St. Clements University

MBA Program
Hong Kong

Management Information System

Assignment (2008)

Suppose you are the IT manager of a Company/Department, and your boss asked you to give a report on the status of your current MIS system and rooms for improvement.

The information required in the report includes:

- A review of your current MIS system and how it helps in the company/departments operation.
- Identify any room of improvement. The improvement can be on streamlining the existing operations so that staff and IT resource can be used more effectively, or the purchase of any software/system components to add new functionalities.
- In either case, you need to compare the costs involved in implementing the enhancements, and the benefits that can be derived by them.

Your report should include the following sections:

1. An Executive Summary
2. Provide a background of your Company/Department, and her core business.
3. Describe the existing MIS infrastructure of your Company/Department, and how they help in day-to-day business operations.
4. Describe how your current MIS system is managed, this can include infrastructure management (for example: install new PCs and network equipments) and operations management (for example: backup of data, software upgrade)
5. Propose improvement(s) for the existing system. It can be better IT resource allocation, or add new systems/applications for new functionalities. You should include a table to show some estimation of the dollar values of the cost and benefit of your improvements. (The improvement can mean reduce cost and generation of new revenue.)
6. Use appropriate diagrams, tables and charts to help your presentation.

The whole essay should be around **2000** words. You are required to quote references.

Due date: July 11, 2008

2008-5-28

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Due date: 30.01, 2009

企业知识管理与应用

祁明

1、知识管理系统概述
2、知识产业与知识型企业
3、知识再造与知识管理历史
4、价值链螺旋上升与7个支柱
5、知识管理技术与平台比较
6、企业知识管理应用案例

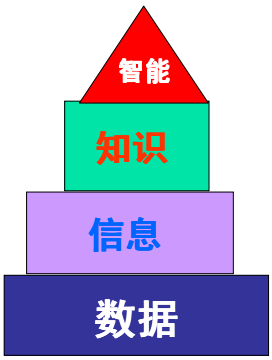
华南理工大学电子商务学院
技术创新管理与工程研究所

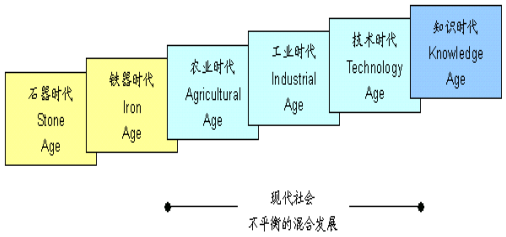
前 言

- 管理地位：管理是生产力！
- 管理职位： CIO/CKO/CEO
- 模仿战略：模仿成功！
- 空白战略：寻求空白点
- 团队战略：没有成功的个人
- 人才战略：一将难求！
- 营销战略：100种方法
- 转折战略：人廉我转
- 知识战略：金点子、创意
- 创新战略：体系、平台、产品

一、知识管理概述

1.1、知识管理时代





表面新闻 → 独特新闻 → 知识新闻

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1.2、知识管理分类

社会知识---社会文化中知识流程与规律；
组织知识---(1) 公司知识管理
(KM of Business)
(2) 非赢利机构知识管理
(KM of Non-profit Org.)
(3) 政府知识管理(KM of G)
(4) 教育与科研机构知识
科学知识------科学知识挖掘、生产、创新。

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1.3 公司知识管理应用

美国The Delphi Group调查发现，65%的美国公司已经实施了知识管理。KPMG公司调查也表明，英国100家大公司中，已有43%的公司开始推行知识管理。IBM就成立了知识管理研究院(The Institute of Knowledge Management,简称IKM).

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1.4 知识管理建设思路

1、将知识管理作为一种公司管理职能，如同公司其他管理活动（人力资源管理、财力管理、战略管理等）一样；

2、将KM视为一种新管理思潮（Management Thought），力图以知识管理以契机再造整个管理科学，在这个新管理科学的指导下全面改革公司管理实践；

3、将知识作为产品生产.

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1.5 知识管理实践内涵

序	知识管理实践	计划比例	实施比例
1	导入新的基于知识的系统	16	14
2	创建新的知识管理角色和任务	9	15
3	企业内部专家技能知识地图	20	18
4	协同工作平台与群件系统	11	33
5	决策支持工具	20	33
6	建立数据仓库和知识库	24	33
7	企业Intranet	25	47

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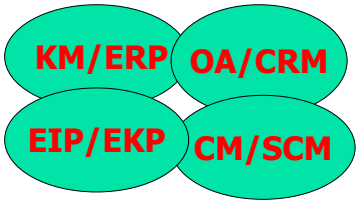
1.6 知识管理的迷惑



工作流----KM
业务过程---OA
企业应用集成--ERP/CRM/SCM

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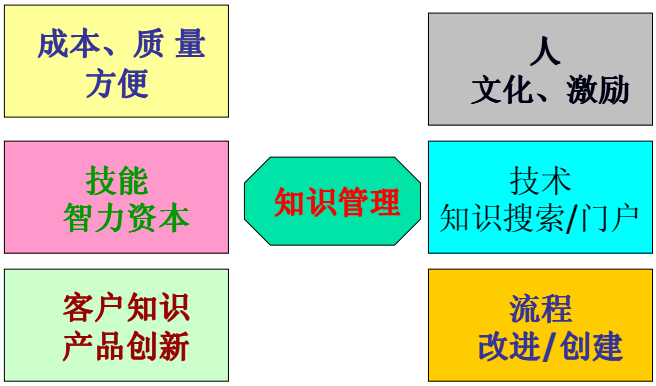
1.7 知识管理驱动力



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1.8 知识与信息比较

信息	知识
独立于行动和决策	与行动和决策密切相关
经过处理改变形态	经过处理改变思维
独立于环境及认为因素	环境及人可改变内涵
容易转让	经过学习才能转让
可复制	无法复制

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1.9知识资源与自然资源比较

自然资源	知识资源
损耗速度快	不会损耗
不可再生	具有再生性
复制成本高	复制成本低
优势递减	优势递增
便于模仿	难以模仿

二、知识产业与知识型企业

2.1 新眼看世界

- 用新眼看世界---知识经济、知识产业、知本家、知识型公司、知识管理、知识生产、知识转化、知识交易；
- 知识型企业-----当企业无形资源超过有形资源，当知识战胜资本时，有关竞争与成功的定义就需要修改（软件注册公司）

2.1.1 世界的观变

- 自70年代初以来，对“未来经济”或“新经济”出现过多种说法。如美国前国家安全事务助理布热金斯基的“电子技术时代”，美国社会学家丹尼尔贝尔的“后工业社会”，美国经济学家斯比特的“信息经济”等等。
- 1990年，联合国研究机构提出了“知识经济”的说法，明确了这种新经济的性质。
- 微软进入“中年”跟随战略、仅windows/office阵地，缺乏创新。

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新世界观 1 -- 向知识资源转变

- 在这个以知识为基础的新世界，知识是经济增长的核心因素。
- 在这个不断变化的世界里，知识已经成为企业竞争的决定因素。
- 在这个不确定是唯一可确定之因素的经济环境中，知识将是企业获得持续竞争优势的最可靠源泉！

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新世界观2---向知识行业转变

- 知识产业已经成为世界经济的主导产业----教育、咨询、文化、设计、管理、艺术、广告、新闻等。
- 商品价值取决于内含的知识价值，而不是原有实体价值。
- 每个行业都必须向知识行业转变，只有这样才能为客户和自己创造更大的价值.

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新世界观 3 --向知识管理转变

- 企业需要从传统的职能管理和资源管理向知识管理转变（OA、ERP、CRM、HRM、MIS）。
- 知识管理能最大限度地积蓄和组织企业的智力资源
- 知识管理能为企业创造面向未来的价值---画圈占地、知识壁垒、能量积蓄、市场观望。
- 知识管理与信息管理、数据管理截然不同。

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2.1.2 每个行业都是知识行业

- 安达信咨询研究

  当发达国家的经济从制造业向以知识为基础的工业和服务业转移时，各种不断变动的市场对公司的形态与种类正产生一种根本性影响。
- 只有落伍的观念，没有落伍的产业。
- 要有善于创新的智慧和改变旧思维的勇气
- 做知识实践（初高中、大学比赛）的先驱者，做知识工人（产品？）。

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2.1.3 知识型企业特征-头脑与心智

工业时代的企业	知识时代的企业
资本密集	知识密集
命令控制结构	共同管理模式）
员工服务于工具	工具服务于员工
重复型工作	知识型工作
资本者占有财富	知识者占有财富
资本是第一驱动力	知识是第一驱动力
大规模生产	大规模定制

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2.1.4 知识管理企业评比

指标	获好评公司名称
企业知识文化成功	英国石油、巴克曼实验室、美国通用电气、惠普公司、卖肯锡公司
知识管理高层支持	IBM公司、世界银行、英国石油、巴克曼实验室、美国通用电气
知识管理产品与服务提供能力	巴克曼实验室、HP公司、毕马威公司、西门子公司、世界银行
企业价值和智力资本最大化的公司	思科公司、通用电气、HP公司、微软公司、世界银行
创造知识环境有效性	英国石油、巴克曼实验室、HP公司、卖肯锡公司、世界银行
建立持续学习文化	安永公司、通用电气、HP、西门子公司、西门子公司
管理客户知识，增加忠诚与价值的有效性	埃森哲公司、巴克曼实验室、美国通用电气、惠普公司、微软公司
管理知识产生股东价值	巴克曼实验室、思科公司、通用电气、HP、Skandia公司

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2.2 知识管理—财富与竞争力

2.2.1 三个角度理解知识管理

1、财富的来源是知识
2、知识工人是战略资产
3、加强知识管理

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2.2.2 生命周期与知识管理

- 企业发展具有两层含义：
  量的增长---资产、销售、盈利、人员等--并购GE/Dell
  质的改善---结构重组(BPR)　　创新能力(南海八镇)
  环境适应（WTO）　　可持续发展（污染）
  学习型组织（源动力）　制度创新等。
- 企业要追求可持续成长，就需要超越特定产品，技术和事业领域的制约；
- 注重自身知识积累

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2.2.3 企业可持续成长与知识创新

- 通过不断产品革新超越某种产品的寿命而持续成长；
- 可通过技术的不断革新，突破某一技术的寿命周期而持续成长
- 可通过产业的追求或转换，跨越特定产业的寿命周期而持续成长
- 可通过制度的创新，使企业保持精神上的年轻

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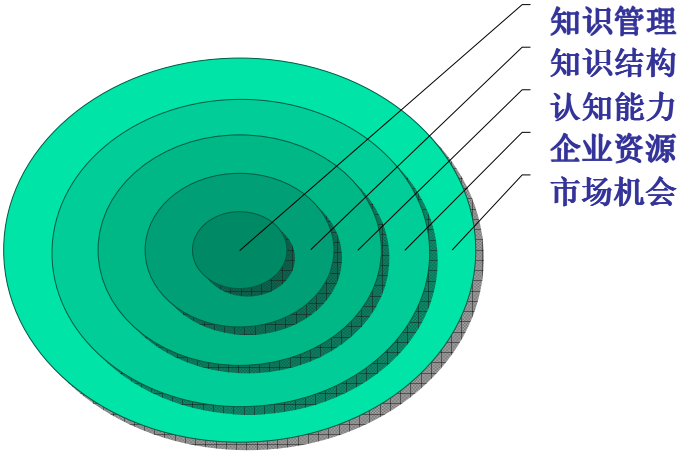
2.2.4 形成竞争力与知识管理



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2.2.5 优化企业经营与知识管理

战略层面	规划企业战略（全员创新战略）	新产品新市场（宝洁、苹果）	改变业务方向（诺基亚、IBM）	知识扩展（菲利普）
战术层面	优化知识的创建、获取分享和使用的效果（80%沉淀）	监控知识的创建获取分享使用过程（防伪、打假）	使合理的知识政策落到实处（45%归个人）	为相关知识创新活动提供资源支持（3000数据库）
运作层面	更好地了解知识应用状况（500强研究）	强化员工的培训和教育（在线终生）	在研究中更好地分享知识（GM汽车联盟）	在线咨询专家网络（特约用户）

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2.2.6 信息技术与知识管理

知识收集的能力	Internet/intranet
知识分类与组织--渠道地图 知识挖掘能力---隐性/私有	数据挖掘DW----CRM应用 商业智能BI------DSS应用 专家系统ES------信息服务
大规模知识分享能力-平台	知识社区—专业区域
知识创新的环境—激励	知识管理系统—协同/交易

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三、企业再造与知识管理历史

3.1 企业需要重塑自我

- 保守旧规则并想改变现状的老牌企业：
  通用汽车（GM）
  IBM　　花旗银行
- 在新环境中找到新规则的新生企业：
  沃尔玛　　微软
  Intel　　SFNB
  盛大网络　　Google
  联想

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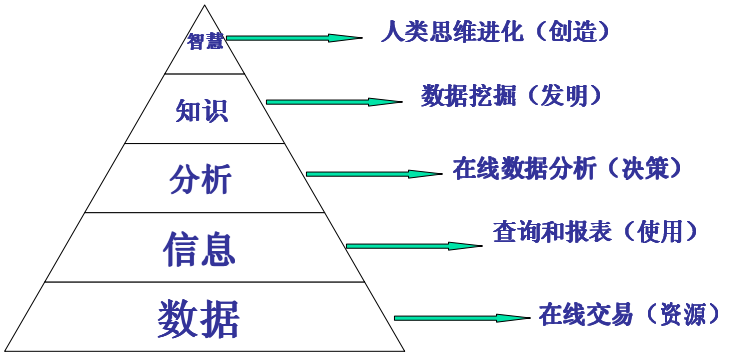
3.1.1 从数据、信息、知识到智慧

- 一个真正的知识型企业不仅需要组织的知识，更需要组织的智慧。



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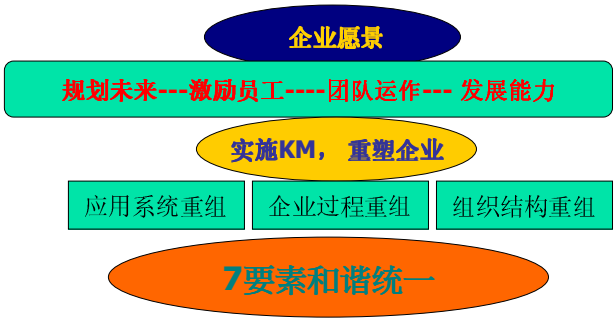
3.1.2 走向转变 远离死亡

- 7S要素模型：结构与团队（BPR、大学）、战略与策略（9+2、231、1+8）、风格与文化（战略、激励）、员工（培训与终身学习）、技能（淡化文凭）、系统与渠道联盟（供应链、价值链）、共享价值观。
- 实施7S步骤：规划未来、激励员工、团队运作、发展能力。



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3.1.3 业务过程重塑与知识管理

传统的工作方式对知识应用和创新的影响

传统工作方式	对于知识应用和创新的影响
•员工对工作过程和目的不了解	•员工工作目的性不强，个人知识难以充分发挥
•员工想法对决策没有重要影响	•阻碍了个人的知识创新意识
•员工动机与愉悦管理者有关	•不能真正面对客户，从而难以集成客户知识
•管理者命令，员工执行，被动；	•使员工怠于思考，而思考是知识创新的前提
•大多数任务是简单化的重复	•员工难以从日常工作中得到提高
•等级式管理，信息传递的僵化渠道	•信息渠道不畅导致了知识分享的困难
•职能"封建"领地	•不同部门的知识难以分享而形成合力

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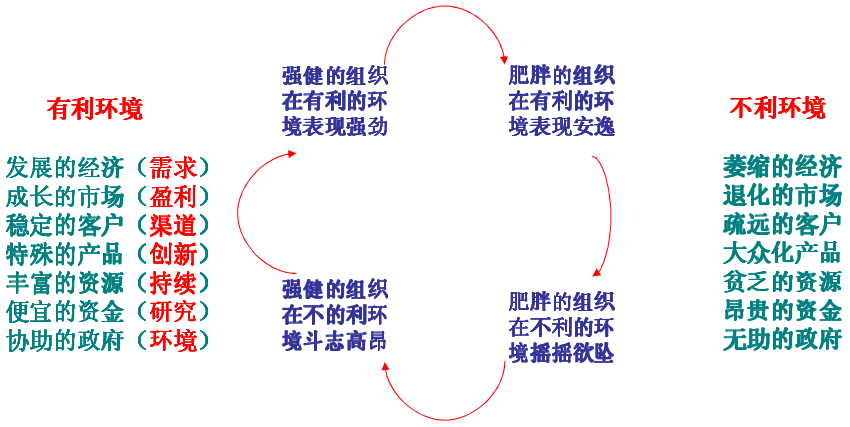
3.1.4 知识管理与组织结构重塑

- 组织状态的循环演变（BPR）



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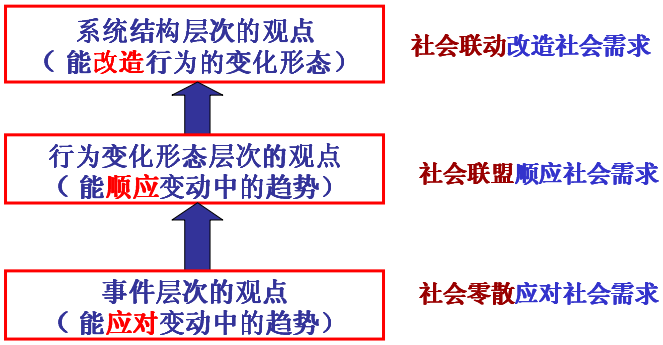
组织状态演变的结构根源

- 行为解释的三个层次



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3.1.5 知识管理与应用系统重塑

现在的企业应用系统	未来的企业应用系统
面向功能	面向过程
部门独立应用	过程性应用
功能性“点对点”集成方式	过程性“总线”集成方式
很少进行重构，且重构复杂	重构是常态，重构相对简便
“制造—销售”方式	“感知—响应”方式
时间战略是竞争优势	时间战略是竞争条件
实时性要求一般	实时性要求很高
以数据库为中心，被动的信息响应	以分散信息为中心，主动信息发布
“计划+需求”驱动	事件驱动
“关系”封闭化	“关系”无界限
狭义的客户（最终顾客、分销商等）	广义的客户
分散的客户管理	统一的客户管理（CRM）
动力：信息应用	动力：知识创新
偏重于信息应用	偏重于知识挖掘
强调信息集成	看重知识集成

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从“过程”角度看企业应用系统演变

- 企业应用系统走过了由强调部门职能向跨部门过程应用，到过程重新整合的这样一个历程：
  - 第5级：业务范围重设计
  - 第4级：业务网络重设计
  - 第3级：业务过程重设计
  - 第2级：集成化应用
  - 第1级：本地化应用
- 由于职能驱动走向过程驱动，企业应用系统的集成模式有了革命性变化。

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从“时间”角度看企业应用系统演变

- “制造与销售”正被“感知与响应”取代。

面向“制造与销售”的企业应用系统	面向“感知与响应”的企业应用系统
注重年度预算性资源规划	动态实时资源规划
“设计、制造、销售”方式	“销售、制造、再设计”方式
面向库存而设计	面向消费者而设计
计划能力强、实时行动能力弱	强的实时反应能力
系统意外处理能力弱	系统擅长管理意外
系统很少重构	系统经常需要重构
存在信息孤岛	完备的信息网络
C/S结构，数据库为中心	业务总线结构，事件驱动
被动的信息响应，询问/问答机制	主动的信息发布，预定/发布机制

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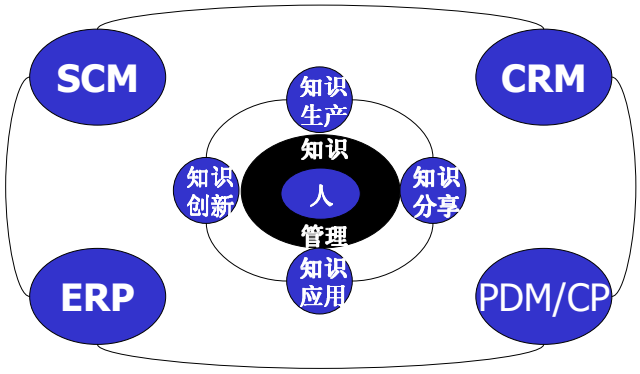
3.1.6 知识管理提升企业应用模式创新



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3.2 知识管理的历史和现实

3.2.1 有关知识的不同理解

	个人层次	团队层次	企业层次	企业外部
显性知识	可以描述的个人知识和经验	团队资源分配规则、资源共享氛围	企业的生产计划方法、战略、策略	合作伙伴的专利产品、竞争性情报
隐性知识	专家议会型经验知识、专利、发明	工作组的协作协同技能与知识分享	文化、价值观、品牌、商标、专利	客户隐含需求、独特设想、建议等

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3.2.2 企业知识的类型和层次

- 智力资产3种类型：
  - ➜内部资产
    知识产权-
    基础资产-文化、管理体系
    渠道、信息系统
  - ➜外部资产
    品牌、市场占有率、满意度
    质量标准、分销、许可证等
  - ➜人力资产
    教育与培训、职业发展、报酬计划、权益、股份制、企业家精神、工作安全等

- 企业知识7个层次：
  - 个人知识—头脑风暴，让员工发表建议
  - 产品知识—用户指南、知识服务
  - 过程知识—设计过程和业务过程知识化
  - 组织记忆—在线知识库和经验库建立
  - 商务环境知识—信息检索
  - 利益相关者知识—供应链
  - 客户知识---客户反馈

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3.2.3 认识企业管理的转变

- 企业管理发展的5个阶段：
  第一代管理：工业时代以所有制为核心
  第二代管理：严格等级制度
  第三代管理：矩阵型组织
  第四代管理：计算机网络为特征
  第五代管理：以“知识网络化”为特征
- 知识时代管理概念性原则：
  1、对等的知识联网；　　2、集成过程
  3、对话式工作；　　4、人类时间与计时；
  5、建立虚拟企业和动态协作。

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3.2.4 企业管理内容与知识管理

管理内容	物流+商流	物流+商流+数据流	物流+商流+信息流	物流+商流+知识流
管理特征	决策过程分散	企业低层次管理	提高决策水平--DSS	知识运用和创新
	信息技术落后	可提高效率	提高管理水平--ERP	隐性知识管理
	信息交流有限		提高管理效率-OA	核心竞争力

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3.2.5 企业管理范围与知识管理

- 企业内“知行分离”阶段—知识工人与劳力工人严格区别
- 企业内“知行合一”阶段---全员知识工作者：日本丰田公司所有人参与知识型活动；
- 价值链“知行合一”阶段---价值链的知识合作与创新：
- 价值网“知行合一”阶段---知识网的知识合作与创新：

40

3.2.6 知识管理的各种概念

- APQC公司—KM是组织采取的有意识战略
- KPMG公司—系统的利用企业内部知识的系统
- Microsoft----即时获取知识并解决问题
- Lotus公司---专家技能、创新能力、响应能力
- K E Sveiby--KM是利用个人和组织的无形资产创造价值的艺术。

知识管理研究的2个角度和2个层次

层次 \ 角度	知识＝对象	知识＝过程
组织层次	企业工程	组织理论
个体层次	知识工程	认知科学

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3.2.7 知识管理的不同模式

知识管理模式的三大模式

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知识管理的不同模式

知识产品的创建、存储、使用、知识库等

促进、鼓励、培育、制度与文化的建立等

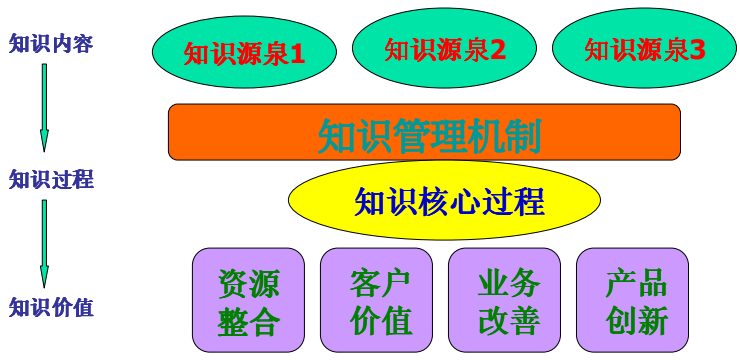
产品中心制知识管理模式（分散短期）

过程中心制知识管理模式（持续集成）

四、价值链螺旋上升与7个支柱

4.1 知识管理也需要平衡

4.1.1 知识管理的本质

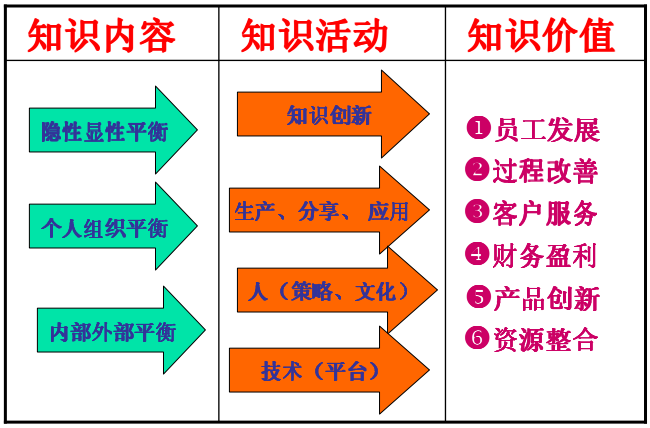


4.1.2 知识管理的“平衡”性分析

- 知识管理是“内容、活动以及价值”的平衡。
  IBM：内容—世界渠道；活动—研究院；价值—18亿
- 知识管理价值计算公式：
  V（KM）＝（内容K＋过程P＋技术T）^{C}
  ＝（知识库量+渠道与活动数量+技术手段数量）^{C}
  C＝分享、激励、制度等。

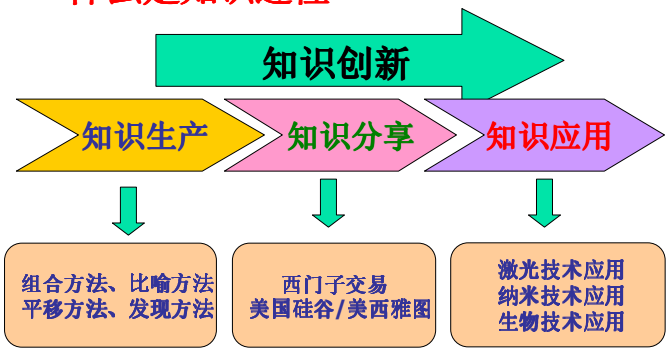
- 平衡：1、隐性与显性的平衡
  2、个人知识与组织知识的平衡
  3、人、流程和技术的平衡
  4、过程平衡—生产/分享/应用
  5、实体和虚体的平衡

4.1.3 知识价值链&联盟



4.2 知识管理的过程管理

4.2.1 什么是知识过程



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4.2.2 知识螺旋模型

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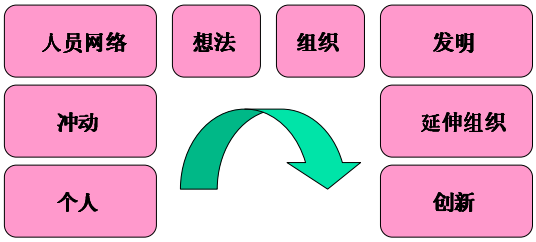
4.2.3 由知识螺旋看知识创新



产生设想、构思框架
组织团队、实现发明

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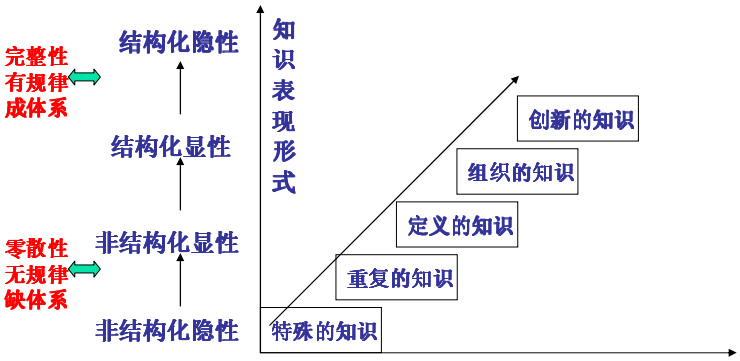
4.2.4知识是这样成熟的

- 知识过程、知识螺旋，其最终目的是知识创新。
- 知识成熟度模型可以描述这种过程。



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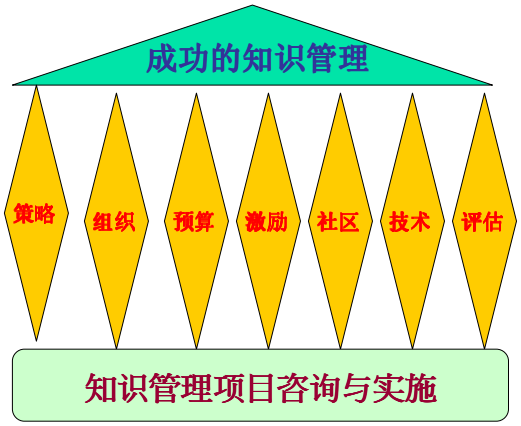
4.3 实施知识管理的7个支柱

策略—战略策略
管理什么
如何管理

组织—机构重组
流程重组

预算—资源预算
资金预算
融资策略

激励—精神奖励
物质奖励
期权奖励
股权奖励



社区—知识采集
知识渠道
团队知识

技术—关键技术
协同平台
保护平台
知识仓库

评估—产权评估
市场评估
效益评估
价值评估

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五、知识管理技术与平台比较

5.1 世界有我更简单

5.1.1你是否为这些现象所困扰

1	寻找资料和利用资料时间严重失调	6	盲目构建知识库，却没得到恰当使用
2	“不务正业”现象很多，很多时间并未花在具有重要价值的工作上	7	新员工加入项目组织，常常无从下手
3	企业信息缺乏交流与整合	8	实践和专家技能的遵循和使用难
4	信息膨胀，知识匮乏	9	响应和满足客户做的不好
5	不知如何应用和保护知识	10	系统众多，却各自为战

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5.1.2 知识管理让世界变得更简单

1	知识管理深深融入你的日常工作之中	5	知识管理能够帮助你快速查取资料、响应客户
2	知识管理给你一个操作知识的统一界面	6	知识管理成为你的数字神经系统
3	知识管理帮助新员工快速成长	7	KM能让你随着每项任务的完成而变得更聪明
4	知识管理能够实现随时随地的个性化培训	8	知识管理能够帮助你从信息中赢取利润

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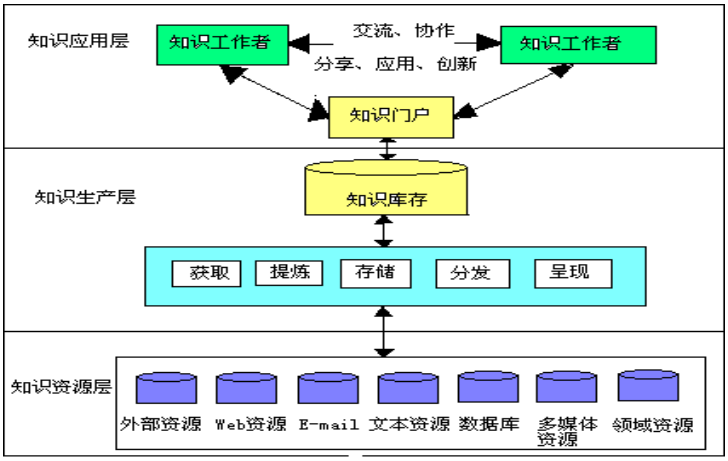
5.2 功能如此多娇

5.2.1知识管理系统的3层模型



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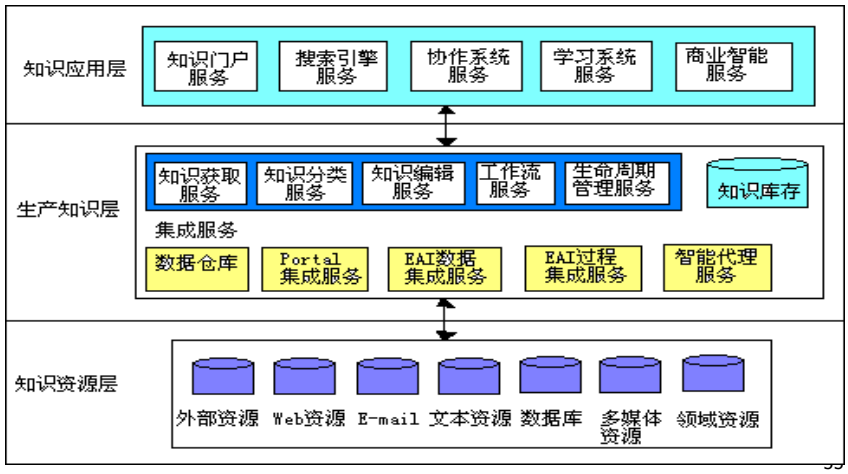
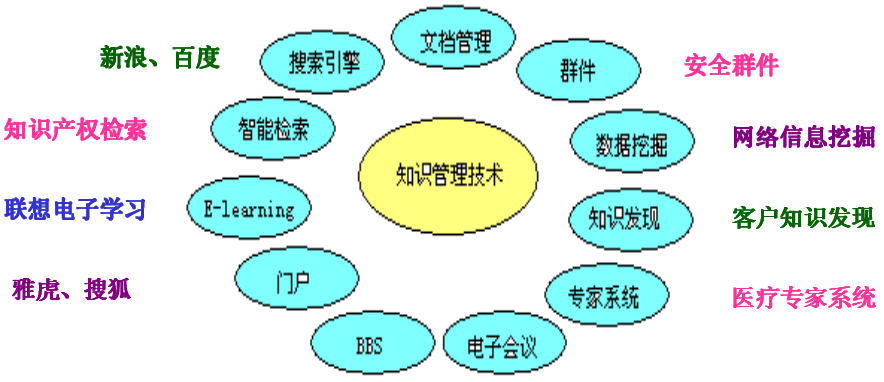
知识管理系统的功能模型



5.2.2 知识管理系统技术分类



大学BBS系统 电子政务会议

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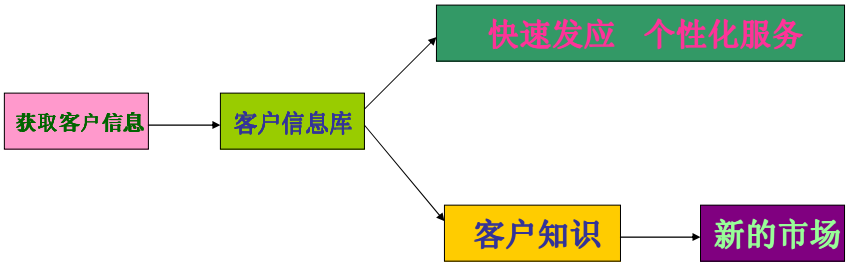
六、企业知识管理体系案例

6.1 CRM构建知识管理系统



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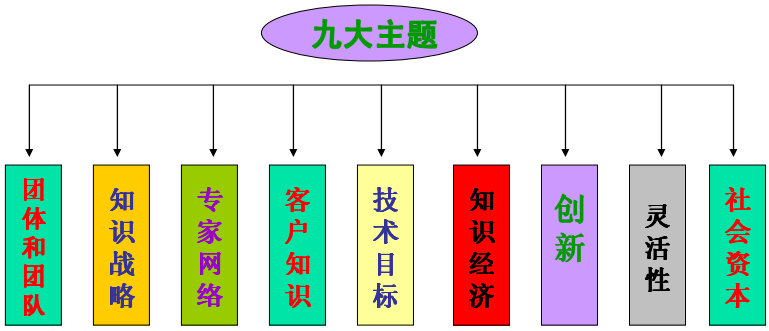
6.2 IBM/KM 研究院



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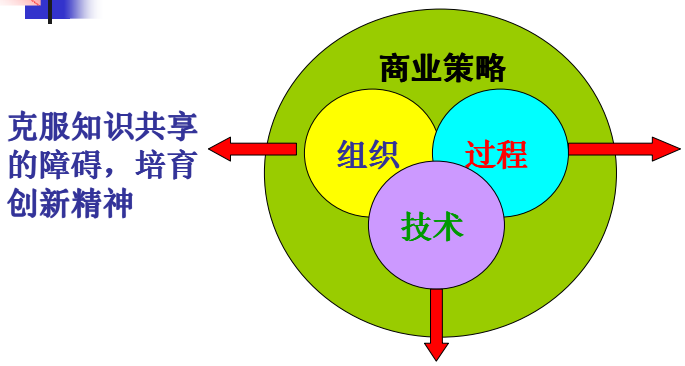
6.3 微软KM体系



克服知识共享的障碍，培育创新精神

保障知识管理与具体的商业过程匹配一致

使人们用熟练的工具进行知识共享活动

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6.4 施乐公司KM战略

- 对知识和最佳业务经验的共享
- 对知识共享责任的宣传
- 积累和利用过去的经验
- 将知识融入产品、服务和生产过程
- 将知识作为产品生产
- 驱动以创新为目的的知识生产
- 建立专家网络
- 建立和挖掘客户的知识库
- 理解和计量知识的价值
- 利用知识资产

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企业知识管理与应用

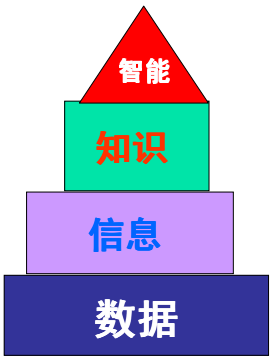
1、知识管理系统概述
2、知识产业与知识型企业
3、知识再造与知识管理历史
4、价值链螺旋上升与7个支柱
5、知识管理技术与平台比较
6、企业知识管理应用案例

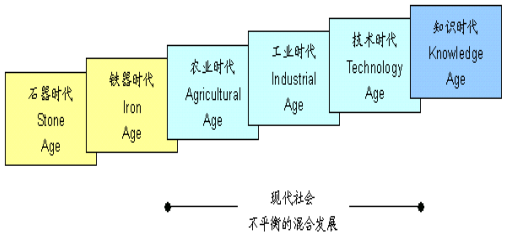
前 言

- 管理地位：管理是生产力！
- 管理职位： CIO/CKO/CEO
- 模仿战略：模仿成功！
- 空白战略：寻求空白点
- 团队战略：没有成功的个人
- 人才战略：一将难求！
- 营销战略：100种方法
- 转折战略：人廉我转
- 知识战略：金点子、创意
- 创新战略：体系、平台、产品

一、知识管理概述

1.1、知识管理时代





表面新闻 → 独特新闻 → 知识新闻

3

1.2、知识管理分类

社会知识---社会文化中知识流程与规律；
组织知识---(1) 公司知识管理
(KM of Business)
(2) 非赢利机构知识管理
(KM of Non-profit Org.)
(3) 政府知识管理(KM of G)
(4) 教育与科研机构知识
科学知识------科学知识挖掘、生产、创新。

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1.3 公司知识管理应用

美国The Delphi Group调查发现，65%的美国公司已经实施了知识管理。KPMG公司调查也表明，英国100家大公司中，已有43%的公司开始推行知识管理。IBM就成立了知识管理研究院(The Institute of Knowledge Management,简称IKM).

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1.4 知识管理建设思路

1、将知识管理作为一种公司管理职能，如同公司其他管理活动（人力资源管理、财力管理、战略管理等）一样；

2、将KM视为一种新管理思潮（Management Thought），力图以知识管理以契机再造整个管理科学，在这个新管理科学的指导下全面改革公司管理实践；

3、将知识作为产品生产.

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1.5 知识管理实践内涵

序	知识管理实践	计划比例	实施比例
1	导入新的基于知识的系统	16	14
2	创建新的知识管理角色和任务	9	15
3	企业内部专家技能知识地图	20	18
4	协同工作平台与群件系统	11	33
5	决策支持工具	20	33
6	建立数据仓库和知识库	24	33
7	企业Intranet	25	47

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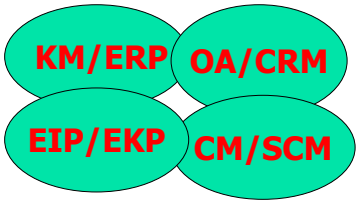
1.6 知识管理的迷惑



工作流----KM
业务过程---OA
企业应用集成--ERP/CRM/SCM

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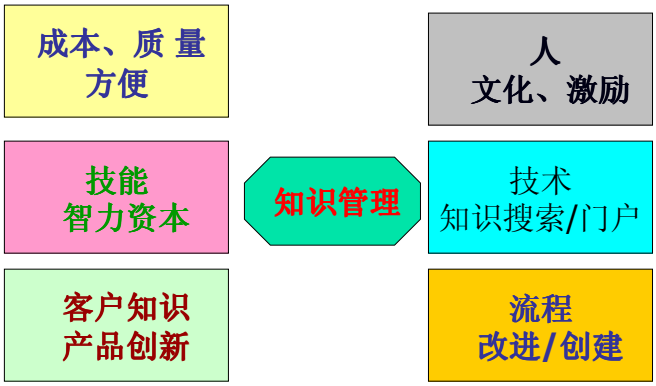
1.7 知识管理驱动力



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1.8 知识与信息比较

信息	知识
独立于行动和决策	与行动和决策密切相关
经过处理改变形态	经过处理改变思维
独立于环境及认为因素	环境及人可改变内涵
容易转让	经过学习才能转让
可复制	无法复制

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1.9知识资源与自然资源比较

自然资源	知识资源
损耗速度快	不会损耗
不可再生	具有再生性
复制成本高	复制成本低
优势递减	优势递增
便于模仿	难以模仿

二、知识产业与知识型企业

2.1 新眼看世界

- 用新眼看世界---知识经济、知识产业、知本家、知识型公司、知识管理、知识生产、知识转化、知识交易；
- 知识型企业-----当企业无形资源超过有形资源，当知识战胜资本时，有关竞争与成功的定义就需要修改（软件注册公司）

2.1.1 世界的观变

- 自70年代初以来，对“未来经济”或“新经济”出现过多种说法。如美国前国家安全事务助理布热金斯基的“电子技术时代”，美国社会学家丹尼尔贝尔的“后工业社会”，美国经济学家斯比特的“信息经济”等等。
- 1990年，联合国研究机构提出了“知识经济”的说法，明确了这种新经济的性质。
- 微软进入“中年”跟随战略、仅windows/office阵地，缺乏创新。

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新世界观 1 -- 向知识资源转变

- 在这个以知识为基础的新世界，知识是经济增长的核心因素。
- 在这个不断变化的世界里，知识已经成为企业竞争的决定因素。
- 在这个不确定是唯一可确定之因素的经济环境中，知识将是企业获得持续竞争优势的最可靠源泉！

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新世界观2---向知识行业转变

- 知识产业已经成为世界经济的主导产业----教育、咨询、文化、设计、管理、艺术、广告、新闻等。
- 商品价值取决于内含的知识价值，而不是原有实体价值。
- 每个行业都必须向知识行业转变，只有这样才能为客户和自己创造更大的价值.

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新世界观 3 --向知识管理转变

- 企业需要从传统的职能管理和资源管理向知识管理转变（OA、ERP、CRM、HRM、MIS）。
- 知识管理能最大限度地积蓄和组织企业的智力资源
- 知识管理能为企业创造面向未来的价值---画圈占地、知识壁垒、能量积蓄、市场观望。
- 知识管理与信息管理、数据管理截然不同。

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2.1.2 每个行业都是知识行业

- 安达信咨询研究

  当发达国家的经济从制造业向以知识为基础的工业和服务业转移时，各种不断变动的市场对公司的形态与种类正产生一种根本性影响。
- 只有落伍的观念，没有落伍的产业。
- 要有善于创新的智慧和改变旧思维的勇气
- 做知识实践（初高中、大学比赛）的先驱者，做知识工人（产品？）。

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2.1.3 知识型企业特征-头脑与心智

工业时代的企业	知识时代的企业
资本密集	知识密集
命令控制结构	共同管理模式）
员工服务于工具	工具服务于员工
重复型工作	知识型工作
资本者占有财富	知识者占有财富
资本是第一驱动力	知识是第一驱动力
大规模生产	大规模定制

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2.1.4 知识管理企业评比

指标	获好评公司名称
企业知识文化成功	英国石油、巴克曼实验室、美国通用电气、惠普公司、卖肯锡公司
知识管理高层支持	IBM公司、世界银行、英国石油、巴克曼实验室、美国通用电气
知识管理产品与服务提供能力	巴克曼实验室、HP公司、毕马威公司、西门子公司、世界银行
企业价值和智力资本最大化的公司	思科公司、通用电气、HP公司、微软公司、世界银行
创造知识环境有效性	英国石油、巴克曼实验室、HP公司、卖肯锡公司、世界银行
建立持续学习文化	安永公司、通用电气、HP、西门子公司、西门子公司
管理客户知识，增加忠诚与价值的有效性	埃森哲公司、巴克曼实验室、美国通用电气、惠普公司、微软公司
管理知识产生股东价值	巴克曼实验室、思科公司、通用电气、HP、Skandia公司

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2.2 知识管理—财富与竞争力

2.2.1 三个角度理解知识管理

1、财富的来源是知识
2、知识工人是战略资产
3、加强知识管理

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2.2.2 生命周期与知识管理

- 企业发展具有两层含义：
  量的增长---资产、销售、盈利、人员等--并购GE/Dell
  质的改善---结构重组(BPR)　　创新能力(南海八镇)
  环境适应（WTO）　　可持续发展（污染）
  学习型组织（源动力）　制度创新等。
- 企业要追求可持续成长，就需要超越特定产品，技术和事业领域的制约；
- 注重自身知识积累

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2.2.3 企业可持续成长与知识创新

- 通过不断产品革新超越某种产品的寿命而持续成长；
- 可通过技术的不断革新，突破某一技术的寿命周期而持续成长
- 可通过产业的追求或转换，跨越特定产业的寿命周期而持续成长
- 可通过制度的创新，使企业保持精神上的年轻

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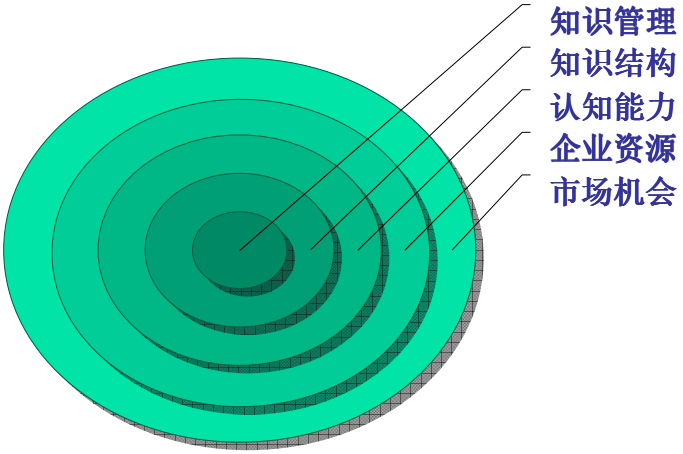
2.2.4 形成竞争力与知识管理



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2.2.5 优化企业经营与知识管理

战略层面	规划企业战略（全员创新战略）	新产品新市场（宝洁、苹果）	改变业务方向（诺基亚、IBM）	知识扩展（菲利普）
战术层面	优化知识的创建、获取分享和使用的效果（80%沉淀）	监控知识的创建获取分享使用过程（防伪、打假）	使合理的知识政策落到实处（45%归个人）	为相关知识创新活动提供资源支持（3000数据库）
运作层面	更好地了解知识应用状况（500强研究）	强化员工的培训和教育（在线终生）	在研究中更好地分享知识（GM汽车联盟）	在线咨询专家网络（特约用户）

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2.2.6 信息技术与知识管理

知识收集的能力	Internet/intranet
知识分类与组织--渠道地图 知识挖掘能力---隐性/私有	数据挖掘DW----CRM应用 商业智能BI------DSS应用 专家系统ES------信息服务
大规模知识分享能力-平台	知识社区—专业区域
知识创新的环境—激励	知识管理系统—协同/交易

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三、企业再造与知识管理历史

3.1 企业需要重塑自我

- 保守旧规则并想改变现状的老牌企业：
  通用汽车（GM）
  IBM　　花旗银行
- 在新环境中找到新规则的新生企业：
  沃尔玛　　微软
  Intel　　SFNB
  盛大网络　　Google
  联想

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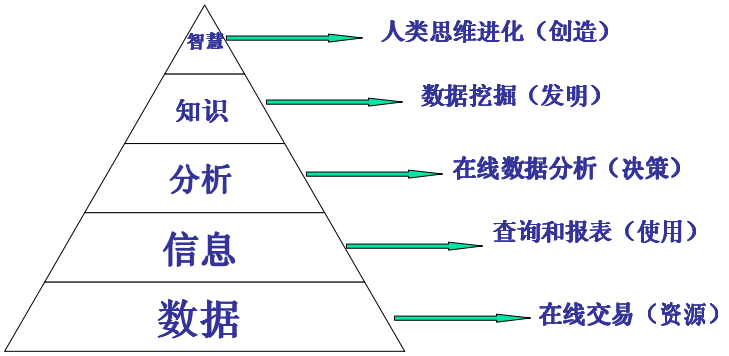
3.1.1 从数据、信息、知识到智慧

- 一个真正的知识型企业不仅需要组织的知识，更需要组织的智慧。



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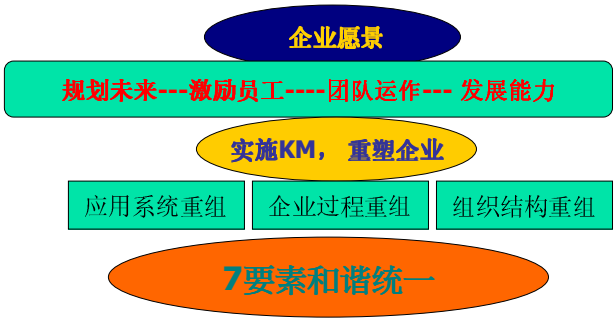
3.1.2 走向转变 远离死亡

- 7S要素模型：结构与团队（BPR、大学）、战略与策略（9+2、231、1+8）、风格与文化（战略、激励）、员工（培训与终身学习）、技能（淡化文凭）、系统与渠道联盟（供应链、价值链）、共享价值观。
- 实施7S步骤：规划未来、激励员工、团队运作、发展能力。



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3.1.3 业务过程重塑与知识管理

传统的工作方式对知识应用和创新的影响

传统工作方式	对于知识应用和创新的影响
•员工对工作过程和目的不了解	•员工工作目的性不强，个人知识难以充分发挥
•员工想法对决策没有重要影响	•阻碍了个人的知识创新意识
•员工动机与愉悦管理者有关	•不能真正面对客户，从而难以集成客户知识
•管理者命令，员工执行，被动；	•使员工怠于思考，而思考是知识创新的前提
•大多数任务是简单化的重复	•员工难以从日常工作中得到提高
•等级式管理，信息传递的僵化渠道	•信息渠道不畅导致了知识分享的困难
•职能"封建"领地	•不同部门的知识难以分享而形成合力

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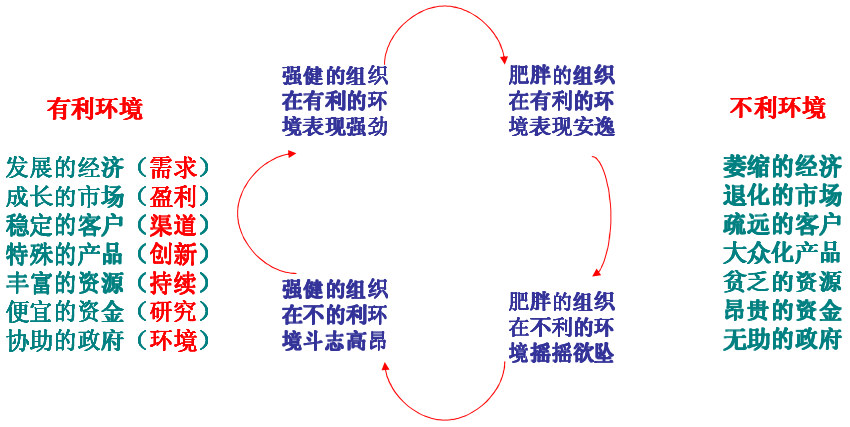
3.1.4 知识管理与组织结构重塑

- 组织状态的循环演变（BPR）



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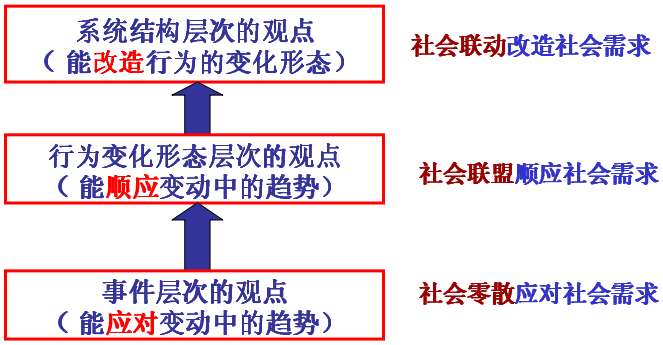
组织状态演变的结构根源

- 行为解释的三个层次



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3.1.5 知识管理与应用系统重塑

现在的企业应用系统	未来的企业应用系统
面向功能	面向过程
部门独立应用	过程性应用
功能性“点对点”集成方式	过程性“总线”集成方式
很少进行重构，且重构复杂	重构是常态，重构相对简便
“制造—销售”方式	“感知—响应”方式
时间战略是竞争优势	时间战略是竞争条件
实时性要求一般	实时性要求很高
以数据库为中心，被动的信息响应	以分散信息为中心，主动信息发布
“计划+需求”驱动	事件驱动
“关系”封闭化	“关系”无界限
狭义的客户（最终顾客、分销商等）	广义的客户
分散的客户管理	统一的客户管理（CRM）
动力：信息应用	动力：知识创新
偏重于信息应用	偏重于知识挖掘
强调信息集成	看重知识集成

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从“过程”角度看企业应用系统演变

- 企业应用系统走过了由强调部门职能向跨部门过程应用，到过程重新整合的这样一个历程：
  - 第5级：业务范围重设计
  - 第4级：业务网络重设计
  - 第3级：业务过程重设计
  - 第2级：集成化应用
  - 第1级：本地化应用
- 由于职能驱动走向过程驱动，企业应用系统的集成模式有了革命性变化。

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从“时间”角度看企业应用系统演变

- “制造与销售”正被“感知与响应”取代。

面向“制造与销售”的企业应用系统	面向“感知与响应”的企业应用系统
注重年度预算性资源规划	动态实时资源规划
“设计、制造、销售”方式	“销售、制造、再设计”方式
面向库存而设计	面向消费者而设计
计划能力强、实时行动能力弱	强的实时反应能力
系统意外处理能力弱	系统擅长管理意外
系统很少重构	系统经常需要重构
存在信息孤岛	完备的信息网络
C/S结构，数据库为中心	业务总线结构，事件驱动
被动的信息响应，询问/问答机制	主动的信息发布，预定/发布机制

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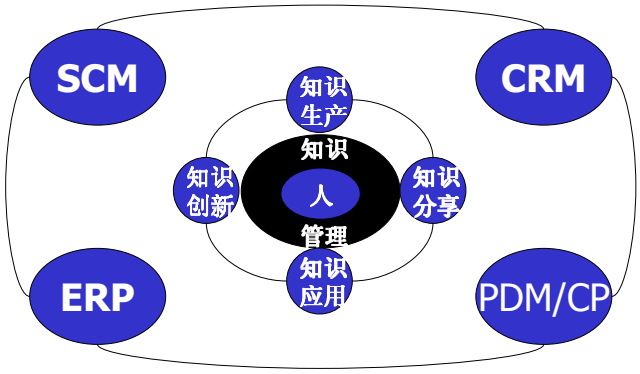
3.1.6 知识管理提升企业应用模式创新



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3.2 知识管理的历史和现实

3.2.1 有关知识的不同理解

	个人层次	团队层次	企业层次	企业外部
显性知识	可以描述的个人知识和经验	团队资源分配规则、资源共享氛围	企业的生产计划方法、战略、策略	合作伙伴的专利产品、竞争性情报
隐性知识	专家议会型经验知识、专利、发明	工作组的协作协同技能与知识分享	文化、价值观、品牌、商标、专利	客户隐含需求、独特设想、建议等

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3.2.2 企业知识的类型和层次

- 智力资产3种类型：
  - ➜内部资产
    知识产权-
    基础资产-文化、管理体系
    渠道、信息系统
  - ➜外部资产
    品牌、市场占有率、满意度
    质量标准、分销、许可证等
  - ➜人力资产
    教育与培训、职业发展、报酬计划、权益、股份制、企业家精神、工作安全等

- 企业知识7个层次：
  - 个人知识—头脑风暴，让员工发表建议
  - 产品知识—用户指南、知识服务
  - 过程知识—设计过程和业务过程知识化
  - 组织记忆—在线知识库和经验库建立
  - 商务环境知识—信息检索
  - 利益相关者知识—供应链
  - 客户知识---客户反馈

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3.2.3 认识企业管理的转变

- 企业管理发展的5个阶段：
  第一代管理：工业时代以所有制为核心
  第二代管理：严格等级制度
  第三代管理：矩阵型组织
  第四代管理：计算机网络为特征
  第五代管理：以“知识网络化”为特征
- 知识时代管理概念性原则：
  1、对等的知识联网；　　2、集成过程
  3、对话式工作；　　4、人类时间与计时；
  5、建立虚拟企业和动态协作。

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3.2.4 企业管理内容与知识管理

管理内容	物流+商流	物流+商流+数据流	物流+商流+信息流	物流+商流+知识流
管理特征	决策过程分散	企业低层次管理	提高决策水平--DSS	知识运用和创新
	信息技术落后	可提高效率	提高管理水平--ERP	隐性知识管理
	信息交流有限		提高管理效率-OA	核心竞争力

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3.2.5 企业管理范围与知识管理

- 企业内“知行分离”阶段—知识工人与劳力工人严格区别
- 企业内“知行合一”阶段---全员知识工作者：日本丰田公司所有人参与知识型活动；
- 价值链“知行合一”阶段---价值链的知识合作与创新：
- 价值网“知行合一”阶段---知识网的知识合作与创新：

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3.2.6 知识管理的各种概念

- APQC公司—KM是组织采取的有意识战略
- KPMG公司—系统的利用企业内部知识的系统
- Microsoft----即时获取知识并解决问题
- Lotus公司---专家技能、创新能力、响应能力
- K E Sveiby--KM是利用个人和组织的无形资产创造价值的艺术。

知识管理研究的2个角度和2个层次

层次 \ 角度	知识＝对象	知识＝过程
组织层次	企业工程	组织理论
个体层次	知识工程	认知科学

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3.2.7 知识管理的不同模式

知识管理模式的三大模式

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知识管理的不同模式

知识产品的创建、存储、使用、知识库等

促进、鼓励、培育、制度与文化的建立等

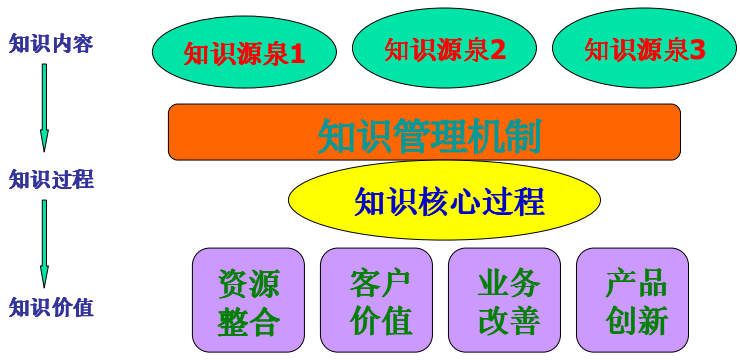
产品中心制知识管理模式（分散短期）

过程中心制知识管理模式（持续集成）

四、价值链螺旋上升与7个支柱

4.1 知识管理也需要平衡

4.1.1 知识管理的本质

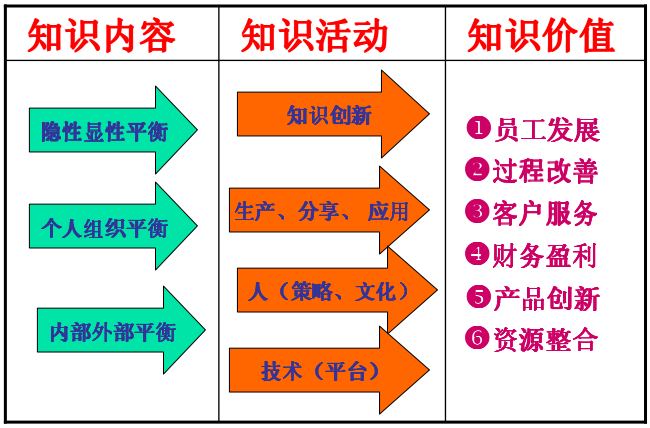


4.1.2 知识管理的“平衡”性分析

- 知识管理是“内容、活动以及价值”的平衡。
  IBM：内容—世界渠道；活动—研究院；价值—18亿
- 知识管理价值计算公式：
  V（KM）＝（内容K＋过程P＋技术T）^{C}
  ＝（知识库量+渠道与活动数量+技术手段数量）^{C}
  C＝分享、激励、制度等。

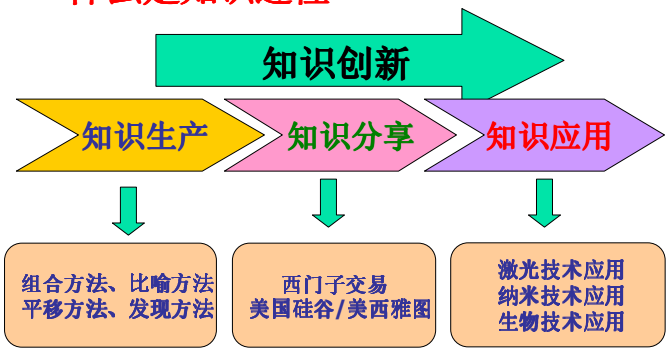
- 平衡：1、隐性与显性的平衡
  2、个人知识与组织知识的平衡
  3、人、流程和技术的平衡
  4、过程平衡—生产/分享/应用
  5、实体和虚体的平衡

4.1.3 知识价值链&联盟



4.2 知识管理的过程管理

4.2.1 什么是知识过程



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4.2.2 知识螺旋模型

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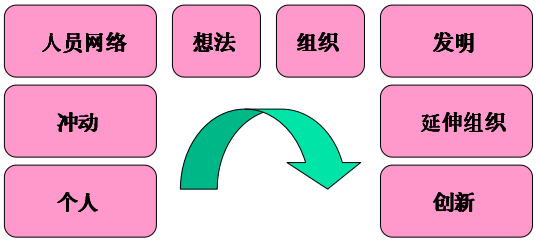
4.2.3 由知识螺旋看知识创新



产生设想、构思框架
组织团队、实现发明

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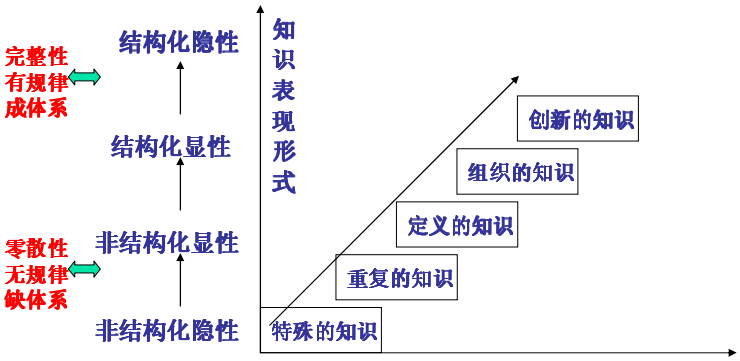
4.2.4知识是这样成熟的

- 知识过程、知识螺旋，其最终目的是知识创新。
- 知识成熟度模型可以描述这种过程。



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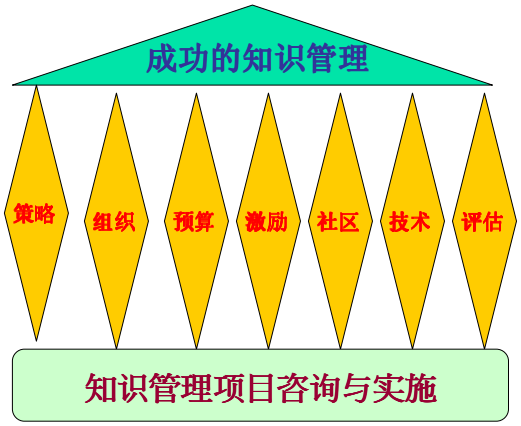
4.3 实施知识管理的7个支柱

策略—战略策略
管理什么
如何管理

组织—机构重组
流程重组

预算—资源预算
资金预算
融资策略

激励—精神奖励
物质奖励
期权奖励
股权奖励



社区—知识采集
知识渠道
团队知识

技术—关键技术
协同平台
保护平台
知识仓库

评估—产权评估
市场评估
效益评估
价值评估

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五、知识管理技术与平台比较

5.1 世界有我更简单

5.1.1你是否为这些现象所困扰

1	寻找资料和利用资料时间严重失调	6	盲目构建知识库，却没得到恰当使用
2	“不务正业”现象很多，很多时间并未花在具有重要价值的工作上	7	新员工加入项目组织，常常无从下手
3	企业信息缺乏交流与整合	8	实践和专家技能的遵循和使用难
4	信息膨胀，知识匮乏	9	响应和满足客户做的不好
5	不知如何应用和保护知识	10	系统众多，却各自为战

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5.1.2 知识管理让世界变得更简单

1	知识管理深深融入你的日常工作之中	5	知识管理能够帮助你快速查取资料、响应客户
2	知识管理给你一个操作知识的统一界面	6	知识管理成为你的数字神经系统
3	知识管理帮助新员工快速成长	7	KM能让你随着每项任务的完成而变得更聪明
4	知识管理能够实现随时随地的个性化培训	8	知识管理能够帮助你从信息中赢取利润

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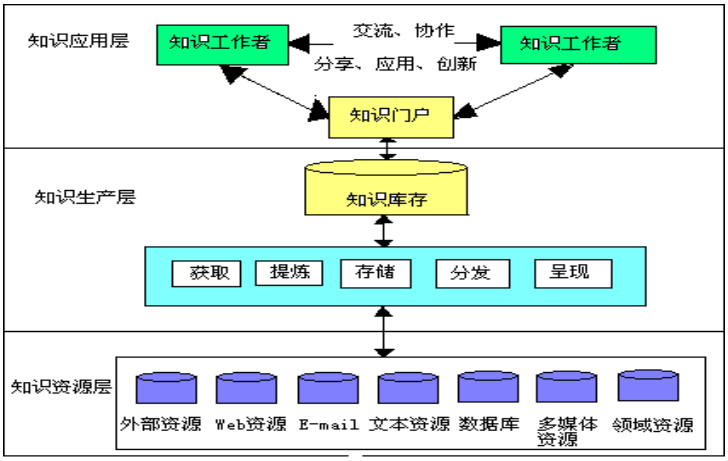
5.2 功能如此多娇

5.2.1知识管理系统的3层模型



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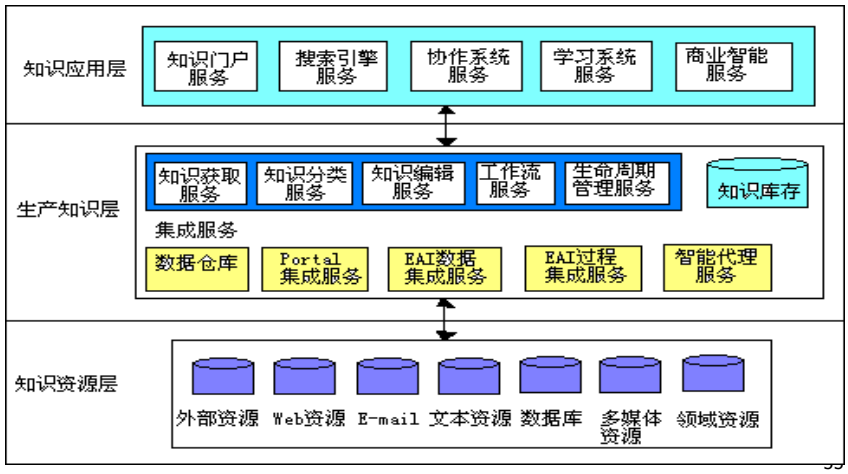
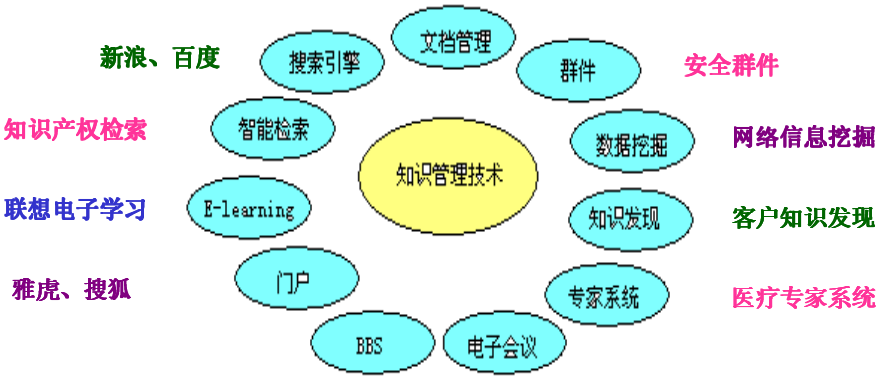
知识管理系统的功能模型



5.2.2 知识管理系统技术分类



大学BBS系统 电子政务会议

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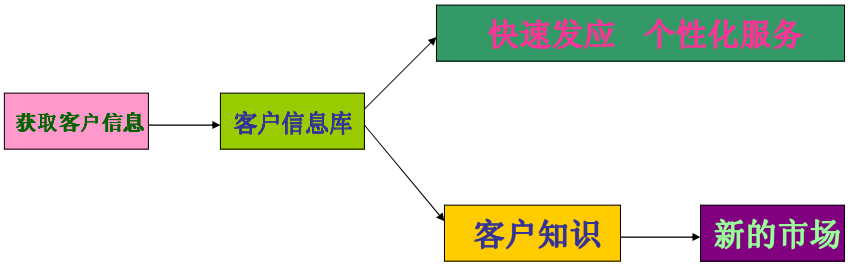
六、企业知识管理体系案例

6.1 CRM构建知识管理系统



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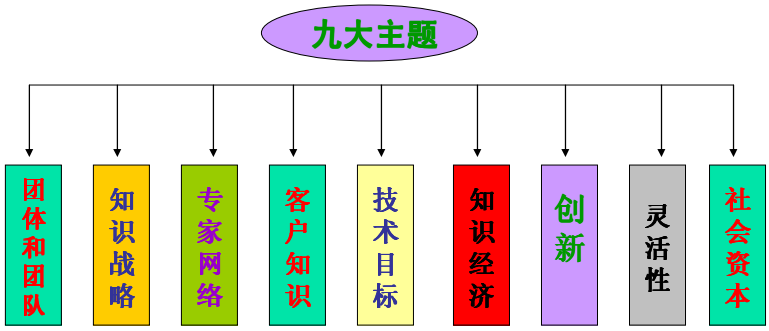
6.2 IBM/KM 研究院



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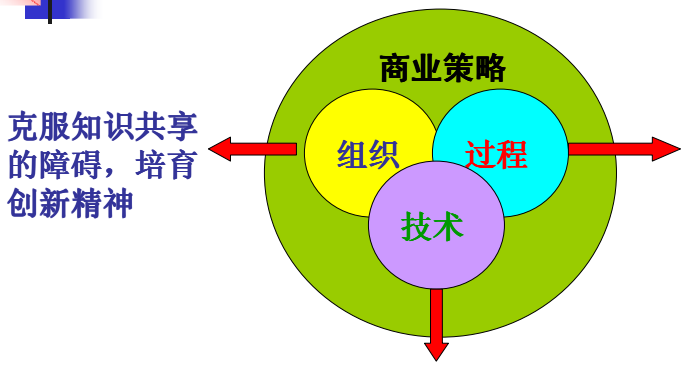
6.3 微软KM体系



克服知识共享的障碍，培育创新精神

保障知识管理与具体的商业过程匹配一致

使人们用熟练的工具进行知识共享活动

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6.4 施乐公司KM战略

- 对知识和最佳业务经验的共享
- 对知识共享责任的宣传
- 积累和利用过去的经验
- 将知识融入产品、服务和生产过程
- 将知识作为产品生产
- 驱动以创新为目的的知识生产
- 建立专家网络
- 建立和挖掘客户的知识库
- 理解和计量知识的价值
- 利用知识资产

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Management Information System

St. Clements University
MBA Program
May, 2008
Hong Kong

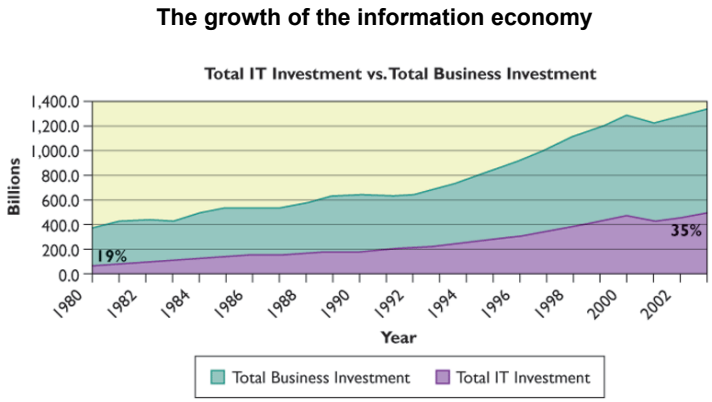
Table of Contents

1. The role of information systems

Rise of the Information Economy - 1

- Rise of the Information Economy have altered the business environment.
  - Knowledge- and information-based economies
  - New products and services
  - Knowledge: a central productive and strategic asset
  - Time-based competition
  - Shorter product life
  - Turbulent environment
  - Limited employee knowledge base

Rise of the Information Economy - 2

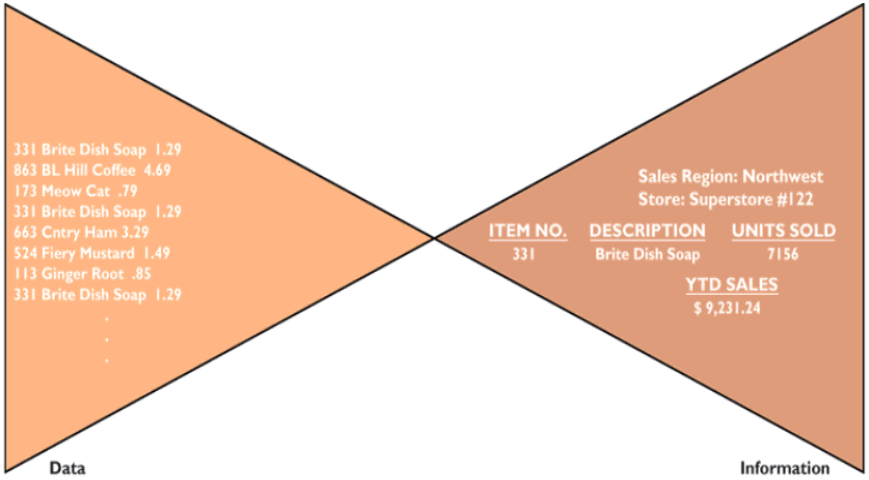


Source: Based on data in U.S. Department of Commerce, Bureau of Economic Analysis, National Income and Product Accounts, Tables 5.2 and 5.8, 2003.

What Is an Information System?

- A set of interrelated components that collect (or retrieve), process, store, and distribute information to support decision making and control in an organization.
- What is the difference between ***information*** and ***data***?
  - **Data:** Streams of raw facts representing events such as business transactions.
  - **Information:** Clusters of data that are meaningful and useful to human beings.

Data and Information



What Is an Information System?

Formal Systems

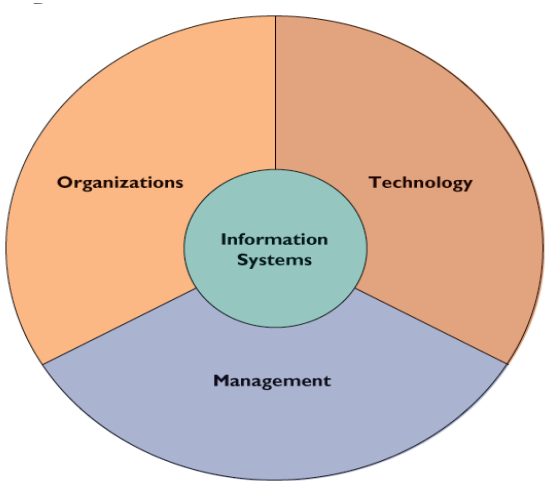
- Fixed definitions of data and procedures for collecting, storing, processing, disseminating, and using these data

Can be computer-based or manual

Computer-based Information Systems

- Use computer hardware and software to process and disseminate information

Information systems are more than computers



A Business Perspective on Information Systems

- **Information systems literacy**: Broad-based understanding of information systems that includes behavioral knowledge about organizations and individuals using information systems and technical knowledge about computers.
- **Computer literacy**: Knowledge about information technology, focusing on understanding how computer-based technologies work.

Information Technology (IT) Infrastructure

- Computer hardware
- Computer software
- Storage technology
- Communications technology

The Challenges of Information Systems: Key Management issues - 1

Positive Impacts of Information Systems

- Faster calculations and paperwork
- Analysis of customer purchase patterns and preferences
- More efficient business services
- Instant global distribution of information

The Challenges of Information Systems: Key Management issues - 2

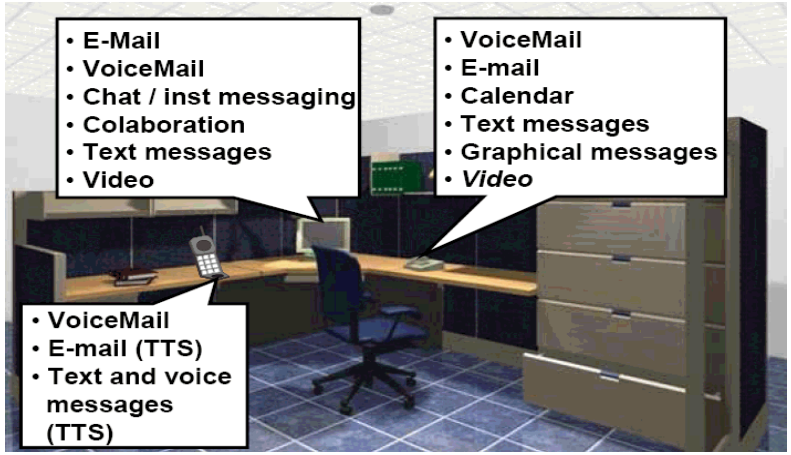
Negative Impacts of Information Systems

- Automation leading to job elimination
- Privacy concerns
- System outages and shutdowns
- Health problems, repetitive stress injury
- Illegal distribution of intellectual property

2. Hardware and Software in the Enterprise

Example of today's work environment - 1

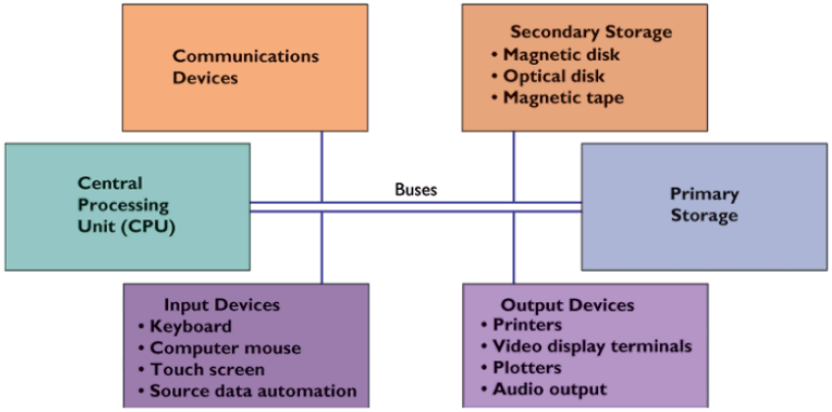
- Three communication devices: PC, desk phone, mobile



Example of today's work environment - 2

Computer Hardware and Information Technology Infrastructure - 1

- Hardware components of a computer system



Computer Hardware and Information Technology Infrastructure - 2

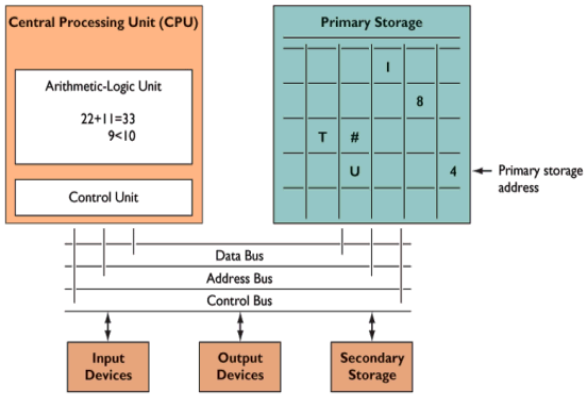
The Computer System

- **Bit**
  - Binary digit
  - Represents 0 or 1
- **Byte**
  - String of eight bits
  - Stores one number, symbol, character, part of picture

Computer Hardware and Information Technology Infrastructure - 3

The Computer System

- **The Central Processing Unit (CPU)**
  - Controls other parts of computer
- **Arithmetic-logic unit**
  - Performs principle logical/mathematical operations
- **Control unit**
  - Coordinates other parts, such as reading a stored program



Computer Hardware and Information Technology Infrastructure - 4

The Computer System

- **Primary Storage**
  - Located near CPU
  - Stores all or part of active software program
  - Stores data the program is using
  - Composed of semi-conductors
  - RAM (random access memory): Used for short-term, temporary storage
  - ROM (read-only memory): Semiconductor memory chips with program instructions

Computer Hardware and Information Technology Infrastructure - 5

The Computer System

- **Secondary Storage Technology**
  - Used for relatively long-term storage of data outside CPU
  - Magnetic disk: floppies, hard disks, RAID
  - Flash memory
  - Optical disk: CD-ROM, CD-RW, DVD
  - Magnetic tape
  - Storage networking: direct-attached storage; network-attached storage; storage area networks

Computer Hardware and Information Technology Infrastructure - 6

Hierarchy of Memory Capacity

- Kilobyte (KB): approximately one thousand bytes.
- Megabyte (MB): approximately one million bytes (1,048,576 bytes, or 1,024 x 1,024).
- Gigabyte (GB): actually 1,073,741,824 bytes (1,024 x 1,024 x 1,024 bytes).
- Terabyte: One trillion bytes, 10^{12} bytes.
- Petabyte: Approximately 10^{15} bytes.
- Exabyte: Approximately 10^{18} bytes.

Computer Hardware and Information Technology Infrastructure - 7

A storage area network (SAN)

Computer Hardware and Information Technology Infrastructure - 8

The Computer System

- **Input Devices**
  - Keyboard and mouse
  - Touch screen
  - Optical character recognition
  - Magnetic ink character recognition (MICR)
  - Pen-based input
  - Digital scanner
  - Audio input
  - Radio-frequency identification (RFID)

Computer Hardware and Information Technology Infrastructure - 9

The Computer System

- **Output Devices**
  - Cathode-ray tube (CRT)
  - LCD Panel
  - Printers
  - Audio output

Classifying Computers

- **Mainframe:** Largest computer, largest multi-user systems, handles massive amounts of data; used for large business, scientific, military applications.

- **Workstation:** More powerful desktop computer used for computation-intense tasks. A midrange systems multi-user system.
- **Personal computer**: Portable or desktop microcomputer. A single user system.

Types of Software

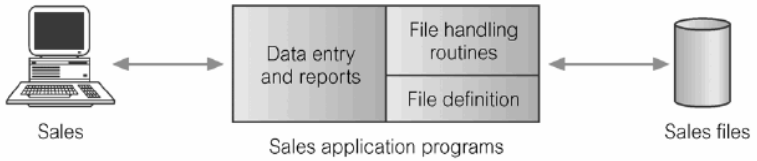
- **Software program:** A series of statements or instructions to the computer
- Two major types of software:
  - **System software**
    - Generalized programs that manage the computer's resources
    - For example, the Windows family of Operating Systems
  - **Application software**
    - Programs written for or by users to perform a specific task.
    - For example, Word,Excel, Powerpoint

3. Database Management Systems

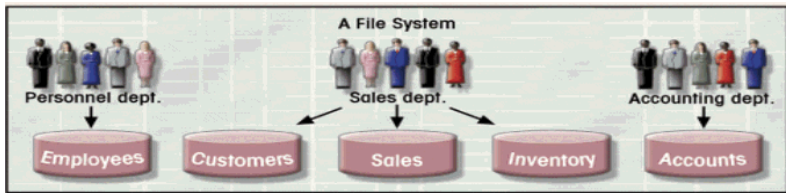
File Systems - 1

Traditional file environment:

- Each application program defines and manages its own data.



- Each program defines and manages its own data.



File Systems - 2

Limitations of File-based Approach:

1. Separation and isolation of data

- Each program maintains its own set of data.
- Users of one program may be unaware of potentially useful data held by other programs.

2. Duplication of data

- Same data is held by different programs.
- Wasted space and potentially different values and/or different formats for the same item.

File Systems - 3

3. **Data dependence**

- File structure is defined in the program code.

4. **Incompatible file formats**

- Programs are written in different languages, and so cannot easily access each others files.

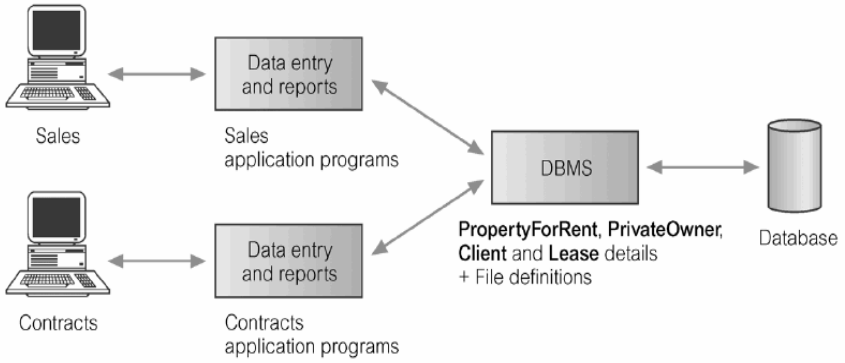
5. **Fixed Queries/Proliferation of application programs**

- Programs are written to satisfy particular functions.
- Any new requirement needs a new program.

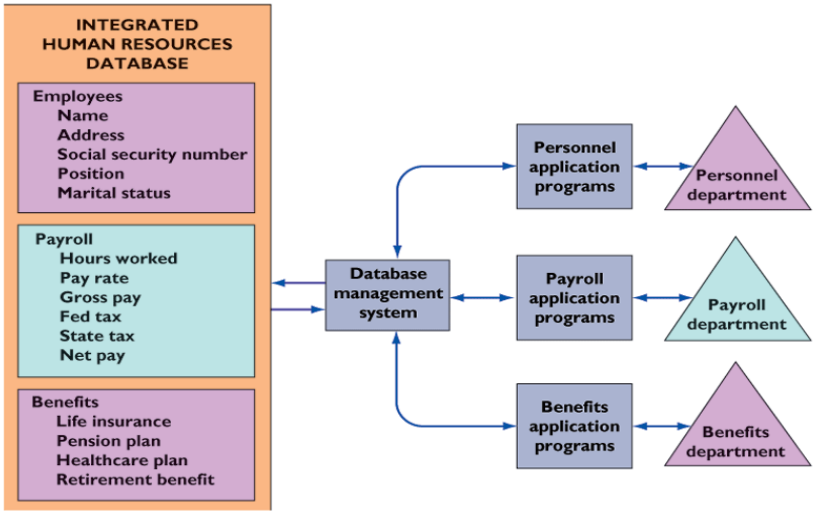
The Database Approach to Data Management - 1

- Shared collection of logically related data (and a description of this data), designed to meet the information needs of an organization.
- System catalog (metadata) provides description of data to enable program–data independence.
- Logically related data comprises entities, attributes, and relationships of an organization's information.

The Database Approach to Data Management - 2



The Database Approach to Data Management - 3



DBMS Approach

Database Management System (DBMS)

- A software system that enables users to define, create, and maintain the database and which provides controlled access to this database.

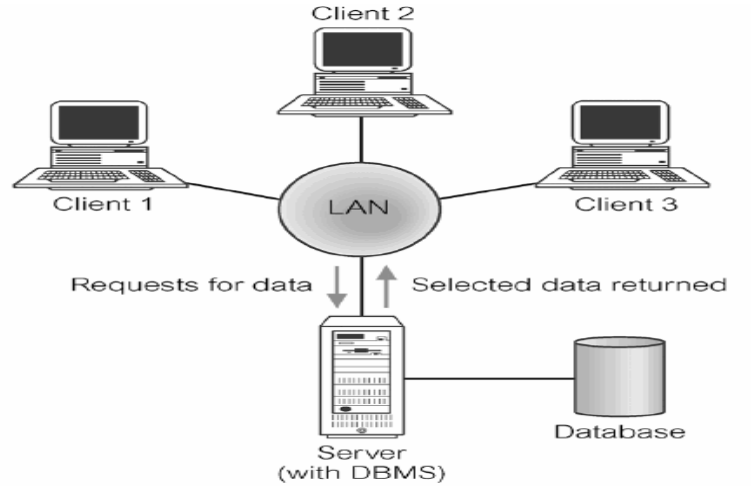
DBMS Components

1. **Data definition language**: Formal language for specifying the structure of database
2. **Data manipulation language**: For extracting data from database, e.g. SQL**.**

How a DBMS Solves Problems of a Traditional File Environment

- Reduces data redundancy
- Eliminates data inconsistency
- Uncouples programs from data
- Increases access and availability of data
- Allows central management of data, data use, and security

Database Client-server Architecture



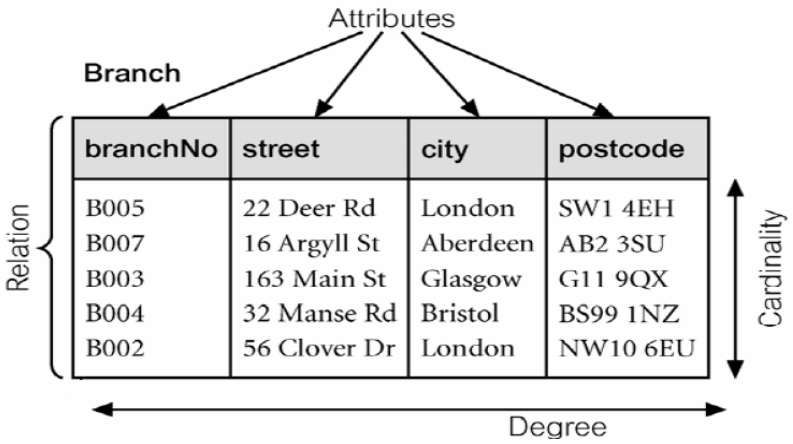
Disadvantages of DBMS

- Complexity
- Size
- Cost of DBMS
- Additional hardware costs
- Cost of conversion
- Performance
- Higher impact of a failure

Relational DBMS - 1

- A **relation** is a table with columns and rows.
  - **Attribute** is a named column of a relation.
  - **Domain** is the set of allowable values for one or more attributes.
  - **Tuple** is a row of a relation.
  - **Degree** is the number of attributes in a relation.
  - **Cardinality** is the number of tuples in a relation.
- Relational Database is a collection of normalized relations with distinct relation names.

Relational DBMS - 2



- Relates data across tables based on **common data element.**

Relational DBMS - 3

Table (Relation)

Columns (Attributes, Fields)

ORDER

Order_ Number	Order_ Date	Delivery_ Date	Part_ Number	Part_ Quantity
1634	02/02/04	02/22/04	152	2
1635	02/12/04	02/28/04	137	3
1636	02/13/04	03/01/04	145	1

PART

Part_ Number	Part_ Description	Unit_ Price	Supplier_ Number
137	Door latch	22.50	4058
145	Door handle	26.25	2038
150	Door seal	6.00	4058
152	Compressor	70.00	1125

SUPPLIER

Supplier_ Number	Supplier_ Name	Supplier_Address
4058	CBM Inc.	44 Winslow, Gary, IN 44950
2038	Ace Inc.	Rte. 101, Essex, NJ 07763
1125	Bryant Corp.	51 Elm, Rochester, NY 11349

Relational DBMS - 4

Alternative terminology for relational model terms

Formal terms	Alternative 1	Alternative 2
Relation	Table	File
Tuple	Row	Record
Attribute	Column	Field

Relational DBMS - 5

Basic Operations in a Relational Database:

- **Select:** Creates subset of rows that meet specific criteria

Original table

P_CODE	P_DESCRIPT	PRICE
123456	Flashlight	5.26
123457	Lamp	25.15
123458	Box Fan	10.99
213345	9v battery	1.92
254467	100W bulb	1.47
311452	Powerdrill	34.99

SELECT ALL will yield → New table or list

P_CODE	P_DESCRIPT	PRICE
123456	Flashlight	5.26
123457	Lamp	25.15
123458	Box Fan	10.99
213345	9v battery	1.92
254467	100W bulb	1.47
311452	Powerdrill	34.99

SELECT only PRICE less than 2.00 will yield →

P_CODE	P_DESCRIPT	PRICE
213345	9v battery	1.92
254467	100W bulb	1.47

SELECT only P_CODE=311452 will yield →

P_CODE	P_DESCRIPT	PRICE
311452	Powerdrill	34.99

Relational DBMS - 6

- **Project:** Yields all values for selected attributes – vertical subset of a table.

Original table

P_CODE	P_DESCRIPT	PRICE
123456	Flashlight	5.26
123457	Lamp	25.15
123458	Box Fan	10.99
213345	9v battery	1.92
254467	100W bulb	1.47
311452	Powerdrill	34.99

PROJECT PRICE yields → New table or list

PRICE
5.26
25.15
10.99
1.92
1.47
34.99

PROJECT P_DESCRIPT and PRICE yields →

P_DESCRIPT	PRICE
Flashlight	5.26
Lamp	25.15
Box Fan	10.99
9v battery	1.92
100W bulb	1.47
Powerdrill	34.99

PROJECT P_CODE and PRICE yields →

P_CODE	PRICE
123456	5.26
123457	25.15
123458	10.99
213345	1.92
254467	1.47
311452	34.99

Relational DBMS - 7

- **Join:** Enables users to create a new table containing only relevant information from **more than one table**.

Table name: CUSTOMER

CUS_CODE	CUS_LNAME	CUS_ZIP	AGENT_CODE
1132445	Walker	32145	231
1217782	Adares	32145	125
1312243	Rakowski	34129	167
1321242	Rodriguez	37134	125
1542311	Smithson	37134	421
1657399	Vanloo	32145	231

Table name: AGENT

AGENT_CODE	AGENT_PHONE
125	6152439887
167	6153426778
231	6152431124
333	9041234445

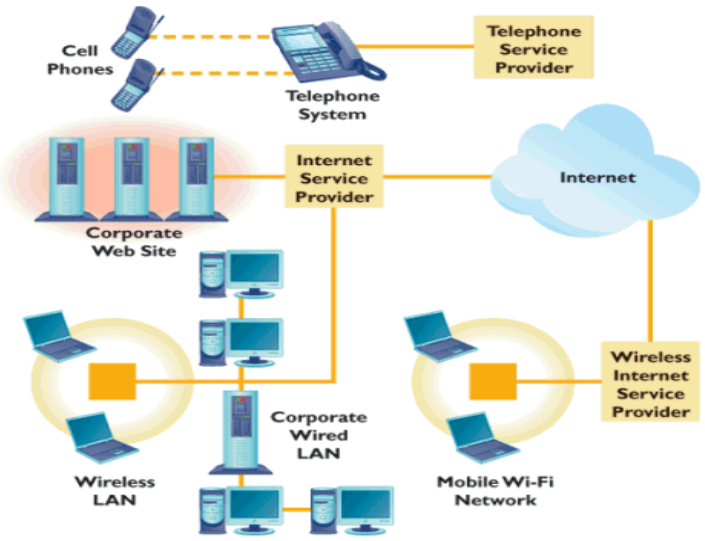
CUS_CODE	CUS_LNAME	CUS_ZIP	AGENT_CODE	AGENT_PHONE
1217782	Adares	32145	125	6152439887
1321242	Rodriguez	37134	125	6152439887
1312243	Rakowski	34129	167	6153426778
1132445	Walker	32145	231	6152431124
1657399	Vanloo	32145	231	6152431124

4. Business Telecommunications System

Telecommunications System

- Facilitation of electronic communication
- Telephone systems
- Broadcast and cable TV
- Radio, satellite, and local area networks
- Internet
- Analog or digital

Corporate Telecommunications System



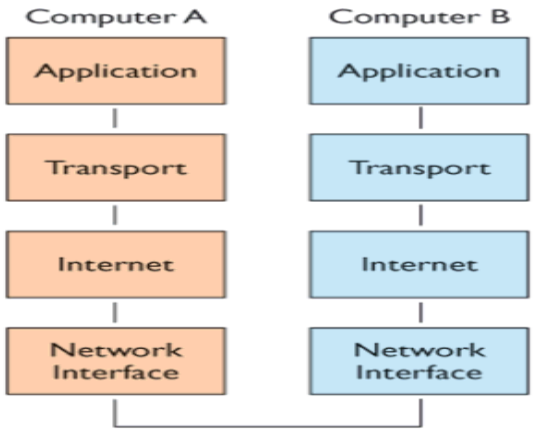
Features of Contemporary Telecommunications Systems - 1

Transmission Control Protocol/Internet Protocol (TCP/IP)

- Open suite of protocols for connectivity developed in 1970s
- Provides standards for breaking messages into packets, routing them to destination addresses, and reassembling them at end
- Allows for communication regardless of hardware/software

Features of Contemporary Telecommunications Systems - 2

TCP/IP: Four-Layer Reference Model



Features of Contemporary Telecommunications Systems – 3

TCP/IP: Four-Layer Reference Model

- **Application layer**: Communication between applications and other layers
- **Transport layer**: Acknowledging and sequencing packets to/from application
- **Internet layer**: Addressing, routing, packaging data packets
- **Network interface layer:** Placing packets on and receiving them from network medium

Features of Contemporary Telecommunications Systems – 4

Transmission Media - 1

Twisted wire

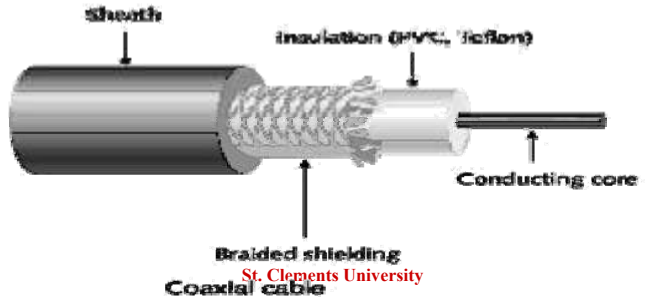
- Copper wire twisted in pairs
- Older analog transmission medium
- Can be used for digital signals
- Modems used for translating analog to digital

Features of Contemporary Telecommunications Systems – 5

Transmission Media - 2

Coaxial cable:

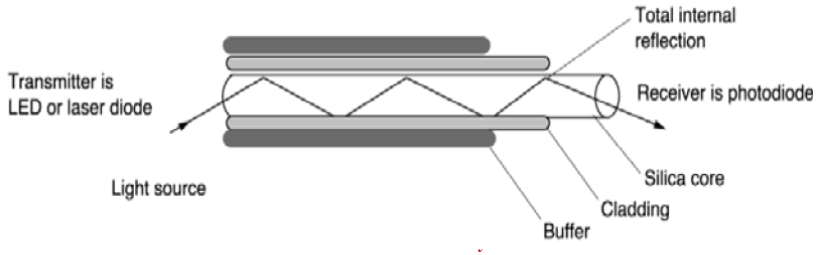
- Insulated copper wire
- Faster, more interference-free than twisted pair
- Difficult to install



Features of Contemporary Telecommunications Systems – 6

Transmission Media – 3

- **Fiber optics**
  - Transmission of data as light pulses through optical fiber
  - First converting electronic binary signals to light, and then convert the light signals back to electronic signals at the receiving end.
  - Faster, lighter, more durable



Features of Contemporary Telecommunications Systems – 7

Transmission Media – 4

- Fiber-optic technology has revolutionized telecommunications due to the very high speed of data transmission it can support.
- 0.1kg of optical fiber carries the same information as 30,000kg of copper cable
- At 2.5 Gbps, it is
  - equivalent to more than 3 hrs of TV per second
  - 24,000 simultaneous phone calls

Features of Contemporary Telecommunications Systems – 8

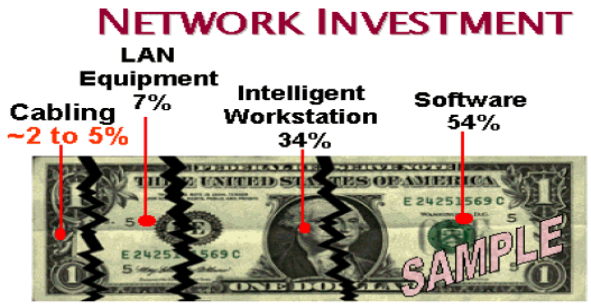
Transmission Media - 5

CABLING LIFE CYCLE

Features of Contemporary Telecommunications Systems – 9

Transmission Media – 6

- Although cabling represents only 2 to 5% of the total network investment, the cabling systems will outlive most network components.



Features of Contemporary Telecommunications Systems – 10

Transmission Media – 7

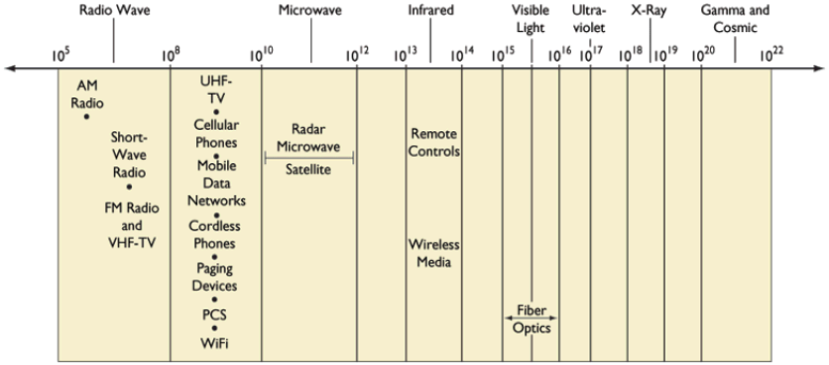
Wireless Transmission

- Use electromagnetic spectrum
- Microwave and infrared use high-frequency radio signals
- Paging systems, cellular telephones, PDAs, mobile data networks
- Wireless communication requires compatible standards
- Security/privacy issues

Features of Contemporary Telecommunications Systems – 11

Transmission Media – 8

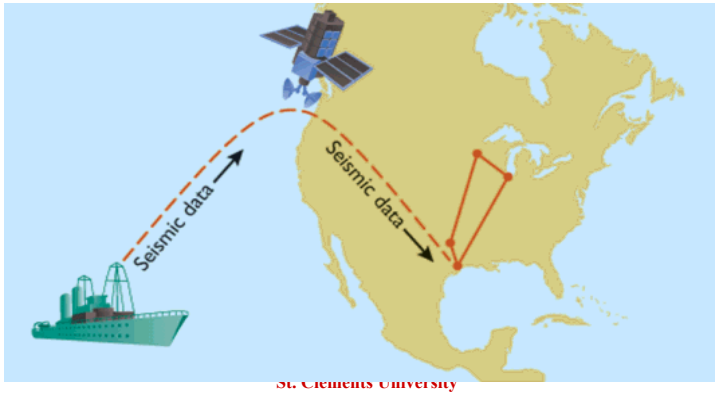
Frequency ranges for communication media and devices



Features of Contemporary Telecommunications Systems – 12

Transmission Media – 9

- **Satellite transmission system**



Features of Contemporary Telecommunications Systems – 13

Transmission Media – 10

- **Transmission Speed Comparison**

Twisted wire	Up to 1G+ Mbps
Microwave	Up to 200+ Mbps
Satellite	Up to 200+ Mbps
Coaxial cable	Up to 200 Mbps
Fiber-optic cable	Up to 6+ Tbps

5. Communications Networks

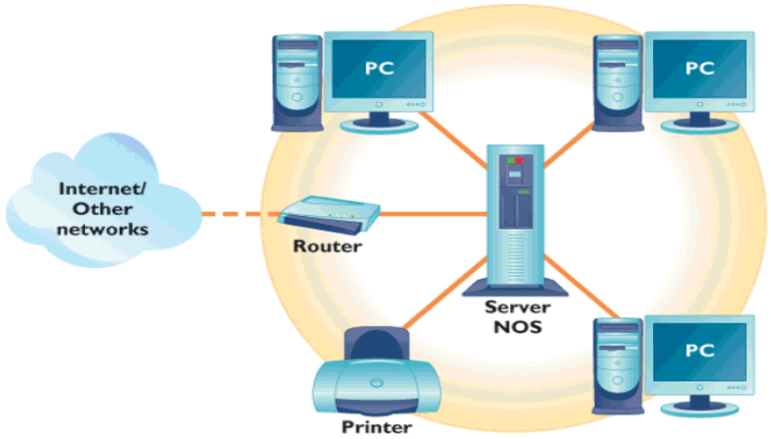
Communications Networks - 1

Local Area Networks (LAN) - 1

- A LAN is a data communication system allowing a number of independent devices to communicate directly with each other,
  - within a moderately sized geographic area,
  - and over a physical communications channel of moderate data rates.
- To implement a LAN, we need to use cabling or wireless technology to link up computers and networking devices, and the required software such as a Network Operating System (NOS).

Communications Networks - 2

Local Area Networks (LAN) - 2



Communications Networks - 3

Local Area Networks (LAN) – 3

- In a client/server arrangement, network services are located on a dedicated computer called a server. The server responds to the requests of clients for, print, application and other services.

Merits:

- The network is scalable.
- Enhanced security, ease of access, and control.

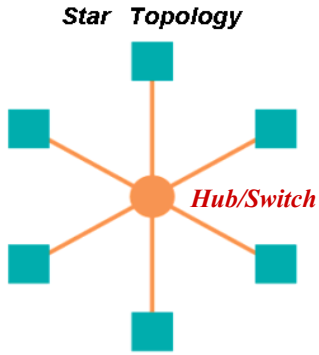
Demerits:

- Introduce a single point of failure in the network.
- More expensive, require specialized hardware and software.
- Require a trained, expert staff member to administer and maintain.

Communications Networks - 4

Local Area Networks (LAN) – 4

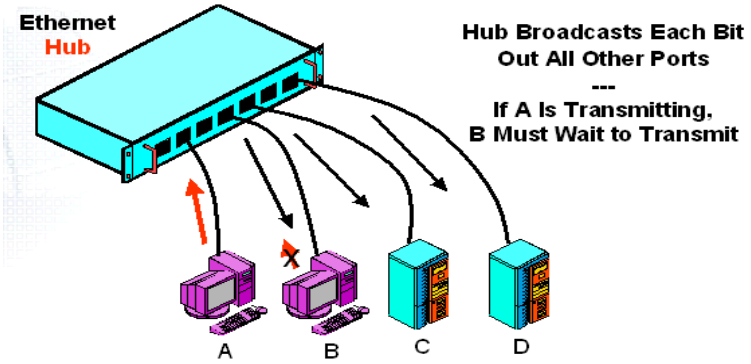
- Ethernet is by far the most common
- Star topology using Ethernet **hubs** and/or **switches**
- Use UTP cabling
- Relatively cheap, easy to install and manage
- Ethernet standards make use of latest developments in network technology



Communications Networks - 5

Local Area Networks (LAN) – 5

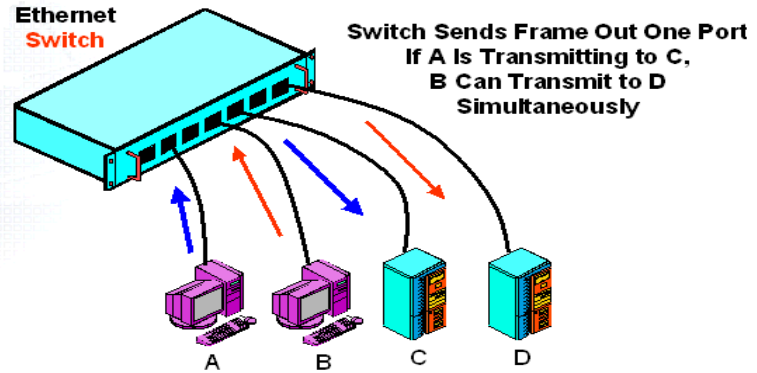
Hub Versus Switch Operation



Communications Networks - 6

Local Area Networks (LAN) – 6

Hub Versus Switch Operation



Communications Networks - 7

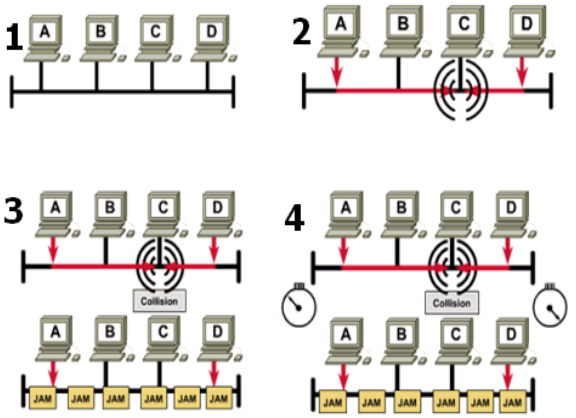
Local Area Networks (LAN) – 7

Hub Versus Switch Operation

- **Hubs Need Media Access Control**
  - This limits when a station may transmit
  - Ethernet hubs use CSMA/CD
- **Carrier Sense Multiple Access (CSMA)**
  - Only transmit if no other station is transmitting
  - Otherwise, wait
- **Collision Detection (CD)**
  - If two NICs transmit at the same time, this is a collision
  - Both will stop, wait a random amount of time, and then go back to CSMA to send again

Communications Networks - 8

Local Area Networks (LAN) – 8



CSMA/CD

1. Listen then transmit
2. Collision occurs
3. Broadcast jam signal
4. Devices back off appropriate amount of time, goes back to listen then transmit and then retransmit

Communications Networks - 9

Local Area Networks (LAN) – 9

UTP dominates the Ethernet access line market

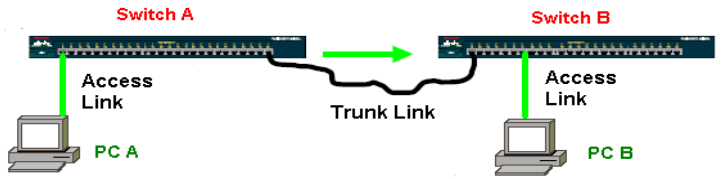
Physical Layer Standard	Speed	Maximum Run Length	Medium Required
10BASE-T	10 Mbps	100 meters	4-pair Category 3 or higher
100BASE-TX	100 Mbps	100 meters	4-pair Category 5 or higher
1000BASE-T (Gigabit Ethernet)	1,000 Mbps	100 meters	4-pair Category 5 or higher

Physical Layer Standard	Speed	Maximum Run Length	Medium 850 nm light (inexpensive) Multimode fiber	
1000BASE-SX	1 Gbps	220 m	62.5 microns	160 MHz-km

Communications Networks - 10

Local Area Networks (LAN) – 10

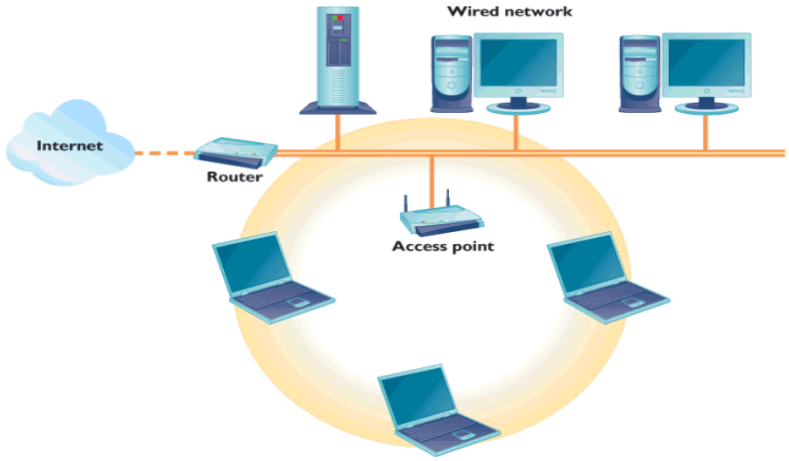
- **Access links** to client stations today are dominated by 100BASE-TX
  - But 1000BASE-T usage is growing
- **Trunk links** today are dominated by 1000BASE-SX
  - Sufficient for most LAN trunk line distances and speeds
  - Short trunk links, however, use UTP
  - Longer and faster trunk links use other fiber standards



Communications Networks - 11

Local Area Networks (LAN) – 11

An 802.11 Wireless LAN



Communications Networks - 12

Local Area Networks (LAN) – 12

Wireless LAN Benefits

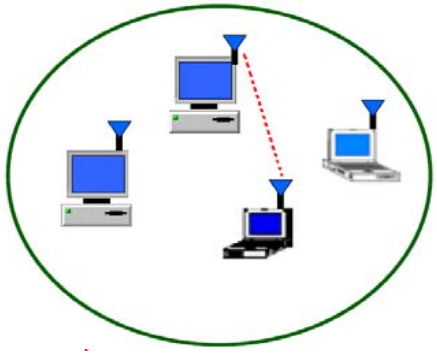
- **Removes wiring challenges**
  - Limited connections to users
  - Perfect for facilities where cost of wiring is prohibitive or impossible
- **Able to redeploy with minimal expense**
  - Low Installation Cost
  - Fast installation, Less Influence
  - Connect permanent or temporary campus buildings quickly and easily
- **Large coverage, High Performance**

Communications Networks - 13

Local Area Networks (LAN) – 13

Wireless LAN

- **Ad-hoc mode**: Peer-to-peer mode; wireless devices communicate with each other directly.
- It involves at least 2 stations
- No backbone infrastructure
- Suitable for small area

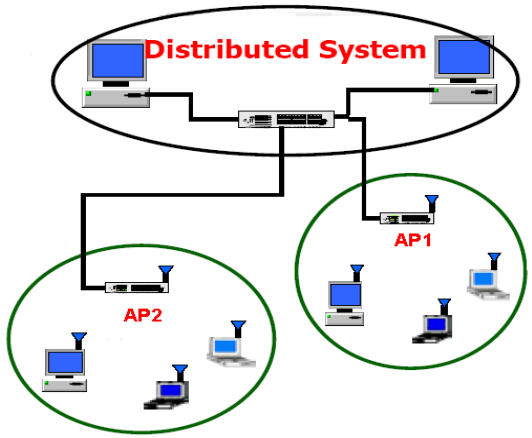


Communications Networks - 14

Local Area Networks (LAN) – 14

Wireless LAN

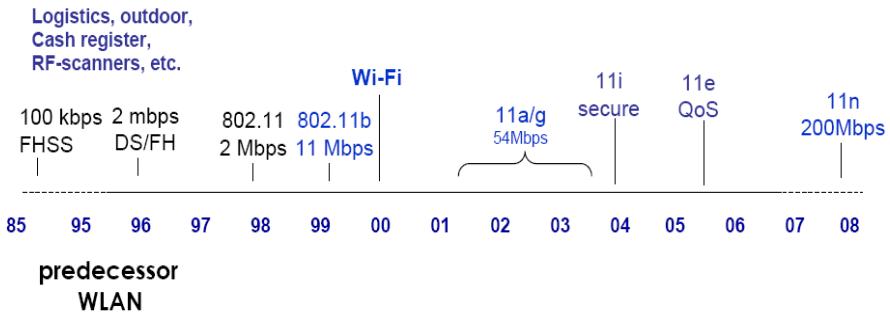
- **Infrastructure mode:**
- Wireless devices communicate with wired LAN via ***access points*** (APs).



Communications Networks - 15

Local Area Networks (LAN) – 15

- **WLAN-standards**



Communications Networks - 16

Local Area Networks (LAN) – 16

- **Wireless LAN Standard**

Standard	802.11b	802.11a	802.11a
Frequency Band	2.4 GHz	5 GHz	2.4GHz
Data rate	11 Mbps	54 Mbps	54 Mbps

- **Hot spot:** Geographic location in which an access point provides public Wi-Fi network service.
  - Eg. Free PCCW Wi-Fi service in the HK International Airport

Communications Networks - 17

Local Area Networks (LAN) – 17

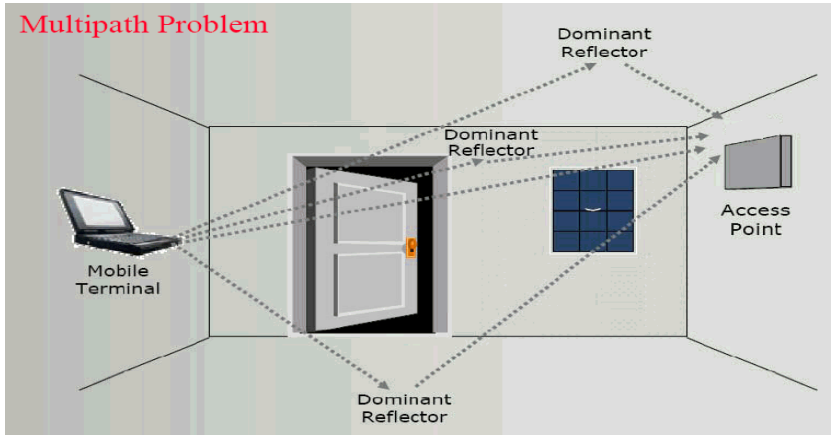
What is 802.11n?

- New IEEE Standard under development
- Uses MIMO radio technology as a basis
- End result will be more "wire-like" performance
- Anywhere from 100Mbps to 600Mbps depending on implementation
- First standard to support both 2.4 GHz and 5 GHz

Communications Networks - 18

Local Area Networks (LAN) – 18

Multi Path Reflections

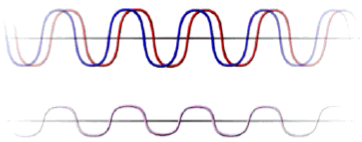


Communications Networks - 19

Local Area Networks (LAN) – 19

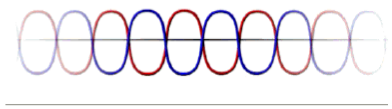
Multi Path Reflections

Original signal + reflections arrive at the receiver and are "added", resulting in a distorted reconstructed signal



Null Waves : Original signal and reflected signals are 180 degrees out of phase, cancelling each other out.

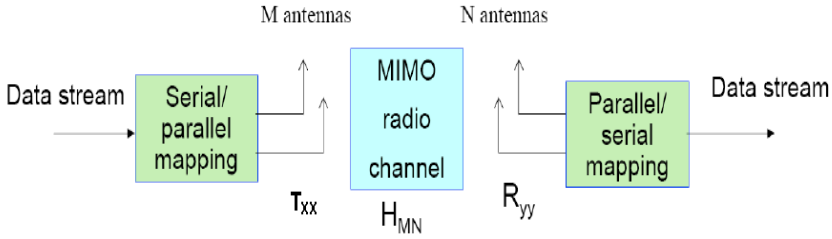
Causing drop outs.



Communications Networks - 20

Local Area Networks (LAN) – 20

- MIMO (Multiple Input / Multiple Output)
- Sending signals on multiple Tx antennas
- Receiving signals on multiple Rx antennas



Communications Networks - 21

Local Area Networks (LAN) – 21

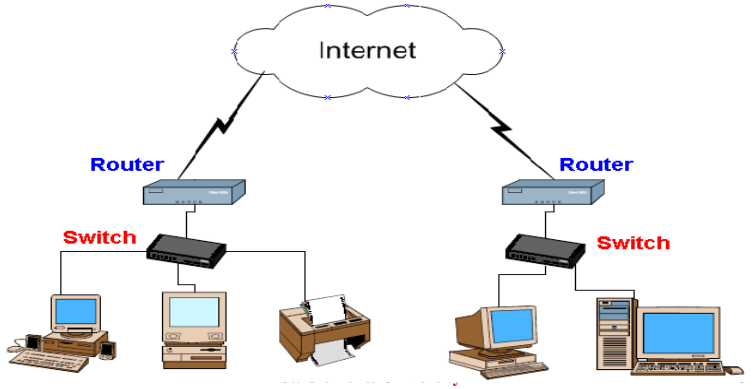
Bluetooth

- Standard for wireless personal area networks that can transmit up to 722 Kbps within 10-meter area
- It is a wireless LAN technology designed to connect devices of different functions such as telephones, notebooks, computers (desktop and laptop), cameras, printers and so on.
- A Bluetooth LAN is an ad-hoc network.
- The Bluetooth technology is the implementation of a a protocol defined by the IEEE 802.15 standard.
  - The standard defines a wireless personal-area network (PAN) opera able in an area the size of a room or a hall.

Communications Networks - 22

Local Area Networks (LAN) – 22

- **Routers** provides access to company networks on other sites, and to the Internet.



Communications Networks - 23

Wide Area Networks - 1

- A WAN is a single networks that connect different sites
- WANs and the Telephone
  - WAN technology usually uses the Public Switched Telephone Network transport system for transmission
  - Adds data switching and management
- WAN Purposes
  - Internet access
  - Link sites within the same corporation
  - Provide remote access to individuals who are off site

Communications Networks - 24

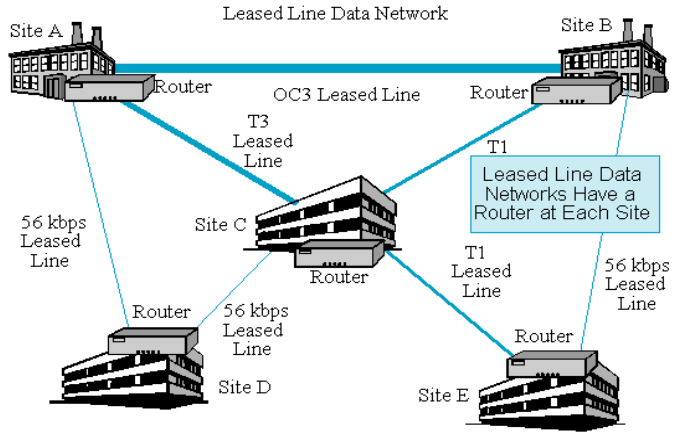
Wide Area Networks – 2

- WANs are characterized by **high cost** and **low speeds**.
- High cost per bit transmitted compared to LANs.
- Consequently, lower speeds (most commonly 128 kbps to a few megabits per second)
- This speed usually is aggregate throughput shared by many users
- Much slower than LAN speeds (100 Mbps to 1 Gbps to the desktop)

Communications Networks - 25

Wide Area Networks – 3

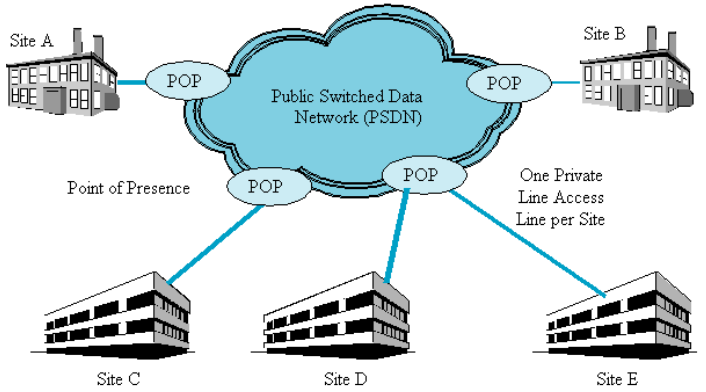
Leased Line Data Networks



Communications Networks - 26

Wide Area Networks – 4

WAN using Public Switched Data Networks



6. The Internet

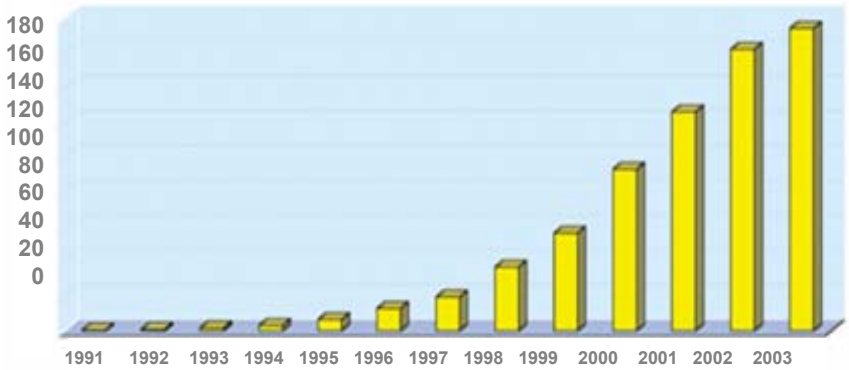
The Internet Revolution

The Internet

- Developed in the early 1960s by the U.S. Department of Defense (DOD) as a need of national security.
- Now grows to an international network of networks
  - Universal technology platform: Any computer can communicate with any other computer
  - Since the introduction of World Wide Web and Web sites, the population in the Internet has grown exponentially.

Growth of the Internet

- ARPANET grew from 4 computers in 1969 to over 300,000 by 1990.



Source: Internet Software Consortium (http://www.isc.org/)

Open Architecture Philosophy

Four key points:

- Independent networks should not require any internal changes to be connected to the Internet.
- Packets that do not arrive at their destinations must be retransmitted from their source network.
- The router computers do not retain information about the packets they handle.
- No global control will exist over the network.

Intranet and Extranet

Intranet

- LANs or WANs that use TCP/IP protocol but do not connect to sites outside the firm.

Extranet

- An intranet that allows selected outside parties to connect.

Communicate and collaborate

- Access information
- Participate in discussions
- Supply information
- Exchange business transactions

Commercialization of the Internet

- Businesses quickly recognized profit-making potential offered by a world-wide network of easy-to-use computers.
- **Web page**
  - An HTML document
- **Web site**
  - A collection of linked Web pages with a common theme
- **Web Browser**
  - Software that lets users read HTML documents and move from one HTML document to another through hypertext link tags in each file.

Hypertext and Links - 1

Hypertext Markup Language (HTML)

- A standard language used on the Web
- HTML uses codes (tags) to tell the Web browser software how to display text.

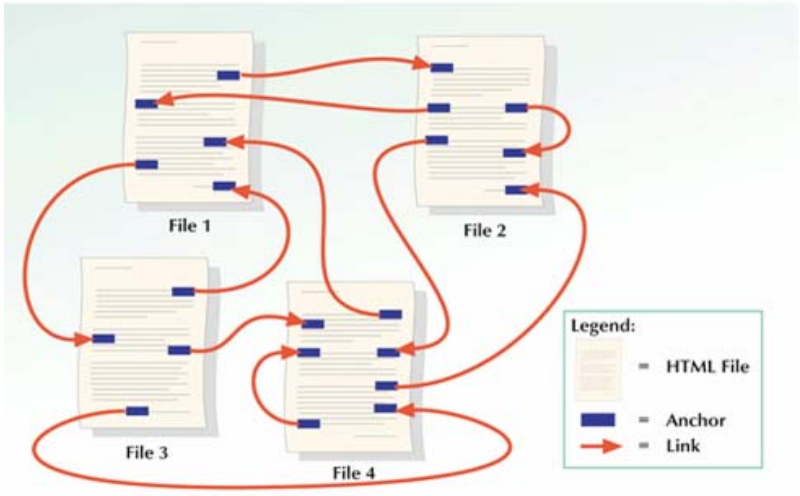
HTML anchor tag

- Enables Web designers to link HTML documents to each other

Hypertext Links

- A link which points to another location in the same or another HTML document

Hypertext and Links - 2



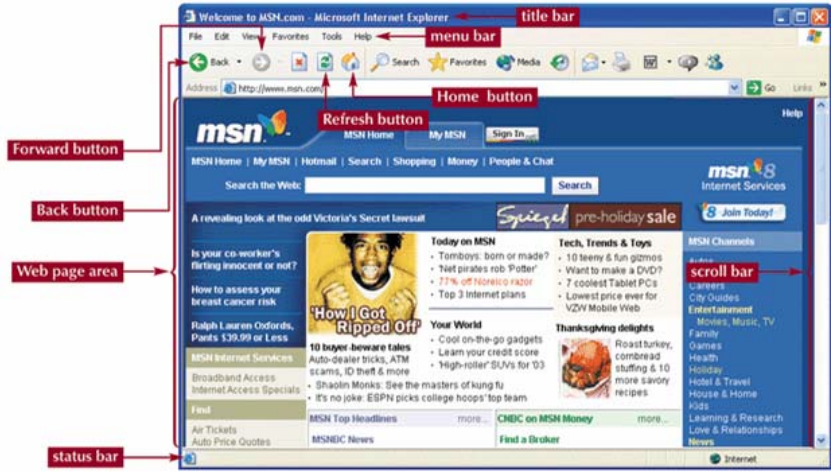
Uniform Resource Locators

Four-part addressing scheme that tells the Web browser:

- Transfer protocol to use when transporting the file
- Domain name of computer on which file resides
- Pathname of folder or directory on computer on which file resides
- Name of the file

Main Elements of Web Browsers

- **Title Bar, Scroll Bars, Status Bar, Menu Bar, Page Tab, Home Button**



Web Search Engines

- Web pages that conduct searches of the Web to find words or expressions you enter.

7. Networked Applications

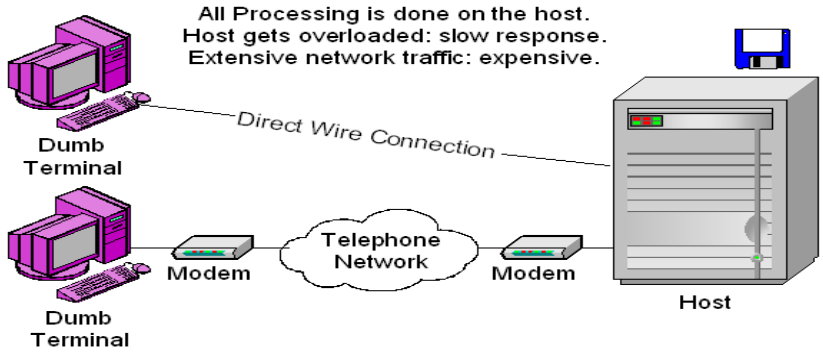
Application Architectures - 1

- An application architecture is the design decision about which network host or hosts to use to do the processing work in an application.
- Two type of application architecture:
  - Terminal-Host System
  - Client/Server Computing

Application Architectures - 2

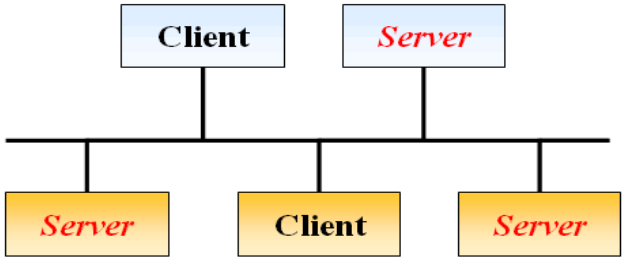
Terminal-Host System

- **Applications and databases reside on the same host computer.**
- **User interacts with the application using a "dumb terminal".**



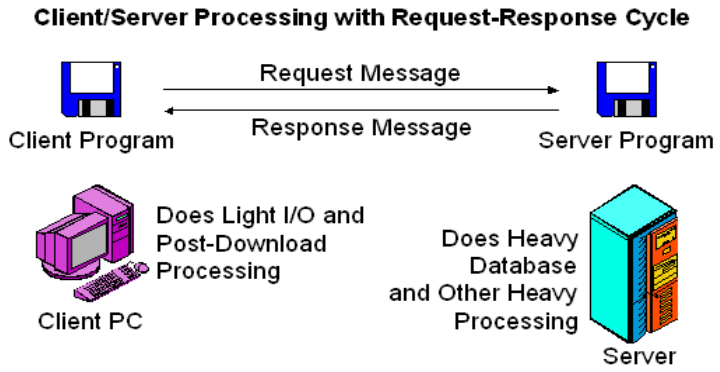
Application Architectures - 3

- Applications and databases reside on specialized host computers.
- Servers do most or all of the processing and transmit the results to the client.



Application Architectures - 4

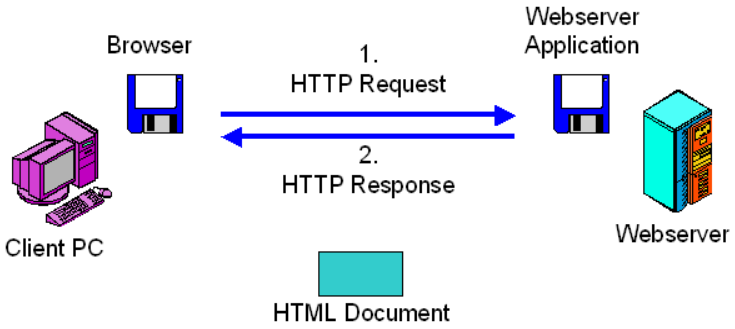
Client/Server Computing



Highly scalable: Use larger server as number of clients increases

Application Architectures - 5

Web Page Browsing



E-Mail - 1

What is E-Mail?

- E-mail (electronic mail) is the exchange of computer-stored messages by telecommunication.

Mail Server

- A hardware and software system that determines from the recipient's address one of several routes on which to send the message.

Mail Client Software or E-Mail Program

- A software that requests mail delivery from the mail server to your PC.

Email Address

- An address that uniquely identifies an individual or organization that is connected to the Internet.
- **mis.st.clements@gmail.com**

E-Mail - 2

Protocols that make email works

- **SMTP (Simple Mail Transfer Protocol)**
  - It decides which paths an e-mail message takes on the Internet.
- **POP (Post Office Protocol)**
  - It handles incoming messages.
- **IMAP (Internet Message Access Protocol)**
  - A protocol for retrieving mail messages from a server.
- **MIME (Multipurpose Internet Mail Extensions)**
  - A protocol that specifies how to encode non-text data, such as graphics and sound, so it can travel over the Internet.

E-Mail - 3

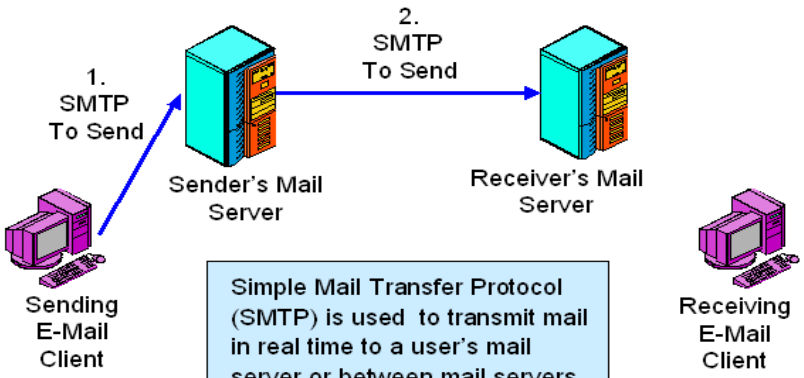
Importance of E-Mail

- Universal service on the Internet
- Attachments make e-mail a general file delivery mechanism!

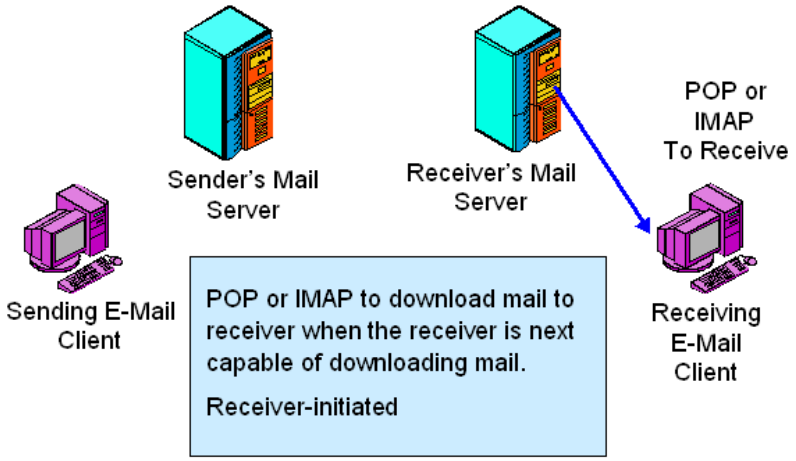
Mail Standards

- Message body standards
- Receiver must understand sender's message
  - RFC 822 and RFC 2822 for all-text bodies
  - HTML bodies with fancy text and graphics
  - UNICODE for non-English language characters

E-Mail - 4



E-Mail - 5



E-Mail – 6

The "evils" come with email:

- Messages with inappropriate content.
  - Racial or sexual harassment
  - Threats
- Spam, adware, spyware, and other abuses.
- Viruses, Worms, and Trojan Horses are often delivered by e-mail attachments!

E-Mail - 7

Viruses, Worms, and Trojan Horses

- Use of antivirus software is a must.
- Where to Do Scanning?
  - On client PCs
    - But users often turn off their software,
    - Fail to download virus definitions regularly
    - Or let their contracts lapse
  - On the corporate mail server or application firewall
    - Users cannot turn off

E-Mail - 8

- **Spam** are unsolicited commercial e-mail
- Why they are harmful?
  - Time consumed by users deleting them
  - Bandwidth and storage consumed
  - Legitimate messages lost because overlooked
- Separating SPAM from legitimate e-mail is difficult
  - Many spam messages get through to users
  - Some legitimate messages are deleted
  - Some firms merely mark messages as probable spam

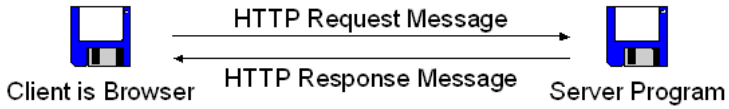
E-Mail - 9

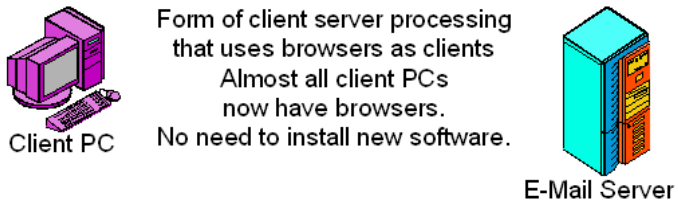
Web-Based E-Mail Services - 1

- Many Internet Web sites provide free e-mail addresses and accounts for **registered users**.
- They may be used with any Web browser.
- Examples: Gmail, Yahoo! Mail, Hotmail etc.

E-Mail - 10

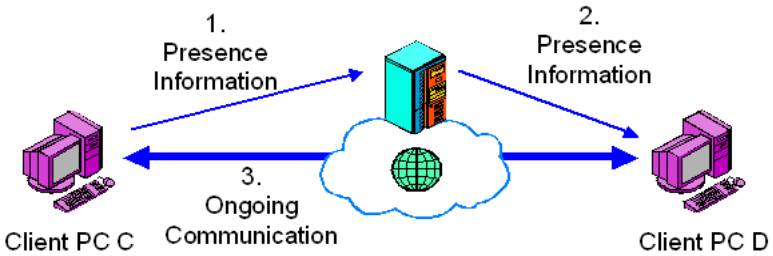
Web-Based E-Mail Services - 2





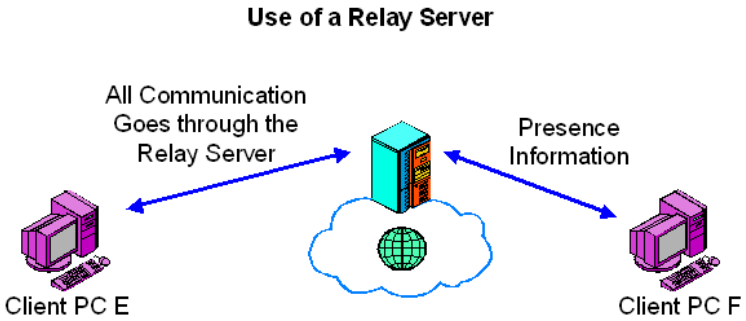
Instant Messaging Servers - 1

Use of a Presence Server



Clients register with presence servers.
Presence servers notify other clients as appropriate.
Clients use this information to communicate directly.

Instant Messaging Servers - 2



Relay servers route all IM messages.
This permits security filtering and other services.
It limits privacy because the relay server sees everything.

8. Contemporary Mobile Services

Mobile Enterprise

- "Today, penetration within organizations that use mobile applications is strong — on average, 22% of the workforce uses mobile applications."
  - *Forrester's March 15, 2006 Topic Overview "Enterprise Mobility"*
- Mobile Enterprise
  - "The ***ability for an enterprise to connect*** and control suppliers, partners, employees, assets, products, and customers ***from any location***."
    - *Forrester's March 15, 2006 Topic Overview "Enterprise Mobility"*

What's Driving Enterprises to Go Mobile?

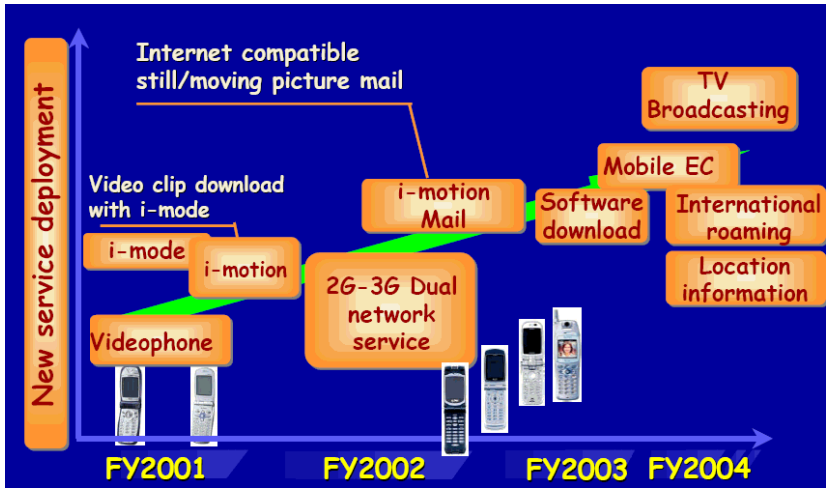
- Increased competitive pressure as others start adopting mobile technology.
- Overall increased speed of business.
- Executives who have experienced mobility through a wireless email device, such as a *BlackBerry*, are now influencing departments to embrace mobility.

Broadband Wireless Networks…
Versatile Devices…
Faster Processors….

Generations of Mobile Networks

- 1G: basic mobile telephony
- 2G: mobile telephony for mass users
  - regional roaming
- 2.5G: mobile internet services
- 3G:
  - global roaming
  - enhanced mobile Internet services

3G Services – To explore the non-voice Applications



HSDPA - 1

- High-Speed Downlink Packet Access (HSDPA) is a 3G mobile telephony communications protocol.
- It support services requiring instantaneous high data rates in the downlink, e.g. Internet browsing, video on demand, office application.
- Peak data rates 3-4 times higher than current 3G.
- Current HSDPA deployments support down-link speeds of 1.8, 3.6, 7.2 and 14.4 Mbit/s.
- New terminals are required to take advantage of HSDPA.

HSDPA - 2

SPEED		Higher bit rates: up to 14 Mbps peak rate
CAPACITY		2 – 3 times improved system capacity
REDUCED DELAY		Quicker response time with interactive services
STANDARDIZED		Integral part of WCDMA (3GPP Rel.5)
Network Coverage		Short time to market with existing sites

Public Wi-Fi Service - 1

- 全民免費試用 PCCW Wi-Fi 寬頻 30 天
- 由即日起，全港市民只需使用備有 Wi-Fi 接駁功能的手提電子產品，如手提電腦、流動電話機、電子手賬電話機或 iPod Touch 等，在遍佈全港的任何一個 PCCW Wi-Fi 熱點進行上網簡單登記，便可以在其後的 30 天內無限量免費試用 PCCW Wi-Fi寬頻服務，體驗極速、穩定、安全的無線上網樂趣。
- 電訊盈科在提供無線傳輸方面領先同儕，在全港敷設超過4,000個Wi-Fi熱點，致力將香港發展成爲「Wi-Fi城市」。

Public Wi-Fi Service - 2

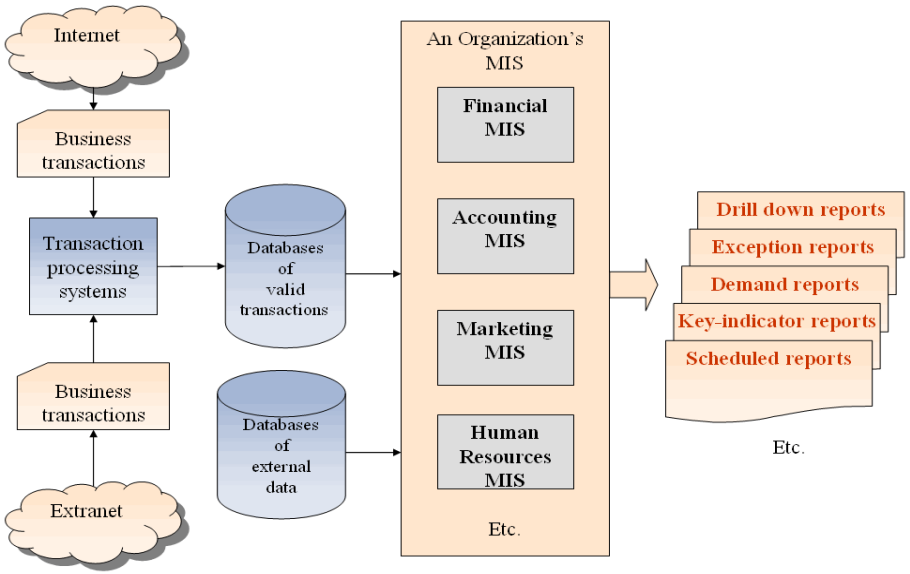
- 每日港幣 18 元使用費，即可全日無限量使用 HSDPA、3G 本地資料傳輸。

9. MIS Examples

Management information system (MIS) - 1

- An MIS provides managers with **information** and **support** for effective decision making, and provides feedback on daily operations.
- Output, or reports, are usually generated through accumulation of transaction processing data.
- MIS is an integrated collection of functional information systems, each supporting particular functional areas.
  - Provides reports based on routine flow of data
  - Assists in general control of the organization

Management information system (MIS) - 2



Management information system (MIS) - 3

Outputs of an MIS

Scheduled reports

- Produced periodically, or on a schedule (daily, weekly, monthly)

Key-indicator report

- Summarizes the previous day's critical activities
- Typically available at the beginning of each day

Demand report

- Gives certain information at a manager's request

Exception report

- Automatically produced when a situation is unusual or requires management action

Drill Down Reports

- Provide detailed data about a situation. To move from summary data to lower and lower levels of detail.

MIS for Competitive Advantage

- Provides support to managers as they work to achieve corporate goals.
- Enables managers to compare results to established company goals and identify problem areas and opportunities for improvement.
- Data may be made available from management information systems on a company's intranet.
- Employees can use browsers and their PC to gain access to the data.

10. Management of MIS

MIS Management - 1

- Managing the information systems and technologies that support the modern business processes of companies today is a major challenge for both business and IT managers and professionals.
- Failures in IT management can be reduced by the **involvement of business managers** in IT planning and management.

MIS Management - 2

- Managing the joint development and implementation of business/IT strategies.
  - Led by the CEO and CIO
  - Proposals are developed by business managers and IT professionals for **using IT** to **support the strategic business priorities** of the company.
  - This is to ensure alignment of IT with strategic business goals.

MIS Management - 3

- Managing the development and implementation of new business/IT applications and technologies.
  - This is the primary responsibility of the CIO/CTO.
  - This area of IT management involves managing the processes for information systems development and implementation.
  - It also includes the responsibility for research into the strategic business uses of new information technologies.

MIS Management - 4

- Managing the IT organization and the IT infrastructure.
  - The CIO and IT managers share responsibility for managing the work of IT professionals who are typically organized into a variety of project teams and other organizational subunits.
  - They are responsible for managing the IT infrastructure of hardware, software, databases, telecommunications networks, and other IT resources, which must be acquired, operated, monitored, and maintained.

MIS Management - 5

The business/IT planning process has three major components:

- **Strategy Development** – Developing e-business and e-commerce strategies that support a company's e-business vision, use information technology to create innovative e-business systems that focus on customer and business value.
- **Resource Management** – Developing strategic plans for managing or outsourcing a company's IT resources, including IS personnel, hardware, software, data, and network resources.
- **Technology Architecture** – Making strategic IT choices that reflect an information technology architecture designed to support a company's business/IT initiatives.

MIS Management - 6

Managing Hardware and Software

- **Capacity planning**: Process of predicting when a computer hardware system becomes saturated
- **Scalability:** Ability of a computer, product, or system to expand to serve a larger number of users without breaking down

MIS Management - 7

- Total Cost of Ownership (TCO) of Technology Assets
  - Includes both direct and indirect costs
  - Hardware and software acquisitions account for only 20% of TCO
  - TCO for a PC may run to three times original purchase price
  - Be aware of hidden costs!

END

Management Information System

St. Clements University
MBA Program
May, 2008
Hong Kong

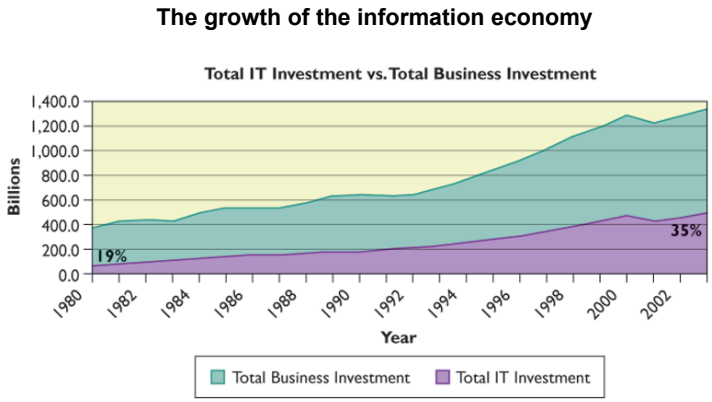
Table of Contents

1. The role of information systems

Rise of the Information Economy - 1

- Rise of the Information Economy have altered the business environment.
  - Knowledge- and information-based economies
  - New products and services
  - Knowledge: a central productive and strategic asset
  - Time-based competition
  - Shorter product life
  - Turbulent environment
  - Limited employee knowledge base

Rise of the Information Economy - 2

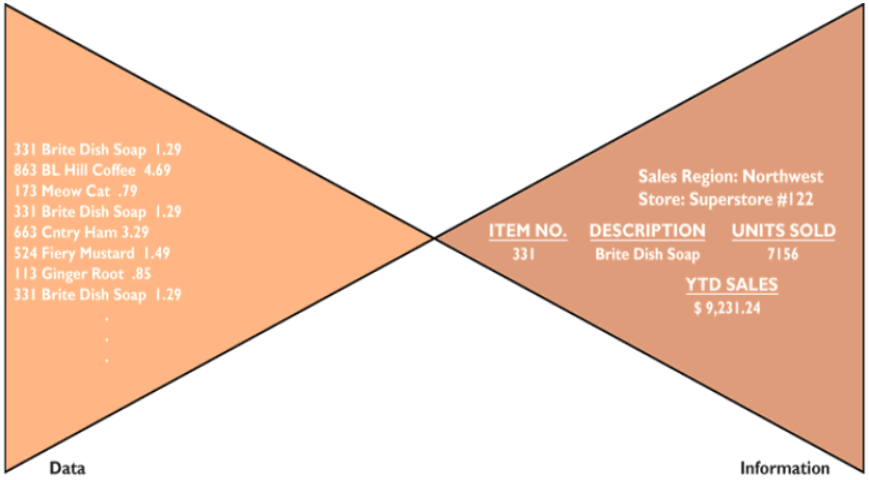


Source: Based on data in U.S. Department of Commerce, Bureau of Economic Analysis, National Income and Product Accounts, Tables 5.2 and 5.8, 2003.

What Is an Information System?

- A set of interrelated components that collect (or retrieve), process, store, and distribute information to support decision making and control in an organization.
- What is the difference between ***information*** and ***data***?
  - **Data:** Streams of raw facts representing events such as business transactions.
  - **Information:** Clusters of data that are meaningful and useful to human beings.

Data and Information



What Is an Information System?

Formal Systems

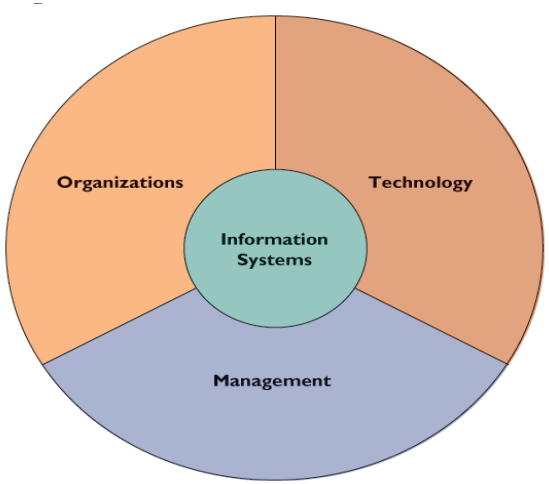
- Fixed definitions of data and procedures for collecting, storing, processing, disseminating, and using these data

Can be computer-based or manual

Computer-based Information Systems

- Use computer hardware and software to process and disseminate information

Information systems are more than computers



A Business Perspective on Information Systems

- **Information systems literacy**: Broad-based understanding of information systems that includes behavioral knowledge about organizations and individuals using information systems and technical knowledge about computers.
- **Computer literacy**: Knowledge about information technology, focusing on understanding how computer-based technologies work.

Information Technology (IT) Infrastructure

- Computer hardware
- Computer software
- Storage technology
- Communications technology

The Challenges of Information Systems: Key Management issues - 1

Positive Impacts of Information Systems

- Faster calculations and paperwork
- Analysis of customer purchase patterns and preferences
- More efficient business services
- Instant global distribution of information

The Challenges of Information Systems: Key Management issues - 2

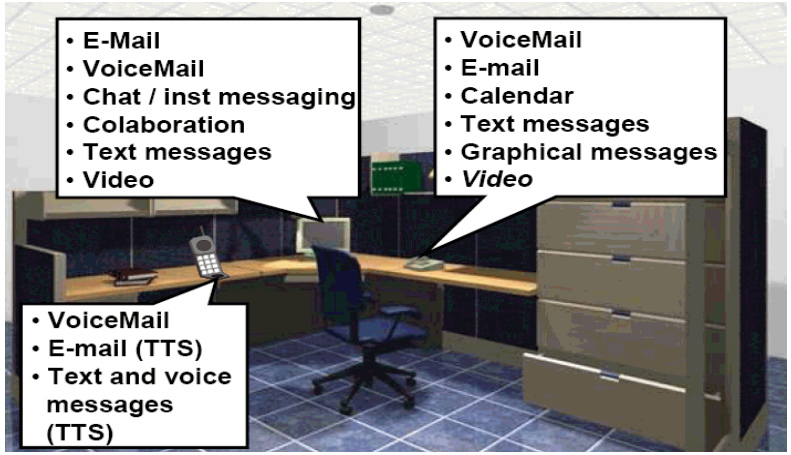
Negative Impacts of Information Systems

- Automation leading to job elimination
- Privacy concerns
- System outages and shutdowns
- Health problems, repetitive stress injury
- Illegal distribution of intellectual property

2. Hardware and Software in the Enterprise

Example of today's work environment - 1

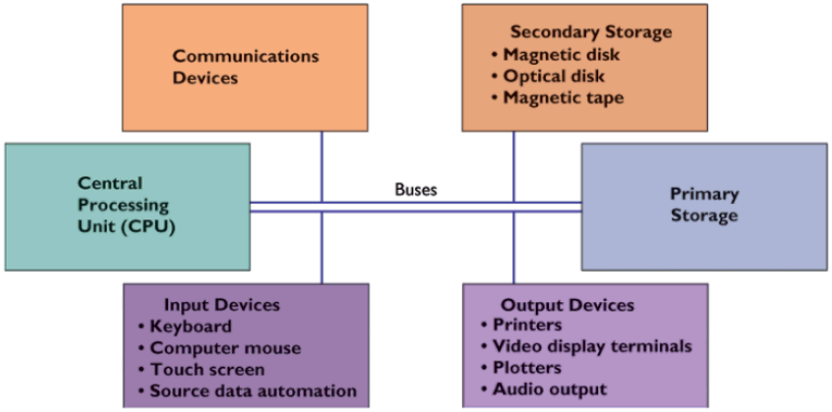
- Three communication devices: PC, desk phone, mobile



Example of today's work environment - 2

Computer Hardware and Information Technology Infrastructure - 1

- Hardware components of a computer system



Computer Hardware and Information Technology Infrastructure - 2

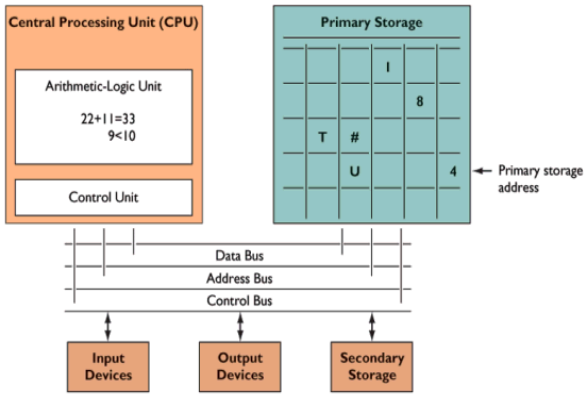
The Computer System

- **Bit**
  - Binary digit
  - Represents 0 or 1
- **Byte**
  - String of eight bits
  - Stores one number, symbol, character, part of picture

Computer Hardware and Information Technology Infrastructure - 3

The Computer System

- **The Central Processing Unit (CPU)**
  - Controls other parts of computer
- **Arithmetic-logic unit**
  - Performs principle logical/mathematical operations
- **Control unit**
  - Coordinates other parts, such as reading a stored program



Computer Hardware and Information Technology Infrastructure - 4

The Computer System

- **Primary Storage**
  - Located near CPU
  - Stores all or part of active software program
  - Stores data the program is using
  - Composed of semi-conductors
  - RAM (random access memory): Used for short-term, temporary storage
  - ROM (read-only memory): Semiconductor memory chips with program instructions

Computer Hardware and Information Technology Infrastructure - 5

The Computer System

- **Secondary Storage Technology**
  - Used for relatively long-term storage of data outside CPU
  - Magnetic disk: floppies, hard disks, RAID
  - Flash memory
  - Optical disk: CD-ROM, CD-RW, DVD
  - Magnetic tape
  - Storage networking: direct-attached storage; network-attached storage; storage area networks

Computer Hardware and Information Technology Infrastructure - 6

Hierarchy of Memory Capacity

- Kilobyte (KB): approximately one thousand bytes.
- Megabyte (MB): approximately one million bytes (1,048,576 bytes, or 1,024 x 1,024).
- Gigabyte (GB): actually 1,073,741,824 bytes (1,024 x 1,024 x 1,024 bytes).
- Terabyte: One trillion bytes, 10^{12} bytes.
- Petabyte: Approximately 10^{15} bytes.
- Exabyte: Approximately 10^{18} bytes.

Computer Hardware and Information Technology Infrastructure - 7

A storage area network (SAN)

Computer Hardware and Information Technology Infrastructure - 8

The Computer System

- **Input Devices**
  - Keyboard and mouse
  - Touch screen
  - Optical character recognition
  - Magnetic ink character recognition (MICR)
  - Pen-based input
  - Digital scanner
  - Audio input
  - Radio-frequency identification (RFID)

Computer Hardware and Information Technology Infrastructure - 9

The Computer System

- **Output Devices**
  - Cathode-ray tube (CRT)
  - LCD Panel
  - Printers
  - Audio output

Classifying Computers

- **Mainframe:** Largest computer, largest multi-user systems, handles massive amounts of data; used for large business, scientific, military applications.

- **Workstation:** More powerful desktop computer used for computation-intense tasks. A midrange systems multi-user system.
- **Personal computer**: Portable or desktop microcomputer. A single user system.

Types of Software

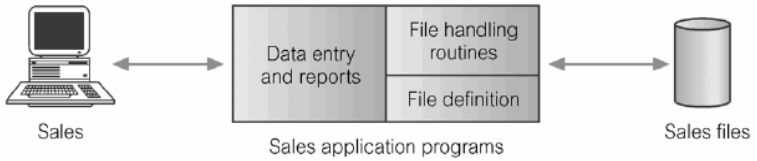
- **Software program:** A series of statements or instructions to the computer
- Two major types of software:
  - **System software**
    - Generalized programs that manage the computer's resources
    - For example, the Windows family of Operating Systems
  - **Application software**
    - Programs written for or by users to perform a specific task.
    - For example, Word,Excel, Powerpoint

3. Database Management Systems

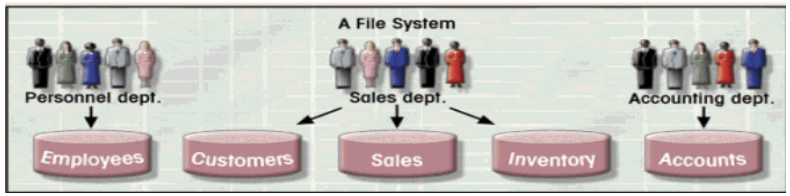
File Systems - 1

Traditional file environment:

- Each application program defines and manages its own data.



- Each program defines and manages its own data.



File Systems - 2

Limitations of File-based Approach:

1. Separation and isolation of data

- Each program maintains its own set of data.
- Users of one program may be unaware of potentially useful data held by other programs.

2. Duplication of data

- Same data is held by different programs.
- Wasted space and potentially different values and/or different formats for the same item.

File Systems - 3

3. **Data dependence**

- File structure is defined in the program code.

4. **Incompatible file formats**

- Programs are written in different languages, and so cannot easily access each others files.

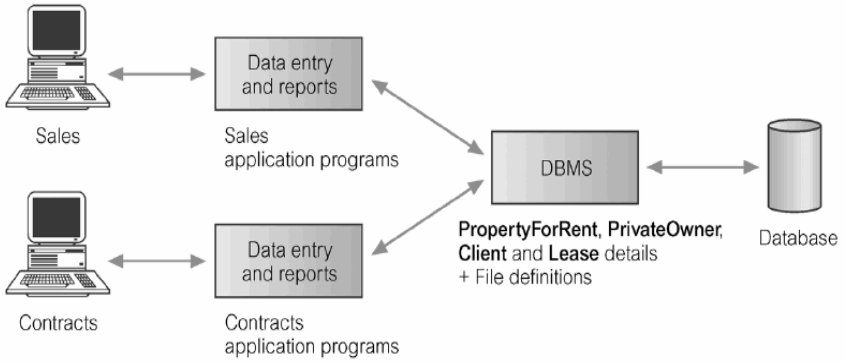
5. **Fixed Queries/Proliferation of application programs**

- Programs are written to satisfy particular functions.
- Any new requirement needs a new program.

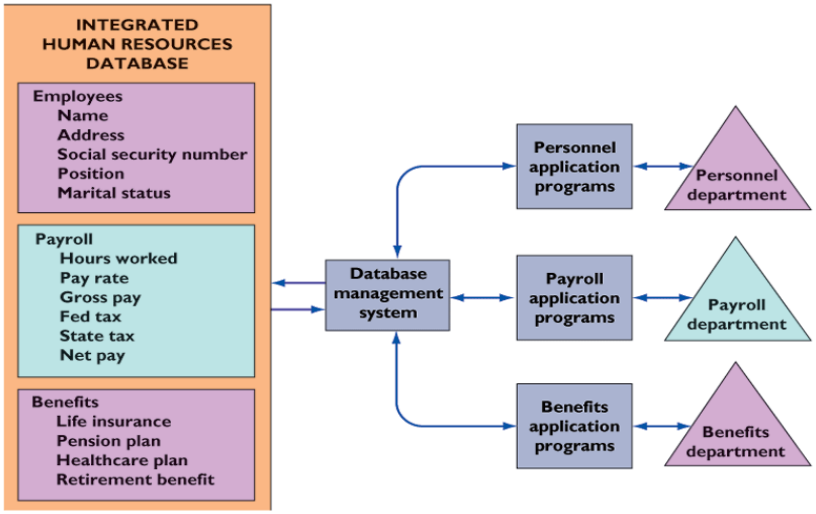
The Database Approach to Data Management - 1

- Shared collection of logically related data (and a description of this data), designed to meet the information needs of an organization.
- System catalog (metadata) provides description of data to enable program–data independence.
- Logically related data comprises entities, attributes, and relationships of an organization's information.

The Database Approach to Data Management - 2



The Database Approach to Data Management - 3



DBMS Approach

Database Management System (DBMS)

- A software system that enables users to define, create, and maintain the database and which provides controlled access to this database.

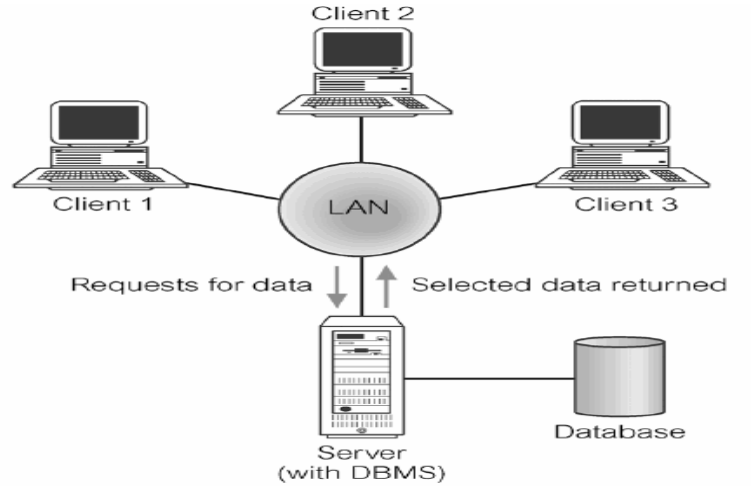
DBMS Components

1. **Data definition language**: Formal language for specifying the structure of database
2. **Data manipulation language**: For extracting data from database, e.g. SQL**.**

How a DBMS Solves Problems of a Traditional File Environment

- Reduces data redundancy
- Eliminates data inconsistency
- Uncouples programs from data
- Increases access and availability of data
- Allows central management of data, data use, and security

Database Client-server Architecture



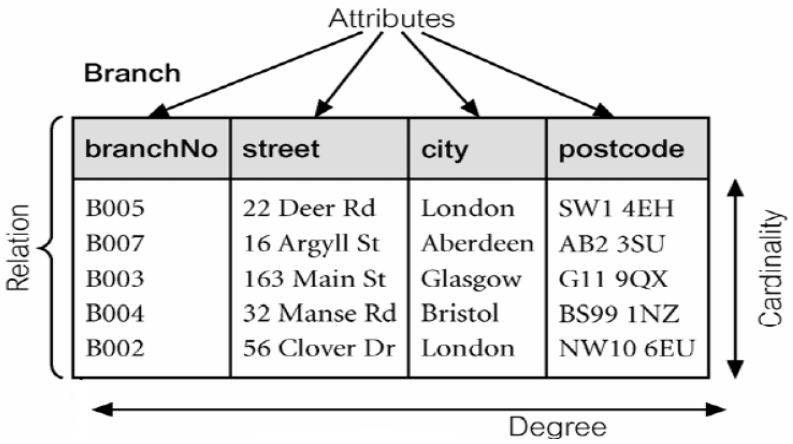
Disadvantages of DBMS

- Complexity
- Size
- Cost of DBMS
- Additional hardware costs
- Cost of conversion
- Performance
- Higher impact of a failure

Relational DBMS - 1

- A **relation** is a table with columns and rows.
  - **Attribute** is a named column of a relation.
  - **Domain** is the set of allowable values for one or more attributes.
  - **Tuple** is a row of a relation.
  - **Degree** is the number of attributes in a relation.
  - **Cardinality** is the number of tuples in a relation.
- Relational Database is a collection of normalized relations with distinct relation names.

Relational DBMS - 2



- Relates data across tables based on **common data element.**

Relational DBMS - 3

Table (Relation)

Columns (Attributes, Fields)

ORDER

Order_ Number	Order_ Date	Delivery_ Date	Part_ Number	Part_ Quantity
1634	02/02/04	02/22/04	152	2
1635	02/12/04	02/28/04	137	3
1636	02/13/04	03/01/04	145	1

PART

Part_ Number	Part_ Description	Unit_ Price	Supplier_ Number
137	Door latch	22.50	4058
145	Door handle	26.25	2038
150	Door seal	6.00	4058
152	Compressor	70.00	1125

SUPPLIER

Supplier_ Number	Supplier_ Name	Supplier_Address
4058	CBM Inc.	44 Winslow, Gary, IN 44950
2038	Ace Inc.	Rte. 101, Essex, NJ 07763
1125	Bryant Corp.	51 Elm, Rochester, NY 11349

Relational DBMS - 4

Alternative terminology for relational model terms

Formal terms	Alternative 1	Alternative 2
Relation	Table	File
Tuple	Row	Record
Attribute	Column	Field

Relational DBMS - 5

Basic Operations in a Relational Database:

- **Select:** Creates subset of rows that meet specific criteria

Original table

P_CODE	P_DESCRIPT	PRICE
123456	Flashlight	5.26
123457	Lamp	25.15
123458	Box Fan	10.99
213345	9v battery	1.92
254467	100W bulb	1.47
311452	Powerdrill	34.99

SELECT ALL will yield → New table or list

P_CODE	P_DESCRIPT	PRICE
123456	Flashlight	5.26
123457	Lamp	25.15
123458	Box Fan	10.99
213345	9v battery	1.92
254467	100W bulb	1.47
311452	Powerdrill	34.99

SELECT only PRICE less than 2.00 will yield →

P_CODE	P_DESCRIPT	PRICE
213345	9v battery	1.92
254467	100W bulb	1.47

SELECT only P_CODE=311452 will yield →

P_CODE	P_DESCRIPT	PRICE
311452	Powerdrill	34.99

Relational DBMS - 6

- **Project:** Yields all values for selected attributes – vertical subset of a table.

Original table

P_CODE	P_DESCRIPT	PRICE
123456	Flashlight	5.26
123457	Lamp	25.15
123458	Box Fan	10.99
213345	9v battery	1.92
254467	100W bulb	1.47
311452	Powerdrill	34.99

PROJECT PRICE yields → New table or list

PRICE
5.26
25.15
10.99
1.92
1.47
34.99

PROJECT P_DESCRIPT and PRICE yields →

P_DESCRIPT	PRICE
Flashlight	5.26
Lamp	25.15
Box Fan	10.99
9v battery	1.92
100W bulb	1.47
Powerdrill	34.99

PROJECT P_CODE and PRICE yields →

P_CODE	PRICE
123456	5.26
123457	25.15
123458	10.99
213345	1.92
254467	1.47
311452	34.99

Relational DBMS - 7

- **Join:** Enables users to create a new table containing only relevant information from **more than one table**.

Table name: CUSTOMER

CUS_CODE	CUS_LNAME	CUS_ZIP	AGENT_CODE
1132445	Walker	32145	231
1217782	Adares	32145	125
1312243	Rakowski	34129	167
1321242	Rodriguez	37134	125
1542311	Smithson	37134	421
1657399	Vanloo	32145	231

Table name: AGENT

AGENT_CODE	AGENT_PHONE
125	6152439887
167	6153426778
231	6152431124
333	9041234445

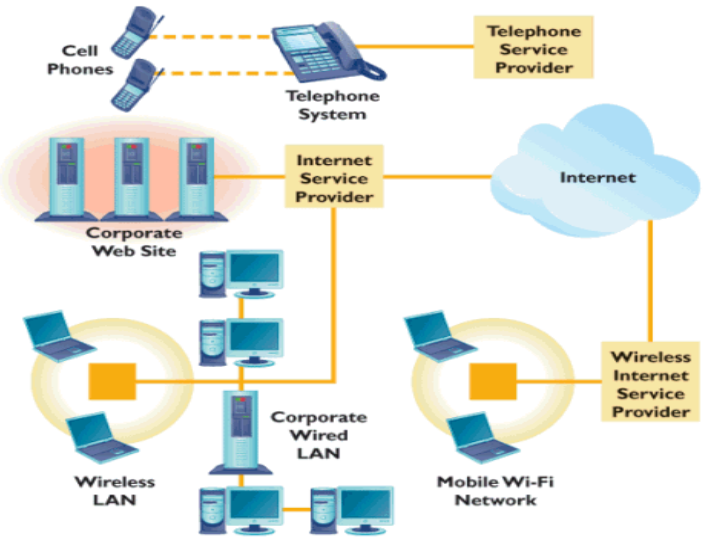
CUS_CODE	CUS_LNAME	CUS_ZIP	AGENT_CODE	AGENT_PHONE
1217782	Adares	32145	125	6152439887
1321242	Rodriguez	37134	125	6152439887
1312243	Rakowski	34129	167	6153426778
1132445	Walker	32145	231	6152431124
1657399	Vanloo	32145	231	6152431124

4. Business Telecommunications System

Telecommunications System

- Facilitation of electronic communication
- Telephone systems
- Broadcast and cable TV
- Radio, satellite, and local area networks
- Internet
- Analog or digital

Corporate Telecommunications System



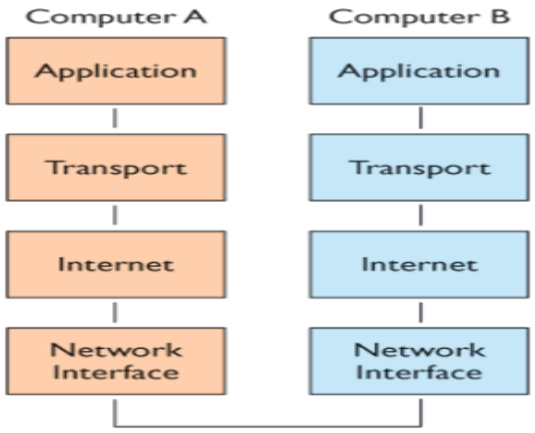
Features of Contemporary Telecommunications Systems - 1

Transmission Control Protocol/Internet Protocol (TCP/IP)

- Open suite of protocols for connectivity developed in 1970s
- Provides standards for breaking messages into packets, routing them to destination addresses, and reassembling them at end
- Allows for communication regardless of hardware/software

Features of Contemporary Telecommunications Systems - 2

TCP/IP: Four-Layer Reference Model



Features of Contemporary Telecommunications Systems – 3

TCP/IP: Four-Layer Reference Model

- **Application layer**: Communication between applications and other layers
- **Transport layer**: Acknowledging and sequencing packets to/from application
- **Internet layer**: Addressing, routing, packaging data packets
- **Network interface layer:** Placing packets on and receiving them from network medium

Features of Contemporary Telecommunications Systems – 4

Transmission Media - 1

Twisted wire

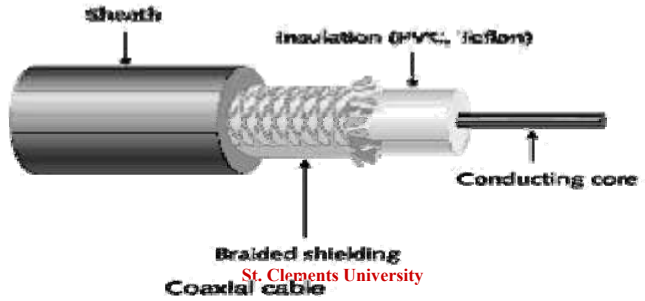
- Copper wire twisted in pairs
- Older analog transmission medium
- Can be used for digital signals
- Modems used for translating analog to digital

Features of Contemporary Telecommunications Systems – 5

Transmission Media - 2

Coaxial cable:

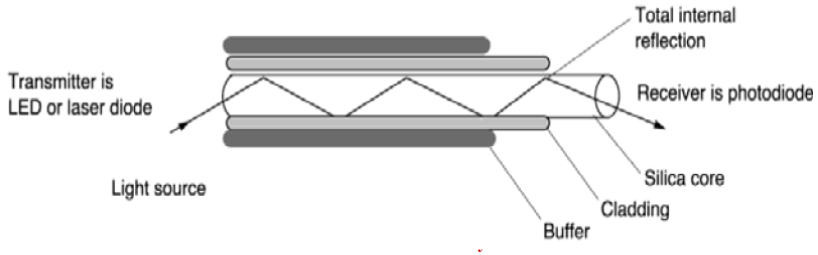
- Insulated copper wire
- Faster, more interference-free than twisted pair
- Difficult to install



Features of Contemporary Telecommunications Systems – 6

Transmission Media – 3

- **Fiber optics**
  - Transmission of data as light pulses through optical fiber
  - First converting electronic binary signals to light, and then convert the light signals back to electronic signals at the receiving end.
  - Faster, lighter, more durable



Features of Contemporary Telecommunications Systems – 7

Transmission Media – 4

- Fiber-optic technology has revolutionized telecommunications due to the very high speed of data transmission it can support.
- 0.1kg of optical fiber carries the same information as 30,000kg of copper cable
- At 2.5 Gbps, it is
  - equivalent to more than 3 hrs of TV per second
  - 24,000 simultaneous phone calls

Features of Contemporary Telecommunications Systems – 8

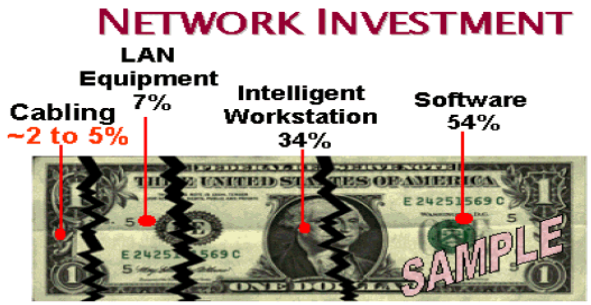
Transmission Media - 5

CABLING LIFE CYCLE

Features of Contemporary Telecommunications Systems – 9

Transmission Media – 6

- Although cabling represents only 2 to 5% of the total network investment, the cabling systems will outlive most network components.



Features of Contemporary Telecommunications Systems – 10

Transmission Media – 7

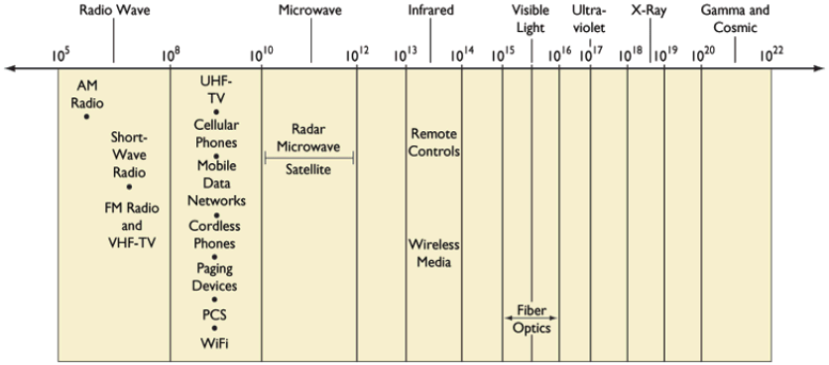
Wireless Transmission

- Use electromagnetic spectrum
- Microwave and infrared use high-frequency radio signals
- Paging systems, cellular telephones, PDAs, mobile data networks
- Wireless communication requires compatible standards
- Security/privacy issues

Features of Contemporary Telecommunications Systems – 11

Transmission Media – 8

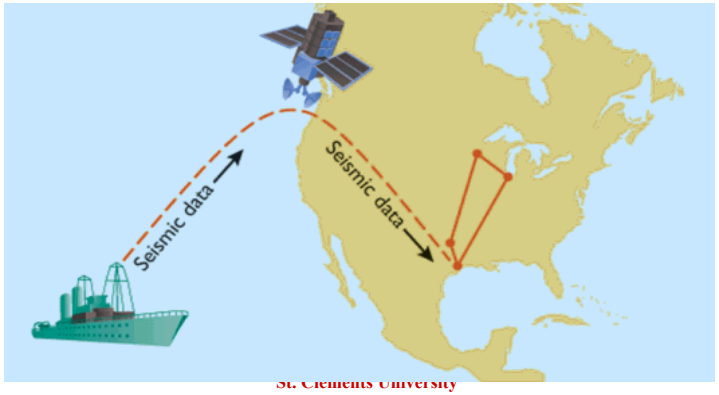
Frequency ranges for communication media and devices



Features of Contemporary Telecommunications Systems – 12

Transmission Media – 9

- **Satellite transmission system**



Features of Contemporary Telecommunications Systems – 13

Transmission Media – 10

- **Transmission Speed Comparison**

Twisted wire	Up to 1G+ Mbps
Microwave	Up to 200+ Mbps
Satellite	Up to 200+ Mbps
Coaxial cable	Up to 200 Mbps
Fiber-optic cable	Up to 6+ Tbps

5. Communications Networks

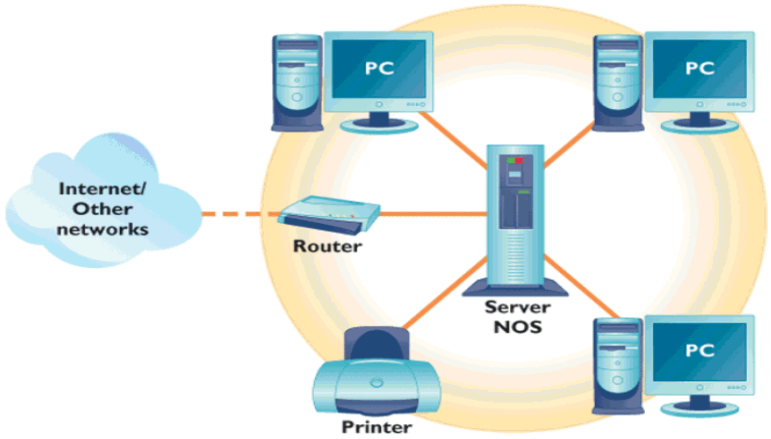
Communications Networks - 1

Local Area Networks (LAN) - 1

- A LAN is a data communication system allowing a number of independent devices to communicate directly with each other,
  - within a moderately sized geographic area,
  - and over a physical communications channel of moderate data rates.
- To implement a LAN, we need to use cabling or wireless technology to link up computers and networking devices, and the required software such as a Network Operating System (NOS).

Communications Networks - 2

Local Area Networks (LAN) - 2



Communications Networks - 3

Local Area Networks (LAN) – 3

- In a client/server arrangement, network services are located on a dedicated computer called a server. The server responds to the requests of clients for, print, application and other services.

Merits:

- The network is scalable.
- Enhanced security, ease of access, and control.

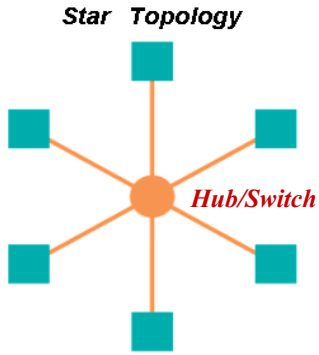
Demerits:

- Introduce a single point of failure in the network.
- More expensive, require specialized hardware and software.
- Require a trained, expert staff member to administer and maintain.

Communications Networks - 4

Local Area Networks (LAN) – 4

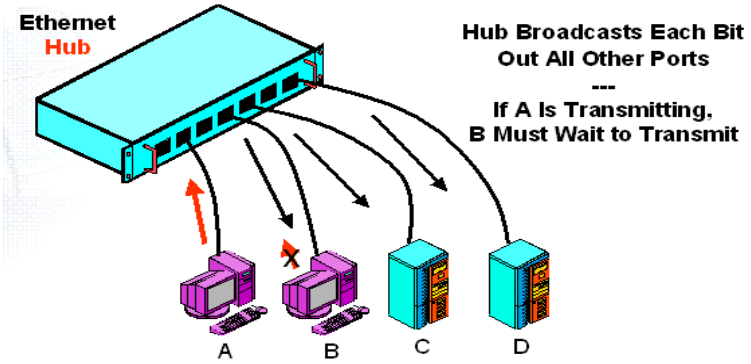
- Ethernet is by far the most common
- Star topology using Ethernet **hubs** and/or **switches**
- Use UTP cabling
- Relatively cheap, easy to install and manage
- Ethernet standards make use of latest developments in network technology



Communications Networks - 5

Local Area Networks (LAN) – 5

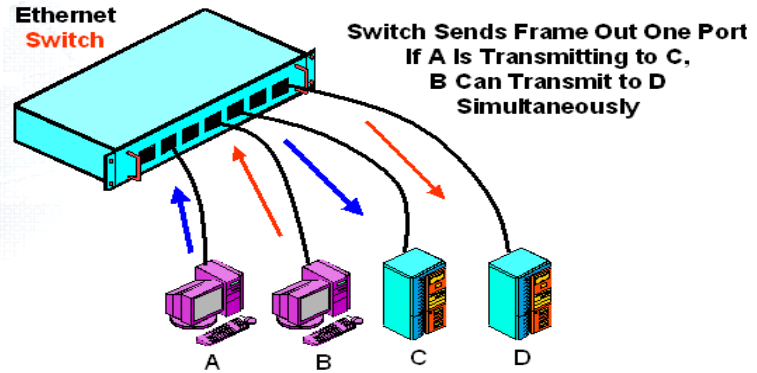
Hub Versus Switch Operation



Communications Networks - 6

Local Area Networks (LAN) – 6

Hub Versus Switch Operation



Communications Networks - 7

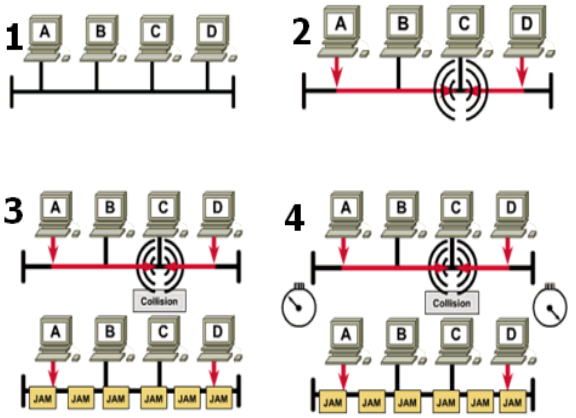
Local Area Networks (LAN) – 7

Hub Versus Switch Operation

- **Hubs Need Media Access Control**
  - This limits when a station may transmit
  - Ethernet hubs use CSMA/CD
- **Carrier Sense Multiple Access (CSMA)**
  - Only transmit if no other station is transmitting
  - Otherwise, wait
- **Collision Detection (CD)**
  - If two NICs transmit at the same time, this is a collision
  - Both will stop, wait a random amount of time, and then go back to CSMA to send again

Communications Networks - 8

Local Area Networks (LAN) – 8



CSMA/CD

1. Listen then transmit
2. Collision occurs
3. Broadcast jam signal
4. Devices back off appropriate amount of time, goes back to listen then transmit and then retransmit

Communications Networks - 9

Local Area Networks (LAN) – 9

UTP dominates the Ethernet access line market

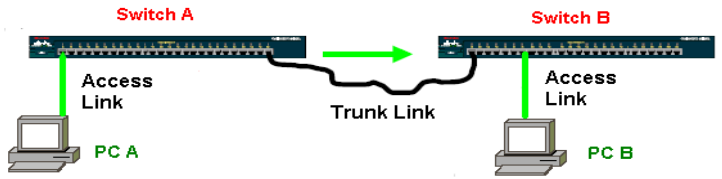
Physical Layer Standard	Speed	Maximum Run Length	Medium Required
10BASE-T	10 Mbps	100 meters	4-pair Category 3 or higher
100BASE-TX	100 Mbps	100 meters	4-pair Category 5 or higher
1000BASE-T (Gigabit Ethernet)	1,000 Mbps	100 meters	4-pair Category 5 or higher

Physical Layer Standard	Speed	Maximum Run Length	Medium 850 nm light (inexpensive) Multimode fiber	
1000BASE-SX	1 Gbps	220 m	62.5 microns	160 MHz-km

Communications Networks - 10

Local Area Networks (LAN) – 10

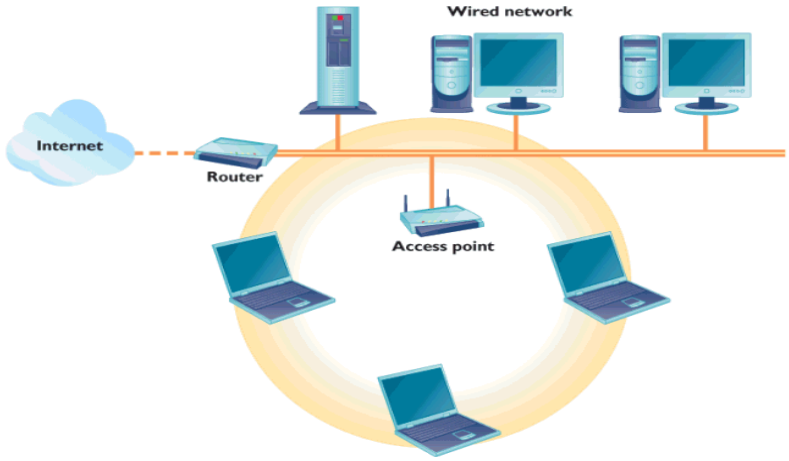
- **Access links** to client stations today are dominated by 100BASE-TX
  - But 1000BASE-T usage is growing
- **Trunk links** today are dominated by 1000BASE-SX
  - Sufficient for most LAN trunk line distances and speeds
  - Short trunk links, however, use UTP
  - Longer and faster trunk links use other fiber standards



Communications Networks - 11

Local Area Networks (LAN) – 11

An 802.11 Wireless LAN



Communications Networks - 12

Local Area Networks (LAN) – 12

Wireless LAN Benefits

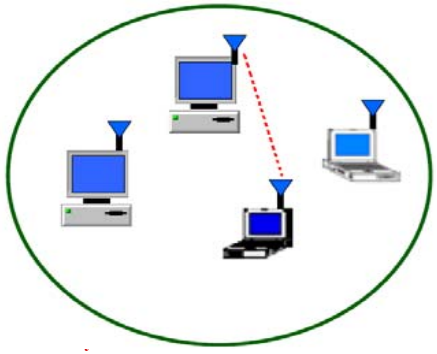
- **Removes wiring challenges**
  - Limited connections to users
  - Perfect for facilities where cost of wiring is prohibitive or impossible
- **Able to redeploy with minimal expense**
  - Low Installation Cost
  - Fast installation, Less Influence
  - Connect permanent or temporary campus buildings quickly and easily
- **Large coverage, High Performance**

Communications Networks - 13

Local Area Networks (LAN) – 13

Wireless LAN

- **Ad-hoc mode**: Peer-to-peer mode; wireless devices communicate with each other directly.
- It involves at least 2 stations
- No backbone infrastructure
- Suitable for small area

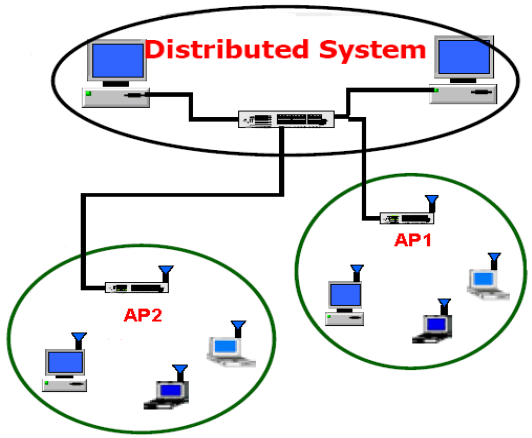


Communications Networks - 14

Local Area Networks (LAN) – 14

Wireless LAN

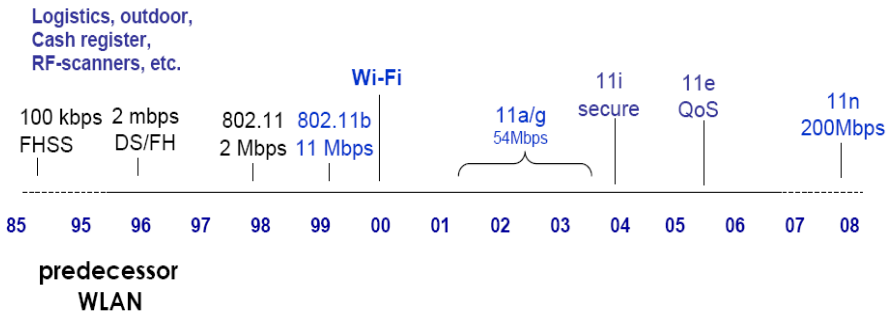
- **Infrastructure mode:**
- Wireless devices communicate with wired LAN via ***access points*** (APs).



Communications Networks - 15

Local Area Networks (LAN) – 15

- **WLAN-standards**



Communications Networks - 16

Local Area Networks (LAN) – 16

- **Wireless LAN Standard**

Standard	802.11b	802.11a	802.11a
Frequency Band	2.4 GHz	5 GHz	2.4GHz
Data rate	11 Mbps	54 Mbps	54 Mbps

- **Hot spot:** Geographic location in which an access point provides public Wi-Fi network service.
  - Eg. Free PCCW Wi-Fi service in the HK International Airport

Communications Networks - 17

Local Area Networks (LAN) – 17

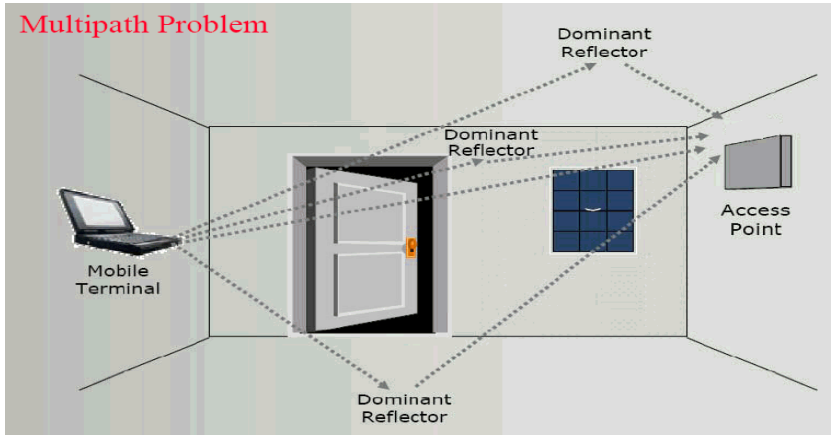
What is 802.11n?

- New IEEE Standard under development
- Uses MIMO radio technology as a basis
- End result will be more "wire-like" performance
- Anywhere from 100Mbps to 600Mbps depending on implementation
- First standard to support both 2.4 GHz and 5 GHz

Communications Networks - 18

Local Area Networks (LAN) – 18

Multi Path Reflections

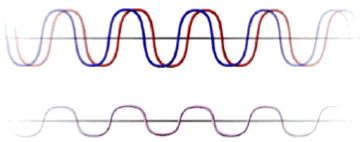


Communications Networks - 19

Local Area Networks (LAN) – 19

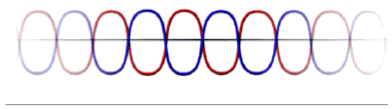
Multi Path Reflections

Original signal + reflections arrive at the receiver and are "added", resulting in a distorted reconstructed signal



Null Waves : Original signal and reflected signals are 180 degrees out of phase, cancelling each other out.

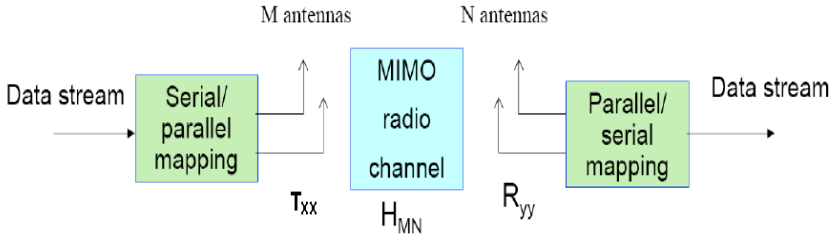
Causing drop outs.



Communications Networks - 20

Local Area Networks (LAN) – 20

- MIMO (Multiple Input / Multiple Output)
- Sending signals on multiple Tx antennas
- Receiving signals on multiple Rx antennas



Communications Networks - 21

Local Area Networks (LAN) – 21

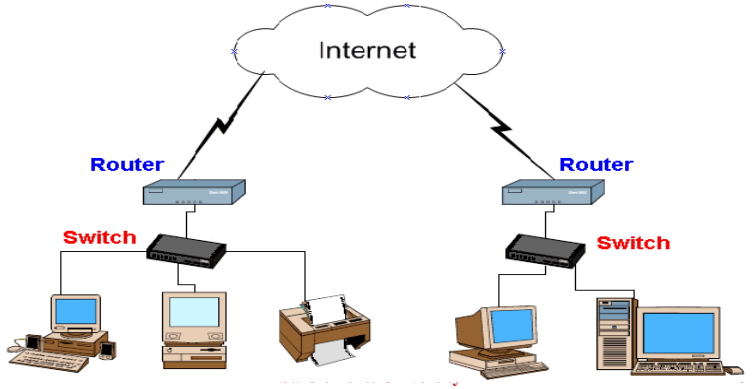
Bluetooth

- Standard for wireless personal area networks that can transmit up to 722 Kbps within 10-meter area
- It is a wireless LAN technology designed to connect devices of different functions such as telephones, notebooks, computers (desktop and laptop), cameras, printers and so on.
- A Bluetooth LAN is an ad-hoc network.
- The Bluetooth technology is the implementation of a a protocol defined by the IEEE 802.15 standard.
  - The standard defines a wireless personal-area network (PAN) opera able in an area the size of a room or a hall.

Communications Networks - 22

Local Area Networks (LAN) – 22

- **Routers** provides access to company networks on other sites, and to the Internet.



Communications Networks - 23

Wide Area Networks - 1

- A WAN is a single networks that connect different sites
- WANs and the Telephone
  - WAN technology usually uses the Public Switched Telephone Network transport system for transmission
  - Adds data switching and management
- WAN Purposes
  - Internet access
  - Link sites within the same corporation
  - Provide remote access to individuals who are off site

Communications Networks - 24

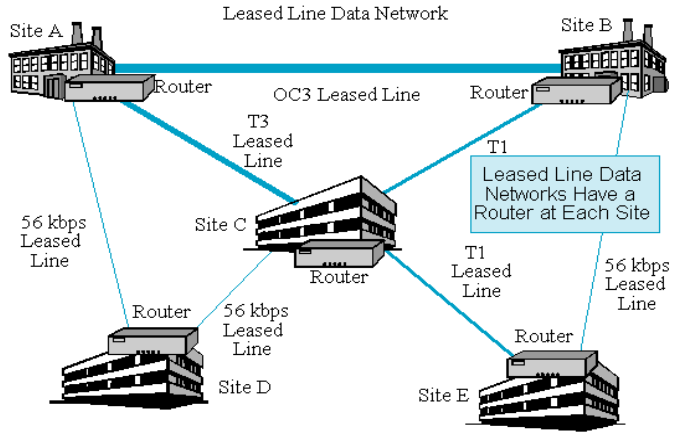
Wide Area Networks – 2

- WANs are characterized by **high cost** and **low speeds**.
- High cost per bit transmitted compared to LANs.
- Consequently, lower speeds (most commonly 128 kbps to a few megabits per second)
- This speed usually is aggregate throughput shared by many users
- Much slower than LAN speeds (100 Mbps to 1 Gbps to the desktop)

Communications Networks - 25

Wide Area Networks – 3

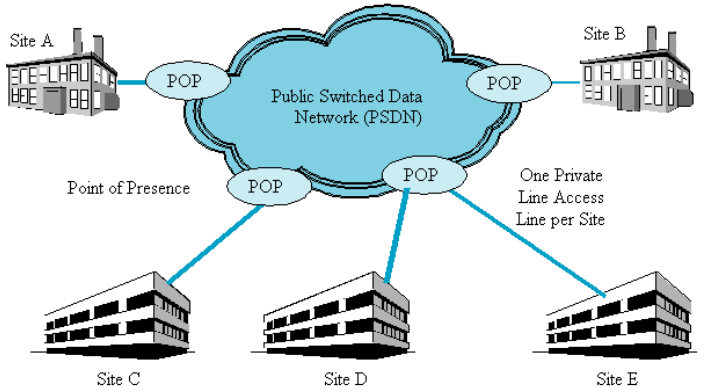
Leased Line Data Networks



Communications Networks - 26

Wide Area Networks – 4

WAN using Public Switched Data Networks



6. The Internet

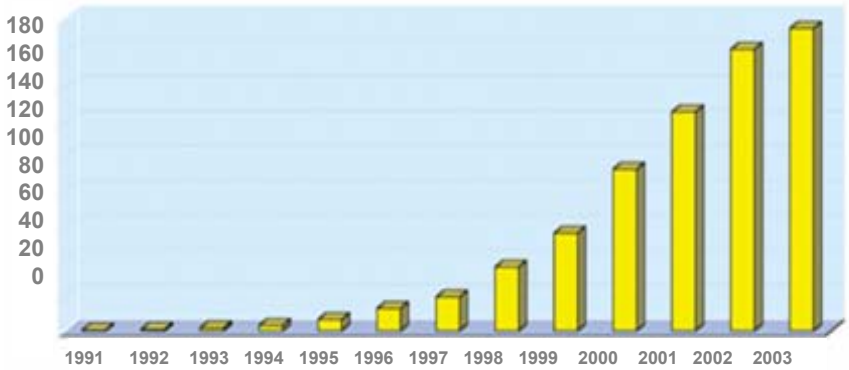
The Internet Revolution

The Internet

- Developed in the early 1960s by the U.S. Department of Defense (DOD) as a need of national security.
- Now grows to an international network of networks
  - Universal technology platform: Any computer can communicate with any other computer
  - Since the introduction of World Wide Web and Web sites, the population in the Internet has grown exponentially.

Growth of the Internet

- ARPANET grew from 4 computers in 1969 to over 300,000 by 1990.



Source: Internet Software Consortium (http://www.isc.org/)

Open Architecture Philosophy

Four key points:

- Independent networks should not require any internal changes to be connected to the Internet.
- Packets that do not arrive at their destinations must be retransmitted from their source network.
- The router computers do not retain information about the packets they handle.
- No global control will exist over the network.

Intranet and Extranet

Intranet

- LANs or WANs that use TCP/IP protocol but do not connect to sites outside the firm.

Extranet

- An intranet that allows selected outside parties to connect.

Communicate and collaborate

- Access information
- Participate in discussions
- Supply information
- Exchange business transactions

Commercialization of the Internet

- Businesses quickly recognized profit-making potential offered by a world-wide network of easy-to-use computers.
- **Web page**
  - An HTML document
- **Web site**
  - A collection of linked Web pages with a common theme
- **Web Browser**
  - Software that lets users read HTML documents and move from one HTML document to another through hypertext link tags in each file.

Hypertext and Links - 1

Hypertext Markup Language (HTML)

- A standard language used on the Web
- HTML uses codes (tags) to tell the Web browser software how to display text.

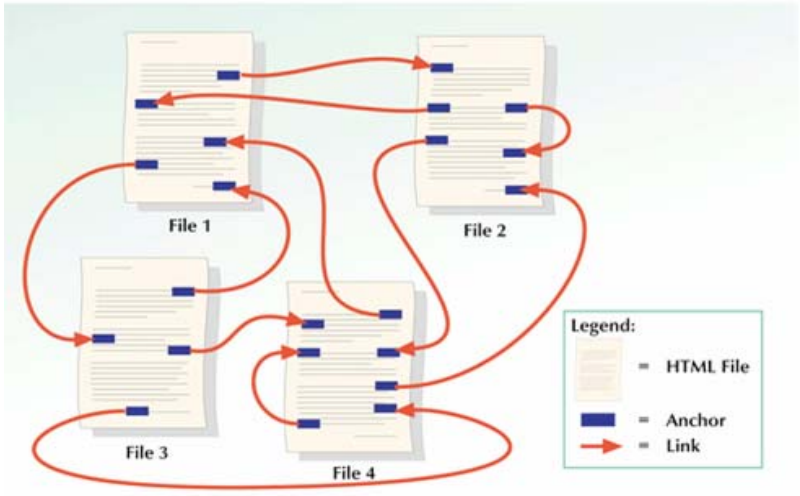
HTML anchor tag

- Enables Web designers to link HTML documents to each other

Hypertext Links

- A link which points to another location in the same or another HTML document

Hypertext and Links - 2



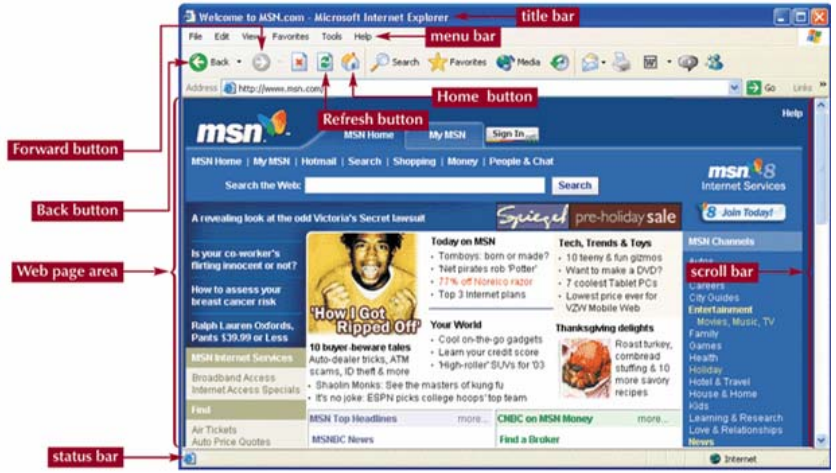
Uniform Resource Locators

Four-part addressing scheme that tells the Web browser:

- Transfer protocol to use when transporting the file
- Domain name of computer on which file resides
- Pathname of folder or directory on computer on which file resides
- Name of the file

Main Elements of Web Browsers

- **Title Bar, Scroll Bars, Status Bar, Menu Bar, Page Tab, Home Button**



Web Search Engines

- Web pages that conduct searches of the Web to find words or expressions you enter.

7. Networked Applications

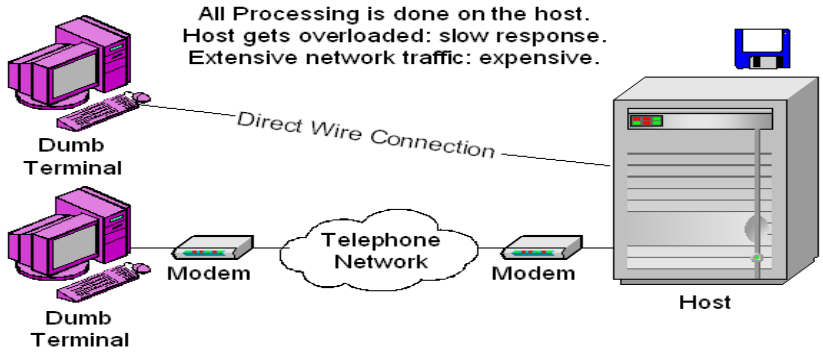
Application Architectures - 1

- An application architecture is the design decision about which network host or hosts to use to do the processing work in an application.
- Two type of application architecture:
  - Terminal-Host System
  - Client/Server Computing

Application Architectures - 2

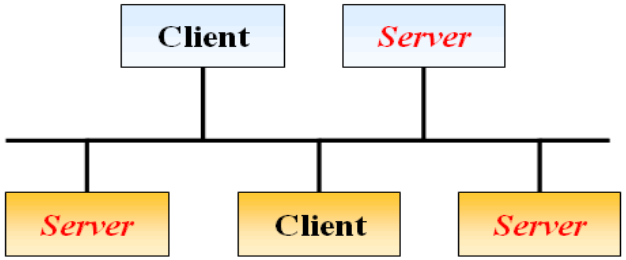
Terminal-Host System

- **Applications and databases reside on the same host computer.**
- **User interacts with the application using a "dumb terminal".**



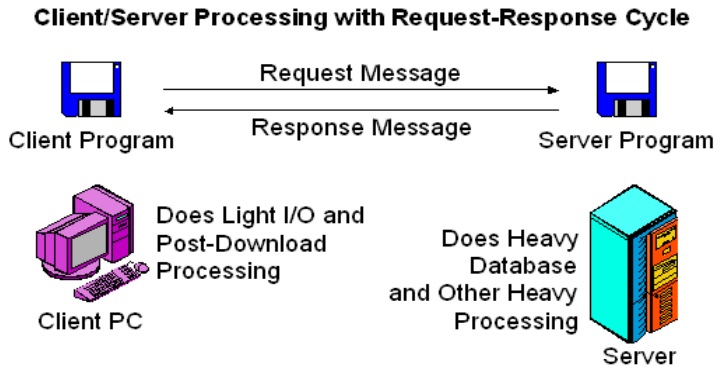
Application Architectures - 3

- Applications and databases reside on specialized host computers.
- Servers do most or all of the processing and transmit the results to the client.



Application Architectures - 4

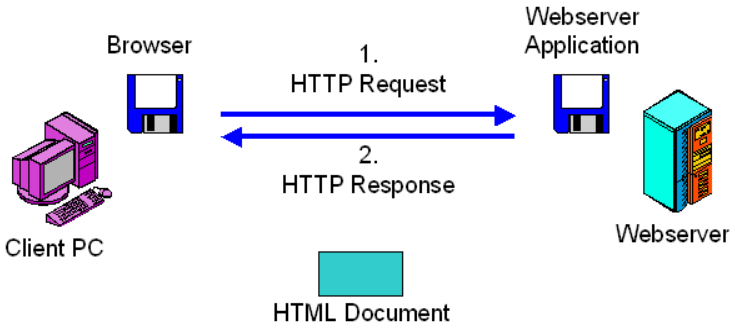
Client/Server Computing



Highly scalable: Use larger server as number of clients increases

Application Architectures - 5

Web Page Browsing



E-Mail - 1

What is E-Mail?

- E-mail (electronic mail) is the exchange of computer-stored messages by telecommunication.

Mail Server

- A hardware and software system that determines from the recipient's address one of several routes on which to send the message.

Mail Client Software or E-Mail Program

- A software that requests mail delivery from the mail server to your PC.

Email Address

- An address that uniquely identifies an individual or organization that is connected to the Internet.
- **mis.st.clements@gmail.com**

E-Mail - 2

Protocols that make email works

- **SMTP (Simple Mail Transfer Protocol)**
  - It decides which paths an e-mail message takes on the Internet.
- **POP (Post Office Protocol)**
  - It handles incoming messages.
- **IMAP (Internet Message Access Protocol)**
  - A protocol for retrieving mail messages from a server.
- **MIME (Multipurpose Internet Mail Extensions)**
  - A protocol that specifies how to encode non-text data, such as graphics and sound, so it can travel over the Internet.

E-Mail - 3

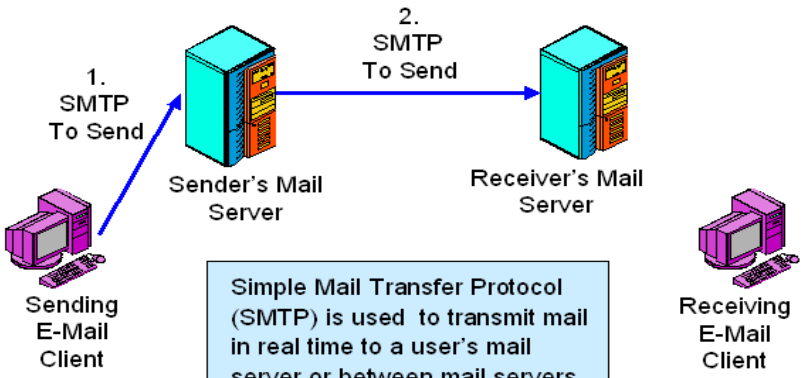
Importance of E-Mail

- Universal service on the Internet
- Attachments make e-mail a general file delivery mechanism!

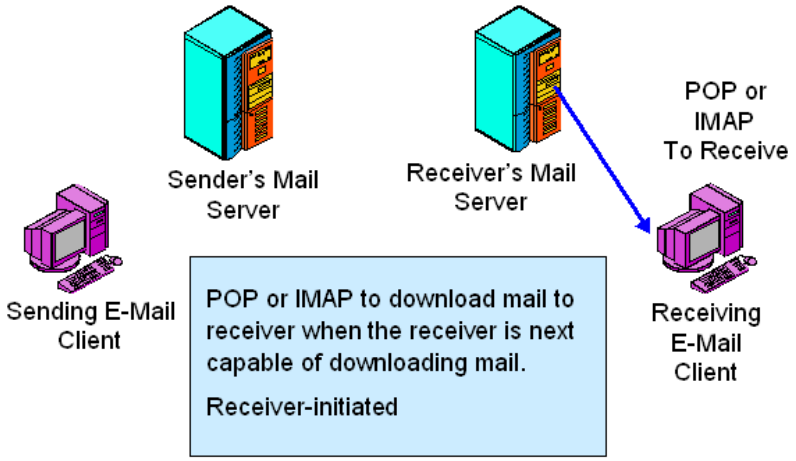
Mail Standards

- Message body standards
- Receiver must understand sender's message
  - RFC 822 and RFC 2822 for all-text bodies
  - HTML bodies with fancy text and graphics
  - UNICODE for non-English language characters

E-Mail - 4



E-Mail - 5



E-Mail – 6

The "evils" come with email:

- Messages with inappropriate content.
  - Racial or sexual harassment
  - Threats
- Spam, adware, spyware, and other abuses.
- Viruses, Worms, and Trojan Horses are often delivered by e-mail attachments!

E-Mail - 7

Viruses, Worms, and Trojan Horses

- Use of antivirus software is a must.
- Where to Do Scanning?
  - On client PCs
    - But users often turn off their software,
    - Fail to download virus definitions regularly
    - Or let their contracts lapse
  - On the corporate mail server or application firewall
    - Users cannot turn off

E-Mail - 8

- **Spam** are unsolicited commercial e-mail
- Why they are harmful?
  - Time consumed by users deleting them
  - Bandwidth and storage consumed
  - Legitimate messages lost because overlooked
- Separating SPAM from legitimate e-mail is difficult
  - Many spam messages get through to users
  - Some legitimate messages are deleted
  - Some firms merely mark messages as probable spam

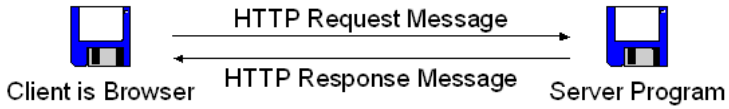
E-Mail - 9

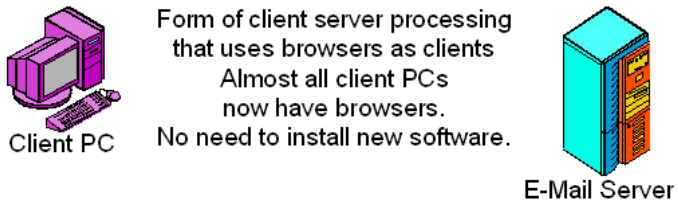
Web-Based E-Mail Services - 1

- Many Internet Web sites provide free e-mail addresses and accounts for **registered users**.
- They may be used with any Web browser.
- Examples: Gmail, Yahoo! Mail, Hotmail etc.

E-Mail - 10

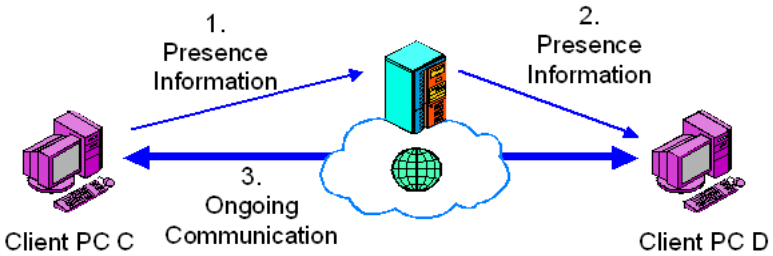
Web-Based E-Mail Services - 2





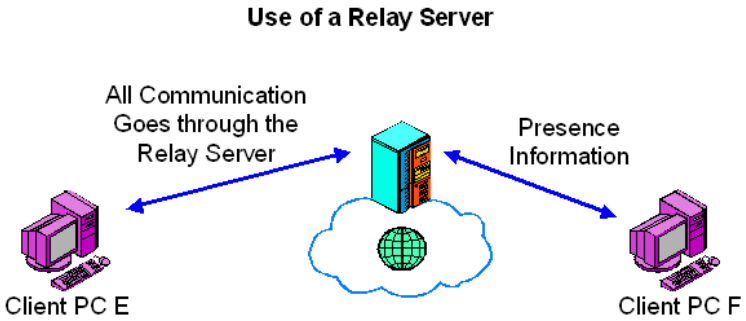
Instant Messaging Servers - 1

Use of a Presence Server



Clients register with presence servers.
Presence servers notify other clients as appropriate.
Clients use this information to communicate directly.

Instant Messaging Servers - 2



Relay servers route all IM messages.
This permits security filtering and other services.
It limits privacy because the relay server sees everything.

8. Contemporary Mobile Services

Mobile Enterprise

- "Today, penetration within organizations that use mobile applications is strong — on average, 22% of the workforce uses mobile applications."
  - *Forrester's March 15, 2006 Topic Overview "Enterprise Mobility"*
- Mobile Enterprise
  - "The ***ability for an enterprise to connect*** and control suppliers, partners, employees, assets, products, and customers ***from any location***."
    - *Forrester's March 15, 2006 Topic Overview "Enterprise Mobility"*

What's Driving Enterprises to Go Mobile?

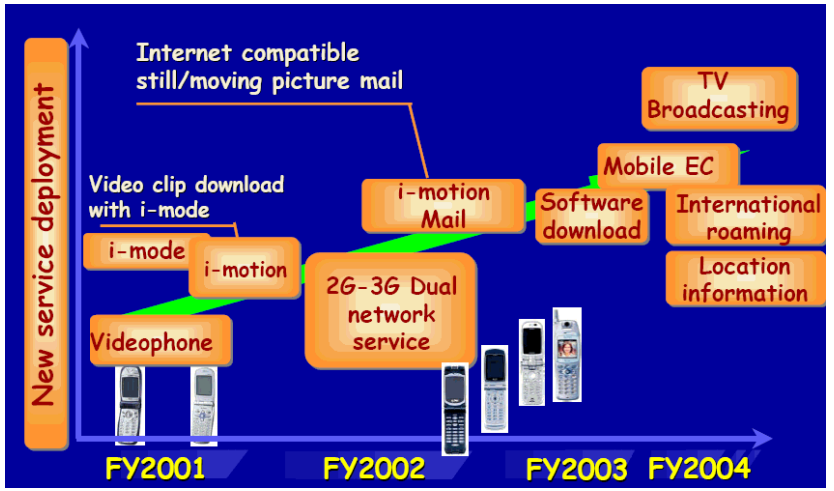
- Increased competitive pressure as others start adopting mobile technology.
- Overall increased speed of business.
- Executives who have experienced mobility through a wireless email device, such as a *BlackBerry*, are now influencing departments to embrace mobility.

Broadband Wireless Networks…
Versatile Devices…
Faster Processors….

Generations of Mobile Networks

- 1G: basic mobile telephony
- 2G: mobile telephony for mass users
  - regional roaming
- 2.5G: mobile internet services
- 3G:
  - global roaming
  - enhanced mobile Internet services

3G Services – To explore the non-voice Applications



HSDPA - 1

- High-Speed Downlink Packet Access (HSDPA) is a 3G mobile telephony communications protocol.
- It support services requiring instantaneous high data rates in the downlink, e.g. Internet browsing, video on demand, office application.
- Peak data rates 3-4 times higher than current 3G.
- Current HSDPA deployments support down-link speeds of 1.8, 3.6, 7.2 and 14.4 Mbit/s.
- New terminals are required to take advantage of HSDPA.

HSDPA - 2

SPEED		Higher bit rates: up to 14 Mbps peak rate
CAPACITY		2 – 3 times improved system capacity
REDUCED DELAY		Quicker response time with interactive services
STANDARDIZED		Integral part of WCDMA (3GPP Rel.5)
Network Coverage		Short time to market with existing sites

Public Wi-Fi Service - 1

- 全民免費試用 PCCW Wi-Fi 寬頻 30 天
- 由即日起，全港市民只需使用備有 Wi-Fi 接駁功能的手提電子產品，如手提電腦、流動電話機、電子手賬電話機或 iPod Touch 等，在遍佈全港的任何一個 PCCW Wi-Fi 熱點進行上網簡單登記，便可以在其後的 30 天內無限量免費試用 PCCW Wi-Fi寬頻服務，體驗極速、穩定、安全的無線上網樂趣。
- 電訊盈科在提供無線傳輸方面領先同儕，在全港敷設超過4,000個Wi-Fi熱點，致力將香港發展成爲「Wi-Fi城市」。

Public Wi-Fi Service - 2

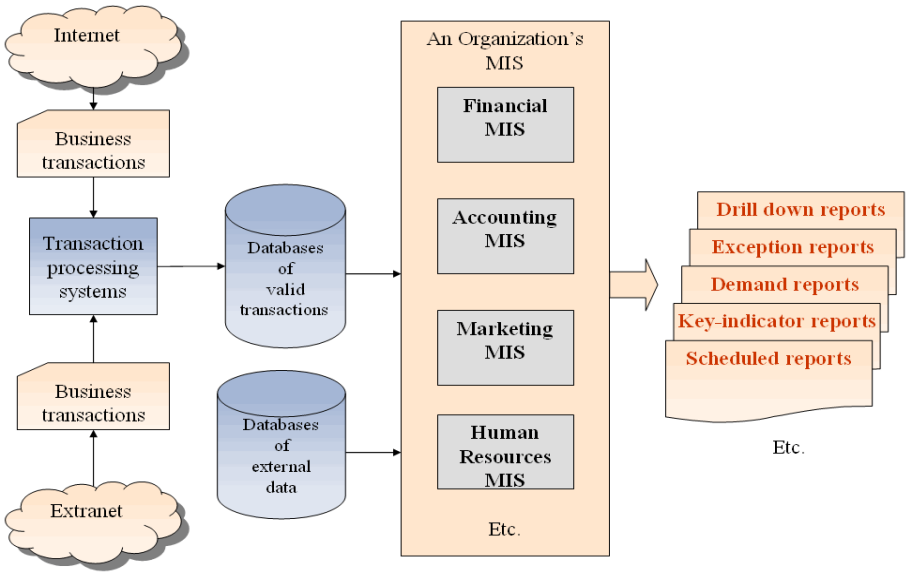
- 每日港幣 18 元使用費，即可全日無限量使用 HSDPA、3G 本地資料傳輸。

9. MIS Examples

Management information system (MIS) - 1

- An MIS provides managers with **information** and **support** for effective decision making, and provides feedback on daily operations.
- Output, or reports, are usually generated through accumulation of transaction processing data.
- MIS is an integrated collection of functional information systems, each supporting particular functional areas.
  - Provides reports based on routine flow of data
  - Assists in general control of the organization

Management information system (MIS) - 2



Management information system (MIS) - 3

Outputs of an MIS

Scheduled reports

- Produced periodically, or on a schedule (daily, weekly, monthly)

Key-indicator report

- Summarizes the previous day's critical activities
- Typically available at the beginning of each day

Demand report

- Gives certain information at a manager's request

Exception report

- Automatically produced when a situation is unusual or requires management action

Drill Down Reports

- Provide detailed data about a situation. To move from summary data to lower and lower levels of detail.

MIS for Competitive Advantage

- Provides support to managers as they work to achieve corporate goals.
- Enables managers to compare results to established company goals and identify problem areas and opportunities for improvement.
- Data may be made available from management information systems on a company's intranet.
- Employees can use browsers and their PC to gain access to the data.

10. Management of MIS

MIS Management - 1

- Managing the information systems and technologies that support the modern business processes of companies today is a major challenge for both business and IT managers and professionals.
- Failures in IT management can be reduced by the **involvement of business managers** in IT planning and management.

MIS Management - 2

- Managing the joint development and implementation of business/IT strategies.
  - Led by the CEO and CIO
  - Proposals are developed by business managers and IT professionals for **using IT** to **support the strategic business priorities** of the company.
  - This is to ensure alignment of IT with strategic business goals.

MIS Management - 3

- Managing the development and implementation of new business/IT applications and technologies.
  - This is the primary responsibility of the CIO/CTO.
  - This area of IT management involves managing the processes for information systems development and implementation.
  - It also includes the responsibility for research into the strategic business uses of new information technologies.

MIS Management - 4

- Managing the IT organization and the IT infrastructure.
  - The CIO and IT managers share responsibility for managing the work of IT professionals who are typically organized into a variety of project teams and other organizational subunits.
  - They are responsible for managing the IT infrastructure of hardware, software, databases, telecommunications networks, and other IT resources, which must be acquired, operated, monitored, and maintained.

MIS Management - 5

The business/IT planning process has three major components:

- **Strategy Development** – Developing e-business and e-commerce strategies that support a company's e-business vision, use information technology to create innovative e-business systems that focus on customer and business value.
- **Resource Management** – Developing strategic plans for managing or outsourcing a company's IT resources, including IS personnel, hardware, software, data, and network resources.
- **Technology Architecture** – Making strategic IT choices that reflect an information technology architecture designed to support a company's business/IT initiatives.

MIS Management - 6

Managing Hardware and Software

- **Capacity planning**: Process of predicting when a computer hardware system becomes saturated
- **Scalability:** Ability of a computer, product, or system to expand to serve a larger number of users without breaking down

MIS Management - 7

- Total Cost of Ownership (TCO) of Technology Assets
  - Includes both direct and indirect costs
  - Hardware and software acquisitions account for only 20% of TCO
  - TCO for a PC may run to three times original purchase price
  - Be aware of hidden costs!

END

Management Information System

St. Clements University
MBA Program
August, 2009
Hong Kong

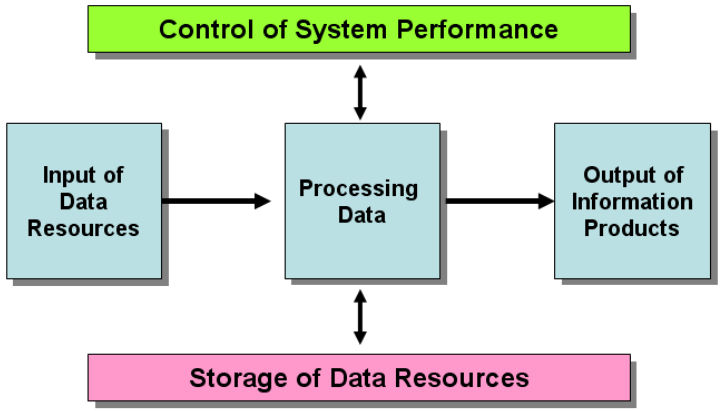
Table of Contents

1. The role of information systems

What Is an Information System ?

- An information system is a mechanism that helps people collect, store, organize, and use information. This is the primary use for computers.
- An information system can be manual, like a card catalog or an address book.
- Computerized information systems can range from a simple database of names to a sophisticated ERP system.

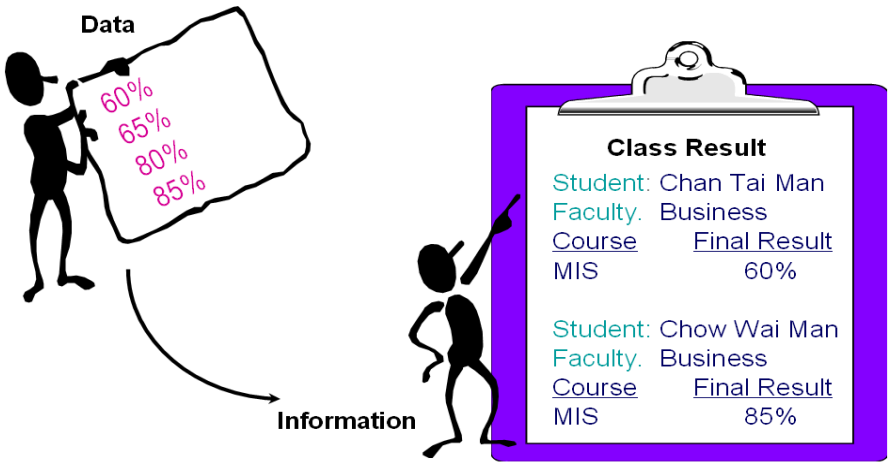
Computer-based Information Systems Model



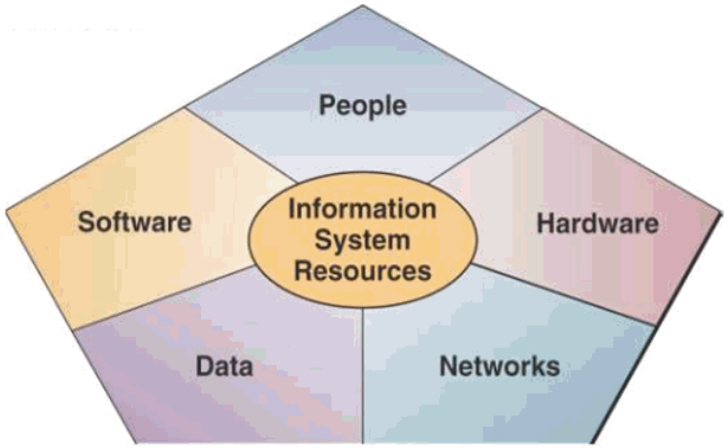
Data and Information - 1

- An IS is a set of interrelated components that collect (or retrieve), process, store, and distribute information to support decision making and control in an organization.
- What is the difference between ***information*** and ***data***?
  - **Data:** Streams of raw facts representing events such as business transactions.
  - **Information:** Clusters of data that are meaningful and useful to human beings in the processes such as making decisions.

Data and Information - 2



Components of Information Systems



The Challenges of Information Systems: Key Management issues - 1

Positive Impacts of Information Systems

- Faster calculations and paperwork
- Analysis of customer purchase patterns and preferences
- More efficient business services
- Instant global distribution of information

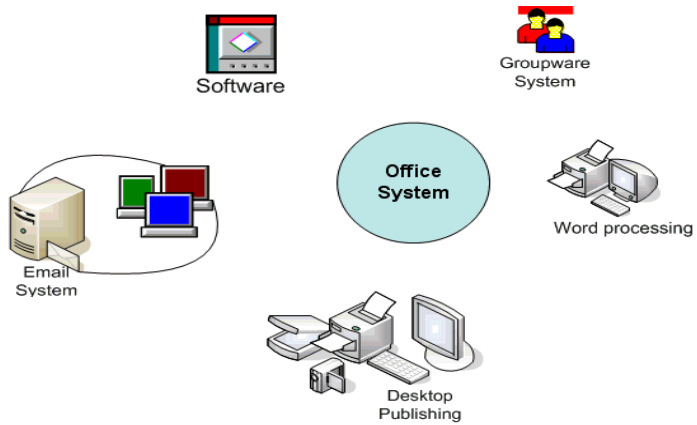
The Challenges of Information Systems: Key Management issues - 2

Negative Impacts of Information Systems

- Automation leading to job elimination
- Privacy concerns
- System outages and shutdowns
- Health problems, repetitive stress injury
- Illegal distribution of intellectual property

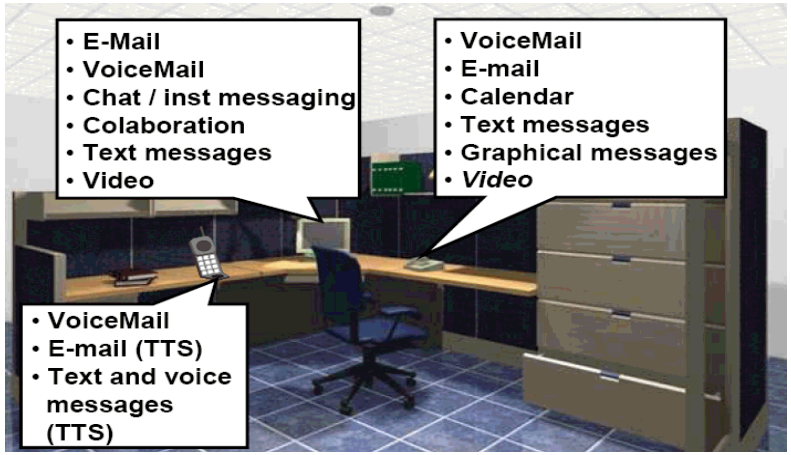
2. Hardware and Software in the Enterprise

Common Compartments in an Office System



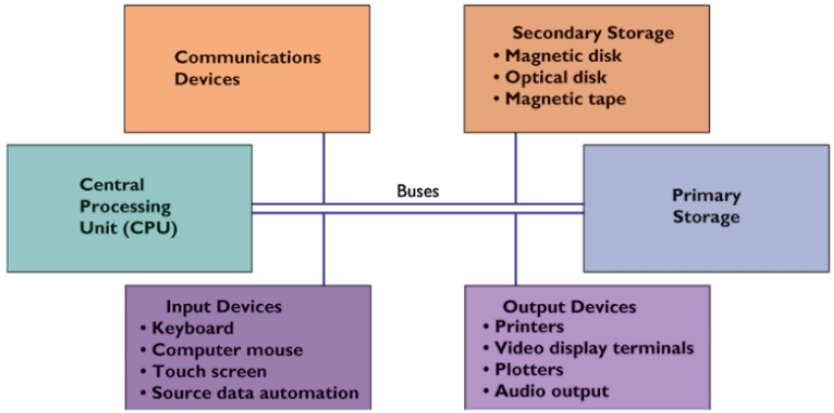
Example of today's work environment

- Three communication devices: PC, desk phone, mobile



Computer Hardware and Information Technology Infrastructure - 1

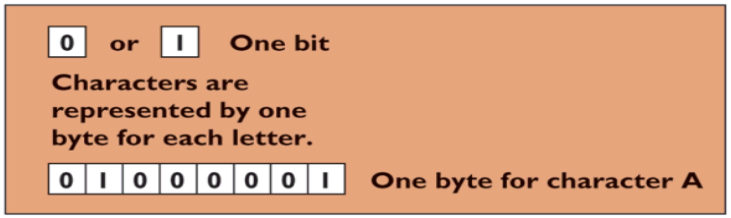
- Hardware components of a computer system



Computer Hardware and Information Technology Infrastructure - 2

The Computer System

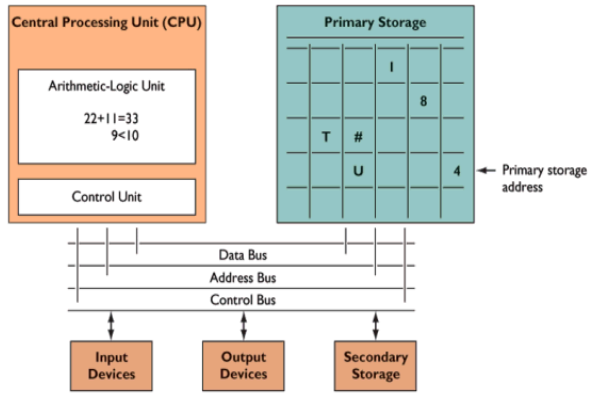
- **Bit**
  - Binary digit
  - Represents 0 or 1
- **Byte**
  - String of eight bits
  - Stores one number, symbol, character, part of picture



Computer Hardware and Information Technology Infrastructure - 3

The Computer System

- **The Central Processing Unit (CPU)**
  - Controls other parts of computer
- **Arithmetic-logic unit**
  - Performs principle logical/mathematical operations
- **Control unit**
  - Coordinates other parts, such as reading a stored program



Computer Hardware and Information Technology Infrastructure - 4

The Computer System

- **Primary Storage**
  - Located near CPU
  - Stores all or part of active software program
  - Stores data the program is using
  - Composed of semi-conductors
  - RAM (random access memory): Used for short-term, temporary storage
  - ROM (read-only memory): Semiconductor memory chips with program instructions

Computer Hardware and Information Technology Infrastructure - 5

The Computer System

- **Secondary Storage Technology**
  - Used for relatively long-term storage of data outside CPU
  - Magnetic disk: floppies, hard disks, RAID
  - Flash memory (USB Drive)
  - Optical disk: CD-ROM, CD-RW, DVD
  - Magnetic tape
  - Storage networking: direct-attached storage; network-attached storage; storage area networks

Computer Hardware and Information Technology Infrastructure - 6

Hierarchy of Memory Capacity

- Kilobyte (KB): approximately one thousand bytes.
- Megabyte (MB): approximately one million bytes (1,048,576 bytes, or 1,024 x 1,024).
- Gigabyte (GB): actually 1,073,741,824 bytes (1,024 x 1,024 x 1,024 bytes).
- Terabyte: One trillion bytes, 10^{12} bytes.
- Petabyte: Approximately 10^{15} bytes.
- Exabyte: Approximately 10^{18} bytes.

Computer Hardware and Information Technology Infrastructure - 7

A storage area network (SAN)

Computer Hardware and Information Technology Infrastructure - 8

The Computer System

- **Input Devices**
  - Keyboard and mouse
  - Touch screen
  - Optical character recognition
  - Magnetic ink character recognition (MICR)

  - Pen-based input
  - Digital scanner
  - Audio input
  - Radio-frequency identification (RFID)

Computer Hardware and Information Technology Infrastructure - 9

The Computer System

- **Output Devices**
  - Cathode-ray tube (CRT)
  - LCD Panel
  - Printers
  - Audio output

Classifying Computers

- **Mainframe:** Largest computer, largest multi-user systems, handles massive amounts of data; used for large business, scientific, military applications.

- **Workstation:** More powerful desktop computer used for computation-intense tasks. A midrange systems multi-user system.
- **Personal computer**: Portable or desktop microcomputer. A single user system.

Types of Software

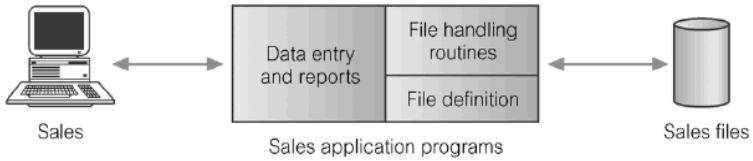
- **Software program:** A series of statements or instructions to the computer
- Two major types of software:
  - **System software**
    - Generalized programs that manage the computer's resources
    - For example, the Windows family of Operating Systems
  - **Application software**
    - Programs written for or by users to perform a specific task.
    - For example, Word,Excel, Powerpoint

3. Database Management Systems

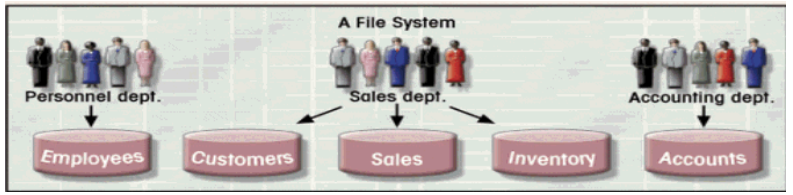
File Systems - 1

Traditional file environment:

- Each application program defines and manages its own data.



- Each program defines and manages its own data.



File Systems - 2

Limitations of File-based Approach:

1. Separation and isolation of data

- Each program maintains its own set of data.
- Users of one program may be unaware of potentially useful data held by other programs.

2. Duplication of data

- Same data is held by different programs.
- Wasted space and potentially different values and/or different formats for the same item.

File Systems - 3

3. **Data dependence**

- File structure is defined in the program code.

4. **Incompatible file formats**

- Programs are written in different languages, and so cannot easily access each others files.

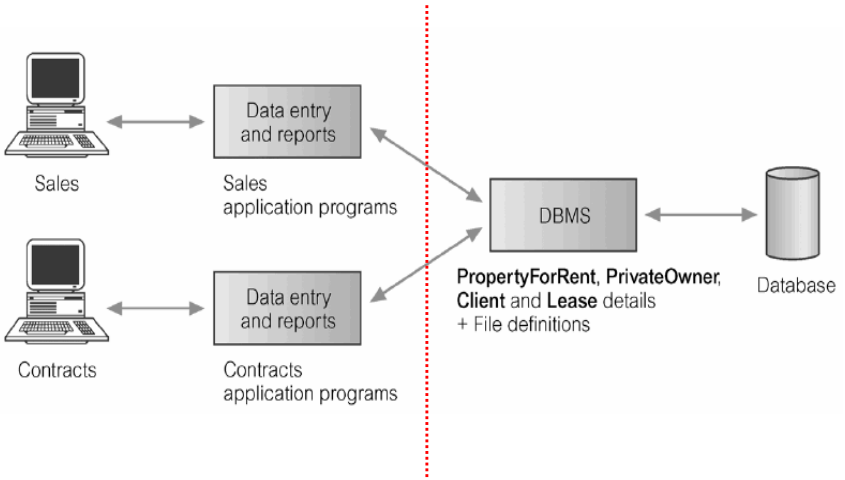
5. **Fixed Queries/Proliferation of application programs**

- Programs are written to satisfy particular functions.
- Any new requirement needs a new program.

The Database Approach to Data Management - 1

- **Shared collection** of logically related data (and a description of this data), designed to meet the information needs of an organization.
- System catalog (metadata) provides **description of data** to enable program–data independence.
- Logically related data comprises entities, attributes, and relationships of an organization's information.

The Database Approach to Data Management - 2



DBMS Approach

Database Management System (DBMS)

- A software system that enables users to define, create, and maintain the database and which provides controlled access to this database.

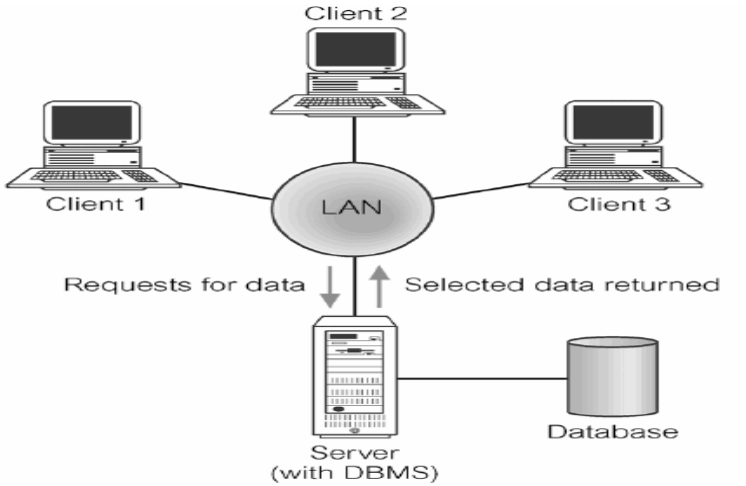
DBMS Components

1. **Data definition language**: Formal language for specifying the structure of database
2. **Data manipulation language**: For extracting data from database, e.g. SQL**.**

How a DBMS Solves Problems of a Traditional File Environment

- Reduces data redundancy
- Eliminates data inconsistency
- Uncouples programs from data
- Increases access and availability of data
- Allows central management of data, data use, and security

Database Client-server Architecture



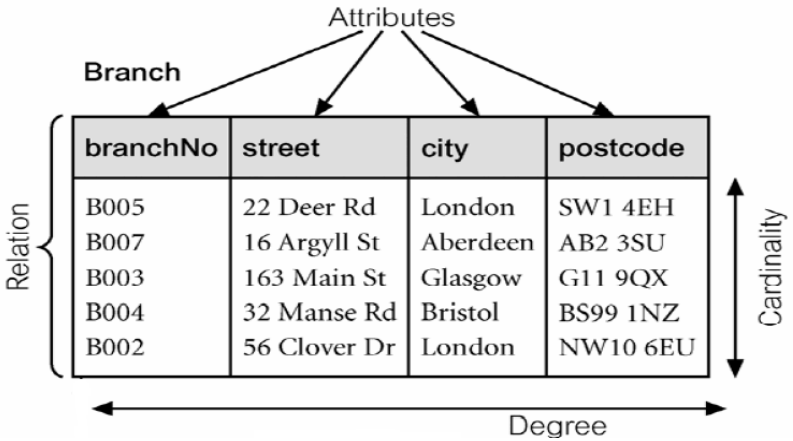
Disadvantages of DBMS

- Complexity
- Size
- Cost of DBMS
- Additional hardware costs
- Cost of conversion
- Performance
- Higher impact of a failure

Relational DBMS - 1

- A **relation** is a table with columns and rows.
  - **Attribute** is a named column of a relation.
  - **Domain** is the set of allowable values for one or more attributes.
  - **Tuple** is a row of a relation.
  - **Degree** is the number of attributes in a relation.
  - **Cardinality** is the number of tuples in a relation.
- Relational Database is a collection of normalized relations with distinct relation names.

Relational DBMS - 2



- Relates data across tables based on **common data element.**

Relational DBMS - 3

Table (Relation)

Columns (Attributes, Fields)

ORDER

Order_ Number	Order_ Date	Delivery_ Date	Part_ Number	Part_ Quantity
1634	02/02/04	02/22/04	152	2
1635	02/12/04	02/28/04	137	3
1636	02/13/04	03/01/04	145	1

PART

Part_ Number	Part_ Description	Unit_ Price	Supplier_ Number
137	Door latch	22.50	4058
145	Door handle	26.25	2038
150	Door seal	6.00	4058
152	Compressor	70.00	1125

SUPPLIER

Supplier_ Number	Supplier_ Name	Supplier_Address
4058	CBM Inc.	44 Winslow, Gary, IN 44950
2038	Ace Inc.	Rte. 101, Essex, NJ 07763
1125	Bryant Corp.	51 Elm, Rochester, NY 11349

Relational DBMS - 4

Alternative terminology for relational model terms

Formal terms	Alternative 1	Alternative 2
Relation	Table	File
Tuple	Row	Record
Attribute	Column	Field

Relational DBMS - 5

Basic Operations in a Relational Database:

- **Select:** Creates subset of rows that meet specific criteria

Original table

P_CODE	P_DESCRIPT	PRICE
123456	Flashlight	5.26
123457	Lamp	25.15
123458	Box Fan	10.99
213345	9v battery	1.92
254467	100W bulb	1.47
311452	Powerdrill	34.99

SELECT ALL will yield

New table or list

P_CODE	P_DESCRIPT	PRICE
123456	Flashlight	5.26
123457	Lamp	25.15
123458	Box Fan	10.99
213345	9v battery	1.92
254467	100W bulb	1.47
311452	Powerdrill	34.99

SELECT only PRICE less than 2.00 will yield

P_CODE	P_DESCRIPT	PRICE
213345	9v battery	1.92
254467	100W bulb	1.47

SELECT only P_CODE=311452 will yield

P_CODE	P_DESCRIPT	PRICE
311452	Powerdrill	34.99

Relational DBMS - 6

- **Project:** Yields all values for selected attributes – vertical subset of a table.

Original table

P_CODE	P_DESCRIPT	PRICE
123456	Flashlight	5.26
123457	Lamp	25.15
123458	Box Fan	10.99
213345	9v battery	1.92
254467	100W bulb	1.47
311452	Powerdrill	34.99

PROJECT PRICE yields

New table or list

PRICE
5.26
25.15
10.99
1.92
1.47
34.99

PROJECT P_DESCRIPT and PRICE yields

P_DESCRIPT	PRICE
Flashlight	5.26
Lamp	25.15
Box Fan	10.99
9v battery	1.92
100W bulb	1.47
Powerdrill	34.99

PROJECT P_CODE and PRICE yields

P_CODE	PRICE
123456	5.26
123457	25.15
123458	10.99
213345	1.92
254467	1.47
311452	34.99

Relational DBMS - 7

- **Join:** Enables users to create a new table containing only relevant information from **more than one table**.

Table name: CUSTOMER

CUS_CODE	CUS_LNAME	CUS_ZIP	AGENT_CODE
1132445	Walker	32145	231
1217782	Adares	32145	125
1312243	Rakowski	34129	167
1321242	Rodriguez	37134	125
1542311	Smithson	37134	421
1657399	Vanloo	32145	231

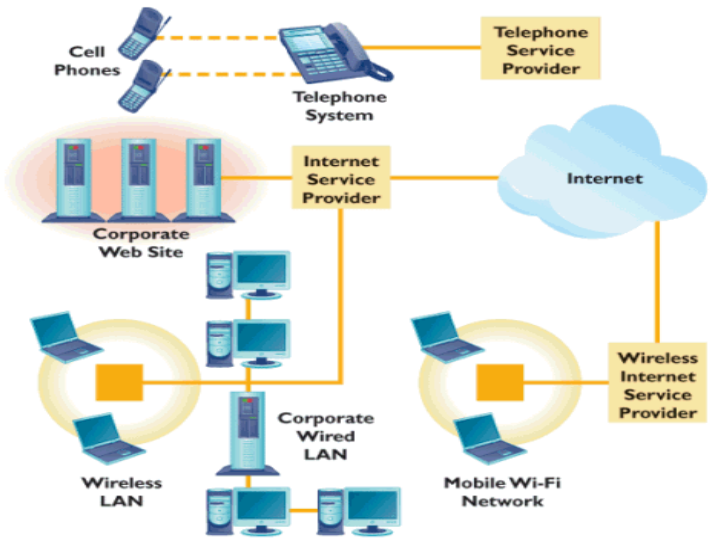
Table name: AGENT

AGENT_CODE	AGENT_PHONE
125	6152439887
167	6153426778
231	6152431124
333	9041234445

CUS_CODE	CUS_LNAME	CUS_ZIP	AGENT_CODE	AGENT_PHONE
1217782	Adares	32145	125	6152439887
1321242	Rodriguez	37134	125	6152439887
1312243	Rakowski	34129	167	6153426778
1132445	Walker	32145	231	6152431124
1657399	Vanloo	32145	231	6152431124

4. Business Telecommunications System

Corporate Telecommunications System

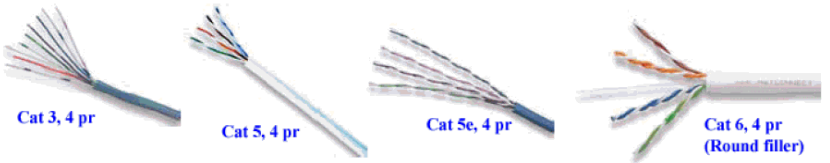


Features of Contemporary Telecommunications Systems – 1

Transmission Media - 1

Twisted wire

- Copper wire twisted in pairs
- Older analog transmission medium
- Can be used for digital signals
- Modems used for translating analog to digital

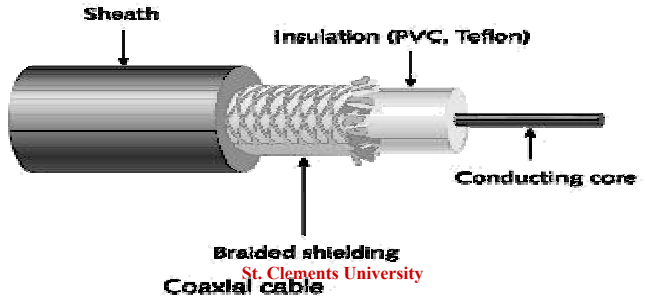


Features of Contemporary Telecommunications Systems – 2

Transmission Media - 2

Coaxial cable:

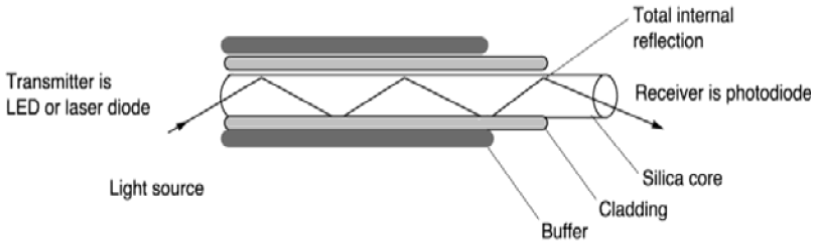
- Insulated copper wire
- Faster, more interference-free than twisted pair
- Difficult to install



Features of Contemporary Telecommunications Systems – 3

Transmission Media – 3

- **Fiber optics**
  - Transmission of data as light pulses through optical fiber
  - First converting electronic binary signals to light, and then convert the light signals back to electronic signals at the receiving end.
  - Faster, lighter, more durable



Features of Contemporary Telecommunications Systems – 4

Transmission Media – 4

- Fiber-optic technology has revolutionized telecommunications due to the very high speed of data transmission it can support.
- 0.1kg of optical fiber carries the same information as 30,000kg of copper cable
- At 2.5 Gbps, it is
  - equivalent to more than 3 hrs of TV per second
  - 24,000 simultaneous phone calls

Features of Contemporary Telecommunications Systems – 5

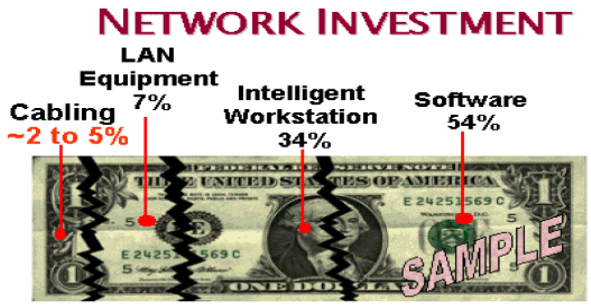
Transmission Media - 5

CABLING LIFE CYCLE

Features of Contemporary Telecommunications Systems – 6

Transmission Media – 6

- Although cabling represents only 2 to 5% of the total network investment, the cabling systems will outlive most network components.



Features of Contemporary Telecommunications Systems – 7

Transmission Media – 7

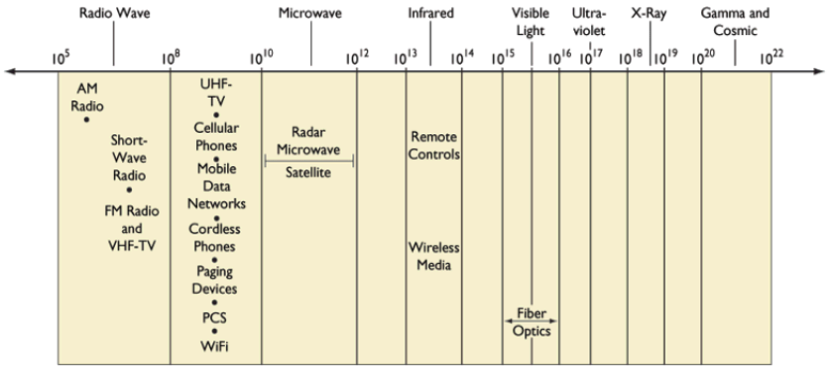
Wireless Transmission

- Use electromagnetic spectrum
- Microwave and infrared use high-frequency radio signals
- Paging systems, cellular telephones, PDAs, mobile data networks
- Wireless communication requires compatible standards
- Security/privacy issues

Features of Contemporary Telecommunications Systems – 8

Transmission Media – 8

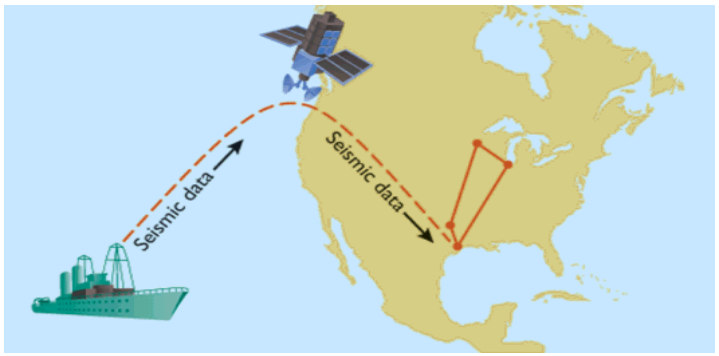
Frequency ranges for communication media and devices



Features of Contemporary Telecommunications Systems – 9

Transmission Media – 9

- **Satellite transmission system**



Features of Contemporary Telecommunications Systems – 10

Transmission Media – 10

- **Transmission Speed Comparison**

Twisted wire	Up to 1G+ Mbps
Microwave	Up to 200+ Mbps
Satellite	Up to 200+ Mbps
Coaxial cable	Up to 200 Mbps
Fiber-optic cable	Up to 6+ Tbps

5. Communications Networks

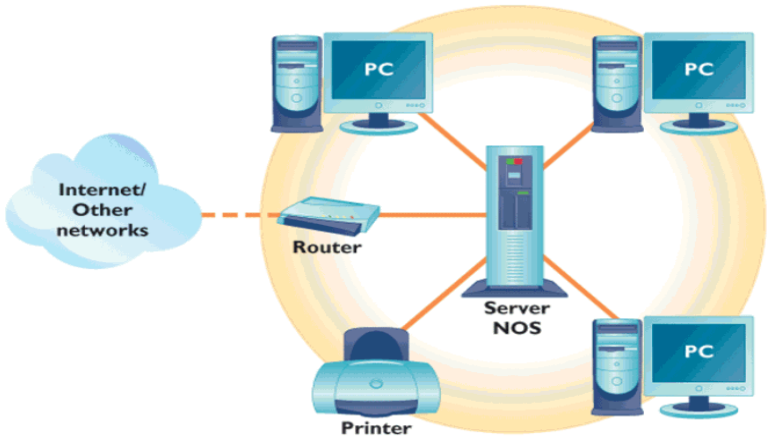
Communications Networks - 1

Local Area Networks (LAN) - 1

- A LAN is a data communication system allowing a number of independent devices to communicate directly with each other,
  - within a moderately sized geographic area,
  - and over a physical communications channel of moderate data rates.
- To implement a LAN, we need to use cabling or wireless technology to link up computers and networking devices, and the required software such as a Network Operating System (NOS).

Communications Networks - 2

Local Area Networks (LAN) - 2



Communications Networks - 3

Local Area Networks (LAN) – 3

- In a client/server arrangement, network services are located on a dedicated computer called a server. The server responds to the requests of clients for, print, application and other services.

Merits:

- The network is scalable.
- Enhanced security, ease of access, and control.

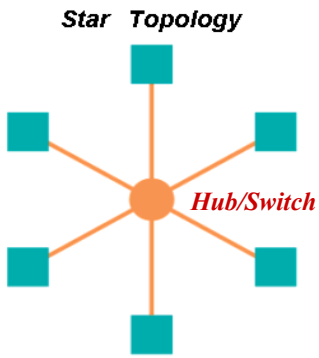
Demerits:

- Introduce a single point of failure in the network.
- More expensive, require specialized hardware and software.
- Require a trained, expert staff member to administer and maintain.

Communications Networks - 4

Local Area Networks (LAN) – 4

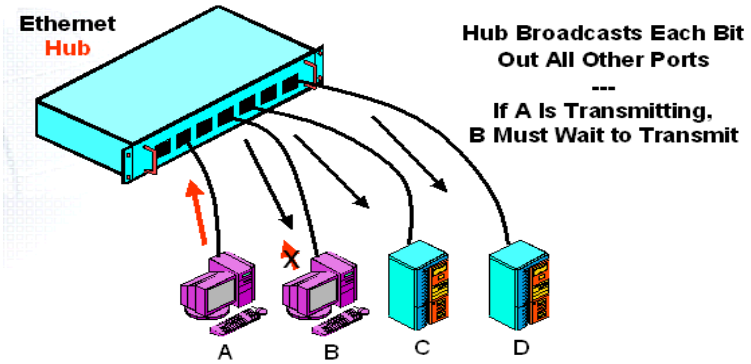
- Ethernet is by far the most common
- Star topology using Ethernet **hubs** and/or **switches**
- Use UTP cabling
- Relatively cheap, easy to install and manage
- Ethernet standards make use of latest developments in network technology



Communications Networks - 5

Local Area Networks (LAN) – 5

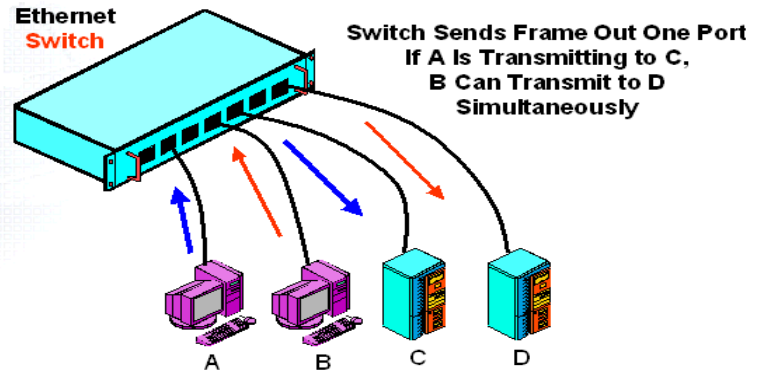
Hub Versus Switch Operation



Communications Networks - 6

Local Area Networks (LAN) – 6

Hub Versus Switch Operation



Communications Networks - 7

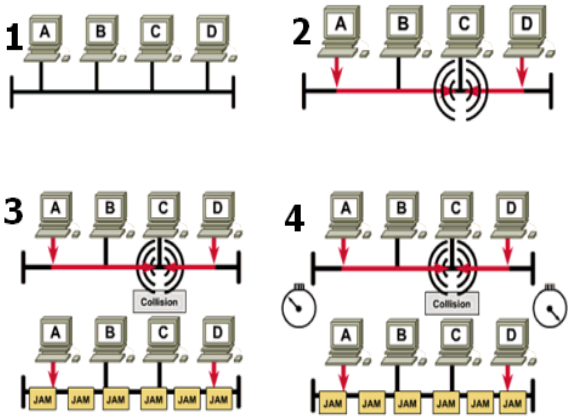
Local Area Networks (LAN) – 7

Hub Versus Switch Operation

- **Hubs Need Media Access Control**
  - This limits when a station may transmit
  - Ethernet hubs use CSMA/CD
- **Carrier Sense Multiple Access (CSMA)**
  - Only transmit if no other station is transmitting
  - Otherwise, wait
- **Collision Detection (CD)**
  - If two NICs transmit at the same time, this is a collision
  - Both will stop, wait a random amount of time, and then go back to CSMA to send again

Communications Networks - 8

Local Area Networks (LAN) – 8



CSMA/CD

1. Listen then transmit
2. Collision occurs
3. Broadcast jam signal
4. Devices back off appropriate amount of time, goes back to listen then transmit and then retransmit

Communications Networks - 9

Local Area Networks (LAN) – 9

UTP dominates the Ethernet access line market

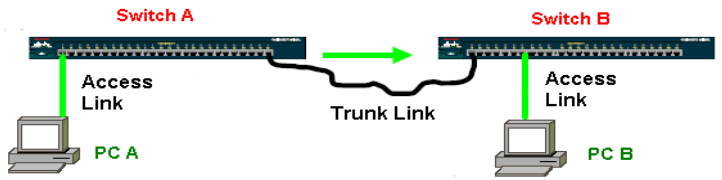
Physical Layer Standard	Speed	Maximum Run Length	Medium Required
10BASE-T	10 Mbps	100 meters	4-pair Category 3 or higher
100BASE-TX	100 Mbps	100 meters	4-pair Category 5 or higher
1000BASE-T (Gigabit Ethernet)	1,000 Mbps	100 meters	4-pair Category 5 or higher

Physical Layer Standard	Speed	Maximum Run Length	Medium 850 nm light (inexpensive) Multimode fiber	
1000BASE-SX	1 Gbps	220 m	62.5 microns	160 MHz-km

Communications Networks - 10

Local Area Networks (LAN) – 10

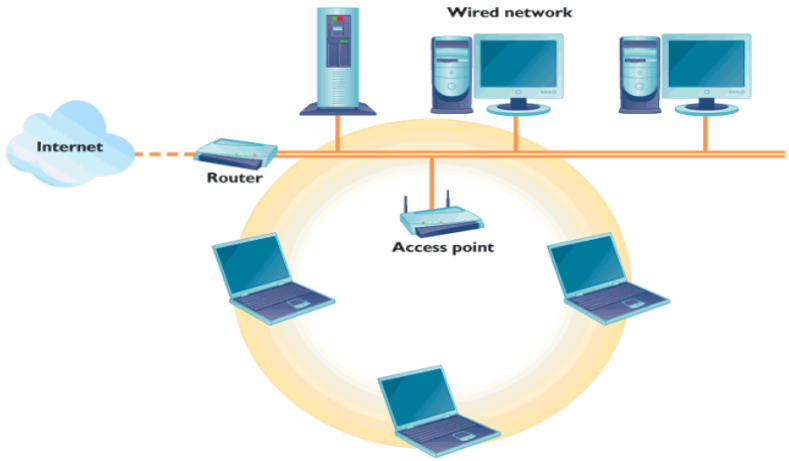
- **Access links** to client stations today are dominated by 100BASE-TX
  - But 1000BASE-T usage is growing
- **Trunk links** today are dominated by 1000BASE-SX
  - Sufficient for most LAN trunk line distances and speeds
  - Short trunk links, however, use UTP
  - Longer and faster trunk links use other fiber standards



Communications Networks - 11

Local Area Networks (LAN) – 11

An 802.11 Wireless LAN



Communications Networks - 12

Local Area Networks (LAN) – 12

Wireless LAN Benefits

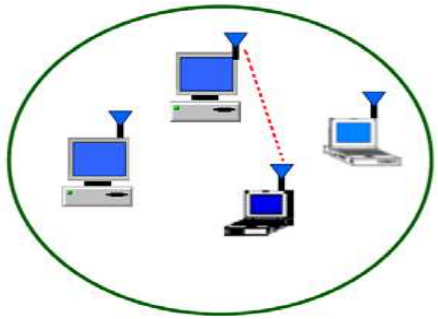
- **Removes wiring challenges**
  - Limited connections to users
  - Perfect for facilities where cost of wiring is prohibitive or impossible
- **Able to redeploy with minimal expense**
  - Low Installation Cost
  - Fast installation, Less Influence
  - Connect permanent or temporary campus buildings quickly and easily
- **Large coverage, High Performance**

Communications Networks - 13

Local Area Networks (LAN) – 13

Wireless LAN

- **Ad-hoc mode**: Peer-to-peer mode; wireless devices communicate with each other directly.
- It involves at least 2 stations
- No backbone infrastructure
- Suitable for small area

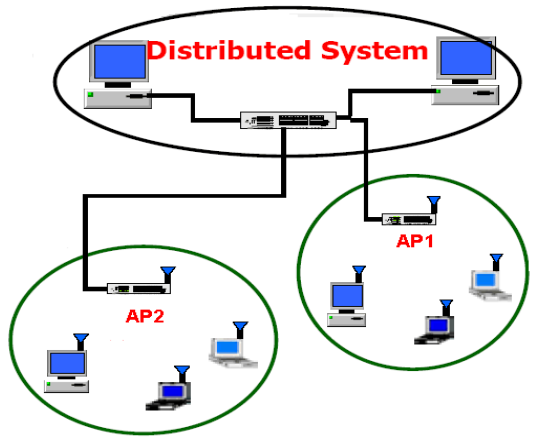


Communications Networks - 14

Local Area Networks (LAN) – 14

Wireless LAN

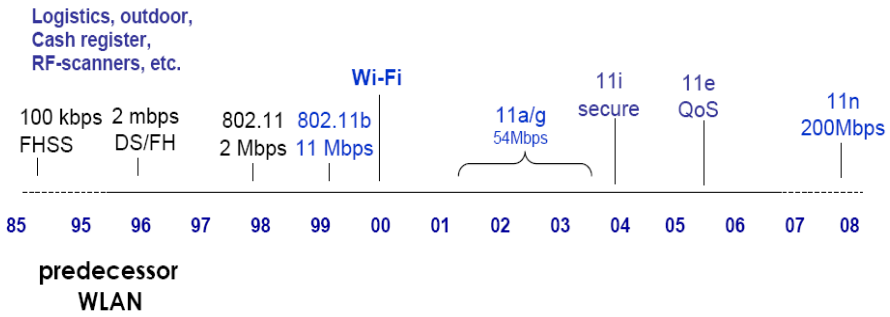
- **Infrastructure mode:**
- Wireless devices communicate with wired LAN via ***access points*** (APs).



Communications Networks - 15

Local Area Networks (LAN) – 15

- **WLAN-standards**



Communications Networks - 16

Local Area Networks (LAN) – 16

- **Wireless LAN Standard**

Standard	802.11b	802.11a	802.11g
Frequency Band	2.4 GHz	5 GHz	2.4GHz
Data rate	11 Mbps	54 Mbps	54 Mbps

- **Hot spot:** Geographic location in which an access point provides public Wi-Fi network service.
  - Eg. Free PCCW Wi-Fi service in the HK International Airport

Communications Networks - 17

Local Area Networks (LAN) – 17

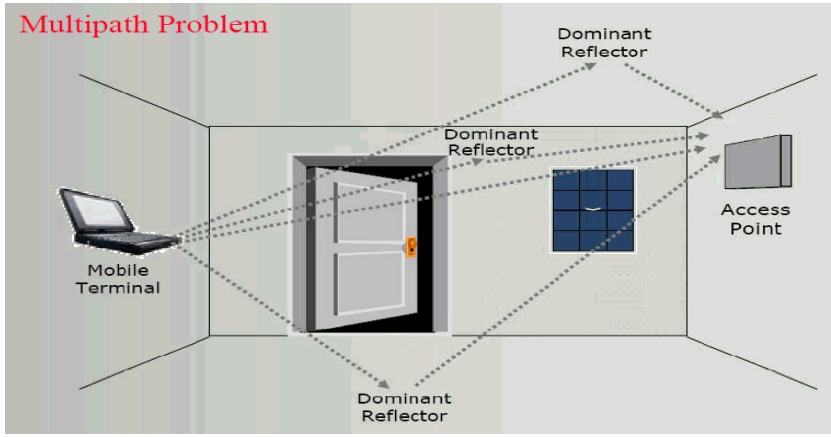
What is 802.11n?

- New IEEE Standard under development
- Uses MIMO radio technology as a basis
- End result will be more "wire-like" performance
- Anywhere from 100Mbps to 600Mbps depending on implementation
- First standard to support both 2.4 GHz and 5 GHz

Communications Networks - 18

Local Area Networks (LAN) – 18

Multi Path Reflections

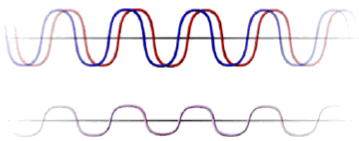


Communications Networks - 19

Local Area Networks (LAN) – 19

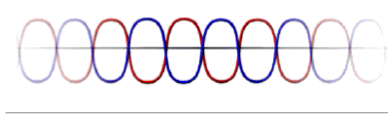
Multi Path Reflections

Original signal + reflections arrive at the receiver and are "added", resulting in a distorted reconstructed signal



Null Waves : Original signal and reflected signals are 180 degrees out of phase, cancelling each other out.

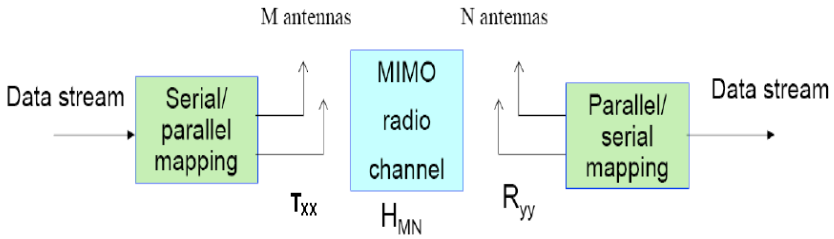
Causing drop outs.



Communications Networks - 20

Local Area Networks (LAN) – 20

- MIMO (Multiple Input / Multiple Output)
- Sending signals on multiple Tx antennas
- Receiving signals on multiple Rx antennas



Communications Networks - 21

Local Area Networks (LAN) – 21

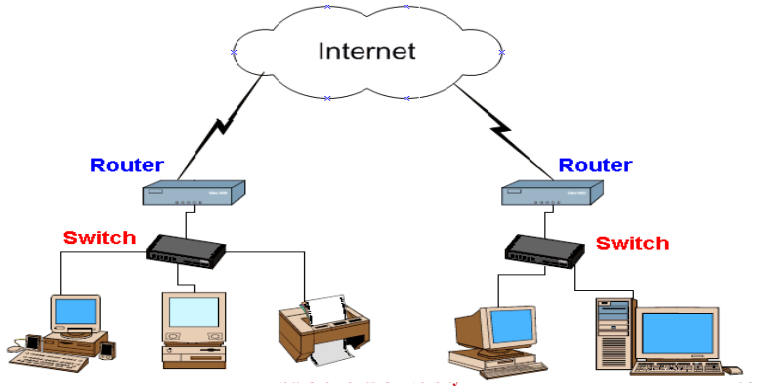
Bluetooth

- Standard for wireless personal area networks that can transmit up to 722 Kbps within 10-meter area
- It is a wireless LAN technology designed to connect devices of different functions such as telephones, notebooks, computers (desktop and laptop), cameras, printers and so on.
- A Bluetooth LAN is an ad-hoc network.
- The Bluetooth technology is the implementation of a a protocol defined by the **IEEE 802.15** standard.
  - The standard defines a wireless personal-area network (PAN) operable in an area the size of a room or a hall.

Communications Networks - 22

Local Area Networks (LAN) – 22

- **Routers** provides access to company networks on other sites, and to the Internet.



Communications Networks - 23

Wide Area Networks - 1

- A WAN is a single networks that connect different sites
- WANs and the Telephone
  - WAN technology usually uses the Public Switched Telephone Network transport system for transmission
  - Adds data switching and management
- WAN Purposes
  - Internet access
  - Link sites within the same corporation
  - Provide remote access to individuals who are off site

Communications Networks - 24

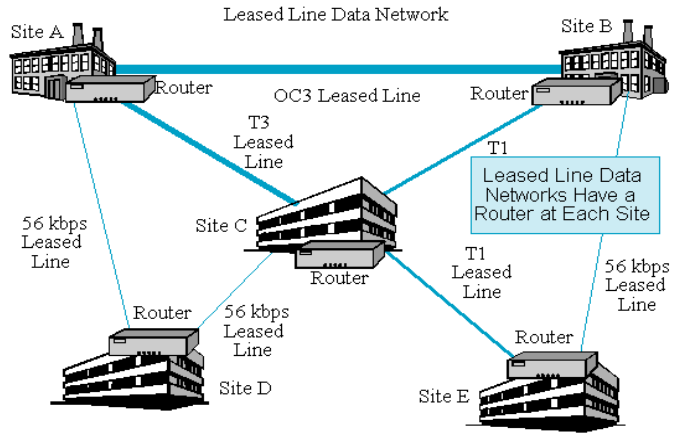
Wide Area Networks – 2

- WANs are characterized by **high cost** and **low speeds**.
- High cost per bit transmitted compared to LANs.
- Consequently, lower speeds (most commonly 128 kbps to a few megabits per second)
- This speed usually is aggregate throughput shared by many users
- Much slower than LAN speeds (100 Mbps to 1 Gbps to the desktop)

Communications Networks - 25

Wide Area Networks – 3

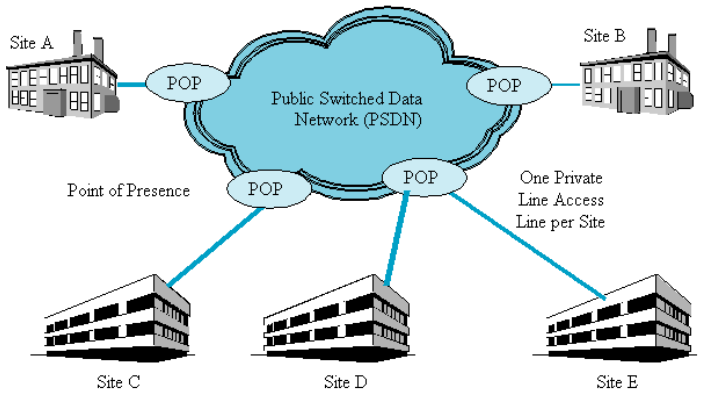
Leased Line Data Networks



Communications Networks - 26

Wide Area Networks – 4

WAN using Public Switched Data Networks



Communications Networks - 27

Source: HKBN

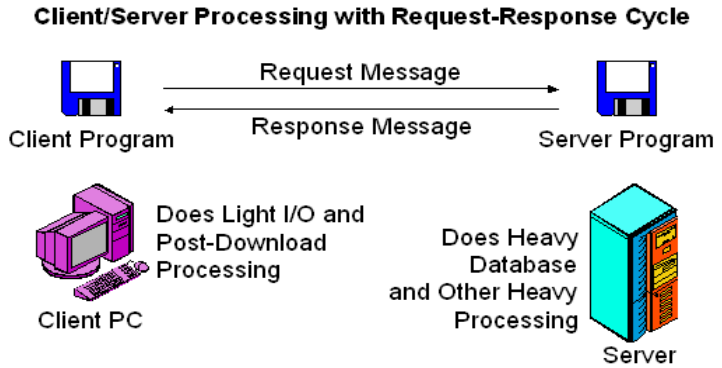
Communications Networks - 28

Source: HKBN

6. Networked Applications

Application Architectures - 1

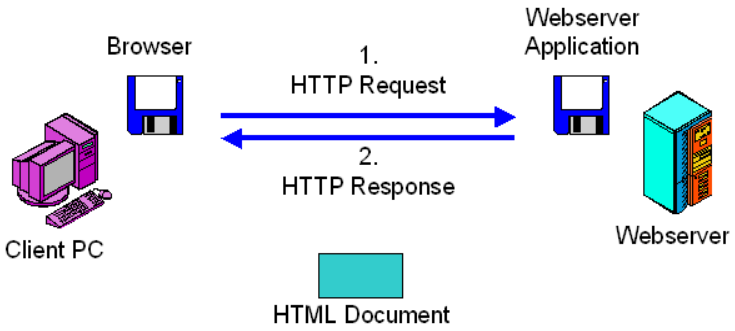
Client/Server Computing



Highly scalable: Use larger server as number of clients increases

Application Architectures - 2

Web Page Browsing



Web Search Engines

- Web pages that conduct searches of the Web to find words or expressions you enter.

E-Mail - 1

What is E-Mail?

- E-mail (electronic mail) is the exchange of computer-stored messages by telecommunication.

Mail Server

- A hardware and software system that determines from the recipient's address one of several routes on which to send the message.

Mail Client Software or E-Mail Program

- A software that requests mail delivery from the mail server to your PC.

Email Address

- An address that uniquely identifies an individual or organization that is connected to the Internet.
- **mis.st.clements@gmail.com**

E-Mail - 2

Protocols that make email works

- **SMTP (Simple Mail Transfer Protocol)**
  - It decides which paths an e-mail message takes on the Internet.
- **POP (Post Office Protocol)**
  - It handles incoming messages.
- **IMAP (Internet Message Access Protocol)**
  - A protocol for retrieving mail messages from a server.
- **MIME (Multipurpose Internet Mail Extensions)**
  - A protocol that specifies how to encode non-text data, such as graphics and sound, so it can travel over the Internet.

E-Mail - 3

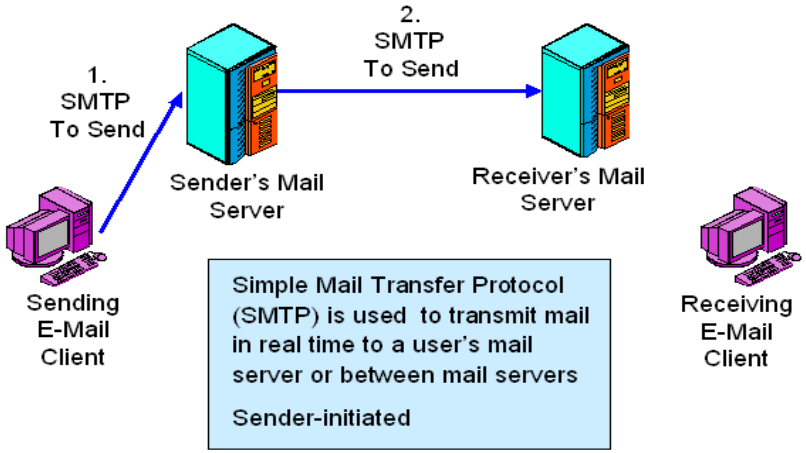
Importance of E-Mail

- Universal service on the Internet
- Attachments make e-mail a general file delivery mechanism!

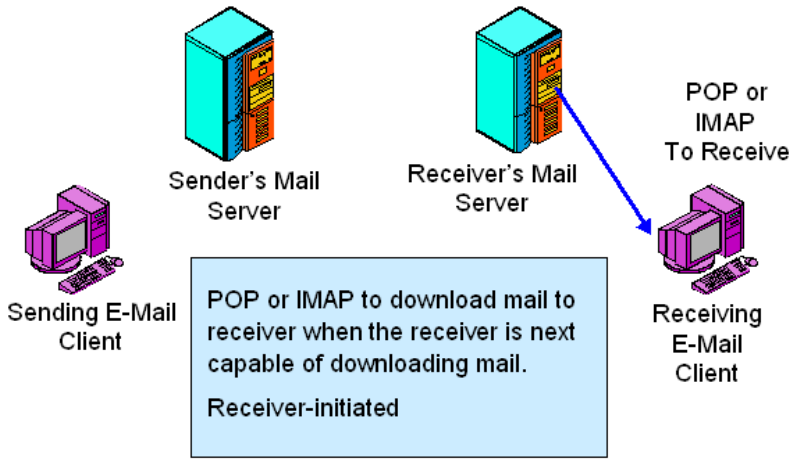
Mail Standards

- Message body standards
- Receiver must understand sender's message
  - RFC 822 and RFC 2822 for all-text bodies
  - HTML bodies with fancy text and graphics
  - UNICODE for non-English language characters

E-Mail - 4



E-Mail - 5



E-Mail – 6

The "evils" come with email:

- Messages with inappropriate content.
  - Racial or sexual harassment
  - Threats
- Spam, adware, spyware, and other abuses.
- Viruses, Worms, and Trojan Horses are often delivered by e-mail attachments!

E-Mail - 7

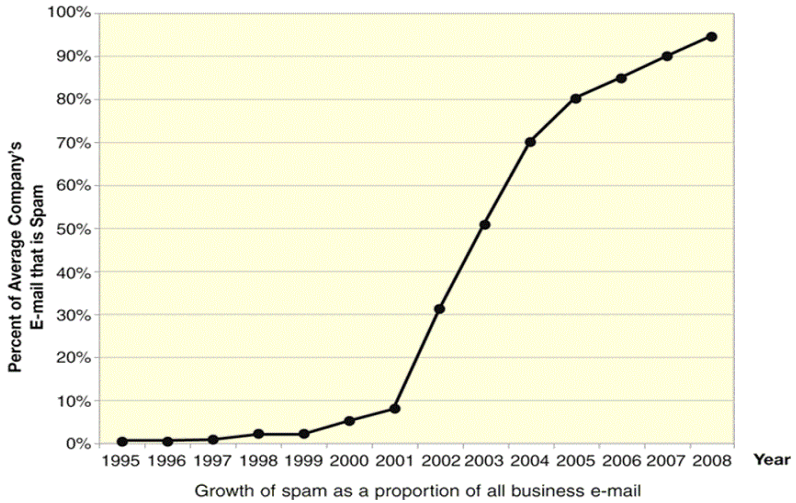
Viruses, Worms, and Trojan Horses

- Use of antivirus software is a must.
- Where to Do Scanning?
  - On client PCs
    - But users often turn off their software,
    - Fail to download virus definitions regularly
    - Or let their contracts lapse
  - On the corporate mail server or application firewall
    - Users cannot turn off

E-Mail - 8

- **Spam** are unsolicited commercial e-mail
- Why they are harmful?
  - Time consumed by users deleting them
  - Bandwidth and storage consumed
  - Legitimate messages lost because overlooked
- Separating SPAM from legitimate e-mail is difficult
  - Many spam messages get through to users
  - Some legitimate messages are deleted
  - Some firms merely mark messages as probable spam

E-Mail - 9 Growth of SPAM in business email



E-Mail - 10

- Magnitude of spam problem
  - 24-hour period in 2008
  - 220 billion spam e-mail messages sent
- Researchers believe:
  - More than 98 percent of all e-mail messages will be spam before effective technical solutions implemented
  - Spam leveling off (approaching 100 percent)
  - Absolute spam e-mail numbers could continue to grow rapidly

E-Mail - 11

- Antispam efforts
  - Limit spam annoyance and cost
  - E-mail server computer software
    - Server-level filtering: mail server computers
    - Limit amount of spam getting through to employees
  - Individual users
    - Client-level filtering: individual users' computers
    - Install client-based spam-filtering programs, set filters
- Some solutions require:
  - Passing of new laws
  - Technical changes in Internet mail-handling systems

E-Mail - 12

Individual user antispam tactics

- Focus
  - Limit spammer's access to (use of) e-mail address
- Use complex e-mail address
  - Reduce the likelihood that a spammer can automatically generate e-mail addresses
  - xq7iy23@mycompany
- Control e-mail address exposure
  - Discussion boards, chat rooms, other online sources
- Use multiple e-mail addresses
  - Switch to another if spammers uses one

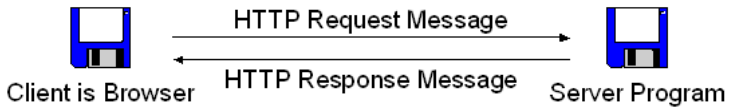
E-Mail - 13

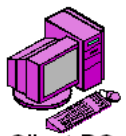
Web-Based E-Mail Services - 1

- Many Internet Web sites provide free e-mail addresses and accounts for **registered users**.
- They may be used with any Web browser.
- Examples: Gmail, Yahoo! Mail, Hotmail etc.

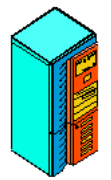
E-Mail - 14

Web-Based E-Mail Services - 2



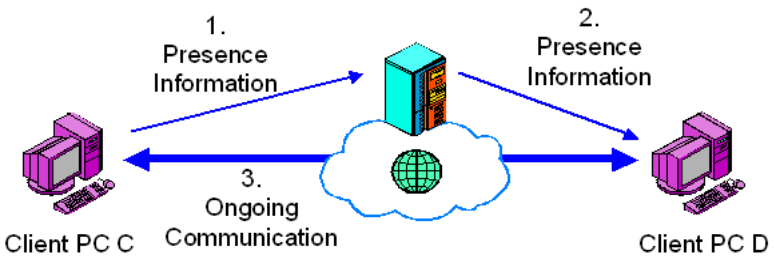


Form of client server processing
that uses browsers as clients
Almost all client PCs
now have browsers.
No need to install new software.



Instant Messaging Servers - 1

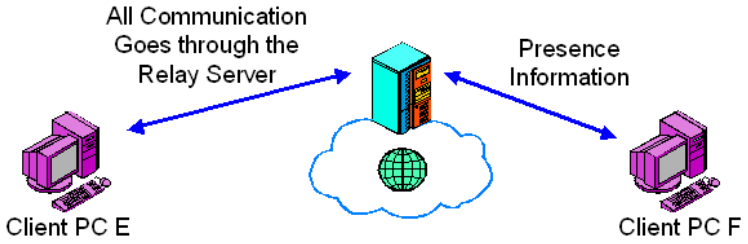
Use of a Presence Server



Clients register with presence servers.
Presence servers notify other clients as appropriate.
Clients use this information to communicate directly.

Instant Messaging Servers - 2

Use of a Relay Server



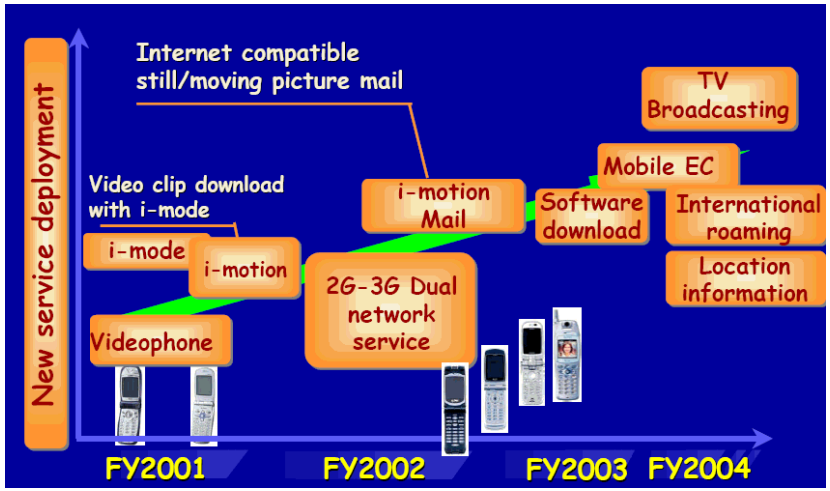
Relay servers route all IM messages.
This permits security filtering and other services.
It limits privacy because the relay server sees everything.

8. Contemporary Mobile Services

Generations of Mobile Networks

- 1G: basic mobile telephony
- 2G: mobile telephony for mass users
  - regional roaming
- 2.5G: mobile internet services
- 3G:
  - global roaming
  - enhanced mobile Internet services

3G Services – To explore the non-voice Applications



HSDPA

- High-Speed Downlink Packet Access (HSDPA) is a 3G mobile telephony communications protocol.
- It support services requiring instantaneous high data rates in the downlink, e.g. Internet browsing, video on demand, office application.
- Peak data rates 3-4 times higher than current 3G.
- Current HSDPA deployments support down-link speeds of 1.8, 3.6, 7.2 and 14.4 Mbit/s.
- New terminals are required to take advantage of HSDPA.

SmarTone-Vodafone

Public Wi-Fi Service

- 每日港幣 18 元使用費，即可全日無限量使用 HSDPA、3G 本地資料傳輸。

PCCW NEXTGEN HSPA+ 21Mbps - 1

- Rolled out in 09 Q2.

PCCW NEXTGEN HSPA+ 21Mbps - 2

- The Evolved High Speed Packet Access，HSPA+ will increase the download speed of mobile handset from 7.2 Mbps to 21 Mbps.
- 目前，市場上流動通訊業者一般沿用的基幹線路網絡是傳統的 E1 歐洲制式，每條陸上線路的傳輸速度只稍微高於 2Mbps。
- 然而，電訊盈科的全光纖基幹線路爲客戶提供數據高速公路」，助他們享用超越 1000Mbps 的超高速上網服務。

8. Information Systems Types

Types of Information Systems

- Office Automation Systems
- Transaction Processing Systems
- Management Information Systems
- Decision Support Systems
- Expert Systems

Office Automation Systems

- Office automation systems are used to automate routine office tasks, such as the creation of documents, billing, and others.
- Office automation systems can be built from off-the-shelf applications – standard productivity software that most users are familiar with.
- In some office systems, commercial software may be customized to perform specific tasks, but this is not always necessary.

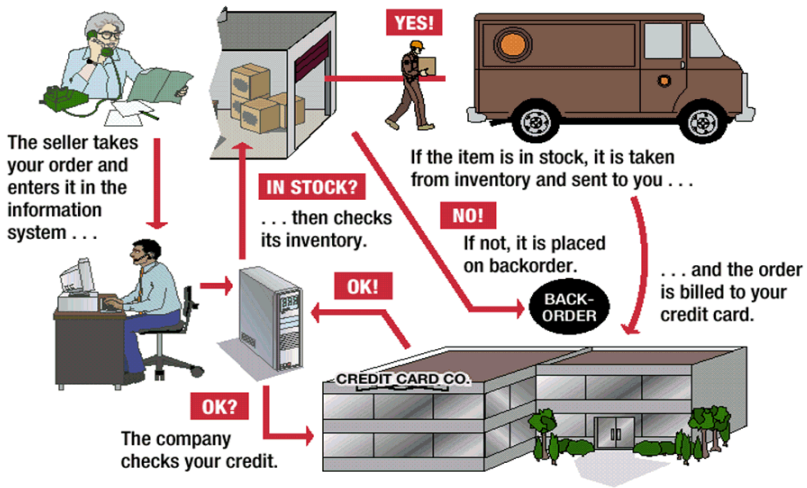
Example: Convenient Store

- Convenience store chain needs accurate stock count
  - Overstocking expensive
  - Understocking results in customer dissatisfaction
  - Manual counts used data collection sheets
  - Expensive, labor intensive
- Solution based on handheld computer
  - Counts entered relayed immediately to headquarters
  - Bar code scanner employed to shorten process, minimize errors
  - Allows for real time product totals
  - Dramatic reduction in labor involved
  - Lower inventory levels and quicker response time

Transaction Processing Systems - 1

- A transaction processing system is used to handle the processing and tracking of transactions.
  - A transaction is an event that can occur as a series of steps, such as taking and fulfilling an order from a customer.
- A Transaction Processing System (TPS) monitors, collects, stores and processes data generated from all business transactions.
  - **Source data automation** is the process of automating the TPS data entry as much as possible because of the large volume involved.

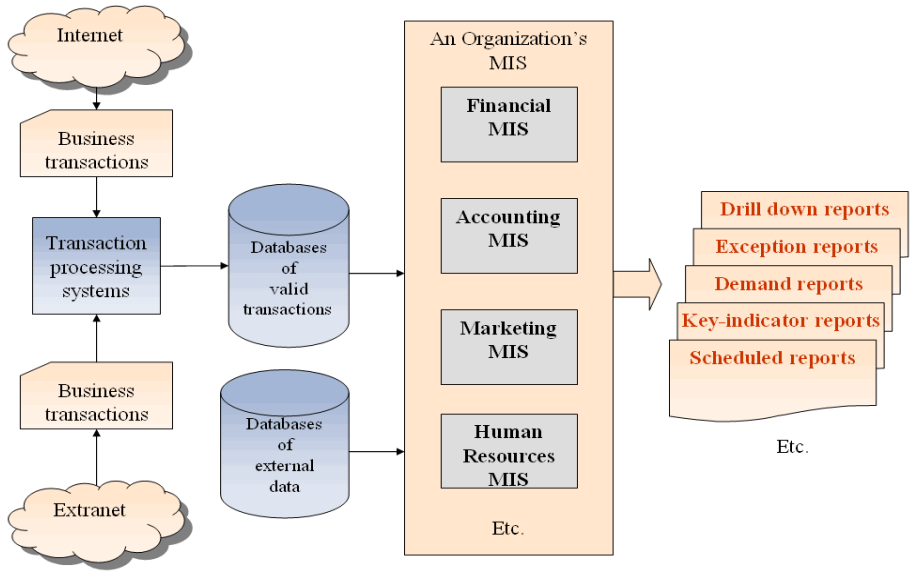
Transaction Processing Systems - 2



Management information system (MIS) - 1

- Also called “information reporting systems”
- Original type of management support system
- Produce information products that support many of the day-to-day decision-making needs of the organization.
- Provide information to (middle level) managers in the functional areas to support planning, organizing, and controlling operations.
- Output, or reports, are usually generated through accumulation of transaction processing data.

Management information system (MIS) - 2



Management information system (MIS) - 3

Outputs of an MIS

Scheduled reports

- Produced periodically, or on a schedule (daily, weekly, monthly)

Key-indicator report

- Summarizes the previous day’s critical activities
- Typically available at the beginning of each day

Demand report

- Gives certain information at a manager’s request

Exception report

- Automatically produced when a situation is unusual or requires management action

Drill Down Reports

- Provide detailed data about a situation. To move from summary data to lower and lower levels of detail.

Information Systems for Specific Functional Areas

- Information Systems that are designed to support a functional area by increasing its internal effectiveness and efficiency in the following areas:
  - accounting, finance, marketing, operations, and human resources management functional areas.

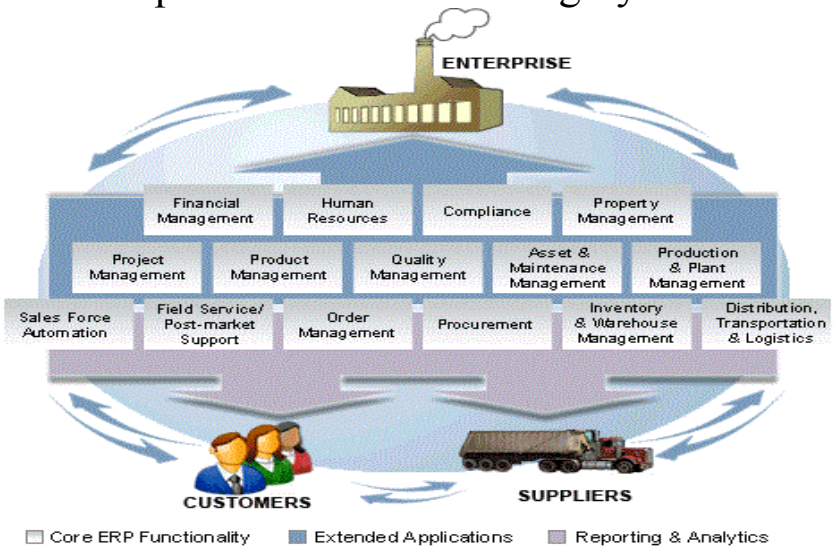
Enterprise Resource Planning Systems - 1

- The term ERP originally referred to how a large organization planned to use organizational wide resources.
- ERP is a way to integrate the data and processes of an organization into one single system.
- ERP's major objective is to tightly integrate the functional areas of the organization and to enable seamless information flows across the functional areas.

Enterprise Resource Planning Systems - 2

- **Data sharing**
  - One data model
  - No data replication
  - Automatic synchronization
  - All applications/modules share same data, with same data model
- **Modularity**
  - Independent modules

Enterprise Resource Planning Systems - 3



Enterprise Resource Planning Systems - 4

- Why ERP?
- A need to replace outdated business applications
  - common processes and procedures
  - common shared data
  - common reporting
- A need to consolidate IT platforms
  - replacement of legacy systems
  - reduced IT operating costs

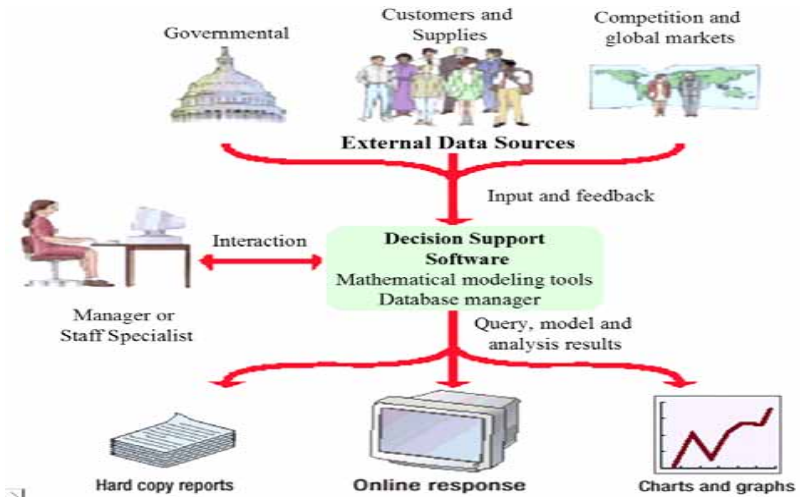
Decision Support Systems (DSS) - 1

- A decision support system **collects various types of business data**, and is used to generate special reports that help managers make decisions.
- A decision support system may use data from a company's transaction processing system and from external sources, such as stock market reports, information about competitors, and so on.
- These systems provide highly tailored, structured reports that can be used for very specific business situations.

Decision Support Systems (DSS) - 2

- Some Sophisticate Functions of DDS
- **What-If Analysis**
  - An end user makes changes to variables, or relationships among variables, and observes the resulting change in the value of other variables.
- **Sensitivity Analysis**
  - A special type of what-if analysis in which the value of only one variable is changed repeatedly, and the resulting changes on other variables are observed.
- **Goal-seeking analysis**
  - Attempts to find the value of the inputs necessary to achieve a desired level of output.

Decision Support Systems (DSS) - 3



Expert systems - 1

- An expert system is a specialized information system that performs tasks normally done by people, such as making decisions.
- Can ***support*** decision makers or completely ***replace*** them.
  - Expert systems are used to approve bank loans, make large-scale purchasing decisions, and assist with medical diagnoses.
- Expert systems rely on huge, detailed databases (**knowledge bases**). Special software, called an **inference engine**, analyzes data to answer questions or make choices.

Expert systems - 2

- The transfer of expertise from an expert to a computer and then to a user involves four activities:
  - **Knowledge acquisition**: Knowledge is from experts or from documented sources.
  - **Knowledge representation**: Acquired knowledge is organized as rules or frames (objective-oriented) and stored electronically in a knowledge base.

Expert systems - 3

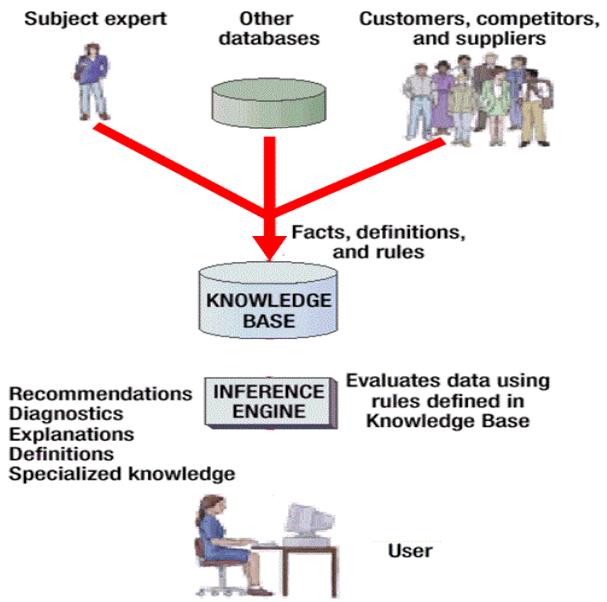
- **Knowledge inferencing**: Given the necessary expertise stored in the knowledge base, the computer is programmed so that it can make inferences. The reasoning function is performed in a component called the ***inference engine***, which is the brain of ES.
- **Knowledge transfer**: The inferenced expertise is transferred to the user in the form of a recommendation.

Expert systems - 4

The Components of Expert Systems

- **Knowledge base** contains knowledge necessary for understanding, formulating and solving problems.
- **Inference engine** is a computer program that provides a methodology for reasoning and formulating conclusions.
- **User interface** enables users to communicate with the computer
- **Blackboard** is an area of working memory set aside for the description of a current problem.
- **Explanation subsystem** explains its recommendations.

Expert systems - 5



Expert systems - 6

- Rule: Example

關係
If the 'fuel tank' is empty
Then the car is dead

建議
If the season is autumn
and the sky is cloudy
and the forecast is drizzle
Then the advice is 'take an umbrella'

策略
If the car is dead
Then the action is 'check the fuel tank'
If the 'fuel tank' is full
Then the action is 'check the battery'

指示
If the car is dead
and the 'fuel tank' is empty
Then the action is 'refuel the car'

啓發式
If the spill is liquid
and the 'spill pH' < 6
and the 'spill smell' is vinegar
Then the 'spill material' is 'acetic acid'

Why Managers Need IT Support - 1

- A key to good decision making is to explore and compare many relevant alternatives. The more alternatives that exist, the more computer-assisted search and comparison are needed.
- Typically, decisions must be made under time pressure. Frequently it is not possible to manually process the needed information fast enough to be effective.

Why Managers Need IT Support - 2

- It is usually necessary to conduct a sophisticated analysis in order to make a good decision. Such analysis requires the use of modeling.
- Decision makers can be in different locations and so is the information. Bringing them all together quickly and inexpensively may be a difficult task.

9. Management of MIS

Role of the IS Department

- The Information Systems (IS) department is responsible for designing, building, and managing an organization's information systems.
- In years past, the IS department served only the informational needs of managers. Today, the IS team supports all workers in a business, and supports the business' mission, as well.
- An IS department's tasks include designing, planning, installing, and maintaining systems; generating reports; and cost control.

MIS Management - 1

Managing Hardware and Software

- **Capacity planning**: Process of predicting when a computer hardware system becomes saturated
- **Scalability:** Ability of a computer, product, or system to expand to serve a larger number of users without breaking down

MIS Management - 2

- Total Cost of Ownership (TCO) of Technology Assets
  - Includes both direct and indirect costs
  - Hardware and software acquisitions account for only 20% of TCO
  - TCO for a PC may run to three times original purchase price
  - Be aware of hidden costs!

END

Management Information System

St. Clements University
MBA Program
November, 2007
Hong Kong

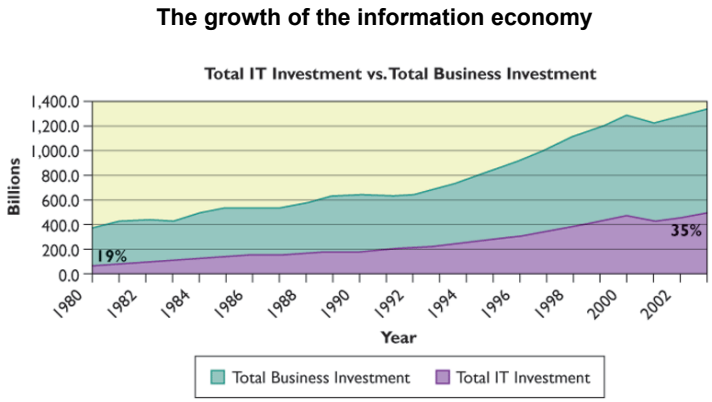
Table of Contents

1. The role of information systems

Rise of the Information Economy - 1

- Rise of the Information Economy have altered the business environment.
  - Knowledge- and information-based economies
  - New products and services
  - Knowledge: a central productive and strategic asset
  - Time-based competition
  - Shorter product life
  - Turbulent environment
  - Limited employee knowledge base

Rise of the Information Economy - 2

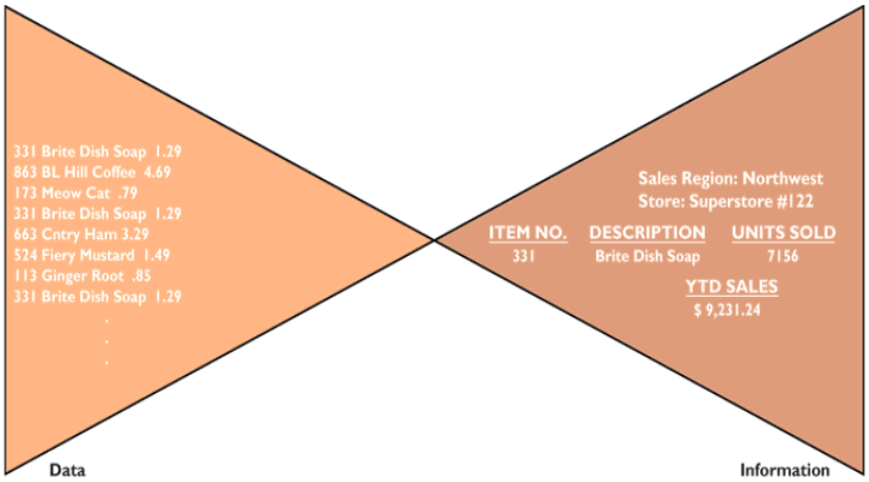


Source: Based on data in U.S. Department of Commerce, Bureau of Economic Analysis, National Income and Product Accounts, Tables 5.2 and 5.8, 2003.

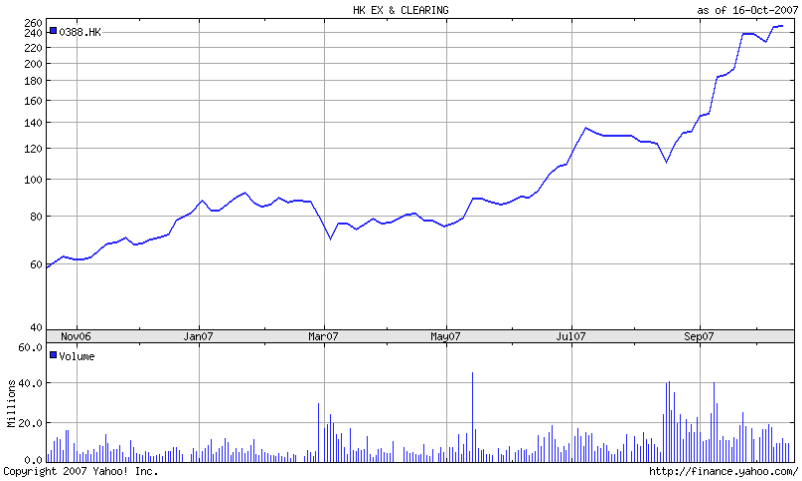
What Is an Information System?

- A set of interrelated components that collect (or retrieve), process, store, and distribute information to support decision making and control in an organization.
- What is the difference between ***information*** and ***data***?
  - **Data:** Streams of raw facts representing events such as business transactions.
  - **Information:** Clusters of data that are meaningful and useful to human beings.

Data and Information



Information and Knowledge



What Is an Information System?

Formal Systems

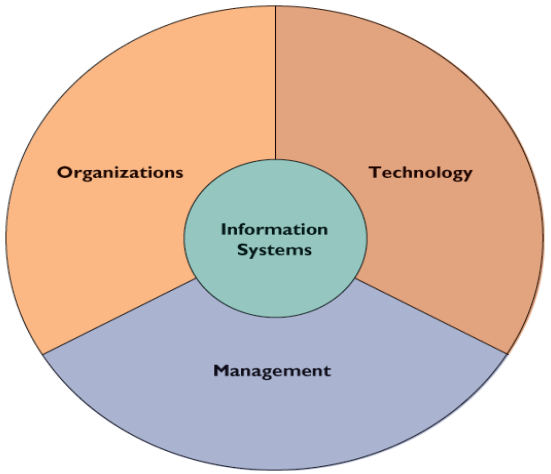
- Fixed definitions of data and procedures for collecting, storing, processing, disseminating, and using these data

Can be computer-based or manual

Computer-based Information Systems

- Use computer hardware and software to process and disseminate information

Information systems are more than computers



A Business Perspective on Information Systems

- **Information systems literacy**: Broad-based understanding of information systems that includes behavioral knowledge about organizations and individuals using information systems and technical knowledge about computers.
- **Computer literacy**: Knowledge about information technology, focusing on understanding how computer-based technologies work.

A Business Perspective on Information Systems

Major Business Functions

- Sales and marketing
- Manufacturing
- Finance
- Accounting
- Human resources

We will cover some examples of MIS for various business functions latter.

Information Technology (IT) Infrastructure

- Computer hardware
- Computer software
- Storage technology
- Communications technology

The Challenges of Information Systems: Key Management issues - 1

Positive Impacts of Information Systems

- Faster calculations and paperwork
- Analysis of customer purchase patterns and preferences
- More efficient business services
- Instant global distribution of information

The Challenges of Information Systems: Key Management issues - 2

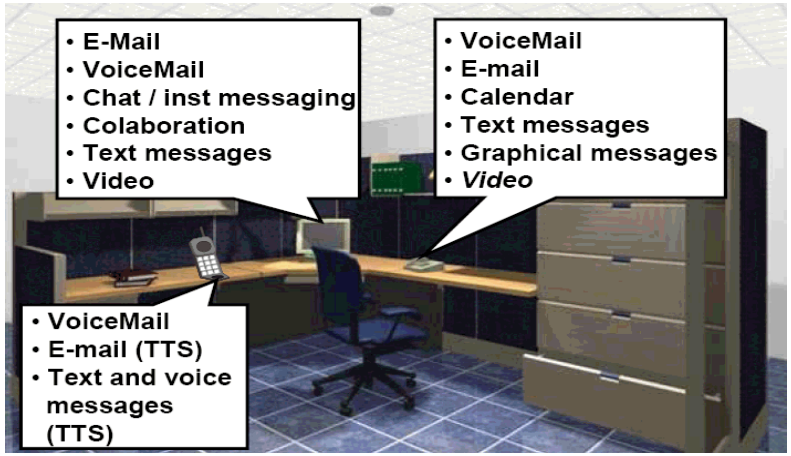
Negative Impacts of Information Systems

- Automation leading to job elimination
- Privacy concerns
- System outages and shutdowns
- Health problems, repetitive stress injury
- Illegal distribution of intellectual property

2. Hardware and Software in the Enterprise

Example of today's work environment - 1

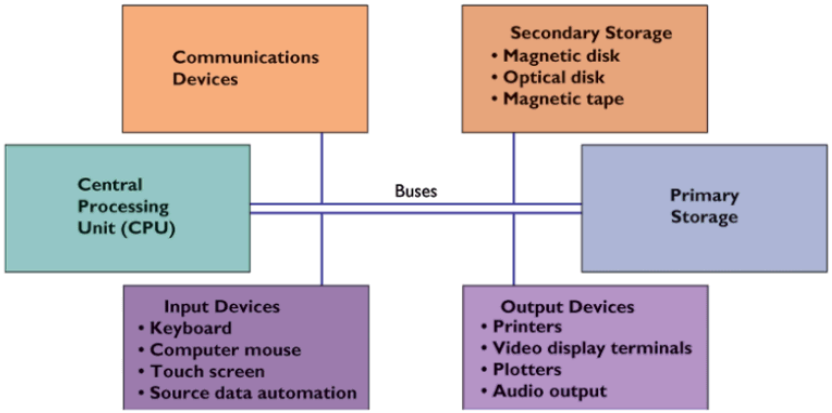
- Three communication devices: PC, desk phone, mobile



Example of today's work environment - 2

Computer Hardware and Information Technology Infrastructure - 1

- Hardware components of a computer system



Computer Hardware and Information Technology Infrastructure - 2

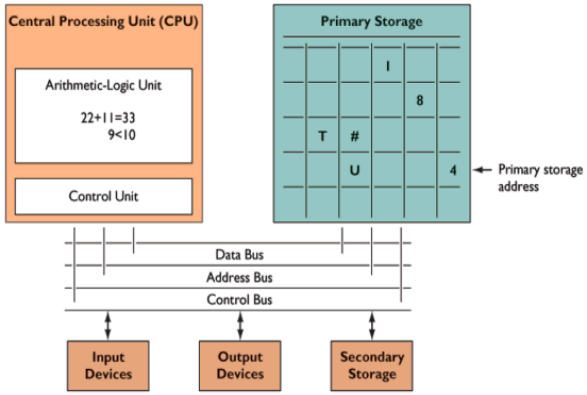
The Computer System

- **Bit**
  - Binary digit
  - Represents 0 or 1
- **Byte**
  - String of eight bits
  - Stores one number, symbol, character, part of picture

Computer Hardware and Information Technology Infrastructure - 3

The Computer System

- **The Central Processing Unit (CPU)**
  - Controls other parts of computer
- **Arithmetic-logic unit**
  - Performs principle logical/mathematical operations
- **Control unit**
  - Coordinates other parts, such as reading a stored program



Computer Hardware and Information Technology Infrastructure - 4

The Computer System

- **Primary Storage**
  - Located near CPU
  - Stores all or part of active software program
  - Stores data the program is using
  - Composed of semi-conductors
  - RAM (random access memory): Used for short-term, temporary storage
  - ROM (read-only memory): Semiconductor memory chips with program instructions

Computer Hardware and Information Technology Infrastructure - 5

The Computer System

- **Secondary Storage Technology**
  - Used for relatively long-term storage of data outside CPU
  - Magnetic disk: floppies, hard disks, RAID
  - Flash memory
  - Optical disk: CD-ROM, CD-RW, DVD
  - Magnetic tape
  - Storage networking: direct-attached storage; network-attached storage; storage area networks

Computer Hardware and Information Technology Infrastructure - 6

Hierarchy of Memory Capacity

- Kilobyte (KB): approximately one thousand bytes.
- Megabyte (MB): approximately one million bytes (1,048,576 bytes, or 1,024 x 1,024).
- Gigabyte (GB): actually 1,073,741,824 bytes (1,024 x 1,024 x 1,024 bytes).
- Terabyte: One trillion bytes, 10^{12} bytes.
- Petabyte: Approximately 10^{15} bytes.
- Exabyte: Approximately 10^{18} bytes.

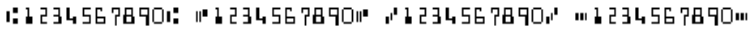
Computer Hardware and Information Technology Infrastructure - 7

A storage area network (SAN)

Computer Hardware and Information Technology Infrastructure - 8

The Computer System

- **Input Devices**
  - Keyboard and mouse
  - Touch screen
  - Optical character recognition
  - Magnetic ink character recognition (MICR)



  - Pen-based input
  - Digital scanner
  - Audio input
  - Radio-frequency identification (RFID)

Computer Hardware and Information Technology Infrastructure - 9

The Computer System

- **Output Devices**
  - Cathode-ray tube (CRT)
  - LCD Panel
  - Printers
  - Audio output

Classifying Computers

- **Mainframe:** Largest computer, largest multi-user systems, handles massive amounts of data; used for large business, scientific, military applications.

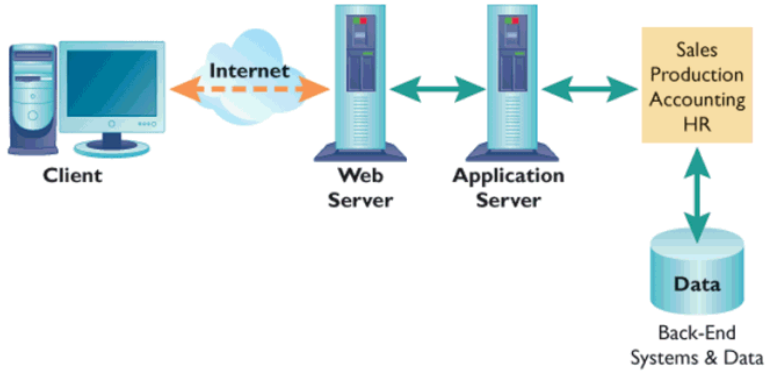
- **Workstation:** More powerful desktop computer used for computation-intense tasks. A midrange systems multi-user system.
- **Personal computer**: Portable or desktop microcomputer. A single user system.

Types of Software

- **Software program:** A series of statements or instructions to the computer
- Two major types of software:
  - **System software**
    - Generalized programs that manage the computer's resources
    - For example, the Windows family of Operating Systems
  - **Application software**
    - Programs written for or by users to perform a specific task.
    - For example, Word,Excel, Powerpoint

Example IT Infrastructure

An example IT architecture for e-commerce and e-business



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- Includes both direct and indirect costs
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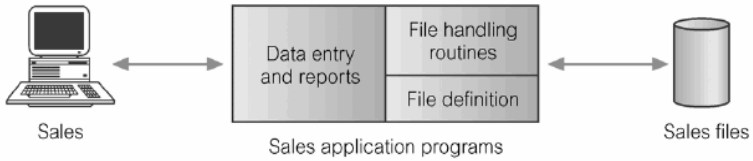
- Be aware of hidden costs!

3. Database Management Systems

File Systems - 1

Traditional file environment:

- Each application program defines and manages its own data.



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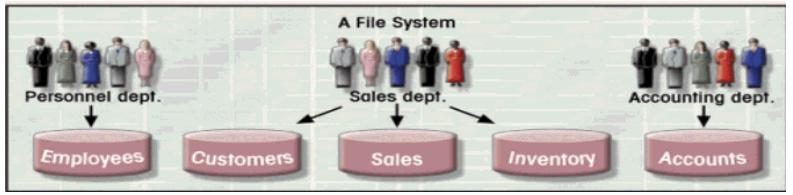


File Systems - 2

Limitations of File-based Approach:

1. Separation and isolation of data

- Each program maintains its own set of data.
- Users of one program may be unaware of potentially useful data held by other programs.

2. Duplication of data

- Same data is held by different programs.
- Wasted space and potentially different values and/or different formats for the same item.

File Systems - 3

3. **Data dependence**

- File structure is defined in the program code.

4. **Incompatible file formats**

- Programs are written in different languages, and so cannot easily access each others files.

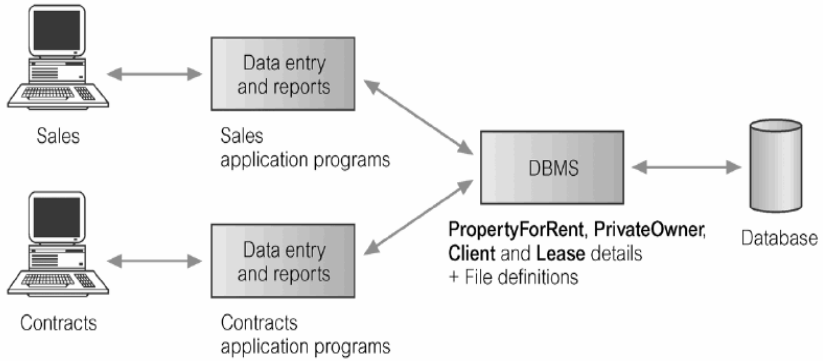
5. **Fixed Queries/Proliferation of application programs**

- Programs are written to satisfy particular functions.
- Any new requirement needs a new program.

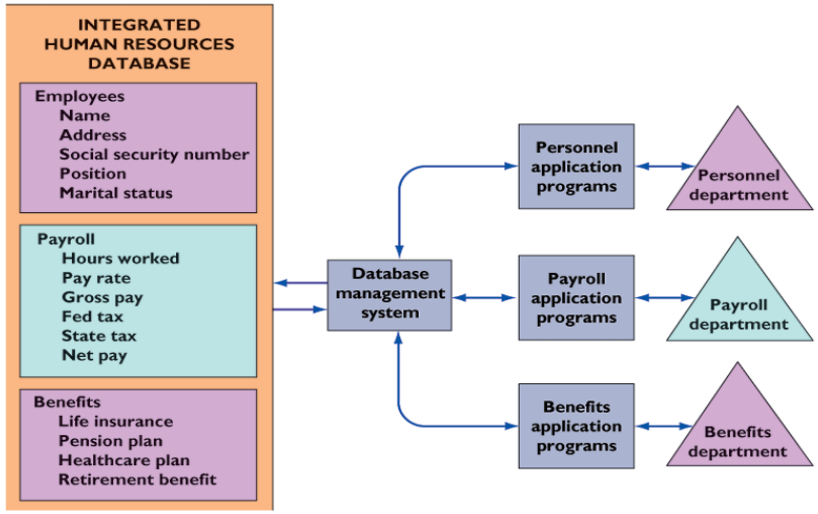
The Database Approach to Data Management - 1

- Shared collection of logically related data (and a description of this data), designed to meet the information needs of an organization.
- System catalog (metadata) provides description of data to enable program–data independence.
- Logically related data comprises entities, attributes, and relationships of an organization's information.

The Database Approach to Data Management - 2



The Database Approach to Data Management - 3



DBMS Approach

Database Management System (DBMS)

- A software system that enables users to define, create, and maintain the database and which provides controlled access to this database.

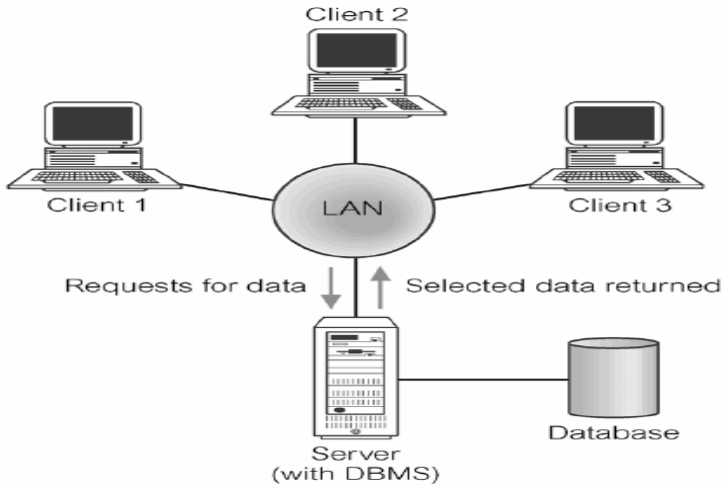
DBMS Components

1. **Data definition language**: Formal language for specifying the structure of database
2. **Data manipulation language**: For extracting data from database, e.g. SQL.

How a DBMS Solves Problems of a Traditional File Environment

- Reduces data redundancy
- Eliminates data inconsistency
- Uncouples programs from data
- Increases access and availability of data
- Allows central management of data, data use, and security

Database Client-server Architecture



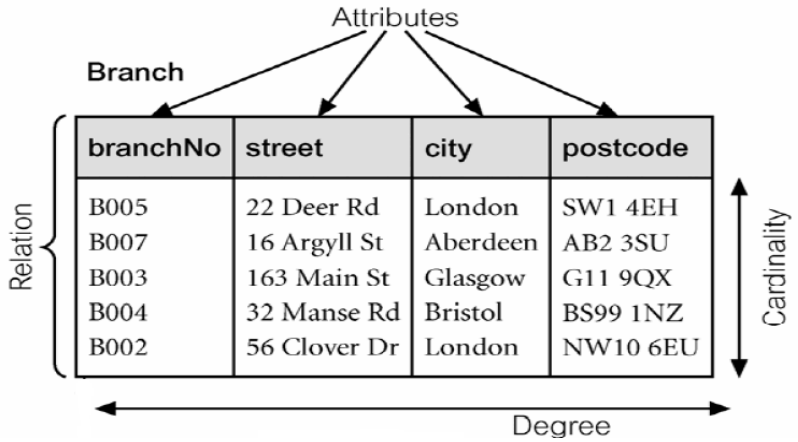
Disadvantages of DBMS

- Complexity
- Size
- Cost of DBMS
- Additional hardware costs
- Cost of conversion
- Performance
- Higher impact of a failure

Relational DBMS - 1

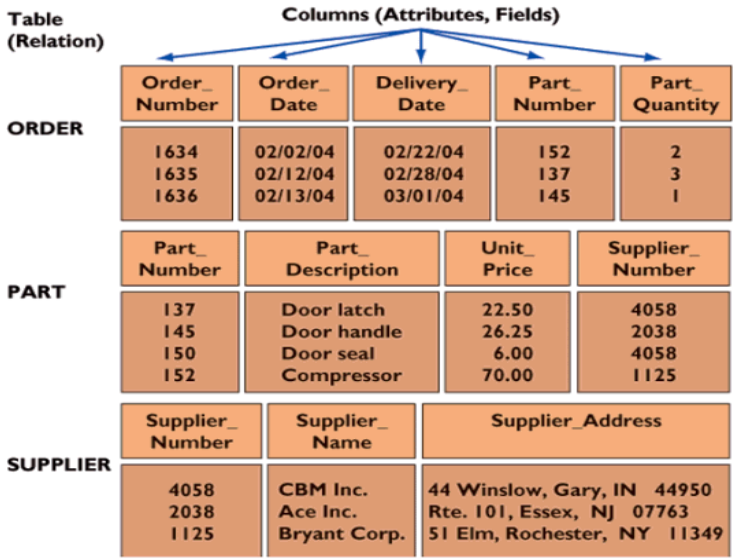
- A **relation** is a table with columns and rows.
  - **Attribute** is a named column of a relation.
  - **Domain** is the set of allowable values for one or more attributes.
  - **Tuple** is a row of a relation.
  - **Degree** is the number of attributes in a relation.
  - **Cardinality** is the number of tuples in a relation.
- Relational Database is a collection of normalized relations with distinct relation names.

Relational DBMS - 2



- Relates data across tables based on **common data element.**

Relational DBMS - 3



Relational DBMS - 4

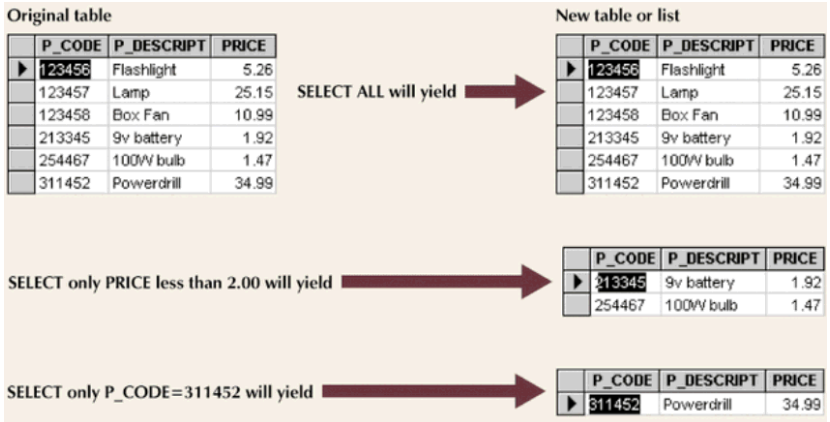
Alternative terminology for relational model terms

Formal terms	Alternative 1	Alternative 2
Relation	Table	File
Tuple	Row	Record
Attribute	Column	Field

Relational DBMS - 5

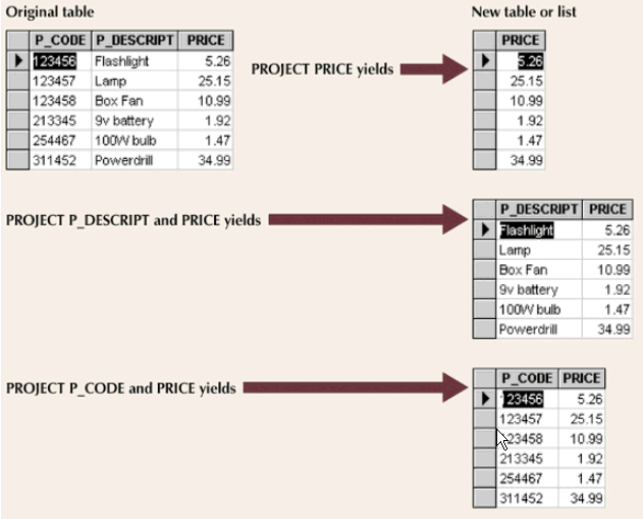
Basic Operations in a Relational Database:

- **Select:** Creates subset of rows that meet specific criteria



Relational DBMS - 6

- **Project:** Yields all values for selected attributes – vertical subset of a table.



P_CODE	P_DESCRIPT	PRICE
123456	Flashlight	5.26
123457	Lamp	25.15
123458	Box Fan	10.99
213345	9v battery	1.92
254467	100W bulb	1.47
311452	Powerdrill	34.99

PRICE
5.26
25.15
10.99
1.92
1.47
34.99

P_DESCRIPT	PRICE
Flashlight	5.26
Lamp	25.15
Box Fan	10.99
9v battery	1.92
100W bulb	1.47
Powerdrill	34.99

P_CODE	PRICE
123456	5.26
123457	25.15
123458	10.99
213345	1.92
254467	1.47
311452	34.99

Relational DBMS - 7

- **Join:** Enables users to create a new table containing only relevant information from **more than one table**.

Table name: CUSTOMER

CUS_CODE	CUS_LNAME	CUS_ZIP	AGENT_CODE
1132445	Walker	32145	231
1217782	Adares	32145	125
1312243	Rakowski	34129	167
1321242	Rodriguez	37134	125
1542311	Smithson	37134	421
1657399	Vanloo	32145	231

Table name: AGENT

AGENT_CODE	AGENT_PHONE
125	6152439887
167	6153426778
231	6152431124
333	9041234445

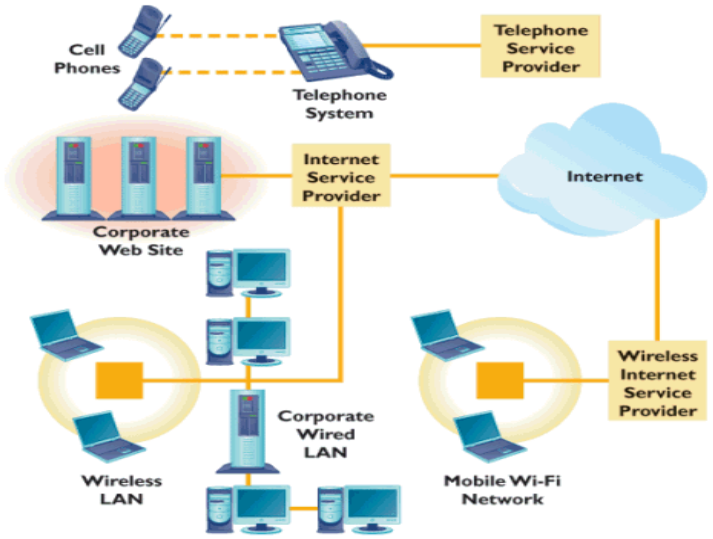
CUS_CODE	CUS_LNAME	CUS_ZIP	AGENT_CODE	AGENT_PHONE
1217782	Adares	32145	125	6152439887
1321242	Rodriguez	37134	125	6152439887
1312243	Rakowski	34129	167	6153426778
1132445	Walker	32145	231	6152431124
1657399	Vanloo	32145	231	6152431124

4. Business Telecommunications System

Telecommunications System

- Facilitation of electronic communication
- Telephone systems
- Broadcast and cable TV
- Radio, satellite, and local area networks
- Internet
- Analog or digital

Corporate Telecommunications System



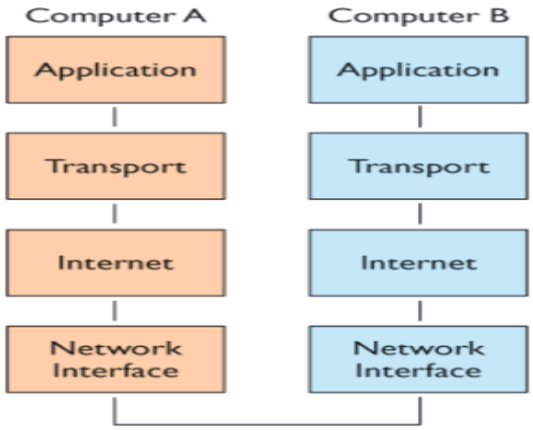
Features of Contemporary Telecommunications Systems - 1

Transmission Control Protocol/Internet Protocol (TCP/IP)

- Open suite of protocols for connectivity developed in 1970s
- Provides standards for breaking messages into packets, routing them to destination addresses, and reassembling them at end
- Allows for communication regardless of hardware/software

Features of Contemporary Telecommunications Systems - 2

TCP/IP: Four-Layer Reference Model



Features of Contemporary Telecommunications Systems – 3

TCP/IP: Four-Layer Reference Model

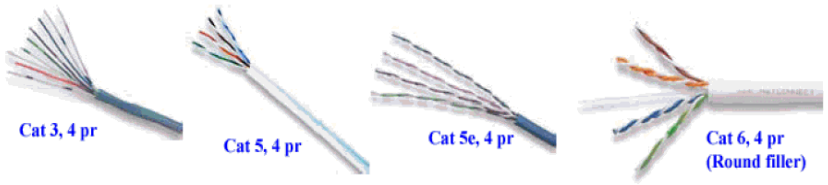
- **Application layer**: Communication between applications and other layers
- **Transport layer**: Acknowledging and sequencing packets to/from application
- **Internet layer**: Addressing, routing, packaging data packets
- **Network interface layer:** Placing packets on and receiving them from network medium

Features of Contemporary Telecommunications Systems – 4

Transmission Media - 1

Twisted wire

- Copper wire twisted in pairs
- Older analog transmission medium
- Can be used for digital signals
- Modems used for translating analog to digital

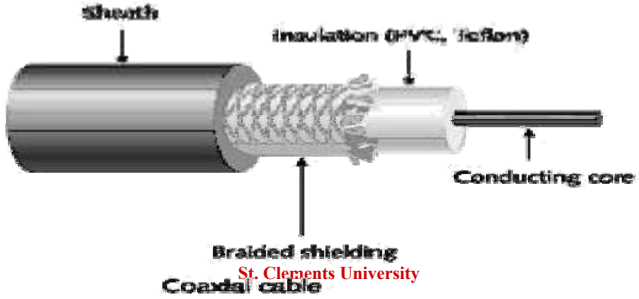


Features of Contemporary Telecommunications Systems – 5

Transmission Media - 2

Coaxial cable:

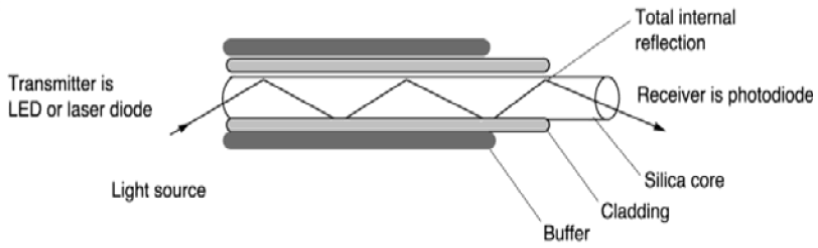
- Insulated copper wire
- Faster, more interference-free than twisted pair
- Difficult to install; doesn't support analog signals



Features of Contemporary Telecommunications Systems – 6

Transmission Media – 3

- **Fiber optics**
  - Transmission of data as light pulses through optical fiber
  - First converting electronic binary signals to light, and then convert the light signals back to electronic signals at the receiving end.
  - Faster, lighter, more durable



Features of Contemporary Telecommunications Systems – 7

Transmission Media – 4

- Fiber-optic technology has revolutionized telecommunications due to the very high speed of data transmission it can support.
- 0.1kg of optical fiber carries the same information as 30,000kg of copper cable
- At 2.5 Gbps, it is
  - equivalent to more than 3 hrs of TV per second
  - 24,000 simultaneous phone calls

Features of Contemporary Telecommunications Systems – 8

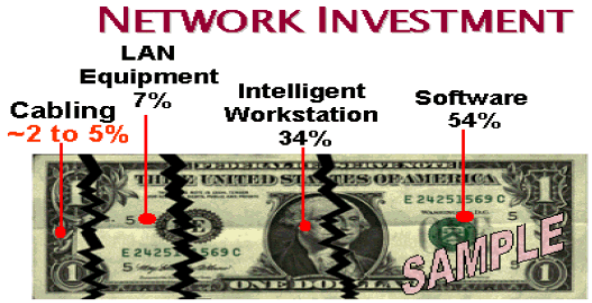
Transmission Media - 5

CABLING LIFE CYCLE

Features of Contemporary Telecommunications Systems – 9

Transmission Media – 6

- Although cabling represents only 2 to 5% of the total network investment, the cabling systems will outlive most network components.



Features of Contemporary Telecommunications Systems – 10

Transmission Media – 7

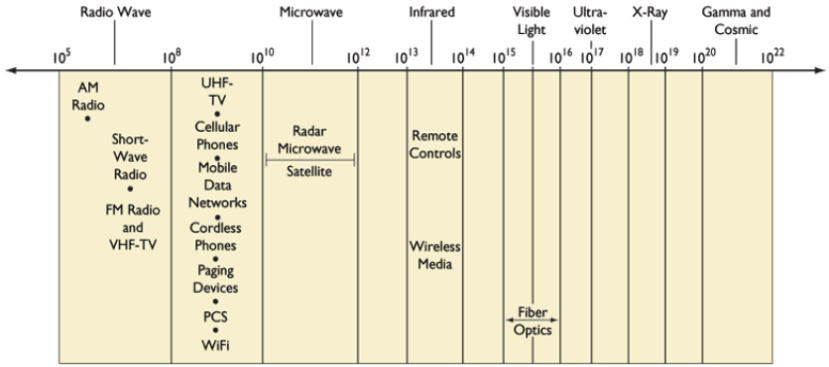
Wireless Transmission

- Use electromagnetic spectrum
- Microwave and infrared use high-frequency radio signals
- Paging systems, cellular telephones, PDAs, mobile data networks
- Wireless communication requires compatible standards
- Security/privacy issues

Features of Contemporary Telecommunications Systems – 11

Transmission Media – 8

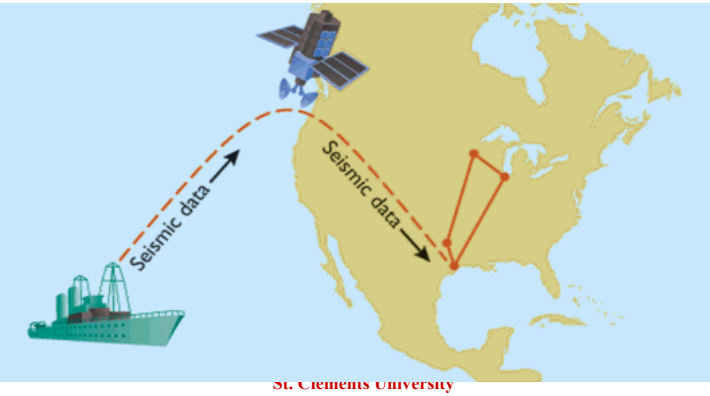
Frequency ranges for communication media and devices



Features of Contemporary Telecommunications Systems – 12

Transmission Media – 9

- **Satellite transmission system**



Features of Contemporary Telecommunications Systems – 13

Transmission Media – 10

- **Transmission Speed Comparison**

Twisted wire	Up to 1G+ Mbps
Microwave	Up to 200+ Mbps
Satellite	Up to 200+ Mbps
Coaxial cable	Up to 200 Mbps
Fiber-optic cable	Up to 6+ Tbps

5. Communications Networks

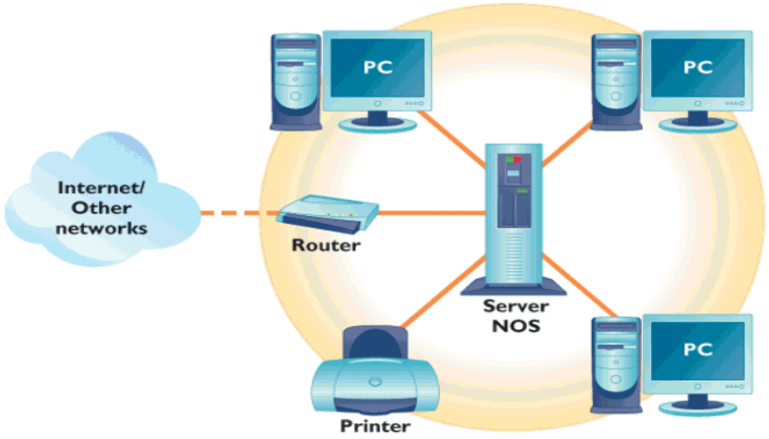
Communications Networks - 1

Local Area Networks (LAN) - 1

- A LAN is a data communication system allowing a number of independent devices to communicate directly with each other,
  - within a moderately sized geographic area,
  - and over a physical communications channel of moderate data rates.
- To implement a LAN, we need to use cabling or wireless technology to link up computers and networking devices, and the required software such as a Network Operating System (NOS).

Communications Networks - 2

Local Area Networks (LAN) - 2



Communications Networks - 3

Local Area Networks (LAN) – 3

- In a client/server arrangement, network services are located on a dedicated computer called a server. The server responds to the requests of clients for, print, application and other services.

Merits:

- The network is scalable.
- Enhanced security, ease of access, and control**.**

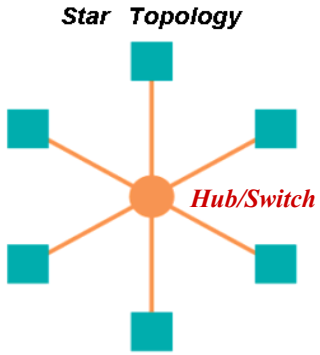
Demerits:

- Introduce a single point of failure in the network.
- More expensive, require specialized hardware and software.
- Require a trained, expert staff member to administer and maintain.

Communications Networks - 4

Local Area Networks (LAN) – 4

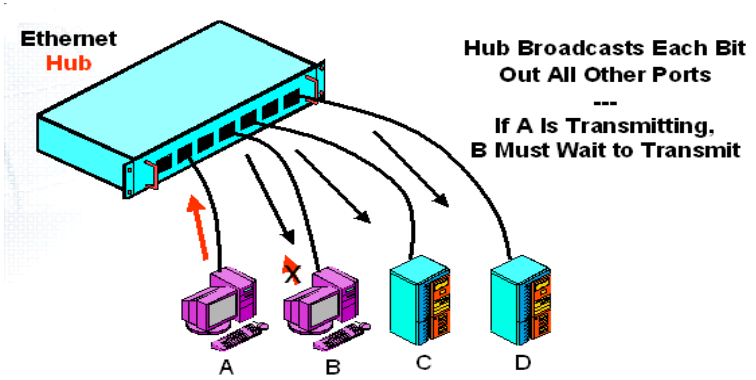
- Ethernet is by far the most common
- Star topology using Ethernet **hubs** and/or **switches**
- Use UTP cabling
- Relatively cheap, easy to install and manage
- Ethernet standards make use of latest developments in network technology



Communications Networks - 5

Local Area Networks (LAN) – 5

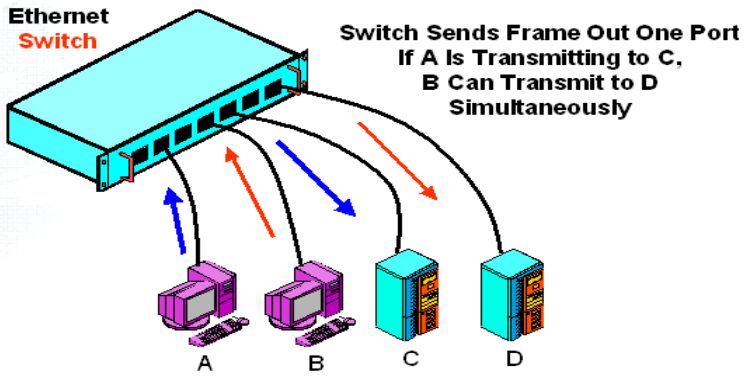
Hub Versus Switch Operation



Communications Networks - 6

Local Area Networks (LAN) – 6

Hub Versus Switch Operation



Communications Networks - 7

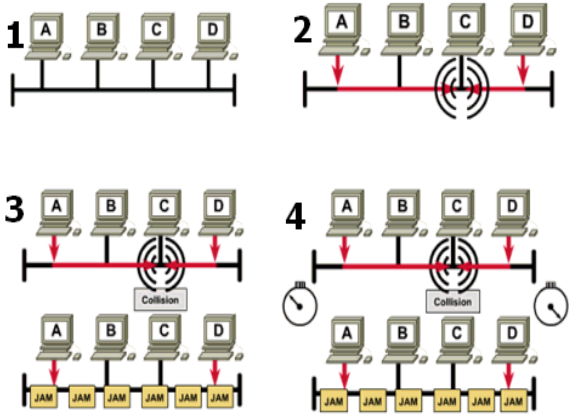
Local Area Networks (LAN) – 7

Hub Versus Switch Operation

- **Hubs Need Media Access Control**
  - This limits when a station may transmit
  - Ethernet hubs use CSMA/CD
- **Carrier Sense Multiple Access (CSMA)**
  - Only transmit if no other station is transmitting
  - Otherwise, wait
- **Collision Detection (CD)**
  - If two NICs transmit at the same time, this is a collision
  - Both will stop, wait a random amount of time, and the go back to CSMA to send again

Communications Networks - 8

Local Area Networks (LAN) – 8



CSMA/CD

1. Listen then transmit
2. Collision occurs
3. Broadcast jam signal
4. Devices back off appropriate amount of time, goes back to listen then transmit and then retransmit

Communications Networks - 9

Local Area Networks (LAN) – 9

UTP dominates the Ethernet access line market

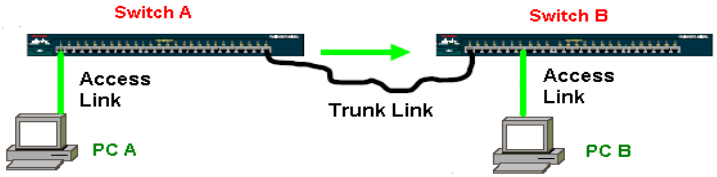
Physical Layer Standard	Speed	Maximum Run Length	Medium Required
10BASE-T	10 Mbps	100 meters	4-pair Category 3 or higher
100BASE-TX	100 Mbps	100 meters	4-pair Category 5 or higher
1000BASE-T (Gigabit Ethernet)	1,000 Mbps	100 meters	4-pair Category 5 or higher

Physical Layer Standard	Speed	Maximum Run Length	Medium 850 nm light (inexpensive) Multimode fiber	
1000BASE-SX	1 Gbps	220 m	62.5 microns	160 MHz-km

Communications Networks - 10

Local Area Networks (LAN) – 10

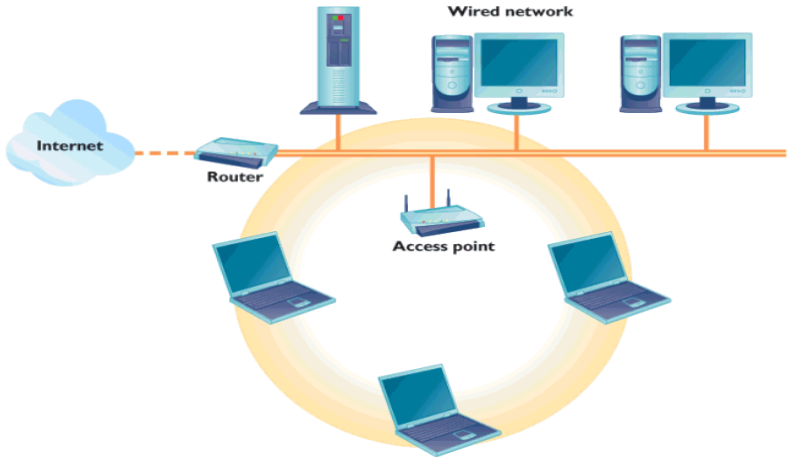
- **Access links** to client stations today are dominated by 100BASE-TX
  - But 1000BASE-T usage is growing
- **Trunk links** today are dominated by 1000BASE-SX
  - Sufficient for most LAN trunk line distances and speeds
  - Short trunk links, however, use UTP
  - Longer and faster trunk links use other fiber standards



Communications Networks - 11

Local Area Networks (LAN) – 11

An 802.11 Wireless LAN

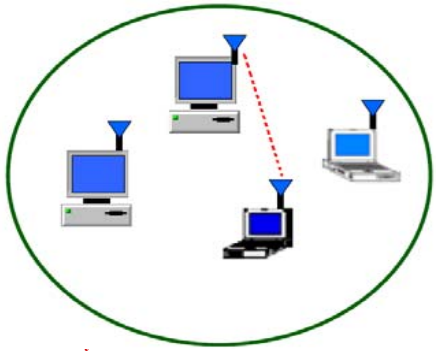


Communications Networks - 12

Local Area Networks (LAN) – 12

Wireless LAN

- **Ad-hoc mode**: Peer-to-peer mode; wireless devices communicate with each other directly.
- It involves at least 2 stations
- No backbone infrastructure
- Suitable for small area

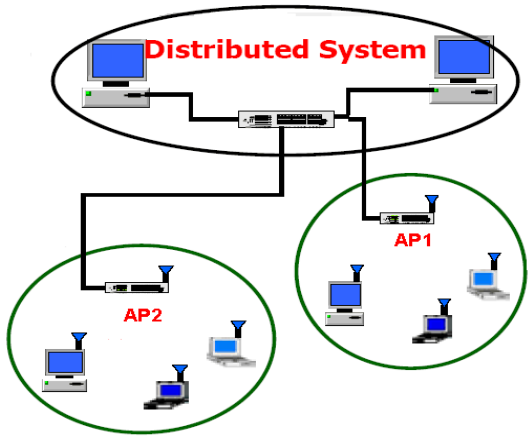


Communications Networks - 13

Local Area Networks (LAN) – 13

Wireless LAN

- **Infrastructure mode:**
- Wireless devices communicate with wired LAN via ***access points*** (APs).



Communications Networks - 14

Local Area Networks (LAN) – 14

- **Wireless LAN Standard**

Standard	802.11b	802.11a	802.11a
Frequency Band	2.4 GHz	5 GHz	2.4GHz
Data rate	11 Mbps	54 Mbps	54 Mbps

- **Hot spot:** Geographic location in which an access point provides public Wi-Fi network service.
  - Eg. Free PCCW Wi-Fi service in the HK International Airport

Communications Networks - 15

Local Area Networks (LAN) – 15

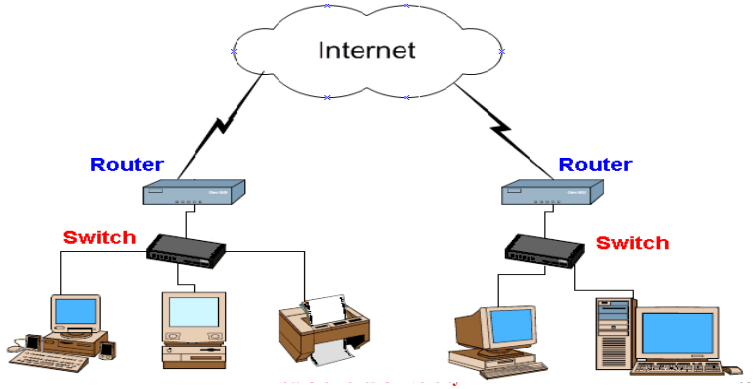
Bluetooth

- Standard for wireless personal area networks that can transmit up to 722 Kbps within 10-meter area
- It is a wireless LAN technology designed to connect devices of different functions such as telephones, notebooks, computers (desktop and laptop), cameras, printers and so on.
- A Bluetooth LAN is an ad-hoc network.
- The Bluetooth technology is the implementation of a a protocol defined by the IEEE 802.15 standard.
  - The standard defines a wireless personal-area network (PAN) opera able in an area the size of a room or a hall.

Communications Networks - 16

Local Area Networks (LAN) – 16

- **Routers** provides access to company networks on other sites, and to the Internet.



Communications Networks - 17

Wide Area Networks - 1

- A WAN is a single networks that connect different sites
- WANs and the Telephone
  - WAN technology usually uses the Public Switched Telephone Network transport system for transmission
  - Adds data switching and management
- WAN Purposes
  - Internet access
  - Link sites within the same corporation
  - Provide remote access to individuals who are off site

Communications Networks - 18

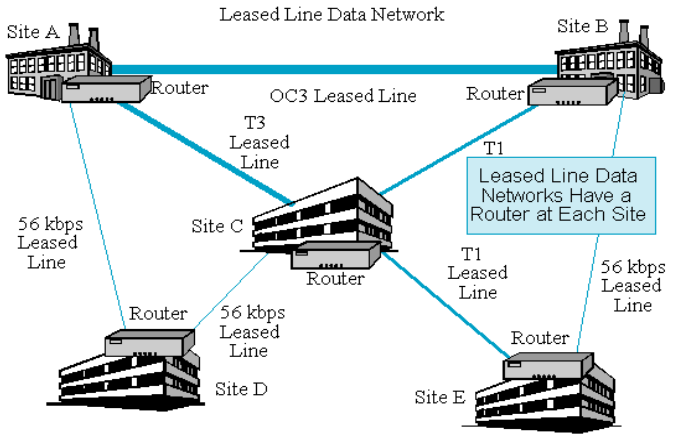
Wide Area Networks – 2

- WANs are characterized by **high cost** and **low speeds**.
- High cost per bit transmitted compared to LANs.
- Consequently, lower speeds (most commonly 128 kbps to a few megabits per second)
- This speed usually is aggregate throughput shared by many users
- Much slower than LAN speeds (100 Mbps to 1 Gbps to the desktop)

Communications Networks - 19

Wide Area Networks – 3

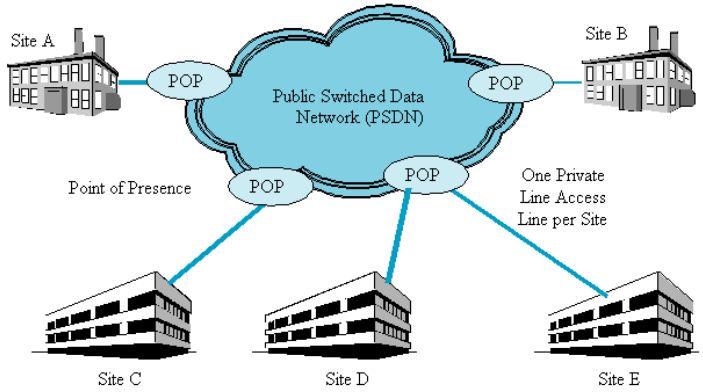
Leased Line Data Networks



Communications Networks - 20

Wide Area Networks – 4

WAN using Public Switched Data Networks



6. The Internet

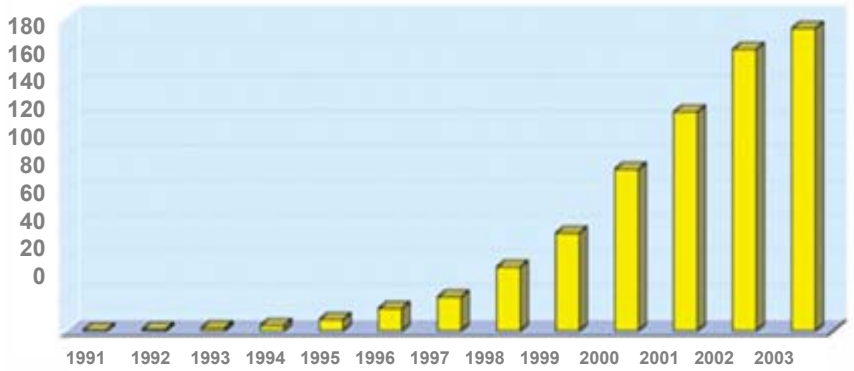
The Internet Revolution

The Internet

- Developed in the early 1960s by the U.S. Department of Defense (DOD) as a need of national security.
- Now grows to an international network of networks
  - Universal technology platform: Any computer can communicate with any other computer
  - Since the introduction of World Wide Web and Web sites, the population in the Internet has grown exponentially.

Growth of the Internet

- ARPANET grew from 4 computers in 1969 to over 300,000 by 1990.



Source: Internet Software Consortium (http://www.isc.org/)

Open Architecture Philosophy

Four key points:

- Independent networks should not require any internal changes to be connected to the Internet.
- Packets that do not arrive at their destinations must be retransmitted from their source network.
- The router computers do not retain information about the packets they handle.
- No global control will exist over the network.

Intranet and Extranet

Intranet

- LANs or WANs that use TCP/IP protocol but do not connect to sites outside the firm.

Extranet

- An intranet that allows selected outside parties to connect.

Communicate and collaborate

- Access information
- Participate in discussions
- Supply information
- Exchange business transactions

Commercialization of the Internet

- Businesses quickly recognized profit-making potential offered by a world-wide network of easy-to-use computers.
- Web page
  - An HTML document
- Web site
  - A collection of linked Web pages with a common theme
- Web Browser
  - Software that lets users read HTML documents and move from one HTML document to another through hypertext link tags in each file.

Hypertext and Links - 1

Hypertext Markup Language (HTML)

- A standard language used on the Web
- HTML uses codes (tags) to tell the Web browser software how to display text.

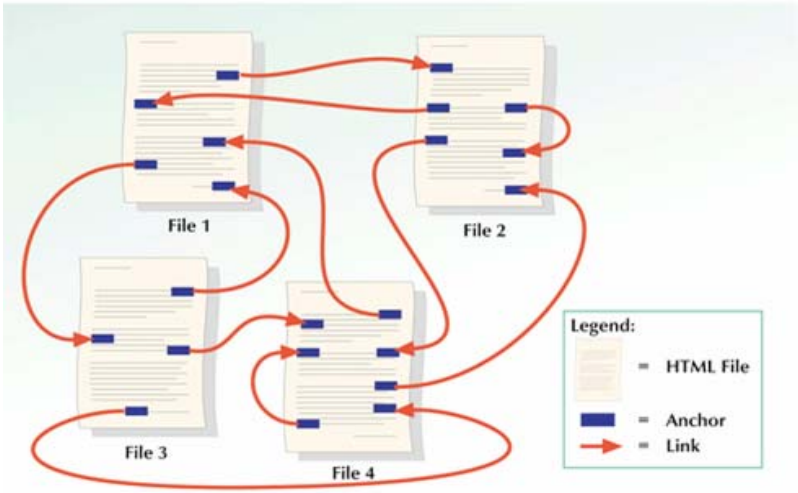
HTML anchor tag

- Enables Web designers to link HTML documents to each other

Hypertext Links

- A link which points to another location in the same or another HTML document

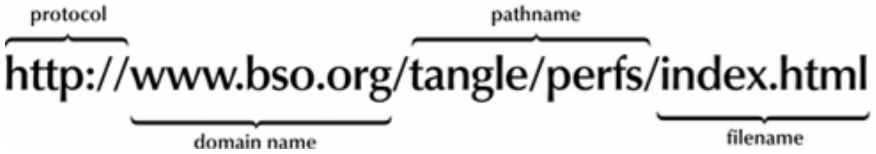
Hypertext and Links - 2



Uniform Resource Locators

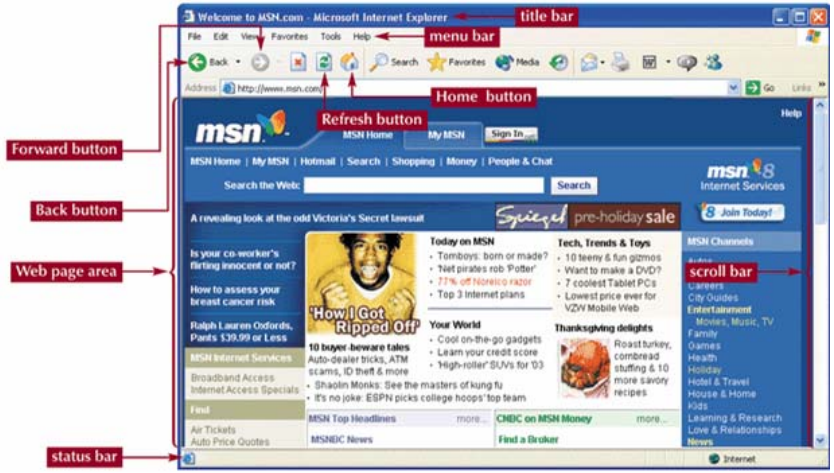
Four-part addressing scheme that tells the Web browser:

- Transfer protocol to use when transporting the file
- Domain name of computer on which file resides
- Pathname of folder or directory on computer on which file resides
- Name of the file



Main Elements of Web Browsers

- **Title Bar, Scroll Bars, Status Bar, Menu Bar, Page Tab, Home Button**



Web Search Engines

- Web pages that conduct searches of the Web to find words or expressions you enter.

7. Networked Applications

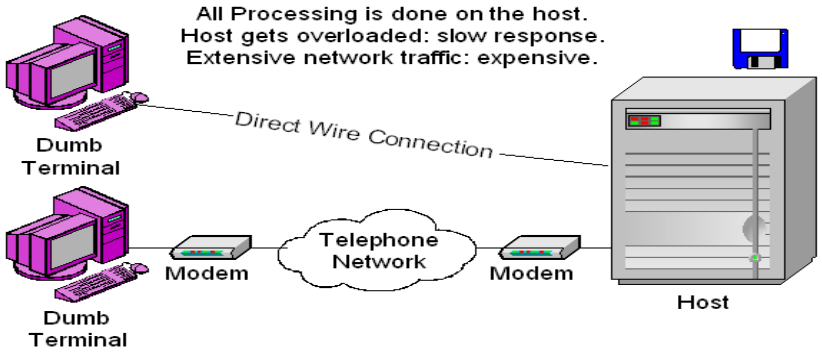
Application Architectures - 1

- An application architecture is the design decision about which network host or hosts to use to do the processing work in an application.
- Two type of application architecture:
  - Terminal-Host System
  - Client/Server Computing

Application Architectures - 2

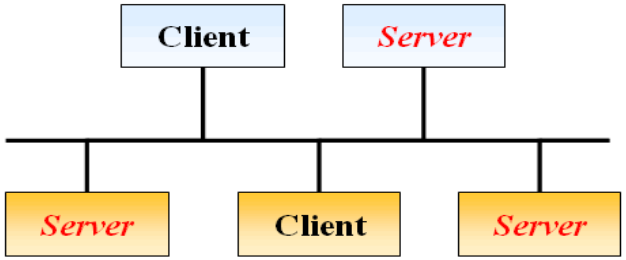
Terminal-Host System

- **Applications and databases reside on the same host computer.**
- **User interacts with the application using a "dumb terminal".**



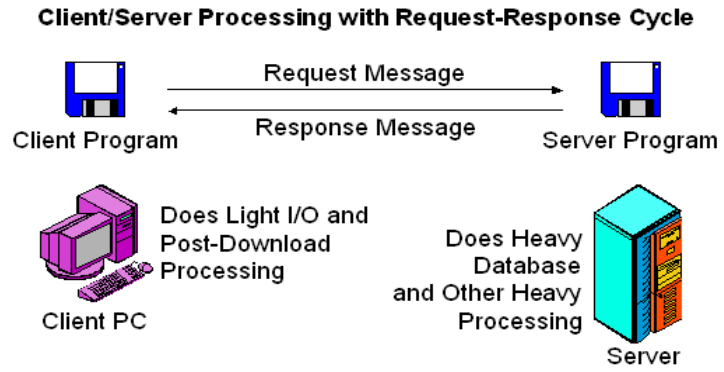
Application Architectures - 3

- Applications and databases reside on specialized host computers.
- Servers do most or all of the processing and transmit the results to the client.



Application Architectures - 4

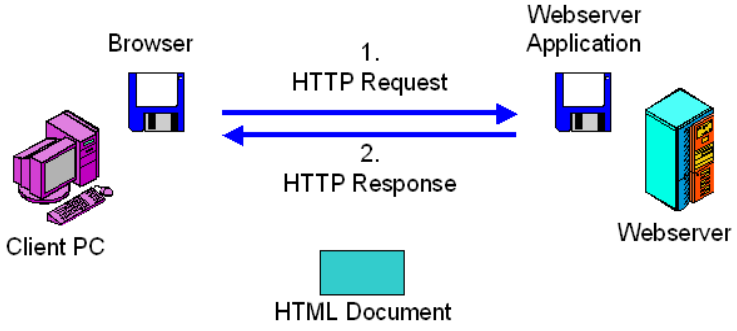
Client/Server Computing



Highly scalable: Use larger server as number of clients increases

Application Architectures - 5

Web Page Browsing



E-Mail - 1

What is E-Mail?

- E-mail (electronic mail) is the exchange of computer-stored messages by telecommunication.

Mail Server

- A hardware and software system that determines from the recipient's address one of several routes on which to send the message.

Mail Client Software or E-Mail Program

- A software that requests mail delivery from the mail server to your PC.

Email Address

- An uniquely identifies an individual or organization that is connected to the Internet.
- **stclementsmba@gmail.com**

E-Mail - 2

Protocols that make email works

- **SMTP (Simple Mail Transfer Protocol)**
  - It decides which paths an e-mail message takes on the Internet.
- **POP (Post Office Protocol)**
  - It handles incoming messages.
- **IMAP (Internet Message Access Protocol)**
  - A protocol for retrieving mail messages from a server.
- **MIME (Multipurpose Internet Mail Extensions)**
  - A protocol that specifies how to encode non-text data, such as graphics and sound, so it can travel over the Internet.

E-Mail - 3

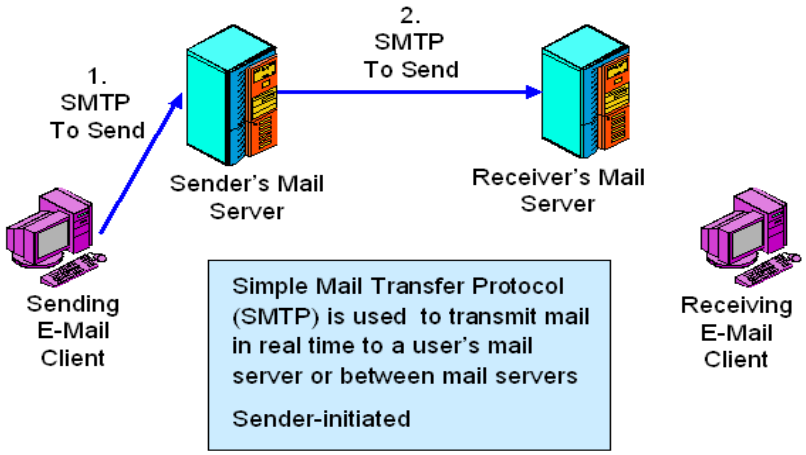
Importance of E-Mail

- Universal service on the Internet
- Attachments make e-mail a general file delivery mechanism!

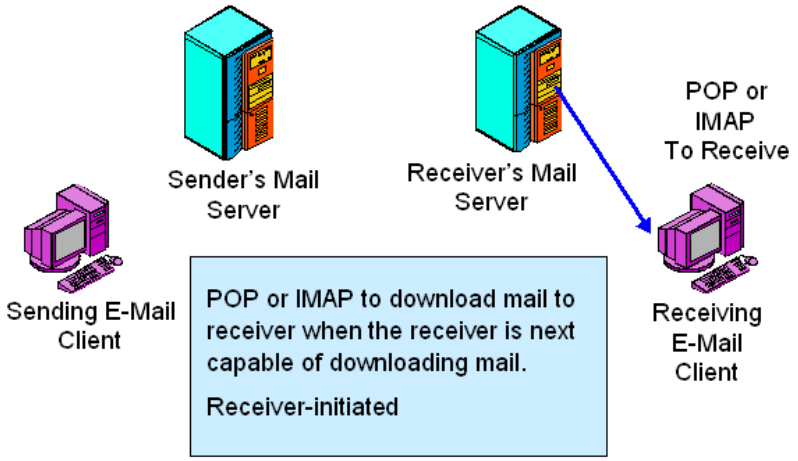
Mail Standards

- Message body standards
- Receiver must understand sender's message
  - RFC 822 and RFC 2822 for all-text bodies
  - HTML bodies with fancy text and graphics
  - UNICODE for non-English language characters

E-Mail - 4



E-Mail - 5



E-Mail – 6

The "evils" come with email:

- Messages with inappropriate content.
  - Racial or sexual harassment
  - Threats
- Spam, adware, spyware, and other abuses.
- Viruses, Worms, and Trojan Horses are often delivered by e-mail attachments!

E-Mail - 7

Viruses, Worms, and Trojan Horses

- Use of antivirus software is a must.
- Where to Do Scanning?
  - On client PCs
    - But users often turn off their software,
    - Fail to download virus definitions regularly
    - Or let their contracts lapse
  - On the corporate mail server or application firewall
    - Users cannot turn off

E-Mail - 8

- **Spam** are unsolicited commercial e-mail
- Why they are harmful?
  - Time consumed by users deleting them
  - Bandwidth and storage consumed
  - Legitimate messages lost because overlooked
- Separating SPAM from legitimate e-mail is difficult
  - Many spam messages get through to users
  - Some legitimate messages are deleted
  - Some firms merely mark messages as probable spam

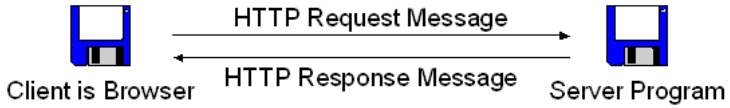
E-Mail - 9

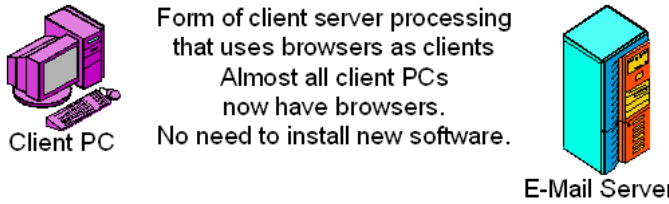
Web-Based E-Mail Services - 1

- Many Internet Web sites provide free e-mail addresses and accounts for **registered users**.
- They may be used with any Web browser.
- Examples: Gmail, Yahoo! Mail, Hotmail etc.

E-Mail - 10

Web-Based E-Mail Services - 2

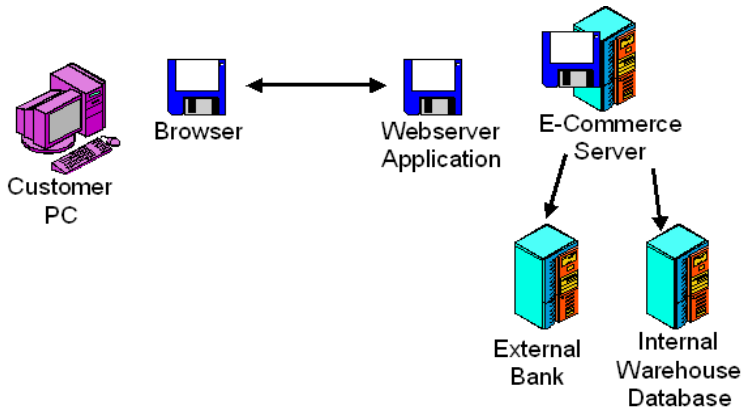




Electronic Commerce Functions - 1

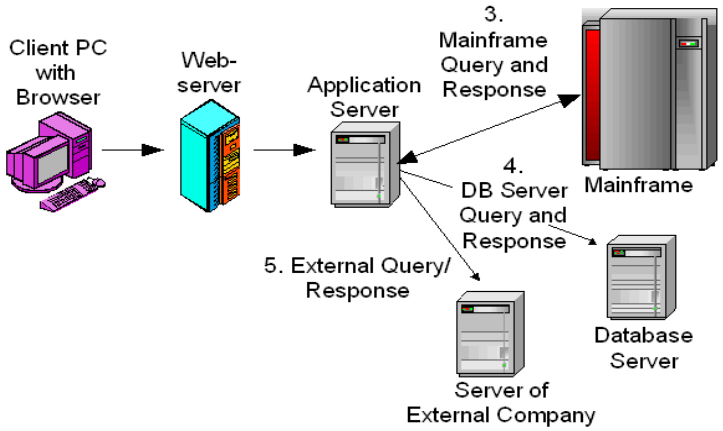
- **Webserver Functionality**, Plus…
- **E-Commerce functionality**
  - Online catalog
  - Shopping cart
  - Checkout, including payment
  - Customer resource management (CRM)
  - Links to External Systems
    - Credit card number checking
    - Bank settlement
  - Links to internal systems
    - Accounting
    - Warehousing (Product Availability)
    - Shipment
    - etc.

Electronic Commerce Functions - 2



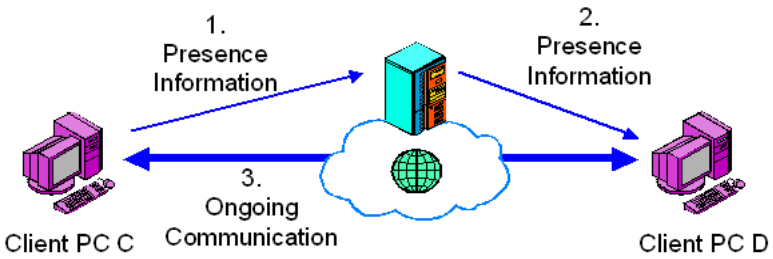
Electronic Commerce Functions - 3

Application Server (3-Tier Architecture)



Instant Messaging Servers - 1

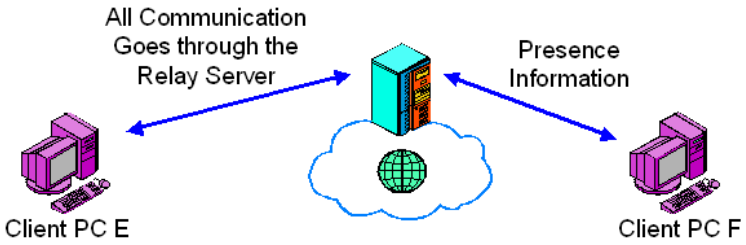
Use of a Presence Server



Clients register with presence servers.
Presence servers notify other clients as appropriate.
Clients use this information to communicate directly.

Instant Messaging Servers - 2

Use of a Relay Server



Relay servers route all IM messages.
This permits security filtering and other services.
It limits privacy because the relay server sees everything.

8. Contemporary Mobile Services

Mobile Enterprise

- "Today, penetration within organizations that use mobile applications is strong — on average, 22% of the workforce uses mobile applications."
  - *Forrester's March 15, 2006 Topic Overview "Enterprise Mobility"*
- Mobile Enterprise
  - "The ***ability for an enterprise to connect*** and control suppliers, partners, employees, assets, products, and customers ***from any location***."
    - *Forrester's March 15, 2006 Topic Overview "Enterprise Mobility"*

What's Driving Enterprises to Go Mobile?

- Increased competitive pressure as others start adopting mobile technology.
- Overall increased speed of business.
- Executives who have experienced mobility through a wireless email device, such as a *BlackBerry*, are now influencing departments to embrace mobility.

Broadband Wireless Networks…
Versatile Devices…
Faster Processors….

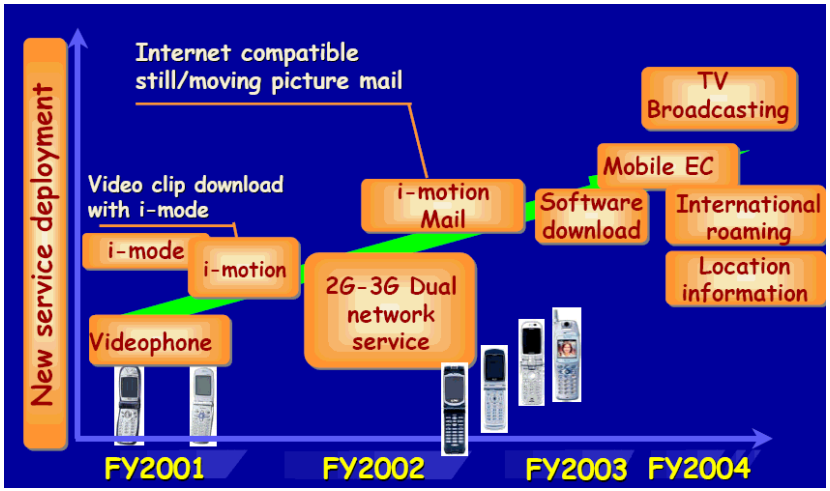
The Business Case for Mobile Worker Applications

- **Productivity**
  - With scheduling systems, service technicians achieve higher utilization and more efficient routings; avoid wasted visits when clients cancel or when they don't have necessary parts on the truck. Productivity improvements of 5% to 25% are commonplace with real-time scheduling.
- **Accuracy**
  - Data entry and collection at the time when the data is created to reduce errors/eliminate transcription mistakes.
- **Process Improvement**
  - Real-time data collection and transmission improves many processes like order shipping. Downstream benefits -- lower inventory and carrying costs; more efficient routing of multi-drop deliveries; and greater customer satisfaction.

Generations of Mobile Networks

- 1G: basic mobile telephony
- 2G: mobile telephony for mass users
  - regional roaming
- 2.5G: mobile internet services
- 3G:
  - global roaming
  - enhanced mobile Internet services

3G Services – To explore the non-voice Applications



HSDPA - 1

- High-Speed Downlink Packet Access (HSDPA) is a 3G mobile telephony communications protocol.
- It support services requiring instantaneous high data rates in the downlink, e.g. Internet browsing, video on demand, office application.
- Peak data rates 3-4 times higher than current 3G.
- Current HSDPA deployments support down-link speeds of 1.8, 3.6, 7.2 and 14.4 Mbit/s.
- New terminals are required to take advantage of HSDPA.

HSDPA - 2

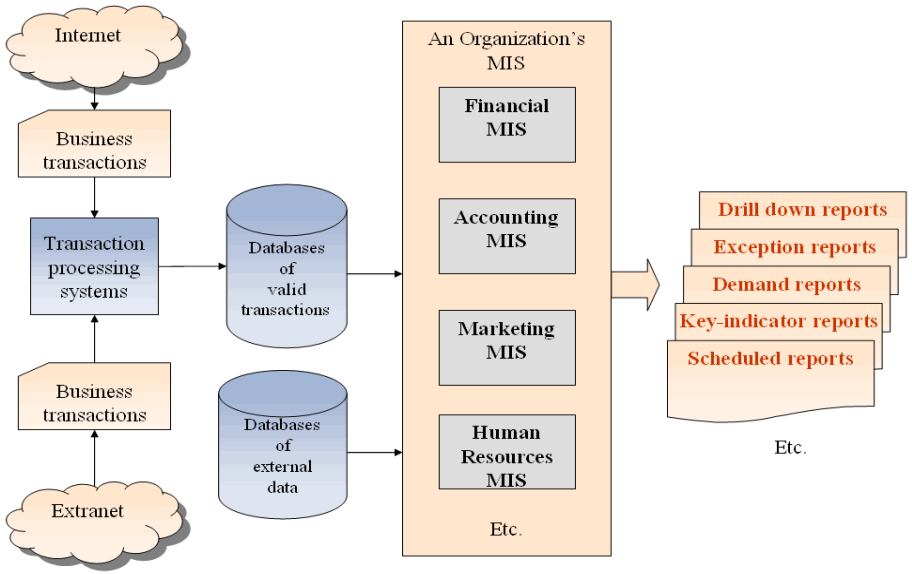
SPEED		Higher bit rates: up to 14 Mbps peak rate
CAPACITY		2 – 3 times improved system capacity
REDUCED DELAY		Quicker response time with interactive services
STANDARDIZED		Integral part of WCDMA (3GPP Rel.5)
Network Coverage		Short time to market with existing sites

9. MIS Examples

Management information system (MIS) - 1

- An MIS provides managers with **information** and **support** for effective decision making, and provides feedback on daily operations.
- Output, or reports, are usually generated through accumulation of transaction processing data.
- MIS is an integrated collection of functional information systems, each supporting particular functional areas.
  - Provides reports based on routine flow of data
  - Assists in general control of the organization
- DSS
  - Emphasizes change, flexibility, rapid response, models, assumptions, ad-hoc queries, and display graphics

Management information system (MIS) - 2



Management information system (MIS) - 3

Outputs of an MIS

Scheduled reports

- Produced periodically, or on a schedule (daily, weekly, monthly)

Key-indicator report

- Summarizes the previous day's critical activities
- Typically available at the beginning of each day

Demand report

- Gives certain information at a manager's request

Exception report

- Automatically produced when a situation is unusual or requires management action

Drill Down Reports

- Provide detailed data about a situation. To move from summary data to lower and lower levels of detail.

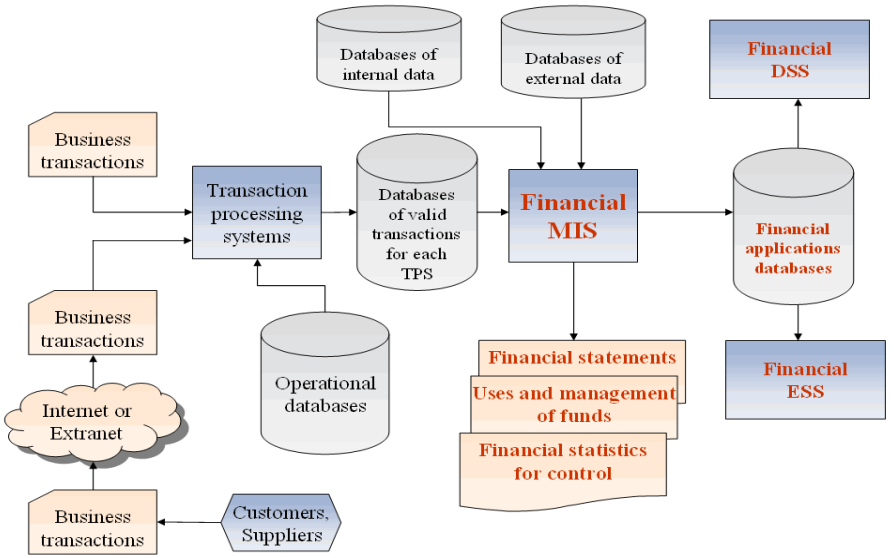
MIS for Competitive Advantage

- Provides support to managers as they work to achieve corporate goals.
- Enables managers to compare results to established company goals and identify problem areas and opportunities for improvement.
- Data may be made available from management information systems on a company's intranet.
- Employees can use browsers and their PC to gain access to the data.

Financial MIS - 1

- Provides financial information to all financial managers within an organization.
- Inputs to the Financial Information System:
  - Strategic plan or corporate policies
    - Contains major financial objectives and often projects financial needs.
  - Transaction processing system (TPS)
    - Important financial information collected from almost every TPS - payroll, inventory control, order processing, accounts payable, accounts receivable, general ledger.
    - External sources
    - Annual reports and financial statements of competitors and general news items.

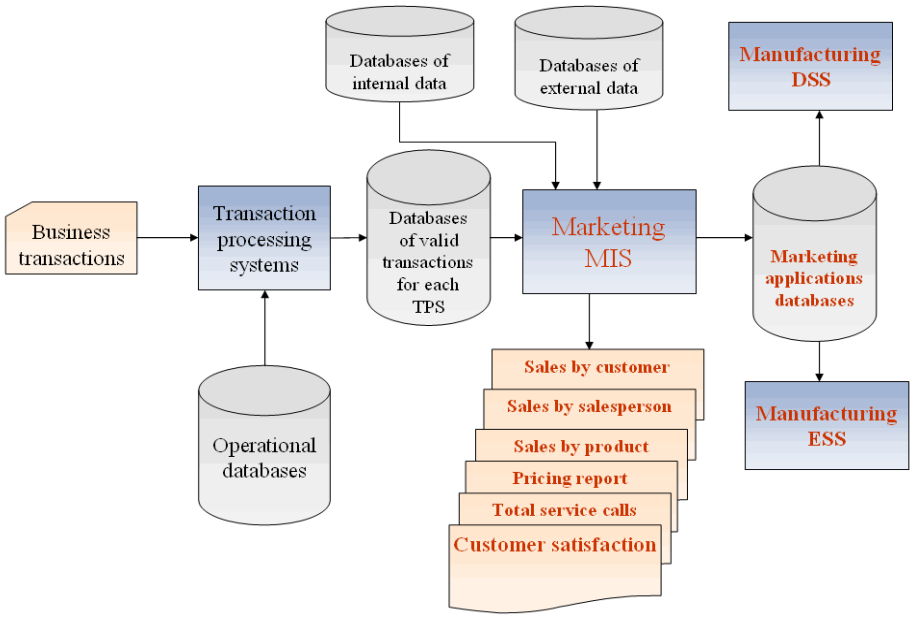
Financial MIS - 2



Marketing MIS - 1

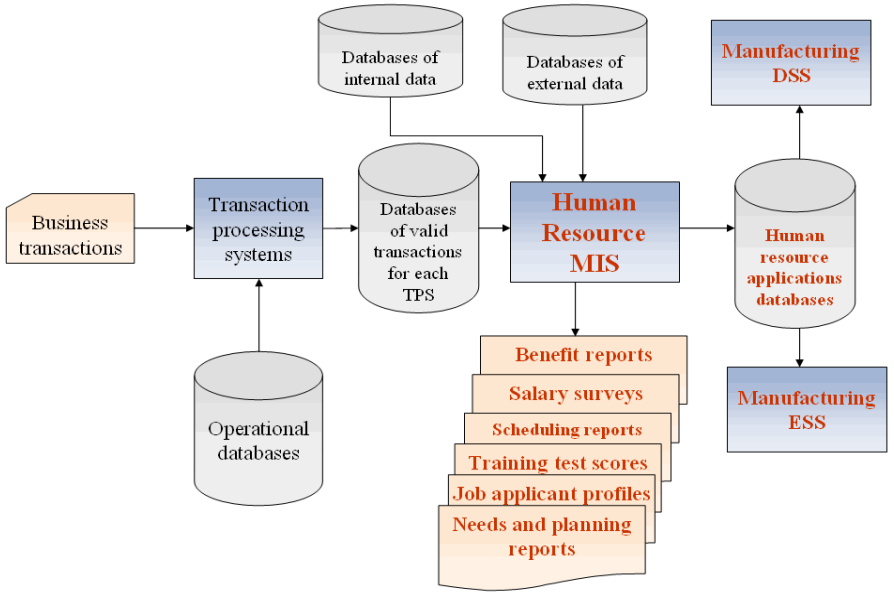
- Supports managerial activities in product development, distribution, pricing decisions, and promotional effectiveness.
- Inputs to Marketing MIS:
  - Strategic plan and corporate policies
  - The TPS
  - External sources:
    - The competition
    - The market

Marketing MIS - 2



Human Resource MIS - 1

- Concerned with all of the activities related to employees and potential employees of the organization.
- Inputs to the Human Resource MIS:
  - Strategic plan or corporate policies
  - The TPS:
    - Payroll data
    - Order processing data
    - Personnel data
  - External sources



END

Management Information System

St. Clements University

MBA Program

September, 2008

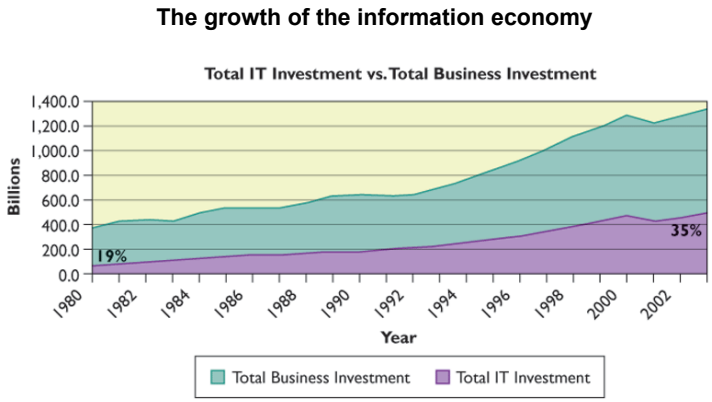
Table of Contents

1. The role of information systems

Rise of the Information Economy - 1

- Rise of the Information Economy have altered the business environment.
  - Knowledge- and information-based economies
  - New products and services
  - Knowledge: a central productive and strategic asset
  - Time-based competition
  - Shorter product life
  - Turbulent environment
  - Limited employee knowledge base

Rise of the Information Economy - 2

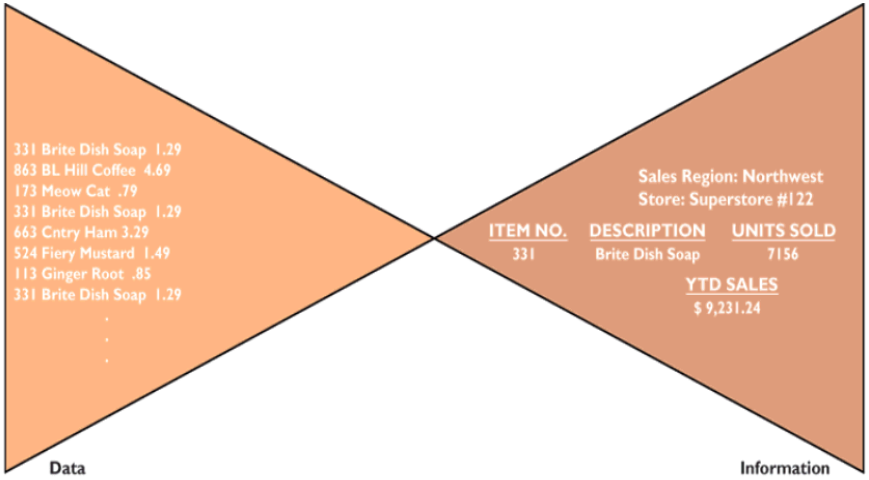


Source: Based on data in U.S. Department of Commerce, Bureau of Economic Analysis, National Income and Product Accounts, Tables 5.2 and 5.8, 2003.

What Is an Information System?

- A set of interrelated components that collect (or retrieve), process, store, and distribute information to support decision making and control in an organization.
- What is the difference between ***information*** and ***data***?
  - **Data:** Streams of raw facts representing events such as business transactions.
  - **Information:** Clusters of data that are meaningful and useful to human beings.

Data and Information



What Is an Information System?

Formal Systems

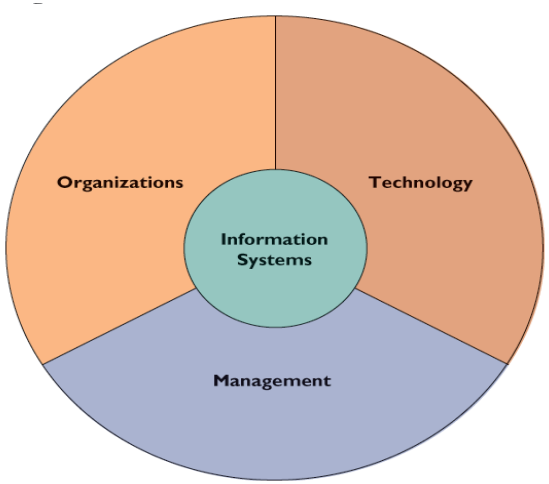
- Fixed definitions of data and procedures for collecting, storing, processing, disseminating, and using these data

Can be computer-based or manual

Computer-based Information Systems

- Use computer hardware and software to process and disseminate information

Information systems are more than computers



A Business Perspective on Information Systems

- **Information systems literacy**: Broad-based understanding of information systems that includes behavioral knowledge about organizations and individuals using information systems and technical knowledge about computers.
- **Computer literacy**: Knowledge about information technology, focusing on understanding how computer-based technologies work.

Information Technology (IT) Infrastructure

- Computer hardware
- Computer software
- Storage technology
- Communications technology

The Challenges of Information Systems: Key Management issues - 1

Positive Impacts of Information Systems

- Faster calculations and paperwork
- Analysis of customer purchase patterns and preferences
- More efficient business services
- Instant global distribution of information

The Challenges of Information Systems: Key Management issues - 2

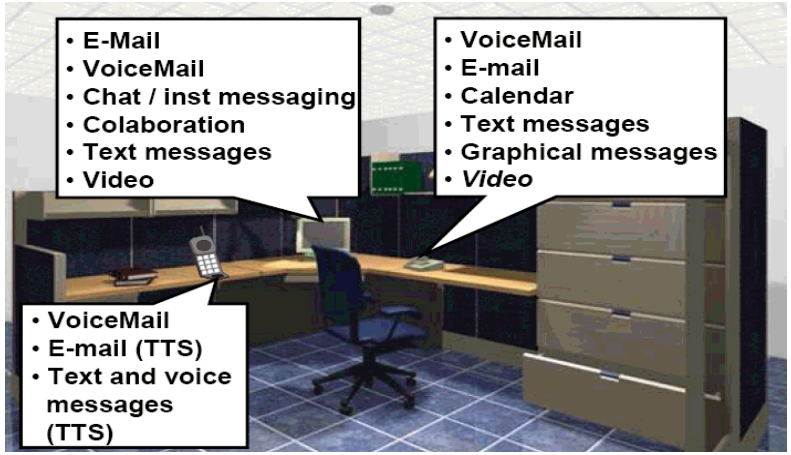
Negative Impacts of Information Systems

- Automation leading to job elimination
- Privacy concerns
- System outages and shutdowns
- Health problems, repetitive stress injury
- Illegal distribution of intellectual property

2. Hardware and Software in the Enterprise

Example of today's work environment - 1

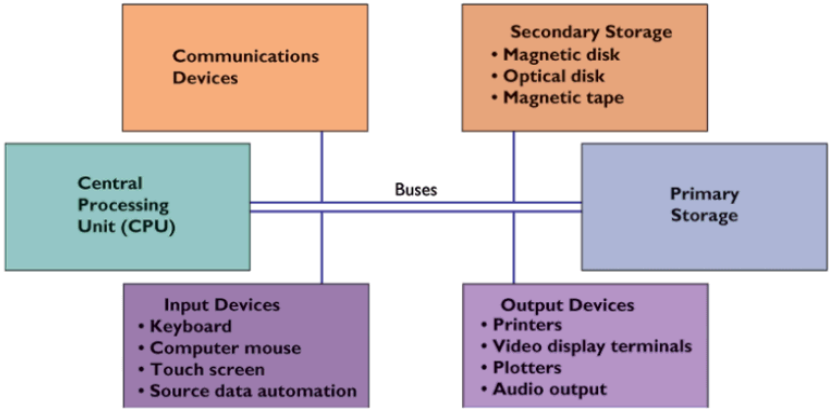
- Three communication devices: PC, desk phone, mobile



Example of today's work environment - 2

Computer Hardware and Information Technology Infrastructure - 1

- Hardware components of a computer system



Computer Hardware and Information Technology Infrastructure - 2

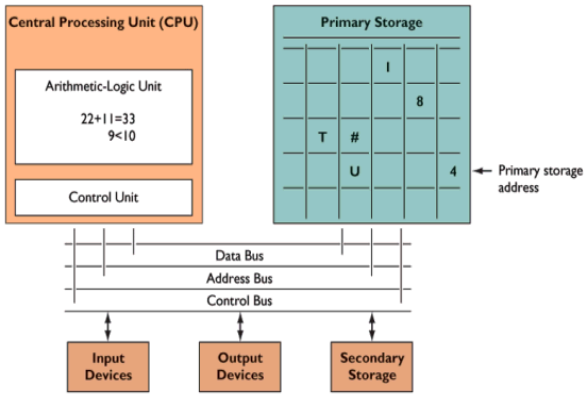
The Computer System

- **Bit**
  - Binary digit
  - Represents 0 or 1
- **Byte**
  - String of eight bits
  - Stores one number, symbol, character, part of picture

Computer Hardware and Information Technology Infrastructure - 3

The Computer System

- **The Central Processing Unit (CPU)**
  - Controls other parts of computer
- **Arithmetic-logic unit**
  - Performs principle logical/mathematical operations
- **Control unit**
  - Coordinates other parts, such as reading a stored program



Computer Hardware and Information Technology Infrastructure - 4

The Computer System

- **Primary Storage**
  - Located near CPU
  - Stores all or part of active software program
  - Stores data the program is using
  - Composed of semi-conductors
  - RAM (random access memory): Used for short-term, temporary storage
  - ROM (read-only memory): Semiconductor memory chips with program instructions

Computer Hardware and Information Technology Infrastructure - 5

The Computer System

- **Secondary Storage Technology**
  - Used for relatively long-term storage of data outside CPU
  - Magnetic disk: floppies, hard disks, RAID
  - Flash memory
  - Optical disk: CD-ROM, CD-RW, DVD
  - Magnetic tape
  - Storage networking: direct-attached storage; network-attached storage; storage area networks

Computer Hardware and Information Technology Infrastructure - 6

Hierarchy of Memory Capacity

- Kilobyte (KB): approximately one thousand bytes.
- Megabyte (MB): approximately one million bytes (1,048,576 bytes, or 1,024 x 1,024).
- Gigabyte (GB): actually 1,073,741,824 bytes (1,024 x 1,024 x 1,024 bytes).
- Terabyte: One trillion bytes, 10^{12} bytes.
- Petabyte: Approximately 10^{15} bytes.
- Exabyte: Approximately 10^{18} bytes.

Computer Hardware and Information Technology Infrastructure - 7

A storage area network (SAN)

Computer Hardware and Information Technology Infrastructure - 8

The Computer System

- **Input Devices**
  - Keyboard and mouse
  - Touch screen
  - Optical character recognition
  - Magnetic ink character recognition (MICR)
  - Pen-based input
  - Digital scanner
  - Audio input
  - Radio-frequency identification (RFID)

Computer Hardware and Information Technology Infrastructure - 9

The Computer System

- **Output Devices**
  - Cathode-ray tube (CRT)
  - LCD Panel
  - Printers
  - Audio output

Classifying Computers

- **Mainframe:** Largest computer, largest multi-user systems, handles massive amounts of data; used for large business, scientific, military applications.

- **Workstation:** More powerful desktop computer used for computation-intense tasks. A midrange systems multi-user system.
- **Personal computer**: Portable or desktop microcomputer. A single user system.

Types of Software

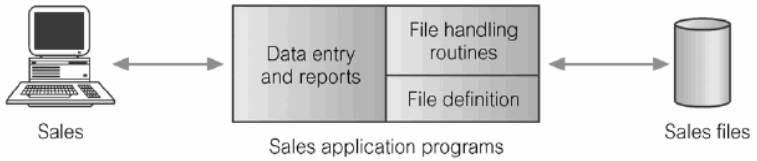
- **Software program:** A series of statements or instructions to the computer
- Two major types of software:
  - **System software**
    - Generalized programs that manage the computer's resources
    - For example, the Windows family of Operating Systems
  - **Application software**
    - Programs written for or by users to perform a specific task.
    - For example, Word,Excel, Powerpoint

3. Database Management Systems

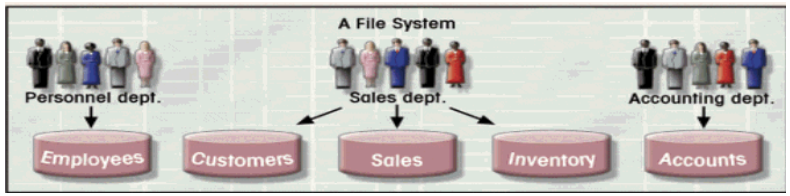
File Systems - 1

Traditional file environment:

- Each application program defines and manages its own data.



- Each program defines and manages its own data.



File Systems - 2

Limitations of File-based Approach:

1. Separation and isolation of data

- Each program maintains its own set of data.
- Users of one program may be unaware of potentially useful data held by other programs.

2. Duplication of data

- Same data is held by different programs.
- Wasted space and potentially different values and/or different formats for the same item.

File Systems - 3

3. **Data dependence**

- File structure is defined in the program code.

4. **Incompatible file formats**

- Programs are written in different languages, and so cannot easily access each others files.

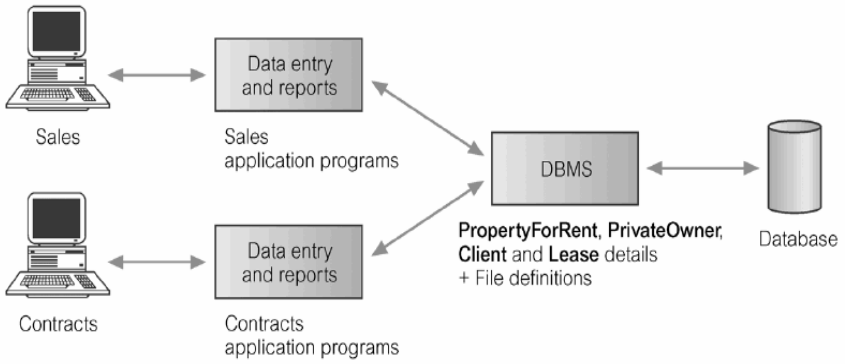
5. **Fixed Queries/Proliferation of application programs**

- Programs are written to satisfy particular functions.
- Any new requirement needs a new program.

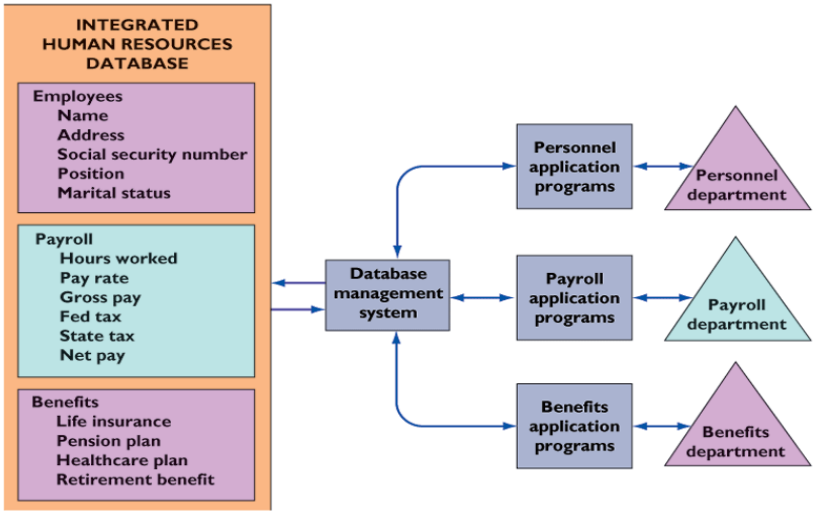
The Database Approach to Data Management - 1

- Shared collection of logically related data (and a description of this data), designed to meet the information needs of an organization.
- System catalog (metadata) provides description of data to enable program–data independence.
- Logically related data comprises entities, attributes, and relationships of an organization's information.

The Database Approach to Data Management - 2



The Database Approach to Data Management - 3



DBMS Approach

Database Management System (DBMS)

- A software system that enables users to define, create, and maintain the database and which provides controlled access to this database.

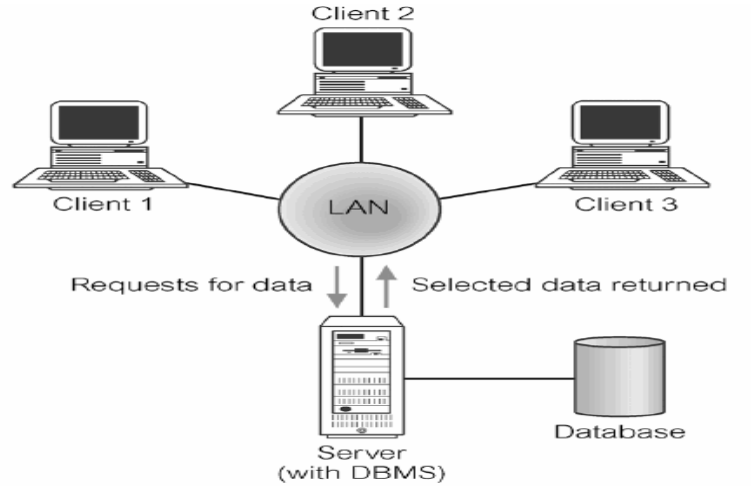
DBMS Components

1. **Data definition language**: Formal language for specifying the structure of database
2. **Data manipulation language**: For extracting data from database, e.g. SQL.

How a DBMS Solves Problems of a Traditional File Environment

- Reduces data redundancy
- Eliminates data inconsistency
- Uncouples programs from data
- Increases access and availability of data
- Allows central management of data, data use, and security

Database Client-server Architecture



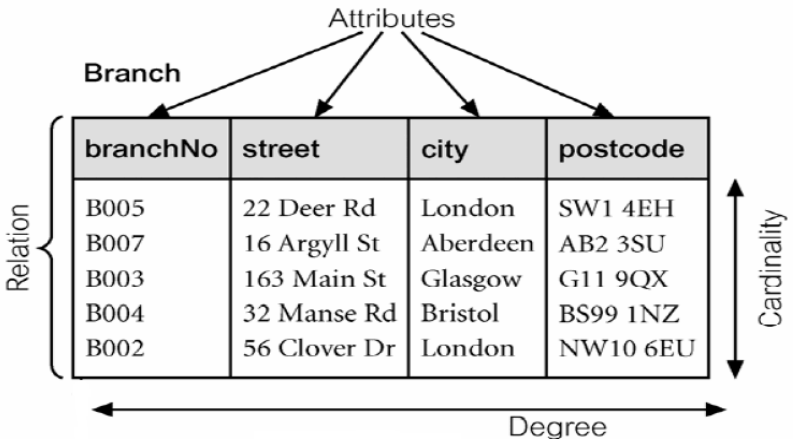
Disadvantages of DBMS

- Complexity
- Size
- Cost of DBMS
- Additional hardware costs
- Cost of conversion
- Performance
- Higher impact of a failure

Relational DBMS - 1

- A **relation** is a table with columns and rows.
  - **Attribute** is a named column of a relation.
  - **Domain** is the set of allowable values for one or more attributes.
  - **Tuple** is a row of a relation.
  - **Degree** is the number of attributes in a relation.
  - **Cardinality** is the number of tuples in a relation.
- Relational Database is a collection of normalized relations with distinct relation names.

Relational DBMS - 2



- Relates data across tables based on **common data element.**

Relational DBMS - 3

Table (Relation)

Columns (Attributes, Fields)

ORDER

Order_ Number	Order_ Date	Delivery_ Date	Part_ Number	Part_ Quantity
1634	02/02/04	02/22/04	152	2
1635	02/12/04	02/28/04	137	3
1636	02/13/04	03/01/04	145	1

PART

Part_ Number	Part_ Description	Unit_ Price	Supplier_ Number
137	Door latch	22.50	4058
145	Door handle	26.25	2038
150	Door seal	6.00	4058
152	Compressor	70.00	1125

SUPPLIER

Supplier_ Number	Supplier_ Name	Supplier_Address
4058	CBM Inc.	44 Winslow, Gary, IN 44950
2038	Ace Inc.	Rte. 101, Essex, NJ 07763
1125	Bryant Corp.	51 Elm, Rochester, NY 11349

Relational DBMS - 4

Alternative terminology for relational model terms

Formal terms	Alternative 1	Alternative 2
Relation	Table	File
Tuple	Row	Record
Attribute	Column	Field

Relational DBMS - 5

Basic Operations in a Relational Database:

- **Select:** Creates subset of rows that meet specific criteria

Original table

P_CODE	P_DESCRIPT	PRICE
123456	Flashlight	5.26
123457	Lamp	25.15
123458	Box Fan	10.99
213345	9v battery	1.92
254467	100W bulb	1.47
311452	Powerdrill	34.99

SELECT ALL will yield → New table or list

P_CODE	P_DESCRIPT	PRICE
123456	Flashlight	5.26
123457	Lamp	25.15
123458	Box Fan	10.99
213345	9v battery	1.92
254467	100W bulb	1.47
311452	Powerdrill	34.99

SELECT only PRICE less than 2.00 will yield →

P_CODE	P_DESCRIPT	PRICE
213345	9v battery	1.92
254467	100W bulb	1.47

SELECT only P_CODE=311452 will yield →

P_CODE	P_DESCRIPT	PRICE
311452	Powerdrill	34.99

Relational DBMS - 6

- **Project:** Yields all values for selected attributes – vertical subset of a table.

Original table

P_CODE	P_DESCRIPT	PRICE
123456	Flashlight	5.26
123457	Lamp	25.15
123458	Box Fan	10.99
213345	9v battery	1.92
254467	100W bulb	1.47
311452	Powerdrill	34.99

PROJECT PRICE yields → New table or list

PRICE
5.26
25.15
10.99
1.92
1.47
34.99

PROJECT P_DESCRIPT and PRICE yields →

P_DESCRIPT	PRICE
Flashlight	5.26
Lamp	25.15
Box Fan	10.99
9v battery	1.92
100W bulb	1.47
Powerdrill	34.99

PROJECT P_CODE and PRICE yields →

P_CODE	PRICE
123456	5.26
123457	25.15
123458	10.99
213345	1.92
254467	1.47
311452	34.99

Relational DBMS - 7

- **Join:** Enables users to create a new table containing only relevant information from **more than one table**.

Table name: CUSTOMER

CUS_CODE	CUS_LNAME	CUS_ZIP	AGENT_CODE
1132445	Walker	32145	231
1217782	Adares	32145	125
1312243	Rakowski	34129	167
1321242	Rodriguez	37134	125
1542311	Smithson	37134	421
1657399	Vanloo	32145	231

Table name: AGENT

AGENT_CODE	AGENT_PHONE
125	6152439887
167	6153426778
231	6152431124
333	9041234445

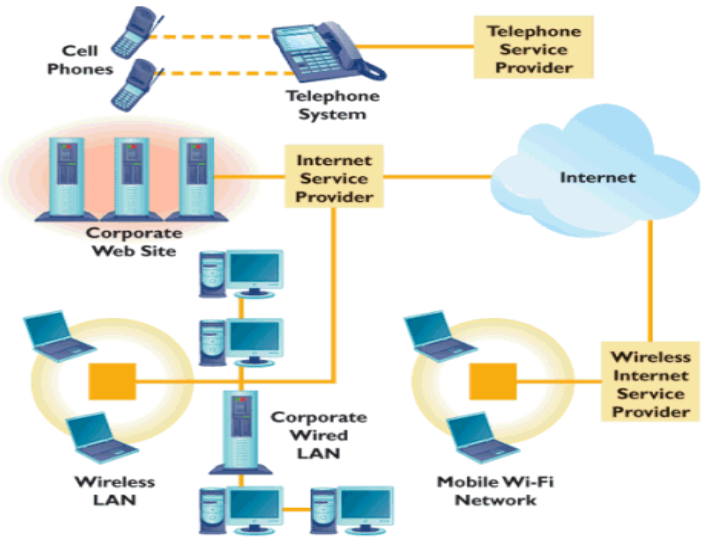
CUS_CODE	CUS_LNAME	CUS_ZIP	AGENT_CODE	AGENT_PHONE
1217782	Adares	32145	125	6152439887
1321242	Rodriguez	37134	125	6152439887
1312243	Rakowski	34129	167	6153426778
1132445	Walker	32145	231	6152431124
1657399	Vanloo	32145	231	6152431124

4. Business Telecommunications System

Telecommunications System

- Facilitation of electronic communication
- Telephone systems
- Broadcast and cable TV
- Radio, satellite, and local area networks
- Internet
- Analog or digital

Corporate Telecommunications System



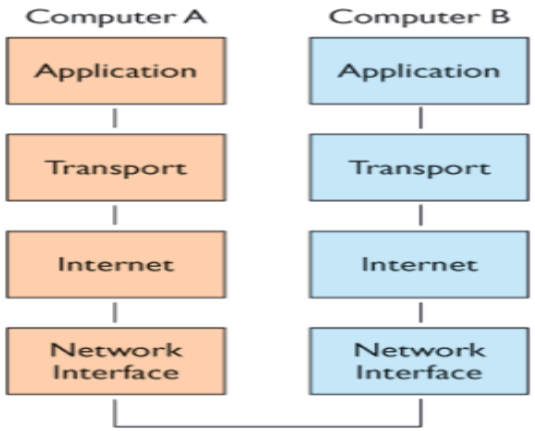
Features of Contemporary Telecommunications Systems - 1

Transmission Control Protocol/Internet Protocol (TCP/IP)

- Open suite of protocols for connectivity developed in 1970s
- Provides standards for breaking messages into packets, routing them to destination addresses, and reassembling them at end
- Allows for communication regardless of hardware/software

Features of Contemporary Telecommunications Systems - 2

TCP/IP: Four-Layer Reference Model



Features of Contemporary Telecommunications Systems – 3

TCP/IP: Four-Layer Reference Model

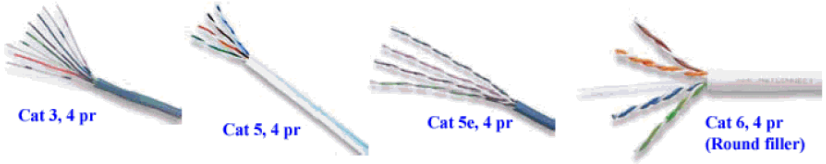
- **Application layer**: Communication between applications and other layers
- **Transport layer**: Acknowledging and sequencing packets to/from application
- **Internet layer**: Addressing, routing, packaging data packets
- **Network interface layer:** Placing packets on and receiving them from network medium

Features of Contemporary Telecommunications Systems – 4

Transmission Media - 1

Twisted wire

- Copper wire twisted in pairs
- Older analog transmission medium
- Can be used for digital signals
- Modems used for translating analog to digital

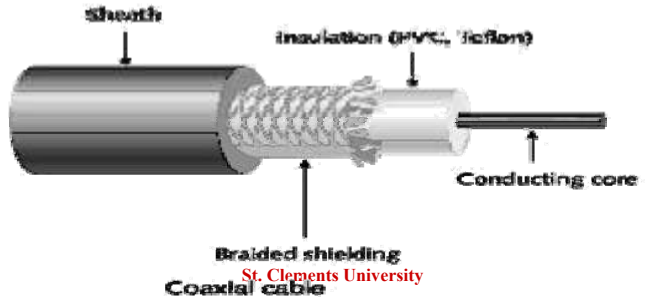


Features of Contemporary Telecommunications Systems – 5

Transmission Media - 2

Coaxial cable:

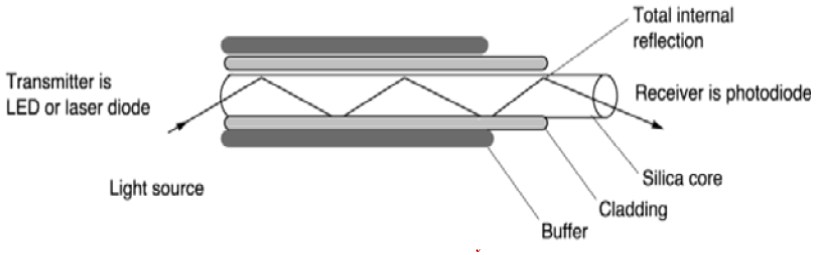
- Insulated copper wire
- Faster, more interference-free than twisted pair
- Difficult to install



Features of Contemporary Telecommunications Systems – 6

Transmission Media – 3

- **Fiber optics**
  - Transmission of data as light pulses through optical fiber
  - First converting electronic binary signals to light, and then convert the light signals back to electronic signals at the receiving end.
  - Faster, lighter, more durable



Features of Contemporary Telecommunications Systems – 7

Transmission Media – 4

- Fiber-optic technology has revolutionized telecommunications due to the very high speed of data transmission it can support.
- 0.1kg of optical fiber carries the same information as 30,000kg of copper cable
- At 2.5 Gbps, it is
  - equivalent to more than 3 hrs of TV per second
  - 24,000 simultaneous phone calls

Features of Contemporary Telecommunications Systems – 8

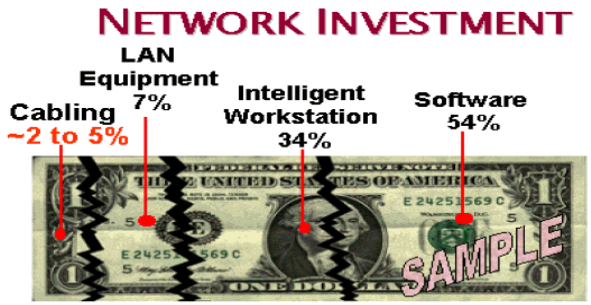
Transmission Media - 5

CABLING LIFE CYCLE

Features of Contemporary Telecommunications Systems – 9

Transmission Media – 6

- Although cabling represents only 2 to 5% of the total network investment, the cabling systems will outlive most network components.



Features of Contemporary Telecommunications Systems – 10

Transmission Media – 7

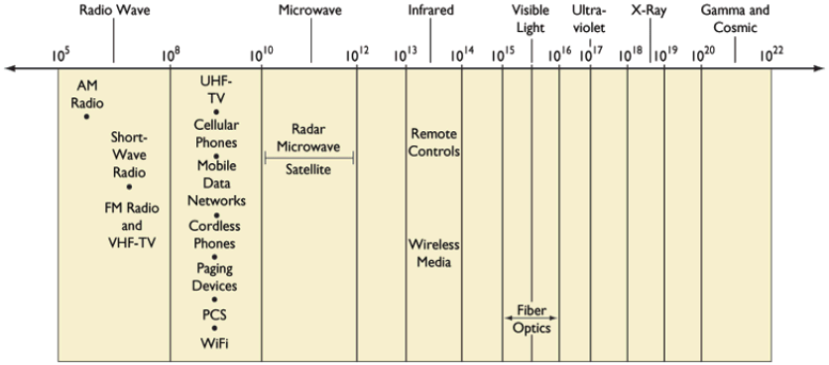
Wireless Transmission

- Use electromagnetic spectrum
- Microwave and infrared use high-frequency radio signals
- Paging systems, cellular telephones, PDAs, mobile data networks
- Wireless communication requires compatible standards
- Security/privacy issues

Features of Contemporary Telecommunications Systems – 11

Transmission Media – 8

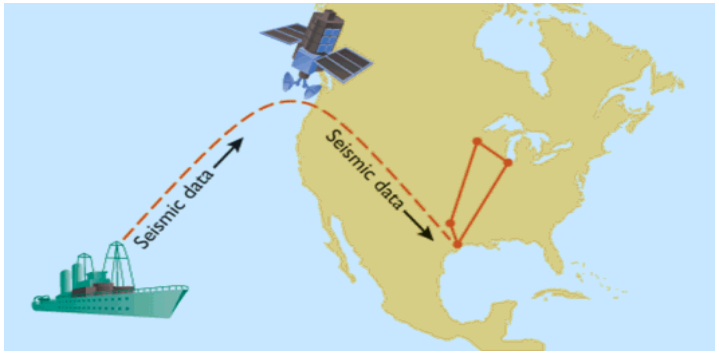
Frequency ranges for communication media and devices



Features of Contemporary Telecommunications Systems – 12

Transmission Media – 9

- **Satellite transmission system**



Features of Contemporary Telecommunications Systems – 13

Transmission Media – 10

- **Transmission Speed Comparison**

Twisted wire	Up to 1G+ Mbps
Microwave	Up to 200+ Mbps
Satellite	Up to 200+ Mbps
Coaxial cable	Up to 200 Mbps
Fiber-optic cable	Up to 6+ Tbps

5. Communications Networks

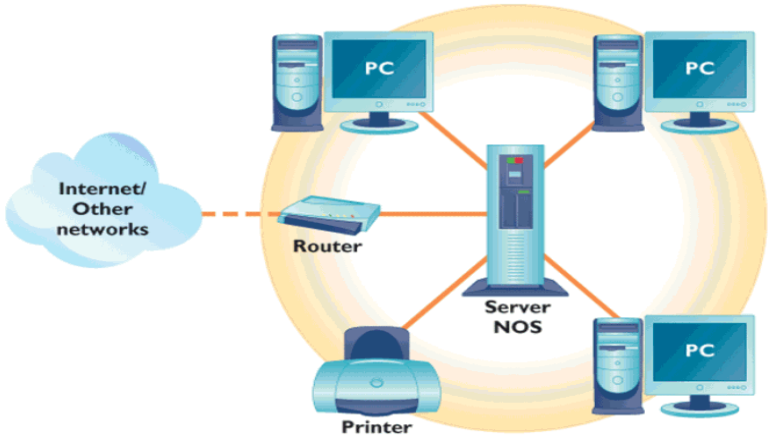
Communications Networks - 1

Local Area Networks (LAN) - 1

- A LAN is a data communication system allowing a number of independent devices to communicate directly with each other,
  - within a moderately sized geographic area,
  - and over a physical communications channel of moderate data rates.
- To implement a LAN, we need to use cabling or wireless technology to link up computers and networking devices, and the required software such as a Network Operating System (NOS).

Communications Networks - 2

Local Area Networks (LAN) - 2



Communications Networks - 3

Local Area Networks (LAN) – 3

- In a client/server arrangement, network services are located on a dedicated computer called a server. The server responds to the requests of clients for, print, application and other services.

Merits:

- The network is scalable.
- Enhanced security, ease of access, and control.

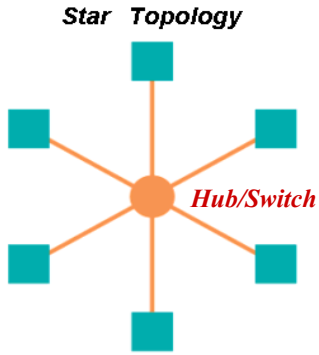
Demerits:

- Introduce a single point of failure in the network.
- More expensive, require specialized hardware and software.
- Require a trained, expert staff member to administer and maintain.

Communications Networks - 4

Local Area Networks (LAN) – 4

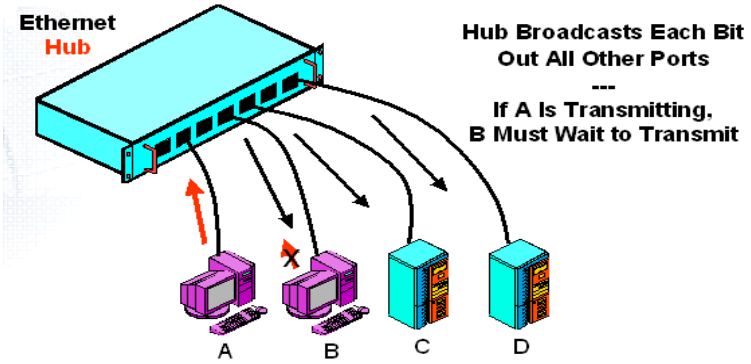
- Ethernet is by far the most common
- Star topology using Ethernet **hubs** and/or **switches**
- Use UTP cabling
- Relatively cheap, easy to install and manage
- Ethernet standards make use of latest developments in network technology



Communications Networks - 5

Local Area Networks (LAN) – 5

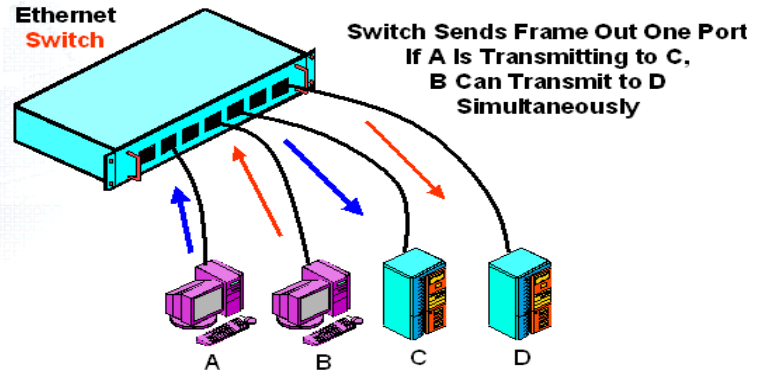
Hub Versus Switch Operation



Communications Networks - 6

Local Area Networks (LAN) – 6

Hub Versus Switch Operation



Communications Networks - 7

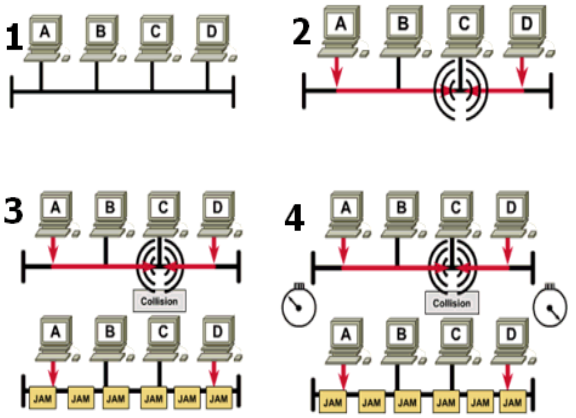
Local Area Networks (LAN) – 7

Hub Versus Switch Operation

- **Hubs Need Media Access Control**
  - This limits when a station may transmit
  - Ethernet hubs use CSMA/CD
- **Carrier Sense Multiple Access (CSMA)**
  - Only transmit if no other station is transmitting
  - Otherwise, wait
- **Collision Detection (CD)**
  - If two NICs transmit at the same time, this is a collision
  - Both will stop, wait a random amount of time, and then go back to CSMA to send again

Communications Networks - 8

Local Area Networks (LAN) – 8



CSMA/CD

1. Listen then transmit
2. Collision occurs
3. Broadcast jam signal
4. Devices back off appropriate amount of time, goes back to listen then transmit and then retransmit

Communications Networks - 9

Local Area Networks (LAN) – 9

UTP dominates the Ethernet access line market

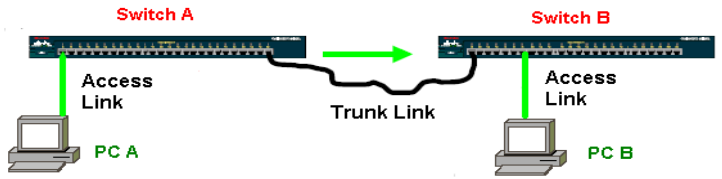
Physical Layer Standard	Speed	Maximum Run Length	Medium Required
10BASE-T	10 Mbps	100 meters	4-pair Category 3 or higher
100BASE-TX	100 Mbps	100 meters	4-pair Category 5 or higher
1000BASE-T (Gigabit Ethernet)	1,000 Mbps	100 meters	4-pair Category 5 or higher

Physical Layer Standard	Speed	Maximum Run Length	Medium 850 nm light (inexpensive) Multimode fiber	
1000BASE-SX	1 Gbps	220 m	62.5 microns	160 MHz-km

Communications Networks - 10

Local Area Networks (LAN) – 10

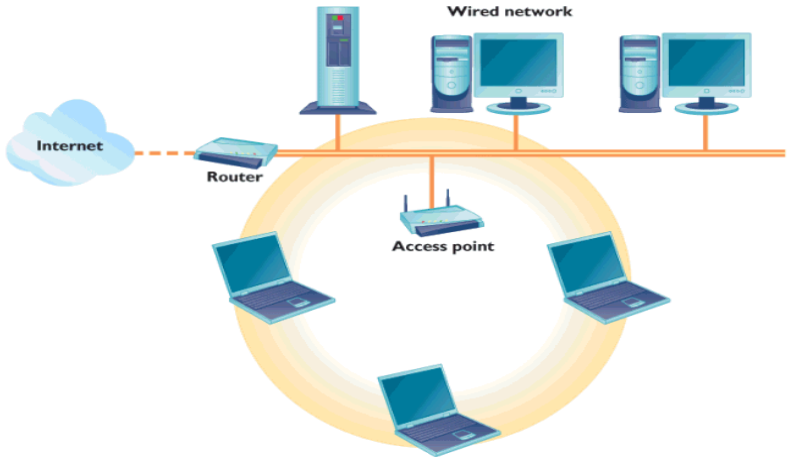
- **Access links** to client stations today are dominated by 100BASE-TX
  - But 1000BASE-T usage is growing
- **Trunk links** today are dominated by 1000BASE-SX
  - Sufficient for most LAN trunk line distances and speeds
  - Short trunk links, however, use UTP
  - Longer and faster trunk links use other fiber standards



Communications Networks - 11

Local Area Networks (LAN) – 11

An 802.11 Wireless LAN



Communications Networks - 12

Local Area Networks (LAN) – 12

Wireless LAN Benefits

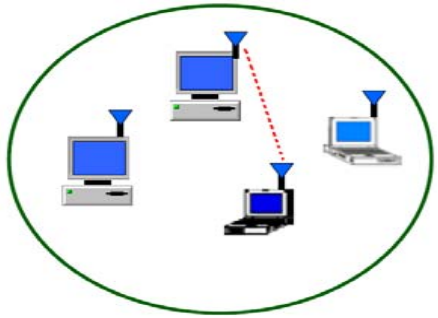
- **Removes wiring challenges**
  - Limited connections to users
  - Perfect for facilities where cost of wiring is prohibitive or impossible
- **Able to redeploy with minimal expense**
  - Low Installation Cost
  - Fast installation, Less Influence
  - Connect permanent or temporary campus buildings quickly and easily
- **Large coverage, High Performance**

Communications Networks - 13

Local Area Networks (LAN) – 13

Wireless LAN

- **Ad-hoc mode**: Peer-to-peer mode; wireless devices communicate with each other directly.
- It involves at least 2 stations
- No backbone infrastructure
- Suitable for small area

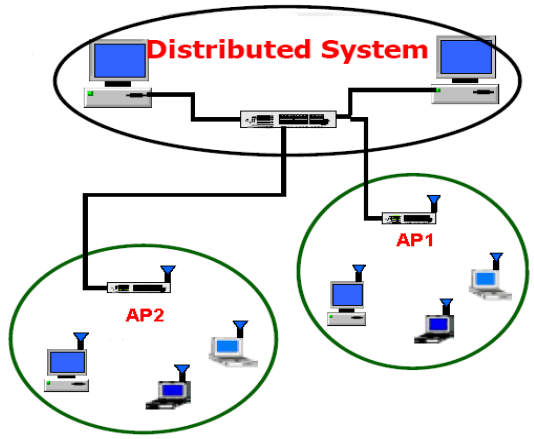


Communications Networks - 14

Local Area Networks (LAN) – 14

Wireless LAN

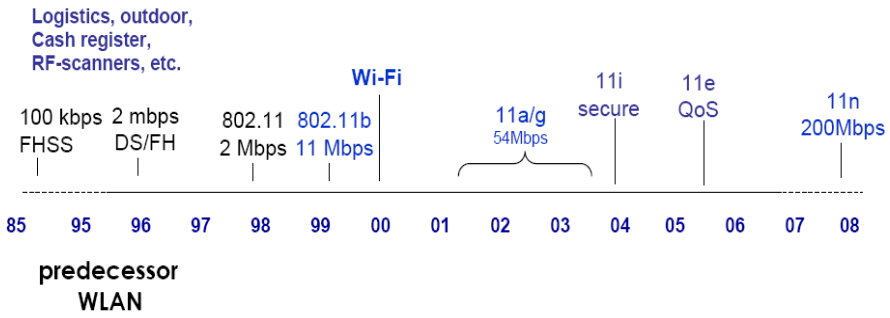
- **Infrastructure mode:**
- Wireless devices communicate with wired LAN via ***access points*** (APs).



Communications Networks - 15

Local Area Networks (LAN) – 15

- **WLAN-standards**



Communications Networks - 16

Local Area Networks (LAN) – 16

- **Wireless LAN Standard**

Standard	802.11b	802.11a	802.11g
Frequency Band	2.4 GHz	5 GHz	2.4GHz
Data rate	11 Mbps	54 Mbps	54 Mbps

- **Hot spot:** Geographic location in which an access point provides public Wi-Fi network service.
  - Eg. Free PCCW Wi-Fi service in the HK International Airport

Communications Networks - 17

Local Area Networks (LAN) – 17

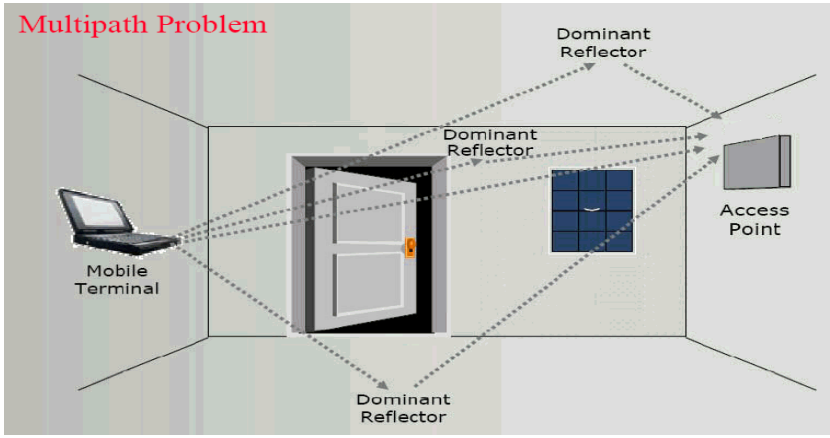
What is 802.11n?

- New IEEE Standard under development
- Uses MIMO radio technology as a basis
- End result will be more "wire-like" performance
- Anywhere from 100Mbps to 600Mbps depending on implementation
- First standard to support both 2.4 GHz and 5 GHz

Communications Networks - 18

Local Area Networks (LAN) – 18

Multi Path Reflections

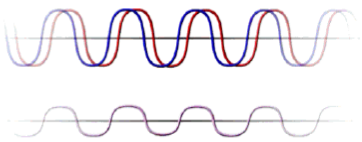


Communications Networks - 19

Local Area Networks (LAN) – 19

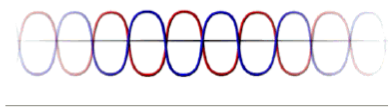
Multi Path Reflections

Original signal + reflections arrive at the receiver and are "added", resulting in a distorted reconstructed signal



Null Waves : Original signal and reflected signals are 180 degrees out of phase, cancelling each other out.

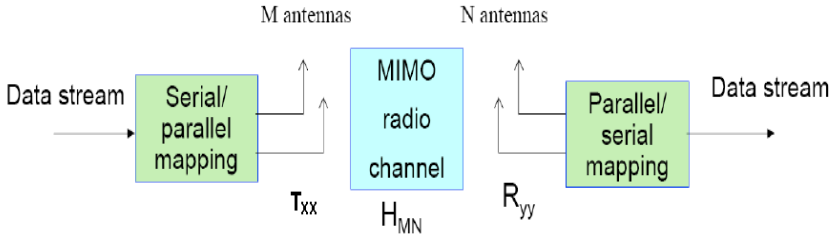
Causing drop outs.



Communications Networks - 20

Local Area Networks (LAN) – 20

- MIMO (Multiple Input / Multiple Output)
- Sending signals on multiple Tx antennas
- Receiving signals on multiple Rx antennas



Communications Networks - 21

Local Area Networks (LAN) – 21

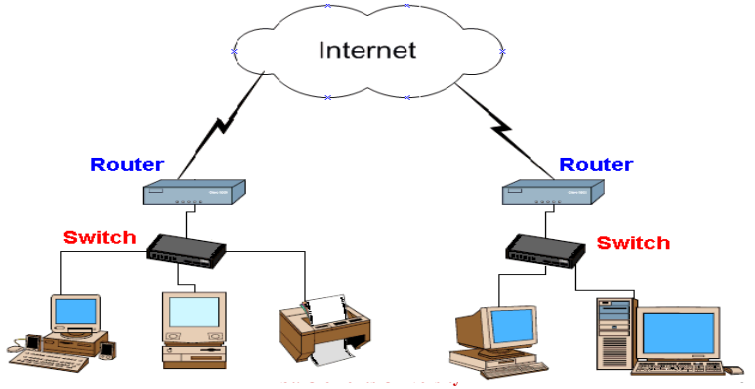
Bluetooth

- Standard for wireless personal area networks that can transmit up to 722 Kbps within 10-meter area
- It is a wireless LAN technology designed to connect devices of different functions such as telephones, notebooks, computers (desktop and laptop), cameras, printers and so on.
- A Bluetooth LAN is an ad-hoc network.
- The Bluetooth technology is the implementation of a a protocol defined by the **IEEE 802.15** standard.
  - The standard defines a wireless personal-area network (PAN) operable in an area the size of a room or a hall.

Communications Networks - 22

Local Area Networks (LAN) – 22

- **Routers** provides access to company networks on other sites, and to the Internet.



Communications Networks - 23

Wide Area Networks - 1

- A WAN is a single networks that connect different sites
- WANs and the Telephone
  - WAN technology usually uses the Public Switched Telephone Network transport system for transmission
  - Adds data switching and management
- WAN Purposes
  - Internet access
  - Link sites within the same corporation
  - Provide remote access to individuals who are off site

Communications Networks - 24

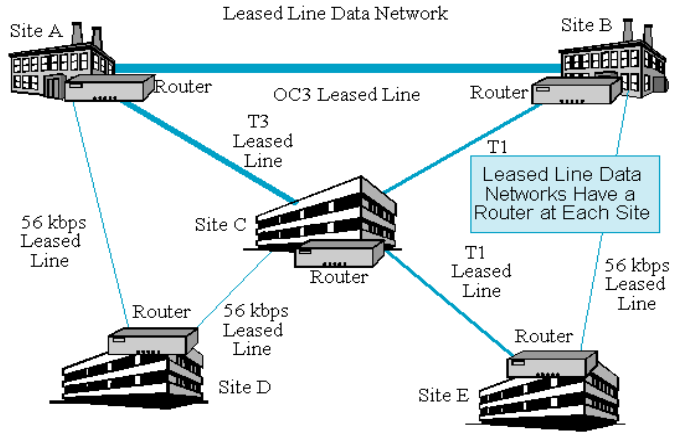
Wide Area Networks – 2

- WANs are characterized by **high cost** and **low speeds**.
- High cost per bit transmitted compared to LANs.
- Consequently, lower speeds (most commonly 128 kbps to a few megabits per second)
- This speed usually is aggregate throughput shared by many users
- Much slower than LAN speeds (100 Mbps to 1 Gbps to the desktop)

Communications Networks - 25

Wide Area Networks – 3

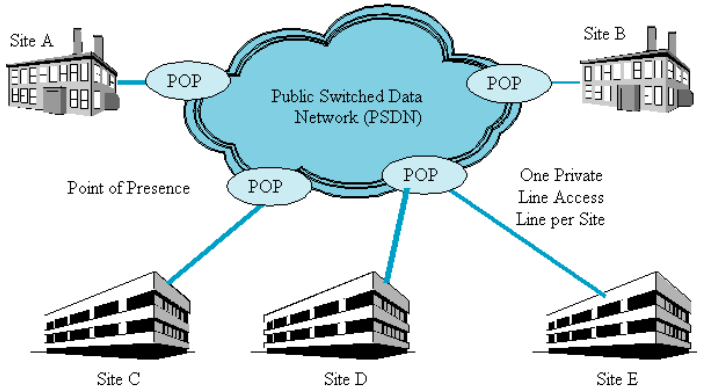
Leased Line Data Networks



Communications Networks - 26

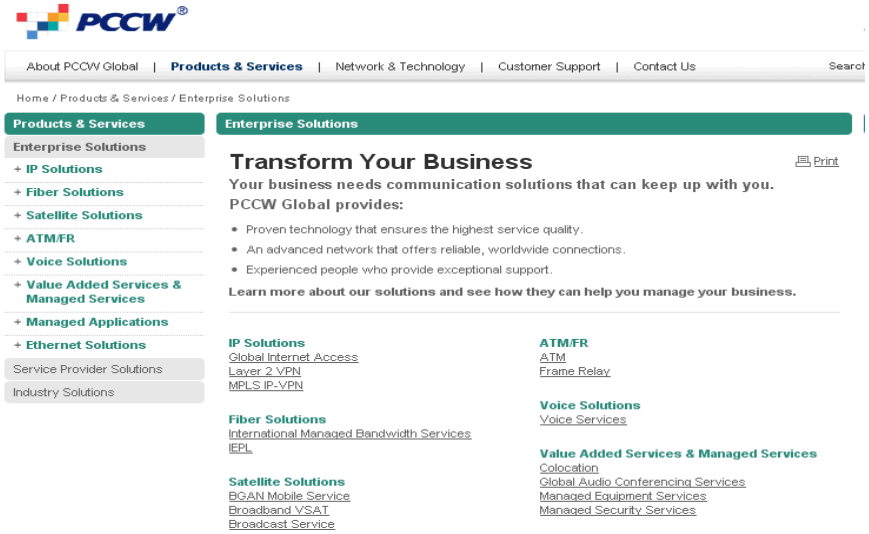
Wide Area Networks – 4

WAN using Public Switched Data Networks



Communications Networks - 27

Wide Area Networks – 5



6. The Internet

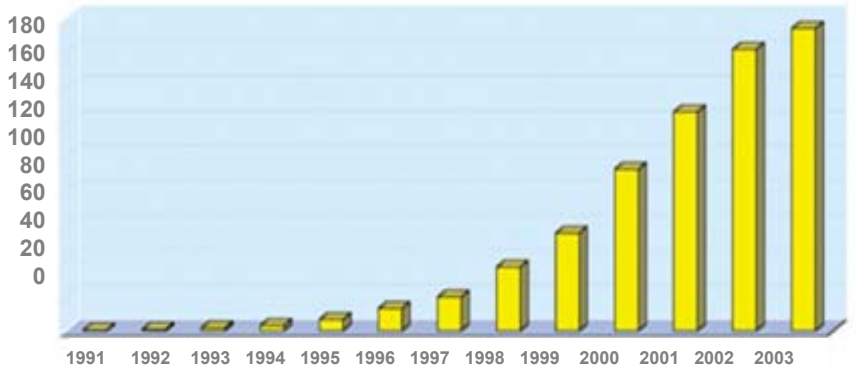
The Internet Revolution

The Internet

- Developed in the early 1960s by the U.S. Department of Defense (DOD) as a need of national security.
- Now grows to an international network of networks
  - Universal technology platform: Any computer can communicate with any other computer
  - Since the introduction of World Wide Web and Web sites, the population in the Internet has grown exponentially.

Growth of the Internet

- ARPANET grew from 4 computers in 1969 to over 300,000 by 1990.



Source: Internet Software Consortium (http://www.isc.org/)

Open Architecture Philosophy

Four key points:

- Independent networks should not require any internal changes to be connected to the Internet.
- Packets that do not arrive at their destinations must be retransmitted from their source network.
- The router computers do not retain information about the packets they handle.
- No global control will exist over the network.

Intranet and Extranet

Intranet

- LANs or WANs that use TCP/IP protocol but do not connect to sites outside the firm.

Extranet

- An intranet that allows selected outside parties to connect.

Communicate and collaborate

- Access information
- Participate in discussions
- Supply information
- Exchange business transactions

Commercialization of the Internet

- Businesses quickly recognized profit-making potential offered by a world-wide network of easy-to-use computers.
- **Web page**
  - An HTML document
- **Web site**
  - A collection of linked Web pages with a common theme
- **Web Browser**
  - Software that lets users read HTML documents and move from one HTML document to another through hypertext link tags in each file.

Hypertext and Links - 1

Hypertext Markup Language (HTML)

- A standard language used on the Web
- HTML uses codes (tags) to tell the Web browser software how to display text.

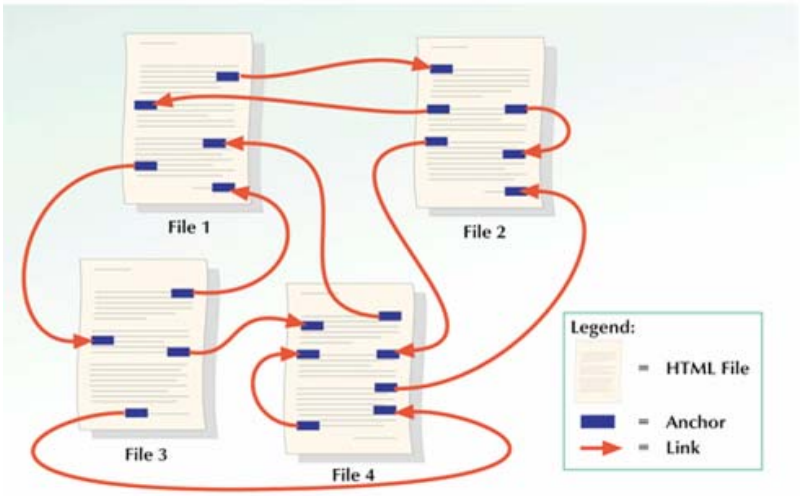
HTML anchor tag

- Enables Web designers to link HTML documents to each other

Hypertext Links

- A link which points to another location in the same or another HTML document

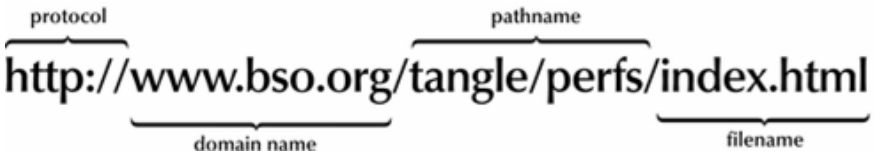
Hypertext and Links - 2



Uniform Resource Locators

Four-part addressing scheme that tells the Web browser:

- Transfer protocol to use when transporting the file
- Domain name of computer on which file resides
- Pathname of folder or directory on computer on which file resides
- Name of the file



Main Elements of Web Browsers

- **Title Bar, Scroll Bars, Status Bar, Menu Bar, Page Tab, Home Button**

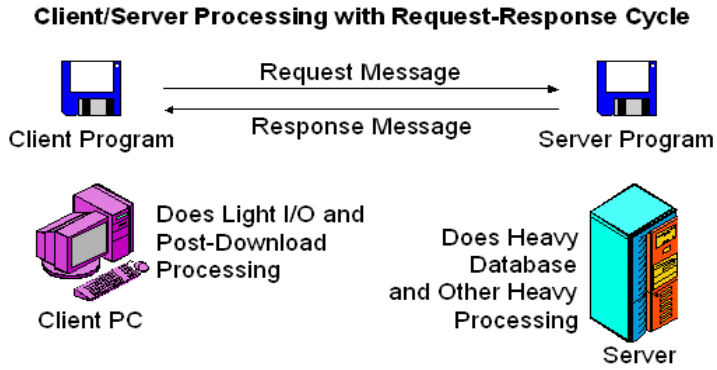
Web Search Engines

- Web pages that conduct searches of the Web to find words or expressions you enter.

7. Networked Applications

Application Architectures - 1

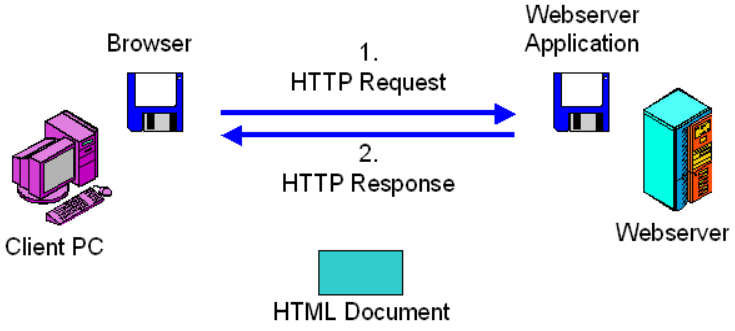
Client/Server Computing



Highly scalable: Use larger server as number of clients increases

Application Architectures - 2

Web Page Browsing



E-Mail - 1

What is E-Mail?

- E-mail (electronic mail) is the exchange of computer-stored messages by telecommunication.

Mail Server

- A hardware and software system that determines from the recipient's address one of several routes on which to send the message.

Mail Client Software or E-Mail Program

- A software that requests mail delivery from the mail server to your PC.

Email Address

- An address that uniquely identifies an individual or organization that is connected to the Internet.
- **mis.st.clements@gmail.com**

E-Mail - 2

Protocols that make email works

- **SMTP (Simple Mail Transfer Protocol)**
  - It decides which paths an e-mail message takes on the Internet.
- **POP (Post Office Protocol)**
  - It handles incoming messages.
- **IMAP (Internet Message Access Protocol)**
  - A protocol for retrieving mail messages from a server.
- **MIME (Multipurpose Internet Mail Extensions)**
  - A protocol that specifies how to encode non-text data, such as graphics and sound, so it can travel over the Internet.

E-Mail - 3

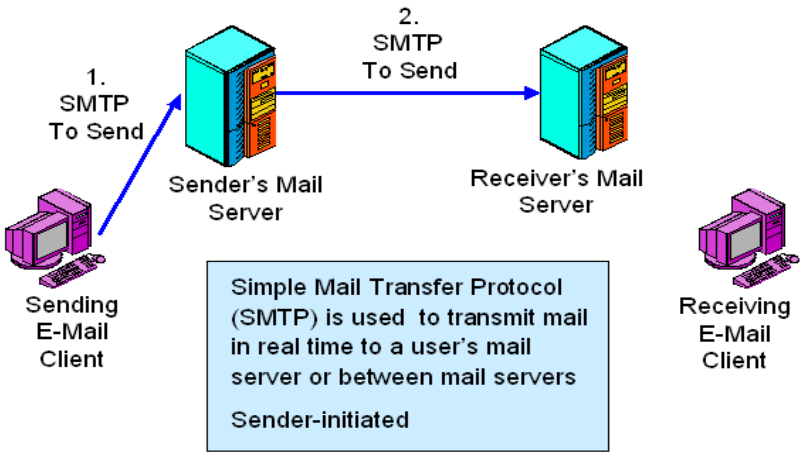
Importance of E-Mail

- Universal service on the Internet
- Attachments make e-mail a general file delivery mechanism!

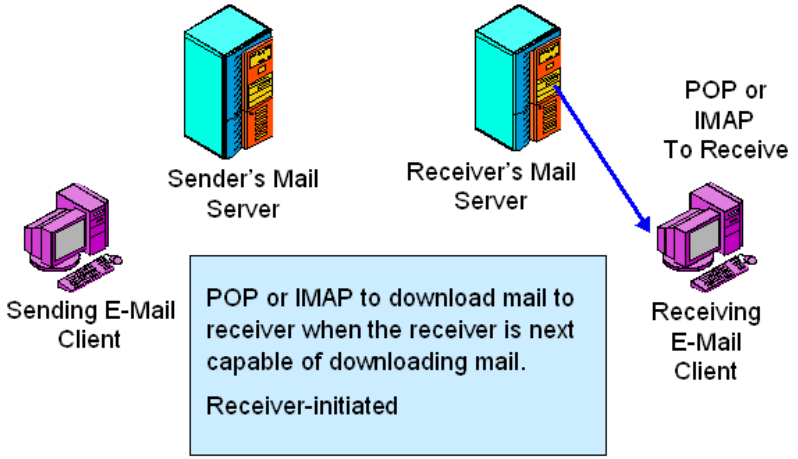
Mail Standards

- Message body standards
- Receiver must understand sender's message
  - RFC 822 and RFC 2822 for all-text bodies
  - HTML bodies with fancy text and graphics
  - UNICODE for non-English language characters

E-Mail - 4



E-Mail - 5



E-Mail – 6

The “evils” come with email:

- Messages with inappropriate content.
  - Racial or sexual harassment
  - Threats
- Spam, adware, spyware, and other abuses.
- Viruses, Worms, and Trojan Horses are often delivered by e-mail attachments!

E-Mail - 7

Viruses, Worms, and Trojan Horses

- Use of antivirus software is a must.
- Where to Do Scanning?
  - On client PCs
    - But users often turn off their software,
    - Fail to download virus definitions regularly
    - Or let their contracts lapse
  - On the corporate mail server or application firewall
    - Users cannot turn off

E-Mail - 8

- **Spam** are unsolicited commercial e-mail
- Why they are harmful?
  - Time consumed by users deleting them
  - Bandwidth and storage consumed
  - Legitimate messages lost because overlooked
- Separating SPAM from legitimate e-mail is difficult
  - Many spam messages get through to users
  - Some legitimate messages are deleted
  - Some firms merely mark messages as probable spam

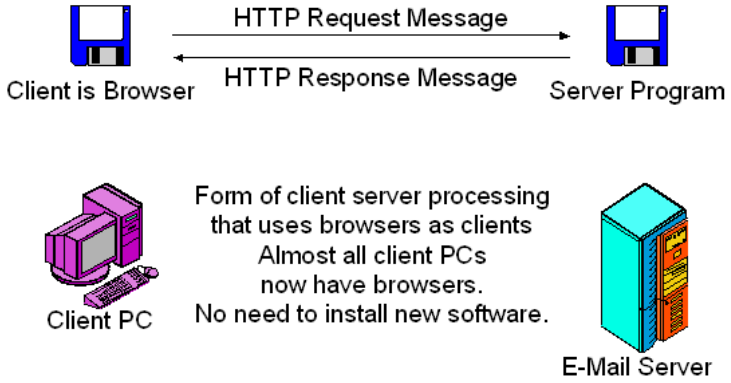
E-Mail - 9

Web-Based E-Mail Services - 1

- Many Internet Web sites provide free e-mail addresses and accounts for **registered users**.
- They may be used with any Web browser.
- Examples: Gmail, Yahoo! Mail, Hotmail etc.

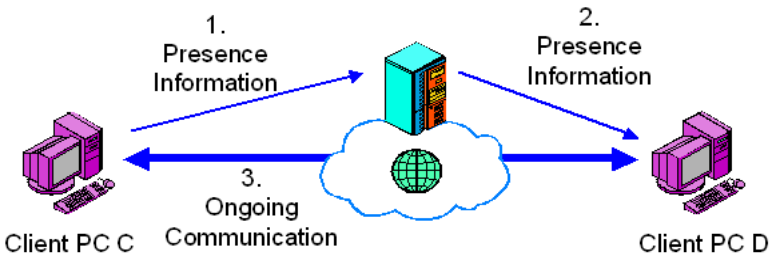
E-Mail - 10

Web-Based E-Mail Services - 2



Instant Messaging Servers - 1

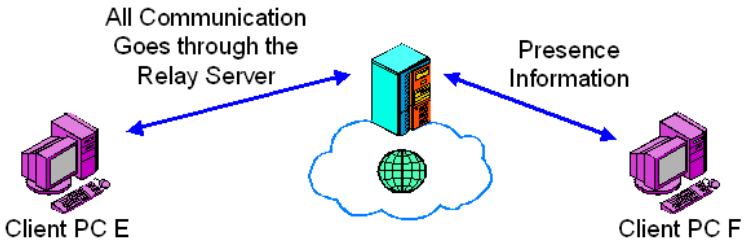
Use of a Presence Server



Clients register with presence servers.
Presence servers notify other clients as appropriate.
Clients use this information to communicate directly.

Instant Messaging Servers - 2

Use of a Relay Server



Relay servers route all IM messages.
This permits security filtering and other services.
It limits privacy because the relay server sees everything.

8. Contemporary Mobile Services

Mobile Enterprise

- "Today, penetration within organizations that use mobile applications is strong — on average, 22% of the workforce uses mobile applications."
  - *Forrester's March 15, 2006 Topic Overview "Enterprise Mobility"*
- Mobile Enterprise
  - "The ***ability for an enterprise to connect*** and control suppliers, partners, employees, assets, products, and customers ***from any location***."
    - *Forrester's March 15, 2006 Topic Overview "Enterprise Mobility"*

What's Driving Enterprises to Go Mobile?

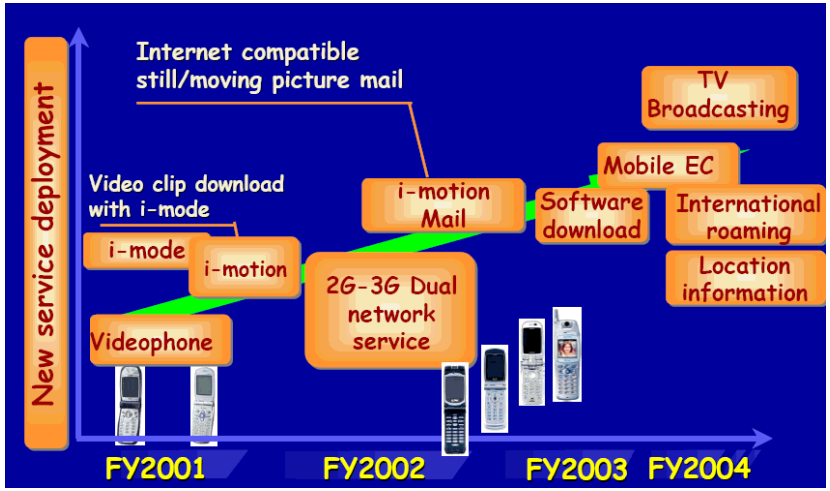
- Increased competitive pressure as others start adopting mobile technology.
- Overall increased speed of business.
- Executives who have experienced mobility through a wireless email device, such as a *BlackBerry*, are now influencing departments to embrace mobility.

Broadband Wireless Networks…
Versatile Devices…
Faster Processors….

Generations of Mobile Networks

- 1G: basic mobile telephony
- 2G: mobile telephony for mass users
  - regional roaming
- 2.5G: mobile internet services
- 3G:
  - global roaming
  - enhanced mobile Internet services

3G Services – To explore the non-voice Applications



HSDPA - 1

- High-Speed Downlink Packet Access (HSDPA) is a 3G mobile telephony communications protocol.
- It support services requiring instantaneous high data rates in the downlink, e.g. Internet browsing, video on demand, office application.
- Peak data rates 3-4 times higher than current 3G.
- Current HSDPA deployments support down-link speeds of 1.8, 3.6, 7.2 and 14.4 Mbit/s.
- New terminals are required to take advantage of HSDPA.

HSDPA - 2

SPEED		Higher bit rates: up to 14 Mbps peak rate
CAPACITY		2 – 3 times improved system capacity
REDUCED DELAY		Quicker response time with interactive services
STANDARDIZED		Integral part of WCDMA (3GPP Rel.5)
Network Coverage		Short time to market with existing sites

Public Wi-Fi Service - 1

- 全民免費試用 PCCW Wi-Fi 寬頻 30 天
- 由即日起，全港市民只需使用備有 Wi-Fi 接駁功能的手提電子產品，如手提電腦、流動電話機、電子手賬電話機或 iPod Touch 等，在遍佈全港的任何一個 PCCW Wi-Fi 熱點進行上網簡單登記，便可以在其後的 30 天內無限量免費試用 PCCW Wi-Fi寬頻服務，體驗極速、穩定、安全的無線上網樂趣。
- 電訊盈科在提供無線傳輸方面領先同儕，在全港敷設超過4,000個Wi-Fi熱點，致力將香港發展成爲「Wi-Fi城市」。

Public Wi-Fi Service - 2

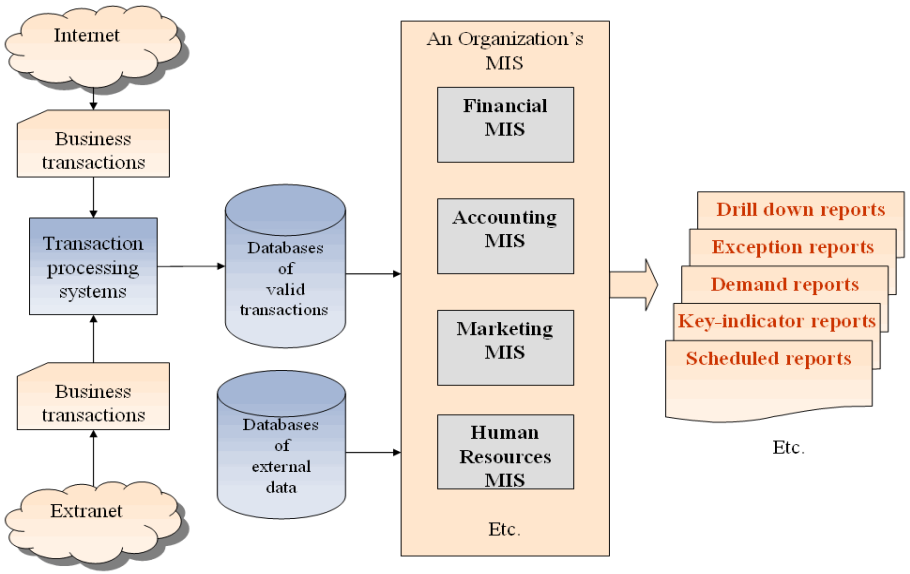
- 每日港幣 18 元使用費，即可全日無限量使用 HSDPA、3G 本地資料傳輸。

9. MIS Examples

Management information system (MIS) - 1

- An MIS provides managers with **information** and **support** for effective decision making, and provides feedback on daily operations.
- Output, or reports, are usually generated through accumulation of transaction processing data.
- MIS is an integrated collection of functional information systems, each supporting particular functional areas.
  - Provides reports based on routine flow of data
  - Assists in general control of the organization

Management information system (MIS) - 2

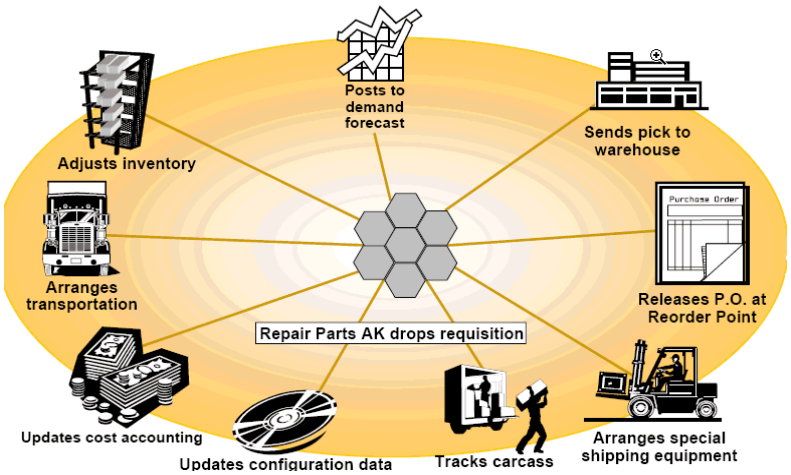


MIS for Competitive Advantage

- Provides support to managers as they work to achieve corporate goals.
- Enables managers to compare results to established company goals and identify problem areas and opportunities for improvement.
- Data may be made available from management information systems on a company's intranet.
- Employees can use browsers and their PC to gain access to the data.

Enterprise Resource Planning - 1

- One System -One Database – One Touch Updates



Enterprise Resource Planning - 2

- An industry term for a broad set of business process solutions supported by commercial available multi-module software.
- Uses an integrated relational database system to help manage the operations of an enterprise, i.e. sales, planning, purchasing, maintenance, inventory control, financials.
- ERP system integrates information and business processes to enable information entered once to be shared throughout the organization.

Enterprise Resource Planning - 3

- **Shares common data and practices across the enterprise**
- **Provides consistent real-time information for decision making and performance measurement.** (Change of data in one part makes the changes in whole system – coordination)
- **Is a key enabler of Business Process Reengineering (BPR), incorporating best practices**
  - Organization and standardization of business processes

10. Management of MIS

MIS Management - 1

- Managing the information systems and technologies that support the modern business processes of companies today is a major challenge for both business and IT managers and professionals.
- Failures in IT management can be reduced by the **involvement of business managers** in IT planning and management.

MIS Management - 2

- Managing the joint development and implementation of business/IT strategies.
  - Led by the CEO and CIO
  - Proposals are developed by business managers and IT professionals for **using IT** to **support the strategic business priorities** of the company.
  - This is to ensure alignment of IT with strategic business goals.

MIS Management - 3

- Managing the development and implementation of new business/IT applications and technologies.
  - This is the primary responsibility of the CIO/CTO.
  - This area of IT management involves managing the processes for information systems development and implementation.
  - It also includes the responsibility for research into the strategic business uses of new information technologies.

MIS Management - 4

- Managing the IT organization and the IT infrastructure.
  - The CIO and IT managers share responsibility for managing the work of IT professionals who are typically organized into a variety of project teams and other organizational subunits.
  - They are responsible for managing the IT infrastructure of hardware, software, databases, telecommunications networks, and other IT resources, which must be acquired, operated, monitored, and maintained.

MIS Management - 5

The business/IT planning process has three major components:

- **Strategy Development** – Developing e-business and e-commerce strategies that support a company's e-business vision, use information technology to create innovative e-business systems that focus on customer and business value.
- **Resource Management** – Developing strategic plans for managing or outsourcing a company's IT resources, including IS personnel, hardware, software, data, and network resources.
- **Technology Architecture** – Making strategic IT choices that reflect an information technology architecture designed to support a company's business/IT initiatives.

MIS Management - 6

Managing Hardware and Software

- **Capacity planning**: Process of predicting when a computer hardware system becomes saturated
- **Scalability:** Ability of a computer, product, or system to expand to serve a larger number of users without breaking down

MIS Management - 7

- Total Cost of Ownership (TCO) of Technology Assets
  - Includes both direct and indirect costs
  - Hardware and software acquisitions account for only 20% of TCO
  - TCO for a PC may run to three times original purchase price
  - Be aware of hidden costs!

END

Management Information System

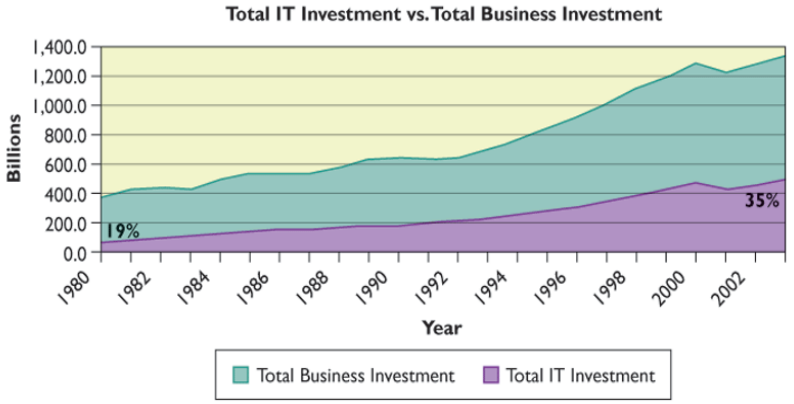
St. Clements University
MBA Program
January, 2009
Hong Kong

Table of Contents

1. The role of information systems

Rise of the Information Economy

The growth of the information economy

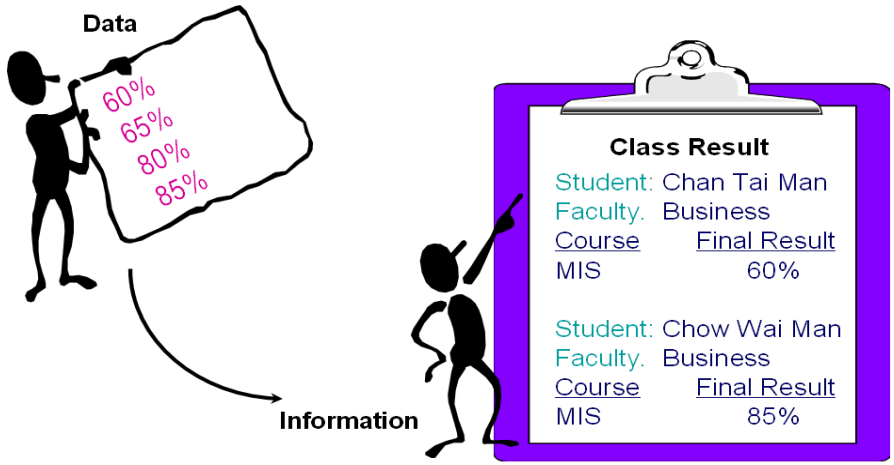


Source: Based on data in U.S. Department of Commerce, Bureau of Economic Analysis, National Income and Product Accounts, Tables 5.2 and 5.8, 2003.

What Is an Information System?

- A set of interrelated components that collect (or retrieve), process, store, and distribute information to support decision making and control in an organization.
- What is the difference between ***information*** and ***data***?
  - **Data:** Streams of raw facts representing events such as business transactions.
  - **Information:** Clusters of data that are meaningful and useful to human beings in the processes such as making decisions.

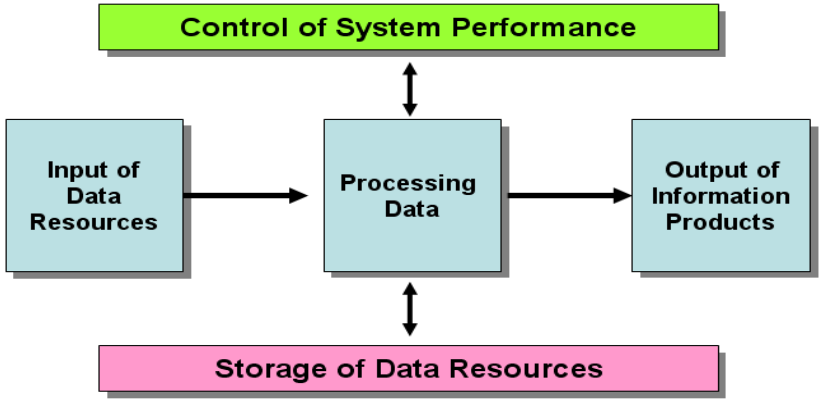
Data and Information



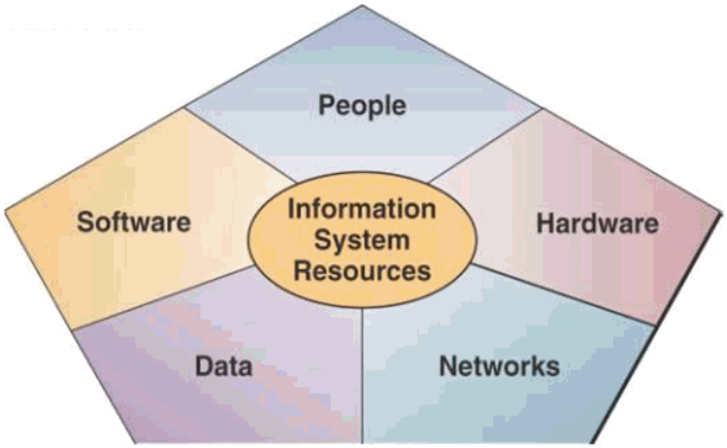
Information Technology (IT) & Information System (IS)

- IT
  - Application of technological knowledge for generating, manipulating & communicating information
  - Refers to technical aspect of an information system
- IS
  - Manual / computer-based
  - Assuming all IS are computer-based in this course
- Use computer hardware and software to process and disseminate information

What is Computer-based Information Systems?



Components of Information Systems



The Challenges of Information Systems: Key Management issues - 1

Positive Impacts of Information Systems

- Faster calculations and paperwork
- Analysis of customer purchase patterns and preferences
- More efficient business services
- Instant global distribution of information

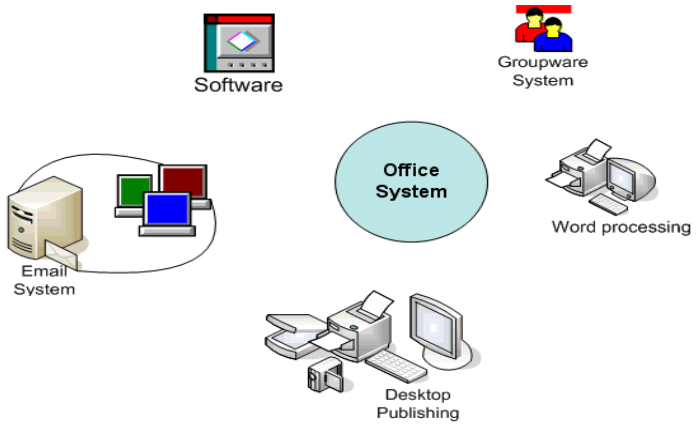
The Challenges of Information Systems: Key Management issues - 2

Negative Impacts of Information Systems

- Automation leading to job elimination
- Privacy concerns
- System outages and shutdowns
- Health problems, repetitive stress injury
- Illegal distribution of intellectual property

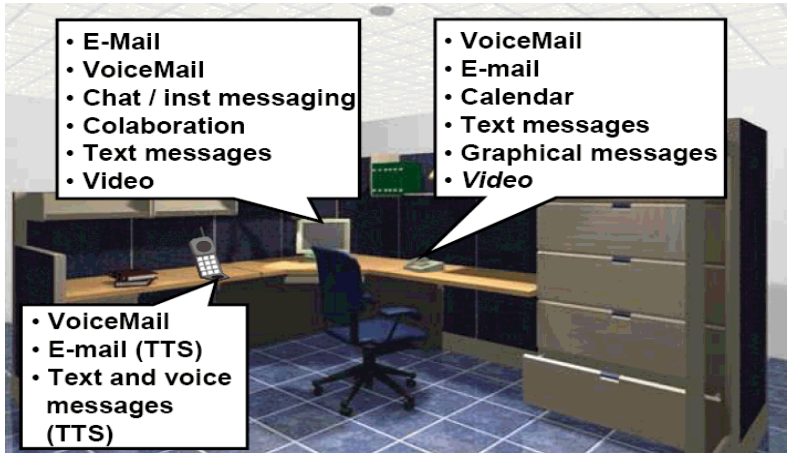
2. Hardware and Software in the Enterprise

Common Compartments in an Office System



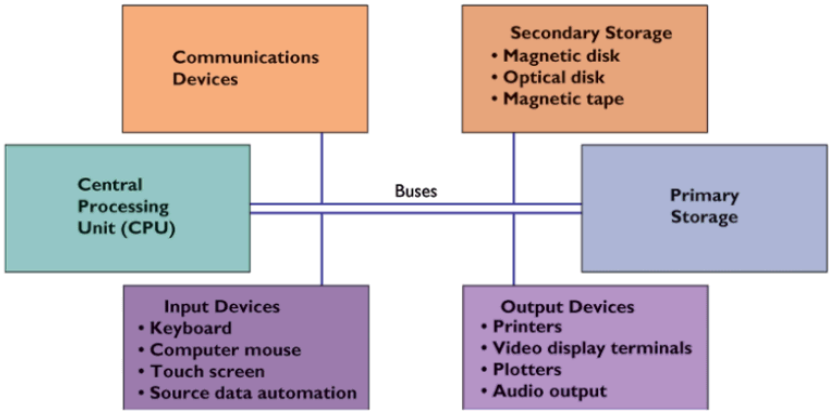
Example of today's work environment

- Three communication devices: PC, desk phone, mobile



Computer Hardware and Information Technology Infrastructure - 1

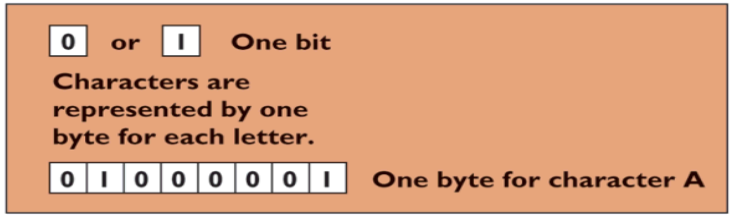
- Hardware components of a computer system



Computer Hardware and Information Technology Infrastructure - 2

The Computer System

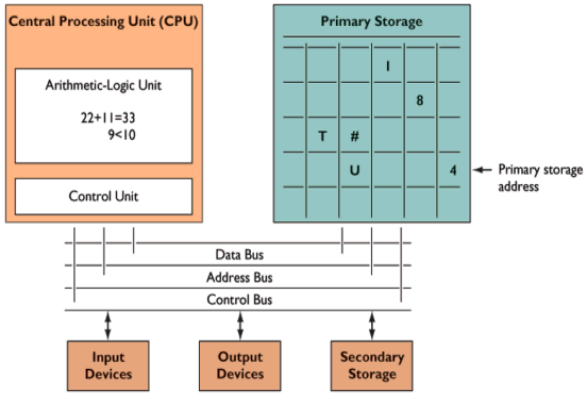
- **Bit**
  - Binary digit
  - Represents 0 or 1
- **Byte**
  - String of eight bits
  - Stores one number, symbol, character, part of picture



Computer Hardware and Information Technology Infrastructure - 3

The Computer System

- **The Central Processing Unit (CPU)**
  - Controls other parts of computer
- **Arithmetic-logic unit**
  - Performs principle logical/mathematical operations
- **Control unit**
  - Coordinates other parts, such as reading a stored program



Computer Hardware and Information Technology Infrastructure - 4

The Computer System

- **Primary Storage**
  - Located near CPU
  - Stores all or part of active software program
  - Stores data the program is using
  - Composed of semi-conductors
  - RAM (random access memory): Used for short-term, temporary storage
  - ROM (read-only memory): Semiconductor memory chips with program instructions

Computer Hardware and Information Technology Infrastructure - 5

The Computer System

- **Secondary Storage Technology**
  - Used for relatively long-term storage of data outside CPU
  - Magnetic disk: floppies, hard disks, RAID
  - Flash memory
  - Optical disk: CD-ROM, CD-RW, DVD
  - Magnetic tape
  - Storage networking: direct-attached storage; network-attached storage; storage area networks

Computer Hardware and Information Technology Infrastructure - 6

Hierarchy of Memory Capacity

- Kilobyte (KB): approximately one thousand bytes.
- Megabyte (MB): approximately one million bytes (1,048,576 bytes, or 1,024 x 1,024).
- Gigabyte (GB): actually 1,073,741,824 bytes (1,024 x 1,024 x 1,024 bytes).
- Terabyte: One trillion bytes, 10^{12} bytes.
- Petabyte: Approximately 10^{15} bytes.
- Exabyte: Approximately 10^{18} bytes.

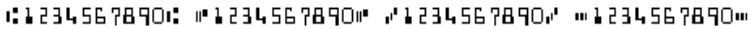
Computer Hardware and Information Technology Infrastructure - 7

A storage area network (SAN)

Computer Hardware and Information Technology Infrastructure - 8

The Computer System

- **Input Devices**
  - Keyboard and mouse
  - Touch screen
  - Optical character recognition
  - Magnetic ink character recognition (MICR)



  - Pen-based input
  - Digital scanner
  - Audio input
  - Radio-frequency identification (RFID)

Computer Hardware and Information Technology Infrastructure - 9

The Computer System

- **Output Devices**
  - Cathode-ray tube (CRT)
  - LCD Panel
  - Printers
  - Audio output

Classifying Computers

- **Mainframe:** Largest computer, largest multi-user systems, handles massive amounts of data; used for large business, scientific, military applications.

- **Workstation:** More powerful desktop computer used for computation-intense tasks. A midrange systems multi-user system.
- **Personal computer**: Portable or desktop microcomputer. A single user system.

Types of Software

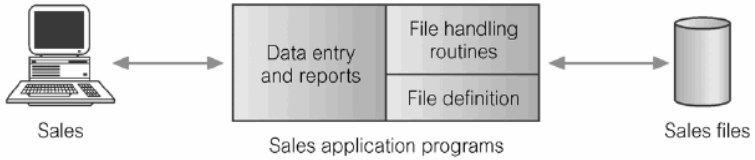
- **Software program:** A series of statements or instructions to the computer
- Two major types of software:
  - **System software**
    - Generalized programs that manage the computer's resources
    - For example, the Windows family of Operating Systems
  - **Application software**
    - Programs written for or by users to perform a specific task.
    - For example, Word,Excel, Powerpoint

3. Database Management Systems

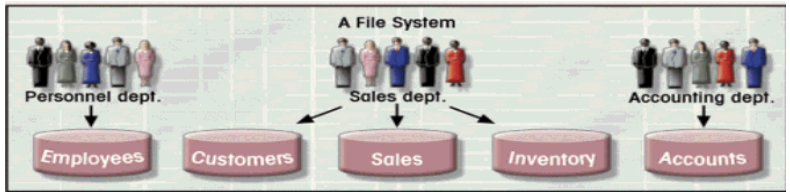
File Systems - 1

Traditional file environment:

- Each application program defines and manages its own data.



- Each program defines and manages its own data.



File Systems - 2

Limitations of File-based Approach:

1. Separation and isolation of data

- Each program maintains its own set of data.
- Users of one program may be unaware of potentially useful data held by other programs.

2. Duplication of data

- Same data is held by different programs.
- Wasted space and potentially different values and/or different formats for the same item.

File Systems - 3

3. **Data dependence**
- File structure is defined in the program code.

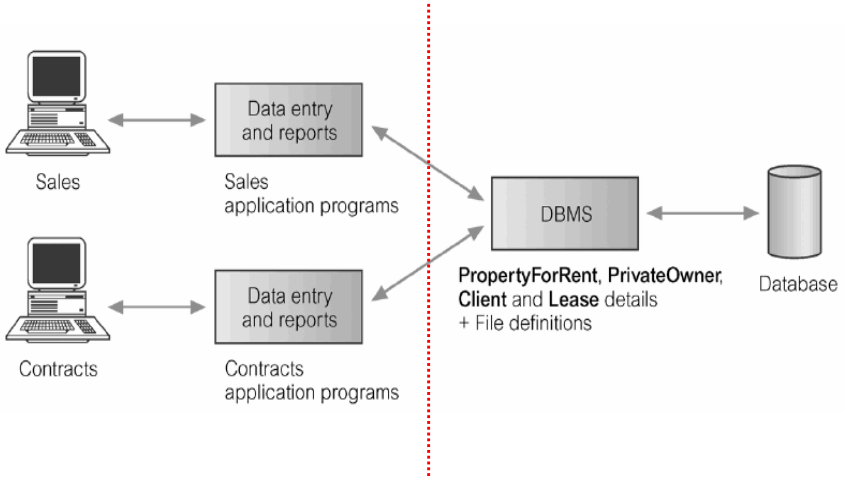
4. **Incompatible file formats**
- Programs are written in different languages, and so cannot easily access each others files.

5. **Fixed Queries/Proliferation of application programs**
- Programs are written to satisfy particular functions.
- Any new requirement needs a new program.

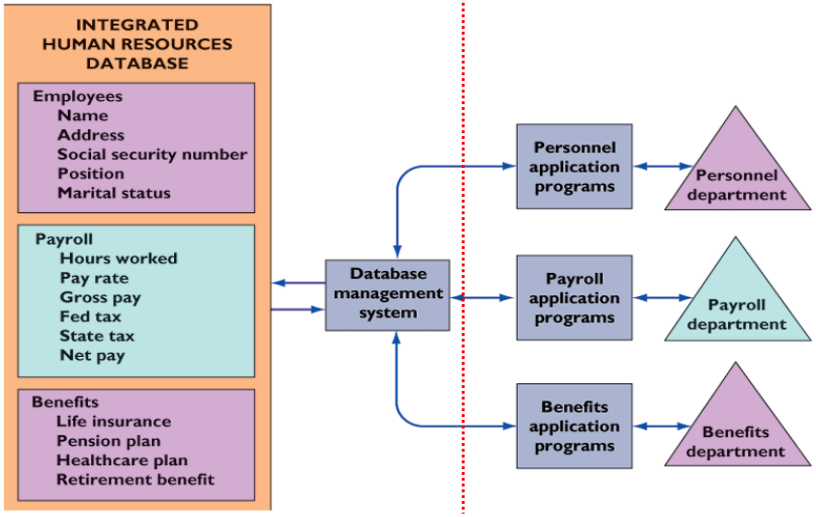
The Database Approach to Data Management - 1

- Shared collection of logically related data (and a description of this data), designed to meet the information needs of an organization.
- System catalog (metadata) provides description of data to enable program–data independence.
- Logically related data comprises entities, attributes, and relationships of an organization's information.

The Database Approach to Data Management - 2



The Database Approach to Data Management - 3



DBMS Approach

Database Management System (DBMS)

- A software system that enables users to define, create, and maintain the database and which provides controlled access to this database.

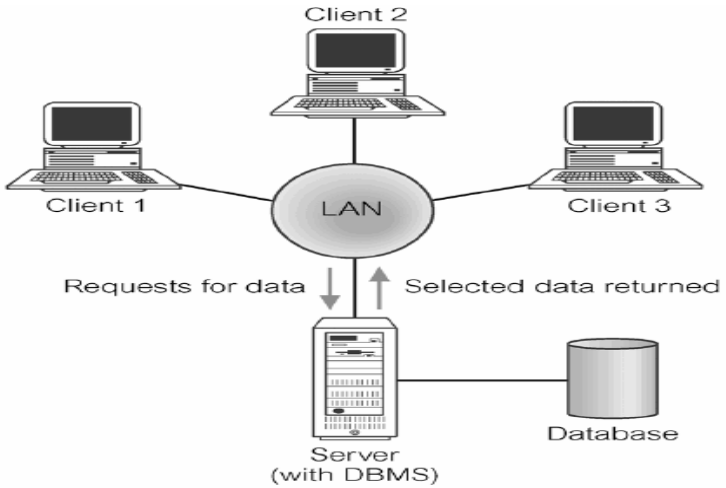
DBMS Components

1. **Data definition language**: Formal language for specifying the structure of database
2. **Data manipulation language**: For extracting data from database, e.g. SQL**.**

How a DBMS Solves Problems of a Traditional File Environment

- Reduces data redundancy
- Eliminates data inconsistency
- Uncouples programs from data
- Increases access and availability of data
- Allows central management of data, data use, and security

Database Client-server Architecture



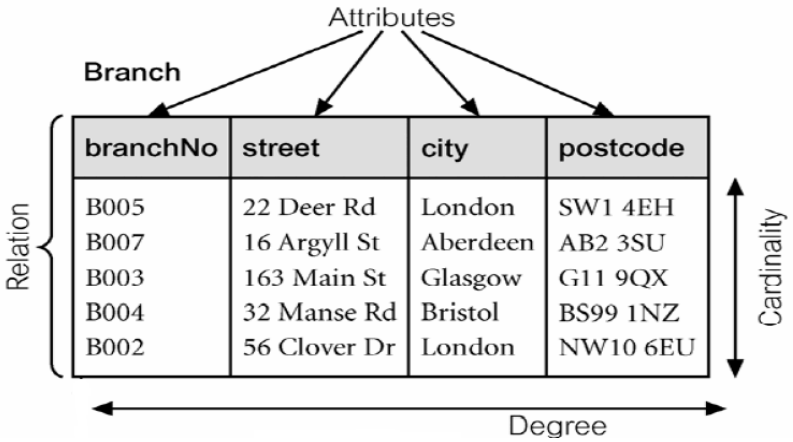
Disadvantages of DBMS

- Complexity
- Size
- Cost of DBMS
- Additional hardware costs
- Cost of conversion
- Performance
- Higher impact of a failure

Relational DBMS - 1

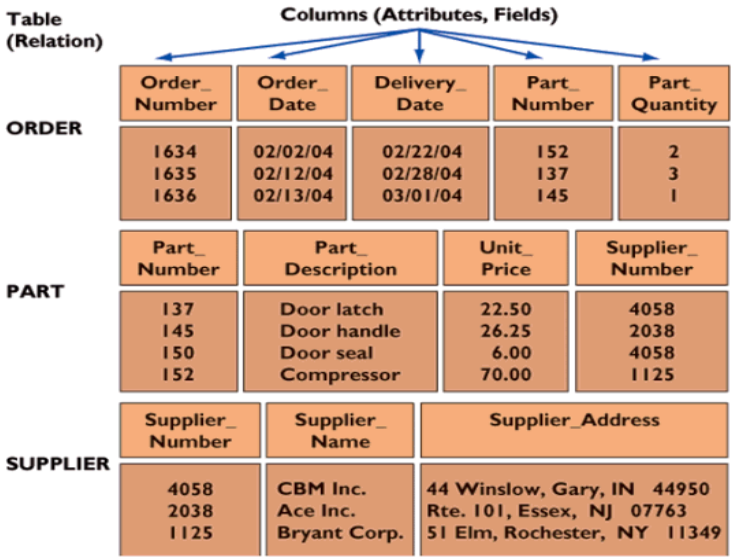
- A **relation** is a table with columns and rows.
  - **Attribute** is a named column of a relation.
  - **Domain** is the set of allowable values for one or more attributes.
  - **Tuple** is a row of a relation.
  - **Degree** is the number of attributes in a relation.
  - **Cardinality** is the number of tuples in a relation.
- Relational Database is a collection of normalized relations with distinct relation names.

Relational DBMS - 2



- Relates data across tables based on **common data element.**

Relational DBMS - 3



Relational DBMS - 4

Alternative terminology for relational model terms

Formal terms	Alternative 1	Alternative 2
Relation	Table	File
Tuple	Row	Record
Attribute	Column	Field

Relational DBMS - 5

Basic Operations in a Relational Database:

- **Select:** Creates subset of rows that meet specific criteria

Original table

P_CODE	P_DESCRIPT	PRICE
123456	Flashlight	5.26
123457	Lamp	25.15
123458	Box Fan	10.99
213345	9v battery	1.92
254467	100W bulb	1.47
311452	Powerdrill	34.99

SELECT ALL will yield →

New table or list

P_CODE	P_DESCRIPT	PRICE
123456	Flashlight	5.26
123457	Lamp	25.15
123458	Box Fan	10.99
213345	9v battery	1.92
254467	100W bulb	1.47
311452	Powerdrill	34.99

SELECT only PRICE less than 2.00 will yield →

P_CODE	P_DESCRIPT	PRICE
213345	9v battery	1.92
254467	100W bulb	1.47

SELECT only P_CODE=311452 will yield →

P_CODE	P_DESCRIPT	PRICE
311452	Powerdrill	34.99

Relational DBMS - 6

- **Project:** Yields all values for selected attributes – vertical subset of a table.

Original table

P_CODE	P_DESCRIPT	PRICE
123456	Flashlight	5.26
123457	Lamp	25.15
123458	Box Fan	10.99
213345	9v battery	1.92
254467	100W bulb	1.47
311452	Powerdrill	34.99

PROJECT PRICE yields →

New table or list

PRICE
5.26
25.15
10.99
1.92
1.47
34.99

PROJECT P_DESCRIPT and PRICE yields →

P_DESCRIPT	PRICE
Flashlight	5.26
Lamp	25.15
Box Fan	10.99
9v battery	1.92
100W bulb	1.47
Powerdrill	34.99

PROJECT P_CODE and PRICE yields →

P_CODE	PRICE
123456	5.26
123457	25.15
123458	10.99
213345	1.92
254467	1.47
311452	34.99

Relational DBMS - 7

- **Join:** Enables users to create a new table containing only relevant information from **more than one table**.

Table name: CUSTOMER

CUS_CODE	CUS_LNAME	CUS_ZIP	AGENT_CODE
1132445	Walker	32145	231
1217782	Adares	32145	125
1312243	Rakowski	34129	167
1321242	Rodriguez	37134	125
1542311	Smithson	37134	421
1657399	Vanloo	32145	231

Table name: AGENT

AGENT_CODE	AGENT_PHONE
125	6152439887
167	6153426778
231	6152431124
333	9041234445

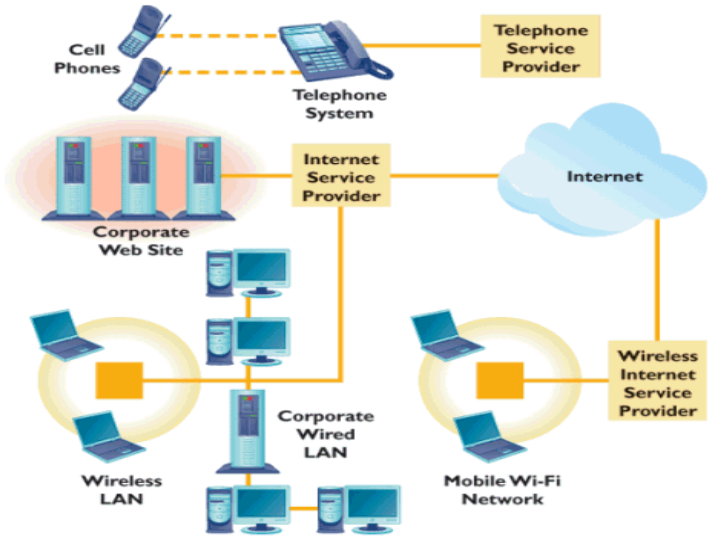
CUS_CODE	CUS_LNAME	CUS_ZIP	AGENT_CODE	AGENT_PHONE
1217782	Adares	32145	125	6152439887
1321242	Rodriguez	37134	125	6152439887
1312243	Rakowski	34129	167	6153426778
1132445	Walker	32145	231	6152431124
1657399	Vanloo	32145	231	6152431124

4. Business Telecommunications System

Telecommunications System

- Facilitation of electronic communication
- Telephone systems
- Broadcast and cable TV
- Radio, satellite, and local area networks
- Internet
- Analog or digital

Corporate Telecommunications System



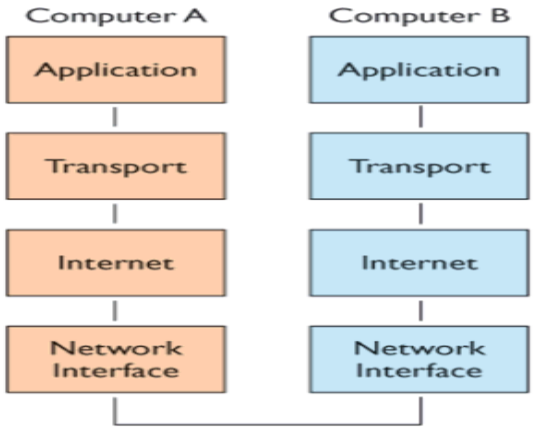
Features of Contemporary Telecommunications Systems - 1

Transmission Control Protocol/Internet Protocol (TCP/IP)

- Open suite of protocols for connectivity developed in 1970s
- Provides standards for breaking messages into packets, routing them to destination addresses, and reassembling them at end
- Allows for communication regardless of hardware/software

Features of Contemporary Telecommunications Systems - 2

TCP/IP: Four-Layer Reference Model



Features of Contemporary Telecommunications Systems – 3

TCP/IP: Four-Layer Reference Model

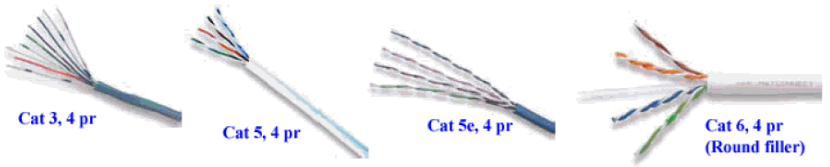
- **Application layer**: Communication between applications and other layers
- **Transport layer**: Acknowledging and sequencing packets to/from application
- **Internet layer**: Addressing, routing, packaging data packets
- **Network interface layer:** Placing packets on and receiving them from network medium

Features of Contemporary Telecommunications Systems – 4

Transmission Media - 1

Twisted wire

- Copper wire twisted in pairs
- Older analog transmission medium
- Can be used for digital signals
- Modems used for translating analog to digital

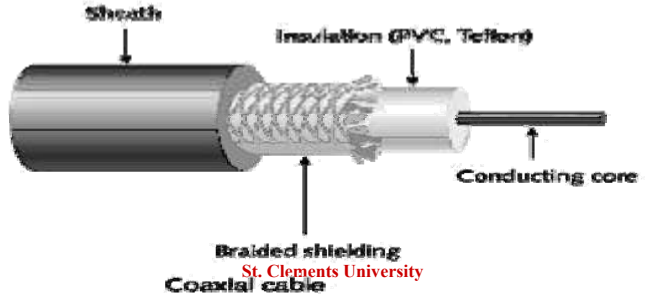


Features of Contemporary Telecommunications Systems – 5

Transmission Media - 2

Coaxial cable:

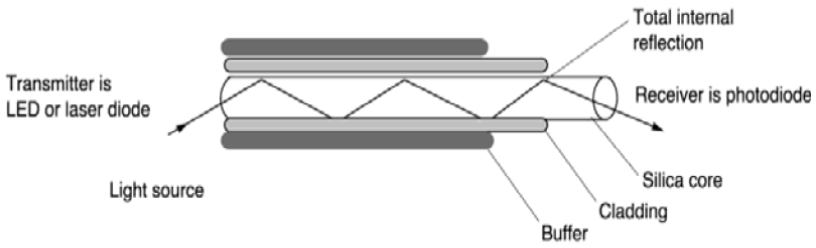
- Insulated copper wire
- Faster, more interference-free than twisted pair
- Difficult to install



Features of Contemporary Telecommunications Systems – 6

Transmission Media – 3

- **Fiber optics**
  - Transmission of data as light pulses through optical fiber
  - First converting electronic binary signals to light, and then convert the light signals back to electronic signals at the receiving end.
  - Faster, lighter, more durable



Features of Contemporary Telecommunications Systems – 7

Transmission Media – 4

- Fiber-optic technology has revolutionized telecommunications due to the very high speed of data transmission it can support.
- 0.1kg of optical fiber carries the same information as 30,000kg of copper cable
- At 2.5 Gbps, it is
  - equivalent to more than 3 hrs of TV per second
  - 24,000 simultaneous phone calls

Features of Contemporary Telecommunications Systems – 8

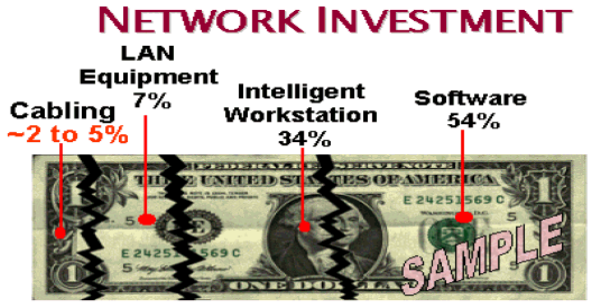
Transmission Media - 5

CABLING LIFE CYCLE

Features of Contemporary Telecommunications Systems – 9

Transmission Media – 6

- Although cabling represents only 2 to 5% of the total network investment, the cabling systems will outlive most network components.



Features of Contemporary Telecommunications Systems – 10

Transmission Media – 7

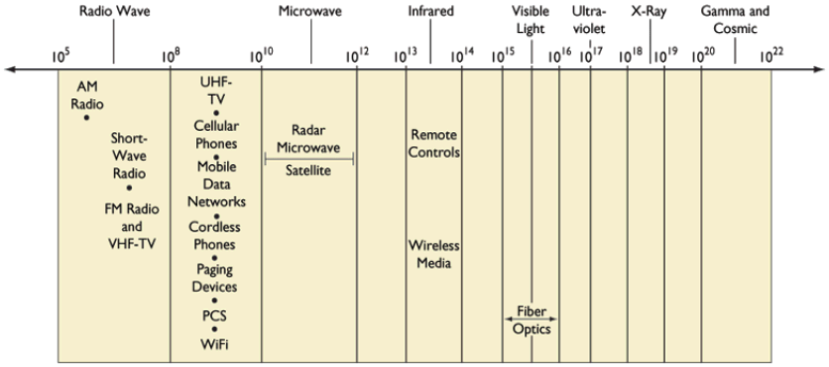
Wireless Transmission

- Use electromagnetic spectrum
- Microwave and infrared use high-frequency radio signals
- Paging systems, cellular telephones, PDAs, mobile data networks
- Wireless communication requires compatible standards
- Security/privacy issues

Features of Contemporary Telecommunications Systems – 11

Transmission Media – 8

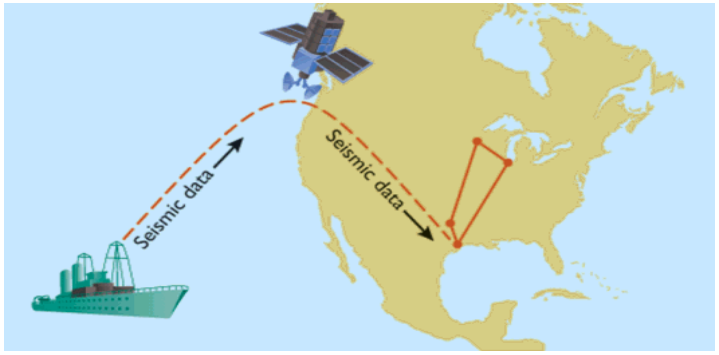
Frequency ranges for communication media and devices



Features of Contemporary Telecommunications Systems – 12

Transmission Media – 9

- **Satellite transmission system**



Features of Contemporary Telecommunications Systems – 13

Transmission Media – 10

- **Transmission Speed Comparison**

Twisted wire	Up to 1G+ Mbps
Microwave	Up to 200+ Mbps
Satellite	Up to 200+ Mbps
Coaxial cable	Up to 200 Mbps
Fiber-optic cable	Up to 6+ Tbps

5. Communications Networks

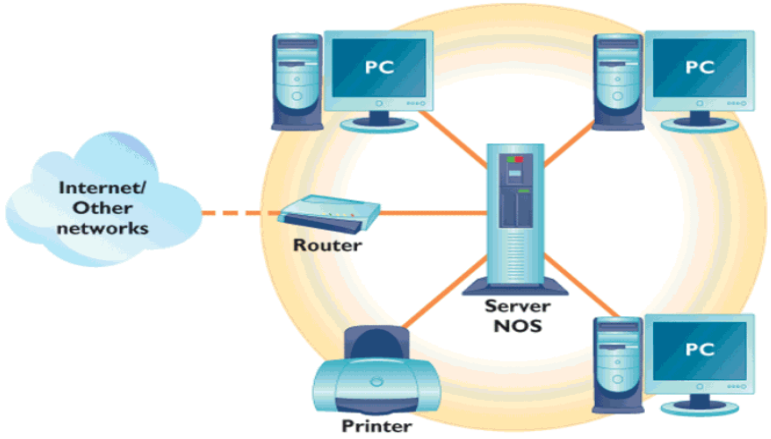
Communications Networks - 1

Local Area Networks (LAN) - 1

- A LAN is a data communication system allowing a number of independent devices to communicate directly with each other,
  - within a moderately sized geographic area,
  - and over a physical communications channel of moderate data rates.
- To implement a LAN, we need to use cabling or wireless technology to link up computers and networking devices, and the required software such as a Network Operating System (NOS).

Communications Networks - 2

Local Area Networks (LAN) - 2



Communications Networks - 3

Local Area Networks (LAN) – 3

- In a client/server arrangement, network services are located on a dedicated computer called a server. The server responds to the requests of clients for, print, application and other services.

Merits:

- The network is scalable.
- Enhanced security, ease of access, and control.

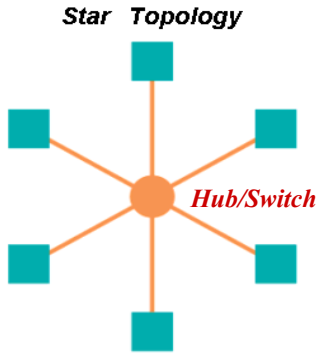
Demerits:

- Introduce a single point of failure in the network.
- More expensive, require specialized hardware and software.
- Require a trained, expert staff member to administer and maintain.

Communications Networks - 4

Local Area Networks (LAN) – 4

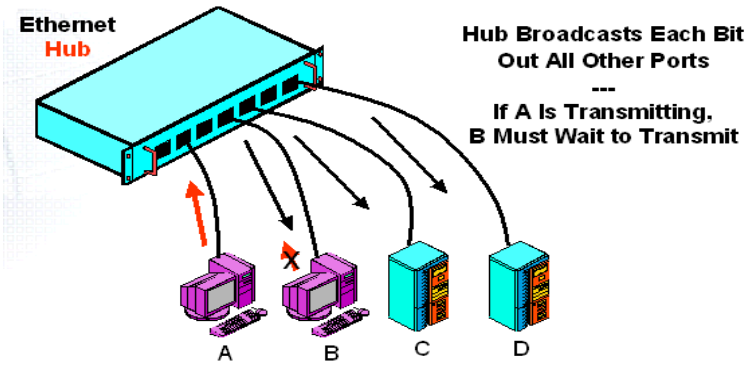
- Ethernet is by far the most common
- Star topology using Ethernet **hubs** and/or **switches**
- Use UTP cabling
- Relatively cheap, easy to install and manage
- Ethernet standards make use of latest developments in network technology



Communications Networks - 5

Local Area Networks (LAN) – 5

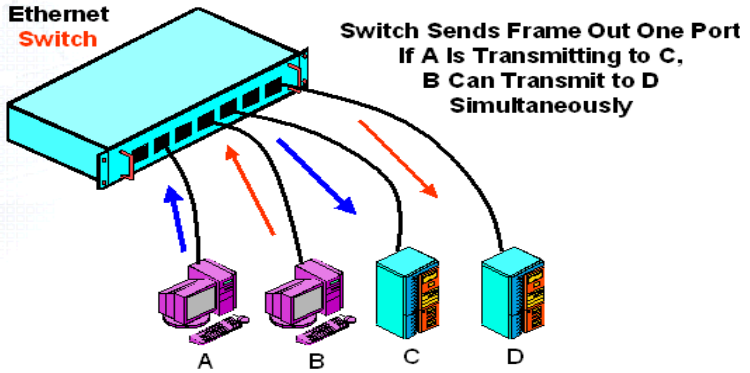
Hub Versus Switch Operation



Communications Networks - 6

Local Area Networks (LAN) – 6

Hub Versus Switch Operation



Communications Networks - 7

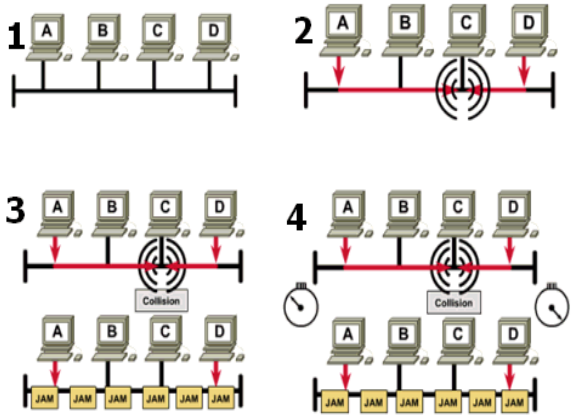
Local Area Networks (LAN) – 7

Hub Versus Switch Operation

- **Hubs Need Media Access Control**
  - This limits when a station may transmit
  - Ethernet hubs use CSMA/CD
- **Carrier Sense Multiple Access (CSMA)**
  - Only transmit if no other station is transmitting
  - Otherwise, wait
- **Collision Detection (CD)**
  - If two NICs transmit at the same time, this is a collision
  - Both will stop, wait a random amount of time, and then go back to CSMA to send again

Communications Networks - 8

Local Area Networks (LAN) – 8



CSMA/CD

1. Listen then transmit
2. Collision occurs
3. Broadcast jam signal
4. Devices back off appropriate amount of time, goes back to listen then transmit and then retransmit

Communications Networks - 9

Local Area Networks (LAN) – 9

UTP dominates the Ethernet access line market

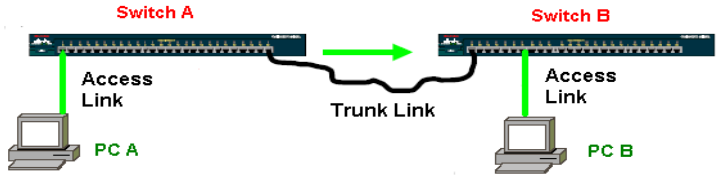
Physical Layer Standard	Speed	Maximum Run Length	Medium Required
10BASE-T	10 Mbps	100 meters	4-pair Category 3 or higher
100BASE-TX	100 Mbps	100 meters	4-pair Category 5 or higher
1000BASE-T (Gigabit Ethernet)	1,000 Mbps	100 meters	4-pair Category 5 or higher

Physical Layer Standard	Speed	Maximum Run Length	Medium 850 nm light (inexpensive) Multimode fiber	
1000BASE-SX	1 Gbps	220 m	62.5 microns	160 MHz-km

Communications Networks - 10

Local Area Networks (LAN) – 10

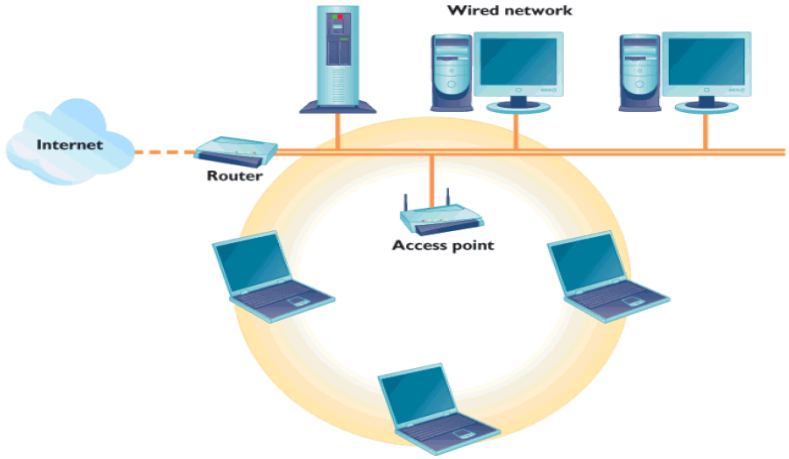
- **Access links** to client stations today are dominated by 100BASE-TX
  - But 1000BASE-T usage is growing
- **Trunk links** today are dominated by 1000BASE-SX
  - Sufficient for most LAN trunk line distances and speeds
  - Short trunk links, however, use UTP
  - Longer and faster trunk links use other fiber standards



Communications Networks - 11

Local Area Networks (LAN) – 11

An 802.11 Wireless LAN



Communications Networks - 12

Local Area Networks (LAN) – 12

Wireless LAN Benefits

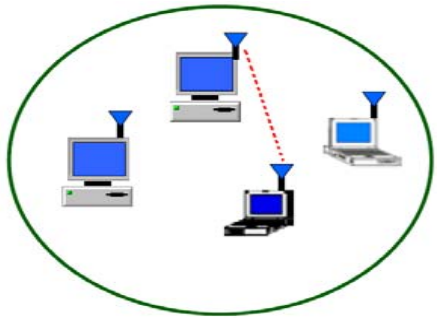
- **Removes wiring challenges**
  - Limited connections to users
  - Perfect for facilities where cost of wiring is prohibitive or impossible
- **Able to redeploy with minimal expense**
  - Low Installation Cost
  - Fast installation, Less Influence
  - Connect permanent or temporary campus buildings quickly and easily
- **Large coverage, High Performance**

Communications Networks - 13

Local Area Networks (LAN) – 13

Wireless LAN

- **Ad-hoc mode**: Peer-to-peer mode; wireless devices communicate with each other directly.
- It involves at least 2 stations
- No backbone infrastructure
- Suitable for small area

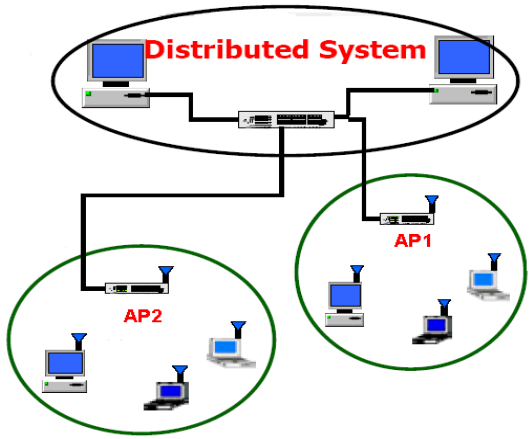


Communications Networks - 14

Local Area Networks (LAN) – 14

Wireless LAN

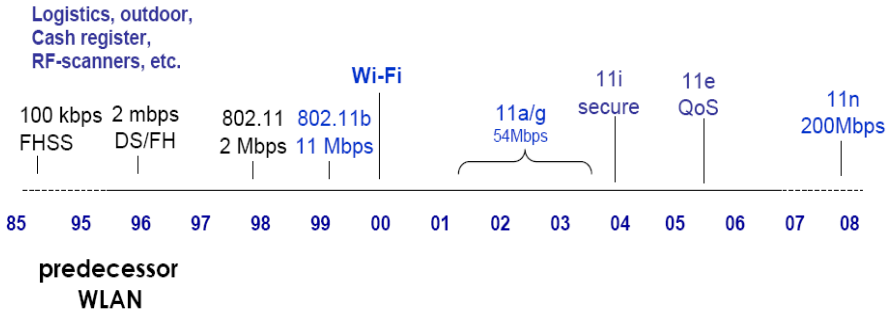
- **Infrastructure mode:**
- Wireless devices communicate with wired LAN via ***access points*** (APs).



Communications Networks - 15

Local Area Networks (LAN) – 15

- **WLAN-standards**



Communications Networks - 16

Local Area Networks (LAN) – 16

- **Wireless LAN Standard**

Standard	802.11b	802.11a	802.11g
Frequency Band	2.4 GHz	5 GHz	2.4GHz
Data rate	11 Mbps	54 Mbps	54 Mbps

- **Hot spot:** Geographic location in which an access point provides public Wi-Fi network service.
  - Eg. Free PCCW Wi-Fi service in the HK International Airport

Communications Networks - 17

Local Area Networks (LAN) – 17

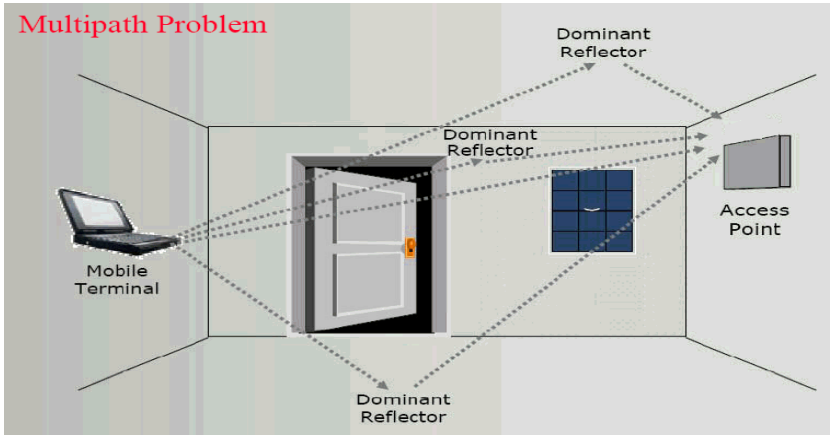
What is 802.11n?

- New IEEE Standard under development
- Uses MIMO radio technology as a basis
- End result will be more “wire-like” performance
- Anywhere from 100Mbps to 600Mbps depending on implementation
- First standard to support both 2.4 GHz and 5 GHz

Communications Networks - 18

Local Area Networks (LAN) – 18

Multi Path Reflections

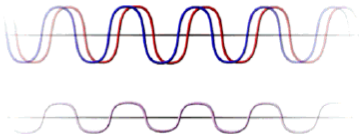


Communications Networks - 19

Local Area Networks (LAN) – 19

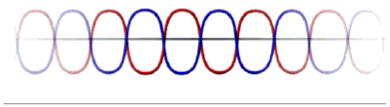
Multi Path Reflections

Original signal + reflections arrive at the receiver and are “added”, resulting in a distorted reconstructed signal



Null Waves : Original signal and reflected signals are 180 degrees out of phase, cancelling each other out.

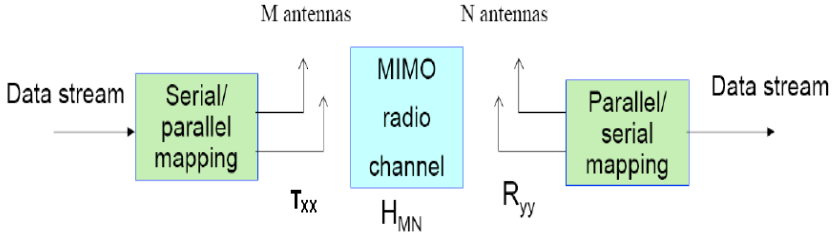
Causing drop outs.



Communications Networks - 20

Local Area Networks (LAN) – 20

- MIMO (Multiple Input / Multiple Output)
- Sending signals on multiple Tx antennas
- Receiving signals on multiple Rx antennas



Communications Networks - 21

Local Area Networks (LAN) – 21

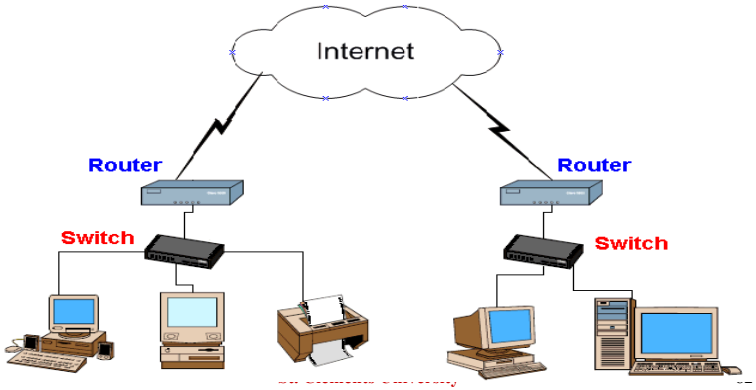
Bluetooth

- Standard for wireless personal area networks that can transmit up to 722 Kbps within 10-meter area
- It is a wireless LAN technology designed to connect devices of different functions such as telephones, notebooks, computers (desktop and laptop), cameras, printers and so on.
- A Bluetooth LAN is an ad-hoc network.
- The Bluetooth technology is the implementation of a a protocol defined by the **IEEE 802.15** standard.
  - The standard defines a wireless personal-area network (PAN) operable in an area the size of a room or a hall.

Communications Networks - 22

Local Area Networks (LAN) – 22

- **Routers** provides access to company networks on other sites, and to the Internet.



Communications Networks - 23

Wide Area Networks - 1

- A WAN is a single networks that connect different sites
- WANs and the Telephone
  - WAN technology usually uses the Public Switched Telephone Network transport system for transmission
  - Adds data switching and management
- WAN Purposes
  - Internet access
  - Link sites within the same corporation
  - Provide remote access to individuals who are off site

Communications Networks - 24

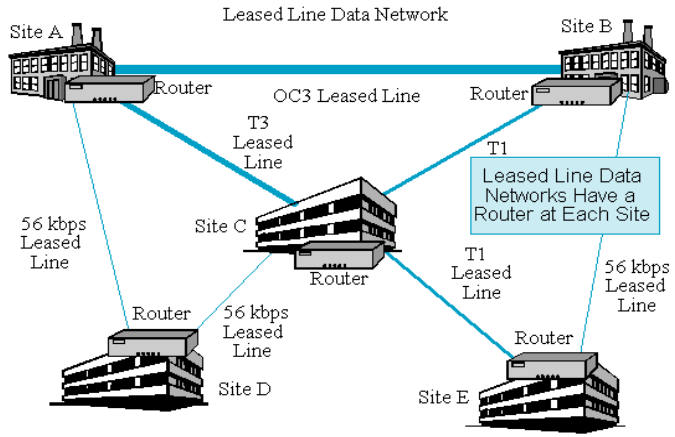
Wide Area Networks – 2

- WANs are characterized by **high cost** and **low speeds**.
- High cost per bit transmitted compared to LANs.
- Consequently, lower speeds (most commonly 128 kbps to a few megabits per second)
- This speed usually is aggregate throughput shared by many users
- Much slower than LAN speeds (100 Mbps to 1 Gbps to the desktop)

Communications Networks - 25

Wide Area Networks – 3

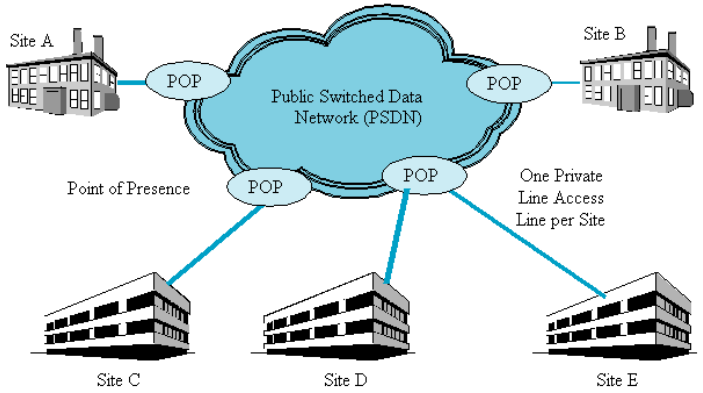
Leased Line Data Networks



Communications Networks - 26

Wide Area Networks – 4

WAN using Public Switched Data Networks



Communications Networks - 27

Source: HKBN

Communications Networks - 28

Source: HKBN

6. Networked Applications

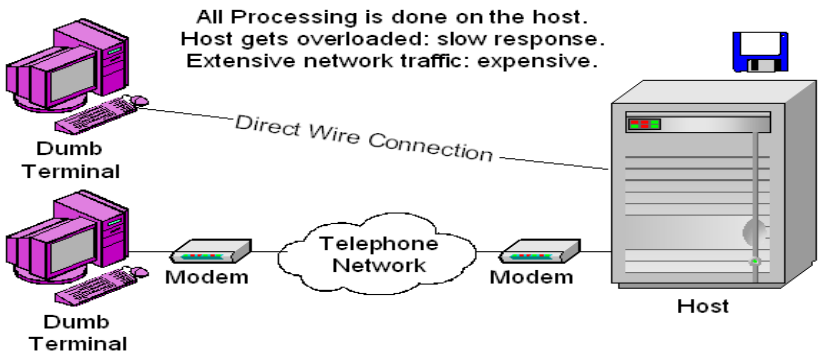
Application Architectures - 1

- An application architecture is the design decision about which network host or hosts to use to do the processing work in an application.
- Two type of application architecture:
  - Terminal-Host System
  - Client/Server Computing

Application Architectures - 2

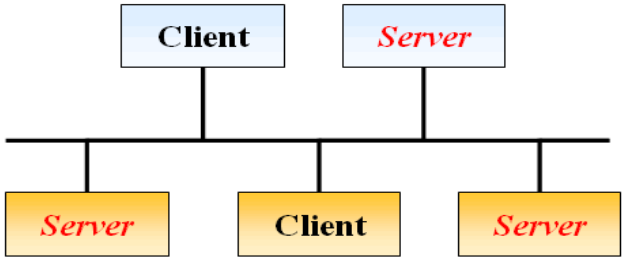
Terminal-Host System

- **Applications and databases reside on the same host computer.**
- **User interacts with the application using a "dumb terminal".**



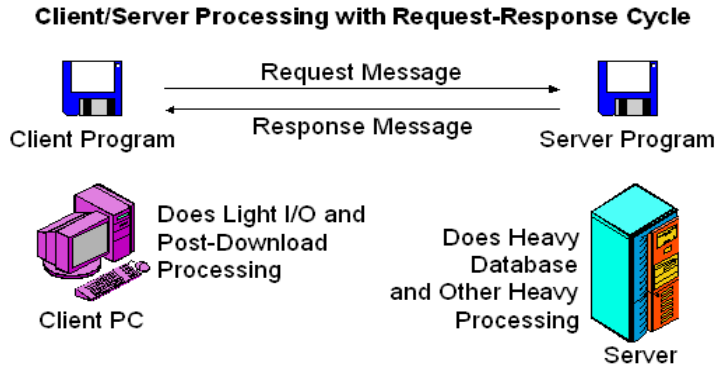
Application Architectures - 3

- Applications and databases reside on specialized host computers.
- Servers do most or all of the processing and transmit the results to the client.



Application Architectures - 4

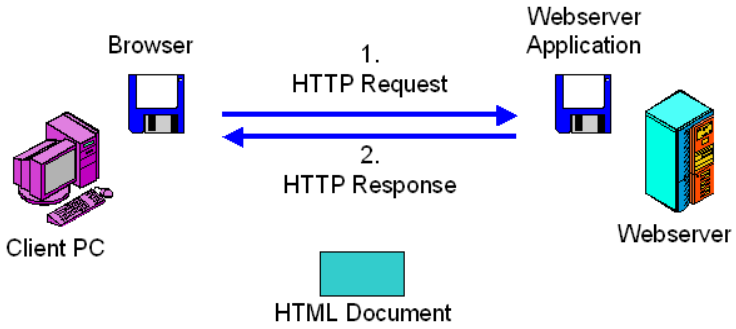
Client/Server Computing



Highly scalable: Use larger server as number of clients increases

Application Architectures - 5

Web Page Browsing



Web Search Engines

- Web pages that conduct searches of the Web to find words or expressions you enter.

E-Mail - 1

What is E-Mail?

- E-mail (electronic mail) is the exchange of computer-stored messages by telecommunication.

Mail Server

- A hardware and software system that determines from the recipient's address one of several routes on which to send the message.

Mail Client Software or E-Mail Program

- A software that requests mail delivery from the mail server to your PC.

Email Address

- An address that uniquely identifies an individual or organization that is connected to the Internet.
- **mis.st.clements@gmail.com**

E-Mail - 2

Protocols that make email works

- **SMTP (Simple Mail Transfer Protocol)**
  - It decides which paths an e-mail message takes on the Internet.
- **POP (Post Office Protocol)**
  - It handles incoming messages.
- **IMAP (Internet Message Access Protocol)**
  - A protocol for retrieving mail messages from a server.
- **MIME (Multipurpose Internet Mail Extensions)**
  - A protocol that specifies how to encode non-text data, such as graphics and sound, so it can travel over the Internet.

E-Mail - 3

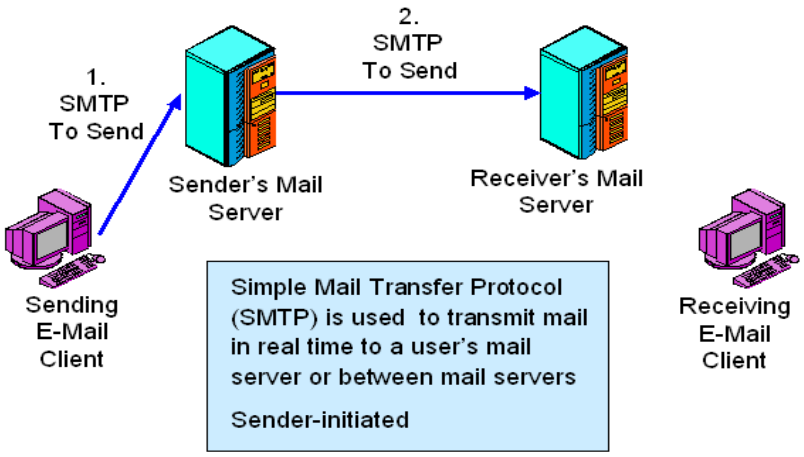
Importance of E-Mail

- Universal service on the Internet
- Attachments make e-mail a general file delivery mechanism!

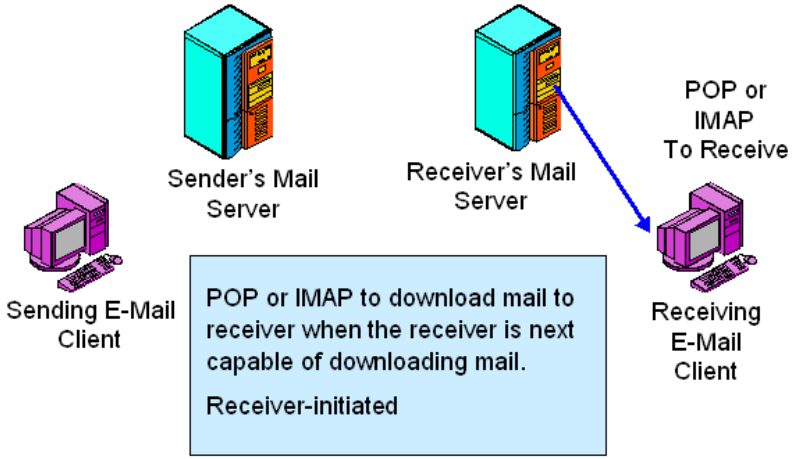
Mail Standards

- Message body standards
- Receiver must understand sender's message
  - RFC 822 and RFC 2822 for all-text bodies
  - HTML bodies with fancy text and graphics
  - UNICODE for non-English language characters

E-Mail - 4



E-Mail - 5



E-Mail – 6

The “evils” come with email:

- Messages with inappropriate content.
  - Racial or sexual harassment
  - Threats
- Spam, adware, spyware, and other abuses.
- Viruses, Worms, and Trojan Horses are often delivered by e-mail attachments!

E-Mail - 7

Viruses, Worms, and Trojan Horses

- Use of antivirus software is a must.
- Where to Do Scanning?
  - On client PCs
    - But users often turn off their software,
    - Fail to download virus definitions regularly
    - Or let their contracts lapse
  - On the corporate mail server or application firewall
    - Users cannot turn off

E-Mail - 8

- **Spam** are unsolicited commercial e-mail
- Why they are harmful?
  - Time consumed by users deleting them
  - Bandwidth and storage consumed
  - Legitimate messages lost because overlooked
- Separating SPAM from legitimate e-mail is difficult
  - Many spam messages get through to users
  - Some legitimate messages are deleted
  - Some firms merely mark messages as probable spam

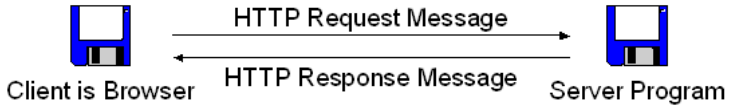
E-Mail - 9

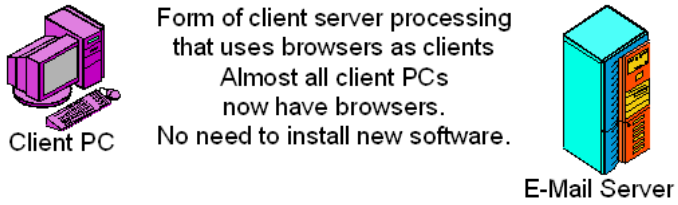
Web-Based E-Mail Services - 1

- Many Internet Web sites provide free e-mail addresses and accounts for **registered users**.
- They may be used with any Web browser.
- Examples: Gmail, Yahoo! Mail, Hotmail etc.

E-Mail - 10

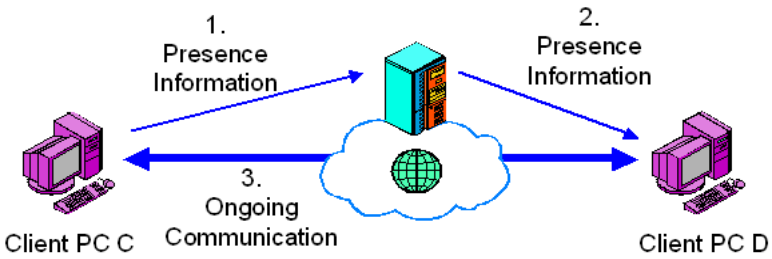
Web-Based E-Mail Services - 2





Instant Messaging Servers - 1

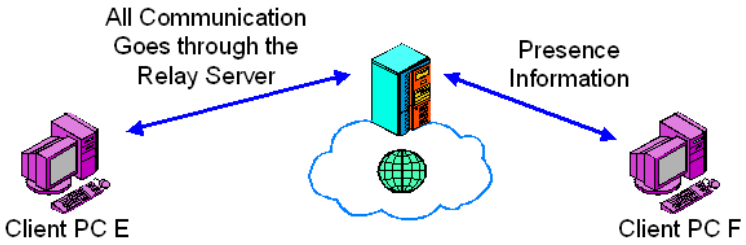
Use of a Presence Server



Clients register with presence servers.
Presence servers notify other clients as appropriate.
Clients use this information to communicate directly.

Instant Messaging Servers - 2

Use of a Relay Server



Relay servers route all IM messages.
This permits security filtering and other services.
It limits privacy because the relay server sees everything.

8. Contemporary Mobile Services

Mobile Enterprise

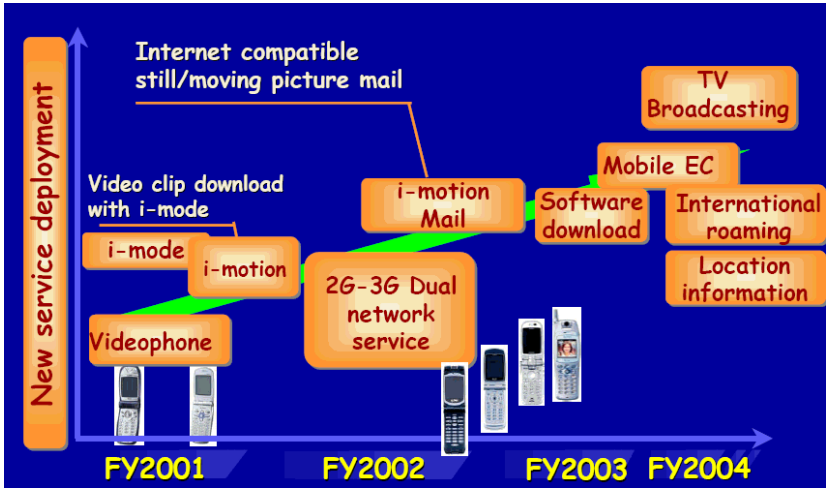
- Mobile Enterprise
  - "The ***ability for an enterprise to connect*** and control suppliers, partners, employees, assets, products, and customers ***from any location***."
    - *Forrester's March 15, 2006 Topic Overview "Enterprise Mobility"*

Broadband Wireless Networks…
Versatile Devices…
Faster Processors….

Generations of Mobile Networks

- 1G: basic mobile telephony
- 2G: mobile telephony for mass users
  - regional roaming
- 2.5G: mobile internet services
- 3G:
  - global roaming
  - enhanced mobile Internet services

3G Services – To explore the non-voice Applications



HSDPA

- High-Speed Downlink Packet Access (HSDPA) is a 3G mobile telephony communications protocol.
- It support services requiring instantaneous high data rates in the downlink, e.g. Internet browsing, video on demand, office application.
- Peak data rates 3-4 times higher than current 3G.
- Current HSDPA deployments support down-link speeds of 1.8, 3.6, 7.2 and 14.4 Mbit/s.
- New terminals are required to take advantage of HSDPA.

Smartone-Vodafone

Public Wi-Fi Service

- 每日港幣 18 元使用費，即可全日無限量使用 HSDPA、3G 本地資料傳輸。

PCCW NEXTGEN HSPA+ 21Mbps 流動新技術 - 1

- 預料支援 HSPA+ 的裝置將於09年第二季推出。

PCCW NEXTGEN HSPA+ 21Mbps 流動新技術 - 2

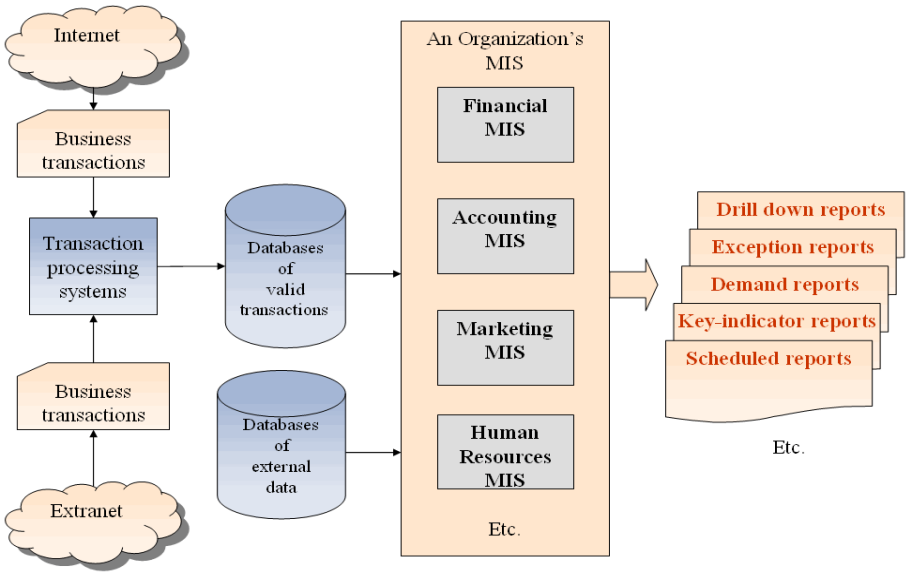
- Evolved High Speed Packet Access，HSPA+）技術，將手機下載速度由現時的 7.2Mbps 激增三倍至 21Mbps
- 目前，市場上流動通訊業者一般沿用的基幹線路網絡是傳統的 E1 歐洲制式，每條陸上線路的傳輸速度只稍微高於 2Mbps。
- 然而，電訊盈科的全光纖基幹線路爲客戶提供數據高速公路」，助他們享用超越 1000Mbps 的超高速上網服務。

9. MIS Types

Management information system (MIS) - 1

- An MIS provides managers with **information** and **support** for effective decision making, and provides feedback on daily operations.
- Output, or reports, are usually generated through accumulation of transaction processing data.
- MIS is an integrated collection of functional information systems, each supporting particular functional areas.
  - Provides reports based on routine flow of data
  - Assists in general control of the organization

Management information system (MIS) - 2



Management information system (MIS) - 3

Outputs of an MIS

Scheduled reports

- Produced periodically, or on a schedule (daily, weekly, monthly)

Key-indicator report

- Summarizes the previous day's critical activities
- Typically available at the beginning of each day

Demand report

- Gives certain information at a manager's request

Exception report

- Automatically produced when a situation is unusual or requires management action

Drill Down Reports

- Provide detailed data about a situation. To move from summary data to lower and lower levels of detail.

Major Types of Systems

- Transaction Processing Systems (TPS)
- Management Information Systems (MIS)
- Decision Support Systems (DSS)
- Executive Information Systems (EIS)

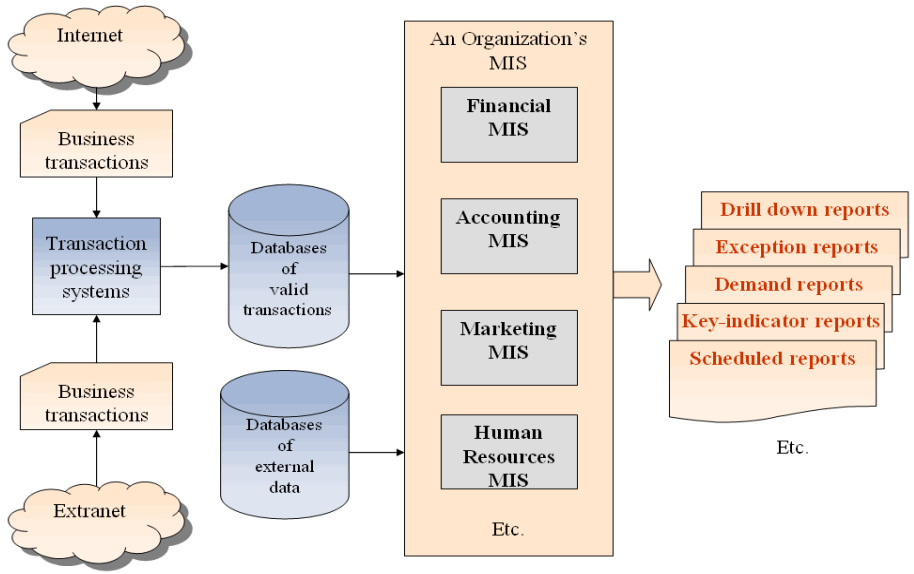
Transaction Processing Systems (TPS)

- A Transaction Processing System (TPS) is a type of information system that collects, stores, modifies and retrieves the data transactions of an enterprise.
- In computer science, transaction processing is information processing that is divided into individual, indivisible operations, called transactions.
- Each transaction must succeed or fail as a complete unit; it cannot remain in an intermediate state.
- Transaction processing allows multiple individual operations to be linked together automatically as a single, indivisible transaction.
- Transaction processing is designed to maintain a a database in a known, consistent state.

Management information system (MIS) - 1

- Also called “information reporting systems”
- Original type of management support system
- Produce information products that support many of the day-to-day decision-making needs of the organization
- Output, or reports, are usually generated through accumulation of transaction processing data.

Management information system (MIS) - 2



Management information system (MIS) - 3

Major types of MIS Reports

Scheduled reports
- Produced periodically, or on a schedule (daily, weekly, monthly)

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Drill Down Reports
- Provide detailed data about a situation. To move from summary data to lower and lower levels of detail.

Decision Support Systems (DSS) - 1

- Decision Support Systems (DSS) are a specific class of computerized information system that **supports** business and organizational **decision-making activities**.
- A properly designed DSS is an interactive software-based system intended to help decision makers compile useful information from raw data, documents, personal knowledge, and/or business models to identify and solve problems and make decisions.

Decision Support Systems (DSS) - 2

- Some Sophisticate Functions of DDS
- What-If Analysis.
  - An end user makes changes to variables, or relationships among variables, and observes the resulting change in the value of other variables.
- Sensitivity Analysis.
  - A special type of what-if analysis in which the value of only one variable is changed repeatedly, and the resulting changes on other variables are observed.

Executive Information Systems (EIS) - 1

- Information systems at the organization's top level of management.
- Designed to address unstructured decision making through advanced graphics and communication but easy to use.
- Information sources from both inside and outside of the firm.

Executive Information Systems (EIS) - 2

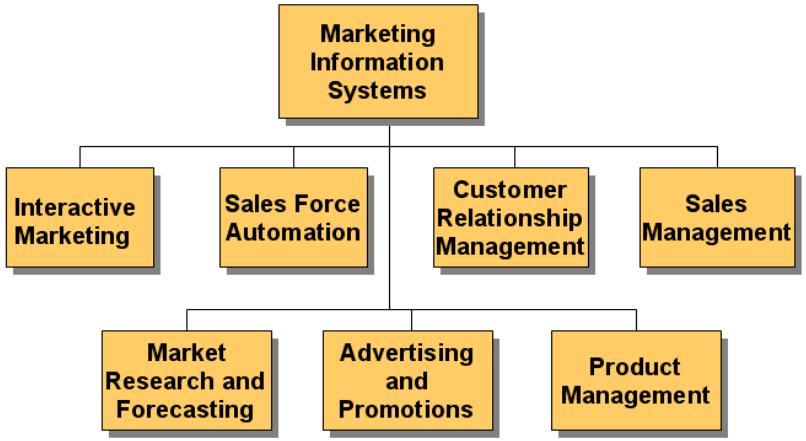
- Help minimize amount of information by giving key figures where point to level of success / failure.
- E.g. possible success factors for sales manager:

Success area	Factors	Critical?
Business growth / Profitability	% sales volume growth % revenue growth No new business proposals submitted % revenue from new proposals % profit growth cost/revenue ratio	 C C
Personnel	% staff satisfied with management % annual staff reviews by due date To financial staff targets	 C
Head office reporting	To financial branch targets and budgets % monthly reports on time	C
Market awareness	To initiate market research programme	

How IS Support Marketing - 1

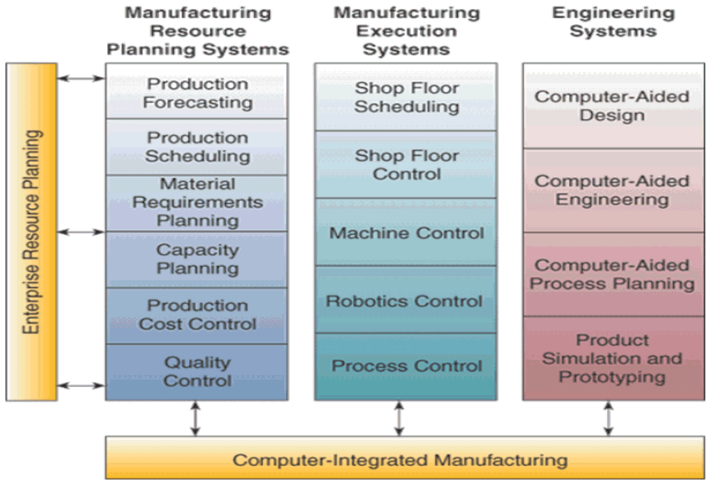
- **Goal:**
  - To profitably attract and keep customers
  - To induce retained customers becoming partners with the business by creating, purchasing and improving products and services
- A customer-focused marketing process
- Using the Internet, intranets, and extranets to establish two-transactions between a company and its customers or potential customers

How IS Support Marketing - 2

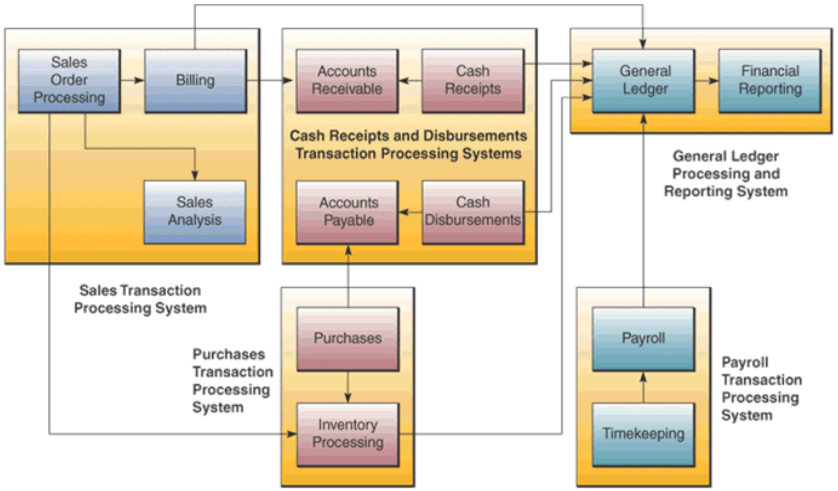


How IS Support Production and Operation

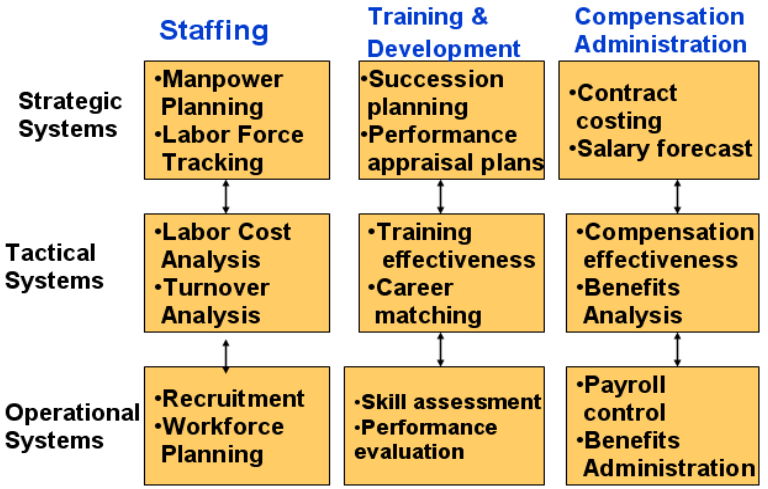
Computer-integrated manufacturing (CIM)



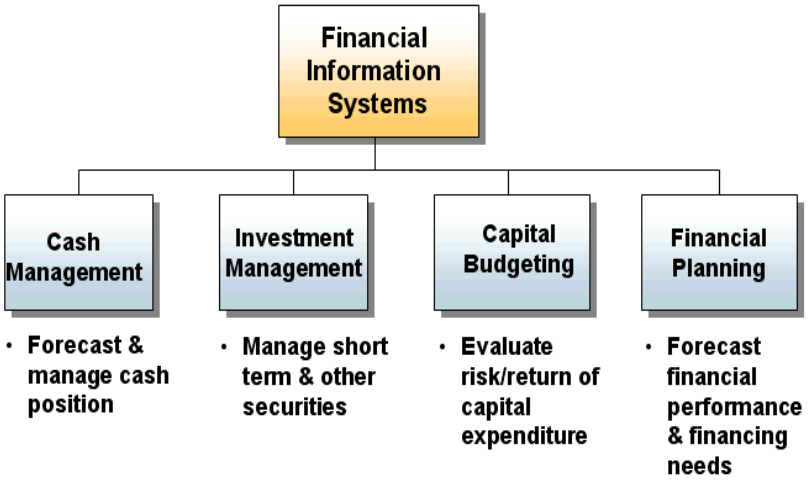
How IS Support Accounting



How IS Support Human Resources



How IS Support Finance



10. Management of MIS

MIS Management - 1

Managing Hardware and Software

- **Capacity planning**: Process of predicting when a computer hardware system becomes saturated
- **Scalability:** Ability of a computer, product, or system to expand to serve a larger number of users without breaking down

MIS Management - 2

- Total Cost of Ownership (TCO) of Technology Assets
  - Includes both direct and indirect costs
  - Hardware and software acquisitions account for only 20% of TCO
  - TCO for a PC may run to three times original purchase price
  - Be aware of hidden costs!

END