UNIVERSITAS KOMPUTER INDONESIA

Bab 7: IT Infrastructure

[Laudon] Chap 6

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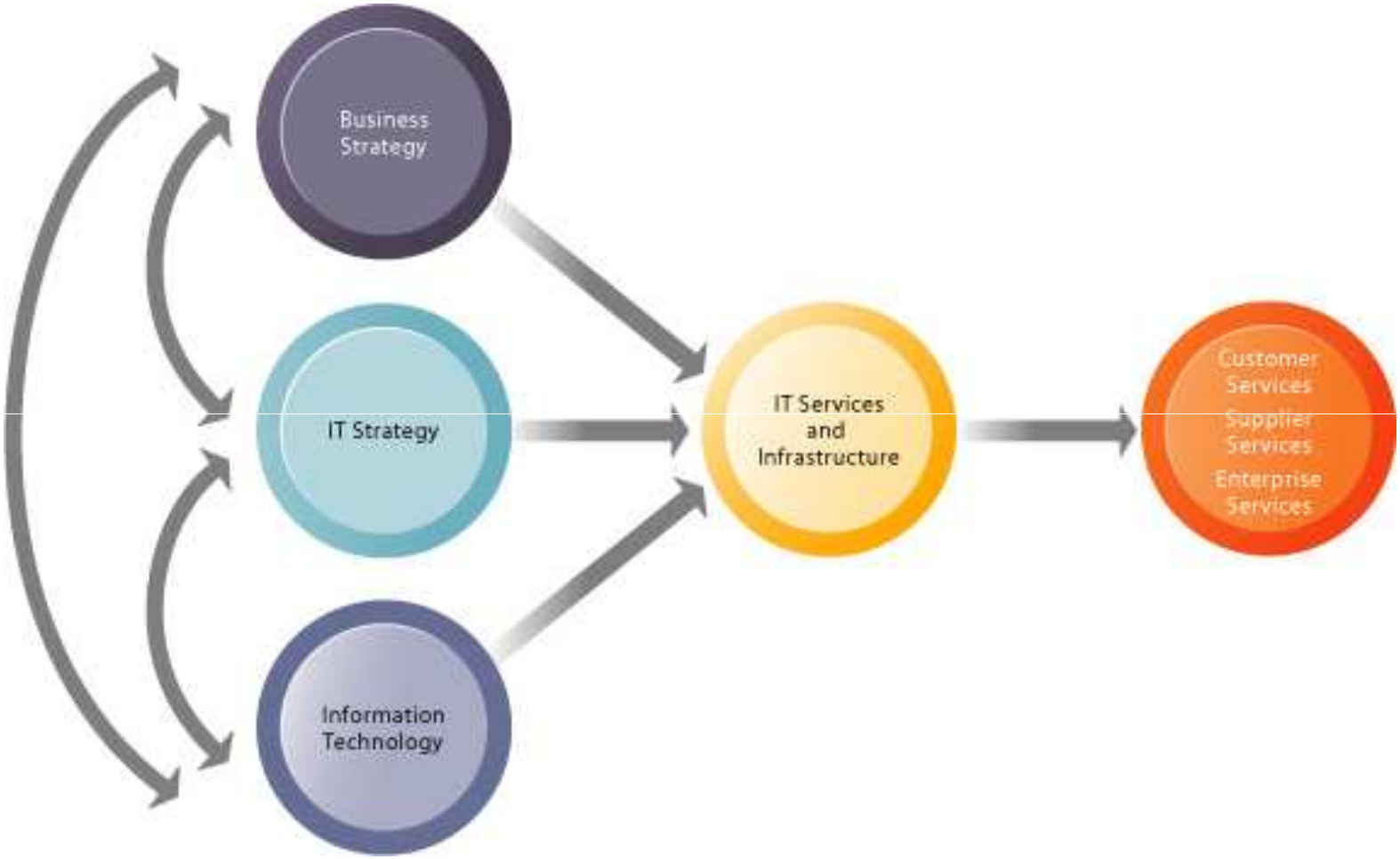
Overview

- Defining IT Infrastructure
- Levels of IT Infrastructure
- Evolution of IT Infrastructure: 1950–2005
- Technology Drivers of Infrastructure Evolution

What is IT Infrastructure?

- Shared technology resources that provide the platform for the firm's specific information system applications.
- IT infrastructure includes investment in hardware, software, and services—such as consulting, education, and training—that are shared across the entire firm or across entire business units in the firm.
- For instance, a firm's investment in thousands of new desktop computers networked together and linked to the Internet is an infrastructure investment because it serves many groups, goals, and business initiatives.

The connection between the firm, IT infrastructure, and business capabilities



Defining IT Infrastructure

- as technology
- as services clusters

As service Platform

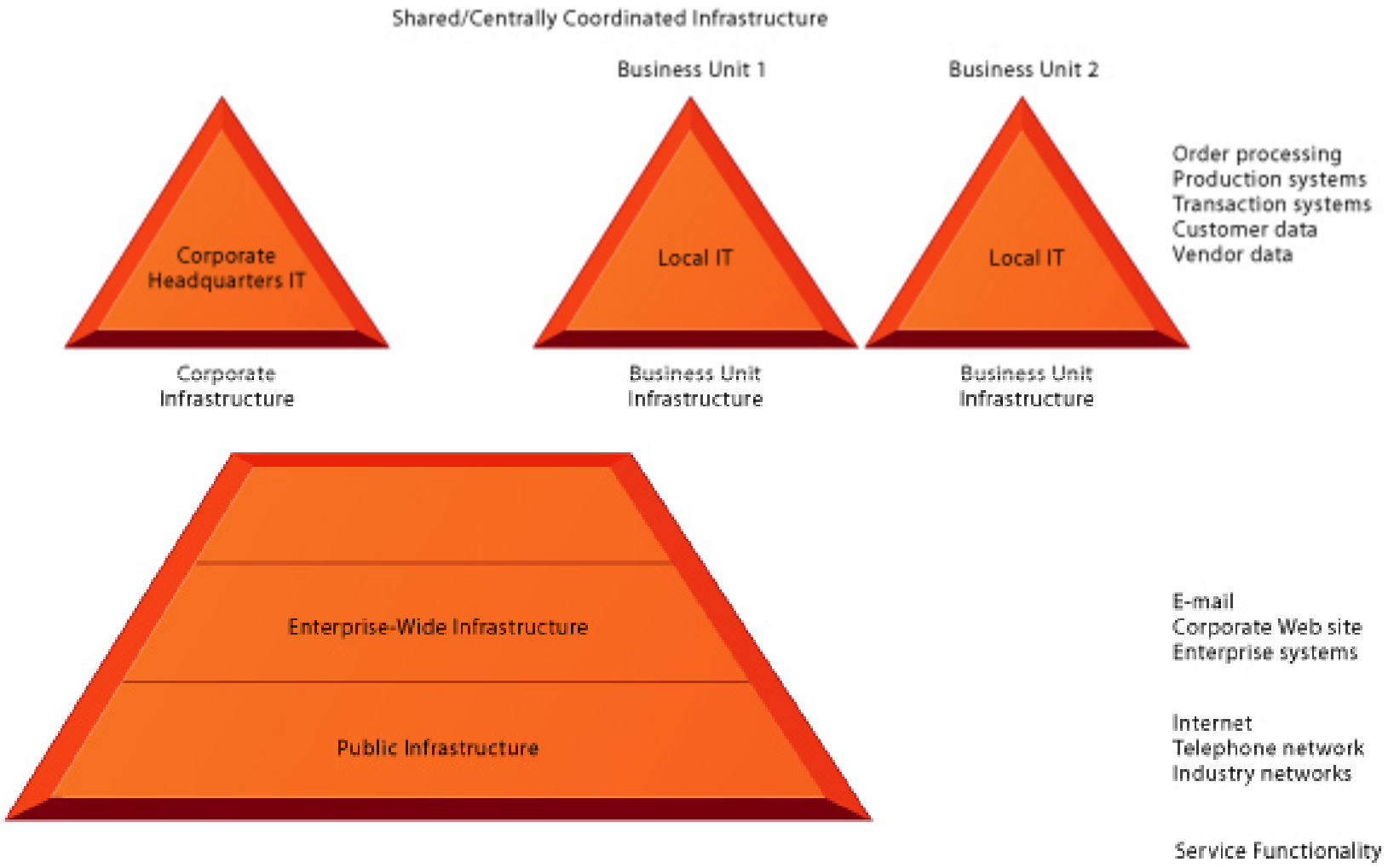
- Computing platforms used to provide computing services that connect employees customers, and suppliers into a coherent digital environment, including large mainframes, desktop and laptop computers, and personal digital assistants (PDAs) and Internet appliances

- Telecommunications services that provide data, voice, and video connectivity to employees, customers, and suppliers.

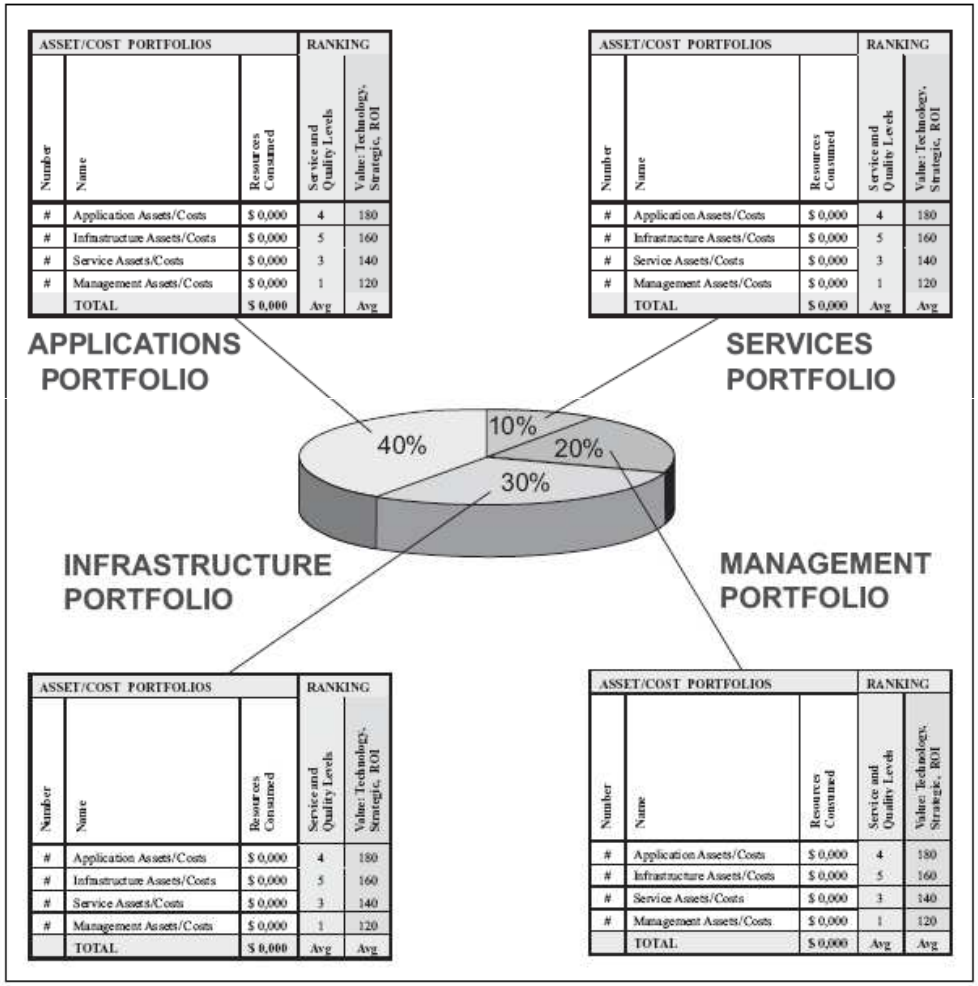
- Data management services that store and manage corporate data and provide capabilities for analyzing the data.

- Application software services that provide enterprise-wide capabilities such as enterprise resource planning, customer relationship management, supply chain management, and knowledge management systems that are shared by all business units.

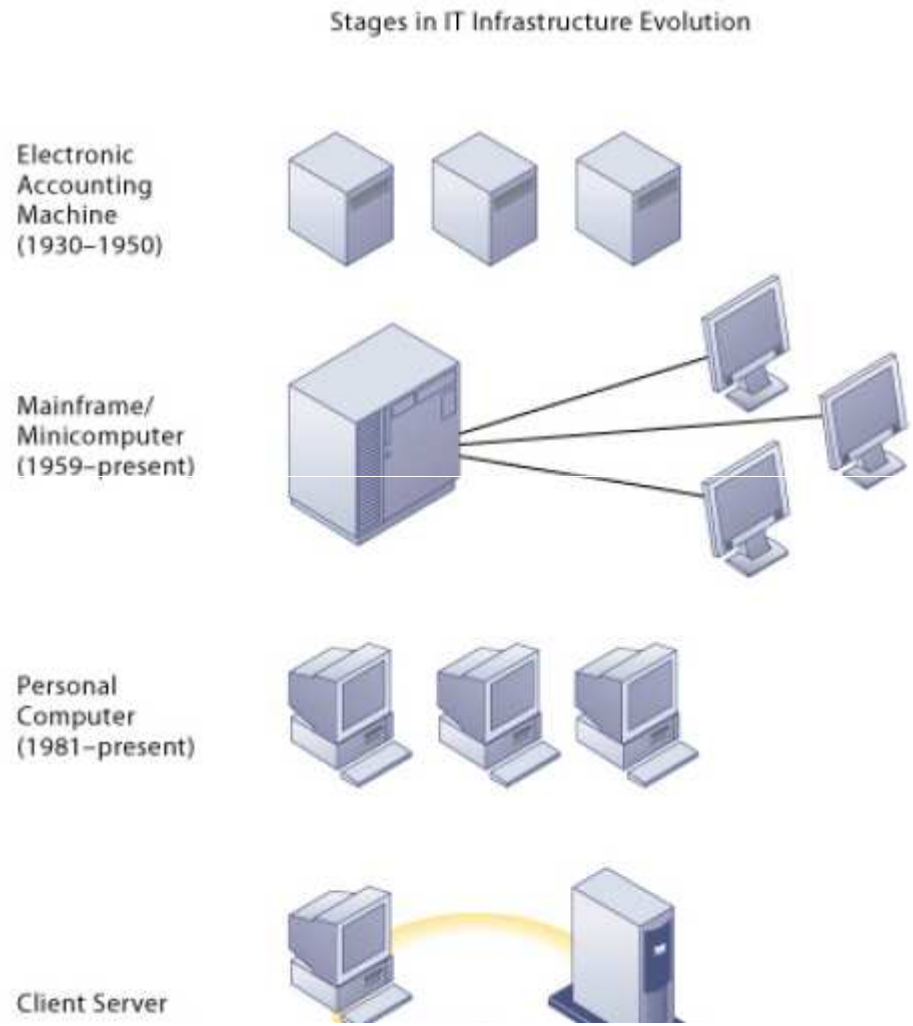
Level of IT Infrastructure

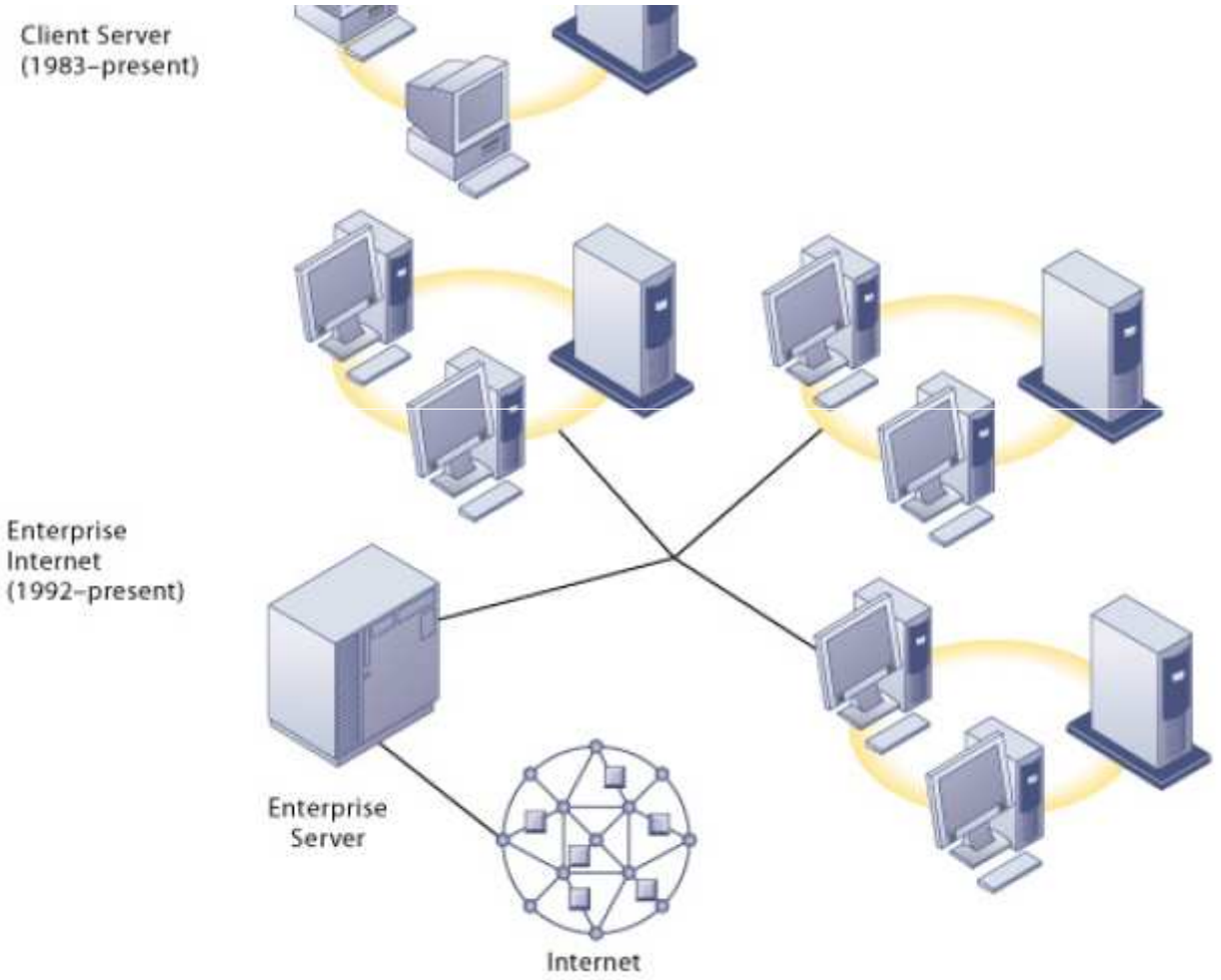


Infrastructure as A part of IT Portfolio



Evolution of IT Infrastructure: 1950–2005




Client Server
(1983–present)
Enterprise
Internet
(1992–present)
Enterprise
Server
Internet

- ELECTRONIC ACCOUNTING MACHINE ERA: 1930–1950
- GENERAL-PURPOSE MAINFRAME AND MINICOMPUTER ERA: 1959 TO PRESENT
- PERSONAL COMPUTER ERA: (1981 TO PRESENT)
- CLIENT/SERVER ERA (1983 TO PRESENT)
- ENTERPRISE INTERNET COMPUTING ERA (1992 TO PRESENT)

A multitiered client/server network (N-tier)

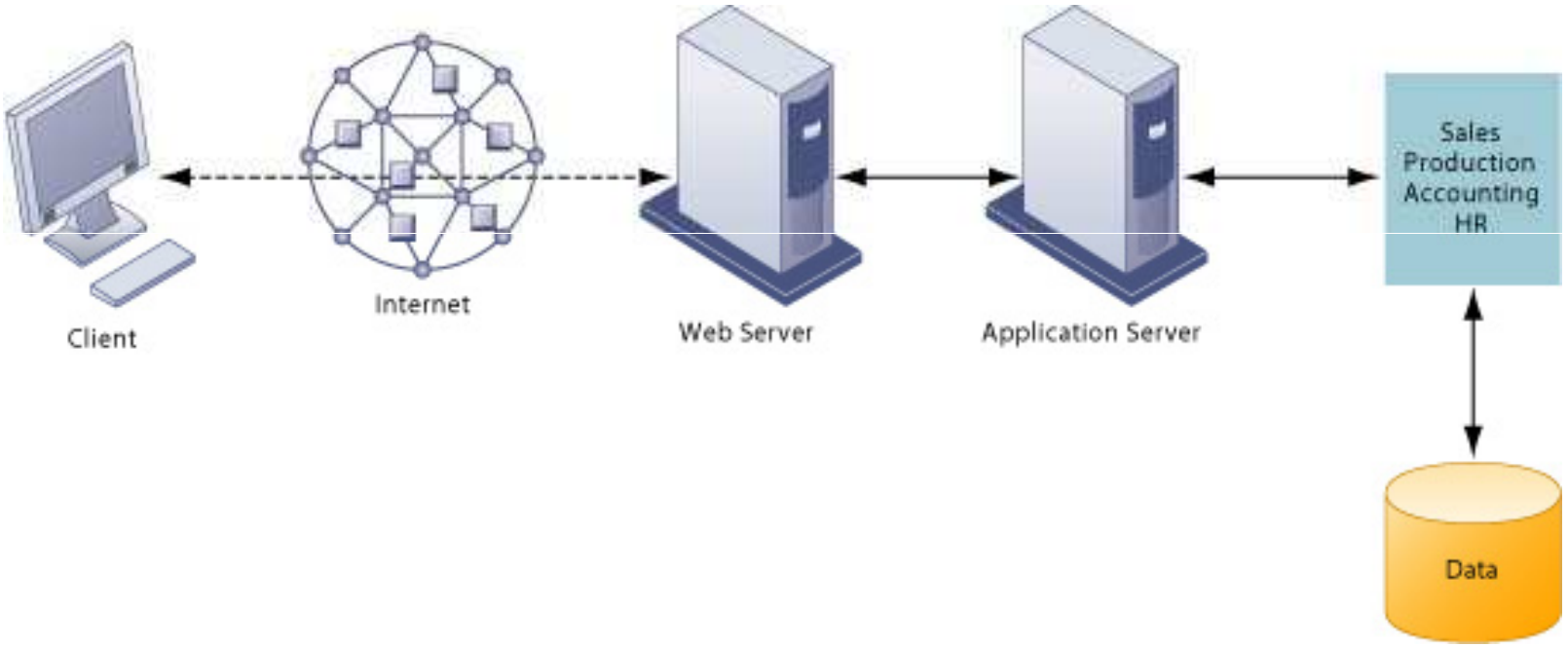


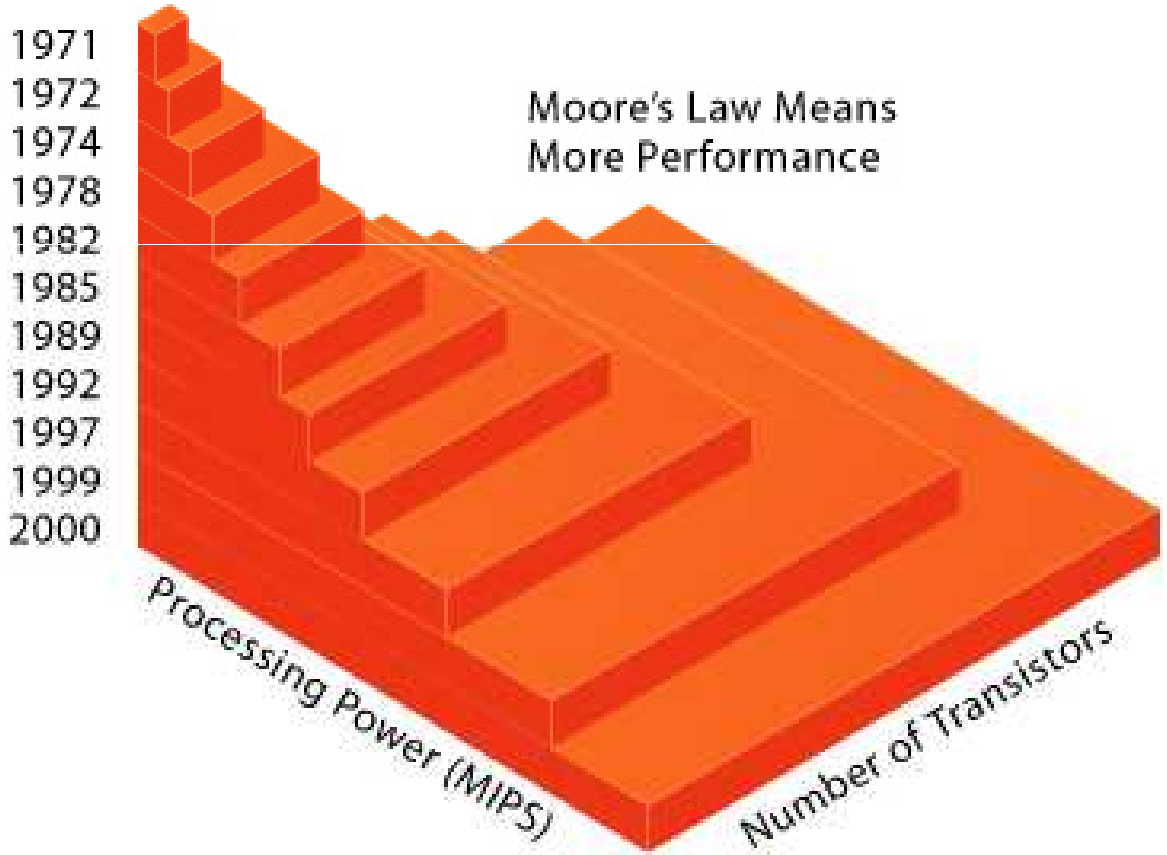
TABLE 6-1 Stages in the IT Infrastructure Evolution

Infrastructure Dimension	Electronic Accounting Machine Era (1930–1950)	Mainframe Era (1959 to Present)	PC Era (1981 to Present)	Client/Server Era (1983 to Present)	Enterprise Era (1992 to Present)
Signature Firm(s)	IBM Burroughs NCR	IBM	Microsoft/Intel Dell HP IBM	Novell Microsoft	SAP Oracle PeopleSoft
Hardware Platform	Programmable card sorters	Centralized mainframe	Wintel computers	Wintel computers	Multiple: • Mainframe • Server • Client
Operating System	Human operators	IBM 360 IBM 370 Unix	DOS/Windows Linux IBM 390	Windows 3.1 Windows Server Linux	Multiple: • Unix/Linux • OS 390 • Windows Server
Application and Enterprise Software	None; application software created by technicians	Few enterprise-wide applications; departmental applications created by in-house programmers	No enterprise connectivity; boxed software	Few enterprise-wide applications; boxed software applications for workgroups and departments	Enterprise-wide applications linked to desktop and departmental applications: • mySAP • Oracle E-Business Suite • PeopleSoft Enterprise One
Networking/ Telecommunications	None	Vendor-provided: • Systems Network Architecture (IBM) • DECNET (Digital) • AT&T voice	None or limited	Novell NetWare Windows 2003 Linux AT&T voice	LAN Enterprise-wide area network (WAN) TCP/IP Internet standards-enabled
System Integration	Vendor-provided	Vendor-provided	None	Accounting and consulting firms Service firms	Software manufacturer Accounting and consulting firms System integration firms Service firms
Data Storage and Database Management	Physical card management	Magnetic storage Flat files Relational databases	DBase II and III Access	Multiple database servers with optical and magnetic storage	Enterprise database servers
Internet Platforms	None	Poor to none	None at first Later browser-	None at first Later:	None in the early years

Data Storage and Database Management	Physical card management	Magnetic storage Flat files Relational databases	DBase II and III Access	Multiple database servers with optical and magnetic storage	Enterprise database servers
Internet Platforms	None	Poor to none	None at first Later browser-enabled clients	None at first Later: • Apache server • Microsoft IIS	None in the early years Later: • Intranet- and Internet-delivered enterprise services • Large server farms

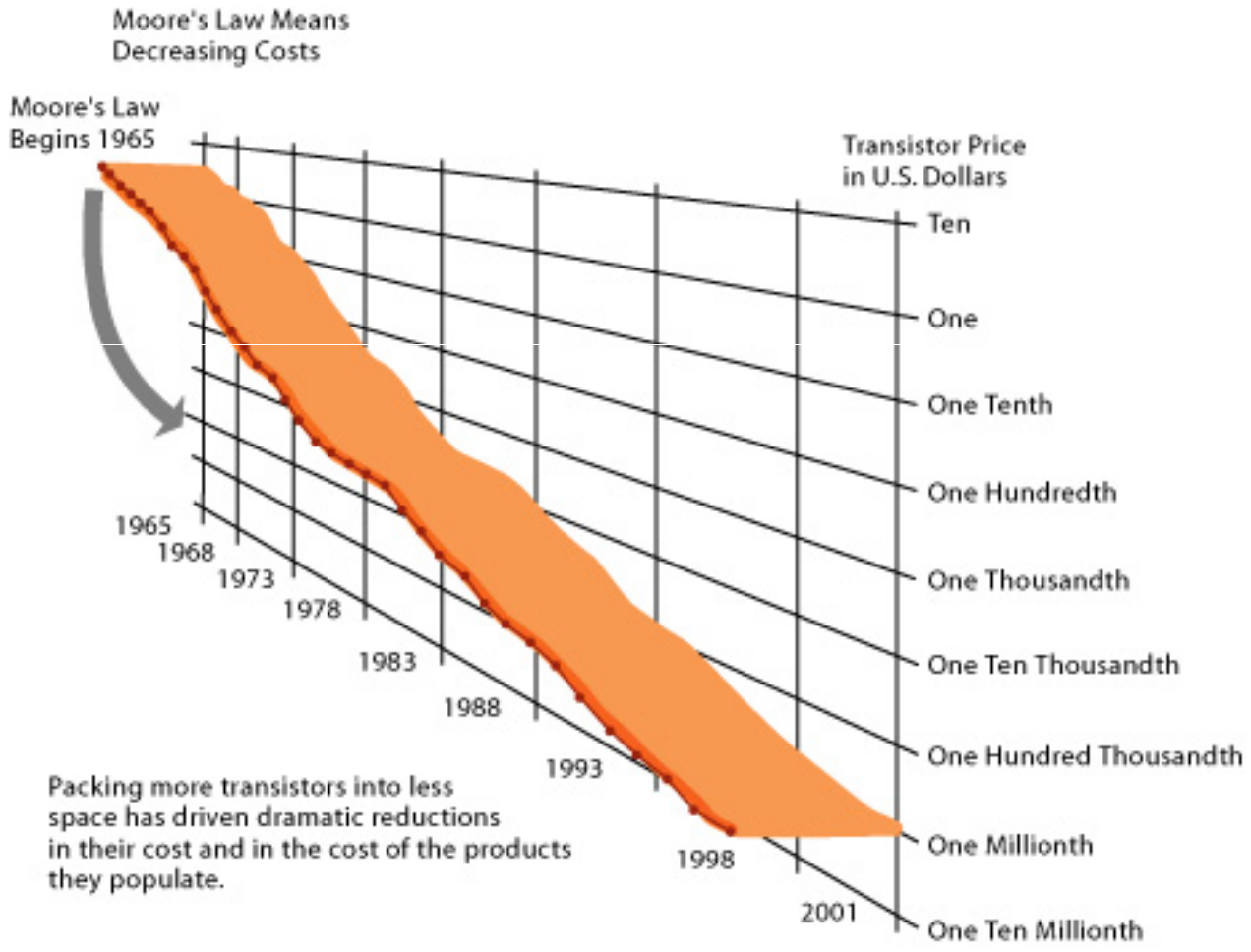
Technology Drivers of Infrastructure Evolution

Moore's Law and microprocessor performance



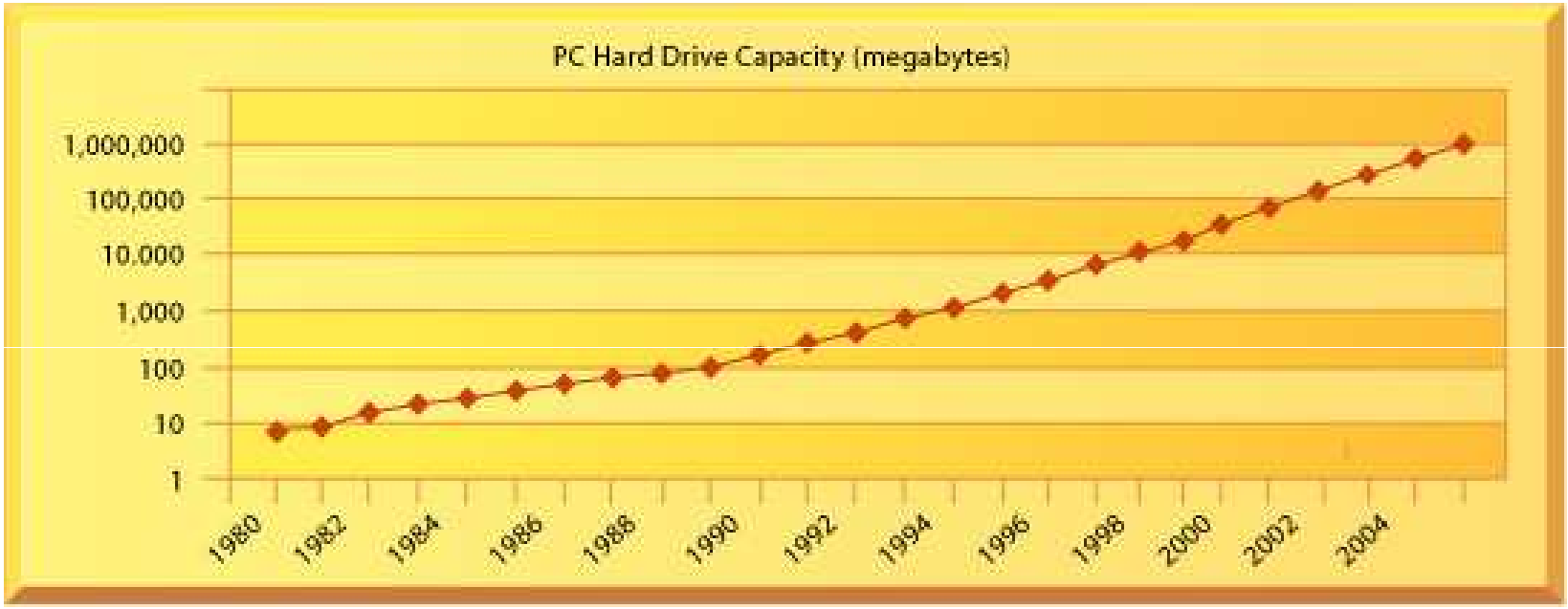
Moore's Law and microprocessor performance

Falling cost of chips



Technology Drivers of Infrastructure Evolution

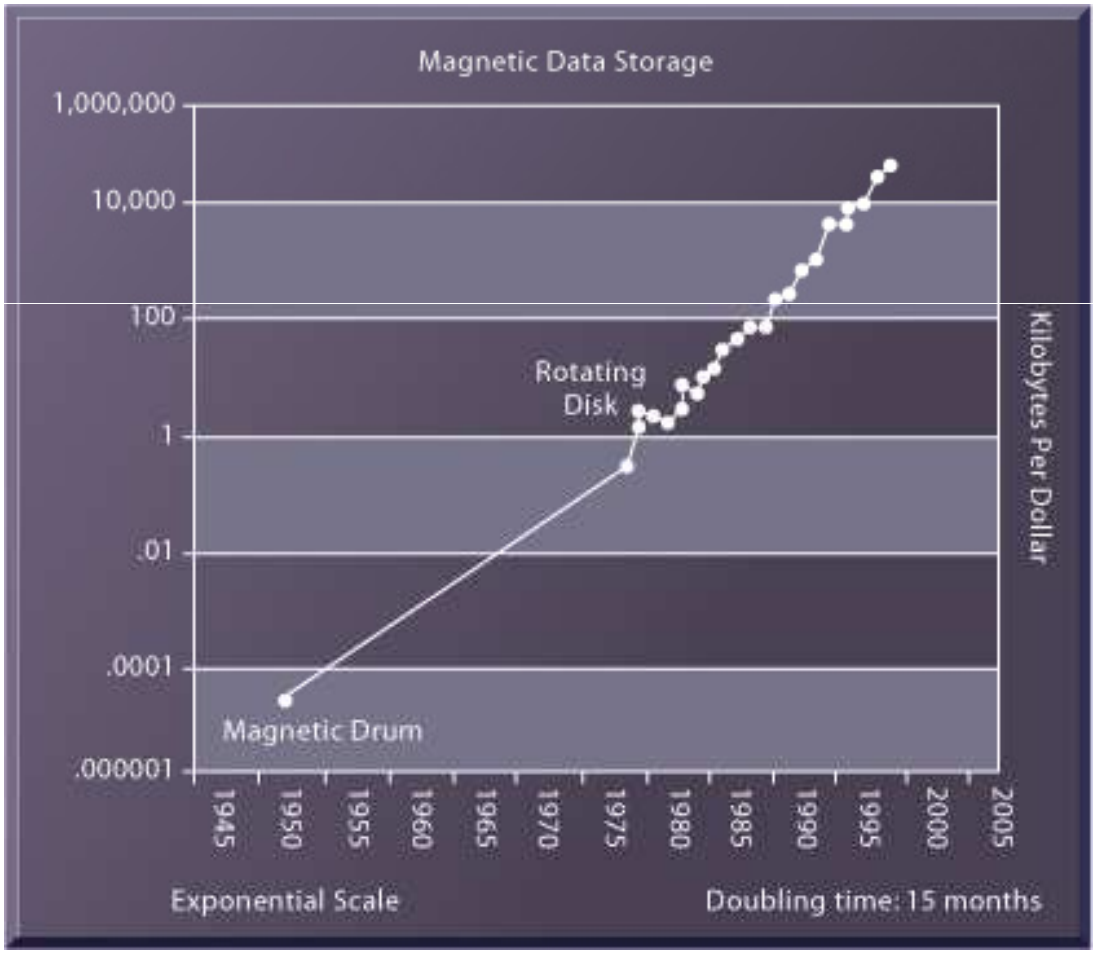
THE LAW OF MASS DIGITAL STORAGE



The capacity of hard disk drives grows exponentially, 1980–2004

THE LAW OF MASS DIGITAL STORAGE

The cost of storing data declines exponentially, 1950–2004



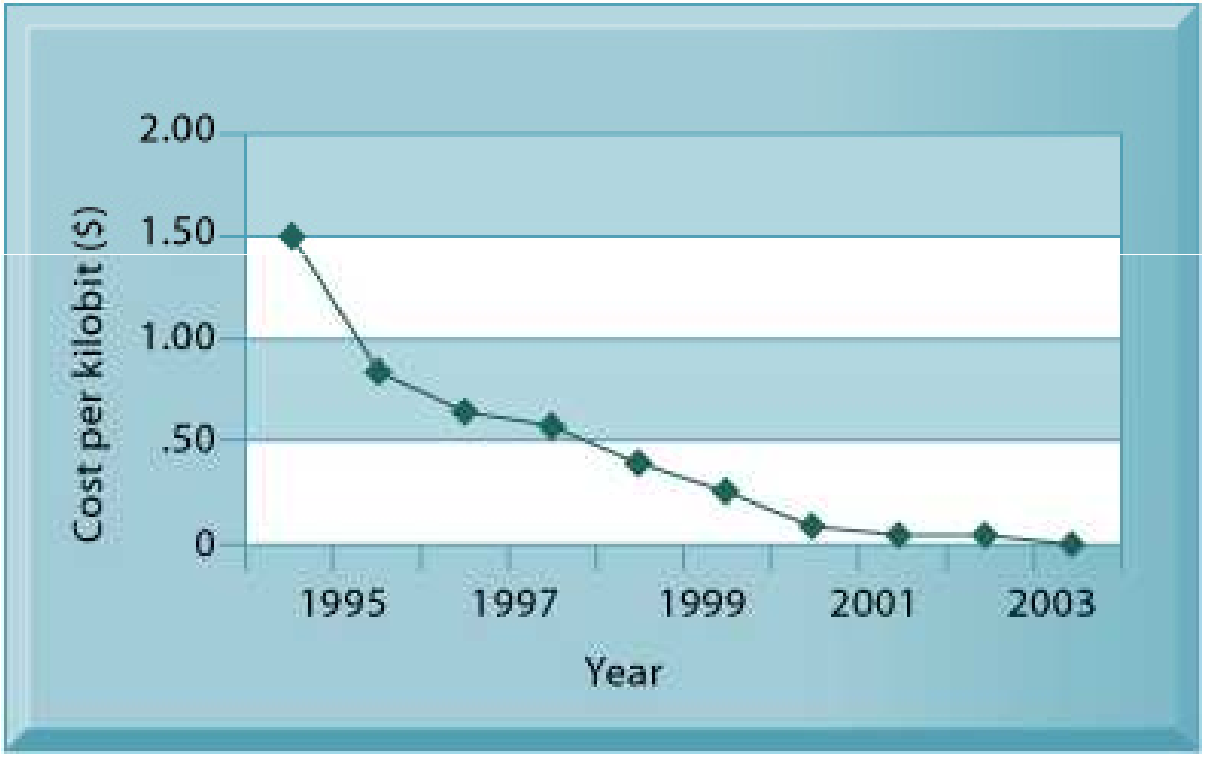
Source: Kurzweill, 2003.

Technology Drivers of Infrastructure Evolution

METCALFE'S LAW AND NETWORK ECONOMICS

The value or power of a network grows exponentially as a function of the number of network members. Metcalfe and others point to the increasing returns to scale that network members receive as more and more people join the network. As the number of members in a network grows linearly, the value of the entire system grows exponentially and theoretically continues to grow forever as members increase.

DECLINING COMMUNICATIONS COSTS AND THE INTERNET



Exponential declines in Internet communications costs

METCALFE'S LAW AND NETWORK ECONOMICS

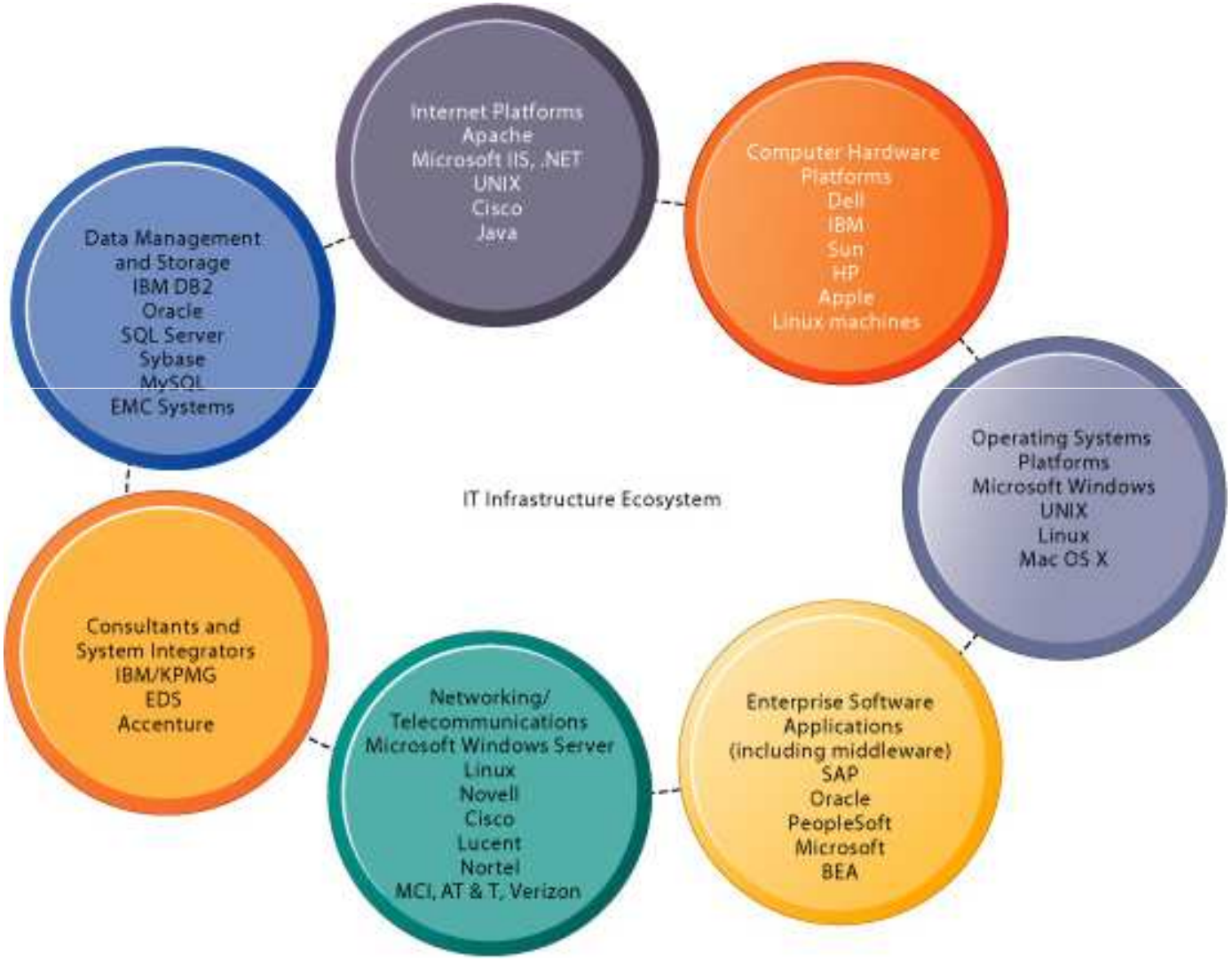
STANDARDS AND NETWORK EFFECTS

Standard	Significance
American Standard Code for Information Interchange (ASCII)(1958)	Made it possible for computer machines from different manufacturers to exchange data; later used as the universal language linking input and output devices such as keyboards and mice to computers. Adopted by the American National Standards Institute in 1963.
Common Business Oriented Language (COBOL) (1959)	An easy-to-use software language that greatly expanded the ability of programmers to write business-related programs and reduced the cost of software. Sponsored by the Defense Department in 1959.
Unix (1969–1975)	A powerful multitasking, multiuser, portable operating system initially developed at Bell Labs (1969) and later released for use by others (1975). It operates on a wide variety of computers from different manufacturers. Adopted by Sun, IBM, HP, and others in the 1980s and became the most widely used enterprise-level operating system.
Transmission Control Protocol/Internet Protocol (TCP/IP) (1974)	Suite of communications protocols and a common addressing scheme that enables millions of computers to connect together in one giant global network (the Internet). Later, it was used as the default networking protocol suite for local area networks and intranets. Developed in the early 1970s for the U.S. Department of Defense.
Ethernet (1973)	A network standard for connecting desktop computers into local area networks that enabled the widespread adoption of client/server computing and local area networks and further stimulated the adoption of personal computers.
IBM/Microsoft/Intel Personal Computer (1981)	The standard Wintel design for personal desktop computing based on standard Intel processors and other standard devices, Microsoft DOS, and later Windows software. The emergence of this standard, low-cost product laid the foundation for a 25-year period of explosive growth in computing throughout all organizations around the globe. Today, more than 1 billion PCs power business and government activities every day.
World Wide Web (1989–1993)	Standards for storing, retrieving, formatting, and displaying information as a worldwide web of electronic pages incorporating text, graphics, audio, and video enables the creation of a global repository of billions of Web pages by 2004.

INFRASTRUCTURE COMPONENTS

- Computer Hardware Platforms
- Operating System Platforms
- Enterprise Software Applications
- Data Management and Storage
- Networking/Telecommunications Platforms
- Internet Platforms
- Consulting and System Integration Services

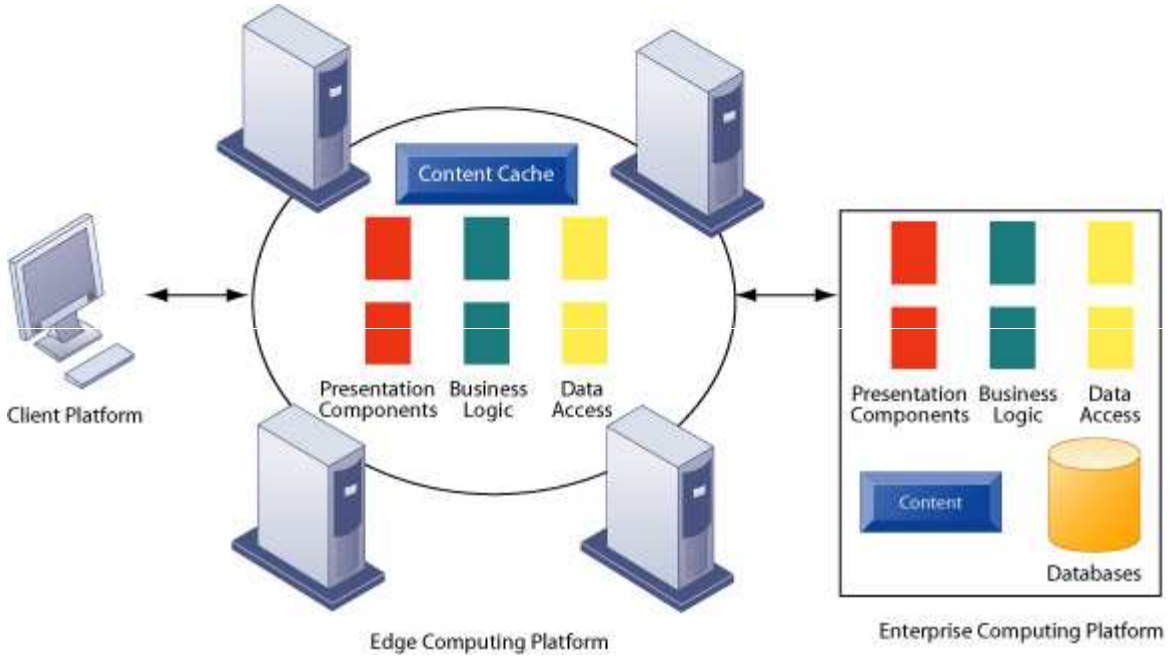
The IT infrastructure ecosystem



CONTEMPORARY HARDWARE PLATFORM TRENDS

- The Integration of Computing and Telecommunications Platforms
- Grid Computing
- On-Demand Computing (Utility Computing)
- Autonomic Computing
- Window on Management
- Edge Computing

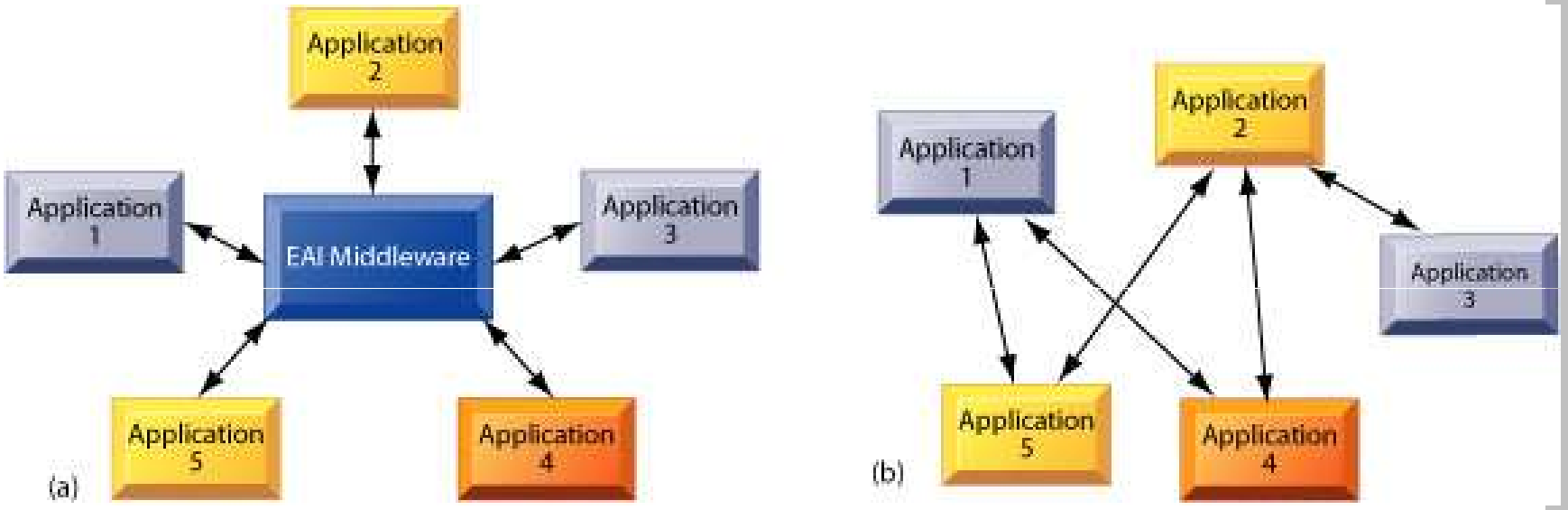
Edge computing platform



CONTEMPORARY SOFTWARE PLATFORM TRENDS

- Linux and open-source software
- Java
- Web services and service-oriented architecture
- Software outsourcing

Enterprise application integration (EAI) software versus traditional integration



How Dollar Rent A Car uses Web services