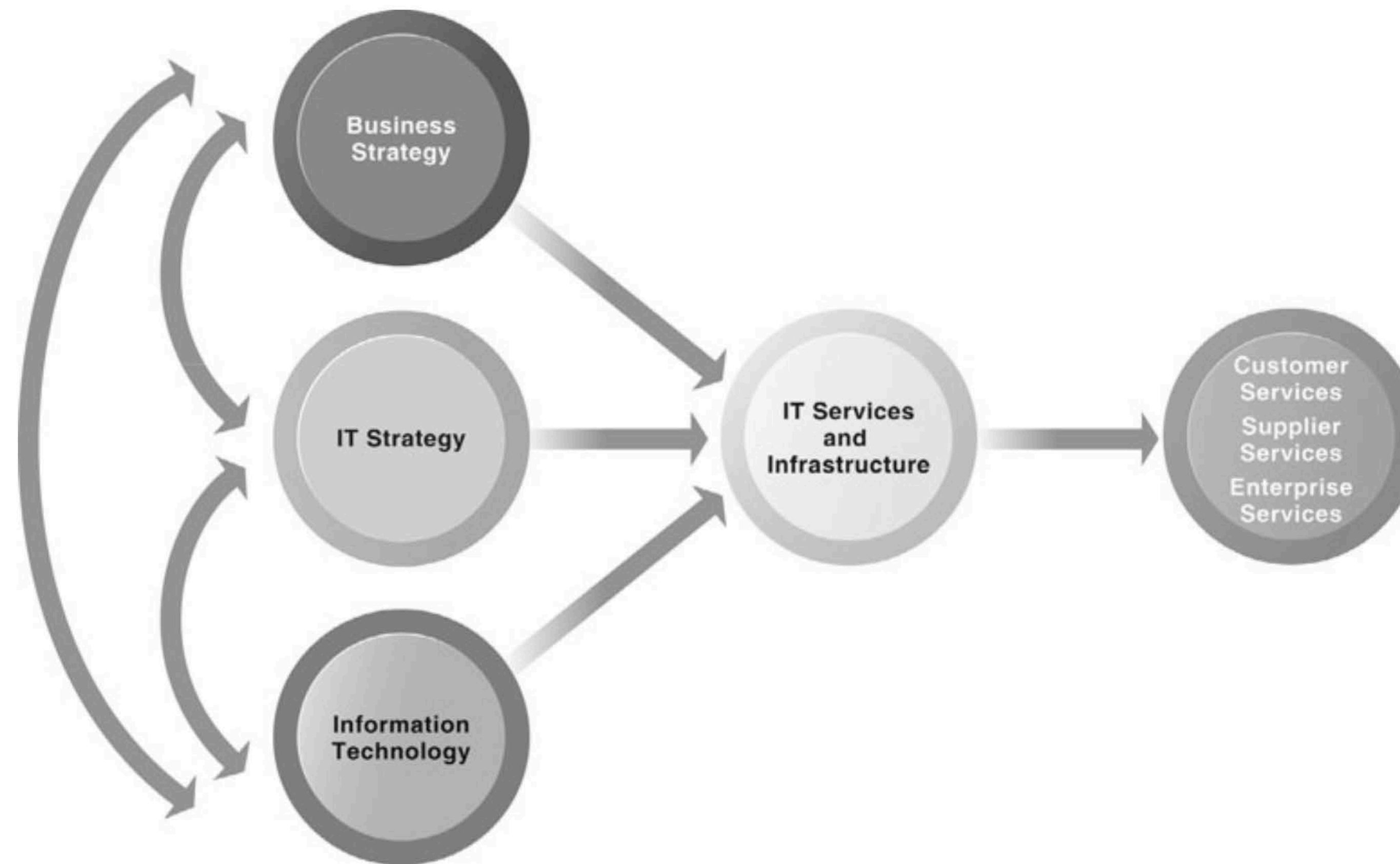


IT Infrastructures and Emerging Technologies

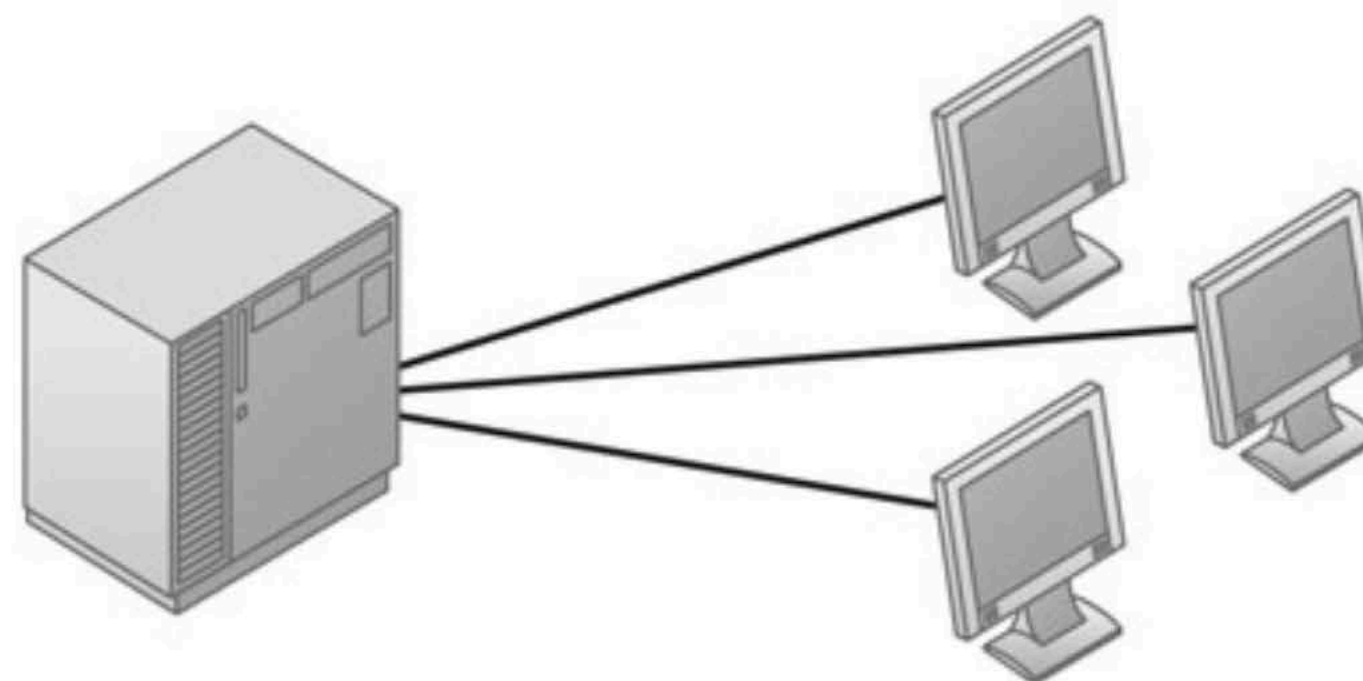
Chapter 5



The services a firm is capable of providing to its customers, suppliers, and employees are a direct function of its IT infrastructure. Ideally, this infrastructure should support the firm's business and information systems strategy. New information technologies have a powerful impact on business and IT strategies, as well as the services that can be provided to customers.

Stages in IT Infrastructure Evolution

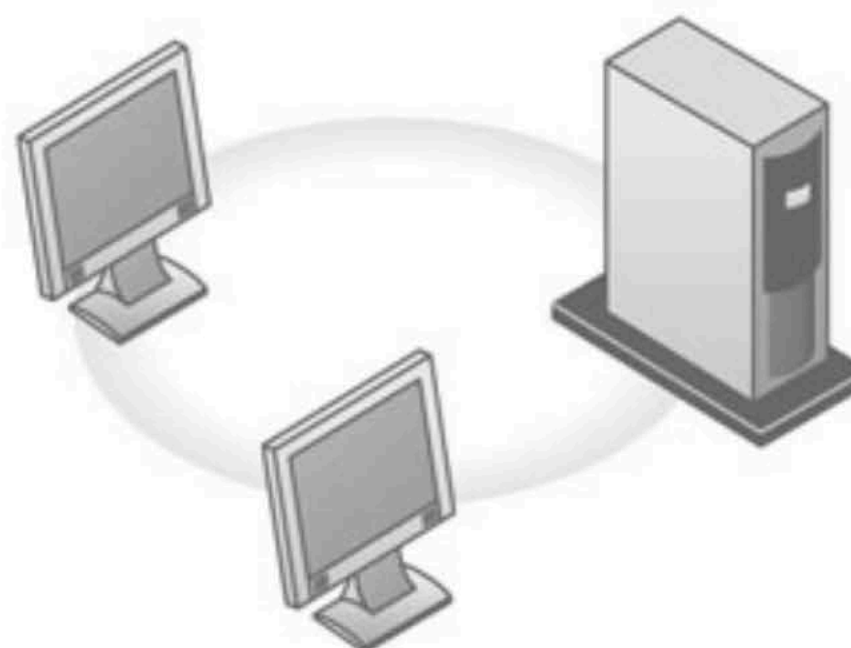
Mainframe/
Minicomputer
(1959–present)



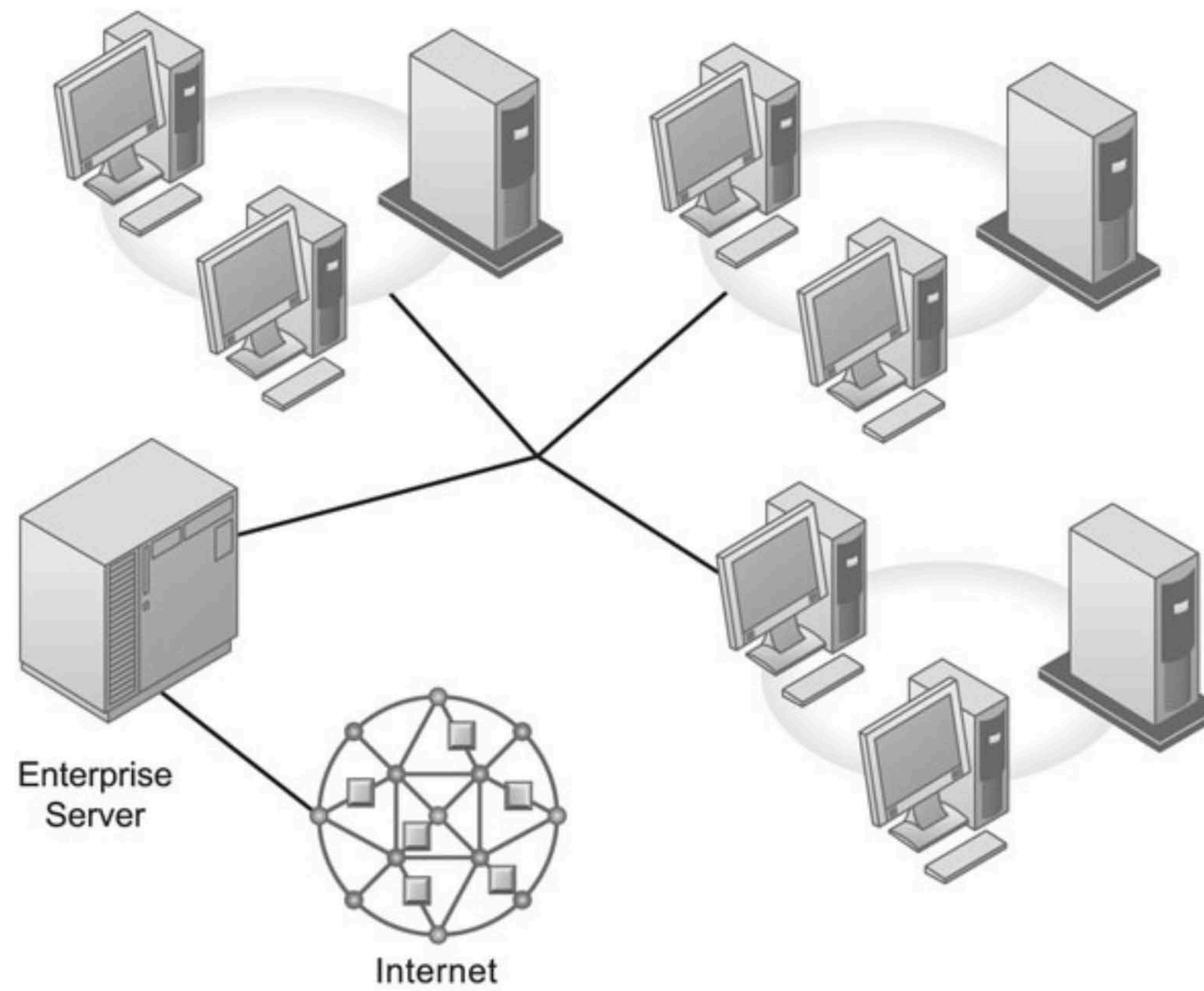
Personal
Computer
(1981–present)



Client/Server
(1983–present)

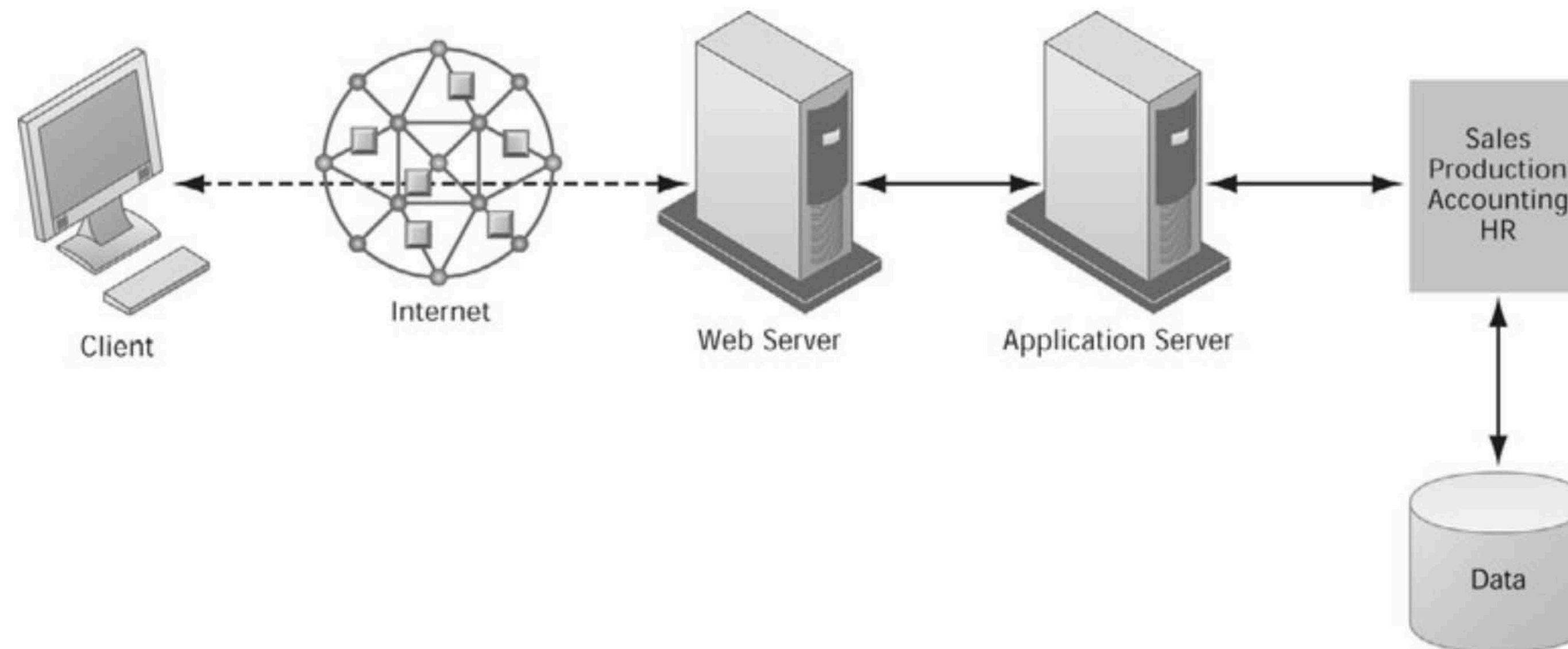


Enterprise
Computing
1992–present)

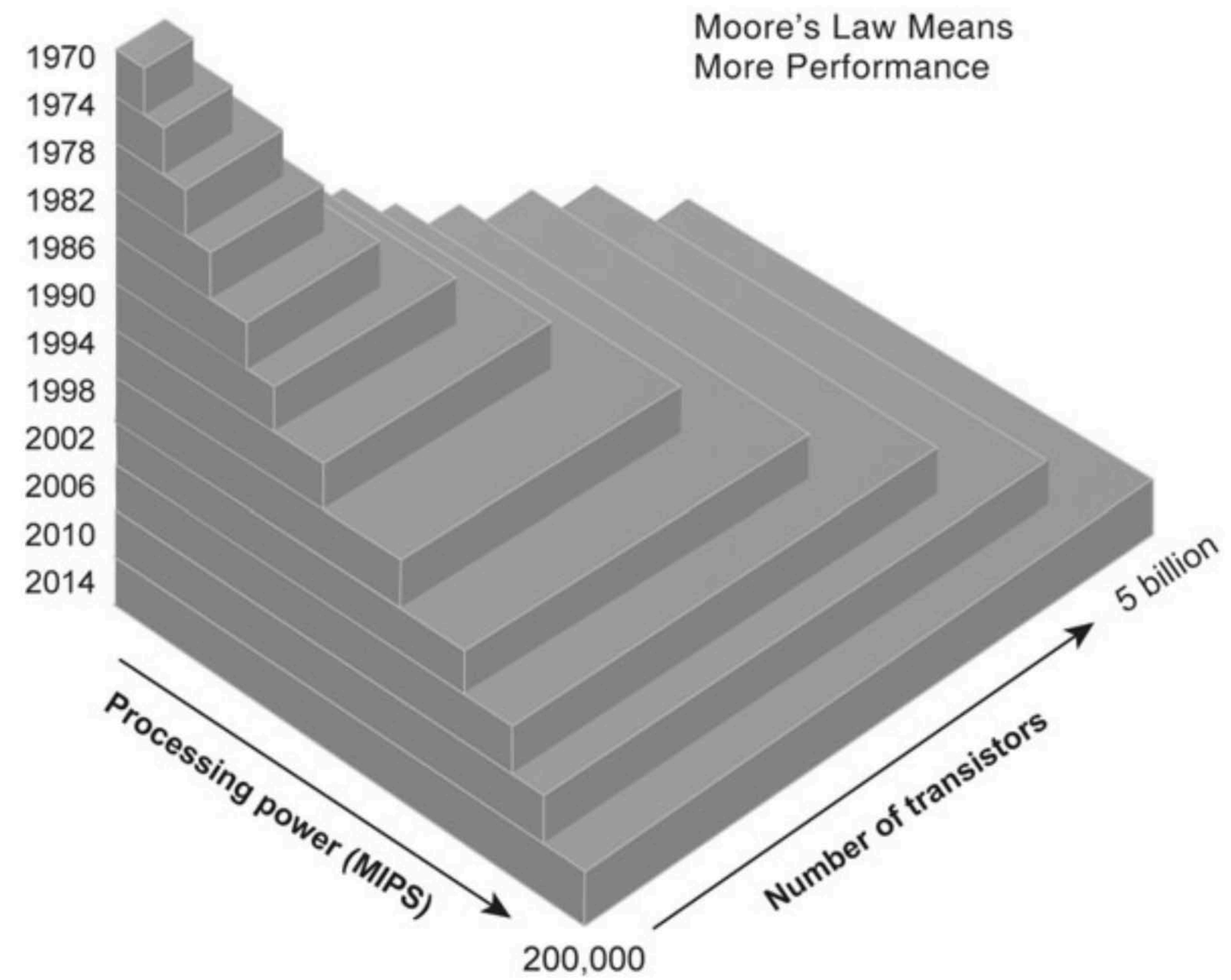


Cloud
Computing
(2000–present)

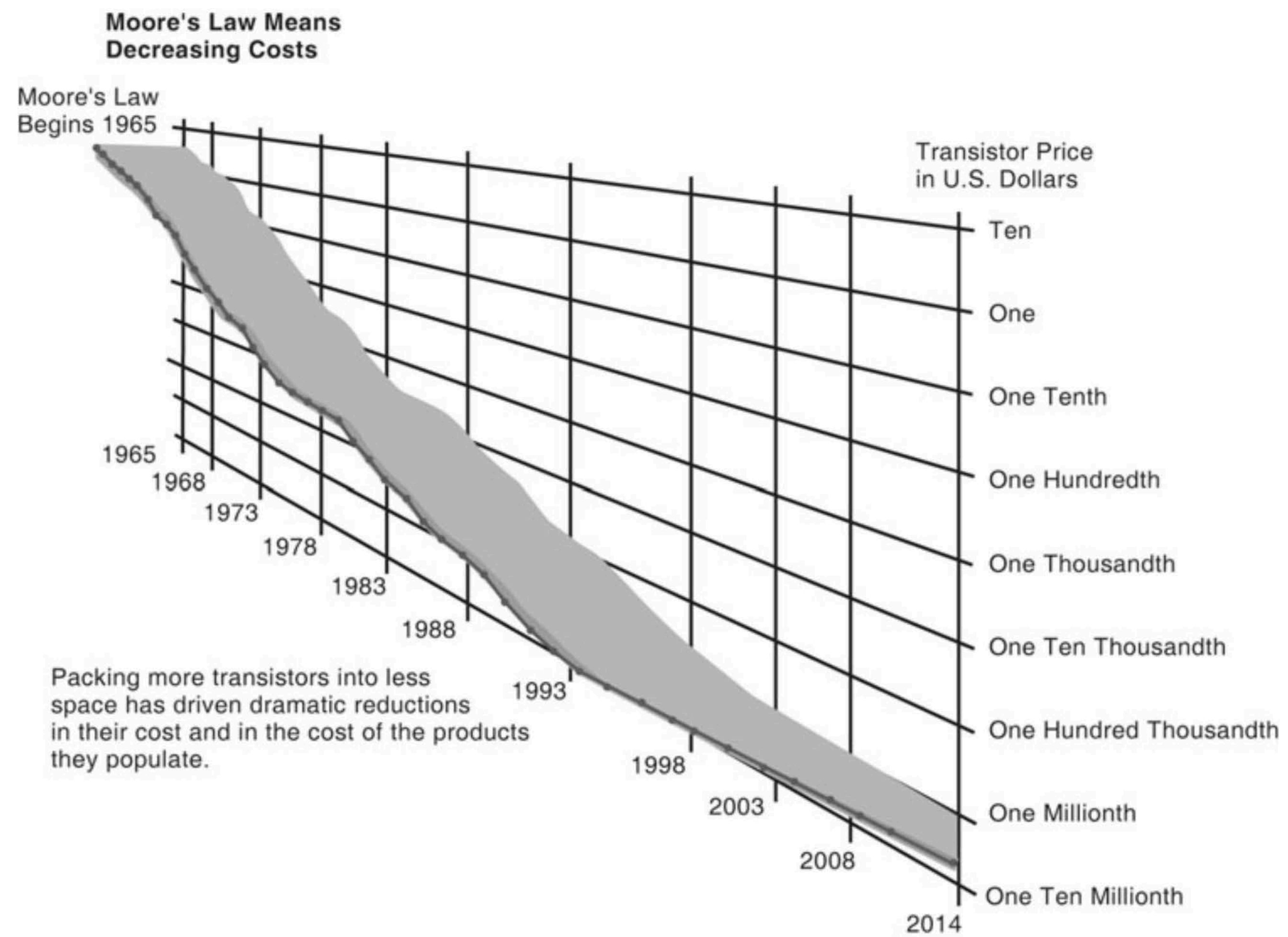


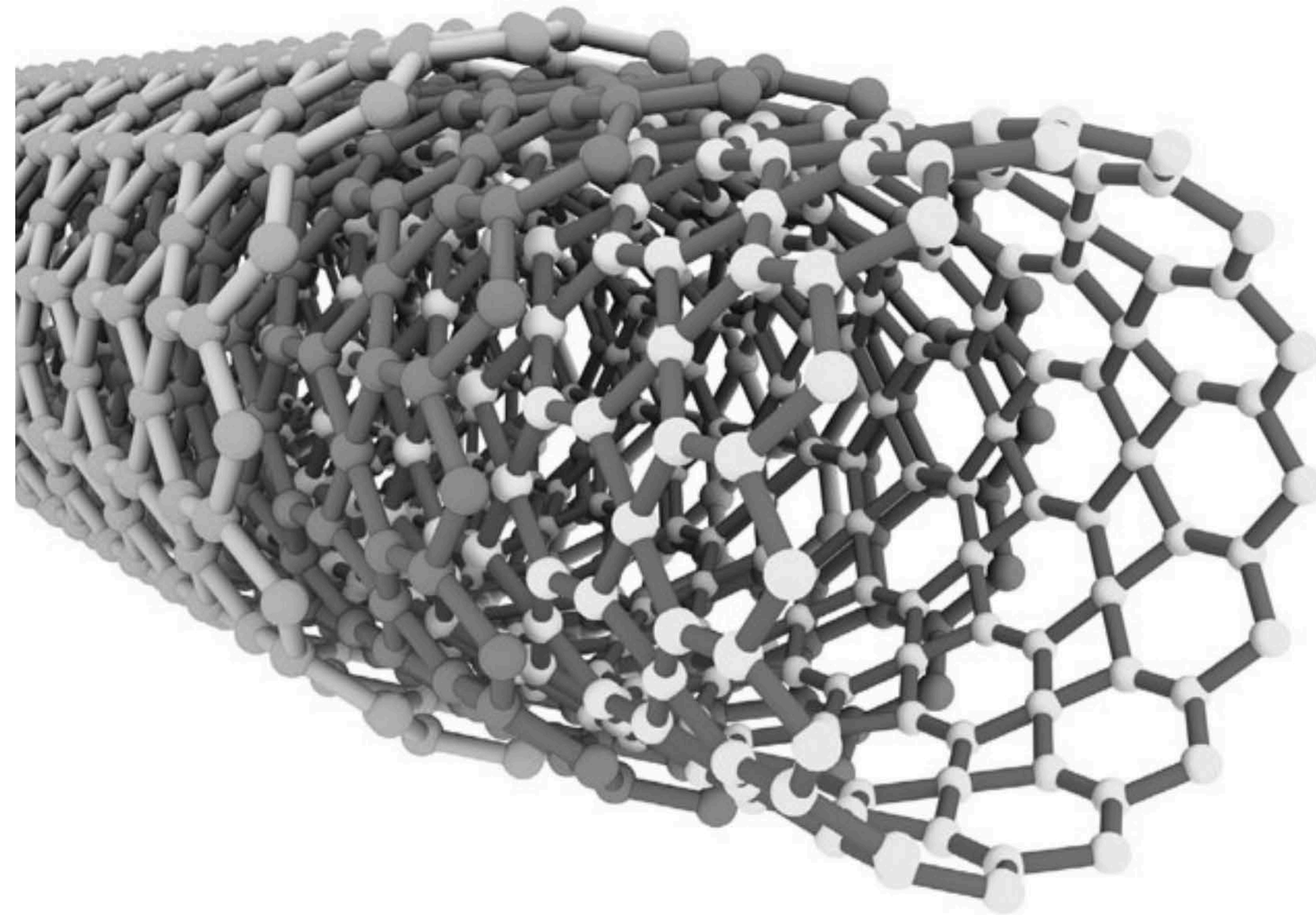


In a multitiered client/server network, client requests for service are handled by different levels of servers.

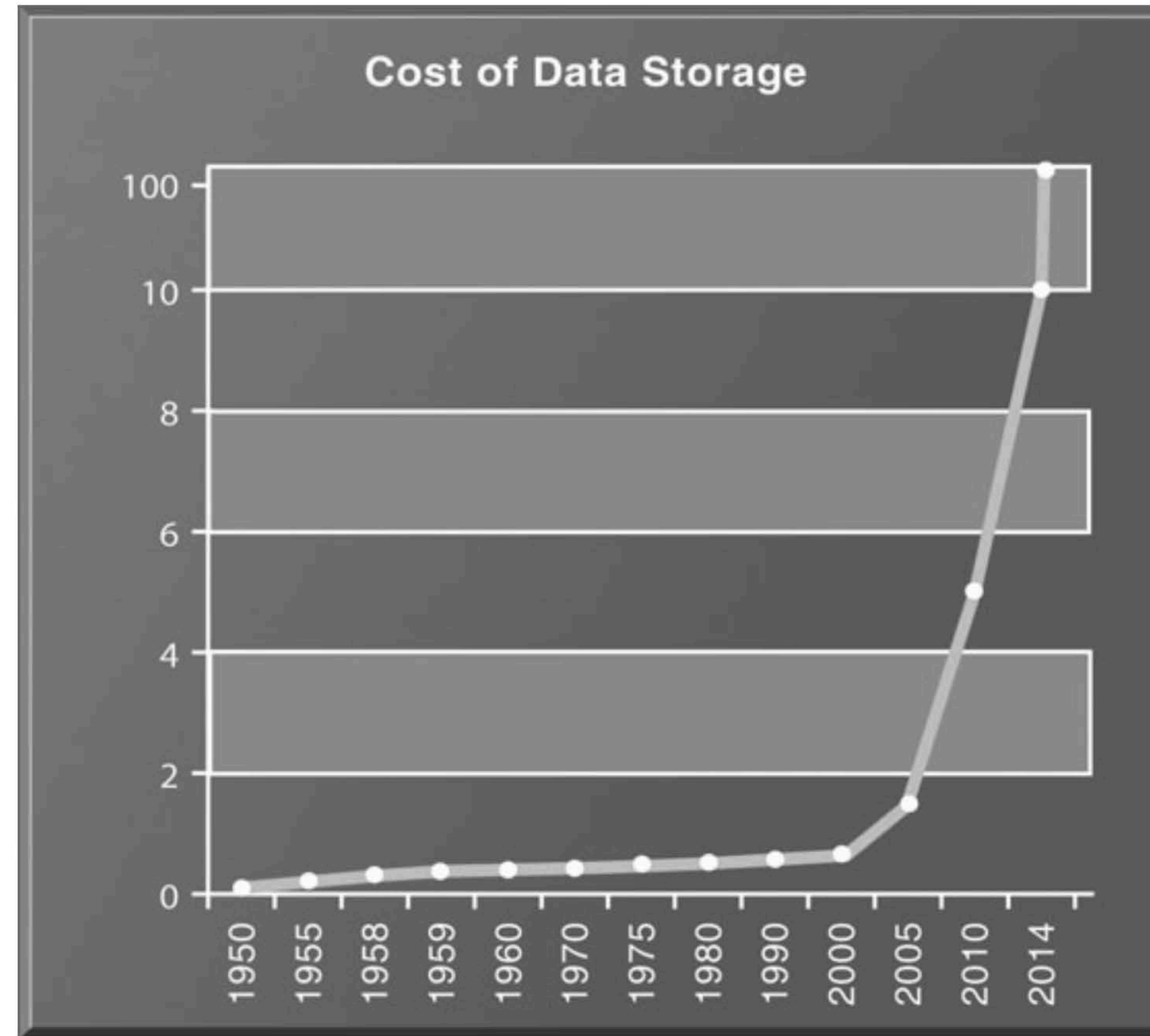


Packing over 5 billion transistors into a tiny microprocessor has exponentially increased processing power. Processing power has increased to over 200,000 MIPS (2.6 billion instructions per second).

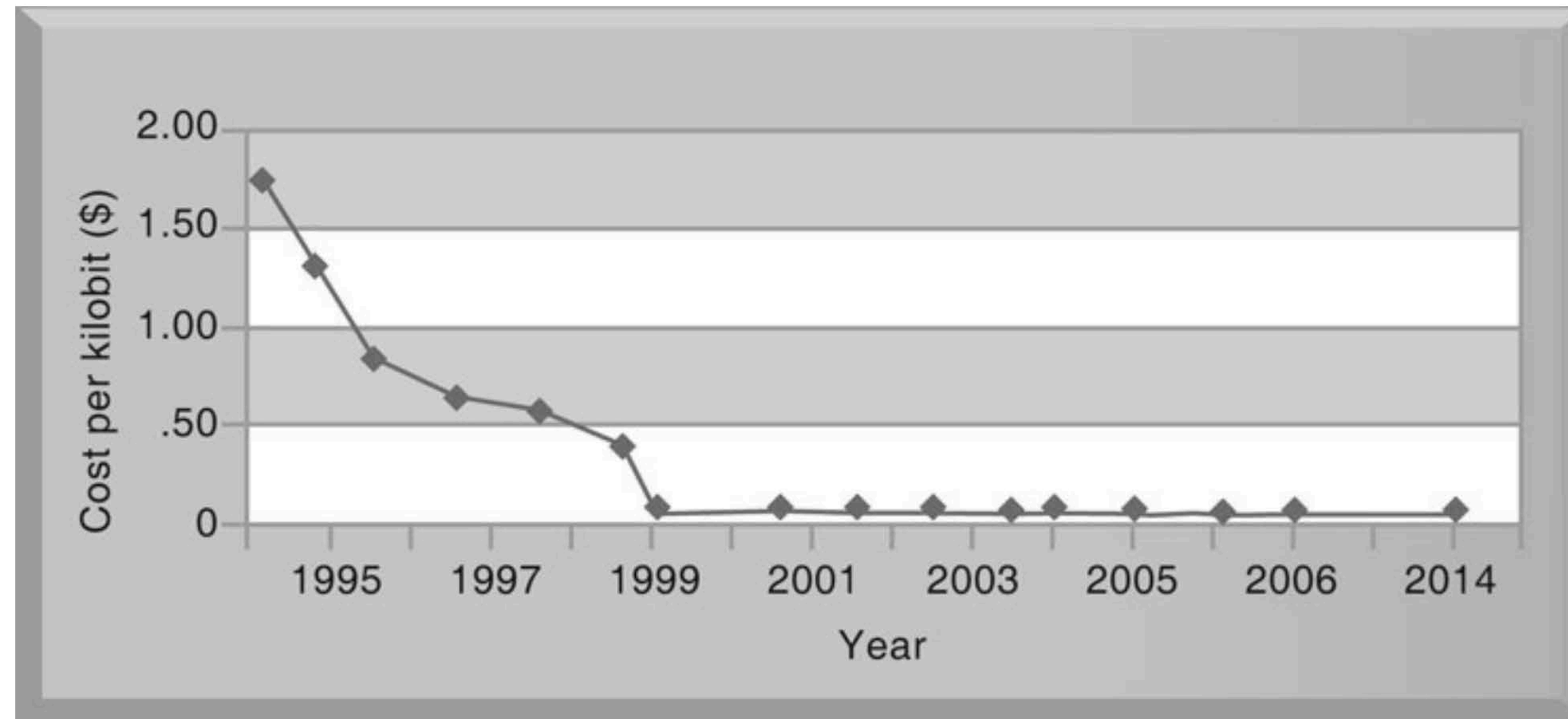




Nanotubes are tiny tubes about 10,000 times thinner than a human hair. They consist of rolled-up sheets of carbon hexagons and have the potential uses as minuscule wires or in ultrasmall electronic devices and are very powerful conductors of electrical current. © Tyler Boyes/Shutterstock.

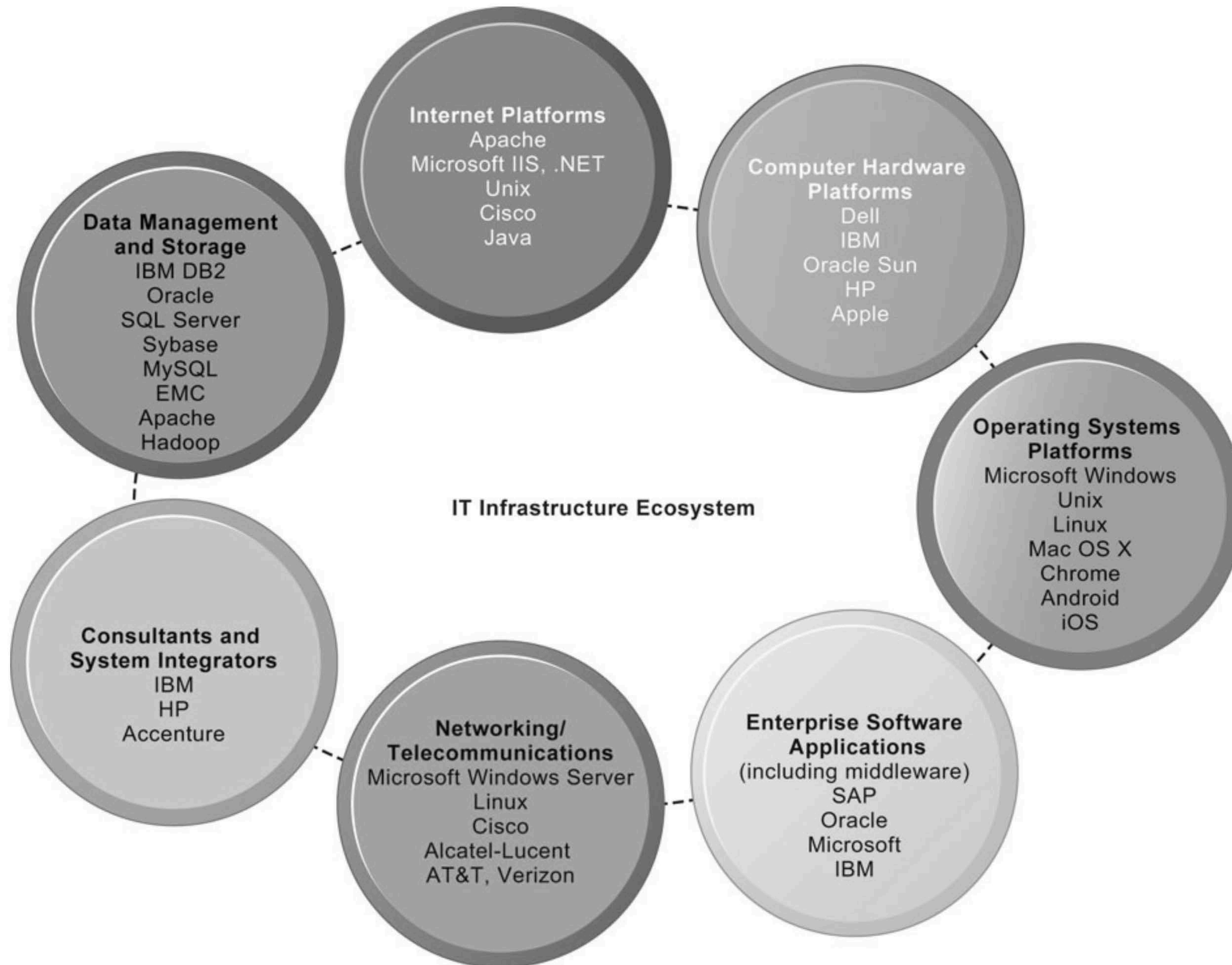


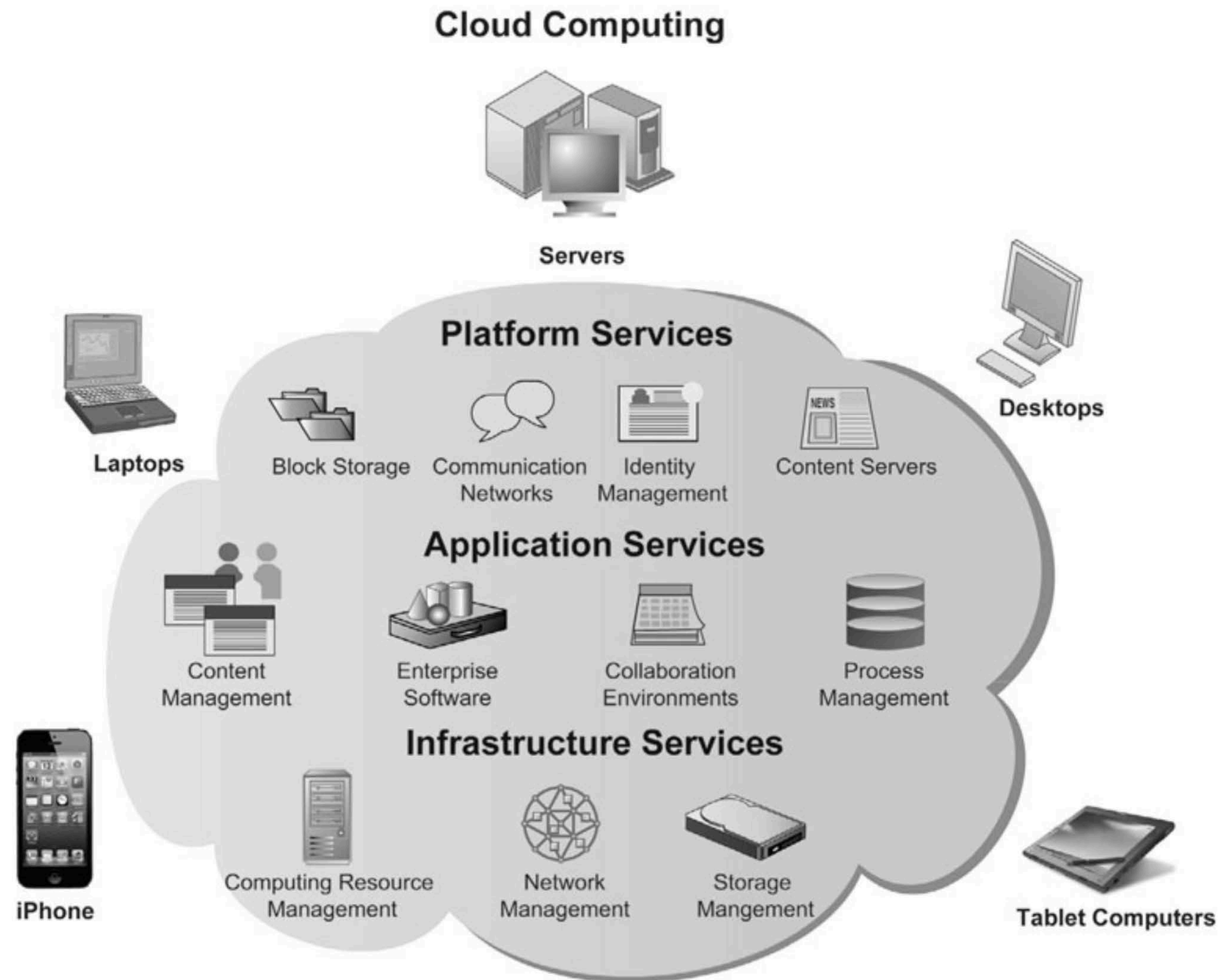
Since the first magnetic storage device was used in 1955, the amount of storage a dollar buys has risen exponentially, doubling the amount of digital storage for each dollar expended every 15 months on average. Cloud storage services provide 100 gigabytes of storage for about \$1.00



One reason for the growth in the Internet population is the rapid decline in Internet connection and overall communication costs. The cost per kilobit of Internet access has fallen exponentially since 1995. Digital subscriber line (DSL) and cable modems now deliver a kilobit of communication for a retail price of less than one penny.

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, it 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 creation of a global repository of billions of Web pages.





In cloud computing, hardware and software capabilities are a pool of virtualized resources provided over a network, often the Internet. Businesses and employees have access to applications and IT infrastructure anywhere, at any time, and on any device.

PLAIN ENGLISH

XML

Subcompact

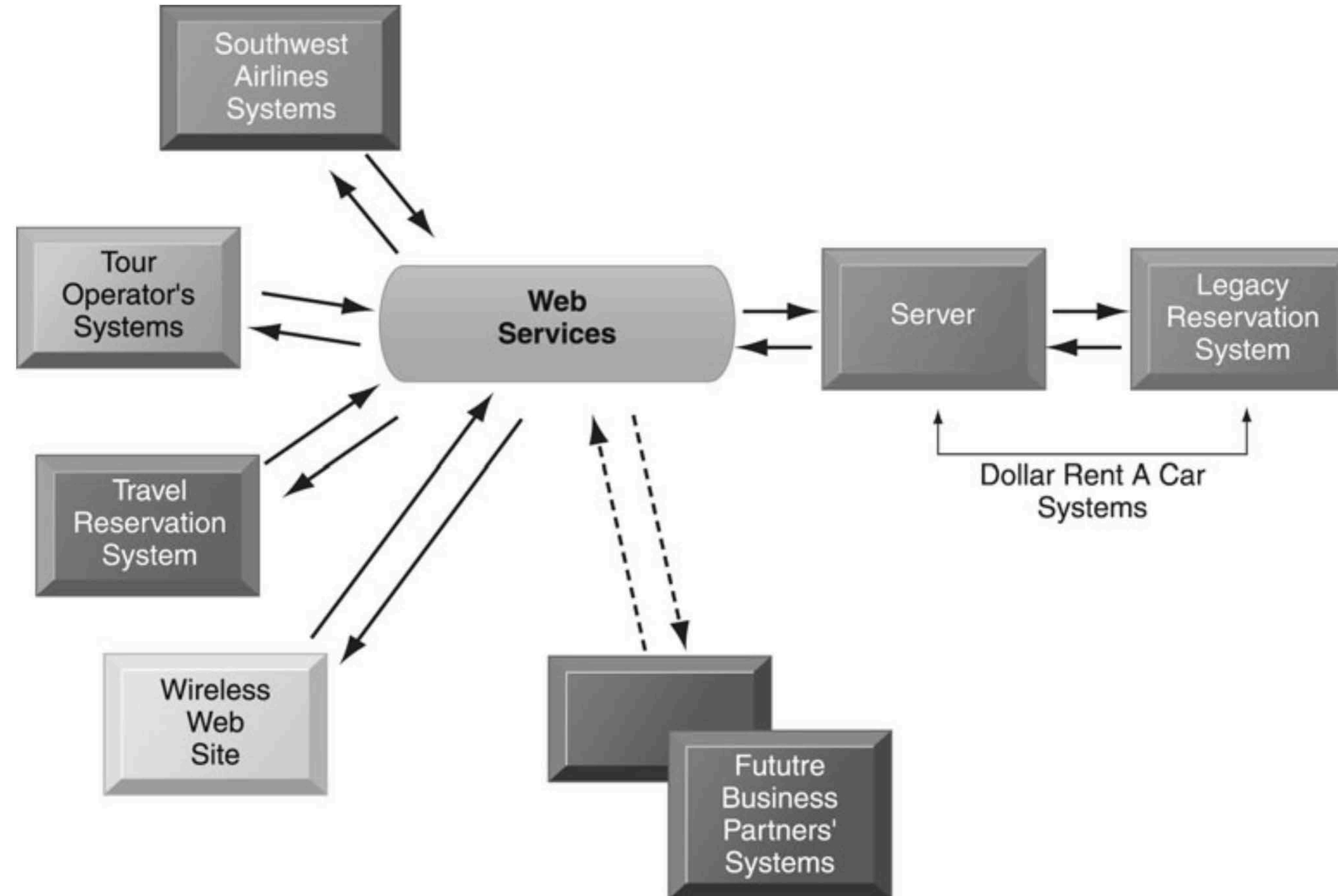
<AUTOMOBILETYPE="Subcompact">

4 passenger

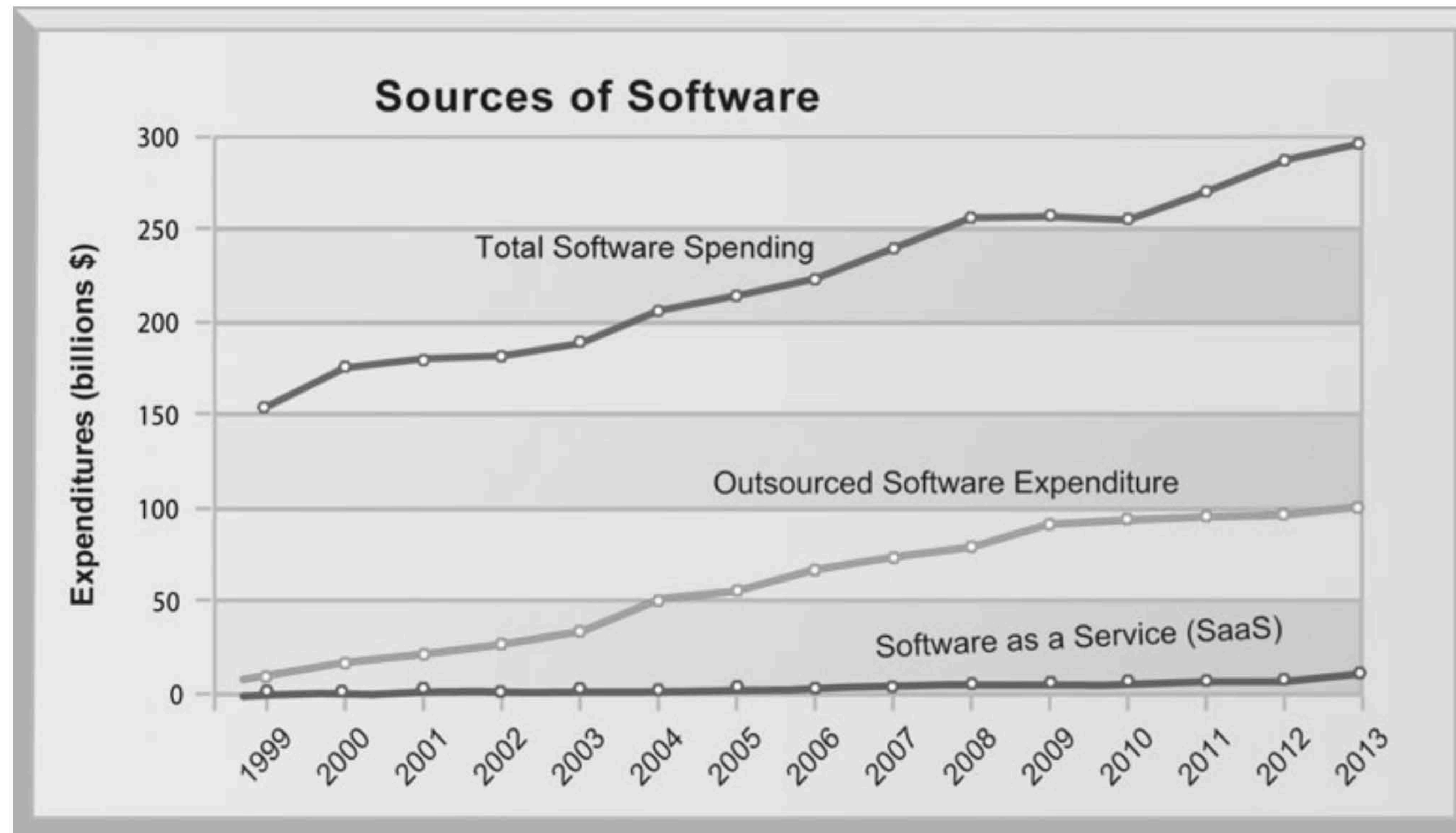
<PASSENGERUNIT="PASS">4</PASSENGER>

\$16,800

<PRICE CURRENCY="USD">\$16,800</PRICE>

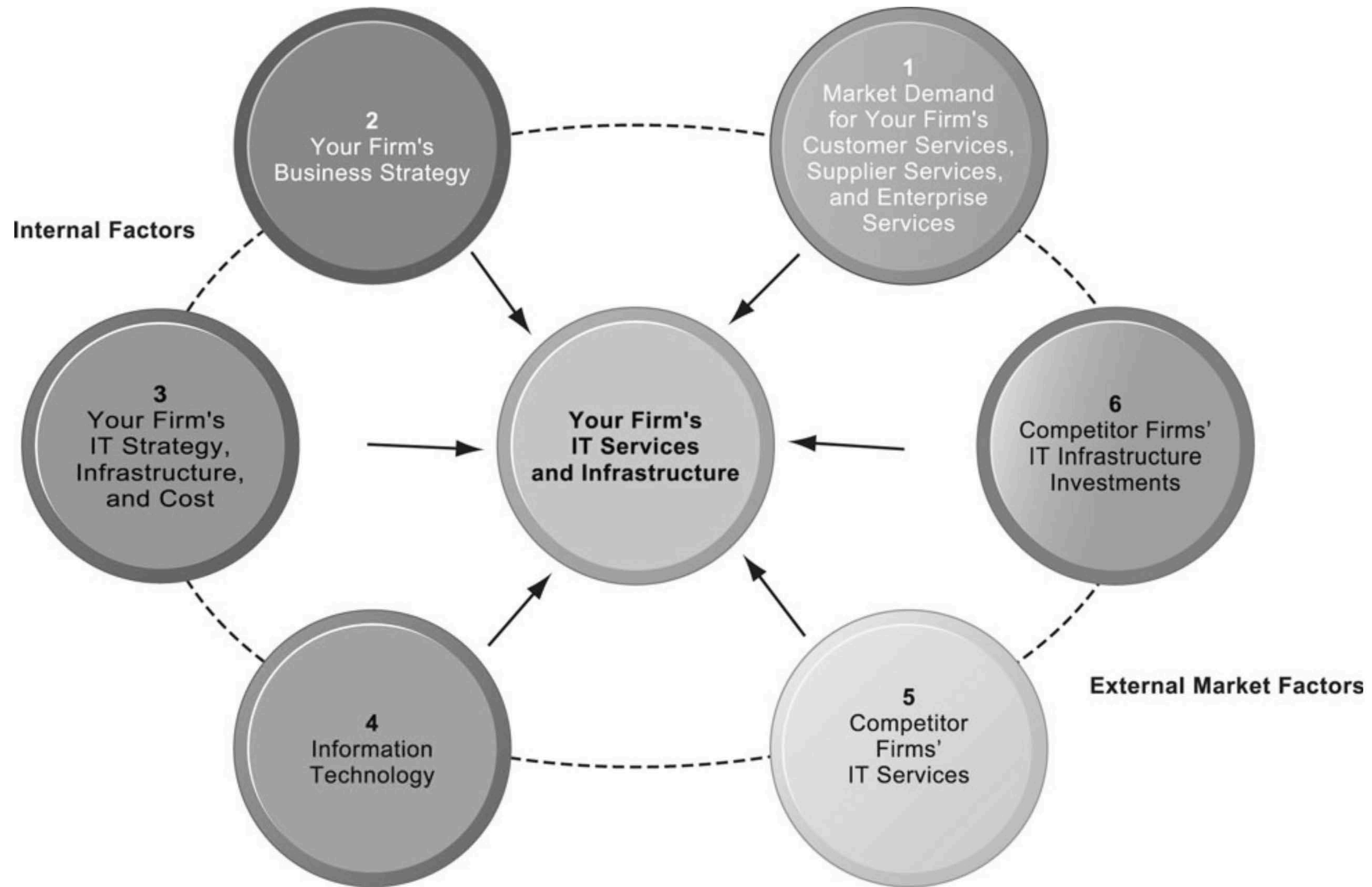


Dollar Rent A Car uses Web services to provide a standard intermediate layer of software to “talk” to other companies’ information systems. Dollar Rent A Car can use this set of Web services to link to other companies’ information systems without having to build a separate link to each firm’s systems.



In 2014, U.S. firms will spend over \$279 billion on software. About 35 percent of that will originate outside the firm, either from enterprise software vendors selling firmwide applications or individual application service providers leasing or selling software modules. Another 4 percent (\$11 billion) will be provided by SaaS vendors as an online cloud-based service.

INFRASTRUCTURE COMPONENT	COST COMPONENTS
Hardware acquisition	Purchase price of computer hardware equipment, including computers, terminals, storage, and printers
Software acquisition	Purchase or license of software for each user
Installation	Cost to install computers and software
Training	Cost to provide training for information systems specialists and end users
Support	Cost to provide ongoing technical support, help desks, and so forth
Maintenance	Cost to upgrade the hardware and software
Infrastructure	Cost to acquire, maintain, and support related infrastructure, such as networks and specialized equipment (including storage backup units)
Downtime	Cost of lost productivity if hardware or software failures cause the system to be unavailable for processing and user tasks
Space and energy	Real estate and utility costs for housing and providing power for the technology



1. *What is IT infrastructure and what are the stages and drivers of IT infrastructure evolution?*

IT infrastructure is the shared technology resources that provide the platform for the firm's specific information system applications. IT infrastructure includes hardware, software, and services that are shared across the entire firm.

The five stages of IT infrastructure evolution are: the mainframe era, the personal computer era, the client/server era, the enterprise computing era, and the cloud and mobile computing era. Moore's Law deals with the exponential increase in processing power and decline in the cost of computer technology, stating that every 18 months the power of microprocessors doubles and the price of computing falls in half. The Law of Mass Digital Storage deals with the exponential decrease in the cost of storing data, stating that the number of kilobytes of data that can be stored on magnetic media for \$1 roughly doubles every 15 months. Metcalfe's Law states that a network's value to participants grows exponentially as the network takes on more members. The rapid decline in costs of communication and growing agreement in the technology industry to use computing and communications standards is also driving an explosion of computer use.

2. *What are the components of IT infrastructure?*

Major IT infrastructure components include computer hardware platforms, operating system platforms, enterprise software platforms, networking and telecommunications platforms, database management software, Internet platforms, and consulting services and systems integrators.

3. *What are the current trends in computer hardware platforms?*

Increasingly, computing is taking place on a mobile digital platform. Quantum computing is an emerging technology that could dramatically boost processing power through the ability to be in more than one state at the same time. Consumerization of IT is the business use of information technology that originated in the consumer market. Virtualization organizes computing resources so that their use is not restricted by physical configuration or geographic location. In cloud computing, firms and individuals obtain computing power and software as services over a network, including the Internet, rather than purchasing and installing the hardware and software on their own computers. A

multicore processor is a microprocessor to which two or more processing cores have been attached for enhanced performance. Green computing includes practices and technologies for producing, using, and disposing of information technology hardware to minimize negative impact on the environment.

4. *What are the current trends in computer software platforms?*

Open source software is produced and maintained by a global community of programmers and is often downloadable for free. Linux is a powerful, resilient open source operating system that can run on multiple hardware platforms and is used widely to run Web servers. Java is an operating-system- and hardware-independent programming language that is the leading interactive programming environment for the Web. HTML5 makes it possible to embed images, audio, and video directly into a Web document without add-on programs. Web services are loosely coupled software components based on open Web standards that work with any application software and operating system. They can be used as components of Web-based applications linking the systems of two different organizations or to link disparate systems of a single company. Companies are purchasing their new software applications from outside sources, including software packages, by outsourcing custom application development to an external vendor (that may be offshore), or by renting online software services (SaaS). Mashups combine two different software services to create new software applications and services. Apps are small pieces of software that run on the Internet, on a computer, or on a mobile phone and are generally delivered over the Internet.

5. *What are the challenges of managing IT infrastructure and management solutions?*

Major challenges include dealing with platform and infrastructure change, infrastructure management and governance, and making wise infrastructure investments. Solution guidelines include using a competitive forces model to determine how much to spend on IT infrastructure and where to make strategic infrastructure investments, and establishing the total cost of ownership (TCO) of information technology assets. The total cost of owning technology resources includes not only the original cost of computer hardware and software but also costs for hardware and software upgrades, maintenance, technical support, and training.

Android, 215
Application server, 206
Apps, 232
Blade servers, 214
Chrome OS, 215
Clients, 205
Client/server computing, 205
Cloud computing, 207
Consumerization of IT, 217
Extensible Markup Language (XML), 228
Green computing, 225
HTML (Hypertext Markup Language), 227
HTML5, 227
Hybrid cloud, 225
iOS, 215
Java, 226
Legacy systems, 216
Linux, 214
Mainframe, 203
Mashup, 231
Minicomputers, 205
Moore's Law, 207
Multicore processor, 225
Multitiered (N-tier) client/server architecture, 206
Multitouch, 215
Nanotechnology, 208

On-demand computing, 222
Open source software, 226
Operating system, 214
Outsourcing, 230
Private cloud, 222
Public cloud, 222
Quantum computing, 220
SaaS (Software as a Service), 231
Scalability, 233
Service level agreement (SLA), 231
Server, 205
Service-oriented architecture (SOA), 228
Software package, 230
Storage area network (SAN), 215
Tablet computers, 217
Technology standards, 211
Total cost of ownership (TCO), 234
Unix, 214
Virtualization, 220
Web browser, 227
Web hosting service, 216
Web server, 206
Web services, 227
Windows, 206
Windows 8, 215
Wintel PC, 205