Significant of Cloud Computing

- A startup leases cloud facilities for its web site; the company can pay for additional facilities as web traffic grows.
- An individual uses a smart phone to check *Internet of Things* (*IoT*) devices in their residence.
- An enterprise company leases facilities and software for business functions, such as payroll, accounting, and billing.

- A patient wears a medical device that periodically uploads readings for analysis; their doctor is alerted if a medical problem is detected.
- A seasonal company leases computing facilities during four peak months each year; the company doesn't pay for facilities at other times.
- A retail company leases facilities at the end of each fiscal year to run data analytics software that analyzes sales for the year.
- An individual uses a streaming service to watch a movie; a copy of the movie is kept in a facility near the family's residence.
- The recipient of a package uses a tracking number to learn about the current location of the package and the expected delivery time.

- *Cloud computing allows each customer to increase or decrease their use of cloud facilities at any time; a customer only pays for the facilities they use.*

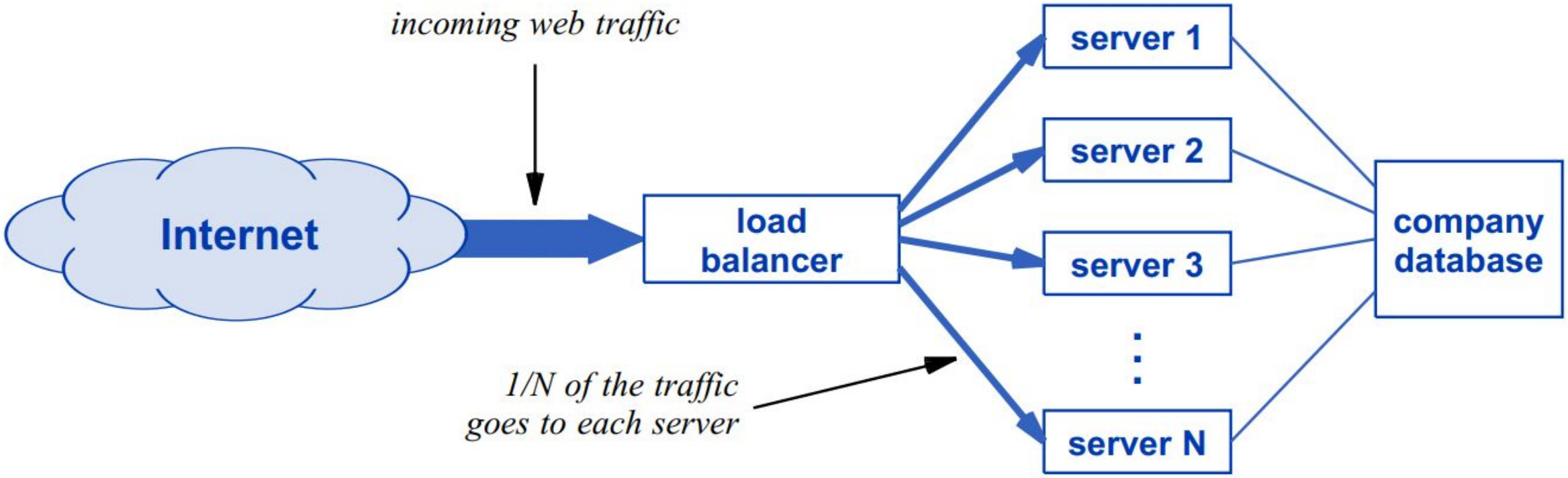

Figure 1.1 Illustration of a load balancer used to divide incoming network traffic among a set of computers.

Racks of Server Computers

In practice, additional constraints usually mean that a rack is not full of servers.

For example, at least one slot in a rack (usually the top of the rack) contains a network switch used to provide network connections for the servers in the rack. In addition, some slots may be left empty to allow air flow to keep the servers from overheating.

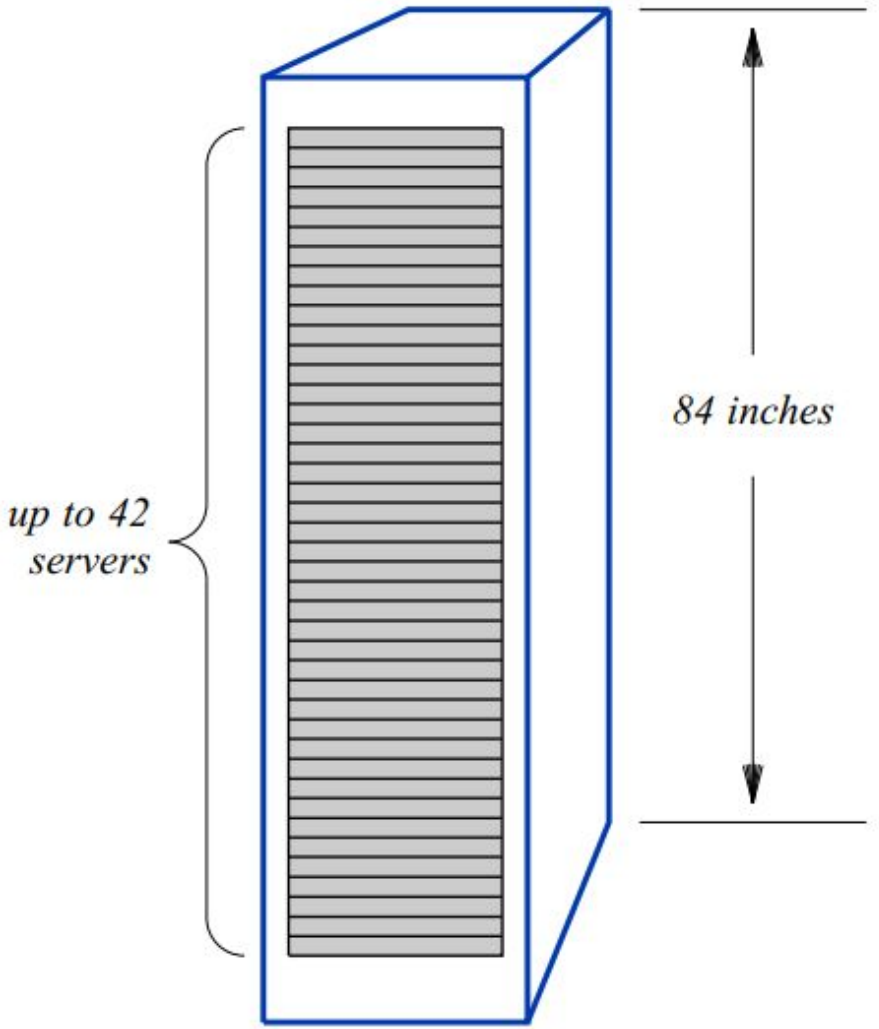

Figure 1.2 Illustration of a rack that holds multiple servers.

Elastic Computing (Dynamic Services)

- A user can change the allocation dynamically, adding servers during peak times and decreasing the number of servers during times they are not needed.
- We use the term *elastic computing* to describe or dynamic service.

- *Virtualized servers*
- A user runs software on dedicated physical server that allows to create a set of *virtualized servers.*

Because virtualization technologies guarantee isolation, a cloud provider can place virtualized servers on physical servers without regard to the owner, the apps they will run, or the data they will handle.

In particular, isolation allows a provider to mix virtualized servers from multiple customers on the same physical server without any interference and without any chance of data from one customer's virtualized server "leaking" to another customer.

Virtualized servers provides invaluable advantages for cloud providers, including the ability to scale the service and to balance the load and avoid overloading a physical server while other physical servers remain idle.

A virtualized server appears to act like a physical server and apps running on a virtualized server can communicate over the Internet.

Advantages virtualization

- Ease of creating and deploying new services.
- Cloud providers and third-party vendors offer software that makes it easy to create new apps for a cloud environment.
- Rapid scaling of a service.
- Scaling an app to handle more users means adding more copies.
- If an app runs on virtualized servers, new copies can be created quickly (e.g., as requests arrive over the Internet).
- Safe and rapid testing of new software or new versions.
- Deploying new apps or new versions of software, most large organizations deploy the software on an isolated test system before installing it in production.
- Virtualized servers allow an organization to create isolated virtualized servers for a test system without interfering with the production systems

Types of Clouds

Private Cloud – an internal cloud used only by one organization
Public Cloud – a commercial service used by multiple customers

When an organization uses cloud technology on an internal data center, we say that the organization owns and operates a private cloud*. A private cloud can avoid underutilized as well as oversubscribed resources by spreading computing across all physical servers.*

A company that offers cloud services to customers is known as a public cloud provider*, and the cloud facility that such a company operates is known as a* public cloud facility.

Advantages of Public Cloud

- Economic – less cost than a private cloud
  Expertise – access to a staff with expertise on many topics
  Advanced services – offerings not available elsewhere

Advantages of Private Cloud

- Retention of control and visibility
- Reduced latency with on-premises facilities
- Insurance against future rate hikes