Cloud Computing (Облачни услуги)

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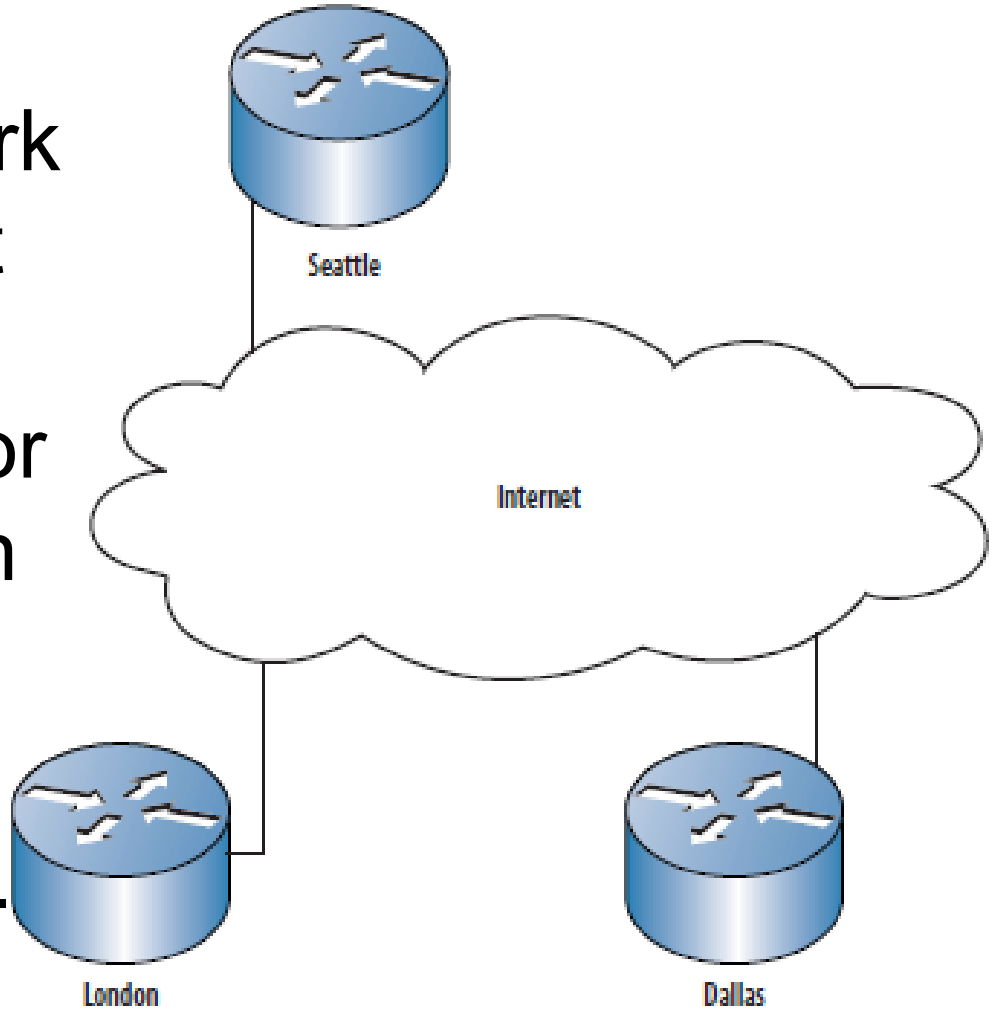
Why Cloud?

- Cloud is a symbol often used in network diagrams to present a network with unknown structure or unimportant in given context.
- Often used to present the Internet.



Cloud Computing

Cloud computing delivers computing resources as a service, rather than a product

Cloud Computing

Infrastructure

Software

Hardware

For example, using Gmail rather than purchasing hardware and software (such as Microsoft Exchange)

What are the Benefits of ‘xxx as a Service’?

- Electricity as a service
- Car as a service
  - Scalable
  - Available when needed
  - Pay-per-use
  - No (or minimal) initial fees

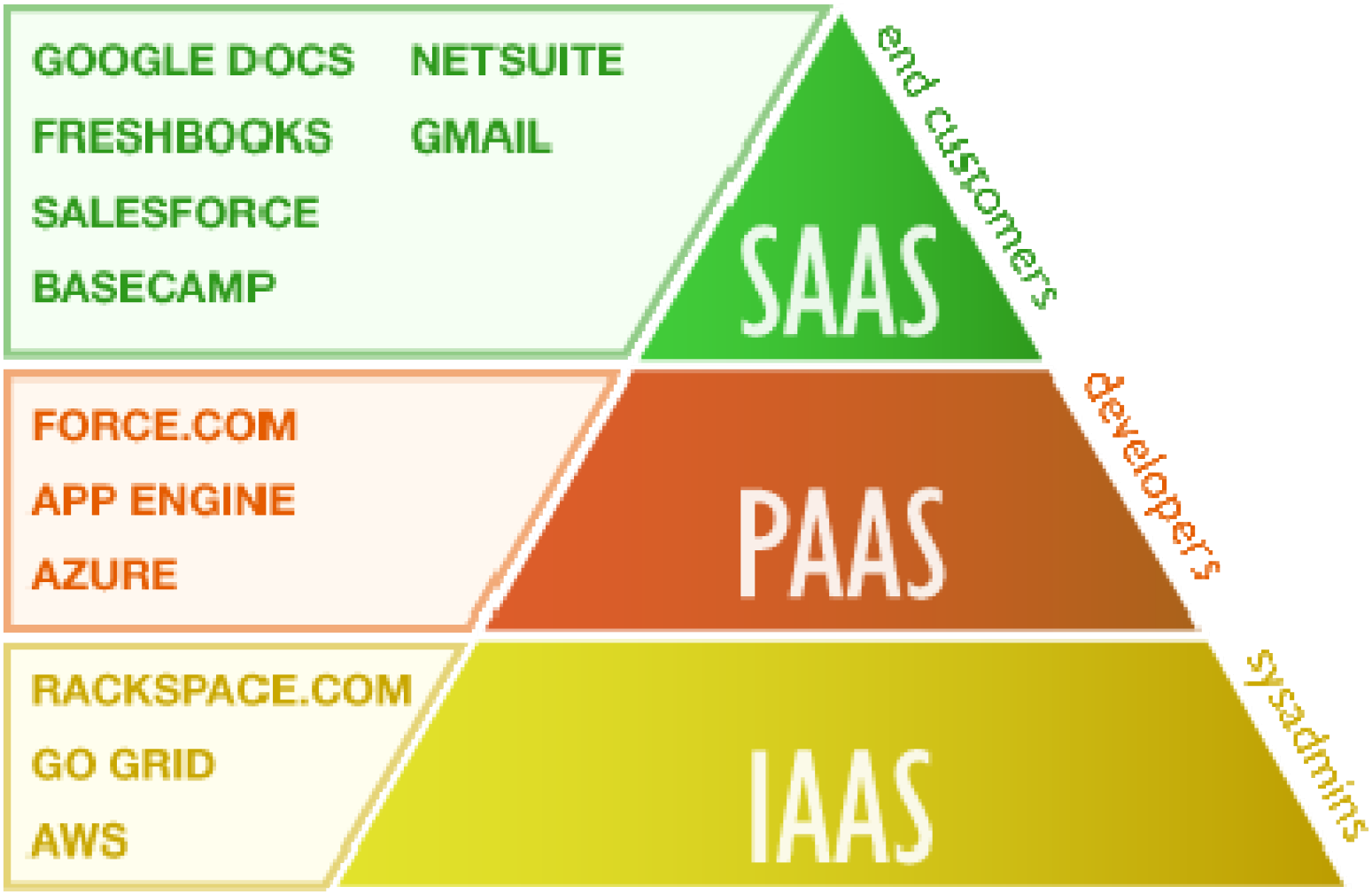
Cloud Computing characteristics

- On-demand self-service (without human intervention from the cloud provider)
- Always on
- Rapidly provisioned
- Elastic
- Pooled resources

Cloud Computing Benefits

- Replaces up front costs with pay-as-you-go (metered) service
- Agile
- Highly scalable
- Highly available
- Ubiquitous access (usually through a web browser)

Types of Cloud



Infrastructure as a service (IaaS)

- Complete outsourcing of operations infrastructure, including storage, hardware, service and networking components (Amazon EC2, Vmware vCloud).
- Pros: Ability to spin-up servers on demand, quickly and cost-effectively. More control of systems with remote accessibility and complete flexibility.
- Cons: An administrator is required with knowledge of systems/networking.

Platform as a Service (PaaS)

- Creating applications from the Internet (Google App Engine, Microsoft Azure).
- Pros: Applications can be developed, tested and deployed without the cost and complexity of purchasing and managing hardware, software and hosting. This allows for faster time-to-market and cost control. Services are delivered like a utility, so you only use and PAY for what you need.
- Cons: Mostly suitable for Web applications as users have no authority over underlying infrastructure. This lack of control over data, physical location of hardware/software and availability make audit requirements and compliance impossible.

Software as a Service (SaaS)

- Accessing applications from the Internet (online banking, Gmail).
- Pros: Reduces your dependency on devices and the management that goes with them. Apps aren't bound to the office closet (err data center) anymore.
- Cons: Security is a concern for the enterprise. Applications are controlled by the provider and provide little to no customization.

Cloud Deployment Models

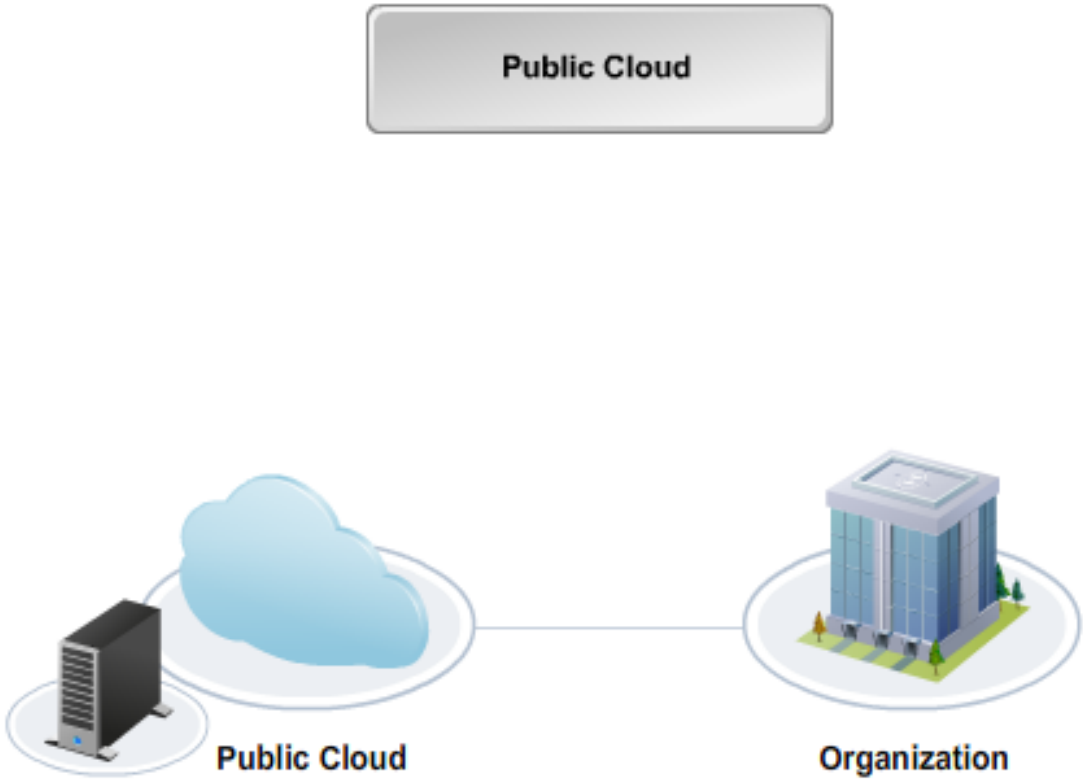
Private clouds can be **offsite**, hosted by a Cloud Service Provider (CSP) or

Onsite, hosted in an corporation's own physical datacenters

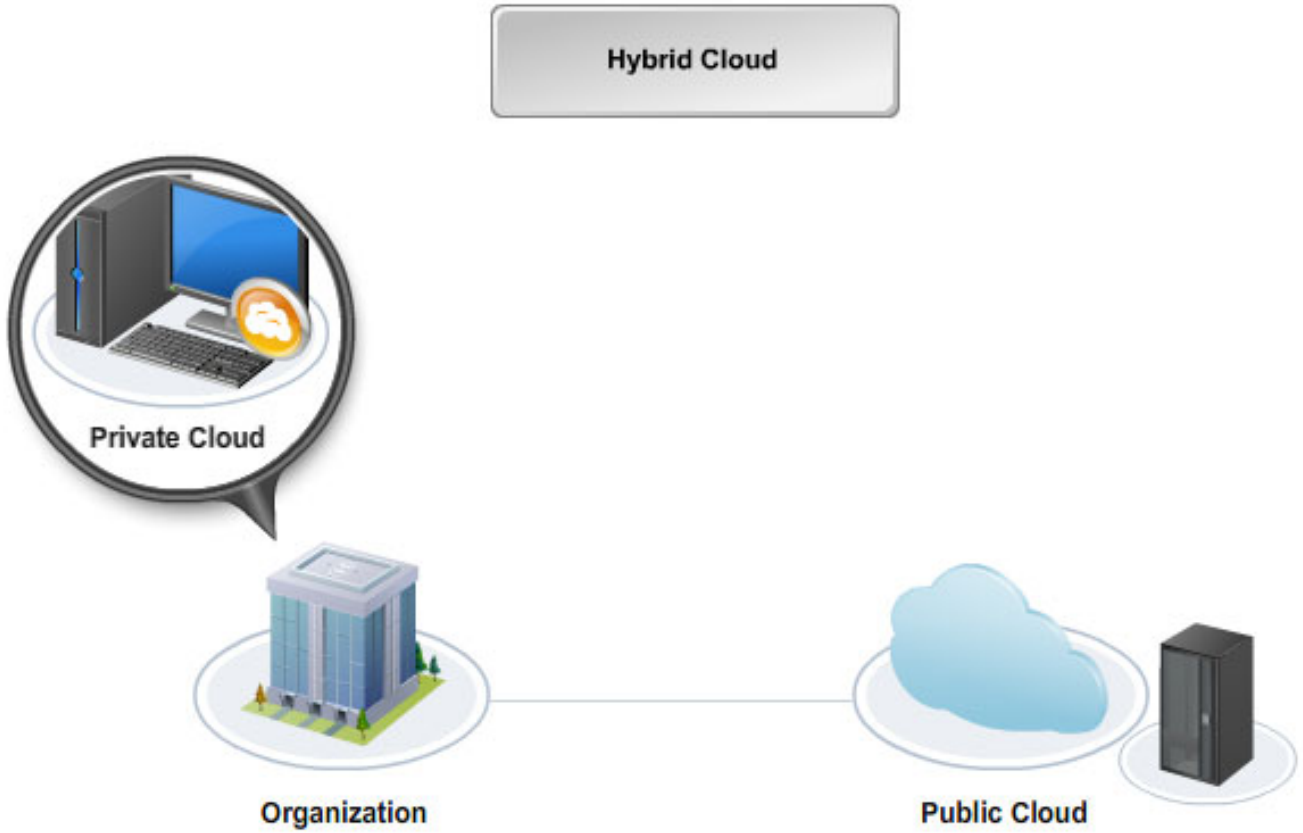
Offsite private clouds usually means the CSP has dedicated hardware for the customer's exclusive use

Cloud Deployment Models (Cont.)

Hosted offsite, at CSP's datacenters. In a public cloud, resources are shared, raising issues of multi-tenancy, such as security and resource sharing



Cloud Deployment Models (Cont.)



For example, when demand is high the private cloud resources can be augmented with public cloud. Or some processing could be offloaded to a public cloud

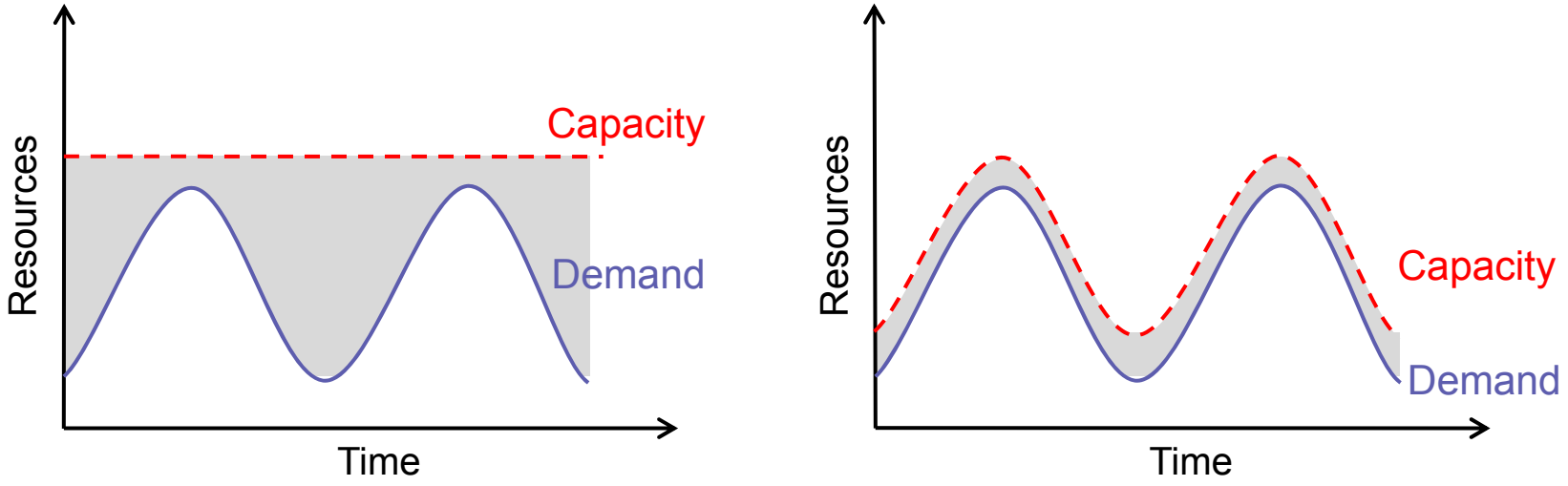
Cloud Deployment Models (Cont.)

Some organizations act as cloud providers and some as cloud consumers. Can be private onsite or offsite clouds

Raises issues of security

Economics of Cloud Users

- Pay by use instead of provisioning for peak



Static data center

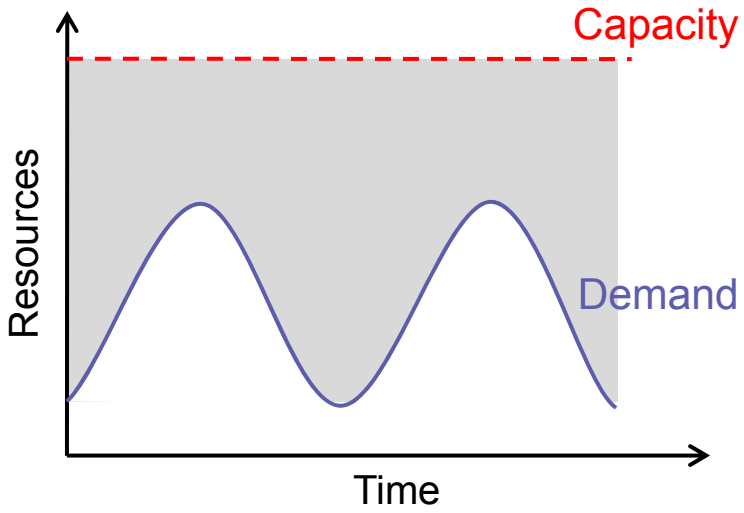
Data center in the cloud

Unused resources

Slide Credits: Berkeley RAD Lab

Economics of Cloud Users

- Risk of over-provisioning: underutilization



Unused resources

Static data center

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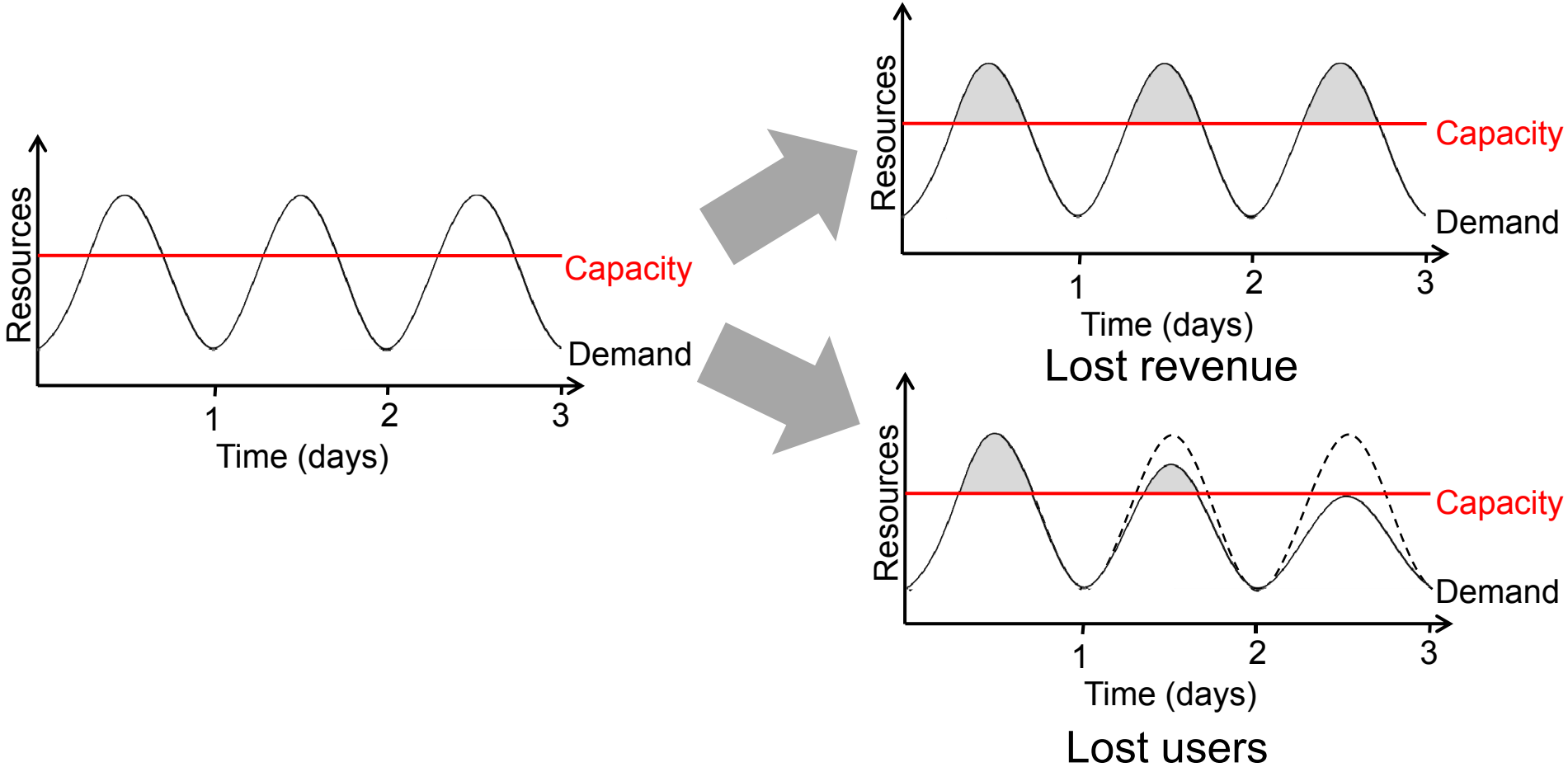
Economics of Cloud Users

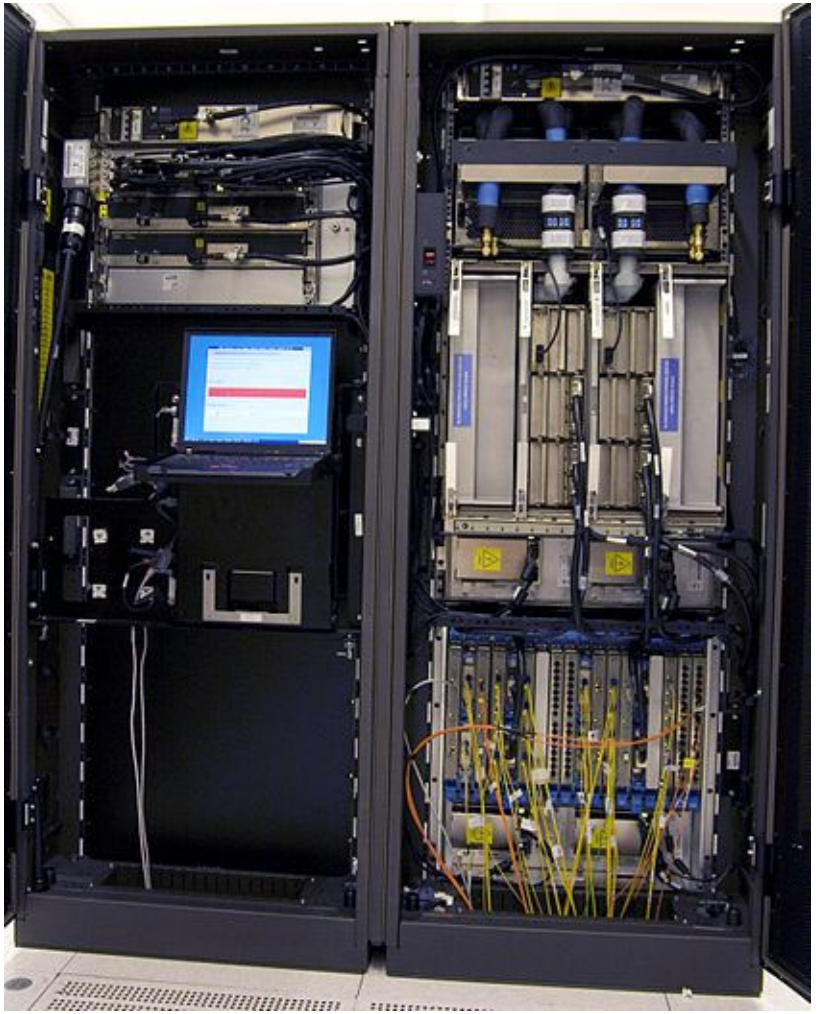
- Heavy penalty for under-provisioning



Cloud: The Technologies

- The Cloud represents the convergence of several technologies, old and new
  - Mainframe concepts
    - Thin clients
    - Distributed computing
    - Client/Server models
  - Virtualization
  - Networking
  - High Availability
  - Web enabled applications
  - Enterprise datacenters
  - Remote Access and Remote Desktop

Mainframe



In 2012, NASA powered down its last mainframe