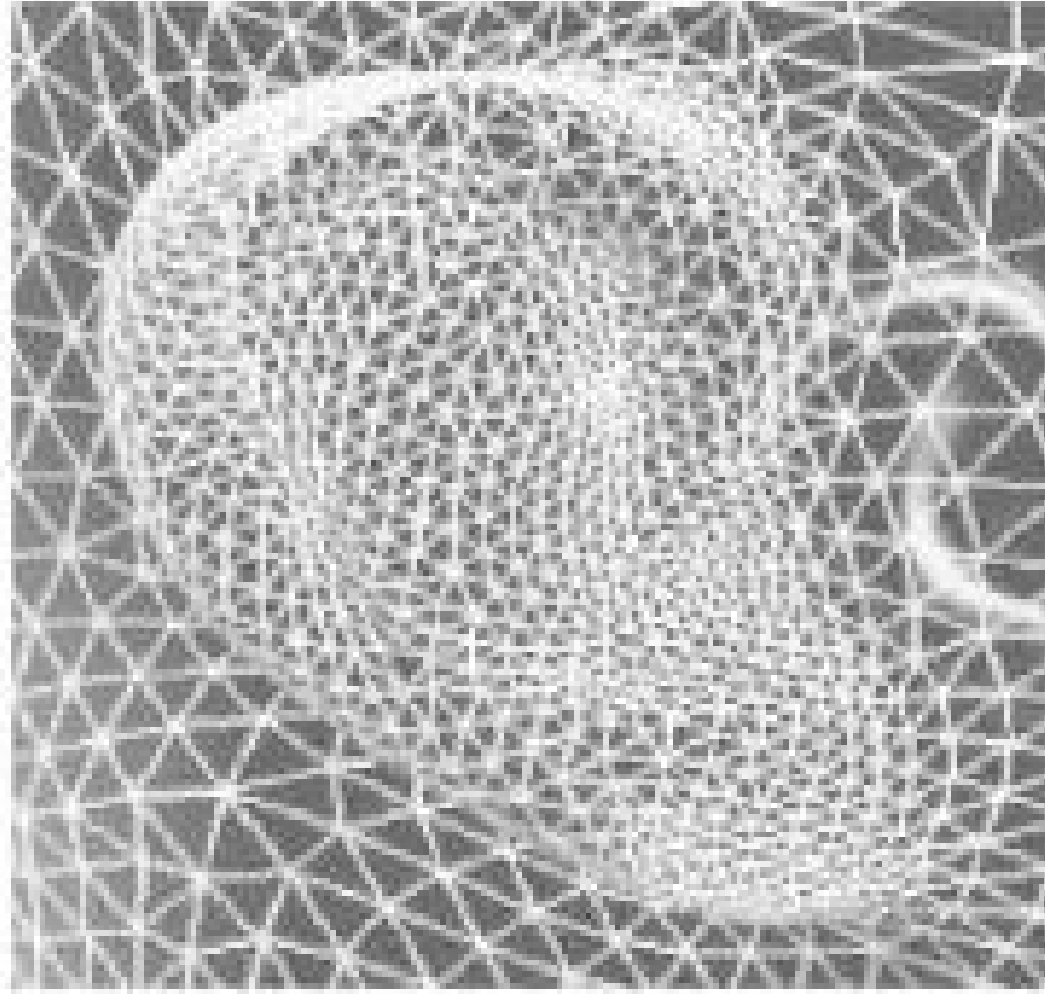


ICS 362 Distributed Systems

Distributed Systems: Part 18

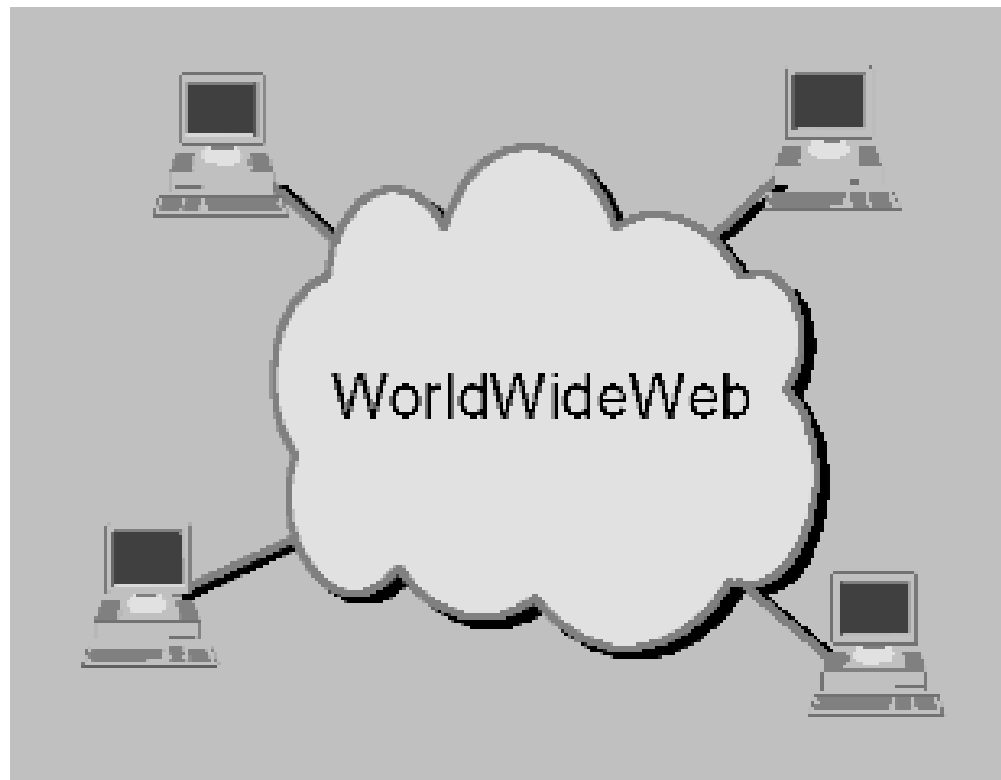
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Cloud Computing



Cloud Computing

- **Cloud Computing** is a relatively new phrase that is used to describe the use of distributed computer resources on the internet (the cloud) to run applications.



Cloud Computing

Why is the Internet a 'cloud'?



Internet 'cloud'

- To the user the network can be pictured as simply a 'cloud' to which one attaches the end system building blocks necessary to access the services on the Internet (www, email, etc.)
- This is the view that the network should expose to the clients of the distributed system – **remember system transparency?**
- The underlying connectivity issues are effectively hidden (hardware, software and networks)

Inside the cloud

One level of detail down, the network architecture is a *network of networks* consisting of:

- Local Area Networks (LANs),
- Wide Area Networks (terrestrial WANs), and radio-based subnetwork components tied together with
- Routers.

Cloud Apps

- So how does the idea of applications running in a cloud differ from traditional application software?
- In the cloud computing paradigm, software that is traditionally installed on personal computers is shifted or extended to be accessible via the Internet.
- Which begs some interesting questions...

...Questions

- Where are the applications running?
- What are they running on?
- Who maintains them and how?
- What are the benefits?

Cloud Apps

- In general these cloud applications utilize massive data centers and powerful servers that host web applications and web services.
- They can be accessed by anyone with a suitable Internet connection and a standard web browser.
- They can expand and scale depending on usage – possibly in a dynamic way.

Virtual Servers

- Cloud applications can be hosted on “Virtual Servers”.
- An instance of a virtual server can be created on the cloud computer network of servers.
- This dynamic set of computer resources allows scaling of computer resources up and down as needs change - without upfront investment in hardware or software from the users of the cloud.

Architecture

- The architecture behind cloud computing is a massive network of "cloud servers" interconnected as if in a grid running in parallel, sometimes using the technique of virtualization to maximize computing power per server.



Examples of Cloud Computing

- Amazon Elastic Compute Cloud (EC2)
- Simple Storage Service (S3)
- Red Hat Enterprise Linux

Amazon Elastic Compute Cloud

- Amazon Elastic Compute Cloud (EC2) gives developers scalable computing capacity in the cloud (using Amazon's own cloud network)
- Amazon has made a significant investment in technology to run its own Web-scale business and serve millions of customers. Opening that technology up for other developers is just another way to make returns on that investment.
- EC2 presents a true virtual computing environment allowing developers to use Web service interfaces to requisition machines for use, load them with custom application environments, manage a network's access permissions, and run images using as many or few systems as necessary.

Simple Storage Service (S3)

- To use EC2, developers create an Amazon Machine Image that contains applications, libraries, data and configuration settings. Then they upload the image into Amazon **Simple Storage Service** (S3), a cloud-based storage service. Amazon claims 265,000 developers have already signed up to use S3.
- Developers pay for the EC2 hours and bandwidth, as well as the S3 storage, based on how much—or how little—they use.

Red Hat Enterprise Linux

- Cloud computing with Red Hat Enterprise Linux is a web-scale virtual computing environment.
- It provides everything needed to develop and host applications: compute capacity, bandwidth, storage, and the leading open source operating system platform, Red Hat Enterprise Linux.
- It makes it easy to develop, deploy, and manage new and existing applications in a virtual computing environment.

Reasons for using Cloud Computing

- Freedom
 - from IT Infrastructure constraints, from long-term contracts, from capital expenses, from management nightmares.
- Power
 - scalable resources across leading hardware architectures, bandwidth and storage to meet the needs of your job or service.
- Control
 - your data, your applications, your virtual server, when you need it - and only when you need it.

Concerns

- Data privacy
- Security
- Reliability
- Availability
- Trust



Get your head in the clouds...

