Grid vs Cloud/Utility Computing: Why This Should Concern the Optical Networking Community

Monday 8 – 11

Organized by

Chunming Qiao (SUNY Buffalo, USA),
Bill St. Arnaud (Canarie Inc. Canada),
Dimitra Simeonidou (Essex Univ. UK)
and Peter Tomsu (Cisco, USA)

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Speakers

- *Bill St Arnaud, Chief Research Officer,CANARIE Inc., Canada*

- *Piero Castoldi, Scuola Superiore Sant'Anna Univ., Italy*

- *Cees de Laat, Univ. of Amsterdam, Netherlands*

- *Pascale Vicat-Blanc Primet, INRIA, France*

- *Rodney Tucker, U. Melbourne, Australia*

- *Chunming Qiao, University at Buffalo (SUNY)*

Introduction

- What is Grid Computing?

- What is Cloud Computing?

- Grid Computing vs. Cloud (Utility) Computing

- Grid/Cloud Computing over optical networks

Brief History

- ## 1970s: Internet
  - TCP/IP protocols

- ## 1980s: Cluster Computing
  - Beginning to exploit distributed resources

- ## 1990s: Grid Computing
  - SETI@home uses spare CPU cycles worldwide

- ## 2000s: Cloud Computing
  - Google Apps, Amazon EC2

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The Vision of Grid Computing

- Analogy to "Power Grid"
  - Computing power from "a plug in the wall"
  - Transparent exchange of computing power
- "**When the network is as fast as the computer's internal links, the machine disintegrates across the net into a set of special purpose appliances**"
- (Gilder Technology Report, 2001)
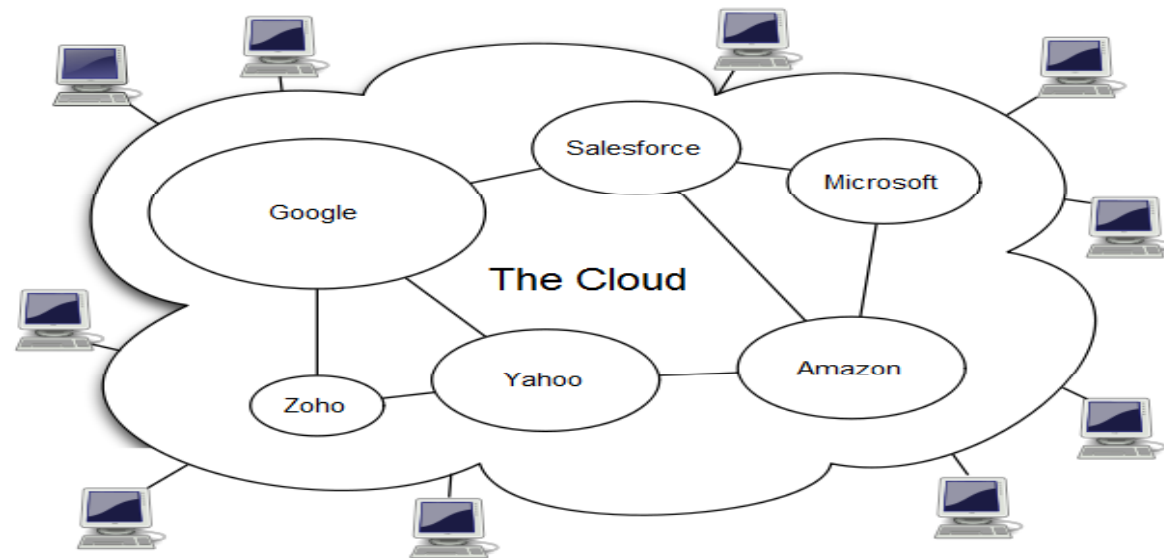
What is Grid Computing?

- **<u>Grid Computing</u>** is the ability, using a set of open standards and protocols, to gain access to applications, data, CPU, storage, and other computing resources over the Internet.

- **<u>A Grid</u>** is a distributed system that enables the sharing, selection, and aggregation of resources dispersed across multiple administrative domains based on their availability, capacity, performance, cost and users' QoS requirements.

What is Cloud Computing?

- **Cloud computing:** _Internet_ ("cloud") based development and use of computer technology ("computing").

- Its style: dynamically scalable and often virtualized resources are provided as a service over the Internet.

    – Users need not have knowledge of, expertise in, or control over the technology infrastructure "in the cloud".

Overview of Cloud Computing

- Incorporates **infrastructure as a service (IaaS)**, **platform as a service (PaaS)**, **software as a service (SaaS) – e.g., Google Apps**, and Web 2.0 for satisfying the computing needs of the users.

Grid vs. Cloud Computing

- Cloud Computing is **<u>a natural next step</u>** from Grid Computing
  - Many Cloud Computing deployments today depend on Grids
  - Cloud Computing bills like utilities
    - The packaging of computing resources (CPU, storage, software), as a metered service similar to a traditional public utility such as electricity

Schedule

- Up to 20 min for Each Presentation
    - Clouds and Optical Networks, Bill St. Arnaud
    - Cloud Computing over Optical Networks, Piero Castoldi
    - Grid Computing over Optical Networks, Cees de Laat,
    - Virtualizing and Scheduling Network Resource inCARRIOCAS, Pascale Vicat-Blanc Primet
    - Energy/Cost Benefits of Cloud Computing, Rodney Tucker, U. Melbourne
    - Concluding Remarks: Opportunities and Research Issues , Chunming Qiao,

- There will be 35 min of Panel and Q&A session near the end of the workshop