

The Technology of Cloud Computing



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What is OnStar?

- In-vehicle safety, security and information services system offering 24-hour access to live assistance
- Launched in North America in 1996 on Cadillacs
- Launched in China in Dec 2009
- Over 6 million active subscribers
- Over 350 million customer interactions to date
- OnStar aftermarket product on target for launch summer 2011



Key OnStar Services



Automatic Crash Response
2,450/month



Emergency Service
10,000/month



Good Samaritan
6,400/month



Stolen Vehicle Assistance
440/month



Remote Door Unlock
61,000/month



Roadside Assistance
29,600/month



Turn-by-Turn Routes Delivered*
Over 1.9 million routes / month



OnStar Vehicle Diagnostics
Over 3.7 million emails / month



On-Demand Diagnostics
55,900/month



OnStar Hands-Free Calling
175+ million mins purchased / month



OnStar Mobile Apps
489,000+ downloads / month



One Very Hardworking Button
Over 367 million Cumulative Service Interactions

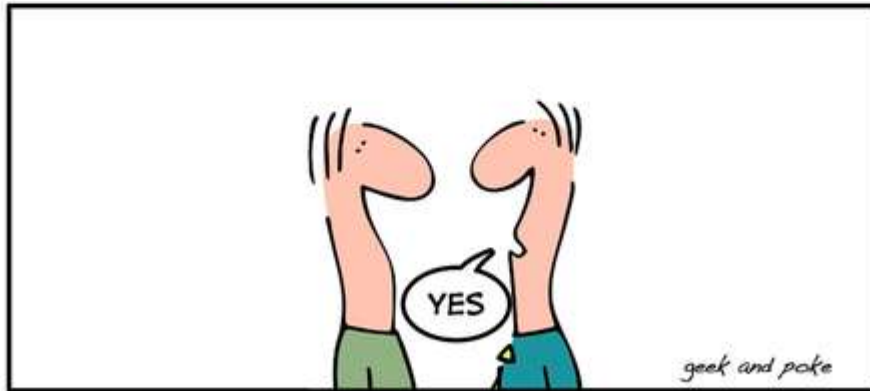
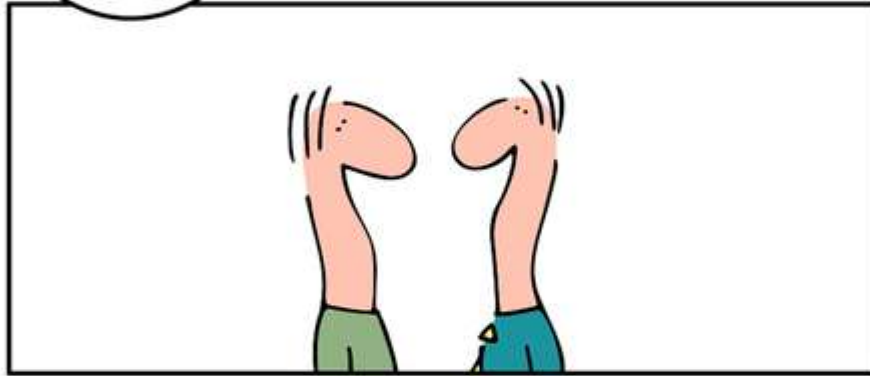
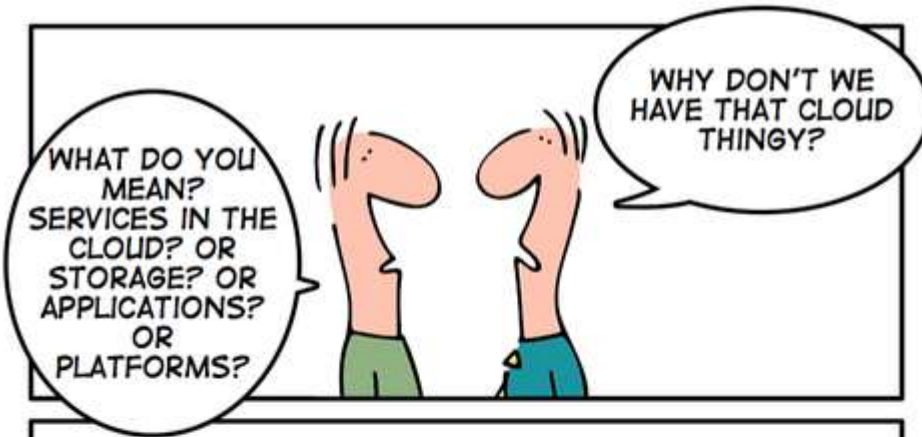
* Includes Advisor and TBT delivered routes

3 Month Rolling Average (Feb - Apr '11)

U.S. and Canada

Cloud Computing

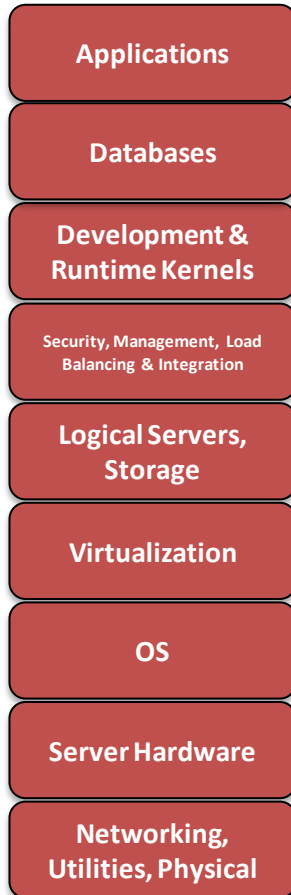
a style of computing where scalable and elastic information technology capabilities are provided 'as a service' to customers using internet technologies with pay-as-you-go pricing



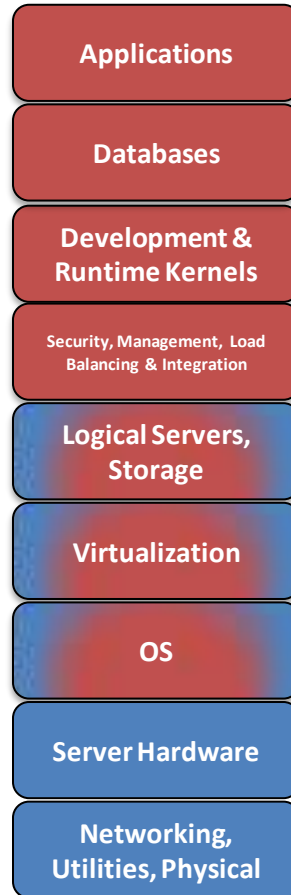
THE CLOUD THINGY

Cloud Service Models

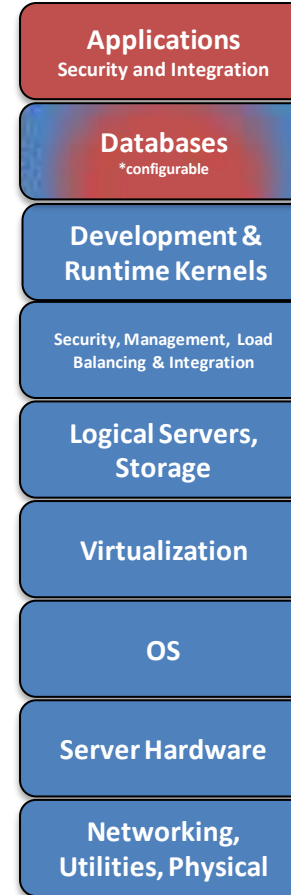
Private (On-Premise)



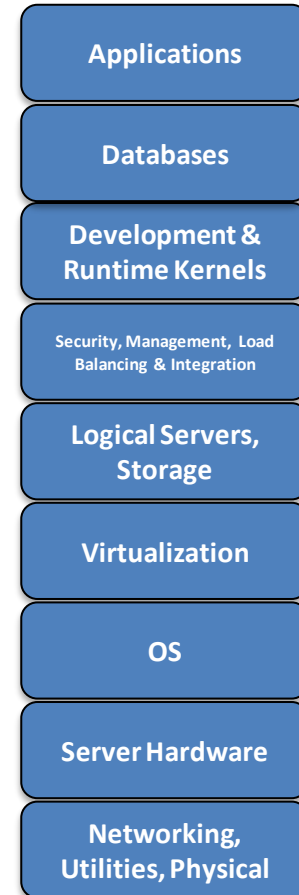
Infrastructure as a Service (IaaS)



Platform as a Service (PaaS)

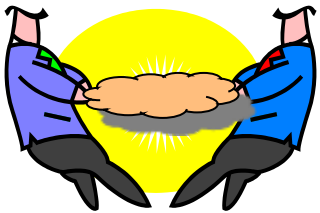


Software as a Service (SaaS)



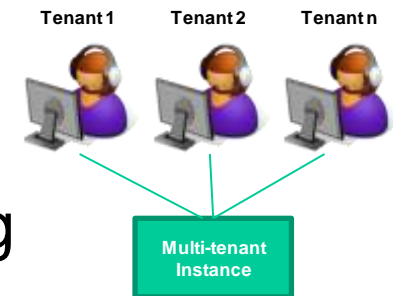
Key Characteristics of a Cloud

Multi-tenant elasticity is the definitive attribute of cloud computing



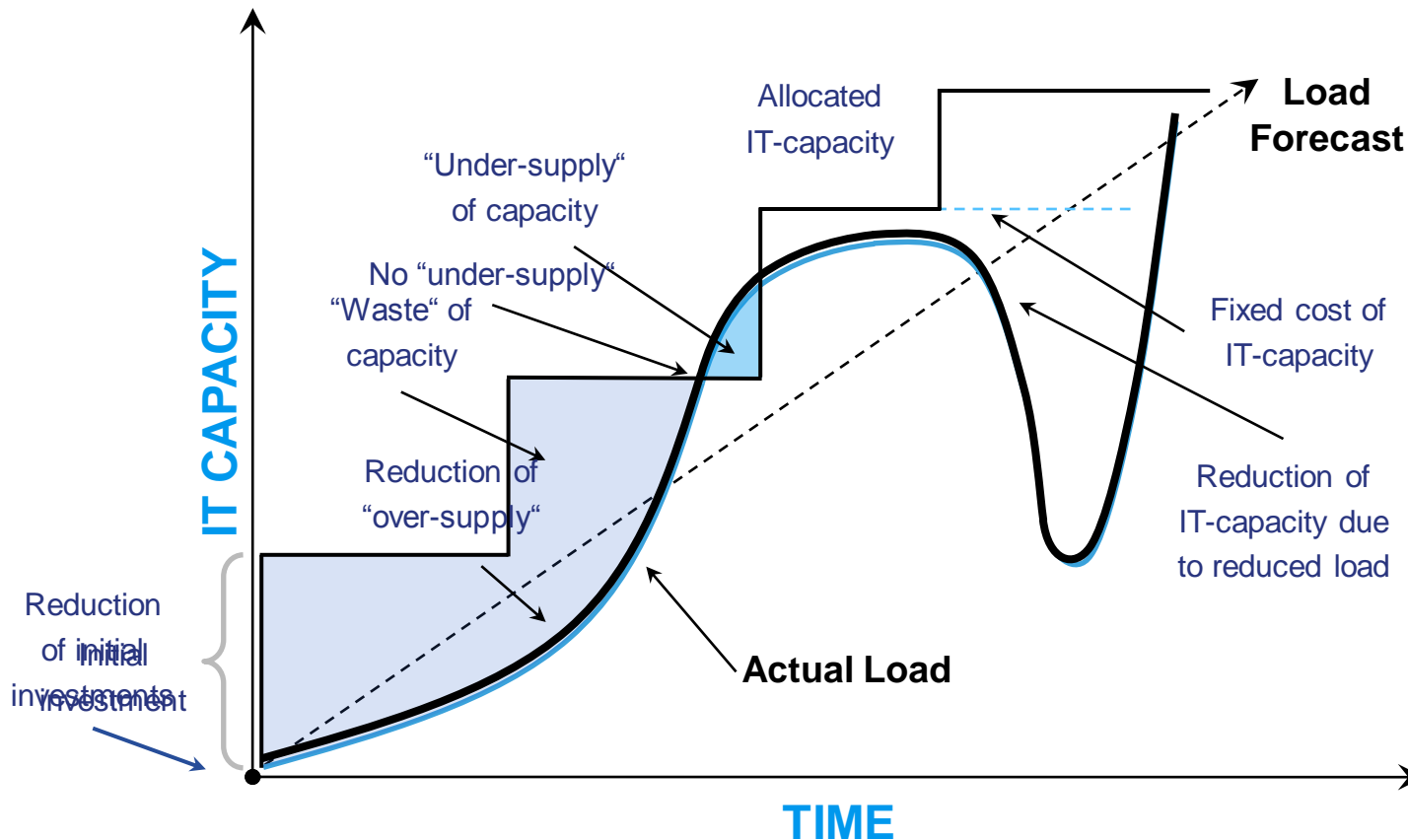
- **Elasticity:** the ability of software to meet changing capacity demands without interrupting operations
 - deploying and releasing necessary resources on-demand, and
 - automatically spreading (or contracting) over multiple physical or virtual machines

- **Multi-tenancy:** the ability of a single shared instance of a software to serve multiple customers (tenants) with each tenant operating as logically isolated



Value Proposition

- Useful for business applications that require:
 - On-demand scalability and elasticity
 - Speed-to-market



Enabling Technologies

■ Blade Infrastructure



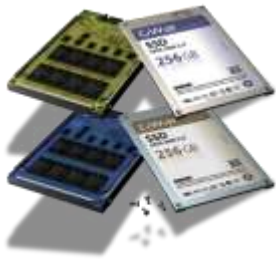
- Modular form of computing where a system is aggregated from separate building-block modules (processor, memory, I/O, and offload modules) connected over a switched backplane

■ Commodity Servers

- Affordable AMD or Intel based servers typically running Windows or Linux

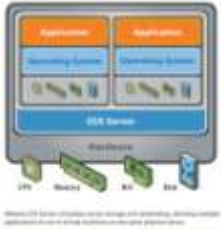


■ Solid State Storage



- Data storage device that uses solid-state memory, typically flash memory, to store persistent data
- Faster, more energy efficient, more rugged and more compact

Enabling Technologies

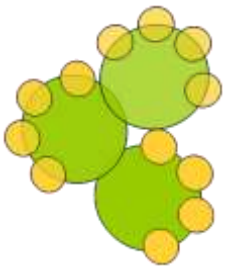


■ Virtualization

- Abstraction of single computing resource into separate logical components
- Allows greater flexibility and utilization of the underlying computing resource

■ Grid Computing

- Loosely coupled, heterogeneous compute resources connected across a network working together as one large compute resource
- Originally conceived to tackle complex computations



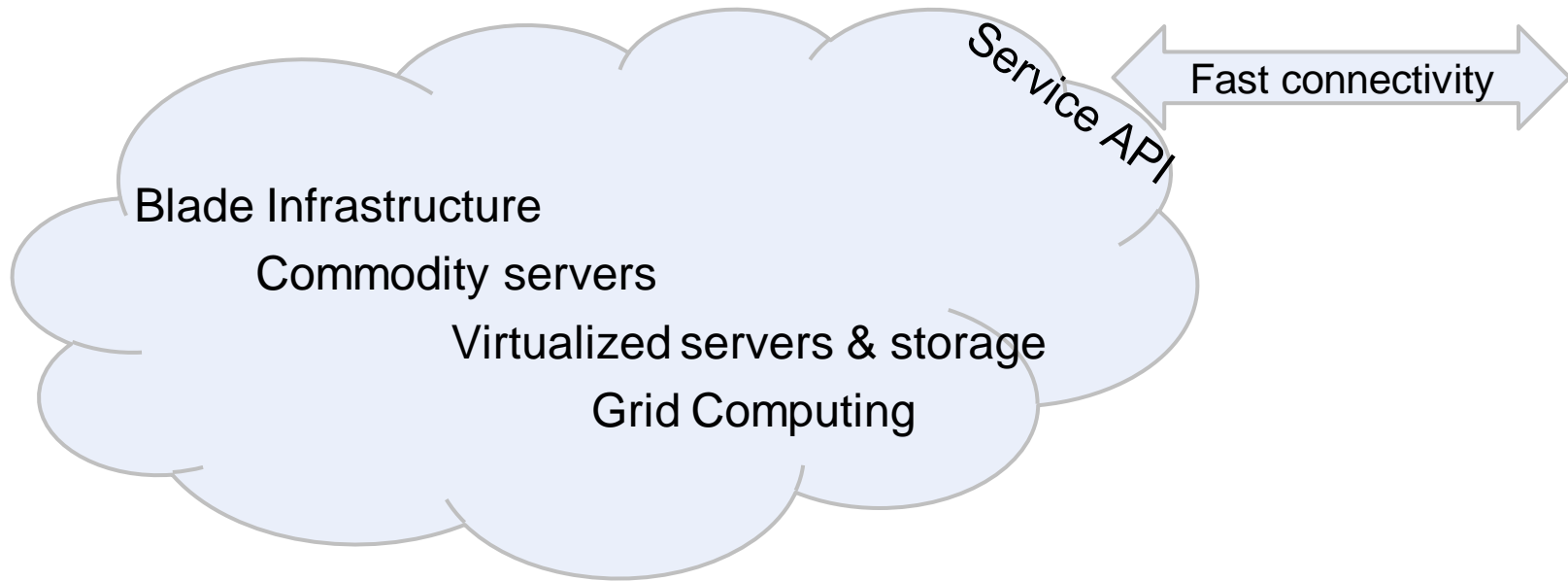
■ Service Oriented Architecture

- An approach to organizing software into independent, interoperable loosely-coupled modules that can be composed and recomposed to fulfill multiple business functions

■ Network Connectivity

- Fast local area / wide area, wireline and short range / long range and wireless network technologies

Putting it all together...



A model for on-demand access to a shared pool of configurable computing resources that can be rapidly provisioned and released

Key Concerns for Cloud Implementations

Lack of standards

Limited portability

Security



Integration with
internal resources

Lack of guaranteed
availability

Limited configurability
and monitoring

A photograph of a desert landscape. In the foreground, a paved road with a yellow center line leads towards the horizon. The road is flanked by dry, scrubby vegetation. In the background, a range of mountains stretches across the horizon under a clear blue sky. The entire image is framed by a decorative, textured border with a repeating diamond pattern.

Thank You