Cloud Computing Paradigm Shift

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What is Cloud Computing?

“A style of computing where **SCALABLE** and **ELASTIC** IT-enabled capabilities are provided as a **service** to external customers using Internet technologies.”


“A standardized IT capability, such as **SOFTWARE, APP PLATFORM, OR INFRASTRUCTURE**, delivered via Internet technologies in a **pay-per-use and self-service way**.”

Why Cloud Computing?

- "On and Off"
- "Growing Fast"
- "Unpredictable Bursting"
- "Predictable Bursting"
IT as a Service

**PACKAGED SOFTWARE**
- Applications
- Data
- Runtime
- Middleware
- O/S
- Virtualization
- Servers
- Storage
- Networking

**INFRASTRUCTURE AS A SERVICE**
- You manage
  - Applications
  - Data
  - Runtime
  - Middleware
  - O/S
  - Virtualization
  - Servers
  - Storage
  - Networking

**PLATFORM AS A SERVICE**
- You manage
  - Applications
  - Data
  - Runtime
  - Middleware
  - O/S
  - Virtualization
  - Servers
  - Storage
  - Networking

**SOFTWARE AS A SERVICE**
- Managed by provider
  - Applications
  - Data
  - Runtime
  - Middleware
  - O/S
  - Virtualization
  - Servers
  - Storage
  - Networking
Server & Services Platforms

SERVICES PLATFORM

- STANDARDIZED SERVICE
- LOWEST OPERATIONS COST
- UPDATED BY MICROSOFT

SERVER PLATFORM

- CUSTOMIZABLE PRODUCT
- SUPPORTS ALL EXISTING APPS
- LOW OPERATIONS COST
- UPDATED BY CUSTOMER

- SQL Azure
- Windows Azure

- SQL Server
- Windows Server
- System Center
Windows Azure Platform

- Scalable compute and storage
- Automated service management
- Familiar tools, technologies, languages

Relational storage for the cloud
- Consistent development model
- Automated database management

Connect existing apps to the cloud
- Connect through network boundaries
- Easily control authorization to apps
Codename “Dallas”

Information Discovery
Discover, acquire, and consume structured and blob datasets to power any application – on any platform and any screen size.

Data Brokerage
Partner driven ecosystem and global reach to deliver data and functionality to developers and information workers.

Analytics and Reporting
Augment private data with premium commercial and public domain data: on premises or in the Cloud.

All powered by the Windows Azure platform
Windows Azure Platform
Data Centers

North America Region
- N. Central – U.S.
- S. Central – U.S.

Europe Region
- N. Europe
- W. Europe

Asia Pacific Region
- E. Asia
- S.E. Asia

6 datacenters across 3 continents
Simply select your data center of choice when deploying an application
Windows Azure Platform Appliance

Microsoft

Appliance
Service Provider

Appliance
Customer
Scalability, Elasticity & Multi-tenancy

PARADIGM SHIFT
Paradigm Shift

Scalability & Elasticity

Manage thousands of servers per admin

Application and hardware failures are expected

Constant feedback about usage and performance

Globally distributed workloads
Scalability & Elasticity

Quickly increase and decrease resources

Special considerations for instance startup and synchronization

Manage state across instances

Queues provide the glue for work coordination

```xml
<?xml version="1.0"?>
...
<Instances count="20"/>
...
</ServiceConfiguration>
```

```
CREATE DATABASE foo ...
CREATE DATABASE foo_copy1 AS COPY OF foo;
CREATE DATABASE foo_copy2 AS COPY OF foo;
CREATE DATABASE foo_copy3 AS COPY OF foo;
CREATE DATABASE foo_copy4 AS COPY OF foo;
```
Paradigm Shift

Multi-tenancy

Oftentimes the key for cost reduction

Data partitioning and synchronization becomes a key architecture concern

Tenant isolation is critical for security and minimizing side affects
In 15 years we’ll have all the sequence, a list of the genes everyone has in common and those that differ among people. We know only something like a tenth of 1 percent of the sequence at the moment...

Walter Gilbert
AzureBLAST

All-Against-All Experiment

Discover the interrelationships of known protein sequences
*Theoretically, 100 billion sequence comparisons, estimated 6.1 years on desktop*

Allocated a total of ~4000 instances
*475 extra-large VMs (8 cores per VM) across four datacenters worldwide*

8 deployments of AzureBLAST w/co-located storage service

Divide 10 million sequences into multiple segments

Output result is ~230GB with 1,764,579,487 total hits
Large-scale Parallel Machine Learning Toolkit

SIGMA
Sigma Architecture

Sigma Azure UI
http://msrasigma.cloudapp.net/

Machine Learning algorithms

Sigma Algorithm Framework for Windows Azure

Sigma Azure Job System

Sigma Azure Data System

Windows Azure
LET’S MOVE FORWARD TOGETHER
Call To Action

Engage with Microsoft to help us solve the hard problems

Teach distributed and scale out programming

Build your own Cloud or partner with Cloud Providers for hands-on experience