PaaS Players

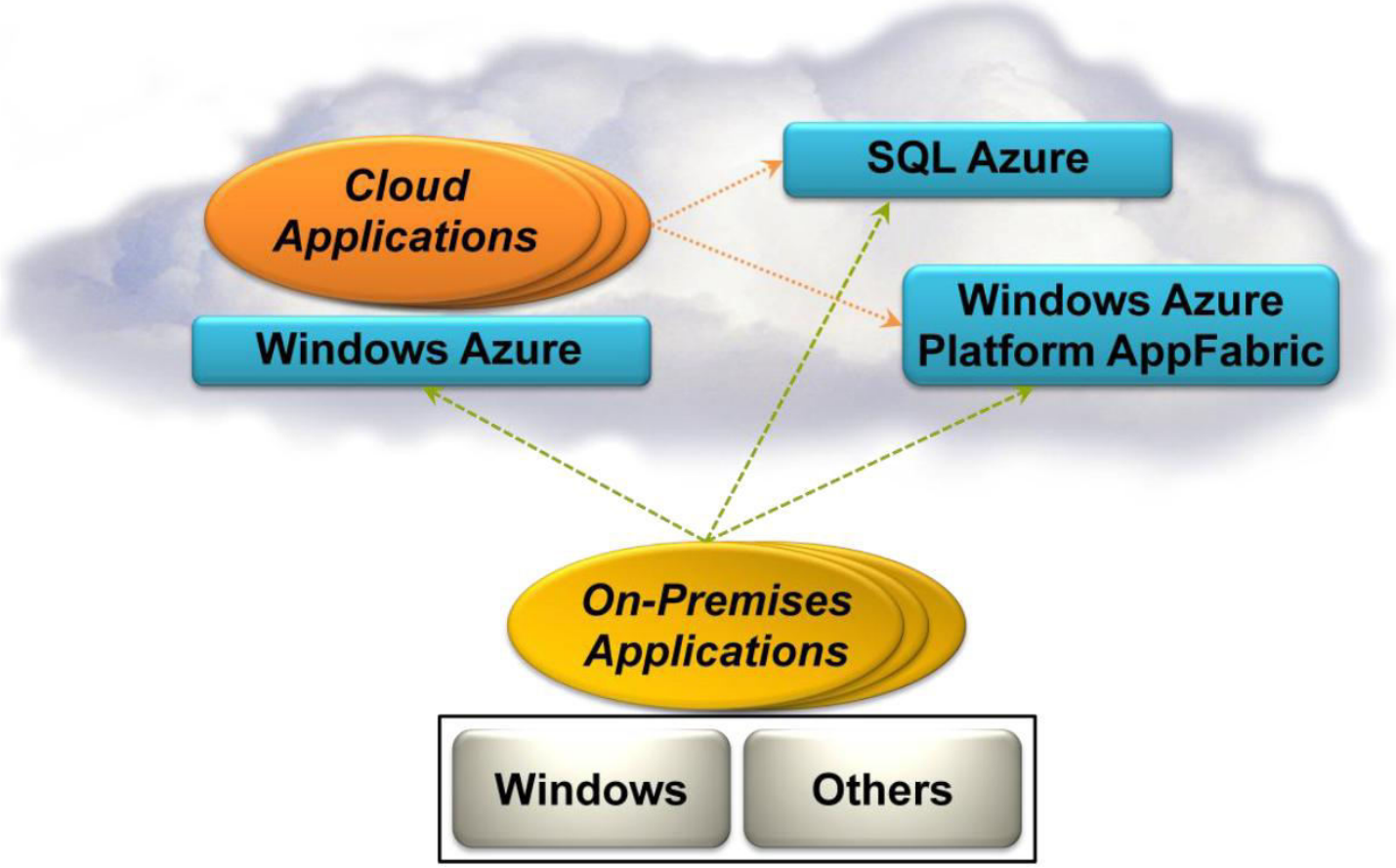
- PaaS venders
  - Microsoft Windows Azure
  - Hadoop
  - Google App Engine

Microsoft Windows Azure

- Windows Azure platform is one of PaaS vendors
  - Based on .NET and Microsoft's supported development tools
- Windows Azure starts general availability at Feb 2010, and builds the global data center around the world

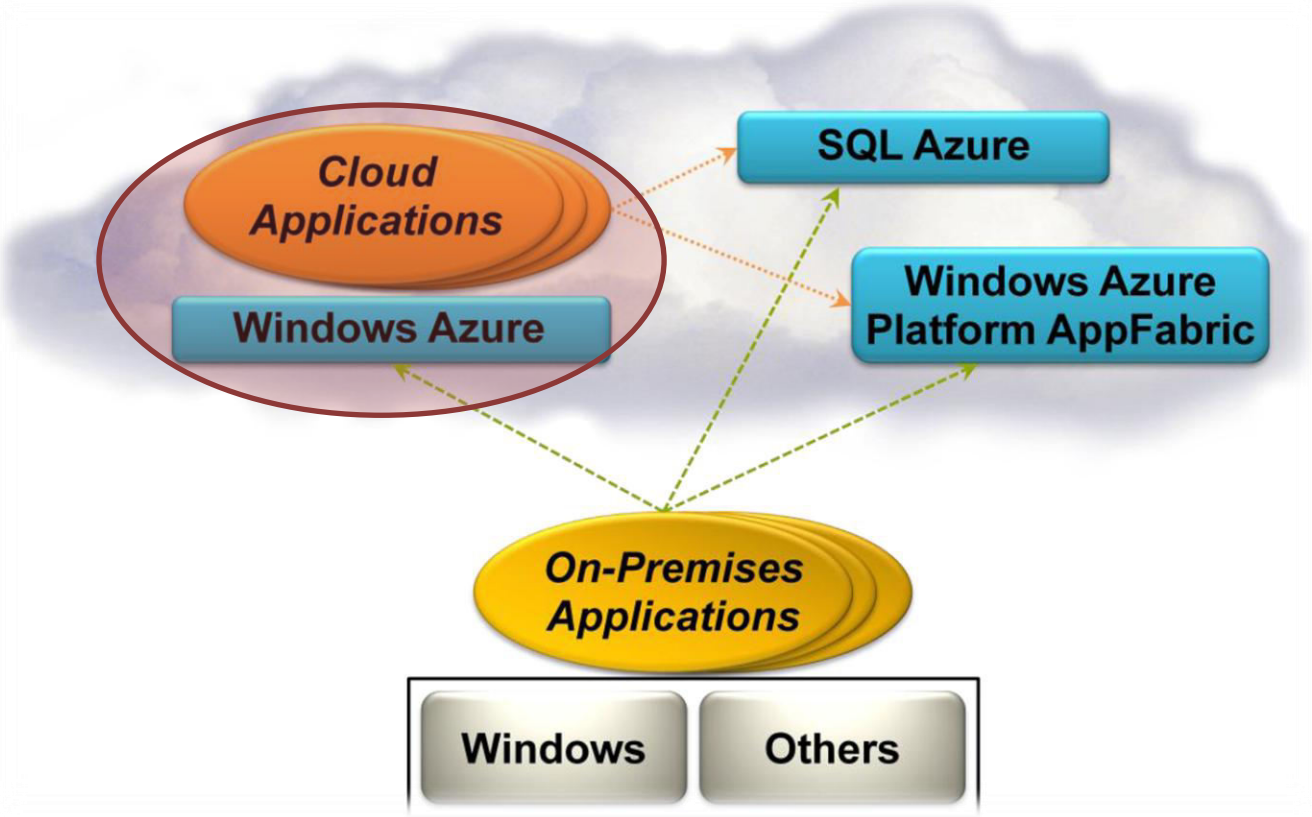
Windows Azure Platform

- A group of cloud technologies, each providing a specific set of services to application developers



Major Components

- Windows Azure
  - Provides a Windows-based environment for running applications and storing data on servers in Microsoft data centers
- SQL Azure
  - Provides data services in the cloud based on SQL Server
- AppFabric
  - Provides cloud services for connecting applications running in the cloud or on premises



Windows Azure

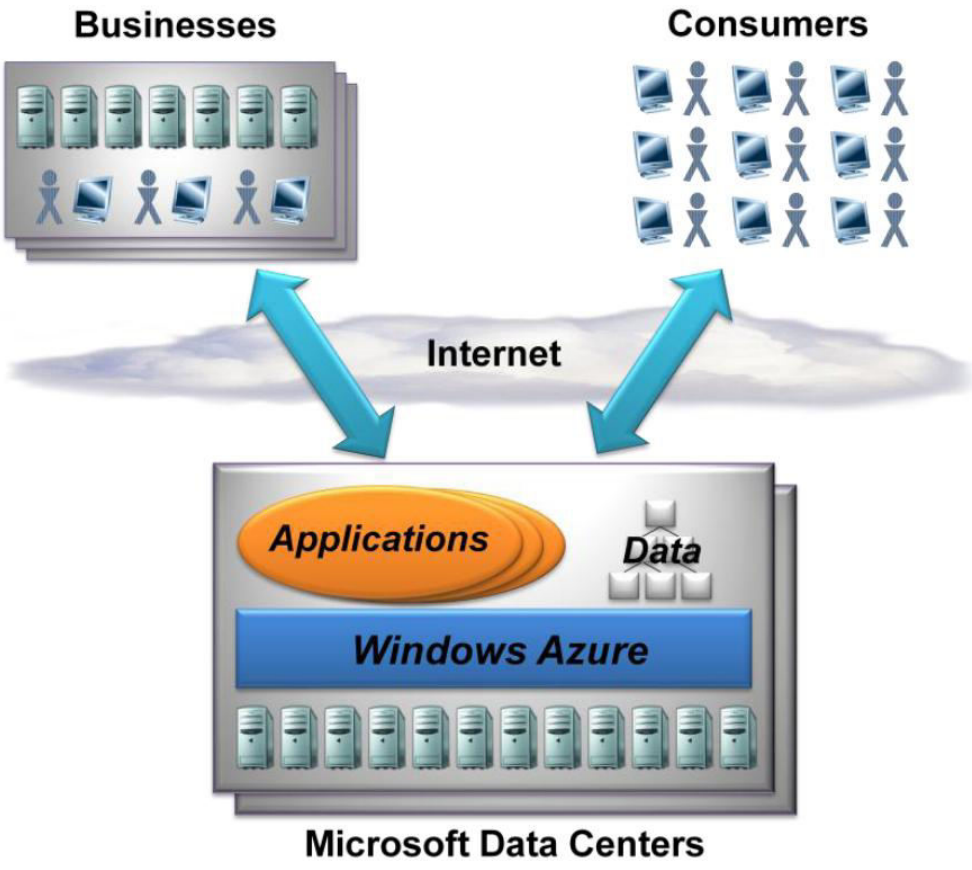
SQL Azure

AppFabric

WINDOWS AZURE PLATFORM

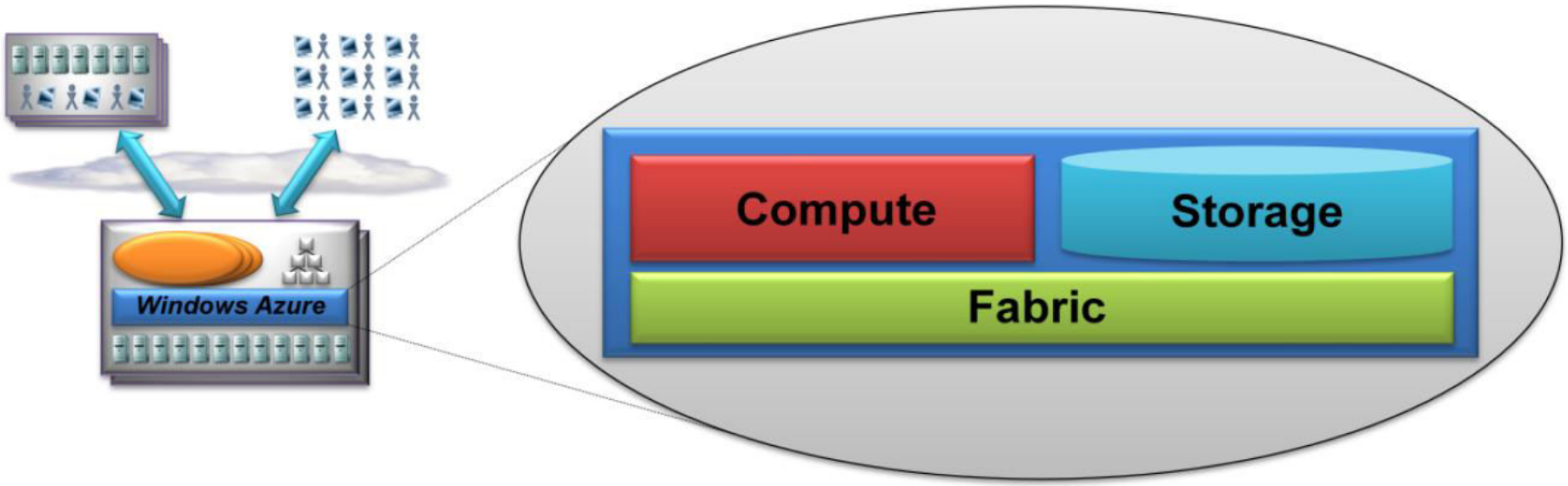
Windows Azure

- Customers use it to run applications and store data on Internet-accessible machines owned by Microsoft
- Those applications might provide services to businesses, to consumers, or both



What is Windows Azure

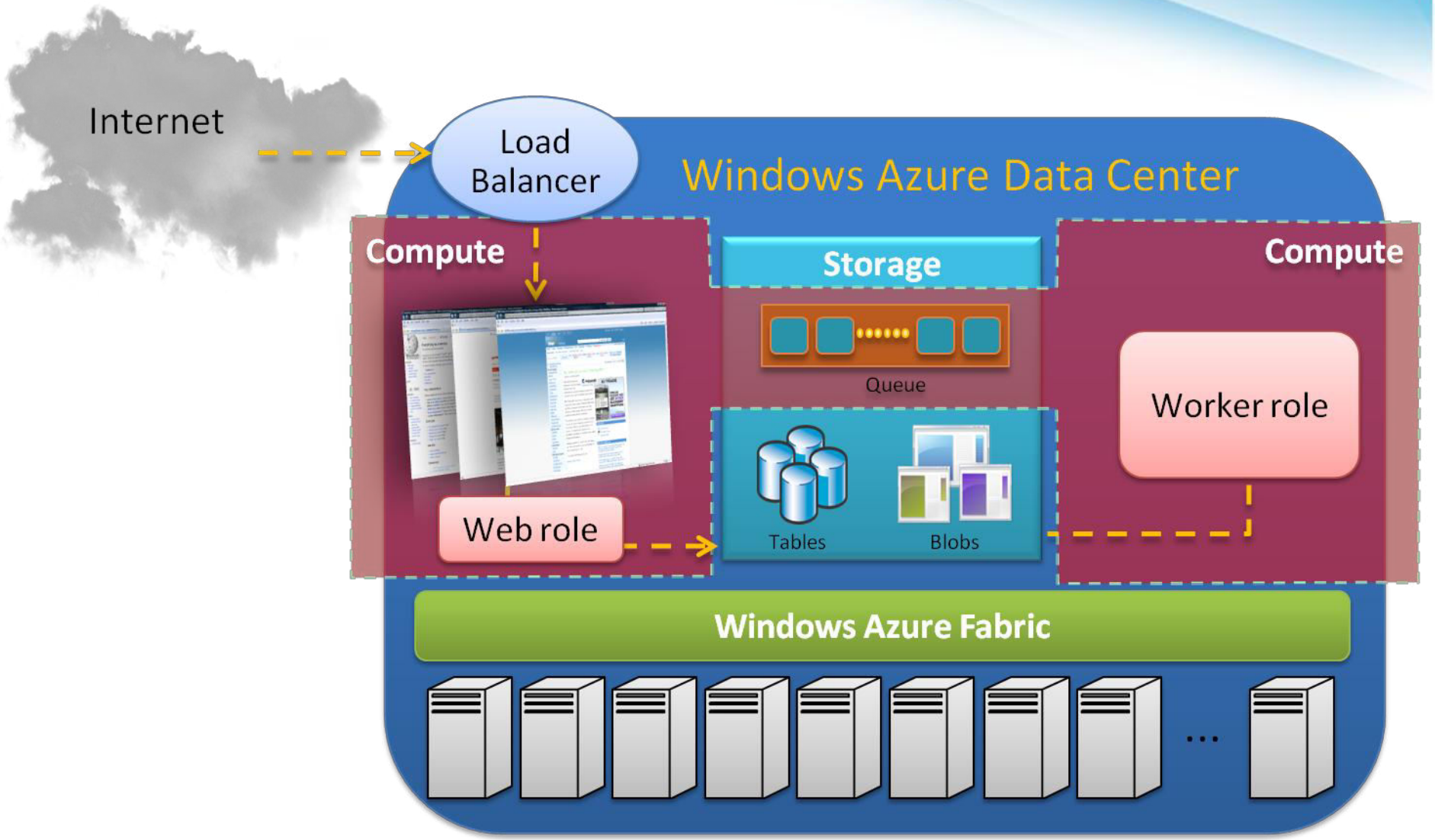
- **Windows Azure** is a foundation for running Windows applications and storing data in the cloud
  - Provides Windows-based *compute* and *storage* services for cloud applications



Components

- Compute
  - Running applications
  - Support applications that have a very large number of simultaneous users and that can scale out
- Storage
  - Storing and accessing data
  - Applications require storage as simple blobs, a more structured way to store information, or a way to exchange data between different parts of an application
- Fabric
  - Managing resources
  - Providing a common way to manage and monitor applications that use this cloud platform

Overview

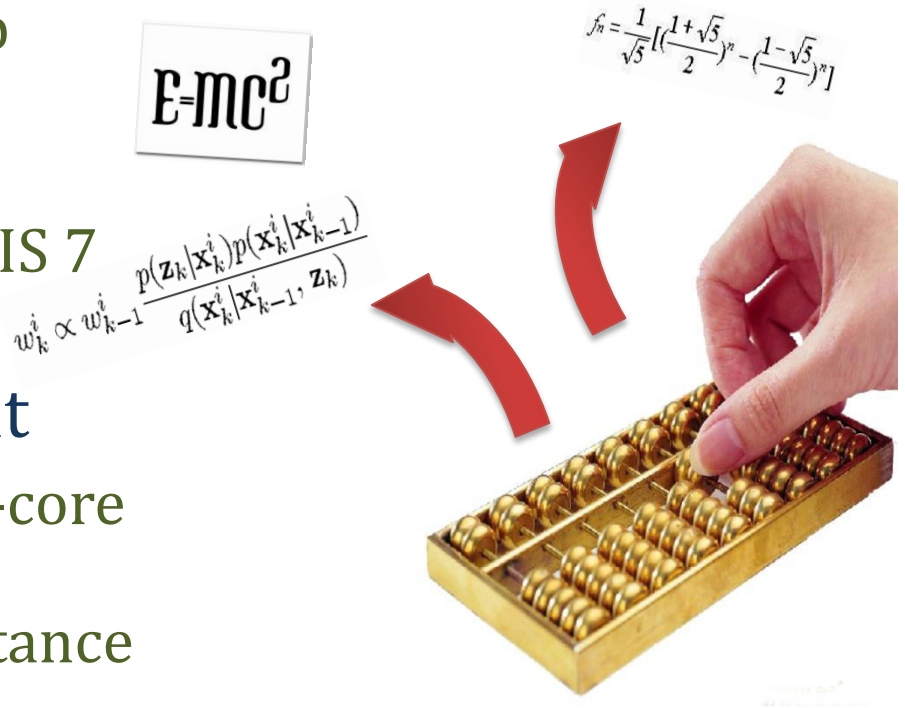

Internet
Load Balancer
Windows Azure Data Center
Compute
Storage
Compute
Queue
Worker role
Web role
Tables
Blobs
Windows Azure Fabric
...

- Compute
- Storage
- Fabric

Windows Azure

Windows Azure - Compute

- In cloud computation, Windows Azure provides
  - Variety of services, like web service or background computation
  - A running environment of IIS 7 and .NET
- Four types of compute unit
  - A basic type provide single-core 1.66 GHz CPU, 1.75 GB of memory, and 225 GB of instance storage
  - Incremental by power of 2

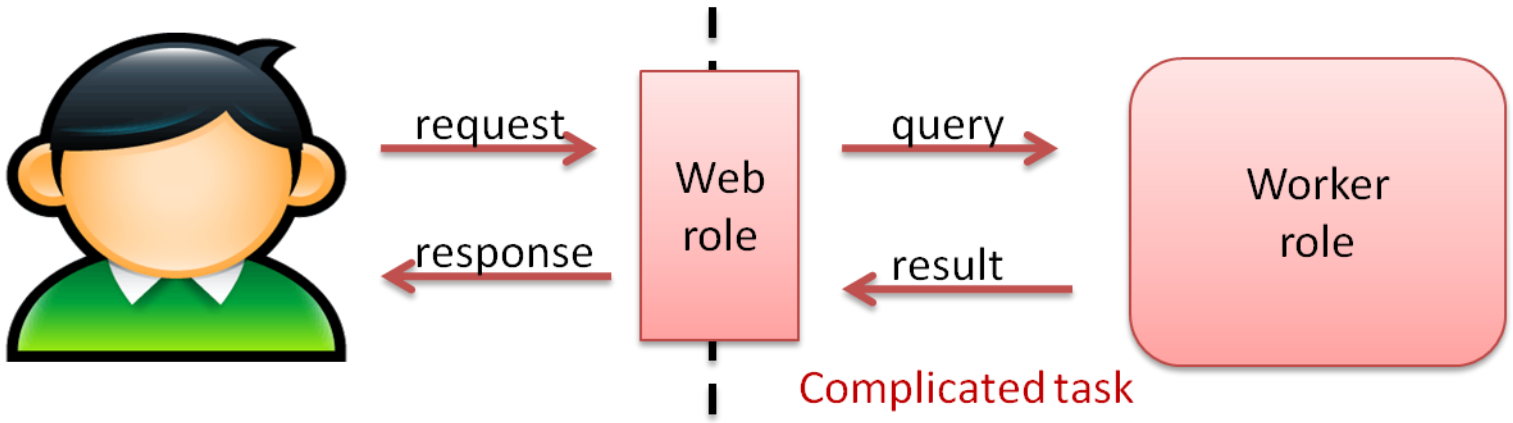


Compute

- A Windows Azure application can have multiple *instances*, each executing in its own virtual machine (VM)
- Each VM is provided by a *hypervisor* (Hyper-V)
- A developer can create
  - A hosting account for running applications
  - A storage account for storing data
  - or both
- A developer can access
  - The instance through an interface
  - The Windows Azure portal through the Web browser

Instance Types

- Windows Azure provides two types of computation roles
  - Web role
    - A running environment that user can access
    - Web application service
  - Worker role
    - A environment runs particular processing
    - Ability to handle distributed or complicated tasks



Instance Types

- Any service must include *at least one role* of either type, but may consist of any number of web roles or work roles
- Worker role can *communicate* with Web role using the Windows Azure storage *queues*
- Each VM contains an *agent* to allow the application to interact with the Windows Azure fabric

- Compute
- Storage
- Fabric

Windows Azure

Windows Azure - Storage

- In enterprise, it may need 10GB to 10PB storage space when company is growing
- Enterprise does not know how many disks is needed at initial
  - It could be underestimate or overestimate

Storage

- If underestimate
  - Violate the contract and does not expand storage in time
- If overestimate
  - Waste of resource and additional management costs

- Windows Azure can take care about the storage management
  - Users do not need to worry about maintaining storage space, back-up and hardware fail
  - Enterprises do not need to purchase the data center nor take the responsibility of maintenance only for a peak loads

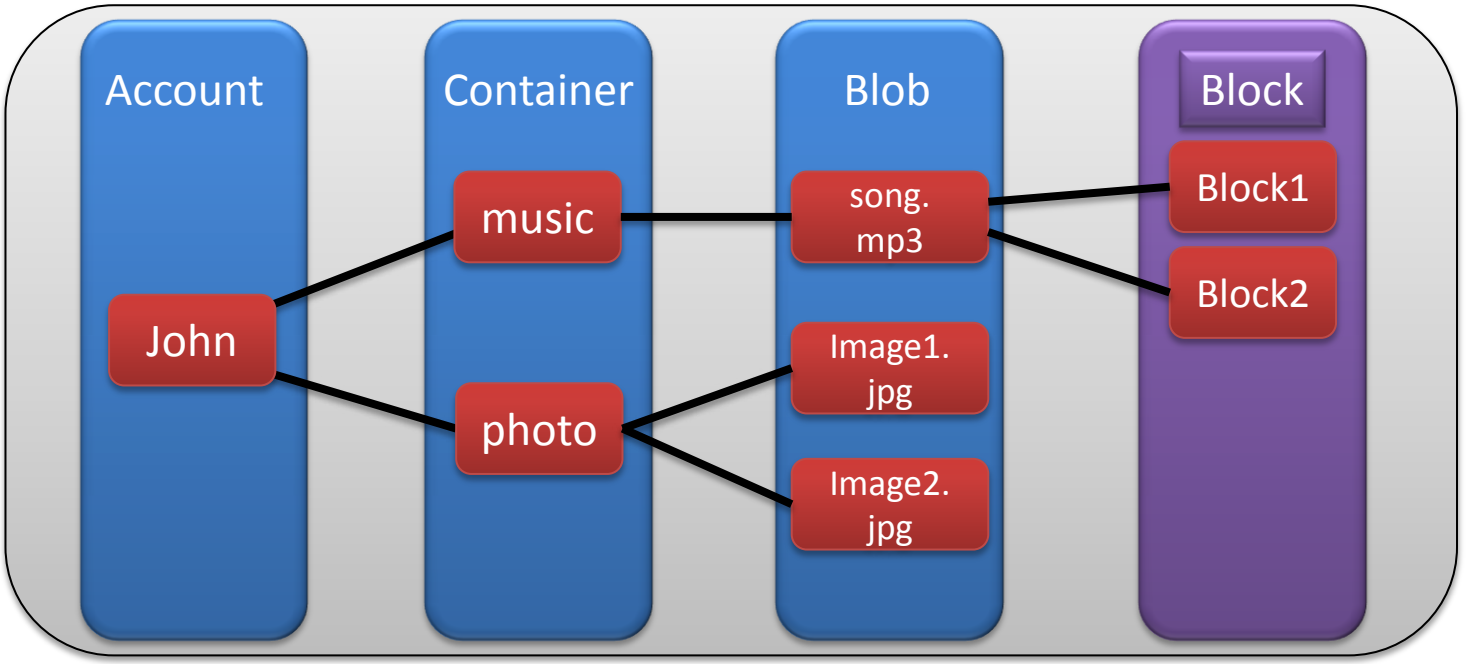
Storage Types

- Windows Azure provides three type of storage and each one provides a special purpose
  - Blob
    - Provides blocks of storage that can store text or binary file
  - Table
    - Provides structured-based storage
  - Queue
    - Provides slices storages that support communication between applications

- Each type of storage service has its own limitation
  - Size of a file
  - Number of operations at once

Blob

- An account has his Blob storage, and can have multiple containers
- Each container has multiple Blobs, each can store blocks or pages



Blob Types

- Block Blob
  - Segment read/write
  - Identify by Block ID
  - Maximum size
    - 4MB for each block, and up to 50000 block
- Page Blob
  - Provided a Windows Azure Driver (aka X-Driver)
  - Random read/write
  - Identify by a range
  - Up to 1TB

X-Driver

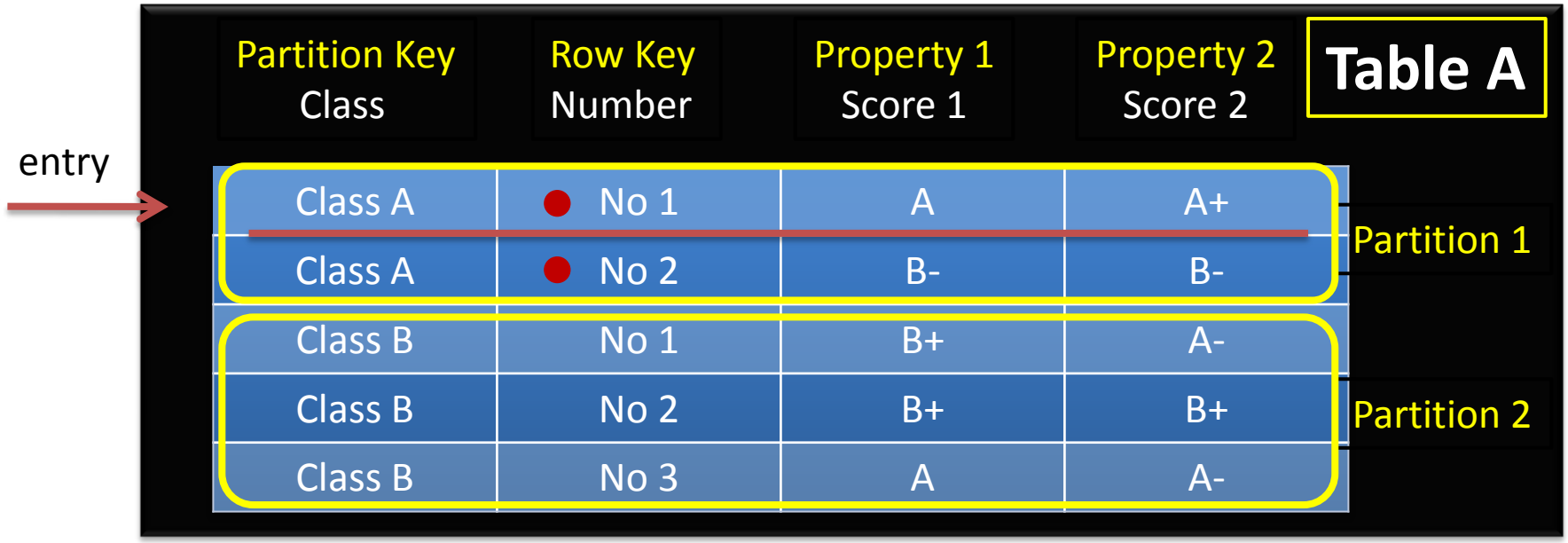
- The underlying storage
- A mechanism for viewing persistent storage as if it were a local drive
- Implemented as a Windows Azure Page Blob containing an NTFS-formatted Virtual Hard Disk (VHD)

Table

- A simple structural data storage that can store some structural data
  - Similar to the EXIF information for describing a photo
- Table can be used as a lightweight database
- Entry is called as a line of data
- Every entry has a particular identifier which contains Account Key and Table Key

Table

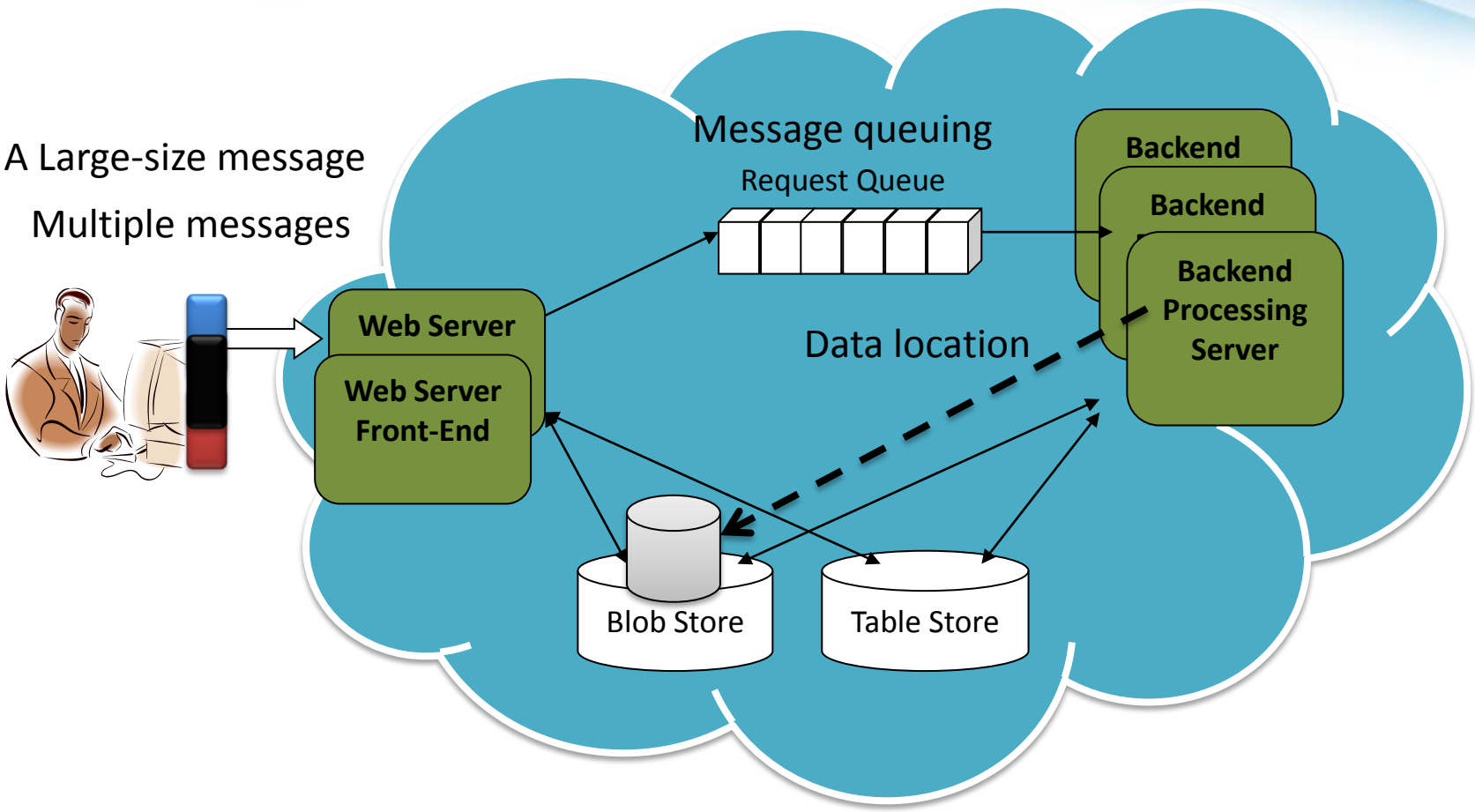
- Account Name and Table Name are used to specify the account and table
- Partition Key is used to specify the same data on different partitions
- Row Key is an identifier of row data



Queue

- Queue usually is used between application's communication
- A queue consists of some slices
- Each slice contains 8 KB data
- There is a particular process handling the queue, ensure each slice operator once

Queue

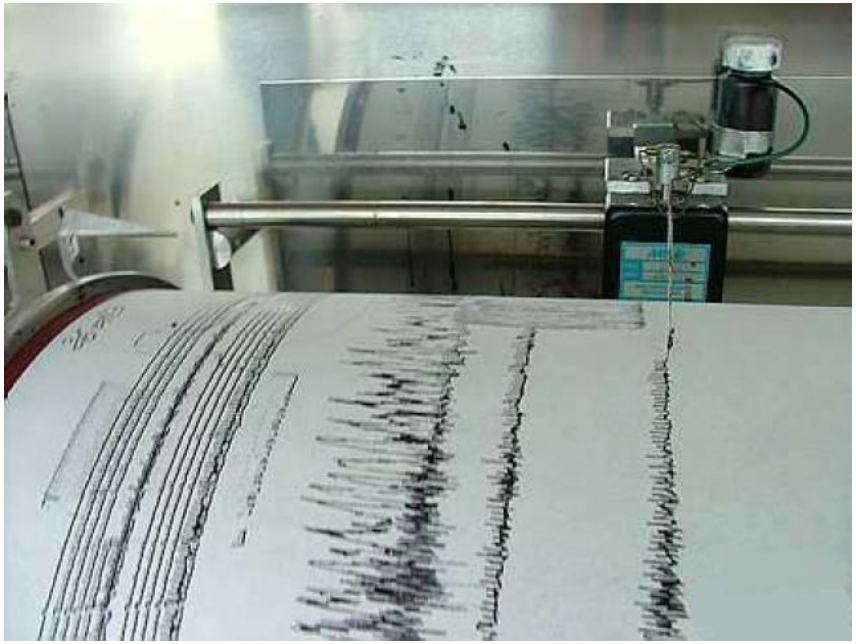

A Large-size message
Multiple messages
Message queuing
Request Queue
Backend
Backend
Backend Processing Server
Web Server
Web Server Front-End
Data location
Blob Store
Table Store

- Compute
- Storage
- Fabric

Windows Azure

Windows Azure - Fabric

- Windows Azure provides an automatic and autonomous way to manage resources
  - Automatically report and recode the status of machines
  - Provide a control center which can failure recover when one or many machines crash

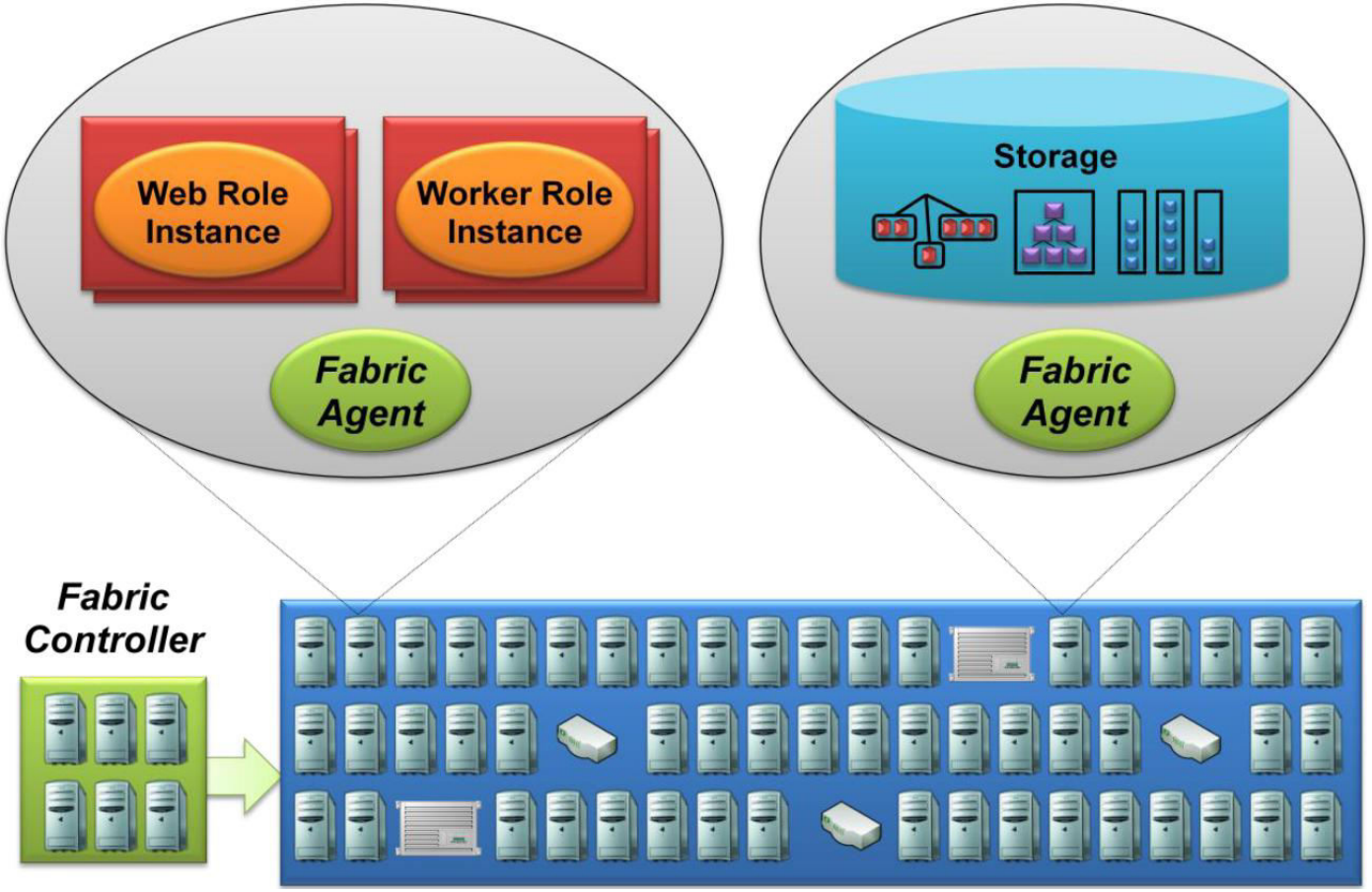


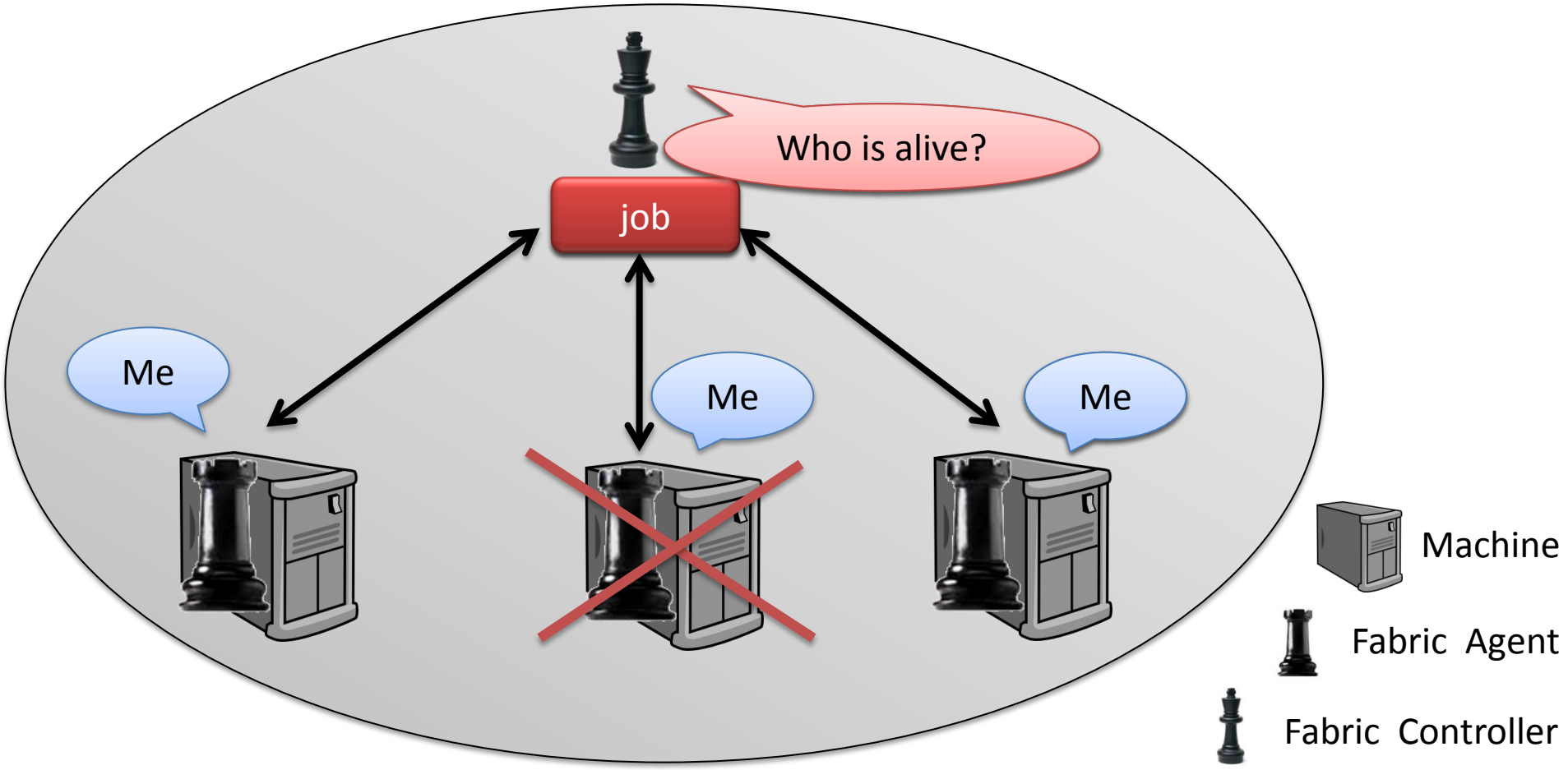
Fabric Types

- Windows Azure supports two fabrics to control and management the machines and jobs
- Fabric Agent
  - Each one of virtual machine has one fabric agent
  - Report the status to fabric controller
  - Provide user's authentication and defense of attack
- Fabric Controller
  - Monitor and control the virtual machine by fabric agent
  - Manage the virtual machines, running environment and software configuration
  - Control the work flow

Example of Fabric

- The *fabric controller* interacts with Windows Azure applications via the *fabric agent*



Fabric

- Fabric Agent records the status of machine and reports to Fabric Controller