DISTRIBUTED RESEARCH ON EMERGING APPLICATIONS & MACHINES
dream-lab.in | **Indian Institute of Science**, Bangalore

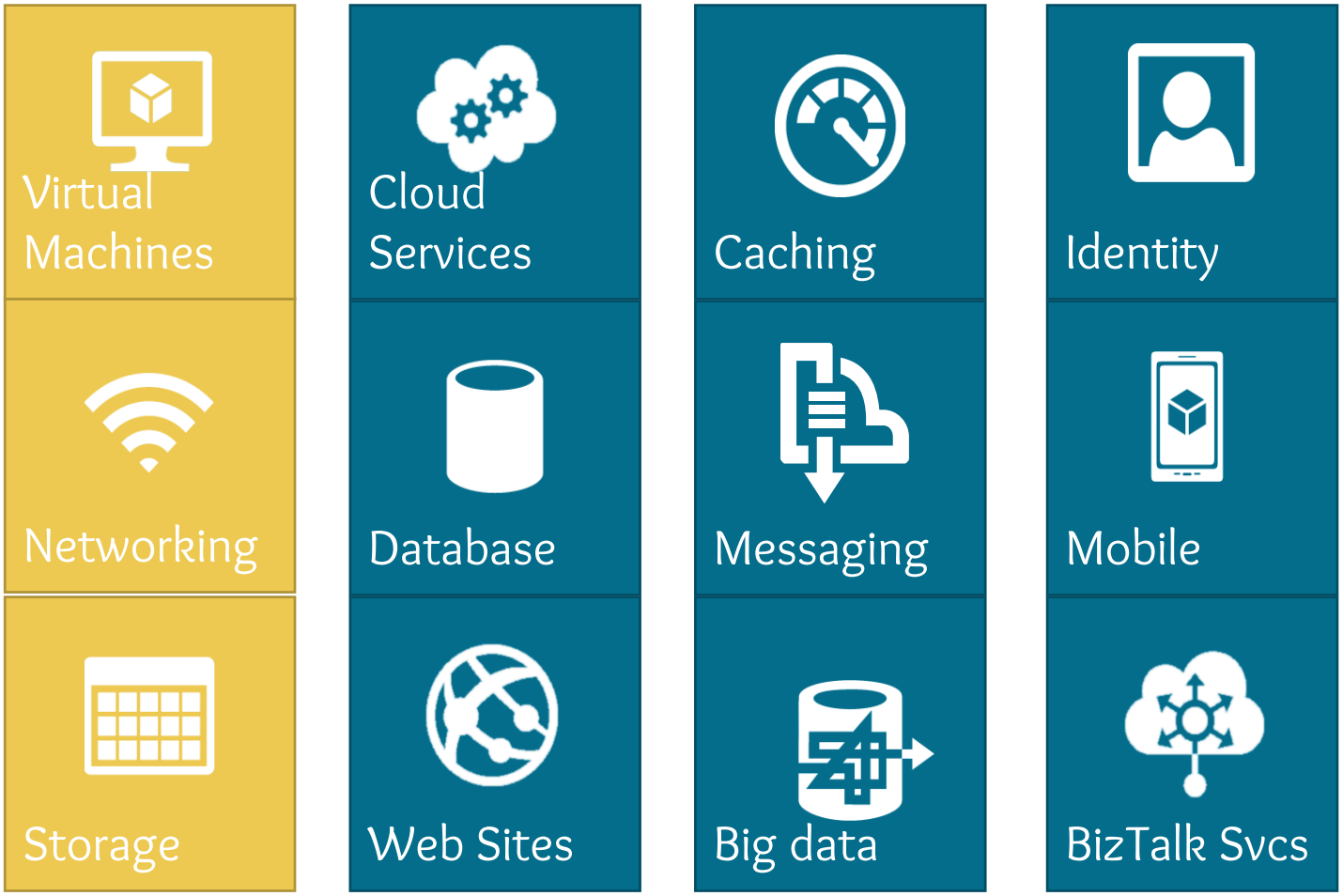
SE252:Lecture 7, Jan 29

ILO2:*Cloud Virtualization*, Abstractions and SOA

Yogesh Simmhan

Platform as a Service

- PaaS offers application building blocks
  - Beyond the hardware abstraction of IaaS

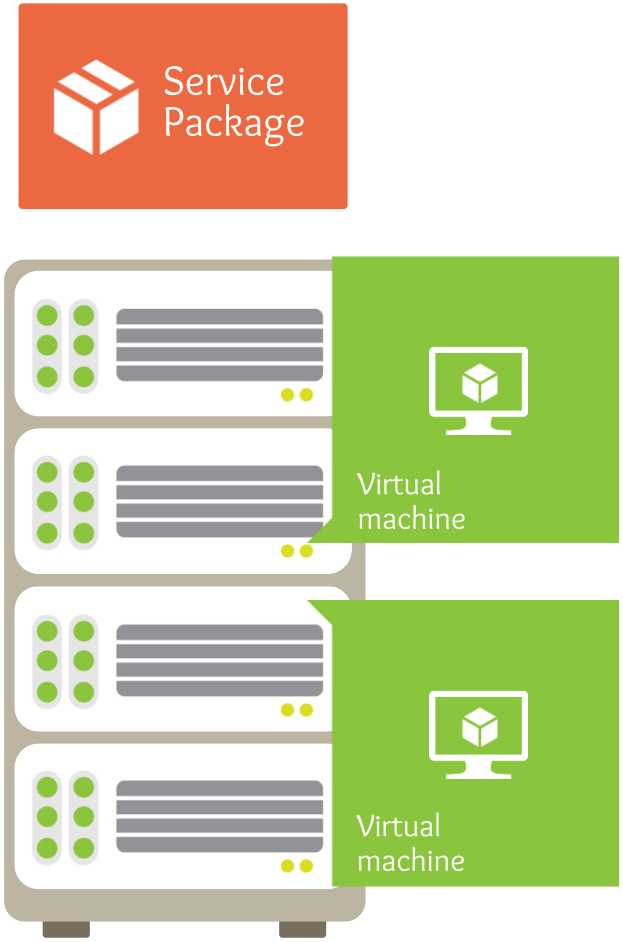


PaaS

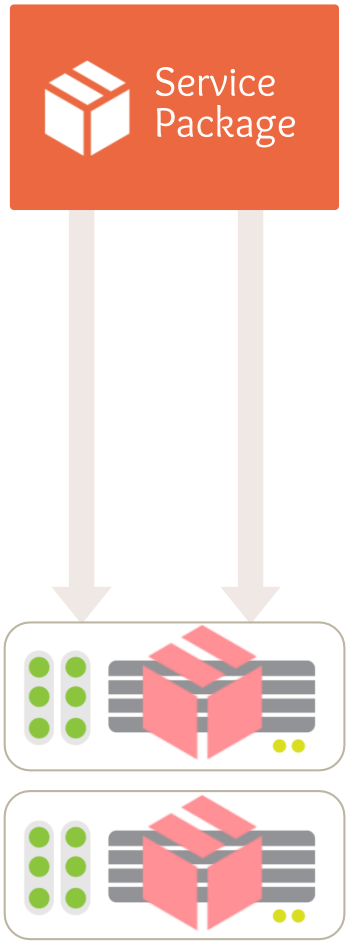
- Composable service components
  - Implement interface, MapReduce
  - Structured storage & querying
  - Complete ecosystem, pre-configured
- Tighter coupling between blocks
  - Easier to develop applications
  - Integrated development environment
  - But, may lock into service provider standards

Windows Azure PaaS

Develop *Role* & Package



Provision Role *Instances*



Deploy Package to Instances

Azure Cloud Services

A container of related service roles

Language: C#, VB, C++, Java, PHP, Node.js, Python, etc.

Framework: .NET, ExpressJS, Rails, Zend, etc.

OS: Windows Server

Programming an Azure Role

App Logic Inherits RoleEntryPoint

OnStart() Method

Called by Fabric on startup, allows you to perform initialization tasks.
Reports Busy status to load balancer until you return true.

Run() Method

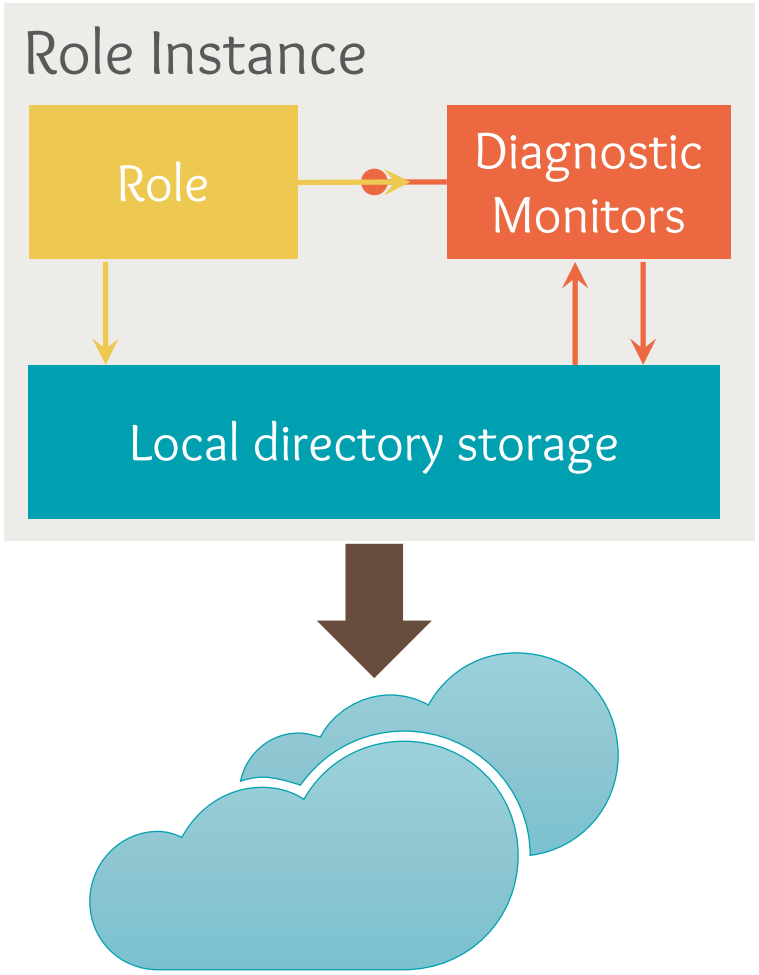
Main logic is here – can do anything, typically infinite loop. Should never exit.

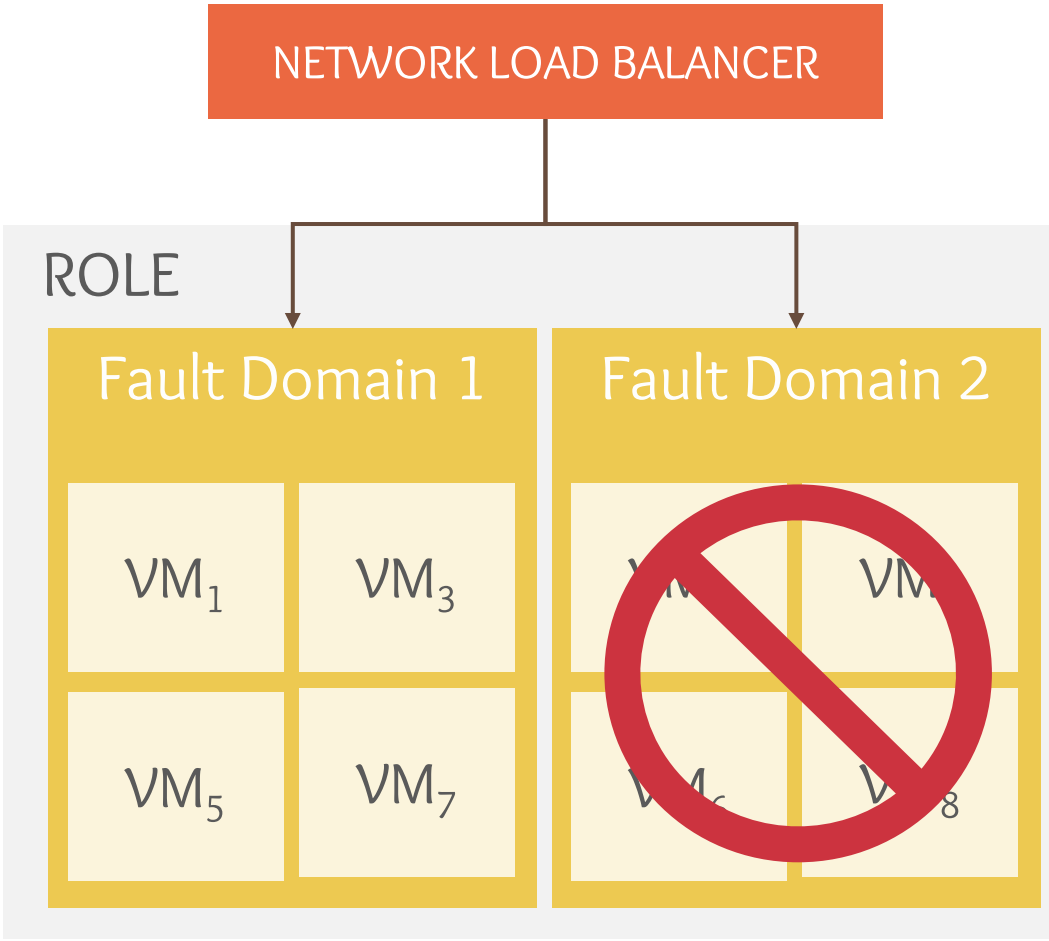
OnStop() Method

Called when role is to be shutdown, graceful exit.
30 Seconds to tidy up.

Role Lifetime

Debugging & Resiliency





Instance Storage & Networking

- Local Storage
  - » Role instances have available disk storage
  - » Persistent but not guaranteed durable
    - › Good for cached resources or temporary files
- Azure Storage Drives provide durable storage (EBS)
- Input Endpoint
  - Single port, Load-balanced endpoint
  - HTTP, HTTPS, TCP, UDP
- Internal Endpoint
  - Instance-to-instance communication, range of ports
  - HTTP, TCP, UDP

Instance Options for Role

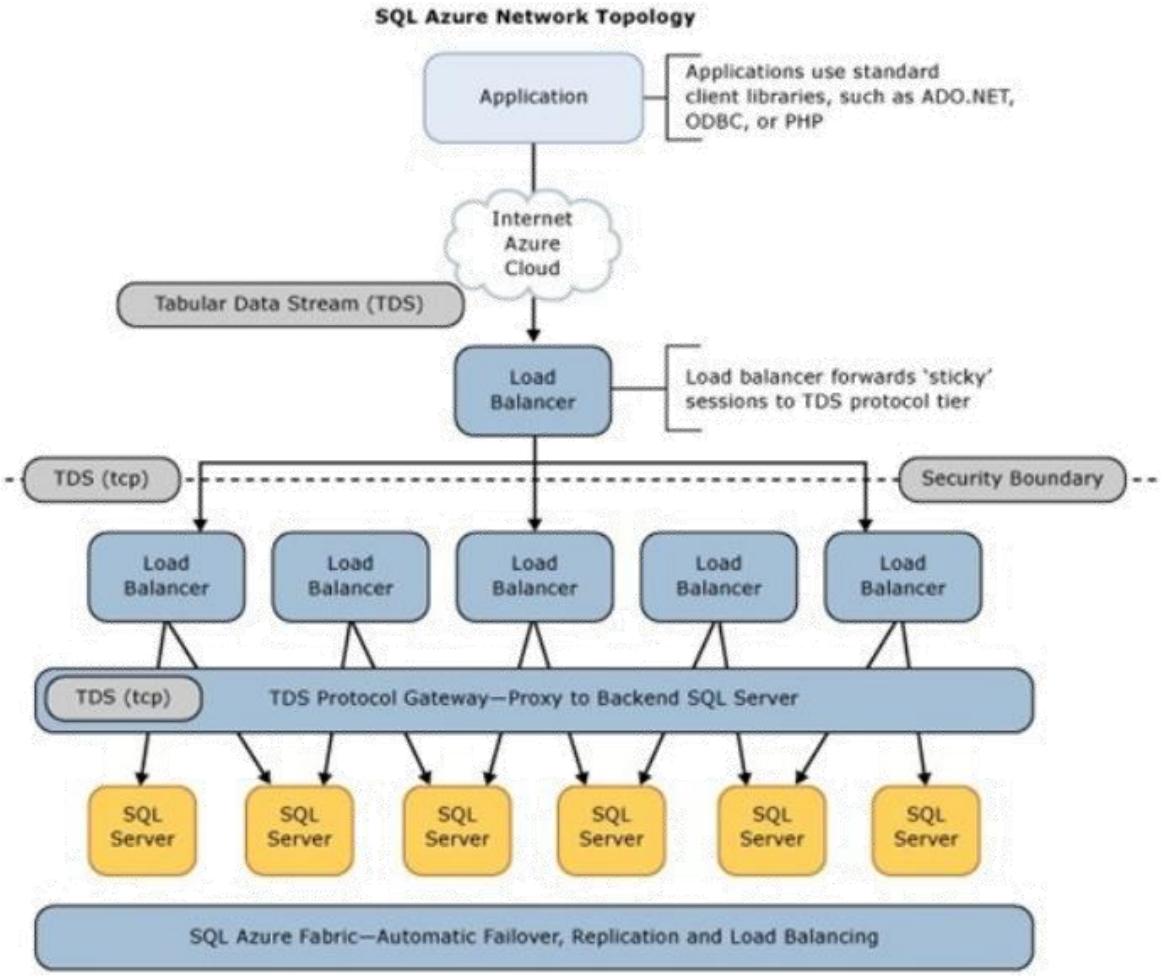
- All instances of role will be of equal size
- Service can have multiple roles

Size	Virt. Cores	CPU Speed	RAM	Local Storage	Cost (USD)
Extra Small	Shared	1.0 GHz	768M	20GB	.02
Small	1	1.6 GHz	1.75GB	225GB	.08
Medium	2	1.6 GHz	3.5GB	490GB	.16
Large	4	1.6 GHz	7GB	1,000GB	.32
Extra large	8	1.6 GHz	14GB	2,040GB	.64

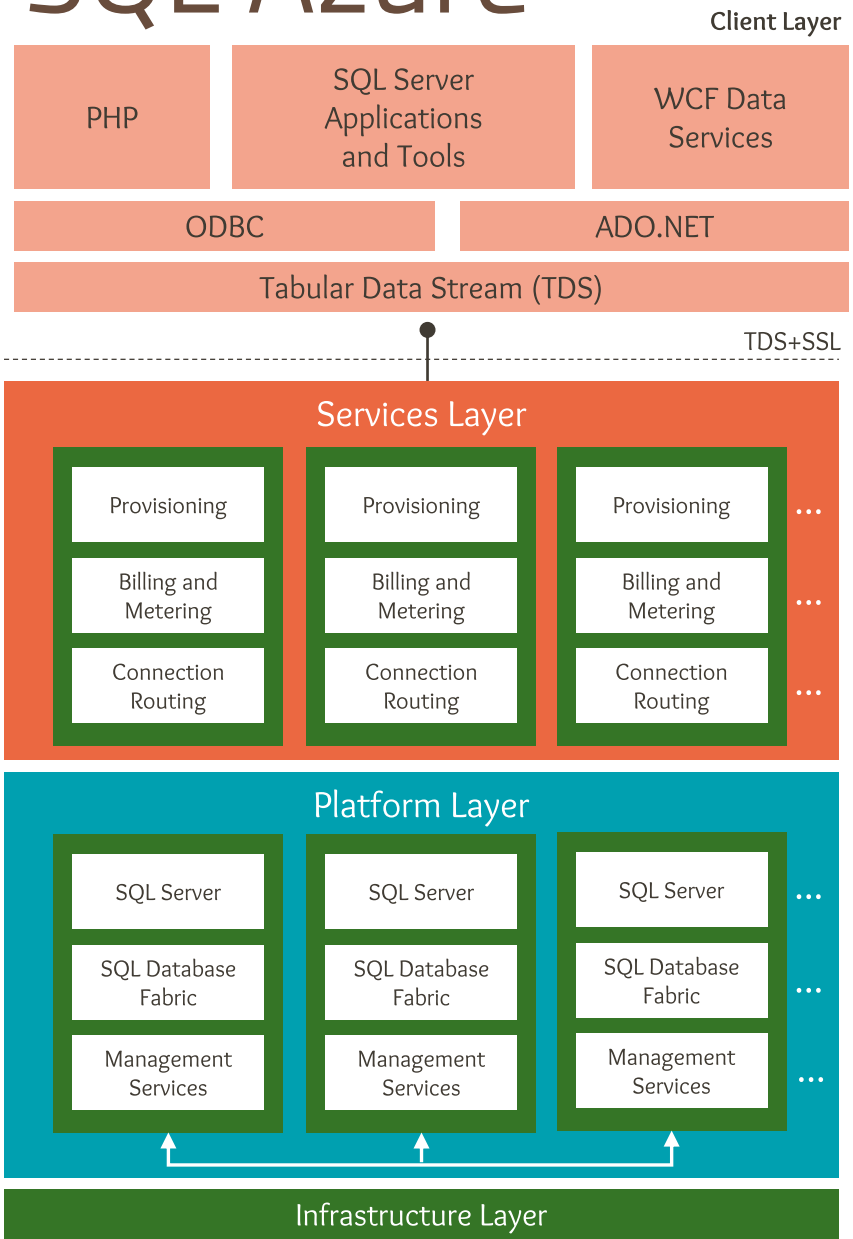
SQL Azure, Relational DB as a Service

SQL Server → A Machine

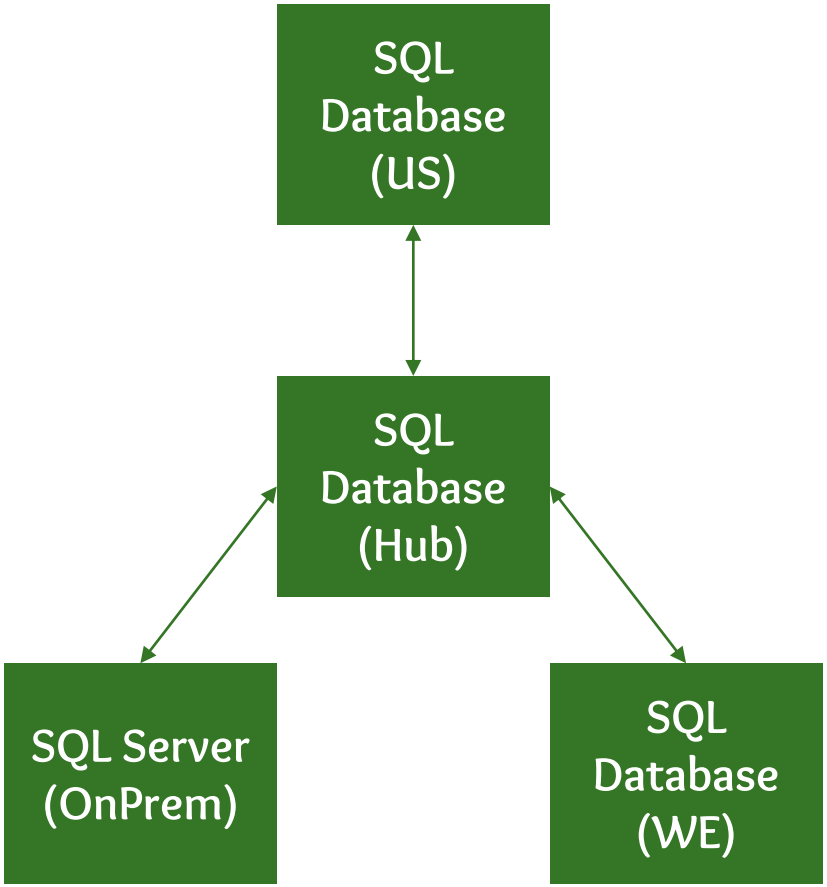
SQL Azure Service → A TDS Endpoint



SQL Azure

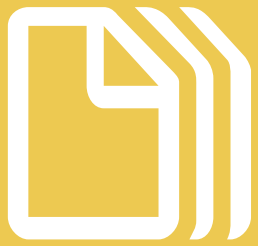


SQL Data Sync



Cloud Providers Span Abstractions

Windows Azure Storage Abstractions



Blobs

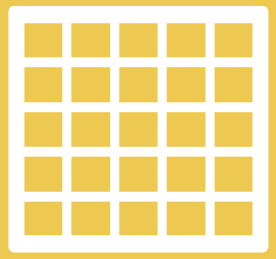
Simple named files along with metadata for the file.

S3

Drives

Durable NTFS volumes for Windows Azure applications to use. Based on Blobs.

EBS



Tables

Structured storage. A table is a set of entities; an entity is a set of properties.

SDB

Queues

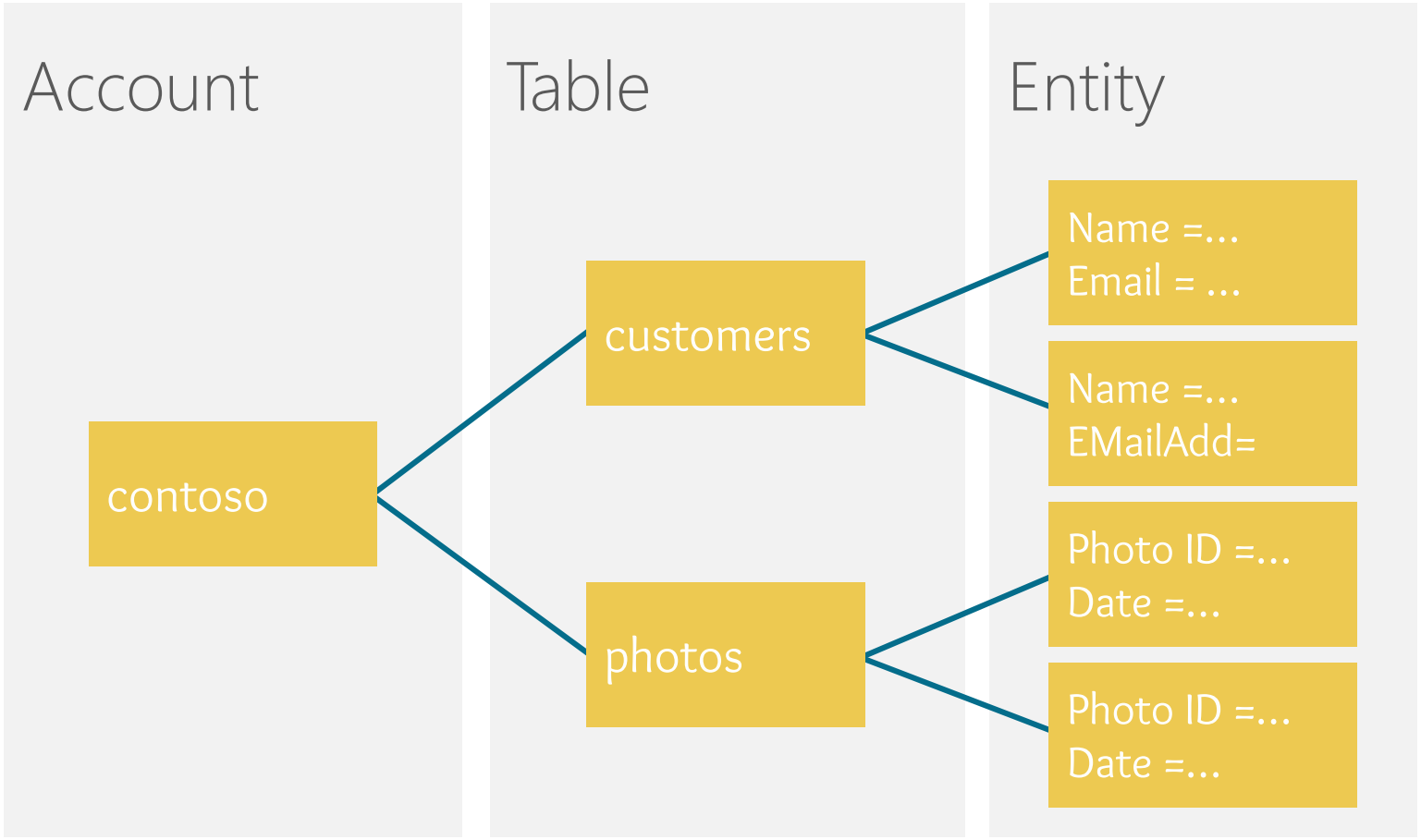
Reliable storage and delivery of messages for an application.

SQS

Table Storage Concepts

Create, Query, Delete

Tables can have metadata



Insert
Update
Upsert
Delete
Query

Entity Properties

Entity can have up to 255 properties

Mandatory Properties

- PartitionKey & RowKey (only indexed properties)
  - Uniquely identifies an entity, Defines the sort order
- Timestamp
  - Optimistic Concurrency, Exposed as an HTTP Etag

No fixed schema for other properties

- Each property is stored as a <name, typed value> pair
  - No schema stored for a table
  - String, binary, bool, DateTime, GUID, int, int64, and double

Partition Key

- Entities in the same partition will be stored together
  - Endeavour to include partition key in all queries
- Atomic multiple Insert/Update/Delete in same partition

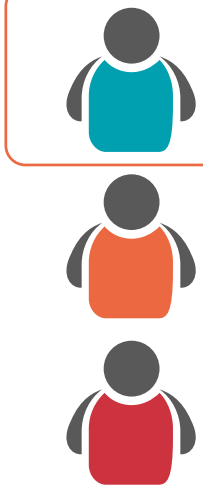
No Fixed Schema

FIRST	LAST	BIRTHDATE	FAV SPORT
Wade	Wegner	2/2/1981	
Nathan	Totten	3/15/1965	Canoeing
Nick	Harris	May 1, 1976	

Simple Querying

Endeavour to include partition key in all queries

```
?$filter=Last eq 'Wegner'
```



FIRST	LAST	BIRTHDATE
Wade	Wegner	2/2/1981
Nathan	Totten	3/15/1965
Nick	Harris	May 1, 1976

Software as a Service

- End user services, out of the box
- Can be composed to provide complex services
  - E.g. eCommerce Website using Email, Shopping Cart, Inventory Management, Billing and Credit Card Processing Service

Reading from Today's Lecture

- Textbook, Sec 4.1 – 4.4

Assignments

- Homework A is available. Due on Feb 6.
- Project & team selection due on Feb 5.

Makeup Class, Project Discussion: **Fri 4-530P**

Data Centres

- MSFT
- https://www.youtube.com/watch?v=hOxA1l1pQIw
- GOOG
- https://www.youtube.com/watch?v=zRwPSFpLX8I
- FB
- https://www.youtube.com/watch?v=-DRxqHrPrFw
- Huawei
- https://www.youtube.com/watch?v=soVDoqRVP5c