Die Microsoft Windows Azure Plattform

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Windows® Azure™ Platform

Abstract

Cloud Computing ist in aller Munde. Microsoft ist mit seiner Windows Azure Plattform auf den Zug aufgesprungen, grenzt sich von Mitbewerbern jedoch dadurch ab, dass nicht Infrastruktur gemietet wird, sondern Entwicklern fertige Services angeboten werden. Was kann Azure? Aus welchen Teilen besteht die Plattform? Für wen macht Azure Sinn und für wen nicht? Rainer Stropek übernimmt im ersten Teil des Tutorials die Rolle des Fremdenführers und leitet Sie durch die Microsoft- Seite des Cloud Computings. Im zweiten Teil des Tutorials nimmt Rainer Stropek eine fertige ASP.NET-Anwendung und bringt sie in die Cloud. Sie sehen SQL Azure, Blob Storage, Queues, Web- und Worker-Roles, die DevFabrik und vieles mehr in Aktion. Die Demonstration setzt dabei auf den Grundlagen auf, die am Beginn des Tutorials vermittelt wurden.

Diese Präsentation basiert zum Teil auf Folien des Windows Azure Training Kit

Vorstellung

- software architects gmbh
- Rainer Stropek
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http://www.timecockpit.com
http://www.software-architects.com

Reasons For The Cloud

What is the cloud?

An approach to computing that's about internet scale and connecting to a variety of devices and endpoints

Hosted

Cloud

Einnahme-quelle

Flexibel

Daten unter Kontrolle

SLAs

Applikation

Backup
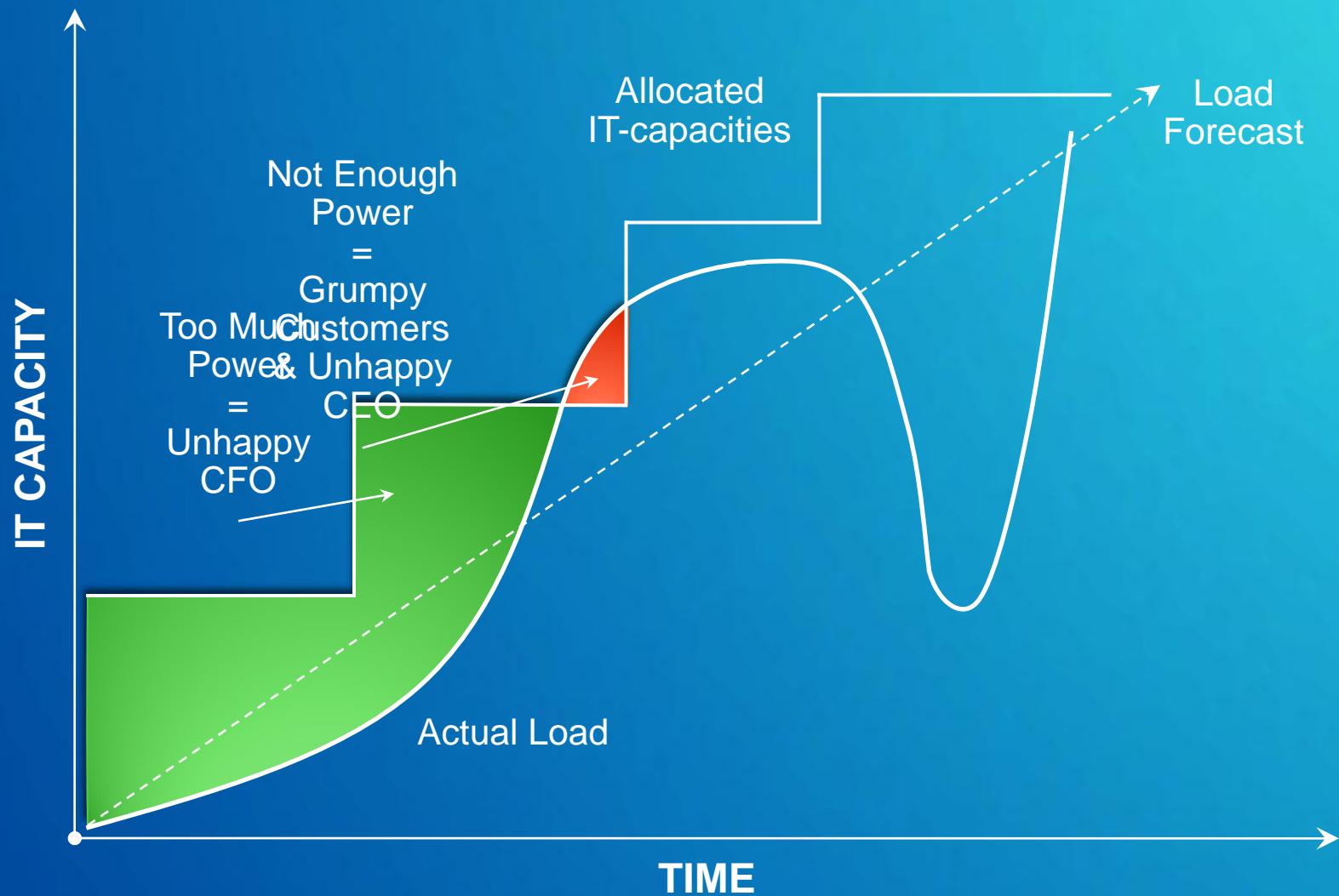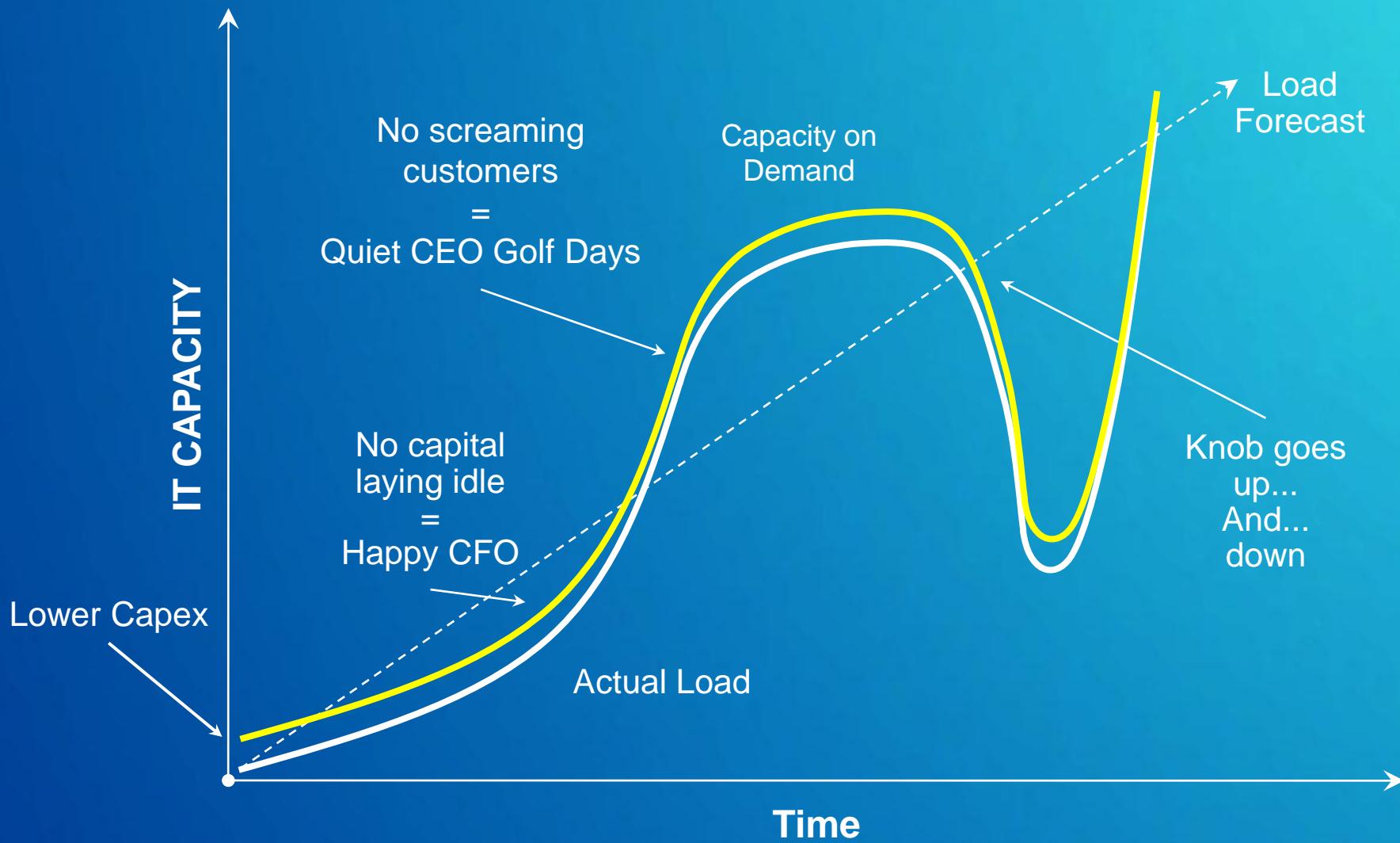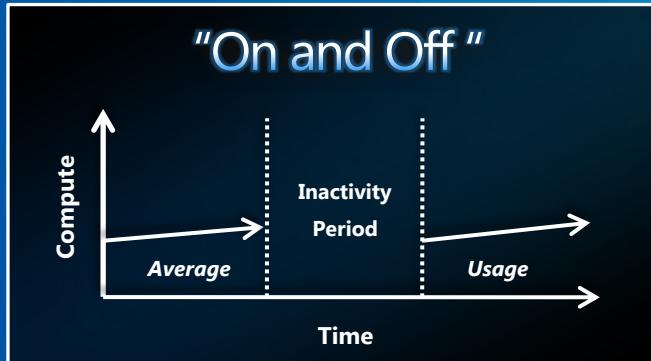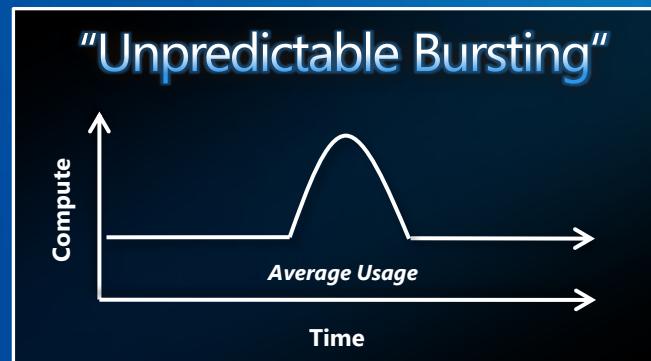
Cloud Workflow Patterns

"On and Off"
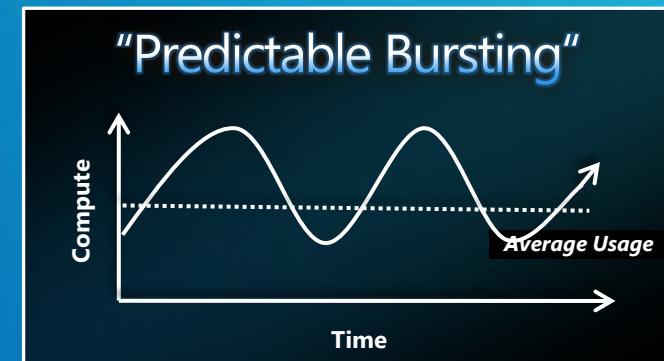
- On & off workloads (e.g. batch job)
- Over provisioned capacity is wasted
- Time to market can be cumbersome

"Growing Fast"

- Successful services needs to grow/scale
- Keeping up w/ growth is big IT challenge
- Cannot provision hardware fast enough

"Unpredictable Bursting"

- Unexpected/unplanned peak in demand
- Sudden spike impacts performance
- Can't over provision for extreme cases

"Predictable Bursting"

- Services with micro seasonality trends
- Peaks due to periodic increased demand
- IT complexity and wasted capacity

Cloud Computing optimal für jeden?

Auf keinen Fall → **zusätzliche Option**

Pro Cloud

- Starke Schwankungen Last/Ressourcen
- Zukünftige Kapazität schwer abschätzbar
- Fehlendes Infrastrukturwissen

Warum?

Pay-Per-Use

Elastizität, dynamische Ressourcen

Infrastruktur-Outsourcing

Contra Cloud

- Strenge Datenschutzbedingungen
- Geringe Kosten bei Ausfall
- Hohe Preissensitivität

Warum?

Daten nicht im eigenen Rechenzentrum

Daten eventuell nicht im Land

Wenig Kontrolle über Infrastruktur

What Is Windows Azure?

Windows Azure-Plattform

Power Usage Efficiency (PUE): 1.22
2.500 Server/Container
Ca. 400.000 Server/Container-Farm
Austausch bei ca. 60% Ausfall / Container

http://news.cnet.com/8301-10805_3-10020902-75.html
http://www.datacenterknowledge.com/inside-microsofts-chicago-data-center/microsoft-chicago-center-aisle-container/
http://www.datacenterknowledge.com/inside-microsofts-dublin-mega-data-center/microsofts-dublin-data-center-server-pods/
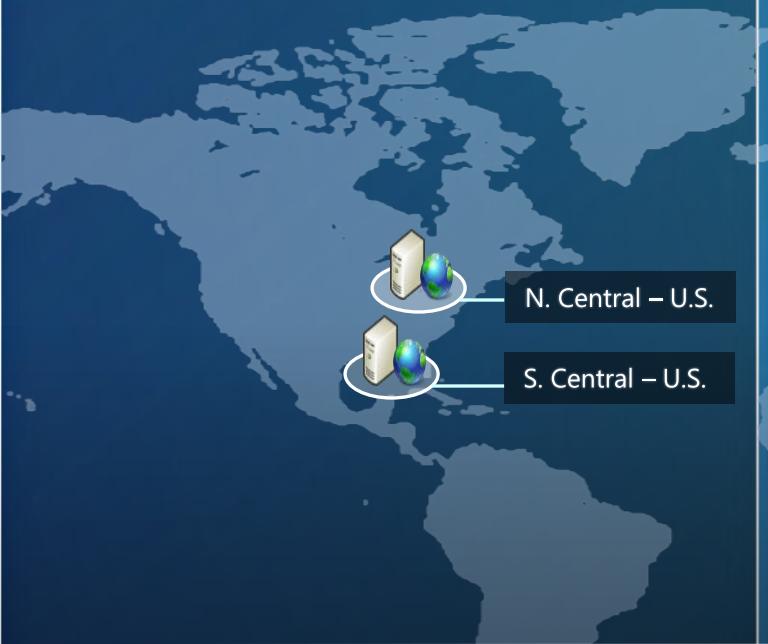
Windows Azure-Plattform

- Videos
  - http://www.microsoft.com/showcase/en/us/details/84f44749-1343-4467-8012-9c70ef77981c
  - http://www.microsoft.com/showcase/en/us/details/36db4da6-8777-431e-aefb-316ccbb63e4e
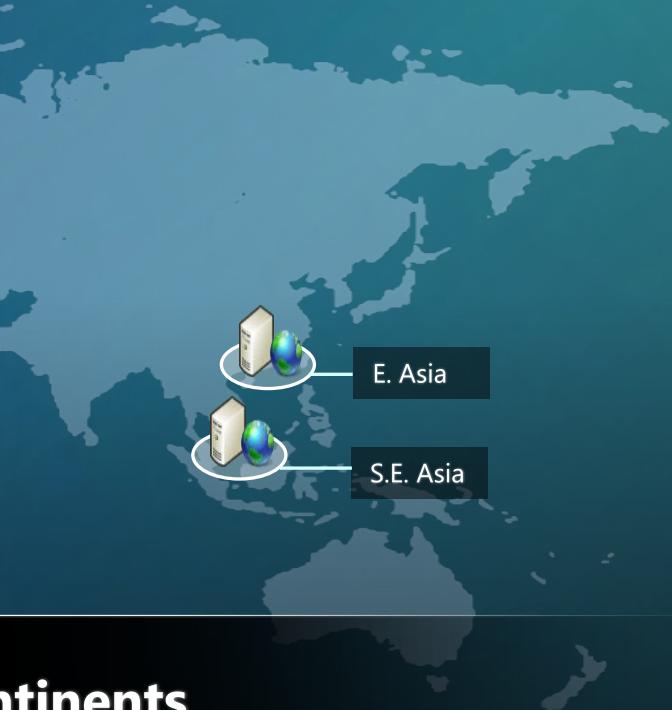
Providing Security with Windows Azure

PHYSICAL:
- Microsoft data centers with modern and current security processes
- Redundant power supplies from separate providers, battery and diesel backup generators, climate control, and fire prevention and suppression

CONTINUITY:
- Multiple data centers in different geographies
- Users can choose single location or geo-distributed data centers
- Storage data is replicated multiple times

LOGICAL:
- Storage encryption and authentication
- HTTPS
- Optimized for Cloud access with no admin access to guests or applications
- Applications and users not allowed to update the underlying environment

COMPLIANCE & CERTIFICATION:
- Microsoft is committed to complying with all local laws
- Industry certification is a core part of the Windows Azure roadmap
- Customers are ultimately responsible for the security and compliance of their services or applications–Windows Azure is a platform
- List of certifications available on Azure.com

Cloud Services

"IaaS"
Infrastructure-as-a-Service

host

"PaaS"
Platform-as-a-Service

build
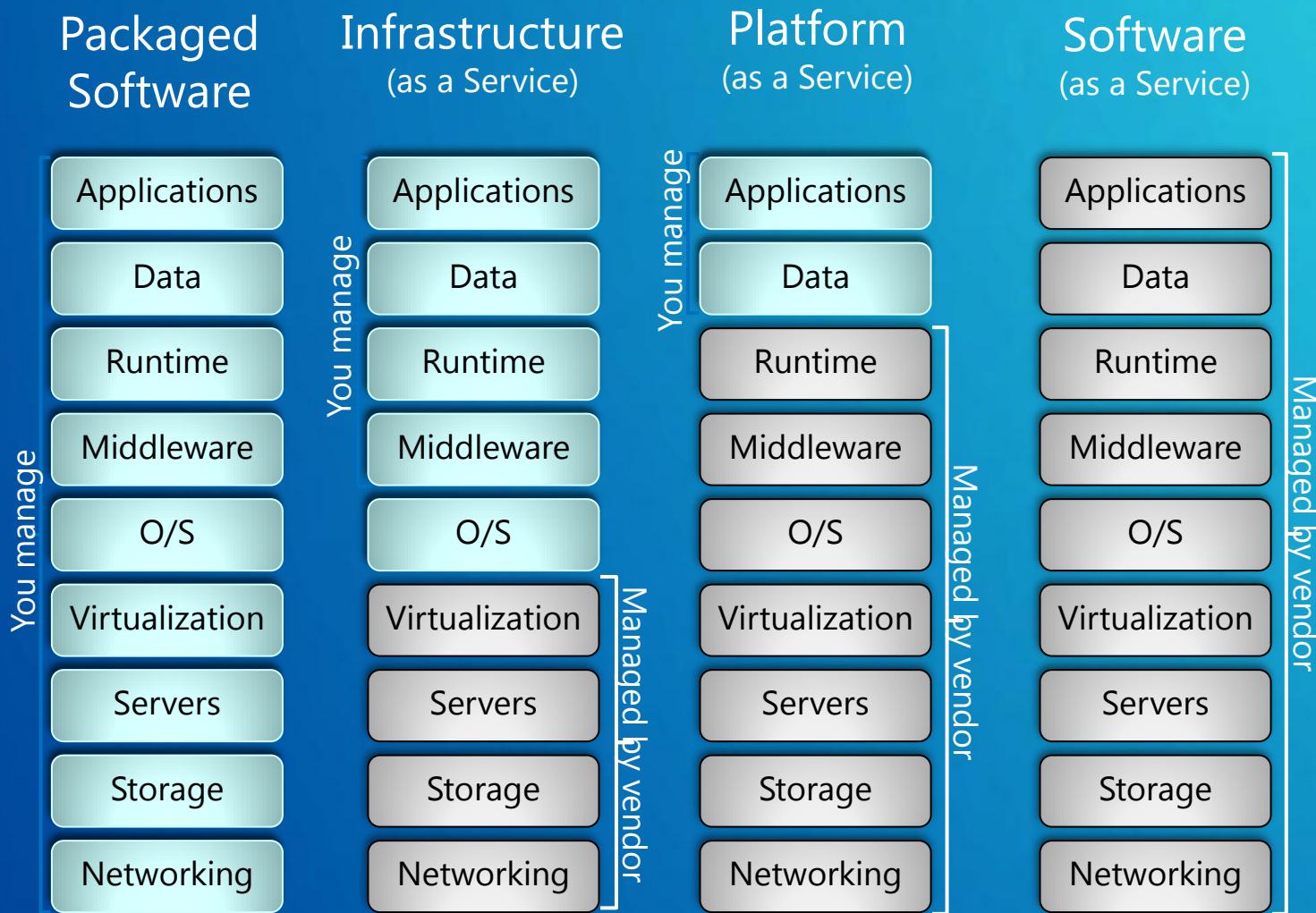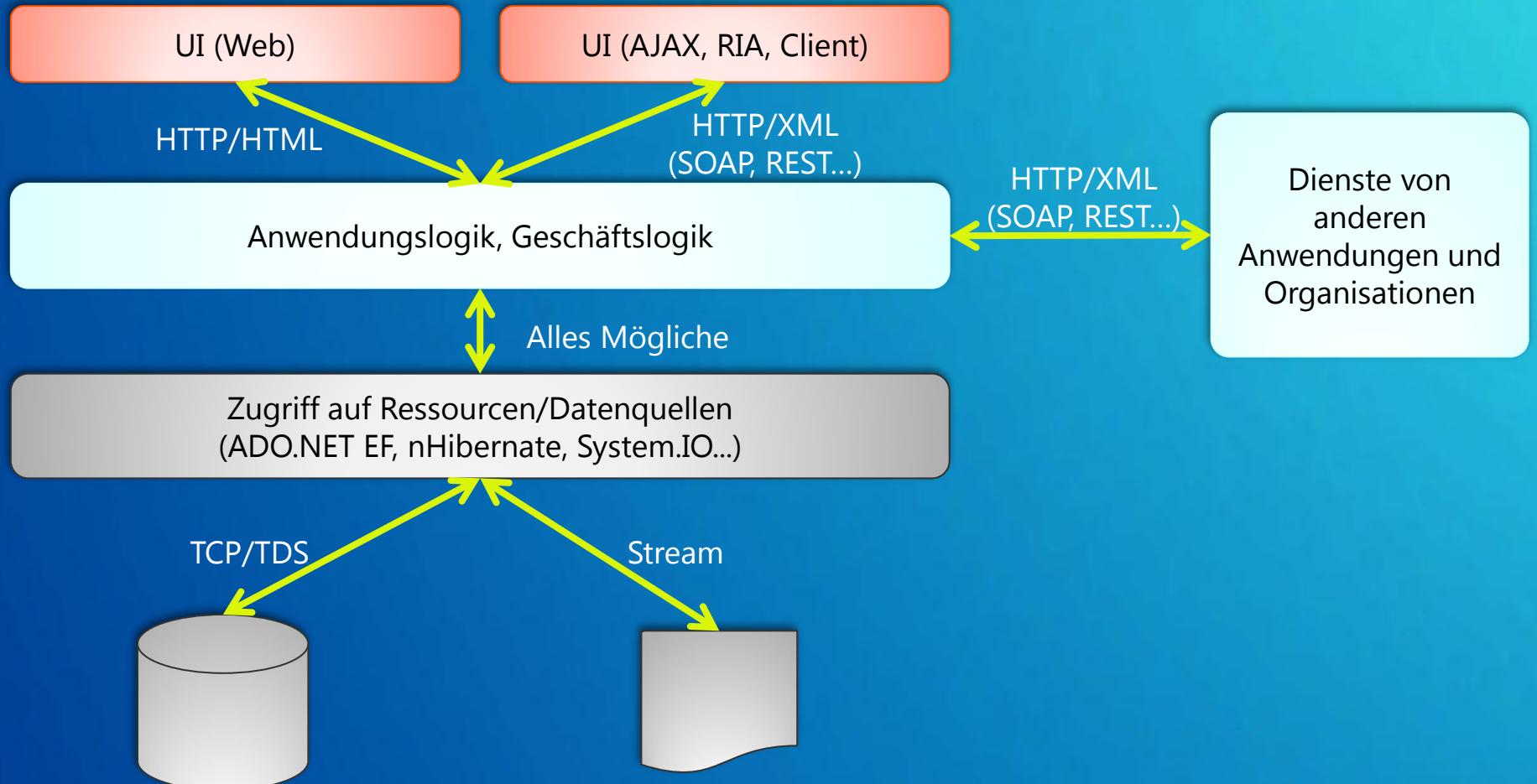
"SaaS"
Software-as-a-Service

consume

Cloud Services

Packaged Software	Infrastructure (as a Service)	Platform (as a Service)	Software (as a Service)
Applications	Applications	Applications	Applications
Data	Data	Data	Data
Runtime	Runtime	Runtime	Runtime
Middleware	Middleware	Middleware	Middleware
O/S	O/S	O/S	O/S
Virtualization	Virtualization	Virtualization	Virtualization
Servers	Servers	Servers	Servers
Storage	Storage	Storage	Storage
Networking	Networking	Networking	Networking

Packaged Software: You manage (all layers)

Infrastructure (as a Service): You manage — Applications, Data, Runtime, Middleware, O/S. Managed by vendor — Virtualization, Servers, Storage, Networking.

Platform (as a Service): You manage — Applications, Data. Managed by vendor — Runtime, Middleware, O/S, Virtualization, Servers, Storage, Networking.

Software (as a Service): Managed by vendor (all layers)

Was braucht eine „Cloud-Plattform"?

UI (Web)

UI (AJAX, RIA, Client)

HTTP/HTML

HTTP/XML
(SOAP, REST…)

Anwendungslogik, Geschäftslogik

HTTP/XML
(SOAP, REST…)

Dienste von anderen Anwendungen und Organisationen

Alles Mögliche

Zugriff auf Ressourcen/Datenquellen
(ADO.NET EF, nHibernate, System.IO…)

TCP/TDS

Stream

Was braucht eine „Cloud-Plattform"?

Windows Azure Platform

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

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

Windows Azure AppFabric
- Connect existing apps to the cloud
- Connect through network boundaries
- Easily control authorization to apps

Moving Apps to the Cloud

Compatible with Windows Azure

- Applications can run in a Windows Azure VM role
- Managed by the customer
- Choice of deployment
- Requires patching & maintenance of VMs

Designed for Windows Azure

- Uses the Windows Azure Service Model
- Application managed by the customer
- OS patching & maintenance provided by the platform
- Faster deployment
- Reliability and fault-tolerance

Delivered as a Service

- Managed by the ISV
- Multi-tenant or isolated
- Latest software for customers
- Flexible business models (per user, subscription, etc.)

Windows Azure Roles

- Windows Server 2008 x64
- .NET Framework – 3.5 SP1 and 4.0
- Supports Full Trust but no Admin rights
- Native Code in User Mode
- Fabric manages role lifecycle

Worker Role

- Managed Code Start
- Inbound on
  - Any TCP Port
  - HTTP/HTTPS

Web Role

- Hosted IIS 7
- HTTP/HTTPS
- ASP.NET
- Fast CGI + PHP

Windows Azure

The Fabric Controller automates load balancing and computes resource scaling

Security and Control Features include storage encryption, access authentication, and over-the-wire encryption using HTTPS. Industry certification is part of the Windows Azure roadmap.

Computation provides application scalability. Developers can build a combination of web and worker roles. Those roles can be replicated as needed to scale the applications and computational processing power.
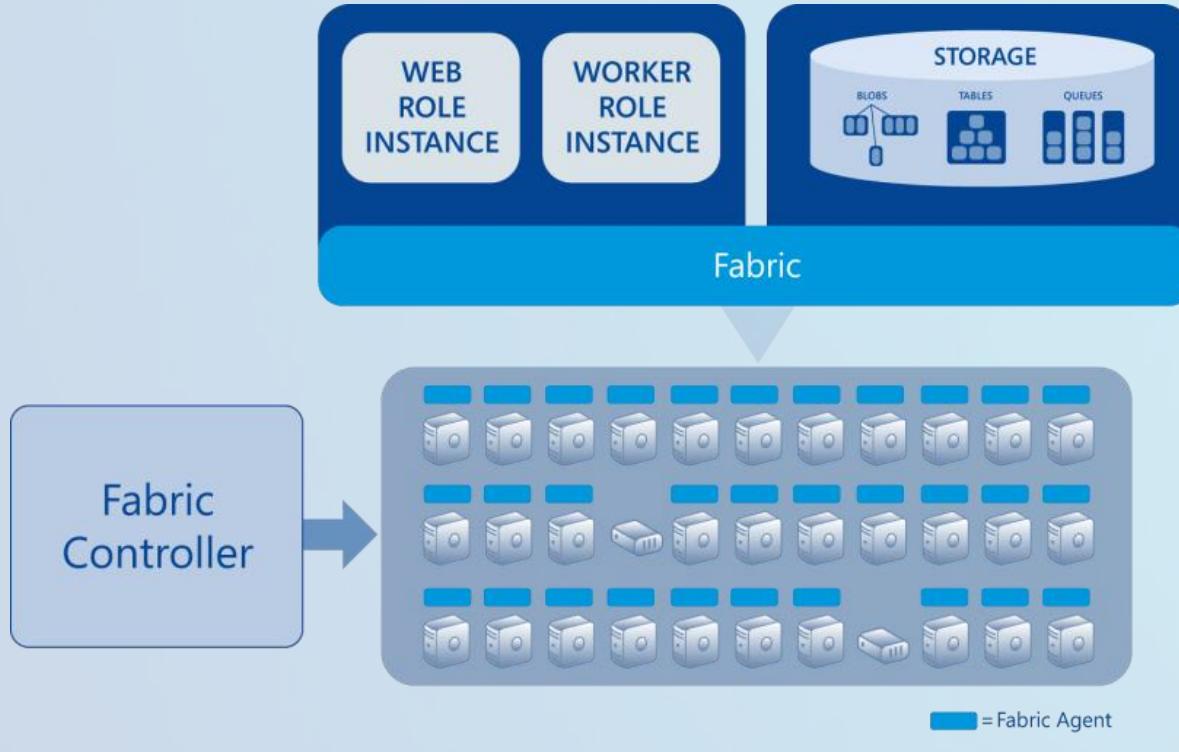
Storage Services allow customers to scale to store large amounts of data – in any format – for any length of time, only paying for what they use or store.

Geographically distributed, state-of-the-art data centers host your applications and data, internet-accessible from everywhere you choose to allow.

Fabric Controller

- Interacts with a "Fabric Agent" on each machine

- Monitors every VM, application and instance

- Performs load balancing, check pointing and recovery

Compute In Windows Azure

Compute in Windows Azure
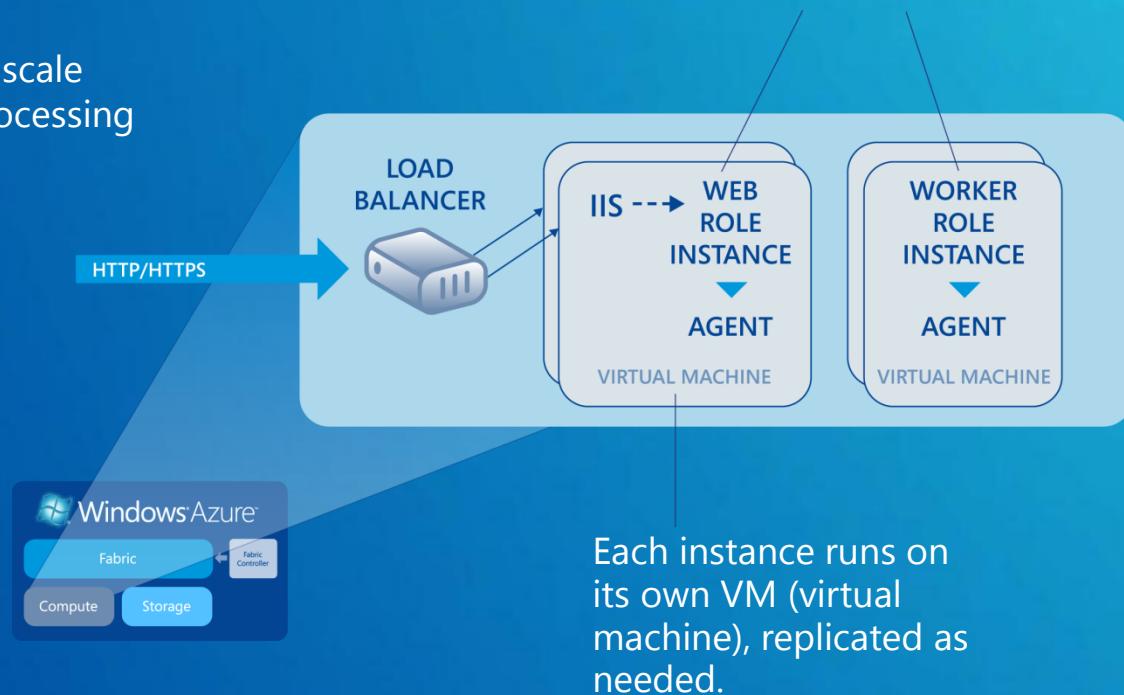
SCALABILITY

Scale out by replicating instances as needed.
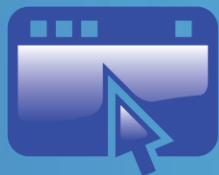
Allow applications to scale user and compute processing independently.

Two instance types: Web Role & Worker Role
Windows Azure applications are built with web role instances, worker role instances, or a combination of both.

LOAD BALANCER

HTTP/HTTPS

IIS --→ WEB ROLE INSTANCE

AGENT

VIRTUAL MACHINE

WORKER ROLE INSTANCE

AGENT

VIRTUAL MACHINE

Windows Azure

Fabric   Fabric Controller

Compute   Storage

Each instance runs on its own VM (virtual machine), replicated as needed.

Defining the Web and Worker Roles

WEB ROLE

Interacts with end-user
or web services

Handles incoming
HTTP/HTTPS requests

Develop with Microsoft and
non-Microsoft tools:
ASP.NET, WCF,
other .NET tools
Java, PHP, etc.

WORKER ROLE

Can only receive inbound traffic
when configured properly

Initiates their own requests
for data or tasks from
the queue

Similar to a "batch job"
or Windows service
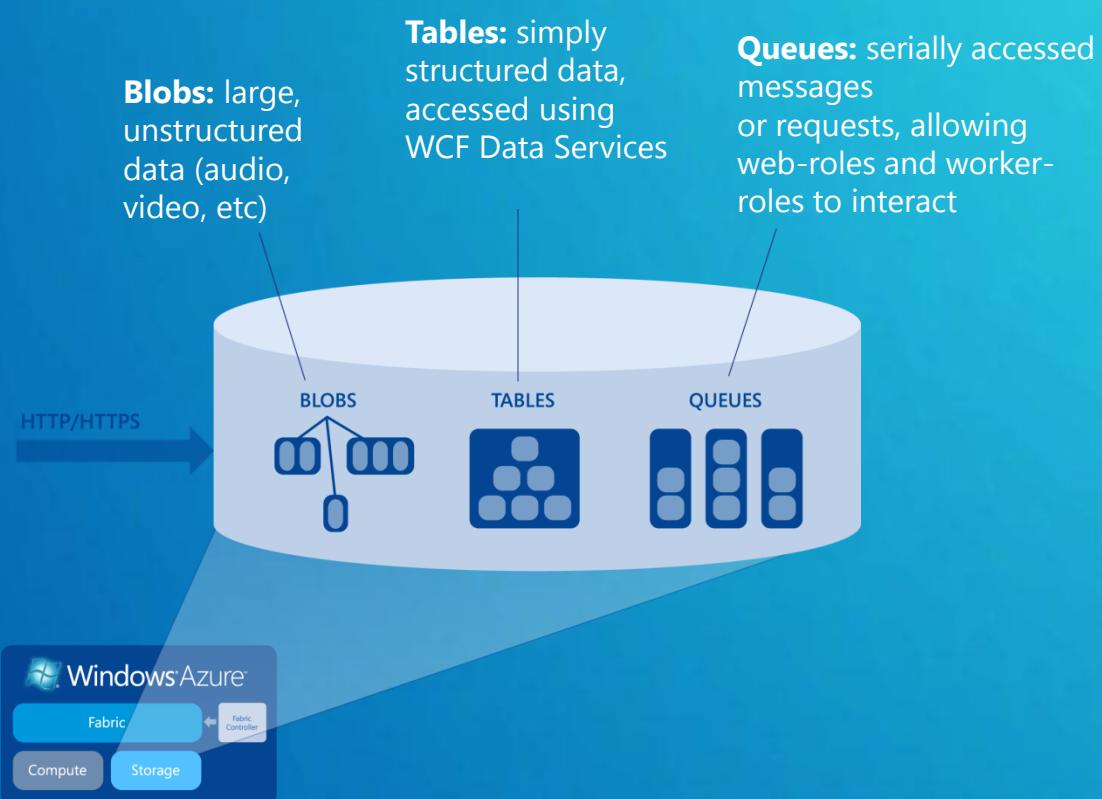
Storage in Windows Azure

GOAL:

SCALABLE, DURABLE STORAGE

Windows Azure storage is an application managed by the Fabric Controller

Windows Azure applications can use native storage or SQL Azure

Application state is kept in storage services, so worker roles can replicate as needed

Blobs: large, unstructured data (audio, video, etc)

Tables: simply structured data, accessed using WCF Data Services

Queues: serially accessed messages or requests, allowing web-roles and worker-roles to interact

HTTP/HTTPS

BLOBS   TABLES   QUEUES

Windows Azure

Fabric   Fabric
                  Controller

Compute   Storage

What does an Operating System do?

App1 App2 App3 App4

Management / Security / etc.

Task Scheduler

Hardware Abstraction Layer

DISK CPU GPU Memory

Azure does this for the cloud

App1	App2	App3	App4

APIs / .NET ACS / etc.

Azure Fabric Controller

Azure Fabric
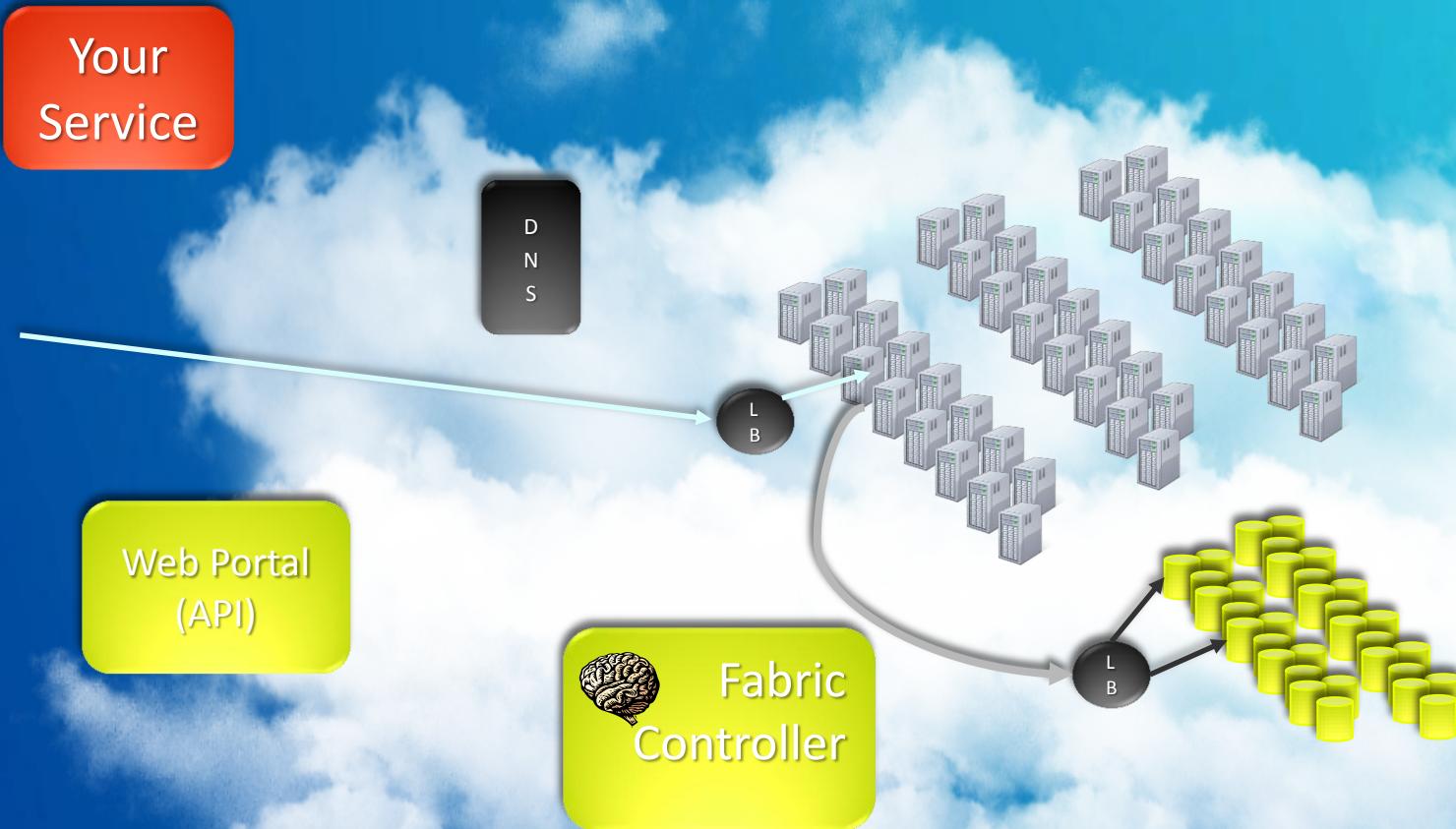
Server 1	Server 2	Server 3	Server 3,500
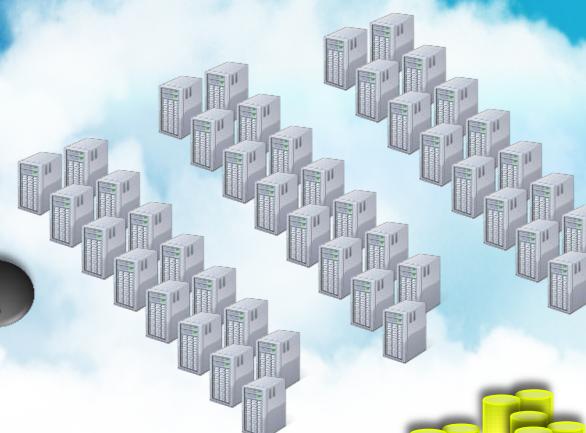
Service Deployment

Service Model

DNS
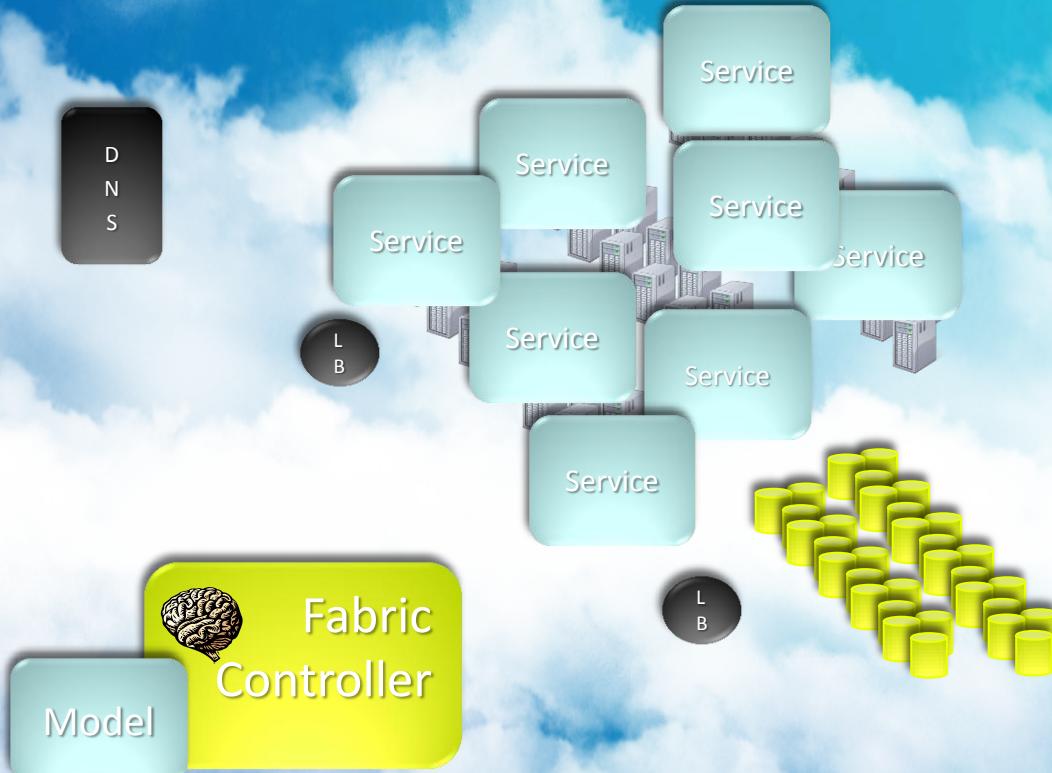
LB

Web Portal
(API)

config

Fabric
Controller

LB

Service Scaling

A Service Example

Port 80
Http

Customer Web Site

S

Port 8090
Http

WebDav

500MB

M

Thumbnail Worker

Height   200px

Width   200px

XL

StatusSvc
HTTP

Service Definition configuration

Storage In Windows Azure

Windows Azure Storage

- Scalable storage in the cloud
  - 100tb per storage account
  - Auto-scale to meet massive volume and throughput
- Accessible via RESTful Web Service API
  - Access from Windows Azure Compute
  - Access from anywhere via internet
  - Supporting .NET Client Library
- Various storage types
  - Table
  - Queue
  - Blob
  - Drives

Windows Azure Storage

- Tables
  - Table = group of entities
  - Entity = name/value pairs
  - Partitioned by key
    - Scale out to Bns of entities
  - Not an RDBMS

- Queues
  - Simple message queue
  - Not transactional
  - Read at least once
  - Delete to remove message, otherwise is returned to queue
  - Partitioned by Queue Name

- Blobs
  - Large binary storage
  - Stored in container
    - Unlimited containers
    - CDN Deliverable
    - Partitioned by Blob name

- Drives
  - NTFS VHD mounted into Compute instance
    - Read/Write 1:1
    - Read only 1:N
  - Backed by Page Blob
  - Cannot remotely map

Windows Azure CDN

Browse to cdn.customer.com GET foo.jpg

ECN NODE...

ECN NODE 2 - TOKYO

ECN NODE 1 - LONDON

EDGE CACHING SERVERS

Azure Storage

Leads to better user experience, global reach, increased engagement, more revenue

Enable CDN for Storage account

Create Storage Account via Portal

Upload content to public BLOB Container

Windows Azure Customer

SQL Azure

Extending SQL Server to the Cloud

Microsoft® SQL Azure™

| Database | Sync Service | . . . |
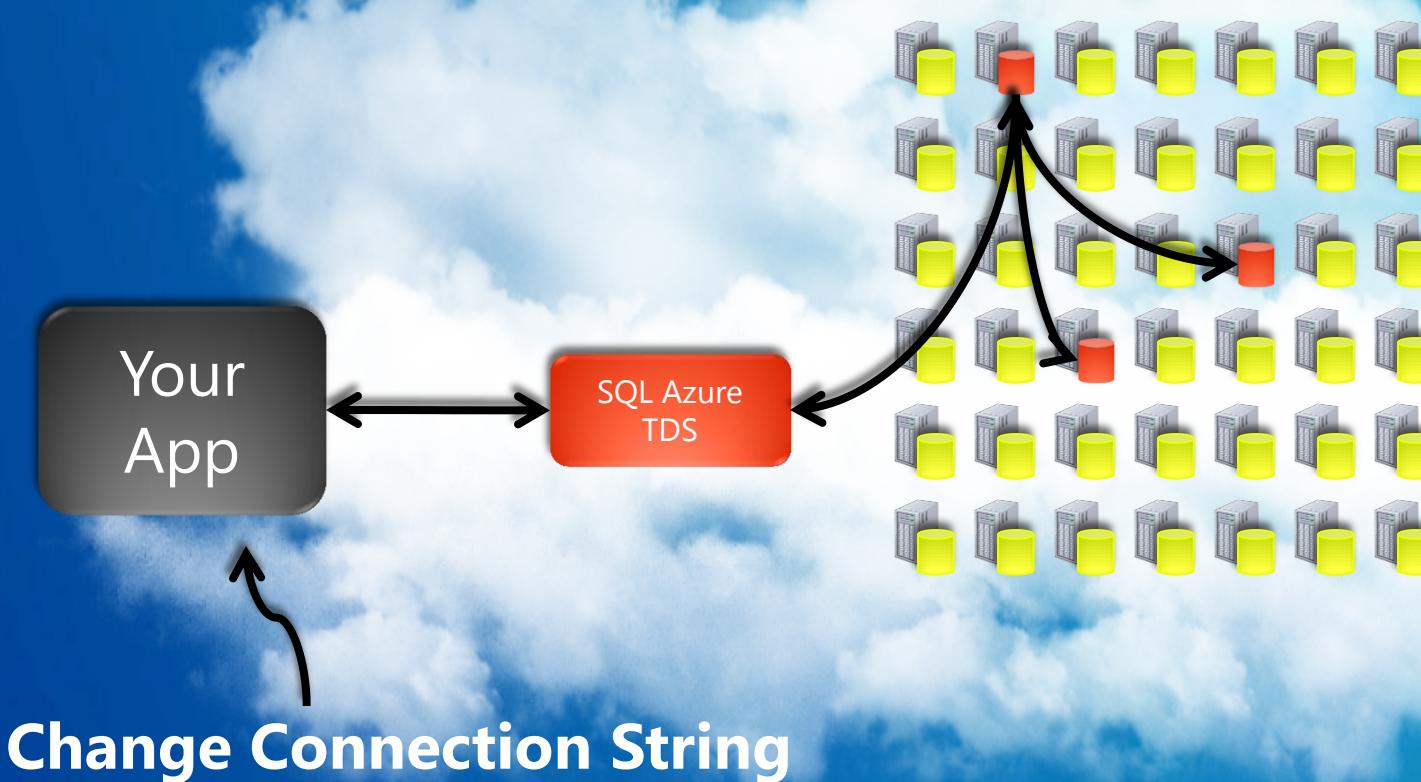
- SQL Azure Database
  - Familiar SQL Server relational database model
  - Support for existing APIs & tools
  - Built for the cloud with high availability & fault tolerance
  - Easily provision and manage databases across multiple datacenters
- Data Sync Service
  - Provides two-way sync of SQL Azure Databases across datacenters
  - Example service available in the SQL Azure Labs environment

SQL Azure Database Service

- SQL Azure provides logical SQL Server
  - Gateway server that understands TDS protocol
  - Looks like SQL Server to TDS Client
  - Actual data stored on multiple backend data nodes
- Logical optimisations supported
  - Indexes, Query plans etc..
- Physical optimisations not supported
  - File Groups, Partitions etc...
- Transparently manages physical storage

Advanced Topics: AppFabric and Azure Appliances

Windows Azure AppFabric

Extending .NET to the cloud with Internet Scale Utility Services

Windows® Azure™ Platform
AppFabric
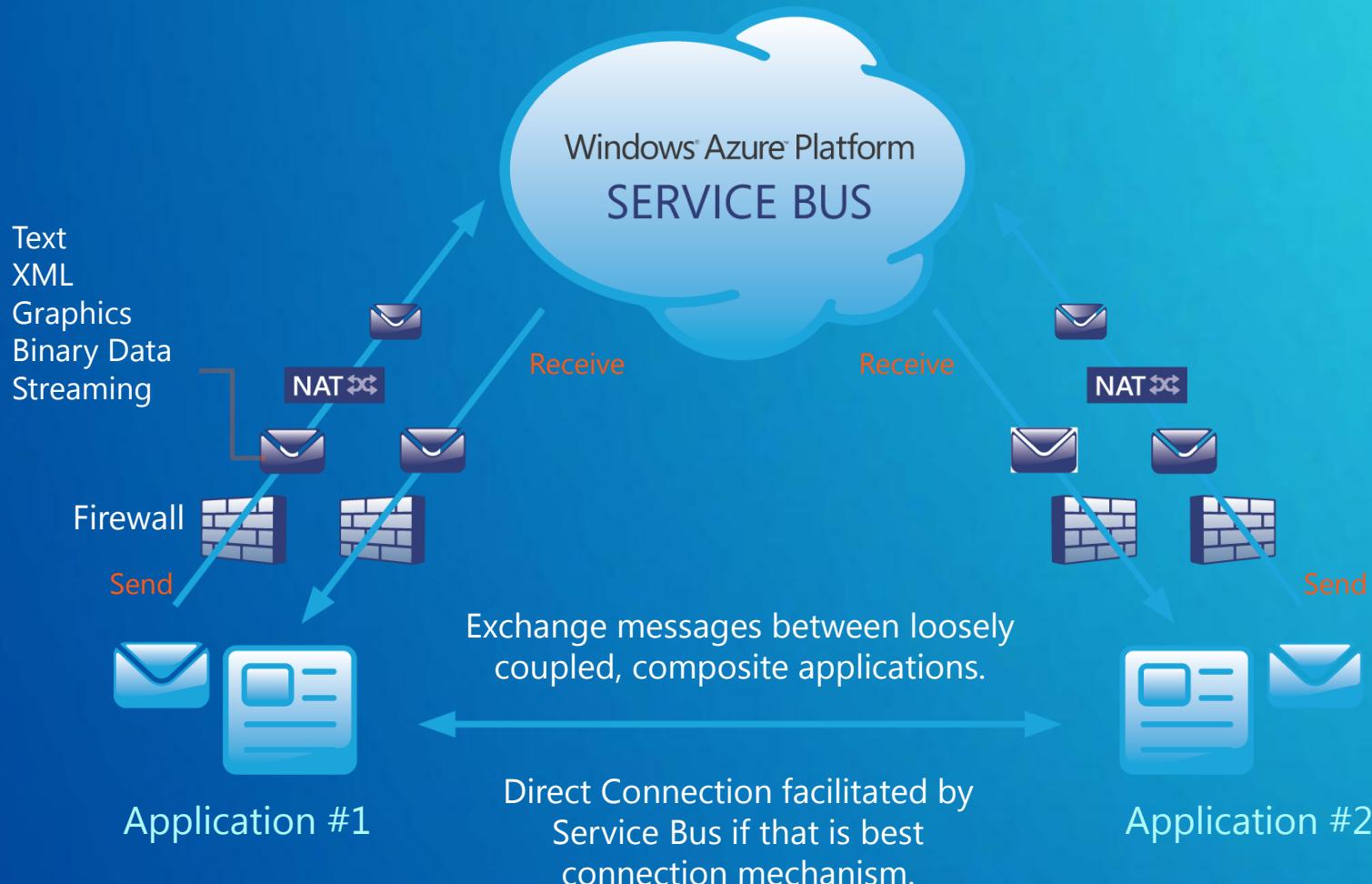
| Service Bus | Access Control | . . . |
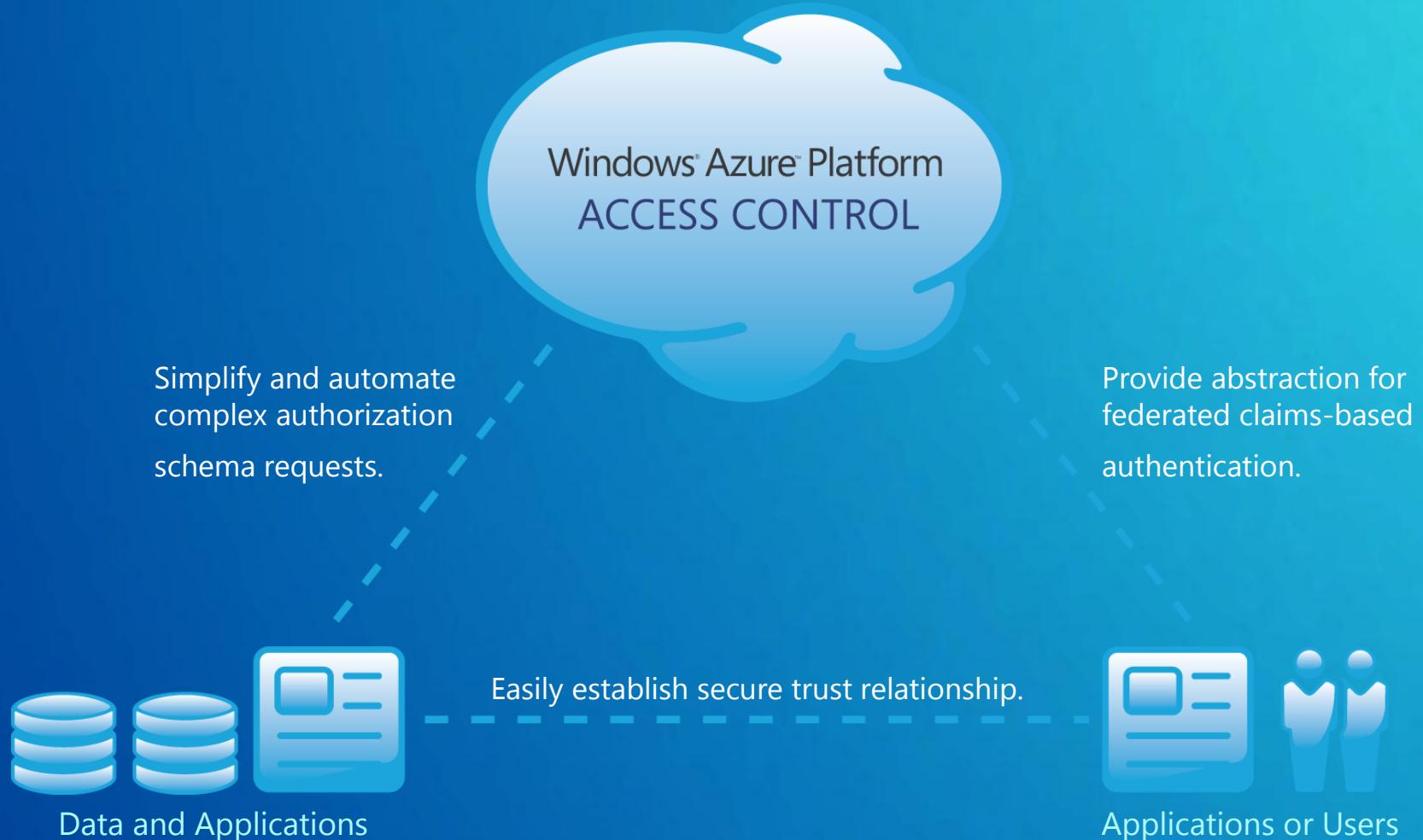
- Collection of building block services
  - Composed to provide foundational pieces for your apps
  - Exposed through open protocols
  - Accessible from anywhere
- Service Bus
  - General purpose application bus & connectivity service
- Access Control
  - Rules-driven, claims-based access control service

AppFabric Service Bus

Windows® Azure™ Platform
SERVICE BUS

Text
XML
Graphics
Binary Data
Streaming

NAT

Receive

Receive

NAT

Firewall

Send

Send

Exchange messages between loosely coupled, composite applications.

Application #1

Direct Connection facilitated by Service Bus if that is best connection mechanism.

Application #2
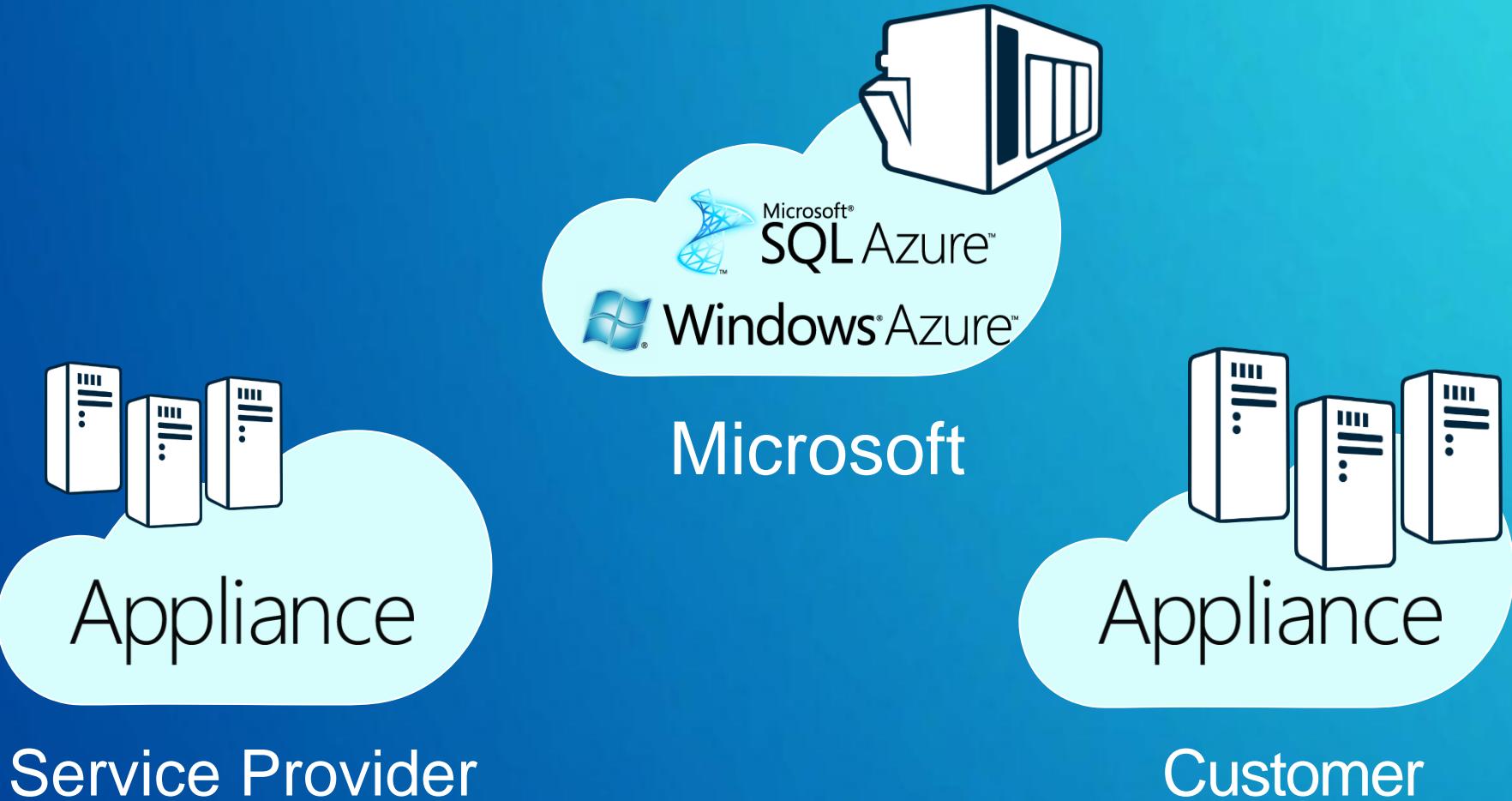
AppFabric Access Control Service

Windows Azure Platform
ACCESS CONTROL

Simplify and automate complex authorization schema requests.

Provide abstraction for federated claims-based authentication.

Easily establish secure trust relationship.

Data and Applications

Applications or Users

Pricing Model

Windows Azure Platform Consumption Prices

Pay as you go and grow for only what you use when you use it

Windows Azure™

Microsoft® **SQL** Azure™

Elastic, scalable, secure, and highly available automated service platform

Highly available, scalable, and self managed distributed database service

Compute

Per service hour

$0.12/hour
+ Variable Instance Sizes

Storage

Per GB stored and transactions
$0.15 GB/month
$0.01/10k transactions

Web Edition

Per database/month

$9.99/month
(up to 1 GB DB/month)

Business Edition

Per database/month

Starting at $99.99/month
(10-50 GB DB/month)

Windows Azure AppFabric Service Bus and Access Control Service

Scalable, automated, highly available services for secure connectivity

Access Control
Per Message Operation

$1.99/10k transactions

Service Bus
Per Message Operation

$3.99/month per connection

Prices shown in USD only

International prices are available

Windows Azure Instance Sizes

Variable instance sizes to handle complex workloads of any size

Small	Medium	Large	X-Large
$0.12	**$0.24**	**$0.48**	**$0.96**
Per service hour	**Per service hour**	**Per service hour**	**Per service hour**

Unit of Compute Defined

Equivalent compute capacity of a 1.6Ghz processor (on 64bit platform)

Small	Medium	Large	X-Large
1 x 1.6Ghz	**2 x 1.6Ghz**	**4 x 1.6Ghz**	**8 x 1.6Ghz**
(moderate IO)	**(high IO)**	**(high IO)**	**(high IO)**
1.75 GB memory	**3.5 GB memory**	**7.0 GB memory**	**14 GB memory**
250 GB storage	**500 GB storage**	**1000 GB storage**	**2000 GB**
(instance storage)	(instance storage)	(instance storage)	(instance storage)

Monthly Service Level Agreement

| Compute connectivity	Instance monitoring and restart	Storage availability	Database availability	Service bus and access control availability
• Your service is connected and reachable via web. Internet facing roles will have external connectivity	• All running roles will be continuously monitored • If role is not running, we will detect and initiate corrective state	• Storage service will be available/reachable (connectivity) • Your storage requests will be processed successfully	• Database is connected to the internet gateway • All databases will be continuously monitored	• Service bus and access control endpoints will have external connectivity • Message operation requests processed successfully
>99.95%	**>99.9%**	**>99.9%**	**>99.9%**	**>99.9%**
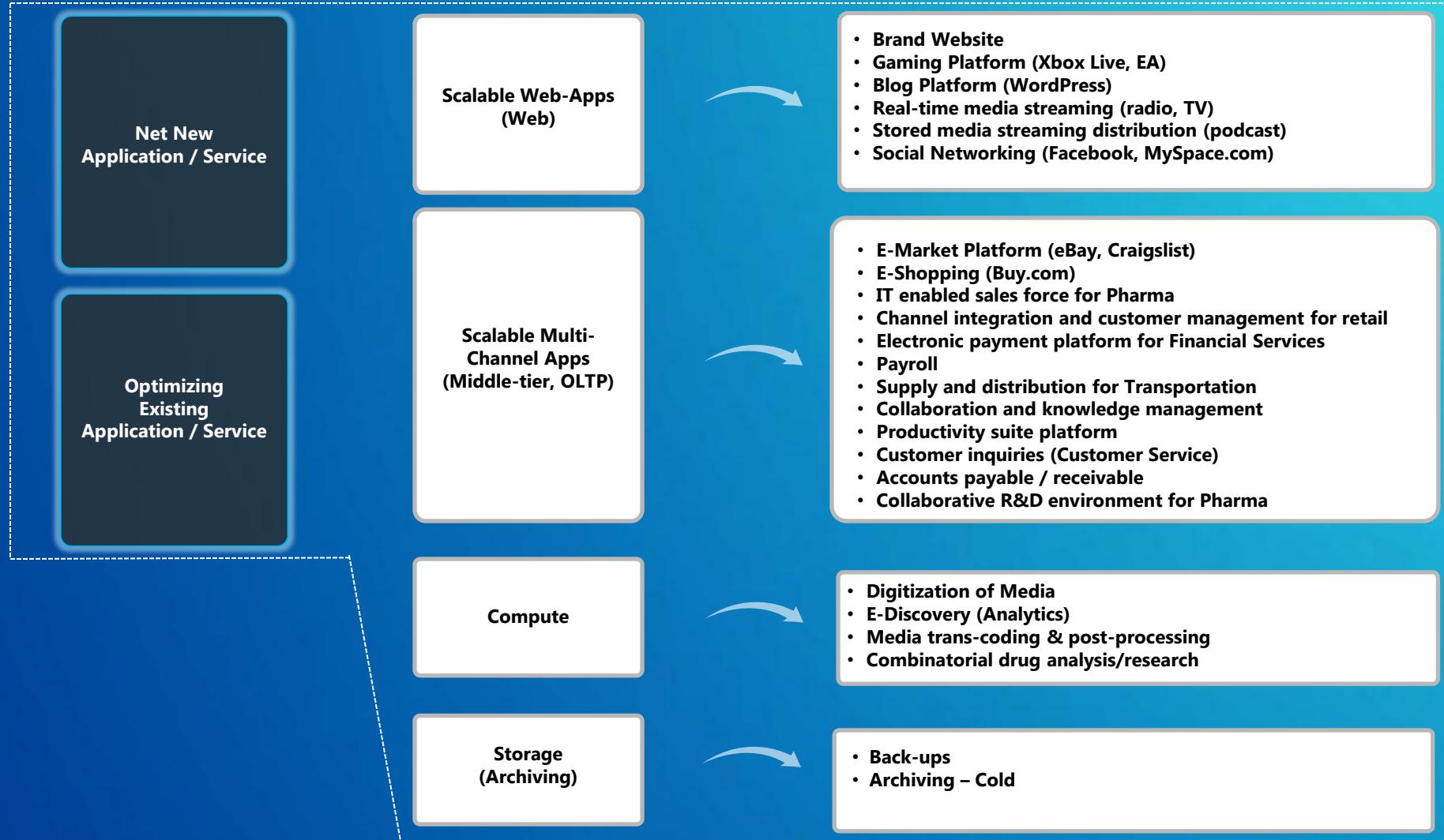
Windows Azure platform Example Scenarios

Net New Application / Service

Optimizing Existing Application / Service

Scalable Web-Apps (Web)
- Brand Website
- Gaming Platform (Xbox Live, EA)
- Blog Platform (WordPress)
- Real-time media streaming (radio, TV)
- Stored media streaming distribution (podcast)
- Social Networking (Facebook, MySpace.com)

Scalable Multi-Channel Apps (Middle-tier, OLTP)
- E-Market Platform (eBay, Craigslist)
- E-Shopping (Buy.com)
- IT enabled sales force for Pharma
- Channel integration and customer management for retail
- Electronic payment platform for Financial Services
- Payroll
- Supply and distribution for Transportation
- Collaboration and knowledge management
- Productivity suite platform
- Customer inquiries (Customer Service)
- Accounts payable / receivable
- Collaborative R&D environment for Pharma

Compute
- Digitization of Media
- E-Discovery (Analytics)
- Media trans-coding & post-processing
- Combinatorial drug analysis/research

Storage (Archiving)
- Back-ups
- Archiving – Cold

Windows Azure Pricing Meters

COMPUTE

- Virtual Machine instances
- Load balancers, routers, etc.
- Relational DB instances
- Automated service management
  - Fabric controller operations
    Load balancer programming
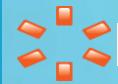
PRICE
- $0.12 / hour per size unit

STORAGE

- Blob Storage
- Table Storage
- Multiple replicas

PRICE
- $0.15 / GB stored / month
- Storage transactions: $0.01 / 10k

BANDWIDTH

- Ingress/Egress
  (to/from internet only)

PRICE
- Bandwidth: $0.10 IN; $0.15 OUT; / GB

SQL Azure

- Easy to use
- Reliable
- Compatible with what you have

PRICE
- 1GB db : $9.99/month
- 5 GB db: $49.95/month *
- 10 GB db : $99.99/month
- 50 GB db: $499.95/month *
- Data transfers = $0.10 in / $0.15 out / GB
* Starting June 28, 2010

Summary

- Today the Windows Azure Platform consists of:
  - Windows Azure
  - SQL Azure
  - Windows Azure AppFabric
- Fundamental concepts:
  - Windows Azure Service Definition & Configuration
  - Windows Azure Roles
- Commercially available today in 41 countries and 6 data centers
- In the future Windows Azure & SQL Azure will be available on-premises as an appliance

Q&A