

Building Cloud Applications for the Real World



Windows® Azure™

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Senior Architect

Microsoft®

Where is Cloud Computing used?

- Massive-scalability scenarios
- High-availability scenarios
- Technical computing
- Global integration

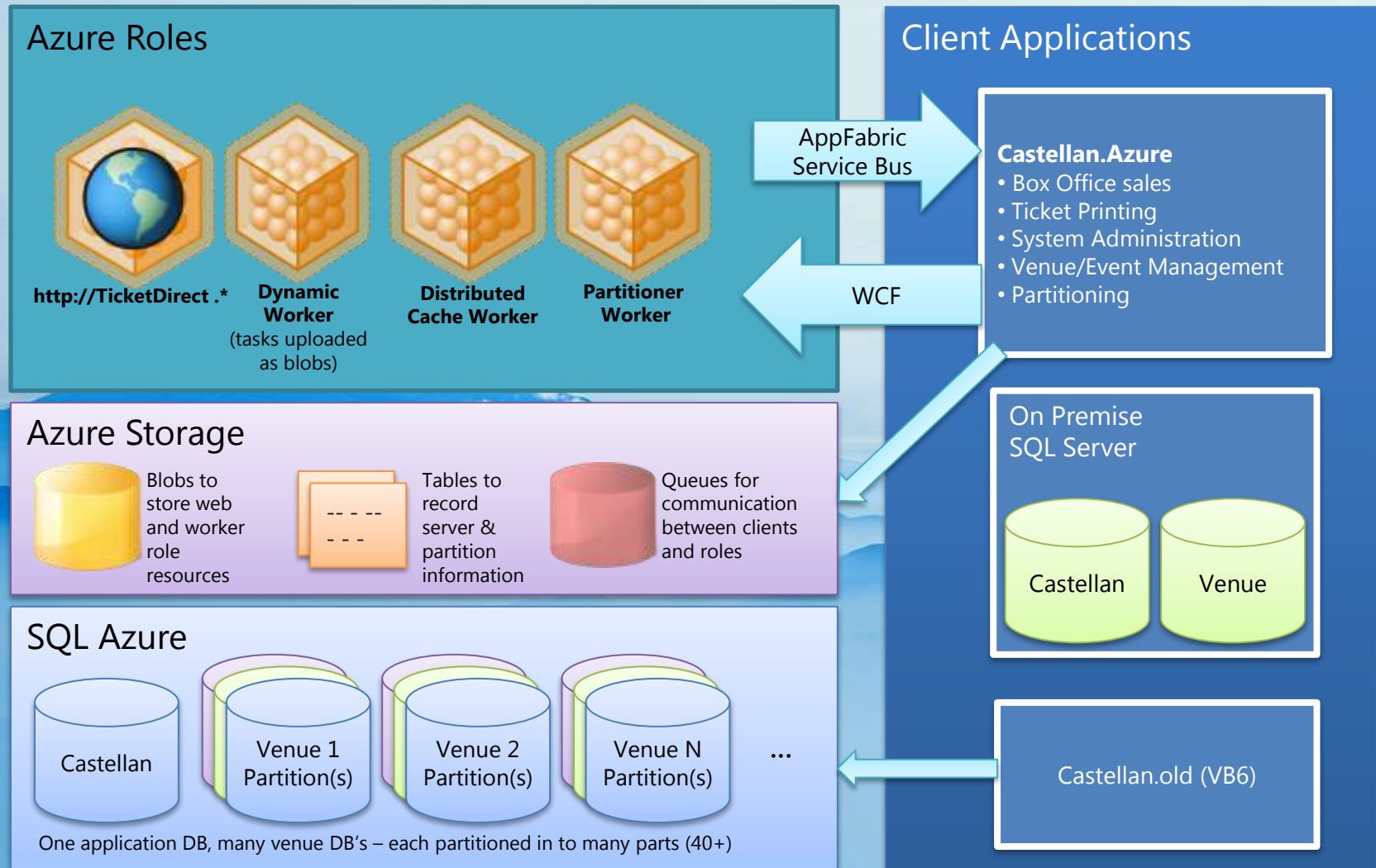


ticketdirect

The screenshot shows the TicketDirect New Zealand website. At the top, there's a navigation bar with "Toll Free 0800 4 TICKET" and "buy tickets online 24/7 - print your own and save!". Below this is a large banner for "The Flew Over the Cuckoo's Nest" comedy show, featuring the text "internationally acclaimed smash hit comedy" and "Tauranga May 20-29". The main navigation menu includes "Home", "My Account", "Venues", and "About Us". On the left, there's a "What's On Where!" section with a search bar and a map of New Zealand. The main content area features a large section for "New Zealand Maori vs. Ireland" celebrating 100 years of Maori Rugby, with a "RAU TAU 100 YEARS OF MAORI RUGBY" logo. Below this are several event tiles: "Miss Saigon", "Lindauer Jazz Night with Supper", "THE CULT 'LOVE' LIVE WORLD TOUR RE...", "BJORN AGAIN 21st Anniversary Tour", "We LOVE Sounds - Winter Festival", "Little Bushman & Jakob", "Auntie & Me", and "All Blacks vs Ireland". At the bottom, there's a "Book my Show" button and an "intergen" logo with the tagline "INTELLIGENT BUSINESS".

- Major ticketing service for Australia and New Zealand
- 80 venues
- 45% of professionally ticketed events in NZ
- Rapid growth

ticketdirect Architecture



Problems

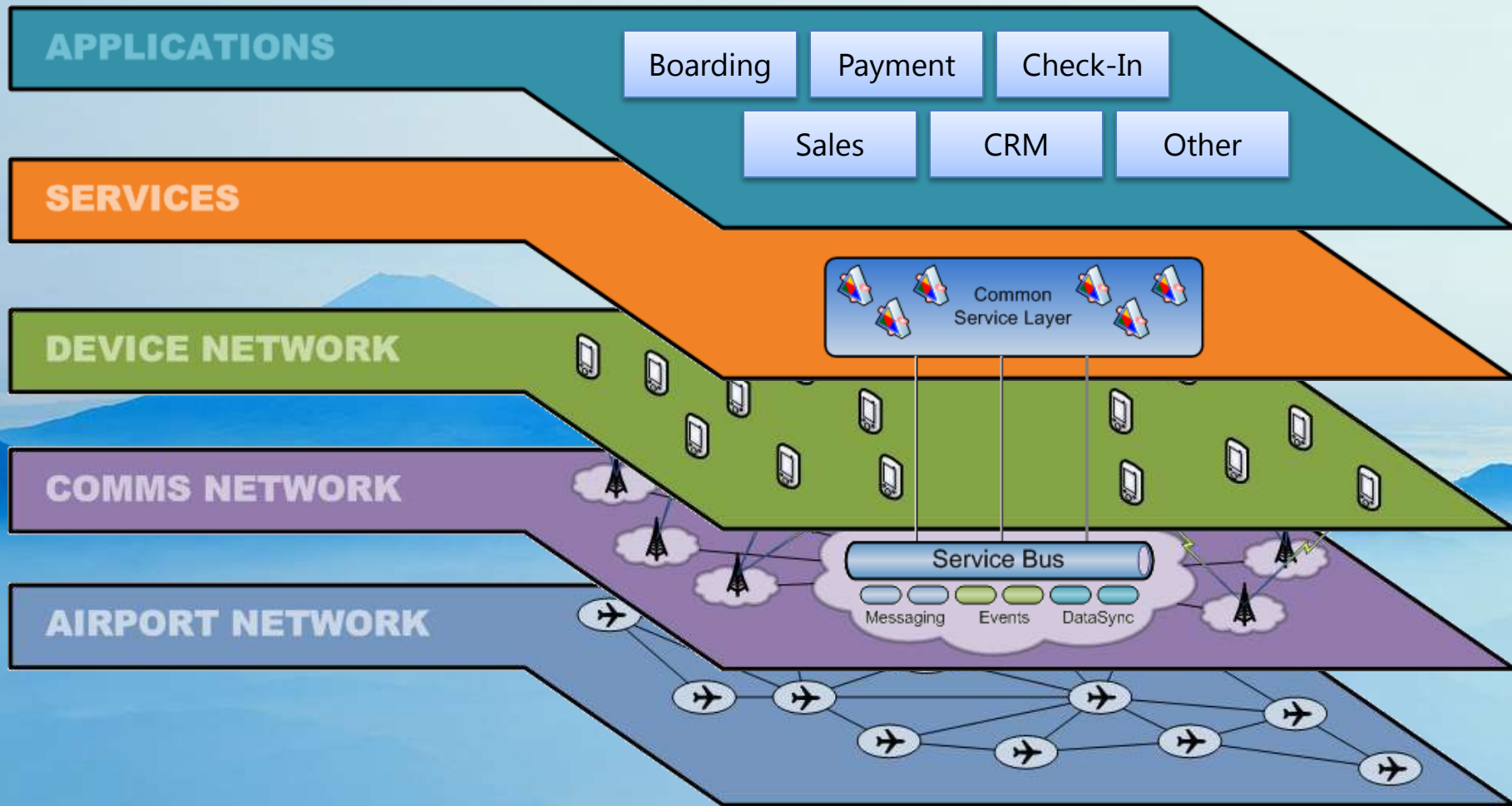
- Ineffective Data Partitioning
 - Tools help a bit
- On-premises integration
- Multi-tenancy
 - Provisioning
 - Billing

easyJet

- European, short haul carrier
 - 120 destinations across Europe
 - 45 million customers/year
 - 1000 flights/day, 160 aircrafts
- Technology company, not a traditional airline



easyJet Architecture



Problems

- Ineffective routing
- Shortest route determination
- Scalability across tenants
- Privacy concerns

Invensys

inven·sys
SMART GRID PILOT

Energy Controller

Energy Pricing

New York New England Mid West

Price: 53.12

Currency: Dollars

Pricing Model: RTP5

Min Price: 52.94

Max Price: 53.8

Energy Consumption

Total Energy
Consumption: 48 (10*Whr)

Accumulated Monthly Cost to Date: 0.25

Projected Monthly
Energy Use: 2280.56

Projected Monthly
Cost: 121.14

Temperature:



Status:

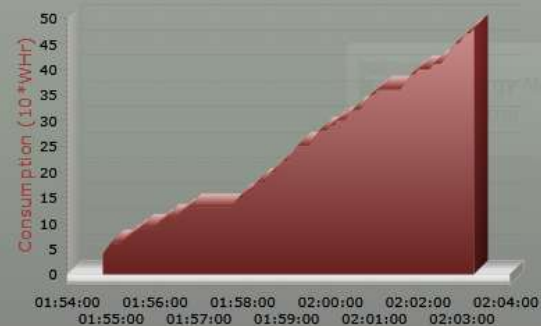
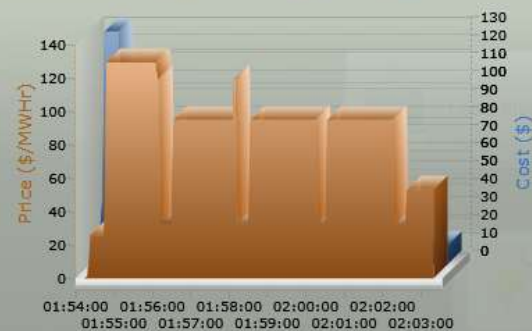


Cost, Pricing, Consumption History

Time Period

1 Hour

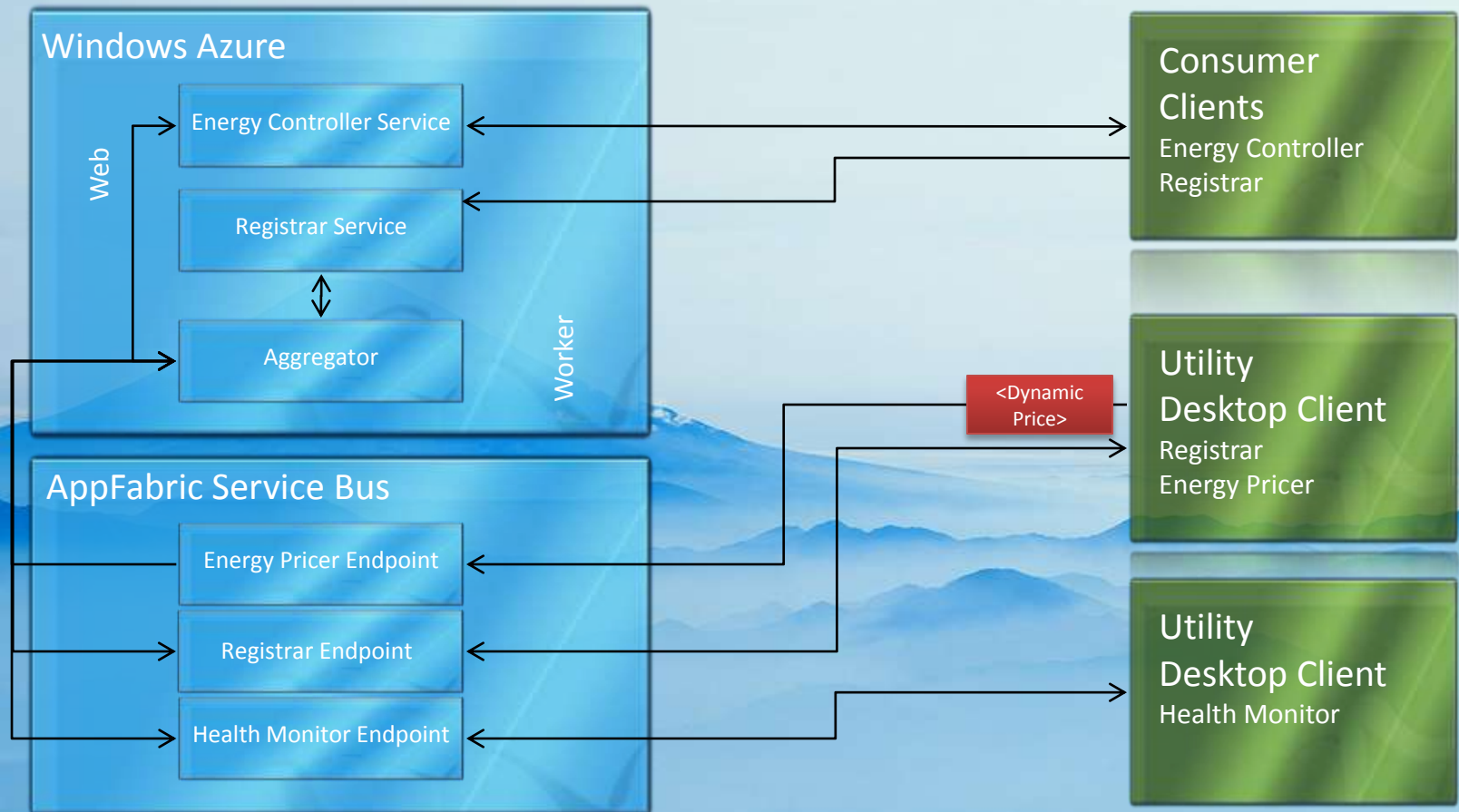
Price Cost Consumption



Invensys Smart Grid Pilot Architecture

Cloud

Client



Problems

- Connection-based pricing
 - \$1.99 per user per month
- Client-server duplex channel limitations
- Potential loss of data and data redundancy

Microsoft DC Evolution

2005

2006

2007

2008

2009

2010

Generation 1



Generation 2



Generation 3



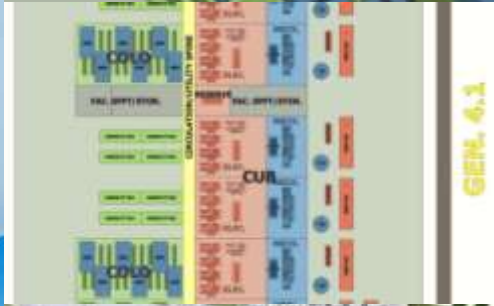
Generation 4
Modular Datacenter



Deployment Scale Unit



Generation 4 DCs



- Modularization of the DC
- All Pre-Manufactured Modules
 - Compute, Power, Cooling
- Racks, Skids or Containers
- Redundancy & Reliability customized to each DC Class



Windows Azure DC Locations

- Windows Azure Facilities at launch
 - North America
 - San Antonio, Chicago
 - South-East Asia
 - Singapore, Hong Kong
 - Europe
 - Dublin, Amsterdam
- World-wide Microsoft network infrastructure
- Capacity expansion and further sites as capacity needs grow



Problems

- Choosing the right DC
 - Pricing
 - Latencies



 Windows Live™  Microsoft Office Live™  Microsoft Exchange Online™  Microsoft SharePoint Online™  Microsoft Dynamics CRM Online™

Windows Azure™ Platform

 Windows Azure™ platform
AppFabric

 Microsoft SQL Azure™

Microsoft SharePoint™ Services

Microsoft Dynamics CRM Services

 Windows Azure™

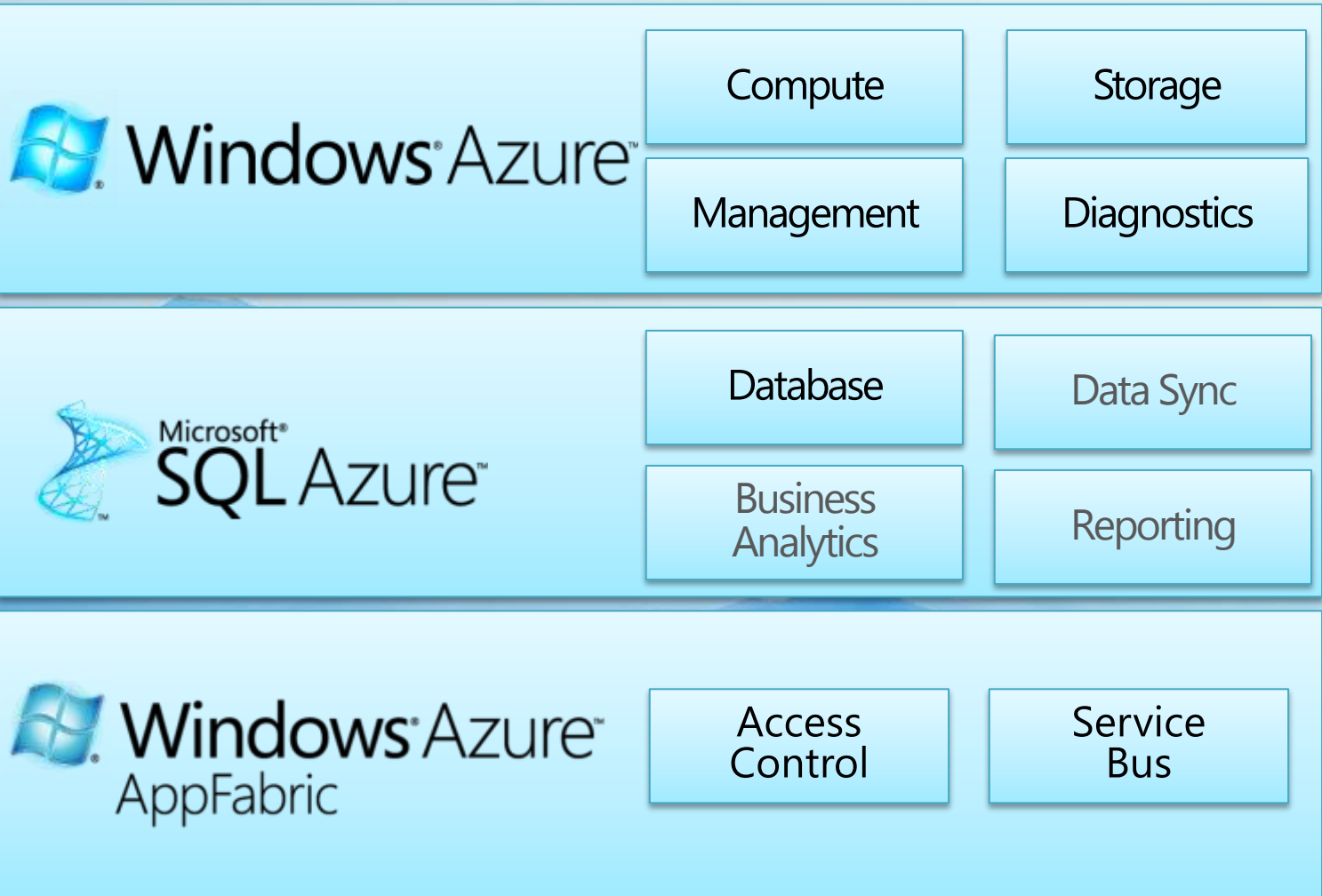


Commercially Available



Future Commercial Availability

Windows Azure Platform Services



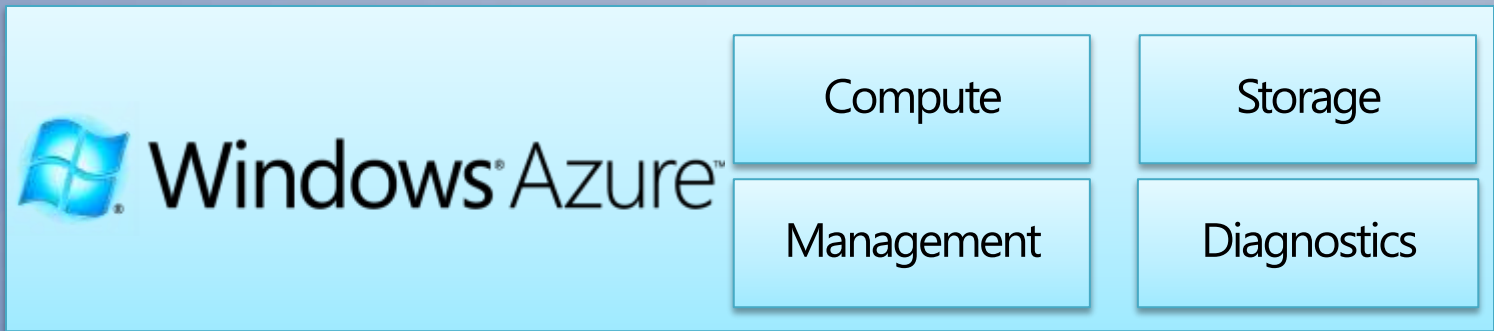
Platform Capability Symmetries

Capability	Windows Server	Windows Azure
Server Process Host	Windows Service	Worker Role
HTTP Application Host	HTTP.SYS / IIS	Web Role
Logging /Diagnostics	Event Tracing (ETW)	Azure Logging
Binary Object Store	File System (NTFS)	Azure Blob Storage
Tabular Data Store	File System, Jet, Registry, 3 rd Party ISAM	Azure Table Storage
Relational Table Store	SQL Server, 3 rd Party RDBMS	SQL Azure
Job Queue Store	Microsoft Message Queue	Azure Queue Storage
Identity and Access Control	Active Directory	AppFabric Access Control + Federation
Endpoint Federation	WCF + BizTalk Server	AppFabric Service Bus + WCF
Network Federation	Remote Access Services	Project "Sydney"

Problems

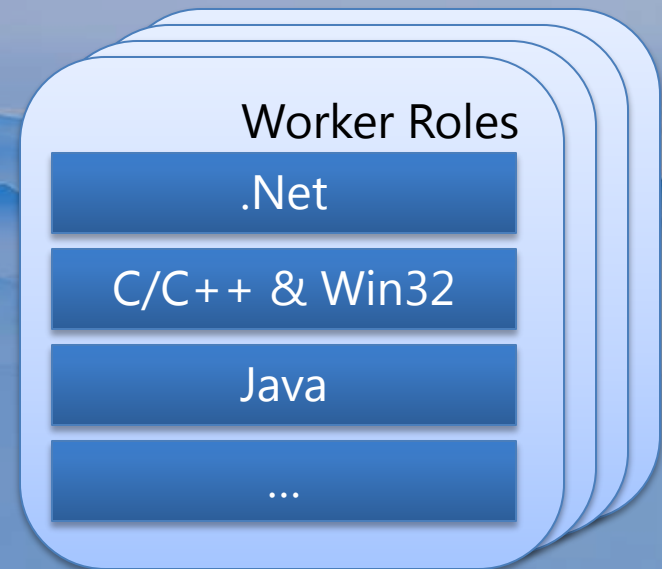
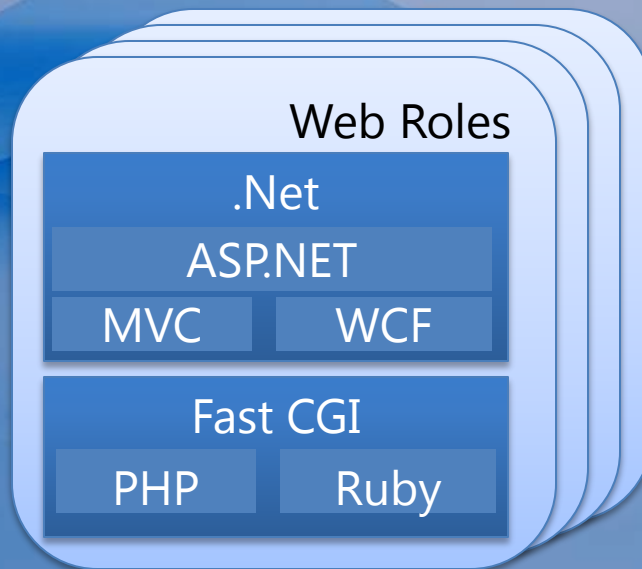
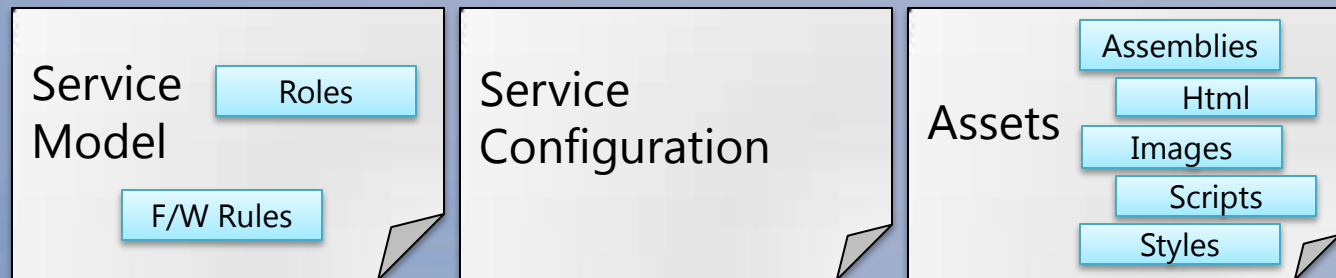
- Differences between server and cloud
 - Functionality
 - Pricing considerations
 - Adoption

Windows Azure



- Flexible Application Hosting
- “Lights-out” Service management
 - Provide Code & Service model
- Storage at Large Scale

Windows Azure Compute



SQL Azure



Microsoft®
SQL Azure™

Database

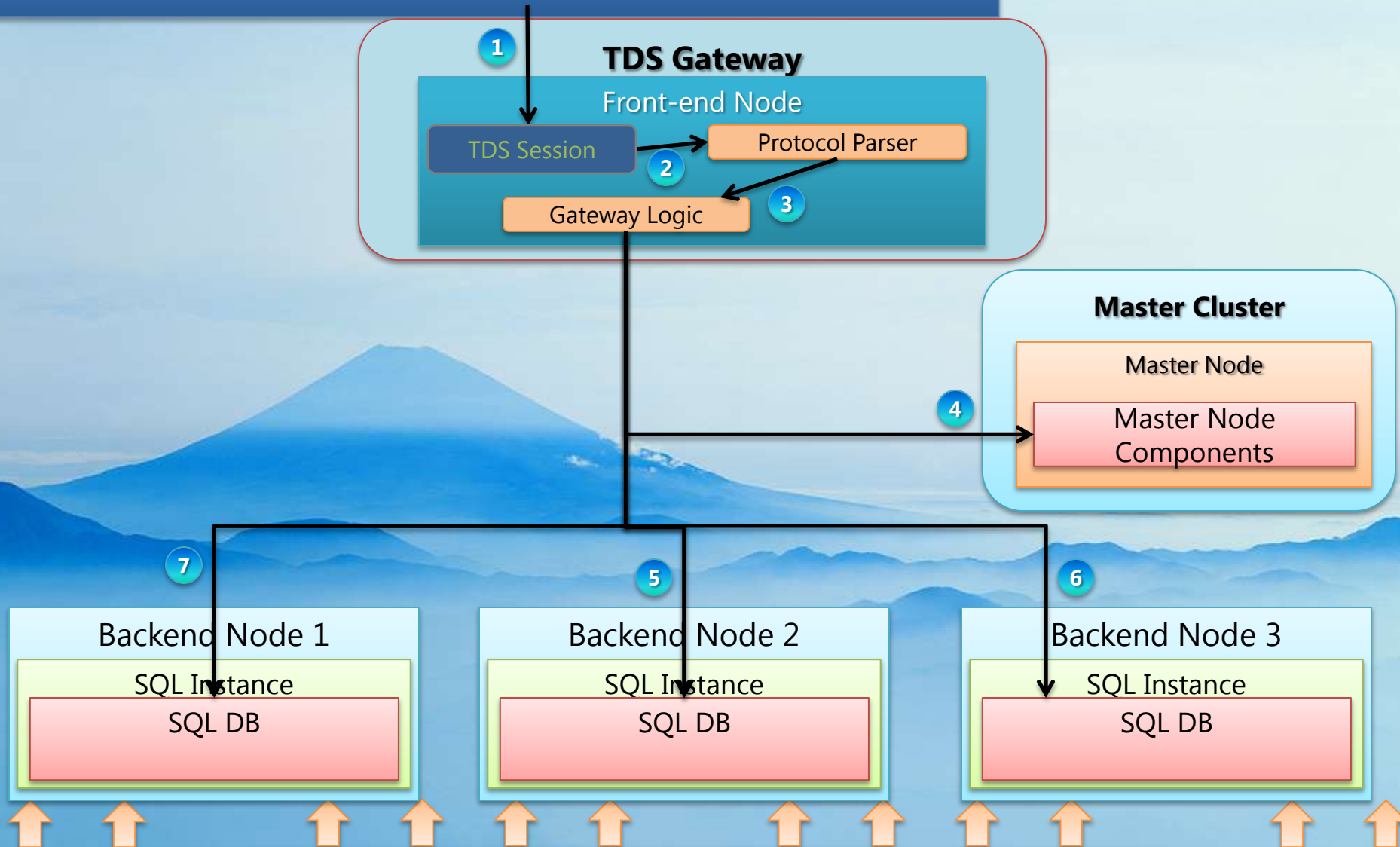
Data Sync

Business
Analytics

Reporting

- Relational database as a service
 - Highly available, automatically maintained
- Extension of the SQL Server Data Platform

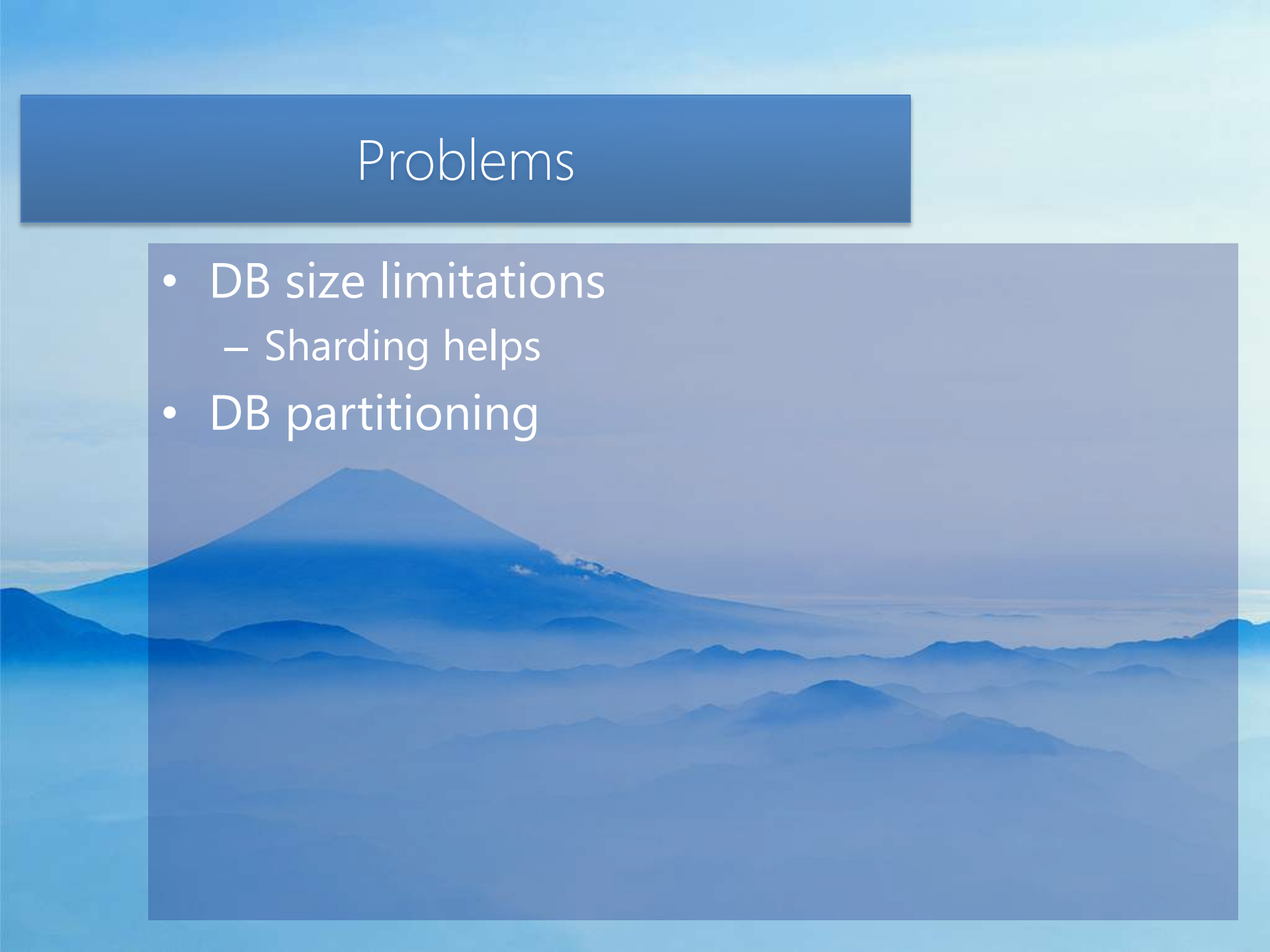
SQL Azure Database Architecture



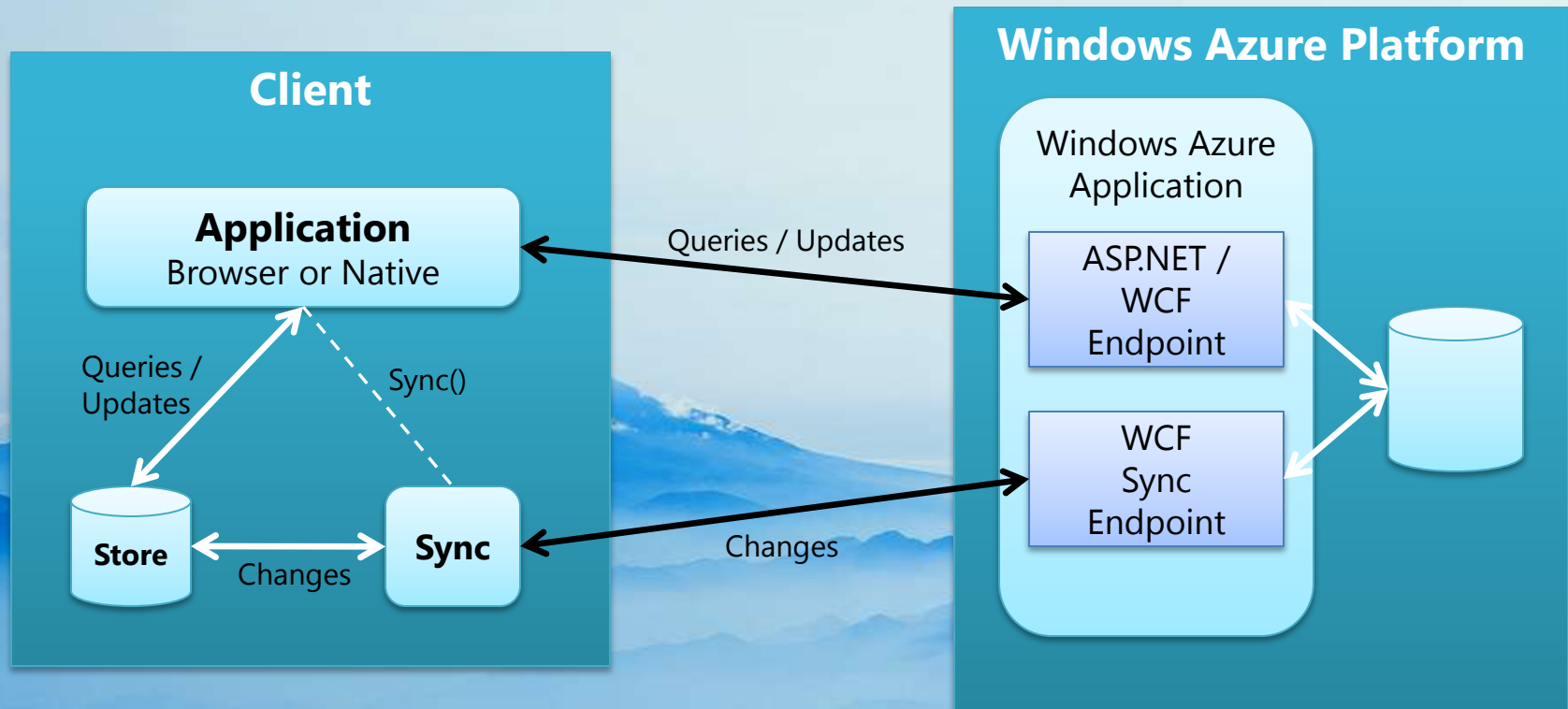
Scalability and Availability: Fabric, Failover, Replication, and Load balancing

Problems

- DB size limitations
 - Sharding helps
- DB partitioning



Offline-Capable Applications





Problems

- Unclear synchronization schemes
- No structured storage on most clients



Windows Azure AppFabric



Access
Control

Service
Bus

- Leverage existing SOA Investments
- Build Federated Hybrid Cloud Applications
- Interconnect Services and Devices

Backend
Naming
Routing
Fabric

Frontend
Nodes

sb://*solution*.servicebus.windows.net/a/b/

One-way
Rendezvous
Ctrl Msg

Service Bus

Ctrl

2

TCP/SSL
or HTTP

1

outbound
socket
connect

HTTP/Socket
Forwarder

3

Ctrl

outbound
socket
rendezvous

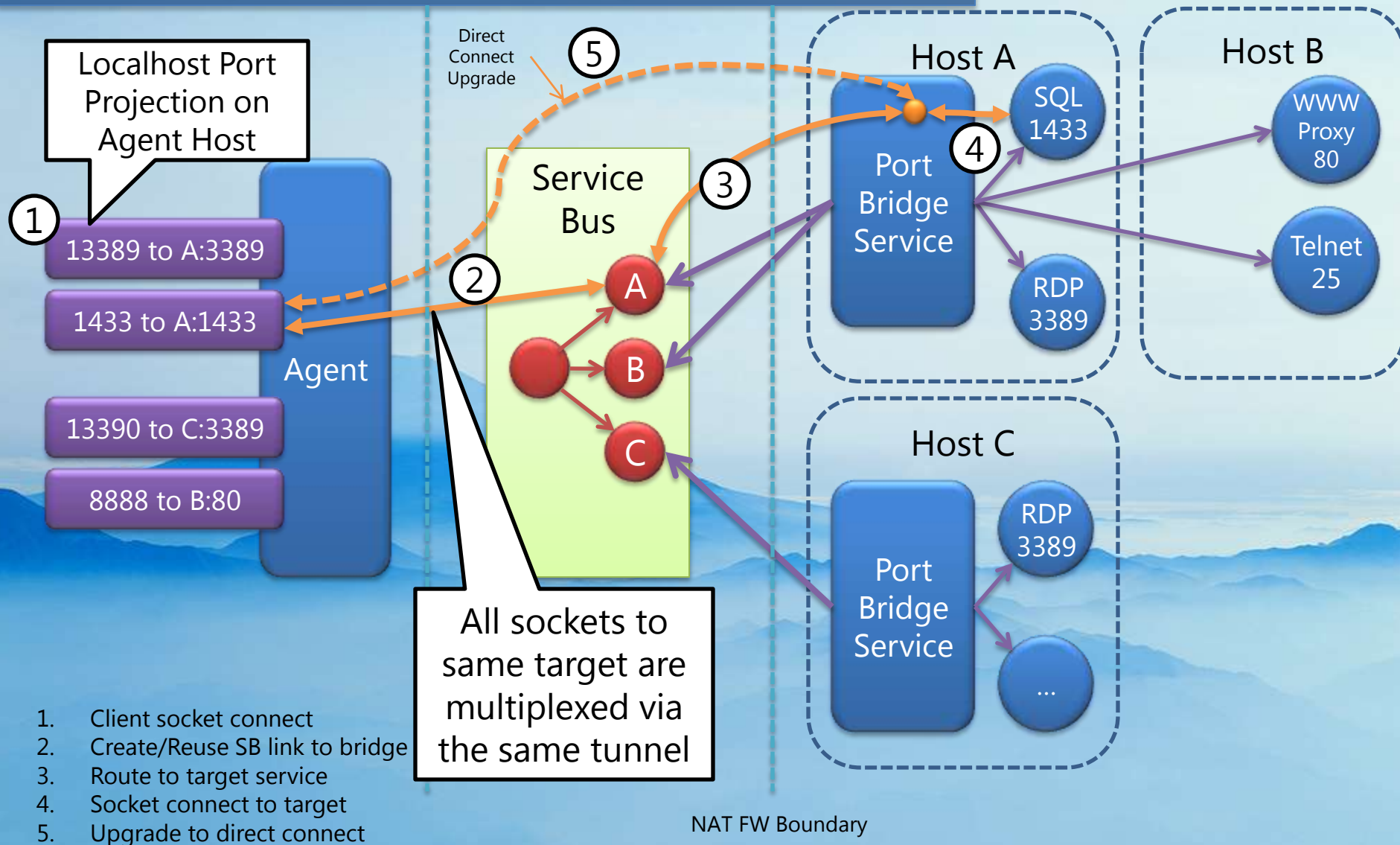
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Sender

Receiver

NLB

PortBridge: P2P Tunneling Architecture



Windows Azure Platform Futures



VM Role

Admin Mode

CDN

System Center



Large DB

Sync

Microsoft®
Codename "Dallas"

Data Market

Microsoft®
Codename "Sydney"

Virtual Private Cloud

Pricing

- Compute
 - \$0.12 / CPU hour (or part thereof)
 - ~ 1.7 GHz, 2GB Ram, Single Core
 - \$2.88 / Day
 - \$86.4 / 30 days (billing period)
 - 2 instances = \$172.80 / month
- Storage
 - \$0.15 / GB/Month
- Bandwidth
 - \$0.10 /GB inbound
 - \$0.15 /GB outbound
 - Triple charges in Asian DCs

One Bill

Daily Usage for 10/1/2009 through 10/31/2009

Daily Usage

Page 1 of 56

More than 1,000 rows of data were returned. To see more than the first 1,000 rows you must export/download the data using the export feature.

Event Date	Name	Type	Region	Resource	Consumed	Sub Region	Service	Component	Service Info 1	Service Info 2	Additional Info
10/29/2009	Windows Azure Storage			Storage Transactions (in 10,000s)	10.010000						
10/29/2009	Windows Azure Compute			Compute Hours	10.000000						
10/29/2009	Windows Azure Platform - All Services		Asia Pacific	Data Transfer Out (GB) - Off Peak	9.990000		SOS		ServiceInfo1 #935		
10/29/2009	.NET Services			Messages (in 100,000s)	9.960000						
10/29/2009	SQL Azure Database	Business Edition		Database (db/month)	9.970000						
10/29/2009	Windows Azure Storage			Storage Transactions (in 10,000s)	19.920000				ServiceInfo1 #936	ServiceInfo2 #936	
10/29/2009	Windows Azure Compute			Compute Hours	9.950000						
10/29/2009	Windows Azure Platform - All Services		North America	Data Transfer In (GB) - Off Peak	9.940000	USSouthWestInt	.NET				
10/29/2009	Windows Azure Compute			Messages (in 100,000s)	19.960000				ServiceInfo1 #933		
10/29/2009	SQL Azure Database	Business Edition		Database (db/month)	9.920000						
10/29/2009	Windows Azure Storage			Storage Transactions (in 10,000s)	9.910000						
10/29/2009	Windows Azure Compute			Compute Hours	19.900000				ServiceInfo1 #930	ServiceInfo2 #930	
10/29/2009	Windows Azure Platform - All Services		North America	Data Transfer Out (GB)	9.890000	USNorthWest	WA				
10/29/2009	.NET Services			Messages (in 100,000s)	9.880000						
10/29/2009	SQL Azure Database	Business Edition		Database (db/month)	19.740000				ServiceInfo1 #937		
10/29/2009	Windows Azure Storage			Storage Transactions (in 10,000s)	9.860000						
10/29/2009	Windows Azure Compute			Compute Hours	9.850000						
10/29/2009	Windows Azure Platform - All Services		Asia Pacific	Data Transfer In (GB)	19.680000		SOS		ServiceInfo1 #934	ServiceInfo2 #934	

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Done

Local intranet | Protected Mode: Off

100%

Problems

- Unavailability in many countries
- Customer and tenant billing
- No billing-on-behalf



Windows Azure in Russia

- Few Russian ISVs already develop applications
- Not available for purchase directly until H22011
- Can be purchased by subsidiary in supported country (21 countries at the moment)
- Can be purchased through partners soon
- Closest DC is Amsterdam
- Russian DC possible in the future
- Contact MS Russia for details on cloud computing project initiatives

Call to Action

- Learn cloud computing platforms and problem domain
- Assess existing issues
- Move existing applications to the cloud or build new ones to close the gaps
- Think big

Cloud Computing

Q & A