

Microsoft Azure Cloud Infrastructure

Erik Jan van Vuuren
Microsoft Azure Lead Netherlands



The background of the slide is a photograph of a large, modern data center. It features multiple rows of white server racks with blue doors, connected by a complex network of metal pipes and conduits. The facility is situated in an open, flat landscape under a clear blue sky with some light clouds. The overall tone is professional and technological.

EMPOWER

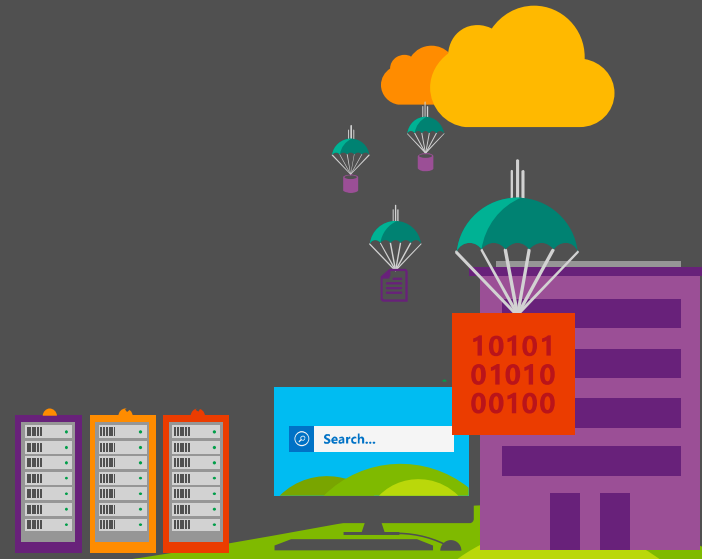
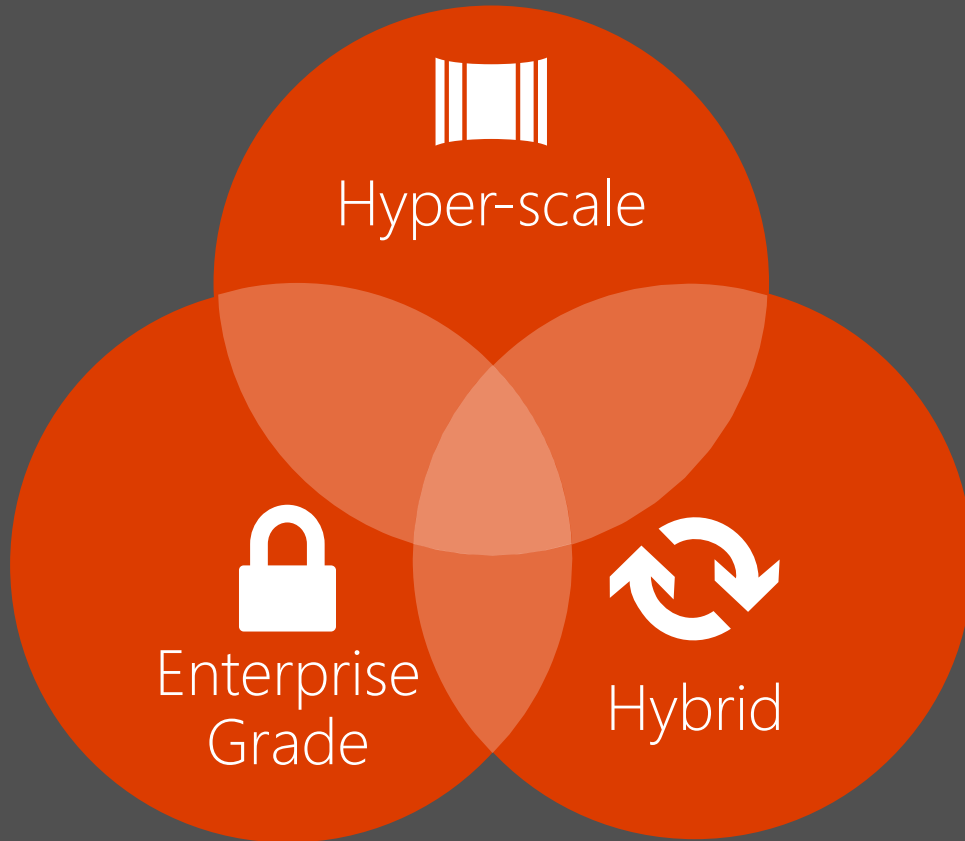
every person and every organization on
the planet to **achieve** more

The background of the slide is a photograph of a large, modern data center. It features multiple rows of white server racks with blue doors, connected by a complex network of metal pipes and conduits. The facility is situated in an open, flat landscape under a clear blue sky with some light clouds. The text "MOBILE FIRST | CLOUD FIRST" is overlaid in the center of the image.

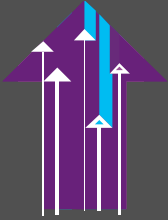
MOBILE FIRST | CLOUD FIRST

200+ Microsoft
cloud services





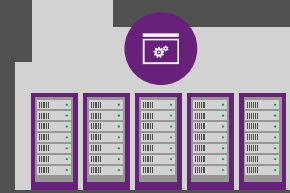
Hyper-scale infrastructure strategy principles



Flexible &
Scalable



Cost
Efficacy



Operational
Simplicity



Infrastructure
Convergence




Resilient
Software

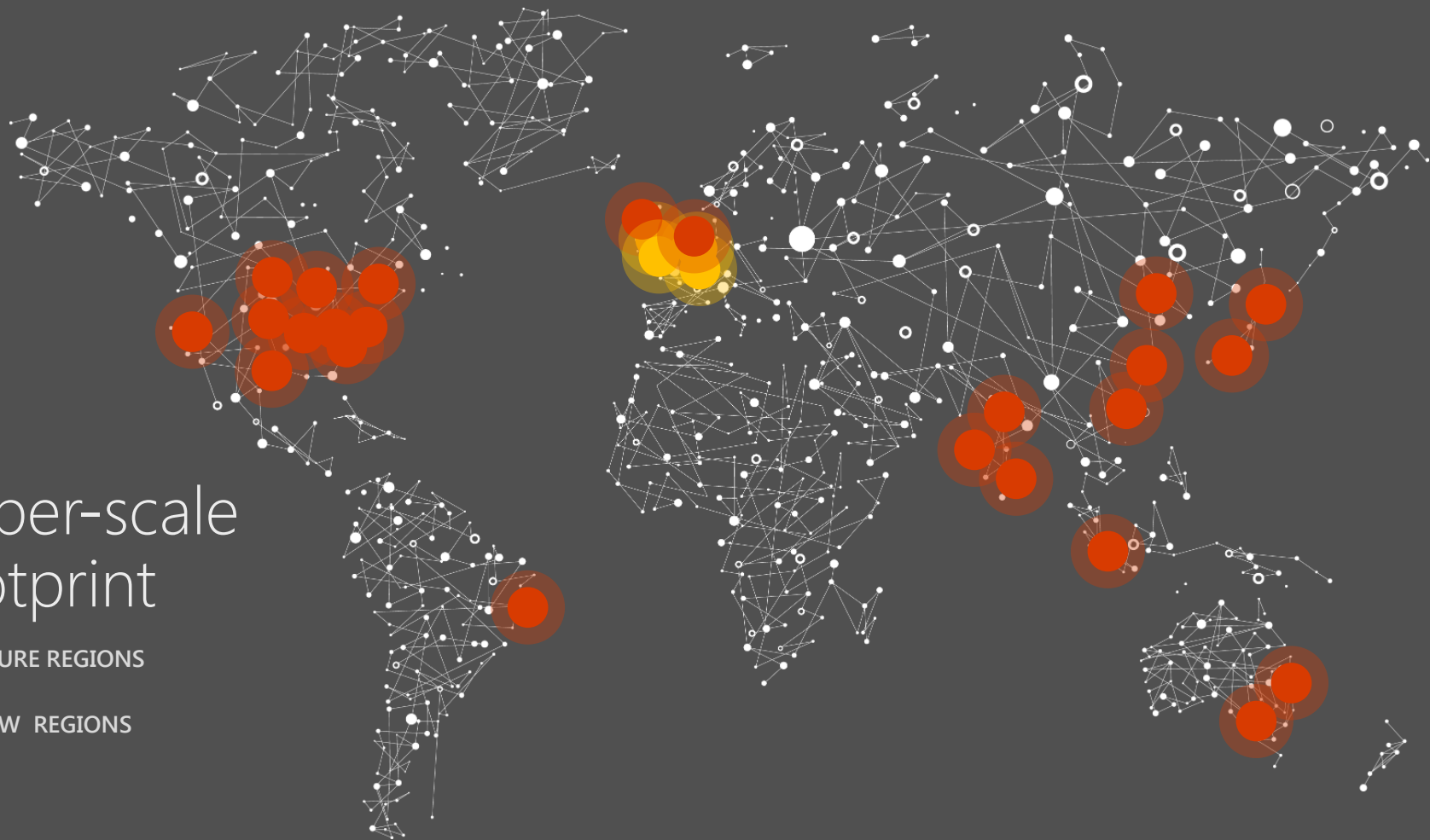


Software-Defined
Availability

Hyper-scale footprint

 AZURE REGIONS

 NEW REGIONS



Global Datacenter Playbook



Capacity

- Location – data residency to meet law and customer sentiment
- Latency – close proximity to users or key network connection points
- Expansion – ability to grow at speed and low cost



Data Residency

- “Geography” may be national (e.g. Japan) or multi-national (e.g. APAC)
- Our commitment is to maintain customer data within a geography*



Operating Model

- By default Microsoft personnel according to Microsoft terms of service
- 21Vianet operates Azure services in China



Services

- Services are available across geographies and regions
- Replication & recovery in-geo by default
- Enterprise-grade compliance and security



Community & Customers

- Some regions only available to local customers (e.g. Australia)
- Some regions only available to eligible communities (e.g. Azure Government)

**Exceptions at azure.com/trust*

Datacenter evolution

1989-2005 • 2007 • 2009 • 2012 • 2015

Generation 1

2.0+ PUE



Colocation

Server
Capacity
20 year Technology

Generation 2

1.4 – 1.6 PUE



Density

Rack
Density & Deployment
Minimized Resource Impact

Generation 3

1.2 – 1.5 PUE



Containment

Containers, PODs
Scalability & Sustainability
Air & Water
Economization
Differentiated SLAs

Generation 4

1.12 – 1.20 PUE



Modular

ITPACs & Colocations
Reduced Carbon
Right-Sized
Faster Time-to-Market
Outside Air Cooled

Generation 5

1.07 – 1.19 PUE



SW Defined

Fully Integrated
Resilient Software
Common Infrastructure
Operational Simplicity
Flexible & Scalable

Efficient by design

Big data analytics

- One million device sample pool

Server optimization

- Remove unnecessary components
- Smart power choices
- 415 volt distribution
- High efficiency DC conversions

Elevated supply temperatures

- 10°C – 34°C;
- 10-80% Relative Humidity
- Time Weighted Average <70% RH

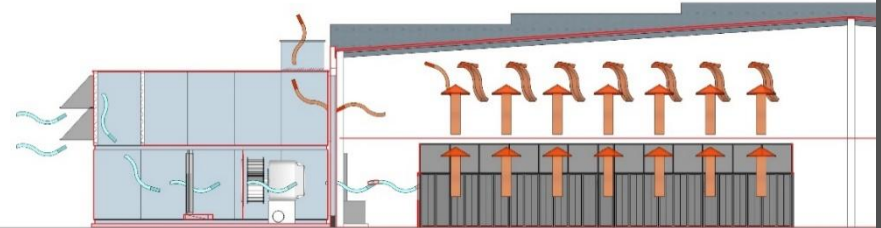
Outside air cooling

- Chiller-less adiabatic cooling
- Extremely low energy consumption

Inlet Temperature and Impact on Hard Disk Failure Rates

Inlet Temp		HDD's in Front, ΔT 1°C		Buried HDDs Design, ΔT 20°C cold de-rated to ΔT 10°C hot	
		HDD Case Temp	Relative AFR	HDD Case Temp	Relative AFR
10 C	50 F	11 C	100%	30 C	100%
15 C	59 F	16 C	100%	34 C	100%
20 C	68 F	21 C	100%	38 C	100%
25 C	77 F	26 C	100%	41 C	106%
30 C	86 F	31 C	100%	45 C	131%
35 C	95 F	36 C	100%	49 C	153%
40 C	104 F	41 C	106%	53 C	189%
45 C	113 F	46 C	138%	56 C	231%
50 C	122 F	51 C	179%	60 C	281%

S. Sankar, K. Vaid, M. Shaw "Impact of Temperature on Hard Disk Drive Reliability in Large Datacenters" Microsoft, IEEE, 2011



Energy innovation

In-rack fuel cell research

- Natural gas converted directly to electricity to power servers
- Wastewater treatment methane recovery pilot

Dramatic improvement in holistic efficiency

- Beyond PUE – removes losses inherent in energy production and delivery
- Efficient energy supply chain from source to motherboard

Increased datacenter reliability

- Fewer moving parts, fewer potential points of failure. Increased global commonality

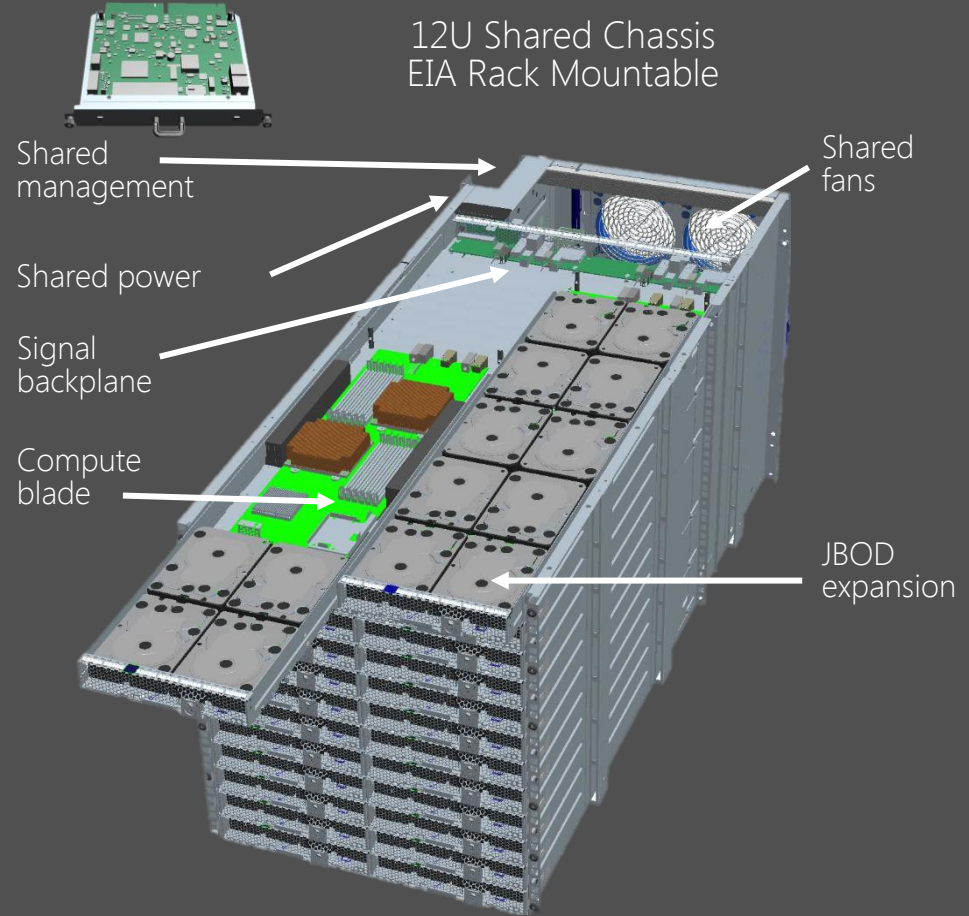
Lower infrastructure costs

- Elimination of electrical distribution, power conditioning, and back-up infrastructure



Microsoft Cloud Server

- Shared infrastructure for efficiency and TCO optimization
- Network and storage connectivity via blind-mate backplane architecture
- Workload enablement via add-on cards
- Secure, scalable and extensible systems management
- Available to all via Open Compute Project Open CloudServer v2 spec

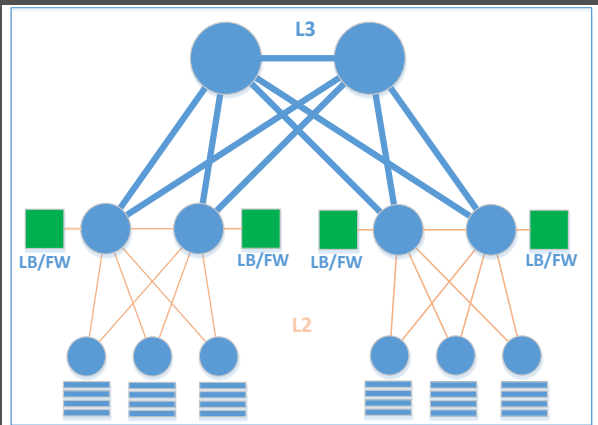


Classic network vs. Hyper-scale network architecture

Large L2 Domains

HW-based service modules

Simple Tree Design



Low due to diversity and manual provisioning process

Low due to complex hardware and lack of automated operations

Low due to high complexity and human error

Agility



Efficiency



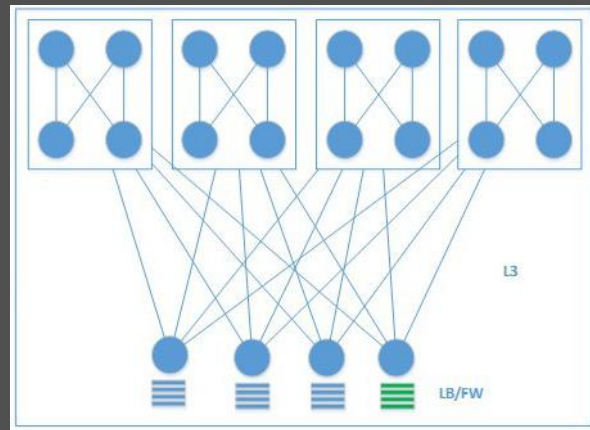
Availability



L3 at all layers

Services in software

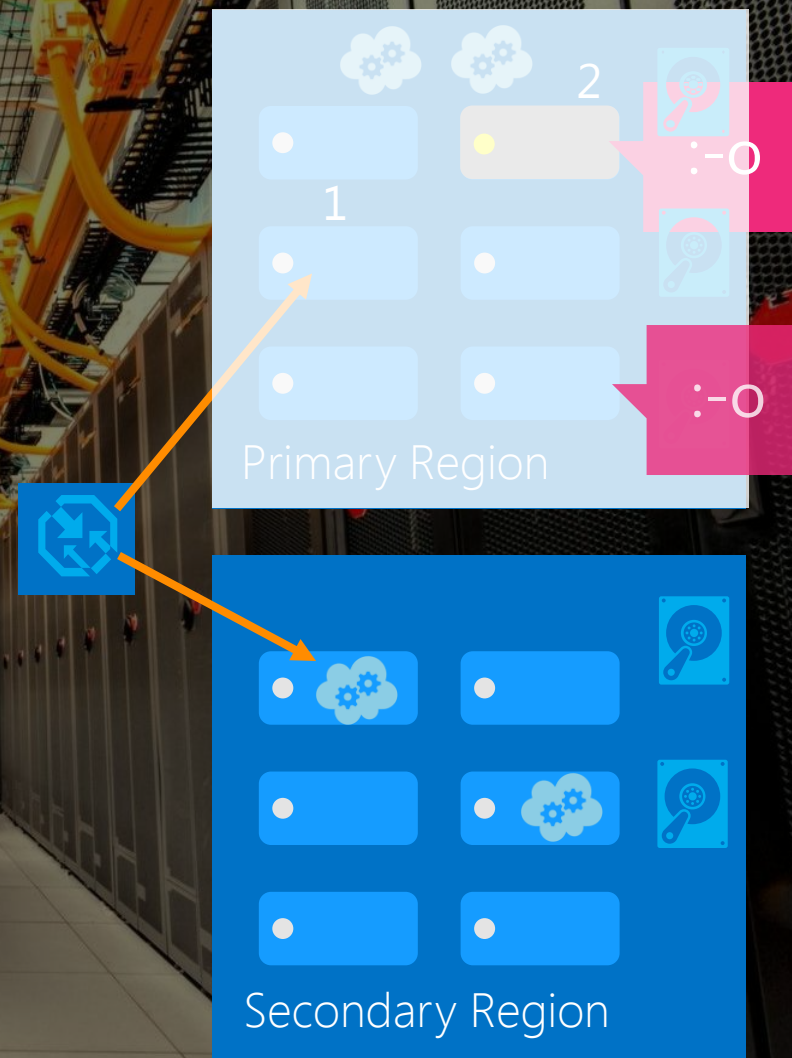
Clos-based design



Automated network provisioning, integrated process

Simplify requirements, optimize design, and unify infrastructure

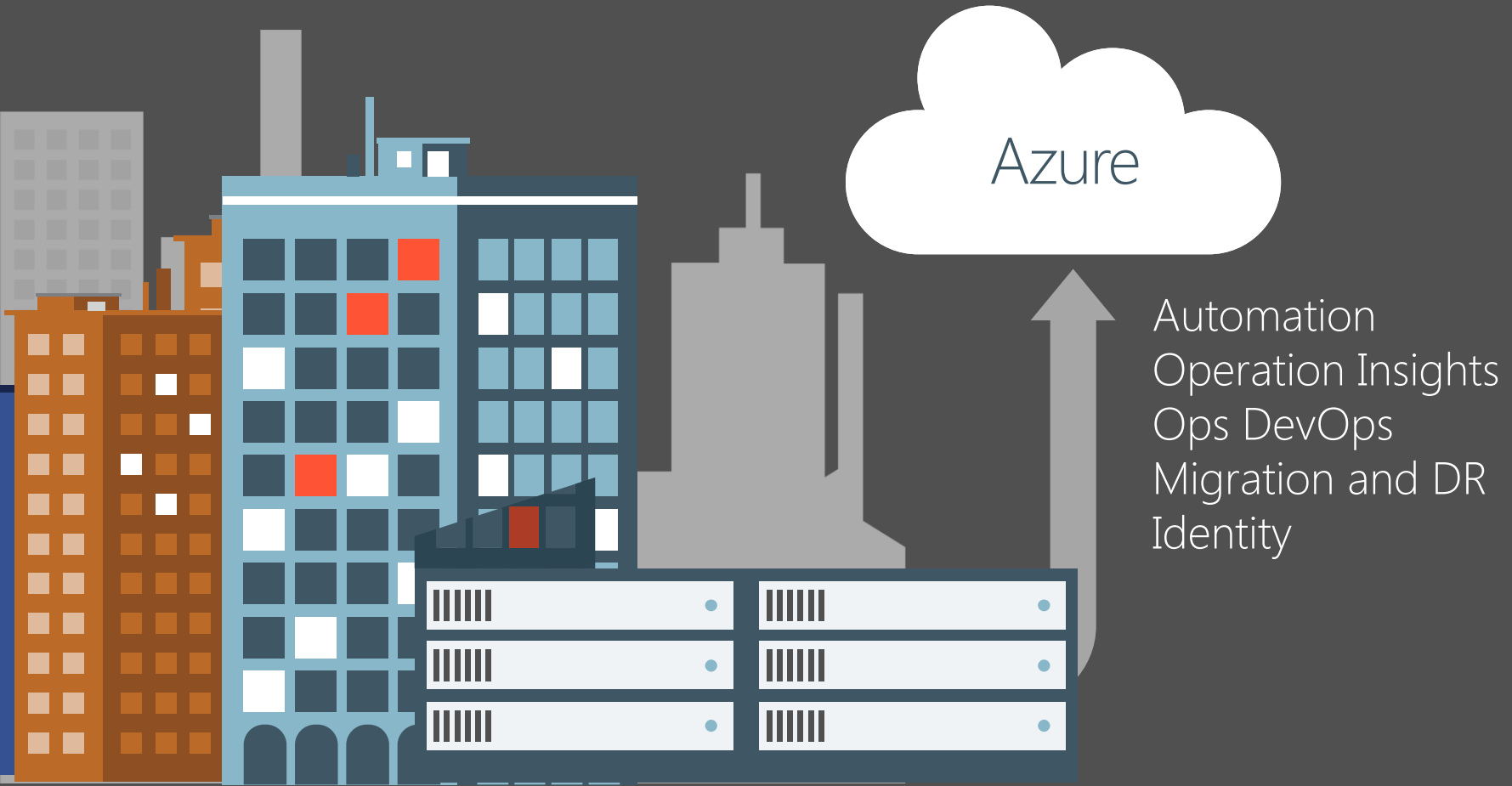
Resilient design, automated monitoring and remediation, minimum human involvement



Microsoft
Network



Connected Services: Bringing it Together



Add Azure to your datacenter



Last 12 months

Offline Operations

Remote Debug Tag Expressions

Traffic Manager

Site to Site Virtual Network

Stop without Billing

Xamarin integration

Large Memory SKU

Hyper-V Recovery

SQL, SharePoint, BizTalk Images

HDInsight

Cloud Services SDK 2.0

Mercurial Deployment

Windows Phone Support

Distributed Cache

Scheduler

Partitioned Queues/Topics

AutoScale

Per Minute Billing

Dynamic Remote Desktop

Log Streaming

HTML 5/CORS

Android Support

IaaS

Active Directory

Custom Mobile API

IP and SNI SSL

http Logs to Storage

BizTalk Services

IP/DDOS Protection

Multi-Factor Auth

http Logs to Storage

Dynamic Remote Desktop

Hyper-V Disaster Recovery Support

MSDN Dev/Test

Integration

Storage Analytics

Delete Disks

WebSockets

AMQP Support

iOS Notification Support

VIP ACLs

New VM Gallery

PowerBI

Read-Only Secondary Storage

Windows Server Backup

Queue Geo Replication

New Relic

Mobile Services

Manage Azure in AD

Git Source Control

Notification Hubs

AD Directory Sync

Windows 8 Notification Support

AD Management Portal

CORS/JSON Storage Support

B2B/EDI and EAI Adapters

Point to Site

VOD Streaming + Encoding

Software VPN

Web Sites

Media Services

AutoScale/Monitoring

VS Online

Message Pump Programming Model

Import/Export Hard Drives



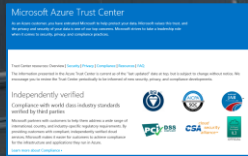
Microsoft cloud infrastructure resources



Microsoft Datacenters Website
microsoft.com/datacenters



Cloud Infrastructure & Operations Blog
blogs.technet.com/msdatacenters



Microsoft Azure Trust Center
azure.microsoft.com/support/trust-center



Office 365 Trust Center
trustoffice365.com

Twitter: @ejvanvuuren

Linkedin: <http://nl.linkedin.com/in/ejvanvuuren>



Microsoft

© 2015 Microsoft Corporation. All rights reserved. The information herein is for informational purposes only and represents the current view of Microsoft Corporation as of the date of this presentation. Because Microsoft must respond to changing market conditions, it should not be interpreted to be a commitment on the part of Microsoft, and Microsoft cannot guarantee the accuracy of any information provided after the date of this presentation. MICROSOFT MAKES NO WARRANTIES, EXPRESS, IMPLIED OR STATUTORY, AS TO THE INFORMATION IN THIS PRESENTATION.