Microsoft Azure

Resiliency in Azure

Business continuity and data protection

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Partner Technology Strategist

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“Failure is always an option”
- Adam Savage

BCDR by the Numbers

Top Causes of Declared Disasters

36%
IT Failure

19%
Power Failure

16%
Flood

13%
Cyber Attack

10%
Natural Disaster

6%
Human Error

Forrester/Disaster Recovery Journal Spring 2017
The State of Disaster Recovery Preparedness

BCDR by the Numbers

The Cost of Downtime

40-60% of small businesses that suffer a disaster never reopen their doors

90% of small businesses that suffer a disaster fail within 5 days

80% of small businesses have experienced downtime

FEMA/IDC

On average...

	SMB	Corporate
per minute	$137-$427	$5,600
per hour	$20K-$100K	$140K-$540K
per incident	$82K-$256K	$574K-$1.78M

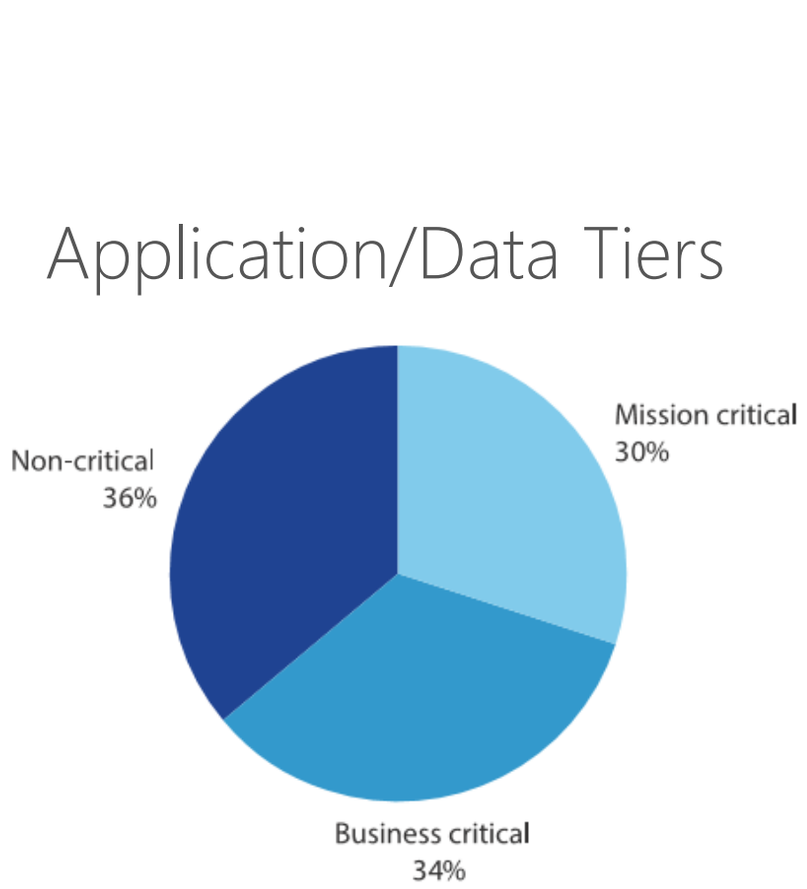
IDC

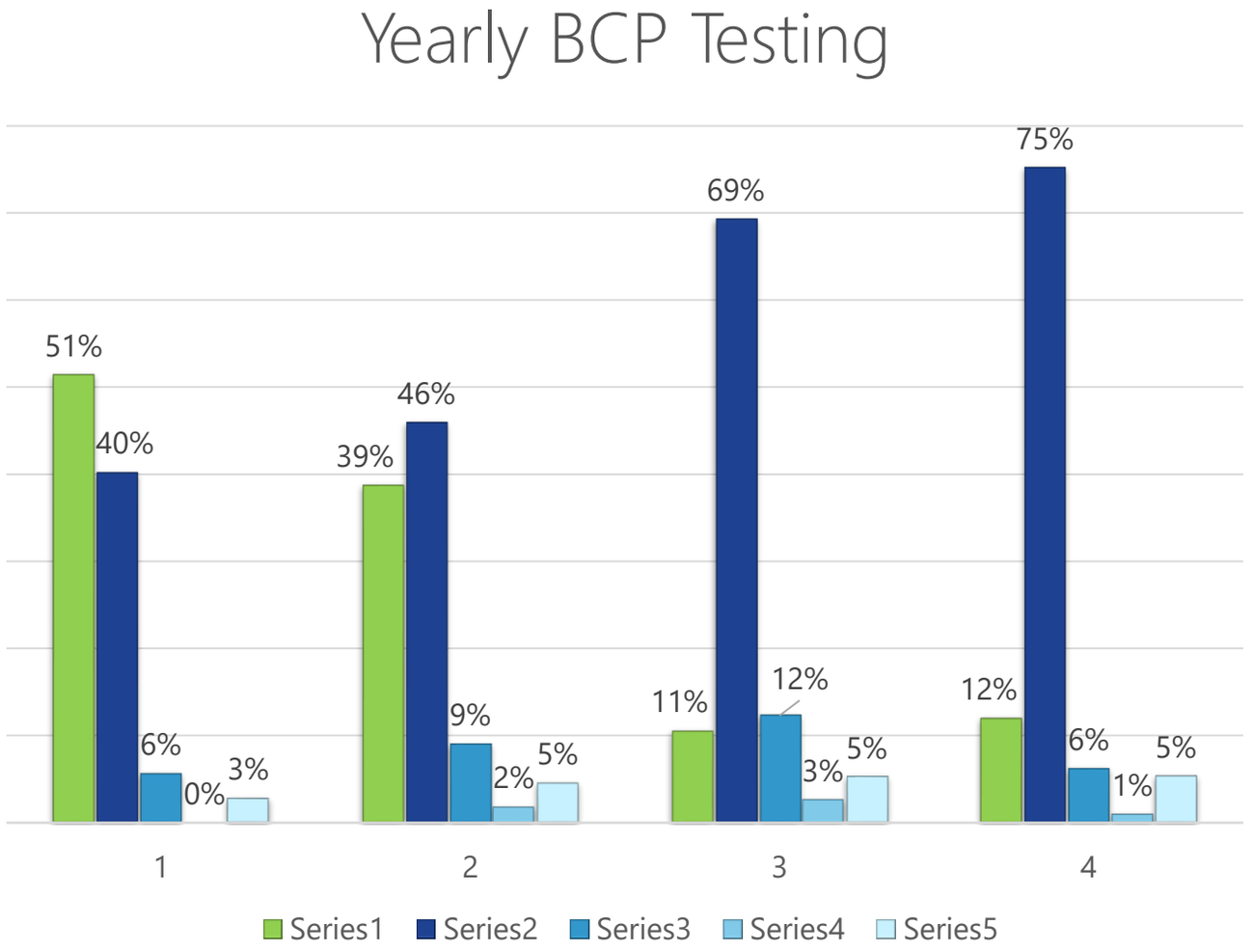
Gartner

BCDR by the Numbers

Forrester/Disaster Recovery Journal Spring 2018
The State of Business Continuity Preparedness

BCP Testing





BCDR by the Numbers

Forrester/Disaster Recovery Journal Spring 2017/2018

How Big is the Opportunity?

Partner Opportunity

How do you/will you provision your recovery sites?

We owr

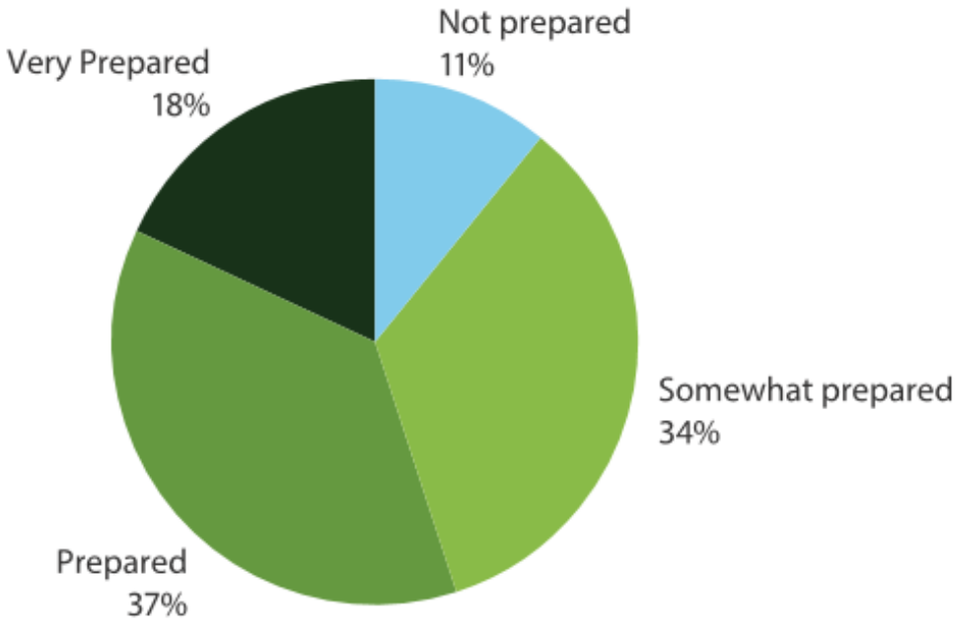
We use a co-location site

We use sharec

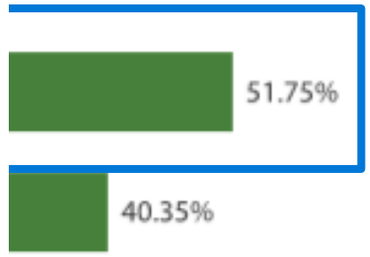
We use a DR-as (end-to-end pack

We use public cloud Infras to architect a custo

"How would you rate your ability to recover your data center in the event of a site failure or disaster event?"



u use
3CPs?



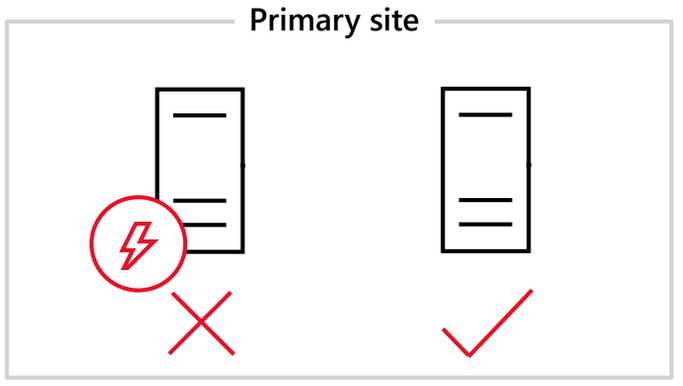
within the next 12 months

Microsoft Azure

Technical Overview

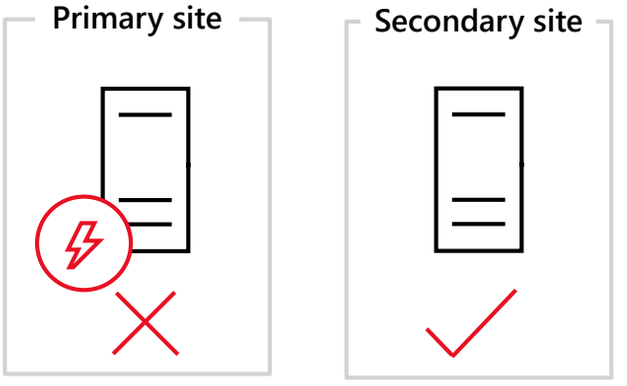
What is Resiliency?

Not about avoiding failures, but responding to failures



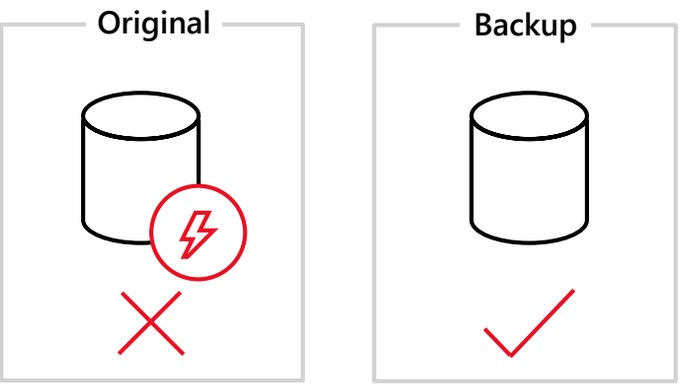
High availability

When your applications have a catastrophic failure, run a second instance



Disaster recovery

When your applications have a catastrophic failure, run them in Azure or a secondary datacenter



Backup

When your data is corrupted, deleted or lost, you can restore it

What are we Recovering?

RTO vs RPO

Recovery Time Objective (RTO)

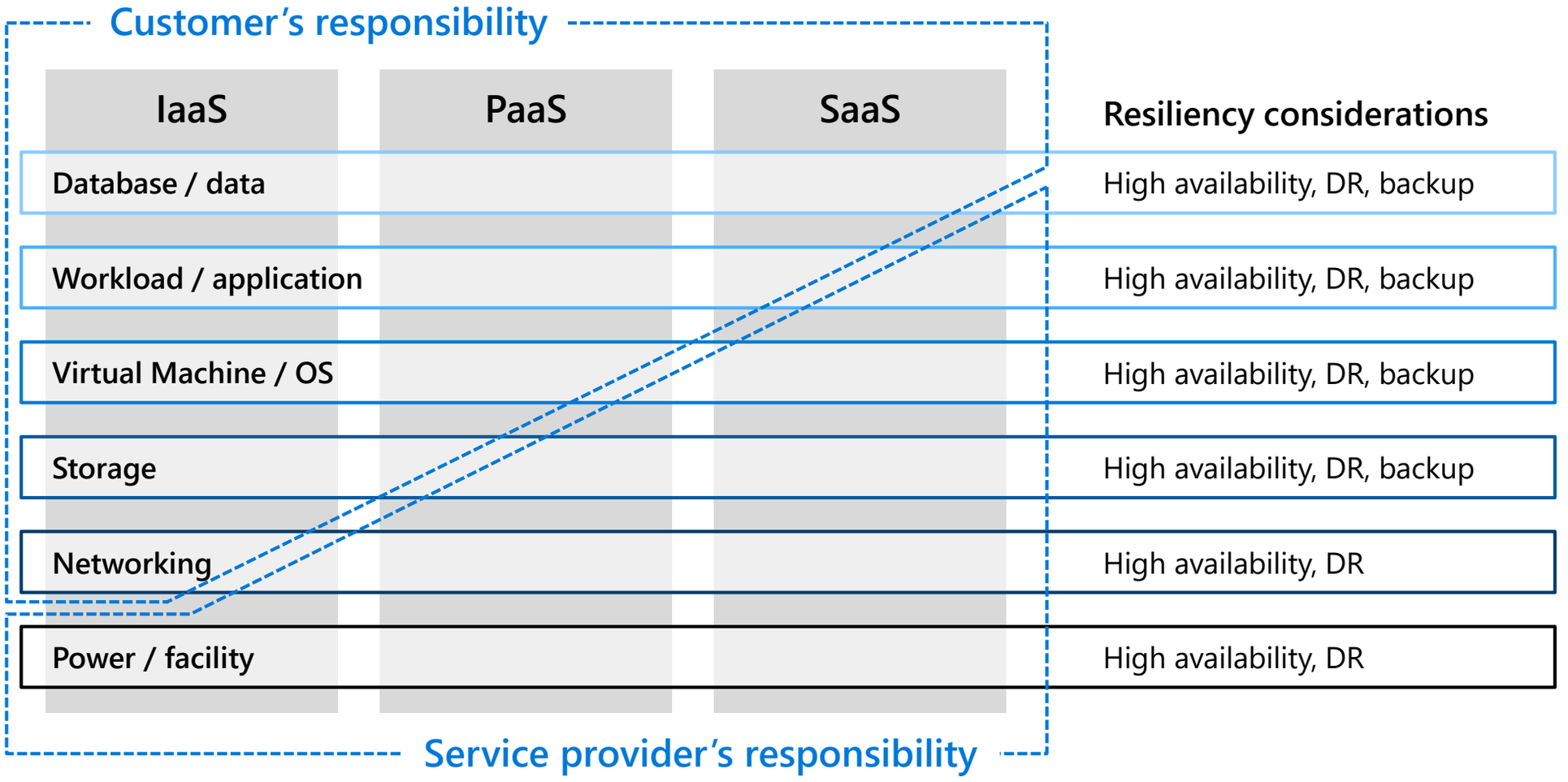
"The recovery time objective (RTO) is the targeted duration of time and a service level within which a business process must be restored after a disaster (or disruption) in order to avoid unacceptable consequences associated with a break in business continuity.", https://en.wikipedia.org/wiki/Recovery_time_objective

Recovery Point Objective (RPO)

"A recovery point objective, or "RPO", is the maximum targeted period in which data might be lost from an IT service due to a major incident. The RPO gives systems designers a limit to work to.", https://en.wikipedia.org/wiki/Recovery_point_objective

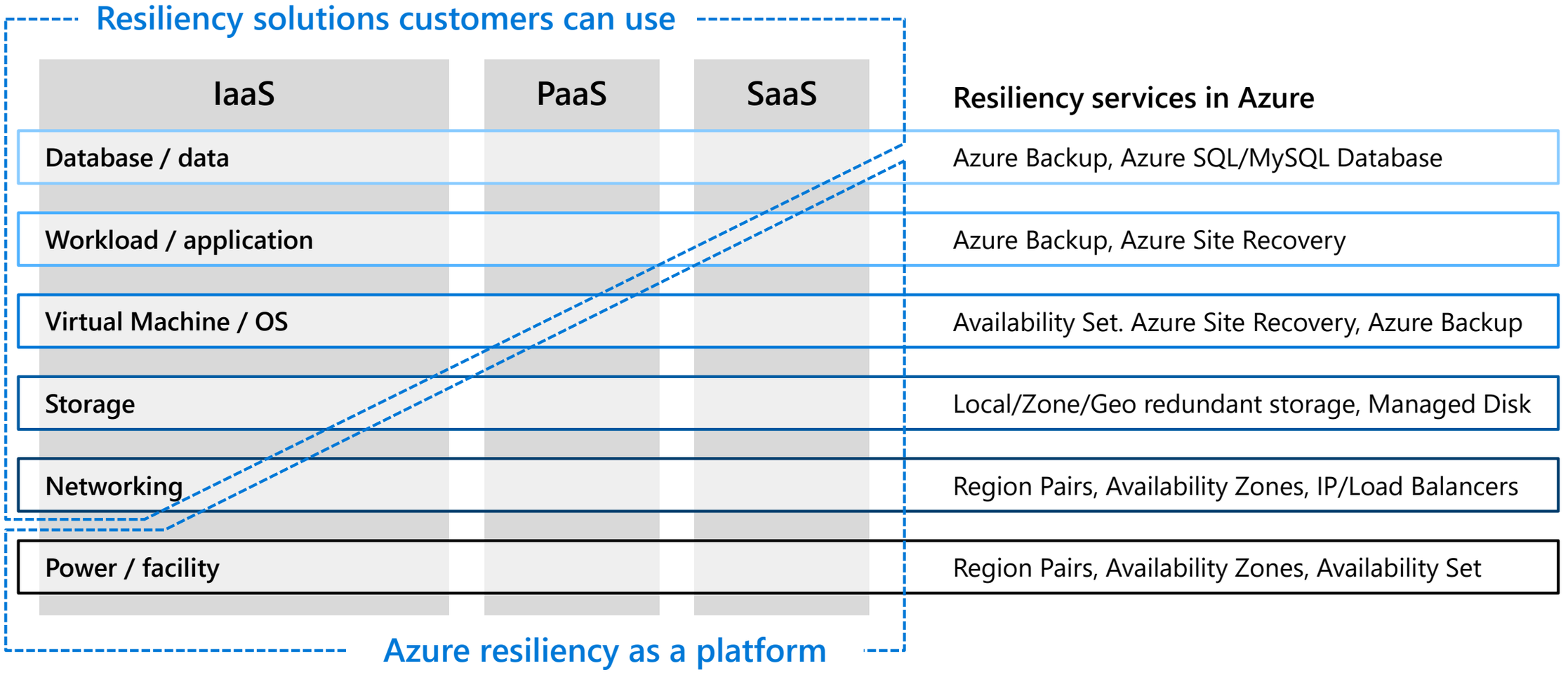
Resiliency in the public cloud

Resiliency is a joint effort between customers and service providers



Resiliency in Azure

Azure provides resiliency as a platform and solutions through globe's largest datacenter footprint

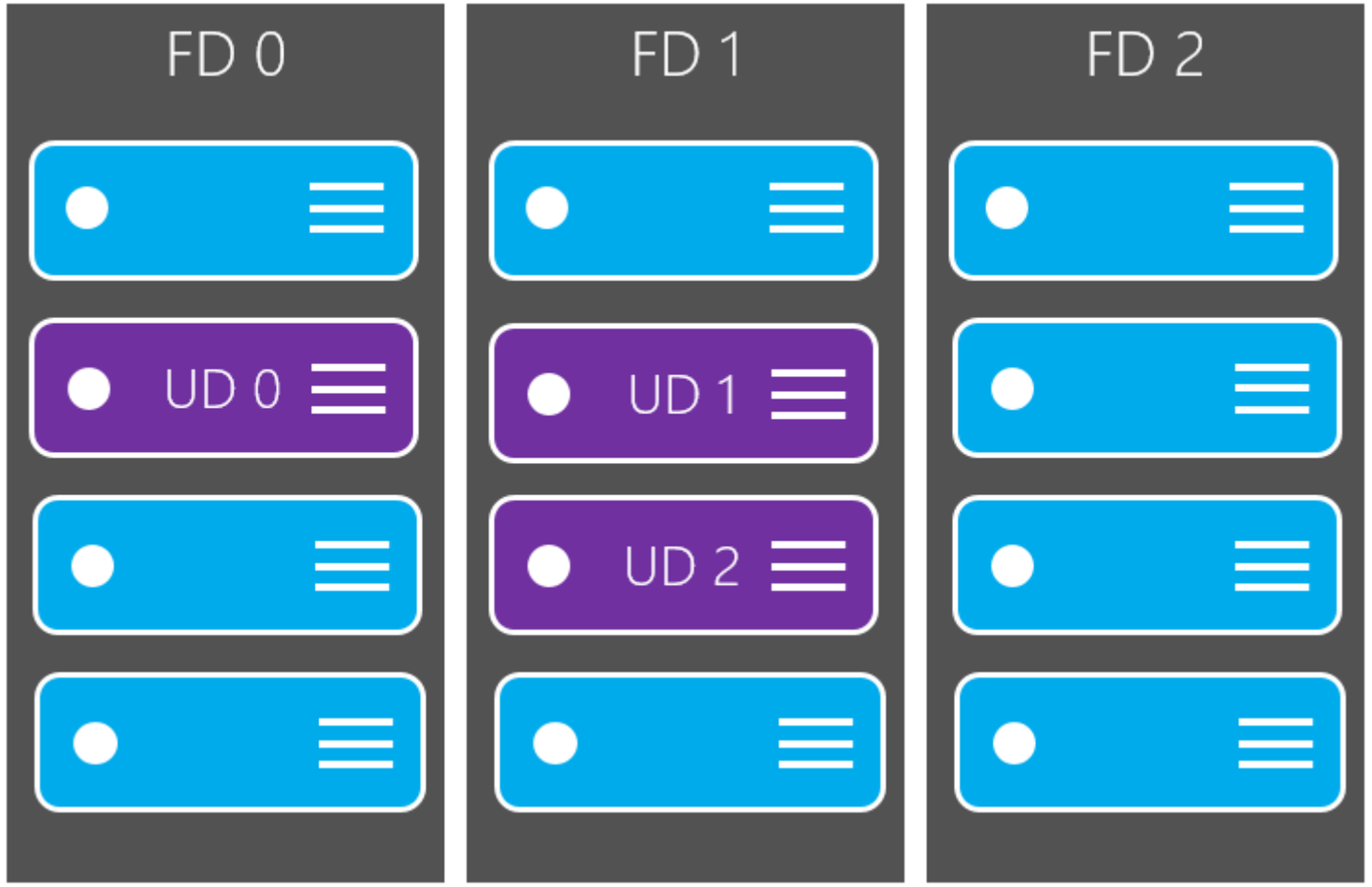


Microsoft Azure

Reference Architecture & Design Patterns

Azure resiliency as a platform

Availability Sets

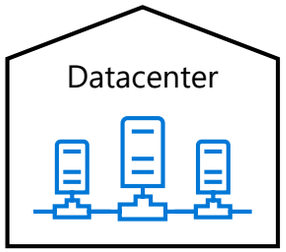


Azure resiliency as a platform

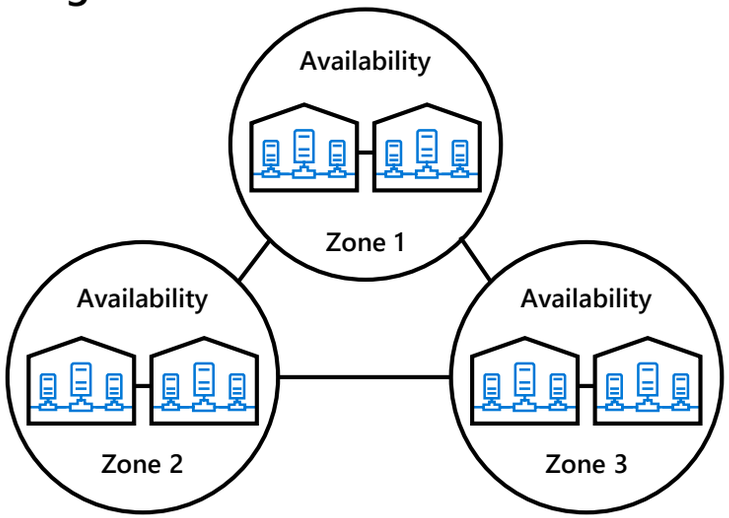
Resilient from hardware, datacenter, and regional outages

Power / facility	Region Pairs, Availability Zones, Availability Set

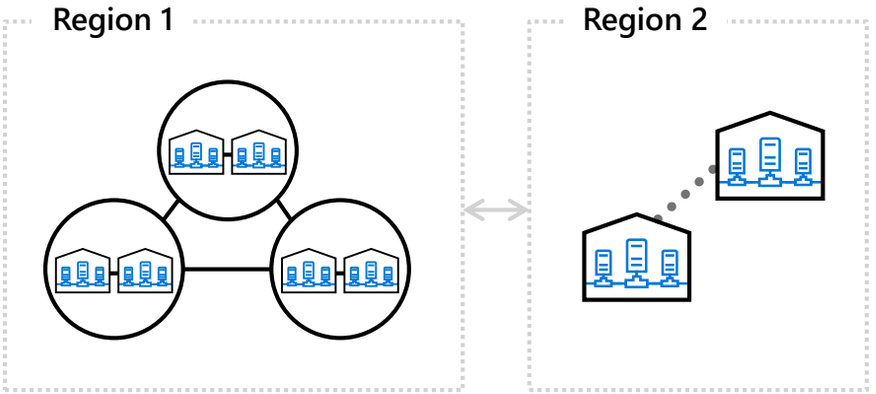
Datacenter



Region



Data Residency boundary



Availability Sets

High Availability protection from hardware failures in a datacenter.

Availability Zones

High Availability protection against loss of datacenters. Multiple datacenters per physically separated zone. Each zone features independent network, cooling, and power.

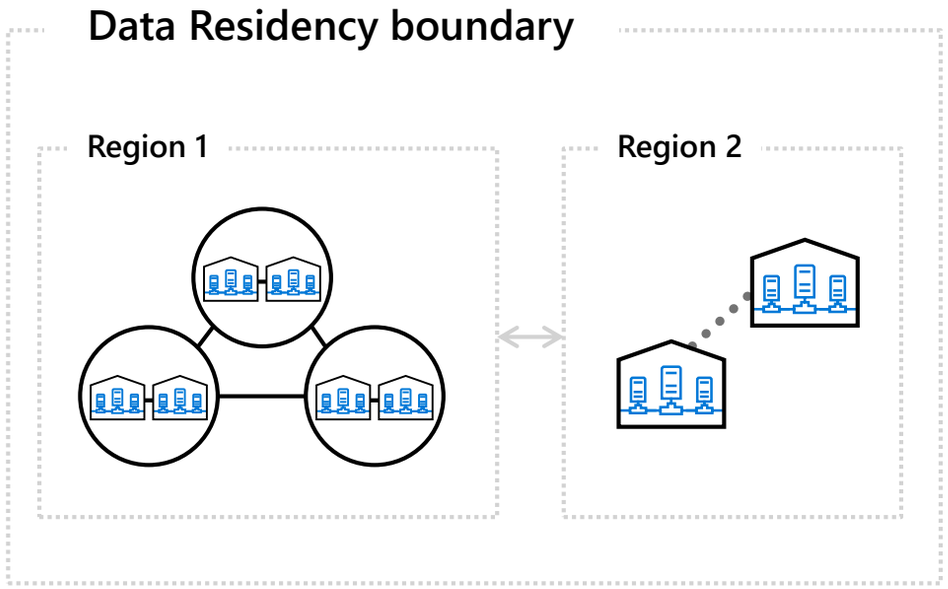
Region Pairs

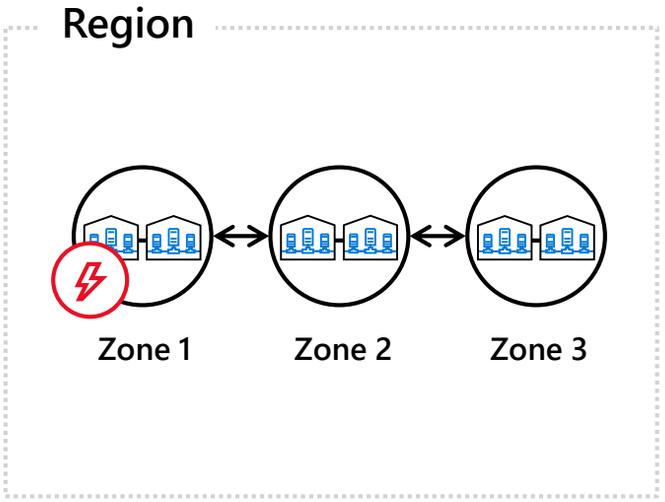
Protection for your data and applications from the loss of an entire region with Geo-redundant storage (GRS) and Azure Site Recovery.

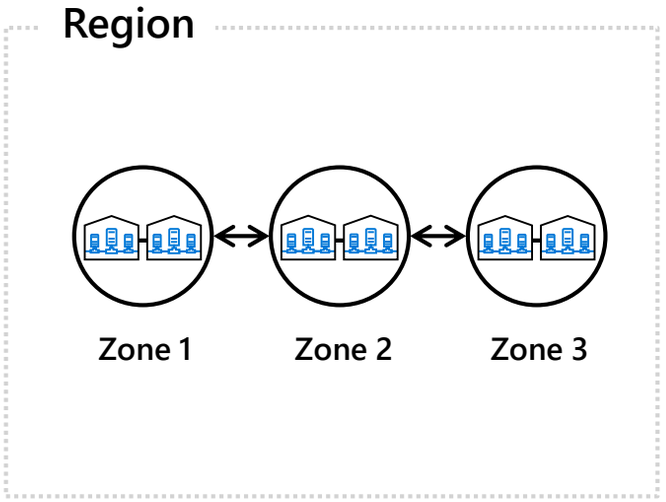
Azure resiliency as a platform

Availability Zones, protecting against datacenter outages

Power / facility	Availability Zones







Resiliency with Data Residency

Availability Zones and a paired region within the same data residency boundary provides high availability, disaster recovery, and backup.

Protection against entire datacenter loss

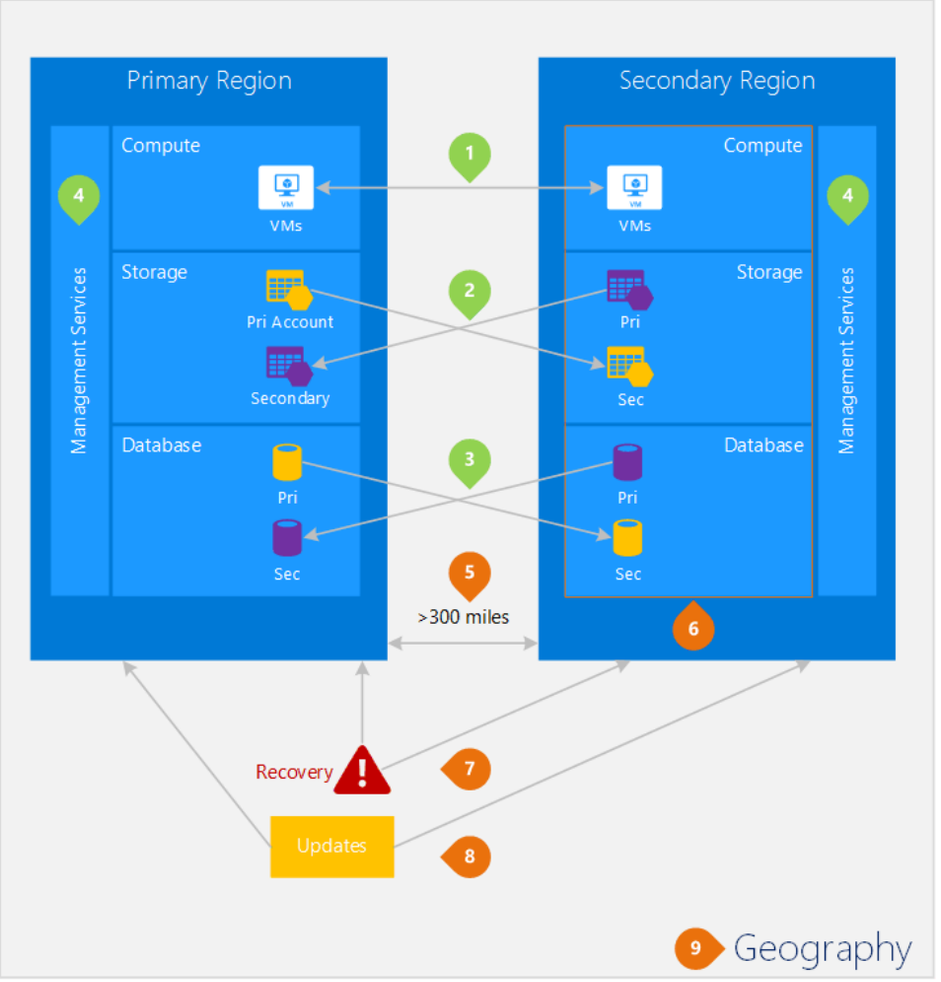
Each zone is physically separated and consists of one or more datacenters with independent power, network, and cooling.

99.99% SLA for mission critical apps

High Availability supported with industry best SLA when two or more VMs are running in separate Availability Zones within a region.

Azure resiliency as a platform

Azure Paired Regions



Cross-region Activities

1. Compute
2. Storage (GRS/Managed/ASR)
3. Database Geo-Replication
4. ARM (Azure Resource Manager)

Benefits

5. Physical Isolation
6. Platform-provided Replication
7. Region Recovery Order
8. Sequential Updates
9. Data Residency

Azure resiliency as a platform

Industry-leading high availability SLA

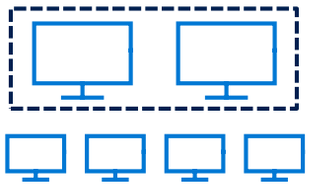
Power / facility	Region Pairs, Availability Zones, Availability Set

Industry-only ····· **Industry-leading high availability SLA** ····· **Industry-leading broadest choice of data residency** ····

VM SLA
99.9%

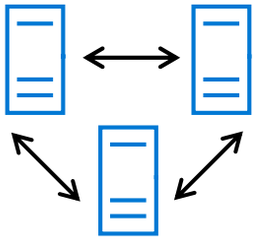
Single VM
Protection with Premium Storage

VM SLA
99.95%



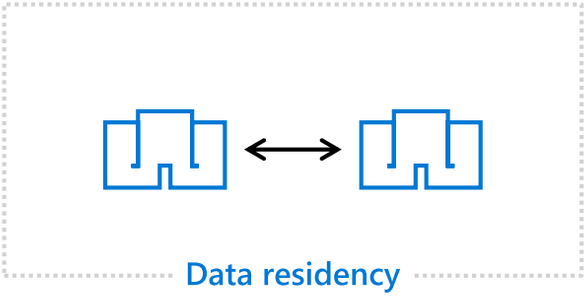
Availability sets
Protection against failures within datacenters

VM SLA
99.99%



Availability zones
Protection from entire datacenter failures

Regions
52



Region pairs
Protection from disaster with Data Residency compliance

Azure networking resiliency solutions

Azure networking resiliency solutions

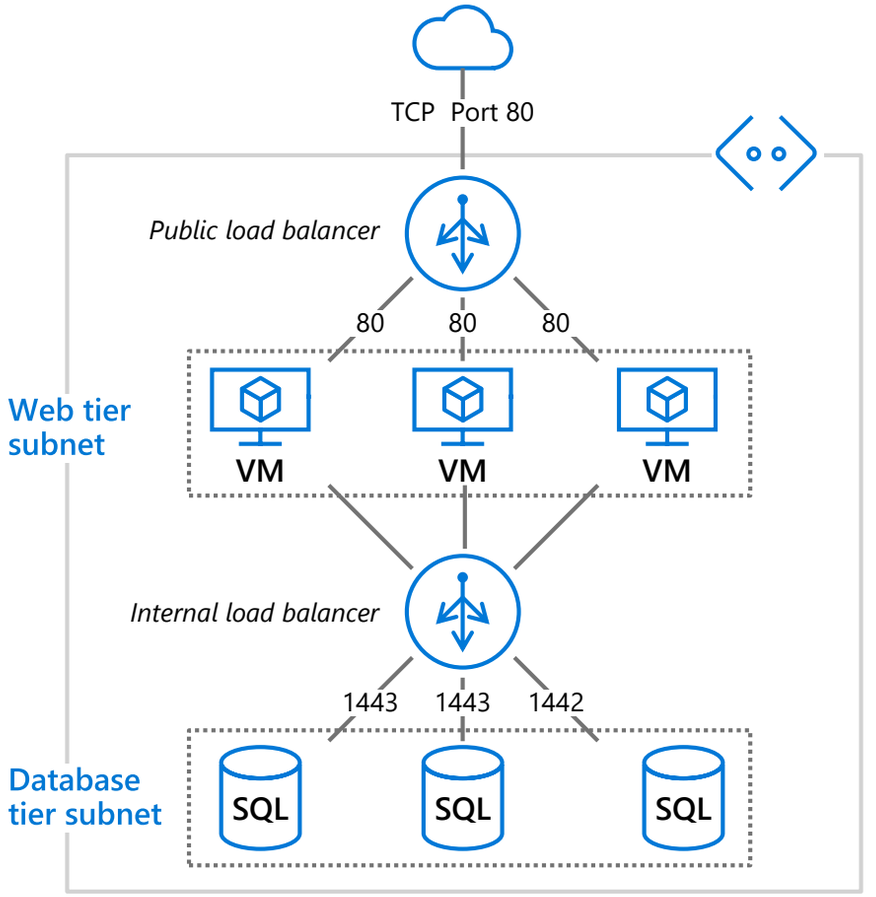
Networking	IP/Load Balancers

Simplify load balancing for applications
Create highly-available and scalable applications in minutes supporting TCP/UDP-based protocols

High availability and robust performance for your applications
Load Balancer automatically scales with increasing application traffic

Internal load balancer
Use the internal load balancer for traffic between virtual machines inside your private virtual networks

Build highly reliable applications
Automatically takes unhealthy instances out of rotation, and reinstates them when they become healthy again



Azure networking resiliency solutions

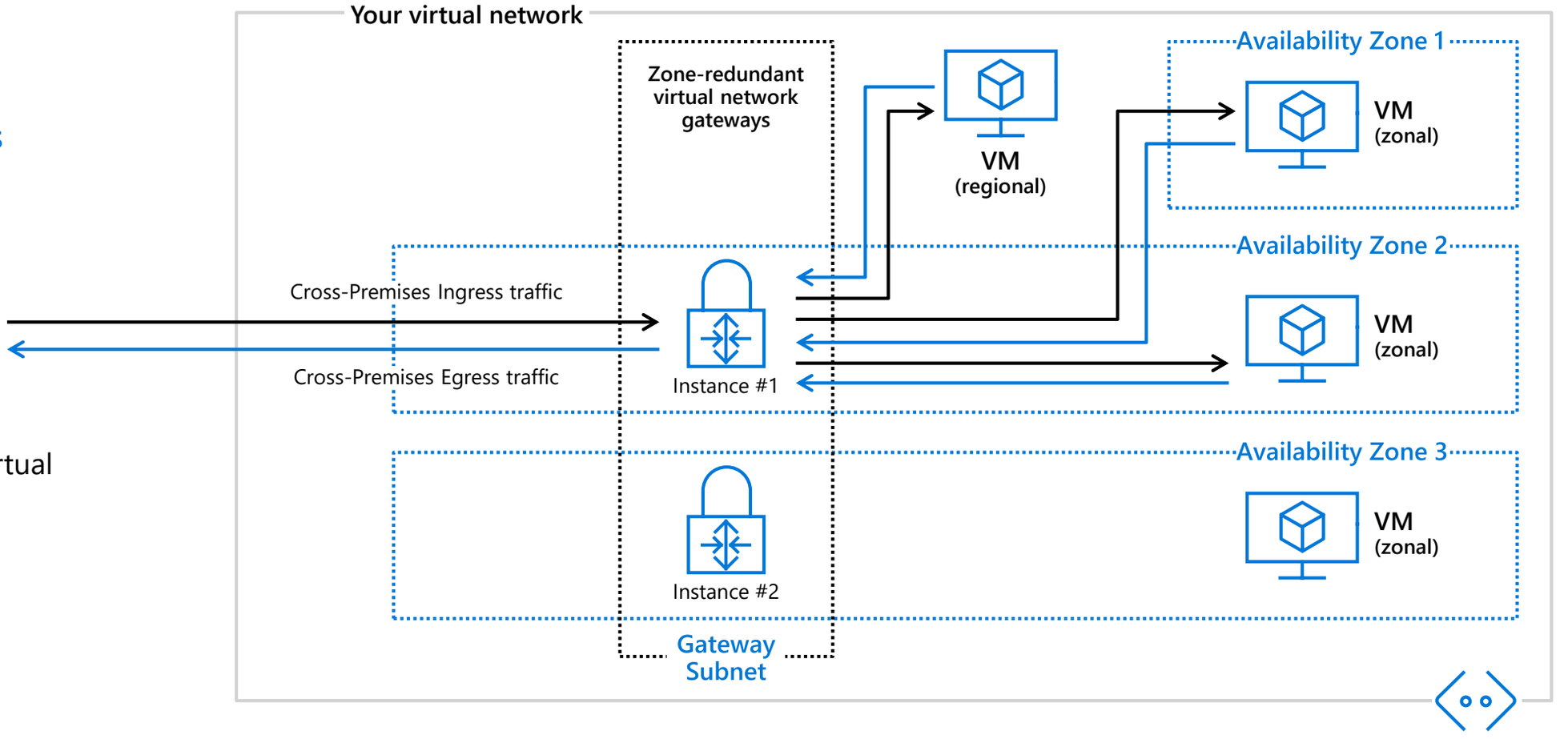
Zone-redundant virtual network gateways (preview)

Networking	Virtual network gateways

Virtual gateways

99.99%

Zone-redundant virtual network gateway



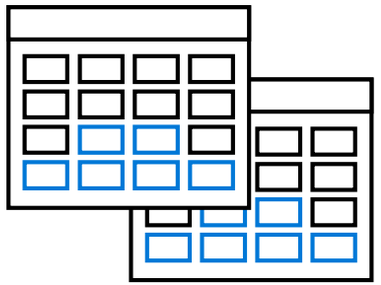
Azure storage resiliency solutions

Azure storage provides replication options based on availability needs

Storage	Local/zone/geo redundant storage

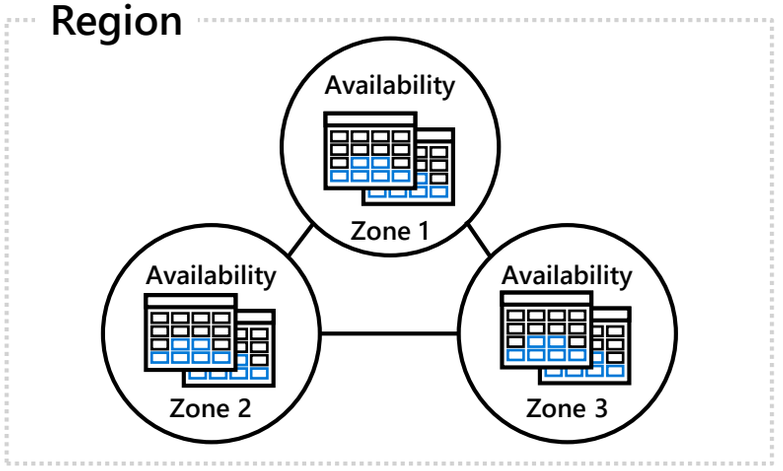
LRS

99.999999999% (11 9s)



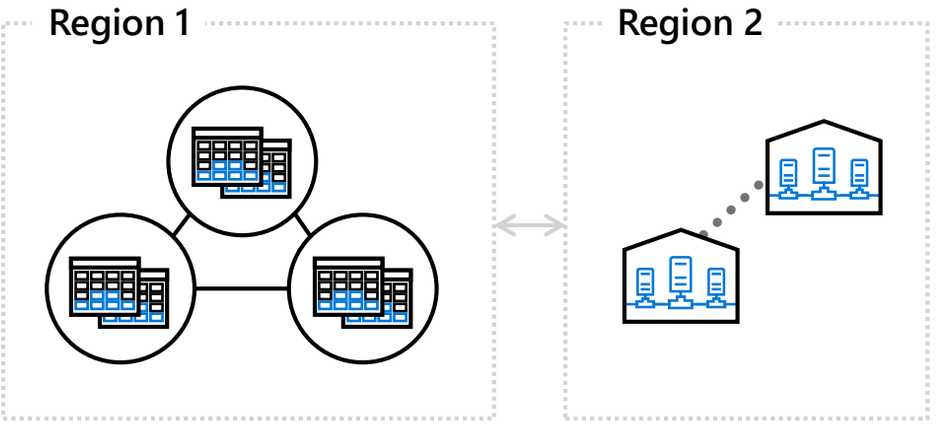
ZRS

99.9999999999% (12 9's)



GRS

99.99999999999999% (16 9s)



Locally redundant storage

The simplest, low-cost replication strategy that Azure Storage offers.

Zone-redundant storage

A simple option for high availability and durability.

Geo-redundant storage

Cross-regional replication to protect against region-wide unavailability.

Azure compute resiliency solutions

Apply autoscaling to virtual machines for high availability

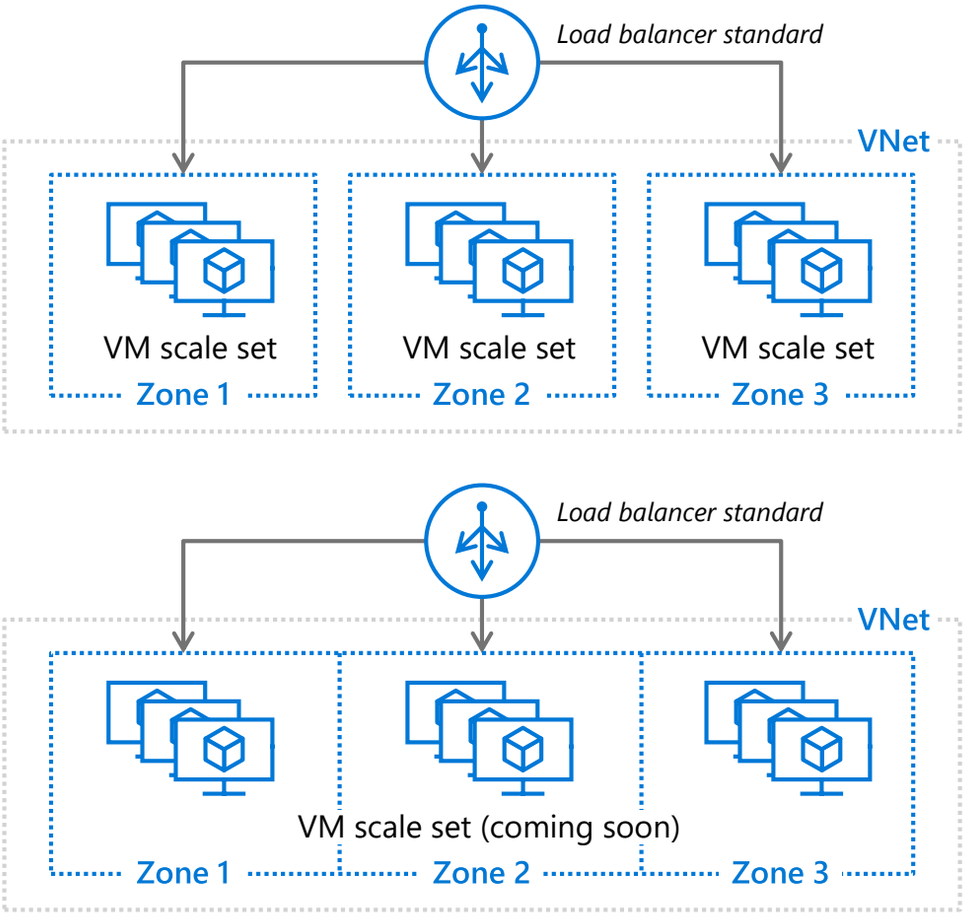
Virtual Machine / OS	VM Scale set (VMSS)

Reliably deploy and update at a large scale
Deploy hundreds of identical virtual machines in minutes.

Scale automatically
Use only the compute resources your application needs at any time.

Simplify networking
Easily spread your workloads across the virtual machines in your Virtual Machine Scale Set.

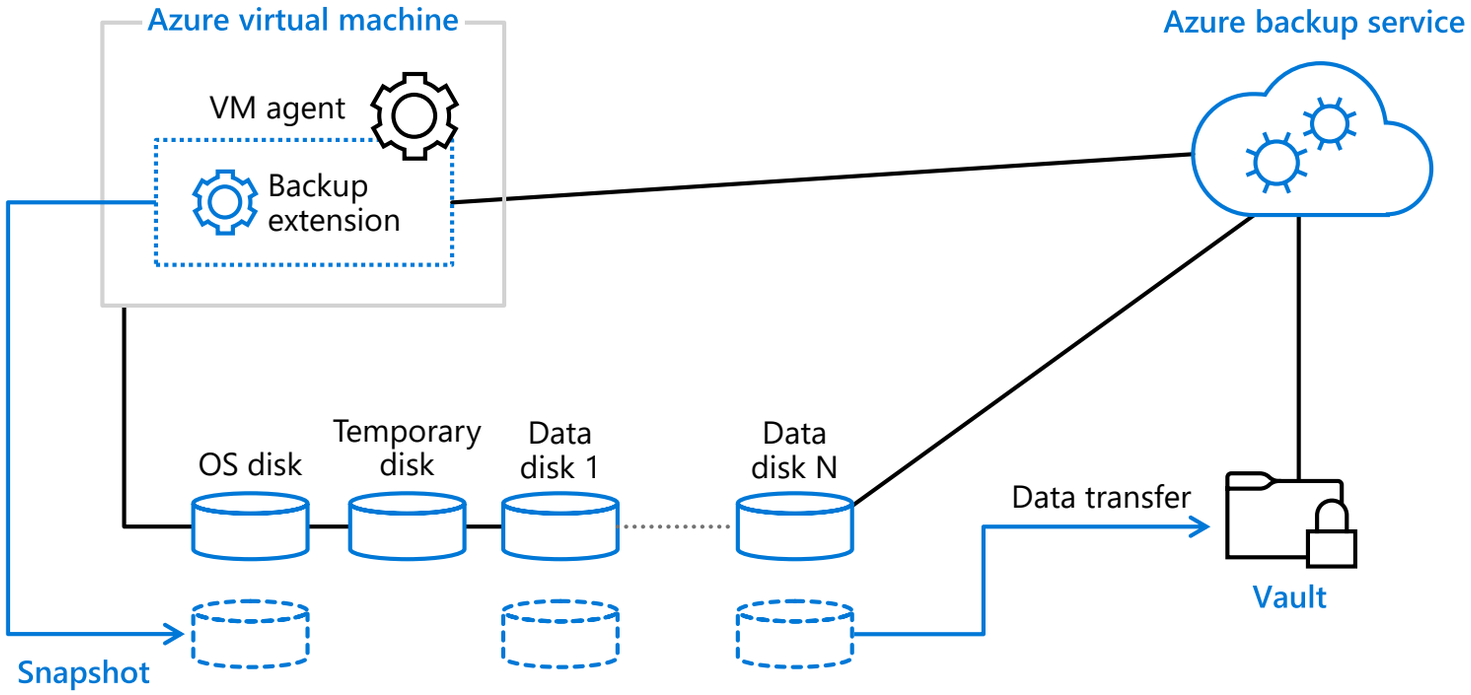
Support hyperscale workloads
Elastic to support your scale-out workloads—including stateless web front ends, container orchestration, and microservices clusters.



Azure compute resiliency solutions

Backup your virtual machine without any infrastructure needs

Virtual Machine / OS	Azure Backup



Application-aware snapshots (VSS)

Native backups for Windows/Linux

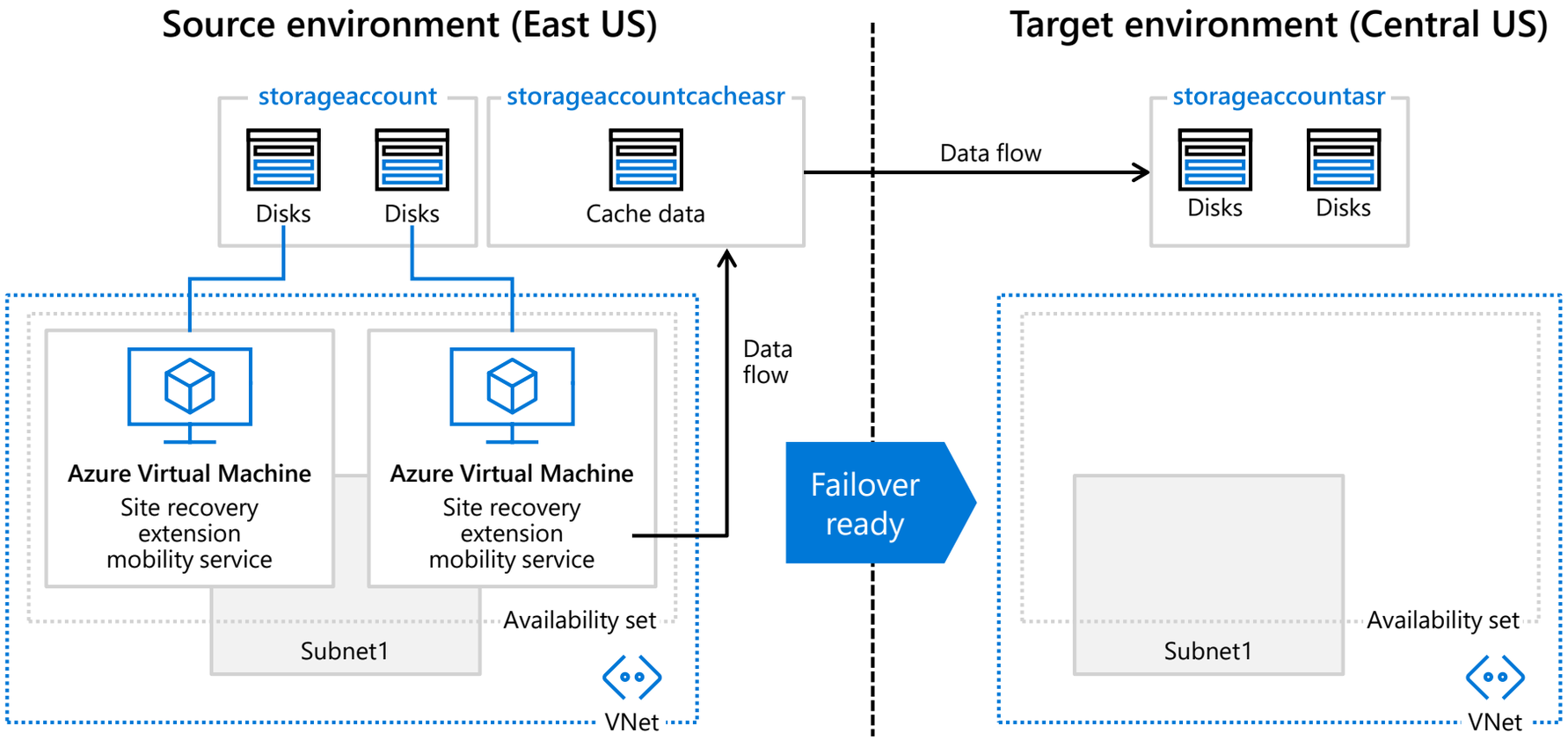
No specific agent installation required

Fabric-level backup with no backup infrastructure needed

Azure application resiliency solutions

Ensure application availability with cloud-based disaster recovery

Workload / application



Site Recovery

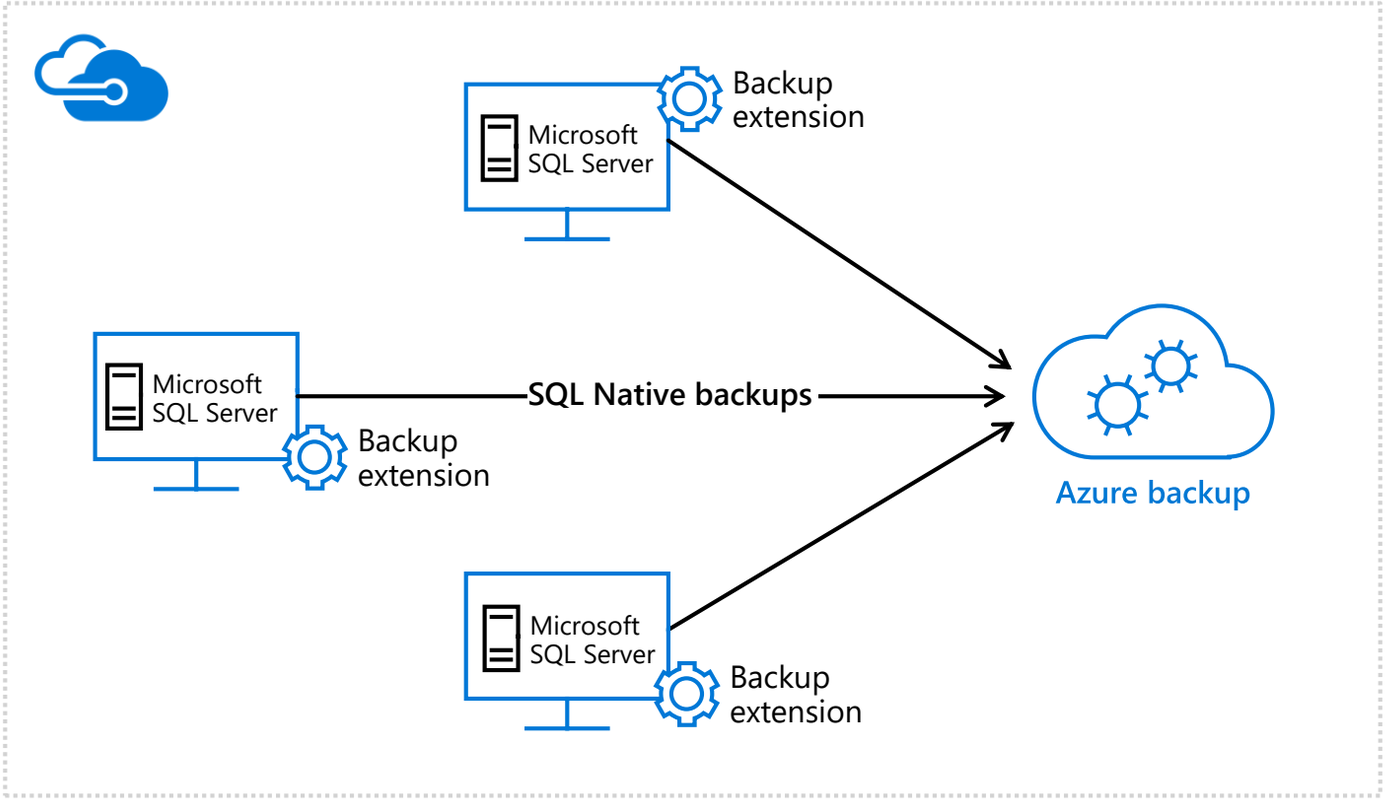
Replicates workloads running on Azure virtual machines (VMs) from a primary site to a secondary location.

When an outage occurs at your primary site, you fail over to the secondary location and access apps from there. After the primary location is running again, you can fail back to it.

Azure database resiliency solutions

Backup your SQL database natively in Azure

Database / data	Azure Backup



Azure Backup
Automatically discovers if a selected virtual machine is running SQL

Supports 15 minutes Recovery time objective (or RPO)

True point in time restore

Support for AG

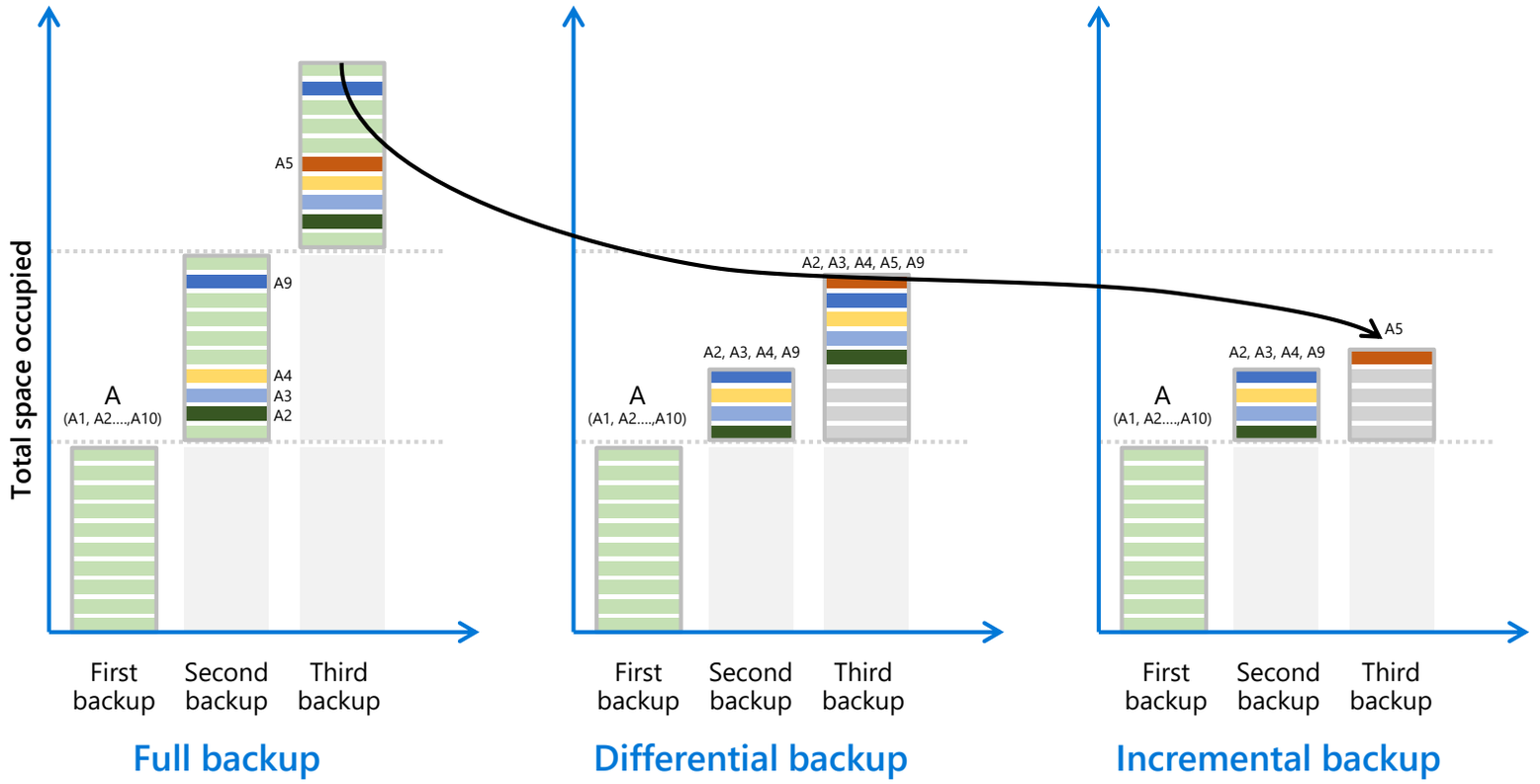
Microsoft Azure

Components & Capabilities

Azure Backup

Comparing full, differential and incremental backup

Data	Azure Backup



Full backup, each backup copy contains the entire data source.

Differential backup stores only the blocks that changed since the initial full backup, resulting in a smaller amount of network and storage consumption.

Incremental backup achieves high storage and network efficiency by storing only the blocks of data that changed since the previous backup. With incremental backup, there is no need to take regular full backups.

Azure Site Recovery

Workload support in Azure Site Recovery

Workload / application	Azure Site Recovery

Workload	Replicate Azure VMs to Azure	Replicate Hyper-V VMs to a secondary site	Replicate Hyper-V VMs to Azure	Replicate VMware VMs to a secondary site	Replicate VMware VMs to Azure
Active Directory, DNS	Y	Y	Y	Y	Y
Web apps (IIS, SQL)	Y	Y	Y	Y	Y
System Center Operations Manager	Y	Y	Y	Y	Y
Sharepoint	Y	Y	Y	Y	Y
SAP Replicate SAP site to Azure for non-cluster	Y (tested by Microsoft)	Y (tested by Microsoft)	Y (tested by Microsoft)	Y (tested by Microsoft)	Y (tested by Microsoft)
Exchange (non-DAG)	Y	Y	Y	Y	Y
Remote Desktop/VDI	Y	Y	Y	Y	Y
Linux (operating system and apps)	Y (tested by Microsoft)	Y (tested by Microsoft)	Y (tested by Microsoft)	Y (tested by Microsoft)	Y (tested by Microsoft)
Dynamics AX	Y	Y	Y	Y	Y
Oracle	Y (tested by Microsoft)	Y (tested by Microsoft)	Y (tested by Microsoft)	Y (tested by Microsoft)	Y (tested by Microsoft)
Windows File Server	Y	Y	Y	Y	Y
Citrix XenApp and XenDesktop	Y	N/A	Y	N/A	Y

HERO products

Protect your data with Azure Backup

Azure Backup landing page: https://aka.ms/azure-backup

Azure Backup's Cloud-First approach: https://aka.ms/azure-backup-cloud-first

Azure Backup blogs: https://aka.ms/azure-backup-blogs

Azure Backup videos: https://aka.ms/azurebackupvideos

Azure Backup documentation: https://aka.ms/azure-backup-documentation

Azure Backup support forum: https://aka.ms/azure-backup-support-forum

Feedback (user voice): https://aka.ms/azure-backup-user-voice

Ensure application availability with Azure Site Recovery

Support matrix for replicating one Azure region to another

Site Recovery documentation: https://aka.ms/siterecovery_documentation

Site Recovery blogs: https://aka.ms/siterecovery_blogs

Site Recovery Academy Course: https://aka.ms/siterecovery_mva

Support forum: https://aka.ms/asrforum

Feedback (user voice): https://aka.ms/ASRuservoice

Build high availability applications with Availability Zones

Visit the Azure regions page for availability: http://aka.ms/AzureRegions

Learn more about Availability Zones: http://aka.ms/AzureAZs

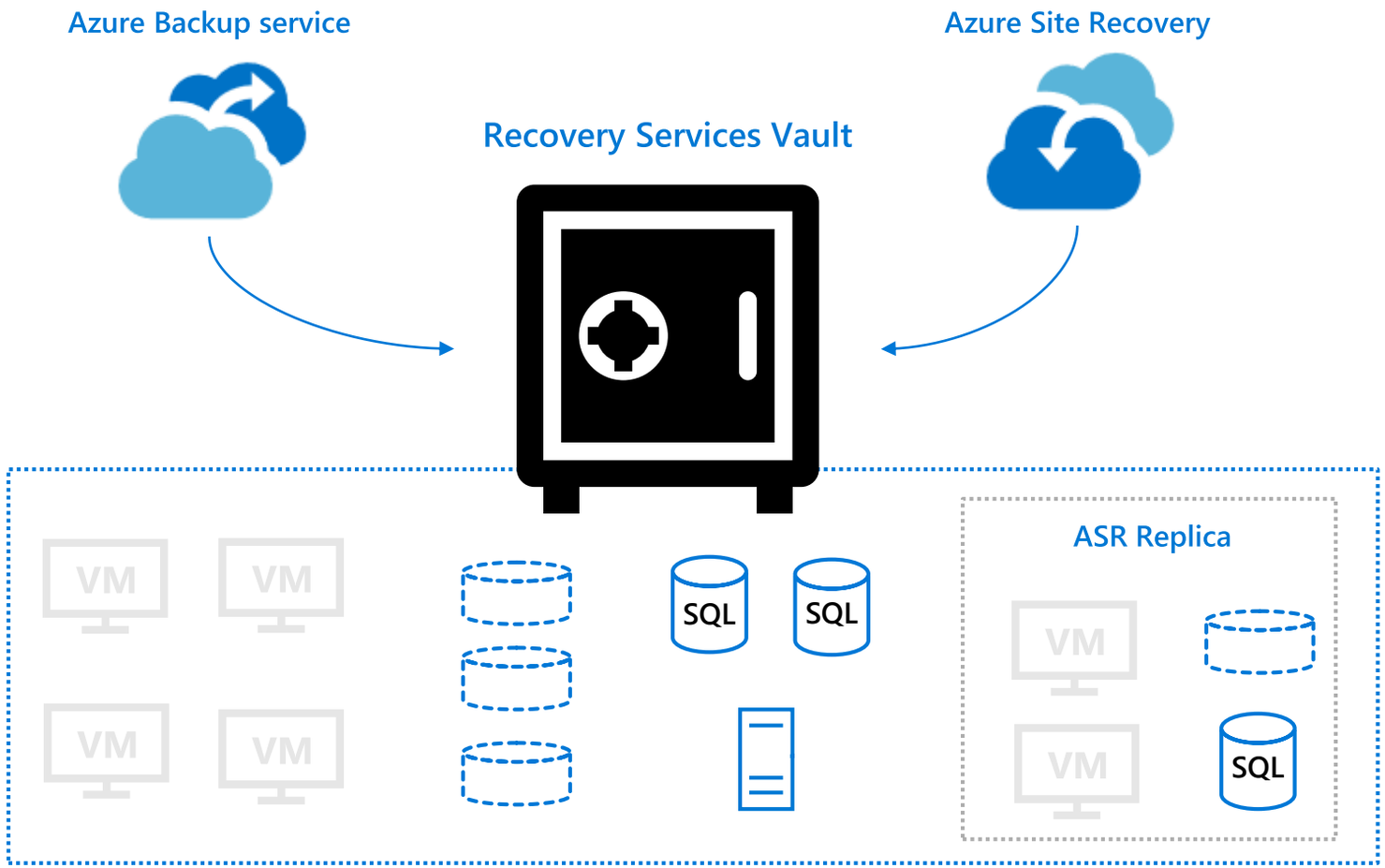
Build a comprehensive resiliency strategy: http://aka.ms/resiliency, http://aka.ms/AZoverview

Microsoft Azure

Azure Backup

Azure Backup

Recovery Services Vault



Azure Backup

Key advantages of Azure Backup

Backup ‘built-into’ Azure delivers:

Zero-infrastructure backup

I get freedom from provisioning and managing backup infrastructure, enabling greater agility.

Lower & Predictable TCO

I can eliminate CapEx and further reduce OpEx.

Secure Backup

I can guard my backups from malicious attacks and stay compliant

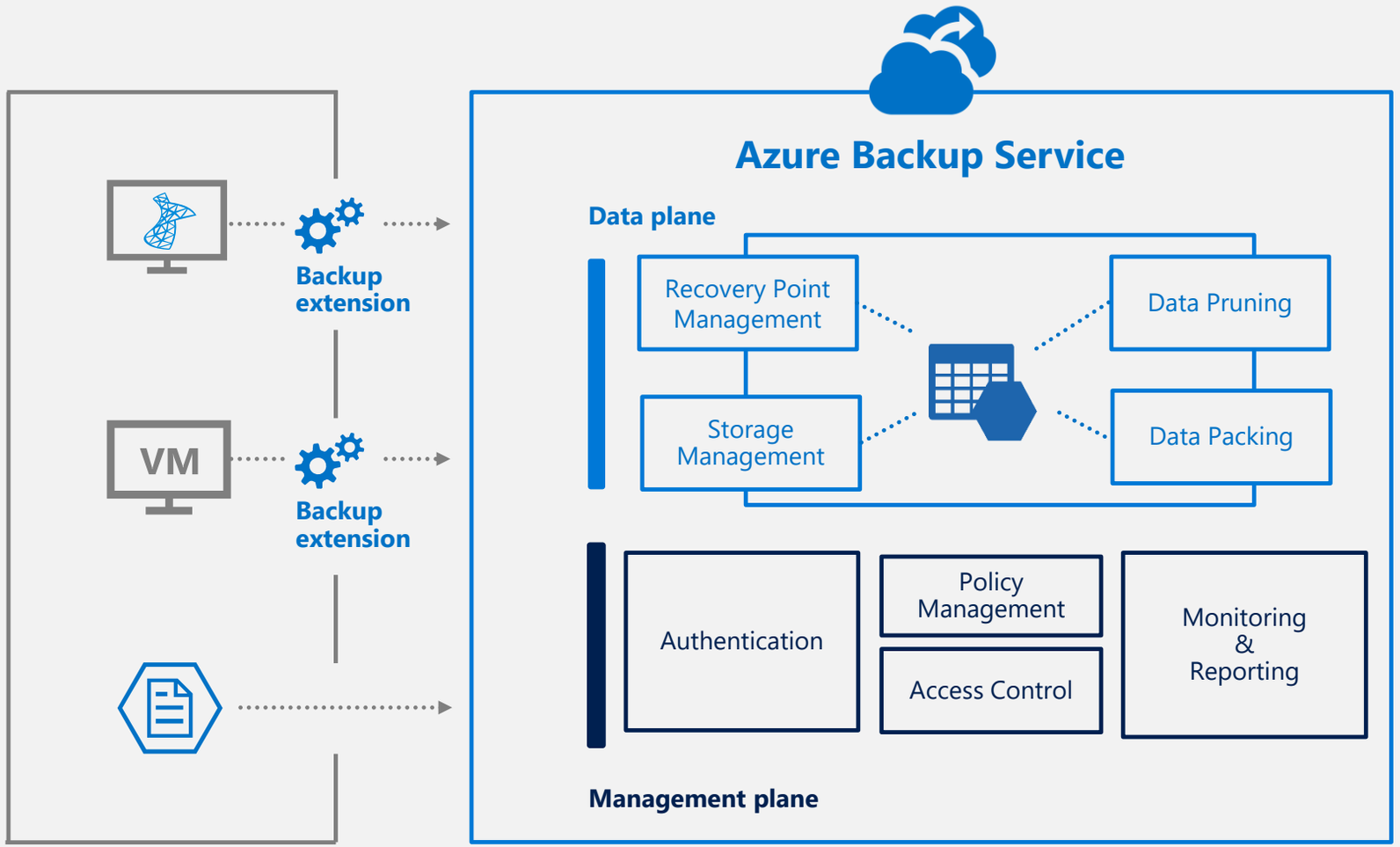
...making Azure a trusted Cloud Platform

Azure Backup

Architecture Matters

Scale-up
Within the enterprise

- **No infrastructure**
- **Enterprise scale**
- **Extensible**
- **Central management**

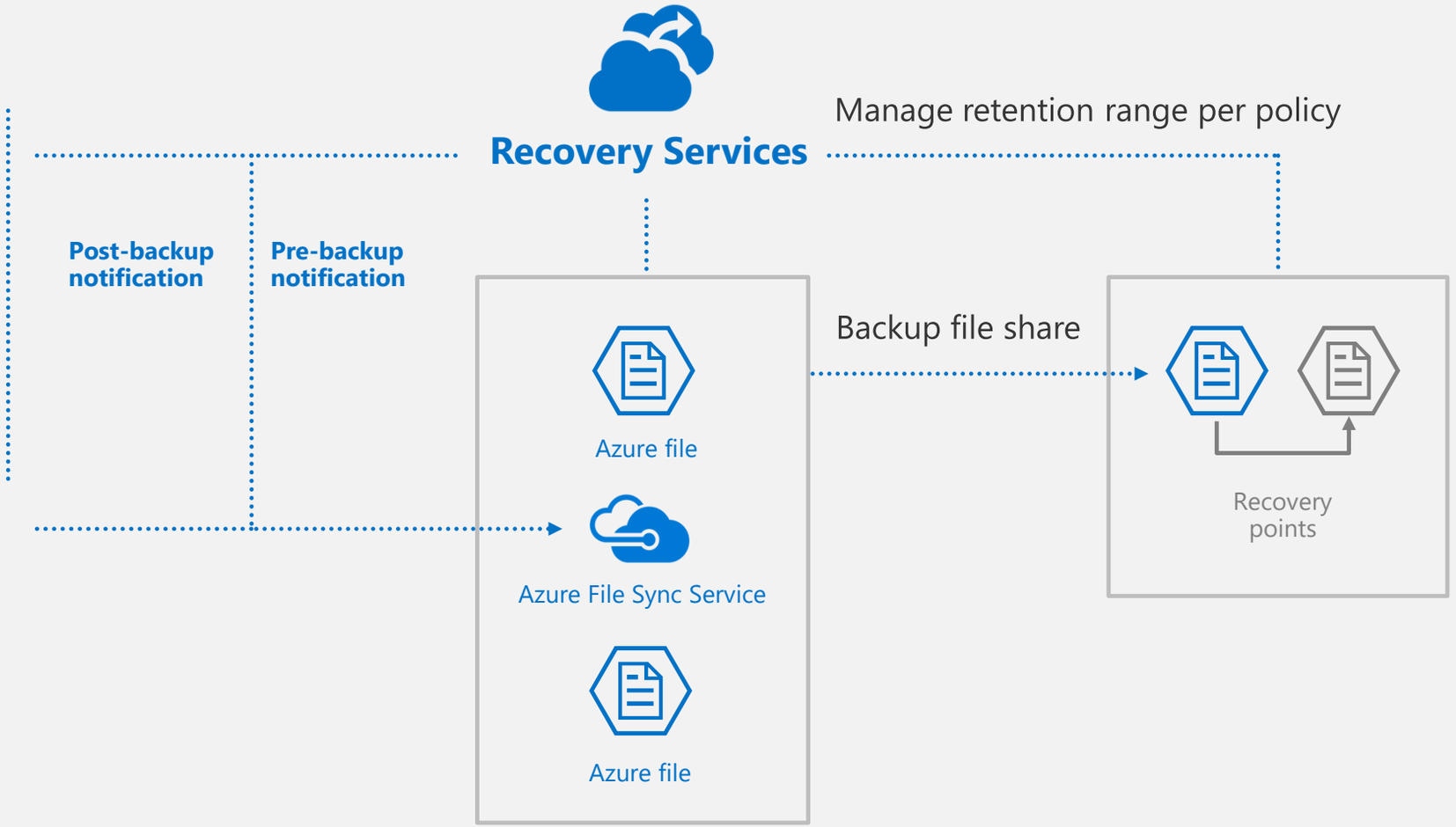


Scale-out
Across Customers

Azure Backup

Protecting files synced by Azure File Sync

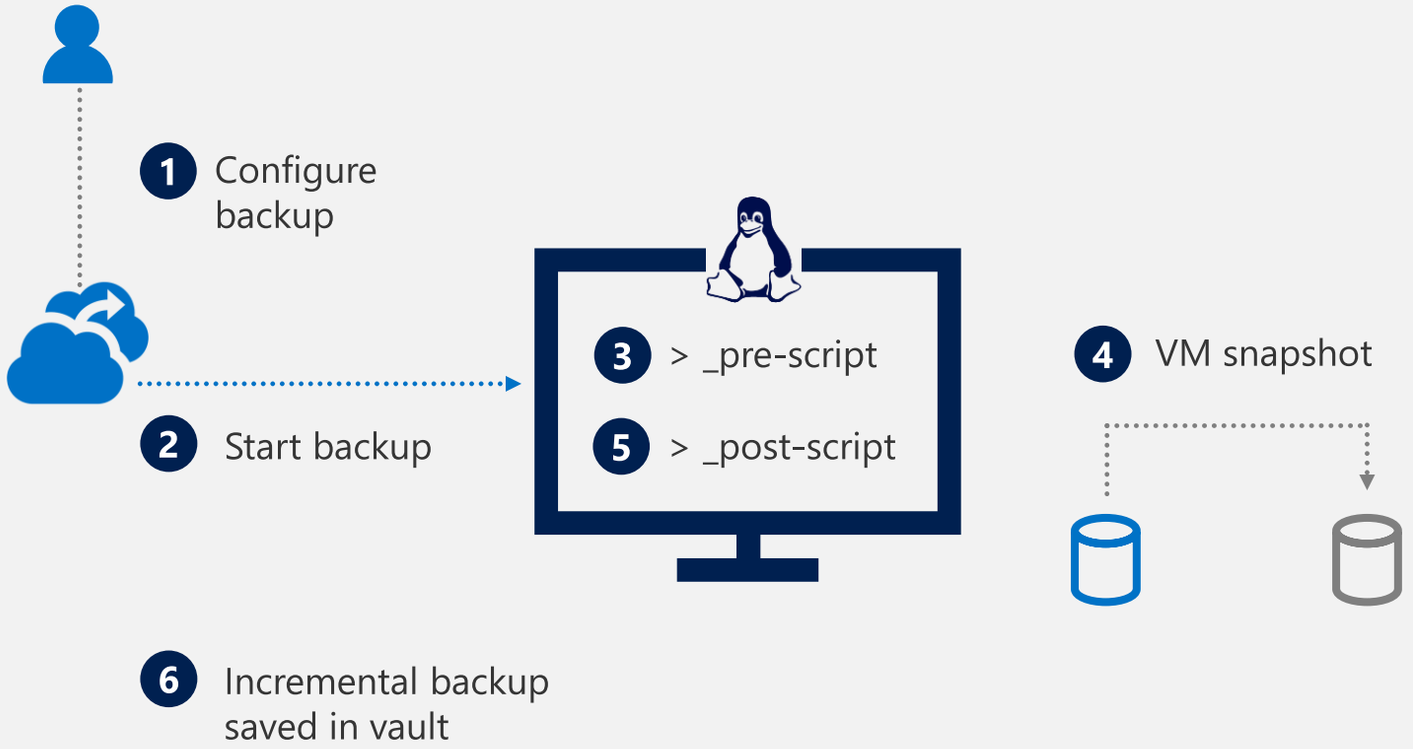
- **Policy driven**
- **Sync aware backup**
- **File level restore**



Azure Backup

Linux application-consistent backup

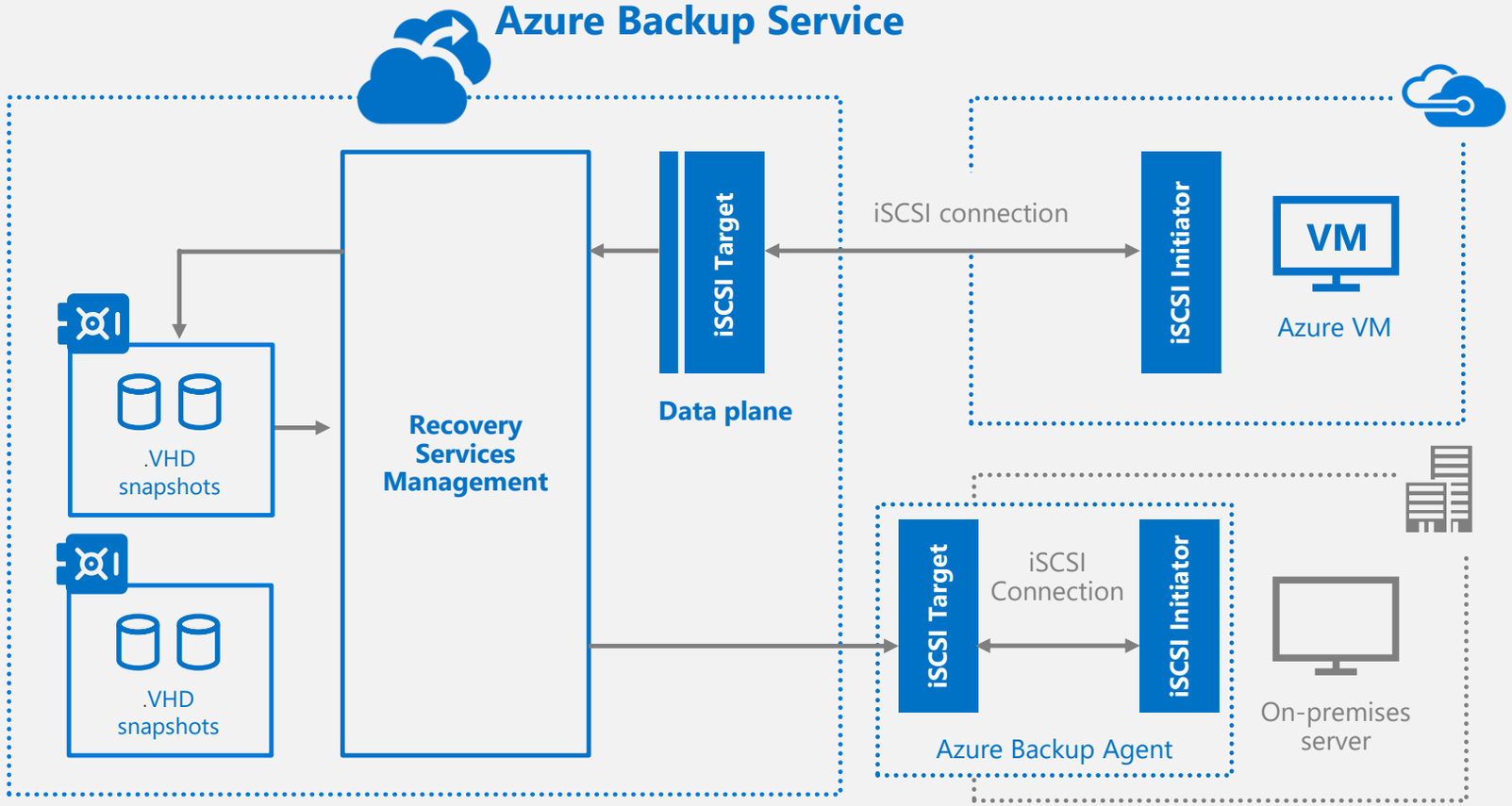
- **Open support platform**
- **Back up any Linux app**
- **Application consistency**



Azure Backup

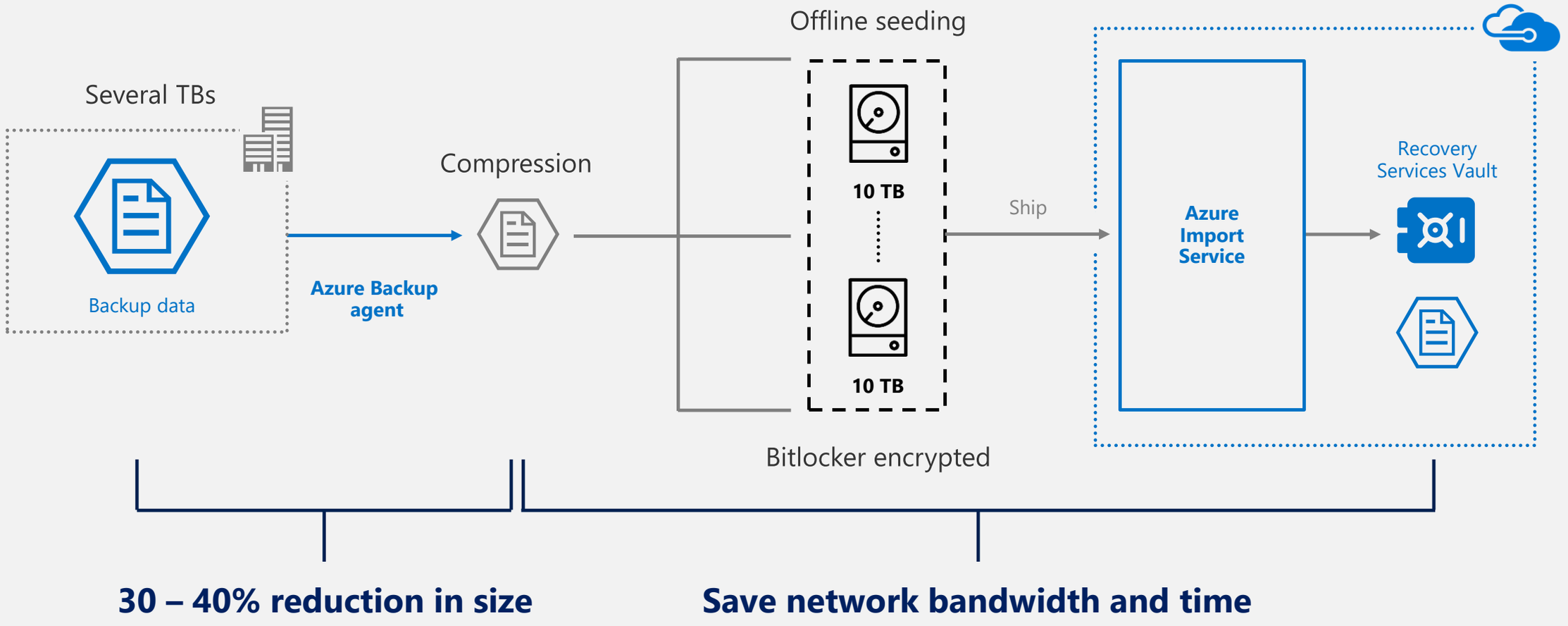
Restore-as-a-Service

- **No infrastructure**
- **Inspect before restore**
- **Consistent**



Azure Backup

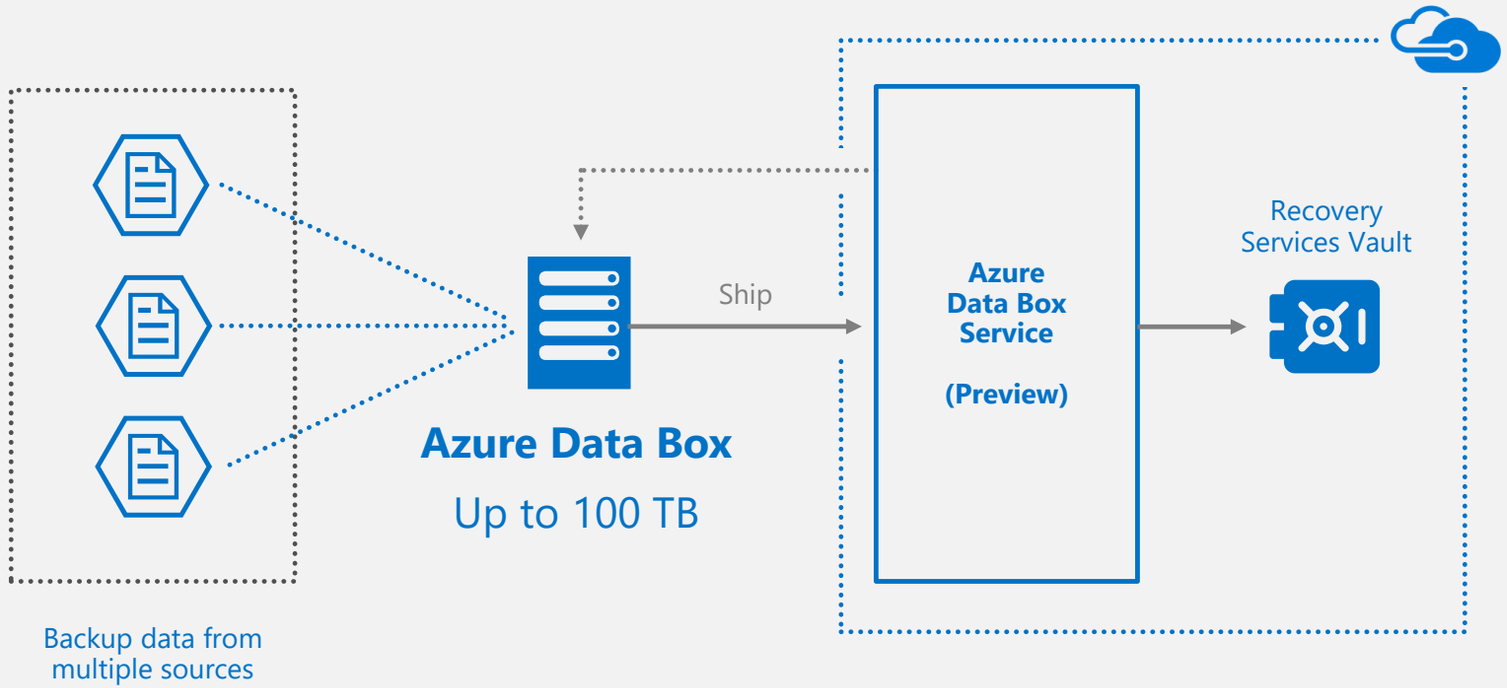
Sending (large) data efficiently



Azure Backup

Send >100 TB with DataBox

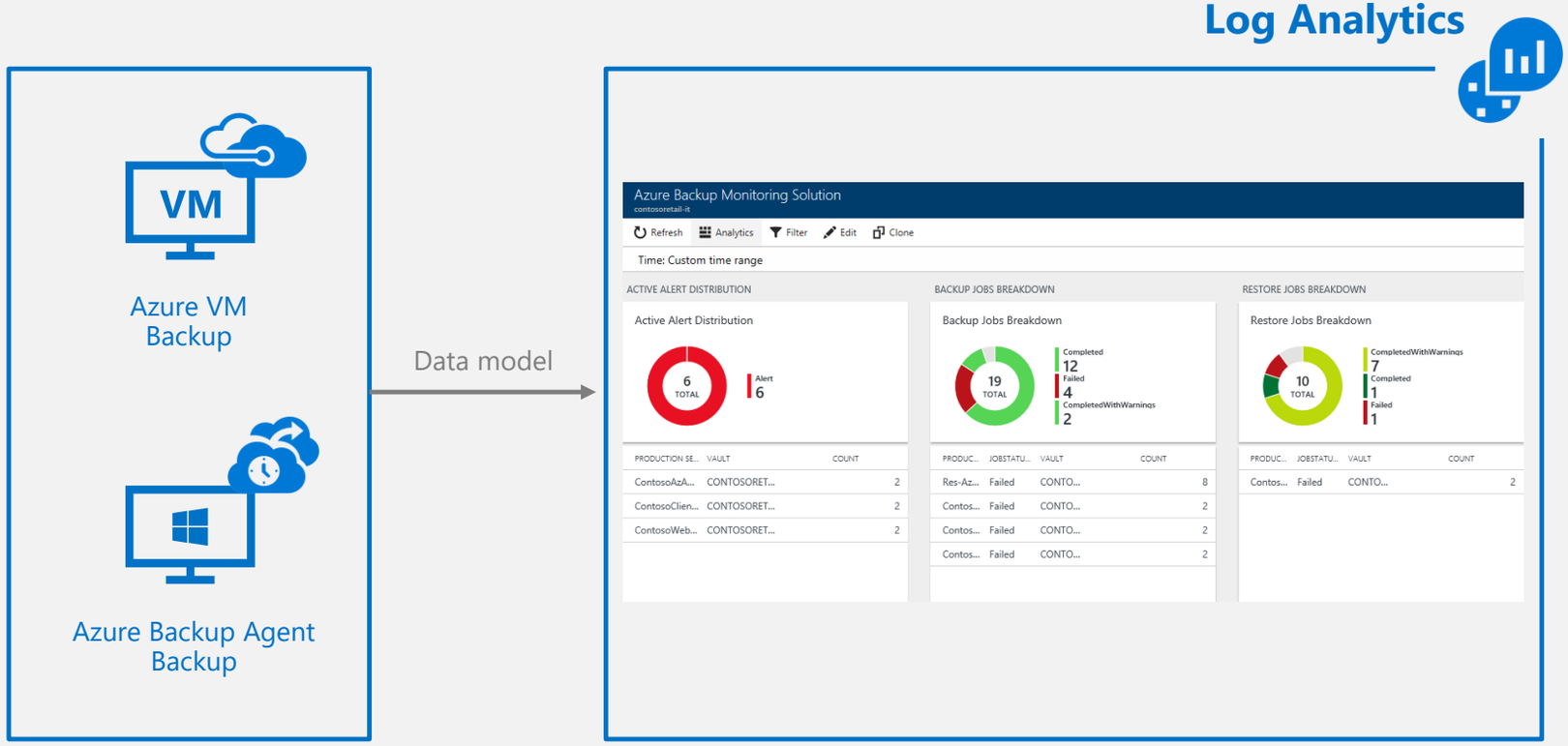
- **No procuring of disks**
- **Parallel transfers**
- **Safe and secure**



Azure Backup

Azure Backup monitoring with Azure Log Analytics

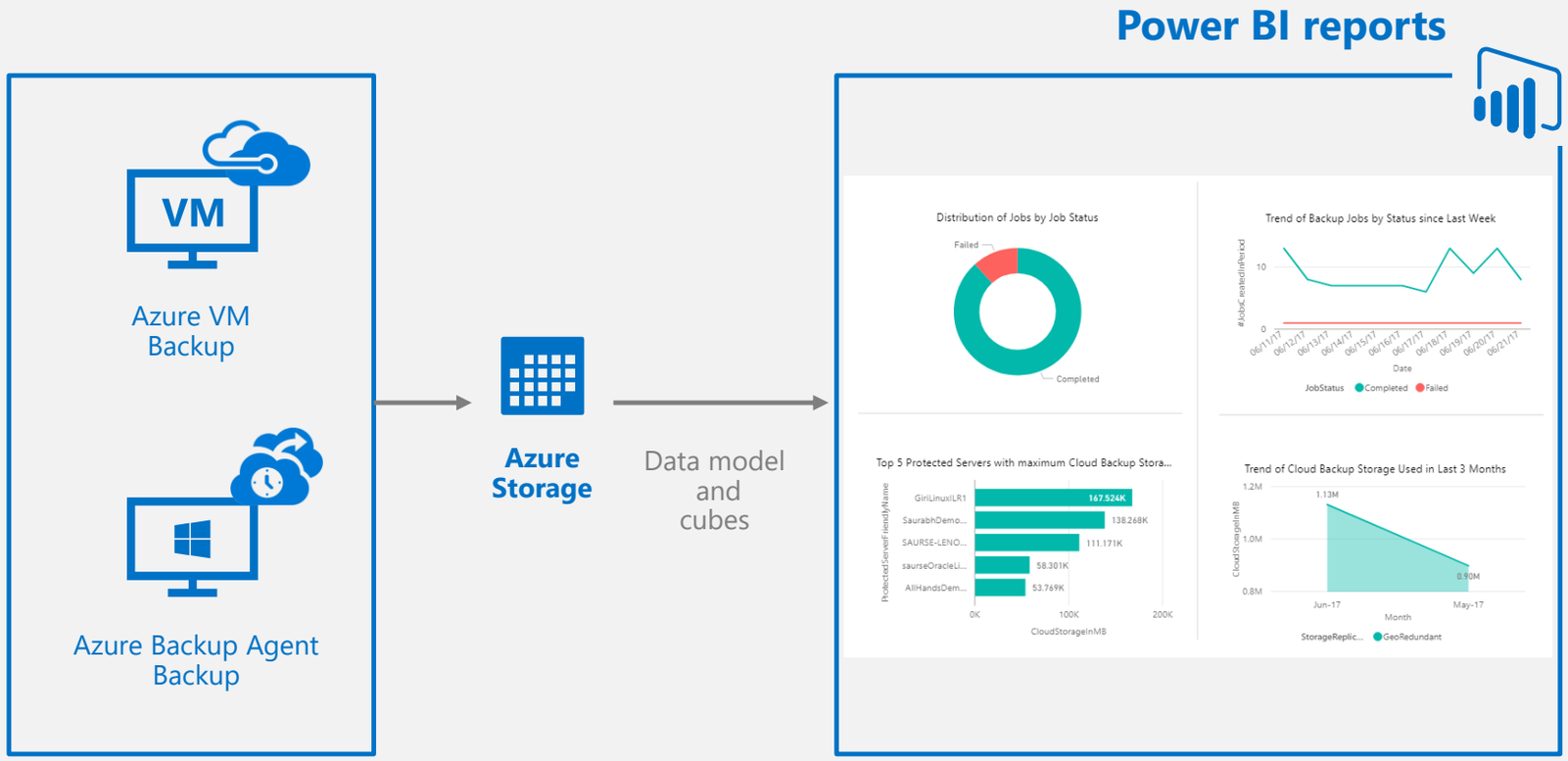
- **No infrastructure**
- **Enterprise wide**
- **Custom queries (KQL)**
- **ITSM integration**



Azure Backup

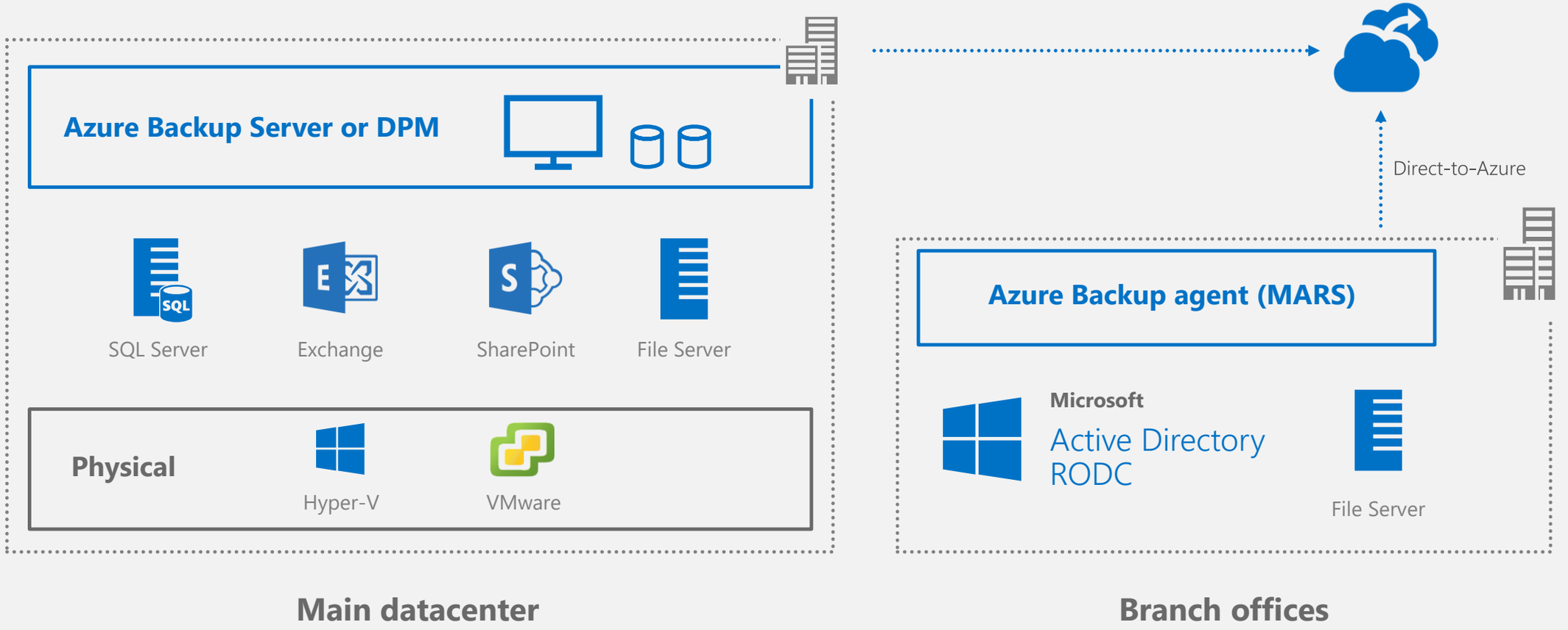
Azure Backup reports with PowerBI

- **No infrastructure**
- **Enterprise wide**
- **Custom reports**
- **Access control**



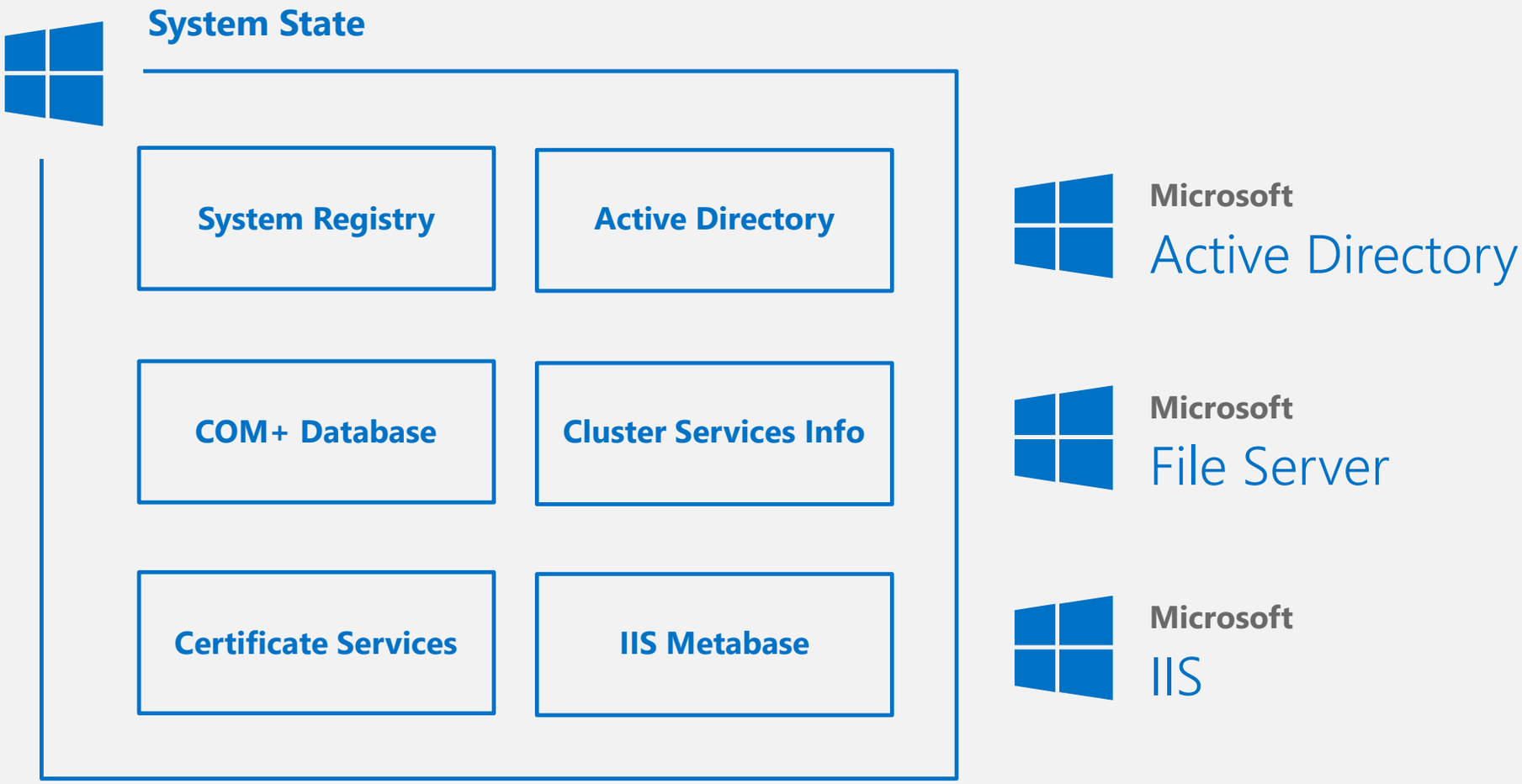
Azure Backup

Hybrid deployment models



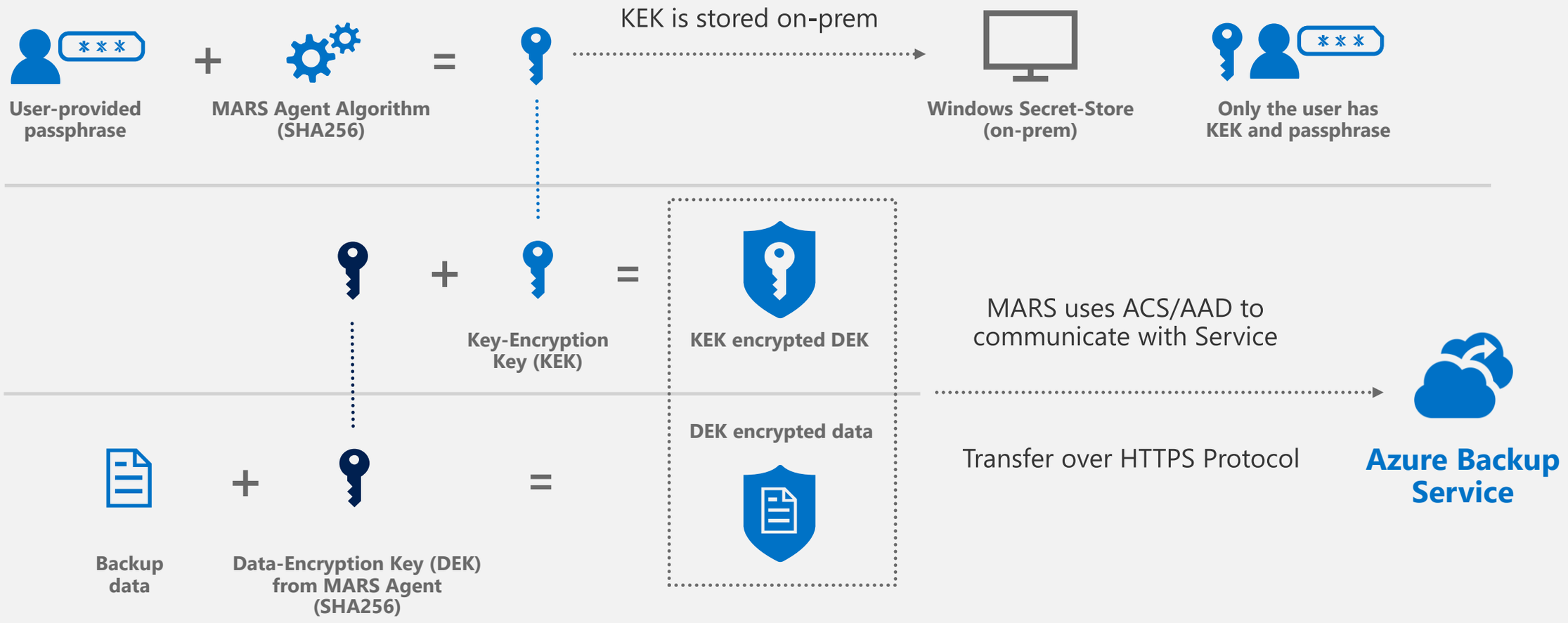
Azure Backup

Windows Server System State - components



Azure Backup

Hybrid backup encryption

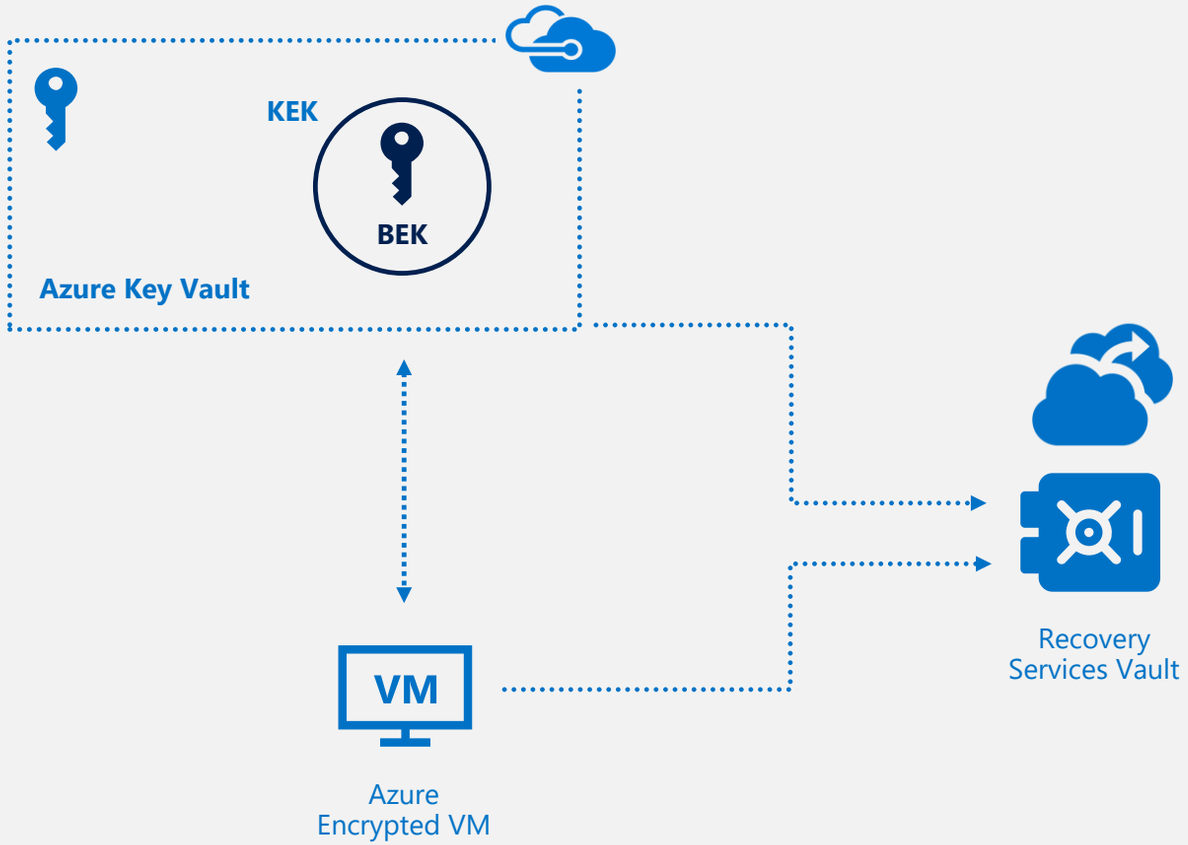


*All assets are AES256 Encrypted

Azure Backup

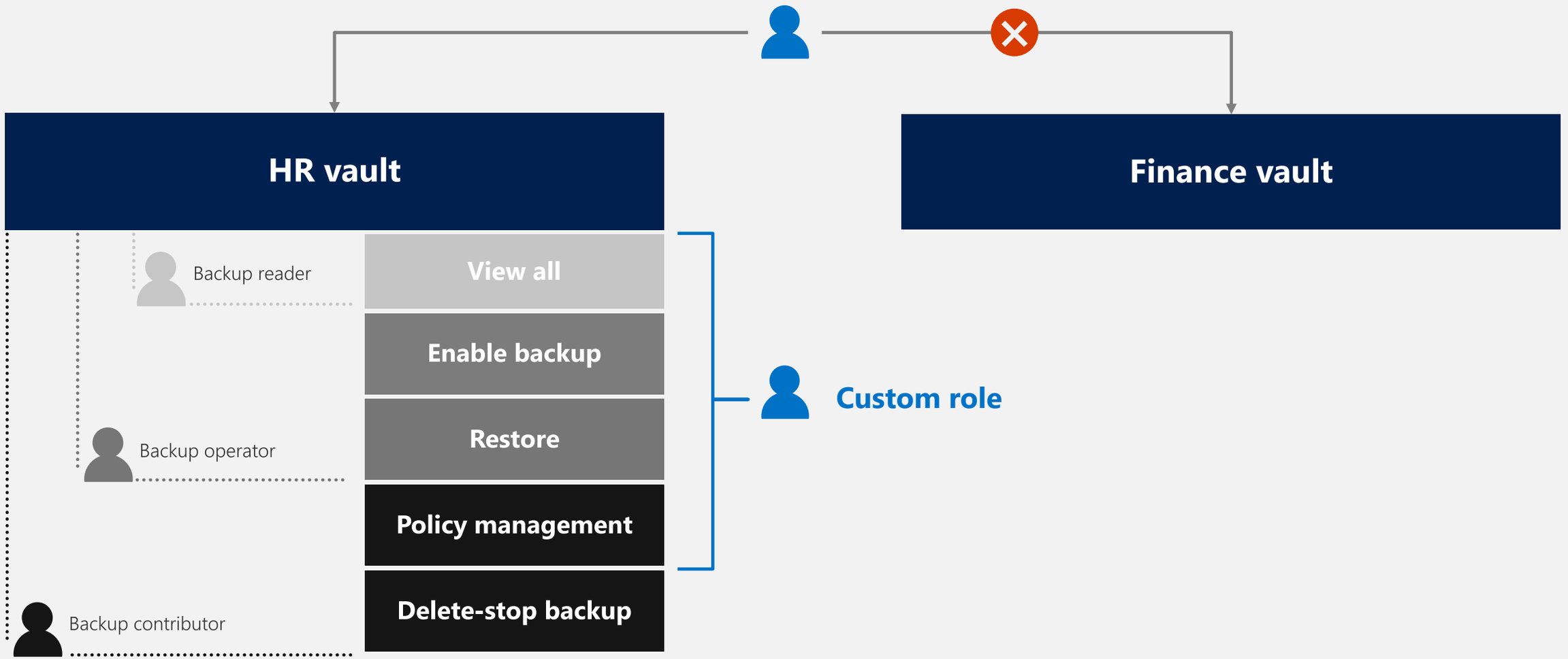
Azure virtual machine disk encryption

- **Intelligent restores**
- **Simplified experience**



Azure Backup

Isolation and access control



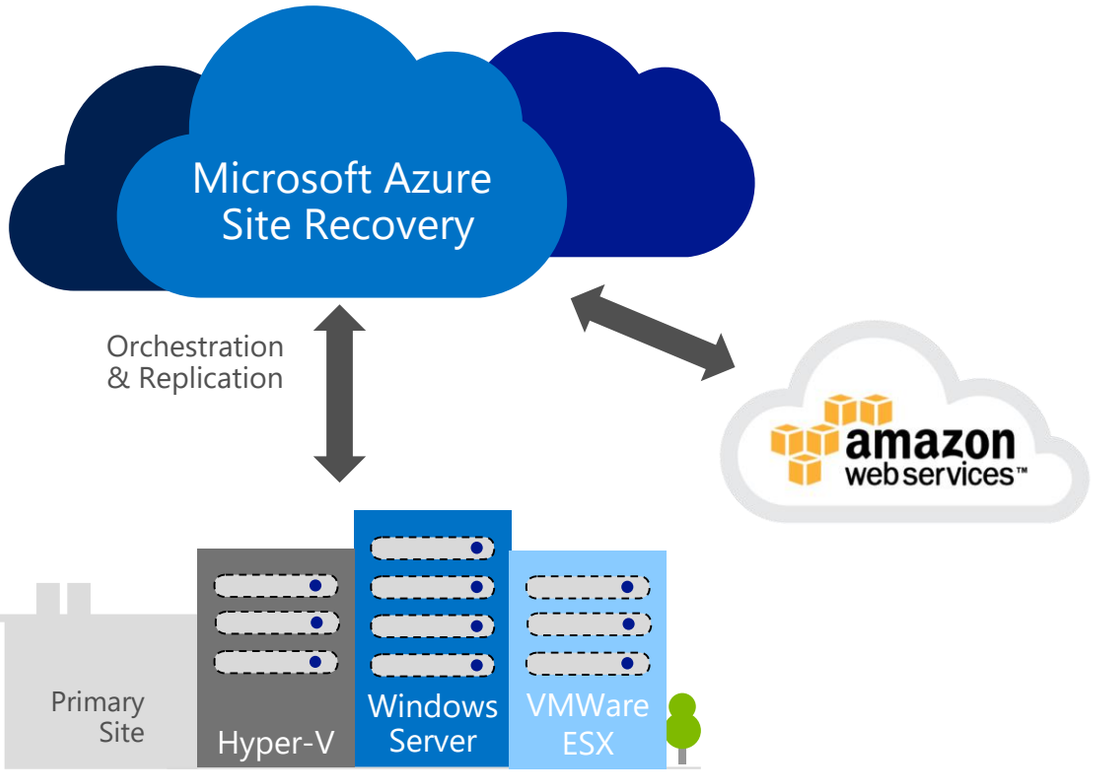
Microsoft Azure

Azure Site Recovery

Azure Site Recovery

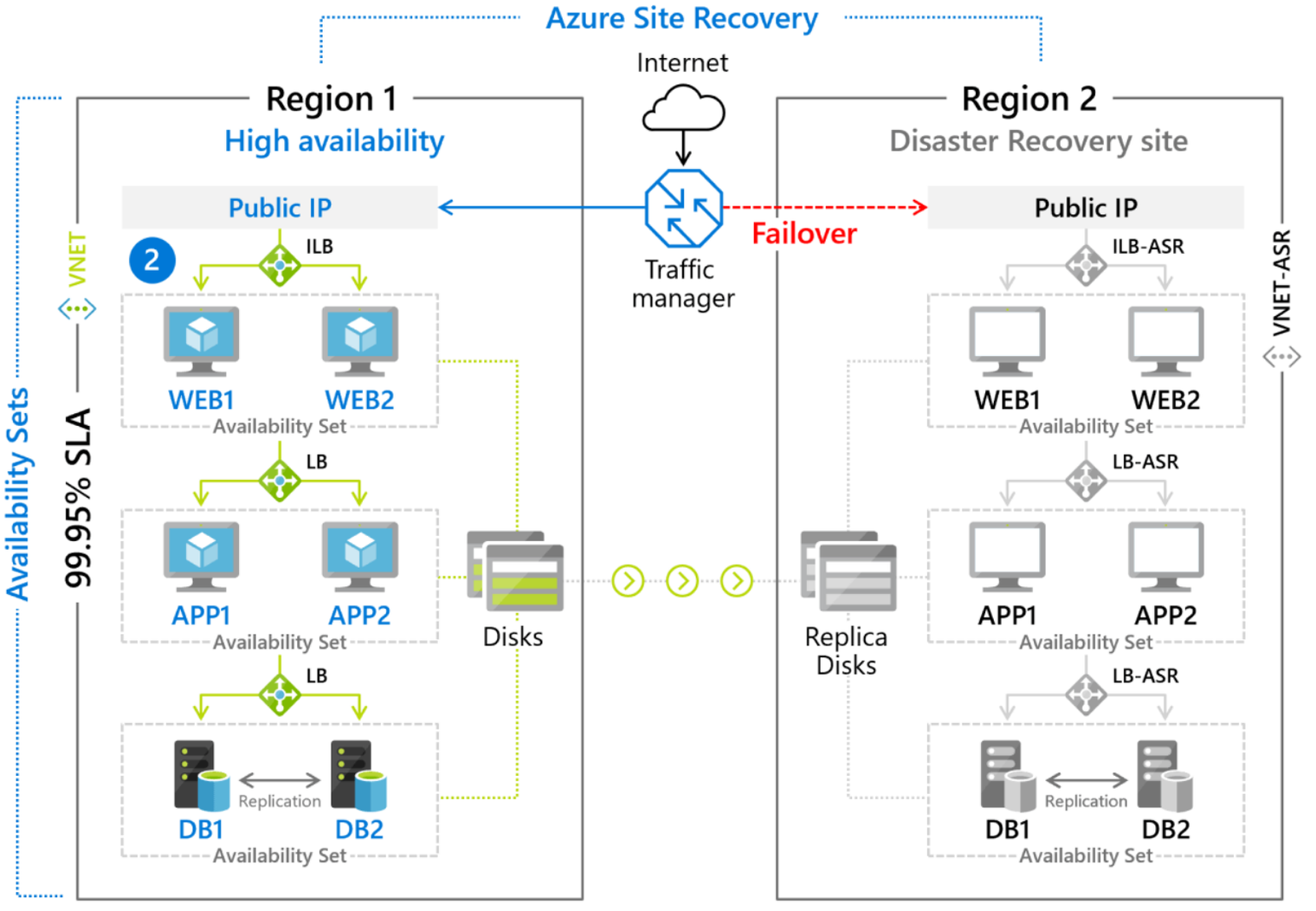
- Use Azure as your DR site
- Near-zero data loss
- Automated VM protection & replication
- Customizable recovery plans
- Remote health monitoring
- No-impact recovery plan testing
- Orchestrated recovery of tiered applications
- RTO and RPO Targets
- Application Failover Consistency

On-premises to Microsoft Azure protection



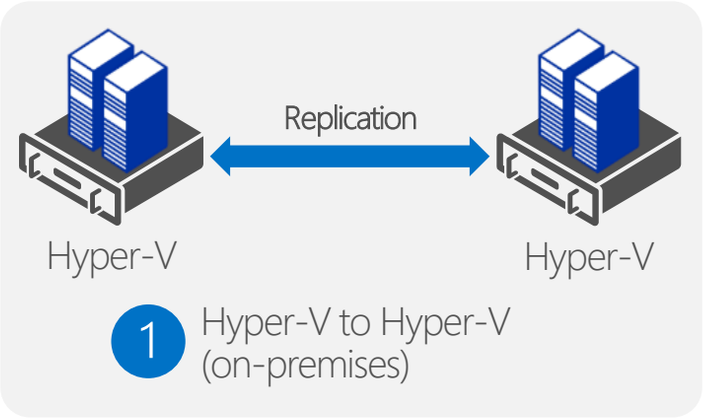
Azure Site Recovery

Regional Disaster Recovery

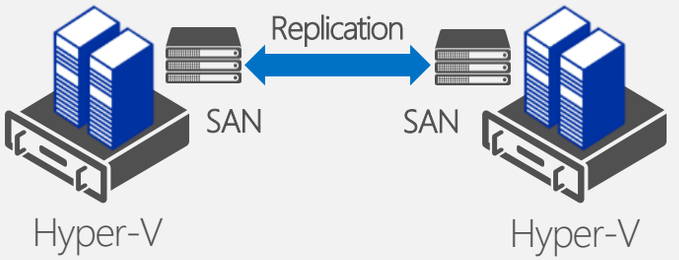


Azure Site Recovery

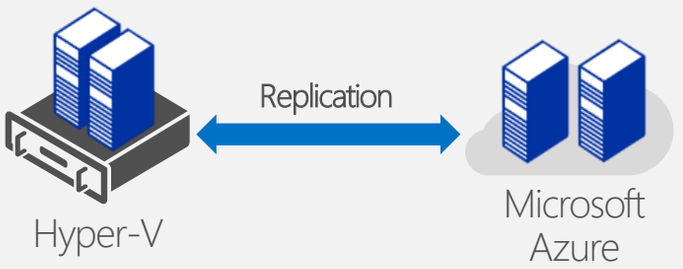
One solution for multiple infrastructures



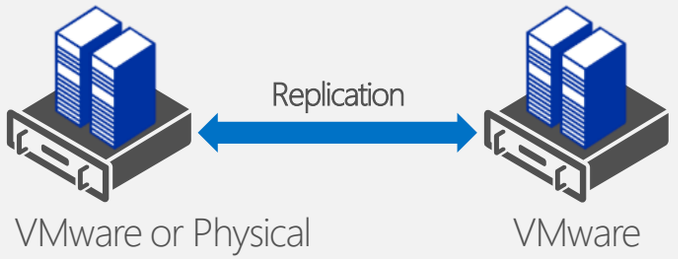
1 Hyper-V to Hyper-V (on-premises)



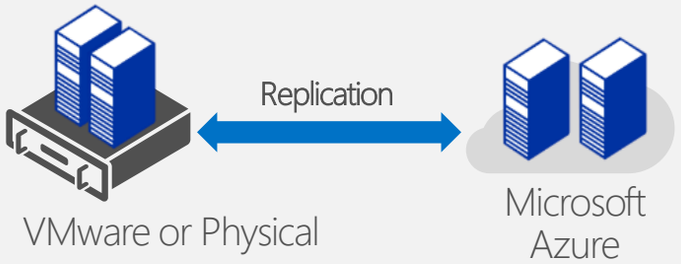
2 Hyper-V to Hyper-V (on-premises)



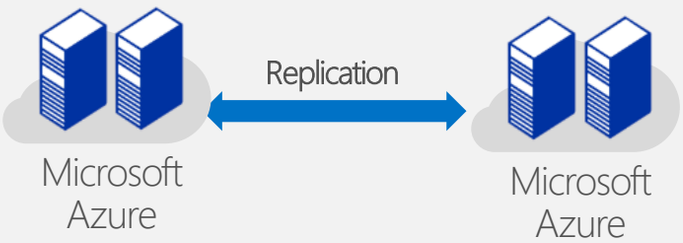
3 Hyper-V to Microsoft Azure



4 VMware or Physical to VMware (on-premises)



5 VMware or Physical to Microsoft Azure



6 Microsoft Azure to Microsoft Azure

Protect important applications by coordinating the replication and recovery of private clouds across sites.
Protect your applications to your own second site, a hoster's site, or even use Microsoft Azure as your disaster recovery site.

Azure Site Recovery

Application DR Scenarios

App-agnostic, providing replication for any workloads running on a supported machine

Near-synchronous replication, with RPOs as low as 30 seconds

App-consistent snapshots, for single or multi-tier applications

Integration with SQL Server AlwaysOn, and AD replication, SQL AlwaysOn, Exchange Database Availability Groups (DAGs)

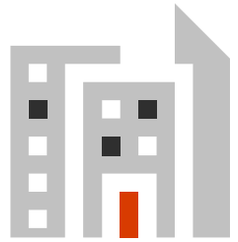
Flexible recovery plans, recover an entire application stack with a single click and include external scripts and manual actions in the plan

Advanced network management in Site Recovery and Azure to simplify app network requirements, including the ability to reserve IP addresses, configure load-balancing, and integration with Azure Traffic Manager, for low RTO network switchovers.

Workload	Replicate Azure VMs to Azure	Replicate Hyper-V VMs to a secondary site	Replicate Hyper-V VMs to Azure	Replicate VMware VMs to a secondary site	Replicate VMware VMs to Azure
Active Directory, DNS	Y	Y	Y	Y	Y
Web apps (IIS, SQL)	Y	Y	Y	Y	Y
System Center Operations Manager	Y	Y	Y	Y	Y
SharePoint	Y	Y	Y	Y	Y
SAP Replicate SAP site to Azure for non-cluster	Y (tested by Microsoft)	Y (tested by Microsoft)	Y (tested by Microsoft)	Y (tested by Microsoft)	Y (tested by Microsoft)
Exchange (non-DAG)	Y	Y	Y	Y	Y
Remote Desktop/VDI	Y	Y	Y	Y	Y
Linux (operating system and apps)	Y (tested by Microsoft)	Y (tested by Microsoft)	Y (tested by Microsoft)	Y (tested by Microsoft)	Y (tested by Microsoft)
Dynamics AX	Y	Y	Y	Y	Y
Windows File Server	Y	Y	Y	Y	Y
Citrix XenApp and XenDesktop	Y	N/A	Y	N/A	Y

Azure Site Recovery

Migrate to Azure



On-premises

redhat CentOS ubuntu

SUSE ORACLE debian

Windows

Azure Site Recovery (ASR)

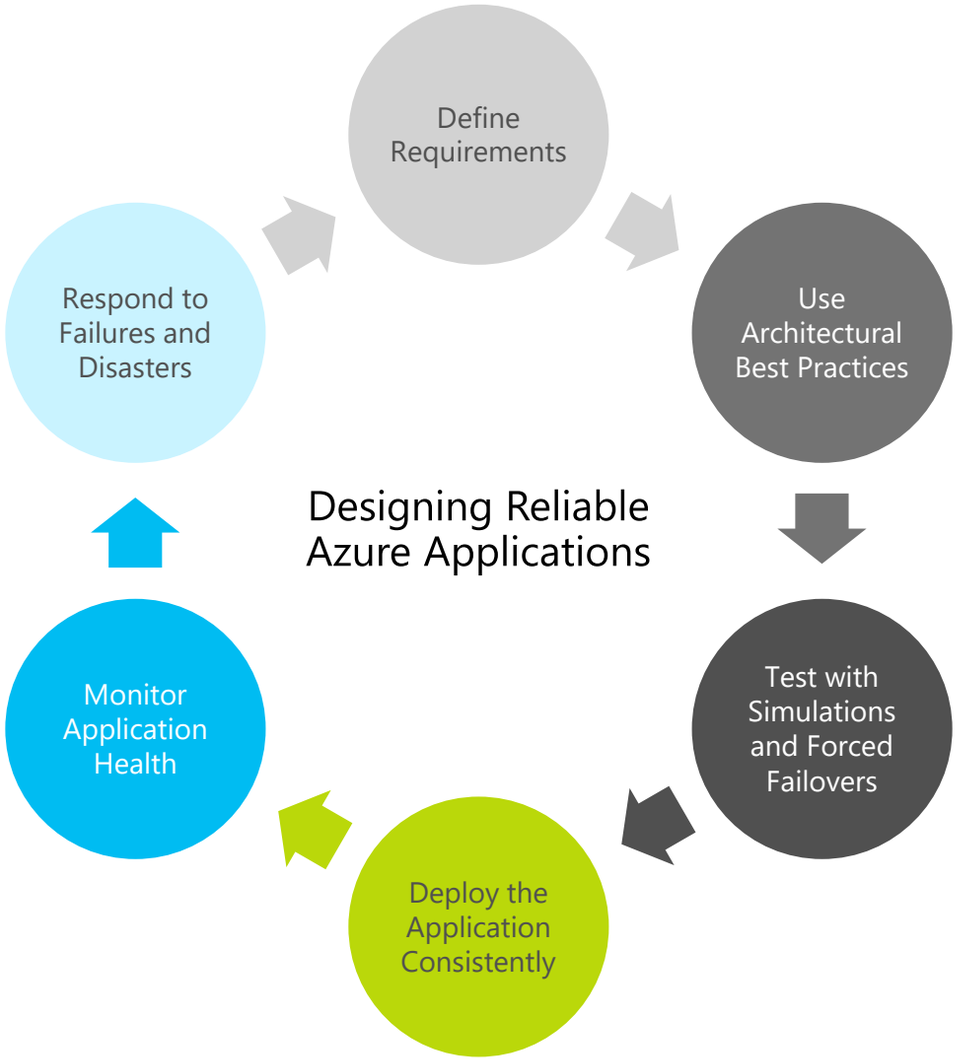
Set up source & target environments
Set up replication policy
Begin replication
Run test migration
Failover to Azure

Azure

Microsoft Azure

Application Deployment Best Practices

Build for Reliability



Define Requirements: Identify your business needs, and build your reliability plan to address them

Use Architectural Best Practices: Focus on implementing practices that meet your business requirements, identify failure points, and minimize the scope of failures

Test: Testing for reliability requires measuring how the end-to-end workload performs under failure conditions that **occur intermittently**

Deploy Consistently: After an application is deployed to production, updates are a possible source of errors. Minimize errors with predictable and repeatable deployment processes

Monitor: Implement best practices for monitoring and alerts in your application so you can detect failures

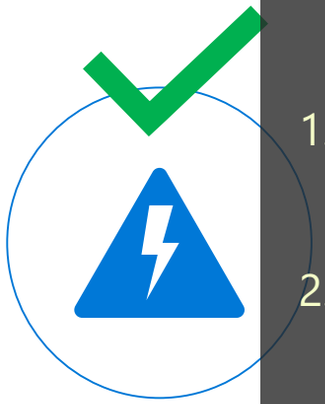
Respond: Create a recovery plan and perform recovery exercises

BCDR by the Numbers

Sept 2018 - South Central Region Outage

36%

IT Failure



19%

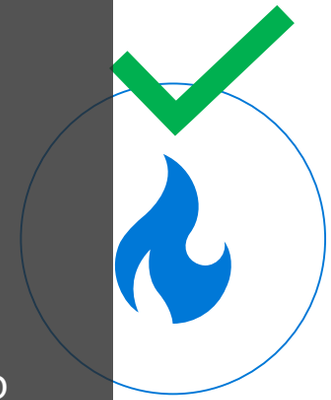
Power Failure

16%

Flood

13%

Cyber Attack



10%

Natural Disaster

6%

Human Error

The Perfect Storm

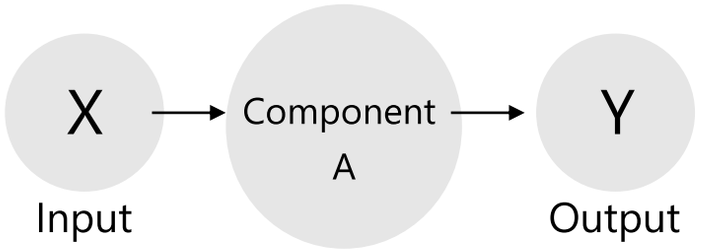
1. High-Energy Storms in Texas
   Lightning causes power swells
2. Utility Power becomes Unstable
   and causes Azure datacenters to transfer to generators. Heat rises to critical levels
3. Systems Engineers Manually Invoke Cooling Failover
   Automatic failovers are interrupted and heat continues to rise
4. Systems Fail Due to Heat
   Heat leads to shutdown of equipment. Some is damaged prior to shutdown.

Forrester/Disaster Recovery Journal Spring 2017
The State of Disaster Recovery Preparedness

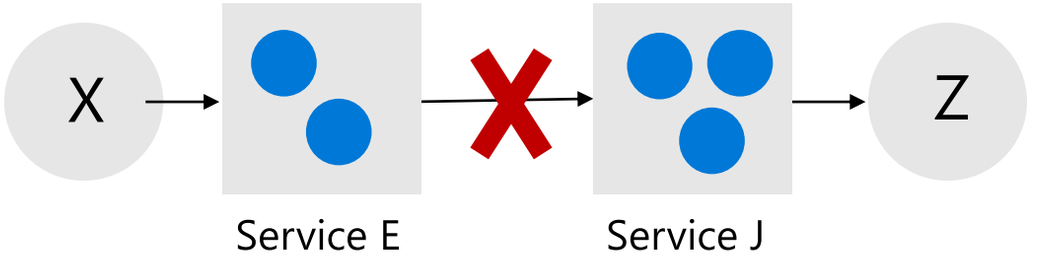
Chaos Engineering

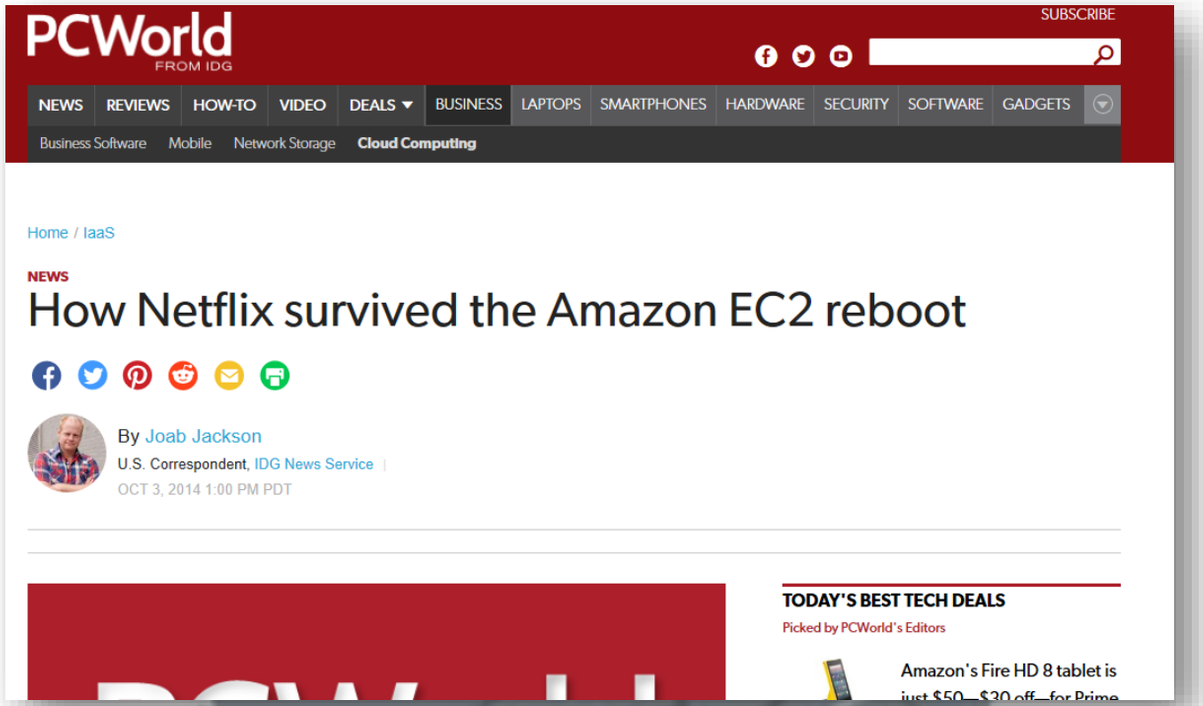
Testing for the Unknown

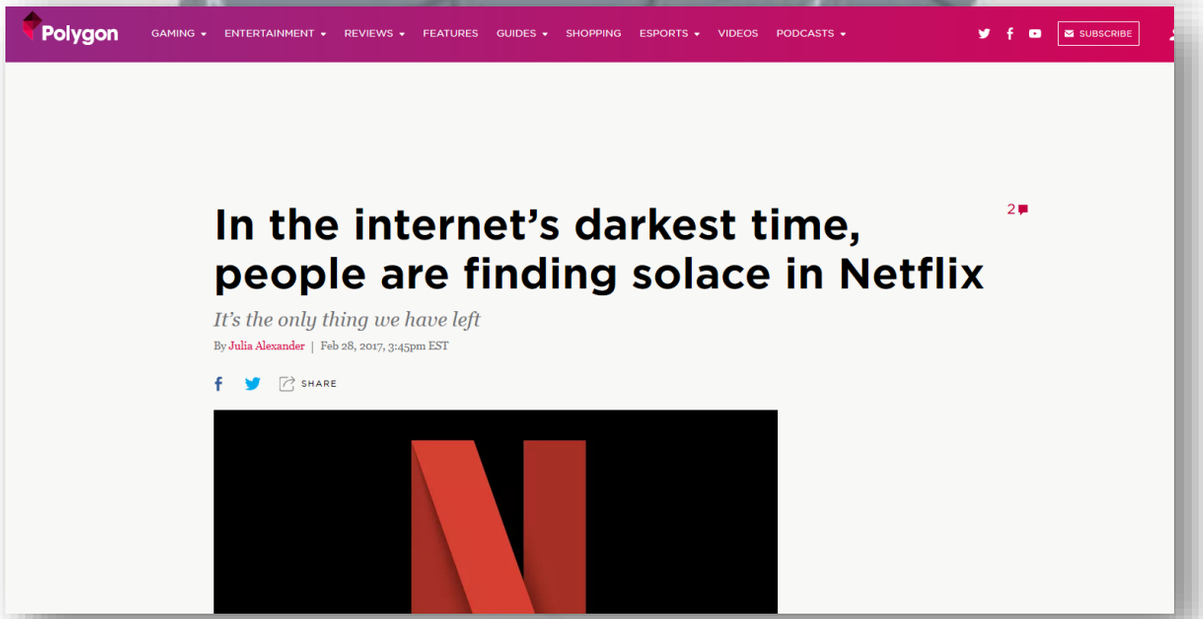
Unit Test



Integration Test







Designing resilient applications in Azure

Best practices in designing resilient Azure applications

Method of designing a resilient application
https://docs.microsoft.com/en-us/azure/architecture/resiliency

Constructing a high available application in Azure
https://docs.microsoft.com/en-us/azure/architecture/resiliency/high-availability-azure-applications

Backup and archive your application
https://azure.microsoft.com/en-us/solutions/architecture/backup-archive-cloud-application/

Architecture of designing disaster recovery
https://azure.microsoft.com/en-us/solutions/architecture/disaster-recovery-smb-azure-site-recovery/

Best practices in creating SAP/HANA with high availability and disaster recovery in place
https://azure.microsoft.com/en-us/solutions/architecture/sap-s4-hana-on-hli-with-ha-and-dr/

Microsoft Azure

Partner Solution Offerings

Azure Backup

Partner opportunities

Deployment scenarios

Assessment and design

Compliance assessment

Design of Backup Infra for Private/Hybrid/Azure workloads

Long term retention to Cloud

Azure Backup Proof Of Concepts

Migration

3rd Party to Azure Backup Migration

Managed services

Managing backup for LoB Apps

Manage LoB Hybrid & Azure environments

Configure and monitor backups

Recover on demand

Backup-as-a-service

Azure Backup Consumption & Monitoring

SLA based backup and recovery experience

Packaged IP

Management IP

Pre-configured custom dashboards (PowerBI)

Automated backups, monitoring, alerting and logging

Workload backup and restore

Application-consistent backups for custom workloads

Pre and post scripts for Linux workloads

Azure Site Recovery

Partner opportunities

CSP support

All ASR scenarios now support ARM and CSP model

Partner owns customer relationship and billing

Partner offers value added services

Model each customer to a subscription and a vault

API support

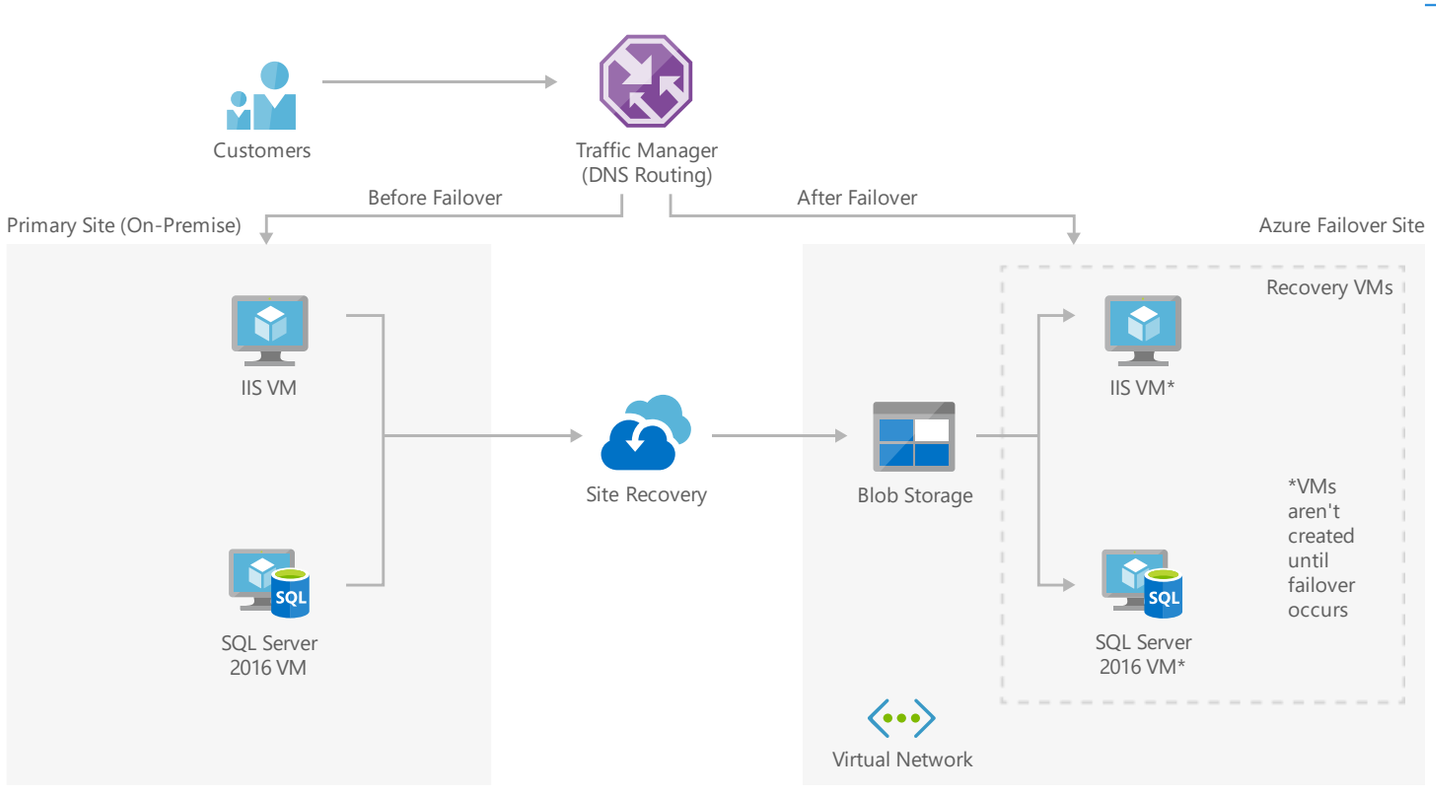
Automation through PowerShell and Rest APIs

Azure Stack support

Restore configuration and service data using the Infrastructure Backup Service

Azure Solution Architecture

SMB disaster recovery with Azure Site Recovery



https://azure.microsoft.com/en-us/solutions/architecture/

Traffic Manager

DNS traffic is routed via Traffic Manager which can easily move traffic from one site to another based on policies defined by your organization

Azure Site Recovery

orchestrates the replication of machines and manages the configuration of the failback procedures

Virtual Networks

The virtual network is where the failover site will be created when a disaster occurs

Blob Storage

Blob storage stores the replica images of all machines that are protected by Site Recovery