Architecting Microsoft Azure Solutions
Operations

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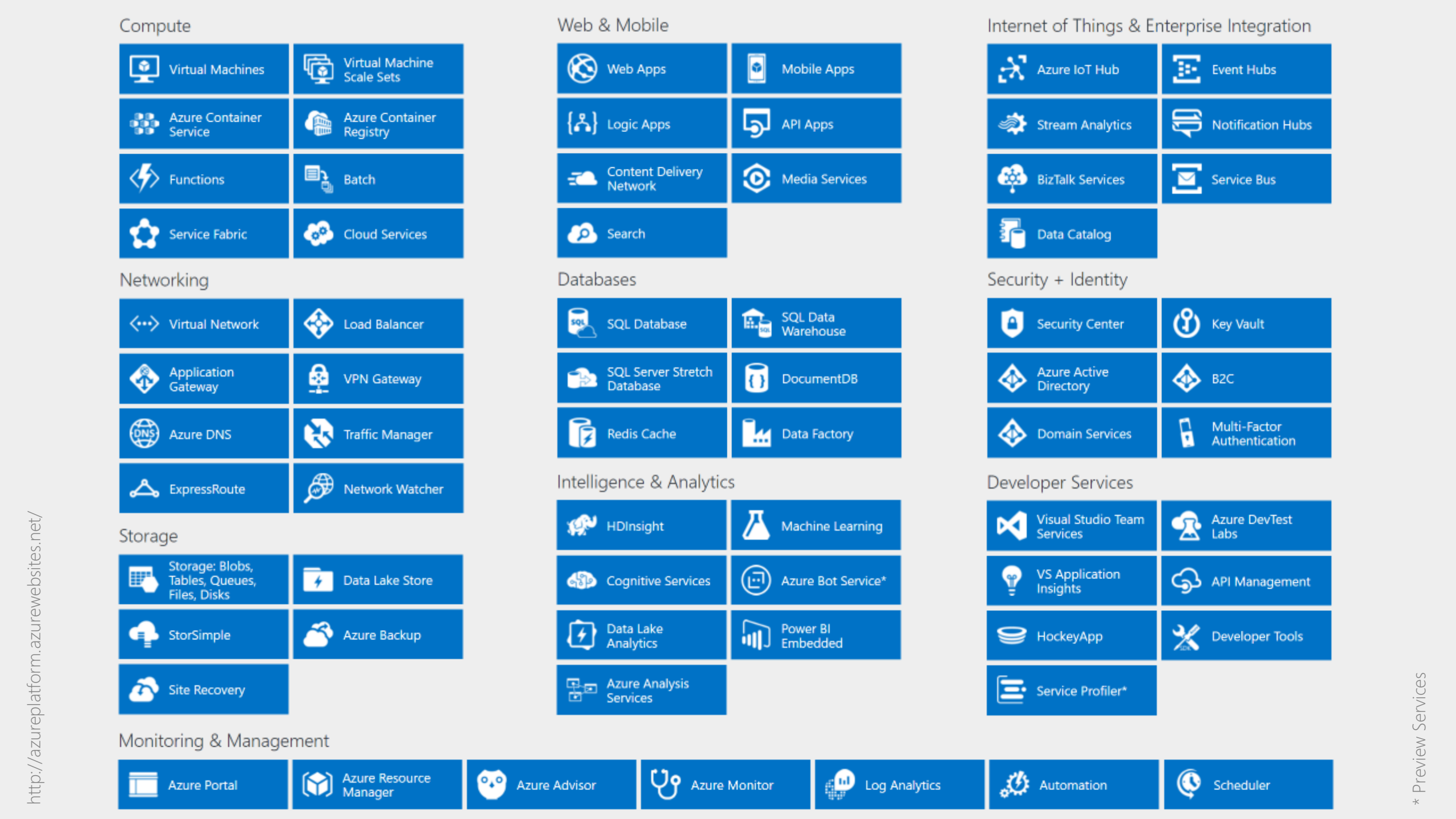
Microsoft

Design for Operations (10-15%)

- Design an application monitoring and alerting strategy
  - Determine the appropriate Microsoft products and services for monitoring applications on Azure; define solutions for analyzing logs and enabling alerts using Azure Log Analytics; define solutions for analyzing performance metrics and enabling alerts using Azure Monitor; define a solution for monitoring applications and enabling alerts using Application Insights
- Design a platform monitoring and alerting strategy
  - Determine the appropriate Microsoft products and services for monitoring Azure platform solutions; define a monitoring solution using Azure Health, Azure Advisor, and Activity Log; define a monitoring solution for Azure Networks using Log Analytics and Network Watcher service; monitor security with Azure Security Center
- Design an operations automation strategy
  - Determine when to use Azure Automation, Chef, Puppet, PowerShell, Desired State Configuration (DSC), Event Grid, and Azure Logic Apps; define a strategy for auto-scaling; define a strategy for enabling periodic processes and tasks


Compute
Virtual Machines
Virtual Machine Scale Sets
Azure Container Service
Azure Container Registry
Functions
Batch
Service Fabric
Cloud Services
Networking
Virtual Network
Load Balancer
Application Gateway
VPN Gateway
Azure DNS
Traffic Manager
ExpressRoute
Network Watcher
Storage
Storage: Blobs, Tables, Queues, Files, Disks
Data Lake Store
StorSimple
Azure Backup
Site Recovery
Web & Mobile
Web Apps
Mobile Apps
Logic Apps
API Apps
Content Delivery Network
Media Services
Search
Databases
SQL Database
SQL Data Warehouse
SQL Server Stretch Database
DocumentDB
Redis Cache
Data Factory
Intelligence & Analytics
HDInsight
Machine Learning
Cognitive Services
Azure Bot Service*
Data Lake Analytics
Power BI Embedded
Azure Analysis Services
Internet of Things & Enterprise Integration
Azure IoT Hub
Event Hubs
Stream Analytics
Notification Hubs
BizTalk Services
Service Bus
Data Catalog
Security + Identity
Security Center
Key Vault
Azure Active Directory
B2C
Domain Services
Multi-Factor Authentication
Developer Services
Visual Studio Team Services
Azure DevTest Labs
VS Application Insights
API Management
HockeyApp
Developer Tools
Service Profiler*
Monitoring & Management
Azure Portal
Azure Resource Manager
Azure Advisor
Azure Monitor
Log Analytics
Automation
Scheduler
http://azureplatform.azurewebsites.net/
* Preview Services

Azure is a cloud partnership

Your Organization

Balance of responsibility
Cloud architectures
Design for high-availability
Leverage Microsoft resources

MICROSOFT RESOURCES

Service resiliency guide
Cloud dev patterns & practices
Proactive and reactive support

CLOUD PLATFORM RELIABILITY

Availability, change orchestration, monitoring, communications, recommendations

Monitoring and Alerting

Azure Monitor

Native monitoring and diagnostics for all your Azure resources

Monitor, diagnose, alert, and be notified of events in your cloud infrastructure

https://aka.ms/azmonitor/

Azure Advisor

Personalized recommendation guide helping you follow best practices

Optimize across four areas - high availability, performance, security, and cost

http://aka.ms/azureadvisor/

Azure Resource Health

Diagnose and get support when an Azure issue impacts your resources

Guides you through solutions to mitigate issues with Azure resources

http://aka.ms/azureresourcehealth/

Design an application monitoring and alerting strategy

Microsoft Azure

Microsoft

What does visibility mean to you?

Diagnose problems across my app, VMs, networks, and PaaS services

Show exec dashboards of application SLAs & KPIs

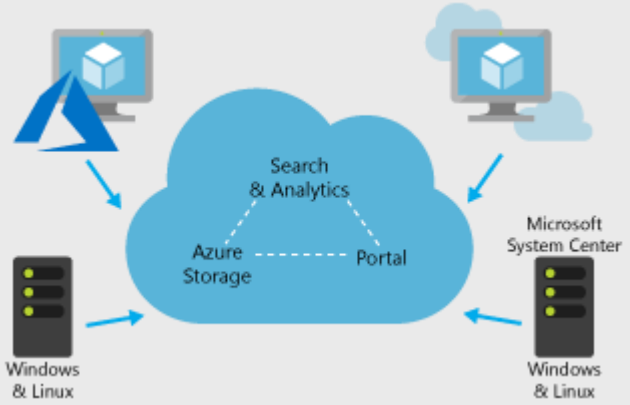
Understand & optimize performance of my app

Track usage, engagement & retention of my app

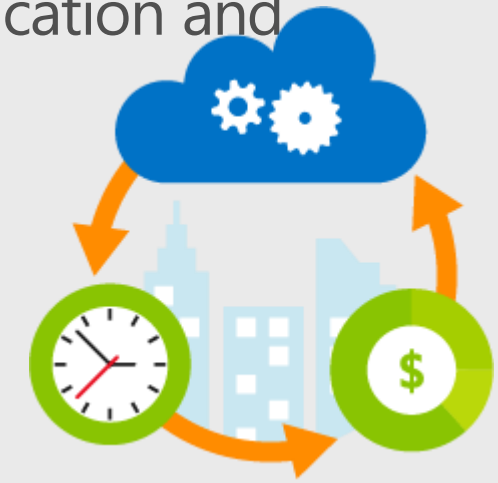
Detect & debug the errors in my apps

Is there is a security threat!!!!!

Log Analytics



- Collect and correlate data from multiple sources
- Collect and analyze Azure activity logs
- Customize dashboards to focus on what matters most to you
- Perform rich data exploration with interactive queries
- Use smart analytics powered by machine learning
- Turn insights into action with built-in notification and automation



Azure Monitor

- View and manage all your monitoring data easily
- Set up alerts and take automated actions
- Diagnose operational issues quickly
- Integrate with your existing tools

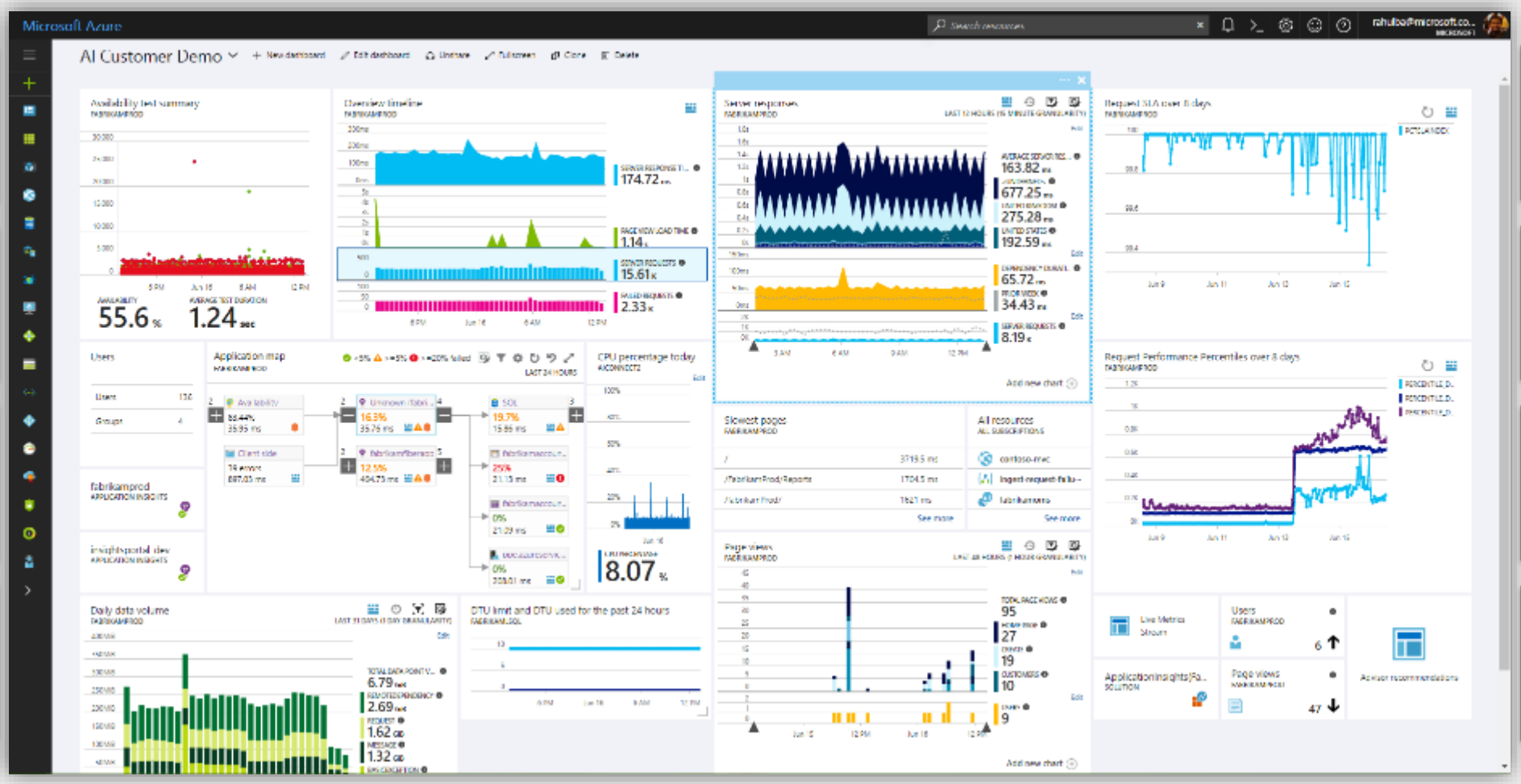
Azure Application Insights

Health Check

Monitor & Optimize

Detect & Debug

Data Analytics



Take Actions

Customer Insights

DevOps Workflows

Export & Correlate

Application Insights Ecosystem

Ingestion

Application Insights
Open Source SDKs
Status Monitor
Azure Extensions

SCOM MP

Open Schema

Exploration

Microsoft Azure Portal
Azure Monitor
Application Map
Live Metrics Stream
Profiler & Debugger

Visual Studio IDE

Analytics Portal

Export & Correlation

OMS Connector

Power BI

Microsoft Azure dashboards

Blob storage

Visual Studio Team Services

Data Access APIs

Support

ASP.NET	PHP	Azure Web Apps	Log4Net/NLog	Concrete
ASP.NET Core	Python	Azure Cloud Services	Log4J/Logback	Drupal
Java - J2EE	Ruby	Azure VMs	System.Diagnostics	Joomla
Windows Desktop	Angular	Azure Functions	Semantic Logging (SLAB)	SharePoint
WCF	Docker	Azure Service Fabric	ETW/EventSource	WordPress
JavaScript	Kubernetes	Glimpse	LogStash	Orchard
Node.JS	Dynamics CRM	Spring	Collectd	OSS/Public Endpoints ...

Design a platform monitoring and alerting strategy

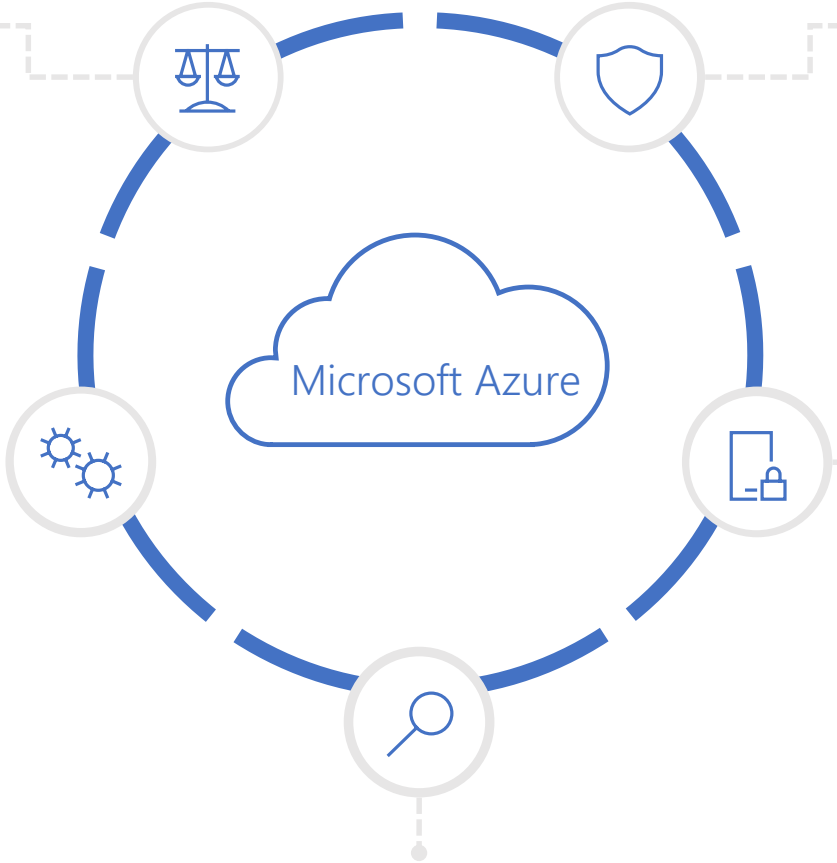
Microsoft Azure

Microsoft

Full set of cloud management capabilities

GOVERN
Policy Management
Cost Management

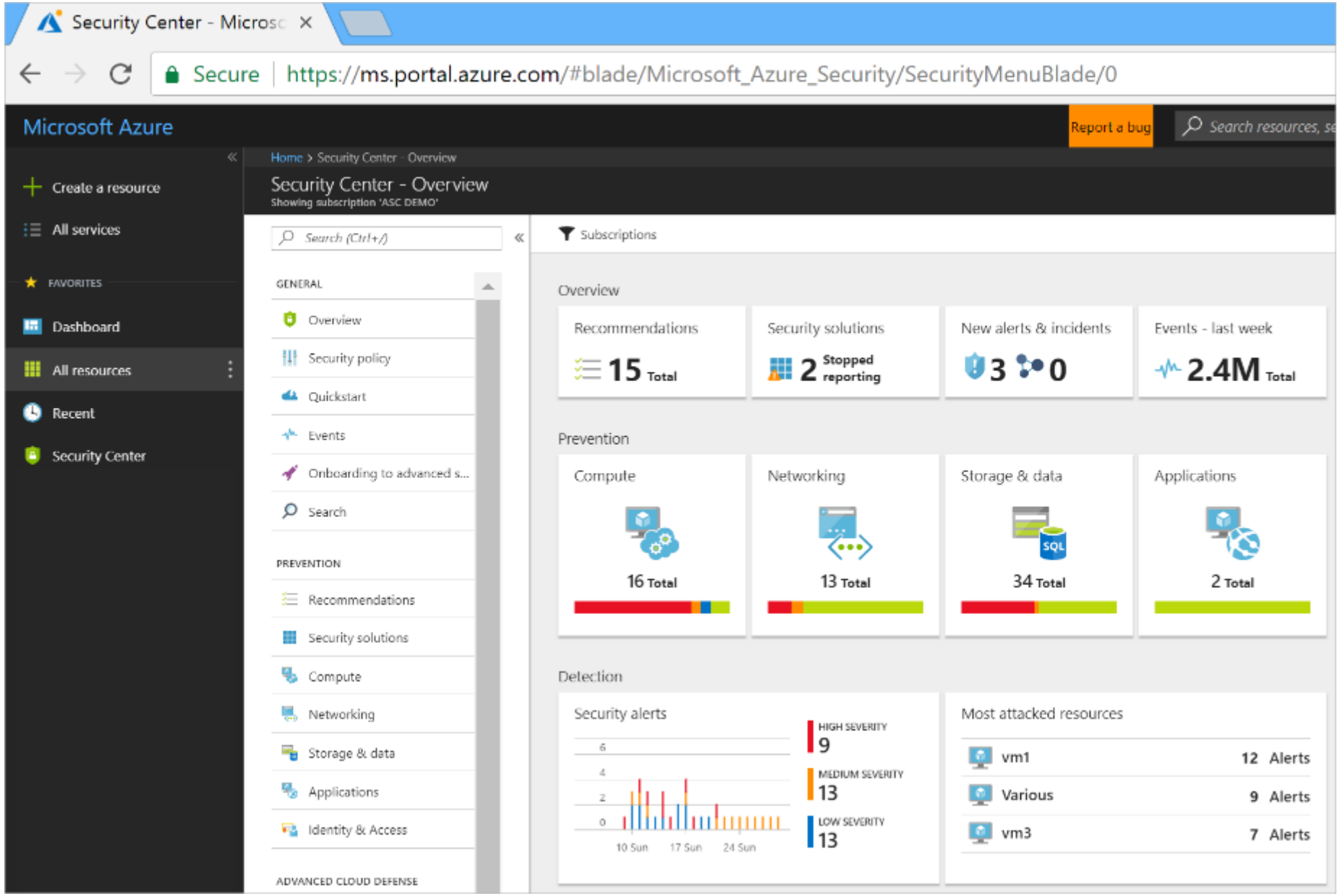
SECURE
Security Management
Threat Protection



CONFIGURE
Configuration
Update Management
Automation
Scripting

PROTECT
Backup
Disaster Recovery

MONITOR
App, Infra, & Network Monitoring
Log Analytics and Diagnostics



https://docs.microsoft.com/en-us/azure/security-center/security-center-intro

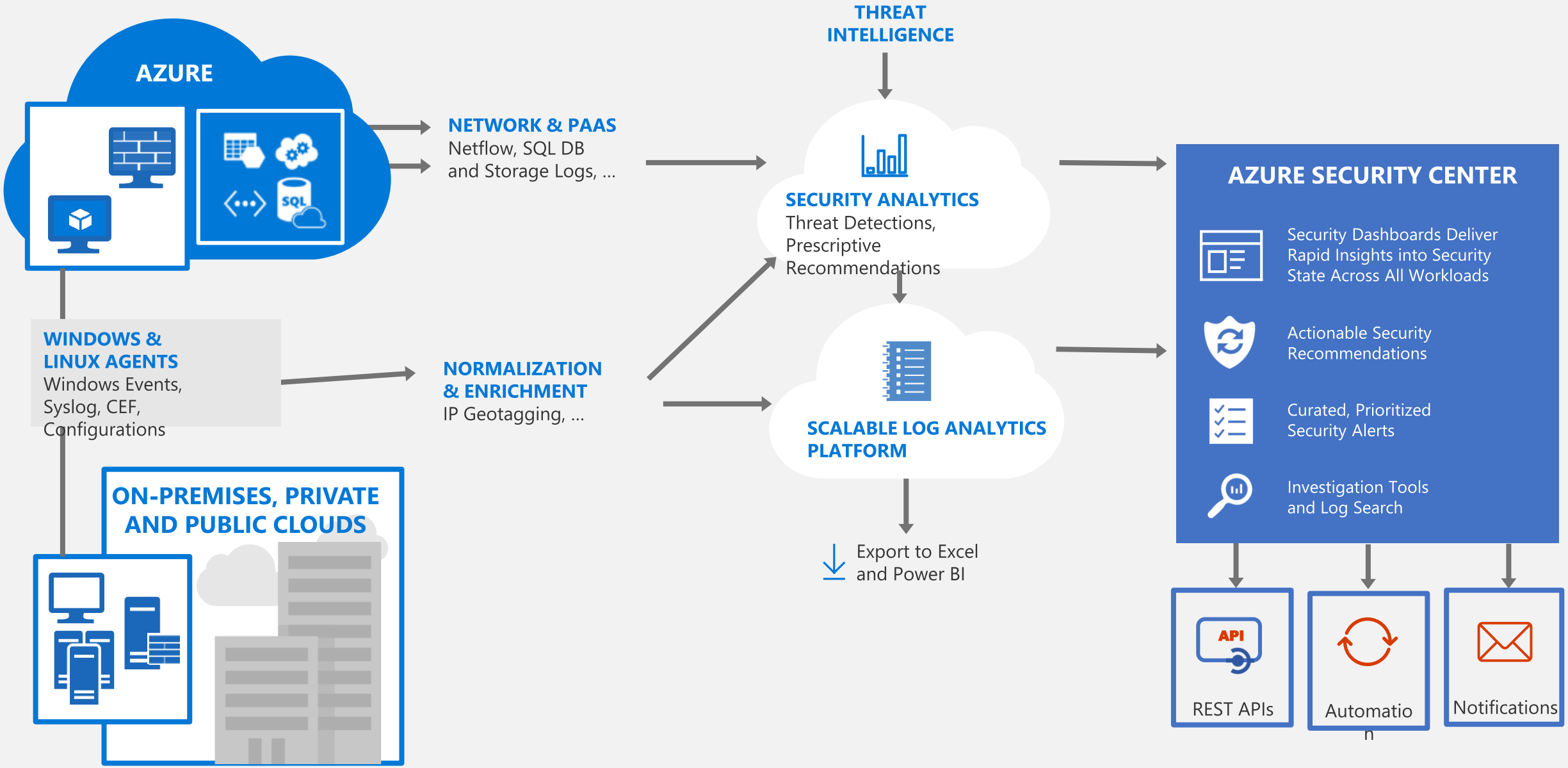
Azure Advisor

- Improve what matters most
- Get ongoing, actionable advice
- Implement recommendations easily

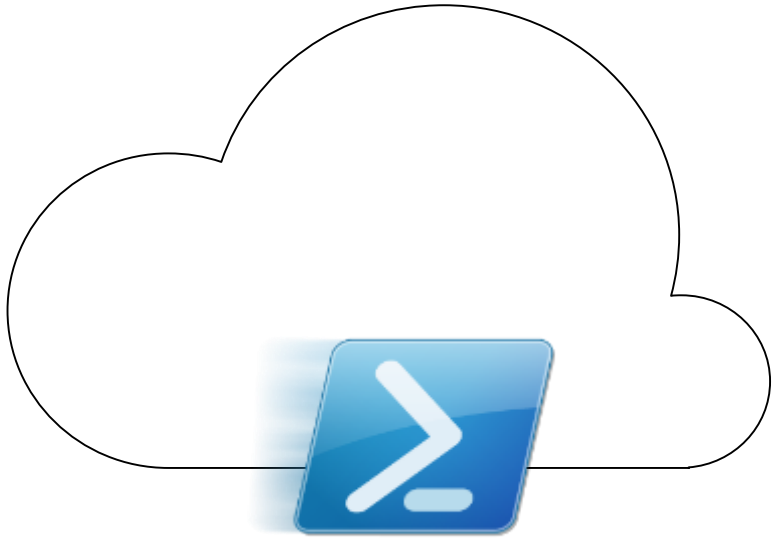
Network Watcher

- Automate remote network monitoring with packet capture
- Gain insight into your network traffic using flow logs
- Diagnose VPN connectivity issues

Architecture



Design an operations automation strategy



Microsoft Azure

Microsoft

Azure Automation

Azure Automation

Runbooks

Chef Configure and Automate. Apply Fine Grained Permissions

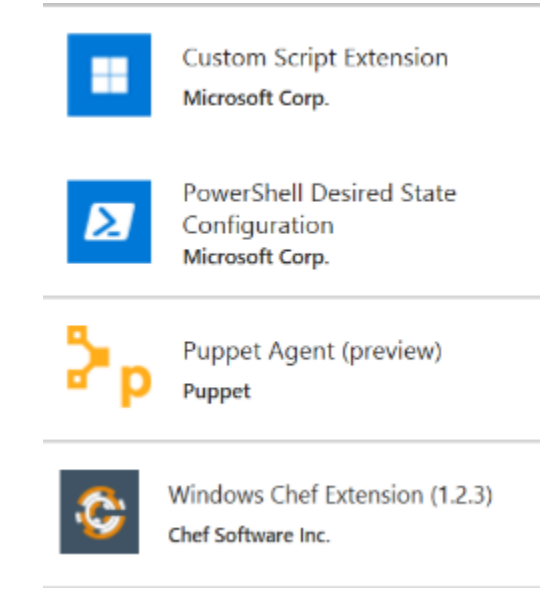
https://www.chef.io/solutions/windows/

Puppet Can Configure and Manage Windows and Azure

http://puppetlabs.com/solutions/microsoft

Desired State Configuration

Make it So
https://docs.microsoft.com/en-us/azure/automation/automation-dsc-overview



In the portal + New – Azure Automation

Others, Docker, Ansible, SaltStack, etc.

DevOps Enabler

Which to use?

All can be used with Windows & Linux

Chef

- If you already have a Chef management infrastructure
- If your primary expertise is managing Linux machines

Puppet

- If you already have a Puppet management infrastructure
- If your primary expertise is managing Linux machines

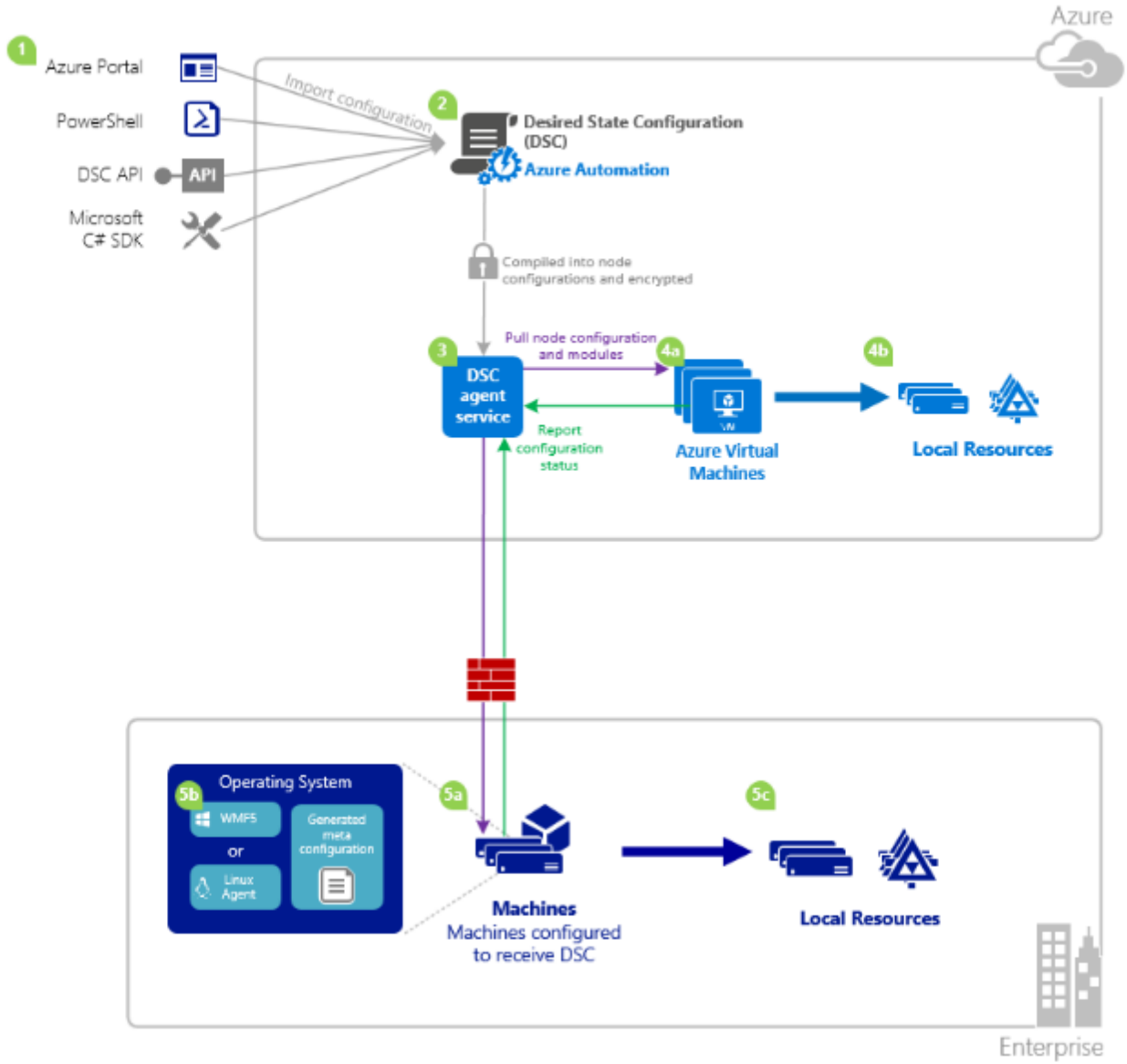
DSC

- If you do not already have a Configuration Management Solution
- If your primary experience is in managing Windows machines
- Uses vender-neutral configuration files (MOF)
- If you already have PowerShell expertise

Azure Automation

- If you do not already have a Configuration Management Solution, or not deeply embedded
- If you want to significantly expand your configuration management without significant expense
- If you already own OMS
- If you already have PowerShell expertise

Desired State Configuration (DSC)



Chef & Puppet

Chef

- Cross-OS systems management, automation, and analytics output
- Ruby and Git are required + agent is on target machine
- Good for development focused teams (code driven approach to configuration)
- Leverage Chef in Azure when already using it.

Puppet

- Stable and mature so good for managing large, heterogeneous enterprise environments
- Automate systems configuration & enforce consistency
- Large Open Source catalog of modules and runs on nearly every OS (cross platform)

Azure Event Grid

Fully-managed event routing

Near real-time event delivery at scale

Broad coverage within Azure and beyond

Backbone of event-driven computing

Manage all events in one place

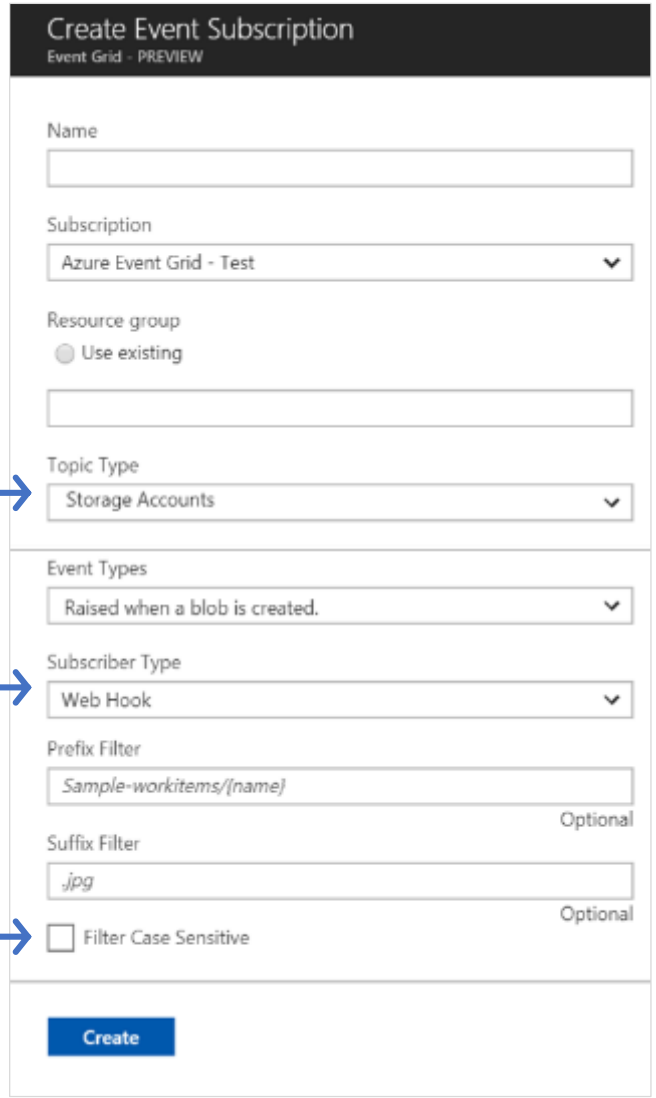
Event publishers

- Blob Storage
- Resource Groups
- Azure Subscriptions
- Event Hubs
- Custom Events

Subscribe to pre-defined system events in Azure or create your own custom topics

Route events to any end-points, Azure or even beyond

Enable filtering and efficient routing of events



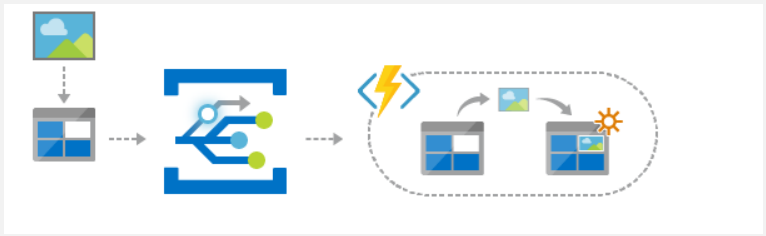
Event handlers

- Azure Functions
- Logic Apps
- Azure Automation
- WebHooks

Scenarios

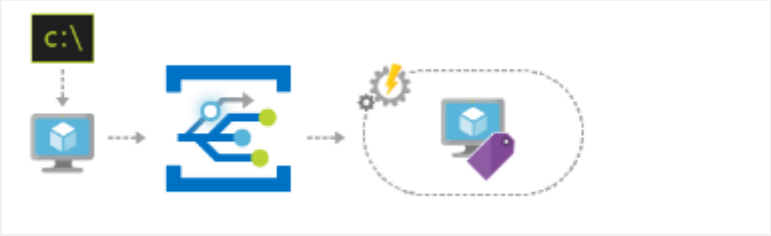
Serverless apps

Instantly trigger a serverless function to run analysis when a new file is added to a blob storage container.



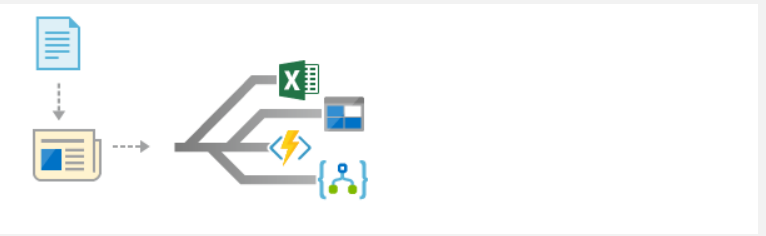
Ops automation

Speed up automation and simplify policy enforcement by notifying Azure Automation when underlying infrastructure is provisioned

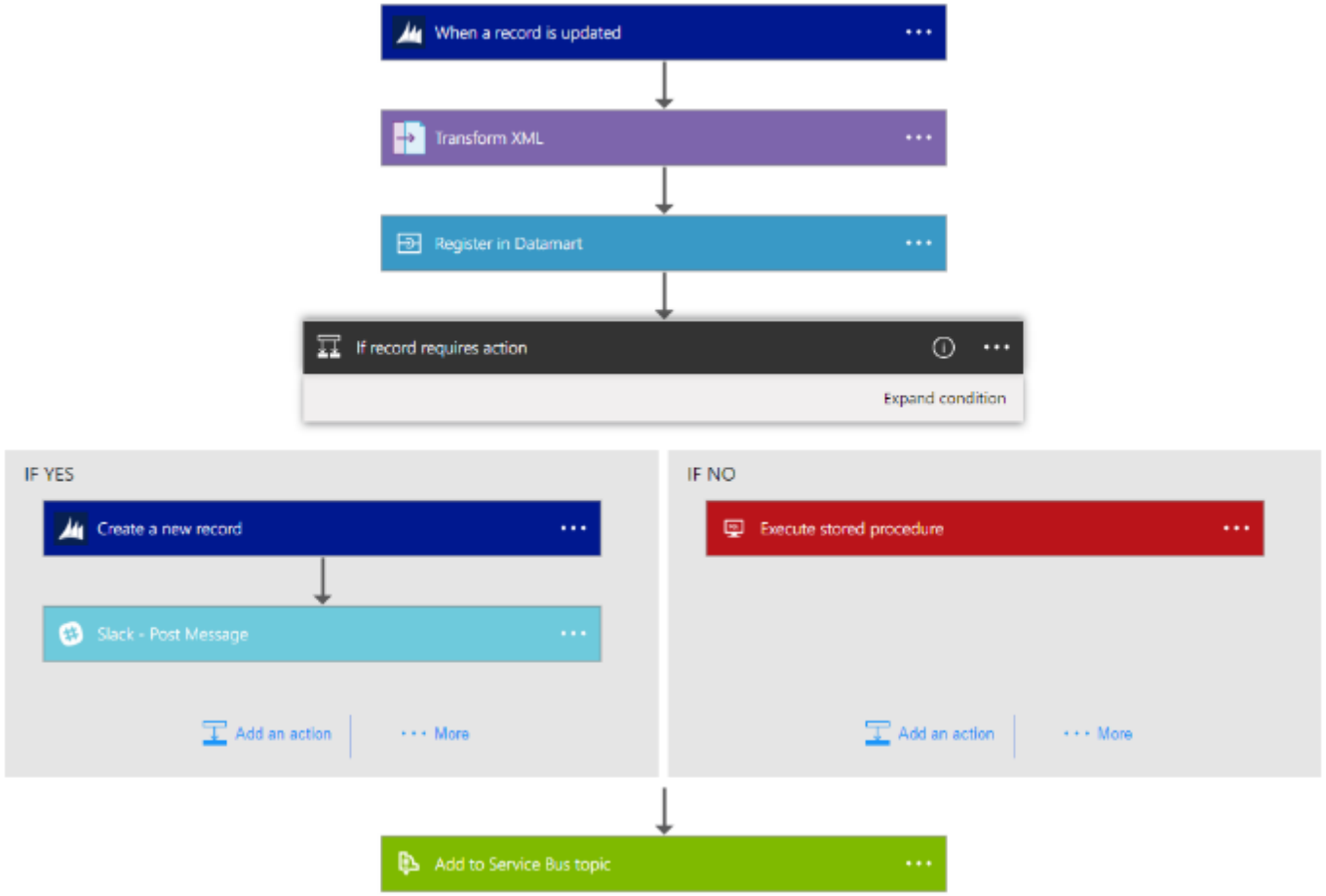


Application integration

Connects your app with other services. Create an application topic to route your app's event data to any desired destination

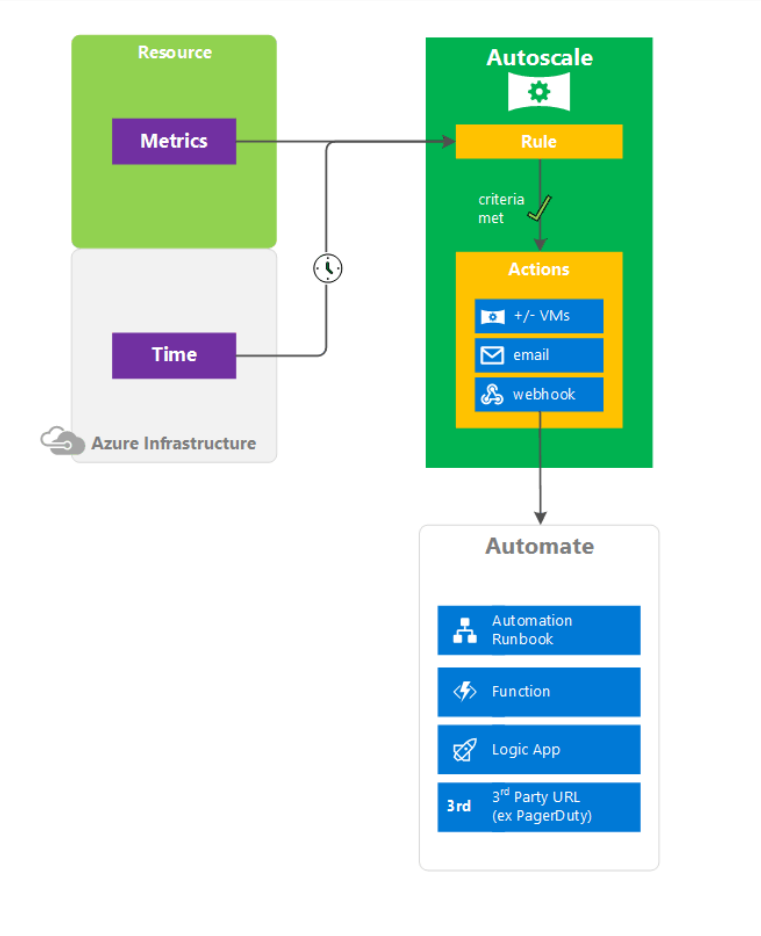


Azure Logic Apps



https://docs.microsoft.com/en-us/azure/logic-apps/logic-apps-what-are-logic-apps

Azure Autoscale



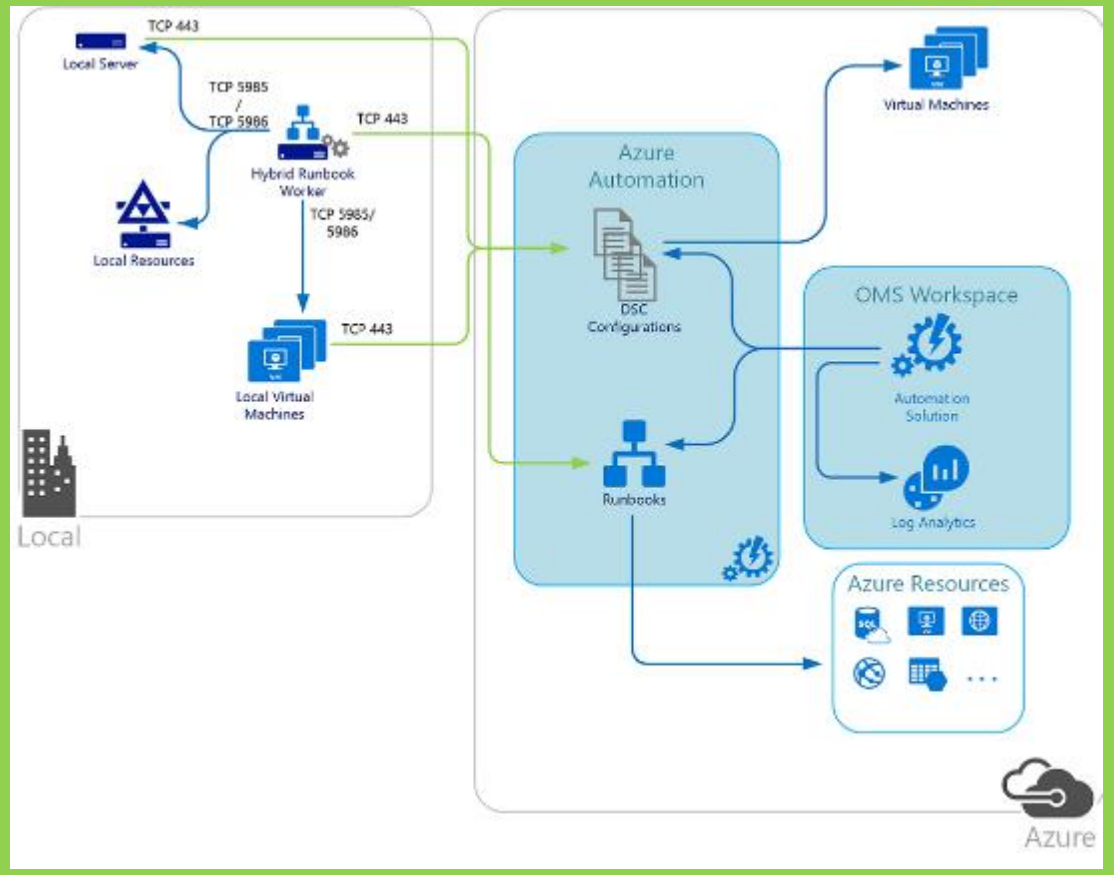
https://azure.microsoft.com/en-us/blog/manage-your-business-needs-with-new-enhancements-in-azure-autoscale/

EXAM TIP! *Hybrid Azure Automation - DSC*

DSC configurations stored in Azure Automation can be directly applied to Azure virtual machines. Other physical and virtual machines can request configurations from the Azure Automation DSC pull server.

Note

- TCP 443 from local to Azure
- TCP 5985/5986 Hybrid Runbook Worker to local machines and resources
- Hybrid Runbook worker is running locally and managing local resources



https://docs.microsoft.com/en-us/azure/automation/automation-offering-get-started

LAB Create a standalone Azure Automation account

Create a new Automation Account from the Azure portal

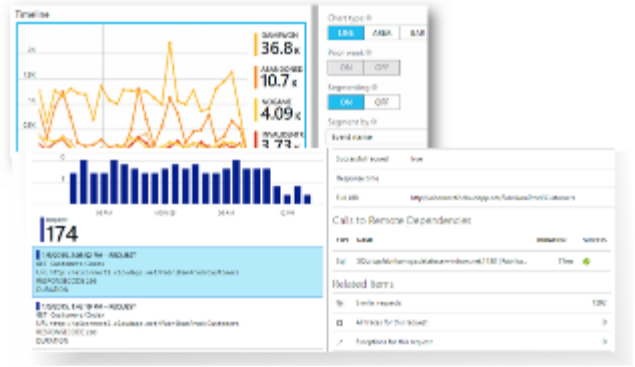
Socialize: #70-535 @ITProGuru

https://docs.microsoft.com/en-us/azure/automation/automation-create-standalone-account

Thank You

Appendix

Application Insights



Detect and diagnose issues in Web apps and services

Alerts through email or webhooks

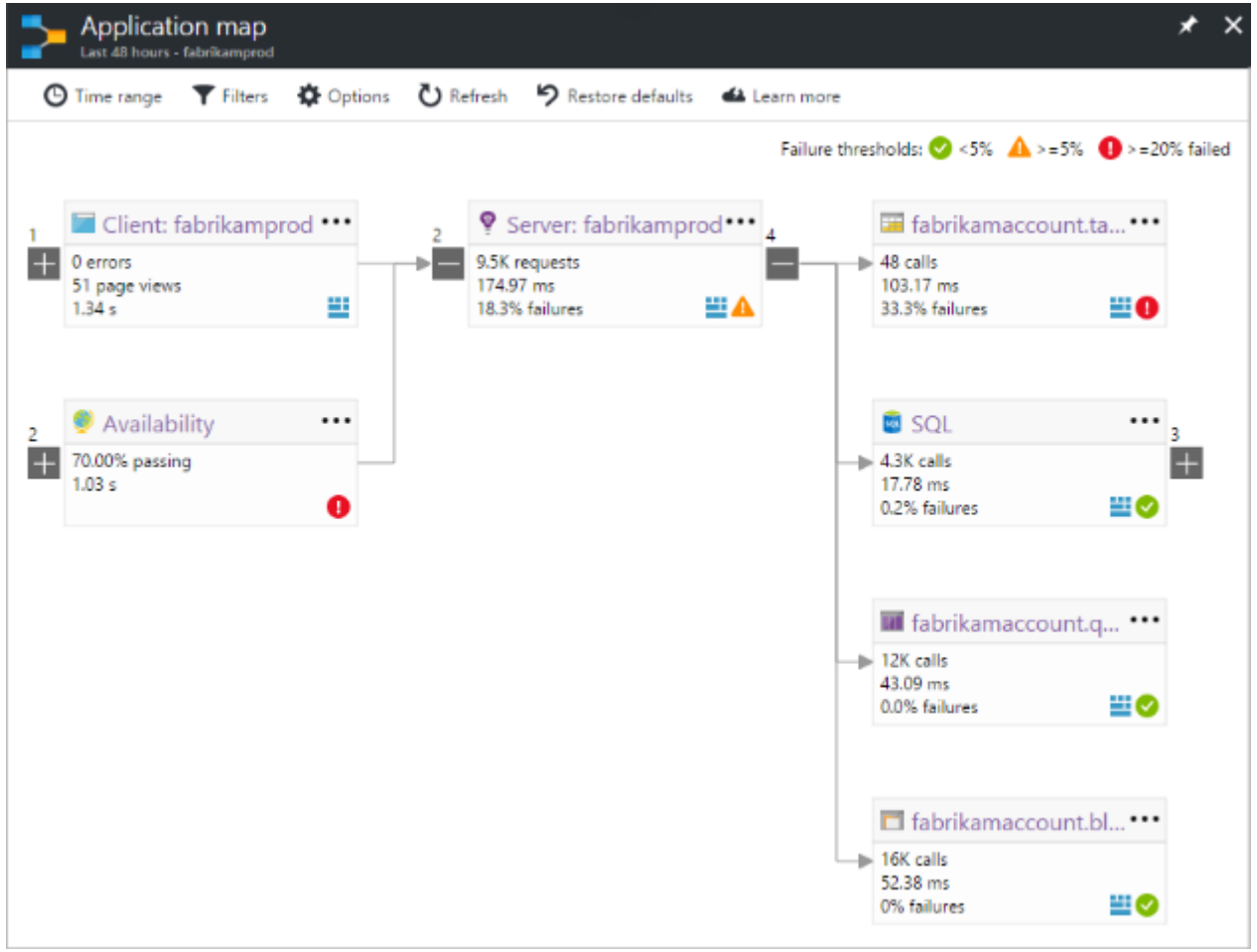
Diagnose exceptions and performance issues

Perform root cause analysis and initiate azure automation runbook

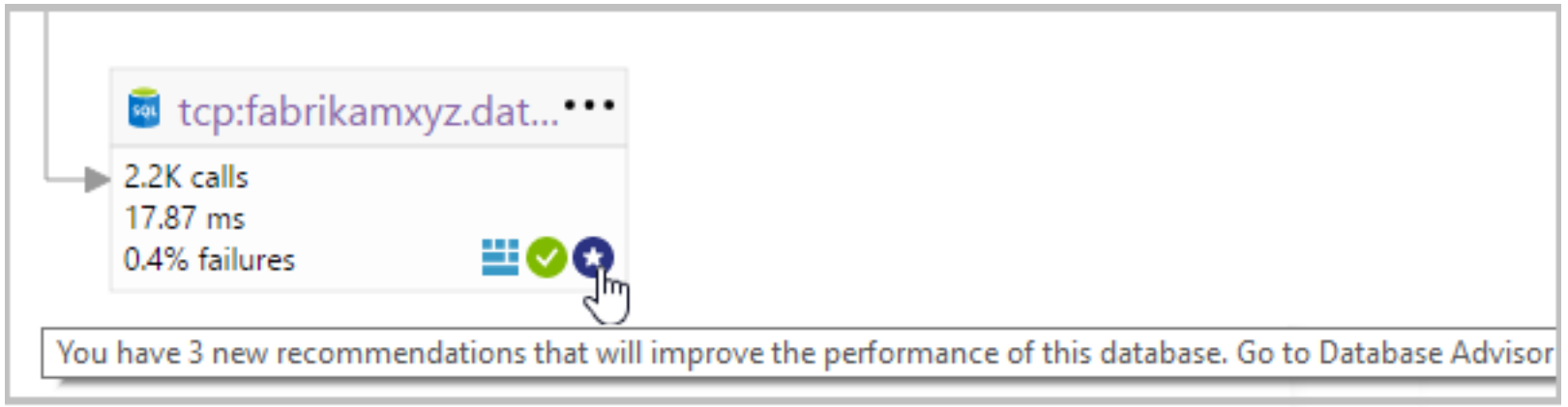
Live application monitoring

HTTP metrics, Dependency (SQL) response times, Log tracing, View and Session counts, Server performance, Availability tests

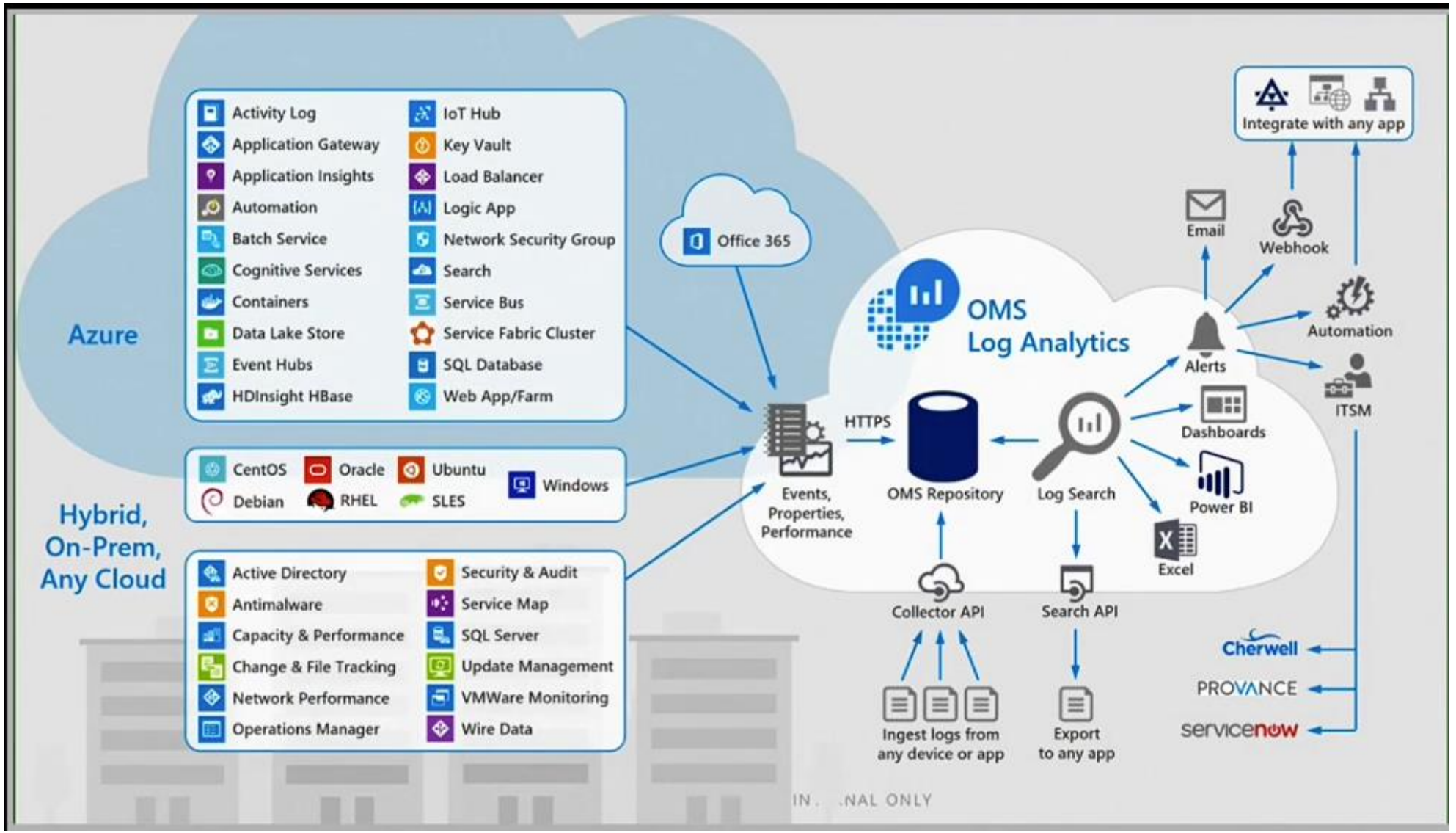
Application Map (Insights)



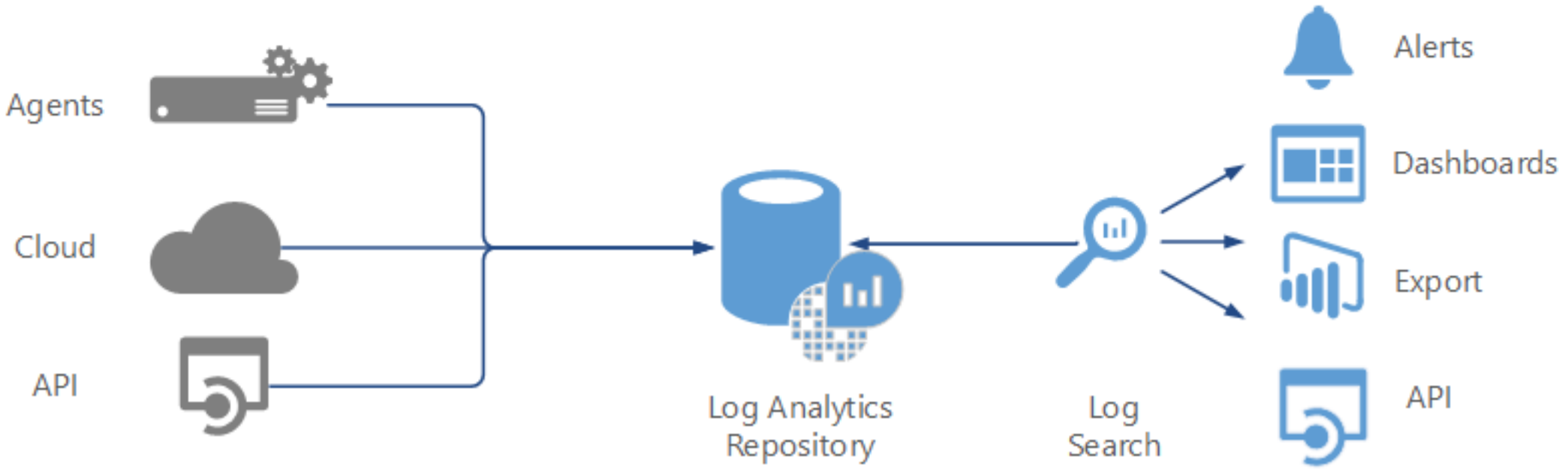
Application Map (Insights)



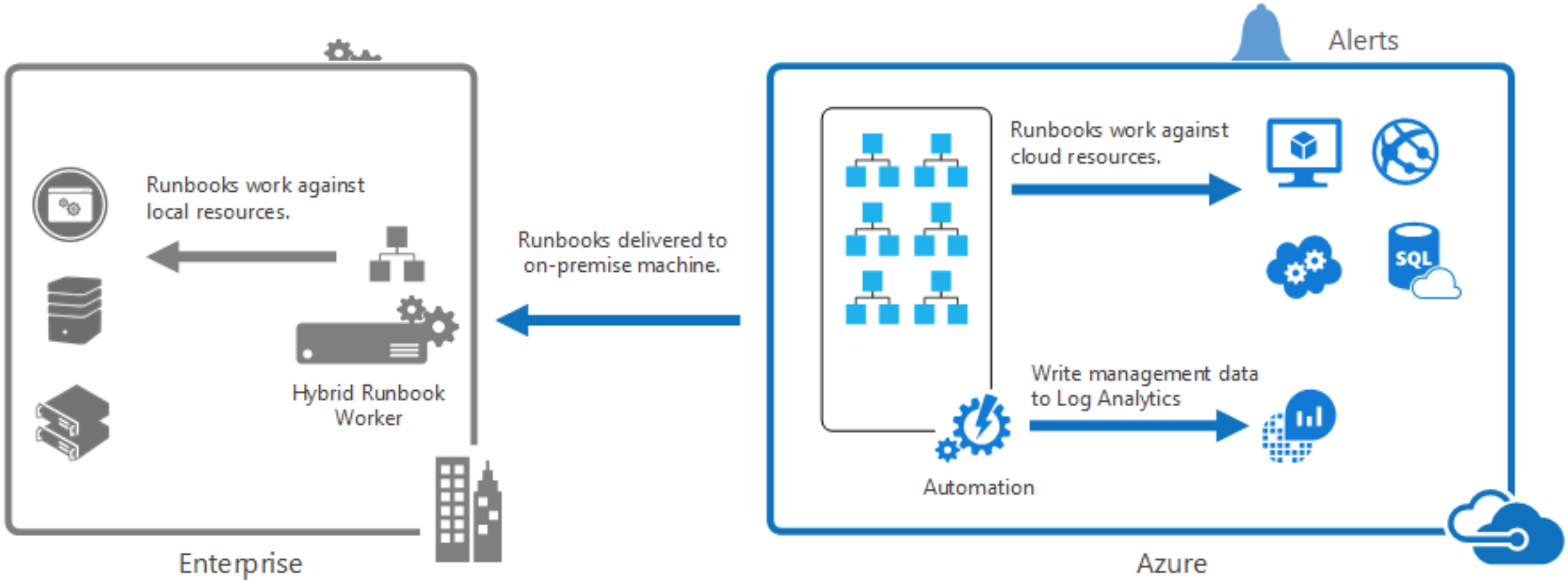
OMS Services



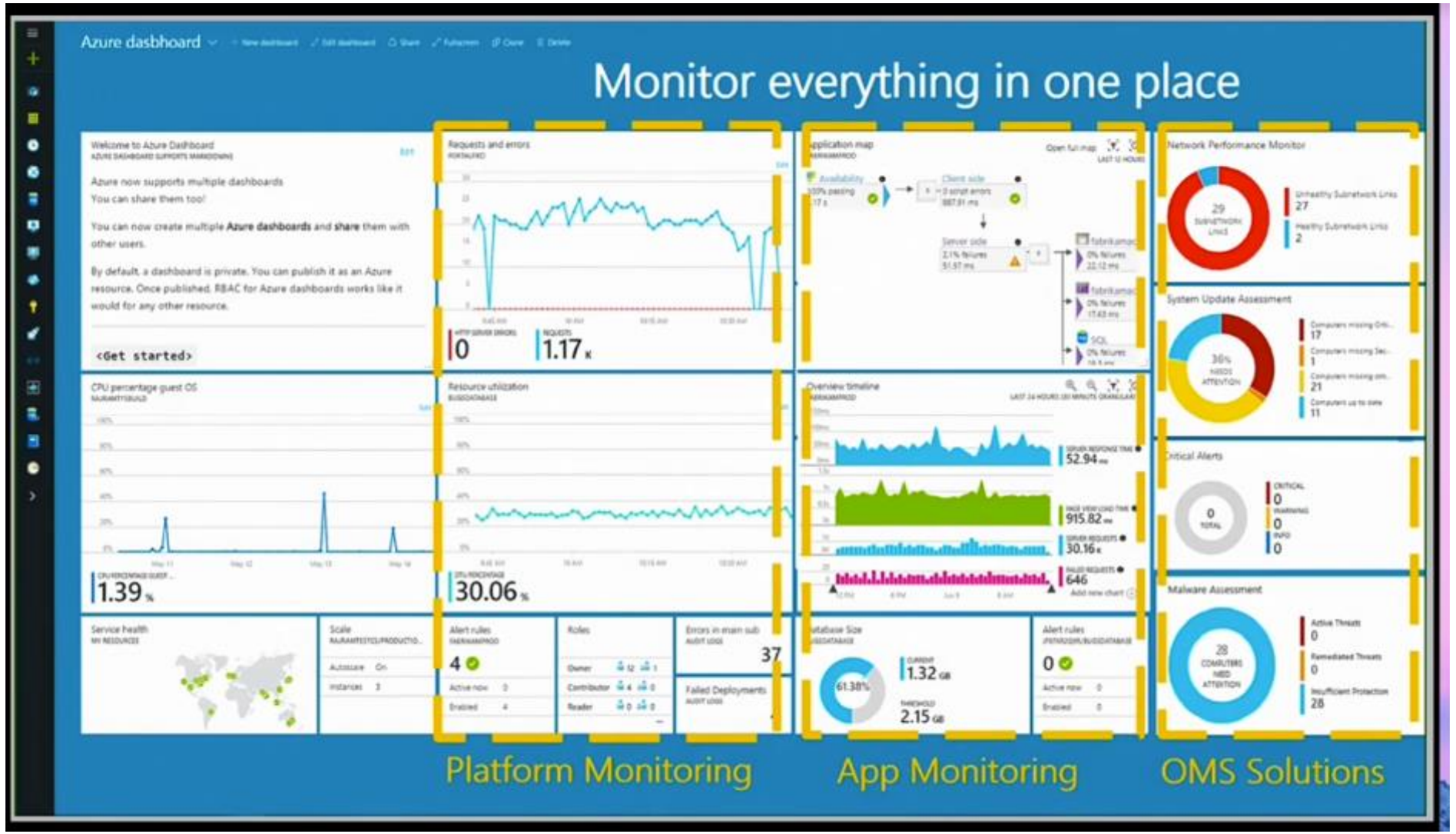
OMS Services – Log Analytics



OMS Services – Process Automation



OMS Services – Security And Compliance



Azure Monitoring

Use the Azure Portal to monitor Web Apps, VMs by default.

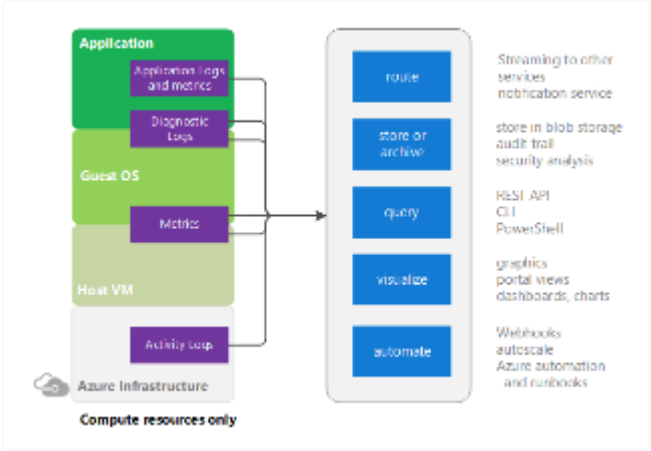
Good Short term solution for point-in-time view

Monitoring writes data to Azure Storage

- Can use Visual Studio to view

Configure Alerts from the portal based on performance metrics

Know the SLAs



Availability Sets

Availability sets provide redundancy to your application.

Must contain the same OS and VM size

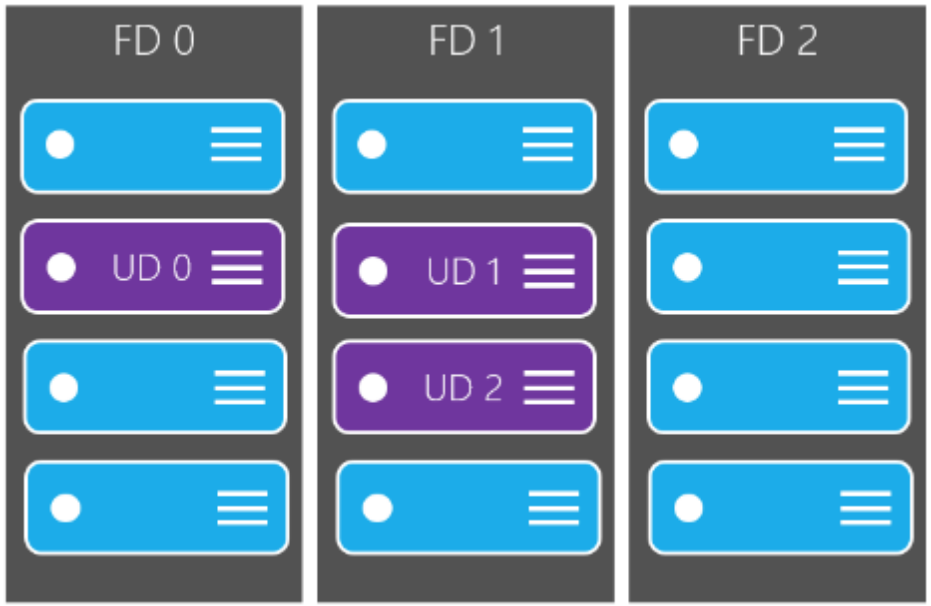
Used to configure Fault/Update domains

If using managed disks, must use a managed availability set

Fault Domains & Update Domains

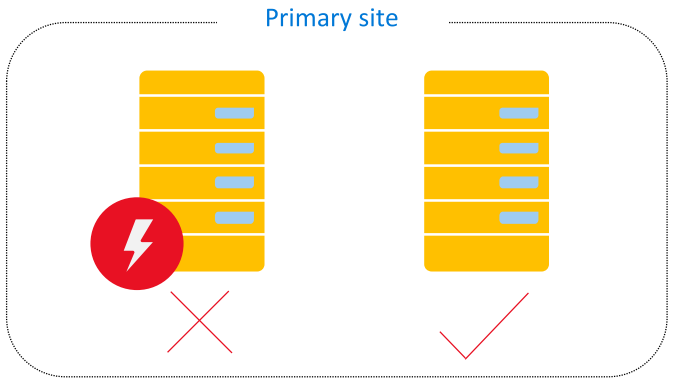
Fault domains define the group of virtual machines that share a common power source and network switch.

Update domains indicate groups of virtual machines and underlying physical hardware that can be rebooted at the same time.



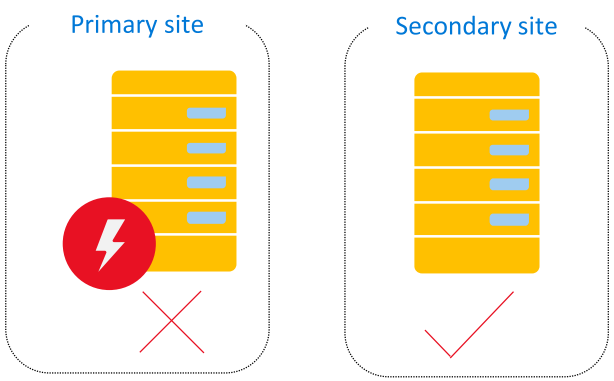
Architectural capabilities of BC/DR

You need all three



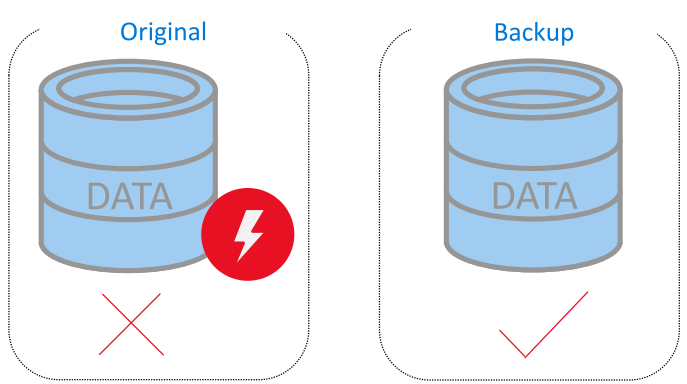
High availability

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

Architectural capabilities of BC/DR

Recovery Point Objective (RPO) and Recovery Time Objective (RTO)

- Drivers of solution cost
- Minimal data loss
- Reduce downtime

Availability: Storage redundancy & SLAs

- Blob storage: (LRS, GRS, RA-GRS), SLAs
- Synchronous vs asynchronous (how data is written)
- SQL Server Always On Availability Groups (replication for availability)

Network connectivity

- Application connectivity post failover
- IP management
- Load balancers

Azure Site Recovery

Automated, seamless disaster recovery from the cloud to protect applications

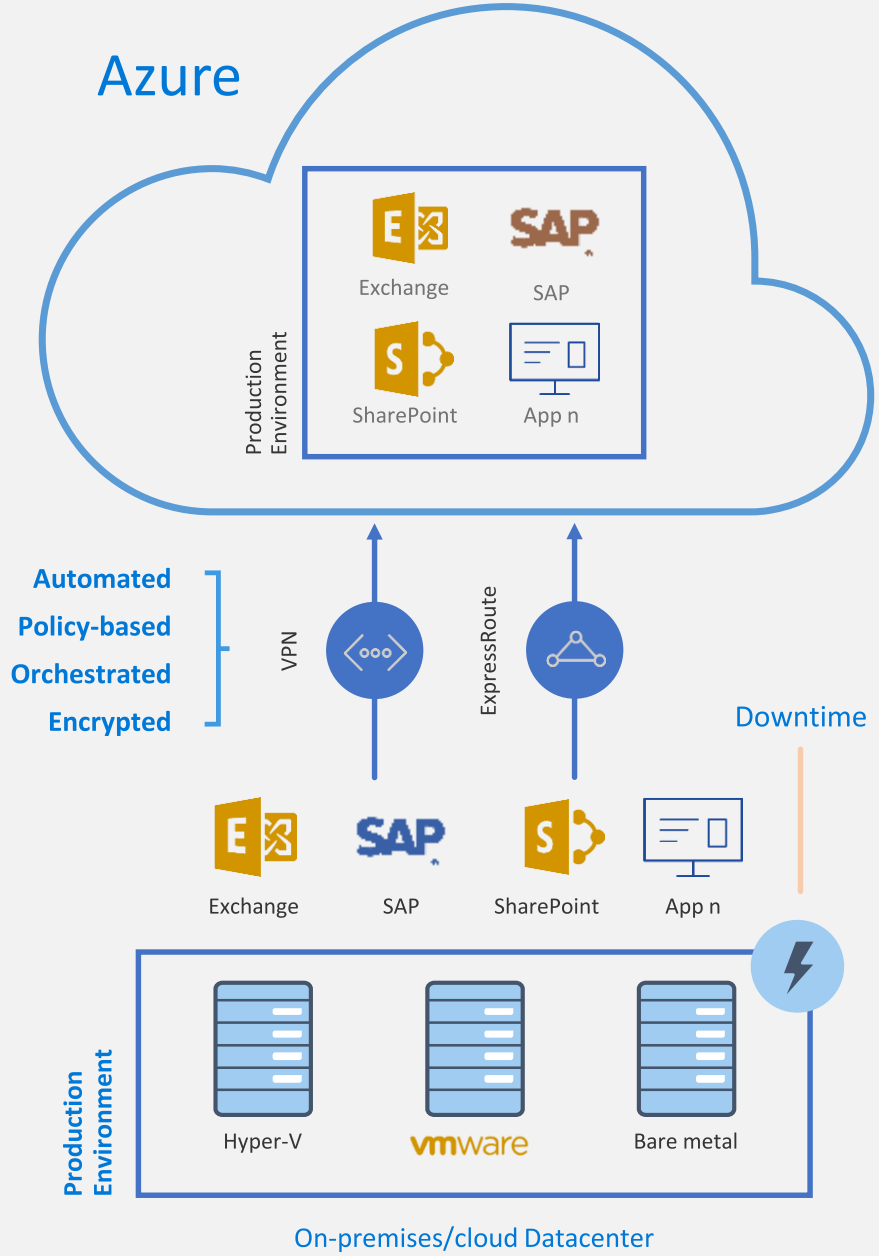
Provides application-consistent recovery of critical workloads

Leverage current investments

Orchestrate one-click recovery even for complex multi-tier applications

WHEN NOT

Workload requires synchronous replication, data outside of VHD



Azure Site Recovery support matrix *

Source	Target	Availability	Supported Guest OS Types
Hyper-V 2012 R2	Azure	Available	All Guest OS types supported by Azure
Hyper-V 2008 R2 SP1 and 2012	Azure	Available	Windows* and Linux*
VMware vSphere 5.1, 5.5, 6.0 and Physical Servers	Azure	Available	Windows* and Linux*
Amazon Web Services (Windows AMIs)	Azure	Available	Windows Server 2008 R2 SP1+ (HVM only)
Amazon Web Services (Linux AMIs)	Azure	Available	RHEL 6.7 HVM
Hyper-V 2012	Hyper-V 2012R2	Available	All Guest OS types supported by Hyper-V
VMware vSphere 5.1, 5.5, 6.0	Hyper-V 2012R2	Available via Microsoft Services Global Delivery	Windows Server 2008 R2 SP1+

** May be asked on the exam what ASR will support for a certain scenario*

Source: https://docs.microsoft.com/en-us/azure/site-recovery/

Azure BC/DR Capabilities & Use Cases

Hyper-V Replica

- Simple, Affordable Second Site
- “Extended Replication” + 3rd Party Integration
- Hardware Agnostic – either side

Hybrid Cloud

- Seamless Integration:
- Private Cloud or on-premises to…
- Service Provider Cloud
- Microsoft Azure

• Azure Site Recovery (ASR)

WHEN TO USE: 2nd Site / Use SCCM,SCVMM, Unprotected workloads

WHEN NOT TO USE:

- Workload requires synchronous replication, data outside of VHD
- Workload needs to recover physical servers, beyond Hyper-V replica’s capabilities

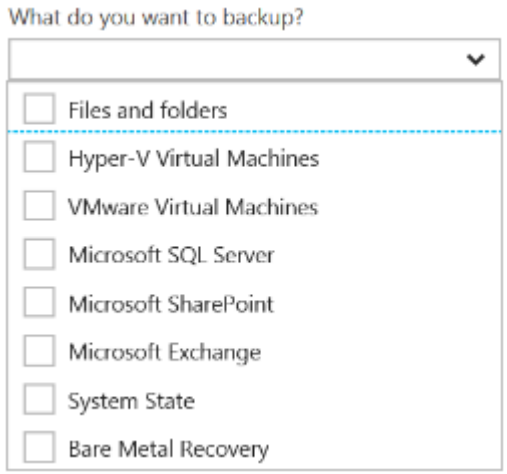
Disaster Recovery Capabilities & Use Cases

Azure Backup

- Reliable, Simple, Efficient backup and restore (agent based)
- Use for Branch Office or Small Business
- Backup and restore files and folders
- No Central Management

Azure Backup Server

- Disk (D2D), giving high RTOs for tier 1 workloads
- Azure (D2D2C) for long term retention
- Modern Backup Storage technology (MABS v2)
- VMware capabilities
- Application Consistency (SQL, Exchange, SharePoint)



- No Tape Backup
- No Integration with System Center
- Requires Azure Subscription

System Center Data Protection Manager (DPM)

- Physical, VM, Azure VM
- Store Locally to Disks (D2D) **and to Tape (D2T)**
- Store in Azure (D2D2C) for long term retention
- Full application consistency across server apps (Exch, SP, SQL…)
- Small backup window
- Bare Metal Recovery / Recovery to Azure
- Full System Center Integration (discovery, reporting, etc)

StorSimple

- Proprietary Device | Multiple Tiers
- Cloud Integrated Storage (CiS)
- Seamless view of ALL Enterprise Storage
  - Windows and VMWare
- Multi-Tiers backup and recovery (Hot/Cold)
- Fastest Solution
- Long Term Azure storage; scale storage out to Azure
- minimize on-premesis disk requirements
- Seamless view of ALL Enterprise Storage | Windows and VMWare

EXAM TIP!

Additional Information: SLA for Site Recovery 99.9%

"**Failover**" is the process of transferring control, either simulated or actual, of a Protected Instance from a primary site to a secondary site.

"**On-Premises-to-Azure Failover**" is the Failover of a Protected Instance from a non-Azure primary site to an Azure secondary site. Customer may designate a particular Azure datacenter as a secondary site, provided that if Failover to the designated datacenter is not possible, Microsoft may replicate to a different datacenter in the same region.

"**On-Premises-to-On-Premises Failover**" is the Failover of a Protected Instance from a non-Azure primary site to a non-Azure secondary site.

"**Protected Instance**" refers to a virtual or physical machine configured for replication by the Site Recovery Service from a primary site to a secondary site. Protected Instances are enumerated in the Protected Items tab in the Recovery Services section of the Management Portal.

EXAM TIP!

Sharding is when you split a database and partition the different parts of the database across multiple drives. A shard is a single horizontal partition of the database.

EXAM TIP!

READ & Practice
https://docs.microsoft.com/pdfstore/en-us/Azure.azure-documents/live/backup.pdf

Link from https://docs.microsoft.com/en-us/azure/backup/backup-try-azure-backup-in-10-mins – Download PDF

Azure Backup Key Workloads

Specialized Workloads

- Exchange
- SharePoint
- SQL Server

File/Folders/Volumes

- Windows Server
- Windows

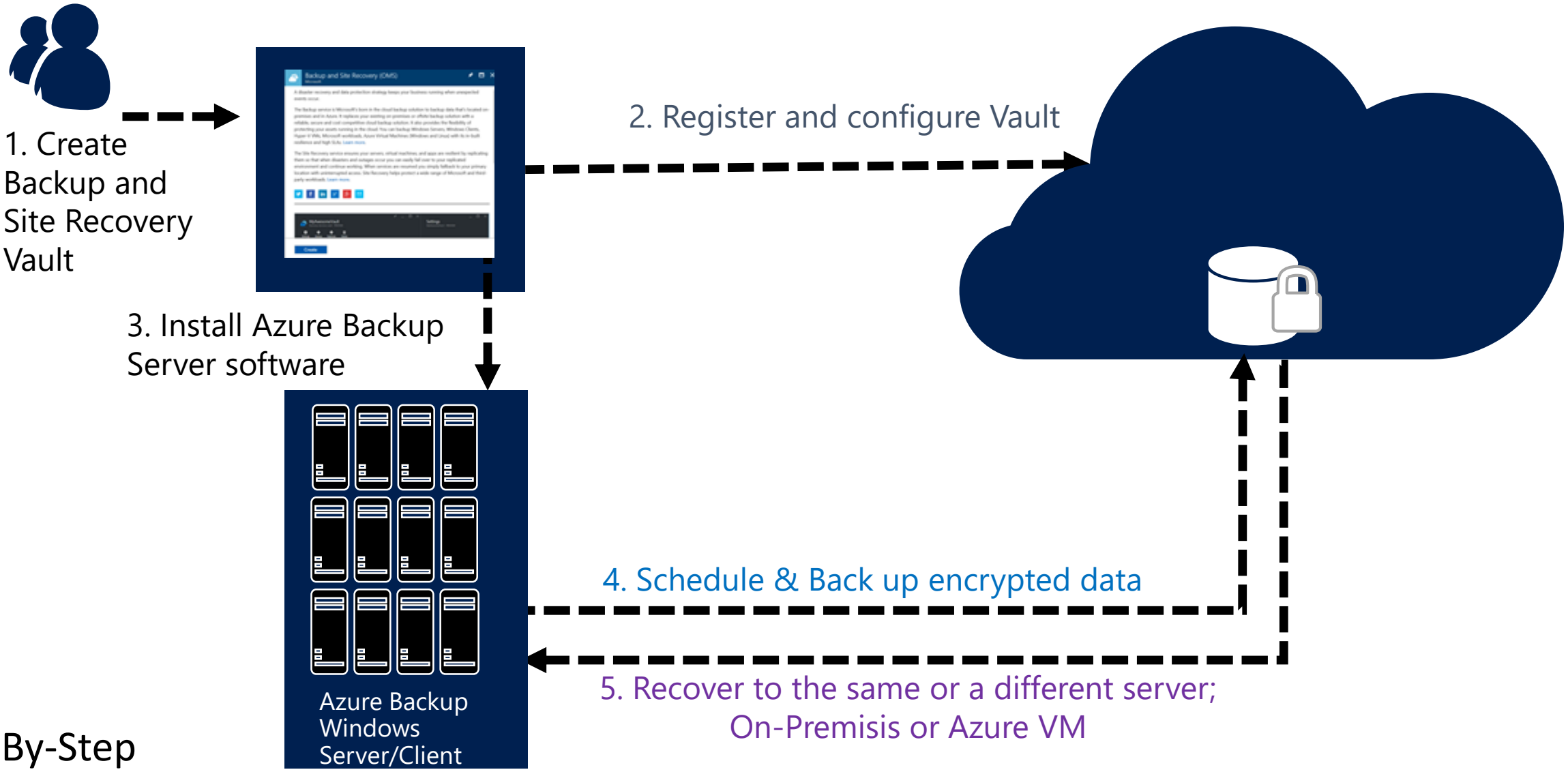
Virtual Machines

- Windows
- Linux

- Hyper-V
- Windows Server

- Microsoft Azure
- VMware

How It Works: Azure Backup Server



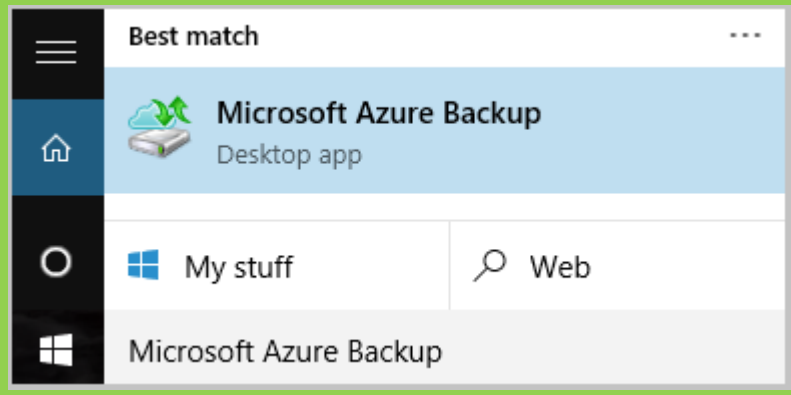
Step-By-Step

https://docs.microsoft.com/en-us/azure/backup/backup-try-azure-backup-in-10-mins

EXAM TIP!

Name of the Backup agent **Installer** is:

MARSagentinstaller.exe



Backup Agent is

Microsoft Azure Backup

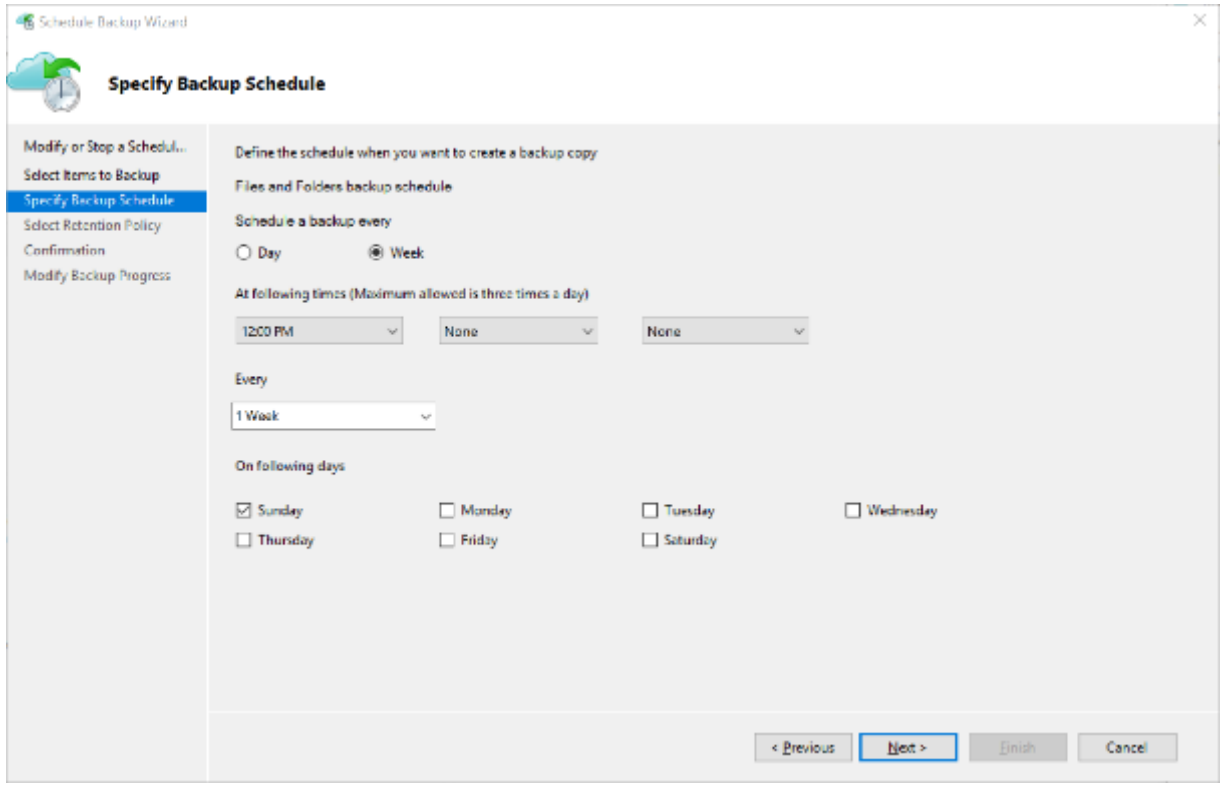
"C:\Program Files\Microsoft Azure Recovery Services Agent\bin**wabadmin.msc**"

Maximum rate of backups per day?

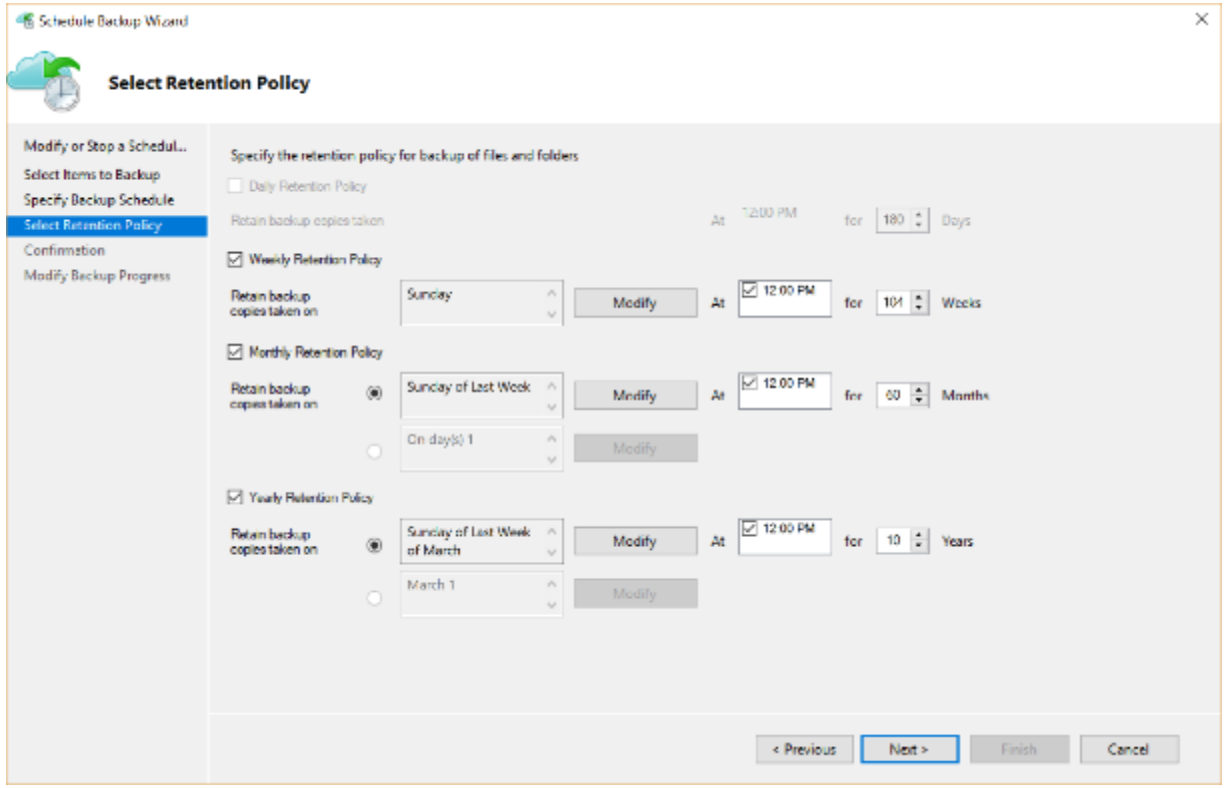
Three (3) times per day!

Backup Schedule & Retention Policy

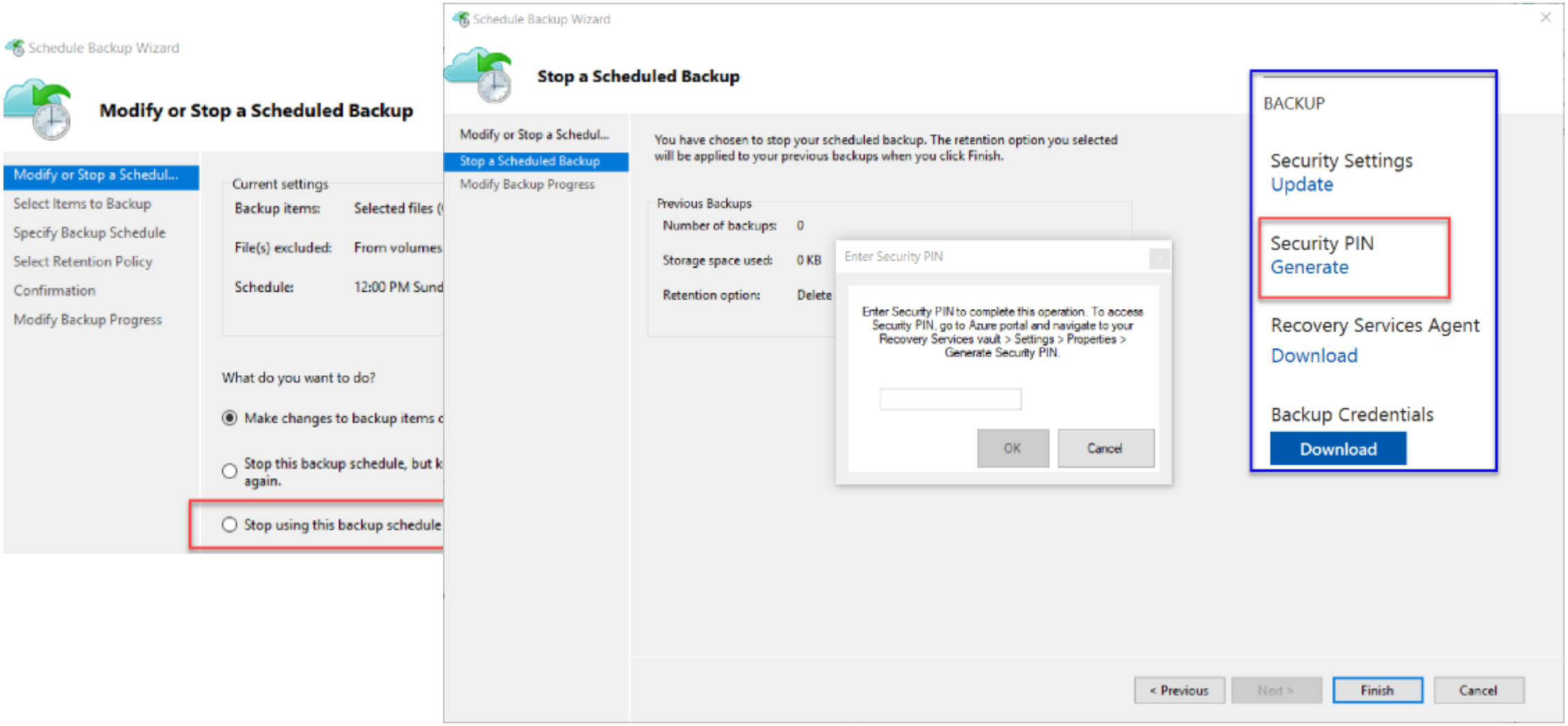
Backup Schedule



Retention Policy



Cancelling Schedule and Removing Backups



Microsoft Azure Backup Server v2

- Protect application workloads:
  - Hyper-V VMs, Microsoft SQL Server, SharePoint Server, Microsoft Exchange and Windows clients
- Backup To:
  - Disk (D2D), giving high RTOs for tier 1 workloads
  - Azure (D2D2C) for long term retention
  - Modern Backup Storage technology (MABS v2) store backups:
    - Using Resilient File System (ReFS) block-cloning technology to store incremental backups,
    - MABS v2 significantly improves storage usage and performance.

Note: VMware is supported only in testing if Azure Backup Server is deployed on Windows 2016

- Microsoft Azure Backup Server (MABS) Deployment:
  - physical standalone server.
  - Hyper-V virtual machine
  - Windows virtual machine in VMWare
    - Physical standalone server
    - Hyper-V virtual machine
    - Windows virtual machine in VMWare
  - An Azure virtual machine - back up cloud workloads running as Azure virtual machines.

Disks for backup storage pool: 1.5 times size of data to be protected

Docs: https://azure.microsoft.com/en-us/blog/announcing-microsoft-azure-backup-server/

Download: https://www.microsoft.com/en-us/download/details.aspx?id=55269

Documentation / More Info…

Azure Key Vault:

https://docs.microsoft.com/en-us/azure/key-vault/

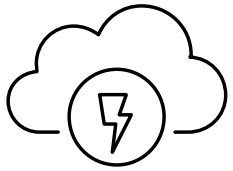
Azure Backup:

https://docs.microsoft.com/en-us/azure/backup/

How customers benefit

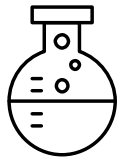
Supported workloads

Infrastructure on-demand workloads

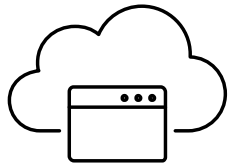


DR

Search / Data mining

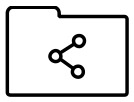


Dev / Test

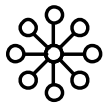


Cloud apps

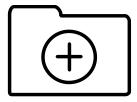
Capacity driven workloads



File shares



Collaboration



Archives

Traditional on-premises workloads

VM workloads

SharePoint

SQL Server

6.5 Describe the use cases for Azure Automation configuration

- Evaluate when to use Azure Automation, Chef, Puppet, PowerShell, or Desired State Configuration (DSC)

Microsoft

Azure Automation

PowerShell & PS Workflow Engines
- Use your existing PS scripts
- Checkpoint/Parallel if needed

Runbooks, Modules
- Author PS, PSWF, Graphical runbooks
- Gallery – Runbooks, modules
- Extensibility, integration

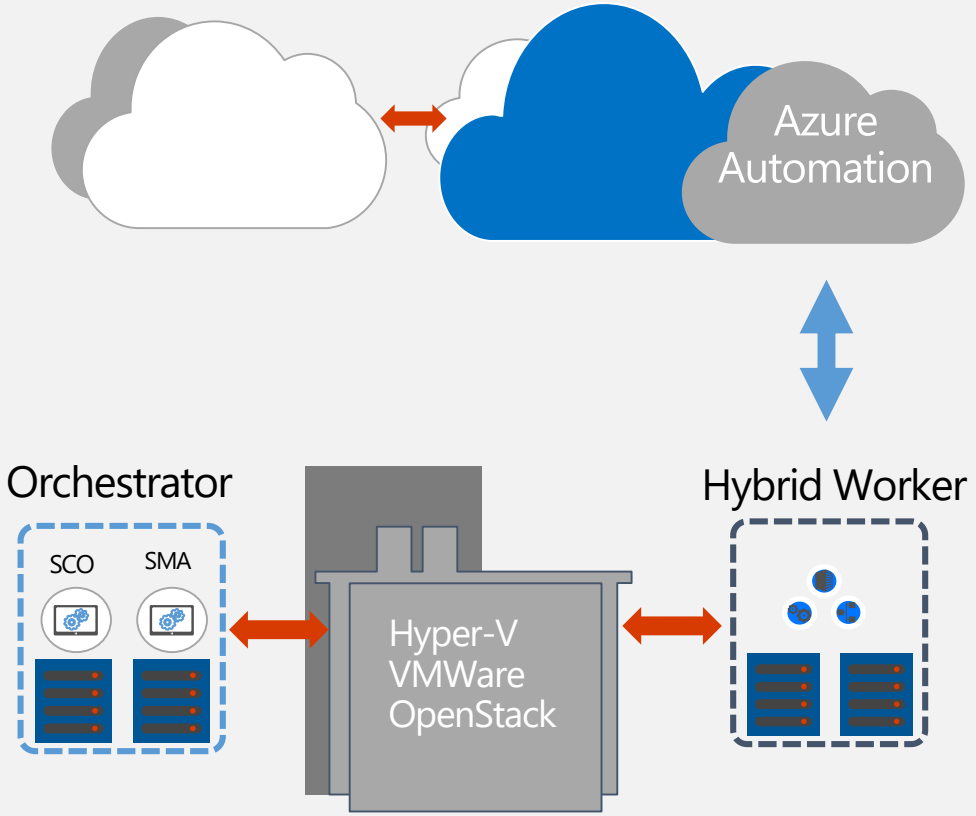
Assets
- Secure, global store for variables, credentials, …
- Schedules

Jobs
- Troubleshoot/audit via job history

PowerShell DSC
- Configurations, Pull service
- Node Management & Reporting

Hybrid Runbook Workers
- Install on any machine
- Secure, only outbound ports

Webhooks
- URL to start runbook remotely
- Integration



PowerShell for automation

- Automating repeatable, identical tasks
- Creating resources such as VMs
- Tasks that are very time consuming or prone to error

Azure Automation Use Cases

Monitoring Configurations

Eliminate Configuration Drift

Automated Change of Configuration

Maintain Exact Configuration (override other changes)

Automated Testing

Automating Usage – Auto Start – Auto Stop

Automating Hybrid Scenarios

Automated Deployment

Implement DevOps practices