DR in Azure

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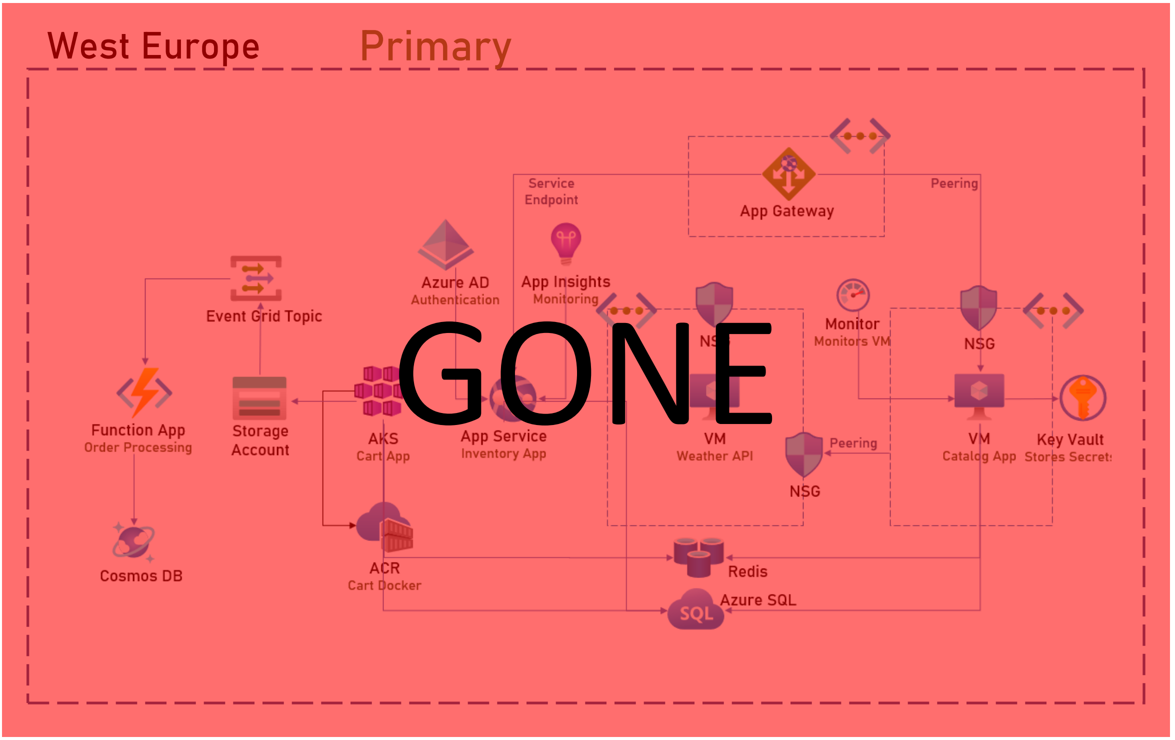
DR

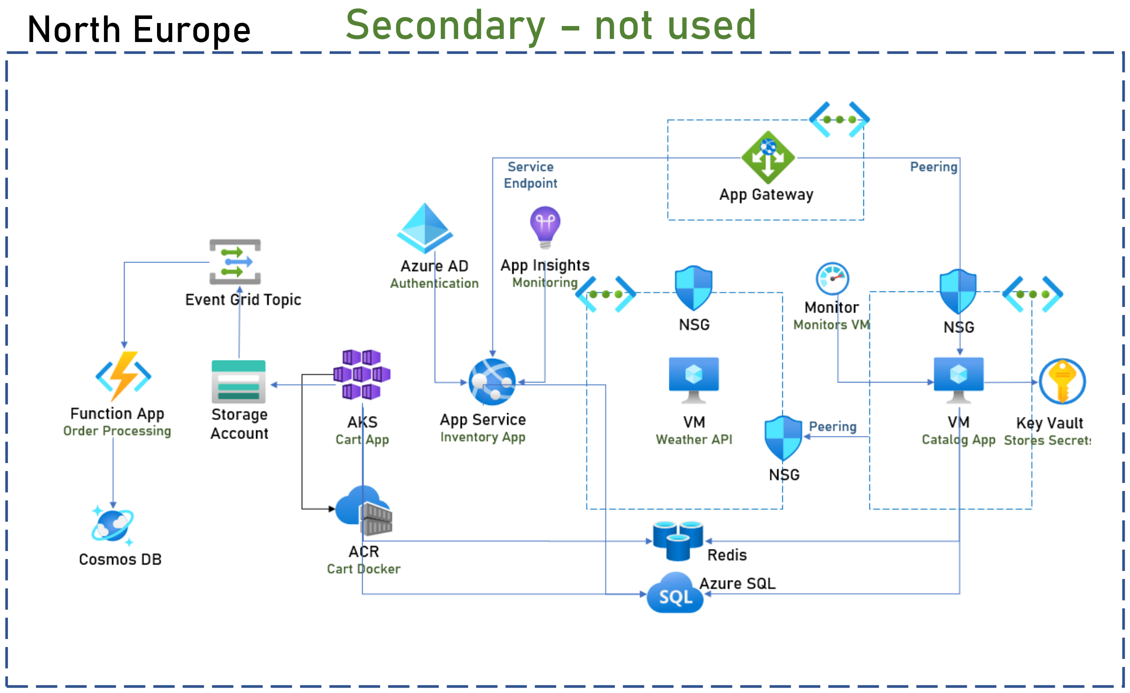
- Disaster Recovery
- A plan to recover from a complete shutdown of a Region
    - Usually as a result of a disaster (earthquake, flood, etc)
- Some apps require it, some don’t
- Might have substantial cost aspects
- Remember: A complete shutdown of a Region is extremely rare

How DR Works?

- In order to set up DR, we need to do the following:
  - Select a DR site
    - A secondary Region that will function as our primary in case of a disaster
    - Configure it to be ready for activation when necessary

How DR Works?


West Europe
Primary
GONE
App Gateway
Service Endpoint
Peering
Azure AD
Authentication
App Insights
Monitoring
Event Grid Topic
NSG
Monitor
Monitors VM
NSG
Function App
Order Processing
Storage Account
AKS
Cart App
App Service
Inventory App
VM
Weather API
VM
Catalog App
Key Vault
Stores Secrets
Peering
NSG
Cosmos DB
ACR
Cart Docker
Redis
Azure SQL
SQL


North Europe
Secondary – not used
App Gateway
Service Endpoint
Peering
Azure AD
Authentication
App Insights
Monitoring
Event Grid Topic
NSG
Monitor
Monitors VM
NSG
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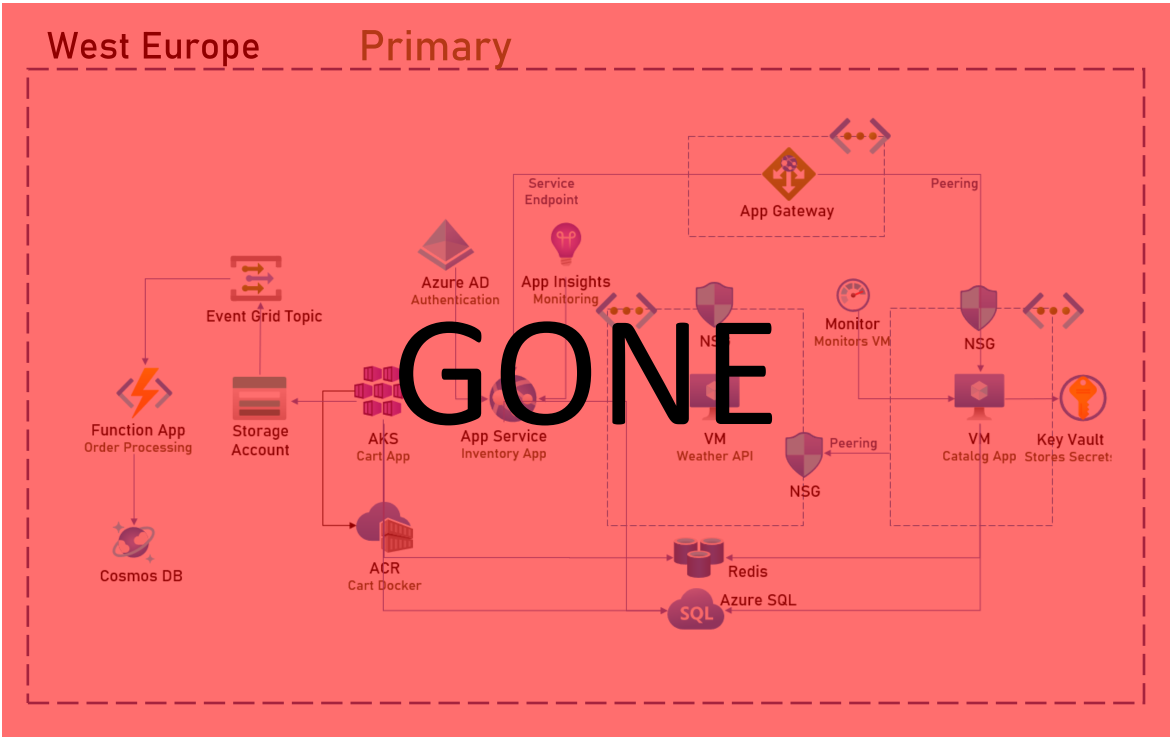
How DR Works?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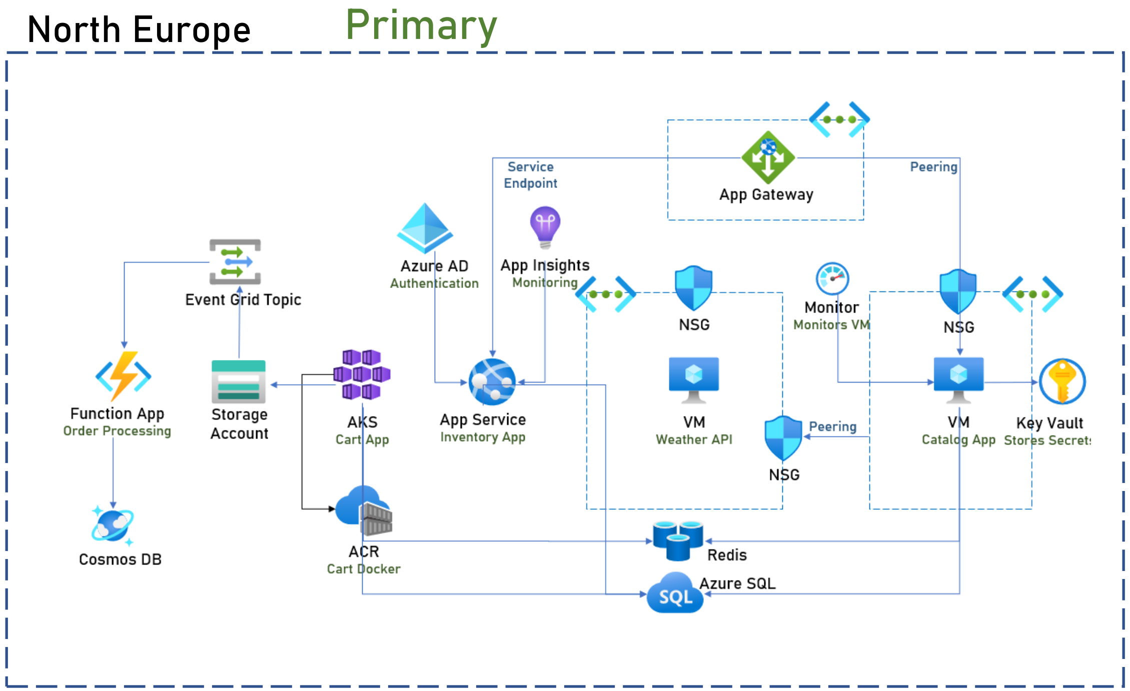
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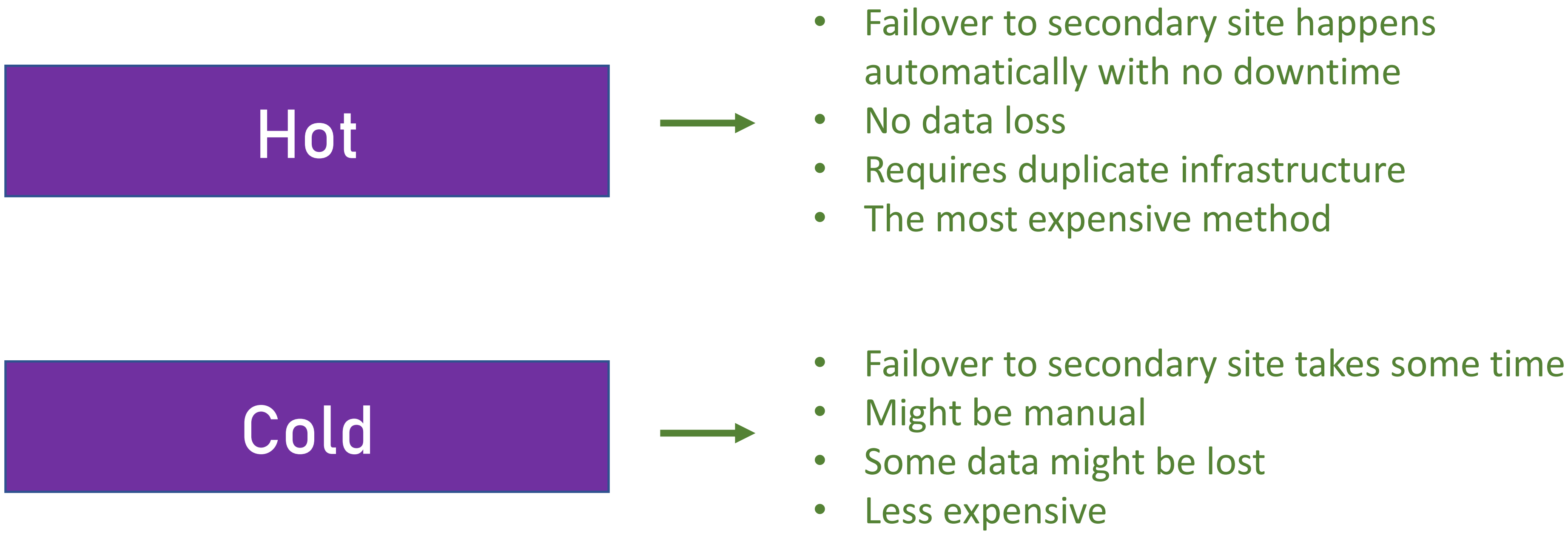
DR Concepts

- Hot / Cold



Hot →

- Failover to secondary site happens automatically with no downtime
- No data loss
- Requires duplicate infrastructure
- The most expensive method

Cold →

- Failover to secondary site takes some time
- Might be manual
- Some data might be lost
- Less expensive

DR Concepts

- Hot or Cold – how to decide?
- Depends on the system's requirements
- A global ecommerce website, serving million of customers – probably Hot
- An HR app for the organization – definitely Cold (if at all…)

DR Concepts

- RPO / RTO

RPO

- Recovery Point Objective
- How much data we allow ourselves to lose in case of a disaster
- Usually measured in minutes
- In other words – what’s the frequency of data sync to the secondary region
- Example: We have an RPO of 5 minutes

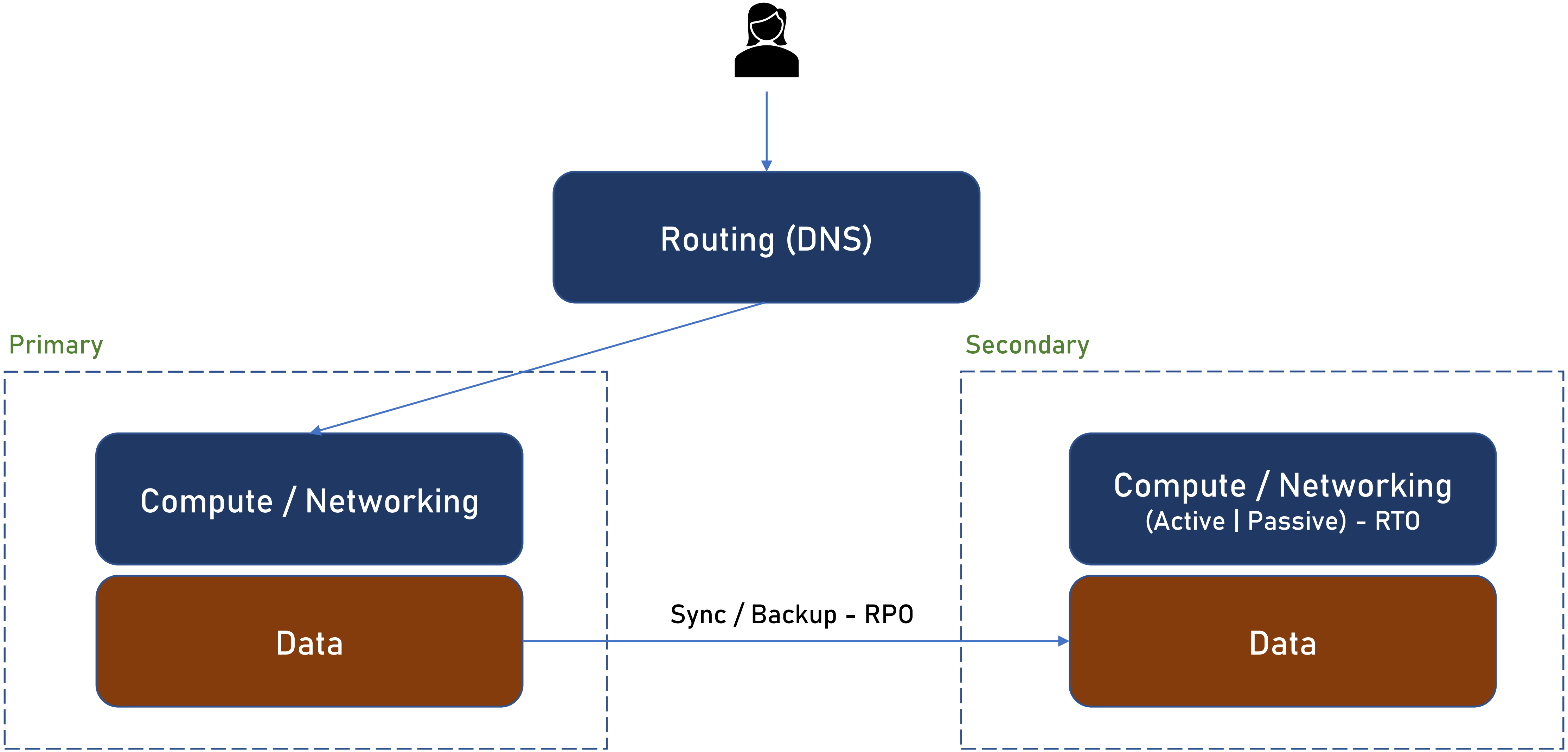
RTO

- Recovery Time Objective
- How much downtime we can tolerate in case of a disaster
- Usually measured in minutes
- In other words – how long it should take before the system is up again
- Not necessarily with the most up to date data, depends on the RPO

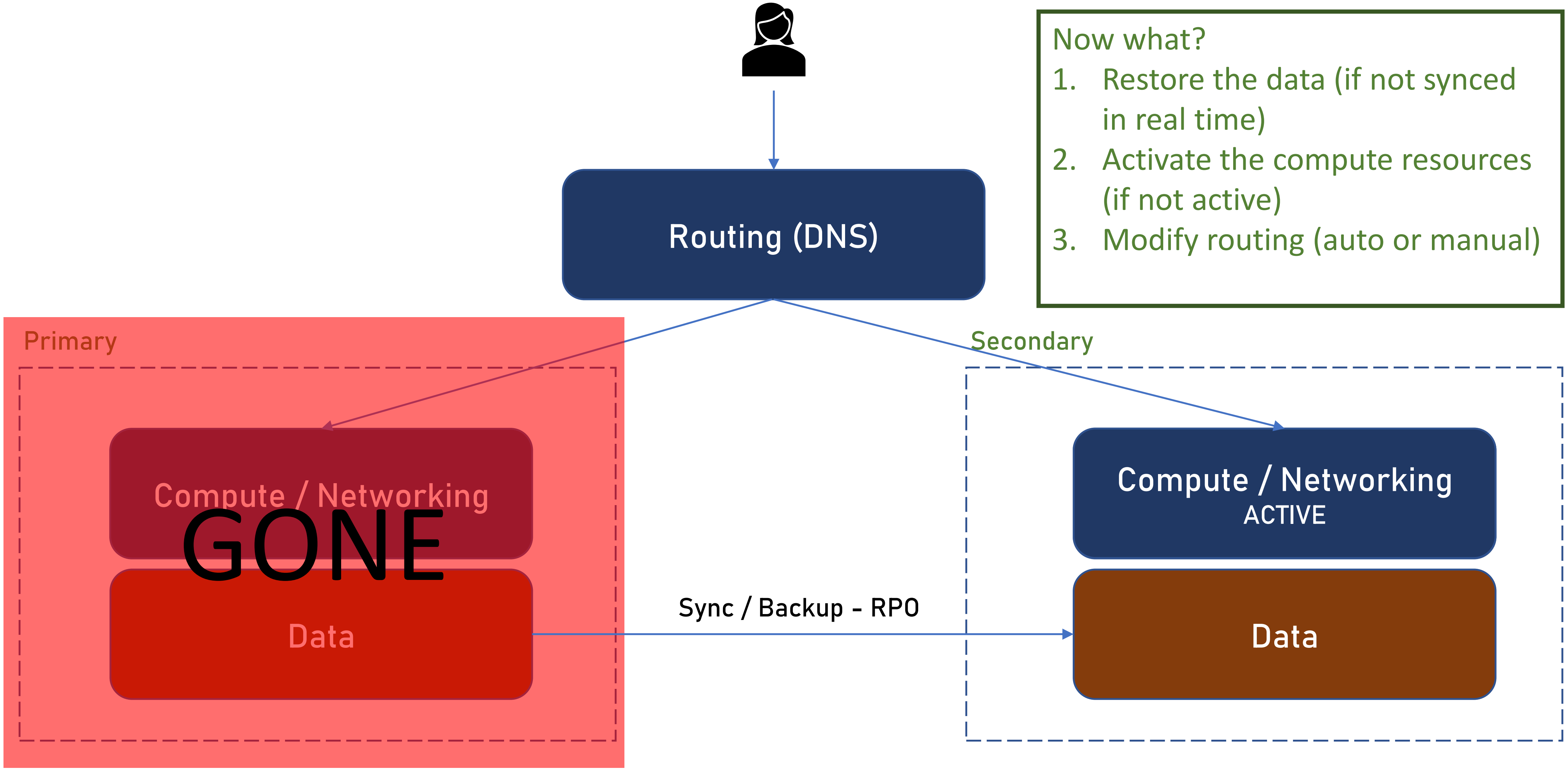
DR Concepts

- RPO and RTO– how to decide?
- Depends on the system's requirements
- A massive reporting system will probably go for low RPO, but can compromise on the RTO
- A global chat will focus on RTO

Basics of DR Implementation



Basics of DR Implementation



Now what?

1. Restore the data (if not synced in real time)
2. Activate the compute resources (if not active)
3. Modify routing (auto or manual)

DR of Data in Azure

- Main question when designing the DR of data is:

What is the RPO?

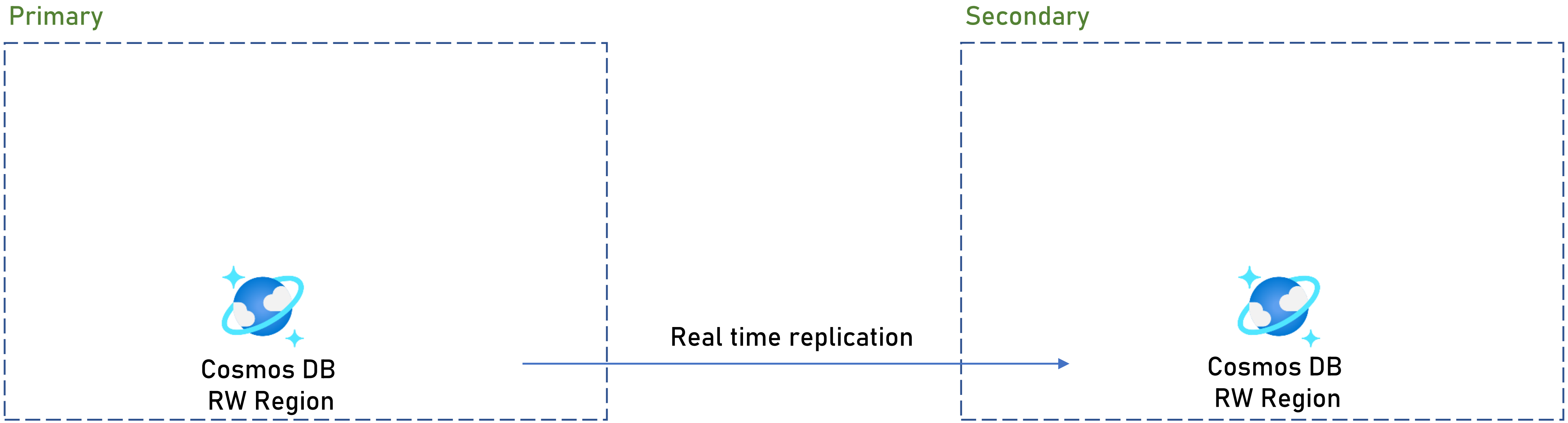
(Or – how much data loss do we tolerate?)

DR of Data in Azure

- If RPO = 0 (no data loss in case of disaster):
  - We need database that always syncs with the secondary region
  - Currently – three such databases in Azure:
    - Azure SQL (with Geo-Replication and Failover Group)
    - Cosmos DB (with multi-region account)
    - Azure Storage (with GRS redundancy)

DR of Data in Azure

RPO = 0



Primary

Secondary

Cosmos DB
RW Region

Real time replication

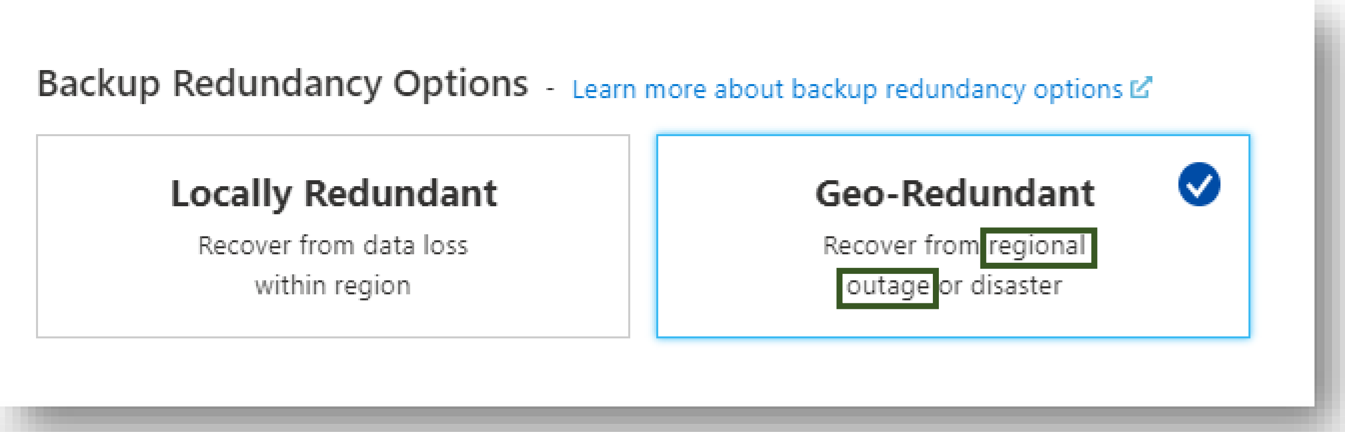
Cosmos DB
RW Region

DR of Data in Azure

- If RPO > 0 (some data can be lost):
  - Ensure DB’s backup frequency is compliant with the RPO
  - The backup storage should be GRS

DR of Data in Azure

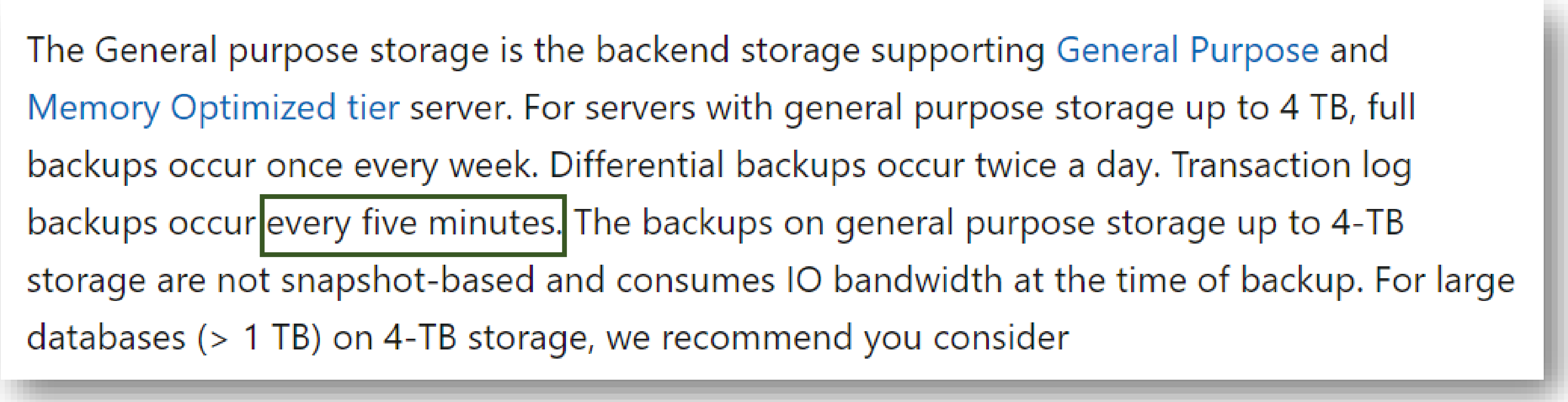
- Example – Azure MySQL:



Backup Redundancy Options - Learn more about backup redundancy options

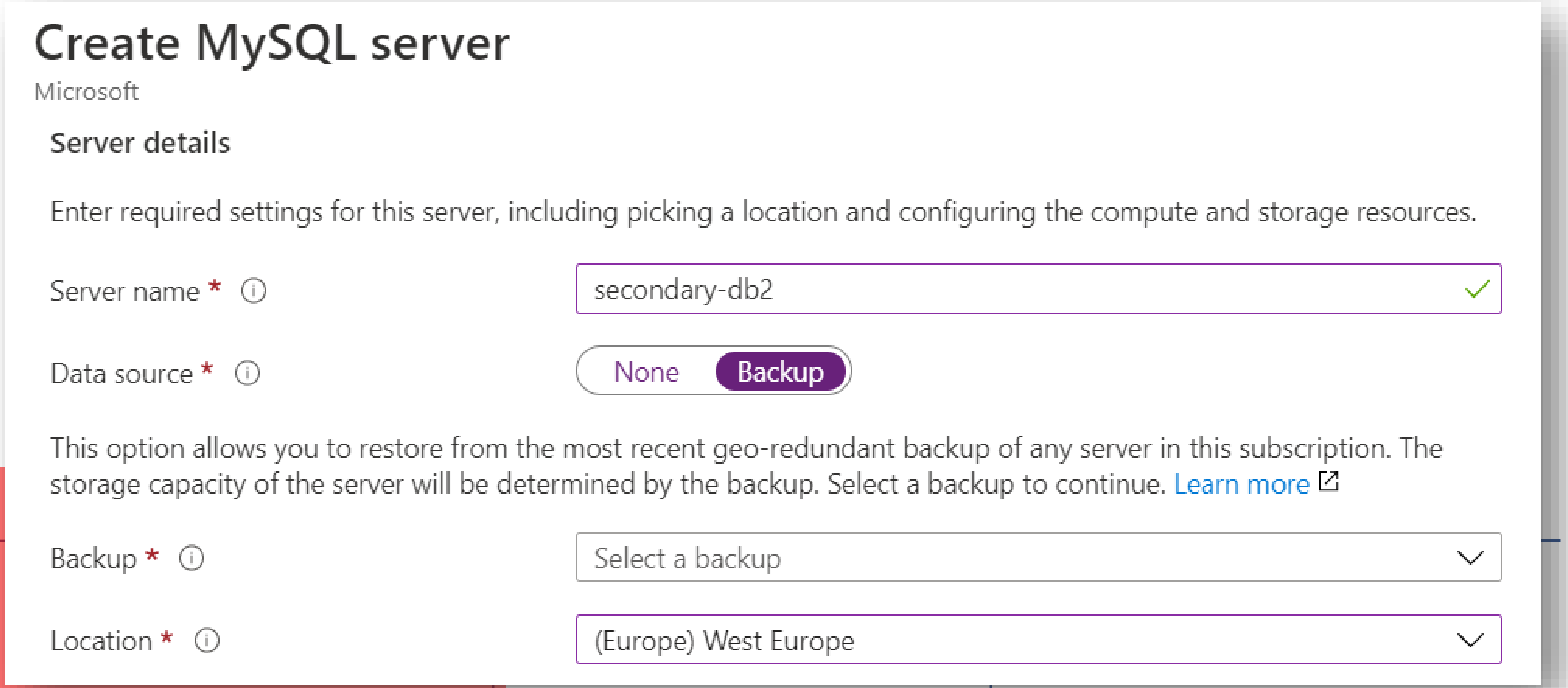
Locally Redundant
Recover from data loss within region

[✓ **Geo-Redundant**]
Recover from regional outage or disaster



The General purpose storage is the backend storage supporting General Purpose and Memory Optimized tier server. For servers with general purpose storage up to 4 TB, full backups occur once every week. Differential backups occur twice a day. Transaction log backups occur every five minutes. The backups on general purpose storage up to 4-TB storage are not snapshot-based and consumes IO bandwidth at the time of backup. For large databases (> 1 TB) on 4-TB storage, we recommend you consider

DR of Data in Azure



Create MySQL server

Microsoft

Server details

Enter required settings for this server, including picking a location and configuring the compute and storage resources.

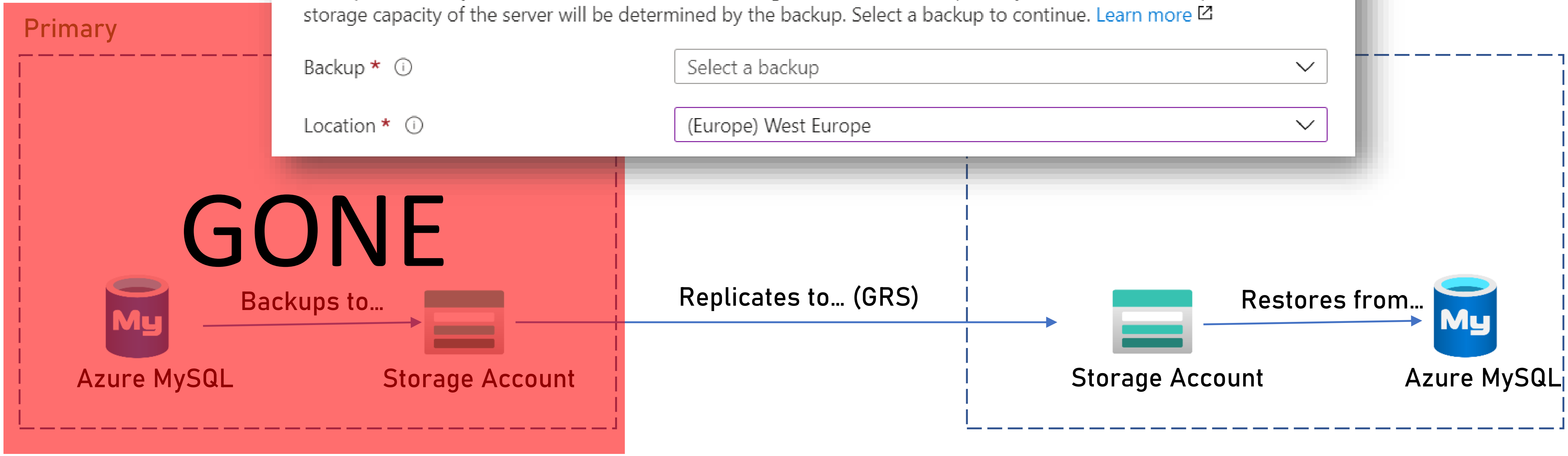
Server name * ⓘ secondary-db2 ✓

Data source * ⓘ None [✓ Backup]

This option allows you to restore from the most recent geo-redundant backup of any server in this subscription. The storage capacity of the server will be determined by the backup. Select a backup to continue. Learn more

Backup * ⓘ Select a backup

Location * ⓘ (Europe) West Europe



DR of Data in Azure

- Note that:
  - The RPO in the previous example is minimum 5 minutes (the backup frequency)
  - The second example is much cheaper, no secondary active database is needed when primary is active

DR of Compute in Azure

- Main question when designing the DR of compute is:

What is the RTO?

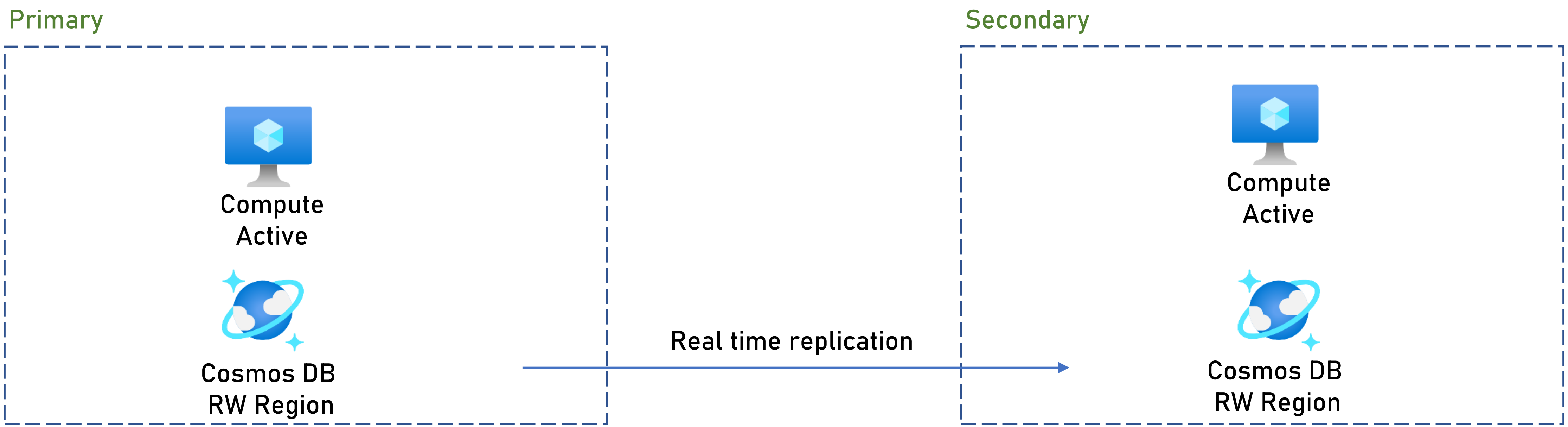
(Or – how much downtime can we tolerate?)

DR of Compute in Azure

- If RTO = 0 (no downtime in case of disaster):
    - Compute in secondary region should always be up and running

DR of Compute in Azure

RTO = 0



Primary

Compute
Active

Cosmos DB
RW Region

Real time replication

Secondary

Compute
Active

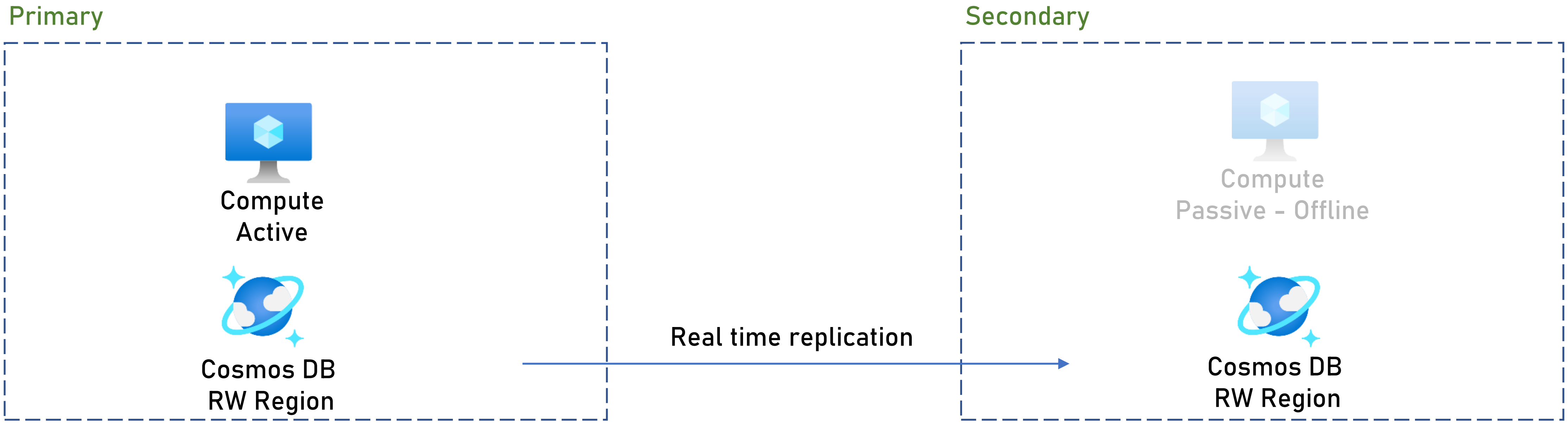
Cosmos DB
RW Region

DR of Compute in Azure

- If RTO > 0 (some downtime is tolerated):
  - Either:
    - Have non-active (passive) compute on standby in secondary region
    - Create the compute when disaster occurs in secondary region

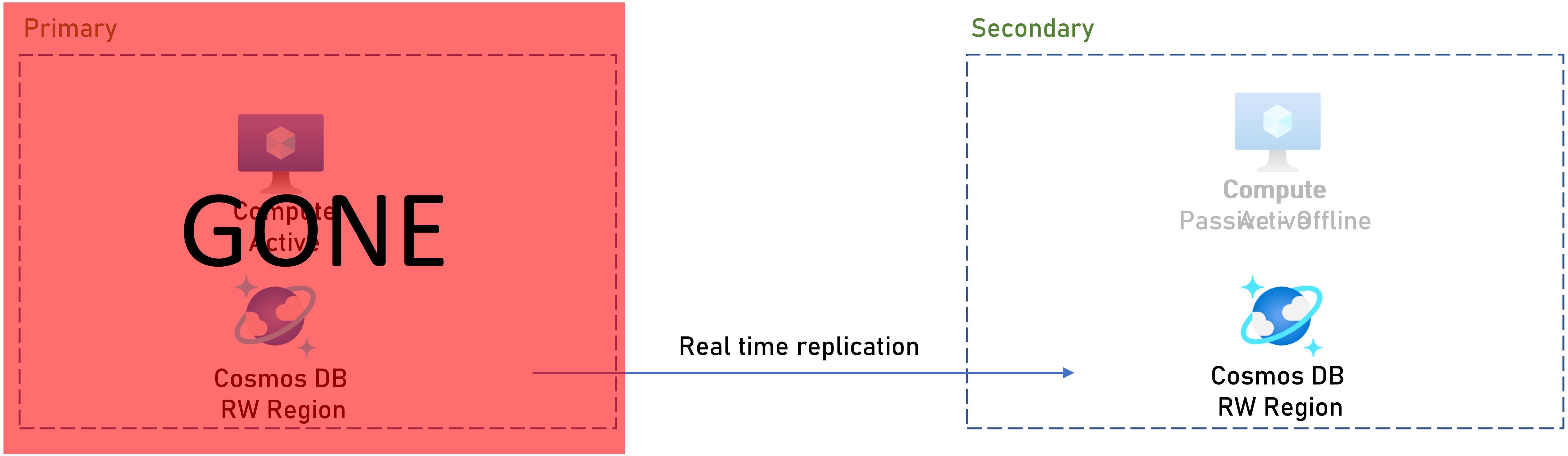
DR of Compute in Azure

RTO > 0



DR of Compute in Azure

RTO > 0



DR of Compute in Azure

- Note that:
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Routing in DR

- During DR users should be routed to the secondary region

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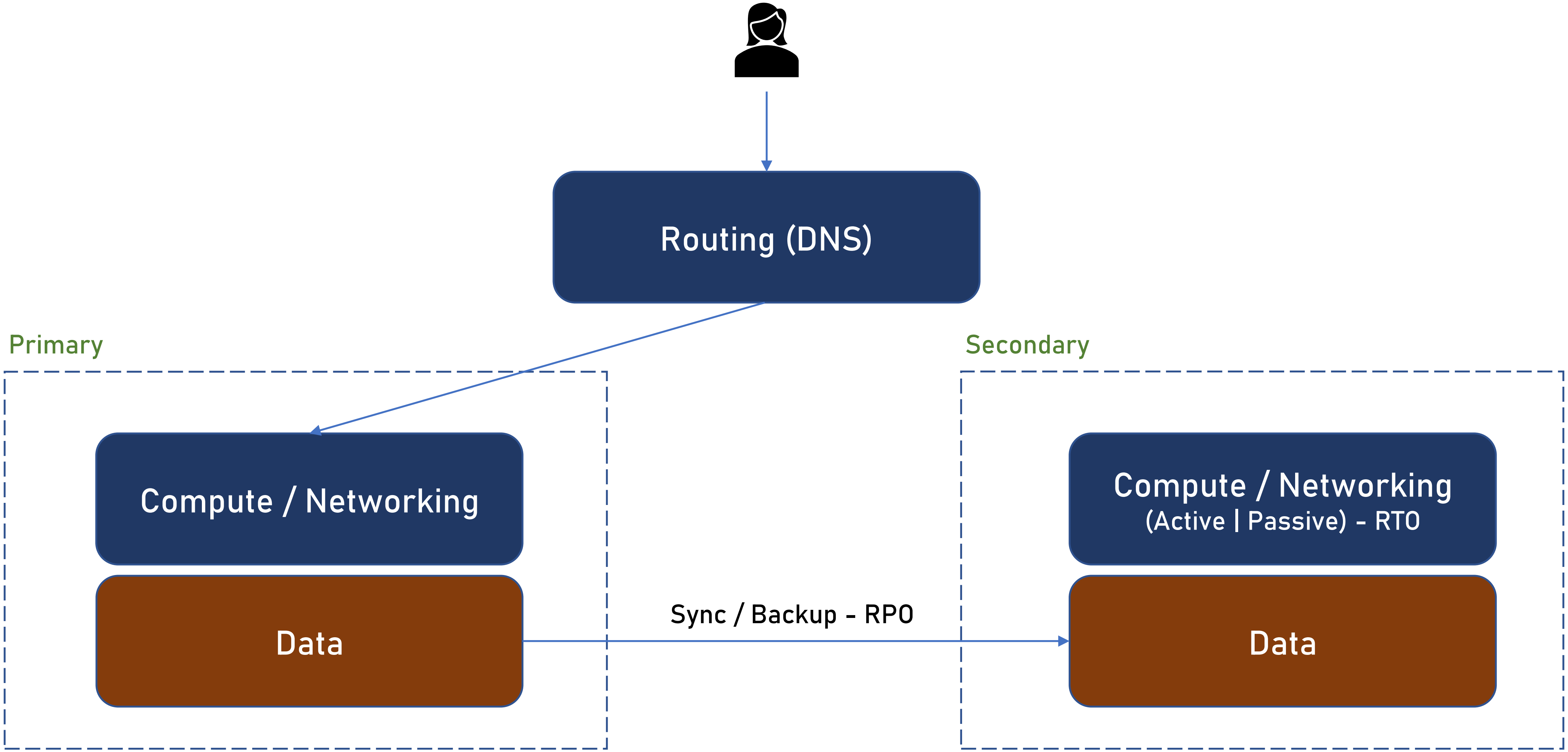


Routing (DNS)

Primary

Compute / Networking

Data

Sync / Backup - RPO

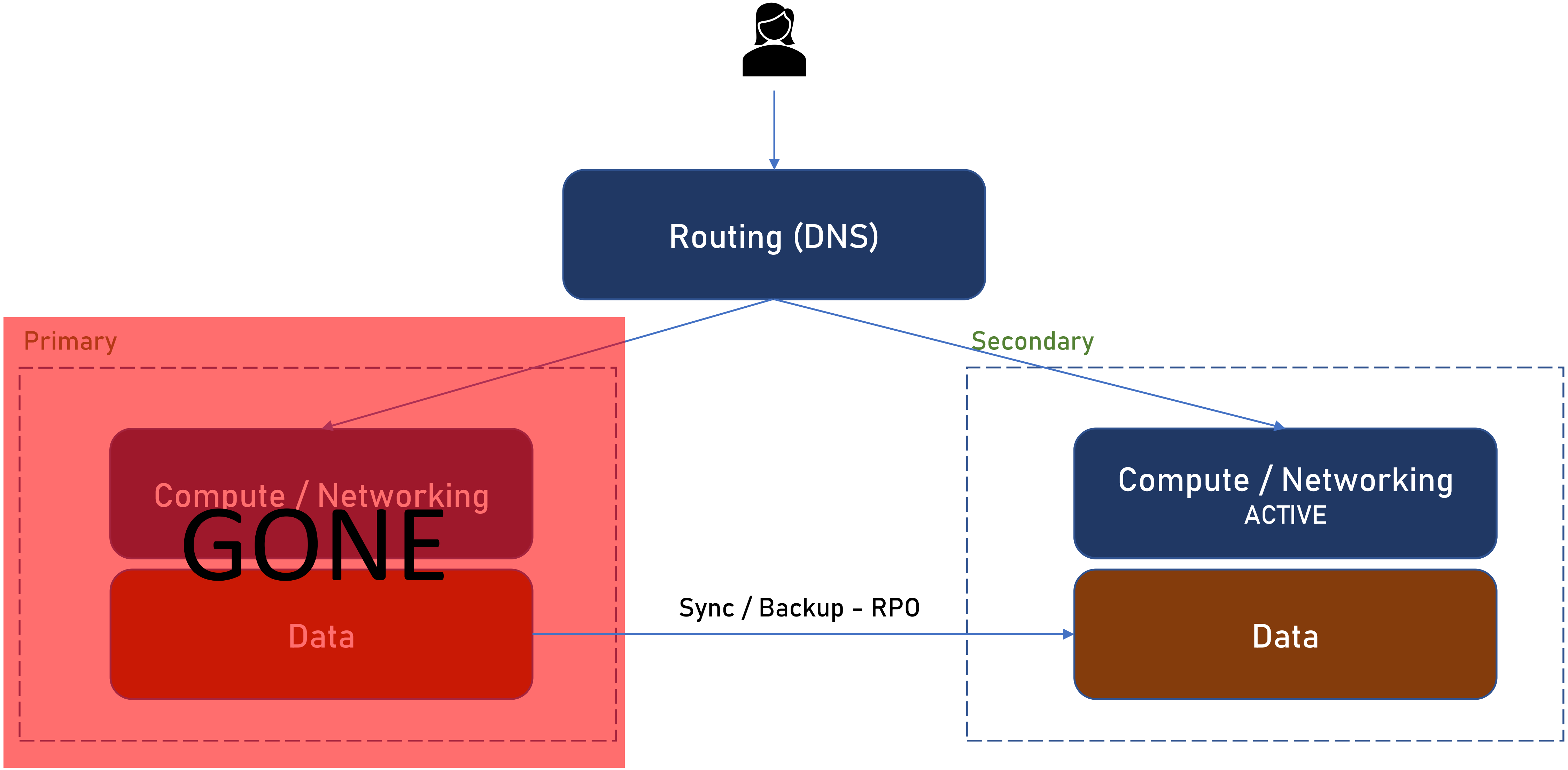
Secondary

Compute / Networking

(Active | Passive) - RTO

Data

Basics of DR Implementation



Routing in DR

- Major three methods:
  - Inform the users about the new address of the app (in the secondary region)
  - Manually change DNS record to point to the secondary region
  - Use automatic routing

Routing in DR

- Azure has two automatic routing services

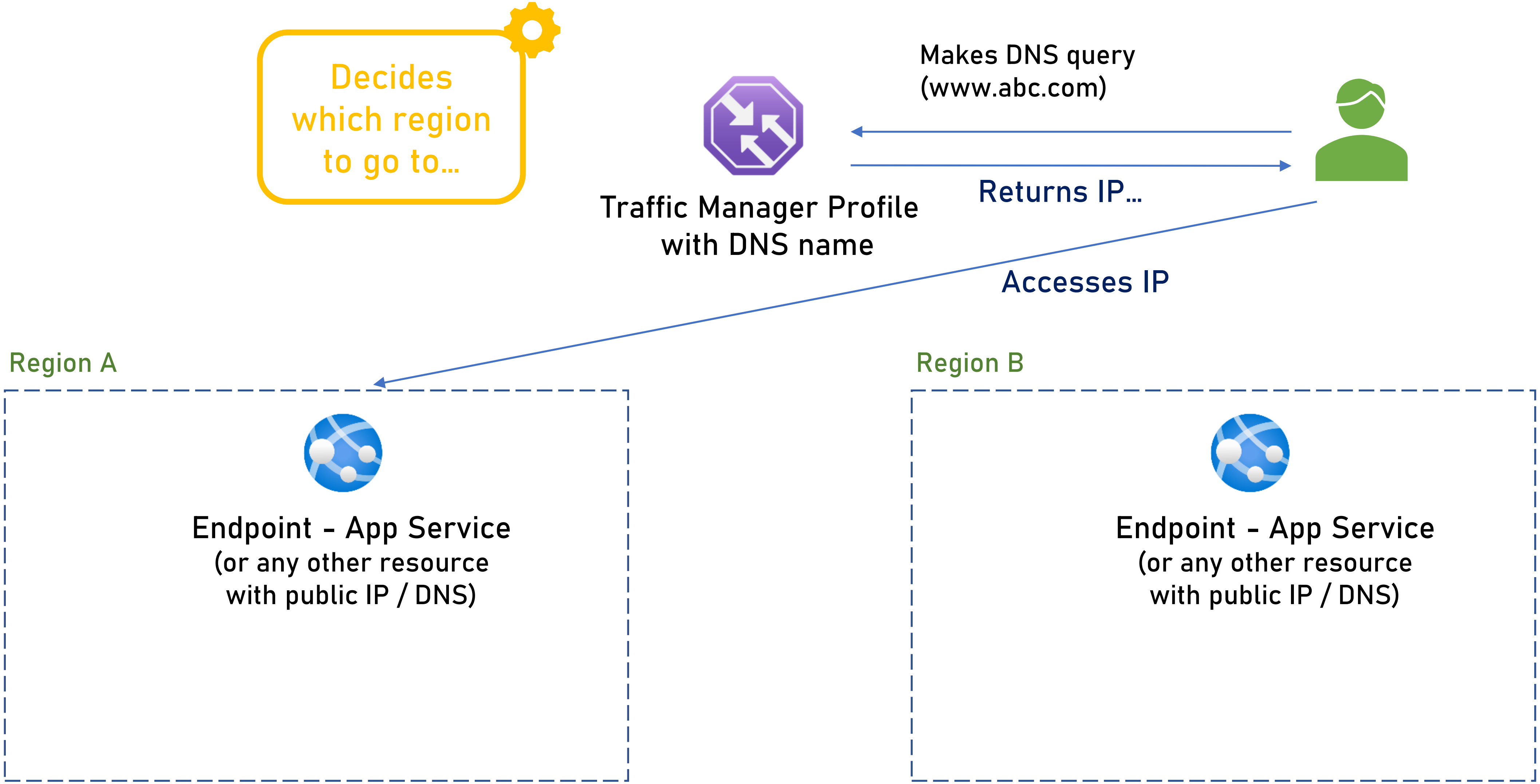
Traffic Manager

Front Door

Azure Traffic Manager

- DNS-based traffic load balancer
- Enables traffic distribution across global Azure regions
- Provides high availability and responsiveness

How Does Azure Traffic Manager Work?



Decides which region to go to…

Makes DNS query (www.abc.com)

Traffic Manager Profile with DNS name

Returns IP…

Accesses IP

Region A

Endpoint - App Service (or any other resource with public IP / DNS)

Region B

Endpoint - App Service (or any other resource with public IP / DNS)

Routing Algorithms

Priority → Always use primary service, when it’s down – using backup endpoints (That’s the DR…)

Weighted → Distribute traffic across endpoints according to weights defined by you

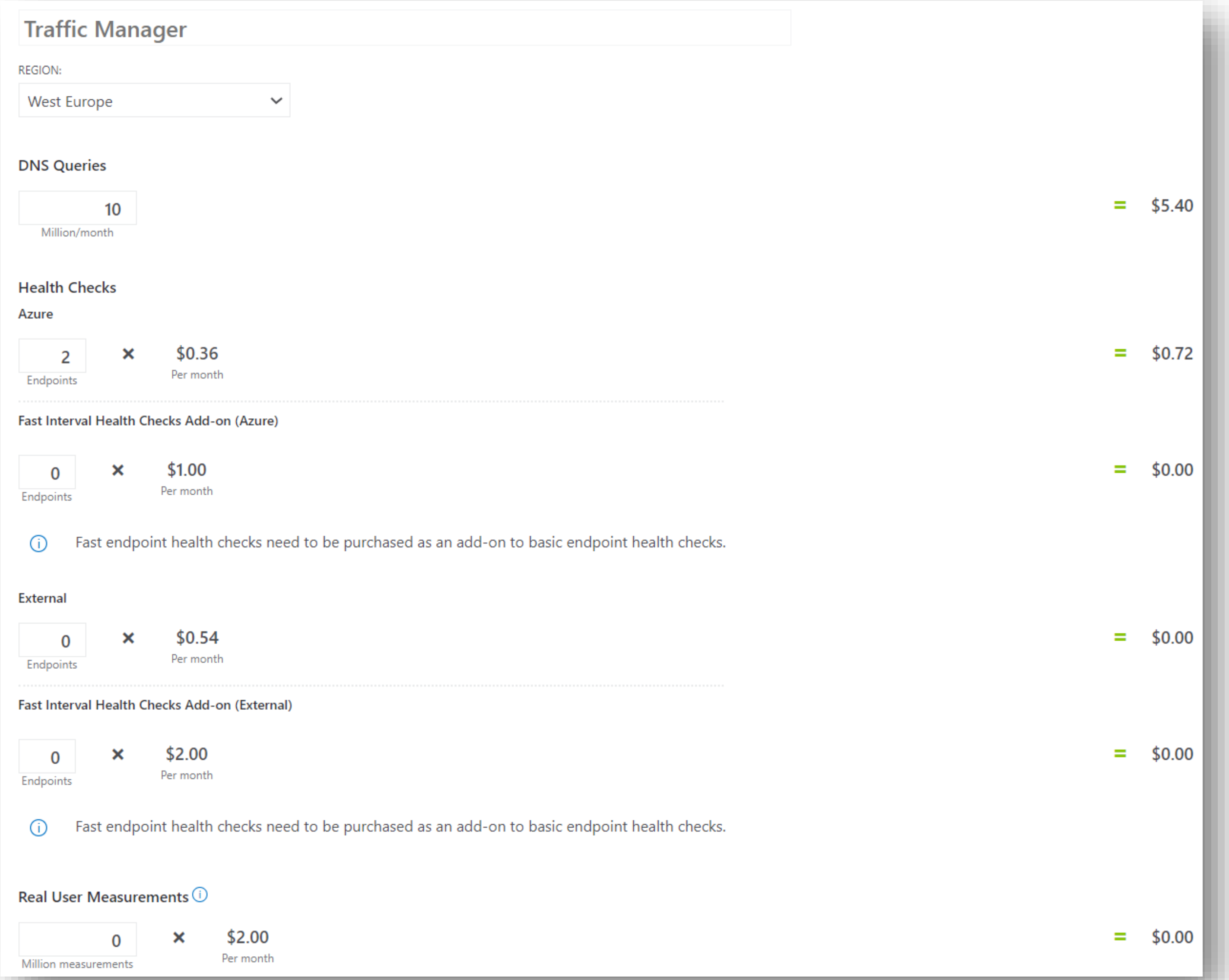
Performance → Use the closest region to improve latency

Geographic → Direct traffic to specific geography based on the location of the DNS query

Multivalue → Returns list of healthy endpoints so the client can choose what to do with them

Subnet → Map source IP to endpoint

Traffic Manager Pricing



Traffic Manager

REGION:

West Europe

DNS Queries

10 Million/month = $5.40

Health Checks

Azure

2 Endpoints × $0.36 Per month = $0.72

Fast Interval Health Checks Add-on (Azure)

0 Endpoints × $1.00 Per month = $0.00

ⓘ Fast endpoint health checks need to be purchased as an add-on to basic endpoint health checks.

External

0 Endpoints × $0.54 Per month = $0.00

Fast Interval Health Checks Add-on (External)

0 Endpoints × $2.00 Per month = $0.00

ⓘ Fast endpoint health checks need to be purchased as an add-on to basic endpoint health checks.

Real User Measurements ⓘ

0 Million measurements × $2.00 Per month = $0.00

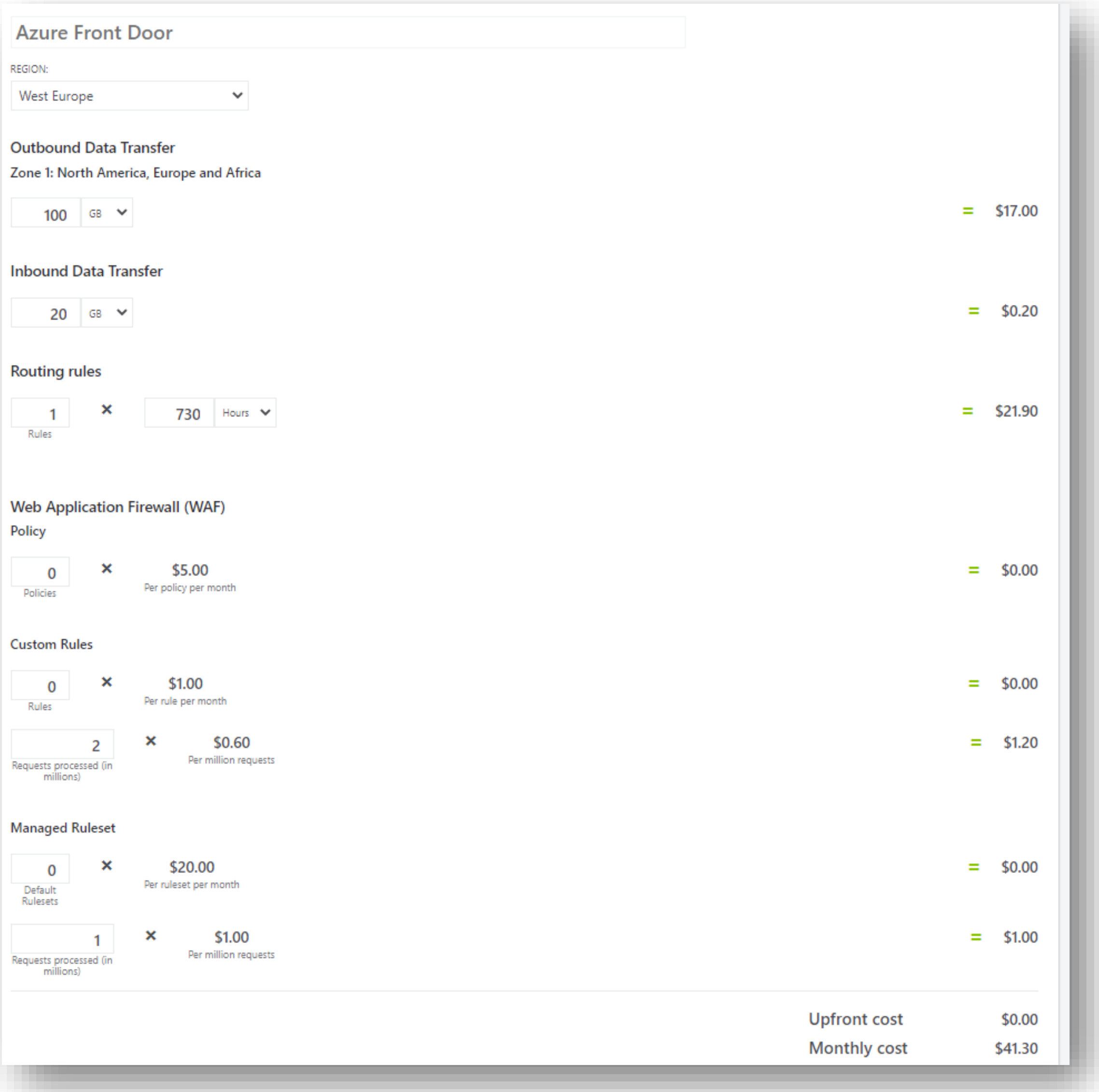
Azure Front Door

- Global entry point for web apps
- Works on Layer 7 (HTTP/HTTPS)
- Multiple routing methods
- Similar to Application Gateway but in global scale

Azure Front Door Features

- URL-path based routing
- Session affinity
- SSL Offloading
- Web Application Firewall (WAF) integration
- URL Rewrites
- HTTP/2 support

Azure Front Door Pricing



Azure Front Door

REGION:

West Europe

Outbound Data Transfer

Zone 1: North America, Europe and Africa

100 GB = $17.00

Inbound Data Transfer

20 GB = $0.20

Routing rules

1 Rules × 730 Hours = $21.90

Web Application Firewall (WAF)

Policy

0 Policies × $5.00 Per policy per month = $0.00

Custom Rules

0 Rules × $1.00 Per rule per month = $0.00

2 Requests processed (in millions) × $0.60 Per million requests = $1.20

Managed Ruleset

0 Default Rulesets × $20.00 Per ruleset per month = $0.00

1 Requests processed (in millions) × $1.00 Per million requests = $1.00

Upfront cost $0.00

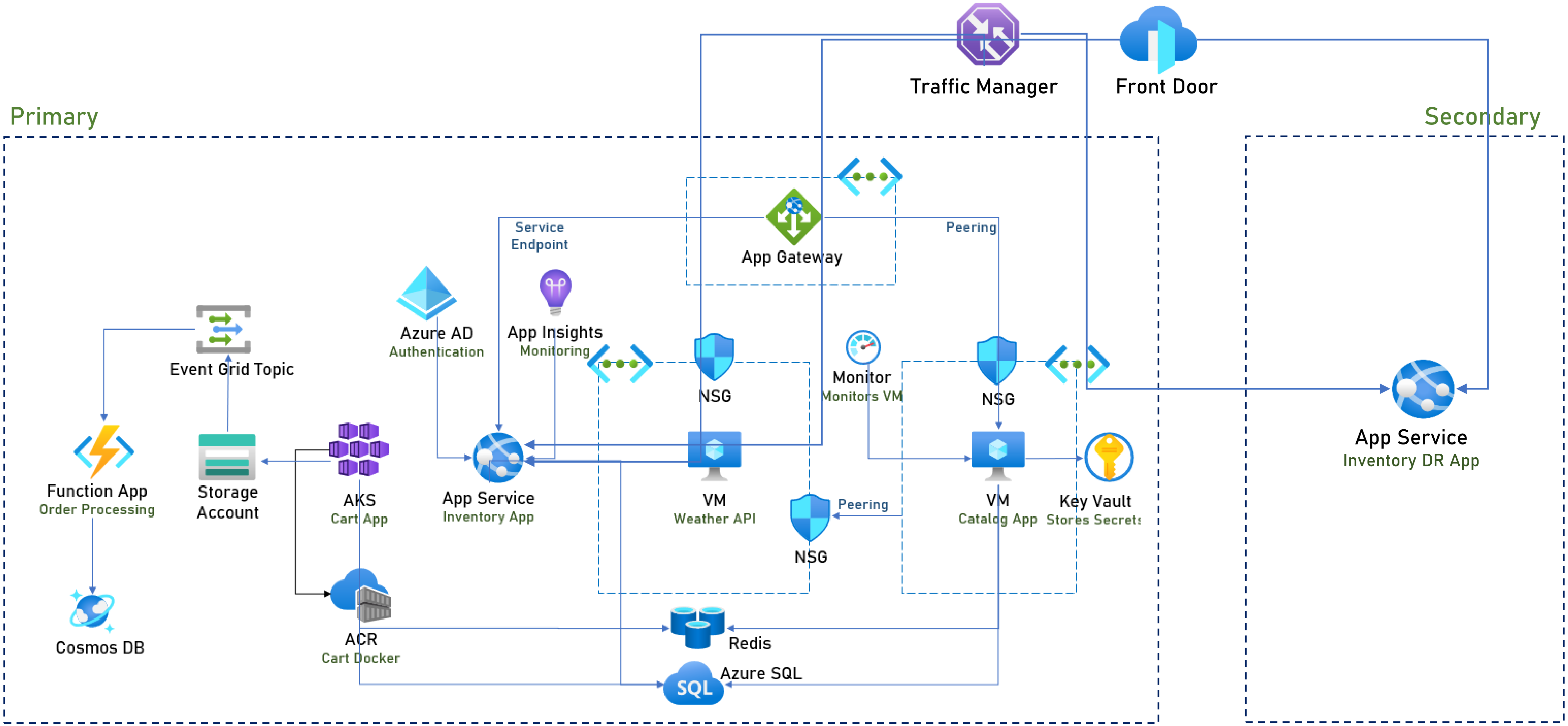
Monthly cost $41.30

Traffic Manager vs Front Door

- Which one to choose?
- Generally – if you need HTTP-related capabilities go with Front Door
- Examples:
  - URL-path based routing
  - SSL Offloading
  - Web Application Firewall
- Otherwise – go with Traffic Manager, usually cheaper

ReadIt!

Cloud Architecture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