ArchitectNow

WORKSHOP:

Building Resilient Cloud Applications – Exploring Modern Cloud Designs

PRESENTED BY

Alex Will &
Kevin Grossnicklaus

info@architectnow.net
www.architectnow.net

ArchitectNow

TRANSFORMATION THROUGH TECHNOLOGY

WELCOME TO ARCHITECTNOW

Whether launching new Cloud or mobile apps or modernizing your legacy platforms we can help you identify the best options and work with you on bringing those ideas to life. To get the ball rolling, reach out and tell us a bit about your needs and we can start identifying solutions. There is no risk and we can quickly get to the point of providing initial ideas along with rough estimates of the costs and implementation times required with various recommendations.

info@architectnow.net
www.architectnow.net

ArchitectNow

ArchitectNow

CONTACT INFORMATION

Kevin Grossnicklaus
President
ArchitectNow
kvgros@architectnow.net
LinkedIn
@kvgros

Alex Will
Chief Technology Officer
ArchitectNow
awill@architectnow.net
LinkedIn
YouTube
@alwill_dotnet

www.ArchitectNow.net
@architectnow
LinkedIn

ArchitectNow

EXPECTATIONS AND AGENDA

- Agenda
  - Intro
  - Basics
  - Event Driven Design
  - Data-Centric
  - Serverless
  - Low Code/No Code
  - Microservices
  - Best Practices
  - Case Study
  - Q&A/Conclusion

What are we going to discuss?

How deep are we going?

How can I get help and advice?

Are you going to focus on the “why” or the “how” to move to Azure?

ArchitectNow

ArchitectNow

Introduction

What do we consider “Legacy”?

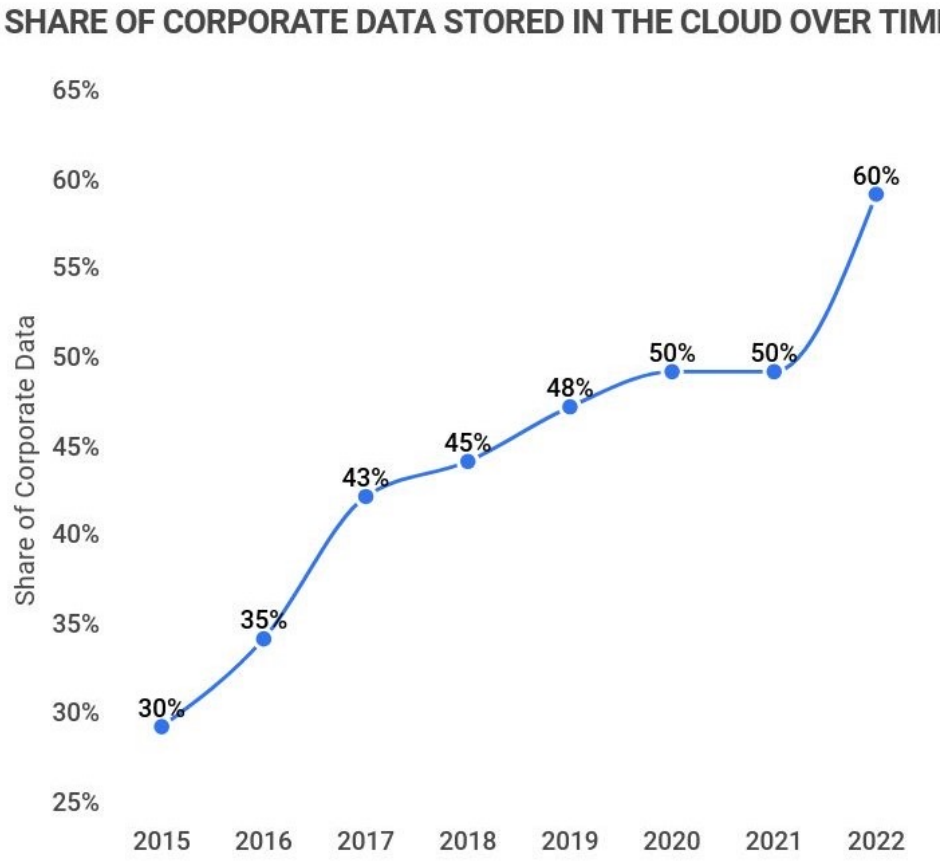
What do we consider “Cloud Native”?

Why Cloud Computing?

- More tools
- Faster to fail and succeed
- Design for Failure
- Increase Collaboration
- Focus on what you do best

ArchitectNow

Importance of Cloud Computing



Source: Zappia https://www.zippia.com/advice/cloud-adoption-statistics/

- Increasing demand of Cloud Knowledge
- Faster to Market time
- Spend over time not upfront
- CAPEX VS OPEX

ArchitectNow

Importance of Cloud Computing

Bare Metal

Virtualization

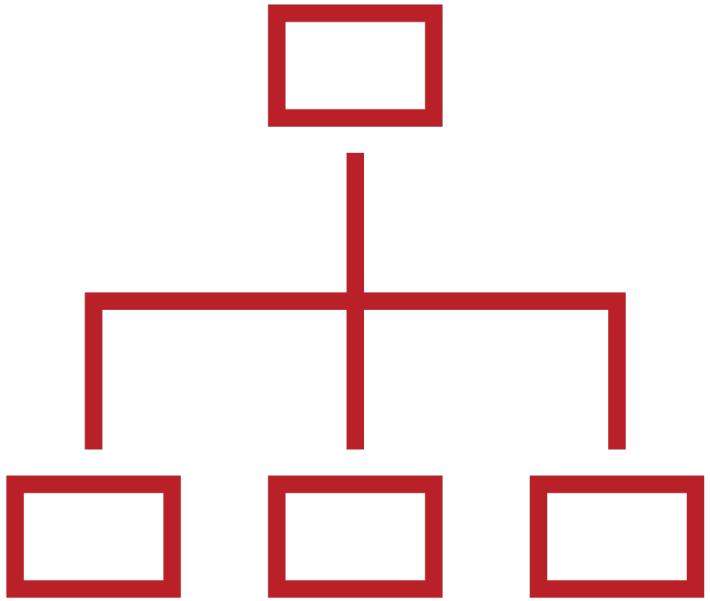
Cloud

ArchitectNow

Infrastructure as a Service (IaaS)	• Give me access low level VM's and OS's and I'll handle configuring everything myself
Platform as a Service (PaaS)	• I want to deploy code and let someone else handle the configuration, maintenance, and uptime of the infrastructure
Software as a Service (SaaS)	• Pre-built software or services exposed as API's for development teams to utilize

ArchitectNow

Why do we need Design Patterns?

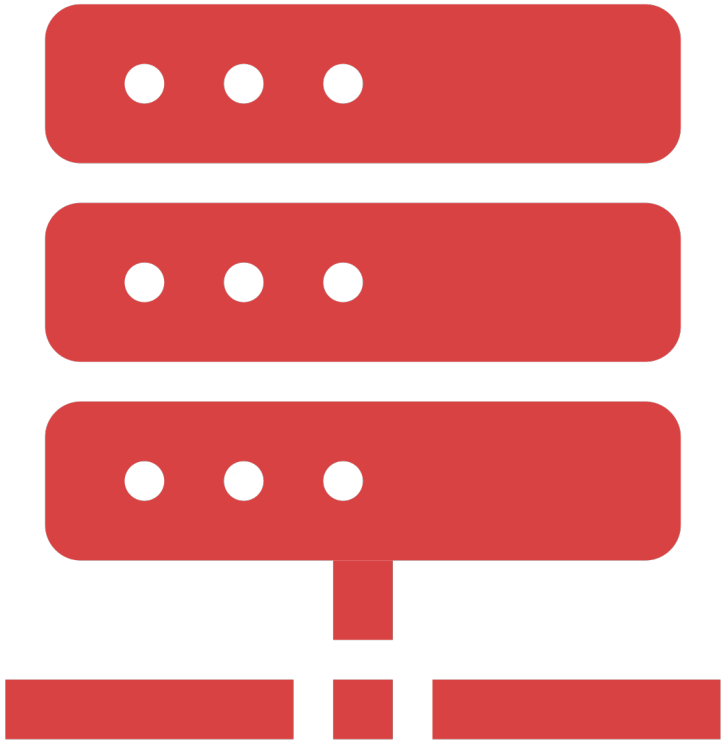


- Reliability
- Security
- Cost Optimization
- DevOps
- Efficiency

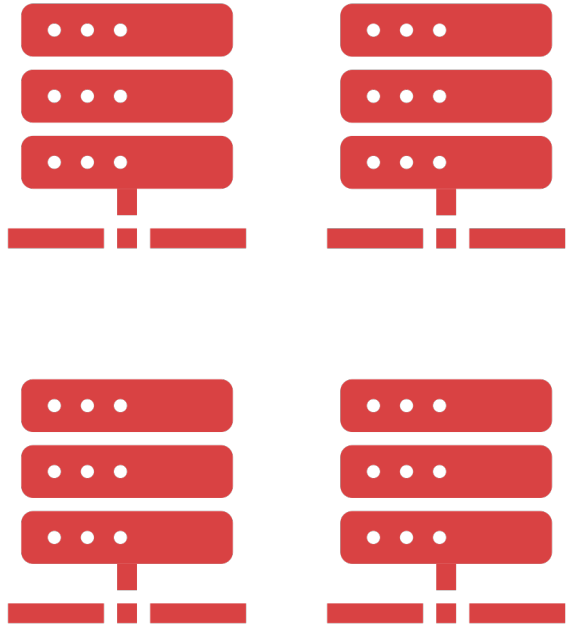
ARCHITECTURE AND DESIGN BASICS

ArchitectNow

Vertical

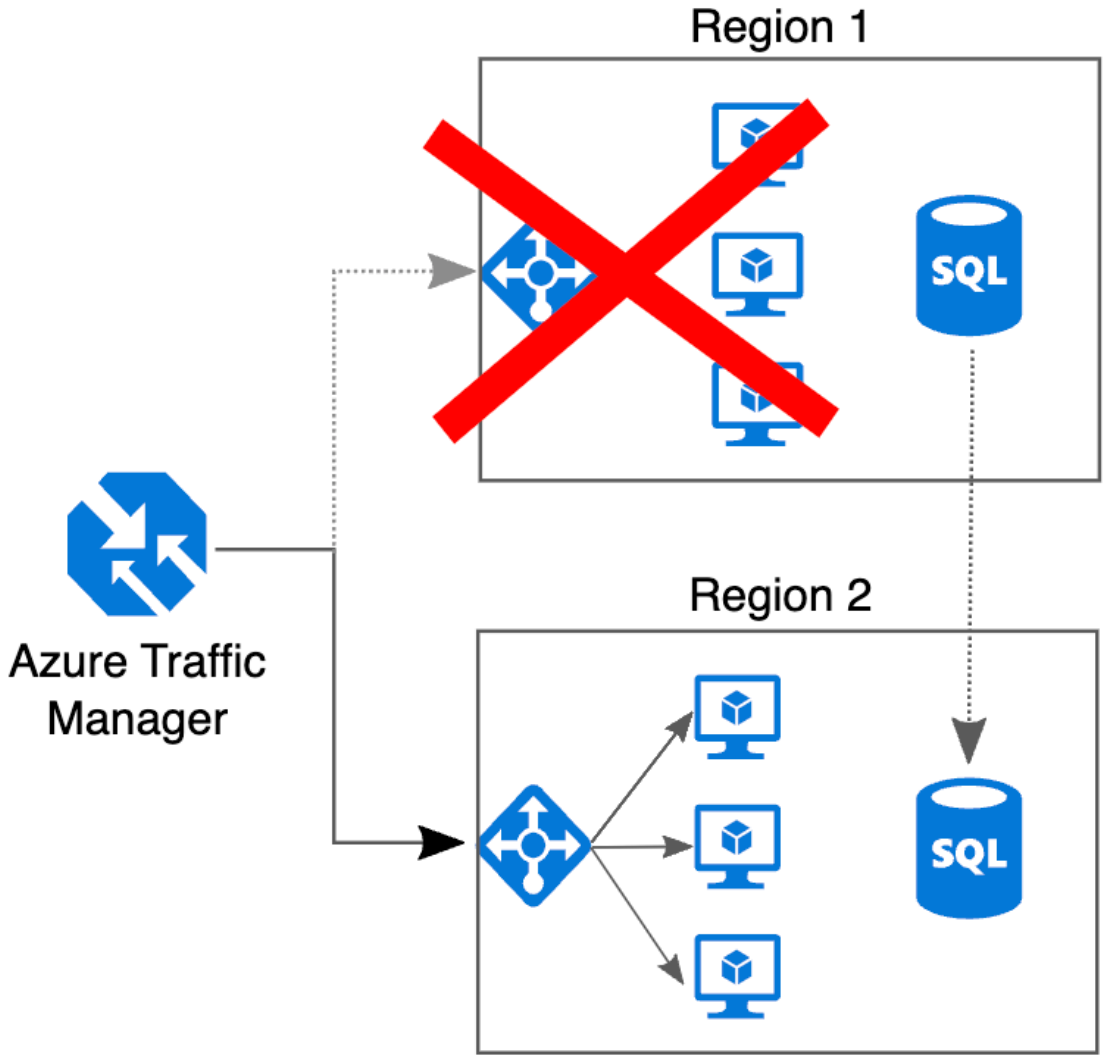


Horizontal



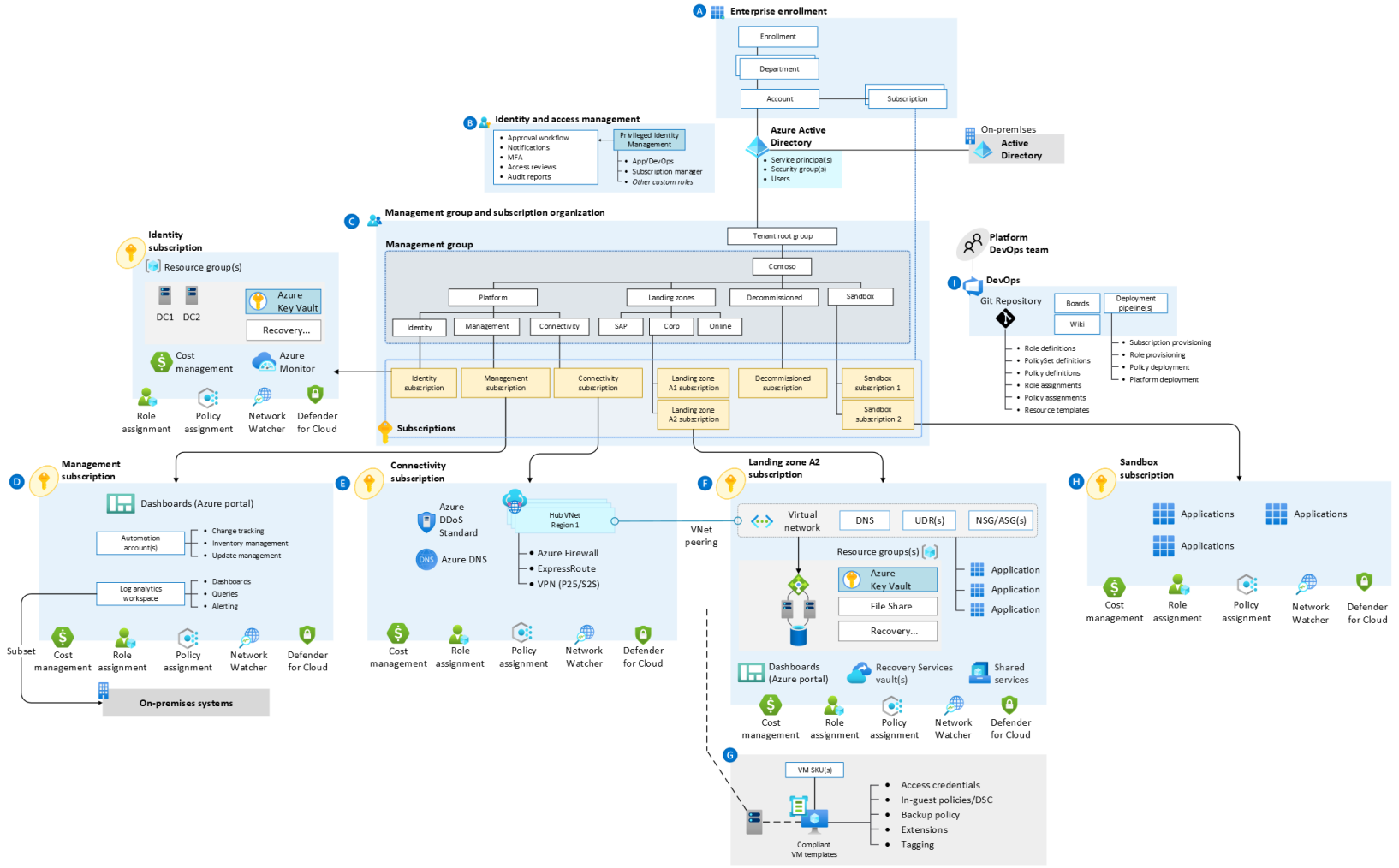
ArchitectNow

Reliability



Source: https://learn.microsoft.com/en-us/azure/architecture/guide/design-principles/redundancy

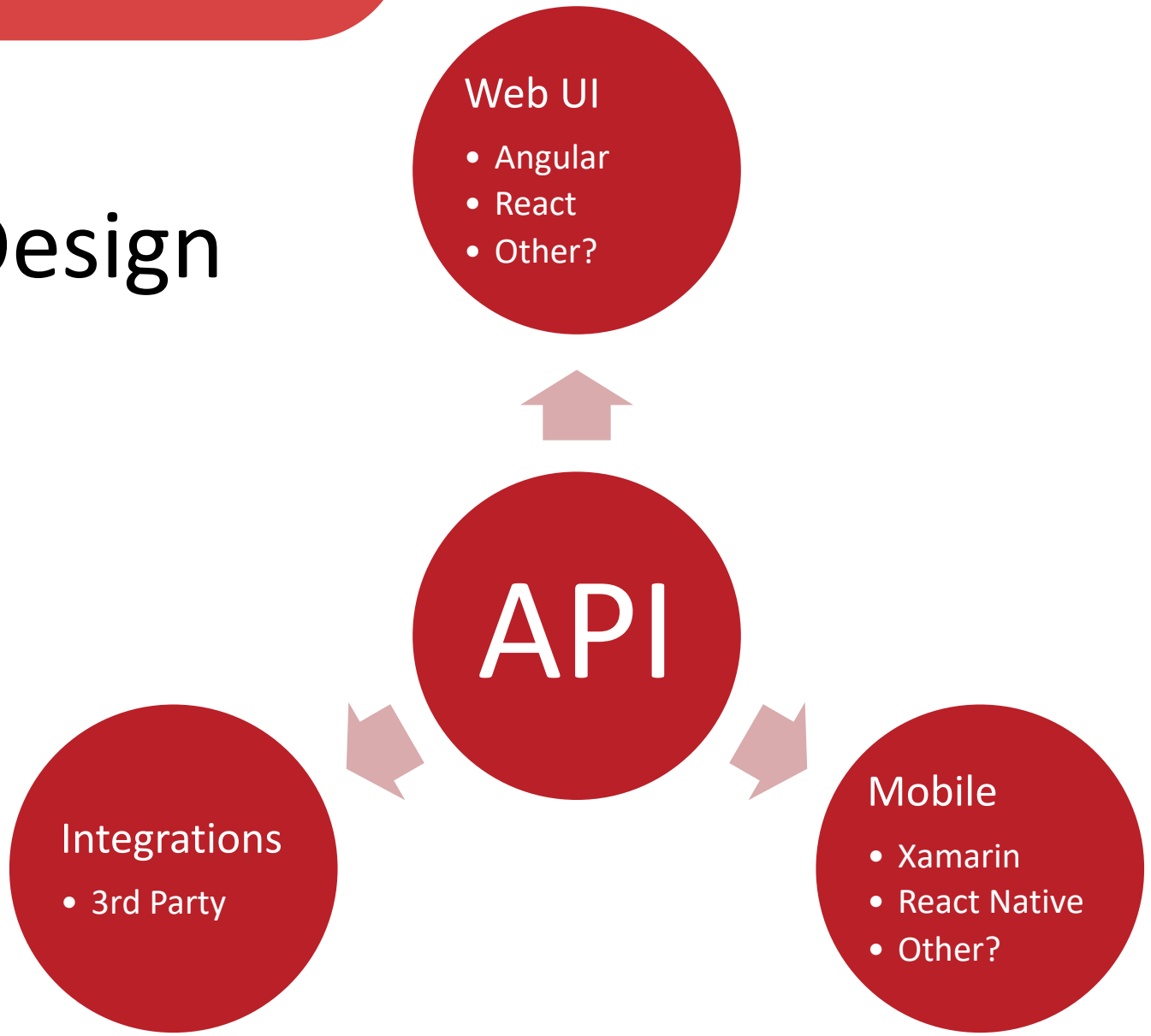
Security

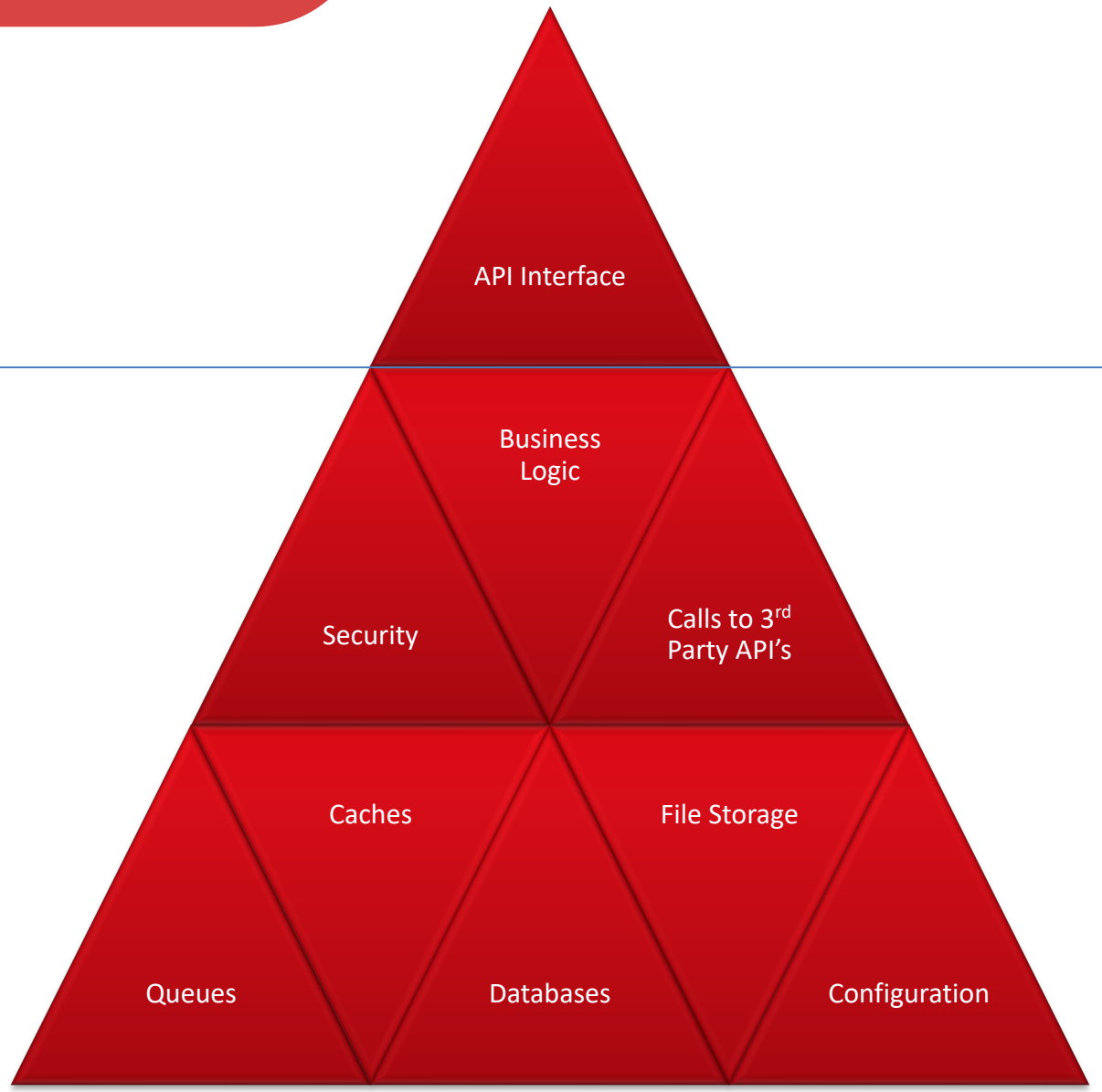


https://learn.microsoft.com/en-us/azure/cloud-adoption-framework/secure/infrastructure-security-architecture

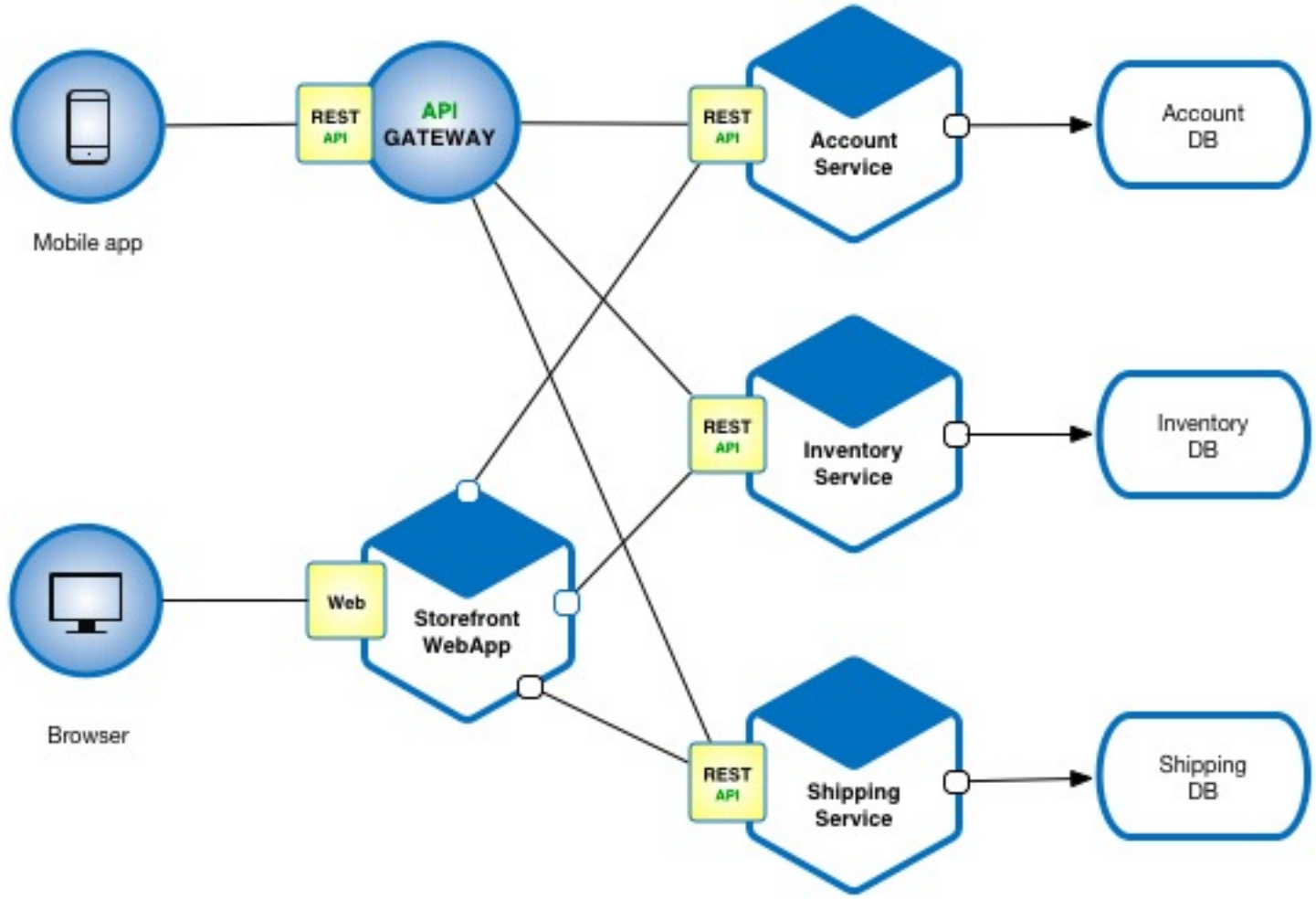
ArchitectNow

Modular Design





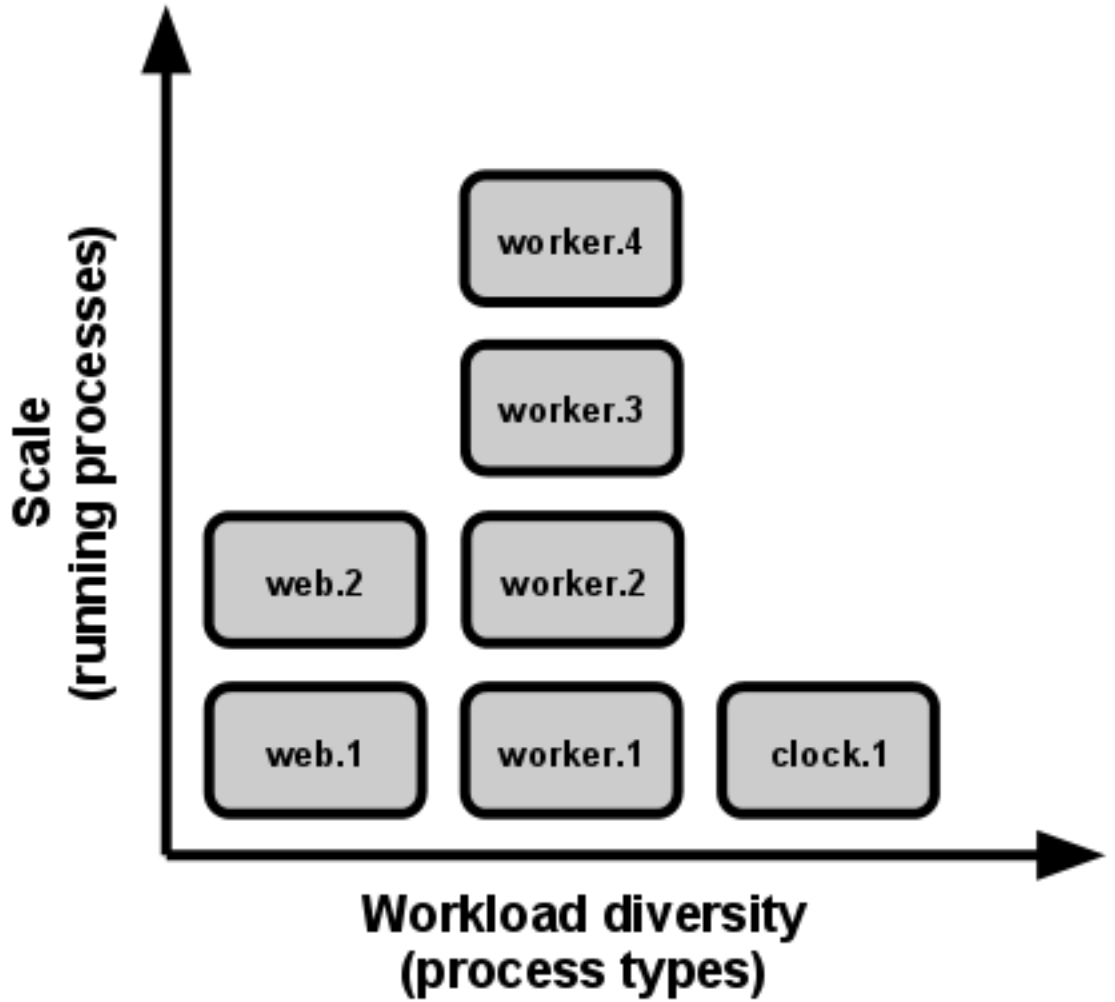
ArchitectNow



ArchitectNow

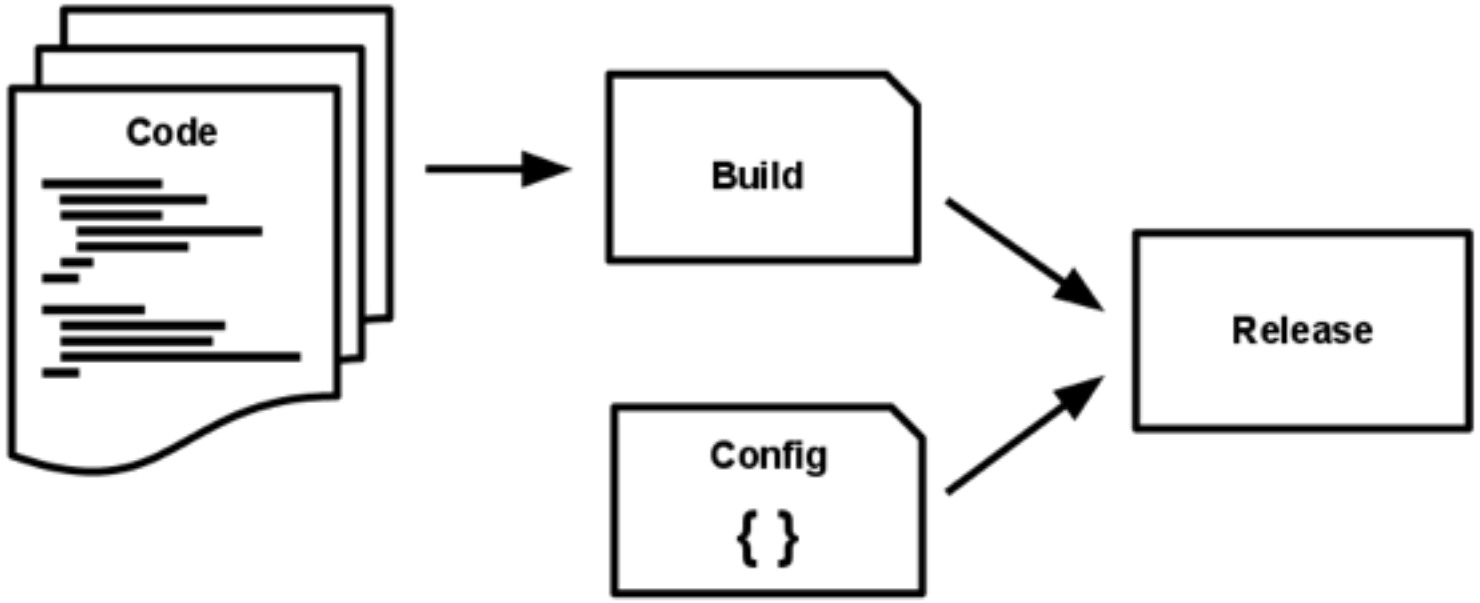
The Twelve-Factor App

ArchitectNow



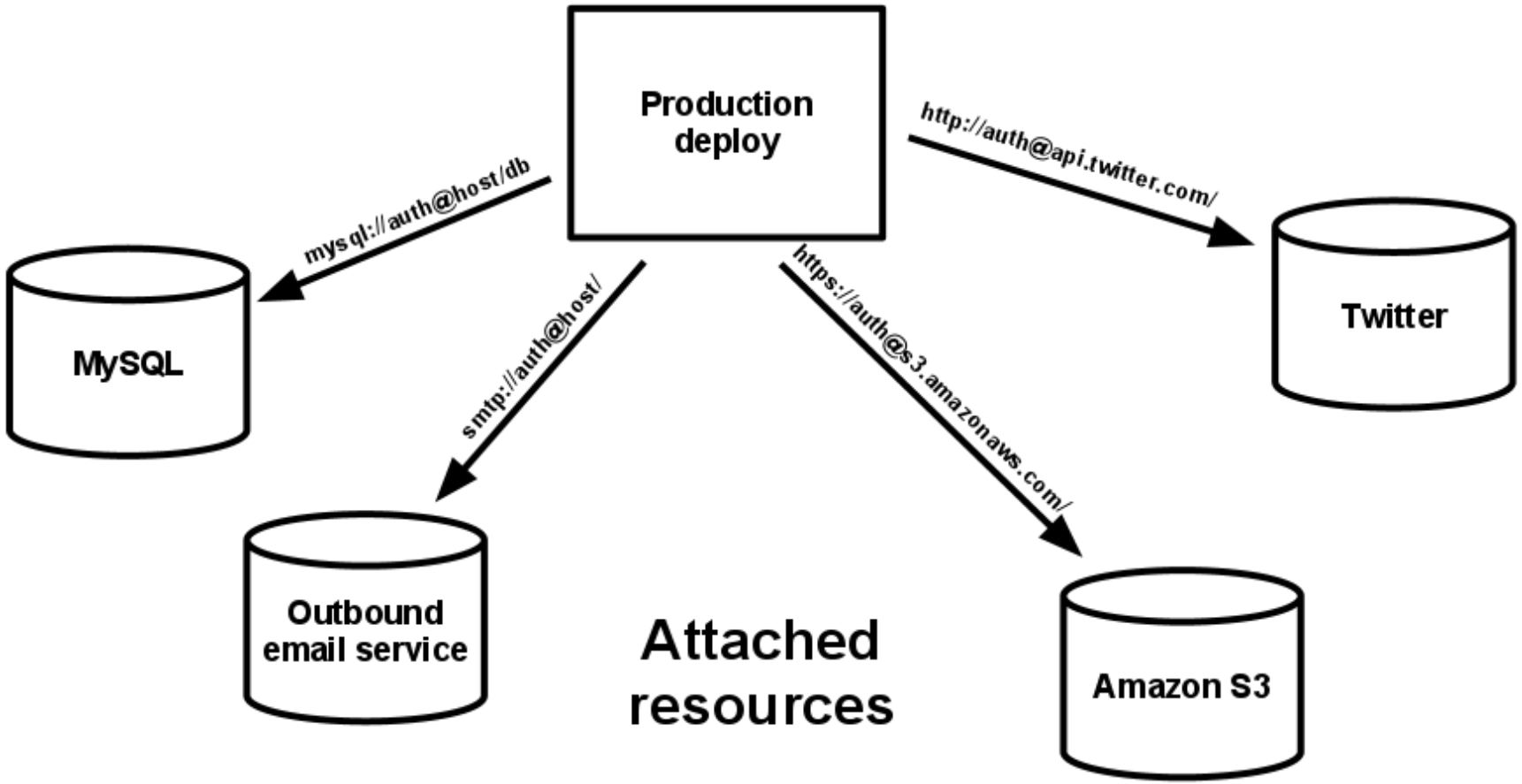
https://12factor.net/

ArchitectNow



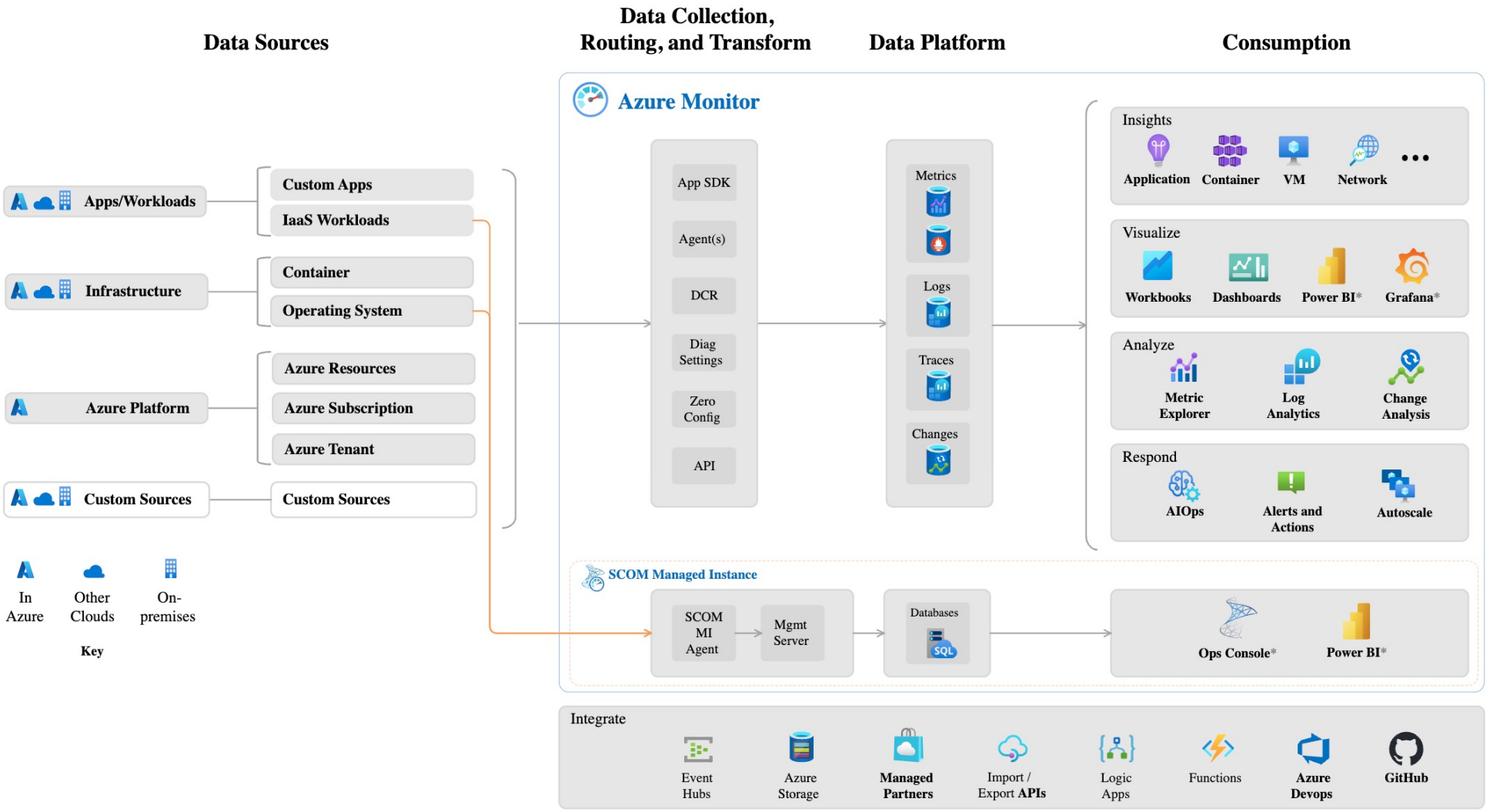
https://12factor.net/

ArchitectNow


Production deploy
mysql://auth@host/db
MySQL
http://auth@api.twitter.com/
Twitter
smtp://auth@host/
Outbound email service
https://auth@s3.amazonaws.com/
Amazon S3
Attached resources

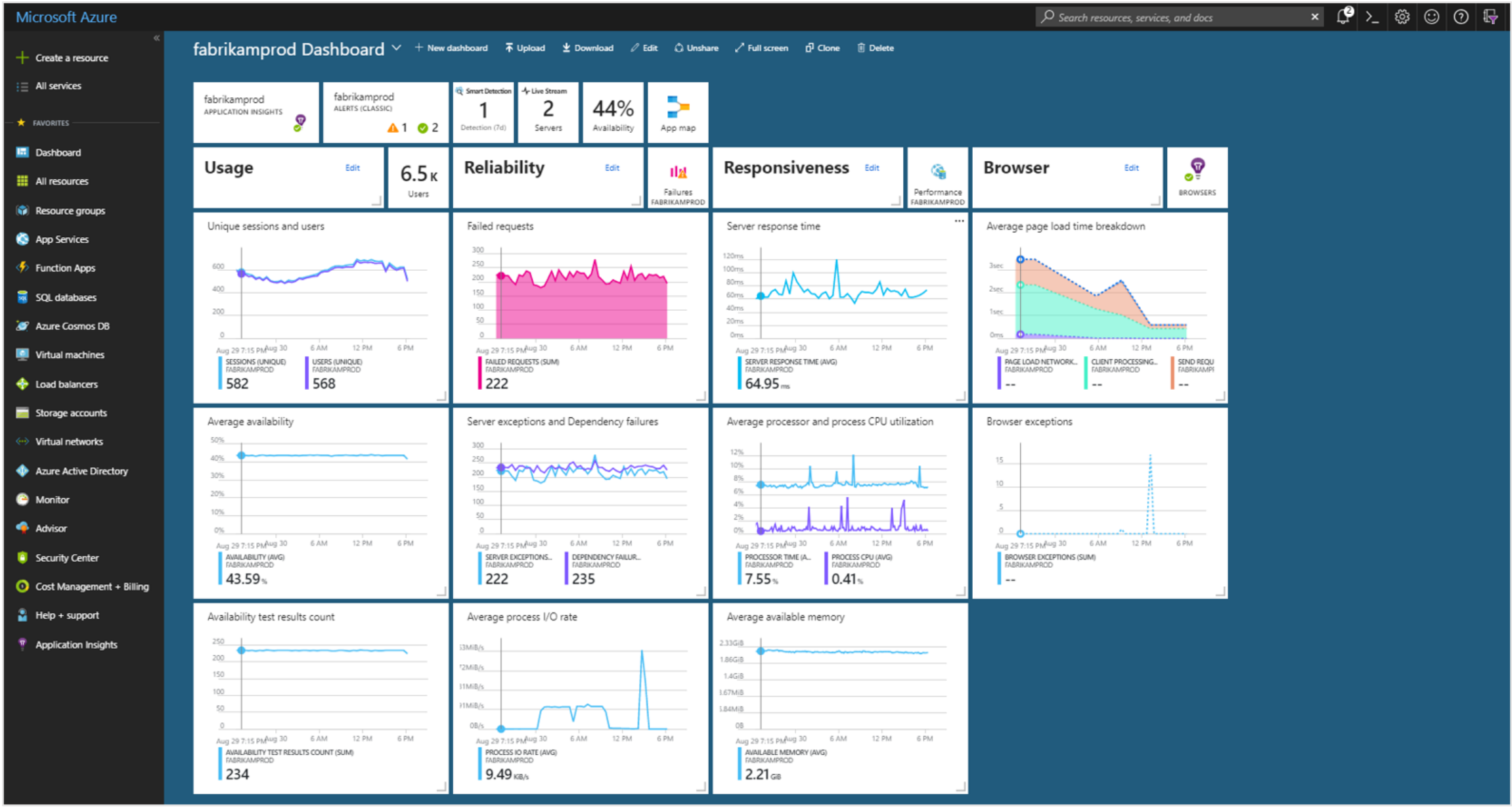
Monitoring and Observability

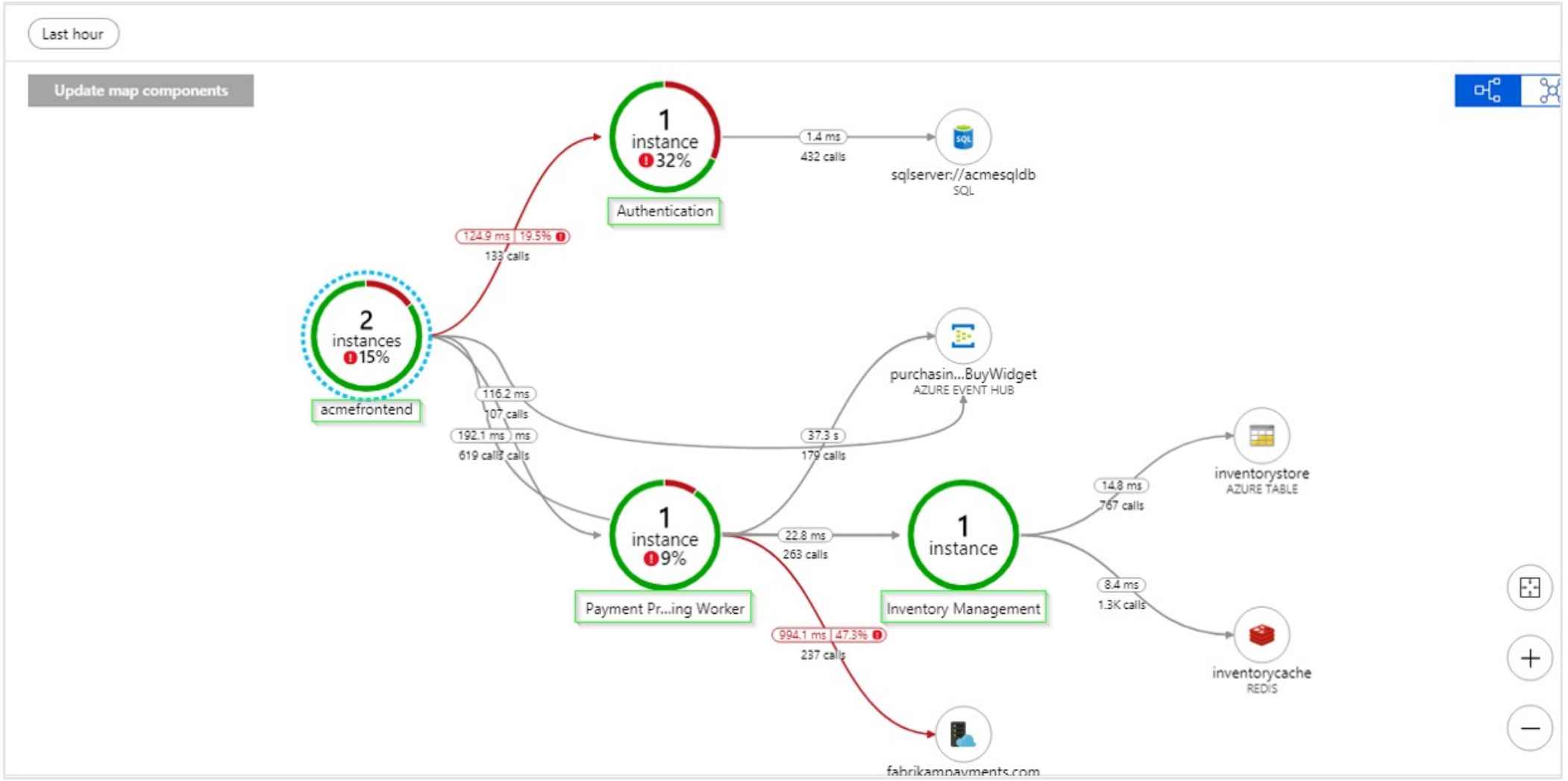
ArchitectNow



Source: https://learn.microsoft.com/en-us/azure/azure-monitor/media/overview/overview-blowout-20230707-opt.svg#lightbox

ArchitectNow


Microsoft Azure
Search resources, services, and docs
Create a resource
All services
FAVORITES
Dashboard
All resources
Resource groups
App Services
Function Apps
SQL databases
Azure Cosmos DB
Virtual machines
Load balancers
Storage accounts
Virtual networks
Azure Active Directory
Monitor
Advisor
Security Center
Cost Management + Billing
Help + support
Application Insights
fabrikamprod Dashboard
New dashboard
Upload
Download
Edit
Unshare
Full screen
Clone
Delete
fabrikamprod
APPLICATION INSIGHTS
fabrikamprod
ALERTS (CLASSIC)
1
2
Smart Detection
1
Detection (7d)
Live Stream
2
Servers
44%
Availability
App map
Usage
Edit
6.5 K
Users
Reliability
Edit
Failures
FABRIKAMPROD
Responsiveness
Edit
Performance
FABRIKAMPROD
Browser
Edit
BROWSERS
Unique sessions and users
SESSIONS (UNIQUE)
FABRIKAMPROD
582
USERS (UNIQUE)
FABRIKAMPROD
568
Failed requests
FAILED REQUESTS (SUM)
FABRIKAMPROD
222
Server response time
SERVER RESPONSE TIME (AVG)
FABRIKAMPROD
64.95 ms
Average page load time breakdown
PAGE LOAD NETWORK...
FABRIKAMPROD
--
CLIENT PROCESSING...
FABRIKAMPROD
--
SEND REQU
FABRIKAMPI
--
Average availability
AVAILABILITY (AVG)
FABRIKAMPROD
43.59 %
Server exceptions and Dependency failures
SERVER EXCEPTIONS...
FABRIKAMPROD
222
DEPENDENCY FAILUR...
FABRIKAMPROD
235
Average processor and process CPU utilization
PROCESSOR TIME (A...
FABRIKAMPROD
7.55 %
PROCESS CPU (AVG)
FABRIKAMPROD
0.41 %
Browser exceptions
BROWSER EXCEPTIONS (SUM)
FABRIKAMPROD
--
Availability test results count
AVAILABILITY TEST RESULTS COUNT (SUM)
FABRIKAMPROD
234
Average process I/O rate
PROCESS IO RATE (AVG)
FABRIKAMPROD
9.49 KiB/s
Average available memory
AVAILABLE MEMORY (AVG)
FABRIKAMPROD
2.21 GiB



Source: https://learn.microsoft.com/en-us/azure/azure-monitor/app/app-map?tabs=net

ArchitectNow

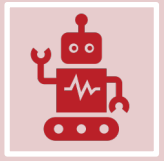
DevOps and Code

- .NET Core vs. Full Framework
- 3rd Party Components
  - Commercial or Open Source
- Target containerization
- Automate build/deployment
- Design with monitoring in mind
- Consider how to load test and prove scale
- Consider modularizing app and deployments
  - Website vs API vs Mobile
  - Separate versioning

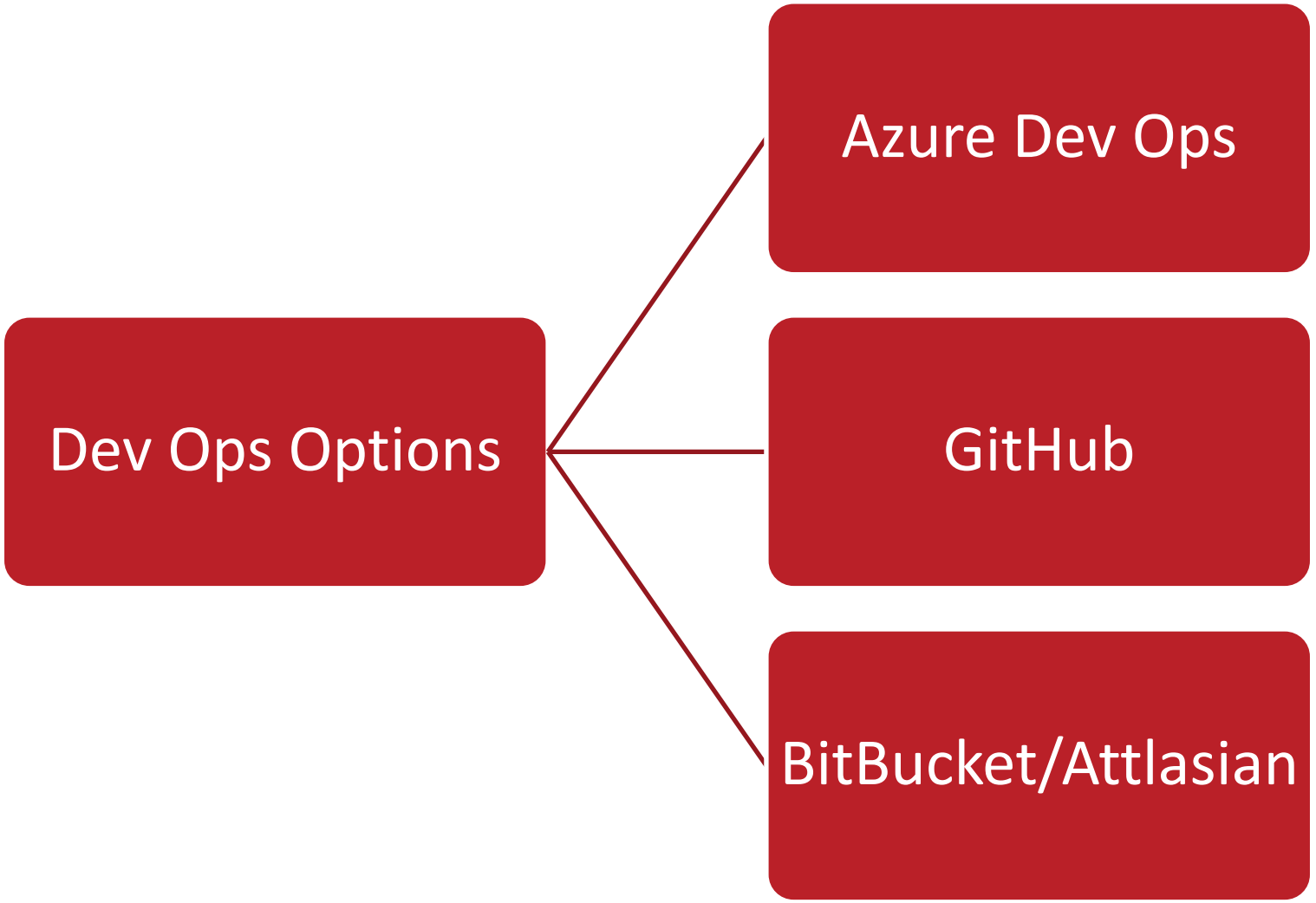
Plan for multiple environments

- Development
- Testing
- Staging
- Production

Document Configuration Changes

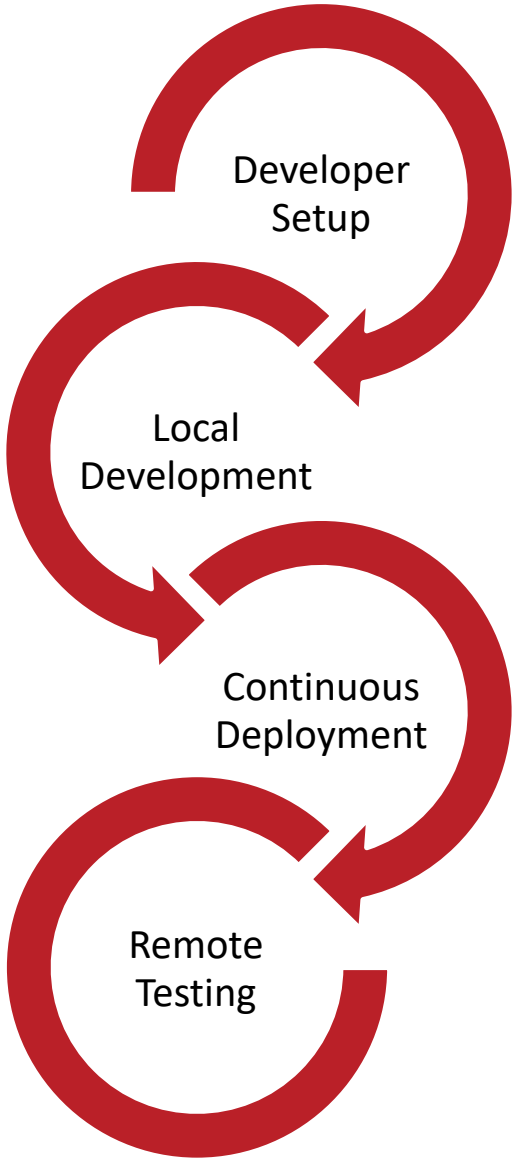


Automate via Azure Pipelines


Dev Ops Options
Azure Dev Ops
GitHub
BitBucket/Attlasian

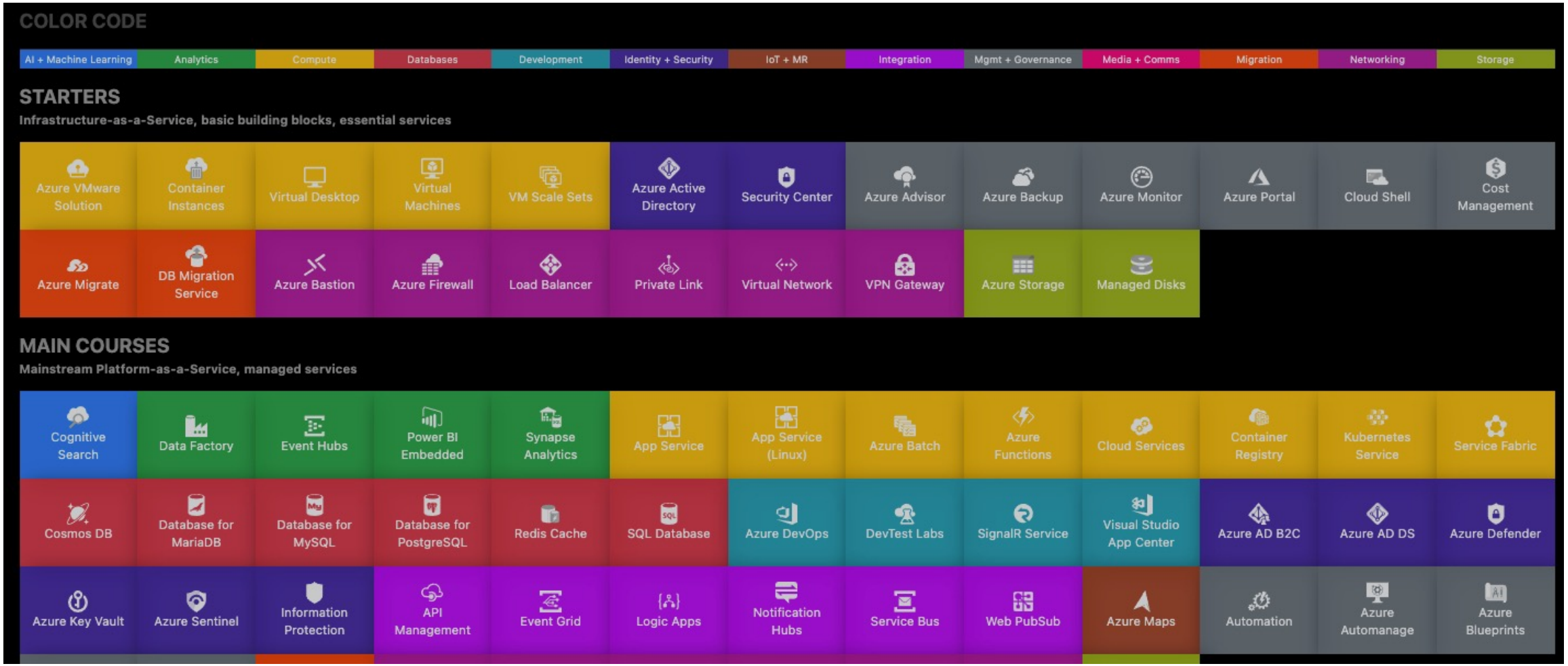
- Source Control (Git)
- Build/Release Management
- Agile Planning
- Testing

ArchitectNow


Developer
Setup
Local
Development
Continuous
Deployment
Remote
Testing

https://trunkbaseddevelopment.com/

Azure Basics

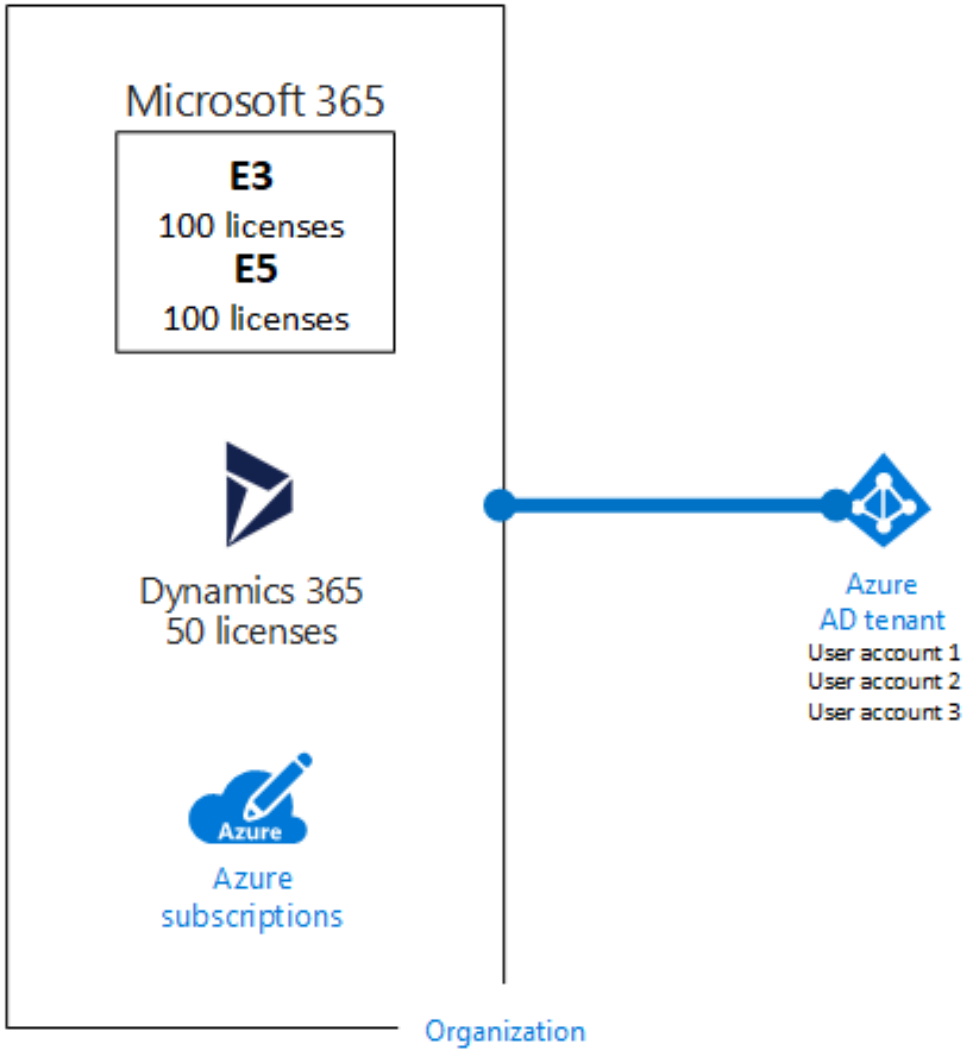


https://azurecharts.com/menu

ArchitectNow

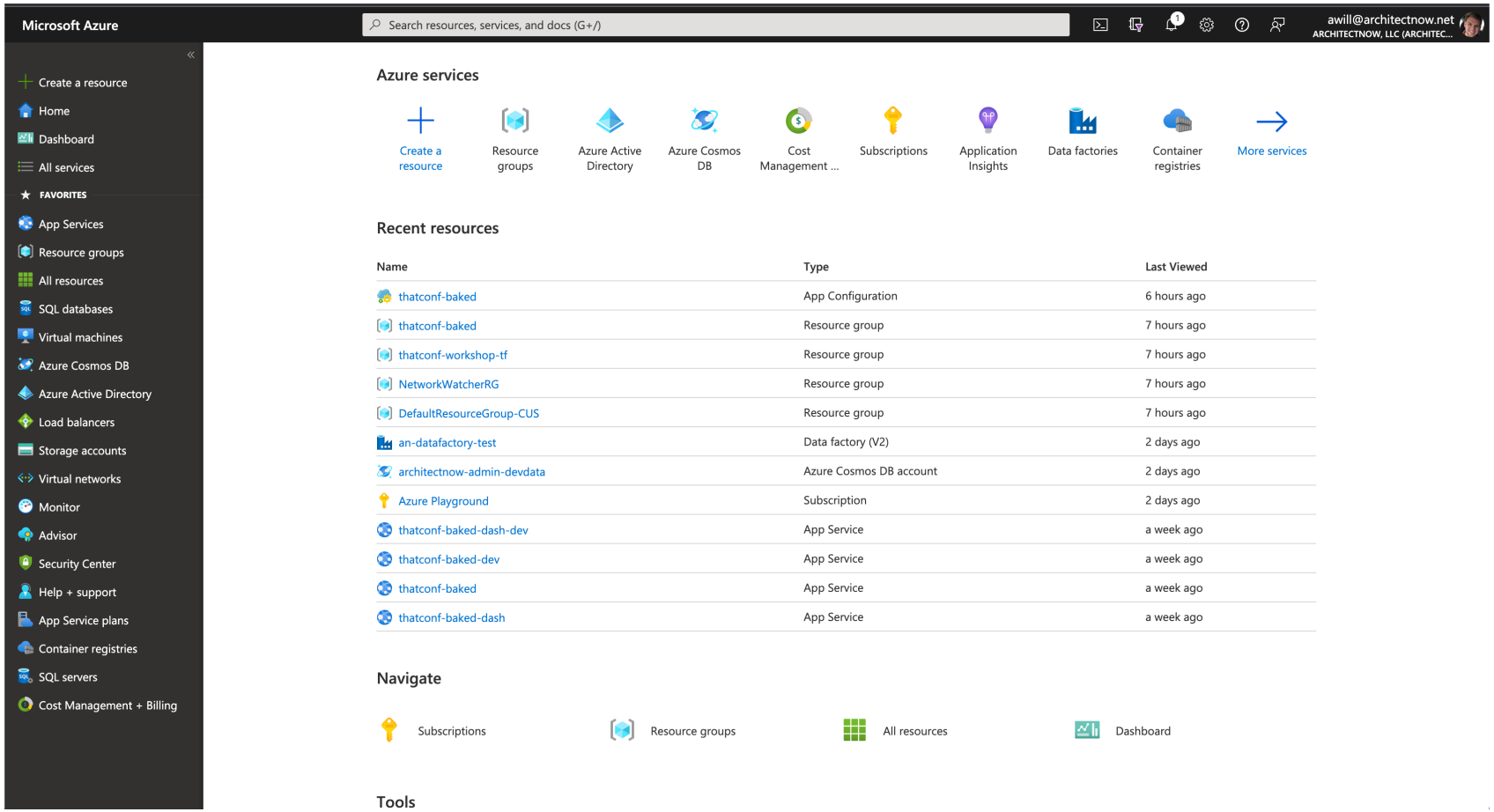
Azure Basics

- Tenant
  - Houses the users
- Organization
  - Domain
- Subscriptions
  - M365
  - Dynamics
  - Azure



ArchitectNow

Azure Portal



https://portal.azure.com/

ArchitectNow

- Hybrid Deployments
- Migrate some aspects of an application in the cloud and maintain others internally
- Data Center selection is critical
- Be Creative and use Common Sense

Types of Azure Subscriptions

Pay-As-You-Go

VS Benefits

EA

Sponsorship

CSP

Dev/Test

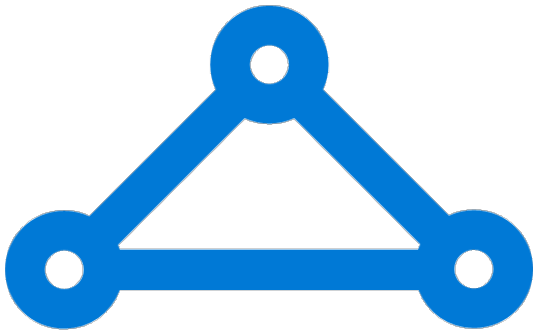
ArchitectNow

Types of Pricing

- License Based
  - Per User
  - Per App
- Pay-as-you-go
- Reserved Pricing
- Spot Pricing

Base Costs - Bandwidth

- Ingress*: Free
- Egress: .05 – 0.0875 per GB



Azure VMs (IAAS)

- Pay-as-you-go
  - Pay only when it is on
  - Pay per hour
- Reserved
  - Known capacity. Purchase chunks for discount
- Spot
  - Purchase unused capacity for discount
- Types
  - Memory, General, CPU, Storage
- Auto turn-off
- Scale Sets

ArchitectNow

Azure App Services

- Pay-as-you-go
- You still pay when it is turned off
- Types
  - Free, Shared, Basic, Standard, Premium, Isolated
- Scale out, and Up
- Pay at the Service Plan level
- SLA when more than 1 instance

ArchitectNow

Azure Kubernetes Services

- No Charge for managing Cluster
- Based on VM Pricing for nodes

Azure Kubernetes Service (AKS)

Azure SQL

- Serverless
- V-Core
- DTU
  - Database Transaction Unit
  - CPU, Memory, I/O
- Single Database
- Elastic Pool
- Service Tier
  - Basic, Business Critical, HyperScale

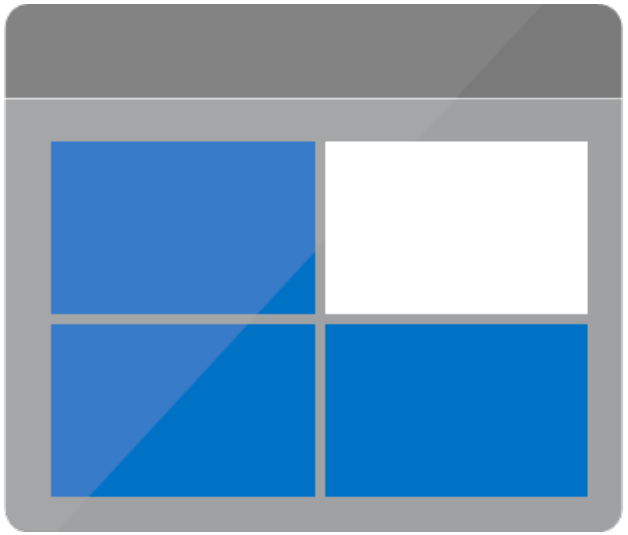
ArchitectNow

Azure Cosmos

- Provisioned Throughput
- Serverless
- Storage Costs
- RUs
  - Request Units

Azure Blob Storage

- Premium/Hot/Cold/Archive
- Priced per GB
- Tiered Pricing on TB



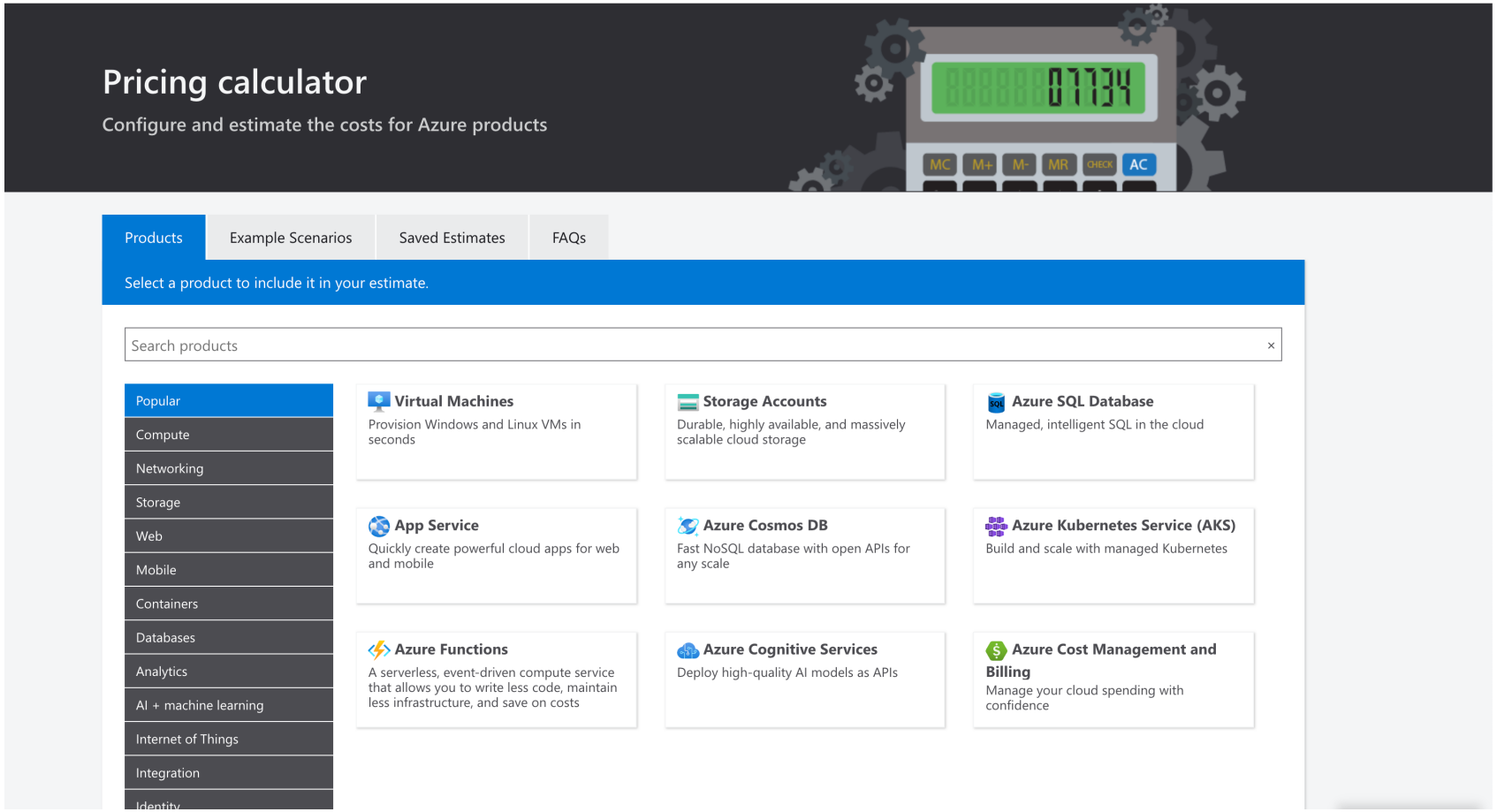
Azure Functions

- Consumption
  - 1 Million Free
  - Cold Starts
- Premium
  - Pay for Cores, and Memory
- App Service Plan

Azure App Insights

- Commitment
- Pay-as-you-go
  - $2.76 /GB
  - First 5 GB free
- Cost for storage
  - 0.12 per GB
- Alerts

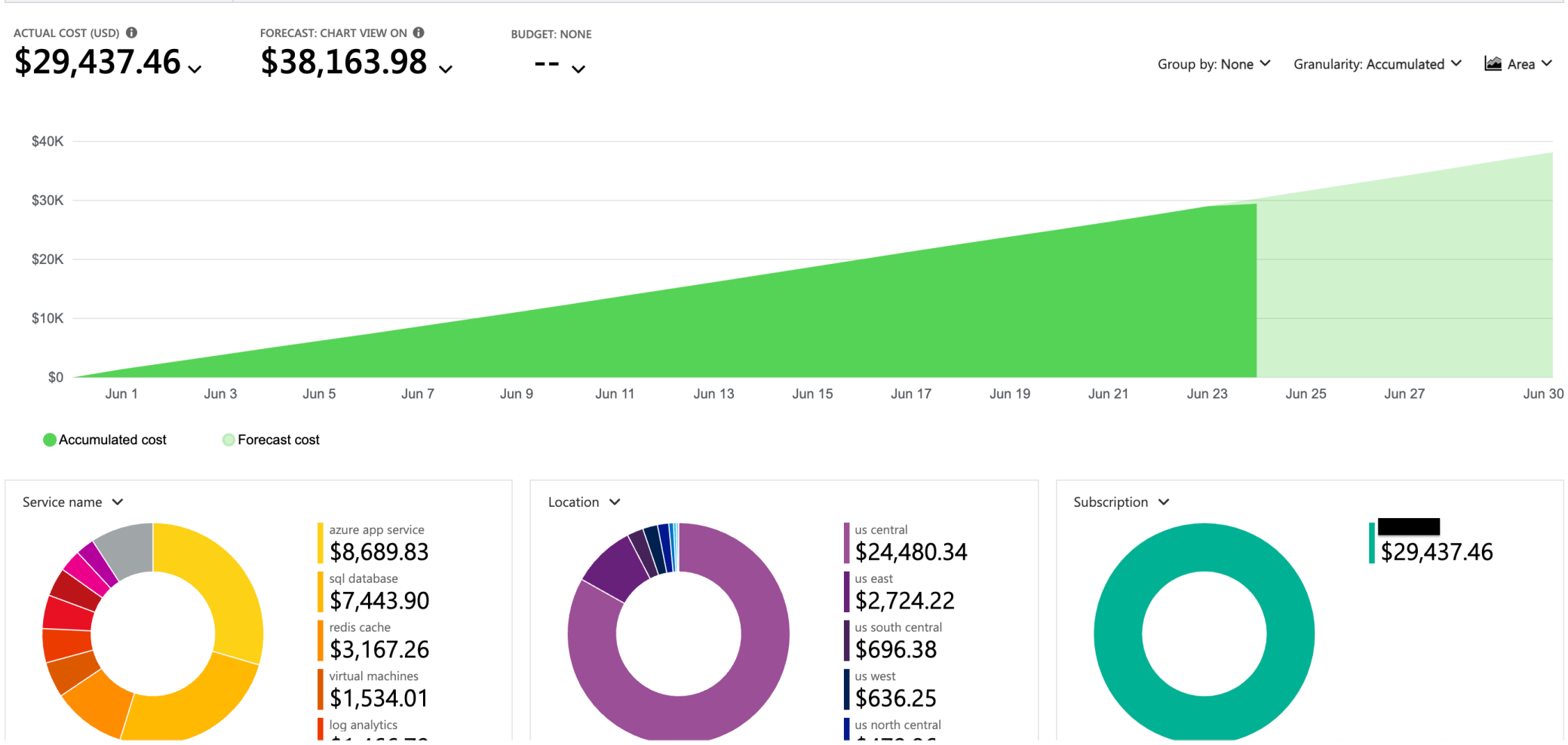
Azure Pricing Calculator



https://azure.microsoft.com/en-us/pricing/calculator/

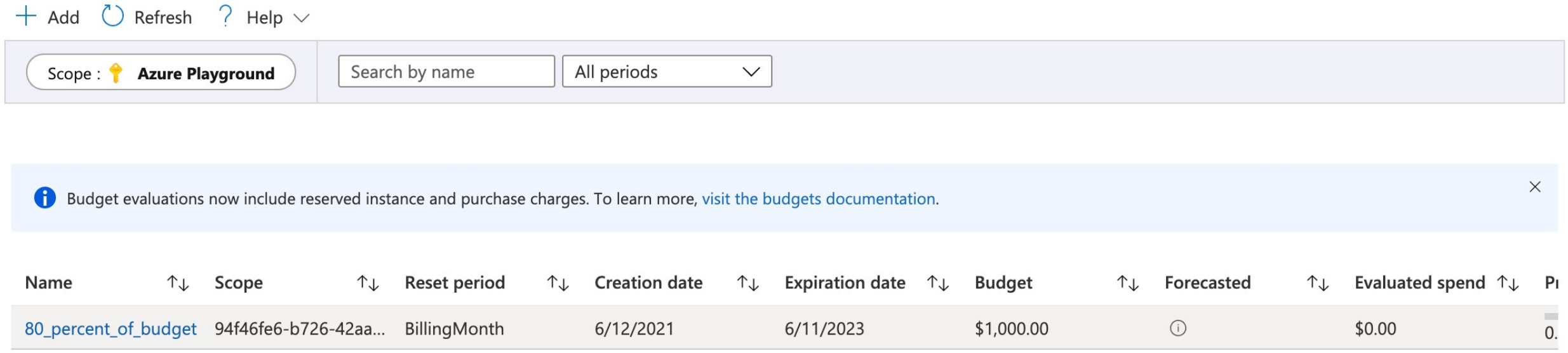
ArchitectNow

Azure Cost Management



ArchitectNow

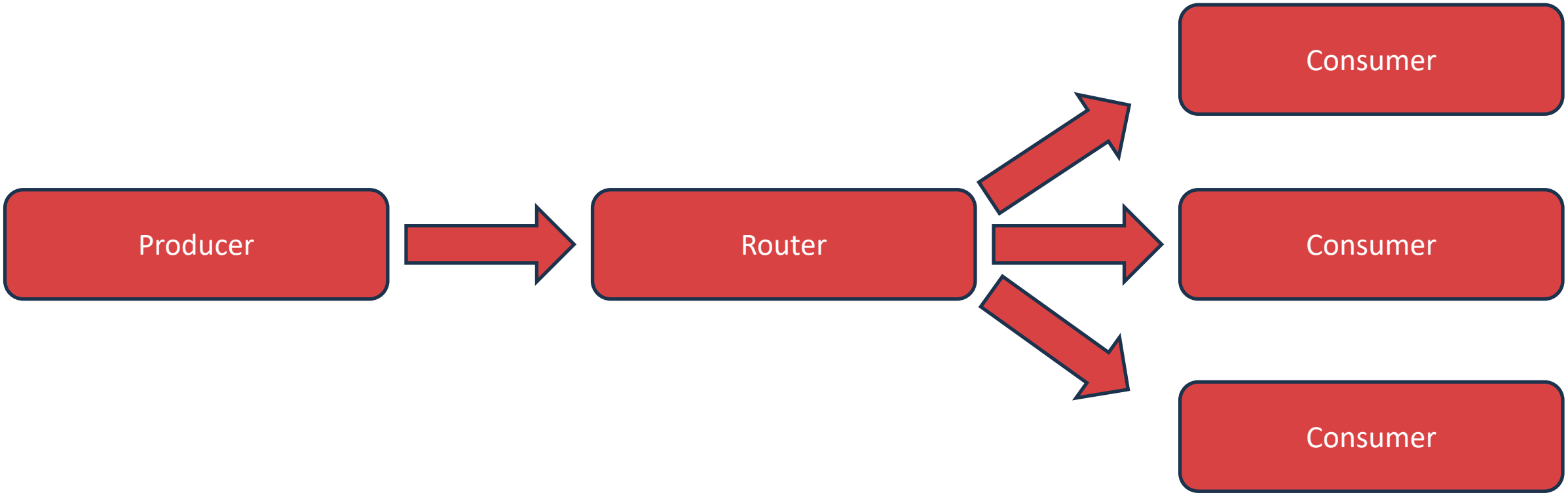
Azure Cost Management

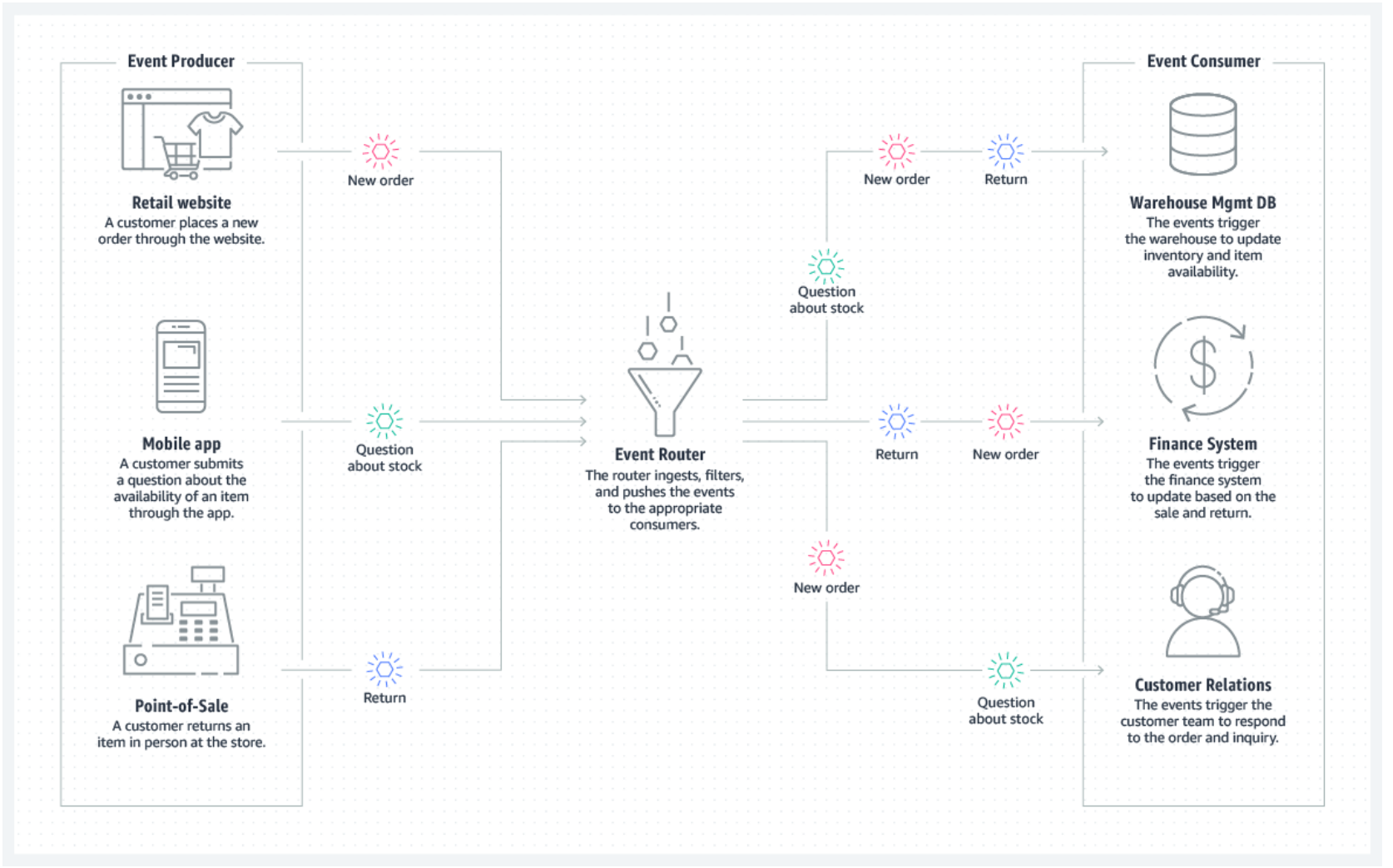


ArchitectNow

Event-Driven Design

ArchitectNow


Producer
Router
Consumer
Consumer
Consumer



Source: https://aws.amazon.com/event-driven-architecture/

ArchitectNow

Common Types

Pub/Sub

- Sends event to each subscriber
- No replay or history

Streaming

- Events written to log
- Typically ordered
- Consumers read from stream on their own pace

ArchitectNow

Benefits

- Decouple Producers and Consumers
- Scale Independently
- Optimize
- Compliance and Audit
- Durability
- Easy to add consumers
- Real time processing

ArchitectNow

Real World

E-commerce

IoT systems

Analytic platforms

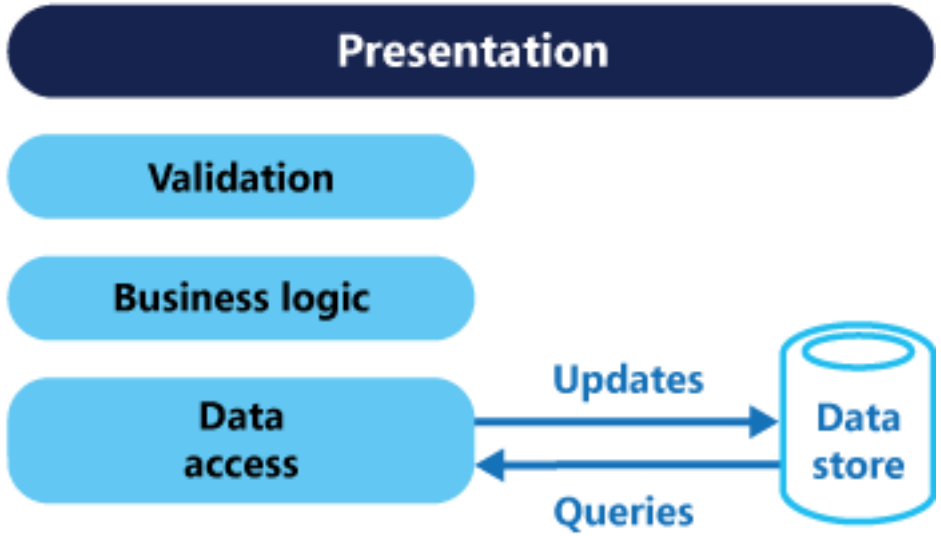
Data Centric/Management

What is Data Centric? How does it differ?

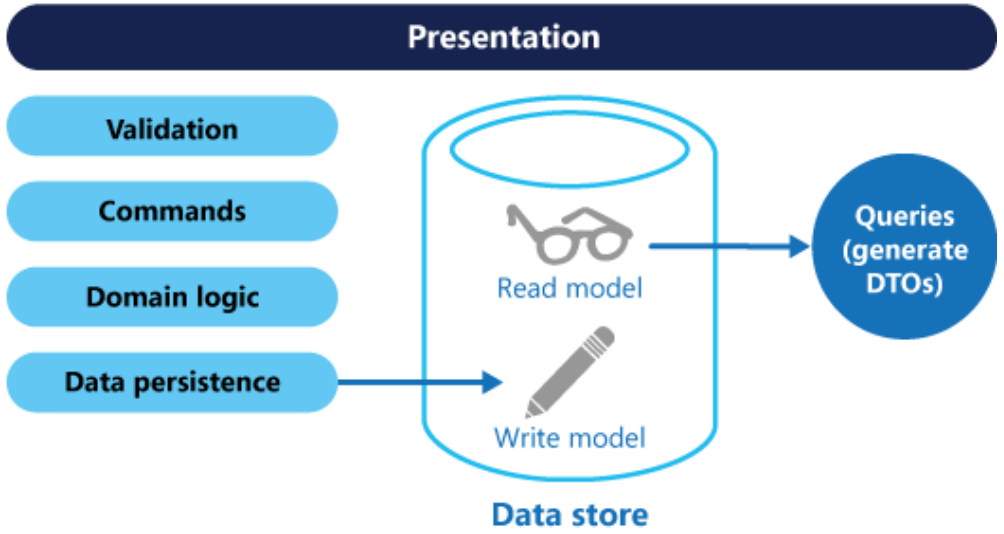
When to use Data Centric?

CQRS

BEFORE



AFTER

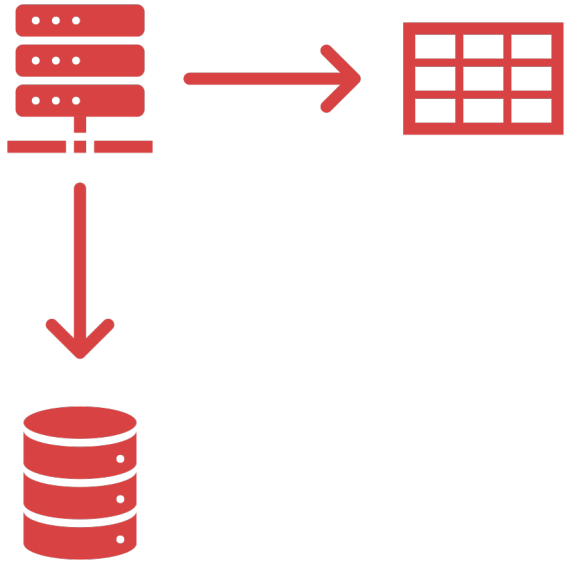


ArchitectNow

Caching

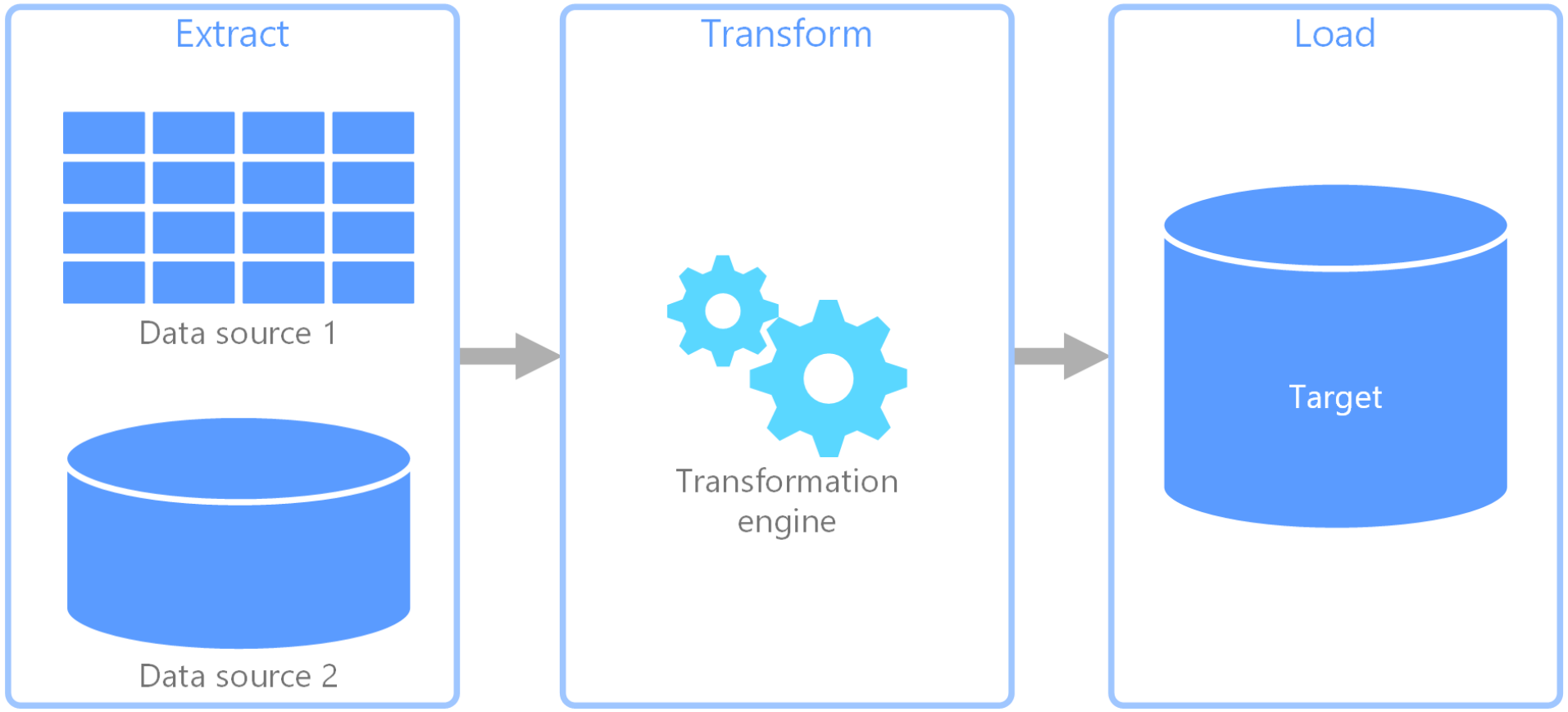
BEFORE

AFTER



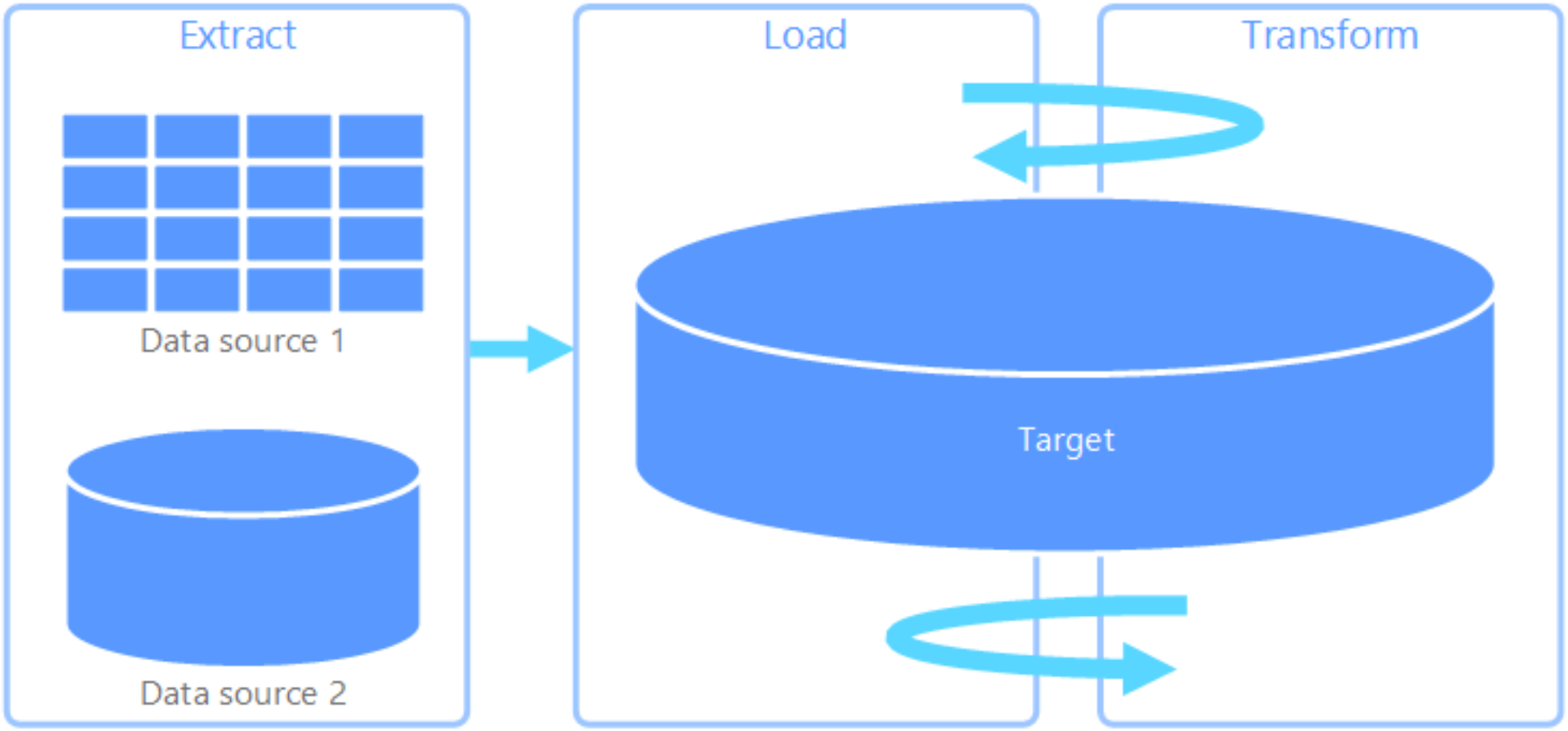
ArchitectNow

ETL vs ELT



ArchitectNow

ETL vs ELT



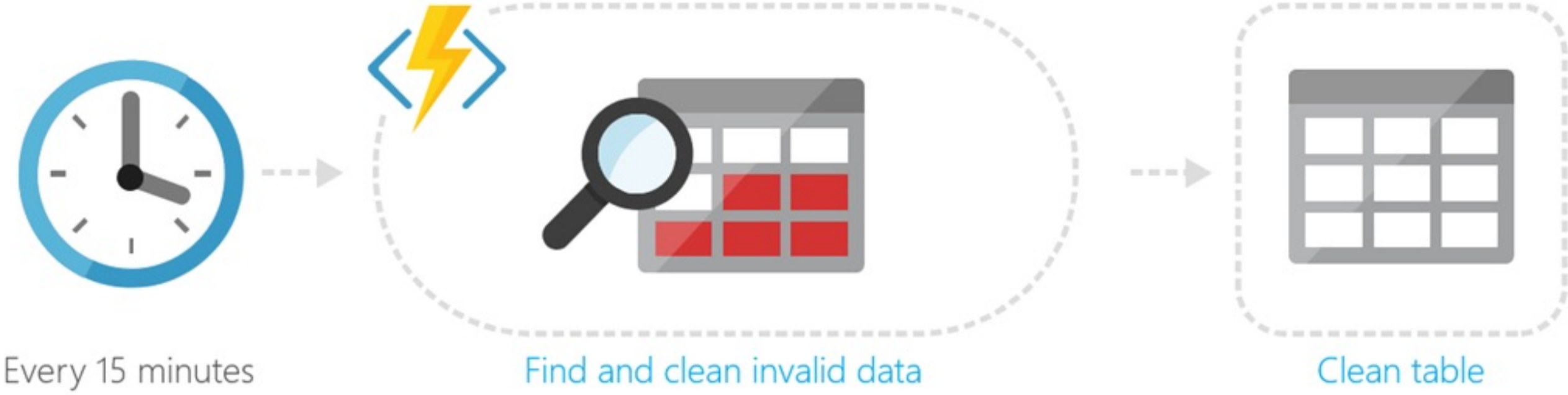
itectNow

Considerations

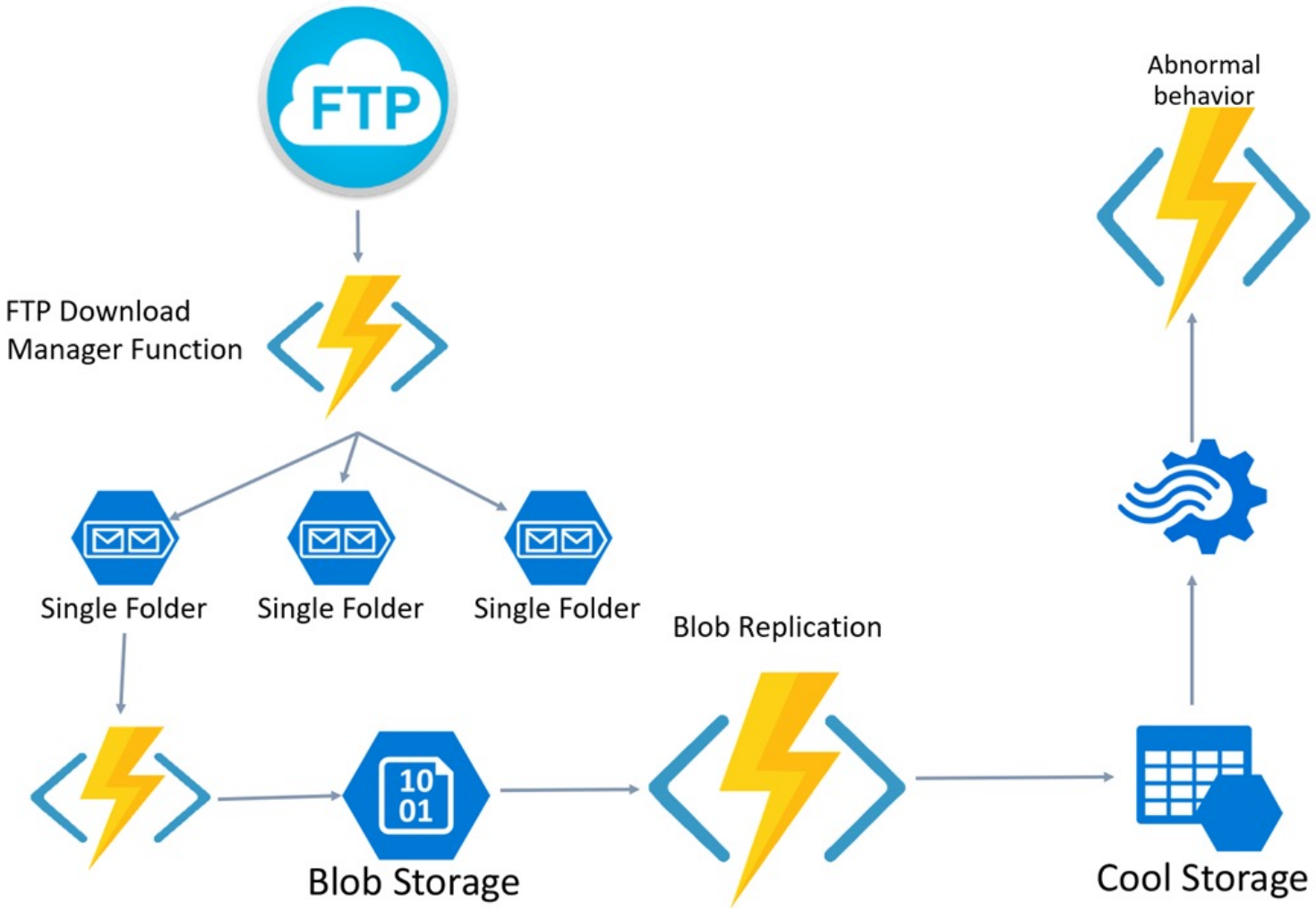
- Data Governance
- Security
- Monitoring and observability

Serverless Computing

Common Scenarios



Common Scenarios



ArchitectNow

Use Cases

- Data Processing
- Automation
- APIs***
- IoT
- Add-on

ArchitectNow

Benefits

- Cost
- Scaling
- Single Responsibility
- Focus on Code

Considerations

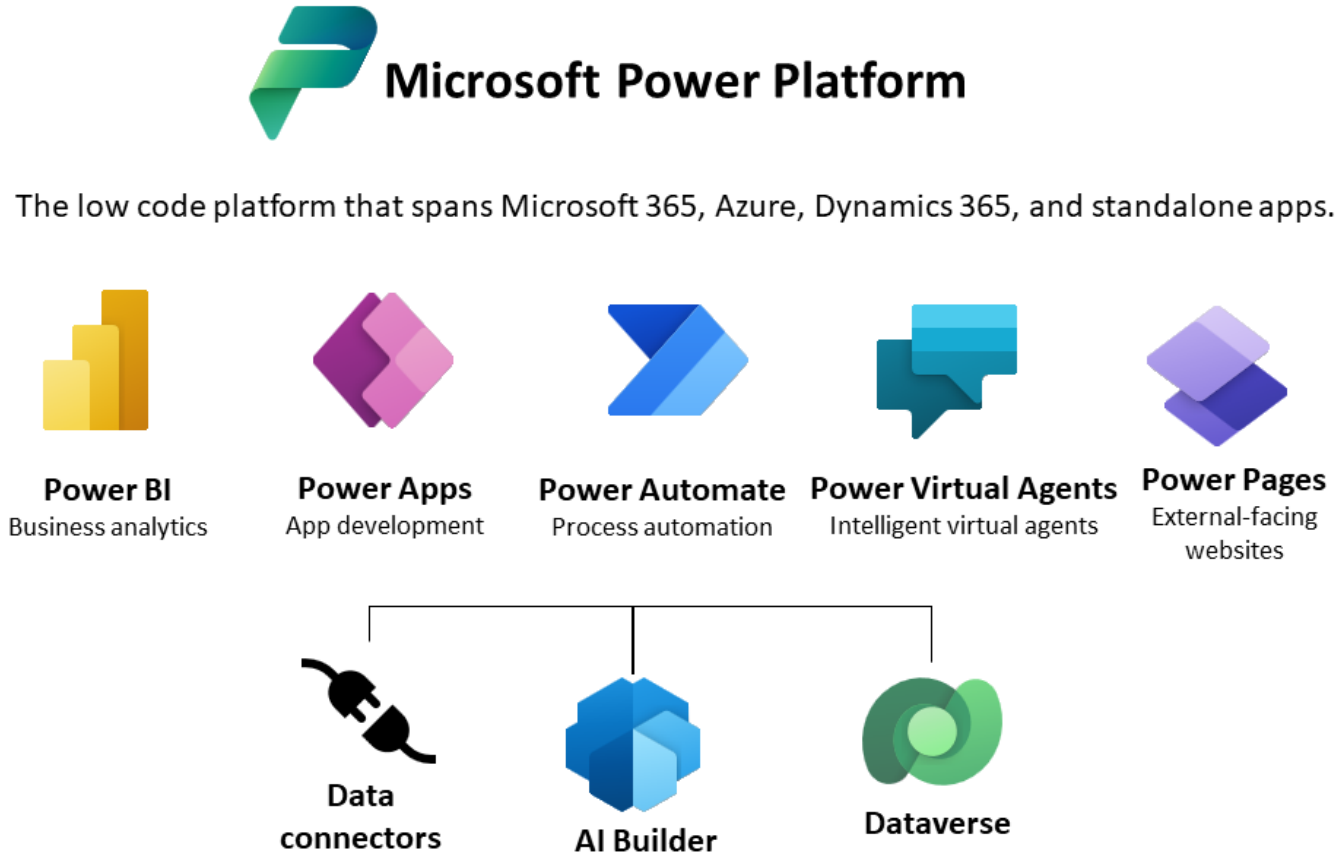
- State
- Long Running/Resource Limits
- Startup Time
- Complexity of multiple functions
- Durable functions

ArchitectNow

Demo

Low Code/No Code Solutions

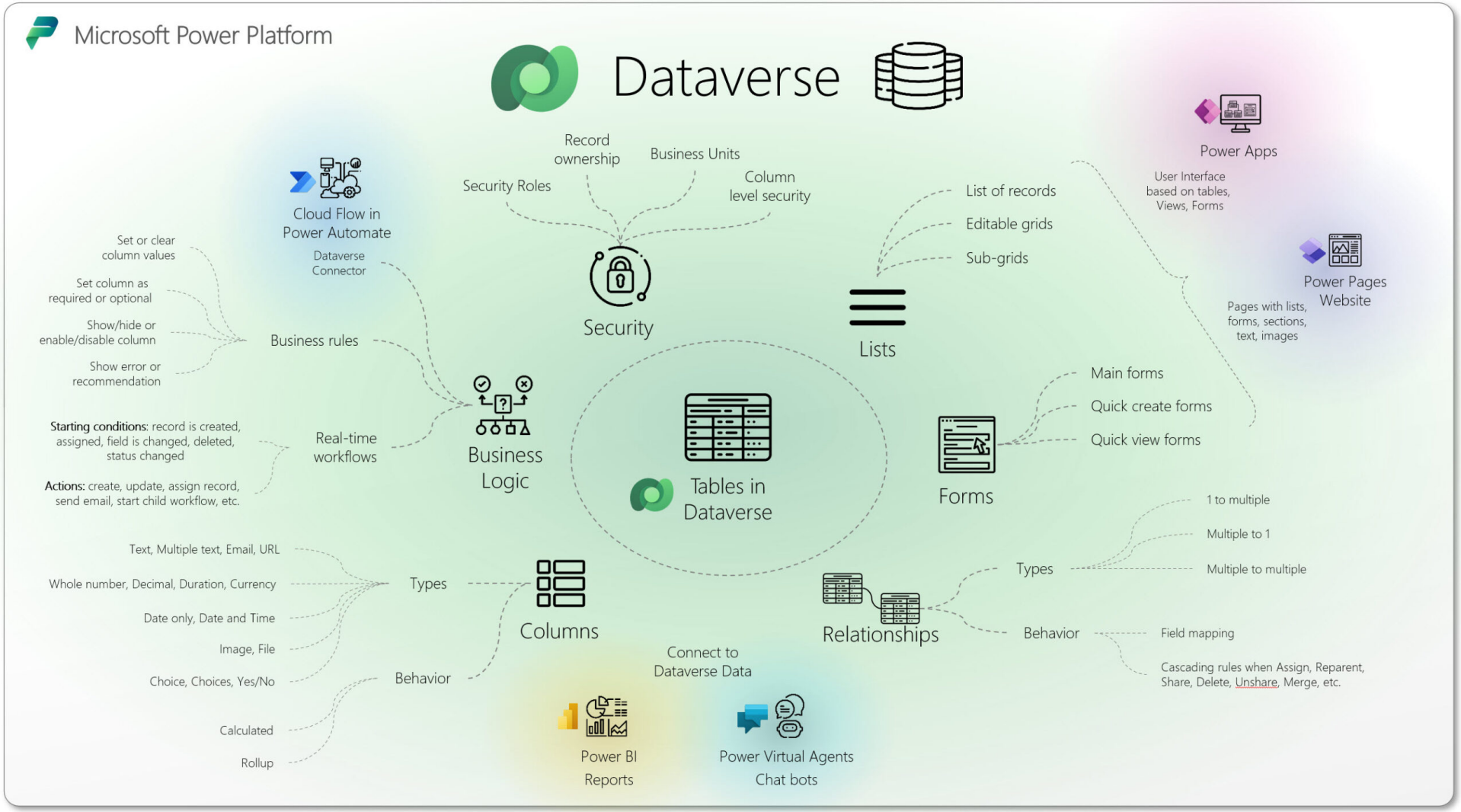
Microsoft Power Platform



https://make.powerapps.com/

ArchitectNow

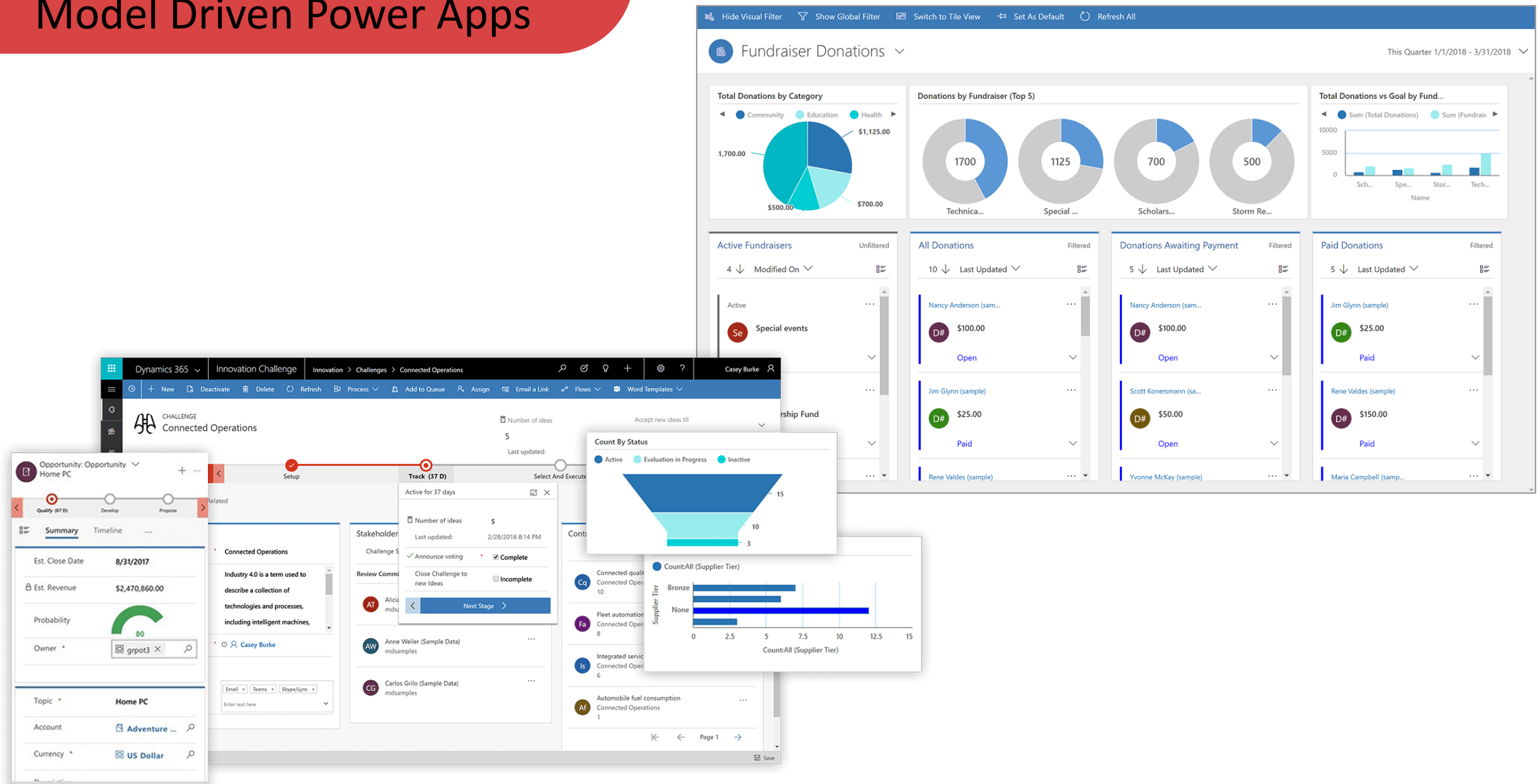
DataVerse



https://make.powerapps.com/

ArchitectNow

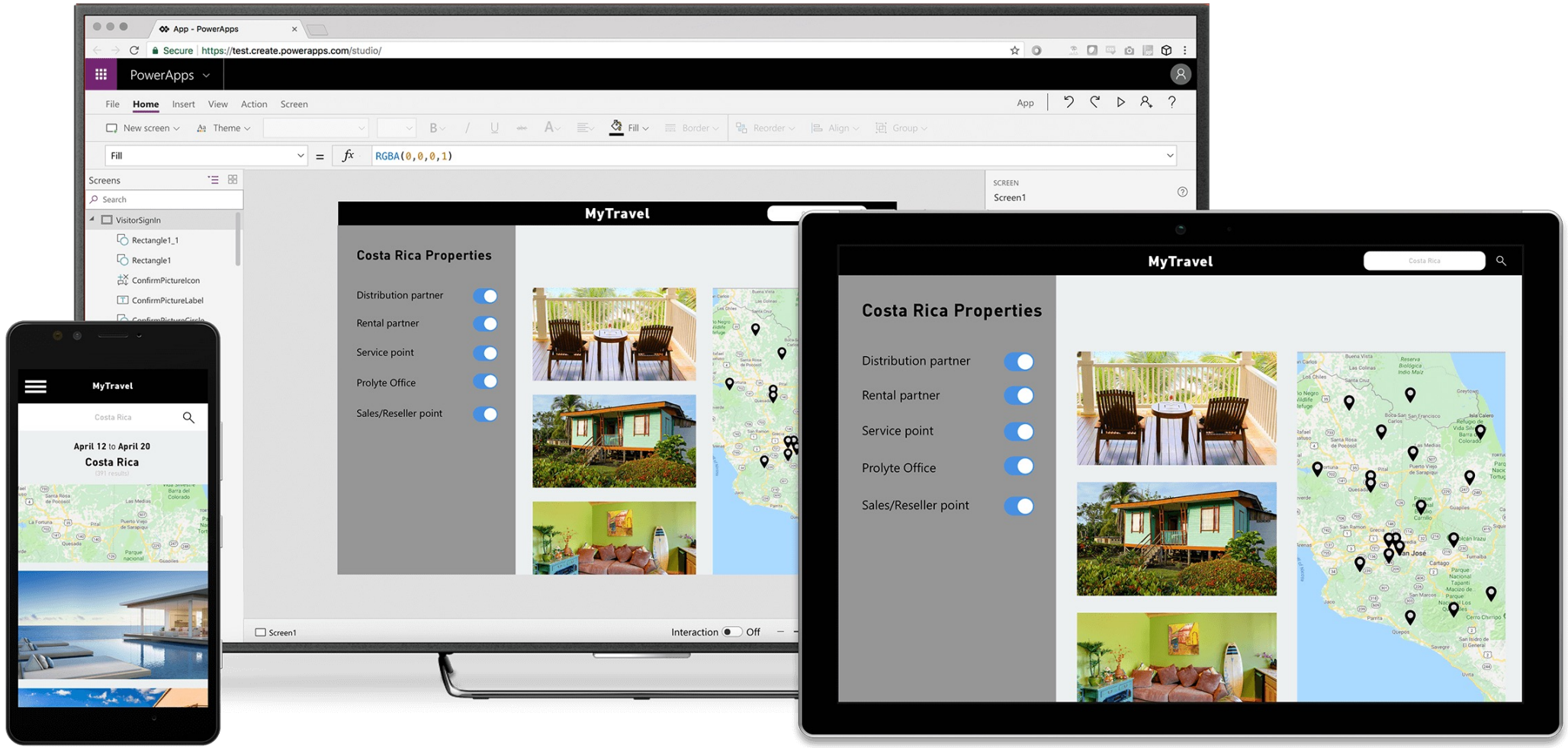
Model Driven Power Apps



https://make.powerapps.com/

ArchitectNow

Canvas Power Apps

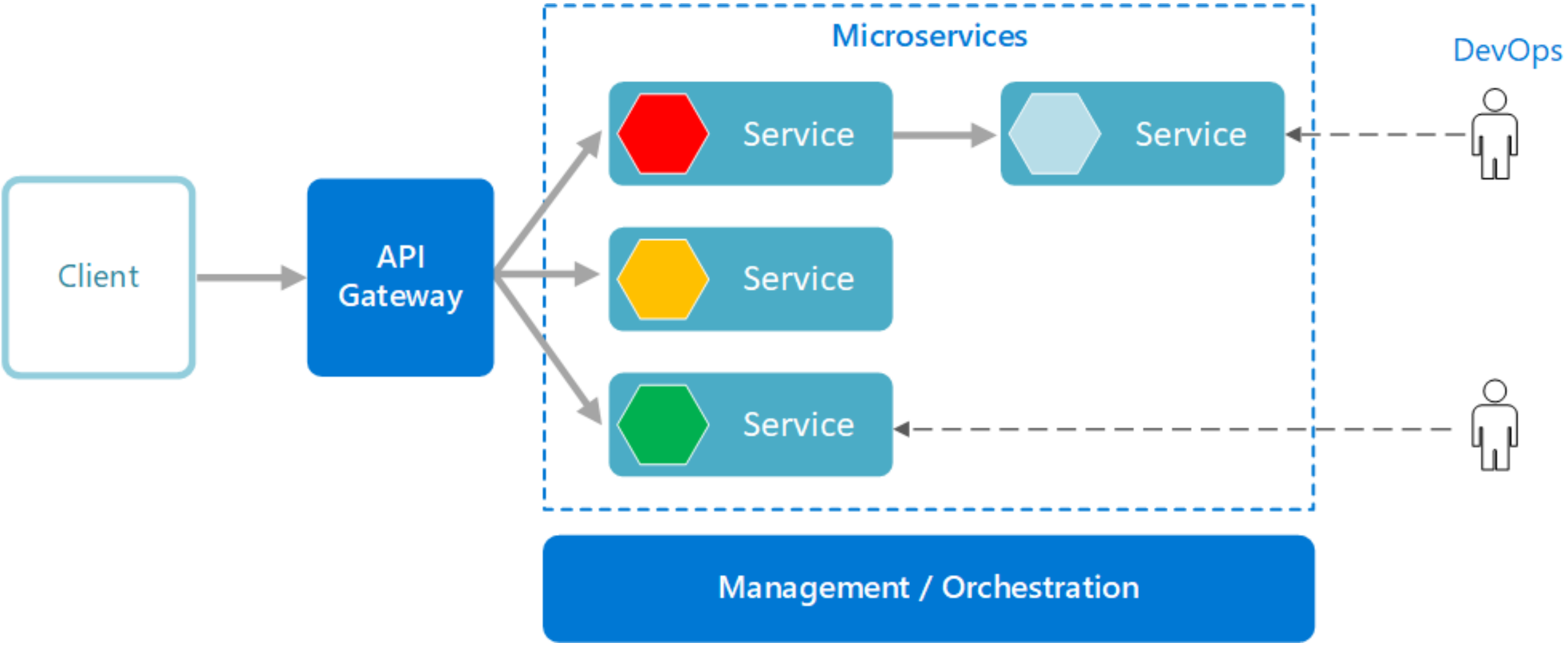


https://make.powerapps.com/

ArchitectNow

Microservices

ArchitectNow



Source: https://learn.microsoft.com/en-us/azure/architecture/microservices/

ArchitectNow

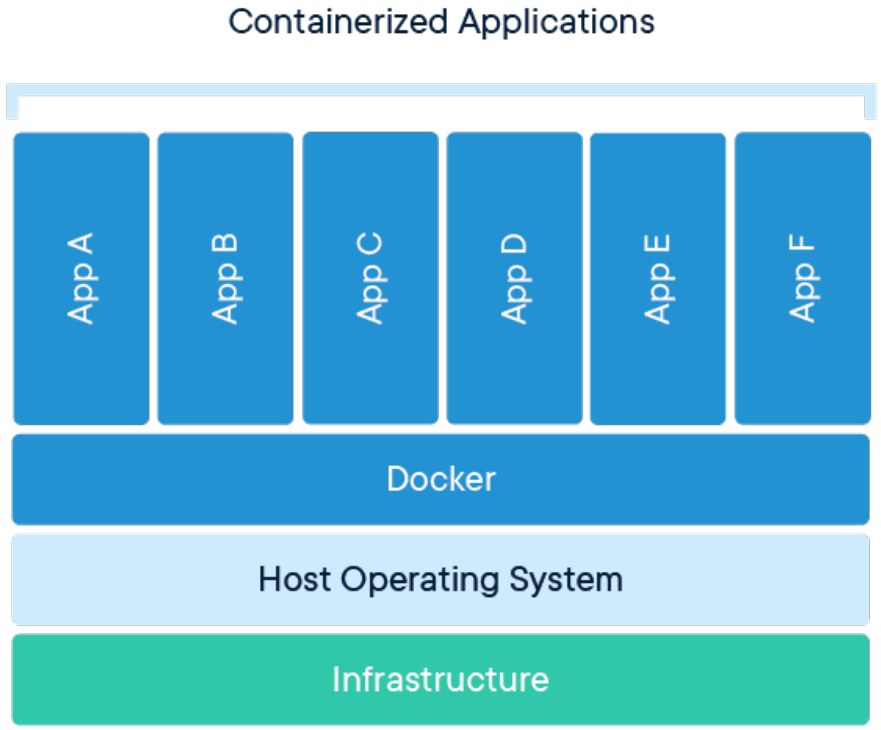
Benefits

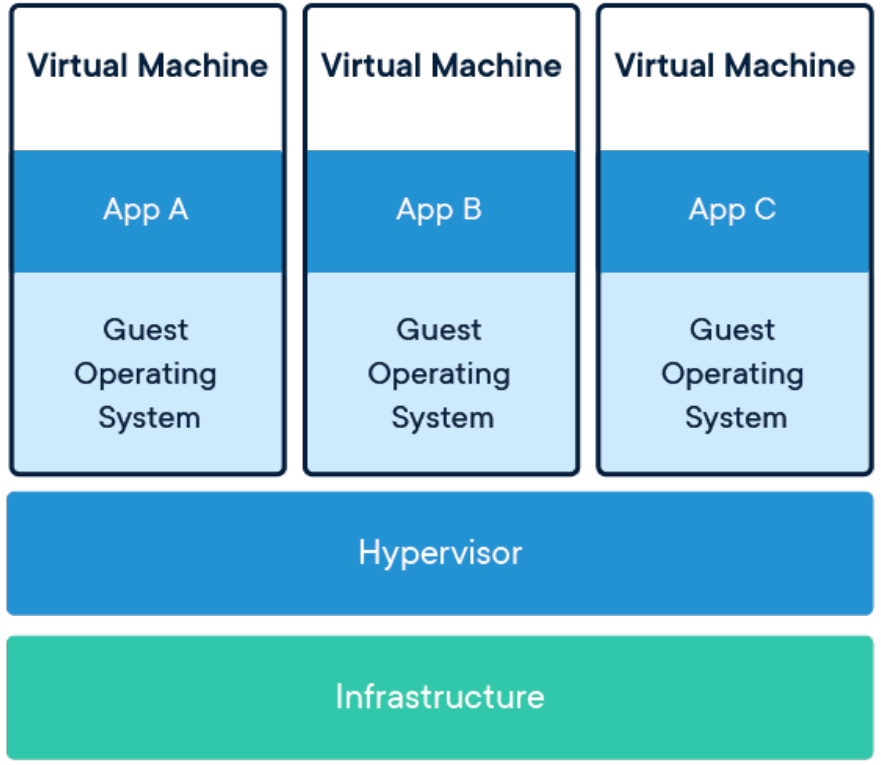
- Scalability
- Flexibility
- Fault Isolation
- Smaller
- Data Isolation

ArchitectNow

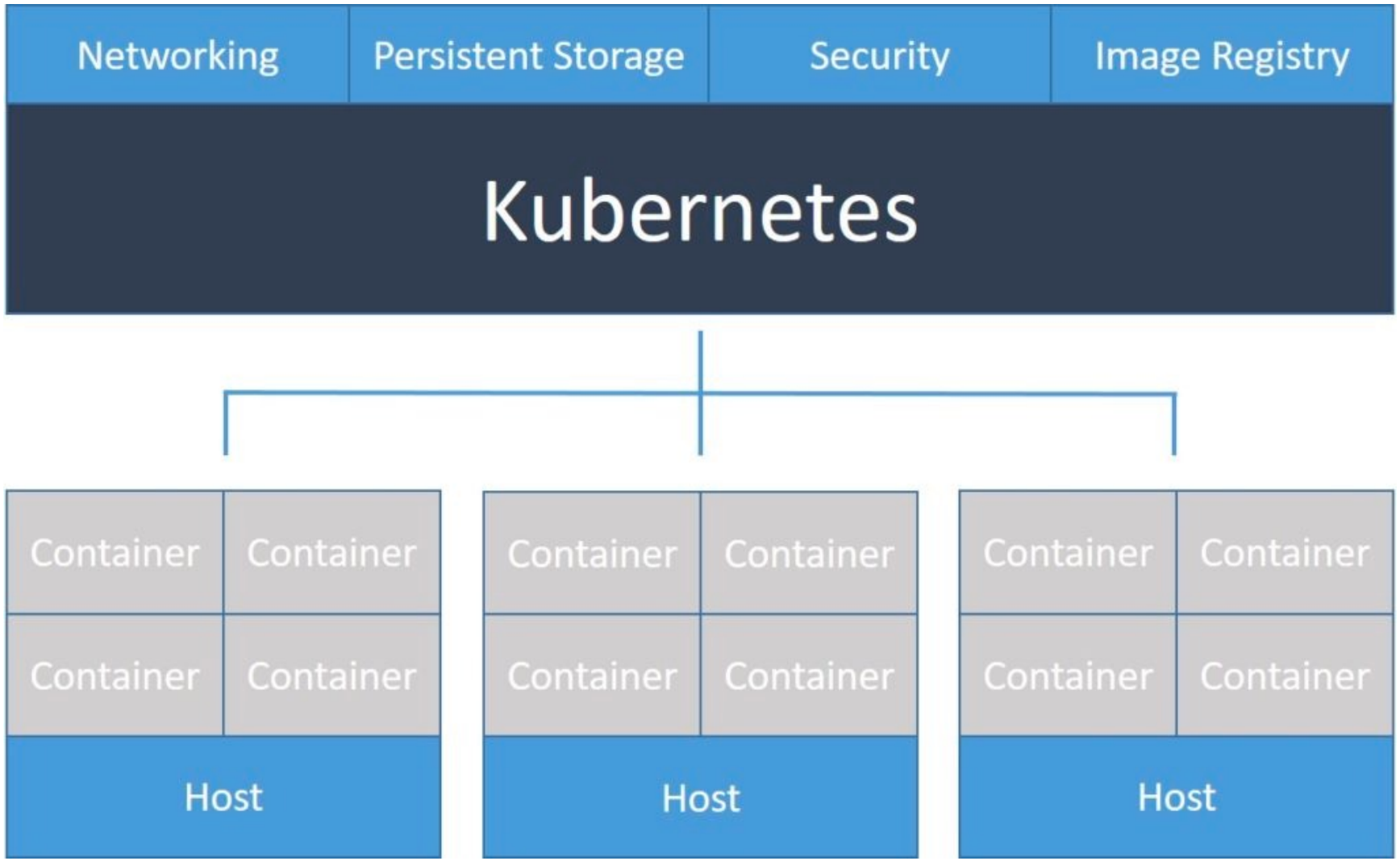
Challenges

- Complex
- Distributed Failover
- Versioning
- Management



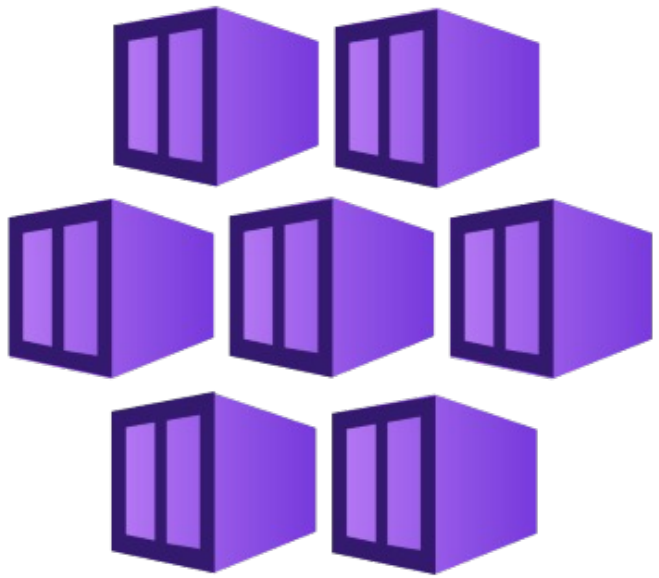


ArchitectNow



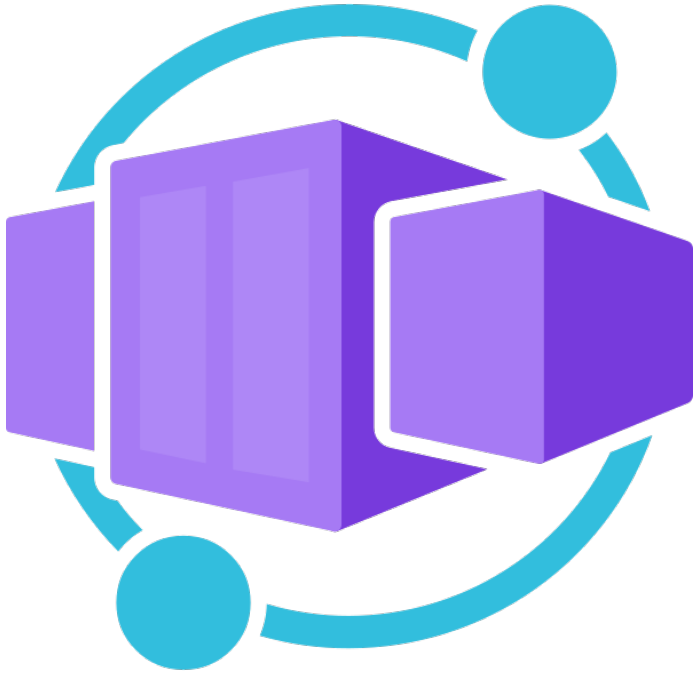
ArchitectNow

Azure Kubernetes Service



- Azure handles operational overhead
- Deploy containers
- Self Healing
- Scaling
- Private networks

Azure Container Apps



- Full managed k8s environment
- No Access to k8’s api
- Public Endpoints
- Background Jobs
- Event-Driven
- Microservices

Refactor and extend code to better leverage the environment

Typically this means we phase in the use of native Azure technologies

Examples

- Docker/Kubernetes
- Azure Functions
- Service Bus
- Data Factories
- Redis Cache
- Azure Search
- Cognitive Services
- Artificial Intelligence
- Machine Learning
- Azure AD
- Azure Frontdoor - https://azure.microsoft.com/en-us/services/frontdoor/
- API Management Services - https://azure.microsoft.com/en-us/services/api-management/
- Traffic Manager

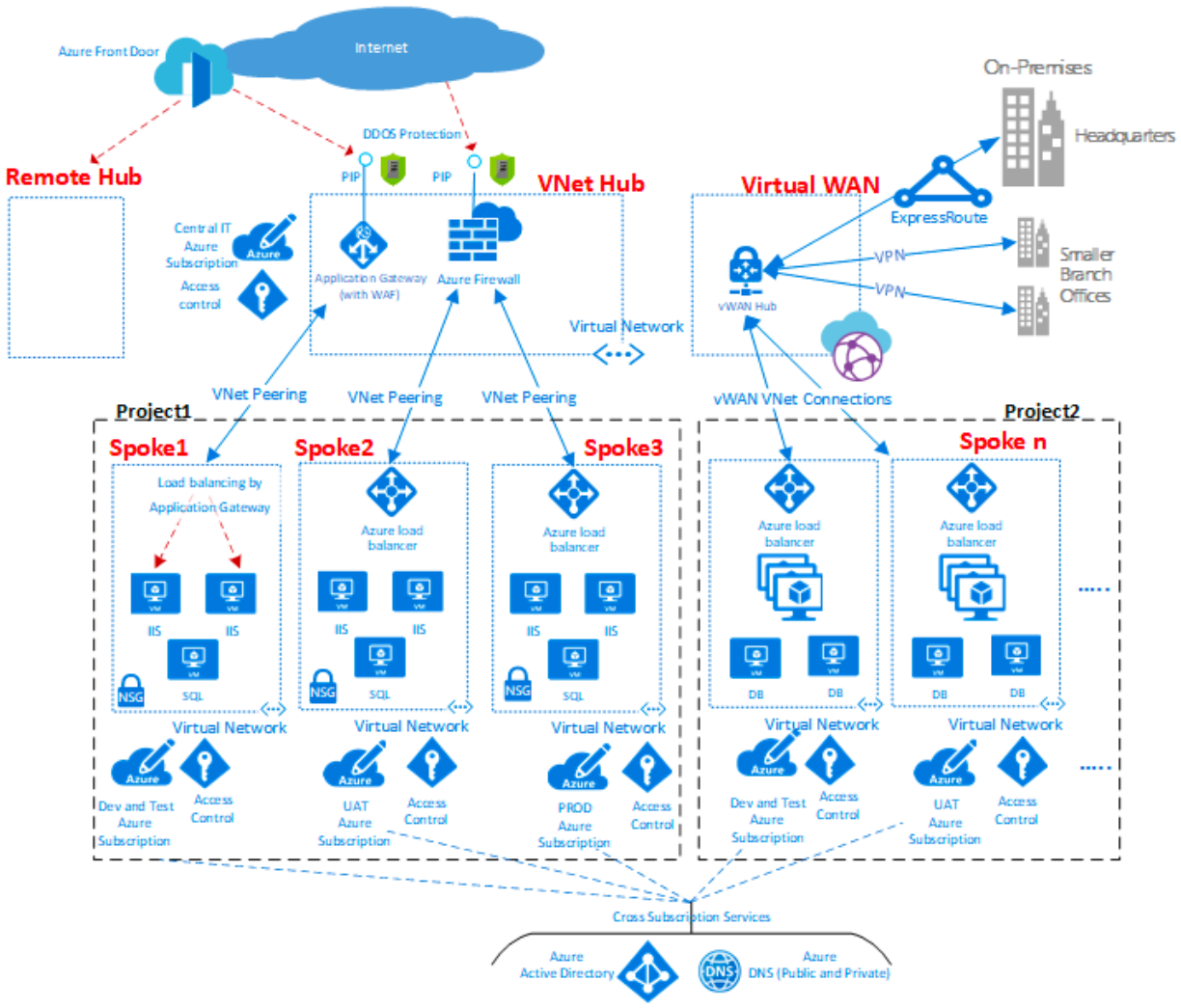
Architecture

- Very flexible infrastructure to design full network topology
- Can likely design an equivalent (or better) environment than utilized currently
- Very possible to design architectures for on-prem and Cloud to interact securely and efficiently

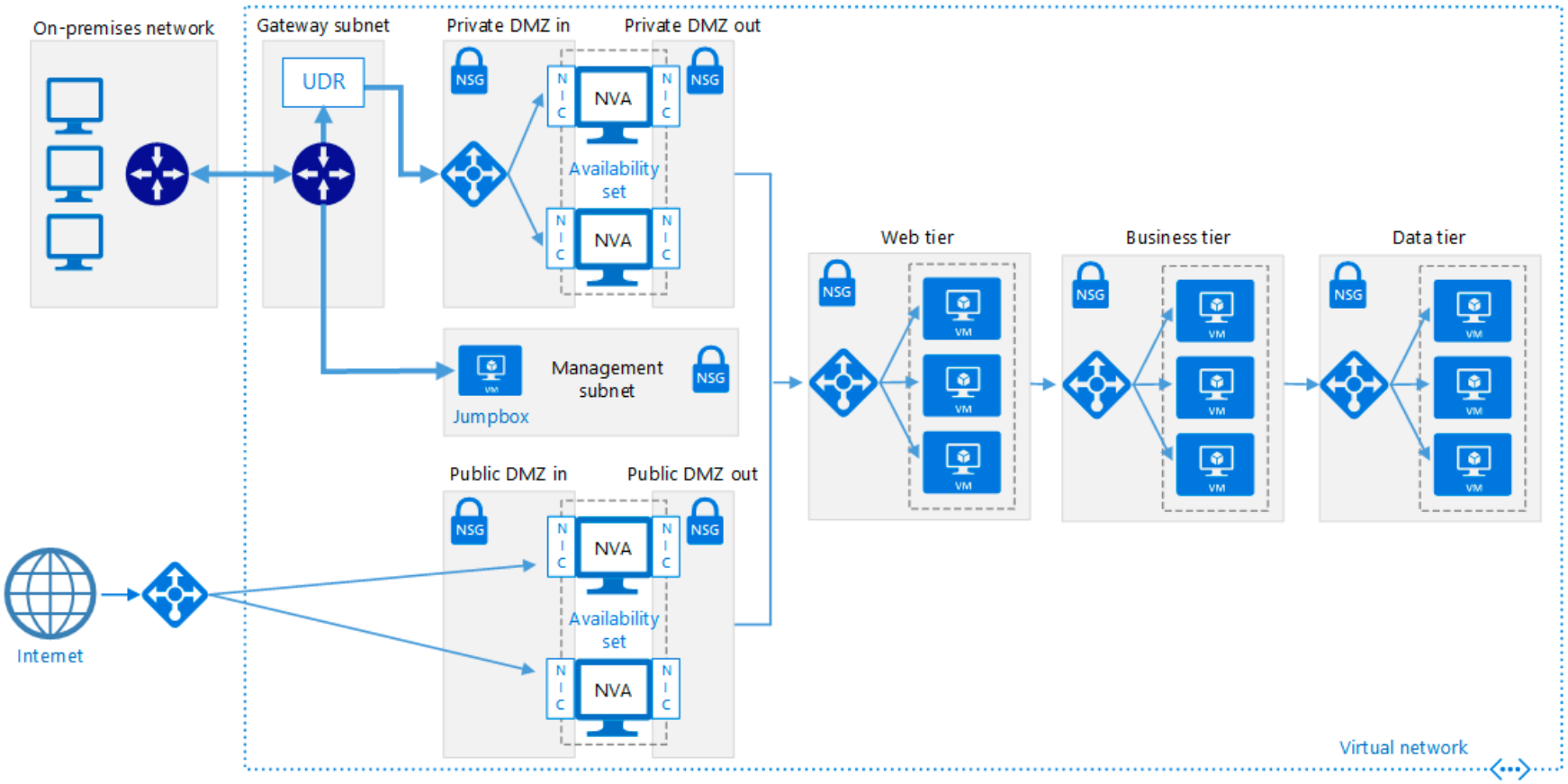
Hosting Options

- Azure AD
- VNETS
- Firewalls
- Load Balancer
- ExpressRoute
  - https://azure.microsoft.com/en-us/services/expressroute/

ArchitectNow



ArchitectNow



ArchitectNow

ADVANCED TOPICS

Infrastructure as Code
API Considerations

INFRASTRUCTURE AS CODE

Terraform

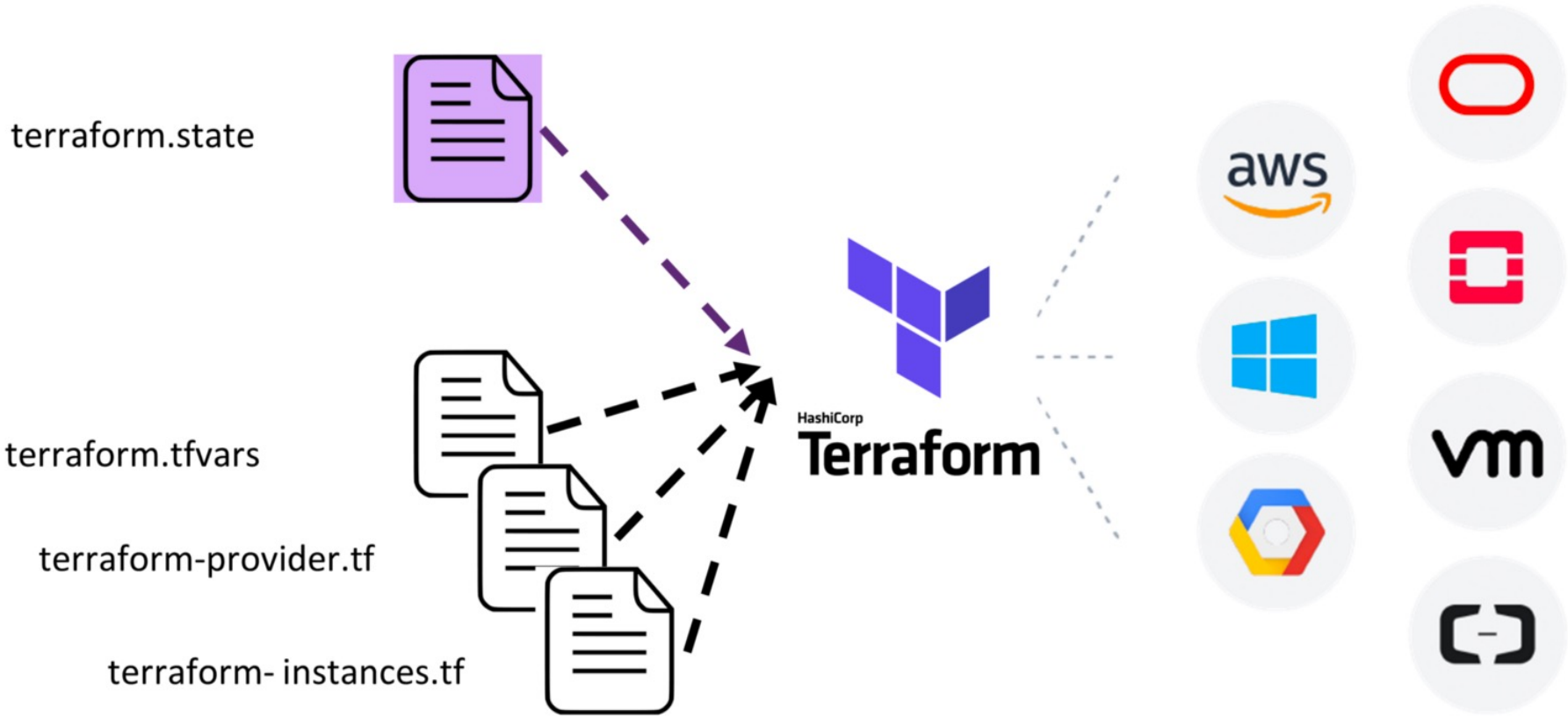
- https://www.terraform.io/

Azure Bicep

- https://github.com/Azure/bicep

Pulumi

- https://www.pulumi.com



ArchitectNow

DEMO: TERRAFORM

API CONSIDERATIONS

ArchitectNow

Monitoring	• AppInsights • Health Checks
Discoverability	• Swagger/OpenAPI
Configuration	• Azure App Configuration • .NET Core • AppSettings.json
Caching	• Azure Cache (Redis)
Queuing	• Event Grid • Azure Queue

Swagger/OpenAPI	• https://swagger.io/
Nswag	• https://github.com/RicoSuter/NSwag
Swagger Codegen	• https://swagger.io/tools/swagger-codegen/

QUESTIONS AND DISCUSSION

NEXT STEPS

Azure Pricing Review

- Process:
  - Review high-level Azure usage and architecture
  - Review typical business use cases
  - Review metrics and pricing history

- Outcomes:
  - Recommendations on a right-sized plan for your organization
  - Preliminary suggestions roadmap on how to utilize Azure
  - Tactical ideas on changes that could result in overall savings and higher reliability

Given the appropriate level of access to the necessary tenants and data (under NDA), the above outcomes can typically be accomplished during an engagement costing approximately $2,000.

Contact us for more details

ArchitectNow

CONTACT INFORMATION

Kevin Grossnicklaus
President
ArchitectNow
kvgros@architectnow.net
LinkedIn
@kvgros

Alex Will
Chief Technology Officer
ArchitectNow
awill@architectnow.net
LinkedIn
YouTube
@alwill_dotnet

www.ArchitectNow.net
@architectnow
LinkedIn

ArchitectNow

Thank you!

info@architectnow.net
www.architectnow.net

ArchitectNow