

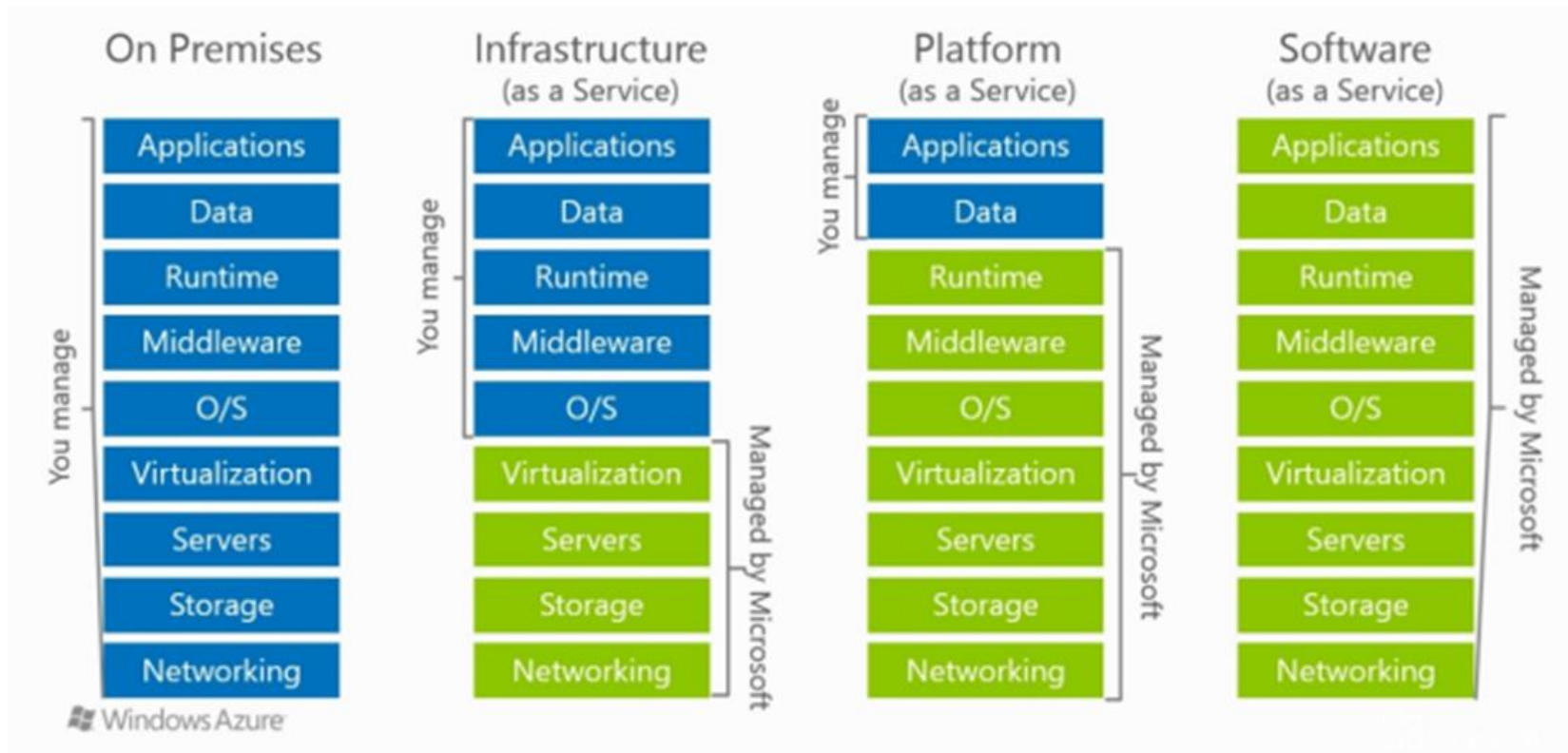
Serverless

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Cloud Models



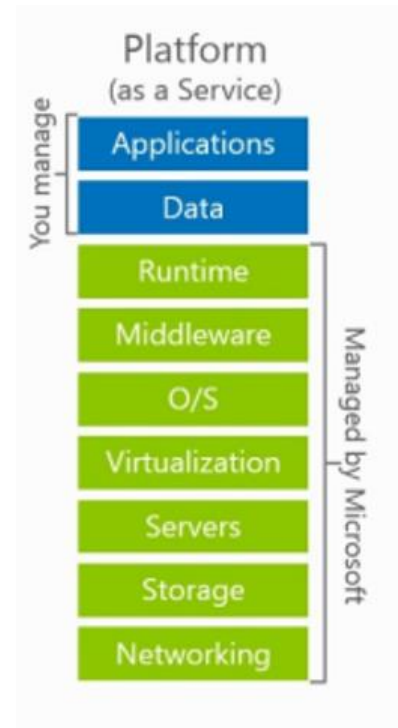
Serverless?

- No servers?
- More like server-less
- No worries?
- Different worries



Web App (App Service)

- Web Site
- Managed environment
- First-class support
 - ASP.NET
 - ASP.NET Core
 - Java
 - Ruby
 - Node.js
 - PHP
 - Python



Web App (App Service)

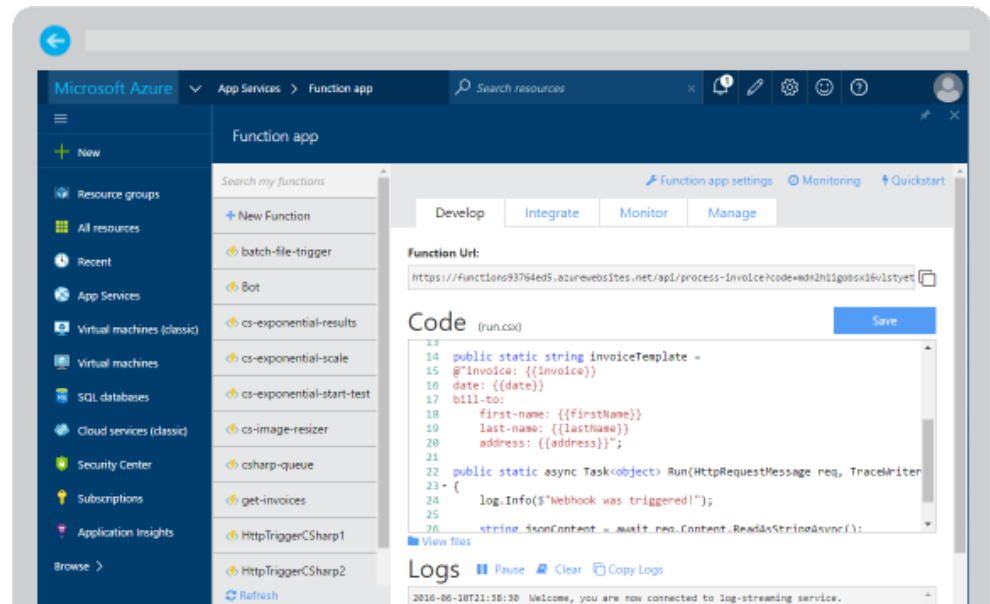
- DevOps optimization – CI & CD
 - Azure DevOps, GitHub, Bitbucket, Docker Hub...
- High availability
- Security and compliance
- Visual Studio integration
- Scale Up
- Scale Out
- ...

WebJobs

- Run program or script
- Trigger based execution
- Supported programs:
 - Windows CMD (.cmd, .bat, .exe), PowerShell, Bash, PHP, Python, Node.js, Java
- Scale Up
- Scale Out
- Running in context of a Web App

Azure Functions

- Serverless
- Event-driven
- Nanoservices
- Scale on demand



2 versions

- 1.X
 - Full .NET Framework
 - Limited language support
- 2.X
 - Rewrite
 - .NET Core
 - New languages
 - New features

Supported Languages

| Language | 1.X | 2.X |
|--------------------|--------------------|-----------------------------|
| C# | .NET Framework 4.7 | .NET Core 2 |
| Javascript | Node 6 | Node 8 & 10 |
| F# | .NET Framework 4.7 | .NET Core 2.2 |
| Java | N/A | Java 8 |
| TypeScript | N/A | Transpiling to JavaScript |
| Python | Experimental | Python 3.6.x |
| PHP | Experimental | N/A |
| Batch (.cmd, .bat) | Experimental | N/A |
| Bash | Experimental | N/A |
| PowerShell | Experimental | Preview (Powershell Core 6) |

.Net Core 3

- Preview - October 2019
- GA – Q1 2020
- Upgrade – no changes needed

- <https://github.com/Azure/app-service-announcements/issues/200>

Supported Tools



Visual Studio

- Good integration
- Primarily for .NET development



Visual Studio Code

- Good integration through extensions
- .NET & Node.JS development



IntelliJ IDEA

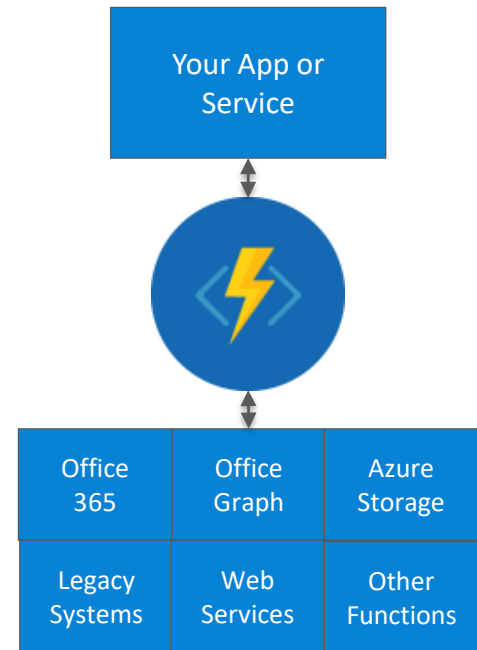
- Java development



Command Line Interface

Common Scenarios

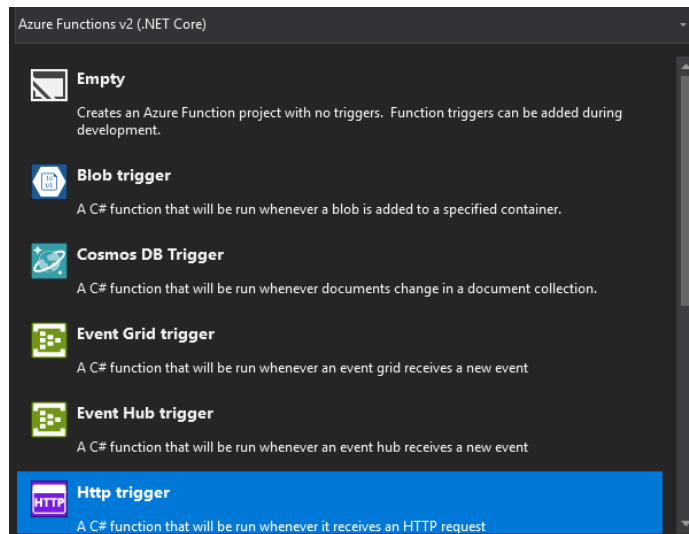
- Timer-based processing
- Azure service event processing
- SaaS event processing
- Serverless web application architectures
- Serverless mobile backends
- Real-time stream processing



Function App Templates

Categories:

- Timer based
- Data Processing
- Webhook & API



Triggers:

- BlobTrigger
- EventHubTrigger
- Generic webhook
- GitHub webhook
- HTTPTrigger
- QueueTrigger
- ServiceBusQueueTrigger
- ServiceBusTopicTrigger
- TimerTrigger
- ...

Timer Function Apps

- Run at explicitly specified intervals using CRON expressions
- CRON expression examples:
 - 9:30 AM every day "0 30 9 * * *"
 - every 5 minutes "0 */5 * * * *"
- Can send information to other systems
- Typically don't "return" information, only write to logs
- Great for redundant cleanup and data management
- Great for checking state of services
- Can be combined with other functions

Data Processing Function Apps

- Run when triggered by a data event, such as an item being added to a queue or container
- Typically have in and out parameters
- Great for responding to CRUD events
- Great for performing CRUD events
- Great for moving content
- Access data across services

Webhook & API Function Apps

- Triggered by events in other services, like GitHub, Team Foundation Services, Office 365, OneDrive, Microsoft PowerApps
- Takes in a request and sends back a response
- Often mimic Web API and legacy web services flows
- Typically need CORS settings managed
- Best for exposing functionality to other apps and services
- Great for building Logic Apps

Function Triggers & Bindings

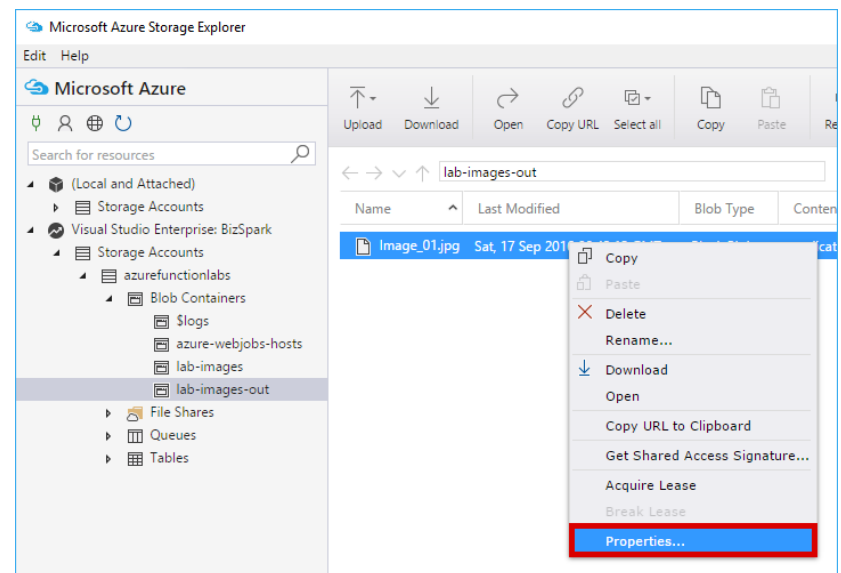
| Type | 1.x | 2.x | Trigger | Input | Output |
|---|-----|-----|---------|-------|--------|
| Blob storage | ✓ | ✓ | ✓ | ✓ | ✓ |
| Cosmos DB | ✓ | ✓ | ✓ | ✓ | ✓ |
| Event Grid | ✓ | ✓ | ✓ | | |
| Event Hubs | ✓ | ✓ | ✓ | | ✓ |
| HTTP & webhooks | ✓ | ✓ | ✓ | | ✓ |
| Microsoft Graph | | ✓ | | ✓ | ✓ |
| Excel tables | | | | | |
| Microsoft Graph | | ✓ | | ✓ | ✓ |
| OneDrive files | | | | | |
| Microsoft Graph | | ✓ | | | ✓ |
| Outlook email | | | | | |
| Microsoft Graph events | | ✓ | ✓ | ✓ | ✓ |
| Microsoft Graph Auth tokens | | ✓ | | ✓ | |

Function Triggers & Bindings

| Type | 1.x | 2.x | Trigger | Input | Output |
|-----------------------------------|-----|-----|---------|-------|--------|
| Mobile Apps | ✓ | | | ✓ | ✓ |
| Notification Hubs | ✓ | | | | ✓ |
| Queue storage | ✓ | ✓ | ✓ | | ✓ |
| SendGrid | ✓ | ✓ | | | ✓ |
| Service Bus | ✓ | ✓ | ✓ | | ✓ |
| SignalR | | ✓ | | ✓ | ✓ |
| Table storage | ✓ | ✓ | | ✓ | ✓ |
| Timer | ✓ | ✓ | ✓ | | |
| Twilio | ✓ | ✓ | | | ✓ |

Testing Functions

- Visual Studio
- Command-line tools
- 3rd party products such as Postman and Swagger
- Direct web calls via cURL
- Service Bus Explorer
- Microsoft Azure Storage Explorer
- Visual Studio Cloud Explorer



Pricing

| METER | PRICE | FREE GRANT (PER MONTH) |
|-------------------------------|-------------------------------|------------------------|
| Execution Time [*] | €0.000014/GB-s | 400,000 GB-s |
| Total Executions [*] | €0.169 per million executions | 1 million executions |

- Average memory size in GB x time in milliseconds
- Rounded up to nearest 128 MB
- Rounded up to nearest 1 ms
- Minimum 128 MB & 100 ms

';--have i been pwned?

- <https://haveibeenpwned.com/>
- Check if you have an account that has been compromised in a data breach
- Troy Hunt



Troy Hunt ✓
@troyhunt

Follow

I've been moving *a lot* of @haveibeenpwned stuff to @AzureFunctions lately which has massively cut my app services costs (hundreds per month). Just checked my Function usage for the last month: 77,500,000 executions and 1,580,000,000,000 execution units which costs... \$33.59 😎

12:27 AM - 26 Oct 2018

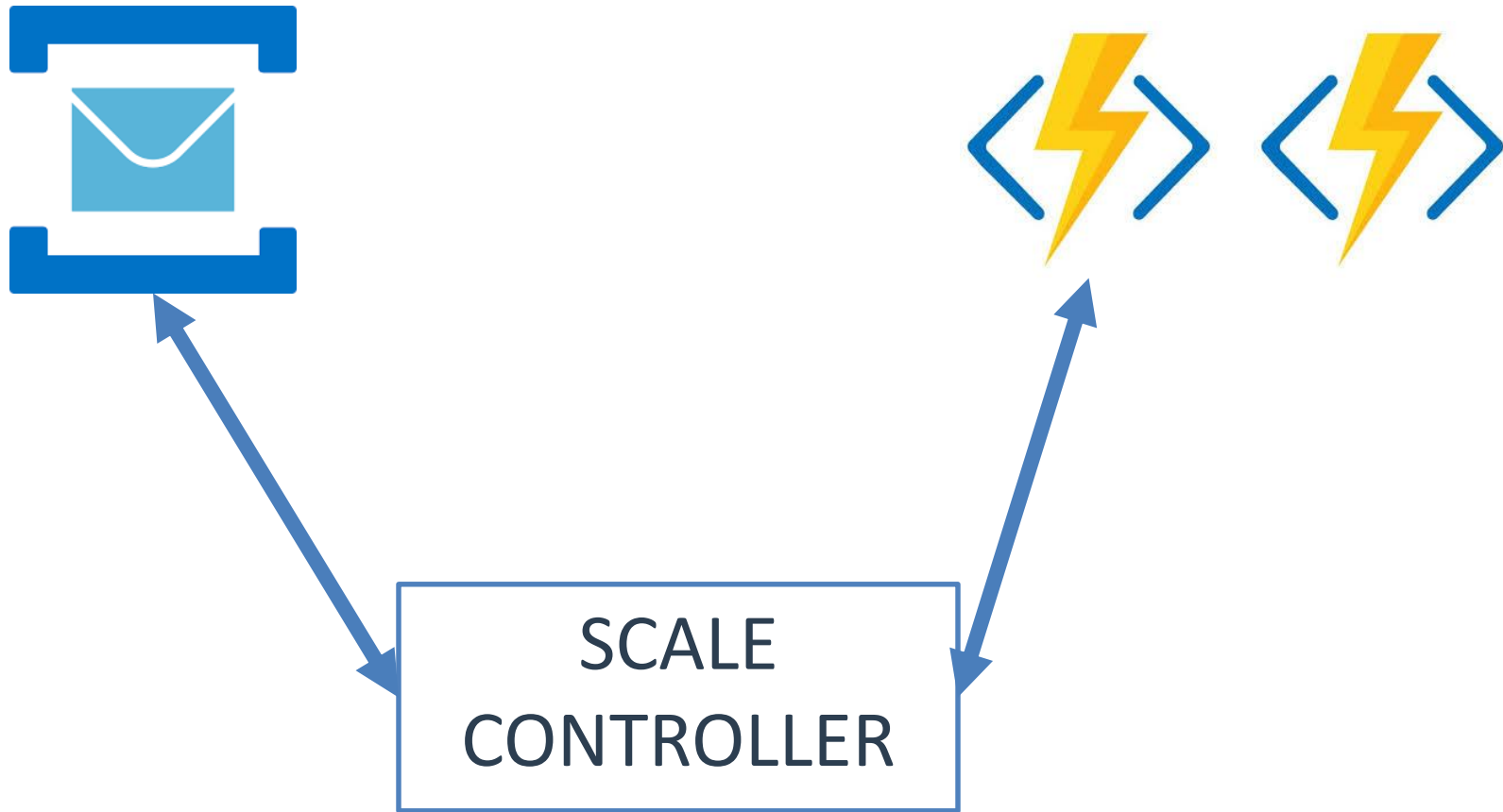
Deployment Slots

- Swap staging and production environment
- Traffic redirection - no requests are dropped
- How to scale slots?
 - Many instances in production
 - Few instances in staging
- Slot scales as production
- Not available for Linux Consumption plan

KEDA

- Kubernetes-based Event Driven Autoscaling
- Running Azure Functions in hosted environment
- Runtime & scale controller

KEDA



KEDA

- Triggers
 - Azure Storage Queues
 - Azure Service Bus Queues
 - HTTP
 - Apache Kafka
 - RabbitMQ

ZIP Deployment

- Deploy ZIP file with the Function to Azure
- Extracts to the wwwroot folder
- Deletion of files that were left over
- Deployment customization, including running deployment scripts
- Deployment logs
- Syncing function triggers

Run from package

- Reduces the risk of file copy locking issues
- Can be deployed to a production app (with restart)
- May reduce cold-start times, particularly for JavaScript functions with large npm package trees
- WEBSITE_RUN_FROM_PACKAGE
 - 1 – Windows
 - <url> - deploy from Blob Storage

Running locally

- 1 Function – OK
- A few Functions – OK
- Many Functions – Slow
- Local runner

Sharing Resources

- Many instances
- Many connections
- Possible socket exhaustion
- Solutions
 - Use static fields
 - Shared while the function app is running
 - Dependency injection

Dependency Injection

- Startup class
[assembly: FunctionsStartup(typeof(Startup))]
- Override Configure method
public override void Configure(IFunctionsHostBuilder builder)
- builder.Services - **IServiceCollection**
- May 2019
- Scrutor

Alert Rules – Service Bus

- If something happens – get an alert
- Rules
 - Failure Anomalies
 - Count of active messages in queue > threshold
- Actions
 - Get an email
 - Get an SMS

Service Bus Explorer

- Saved connections – compile your own version

Premium plan

- Pre-warmed instances (at least 1)
- VNet connectivity
- Unlimited execution duration
- Premium instance sizes
- More predictable pricing

Premium Plan Pricing

METER

Premium instance duration^{*}

PRICE

Memory: €0.000380/100 GB-s
vCPU: €0.001535/100 vCPU-s

- Core seconds
- Execution time
- Memory used

- Pay for at least 1 running instance

Premium Plan Pricing

Recommended pricing tiers

| | | |
|--|--|---|
| S1 100 total ACU 1.75 GB memory A-Series compute equivalent 61.56 EUR/Month (Estimated) | P1V2 210 total ACU 3.5 GB memory Dv2-Series compute equivalent 123.12 EUR/Month (Estimated) | P2V2 420 total ACU 7 GB memory Dv2-Series compute equivalent 246.24 EUR/Month (Estimated) |
| P3V2 840 total ACU 14 GB memory Dv2-Series compute equivalent 492.49 EUR/Month (Estimated) | EP1 210 total ACU 3.5 GB memory Dv2-Series compute equivalent 73.80 EUR/Month Baseline (Estimated) | EP2 420 total ACU 7 GB memory Dv2-Series compute equivalent 187.27 EUR/Month Baseline (Estimated) |
| EP3 840 total ACU 14 GB memory Dv2-Series compute equivalent 295.20 EUR/Month Baseline (Estimated) | | |

Premium Plan – When to use

- App runs (nearly) continuously
- Need more CPU or memory
- Need to run longer than limit (5-10 minutes)
- Need VNet/VPN

When to use Azure Functions?

- Fully managed environment
- Event-based scenarios
- Scaling
- Modularity
- Price