

Microsoft Azure Batch: Getting Started

CLOUD COMPUTING, PARALLEL JOB PROCESSING
SCENARIOS AND AZURE BATCH



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Overview



Cloud Computing

Parallel Processing Scenarios

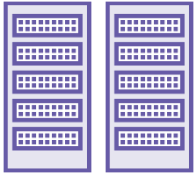
Microsoft Azure

Azure Batch Overview

Demo: Rendering a 3D Animation with
Azure Batch

Cloud Computing

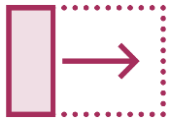
Four Tenets of Cloud Computing



Resources available on demand



Self-service

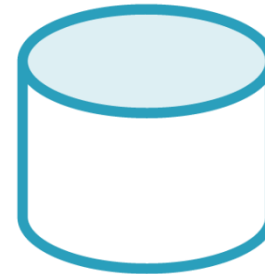
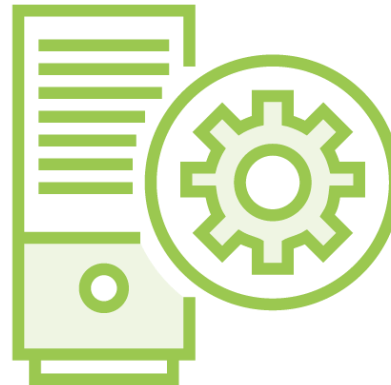
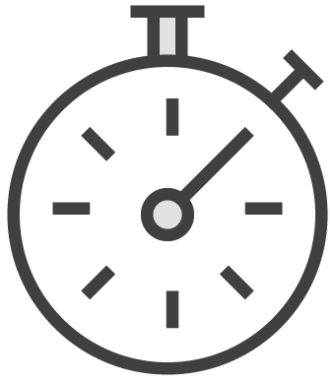


Massive scalability

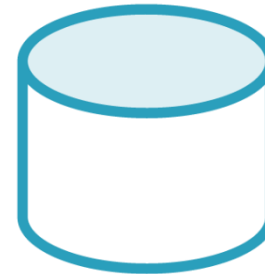
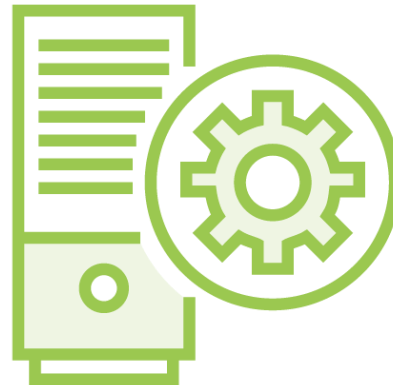
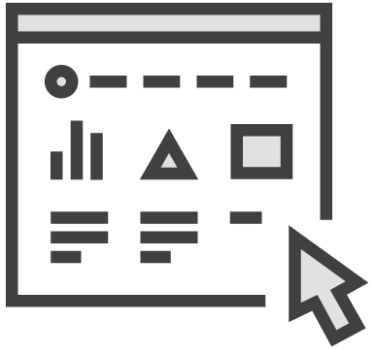


Billing based on consumption

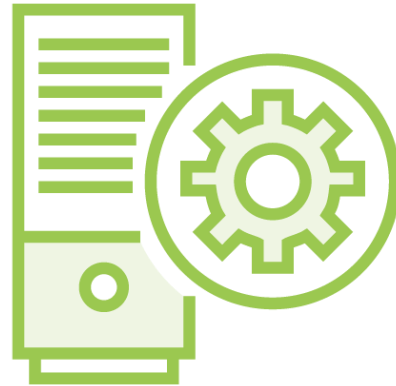
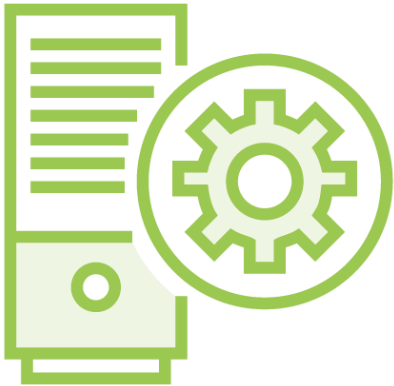
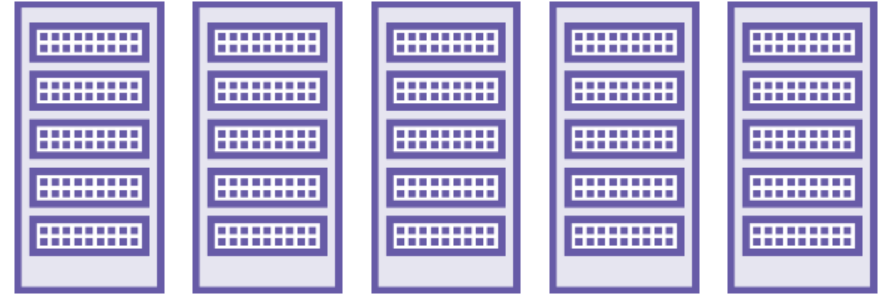
Resources Available on Demand



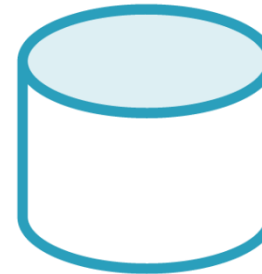
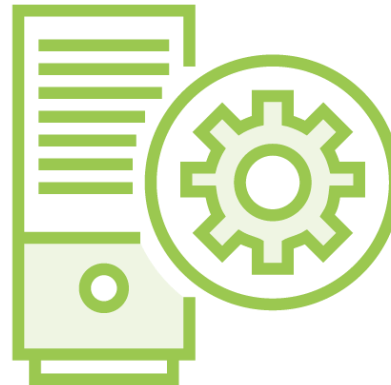
Self-Service





Massive Scalability





Billing Based on Consumption





Microsoft Azure


-  Create a resource
-  All services
- ★ FAVORITES


 Dashboard


 Resource groups


 All resources


 Recent


 SQL databases


 Virtual machines


 Cloud services (classic)


 Subscriptions


 App Services


 Service Bus


 Cost Management + Billing


 Help + support


 Logic apps

 Storage accounts

 SQL servers


 Stream Analytics jobs


 Azure Cosmos DB


 Function Apps


Dashboard ▾


+ New dashboard


 Upload dashboard


 Download dashboard

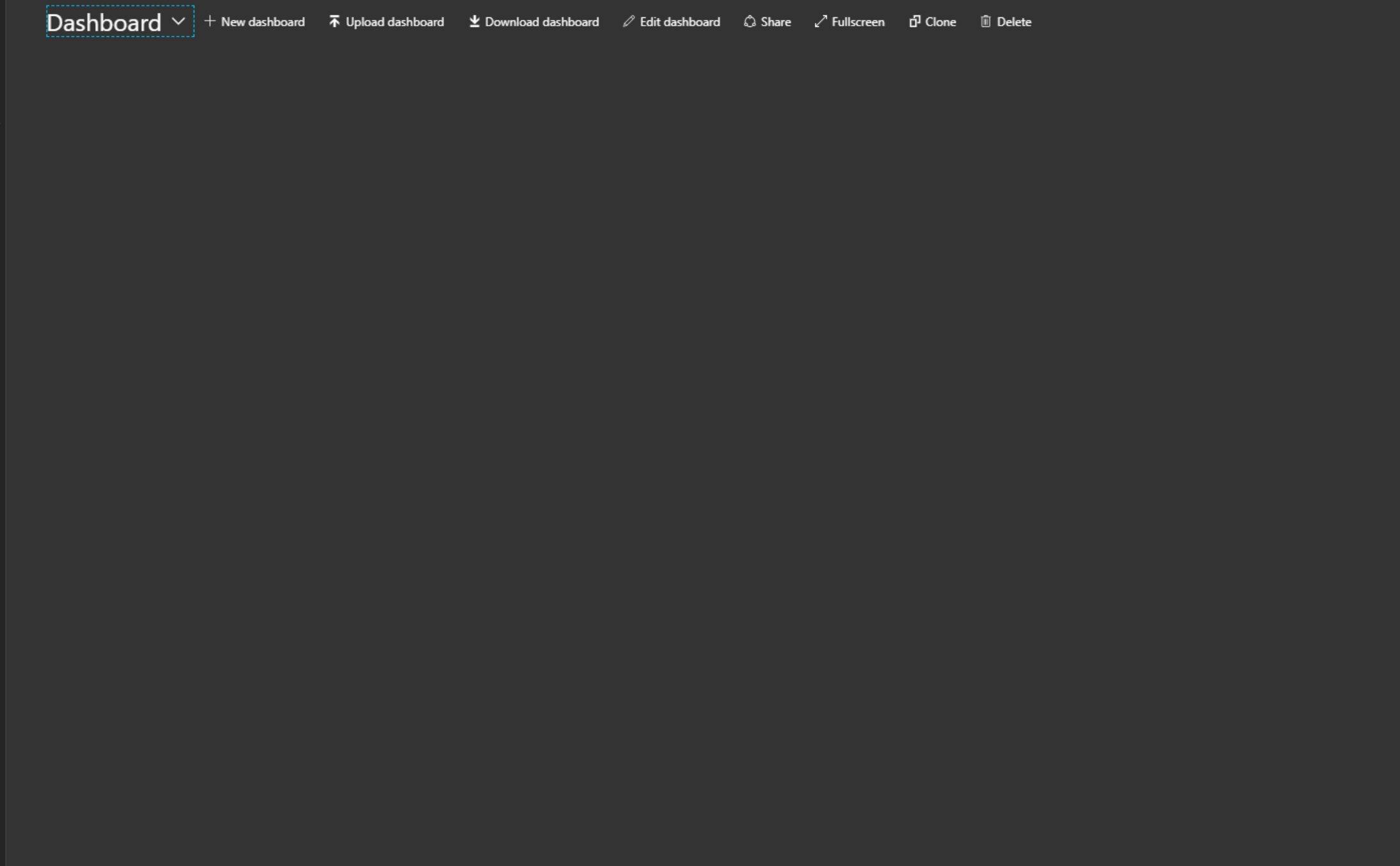
 Edit dashboard

 Share

 Fullscreen

 Clone

 Delete



- <<
- Home > New
- +

Create a resource
- ☰

All services
- FAVORITES
- 📊

Dashboard
- 📁

Resource groups
- 📊

All resources
- 🕒

Recent
- 🗄️

SQL databases
- 🖥️

Virtual machines
- ☁️

Cloud services (classic)
- 🔑

Subscriptions
- 🌐

App Services
- 📧

Service Bus
- 💰

Cost Management + Billing
- 👤

Help + support
- 🔗

Logic apps
- 📁

Storage accounts
- 🗄️

SQL servers
- 🌿

Stream Analytics jobs
- 🌐

Azure Cosmos DB
- ⚡

Function Apps

New

☐ ×

🔍

Search the Marketplace

Azure Marketplace

See all

Popular

Get started

Recently created

Compute

Networking

Storage

Web + Mobile

Containers

Databases

Data + Analytics

AI + Cognitive Services

Internet of Things

Enterprise Integration

Security + Identity

Developer tools

Monitoring + Management

Add-ons

Blockchain

🏠

Windows Server 2016 VM
Quickstart tutorial

🐧

Ubuntu Server 17.10 VM
Learn more

🌐

Web App
Quickstart tutorial

🗄️

SQL Database
Quickstart tutorial

🌌

Cosmos DB
Quickstart tutorial

🔧

DevOps Project
Quickstart tutorial



📊


Storage Account
Quickstart tutorial


⚡


Serverless Function App
Quickstart tutorial


Show recently created items


- << Home > New
-  Create a resource
-  All services
- ★ FAVORITES


 Dashboard


 Resource groups


 All resources


 Recent


 SQL databases


 Virtual machines


 Cloud services (classic)


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 Storage accounts



 SQL servers

 Stream Analytics jobs

 Azure Cosmos DB

 Function Apps

New

Search the Marketplace

Azure Marketplace

See all

Featured

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Data + Analytics

AI + Cognitive Services

Internet of Things

Enterprise Integration


Security + Identity


Developer tools


Monitoring + Management


Add-ons


Blockchain


 Windows Server 2016 Datacenter
Quickstart tutorial


 Red Hat Enterprise Linux 7.2
Quickstart tutorial


 Ubuntu Server 17.10
Learn more


 SQL Server 2017 Enterprise Windows Server 2016
Learn more


 Reserved VM Instances
Quickstart tutorial

 Service Fabric Cluster
Quickstart tutorial

 Web App for Containers
Quickstart tutorial

 Function App
Quickstart tutorial

 Batch Service
Quickstart tutorial

 Cloud service
Learn more

Microsoft Azure Compute Services



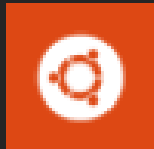
Windows Server 2016 Datacenter

[Quickstart tutorial](#)



Red Hat Enterprise Linux 7.2

[Quickstart tutorial](#)



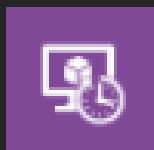
Ubuntu Server 17.10

[Learn more](#)



SQL Server 2017 Enterprise Windows Server 2016

[Learn more](#)



Reserved VM Instances

[Quickstart tutorial](#)



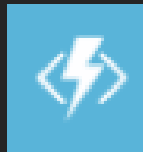
Service Fabric Cluster

[Quickstart tutorial](#)



Web App for Containers

[Quickstart tutorial](#)



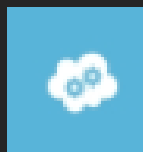
Function App

[Quickstart tutorial](#)



Batch Service

[Quickstart tutorial](#)



Cloud service

[Learn more](#)

Microsoft Azure Virtual Machines



VM

Infrastructure as a Service (IaaS)

Durable stateful storage

Many specification options

Many operating systems

Full access to operating system

Custom Images

Microsoft Azure Virtual Machine Types



VM

General purpose

Compute optimized

Memory optimized

Storage optimized

Graphics Processing Unit (GPU)

High performance compute

Microsoft Azure Cloud Services



Cloud
Service

Web Roles and Worker Roles

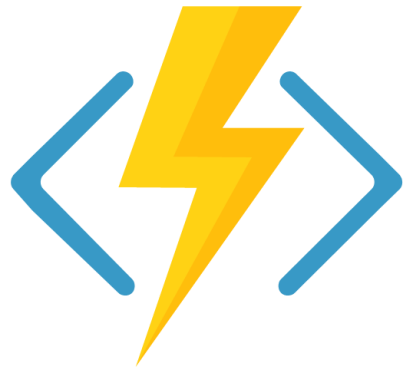
Stateless Virtual Machine

Platform as a Service (PaaS)

Limited operating systems

Temporary local storage

Microsoft Azure Functions



Function

Serverless compute

Code as a service

Billing based on execution

Various endpoints and triggers

Microsoft Azure Web Jobs

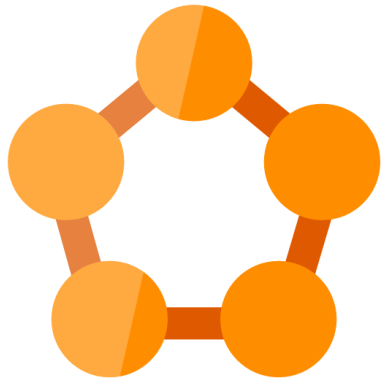


Back end processing

Limited access to operating system

Limited local storage options

Microsoft Azure Service Fabric



**Service
Fabric**

Microservice architecture

Stateless and durable services

**Complex application and service
development**

Compute Services for Workload Processing



VM



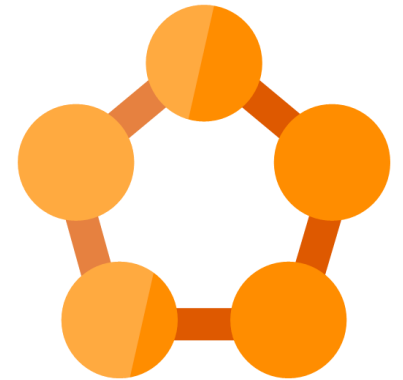
Cloud
Service



Function



Web Job



Service
Fabric

Compute Services for Workload Processing



VM



Cloud
Service

Microsoft Azure Storage



Blob Storage



Storage Queue



Table Storage

Blob storage – Storage of files and binary data

Storage Queues – Workload distribution

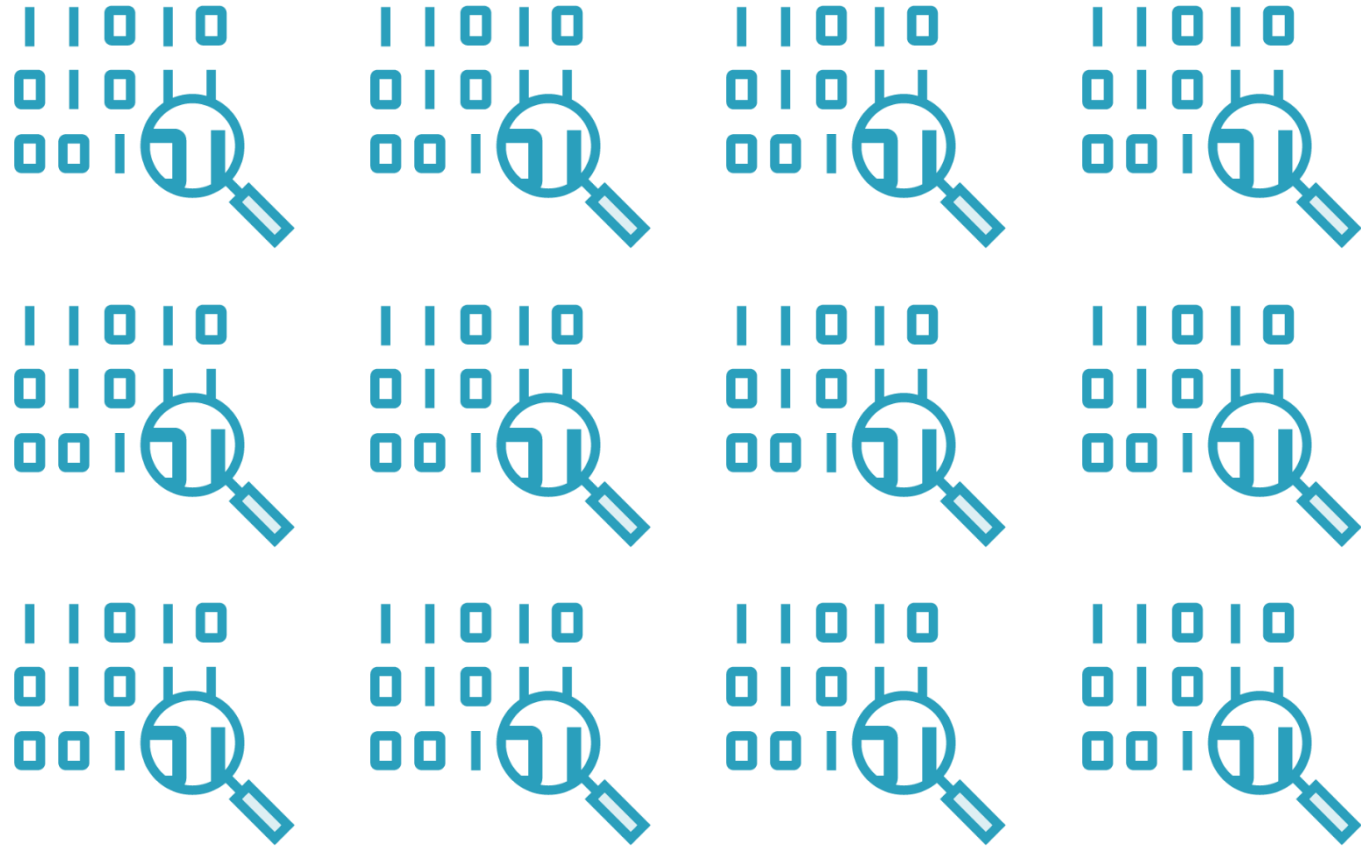
Table Storage – Non-relational entity storage

Parallel Job Processing

Parallel Job Processing



Job

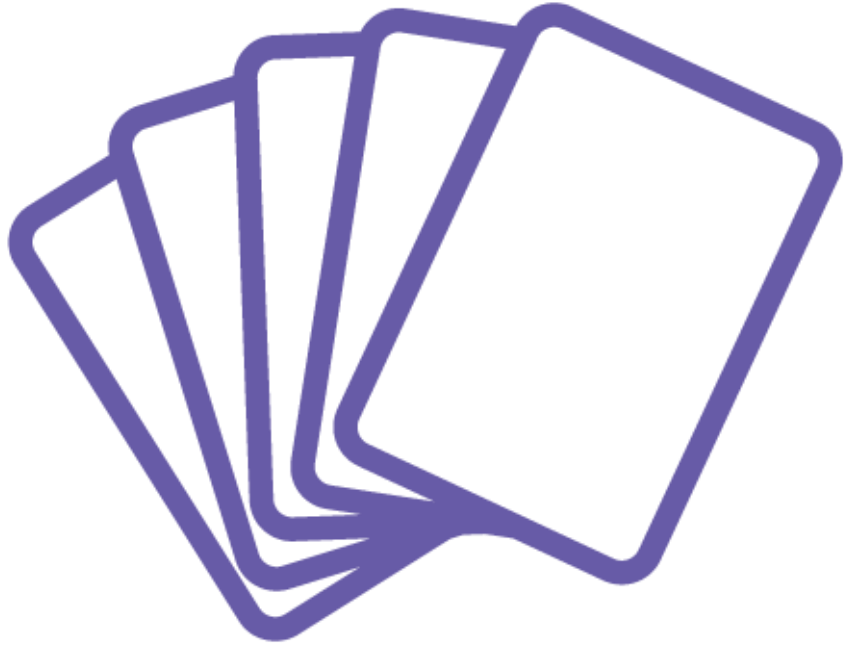


Tasks



Result

Monte Carlo Simulations

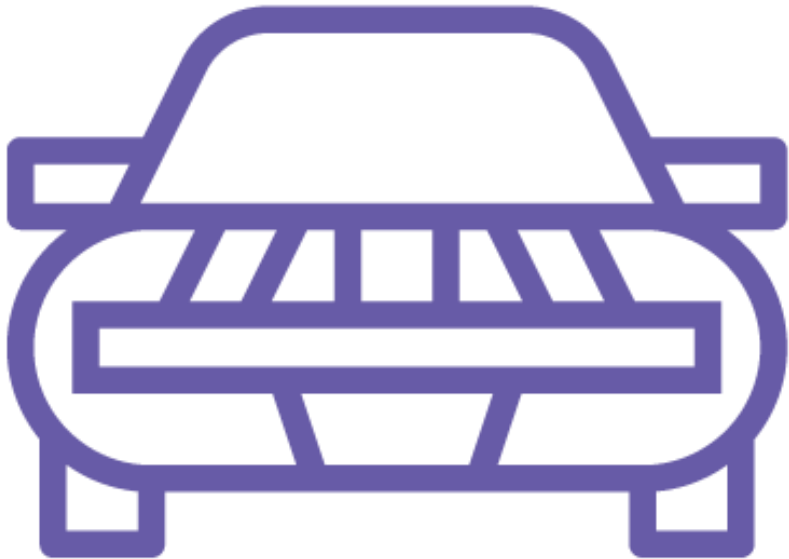


Used to solve complex physics and mathematical problems

Run simulations many times with variable inputs

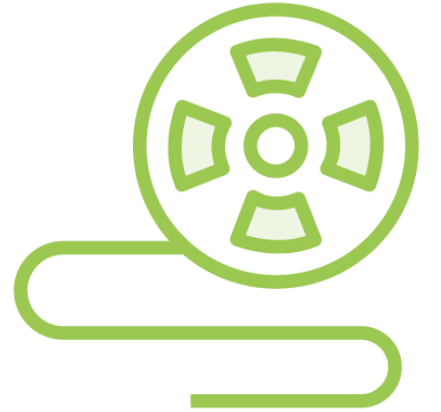
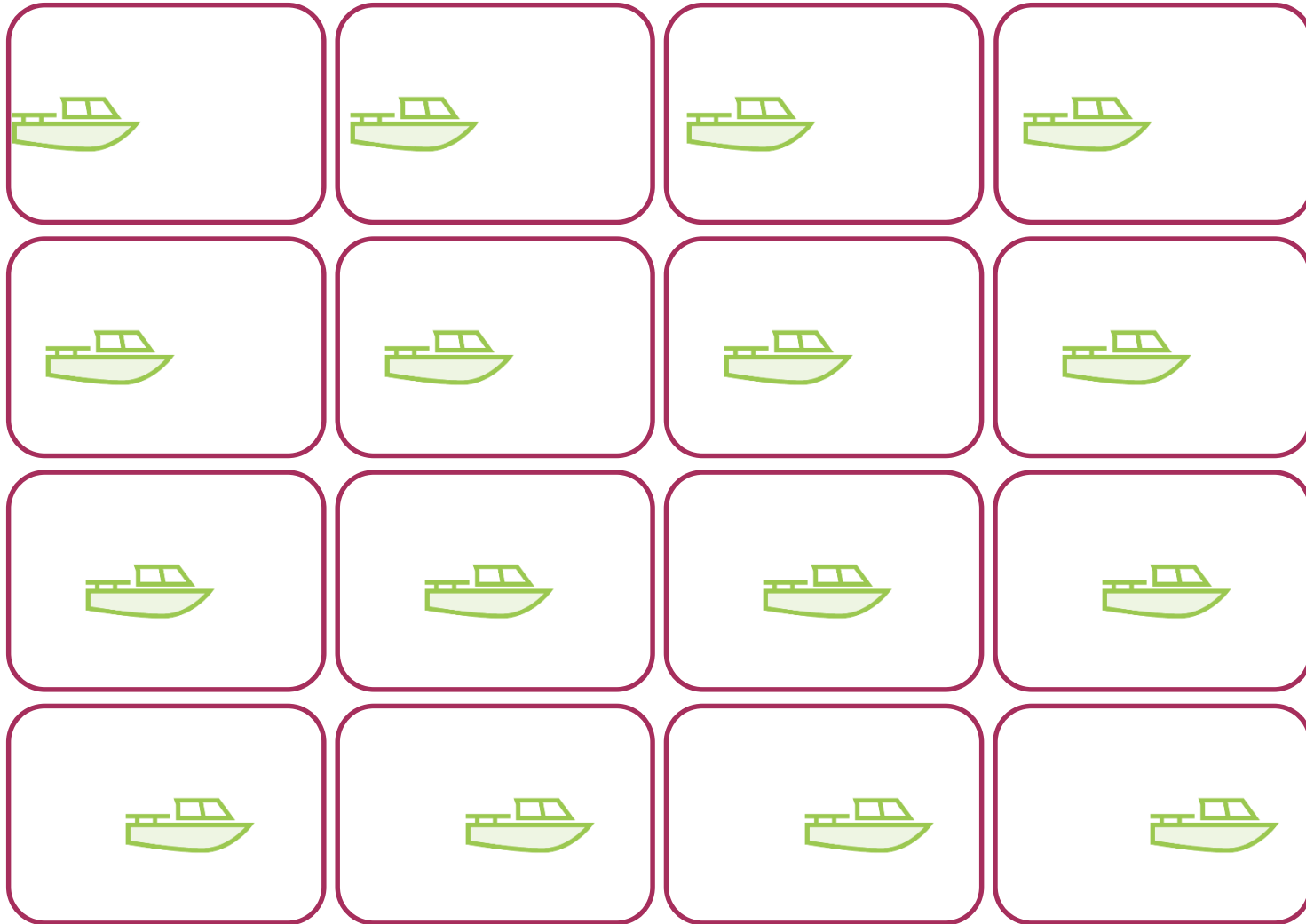
Many compute nodes increases number of simulations run

Motor Racing Simulations



Run complex simulations and predictions
Gain the edge over competing teams
Deliver results to engineers in short time frame

Animation Rendering



Cost of On-Premise Render Farm

Nodes	Cost
1	\$500
10	\$5,000
100	\$50,000
1,000	\$500,000
10,000	\$5,000,000

On-Premise Resource Costs

- Increases in proportion to node count

Other Cost Considerations

- Building premises
- Power
- Cooling
- Installation & Maintenance

Cost of 10,000 Hour Render Job

Nodes	Hours	Cost
1	10,000	\$1,200
10	1,000	\$1,200
100	100	\$1,200
1,000	10	\$1,200
10,000	1	\$1,200

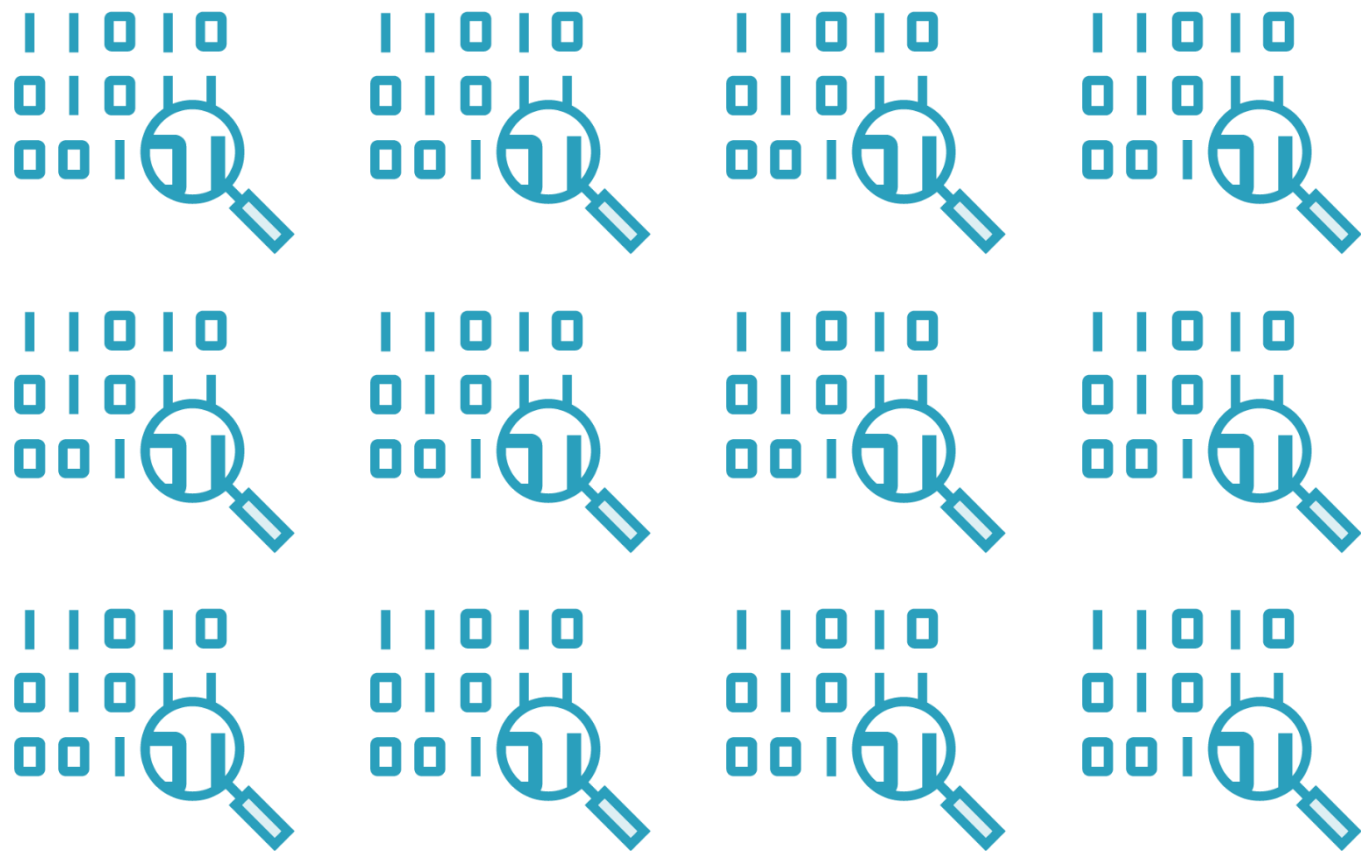
On-Premise Resource Costs

- Cost is consistent across all node counts

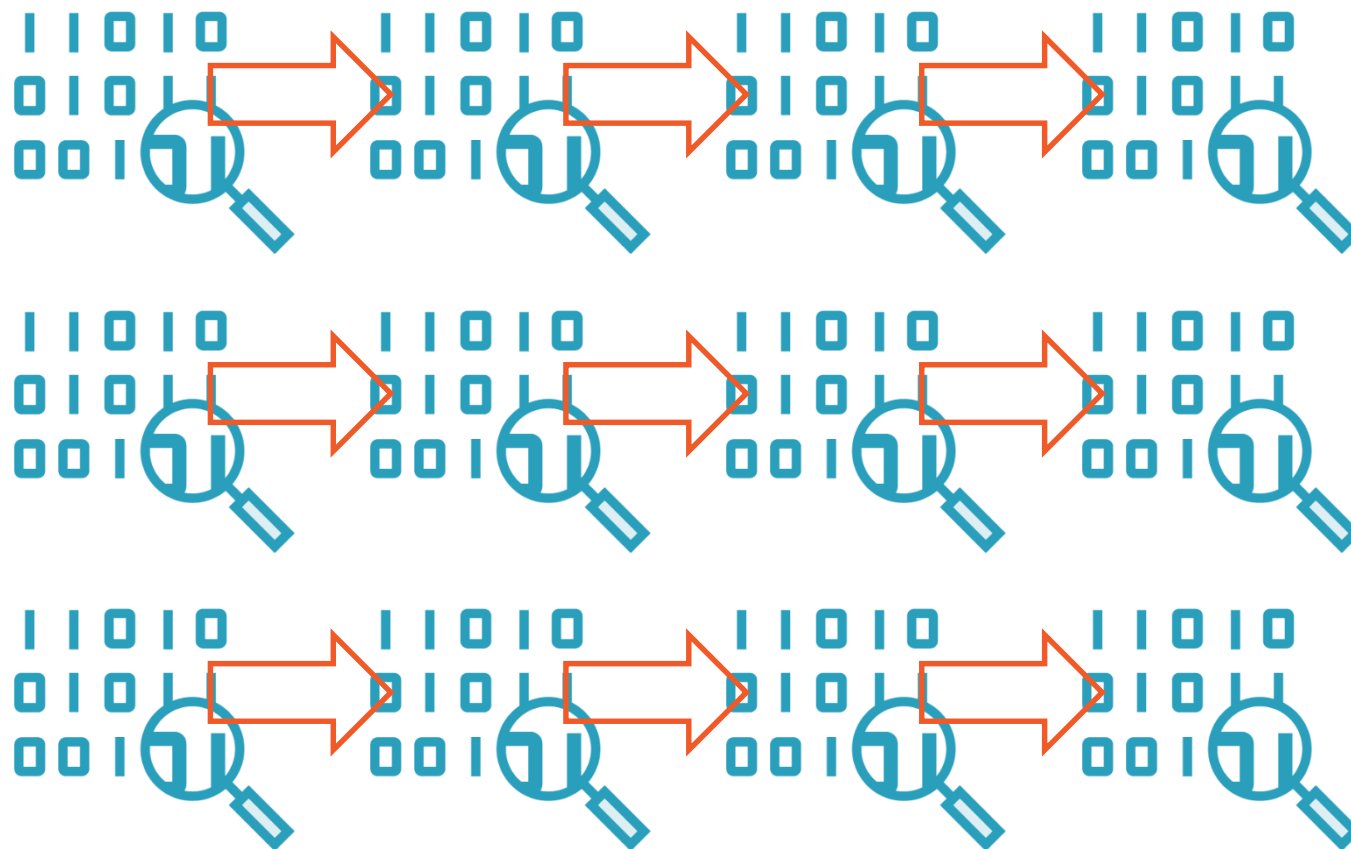
Assumptions Made

- Resources are used efficiently

Task Dependencies

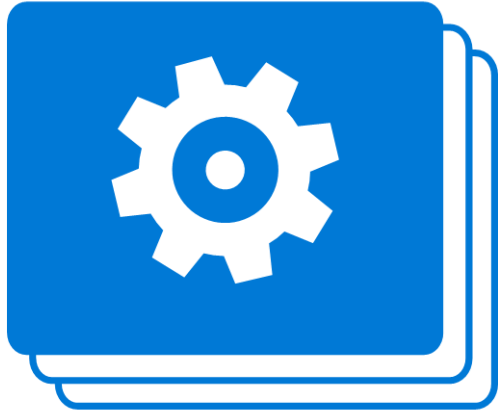


Task Dependencies



Microsoft Azure Batch Overview

Microsoft Azure Batch Features



Resource Management

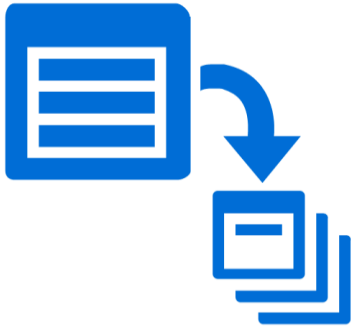


Process Management



Resource and
Process Monitoring

Azure Batch Pricing



Azure Batch



VM



Worker
Role

Service	Min Price / Hour	Max Price / Hour
Azure Batch	Free	Free
Virtual Machine	\$0.02	> \$20
Worker Role	\$0.02	> \$20

Parallel Processing Development Options

Custom Implementation

Features implemented where required

Domain specific job processing
architecture

Complex functionality can be
implemented when required

Costs associated with developing code

Azure Batch Implementation

Feature rich

Generic job processing architecture

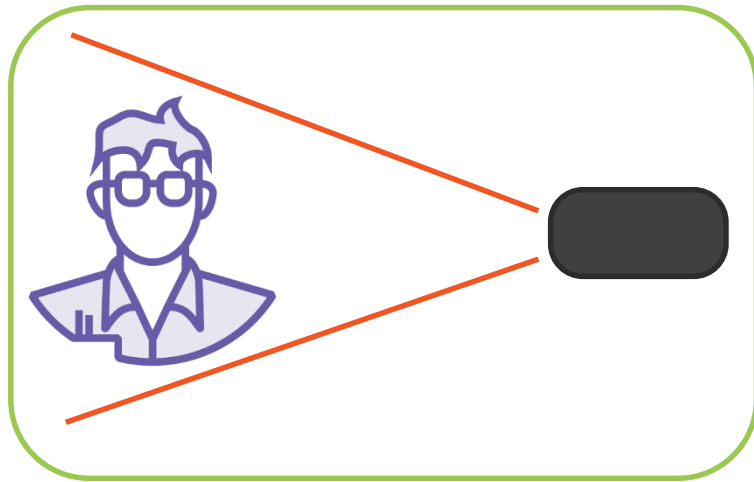
Some features may be limiting and
non-extensible

Free to use

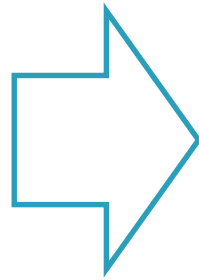
Demo Scenario - 3D Animation Rendering

Pinboard Animation

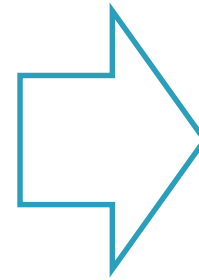
Demo Scenario - Animation Creation



Kinect Sensor



Depth Image



Scene File

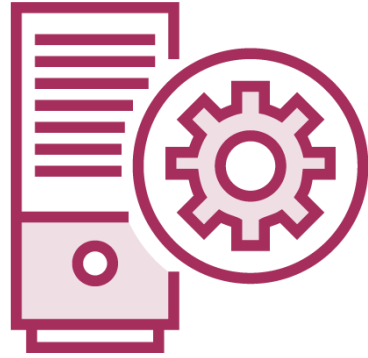
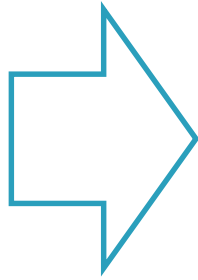
Example Scene File

```
viewpoint {  
    from <6.125, 4.000, 5.146>  
    at <0.000, 2.000, 0.000>  
    up <0, 1, 0>  
    angle 60 resolution  
    3840, 2160  
    aspect 1.6  
}  
light <-10, 30, 20>  
light <-10, 30, -20>  
object { disc <0, -2, 0>, <0, 1, 0>, 30 wooden }  
object { sphere <-5.000, -1.000, 0.000>, 0.030 chrome }  
object { cylinder <-5.000, -1.000, 0.000>, <-5.000, -1.000, -1.500>, 0.010 chrome }  
object { sphere <-5.000, -0.900, 0.000>, 0.030 chrome }  
object { cylinder <-5.000, -0.900, 0.000>, <-5.000, -0.900, -1.500>, 0.010 chrome }  
object { sphere <-5.000, -0.800, 0.000>, 0.030 chrome }  
object { cylinder <-5.000, -0.800, 0.000>, <-5.000, -0.800, -1.500>, 0.010 chrome }  
object { sphere <-5.000, -0.700, 0.000>, 0.030 chrome }
```

Demo Scenario – Animation Rendering



Scene File



Ray Tracer

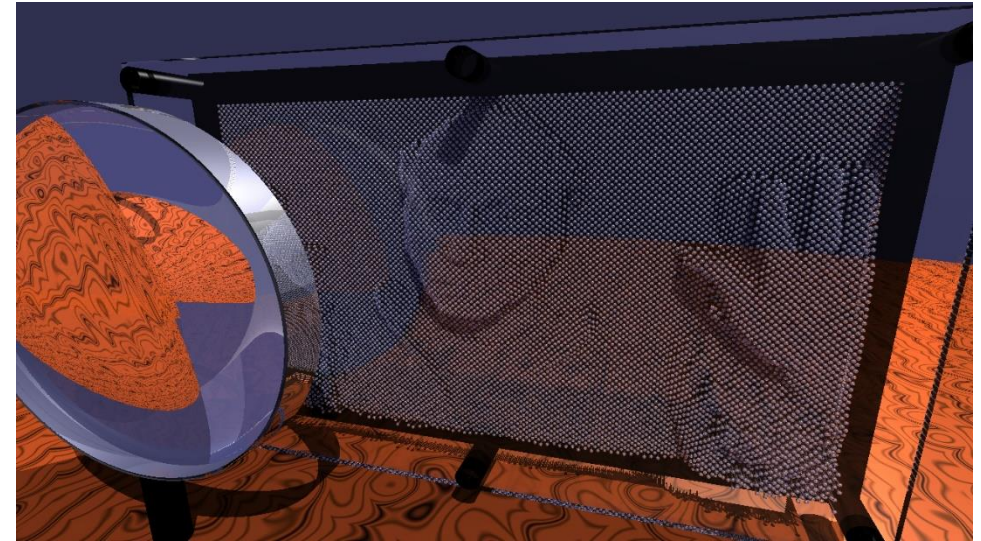
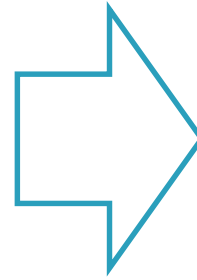
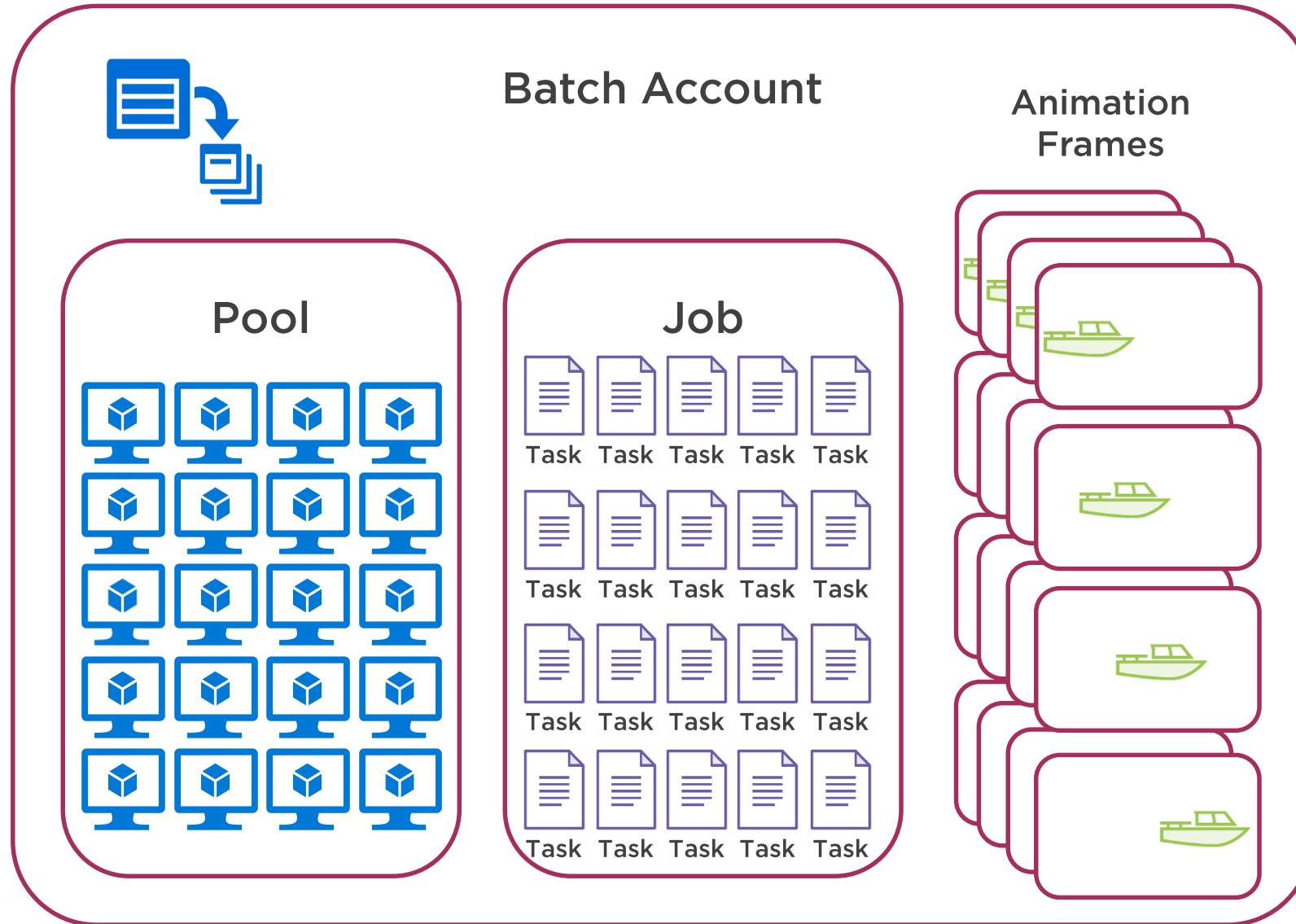
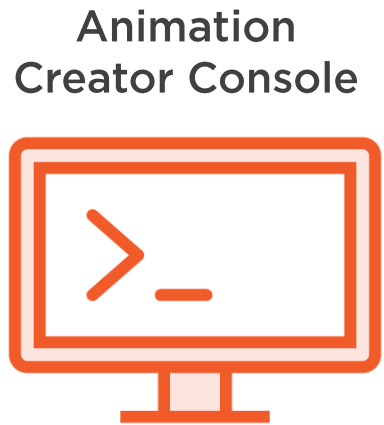
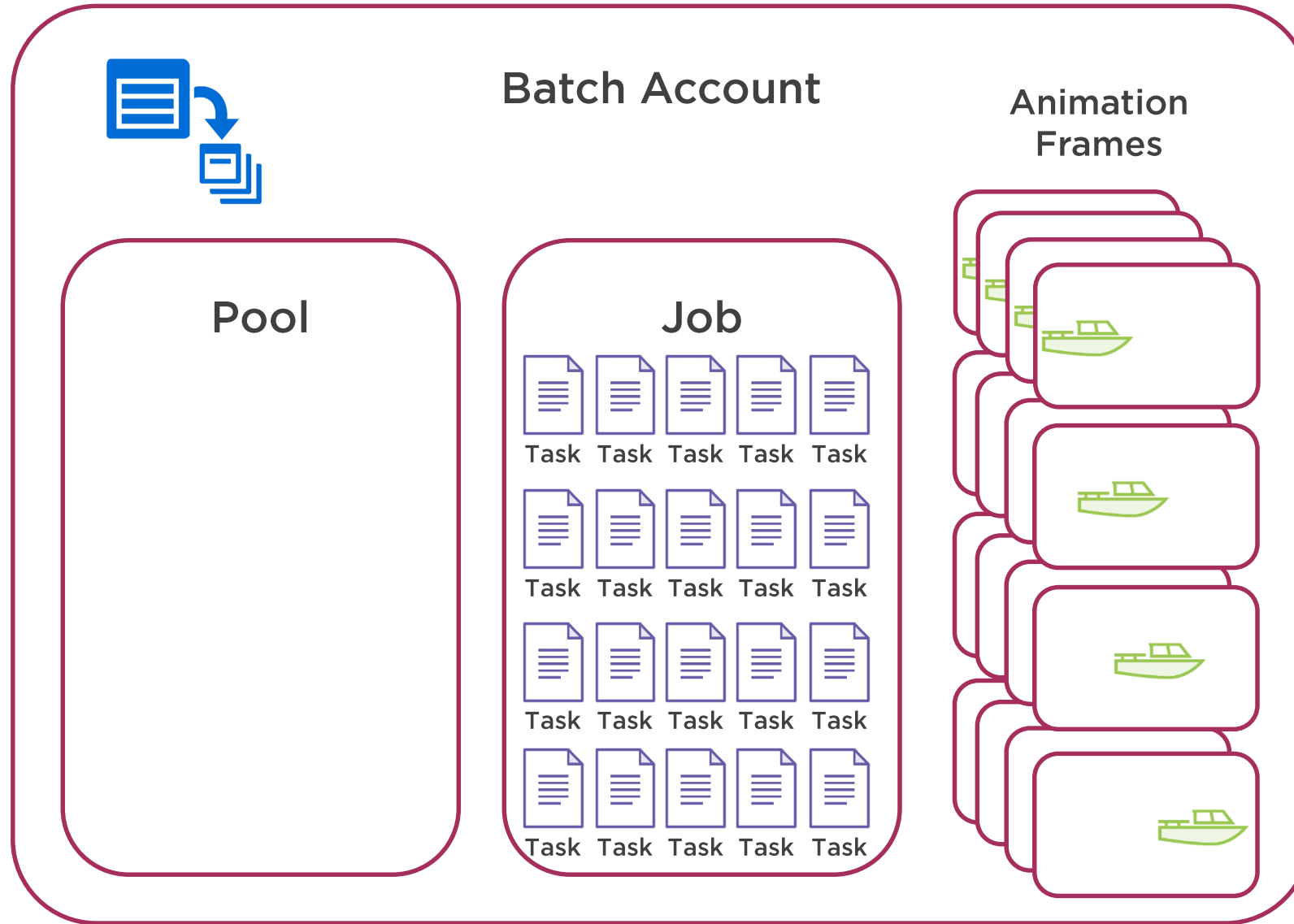
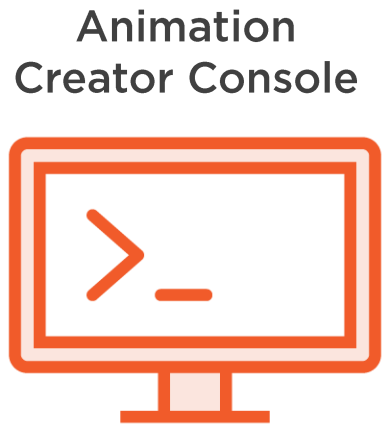


Image File

Demo Scenario – 3D Animation Rendering



Demo Scenario – 3D Animation Rendering



Demo



Rendering a 3D Animation with Azure Batch

- Creating an Azure Batch Pool
- Creating a Job
- Submitting Tasks to a Job
- Monitoring Job Progress
- Scaling the Pool
- Showing the Results
- Cleaning up the Environment

Summary



Cloud Computing

- Billing based on usage
- Massive scalability on demand

Microsoft Azure

- Microsoft's cloud computing offering
- Many different compute services

Azure Batch

- Free to use service
- Resource management
 - Virtual Machines
 - Worker Roles
- Process management
- Monitoring