

Azure Batch Architecture and Features



Alan Smith

SENIOR CONSULTANT - ACTIVE SOLUTION SWEDEN

@alansmith www.cloudcasts.net

Overview



Azure Batch Architecture

Core Features

Integrating with Azure Batch

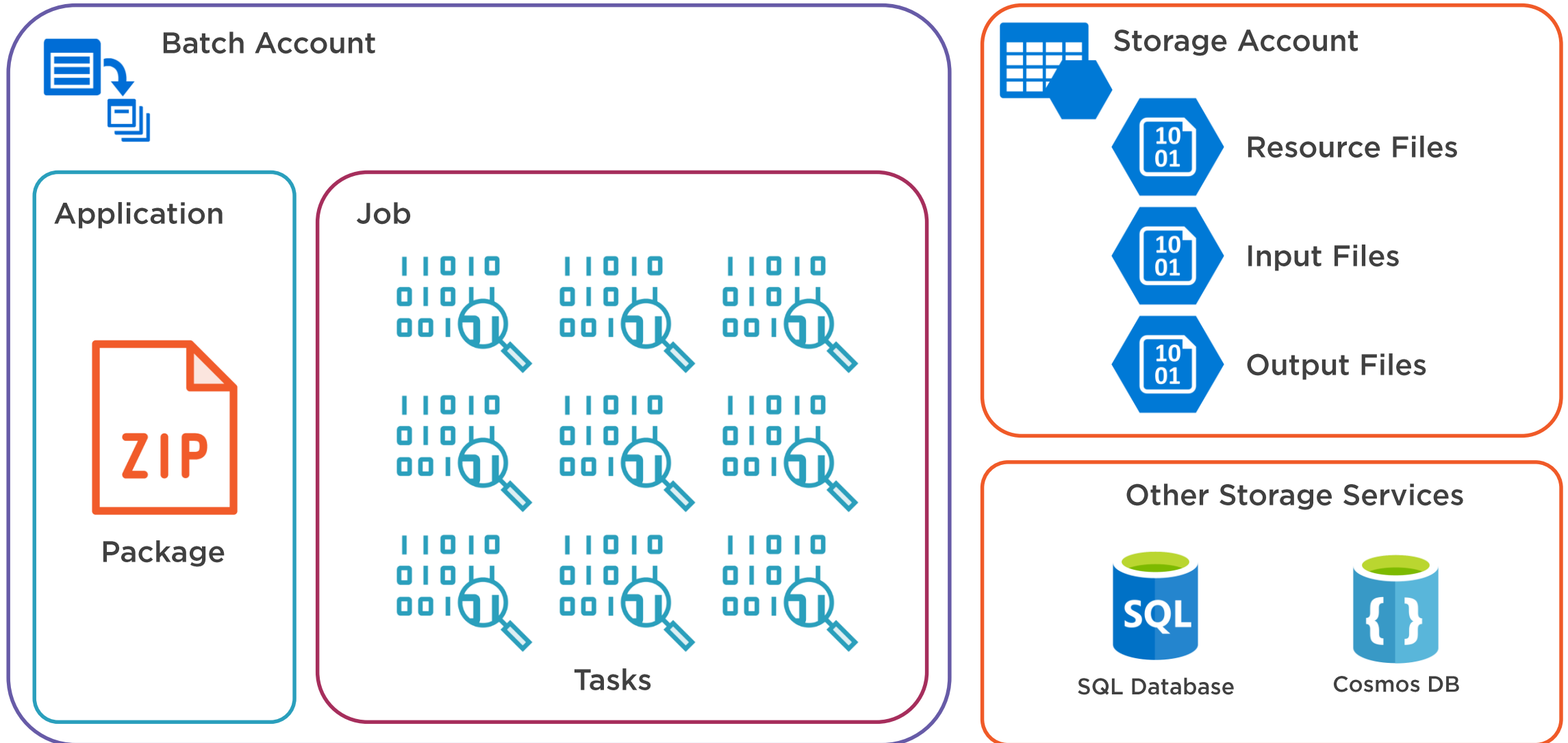
Limits and Quotas

Demo: Provisioning and Managing an Azure Batch Service using the Azure Portal

Demo: Managing an Azure Batch Service using Batch Labs

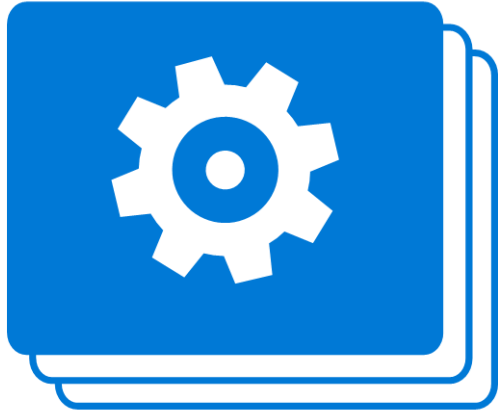
Azure Batch Architecture

Azure Batch Processing Architecture



Azure Batch Features

Microsoft Azure Batch Core Features



Resource Management

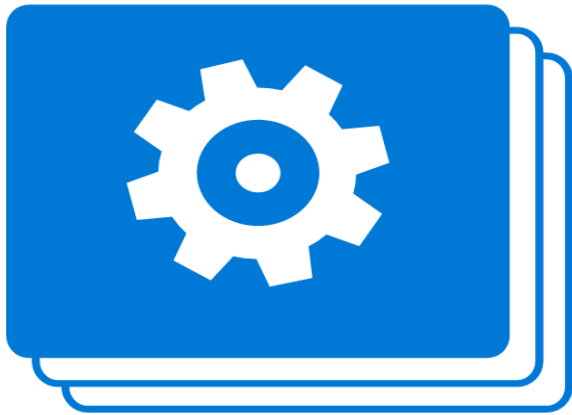


Process Management



Resource and
Process Monitoring

Resource Management



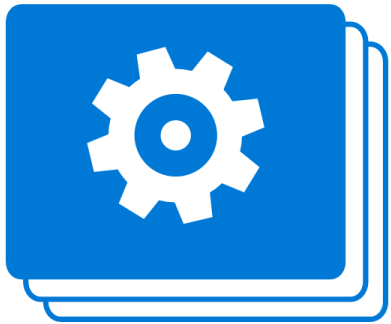
Node Management

Auto-Scaling

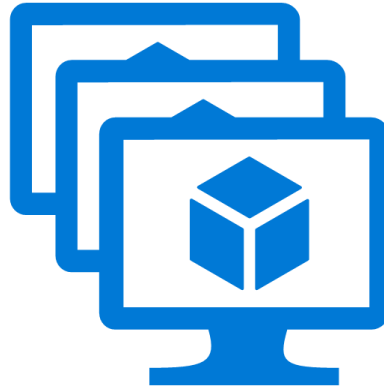
Low Priority Nodes

Applications

Node Management



Cloud Service
Worker Roles

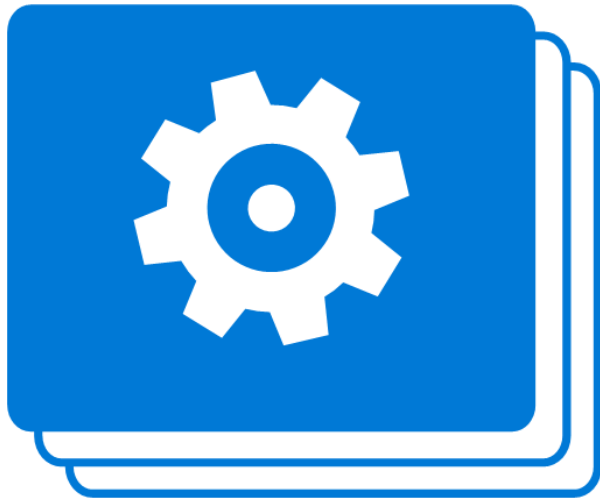


Virtual Machines



Third Party
Applications

Cloud Service Worker Roles



Stateless Virtual Machine

Platform as a Service (PaaS)

Limited operating systems

Temporary local storage

Limited customization

Virtual Machines



Infrastructure as a Service (IaaS)

Durable stateful storage

Many specification options

Many operating systems

Full access to operating system

Third Party Applications



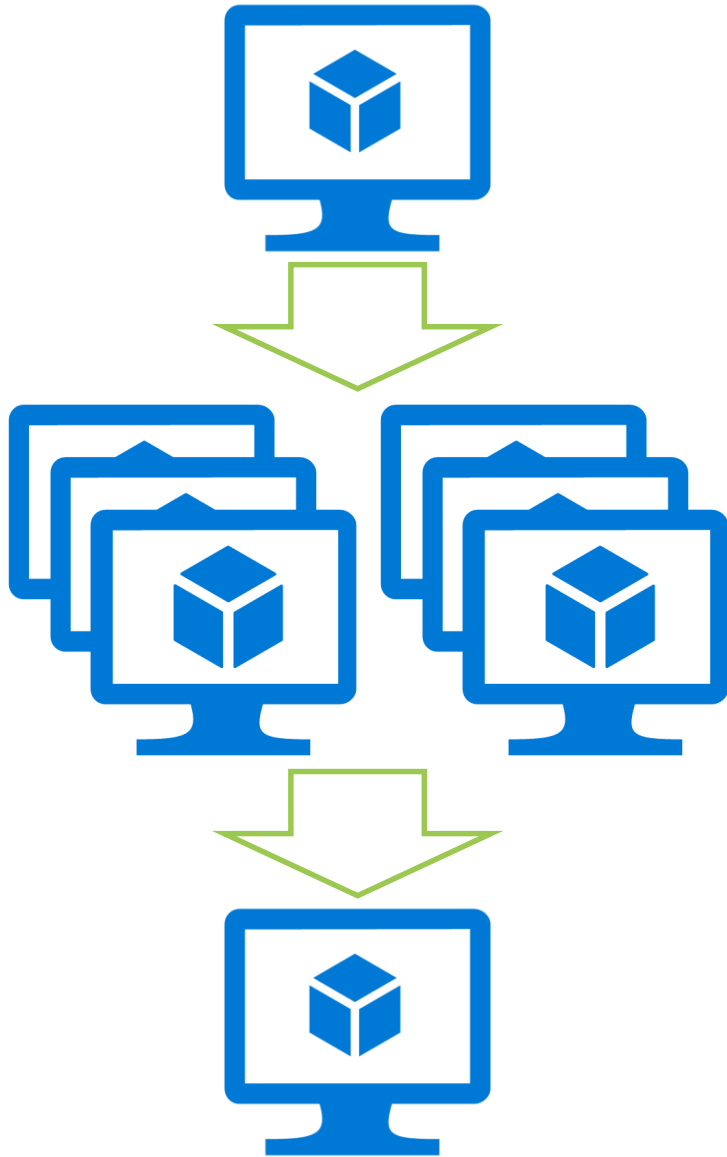
Specialized rendering applications

- Autodesk Maya
- Autodesk 3ds Max
- Autodesk Arnold
- Chaos Group V-Ray

Hourly billing

- Currently around \$0.18/VM/hour

Auto-Scaling



Set the number of nodes in a pool

Defined in a formula

Based on service variables

- CPU percentage
- Memory
- Number of tasks
 - Active
 - Running
 - Pending
 - Failed

Low Priority Nodes



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Reduced resource cost

Tasks processed when capacity is available

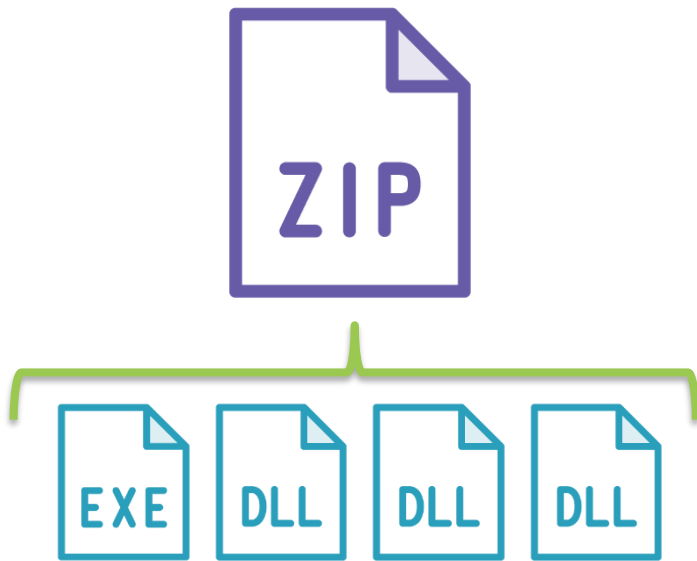
Useful when

- Costs must be minimized
- Job processing is not time critical
- Maximizing resources with a fixed budget

Avoid when

- Job processing is time critical

Applications



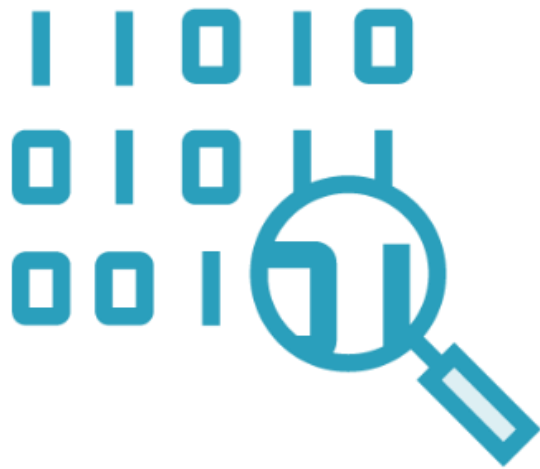
ZIP Package containing executables

Deployed to nodes when required

Can be owned by

- Pools – Deployed to all nodes in pool
- Task – Deployed to nodes running the task

Process Management



Job and task management

Task dependencies

Multi-instance tasks

Job and Task Management

Job



Task



Task



Task



Task



Task



Task



Task



Task



Task

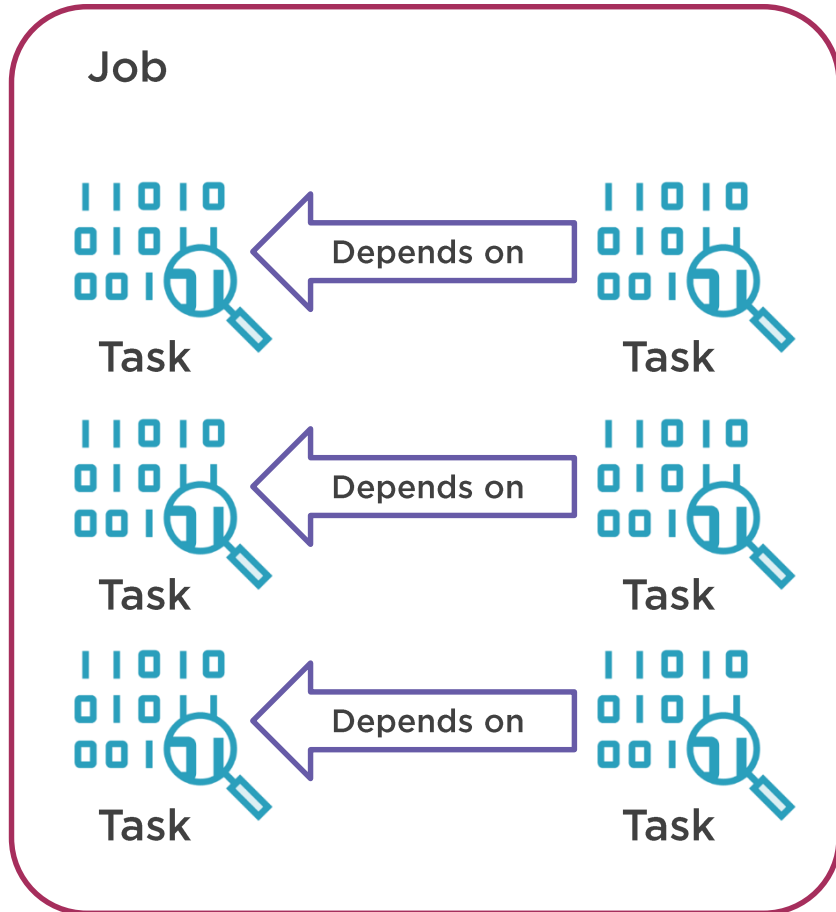
Job and task scheduling

Job prioritization

Re-try tasks on failure

Maximum task duration

Task Dependencies



Tasks can have dependencies on other tasks

- Input of task 2 is output of task 1

Explicitly defined on task creation

Used for scheduling tasks appropriately

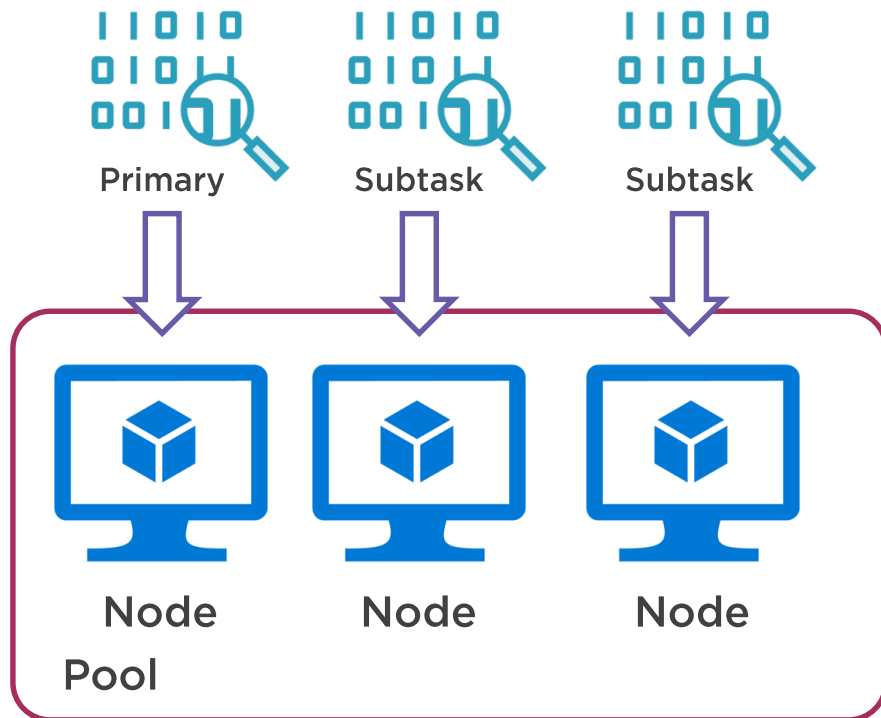
Multi-Instance Tasks



Run tasks on multiple compute nodes

Allows for Message Passing Interface (MPI)

Inter-node communication required on pool



Resource and Process Monitoring



Azure Portal Monitoring

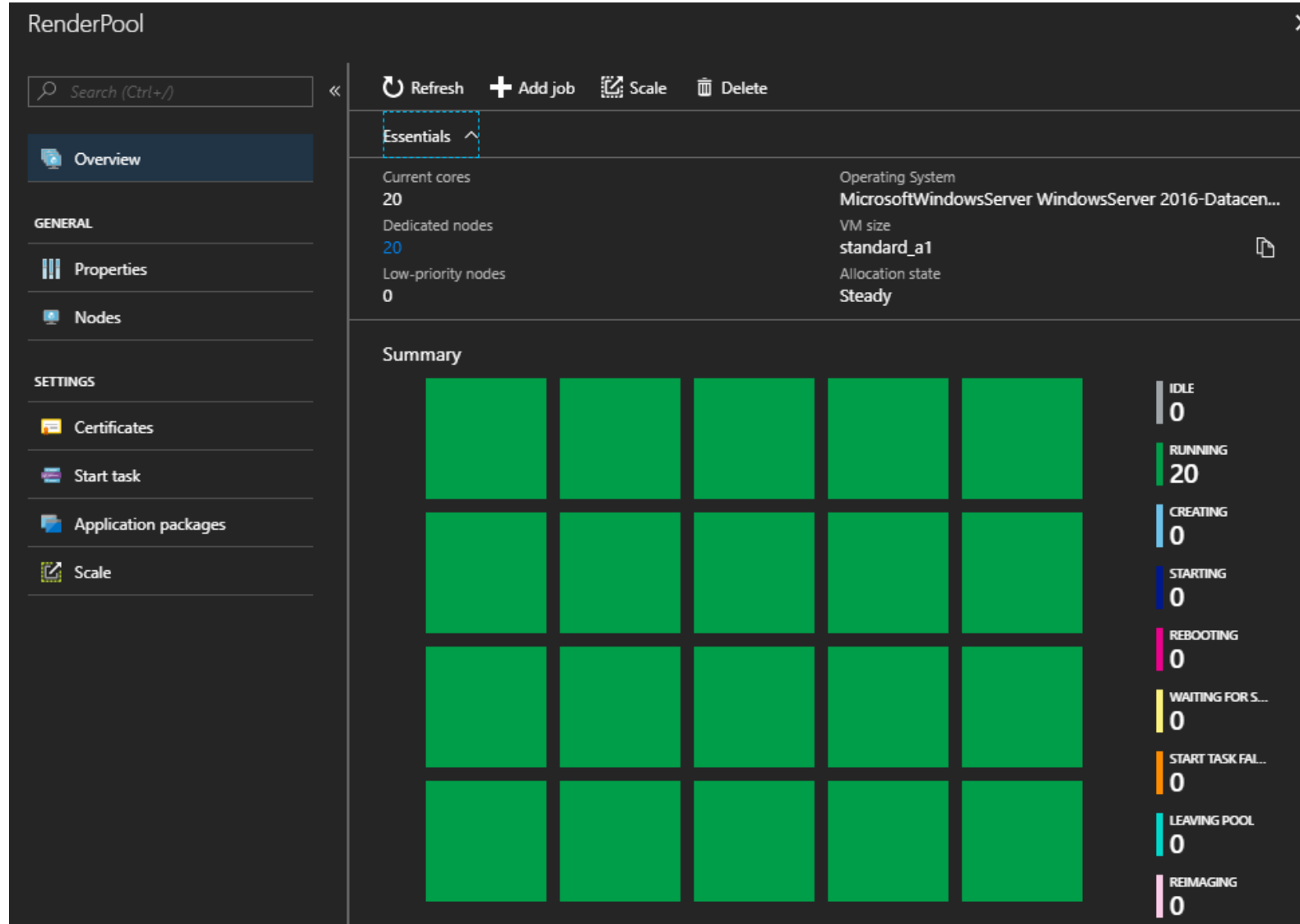
Batch Labs Monitoring

Application Insights

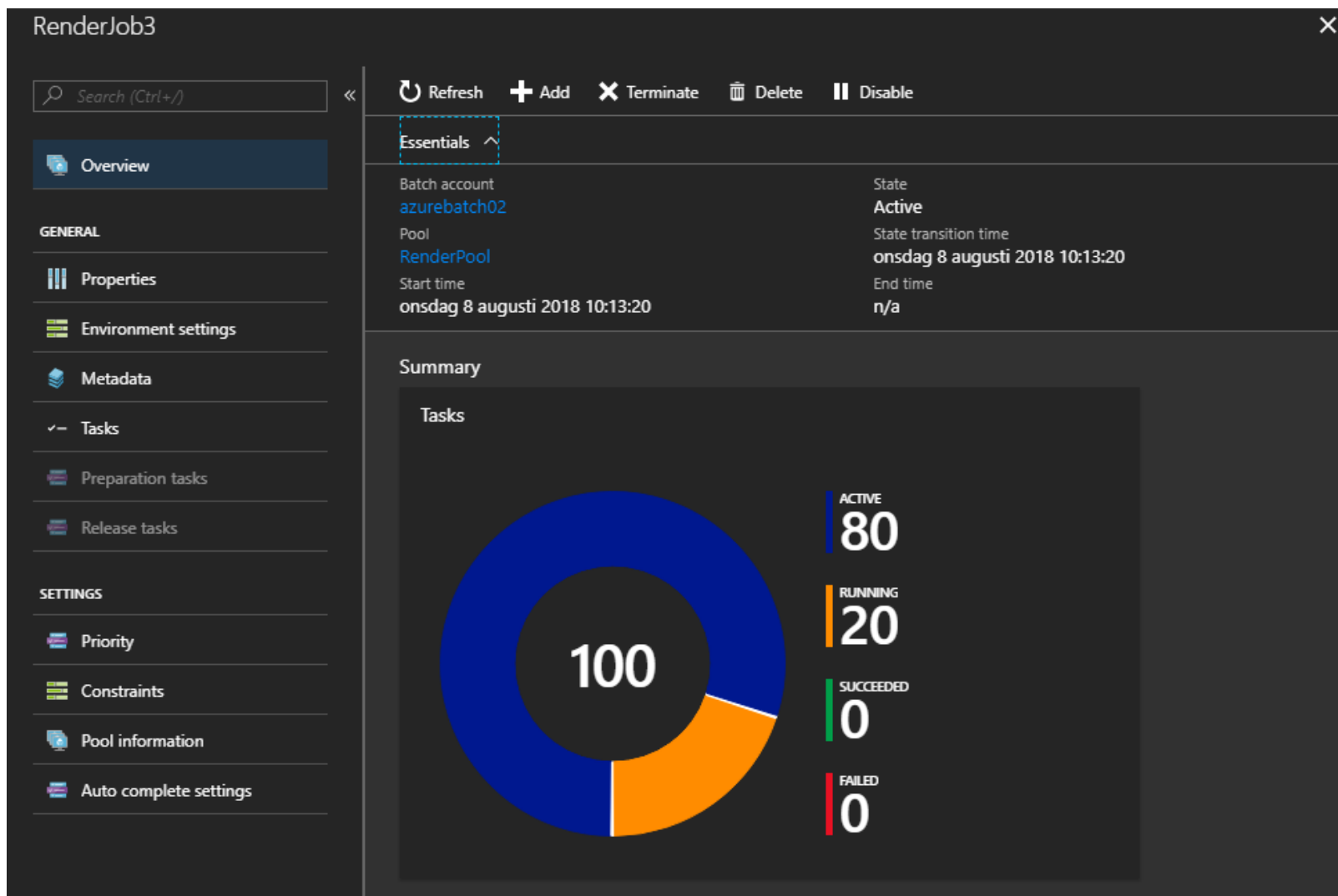
Metrics available through API

- REST
- .NET
- Azure CLI
- Azure PowerShell

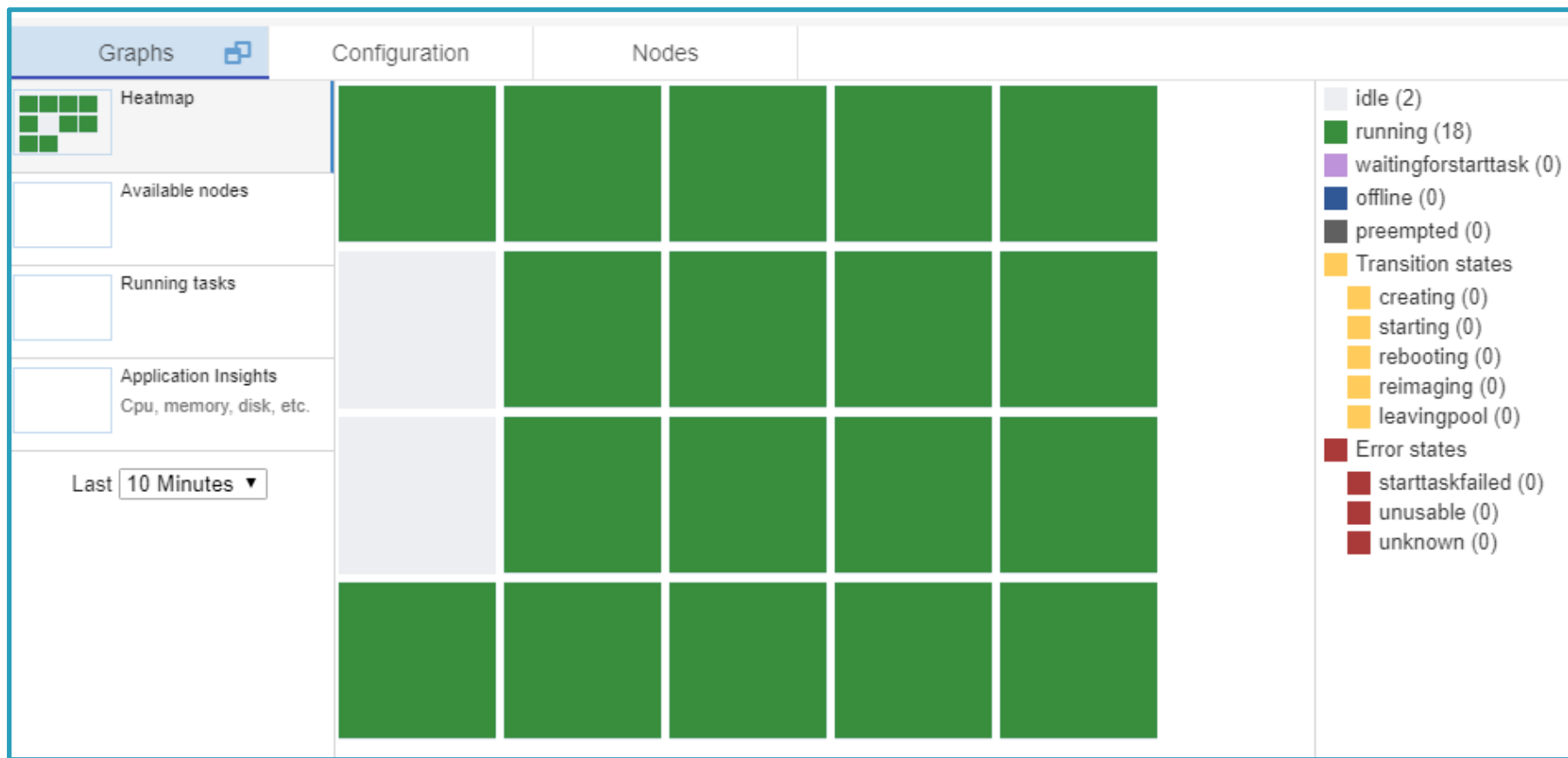
Azure Portal Monitoring



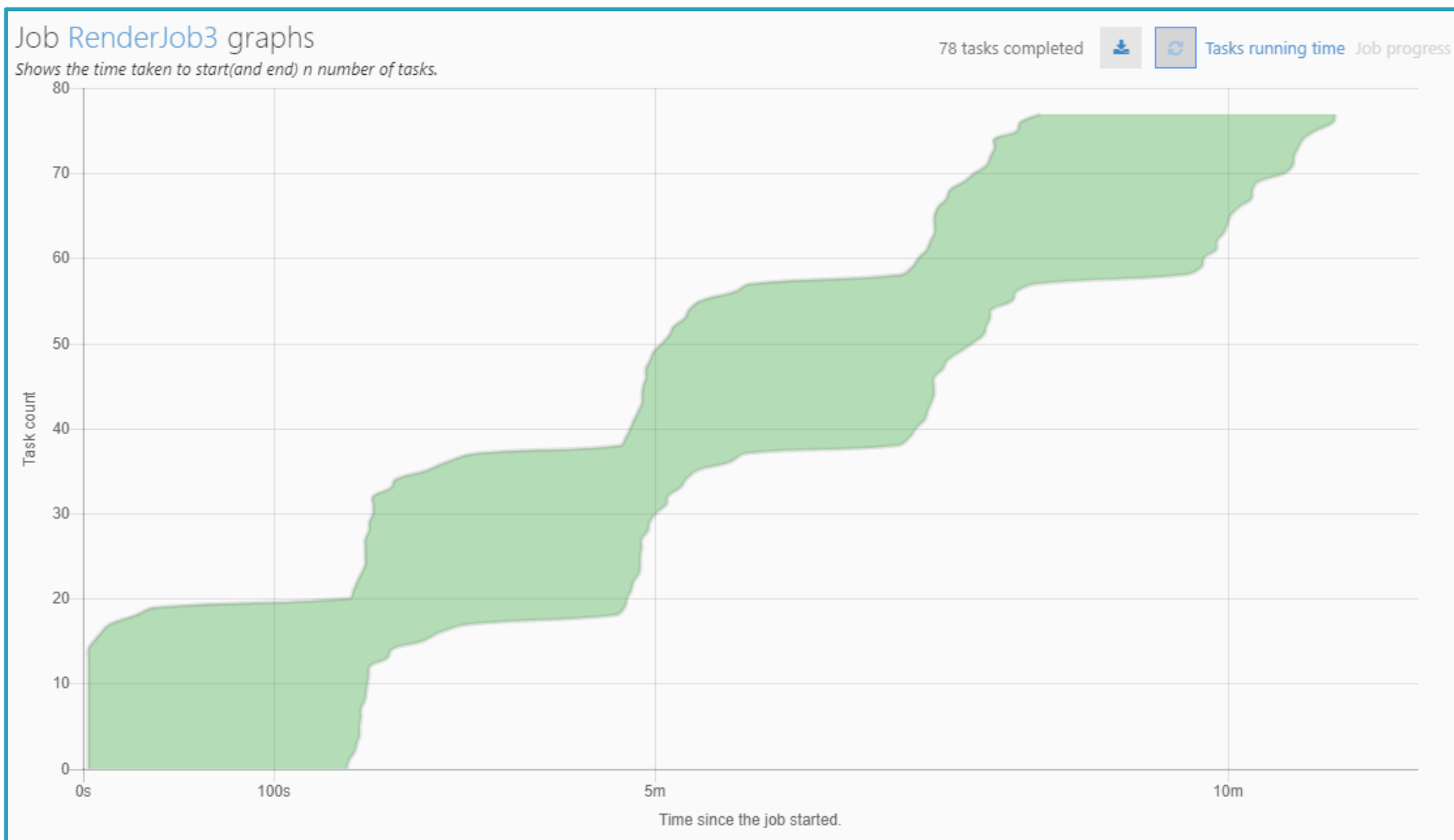
Azure Portal Monitoring



Batch Explorer Monitoring



Batch Explorer Monitoring



Application Insights



**Application
Insights**

Application Insights

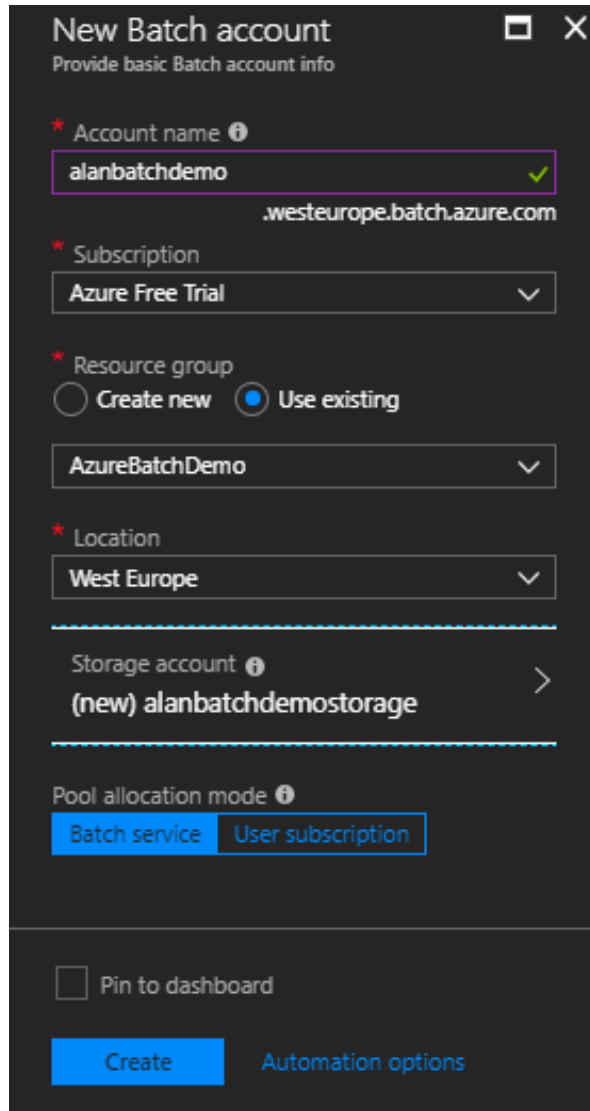
- Azure application monitoring service
- Used in many Azure projects

Monitoring Azure Batch

- Node performance counters
- Instrumentation in code

Azure Batch Integration

Azure Portal



The screenshot shows the 'New Batch account' form in the Azure Portal. The form is titled 'New Batch account' with a subtitle 'Provide basic Batch account info'. It contains several fields and options:

- Account name:** A text input field containing 'alanbatchdemo' with a green checkmark icon to its right. Below the field is the URL '.westeurope.batch.azure.com'.
- Subscription:** A dropdown menu showing 'Azure Free Trial'.
- Resource group:** Radio buttons for 'Create new' and 'Use existing'. The 'Use existing' option is selected. Below the buttons is a dropdown menu showing 'AzureBatchDemo'.
- Location:** A dropdown menu showing 'West Europe'.
- Storage account:** A text input field containing '(new) alanbatchdemostorage' with a right-pointing arrow icon to its right.
- Pool allocation mode:** Two buttons: 'Batch service' (highlighted in blue) and 'User subscription'.
- Pin to dashboard:** A checkbox that is currently unchecked.
- Buttons:** A blue 'Create' button and a link 'Automation options'.

Familiar interface for Azure developers
Management and monitoring functionality
Changes and updates can occur frequently

Azure Portal

alanbatchdemo
Batch account

Search (Ctrl+)

«

Overview

Activity log

Access control (IAM)

Tags

SETTINGS

Properties

Quotas

Storage account

Keys

Locks

Automation script

FEATURES

Applications

Pools

Jobs

Job schedules

Certificates

MONITORING

Account usage

Metrics

Alerts (classic)

Diagnostics logs

Delete

Essentials ^

Resource group (change)
AzureBatchDemo

Status
Online

Location
West Europe

Subscription name (change)
Azure Free Trial

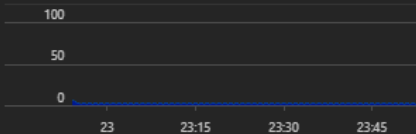
Subscription ID
723b38d9-53c7-4809-9e78-b36857b0ad4c

URL
https://alanbatchdemo.westeurope.batch.azure.com


Pool allocation mode
Batch service

Monitoring


Task states



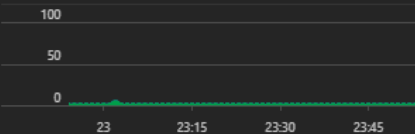
Failed tasks



Core count



Node states



Account Usage

Account quota usage
ALANBATCHDEMO

Pool usage	0/20 (0%)
Job and job schedule usage	0/100 (0%)
Dedicated cores usage	0/20 (0%)
Low priority cores usage	0/20 (0%)

Total core hours
ALANBATCHDEMO

01

TOTAL

Hours

Batch Explorer



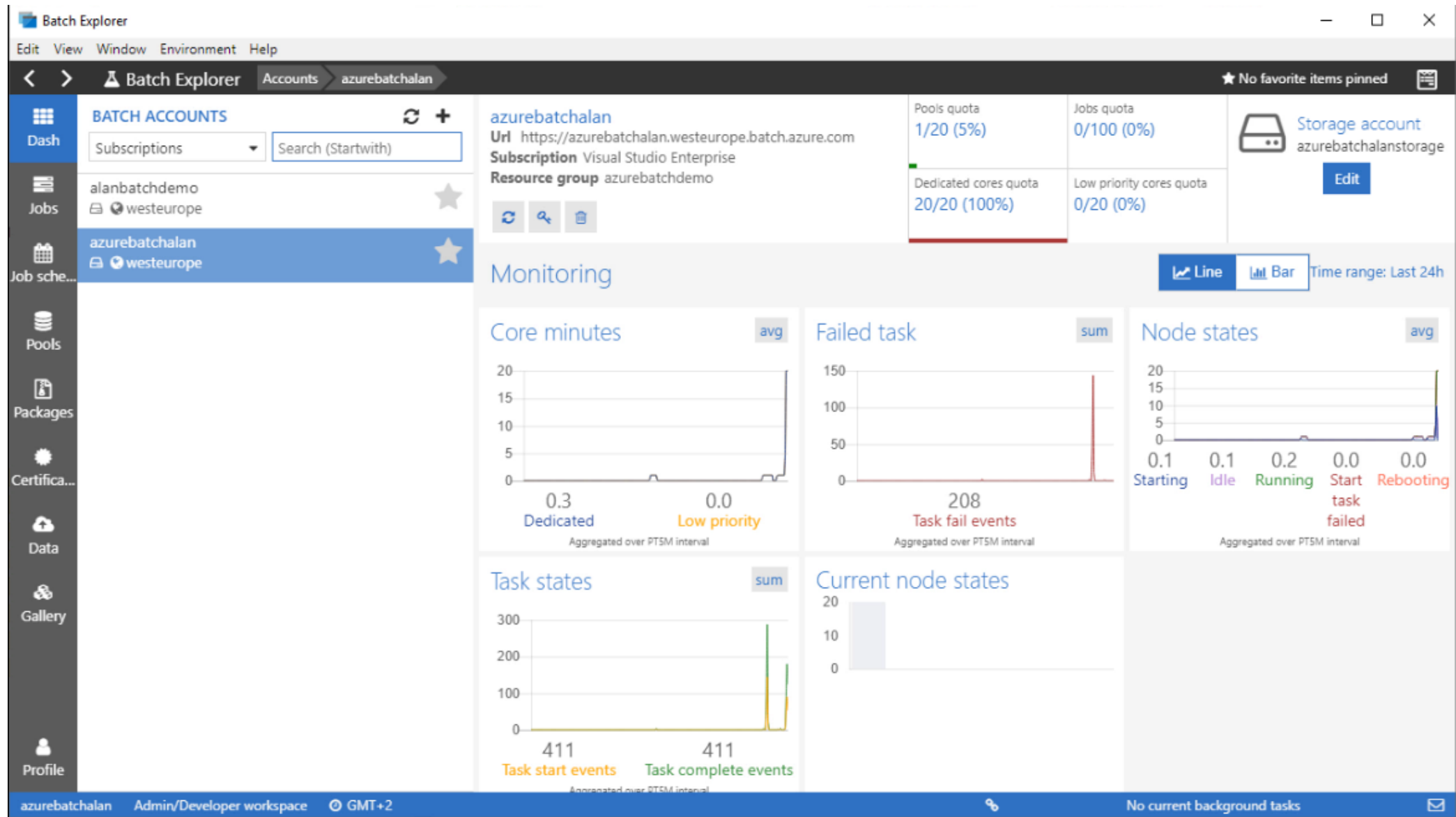
Batch
Explorer

Desktop application for managing Azure Batch

Open source project

Available for Windows, OSX and Linux

Batch Explorer



Azure Batch .NET Client Library



Version: Latest stable 8.1.2

Options

Description

This client library provides access to the Microsoft Azure Batch service.

Version: 8.1.2
Author(s): Microsoft
License: <https://raw.githubusercontent.com/Microsoft/dotnet/master/LICENSE>
Date published: Tuesday, May 22, 2018 (5/22/2018)
Project URL: <http://aka.ms/batch>
Report Abuse: <https://www.nuget.org/packages/Azure.Batch/8.1.2/ReportAbuse>
Tags: Microsoft, Batch, windowsazureofficial, BatchService_2018-03-01.6.1, Azure

Dependencies

.NETStandard,Version=v1.4
NETStandard.Library (>= 1.6.1)
Microsoft.Rest.ClientRuntime.Azure (>= 3.3.12 && < 4.0.0)
Microsoft.AspNetCore.WebUtilities (>= 1.0.2)
Microsoft.Rest.ClientRuntime (>= 2.3.11 && < 3.0.0)
System.Net.Http (>= 4.3.0)
Newtonsoft.Json (>= 9.0.1)
.NETFramework,Version=v4.5.2
Microsoft.Rest.ClientRuntime (>= 2.3.11 && < 3.0.0)
Newtonsoft.Json (>= 6.0.8)
Microsoft.Rest.ClientRuntime.Azure (>= 3.3.12 && < 4.0.0)

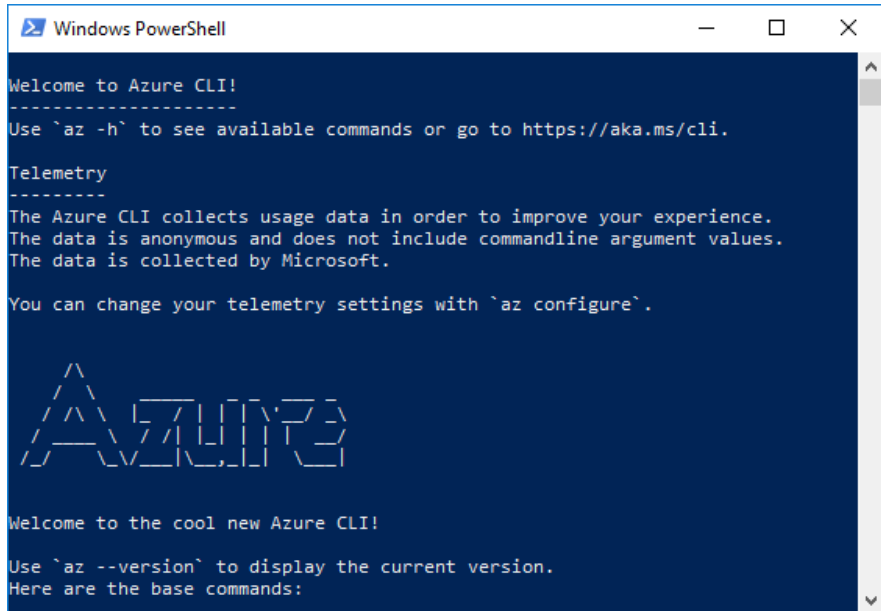
Azure.Batch NuGet Package

Provides programmatic access to Azure Batch services

Programmatically create jobs and tasks

Perform additional storage operations

Azure CLI



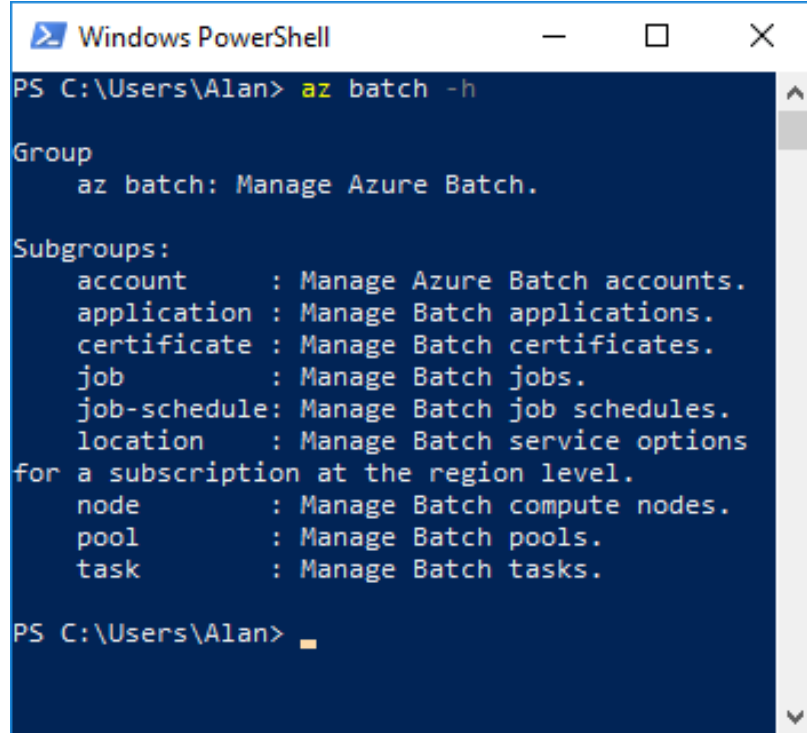
Command line tool for managing Azure resources

Browser based interface

Installable on Windows, macOS or Linux

Consistent interface not subject to constant updates

Managing Azure Batch with Azure CLI



```
Windows PowerShell
PS C:\Users\Alan> az batch -h

Group
  az batch: Manage Azure Batch.

Subgroups:
  account      : Manage Azure Batch accounts.
  application   : Manage Batch applications.
  certificate   : Manage Batch certificates.
  job           : Manage Batch jobs.
  job-schedule : Manage Batch job schedules.
  location      : Manage Batch service options
for a subscription at the region level.
  node         : Manage Batch compute nodes.
  pool         : Manage Batch pools.
  task         : Manage Batch tasks.

PS C:\Users\Alan>
```

Commands for managing Azure Batch workloads

Account, pool, job and application management

PowerShell

```
Administrator: PowerShell 6 (x64)
PS C:\> Get-Command -Module Az.Batch
```

CommandType	Name	Version	Source
Alias	Get-AzBatchAccountKeys	1.1.0	Az.Batch
Alias	Get-AzBatchJobStatistics	1.1.0	Az.Batch
Alias	Get-AzBatchLocationQuotas	1.1.0	Az.Batch
Alias	Get-AzBatchPoolNodeCounts	1.1.0	Az.Batch
Alias	Get-AzBatchPoolStatistics	1.1.0	Az.Batch
Alias	Get-AzBatchPoolUsageMetrics	1.1.0	Az.Batch
Alias	Get-AzBatchRemoteLoginSettings	1.1.0	Az.Batch
Alias	Get-AzBatchSubscriptionQuotas	1.1.0	Az.Batch
Alias	Get-AzBatchTaskCounts	1.1.0	Az.Batch
Alias	Reactivate-AzBatchTask	1.1.0	Az.Batch
Cmdlet	Disable-AzBatchAutoScale	1.1.0	Az.Batch
Cmdlet	Disable-AzBatchComputeNodeScheduling	1.1.0	Az.Batch
Cmdlet	Disable-AzBatchJob	1.1.0	Az.Batch
Cmdlet	Disable-AzBatchJobSchedule	1.1.0	Az.Batch
Cmdlet	Enable-AzBatchAutoScale	1.1.0	Az.Batch
Cmdlet	Enable-AzBatchComputeNodeScheduling	1.1.0	Az.Batch
Cmdlet	Enable-AzBatchJob	1.1.0	Az.Batch
Cmdlet	Enable-AzBatchJobSchedule	1.1.0	Az.Batch
Cmdlet	Enable-AzBatchTask	1.1.0	Az.Batch
Cmdlet	Get-AzBatchAccount	1.1.0	Az.Batch
Cmdlet	Get-AzBatchAccountKey	1.1.0	Az.Batch
Cmdlet	Get-AzBatchApplication	1.1.0	Az.Batch
Cmdlet	Get-AzBatchApplicationPackage	1.1.0	Az.Batch
Cmdlet	Get-AzBatchCertificate	1.1.0	Az.Batch
Cmdlet	Get-AzBatchComputeNode	1.1.0	Az.Batch
Cmdlet	Get-AzBatchJob	1.1.0	Az.Batch

Az.Batch cmdlets in Azure PowerShell module

Scripted management of Azure Batch

Familiar tool for developers and administrators

Azure Batch Limits and Quotas

Azure Batch Resource Quotas

Resource	Default	Max
Batch accounts per region per subscription	1-3	50
Dedicated cores per Batch account	90-900	Unspecified
Low-priority cores per Batch account	10 – 100	Unspecified
Active jobs and job schedules per Batch account	100 - 300	1,000
Pools per Batch account	20 – 100	500

Azure Batch Other Limits

Resource	Limit
Concurrent tasks per compute node	4 x node cores
Applications per Batch account	20
Application packages per application	40
Maximum task lifetime	180 days
Compute nodes in inter-node communication enabled pool	100

Quotas and Limits Can Change

Batch service quotas and limits

<https://docs.microsoft.com/en-us/azure/batch/batch-quota-limit>

Demo



Provisioning and Managing an Azure Batch Service using the Azure Portal

- Creating a Resource Group

- Creating a Batch Account

- Create an Application

- Creating a Pool

- Creating a Job

- Creating a Task

Demo



Managing an Azure Batch Service using Batch Explorer

- Batch Explorer user interface
- Viewing node files
- Managing pools

Summary



Batch accounts contain pools, which contain nodes

Batch jobs contain tasks

Azure batch manages resources and job scheduling and task execution

Management can be performed using the Azure Portal or Batch Labs

Management tasks can be automated using code and scripts