

February 28, 2019 — 8:30 AM - 5:00 PM | Detroit, Michigan



Fundamentals of DevOps



Learn.
Connect.
Explore.

Agenda

Why Organizations Care about DevOps

The fundamentals of Azure DevOps

Why Azure DevOps

Why GitHub + Azure DevOps

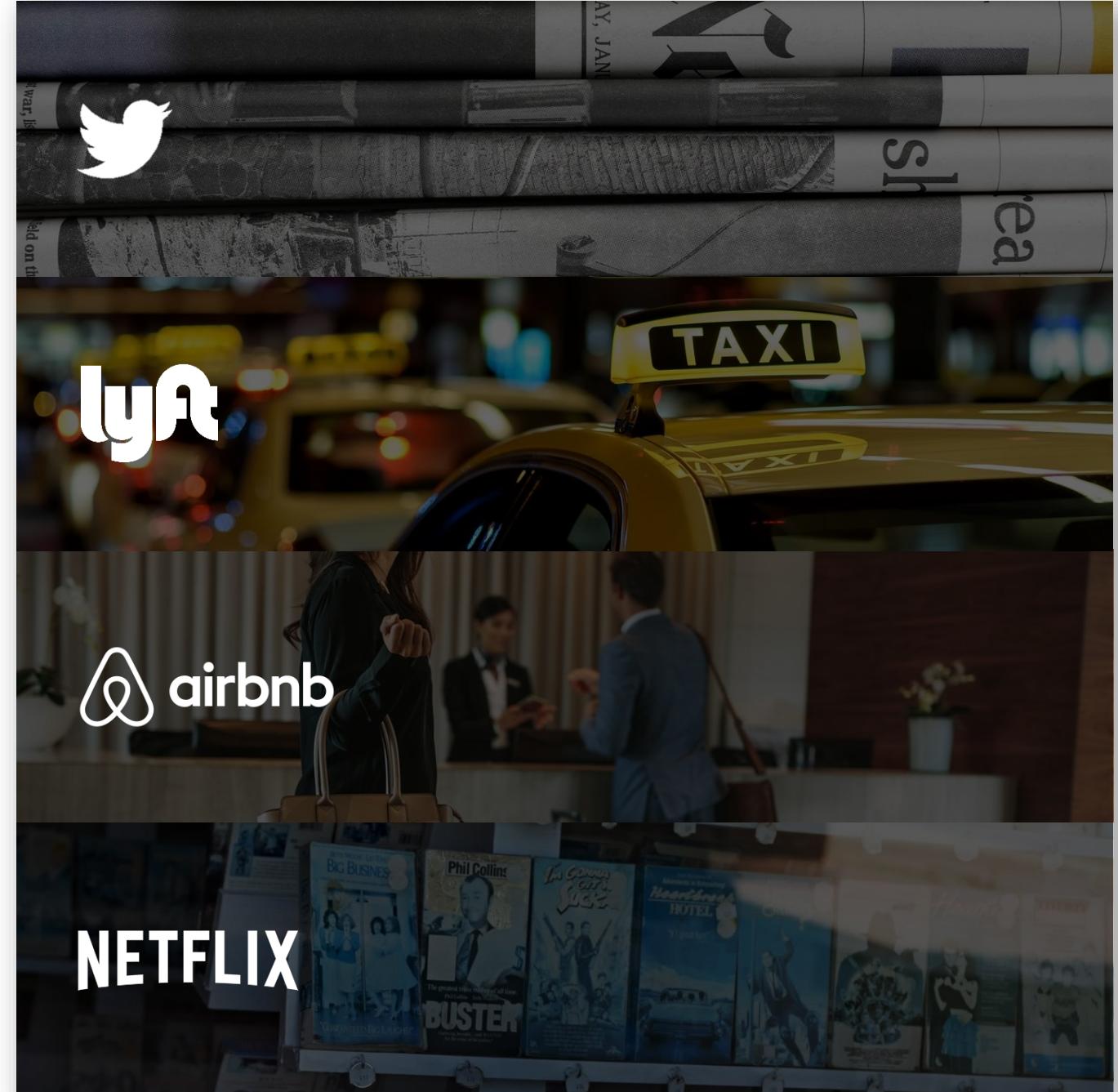
Azure DevTest Labs

Why Organizations Care about DevOps

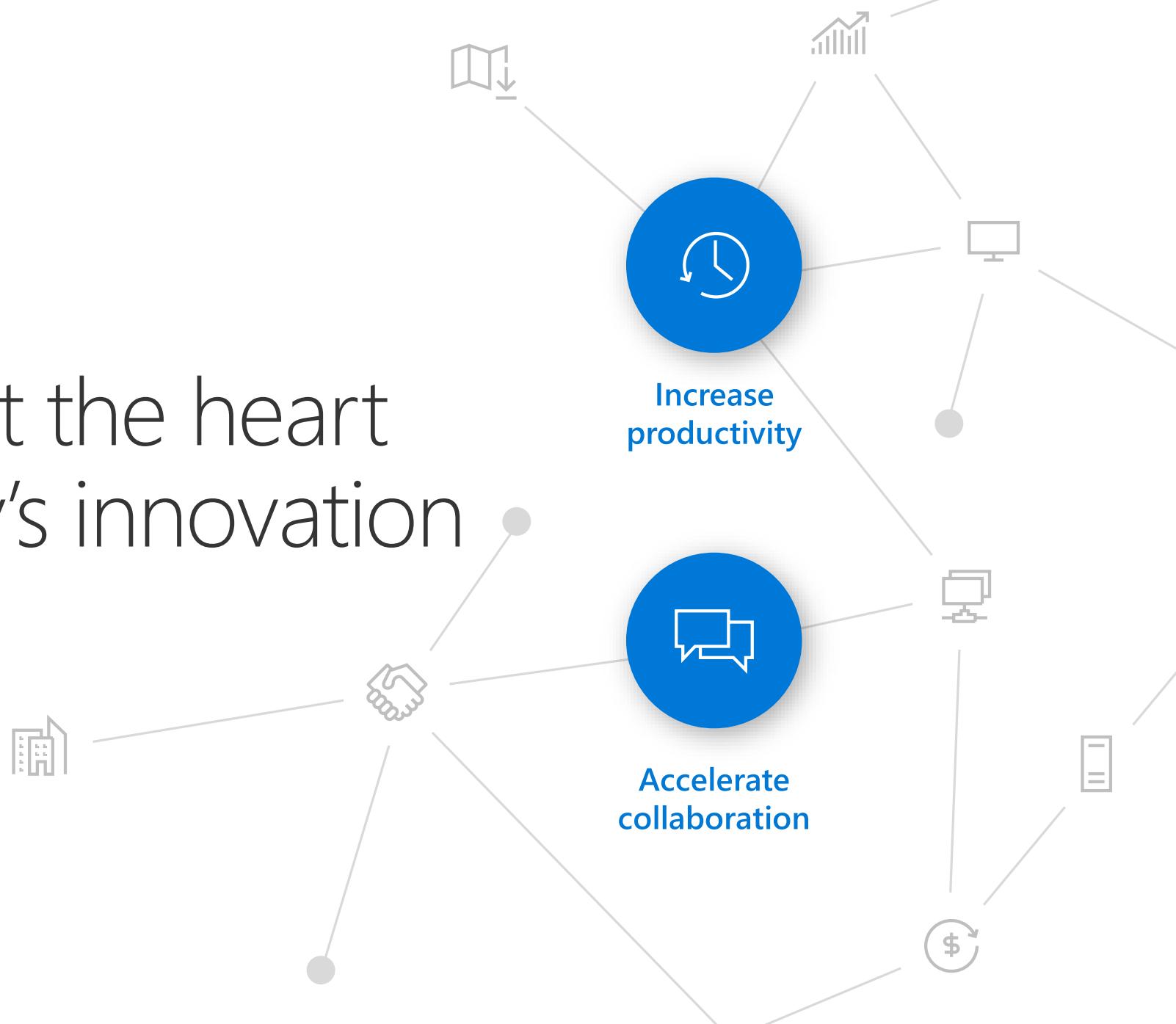
Nearly 50% of the current S&P 500 will be replaced by 2026

Innosight

Corporate Longevity: Turbulence Ahead for Large Organizations



Developers are at the heart
of your company's innovation



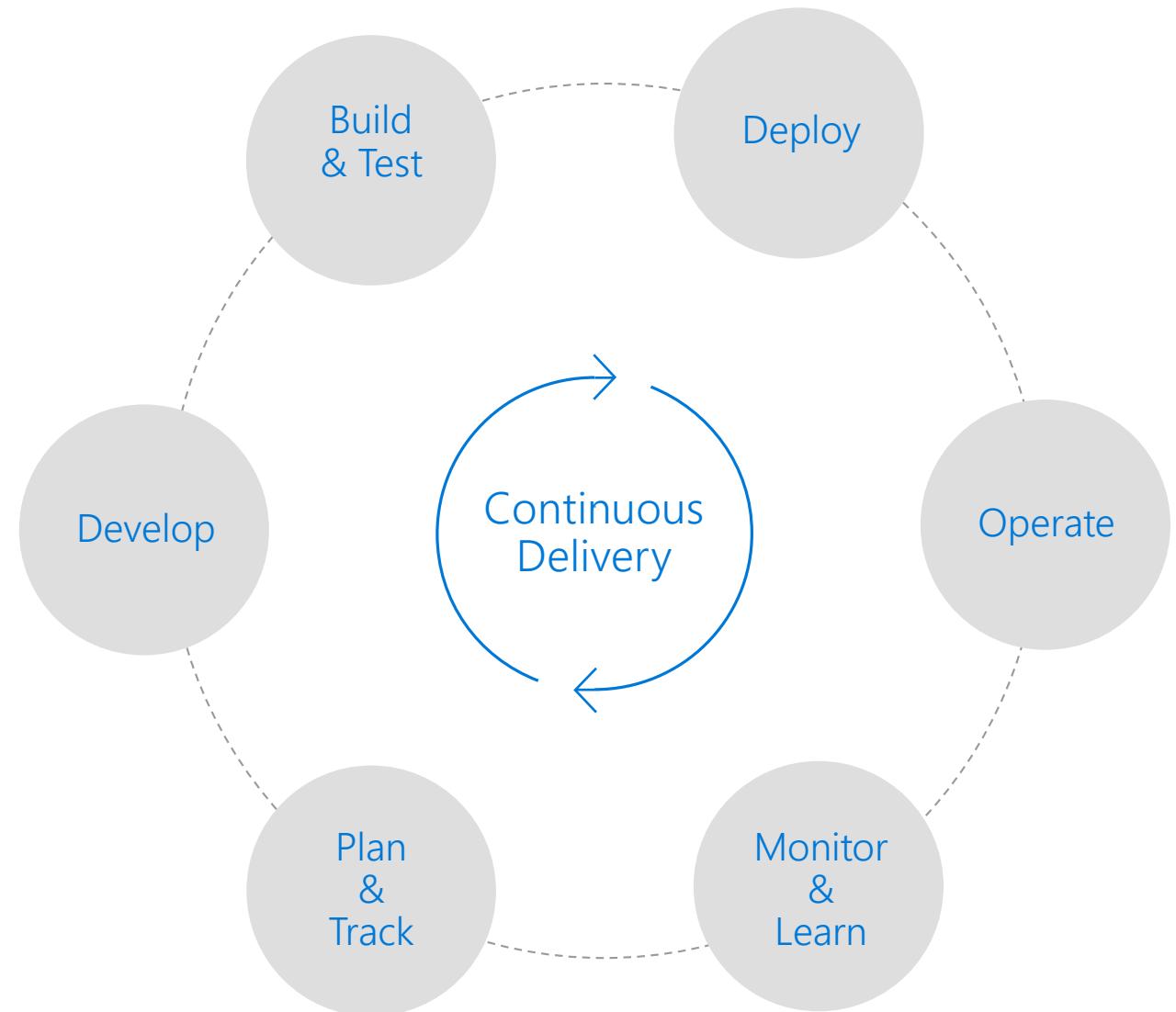
What is DevOps?

People. Process. Products.

“

DevOps is the union of **people**, **process**, and **products** to enable continuous delivery of **value** to your end users.

”



High Performance DevOps Companies Achieve...

46x Deployment Frequency

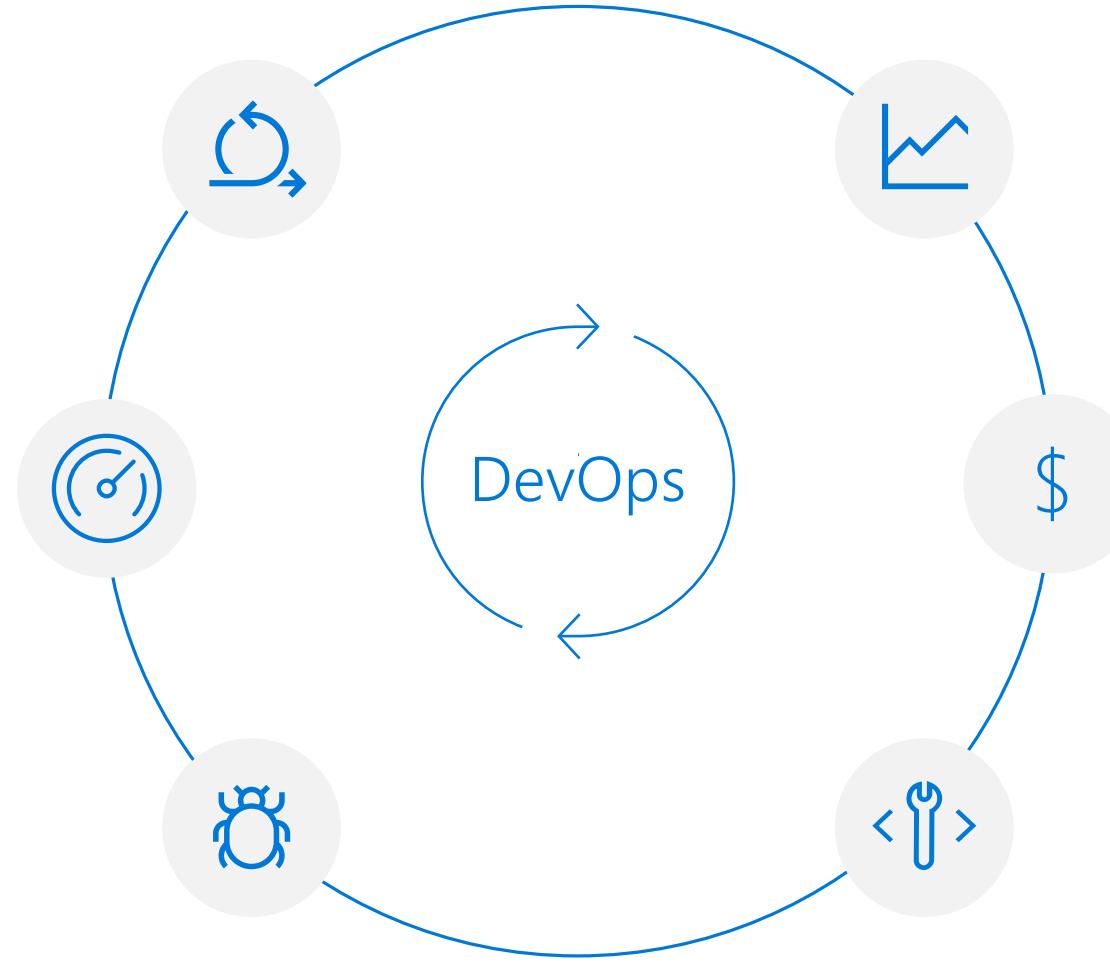
Faster Time to Market

7x Lower Change Failure Rate

2,555x Faster Lead Time For Changes

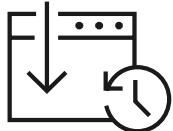
Increased Revenue

2,604x Faster Mean Time to Recover



What technologies do I need to support DevOps?

DevOps brings together people, processes, and technology, automating software delivery to provide continuous value to your users. Using Azure DevOps, you can deliver software faster and more reliably - no matter how big your IT department or what tools you're using.



Continuous Integration (CI)

- Improve software development quality and speed.
- When you use Azure Pipelines or Jenkins to build apps in the cloud and deploy to Azure, each time you commit code, it's automatically built and tested and bugs are detected faster.

101010
010101
101010

Continuous Deployment (CD)

- By combining continuous integration and infrastructure as code (IaC), you'll achieve identical deployments and the confidence to deploy to production at any time.
- With continuous deployment, you can automate the entire process from code commit to production if your CI/CD tests are successful.



Continuous Monitoring (CM)

- With Azure Monitor you can identify how your apps & infra is performing and test if the recent deployment made things better or worse.
- Using CI/CD practices, paired with monitoring tools, you'll be able to safely deliver features to your customers as soon as they're ready.

The fundamentals of Azure DevOps

Introducing Azure DevOps



Azure Boards

Kanban Boards, Backlogs,
Dashboards + Reporting



Azure Pipelines

CI/CD platform, FREE for
open source projects



Azure Test Plans

Manual and Exploratory
Testing Tools



Azure Artifacts

Package Management for
Maven, npm, and NuGet



Azure Repos

Private Git repos and collaborate
to build better code with pull
requests



Azure Lab Services

Self-service Dev/Test
Environments

Azure DevOps

Better together



Azure Boards



Azure Repos



Azure Pipelines



Azure Test Plans



Azure Artifacts

An end-to-end solution for organizations looking for an enterprise-grade toolchain

Fully Integrated
with end
to end
traceability

Scalable to
any team
and project
size

Highly
available,
multi region,
hybrid
cloud &
on-prem

Customer
Support

Consistent
admin
and access
control

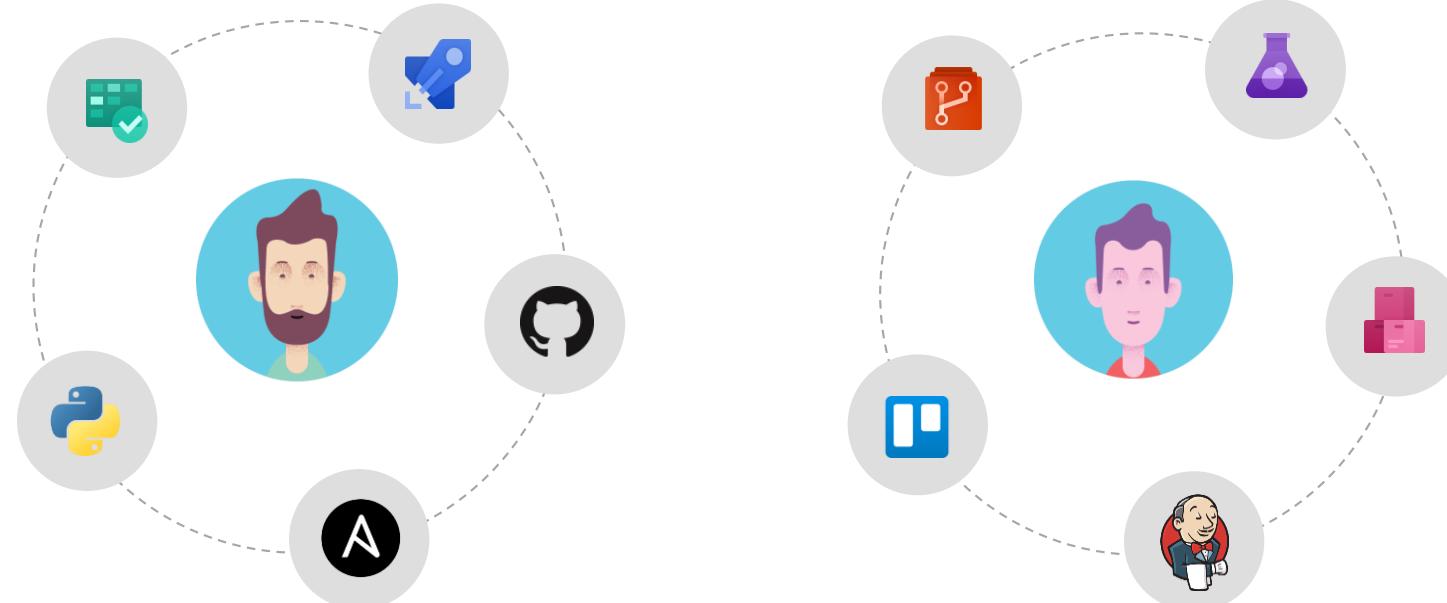


<https://azure.com/devops>

Azure DevOps: Choose what you love

Any Language, Any Platform

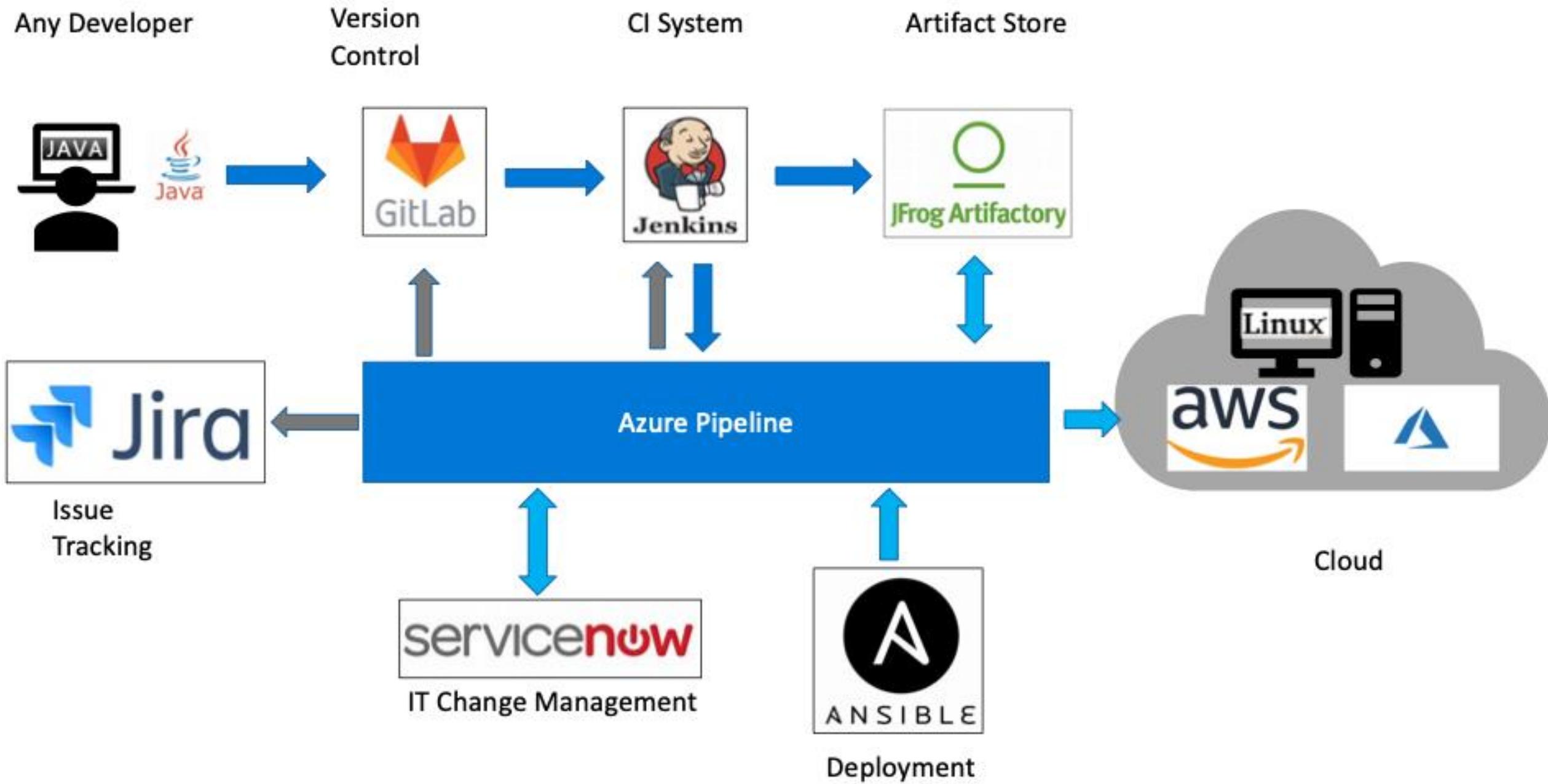
Azure DevOps lets developers choose the tools and languages that are right for them



Mix and match to create workflows with tools from Microsoft, open source or your favorite 3rd party tools

Target any cloud, on-prem or both and deploy to the servers you need





Azure Pipelines

Cloud-hosted pipelines for Linux, Windows and macOS, with unlimited minutes for open source



Any language, any platform, any cloud

Build, test, and deploy Node.js, Python, Java, PHP, Ruby, C/C++, .NET, Android, and iOS apps. Run in parallel on Linux, macOS, and Windows. Deploy to Azure, AWS, GCP or on-premises



Extensible

Explore and implement a wide range of community-built build, test, and deployment tasks, along with hundreds of extensions from Slack to SonarCloud. Support for YAML, reporting and more



Containers and Kubernetes

Easily build and push images to container registries like Docker Hub and Azure Container Registry. Deploy containers to individual hosts or Kubernetes.



Best-in-class for open source

Ensure fast continuous integration/continuous delivery (CI/CD) pipelines for every open source project. Get unlimited build minutes for all open source projects with up to 10 free parallel jobs across Linux, macOS and Windows

The screenshot shows the Azure DevOps Pipelines interface for the AdventureWorks Mobile project. The pipeline is titled "Enabling feature flags for Preview Attachment and Grid Views". It includes three parallel jobs: "Windows Job" (Running, 1m 53s), "Linux Job" (Running, 3m 29s), and "macOS Job" (Running, 3m 07s). The "Logs" tab is selected, displaying the command-line output of the "yarn install" step, which includes package resolution, fetching, linking, and building dependencies, followed by a successful compilation and tsc run.

```
yarn install v1.7.0
$ node build/npm/preinstall.js
[1/4] Resolving packages...
[2/4] Fetching packages...
[3/4] Linking dependencies...
[4/4] Building fresh packages...
$ npm run compile
> code-oss-dev-build@1.0.0 compile ./adventureworks/build
> tsc -p tsconfig.build.json

* Done in 4.89s.
$ node ./postinstall
[##] 2/2 removed './adventureworks/extensions/node_modules/typescript/lib/tsc.js'
removed './adventureworks/extensions/node_modules/typescript/lib/tsserverlibrary.d.ts'
removed './adventureworks/extensions/node_modules/typescript/lib/tsserverlibrary.js'
removed './adventureworks/extensions/node_modules/typescript/lib/typescriptServices.d.ts'
removed './adventureworks/extensions/node_modules/typescript/lib/typescriptServices.js'
```



<https://azure.com/pipelines>

Azure Boards

Track work with Kanban boards, backlogs, team dashboards, and custom reporting



Connected from idea to release

Track all your ideas at every development stage and keep your team aligned with all code changes linked directly to work items.



Scrum ready

Use built-in scrum boards and planning tools to help your teams run sprints, stand-ups, and planning meetings.



Project insights

Gain new insights into the health and status of your project with powerful analytics tools and dashboard widgets.



<https://azure.com/devops>

The screenshot shows the Azure DevOps Boards interface for the 'FabrikamFiber' project. The left sidebar includes links for 'AdventureWorks Mobile', 'Overview', 'Boards' (which is selected), 'Work Items', 'Backlogs', 'Sprints', 'Queries', 'Plans', 'Repos', 'Pipelines', 'Test Plans', and 'Artifacts'. The main area is titled 'FabrikamFiber Board' and displays a Kanban board with columns for 'New', 'Active', '5/5 Staging', and '15/5 Deployed'. The 'New' column contains a 'New item' card for 'Hotels filter page' by 'Carlos Slattery' (Xamarin). The 'Active' column contains cards for 'Home page (selected room)' by 'Kat Larson' (Design), 'Top page controls' by 'Celeste Burton' (ML, Xamarin), 'Guests page' by 'Carole Poland' (ML, Xamarin), 'NFC open door' by 'Cecil Folk' (Spike, Xamarin), 'Room Tab' by 'Celeste Burton' (Rooms [Detail]), 'Map filter' by 'Carole Poland' (General, Room [List]), and 'Hotel reviews page' by 'Celeste Burton' (Rooms [Detail]). The 'Staging' and 'Deployed' columns contain several more cards related to mobile application components like 'Footer', 'Entry + validations', 'Navigation menu', 'Login page', 'Ambient settings', and 'Notifications list'.

Azure Repos

Unlimited private Git repo hosting and support for TFVC that scales from a hobby project to the world's largest Git repositories



Works with your Git client

Securely connect with and push code into your Git repos from any IDE, editor, or Git client.



Web hooks and API integration

Add validations and extensions from the marketplace or build your own using web hooks and REST APIs.



Semantic code search

Quickly find what you're looking for with code-aware search that understands classes and variables.



<https://azure.com/devops>

The screenshot shows the Azure DevOps interface for the 'AdventureWorks Mobile' project. The left sidebar has a dark theme with white icons and text. It includes links for Overview, Boards, Repos (which is selected), Files, Commits, Pushes, Branches, Tags, Pull requests (selected), Pipelines, Test Plans, and Artifacts. At the bottom of the sidebar is a 'Project settings' link. The main content area is titled 'Pull requests' and shows a list of pull requests under four categories: 'Mine', 'Active', 'Completed', and 'Abandoned'. The 'Mine' tab is selected. A search bar at the top of the list allows filtering by keyword or ID. Below the search bar are sections for 'Created by me' and 'Assigned to me'. Each pull request entry includes the author's name, a brief description of the changes, and the target branch. To the right of each entry are small profile icons for the author and the number of reviews (e.g., 6, 0, 1). At the bottom right of the list, there is a summary showing 99+ reviews across all pull requests.

Category	Pull Request	Author	Reviewers
Mine	Initialize client with .client.init	Kat Larsson	6
Mine	Testing configuration settings	Kat Larsson	0
Mine	Check returned identity for null status	Colin Ballinger	1
Mine	[WIP] Add tests for deployment mapping	Robin Counts	3
Mine	Add exception on disconnect	Colin Ballinger	0
Mine	Maintain structure when converting isomorphs	Robin Counts	0
Mine	Hotfix payload to releases/99	Robin Counts	99+

Azure Artifacts

Create and share Maven, npm, and NuGet package feeds from public and private sources – fully integrated into CI/CD pipelines



Manage all package types

Get universal artifact management for Maven, npm, and NuGet.



Add packages to any pipeline

Share packages, and use built-in CI/CD, versioning, and testing.



Share code efficiently

Easily share code across small teams and large enterprises.



<https://azure.com/devops>

The screenshot shows the Azure DevOps interface for managing artifacts. On the left, there's a sidebar with links for 'AdventureWorks Mobile' (selected), 'Overview', 'Boards', 'Repos', 'Pipelines', 'Test Plans', and 'Artifacts' (which is highlighted). The main area is titled 'Artifacts' and shows a table of packages. The columns are 'Package', 'Views', 'Source', 'Last pushed', and 'Description'. The packages listed are:

Package	Views	Source	Last pushed	Description
abbrev		nuget	a year ago	Like ruby's abbrev module, but in js
accepts		npmjs	a year ago	Higher-level content negotiation
acorn		MyFeed	a year ago	ECMAScript parser
acorn-dynamic-import		maven	a year ago	Support dynamic imports in acorn
aclr-jsx		nuget	a year ago	Alternative, faster React.js JSX parser
acorn-object-spread		maven	a year ago	Custom JSON-Schema keywords for ajv validator
ajv		npmjs	a year ago	Alphanumeric sorting algorithm
ajv-keywords		nuget	a year ago	ANSI escape codes for manipulating the terminal
alphanum-sort		npmjs	a year ago	An elegant lib that converts the chalked (ANSI) text to HTML

Azure Test Plans

Get end-to-end traceability. Run tests and log defects from your browser. Track and assess quality throughout your testing lifecycle.



Capture rich data

Capture rich scenario data as you execute tests to make discovered defects actionable. Explore user stories without test cases or test steps. You can create test cases directly from your exploratory test sessions.



Test across web and desktop

Test your application where it lives. Complete scripted tests across desktop or web scenarios. Test on-premises application from the cloud and vice-versa.

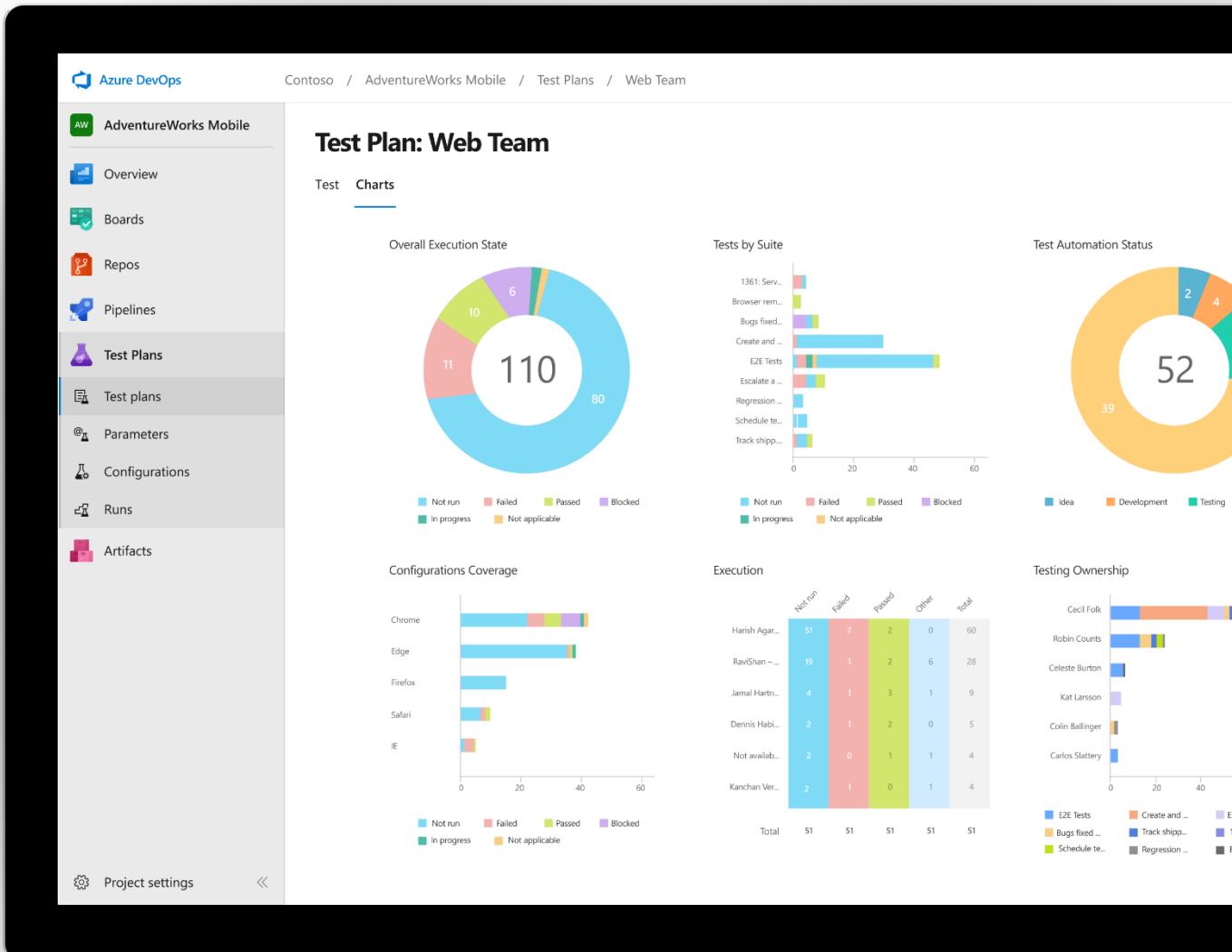


Get end-to-end traceability

Leverage the same test tools across your engineers and user acceptance testing stakeholders. Pay for the tools only when you need them.



<https://azure.com/devops>



Azure DevTest Labs

Azure Lab Services

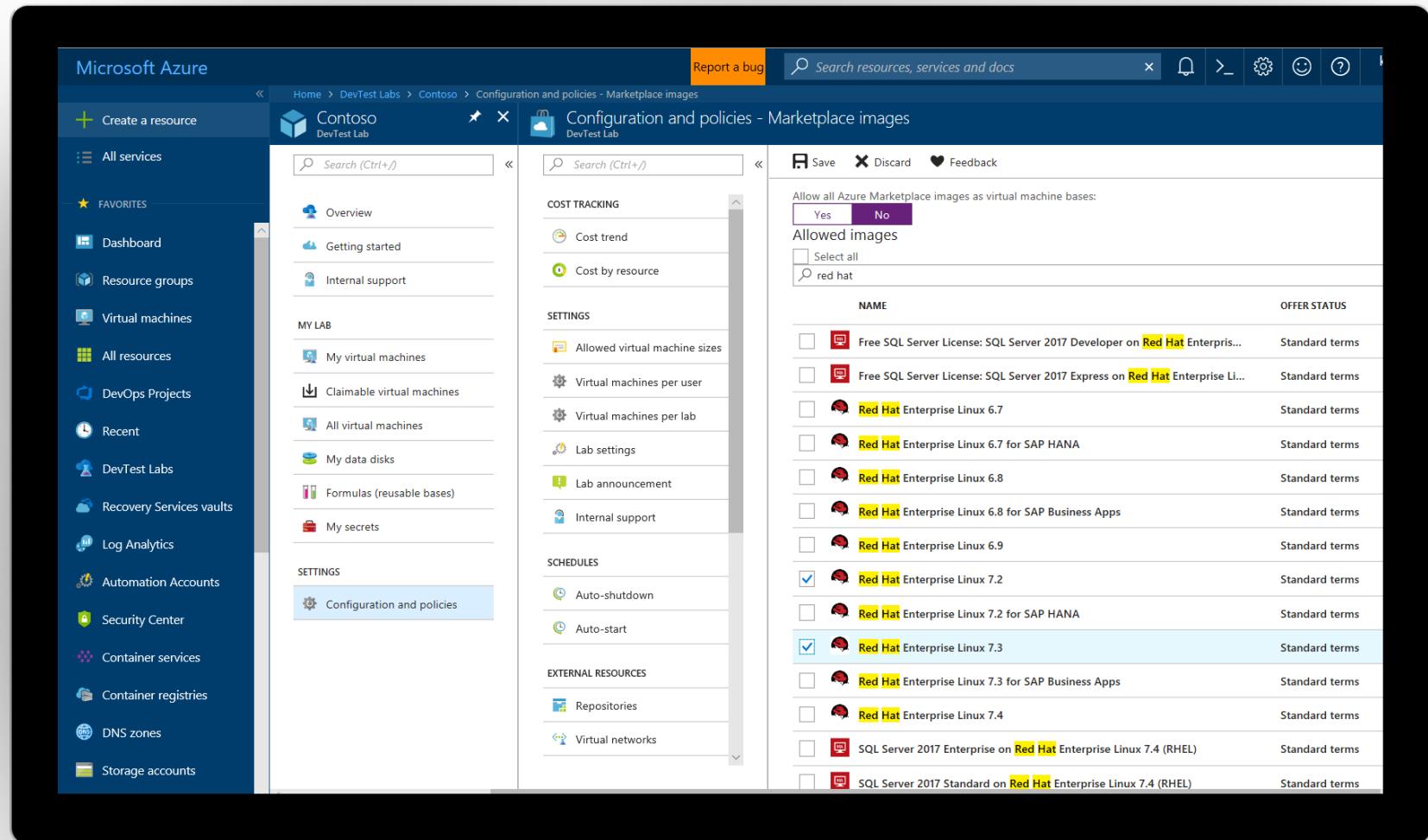
Self-Service Dev/Test Environments

→ Simplify cloud environment management for developers and testers.

→ Enforce policies and control costs with full visibility

→ Use templates, custom images and formulas to reproduce environments.

→ Orchestrate with Azure Pipelines or integrate using REST API





Self-service provisioning

Dev VM (i.e. Visual Studio)

Test VM (i.e. Selenium)

Environments (i.e. Dev, Test, ...)

Azure DevOps agents (i.e. Build)

Configuration & policies

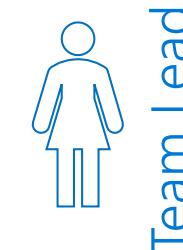
Control & analyze costs

Auto shutdown / start

Set policies (#VMs, VM sizes, ...)

Create formulas / templates

Claimable VMs



Home > devcloud-lab

devcloud-lab
DevTest Lab

Search (Ctrl+ /)

Refresh Add Claim any Delete MSDN forum Feedback

Resource group (change) : devcloud

Status : Ready

Location : West Europe

Subscription (change) : fawohlsc Internal Consumption

Subscription ID : fdacc2d-9de7-4b80-933d-290ab5b6d893

Overview Getting started Internal support My Lab

- My virtual machines
- Claimable virtual machines
- All virtual machines
- My data disks
- Formulas (reusable bases)
- My secrets
- Personal data

Settings Configuration and policies

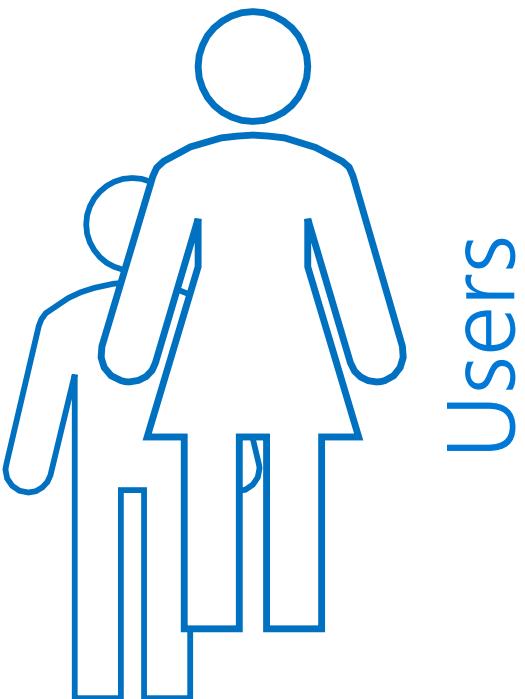
My virtual machines

NAME	STATUS	AUTO-START
javadevbox001	Stopped (deallocated)	No

Claimable virtual machines

NAME	STATUS	AUTO-START
dotnetdevbox001	Available	No
linuxdevbox001	Available	No

Self-service provisioning



Users

Home > Resource groups > lab > lab > Choose a base > Virtual machine > Add artifacts

Choose a base

NAME	PUBLISHER	OS TYPE	TYPE
Windows 10 Pro, Version 1803	Microsoft	Windows	Gallery image
Windows 10 Pro N, Version 1803	Microsoft	Windows	Gallery image
Windows 10 Pro N, Version 1709	Microsoft	Windows	Gallery image
Windows 10 Pro, Version 1709	Microsoft	Windows	Gallery image

Virtual machine
Configure settings

* Virtual machine name: devbox1 (checked)

* User name: fawohlsc

Password:
 Use a saved secret
 Save as default password

Disk and size
Virtual machine disk type: HDD SSD

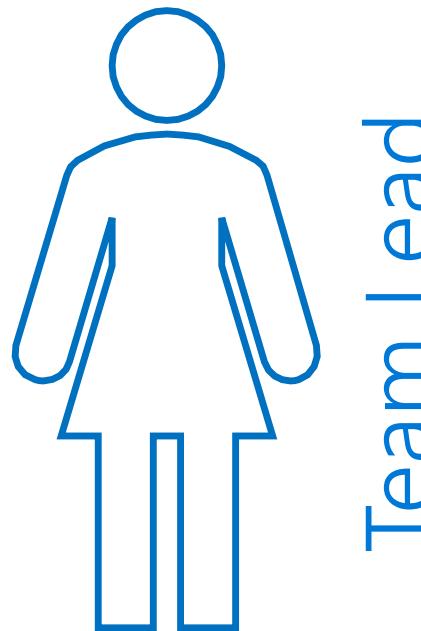
Virtual machine size: Standard_DS1

More options
Artifacts: 0 artifact(s) selected
Advanced settings
* Image: Windows 10 Pro N, Version 1803
View ARM template

Add artifacts

- Feedback
- Applying artifacts cases
- Create web s...
- Docker
- Download fil...
- Download VS...
- Eclipse
- Enable local...
- Firefox
- git
- gVim (Cream...
- Install Chocol...
- Install RuckZ...
- IntelliJ IDEA (...)
- IIS Internet Infor...
- JHipster
- Join Active D...
- Microsoft .N...
- MongoDB
- Node JS
- No-Op
- Notepad++
- NVM
- PowerShell 3...
- PowerShell D...
- PuTTY

Configuration & policies



Team Lead

Home > lab > Configuration and policies - Auto-shutdown

Configuration and policies - Auto-shutdown

DevTest Lab

Search (Ctrl+ /)

Enabled On Off

Scheduled shutdown 19:00:00

Time zone (UTC+01:00) Amsterdam, Berlin, Bern, Rome, Stockholm, Vienna

Send notification before auto-shutdown? Yes No

Webhook URL

Email address

i This policy automatically applies auto-shutdown to all the virtual machines in the lab's virtual machine blade.

COST TRACKING

- Cost trend
- Cost by resource

SETTINGS

- Allowed virtual machine sizes
- Virtual machines per user
- Virtual machines per lab
- Lab settings
- Lab announcement
- Internal support

SCHEDULES

- Auto-shutdown
- Auto-start

EXTERNAL RESOURCES

- Repositories
- Mandatory artifacts
- Virtual networks

Big Picture

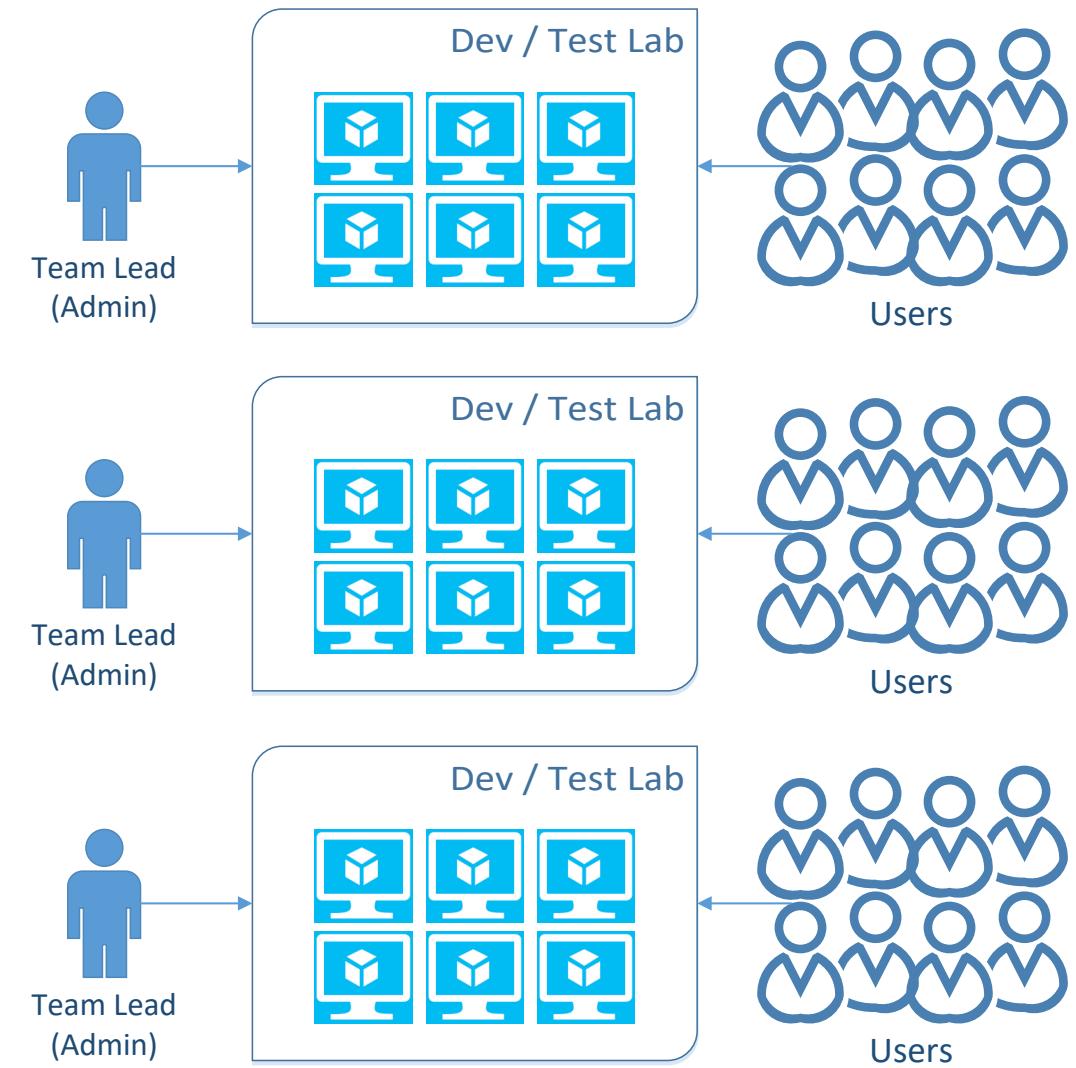
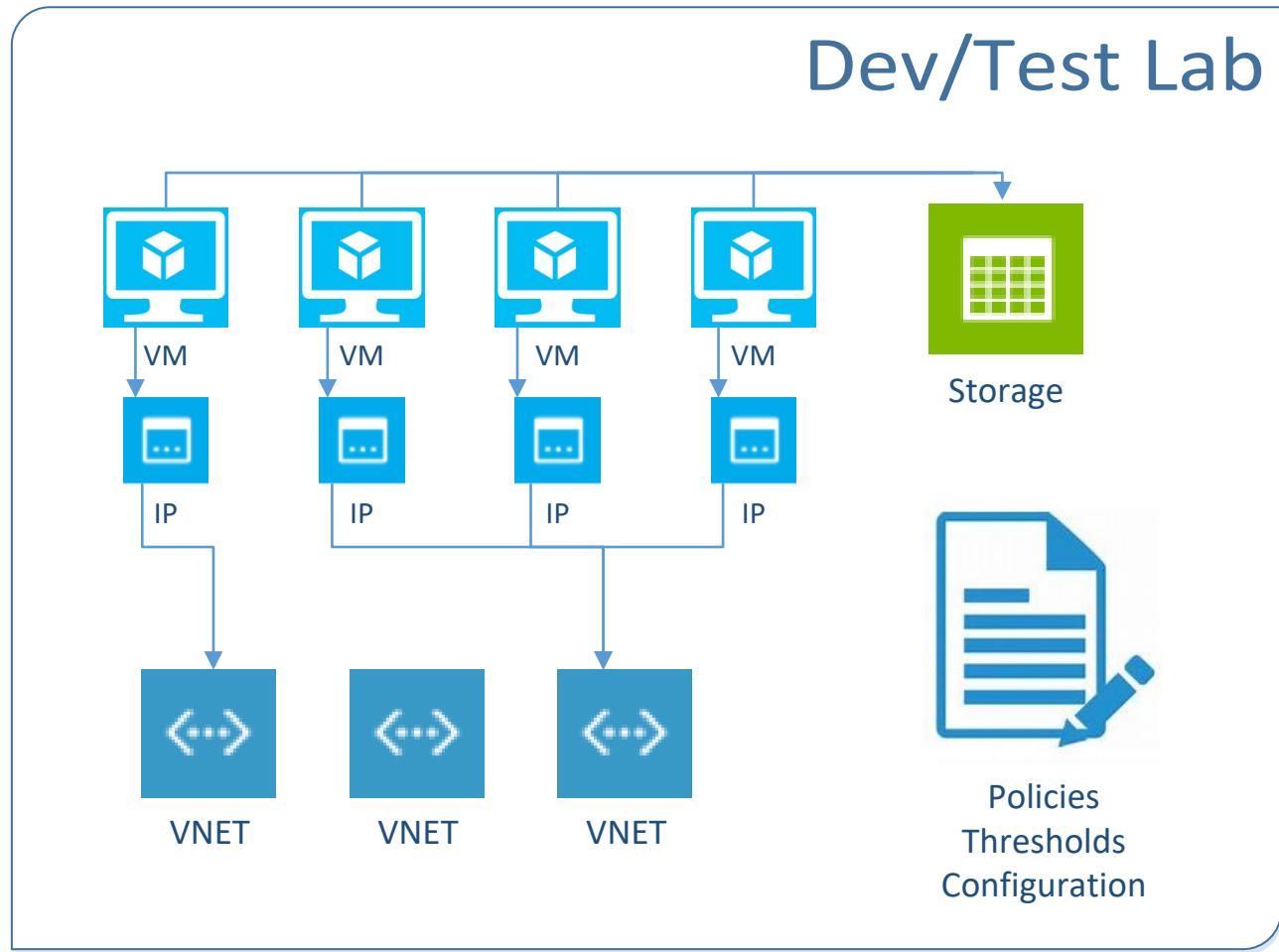
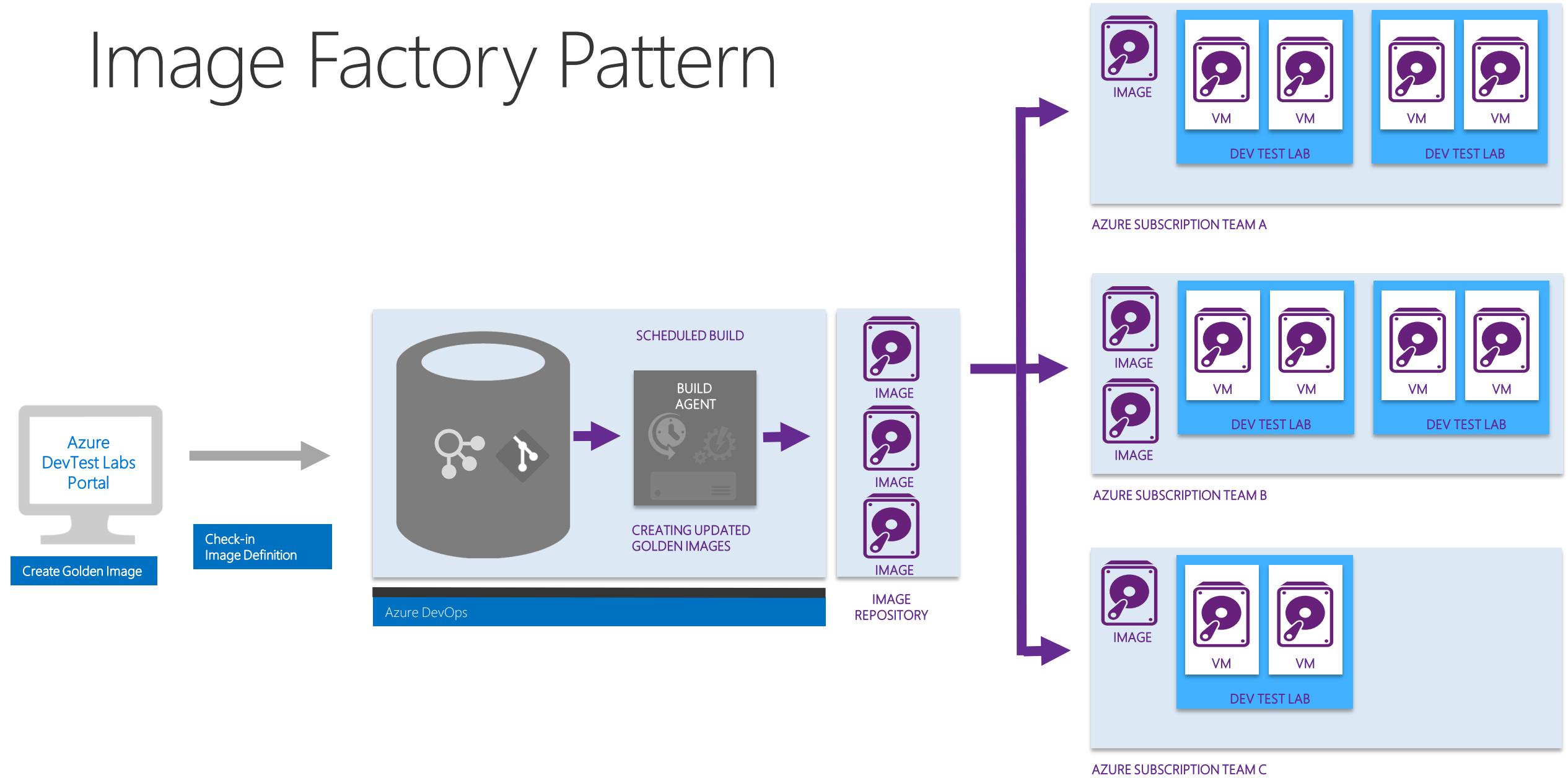


Image Factory Pattern



Migrating from TFS to Azure DevOps

Move from Team Foundation Server to Azure DevOps and bring your data along

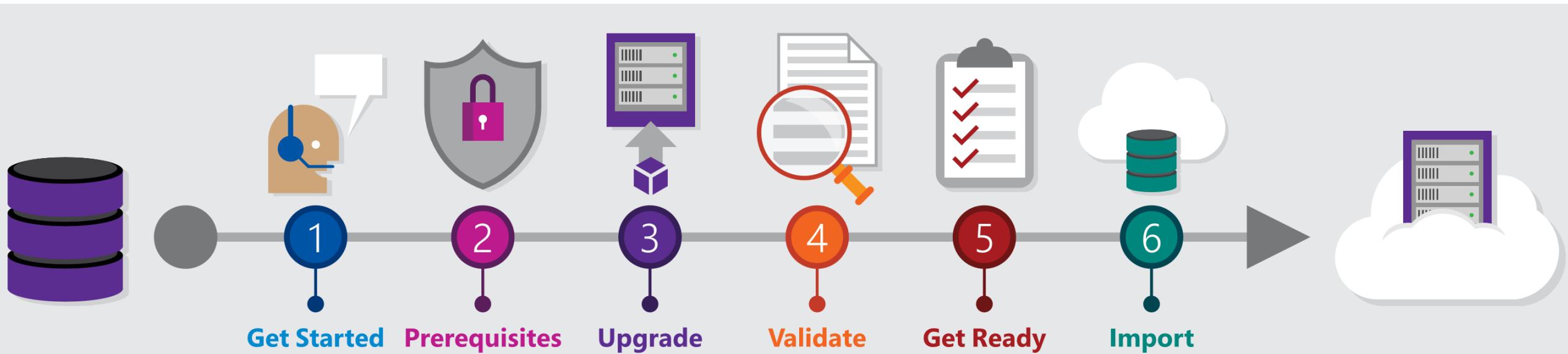
Benefits of Cloud Hosted Azure DevOps Services

- Global availability
- Hosted and maintained by Microsoft with 99.9% uptime guarantee and 24x7 support
- Immediate access to latest features
- Simplified deployment to Azure

TFS Import Service

- Fully supported high fidelity migration path
- Trusted by many large enterprises
- Now faster and easier to use

➡ <https://aka.ms/tfsimport>



Azure DevOps Services Pricing

Open Source Projects

Free

Unlimited users and build time

- Azure Pipelines: 10 parallel jobs with unlimited minutes for CI/CD
- Azure Boards: Work item tracking and Kanban boards
- Azure Repos: Unlimited public Git repos

Small Teams

Free

Start free with up to 5 users

- Azure Pipelines: Run 1 Microsoft-hosted job for 1,800 minutes per month and 1 self-hosted job for any amount of time
- Azure Boards: Work item tracking and Kanban boards
- Azure Repos: Unlimited public Git repos
- Azure Artifacts: package management
- Unlimited stakeholders

Teams of any size

Starts at \$6

per user, per month for Boards & Repos*

Easy pricing that grows with your team

- Azure Pipelines: Run 1 Microsoft-hosted job for 1,800 minutes per month and 1 self-hosted job for any amount of time
- Azure Boards: Work item tracking and Kanban boards
- Azure Repos: Unlimited public Git repos
- Azure Artifacts: package management
- Unlimited stakeholders
- Boards & Repos included for Visual Studio subscribers



<https://azure.com/pricing/details/devops/>

* 5 Boards & Repos users and 5 Artifacts users free. Pipelines with unlimited minutes, Test Plans users and additional Artifacts users also available. Please see the Azure pricing calculator for details.

Azure DevOps & GitHub



GitHub

The #1 Developer
platform on the planet

Most contributions [1.1B](#) in 2018

Most developers [33M](#)

Highest growth [8M](#) new devs in 2018

Most Repos [96M](#)

Most activity [200M](#) PRs, [800M](#) API requests daily

Most students [1.1M](#)

Most organizations [2.2M](#)

Most secure [5M](#) vulnerability alerts in 2018

Home to the most
important and popular
open source projects
on the planet



GitHub and Azure DevOps

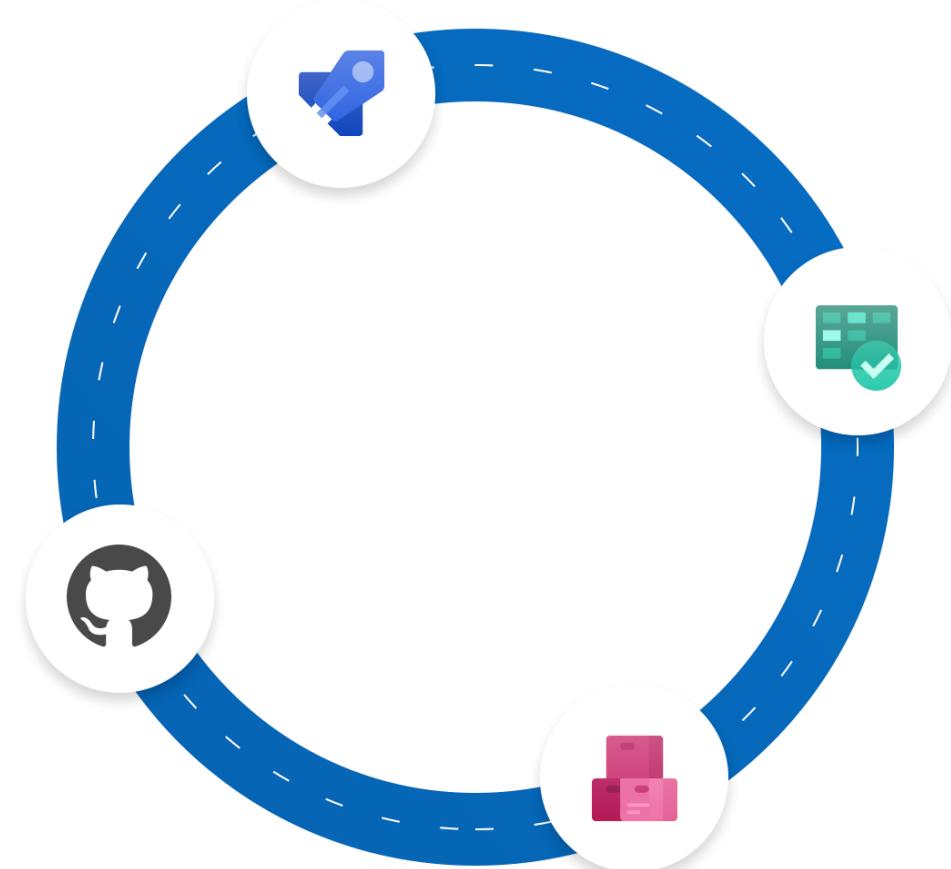
Keep GitHub independent, open and loved by developers

GitHub WILL and MUST stay independent and open

GitHub & Azure DevOps are complementary

Azure DevOps is how we bring customers to Azure

Azure Pipelines, Boards and Artifacts bring
GitHub users into Azure DevOps





Azure Pipelines Integrated with GitHub

Azure Pipelines available now to
any developer from the GitHub
Marketplace

The screenshot shows the GitHub Marketplace interface. At the top, there's a navigation bar with links for "Pull requests", "Issues", "Marketplace", and "Explore". Below the navigation, the URL "Marketplace / Azure Pipelines" is visible. On the left side, there's a sidebar with a circular icon containing the Azure Pipelines logo, followed by sections for "Categories" (with "Continuous integration" and "Deployment" options), "Supported languages" (listing Dockerfile, Go, Java, and 7 other languages), and "Developer links" (with links for "Support", "Status", "Documentation", and "Privacy Policy"). The main content area has a dark header with the text "Azure Pipelines" and two buttons: "Set up a new plan" and "Edit your plan ▾". Below the header, a sub-header reads "Continuously build, test, and deploy to any platform and cloud". A descriptive paragraph states: "Azure Pipelines offers cloud-hosted pipelines for Linux, macOS, and Windows with 10 free parallel jobs and unlimited minutes for open source projects." There's also a "Read more..." link. The bottom half of the screenshot features a large blue callout box with the heading "Linux, macOS, and Windows agents" and a subtext: "Simplify managing hardware and VMs by using Microsoft cloud-hosted agents. Get full CI/CD pipeline support for every major platform and tool." It shows a flowchart of pipeline steps: "Test 27 succeeded" (green checkmark), "Build Linux 6 succeeded" (green checkmark), "Build Windows 2 succeeded" (green checkmark), "Build macOS 64% in progress..." (blue circle), and a final step "Distribute" (grey outline).



Azure Pipelines

Free unlimited build minutes for public projects

Up to 10 free parallel jobs across Windows, Linux and macOS



<https://azure.com/pipelines>

Microsoft ❤️ Open Source

OSS Projects using Azure Pipelines

- Azure/IoT-Pi-Day
- desktop/desktop
- git-for-windows/git
- Microsoft/VFSForGit
- webpack/webpack
- libgit2/libgit2
- Microsoft/vscode
- appium/appium-desktop
- webpack/webpack-cli
- pypa/pipenv
- atom/atom
- tox-dev/tox
- PowerShell/PowerShell
- ehcache/ehcache3
- python/cpython
- esy/esy
- ibis-project/ibis
- GitTools/GitVersion
- InsightSoftwareConsortium/

- ITKExamples
- jhipster/generator-jhipster
- Microsoft/lightGBM
- graphql-rust/juniper
- nteract/nteract
- commitizen/cz-cli
- wireapp/wire-ios
- parcel-bundler/parcel
- crate/crate
- zeit/next.js
- ukoethe/vigra
- OptiKey/OptiKey
- sympy/sympy
- pandas-dev/pandas
- node-modules/urllib
- reactiveui/ReactiveUI
- oatpp/oatpp
- nuxt/nuxt.js
- alexaubry/BulletinBoard



$$y_{it} = \beta' x_{it} + \mu_i + \epsilon_{it}$$



Ahhhhh...but what about...

GitHub Code & Azure Repos?

GitHub Issues & Azure Boards?

GitHub Actions & Azure Pipelines?



GitHub Code & Azure Repos

GitHub is the premier social coding experience and the Git experience that most developers are familiar with. But there are significant enterprise & IES gaps addressed by Azure Repos that are not yet addressed by GitHub. Over time GitHub is expected to gain more enterprise capabilities & integrations into rest of Azure DevOps continue to improve.

GitHub

Fantastic forking and PR workflow
(leading inner-source and open-source workflows)
Easy collaboration with people outside the company &
open source
Much loved brand & conversation starter with developers
Usage share and momentum

Azure Repos

Integration with AAD
Supports larger repos and larger teams
Has support for Git and TFVC
Wide support for Data-Sovereignty requirements
Existing customers, no need to change and migration
path will be well supported in the future.

Be customer driven

Help them select the tool that will make them most happy, knowing that there is an easy migration path from Azure Repos to GitHub and tight integration that will continue to improve.

GitHub Issues & Azure Boards

GitHub issues provide a simple but powerful mechanism for developers to track bugs and issues close to the code which is loved by developers. Azure Boards provides the agile tooling and reporting capabilities to track and manage work across teams.

GitHub Issues

- Bug and issue tracking co-located with code stored in GitHub
- Great for OSS community discussion
- Developer friendly interface
- Labelling features to quickly filter lists of work
- Issue alerting integrated with-in GitHub UI and visible in developers workflow on GitHub

Azure Boards

- Easy to use agile tooling including backlogs, Kanban boards & delivery plans
- Scales to teams of any size and any volume of work
- Powerful querying and reporting capabilities
- Scale to the largest of teams
- Available as a stand-alone service suitable for stakeholders and PMO
- Integration soon between Azure Boards and GitHub Issues

For bug and issue tracking with-in the code base (especially for public projects) GitHub issues provides all the tooling individual developers need without adding the friction associated with tools such as Jira. To manage work performed by the team use Azure Boards and make use of the integration between GitHub and Azure DevOps to ensure traceability across the entire project.

GitHub Actions (Beta) & Azure Pipelines

Think of GitHub Actions as a full serverless project automation suite (like Zapier or IFFT for your GitHub projects). Azure Pipelines is a dedicated CI/CD platform with support for Linux, Mac and Windows and the most generous free build allowance for open source projects.

GitHub Actions

Automation across a number of activities including issues, pull requests, pushes and commits

Lightweight serverless automation capabilities with limited logging

Pre-build automation workflows and actions (such as performing an action when a comment is left on an issue)

Limited run time & concurrency (58 min, 2 concurrent actions)

Powerful graphical editor built into directly into GitHub UI

Azure Pipelines

Dedicated CI/CD service with support for unlimited numbers of concurrent jobs

Detailed build reporting including integration with unit testing and code coverage

Choice of Linux, Windows and Mac for hosted builds & ability to self-host hardware

Deployment options to on-premises, Azure, AWS and GCP (Windows, Mac and Linux)

Rich deployment approvals, UI, traceability, monitoring and logging

When ready for wide release, GitHub Actions will provide a platform to automate actions with-in the project. Azure Pipelines is the largest hosted cloud build provider providing compute intensive resources needed for build and deployment along with the reporting and monitoring tooling necessary to scale to any size of build and deployment needs.

Demo of Azure DevOps



Break – 15 min

Thank you!