DevOps This document will change over time. Today is 06/02/2023

Your AI-Powered Browser | Microsoft Edge

Master Lab TOC for MOC

AZ400-DesigningandImplementingMicrosoftDevOpsSolutions (microsoftlearning.github.io)

Step One: Define the Organization; Teams; Projects & Repos

- An Azure DevOps account: https://dev.azure.com
- A GitHub account: https://github.com
- An Azure account: https://azure.microsoft.com/

Create Backlog list items - work items for each project

List each item of work

What is the Branching Strategy?

- Master - kept isolated
- Dev branch - used for development
- When to clone
- When to fork

DevOps Automation

1. Choose process to use
2. Determine update stages - Columns
    a. Update Status - triggers / hooks
    b. start - steps we need – finish
    c. Specify events that trigger pipelines:
    d. https://docs.microsoft.com/en-us/azure/devops/pipelines/build/triggers?view=azure-devops
3. What do I automate?
4. Code writing - commit - pull request
5. Testing
6. Validated
7. Approved
8. Deployed - to what targets
9. Policies - code-review workflow

Enable preview features: https://docs.microsoft.com/en-us/azure/devops/project/navigation/preview-features?view=azure-devops&tabs=new-account-enabled

New Pull Request Experience for Azure Repos: https://devblogs.microsoft.com/devops/introducing-the-new-pull-request-experience-for-azure-repos/

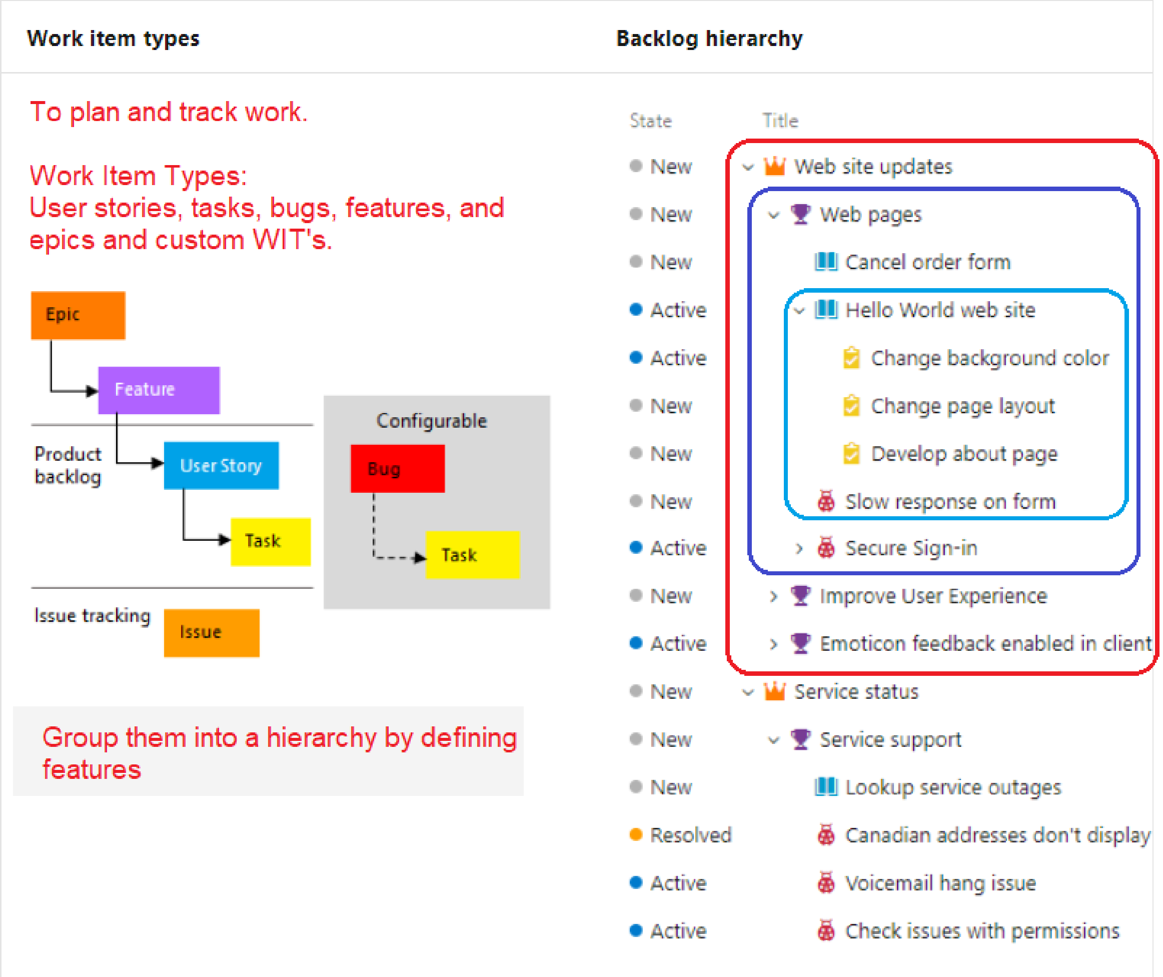
Daily Workflow

****Manage work items that you're following:** https://docs.microsoft.com/en-us/azure/devops/boards/work-items/follow-work-items?view=azure-devops#manage-work-items-that-youre-following

- You can review and manage all the work items you've selected to follow.

Add and update a work item: https://docs.microsoft.com/en-us/azure/devops/boards/backlogs/add-work-items?view=azure-devops&tabs=browser

Track work with user stories, issues, bugs, features, and epics – in a Nutshell: https://docs.microsoft.com/en-us/azure/devops/boards/work-items/about-work-items?view=azure-devops&tabs=agile-process#in-a-nutshell



Work item types

Backlog hierarchy

To plan and track work.

Work Item Types:
User stories, tasks, bugs, features, and epics and custom WIT's.

Group them into a hierarchy by defining features

State	Title
New	Web site updates
New	Web pages
New	Cancel order form
Active	Hello World web site
Active	Change background color
New	Change page layout
New	Develop about page
New	Slow response on form
Active	Secure Sign-in
New	Improve User Experience
Active	Emoticon feedback enabled in client
New	Service status
New	Service support
New	Lookup service outages
Resolved	Canadian addresses don't display
Active	Voicemail hang issue
Active	Check issues with permissions

Add child items: https://docs.microsoft.com/en-us/azure/devops/boards/backlogs/define-features-epics?view=azure-devops&tabs=agile-process#add-child-items

- From any backlog, you can add child items. You can add features to epics, and backlog items to features.

****Tutorial: Follow a user story, bug, issue, or other work item or pull request:** https://docs.microsoft.com/en-us/azure/devops/boards/work-items/follow-work-items?view=azure-devops

Open your backlog: https://docs.microsoft.com/en-us/azure/devops/boards/backlogs/create-your-backlog?view=azure-devops&tabs=agile-process#open-your-backlog

Manage your notifications: https://docs.microsoft.com/en-us/azure/devops/notifications/manage-your-personal-notifications?view=azure-devops&tabs=preview-page

- As changes occur to work items, code reviews, source control files, and builds, you can receive email notifications for alerts that you define

Drive Git development from a work item: https://docs.microsoft.com/en-us/azure/devops/boards/backlogs/connect-work-items-to-git-dev-ops?view=azure-devops

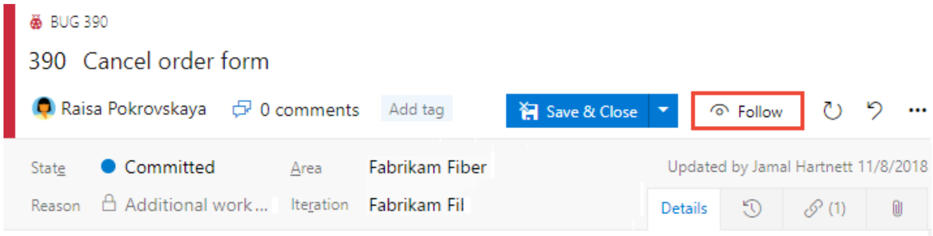
One of the ways your team can drive their development is to stay in sync:

- Link your work items to the objects created during development, such as branches, commits, pull requests, and builds
- Get notified of changes made to a specific work item or a pull request
- Elect to follow them
- The Follow feature provides an ad hoc way of getting notified on a case-by-case basis
- Subscribe to receive email notifications automatically based on changes that occur based on your targeted set of criteria in Manage personal notifications.

For example, you can create a subscription to automatically get notified whenever a work item that you created or that was assigned to you is modified.

Follow a work item

When you want to track the progress of a single work item, choose the 👁 Follow



BUG 390

390 Cancel order form

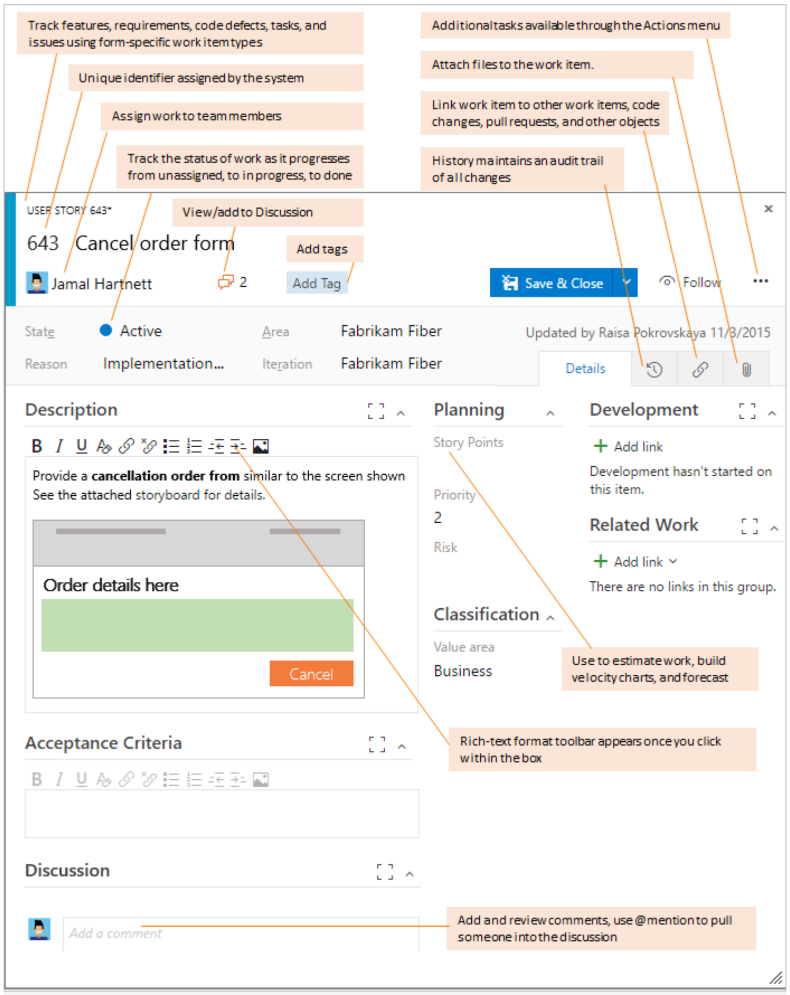
Raisa Pokrovskaya 0 comments Add tag

State	Committed	Area	Fabrikam Fiber
Reason	Additional work…	Iteration	Fabrikam Fil

Updated by Jamal Hartnett 11/8/2018

- Specify conditions on when you'll get notified of changes, choose the ⚙ icon and choose from the options provided.
- You'll only receive notifications when other members of your team modify the work item, such as adding to the discussion, changing a field value, or adding an attachment.
- Notifications are sent to your preferred email address, which you can change from your user profile

Work item form



Track features, requirements, code defects, tasks, and issues using form-specific work item types

Unique identifier assigned by the system

Assign work to team members

Track the status of work as it progresses from unassigned, to in progress, to done

View/add to Discussion

Add tags

Additional tasks available through the Actions menu

Attach files to the work item.

Link work item to other work items, code changes, pull requests, and other objects

History maintains an audit trail of all changes

USER STORY 643*

643 Cancel order form

Jamal Hartnett 2 Add Tag

State	Active	Area	Fabrikam Fiber
Reason	Implementation…	Iteration	Fabrikam Fiber

Updated by Raisa Pokrovskaya 11/3/2015

Description

Provide a **cancellation order from** similar to the screen shown
See the attached storyboard for details.

Planning

Story Points

Priority
2

Risk

Classification

Value area
Business

Development

Add link

Development hasn't started on this item.

Related Work

Add link

There are no links in this group.

Use to estimate work, build velocity charts, and forecast

Acceptance Criteria

Rich-text format toolbar appears once you click within the box

Discussion

Add a comment

Add and review comments, use @mention to pull someone into the discussion

Notifications, Favorites, Following

About notifications: https://docs.microsoft.com/en-us/azure/devops/notifications/about-notifications?view=azure-devops

- When changes occur to work items, code reviews, pull requests, source control files, and builds. You can be notified via email.
- For example, you can get notified whenever you resolve a bug or are assigned a work item.

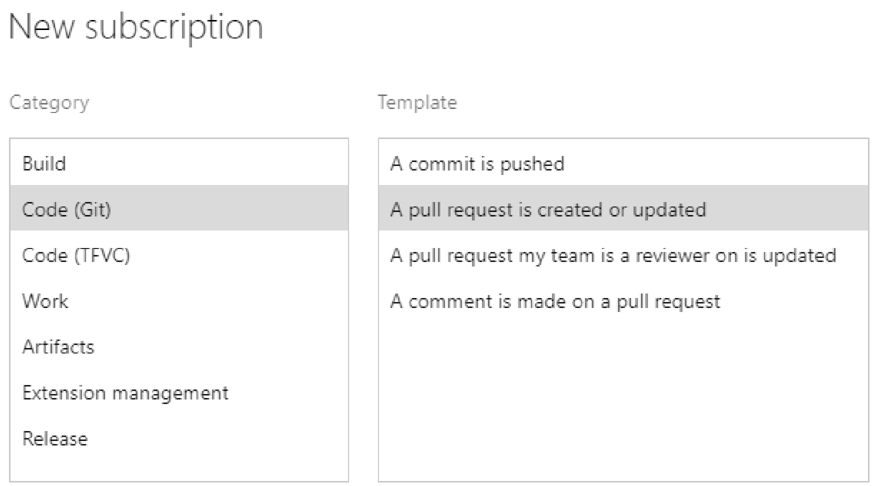
Notifications are managed by an administrator at the following levels:

- Team notifications, managed by a team administrator
- Project notifications, managed by a member of the Project Administrators group
- Organization/collection-level notifications, managed by a member of the Project Collection Administrators group
- Default is the email address you signed into Azure DevOps with.
- Manage this email address via your organization preferences profile page.

Manage notifications for a team or group: https://docs.microsoft.com/en-us/azure/devops/notifications/manage-team-group-notifications?view=azure-devops

As changes occur to work items, code reviews, pull requests, source control files, and builds, your team or group can be notified via email. For example, when a high priority work item is assigned to your team's area path, an email can be sent to the team.

Subscriptions can allow


New subscription
Category
Build
Code (Git)
Code (TFVC)
Work
Artifacts
Extension management
Release
Template
A commit is pushed
A pull request is created or updated
A pull request my team is a reviewer on is updated
A comment is made on a pull request

Use @mentions in work items and pull requests: https://docs.microsoft.com/en-us/azure/devops/notifications/at-mentions?view=azure-devops

- The @mention control allows you to quickly add someone into a work item or pull request discussion
- Upon completion of your selection and text entry, your @mention user receives an email alerting them about the mention.

Use #ID to link to work items: https://docs.microsoft.com/en-us/azure/devops/notifications/add-links-to-work-items

- Link a pull request to a work item: Use the #ID control in pull request discussions, commit comments, changeset comments, and shelveset comments.

*****Use AB# mention to link from GitHub to Azure Boards work items**: https://docs.microsoft.com/en-us/azure/devops/boards/github/link-to-from-github?view=azure-devops#use-ab-mention-to-link-from-github-to-azure-boards-work-items

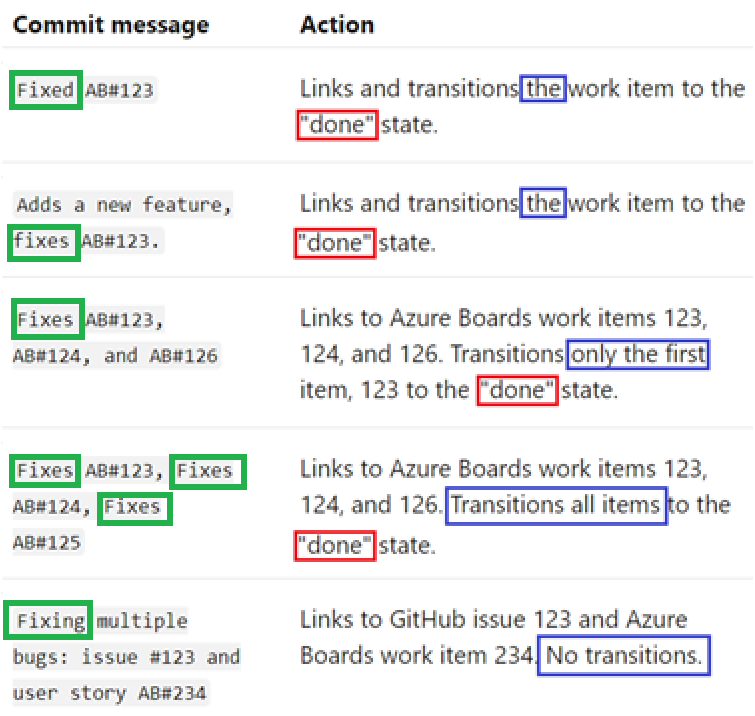
- From a GitHub commit, pull request or issue, use the following syntax to create a link to your Azure Boards work item.
- Enter the AB#ID within the text of a commit message.
- Or, for a pull request or issue, enter the AB#ID within the title or description

Example: AB#125 will link to work item ID 125.

**Enter a commit or pull request message to transition the work item. This means change the state of the Kanban card.

The system will recognize:

- Fix
- Fixes
- Fixed
- And apply it to the #-mention item that follows.



Commit message	Action
`Fixed AB#123`	Links and transitions the work item to the "done" state.
`Adds a new feature, fixes AB#123.`	Links and transitions the work item to the "done" state.
`Fixes AB#123, AB#124, and AB#126`	Links to Azure Boards work items 123, 124, and 126. Transitions only the first item, 123 to the "done" state.
`Fixes AB#123, Fixes AB#124, Fixes AB#125`	Links to Azure Boards work items 123, 124, and 126. Transitions all items to the "done" state.
`Fixing multiple bugs: issue #123 and user story AB#234`	Links to GitHub issue 123 and Azure Boards work item 234. No transitions.

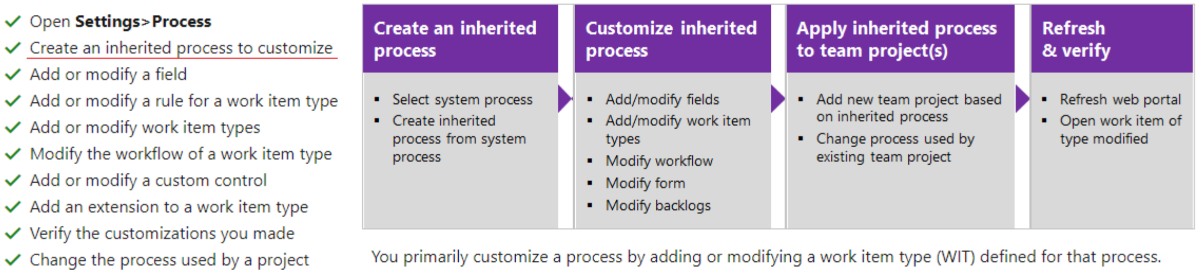
Change your preferred email address for notifications: https://docs.microsoft.com/en-us/azure/devops/notifications/change-email-address

Create Project, Process, Work Items – Create custom State to Column maps.

Plan and track work: https://docs.microsoft.com/en-us/azure/devops/boards/get-started/plan-track-work

Map the flow of work: https://docs.microsoft.com/en-us/azure/devops/boards/boards/add-columns?view=azure-devops#map-the-flow-of-work

The general sequence for customizing a project is to *customize an inherited process*, verify your customizations, and then change the process of the project(s) to use that process.



- ✓ Open **Settings>Process**
- ✓ Create an inherited process to customize
- ✓ Add or modify a field
- ✓ Add or modify a rule for a work item type
- ✓ Add or modify work item types
- ✓ Modify the workflow of a work item type
- ✓ Add or modify a custom control
- ✓ Add an extension to a work item type
- ✓ Verify the customizations you made
- ✓ Change the process used by a project

Create an inherited process
- Select system process
- Create inherited process from system process

Customize inherited process
- Add/modify fields
- Add/modify work item types
- Modify workflow
- Modify form
- Modify backlogs

Apply inherited process to team project(s)
- Add new team project based on inherited process
- Change process used by existing team project

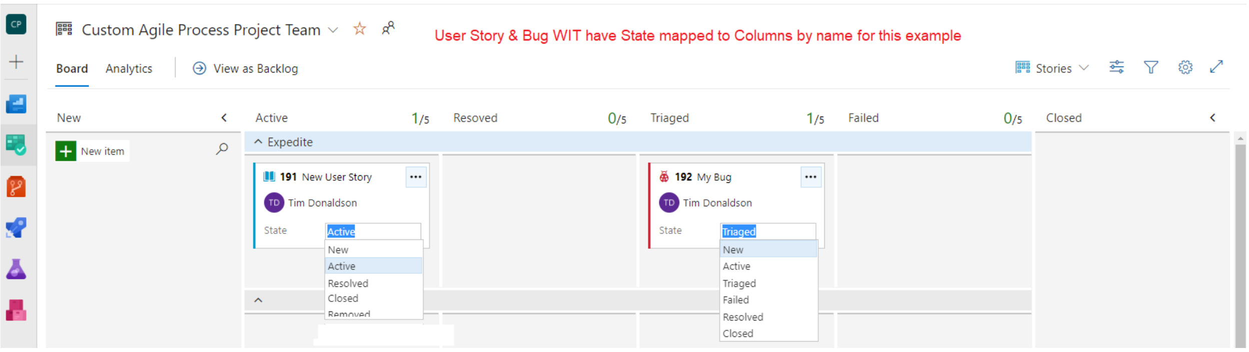
Refresh & verify
- Refresh web portal
- Open work item of type modified

You primarily customize a process by adding or modifying a work item type (WIT) defined for that process.

Column to state map examples

Columns name match State in some cases

Can a bug or User Story/Work Item update correctly to each column?

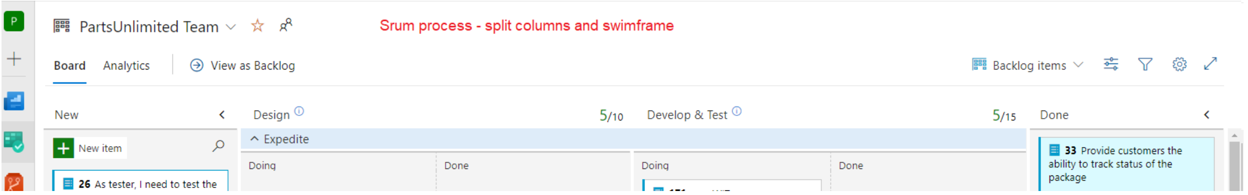


User Story & Bug WIT have State mapped to Columns by name for this example

Custom Agile Process Project Team

Board | Analytics | View as Backlog | Stories

New	Active 1/5	Resoved 0/5	Triaged 1/5	Failed 0/5	Closed
New item	191 New User Story Tim Donaldson State: Active		192 My Bug Tim Donaldson State: Triaged		



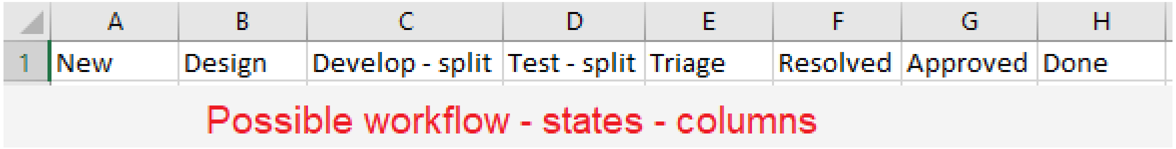
Srum process - split columns and swimframe

PartsUnlimited Team

Board | Analytics | View as Backlog | Backlog items

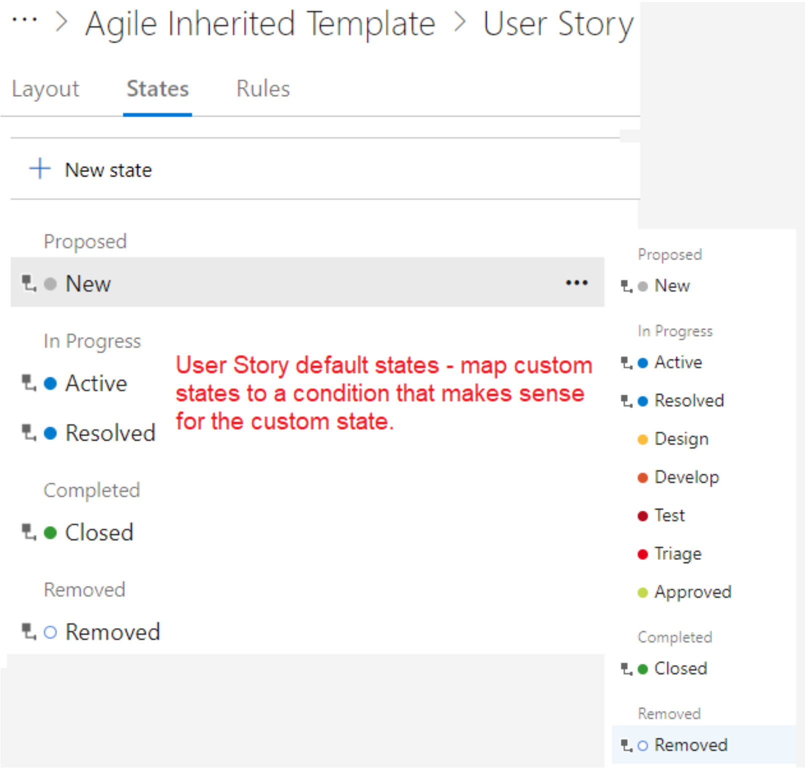
New	Design 5/10		Develop & Test 5/15		Done
	Doing	Done	Doing	Done	
New item 26 As tester, I need to test the					33 Provide customers the ability to track status of the package

What default State will map to a Kanban card move



	A	B	C	D	E	F	G	H
1	New	Design	Develop - split	Test - split	Triage	Resolved	Approved	Done

Possible workflow - states - columns



··· > Agile Inherited Template > User Story

Layout | **States** | Rules

+ New state

Proposed
- ● New

In Progress
- ● Active
- ● Resolved

Completed
- ● Closed

Removed
- ○ Removed

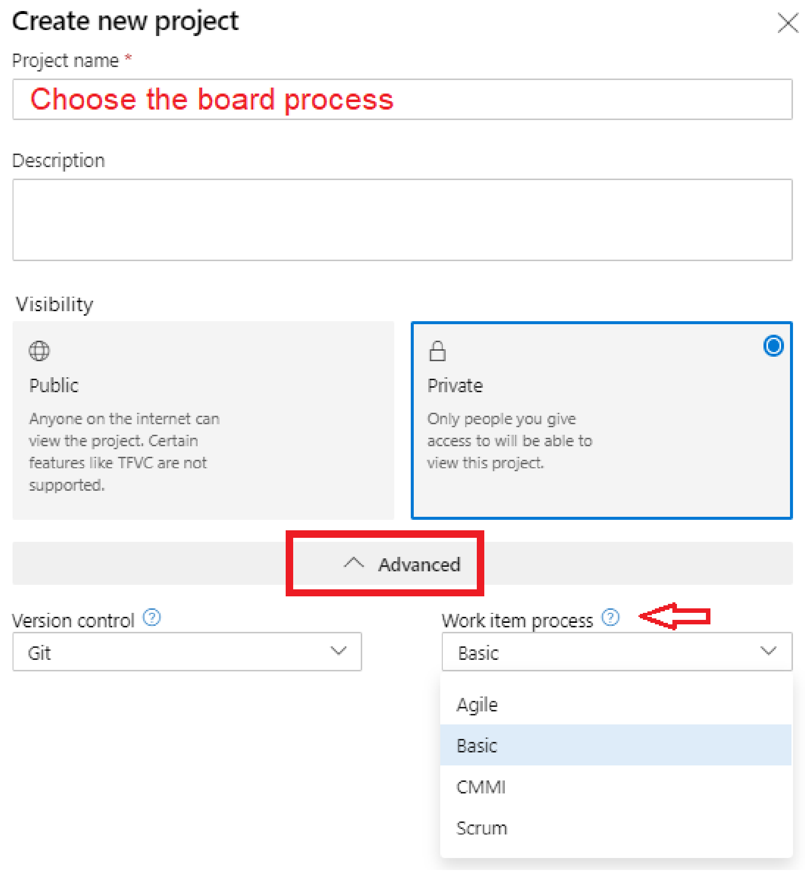
User Story default states - map custom states to a condition that makes sense for the custom state.

Proposed
- ● New

In Progress
- ● Active
- ● Resolved
- ● Design
- ● Develop
- ● Test
- ● Triage
- ● Approved

Completed
- ● Closed

Removed
- ○ Removed



Create new project

Project name *

Choose the board process

Description

Visibility

Public
Anyone on the internet can view the project. Certain features like TFVC are not supported.

● Private
Only people you give access to will be able to view this project.

Advanced

Version control: Git

Work item process: Basic

- Agile
- Basic
- CMMI
- Scrum

Customize your boards: https://docs.microsoft.com/en-us/azure/devops/boards/get-started/customize-boards?view=azure-devops&tabs=basic-process

Add columns to your Kanban board: https://docs.microsoft.com/en-us/azure/devops/boards/boards/add-columns?view=azure-devops

- Now that you've got the essentials of how to work with your Kanban board, here's how you get it to look like what you need it to.

Expedite work with swimlanes: https://docs.microsoft.com/en-us/azure/devops/boards/boards/expedite-work?view=azure-devops

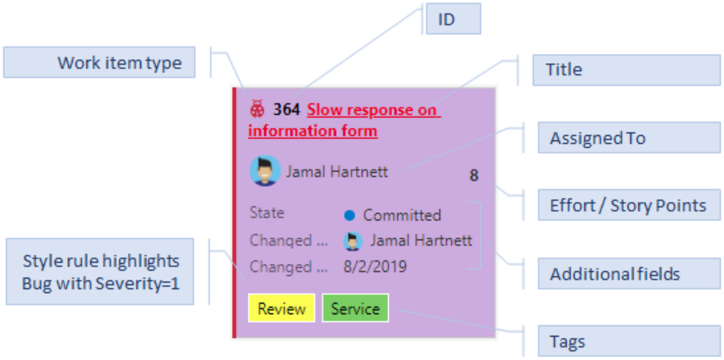
Identify bottlenecks - use split columns to improve workflow: https://docs.microsoft.com/en-us/azure/devops/boards/boards/split-columns?view=azure-devops#identify-bottlenecks-drive-toward-a-perfect-flow-scenario

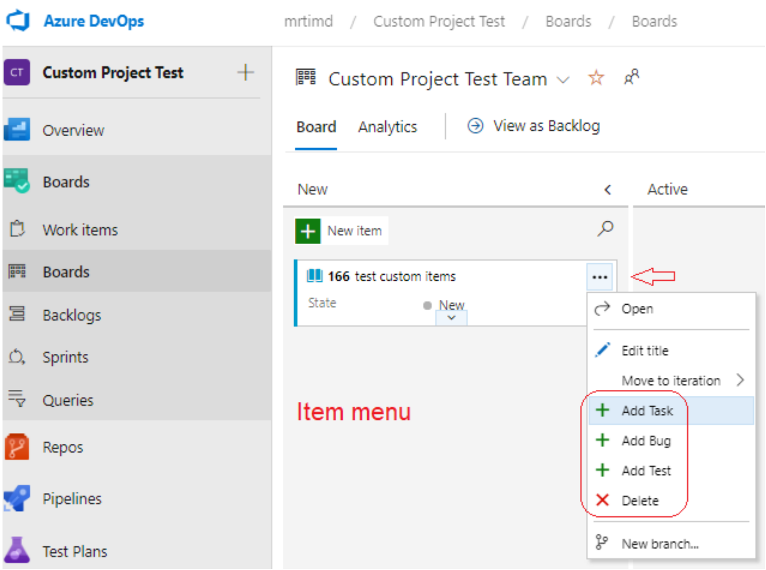
Customize cards: https://docs.microsoft.com/en-us/azure/devops/boards/boards/customize-cards?view=azure-devops

1. Update a field without opening the work item.
2. Use style rules to highlight work items with select colors based on the criteria you set.

In the card shown below, the following customizations have been set for the bug work item type (WIT):

- Show all core fields: ID, Assigned To, Story Points, Tags
- Show three additional fields: State, Changed By, and Changed Date
- Apply tag colors
- Apply styling rule to display bugs with Severity=1 as yellow and bold and underline the Title field
- Card customize to show additional fields, tags, and style rule



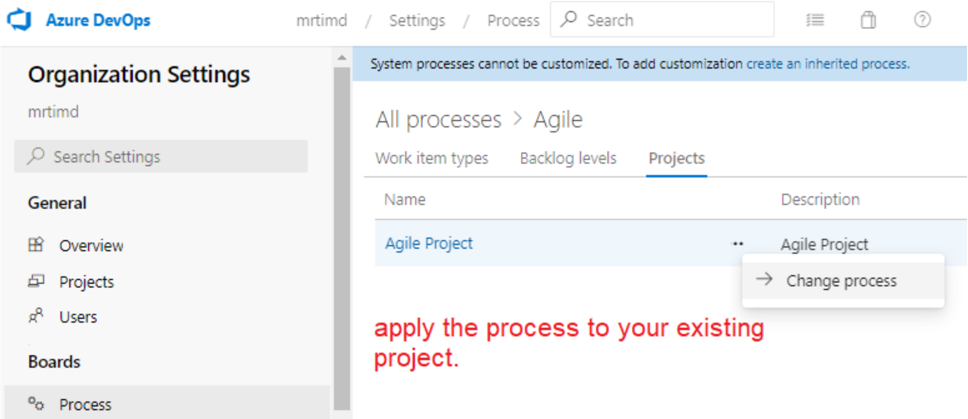


Customize a project using an inherited process: https://docs.microsoft.com/en-us/azure/devops/organizations/settings/work/customize-process

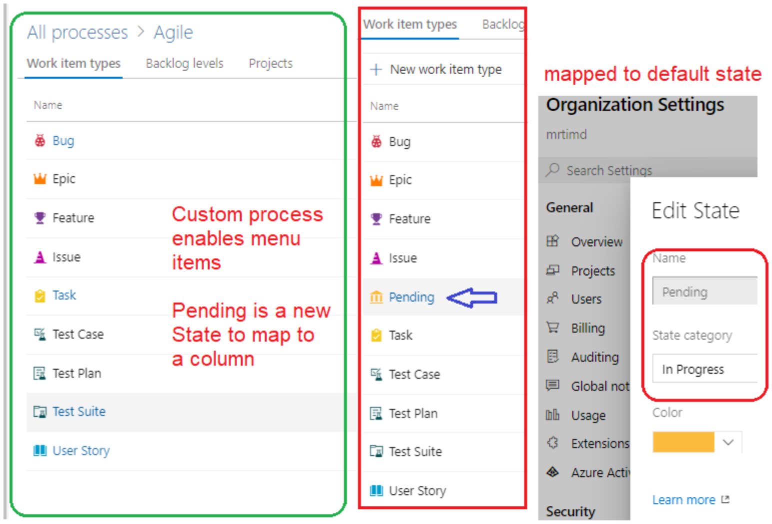
You must create an inherited process to customize WIT's or you will see:

Apply the customized process to your project: https://docs.microsoft.com/en-us/azure/devops/organizations/settings/work/customize-process?view=azure-devops#apply-the-customized-process-to-your-project

Apply the process to your existing project vs. create a new project with the new process


System processes cannot be customized. To add customization create an inherited process.

Or Create a New Project



Custom process enables menu items

Pending is a new State to map to a column

mapped to default state

Verify New Project wizard shows custom process name and the changes made work in DevOps

Add a custom field to a work item type: https://docs.microsoft.com/en-us/azure/devops/organizations/settings/work/add-custom-field?view=azure-devops

To update status of a work item, you simply drag-and-drop cards to a different column. To change the order or stack ranking of a work item, you drag a card up or down within a column.

Moving the card from Analyze to Develop updates the corresponding State field.

Customize the workflow: https://docs.microsoft.com/en-us/azure/devops/organizations/settings/work/customize-process-workflow?view=azure-devops#open-settingsprocess

**Add custom states when you want all teams to track the status according to the business workflow adopted by the organization.

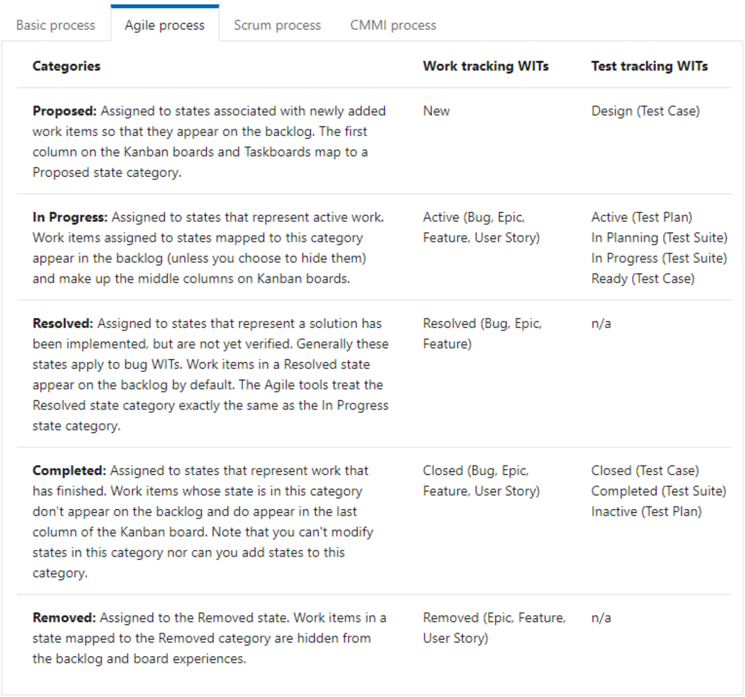
To support your business and team processes, you can *add custom states to most work item types* (WITs). For example, you may want to insert a Triaged state for bugs, or a Design state for features or user stories.

Add a workflow state: https://docs.microsoft.com/en-us/azure/devops/organizations/settings/work/customize-process-workflow?view=azure-devops#add-a-workflow-state

- Workflow states define how a work item progresses upon its creation to closure.
- Workflow states are shared across a project while Kanban columns are shared within a team.
- Only project collection admins can add inherited custom states, while team admins can add Kanban columns.
- States you add appear in the picklist for the States field shown in work item forms and the query editor.

- The state categories used by the backlogs, boards and widgets are Proposed, In Progress, and Complete.

The default, inherited states map to the state categories for all three system processes plus test case management WITs.



Categories	Work tracking WITs	Test tracking WITs
Proposed: Assigned to states associated with newly added work items so that they appear on the backlog. The first column on the Kanban boards and Taskboards map to a Proposed state category.	New	Design (Test Case)
In Progress: Assigned to states that represent active work. Work items assigned to states mapped to this category appear in the backlog (unless you choose to hide them) and make up the middle columns on Kanban boards.	Active (Bug, Epic, Feature, User Story)	Active (Test Plan) In Planning (Test Suite) In Progress (Test Suite) Ready (Test Case)
Resolved: Assigned to states that represent a solution has been implemented, but are not yet verified. Generally these states apply to bug WITs. Work items in a Resolved state appear on the backlog by default. The Agile tools treat the Resolved state category exactly the same as the In Progress state category.	Resolved (Bug, Epic, Feature)	n/a
Completed: Assigned to states that represent work that has finished. Work items whose state is in this category don't appear on the backlog and do appear in the last column of the Kanban board. Note that you can't modify states in this category nor can you add states to this category.	Closed (Bug, Epic, Feature, User Story)	Closed (Test Case) Completed (Test Suite) Inactive (Test Plan)
Removed: Assigned to the Removed state. Work items in a state mapped to the Removed category are hidden from the backlog and board experiences.	Removed (Epic, Feature, User Story)	n/a

The color you specify appears throughout the product including on the work item form and when the State field appears on a backlog, boards, query results, and more.

Update Kanban column-to-State mappings: https://docs.microsoft.com/en-us/azure/devops/boards/boards/add-columns?view=azure-devops#update-kanban-column-to-state-mappings

- New example states have been added, Triaged for bug, and Investigate for user story.
- *Each needs to be mapped to an existing or new column in order for the Kanban board to display work items assigned to these states.*

How workflow states and state categories are used in Backlogs and Boards: https://docs.microsoft.com/en-us/azure/devops/boards/work-items/workflow-and-state-categories?view=azure-devops&tabs=agile-process

Add or modify a rule for a work item type: https://docs.microsoft.com/en-us/azure/devops/organizations/settings/work/customize-process?view=azure-devops#add-or-modify-a-rule-for-a-work-item-type

- Rules allow you to clear the value of a field, copy a value into a field, and apply values based on dependencies between different fields' values.

****Add link from a work item to a GitHub commit, pull request, or issue**: https://docs.microsoft.com/en-us/azure/devops/boards/github/link-to-from-github?view=azure-devops#add-link-from-a-work-item-to-a-github-commit-pull-request-or-issue

This links to the item URL and just opens that web page Example: https://github.com/mrtimd/calculator/pull/1

****Auto completion of work items with pull requests:** https://docs.microsoft.com/en-us/azure/devops/boards/work-items/workflow-and-state-categories?view=azure-devops&tabs=agile-process#auto-completion-of-work-items-with-pull-requests

- This new feature that will move all linked work items in a pull request as done. This is helpful for tasks, but not for bugs or other work items that need to pass In Test first.
- Appears to be part of Visual Studio Code

See Also: Working with Pull Requests in Visual Studio Code and Azure DevOps: https://azuredevopslabs.com/labs/azuredevops/pullrequests/#task-3-managing-git-branch-and-pull-request-policies

See Also: Ways to review code with pull requests: https://docs.microsoft.com/en-us/azure/devops/repos/git/pull-requests?view=azure-devops

Resolve work items on commit: Enable commit mention work item resolution: https://docs.microsoft.com/en-us/azure/devops/repos/git/resolution-mentions?view=azure-devops#enable-commit-mention-work-item-resolution

- Allow mentions in commit comments to close work items (e.g. "Fixes #123")

View GitHub objects on Kanban board: https://docs.microsoft.com/en-us/azure/devops/boards/github/link-to-from-github?view=azure-devops#view-github-objects-on-kanban-board

Show bugs on backlogs and boards: https://docs.microsoft.com/en-us/azure/devops/organizations/settings/show-bugs-on-backlog?view=azure-devops

- As your team identifies code defects or bugs, they can add them to the backlog and track them similar to requirements.
- Or, they can schedule them to be fixed within a sprint along with other tasks.

Backlogs, Portfolio, Area Path & Team mapping

Define features and epics: https://docs.microsoft.com/en-us/azure/devops/boards/backlogs/define-features-epics

Portfolio backlogs to bring more order to your backlog. Use your backlogs to plan your project and to:

- Manage a portfolio of features that are supported by different development and management teams
- Group items into a release train
- Minimize size variability of your deliverables by breaking down a large feature into smaller backlog items

The epics and features that you create should reflect your business focus.

- A user story is a tool used in Agile software development to capture a description of a software feature from an end user perspective.
- As user stories or product backlog items roll up into features, and features roll up into epics—you'll want to name your features and epics with that in mind.
- A feature typically represents a shippable component of software.
- An epic represents a business initiative to be accomplished.

Area Paths: https://docs.microsoft.com/en-us/azure/devops/organizations/settings/set-area-paths

You can add area paths to support teams and to group work items based on product, feature, or business areas. Then, define area paths at the project level and assign them to a team under the team configuration. You can also create a hierarchy of area paths to support subcategories within categories.

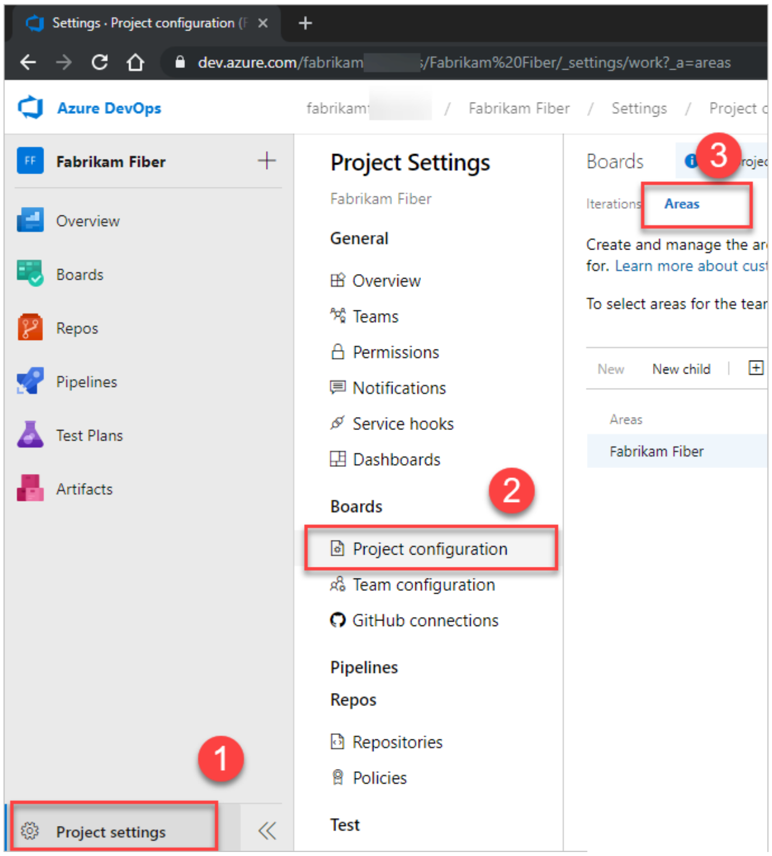
About area and iteration paths (aka sprints): https://docs.microsoft.com/en-us/azure/devops/organizations/settings/about-areas-iterations?view=azure-devops

- Area paths allow you to group work items by team, product, or feature area.
- Whereas, iteration paths allow you to group work into sprints, milestones, or other event-specific or time-related period.
- Both these fields allow you to define a hierarchy of paths.

Define area paths and assign to a team: https://docs.microsoft.com/en-us/azure/devops/organizations/settings/set-area-paths?toc=%2Fazure%2Fdevops%2Fboards%2Ftoc.json&bc=%2Fazure%2Fdevops%2Fboards%2Fbreadcrumb%2Ftoc.json&view=azure-devops&tabs=preview-page

Get started sequence: https://docs.microsoft.com/en-us/azure/devops/organizations/settings/set-area-paths?toc=%2Fazure%2Fdevops%2Fboards%2Ftoc.json&bc=%2Fazure%2Fdevops%2Fboards%2Fbreadcrumb%2Ftoc.json&view=azure-devops&tabs=preview-page#get-started-sequence

- Straight forward sequence for configuring your project and teams

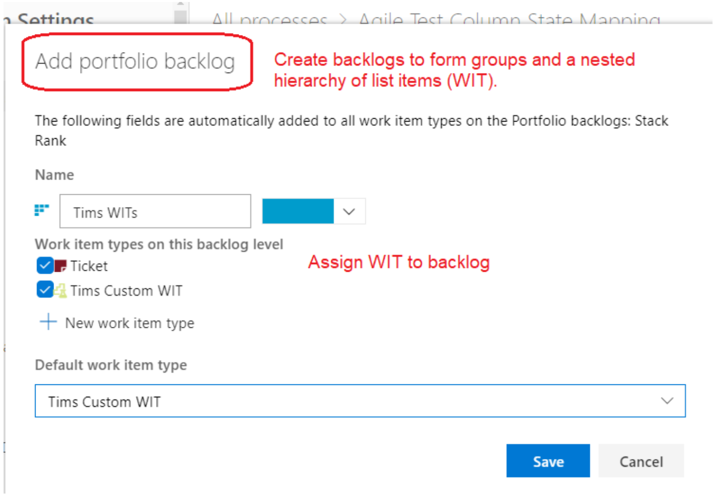


Create and manage the ar
for. Learn more about cus

To select areas for the tear

1. Determine the *number and names of Area Paths* that you want to support to categorize your work.
2. Minimum: One Area Path for each team. For guidance, review About areas and iterations.
3. Determine the **number and names of teams** you want to support. For guidance, review About teams and Agile tools.
4. Open Project settings>Project configuration and define the Area Paths to support steps 1 and 2 at the project level.
5. Define the teams you need to support step 2. For guidance, see Add a team, move from one default team to several teams.
6. Open the team configuration and assign the default and additional Area Path(s) to each team.
7. Assign the Area Path of work items to an area path you defined.
8. Use bulk modify to modify several work items at once.

Organize your backlog, map child work items to parents: https://docs.microsoft.com/en-us/azure/devops/boards/backlogs/organize-backlog?view=azure-devops



Add portfolio backlog

Create backlogs to form groups and a nested hierarchy of list items (WIT).

The following fields are automatically added to all work item types on the Portfolio backlogs: Stack Rank

Name

Tims WITs

Work item types on this backlog level

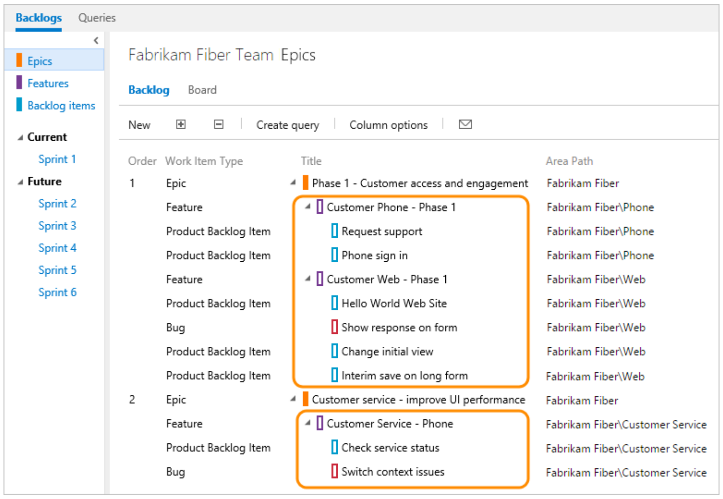
☑ Ticket

☑ Tims Custom WIT

Assign WIT to backlog

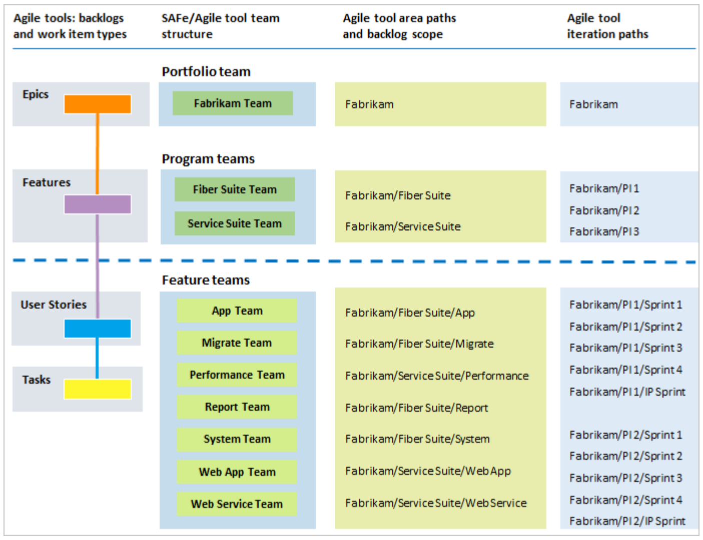
Default work item type

Tims Custom WIT



Fabrikam Fiber Team Epics

Order	Work Item Type	Title	Area Path
1	Epic	Phase 1 - Customer access and engagement	Fabrikam Fiber
	Feature	Customer Phone - Phase 1	Fabrikam Fiber\Phone
	Product Backlog Item	Request support	Fabrikam Fiber\Phone
	Product Backlog Item	Phone sign in	Fabrikam Fiber\Phone
	Feature	Customer Web - Phase 1	Fabrikam Fiber\Web
	Product Backlog Item	Hello World Web Site	Fabrikam Fiber\Web
	Bug	Show response on form	Fabrikam Fiber\Web
	Product Backlog Item	Change initial view	Fabrikam Fiber\Web
	Product Backlog Item	Interim save on long form	Fabrikam Fiber\Web
2	Epic	Customer service - improve UI performance	Fabrikam Fiber
	Feature	Customer Service - Phone	Fabrikam Fiber\Customer Service
	Product Backlog Item	Check service status	Fabrikam Fiber\Customer Service
	Bug	Switch context issues	Fabrikam Fiber\Customer Service



Agile tools: backlogs and work item types	SAFe/Agile tool team structure	Agile tool area paths and backlog scope	Agile tool iteration paths
	Portfolio team		
Epics	Fabrikam Team	Fabrikam	Fabrikam
	Program teams		
Features	Fiber Suite Team Service Suite Team	Fabrikam/Fiber Suite Fabrikam/Service Suite	Fabrikam/PI 1 Fabrikam/PI 2 Fabrikam/PI 3
	Feature teams		
User Stories Tasks	App Team Migrate Team Performance Team Report Team System Team Web App Team Web Service Team	Fabrikam/Fiber Suite/App Fabrikam/Fiber Suite/Migrate Fabrikam/Service Suite/Performance Fabrikam/Fiber Suite/Report Fabrikam/Fiber Suite/System Fabrikam/Service Suite/Web App Fabrikam/Service Suite/Web Service	Fabrikam/PI 1/Sprint 1 Fabrikam/PI 1/Sprint 2 Fabrikam/PI 1/Sprint 3 Fabrikam/PI 1/Sprint 4 Fabrikam/PI 1/IP Sprint Fabrikam/PI 2/Sprint 1 Fabrikam/PI 2/Sprint 2 Fabrikam/PI 2/Sprint 3 Fabrikam/PI 2/Sprint 4 Fabrikam/PI 2/IP Sprint

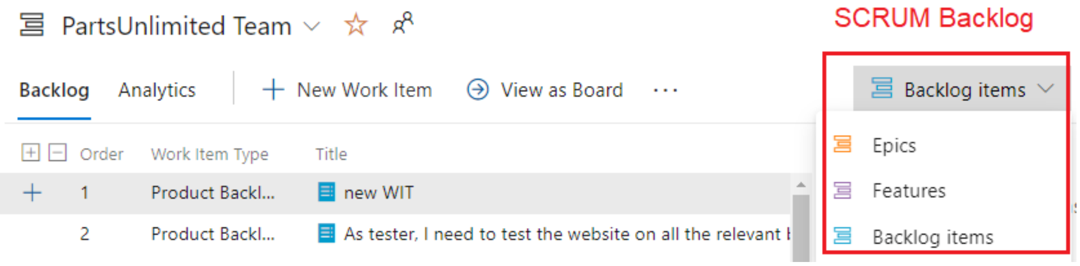
Set up your Backlogs and Boards: https://docs.microsoft.com/en-us/azure/devops/boards/backlogs/set-up-your-backlog

A default team is created along with associated backlogs and boards. You can create Portfolios to group backlogs.

Product Backlog and Board display work items which meet the following criteria:

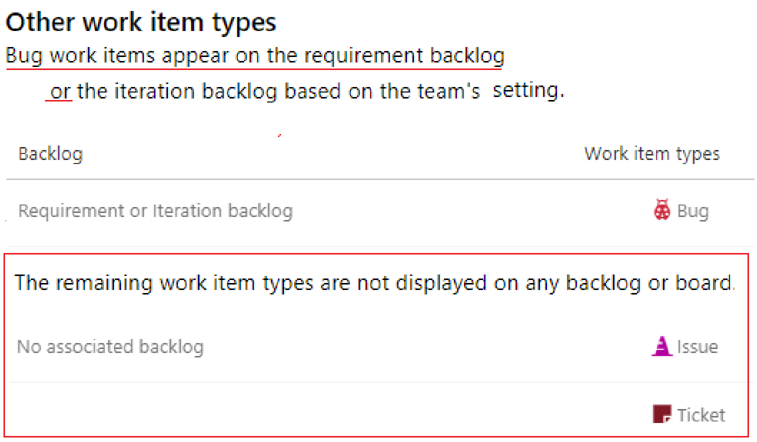
- Work item type belongs to the Requirements category.
- The types differ depending on the process selected for your project – Name shows in drop down.
  - Basic : Issue, **Backlog name=Issues**
  - Agile: User Story, **Backlog name=Stories**
  - Scrum: Product Backlog Item, **Backlog name=Backlog items**
  - CMMI: Requirement, **Backlog name=Requirements**
- Work item Area Path matches one of the selected team's Area Paths
- Work item Iteration Path is under the team's Default Iteration Path

Determine the work item types that belong to your Requirements category by opening your product Backlog and checking the product backlog name.



Order	Work Item Type	Title
1	Product Backl...	new WIT
2	Product Backl...	As tester, I need to test the website on all the relevant b

Add or edit portfolio backlog: https://docs.microsoft.com/en-us/azure/devops/organizations/settings/work/customize-process-backlogs-boards?view=azure-devops#add-or-edit-portfolio-backlogs



Other work item types

Bug work items appear on the requirement backlog or the iteration backlog based on the team's setting.

Backlog	Work item types
Requirement or Iteration backlog	Bug

The remaining work item types are not displayed on any backlog or board.

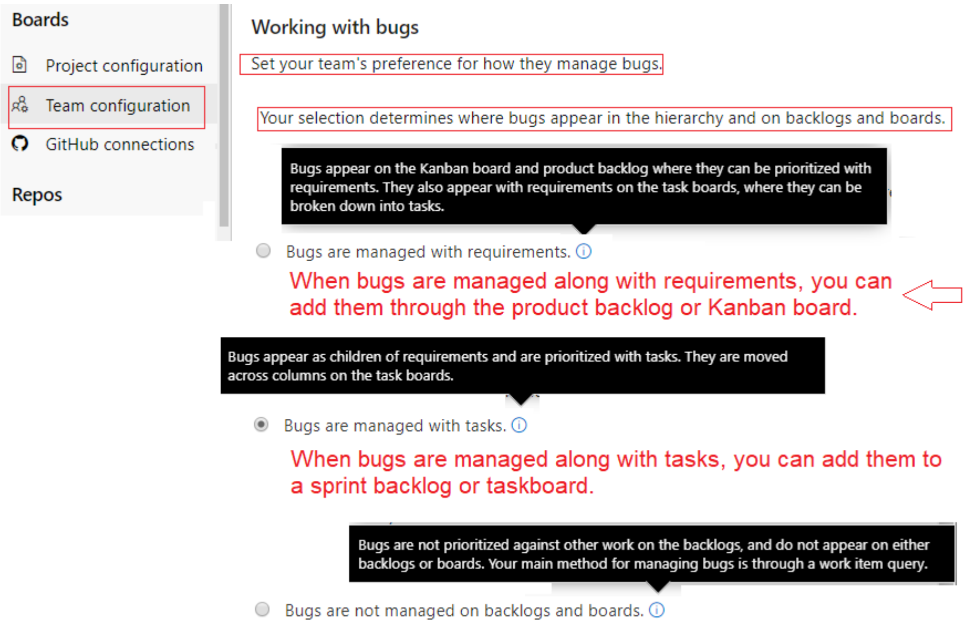
No associated backlog	Issue
	Ticket

Checklist for work items, backlogs, and boards: https://docs.microsoft.com/en-us/azure/devops/boards/backlogs/set-up-your-backlog?view=azure-devops#checklist-for-work-items-backlogs-and-boards

Track bugs as requirements or tasks: https://docs.microsoft.com/en-us/azure/devops/boards/work-items/about-work-items?view=azure-devops&tabs=agile-process#track-bugs-as-requirements-or-tasks

Bugs, like product backlog items (PBIs) and user stories, represent work that needs doing.

- Track your bugs along with other items in the product backlog items
- Or as tasks linked to those backlog items?



Working with bugs

Set your team's preference for how they manage bugs.

Your selection determines where bugs appear in the hierarchy and on backlogs and boards.

Bugs appear on the Kanban board and product backlog where they can be prioritized with requirements. They also appear with requirements on the task boards, where they can be broken down into tasks.

○ Bugs are managed with requirements.

When bugs are managed along with requirements, you can add them through the product backlog or Kanban board.

Bugs appear as children of requirements and are prioritized with tasks. They are moved across columns on the task boards.

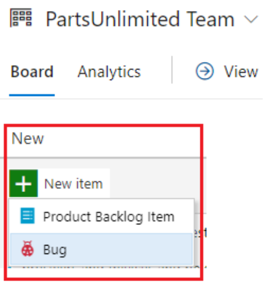
● Bugs are managed with tasks.

When bugs are managed along with tasks, you can add them to a sprint backlog or taskboard.

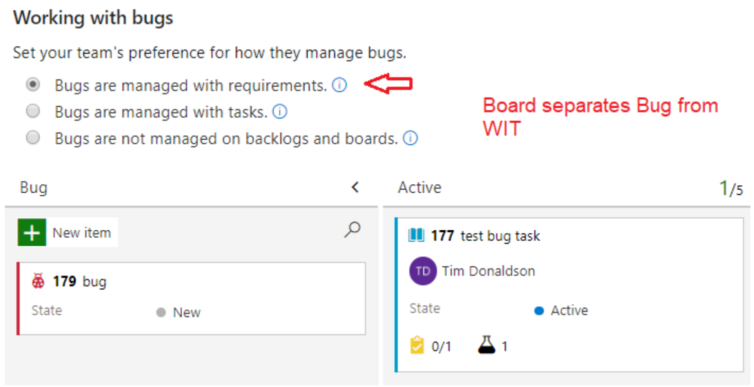
Bugs are not prioritized against other work on the backlogs, and do not appear on either backlogs or boards. Your main method for managing bugs is through a work item query.

○ Bugs are not managed on backlogs and boards.

Add WIT to Kanban Board New Item List



Show Bug & Backlog under New Item

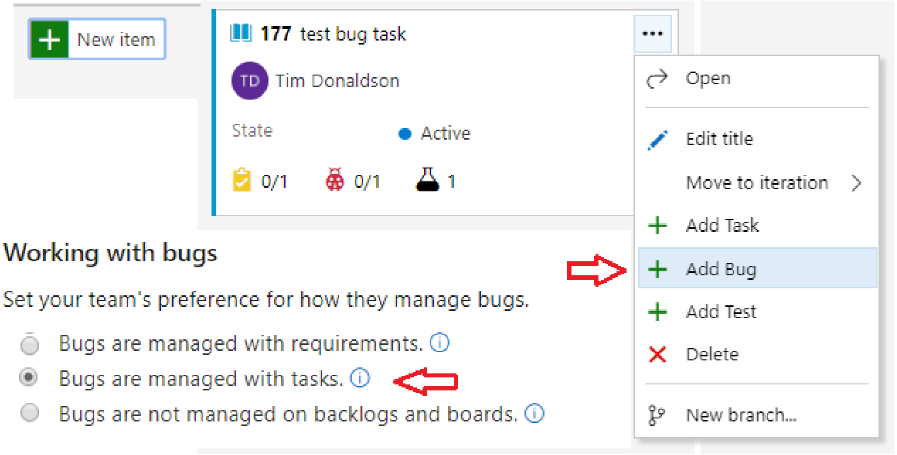


Working with bugs

Set your team's preference for how they manage bugs.

- ● Bugs are managed with requirements.
- ○ Bugs are managed with tasks.
- ○ Bugs are not managed on backlogs and boards.

Board separates Bug from WIT



Working with bugs

Set your team's preference for how they manage bugs.

- ○ Bugs are managed with requirements.
- ● Bugs are managed with tasks.
- ○ Bugs are not managed on backlogs and boards.

Add a work item type to a backlog and board: https://docs.microsoft.com/en-us/azure/devops/reference/add-wits-to-backlogs-and-boards?view=azure-devops

Add a WIT to track it like a requirement: https://docs.microsoft.com/en-us/azure/devops/reference/add-wits-to-backlogs-and-boards?view=azure-devops#wits-as-requirements

- WITs that you add to the Requirement Category show up on the product backlog and Kanban board.
- *This is hosted XML based not inherited*

Other References

Sample work item templates: https://docs.microsoft.com/en-us/azure/devops/boards/work-items/work-item-template-examples

Best tool to add, update, and link work items: https://docs.microsoft.com/en-us/azure/devops/boards/work-items/best-tool-add-update-link-work-items?view=azure-devops

Customize your work tracking experience: https://docs.microsoft.com/en-us/azure/devops/reference/customize-work?view=azure-devops#projects-and-process-customizations

- Specifically, the project determines the work item types (WITs)—user stories, tasks, bugs— and the data fields used to capture information.

Define, triage, and manage bugs: https://docs.microsoft.com/en-us/azure/devops/boards/backlogs/manage-bugs?view=azure-devops&tabs=new-web-form#define-and-list-bugs

Change your preferred email address for notifications: https://docs.microsoft.com/en-us/azure/devops/notifications/change-email-address?view=azure-devops&tabs=preview-page

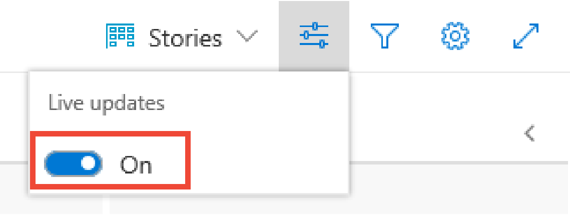
Import a Git repo: https://docs.microsoft.com/en-us/azure/devops/repos/git/import-git-repository?view=azure-devops

Create and manage inherited processes: https://docs.microsoft.com/en-us/azure/devops/organizations/settings/work/manage-process?view=azure-devops

- A process defines the building blocks of the work tracking system.

Enable live updates: https://docs.microsoft.com/en-us/azure/devops/boards/boards/live-updates?view=azure-devops

- Choose the   view options icon and move the slider for Live updates to On.



Live updates

On

- As one team member updates the status of a work item, other team members will see those updates in real time as they occur.

Improve code quality with branch policies: https://docs.microsoft.com/en-us/azure/devops/repos/git/branch-policies?view=azure-devops

Create a test plan: https://docs.microsoft.com/en-us/azure/devops/test/create-a-test-plan?view=azure-devops#create-a-test-plan

Connect your organization to Azure Active Directory: https://docs.microsoft.com/en-us/azure/devops/organizations/accounts/connect-organization-to-azure-ad?view=azure-devops#connect-your-organization-to-your-azure-ad

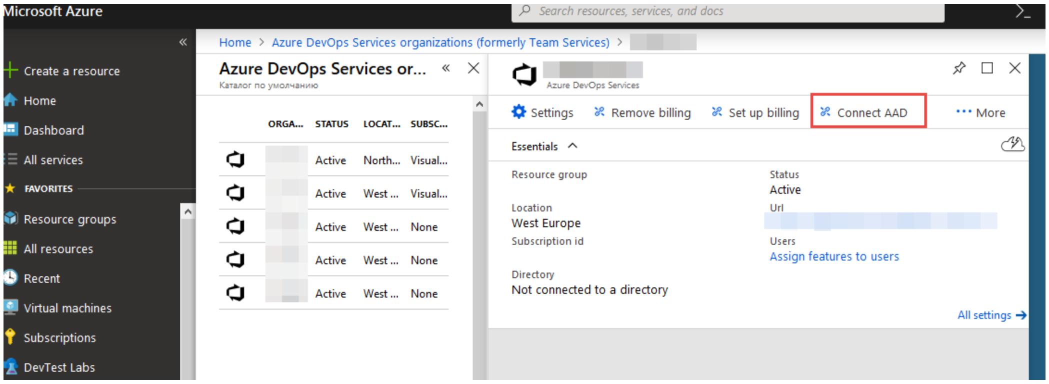
How to tie VSTS (aka Azure DevOps) account to Azure Subscription:
https://stackoverflow.com/questions/54056569/how-to-tie-vsts-aka-azure-devops-account-to-azure-subscription

To create a new DevOps project from https://portal.azure.com and I see how that creates a new DevOps organization or reuses an existing one (scoped to that AzureAD).

A new project is also created as well as an associated WebApps project.

1. When one creates a new Project in a DevOps organization, it doesn't show up for management in https://portal.azure.com . How can one ensure the resources consumed by that project are part of the Azure Subscription to which the parent organization is tied? Or is that the default?
2. What is the easiest way of tying existing DevOps organizations and projects to an Azure subscription to allow increasing the default 5 user limit and consuming more pipeline resources?

use Azure DevOps Organizations to connect your azure subscription with DevOps account:



ORGA...	STATUS	LOCAT...	SUBSC...
[redacted]	Active	North...	Visual...
[redacted]	Active	West ...	Visual...
[redacted]	Active	West ...	None
[redacted]	Active	West ...	None
[redacted]	Active	West ...	None

Resource group

Location
West Europe

Subscription id

Directory
Not connected to a directory

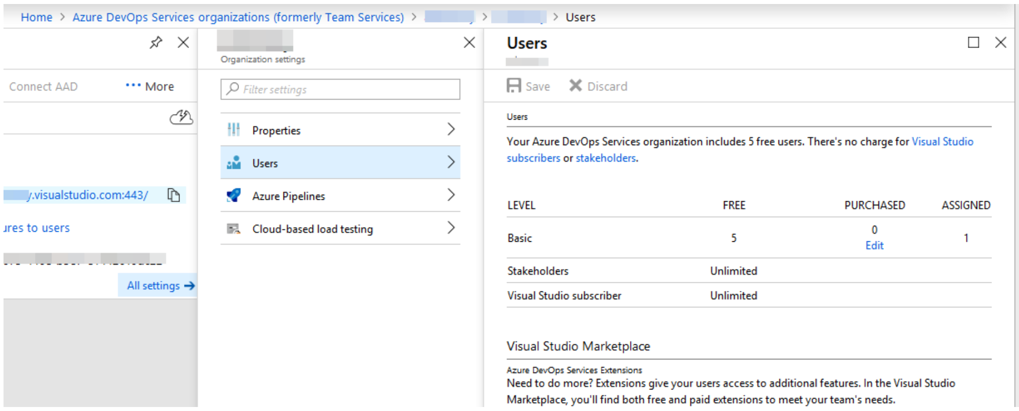
Status
Active

Url
[redacted]

Users
Assign features to users

All settings →

Then you may use users on Azure DevOps from Azure Active Directory and manage billing (get more license):



Users

Your Azure DevOps Services organization includes 5 free users. There's no charge for Visual Studio subscribers or stakeholders.

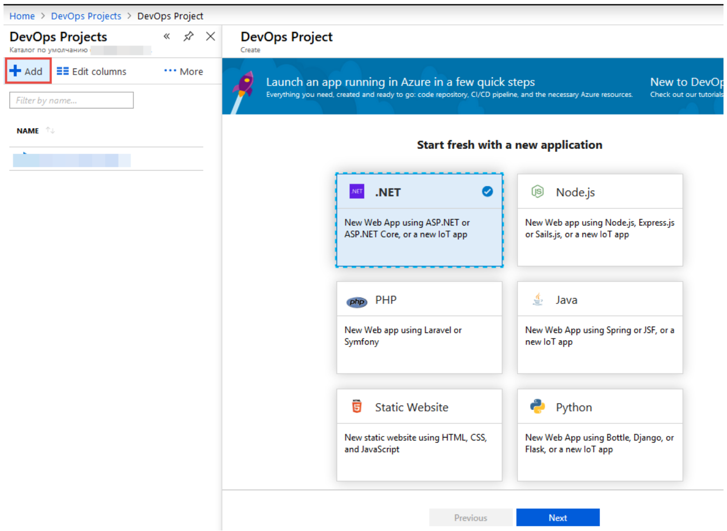
LEVEL	FREE	PURCHASED	ASSIGNED
Basic	5	0 Edit	1
Stakeholders	Unlimited		
Visual Studio subscriber	Unlimited		

Visual Studio Marketplace

Azure DevOps Services Extensions

Need to do more? Extensions give your users access to additional features. In the Visual Studio Marketplace, you'll find both free and paid extensions to meet your team's needs.

Also you may use DevOps Project wizard to create a team project from a template.



Launch an app running in Azure in a few quick steps

Everything you need, created and ready to go: code repository, CI/CD pipeline, and the necessary Azure resources.

Start fresh with a new application

.NET – New Web App using ASP.NET or ASP.NET Core, or a new IoT app

Node.js – New Web app using Node.js, Express.js or Sails.js, or a new IoT app

PHP – New Web app using Laravel or Symfony

Java – New Web App using Spring or JSF, or a new IoT app

Static Website – New static website using HTML, CSS, and JavaScript

Python – New Web App using Bottle, Django, or Flask, or a new IoT app

Known Issues

Configurations that hides issues on boards

1. Q - How do I make issues visible on a Kanban board?
    a. In this one project, I have two boards (one board for each team). One team does development work and will use a scrum board and one team does maintenance and that will use a Kanban board. How do I make issues for the maintenance team visible on the Kanban board? Right now, when I create an issue, it shows up in the backlog of scrum board for the development team.
2. A - If your issues show up in the issue navigator when using the same filter there are three things that could potentially hide them in the board:
    a. Quick filter - make sure you have no enabled quick filters in the board
    b. Column configuration - If there are unmapped workflow steps in your board. This does not seem to be the problem in your case, so ...
    c. The Board Sub-filter is hiding the issues. The subfilter (found at the bottom of the Board/Configuration) is an extra filter that you can apply within the board. It is normally used to hide issues that are released to a FixVersion. It looks something like "fixversion in unreleasedversion() OR fixversion is EMPTY" If you have issues beloning to a released fixversion they will be eclipsed by this default sub-filter. Try to remove the sub-filter and see if your issues re-appear.
3. My query searches for all epics in the project. When the swimlanes are set to epic also, nothing is shown. Setting the swimlanes to "no swimlanes" showed all the epics.

Pipelines & CI/CD discussions

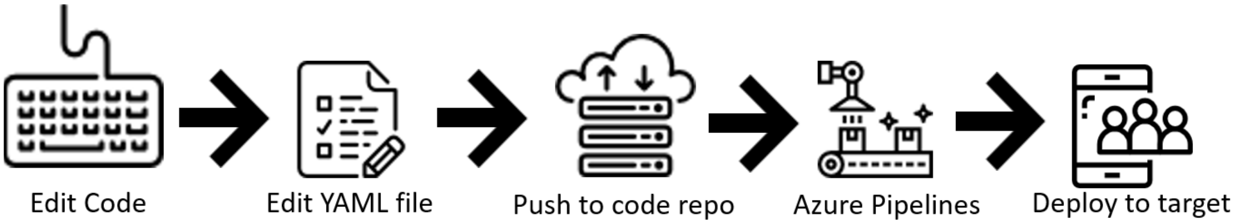
- Microsoft Azure is a cloud computing service created by Microsoft for building, testing, deploying, and managing applications and services through Microsoft-managed data centers.
- Azure DevOps is a Microsoft product that provides version control, reporting, requirements management, project management, automated builds, lab management, testing and release management capabilities. It covers the entire application lifecycle, and enables DevOps capabilities.
- Azure Repos is a set of version control tools that you can use to manage your code.
    - Provides two types of version control:
        - Git: distributed version control
        - Team Foundation Version Control (TFVC): centralized version control

Azure Pipelines

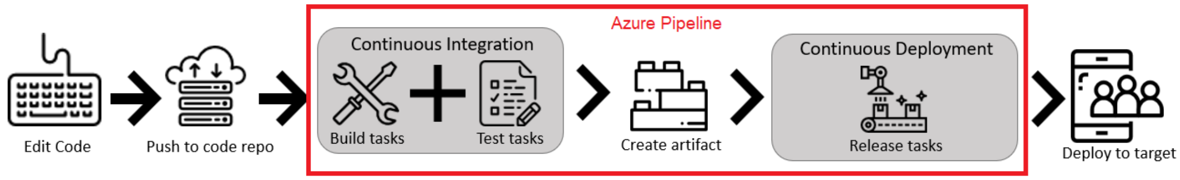
- A cloud service that you can use to automatically build and test your code project and make it available to other users. It works with just about any language or project type.

Automate tests, builds, and delivery: https://docs.microsoft.com/en-us/azure/devops/pipelines/get-started/pipelines-get-started?view=azure-devops#automate-tests-builds-and-delivery

- Define pipelines using the YAML syntax or through the user interface (Classic).



Azure Pipelines combines continuous integration (CI) and continuous delivery (CD) to constantly and consistently test and build your code and ship it to any target.



To use Azure Pipelines, you need: https://docs.microsoft.com/en-us/azure/devops/pipelines/get-started/what-is-azure-pipelines?view=azure-devops#what-do-i-need-to-use-azure-pipelines

- An organization in Azure DevOps.
- To have your source code stored in a version control system.
- Sign up for an Azure DevOps organization and Azure Pipelines to begin managing CI/CD to deploy your code with high-performance pipelines.

Key concepts for new Azure Pipelines users: https://docs.microsoft.com/en-us/azure/devops/pipelines/get-started/key-pipelines-concepts?view=azure-devops

Certain pipeline features are only available when using YAML or when defining build or release pipelines with the Classic interface: https://docs.microsoft.com/en-us/azure/devops/pipelines/get-started/pipelines-get-started?view=azure-devops#feature-availability

Agents - Jobs

Azure Pipelines agents: https://docs.microsoft.com/en-us/azure/devops/pipelines/agents/agents?view=azure-devops&tabs=browser

To build your code or deploy your software using Azure Pipelines, you need at least one agent. As you add more code and people, you'll eventually need more.

When your pipeline runs, the system begins one or more jobs. An agent is installable software that runs one job at a time.

Relationship between jobs and parallel jobs: https://docs.microsoft.com/en-us/azure/devops/pipelines/licensing/concurrent-jobs?view=azure-devops#relationship-between-jobs-and-parallel-jobs

The term job can refer to multiple concepts, and its meaning depends on the context:

- When you define a pipeline, you can define it as a collection of jobs. When a pipeline runs, you can run multiple jobs as part of that pipeline.
- Each job consumes a parallel job that runs on an agent. When there aren't enough parallel jobs available for your organization, the jobs are queued up and run one after the other.

View available parallel jobs: https://docs.microsoft.com/en-us/azure/devops/pipelines/licensing/concurrent-jobs?view=azure-devops#view-available-parallel-jobs

1. Browse to Organization settings > Pipelines > Retention and parallel jobs > Parallel jobs.
2. View the maximum number of parallel jobs that are available in your organization.
3. Select View in-progress jobs to display all the builds and releases that are actively consuming an available parallel job or that are queued waiting for a parallel job to be available.

Azure Artifacts: https://docs.microsoft.com/en-us/azure/devops/pipelines/artifacts/artifacts-overview?view=azure-devops

Classic Artifacts: https://docs.microsoft.com/en-us/azure/devops/pipelines/release/artifacts?view=azure-devops

- A release is a collection of artifacts in your DevOps CI/CD processes. An artifact is a deployable component of your application.

Build and release tasks index: https://docs.microsoft.com/en-us/azure/devops/pipelines/tasks/?view=azure-devops

Tutorials

Create your first pipeline: https://docs.microsoft.com/en-us/azure/devops/pipelines/create-first-pipeline?view=azure-devops&tabs=java%2Cyaml%2Cbrowser%2Ctfs-2018-2

- This gets used across tutorials

Customize your pipeline: https://docs.microsoft.com/en-us/azure/devops/pipelines/customize-pipeline?view=azure-devops

- Step-by-step guide on common ways to customize your pipeline.
- Prerequisite: Follow instructions in Create your first pipeline to create a working pipeline.
- Understand the azure-pipelines.yml file

A pipeline is defined using a YAML file in your repo. Usually, this file is named azure-pipelines.yml and is located at the root of your repo.

Deploy an Azure Web App: https://docs.microsoft.com/en-us/azure/devops/pipelines/targets/webapp?view=azure-devops&tabs=yaml

- Automatically deploy your web app to an Azure App Service web app after every successful build.
- Some of the more common changes that people make to customize an Azure Web App deployment.

Enabling Continuous Integration with Azure Pipelines - PartsUnlimited: https://www.azuredevopslabs.com/labs/azuredevops/continuousintegration/

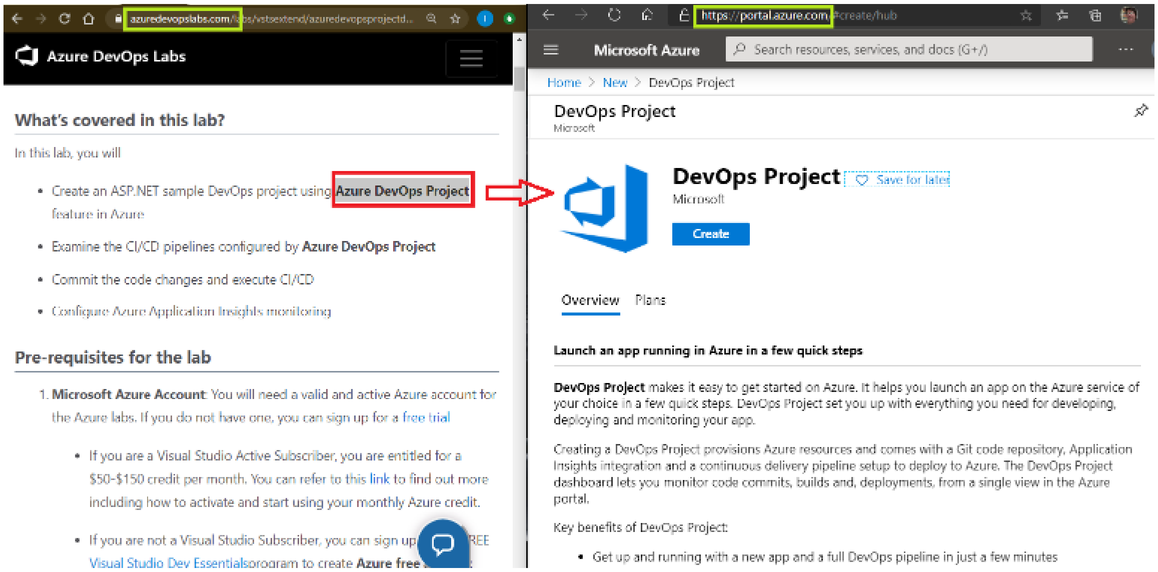
- Create pipeline in DevOps Portal

Create a CI/CD pipeline for .NET with the Azure DevOps Project - dotnetdevops: https://azuredevopslabs.com/labs/vstsextend/azuredevopsprojectdotnet/

- *Sign into the Microsoft Azure portal as the entry point.*
- Create an ASP.NET sample DevOps project using Azure DevOps Project feature in Azure
    - This sample is an ASP.NET Core MVC application.
    - And enable Add a database toggle to add the database to the application.
- The Azure DevOps project automatically configured a full CI/CD pipeline in your Azure DevOps organization.
    - Examine the CI/CD pipelines configured by Azure DevOps Project
- Commit the code changes and execute CI/CD
- Configure Azure Application Insights monitoring

Creating an Azure DevOps Project provisions Azure resources and comes with a Git code repository, Application Insights integration and a continuous delivery pipeline setup to deploy to Azure.

The DevOps Project dashboard lets you monitor code commits, builds and, deployments, from a single view in the Azure portal.



What's covered in this lab?

In this lab, you will

- Create an ASP.NET sample DevOps project using **Azure DevOps Project** feature in Azure
- Examine the CI/CD pipelines configured by **Azure DevOps Project**
- Commit the code changes and execute CI/CD
- Configure Azure Application Insights monitoring

Pre-requisites for the lab

1. **Microsoft Azure Account**: You will need a valid and active Azure account for the Azure labs. If you do not have one, you can sign up for a free trial
   - If you are a Visual Studio Active Subscriber, you are entitled for a $50-$150 credit per month. You can refer to this link to find out more including how to activate and start using your monthly Azure credit.
   - If you are not a Visual Studio Subscriber, you can sign up FREE Visual Studio Dev Essentialsprogram to create **Azure free**

https://portal.azure.com/#create/hub
Microsoft Azure
Search resources, services, and docs (G+/)
Home > New > DevOps Project

DevOps Project
Microsoft

DevOps Project
Microsoft

Launch an app running in Azure in a few quick steps

DevOps Project makes it easy to get started on Azure. It helps you launch an app on the Azure service of your choice in a few quick steps. DevOps Project set you up with everything you need for developing, deploying and monitoring your app.

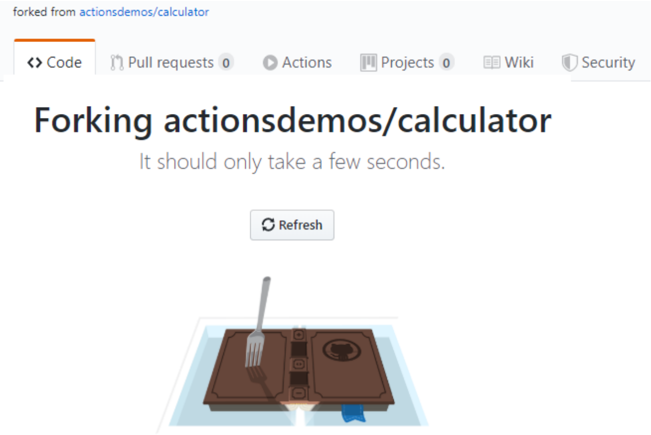
Creating a DevOps Project provisions Azure resources and comes with a Git code repository, Application Insights integration and a continuous delivery pipeline setup to deploy to Azure. The DevOps Project dashboard lets you monitor code commits, builds and, deployments, from a single view in the Azure portal.

Key benefits of DevOps Project:

- Get up and running with a new app and a full DevOps pipeline in just a few minutes

Calculator Project: Integrate a GitHub project with Azure DevOps using Azure Pipelines:
https://www.azuredevopslabs.com/labs/azuredevops/github-integration/

- Install Azure Pipelines from the GitHub Marketplace.
- Integrate a GitHub project with an Azure DevOps pipeline.
- Track pull requests through the pipeline.



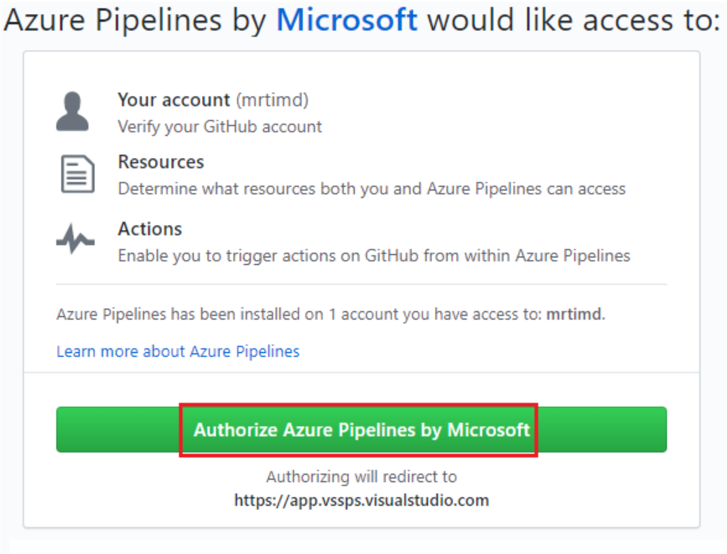
Forking actionsdemos/calculator

It should only take a few seconds.

Task 2: Configuring your Azure Pipelines project

1. *You are now on the Azure DevOps* site and need to set up your Azure Pipelines project.
2. *Select or create the Azure DevOps organization* for which to perform these builds.

3. *Select or create the Azure DevOps project* from that organization you would like to use.
4. Authorize Access is just a new step in the process to link GitHub to DevOps.



Azure Pipelines by Microsoft would like access to:

Your account (mrtimd)
Verify your GitHub account

Resources
Determine what resources both you and Azure Pipelines can access

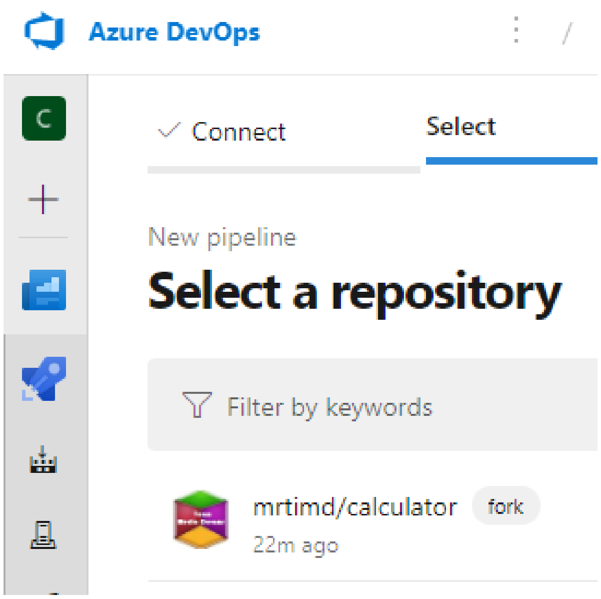
Actions
Enable you to trigger actions on GitHub from within Azure Pipelines

Azure Pipelines has been installed on 1 account you have access to: **mrtimd.**

Learn more about Azure Pipelines

Authorizing will redirect to
https://app.vssps.visualstudio.com

Inside DevOps



Azure DevOps

✓ Connect

Select

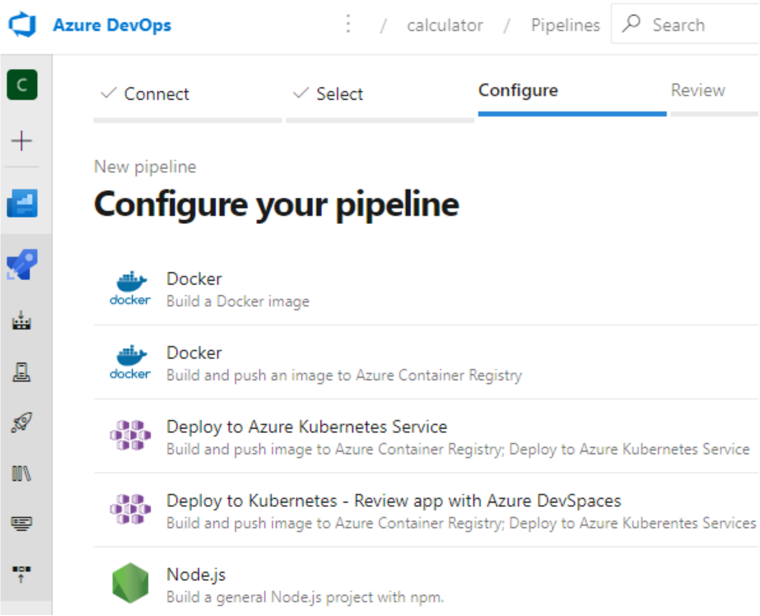
New pipeline

Select a repository

Filter by keywords

mrtimd/calculator fork
22m ago

Examine Configure Options



Azure DevOps / calculator / Pipelines Search

✓ Connect ✓ Select Configure Review

New pipeline

Configure your pipeline

Docker
Build a Docker image

Docker
Build and push an image to Azure Container Registry

Deploy to Azure Kubernetes Service
Build and push image to Azure Container Registry; Deploy to Azure Kubernetes Service

Deploy to Kubernetes - Review app with Azure DevSpaces
Build and push image to Azure Container Registry; Deploy to Azure Kuberentes Services

Node.js
Build a general Node.js project with npm.

Task 3: Modifying a YAML build pipeline definition

YAML is a markup syntax well-suited to defining processes and allows

1. Manage the configuration of the pipeline like any other file in the repo.
2. Is a template that identifies the pool to pull a VM from for building
3. The process to install Node.js for building
4. The actual build itself.

The default pipeline is a great start but it doesn't do everything we want to have automated.

1. Run tests to confirm that changes don't create bugs.
2. Return to GitHub where we can edit the YAML by hand.
3. Right-click the GitHub project link and select Open in new tab.
4. *This lab will involve stepping back and forth between GitHub and Azure DevOps, it'll be easier to keep a browser tab open to each*.

Run Tests

Add the test run, add the "npm test" command to the azure-pipelines.yml file.

Also update the displayName to 'npm install, build, and test' so that it's easier to track what each task of the build is doing later on.

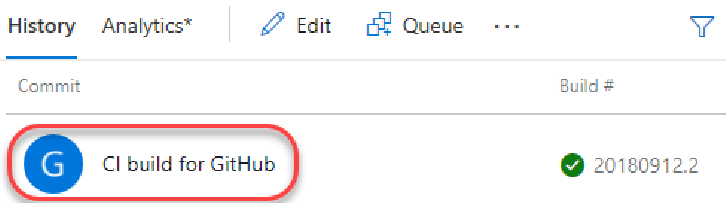
The display name update seems to cause a fail. The npm test seem to run the validations if the name is not changed.

Understand YML file: https://docs.microsoft.com/en-us/azure/devops/pipelines/customize-pipeline?view=azure-devops#understand-the-azure-pipelinesyml-file

Step 6. Return to the Azure DevOps browser tab. Use the breadcrumb navigation to return to the Pipelines page.

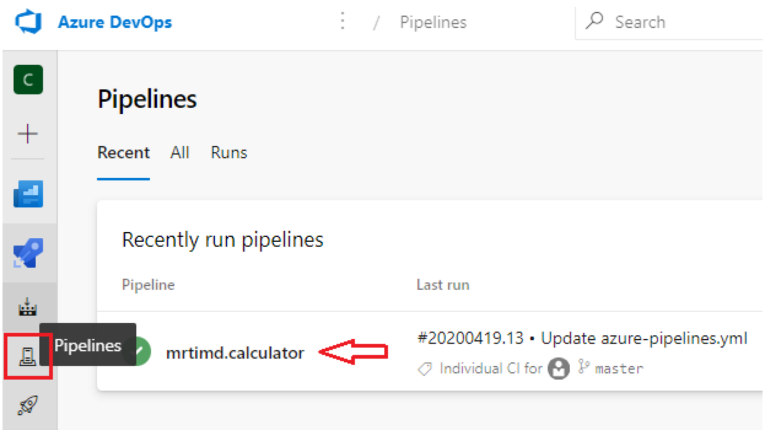
This area has UI changes

Pipelines – History – Analytics



Commit	Build #
G CI build for GitHub	✓ 20180912.2

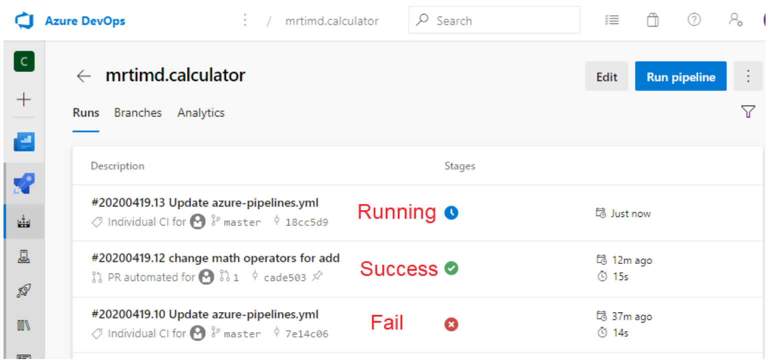
Now looks more like this:



Recently run pipelines

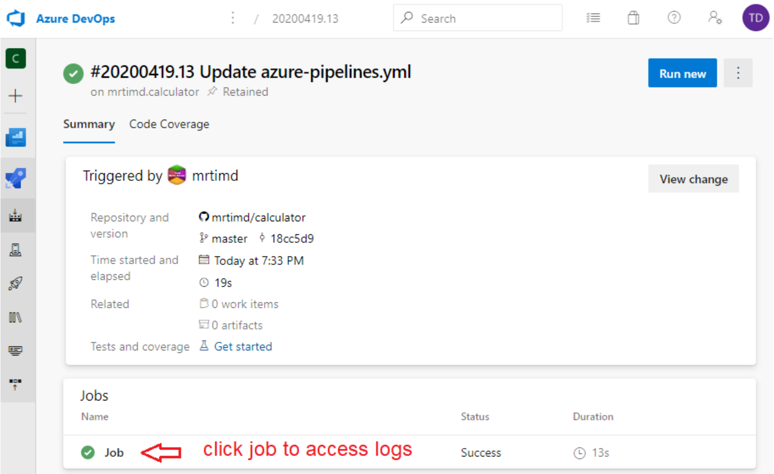
Pipeline	Last run
mrtimd.calculator	#20200419.13 • Update azure-pipelines.yml Individual CI for master

Click on the Pipeline to access commits – Analytics is here also



Description	Stages	
#20200419.13 Update azure-pipelines.yml Individual CI for master 18cc5d9	Running	Just now
#20200419.12 change math operators for add PR automated for 1 cade503	Success	12m ago 15s
#20200419.10 Update azure-pipelines.yml Individual CI for master 7e14c06	Fail	37m ago 14s

And then Jobs



#20200419.13 Update azure-pipelines.yml

on mrtimd.calculator Retained

Triggered by mrtimd

Repository and version: mrtimd/calculator; master 18cc5d9

Time started and elapsed: Today at 7:33 PM; 19s

Related: 0 work items; 0 artifacts

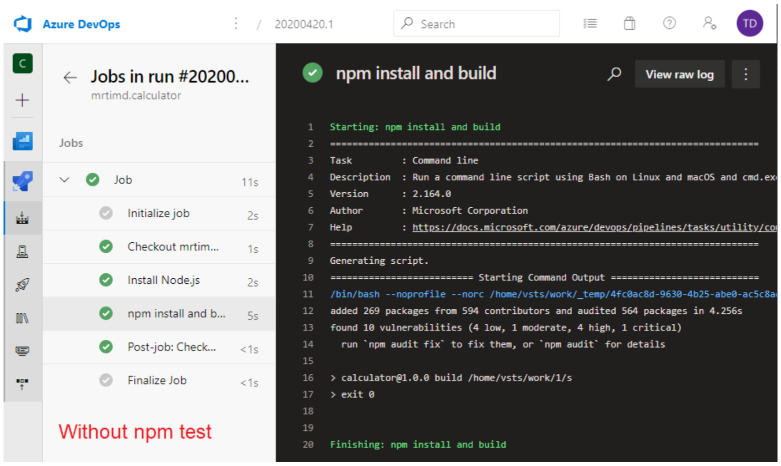
Tests and coverage: Get started

Jobs

Name	Status	Duration
Job	Success	13s

click job to access logs

Before npm test is added to Yaml

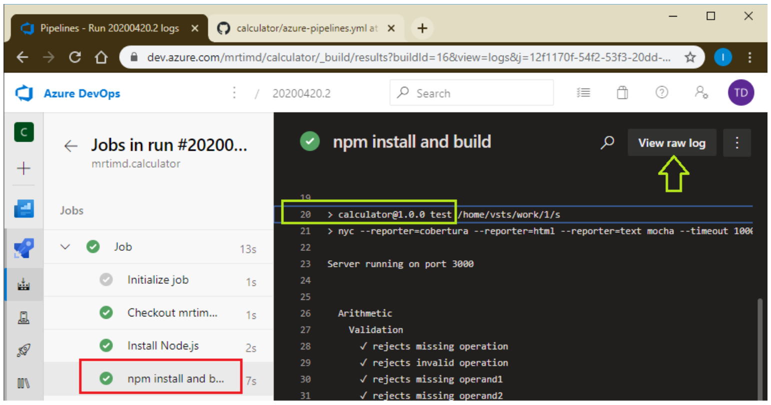


npm install and build

```
Starting: npm install and build
==============================================================================
Task         : Command line
Description  : Run a command line script using Bash on Linux and macOS and cmd.ex
Version      : 2.164.0
Author       : Microsoft Corporation
Help         : https://docs.microsoft.com/azure/devops/pipelines/tasks/utility/co
==============================================================================
Generating script.
========================== Starting Command Output ===========================
/bin/bash --noprofile --norc /home/vsts/work/_temp/4fc0ac8d-9630-4b25-abe0-ac5c8a
added 269 packages from 594 contributors and audited 564 packages in 4.256s
found 10 vulnerabilities (4 low, 1 moderate, 4 high, 1 critical)
  run `npm audit fix` to fix them, or `npm audit` for details

> calculator@1.0.0 build /home/vsts/work/1/s
> exit 0


Finishing: npm install and build
```

Without npm test

After npm test



npm install and build

```
> calculator@1.0.0 test /home/vsts/work/1/s
> nyc --reporter=cobertura --reporter=html --reporter=text mocha --timeout 100

Server running on port 3000


  Arithmetic
    Validation
      ✓ rejects missing operation
      ✓ rejects invalid operation
      ✓ rejects missing operand1
      ✓ rejects missing operand2
```

in Yaml file:

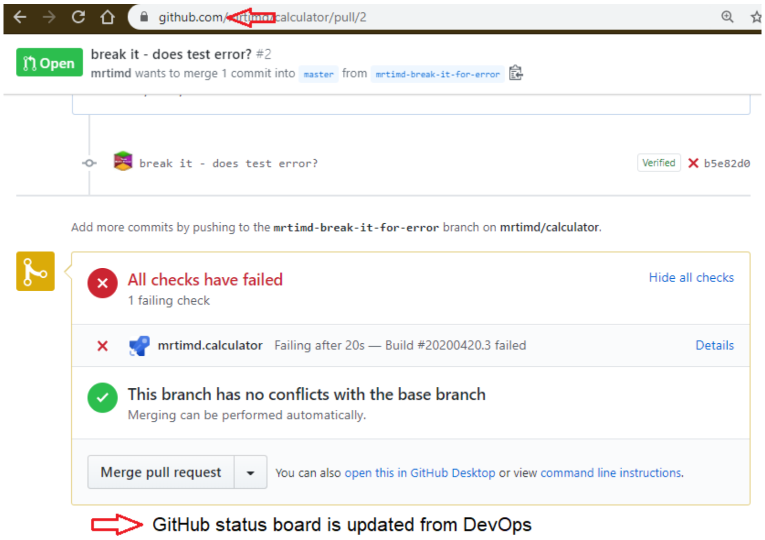
Changing - displayName: 'npm install and build' - to - displayName: 'npm install, build, and test'
Causes errors - Test runs if you leave the line alone.

View raw log and other menu items

Step 9

When you finally get the test to fail with the code edit on the add function

1. Azure DevOps will detect the change and start the build pipeline.
2. *This will update the UI in GitHub* explaining that some of the checks haven't completed yet.
3. Click Details to learn more.



github.com/mrtimd/calculator/pull/2

ⁿ Open break it - does test error? #2
mrtimd wants to merge 1 commit into `master` from `mrtimd-break-it-for-error`

`break it - does test error?` Verified ✕ b5e82d0

Add more commits by pushing to the **mrtimd-break-it-for-error** branch on **mrtimd/calculator**.

All checks have failed — Hide all checks
1 failing check

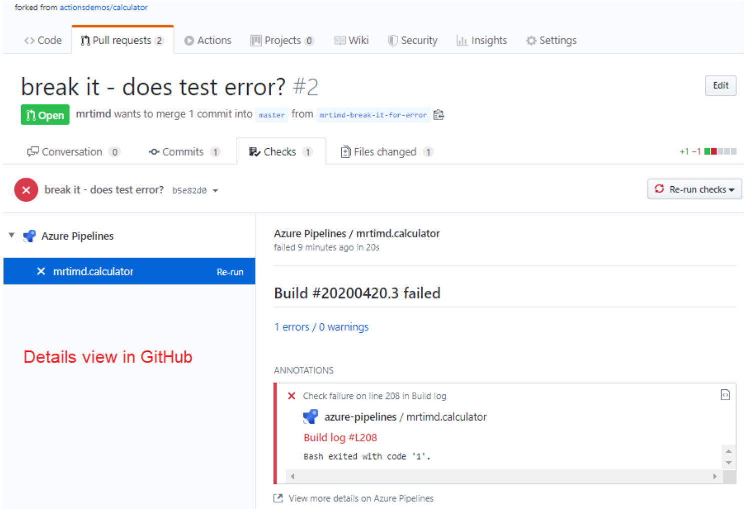
✕ **mrtimd.calculator** Failing after 20s — Build #20200420.3 failed — Details

✓ This branch has no conflicts with the base branch
Merging can be performed automatically.

Merge pull request ▾ You can also open this in GitHub Desktop or view command line instructions.

GitHub status board is updated from DevOps

Details View in GitHub



forked from actionsdemos/calculator

break it - does test error? #2 — Edit
ⁿ Open mrtimd wants to merge 1 commit into `master` from `mrtimd-break-it-for-error`

✕ break it - does test error? `b5e82d0` ▾ — Re-run checks ▾

▾ Azure Pipelines
✕ mrtimd.calculator — Re-run

Azure Pipelines / mrtimd.calculator
failed 9 minutes ago in 20s

Build #20200420.3 failed

1 errors / 0 warnings

ANNOTATIONS

✕ Check failure on line 208 in Build log
azure-pipelines / mrtimd.calculator
Build log #L208

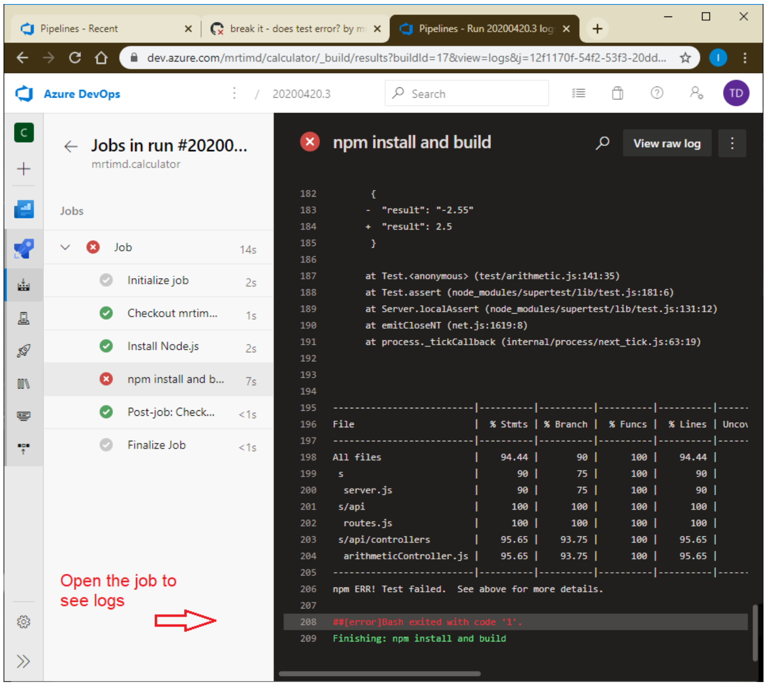
```
Bash exited with code '1'.
```

View more details on Azure Pipelines

Details view in GitHub

Click View more details on Azure Pipelines – this opens DevOps

****Click the Jobs task to view the log output*.



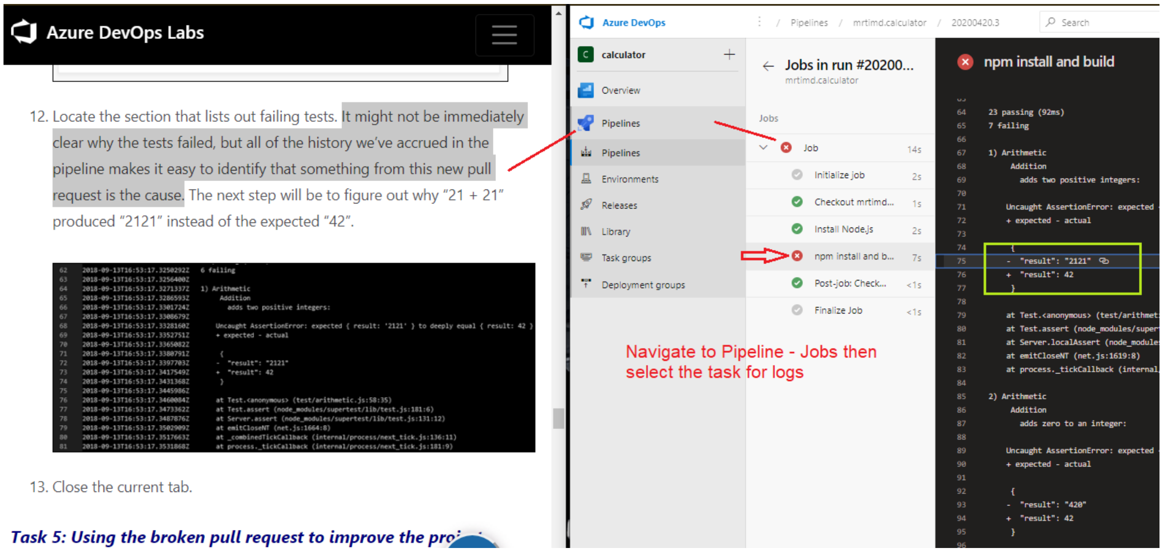
npm install and build

```
       {
      -  "result": "-2.55"
      +  "result": 2.5
       }

      at Test.<anonymous> (test/arithmetic.js:141:35)
      at Test.assert (node_modules/supertest/lib/test.js:181:6)
      at Server.localAssert (node_modules/supertest/lib/test.js:131:12)
      at emitCloseNT (net.js:1619:8)
      at process._tickCallback (internal/process/next_tick.js:63:19)



--------------------------|----------|----------|----------|----------|-----
File                      |  % Stmts | % Branch |  % Funcs |  % Lines | Uncov
--------------------------|----------|----------|----------|----------|-----
All files                 |    94.44 |       90 |      100 |    94.44 |
 s                        |       90 |       75 |      100 |       90 |
  server.js               |       90 |       75 |      100 |       90 |
 s/api                    |      100 |      100 |      100 |      100 |
  routes.js               |      100 |      100 |      100 |      100 |
 s/api/controllers        |    95.65 |    93.75 |      100 |    95.65 |
  arithmeticController.js |    95.65 |    93.75 |      100 |    95.65 |
--------------------------|----------|----------|----------|----------|-----
npm ERR! Test failed.  See above for more details.

##[error]Bash exited with code '1'.
Finishing: npm install and build
```

Open the job to see logs

Step 12 Locate failing tests.

View Logs: Navigate to DevOps – Pipelines – The Pipeline – Jobs - Task



12. Locate the section that lists out failing tests. It might not be immediately clear why the tests failed, but all of the history we've accrued in the pipeline makes it easy to identify that something from this new pull request is the cause. The next step will be to figure out why "21 + 21" produced "2121" instead of the expected "42".

```
2018-09-13T16:53:17.3250292Z   6 failing
2018-09-13T16:53:17.3256400Z
2018-09-13T16:53:17.3271337Z   1) Arithmetic
2018-09-13T16:53:17.3286593Z        Addition
2018-09-13T16:53:17.3301724Z          adds two positive integers:
2018-09-13T16:53:17.3308679Z
2018-09-13T16:53:17.3328160Z      Uncaught AssertionError: expected { result: '2121' } to deeply equal { result: 42 }
2018-09-13T16:53:17.3352751Z      + expected - actual
2018-09-13T16:53:17.3365082Z
2018-09-13T16:53:17.3380791Z       {
2018-09-13T16:53:17.3397703Z      -  "result": "2121"
2018-09-13T16:53:17.3417549Z      +  "result": 42
2018-09-13T16:53:17.3431368Z       }
2018-09-13T16:53:17.3445986Z
2018-09-13T16:53:17.3460084Z      at Test.<anonymous> (test/arithmetic.js:58:35)
2018-09-13T16:53:17.3473362Z      at Test.assert (node_modules/supertest/lib/test.js:181:6)
2018-09-13T16:53:17.3487876Z      at Server.assert (node_modules/supertest/lib/test.js:131:12)
2018-09-13T16:53:17.3502909Z      at emitCloseNT (net.js:1664:8)
2018-09-13T16:53:17.3517663Z      at _combinedTickCallback (internal/process/next_tick.js:136:11)
2018-09-13T16:53:17.3531868Z      at process._tickCallback (internal/process/next_tick.js:181:9)
```

13. Close the current tab.

Task 5: Using the broken pull request to improve the proj

```
  23 passing (92ms)
  7 failing

  1) Arithmetic
       Addition
         adds two positive integers:

      Uncaught AssertionError: expected
      + expected - actual

       {
      -  "result": "2121"
      +  "result": 42
       }

      at Test.<anonymous> (test/arithmet
      at Test.assert (node_modules/super
      at Server.localAssert (node_module
      at emitCloseNT (net.js:1619:8)
      at process._tickCallback (internal

  2) Arithmetic
       Addition
         adds zero to an integer:

      Uncaught AssertionError: expected
      + expected - actual

       {
      -  "result": "420"
      +  "result": 42
       }
```

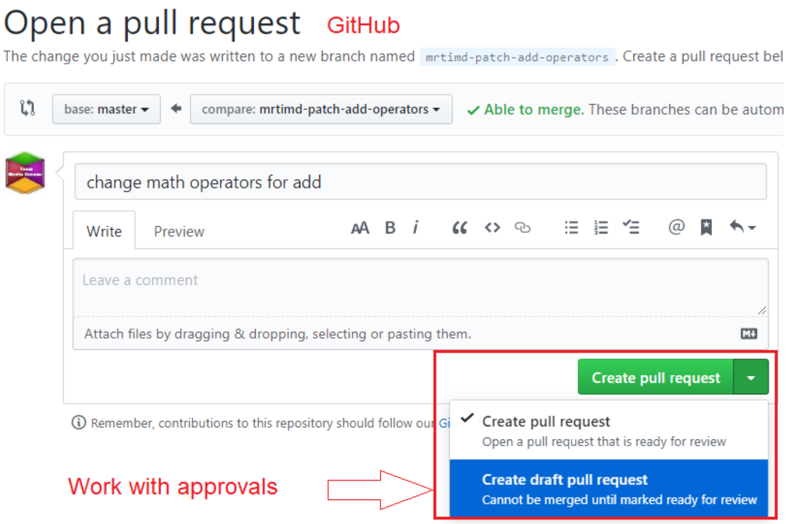
Navigate to Pipeline - Jobs then select the task for logs

Task 4: Proposing a change via GitHub pull request

One of the great benefits of this pipeline setup is that we now have a quality gate that's automatically run every time someone commits a change.

**Create pull request to *trigger* the process of getting your untested changes into some production code.

Once all checks have passed, click Merge pull request.



Open a pull request GitHub

The change you just made was written to a new branch named `mrtimd-patch-add-operators`. Create a pull request bel

base: master ▾ ← compare: mrtimd-patch-add-operators ▾ ✓ Able to merge. These branches can be autom

change math operators for add

Write
Preview
Leave a comment
Attach files by dragging & dropping, selecting or pasting them.
Create pull request ▾

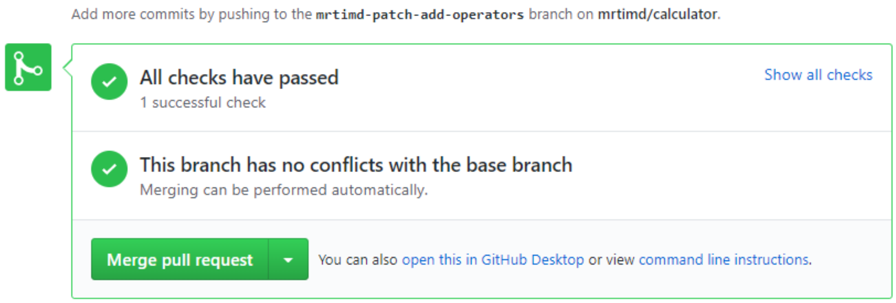
ⓘ Remember, contributions to this repository should follow our Gi

✓ Create pull request
Open a pull request that is ready for review

Create draft pull request
Cannot be merged until marked ready for review

Work with approvals

I got instead of checks not complete – the edit to controller did not fail as expected – no test setup to run as that step failed. Error 127



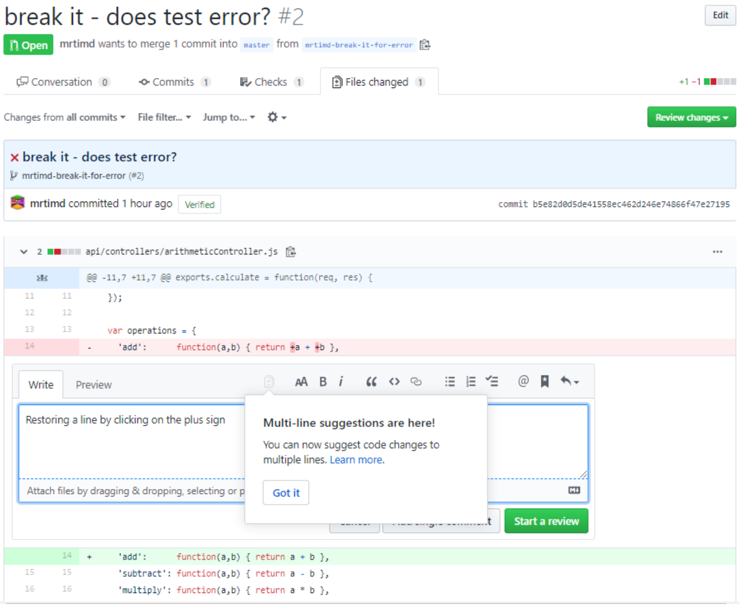
Add more commits by pushing to the **mrtimd-patch-add-operators** branch on **mrtimd/calculator**.

✓ All checks have passed
1 successful check

✓ This branch has no conflicts with the base branch
Merging can be performed automatically.

You can also open this in GitHub Desktop or view command line instructions.

Task 5: Using the broken pull request to improve the project



break it - does test error? #2

mrtimd wants to merge 1 commit into `master` from `mrtimd-break-it-for-error`

✕ break it - does test error?
mrtimd-break-it-for-error (#2)

mrtimd committed 1 hour ago Verified commit b5e82d0d5de41558ec462d246e74866f47e27195

2 api/controllers/arithmeticController.js

```
@@ -11,7 +11,7 @@ exports.calculate = function(req, res) {
      });

      var operations = {
-       'add':      function(a,b) { return +a + +b },
```

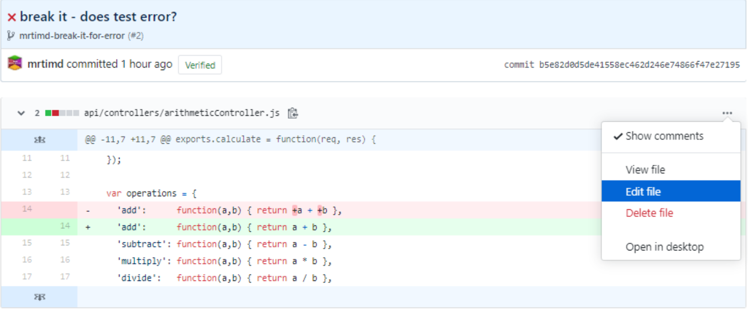
Restoring a line by clicking on the plus sign

Multi-line suggestions are here!
You can now suggest code changes to multiple lines. Learn more.

```
+       'add':      function(a,b) { return a + b },
        'subtract': function(a,b) { return a - b },
        'multiply': function(a,b) { return a * b },
```

Navigate to commits

Files Changed – Edit File



✕ break it - does test error?

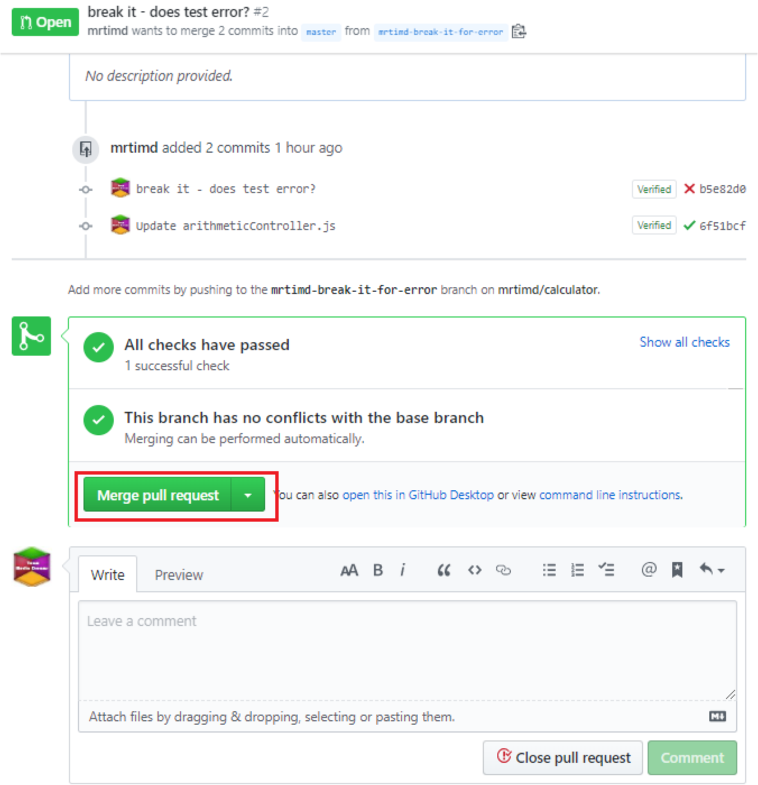
mrtimd-break-it-for-error (#2)

mrtimd committed 1 hour ago Verified commit b5e82d0d5de41558ec462d246e74866f47e27195

2 api/controllers/arithmeticController.js

```
@@ -11,7 +11,7 @@ exports.calculate = function(req, res) {
    });

    var operations = {
-     'add':      function(a,b) { return +a + +b },
+     'add':      function(a,b) { return a + b },
      'subtract': function(a,b) { return a - b },
      'multiply': function(a,b) { return a * b },
      'divide':   function(a,b) { return a / b },
```

Merge/Confirm merge pull request



Open break it - does test error? #2

mrtimd wants to merge 2 commits into master from mrtimd-break-it-for-error

No description provided.

mrtimd added 2 commits 1 hour ago

- break it - does test error? Verified ✕ b5e82d0
- Update arithmeticController.js Verified ✓ 6f51bcf

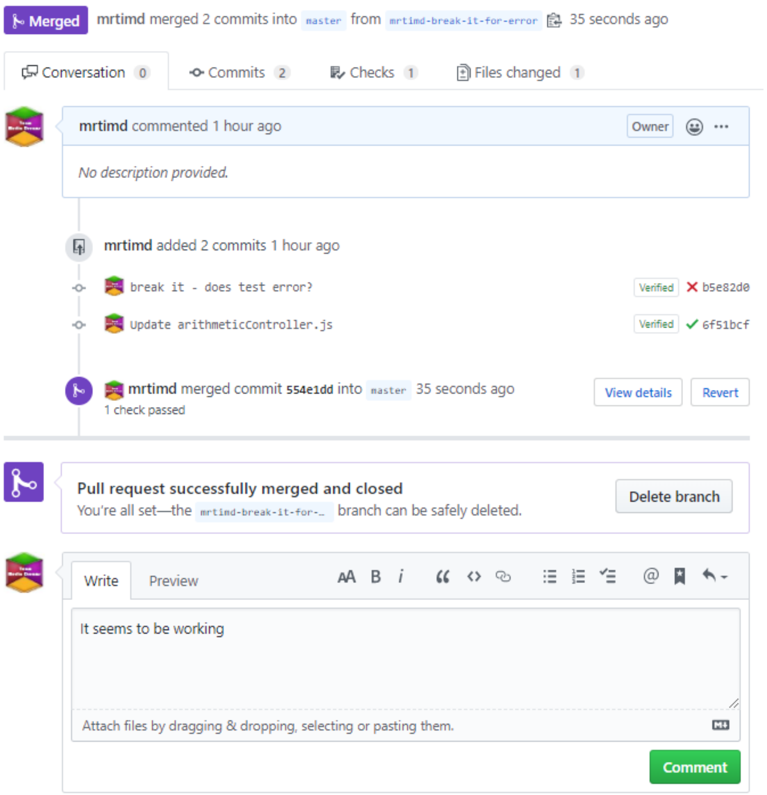
Add more commits by pushing to the **mrtimd-break-it-for-error** branch on **mrtimd/calculator**.

✓ **All checks have passed**
1 successful check

✓ **This branch has no conflicts with the base branch**
Merging can be performed automatically.

You can also open this in GitHub Desktop or view command line instructions.

Success



Merged mrtimd merged 2 commits into master from mrtimd-break-it-for-error 35 seconds ago

mrtimd commented 1 hour ago

No description provided.

mrtimd added 2 commits 1 hour ago

```
break it - does test error?        Verified ✗ b5e82d0
Update arithmeticController.js     Verified ✓ 6f51bcf
```

mrtimd merged commit 554e1dd into master 35 seconds ago

1 check passed

Pull request successfully merged and closed

You're all set—the mrtimd-break-it-for-… branch can be safely deleted.

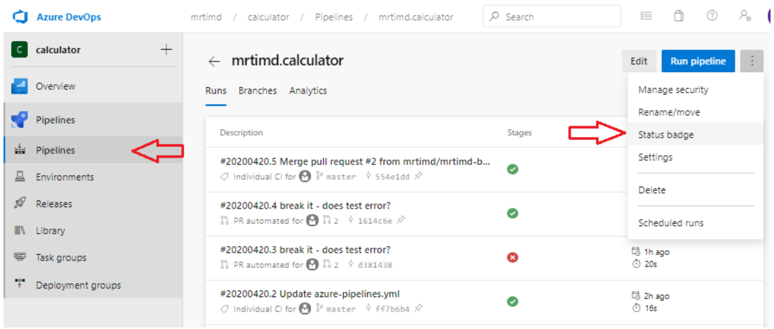
It seems to be working

Attach files by dragging & dropping, selecting or pasting them.

Task 6: Adding a build status badge

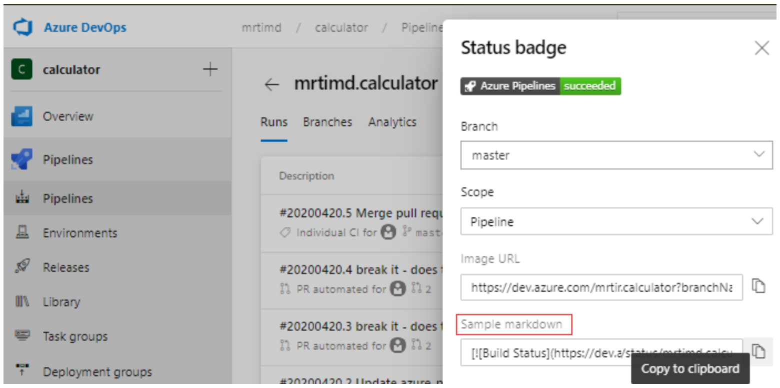
An important sign for a quality project is its build status badge. When someone finds a project that has a badge indicating that the project is currently in a successful build state, it's a sign that the project is maintained effectively.

Open Azure DevOps – navigate to Pipelines then the ellipse menu



Description	Stages	
#20200420.5 Merge pull request #2 from mrtimd/mrtimd-b... Individual CI for master 554e1dd	✓	
#20200420.4 break it - does test error? PR automated for 2 1614c6e	✓	
#20200420.3 break it - does test error? PR automated for 2 d381438	✗	1h ago 20s
#20200420.2 Update azure-pipelines.yml Individual CI for master ff7b6b4	✓	2h ago 16s

Status Badge



#20200420.5 Merge pull requ
Individual CI for mast

#20200420.4 break it - does
PR automated for 2

#20200420.3 break it - does
PR automated for 2

Status badge

Branch: master

Scope: Pipeline

Image URL: https://dev.azure.com/mrtir.calculator?branchNa

Sample markdown: [![Build Status](https://dev.a/status/mrtimd.calcu

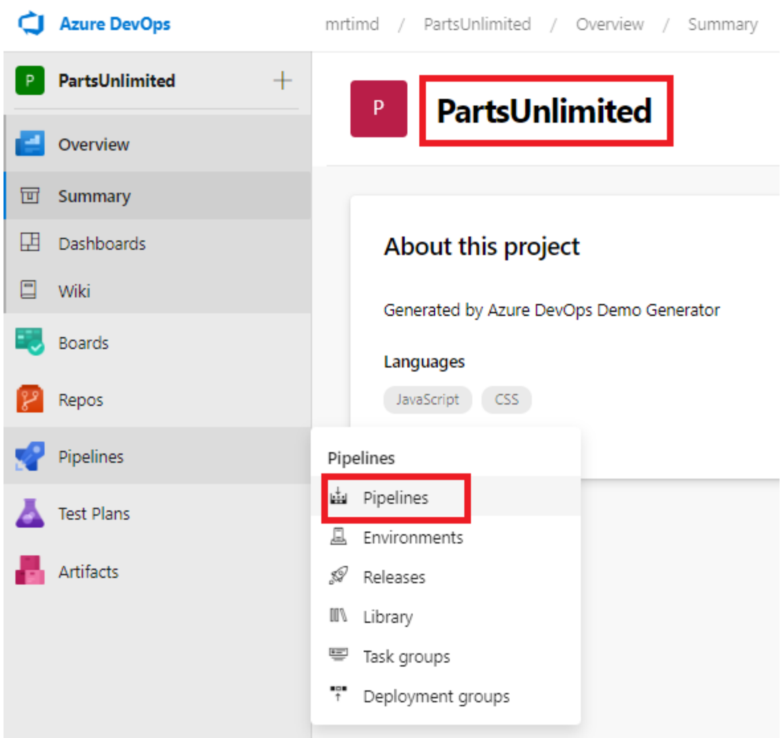
End Calculator Tutorial

Enabling Continuous Integration with Azure Pipelines - PartsUnlimited:
https://www.azuredevopslabs.com/labs/azuredevops/continuousintegration/#task-1-creating-a-basic-build-pipeline-from-a-template

- Configure continuous integration (CI) and continuous deployment (CD) for your applications using Build and Release in Azure Pipelines *from DevOps portal*.

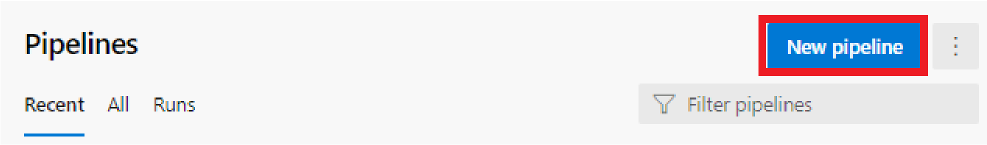
Task 1: Creating a basic build pipeline from a template

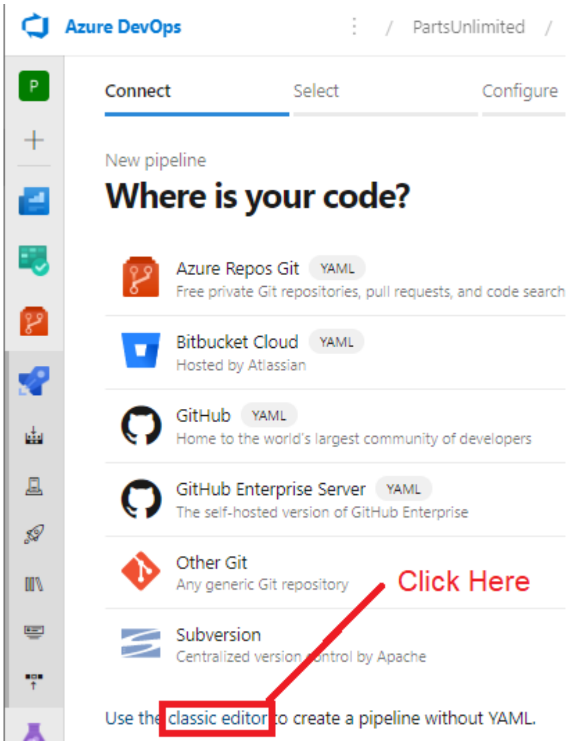
Skillpipe CI: Create Pipeline for PartsUnlimited



Generated by Azure DevOps Demo Generator

Languages





Azure DevOps / PartsUnlimited /

Connect Select Configure

New pipeline

Where is your code?

Azure Repos Git YAML
Free private Git repositories, pull requests, and code search

Bitbucket Cloud YAML
Hosted by Atlassian

GitHub YAML
Home to the world's largest community of developers

GitHub Enterprise Server YAML
The self-hosted version of GitHub Enterprise

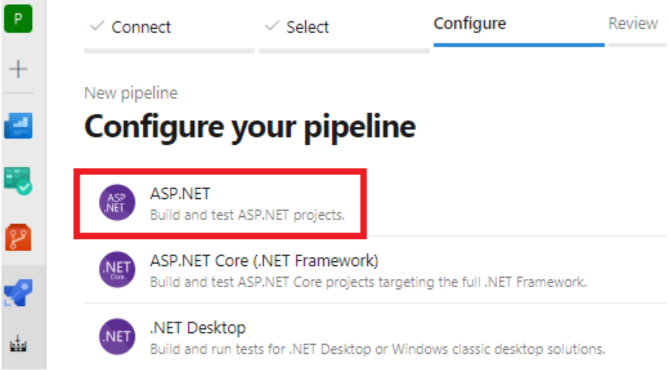
Other Git
Any generic Git repository

Subversion
Centralized version control by Apache

Use the classic editor to create a pipeline without YAML.

Click Here

Configure



✓ Connect ✓ Select Configure Review

New pipeline

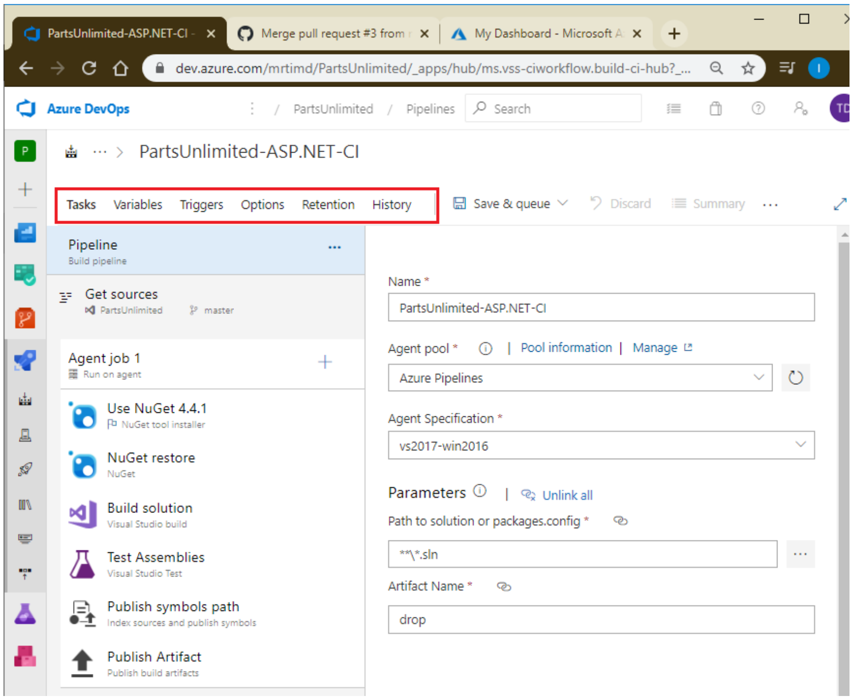
Configure your pipeline

ASP.NET
Build and test ASP.NET projects.

ASP.NET Core (.NET Framework)
Build and test ASP.NET Core projects targeting the full .NET Framework.

.NET Desktop
Build and run tests for .NET Desktop or Windows classic desktop solutions.

Navigate to triggers: Check Enable continuous integration



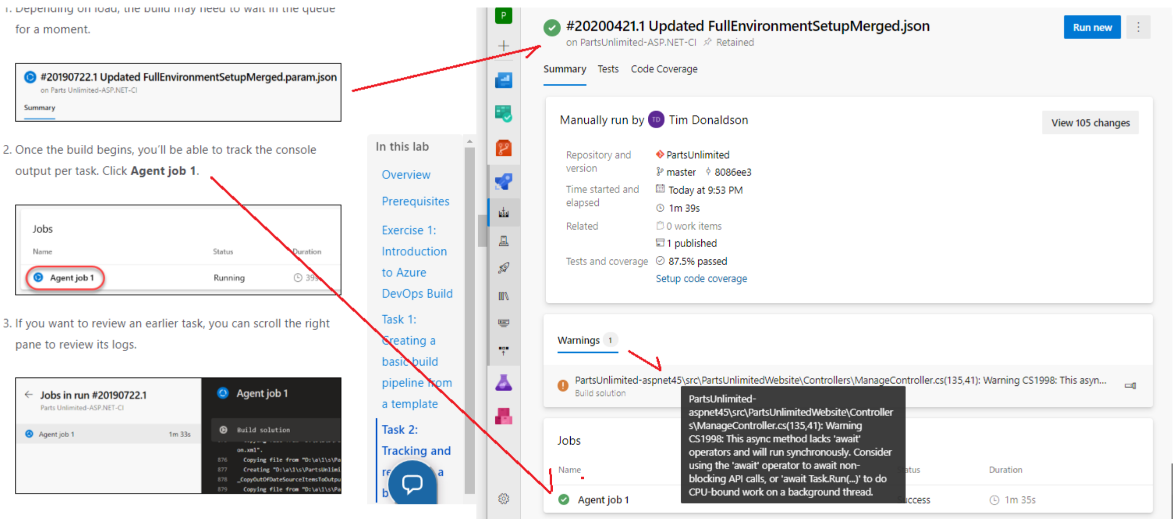
Name * PartsUnlimited-ASP.NET-CI

Agent pool * Azure Pipelines

Agent Specification * vs2017-win2016

Path to solution or packages.config * ***.sln

Artifact Name * drop



1. Depending on load, the build may need to wait in the queue for a moment.

#20190722.1 Updated FullEnvironmentSetupMerged.param.json
on Parts Unlimited-ASP.NET-CI
Summary

2. Once the build begins, you'll be able to track the console output per task. Click **Agent job 1**.

Name	Status	Duration
Agent job 1	Running	39s

3. If you want to review an earlier task, you can scroll the right pane to review its logs.

Jobs in run #20190722.1
Parts Unlimited-ASP.NET-CI
Agent job 1 1m 33s

Agent job 1

```
Build solution
on.xml".
876   Copying file from "D:\a\1\s\Pa
877   Creating "D:\a\1\s\PartsUnlimi
878 _CopyOutOfDateSourceItemsToOutpu
879   Copying file from "D:\a\1\s\Pa
```

In this lab
Overview
Prerequisites
Exercise 1: Introduction to Azure DevOps Build
Task 1: Creating a basic build pipeline from a template
Task 2: Tracking and re... a b...

#20200421.1 Updated FullEnvironmentSetupMerged.json
on PartsUnlimited-ASP.NET-CI Retained

Manually run by Tim Donaldson

Repository and version: PartsUnlimited, master 8086ee3
Time started and elapsed: Today at 9:53 PM, 1m 39s
Related: 0 work items, 1 published
Tests and coverage: 87.5% passed, Setup code coverage

Warnings 1

PartsUnlimited-aspnet45\src\PartsUnlimitedWebsite\Controllers\ManageController.cs(135,41): Warning CS1998: This asyn...
Build solution

```
PartsUnlimited-aspnet45\src\PartsUnlimitedWebsite\Controllers\ManageController.cs(135,41): Warning CS1998: This async method lacks 'await' operators and will run synchronously. Consider using the 'await' operator to await non-blocking API calls, or 'await Task.Run(...)' to do CPU-bound work on a background thread.
```

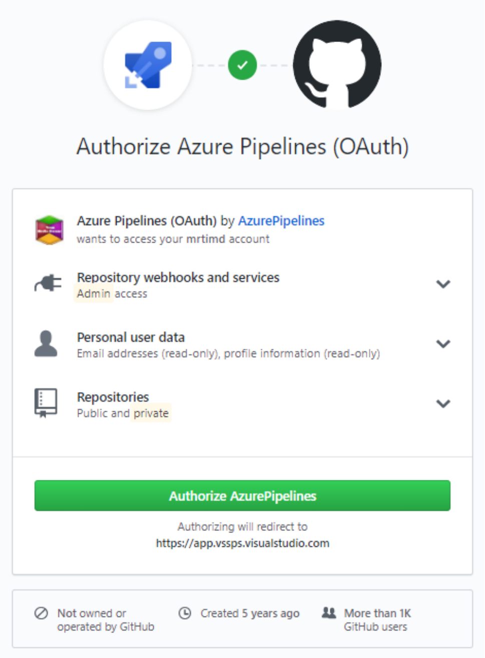
Jobs

Name	Status	Duration
Agent job 1	Success	1m 35s

Tutorial: Create a CI/CD pipeline for your existing code by using Azure DevOps Projects:
https://docs.microsoft.com/en-us/azure/devops-project/azure-devops-project-github

- Use DevOps Projects to create a CI/CD pipeline
- Configure access to your GitHub repo and choose a framework
- Configure Azure DevOps and an Azure subscription
- Commit changes to GitHub and automatically deploy them to Azure
- Examine the Azure Pipelines CI/CD pipeline
- Clean up resources

Authentication – not the Is **app Dockerized** to **YES** selection



Authorize Azure Pipelines (OAuth)

Azure Pipelines (OAuth) by AzurePipelines
wants to access your mrtimd account

Repository webhooks and services
Admin access

Personal user data
Email addresses (read-only), profile information (read-only)

Repositories
Public and private

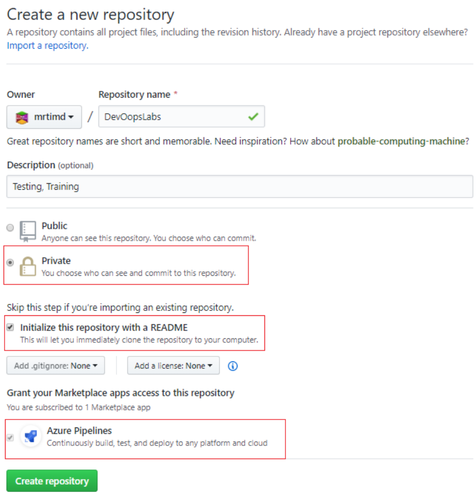
Authorizing will redirect to
https://app.vssps.visualstudio.com

Not owned or operated by GitHub

Created 5 years ago

More than 1K GitHub users

Create and configure access to your GitHub repo then select a framework



Create a new repository

A repository contains all project files, including the revision history. Already have a project repository elsewhere? Import a repository.

Owner: mrtimd / Repository name *: DevOopsLabs ✓

Great repository names are short and memorable. Need inspiration? How about probable-computing-machine?

Description (optional): Testing, Training

○ Public
Anyone can see this repository. You choose who can commit.

● Private
You choose who can see and commit to this repository.

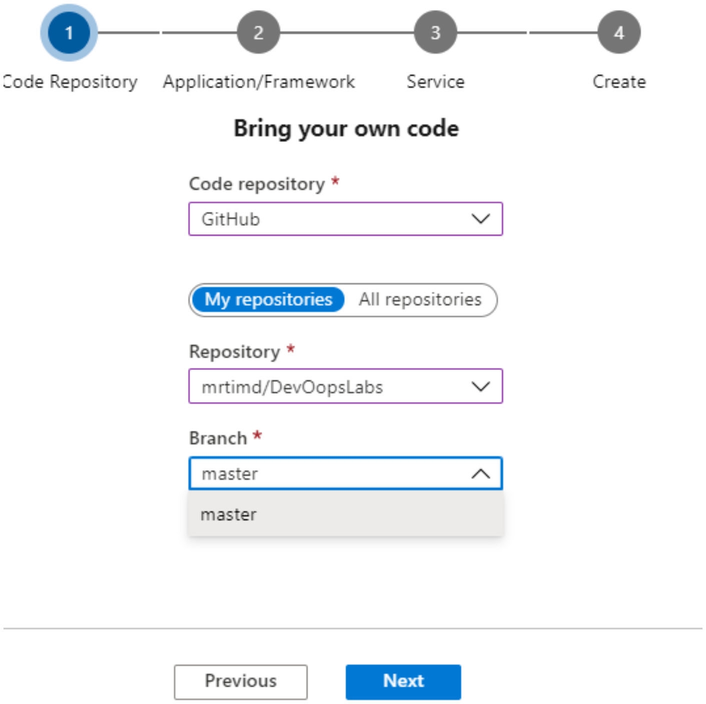
Skip this step if you're importing an existing repository.

☑ Initialize this repository with a README
This will let you immediately clone the repository to your computer.

Add .gitignore: None | Add a license: None

Grant your Marketplace apps access to this repository
You are subscribed to 1 Marketplace app

☑ Azure Pipelines
Continuously build, test, and deploy to any platform and cloud



Bring your own code

Code repository * GitHub

My repositories | All repositories

Repository * mrtimd/DevOopsLabs

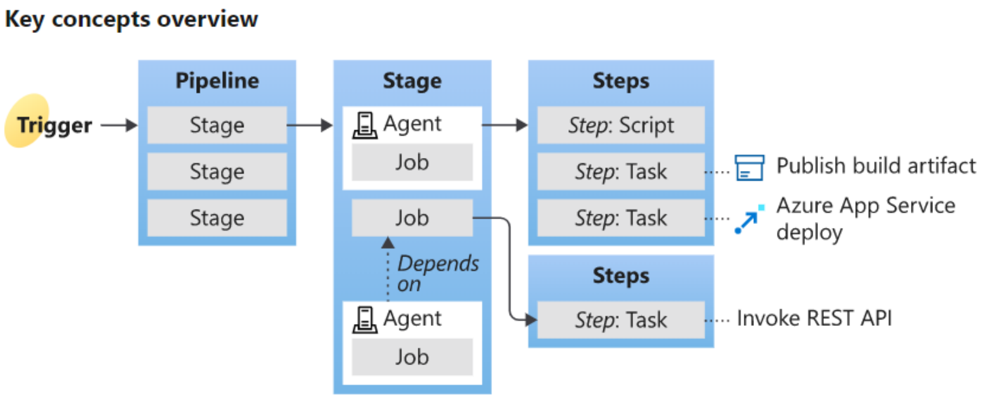
Branch * master

master

Tutorial: Define your multi-stage continuous deployment (CD) pipeline: https://docs.microsoft.com/en-us/azure/devops/pipelines/release/define-multistage-release-process?view=azure-devops&viewFallbackFrom=vsts

- Configuring triggers within the release pipeline
- Extending a release pipeline by adding stages
- Configuring the stages as a multi-stage release pipeline
- Adding approvals to your release pipeline
- Creating a release and monitoring the deployment to each stage

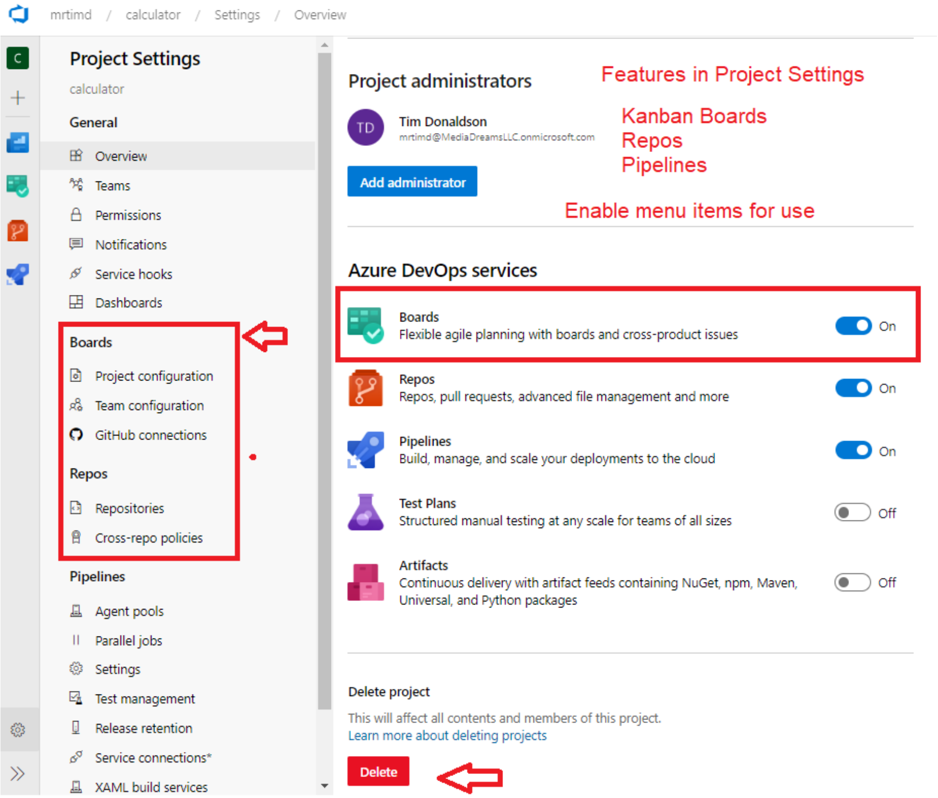
Key concepts overview



- A trigger tells a Pipeline to run.
- A pipeline is made up of one or more stages.
- A pipeline can deploy to one or more environments.
- A stage is a way of organizing jobs in a pipeline
  - Each stage can have one or more jobs.
- Each job runs on one agent. A job can also be agentless.
- Each agent runs a job that contains one or more steps.
- A step can be a task or script and is the smallest building block of a pipeline.
- A task is a pre-packaged script that performs an action, such as invoking a REST API or publishing a build artifact.
- An artifact is a collection of files or packages published by a run.

Enable features in Project Settings – Azure Boards & GitHub: https://docs.microsoft.com/en-us/azure/devops/boards/github/?view=azure-devops

Add a GitHub connection: https://docs.microsoft.com/en-us/azure/devops/boards/github/connect-to-github?view=azure-devops



mrtimd / calculator / Settings / Overview

Project administrators

Tim Donaldson
mrtimd@MediaDreamsLLC.onmicrosoft.com

Features in Project Settings

Kanban Boards
Repos
Pipelines

Enable menu items for use

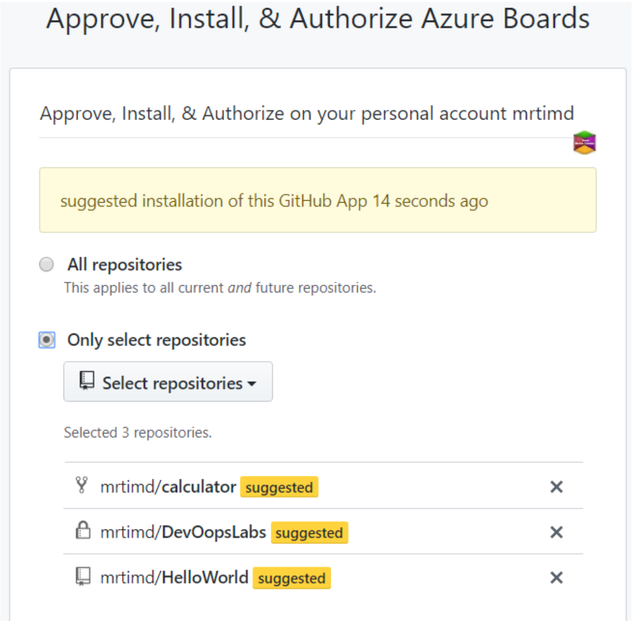
Azure DevOps services

Boards	Flexible agile planning with boards and cross-product issues	On
Repos	Repos, pull requests, advanced file management and more	On
Pipelines	Build, manage, and scale your deployments to the cloud	On
Test Plans	Structured manual testing at any scale for teams of all sizes	Off
Artifacts	Continuous delivery with artifact feeds containing NuGet, npm, Maven, Universal, and Python packages	Off

Delete project

This will affect all contents and members of this project.
Learn more about deleting projects

Connect to Git Repos



Approve, Install, & Authorize Azure Boards

Approve, Install, & Authorize on your personal account mrtimd

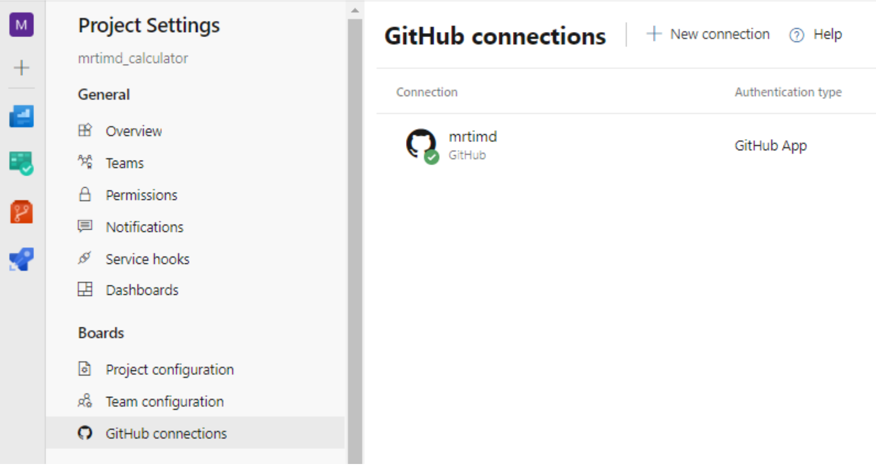
suggested installation of this GitHub App 14 seconds ago

○ All repositories
This applies to all current *and* future repositories.

● Only select repositories

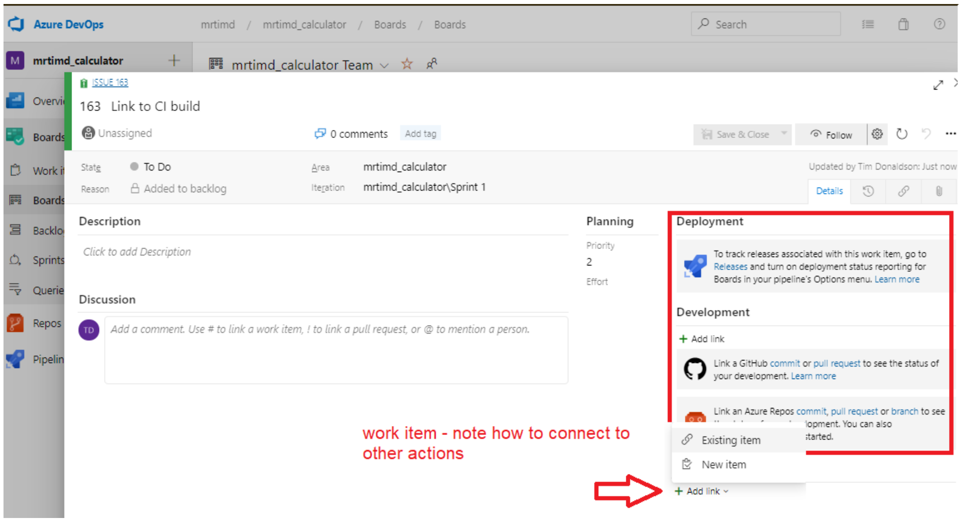
Selected 3 repositories.

- mrtimd/calculator suggested ✕
- mrtimd/DevOopsLabs suggested ✕
- mrtimd/HelloWorld suggested ✕



Connection	Authentication type
mrtimd GitHub	GitHub App

**Link GitHub commits, pull requests, and issues to work items: https://docs.microsoft.com/en-us/azure/devops/boards/github/link-to-from-github?view=azure-devops#add-link-from-a-work-item-to-a-github-commit-pull-request-or-issue



163 Link to CI build

Unassigned 0 comments Add tag

State: To Do
Reason: Added to backlog
Area: mrtimd_calculator
Iteration: mrtimd_calculator\Sprint 1

Updated by Tim Donaldson: Just now

Click to add Description

Add a comment. Use # to link a work item, ! to link a pull request, or @ to mention a person.

Priority: 2
Effort

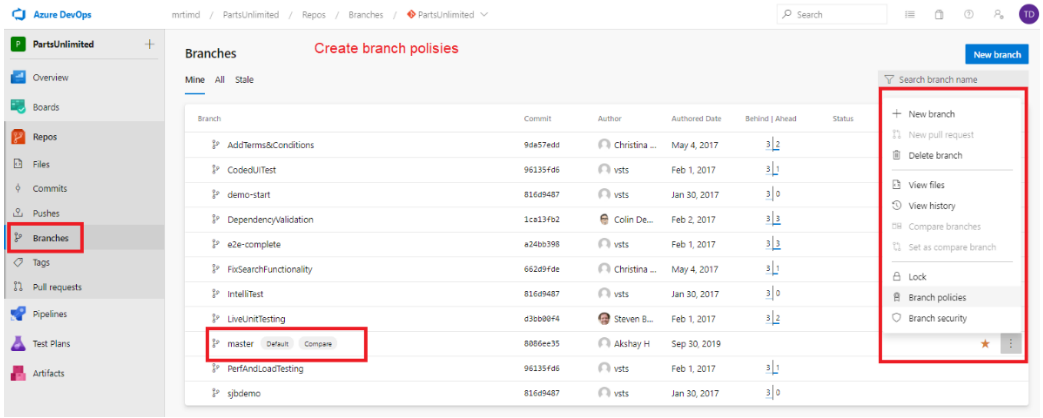
To track releases associated with this work item, go to Releases and turn on deployment status reporting for Boards in your pipeline's Options menu. Learn more

Link a GitHub commit or pull request to see the status of your development. Learn more

Link an Azure Repos commit, pull request or branch to see ...lopment. You can also ...tarted.

work item - note how to connect to other actions

Create Branch Policy

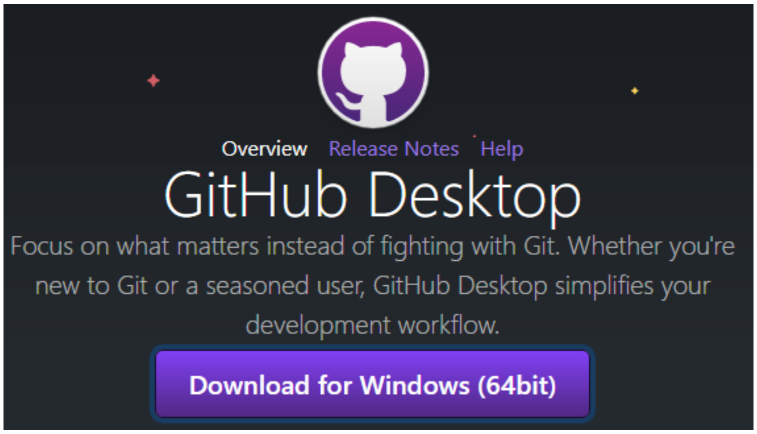


Create branch polisies

Branch	Commit	Author	Authored Date	Behind | Ahead	Status
AddTerms&Conditions	9da57edd	Christina ...	May 4, 2017	3 | 2	
CodedUITest	96135fd6	vsts	Feb 1, 2017	3 | 1	
demo-start	816d9487	vsts	Jan 30, 2017	3 | 0	
DependencyValidation	1ca13fb2	Colin De...	Feb 2, 2017	3 | 3	
e2e-complete	a24bb398	vsts	Feb 1, 2017	3 | 3	
FixSearchFunctionality	662d9fde	Christina ...	May 4, 2017	3 | 1	
IntelliTest	816d9487	vsts	Jan 30, 2017	3 | 0	
LiveUnitTesting	d3bb00f4	Steven B...	Feb 1, 2017	3 | 2	
master Default Compare	8086ee35	Akshay H	Sep 30, 2019		
PerfAndLoadTesting	96135fd6	vsts	Feb 1, 2017	3 | 1	
sjbdemo	816d9487	vsts	Jan 30, 2017	3 | 0	

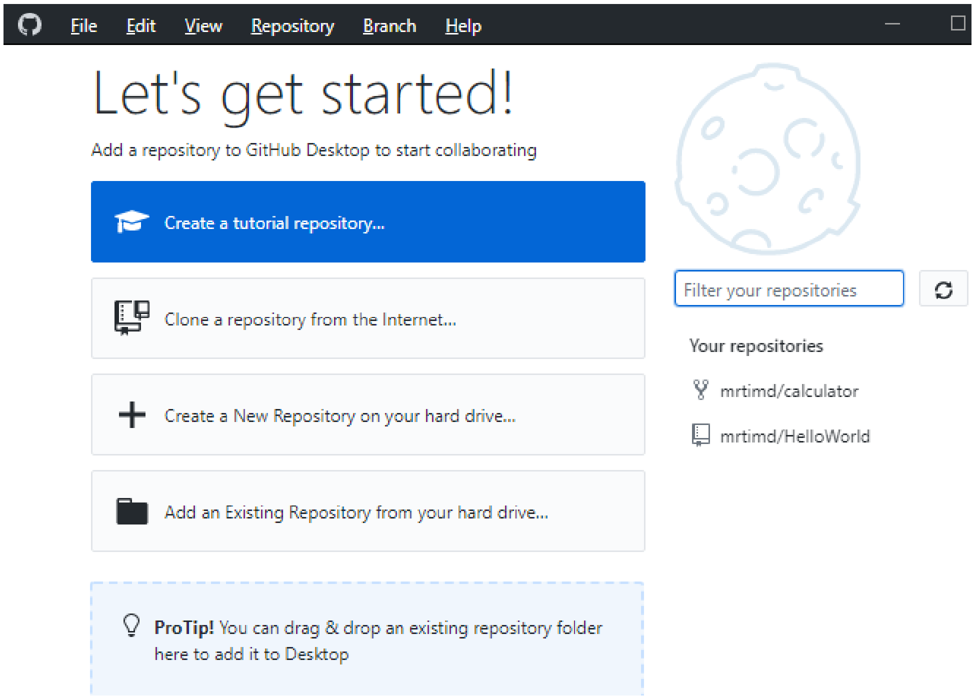
Introducing the New Pull Request Experience for Azure Repos: https://devblogs.microsoft.com/devops/introducing-the-new-pull-request-experience-for-azure-repos/

An Option to Explore GitHub Desktop



GitHub Desktop

Focus on what matters instead of fighting with Git. Whether you're new to Git or a seasoned user, GitHub Desktop simplifies your development workflow.



File
Edit
View
Repository
Branch
Help
Create a tutorial repository...
Clone a repository from the Internet...
Create a New Repository on your hard drive...
Add an Existing Repository from your hard drive...
Filter your repositories

Let's get started!

Add a repository to GitHub Desktop to start collaborating

ProTip! You can drag & drop an existing repository folder here to add it to Desktop

Your repositories

- mrtimd/calculator
- mrtimd/HelloWorld

References

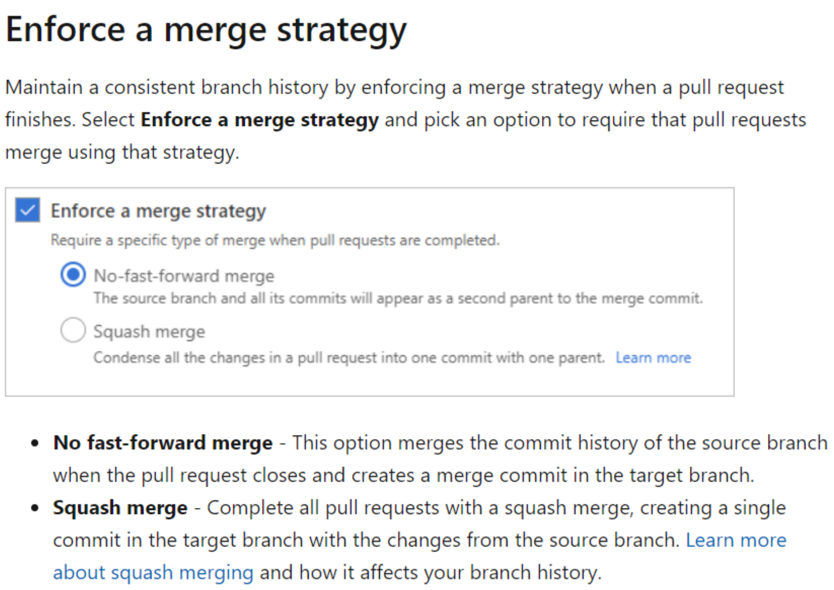
- [Course AZ-400T00--A: Designing and Implementing Microsoft DevOps solutions - Training | Microsoft Learn]()
- [Exam AZ-400: Designing and Implementing Microsoft DevOps Solutions - Certifications | Microsoft Learn]()

Study topics

Project Settings - Pipelines

Security

1. Service connections in Azure Pipelines - Azure Pipelines | Microsoft Learn
2. What is Conditional Access in Azure Active Directory? - Microsoft Entra | Microsoft Learn
3. Authenticate with your Git repos - Azure Repos | Microsoft Learn
    a. Overview
4. Guidance for authentication - Azure DevOps | Microsoft Learn
5. Use personal access tokens - Azure DevOps | Microsoft Learn
6. Connect to your Git repos using credential managers - Azure Repos | Microsoft Learn
7. Using secrets from Azure Key Vault in a pipeline | Azure DevOps Hands-on-Labs (azuredevopslabs.com)
8. Set Git branch security and permissions - Azure Repos | Microsoft Learn



Enforce a merge strategy

Maintain a consistent branch history by enforcing a merge strategy when a pull request finishes. Select **Enforce a merge strategy** and pick an option to require that pull requests merge using that strategy.

☑ Enforce a merge strategy
Require a specific type of merge when pull requests are completed.
● No-fast-forward merge
The source branch and all its commits will appear as a second parent to the merge commit.
○ Squash merge
Condense all the changes in a pull request into one commit with one parent. Learn more

- **No fast-forward merge** - This option merges the commit history of the source branch when the pull request closes and creates a merge commit in the target branch.
- **Squash merge** - Complete all pull requests with a squash merge, creating a single commit in the target branch with the changes from the source branch. Learn more about squash merging and how it affects your branch history.

9.
10. Maven – Introduction (apache.org)

Tasks

11. Controlling Deployments using Release Gates | Azure DevOps Hands-on-Labs (azuredevopslabs.com)
12. Device registration - Visual Studio App Center | Microsoft Learn
13. Scale up features and capacities - Azure App Service | Microsoft Learn
14. Slack Integration - Visual Studio Marketplace
15. Create a service hook with Slack - Azure DevOps | Microsoft Learn

Backlog items: Setting up Board and WIT behaviour

16. Create your product backlog in Azure Boards - Azure Boards | Microsoft Learn
    a. Create your product backlog by adding user stories, backlog items, or requirements.

   b. A list of work items
   c. To manage work, you have access to three classes of backlogs (portfolio, product, and sprint)
   d. Tasks that support backlogs, boards, & plans in Azure Boards - Azure Boards | Microsoft Learn
   e. Two types of boards (Kanban and Taskboards).
      i. Backlogs list work items
      ii. Boards display work items as cards.
   f. Backlog and board views provide similar and distinct features to support planning and tracking.

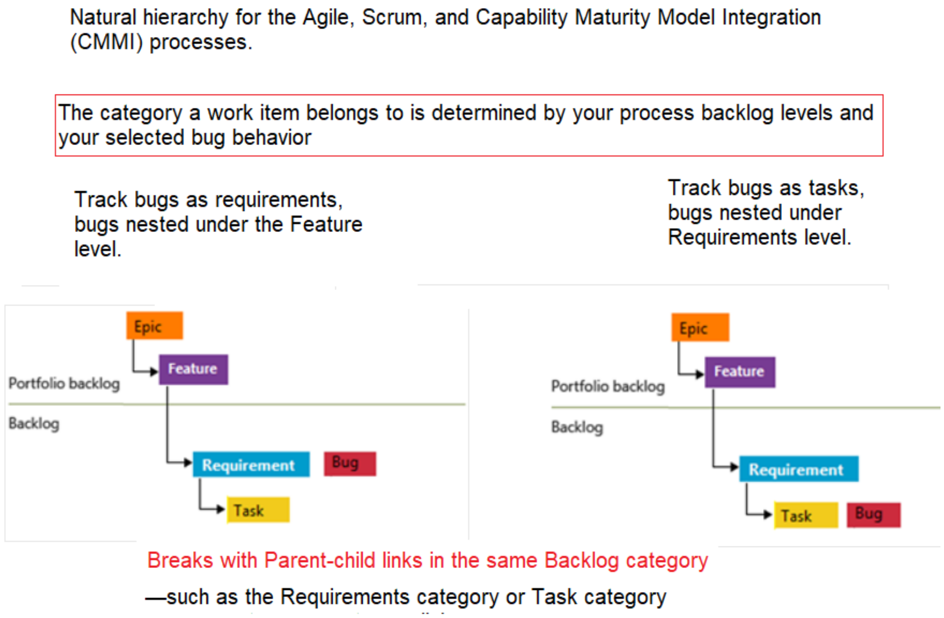
17. **Settings: Show bugs on backlogs and boards - Azure DevOps | Microsoft Learn
    a. Track bugs as requirements they appear on the product Backlogs and Kanban boards.
    b. Track bugs as tasks the bugs appear on Sprint Backlogs and Taskboards.
    c. Add other work item types—such as change requests, issues, or impediments—by customizing your process or project, based on the process model you use.
18. Customize backlogs and boards - Azure Boards | Microsoft Learn
    a. Add more levels or add custom work item types to them. Hierarhies
19. Azure Boards-GitHub integration - Azure Boards | Microsoft Learn
    a. Enable linking between GitHub commits, pull requests, and issues to work items.
    b. GitHub for software development
    c. Azure Boards to plan and track your work.
20. Use infrastructure automation tools - Azure Virtual Machines | Microsoft Learn
    a. Ansible
    b. Chef
    c. Puppet
    d. Cloud-init
    e. PowerShell DSC
    f. Azure Custom Script Extension
    g. Packer
    h. Terraform
    i. Azure Automation
    j. Azure DevOps Services
    k. Jenkins
    l. Azure Resource Manager template

Kubernetes

21. Integrate Azure Container Registry with Azure Kubernetes Service - Azure Kubernetes Service | Microsoft Learn
22. Integrate Azure Container Registry with Azure Kubernetes Service - Azure Kubernetes Service | Microsoft Learn
    a. kubernetes.io/azure-file
23. Create a persistent volume with Azure Files in Azure Kubernetes Service (AKS) - Azure Kubernetes Service | Microsoft Learn
24. Pipeline Automation Case Study for World Wide Time Keeping - TFS | Microsoft Learn

Testing

25. About pipeline tests - Azure Pipelines | Microsoft Learn
    a. Flaky test: A test with non-deterministic behavior. For example, the test may result in different outcomes for the same configuration, code, or inputs.
26. What is Azure Test Plans? Manual, exploratory, and automated test tools. - Azure Test Plans | Microsoft Learn
    a. Planned manual testing, user acceptance testing, exploratory testing, and gathering feedback from stakeholders.
    b. Azure Boards Kanban boards, you can add tests from a user story or feature, automatically linking the test case to the user story or feature.
    c. Test Runner supports rich data collection while performing tests, such as image action log, video recording, code coverage, etc. It also allows users to create bugs and mark the status of tests.
    d. Test & Feedback extension
        i. Helps teams perform exploratory testing and provide feedback.
        ii. Exploratory test your web app - Azure Test Plans | Microsoft Learn
        iii. Exploratory testing in connected mode - Azure Test Plans | Microsoft Learn
    e. Overview of Test Automation | Selenium
    f. AZ400-DesigningandImplementingMicrosoftDevOpsSolutions (microsoftlearning.github.io)
        i. Mend Bolt (formerly WhiteSource) automatically detect vulnerable open source components, outdated libraries, and license compliance issues in your code.
27. Buy access to Azure Test Plans - Azure DevOps Server | Microsoft Learn
28. Work Item Type Tracking
    a. Bug work item type
    b. Define, capture, triage, and manage bugs or code defects in Azure Boards - Azure Boards | Microsoft Learn
    c. About work items and work item types - Azure Boards | Microsoft Learn
    d. Resolve Azure Boards nest, display, and reorder issues for work items - Azure Boards | Microsoft Learn
        i. Msg: You cannot reorder work items and some work items may not be shown.
        ii. The category a work item belongs to is determined by your process backlog levels and your team's selected bug behavior.



Natural hierarchy for the Agile, Scrum, and Capability Maturity Model Integration (CMMI) processes.

The category a work item belongs to is determined by your process backlog levels and your selected bug behavior

Track bugs as requirements, bugs nested under the Feature level.

Track bugs as tasks, bugs nested under Requirements level.

Breaks with Parent-child links in the same Backlog category

—such as the Requirements category or Task category

29.
30. Create and manage agent pools - Azure Pipelines | Microsoft Learn
31. Testing Labs:
    a. AZ400-DesigningandImplementingMicrosoftDevOpsSolutions (microsoftlearning.github.io)
    b. Add, run, update inline tests - Azure DevOps | Microsoft Learn
32. Test & Feedback - Visual Studio Marketplace
33. Try Azure Test Plans for free - Azure DevOps Services | Microsoft Learn
34. Black Duck Detect - Visual Studio Marketplace
35. SonarQube - Visual Studio Marketplace
36. Web based Test Case Management with Visual Studio Online | Microsoft Learn

Monitor

37. AZ400-DesigningandImplementingMicrosoftDevOpsSolutions (microsoftlearning.github.io)
    a. add Application Insights to an existing web application and how to monitor the application via the Azure portal.
38. AZ400-DesigningandImplementingMicrosoftDevOpsSolutions (microsoftlearning.github.io)
39. Configure monitoring for ASP.NET with Azure Application Insights - Azure Monitor | Microsoft Learn
40. Enable Container insights for Azure Kubernetes Service (AKS) cluster - Azure Monitor | Microsoft Learn
41. Securing Azure Pipelines - Azure Pipelines | Microsoft Learn

Boards

42. Install the Azure Boards app for GitHub - Azure Boards | Microsoft Learn
    a. Installing the Azure Boards app for GitHub is the first step in connecting Azure Boards to your GitHub repositories

43. Connect an Azure Boards or Azure DevOps project to a GitHub repository - Azure Boards | Microsoft Learn
44. Linking your GitHub commits with Azure Boards | Azure Blog | Microsoft Azure
45. Microsoft Teams with Azure DevOps Services (Collaborate, Communicate and Celebrate) | Azure DevOps Hands-on-Labs (azuredevopslabs.com)
    a. @azure pipelines subscriptions
46.