

# Enterprise RPA Toolkit for Microsoft Power Platform

Wednesday, January 12, 2022 10:06 AM

What is this toolkit for?

Who is the intended audience?

How to begin working with this toolkit

## Conventions

Whenever *a piece of text* is written in italic, it is a name of an object, a flow, a menu item or something similar.

**Bold** is used to emphasize important pieces of content or places where a mistake is likely, so please pay attention.

Any occurrence of [PREFIX] should be replaced with your actual chosen module prefix in square brackets (i.e., [MYAPP]). See [Using the test case template](#) for more information on module prefixes. This is **not** the same as your usual Dataverse publisher prefix, although it plays a similar role.

# Your Automation Solution

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Your process automation solution will use the following solutions that have to be installed first:

- Orchestration Center - provides supporting Dataverse tables for test cases and work items
- XX Integration - one or more of your integration modules, built to interface between the Business Process solution and the actual app being integrated. As a fundamental rule, you should avoid manipulating apps directly from the business process, and use integration module(s) instead.
- Final RPA solution, where you use these integration modules

# Solution structure

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Your business process (master) solution should use *modules* built for connection to any other apps.

Modules are solutions (usually imported as managed) that provide actions on the target application. Typically, there's an **Init** action that opens the target app, performs login, and does any preparation steps needed by all the other flows. There's also a **Close** module that performs cleanup - logs out, closes the web browser.

For any other action that might be needed by the RPA flow makers, there should be a separate flow in your module.

Example:



[CS] Close



[CS] Init



[CS] Open Credit details page



[CS] Open Customer page



[CS] Retrieve most recent order reference

## Naming

All flows in one module should follow the naming convention, where [CS] is the short name for the app being integrated (here: a "Credit System"). The CS should be the name of the solution, or the beginning of the name.

## Sequence

The RPA maker should always call **Init** first. Then, they should call any business actions as required, and finally **Close** to clean up.

Any flow other than **Init** may have one or more requirements. For example, in the above solution **[CS] Open Customer page** requires **Init** only. But **[CS] Retrieve most recent order reference** requires that a customer page is opened first.

## Using environments

It is strongly recommended that *modules* would be developed in a separate environment ("dev"), where they are built, tested and packaged for usage. Then, as *managed* solutions they are exported from "dev" and imported to the build location for the complete solution.

The use of solutions helps separate the job of app module builder, and that of SME (*subject matter expert* in the field being automated). The app module builder takes care of integration, while the SME is building the actual business flow.

By keeping these two roles separate, we facilitate reuse of the content created, and reduce maintenance costs. If the underlying app is ever modified in a way that breaks an existing process, it becomes the app module builder responsibility to fix it. Ideally, the SMEs should never have to update their processes again - the interfacing layer should be the place where updates are applied.

Once the update is completed, tested and ready to move to production, it would be exported as a new version of a managed solution. That solution would be then imported to the "production" environments, and the business would start leveraging the updated capacity.

It's worth noting that this approach significantly reduces the maintenance cost - if the same module is used in 5 different business flows, a single fix can resolve issues in all 5 of them. Building strong test cases in the module helps pinpoint any problems as they appear. Also, test cases help prove to the business flow maker that the app connection is in proper working order.

# DEV/TEST/PROD separation

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Development, testing and production should be separated environments. Any environment-specific parameters, such as logins to a test app, or URLs to non-production instances can be then stored in that environment as environment variables.

Since environment variable values are not transferred across environments, this approach helps make sure that any testing or development effort will not impact the production data in any way.



If desired, it is completely possible that app module builders and business flow makers would have no access to the production system. They don't need such access to develop RPA solutions. When the work is done and products are uploaded to production environment, the RPA operations team will provide credentials/URLs to the actual apps being integrated.

# Satisfying the requirements

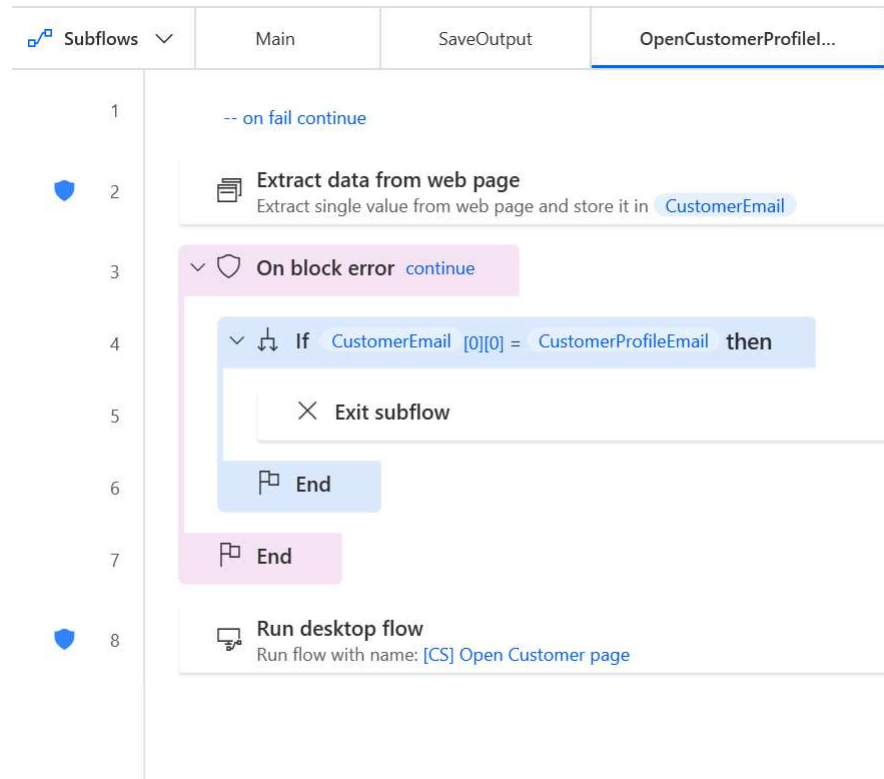
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If an assumption can be easily satisfied by calling another flow (other than **Init**), it is better to remove it from prerequisites and call the required flow instead.

Example:

3 |  Run subflow [OpenCustomerProfileIfNotOpen](#) 

Code:



Here, the process checks if the user profile being open (#2) is actually the one we want to be seeing (#3). If it is the right user, subflow exits back to main. If it is not the right user profile, it calls **[CS] Open Customer page** to satisfy the requirement.

Note that an error in data extraction means we have completely wrong page open, so this flow quietly moves on to running a desktop flow to open the profile. Any error in actions #3..#7 is also silently ignored and leads to calling **[CS] Open Customer page** to satisfy the dependency.

# Solutions to be loaded first

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This chapter describes the structure and dependencies of managed solutions that would be imported (installed) in the target production environment. See subpages for more information about the contents of these solutions.

## Orchestration Center

Provides critical dependencies for the integration modules, as well as UI to access the data collected throughout the automated processes.

## App integration modules

Your custom app integration modules fall under this category. They will all depend on the orchestration center being loaded first, as it provides critical components of both testing and work item capabilities.

# Orchestration Center

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## Main components:

- Apps
  - Orchestration Center - the main UI
- Tables
  - RPA Modules - one record will be created and used by each installed module
  - Tag Rules - here are the default and custom rules for tagging *Work Items* based on the exceptions found during the desktop flow execution
  - Test Case - one record will be created automatically for any test case ran (as long as it is using the template provided)
  - Test Case Runs - documents every single run of any test case
  - Test Run History - a "test run" occurs when test cases for a particular module are ran, either scheduled or on demand
  - Work Items - common table for all events that should trigger a desktop flow run. Work item will contain both the input data (Payload) as well as - if the process is ran successfully - the output (Payload Output). Every attempt to run that process, whether successful or failed, will be linked to this common record as a child
  - Work Item History - these are individual runs of desktop flows. A work item history will be first created when the process is scheduled for execution, and then depending on outcome - updated with either a Failure or Success status. Work Item History records are linked to parent Work Item, which contains the input and latest output data
- Cloud flows
  - Apply Tag Rules - applies rules stored in Tag Rules upon failure of a Work Item job. The tags are then stored in the Tags field in respective Work Item record.
  - Fill SLA deadline if not provided (default 24 hrs) - sets the SLA Deadline field on new Work Items, if a deadline was not provided during record creation. The default is 24 hours.
  - Retry policy implementation - implements the basic retry policy of restarting a job once, after 10 minutes. Upon restart, the job is assigned the RETRIED flag.
- Dashboards
  - Automation overview - shows the status of work items queue, test results and recent work statistics.
  - RPA Details - links up a Power BI dashboard that analyzes the performance of bots
- Choices (option sets)
  - Automatic test cycle - hourly or daily. The implementation of a particular test cycle is provided by individual RPA modules.
  - Execution Status - used by work items:
    - Added - a draft record, not yet scheduled to run
    - Queued for execution - setting this value will cause the job to be sent to appropriate bot
    - Test result - either a success or a failure
    - Work Item type - one value for every job type (one desktop flow) that will be scheduled through the Work Items mechanism.



# App integration modules

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To create an app integration module, please use the supplied template.

Mandatory components of an app integration module:

Type	Name	Purpose	Adaptations required from toolkit template
Cloud Flow	Ad-hoc test case run	Run it manually to start the test cases.	None
Cloud Flow	Run xxx	Xxx represents one type of work item (see <i>Work Item Type</i> choice).	Create one for each of your <i>Work Item Types</i> . In the flow's trigger, replace 768280000 with the choice id for your work item type.  rpakit_type eq <b>768280000</b> and rpakit_executionstatus eq 343970001  This is <b>the place</b> for building your cloud+desktop flow combinations to deal with your work items.
Cloud Flow	Run test cases (child)	To collect all the credentials needed from Key Vault and run desktop flow with test cases, passing the credentials.	Use the <b>Retrieve credentials</b> scope element to put your Azure Key Vault actions for any user id or passwords your test case desktop flow requires. Make sure these values are actually supplied to the desktop flow.
Cloud Flow	Scheduled test case run	To start "Run test cases (child)" in regular intervals.	None.
Desktop Flow	[AppName] Test cases	This flow contains subflows for each individual test case you have built.	Add your test cases as subflows. Call each and every subflow from the Main subflow.  See <a href="#">Tests</a>
Environment Variables	As needed	To hold configuration parameters for the apps you integrate with.	Create any environment variables needed to access your target systems (only non-confidential values may go here, for everything else - use Azure Key Vault).
Security Role	Power Automate Desktop user for test cases	To allow PowerShell scripts in PAD (used in test case template) to manipulate Dataverse entities like Test Case, and to read environment variables.	Only if you need your test cases to do additional operations on Dataverse.

As your integration module connects to orchestration tables (i.e. to Work Items and RPA Modules), it will require the Orchestration solution to be installed first.

The "[Sample] Integration" module provided is a template for building integration modules. Do not use the solution itself - create your own solution and add the same components to it. Otherwise you will not be able to import more than one such module into the target environment.

# Flows

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# Browser handle

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Since you cannot (currently) pass a browser instance variable between desktop flows, the following alternative solution is used.

## Init flow

This flow is expected to attach to existing browser or open a new instance. Usually, it takes the following input (your use case may vary):

- *Username* and *Password* as sensitive values
- *Application URL* of the app to open - making it a parameter helps build test environments that work with test instance of your app

The *Init* flow returns two values:

- *BrowserURL* is taken from %Browser.URL% and is the most recently open address (it can change throughout your process, so you will need to keep it up to date throughout your work with the browser)
- *BrowserHandle* is taken from %Browser.Handle% and does not change throughout execution. Unfortunately, a flow cannot connect to the browser by handle, the only thing you can do with the handle is close window.

Example:

Input variables

Username:	<input type="password"/>	
Password:	<input type="password"/>	
AppURL:	<input type="text" value="https://creditapp-poc.web.app"/>	{x}

> Variables produced **BrowserHandle** **BrowserURL**

## Your "actual work" flows

They should receive the following input:

- *BrowserURL* - the most recent URL in the web browser
- Plus any business data required to do the job

Assigning a meaningful default value to *BrowserURL* will help you in debugging.

They should return the following output:

- *BrowserURLOutput* - in your calling flow, you should redirect this to *BrowserURL* variable like this:

Example:

Desktop flow: [CS] Open Customer page ▼ ⓘ

Input variables

BrowserURL: %BrowserURL% {x} ⓘ

CustomerSearchCriteria: %TestData\_CustomerEmail% {x} ⓘ

> Variables produced **BrowserURL**

See [Subflow structure](#) for more recommendations.

## Close flow

This flow should use BrowserHandle and/or BrowserURL to close the browser.

Example:

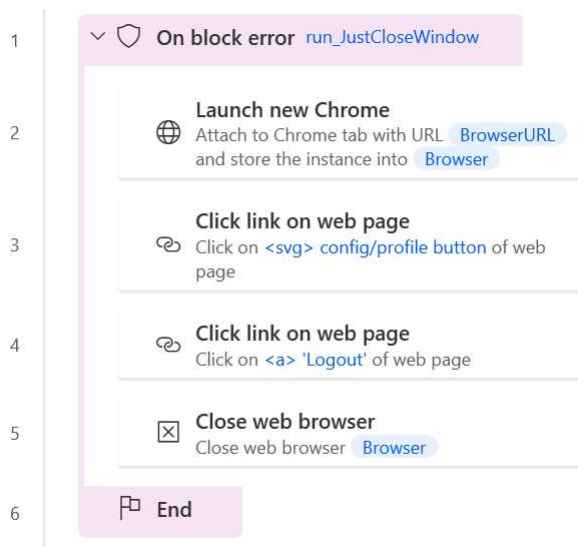
Desktop flow: [CS] Close ▼ ⓘ

Input variables

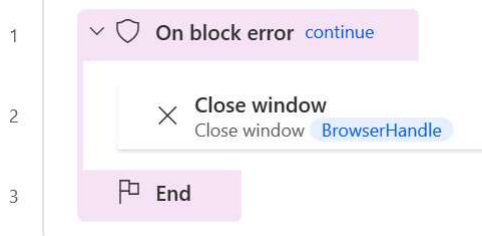
BrowserHandle: %BrowserHandle% {x} ⓘ

BrowserURL: %BrowserURL% {x} ⓘ

It should use reasonable means to attach to browser and log out of the app, and if that fails, just use the handle to close browser window. Example code:



JustCloseWindow subflow is started on any errors:



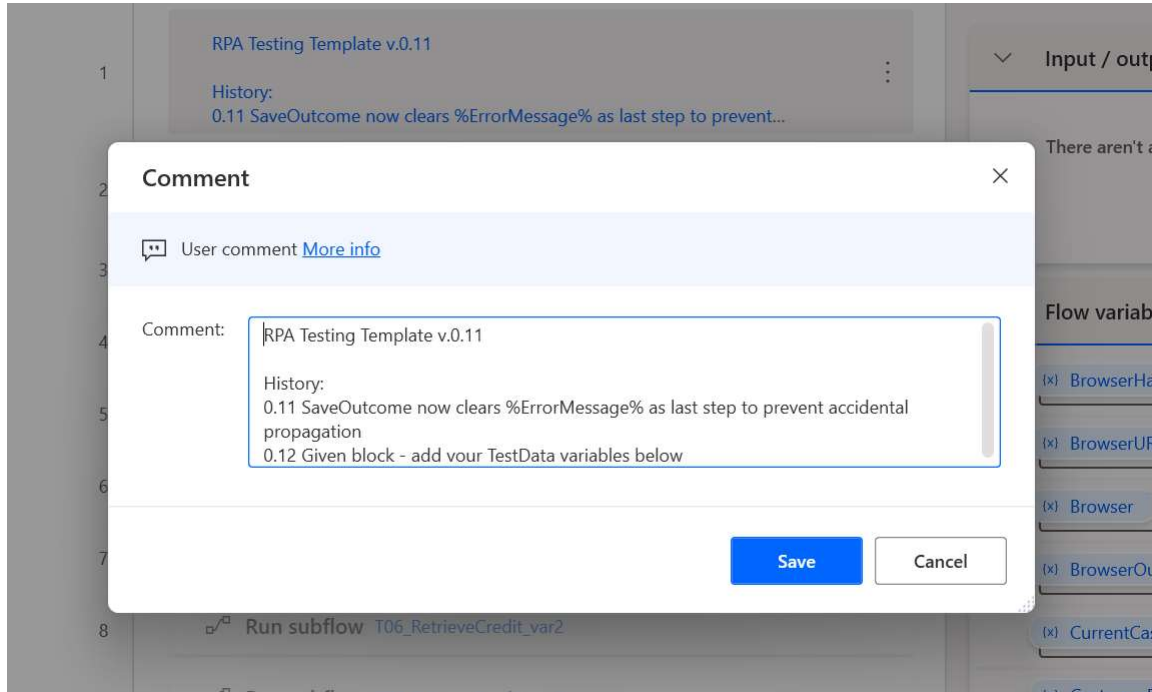
The on block error section here just ignores any issues found.



# First comment block

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Every flow should start with a comment block listing flow name, version, update history, prerequisites that have to be completed prior to starting (i.e. web browser should be open on the customer profile).



*RPA Testing Template v.0.11*

*This flow carries out all test cases and shows output in a message box.*

*Prerequisites: none.*

*History:*

*0.11 SaveOutcome now clears %ErrorMessage% as last step to prevent accidental propagation*

*0.12 Given block - add your TestData variables below*

# Standard variable names

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## ErrorMessage

used to pass custom exception text to **ProcessException** subflow

Example 1:

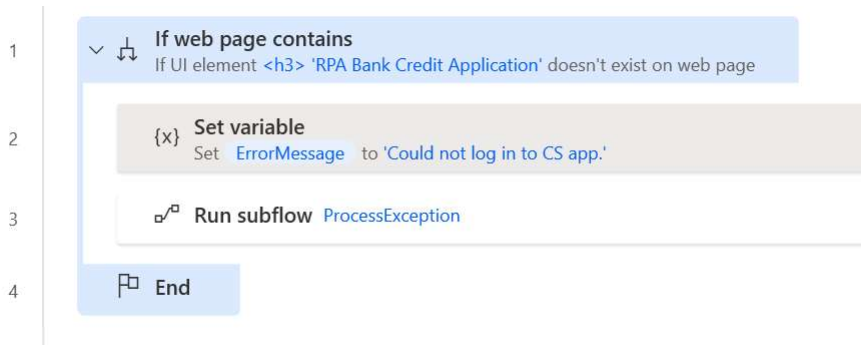
▼ All errors ⊕ New rule ✕ Clear all

Set **ErrorMessage** {x} to  {x}

Run subflow  ▼

Continue flow run Throw error

Example 2:



# Standard variable prefixes

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## TestData\_

If your test case requires a piece of data, like a customer ID, put it in a TestData\_\* variable and set its content in the **Given** section.

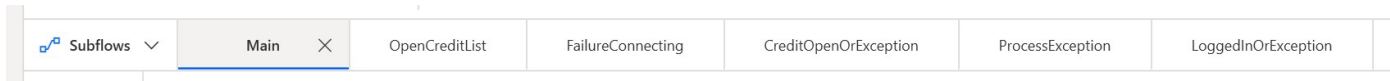
The screenshot displays a test case editor interface. On the left, a vertical line marks steps 2 through 8. Step 2 is a pink header bar labeled 'On block error' with a shield icon and the word 'Given' in blue. Below this, the 'Given' section contains three steps: 3. 'Set variable' for 'CurrentCase' to 'T11'; 4. 'Set variable' for 'ErrorMessage' to an empty string; 5. A blue link 'Add your test data variables below'; 6. 'Set variable' for 'TestData\_CreditRefNo' to 'K0P27L'; 7. 'Run desktop flow' for 'Init'; and 8. A pink 'End' block with a flag icon.

```
graph TD
    subgraph Given
        S3["{x} Set variable  
Set CurrentCase to 'T11'"]
        S4["{x} Set variable  
Set ErrorMessage to ''"]
        S5["Add your test data variables below"]
        S6["{x} Set variable  
Set TestData_CreditRefNo to 'K0P27L'"]
        S7["{icon} Run desktop flow  
Run flow with name: [CS] Init"]
    end
    S3 --> S4
    S4 --> S5
    S5 --> S6
    S6 --> S7
    S7 --> End["End"]
```



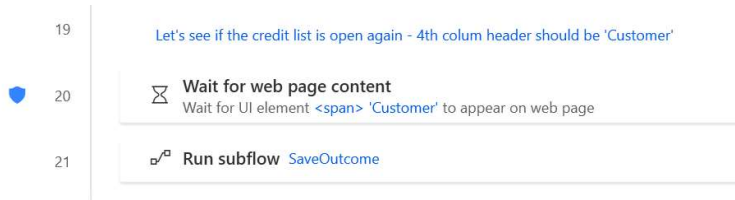
# Subflow structure

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## Main flow

It should end calling the **SaveOutcome** subflow. Example:

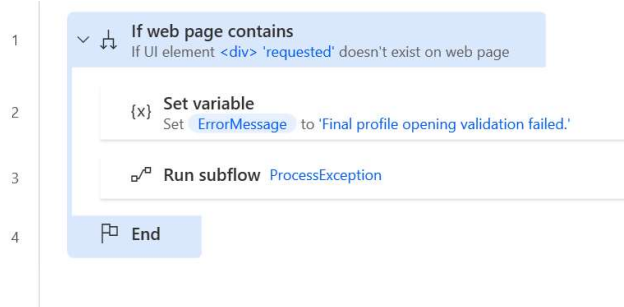


If there's any place where your flow could end successfully using the Stop flow action, you should call **SaveOutcome** there as well.

## ...OrException flows

These flows check your assertions. They are not taking any parameters, they are meant to silently finish if the assertion is satisfied, and fail otherwise.

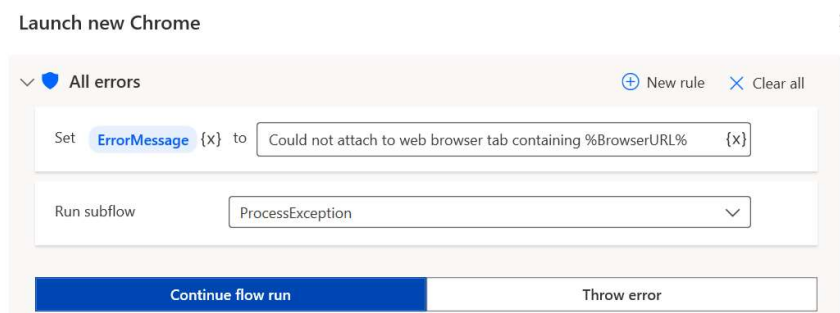
Example:



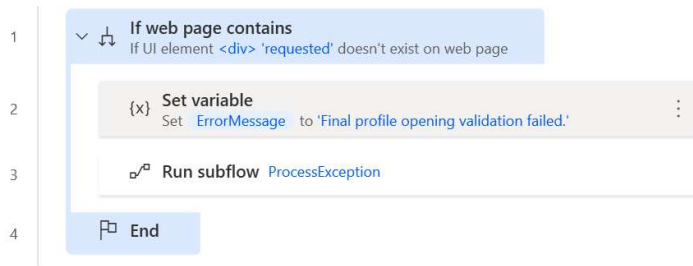
**Always check every single assumption that your flow has, and fail gently if they are not satisfied. Failing gently (through ProcessException) will help user understand what their fault was.**

Example assumptions:

The web browser is open - your attach to browser action will fail otherwise, so make sure you override that error using **ErrorMessage** and **ProcessException**. Example:



Logged in to a specific app - check if some common UI element is available on the page, and override the exception:



If the application is in progress of doing something, and it's not the start condition for your flow but a result of actions in that flow, it is better to use **Wait for web page content** and handle the **Timeout** error, than to just check if web page contains some element:

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**Wait for web page content**  
 Wait for UI element <span> 'Customer' to appear on web page

Select parameters
 

Web browser instance: %Browser%

Wait for web page to: Contain element

UI element: Web Page 'https://creditapp-poc.web.app/#/customers' > <span>

Fail with timeout error: ☒

Duration: 5 {x}

Advanced
 

Wait for web page content failed
 [New rule](#) [Clear all](#)

Timeout error
 [New rule](#) [Clear all](#)

Set ErrorMessage {x} to Save credit failed {x}

Run subflow ProcessError

Continue flow run
 Throw error

## ProcessException

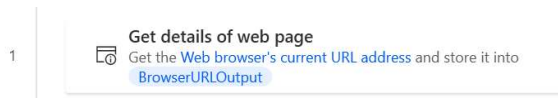
See [ProcessException flow](#). Only launched on unsuccessful close.

## SaveOutcome

This flow saves the most recent URL the browser is pointing to in **BrowserURLOutput** variable. **SaveOutcome** can also be used for any cleanup actions - but you should make sure it never throws any error on its own. If any of the cleanup actions is at risk of an error, you should catch the exception and handle it.

**SaveOurcome** will be launched on both successful and unsuccessful close.

Example code:



## All other subflows

Use as required.

However, if your subflow is requiring any parameters, and these are not among the [Standard variable names](#), it is a good practice to prefix the parameter flow variables with the prefix of the flow name.

Example: in a **SaveCustomerName** flow, the name to be saved is provided through **SaveCustomerName\_Name** variable.

# ProcessException flow

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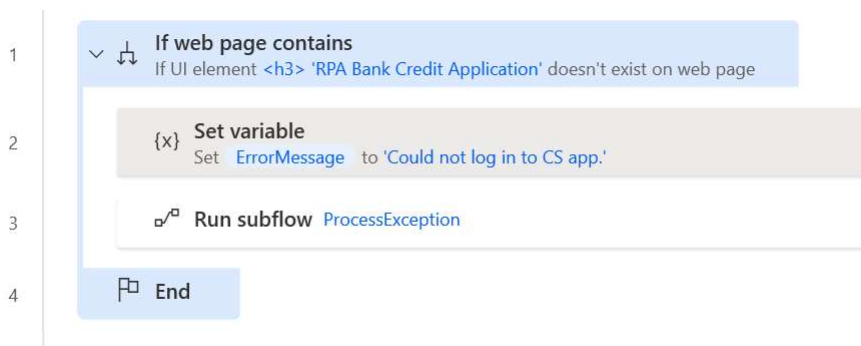
If you want to override an error and provide your own leading message, or you have a business error (no issue in PAD, but still your flow cannot continue), you should call **ProcessException**.

Before calling, set **ErrorMessage** to your custom error message.

Example 1:

The screenshot shows the 'All errors' configuration window. At the top, there are links for 'New rule' and 'Clear all'. The main configuration area has two sections: 'Set ErrorMessage {x} to' with a text input field containing 'Could not attach to web browser tab containing %BrowserURL%' and a dropdown menu set to 'ProcessException'. Below this is a 'Run subflow' section with a dropdown menu also set to 'ProcessException'. At the bottom, there are two buttons: 'Continue flow run' (highlighted in blue) and 'Throw error'.

Example 2:



The actual code for **ProcessException** updates the BrowserURLOutput variable with the latest the browser is pointing to, and throws an exception. Then, the calling process should look at exception details and catch the exception if desired.

Example:



# Tests

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# Modules provided in this toolkit

Tuesday, March 1, 2022 2:21 PM

## Contents

*Sample Integration* - this is an almost clean template for creating your own integration modules. Use this sample to create your own modules.

*EPA Website Integration* - this is an assembled module for integration with the Environmental Protection Agency, offering a simple action. Use this sample to learn how modules are built.

## EPA Website Integration scenario

This module implements the capability to connect to [AirNow.gov](https://airnow.gov) and retrieve pollutant information for a ZIP code.

### Available functions

- *[EPA] Init* opens the webpage and checks if search box is available
- *[EPA] Retrieve pollutants by ZIP code* - for a given U.S. ZIP code, provides primary pollutant, other pollutant(s) and location friendly name for verification purposes. Throws an error if primary pollutant is not available in a given ZIP.
- *[EPA] Close* - closes the web browser

### Test cases implemented

- T01 Basic Flow - checks a simple sequence of init + retrieve + close for Beverly Hills, CA. Verifies if location name matches ZIP code to see if we actually got data for Beverly Hills.
- T02 Sequential Calls - checks if two calls done in sequence will actually provide a different location name on 2nd call. Created to verify if multiple calls without closing the browser actually work OK.
- T03 Bad ZIP code - checks for error thrown on invalid ZIP code.

# Using the test case template

Monday, February 28, 2022 7:46 PM

The template for an integration module is provided as unmanaged solution. Since you can only load a particular solution once in any environment, you must take the following steps to make your own copy prior to any development.

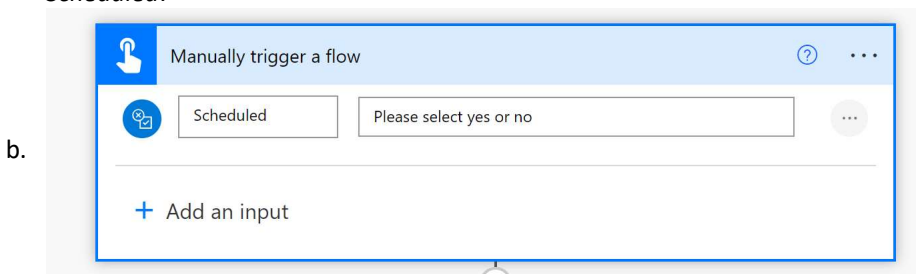
## Creating your copy of the *Sample Integration* solution

Here are the steps:

1. Import the *Orchestration Center* solution. Here we use a managed solution - we do not intend to make any changes to it.
2. Import the *SampleIntegration* unmanaged solution. You will use it later as a source of desktop flow templates.
3. Create your own, new solution (use your own publisher prefix, not kit's "rpakit\_")
4. Decide on your module name and prefix.
  - a. Module name should be alphanumeric (+ spaces)
  - b. Module prefix should ideally be a short acronym, uppercase - the prefix will be added to all test case names in square brackets
  - c. Module version - use just major and minor version number, i.e. 1.1 (not 1.1.0.7)
5. Create a stub of *[PREFIX] Test cases desktop* flow by making a copy of the *[SAMPLE] Test cases* template. Add the newly created flow to your new solution. Replace *[PREFIX]* with your actual chosen prefix from the previous step.

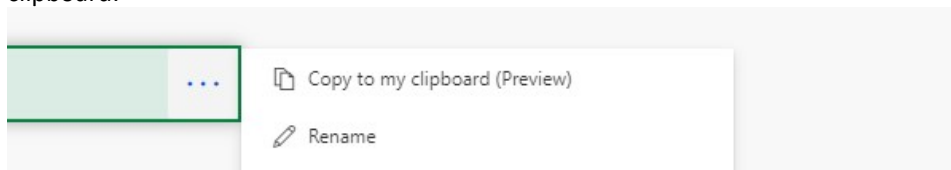


6. Fill in the values for *Module Name*, *Module Version* and *Module Prefix* in steps 2-4 of the *Init* subflow. Save & close.
7. Create the Dataverse Access Object (as shown in [Dataverse Access Object](#)) and add to your Azure Key Vault.
8. Create the necessary Dataverse records:
  - a. From the main Power Automate window (with the test cases flow closed), hit *play* to run the flow. Paste your Dataverse Access Object when asked for input parameters.
  - b. The flow should complete and report issues with test case *T01\_BasicFlow* - this is normal:
  - c. From the *Orchestration Center* solution, run the *Orchestration Center* app. You might want to bookmark it for later.
  - d. Navigate to *RPA Modules*. You should see a record created for your module. Click on the name to open its form.
  - e. From the browser URL, note the last GUID - this is the ID of your module record. Write it down, we will need it in the next step.
  - f. Example - you need the highlighted part:  
[https://org45b2a0fb.crm4.dynamics.com/main.aspx?appid=6b2f536c-3e99-ec11-b400-000d3abe520e&pagetype=entityrecord&etn=rpakit\\_rpamodule&id=99cc4196-4799-ec11-b400-000d3abf3b6c](https://org45b2a0fb.crm4.dynamics.com/main.aspx?appid=6b2f536c-3e99-ec11-b400-000d3abe520e&pagetype=entityrecord&etn=rpakit_rpamodule&id=99cc4196-4799-ec11-b400-000d3abf3b6c)
9. Now let's switch to Power Automate on the web. Create your own *[PREFIX] Run test cases instant cloud* flow as part of the new solution:
  - a. Your flow's trigger will be *Manually trigger a flow*. Add one yes/no parameter named *Scheduled*:



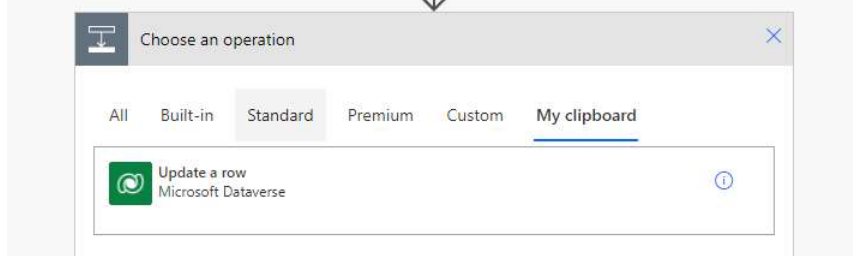
- c. Once you added the trigger, copy all the steps from *[CMS] Run test cases flow* using clipboard:

d.



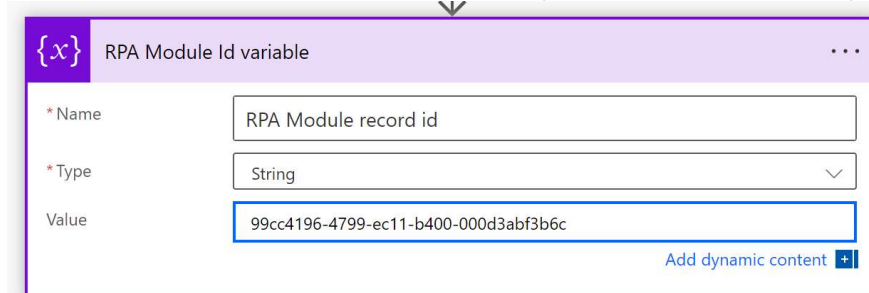
- e. And then paste them into your new flow: (opened in a separate browser tab)

f.



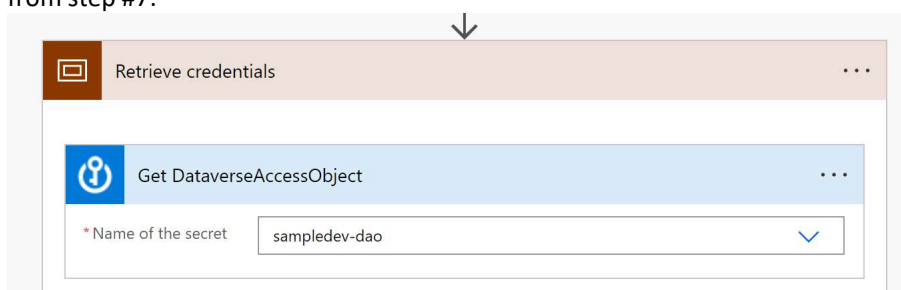
- g. In the default value for variable RPA Module Id, paste the ID obtained in step #8:

h.



- i. When copying the *Run a flow built with Power Automate for desktop* action, make sure you link it to your new desktop flow (*[PREFIX] Test cases*).
- j. In the *Get DataverseAccessObject* action, adjust the parameter to match your actual secret from step #7:

k.



- l. You might want to run this flow for testing. If everything runs smoothly, you should see a test case record and the results of the test in your *Orchestration Center* app:



m.

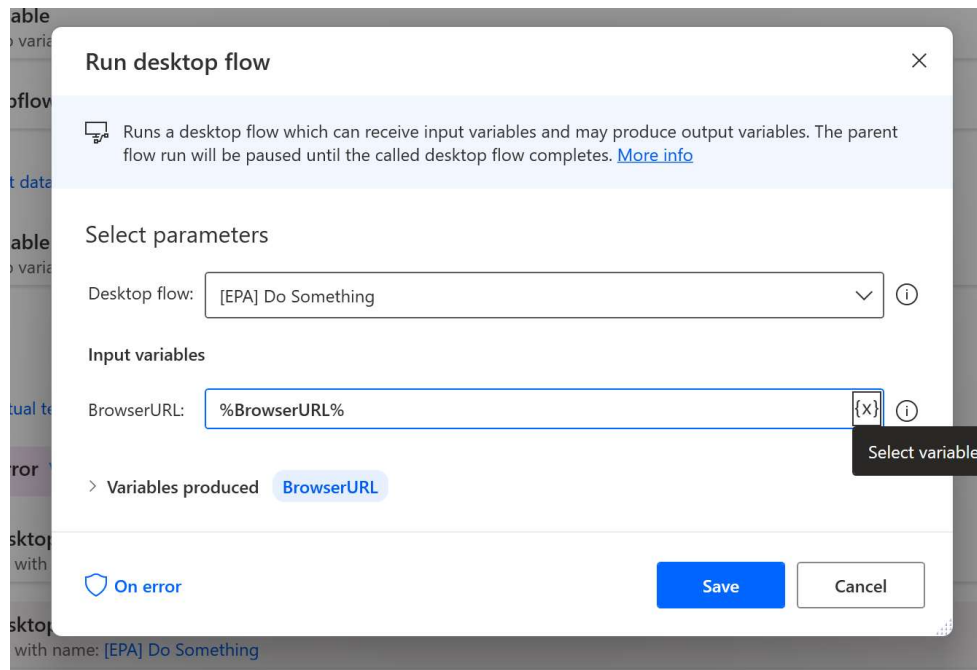
Name	RPA Module	Created On (Last Test Case Run)	Output (Last Test Case Run)
[EPA] T01 Basic Flow	EPA Website Integration	3/1/2022 11:38 AM	"When" block failed (Subflow: , Action: -1, Action name: Er...

10. In a similar way, copy *[SAMPLE] Ad-hoc test run* to *[PREFIX] Ad-hoc test run*:
  - a. You will need to create the trigger manually, as triggers cannot be copied through clipboard.
  - b. Make sure you open the advanced options in the trigger, and copy also the values for select columns and filter rows.
  - c. Update the search criteria in *Filter rows* to **match your module name** (see #4 above).
  - d. Once the flow is saved, go back from edit page to flow overview. Open *Run only users*:
 

e.

**Run only users** Edit

Your flow hasn't been shared with anyone.
  - f. For every connection that says *Provided by run-only user*, switch to the other option which should be a specific connection for your username. Accept the warning message.
  - g. Add the newly created flow to your solution.
11. Once more, copy a flow one step at a time - from *[SAMPLE] Scheduled test case run* to *[PREFIX] Scheduled test case run*:
  - a. Make sure you link the child flow action to the proper child flow - it should be your new *[PREFIX] Run test cases (child)*.
  - b. Add the newly created flow to your solution.
12. Create your module's Init, Close and all other desktop flows as required. Do not rename the *[SAMPLE]* ones, instead open Power Automate Desktop and make copies with new names (with your *[PREFIX]*). Make sure you add all your desktop flows to the new solution.
13. If you intend to use the T01 test case example, please adjust the function calls for Init, Do Something and Close to their respective versions for your *[PREFIX]*.
  - a. Whenever you change the *Run desktop flow* action in any flow (i.e., in the test case), make sure that you update the mapping of its output variable. The output parameter *BrowserURLOutput* should be stored in the *BrowserURL* variable instead. Example:



- b.
- c. The BrowserURL variable should be always in both the input data as well as output mapping, to ensure that the parent flow is always aware of what URL is the web browser pointing at.
  - d. See [Browser handle](#) for more information on browser URL handling.
14. When done with the module functions, export the module into a managed solution to bring it to your target assembly environment.

# Dataverse Access Object

Monday, February 28, 2022 6:19 PM

The **Test cases** flow template uses Dataverse to record outcomes of the tests that have been carried out. The *Dataverse Access Object* is a connection string that you need to pass as a parameter to the **Test cases** desktop flow.

## Azure AD configuration

The following steps need to be carried out to allow desktop flows to access Dataverse:

- 1) In *Azure Portal*, configure *Azure Active Directory* for your tenant (for small projects and trial tenants, this is a free service).
- 2) In *Azure Active Directory*, go to *App registrations* and create a registration for Power Automate Desktop.
- 3) Since ideally you should have separate users for each environment, you might want to include your environment name in the name of the app registration (i.e. "PAD user for DEV")
- 4) Once your app registration is saved, note the following values - you will need them later:
  - a. **OAuth 2.0 token endpoint (v2)** - click on "Endpoints" to obtain
  - b. **Application (client) ID**
  - c. **Client secret** - click on "Add a certificate or secret" and then "New client secret" to obtain. You will need to record it immediately after creation, as it will not be accessible later.

The final Dataverse Access Object is a JSON-encoded array of strings, where index 0 is the token endpoint, 1 is client ID, 2 is client secret and 3 is your organization URL with `https://` prefix (no trailing '/' needed).

Sample:

```
['https://login.microsoftonline.com/89ca8979-abcd-9cde-ab31-0e14fcc21aaa/oauth2/v2.0/token',  
'0e286789-b506-1234-1234-dd2deed57809',  
'oiuewf98p23oirewf98opijk239r8pweoijk',  
'https://yourorganization.crm4.dynamics.com']
```

## Creating an application user

Next, we need to create an application user and assign a security role:

- 1) Open Power Platform Admin Center (<https://aka.ms/ppac>)
- 2) Select your environment, click *Settings*, then *Users + Permissions* and finally *Application users*.
- 3) Click *New app user*, then select the application you created in previous step
- 4) Select business unit (top level) and security role (*Power Automate Desktop user for test cases*)

## Storing

Recommendations for handling your Dataverse Access Object:

- The client secret you created will expire by default in 6 months. Make sure you have a process in place for timely refresh of your client secrets.
- Avoid reusing the same application/client IDs and secrets for multiple environments - you should have a separate string for each environment
- The JSON value is effectively a connection string that grants access to your environment. Store it in a proper credentials vault, i.e. Azure Key Vault.
- Never set any default values for the *DataverseAccessObject* input parameter
- Never assign admin permissions to the newly created app user - use the provided security role for this.

# Customizing the template

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## Required steps prior to using the template

You must do the following:

- Each test case must have a unique name
- The name is configured in the *CurrentCase* variable (line 3):

The screenshot shows the RPA Studio interface. At the top, there is a toolbar with icons for Save, Run, Stop, Run next action, and Recorder. Below the toolbar is a tabbed interface with tabs labeled 'Subflows', 'Main', 'T01\_BasicFlow', 'Init', and 'Sav'. The 'Subflows' tab is active, showing a table of steps:

Step	Description
1	This section prepares your use case. Any error here is an error in test specification or
2	On block error Given
3	Set variable Assign to variable CurrentCase the value 'T01 Basic Flow'

# Test case naming

Wednesday, January 12, 2022 10:20 AM




## Txx\_CaseName

**Txx** - two digit case number. It is not required that there would be no gaps - feel free to use multiplies of 10 for signifying areas. Example:

8	 Run subflow T06_RetrieveCredit_var2
9	 Run subflow T07_RetrieveCredit_var3
10	 Run subflow T10_SetCreditRequested
11	 Run subflow T11_SetCreditRequested_NoPage
12	 Run subflow T12_SetCreditRequested_WrongRef

T1x cases are for setting credit requested parameter.

**CaseName** - name of the action or behavior being tested.

3	 Run subflow T01_BasicFlow
4	 Run subflow T02_LoginFailed
5	 Run subflow T03_RetrieveCustomerTwice

## Txx\_CaseName\_variant

If there are multiple variants of the function behavior, test them in cases grouped with common case name. Example:

7	 Run subflow T05_RetrieveCredit
8	 Run subflow T06_RetrieveCredit_var2
9	 Run subflow T07_RetrieveCredit_var3

These are variants, not *versions*. All variants are meant to be used, they're just different things being tested.

# Subflow structure

Wednesday, January 12, 2022 10:06 AM

Subflows	Main	T01_BasicFlow	T02_LoginFailed	Txx_Template	SaveOutcome
----------	------	---------------	-----------------	--------------	-------------

## Main

all your actual cases should be called from here. Example:

1

RPA Testing Template v.0.11  
History:  
0.11 SaveOutcome now clears %ErrorMessage% as last step to prevent accidental propagation

2

+

Create new list

Create a new list and store it to List\_TestOutput

3

Run subflow

T01\_BasicFlow

4

Run subflow

T02\_LoginFailed

5

Run subflow

T03\_RetrieveCustomerTwice

6

Run subflow

T04\_GetLastOrderRef

7

Run subflow

T05\_RetrieveCredit

8

Run subflow

T06\_RetrieveCredit\_var2

9

Run subflow

T07\_RetrieveCredit\_var3

10

Run subflow

T10\_SetCreditRequested

11

Run subflow

T11\_SetCreditRequested\_NoPage

12

Run subflow

T12\_SetCreditRequested\_WrongRef

13

Display message

Display message List\_TestOutput in the notification popup window with title 'Status'.

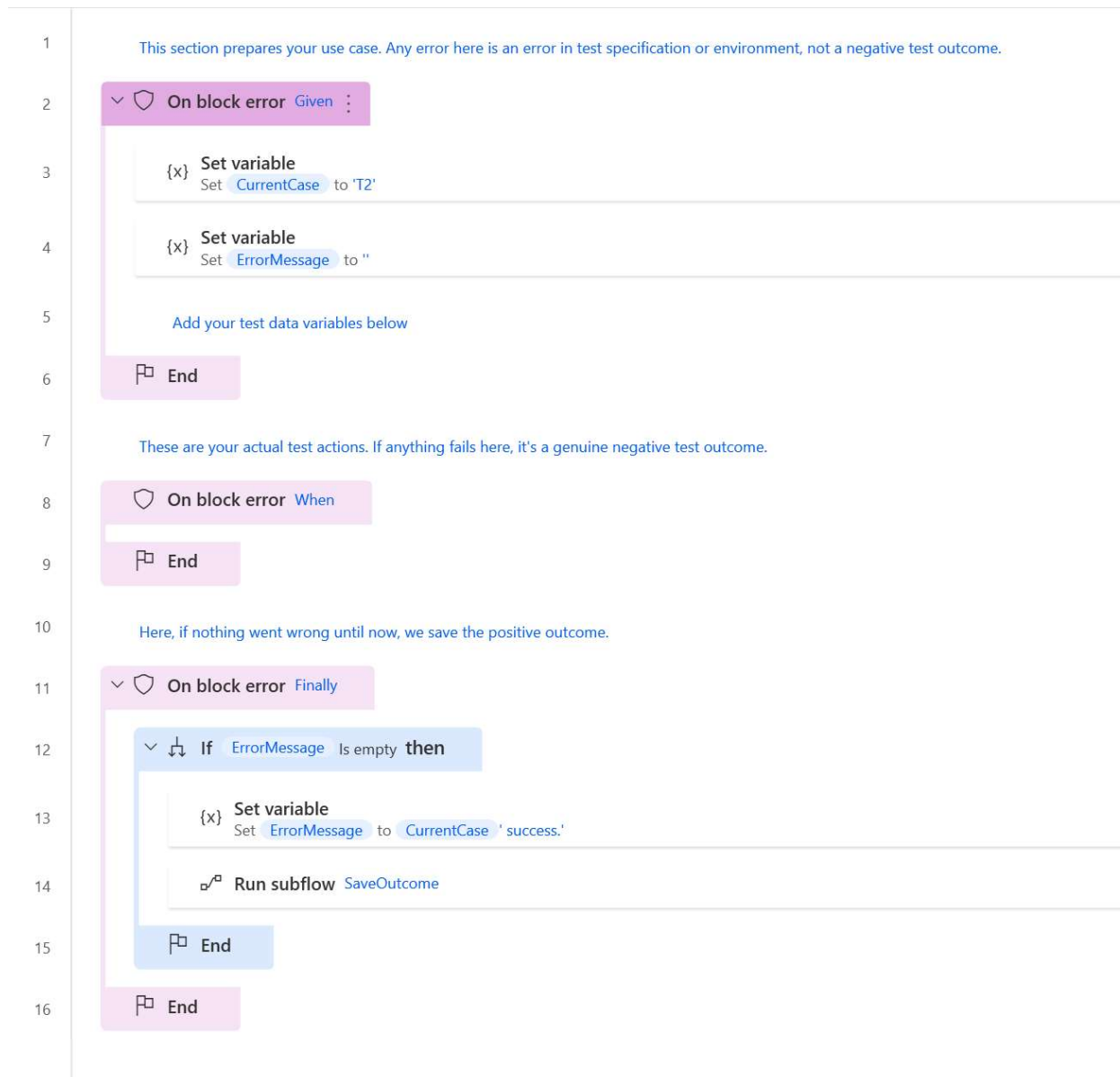
You may disable cases you don't need while you're working on the scenarios. Cases should not depend on each other - every case must contain its own starting conditions and must clean up (i.e. close browser).

## T00\_CaseName

These are your cases. They should append "Txx success" to List\_TestOutput variable on success, or error description on failure. Use SaveOutcome for this.

## Txx\_Template

A template for building more test cases. Example:



## SaveOutcome

# Given-When-Finally

Wednesday, February 23, 2022 10:15 AM

Modification of standard pattern Given-When-Then, adapted to the Power Automate Desktop (*then* is a reserved keyword)

Reference:

[What is "Given - When - Then"? | Agile Alliance](#)

? \*\*\* describe finally / invert block



# Data driven testing

Monday, February 28, 2022 6:20 PM

\*\*\* todo: you can create a dataflow that will load your test records into Work Items and compare outputs.

\*\*\* todo: data driven testing add-on module (addl. field in Work items, flow to compare, dashboard for display)