

# My Workflow Runs are not running in the order I expect

Last Modified on 26/05/2020 5:48 pm AEST

While Workflow Runs are triggered on a first come, first serve basis, the order in which the Workflow Runs will be executed is not guaranteed to adhere to that order. This is not a Platform shortcoming but simply the case where potentially hundreds of Workflows may be queued to run or currently running cannot be handled in an enforced consecutive manner. In the vast majority of cases this will not have any impact on the correct functioning of the application, but it can present a potential issue if the Workflows have been designed in such a manner that timing down to the millisecond level becomes important - and should be a foremost design concern in the application architecture.

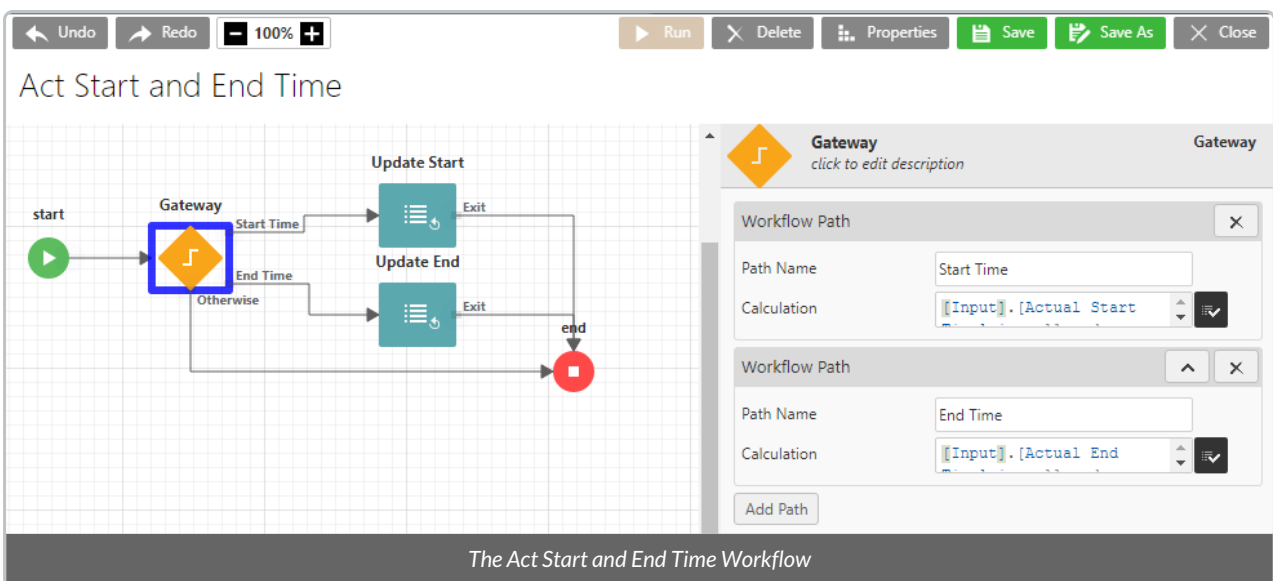
Consider a Parent Workflow A, which itself contains Child Workflows X, Y, Z and there are numerous Activities that result in firing off Triggers which in turn start their associated Workflows, each of which may have their own Child and Triggered Workflows. When designing a series of coordinated Workflows, and walking through all the possible paths and triggering events, there may be a scenario where the value of a particular Field in particular Record is used for a Calculation in another Workflow, and that value may not be the expected value at the time the latter Workflow executes.

## Sample Case Study

The Tenant Administrator had noticed that on a very few Records, an important piece of data was missing which was meant to be populated by a Workflow. These Records were for *IT Recovery Scenarios* which included the fields *Actual Start Time* and *Actual End Time*, which are in turn used in calculating the real elapsed time taken to execute that *IT Recovery Scenario*.

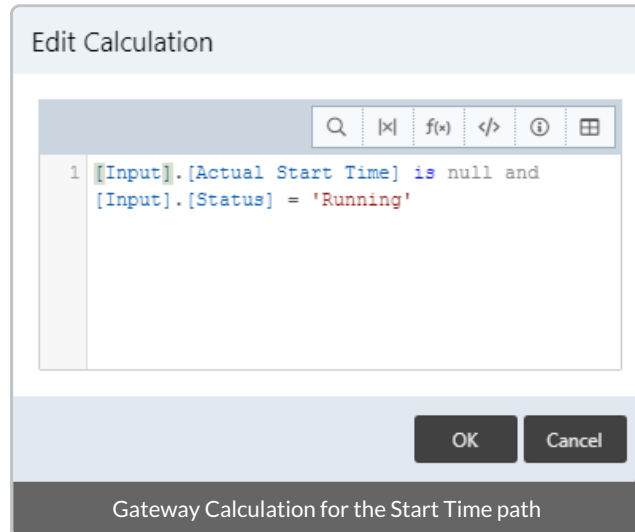
However, out of thousands of *IT Recovery Scenarios*, there were 6 that were missing *Actual Start Time*. As such, the elapsed time could not be calculated.

The Tenant Administrator knows which Workflow is responsible for setting the *Actual Start Time* and opens it in the Workflow Builder to commence troubleshooting. This Workflow is called *Act Start and End Time*, and the Input is an *IT Recovery Scenario* record. *BELOW*



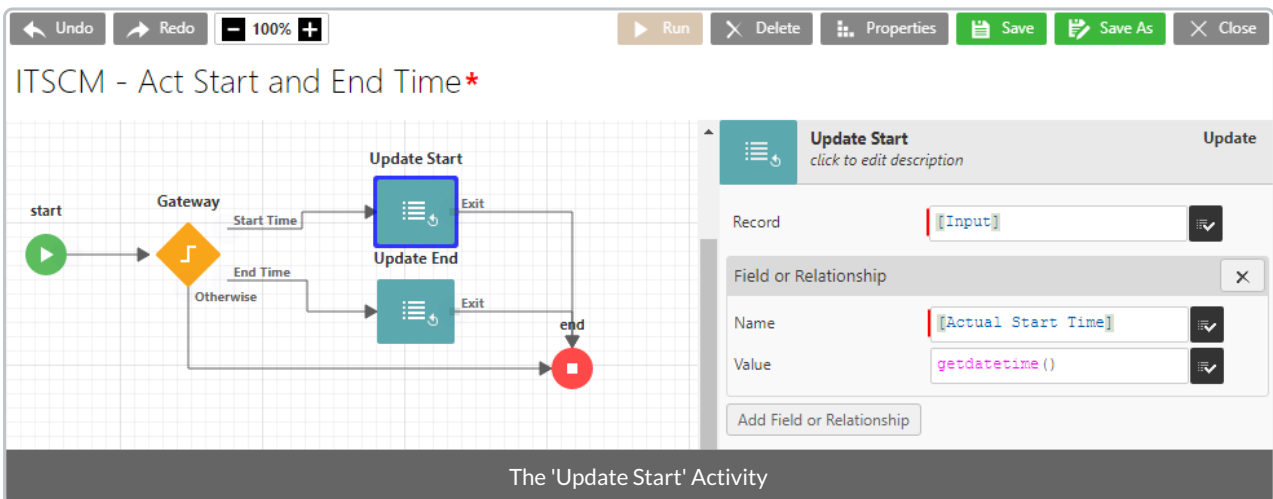
The Tenant Administrator inspects the Gateway Activity and opens the Calculation used to determine the criteria

that the Gateway will take the *Start Time* path.



This Calculation is saying "if the *IT Recovery Scenario* has no *Actual Start Time* value and the value for the field *Status* on this *IT Recovery Scenario* is equal to *Running*, then take this path".

The Tenant Administrator inspects the *Update Start* Activity - this appears to be straight forward.



It simply updates the value of *Actual Start Time* on the Input Record (*IT Recovery Scenario*) with the current date and time.

There is nothing that looks complicated about this Activity, and it has worked for the vast majority of Records that have been passed through it. Using the **Examine Workflow Run**, the Tenant Administrator views the *Steps Taken* tab for the *Act Start and End Time* Workflow for the record that was missing the *Actual Start Time* and notices a key piece of information - the Gateway did not take the *Start Time* path, and instead went straight to the End Activity.

Steps taken

Timestamp	Step	Activity	Evaluate inputs (ms)	Run (ms)
2020-05-25 14:39:43.777 +1000	1	Gateway	2	4

The Gateway was the only Activity executed

For some reason, based on the available evidence, the Calculation:

**[Input].[Actual Start Time] is null and [Input].[Status] = 'Running'**

... is returning FALSE (for the sake of accuracy, both paths evaluate as FALSE since neither path was taken, but we are focusing on Start since the expectation is that this returns TRUE). For that to occur, either the *Actual Start Time* is not empty, or the value for the *Status* field on the Input *IT Recovery Scenario* is not *Running*. Given that the problem the Tenant Administrator is troubleshooting is that the *Actual Start Time* is empty, that leaves only the other alternative - that the value for the field *Status* is not set as *Running* when this Gateway was evaluated.

The Tenant Administrator determines that the *Act Start and End Time* Workflow has a Trigger for it.

Triggers

TRIGGER ON CREATE/UPDATE

Search

Trigger on Create/Update	Workflow to Run	Object to Trigger on	Enabled	Applications	Last im...	Modifie...
Trig Step Start and End Time	Act Start and End Time	IT Recovery Scenario	✓			

The Trigger responsible for Act Start and End Time

Inspecting the Trigger, it is seen that the *Act Start and End Time* Workflow will be run whenever the Relationship *Status* on a Record of type *IT Recovery Scenario* has been updated.

**TRIGGER DETAILS**

Enabled:

Triggered on: **Update**

Object to trigger on: IT Recovery Scenario

Workflow to run: ITSCM - Act Start and End Time

Run in foreground:

Allow self triggering:

Fields to Trigger on Relationships to Trigger on Running Workflows

↻ ACTION ↻ EDIT INLINE

Name	From Object	Secure...	Clone ...	Secure...	To Object	Cardinality
<b>Status</b>	IT Recovery Scenario	No	Clone R...	No	Status	Many to one

Trigger definition for when to run 'Act Start and End time'

The Tenant Administrator opens the Form for the IT Recovery Scenario to check in what ways the *Status* Field may be changed. When editing a Record, it can be seen that the *Status* Field is not directly editable from the Form. However, there is an Action Button labelled Start.

Step #4

Save Cancel

Start

**STEP EXECUTION DETAIL**

Step ID: 4

Name: Step #4

Recovery Instructions: DBA team will execute the job

Execution Order: Sequential

IT RTO: [Select]

RTO Start?:

RTO End?:

**EXECUTION METRICS**

Ready to start?:

Status: ● Not Started ⓘ

Exp Duration (Mins): 45

Actual Duration (Mins):

Business Constraint: None (As soon as possible)

Estimated Start Time:

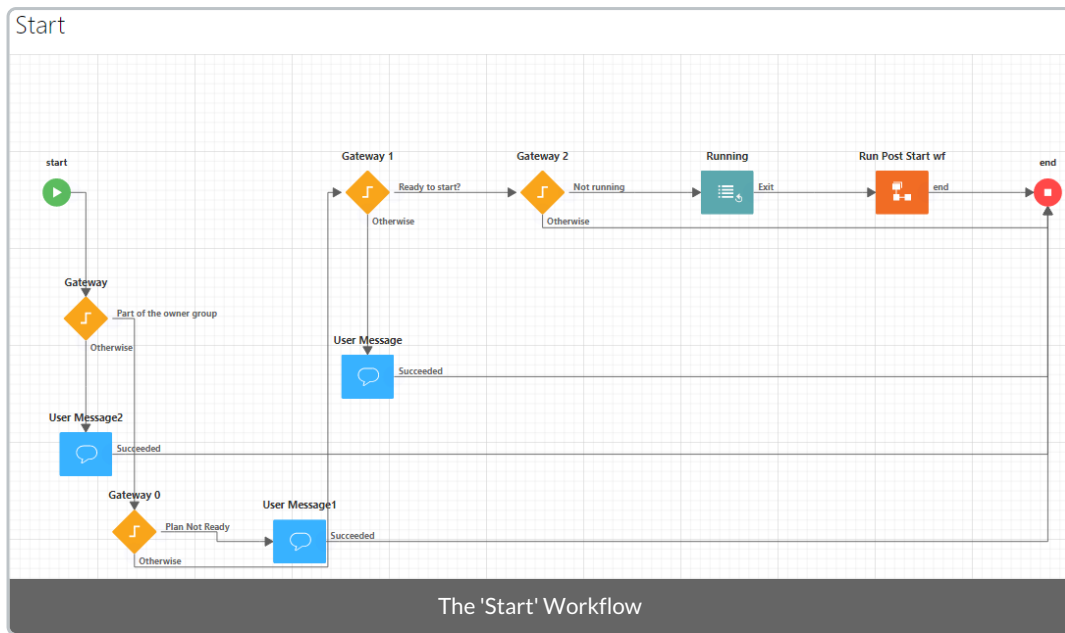
Actual Start Time:

Estimated End Time:

Actual End Time:

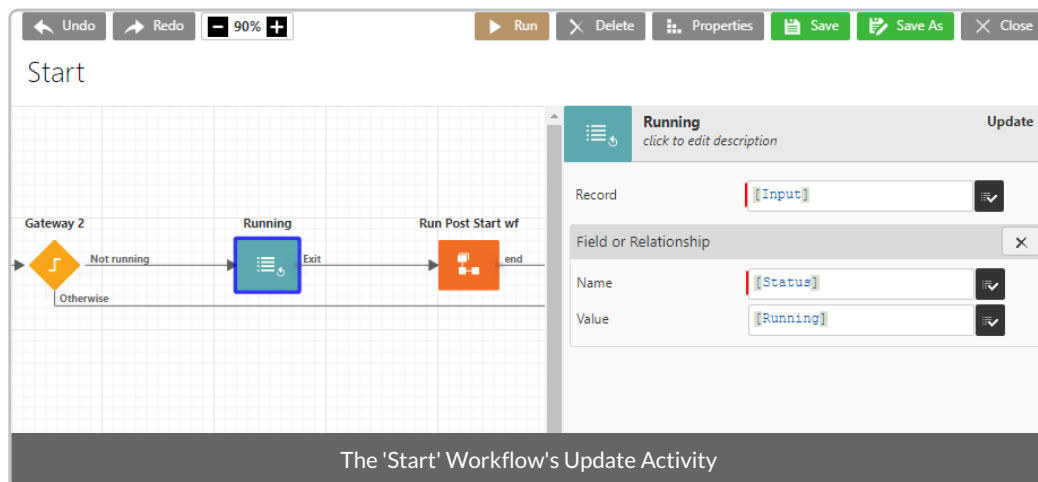
An IT Recovery Scenario Record

The Tenant Administrator then opens the *Start* Workflow in the Workflow Builder.



There are several Gateways which provide validation checks to ensure that this *IT Recovery Scenario* may be started - whether the initiator is part of the group that owns this *IT Recovery Scenario*, whether it has been marked as ready, whether it has been allowed to be started, and whether it was already marked as *Running*.

Inspecting the sole Update Activity in the Workflow reveals that this is how the Trigger to run *Act Start and End Time* is fired - an update to the *Status Relationship*.



The scenario is as follows:

1. A user is viewing an *IT Recovery Scenario* who is a member of the group that owns it
2. The *IT Recovery Scenario* is marked as both ready and allowed to start, and it is not marked as *Running*
3. The user presses the Start Action button, and the *IT Recovery Scenario* Record is passed into the Start Workflow
4. It passes all of the Gateway checks contained within the Start workflow and reaches the *Update* Activity
5. The *Running* Update Activity changes the value of the Status Field from *Not Started* to *Running*
6. This change triggers the *Act Start and End Time* Workflow to execute, which takes the same *IT Recovery Scenario* Record as input

7. The Gateway in *Act Start and End Time* evaluated to FALSE, and by elimination it is because the value of the Status Field is not *Running*
8. The *Act Start and End Time Workflow* proceeds directly the End activity, and the value for *Actual Start Time* is not set

Due to the way that Workflows are queued, and depending on the precise timing, it is possible that the *Act Start and End Time* workflow runs to completion before the change to the value of the *Status* Field has been propagated to the database. In the vast majority of the cases this does not happen - when the *Act Start and End Time Workflow's* Gateway evaluates, the *Status* Field has been changed to *Running*.

However, in a very small number of cases this condition does occur, and as such the way these Workflows are implemented needs to be changed.

Consider that there are two Fields which are being acted on - the *Status* Field and the *Actual Start Time* field. Both of these values are on the same *IT Recovery Scenario* Record, and yet the updates are in two separate Workflows. The second Workflow, *Act Start and End Time* serves no other function than to set the *Actual Start Time* (and *Actual End Time*).

There is no reason to split the updates into two Workflows - there is an existing *Update Activity* in the *Start Workflow* that is already making a change to one Field. The solution is set the *Actual Start Time* in the same *Update Activity* that changes the *Status* Field.

The screenshot shows a configuration window for an 'Update' activity. The activity is titled 'Running' with a sub-label 'click to edit description'. There are two field update sections. The first section has 'Name' as '[Status]' and 'Value' as '[Running]'. The second section, highlighted with a red border, has 'Name' as '[Actual Start Time]' and 'Value' as 'getdatetime()'. Below the field sections is a button labeled 'Add Field or Relationship'. At the bottom of the window, the text 'Mitigating the race condition' is displayed.

Before the Tenant Administrator is moves the update to the *Actual Start Time* out of the *Act Start and End Time* Workflow, the impact needs to be considered. The *Act Start and End Time* had Gateway conditions to dictate when to set the *Actual Start Time*:

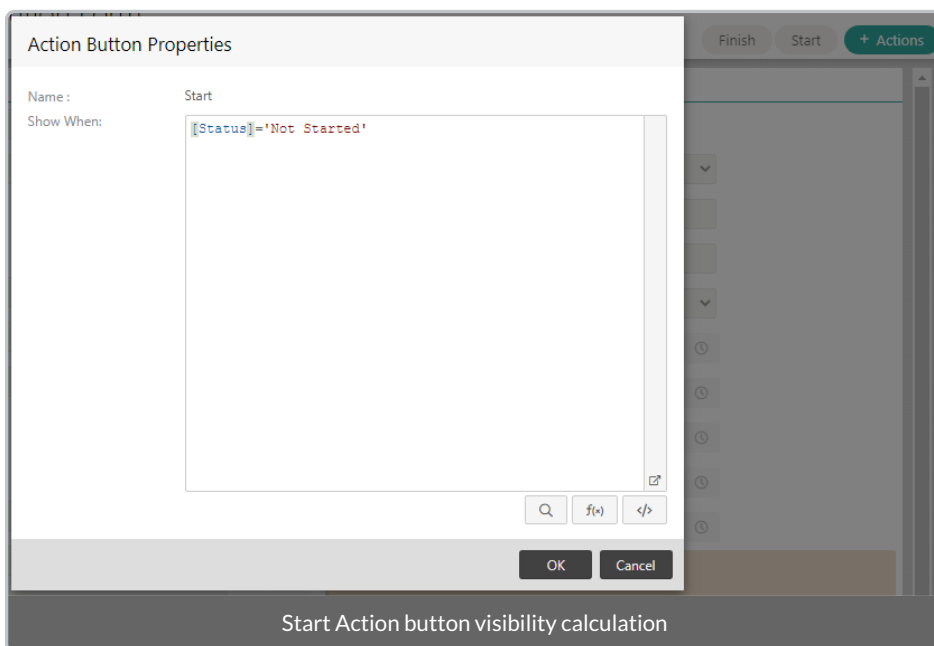
**[Input].[Actual Start Time] is null and [Input].[Status] = 'Running'**

The second condition is checking whether the *Status* Field is set to *Running*, and given that the *Running Update Activity* is setting *Status* Field to *Running*, this does not represent a problem - there is no need to check as that condition is being set in that *Update Activity*.

The first condition is checking that there is no *Actual Start Time* value. This could be a problem if someone is able to

run the *Start Workflow* using an *IT Recovery Scenario* that is already *Running* or *Completed* where there is an existing value for *Actual Start Time* - the original value would be overridden with an incorrect value.

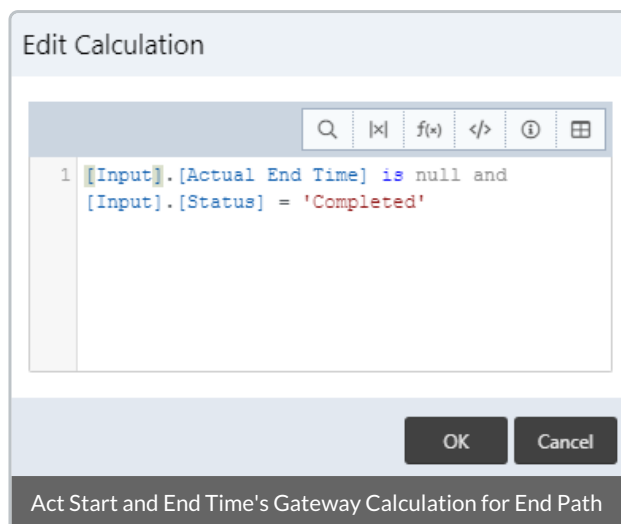
The Tenant Administrator revisits the *IT Recovery Scenario* Form and checks the Start Action Button. It is only visible when the *Status* Field is set to *Not Started*.



As long as the following criteria are met, it is safe to make the change:

1. There is no other valid path to populate *Actual Start Time* apart from the *Start Workflow*
2. The *Start Workflow* can only be initiated on an *IT Recovery Scenario* Record via the Start Action button on the Form
3. That the default value for all *IT Recovery Scenario* Records for the *Status* Field is *Not Started*

Once this is done, the Tenant Administrator knows there is another avenue to check, even though there is not yet an issue arising from it - the Act Start and End Time Workflow, as the name states, does both the Start and End times. It is possible that the Gateway that evaluates the condition for the End path may be vulnerable to the same problem.



The Tenant Administrator now follows a similar analytical approach as they did with the Actual Start Time to determine if there is a safer way to implement this.

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