

# Benefits of Test Automation in Time Travel Testing

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14/09/2022





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**Time Travel Testing - An Overview** : Background and business impact of time travel testing

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**Necessity of Test Automation**: Key advantages and business value of using test automation in time travel testing

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**Phases and Subsequent Steps in Time Travel Test Automation**: Time Travel test automation is a process which can be broken down into phases and then into granular steps. This section will deep dive into the nitty-gritty of time travel testing

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**Best Practices & Accelerator Ideas**: Best practices associated with time travel testing and some common ideas which assist teams to develop accelerators

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**Challenges & Corresponding Mitigation**: Frequent challenges faced during time travel test automation and mitigation of the same

- Covid 19 has immensely disrupted the way business was done. Apart from that , there is a possibility of economic slowdown across the globe. In this scenario ,along with expansion into the newer pasture , retaining existing customer base is an extremely important task for the organization
- In order to retain customers where relationship gets re-established after a fixed period of time , a flawless and smooth renewal experience is required
- By effectively leveraging time travel testing organizations can attain the same. In this presentation all the key aspects of time travel testing and how test automation can improve the overall quality will be discussed

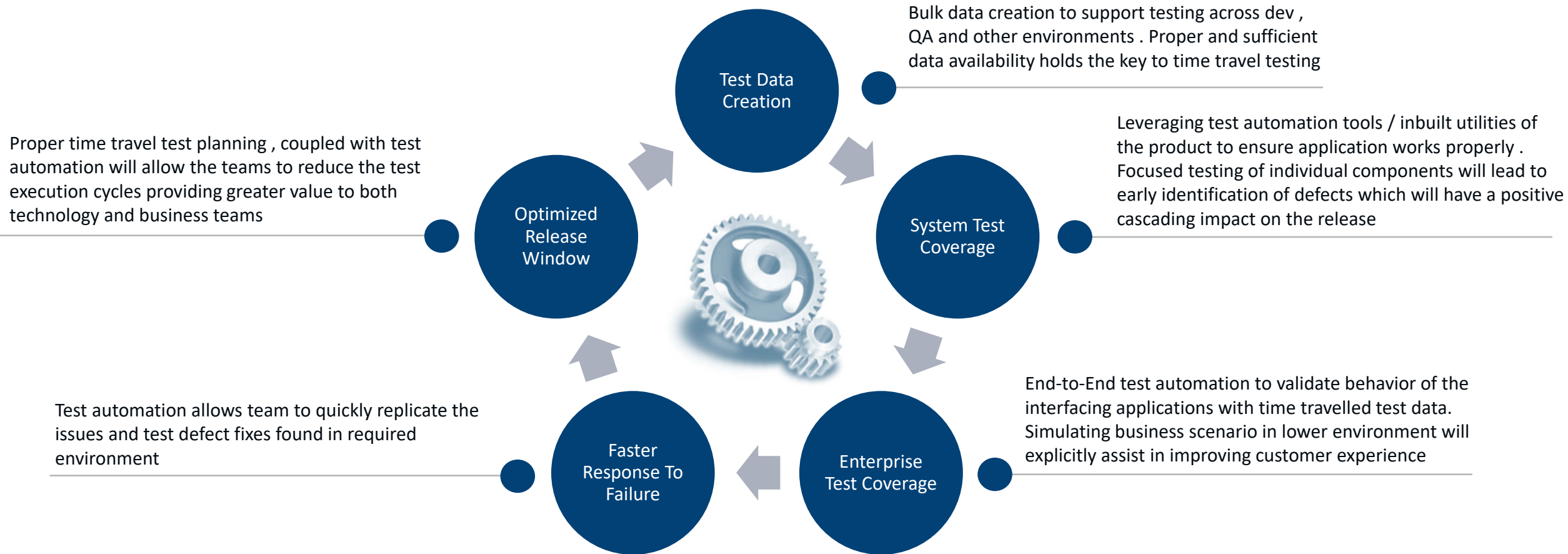
## What is Time Travel Testing

- In time travel testing required system(s) either travels backwards or travel forward based on the business scenario
- Then test data gets prepared either on the past date or in the future date. Post that system(s) travels to the required date and testing is performed
- Focus should on covering all possible renewal scenarios and also validating how interfacing applications are accommodating renewed test data

## Why Is It Required

- Time travel testing focuses on the renewal business scenario. It is an extremely important component for businesses. According to Havard Business Review ***“Increasing customer retention by 5% improves profits by 25-90%”***
- It will improve the holistic customer experience. This will implicitly have an impact on future customer acquisition along with the existing once
- There are business requirement in some countries where by a specific documentation needs to be shared within a specific time . All those activities need to be monitored.

# Necessity of Test Automation

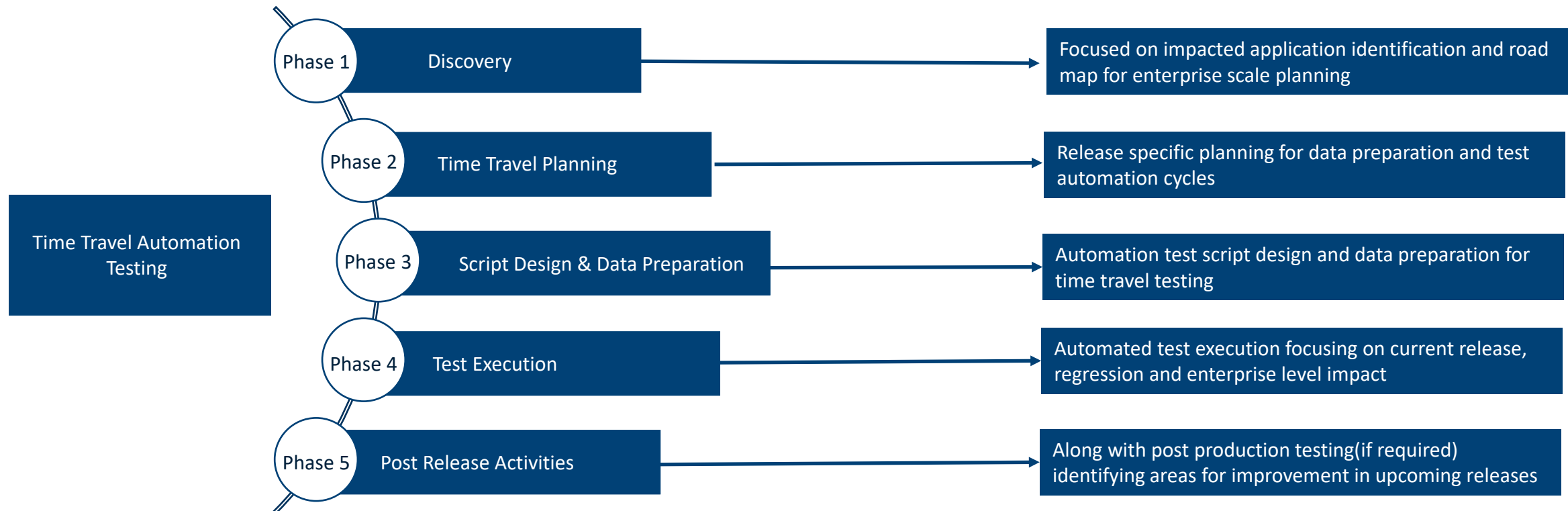


## Phase & Steps in Time Travel Test Automation

- Phases in Time Travel Test Automation
- Phase 1 – Discovery
- Phase 2- Time Travel Planning
- Phase 3 – Data Preparation
- Phase 4 – Test Execution
- Phase 5 – Post Release Activities

# Phases in Time Travel Test Automation

Benefits of test automation can be achieved by following a five phase approach . This approach holds good for both agile and for waterfall model. It will assist any program looking to implement time travel test automation .



# Phase 1-Discovery

The first phase of time travel test automation is the discovery phase where team will perform a set of activities to define the roadmap for the program. This phase doesn't need to be repeated for every release but it is extremely critical to start journey . In this slide key steps of the phase and Responsible-Accountable-Consulted-Informed matrix will be covered

## Stakeholder Identification

Identify the stakeholders responsible for driving the entire time travel process

## Application Selection

Work with the stakeholders to identify the set of applications that will be impacted

## Time Travel Mechanism

Define approach for individual applications on how to change the date to a past date or a future date

## Proof of Concept

Perform proof of concept by shifting the dates and validating functionality with test automation

## High Level Plan

Define a template for time travel calendar which can be followed in future releases

RACI Matrix

Steps	Business Stake Holder	Enterprise Architect	Project Manager	Development Team	Infrastructure Team	QA Team
★ Stakeholder Identification	R	R	R	I	I	I
★ Application Selection	I	R	R	R	R	I
Time Travel Mechanism	I	R	R	R	R	I
Proof of Concept	C	C	R	R	R	R
High Level Plan	C	C	R	R	R	R

**R** Consulted    **C** Responsible    **A** Accountable    **I** Informed

★ Roles mentioned in the RACI is not be limited to above five only. In the next slide more roles pertaining to Stakeholder identification will be discussed. Along with that generic mechanism for 'Application Selection' will be discussed in more details.

Stakeholder identification and Application Selection are two very important tasks for time travel testing. This slide talks about expected outcomes from these two phases, some of the key people who should be involved and considerations for application selection. These activities will be generic across different verticals.

## Stakeholder Identification

**Below are some of the main people who should be responsible for identifying the stakeholders driving the program**

- Chief Enterprise Architect – Responsible for selecting an enterprise architect having knowledge around how systems will collaborate together
- Networking Administrator – Analyse the possible impact from a networking perspective and select a team accordingly
- Delivery Program Manager – Define the initial communication model and SLAs. Identify possible development points of contacts and project managers
- QA Program Manager – Understanding the scope of work and start preparing a team for executing the job on the ground
- Principal Database Architect – Identifying a team who will be involved in the entire time travel testing cycle

### Outcome expected at the end of this phase

- A team of technical and functional experts should be in place who will be able to drive the program
- Key people need to be identified along with proper backups
- Initial communication mechanism and escalation model to be chalked out

## Application Selection

**There are two key aspects here. Firstly applications which need to be time travelled have to be identified. Secondly applications which will be impacted by the time travelled data need to be decided. Below are some of the indicative applications:**

- The main system where policy renewal process will take place
- Offer management system where type of offers and sequencing of offer changes based on time of year
- Valuation system which will drive the cost of policy
- Billing systems
- Communication management systems responsible for sending social media feeds, emails, sms etc. to customers
- Any other applications which interface with the time travelled app

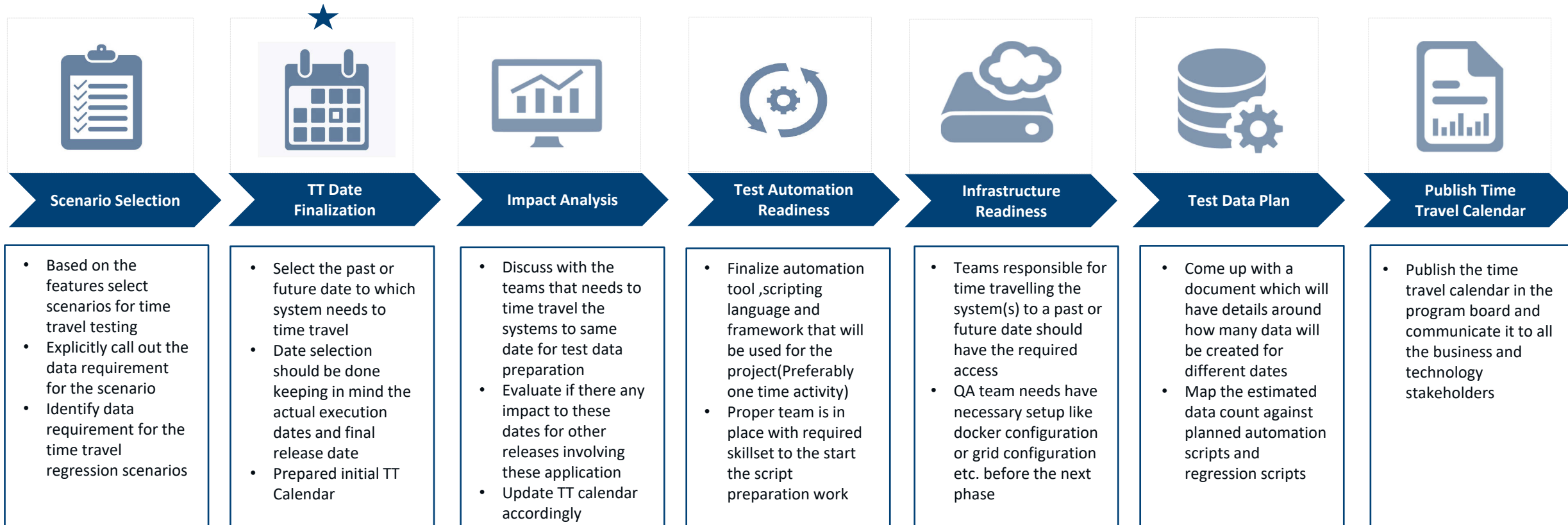
### Outcome expected at the end of this phase

- Identification of the applications which need to be time travelled
- Identification of the applications which need to be validated with time travel test data
- Selection of point-of-contacts and back ups for all these applications





# Phase 2-Time Travel Planning

Preparing a detailed 'Time Travel(TT) Plan' and communicating it efficiently with the stakeholders is the next step of the journey. This slide talks about the different steps in the planning stage



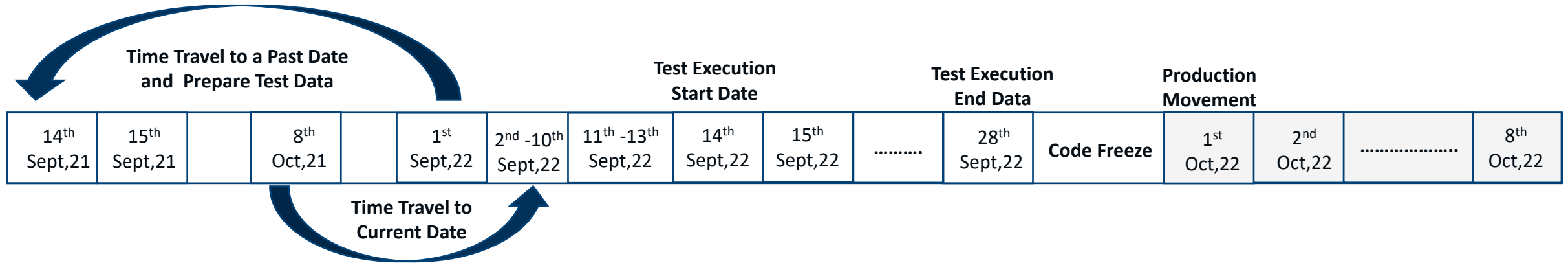
★ Time travel(TT) date finalization step will be explained with examples in the next slide

# Time Travel Planning ... Continued

	★ Scenario 1	Scenario 2
 <p><b>Business Scenario</b></p>	<ul style="list-style-type: none"> <li>• Customer wants to renew the policy after a year</li> <li>• Test execution start date is 14<sup>th</sup> September,2022</li> <li>• Test execution window is 2 weeks</li> </ul>	<ul style="list-style-type: none"> <li>• Customer has failed to make a renewal payment and policy has been marked as deactivated after 7 days. Business wants to give customer the flexibility to renew the policy within a month with a minimum late charge fee.</li> <li>• Test execution start date is 14<sup>th</sup> September,2022</li> <li>• Test execution window is 2 weeks</li> </ul>
 <p><b>Time Travel Plan</b></p>	<ul style="list-style-type: none"> <li>• Systems must time travel back to 14th September,2021. From there , at least 4 test data of needs to be prepared for every scenario</li> <li>• Data should be prepared for every day considering test execution start date till 7 days after production(It may vary based on different criteria)</li> <li>• QA team needs to request infrastructure team to change the date as per time travel calendar once data preparation for that day is done</li> </ul>	<ul style="list-style-type: none"> <li>• Create policies starting from 12th September ,2021 to test scenario that customers can renew the policies within 7 days without paying anything extra</li> <li>• Create policies starting from 7th September,2021 to test the boundary condition</li> <li>• Create policies starting from 6th September,2021 to test the boundary condition where customer has to be pay late charge for reactivating the policies</li> <li>• Create policies starting from 13th August,2021 to test the condition where customer cannot renew the policies</li> </ul>

★ Scenario 1 is explained in more details with diagrammatic representation in the next slide

# Time Travel Calendar Creation – Scenario 1



- From 1<sup>st</sup> September,22 move to 14<sup>th</sup> September,2021 and start preparing the data
- Time travel back 365 days considering test execution start date is on 14<sup>th</sup> September,2021
- Once data preparation on 14<sup>th</sup> September,2021 is done , request infra team to change the date to 16<sup>th</sup> September,2021. So basically in a single calendar date , data is getting prepared for multiple time travelled date
- Plan for preparing test data till 8<sup>th</sup> October,2021. This will cover any production issue pertaining to this scenario till 8<sup>th</sup> October,2022
- Complete data preparation for 3 weeks within 3-5 calendar days
- If possible please have a few buffer days before test execution starts

# Phase 3 – Script Design and Data Preparation

## Automation Test Script Creation

Based on the requirements , design the automation test scripts . Ensure integration between upstream and downstream applications are also covered during scripting.

## Infrastructure Setup

Setup the necessary infrastructure running the scripts for data preparation and test execution. For e.g. if Selenium grid is used nodes and hubs setup should be completed in this step

## Time Travel

Co-ordinate with the responsible teams identified in the earlier phases and move to the specific date based on the time travel calendar



## Dry Runs

Execute the scripts with sample data and fix any immediate scripting issues . Perform a playback session of some scripts with stakeholders to revalidate if the traversed workflow.

## Refactor Regression suite

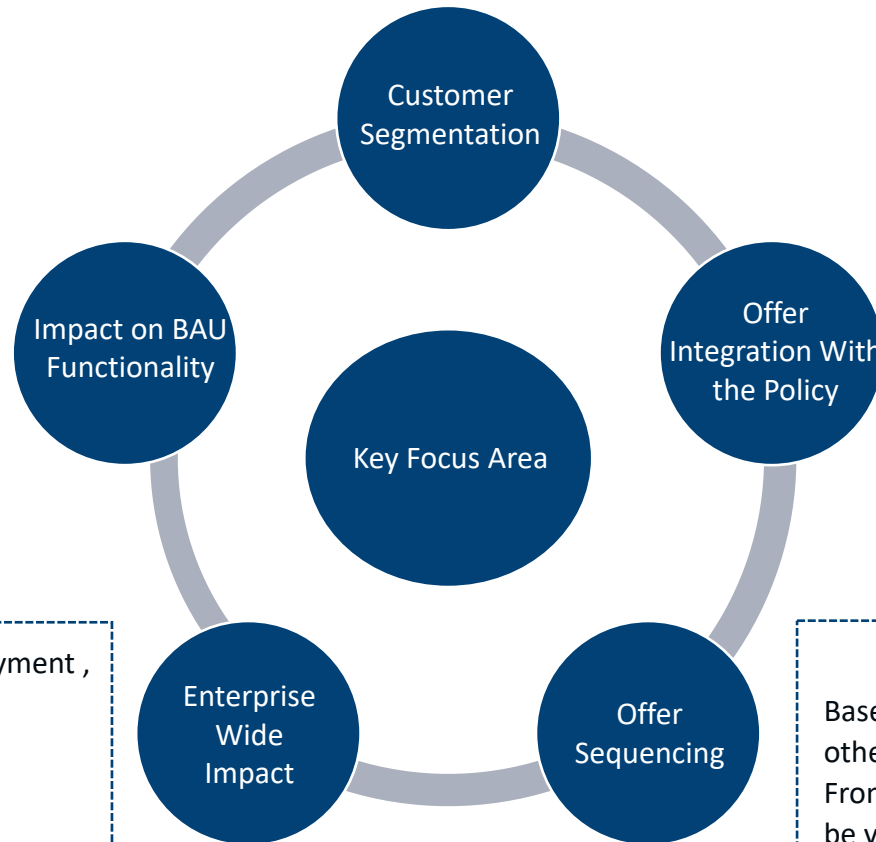
Revalidate the impact of new functionality on existing code. Check for options of removing technical debts and improving performance of the automation scripts.

## Data Preparation

Execute the scripts pertaining to test data creation . Ensure that count of data prepared is in line with the data plan

# Phase 4 – Test Execution

Offers are grouped based parameters like age, region , profession etc. Need to ensure that offers are getting rolled out to the correct customer segment.



Through regression needs to be performed to ensure that existing renewal and other functionalities are working properly post deployment of the new features

Once customer accepts the offer , it should be associated with the correct policy. Need to validate policy lifecycle is getting updated properly after customer accepts the offers

Once customer accepts the offer and makes the payment , multiple upstream and downstream systems gets impacted . From a QA perspective it is absolutely imperative that data remains consistent across applications and financial transactions are captured accurately

Based on the customer behaviour , usage patterns and other attributes , multiple offers are rolled out customers. From a QA perspective correct ordering of offers needs to be validated

01

## Recreate Production Issues

- Use time travel test data to specific production issues in the lower environment. Pass the result of testing to the respective teams
- In case it is an issue specific to a particular data combination only available in production and cannot be recreated in lower non-production environments , highlight the same to the respective teams so that data specific issue can be fixed accordingly

02

## Regression Testing

- Update scripts in case a scenario has been missed . It can be a current release functionality or even a regression scenario also. Behavior pattern of the user changes . So automation scripts may require to be modified accordingly
- Leverage test automation to validate impact of the production defect fixes

03

## Root Cause Analysis

- Look for areas of improvement especially around mirroring production data characteristics to avoid any data combination with specific issues
- Look for options around mitigating the data-loss specific issues by updating the automation scripts
- Look for options around improving the execution speed of test automation

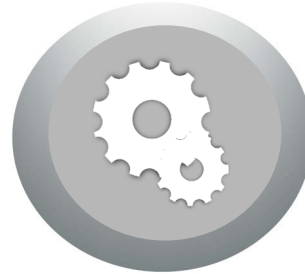


# Best Practices in Time Travel Test Automation



## People

- Select a quality architect at the beginning of the project and continue to retain the associate at least for first 6 months . Within this period work pertaining to framework development/modification should be completed and initial set of automation scripting related technical challenges should also be resolved
- Prepare a pre-onboarding training plan for 2-3 weeks focusing on test automation skill upliftment . It will help the associates to upskill and be more productive during the actual work
- Once the associate has access to customer network , along with application overview , always plan for a cross team training session. This will help in moving associates across the teams if need arise



## Process

- Come up with a time travel calendar at the beginning of the release and share it with all the required stakeholders. This will give a visibility to all the interfacing application teams and reduce the unplanned releases
- Teams need to take a shift-left approach and complete majority of the test script design in the development environment itself. This will give them time to update or even complete the scripting before execution in the QA environment starts
- As part of time travel testing , enterprise wide workflow needs to be checked . Also interfacing applications should run their regression tests to ensure that nothing has broken due to the time travel specific implementation

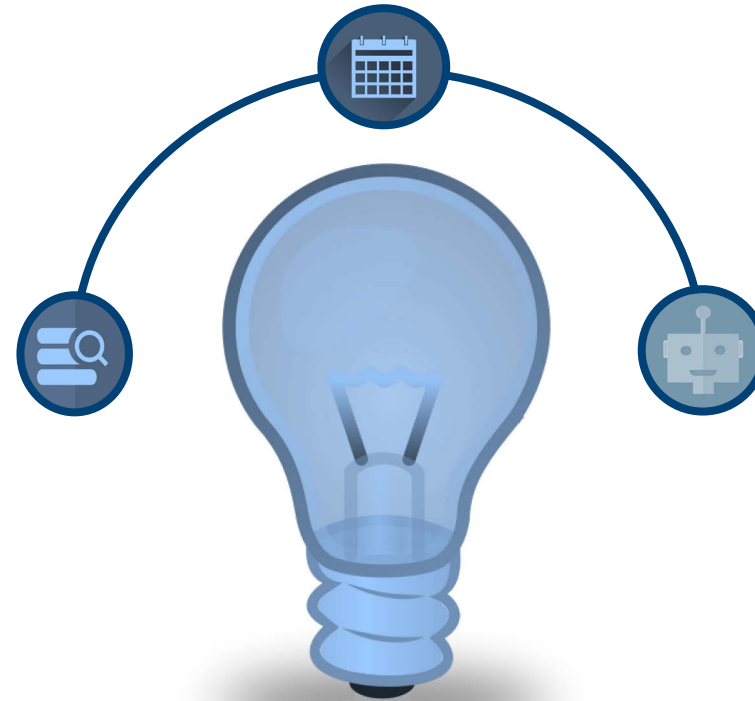


## Technology

- Use singleton design pattern while developing the test automation framework. It is thread-safe and will assist in parallel execution improving overall execution performance
- Always have an option of re-executing failed test scripts especially for data preparation scenario. During bulk data preparation, scripts may fail in non-prod environment due to various reason. Having the option of re-executing failed test scripts at least couple of time will improve test data preparation productivity
- In case Kubernetes and Dockers are getting used in the project, same needs to be leveraged during script execution. This will also improve the execution productivity significantly

Automated time shifting utility which will update the application specific time . It is applicable for a single application . In case one application is being tested as a single isolated unit , then time can be shifted without the help of infrastructure team.

Bulk data generation automation script which will take input from business for different combination and based on that will create the test data. This utility can be leveraged during test data creation for time travel testing .



Implement a script review utility which will check for the best practices during test automation. At the same time have a checklist to map if the key activities like time travel planning has happened properly or not. Combine the two to provide a health score of the project.



Challenge	Potential Consequence	Mitigation
<p>Availability of suitable test data for time travel testing</p>	<ul style="list-style-type: none"> <li>Sufficient test data will be required to perform test execution , defect retesting , replication of production issues in lower environment and regression testing. Without appropriate test data , time travel testing cannot be done properly</li> </ul>	<ul style="list-style-type: none"> <li>Prepare time travel calendar to plan for the dates that needs to covered</li> <li>Leverage test automation for bulk test data generation on specific dates</li> </ul>
<p>Accommodate unplanned releases for interfacing applications during test data preparation phase without extending the timeline</p>	<p>Time travel has to be stopped when release is planned for the interfacing application and system has to be brought back to the current date. Due to this the time travel calendar dates needs to be altered. Following challenges can be observed in this scenario:</p> <ul style="list-style-type: none"> <li>Sufficient test data may not be available impacting quality of testing</li> <li>If time travel data preparation is extended , it may shorten the test execution window. That may lead to schedule slippage and production defect leakage</li> </ul>	<ul style="list-style-type: none"> <li>Have buffers days while preparing for time travel calendar</li> <li>Use parallel execution to improve test execution speed both during test data preparation and during test execution</li> </ul>
<p>Minimizing impact to interfacing applications</p>	<ul style="list-style-type: none"> <li>BAU workflow in the interfacing applications may break due to deployment of renewal functionality. This can lead to production defect leakage and have direct impact on the customer experience</li> </ul>	<ul style="list-style-type: none"> <li>Automation scripts should provide enterprise wide test coverage</li> <li>Interfacing application team should also perform regression testing on their BAU functionalities</li> </ul>

# **Any further questions?**

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**Thank You**

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