

Test Challenges and Approaches With SaaS and PaaS

Dr. Ganesh Neelakanta Iyer
Principal QA Engineer
Progress Software

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About Me

- Completed B.Tech. in Computer Science and Engineering from Mahatma Gandhi University, India in 2004 with University First Rank
- Five years of Industry work experience in Bangalore (2004–2007) and HYD (2012–till date), India
- Finished Masters and Ph.D. from National University of Singapore in 2008 and 2012 respectively
- **Research interests:** Cloud computing, Game theory, Wireless Networks, Pricing, Software Quality Analysis
- **Personal Interests:** Kathakali, Teaching, Traveling, Photography, Cooking
- **Website:** <http://ganeshniyer.com>
- **Currently Principal Engineer at Progress Software, India**



Agenda

- Challenges Introduced by Cloud for Testing
- Cloud Test Dimensions
- Integration Testing & Test Automation
- Overview of an In-House Web UI Automation Framework
- Conclusions

Introduction



1

Web-driven applications

3

Faster time to market

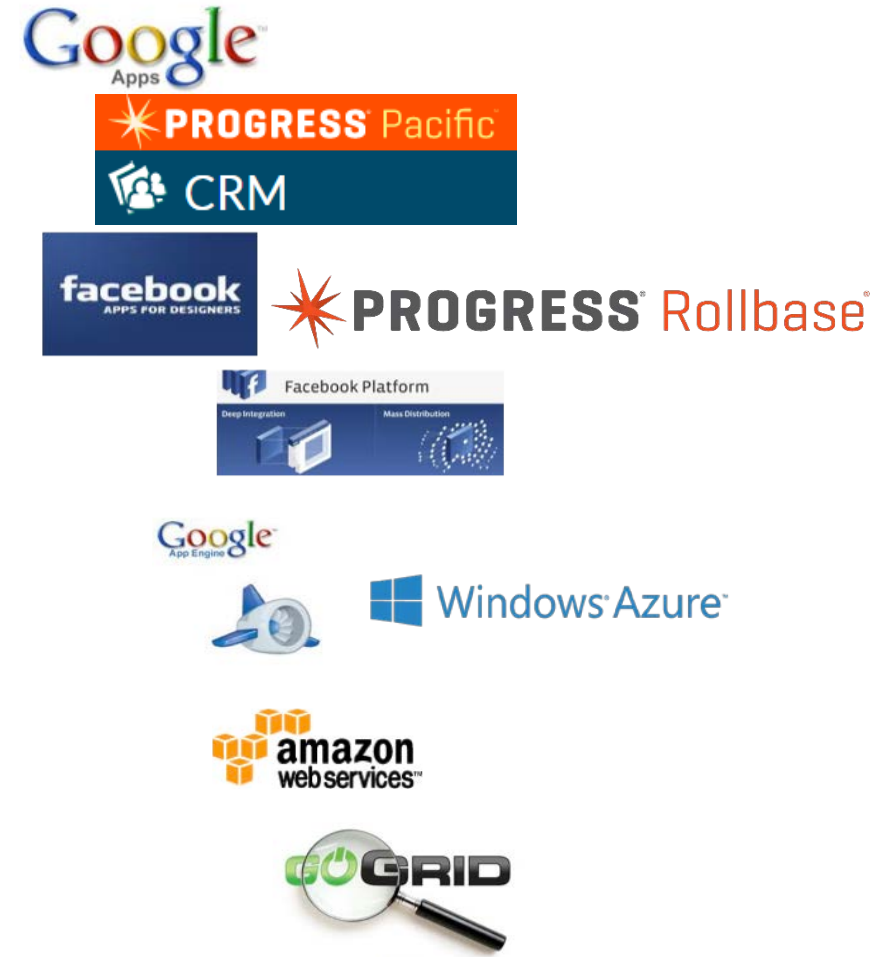
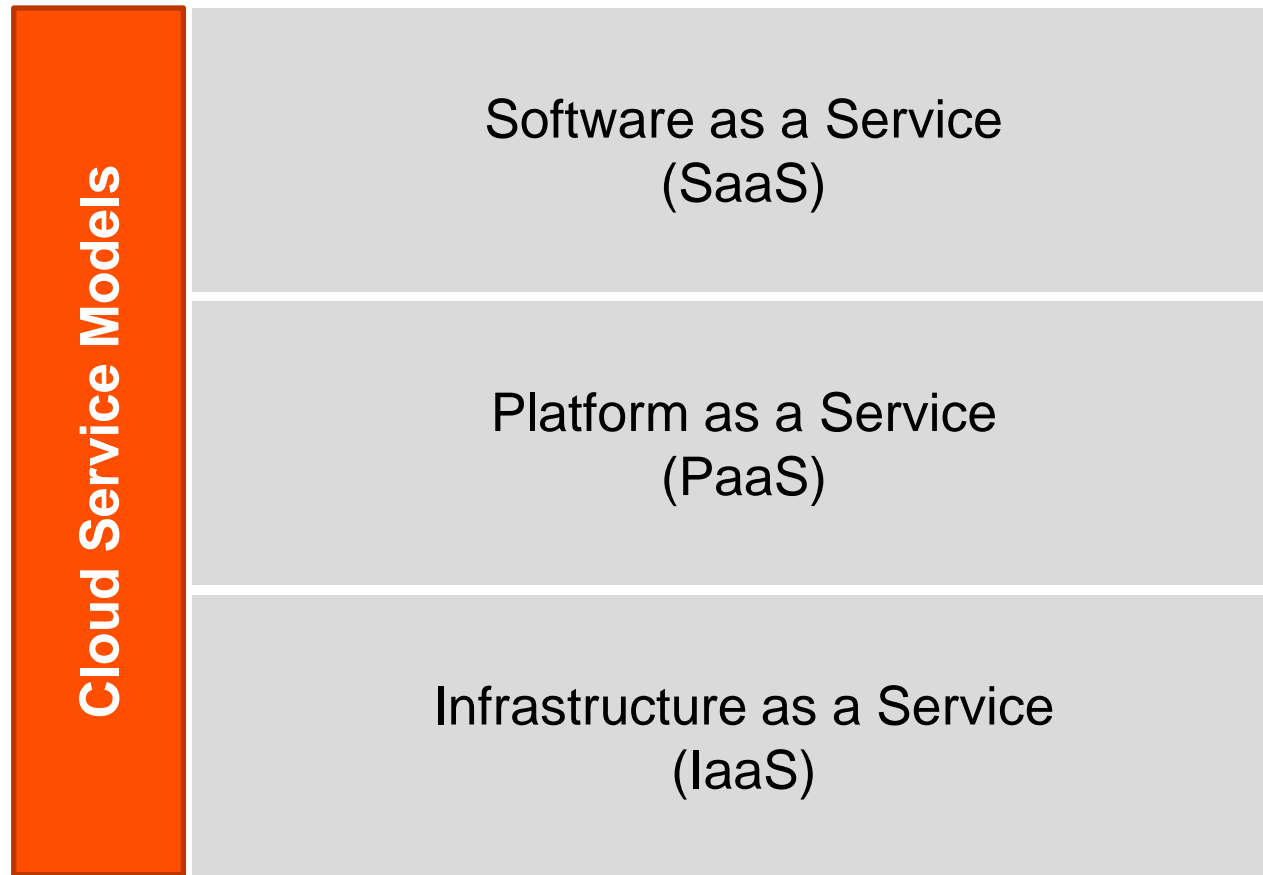
2

On-demand resource availability

4

Reduced capital and operational expenses

Overview of Cloud Delivery Models...



Software Test Challenges With Cloud

Paradigm Shift

- Web-driven SaaS applications are getting more popular
- Everything happens in few mouse clicks

Seamless Upgrades

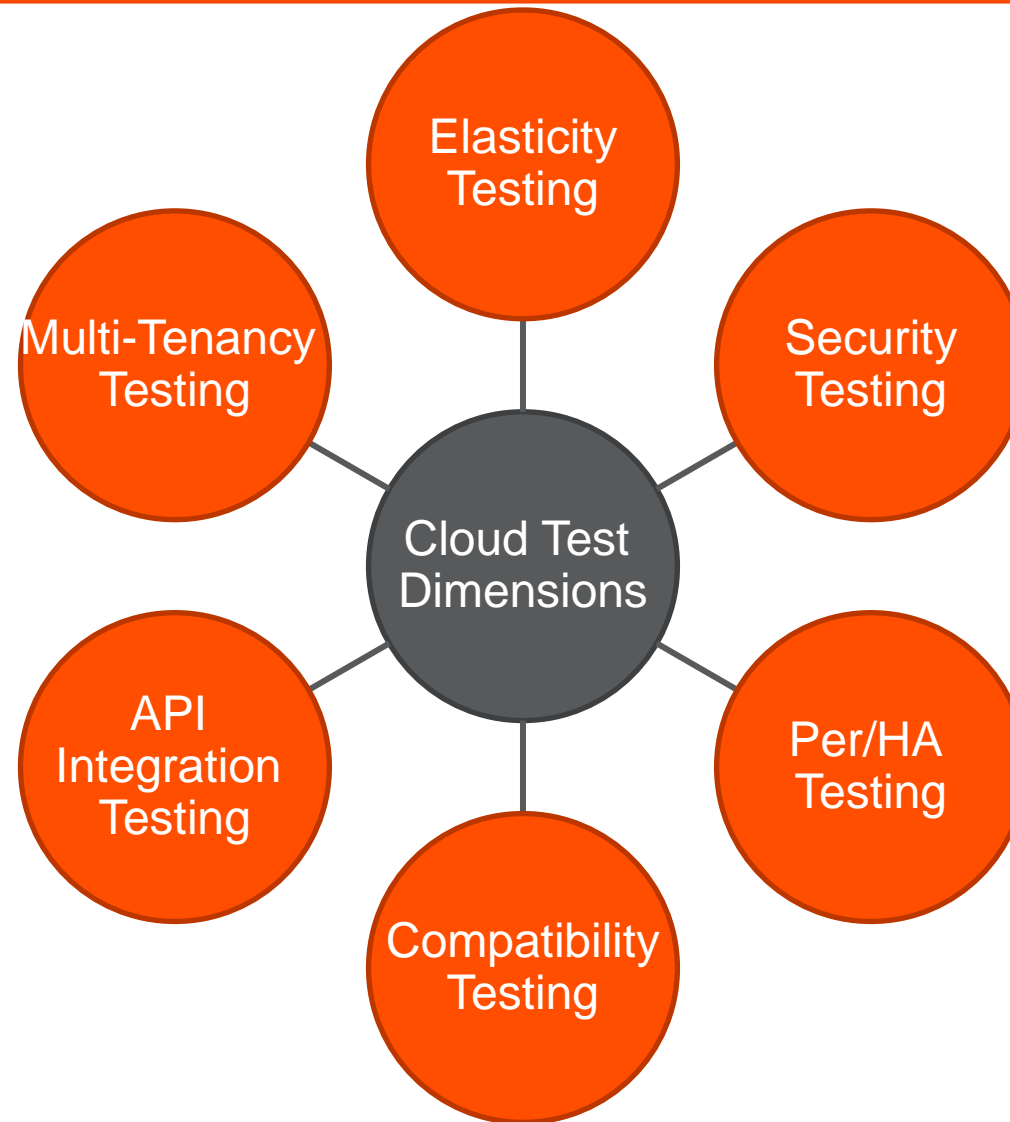
- With Cloud, upgrade should happen live with minimal or no down time
- Test the upgrade process of software products seamlessly

Sharing of Resources: Multi-Tenancy

- The resources used for software development as well as deployment might be in publically shared resources
- Need for having specific testing for such systems such as multi-tenant penetration testing

Cloud Test Dimensions

Cloud Test Dimensions in a Nut-shell



Elasticity Testing

Elasticity Testing

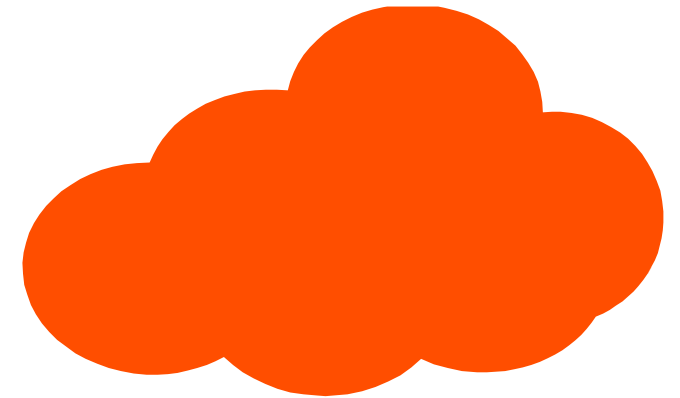
Resource acquisition/
release time

Provisioning
on-the-go

Table text load
testing for ELB

Cloud App Development Platform

- Limitations on max objects/applications at a time
- Number of applications that can be executed per platform instance
- 100's of administrators accessing the management console



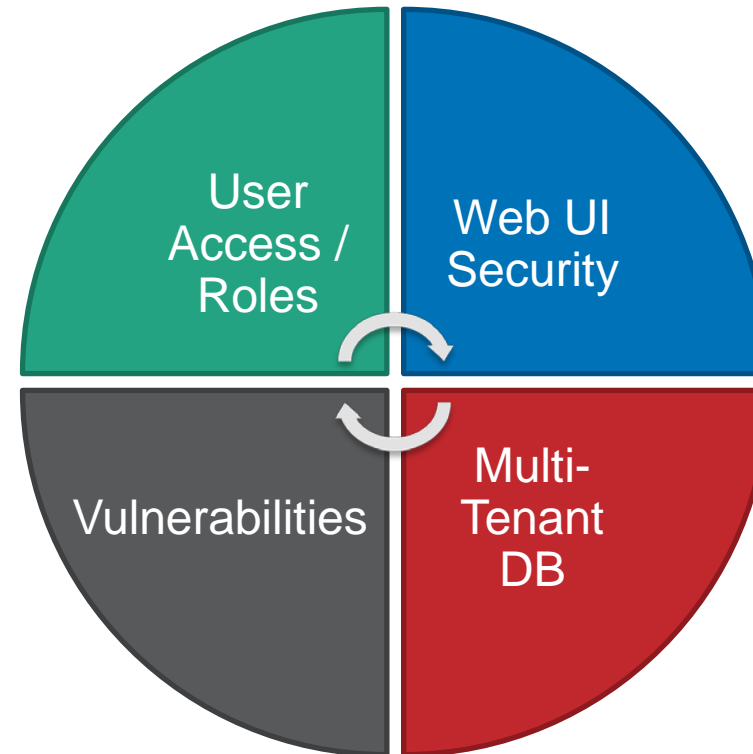
SaaS Application Development
PaaS Capabilities

Security Testing

Security Testing
Traversal vulnerability
User access/ roles
Identity federation management
Communication latency over SSL
Multi-tenant penetration

Automation:

- Websecurify
- ZAP tool
- Scripts



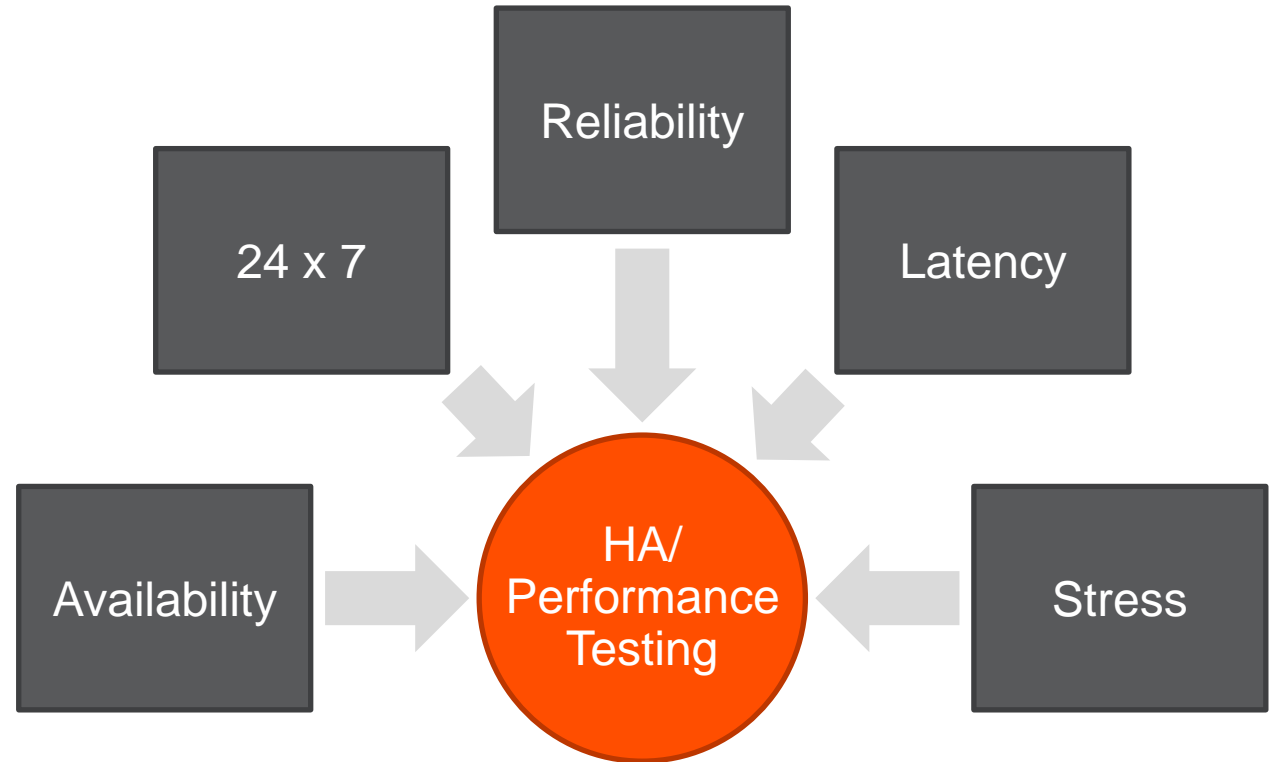
All Areas of SaaS and PaaS

High Availability (HA) and Performance Testing

HA & Performance
Time to deploy
Multi-tenancy
Time to genesis
Connectivity and reliability with 3rd parties
Reliability and availability
Latency

Automation:

- NeoLoad
- JMeter



All Areas of SaaS and PaaS

Compatibility Testing

Compatibility Testing

Accessibility testing

Globalization and localization testing

Compatibility under different situations

Automation:

- Sahi
- Selenium



All Areas of SaaS and PaaS

API Integration Testing

API Integration

Connectivity and invocation testing

API load testing

API security

Multi-tenancy

Automation:

- SoapUI
- NeoLoad



SaaS Apps Which Uses APIs

Multi-Tenancy Testing

Multi-Tenancy

Multi-tenant penetration

Rigid failure containment

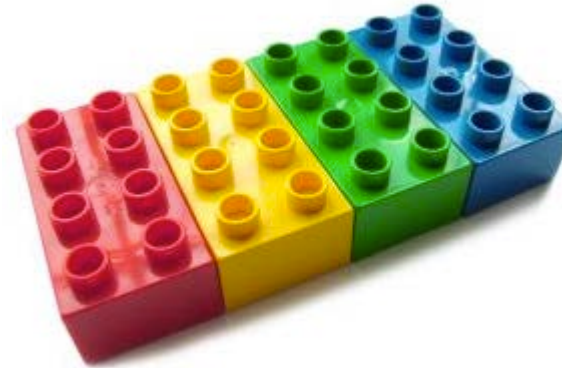
Availability and business continuity

Risk of correlated behaviors

Service transition activity analysis

Automation:

- UI frameworks
- Hybrid frameworks



SaaS Apps for ISVs / PaaS

Cloud Test Dimensions in a Nut Shell

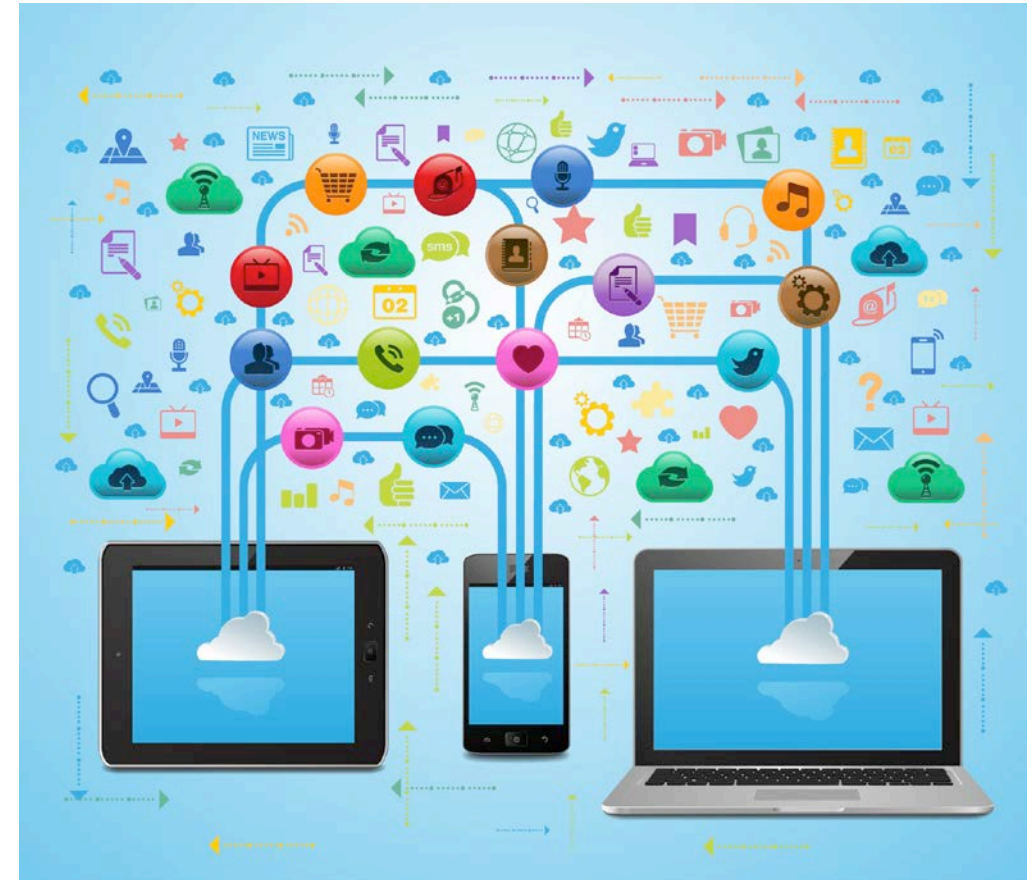
Elasticity Testing	Security Testing	HA & Performance	Compatibility	API Integration	Multi-Tenancy
Resource acquisition/release time	Traversal vulnerability	Time to deploy	Accessibility testing	Connectivity and invocation testing	Multi-tenant penetration
Provisioning on-the-go	User access/ roles	Multi-tenancy	Globalization and localization testing	API load testing	Rigid failure containment
Table text load testing for ELB	Identity federation management	Time to genesis	Compatibility under different situations	API security	Availability and business continuity
	Communication latency over SSL	Connectivity and reliability with 3rd parties		Multi-tenancy	Risk of correlated behaviors
	Multi-tenant penetration	Reliability and availability			Service transition activity analysis
		Latency			

Integration Testing & Test Automation

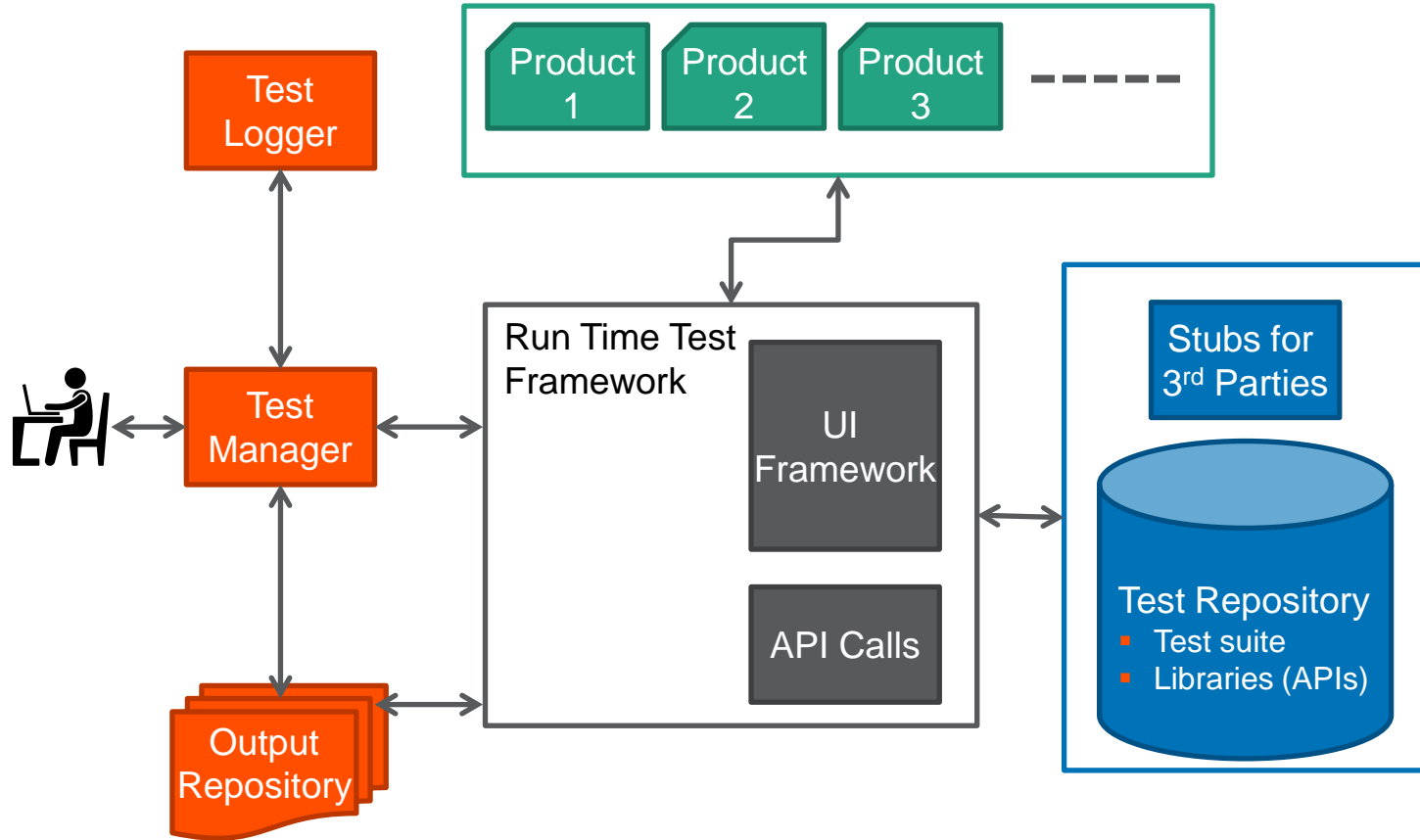
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Integration Test Challenges and Approaches

- Integration Test automation challenges
 - Multiple systems behave differently
 - Some systems do not allow automated deletion of test data
 - Unpredictable delays in updating various systems.
 - Different types of environments for testing
 - Perform web UI testing and runtime testing at once




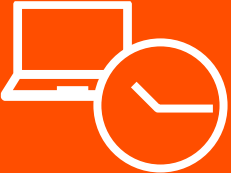


Integration Test Automation With Cloud



- The outer harness is the run time automation framework and the inner harness is the UI automation framework
- Switching between runtime component and UI component testing
- Combined test results and test logging

Sahi as the UI framework
Java + TestNG as the Runtime framework

Automation Frameworks

 Functional Testing – (Web UI)	Sahi / Selenium scripts Sahi based in-house test framework – WaFeR
 Performance Testing	Neoload JMeter
 API Integration Testing	SOAP UI
 Integration Testing	Test-NG + Java + Sahi combined approach

In-House Flow-Driven UI Test Automation Framework – WaFeR

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Motivation

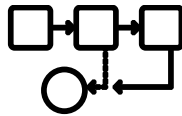
- Emergence of Cloud
 - SaaS: Several Web-driven Applications
 - PaaS: Web platform to build SaaS
- Presence of dynamic objects in the UI
- Database-driven applications
 - Table-based output screens
 - Dynamic URLs get generated with database sequence
- Frequent changes to UI in Agile environment
 - Changes can be expected on every sprint

Requirement for extensible flow-driven test framework
to automate web-application testing

Progress Products That Use This Framework for Web UI Testing



Data Model



Workflow & Logic Model



User Interface Model



Permissions Model



Organization Model



Integration Model



Application Directory




Hybrid Mobile App




Proposed Flow-Driven Framework: Three Step Flow

Record test in the preferred User Interface (UI) testing tool
(e.g. Sahi, Selenium)

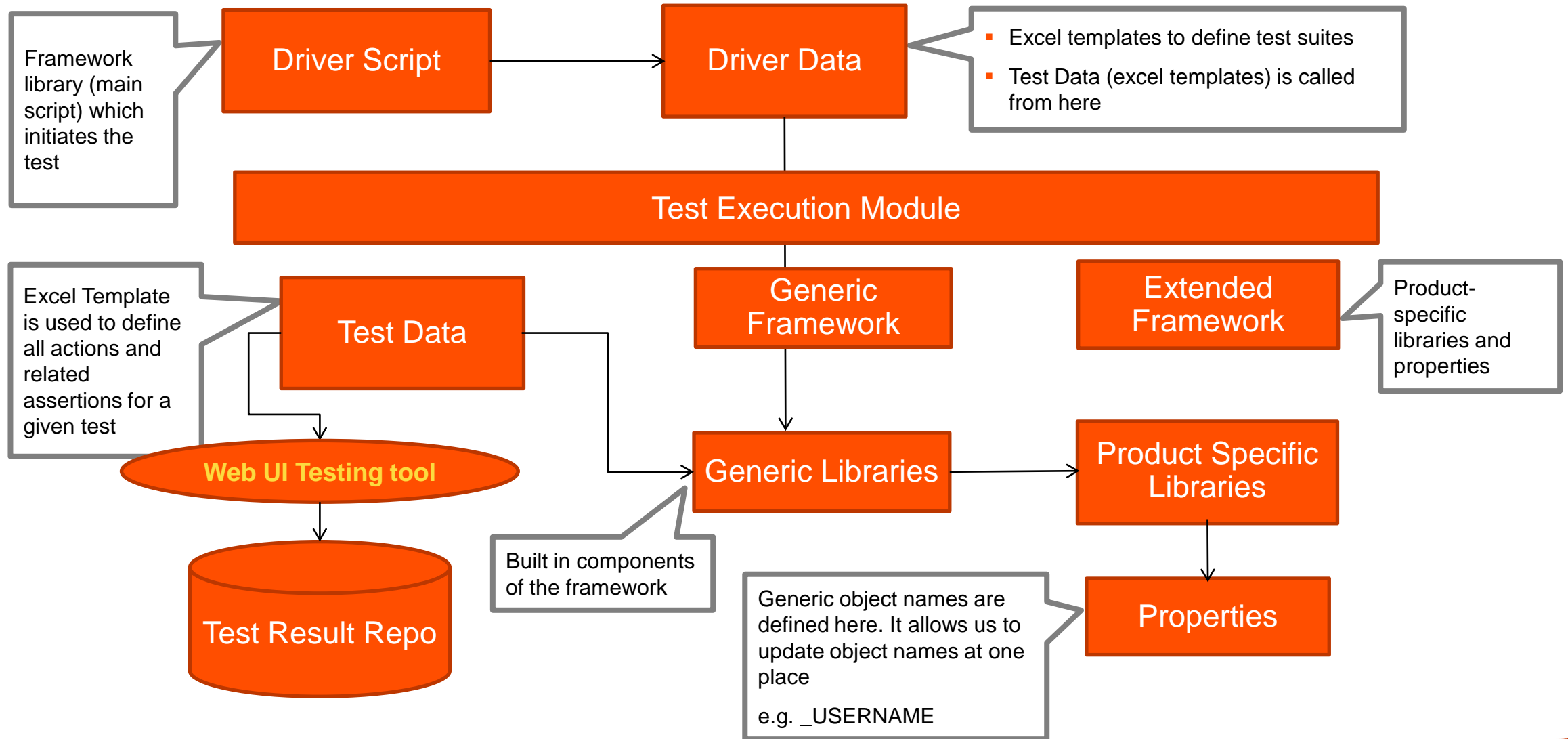


Identify properties of the test flow (e.g. buttons, tabs etc.)
Test lines for testing the web application under
consideration gets identified



Add pre assertions and post assertions for
different test lines identified above

Proposed Automation Framework: Components



Example Test Case

Welcome to Pacific

Come on in. The water is warm!

Username:

gaiyer|

Password:

.....

[I forgot my Username](#)

[I forgot my Password](#)

Log In

Don't have a Pacific Account? [Register now.](#)

Example Test Case

The screenshot displays the Progress Pacific Progress Rollbase application interface. The top navigation bar includes the Progress Pacific logo and the application name 'Progress Rollbase'. A secondary navigation bar contains links for 'Home', 'Calendar', 'Meetings', 'To-Dos', 'Reports', 'Users', 'Gmail', and a '+ New' button. A 'New Application' button is highlighted with a blue circle. Below the navigation, there is a 'Welcome to Progress Rollbase' message and a 'Log In' button. A link to 'Register now' is also visible.

PROGRESS Pacific

Progress Rollbase

New Application

Home Calendar Meetings To-Dos Reports Users Gmail + New

Install Applications

RECENT ITEMS

Recycle Bin (3)

Welcome to Progress Rollbase

Dear ,

Welcome to Progress Rollbase, a new way to find, create, customize and share web-based business applications. Once you have started you can install pre-built applications from the Application Directory.

Each Progress Rollbase application consists of a set of components which can be modified to meet your requirements. Once you become familiar with Progress Rollbase you can build entirely new applications from scratch.

Thank you and welcome to Progress Rollbase!

The Progress Rollbase Team

Log In

Don't have a Pacific Account? [Register now.](#)

Example Test Case

PROGRESS Pacific
Progress Rollbase

New Application

Install Applications

RECENT ITEMS

Recycle Bin (3)

Log

Don't have a Pacific Account? [Register now.](#)

Create a New Application

New Rollbase Web App
Build a custom web-based business app designed for your specific business needs.
[Guide Me Through It](#)

Let me build it my way...

Install from App Library Create from External Data Create from Existing Objects

New Mobile App
Build custom applications for mobile devices, quickly and with ease.
[Create Mobile App](#)

Example Test Case

PROGRESS Pacific

Progress Rollb

New Application

Install Applications

RECENT ITEMS

Recycle Bin (3)

Home

Welcome

Dear,

Welcome

started

Each P

tools. C

Thank

The Pr

Log

Don't have a Pacific Account? [Register now.](#)

PROGRESS Pacific 98 Trial Days Remaining

Setup

Create a New Application

Quick Create Application - *ExchangeApp*

- 1 App Name
- 2 Create Objects
- 3 Add Fields
- 4 Relationships

Application Name

ExchangeApp

Application Description

Application Description

Cancel Previous Next

Sample Script File for Previous Scenario

SeqID	Flow	ObjectType	ObjectName	Data	GotoAction	Action
1	ACT	link	VAR_RB_URL			navigateTo
2	ACT	function	fncRBLogin	_RB_USERNAME_		exec
0	ASST	RTData	fncRBLoginRV	true	0	
4	ACT	link	New Application			click
5	ACT	link	Guide Me Through It			click
6	ACT	textbox	txtAppName	ExchangeApp		setValue
7	ACT	link	Next			click

Advantages of the Proposed Model

- Considerable improvement in **test development**
- Works seamlessly with **existing test scripts**
- Extensible to testing any **web-driven/Cloud-based applications**
- Entire framework can be **deployed and executed from any platform**
 - Local test machine
 - Cloud platforms such as AWS
- **Reduced effort and manual intervention** for maintenance

Conclusions

- Cloud gives unique opportunities and challenges for QA
- New test dimensions
 - Security, Multi-tenancy, etc.
- Faster test execution
 - Agile Testing
 - Leveraging automation tools
 - New automation frameworks

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