

CQAA May 2013 Lunch & Learn: Tools for Quality Assurance / Quality Control

Date - 16 May 2013

Time - 11:30 AM - 1:00 PM

Location - 233 South Wacker Drive 33rd Floor Chicago, IL 60606

Presenter -

Raj Koul

United Airlines



Introduction

Raj Koul manages Enterprise Quality Assurance (EQA) team at United Airlines IT department. He has more than 16 years of experience in Application Development, Project and Program Management and Quality Assurance. Raj oversees an organization which has been in the middle of merger and system integration, playing a critical role in Service Delivery, Risk Management and Stability. In recent past Raj has redefined his teams approach to innovation, steering EQA team to support Agile development introducing dynamic white box testing, encouraging team to find new ways to optimize manual testing and lean on technology. Raj has a MS in Computer Science from Governors State University.

Session

In the dynamic and high paced environment of change, expectations are high for Quality Control and Quality Assurance teams.

Ability to respond to change with agility and speed is something all QA professionals need to strive for.

As application development is getting distributed, agile and just in time, challenges for testers are growing.

In this technology driven environment, how can we leverage technology itself to help us.

Our team is embracing technology, innovation, and tools including QC/QTP, MTM/Coded UI and other tools aimed at reducing complexity of testing and identifying effective testing solutions.

Typical issues and challenges for testing teams

- Software Development Life Cycle process variations
- Maturity of SDLC
- Organizational Models
 - Central
 - Federated
- Executive Leadership support
- Technology variations and flavors
- Time to market pressure
- Continuous process improvements expectations
- Release Management and Deployment management
- Configurations Management
- Stereotype – QA slows me down

Transformation in expectations for testing teams

- Accelerate release cycles
- Continuous development / deployment
- Just in time testing
- Shorter release cycles
- Manage change effectively
- Automate test efforts
- Leverage tools
- Smart Testing – think out of box

What is the most Popular Testing/QA “Tool”?



Quality Tools

A tool is defined as a vehicle that assists in performing a task.

For Quality Management tasks, Tools can be used for:

- Defining a mission, vision, goals, and objectives
- Defining Do and Check processes
- Defining measures
- Collecting data
- Problem-solving
- Designing solutions
- Improving processes
- Measuring results



Management Tools

Tools based on logic rather than mathematics, to address idea generation and organization, decision-making and implementation.

- Brainstorming
- Affinity Diagram
- Nominal Group Technique
- Cause-and-Effect Diagram
- Force Field Analysis
- Flowchart and Process Map
- Benchmarking
- Matrix
- Quality Function Deployment
- Playscript

Statistical Tools

- Tools having mathematical focus, usually related to data collection, organization, or interpretation. They may also be separated into tools used for counting and tools used with measures.
 - Check Sheet
 - Histogram
 - Pareto Chart
 - Run Chart
 - Control Chart
 - Scatter Plot

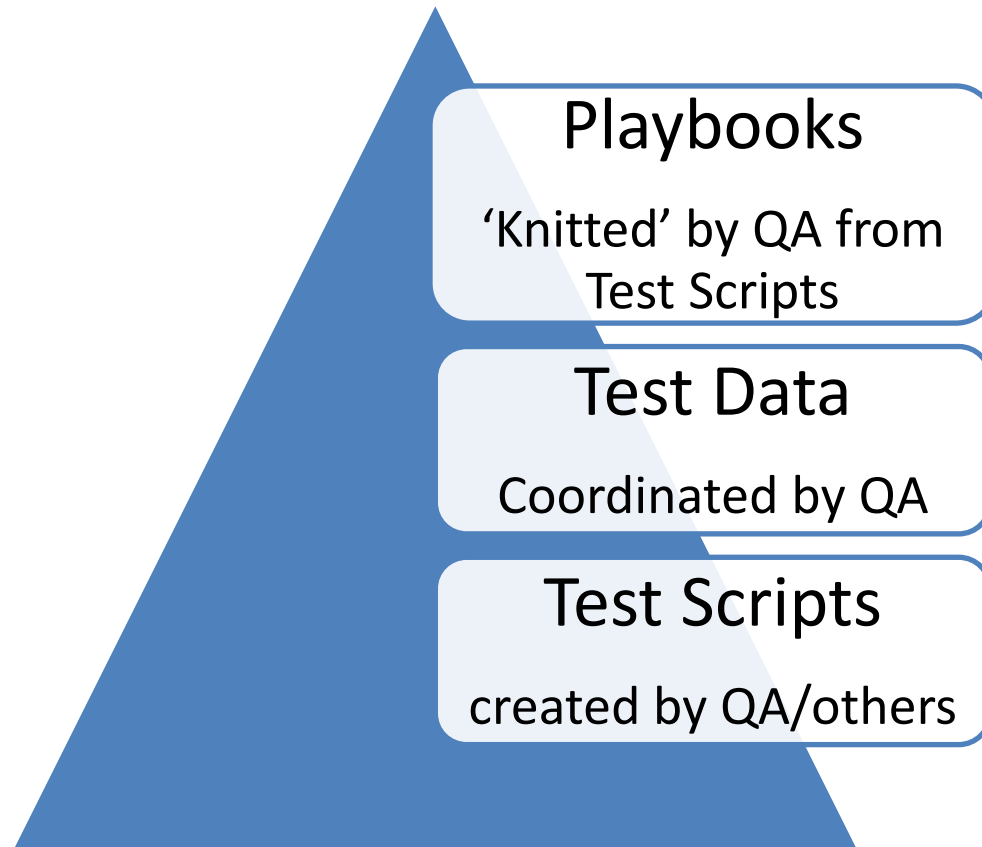
Presentation Tools

- Tools used during presentations to summarize or graphically illustrate data also used in the development of written materials, such as proposals or reports, or to accompany oral presentations.
 - Table
 - Line Chart
 - Bar Chart
 - Pie Chart
 - Stem-and-Leaf Chart

System Migration and Integration

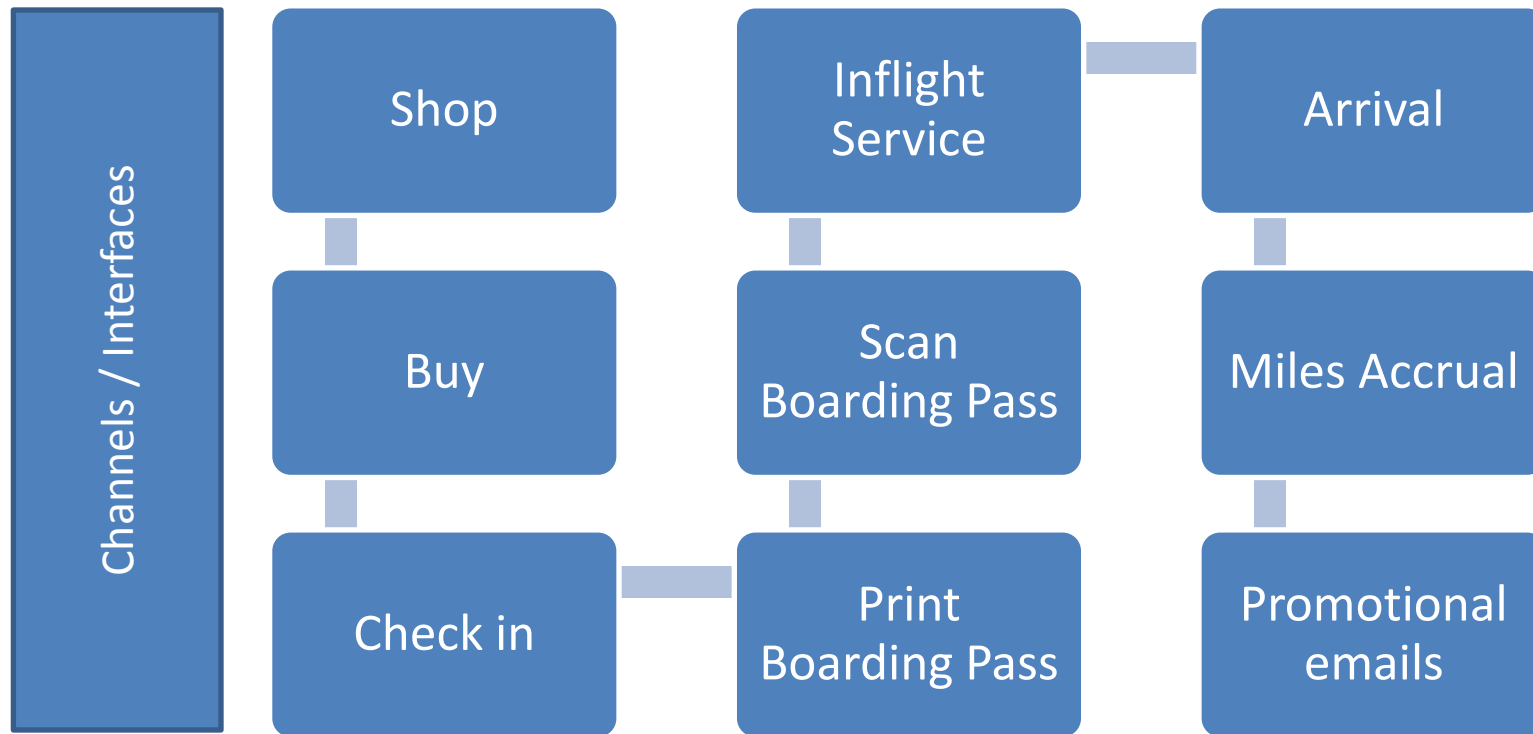
- Application Testing
- Play Book and End to End Testing
- Business Process Testing
- Automation and Regression Testing
- Defect Tracking
- Load and Performance Testing
- Integration Testing
- Metrics

Playbook Development



Typical Airline End to End Flow

Channel touch points may turn out as dependencies incase of non-availability during end to end testing.



E2E Testing Framework

Unit/Integration
Test

Systems Integration /
End-to-End (String) Test

Test Plan

Test Case

Test Scripts

Test Set

Cycle 1

Cycle 2

Cycle 4

Cycle 5

Cycle 6

Cycle n

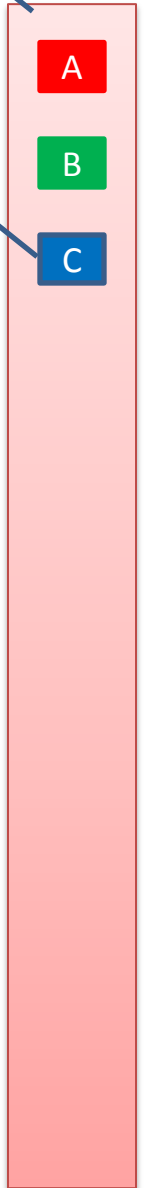
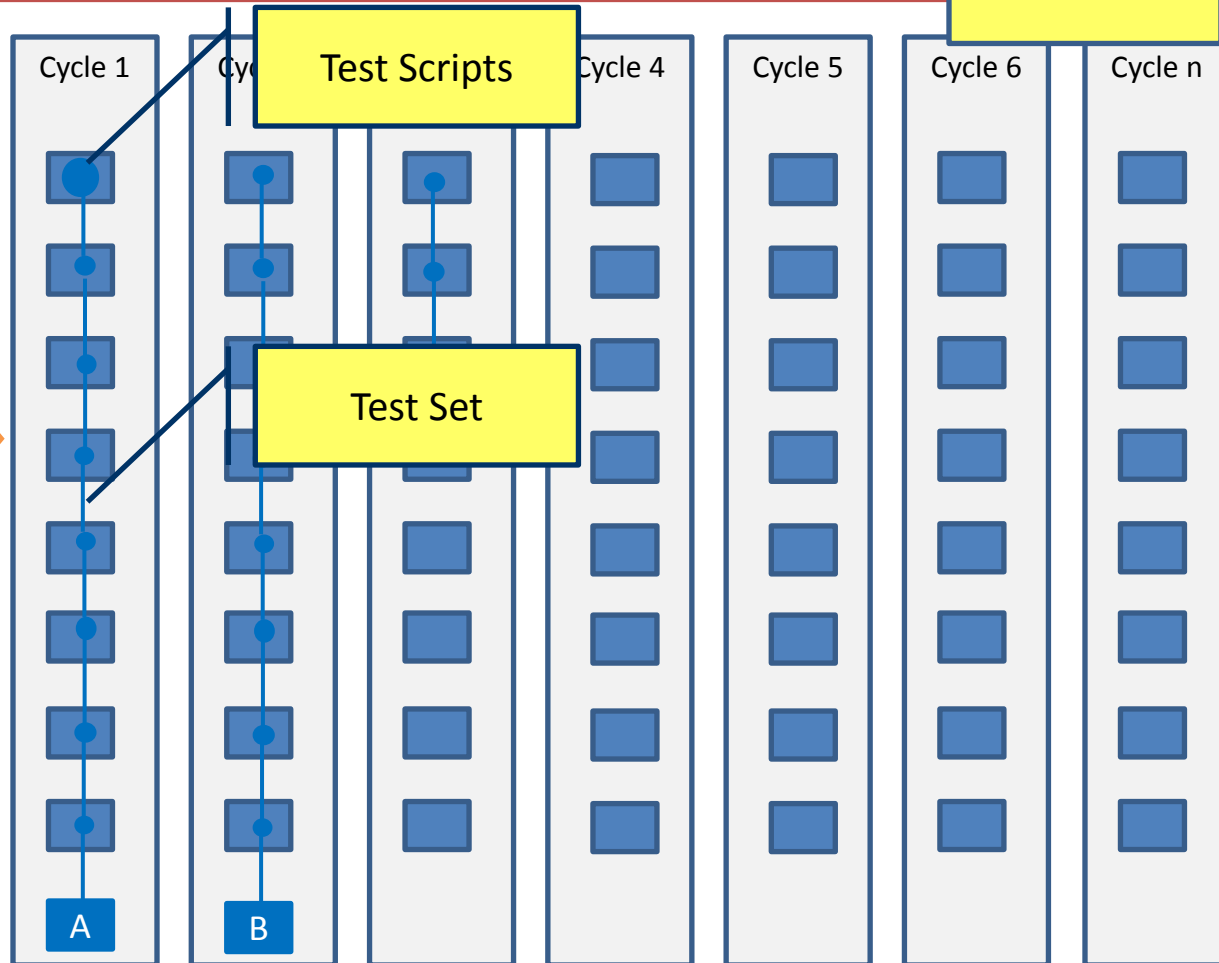
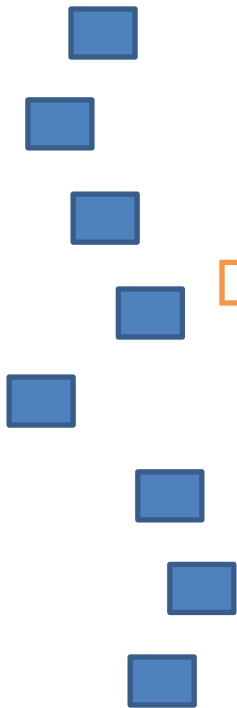
A

B

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B

C



Business Process Testing

BPT stands for ***Business Process Testing*** which enables testing of the full business process, from the start of a transaction through to the completion

BPT Objective:

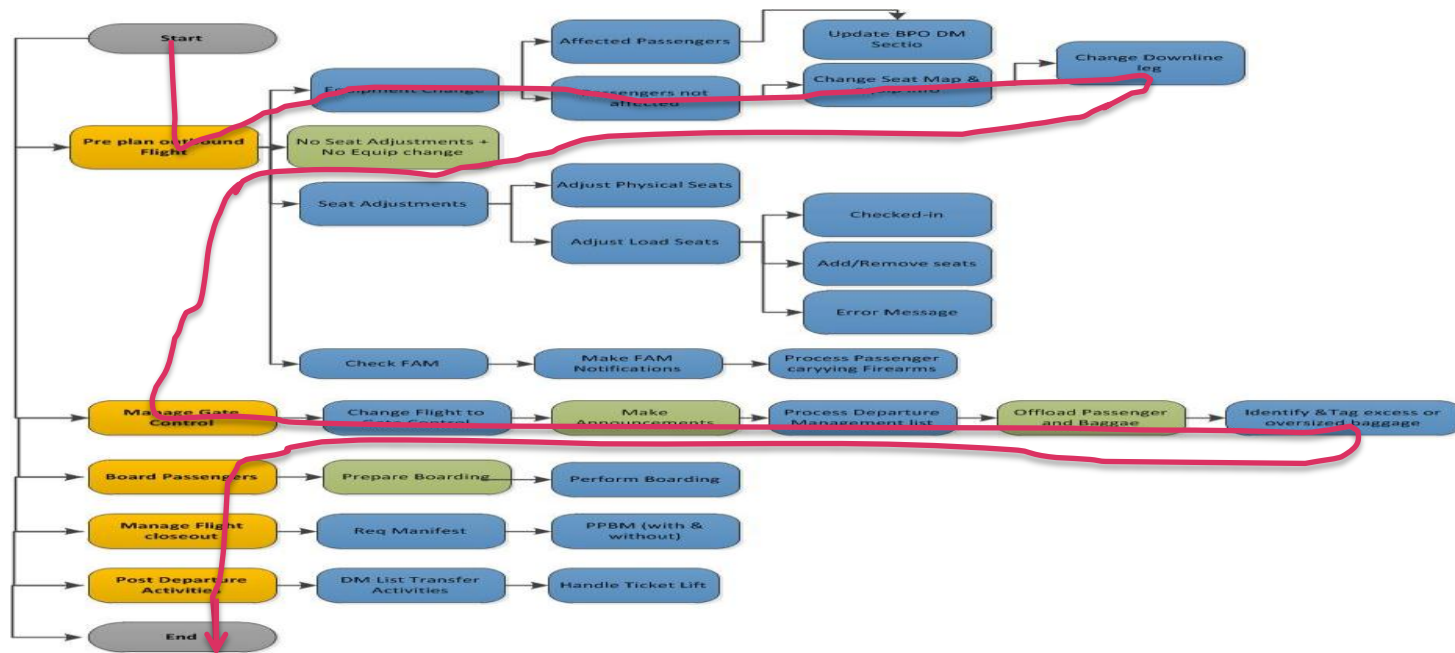
- Ensure that the complete system is working good
- Tests span across all the business components and flows
- Build high efficient reusable automation scripts
- Facilitate to start test design earlier in the development lifecycle, even before an application is delivered to Quality Assurance team
- Increase end user experience by eliminating issues

BPT Tactful Approach

In order to successfully run the BPT,
BPT workflow

- Touch points & Dependencies identified
- Automation
- Smart Test Data

BPT Workflow



Business Process Flows (Primary & Alternative) will be identified and reviewed with SME for adequate test coverage (sample flow is shown in the fig). Further identified flows will be reviewed for Automation feasibility and test script development.

Mobile Testing - Needs

- Ability to validate apps on different handsets with different OS
- Ability to convert manual Test Cases to Automated Test Cases
- Reusability of test scripts to cover multiple devices and operating systems
- Tools Integration
- Ability to Generate Reports
- Ability to capture the screenshots during scripts execution
- Testing is needed for Apple, Android, other types of builds.

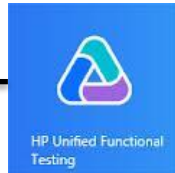
Issues/Challenges

- As Mobile device OS versions keep on upgrading, apps need to be tested on all the OS versions and hence we need to upgrade the device OS or get new devices for further testing
- Older devices are NOT compatible with new OS versions released
- Once updated to newer OS version, can not use the Device for old OS version (Losing the capability of testing on older versions)
- For Android Devices can not capture the error screen shots for defect logging
- Navigation of screens on Blackberry and Android devices is very cumbersome
- Can not share the devices between offshore and onsite team (dependency on physical location of devices)

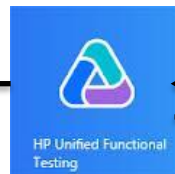
Mobile Testing – High Level Overview



- Access devices with USB
- OR Wi-Fi



- HP-UFT integration
- Scripting with UFT insight (Image based Automation)
- Image Libraries & Device agnostic scripting



ALM

Public/Private



Mobile Testing - Cloud Providers

Approach/Solution

Pilot phase was executed using leading Mobile' cloud service providing tools

Pilot phase was performed on selected Mobile app functional test cases

Inbuilt QTP plugin was used to capture the mobile screen and recorded the scripts

Test Scripts were developed in QTP while reading the screen movements on the cloud device

Benefits

Priority devices are available in the cloud, which will avoid purchase cost of physical devices

QTP and QC integration with cloud devices are flawless

Automated scripts executed on multiple devices

Dashboard reports were generated along with screenshot for the failed steps

Conclusion:

- ❖ Comparable, Industry leaders in Cloud based Mobile Test solutions
- ❖ QTP / QC Integration possible
- ❖ Can leverage same license round the clock (Onshore and Offshore)

In-house installation of a Mobile testing product

Approach/Solution

Analysis was performed on selected mobile functional test cases

Physical devices were simulated on the user desktop using RealVNC to capture the screen movements during scripting

Test Scripts were developed in QTP while reading the screen movements on the cloud device

Benefits

Scripting can be done on majority of the priority devices connected directly to server

Tool use senseTalk as scripting language which is open source and English like language for ease of use

Automated scripts were allowed to execute on multiple devices like iPhone, android etc.

Dashboard reports were generated along with screenshot for the failed steps

Conclusion:

- ❖ Needs two different systems, one (client) to record the scripts and other to run the scripts (server)
- ❖ Needs physical devices to procure and keep them up to date with OS, Hardware, connected over WIFI
- ❖ Integration with other tools like QTP or QC is not that seamless

In-house Developed Tool

Approach/Solution

Pilot phase was executed using Tool developed in-house

Pilot phase was executed on both iPhone and Android devices with various OS combinations

Pilot phase was performed on selected mobile functional test cases manually and by scripting

Scripting was done by mimicking the real physical devices on the client system using RealVNC

Test Scripts can be developed in QTP 11.5 while reading the screen movements on the simulated device screen

Benefits

Scripting can be done on majority of the priority devices connected directly to server, but have some limitations

Both Automation and Manual testing can be done using the same license

Well integrated with other test management tools like ALM and ATP

Automated scripts were allowed to execute on multiple devices like iPhone, android etc.

Dashboard reports were generated along with screenshot for the failed steps as part of QTP scripts

Conclusion:

- ❖ No Cost Involved, as it is being developed/enhanced in house,
- ❖ Requires physical devices to procure and keep them up to date with OS, Hardware, connected over WIFI
- ❖ For now limited only to iPhone and Android devices, exploring the options with other models like windows and blackberry phone
- ❖ Can very well be integrated with QTP 11.5 since it has image recognition ability

Recommendations

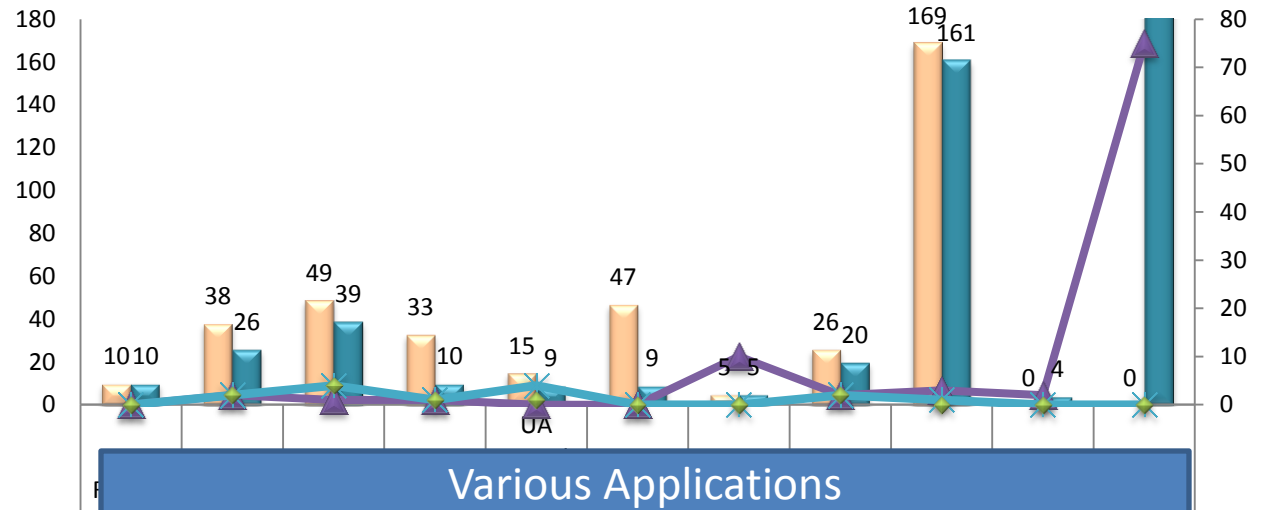
- Technology is changing
- Stay connected
- Blended model
- Minimum dependency

Automation

- Creation of custom test harness
 - Feasibility Study : Identify all the external applications and understand their protocols used for communication.
 - Analysis : Evaluate the feasibility study and come up with the design on building the framework for automation.
 - Develop : Build and test the automation framework.
 - Identification of test cases : Prioritize the critical and normal scenarios based on the timelines.
 - Execution : Execute the automation framework and publish the results.
- Automation Advantages
 - Integrated set of automation scripts for validating end to end customer experience for various types of users cutting across multiple applications
 - High reduction of test maintenance effort due to centralized “Business Components” as changes are automatically propagated through automated test assets
 - Reuse of business component scripts in multiple business flows
 - Reduce dependency on cross application QA teams for performing BPT

Automation Coverage

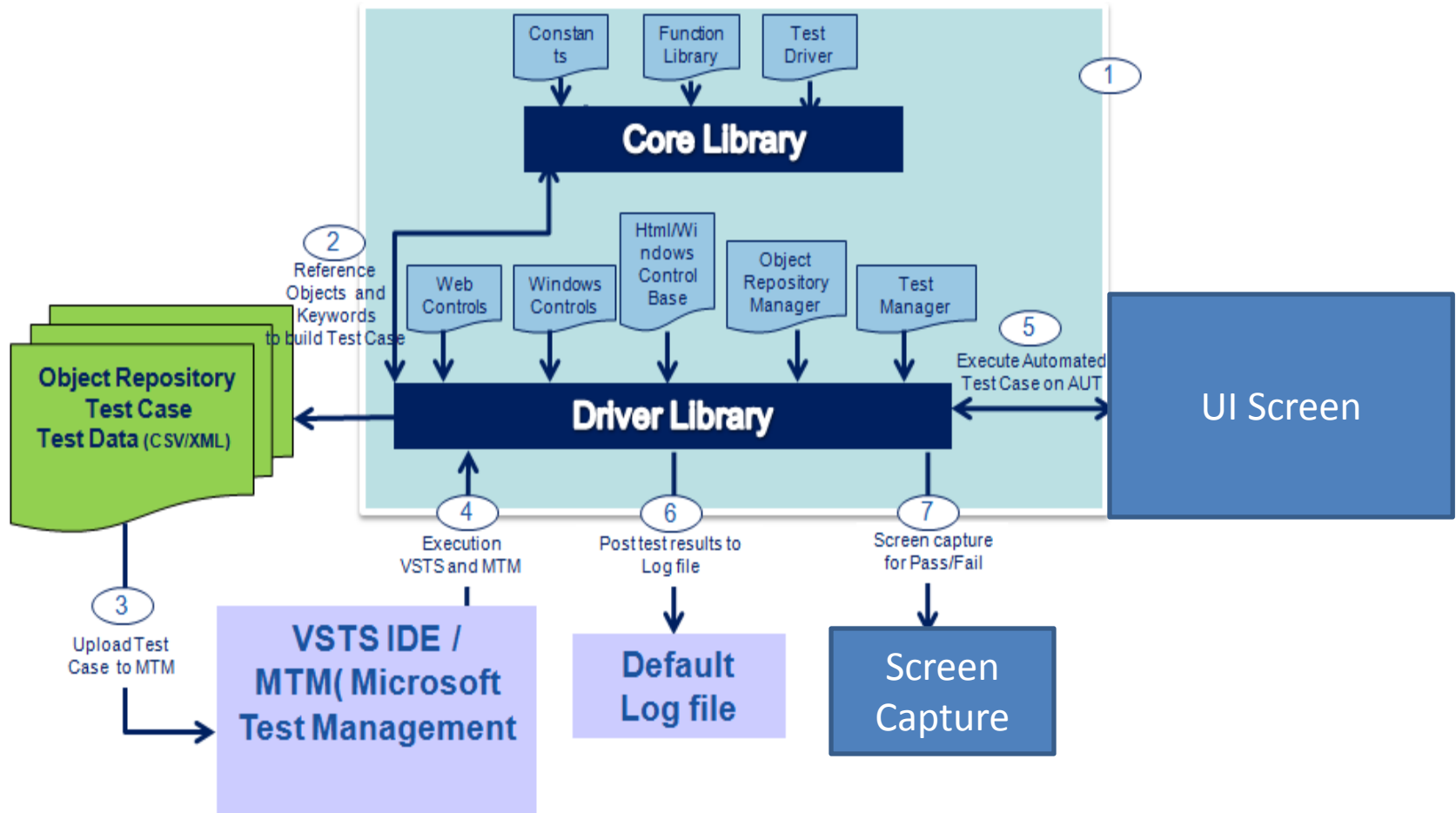
Automation Coverage - Manual Vs Automation



	# of Regression scripts
	# of scripts automated
	# of times Automated Scripts Executed
	# of times Manual Scripts Executed
	How Many releases Happened after the Demo Date

Various Applications	10	38	49	33	15	47	5	26	169	0	0
1)	10	26	39	10	9	9	5	20	161	4	187
	0	2	1	1	0	0	10	2	3	2	75
	0	2	4	1	4	0	0	2	1	0	0
	0	2	4	1	1	0	0	2	0	0	0

CodedUI – High Level Overview



Script execution without IDE

- IDE is not needed since scripts executed from windows application
- User friendly GUI

The screenshot shows a Windows application window titled "eTaskCard TestCases". Inside the window, there are three tabs: "MxSupv", "Mechanic", and "ETOPS". The "MxSupv" tab is currently selected. Below the tabs, there are four radio button options for test cases. The first option, "MxSupv_Work_SelfAssign_EA_WorkFromInWorkPartialToInWorkAssigned", is selected. Below these options, there are five text input fields with the following values: "AC Number" (0006), "Station" (EWR), "CardType" (ET), "Card Number" (7900-01212-001), and "User Name" (N5066542). At the bottom of the form, there are two buttons: "Execute" and "Clear". Below the buttons, the status is displayed as "Status: Pass" in green text.

eTaskCard TestCases

MxSupv Mechanic ETOPS EA

☒ MxSupv_Work_SelfAssign_EA_WorkFromInWorkPartialToInWorkAssigned

☐ MxSupv_Work_SelfAssign_EA_WorkFromInWorkToWorkComplete

☐ MxSupv_Work_EA_MxSupvSignoff_InspectorSupvbyback_WorkFromInWorkToWorkComplete_Release

☐ MxSupv_ReleaseCardFrom_AircraftTab

AC Number 0006

Station EWR

CardType ET

Card Number 7900-01212-001

User Name N5066542

Execute Clear

Status: Pass

Performance Testing Overview

- The objective of performance testing is to validate and verify that the functionalities of the system under test respond as expected under various loads and conditions.
- Types of performance tests include the following:



Load Test



Spike Test



Volume Test



Endurance Test



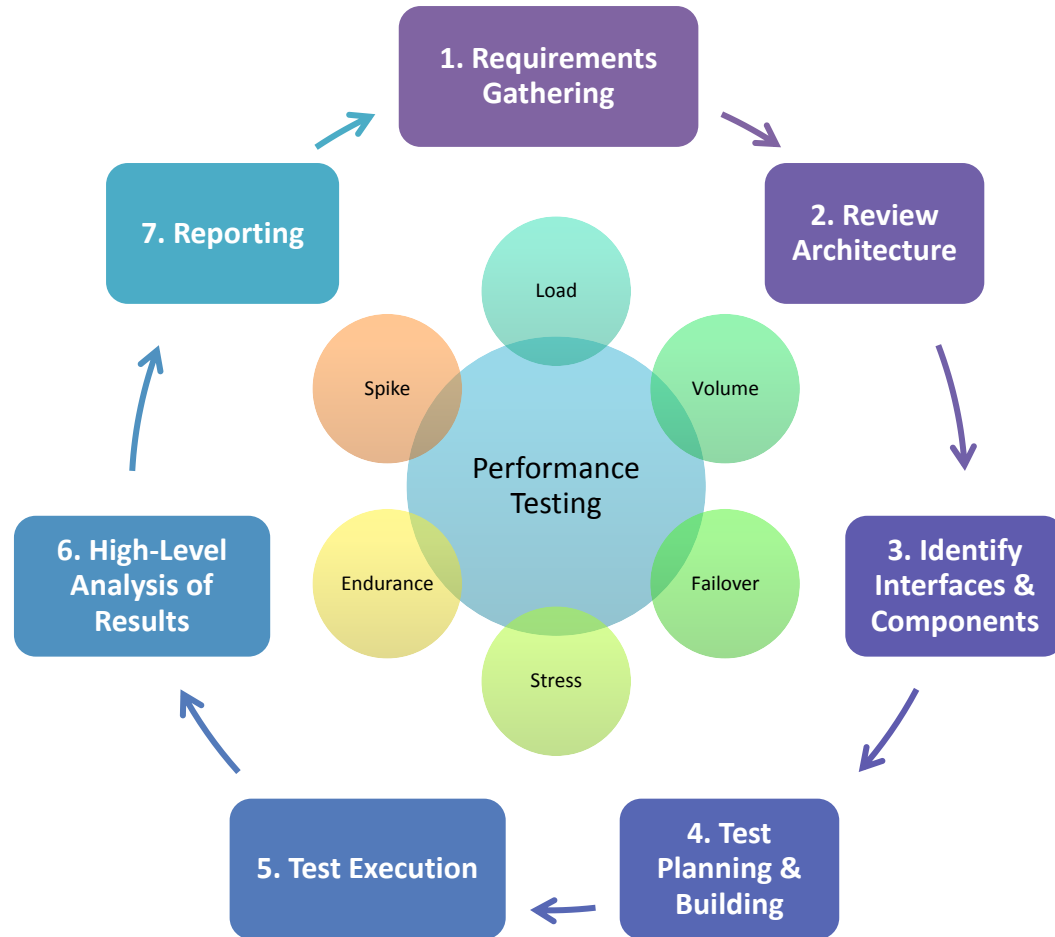
Stress Test



Failover Test

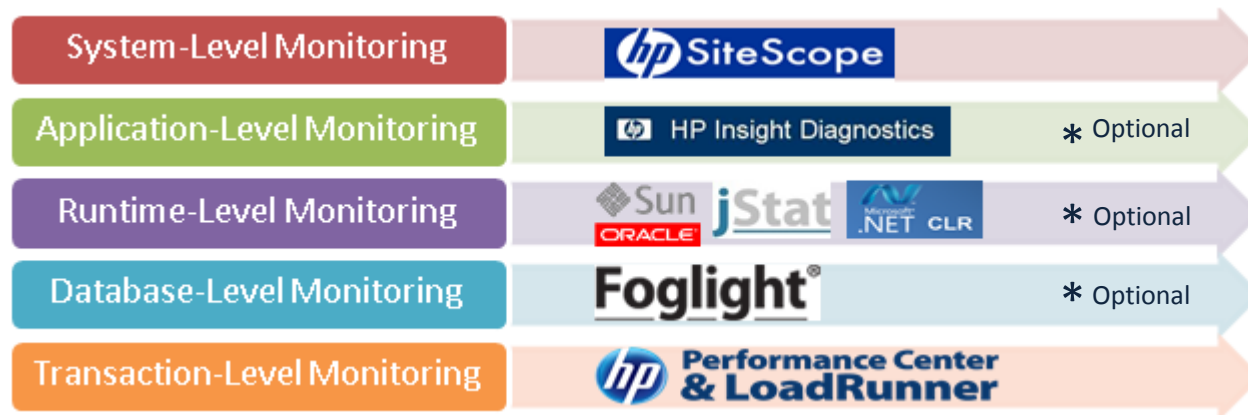
Performance Testing Process Flow

- Standardized methodology & approach to performance testing



Performance Monitoring Strategy

- As part of the test execution lifecycle, performance monitoring plays a key role in helping to identify and verify:
 - ☐ Interoperability of integration points
 - ☐ No single points of failure
 - ☐ No memory or connection pool leaks
 - ☐ Technology failover and recovery
 - ☐ Proper load balancing
- Levels of monitoring include the following:



Results of Performance Testing

- Create threshold statistics for baselines & benchmarks
 - Develop SLA requirements for system under test
 - Create performance comparison reports versus benchmarks
 - Automate performance testing to shorten testing life-cycle
 - Facilitate development of new QA processes
 - Certify test environment is ready for release to SDLC
-

Monitoring Performance Metrics

- Typical standard and pre-defined performance metric objects collected are depicted below; each performance object has a set of performance counters:

Operating System Metrics

- Processor (CPU)
- Memory
- Page/Swap
- Network
- Socket
- Disk I/O
- Processes
- Process Utilization

Application Metrics

- Thread pool
- Connection pools
- Transactions/sec
- Successful transactions
- Failed transaction
- Transaction Response Times

JVM Metrics

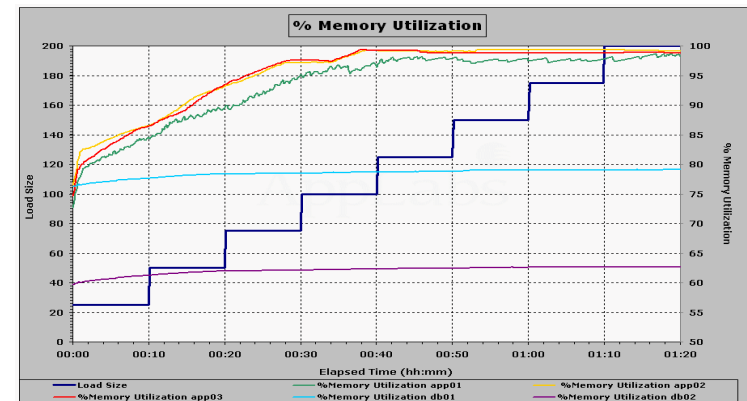
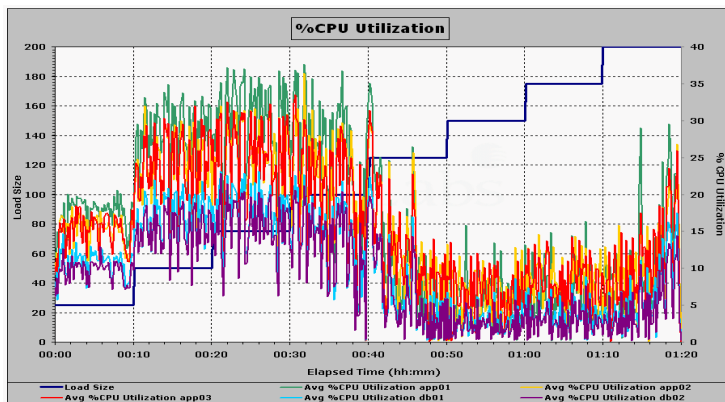
- Class loaders
- Garbage collections
- Heap size / Used heap size
- Young and tenure collections

Database Metrics

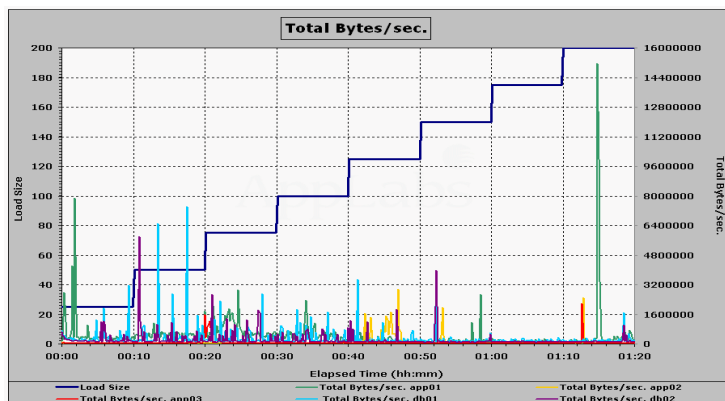
- Ratios
- I/O
- Data Cache
- Memory Pools
- Connections
- Transactions
- Parameters

Performance Reporting – Server side metrics

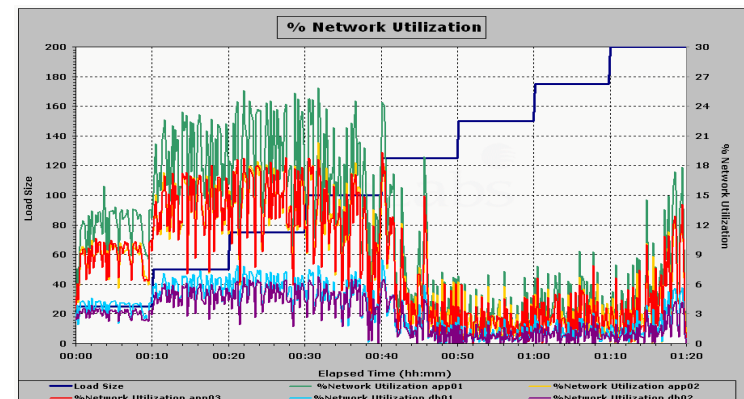
- After test execution has completed Performance Reporting is done to highlight the overall results of the test, this includes performance graphs such as the following:



Disk I/O (Bytes/sec) vs. Virtual User Load



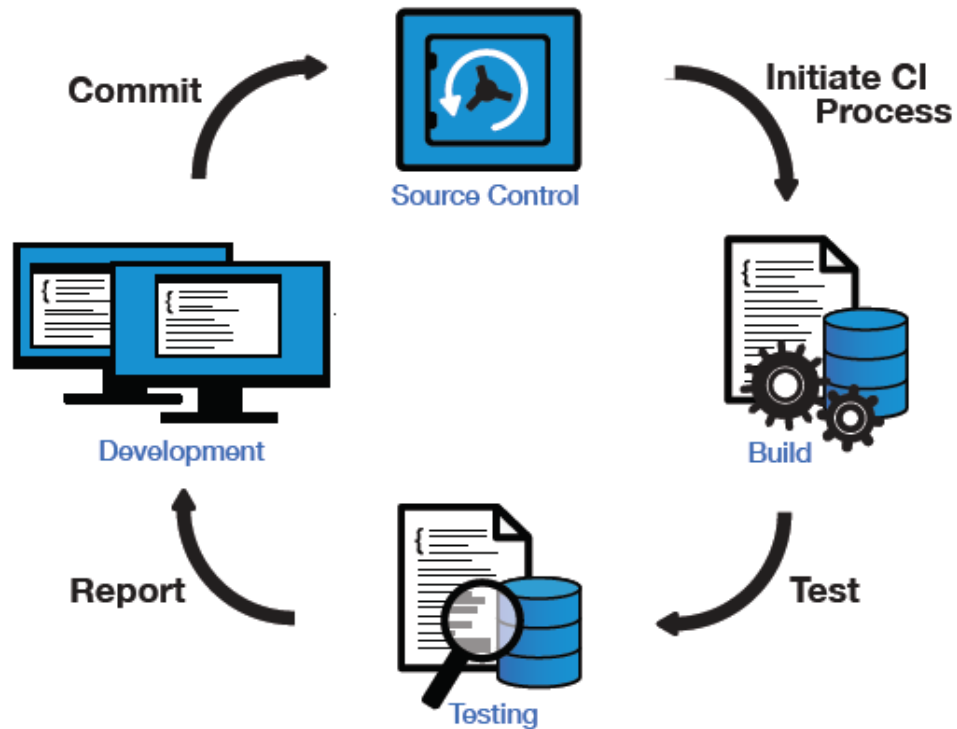
%Network Utilization vs. Virtual User Load



Web Service Testing

- Typical tools used for Web Service Testing are
 - soapUI, Fiddler and HP Service Test
- Limited options for automated test verification
- Need for continuous integration

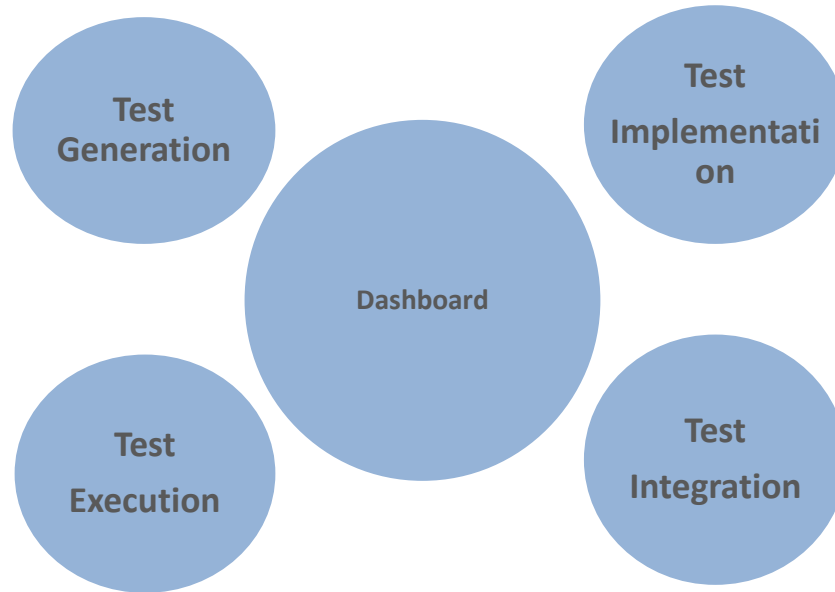
Continuous Integration



Approach

- QA team Engaged right from the beginning
- Functional Requirements
- Build empty Functional stubs
 - Visual Studio / Eclipse
- SVN – Build Process
- Dashboard (Pass / Fail)
- XML Data inputs from the Host System

Web Service Testing – Automated in CI



Development to Operations

- Continuous integration repository
- Build / Configuration Package
- Virtual Environments / On demand
- Installation
- Validation
- Deployments

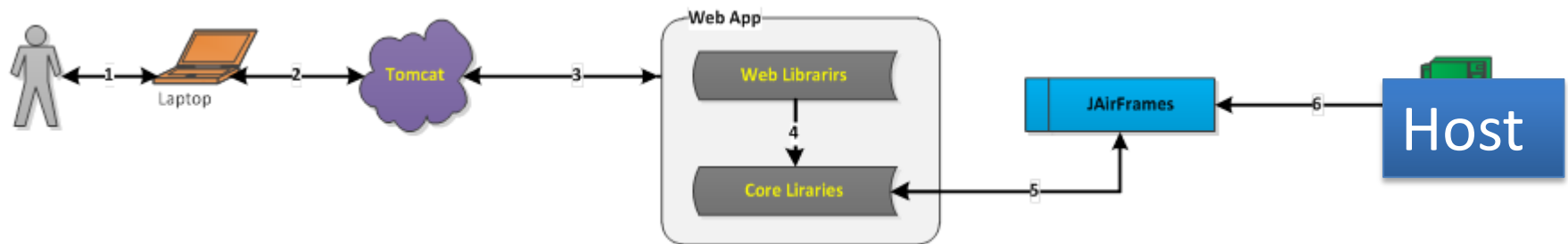
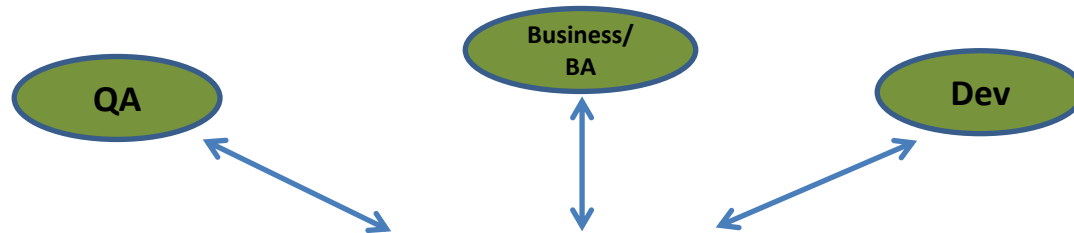
Issues / Challenges

- Non Standard Deployment Practices (Manual Deployments)
- Configuration Management
 - Varies from team to team
 - Nonexistent
- Release Management
 - Varies from team to team
 - Nonexistent
- Need for a Central Production Build Repository
 - Code Fragmented

Test Data and Tools

- Applications are tested in varied environments, mainframe, client server, web, which forces QA, Dev and Business teams to create data in all those environments.
- Time spent on data creation is a bottleneck for SIT, Regression, defect validations, UAT or GO/NO-GO decisions
- Development and Business teams require test data
- Time is the essence

In house tool



- Dependency on critical resources removed
- Cost saving and productivity improvements
- Access controls by role

QA Enablement and Success

- Read the pulse
- Embrace change
- Tools as enablers
- Research and innovate
- QA value proposition

Thank You
Q&A & Group Discussions