IBM Innovate 2012
IBM Rational's New Integration Testing and Virtualization Solution

Manoj Panda
Sr. Consultant
Manoj.Panda@in.ibm.com

IBM Software

Innovate2012

The Premier Event for Software and Systems Innovation

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Agenda

- **How to ensure better Software Quality?**
  - From "testing" to a smarter quality management
- IBM Rational Test Virtualization Solution
  - Rational Test Workbench
  - Rational Test Virtualization Server
  - Rational Performance Test Server
- Summary
  - Success Stories

A Smarter
quality
management
solution

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IBM

Software drives today's innovation for a smarter planet
Transforming the way we live, work, and play

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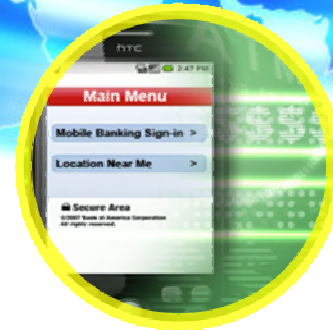
Yet software quality is a major problem across all industries

- Software is blamed for *more major business problems than any other man-made product*.

- Poor software quality has become *one of the most expensive topics in human history*

  - *$150+ billion per year in U.S*.

  - *$500+ billion per year worldwide*.

- Projects cancelled due to poor quality are *15% more costly than successful projects* of the same size and type.
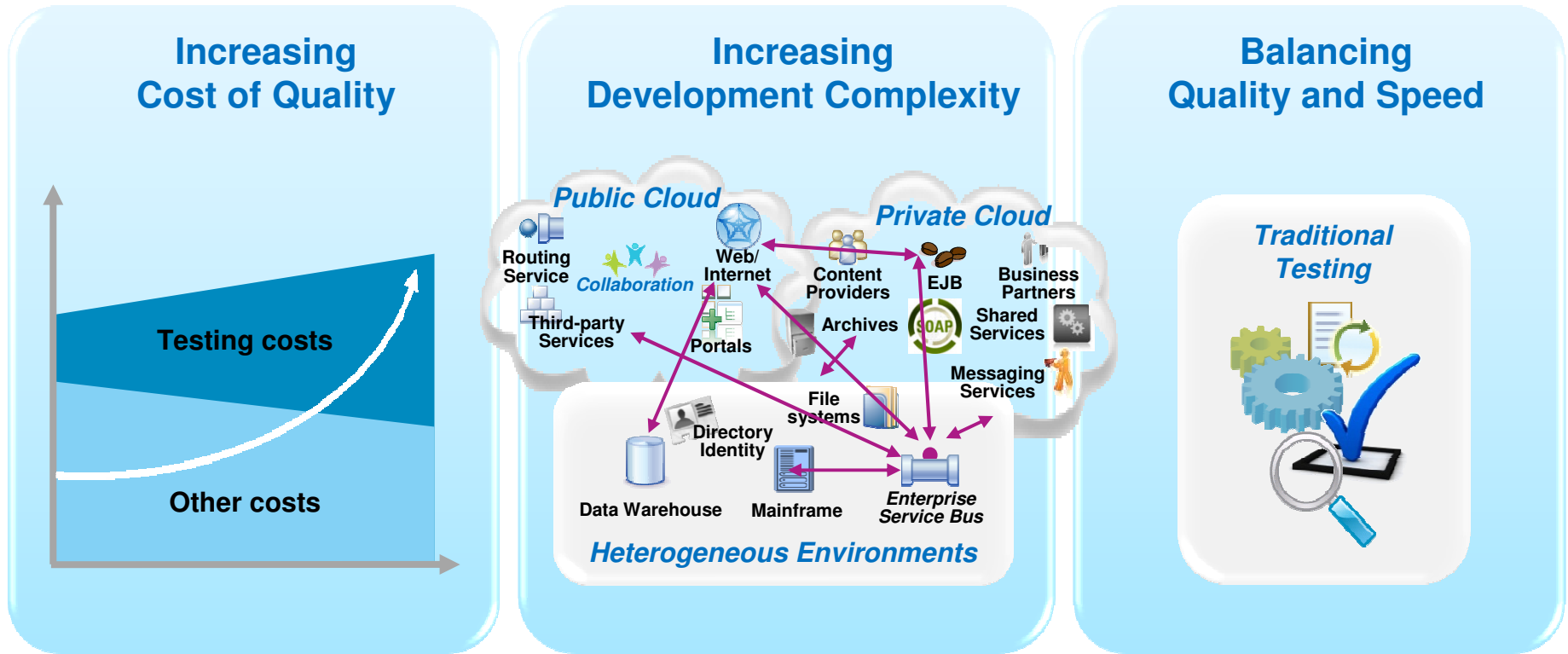
Source: Capers Jones, 2011
Based on 675 companies, 35 government/military groups, 13,500 projects, 50-75 new projects/month, 24 countries, 15 lawsuits

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Cost, complexity and velocity make today's quality paradigm impractical

An estimated 60 - 80 percent of the cost of software development is in rework*

Increasing Cost of Quality

Testing costs

Other costs

Increasing Development Complexity

Public Cloud

Routing Service

Collaboration

Web/Internet

Third-party Services

Portals

Content Providers

Archives

SOAP

Private Cloud

EJB

Business Partners

Shared Services

Messaging Services

File systems

Directory Identity

Data Warehouse

Mainframe

Enterprise Service Bus

Heterogeneous Environments

Balancing Quality and Speed

Traditional Testing

Outsourcing **labor** is no longer a sustainable model as global wages are increasing

Product and application **complexity** and size are increasing

Productivity is inhibited as test teams can no longer keep up with agile development

* Source:http://www.sei.cmu.edu/about/message/

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Managing software quality has become extremely challenging

Increasing Cost of Quality

$59.5 billion

The estimated cost of software defects cost to U.S. economy[c]

13%

The forecasted increase in wages for India IT workforce in 2011[a]

Increasing Development Complexity

$5-30 million

The typical investment to build a single test lab for a Fortune 500 company. Most have dozens[b]…

5x more test labs required

Large global financial services firm increases test lab deployments from 6 to 32 in 13 years[b]

Balancing Quality and Speed

74%

The estimated number of projects with significant delays or quality issues[c]

30-50%

The average amount of time testing teams spend on setting up test environments, instead of testing[c]

a The Times of India, IT sector to get 12% average salary hike in 2011, TOI Tech & Agencies, March 8, 2011.
b IBM customer reference.
c NIST, Planning Report 2002-2003. The Economic Impacts of Inadequate Infrastructure for Software Testing, May 2002.

Last Updated: 17 January 2012

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Better software quality requires a shift in focus
Evolving from Testing to Quality Management

Testing

A technical investigation done to expose quality-related information about the product or service under test
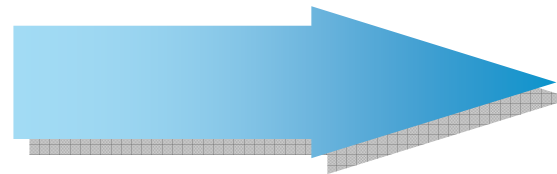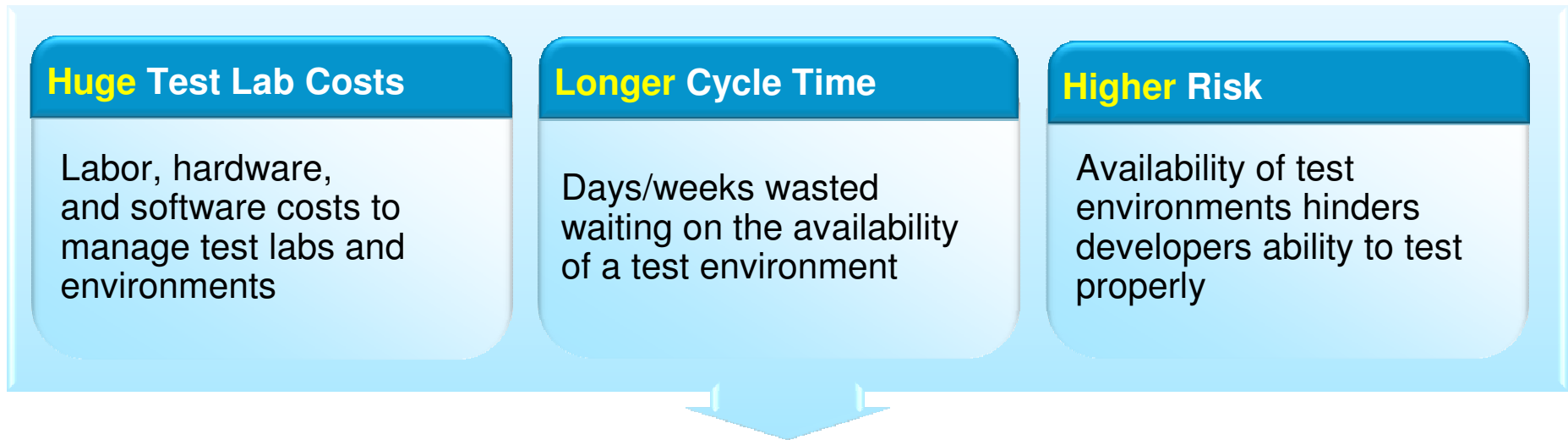
"I have hundreds of testers & lots of automation, but all I do is find more defects. I don't have a testing problem, I have a quality problem." – large global bank

Quality Management

Systematic monitoring and evaluation of the various aspects of a product or service, to maximize the potential to attain target quality standards

Past Solutions and Limitations

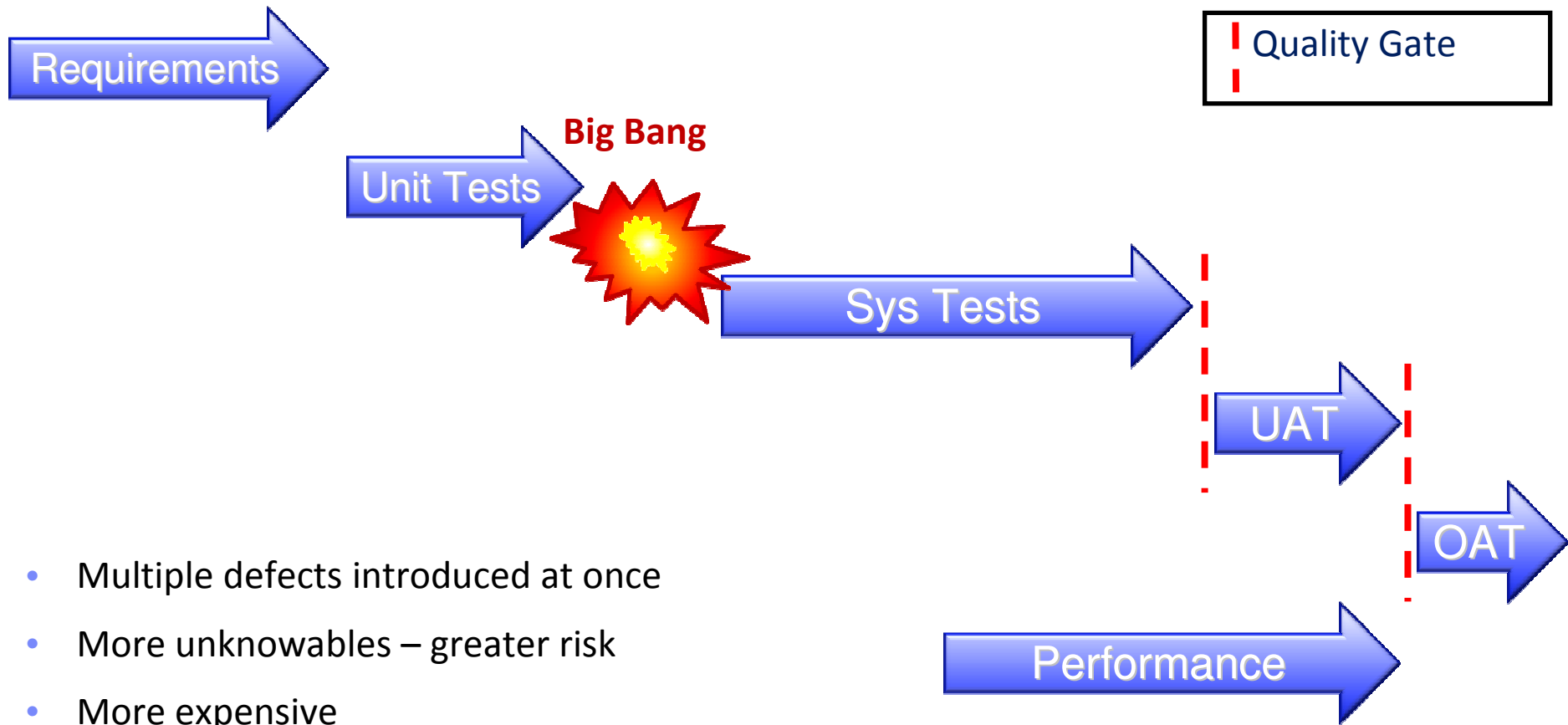| **Huge Test Lab Costs**	**Longer Cycle Time**	**Higher Risk**
Labor, hardware, and software costs to manage test labs and environments	Days/weeks wasted waiting on the availability of a test environment	Availability of test environments hinders developers ability to test properly

- Lots of under-utilized and costly test lab resources

- Development and QA waste a lot of time on unproductive activities: installation, configuration, trial/error, etc.

- A significant portion of the testing effort is pushed late in the process resulting in defects costing 10-100x to fix

Agenda

- How to ensure better Software Quality?

  – From "testing" to a smarter quality management

- IBM Rational Test Virtualization Solution

  – Rational Test Workbench

  – Rational Test Virtualization Server

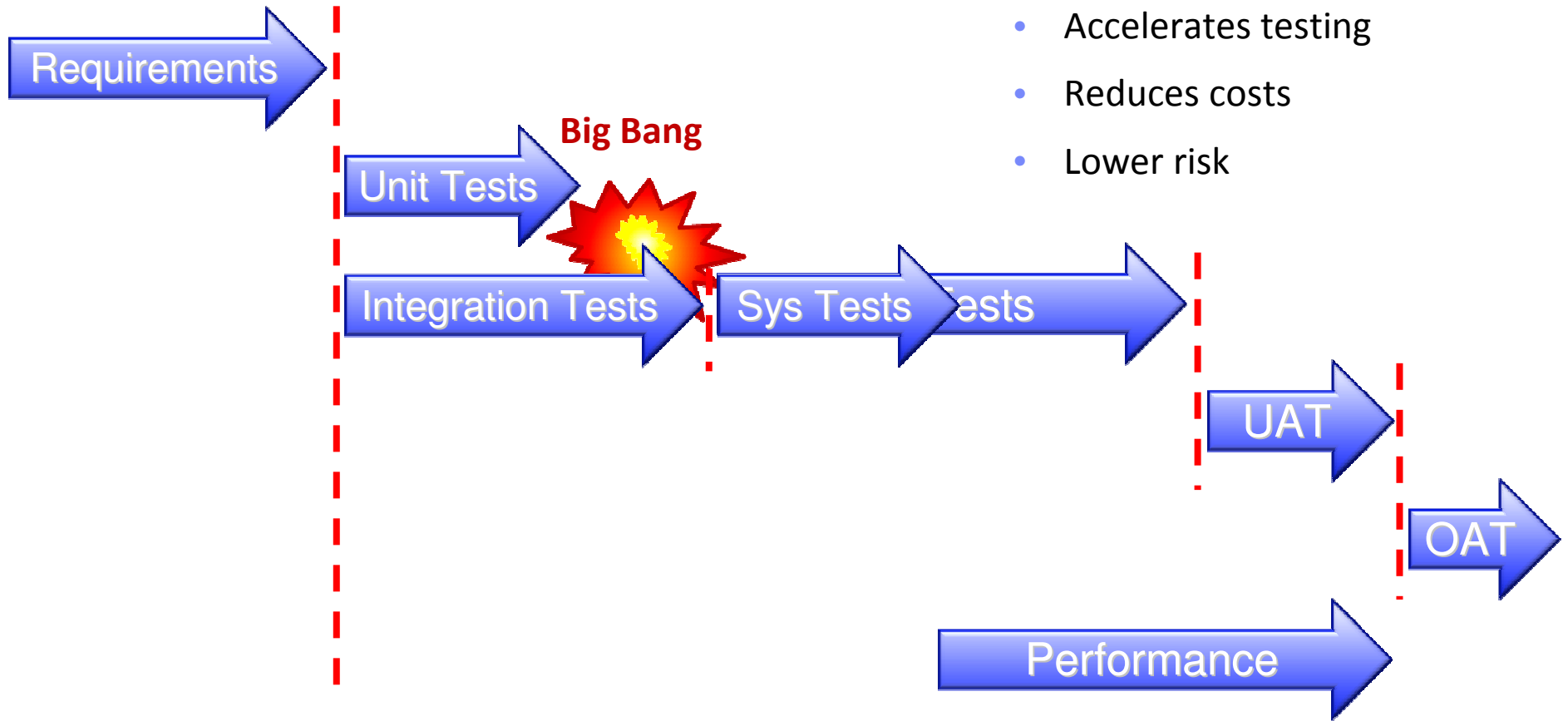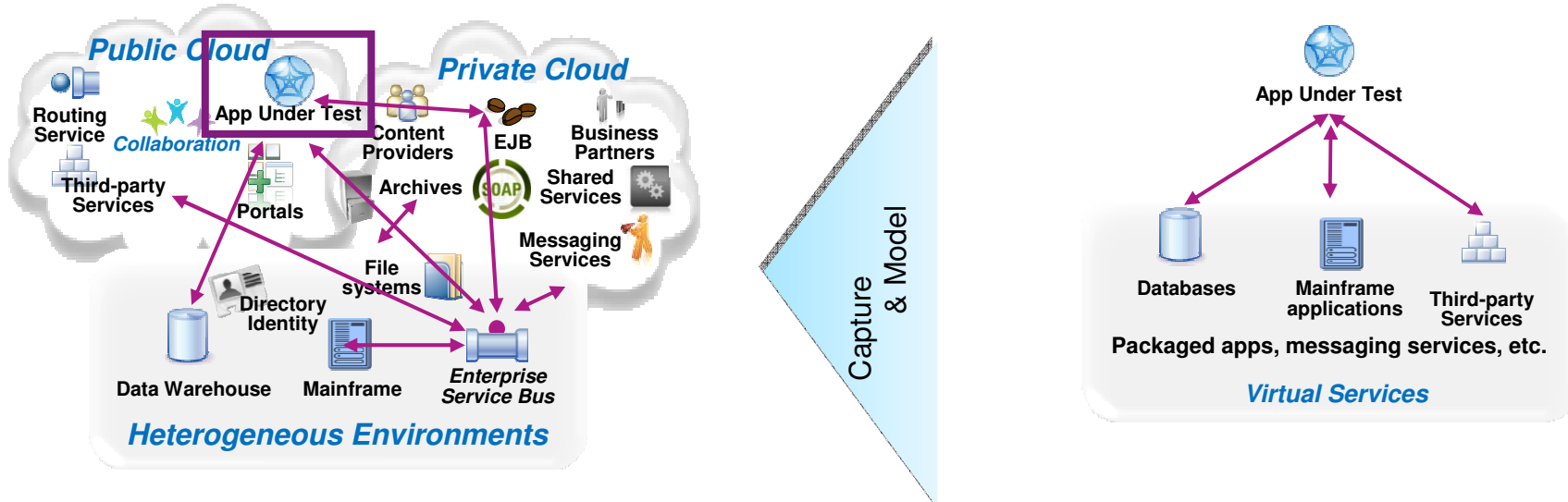 – Rational Performance Test Server

- Summary

  – Success Stories

A Smarter quality management solution

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The Old World

Requirements

Unit Tests

Big Bang

Sys Tests

UAT

OAT

Performance

Quality Gate

- Multiple defects introduced at once

- More unknowables – greater risk

- More expensive

The New World

Requirements

Unit Tests

Big Bang

Integration Tests

Sys Tests Tests

UAT

OAT

Performance

- Accelerates testing
- Reduces costs
- Lower risk

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What is Test Virtualization?

Public Cloud

Routing Service

Collaboration

Third-party Services

App Under Test

Portals

Content Providers

Archives

SOAP

Private Cloud

EJB

Business Partners

Shared Services

Messaging Services

Directory Identity

File systems

Data Warehouse

Mainframe

Enterprise Service Bus

Heterogeneous Environments

Capture & Model

App Under Test

Databases

Mainframe applications

Third-party Services

Packaged apps, messaging services, etc.

Virtual Services

System *dependencies* are a key challenge in setting up test environments:

▸ *Unavailable/inaccessible*: Testing is constrained due to production schedules, security restrictions, contention between teams, or because they are still under development

▸ *Costly 3rd party access fees*: Developing or testing against Cloud-based or other shared services can result in costly usage fees

▸ *Impractical hardware-based virtualization*: Systems are either too difficult (mainframes) or remote (third-party services) to replicate via traditional hardware-based virtualization approaches
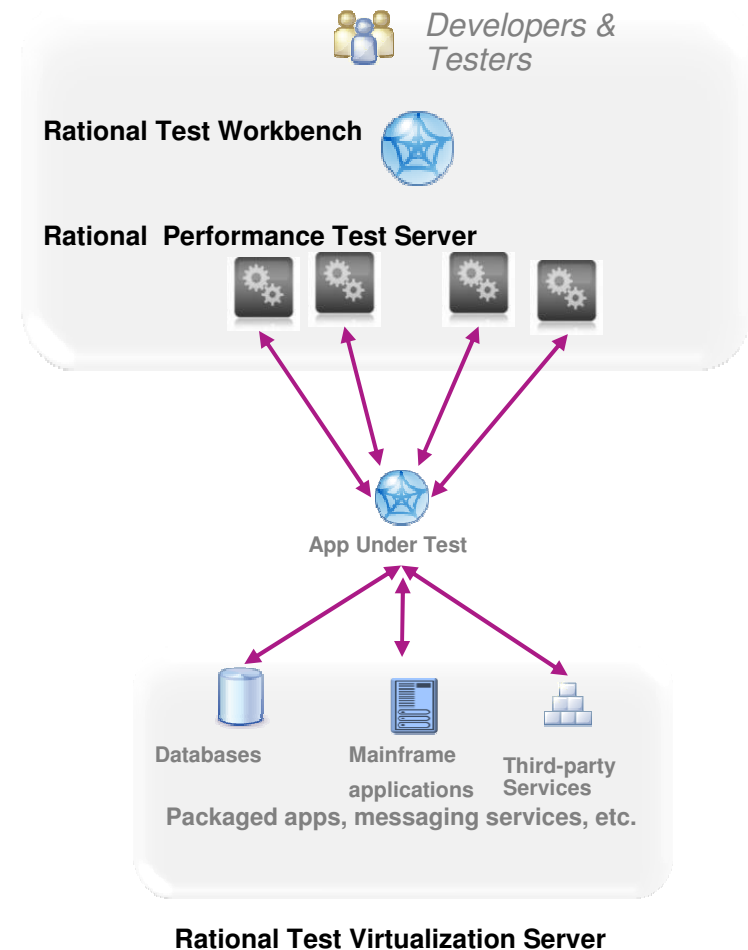
Test Virtualization enables to create "*virtual services*":

– *Virtual Services simulate the behavior of an entire application or system* during testing

– Virtual Services can **run on commodity hardware, private cloud, public cloud**

– *Each developer, tester can easily have their own test environment*

– Developer and testers **continue to use their testing tools** (Manual, Web performance, UI test automation)

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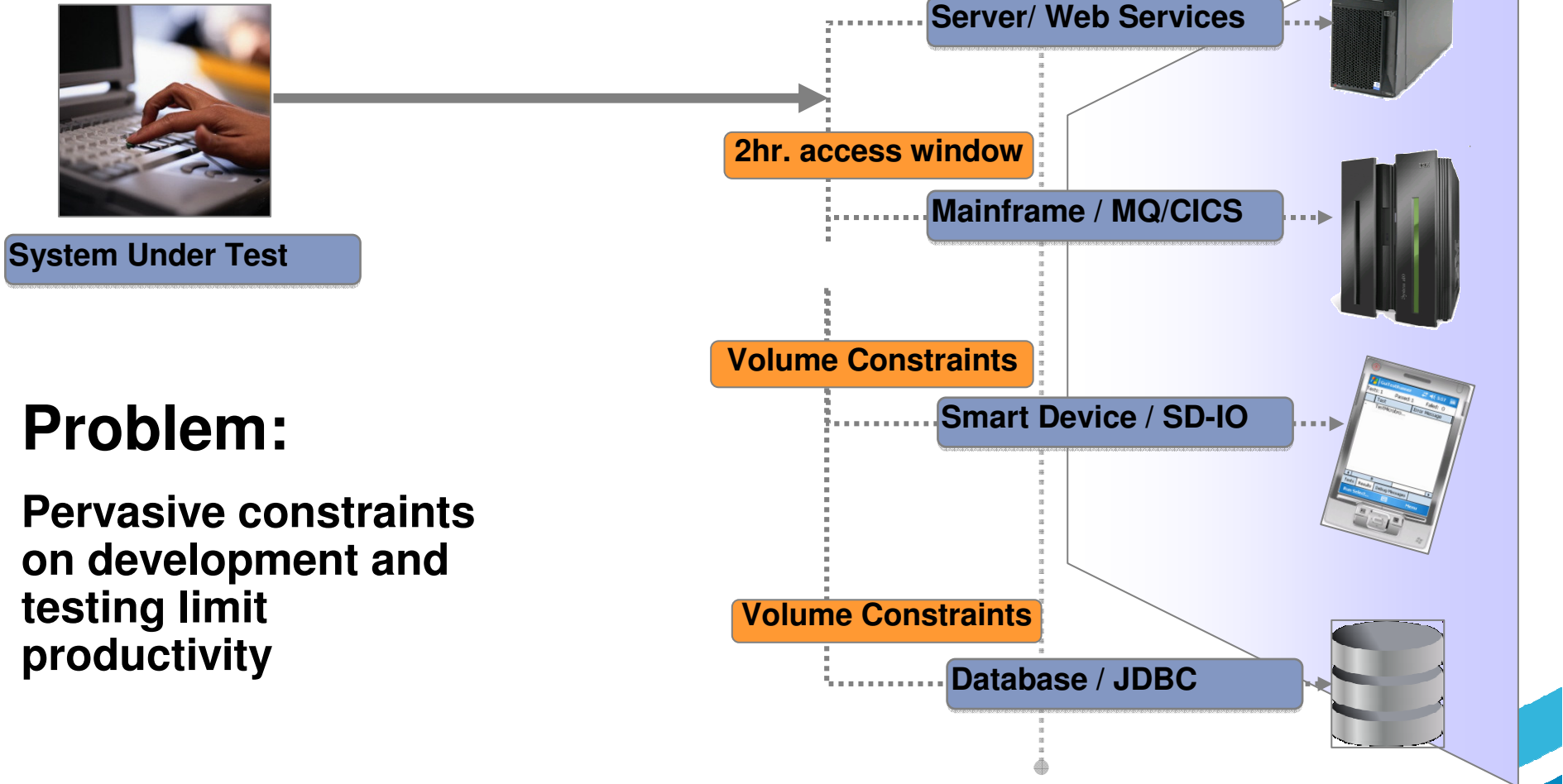# IBM Rational Test Virtualization Solution
A smarter solution to better quality

- **Rational Test Workbench** is a desktop solution that enables testers/developers to:

  – Capture and model virtual services

  – Test services and applications long before their user interfaces becomes available and do integration testing (SOA, BPM)

- **Rational Test Virtualization Server** is a server solution that:

  – Provides a central environment to virtualize heterogeneous hardware, software and services to provide 24x7 testing capabilities

  – Reduces infrastructure costs of traditional testing environments

  – Virtual Services can be built from the interface definition of the system for a wide variety of protocols, including HTTP, web services, SOA, JMS, TIBCO, IBM WebSphere MQ, Oracle, etc.

- **Rational Performance Test Server** enables Rational Test Workbench users to reuse test scripts to drive performance testing

  – Can be used in combination with Virtual Services

  – Probe for identification of system bottlenecks

Developers & Testers

Rational Test Workbench

Rational Performance Test Server

App Under Test

Databases   Mainframe applications   Third-party Services

Packaged apps, messaging services, etc.

Rational Test Virtualization Server

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Challenge: Constraints in the development and testing lifecycle

Physical Test Environment

Maintenance Constraints

Server/ Web Services

2hr. access window

Mainframe / MQ/CICS

System Under Test

Problem:

Pervasive constraints on development and testing limit productivity

Volume Constraints

Smart Device / SD-IO

Volume Constraints

Database / JDBC

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Solution : IBM Rational Test Virtualization Solution
Test Virtualization listens to and captures the behavior and characteristics of back-end systems

Physical Test Environment

Listen / Capture

Maintenance Constraints

Server/ Web Services

System Under Test

2hr. access window

Store

Mainframe / MQ/CICS

Capture & Model

Volume Constraints

Test Case Repository

Smart Device / SD-IO

Web Services

MQ/CICS

Volume Constraints

Smart Devices

Database / JDBC

JDBC

Virtual Environment

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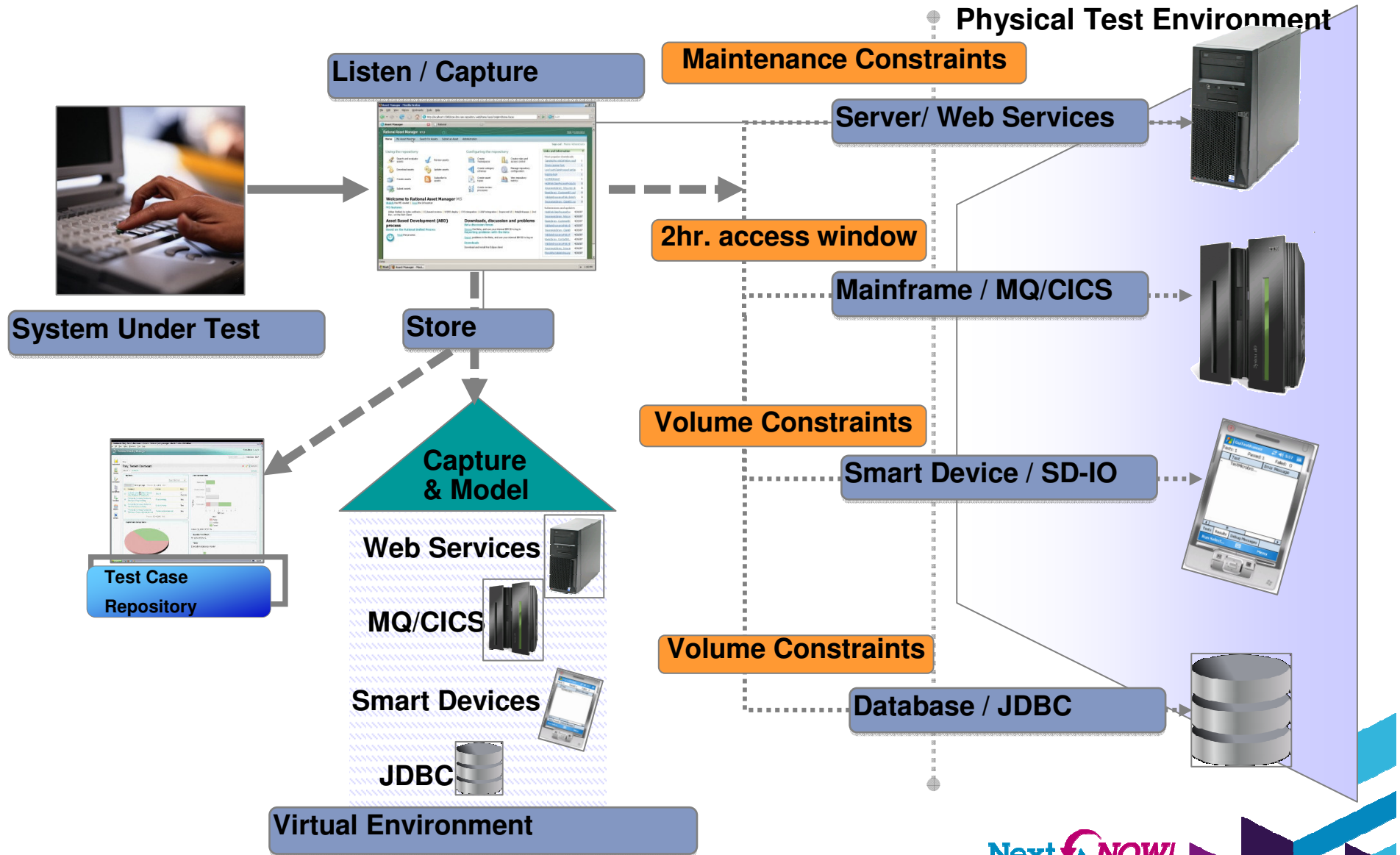
IBM Rational Test Virtualization Solution enables deployment of virtual services to multiple environments

Model and Deploy

Live / Virtual

System Under Test

Test Case Repository

Physical Test Environment

Maintenance Constraints

Server/Web Services

2hr. access window

Mainframe / MQ/CICS

Volume Constraints

Smart Device / SD-IO

Volume Constraints

Database / JDBC

Capture & Model

Web Services

MQ/CICS

Smart Devices

JDBC

AV - FTE

Capture & Model

Web Services

MQ/CICS

Smart Devices

JDBC

AV - SIT

Capture & Model

Web Services

MQ/CICS

Smart Devices

JDBC

AV - UAT

IBM Rational Test Virtualization Solution provides benefits across the software delivery life cycle

Developer uses virtual services to unit test code on their workstation – no elaborate environment required

Development and Test teams uses virtual services for early stage advanced testing

Define constrained systems and services for virtualization

Unit	Integration	System	System Integration	User Acceptance	Operability

Performance

The full system or components of the system can be performance tested early in the cycle. Virtual services can be used when components are not available

Later in the cycle, final pre-production versions of services are swapped in as they become available. Final testing is done against real services

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Incremental Integration Testing

Units are introduced into the
continuous integration cycle in a
prioritised, controlled fashion.

Units not yet built can be simulated
and tested against.

Actual Component
Stubbed Component
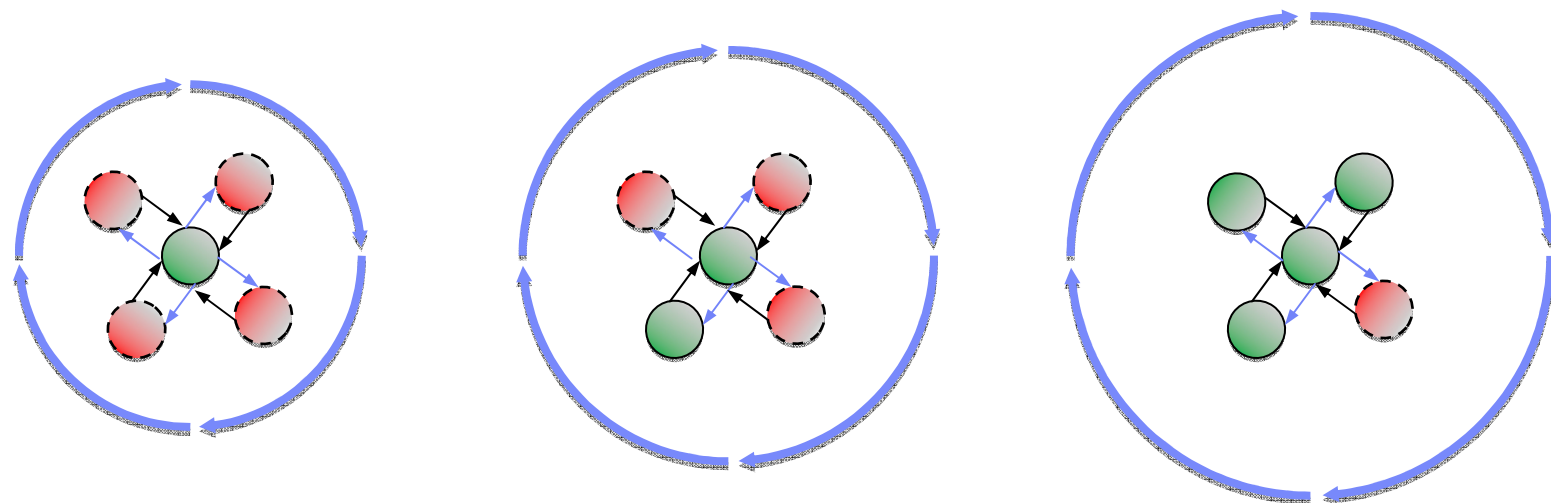
Incremental Integration Testing

IBM Rational Test Virtualization Solution is a key enabler for Continuous Integration Testing

✓Test Virtualization is an enabler for continuous Integration Testing

⬤ Actual Service/App

⬤ Virtual Service/App

✓Services, applications, systems are introduced into the continuous integration cycle in a prioritized, controlled fashion.
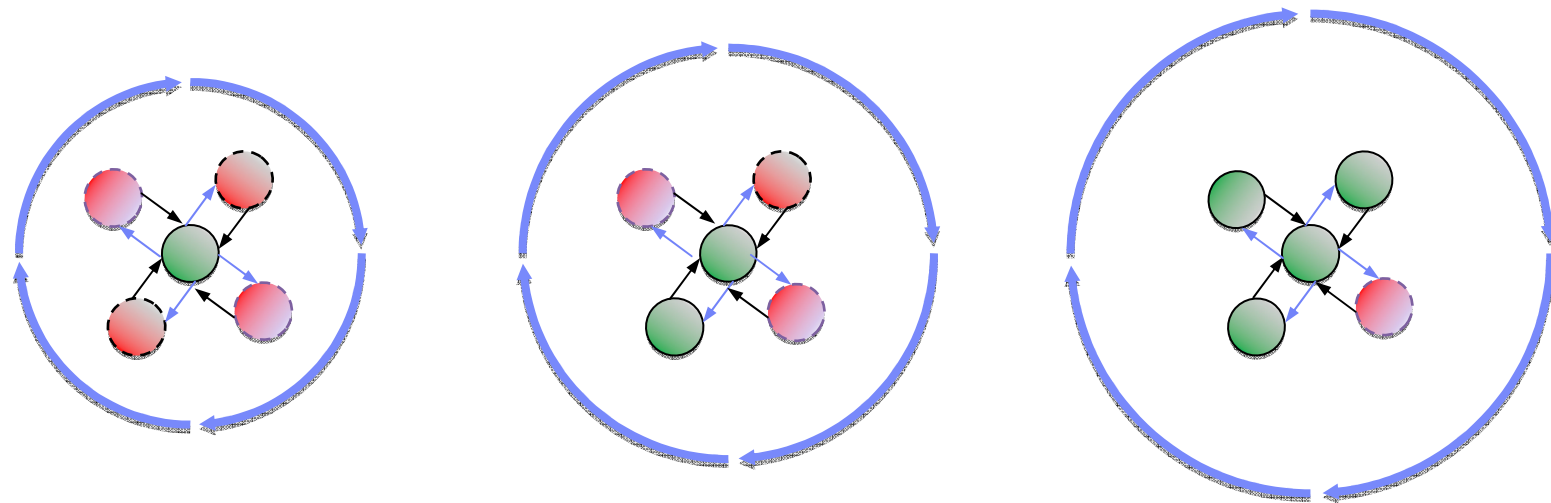
Incremental Integration Testing

IBM Rational Test Virtualization Solution streamlines continuous integration and testing

- Avoid time spent installing and configuring software just to discover basic build issues

- Smoke tests can be integrated as part of the continuous integration process through deployment automation and test virtualization

- Smoke test results are made available to the entire team to shorten resolution

Cloud Environment

Virtual Lab Manager   VM Catalog

CRM
Order Mgr
App Server

Virtual Machines

Build

Assets

Product Increment

- **Smoke Tests**
- **Sandboxes**
- **Self-provisionning**
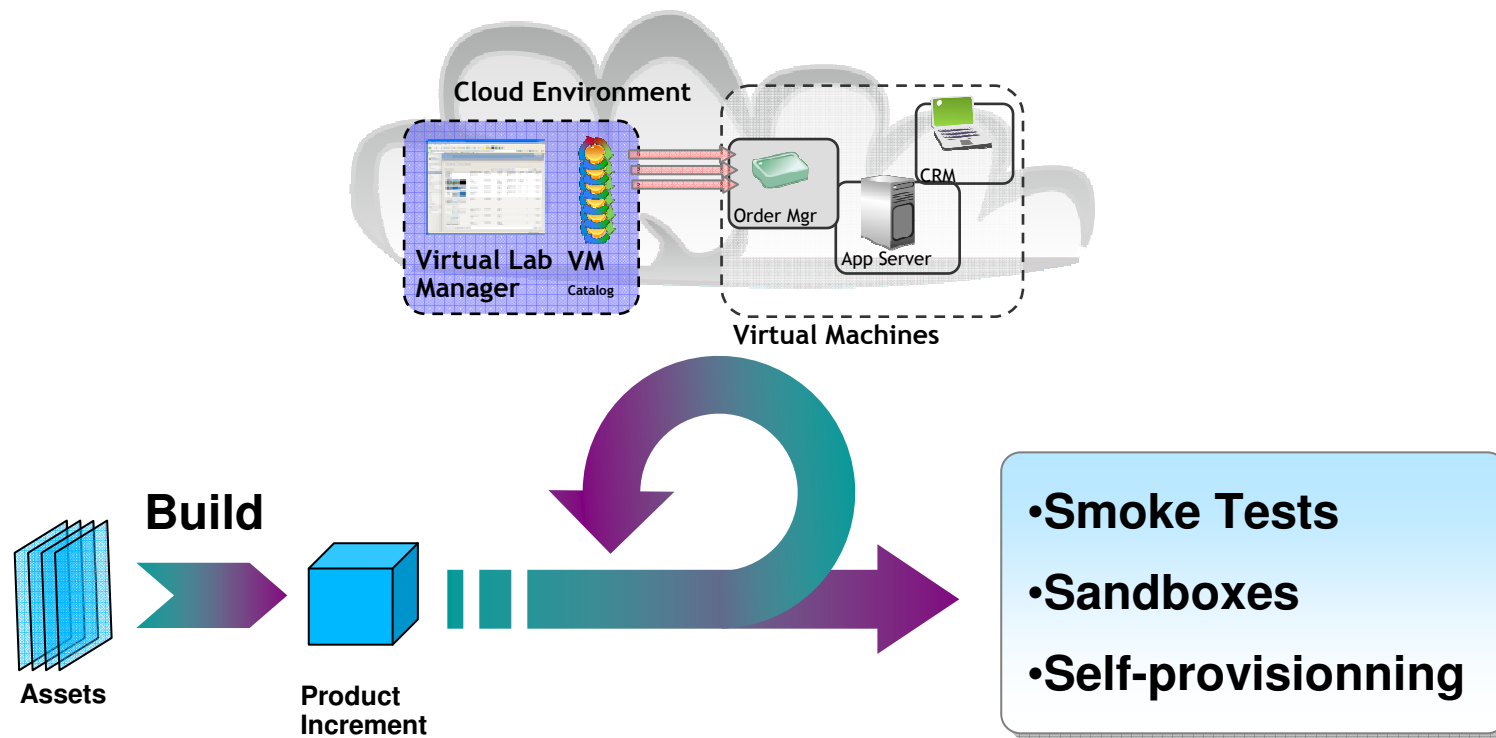
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Performance Testing with IBM Rational Test Virtualization Solution

Configure & Control

Execute

Virtualize

1700 New Orders Type A per second

5 Cancelled Orders per second

50 Order Edits per second

1 Heartbeat per second

750 New Orders Type B per second

Analyse
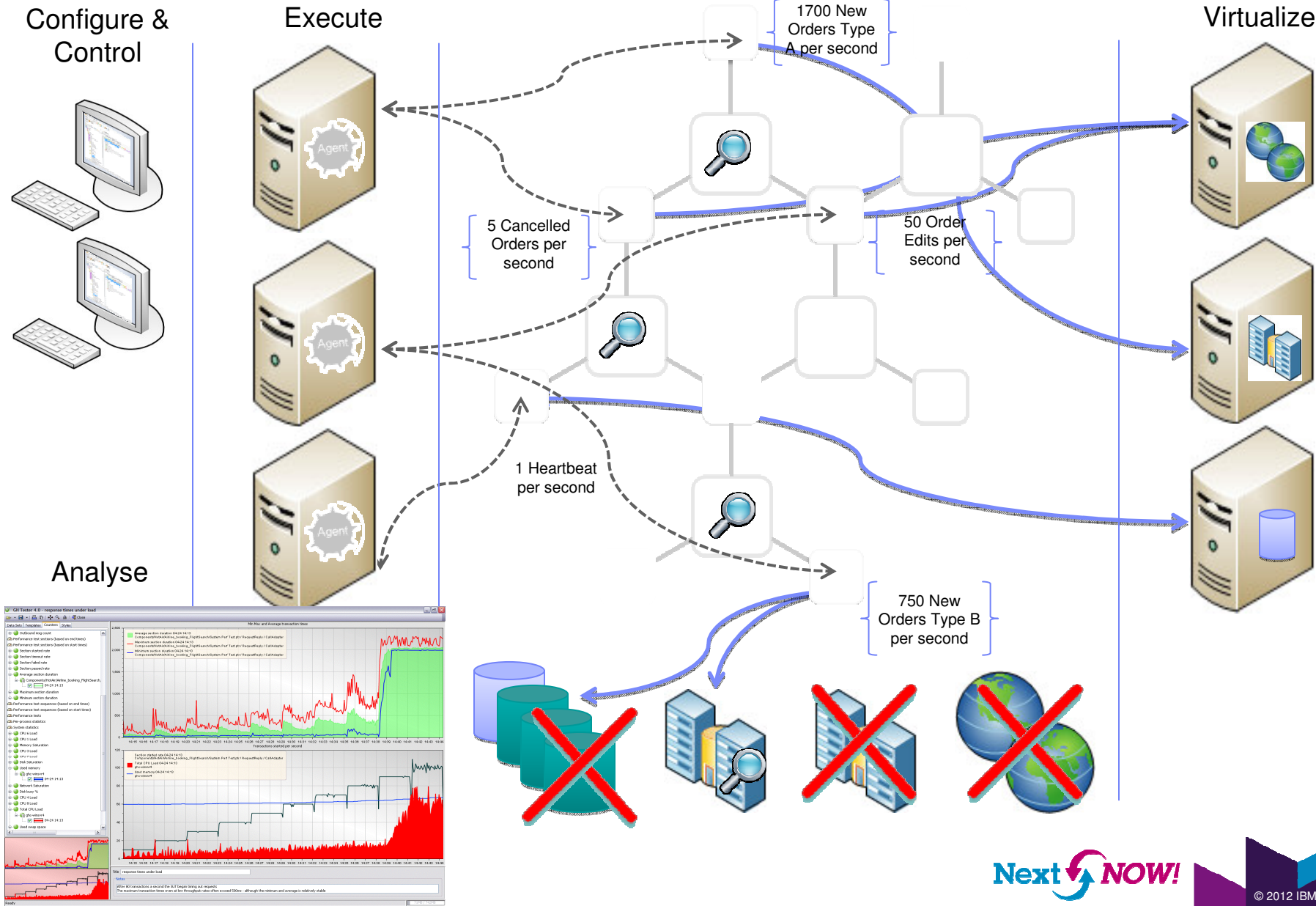
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Supported Environments and Technologies

Messaging Protocols

- ActiveMQ
- Email (SMTP, IMAP)
- Files
- FTP/S
- HTTP/S
  JMS (JBOSS et al)
  IBM WebSphere MQ
- JBoss MQ
- SAP IDoc, BAPI, RFC & XI/PI
- Software AG's IB & IS
- Solace
- Sonic MQ
- TCP
  TIBCO Rendezvous, Smart
  Sockets & EMS
- Custom

SOA, ESB, Others

- CentraSite
- Oracle Fusion
- SCA Domain
- Software AG IS, BPMS
- Sonic ESB
- TIBCO ActiveMatrix
- UDDI
- Web Services
- WebSphere RR
- WSDL

- BPM
- Databases
- Log Files

Message Formats

- .Net Objects
- Bytes
- COBOL Copybook
- ebXML
- EDI
- Fixed Width
- HL7
- IATA
- Java Objects
- MIME
- OAG
- SOAP
- Software AG Broker Docs
- SWIFT
- TIBCO ActiveEnterprise
- XML (DTD, XSD, WSDL)
- Custom

Note : Custom protocol support can be developed

Virtual Application Types

Simple	Hard-coded response returned for given input
Non-deterministic	One-of-n hard-coded responses
Data driven	Input and/or output data specified in external data source (Excel, file, database)
Model driven, stateful	Input and/or output data kept in data model with complex relationships. Supports CRUD and other stateful behavior
Behavioural	Extends model-driven to provide pre-packaged functionality, e.g. shopping basket, real-time data feed, trading exchange, order matching

IBM Rational Test Virtualization Solution Workflow
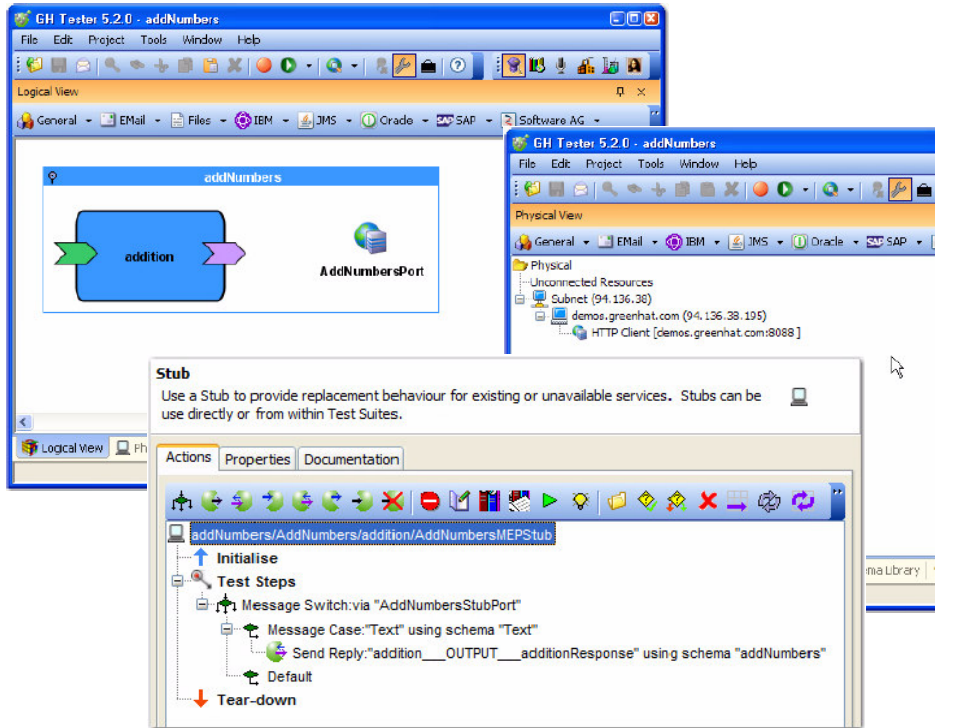
- **Using Rational Integration Tester (part of Rational Test Workbench)**

  – Define system architecture in "architecture school"

  – Define protocols

    • Import specification, e.g. WSDL for web services

    • Record conversations

  – Define stubs and data

    • Data captured during recording or supplied in a file, database

  – Publish stubs to Rational Test Virtualization Server (RTVS)

- **Dynamically configure message routing from RTVS web console**

- **Test against virtual system from tool of choice**

Agenda

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  – Rational Performance Test Server

- **Summary**

  – Success Stories

A Smarter quality management solution

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IBM Rational Test Virtualization Solution has proven measureable results and business value

Major telecom carrier

Multiple test releases required additional test resources, increasing testing costs

- Solution: Virtualized services and created reusable test cases across multiple environments

- Results: Reduced testing time by 50%, saving $800K over 3 years

A leading global financial services firm with assets of over $2 trillion

Many disparate legacy format to be migrated to next gen payments system

- Solution: Virtualized third-party systems otherwise unavailable for testing

- Results: Reduced manual testing from 10 days to 10 minutes, saving over $7 million to date

Major U.S. insurer

Recognized manual efforts insufficient for complex SOA and web services

- Solution: Agile middleware solution created to match the legacy systems' functionality

- Results: Reduced testing by 95% to 2 hours; reduced 'rate filing' validation by 94% to 320 hours

Global manufacturer acquires competitor

Migrate off rented infrastructure onto company's standardized middleware platform

- Solution: Virtualized critical, unavailable systems during migration

- Results: Fully integrated in 6 months – 2 months ahead of schedule; saved significant rental costs and dependencies on third-party systems

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IBM Rational Test Virtualization Solution
A Smarter Solution for Better Quality

Significantly Lesser Test Lab costs

- Test lab infrastructure costs can be reduced by up to 90%
- Labor involved in setting up test environments can be reduced by 80%+
- Reduced or eliminated the cost of invoking 3rd party systems for non-production use, fee-based web services
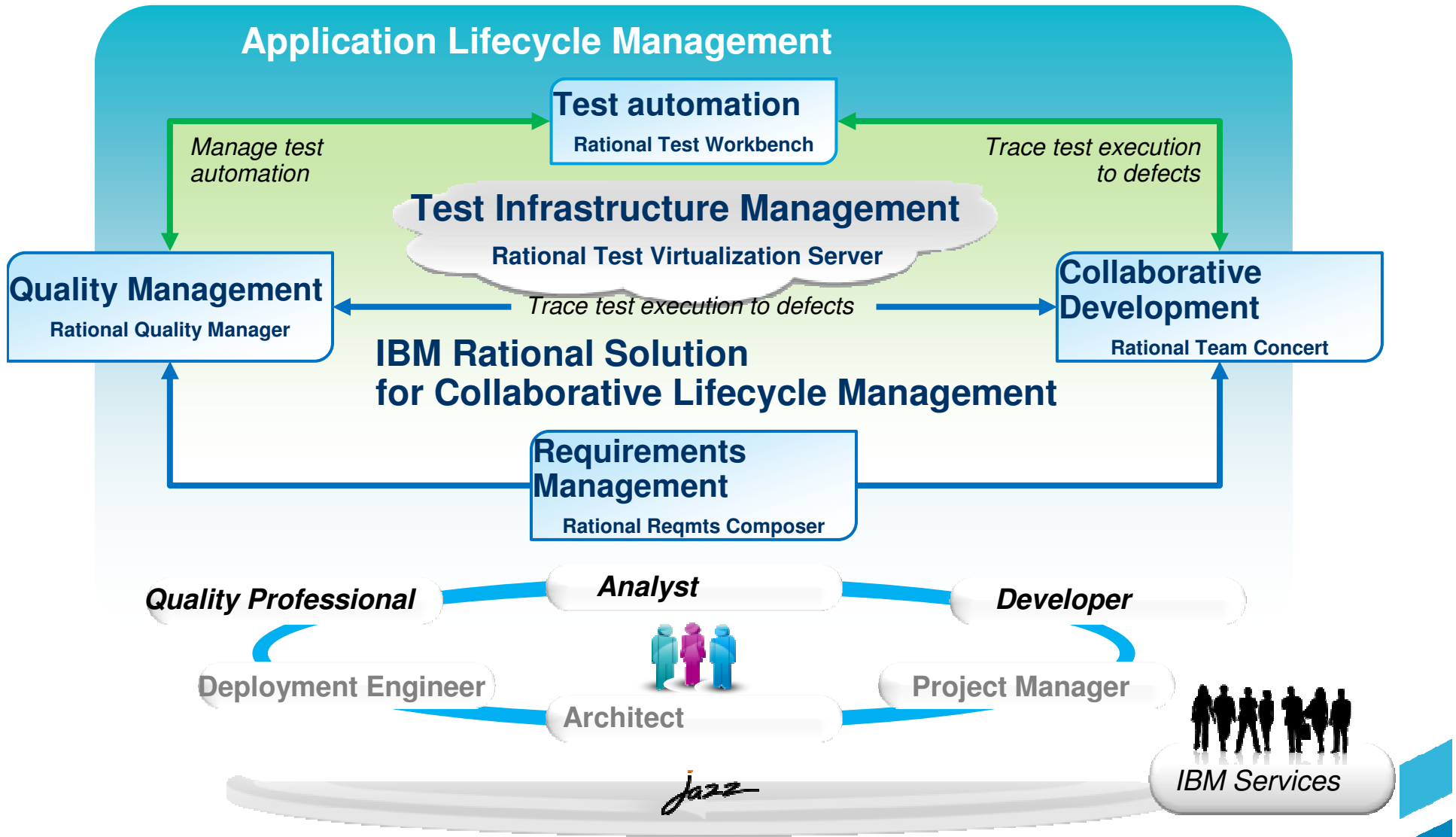
Reduced Cycle Time

- Test environments can be configured in minutes vs weeks
- More testers can be focused on testing, rather than configuring test environments
- More regression testing can be done independently from the User Interface, during development

Lower Risk

- Developers have the means to test software earlier at the Service/API level
- Large teams working on different parts of an application or system can effectively do parallel development by virtualizing different parts of the system

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IBM Rational Integrated Quality Management Solution

Application Lifecycle Management

Test automation
Rational Test Workbench

Manage test automation

Trace test execution to defects

Test Infrastructure Management

Rational Test Virtualization Server

Quality Management
Rational Quality Manager

Trace test execution to defects

Collaborative Development
Rational Team Concert

IBM Rational Solution for Collaborative Lifecycle Management

Requirements Management
Rational Reqmts Composer

Quality Professional

Analyst

Developer

Deployment Engineer

Project Manager

Architect

jazz

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