# Preparing Applications For Heavy Load

Peak Load High Volume Traffic Planning

About Northway Solutions Group

- HP Elite Solutions Partner and Reseller

- Application Lifecycle Management

- IT Performance Suite Provider

- HP Software Certified (ASE/AIS/CI) Consultants

- Testing Center of Excellence Solution Provider

- Quality Management Practice (Process-Focused)

- Experience With Large, Complex Projects

- A "Value Outsourcer". We compete on skill sets, not $$$.

- Headquarters: Nashville, TN.

About The Speaker – Scott Moore

- 18+ years of IT experience

- Tested some of the largest systems in the world.

- Thought leader for the Performance Center of Excellence

- President & CEO of Northway Solutions Group

- Elite HP Partner/Reseller

- Certified Product Consultant

- Certified Instructor

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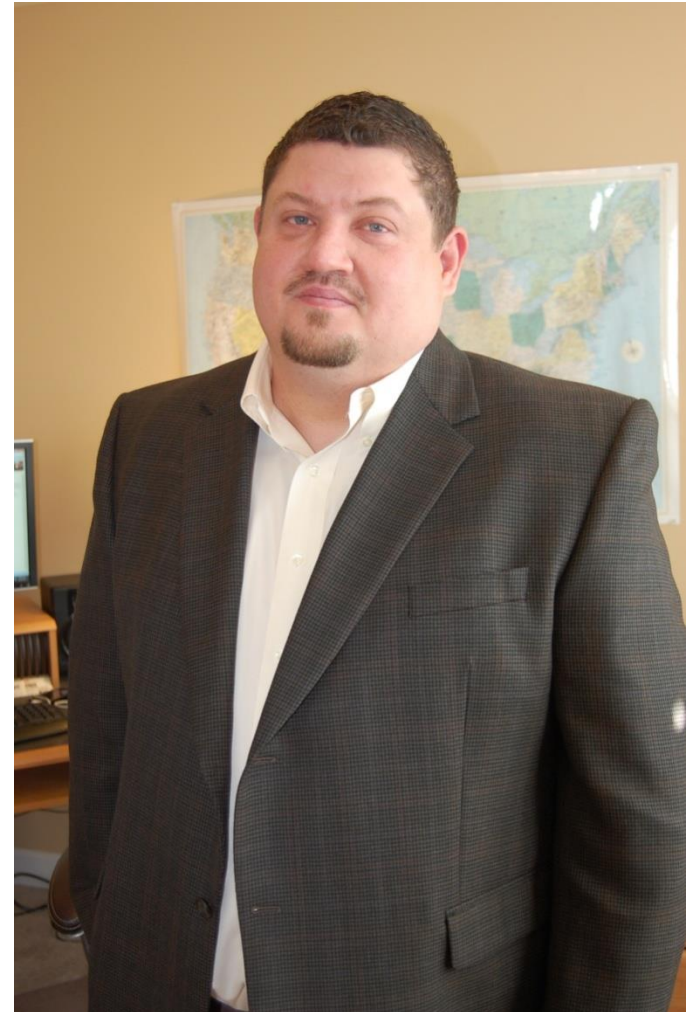
About The Speaker – Wilson Mar

- HP Developer Advocate for Mobile development, performance, and capacity.

- 30+ years of IT experience

- Tested some of the largest, most secure systems in the world

- Trained many as Mercury Certified Instructor and consultant

Peak/Point Load

- Sudden spikes or sustained usage volumes on an application (expected or unexpected)

- Expected
  - Seasonal
  - Marketing

- Unexpected
  - Unscheduled Celebrity Endorsement (TV/Radio)
  - Viral Internet Appeal
  - Unscheduled news event that affects business
  - DDOS Attacks

Point Load Outages Are Common

What if we're on the "Cloud"?

The Cloud Has Unlimited Scalability?

This webpage is not available

chrome

Google Chrome could not load the webpage because **ad.doubleclick.net** took too long to respond. The website may be down, or you may be experiencing issues with your Internet connection.

Google services down for some users

By **Brandon Griggs**, CNN
updated 10:12 AM EDT, Wed July 10, 2013 | Filed under: Web

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chrome

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Cloudy With A Chance of Slow

- Cloud services are variable

- "Business Jitter"

- Low Tolerance for Jitter?
  - Dedicated physical resource
  - Virtual private cloud
  - Used to be known as <u>HOSTING</u>

- Understand the business impact BEFORE doing a cloud initiative!

APPLICATION PERFORMANCE
BUSINESS PRODUCTIVITY
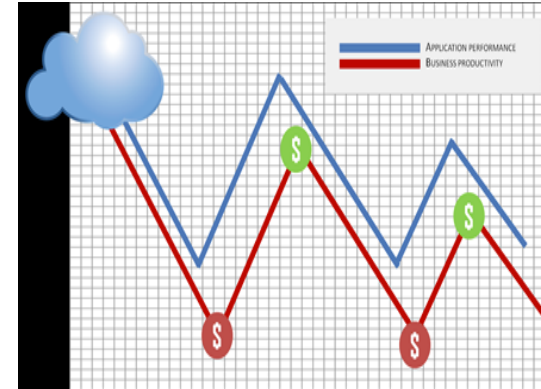
Some Problems Hardware Can't Fix

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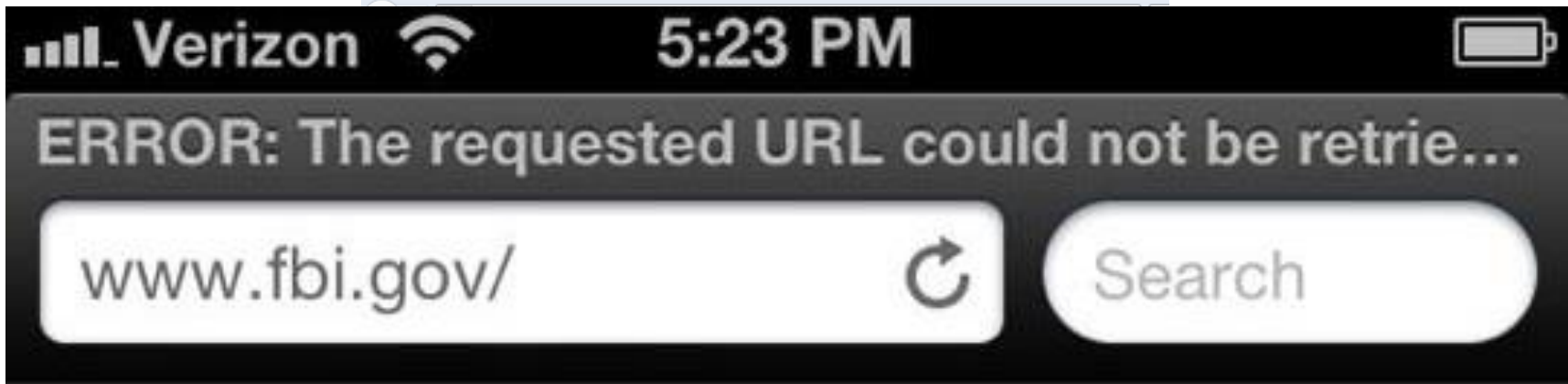
ERROR

The requested URL could not be retrieved

While trying to retrieve the requested URL the following error was encountered:

- **Unable to forward this request at this time.**

Footprint 4.8/FPMCP

Generated Thu, 18 Apr 2013 21:23:36 GMT by 205.128.73.116 (Footprint 4.8/FPMCP)

Does this company value your time?

Terms of Use

The page at [blurred].com says:

NOTE - We are currently experiencing unusually high order volume. If you notice that the order processing time runs past 120 seconds, please contact our office via the customer service number listed at the bottom of this screen and ask to speak to speak with a member of our sales team who will assist you in completing your order. Your satisfaction is extremely important to us!

OK

Preparing For Heavy Traffic

- Implement effective caching and static content optimization techniques

- Content Delivery Network (CDN) – distributed cache

- Redirect to static, scaled down page under heavy load

- Don't Load Shopping Cart From Front Page

- Proactive production monitoring

  - Server and Network Resources

  - Web Server Logs

  - End User Perspective – real browser page rendering

  - JVM, SQL, Load Balancers, Gateways

- Long Term Solution = Performance testing in SDLC

Case Study: Netflix

- **Chaos Monkey -** randomly disables production instances

- **Latency Monkey** - induces artificial delays in RESTful client-server communication (simulate service degradation)

- **Conformity Monkey** - shuts down instances that don't adhere to best-practices.

- **Doctor Monkey** - runs health checks for each instance. Unhealthy instances are detected and removed.

- **Janitor Monkey** - ensures that the cloud environment is clutter and waste free

- **Security Monkey** - finds security violations/vulnerabilities, and ensures all SSL and DRM certificates are valid.

- **10-18 Monkey** - detects configuration and run time problems in instances serving customers in multiple geographic regions/character sets.

- **Chaos Gorilla** - simulates an outage of an entire Amazon availability zone.

Planning

- The planning phase is the key to load testing

- Planning includes

  - Analyzing User Behaviors

  - System Information

  - Focusing on specific goals and objectives

- A good load test creates chaos in a controlled way

  - Chaos = randomization of activity and data

  - Controlled = user and transaction volume, environment

Making Goals Measurable

Performance should be measured on:

- **System Capacity** – <u>concurrent</u> users or system activities the application can handle.

- **User/Service Experience** –response time of user experience and error rates under load.

- **Infrastructure Cost** – utilization of critical system resources such as CPU, memory, disk, and network throughput.

- **Functional Issues Under Load** – if a failure is found only under load, how many are acceptable?

Concurrency

A set of users acting upon an application in a similar manner and at the same time.

- ## Application Level
  - How many users are active on the system?

- ## Business Process Level
  - How many users are buying tickets?

- ## Transaction Level
  - How many users are buying tickets NOW?

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Bad Performance Requirements

- "This thing needs to be *fast*..."

- Sub-second response time for everything, always

- We have a total audience of 10,000 so we need 10,000 users in the load test

- "Let's just kick it around and see what numbers we get. Then we'll make the goals specific...."

CONCEPTUAL GOALS ARE NOT ENOUGH!!!!

Good Performance Requirements

- Peak load = 500 concurrent users or 50,000 page views per hour

- Under peak load, all web page requests should return in under 8 seconds.

- All CPU Utilization metrics should be under 80% under the peak load conditions.

- Less than 5% failure rate for page request under peak load conditions

Determining Volume and Performance Requirements – Existing Systems

- **Find sources of data that have usage patterns:**
  - Database logs/traces (audit tables, traces from tools)
  - Financial systems (sales records, etc)
  - Call center records
  - Web logs (best of all, if your system has them!)
- **Gather information about the users:**
  - Who are the users? (roles, profiles)
  - What are they doing? (business processes)
  - How often are they doing it? (volumes per business process)
  - Determine weekly, monthly, seasonal trends – will help you identify peak volumes!
  - Acquire data for one year and forecast using trend analysis (don't forget seasonal components)

New Systems

- Involves more uncertainty

- Map use cases to application 'entry points'

- Developing requirements:

  1. Start with any hard data about the system, then build a model summarizing that data

  2. Run "what if" situation to determine if this would cause the data from #1 to change drastically

  3. Define customer performance expectations by getting feedback from customers directly.

  4. Combine all data to provide a "best guess" for volume and performance requirements.

  5. Assume a standard deviation of 30% – 70%

Use Cases

Business Projections

Performance / Volume data from analogous systems

Model Building (generally in Excel)

Sensitivity Analysis

Expected Volume Requirements + **Customer Performance Expectations**

Performance and Volume Requirements

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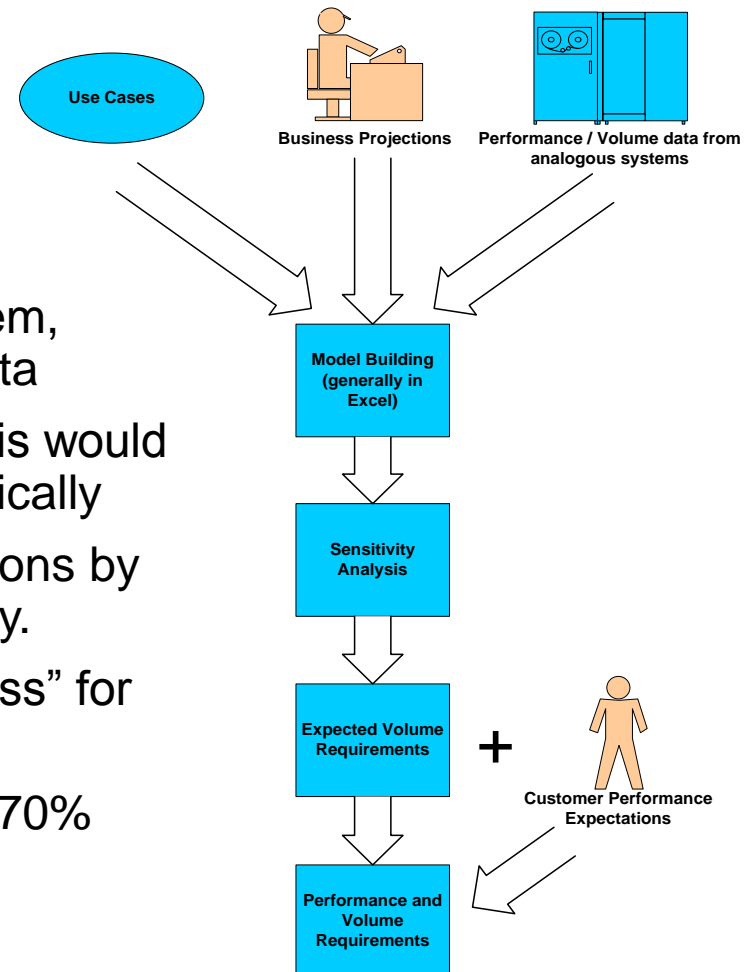
What Should We Test?

- Prioritization and scope reduction
  - Limited testing time or resources
  - Its not economical to test everything
  - Find a compromise that reduces risks
- Use a ranking system
  - What will be used the most?
  - What are the most performance sensitive areas?
  - What areas pose the most business risk if they fail under load?
  - Organize the top areas based on this criteria

Use Case Diagram for Simple Insurance System
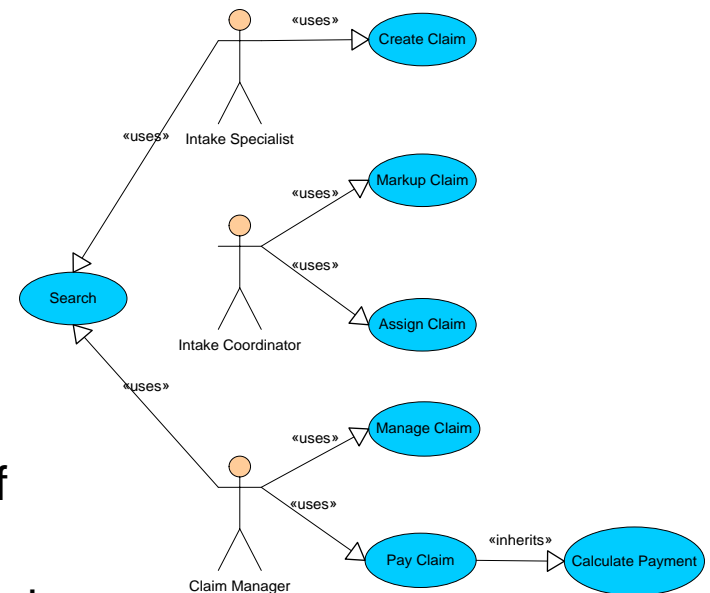
Roles and Responsibilities
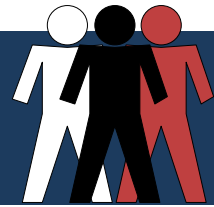
Role:	Involved in:	Qualities brought:	Outputs:
Architect/Technical Contact	**All aspects of Load Test Planning and Execution**	**Vision, Technical Guidance, Mentoring, Hard-nosed analysis, Broad knowledge of system**	**Test Strategy, Success Requirements**
Business Analyst	**Testing Strategy, Success Requirements**	**Factual analysis of marketing data, knowledge of business processes, knowledge of customer**	**Use Case Prioritization, "Voice of customer" data**
Developer	**Test Execution Methodology, Data Acquisition**	**Detailed knowledge of system and team**	**Design and data analyses, Data Requirements**
Project Manager	**Resource Management, Project plan creation**	**Project management experience, resource acquisition skills**	**Load Test Project Plan, Status Reports**
QA Team Leader or QA Mgr	**All aspects of Load Test Planning and Execution**	**Experience, knowledge of system failure points, knowledge of test case implementations**	**Load Test Plan**

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Which Load Testing Tool?

- Is it an industry standard or commonly accepted?

- Is it enterprise ready?

  - Does it support multiple protocols or technology stacks?
  - Does it work with most major platforms?

- Does it have monitoring capabilities? (OS/APP,ETC)

- Does it provide a good way to analyze test results?

- Can you assess the impact of the network for remote users in a pristine lab (i.e. WAN Emulation)?

- Is there a community of users to share problems, tips, tricks, etc?
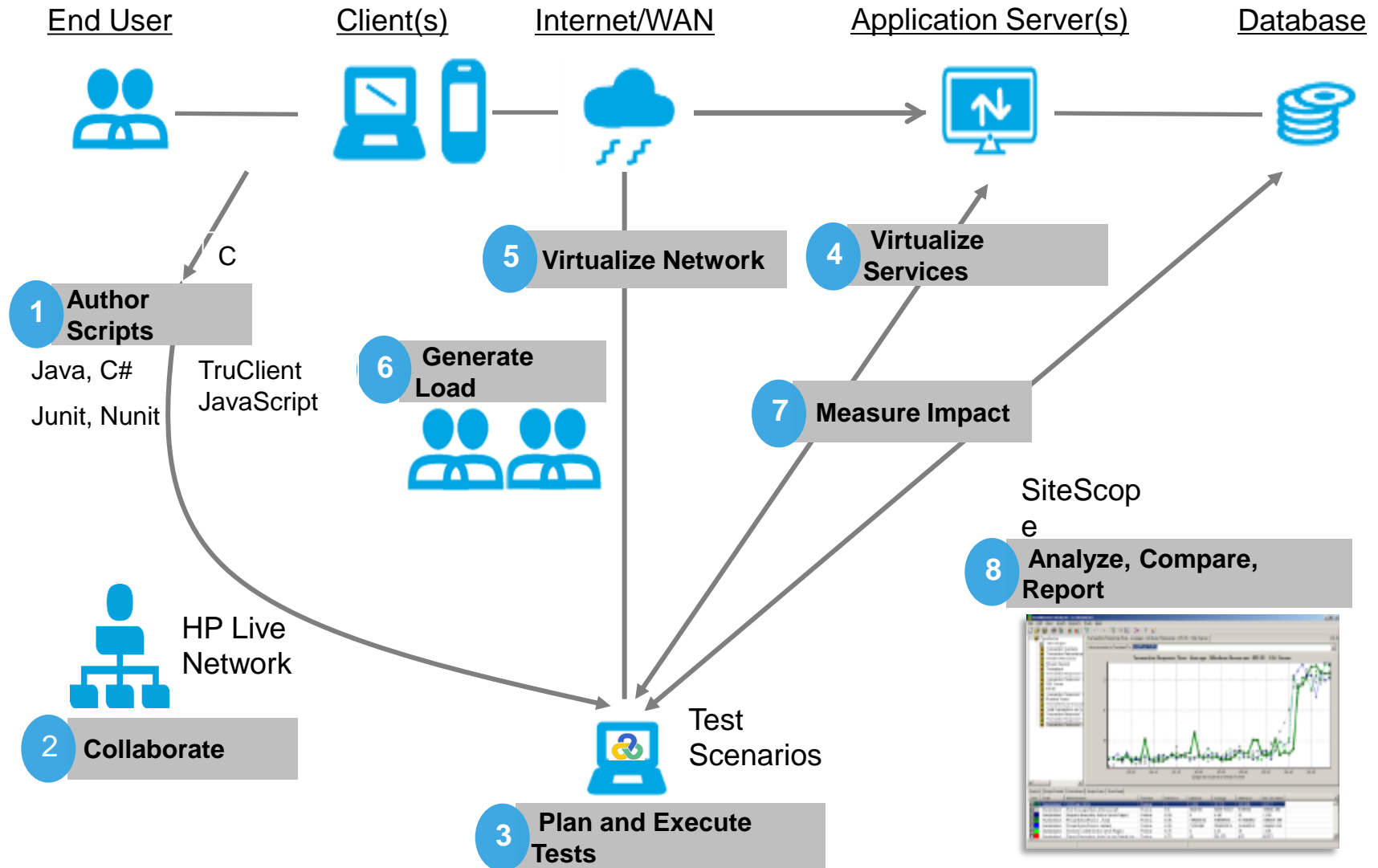
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HP LoadRunner

LoadRunner Key capabilities

A. Large pool of experienced users world-wide
B. Several forums, new HP Live Network, HP Education
   - Powerful correlation studio
C. Broad range of application support
   - 50+ Protocols (Mobile, RIA, SAP, Oracle DB, etc.)
   - TruClient for automatic JavaScript AJAX handling
   - Linux and Windows load generators
D. Monitoring with HP SiteScope & Diagnostics
   - Visibility on root cause of performance issues
   - Script re-use for production monitoring
E. WAN Emulation in HP Network Virtualization
F. Advanced performance analysis & reporting

Workflow and components

End User   Client(s)   Internet/WAN   Application Server(s)   Database

C

1 **Author Scripts**

Java, C#

Junit, Nunit

TruClient JavaScript

5 **Virtualize Network**

4 **Virtualize Services**

6 **Generate Load**

7 **Measure Impact**

SiteScope

8 **Analyze, Compare, Report**

HP Live Network

2 **Collaborate**

Test Scenarios

3 **Plan and Execute Tests**

Triage, isolate and route to effective root-cause analysis

HP Sitescope and HP Diagnostics integrated to HP LoadRunner

- Transaction traceability from end user response time to the slow method or SQL query
- Diagnostics across JAVA, .NET, SAP, SOA, ERP/CRM applications
- Identify performance bottlenecks including memory leaks
- Diagnose complex issues and reduce Mean Time to Resolution (MTTR)
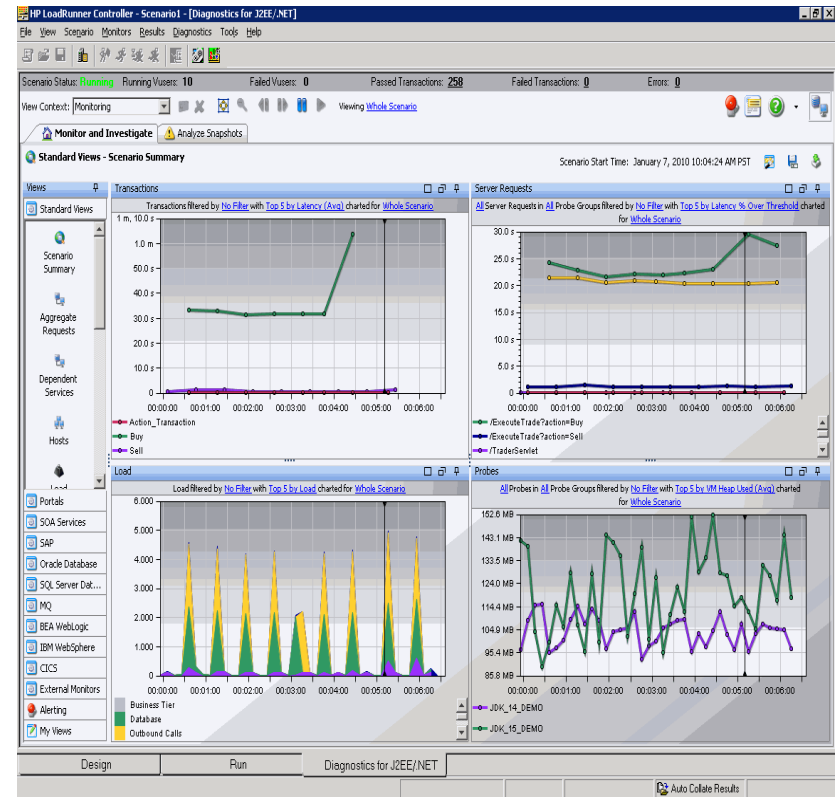
Summary

- Prepare for the perfect storm before it hits
- The cloud is not a fool-proof solution
- Planning is the key to avoiding performance issues
- Use a lifecycle approach to performance testing
- Select your choice of tool based on industry standards and best practices

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Additional References

- Northway Solutions Group Blogs
  - http://northwaysolutions.com/blog
  - @northwaysg and @loadtester
  - For this slide deck - events@northwaysolutions.com

- HP LoadRunner Official Web Pages
  - http://www.hp.com/go/loadrunner
  - HP Blog http://t.co/HourUQikNS

- Perfbytes – www.perfbytes.com
  - Episode 17 – "How to Survive Point Load"

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