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Load Testing: See a Bigger Picture

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Speaker Bio

- Have specialized in performance for the last 17 years
- Currently performance testing and optimization of Hyperion products at Oracle
- Board director at CMG (<http://cmg.org>), organization of performance and capacity professionals
 - Next conference November 3-6, 2014 in Atlanta, GA

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In This Session, You'll Learn...

- *Load testing and its role in performance risk mitigation*
- Different approaches: load generation
- Different approaches: environments
- Load testing tools

Load Testing: Terminology

Applying multi-user synthetic load to the system

- Load testing
- Performance testing
- Stress testing
- Scalability testing
- Volume testing
- Reliability testing
- Concurrency testing
- Endurance testing
- Longevity testing
- Soak testing
- Stability testing

The Stereotype

- Load / Performance Testing is:
 - Last moment before deployment
 - Last step in the waterfall process
 - Protocol level record-and-playback
 - Large corporations
 - Expensive tools requiring special skills
 - Lab environment
 - Scale-down environment
 - ...

Load Testing

- It is only one very specific kind of load testing
 - Most popular due to easier integration in corporate SDLC
- But load testing in no way limited to this one

Technology evaluation

What/if scenarios

Infrastructure evaluation

Performance troubleshooting

Prototypes / POC

Performance optimization

Component / unit

Benchmarking

Performance Risk Mitigation

- Single-user performance engineering
 - Profiling, WPO, single-user performance
- Software Performance Engineering
 - Modeling, Performance Patterns
- Instrumentation / APM / Monitoring
 - Production system insights
- Capacity Planning/Management
 - Resources Allocation
- Continuous Integration / Deployment
 - Ability to deploy and remove changes quickly

But all of them
don't replace
load testing

Load testing
complements them in
several important ways

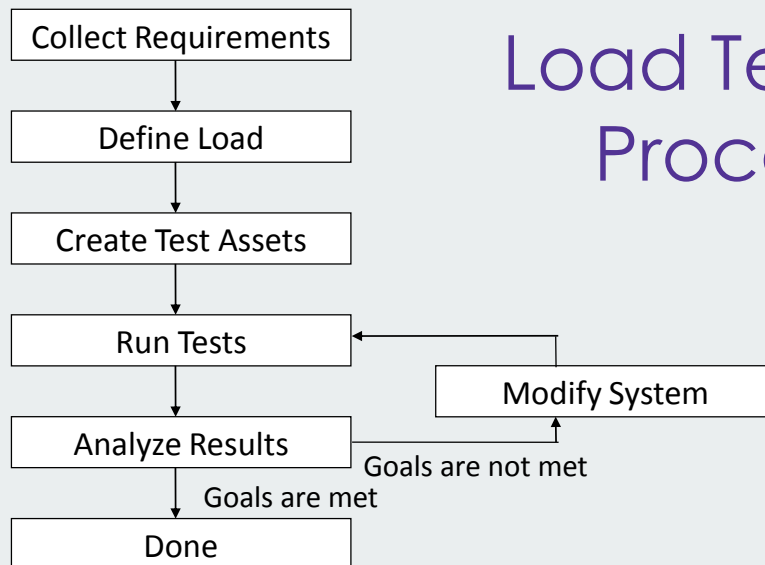
What Load Testing Adds

- Verification that the system handles the load
- Verification of multi-user performance
- Performance optimization
 - Exactly the same load
- Debugging/verification of multi-user issues
- Testing self-regulation functionality
 - Such as auto-scaling or changing the level of service depending on load

Agenda

- Load testing and its role in performance risk mitigation
- *Different approaches: load generation*
- Different approaches: environments
- Load testing tools

Load Testing Process



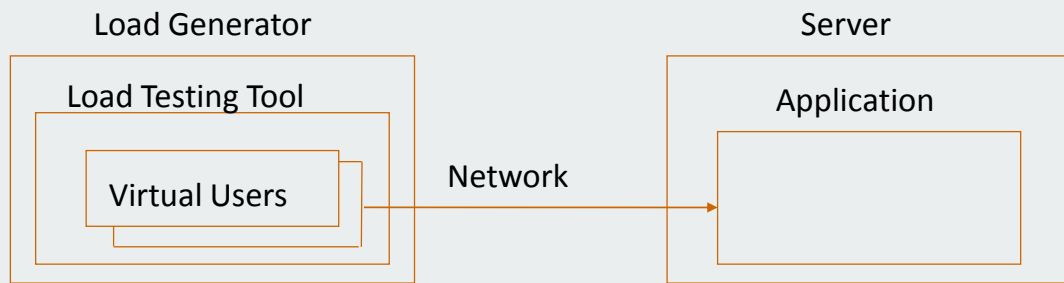
Load Generation

- Create test assets – run test
- A must step in load testing
- 'Test assets' - usually scripts or programs in load testing
- Time constraints can make it very challenging
 - Different for each product / interface

Record and Playback: Protocol Level

- Virtual users: record communication between two tiers and then playback an automatically created script
- Usually after proper correlation / parameterization

Record and Playback: Protocol Level



Issues

- Usually doesn't work for testing components
- Each tool support a limited number of technologies (protocols)
- Some technologies are very time-consuming
- Workload validity in case of sophisticated logic on the client side is not guaranteed

Recalling Challenges

- 199x – SMB (Server Message Block), DCOM, Java RMI
- 200x – Applets and ActiveX controls
- 201x – Rich Internet Applications

It was just a short period of time when Web sites were simple – it was rather an exception

Not so Simple: Example

- Back-end calculation (financial consolidation)
 - Long time, shows progress bar
 - Polling back-end
 - Explicit loop is needed to work properly

Recorded Script

```
web_custom_request("XMLDataGrid.asp_7","URL={URL}/Data/XML
DataGrid.asp?Action=EXECUTE&TaskID=1024&RowStart=1&ColS
tart=2&RowEnd=1&ColEnd=2&SelType=0&Format=JavaScript",
LAST);
web_custom_request("XMLDataGrid.asp_8","URL={URL}/Data/XML
DataGrid.asp?Action=GETCONSOLSTATUS", LAST);
web_custom_request("XMLDataGrid.asp_9","URL={URL}/Data/XML
DataGrid.asp?Action=GETCONSOLSTATUS", LAST);
web_custom_request("XMLDataGrid.asp_9","URL={URL}/Data/XML
DataGrid.asp?Action=GETCONSOLSTATUS", LAST);
```

Working Script

```
web_custom_request("XMLDataGrid.asp_7","URL={URL}/Data/XML
DataGrid.asp?Action=EXECUTE&TaskID=1024&RowStart=1&Col
Start=2&RowEnd=1&ColEnd=2&SelType=0&Format=JavaScript",
LAST);
do {
    sleep(3000);
    web_reg_find("Text=1","SaveCount=abc_count",LAST);
    web_custom_request("XMLDataGrid.asp_8","URL={URL}/Data/X
MLDataGrid.asp?Action=GETCONSOLSTATUS", LAST);
} while (strcmp(lr_eval_string("{abc_count}"),"1")==0);
```

Alternatives

- Manual
- Real Users
- Record and Playback, UI Level
- Programming
- Mixed

Manual

- Not an option for a large number of users
- Always variation in human input times
- Can be a good option to simulate quickly a few users
- Can be used with other methods to verify correctness

Real Users

- Testing in production
 - Full load
 - Partial load (A/B testing, canary testing)
- You trade in the need to generate and validate workload for a possibility of performance issues and load variability

Considerations

- May make sense for the following conditions
 - Potential issues have minimal impact on user satisfaction and company image
 - Easy rollback of the changes
 - Homogenous workload and a way to control it
 - Fully parallel and scalable architecture

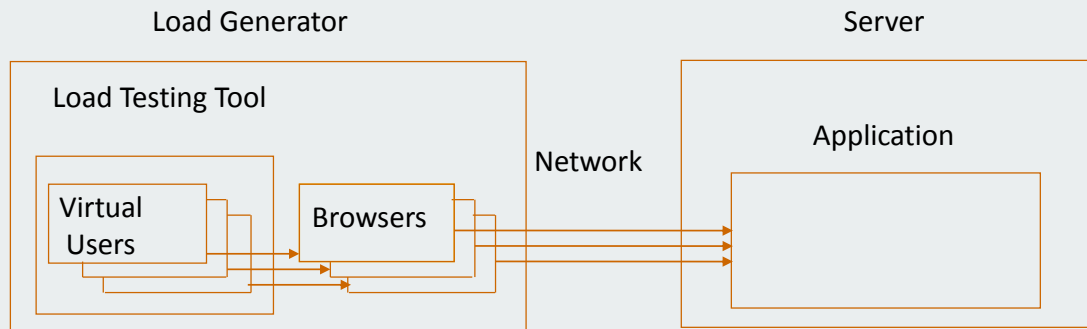
Record and Playback: UI Level

- Functional / regression testing tools
- Record and playback communication between user and client GUI
- Don't care about communication protocols / internals
- Accurate data (real client, end-to-end)

History of the Approach

- Traditional tools, fat clients
 - Require a separate machine (or a terminal session) per user
- Low-level graphical protocols
 - Citrix, Remote Desktop
- Web tools, browser
 - Require a separate browser instance
- Web tools, light-weight browser
 - Require a separate light-weight browser instance
 - For example, HtmlUnit or PhantomJS

Record and Playback: UI Level



Challenges

- Scalability
 - Still require more resources
- Supported technologies
- Timing accuracy
- Playback accuracy
 - For example, for HtmlUnit

Programming: Custom Test Harness

- Special program to generate workload
- Requires access to the API or source code
- Requires programming
- Could be cost effective solution in some simple cases

Advantages

- Doesn't require any special tool
- Starting version could be quickly created by a programmer familiar with API
- Should work if API works
- You don't care what protocol is used for communication

Disadvantages

- Efforts to update and maintain harness increase drastically as you need to add features
- When you have numerous products you really need to create something like a commercial load testing tool

Mixed Approach

- Programming using load testing tools
 - Program a script instead of recording
 - Run it using a load testing tool
- Implementation depends on the particular tool
 - Scripting support
 - Languages support
 - API calls (may require external dll / client stubs)

Advantages

- Eliminates dependency on supporting specific protocols
- Leverages all the features of the load testing tool and allows using it as a test harness
- Sometimes simplifies work with difficult to parameterize protocols

Considerations

- Requires programming / access to APIs
- May require more resources on agents
- Environment may need to be set on all agents
- Results should be cautiously interpreted
- May require a load test tool license

Mixed Approach: Example

- Middleware, no GUI interface
- Functional test scripts in Java
- Solution: creation of load testing scripts from the functional test scripts

Example Script

```
import lrapi.Ir;
...
public int action() {
    lr.start_transaction("o1_Create_API_instance");
    ess = IEssbase.Home.create(IEssbase.JAPI_VERSION);
    lr.end_transaction("o1_Create_API_instance", lr.AUTO);
    lr.start_transaction("o2_SignOn");
    IEssDomain dom = ess.signOn(s_userName, s_password,
    s_domainName, s_prefEesSvrName, s_orbType, s_port);
    lr.end_transaction("o2_SignOn", lr.AUTO);
    ...
}
```

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- *Different approaches: environments*
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Environments

- Lab vs. Service (SaaS) vs. Cloud (IaaS)
 - For both the SUT and load testing tool
- Test vs. Production
- No best solution, depends on your goals / system

Scenarios

- System validation for high load
 - Outside load (service or cloud), production system
 - Wider scope, lower repeatability
- Performance optimization / troubleshooting
 - Isolated lab environment
 - Limited scope, high repeatability
- Testing in Cloud
 - Lowering costs (in case of periodic tests)
 - Limited scope, low repeatability

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- Different approaches: environments
- *Load testing tools*

Load Testing Tools

- Differ drastically
 - Supported approaches / protocols
 - Scripting / extendibility
 - Supported environments
 - Scalability
 - Integration
 - Result analysis
 - Environment monitoring
 - Cost/Licensing
 - Available support and skills

Load Testing Tools

- There is no best tool – it depends on your needs
- Almost every tool works for a simple web site
- If using more sophisticated technologies, always check if the tool / approach supports it

Summary

- Load testing is an important way of performance risk mitigation
 - Other ways don't substitute load testing
- There are many ways to do load testing.
- There is no best approach or tool – it depends on your needs.

Any questions?

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Thank you for joining us!