BELGIUM TESTING DAYS 2013

# Agile Aspects of Performance Testing

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## About Me

- Specialize in performance last 16 years
- Currently performance testing and optimization of Hyperion products at Oracle
- Blog at http://alexanderpodelko.com/blog, have a collection of performance-related links at http://alexanderpodelko.com, on Twitter as @apodelko
- Involved in CMG http://cmg.org, a volunteer organization of performance and capacity planning professionals
  - Conference November 4-8, 2013 in La Jolla, CA



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# Agenda

- Status Quo
- Performance Testing in Agile Project
- Agile Performance Testing

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# Performance Testing

- Here used as an umbrella term including load, stress, concurrency, etc. testing
- An important project step in many corporations
- A project itself
  - We can apply software development methodologies to this project
- Waterfall approach in most cases
  - Often pre-production performance validation

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# Assumptions

*Two important assumptions for this session:*

1. Stakeholders understand the need
2. The team knows the basics

*How to get there are very interesting topics, but outside this session*

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# Waterfall Approach to Performance Testing

- Flowing steadily downwards through the phases
  - Get the system ready
  - Develop scripts requested
  - Run scripts in the requested combinations
  - Compare with the provided requirements
  - If requirements missed, throw back to development

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## Main Problems

- We learn about system by preparing scripts and running tests
  - With each test
- We don't have much information about the system before tests to do a reliable plan
- Much more than in development and functional testing
  - Often based on internal communication
- It is agile / explorative by nature

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## Main Problems

- The system must be ready
  - Late changes are expensive
  - If we want earlier, should be more agile / explorative
- Test scripts are also software
  - Even with record/playback you still need to correlate, parameterize, debug, and verify
  - Many details get uncovered as you go

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## Main Problems

- Running all scripts together makes it very difficult to tune and troubleshoot
  - Shot-in-the-dark anti-pattern
  - Tuning and troubleshooting are iterative
- Minimal information about the system behavior
  - You cannot build any kind of model

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## Manifesto for Agile Software Development

*We are uncovering better ways of developing software by doing it and helping others do it.*

*Through this work we have come to value:*

- *Individuals and interactions over processes and tools*
- *Working software over comprehensive documentation*
- *Customer collaboration over contract negotiation*
- *Responding to change over following a plan*

*That is, while there is value in the items on the right, we value the items on the left more.*

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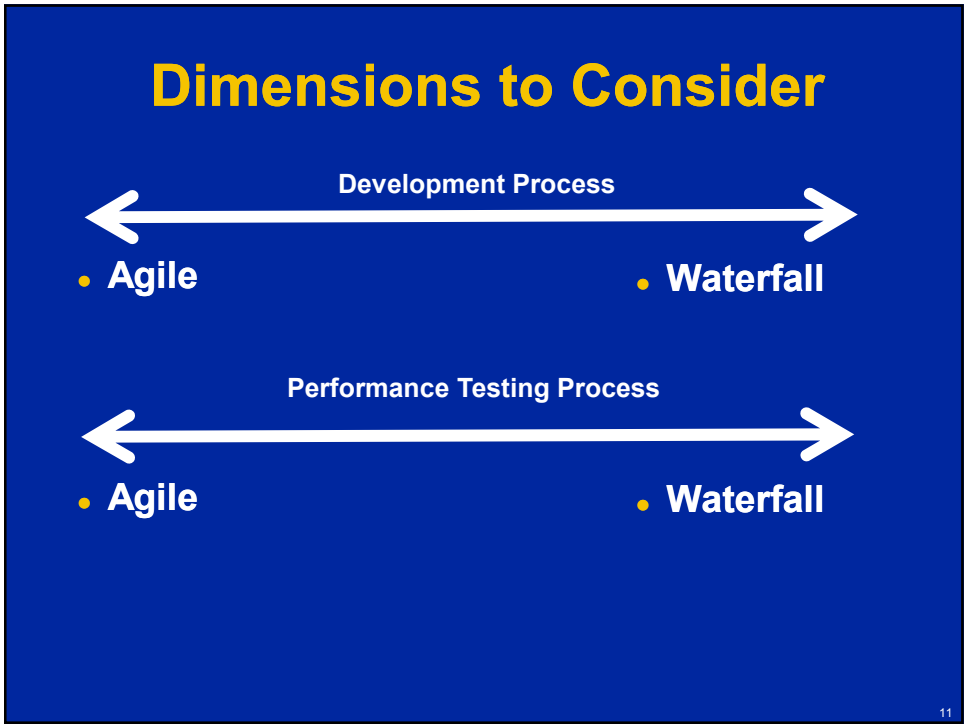
Dimensions to Consider
Development Process
Agile
Waterfall
Performance Testing Process
Agile
Waterfall
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## Agile Development

- Agile development is rather a trivial case for performance testing
  - You have a working system each iteration to test early by definition.
  - You need performance engineer for the whole project

    Savings come from detecting problems early
- You need to adjust requirements for implemented functionality
  - Additional functionality will impact performance

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## The Main Issue on the Agile Side

- It doesn't [always] work this way in practice
- That is why you have "Hardening Iterations", "Technical Debt" and similar notions
- Same old problem: functionality gets priority over performance

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## The Main Issue on the Testing Side

- Performance Engineering teams don't scale well
  - Even assuming that they are competent and effective
- Increased volume exposes the problem
  - Each iteration
- Remedies: automation, making performance everyone's job

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## Automation: Difficulties

- Complicated setups
- Long list of possible issues
- Complex  results (no pass/fail)
- Not easy to compare two result sets

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## Automation: Considerations

- You need know system well enough to make meaningful automation
- If system is new, overheads are too high
  - So almost no automation in traditional environment [with testing in the end]
- If the same system is tested again and again
  - It makes sense to invest in setting up automation

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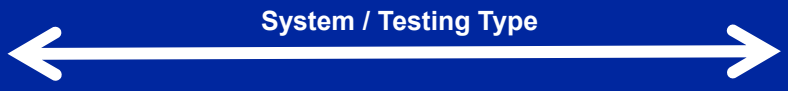
## One More Dimensions to Consider




- New (Exploratory)
- Well-known (Regression)

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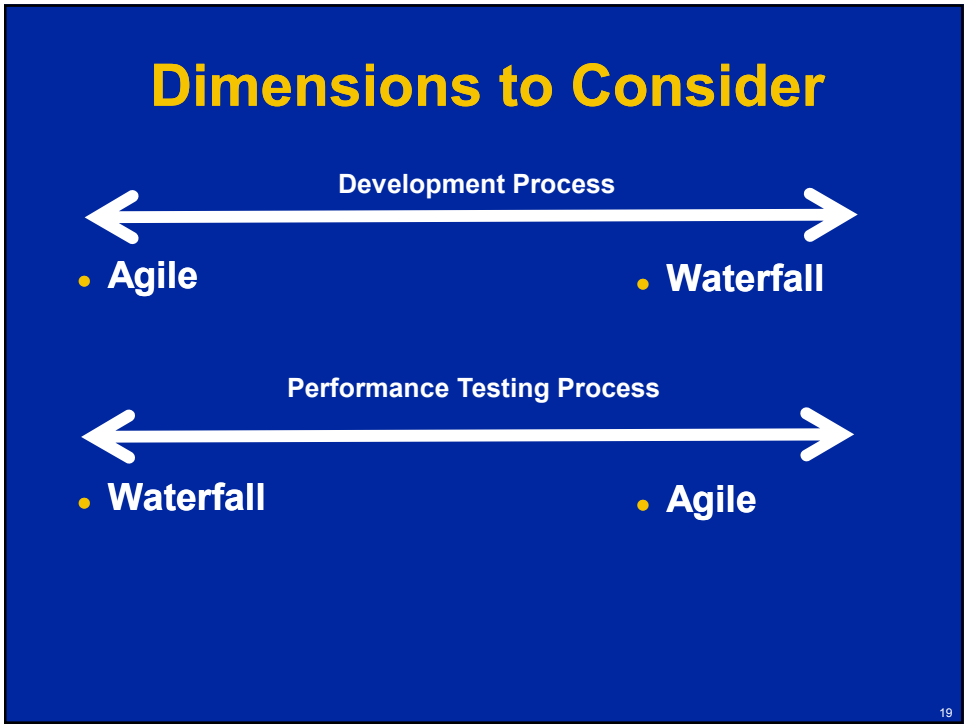
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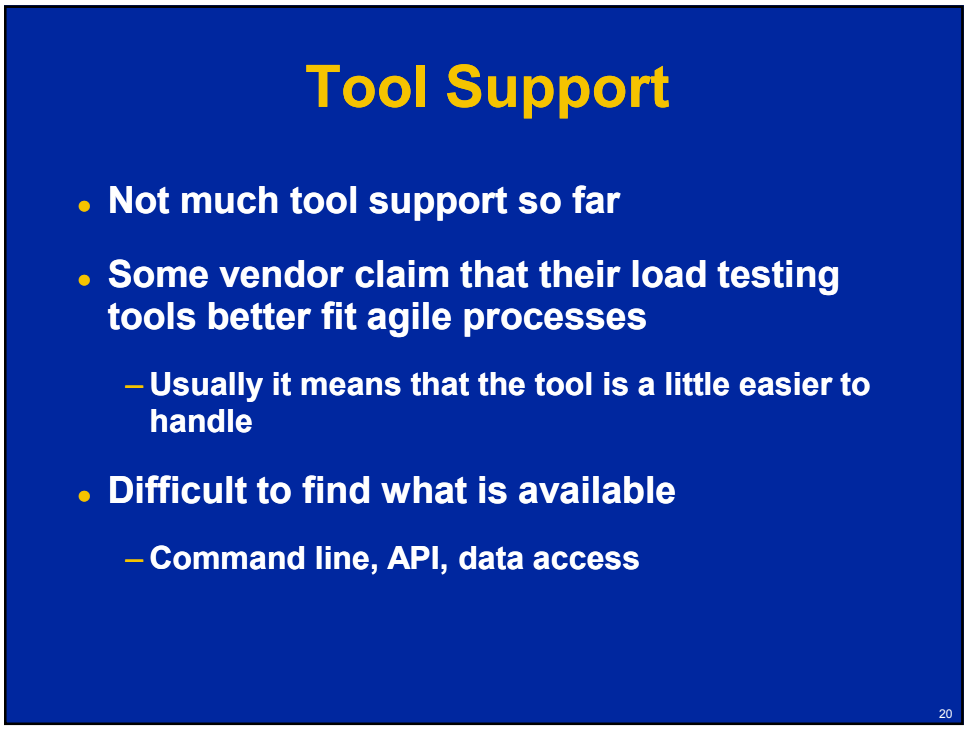
Tool Support
Not much tool support so far
Some vendor claim that their load testing tools better fit agile processes
Usually it means that the tool is a little easier to handle
Difficult to find what is available
Command line, API, data access
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# Performance Challenges in Agile Projects

- Performance-related activities usually span the whole project
- Specifying performance requirements
  - Constraints

    As user stories should represent finite manageable tasks
  - User stories

    Separating of initial and ongoing compliance

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# Heretic Thought

*"we have come to value:*
- *Individuals and interactions over processes and tools"*

- Is agile process oxymoron?
- Maybe different dimensions:
  - Waterfall – Iterative
  - Process Oriented – Agile
  - Build to Grow – Lean

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# Agile

- 'Agile software development refers to a group of software development methodologies that promotes development iterations, open collaboration, and process adaptability through the life-cycle of the project'
- Fully applicable to performance testing
- Performance testing of new systems is agile by its nature
  - As far as we learn about the system with each test

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## Agile Performance Testing

- Finding new opportunities inside existing processes using collaboration, iterative and adaptive processes
- Separate from performance testing in agile development, which was discussed earlier
- Most good performance engineers already use similar approaches
  - Although waterfall-like plan is usually presented to management

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## Testing Early

- The main problem in waterfall development
- Nobody argues against, but rarely happens in practice
  - In agile projects it supposed to happened automatically
- Require different, more agile approach
- Making performance everyone's job

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## Mentality Change

- Late record/playback performance testing -> Early Performance Engineering
- System-level requirements -> Component-level requirements
- Record/playback approach -> Programming to generate load/create stubs
- "Black Box" -> "Grey Box"

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## Unit Performance Testing

- Any part of the system
- Not a standard practice
- Do not wait the system is assembled
- Test cases are simpler, fewer variables
- Many systems are monolithic
  - Test-Driven Development may be an answer
- Third-party components

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## Single-User Performance

- If performance for one user isn't good, it won't be any better for multiple users
- Single-user testing is conducted throughout the development life cycle
  - Gathering performance data can be extremely helpful
  - Can provide a good indication of what business functions need to be investigated further

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## Early Involvement

- Any early involvement would be beneficial
  - Even if only asking a few key questions
  - Don't wait until everything gets in place
  - A few guerrilla-style actions can save a lot of time and resources later
- Unfortunately, you often get involved in the project at a later stage
  - Next sections are still fully applicable

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## Don't Underestimate Workload Generation

### Only the Paranoid Survive

- The title of Andy Grove's book should be performance engineering's motto

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## Be a Performance Test Architect

- Gather all requirements and project them onto the system architecture
  - Business requirements are not the "Holy Scripture"
  - Iterative process, evaluate and validate
  - Scrutinize workload
  - Project requirements onto the system architecture
    - What components are involved

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## Be a Performance Test Architect

- Make sure that the system is properly configured and results are meaningful
  - Difference between environments
  - Data used
  - User access
- Make the test environment as close to the production as possible
- Performance testing isn't an exact science

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## Scripting Process

- Record/playback is easy for static content and plain HTML
  - Not many such systems anymore
  - Learn as you script
- Software Development Project
  - Correlate and parameterize
  - Validate
    - Lack of error messages is not the proof
    - Test different input data

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# Scripting Example

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

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# Recorded Script

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

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# Working Script

```
web_custom_request("XMLDataGrid.asp_7","URL={URL}/
  Data/XMLDataGrid.asp?Action=EXECUTE&TaskID=1024
  &RowStart=1&ColStart=2&RowEnd=1&ColEnd=2&SelTy
  pe=0&Format=JavaScript", LAST);
do {
  sleep(3000);
  web_reg_find("Text=1","SaveCount=abc_count",LAST);
  web_custom_request("XMLDataGrid.asp_8","URL={UR
  L}/Data/XMLDataGrid.asp?Action=GETCONSOLSTATU
  S",  LAST);
 } while (strcmp(lr_eval_string("{abc_count}"),"1")==0);
```

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# Performance Testing

- Often is not separated from:
  - Tuning
    - System should be properly tuned
  - Troubleshooting / Diagnostics
    - Diagnose to the point when it is clear how to handle
  - Capacity Planning / Sizing
- "Pure" performance testing is rare
  - Regression testing ?

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## Tuning and Troubleshooting

- Both are iterative processes
  - Make a change
  - Run the test
  - Analyze results
  - Repeat if necessary
- You apply the same synthetic workload
  - Easy to quantify the impact of the change

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## Issues

- Requires close collaboration of all stakeholders
- Impossible to predict how many test iterations would be necessary
  - Shorter / simpler tests may be needed
  - Complex tests may make problems less evident
- Usually no indications at the beginning how much time and resources would be needed

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## Process

- Asynchronous process doesn't work well
  - Problem often blocks further testing
  - Full setup is usually needed to reproduce
  - Debugging is a collaborative process
- Open collaboration needed
  - Synchronized work of all stakeholders to fix problems and complete performance testing

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## Building a Model

- Significantly increases the value of performance testing
  - One more way to validate tests and help to identify problems
  - Answers questions about sizing the system
- Doesn't need to be a formal model
  - May be just simple observations as to how much resources are needed by each component

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# Modeling

- Often is associated with queuing theory
  - Great mechanism, but not required in simple cases
- Most good performance engineers have a model in their mind
  - May be not documented / formalized
  - But they see when the system behaves in an unusual way

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# Sometimes Linear Model Works

- Linear model may often work for multi-processor machines
  - Considering the working range of CPU utilization

    Most IT shops don't want more than 70-80%
  - Throughput and CPU utilization increase proportionally
  - Response times increase insignificantly

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# Example

- Simple queuing model was built using TeamQuest
- Specific workload executed on a four-way server
- Eight different load levels
  - Step 1 represents 100-user workload, each next step adds 200 users, step 8 represents 1,500 users
- Linear model would be good through step 6
  - With CPU utilization 87%

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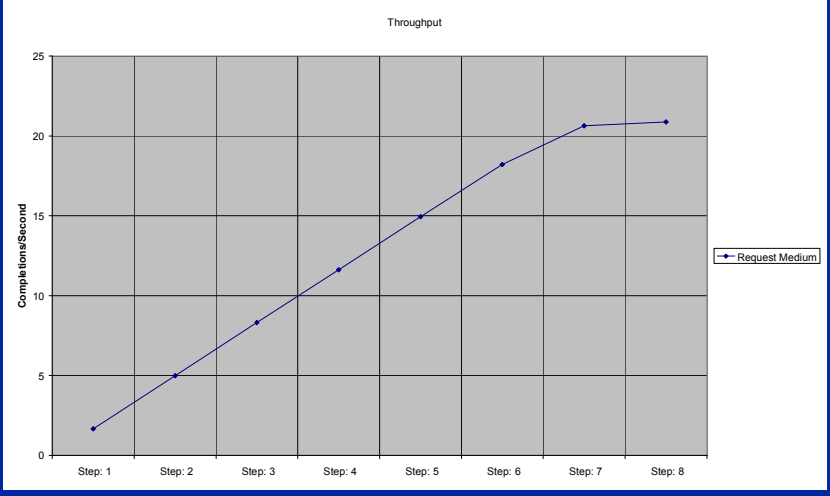
# Throughput

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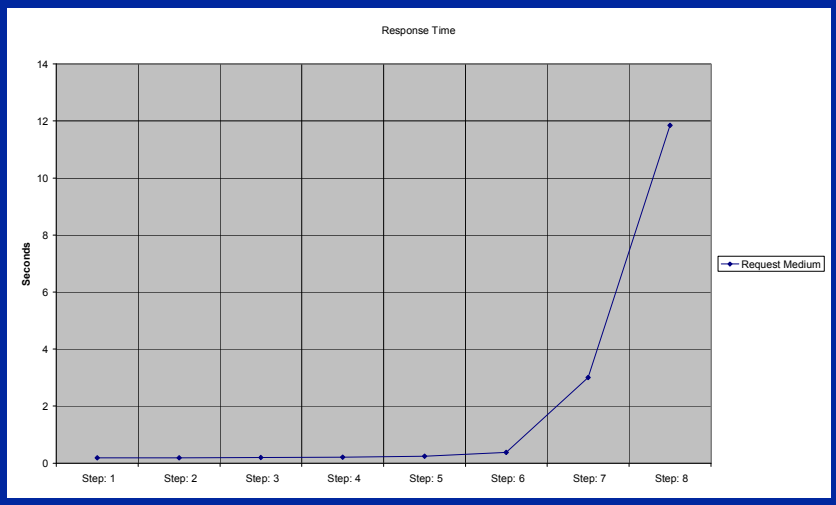
# Response Time

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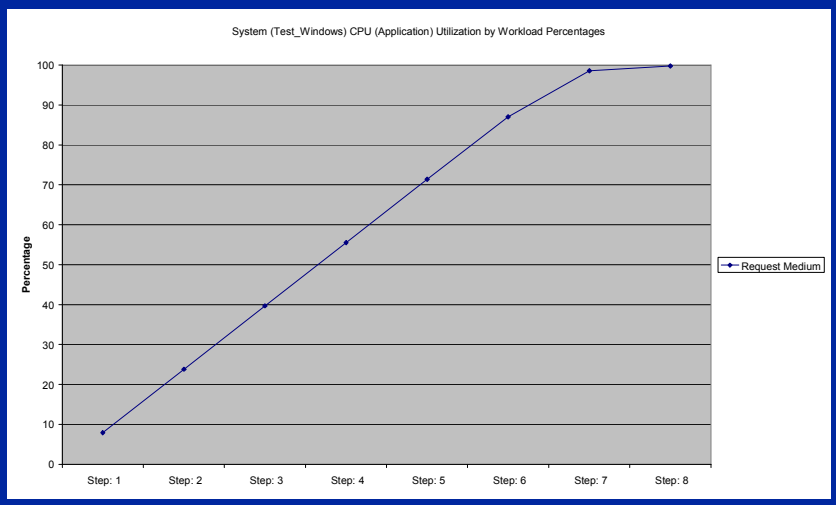
# CPU Utilization

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## How to Approach Modeling?

- Run independent tests for each business function
  - To see how much resources each function requires
  - Load shouldn't be too light
    - To get steady, not distorted by noise resource utilization
  - Load shouldn't be too heavy
    - To avoid non-linear effects

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## Agile Performance Testing

- Get involved early if possible
- Have a plan, but it needs to be very adaptable
- Expect iterative process involving tuning and troubleshooting
  - Each test provides a lot of information
  - If you find a bottleneck, you need to fix it before running further tests

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## Agile Performance Testing

- As soon as you get a working script
  - Run it for one, a few, and many users
  - Sort out errors
  - Note resource utilization (build a "model")
- Even with a single script you can find many problems and, at least partially, tune the system

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## Agile Performance Testing

- Make sure that every script works before running a real-life mixed scenario
  - Verify that the system behaves as expected
  - Pay attention to every issue / deviation
- Work in close cooperation with developers, administrators, and other experts

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## Summary – Agile Projects

- If agile implemented properly, it is much easier and less risky to do performance testing
  - System to test at the end of each iteration
- Automation and making performance everyone's job to handle work increase
- Probably would require more resources
  - Payoff is in decreasing risks and finding problems early

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## Summary – Agile Testing

- Small extra efforts, making the process more agile, increase efficiency significantly – and usually pay off multi-fold
  - Get involved early
  - Be paranoid about workload generation / system setup
  - Expect multiple tuning and troubleshooting iterations
  - Build a "model"

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# Questions?

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*Additional links and references may be found at www.alexanderpodelko.com*

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