



Deutsche SQL Server Konferenz 2015

powered by PASS Deutschland & Microsoft



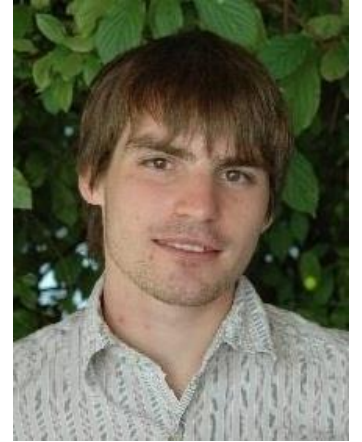
Load Testing Analysis Services Gerhard Brückl



About Me

Gerhard Brückl

- Working with Microsoft BI since 2006
- Mainly focused on Analytics and Reporting
 - Analysis Services / Reporting Services
 - Power BI / O365
 - MDX / DAX
 - SAP HANA
- Blog: blog.gbrueckl.at
- eMail: gerhard@gbrueckl.at



SSAS
MAESTRO
by Microsoft



<http://www.pmone.com>



Agenda

- What is Load Testing?
- Why Load Testing?
- Setting up a Load Test
- Load Testing Analysis Services
 - Parameters
 - Tools



What is Load Testing?

- According to Wikipedia:
“**Load testing** is the process of putting demand on a system or device and measuring its response. Load testing is performed to determine a system’s behavior under both normal and anticipated peak load conditions. It helps to identify the maximum operating capacity of an application as well as any bottlenecks and determine which element is causing degradation.”



Unit Testing vs. Load Testing



Why Load Testing?

Several Reasons:

- Reduce Risk
- Reduce Cost
- Identify Bottlenecks
- Performance Tuning
- Prove Scalability
- ...



Why Load Testing?

Common questions:

- How many users can my architecture support?
- What is the expected average response time?
- When/Why does my performance decrease?
- What is the best hardware setup?
- Is an upgrade worth the investment?



Setting up a Load Test



Setting up a Load Test

- Define your Goals!
- Define the Test Set
- Choose your Tools
- Run the Load Test



Define your Goals!

- Hypothesis
 - I need an average response time of X seconds
 - I need to support X concurrent users
 - Must be measurable and realistic!
- Investigation
 - Why is my performance decreasing with X users?
 - Why is my cube so slow?




Define the Test Set


- Capture from Prod System
- Extract from Reports
- Free-Form Queries
- Parameterize your Test Set!




Parameterizing the Test Set

- Page-Filters


Date 22.11.2010 

Date From 1/1/2015 

- Varying Rows and Columns

Top 3 Countries 

Australia
Canada
France

Top 3 Products 

+ Mountain Bikes
+ Road Bikes
+ Touring Bikes

- Varying Measures



Choose your Tools

- SQL Server Profiler
- ASCMD (with Stress Testing Scripts)
- AS Performance Workbench
- Visual Studio
- Self Programmed
- SSIS
- ...

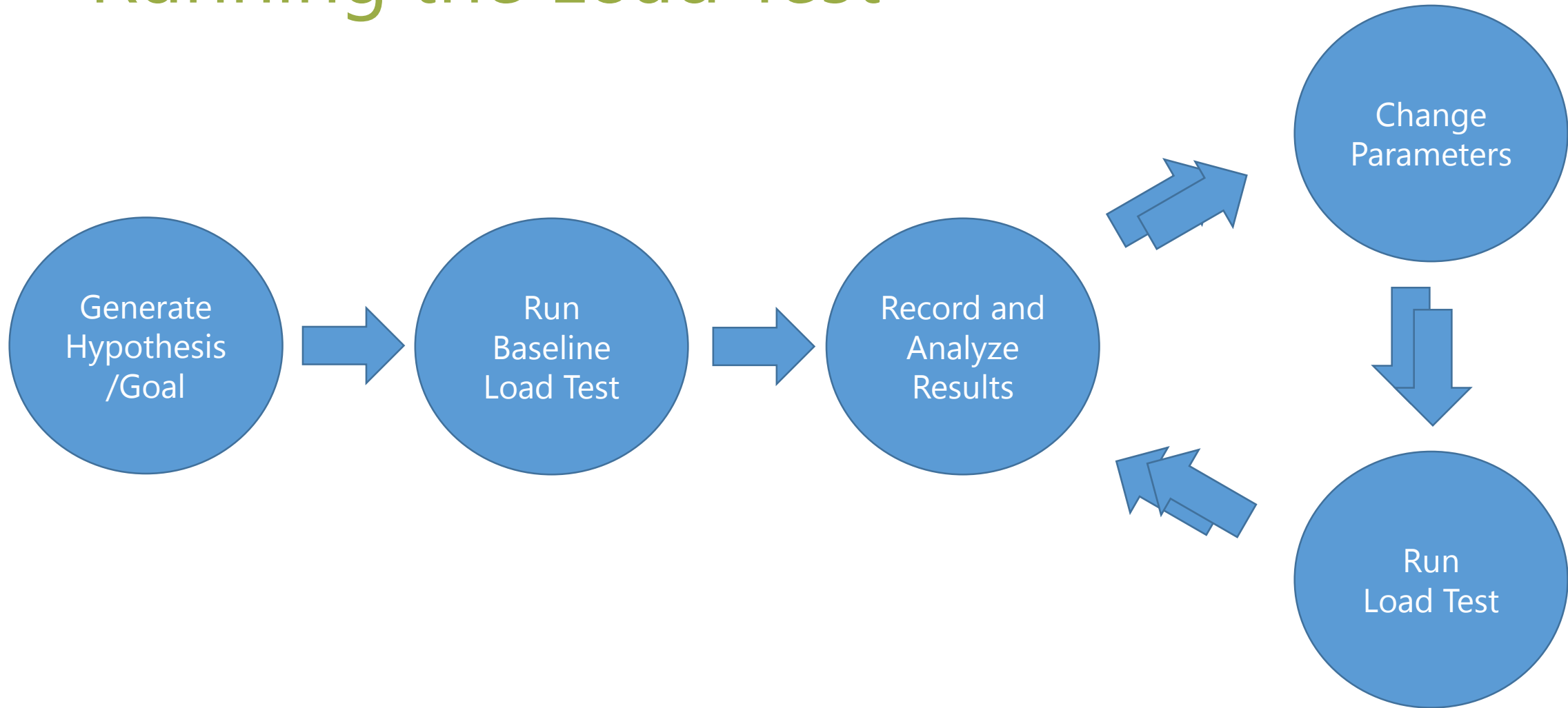


Criteria for Choosing your Tools

- Serial vs. Parallel Execution
- Performance Measurements
- Easy Parametrization
- Multiple Users / Security
- Multiple Clients / Locations
- Result Store / Analysis



Running the Load Test



Monitoring and Benchmarking

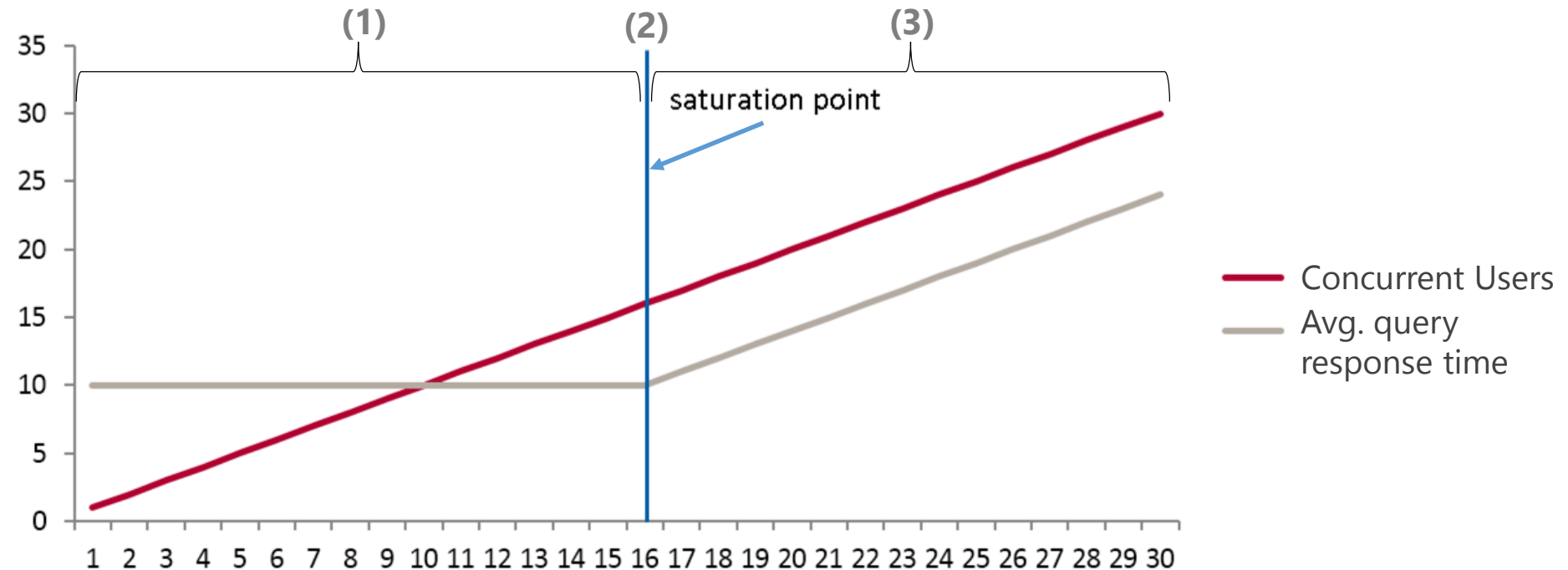
- Performance
 - Min/Max/Avg Test Duration
 - Number of Tests Executed
 - Number of Users
- Hardware Utilization
 - CPU
 - Memory
 - I/O
 - (Network)



Analyzing the Results



Expected results



- (1) Constant test duration
- (2) Until saturation point is reached
- (3) Linear increase of test duration together with concurrent users

The Myth of “Concurrent Users”

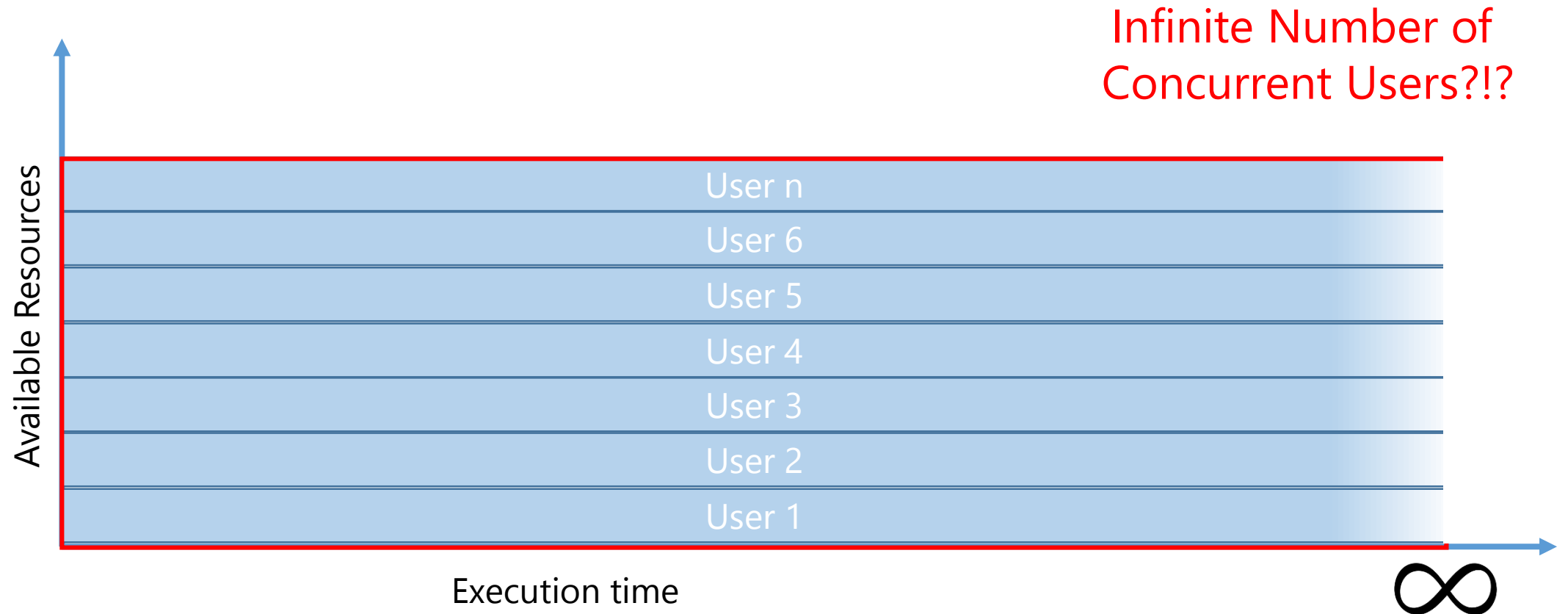
Defining Concurrency

“How many users can run a query
at the same time”

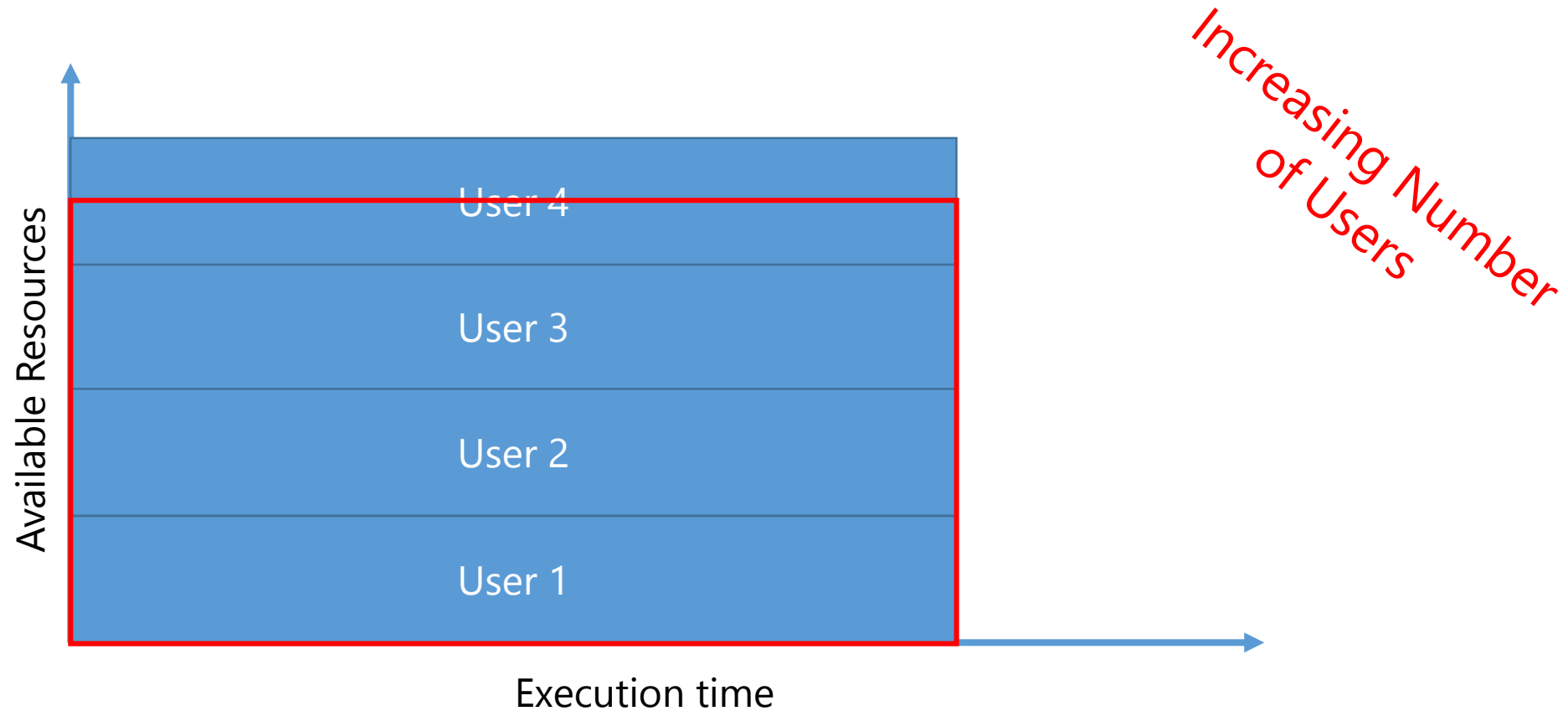
“How many queries can be answered
/ How many users can be satisfied
within a given time period”



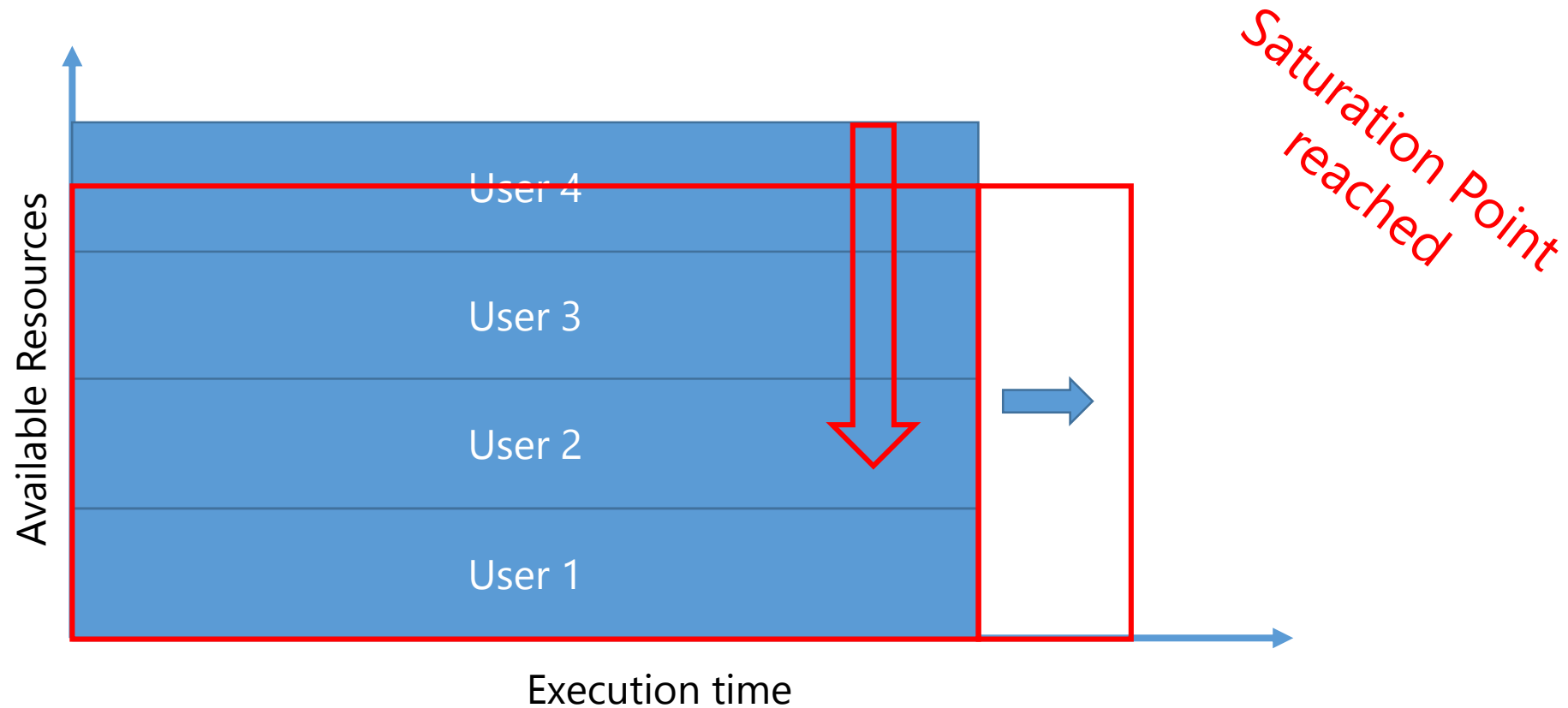
The Myth of "Concurrent Users"



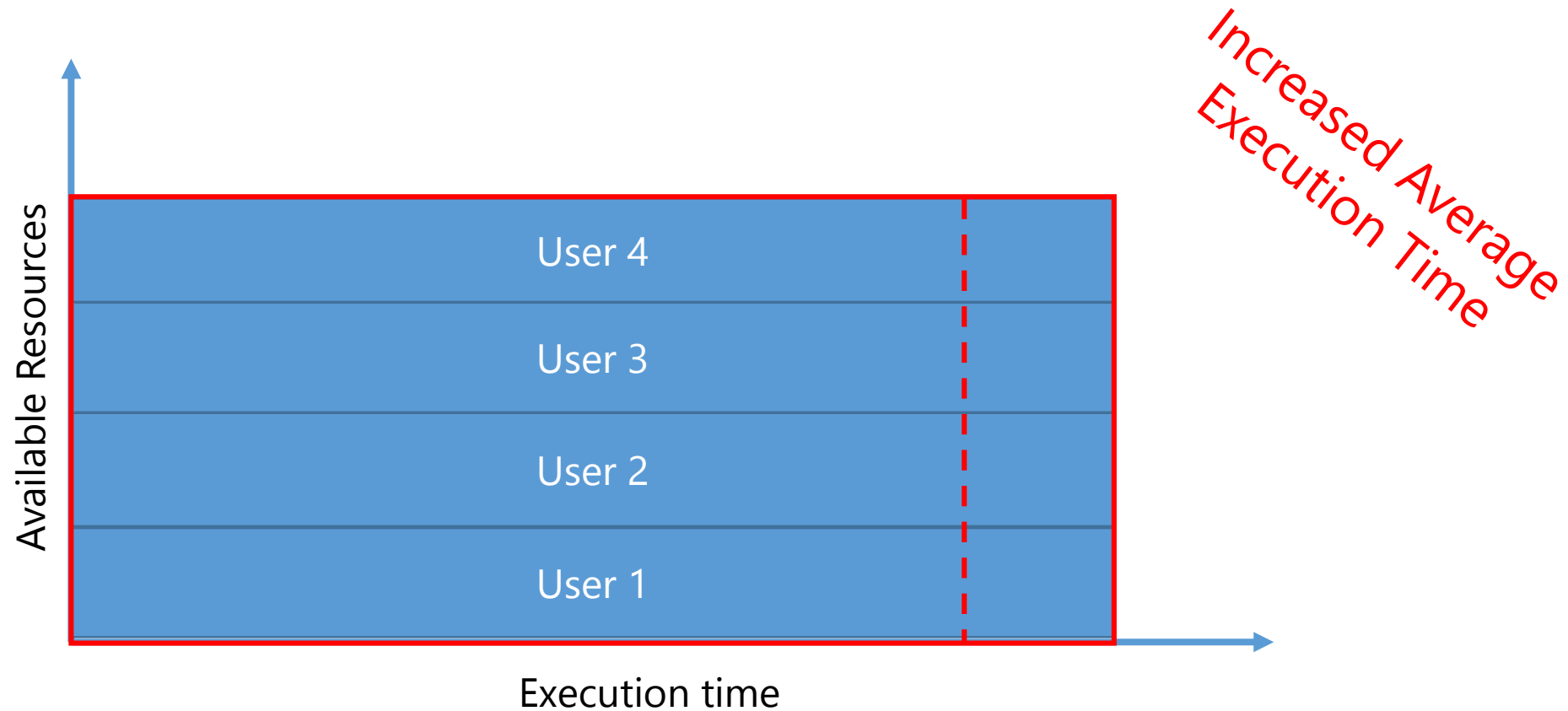
The Myth of "Concurrent Users"



The Myth of "Concurrent Users"



The Myth of "Concurrent Users"



Finding the Bottleneck

- CPU > 90% ?
- Memory
 - Available Server Memory
 - SSAS Memory Usage vs. Memory Limits
- IO
 - Read Bytes/Sec
 - Disk Queue Lengths
 - SSAS Threads



Changing the Parameters



Changing Parameters

- Software
 - OS Settings
 - SSAS Configuration
- (Cube Design/MDX Script)
- Hardware / Architecture
 - CPU
 - Memory
 - I/O



Common Misconfigurations

- Virus Scanner
- Windows Power Settings
- Slow SAN
- Indexed/Encrypted Data Directory
- SQL Server RDBMS on same Machine
- ...

- Bad Cube Design/MDX Script



Visual Studio Load Testing

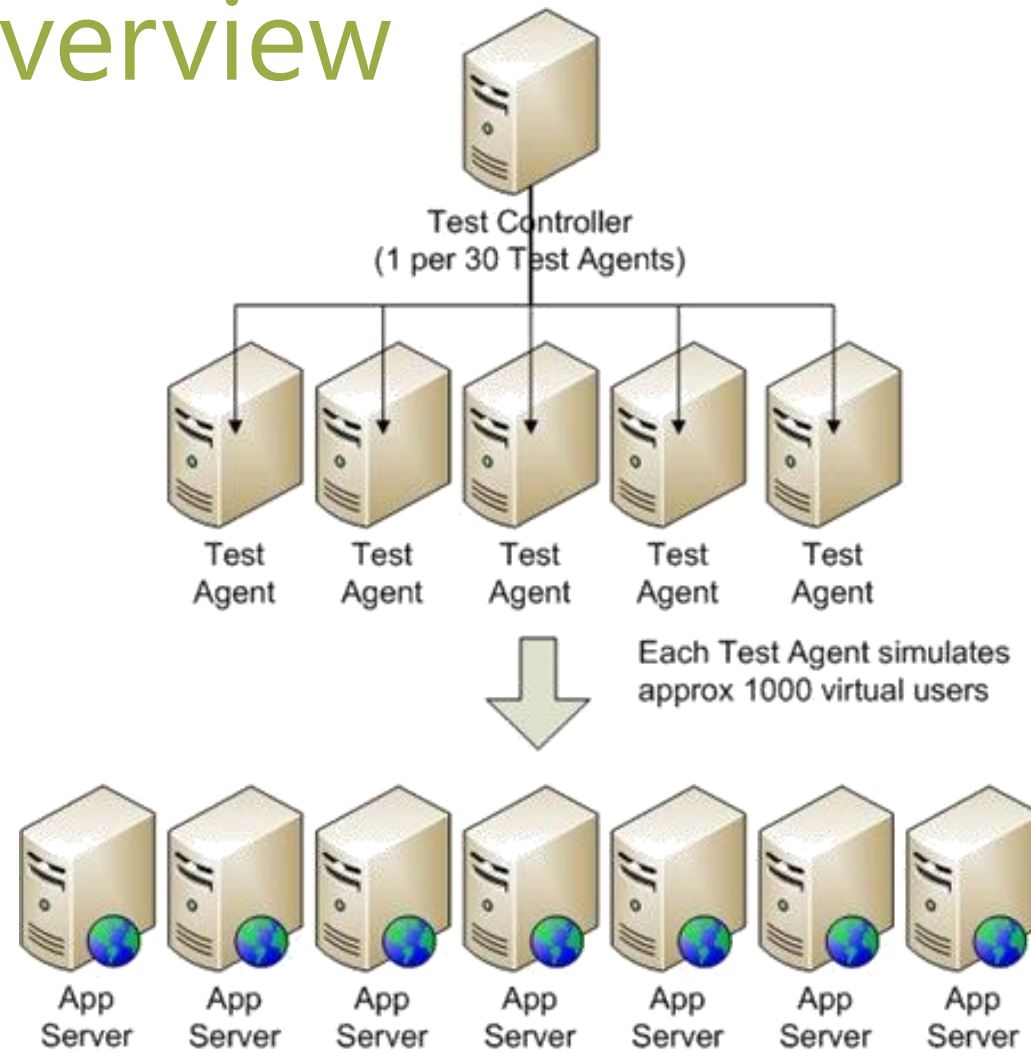


AS Load Sim

- AS Load Simulation
 - integration into VS Test Suite
- Framework
 - can/has to be extended
 - C# code
- For Baseline tests
 - Fixed set of queries
 - Random queries
 - Variable number of users



VS Test Suite – Overview



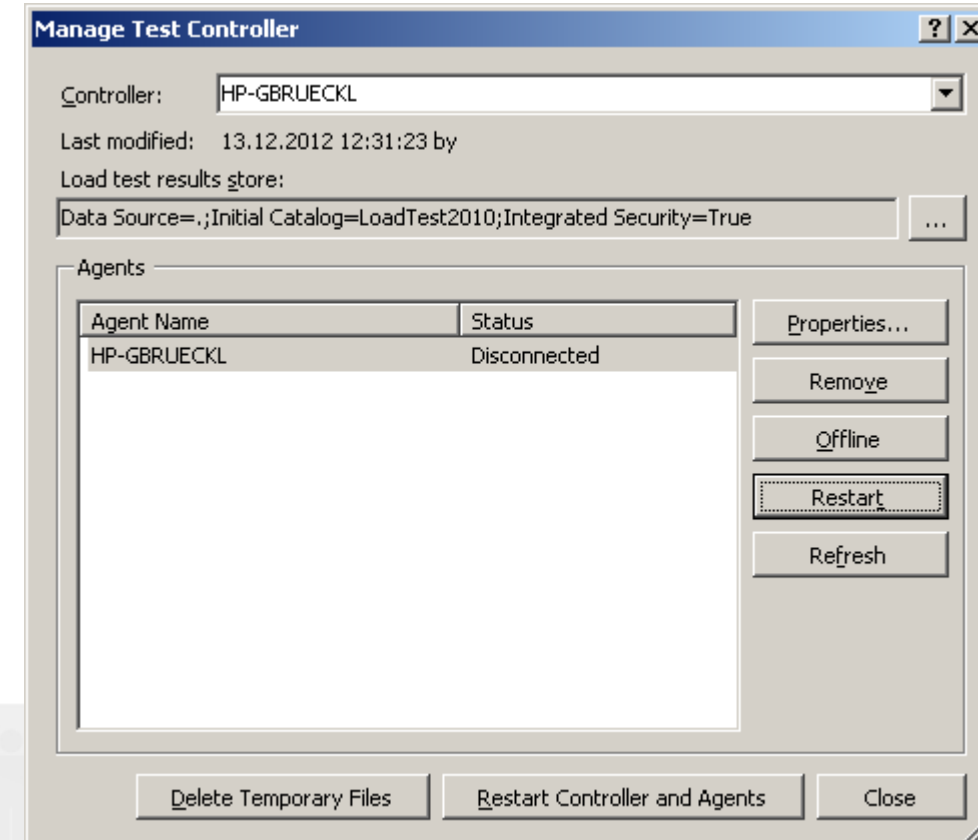
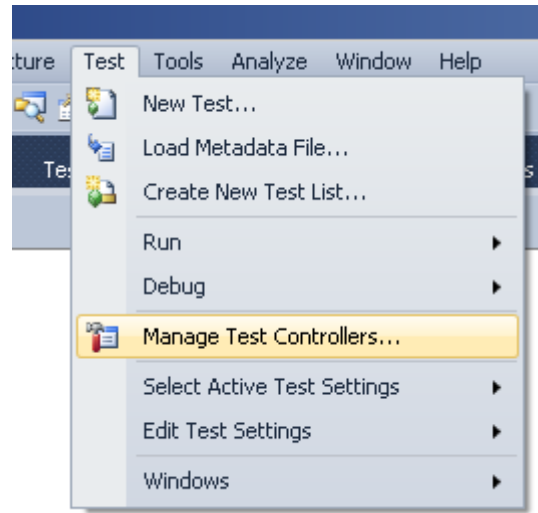
VS Test Suite – Overview

- Test Controller
 - Controls several Test Agents
 - Logs results into Database
 - Number of Tests
 - Average Test duration
 - ...
- Test Agent
 - Runs queries against website / database to test (SSAS, SQL, ...)
 - Logs results into Database
 - Local PerfMon counters
 - Tests per Agent
 - ...



VS Test Suite –Test-Controllers

- Every Test Controller has to be configured
 - Load test result store: relational database to store test results
 - Agents: manage Agents that the controller “owns”

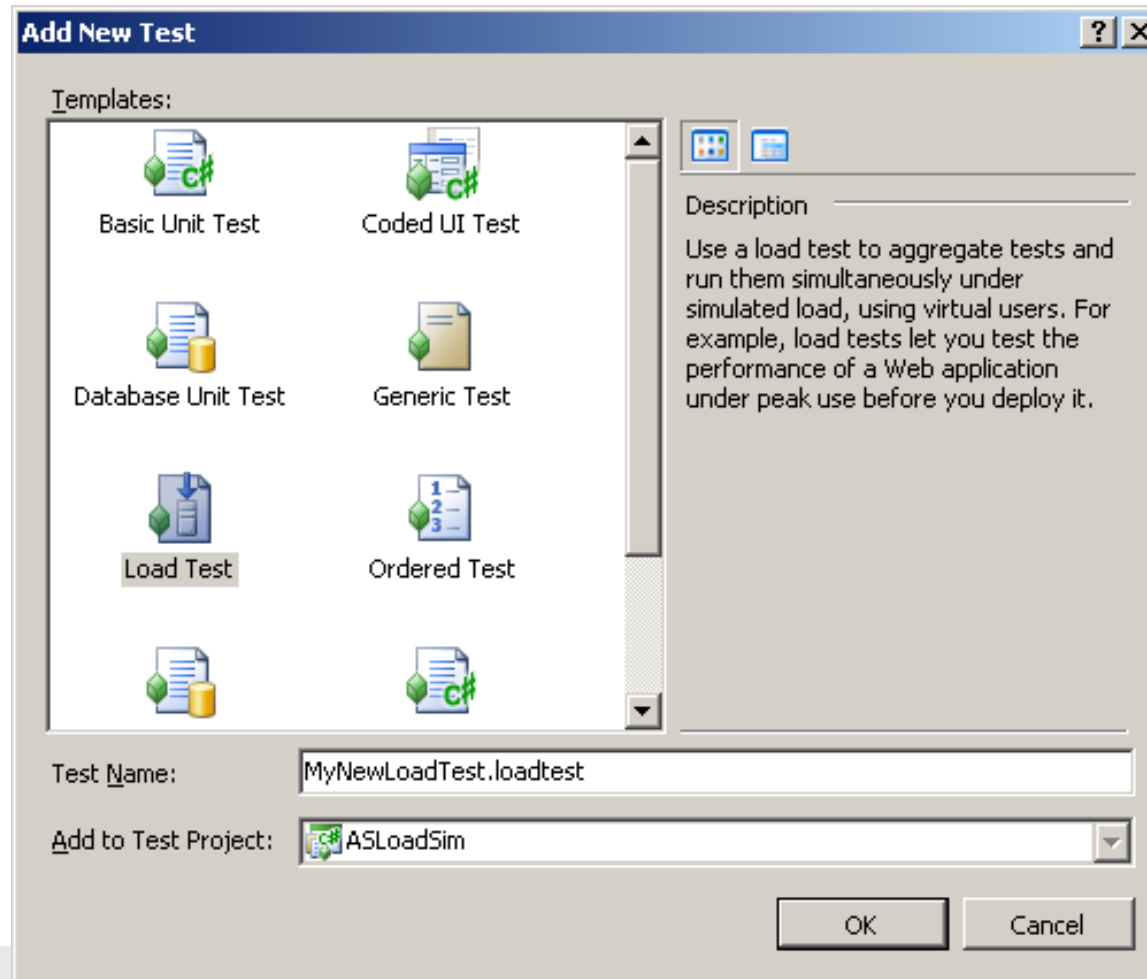


VS Test Suite – Test-Controllers

- Create Load Test Store
- SQL Scripts
 - Create DB: LoadTestResultsRepository.sql
 - Upgrade DB: UpgradeLoadTestResultsRepository.sql
- Scripts can be found at
C:\Program Files (x86)\Microsoft Visual Studio 10.0\Common7\IDE

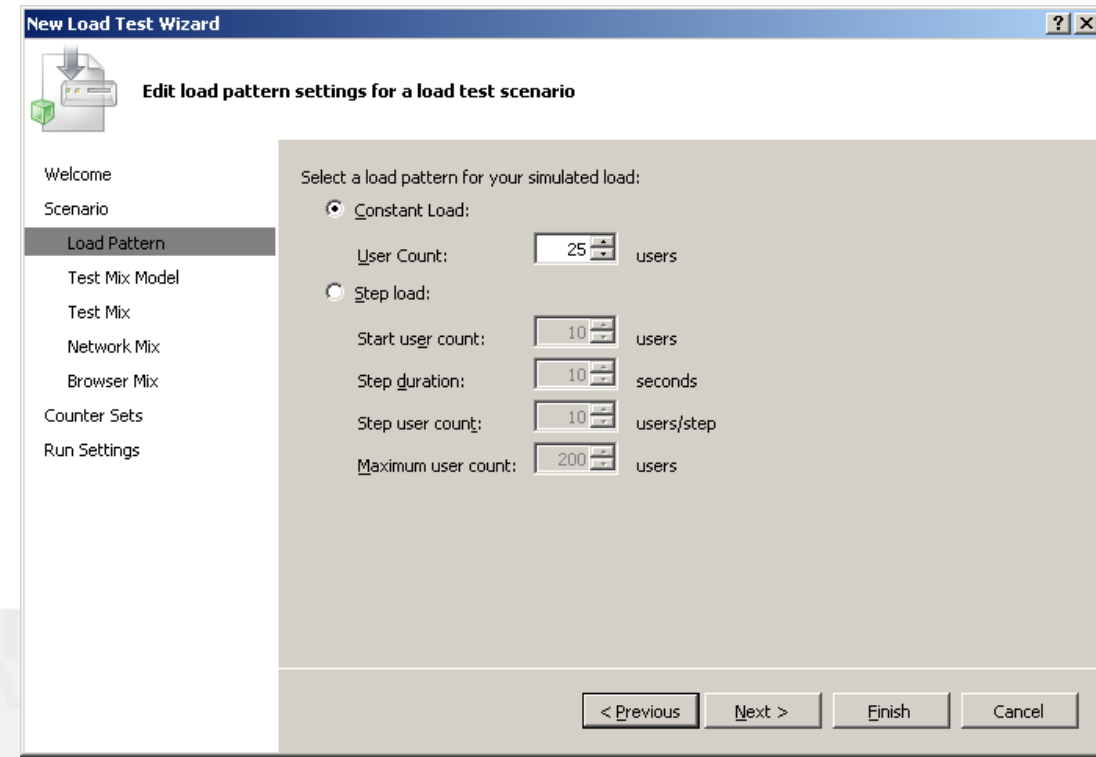


VS Test Suite – Testconfiguration



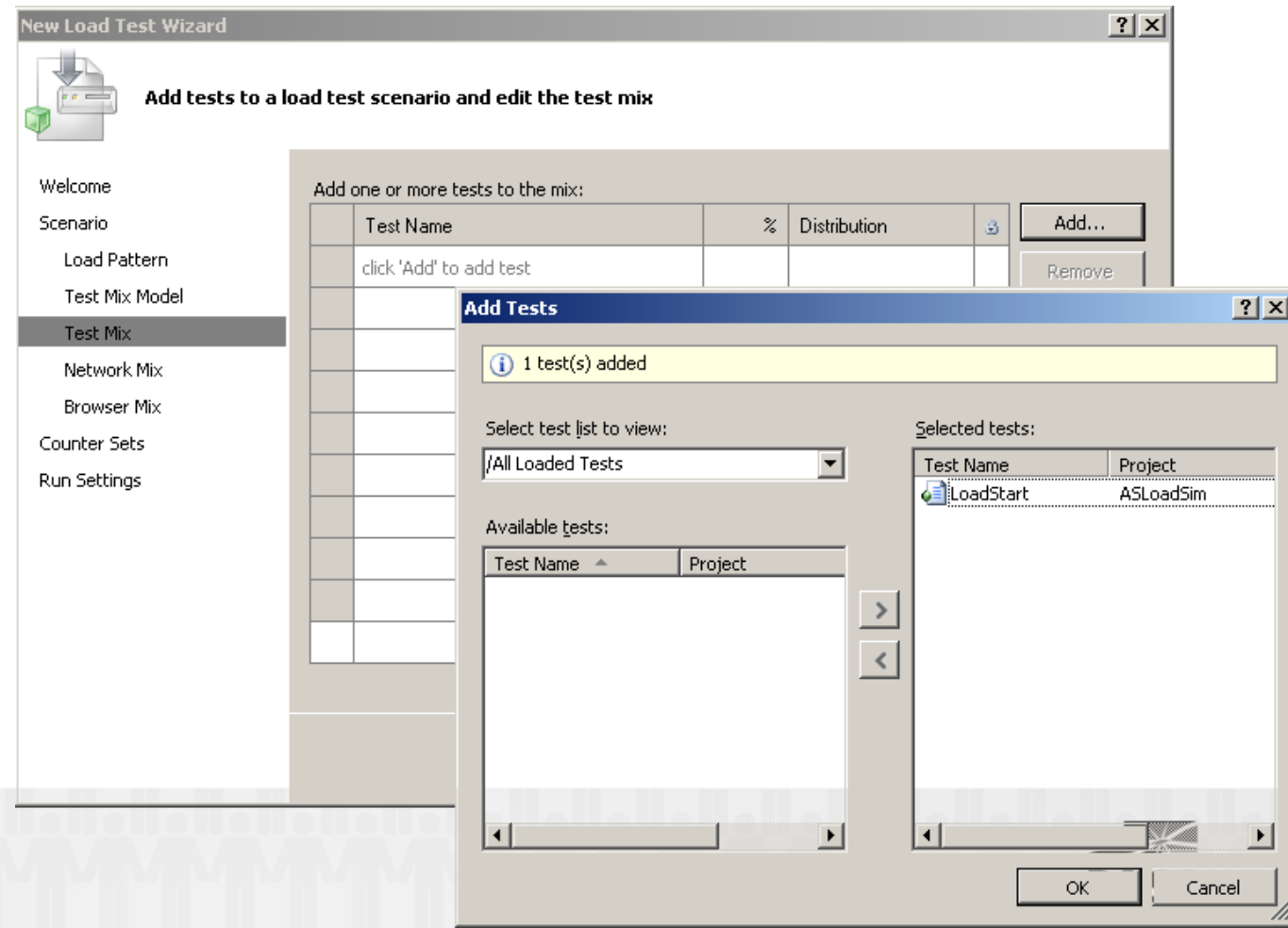
VS Test Suite – Testconfiguration

- Constant Load
 - Always same amount of concurrent Users
- Step Load
 - Increasing number of Users with each Step



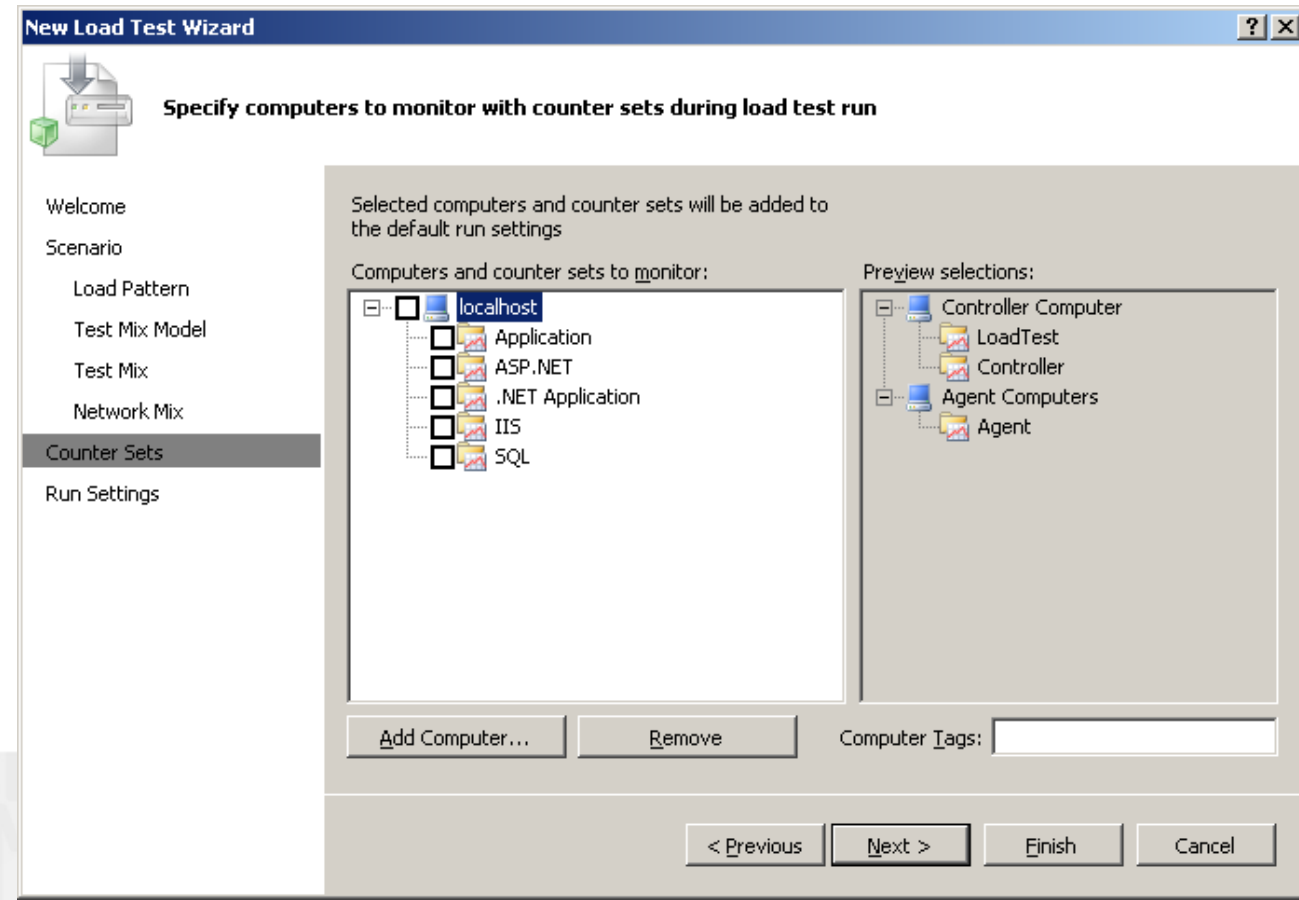
VS Test Suite – Testconfiguration

- Test Mix
 - Add the ASLoadSim Project as a Test Mix



VS Test Suite – Testconfiguration

- Counter Sets
 - Can use predefined sets
 - Can create custom sets



VS Test Suite – Testconfiguration

- Run Settings
 - Limit number of testruns
 - By duration
 - By number of iterations
- Sampling rate
 - Frequency in which
 - Performance-counters are
 - logged

New Load Test Wizard

Review and edit run settings for a load test

Welcome

Scenario

- Load Pattern
- Test Mix Model
- Test Mix
- Network Mix
- Counter Sets
- Run Settings**

Specify the length of the load test by:

Load test duration

Warm-up duration (hh mm ss): 0 0 0

Run duration (hh mm ss): 0 10 0

Test iterations

Test iterations: 100

Details

Sampling rate: 5 seconds

Description:

Save Log on Test Failure: True

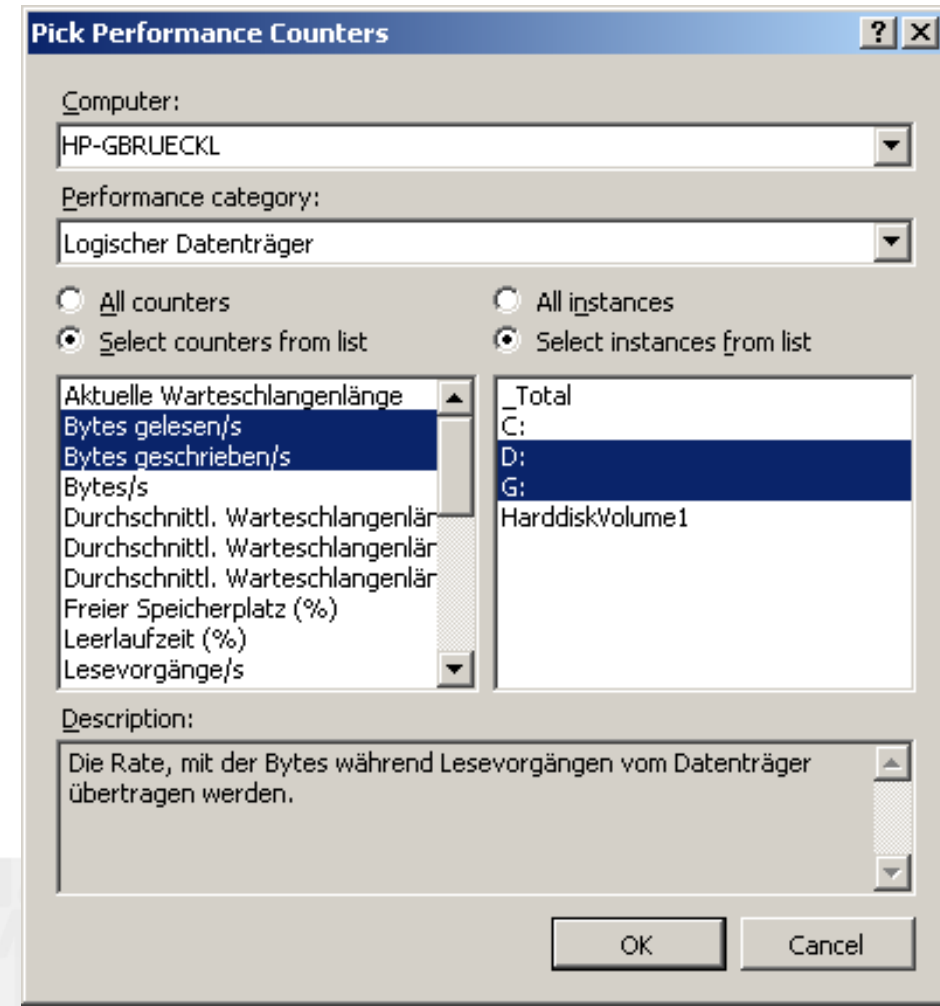
Validation level: High - invoke all validation rules

< Previous Next > Finish Cancel



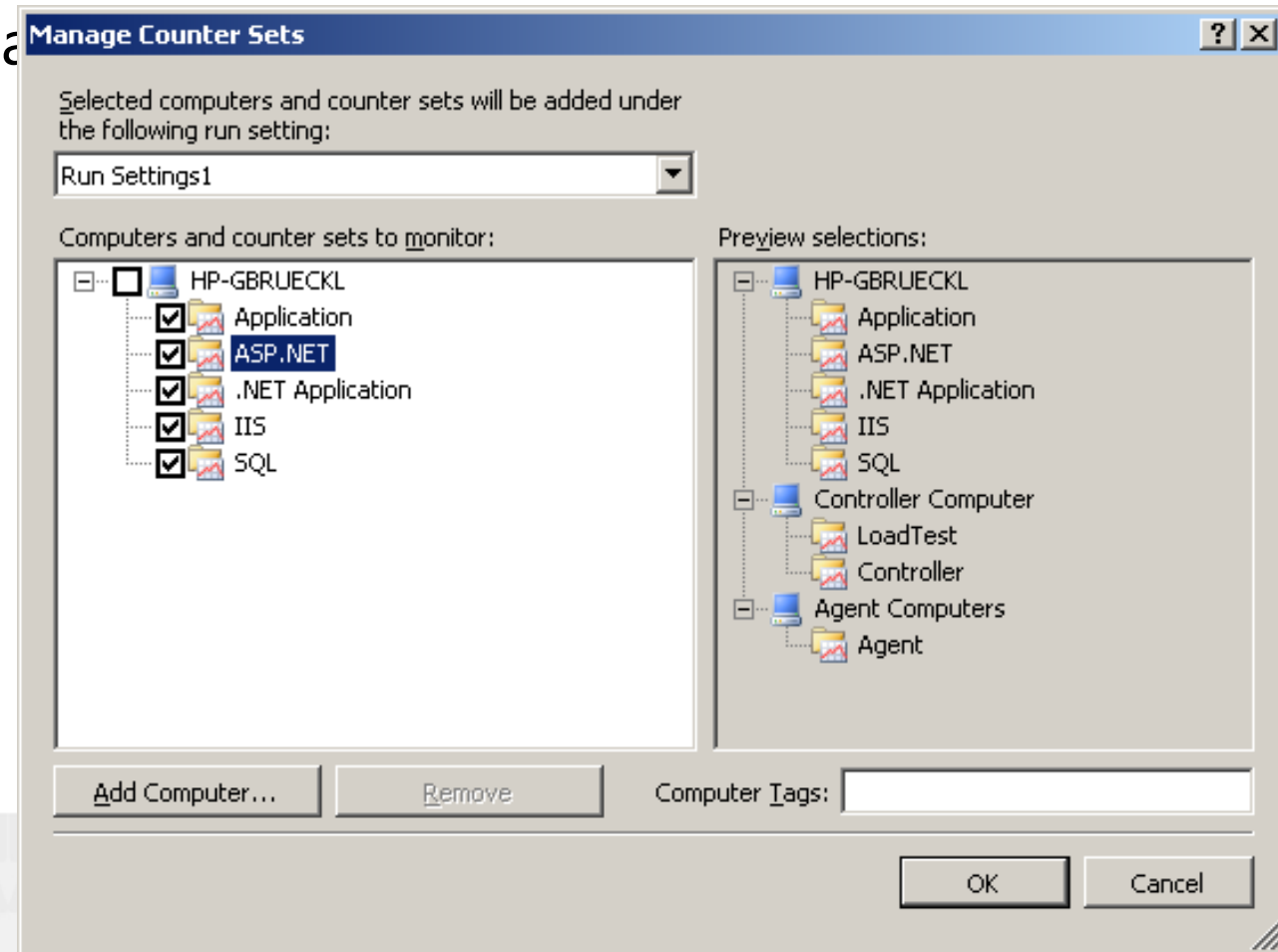
VS Test Suite – Testconfiguration

- Counter Sets
 - Collection of Performance Counters
 - Same Counters that are also
 - available via **PerfMon**



VS Test Suite – Testconfiguration

- Assigning Counter Sets
 - Counter Sets can be assigned to a
 - Controller
 - Agent
 - Test-Server
 - SSAS
 - SQL
 - ...



VS Test Suite – Running the Test

The screenshot displays the MyLoadTest application interface. At the top, a status bar indicates "Test in progress..." with "10 threshold violations" and "12 errors". A "Remaining: 09:07" timer is also visible. The interface is divided into several sections:

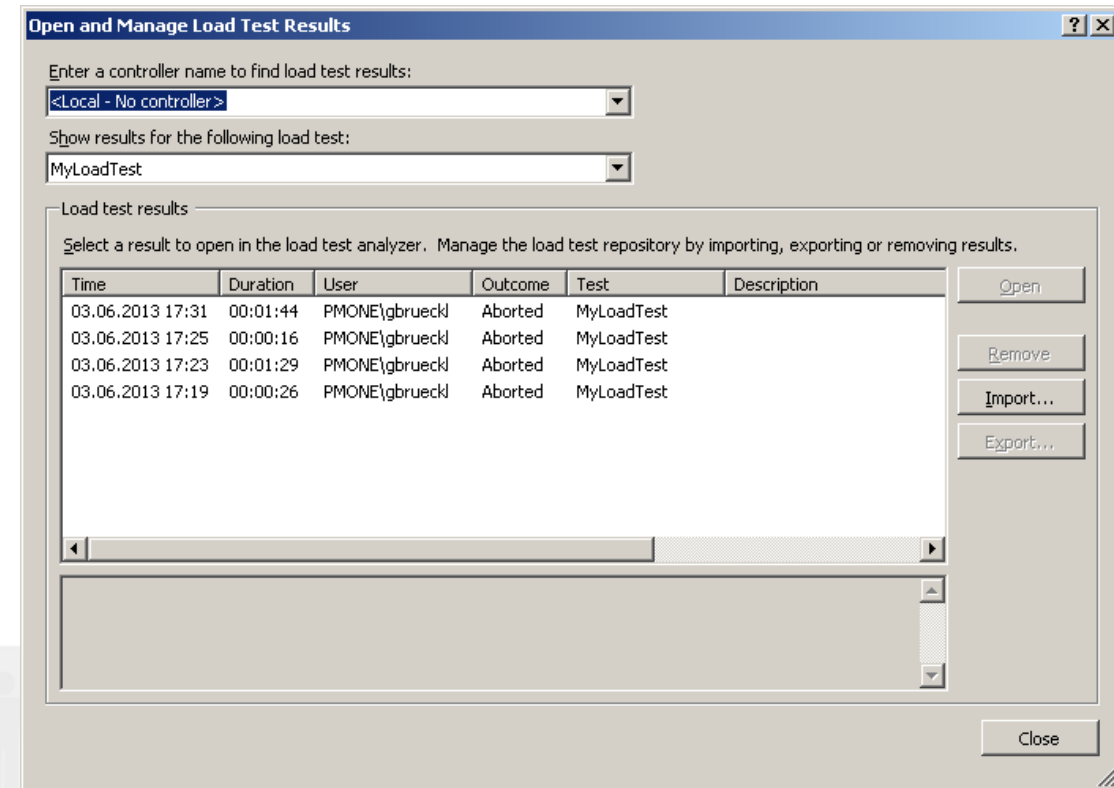
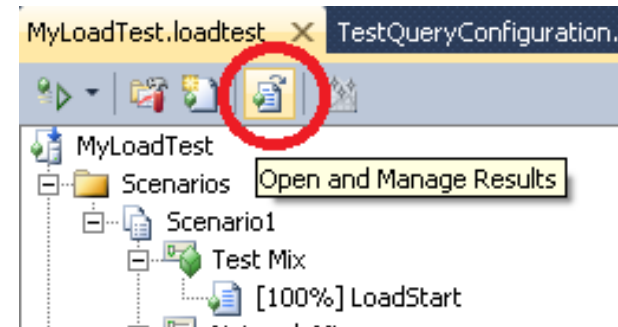
- Counters:** A tree view on the left shows "Overall", "Scenario1", "Computers", and "Errors".
- Overview:** A table showing test statistics:

Configuration	Value
Controller	Local run
Sampling Rate	00:05
Total Tests	0
Tests/Sec	0
Failed Tests	0
- Key Indicators:** A line graph showing various metrics over time (00:00 to 02:00).
- Test Response Time:** A line graph showing response time over time.
- System under Test:** A line graph showing system performance over time.
- Controller and Agents:** A line graph showing controller and agent performance over time.
- Counter Table:** A table listing active counters and their values:

Counter	Instance	Category	Computer	Color	Range	Min	Max	Avg	Last
Key Indicators									
<input checked="" type="checkbox"/> User Load	_Total	LoadTest:Scenario1	HP-GBRUECKL	Red	1,000	1	1	1	1
<input checked="" type="checkbox"/> Tests/Sec	_Total	LoadTest:Test	HP-GBRUECKL	Green	100	0	0	0	0
<input checked="" type="checkbox"/> Avg. Test Time	_Total	LoadTest:Test	HP-GBRUECKL	Blue	100	-	-	-	-
<input checked="" type="checkbox"/> Errors/Sec	_Total	LoadTest:Errors	HP-GBRUECKL	Purple	-	-	-	-	-
<input checked="" type="checkbox"/> Threshold Violations/Sec	_Total	LoadTest:Errors	HP-GBRUECKL	Orange	-	-	-	-	-
Test Response Time									
System under Test									
<input checked="" type="checkbox"/> % Processor Time	Total	Processor	HP-GBRUECKL	Red	100	3.04	18.8	5.76	4.44

VS Test Suite – Analyzing the Results

- Results are stored in the Load Test Store (=SQL Database)
- Can be accessed via Visual Studio



Live-Demo



Summary

- Be sure what you actually want to achieve with your Load Test
- Use appropriate Tools
- Know your System
 - Hardware – physical Limitations
 - Cube/Model – design Limitations
- Make tests as real as possible – Security!





Professional
Association
for SQL
Server

DEUTSCHLAND e.V.