**Presentation**

**Bio**

P R E S E N T A T I O N

# W4

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1:00PM

# THE SCIENCE AND ART OF WEB SITE LOAD TESTING

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# The Science and Art of Web Site Load Testing

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The eLoadTesting™ Company

# Outline

- What you will learn:
  - How web site load testing differs from more traditional enterprise load testing
  - Why web site load testing is absolutely critical for eBusiness success
  - Why realism and accuracy are critical to load testing
  - Why most web site load tests are wildly inaccurate
  - The key principles for developing highly accurate, realistic, and useful web site load tests


# Comparison of Web Site to Traditional Enterprise Load Testing

| Key Factors | Traditional Enterprise Load Testing | Web Site Load Testing |
|---|---|---|
| **Transaction volumes** | Predictable and limited | Unpredictable and potentially unlimited |
| **User behavior and variables** | Predictable and controllable | Unpredictable and uncontrollable |
| **System variables** | LAN, centralized HW and SW | Plus firewalls, routers, hosting company, caching systems, … |
| **Risk** | Failures noticed internally only | Failures highly visible |

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# Why Web Sites Need Load Testing

The Fundamental Theorem of Web Site Performance and Availability


Load testing helps you understand, anticipate, and pre-empt performance and uptime problems that can lead to **major eBusiness disasters** and/or **chronic *minor* losses**.

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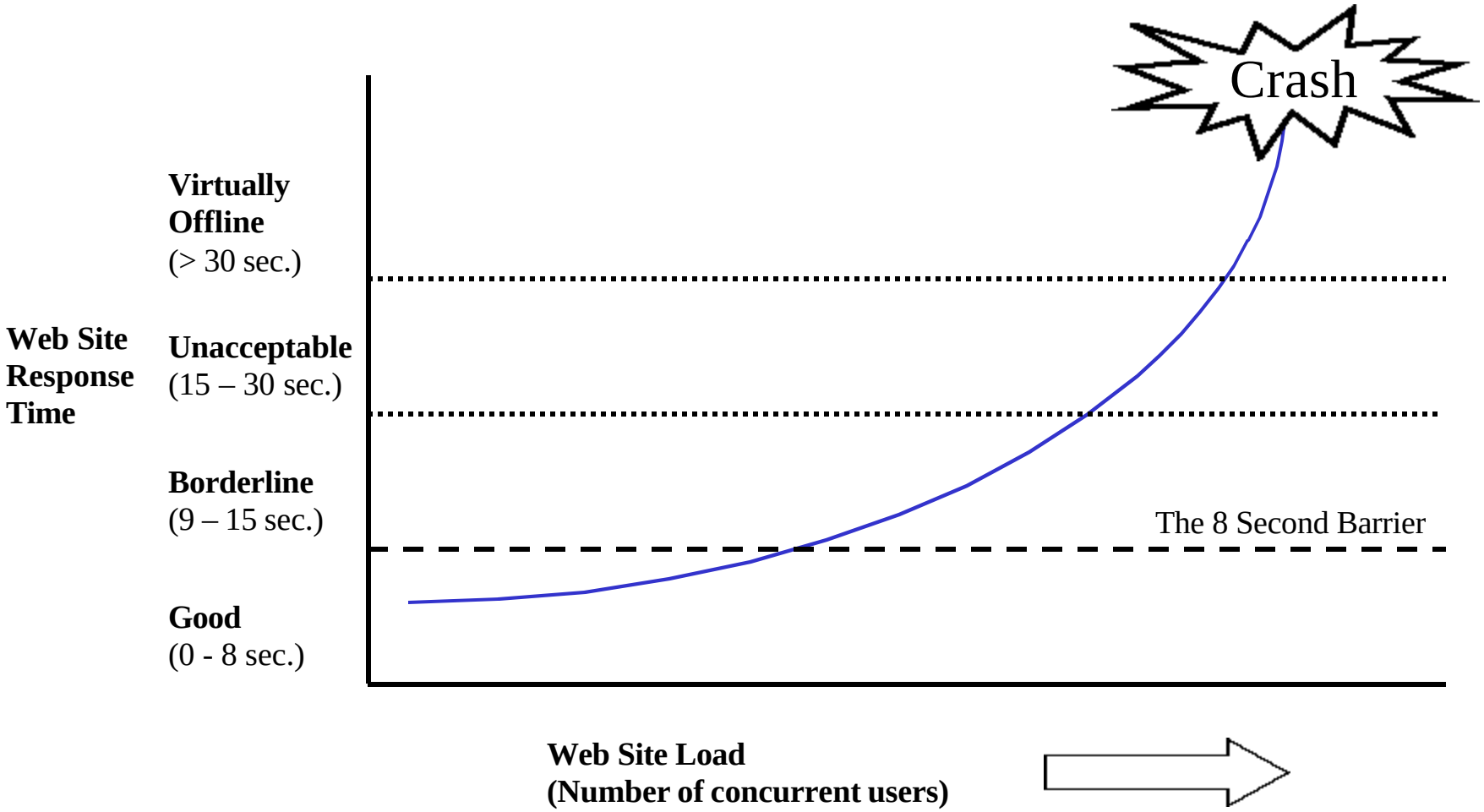
# Web Site Load vs. Web Site Response Time



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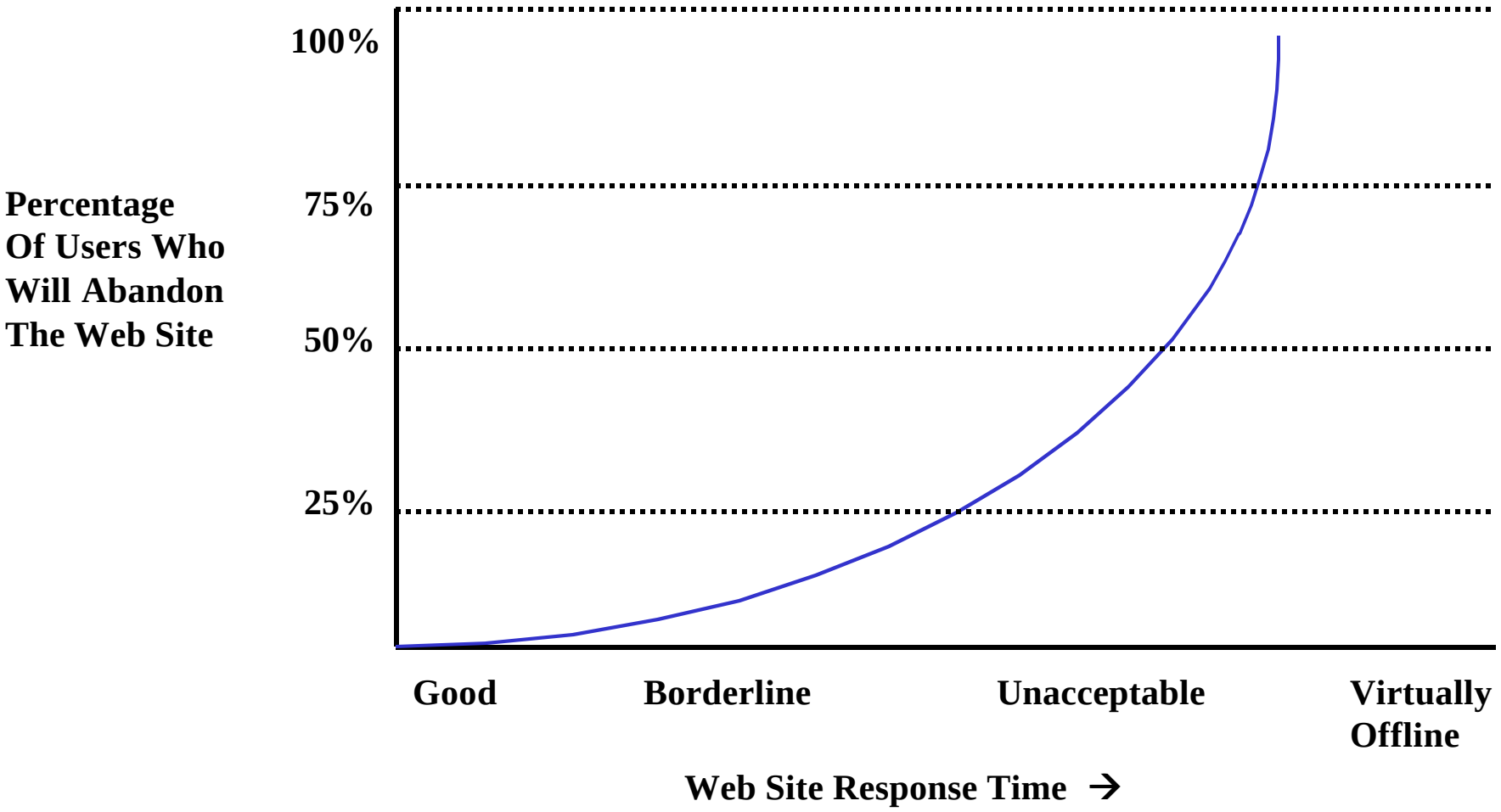
# User Abandonment vs. Web Site Response Time



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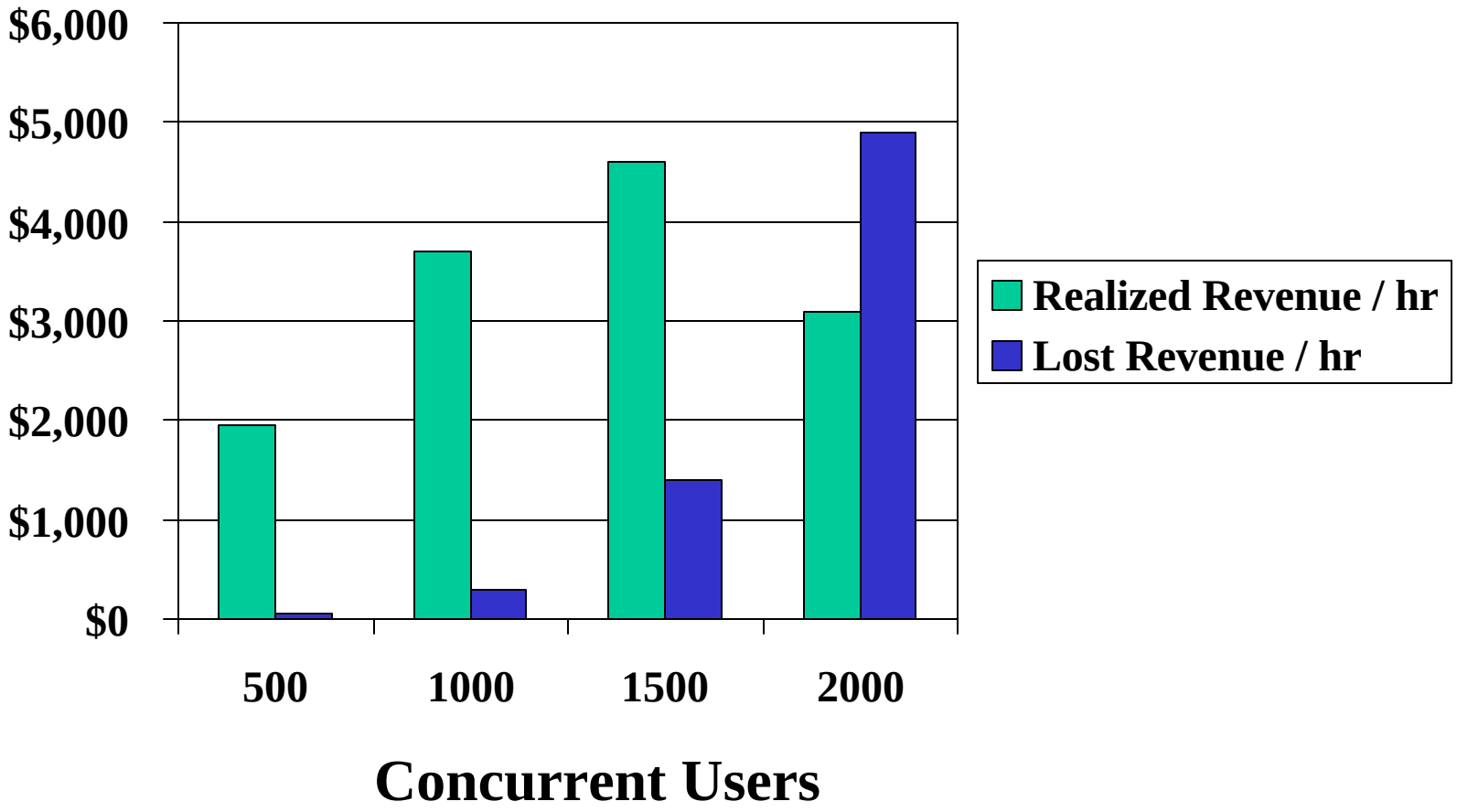
# The Business Impact of Load




# Realism and Accuracy Are Critically Important

- Realism
  - The simulated load must closely match the real load
- Accuracy
  - The measurements taken during the test must provide sufficient detail and granularity
- An unrealistic or inaccurate load test can be dangerously misleading:
  - Overestimating your capacity can lead to problems when the real load hits
  - Underestimating your capacity can cause unnecessary delays and cost additional $ for unnecessary HW and resources


# How Realistic and Accurate Do You Really Have to Be?

- Zona Research experiment*
  - Log files showed that a company's 40Kb (~8 seconds to load) home page had a 30% abandonment rate.
  - The company tweaked the home page to 34Kb (~7 seconds to load).
  - Abandonment rate fell immediately from 30% to 6-8%.
  - All for one (1) tiny second difference in load time.
- Conclusion:
  - Most test scripts are patient, most real users are not.
  - Your load testing measurements should be as accurate as possible. Every second counts!

* "The Economic Impact of Unacceptable Web-Site Download Speeds" , Zona Research Inc. April 1999


# The Science and Art of Realistic and Accurate Web Site Load Testing

- Aim for 80% “science” and 20% “art”
- Systematically capture and standardize load parameters from real world usage
  - Web site Usage Signature (WUS)
- Develop a realistic and accurate load generation model
  - Online behavior profiling
  - User demographics

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# Web site Usage Signature

- Sample WUS components
  - Average and Standard Deviation for:
    - Page Size
    - Hit Size
    - Hits per Page
    - Pages per Session
    - Session Duration
    - ….
  - Page distribution
    - Home page 26%, Search 12%, Product Info 32%, Order 4%, Status 2%, …
- If the WUS from real usage is close to the WUS created by the load test, then your simulated load is realistic and you can draw useful conclusions. If not, you are wasting your time and money.


# Gathering Data for the WUS

## (Log Analyzers – Use With Care)

Whatever log analysis tool and metrics you use, make sure you use them consistently. The lack of standardization makes log analysis data non-portable.

| | WebTrends | Analog | WebAlizer |
|---|---|---|---|
| Total Hits | 1,667,256 | 1,886,952 | 1,920,405 |
| Total Hits (Successful) | 1,651,522 | 1,869,464 | N/A |
| Total Hits (Failed) | 15,734 | 17,488 | N/A |
| Total Page Views | 364,303 | 112,154 | 232,931 |
| Total Kbytes Served | 5,993,150 | 6,930,039 | 6,934,837 |
| Avg. Kbytes served per page | 16.45 | 61.79 | 29.77 |
| Avg. Hits (Successful) Per Page | 4.53 | 16.67 | N/A |
| Total User Sessions | 16,136 | N/A | 36,612 |
| Avg. Session Length (minutes) | 19:17 | N/A | N/A |
| Avg. Pages Per Session | 22.58 | N/A | 6.36 |

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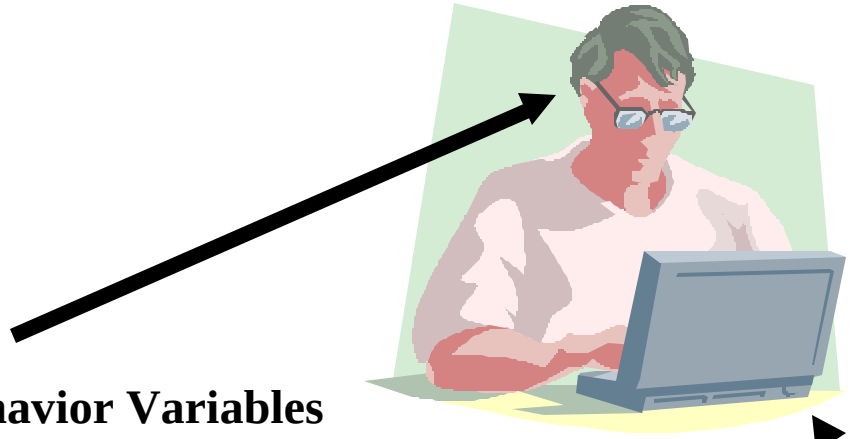
# Creating Realistic Loads

Load testing realism is achieved by creating scripts and scenarios that take into account a number of key variables about web site users and their equipment/location/configuration.



**Online Behavior Variables**

Read/write/think time
Latency tolerance
Tenacity
Familiarity with site
…

**User Demographic Variables**

Geographic location
Connection speed
Access time
…

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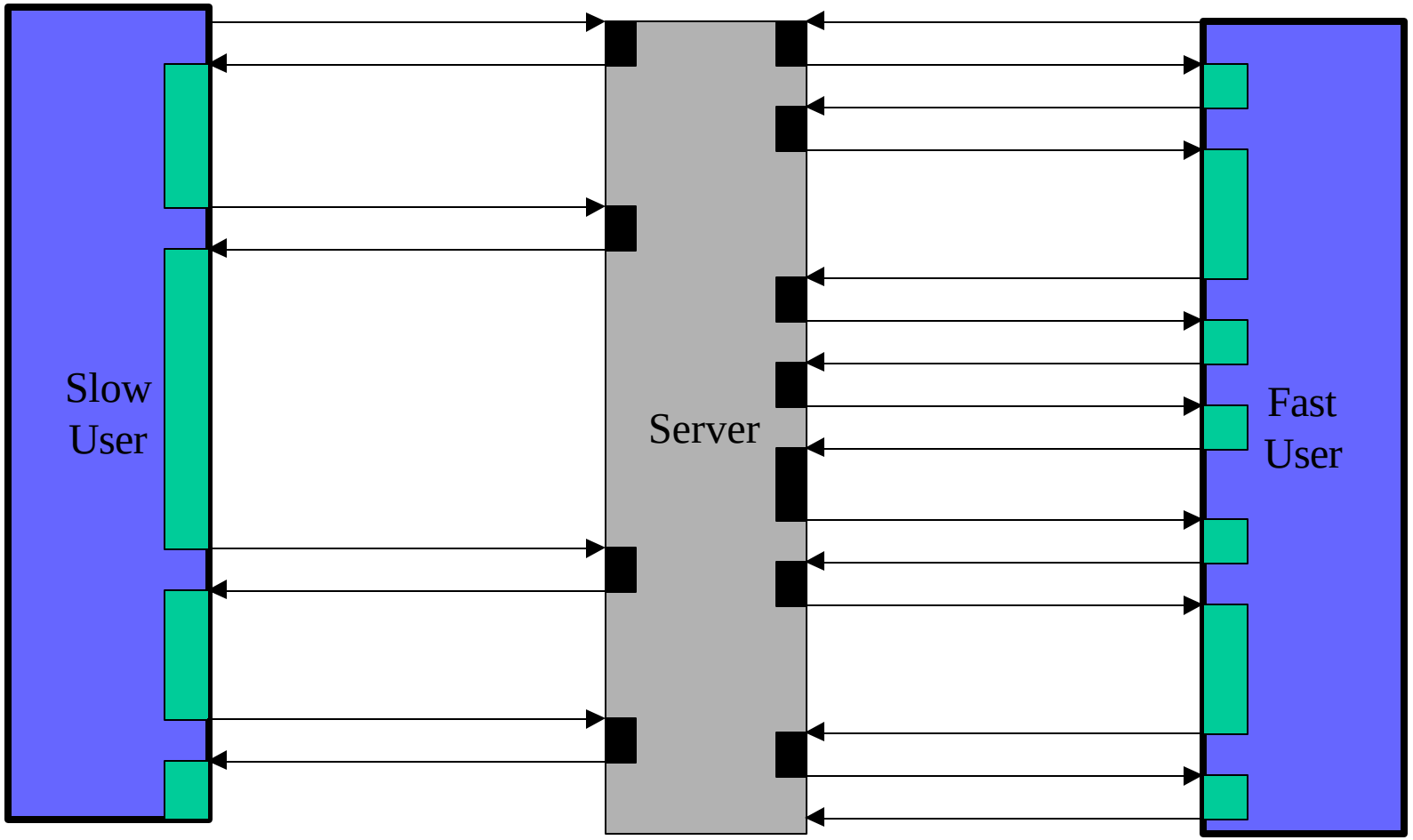
# User Speed Affects Load




= Read, Think, Write Time

= Server loading

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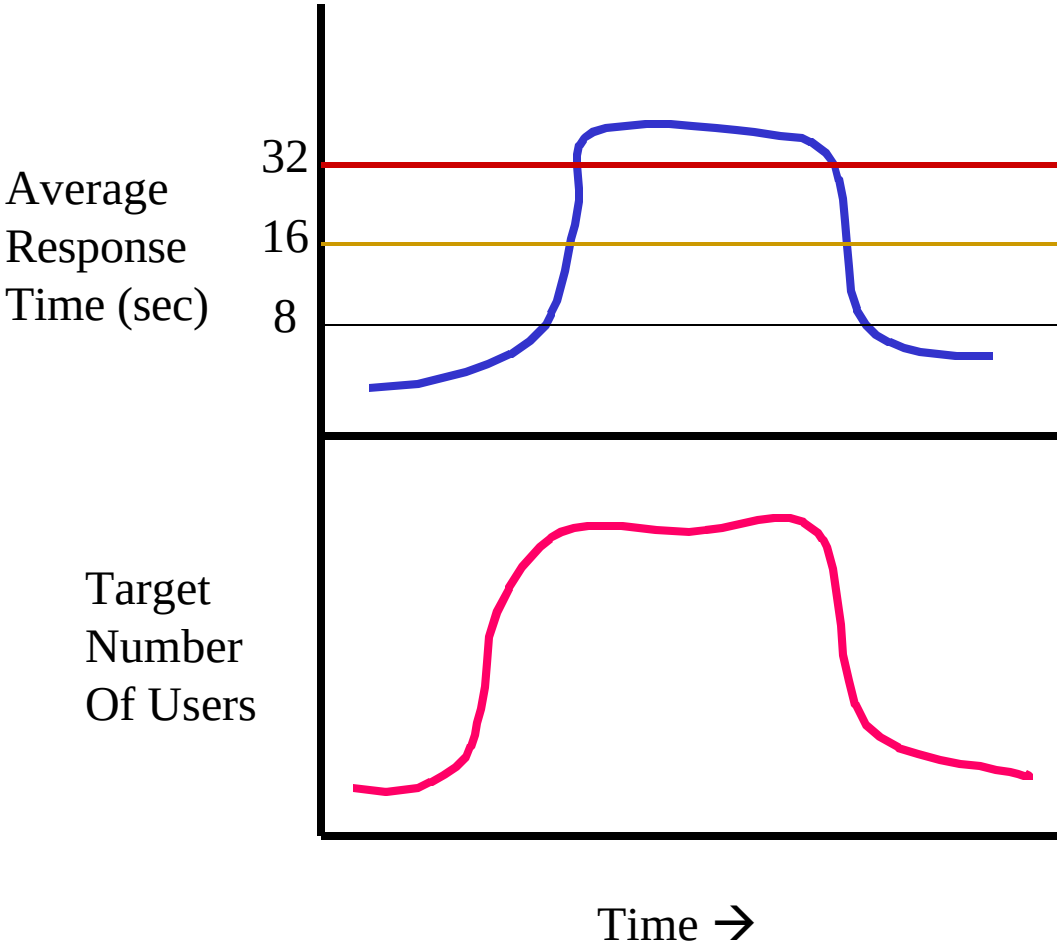
# User Tolerance Affects Loads

Typical load test results:




This is not a realistic load situation.

What does it really tell you?

It tells you what the load would be if you had incredibly patient users willing to wait a VERY long time to get their pages.

**Since this will never happen, what's the value of this?**

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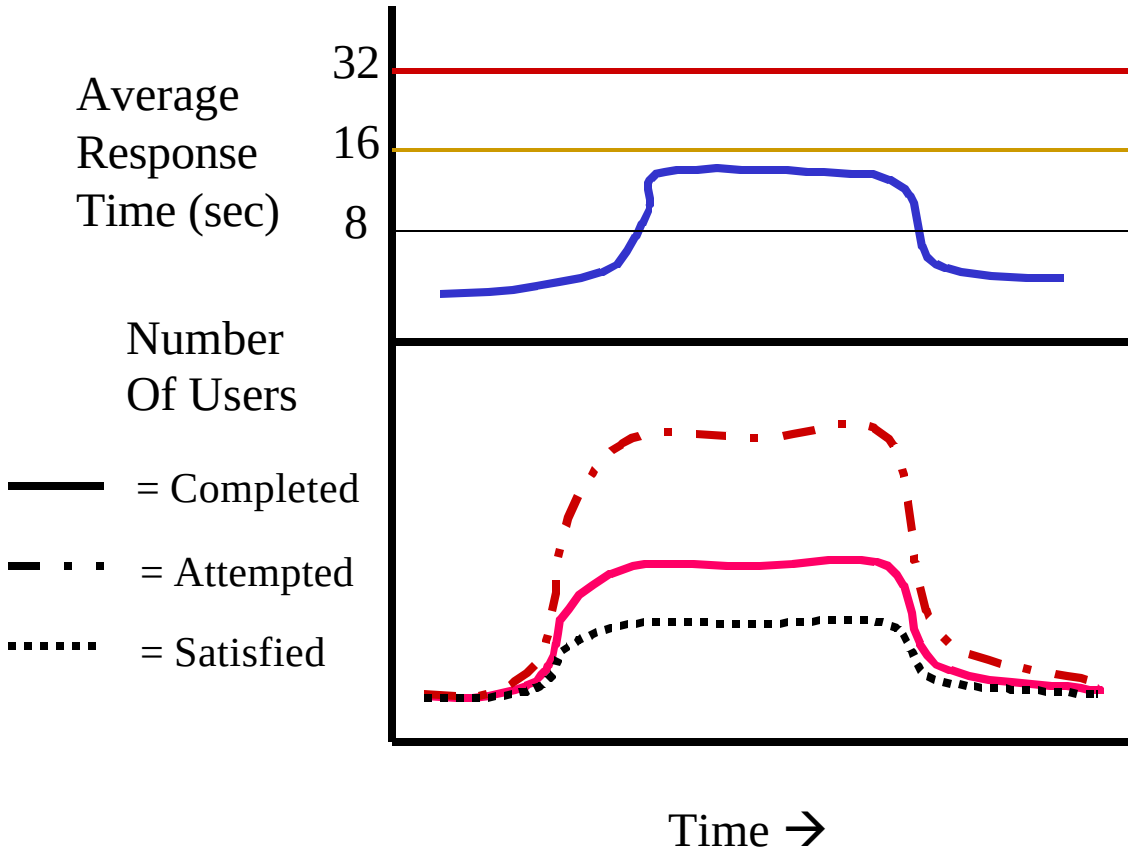
# User Tolerance Affects Loads

Realistic load test results:




The number of actual users never reaches the planned number because the slow response turned people away.

**<u>This is what happens in the real world.</u>**

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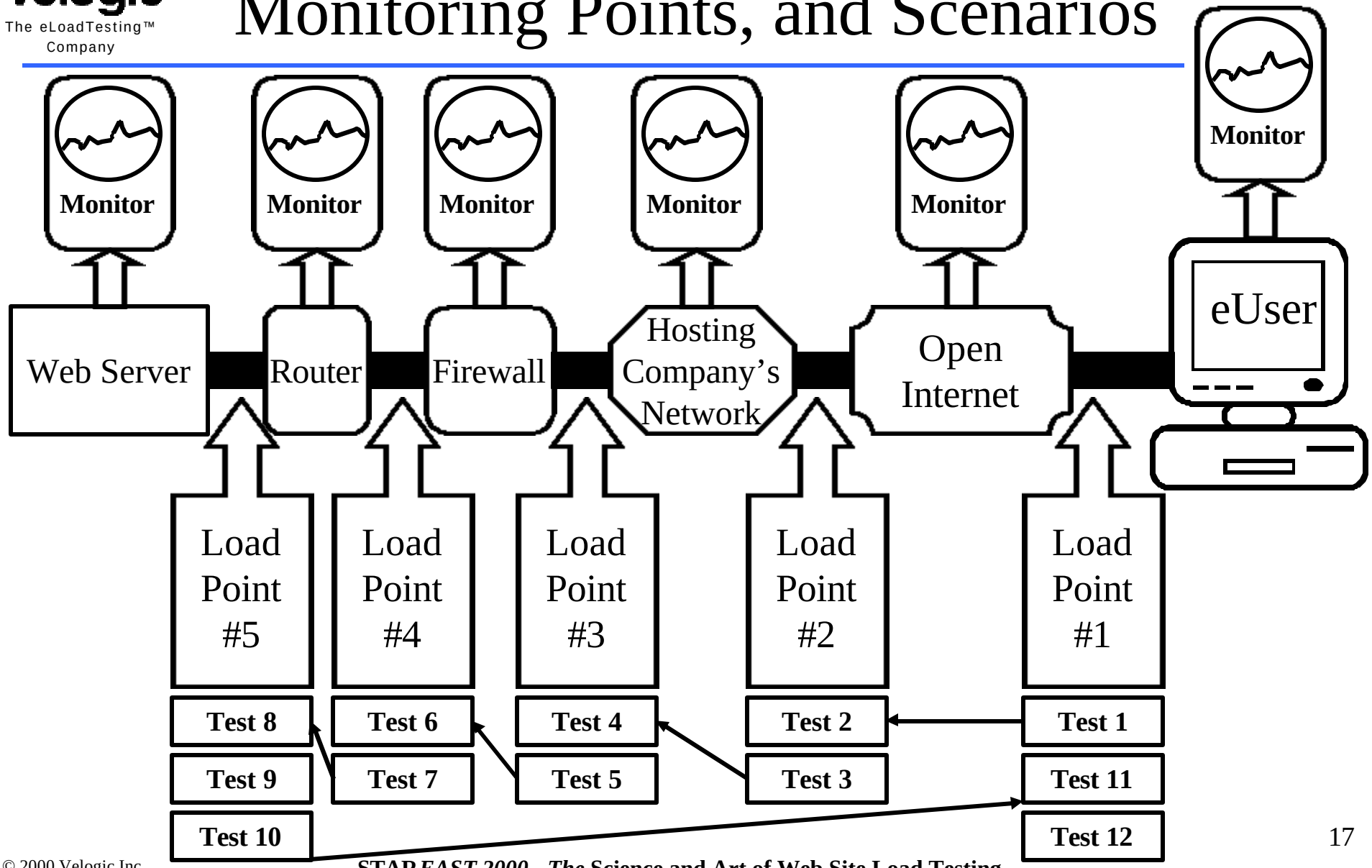
# Use Multiple Load Points, Monitoring Points, and Scenarios




# Load, Stress, and Endurance Testing

- ✓ Load testing
  - Determine web site performance at a pre-defined load level
- ✓ Stress testing
  - Determine the web site's breaking point or unacceptable performance point
- ✓ Endurance testing
  - Determine the web site's performance under continuous, long term loads

- ✓ You should do all three

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# Conclusions

- Web site load testing is very different from traditional load testing and requires new tools and new approaches.
- Load testing is essential for mission critical web sites.
- Most web site load tests are wildly inaccurate and unrealistic and consequently useless and/or dangerously misleading.
- Accurate and realistic web site load tests should include: web site usage signature + online behavior profiling + user demographics.


# Conclusions

- Useful load testing requires loading a web site with different scenarios, at different load points, and monitoring all the key components.
- Load, stress, and endurance are necessary tests for complete quality assurance.
- Approach web site load testing as 80% science and 20% art.

# Alberto Savoia

Alberto Savoia is founder and CTO of Velogic Inc., a professional services company that specializes in Web site load testing. In his 15-year career he has been consistently and passionately committed to improve the state of the art in software testing through the use of formal methods and automation, and has been granted several software patents, including 2 US patents in the area of test automation.

Prior to Velogic, Mr. Savoia was founder and General Manager of SunTest, a business unit of Sun Microsystems that developed and marketed award-winning Java testing tools for API, GUI, and load testing.

Before SunTest, Mr. Savoia, was Director of Software Research at Sun Microsystems Laboratories where, among other projects, he started and led the ADL (Assertion Definition Language) project, a highly successful, 3-year, $4 million, joint international research effort in automated test generation for object oriented systems.