Web Application Stress Testing with Blaise Internet

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Introduction

- Focus: web application stress testing tools, methods, tests and lessons learned
- Benefits of stress testing
  - Realistic simulation of performance of server and application under varying numbers of concurrent users
  - Valuable information on suitability of the server configuration for specific requirements of a survey
  - Potential in usability testing and paradata analysis
- Test results presented here highly dependent on
  - Size and complexity of the data models
  - Server platform
  - Your mileage may vary

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Planning and Configuring a Web Survey

- Calculating server capacity essential
  - Respondent cooperation crucial
  - Web surveys often long and complex
  - Lags processing pages on server drive Rs away
- Server capacity complex
  - Processors, memory, speed etc.
- Application performance that meets needs of study is core
  - Done by stress testing
- Blaise 4.8 internet system enhancements offer improved scalability -- widening potential uses of Blaise

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Peak Concurrent Users

- Key metric for server configuration

  Klaus Salchner : http://aspnet.4guysfromrolla.com/articles/062304-1.aspx#postadlink

Users per day = percentage of total user population = 25 % of 4,000 users = 1,000 users

$$\text{Users per hour} = \frac{\text{User per day}}{\text{hours per day}} = \frac{\text{1,000 users}}{\text{14 hours}} = \text{72 users/hour}$$

$$\text{Supported users per hour} = \frac{\text{60 min}}{\text{session length in min}} = \frac{\text{60 min}}{\text{15 min}} = \text{4 users/hour}$$

$$\text{Concurrent users} = \frac{\text{Users per hour}}{\text{Supported users per hour}} = \frac{\text{72 users/hour}}{\text{4 users/hour}} = 18$$

$$\text{User per day} = \frac{\text{hours per day * 60 min}}{\text{session length in min}} * \text{concurrent users} = \frac{\text{14 hours * 60 min}}{\text{15 min}} * 18 = \text{1008 users}$$

- Peak = three times average concurrent users

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Microsoft Web Application Stress Tool

- Freeware, unsupported by Microsoft
  - Google “web application stress testing” for links
- Capable, adaptable, suits Blaise testing situations

How WAS works

Runs on user workstation using MS Access database

- Records web application session
  - Captures all http traffic
  - Messages generated by user and responses returned
- Testing a script
  - Set parameters--# of users; test times, etc.
  - As script runs, WAS records timing and result codes of script-server interactions
  - Reports on tests generated
- One workstation can simulate hundreds of web users

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Stress Test Methodology

- Follow Blaise team approach reported in Blaise 4.8 Online Assistant at
  "Test results for web server performance"
- Key measure: increase in waiting time per page between
  - Baseline WAS test with one user and
  - Tests of incrementing levels of concurrent users

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Test Steps

- Record Blaise Internet survey session script with WAS
- In WAS
  - Set script's page delay to a constant value reflecting expected average time users take reading, thinking, entering, and pressing Next
  - 10 seconds per field on a page used (for pages that post to the IS page handler)
  - Run
    - benchmark single user test for one hour
    - successive one hour tests increasing # of users
  - Extract count of pages sent from reports
  - Calculate results for session series

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Test series

Table 1: Data models & WAS scripts

	Fields	Signals/ Checks	BMI size (kb)	IS Pages	Script Pages
BRFS	41	0	18	20	17
Wes1	640	29	543	83	31
Wes2	370	22	297	221	177

Server: one Intel Xeon 1.3 Ghz processor and 1Gb of RAM, running Windows 2003 Server

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Table 2: Stress test of BRFS
(60 minutes with average posted page delay of 22.2 seconds)

Users	Pages	TPP*	Extra TPP
1	536	6.72	0.0
25	13268	6.78	0.07
50	25016	7.20	0.48
60	28140	7.68	0.96
70	30580	8.24	1.52
80	30568	9.42	2.71
90	30876	10.49	3.78
100	25397	14.17	7.46
200	25555	28.17	21.46
250	27620	32.59	25.87

*TPP = (Min*60*Users)/Pages

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Table 3. Stress Test of Wes1 and Wes2
(60 minutes, average posted page delay of 23.2 & 11.8 seconds)

Users	Pages	TPP*	Extra TPP
1	454	7.93	
5	2256	7.98	0.0
10	4449	8.09	0.2
15	6368	8.48	0.6
20	7659	9.40	1.5
25	8513	10.57	2.6
30	8845	12.21	4.3
35	8882	14.19	6.3
40	8922	16.14	8.2
45	9184	17.64	9.7
50	9336	19.28	11.4

Users	Pages	TPP*	Extra TPP
1	373	9.65	
5	1867	9.64	0.0
10	3630	9.92	0.3
15	5561	9.71	0.1
20	7366	9.77	0.1
25	8503	10.58	0.9
30	9296	11.62	2.0
35	10098	12.48	2.8
40	10829	13.30	3.6
45	11454	14.14	4.5
50	13693	13.15	3.5

*TPP = (Min*60*Users)/Pages

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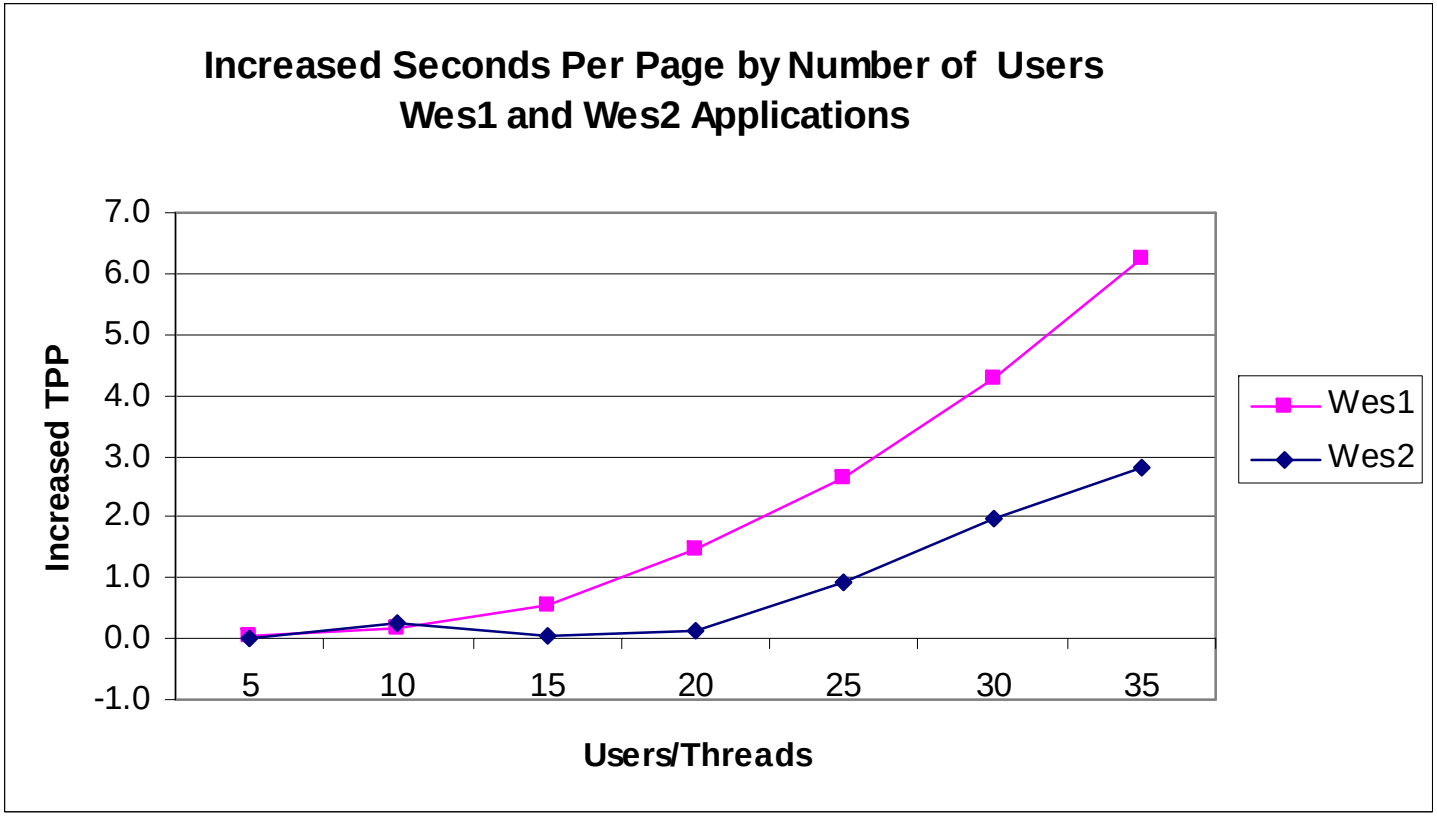
Wes1 & Wes2 Test Comparison



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Wes1 & Wes2 Test Comparison (2)

- Better Wes2 performance
  - 40% fewer fields, less complex rules, more pages
- Follow up plans
  - Add second VM server running as IS rules server
  - More powerful server configurations

	Fields	Signals/ Checks	BMI size (kb)	IS Pages	Script Pages
BRFS	41	0	18	20	17
Wes1	640	29	543	83	31
Wes2	370	22	297	221	177

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Blaise Team's Tests

- Reported in OLA
- Datamodel of 1900 fields with routing and checks
- Peaked at
  - 50 users with no dedicated rules server
  - 100 users with one rules server
  - 150 users with two rules server
- Server with two 2.8 GHz processors, 4 GB RAM

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WAS and Other Types of Application Testing

- Question raised on how an application would feel to a user if run at the same time as a WAS test.
- Ran Wes2 with 15 users and launched another survey interview interactively. Impressions:
  - Performance OK -- page delay ~1 second, occasionally 3-4 seconds
  - Found functional anomaly; in enumerated items, up/down arrow key in browser didn't work
    - SN unable to replicate the problem
- Suggest possible use in usability testing?
  - Check app look and feel under stress

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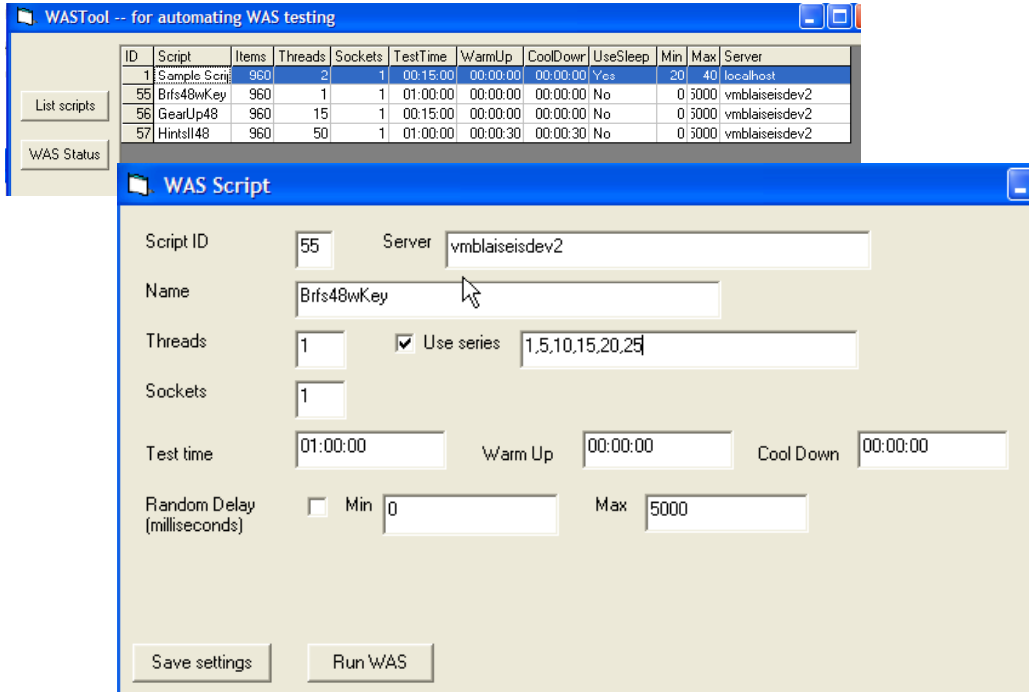
WAS and COM

- WAS has COM interface; open to automation
- Built simple VB app to run series of tests



- Enables high volume testing

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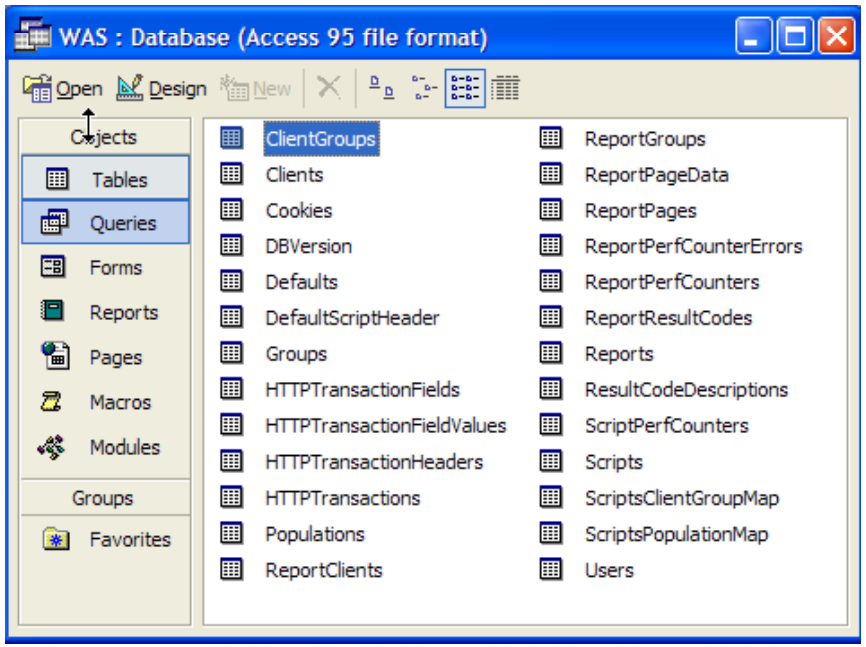
WAS Database

- Detailed data on tests
- MS Access 95
  - Difficult to work with directly
- WAS provides access to script pages to change ResponseDelay etc.
- VB/other apps can access directly
- Mdb also flexible for reading or export data using SQL Server and Crystal Reports etc.



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Other Metrics for Blaise Internet Stress Testing

- Blaise team's stress testing approach
  - WAS scripts, fixed page delays, one hour tests, examining time per page at different user levels
  - Elegant, easy to implement and track, especially with WAS automation
- Tracking interviewing information during WAS series
  - Other possible insights on process
  - # of completed cases
  - Stats on interview times – avg, min, max, stddev
  - Journal data on for every page sent from server
  - Page-level stats of potential value – timing distribution, outliers etc – as indicators of page structure issues

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Linking interviewing and WAS testing

- In workshop enable journaling process
- Set data model primary key to tie interview to journal
- Modify interview starter page to assign web server session id as primary key

```
Function CreateOptions(Hosts)
...
  If UseRunTimeOptions Then
...
              '*** setting sessionid as primary key
              Dim sCaseID
              sCaseID = Session.SessionID
              RootNode.setAttribute "KeyValue", sCaseID
              '***
...
End Function
```

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Conclusions

- Stress testing Blaise Internet with WAS system
  - Relatively easy to implement and use
  - Valuable approach to understanding the expected performance of Blaise Internet for both specific applications and different server configurations.
  - Able to demonstrate to clients whether the Blaise web survey system is ready to meet their needs.
  - Potential for
    - usability testing
    - processing or paradata analysis with journal information

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