



Connections

TE38 QlikView Performance

9 April, 2014

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Who are we?

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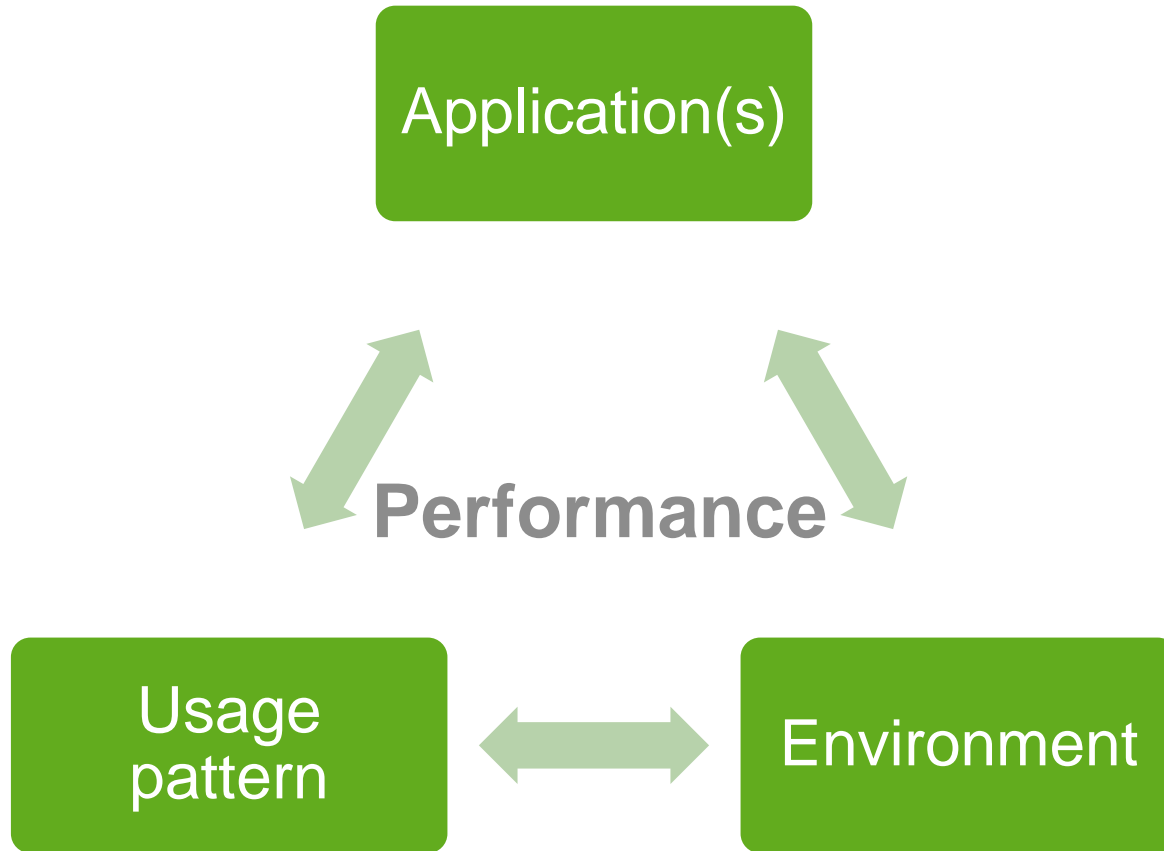
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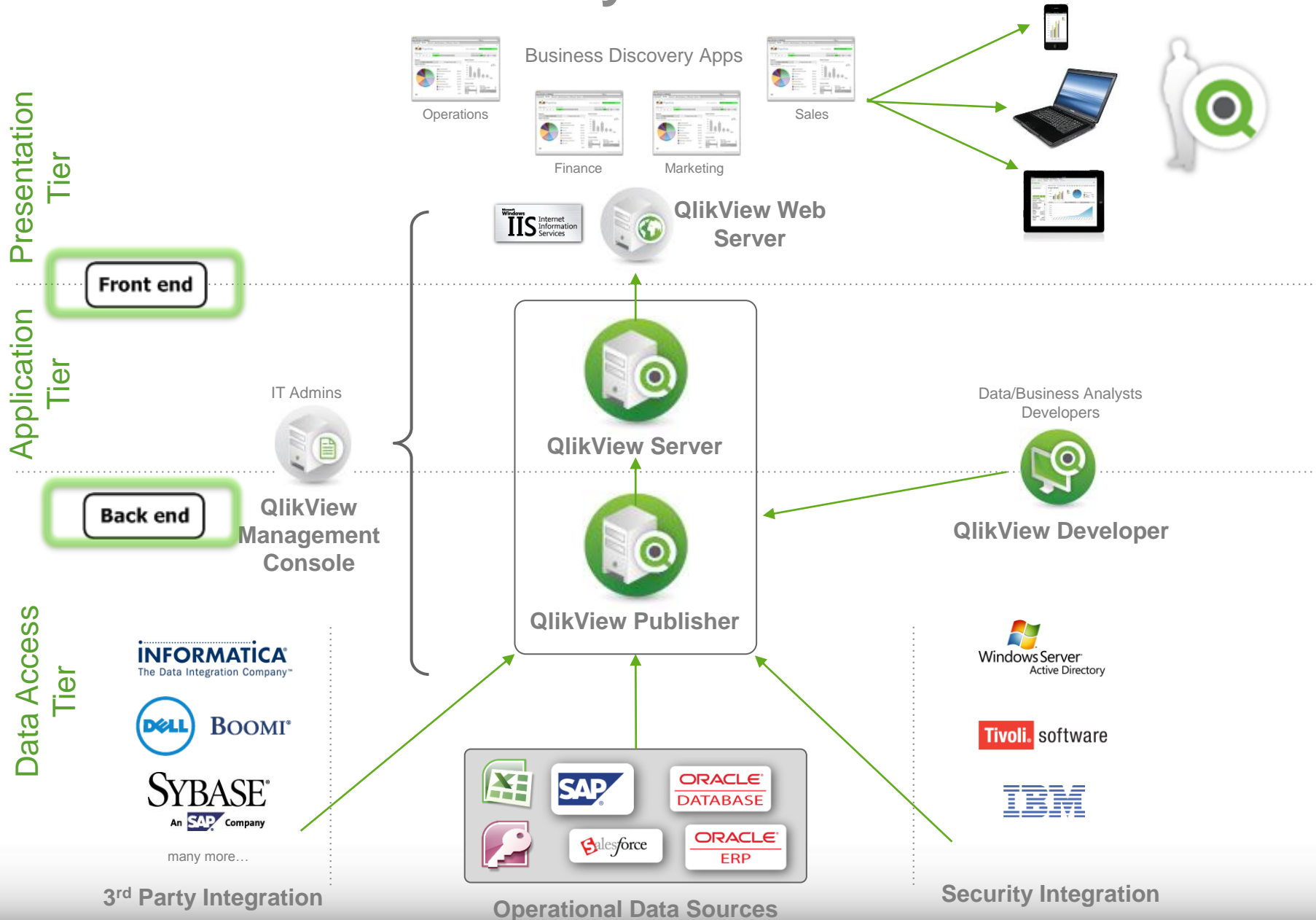
Agenda

- Introduction
 - Performance triangle
- Reload Performance
 - Results
 - Key Takeaways - Selecting Hardware
- QlikView Server performance
 - How QlikView Server utilizes Hardware and proof points
 - Selecting Hardware

On QlikView Scalability



Business Discovery Platform **QlikView 11**



Reload Performance

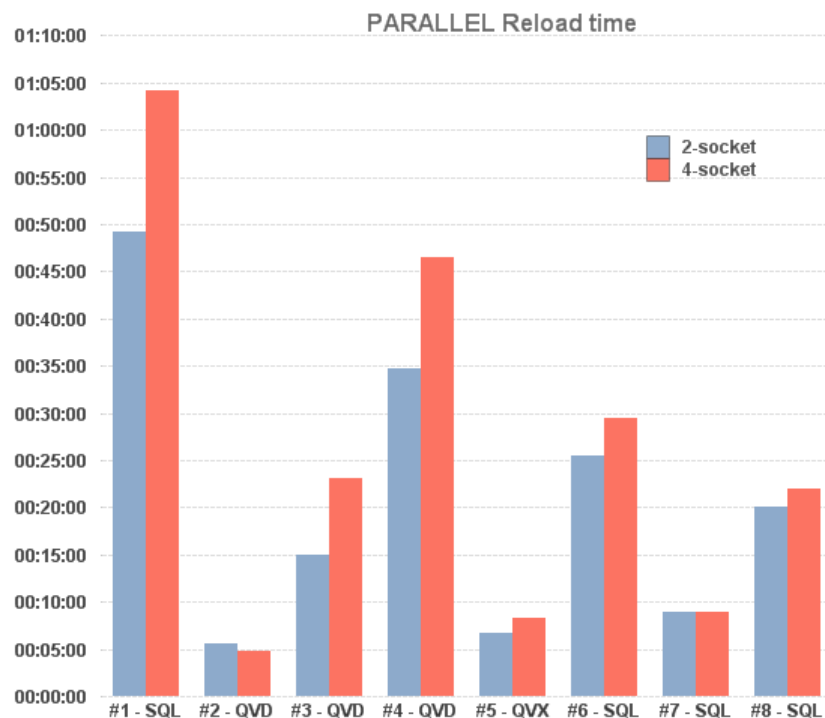
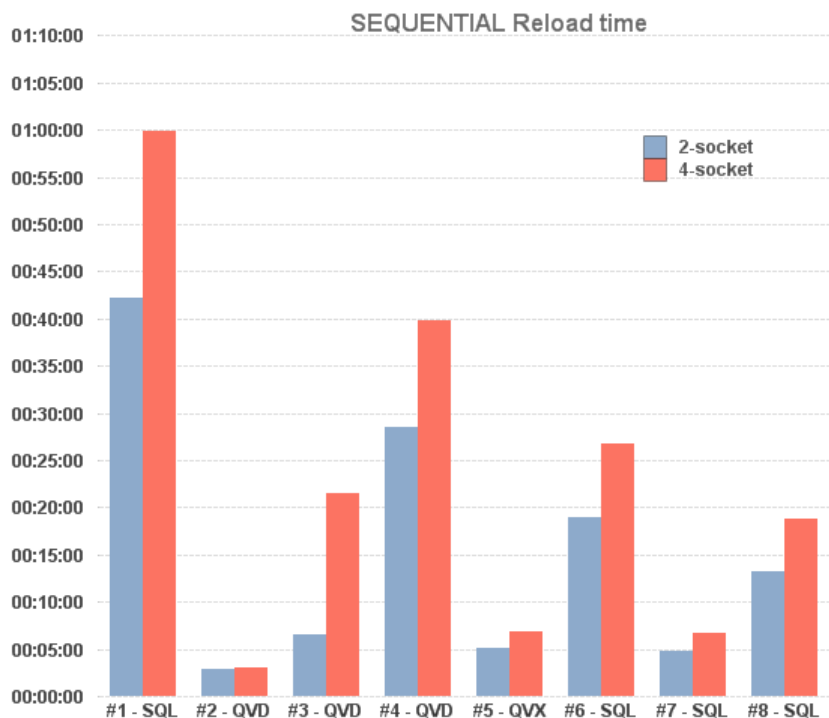


Reload Performance

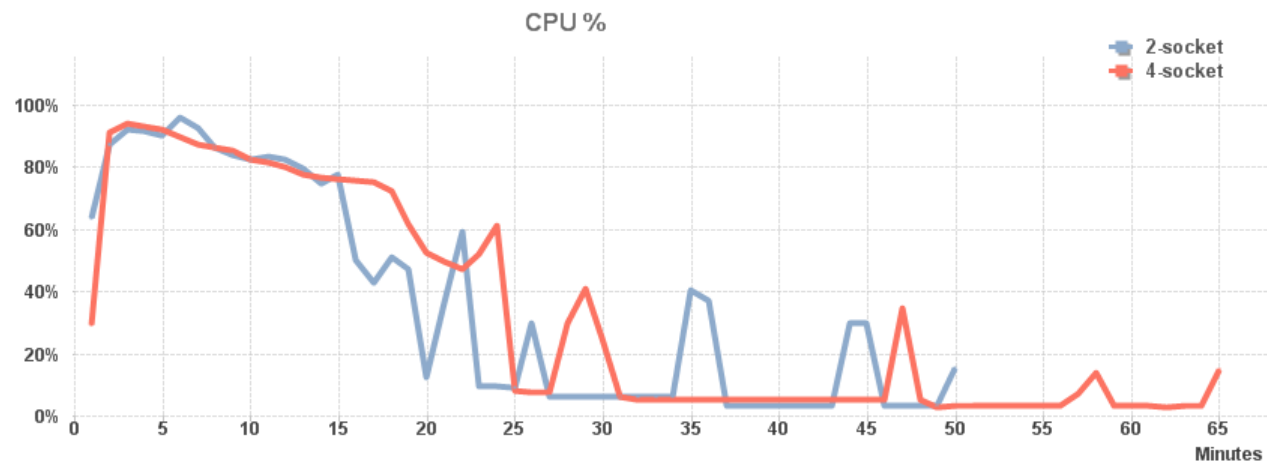
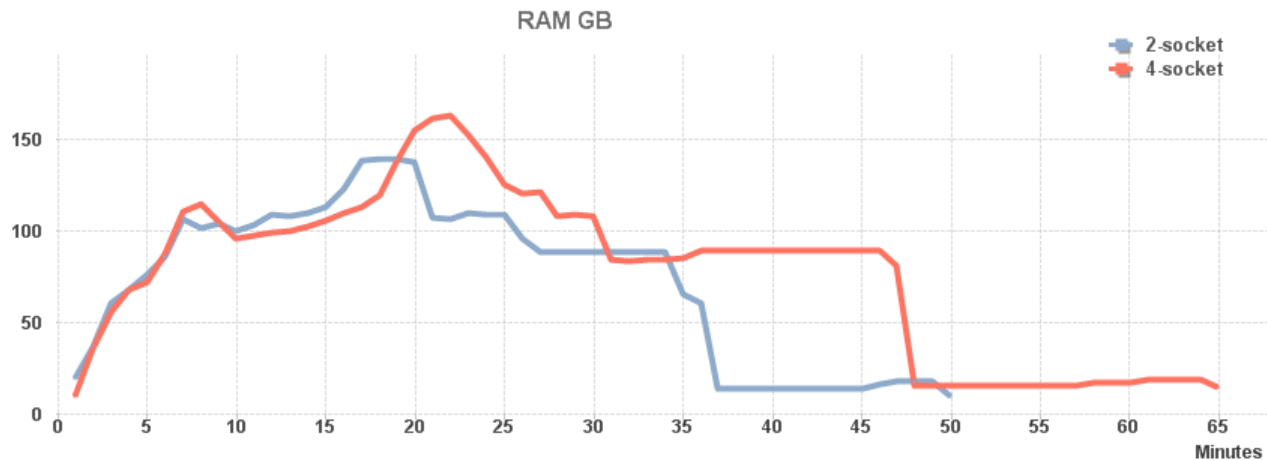
- We will present several case studies focusing on:
 - Environment
 - Reloads and Architectures
 - Reloads and Clock Frequency
 - Reloads and Disk Speed
 - Application/Script
 - Reloads and Data Sources (QVD, SQL)
 - Reloads - Scaling With Data
 - Database Aggregations
 - Usage pattern
 - Reloads - Multiple Reloads

Reloads and Architectures

Tests with different sources, tasks and content performed on two white listed architectures in sequence and in parallel (8 QVBs).



Reloads and Architectures



Key takeaway:

2 socket E5 solutions fit QlikView reload workloads better than 4 socket E7 solutions.

Reloads and Clock Frequency

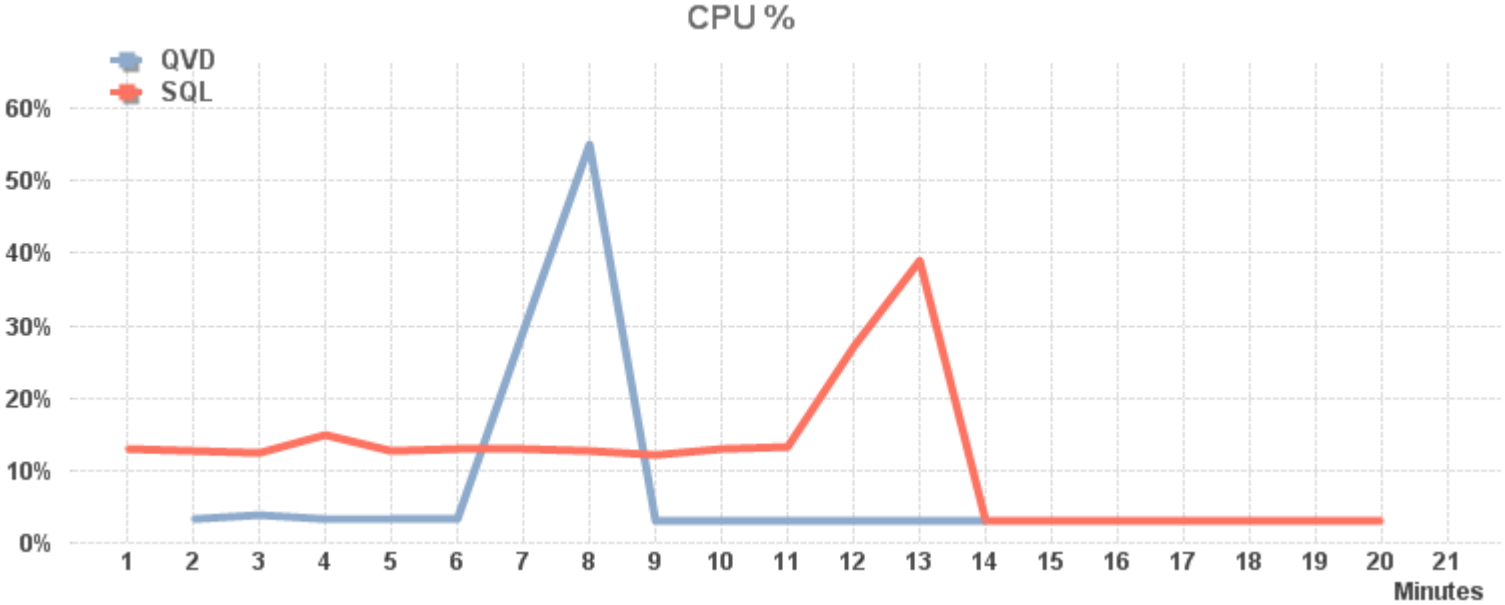


Difference	
Difference in capacity	+11.5 %
QVD	+11.5 %
QVX	+13.6 %
SQL	+ 0 %

Key takeaway:

Clock frequency is one of the main factors to consider for reloads

Reloads and Data Sources (QVD and SQL)



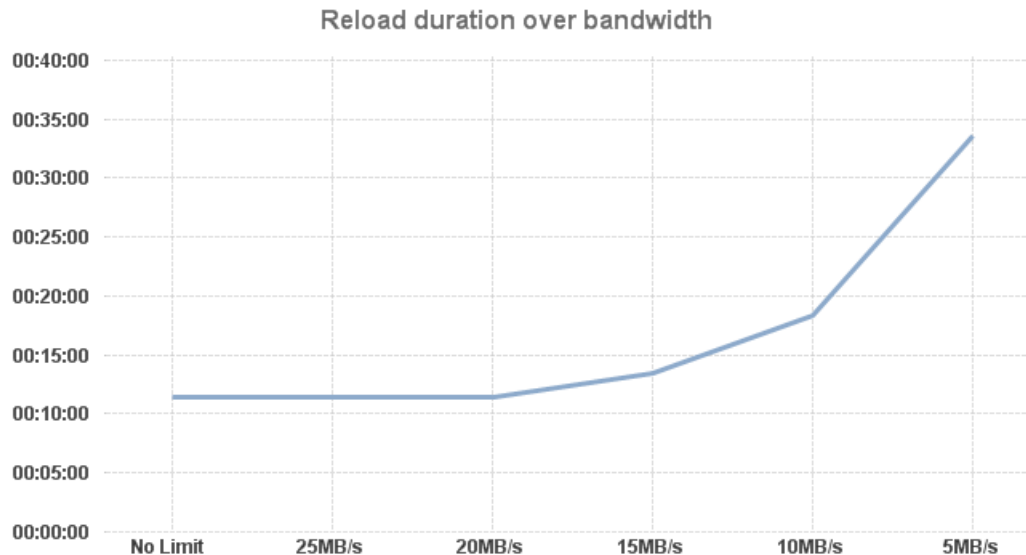
Source	Time Reload (mm:ss)	Time Save (mm:ss)	Total Time (mm:ss)
QVD	5:37	8:05	14:39
SQL	10:56	8:05	19:46

Key takeaway:

QVD is more resource friendly when loaded optimized. SQL loading data continuously requires computational power to transform and validate data.

Reloads From Remote Sources

Source	Reload Time
SQL non cached	25:40
SQL cached	19:55

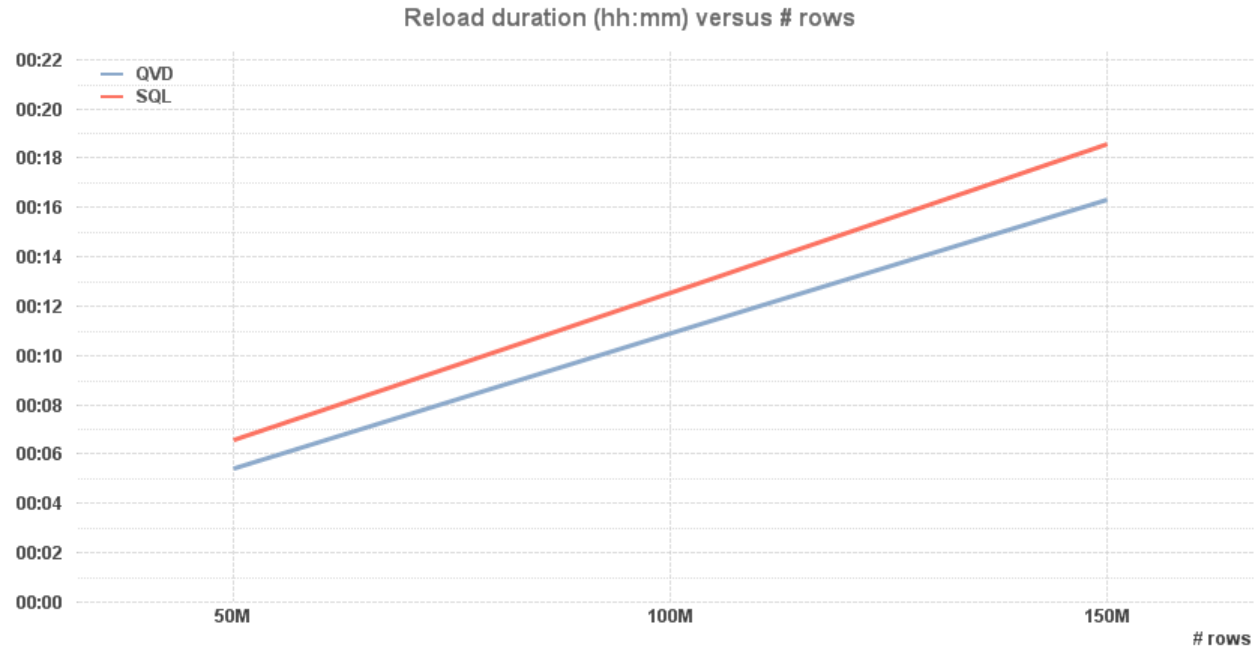


Key takeaway:

Optimizing remote DB (e.g. SQL server) might yield a big improvement.

Ensure bandwidth is sufficient for the pace the remote system can deliver data.

Reloads – Scaling With Data

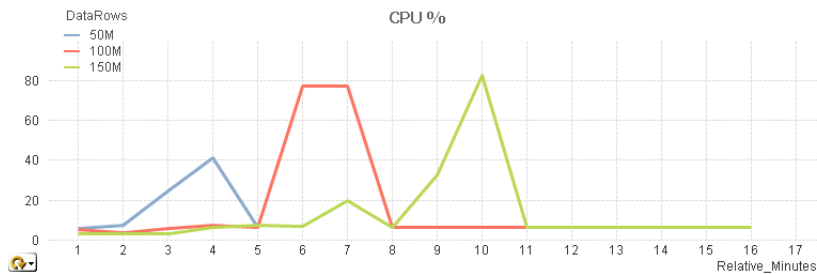
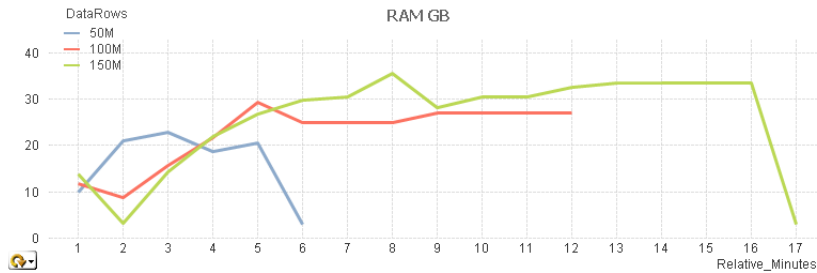


Key takeaway:

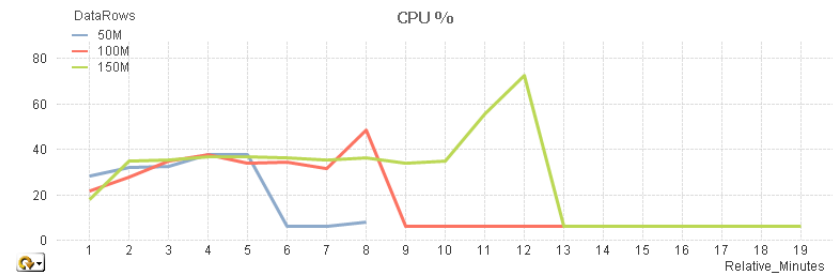
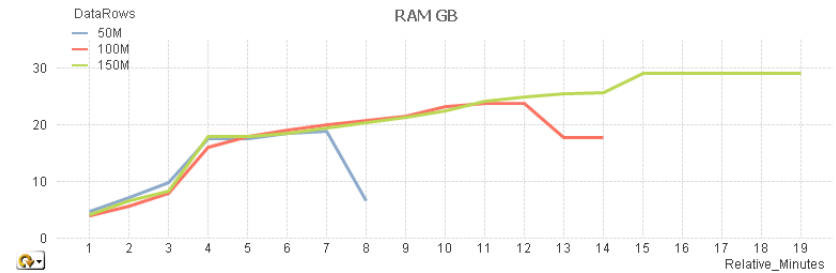
Resource consumption and reload duration is very predictable and scales linearly with amount of data.

Reloads – Scaling With Data

QVD



SQL



Key takeaway:

Resource consumption and reload duration is very predictable and scales linearly with amount of data.

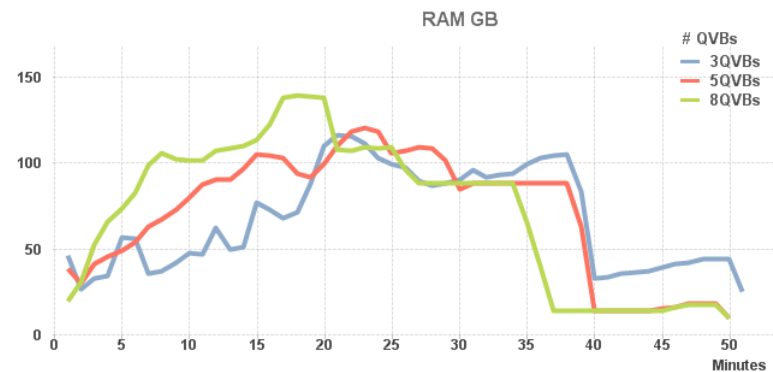
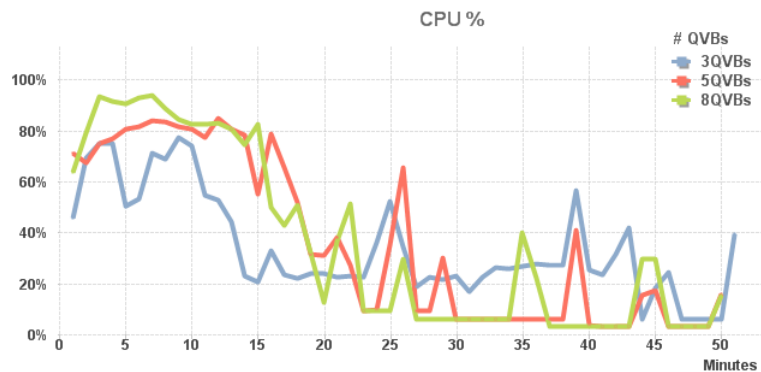
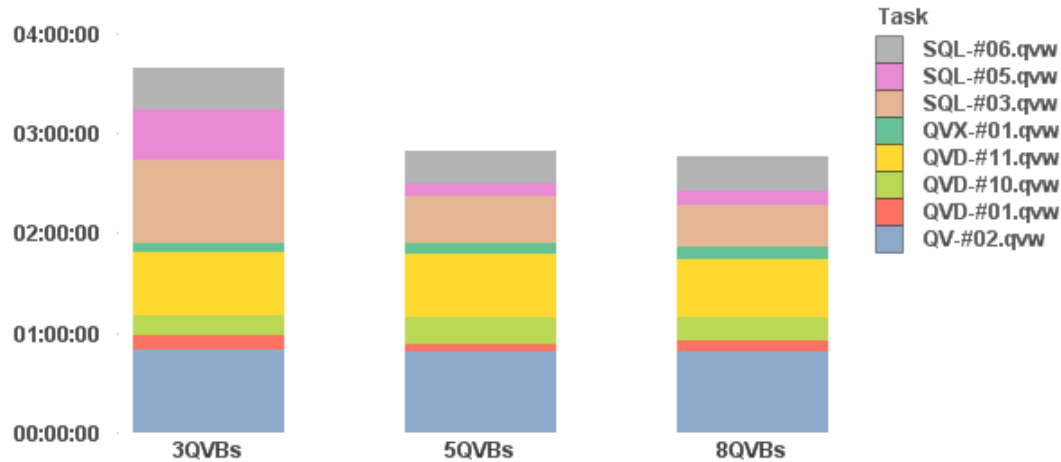
Database Aggregations

Data	QlikView	SQL	Combination
Load tables	7:17	7:22	7:20
Aggregations	14:35	0:08	1:32
Total duration	22:01	7:38	8:59
Script	Facts: SQL SELECT CustomerID, TaxAmount FROM SDB.dbo."50M"; LOAD CustomerID, avg(TaxAmount) as AVGtax RESIDENT Facts GROUP BY CustomerID;	SQL SELECT CustomerID, avg(TaxAmount) as AVGtax FROM SDB.dbo."50M" as Detail GROUP BY Detail.CustomerID;	LOAD CustomerID, avg(TaxAmount) as AVGtax GROUP BY CustomerID; SQL SELECT CustomerID, TaxAmount FROM SDB.dbo."50M";

Key takeaway:

Let each component in the chain perform the task it is best suited for. Here it is allowing database to perform a part of or the whole aggregation needed.

Reloads – Multiple Reloads



Key takeaway:

QlikView Publisher is very efficient with parallel reloads and resource consumption is very predictable.

Reloads – Your Own Investigations

- Reload in QlikView Desktop will calculate initial state and keep document in RAM
- Each reload from Publisher will start a new QVB process.
- The QVB process will terminate when finished and release RAM as soon as the task is complete
- Every QVB is its own process
 - Multiple QVB does not exchange information/coordinate resource consumption
- Use Document Logfile for troubleshooting reload performance per document
- Use Task log for troubleshooting reload performance per machine

Key Takeaways Reloads - Selecting Hardware

- The “reload window” and other circumstances will define the importance of resource utilization and optimization.
 - In many cases a virtual environment might be sufficient or even the QlikView Server machine, if nightly reloads are applicable.
- When there are constraints:
 - Reading a stream of data is often very single threaded and this create a high clock frequency dependency.
 - Parallelizing reloads might improve unless contention reduce the total throughput
- White Listed 2-socket E5 are well suited for reload resource demand

QlikView Server Performance

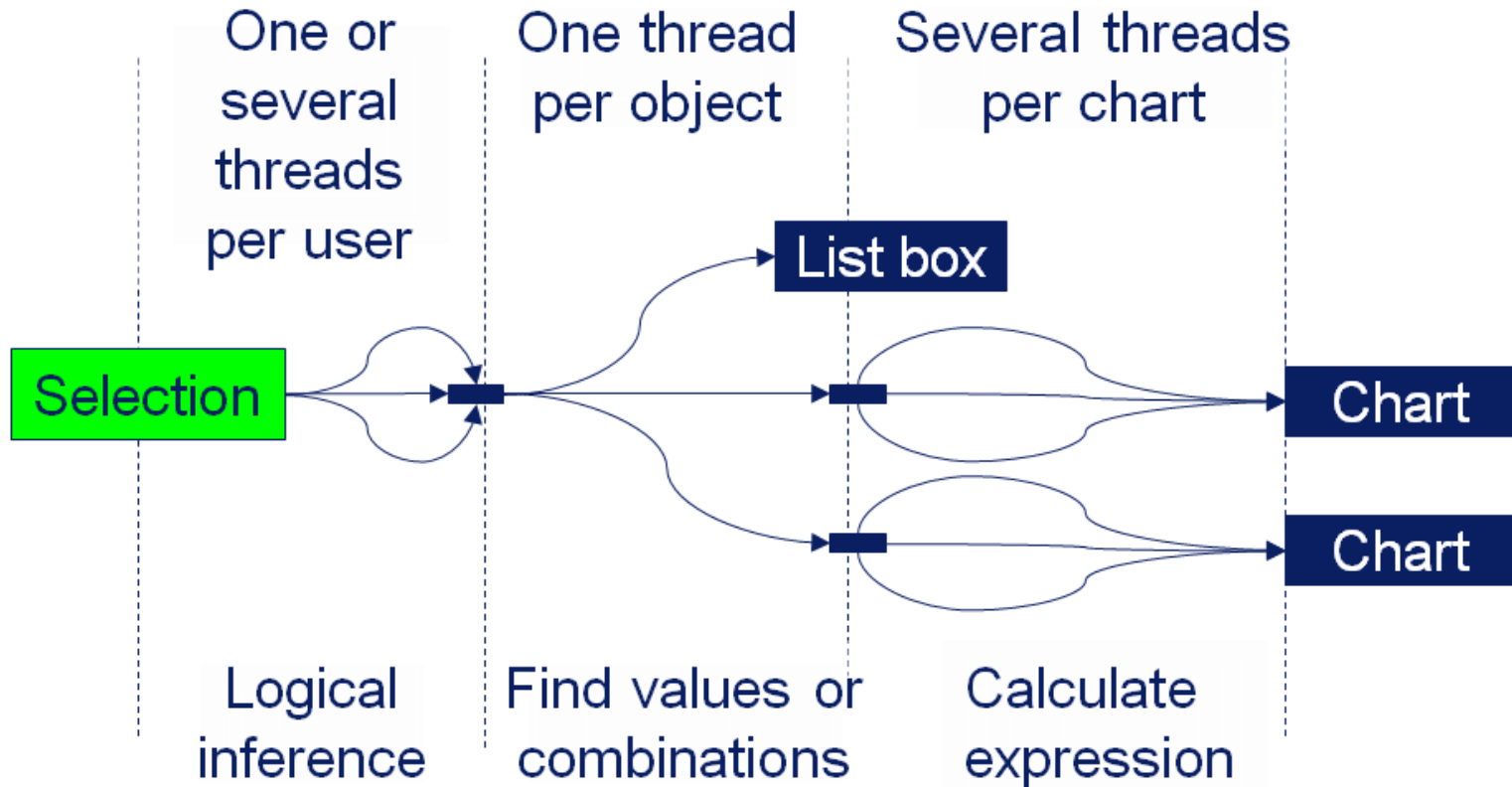


Behind The Scenes

Key components:

- The data, Symbol tables, State vectors, State space, Hyper cubes
- The data model is our view of the underlying structure of the data.
- We will focus on how this effects the hardware

Behind The Scenes

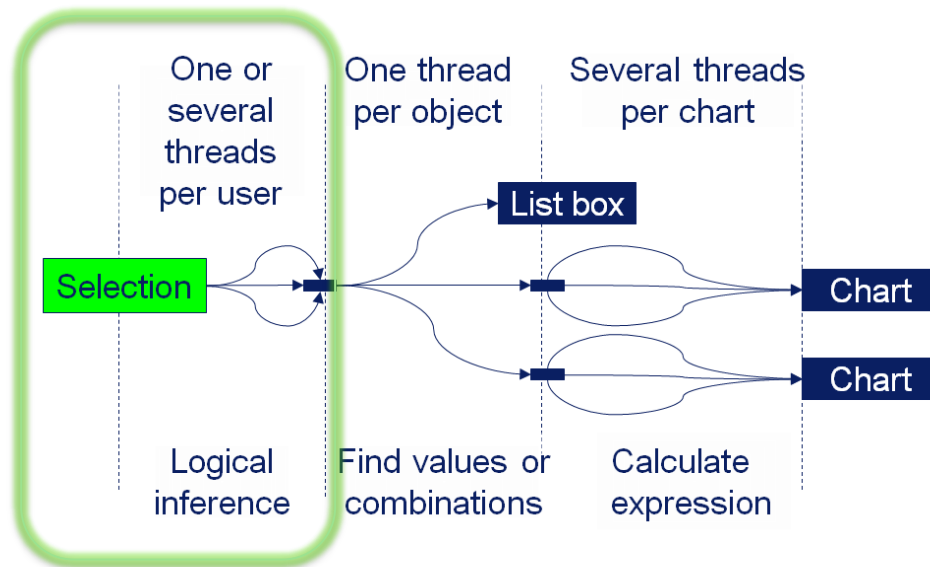


From QlikCommunity -> QlikView Design Blog -> The Calculation Engine
by Henric Cronström, August 20th 2013

Behind The Scenes

Selection phase, multi-threaded

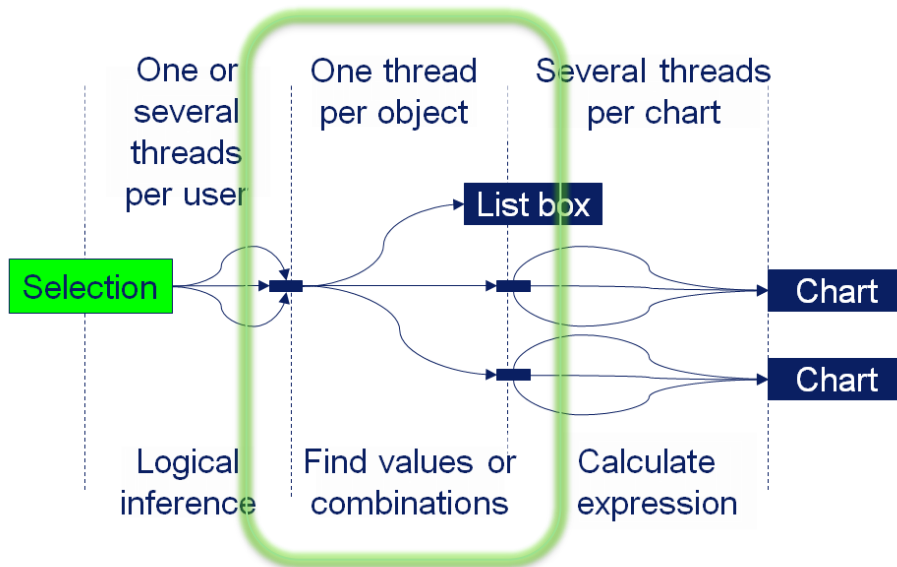
- Performed by the “inference engine”
- Receiving the selected value/s
- Going through the row-based data tables to create the “current state”
- Store the state space in the shared cache



Behind The Scenes

First Calculation phase, single-threaded

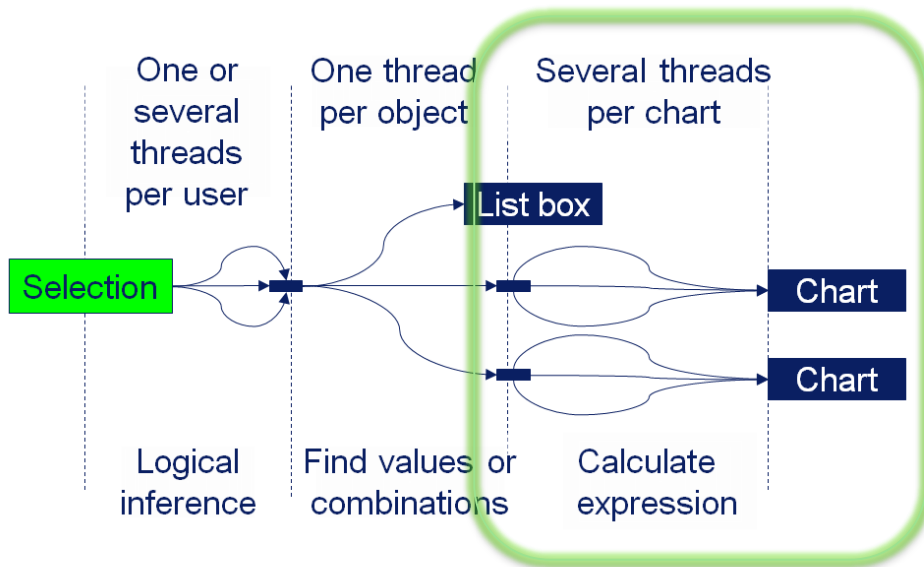
- Find values or combinations
- Per object, get the involved fields, dimensions, measures and use current state as input to create the dataset
- This include creating temporary tables, if needed



Behind The Scenes

Second Calculation phase, multi-threaded

- The actual calculation
- Per object, use the output from the previous phase and iterate over the dimensions and perform the actual calculation
- Perform the presentation of the result-table
- Store the result matrix in the cache



QlikView Server In Action

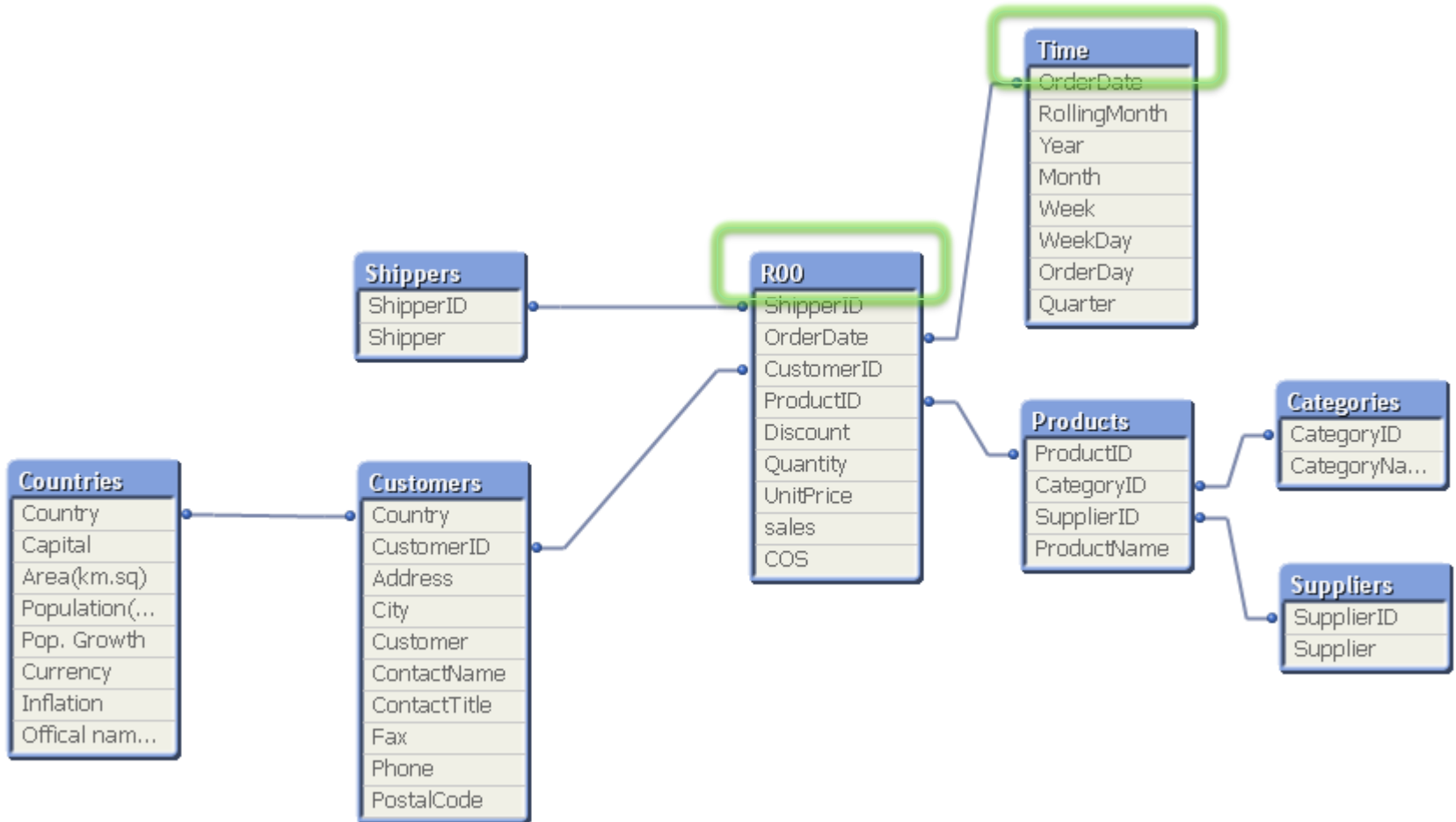
- 200m records fact table
- Sales data
- A quite common data model

Many Objects

- Analysis of sales over time, many separate expressions and objects

QlikView Customer Product Graphs Many objects Many dimension values Suppliers DemoSheet Sheet6											
Year		Sales	Sales TY / Sales LY	Sales TM / Sales LM	Margin%	Year		Sales	Sales TY / Sales LY	Sales TM / Sales LM	Margin%
Jan	2005:	2 757 472 029	149%	93%	49%	Jul	2005:	0	0%	0%	46%
	2004:	1 856 355 843	208%	97%	50%		2004:	1 688 918 197	119%	106%	46%
	2003:	891 235 954	91%	104%	49%		2003:	1 422 672 177	112%	115%	46%
	2002:	983 034 617	171%	109%	47%		2002:	1 270 177 833	144%	93%	46%
	2001:	575 442 048	56%	95%	47%		2001:	884 611 142	85%	91%	47%
	2000:	1 019 343 517	112%	187%	46%		2000:	1 045 292 756	150%	149%	52%
Feb	2005:	2 398 037 015	150%	87%	49%	Aug	2005:	0	0%	0%	47%
	2004:	1 599 375 795	159%	86%	49%		2004:	1 657 774 725	95%	98%	47%
	2003:	1 007 880 558	107%	113%	49%		2003:	1 742 619 411	165%	122%	52%
	2002:	940 474 255	164%	96%	49%		2002:	1 053 228 616	103%	83%	47%
	2001:	575 121 704	48%	100%	48%		2001:	1 018 680 531	96%	115%	47%
	2000:	1 208 262 698	172%	133%	47%		2000:	1 057 450 799	136%	152%	51%
Mar	2005:	2 346 200 017	110%	98%	49%	Sep	2005:	0	0%	0%	49%
	2004:	2 136 204 186	206%	134%	48%		2004:	2 145 832 962	128%	129%	49%
	2003:	1 038 358 010	103%	103%	48%		2003:	1 678 357 805	185%	96%	53%
	2002:	1 003 827 241	138%	107%	49%		2002:	906 120 245	95%	86%	45%
	2001:	729 705 981	52%	127%	49%		2001:	953 006 944	116%	94%	46%
	2000:	1 401 238 044	187%	200%	48%		2000:	819 118 827	106%	105%	49%
Apr	2005:	1 308 023 607	69%	56%	47%	Okt	2005:	0	0%	0%	48%
	2004:	1 908 835 618	102%	80%	46%		2004:	2 489 738 618	136%	116%	48%
	2003:	1 047 776 789	87%	101%	46%		2003:	1 825 115 671	222%	109%	53%
	2002:	1 200 302 445	133%	120%	50%		2002:	822 441 051	78%	91%	45%
	2001:	904 965 399	80%	124%	49%		2001:	1 059 406 002	131%	111%	46%
	2000:	1 129 029 365	136%	150%	49%		2000:	806 035 381	108%	104%	49%
Maj	2005:	897 369 526	43%	69%	45%	Nov	2005:	0	0%	0%	48%
	2004:	2 101 559 421	184%	110%	46%		2004:	2 521 247 261	153%	101%	48%
	2003:	1 143 739 955	83%	109%	45%		2003:	1 627 199 101	244%	89%	50%
	2002:	1 372 504 598	139%	114%	48%		2002:	667 749 933	73%	81%	46%
	2001:	985 224 740	109%	109%	48%		2001:	916 343 907	130%	86%	48%
	2000:	903 824 318	118%	109%	51%		2000:	706 565 708	134%	95%	49%
Jun	2005:	330 790 987	21%	37%	43%	Dec	2005:	0	0%	0%	48%
	2004:	1 599 711 009	129%	78%	45%		2004:	2 973 504 985	156%	118%	48%
	2003:	1 238 064 603	91%	108%	46%		2003:	1 904 458 835	222%	117%	50%
	2002:	1 362 315 606	140%	99%	48%		2002:	859 839 947	95%	82%	48%
	2001:	973 793 466	102%	99%	48%		2001:	903 532 220	149%	99%	47%
	2000:	959 093 857	137%	125%	52%		2000:	608 005 498	111%	115%	49%
Year	2005:	10 047 893 182	41%			2005:	10 047 893 182	41%			48%
	2004:	24 679 058 650	149%			2004:	24 679 058 650	149%			48%
	2003:	16 567 678 870	133%			2003:	16 567 678 870	133%			50%
	2002:	12 442 016 396	119%			2002:	12 442 016 396	119%			48%
	2001:	10 479 834 085	90%			2001:	10 479 834 085	90%			48%
	2000:	11 663 260 799	134%			2000:	11 663 260 799	134%			49%

Many Objects



Many Objects

The image shows a Windows Task Manager window with the Performance tab selected. The CPU Usage History section displays a grid of 14 empty graphs, indicating that no data is currently being recorded. Below this, a QlikView application window is open, displaying a dashboard titled "QlikView Sales Analysis" and "Scability Center Benchmark Application". The dashboard area is mostly blank with a light gray background. The QlikView window's address bar shows the URL: `sc-lab09/QvAJAZZfc/opensdoc.htm?document=SC_BenchmarkApp1_200MDemo.qvw&host=QVS%40sc-lab09`. The QlikView window also shows a menu bar with options like "Customer", "Product", "Graphs", "Many objects", "Many dimension values", "Suppliers", "DemoSheet", and "Sheet6".

Windows Task Manager
File Options View Help
Applications Processes Services Performance Networking Users

CPU Usage
0 %

CPU Usage History

SC_BenchmarkApp1_200M x

sc-lab09/QvAJAZZfc/opensdoc.htm?document=SC_BenchmarkApp1_200MDemo.qvw&host=QVS%40sc-lab09

QlikView Customer Product Graphs Many objects Many dimension values Suppliers DemoSheet Sheet6

QlikView Sales Analysis

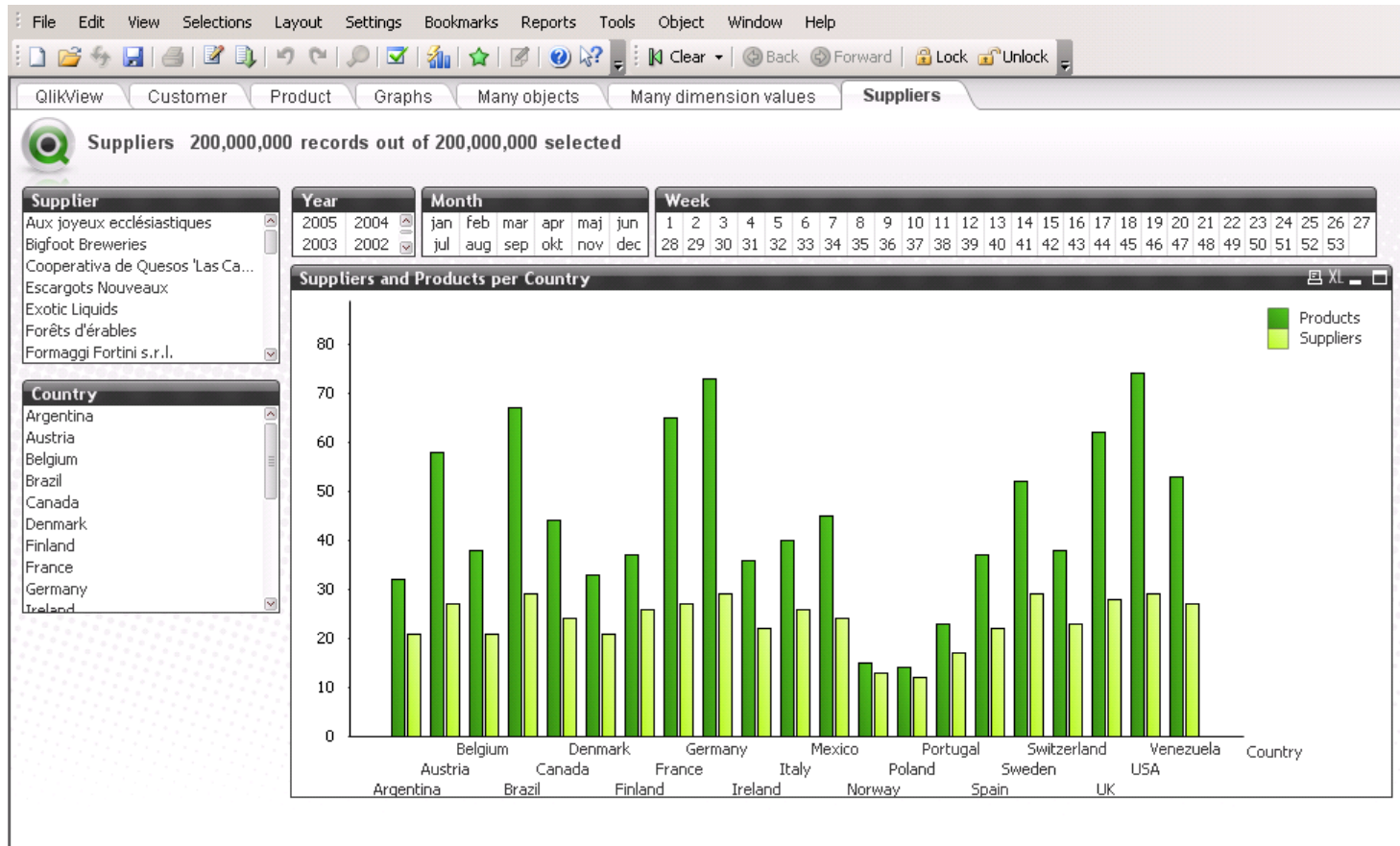
QlikView Sales Analysis
Scability Center Benchmark Application

2 * CPU E5-2690
@ 2.90GHz
8 Core(s)
16 Logical Processor(s)
Total Logical Processors
32

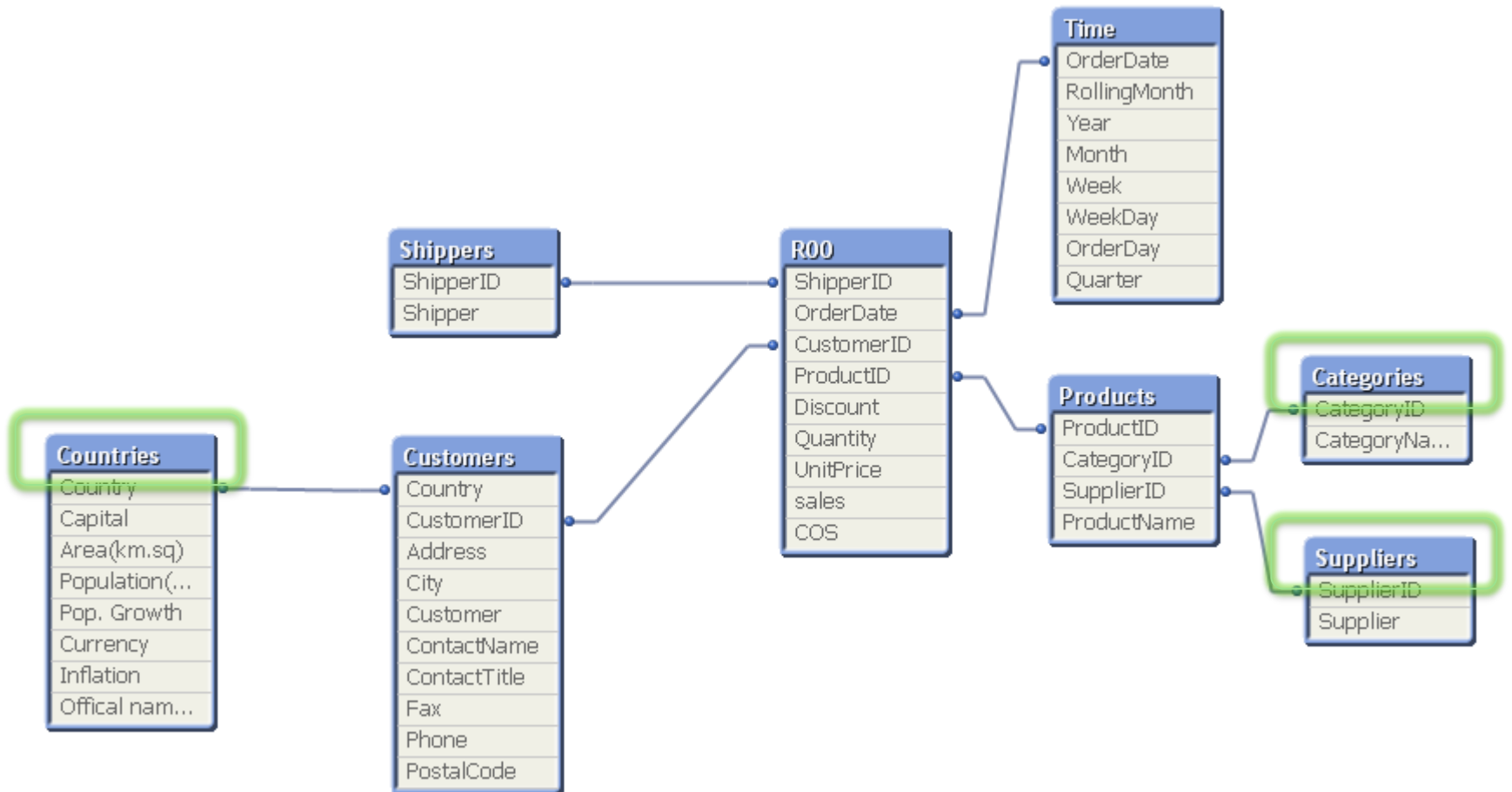
SV 12:00 PM
3/12/2014

Heavy in the “First Calculation” Phase

- Discoveries around suppliers over countries and their products



Heavy in the “First Calculation” Phase



Heavy in the “First Calculation” Phase

Windows Task Manager

File Options View Help

Applications Processes Services Performance Networking Users

CPU Usage

CPU Usage History

SC_BenchmarkApp1_200M

sc-lab09/QvAJAZZfc/opendoc.htm?document=SC_BenchmarkApp1_200MDemo.qvw&host=QVS%40sc-lab09

ClickView Customer Product Graphs Many objects Many dimension values Suppliers DemoSheet Sheet6

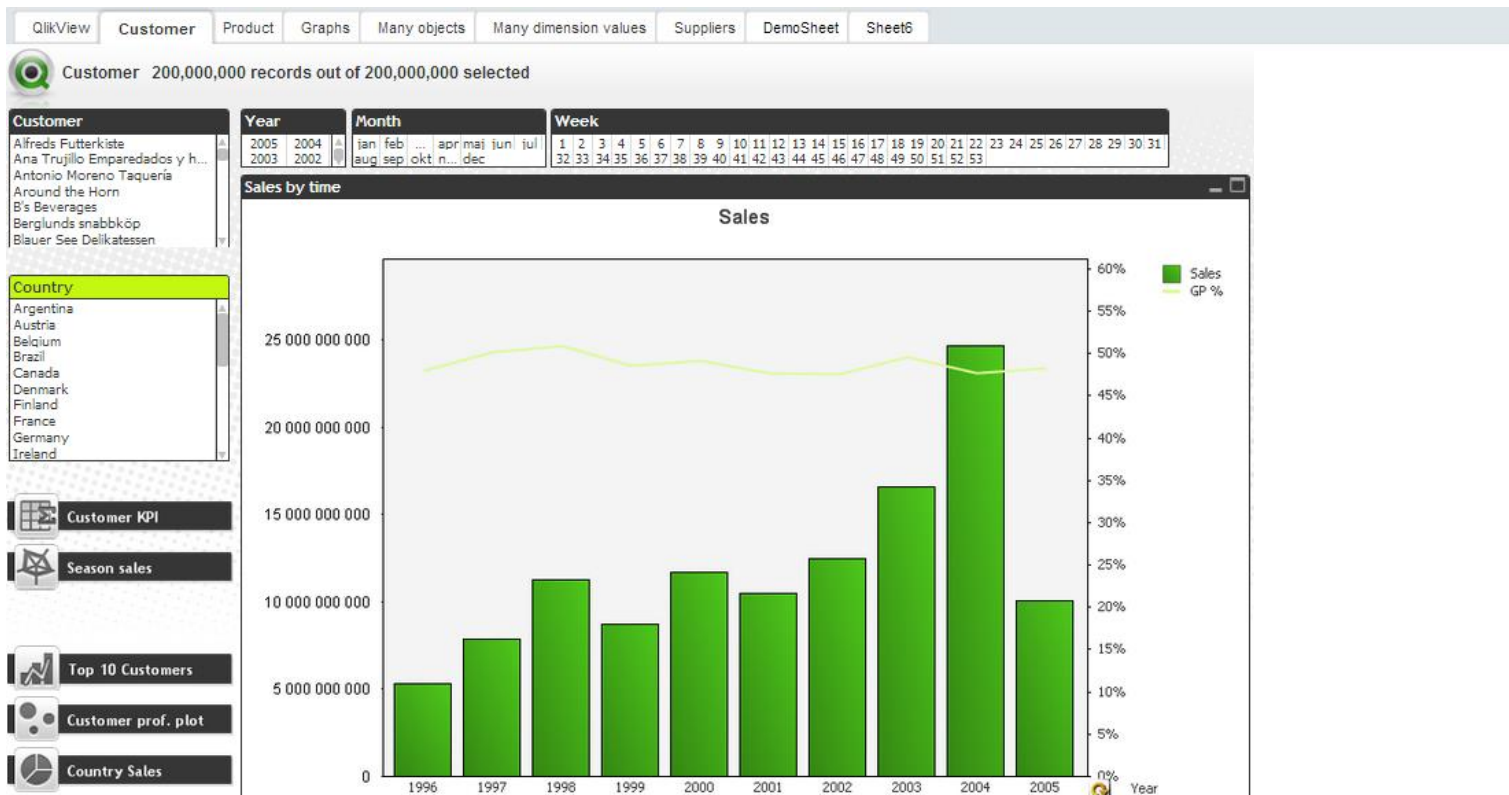
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2 * CPU E5-2690
@ 2.90GHz
8 Core(s),
16 Logical Processor(s)
Total Logical Processors
32

SV 12:03 PM 3/12/2014

Common Resource Usage

- Discoveries around sales in different countries



Common Resource Usage

Windows Task Manager

File Options View Help

Applications Processes Services Performance Networking Users

CPU Usage

CPU Usage History

SC_BenchmarkApp1_2001

sc-lab09/QvAJAZZfc/opendoc.htm?document=SC_BenchmarkApp1_200MDemo.qvw&host=QVS%40sc-lab09

Select Bookmark Select Report More

Many objects Many dimension values Suppliers DemoSheet Sheet6

Sales TY / Sales LY	Sales TM / Sales LM	Margin%	Year	Sales	Sales TY / Sales LY	Sales TM / Sales LM	Margin%	Country
237%	3% 11%	49% 47%	Jul	2005: 0 2004: 42 446 093 2003: 320 750 2002: 6 059 853 2001: 0 2000: 230 175	0% 13 233% 5% 0% 0%	129% 92%	52% 46% 46% 56%	Argentina Austria Belgium Brazil Canada Denmark Finland France Germany Ireland Italy Mexico Norway Poland Portugal Spain Sweden Switzerland UK USA
188%	390% 491%	37% 47%	Aug	2005: 0 2004: 40 826 288 2003: 11 930 641 2002: 18 742 250 2001: 0 2000: 0	0% 342% 64%	96% 309%	50% 49% 46%	
0% 88%		48%						
204%	131% 120%	34% 47%	Sep	2005: 0 2004: 58 408 391 2003: 32 623 982 2002: 18 111 457 2001: 0 2000: 0	0% 179% 180%	143% 273% 97%	48% 49% 46%	
0% 52%	148%	49%						
58% 12 002%	93% 326%	33% 54% 46%	Okt	2005: 0 2004: 84 427 447 2003: 34 315 254 2002: 17 501 792 2001: 0 2000: 0	0% 246% 196%	145% 105% 97%	47% 49% 46%	
0% 68%	66%	51%						
28% 5 965%	67% 142% 287%	33% 57% 46%	Nov	2005: 0 2004: 63 232 413 2003: 25 124 159 2002: 0 2001: 0 2000: 0	0% 252%	75% 73% 0%	45% 49%	
0% 54%								

ProductName

- Boston Crab Meat
- Chef Anton's Gumbo Mix
- Côte de Blaye
- Geitost
- Gorgonzola Telino
- Gumbär Gummibärchen
- Ipoh Coffee
- Jack's New England Clam Chowd
- Konbu

2 * CPU E5-2690
@ 2.90GHz
8 Core(s)
16 Logical Processor(s)
Total Logical Processors
32

SV 12:09 PM 3/12/2014

Cached Calculations

- Once something is calculated, it is stored in the cache and reused, when needed, instead of going through the same phases all over again.

Cached Calculations

Windows Task Manager

File Options View Help

Applications Processes Services Performance Networking Users

CPU Usage

CPU Usage History

SC_BenchmarkApp1_200M

sc-lab09/QvAJAZZfc/opendoc.htm?document=SC_BenchmarkApp1_200MDemo.qvw&host=QVS%40sc-lab09

Customer Product Graphs Many objects Many dimension values Suppliers DemoSheet Sheet6

Customer 200,000,000 records out of 200,000,000 selected

Customer

Year	Month	Week
2005	jan	1
2004	feb	2
2003	mar	3
2002	apr	4
	may	5
	jun	6
	jul	7
	aug	8
	sep	9
	oct	10
	nov	11
	dec	12
		13
		14
		15
		16
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		51
		52
		53

Country

- Argentina
- Austria
- Belgium
- Brazil
- Canada
- Denmark
- Finland
- France
- Germany
- Ireland

Number of supplier per country

Suppliers as function of population

System Information: 2 * CPU E5-2690 @ 2.90GHz, 8 Core(s), 16 Logical Processor(s), Total Logical Processors 32

SV 12:05 PM 3/12/2014

Summary and key takeaways

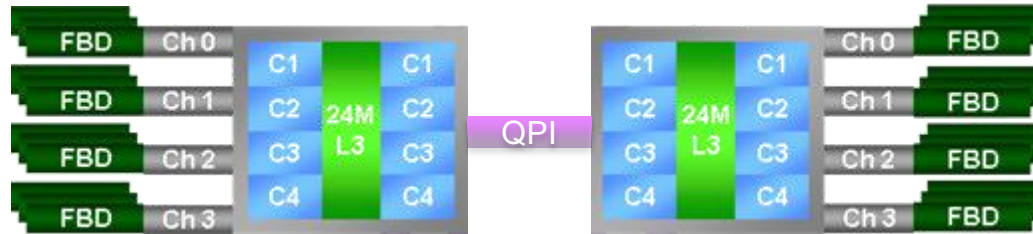
- It is not the functions themselves that appear to be single threaded but how long each object stay in the first calculation phase, when gathering data before performing the actual calculations.
- Key focus areas:
 - Identify the object/s that exhibit the unwanted behavior
 - Identify the fields used in these objects and their position in the data model
 - Understand the data involved when traversing the data model
 - Assess all of the expressions that are triggered in these objects

Selecting Hardware



Architecture

2-socket machine

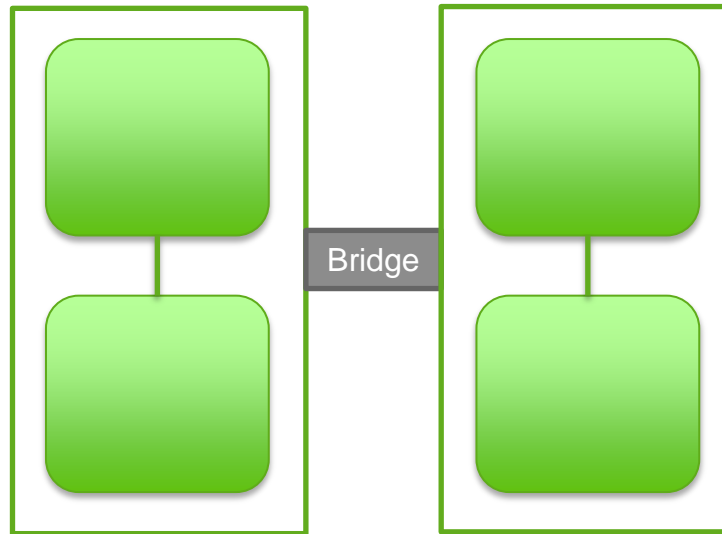


Architecture

2-socket machine

- What is a good fit for QlikView Performance?

Good fit:
E5-26XX



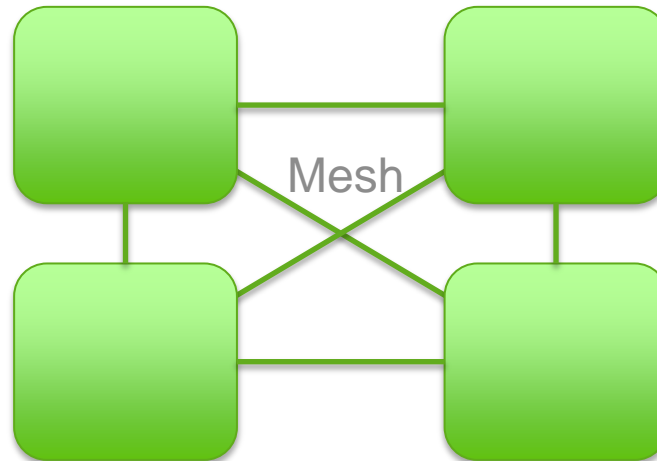
Not a good fit:
E7-28XX

Architecture

4-socket machine

- What is a good fit for QlikView Performance?

Not a good fit:
E5-46XX

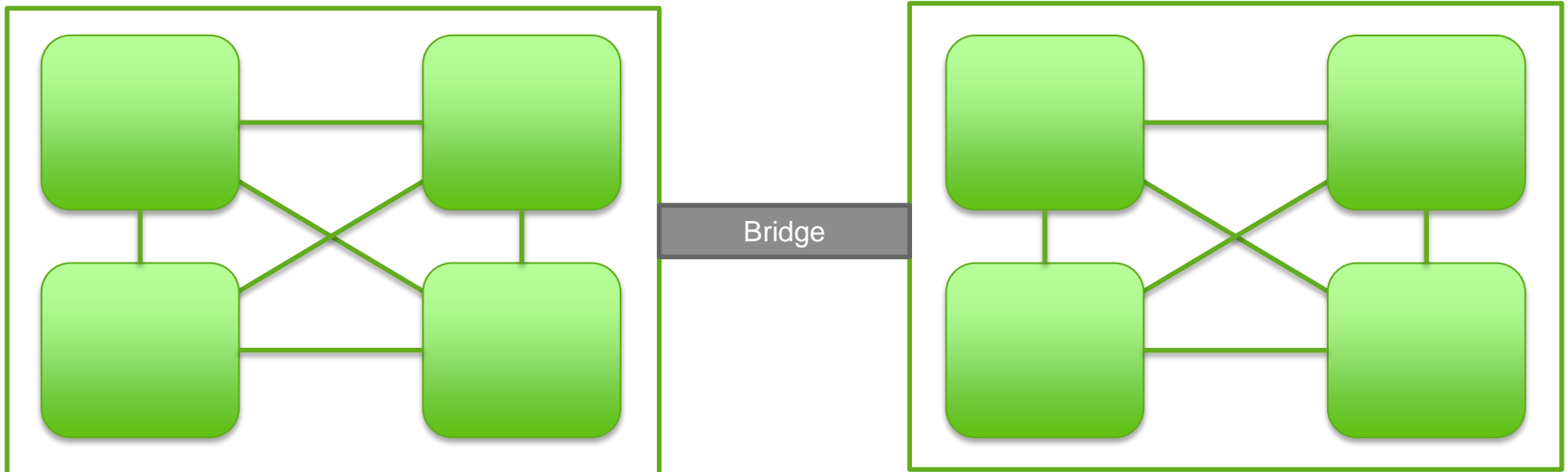


Good fit:
E7-48XX

Architecture

8-socket machine

- 8-sockets can be assembled in many different ways, bridged or “glue less”
- No 8-socket machines have made it to the Server White List



Selecting Hardware

A good starting point

- Whitelisted
 - <http://www.qlik.com/us/explore/resources/brochures-datasheets>
- Configured according to recommendations
 - <http://community.qlik.com/docs/DOC-2362>
- Leverage QlikView Hardware Benchmarking test to validate that server performs as expected
 - <http://community.qlik.com/docs/DOC-2942>

But which and how many of the whitelisted servers to select?

QlikView on 4- and 2-socket

A case study

- Same application
- Side by side comparison
 - 2 socket E5-2690@2.9/3.8 GHz (white listed)
 - 4 socket E7-4870@2.4/2.8 GHz (white listed)
- When does performance benefit from clock speed and when does it benefit from the total processing capacity (cores AND clock speed)?

QlikView on 4- and 2-socket

The image displays two side-by-side screenshots of Windows Task Manager Performance tab, comparing system metrics for two different server configurations: sc-lab08 and sc-lab09.

sc-lab08 - Remote Desktop Connection

- CPU Usage: 0%
- Memory: 24.3 GB
- Physical Memory (MB):
 - Total: 524277
 - Cached: 8016
 - Available: 499358
 - Free: 491359
- System:
 - Handles: 23461
 - Threads: 1399
 - Processes: 65
 - Up Time: 26:01:09:47
 - Commit (GB): 25 / 512
- Kernel Memory (MB):
 - Paged: 294
 - Nonpaged: 350

sc-lab09 - Remote Desktop Connection

- CPU Usage: 0%
- Memory: 17.5 GB
- Physical Memory (MB):
 - Total: 393181
 - Cached: 5314
 - Available: 375200
 - Free: 369901
- System:
 - Handles: 22307
 - Threads: 1311
 - Processes: 66
 - Up Time: 9:05:12:02
 - Commit (GB): 18 / 391
- Kernel Memory (MB):
 - Paged: 203
 - Nonpaged: 366

Below the Task Manager windows are two browser windows showing the QlikView AccessPoint interface for the same servers:

- Left browser window: sc-lab08/qlikview/index.htm. Shows "Welcome Jens A" and "QlikView AccessPoint".
- Right browser window: sc-lab09/qlikview/index.htm. Shows "Welcome Jens Ar" and "QlikView AccessPoint".

4x10 E7-4870@2.4GHz

2x8(HT) E5-2690@2.9GHz

Selecting Hardware

- What is the difference between servers?
 - Vendors
 - Model
 - Architecture
 - # Sockets
 - # RAM
 - Chipsets
 - Clock frequency
 - Cores
 - QPI speed
 - ...

The whitelist is a “cheat sheet” with good combinations of the above

Selecting Hardware

- How to think about these attributes when selecting servers
- What type of resources are needed
 - Performance, single user scenarios
 - For a large well formed application -> Total capacity
 - For applications with many demanding calculations -> Total capacity
 - For less demanding calculations -> Clock frequency
 - For a less than optimal application -> Clock frequency
 - Performance, multi user scenarios
 - See above
 - Once approaching saturation -> Total capacity is key
- To estimate demand for total capacity
 - QlikView Scalability Tools, <http://community.qlik.com/docs/DOC-2705>

When Is My Hardware Saturated?

- CPU
 - Saturation can be detected via average CPU utilization, but what % will depend on time frame and pattern
 - E.g. > 70% during busy hour yields saturation
 - E.g. 80% average over a certain minute does not
- RAM
 - QlikView Server is having a hard time to stay below Working Set Low means saturation. Seen by eventlog messages
 - “Warning WorkingSet: Virtual Memory is growing beyond parameters”
 - “Warning WorkingSet: Virtual Memory is growing CRITICALLY beyond parameters”

Summary and key takeaways

- Leverage the knowledge of how QlikView utilize resources to better:
 - Shorter reload times
 - Make better data strategies
 - Select hardware for reloads
 - Optimize applications
 - Select hardware for QlikView Servers
 - Troubleshoot performance issues

Feedback

Please complete the track session survey via the mobile app



- Access the track session survey through the mobile app
- Enter track session code TE38
- Provide your feedback

Question & Answer





Thank You

