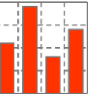


Key Performance Metrics of Oracle Platforms

Technical Presentation

May 2014



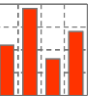
1 Methodology

2 Key Performance Metrics

3 Benchware Performance Suite

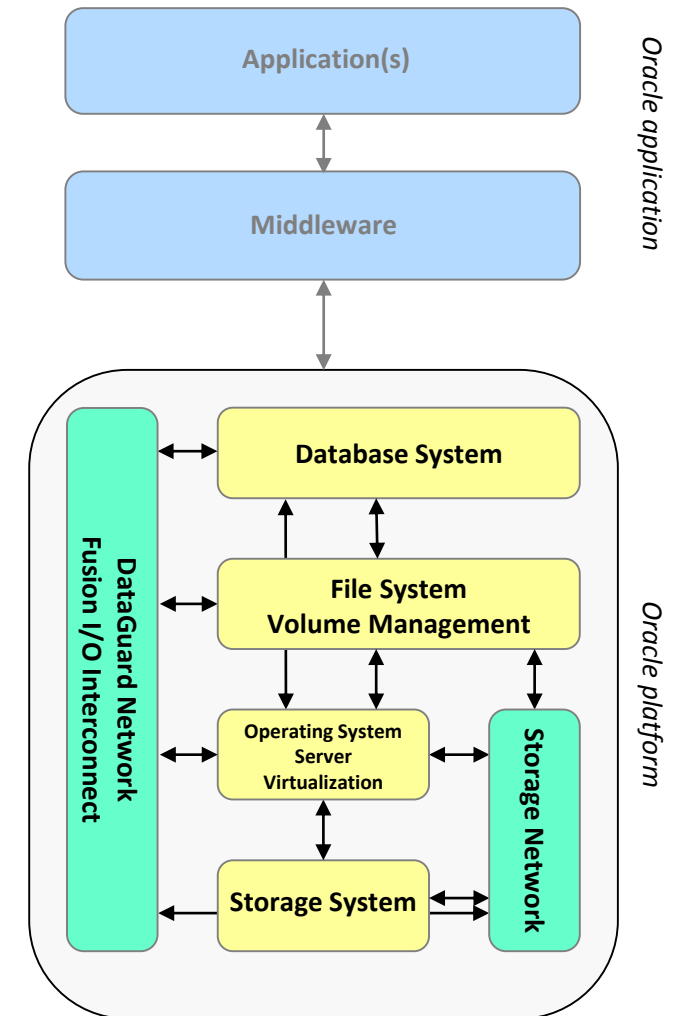
4 Conclusion

Methodology

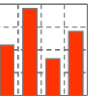


Benchware mission:

- Quality assurance
 - calibrate efficiency of Oracle platforms
- Platform evaluation
 - quantify price-performance ratio of Oracle platforms
- Capacity planning
 - deliver key performance metrics of Oracle platforms for capacity planning



Methodology



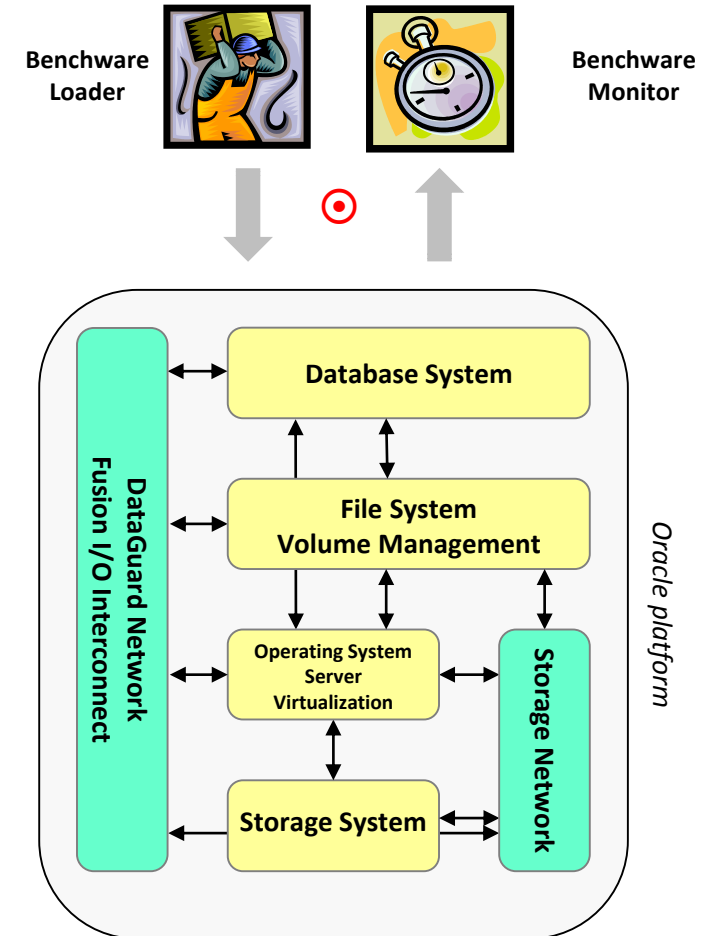
Benchware tools:

■ Benchware Loader

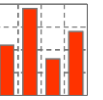
- processor performance
- server system performance
- storage system performance
- database load performance
- database OLTP performance
- database scan performance
- data aggregation performance

■ Benchware Monitor

- Collect performance statistics form v\$ views

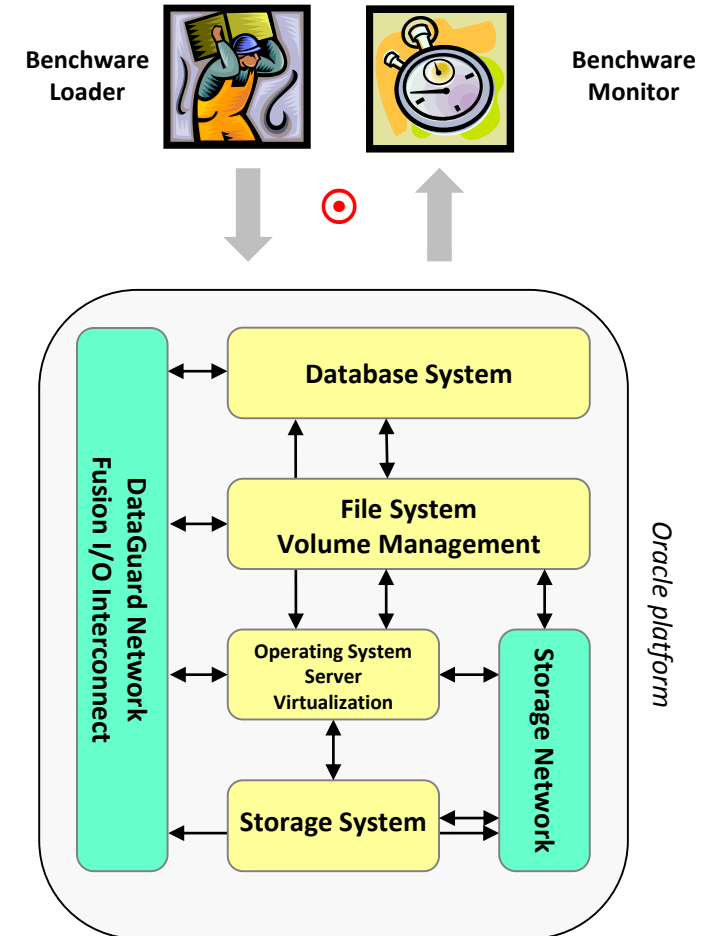


Methodology

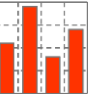


Benchware methodology:

- Benchmark load is generated with representative Oracle database operations
 - even for cpu, server and storage
- Benchware methodology describes Oracle viewpoint of performance
 - even for cpu, server and storage

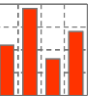


Contents



- 1 Methodology
- 2 Key Performance Metrics**
- 3 Benchware Performance Suite
- 4 Conclusion

Key Performance Metrics



Key Performance Metrics should be self-explanatory

Engine

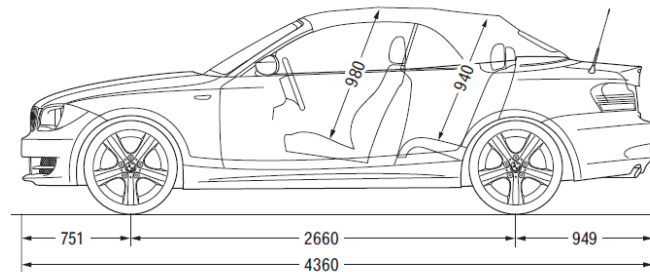
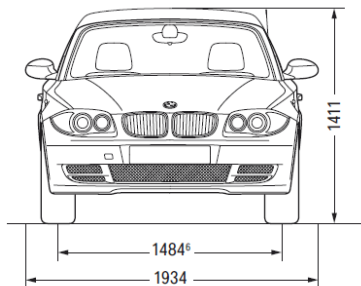
Cylinders/valves	4/4
Capacity in ccm	1,995
Stroke/bore in mm	90.0/84.0
Max. output in kW (hp) at 1/min	105 (143)/6,000
Max. torque in Nm at 1/min	190/4,250
Power-to-weight ratio (EU) in kg/hp	10.5

Performance

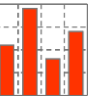
Drag (cw)	0.32
Top speed (km/h)	210
Acceleration 0 - 100 km/h (in s)	9.3
Acceleration 0 - 1,000 m (in s)	30.6
Acceleration 80 - 120 km/h in 4th/5th gear (in s)	9.6/12.5



Source: www.bmw.de

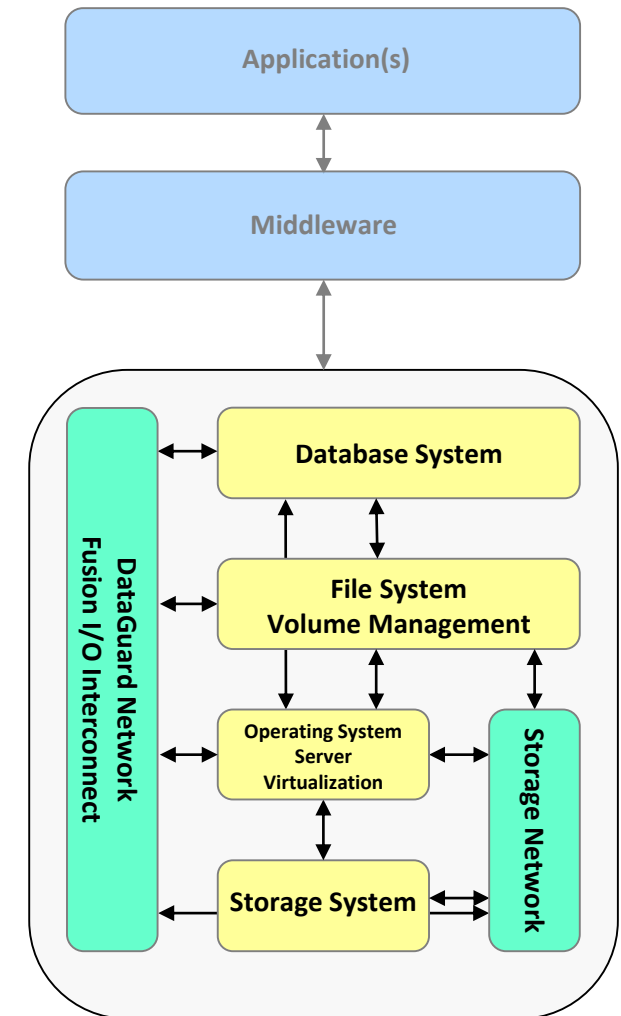


Key Performance Metrics

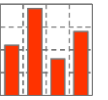


Quality Assurance or Performance calibration

- Does a platform meet performance requirements?
- Are vendor's performance numbers achievable?
- Are there any performance bottlenecks in the platform, which have impact to application performance?
- Does the platform at least deliver the same performance after the system change?

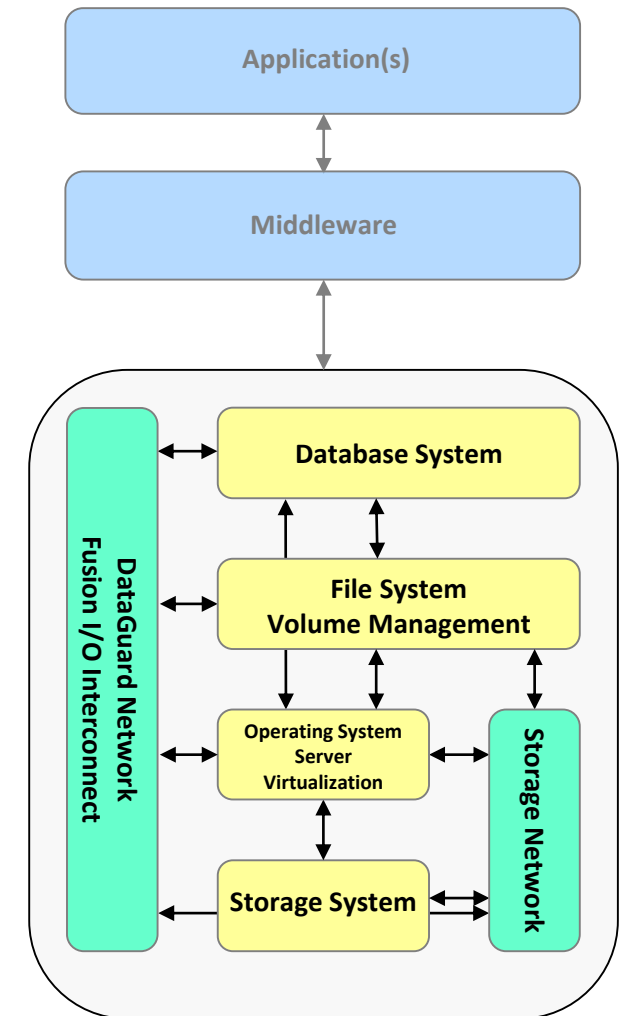
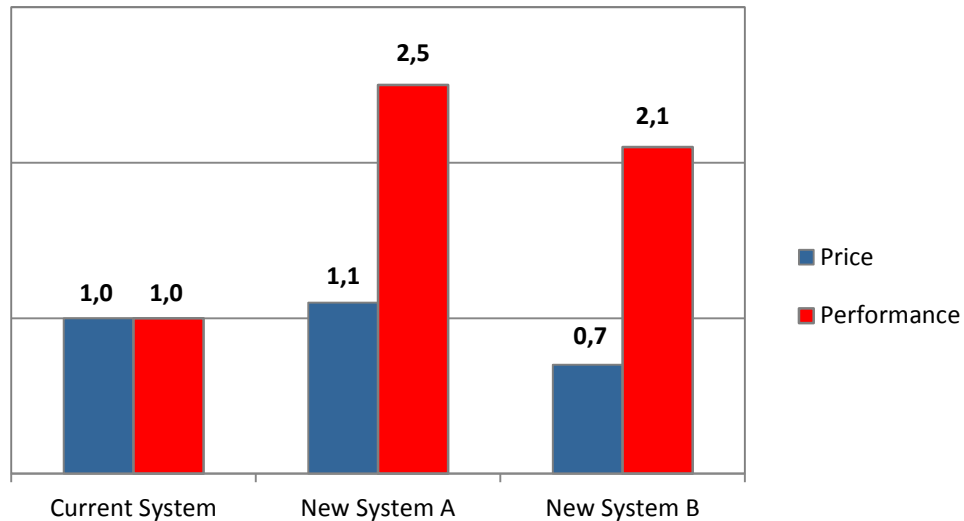


Key Performance Metrics

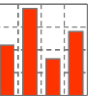


Platform evaluation

- Which platform delivers best price-performance ratio, taking into consideration Oracle license costs?
- How to get adequate figures in a short time for management decisions?

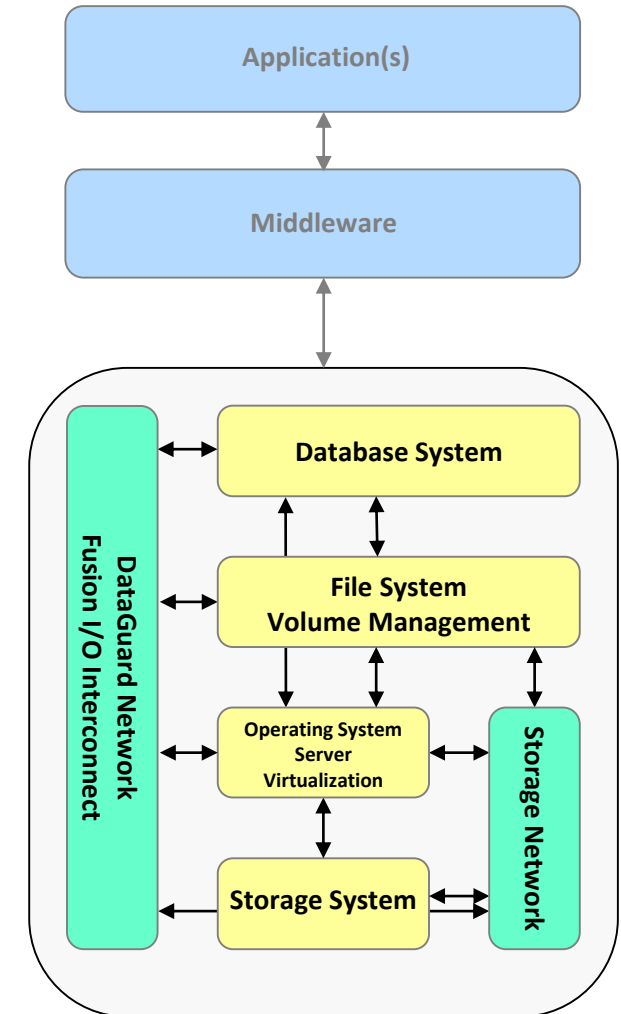


Key Performance Metrics

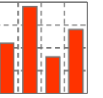


Capacity planning

- What are the performance limitations of a platform?
- How much of the resources are already utilized?
- How much reserve of resources is still available?

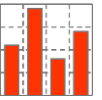


Contents



- 1 Methodology
- 2 Key Performance Metrics
- 3 Benchware Performance Suite**
- 4 Conclusion

Benchmark Performance Suite



Library of Oracle performance tests

Oracle Processor (CPU) Performance Tests CPU-bound operations with typical Oracle data types	OLTP systems	DWH systems	Proof of CPU efficiency	Key Performance Metrics	Unit
<ul style="list-style-type: none"> pl/sql operations arithmetic addition, string operations, SQL built-in functions 	★★★	★★★	multithreading virtualization encryption	speed throughput	[s] [ops]
<ul style="list-style-type: none"> pl/sql algorithms fibonacci, prime numbers 	★★★	★★★			
Oracle Server (SRV) Performance Tests Server-bound in-memory SQL transactions without any I/O operation	OLTP systems	DWH systems	Proof of Server efficiency	Key Performance Metrics	Unit
<ul style="list-style-type: none"> in-memory SQL full scan – all rows per transaction primary key access – 1 row per transaction secondary key access – Ø 25 rows per transaction 	★★★★	★★★★	scalability virtualization cc-numa	speed service time throughput	[µs] [ms] [µs] [ms] [dbps] [tps] [rps]

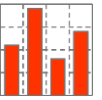
[s] seconds
[ms] milli seconds (10⁻³)
[µs] micro seconds (10⁻⁶)

[dbps] database blocks per second
[rps] rows per second
[tps] transactions per second
[ops] operations per second

[MBps] Mega Byte per second
[GBps] Giga Byte per second
[iops] i/o operations per second

★ less important
★★ important
★★★★ very important

Benchmark Performance Suite



Library of Oracle performance tests

Oracle Storage (STO) Performance Tests I/O-bound operations for all typical Oracle I/O operations	OLTP systems	DWH systems	Proof of Storage efficiency	Key Performance Metrics	Unit
<ul style="list-style-type: none"> sequential I/O 1 MByte, read and write 	★★★	★★★★	data integrity tiering, pooling virtualization replication	service time throughput	[μs] [ms] [MBps] [GBps] [iops]
<ul style="list-style-type: none"> random I/O 8 kByte (default), read and write 	★★★★	★			

Oracle OLTP (DBX) Performance Tests I/O-bound operations for all typical Oracle I/O operations	OLTP systems	DWH systems	Proof of Storage efficiency	Key Performance Metrics	Unit
<ul style="list-style-type: none"> OLTP select primary key access – 1 row per transaction secondary key access – Ø 25 rows per transaction 	★★★★	★	scalability	speed service time throughput	[ms] [s] [ms] [s] [rps] [tps]
<ul style="list-style-type: none"> OLTP update primary key access – 1 row per transaction secondary key access – Ø 25 rows per transaction 	★★★★	★			

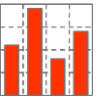
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[MBps] Mega Byte per second
[GBps] Giga Byte per second
[iops] i/o operations per second

★ less important
★★ important
★★★★ very important

Benchware Performance Suite



Library of Oracle performance tests

Oracle Load (DBL) Performance <small>Mixed resource usage: CPU, memory, storage</small>	OLTP systems	DWH systems	Proof of Database efficiency	Key Performance Metrics	Unit
<ul style="list-style-type: none"> transactional data load <small>via buffer cache configurable tx size</small> 	★★★★	★	scalability LGWR process	speed service time throughput	[μs] [ms] [s] [μs] [ms] [s] [rps] [tps]
<ul style="list-style-type: none"> direct bulk load 	★★★	★★★★	scalability compression LGWR process	speed service time throughput	[μs] [ms] [s] [μs] [ms] [s] [rps] [tps]

Oracle Data Aggregation (DBA) Performance <small>Mixed resource usage: CPU, memory, storage</small>	OLTP systems	DWH systems	Proof of Database efficiency	Key Performance Metrics	Unit
<ul style="list-style-type: none"> data aggregation & reports <small>simulated by creating b-tree indexes</small> 	★★★	★★★★	scalability sorting	speed service time throughput	[μs] [ms] [s] [μs] [ms] [s] [rps] [tps]

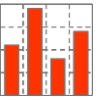
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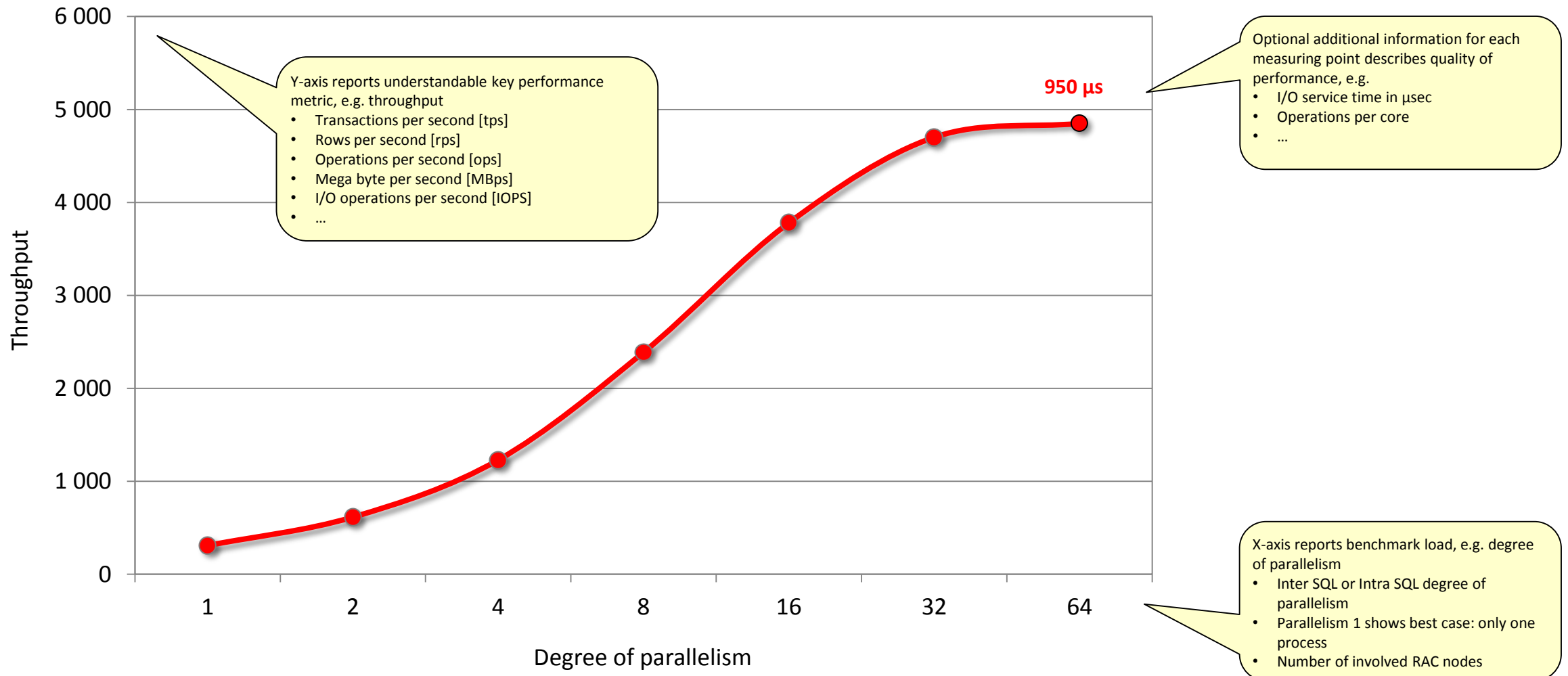
[MBps] Mega Byte per second
[GBps] Giga Byte per second
[iops] i/o operations per second

★ less important
★★ important
★★★★ very important

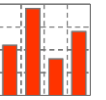
Benchware Performance Suite



All load profiles from single process to saturation



Benchmarkware Performance Suite







Examples with public benchmark results on www.benchmarkware.ch/benchmark

The screenshot shows the Benchmarkware website interface. At the top right, there are links for "WELCOME", "SUPPORT", and "CONTACT". The main header features the "BENCHMARKWARE" logo, which is a member of the LAKE GROUP, and a scenic image of snow-capped mountains reflected in a lake. Below the header is a navigation menu with "Welcome", "Services", "Products", "Benchmarks", and "Company". The "Benchmarks" section is active, displaying a list of benchmark reports on the left and their descriptions on the right.

BENCHMARKWARE
member of the LAKE GROUP

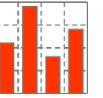
WELCOME • SUPPORT • CONTACT

Welcome Services Products **Benchmarks** Company

-  Oracle 11.2 on Sun/Violin *Benchmark Report*
-  Exadata X2-2 HR HC *Benchmark Report*
-  Oracle Database Appliance *Benchmark Report*
-  Oracle 11.2 on HP/Violin *Benchmark Report*

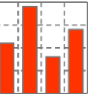
- **Oracle 11.2 on Sun/Violin**
We benchmarked a best-of-breed Oracle platform with enterprise class Solaris 11, fast x86 cpu's, cost-effective 2 socket server with moderate Oracle SE licenses, and Violin flash technology with excellent I/O throughput and low I/O service times.
- **Exadata X2-2 half-rack (HR) high capacity (HC)**
Oracle promises extreme performance of the new engineered system Exadata X2-2 for both online transaction processing as well as data warehouse applications. We benchmarked an X2-2 half-rack system in its high-capacity configuration.
- **Oracle Database Appliance**
The Oracle Database Appliance is another engineered system announced in autumn 2011. It has built-in high-availability features (RAC), uses the newest Intel processor generation but conventional disk technology. And it supports a pay-as-you-grow licensing model.
- **Oracle 11.2 on HP/Violin**
Hewlett-Packard and Violin introduced a new platform, based on Proliant DL 980 server and Violin flash storage technology. The DL 980 provides high scalability within one box. The Violin flash storage not only supports huge amounts of I/O throughput but also very fast I/O service times.

Contents



- 1 Methodology
- 2 Key Performance Metrics
- 3 Benchware Performance Suite
- 4 Conclusion**

Conclusion



- Key Performance Metrics are the foundation for understanding Oracle platform performance
- Decisions taken on key performance metrics are based on facts, not on assumptions
- The Benchware Performance Suite delivers readily understandable key performance metrics for all platform components from Oracle's point of view

BENCHWARE

swiss precision in performance measurement

www.benchmarkware.ch

info@benchmarkware.ch