

SAP Standard Application Benchmarks



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Business perspective

Users

- SAP ERP: 5000 logged-on users (3000 in SD)
- SAP ERP: 36,000 concurrent users in peak
- SAP NetWeaver Portal: 8000 concurrent and 70,000 named users
- SAP NetWeaver Mobile: 1200 synchronizations in 3 hours



Throughput

- SAP ERP: 500,000 payroll calculations in 3 hours
- SAP ERP: Sales orders with 3000+ line items
- SAP ERP Financials: 15 million bookings on peak day, 50 million business partners
- SAP ERP: database size of ~20 TB
- SAP SCM: 600,000 location products
- SAP CRM: 60,000 calls/day (Interaction Center)
- SAP NetWeaver Portal: 800 collaboration rooms

Technical perspective

Network & Infrastructure

- Live customers: 30 application servers to one database (benchmark test: 180+ physical appl. servers)
- 500,000 SAPS landscape (~ 450 CPUs)
- Database server with 100,000 SAPS
- 30,000-40,000 disk I/Os per second

Integration

- SAP NetWeaver PI: 100 messages per second
- SAP NetWeaver Mobile: 120,000,000 messages per day, more than 3 million records in queue
- SAP NetWeaver BI:
 - 8-10 million records in infoCube
 - 60 TB database (planned)

What Exactly Is Good Performance?



Performance typically results in two metrics

- Response time - speed of task completion
- System throughput - amount of work done in a given amount of time

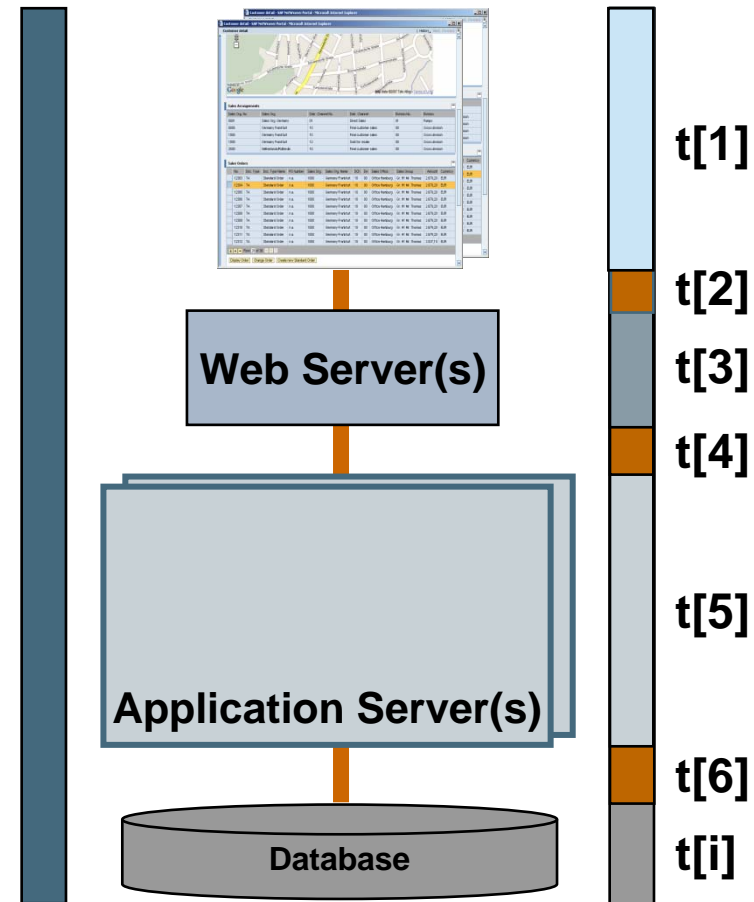
Good performance: If the performance metrics match the customers' needs or Service Level Agreements

Measured resource consumption

- Basis for scalability and performance modeling
- Most important KPIs
 - CPU time consumed
 - Peak memory used
 - Disk space
 - Network load

Proven scalability: Precondition for translating business requirements into actual hardware configurations = Sizing

ResponseTime



$$\text{ResponseTime} = \sum t[i]$$

Vertical & Horizontal Scalability

One-tier

- Laptop demo system

Two-tier

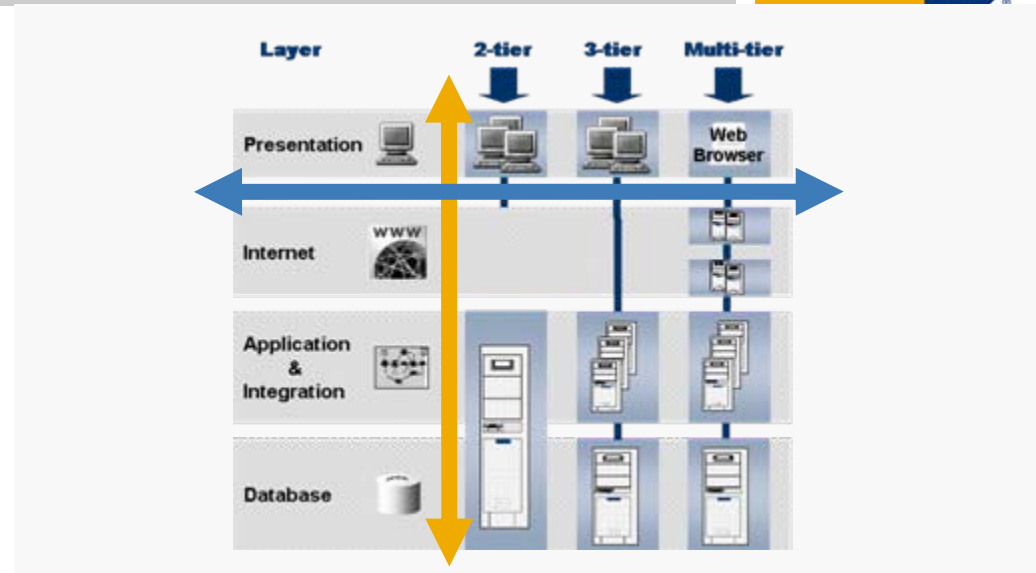
- Central installation (database and application part on one physical server)
- Multiple presentation servers

Three-tier

- One database server
- Multiple application servers
- Multiple presentation servers

Multi-tier

- One database server
- Multiple application servers
- Multiple presentation servers
- Multiple middleware
- Multiple Web servers



Presentation layer

- 160,000 very active users

Internet layer

- More than tens of thousands of hits /sec
- 10 servers at one of our largest customers

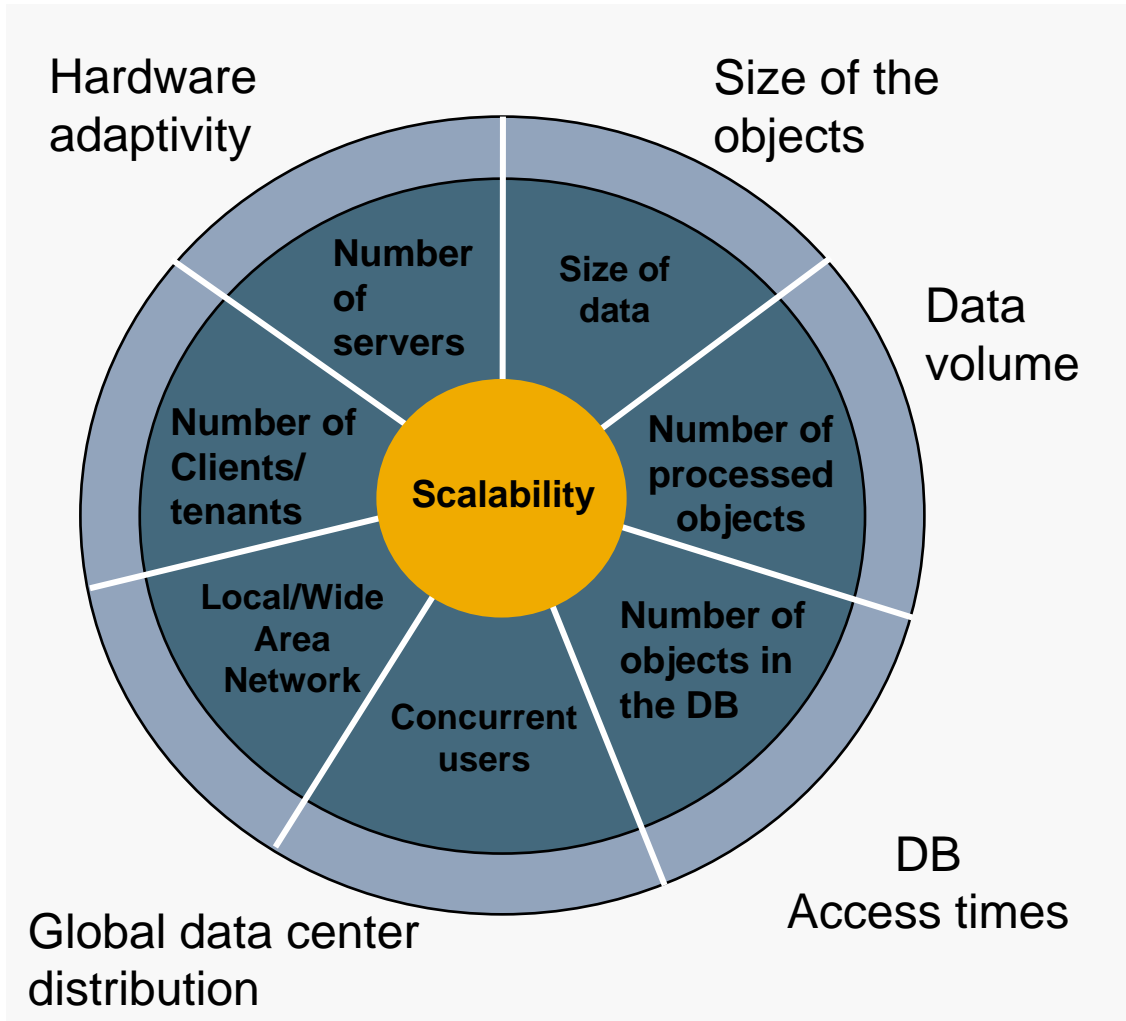
Application and Integration layer

- Up to 187 application servers connected to database

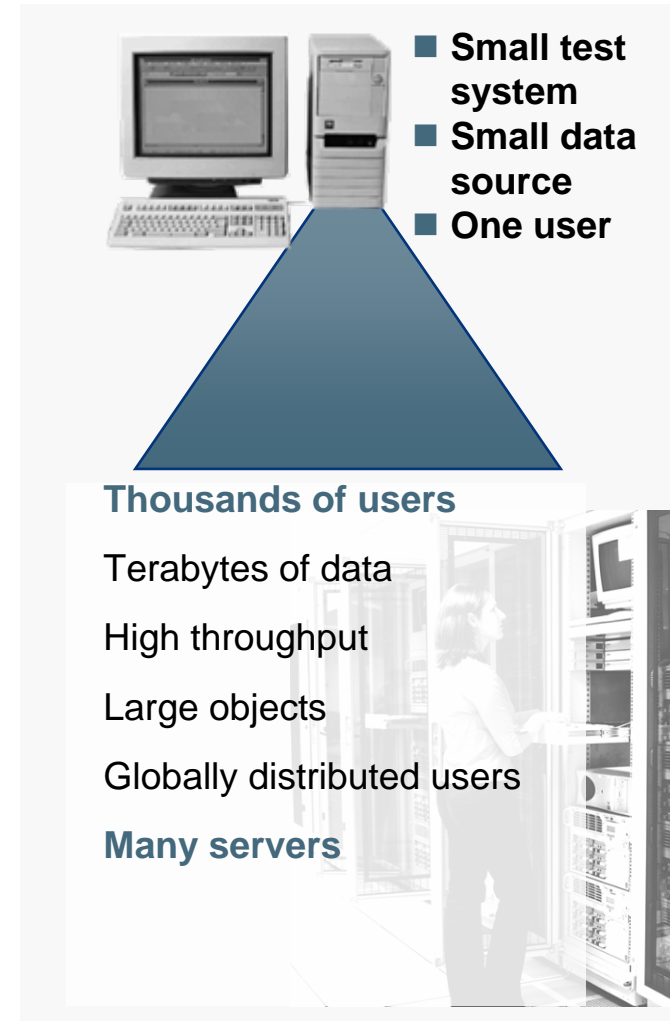
Database layer

- Scalability through SMP architecture of the database server
- More than 120 CPUs and more than 10 TB DB size
- Scalability through parallel databases, components

Dimensions of scalability

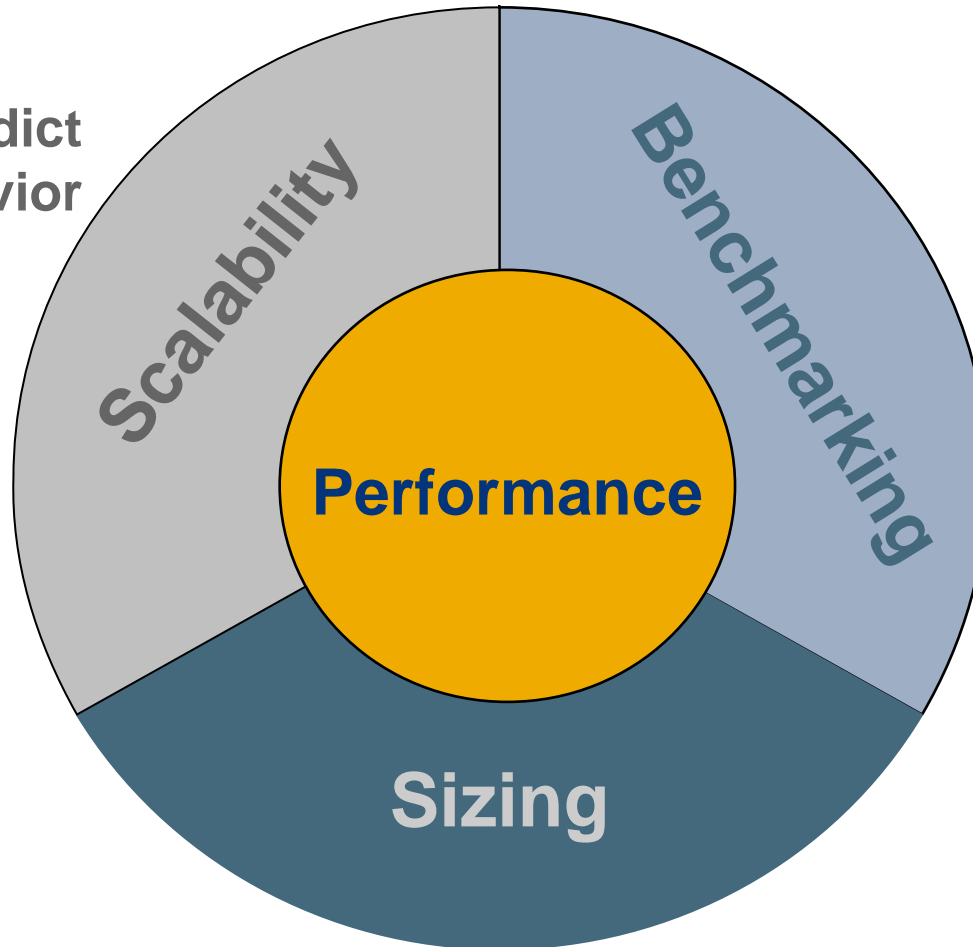


Effects of scalability





- Ability to predict system behavior



- Verification of scalability
- SAPS definition for Sizing

- Translating business requirements into actual hardware resource consumption



SAP ERP

Assemble-To-Order (ATO)
Cross Application Time Sheet (CATS)
Financial Accounting (FI)
Human Resources - Payroll
Materials Management (MM)
Production Planning (PP)
Sales and Distribution (SD)

- Industry standard
- CPU-driven
- Used since 1991
- Delivers SAPS

SAP NetWeaver

Business Intelligence

Business Information Warehouse (BW)
Data Mart (BI-D)
Mixed Load (BI-MXL)

- CPU
- Memory

Enterprise Portal

Employee Self-Service (EP-ESS)
People-Centric CRM (EP-PCC)

SAP Customer Relationship Management

E-Selling
Interaction Center (IC)

- Sub-second response time

SAP Supply Chain Management

Warehouse Management (WM)
Advanced Planner and Optimizer (APO)
Demand Planning (DP)
Prod. Planning/Detailed Scheduling (PP/DS)
Supply Network Planning (SNP)

- In Memory Computing

SAP Product Lifecycle Management

Project System (PS)

- I/O
- CPU
- Memory

Industry Portfolios

SAP for Banking – Transaction Banking (TRBK)
SAP for Retail
SAP for Utilities - Customer Care & Service (ISU/CCS)

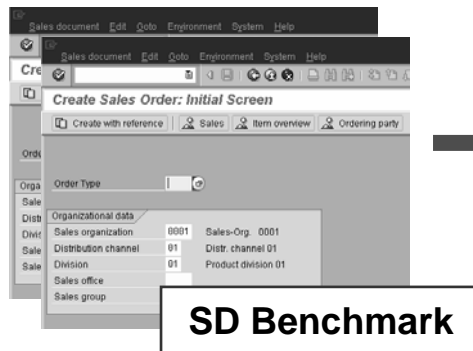


SAP
Application
Performance
Standard

Performance baseline defined via theoretical reference machine*

- Can be adapted to new technologies
 - Enables the comparison of different platforms, client/server configurations (2-tier, 3-tier, multi-tier)
 - Applicable to SAP Standard Application Benchmarks: business processes underlying the SAP application software do not change significantly
- Hardware-independent unit of measurement **SAPS** is derived from Sales & Distribution (SD) Standard Application Benchmark

*[Haas & Zorn 1995] Haas, M.; Zorn, W.: Methodische Leistungsanalyse von Rechensystemen. Reihe: Handbuch der Informatik 2.6, Oldenbourg, München, Wien, 1995.



2,000 fully processed
order line items/hour**



100 SAPS

** $\hat{=}$ 6,000 dialog steps and 2,000 postings or 2,400 SAP transactions

Goals

- Represent SAP business applications as effectively as possible with a view to longevity
- Analyze performance of SAP components and business scenarios and provide input for initial sizing
- Compare the performance of computer systems from different vendors

Simulated user behavior or batch load

- Performance is determined by throughput numbers and system response times
- Throughput numbers are defined in business application terms, e.g. “fully processed order line items per hour”
- Business throughput is mapped onto the resource consumption of the most prominent hardware components, incl. CPU (SAPS) and memory

Business-relevant results

- Free from artifacts, customers can rely on the results
- Hardware and software combination must be available for customers
- Only configurations that can be used in production environments are permitted

Method is monitored and approved by SAP Benchmark Council



Setup

- Established in 1995
- Consists of representatives from SAP and its technology partners
 - Hardware vendors
 - Database vendors
 - CPU vendors
 - Vendors of virtualization software
 - ...

Tasks

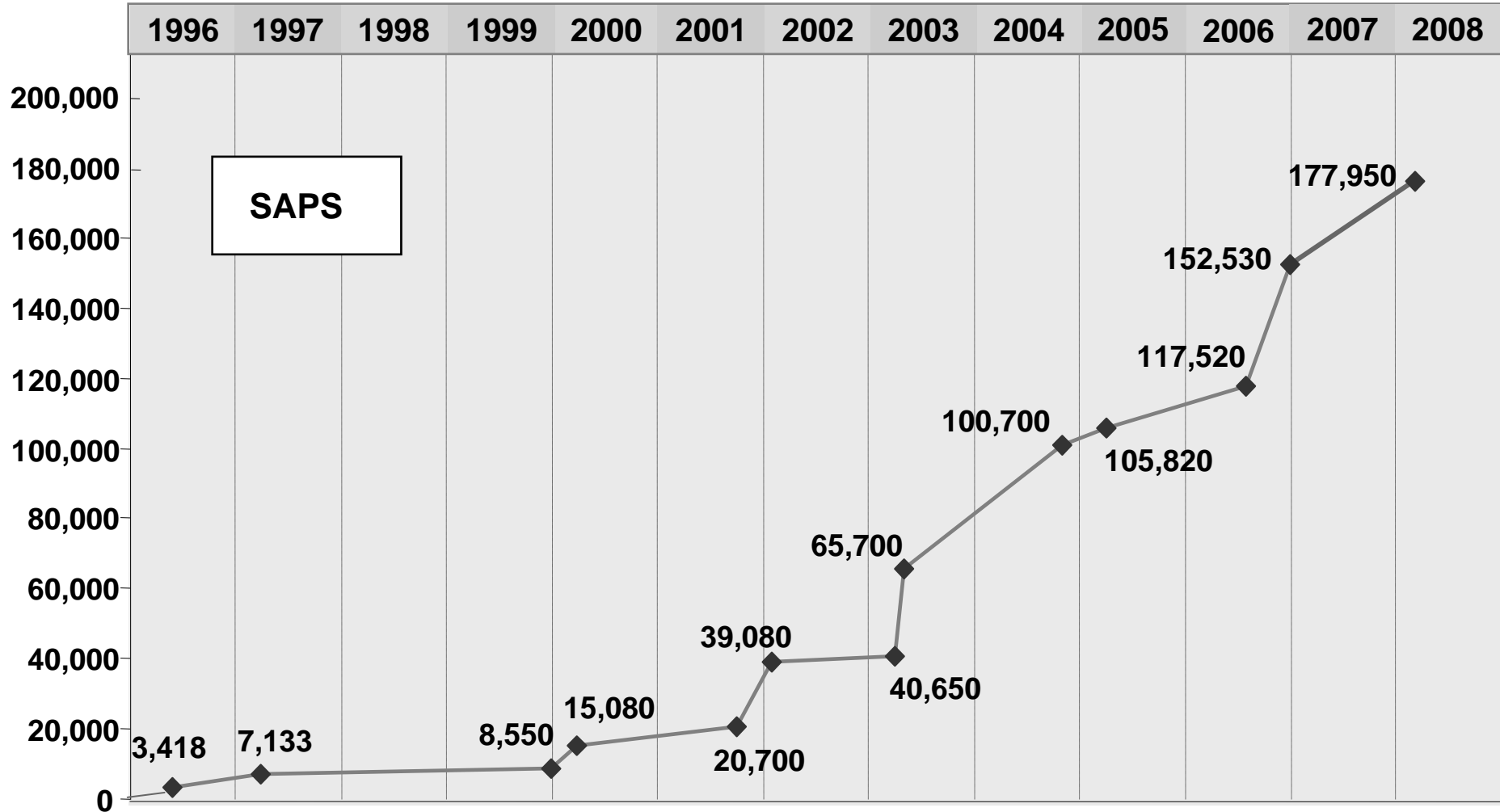
- Monitor and promote activities concerning SAP Standard Application Benchmarks
- Establish and enforce certification rules
- Control content and publication of benchmarks
- SAP certifies benchmarks on behalf of the SAP Benchmark Council

Principles

- Same rights and responsibilities for all
- Self-governance practices
- Full benchmark disclosure policy



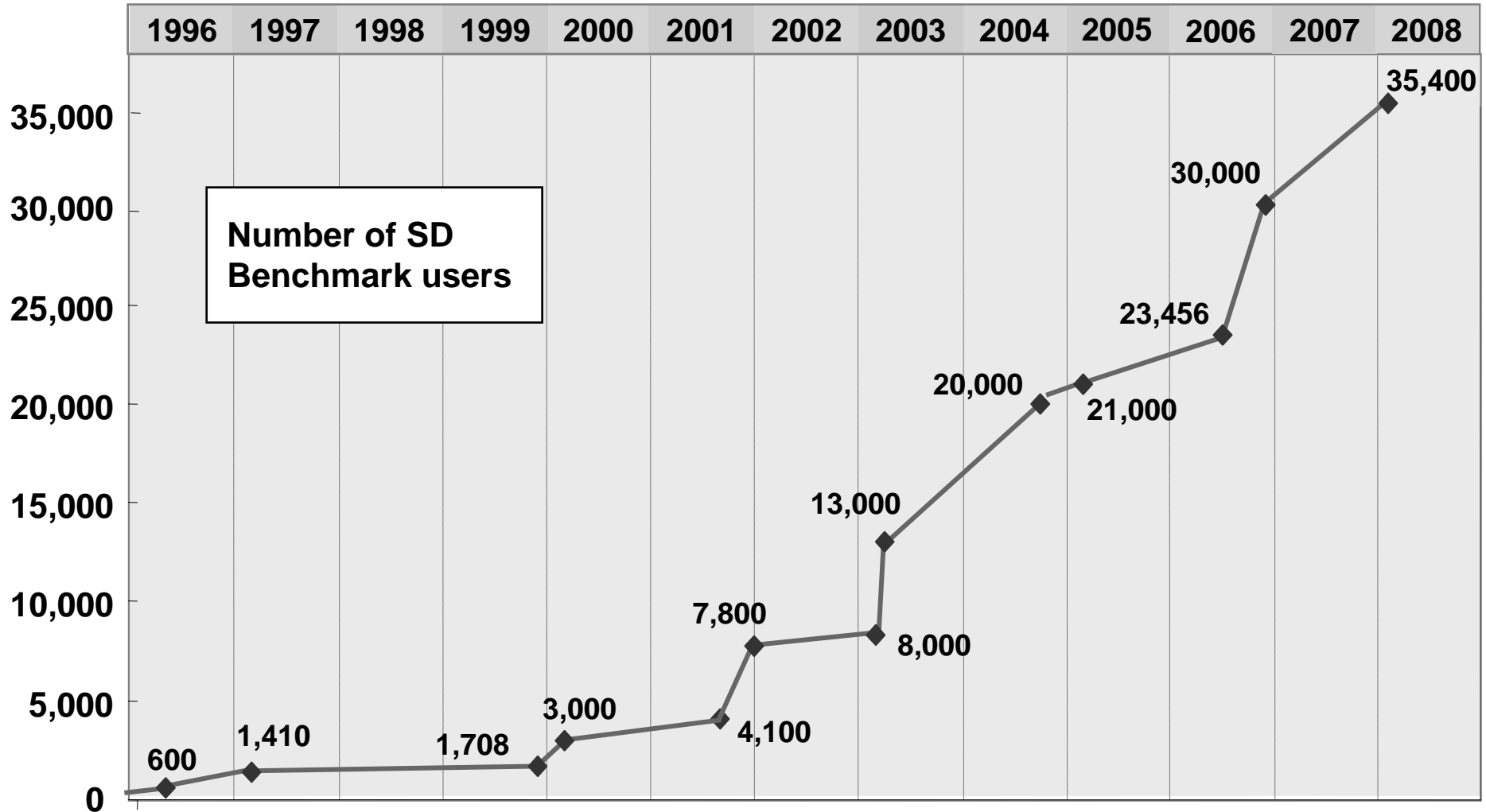
SD Benchmark: Two-Tier Internet Architecture



Hardware is becoming increasingly faster

For certification details see www.sap.com/benchmark.

SD Benchmark: Two-Tier Internet Architecture





Customers

- Benchmark results illustrate the scalability and manageability of large installations from both software and hardware technology perspective
 - High volume tests can be done before customers have to face them
 - Enable proof-of-concepts scenarios
 - Outlook to future performance levels (new platforms, new hardware components, ...)
- Tool to compare different hardware and software releases
- Provide basic information for configuring and sizing of SAP business solutions

Partners

- Enable hardware & technology partners to optimize their technology for SAP Business Suite
- Prove scalability of hardware components
- Marketing departments use benchmark results to support sales

SAP

- Quality assurance, e.g. monitor resource consumption during development of new release
- Analyze system configurations and parameter settings
- Verify sizing recommendations

Thank you!

Appendix

User Interaction Steps – SAP SD Standard Application Benchmark



0. Logon	10. Choose customer order
1. Main screen	11. Change delivery info for order
2. Create customer order	12. Posts goods issue (schedule delivery)
3. Enter order info	13. List orders
4. Enter details for 5 items	14. Choose set of orders
5. Save	15. Create invoice
6. Create a delivery	16. Save
7. Enter delivery info	17. End
8. Save	18. Confirm logoff
9. Display customer order	

Steps 2 to 16 are repeated n times (15 steps take at least 150 seconds).

Business aspect:

One run (steps 2 to 16) corresponds to the selling of 5 line items.

Two-tier SAP SD Standard Application Benchmark Results

Data for the previous graphs:

Certification Number	Date of Certification	Number of Benchmark Users	SAPS	SAP Application Release	Operating System Release	RDBMS Release	Number of Processors	Number of Cores	Number of Threads	Central Server (Model)
N/A	01.03.1995	360	N/A	R/3 2.2C	OSF/1 3.2	Oracle 7.1.4	8	8		DEC 8400 TurboLaser
N/A	28.05.1996	600	3418	R/3 2.2G	Solaris 2.5	Oracle 7.1.6	24	24		SUN ES 6000
1997007	11.03.1997	1410	7133	R/3 3.0E	Solaris 2.5.1	Informix 7.21 UC1	64	64		Bull Express 5800 MH8600
1999040	03.12.1999	1708	8550	R/3 4.0B	AIX 4.3.3	DB2 UDB 6.1	24	24		IBM RS/6000 Enterprise Server
2000004	01.03.2000	3000	15080	R/3 4.0B	Solaris 7	Oracle 8.1.5	64	64		GP7000F-M2000
2001035	25.09.2001	4100	20700	R/3 4.6C	Solaris 8	Oracle 8.1.7	76	76		Sun Fire 15K
2002005	24.01.2002	7800	39080	R/3 4.6C	Solaris 8	Oracle 9i	128	128		Fujitsu Siemens Primepower 2000
2003006	10.02.2003	8000	40650	R/3 4.6C	Solaris 9	Oracle 9i	104	104		Sun Fire 15000
2003030	30.04.2003	13000	65700	R/3 4.6C	Solaris 8	Oracle 9i	128	128		Fujitsu PRIMEPOWER 2500
2004062	15.10.2004	20000	100700	R/3 4.70	AIX 5.3	DB2 UDB 8.2	64	64		IBM eServer p5 Model 595
2005013	24.03.2005	21000	105820	R/3 4.70	Solaris 9	Oracle 9i	128	128		Fujitsu PRIMEPOWER 2500
2006045	25.07.2006	23456	117520	ECC 5.0/ mySAP ERP 2004	AIX 5.3	DB2 9	64	64	128	IBM System p5 595
2006089	18.12.2006	30000	152530	ECC 6.0/ mySAP ERP 2005	HP-UX 11iV3	Oracle 10g	64	128	256	HP Integrity SD64B
2008019	08.04.2008	35400	177950	ECC 6.0/ mySAP ERP 2005	AIX 6.1	DB2 9.5	32	64	128	IBM Power 595

For more details see <http://www.sap.com/benchmark>



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