IBM Systems and Technology Group University 2005

ON DEMAND BUSINESS™

1/8/2005

IBM Systems and Technology Group University 2005

SAP Performance

Course #: CB60

Mark Gordon
Sr. Consulting I/T Specialist

This paper is intended to provide information regarding SAP Performance. It discusses findings based on configurations that were created and tested under laboratory conditions. These findings may not be realized in all customer environments, and implementation in such environments may require additional steps, configurations, and performance analysis. The information herein is provided "AS IS"" with no warranties, express or implied. This information does not constitute a specification or form part of the warranty for any IBM or SAP products.

Agenda

- **Review characteristics of SAP ERP, BW, and SCM systems**
- **Overview of common problems occurring on each**
- **Overview of process for analyzing problems**
- **Review key factors in preventing problems**

Learning Objectives

At the conclusion of this material, you should be able to:

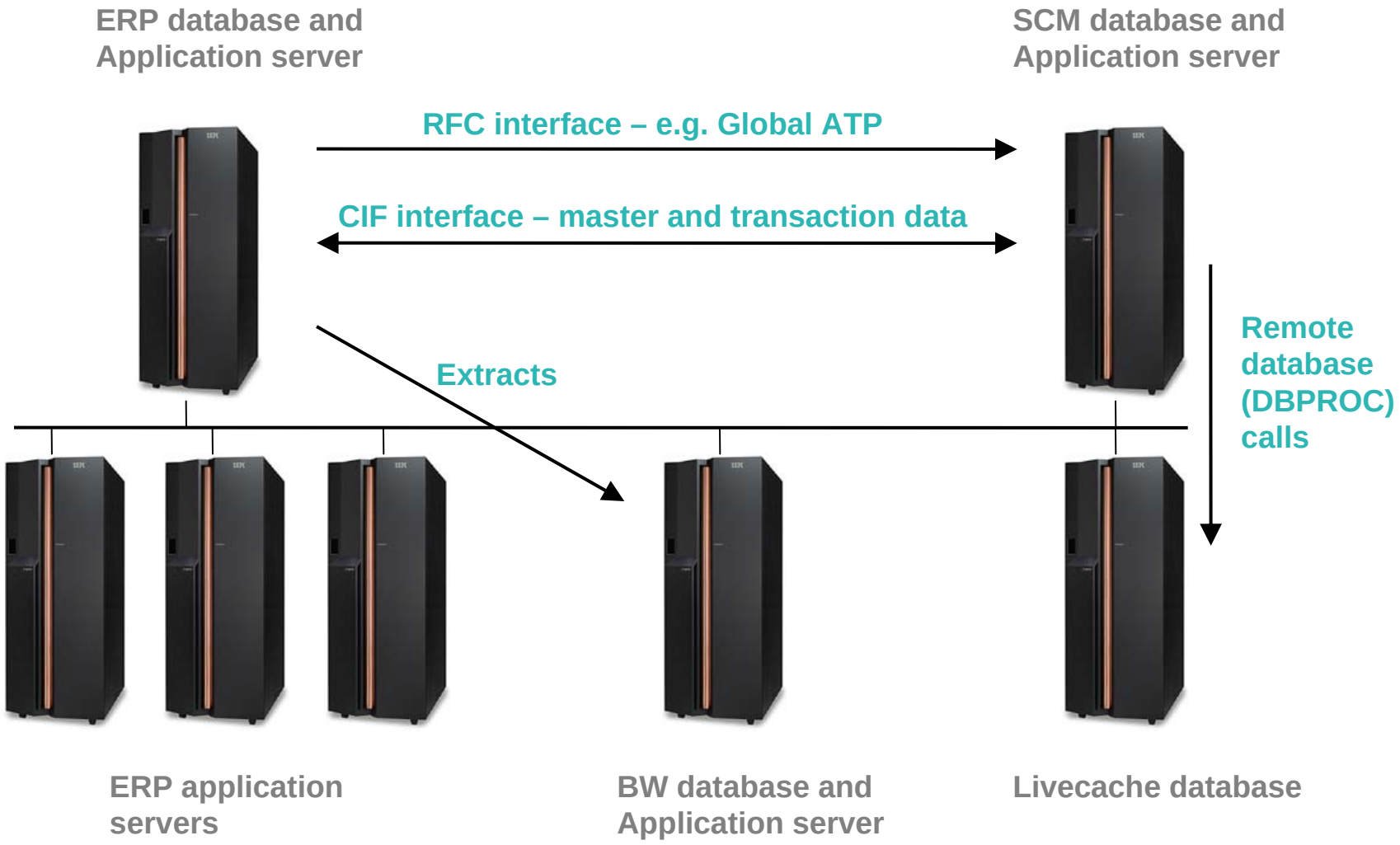
- Describe an application-centered approach for analyzing SAP performance
- Identify key differences in the workload characteristics for ERP, BW, and SCM systems
- Understand the impact of administrative practices on SAP resource utilization

IBM Systems and Technology Group University 2005

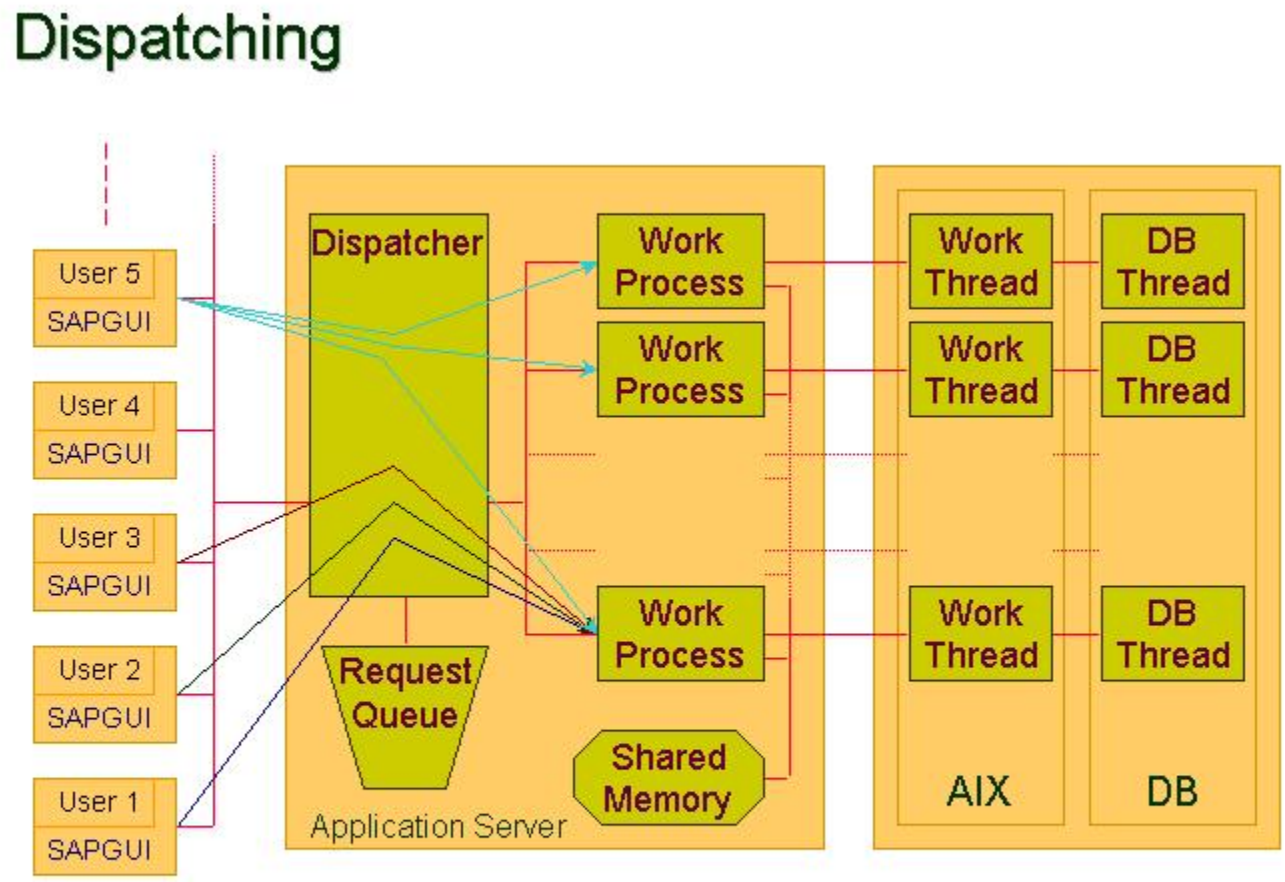
Characteristics of SAP systems

1/8/2005

System Architecture



System Architecture



Characteristics of ERP Systems

- **Simple SQL – few tables joined**
- **Transaction and batch may be running concurrently**
- **SAP functionality is often extended with custom tables, user exits, and programs**
  - Custom tables are more likely to not be indexed correctly
  - Custom programs may not use SAP tables correctly

Characteristics of BW Systems

- **Complex SQL joining many tables**
- **User-defined and SAP-delivered star-schema objects (cubes) may be used**
  - There may be design problems with user-defined objects
- **ODS objects generally require usage analysis to design indexes correctly**
  - Indexes generally are not optimal when the ODS is first created
- **Large volumes of data may be frequently added**
- **Administrative practices are a key factor in performance and CPU utilization**
  - SAP compression
  - Partitioning (if available)
  - Statistics collection
  - Index drop/rebuild

Characteristics of SCM Systems

- **Some ERP and some BW characteristics**
  - Mostly simple SQL
  - Some use of star schema APO cubes
- **There are two databases**
  - Remote (livecache) database accessed via DBPROC routines
  - Local database accessed via SAP open SQL
- **The COM routines that access livecache are delivered by SAP**
- **There are real-time (e.g. Global ATP) and queued (CIF) interfaces from ERP to SCM**

Problem Areas

ERP systems

- **Inefficient SQL**
  - Program does not use available indexes efficiently
  - Optimizer chooses wrong index
    - (host variables issue)
  - Symptom is long DB request time in program
  - Can cause excessive CPU and I/O activity on database server
- **Inefficient ABAP**
  - Program does not scale with number of items processed
  - Symptom is long runtime in program, and high CPU utilization on the application server
- **I/O performance problems caused by database layout**
  - Hotspots on disk become overloaded
  - JFS performance issues (PERFPMR)
  - Symptom is long I/O times in SAP database statistics for files
- **Database load that can be offloaded**
  - Some tables can be buffered on the application server

BW systems

- **Pre-building query results not implemented effectively**
  - Aggregates
  - Caching query results and web templates
- **SAP compression not implemented**
  - Data should be periodically compressed from F to E fact table
  - Compression minimizes the size of F fact table
- **Administrative practices**
  - Index drop and rebuild
  - Database statistics impact
- **I/O performance problems caused by database layout**
  - Hotspots on disk become overloaded
  - JFS performance issues (PERFPMR)
  - Symptom is long I/O times in database statistics for files

SCM systems

- **Inefficient SQL**
  - Program does not use available indexes efficiently
  - Optimizer chooses wrong index
    - (host variables issue)
  - Symptom is long DB request time in program
  - Can cause excessive CPU and I/O activity on database server
- **Inefficient ABAP**
  - Program does not scale with number of items processed
  - Symptom is long runtime in program
  - Can cause excessive CPU utilization on the application server
- **I/O performance problems caused by database layout**
  - Hotspots on disk become overloaded
  - JFS performance issues (PERFPMR)
  - Symptom is long I/O times in database statistics for files
- **Livecache Performance**
  - Livecache database should be resident in memory
  - Livecache has parameters that control tasking and CPUs used
    - Runnable tasks can be blocked from being dispatched


IBM
IBM Systems and Technology Group University 2005
Analysis Process
ON DEMAND BUSINESS™
1/8/2005
© 2005 IBM Corporation

Analysis Process

- **Start with the application**
  - Then go to the database, then to the operating system
- **Define the problem in terms of SAP application response time, if possible**
  - Transaction response times
  - BW query response times
- **Define goals in terms that are meaningful to the business**
  - For example
    - Reduce transaction response times for call centers
    - Reduce data load times, in order to increase availability of data
    - Reduce CPU usage, in order to reduce TCO
  - Some measurements can be useful in tuning, but not as goals
    - Increasing DB hit rate or reducing I/O activity is not a goal that has direct business impact
- **Review SQL efficiency in the SQL statement cache**
  - Problems with interfaces and bolt-ons may not be seen with SAP statistics, but can be found here.
- **Review infrastructure**

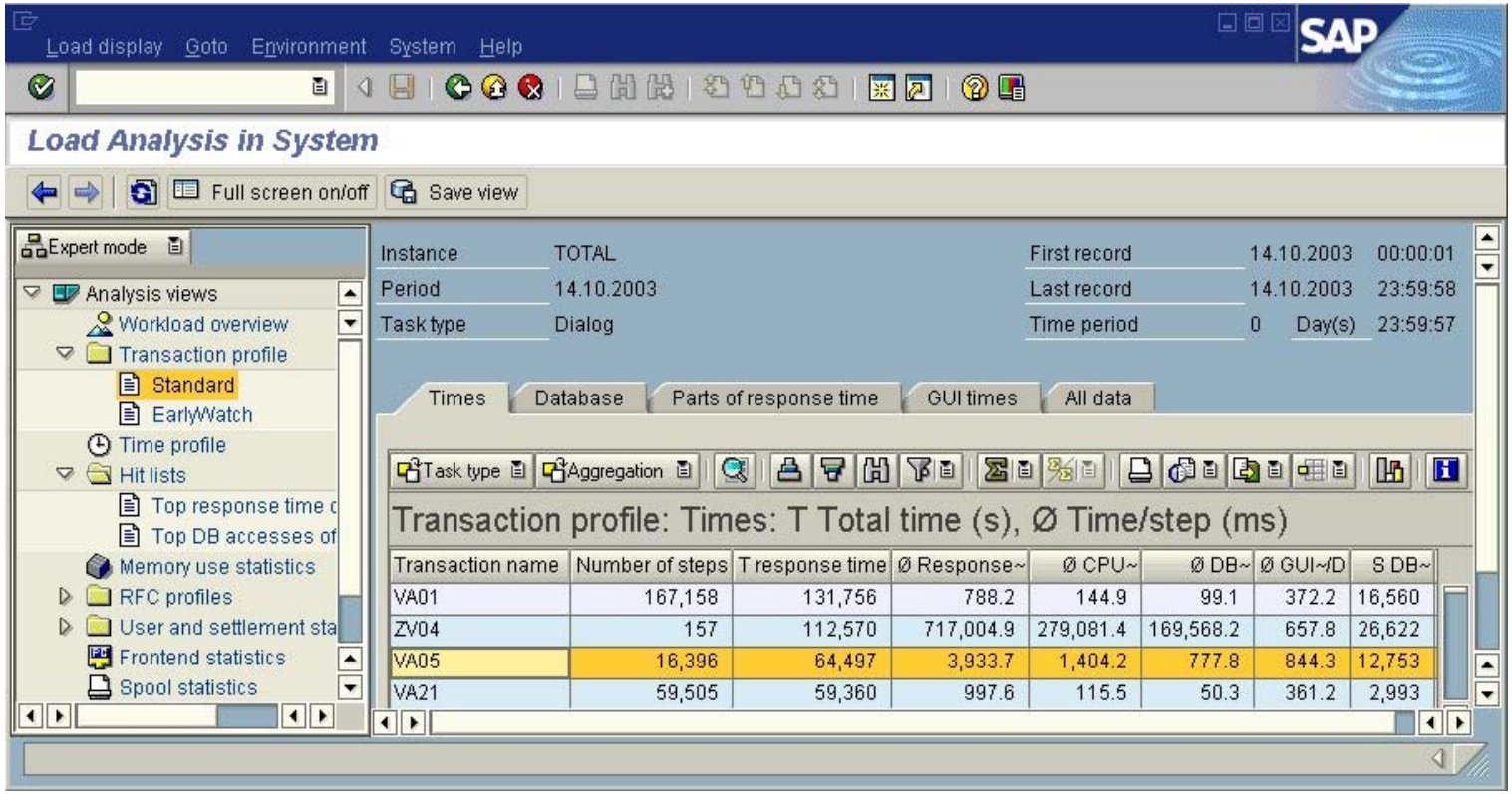
IBM Systems and Technology Group University 2005

Analysis Process

Tools for ERP systems

1/8/2005

First step - start with the application



- **SAP provides program response time statistics**
  - Time breakdown leads to next action
  - high CPU > ABAP trace; high DB > SQL trace

First step - start with the application

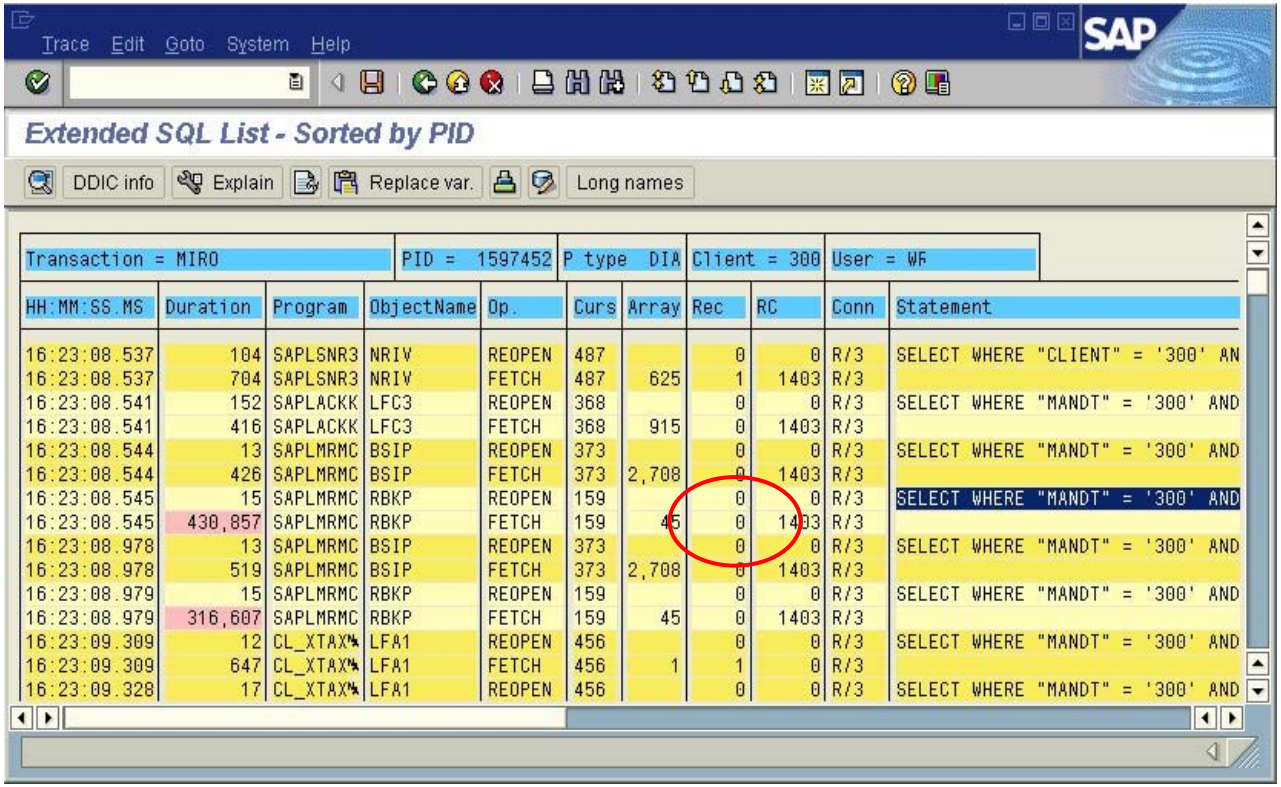
```
System:                     Instance:
Analysed time:  13.11.2003 / 08:10:00  -  13.11.2003 / 09:20:00       Time frame:  +/- 00:14:00

Record:  08:32:02 VA05                      SAPMS380                                  D

     Analysis of time in work process
    --------------------------------------------------------------------------------
    | CPU time                    228,210 ms     Number       Roll ins            1     |
    | RFC+CPIC time                     0 ms                  Roll outs           2     |
    |                                                         Enqueues            0     |
    | Total time in workprocs     702,747 ms                                            |
    |                                            Load time    Program           108  ms |
    |---Response time-----------702,747 ms--|                 Screen              0  ms |
    |                                       |                 CUA interf.         1  ms |
    | Wait for work process             0 ms |                                           |
    | Processing time             100,841 ms |   Roll time    Out                 2  ms |
    | Load time                       109 ms |                In                  1  ms |
    | Generating time                   0 ms |                Wait                0  ms |
    | Roll (in+wait) time               1 ms |                                          |
    | Database request time       601,796 ms |   Frontend     No.roundtrips       2     |
    | Enqueue time                      0 ms |                GUI time          325  ms |
    |                                       |                 Net time          283  ms |
    --------------------------------------------------------------------------------
```

- **STAD response time statistics for individual dialog step**
  - Time breakdown leads to next action
  - high CPU > ABAP trace; high DB > SQL trace

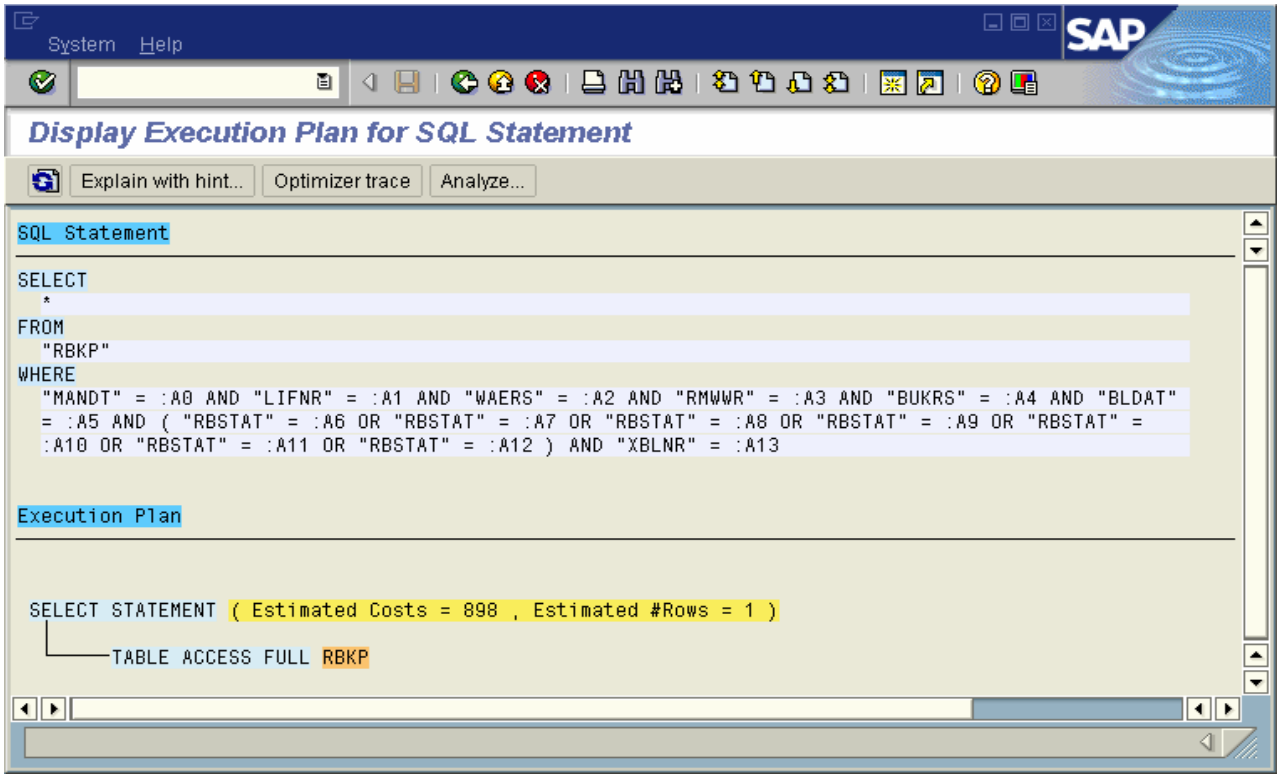
High DB time in transaction



HH:MM:SS.MS	Duration	Program	ObjectName	Op.	Curs	Array	Rec	RC	Conn	Statement
16:23:08.537	104	SAPLSNR3	NRIV	REOPEN	487		0	0	R/3	SELECT WHERE "CLIENT" = '300' AN
16:23:08.537	704	SAPLSNR3	NRIV	FETCH	487	625	1	1403	R/3	
16:23:08.541	152	SAPLACKK	LFC3	REOPEN	368		0	0	R/3	SELECT WHERE "MANDT" = '300' AND
16:23:08.541	416	SAPLACKK	LFC3	FETCH	368	915	0	1403	R/3	
16:23:08.544	13	SAPLMRMC	BSIP	REOPEN	373		0	0	R/3	SELECT WHERE "MANDT" = '300' AND
16:23:08.544	426	SAPLMRMC	BSIP	FETCH	373	2,708	0	1403	R/3	
16:23:08.545	15	SAPLMRMC	RBKP	REOPEN	159		0	0	R/3	SELECT WHERE "MANDT" = '300' AND
16:23:08.545	430,857	SAPLMRMC	RBKP	FETCH	159	45	0	1403	R/3	
16:23:08.978	13	SAPLMRMC	BSIP	REOPEN	373		0	0	R/3	SELECT WHERE "MANDT" = '300' AND
16:23:08.978	519	SAPLMRMC	BSIP	FETCH	373	2,708	0	1403	R/3	
16:23:08.979	15	SAPLMRMC	RBKP	REOPEN	159		0	0	R/3	SELECT WHERE "MANDT" = '300' AND
16:23:08.979	316,607	SAPLMRMC	RBKP	FETCH	159	45	0	1403	R/3	
16:23:09.309	12	CL_XTAX%	LFA1	REOPEN	456		0	0	R/3	SELECT WHERE "MANDT" = '300' AND
16:23:09.309	647	CL_XTAX%	LFA1	FETCH	456	1	1	0	R/3	
16:23:09.328	17	CL_XTAX%	LFA1	REOPEN	456		0	0	R/3	SELECT WHERE "MANDT" = '300' AND

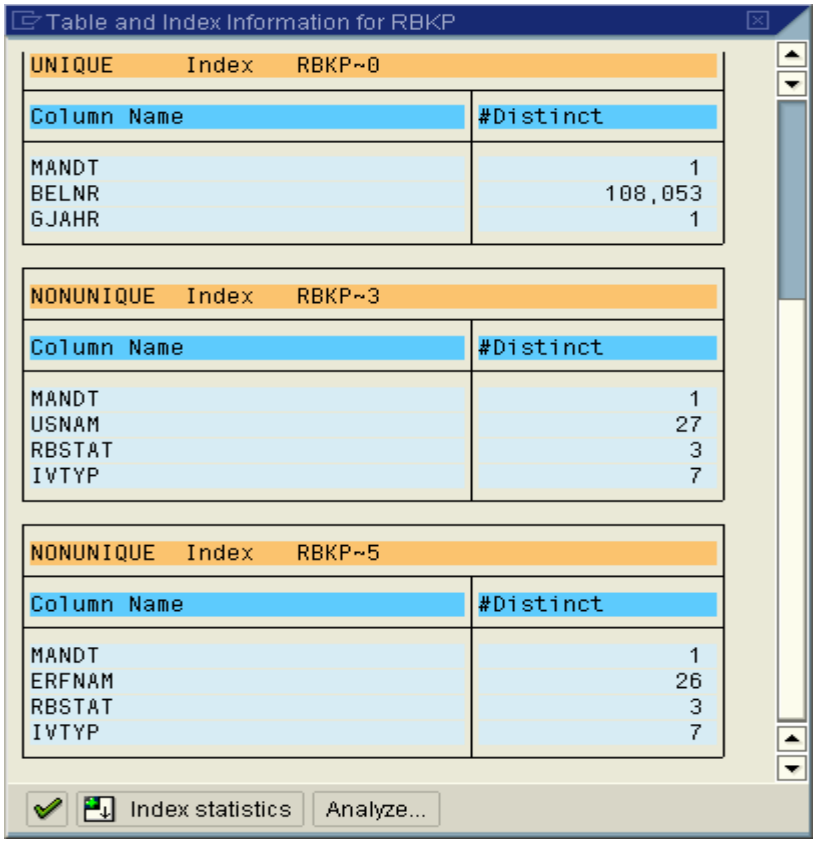
- **SAP ST05 to trace SQL**
- **Look for statements that are slow in terms of time/row**
  - Circled example – 430.8 ms to return no rows

High DB time in transaction



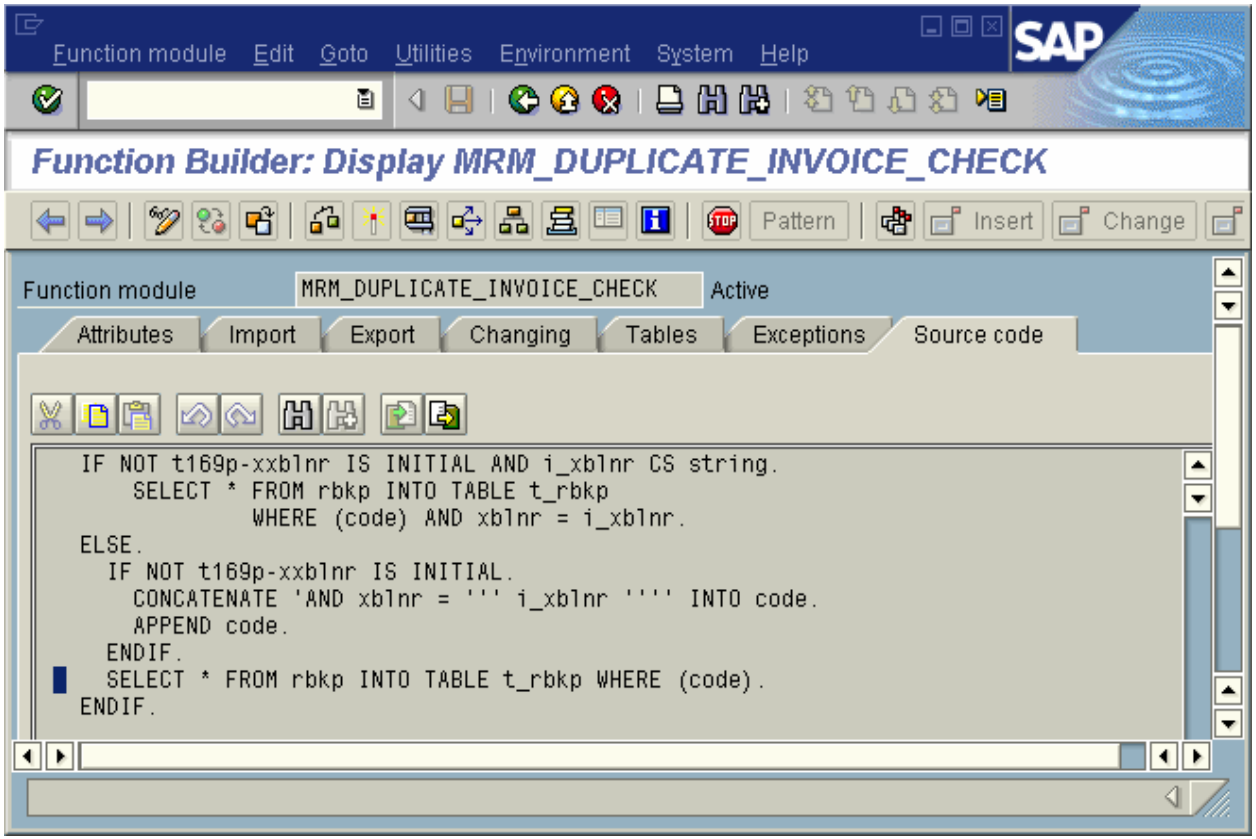
- **Explain the slow statement from preceding page**
- **Evaluate local predicates and compare to available indexes**

High DB time in transaction



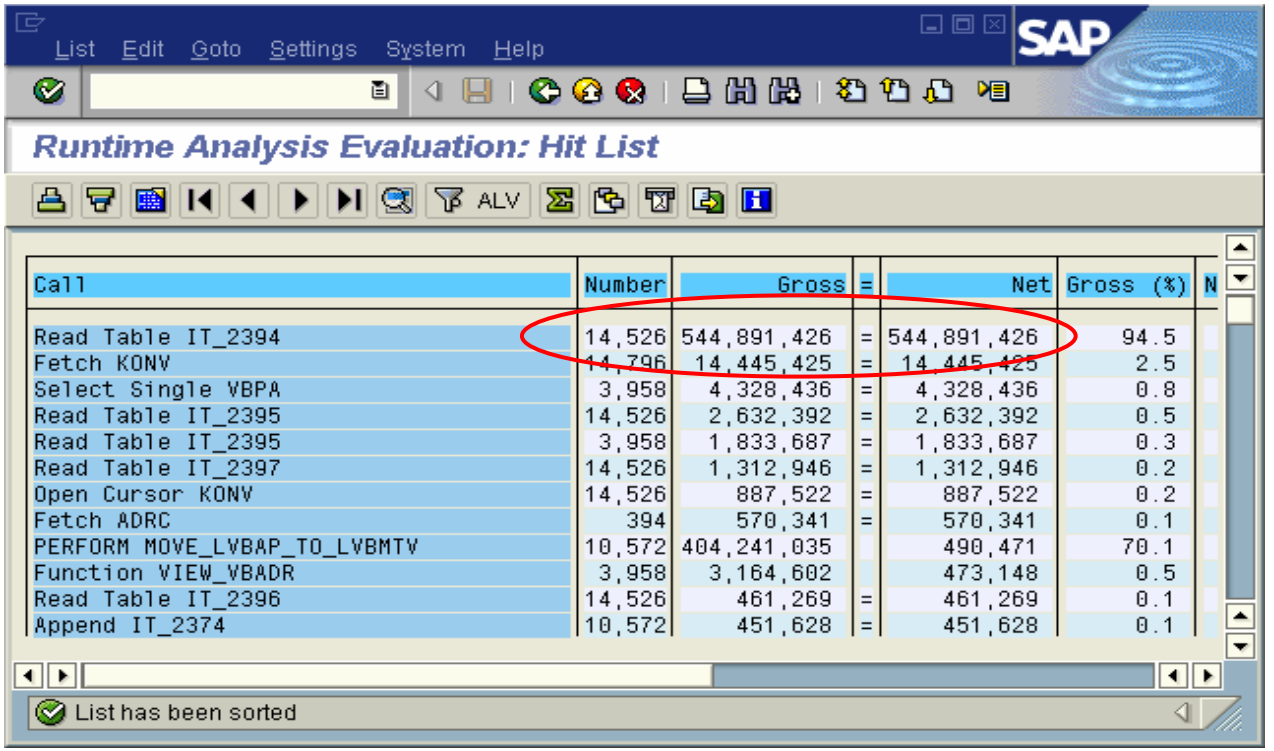
- **Display indexes on table (SE11, DB02, drill-down from explain) and compare to predicates**

High DB time in transaction



- **One can drill into the ABAP code from the trace**

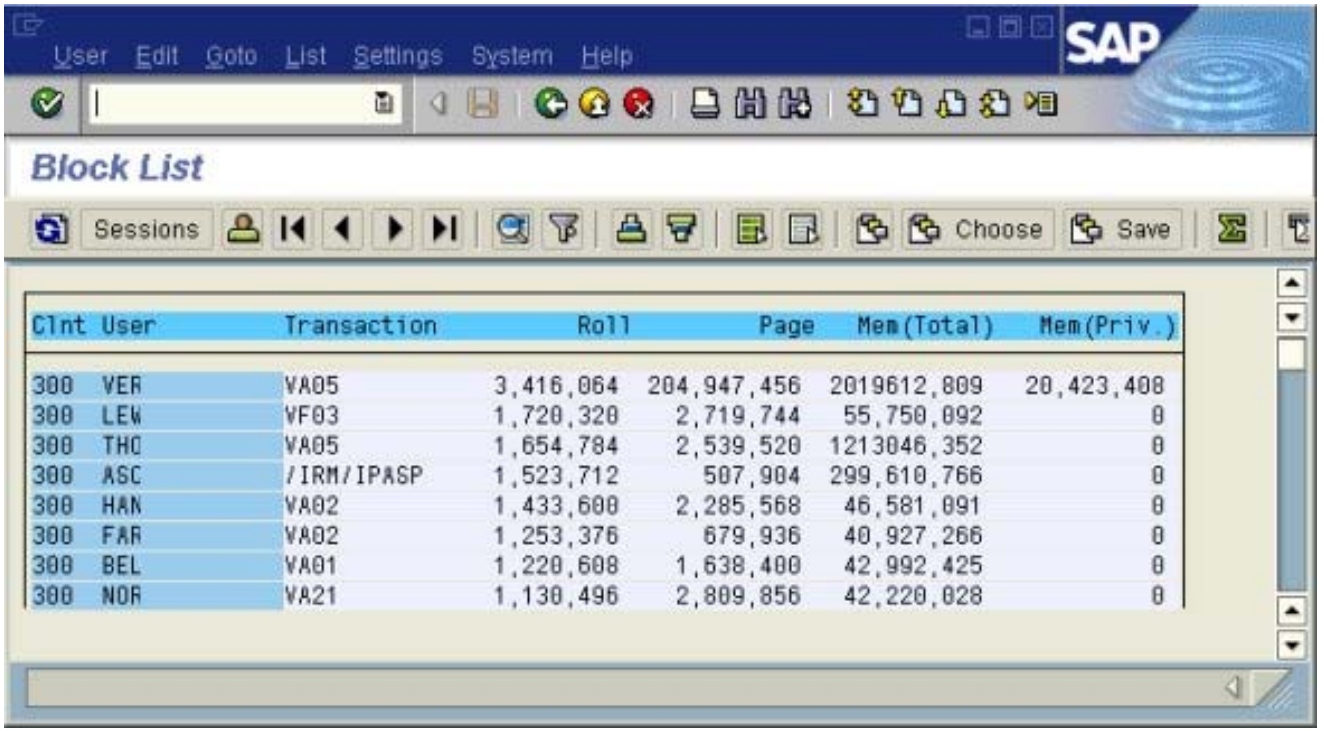
High CPU time in transaction



Call	Number	Gross	=	Net	Gross (%)	N
Read Table IT_2394	14,526	544,891,426	=	544,891,426	94.5	
Fetch KONV	14,796	14,445,425	=	14,445,425	2.5	
Select Single VBPA	3,958	4,328,436	=	4,328,436	0.8	
Read Table IT_2395	14,526	2,632,392	=	2,632,392	0.5	
Read Table IT_2395	3,958	1,833,687	=	1,833,687	0.3	
Read Table IT_2397	14,526	1,312,946	=	1,312,946	0.2	
Open Cursor KONV	14,526	887,522	=	887,522	0.2	
Fetch ADRC	394	570,341	=	570,341	0.1	
PERFORM MOVE_LVBAP_TO_LVBMTV	10,572	404,241,035		490,471	70.1	
Function VIEW_VBADR	3,958	3,164,602		473,148	0.5	
Read Table IT_2396	14,526	461,269	=	461,269	0.1	
Append IT_2374	10,572	451,628	=	451,628	0.1	

- **SAP SE30 to trace ABAP program**
- **Look for area where program spends most time**
  - Circled example takes 37.5 ms to read a row from a table in memory

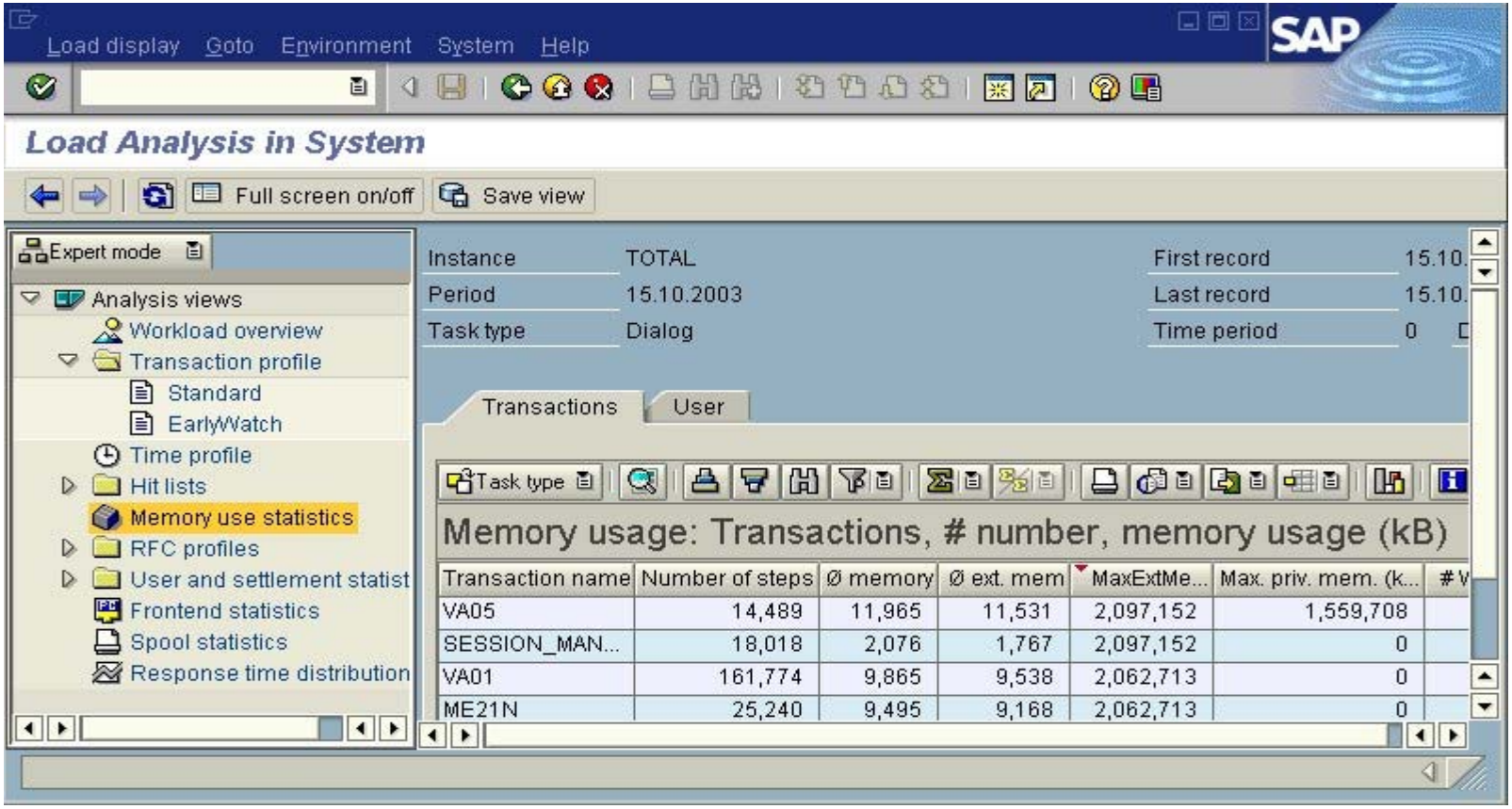
High Memory Use



Clnt	User	Transaction	Roll	Page	Mem(Total)	Mem(Priv.)
300	VER	VA05	3,416,064	204,947,456	2019612,809	20,423,408
300	LEW	VF03	1,720,320	2,719,744	55,750,092	0
300	THO	VA05	1,654,784	2,539,520	1213046,352	0
300	ASC	/IRM/IPASP	1,523,712	507,904	299,610,766	0
300	HAN	VA02	1,433,600	2,285,568	46,581,091	0
300	FAR	VA02	1,253,376	679,936	40,927,266	0
300	BEL	VA01	1,220,608	1,638,400	42,992,425	0
300	NOR	VA21	1,130,496	2,809,856	42,220,028	0

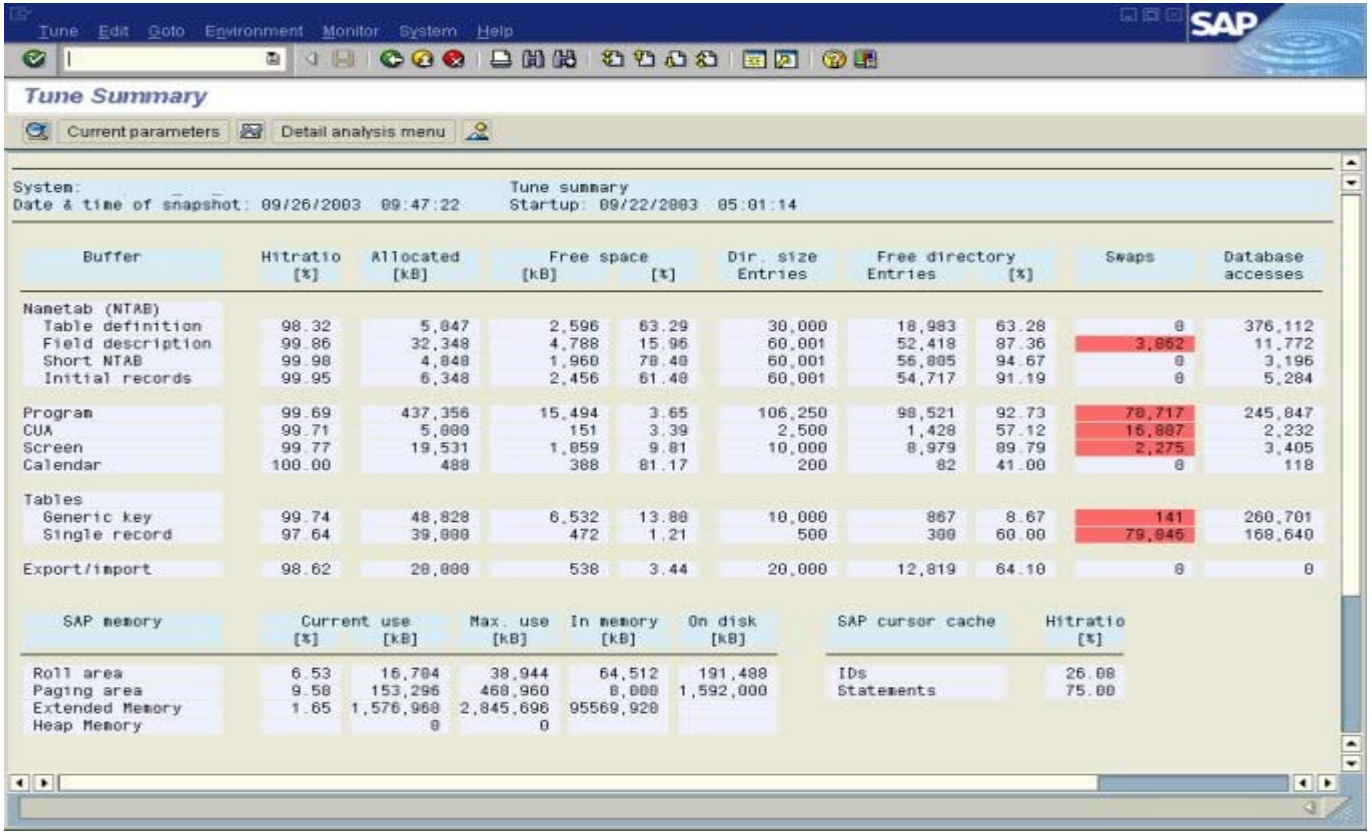
- **SM04 to see memory hogs on active system**
  - Since user can run multiple transactions, the transaction in this display may not be the one that is using all the memory.

High Memory Use



- **ST03N memory profile for historical reporting on memory use**

High Memory Use



Tune Edit Goto Environment Monitor System Help

SAP

Tune Summary

Current parameters | Detail analysis menu

System:
Date & time of snapshot: 09/26/2003 09:47:22

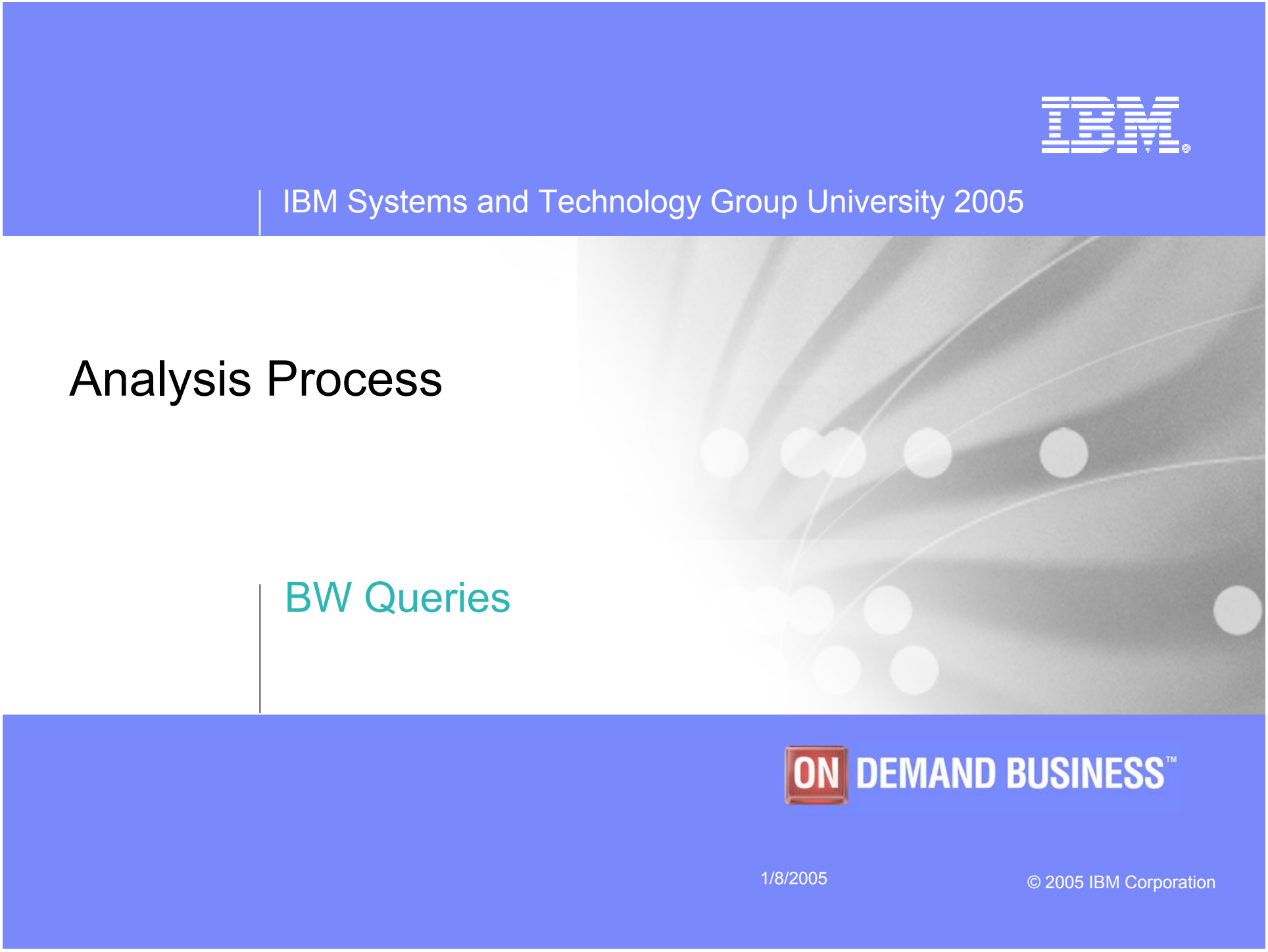
Tune summary
Startup: 09/22/2003 05:01:14

Buffer	Hitratio [%]	Allocated [kB]	Free space [kB]	Free space [%]	Dir. size Entries	Free directory Entries	Free directory [%]	Swaps	Database accesses
Nametab (NTAB)									
Table definition	98.32	5,047	2,596	63.29	30,000	18,983	63.28	0	376,112
Field description	99.86	32,348	4,788	15.96	60,001	52,418	87.36	3,062	11,772
Short NTAB	99.98	4,048	1,960	78.40	60,001	56,805	94.67	0	3,196
Initial records	99.95	6,348	2,456	61.40	60,001	54,717	91.19	0	5,284
Program	99.69	437,356	15,494	3.65	106,250	98,521	92.73	70,717	245,847
CUA	99.71	5,080	151	3.39	2,500	1,428	57.12	16,807	2,232
Screen	99.77	19,531	1,859	9.81	10,000	8,979	89.79	2,275	3,405
Calendar	100.00	488	388	81.17	200	82	41.00	0	118
Tables									
Generic key	99.74	48,828	6,532	13.80	10,000	867	8.67	141	260,701
Single record	97.64	39,080	472	1.21	500	300	60.00	79,046	168,640
Export/import	98.62	20,000	538	3.44	20,000	12,819	64.10	0	0

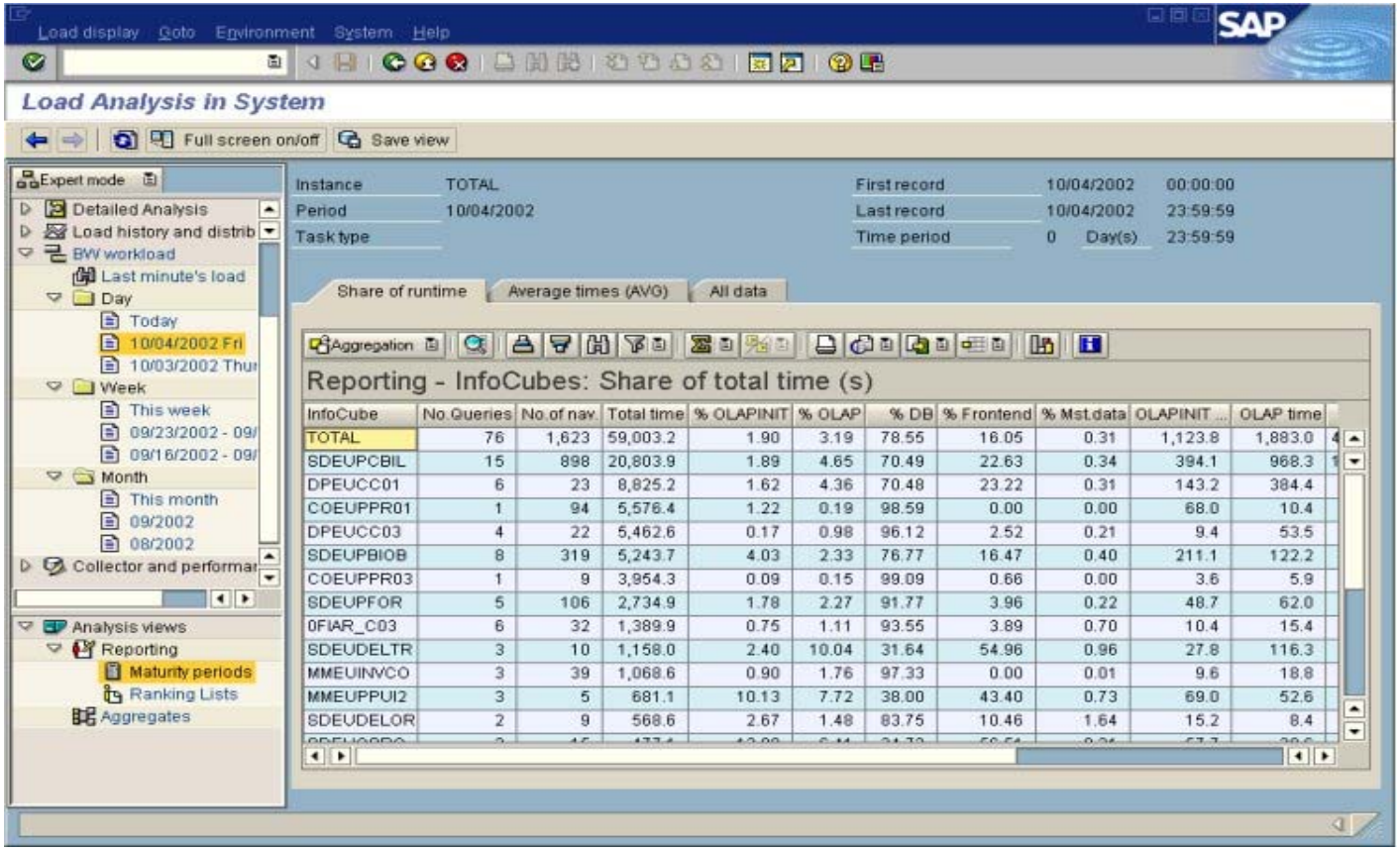
SAP memory	Current use [%]	Current use [kB]	Max. use [kB]	In memory [kB]	On disk [kB]
Roll area	6.53	16,704	38,944	64,512	191,488
Paging area	9.58	153,296	468,960	0,000	1,592,000
Extended Memory	1.65	1,576,960	2,845,696	95569,920	
Heap Memory		0	0		

SAP cursor cache	Hitratio [%]
IDs	26.00
Statements	75.00

- **Excessive use of SAP Paging or Roll usually causes I/O constraint on application server.**
- **Excessive use of EM usually causes paging**


IBM
IBM Systems and Technology Group University 2005
Analysis Process
BW Queries
ON DEMAND BUSINESS™
1/8/2005
© 2005 IBM Corporation

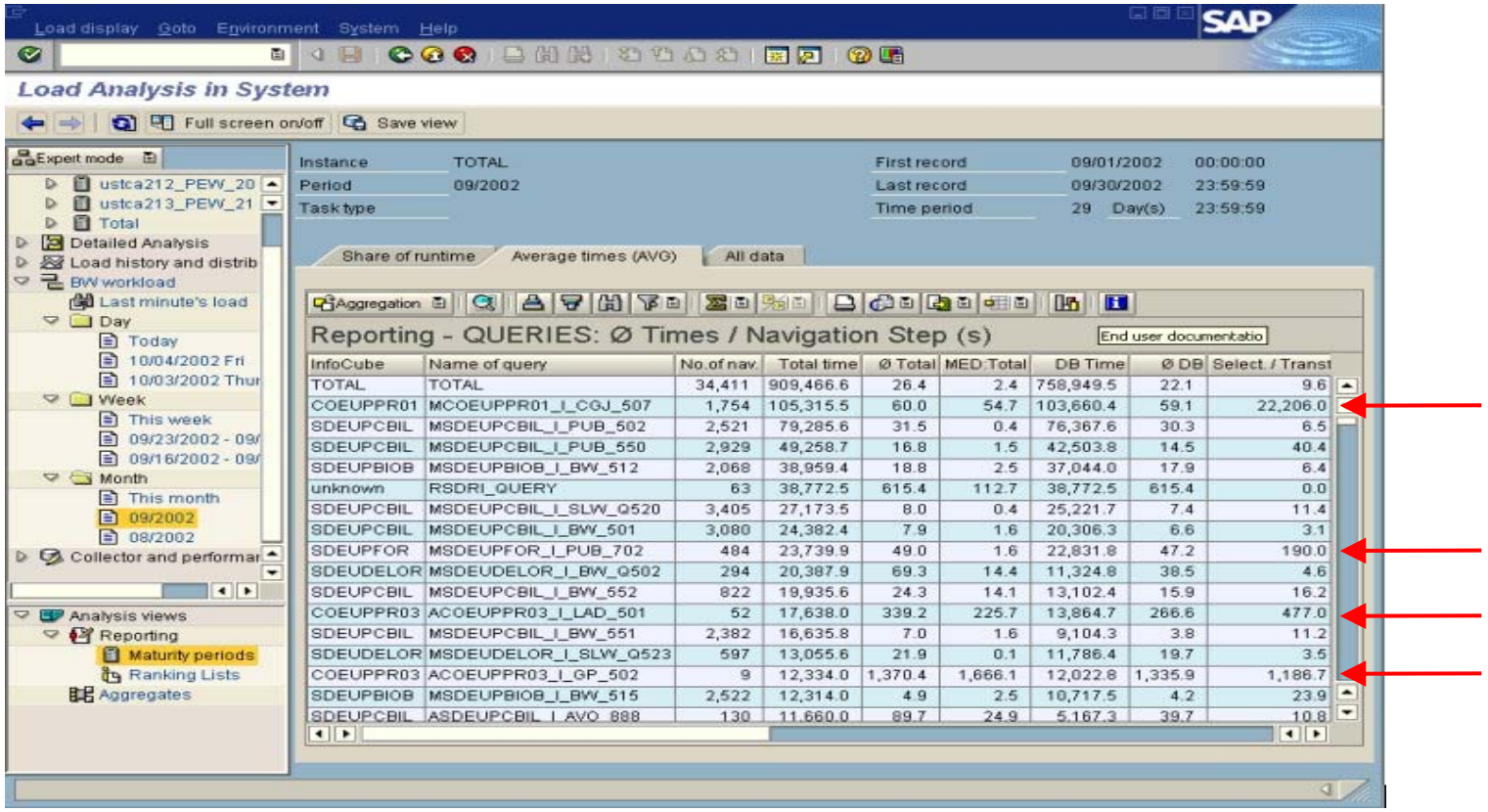
Start with the application – BW variant



InfoCube	No.Queries	No.of nav.	Total time	% OLAPINIT	% OLAP	% DB	% Frontend	% Mst.data	OLAPINIT ...	OLAP time
TOTAL	76	1,623	59,003.2	1.90	3.19	78.55	16.05	0.31	1,123.8	1,883.0
SDEUPCBIL	15	898	20,803.9	1.89	4.65	70.49	22.63	0.34	394.1	968.3
DPEUCC01	6	23	8,825.2	1.62	4.36	70.48	23.22	0.31	143.2	384.4
COEUPPR01	1	94	5,576.4	1.22	0.19	98.59	0.00	0.00	68.0	10.4
DPEUCC03	4	22	5,462.6	0.17	0.98	96.12	2.52	0.21	9.4	53.5
SDEUPBIOB	8	319	5,243.7	4.03	2.33	76.77	16.47	0.40	211.1	122.2
COEUPPR03	1	9	3,954.3	0.09	0.15	99.09	0.66	0.00	3.6	5.9
SDEUPFOR	5	106	2,734.9	1.78	2.27	91.77	3.96	0.22	48.7	62.0
0FIAR_C03	6	32	1,389.9	0.75	1.11	93.55	3.89	0.70	10.4	15.4
SDEUDELTR	3	10	1,158.0	2.40	10.04	31.64	54.96	0.96	27.8	116.3
MMEUINVCO	3	39	1,068.6	0.90	1.76	97.33	0.00	0.01	9.6	18.8
MMEUPPUI2	3	5	681.1	10.13	7.72	38.00	43.40	0.73	69.0	52.6
SDEUDELOR	2	9	568.6	2.67	1.48	83.75	10.46	1.64	15.2	8.4

- **SAP provides program response time statistics**
  - Time breakdown leads to next action
  - High DB > determine whether aggregate can be used

BW – could an aggregate help performance?



- **SAP provides query summarization ratio – select / transferred**
  - High ratio => aggregate would help performance
  - SAP ROT – consider aggregate for select/trans > 10

BW – is the query performance slow?

Microsoft Excel - ST03N query

File Edit View Insert Format Tools Data Window Help

A13 = unknown

	A	B	C	D	E	F	G	H	I	J	K	L
1	InfoCube	Name of query	Nav. steps	Total time	Sel/DB Time	Ø total	Med. total	OLAPINIT time	% OLAPINIT	Ø OLAPINIT	OLAP time	% OLAP
2	TOTAL	TOTAL	24,154.00	785,219.6	618.8	32.5	3.5	8,370.6	1.07	0.3	52,484.2	6.68
3	Z_SLS_ORD	QBPO0011	1,139.00	87,212.9	78.0	76.6	24.5	230.4	0.26	0.2	857.9	0.98
4	YIC_SSC	QBPSS0005A	2,428.00	38,912.3	1,609.4	16.0	5.4	523.4	1.35	0.2	10,134.3	26.04
5	YIC_SSC	QBPSS0005	2,357.00	34,653.8	2,339.4	14.7	3.3	424.0	1.22	0.2	7,959.3	22.97
6	Z_COPA_IC	QBPPA0006	2,133.00	30,498.6	2,092.3	14.3	5.4	681.9	2.24	0.3	4,359.8	14.30
7	Z_SLS_INV	QBPI0006	5,276.00	28,771.6	1,659.5	5.5	2.4	2,025.1	7.04	0.4	4,967.1	17.26
8	ZIC_SMPOS	QSELPOS01	859.00	27,300.0	2,261.6	31.8	5.5	261.2	0.96	0.3	2,556.9	9.37
9	ZIC_SFAPO	QSELMEDMTHL	879.00	20,278.4	1,257.3	23.1	4.5	210.9	1.04	0.2	827.0	4.08
10	ZIC_MINFC	QSELMTDSST0	436.00	19,338.5	653.8	44.4	4.5	388.9	2.01	0.9	1,131.0	5.85
11	Z_SLS_ORD	QBPO0001	760.00	19,084.5	42.9	25.1	3.5	90.5	0.47	0.1	1,303.0	6.83
12	ZIC_FAPSO	QSELNSAA02	372.00	16,306.5	2,509.8	43.8	7.5	108.8	0.67	0.3	680.3	4.17
13	unknown	3MOPZGD8SRIN	68.00	13,238.8	131.2	194.7	33.9	46.1	0.35	0.7	296.5	2.24
14	Z_SLS_ORD	QBPO0007	373.00	13,027.8	1,973.5	34.9	8.6	142.3	1.09	0.4	1,314.6	10.09
15	ZIC_SUM	QSELAAAST01	246.00	12,870.0	1,357.3	52.3	5.9	285.2	2.22	1.2	1,545.5	12.01
16	Z_SLS_INV	QBPI0001	1,043.00	12,142.0	2,746.4	11.6	4.5	267.0	2.20	0.3	3,278.9	27.00
17	ZIC_SFAPO	QSELMKTGBDC	165.00	11,940.0	2,842.9	72.4	6.3	115.1	0.96	0.7	440.0	3.69
18	ZIC_ORD	QSELSLSORD0	721.00	8,057.1	666.2	11.2	4.4	530.8	6.59	0.7	1,294.0	16.06

Sheet1

Draw AutoShapes

Ready Sum=15843739.37

- **If an aggregate is not a feasible solution, evaluate query performance (rows selected per second) to highlight slow queries**
- **Rows selected per second can be derived from SAP ST03N statistics**

IBM Systems and Technology Group University 2005

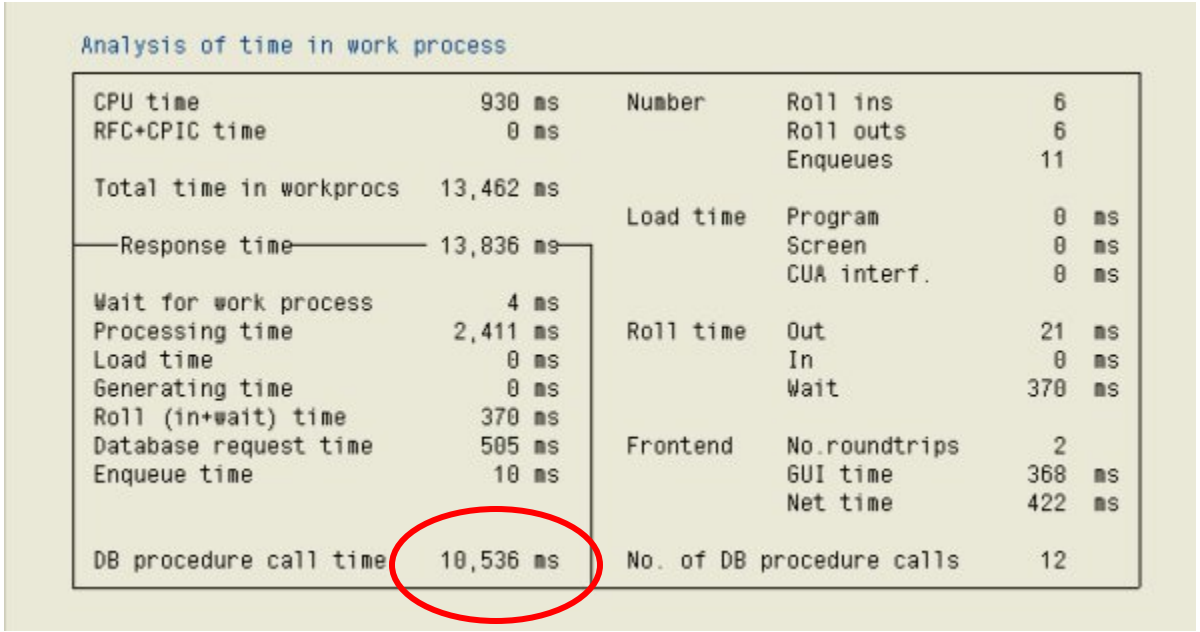
Analysis Process

SCM System

ON DEMAND BUSINESS™

1/8/2005

Start with the application – SCM variant



Analysis of time in work process

CPU time	930 ms	Number	Roll ins	6	
RFC+CPIC time	0 ms		Roll outs	6	
			Enqueues	11	
Total time in workprocs	13,462 ms				
		Load time	Program	0	ms
Response time	13,836 ms		Screen	0	ms
			CUA interf.	0	ms
Wait for work process	4 ms				
Processing time	2,411 ms	Roll time	Out	21	ms
Load time	0 ms		In	0	ms
Generating time	0 ms		Wait	370	ms
Roll (in+wait) time	370 ms				
Database request time	505 ms	Frontend	No.roundtrips	2	
Enqueue time	10 ms		GUI time	368	ms
			Net time	422	ms
DB procedure call time	10,536 ms	No. of DB procedure calls		12	

- **In addition to time categories in ERP system, SCM has DBPROC time for calls to Livecache**

Start with the application – SCM variant

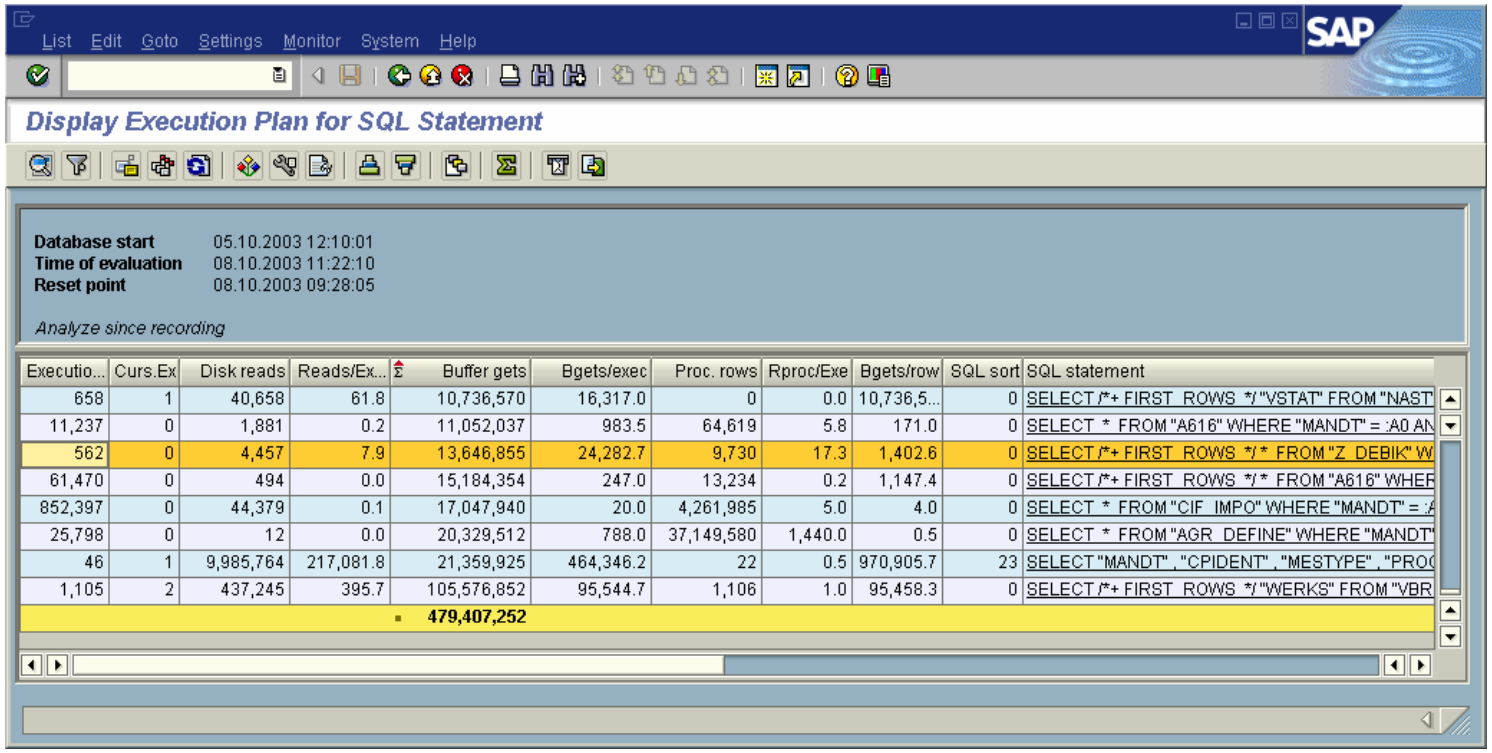
DB procedures (list might be incomplete!)

DB procedure	Log. DB connection	No. of exec.	Exec. time (ms)	Time / exec. (ms)
"SAPAPO_PP_ORDER_GET_DATA"	LCA	3	162,376	54,125.3
"SAPATP_DELTA_UPD_ATP"	LDA	1	1,528	1,528.0
"SAPAPO_TRANS_SIM_CONTROL"	LCA	3	823	274.3
"SAPATP_DELTA_UPD_ALLVPL"	LDA	2	201	100.5
"SAPAPO_PP_ORDMAP_SELECT"	LCA	1	4	4.0

- **The times of individual DBPROC calls can be viewed in the transaction details with STAD transaction**
- **If DBPROC call times are slow, investigate the performance of the Livecache server**


IBM
IBM Systems and Technology Group University 2005
Analysis Process
System-wide review
ON DEMAND BUSINESS™
1/8/2005
© 2005 IBM Corporation

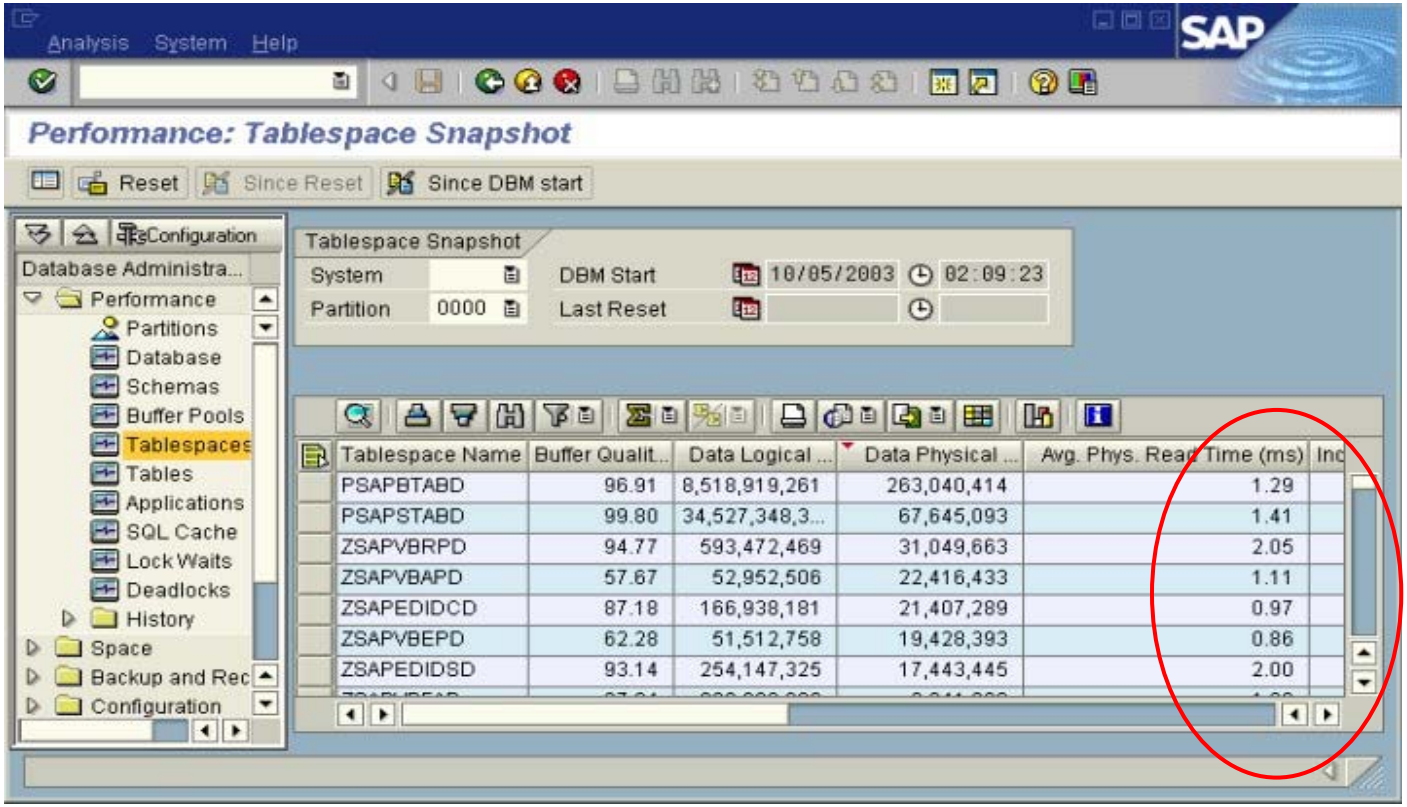
Search for inefficient SQL



Executio...	Curs.Ex	Disk reads	Reads/Ex...	Σ	Buffer gets	Bgets/exec	Proc. rows	Rproc/Exe	Bgets/row	SQL sort	SQL statement
658	1	40,658	61.8		10,736,570	16,317.0	0	0.0	10,736,5...	0	SELECT /*+ FIRST_ROWS */ "VSTAT" FROM "NAST"
11,237	0	1,881	0.2		11,052,037	983.5	64,619	5.8	171.0	0	SELECT * FROM "A616" WHERE "MANDT" = :A0 AN
562	0	4,457	7.9		13,646,855	24,282.7	9,730	17.3	1,402.6	0	SELECT /*+ FIRST_ROWS */ * FROM "Z_DEBIK" W
61,470	0	494	0.0		15,184,354	247.0	13,234	0.2	1,147.4	0	SELECT /*+ FIRST_ROWS */ * FROM "A616" WHER
852,397	0	44,379	0.1		17,047,940	20.0	4,261,985	5.0	4.0	0	SELECT * FROM "CIF_IMPO" WHERE "MANDT" = :A
25,798	0	12	0.0		20,329,512	788.0	37,149,580	1,440.0	0.5	0	SELECT * FROM "AGR_DEFINE" WHERE "MANDT"
46	1	9,985,764	217,081.8		21,359,925	464,346.2	22	0.5	970,905.7	23	SELECT "MANDT","CPIDENT","MESTYPE","PROC
1,105	2	437,245	395.7		105,576,852	95,544.7	1,106	1.0	95,458.3	0	SELECT /*+ FIRST_ROWS */ "WERKS" FROM "VBR
				▪	479,407,252						

- **High I/O activity and high CPU utilization on DB server can be a symptom of inefficient SQL**
- **Inefficient SQL = High Bgets/exec and Bgets/row in Oracle**
  - database must search lots of data to find small result set

Review I/O from the application perspective



- **Find active tablespaces with slow I/O**
  - No problems here

Review I/O from the application perspective

Microsoft Excel - ST04 tablespace

File Edit View Insert Format Tools Data Window Help

G50

	A	B	C	D	E	F	G
1	Tablespace Name	Buffer Quality	Avg. Phys. Read Time	Sync+Async I/O	Data Physical Rea	Index Physica	Data Physical Wri	Inde
2	PSAPSTABD	85.32	21.91	5,157,092	3,854,443	0	9,363	
3	PSAPBTABD	85.95	10.76	4,008,958	2,802,506	0	68,935	
4	ZSAPBSADD	61.78	7.60	2,429,837	1,693,088	0	1,531	
5	ZSAPBSISD	33.58	4.75	2,343,479	1,273,666	0	932	
6	PSAPTEMP2	54.21	8.67	1,226,169	407,298	0	263,755	
7	PSAPSTABI	98.76	28.63	801,475	853	782,507	7	
8	PSAPBTABI	97.53	16.93	714,789	1,519	663,748	14	

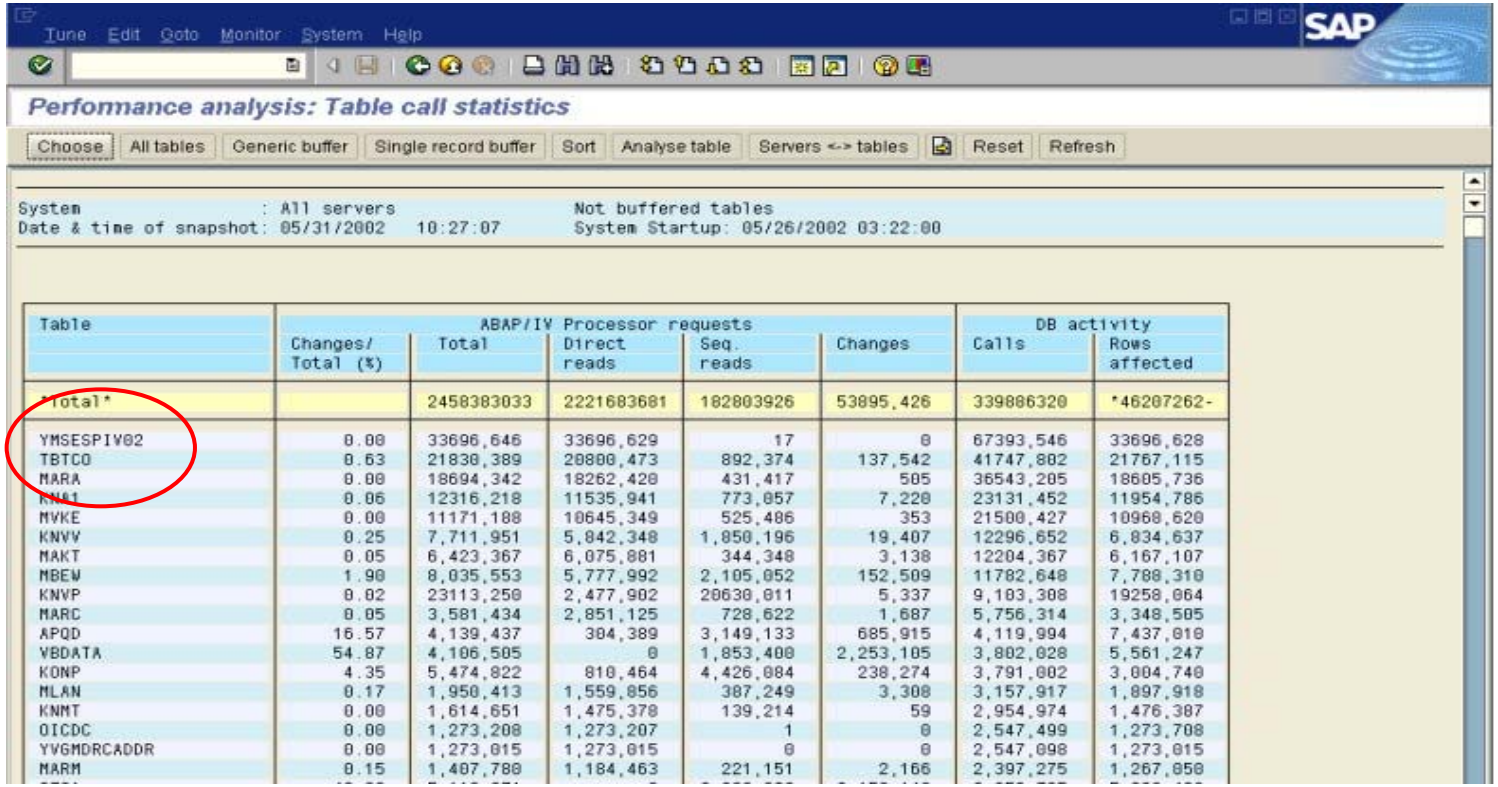
Sheet1

Draw AutoShapes

Ready

- **Find active tablespaces with slow I/O**
  - This is the same information as previous screen, processed in Excel
  - Determine LVs and corresponding hdisks/vpaths/hdiskpowers
  - Determine corresponding physical disks, and evaluate I/O activity

Offload DB with SAP buffering



Tune Edit Goto Monitor System Help

SAP

Performance analysis: Table call statistics

Choose | All tables | Generic buffer | Single record buffer | Sort | Analyse table | Servers <-> tables | Reset | Refresh

System : All servers — Not buffered tables
Date & time of snapshot: 05/31/2002 10:27:07 — System Startup: 05/26/2002 03:22:00

Table	ABAP/IV Processor requests					DB activity	
	Changes/ Total (%)	Total	Direct reads	Seq. reads	Changes	Calls	Rows affected
Total		2458383033	2221683681	182803926	53895,426	339886320	*46207262-
YMSESPIV02	0.00	33696,646	33696,629	17	0	67393,546	33696,628
TBTCO	0.63	21830,389	20800,473	892,374	137,542	41747,802	21767,115
MARA	0.00	18694,342	18262,420	431,417	505	36543,205	18605,736
KNA1	0.06	12316,218	11535,941	773,057	7,220	23131,452	11954,786
MVKE	0.00	11171,188	10645,349	525,486	353	21500,427	10968,620
KNVV	0.25	7,711,951	5,842,348	1,850,196	19,407	12296,652	6,834,637
MAKT	0.05	6,423,367	6,075,881	344,348	3,138	12204,367	6,167,107
MBEW	1.90	8,035,553	5,777,992	2,105,052	152,509	11782,648	7,788,310
KNVP	0.02	23113,250	2,477,902	20630,011	5,337	9,103,308	19258,064
MARC	0.05	3,581,434	2,851,125	728,622	1,687	5,756,314	3,348,505
APQD	16.57	4,139,437	304,389	3,149,133	685,915	4,119,994	7,437,018
VBDATA	54.87	4,106,505	0	1,853,400	2,253,105	3,802,028	5,561,247
KONP	4.35	5,474,822	810,464	4,426,084	238,274	3,791,002	3,004,740
MLAN	0.17	1,950,413	1,559,856	387,249	3,308	3,157,917	1,897,918
KNMT	0.00	1,614,651	1,475,378	139,214	59	2,954,974	1,476,387
OICDC	0.00	1,273,208	1,273,207	1	0	2,547,499	1,273,708
YVGMDRCADDR	0.00	1,273,015	1,273,015	0	0	2,547,098	1,273,015
MARM	0.15	1,407,780	1,184,463	221,151	2,166	2,397,275	1,267,850

- **ST10 to display calls and rows by table**
  - Many calls but very few changes > may be candidate for buffering – check technical settings and discuss with SAP experts

IBM Systems and Technology Group University 2005

Preventing Problems

1/8/2005

Preventing problems with ERP systems

- **Database layout**
  - Distribute I/O as much as possible
  - Plan for bandwidth, as well as capacity
  - Size of data files is important for JFS-structured database
- **Monitor impact of interfaces and bolt-ons**
  - SAP transaction statistics may not show activity
  - Review database statement cache
- **Code reviews of custom code and exits**
- **Use IBM sizing team and its methodology**

Preventing problems with BW systems

- **Database layout**
  - Distribute I/O as much as possible
  - Plan for bandwidth, as well as capacity
  - Size of data files is important for JFS-structured database
- **Aggregate analysis and definition**
  - Reduce the load of queries with summary tables (aggregates)
- **Query caching and pre-calculated web templates**
  - Reduce the load of queries by pre-generating and caching reports
- **Administrative choices**
  - SAP compression to E fact tables should be implemented
  - SAP compression done on a regular (weekly, monthly) cycle
  - Database statistics updated based on data flow, not time period
  - Use partitioning on infocubes and ODSes, if available

Preventing problems with SCM systems

- **Database layout**
  - Distribute I/O as much as possible for APO database
  - Plan for bandwidth, as well as capacity
  - Size of datafiles is important for JFS-structured database
- **Code reviews of custom code and exits**
- **Use IBM sizing team and its methodology**
  - Ensure sufficient memory for livecache database

Summary

Conclusion

- **Start with SAP performance indicators**
  - Align performance goals with business requirements
- **Consider high I/O or CPU activity to be symptoms of application problems, until application has been examined**
  - Database hit rates can be increased or decreased by problem SQL
  - High CPU use can be caused by inefficient ABAP, inefficient SQL, or administrative processes
  - High I/O activity can be caused by inefficient SQL or administrative processes
- **Administrative choices can cause performance and resource utilization problems**
  - BW
    - aggregates
    - SAP compression
    - Partitioning
  - ERP
    - SAP buffering
    - Custom code, Bolt-ons and interfaces

Additional Resources

- **Techdocs**
  - "Tuning SAP R/3 with Oracle on pSeries", document WP100377 at www.ibm.com/support/techdocs
  - "Configuring the Enterprise Storage Server (ESS) for Oracle OLTP Applications", document WP100319 at www.ibm.com/support/techdocs
  - "Database Layout for SAP Installations with DB2 UDB for UNIX and NT", at http://sap.torolab.ibm.com/white_papers.htm
  - "Tuning SAP / DB2 / zSeries", document WP100287 at www.ibm.com/support/techdocs

Thank you for your time

Questions?

Trademarks

The following are trademarks of the International Business Machines Corporation in the United States and/or other countries. For a complete list of IBM Trademarks, see www.ibm.com/legal/copytrade.shtml: AS/400, DBE, e-business logo, ESCO, eServer, FICON, IBM, IBM Logo, iSeries, MVS, OS/390, pSeries, RS/6000, S/30, VM/ESA, VSE/ESA, Websphere, xSeries, z/OS, zSeries, z/VM

The following are trademarks or registered trademarks of other companies

Lotus, Notes, and Domino are trademarks or registered trademarks of Lotus Development Corporation
Java and all Java-related trademarks and logos are trademarks of Sun Microsystems, Inc., in the United States and other countries
LINUX is a registered trademark of Linux Torvalds
UNIX is a registered trademark of The Open Group in the United States and other countries.
Microsoft, Windows and Windows NT are registered trademarks of Microsoft Corporation.
SET and Secure Electronic Transaction are trademarks owned by SET Secure Electronic Transaction LLC.
Intel is a registered trademark of Intel Corporation
* All other products may be trademarks or registered trademarks of their respective companies.

NOTES:

Performance is in Internal Throughput Rate (ITR) ratio based on measurements and projections using standard IBM benchmarks in a controlled environment. The actual throughput that any user will experience will vary depending upon considerations such as the amount of multiprogramming in the user's job stream, the I/O configuration, the storage configuration, and the workload processed. Therefore, no assurance can be given that an individual user will achieve throughput improvements equivalent to the performance ratios stated here.

IBM hardware products are manufactured from new parts, or new and serviceable used parts. Regardless, our warranty terms apply.

All customer examples cited or described in this presentation are presented as illustrations of the manner in which some customers have used IBM products and the results they may have achieved. Actual environmental costs and performance characteristics will vary depending on individual customer configurations and conditions.

This publication was produced in the United States. IBM may not offer the products, services or features discussed in this document in other countries, and the information may be subject to change without notice. Consult your local IBM business contact for information on the product or services available in your area.

All statements regarding IBM's future direction and intent are subject to change or withdrawal without notice, and represent goals and objectives only.

Information about non-IBM products is obtained from the manufacturers of those products or their published announcements. IBM has not tested those products and cannot confirm the performance, compatibility, or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products.

Prices subject to change without notice. Contact your IBM representative or Business Partner for the most current pricing in your geography.

References in this document to IBM products or services do not imply that IBM intends to make them available in every country.

Any proposed use of claims in this presentation outside of the United States must be reviewed by local IBM country counsel prior to such use.

The information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. IBM may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

Any references in this information to non-IBM Web sites are provided for convenience only and do not in any manner serve as an endorsement of those Web sites. The materials at those Web sites are not part of the materials for this IBM product and use of those Web sites is at your own risk.