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Cross Brand Sales, System z™ Software Technical Sales

Optimize IT hardware and software expenditures with Tivoli capacity planning and IBM business analytics webcast

Business Analytics Capacity Management Solution

Capacity Planning Solution Elements

- Gathering, categorizing, and storing, all system data
- Day to day management, service level monitoring, and historical trends
- "What-if" analysis on mainframe workloads and LPAR's
  - Sizing against different hardware
- Forecast and model data relationships at application level
  - Scaling test to production
  - Correlate business metrics to utilization
- Robust and flexible reporting giving greater reporting insight

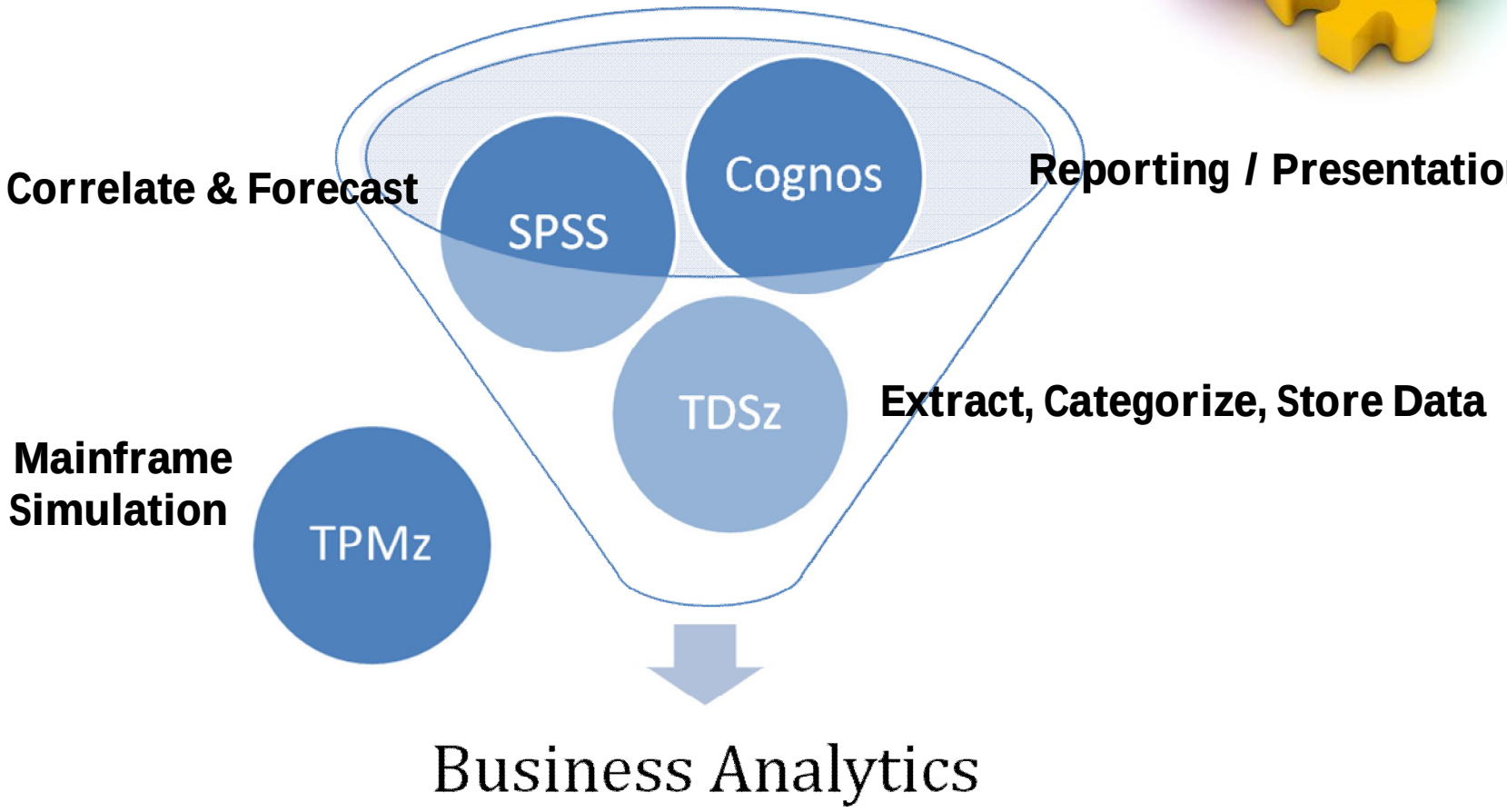
Solution Value

- Cost Avoidance - don't want to upgrade too early or too late
  - Delay hardware & software cost increases
    - Hardware costs are decreasing, while software costs are increasing
  - Avoid penalties by ensuring service level agreements are met

- More Flexible Reporting
  - Using standardized, compliant, and secure tools

- Leverage Predictive/Forecasting Analytics for deeper insight and more optimal planning
  - Gain better insight of resources
  - Plan for future based on historical performance
  - Understand what-if scenarios as business grows
  - Manage SLAs more closely
  - Balance workload based on business targets

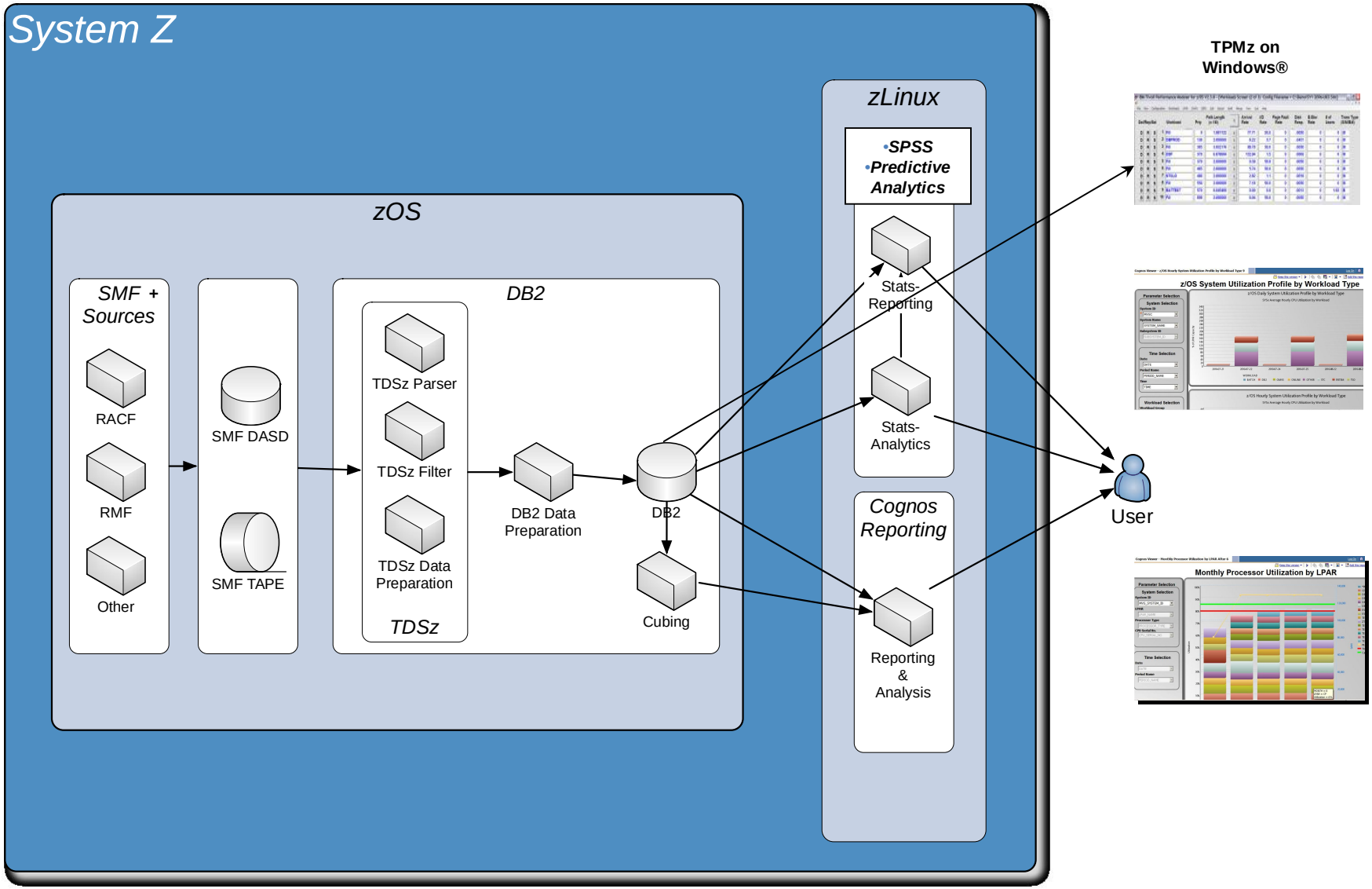
Solution Capabilities & Components



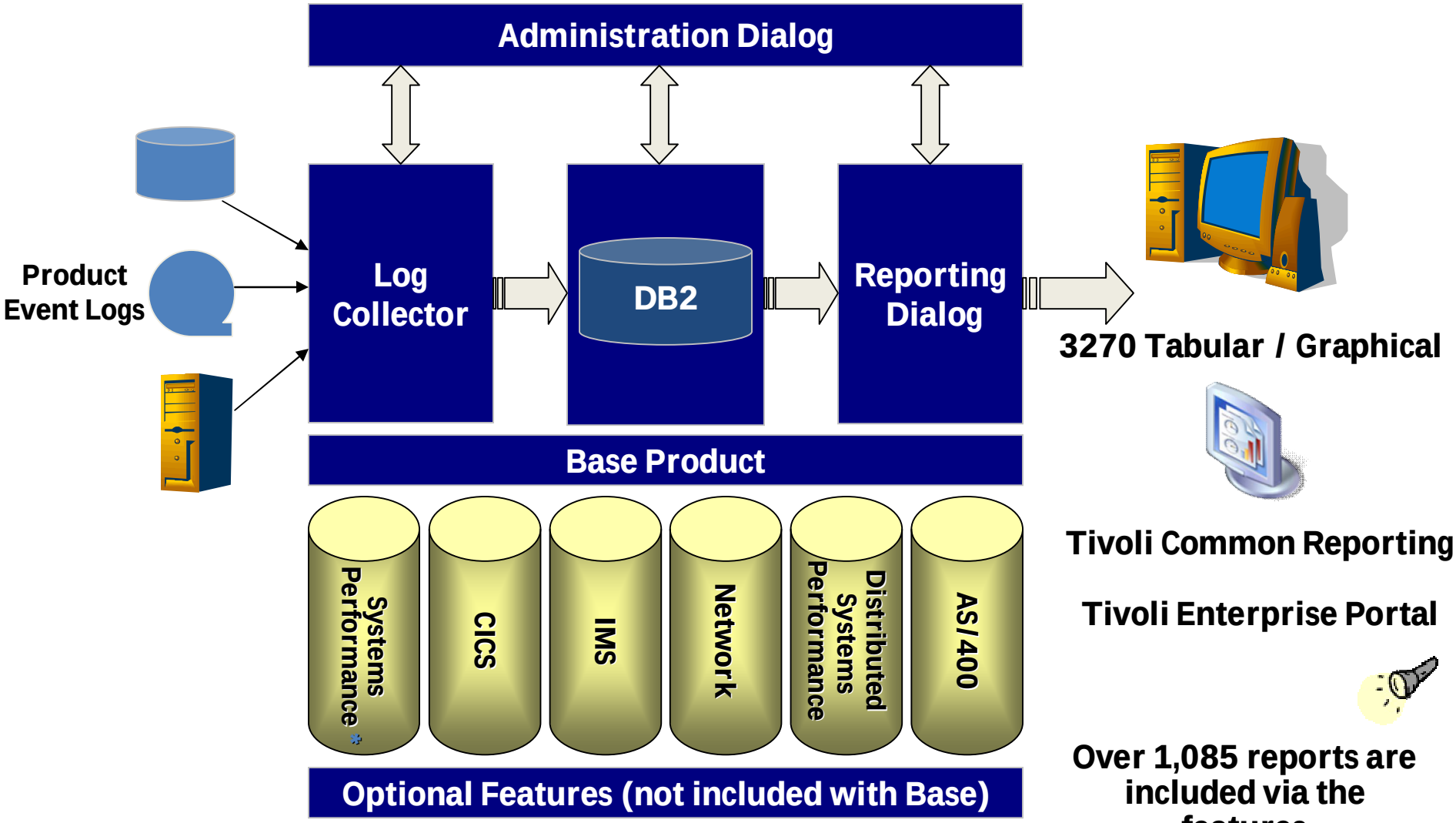
Component Summary

- Tivoli Decision Support for z/OS (TDSz)
  - Measure SLA compliance
  - Quantify increased IT resource consumption or abnormal spikes
  - Compare trends to pinpoint where consumption has increased
  - Converts raw systems management data into business-relevant information
  - Basis for mainframe accounting
- Cognos 10 Business Intelligence
  - Report / Presentation layer
- Tivoli Performance Modeler for z/OS (TPMz)
  - Model z/OS workload performance
    - HiperDispatch
    - At 100% utilization
  - Extensive “what-if” scenarios
    - Growth, Balancing
    - LPAR level, too
  - Average service class response
- SPSS Modeler
  - Granularity / Statistical
  - Forecasting / Prediction
  - Application performance model
  - Correlation of data / relationships
  - Use beyond Capacity Planning

Solution Architecture



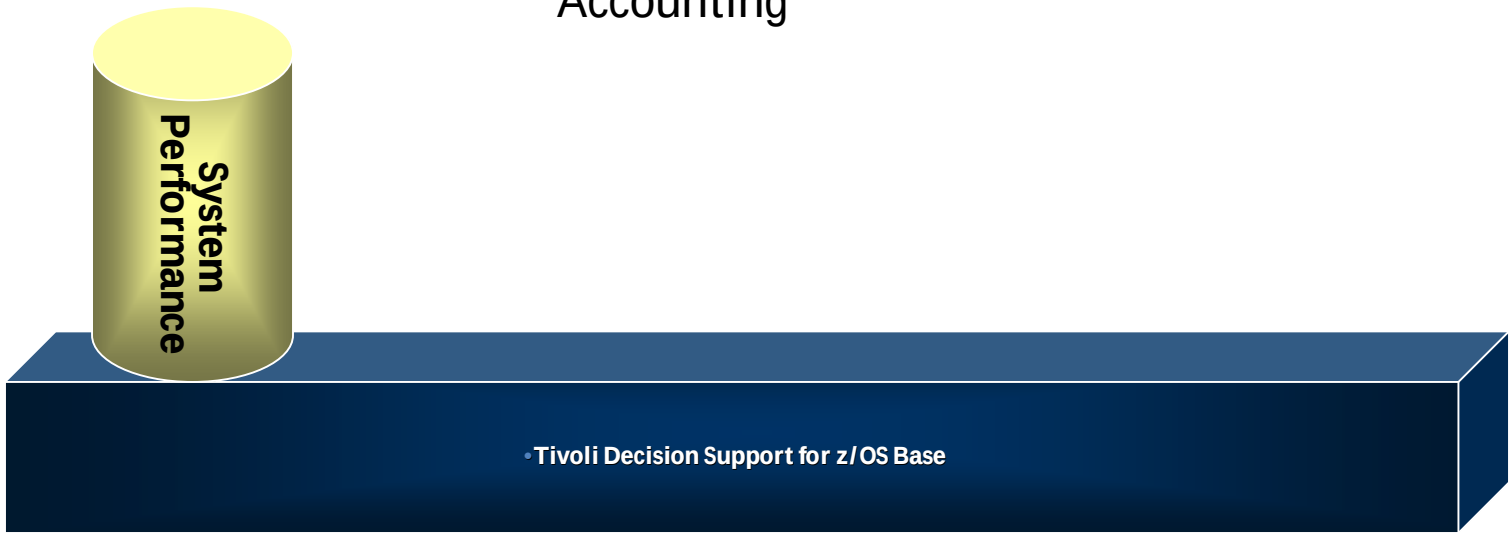
Tivoli Decision Support for z/OS



TDSz System Performance Feature

Includes the following components (**partial list**):

Data set	Lotus Domino	HTTP Server
DB2	TCP/IP	WebSphere Application Server
SMS	Tivoli Workload Scheduler for z	WebSphere Message Broker
RMM	z/OS System	WebSphere MQ for z
RACF	z/OS Performance Mgmt	z/VM Performance
Message Analysis	z/OS Interval Job/Step Accounting	z/Linux



TDS/z System Performance Feature

A partial listing of reports produced:

z/OS System Reports

MVS Exceptions, Daily
MVS No of System Abends by Abend Code, Monthly
MVS No of User Abends by Abend Code, Monthly
MVS Percent Abended Jobs by User Group, Monthly
MVS No of Canceled Batch Jobs by User Group, Daily
MVS Abended Jobs by User Group, Daily
MVS System Overview, Monthly Trend
MVS Average No of Address Spaces, Monthly Trend
MVS Activity by User Group, Daily/Monthly Overview
MVS Activity for a User Group, Daily Trend
MVS Users Swapped Out and Ready, Daily Profile
MVS Workload by Workload Type, Monthly Trend
MVS Sysplex Overview, Monthly Trend
MVS Availability by Sysplex, Monthly Trend
MVS Workload for a Resource Group, Daily/Monthly Trend
MVS Workload by Resource Group, Daily/Monthly Overview
MVS Response (Goal in %), Daily/Monthly Trend
MVS Response (Goal in %), Daily/Monthly Overview
MVS Response (Goal in sec), Daily/Monthly Trend
MVS Response (Goal in sec), Daily/Monthly Overview
MVS Exec Velocity (Goal in %), Daily/Monthly Trend
MVS Exec Velocity (Goal in %), Daily/Monthly Overview
MVS Response Time Distribution, Daily/Monthly Overview
MVS TSO Response Time by Workload, Daily Profile
MVS TSO Response Time by Workload, Daily/Monthly Trend

z/OS System Reports (continued)

MVS TSO Response Time, Peak Hour, Daily Trend
MVS Number of TSO Users, Daily Profile
MVS TSO Transactions by Workload, Daily Profile
MVS TSO Transactions by Workload, Daily/Monthly Trend
MVS TSO Transactions, Peak Hour, Daily Trend
MVS Job Statistics by User Group, Monthly Overview
MVS Job Statistics for a User Group, Daily Trend
MVS Number of Jobs with Tape Mounts, Daily Trend
MVS Job Statistics by Period and User Group, Daily
MVS Jobs with RACF S913 Abends, Daily
MVS Jobs with Input Queue Time > 10 Min, Daily
MVS Jobs with Tape, Daily
MVS Most CPU Consuming Programs, Monthly Overview
MVS Most I/O Intensive Programs, Monthly Overview
MVS Most CPU Losing Programs, Monthly Overview
MVS CPU Usage by Job Account Field and Program, Daily
MVS Interval Account Statistics, Detail
MVS Number of IPLs, Daily Trend
MVS IPLs by Reason Code, Daily
MVS CPU Load by Period, Daily/Monthly Trend
MVS CPU Load by Workload Type, Daily/Monthly Trend
MVS CPU Load by Workload Type, Peak Hour, Daily
MVS CPU Load by Workload Type, Daily Profile
MVS Average and Maximum CPU Load, Daily Profile
MVS CPU Load by LPAR, Daily/Monthly Trend

TDS/z System Performance Feature

A partial listing of reports produced:

MVS Availability Component Reports

MVS Availability not within Target, Daily Trend
MVS Availability, Daily/Monthly Trend
MVS Availability for a Sysplex, Daily/Monthly Trend

z/OS Performance Management Component Reports

MVSPM Workload Descriptions
MVSPM Goal mode Workload Descriptions
MVSPM CPU and Processor Storage Activity Overview
MVSPM Workload Resource Utilization Overview
MVSPM Workload Response Time Components Overview
MVSPM Response Time Goals vs Actuals, Overview
MVSPM Execution Velocity Goals & Actuals, Overview
MVSPM DASD Activity Overview
MVSPM Average CPU Busy, Daily/Hourly Trend
MVSPM Average CPU Busy Profile, Hourly Trend
MVSPM CPU Busy and Other Indicators, Hourly Trend
MVSPM System Central Storage Map, Hourly Trend
MVSPM System Expanded Storage Map, Hourly Trend
MVSPM Minimum Available Exp Storage, Hourly Trend
MVSPM Average High UIC Profile, Hourly Trend
MVSPM Page Data Set Response Time, Hourly Trend
MVSPM Page Data Set Device Resp Time, Hourly Trend
MVSPM Page Data Set Busy Time, Hourly Trend
MVSPM System Storage Paging Rates, Hourly Trend

z/OS Performance Management Component Reports (continued)

MVSPM CPU Busy Profile Shared LPARs, Hourly Trend
MVSPM CPU Busy by Shared LPARs, Hourly Trend
MVSPM Percent of Share Used by LPARs, Hourly Trend
MVSPM LPAR Management Time, Hourly Trend
MVSPM Avg CF Busy Profile, Hourly Trend
MVSPM Avg CF Storage Usage, Hourly Trend
MVSPM CF, Processor and Storage, Overview
MVSPM CF, Request Rate, Overview
MVSPM CF, System Details, Overview
MVSPM CF, Structures Details, Overview
MVSPM MIPS for Machine Model List
MVSPM MIPS for specific System ID
MVSPM MIPS for System ID Hourly List
MVSPM Total CPU MIPS per LPAR and System
MVSPM System Resources by Workload Type
MVSPM CPU Busy by Workload Types, Hourly Trend
MVSPM CPU Busy by Workload PGNs, Hourly Trend
MVSPM Storage Used by Workload Type, Hourly Trend
MVSPM Storage Used by Workload PGNs, Hourly Trend
MVSPM I/O Rate by Workload Types, Hourly Trend
MVSPM CPU per I/O by Workload Type, Hourly Trend
MVSPM CPU per I/O by Workload PGNs, Hourly Trend
MVSPM Page-ins by Workload Types, Hourly Trend
MVSPM Paging Activity by Workload, Hourly Trend

TDSz Distributed Systems Performance Feature

Includes the following components:

Unix Performance (Sun Solaris, HP-UX, AIX)

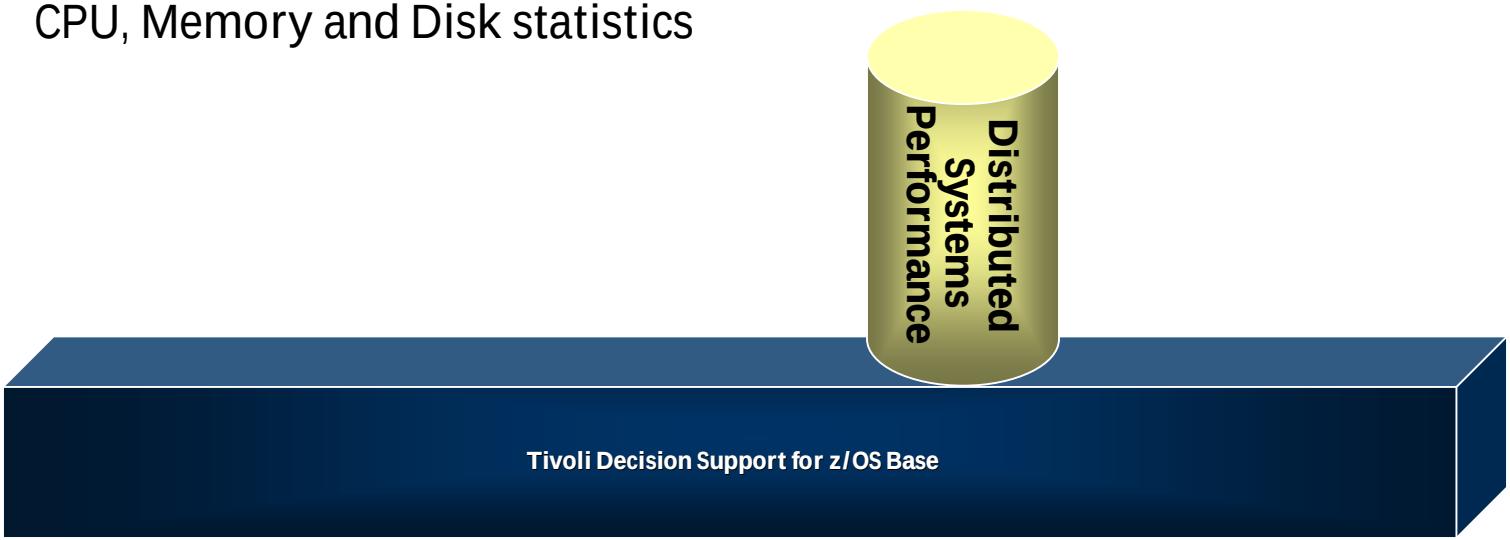
- Accounting, Performance, Configuration and Error Analysis subcomponents

Linux Performance (RedHat, SUSE, TurboLinux)

- Performance subcomponent

Windows (2003 and 2008 Servers) NEW

- CPU, Memory and Disk statistics



TDS/z Distributed Systems Performance Feature

A partial list of reports produced:

UNIX Component Reports

UNIX Acct Commands by User, Daily Overview
UNIX Acct Users by Command, Daily Overview
UNIX Acct Cmd Resource Consumption, Daily Overview
UNIX Acct User Resource Usage, Monthly Overview
UNIX Acct Disk Blocks by User, Monthly Overview
UNIX Acct Disk Blocks in 1000s, Monthly Trend
UNIX Acct Users and Connects, Daily Overview
UNIX Acct Printed Pages by User, Monthly Overview
UNIX Acct Printed Pages by System, Monthly Overview

UNIX Configuration of HW for a System, Overview
UNIX Configuration of HW for Device Class, Overview
UNIX Configuration of SW for a System, Overview
UNIX Configuration of SW for Object, Overview

UNIX Error by ID, Daily Overview
UNIX Error by Type, Daily Overview
UNIX Error by Class, Daily Overview
UNIX Error by Resource, Daily Overview
UNIX Error by Resource, Monthly Trend

UNIX Perf CPU Utilization by System, Hourly Trend
UNIX Perf CPU Utilization by System, Daily Overview
UNIX Perf Statistics by System, Hourly Trend
UNIX Perf Statistics all Systems, Daily Overview
UNIX Perf Vol Group and File Syst, Daily Overview
UNIX Perf Disk I/O for a Disk, Hourly Trend
UNIX Perf Disk I/O for System, Daily Overview
UNIX Perf Page Space Utilization, Hourly Trend

TDS/z Distributed Systems Performance Feature

A partial list of reports produced:

LINUX & Windows Component Reports

LINUX Percentile Work Size
LINUX Disk Space Allocation
LINUX Performance from User Memory
LINUX Performance 'PS' for Volumes Info
LINUX Hardware Configuration
LINUX Software Configuration
LINUX User Information
LINUX Process Information
LINUX Performance 'VM' for Swap Memory
LINUX Performance 'VM' for CPU

Windows Disk Usage for System, Hourly Trend
Windows Disk Usage for Device, Daily Overview
Windows CPU Utilization by System, Hourly Trend
Windows CPU Utilization by System, Daily Overview
Windows Memory Usage by System, Hourly Trend
Windows Memory Usage by System, Daily Overview
Windows System Overview Report

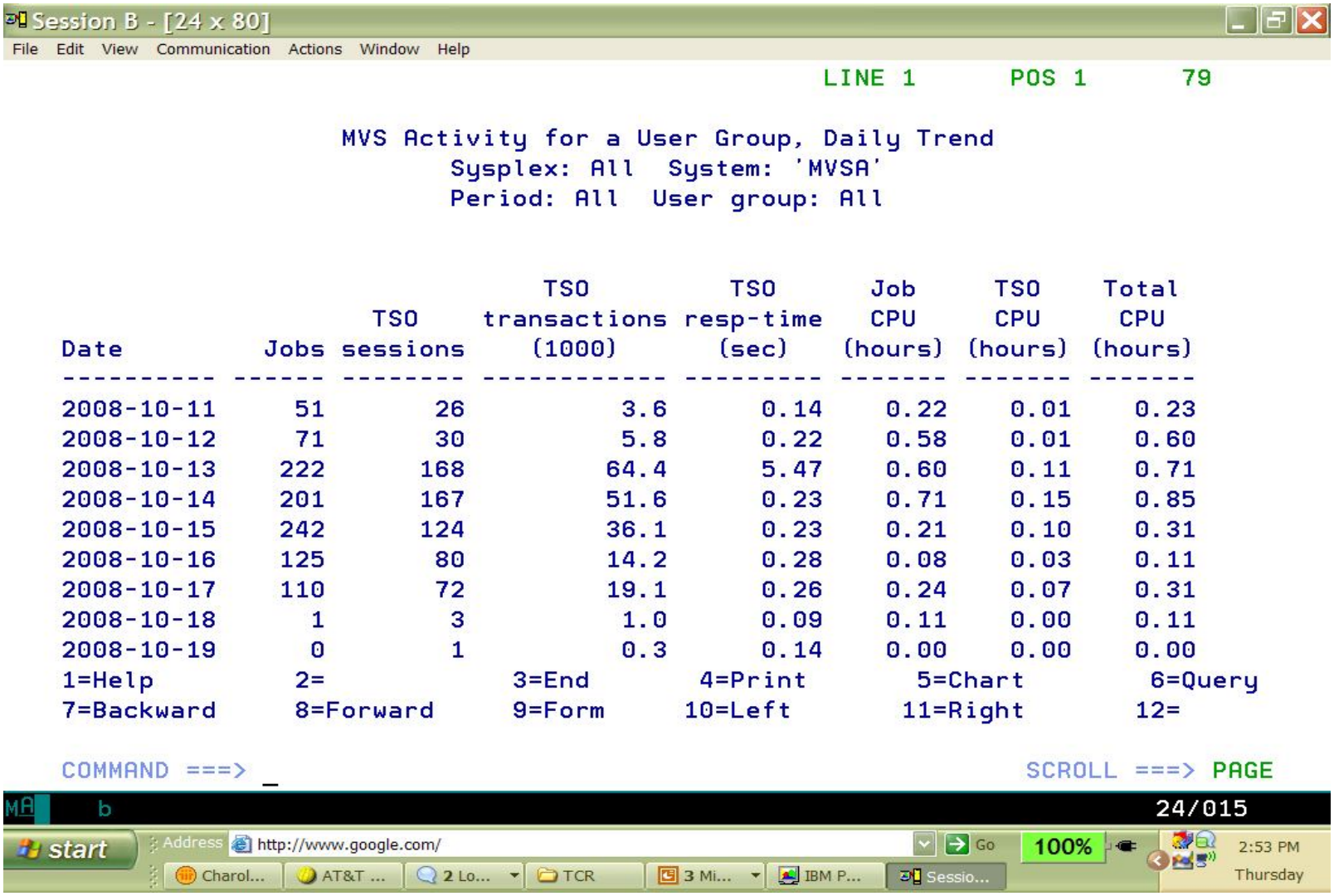
Examples of Reports Available in TDSz

- Traditional 3270/ISPF Reports
  - MVS Activity for a User Group, Daily Trend
  - DB2 System CPU % by Address Space, Overview (graph)
  - DB2 System CPU % by Address Space, Overview (table)

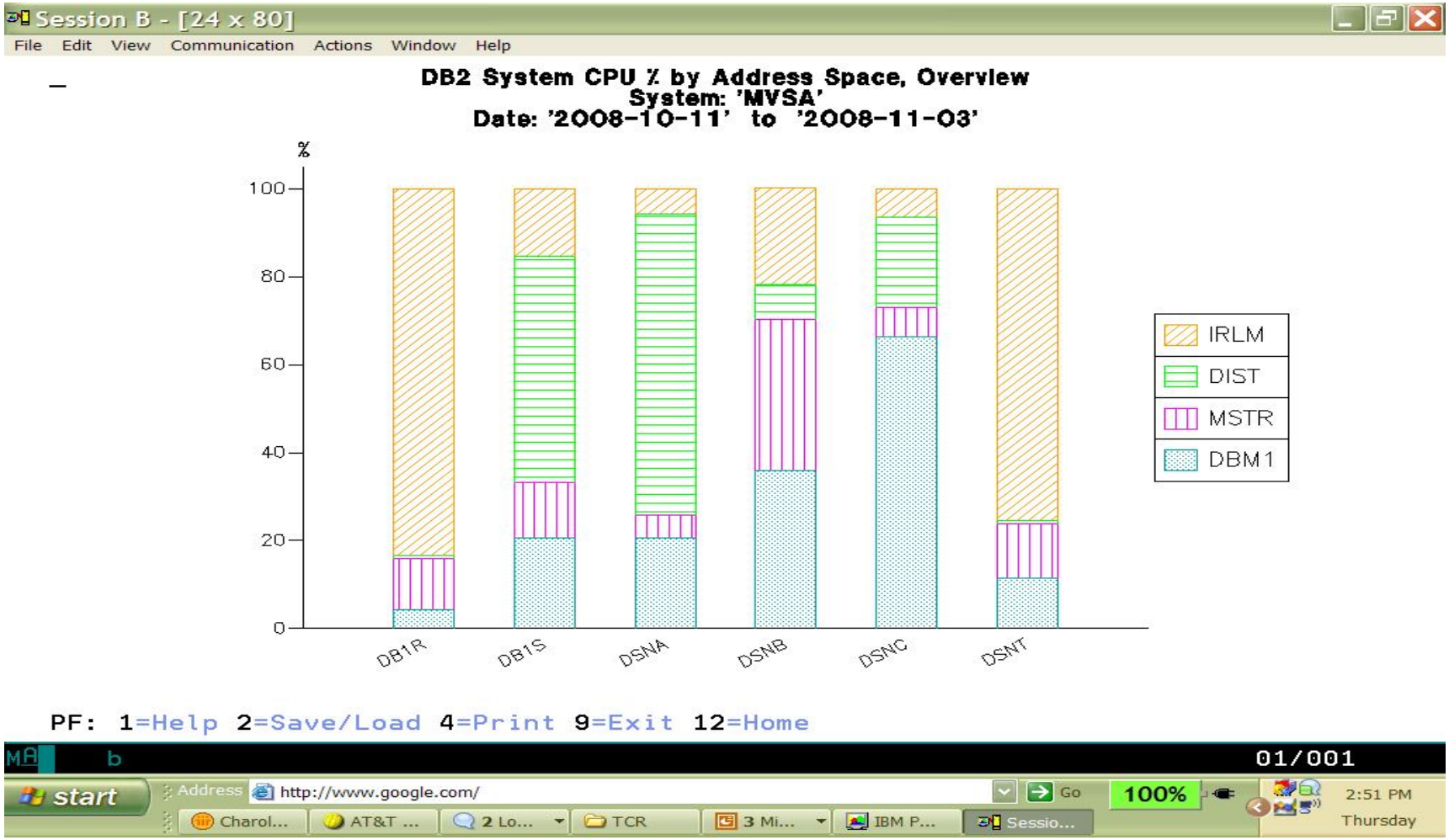
- Tivoli Enterprise Portal (TEP) Reports
  - DB2 Correlations for DB2 Systems
  - DB2 Correlation History

- Tivoli Common Reporting (TCR) Reports
  - MVSPM09 – CPU Busy and Other Indicators Hourly Trend
  - DB210 – DB2 System CPU by Address Space Overview

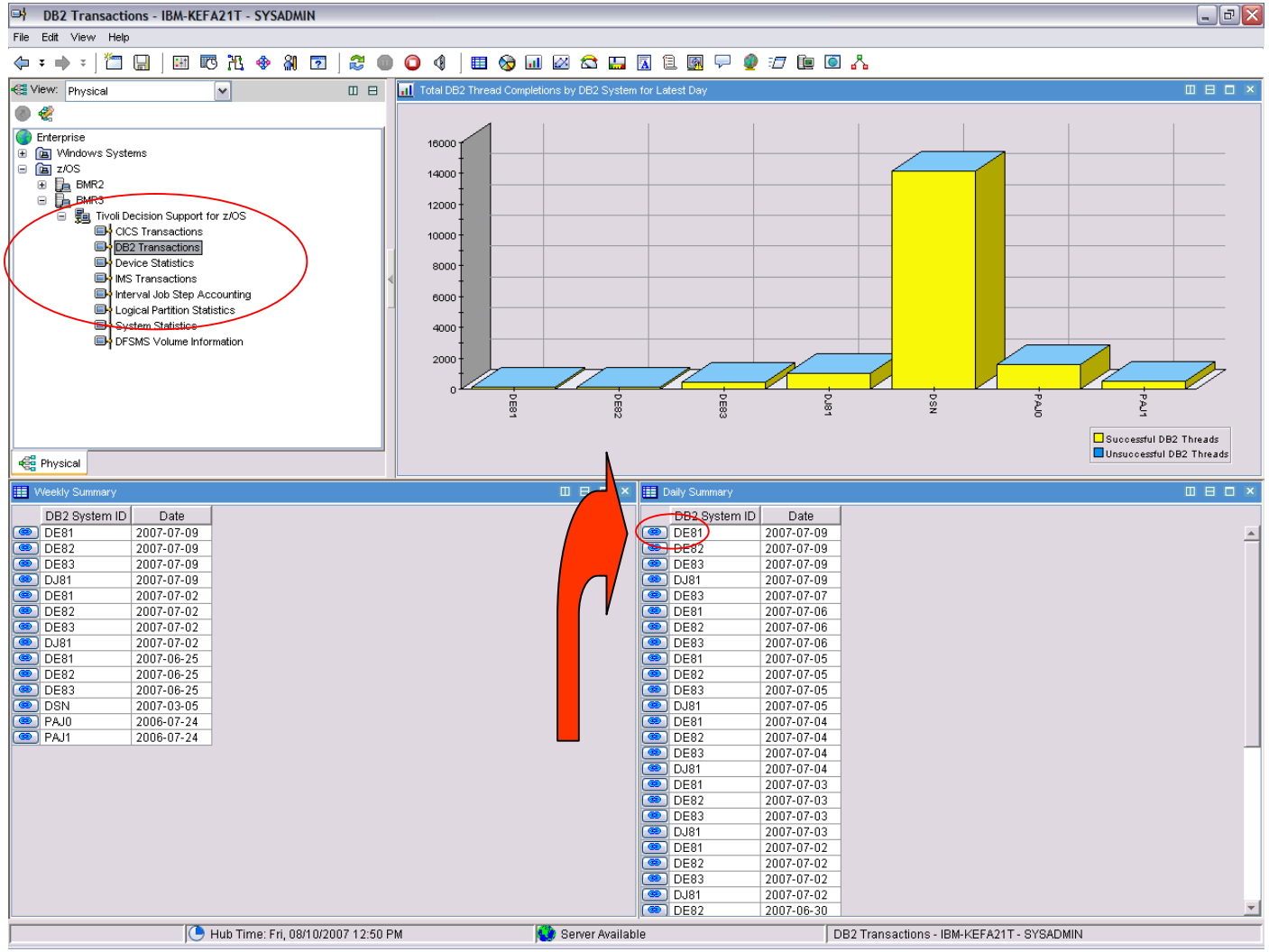
MVS Activity for a User Group, Daily Trend (ISPF)



DB2 System CPU % by Address Space, Overview (ISPF)

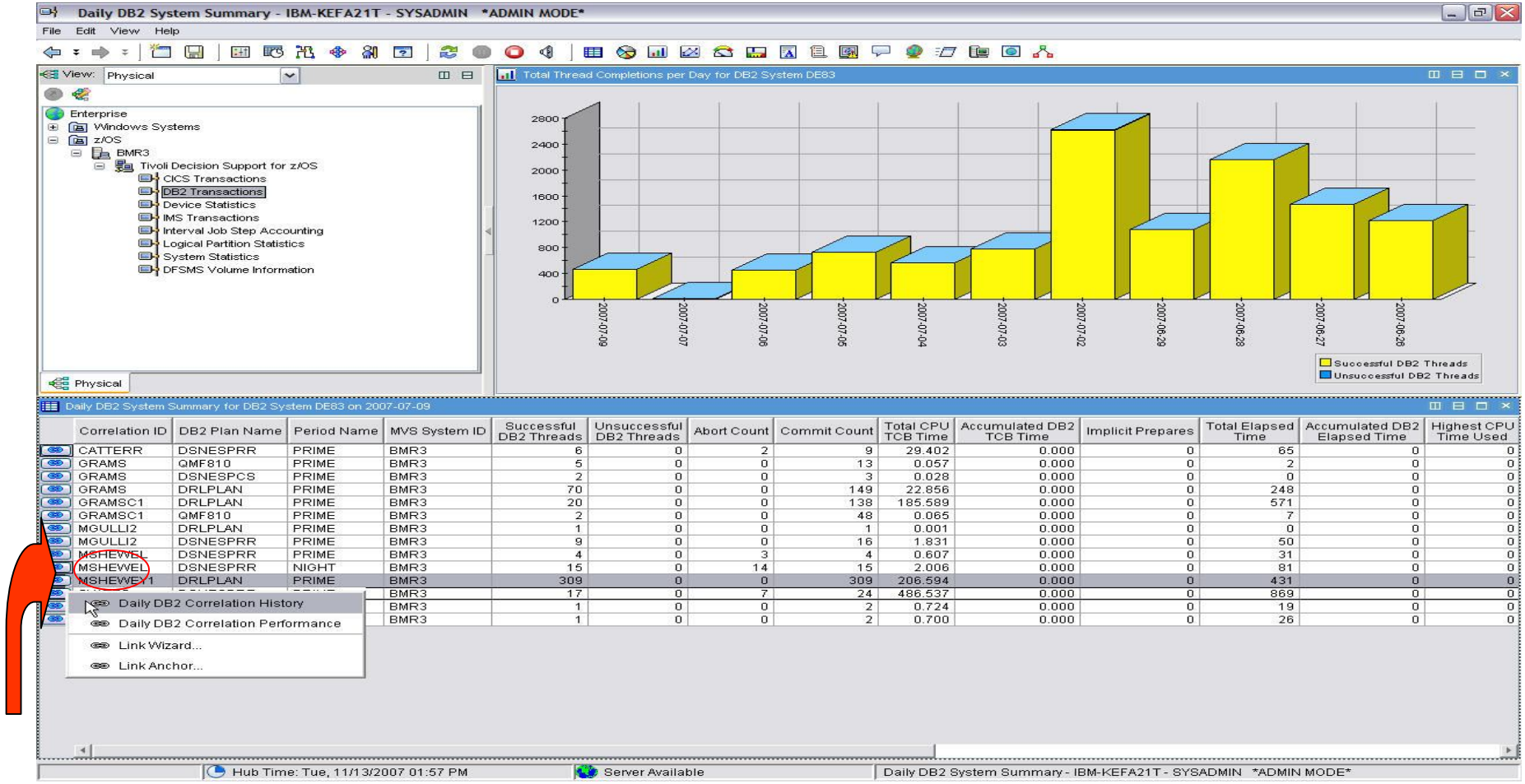


TEP Samples – DB2 Initial Workspace



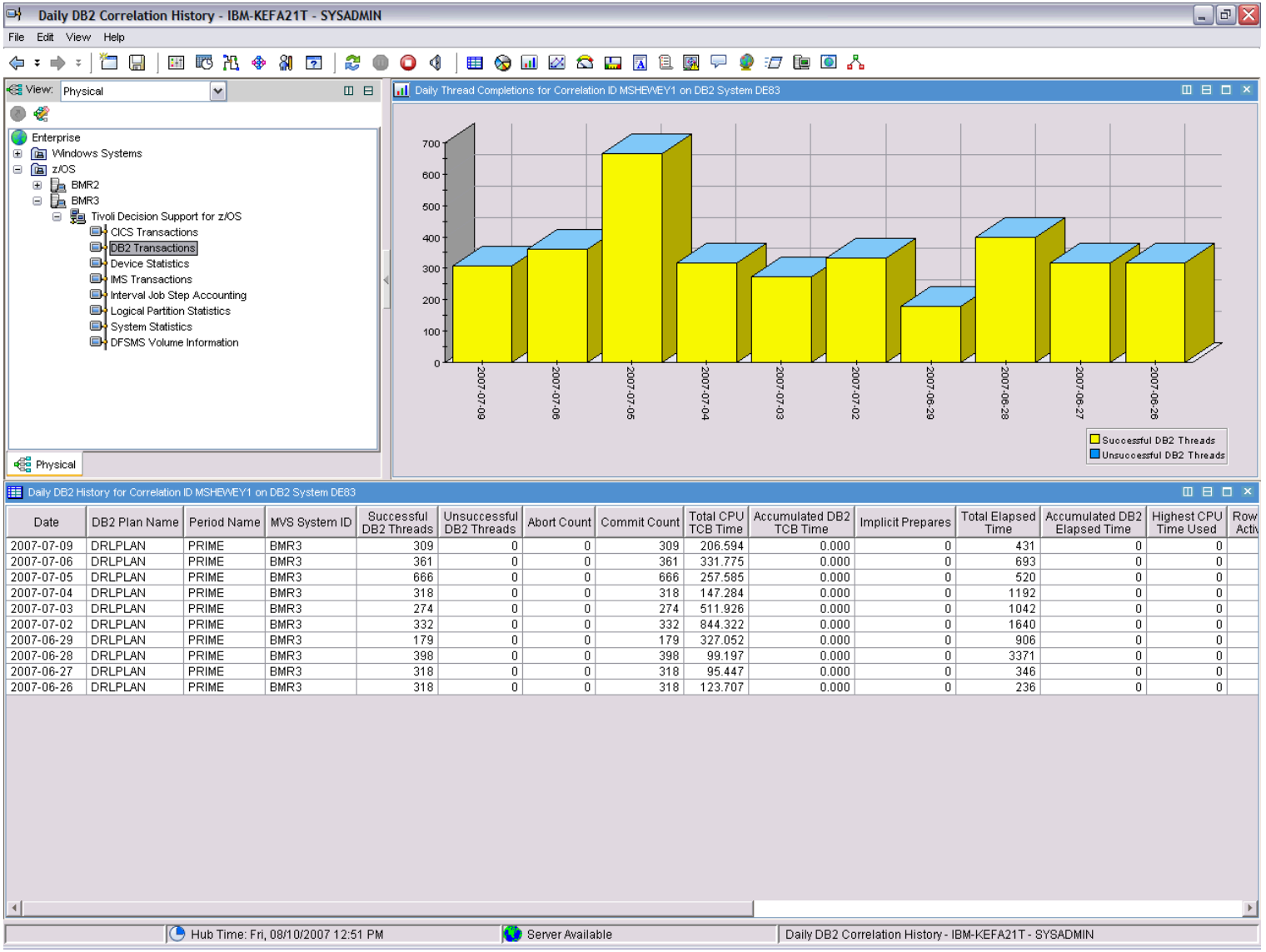
Select this DB2 System Id and Date to link to all DB2 Correlations for DB2 System

TEP Samples – DB2 Correlations for DB2 Systems



Select this Correlation ID for links to history and performance workspaces

TEP Samples – DB2 Correlation History



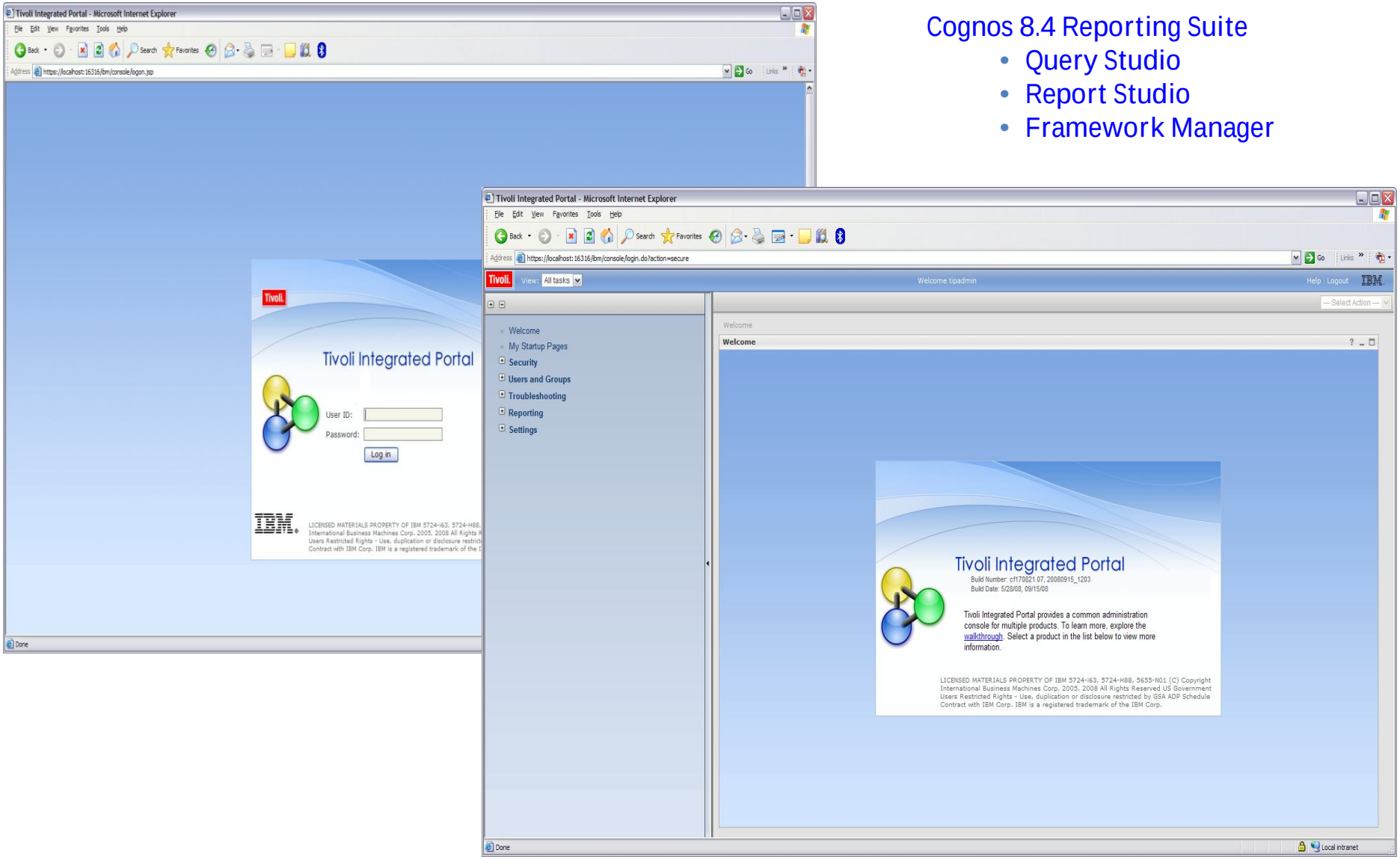
Date	DB2 Plan Name	Period Name	MVS System ID	Successful DB2 Threads	Unsuccessful DB2 Threads	Abort Count	Commit Count	Total CPU TCB Time	Accumulated DB2 TCB Time	Implicit Prepares	Total Elapsed Time	Accumulated DB2 Elapsed Time	Highest CPU Time Used	Row Activ
2007-07-09	DRLPLAN	PRIME	BMR3	309	0	0	309	206.594	0.000	0	431	0	0	
2007-07-06	DRLPLAN	PRIME	BMR3	361	0	0	361	331.775	0.000	0	693	0	0	
2007-07-05	DRLPLAN	PRIME	BMR3	666	0	0	666	257.585	0.000	0	520	0	0	
2007-07-04	DRLPLAN	PRIME	BMR3	318	0	0	318	147.284	0.000	0	1192	0	0	
2007-07-03	DRLPLAN	PRIME	BMR3	274	0	0	274	511.926	0.000	0	1042	0	0	
2007-07-02	DRLPLAN	PRIME	BMR3	332	0	0	332	844.322	0.000	0	1640	0	0	
2007-06-29	DRLPLAN	PRIME	BMR3	179	0	0	179	327.052	0.000	0	906	0	0	
2007-06-28	DRLPLAN	PRIME	BMR3	398	0	0	398	99.197	0.000	0	3371	0	0	
2007-06-27	DRLPLAN	PRIME	BMR3	318	0	0	318	95.447	0.000	0	346	0	0	
2007-06-26	DRLPLAN	PRIME	BMR3	318	0	0	318	123.707	0.000	0	236	0	0	

TCR Web Initialization / Login

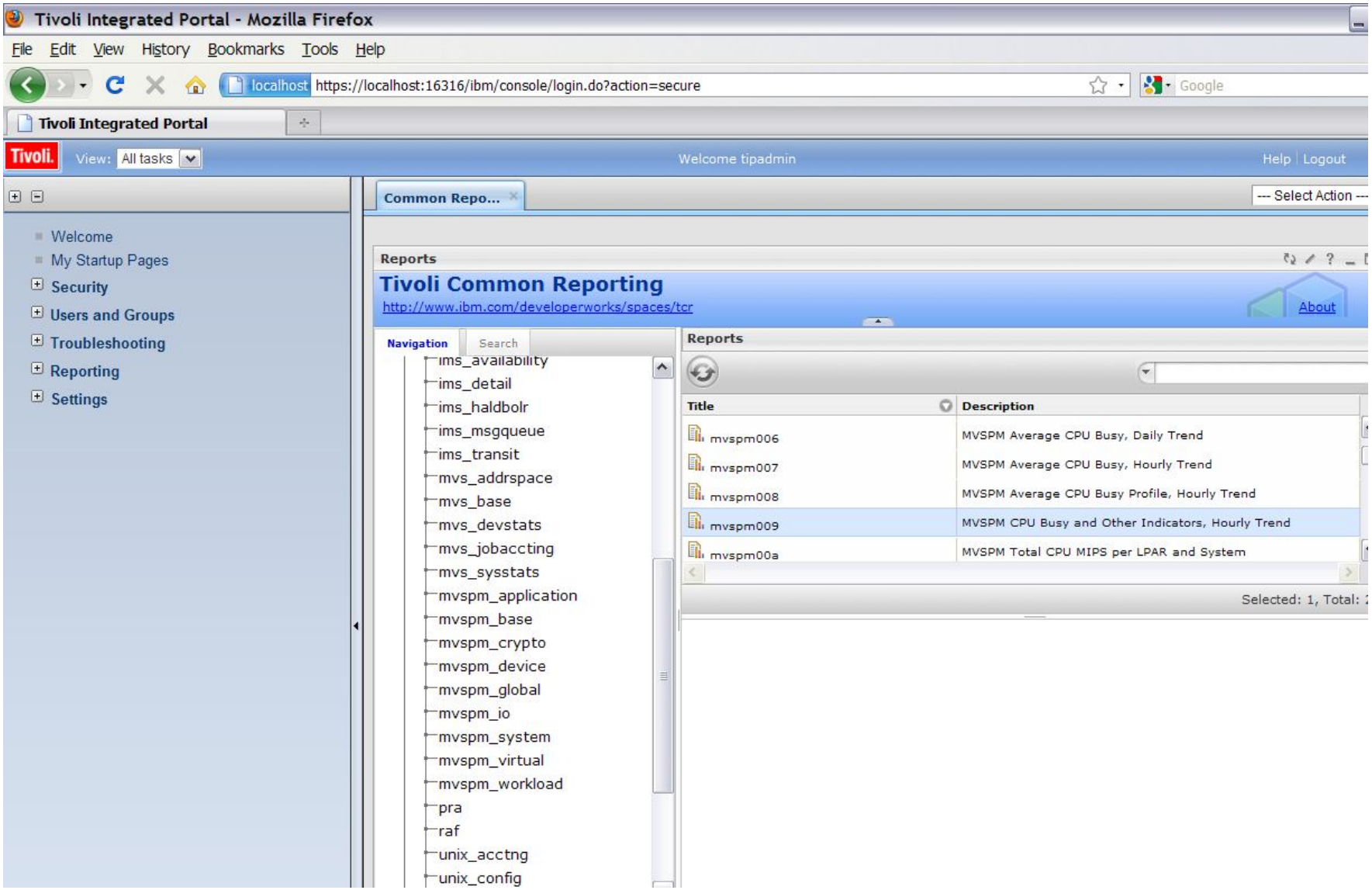
Exploitation of TCR v2.1 underway

Cognos 8.4 Reporting Suite

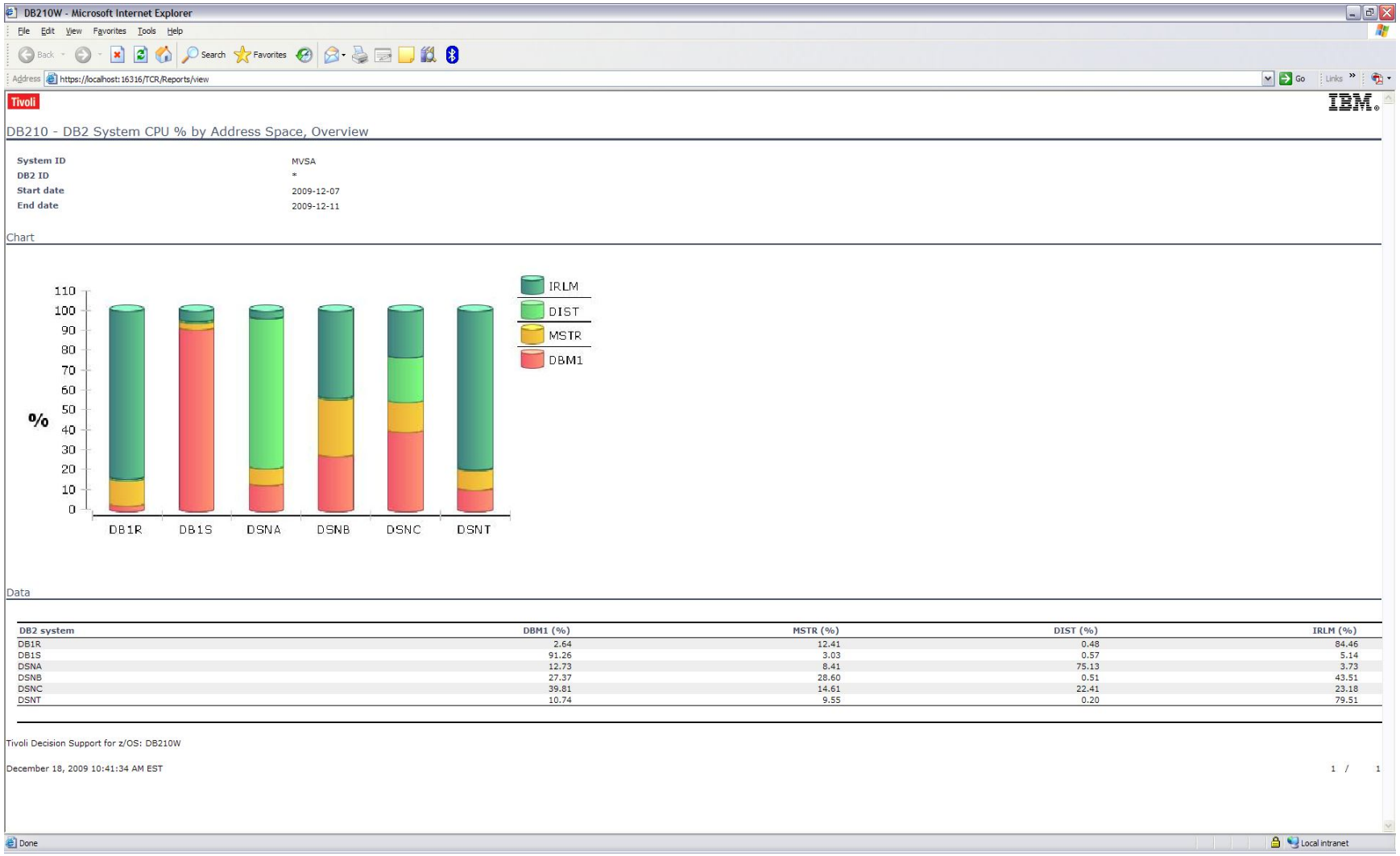
- Query Studio
- Report Studio
- Framework Manager



TCR Report Navigation



DB210 – DB2 System CPU by Address Space Overview



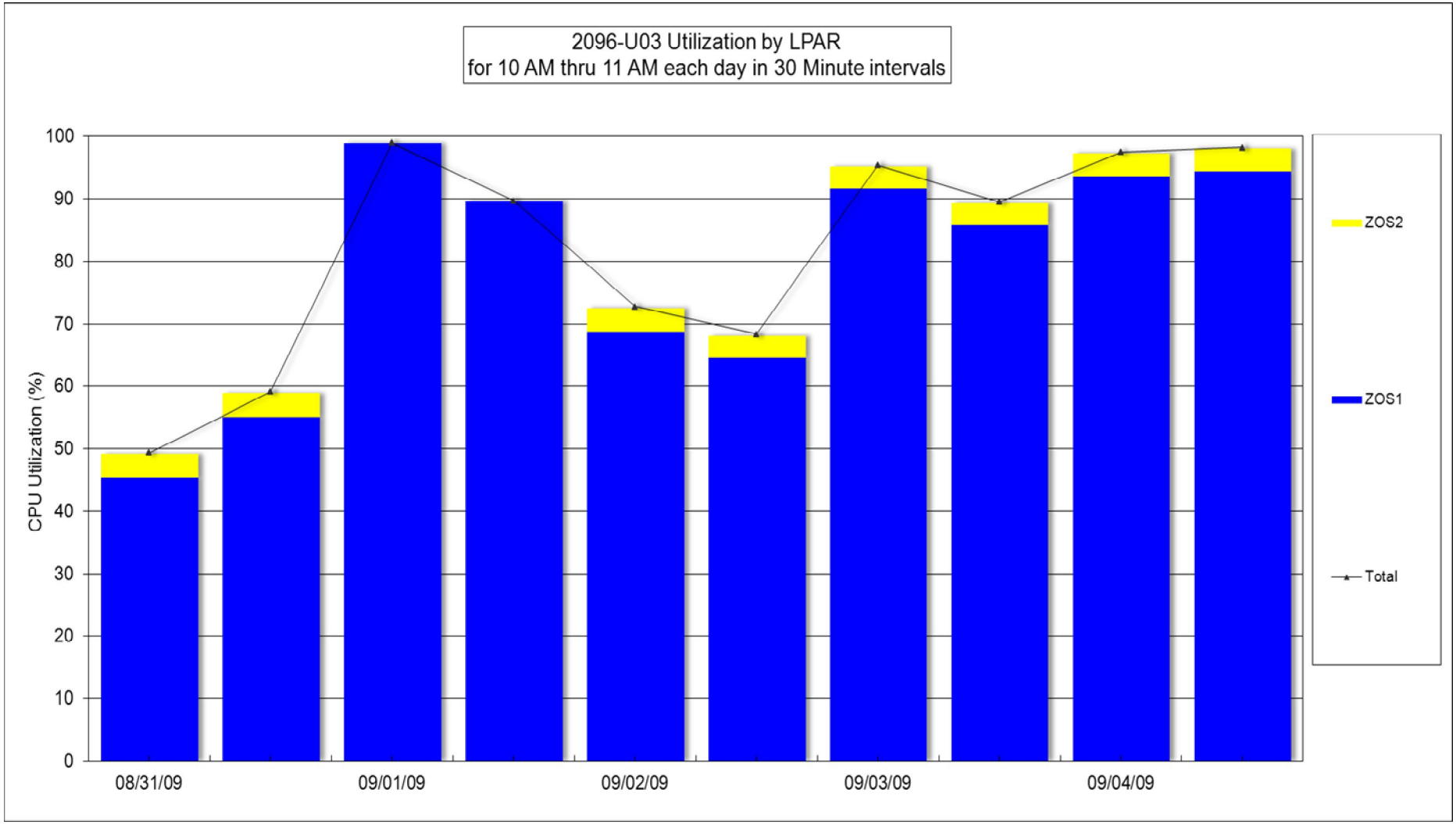
IBM Tivoli Performance Modeler for z/OS

- Hurdles for Capacity Planners
  - Performance is the key metric (not CPU utilization)
  - Performance is difficult to predict yet critical decisions require supporting data
    - How bad will things get if we don't upgrade?
    - How much improvement if we upgrade?
    - How long between upgrades?
- TPMz is a simulation-based modeling tool
  - Simulation models rely on running the actual process modeled, but in a simplified form.
    - Run repeatedly in order to reach a steady state that mimics the real process
    - Models performance at the service class level
  - Analytic models consist of mathematical equations which describe the processes being modeled.

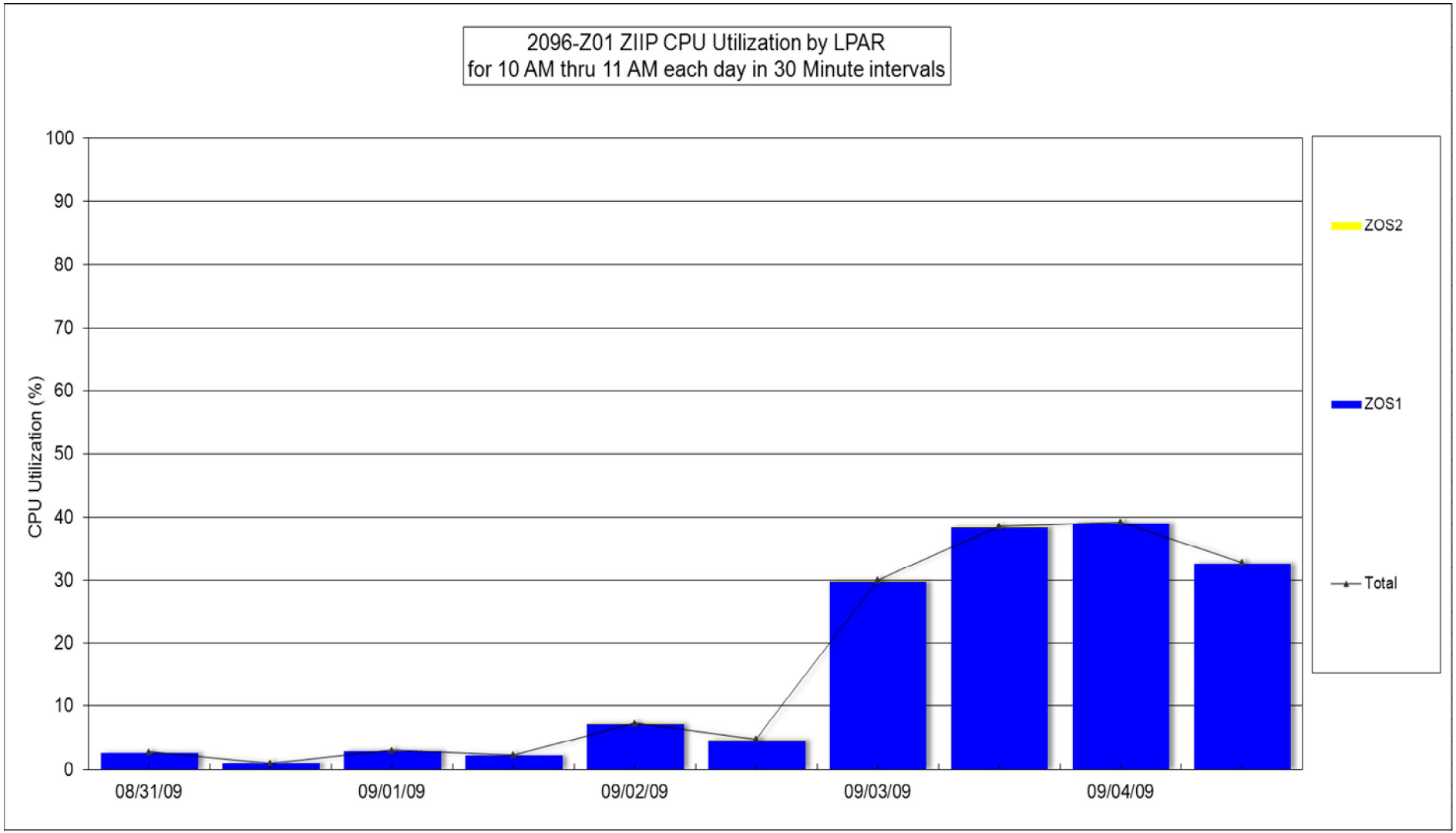
TPMz Capabilities

- Enables several “what-if” scenarios (partial list)
  - Hardware changes
    - Number and speed of general purpose CP’s
    - Addition of zIIP’s & zAAP’s
  - LPAR definition changes
    - Logical CP’s per LPAR
    - Weighting factors
  - Specific workload growth or movement
  - System-wide workload growth
  - LPAR movement or consolidation
  - Workload priority changes
  - Disk I/O response time changes

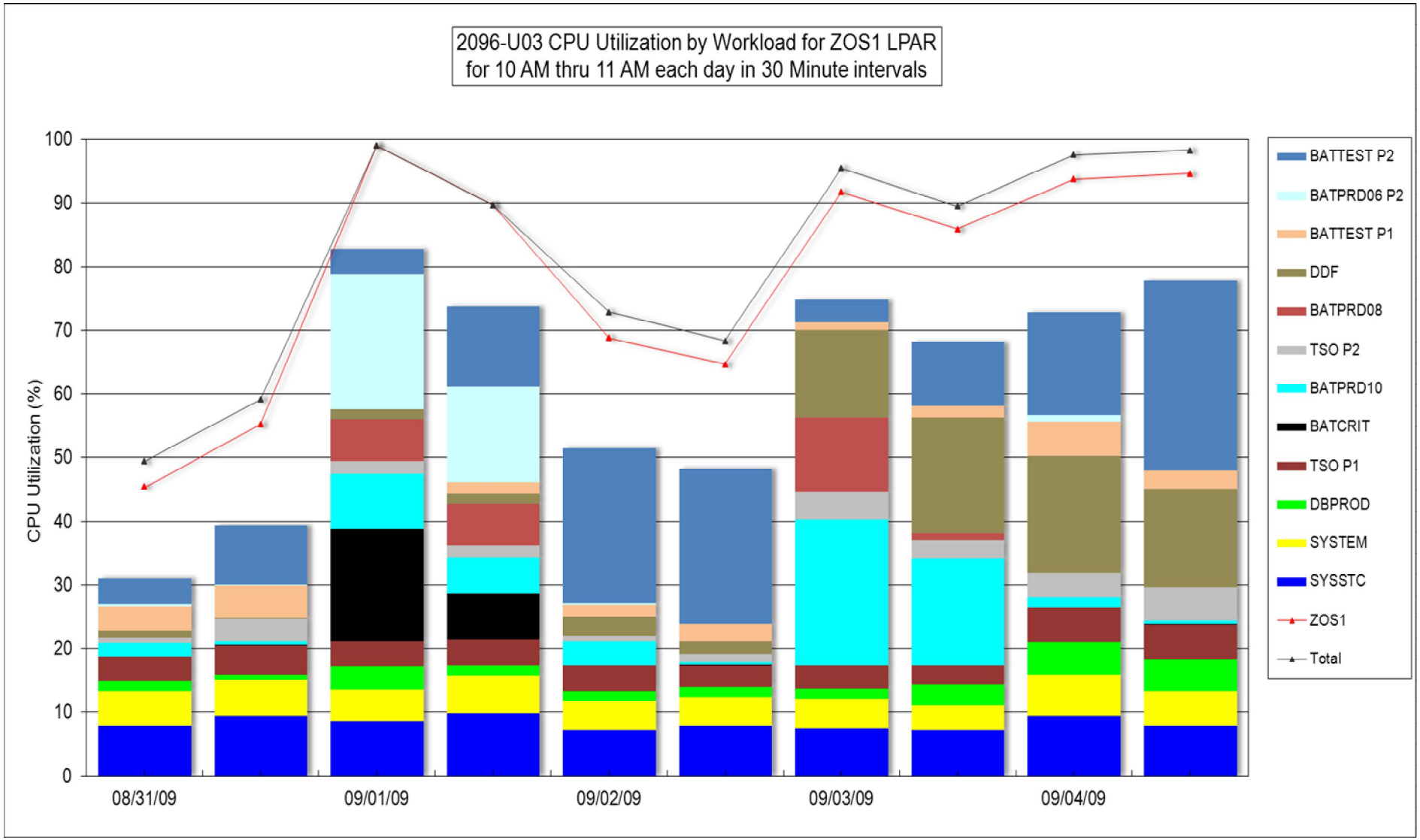
Spreadsheet - CPU Utilization by LPAR



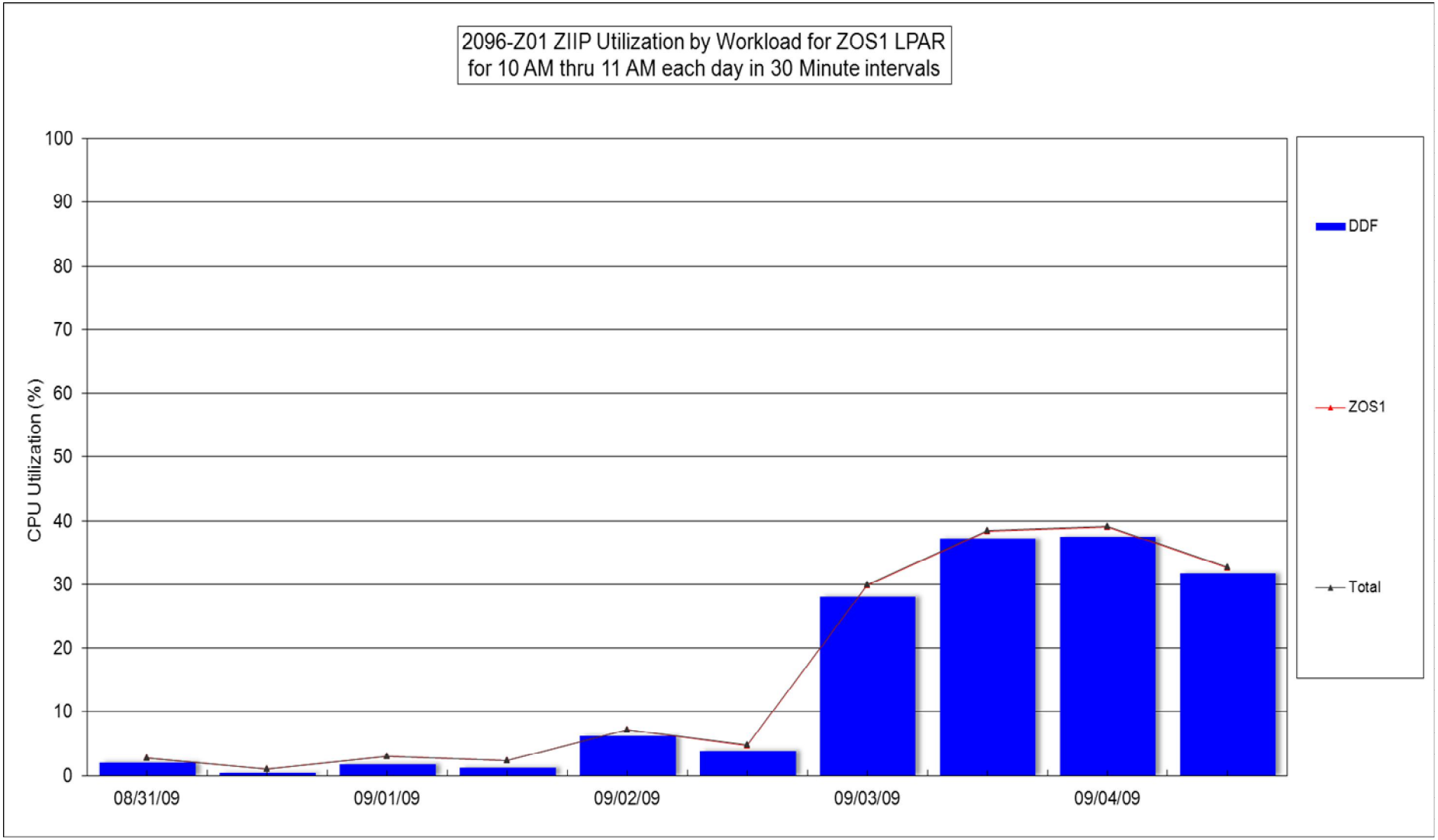
Spreadsheet - zIIP Utilization by LPAR



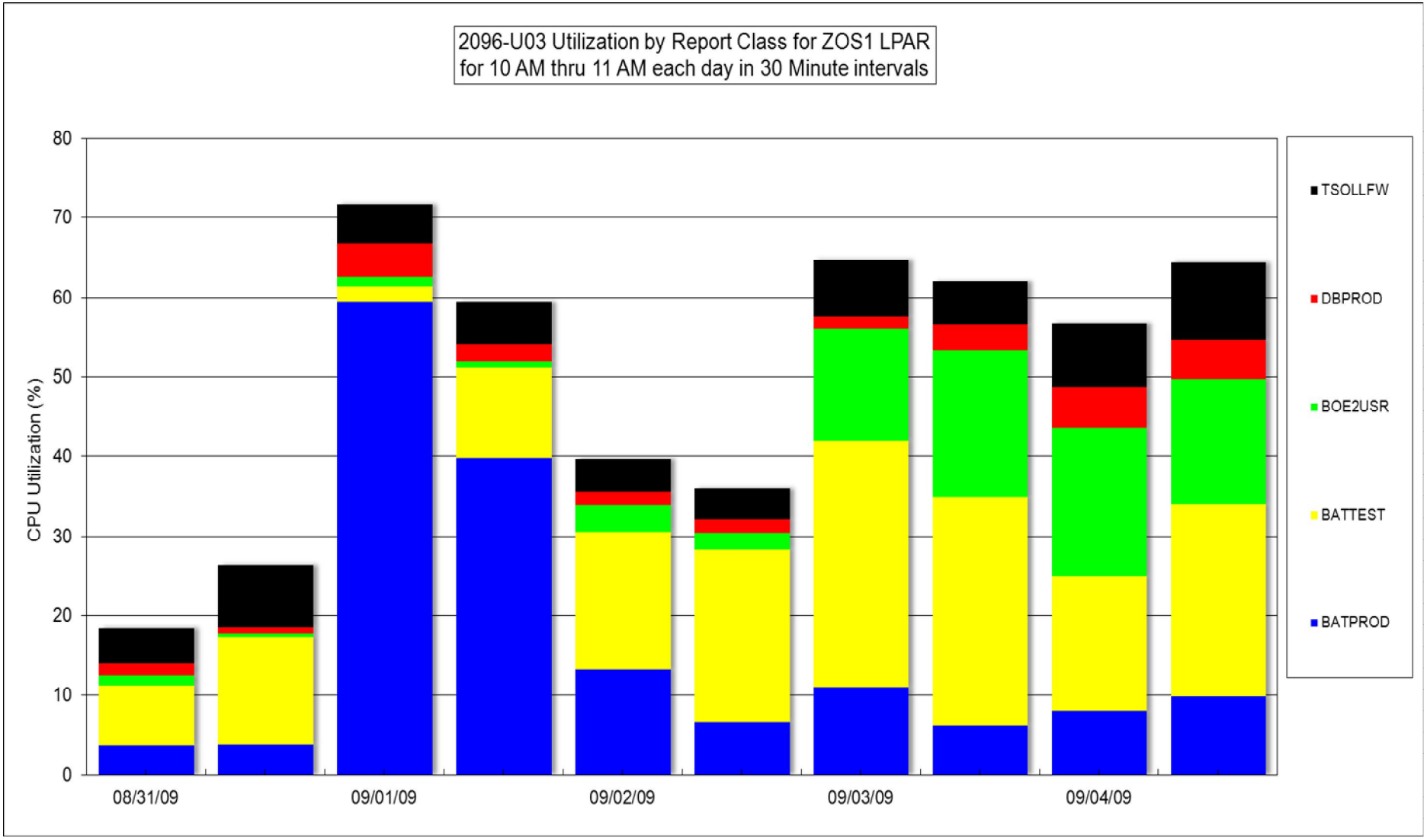
Spreadsheet - CPU Utilization by Service Class



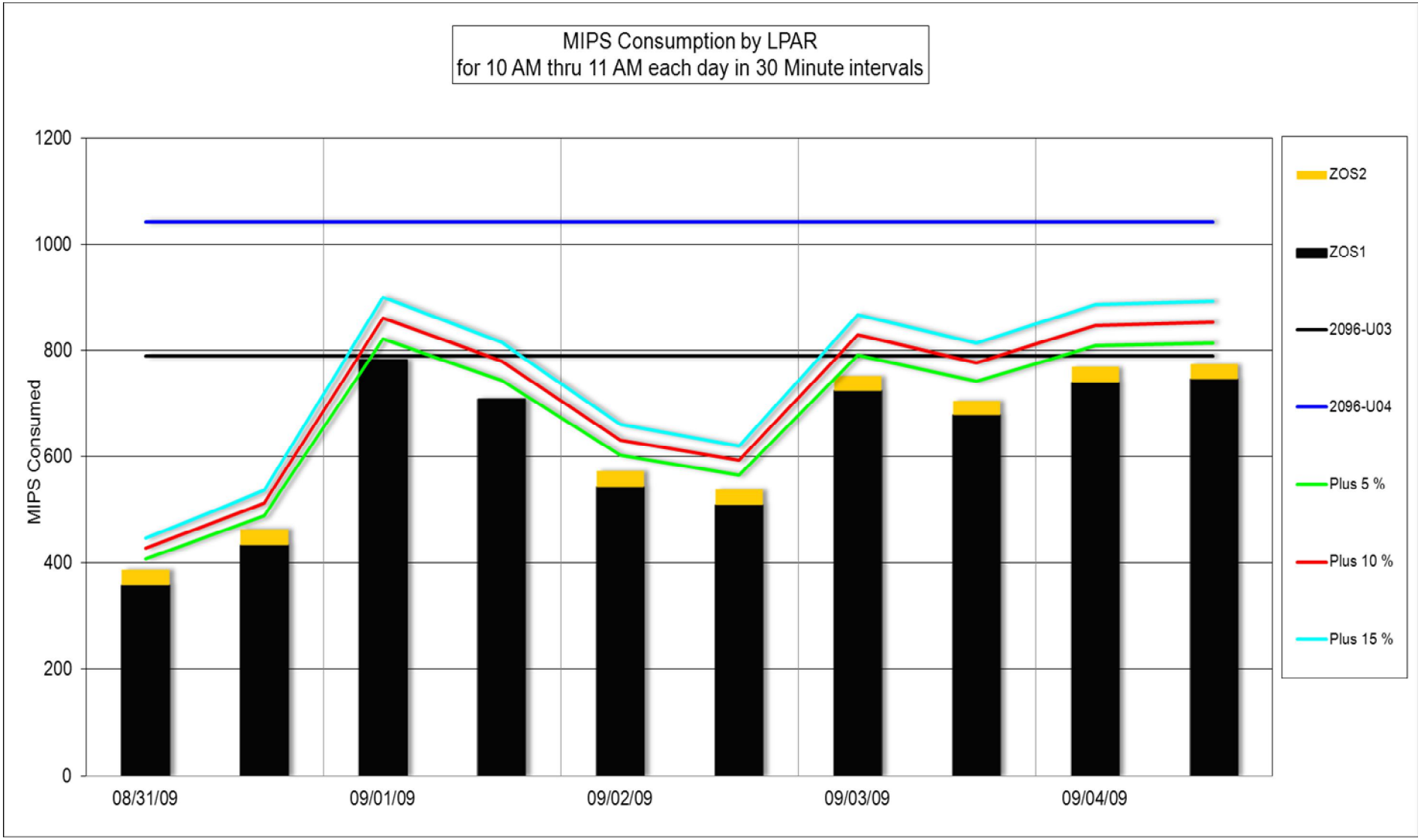
Spreadsheet - zIIP Utilization by Service Class



Spreadsheet - CPU Utilization by Report Class



Spreadsheet - MIPS Consumption by LPAR



Workload Analysis Report

Workload Analysis Report for ZOS1 LPAR on 09/03/2009 at 10.00.00

Workload	Serv Class	Period	Priority	CPU (%)	Total (%)	AAPCPU (%)	AAP (%)	IIPCPU (%)	IIP (%)	Cumulative	MPL	Xrate	Velocity	PI	Goal	SSCHRT	Resp
										7.42							
SYSTEM	**SYSSTC**	**1**	**0**	**22.75**	**7.58**	**0.00**	**0.00**	**0.00**	**0.00**	**15.00**	**64.06**	**0.00**	**64.20**	**0.00**	0.00	225.40	0.0007
SYSTEM	**SYSTEM**	**1**	**0**	**13.64**	**4.55**	**0.00**	**0.00**	**0.00**	**0.00**	**19.55**	**20.29**	**0.00**	**83.40**	**0.00**	0.00	104.40	0.0005
DATABASE	DBPROD	1	130	4.74	1.58	0.00	0.00	0.00	0.00	21.13	17.00	0.00	6.40	11.00	70.00	23.10	0.0451
DDF	DB2QHI	1	140	0.01	0.00	0.00	0.00	0.00	0.01	21.13	0.14	0.03	100.00	0.60	60.00	0.10	0.0023
DDF	DDF	1	200	0.93	0.31	0.00	0.00	0.00	0.64	21.44	0.10	0.08	77.80	1.30	0.00	9.90	0.0019
TSO	**TSO**	**1**	**200**	**11.09**	**3.70**	**0.00**	**0.00**	**0.00**	**0.00**	**25.14**	**1.33**	**6.86**	**70.40**	**0.70**	0.00	136.60	0.0008
BATCH	BATCRIT	1	245	0.05	0.02	0.00	0.00	0.00	0.00	25.15	0.00	0.00	83.30	0.70	55.00	0.70	0.0010
DATABASE	**DBTEST**	**1**	**250**	**6.17**	**2.06**	**0.00**	**0.00**	**0.00**	**0.00**	**27.21**	**15.00**	**0.00**	**43.00**	**1.20**	50.00	38.60	0.0011
STC	**STCHI**	**1**	**250**	**6.40**	**2.13**	**0.00**	**0.00**	**0.00**	**0.00**	**29.34**	**20.10**	**0.00**	**56.20**	**0.90**	50.00	108.70	0.0005
BATCH	BATPRD08	1	260	1.01	0.34	0.00	0.00	0.00	0.00	29.68	0.06	0.00	79.30	0.50	40.00	7.20	0.0058
BATCH	**BATPRD10**	**1**	**350**	**68.58**	**22.86**	**0.00**	**0.00**	**0.00**	**0.68**	**52.54**	**3.03**	**0.02**	**59.20**	**0.80**	50.00	1233.00	0.0007
BATCH	BATPRD06	1	360	1.30	0.43	0.00	0.00	0.00	0.00	52.97	0.11	0.01	45.70	0.90	40.00	24.00	0.0019
DATABASE	DB2PDIST	1	360	0.14	0.05	0.00	0.00	0.00	0.00	53.02	5.00	0.00	5.50	7.20	40.00	0.00	0.0115
STC	STCMED	1	360	4.18	1.39	0.00	0.00	0.00	0.00	54.41	3.00	0.00	59.90	0.70	40.00	107.50	0.0013
TSO	**TSO**	**2**	**360**	**13.19**	**4.40**	**0.00**	**0.00**	**0.00**	**0.00**	**58.81**	**1.40**	**0.02**	**60.40**	**0.70**	40.00	80.60	0.0012
BATCH	**BATPRD08**	**2**	**365**	**34.89**	**11.63**	**0.00**	**0.00**	**0.00**	**0.04**	**70.44**	**2.32**	**0.00**	**45.30**	**0.80**	35.00	974.60	0.0004
DDF	**DDF**	**2**	**370**	**41.17**	**13.72**	**0.00**	**0.00**	**0.02**	**28.18**	**84.16**	**5.09**	**0.01**	**43.70**	**0.70**	30.00	188.20	0.0009
OMVS	OMVS	1	370	0.30	0.10	0.00	0.00	0.00	0.00	84.26	4.46	0.08	12.90	2.30	30.00	0.50	0.0005
BATCH	BATTEST	1	460	3.83	1.28	0.00	0.00	0.00	0.00	85.54	1.07	0.02	15.00	2.70	40.00	146.20	0.0009
BATCH	BATTESTH	1	460	0.47	0.16	0.00	0.00	0.00	0.00	85.70	0.05	0.00	48.80	0.80	40.00	31.20	0.0003
BATCH	BATPRD06	2	465	0.07	0.02	0.00	0.00	0.00	0.00	85.72	0.05	0.00	5.30	6.60	35.00	0.90	0.0016
STC	STCLO	1	480	2.15	0.72	0.00	0.00	0.00	0.00	86.44	42.66	0.01	11.60	1.70	20.00	3.10	0.0018
BATCH	BATTESTH	2	550	5.47	1.82	0.00	0.00	0.00	0.00	88.26	0.33	0.00	77.90	0.60	50.00	390.80	0.0003
BATCH	**BATTEST**	**2**	**570**	**10.35**	**3.45**	**0.00**	**0.00**	**0.00**	**0.01**	**91.71**	**1.93**	**0.00**	**16.10**	**1.90**	30.00	227.80	0.0013
STC	KILLIT	1	699	0.03	0.01	0.00	0.00	0.00	0.00	91.72	1.89	0.00	0.20	0.00	0.00	1.60	0.0006

Total	84.30	0.00	29.56
Actual	91.72	0.00	29.86
Uncaptured	7.42	0.00	0.30
C.R. (%)	91.91	0.00	99.00
All LPARs	95.37	0.00	29.93
Rel IO	41.81		

Spreadsheet – Simulator Results Summary

Simulator Results Summary for ZOS1 LPAR (based on 09/03/2009 at 10.00.00)

Run Description	Total MIPS	MIPS per CP	Total CEC % Busy	ZOS1 % Busy	Total ZIIP	Model ZIIP	DBPROD	DDF	STCLO	BATTEST
2096-U03-Base	790.410	263.470	95.013	91.363	30.191	30.121	0.203	0.035	0.476	8.091
2096-U03#1-Yearly1@8%-Growth #1	790.410	263.470	99.854	95.899	32.340	32.265	0.195	0.135	2.990	71.830
% change=>	0.00%	0.00%	5.09%	4.97%	7.12%	7.12%	-4.00%	290.18%	528.30%	787.79%
2096-U03#1-Yearly2@8%-Growth #1	790.410	263.470	99.943	95.672	34.931	34.850	0.202	0.652	176.641	1288.512
% change=>	0.00%	0.00%	5.19%	4.72%	15.70%	15.70%	-0.78%	1789.42%	37023.34%	15825.51%
2096-U03#1-Yearly1@12%-Growth #2	790.410	263.470	99.858	95.758	33.851	33.773	0.200	0.581	89.253	317.350
% change=>	0.00%	0.00%	5.10%	4.81%	12.12%	12.12%	-1.74%	1585.02%	18657.67%	3822.33%
2096-U03#1-Yearly2@12%-Growth #2	790.410	263.470	99.950	95.358	37.047	36.960	0.199	0.696	186.678	1098.994
% change=>	0.00%	0.00%	5.20%	4.37%	22.71%	22.71%	-2.17%	1915.69%	39132.81%	13483.13%
2096-U04-Base	1042.000	260.500	73.533	70.813	30.192	30.122	0.201	0.008	0.011	3.609
% change=>	31.83%	-1.13%	-22.61%	-22.49%	0.00%	0.00%	-1.25%	-77.11%	-97.62%	-55.40%
2096-U04#2-Yearly1@8%-Growth #1	1042.000	260.500	79.516	76.564	32.380	32.305	0.193	0.008	0.013	3.818
% change=>	31.83%	-1.13%	-16.31%	-16.20%	7.25%	7.25%	-4.90%	-76.64%	-97.23%	-52.81%
2096-U04#2-Yearly2@8%-Growth #1	1042.000	260.500	85.327	82.121	34.810	34.729	0.199	0.009	0.017	4.252
% change=>	31.83%	-1.13%	-10.19%	-10.12%	15.30%	15.30%	-2.10%	-75.31%	-96.37%	-47.44%
2096-U04#2-Yearly1@12%-Growth #2	1042.000	260.500	82.163	79.095	33.340	33.262	0.199	0.010	0.016	4.009
% change=>	31.83%	-1.13%	-13.52%	-13.43%	10.43%	10.43%	-2.16%	-70.49%	-96.59%	-50.45%
2096-U04#2-Yearly2@12%-Growth #2	1042.000	260.500	91.177	87.712	37.669	37.582	0.195	0.011	0.032	5.333
% change=>	31.83%	-1.13%	-4.04%	-4.00%	24.77%	24.77%	-4.06%	-69.07%	-93.29%	-34.08%

Cognos / SPSS Solution Considerations

- Forecasting is interactive, meaning the user can drill down to a specific day, LPAR, CPU type or period
- User can also roll up to a monthly view
- Forecasts take account of several factors:
  - Day of week variations
  - Linear trend
  - Special calendar days, such as holidays, end of month or quarter
  - Lagging week
  - Impact of seasonality
- Additionally, through a services engagement, the forecasts can be extended to include business drivers, such as expected number of claims for an insurance company or calls for a telecom
- Forecasts are updated automatically
- The system has designed-in data cleansing and an assessment of the suitability of a data series for forecasting

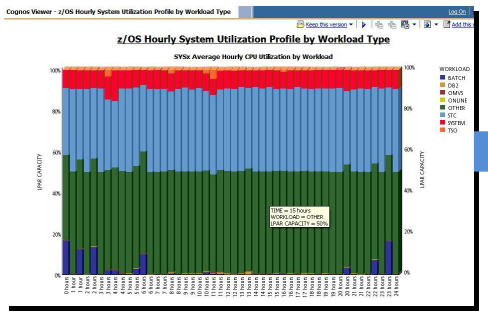
Augment Existing Capabilities

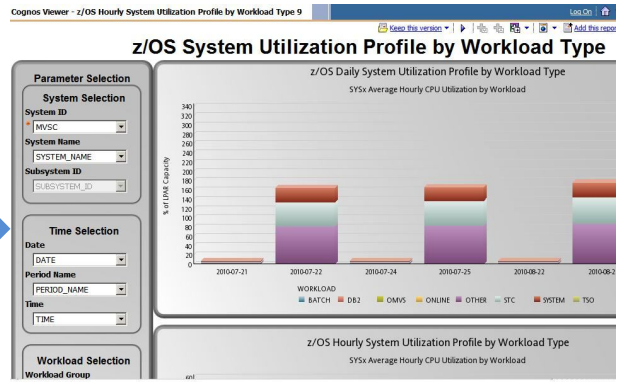
Enhanced reports to show added insight and value

- Delivery to email, portal, mobile devices

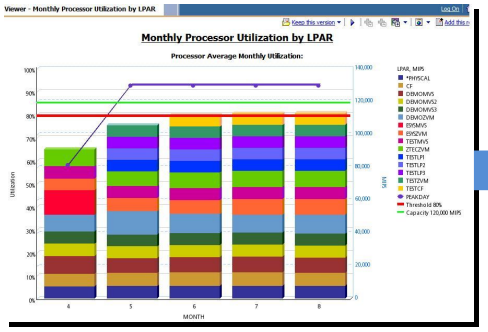
Examples:

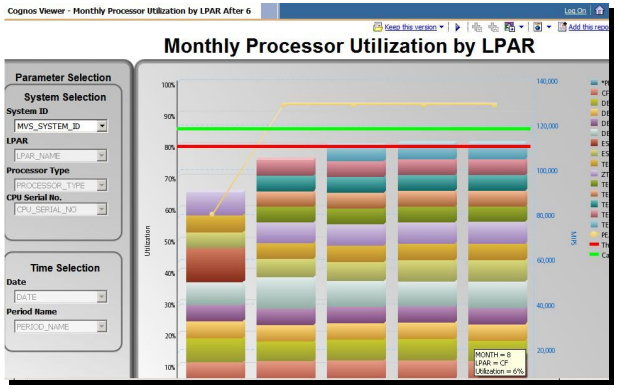
z/OS System Utilization





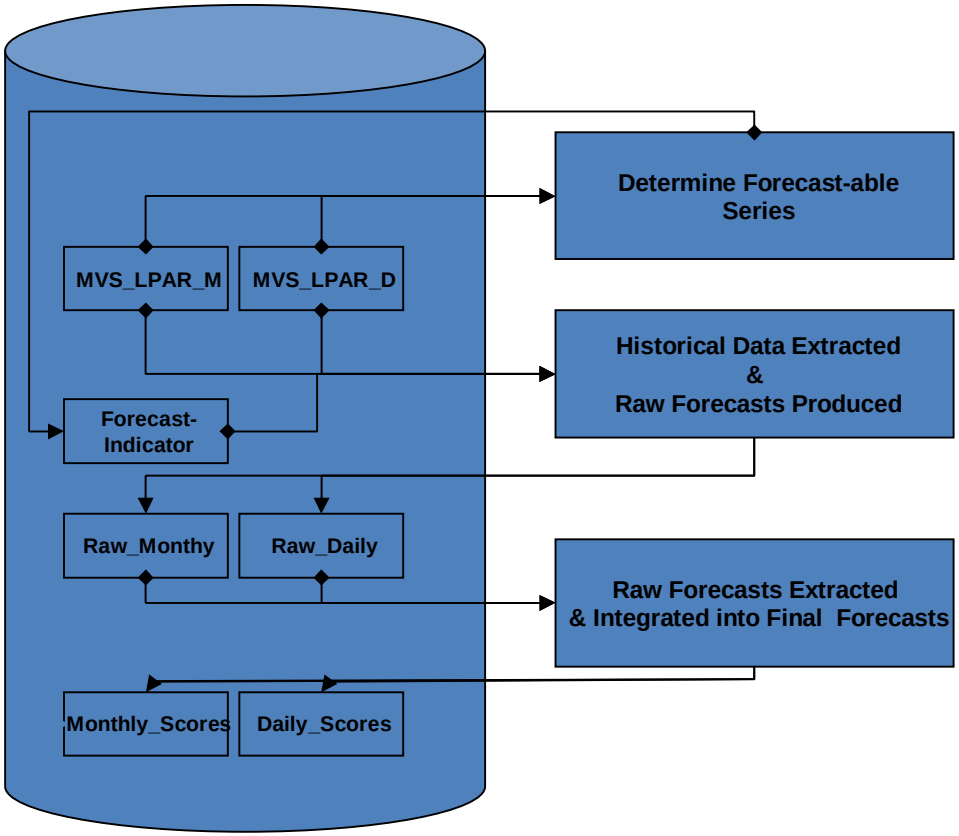
Monthly Processor Utilization





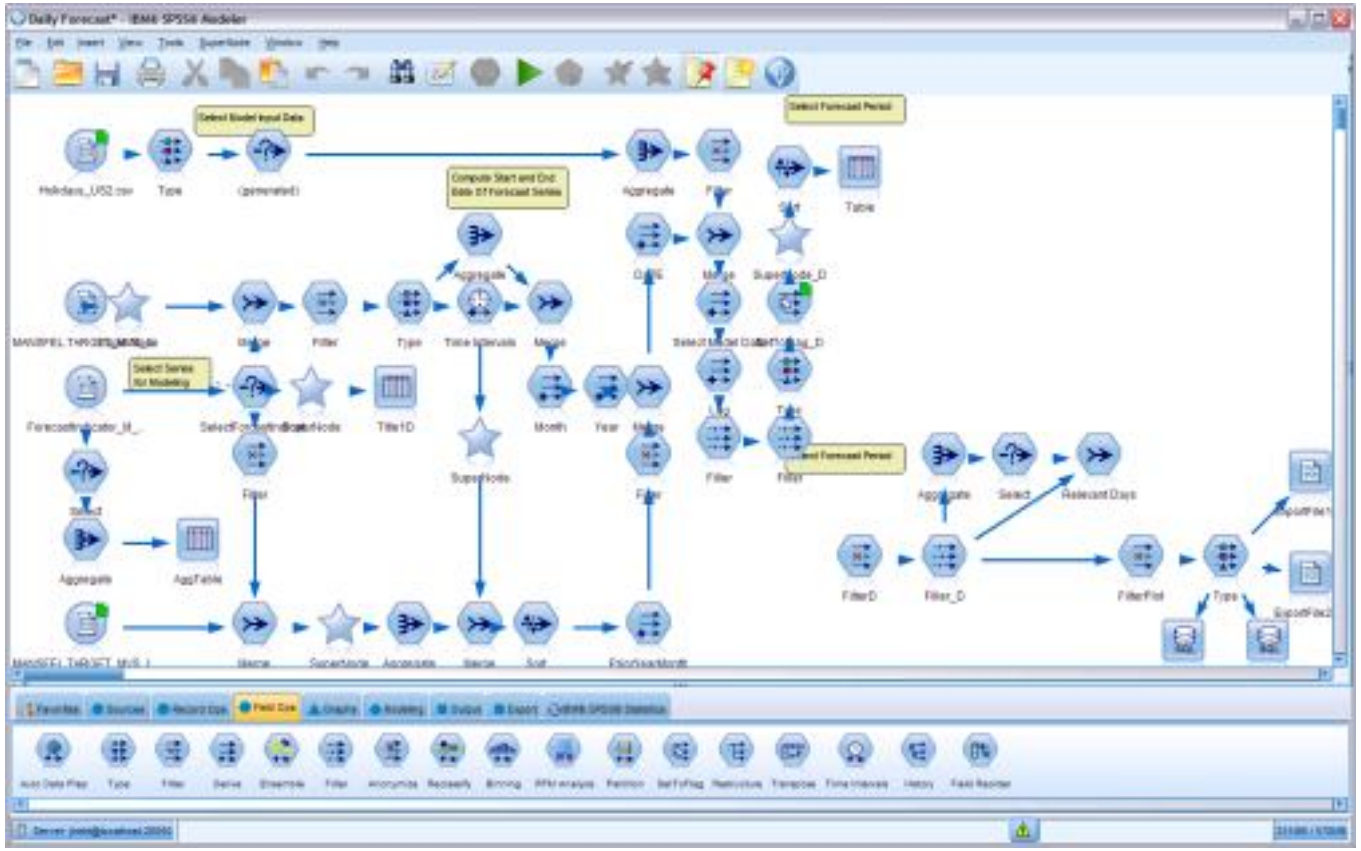
Automation & Integration

- The forecast process is controlled by automation within SPSS Modeler
- 4 Separate streams with associated scripts control the process
- A master ‘stream script’ executes the entire process
- The final results are written into database tables for use by Cognos
- New forecasts replace old forecasts as new data is available
- The entire process takes less than 35 minutes for 350 separate forecast series



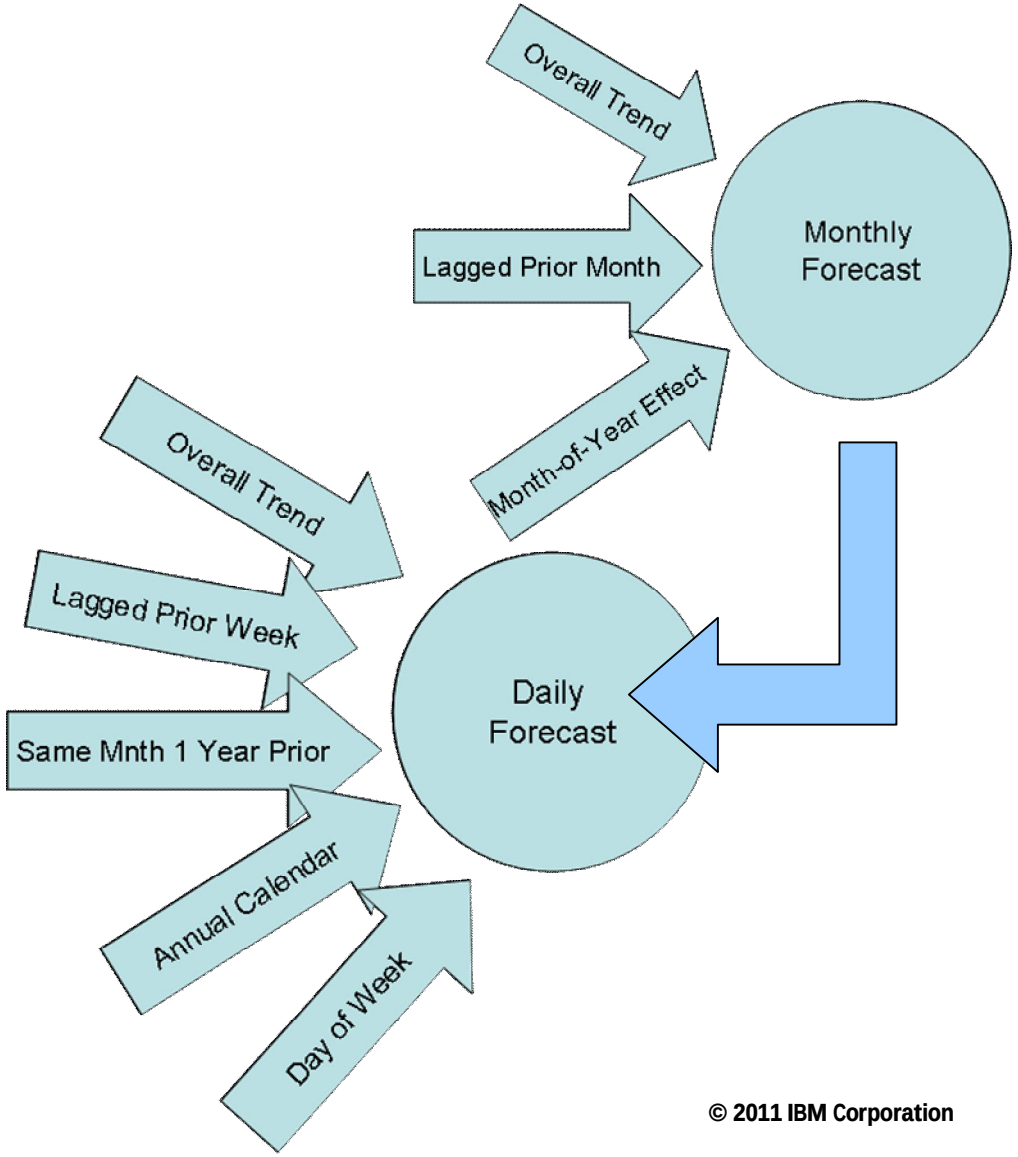
Modeler Streams and Scripts

Master Automation Script



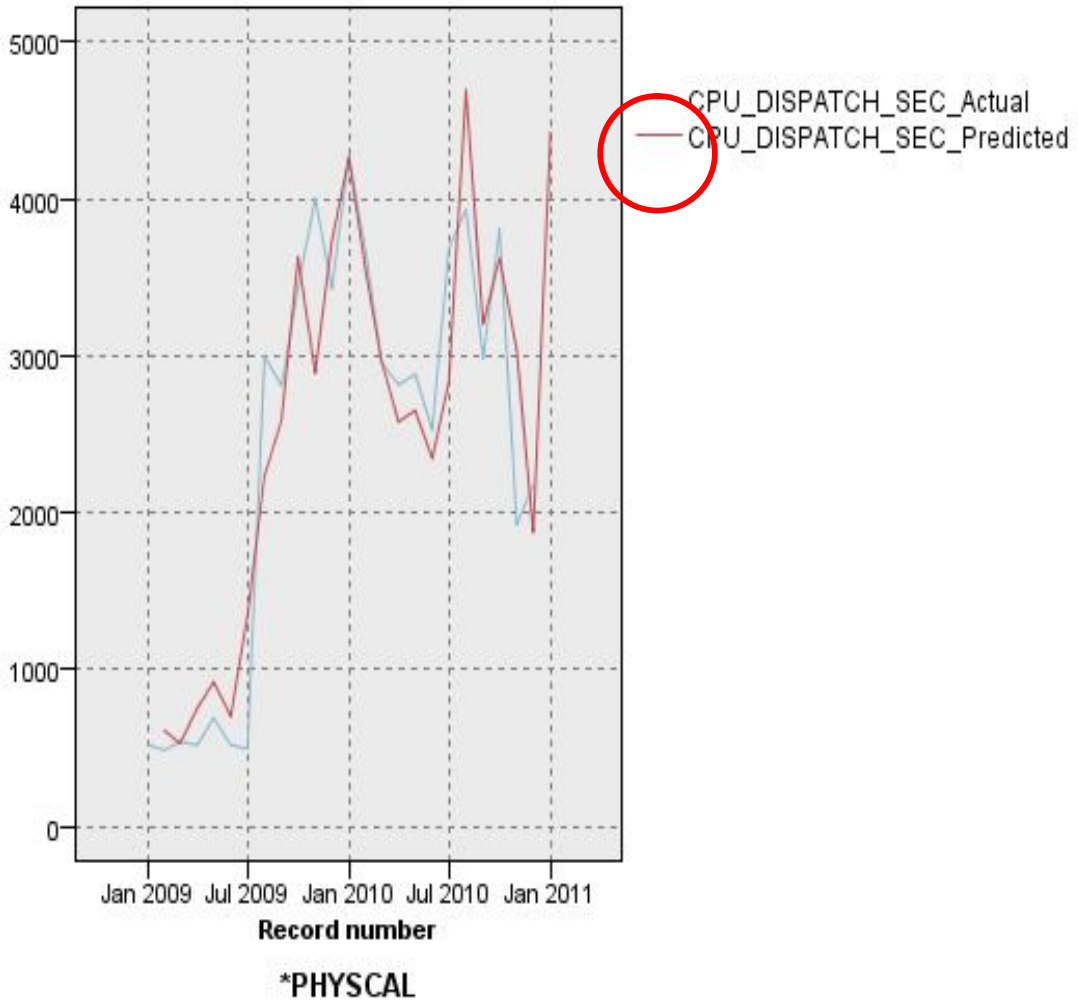
Integrated Forecasting

- Monthly forecasts form the foundation
- These forecasts than are inputs into daily-level forecasts



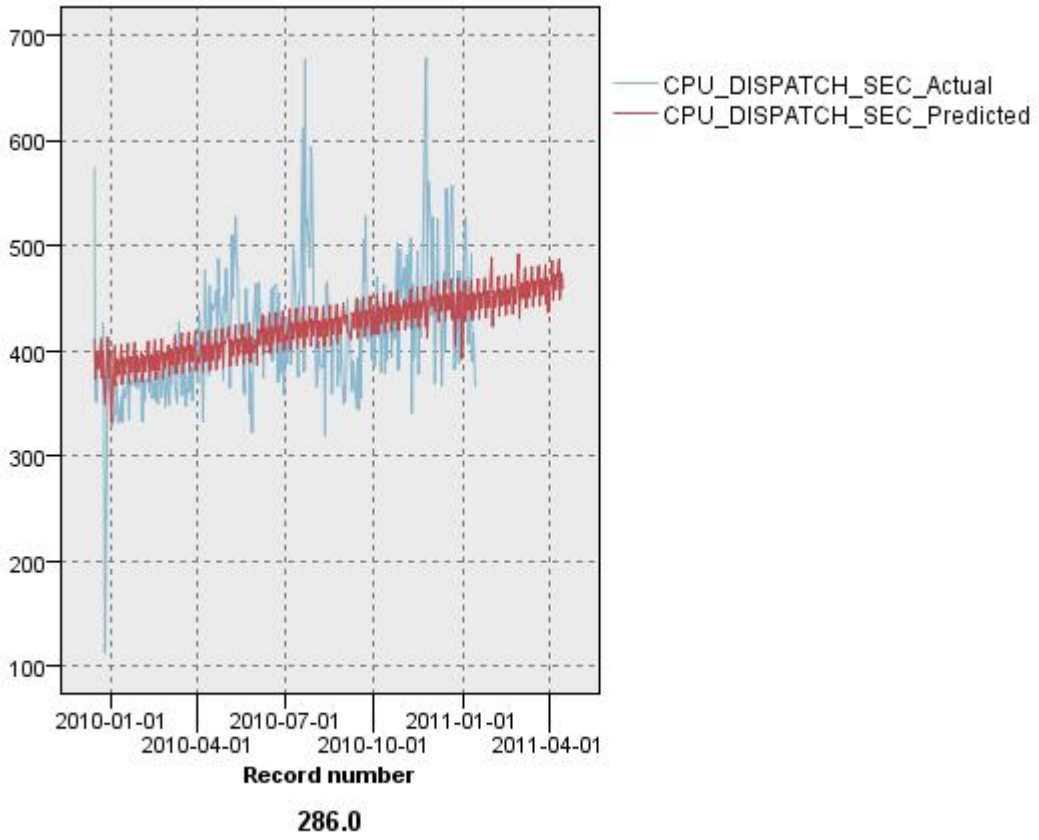
Monthly Forecast Example

- This example shows a typical monthly forecast
- The model has recognized an overall upward trend
- Additionally, data back to 2009 provides information that January tends to be a month with a sharp upward tendency
- The model shows a sharp upward prediction for January 2011



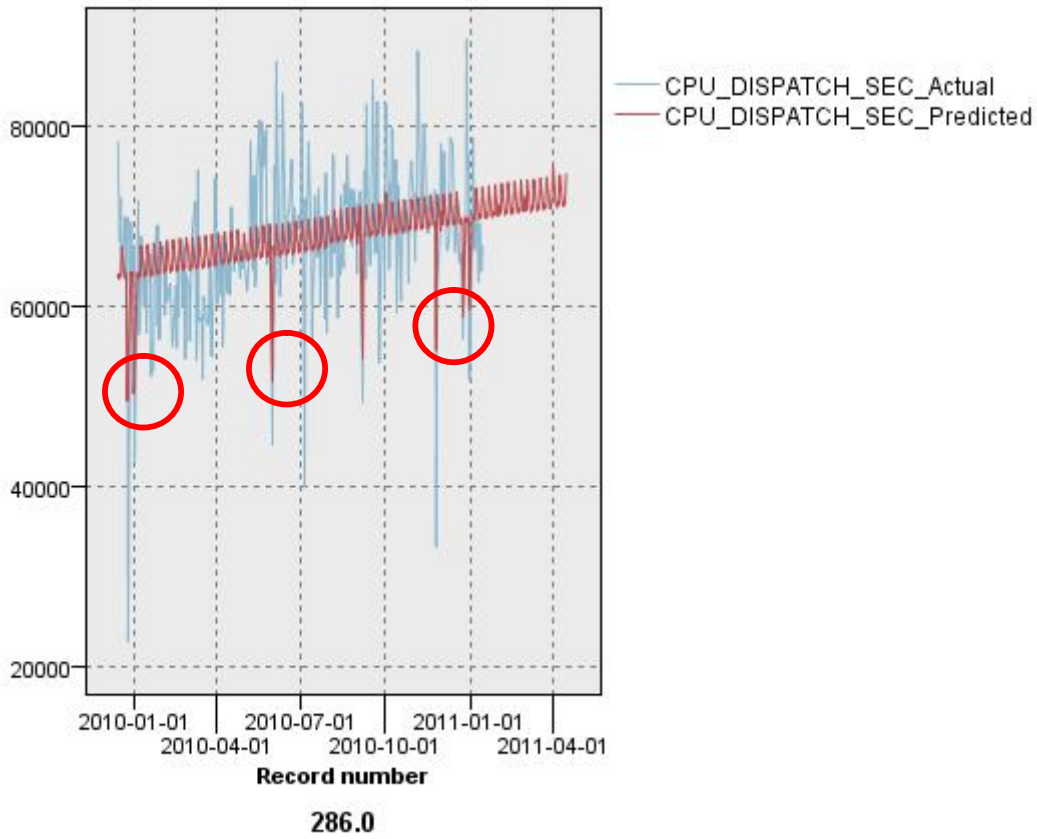
Daily Forecast Example: Linear Trend Dominating

- Daily forecasts take inputs from
  - the overall trend,
  - the specific day of the week,
  - lagged week,
  - and special days such as holiday
- Each forecast model (linear regression) automatically sorts out which inputs are most important and which are ignored
- In the forecast to the left, the linear trend dominates the model, with slight variation by day-of-week:



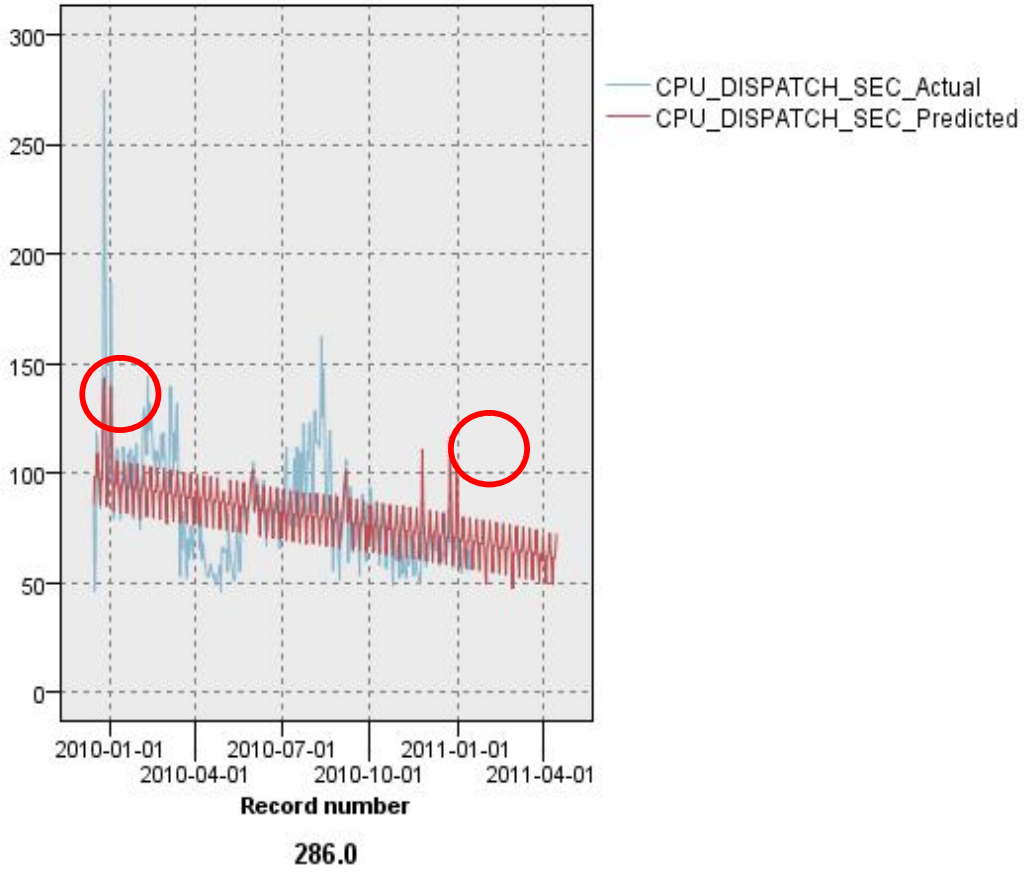
Daily Forecast Example: Monthly Impact On Daily Forecast

- This forecast is essentially linear, but with very pronounced downward spikes
- Large one-time jobs could be planned on these days, rather than on days with higher expected demand



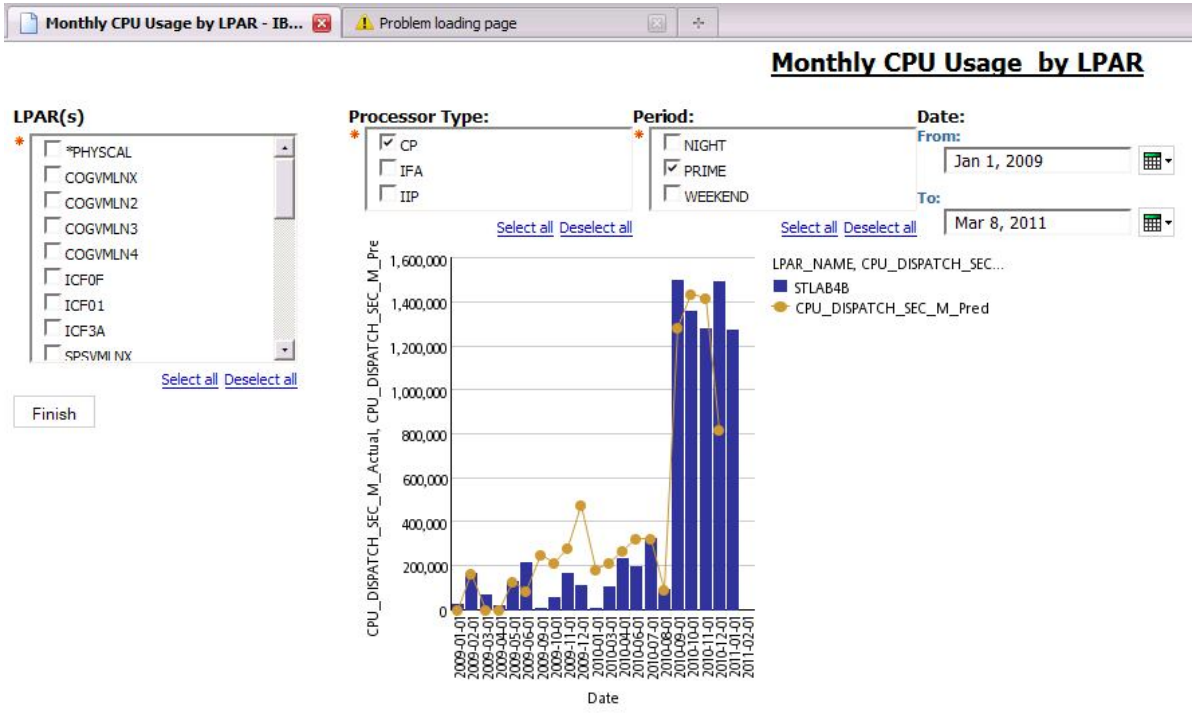
Daily Forecast Example: Upward Spikes Identified

- In this model, specific days with predicted upward spikes are identified in advance
- We can extend this table to include relevant corporate events (year end close, prior year sales volume, etc)
- Enabled with a more accurate assessment of likely demand on system on specific days, more intelligent planning can be undertaken



Putting It All Together

- For the user, the experience is seamless with other capacity reporting
- The forecasts are updated behind the scenes on a scheduled basis
- Cognos supplies an interactive user interface allowing forecasts to be combined.
- For example, a user could select several LPARs, but zoom into forecasted utilization on specific days of the week



Info:

Date	LPAR_NAME	PROCESSOR_TYPE	PERIOD_NAME	CPU_DISPATCH_SEC_M_Actual	CPU_DISPATCH_SEC_M_Pred
Jan 1, 2009	STLAB4B	CP	PRIME	25,198.969386	0
Feb 1, 2009	STLAB4B	CP	PRIME	165,684.756466	165,684.756466
Mar 1, 2009	STLAB4B	CP	PRIME	65,037.862685	0
Apr 1, 2009	STLAB4B	CP	PRIME	16,799.602748	0
May 1, 2009	STLAB4B	CP	PRIME	129,324.121071	129,324.121071
Jun 1, 2009	STLAB4B	CP	PRIME	212,681.868645	85,373.62231873
Sep 1, 2009	STLAB4B	CP	PRIME	5,399.839269	252,750.10667915
Oct 1, 2009	STLAB4B	CP	PRIME	55,195.93871	211,148.07037919
Nov 1, 2009	STLAB4B	CP	PRIME	161,393.691558	278,806.87489697

Questions ?

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