Become More Proactive Through Effective Historical Analysis

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Agenda

- How can you use history to improve your real-time monitoring strategy?
- Are you getting the most from your investment in monitoring and management solutions?
- How can you leverage history to improve your overall performance and availability?
- What are the most effective ways to use history to solve common problems?
- What are the optimal ways to collect historical information?
- How can you use history to become more proactive with real-time monitoring and management?

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The Importance Of History Data
Why History Can Be Essential To Your Overall Strategy

- Not all problems or events can be seen and analyzed in real time
  - Inevitably some analysis will need to be done after the fact using such functions as Near Term History, snapshot history, or report analysis
- History provides an understanding of what happened in the past
  - History of application performance and response time
    - CICS/IMS response time, DB2 thread activity, z/OS batch activity
  - History of resource utilization and resource issues
    - DASD, memory/paging, CPU, pools
  - History of alerts and issues
    - What alerts fired and how often
- History can be used to help visualize what may happen in the future
  - Analysis of the past to help anticipate potential future issues/bottlenecks
- Use history to make real-time monitoring more effective and meaningful
  - Use historical information to make real time alerts more accurate and relevant
  - Include history in custom real time workspaces

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Historical Data Collection Considerations

Monitoring And History Collection Trade-off

- Historical data collection varies in cost and quantity
  - CPU, memory, and software process cost of collection
  - Cost of data storage and retention
  - Cost of retrieval and post processing
  - Ease of review and analysis
- Some historical data will be more relevant and useful than other data
  - Consider the context, nature, and meaningfulness of the data

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Types Of Historical Monitoring Data

- Know the nature and characteristics of the history data being collected
- Detail data
  - Data that documents/measures detail of a specific event
  - Often high quantity data and the most detailed for analysis
  - May pose the greatest challenge in terms of cost, retention, post processing
  - Examples – DB2 Accounting records in Near Term History, CICS Task History, IMS Near Term History
- Summary data
  - Data that summarizes underlying detail data
  - Either an aggregation or an averaging of underlying detail records
  - May be useful for longer term trending and analysis
  - Reduces quantity of data and reduces cost of retention, post processing
  - Less detail may mean less diagnostic value
  - Examples – Summary data in Tivoli Data Warehouse, summary DB2 trace data

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Types Of Historical Monitoring Data - continued

- Interval data
  - History data that includes an encapsulation of one or multiple events within a specified time interval
  - The data will include all activity within that given time interval
  - Useful for problem analysis and trending analysis
  - Examples – DB2 statistics records in Near Term History, Epilog IMS or z/OS history
- Snapshot data
  - Typically a point in time snapshot of activity
  - Snapshots are usually based on a specified time interval
  - Snapshots may be taken of types of history (detail, summary, or interval)
  - Snapshots will show activity at time of the snapshot, but may/may not reflect activity between snapshots
  - Useful for problem analysis and trending analysis
  - Useful as an aid in setting alert thresholds
  - Examples – OMEGAMON DB2 PE GUI snapshot history, Tivoli Data Warehouse snapshot history

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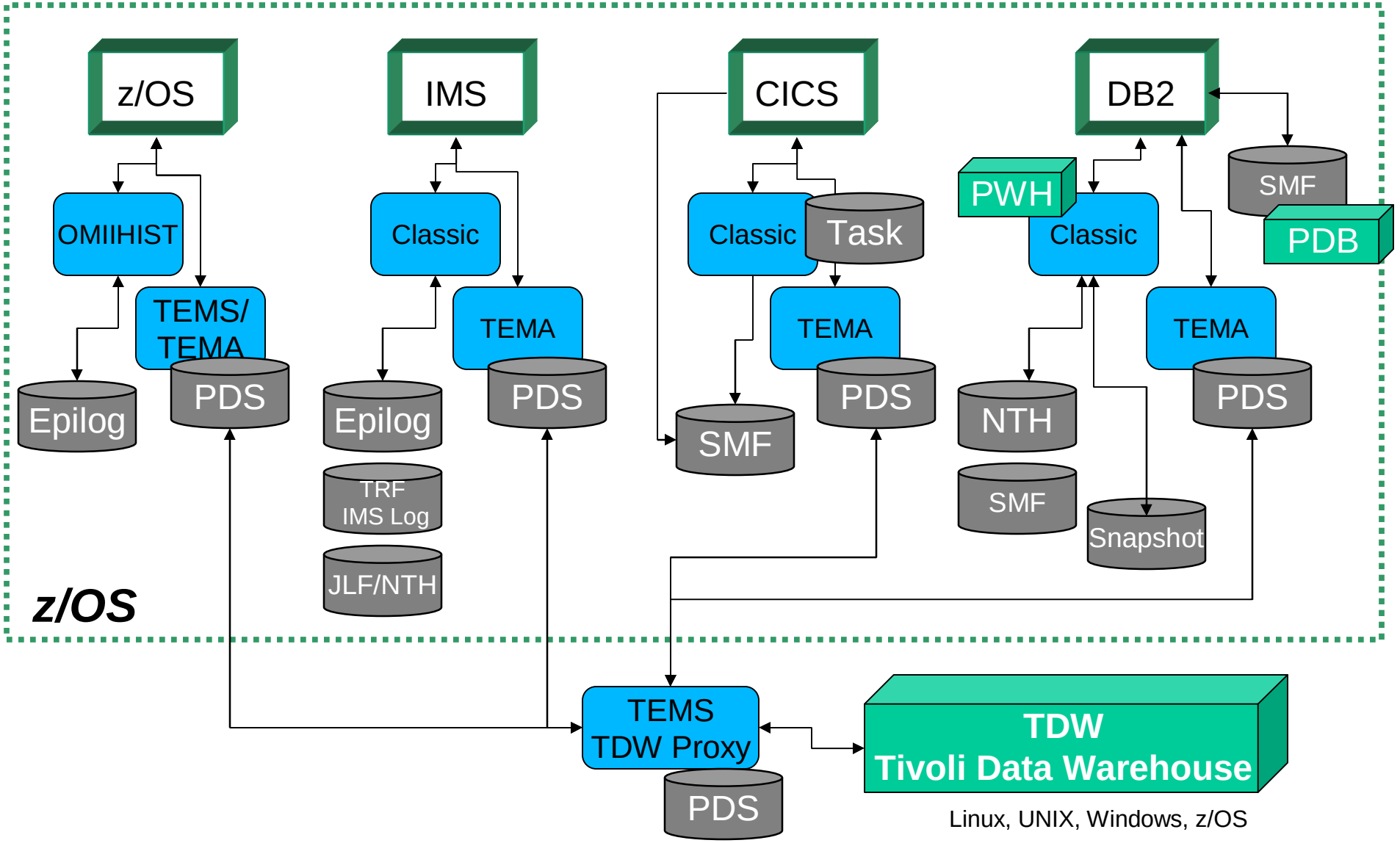
OMEGAMON History Collection Options



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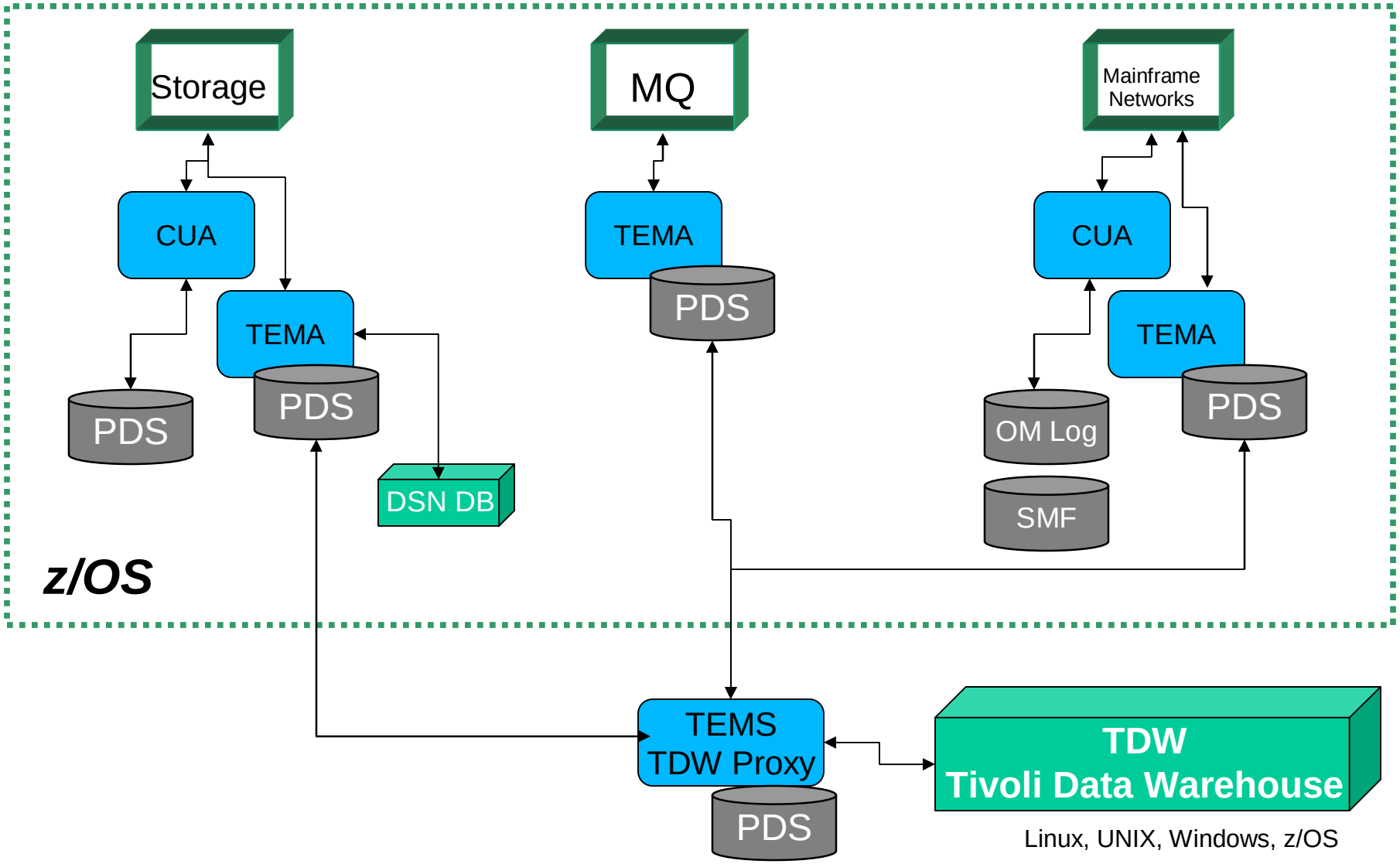
OMEGAMON History Collection Options - continued



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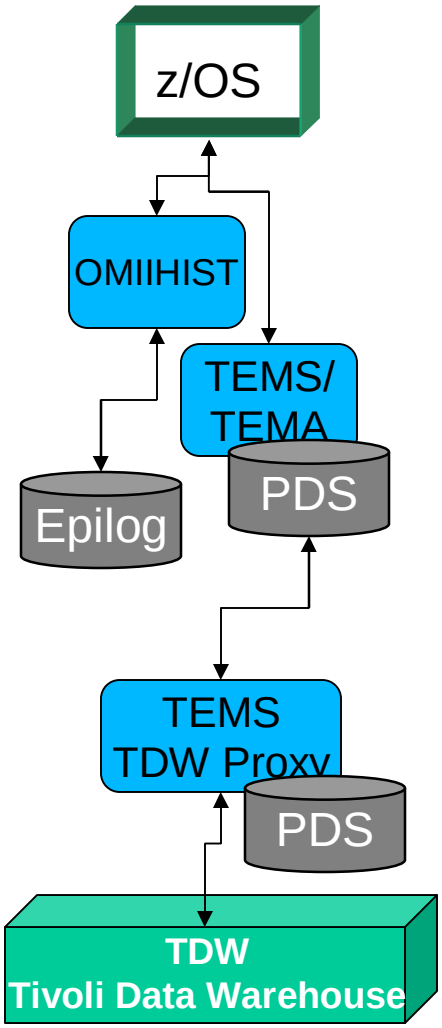
OMEGAMON XE For z/OS History



- OMEGAMON XE on z/OS provides history data in the form of Epilog history
  - Service levels (elapsed times and response times)
  - Resource utilization data
  - Degradation data (bottleneck analysis of z/OS workload)
- Epilog history may be accessed via CUA interface, batch jobs, ISPF command interface
  - Sample batch reporter JCL is in *hilev*.RKANSAMU(KEPPROC)
- OMEGAMON XE on z/OS provides snapshot history data and supports the Tivoli Data Warehouse (TDW)
  - Data is stored in the TEMA/TEMS in the Persistent Data Store (PDS)
  - Data may be optionally sent to the TDW
  - Data may be summarized and pruned using the TDW
- Cost of collection relative to value
  - Epilog – low cost ⟷ Useful for problem analysis
  - Snapshot – low cost ⟷ Useful for trending

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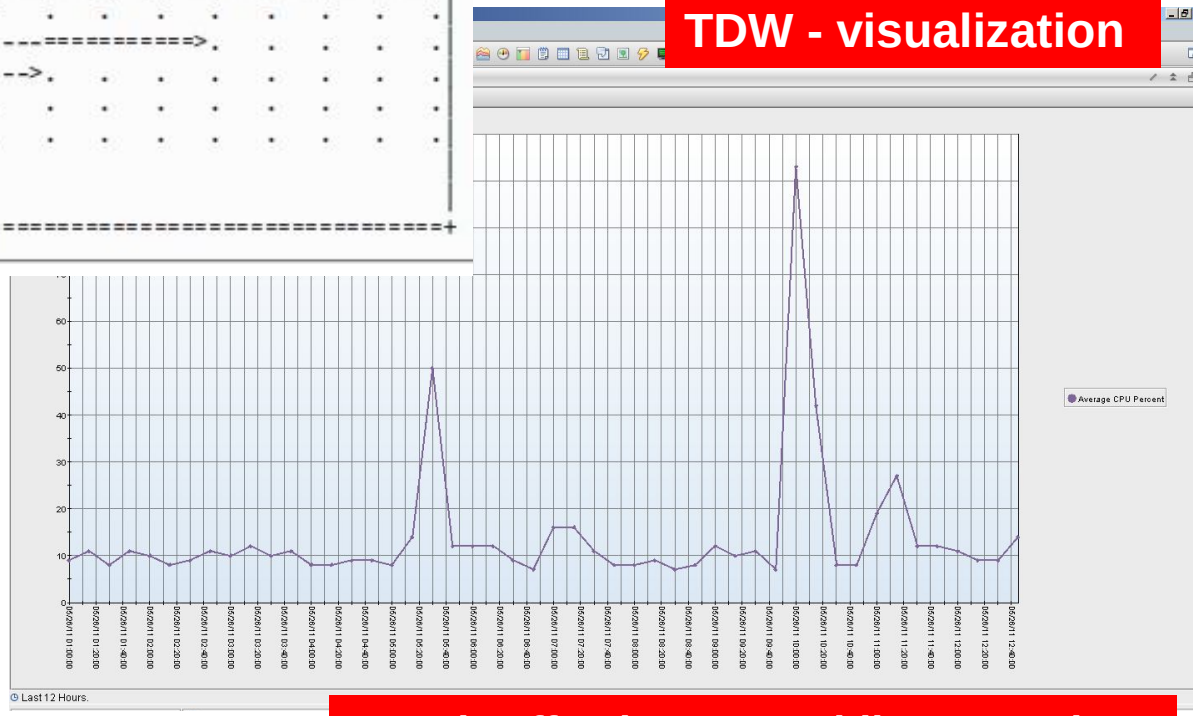
The Value Of OMEGAMON z/OS History

Epilog - historical problem analysis

```
+=============================================================================+
| Job = PAYROLL          JES Number = 2544          Job Steps =   3 /   6     |
| Job Class = T          Account Number = 035G      Input Queue = 48.10 S     |
| From  09:12 To 09:14 On 08/01/99                  Elap =    1:33 M SYSA     |
+-----------------------------------------------------------------------------+
|WAIT_Reason_____________Time_____%_|0___1___2___3___4___5___6___7___8___9___0|
|Using CPU              0.09 S     .1|.   .   .   .   .   .   .   .   .   .   .|
|Swapped With WTOR     52.65 S   59.9|-----------==========>.   .   .   .   .|
|Tape Mount Pending    25.05 S   28.5|---------->.   .   .   .   .   .   .   .|
|ECB Wait               5.01 S    5.7|--> .   .   .   .   .   .   .   .   .   .|
|Tape  IEFU84  522 Que  5.01 S    5.7|--> .   .   .   .   .   .   .   .   .   .|
|Job Elapsed Time       1:27 M                                                 |
+=============================================================================+
```

Epilog history provides historical bottleneck analysis data correlated with resource and usage data

TDW - visualization



Use Epilog for historical problem analysis

Use TDW for highlighting peaks and trending utilization (use as input for setting alert thresholds)

TDW is effective at providing snapshot data for trend analysis

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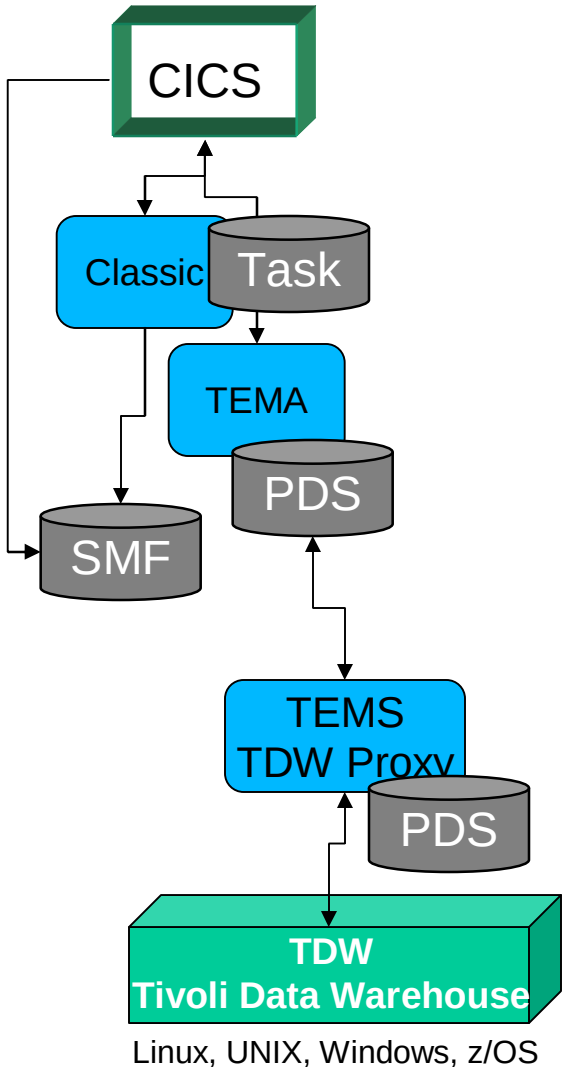
OMEGAMON XE For CICS Provides History Options For History Detail, Near Term Detail And Trending



- Task history (also known as Online data viewing) provides detailed CICS transaction level history
  - Detailed transaction-level data stored in an ONDV task history file (wraparound VSAM file – one per CICS region)
  - Easy to access/filter – very good detail
- SMF 110 records
  - SMF 110 subtype 1 records - CICS task level data
  - CICS Statistics data (SMF 110, subtypes 2, 3, 4, 5)
    - Information collected on an interval basis and/or end of day
  - Note – OMEGAMON may optionally add additional detail to SMF 110 records
- OMEGAMON CICS provides snapshot history data and supports the Tivoli Data Warehouse (TDW)
  - Data is stored in the TEMA/TEMS in the PDS and optionally sent to the TDW
  - Data may be summarized and pruned using the TDW
- Cost of collection relative to value
  - Task history – low to moderate ⟷ Useful for problems
  - SMF 110s – typically low ⟷ Important for reporting
  - Snapshot – typically low ⟷ Useful for trending

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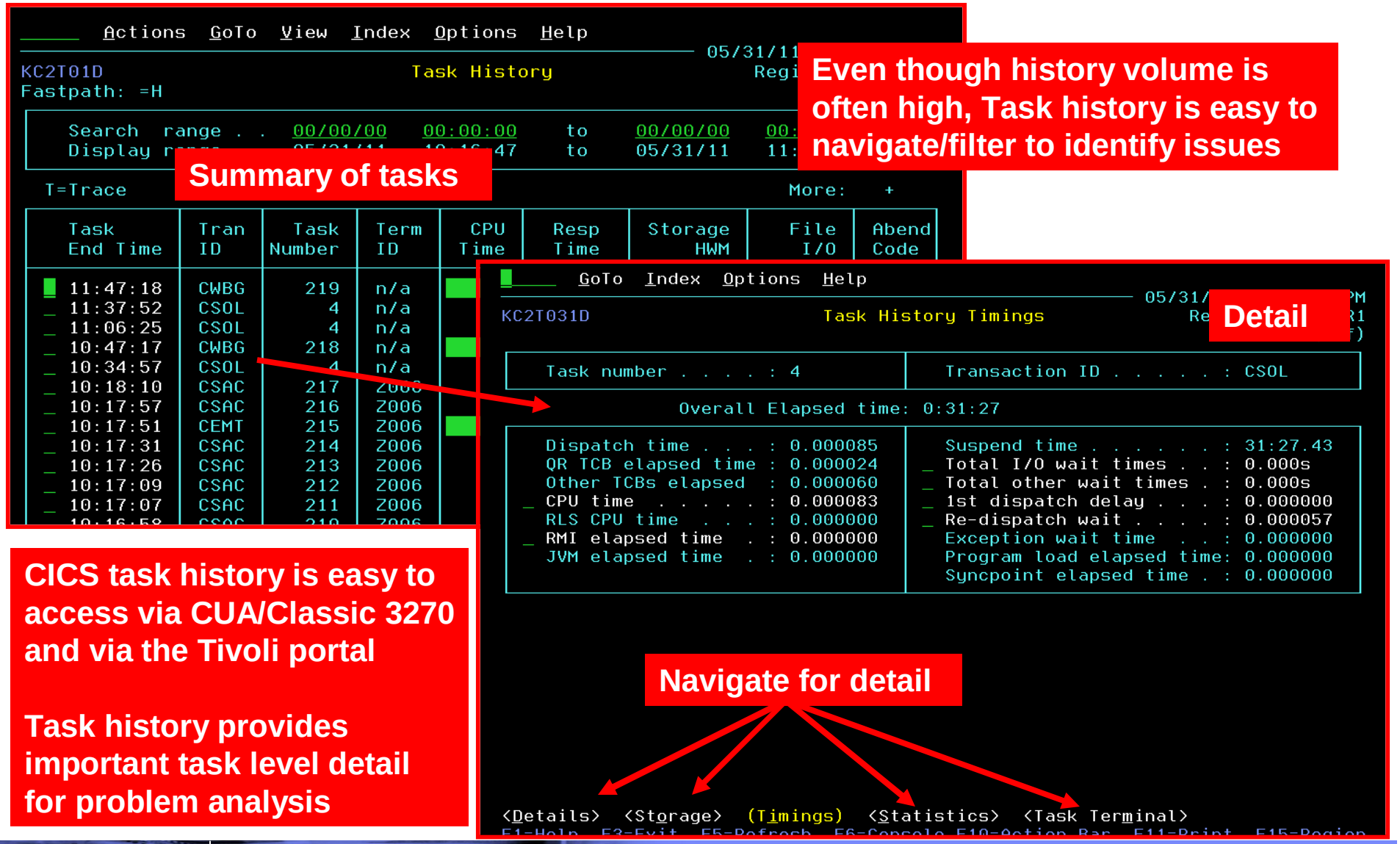
OMEGAMON CICS Task History – Valuable For Problem Analysis Access Via 3270 Interface And The TEP



Even though history volume is often high, Task history is easy to navigate/filter to identify issues

CICS task history is easy to access via CUA/Classic 3270 and via the Tivoli portal

Task history provides important task level detail for problem analysis

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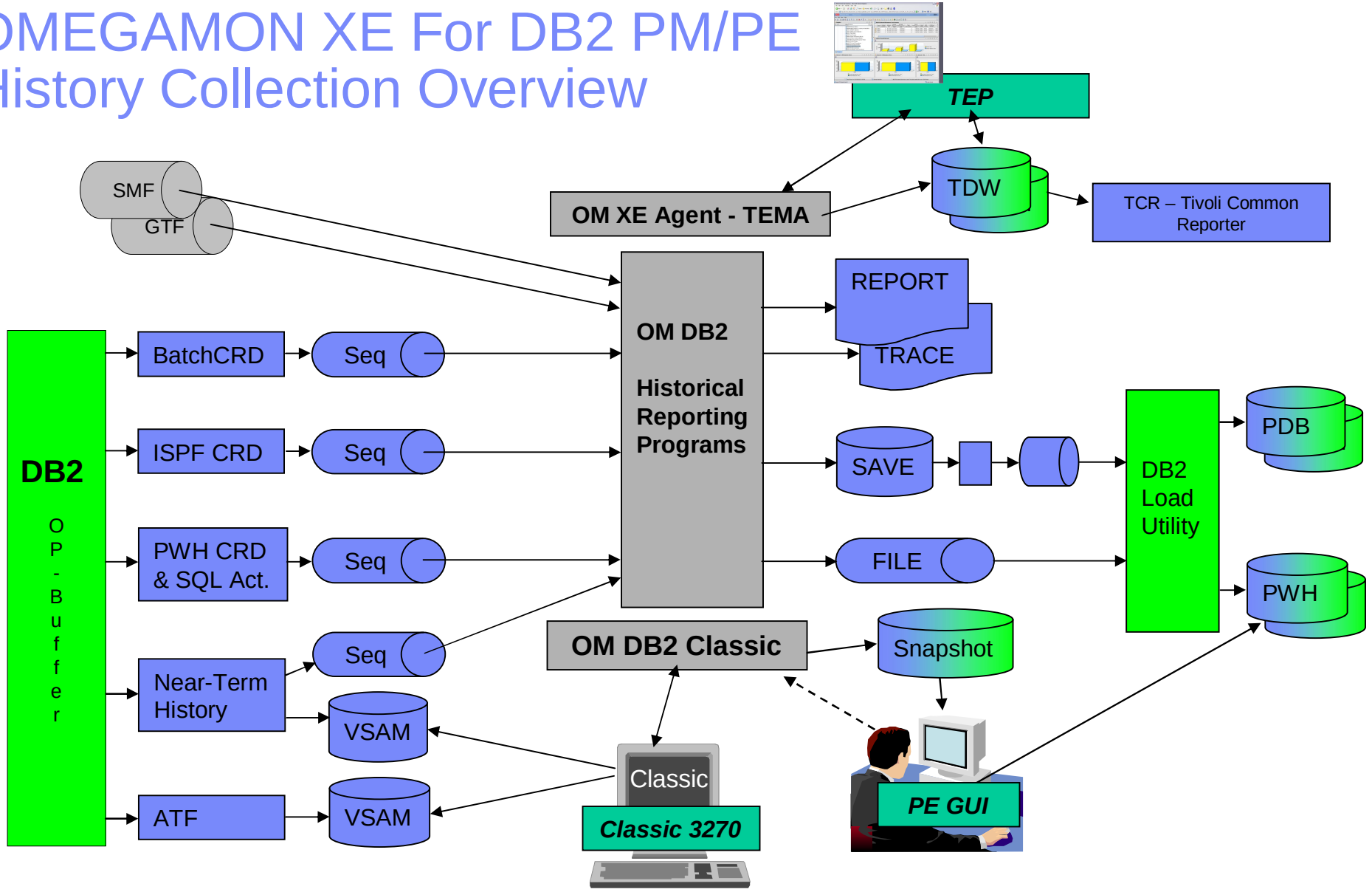
OMEGAMON XE For DB2 PM/PE History Collection Overview



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OMEGAMON DB2 Near Term Thread History

Easy Access To History Within OMEGAMON Classic Interface

View thread level data (Accounting detail or summary)

View DB2 Statistics data (interval data)

```
                                                ./C DSNC 07/25/09  9:24:57   3
                                                 Down PF8          Zoom PF11
>
>                    Enter a selection letter on the top line.
>
> *-BY PLAN       B-BY AUTHID       C-BY PLAN,AUTHID       D-BY AUTHID,PLAN
> O-OPTIONS
================================================================================
>                              THREAD HISTORY BY PLAN
 HAGP
+ Report Interval:   15 mins                          St
+ Report Filtered:       NO
 plan
+      Thread Summary Not Available, Data Collecte
+
+                                    DLk/  In-DB2  In-DB2   In-DB2          GetP/
+ Plan     Thrds Commit Abrt  DML   TOut  Elap Tm CPU Tm  Wait Tm  Getpage RIO
+ -------- ----- ------ ---- ----- ----  ------- ------- -------  ------- -----
+ ASNQA910     9     90    0  1486    0       .5     .15      .4     1225  1225
+ ASNQC910     1     10    0    20    0       .0     .00      .0       54  54.0
+ DISTSERV    15     49   30   117    0       .2     .04      .2      210 210.0
================================================================================
```

Near Term History stored in VSAM files for easy access from Classic interface.

Many filter/view options.

F11 to see more detail on a specific thread

NTH is highly detailed, easy to filter and access via 3270 interface, and is highly useful for problem analysis

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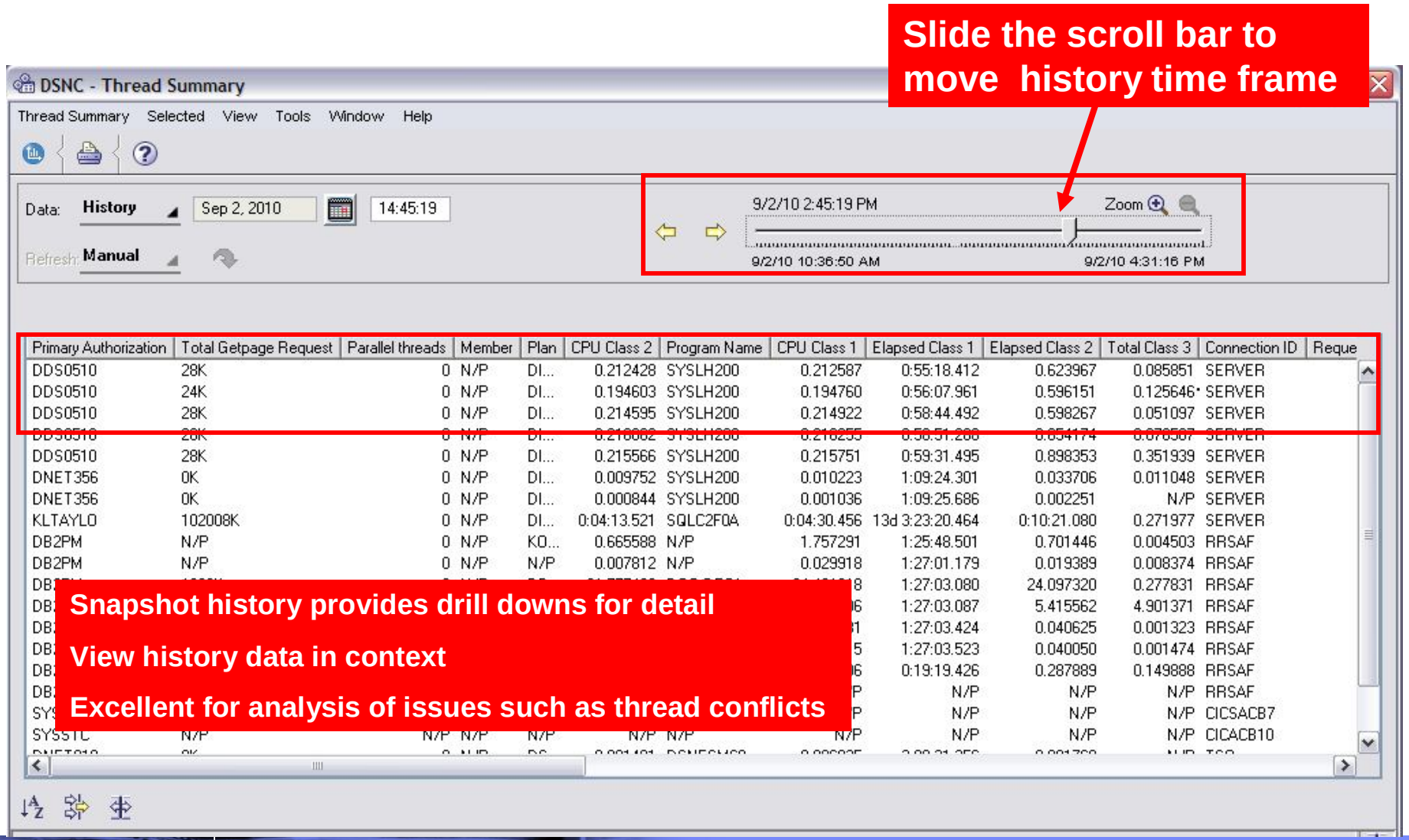
OMEGAMON DB2 Snapshot History Scrollable And Easy To Access Via PE GUI



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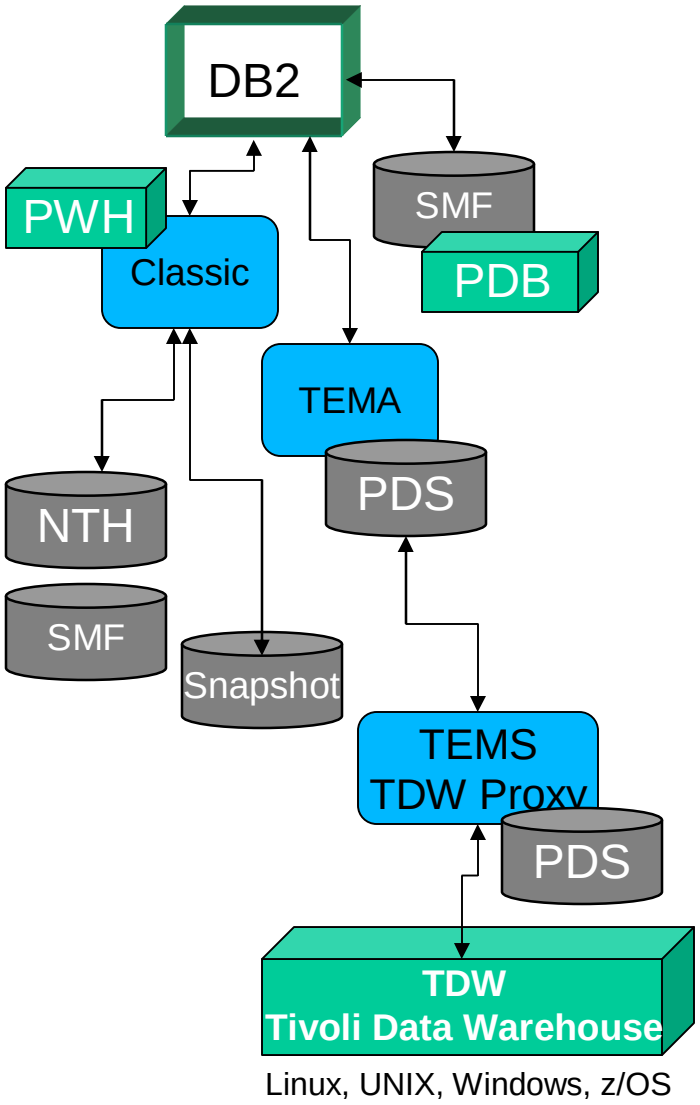
OMEGAMON XE For DB2 History Collection Summary



- Near Term History
  - Accounting (thread detail) and Statistics stored in a set of VSAM files – primary access via 3270 interface
  - Very detailed – useful for problem analysis
- Performance Warehouse
  - DB2 trace data (Accounting, Statistics, Performance) stored in DB2 tables
  - Collection and objects managed by OMEGAMON
  - Detail and quantity of data is variable
- Performance Database
  - DB2 trace data (Accounting, Statistics, Performance) stored in DB2 tables
  - Collection and objects managed by user
  - Detail and quantity of data is variable
- Snapshot history – PE GUI
  - Snapshots on a user defined interval
  - Easy to view and navigate via the PE GUI interface
- TDW snapshot history (different from PE GUI)
  - Use PDS and TDW infrastructure as other OMEGAMONs

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OMEGAMON XE For DB2 History Collection Options Considerations And Recommendations

- Near Term History (NTH)
  - Detailed history data that is easily accessible
  - NTH is often the most costly to collect in most shops
  - Cost of collection – moderate to high  Value – usually high
- Performance Warehouse
  - Detail of data and cost of collection varies depending upon user requirements
  - General recommendation – use when desired for lower cost/quantity data
- Performance Database
  - For higher quantity/detail requirements
  - Provides more manual control for higher volumes of history data collection
- Snapshot history – PE GUI
  - Easy to access and low cost to collect – requires the PE GUI
  - A low cost alternative to NTH  limitations of snapshot data collection
- TDW snapshot history
  - Cost of collection - low
  - Useful for trending analysis, not as detailed NTH or PE GUI snapshot

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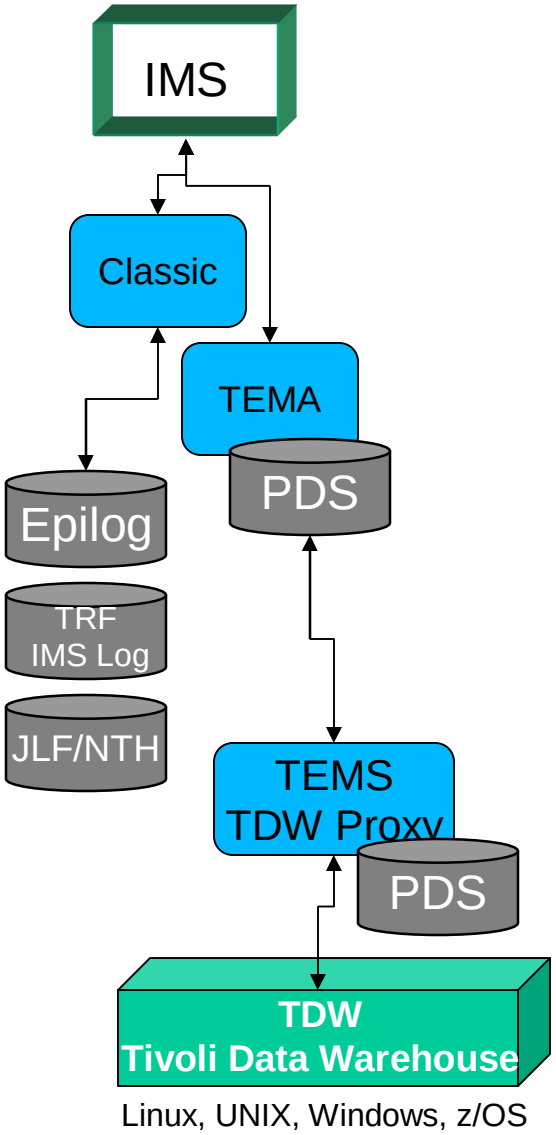
OMEGAMON XE For IMS History



- Epilog provides IMS history
  - Service levels (response times), resource utilization data, and degradation data (bottleneck analysis of IMS workload)
  - Detail is limited - interval/group based
  - Cost – low ⟷ Value – moderate
- Near Term History (NTH)
  - Transaction detail history (tran level/call level detail)
  - Easy to access via 3270 Classic interface
  - Data collected to Journal Logging Facility (JLF)
  - Cost – moderate ⟷ Value – moderate to high
- Transaction Reporting Facility (TRF)
  - DB call level detail and summary data written to IMS log
  - Useful for chargeback and some performance analysis
  - Cost – high ⟷ Value – limited use/requires batch
- Snapshot history data and the Tivoli Data Warehouse (TDW)
  - Data is stored in the TEMA/TEMS in the PDS and optionally sent to the TDW
  - Data may be summarized and pruned using the TDW
  - Cost of collection is low – data is useful for trending analysis

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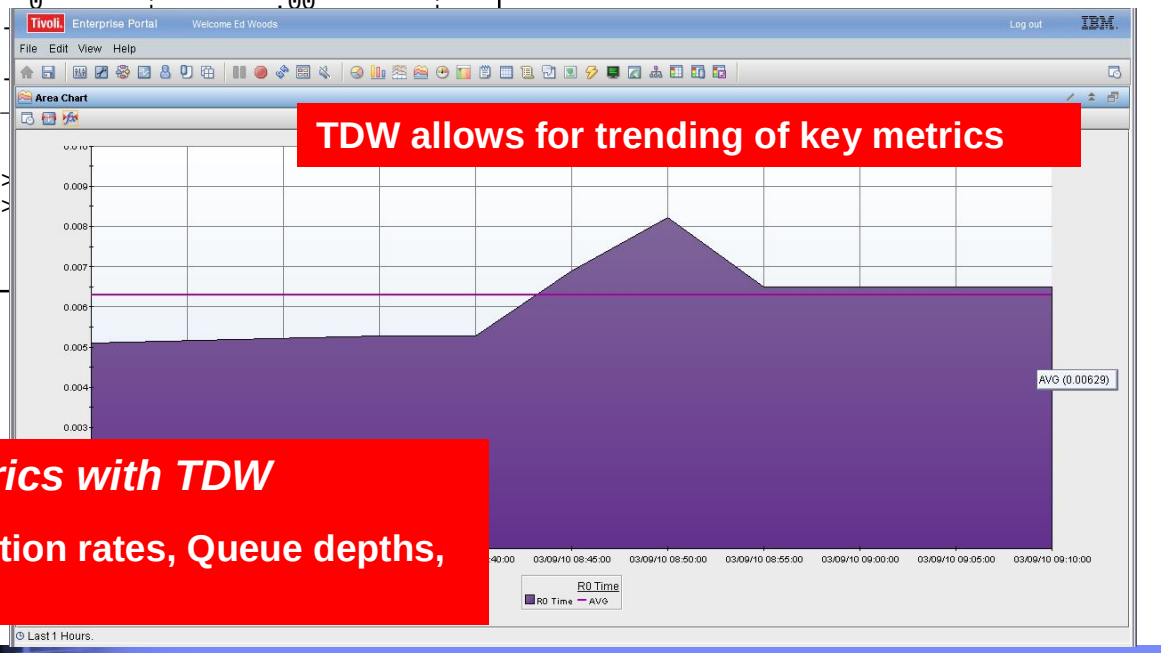
OMEGAMON IMS Historical Data Collection Alternatives

Epilog data is interval based

Useful for analysis of bottlenecks relative to overall system workload

```
EPILOG/IMS V420  09/29/09  7:13  Mode: PAGE
CMD==>
*****************************************
+=======================================
¦ Transaction Group =   1        Symbolic Na
¦ Period:  05:59 to 06:14 on 09/28/09                Elap =  14:4
+-------------------------------------------------------------------
¦                        RESPONSE TIME DATA
+-------------------------------------------------------------------
¦Response_Component_____Avg. Rsp. Time_____Trans. Count_____Rate (per min.)
Input Queue          ¦     0.00 S       ¦          0       ¦        .00
¦Pgm Input Queue     ¦     0.05 S       ¦         56       ¦       3.81
¦Processing          ¦     0.73 S       ¦         55       ¦       3.74
¦Response time 0     ¦     0.77 S       ¦         55       ¦       3.74
¦Output Queue        ¦     0.00 S       ¦          0       ¦        .00
¦Response time 1     ¦     0.00 S       ¦          0       ¦        .00
+-------------------------------------------------
¦                           DEGRADATION DATA
+-------------------------------------------------
¦Competing_State_________Time_____%_¦0___1___2___
¦MVS Waits             0.24 S   14.3¦----->  .
¦ PGM Fetch I/O      (0.24) S (14.3)¦----->  .
¦IMS Waits             0.49 S   28.6¦----------->
¦ Iswitched to CTL   (0.49) S (28.6)¦----------->
```



TDW allows for trending of key metrics

Trend key IMS performance metrics with TDW

Response time, Bottlenecks, Transaction rates, Queue depths, Buffer/pool performance

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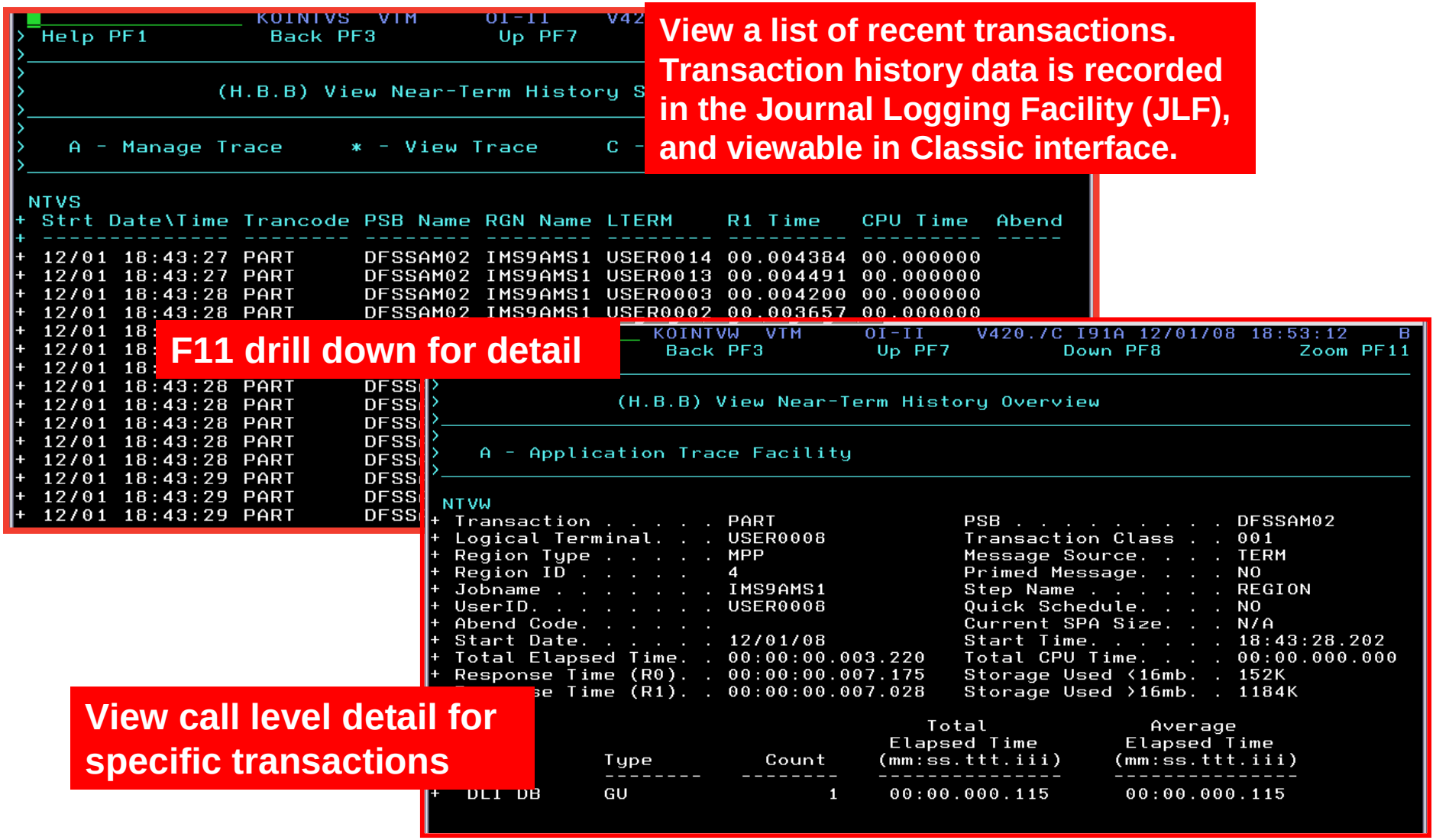
Near Term History Of IMS Transactions Useful For Problem Analysis



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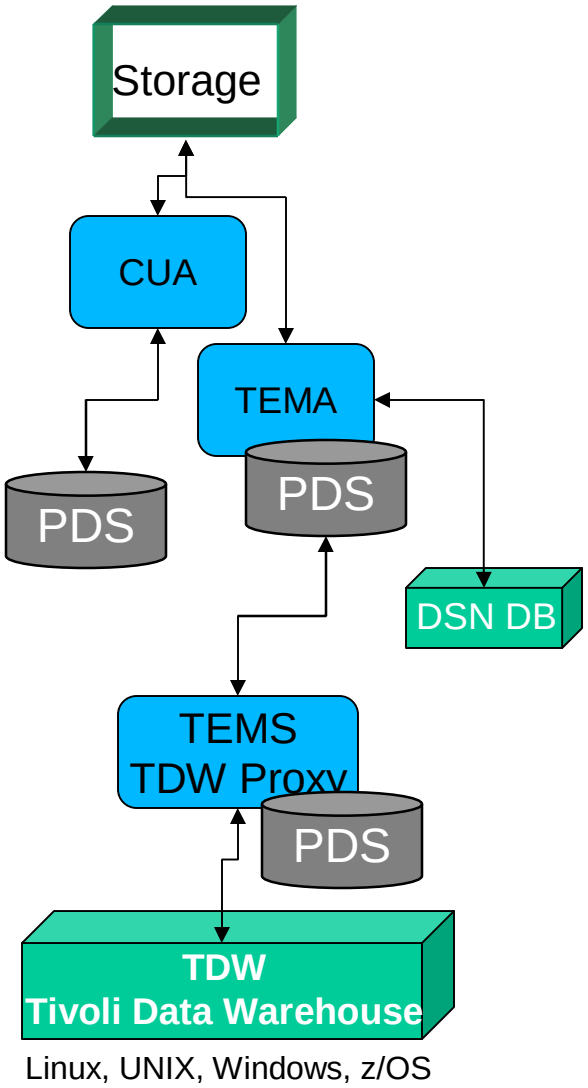
OMEGAMON XE For Storage History



- OMEGAMON XE For Storage makes extensive use of the Persistent Data Store (PDS) for data collection
- PDS data may be accessed by both the CUA 3270 and Tivoli Enterprise Portal interfaces
- OMEGAMON Storage provides numerous product provided Tivoli Enterprise Portal history workspaces
- Cost of collection
  - Potentially high since many shops may have thousands of devices to gather information about
  - Observe best practices for OMEGAMON Storage monitoring
    - Avoid redundant monitoring of devices
    - Group related devices and use wild cards to set options
    - Consider options carefully when monitoring at the application and data set level
  - When defining history in the TEP and TDW consider quantity of data being collected
    - Number of devices, controllers, data sets, applications
- Value can be high, but so can cost

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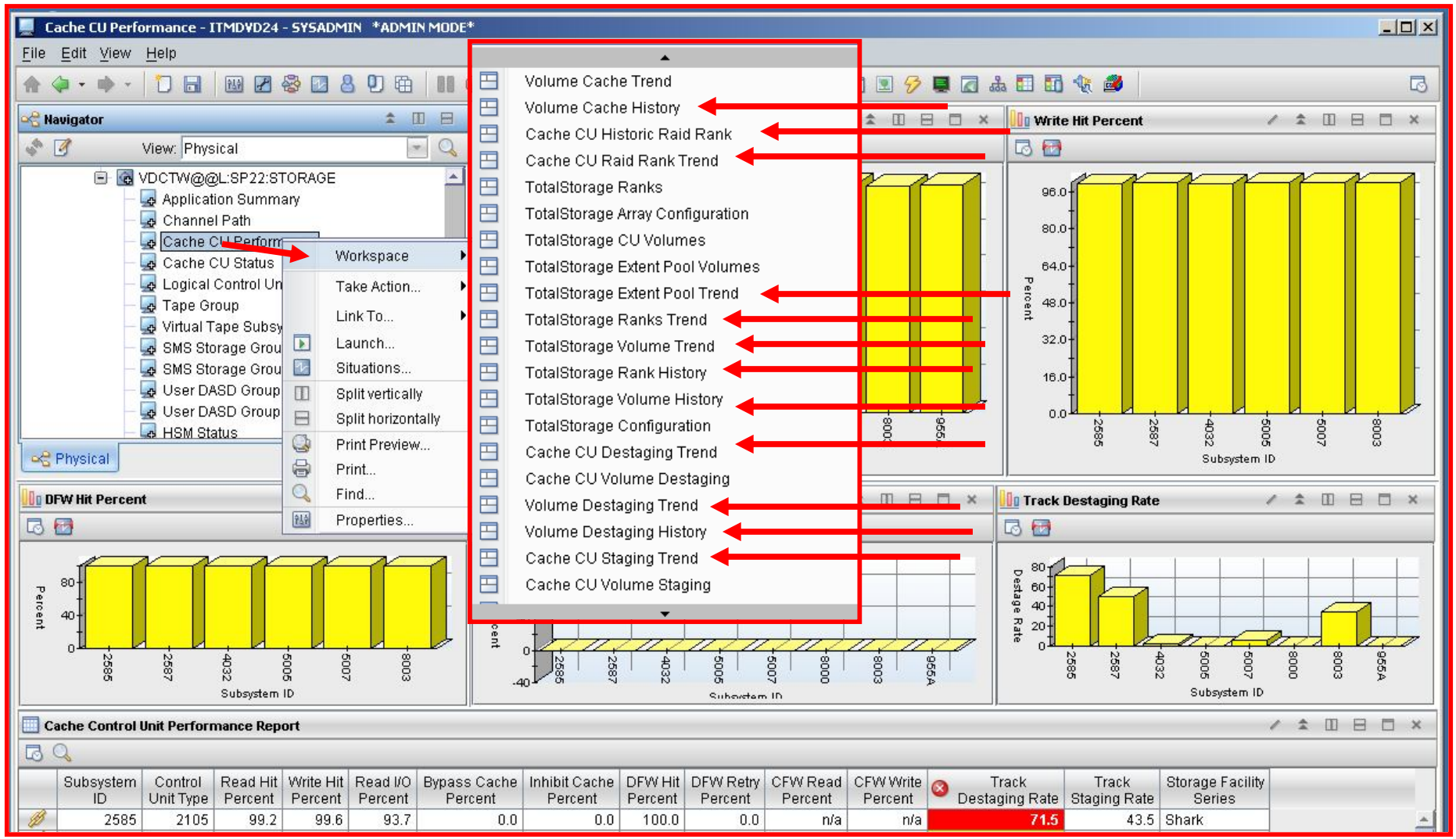
OMEGAMON XE For Storage Provides Trending/History Information At Several Levels



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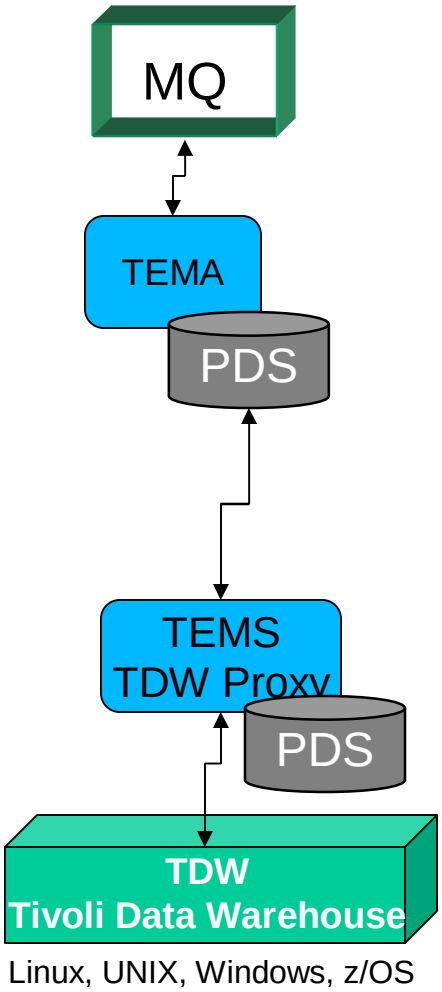
OMEGAMON XE For Messaging History



- OMEGAMON XE For Messaging provides snapshot history data and supports the Tivoli Data Warehouse (TDW)
  - Data is stored in the TEMA/TEMS in the Persistent Data Store (PDS)
  - Data may be optionally sent to the TDW
  - Data may be summarized and pruned using the TDW
- OMEGAMON XE For Messaging provides many history workspaces out of the box
  - Examples of product provided workspaces include
    - Queue statistics, tran/program statistics by queue, Message statistics, Page set statistics, Message manager performance, Log manager performance, Channel performance
- Snapshot data is easy to access within the Tivoli Portal
  - Cost of collection is low ⟷ value is moderate to high

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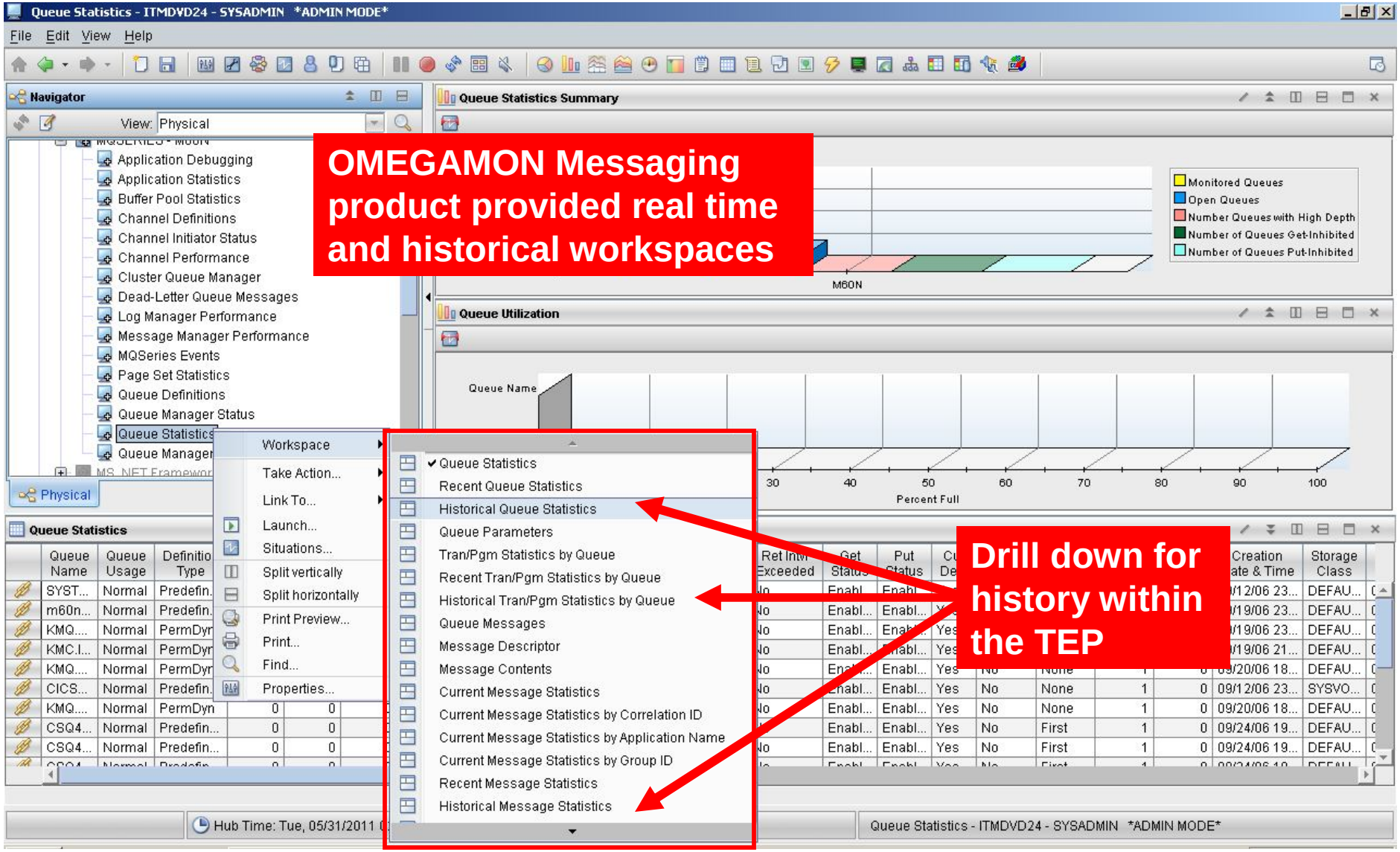
Accessing OMEGAMON Messaging History Data



OMEGAMON Messaging product provided real time and historical workspaces

Drill down for history within the TEP

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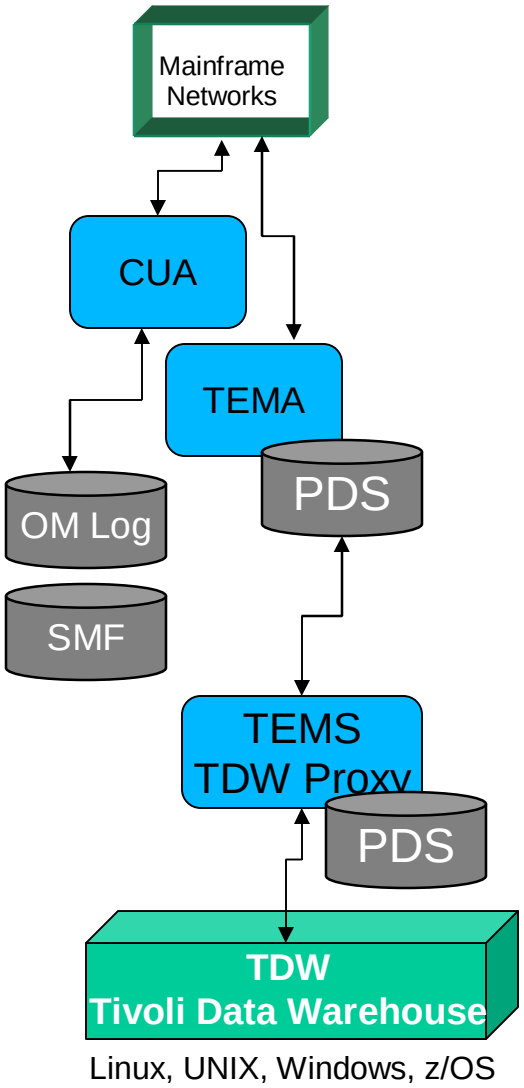
OMEGAMON XE For Mainframe Networks History



- OMEGAMON XE for Mainframe Networks provides snapshot history data and supports the Tivoli Data Warehouse (TDW)
  - Data is stored in the TEMA/TEMS in the Persistent Data Store (PDS)
  - Data may be optionally sent to the TDW
  - Data may be summarized and pruned using the TDW
- When configuring history in the TEP/TDW
  - Be aware of relative number of rows per snapshot and snapshot frequency when specifying collection
    - Example- application level versus connection level history
- OMEGAMON XE For Mainframe Networks provides trending history log in the CUA 3270 interface
  - Data is logged and viewable in CUA
  - Recommendation - the most current information is in the Tivoli Portal, therefore focus history efforts in the TEP
- Cost of collection relative to value
  - CUA log – typically low ⟷ Limited data – use TEP
  - Snapshot – typically low ⟷ Useful for trending/analysis

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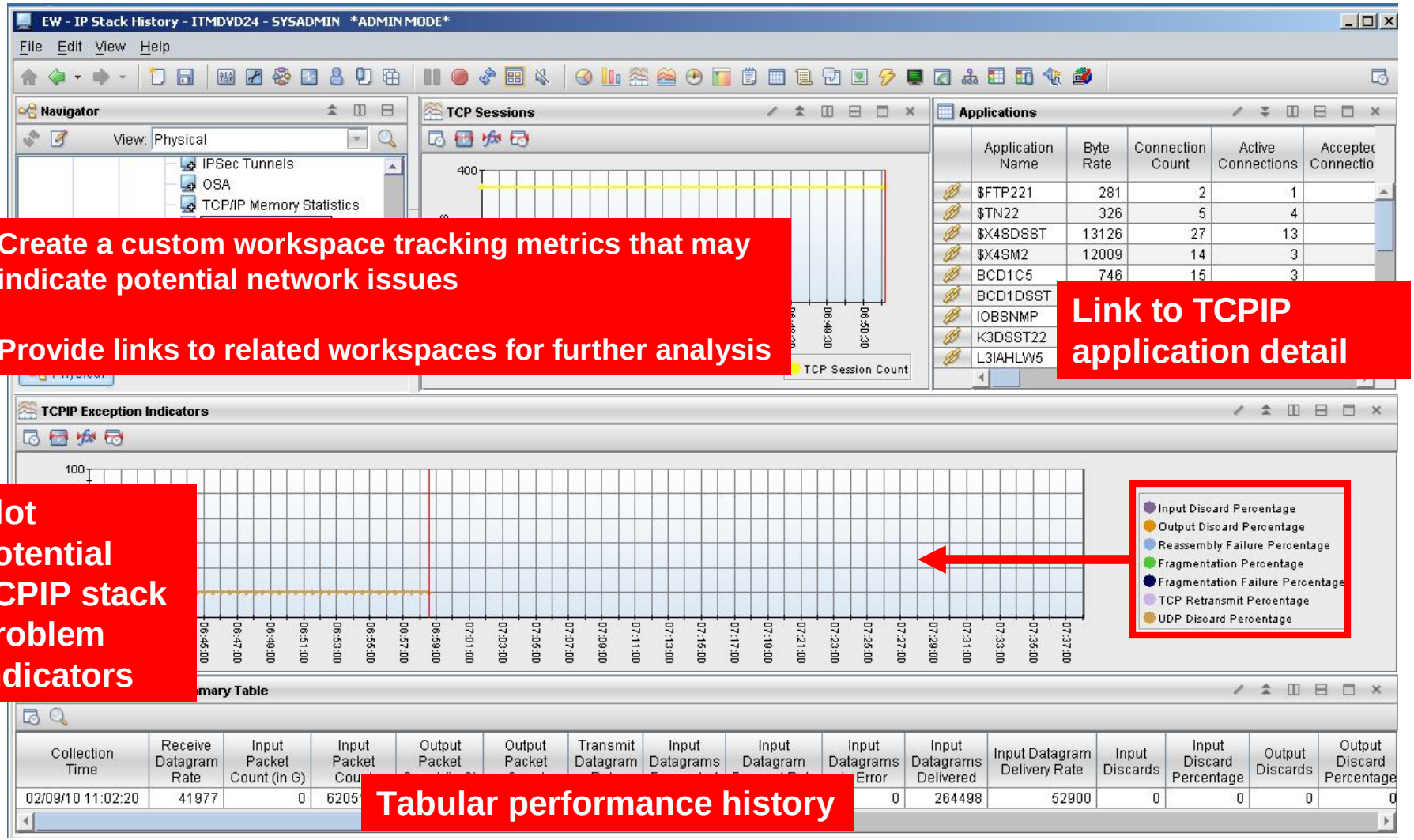
OMEGAMON Mainframe Networks Example
A Custom Workspace Showing Network Problem Indicators



Create a custom workspace tracking metrics that may indicate potential network issues

Provide links to related workspaces for further analysis

Link to TCPIP application detail

Plot potential TCPIP stack problem indicators

Tabular performance history

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Using History To Become More Proactive

- A strategy to be more proactive
  - ***Visualize - Control - Automate***
- Use history data to improve the visualization of system activity and resource utilization
  - Use history data to identify peaks/valleys/bottlenecks
  - Use trending and visualization to identify potential issues
- Use history to improve control
  - Customize workspaces, views and navigation
  - Identify and isolate issues and take corrective actions
- Use history to improve automation
  - Improve alerts by making situation thresholds more accurate and relevant
    - History data can be used as a reference point to make sure threshold levels in situations reflect real problems

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Considerations For Collecting Tivoli Data Warehouse Snapshot History Data

- Avoid the “turn on everything” method
  - Turning on everything will result in a fire-hose of information that will potentially obscure useful information, waste space, increase cost of collection, and slow down data recall
- Project potential volume of history being collected
  - Warehouse projection worksheet provides a means to calculate
  - Here is a link to documentation for the tool:
    - http://publib.boulder.ibm.com/infocenter/tivihelp/v15r1/index.jsp?topic=/com.ibm.itm.doc_6.2.2fp1/ch2.3warehousecon.htm
- Consider options for history data retention
  - Many deploy TDW with DB2 on a Linux/Unix/Windows type platform to collect and house data
  - You may optionally store your history data on DB2 on z/OS
    - Requires DB2 on z/OS at the V9 level, or above
    - Here is a link to a white paper that goes through the setup of TDW on DB2 on z/OS:
      - http://www-03.ibm.com/support/techdocs/atsmastr.nsf/5cb5ed706d254a8186256c71006d2e0a/b327c2b1683071e28625786400634a7f/$FILE/TDW_DB2_ZOS_Considerations.pdf

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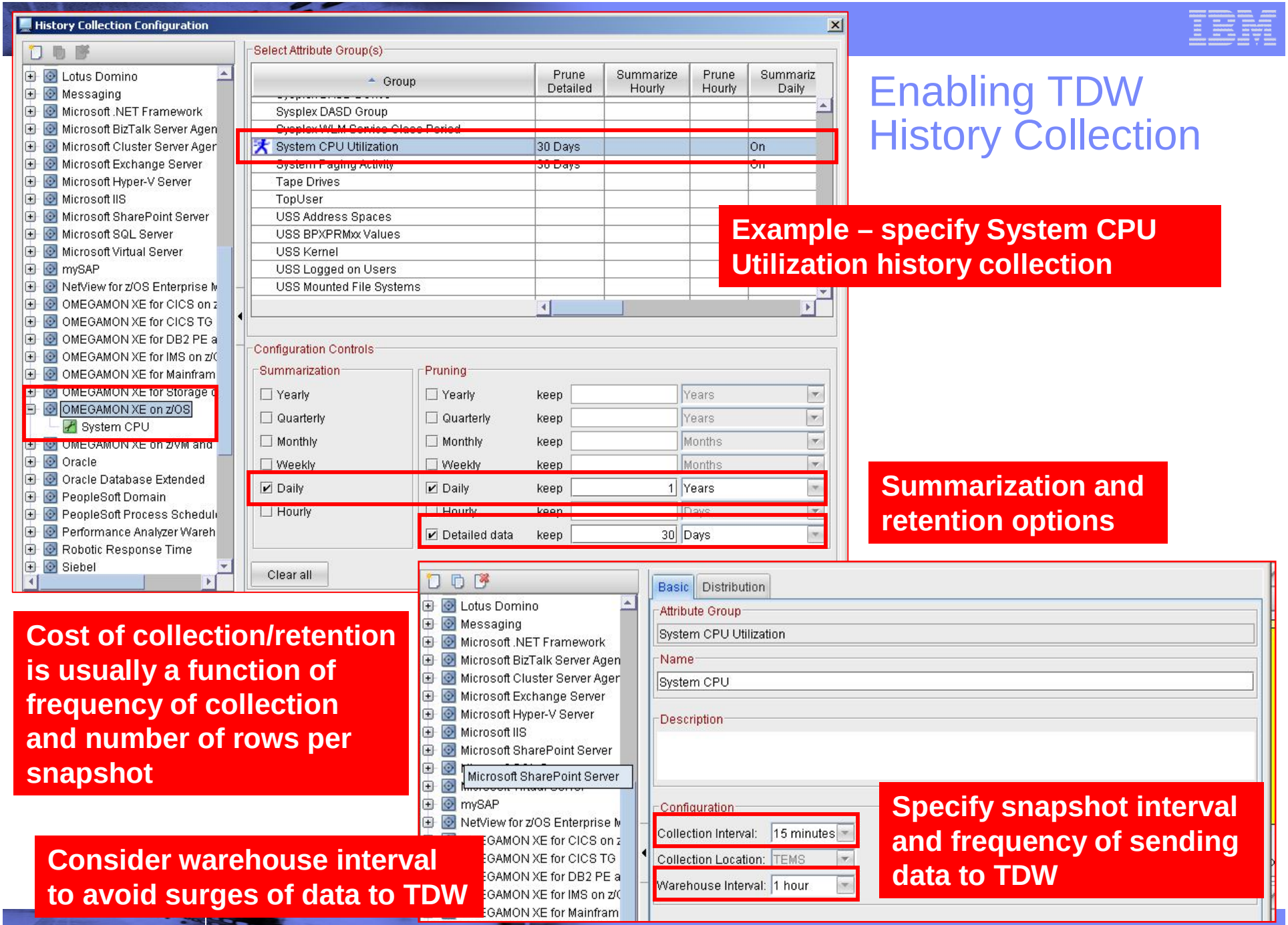
Enabling TDW History Collection



Example – specify System CPU Utilization history collection

Summarization and retention options

Cost of collection/retention is usually a function of frequency of collection and number of rows per snapshot

Specify snapshot interval and frequency of sending data to TDW

Consider warehouse interval to avoid surges of data to TDW

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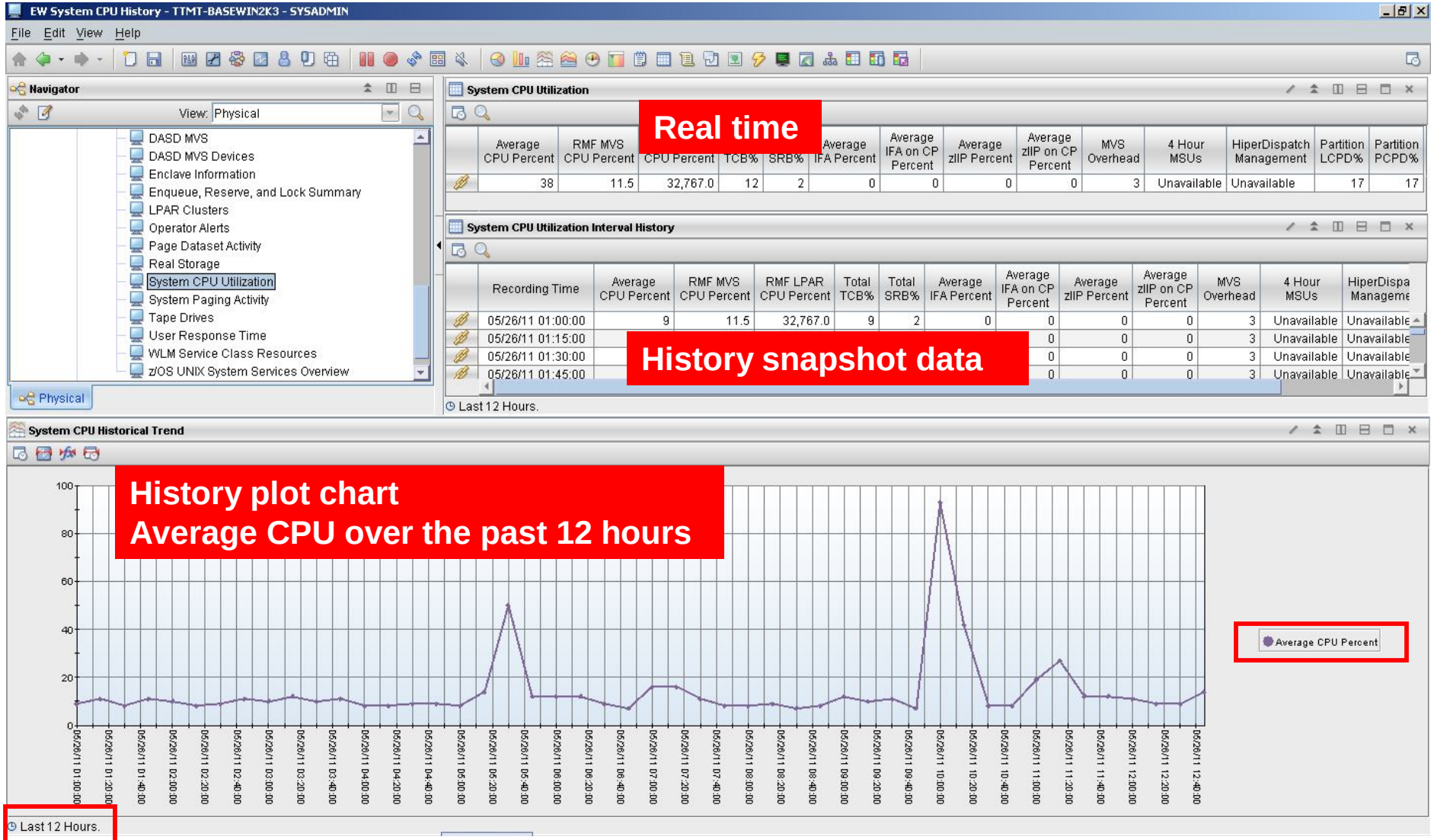
Example - Use The TEP To Create A Custom Workspace As A Starting Point For Historical Data Analysis



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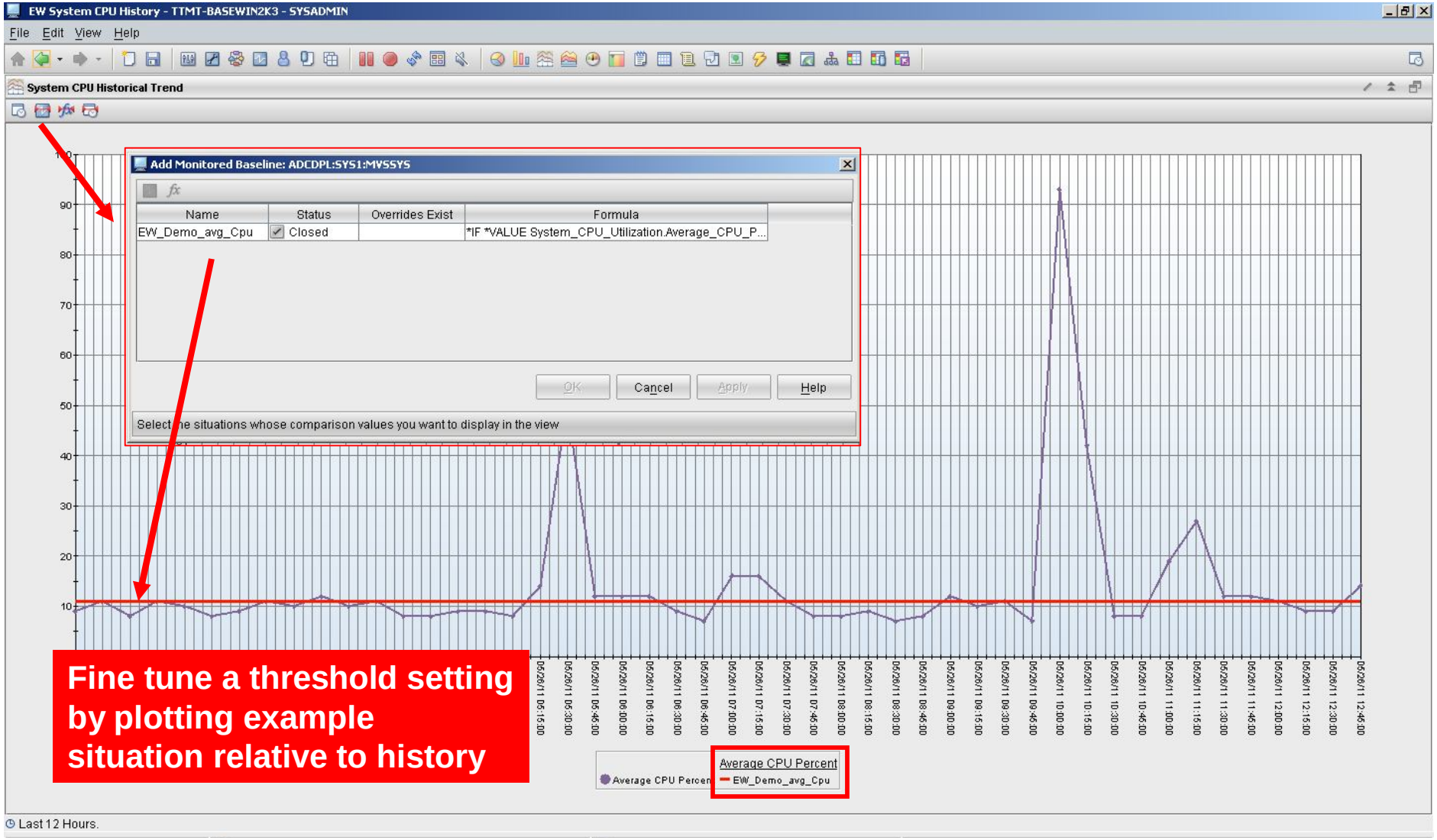
Use A Situation To Track A Monitored Baseline Help Determine Where To Set A Threshold Level



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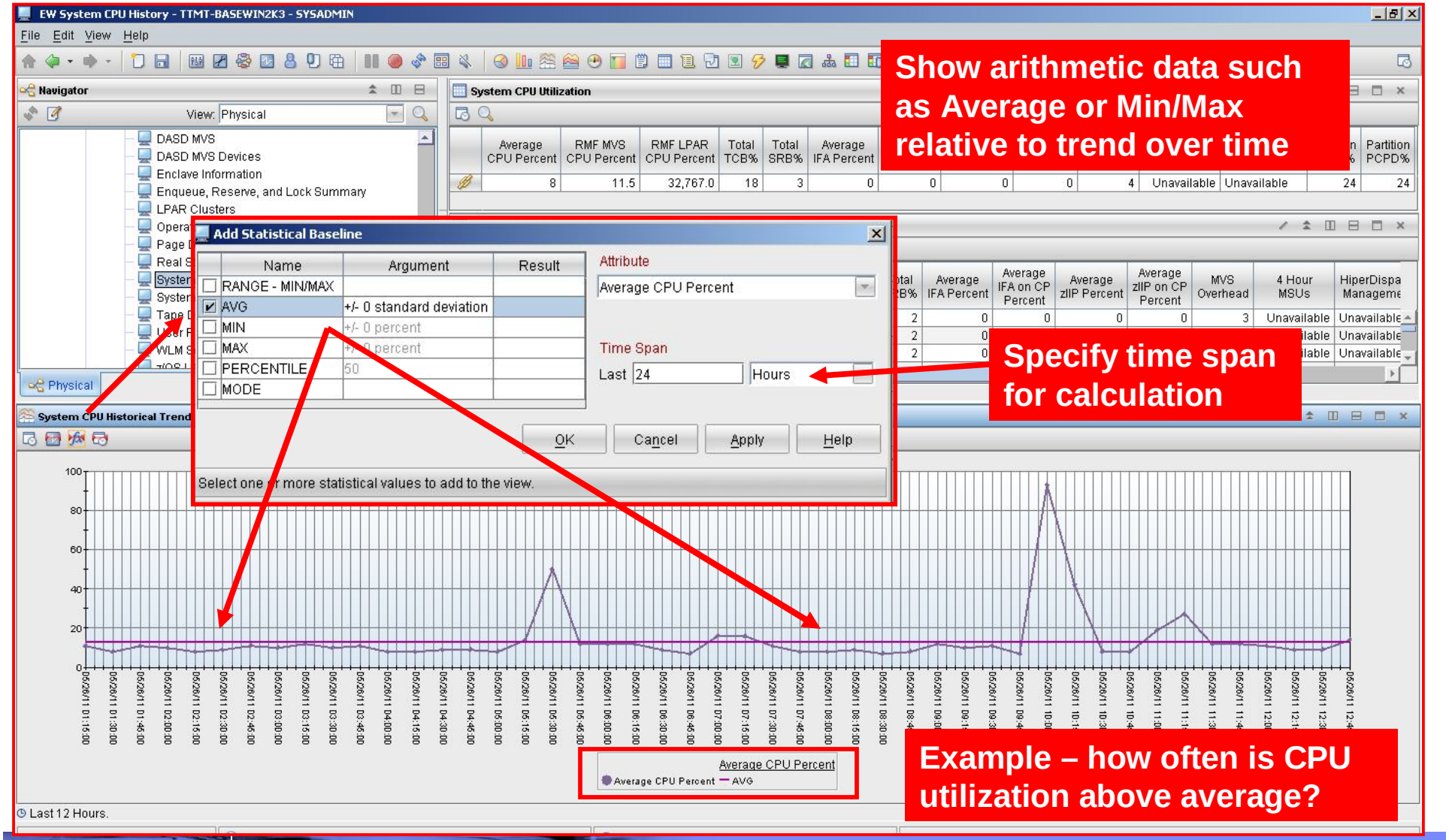
Use Arithmetic Functions To Trend History



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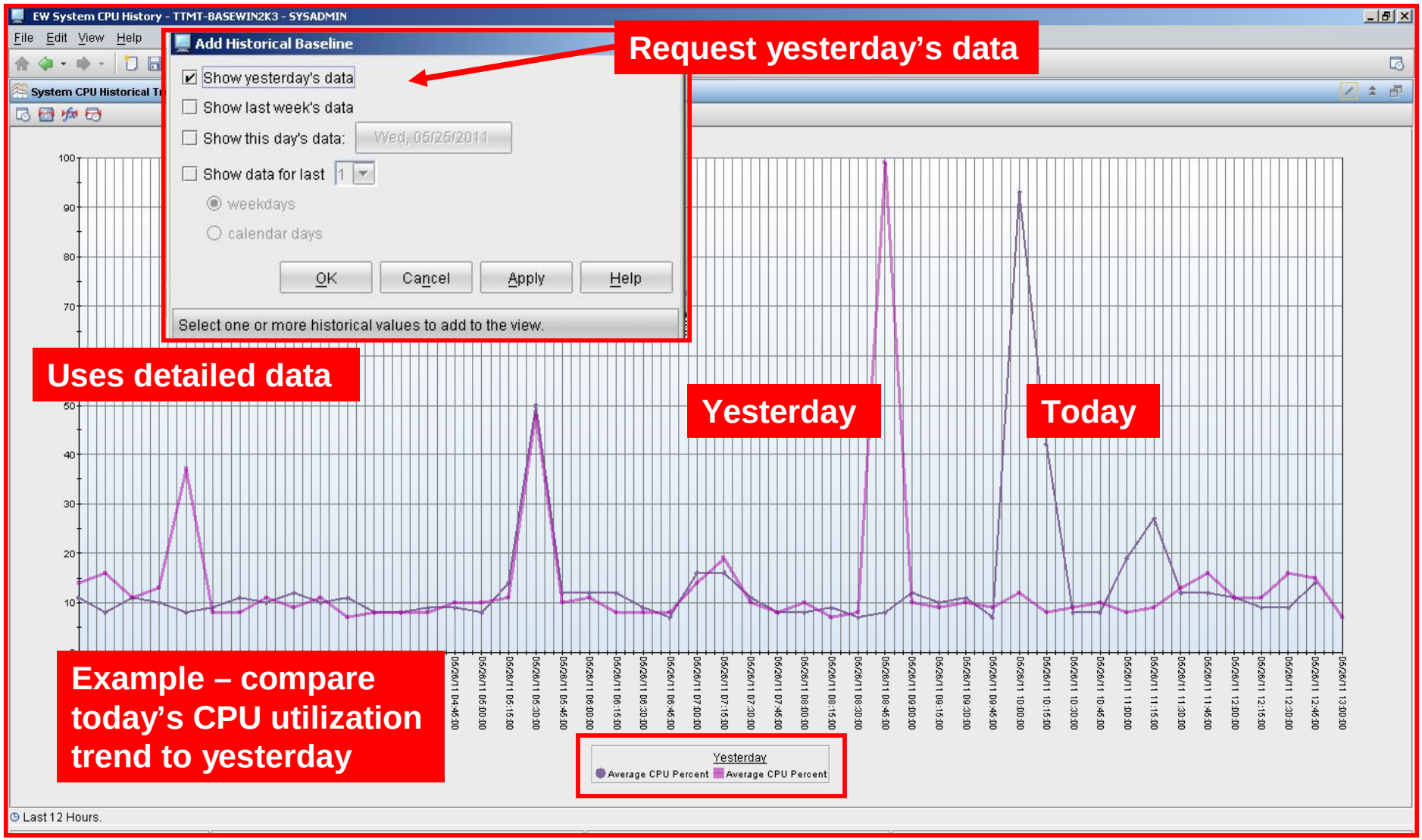
Use Historical Baseline To Compare Past Trends To Current Trends



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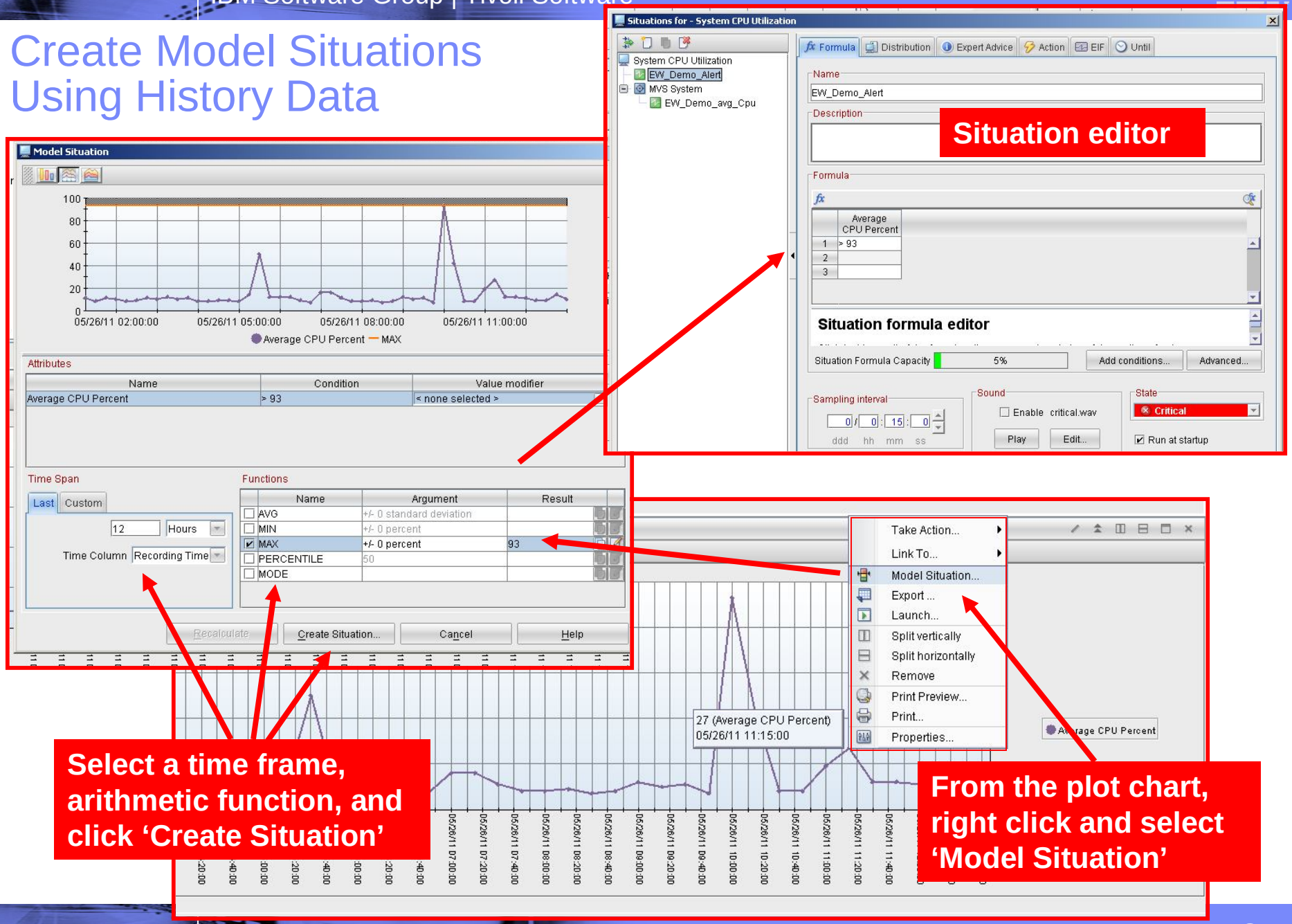
Create Model Situations Using History Data



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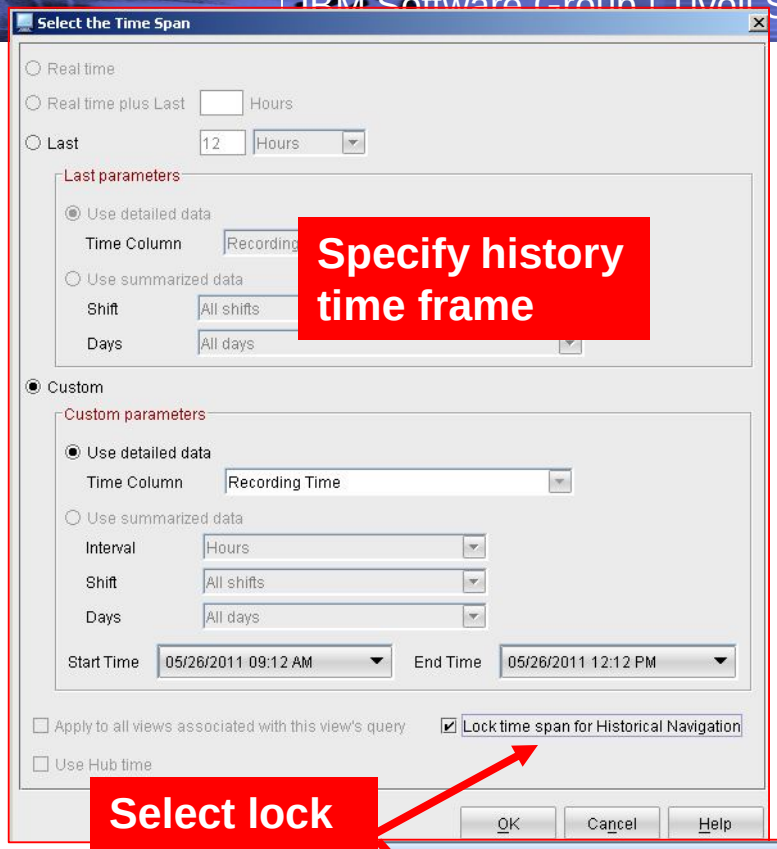
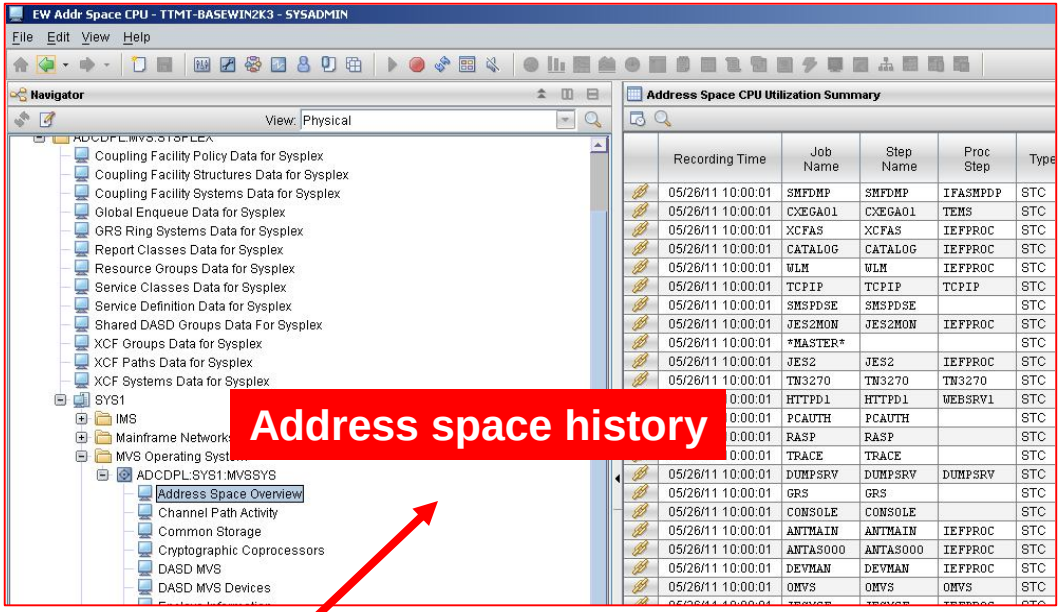
History Links And Drill Down

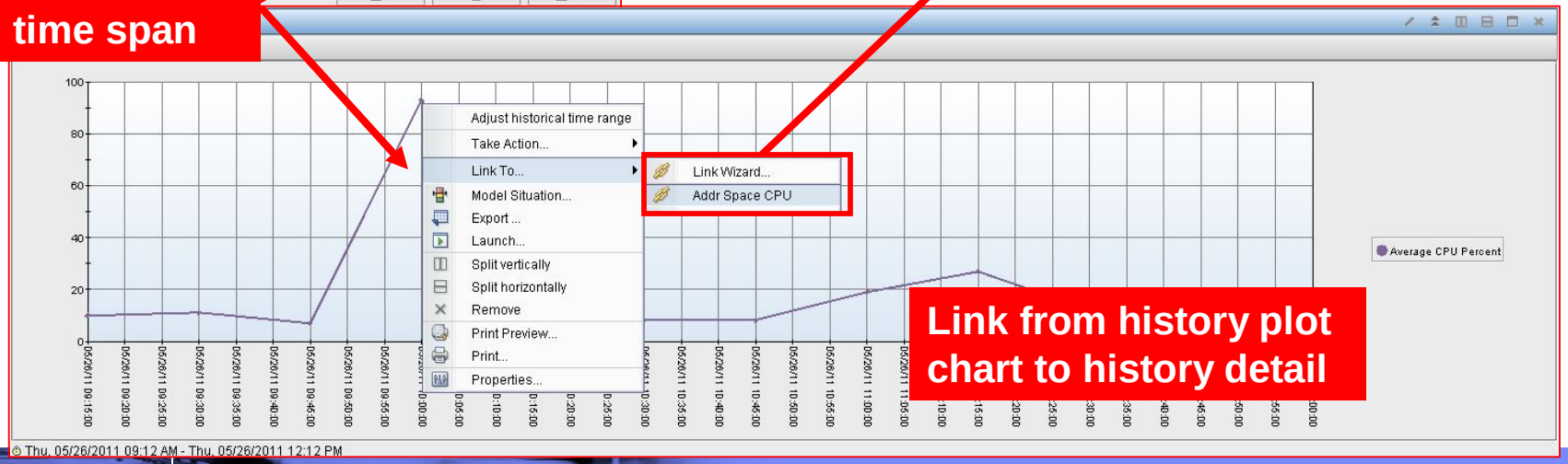


Specify history time frame



Address space history

Select lock time span



Link from history plot chart to history detail

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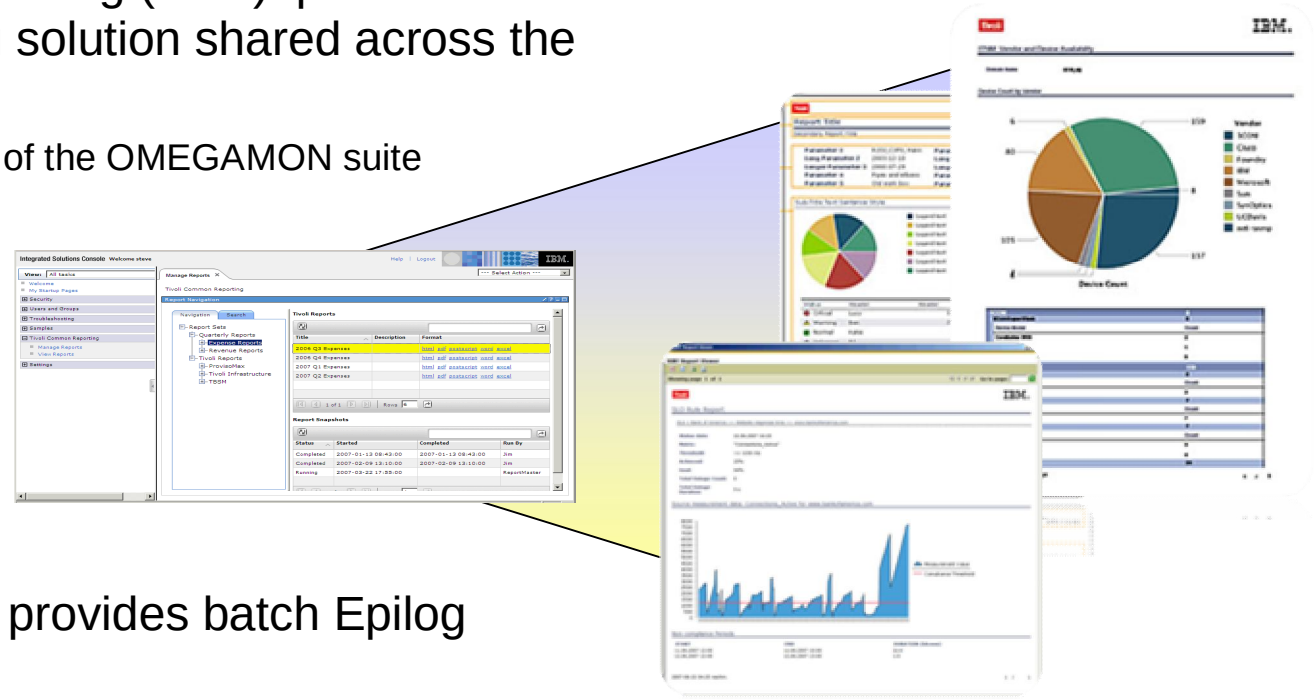
Historical Reporting Options

- Tivoli Common Reporting (TCR) provides a consistent reporting solution shared across the Tivoli Portfolio
  - TCR included as part of the OMEGAMON suite



- OMEGAMON z/OS provides batch Epilog reporting
- OMEGAMON IMS provides batch Epilog reporting
- OMEGAMON CICS provides some basic reports
- OMEGAMON DB2 provides a detailed/robust best-of-breed historical reporting suite

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Improve Your Analysis

Additional Components To Consider For Historical Data Collection And Analysis

- Tivoli Decision Support For z/OS
  - Generate customized reports to communicate system performance, capacity management, resource availability and cost allocation information
  - Collects data, such as SMF, CICS, IMS performance data
  - Provides a central data repository (DB2) and integrates with the Tivoli Portal
  - Integrates with a variety of Tivoli solutions
- IMS Performance Analyzer
  - Provides robust reporting and information on IMS system performance for monitoring, tuning, managing service levels, analyzing trends, and capacity planning
  - Expands the reporting options beyond what's available with OMEGAMON IMS
- CICS Performance Analyzer
  - Comprehensive performance reporting and analysis for CICS, including use of DB2, WebSphere MQ, IMS, and z/OS System Logger
  - Evaluate CICS system efficiency, eliminate system bottlenecks and proactively tune system performance
  - Expands the reporting options beyond what's available with OMEGAMON CICS

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Summary And Conclusions

- Each OMEGAMON monitoring solution offers history along with real time data collection
- Each OMEGAMON has it's own unique considerations specific to history collection and the data that is available
- History data collection is a classic trade-off of cost versus benefit
  - In some scenarios history data collection can be costly
  - Understand the costs versus the benefits
- History is essential to solve problems after the fact
- History is useful to make monitoring more proactive
  - Historical trending to identify peaks/valleys/issues
  - Historical data analysis to optimize alerts and thresholds

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