IBM Software Group

Automated Performance Management Using IBM Tivoli: Techniques And Best Practices

Session 12880
Tuesday, February 6th: 11:00 AM - 12:00 PM

Tivoli software

Agenda

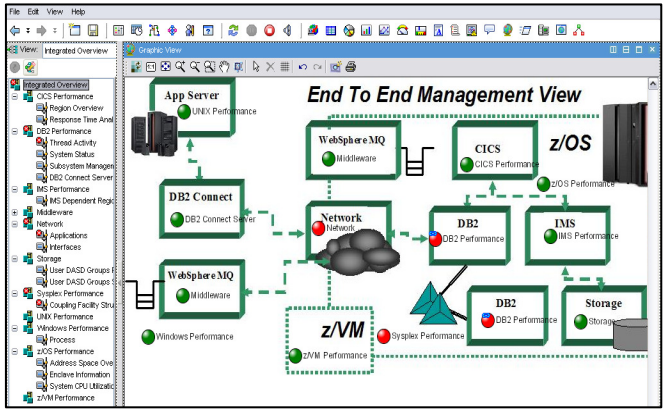
- Why Integrated Automation?
- Where Automation?
- What is Automated Performance Management?
- Integrated Performance Automation
  - Tools, Tips, Techniques
  - Situations and Policies
- Examples And Best Practices
- Recommendations

Why Integrated Automation?
Islands Of Automation Complicate Management

Potentially many consoles, screens, and technologies to monitor and manage

Automated Performance Management Addressing Islands Of Automation

- Many technical platforms, components and core technologies to manage
  - Often each with it's own group of Subject Matter Experts (SMEs)
  - Potentially with it's own set of management tools
- The problems
  - Complex SME tools with different User Interfaces
  - SME tools that do not integrate or share information
    - More difficult to navigate
    - More difficult to do problem identification, isolation, and resolution
  - More challenging to automate corrective actions without clearly defined integration



Recommendation – Where feasible pursue a more integrated approach

Where Automation?
Automation Many Occur At Many Levels

- Traditional z/OS console automation
  - Automated resource management
    - System start up and shut down
  - Console message management – message suppression
  - Resource and application management
    - Abend/failure management
    - Subsystem support management
      - WTORs - log management – archive management
- Automation within monitoring and analysis technologies
  - Command and corrective action capabilities within tools
  - Alerts and notifications
- Event/Network management
  - Alerts, notifications and corrective actions managed by the "Manager of Managers" – example Netcool OMNIbus

z/OS console
Address spaces
Messages
Resource status

Monitoring
Resource monitor
Analytics
Real time
History
Alerts – messages

Event Management
Event correlation
Notification
Correction

A Goal For Many Shops
Make Systems Management More 'Proactive'

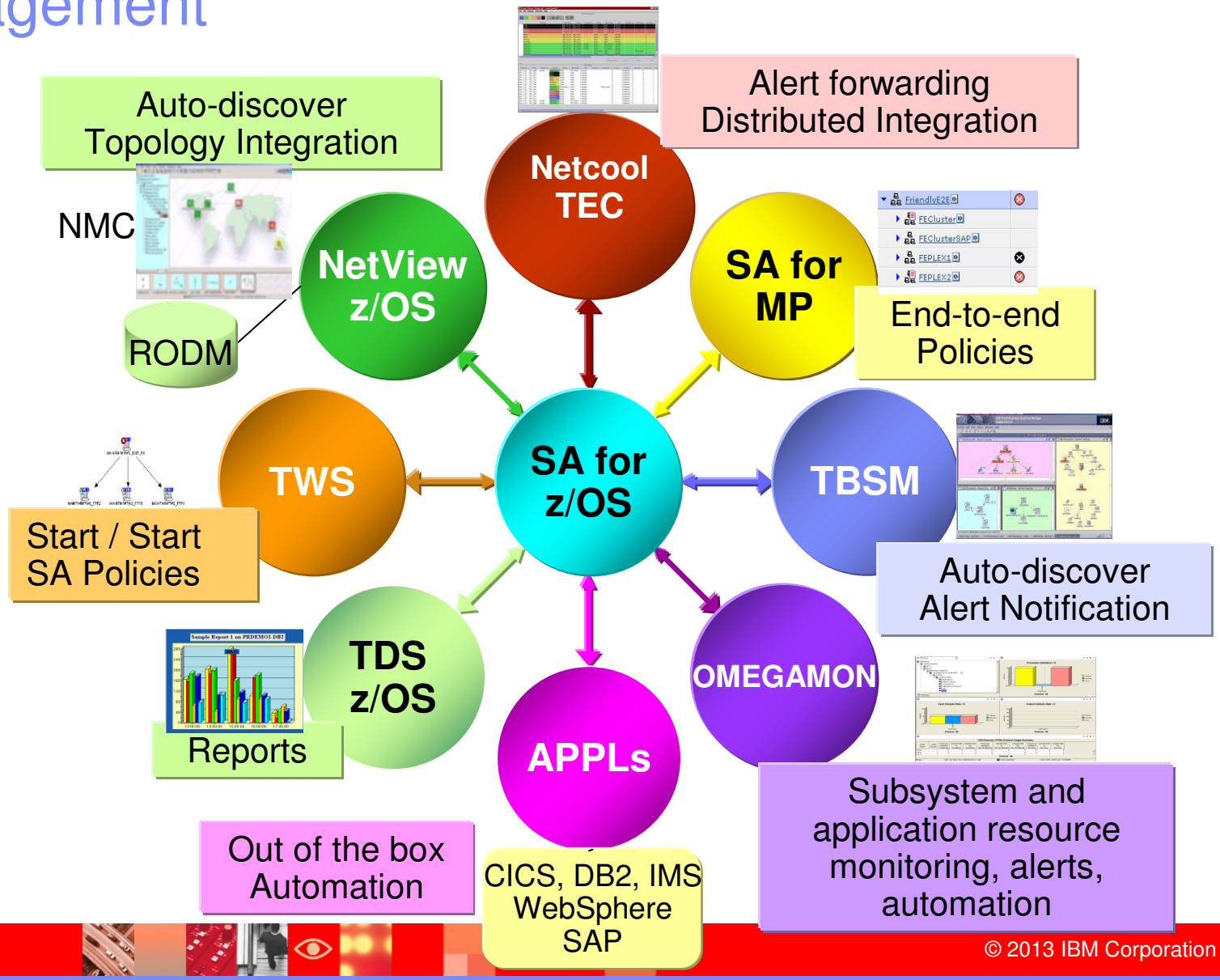
- In many shops systems management tends to be done 'ad hoc'
  - Some alert generation – varies by shop
    - Some shops very alert driven – many are not
  - Often notification consists of 'call the help desk'
- Many customers want to be more 'proactive'
  - Definition of proactive may vary
    - Proactive for some installations may mean more rapid alert and notification of technical and/or business application issues
    - Proactive for some installations may mean notification ***prior*** to the problem
      - Alert when utilization indicates a potential issue in the future
      - Alert when I'm within 90% of the wall
    - Proactive may mean an automated workaround or resolution

What Is Automated Performance Management?

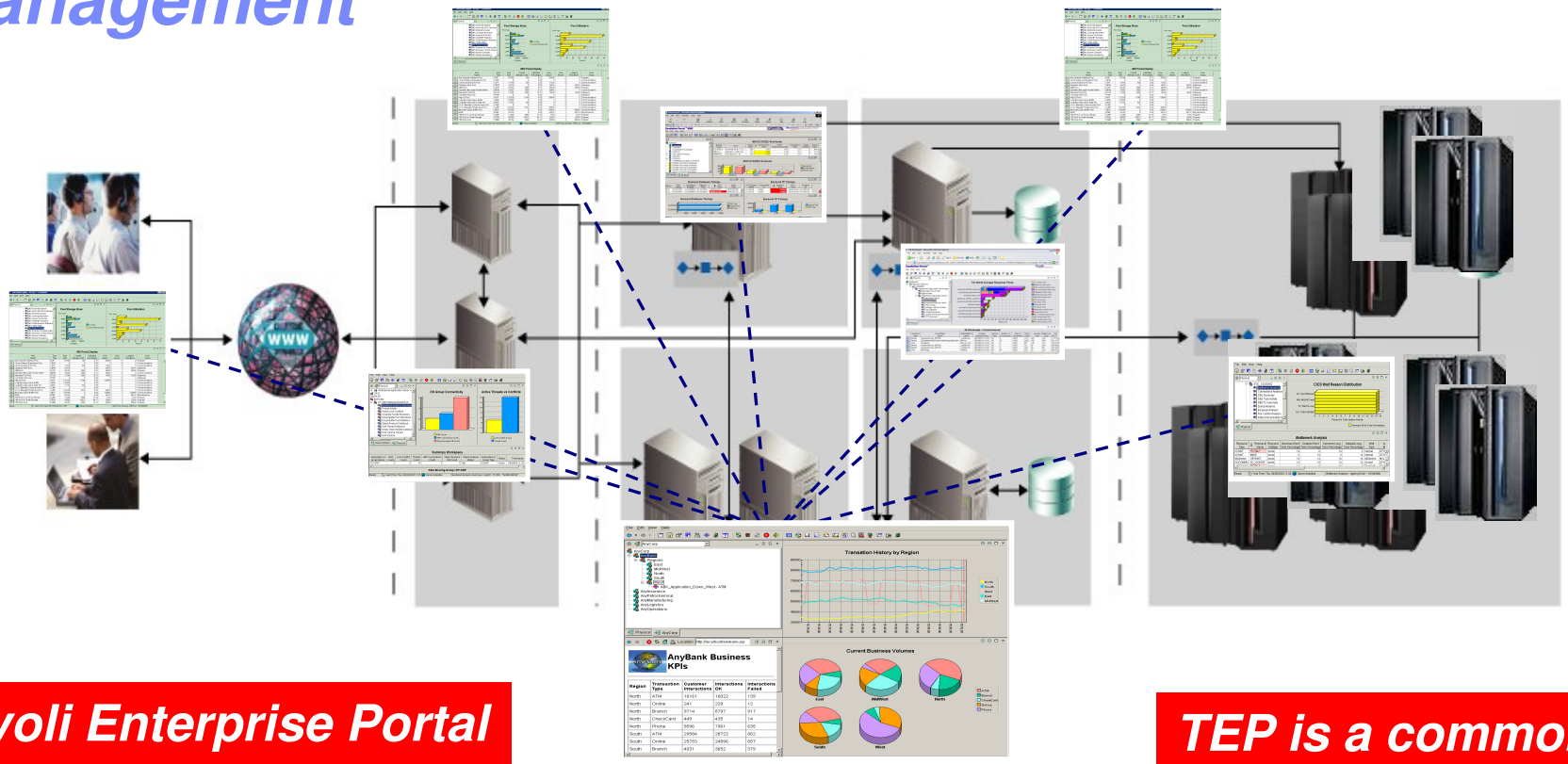
- Exploiting and leveraging the intrinsic monitoring and management capabilities of performance monitoring combined with event management and automation
  - Make automation more powerful and robust by incorporating performance metrics into automation routines
  - Incorporate information from the application and/or subsystem performance level
  - Incorporate systems and application knowledge of the staff into automation routines

- The benefits - Become more ‘proactive’
  - Improved and more meaningful/timely alerts and notifications
  - Improved understanding of systems and systems management
  - Reduce the time for problem identification and isolation
  - Improve MTTR (mean time to resolution)
  - Where possible solve problems at machine speed

IBM System Automation Integrates With Monitoring And Management



Tivoli Enterprise Portal (The TEP) Integrated Performance, Availability, And Systems Management

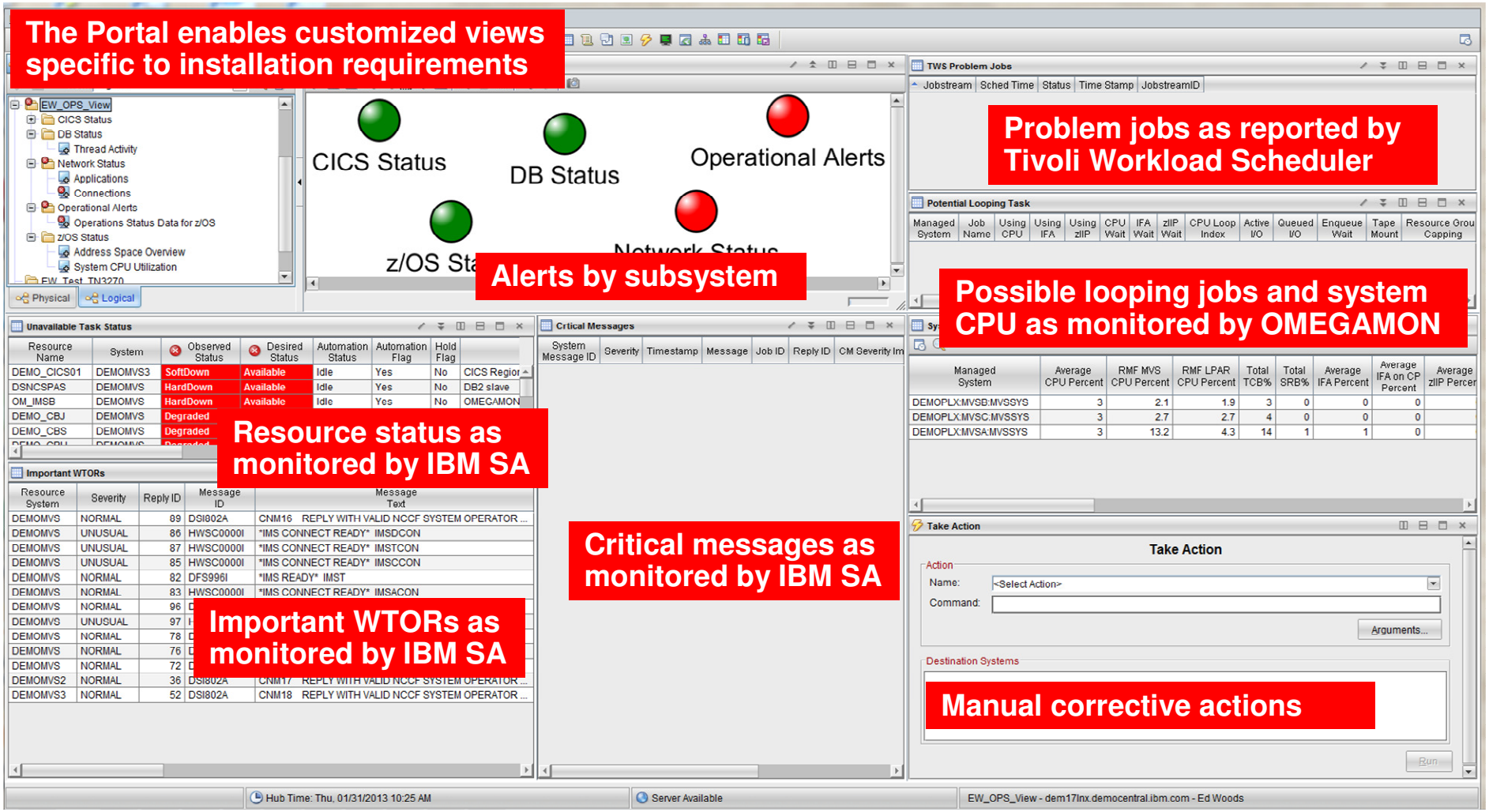


Tivoli Enterprise Portal (TEP)

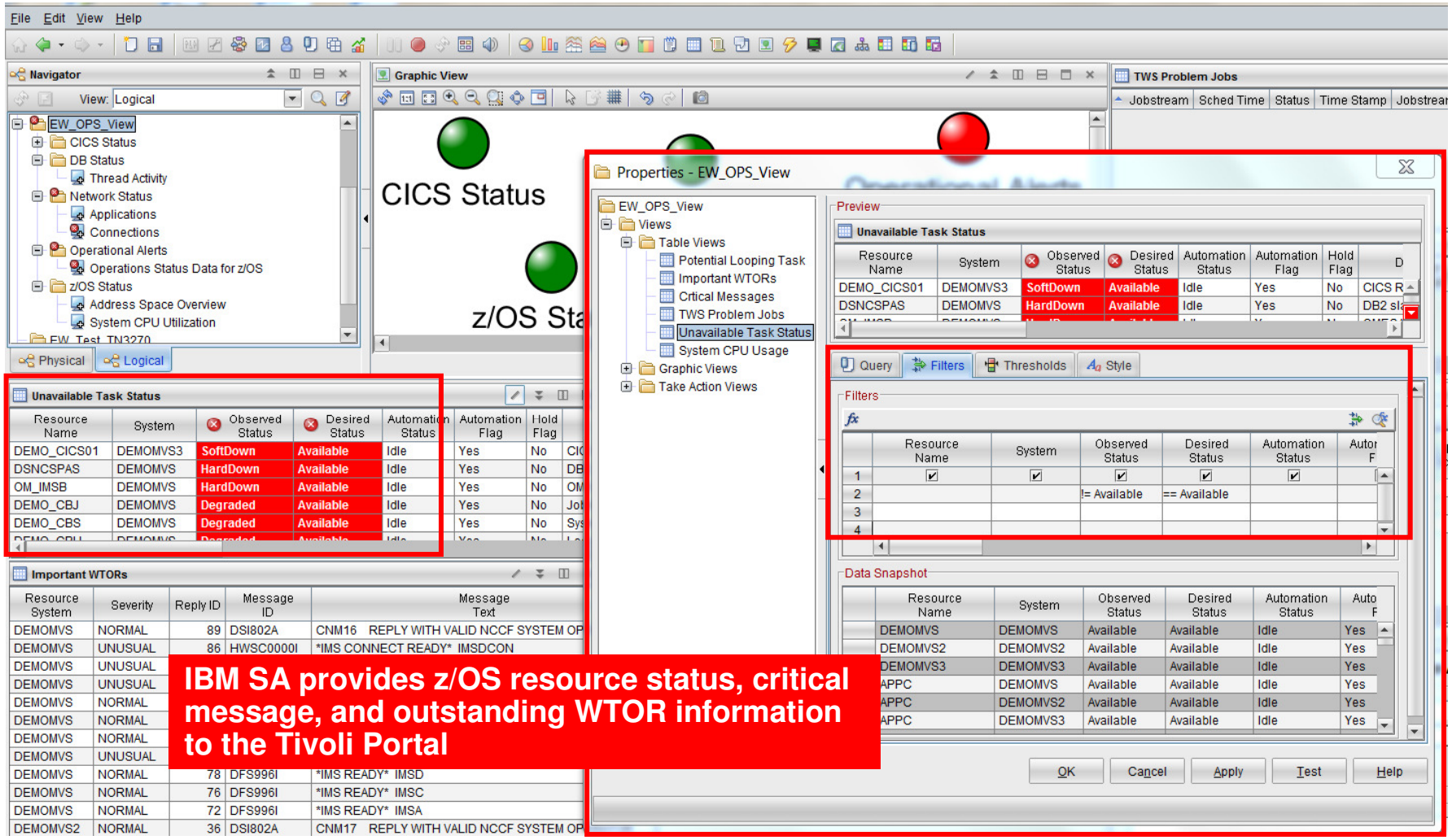
Tivoli Enterprise Portal enables integrated alert and automation capabilities

TEP is a common user interface for a variety of Tivoli solutions

Leverage The Integration Capabilities Of The Tivoli Enterprise Portal To Provide "Visualization"

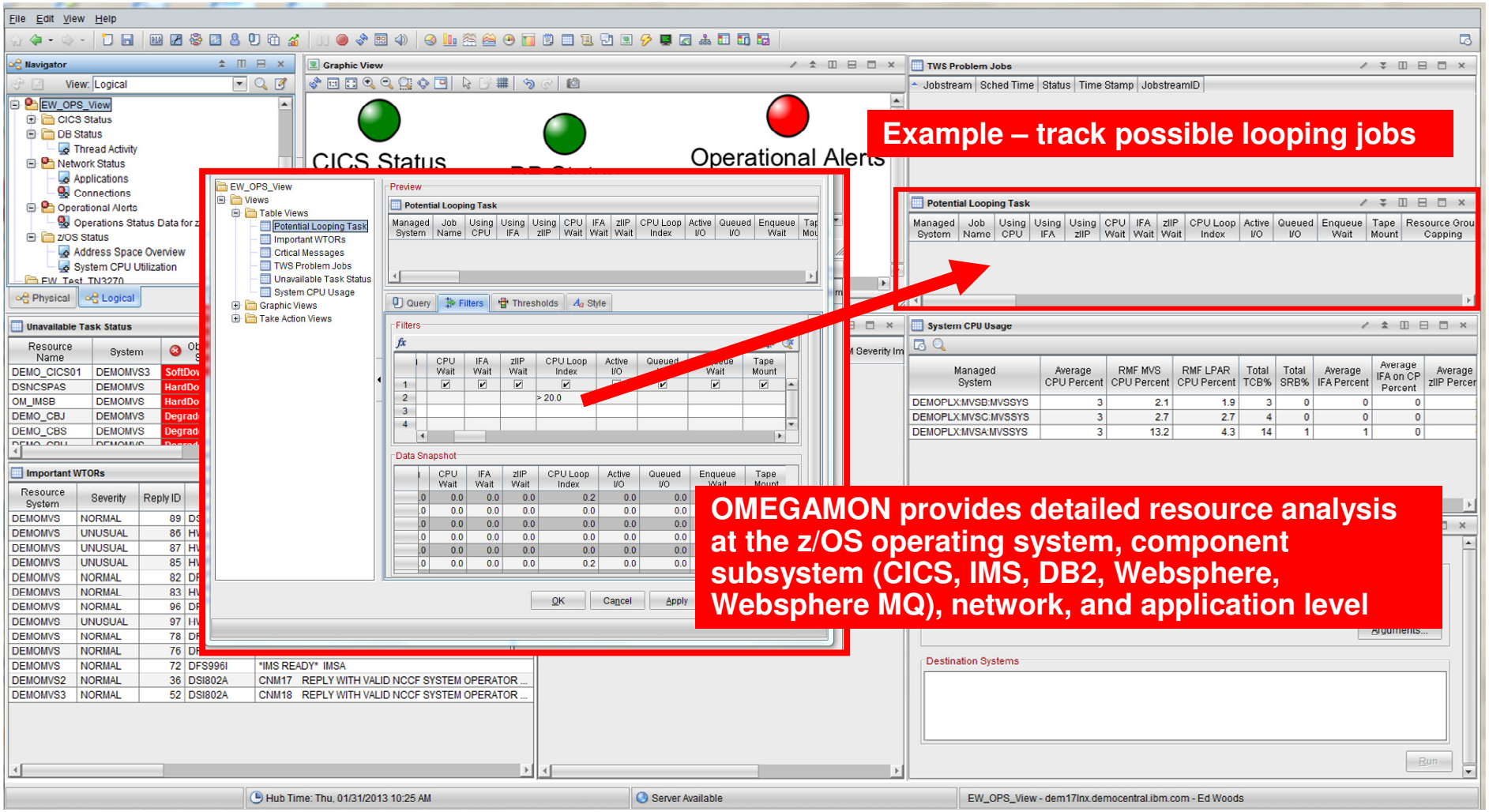


Leverage Resource And Status Information From System Automation



IBM SA provides z/OS resource status, critical message, and outstanding WTOR information to the Tivoli Portal

Leverage Resource And Analysis Information From OMEGAMON Monitoring



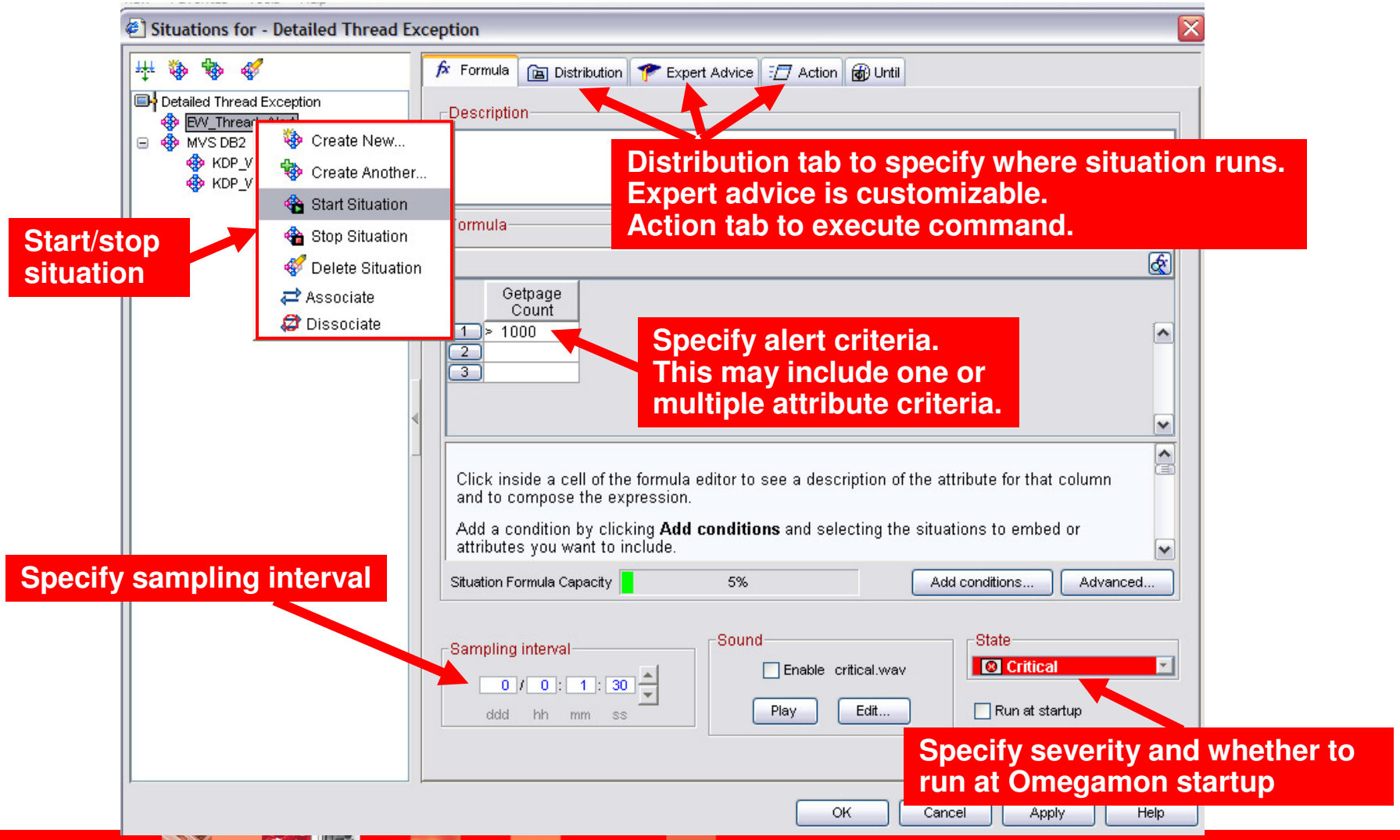
Tivoli Enterprise Portal
Performance Automation Integrated Within The Portal

- The Portal provides manual commands and corrections
  - 'Take Action' provides for manual command capability
  - Commands may be predefined
- The Portal enables automated commands and corrections
  - Implement machine speed corrective actions, issue alerts, and allow for later human intervention
  - Use for automated commands for dynamic subsystem management and 'tweaks' as the workload and system changes
  - Two core types of automated actions
    - ***Situations*** - Use for simple "fire and forget" type of scenarios
    - ***Policies*** – Use for more sophisticated performance automation scenarios

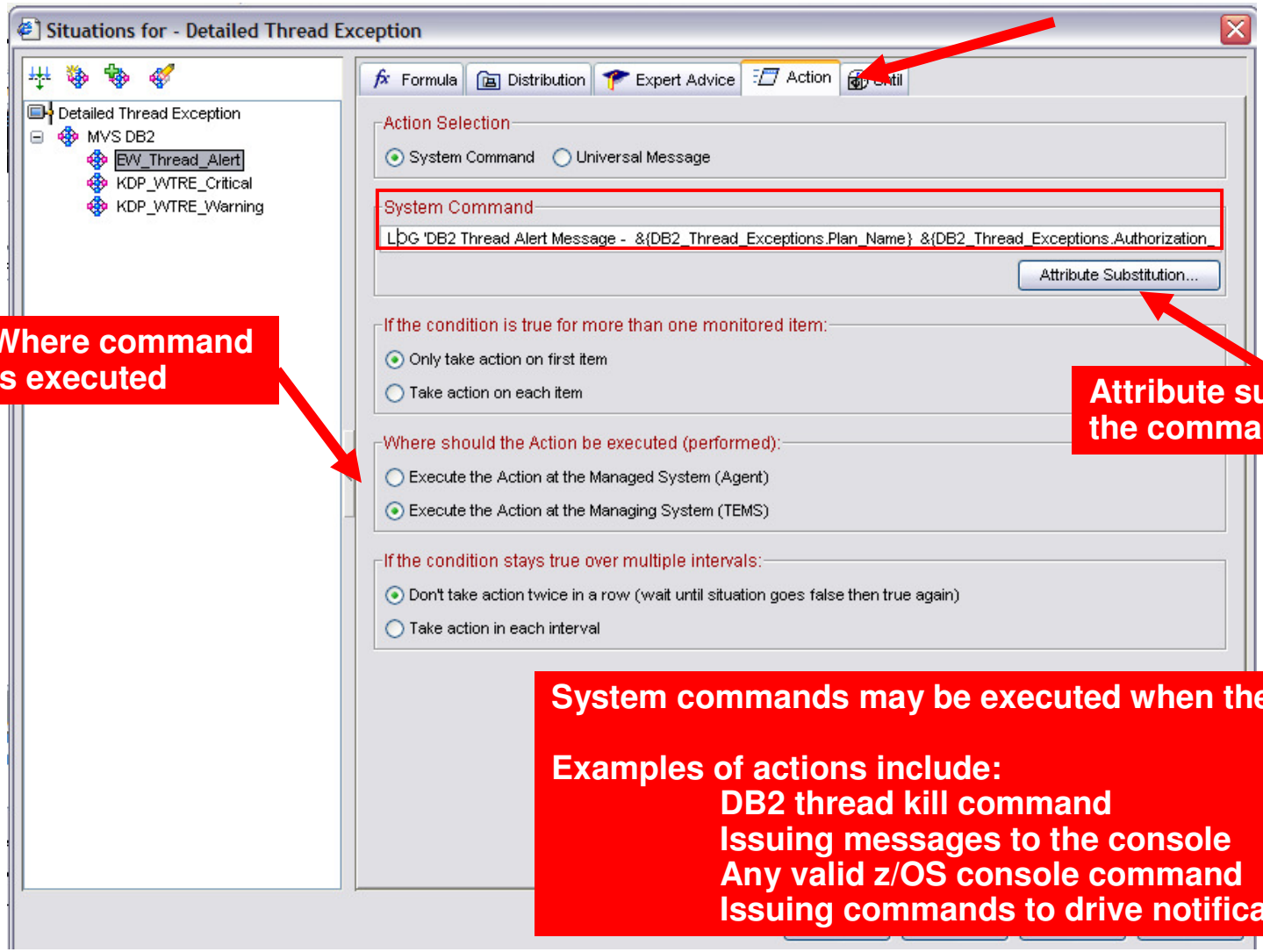
About Situations And Policies

- Situations are the building blocks of systems management logic in the Tivoli Enterprise Portal (TEP)
  - Situations may be used to highlight performance and availability problems within key operating systems, subsystems, and mission critical resources
  - Situation logic may be distributed to the agent (IRA architecture)
    - Situations typically run at the level of the agent (TEMA)
- Policies extend concepts established with situations and add additional functionality to the TEP
  - Situations remain the essential starting point
  - Policies add additional function and flexibility
  - Note - Policies run within the TEMS infrastructure

Situations - A Basic Example
Alert On DB2 Threads With More Than ‘n’ Getpages



Situations
'Action' To Perform Commands And Corrections



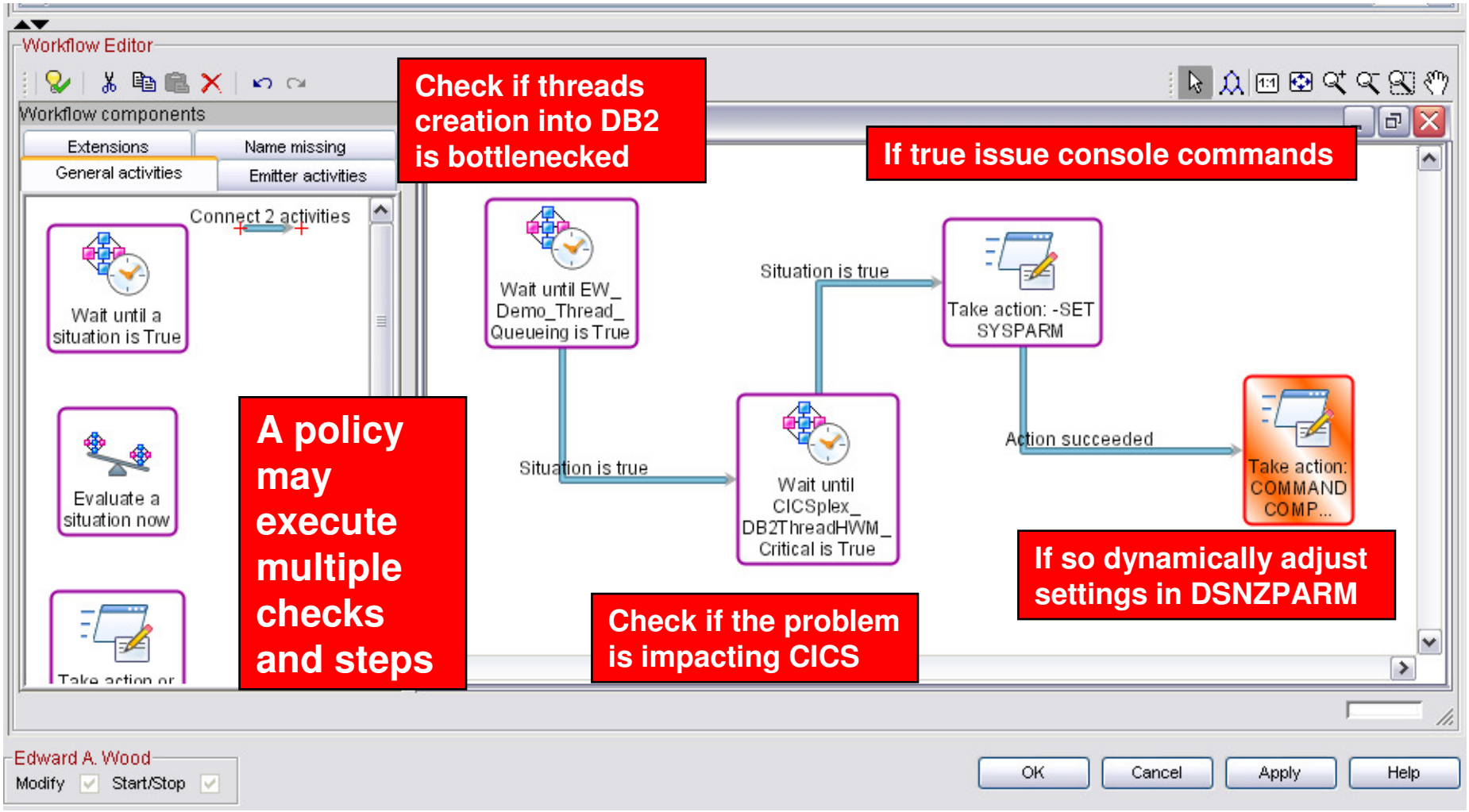
Where command is executed

Attribute substitution in the command line

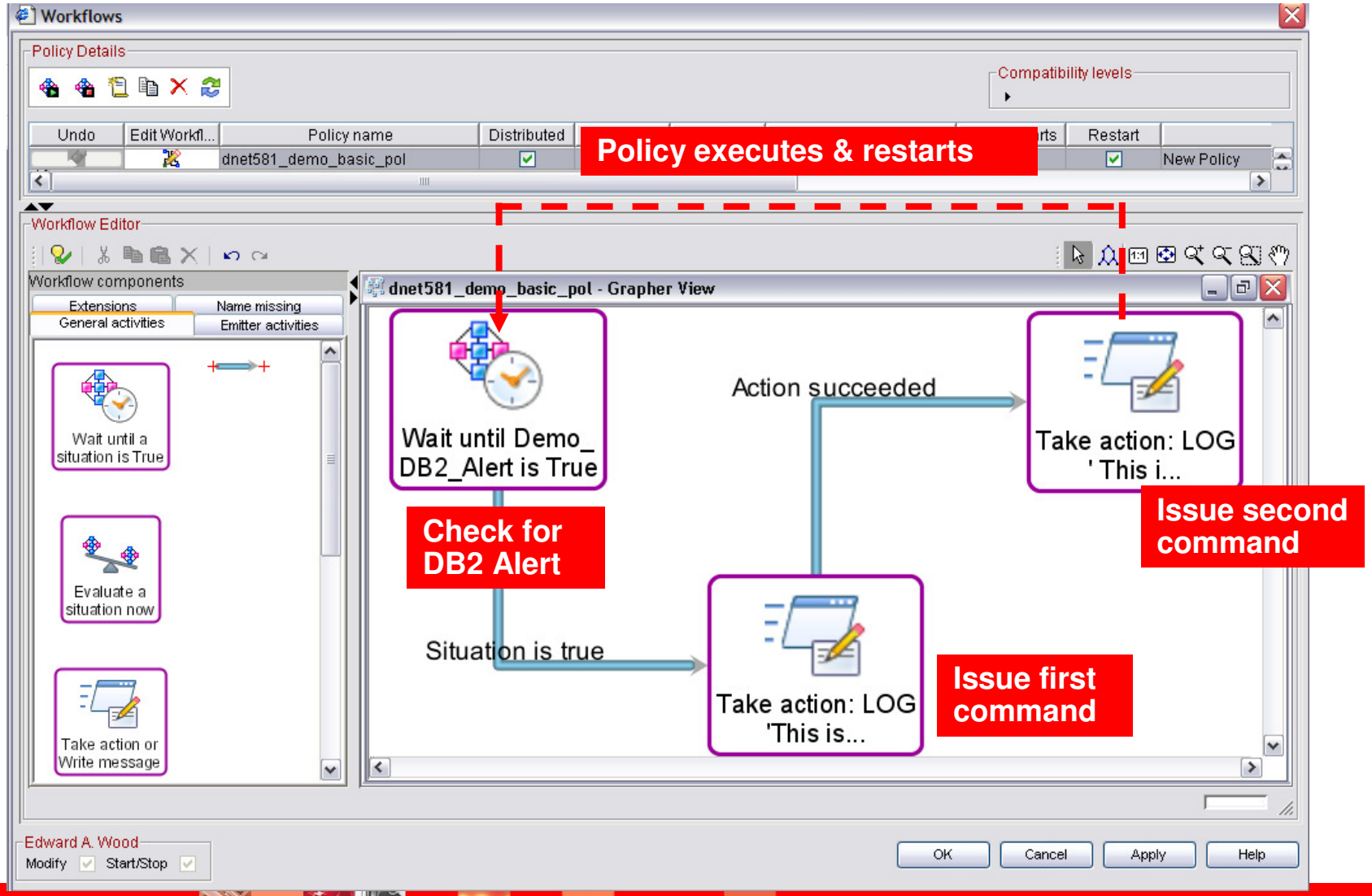
System commands may be executed when the situation is true

Examples of actions include:
- **DB2 thread kill command**
- **Issuing messages to the console**
- **Any valid z/OS console command**
- **Issuing commands to drive notification**

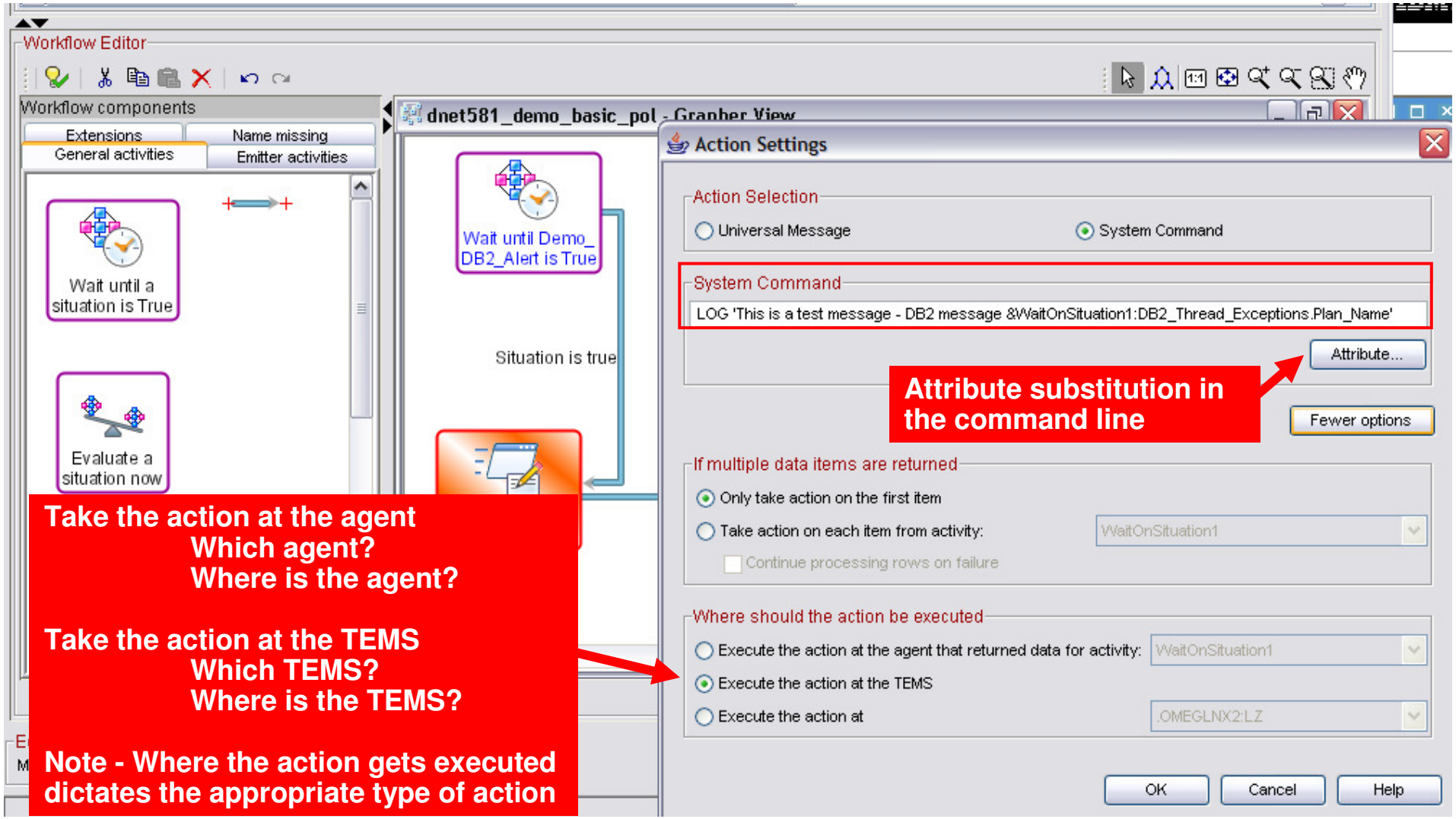
Policies Expand The Concept Of Automated Performance Management



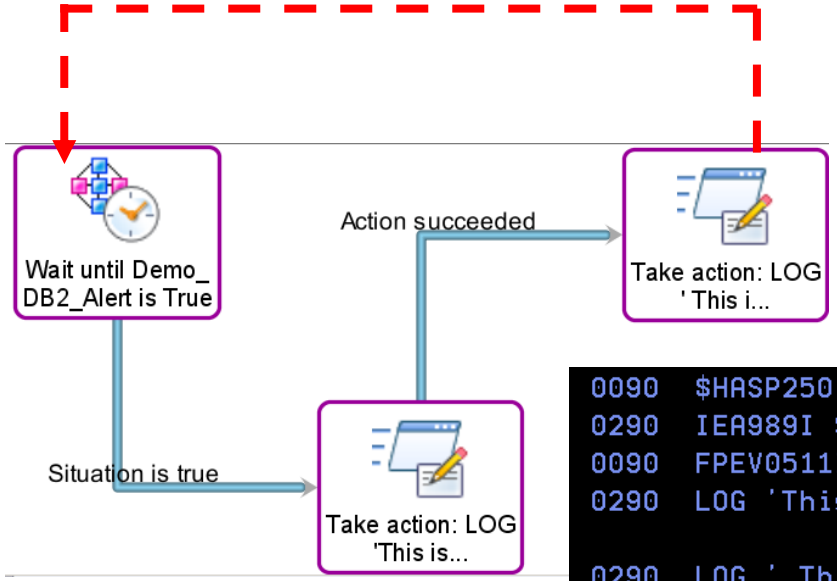
Basic Policy - Example Scenario
Have A Situation Trigger Multiple Commands



Take Action Options Within A Policy



Policy Command Execution



In the example the policy will:

Check the situation status
Execute the first command
Execute the second command
Restart

```
0090  $HASP250 DNET145 PURGED -- (JOB KEY WAS C1C5C854)
0290  IEA989I SLIP TRAP ID=X33E MATCHED.  JOBNAME
0090  FPEV0511I  DSNB HISTORY DATA SET WRAPPED, 4272 INTERVALS STORED
0290  LOG 'This is a test message - DB2 message ADHPLAN3'

0290  LOG ' This is a second test message'

0290
0290  TRAP ID=X33E MATCHED.  JOBNAME=
0290  LOGON
0290  LOG 'This is a test message - DB2 message ADHPLAN3'

0290  LOG ' This is a second test message'

0281  $HASP100 DNET581  ON TSOINRDR
0090  $HASP373 DNET581  STARTED
0090  IEF125I DNET581 - LOGGED ON - TIME=10.06.27
```

First command

Second command

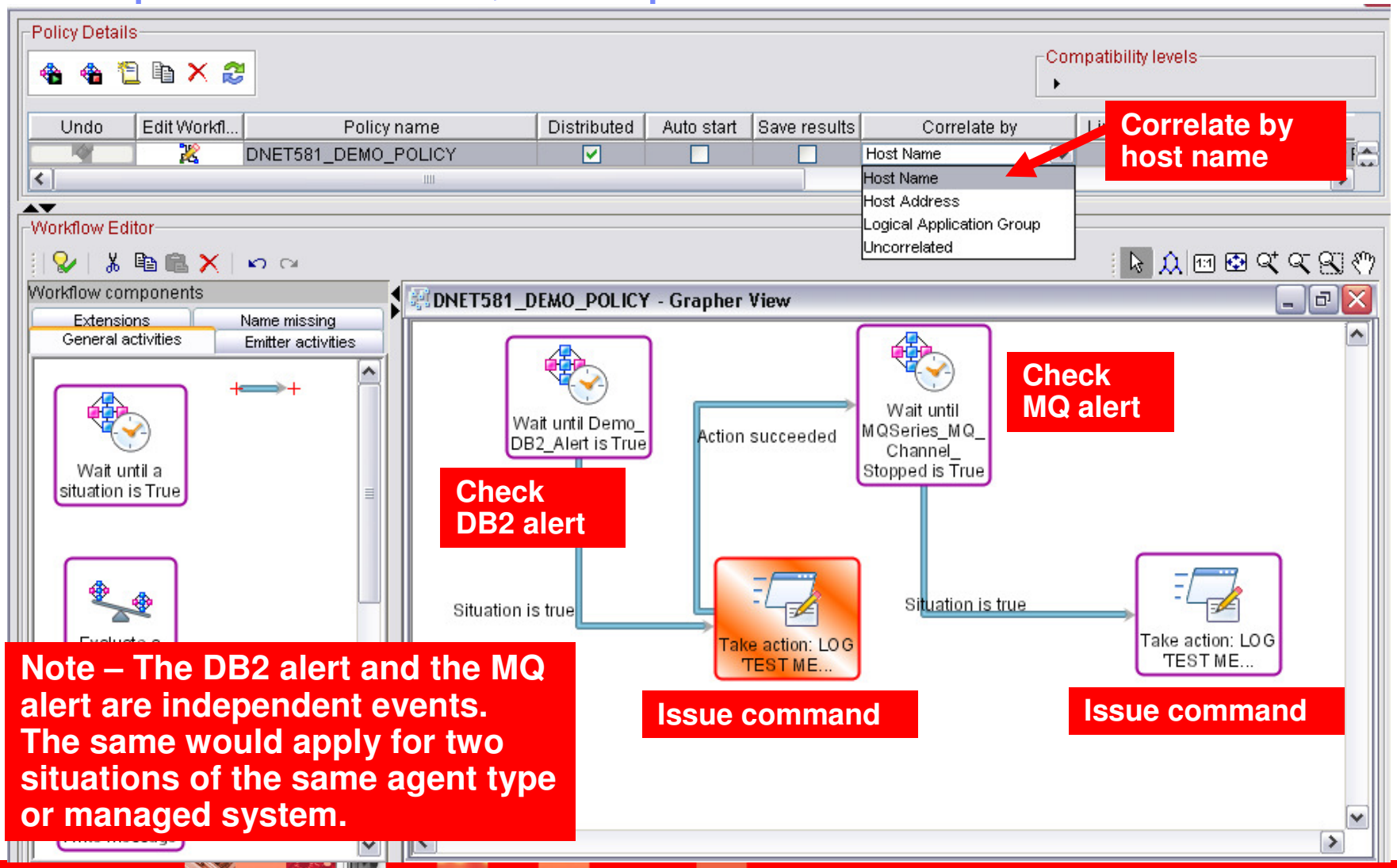
Restart

First command

Second command

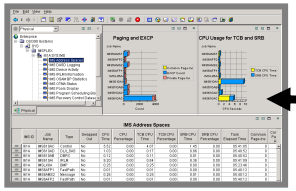
Note – The interval of the situation will have an impact on the duration of the policy

Policy Example
Multiple Situations, Multiple Commands



Policies Require An Understanding Of The Monitoring Infrastructure

Distribution of policies requires a more complete understanding of the monitoring topology
- **What agents?**
- **Agents on what platforms?**
- **What TEMS?**
- **TEMS on what platforms?**



Portal Server TEPS

TEMS Remote

Windows
ITM TEMA

UNIX
ITM TEMA

Linux
ITM TEMA

OMEGAMON TEMA

TEMS HUB

OMEGAMON TEMA

z/OS

TEMS Remote

OMEGAMON TEMA

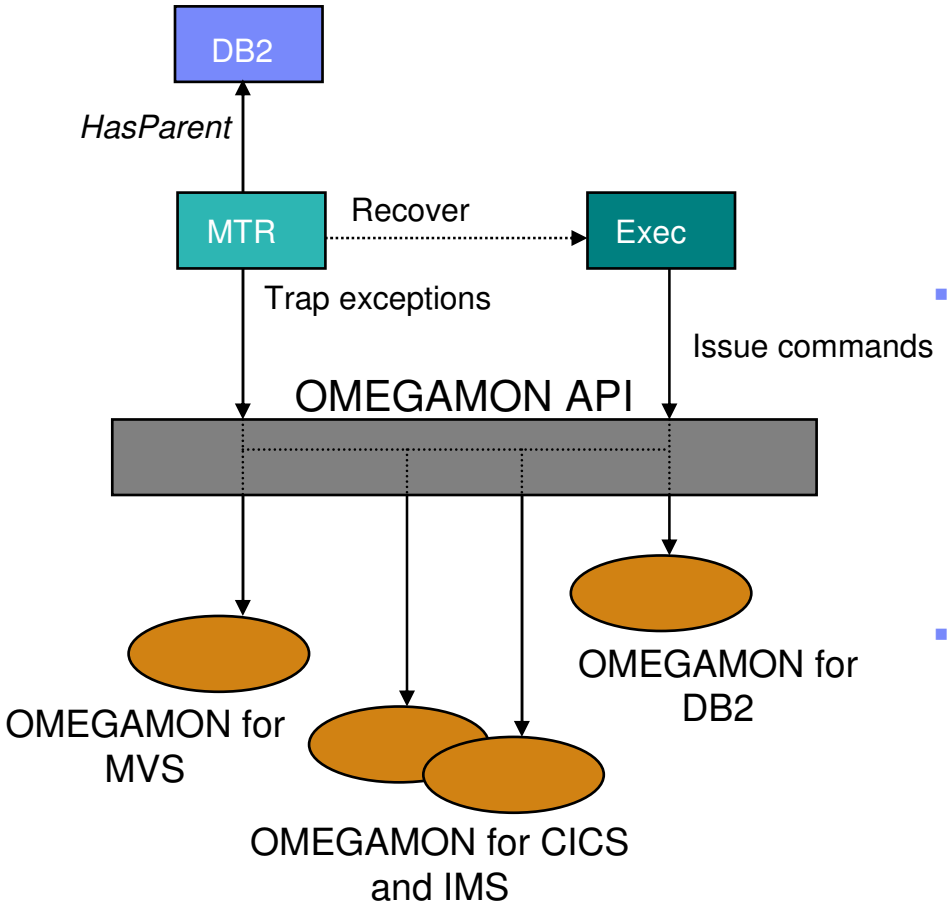
OMEGAMON TEMA

z/OS

Recommendations And Best Practices Situations And Policies What They Are And What They Are Not

- ***Situations And Policies – What they are***
  - Situations are the core alert building block of Tivoli monitoring
  - Policies extend concepts established with situations and add additional functionality to the TEP
  - Policies expand the integrated command and control capabilities of the TEP
    - Situations remain the essential starting point
  - Policies add additional function and flexibility to situation capabilities
- ***Situations And Policies – What they are not***
  - The command capabilities of situations and policies are not a substitute for a full function automation engine such as IBM System Automation
    - Use situations and/or policies for basic detection and command/correction scenarios
    - Use situations and/or policies to drive SA automation execs when needed
    - For more detailed scripts (such as REXX) and analysis use System Automation

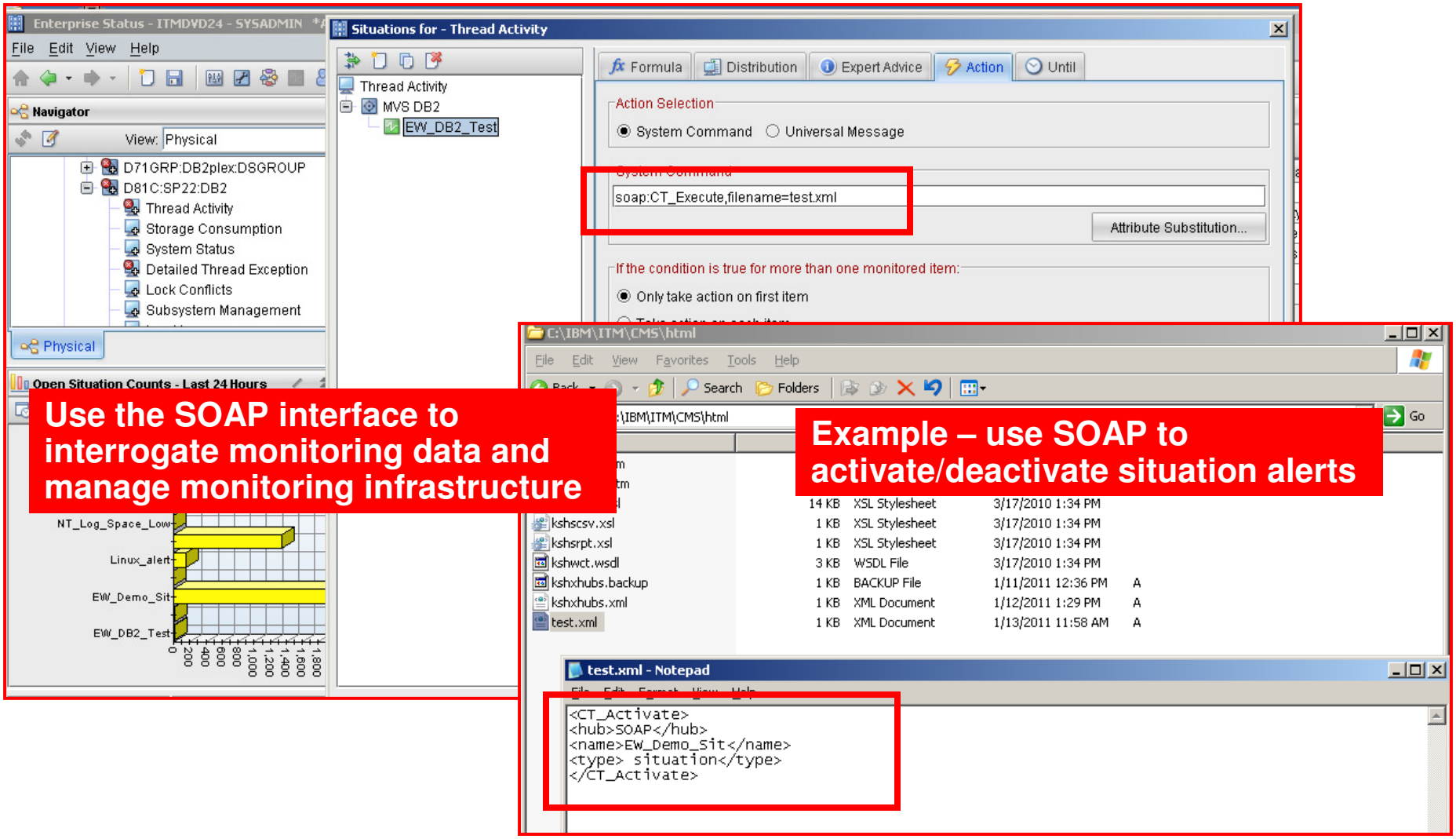
System Automation Integrated With OMEGAMON Bi-directional Interfaces



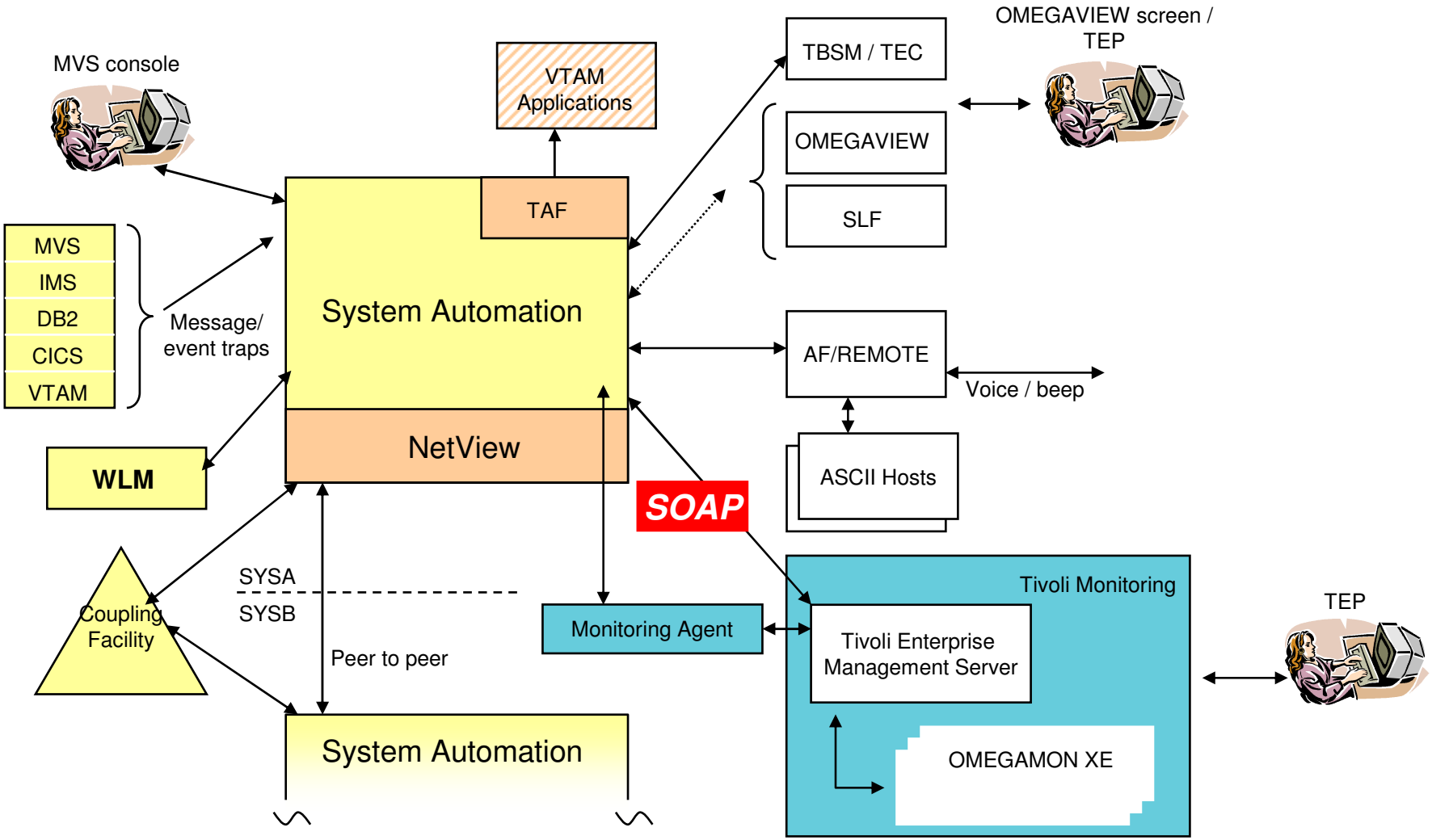
- **Use performance and availability information for Automated Performance Management**
  - **More metrics, more accurate decisions**
  - **Sources: MVS, DB2, CICS, IMS, Network, Webpshere, Websphere MQ, Storage monitoring**
- **Provides APIs to communicate with OMEGAMON monitors to**
  - **Monitor OMEGAMON exceptions**
  - **Monitor/manage situation status**
  - **SOAP interface enables detailed performance data interface to SA**
- **Provides exception monitor based on the Monitor Resource concept**
  - **Monitors „interesting“ set of exceptions**
  - **Sets application health state based on existence of such exceptions**
  - **Provides means to react and resolve exceptional conditions**

Any metric captured by OMEGAMON may be analyzed via automation

OMEGAMON, IBM System Automation And The Tivoli Enterprise Portal Provides SOAP Interface



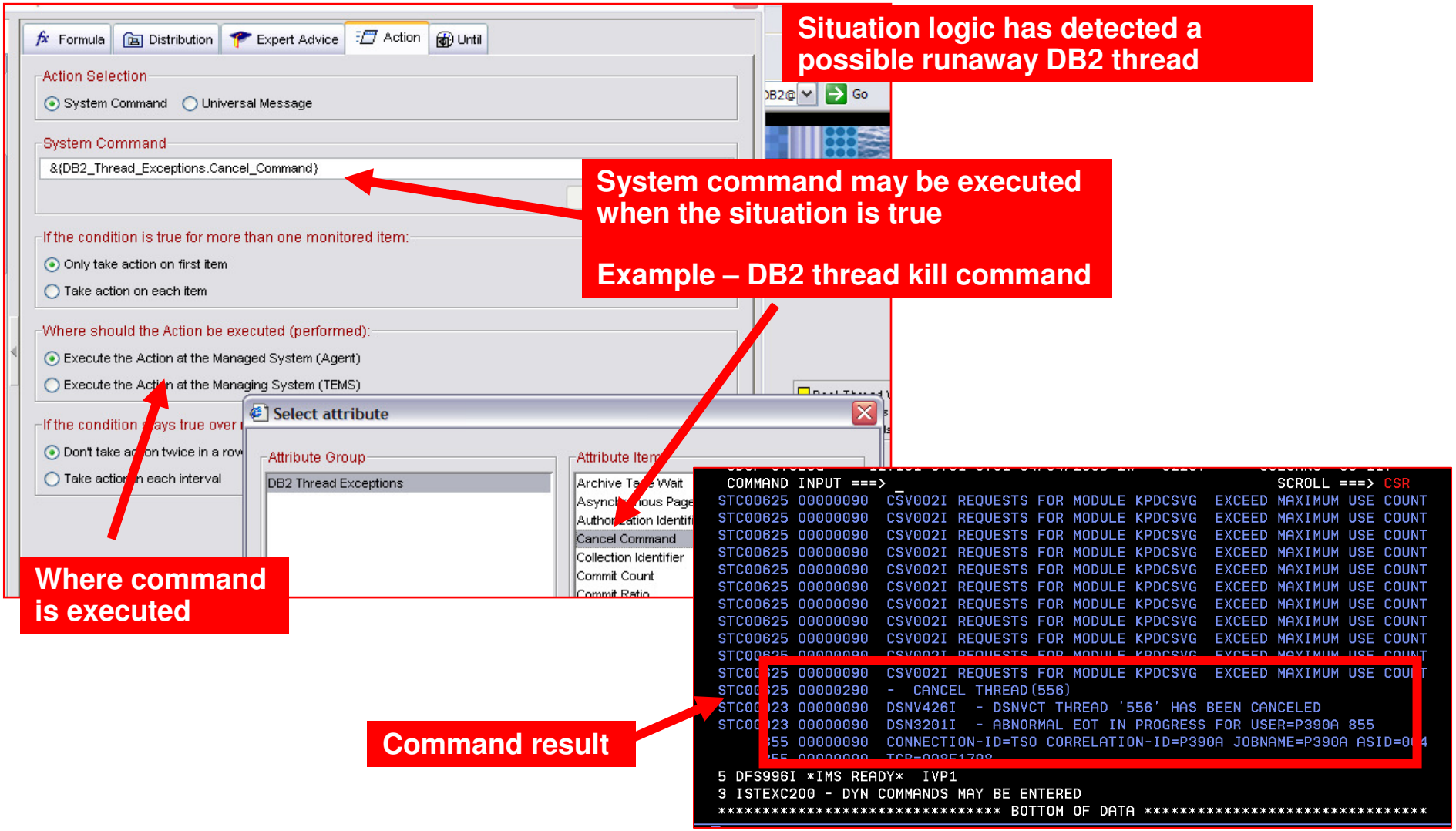
SA / OMEGAMON Integration – Overview
SOAP Interface Enables Detailed Analysis



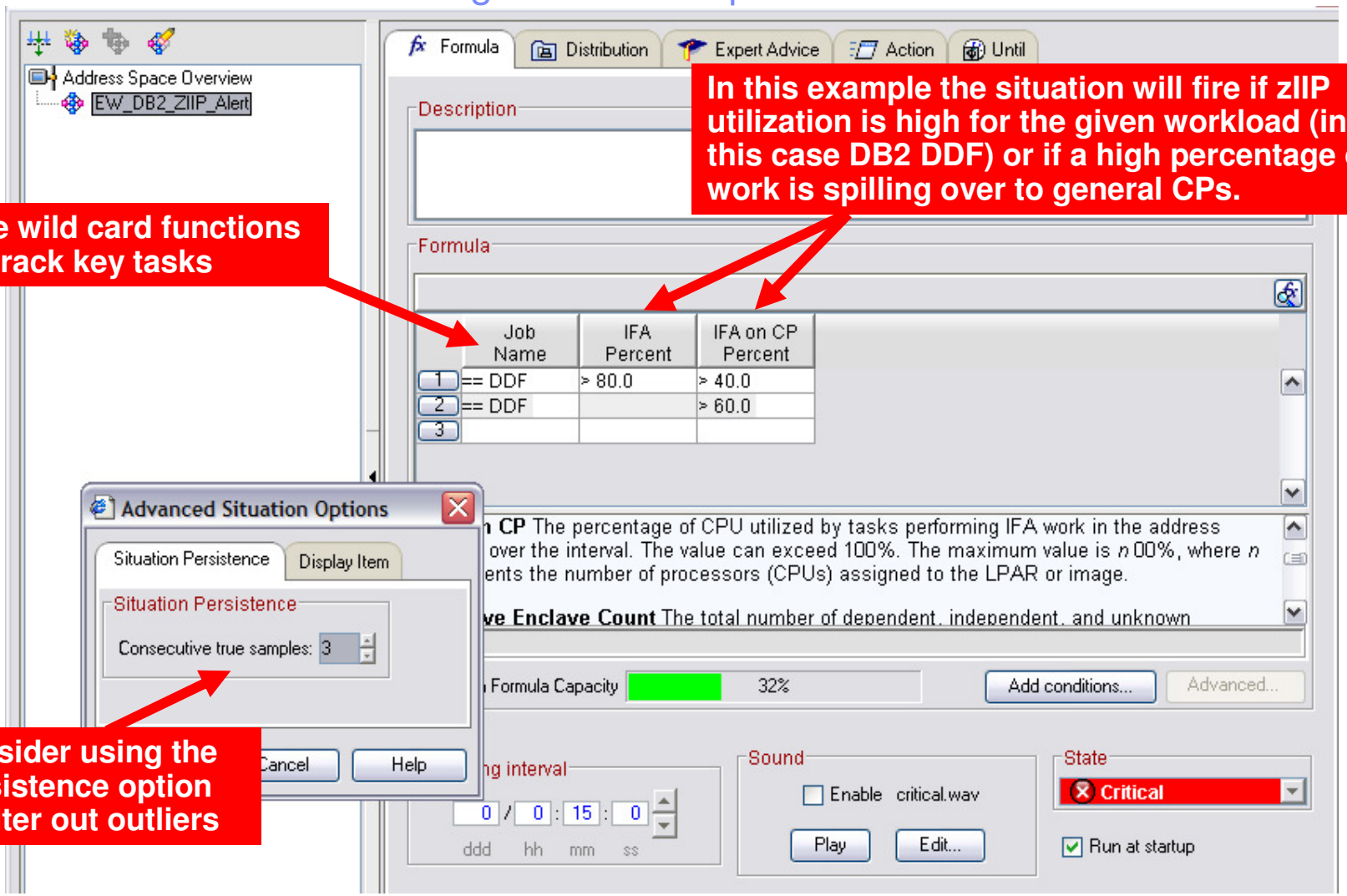
Examples Of Automated Performance Management Scenarios

- ***z/OS example*** - possible z/OS looping task
  - **Monitored symptoms** – high CPU loop index as measured by OMEGAMON >> WLM missing goals >> high overall system CPU usage
  - **Automation response** – adjust priority of problem task or if desired cancel the task
- ***DB2 example*** - DB2 object lock conflict
  - **Monitored symptoms** - long running SQL call >> high In-DB2 time >> longer thread elapsed time
  - **Automation response** - Increase priority of "owner" (as determined by automation) >> "Kill" problem thread
- ***IMS example*** - High IMS message region occupancy time
  - **Monitored symptoms** - IMS transactions queued >> longer IMS transaction scheduling time >> longer IMS response time >> lower IMS transaction processing rate
  - **Automation response** – automation starts additional message regions to handle workload >> issue IMS commands to adjust classes
- ***MQ example*** - Lower MQ message input rate >>
  - **Monitored symptoms** - Higher MQ message queue depth >> lower transaction processing rate >> longer CICS/IMS transaction response time
  - **Automation response** – issue calls to assess potential bottlenecks in CICS/IMS processing >> automation action based on results

An OMEGAMON DB2 Situation Example Addressing A "Runaway" DB2 Thread

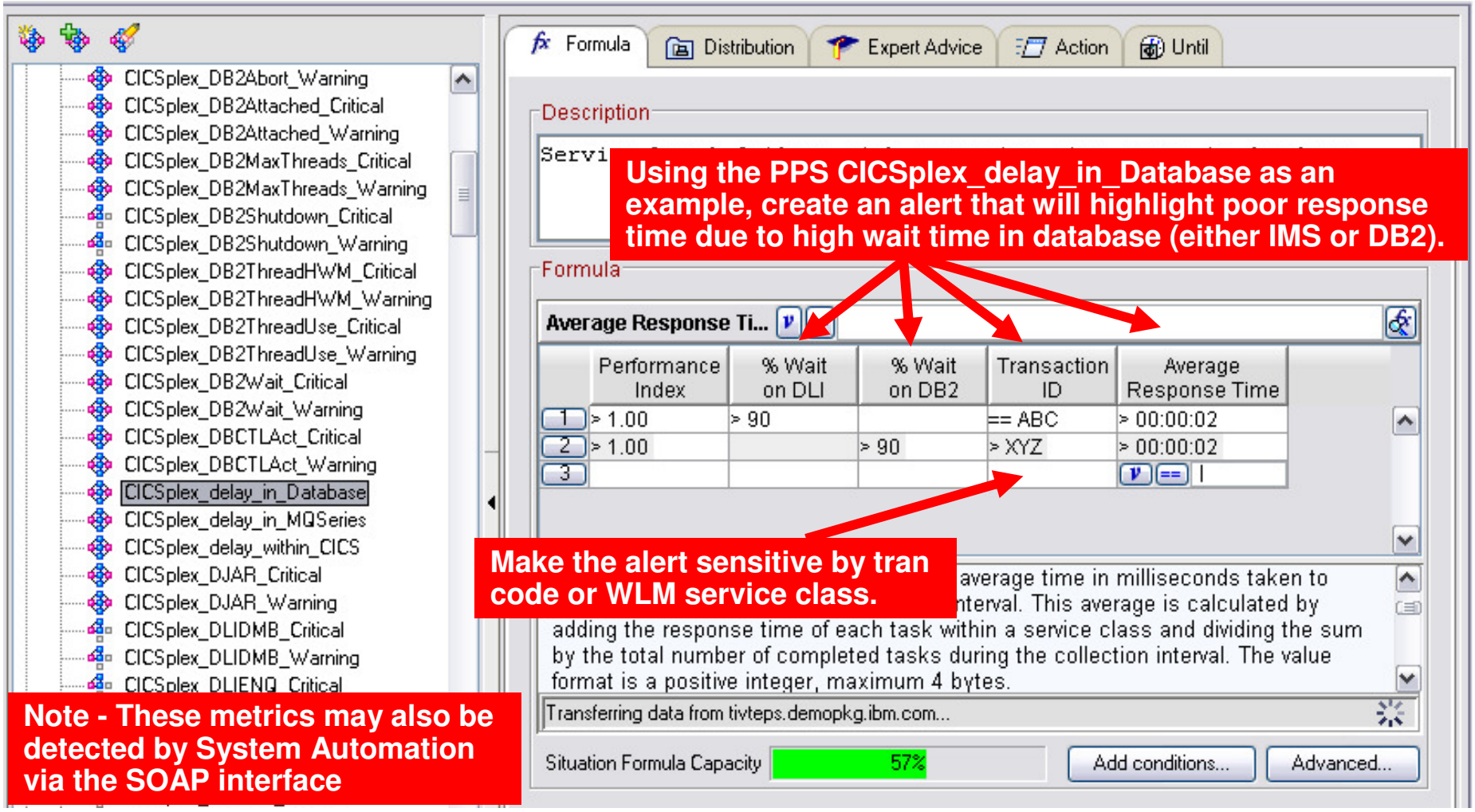


z/OS Example
zIIP Processor CPU Resource Utilization Alert
Alert When zIIP Utilization Is High For zIIP Dependent Workload

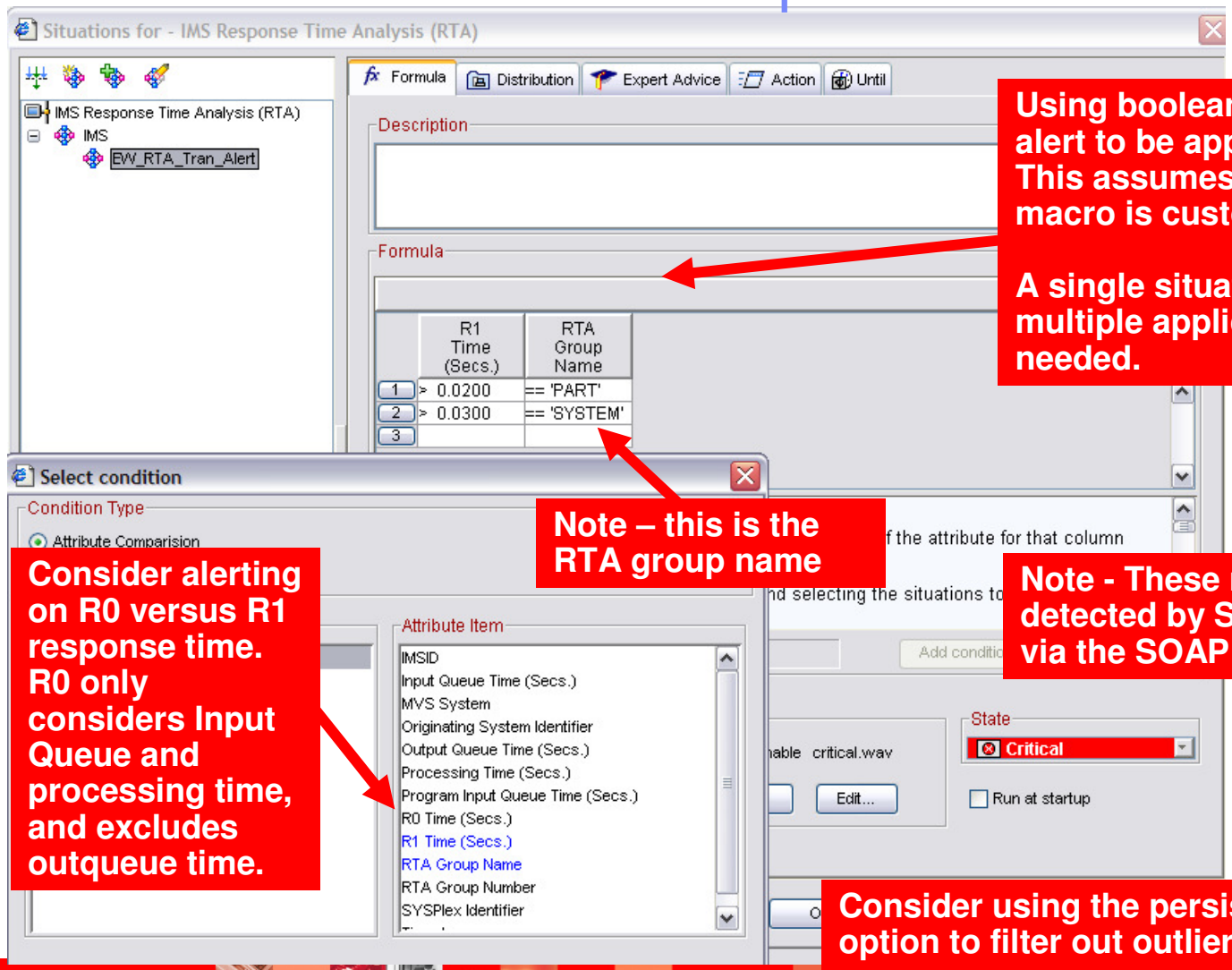


CICS Application Performance Example

Monitor CICS Transaction Response And Highlight High DB Wait



IMS Application Performance Example Situations To Monitor Response Time



Using boolean logic allows the alert to be application sensitive. This assumes that the KOIGBLxx macro is customized.

A single situation can handle multiple application groups, if needed.

Note – this is the RTA group name

Consider alerting on R0 versus R1 response time. R0 only considers Input Queue and processing time, and excludes outqueue time.

Note - These metrics may also be detected by System Automation via the SOAP interface

Consider using the persistence option to filter out outliers

Other Examples Of Common z/OS Critical Performance Metrics

WebSphere MQ
Queue depth
Message send/receive rate
DLQ depth
Channel status and performance

CICS
Transaction response time
Transaction rate
Region CPU rate
File I/O count
String waits
Abend messages

z/OS
System CPU rate
Paging rate
WLM Performance Index
DASD I/O MSR time and rate
Critical console messages

WebSphere
Method call count and elapsed time
Heap size
Garbage collection
Connection pool utilization

Network
Network Connection status and performance
Network interface utilization

Situations
General Recommendations And Rules Of Thumb

- Make situations Meaningful, Actionable, and Useful
- Meaningful situations
  - Situation naming is flexible – make the names understandable
  - Adopt a situation naming convention
    - Makes it easier to identify customer created versus product provided situations
- Actionable situations
  - Have appropriate notification
    - A workspace with an alert icon, command/message notification
  - As a standard have expert advice
  - Have pre-defined take actions where appropriate
- Useful situations
  - Eliminate phony alert indicators – tune out the noise
  - If an alert situation fires it should indicate an actual issue
    - An alert, an owner, and a consequence

Additional Situation Considerations And Recommendations

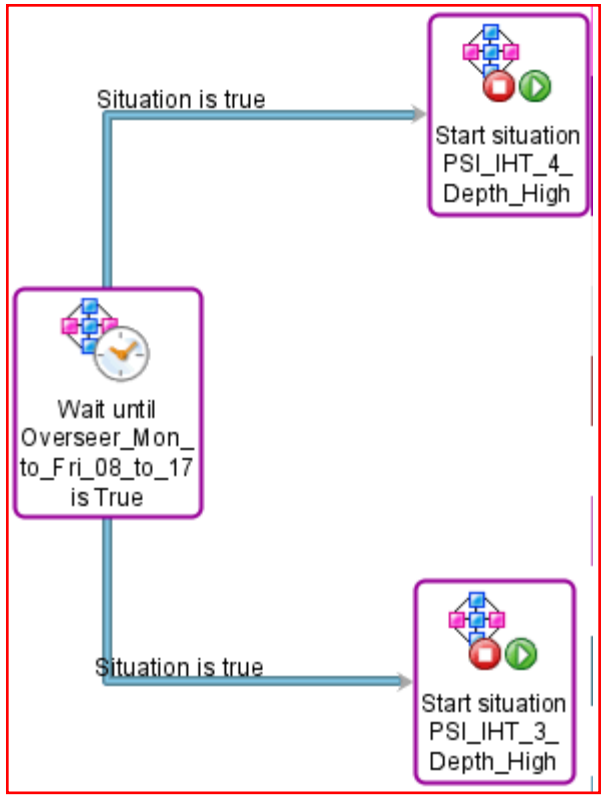
- Use the Product Provided Situations as examples or templates
  - Customization to user-created situations
- When creating and deploying a set of situations consider
  - The number of situations being deployed
  - The number of managed systems (i.e. z/OS LPARs and CICS tasks)
  - Refresh frequency of the situations
- Consider carefully the number of required situations
  - Use boolean logic to reduce the number of needed situations
  - Do not automatically make a warning alert to go with each critical alert
    - Create a warning if it will allow time to address an issue before going critical
  - Use managed system lists to send the right situations to the right managed systems
- Be aware of the situation refresh rates
  - Multiple situations on the same table with the same refresh rate may be optimized by the infrastructure
  - Potential to reduce monitoring overhead if done appropriately

Policies And System Automation Recommendations And Rules Of Thumb

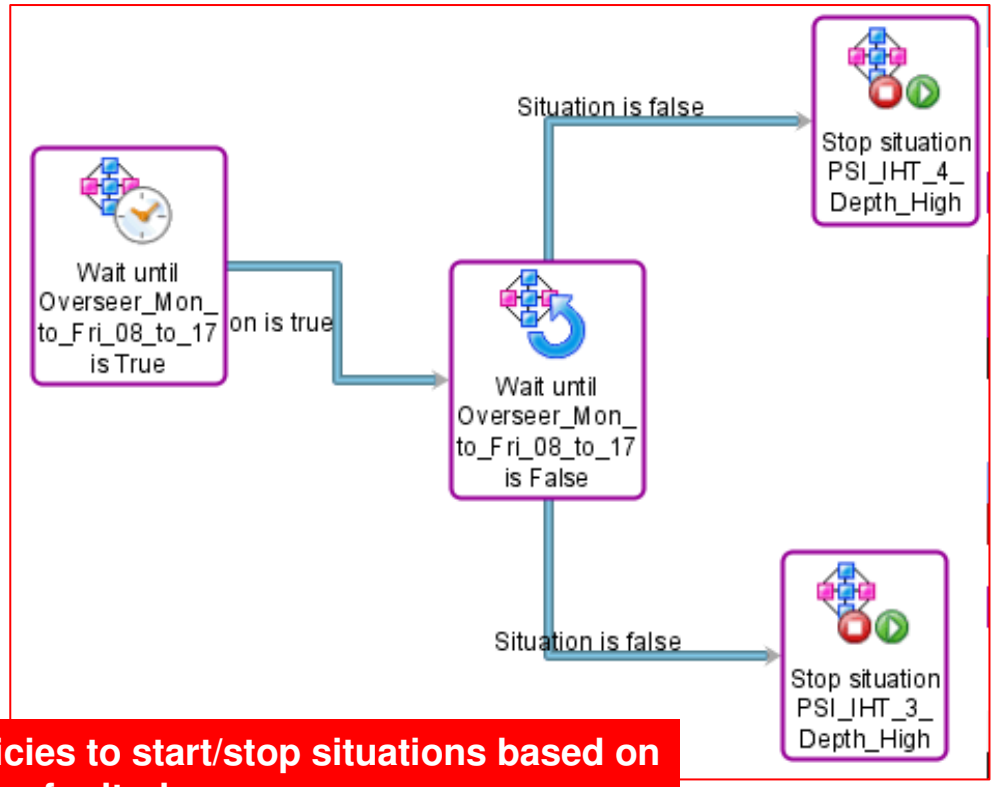
- Policies are not a substitute for System Automation and REXX command script capabilities
  - Policies work well as an extension of situation capabilities
  - Policies work well to manage start/stop of situation logic
  - Policies work well to issue multiple actions and “feed” other tools
- IBM System Automation
  - Use for full function automation logic and routines
    - REXX exec script capabilities
  - Use for more complex logic and actions
  - Exploit the ability of the SOAP interface to pull in key performance metrics from OMEGAMON

Example - Using A Policy To Manage Situations Based Upon Time Of Day Requirements

Overseer policy to start situations



Overseer policy to stop situations



Use policies to start/stop situations based on a variety of criteria

- **Time of day**
- **Start specific analysis situations**
- **and more…..**

Roadmap
Automated Performance Management

- Use a building block approach
- ***Situations*** - Start with identification and definition of situation alerts
  - Meaningful alerts that represent true potential issues
  - Use the analysis to identify critical monitoring metrics
- ***Policies*** – Use policies where appropriate
  - Situation management and correlation
  - Issuing commands for basic performance/availability issues
- ***Visualization*** – Define useful Tivoli Portal views
  - Customize screens in the Portal for specific audiences
    - Operations, applications, management
- ***System Automation*** – exploit the power of integration
  - Define example performance automation management scenarios
  - Leverage the process as a template for additional scenarios

Summary

- The IBM Monitoring And Automation suite provides powerful automation capabilities in multiple core technologies
  - IBM System Automation console management
  - IBM Tivoli OMEGAMON monitoring
  - IBM Netcool OMNIbus network monitoring and management
- Automated Performance Management leverages the intrinsic integration capabilities of the IBM technologies
  - Automation integration with monitoring
  - Integrated monitoring and management (including cross platform)
- Leverage Automated Performance Management to improve problem isolation and MTTR
  - Understand the unique capabilities of OMEGAMON and the Tivoli Portal
  - Use a building block approach to grow management logic over time

Thank You!!

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