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IBM zAware

Using Analytics to Improve System z Availability

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Agenda

- What is IBM zAware, and what can it detect?
  - How can it help identify problems on z/OS systems?
  - How can it help diagnose problems on z/OS systems?
- Operating requirements
- Use of the IBM zAware GUI
- Integration with other management products

Background

Systems are more complex and more integrated than ever

- *Errors can occur anywhere in a complex system*

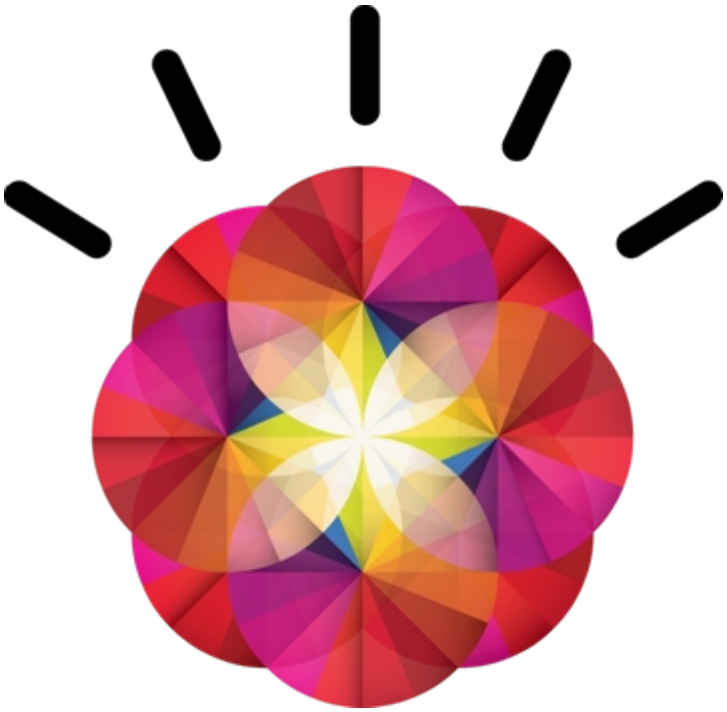
- *Some problems are particularly…*
  - **Difficult to detect**
    - Several allowable anomalies can build up over time
    - Symptoms / problems can manifest for hours or days
    - Problem can grow, cascade, snowball
  - **Difficult to diagnose**
    - Sometimes finding the *system* in error is a challenge
    - Many times finding the *component* in error is a challenge
    - Volume of data is not humanly consumable, *especially* when seconds count
- *Need information and insight*

IBM zAware – IBM System z Advanced Workload Analysis Reporter

- Monitors **z/OS OPERLOG** including all messages written to z/OS console, including ISV and application generated messages
- Detects things typical monitoring systems miss due to:
  - Message suppression (message too common)
    Useful for long-term health issues
  - Uniqueness (message not common enough)
    Useful for real-time event diagnostics
- Color coded easy to use GUI via web browsers
- Output can be queued up to existing monitoring systems.
- Early detection and focused diagnosis can help improve time to recovery

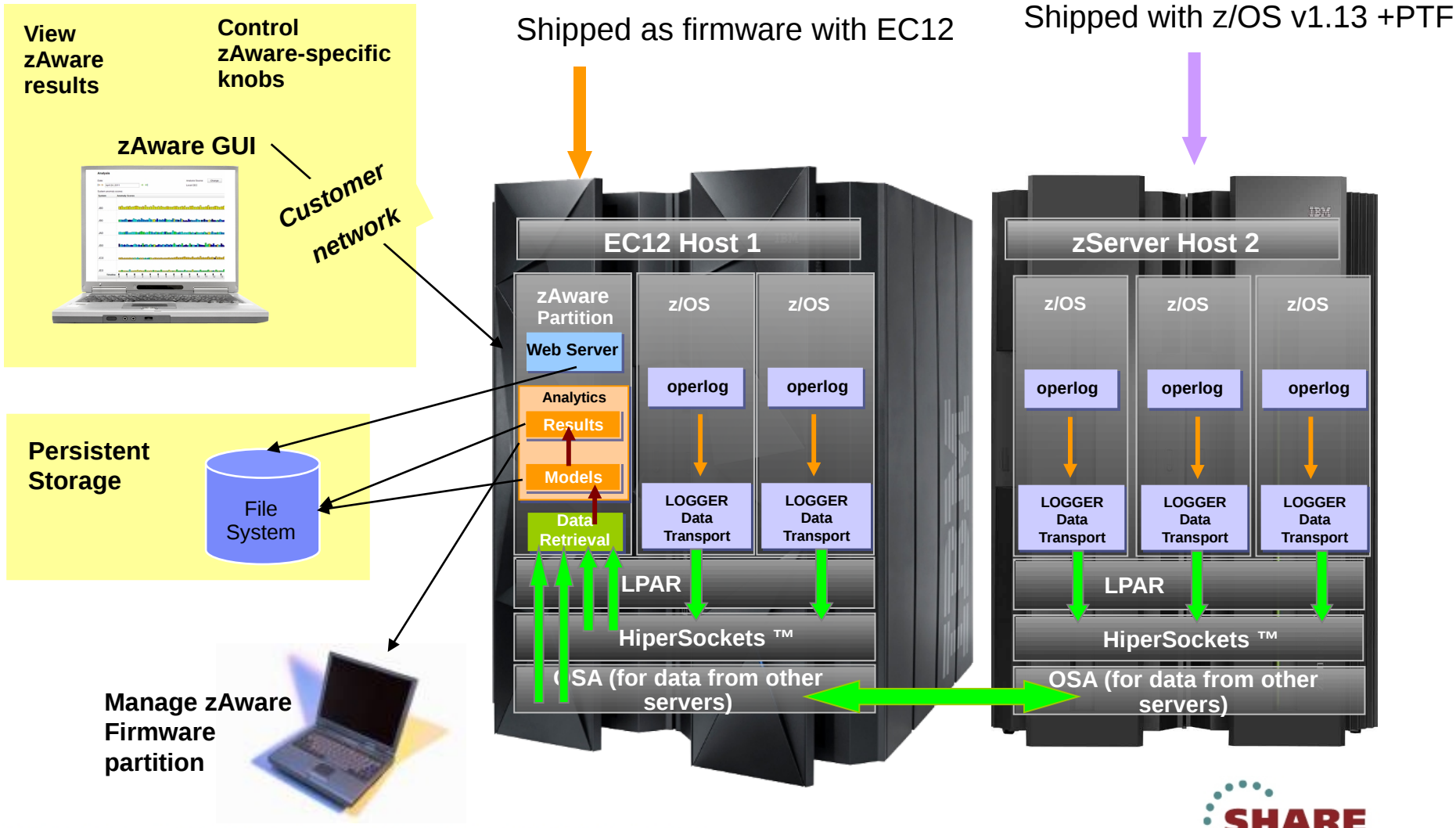
IBM zAware – Smarter Computing Needs Smarter Monitoring

- New technology based on machine learning developed by IBM Research
- Cutting edge pattern recognition techniques look at the health of a system to pinpoint deviations from the 'norm'
- High speed analytics facilitates the ability to consume large quantities of message logs
- Improves problem diagnosis across a set of System z servers
- Speeds up the time to decide on appropriate corrective actions on problems before they get bigger
- Allow establishment of procedures to prevent reoccurrence



zAware's capacity as a 'watch dog' can help to detect unusual behavior in near real time

Inside IBM zAware



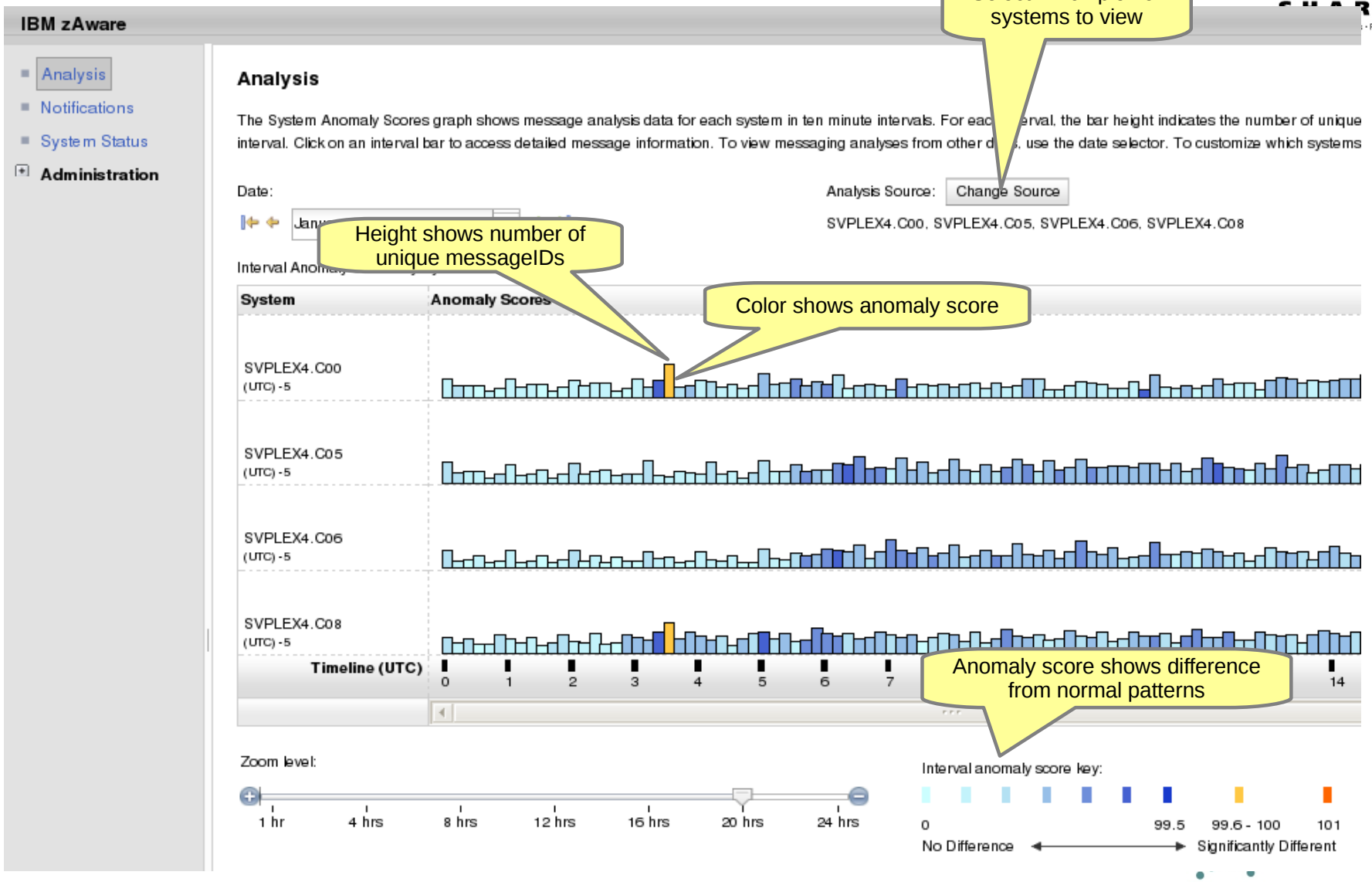
Inside IBM zAware Analytics

- OPERLOG is processed per-system
- zAware recognizes any well-formed message Ids,
  - including IBM and non-IBM products and customer applications
- zAware summarizes the common message text and records the occurrences
- zAware builds a **model** of normal behavior based on the last 90 days
  - Called “Training”
  - Automatically trains every 30 days
  - Can be forced manually
  - Customizable
  - Unusual days can be excluded from future models
- z/OS utility is used to load historical logs into zAware

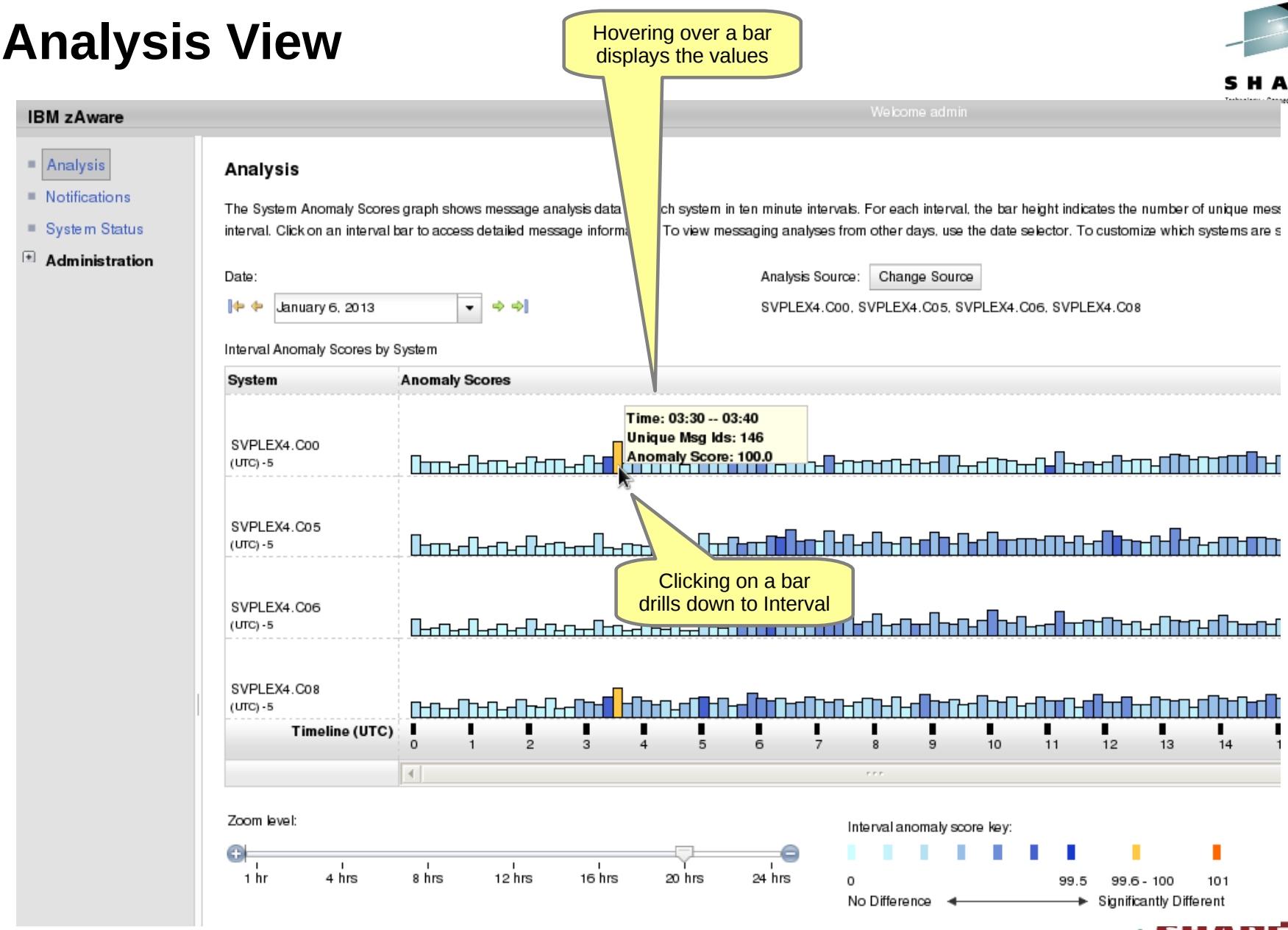
Inside IBM zAware Analytics

- Real-time OPERLOG data is compared to the model
- Assigns a **message anomaly** score to indicate deviation from the model
  - Rare messages
  - Out of context from normal patterns
  - High counts
- Uses z/OS-specific knowledge to influence the scores
- Generates an **interval anomaly** score per 10 minute interval
  - Current interval is updated every 2 minutes
  - GUI shows number of unique message IDs (bar height)
  - GUI shows interval anomaly score (bar color)
- Drill down on interval shows the message scores
- XML output available via HTTP APIs

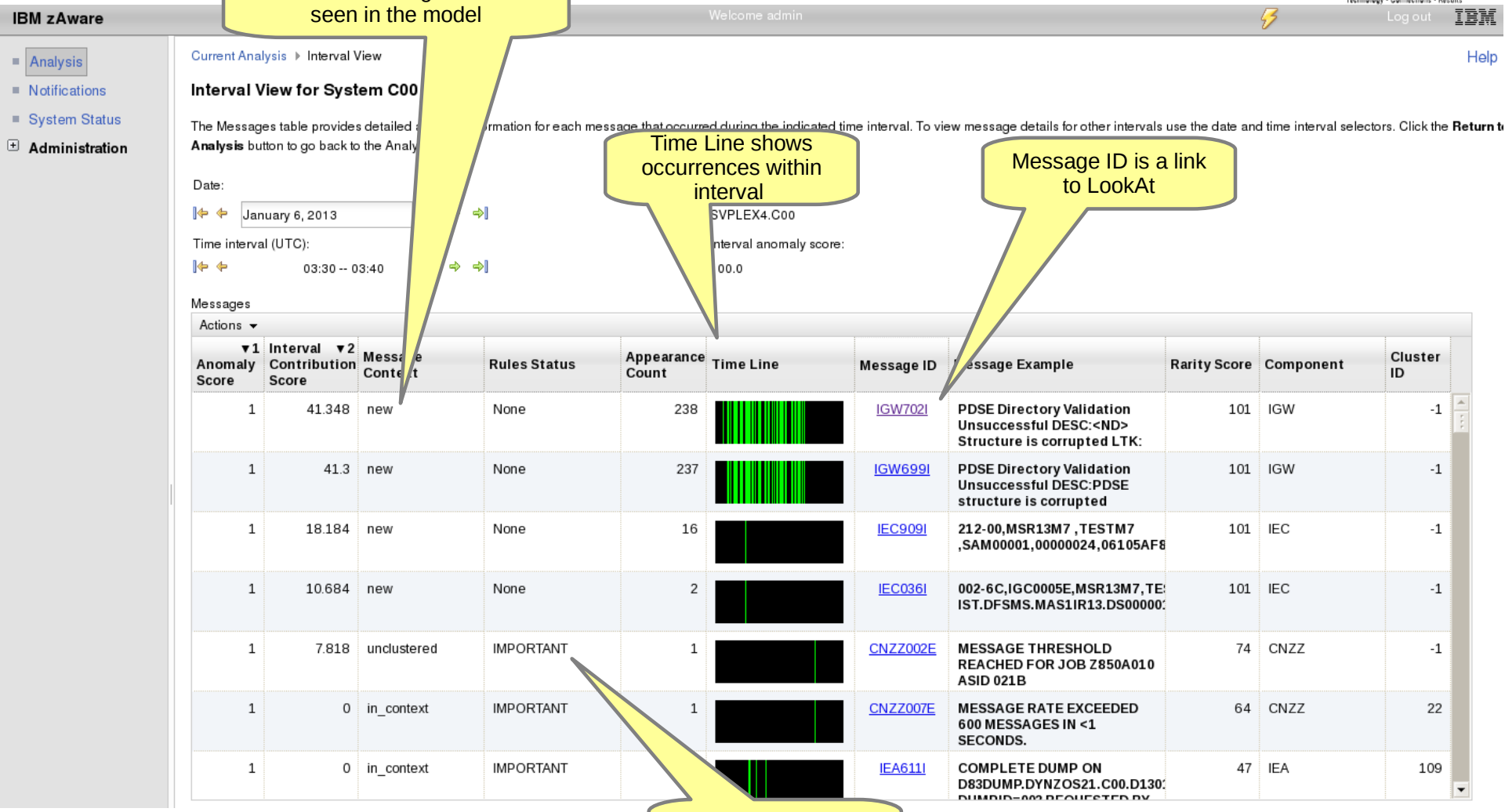
Analysis View



Analysis View



Interval View



Identify unusual behavior quickly

Which z/OS image is having unusual message patterns?

- High score generated by unusual messages or message patterns
- GUI shows all systems or selected subsets

Which subsystem or component is abnormal?

- Examine high-scoring messages

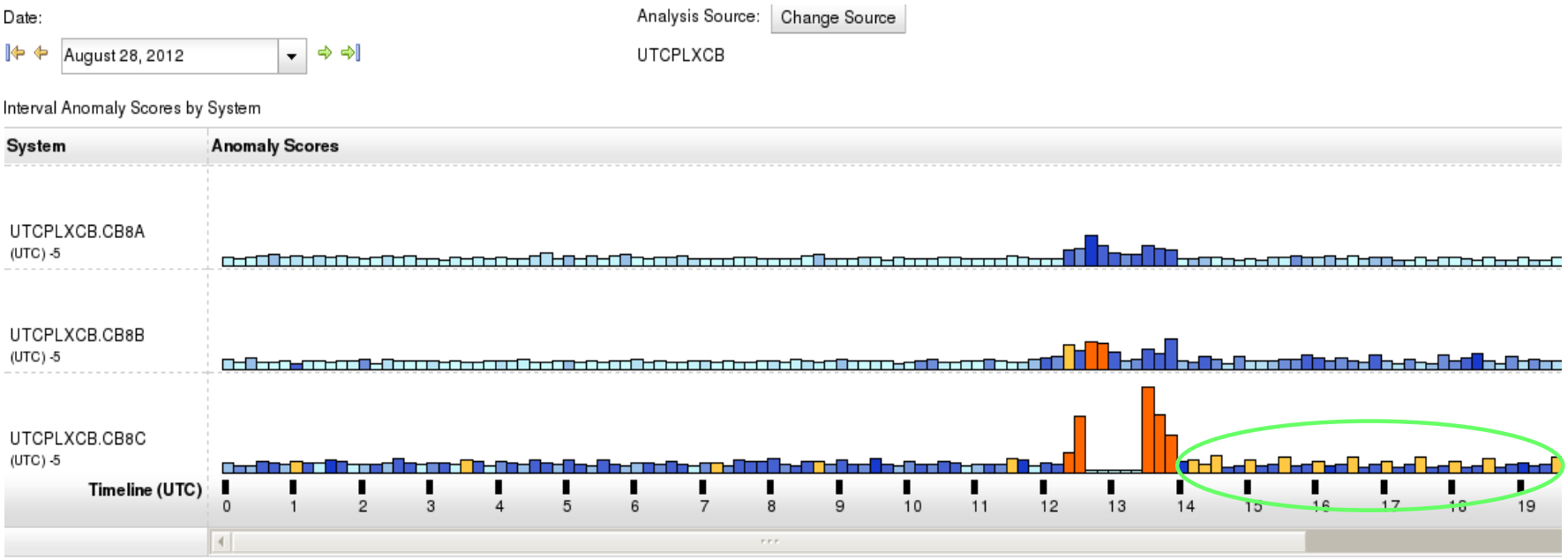
When did the behavior start?

- Current 10 minute interval or earlier?
- Which messages are unusual?
- How often did the message occur?
- When did the messages start to occur?

Were similar messages issued previously

- Easily examine prior intervals or dates

Identify unusual behavior quickly



Which z/OS image is having unusual message patterns?

- ***Recurring yellow and dark blue on CB8C***

When did the behavior start?

- ***After an IPL at 13:30***

Identify unusual behavior quickly

Interval View for System CB8C

The Messages table provides detailed analysis information for each message that occurred during the indicated time interval. To view message details for other intervals use the date and time interval **Return to Analysis** button to go back to the Analysis view.

Date: August 28, 2012

Analysis Source: UTCPLXCB.CB8C

Time interval (UTC): 14:20 -- 14:30

Interval anomaly score: 99.6

Messages

Actions

▼1 Anomaly Score	Interval ▼2 Contribution Score	Message Context	Rules Status	Appearance Count	Time Line	Message ID	Message Example	Rarity Score	Componen
0.999	14.369	unclustered	None	2		IEE838I	TNPROC NON-CANCELABLE - ISSUE FORCE ARM	93	IEE
0.999	12.943	unclustered	None	2		EZZ0621I	AUTOLOG FORCING TNPROC, REASON: TCP/IP HAS BEEN RESTARTED	100	EZZ
0.999	9.41	unclustered	None	1		IXG601I	10.27.18 LOGGER DISPLAY 081 CONNECTION INFORMATION BY	62	IXG
0.997	6.078	unclustered	None	3		IEA631I	OPERATOR GTHOMPS NOW INACTIVE, SYSTEM=CB8C , LU=TCP8C003	31	IEA

Which subsystem or component is abnormal?

- Examine high-scoring messages

When did the behavior start?

- When did the messages start to occur?

Were similar messages issued previously?

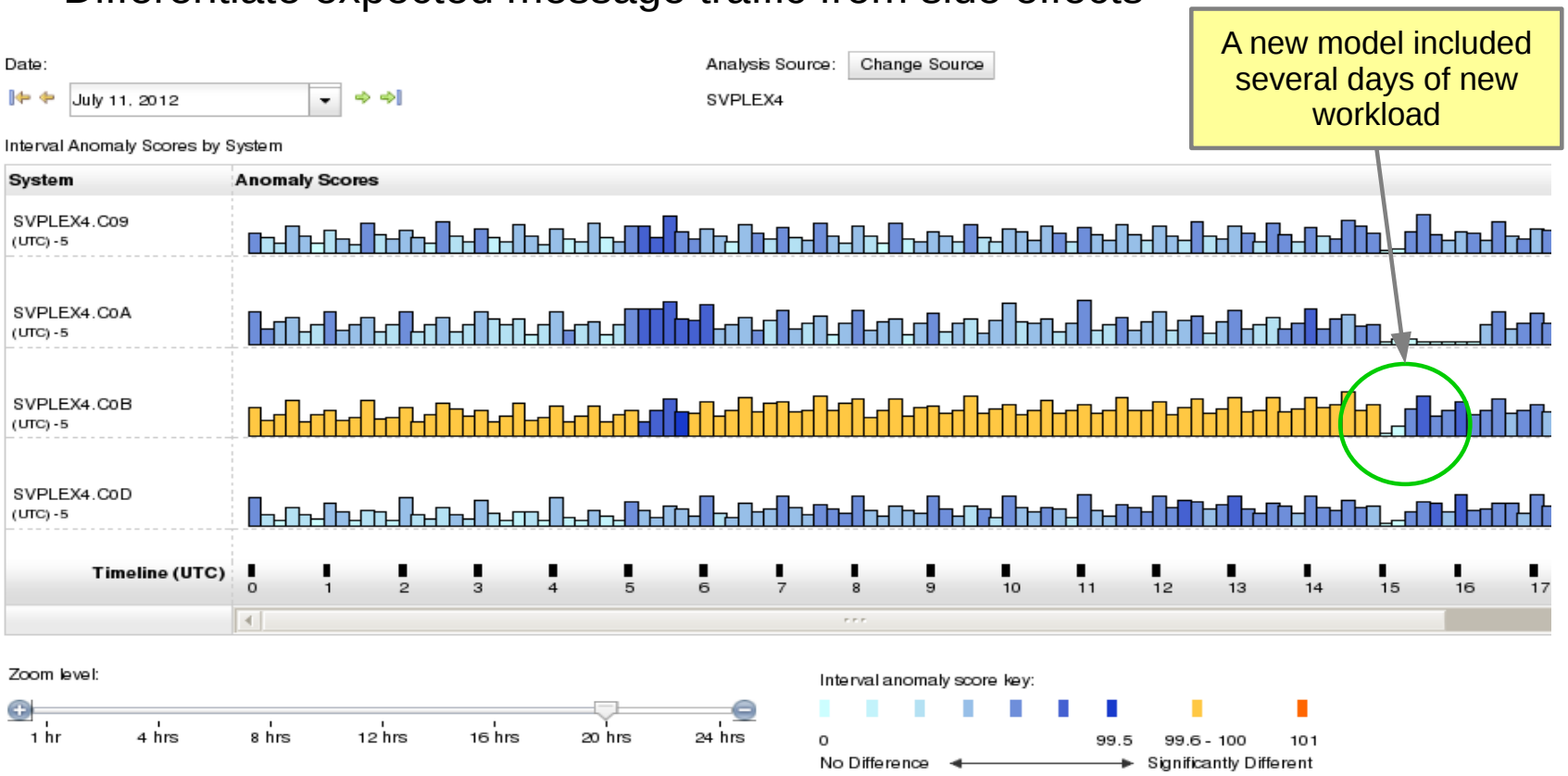
- Easily examine prior intervals or dates

Moving left and right by interval shows messages due to TNPROC being cancelled by TCP/IP

Identify behavior after a change

Are unusual messages being issued after a change?

- New software levels (operating system, middleware, applications)
- Updated system settings or system configurations
- Differentiate expected message traffic from side effects



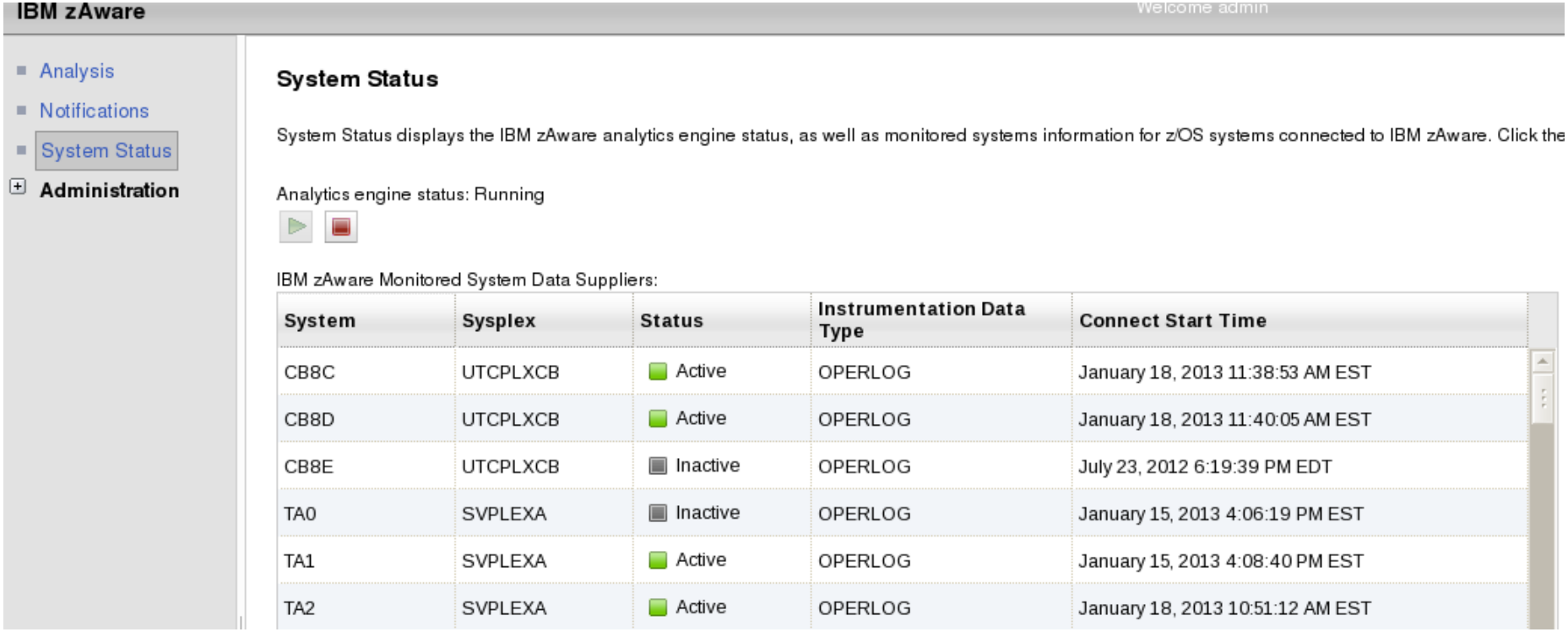
Diagnose Intermittent Problems

Are new unusual messages being issued when an intermittent problem occurs?

- Compare previous time periods
- Are more messages issued then expected?
- Are messages issued differently from the normal pattern?

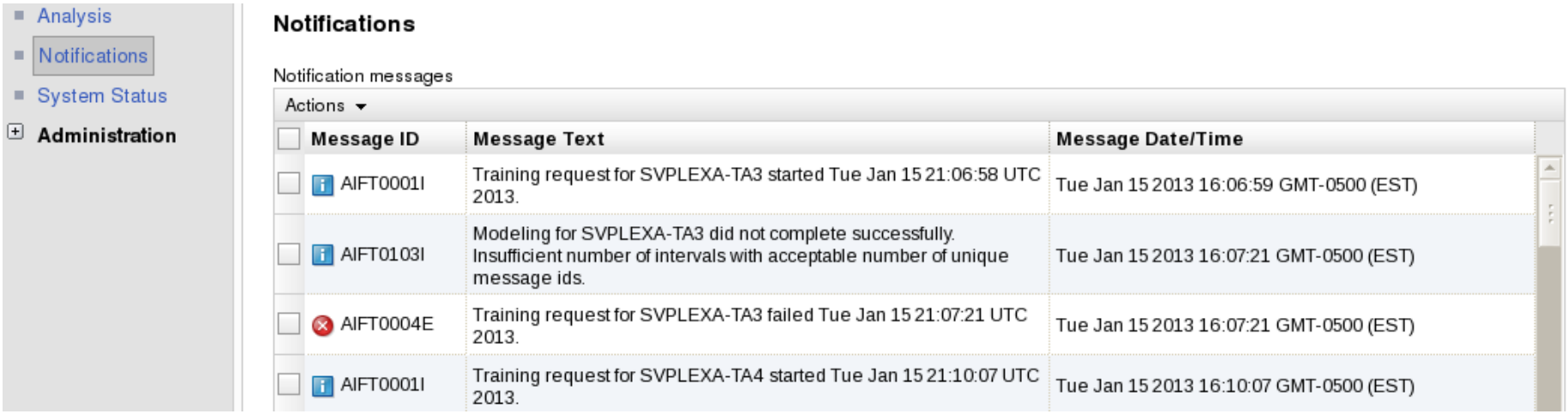
Connection Status

- *Which z/OS Monitored clients are connected?*



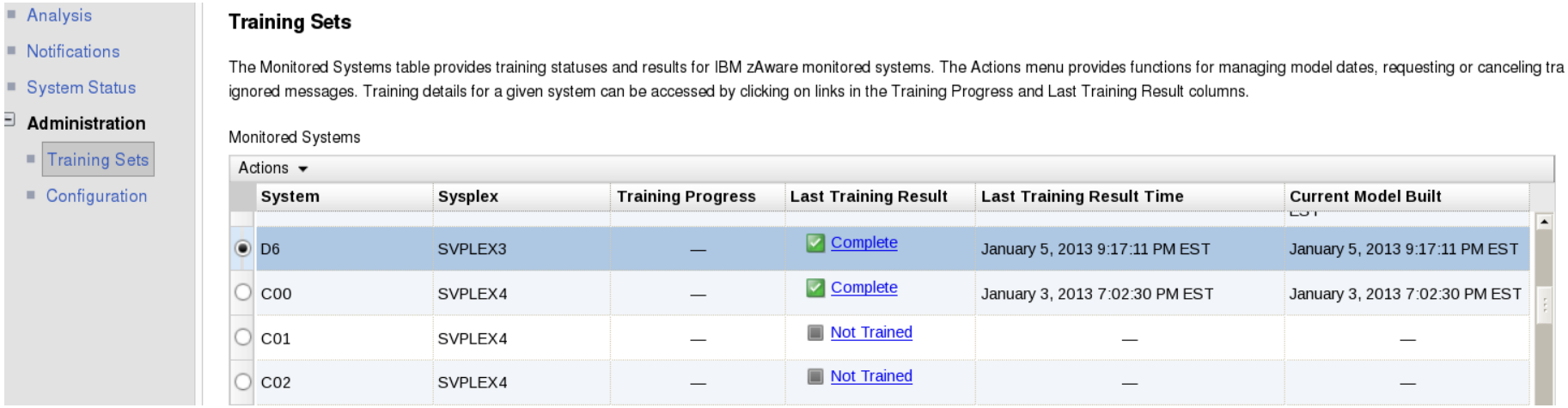
Notifications

- zAware messages for asynchronous events
  - Storage, Training, Bulk load, ...
- Viewable by all users
- Persistent, until removed by an admin
- New ones indicated by  in header



Training Sets

- Admins can view
  - Model training status
  - Dates included in the current model and next model
- Admins can take action
  - Request training
  - Exclude days from the next model



Operating Requirements – IBM zAware Server

- Logical partition on a zEC12 server
  - Runs on **IFL**s or general purpose **CP**s – may be dedicated or shared
  - Runs its own self-contained firmware stack
  - Recommended 2 partial engines
    - *Initial priming and training: 25-80% of 1 IFL*
    - *Analysis: 20-40% of 1 IFL*
- Memory and DASD resources are dependent on the number of monitored clients, amount of message traffic, length of time data retained
  - Minimum Memory is **4 GB** for 6 clients with light message traffic (500 msgs/sec)
    For > 6 clients **+ 256 MB per client** required
  - Estimated DASD storage is ~ **500 GB** (ECKD)
- Network resources
  - HiperSockets or shareable OSA ports
  - IP address for partition
- Browsers
  - Internet Explorer 9
  - Firefox ESR 10

Operating Requirements - z/OS Monitored Clients

- System z servers supported as IBM zAware monitored clients
  - *zEC12*
  - *IBM zEnterprise™ 196 (z196) or z114,*
  - *IBM System z10™ EC or BC*
  - *Prior generations that meet the OS and configuration requirements*

- Running **z/OS 1.13 + PTFs**
  - *APAR OA38747*
  - *APAR OA38613*
  - *APAR OA39256*

- System needs to be configured as a monoplex, system in a multisystem sysplex, or a member of a parallel sysplex
- Using operations log (**OPERLOG**) as the hardcopy medium
- Sysplex name + system name must uniquely identify system
- Requires an OSA or HiperSocket for IP network connection
- z/OS zAware monitored client MIPs usage ~ 1%

Setting up IBM zAware

- Session 13066 Setting up IBM zAware – Step by Step
  - Wednesday, February 6 11:00 AM-12:15 PM
  - Imperial A, Ballroom Level

Integration with other System Management products

- **z/OSMF**
  - Configure a new external **link**
  - Administration > Links > Actions > New
    - Provide link name, SAF suffix, zAware GUI URL,
    - Category – recommend Problem Determination
    - Define authority required to use the link

Integration with other System Management products

- **API**s
  - Provides **XML** equivalent to GUI
    - Analysis page
    - Interval View page
  - Requires HTTPS
    - From z/OS, use AT-TLS
  - HTTP GET/POST requests
    - Connect and authenticate to IBM zAware server
      - *UserID known as a zAware user (e.g. LDAP)*
    - Retrieve analysis for a monitored client
      - *LPAR* *Interval scores for date*
      - *INTERVAL* *Message scores for a 10-minute interval*

Integration with other System Management products

- IBM Tivoli **NetView** for z/OS
  - Can use the APIs to get IBM zAware results
  - Sample programs are available from

    https://www.ibm.com/developerworks/mydeveloperworks/wikis/home/wiki/Tivoli%20System%20z%20Monitoring%20and%20Application%20Management/page/Integration%20Scenarios%20for%20Tivoli%20NetView%20for%20zOS?lang=en

  - described in detail in the Redbook:
    - **Extending z/OS System Management Functions with IBM zAware**
  - The samples can be tailored to drive NetView message automation and raise alerts on anomaly score.
- IBM plans to leverage IBM zAware results in the Tivoli Integrated Service Management products

  Session 12791: Improve Service Levels with Enhanced Data Analysis
  - Thursday, February 7 9:30 AM-10:30 AM Golden Gate 6
- Other products can exploit the XML format results

Summary

You should now understand

- What IBM zAware is, and what can it detect
- How can it help identify problems on z/OS systems
- How can it help diagnose problems on z/OS systems
- Operating requirements
- Use of the IBM zAware GUI
- Integration with other management products

Questions?

References

- IBM System z Advanced Workload Analysis Reporter (IBM zAware) Guide SC27-2623-00

  http://www.ibm.com/systems/z/os/zos/bkserv/r13pdf/#E0Z

- Redbook: Extending z/OS System Management Functions with IBM zAware SF24-8070-00

  http://www.redbooks.ibm.com/abstracts/sg248070.html?Open

- **IBM Mainframe Insights blog www.ibm.com.systemz**
  - The Journey to IBM zAware
    http://www.ibm.com/connections/blogs/systemz/entry/zaware?lang=en_us
  - zAware Installation and Startup
    http://www.ibm.com/connections/blogs/systemz/entry/zaware_installation?lang=en_us
  - Top 10 Most Frequently Asked Questions About IBM zAware
    http://www.ibm.com/connections/blogs/systemz/entry/zawarefaq?lang=en_us
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