



IBM z Systems Technology Summit

# Using Proactive Analytics to Better Manage Your IT Operations

Track 5 Session 2 :

*End to end picture made easier to manage with a complete Analytics solution providing coverage for Predict, Search and Optimize*



DC • Costa Mesa • Chicago • Cincinnati • Toronto • Atlanta • NYC • San Francisco • Dallas

## Solution Branding – Name Change

This solution was previously branded as 'IBM SmartCloud Analytics - Log Analysis'.

The support to search and analyze z/OS logs **was initially provided in March, 2014** under the following product names:

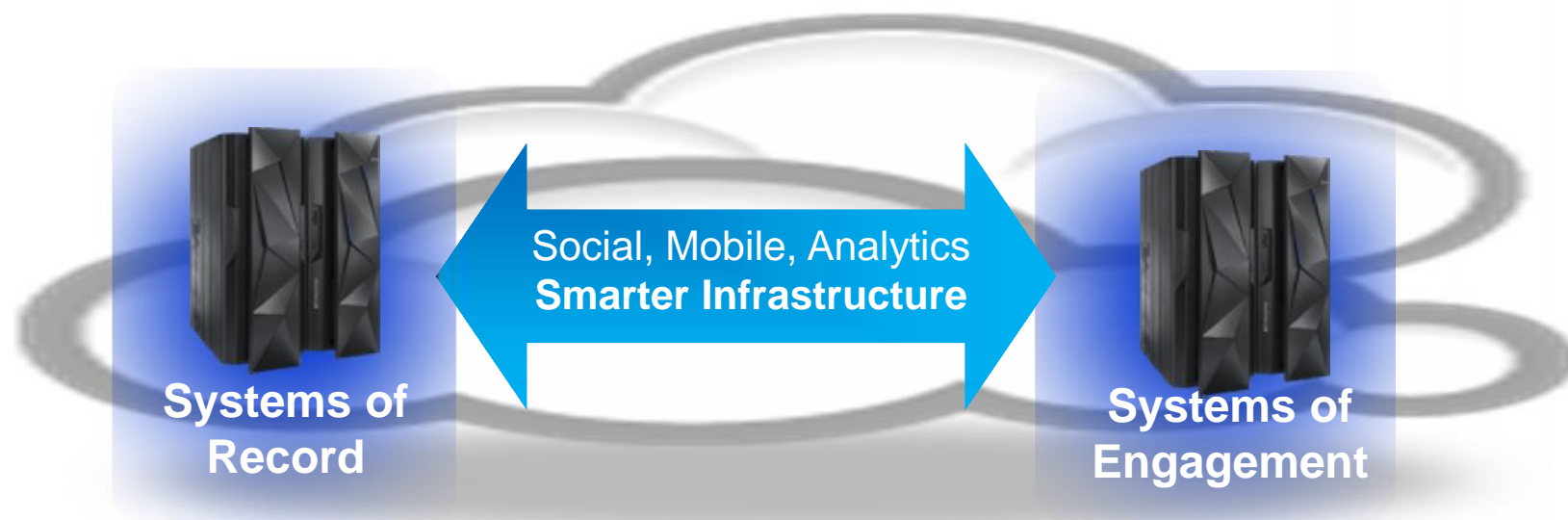
- IBM SmartCloud Analytics - Log Analysis z/OS - Insight Packs – SYSLOG V1.1'
- IBM SmartCloud Analytics - Log Analysis z/OS - Insight Packs - IBM WebSphere® Application Server V1.1

Subsequent releases were named with the SmartCloud brand until April, 2015 when Version 2 of the product was rebranded to

**IBM Operations Analytics for z Systems V2.1.0**

## Rapid growth of data from next generation technologies can be supported seamlessly on zSystems

*zSystems scaling model and security to manage and optimize both*

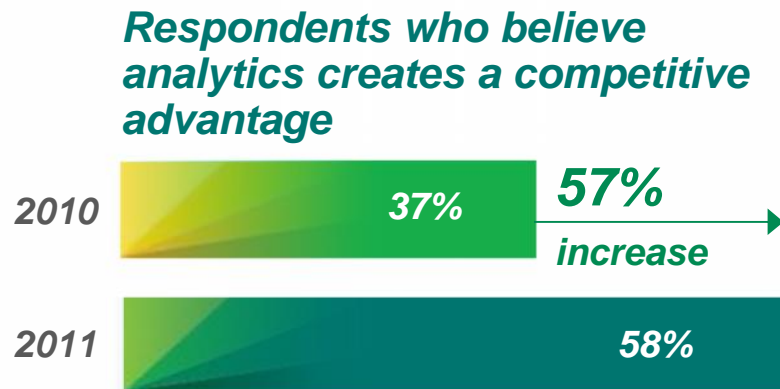


- Business Transactions
- Quality of Service
- Command & Control
- Facts and data “source of truth”
- zSystems

- Mobile and Social
- Dynamic
- Interactions and Collaboration
- Insight, trends, analytics
- Linux on z

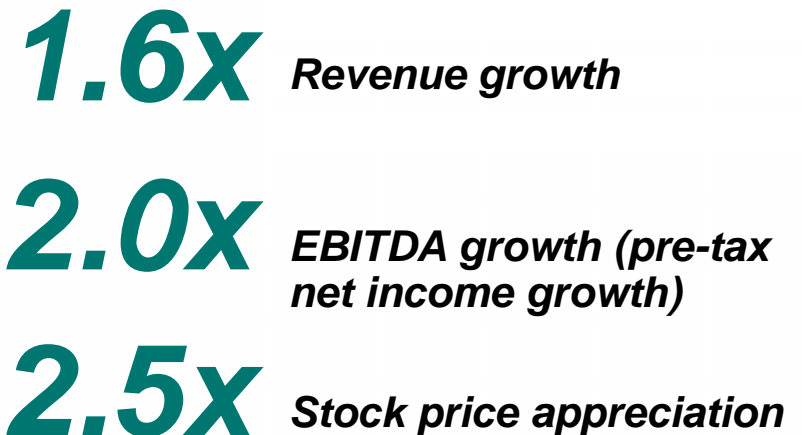
## Organizations using analytics have been shown to outperform competition and improve business results

**More organizations are using analytics to create a competitive advantage**



Source: *The New Intelligent Enterprise*, a joint MIT Sloan Management Review and IBM Institute of Business Value analytics research partnership.  
Copyright © Massachusetts Institute of Technology 2011

**And leaders are outperforming their competitors in key financial measures**



Source: *Outperforming in a data-rich, hyper-connected world*, IBM Center for Applied Insights study conducted in cooperation with the Economist Intelligence Unit and the IBM Institute of Business Value. 2012

## Analytics strategy is now mission critical and impact bottom line results across all industries and IT



### Industries

#### Banking

Increase account profitability

#### Insurance

Retain policy holders with better service & marketing

#### Retail

Understand sales patterns

#### Telecommunications

Reduce churn with custom retention offers



### Operations

#### Industrial

Predict maintenance issues before occur

#### Retail

Improve store performance with P&L reports

#### Telecommunications

Understand & manage network traffic

#### Insurance

Streamline claims process

#### Government

Reduce fraud and waste

## Analytics for System z addresses rapid growth of data and next generation technology requirements

- **Much greater amount of critical IT operational data** (SMF, log, journal) than distributed-only environments.
  - Focus on problem determination and time to resolution while placing premium on availability of services and applications.
  - 100x to 1000x explosion in data flooding existing tools.
  - New runtimes, programming languages needing complex instrumentation.
- By 2016, **40% of Global 2000 enterprises will have IT operations analytics** architecture in place, up from < 1% today, looking to integrate across their enterprise to reduce outages (Gartner).
- **90% of the Fortune 1000 companies are running z** and have 'Systems of Record' dependencies for transactional processing and data serving applications .



# IBM focused on managing end-to-end analytics for improved performance and workload management

## IBM Analytics solutions for System z

### Proactive Outage Avoidance

#### Predict

- IBM Operations Analytics - Predictive Insights
- OMEGAMON & NetView w/ IBM zAware

- Pro-Active Outage Avoidance
- Predict problems before they occur

### Faster Problem Resolution

#### Search

#### IBM Operations Analytics for z Systems

- Quickly search large volumes of log data from a single search bar
- Perform analysis while searching
- Correlate messages from multiple logs for end-to-end problem diagnosis

### Optimized Performance

#### Optimize

#### IBM Capacity Management Analytics (CMA)

- Improve performance and forecast capacity across IT Infrastructure

# IBM System z Advanced Workload Analysis Reporter (zAware) Using Analytics to Improve z Availability

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



- Runs in a special purpose firmware partition on zSystems
- Monitors zSystems running z/OS v1.13 +PTFs or later

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



# IBM zAware

**IBM zAware** runs as a **firmware appliance** on the zEC12

zAware provides z/OS Message log analysis and anomaly detection in a zEnterprise firmware partition for faster diagnosis and improved availability.

**Operlog** is fed into zAware and analyzed in near-real time

## Identify a possible z/OS incident

### *Which image is having a potential problem?*

Examines unique messages

High score generated by unusual messages or message patterns

### *When did this unusual behavior start?*

For a selected 10 minute interval either the current 10 minute interval or past intervals

- Which messages are unusual?
- How often did the message occur?
- When did the message start to occur?

### *Were similar messages issued in the past?*

Understands message characteristics and message patterns

## Identify behavior after a change has been made

### *Are unusual messages being issued after a change ?*

- New software levels (operating system, middleware, applications)
- Updated system settings or system configurations

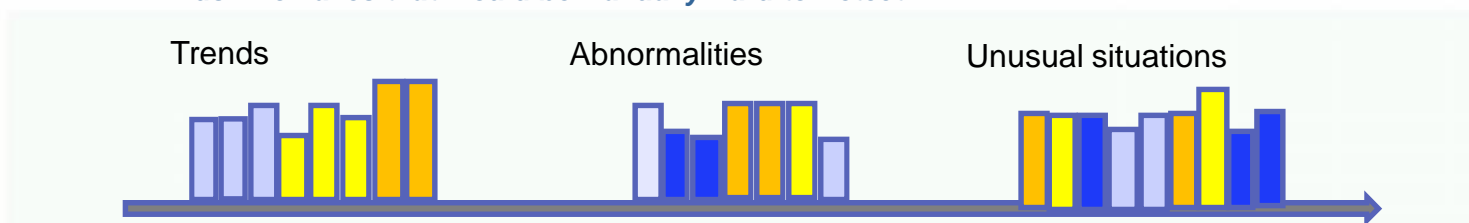
## Diagnose intermittent problems

### *Are new unusual messages being issued in advance of the problem?*

- Are more messages issued then expected?
- Are messages issued out of a normal pattern?

*Appeals to IT VP, Support, Operations, Systems Staff, Service Centers*

### *Finds Anomalies that Would be Manually Hard to Detect*



**Reduces time and effort to identify & diagnose problematic messages**

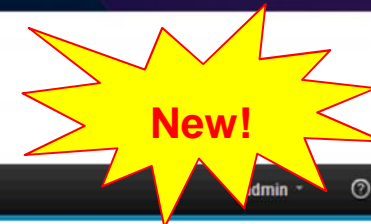
## Enhanced zAware GUI



New!!

- Improved usability and GUI functional enhancements address many customer requirements
  - enhanced filtering, visualization, better use of GUI real estate,
  - improved UI navigation
  - display local time in addition to UTC time
- New improved GUIs are based on IBM One UI guidelines
- Heat map display provides a high level consolidated view with ability to drill down to detail views
  - zOS grouped by sysplex, Linux grouped by model group
  - Scores presented at the hour level
  - Quickly get to all systems in a specific group
  - See the interval summaries per system with the Bar Score view
  - Detailed messages and scores in the Interval view
- Expanded browser support with Firefox ESR 24, 31 and IE 9,10,11

# zAware enhanced GUI – Heatmap



**Analysis** ?

Date (UTC):   All monitored groups

Interval Anomaly Scores

Actions Zoom: 24 hrs View: Heat Map Table Filter

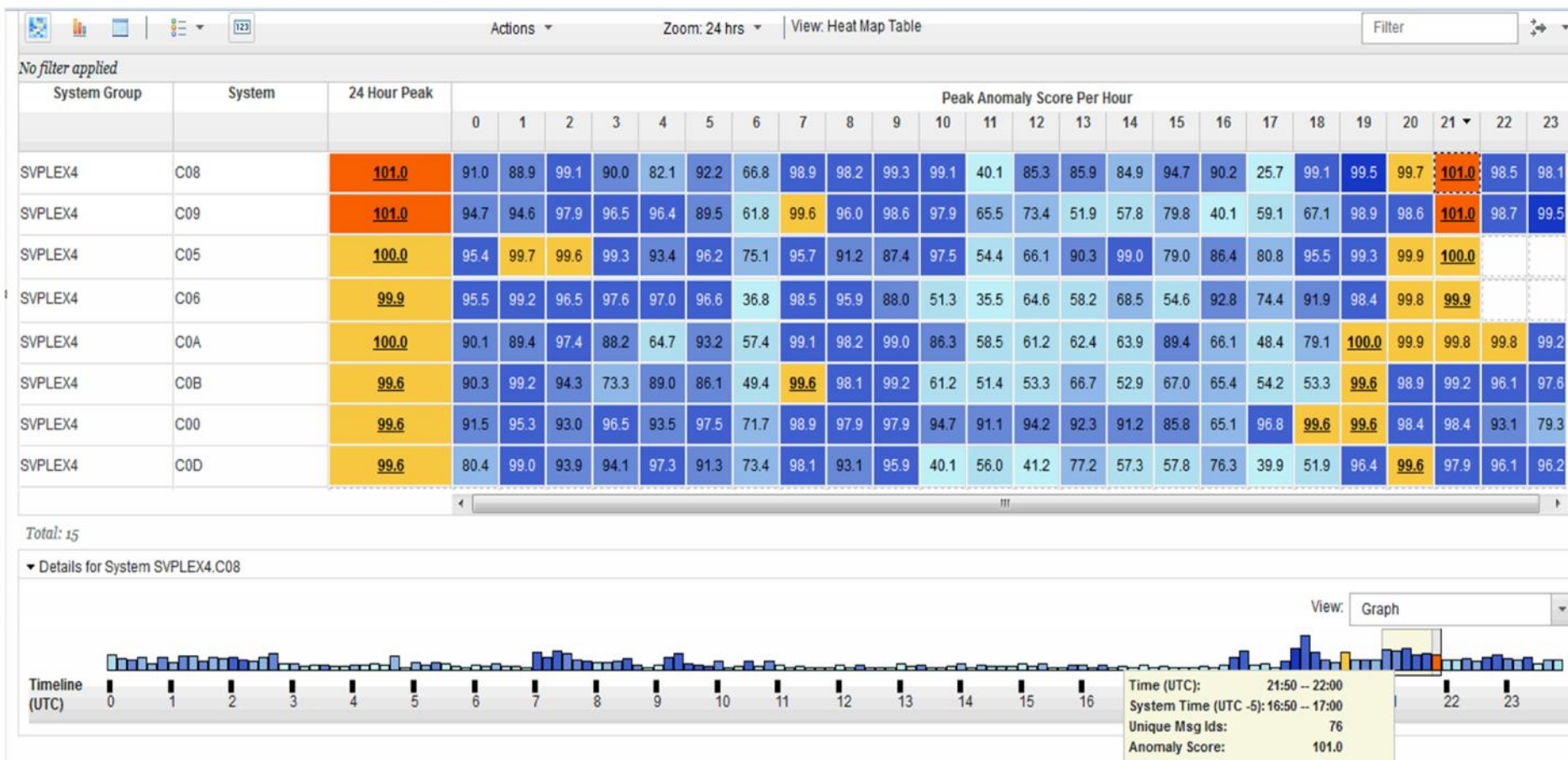
No filter applied

System Group	Type	24 Hour Peak	Peak Anomaly Score Per Hour																							
			0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
SVPLEX4	Sysplex	101.0	95.5	99.7	99.6	99.3	97.3	97.5	75.1	99.6	98.2	99.3	99.1	91.1	94.2	92.3	99.0	94.7	92.8	96.8	99.6	100.0	99.9	101.0	99.8	99.5
SVPLEX7	Sysplex	101.0	101.0	101.0	92.2	88.8	101.0		99.7	75.1	91.2	94.6	87.5	99.9	101.0	101.0	99.8	101.0	99.7	101.0	101.0	101.0	95.7	101.0	92.1	93.9
UTCPLXCB	Sysplex	101.0	80.4	83.7	98.2	98.2	99.4	99.0	98.7	99.3	99.3	99.6	99.3	99.3	98.0	101.0	98.4	97.3	88.6	81.1	94.7	90.7	84.3	97.1	95.8	95.6
SVPLEX1	Sysplex	100.0	99.5	100.0																			99.4	99.8	94.9	91.8
PLEX1	Sysplex	99.9	87.4	86.6	86.6	86.6	93.2	86.6	89.8	94.6	87.6	86.6	86.6	86.6	87.4	86.6	97.1	98.0	94.2	89.3	86.6	99.9	85.7	98.0	80.2	80.2
SVPLEX3	Sysplex	99.7													99.7	98.7	99.2	98.8	96.2	95.6	98.1	96.9	96.0	96.1	92.8	94.0
SVPLEX9	Sysplex	97.7	92.8	93.9	97.7	97.7	97.7	95.4	96.6	96.6	92.1	91.2	97.3	92.1	89.3	95.7	89.2	84.9	96.9	97.3	91.2	69.1	94.3	93.1	78.0	80.0
IGNORE	Sysplex																									
SVPLEX2	Sysplex																									
SVPLEX5	Sysplex																									
SVPLEXA	Sysplex																									
CSST	Model Group																									

Total: 12

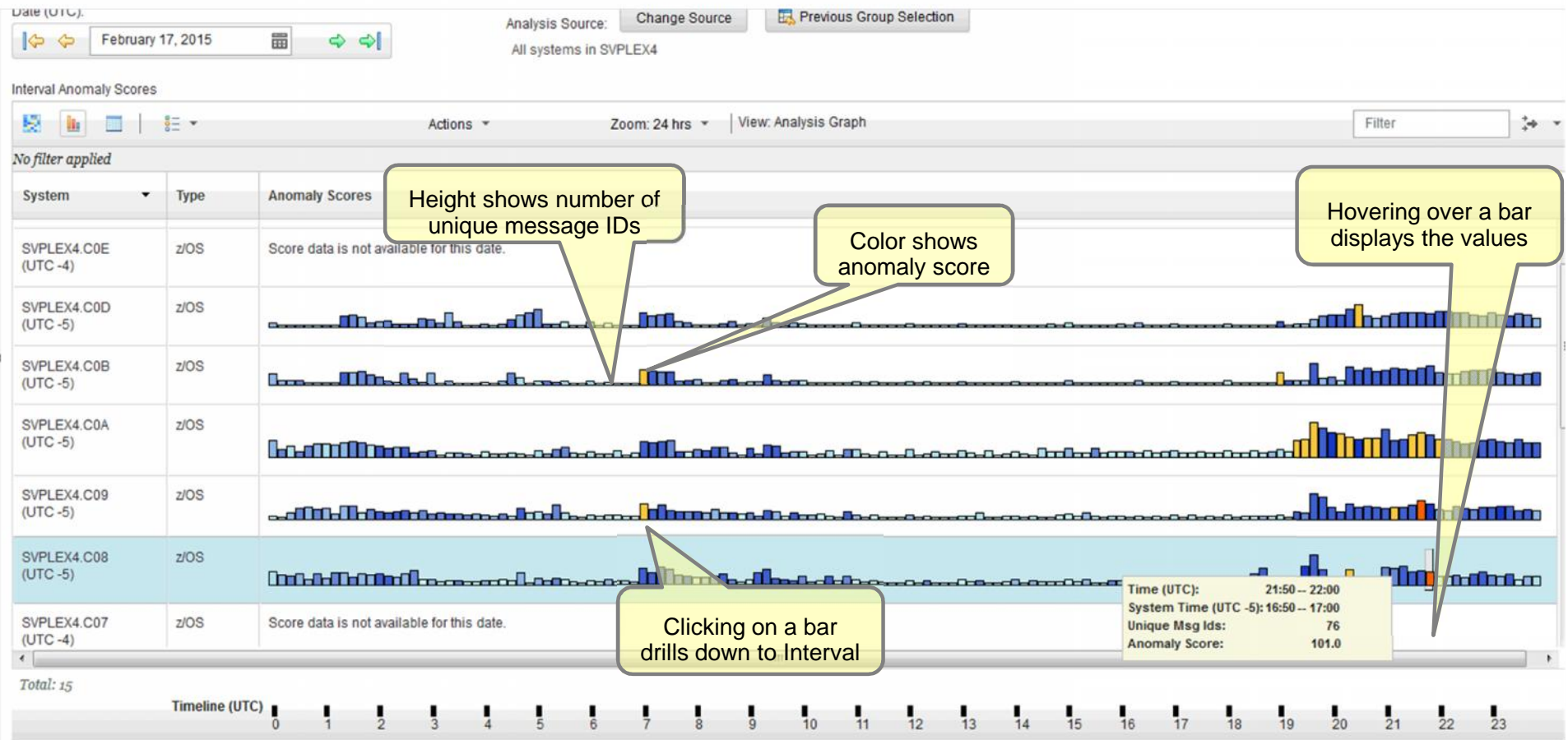
Aggregated analysis score for group with ability to drill down

# Heat Map – All systems in a group w/drilldown



Click on column the 101.0 again in column 21 to bring up your details pane at the bottom with the timeline for that hour highlighted.  
 Hover over an interval for details

# Bar Score view with interval summaries



# Interval View

Current Analysis > Interval View

## Interval View for System SVPLEX4.C08

Date (UTC): February 17, 2015

System date: (UTC -5) February 17, 2015

Analysis source: SVPLEX4.C08

Analysis source type: z/OS

Number of unique message IDs: 76

Time interval (UTC): 21:50 -- 22:00

System time interval: (UTC -5) 16:50 -- 17:00

Interval anomaly score: 101.0

Analysis interval (minutes): 10

Analysis group: SVPLEX4-C08

Messages

Actions Details Filter

No filter applied

Anomaly Score 1	Interval Contribution Score 2	Clustering Status 3	Count	Rules Status	Time Line	ID	Message Example
1.000	1001.00	unclustered	1	Critical		<a href="#">IXC101I</a>	SYSPLX PARTITIONING IN PROGRESS FOR C06 REQUESTED BY XCFA. REASON: OPERATOR VARY REQUEST
0.997	5.698	unclustered	1	None		<a href="#">IXC108I</a>	SYSPLX PARTITIONING INITIATING FENCE SYSTEM NAME: C06 SYSTEM NUMBER: 0800186F SYSTEM IDENTIFIER: C8672964 1600186F
0.997	5.698	unclustered	1	None		<a href="#">IXC109I</a>	FENCE OF SYSTEM C06 SUCCESSFUL.
0.995	5.403	unclustered	1	None		<a href="#">IXC105I</a>	SYSPLX PARTITIONING HAS COMPLETED FOR C06 - PRIMARY REASON: OPERATOR VARY REQUEST - REASON FLAGS: 000004
0.991	4.760	out_of_context	1	None		<a href="#">ISG378I</a>	GRS QSCAN ERROR COMMUNICATING WITH SYSTEM C06, DIAG=00000001
0.978	3.823	unclustered	1	None		<a href="#">IEA031I</a>	STP ALERT RECEIVED. STP ALERT CODE = 18

Time Line shows occurrences within interval

Message ID is a link to knowledge center

z/OS specific rules affect anomaly score

Mark a z/OS message to be ignored

## IBM focused on managing end-to-end analytics for improved performance and workload management

### *IBM Analytics solutions for System z*

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##### Predict

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#### Faster Problem Resolution

##### Search

##### IBM Operations Analytics - Log Analysis

- Quickly search large volumes of log data from a single search bar
- Perform analysis while searching
- Correlate messages from multiple logs for end-to-end problem diagnosis

#### Optimized Performance

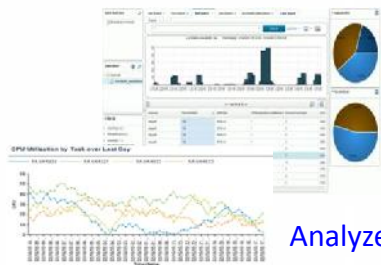
##### Optimize

##### IBM Capacity Management Analytics (CMA)

- Improve performance and forecast capacity across IT Infrastructure

# Rapidly assist in and accelerate problem identification, isolation and repair

## Search



## Analyze

**Locate problems** from system, configuration, software logs and performance metrics using **rapid index search**

**Isolate issues across various domains** including customer session, performance and system faults

**Visualize search results with analytic tools** to rapidly **perform root cause**

**Out-of-the-box analysis and insights** for z/OS, WebSphere, DB2, CICS, IMS, MQ, Network

**Fully customizable** to meet your needs

**Link to support documentation and operations notes** to resolve problems quickly

**Reduce mean time to repair** by identifying and isolating service impacting issues quickly

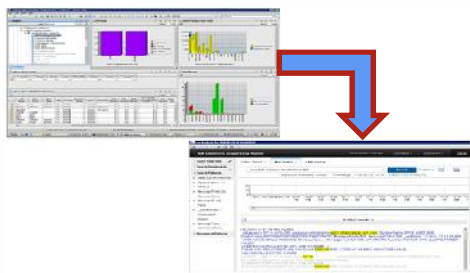
## Resolve



## New in 2015

- Analysis of Performance Metrics (new SMF Data Provider)
- Network Insights
- Event notification
- Hadoop Support
- Integration with ITM/OMEGAMON and Netcool Operations Insight

## Integrate



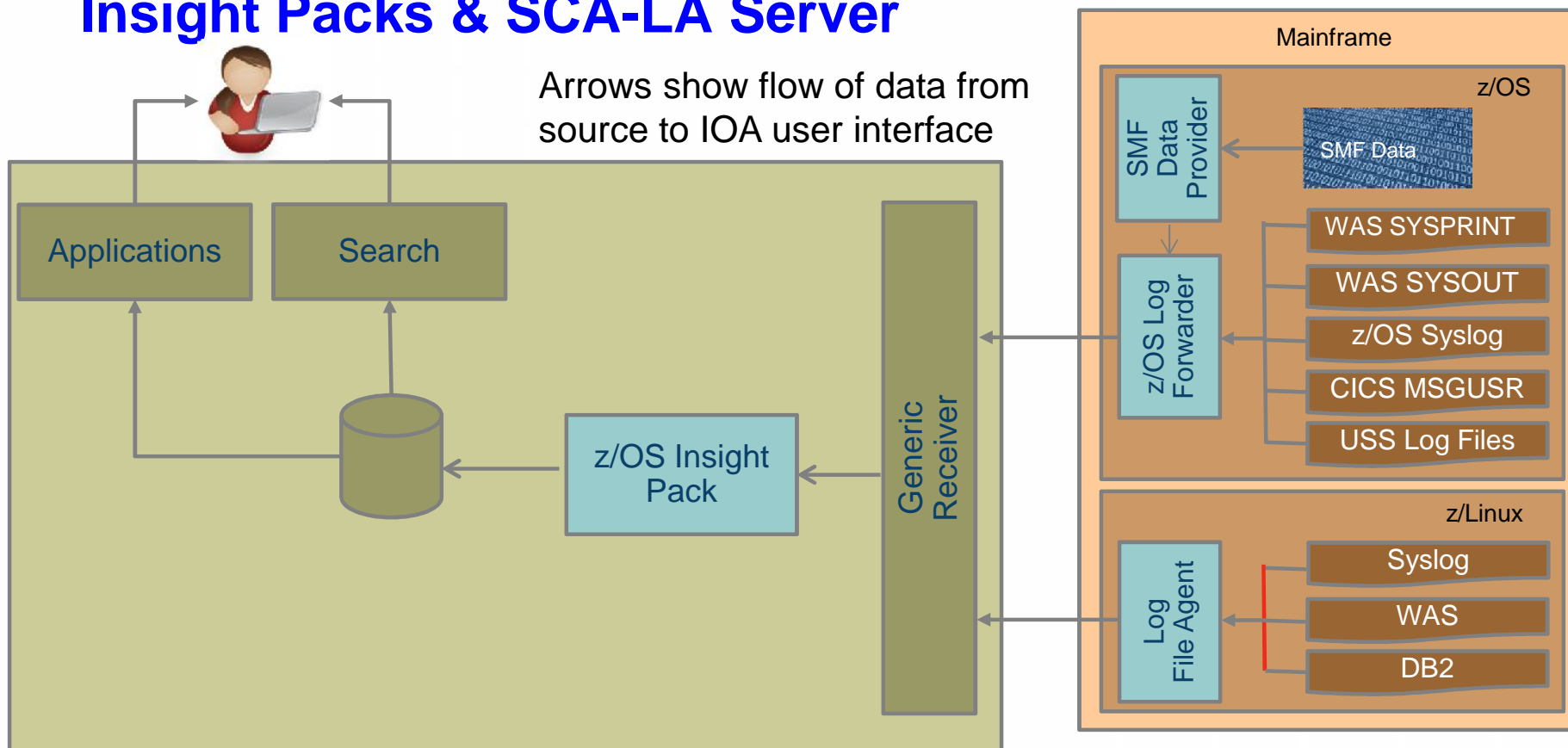


## IOA for z Systems provides Search and Analysis

IOA for z Systems can consume Logs and SMF data

- SMF Data
  - IOA for z Systems includes a real time SMF Data Provider that streams SMF data to the IBM Operations Analytics server
  - In IBM for Operations Analytics for z Systems v2.1.0, the SMF Data Provider collects SMF 30 records. Additional record types will be supported in subsequent releases.
- Log Data
  - **IOA for z Systems, by default, can support z/OS Syslog, CICS MSGUSR, WAS Sysprint, WAS Sysout and USS Log Files (syslogd, etc). Both Search and Analysis (ie 'Insights') are provided for these log sources.**
    - The z/OS Syslog contains messages from z/OS as well as DB2, IMS, CICS, MQ, RACF, etc. IOA for z Systems is able to provide Search and Analysis (ie Insights) for all of these simply by consuming the z/OS Syslog.
  - Additional log types can be supported in a number of ways:
    - Additional log types can be fed into the Default Annotator component of the IOA server to enable the Search capability for those logs.
    - If you want to provide Analysis (ie 'Insights'), you can write an Insight Pack.
    - Check with the IBM Operations Analytics for z Systems development team before writing your own Insight Pack because the development team might already be working on it.

# IBM Operations Analytics – Log Analysis z/OS Insight Packs & SCA-LA Server



- z/OS Log Forwarder / SMF Data Provider installed on each z/OS LPAR where you want to provide Search and Analysis
- The IBM Operations Analytics server is installed on z System (or x System) running Linux (64 bit)
- z/OS Insight Packs are installed on the IBM Operations Analytics server

## Components included in the offering

### 5698-AAP V2.1.0 IBM Operations Analytics for z Systems

- Previous versions of the solution required purchase of multiple products. In this version, a single product provides a complete solution for z Systems.

IBM Operations Analytics for z Systems provides out-of-the-box insights and application views for z/OS, WebSphere, DB2, CICS, IMS and MQ with the addition of Network Insights in V2.1.0 Also in V2.1.0, we have included initial support for consuming and analyzing performance metrics.

- z/OS Log Forwarder
  - A specialized data collector that monitors and forwards z/OS SYSLOG, WebSphere Application Server and or other z/OS log data to IBM Operations Analytics for z Systems
    - Install and configure ONE log forwarder on each z/OS LPAR that is monitored
    - Configurable to specify which logs to stream to the Analytics engine
- SMF Data Provider
  - A specialized data collector that enables SMF data to be streamed to IBM Operations Analytics for z Systems
    - Install and configure ONE SMF Data Provider on each z/OS LPAR that is monitored

## z/OS and Middleware - Message Processing

- Sample 'quick searches' are provided for each of the subsystems to help you get started out-of-the-box.
- Quick searches, application views and Insights have been created from research done with subject matter experts, support teams and development teams from our customers and IBM.
- Custom application views are provided to easily view trends (graphically).

# Simple Search Interface – Easy to Customize

The screenshot shows the IBM SmartCloud Analytics Log Analysis web interface. The browser title is "IBM SmartCloud Analytics Log Analysis - Mozilla Firefox: IBM Edition". The address bar shows the URL "https://unity2.rtp.raleigh.ibm.com:9987/Unity/". The page header includes "IBM SmartCloud Analytics Log Analysis", "Administrative Settings", "Learn More", and "unityadmin".

On the left side, there is a navigation menu with categories: "Quick Searches", "Custom Apps", "ExpertAdvice", "Configured Patterns", and "Discovered Patterns".

The main content area has a "Getting Started" tab and a "New Search" tab. Below the tabs is a search input field containing an asterisk (\*). A yellow callout bubble labeled "Enter search string" points to this field. To the right of the input field is a "Search" button. Further right is a "Timeframe" dropdown menu currently set to "Last 15 Minutes". A yellow callout bubble labeled "Timeframe" points to this dropdown. To the right of the timeframe is a "Save My Search" button. A yellow callout bubble labeled "Save My Search" points to this button. Below the search input field, there is a yellow callout bubble labeled "Search specific logs or ALL logs" pointing to the search area.

# WebSphere Application Server Search – java Exception pattern

The screenshot shows the IBM SmartCloud Analytics Log Analysis interface. On the left, a sidebar lists search filters under 'Configured Patterns', with 'org.apache.openjpa.persistence.PersistenceException (71)' selected. The main area shows a search query: 'javaException:=="org.apache.openjpa.persistence.PersistenceException"'. Below the query is a bar chart showing a significant spike in exceptions at 3:26 AM. A table below the chart displays search results with columns for exceptionPackageName, msgClassifier, \_datasource, and threadID.

exceptionPackageName	msgClassifier	_datasource	threadID
	BB000222I	TVT7008_SYSOUT	0X00000023
	BB000222I	TVT7008_SYSVRT	
org.apache.openjpa.kernel	BB000220E	TVT7008_SYSOUT	0X00000030
	BB000222I	TVT7008_SYSVRT	
	FFDC1003I	TVT7008_SYSOUT	0X00000015
	BBOJ0011I	TVT7008_SYSVRT	
org.apache.openjpa.kernel	BB000220E	TVT7008_SYSOUT	0X00000030
	BB000222I	TVT7008_SYSVRT	
	BB000222I	TVT7008_SYSOUT	
	BBOJ0051I	TVT7008_SYSVRT	
org.apache.openjpa.kernel	BB000220E	TVT7008_SYSOUT	0X00000030
	BBOJ0077I	TVT7008_SYSVRT	
org.apache.openjpa.kernel	BB000220E	TVT7008_SYSOUT	0X00000030
	BBOJ0077I	TVT7008_SYSVRT	

Search WAS log

Timeframe of problem

Log analysis displays number of exceptions during this timeframe

Search results

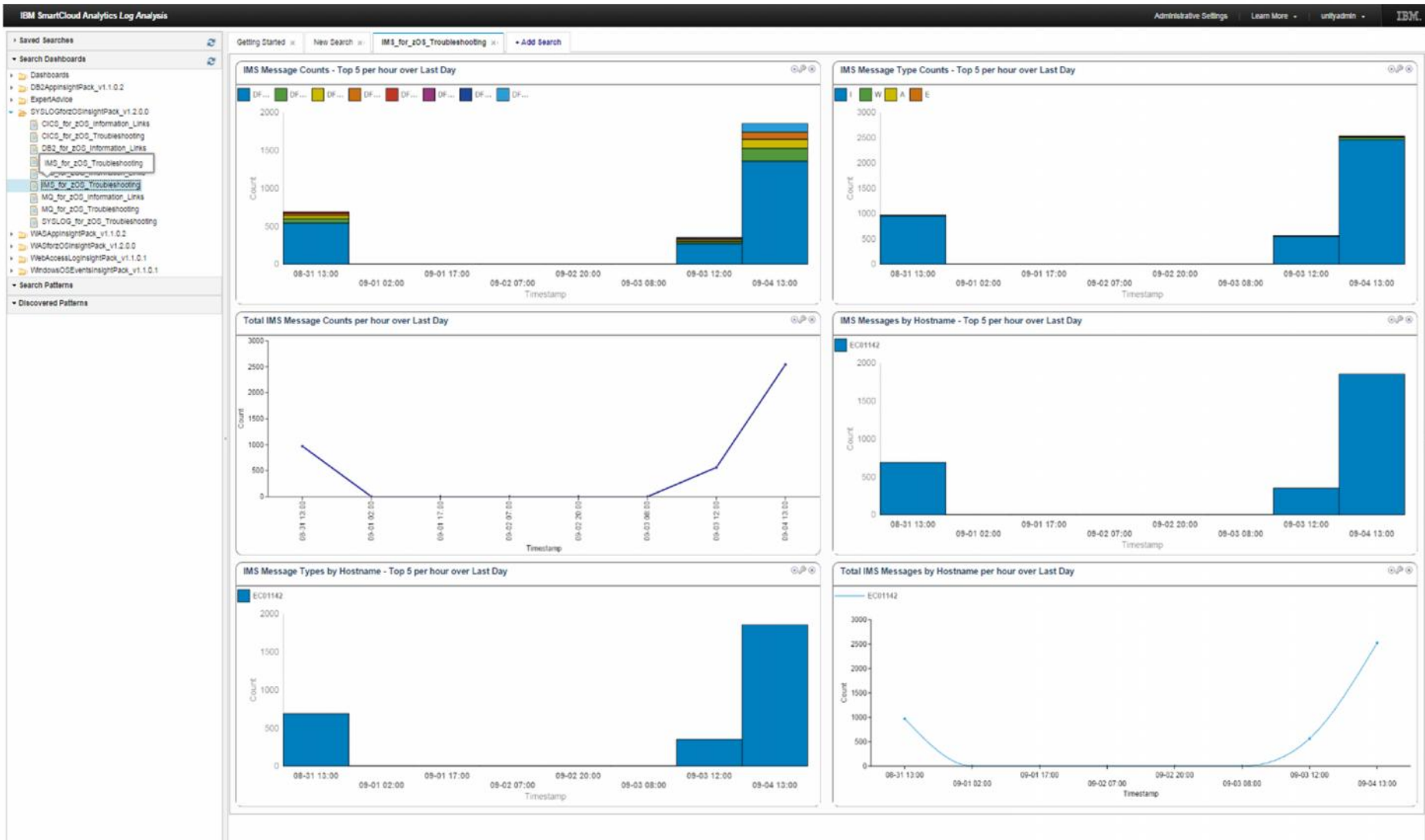
# Quickly and easily access IBM Support Portal based Expert Advice from Log Analysis

Search for expert advice with the click of a button

All IBM support site documents that reference messages from search results

The screenshot shows the IBM Support Portal search results page. On the left, there is a navigation sidebar with sections like 'Quick Searches', 'Custom Apps', 'ExpertAdvice', 'Configured Patterns', and 'Discovered Patterns'. The main content area displays search results for 'WebSphere Application Server V8: Administration and Configuration'. A specific result is highlighted: 'IZ05682: ADMINTASK RECONFIGURETAM PORT CONFLICT'. A red arrow points from this result to a callout box that says 'Launch to Technote'. The callout box also points to a document link in the search results: 'WSKeyStore W CWPKI0041W... com.ibm.ws.ssl.core.SSLDiagnosticModule registered successfully: true. [10/1/07 20:25:26:479 CEST] ...'. The document link is highlighted in yellow. The document content shows a warning message from the SystemOut.log file and provides troubleshooting steps for resolving the problem.

# Sample dashboard





## New in IOA for z Systems V2.1.0

- Analyze your SMF data AND your log data for a complete view of the enterprise.



- Also, Search and provide network Insights with our new Network Insights feature

## IOA: Search syntax – Tailor Your Queries

The Out-of-the-Box capabilities help you realize immediate value from the product. Additionally, IOA can easily be tailored to your specific needs.

- Perform simple free form searches using the standard set of search keywords and operators
- Build complex queries with range searches and *DateMath* functions
- To learn more, consult Online Help available from the **Learn More Search Bar Search query syntax** menu:

Easily create and save your own search string and build your own application views!

The screenshot displays the IBM SmartCloud Analytics Log Analysis interface. The top navigation bar includes 'Administrative Settings', 'Learn More', and 'unityadmin'. The 'Learn More' dropdown menu is open, showing options: 'Search Bar', 'Displaying search results', 'Filtering searches', 'Tour', 'Guided Demo', 'Online Help', and 'Getting Started'. The 'Search Bar' option is highlighted. Below the navigation bar, there is a search input field with a dropdown menu showing a search query syntax example: '\*'. A 'Search' button is visible to the right of the input field. The left sidebar contains navigation options: 'Saved Searches', 'Search Dashboards', 'Search Patterns', and 'Discovered Patterns'.

## Customer Experiences

### Large Insurance Company

- Experienced an application outage that resulted in the team working around the clock for **29 hours** pouring through logs and traces to determine the root cause of the issue. After the issue was resolved, the logs were captured and sent to IBM lab for analysis using SCA-LA. **Within minutes**, the IBM team was able to see the scope of the issues, and find the relevant PTF to resolve the issue through the integrated expert advice.

### State Agency

- Were able to **download, install, configure** and use SCA-LA to search their logs in **2.5 hours**.

### Numerous Customers

- Errors lurking in logs that are never examined because they don't necessarily cause SLA or performance problems. For example, SCA-LA found over 4,000 invalid login attempts in a three day period that had otherwise gone unnoticed.

## Send us your logs!

- Request a product demo using logs from your own test, development or production environments
  - IBM will load your logs into an IBM Operations Analytics server, then demo the results back to you
    - A secure, dedicated drop box will be assigned to you
    - You will be sent detail upload instructions via email
    - Any file uploaded will be automatically moved to a dedicated IBM Operations Analytics environment within 24 hours
    - All log data will be purged from the IBM Operations Analytics environment within 48 hours after the demo event

To request your hosted demo, visit:

<http://services-useast.skytap.com:18280/WebDemo/>

Or take the product for a test drive using IBM-provided sample data at:

<http://zscala.ibmzoperationsanalytics.com:9182/ZLALiveDemo>

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(CMA)

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# IBM Capacity Management Analytics

Cost effective, optimal use of IT Infrastructure capacity:  
Today, tomorrow, beyond

A single, integrated cost-effective solution for zSystems & Distributed Infrastructures



- System management
- Problem identification and resolution
- Capacity forecasting and monitoring
- Software Cost Analysis

Manage the complete time horizons



- Historical reporting of past performance
- Forecasting future requirements
- Real-time anomaly detection

Jump-start your time to value and ease implementation



- Built on IBM's ease-of-use analytics
- Includes prepackaged, interactive reports
- Optional services and education

## Questions capacity management can answer

### System and workload characteristics, performance and trending



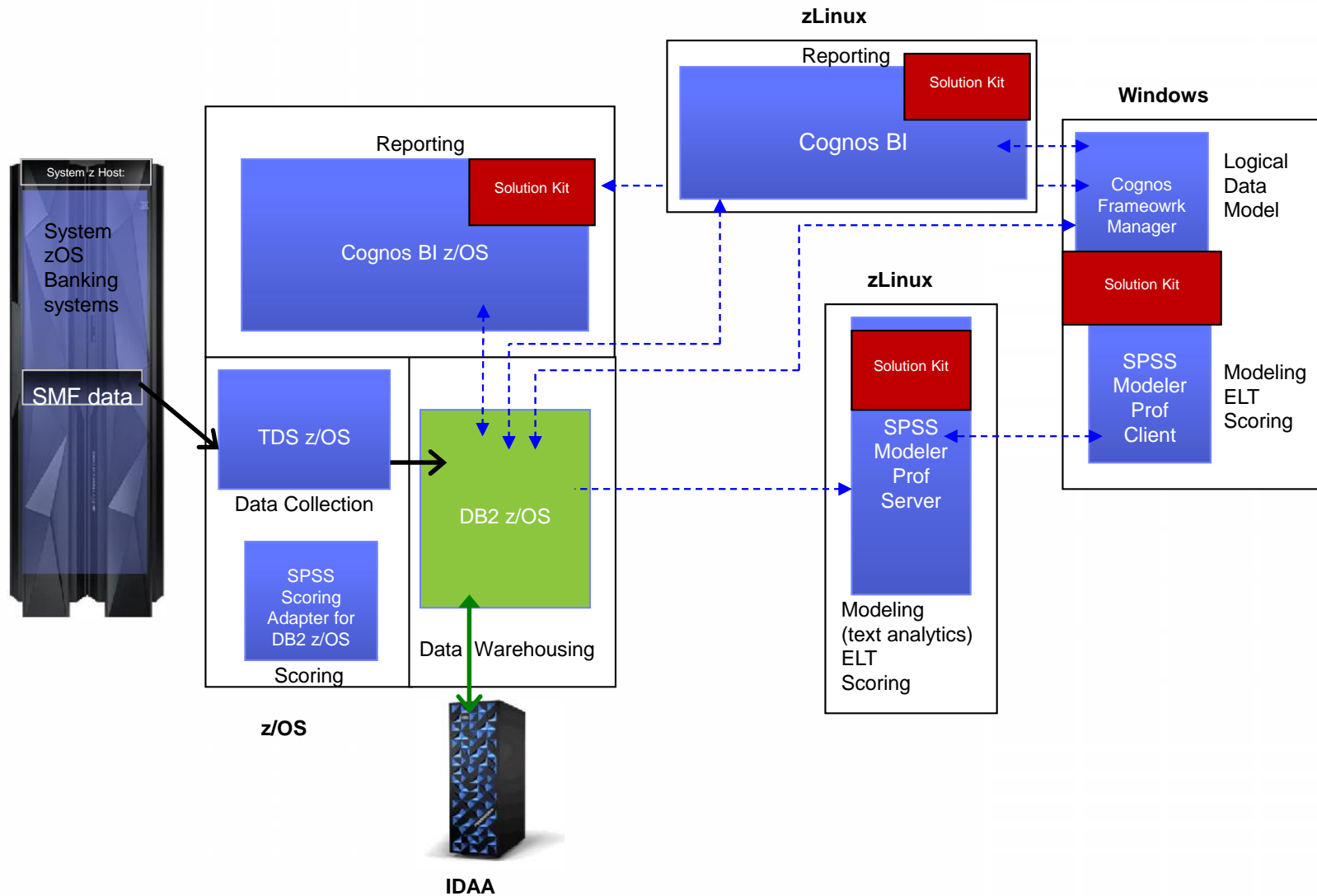
- How is my environment performing?
- What's driving the demand on my capacity?
- Is my IBM Workload Manager environment properly tuned?
- Am I achieving my performance goals?
- Are capacity constraints causing bottlenecks and what is being impacted?
- What anomalies occurred that impacted resource usage, performance or both?

### System and workload optimization, prediction and forecasting



- Do I have windows of available capacity to which I can move workloads and applications in order to alleviate bottlenecks during peak processing?
- Can I better balance my resource usage across servers, logical partitions (LPARs) and virtual machines (VMs) and defer a capacity upgrade?
- Do I have enough available capacity to add new workloads and applications to my current environment?
- When will I need to upgrade capacity in the future to support the planned addition of new workloads and applications?

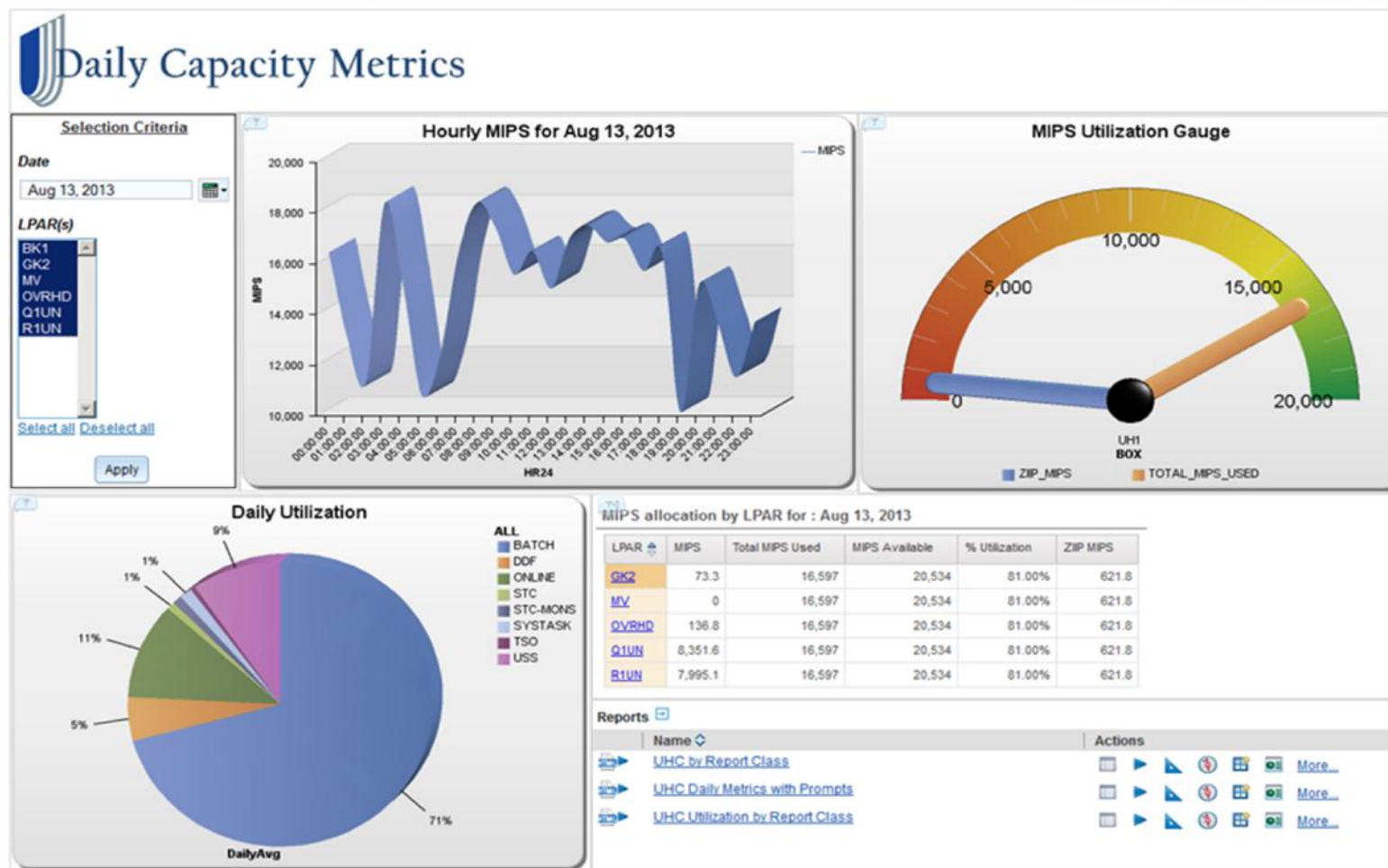
# CMA Architecture





# IBM Capacity Management Analytics: Systems Management

IBM CMA's dashboard & report capabilities provide executives, managers, capacity & performance specialists with custom views to analyze, visualize and make informed decisions.



# Built on IBM's ease-of-use analytics solution



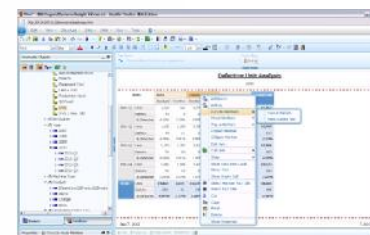
A workspace with greater power, intuitive navigation & cleaner look



Pixel perfect reporting



Advanced Filtering



Seamlessly shift to more advanced analysis interaction



Communicate your analysis using Microsoft Office



Analytics on the go with Mobile devices and disconnected interaction

# CMA 1.1 Reports – CPU: MIPS Used - zServer/LPAR Level w/Forecast

## CPU: MIPS Used zServer/LPAR Level w/Forecast

report ran by Anonymous on 2014-03-28 at 03:42:09

date range Feb 1, 2013 to Mar 28, 2014 interval band --- monthly ---

time range 12:00 AM to 11:59 PM show both

cpu serial no:

- A1A1
- AAA1
- AAA2

Deselect

processor type:

- CP
- ICF
- IFL
- zIIP

Deselect

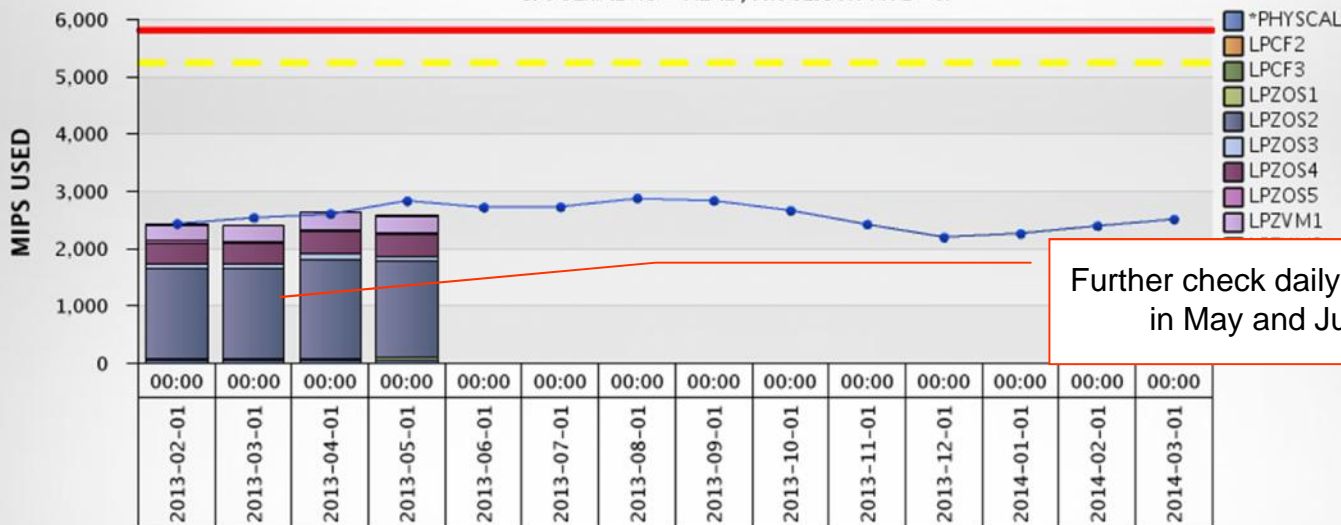
lpar name:

- \*PHYSICAL
- LPCF2
- LPCF3
- LPZOS1
- LPZOS2
- LPZOS3
- LPZOS4
- LPZOS5
- LPZVM1
- LPZVM2

Select all Deselect all

refresh view

CPU: MIPS Used zServer/LPAR Level w/Forecast  
CPU SERIAL NO = A1A1 , PROCESSOR TYPE = CP



Monthly trend and variations, averagely not reaching total capacity.

Further check daily forecast in May and June

DATE BAND	TIME BAND	MIPS CAPACITY (TOTAL)	LPAR NAME	MIPS USED (ACTUAL)	MIPS USED (FORECAST)
Feb 1, 2013	00:00	5,821	*PHYSICAL	55.09	54.45
			LPCF2	2.51	2.35

## Summary

- IBM has various solutions for IT analytics that address different use cases.
  - External products that address various use cases
    - **IBM zAware** for proactive anomaly detection and faster diagnosis
    - **Operations Analytics for z Systems** for faster problem diagnosis with search, analysis and expert advice.
    - **Capacity Management Analytics (CMA)** to enable optimal use of z Systems capacity by managing and predicting consumption of IBM® z Systems® infrastructure resources
- Business Analytics and IT analytics are aligning with a converged platform to provide a foundation for enabling analytics across the enterprise.

Thank  
You

The words 'Thank You' are rendered in a large, 3D-style font. Each letter is filled with a different portrait of a diverse group of people, including men and women of various ethnicities and ages. The portraits are cut out to fit the shape of the letters, creating a mosaic effect. The text is centered on the page.