

# How to perform Capacity Management and Planning on IBM Z

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Session OM



# Agenda

- Capacity Planning challenges
- IBM Z Decision Support for Capacity Planning
  - Overview
  - Near real-time data curation and reporting of resource utilization
  - Capacity Planning: predictive analysis
  - Roadmap & Strategy
- Key Takeaways

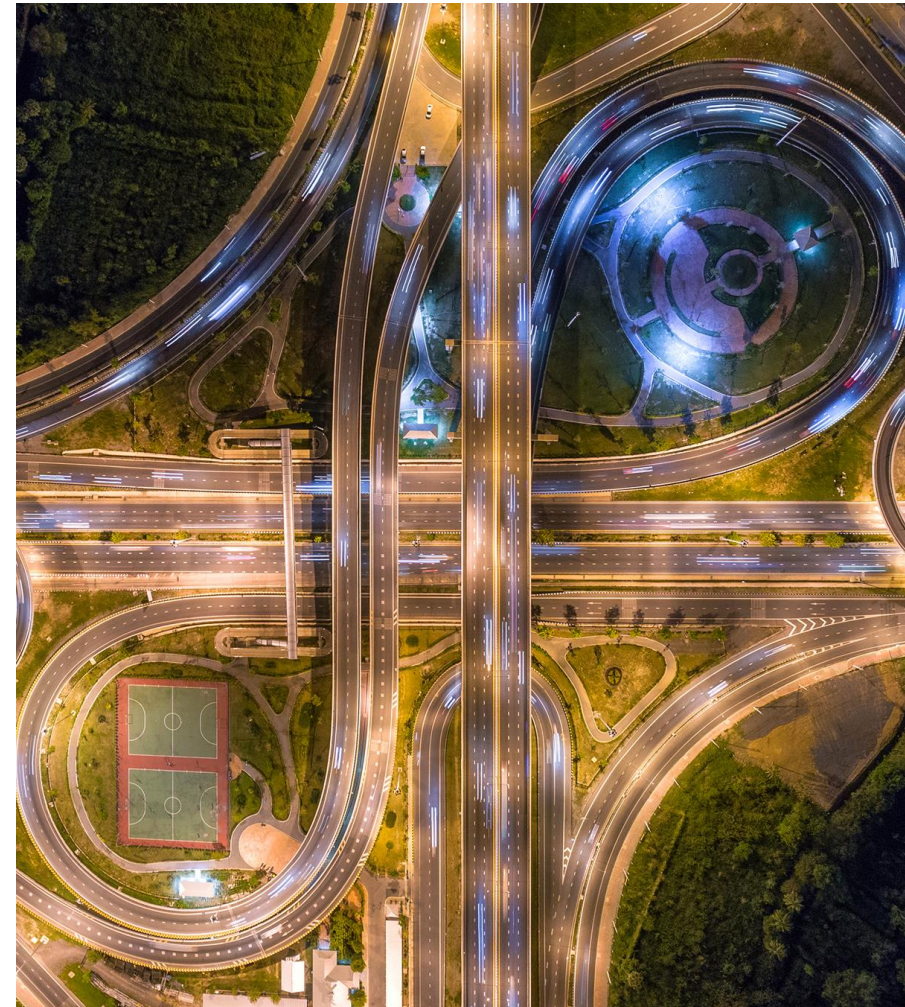
# Capacity Planning challenges

Maintain sufficient resources for an increasingly unpredictable workload

# Challenges Facing the Digital Enterprise

## Maintain sufficient resources for an increasingly unpredictable workload

- Access to **insightful information** for managing workloads and problems is not timely
- Capacity issues need to be prevented **before they happen** to avoid business impacts
- **Predictive analysis** is needed to make resource upgrade decisions based on historical knowledge and business growth
- **'Tribal knowledge'** is disappearing, elongating the time to identify and resolve problems



# Capacity Planner responsibilities

The role of the Capacity Planner is crucial in enabling the Infrastructure and Operations team to *contain IT cost* while *improving service quality*:

*do more, do it better, with less*

Capacity Planner main **responsibilities**:

- Ensure that **resource utilization** is closely managed
- Provide **reliable** and **timely forecasting reports** on the resource needs
- **Hardware purchases** are carefully forecasted and justified with **fact-based information**
- Assess impact of **system configuration changes** on resource utilization



# Capacity Planner activities

Capacity Planners are typically called upon to:

- Create analyses to establish **normal utilization profiles and baseline**
- Create **forecasting models** to predict future utilization of system resources
- Configure **automatic notifications and exception reports**
- Keep **actual utilization versus forecast** under control
- Simulate **optimal placement** for actual and hypothetical workloads

*Final goal: Optimize system resource utilization*



# What Capacity Planners are saying

- A large financial institution tells us “We have **one person** to do Capacity Planning for the mainframe, they have **to rely on other staff** for SAS expertise and it’s all done with **spreadsheets and manual processes**”
- Another customer tells us “The business units don’t give me information, but they expect us to always have **available capacity** on the floor...and by the way, they want everything **at a lower cost**”
- “The tools I have don’t allow me to answer management’s questions **fast enough**. They want information today, not tomorrow”
- “Management requires me to make them aware of **anomalies against the forecast**... That requires time and effort or tools I just don’t have”



**Multiple tools/expertise needed to accomplish their goals**

# IBM Z Decision Support for Capacity Planning

Overview

# IBM Z Decision Support for Capacity Planning



**IBM® Z® Decision Support for Capacity Planning** meets the needs of users to perform *capacity performance management, capacity planning and modeling*, ensuring that **existing resources are optimized**, and that **sufficient capacity is in place to run the business and meet expected service levels**. This is the next step in the evolution of IBM Z Decision Support to fully utilize the aggregation and curation of resource data to benefit your business.

## Key features are

- Simple out-of-the-box capacity planning solution
- Key capacity planning metrics and reports
- Enhanced reporting for your 4HRA
- Forecasting capabilities to predict future resource needs
- Multiple reporting platforms

*One E2E tool for Capacity Management and Planning*



# IBM Z Decision Support for Capacity Planning

## Near real-time data curation and reporting of resource utilization

- **Foundation** for predictive analysis through historical data aggregation
- *System health check reports*

## Capacity Planning and Modelling

- **Predictive analysis** of resource utilization
- **Threshold** definition and **Exception** reporting
- *System health check reports*
- *SLA reporting*

## Cognitive Capacity Management and Planning

- **Intuitive Predictive analysis** at enterprise level
- **What-if modelling**
- *System health check reports*
- *SLA reporting*
- *IT 'Cost of the Business' reporting*

# Near real-time data curation and reporting of resource utilization

IBM Z Decision Support

# Near real-time data curation and reporting of resource utilization

**IBM Z Decision Support** (included in *IBM Z Decision Support for Capacity Planning*) provides Capacity and Performance Management capabilities needed for predictive analytics

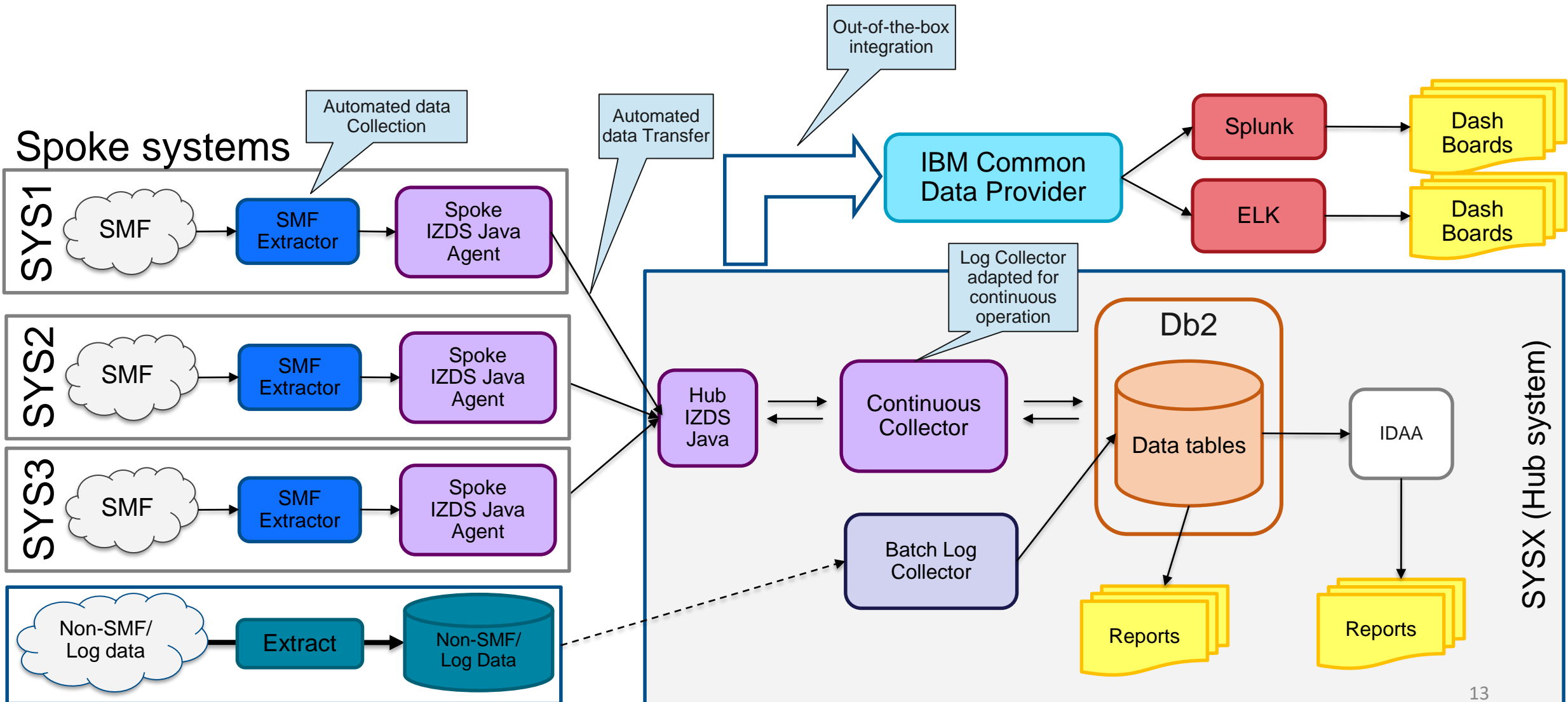
## Near real-time data curation and reporting of resource utilization

- **Foundation** for predictive analysis through historical data aggregation
- *System health check reports*

### Key features:

- **Automated, near real-time IT Operational data collection**
- **Continuous curation** of the data collected, storing the results in Db2 for z/OS database for querying and further analysis
- **Customized reports** to communicate **valuable** system performance, capacity management, resource availability and cost allocation information
- **Possibility to add new data sources** to the collection and data consolidation process as needed
- **Enhanced reporting capabilities** in green screen as well as with Tivoli Common Reporting (TCR) and out of the box TCR reports
- Ability to stream **Z curated data** to Analytic platforms like **Splunk** and **ELK Stack** through the integration with IBM Common Data Provider for z Systems

# IBM Z Decision Support v 1.9.0 Architecture

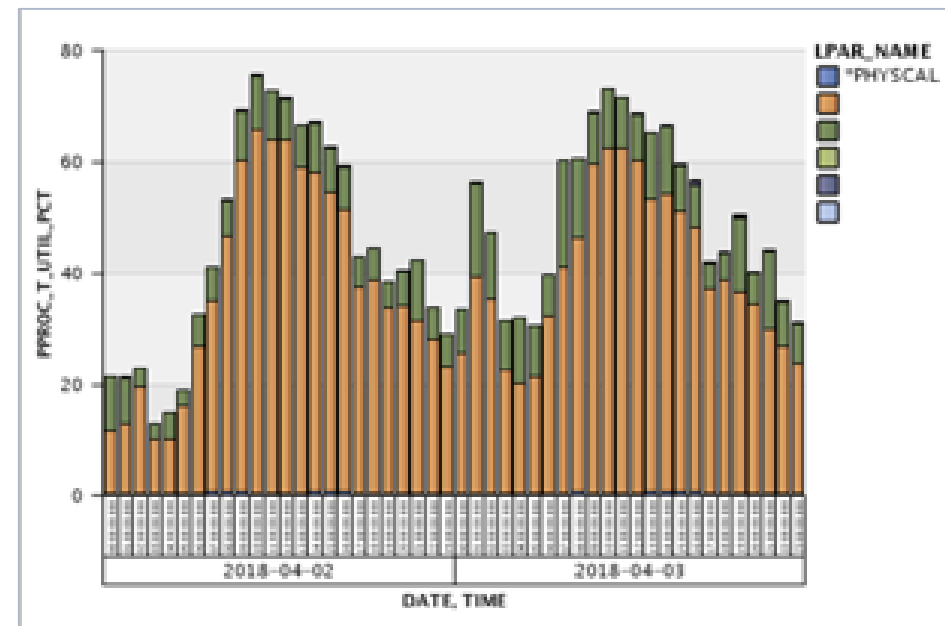
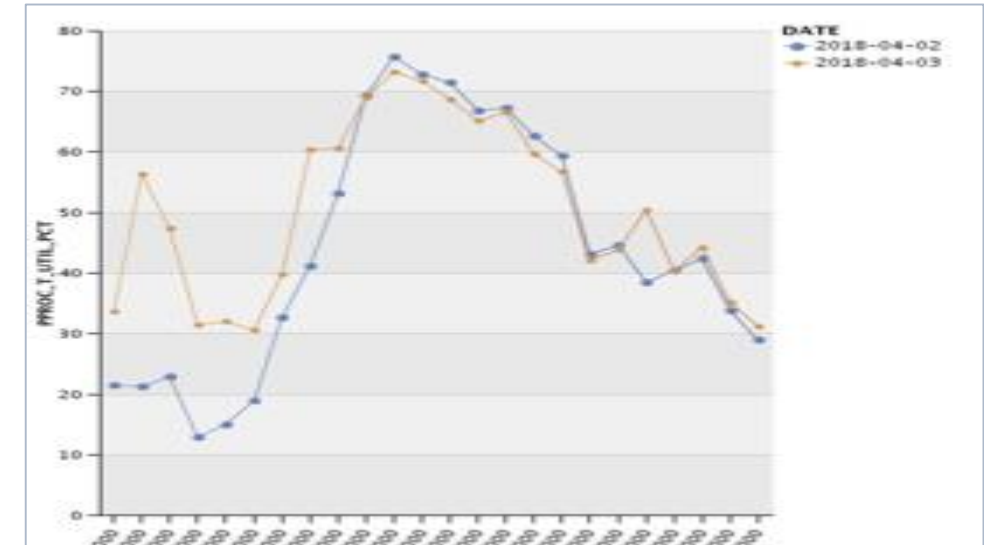


# Reporting of resource utilization

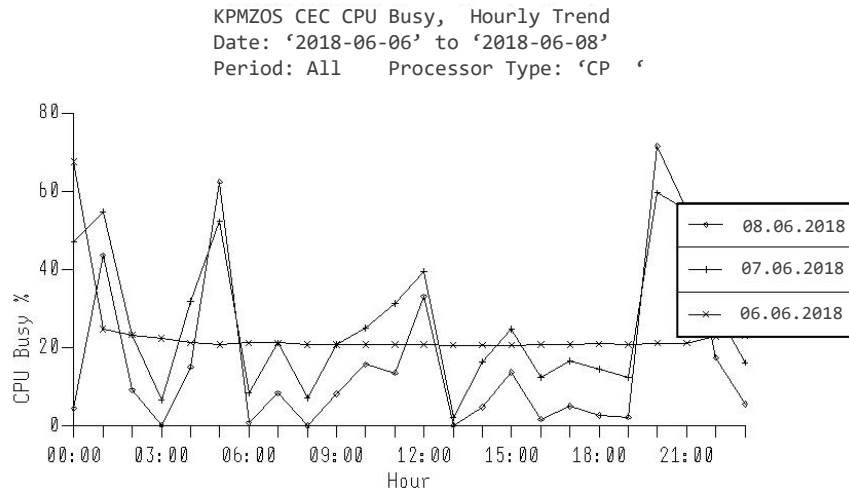
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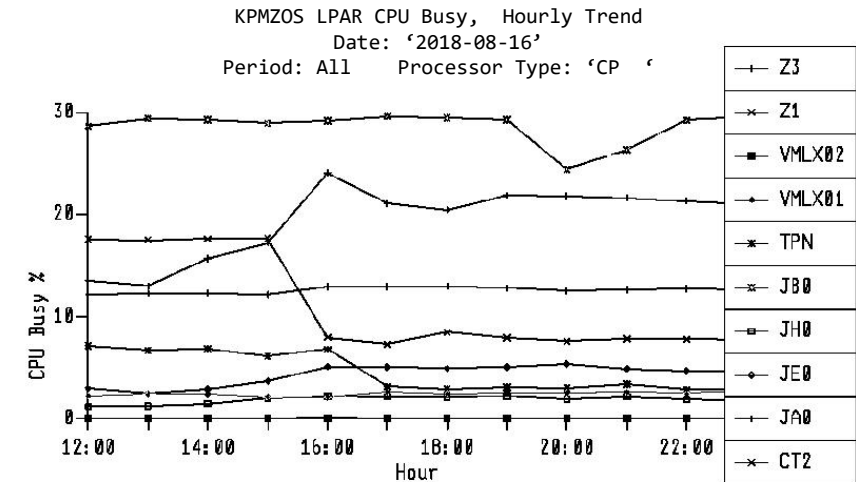
**1,085 reports** available out of the box



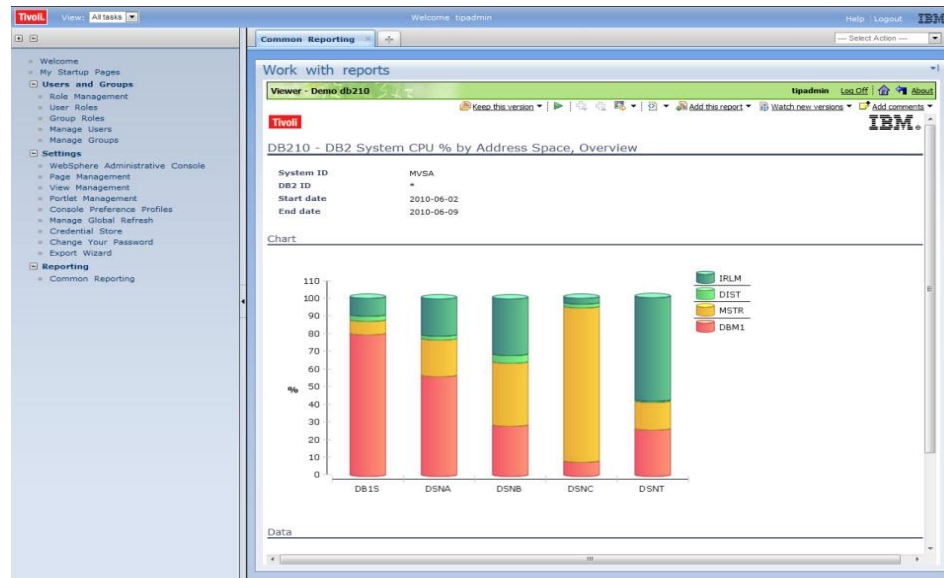
# Reporting of resource utilization - samples



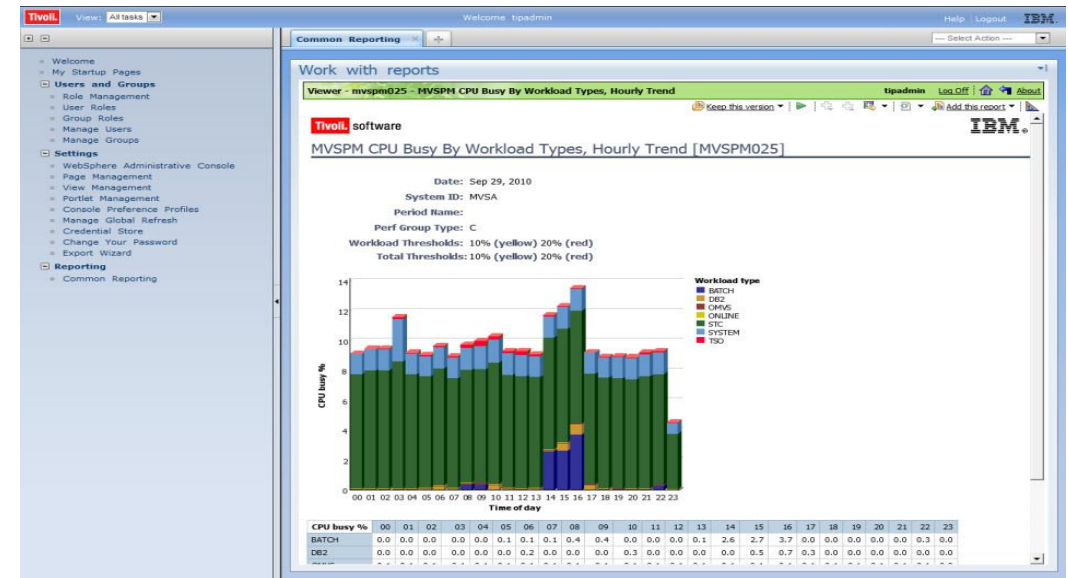
CEC CPU Busy % per hourly interval for the specified processor type.  
The report is useful to monitor CPU utilization patterns.



LPAR CPU Busy % per hourly interval for the specified processor type.  
The report is useful to monitor CPU utilization on an LPAR level.



DB2 System CPU by Address Space



CPU Busy by Workload

# Reporting of resource utilization on modern platforms

**IBM Z Decision Support integration with IBM Common Data Provider for z Systems** provides the ability to stream IBM Z Decision Support **curated data** to an off-platform analytic platform like Splunk



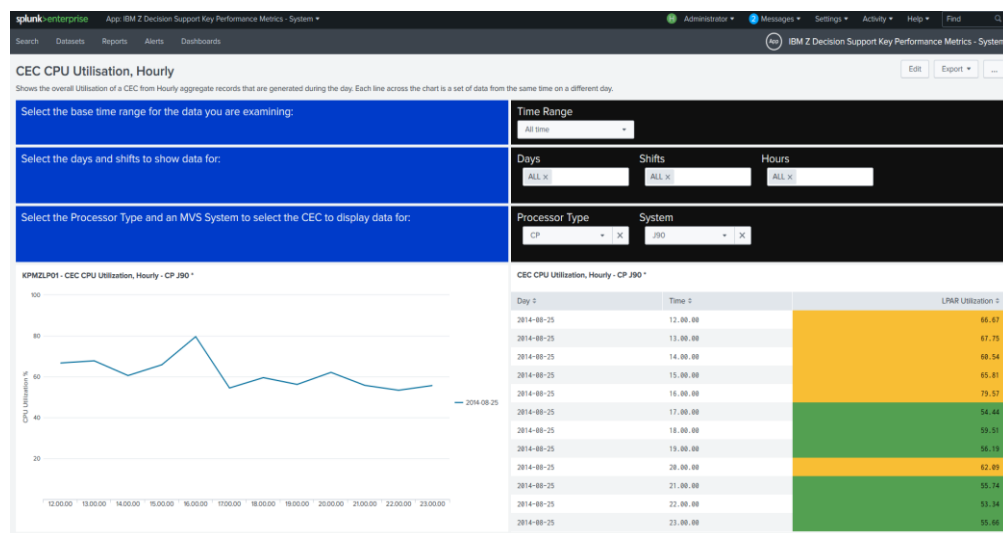
IZDS Splunk Dashboards available:

- CEC CPU Utilization, Hourly
- LPAR CPU Utilization, Hourly
- LPAR Share, Hourly
- LPAR CPU Logical Utilization, Hourly
- LPAR 4 Hour MSU Utilization, Hourly
- LPAR MSU Statistics, Hourly
- System Storage Summary, Hourly

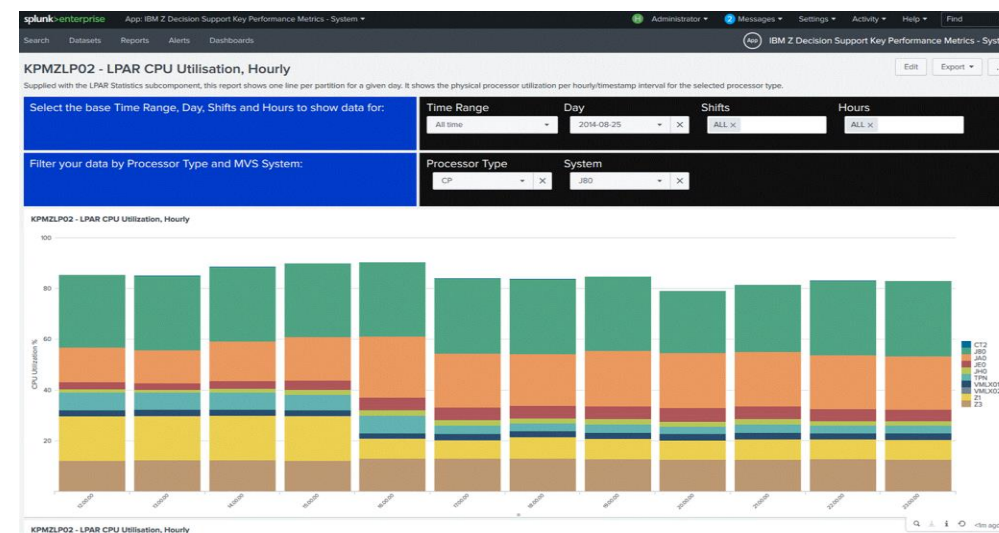
- Workload CPU Utilization, Hourly
- Workload Service Class CPU Utilization, Hourly
- Workload Storage Utilization, Hourly
- Workload Policy Review, Hourly
- Job Highest CPU, Hourly
- Job Maximum CPU Task, Daily
- Job Maximum CPU Task Count, Daily
- CICS Transaction Performance, Hourly

Splunk Dashboard video: <https://youtu.be/lwwxmU1kmfw>

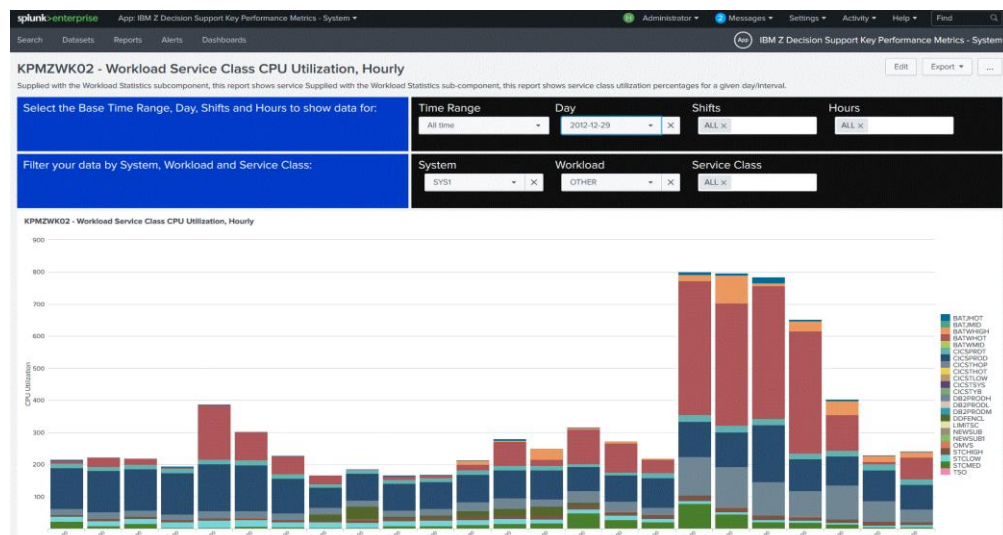
# Reporting of resource utilization – on Splunk



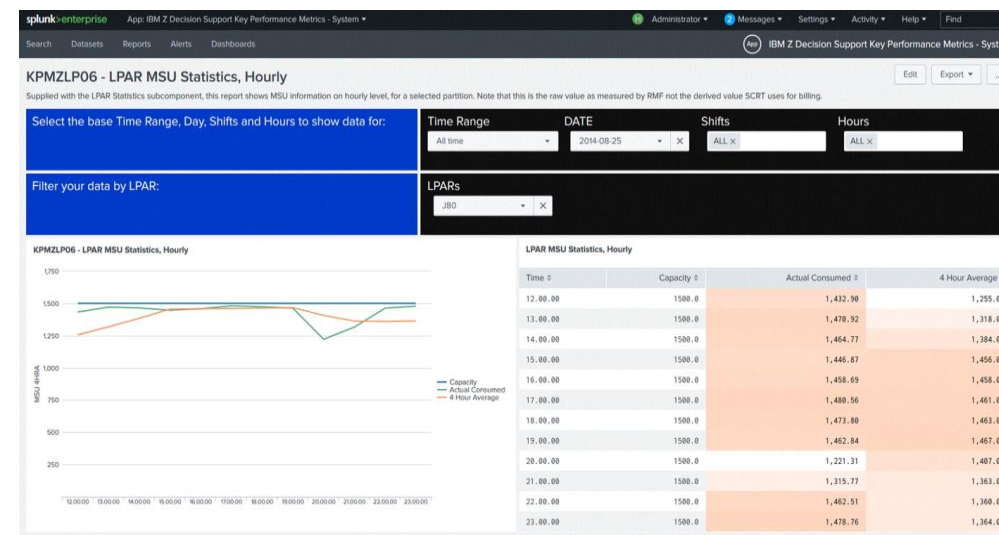
CEC CPU Utilization hourly for the specified processor type



LPAR CPU Utilization hourly for the specified processor type



Workload Service Class CPU Utilization hourly for the specified processor type



LPAR MSU statistics (Capacity, Actual consumed, 4HRA) hourly

# Capacity Planning: predictive analysis

IBM Z Decision Support for Capacity Planning

# Capacity Planning and Modelling

## Capacity Planning and Modelling

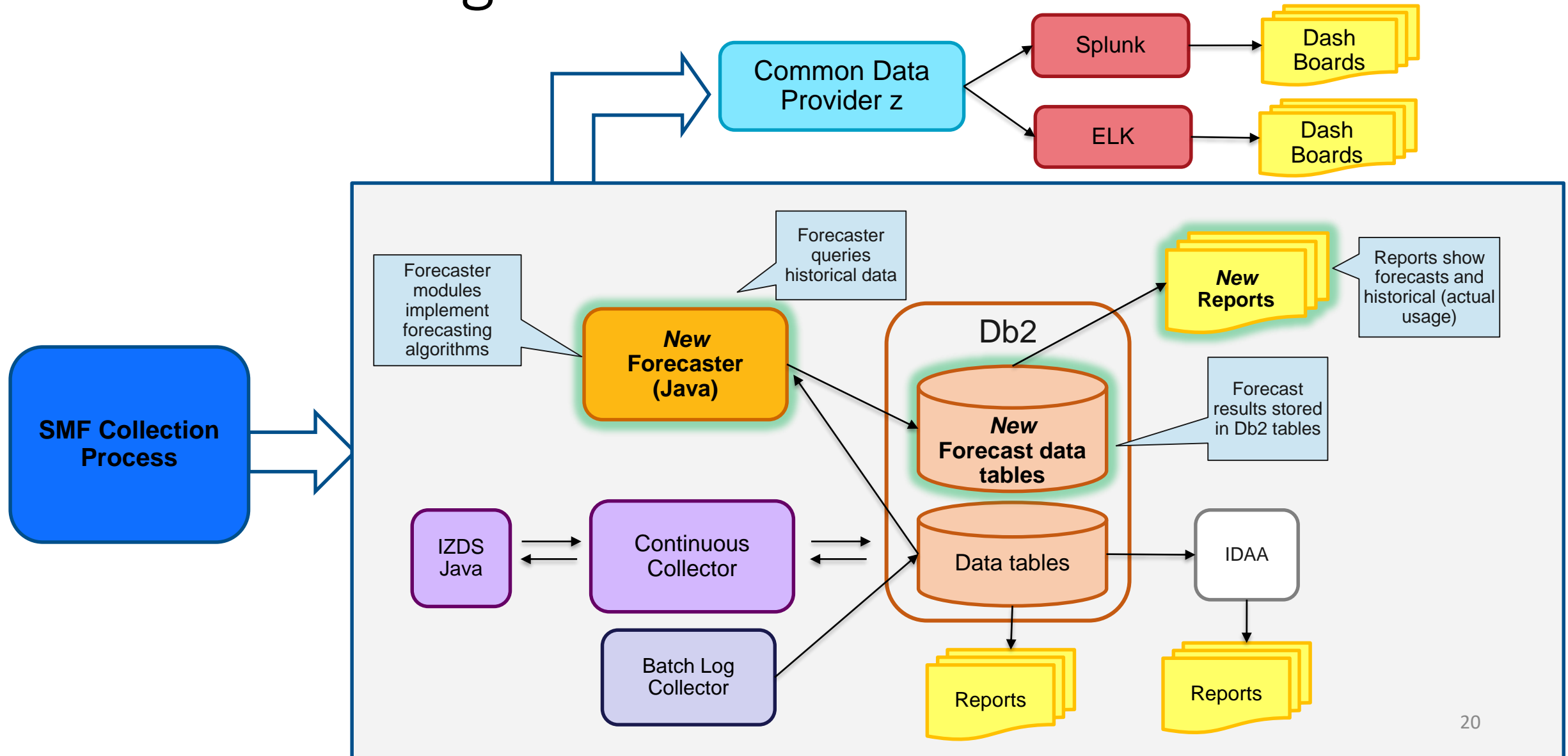
- **Predictive analysis** of resource utilization
- **Threshold** definition and **Exception** reporting
- *System health check reports*
- *SLA reporting*

IBM® Z® Decision Support for Capacity Planning v 2.1.0 is built on top of IBM Z Decision Support v 1.9.0 to provide Capacity Planning and Modelling capabilities **in one tool**

### Key features:

- **Predictive analysis of resource utilization**
- **Out-of-the-box Capacity Planning reports**
- **“Green path”** modelling
- User-defined **Threshold**
- **Exceptions** vs historical patterns and forecast **tracking**
- **Reports on current** resource utilization **versus forecast utilization**

# IBM Z Decision Support for Capacity Planning v 2.1.0: Architecture



# IZDS for Capacity Planning: Forecasting

Capacity Planners activities:

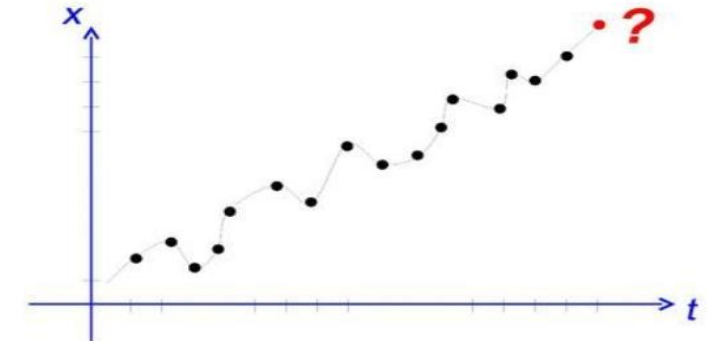
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# Capacity Planning main features

- **Predictive analysis** based on historical data provided in IZDS data tables
  - Resources measured: CPU, Memory, DASD and Tape
  - Aggregation levels: Hourly, Daily and Monthly
- **Predictive capabilities**
  - Forecasting provided for CEC, LPAR, Workload and Application
- **Real-time actual MIPS capacity**
  - Actual MIPS capacity calculated on SMF interval level, in real-time
  - MIPS capacity is based on actual Workload within the SMF interval
- **Forecasting based on statistical algorithms:**
  - **Linear:** Straight line through known data points
  - **Polynomial Forecasting** Uses multi part equation
    - $a + bx + cx^2 + dx^3$
  - And more (Logarithmic, Power, Exponential, Moving average)
- **Out-of-the-box Capacity Planning reports** provided
  - Native Green Screen (QMF and GDDM optional)
  - Tivoli Common Reporting
  - **Splunk** and **ELK Stack**
- **Capacity Planning reports integrated with KPM Health Check Reports**
  - “Drill down” capabilities for root cause analysis

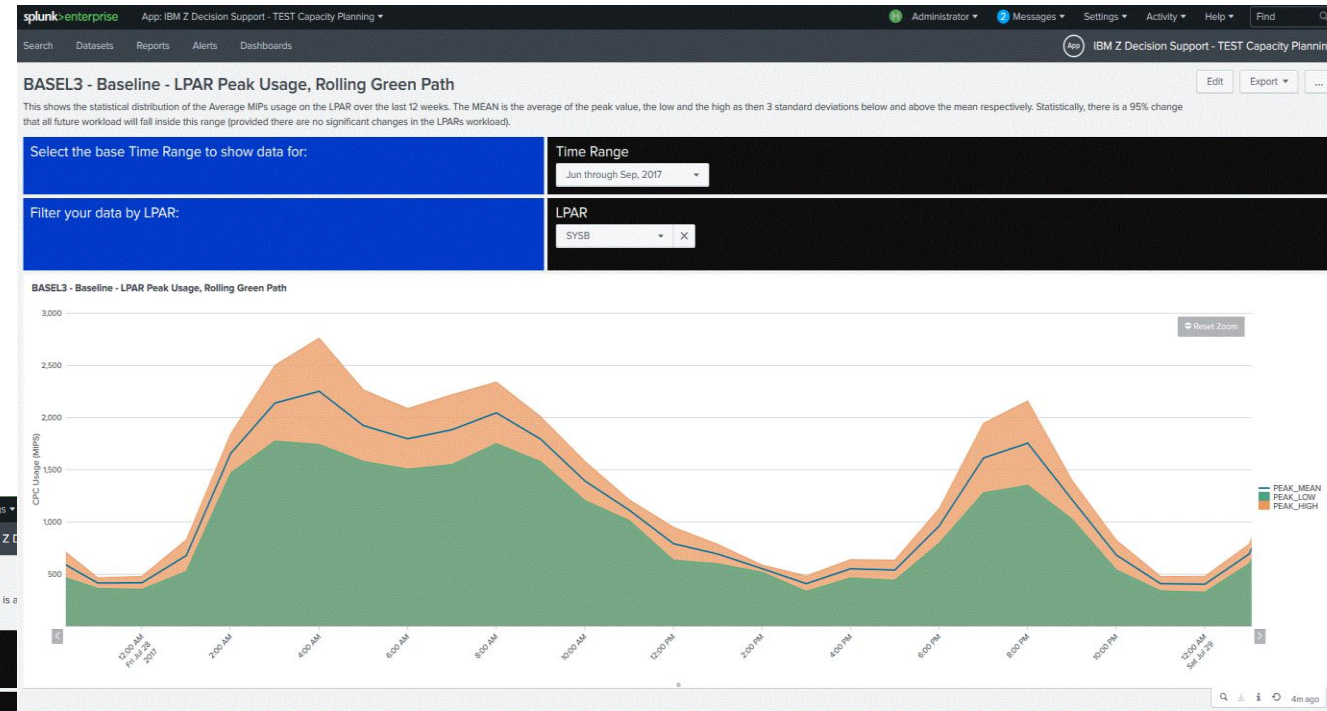
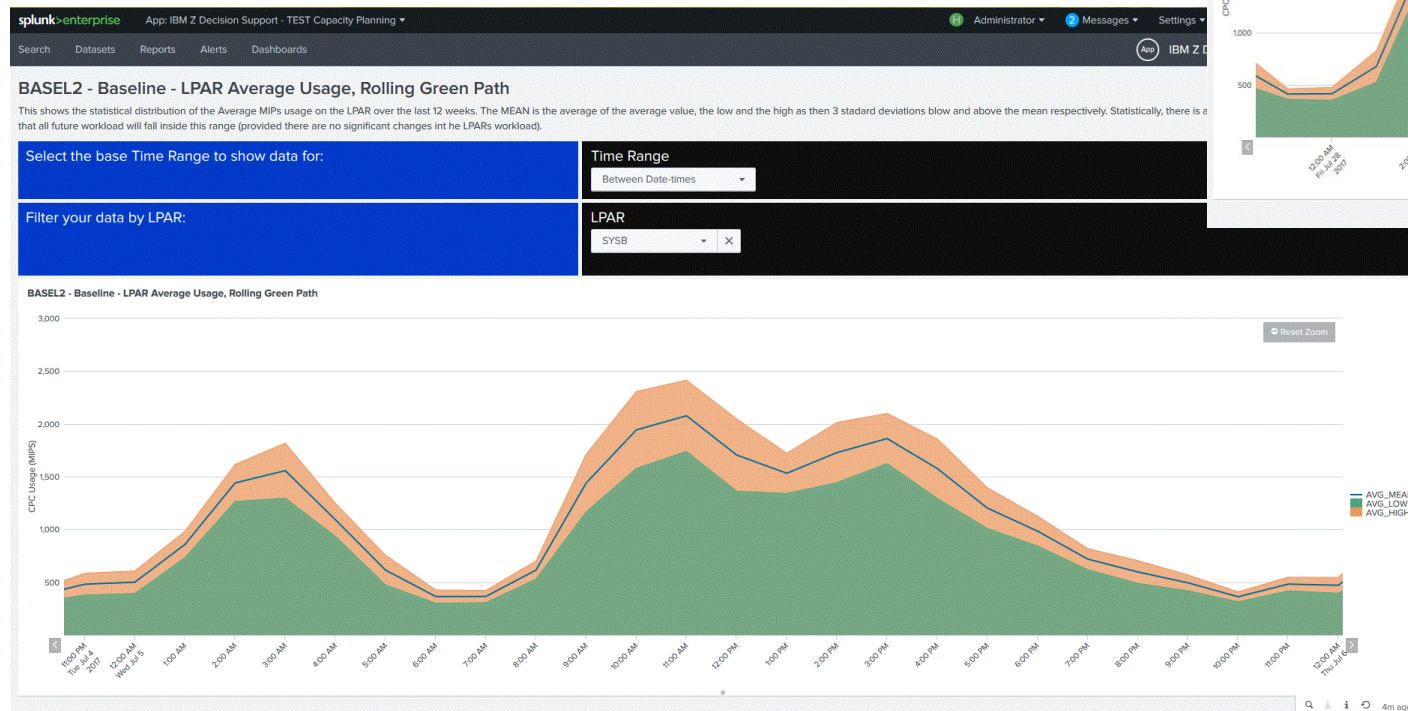
## Forecasting



# Green Path modelling

Shows expected boundaries for current usage

- For each day of the week (Mon, Tue, ..., Sun) x hour
- Based on historical data
- Determine min/max/avg/stddev for each interval



Report can be filtered by day or by hours  
Reports available for **average** and **peak**

# Threshold and Exceptions

Capacity Planners activities:

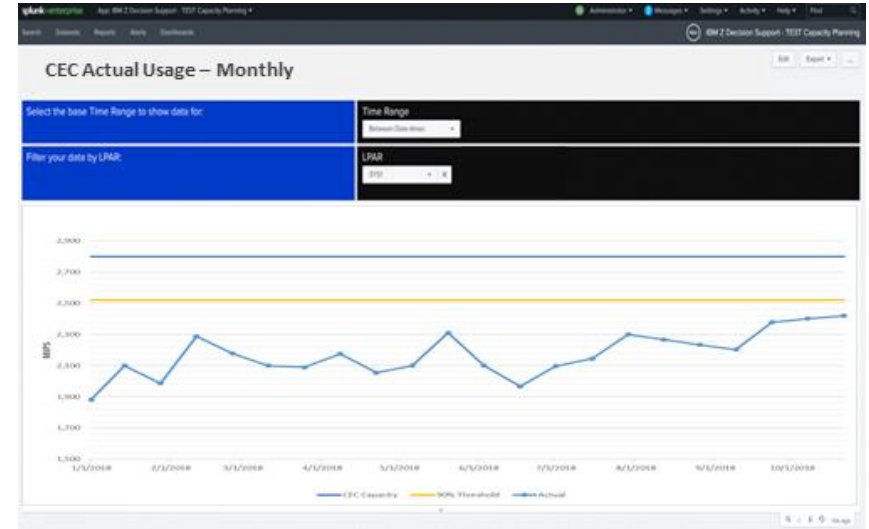
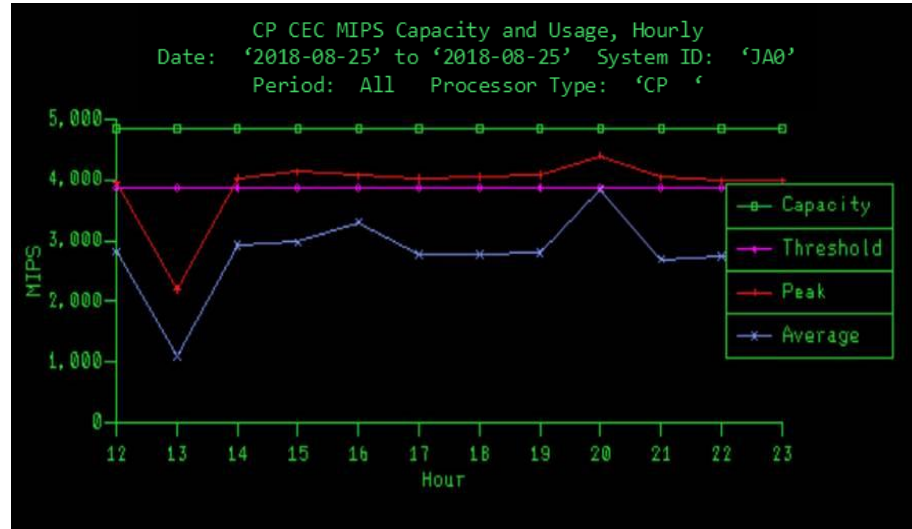
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# Threshold and Exceptions: key features

## Thresholds

- User-defined thresholds



## Exceptions

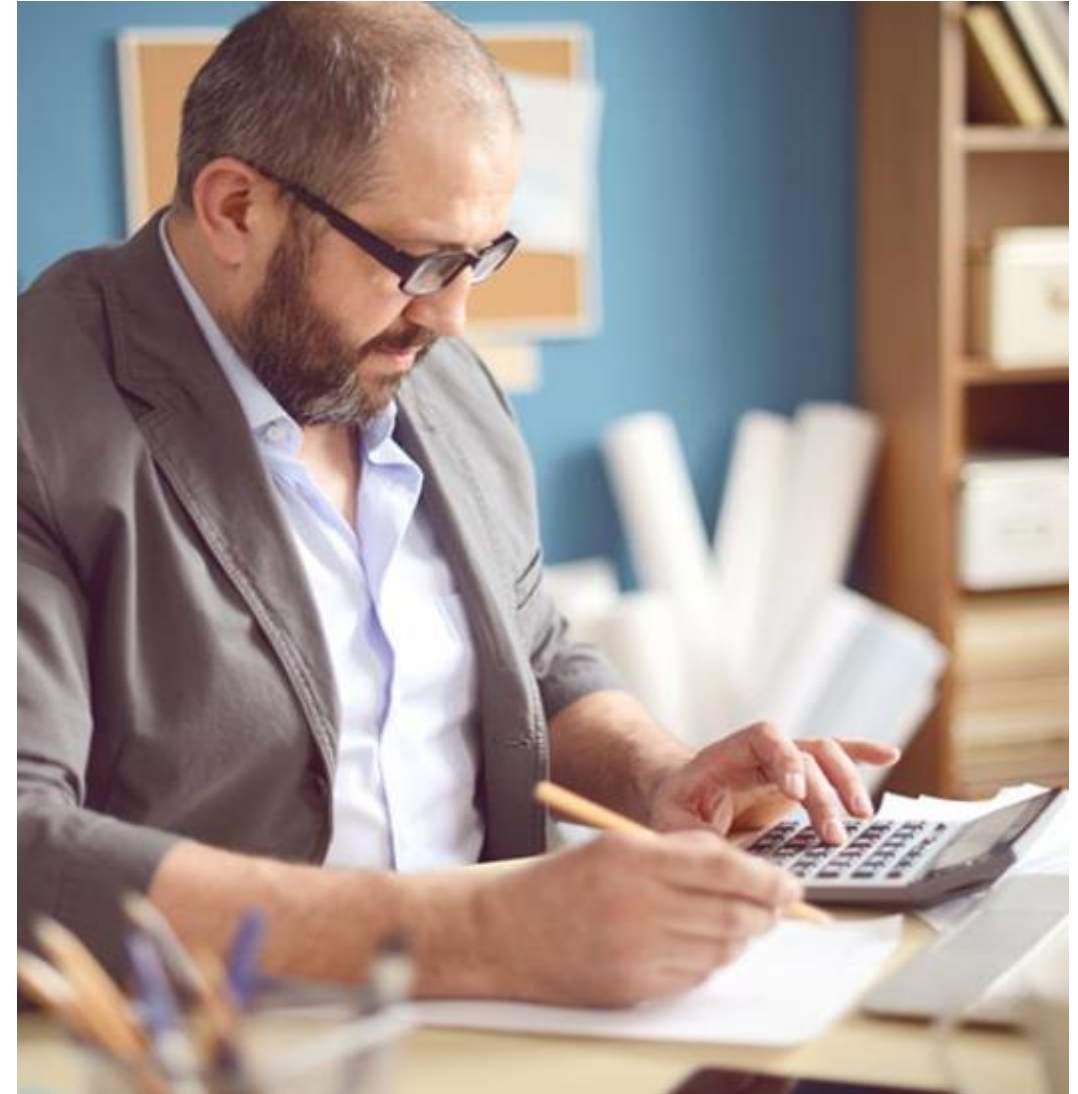
- **Historical**
  - Determine when historic usage was unusual
  - Determine when historic usage exceeded a threshold
- **Real-time**
  - Identify when real time usage is unusual
  - Identify when real time usage exceeds an existing forecast, or threshold
- **Forecasting**
  - Determine if/when forecast value will cross a threshold

Exception ID	Threshold	Description
LPAR_BUSY	90	LPAR Busy > 90%
CHAN_BUSY	50	Channel Busy > 50%
WLM_PI_MAX	1.1	Performance Index > 1.1
WLM_PI_MIN	0.7	Performance Index <= 0.7
STOR_AVLBL	768000	Storage Frames Available < 768000
CF_BUSY	50	Coupling Facility Busy > 50%

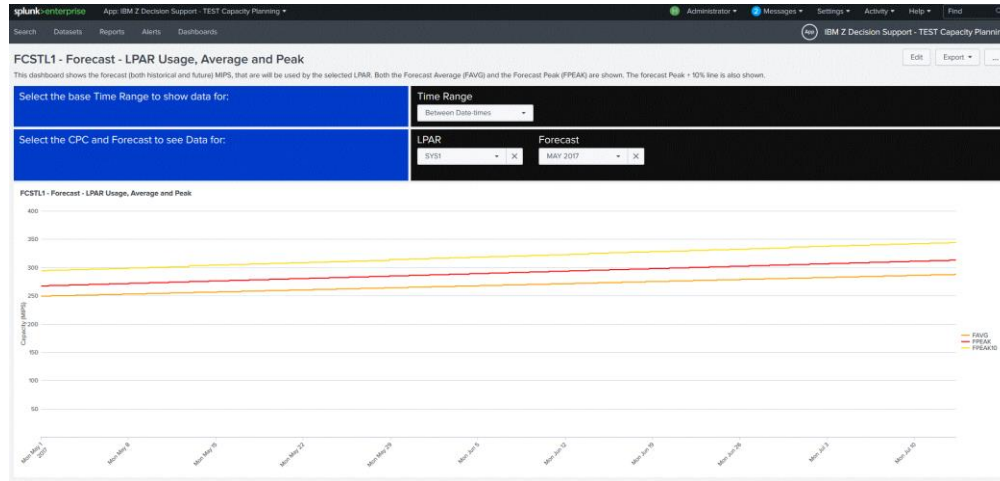
# Reporting: Actual Utilization vs Forecast

## Capacity Planners activities:

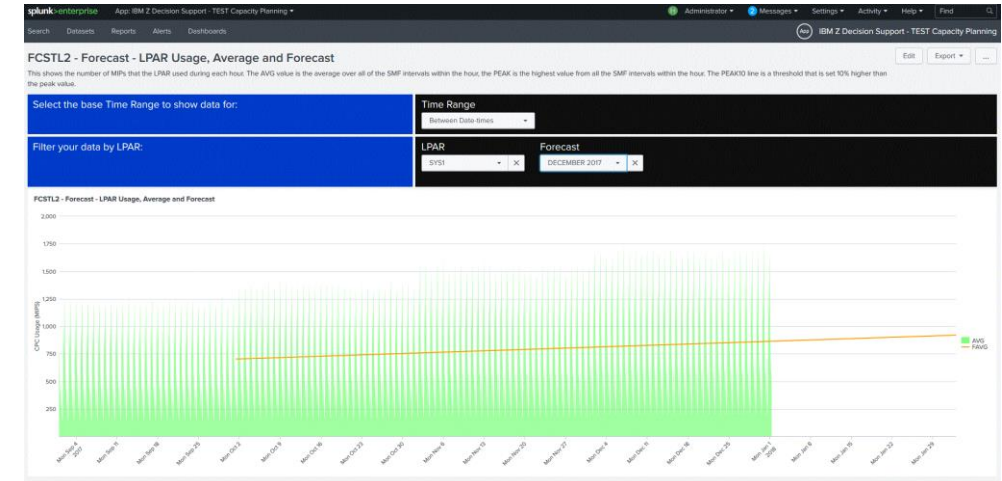
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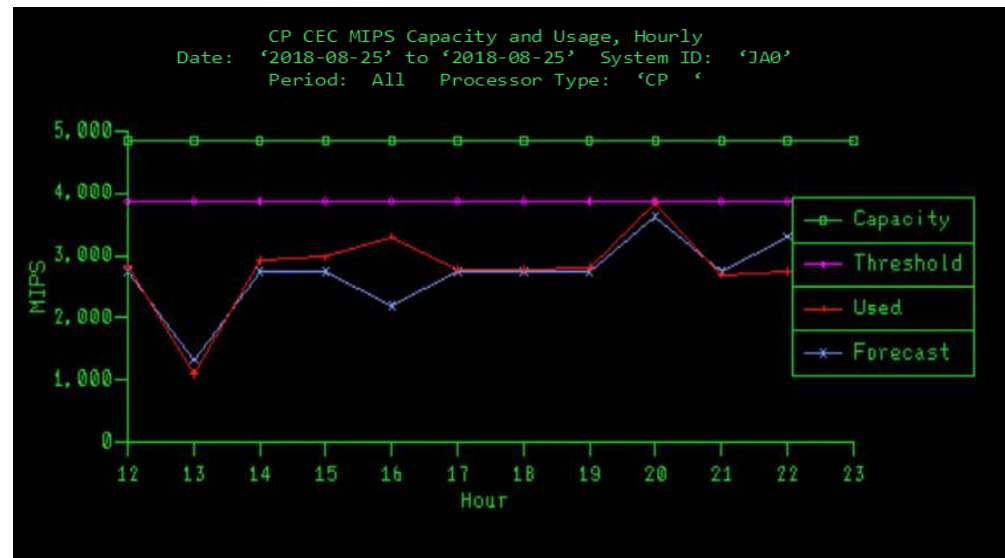
# IZDS for Capacity Planning: Forecasting



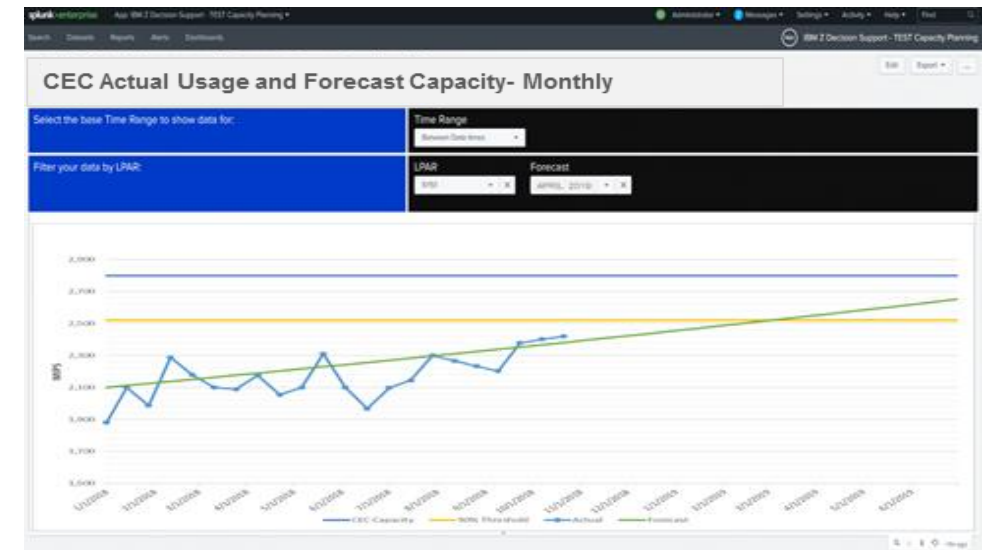
Forecast of LPAR Usage (Averages and Peak)



LPAR Usage Averages and Forecast (linear)



CP CEC MIPS Capacity and Usage hourly  
Actual vs Forecast report



CP CEC MIPS Capacity and Usage Monthly  
Actual vs Forecast report

# Roadmap & Strategy

IBM Z Decision Support for Capacity Planning looking forward

# Please note

- IBM's statements regarding its plans, directions, and intent are subject to change or withdrawal without notice and at IBM's sole discretion.
- Information regarding potential future products is intended to outline our general product direction and it should not be relied on in making a purchasing decision.
- The information mentioned regarding potential future products is not a commitment, promise, or legal obligation to deliver any material, code or functionality. Information about potential future products may not be incorporated into any contract.
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- Performance is based on measurements and projections using standard IBM benchmarks in a controlled environment. The actual throughput or performance that any user will experience will vary depending upon many factors, including considerations such as the amount of multiprogramming in the user's job stream, the I/O configuration, the storage configuration, and the workload processed. Therefore, no assurance can be given that an individual user will achieve results similar to those stated here.

# IBM Z Decision Support for Capacity Planning: Roadmap



## Cognitive Capacity Planning

- **Intuitive Predictive analysis** at enterprise level
  - **Best-fit statistical algorithm** for forecasting automatically detected
  - **Automatic threshold definition**
- **What-if modelling**
  - Simulation of resource utilization forecast due to **workload changes**
  - Simulation of resource utilization forecast due to a **HW configuration change** (merge LPAR, move LPAR, additional HW)
- *System health check reports*
- *SLA reporting*
- *IT 'Cost of the Business' reporting*

# IBM Z Decision Support for Capacity Planning

## Overall strategy

### Provide near real-time curation and reporting of resource utilization

- **Foundation** for predictive analysis through historical data aggregation

*System health check reports*

### Capacity Planning

#### Predictive analysis of resource utilization

- CPU, Memory and Storage (Disk and Tape) utilization **Forecast reports**
- Forecasting based on **statistical algorithms** (multiple choice)
- **Current** resource utilization **versus forecast** reports
- **“Green path”** reports
- **Exceptions** vs historical patterns and forecast **tracking**
- User-defined **Threshold**

*System health check reports  
SLA reporting*

### Cognitive Capacity Planning

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*System health check reports  
SLA reporting  
IT ‘Cost of the Business’ reporting*

# Key Takeaways

Answers to user complaints

# Solving Capacity Planning Challenges with IBM Z Decision Support for Capacity Planning

“We have one person to do Capacity Planning for the mainframe, they have to rely on other staff for SAS expertise and it’s all done with spreadsheets and manual processes”

IZDS for Capacity Planning bridges the skills gap by guiding you to the information you need with drill-down, intuitive reporting

“The business units don’t give me information, but they expect us to always have available capacity on the floor...and by the way, they want everything at a lower cost”

IZDS for Capacity Planning collects the information you need and transforms the overwhelming amount of data into valuable Key Capacity Metrics and Predictive Planning information

“The tools I have don’t allow me to answer management’s questions fast enough. They want information today, not tomorrow”

IZDS for Capacity Planning near real-time curated data gives the credible, fact-based planning information you and your management need, when you need it

“Management requires me to make them aware of anomalies against the forecast... That requires time and effort or tools I just don’t have”

IZDS for Capacity Planning provides access to near real-time, curated data to quickly gain insight into system resources and pinpoint variances in workload behavior



IBM Z Decision support for Capacity Planning is an **End to End tool** for Capacity Planning and Performance Management

Information is **continuously collected and curated near real-time** for immediate availability of reports , huge volumes of data are distilled into relevant, meaningful information

**Predictive capabilities** to ensure business application availability as well as business oriented reporting are available in IBM Z Decision Support for Capacity Planning



IBM and 21<sup>st</sup> Century Software are committed to driving continuous product improvement, focusing on customer requirements



**IBM Z® Webinar**  
**How to perform Capacity**  
**Management and Planning**  
**on IBM Z**  
Wednesday November 14<sup>th</sup>



**How to perform Capacity Management and Planning on IBM Z**

*Wednesday, November 14th at 10:00AM ET*

**Register at: <http://bit.ly/CAPMANZ>**

# Further information

IBM Z Decision Support: <http://ibm.biz/izdsinfo>

IBM Z Decision Support Technical blog: <http://ibm.biz/IZDSBlog>

Capacity Planning page: <http://ibm.biz/CapPlanInfo>

Capacity Planning announcement: <http://ibm.biz/IZDS4CPRFA>

Splunk Dashboard video: <https://youtu.be/lwwxmU1kmfw>

Article “How to visualize IBM Z key performance metrics in Splunk”

<https://www.linkedin.com/pulse/how-visualize-ibm-z-key-performance-metrics-splunk-domenico-d-alterio/>

IBM Common Data Provider for Z System: <http://ibm.biz/CDPzInfo>

IBM Common Data Provider Redbook: <http://ibm.biz/CDPzRedPaper>

White Paper on integrating CDPz with Splunk: <http://ibm.biz/CDPzSplunkWP>

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us create the next  
generation of  
Capacity Planning  
tools?



Influence the direction of product development through direct interaction with our design and development teams. Get early access to the next generation of Capacity Planning.

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*Questions or interested: [ddalteri@it.ibm.com](mailto:ddalteri@it.ibm.com)*

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- Please submit your feedback online at ....
  - <http://conferences.gse.org.uk/2018/feedback/om>
- Paper feedback forms are also available from the Chair person
- This session is **OM**

