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17557

Beyond Analytics: Availability Intelligence from RMF and SMF with z/OS Storage and Systems Examples

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Overview

1. Availability Intelligence
2. Where to Apply Expert Knowledge to RMF/SMF
3. Examples
   - DASD
   - New HDS G1000 SMF Records
   - CPU vs. IO
4. Conclusion

IntelliMagic

- Leadership in "Availability Intelligence" Solutions:
  - Provides new visibility of threats to continuous availability by using built-in expert knowledge automatically applied to the data (RMF, SMF, etc.)
- Over 20 year history of solutions for deep analysis
- Privately held, financially independent
- Customer centric, responsive
- Solutions used daily in some of the world's largest data centers

IntelliMagic Vision

Protect IT infrastructure availability by applying expert knowledge to the performance metrics.

IntelliMagic Direction

Model the performance of your workloads on storage hardware.

Availability Intelligence

← **Why built?**

To communicate knowledge…

about hidden dangers to avoid.

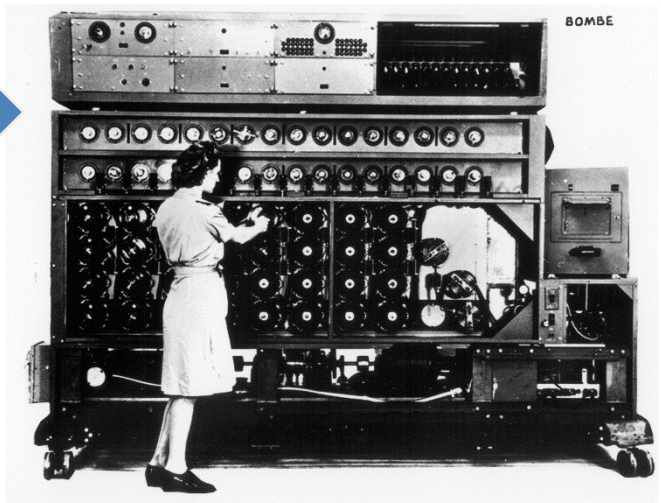
Same objective as Availability Intelligence

What is Availability Intelligence?

- Availability:
  - *"The ability of a configuration item or IT service to perform its agreed function when required."* *(ITIL v.3)*
- Intelligence:
  - *"Foreknowledge of an adversary" –* *(Sun Tzu, 500 bc)*
- **Availability Intelligence**:
  - ***What**: Knowledge about hidden threats to availability*
  - ***Why**: Better protect continuous availability at primary site*
  - ***How**: Automatically apply expert knowledge in the analysis of performance and configuration data*

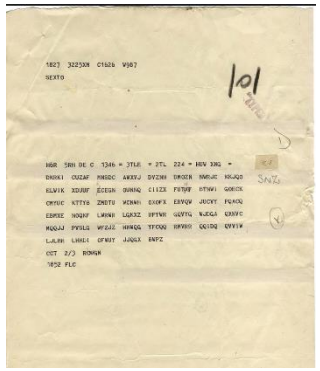
The Power of Good Intelligence to Change Outcomes

Alan Turing created this, which had built-in knowledge



of this machine, plus cryptology expertise,

to turn this "raw data"



into good intel that did this:

- Shorten war by estimated 2 years
- Saved millions of lives

Protect Availability – How hard can it be?

Most Common Cause of Disruptions?

- Natural Disasters
- Malicious Intent
- Software Failure
- Hardware Failure
- Human Error
- **Overloaded HW Components**

Complicating Challenges

- More Dynamic Workloads(mobile)
- More Complexity
- Lean Staffing
- Expertise in Silos
- Expertise Retiring
- **Lack of foreknowledge**

Protect Availability
Before it has to be Recovered

Protect **Before it is Lost**	**Recover** **After it is Lost**
• Capacity Planning • Test & Change Ctl • Fix before it's lost!	• Monitor/Alerting • Fix to recover • Swap to $econdary

Reporting vs. Analytics vs. Intelligence

Data + Analytics ≠ Intelligence

	Reporting	Analytics	Intelligence
Primary Method	Data Visualization	Statistical Analysis	Infrastructure Knowledge
Shows	Tables, graphs, etc.	Anomalies, Correlations	Interpretation to Good and Bad
Answers what from the Data?	What is it?	What patterns?	**What does it mean**?

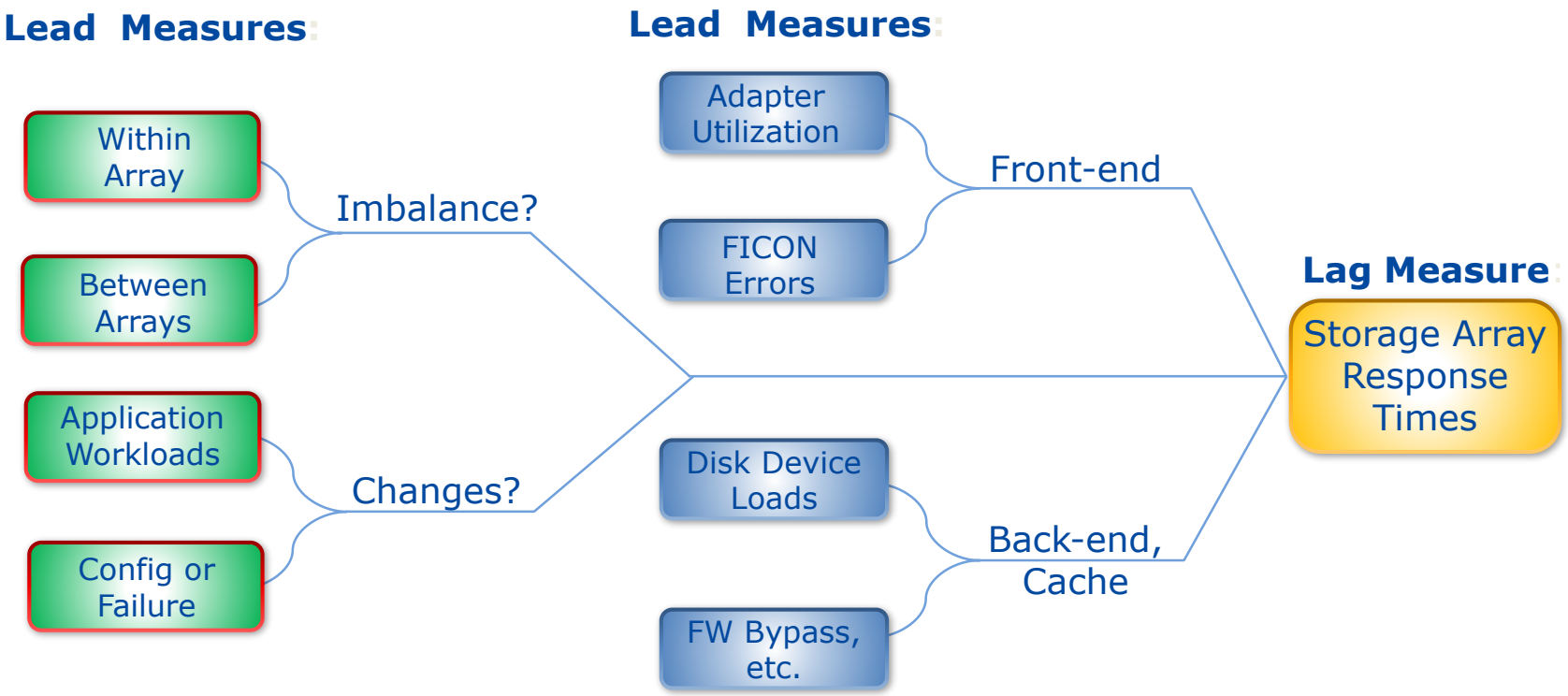
Intelligence Requires Lead Measures

- **Lag Measures**
  - *Show the goal you are trying to achieve*
- **Lead Measures**
  1. Predictive - significantly influences Lag measure
  2. Changeable – you can impact it

  - Different than root causes
  - More difficult to obtain than lag measures – requires knowledge

- **Examples**
  - Losing weight
  - Automobile
  - Storage availability

Lag vs. Lead Measures: Storage Array



Built-in Domain Knowledge Required for Availability Intelligence

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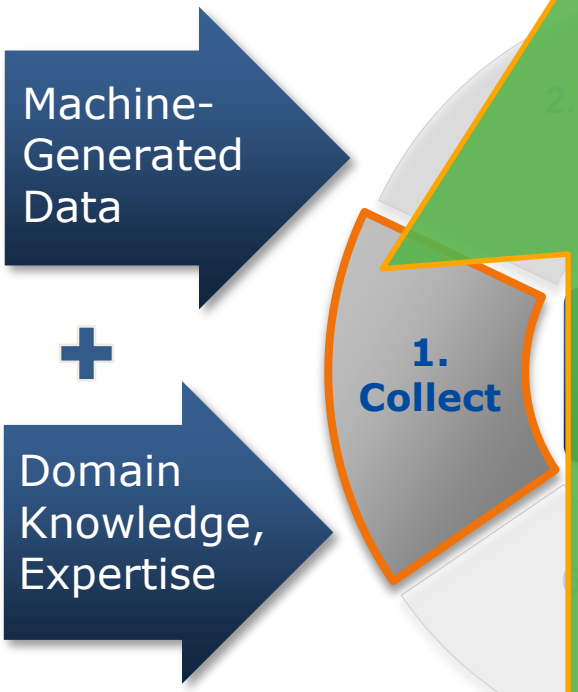
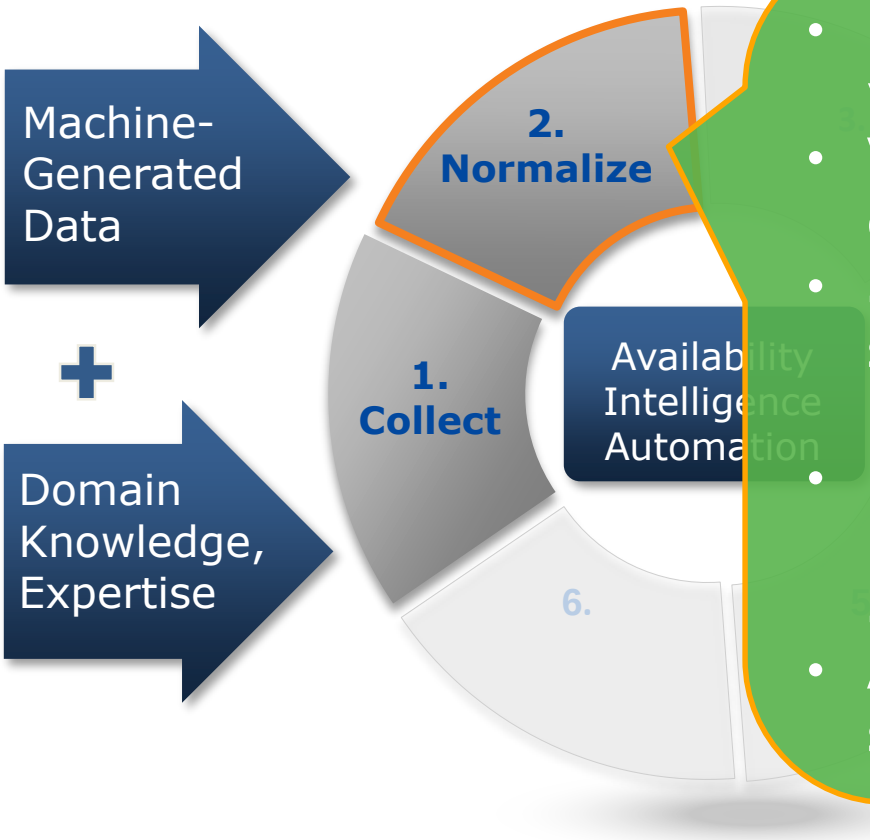


- What to collect?
- Verify valid data, support different SMF Versions, new fields, etc.

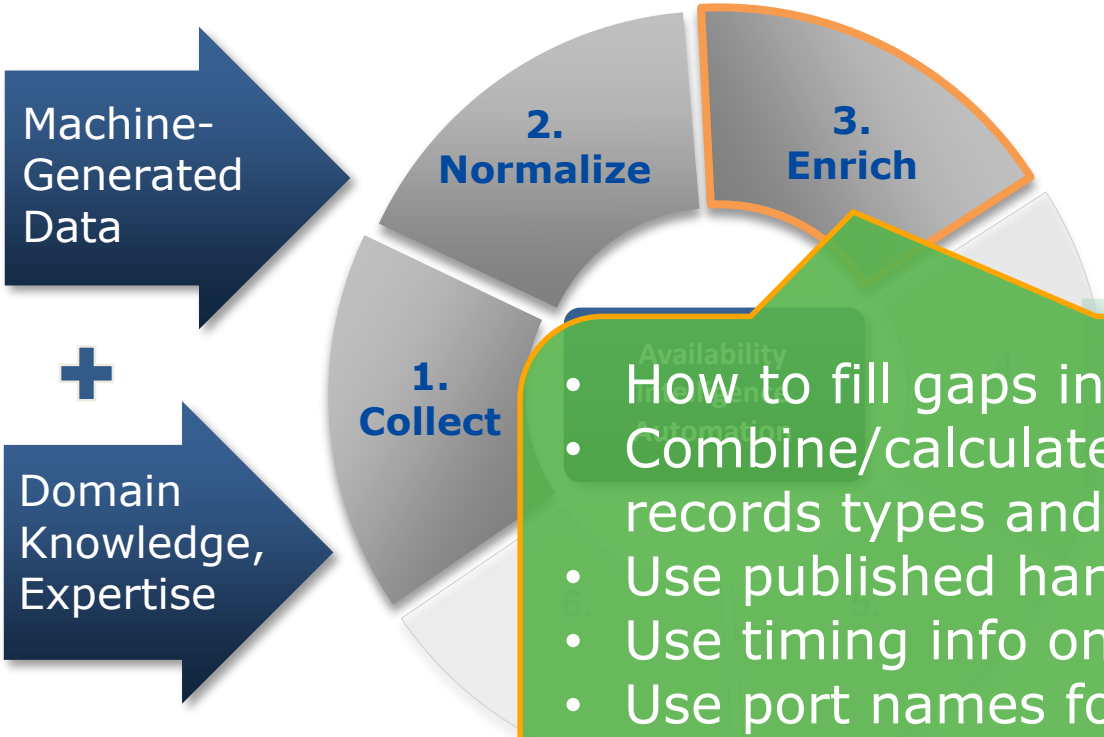
- Storage Systems: (74.1,74.5, 74.8,78.3)
- Replication: GDPS GM, EMC SRDF/A, XRC (105,206,42.11)
- Host channels: (73), FICON: (74.7)
- Processors: CEC, LPARs (70, 72); WLM (72); Paging (75)
- Coupling Facility: (74.4); XCF: (74.2)
- Tape/Virtual Tape: (14,15,21,30, IBM BVIR, Oracle, SMF)
- Jobs: (SMF 30); Datasets (SMF 42)
- Other: DCOLLECT, SQ Mirror, etc.

Built-in Domain Knowledge Required for Availability Intelligence



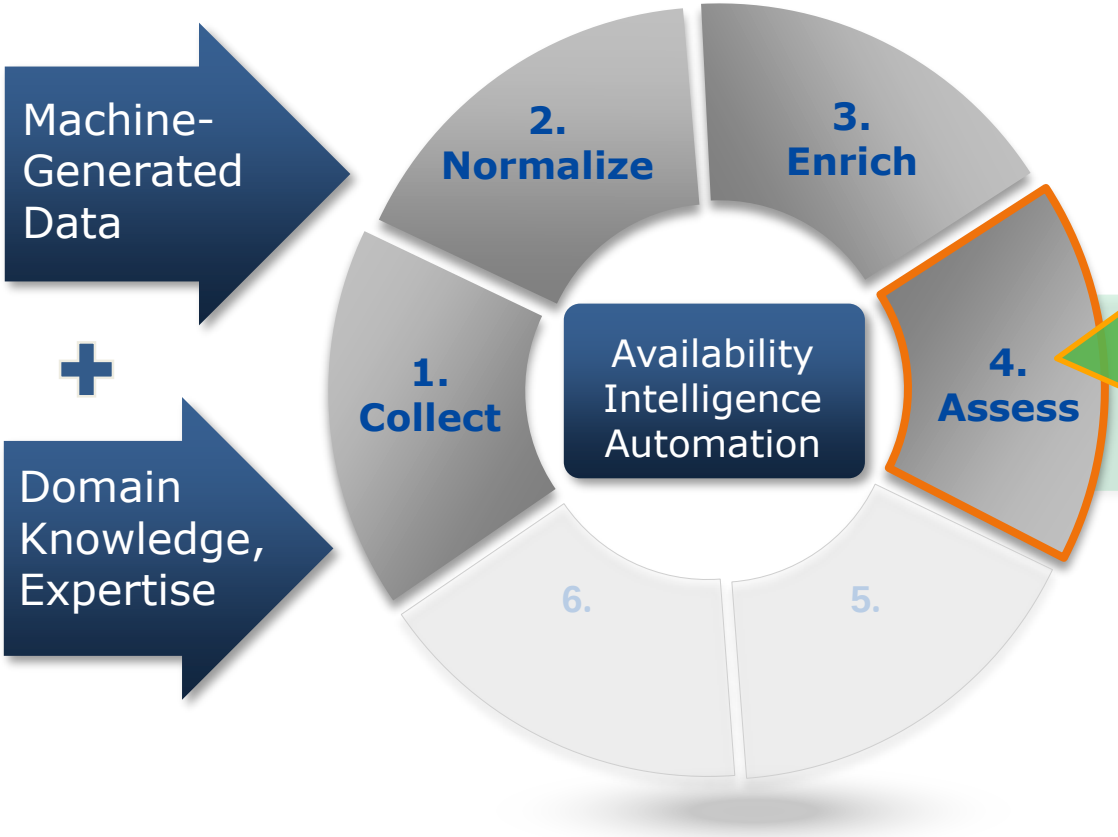
- How to organize for maximum value?
- Validate, normalize, properly categorize the data
- Some resources are shared across systems so consolidate to understand resource stress
- Normalization enables view by LPAR, CEC SYSPlex, Service Class, SSID, etc.
- And enables dataset activity by service class, by storage array, etc.

Built-in Domain Knowledge Required for Availability Intelligence



- How to fill gaps in reported data?
- Combine/calculate information from different records types and data sources…
- Use published hardware vendor information
- Use timing info on processor caches
- Use port names for storage controllers
- Etc.

Built-in Domain Knowledge Required for Availability Intelligence



- Is it good or bad?
- Apply hardware and workload knowledge
- Are the metrics as expected based on the hardware and workload context?

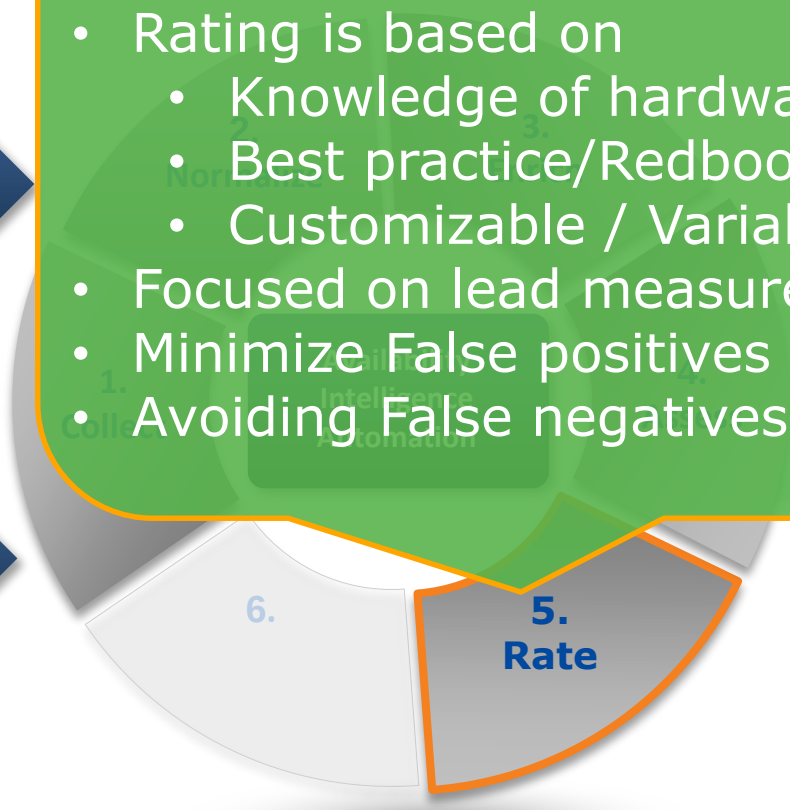
Built-in Domain Knowledge Required for Availability Intelligence

- How significant, risky is it?
- Quantify risk by assigning a rating to key metrics
- Rating is based on
  - Knowledge of hardware components
  - Best practice/Redbook recommendations
  - Customizable / Variable based on workload
- Focused on lead measures
- Minimize False positives
- Avoiding False negatives!

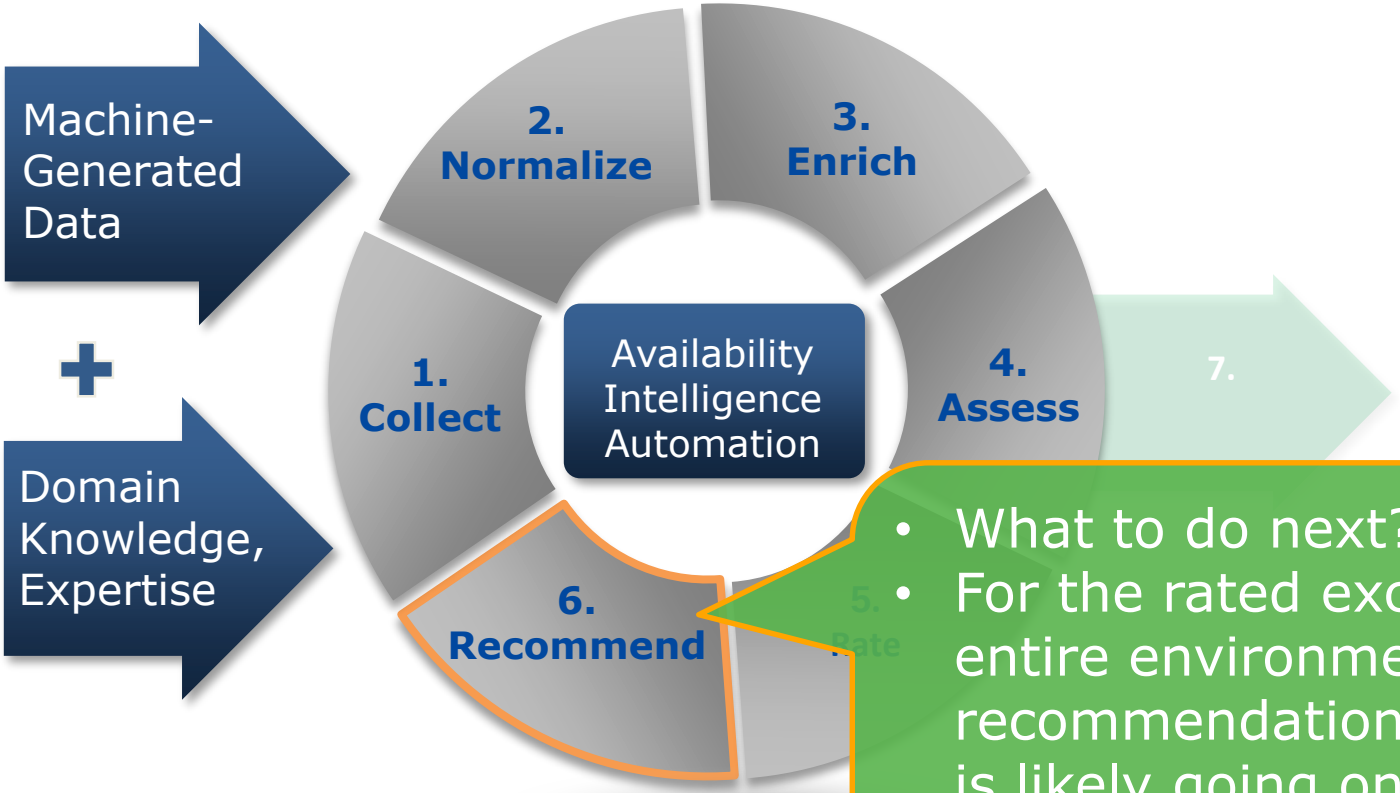
Machine-Generated Data

+

Domain Knowledge, Expertise



Built-in Domain Knowledge Required for Availability Intelligence



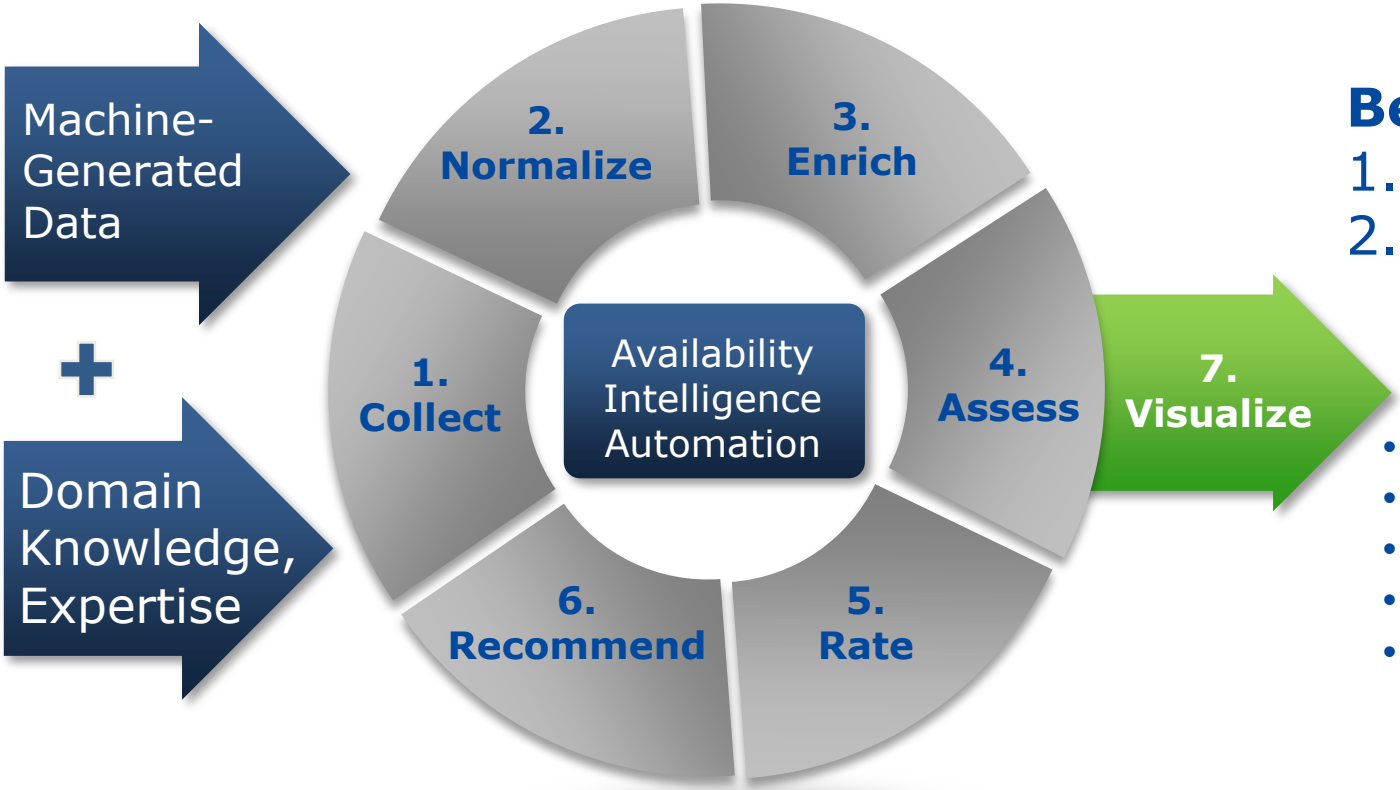
- What to do next?
- For the rated exceptions in the entire environment include recommendations about what is likely going on and what to do…

Built-in Domain Knowledge Required for Availability Intelligence

- See the risk to handle your work across the entire infrastructure
- Massive data reduction – one day of RMF & SMF summarized into a set of dashboards showing the most important information
- Drill down from enterprise view to low-level detailed views
- See from any dimension – LPAR, CEC, Sysplex, Storage System…
- Easily switch perspectives from logical to physical, correlate with service classes, datasets, etc.

7. Visualize

Built-in Domain Knowledge Required for Availability Intelligence



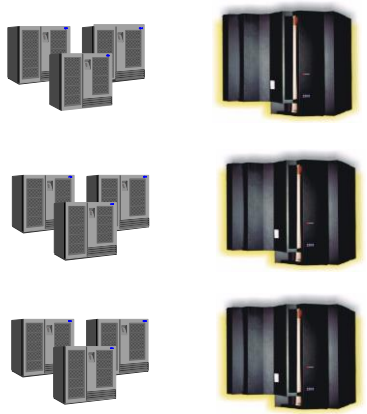
Benefits

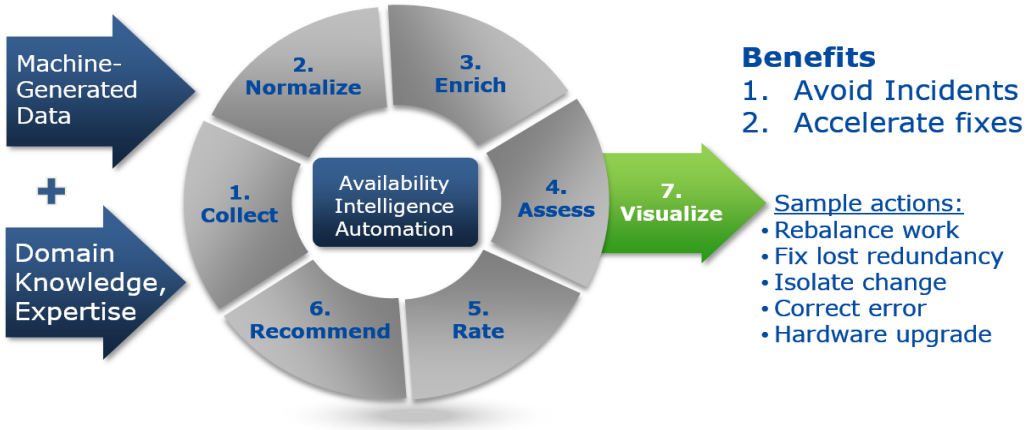
1. Avoid Incidents
2. Accelerate fixes

Sample actions:

- Rebalance work
- Fix lost redundancy
- Isolate change
- Correct error
- Hardware upgrade

ITIL Capacity Management Automated?

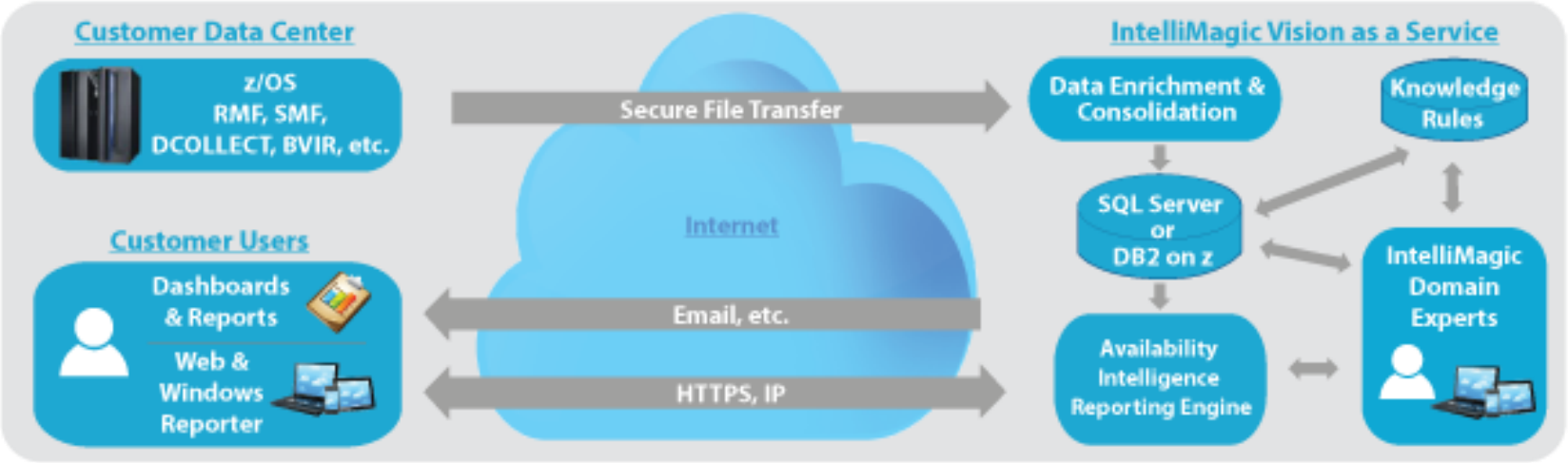




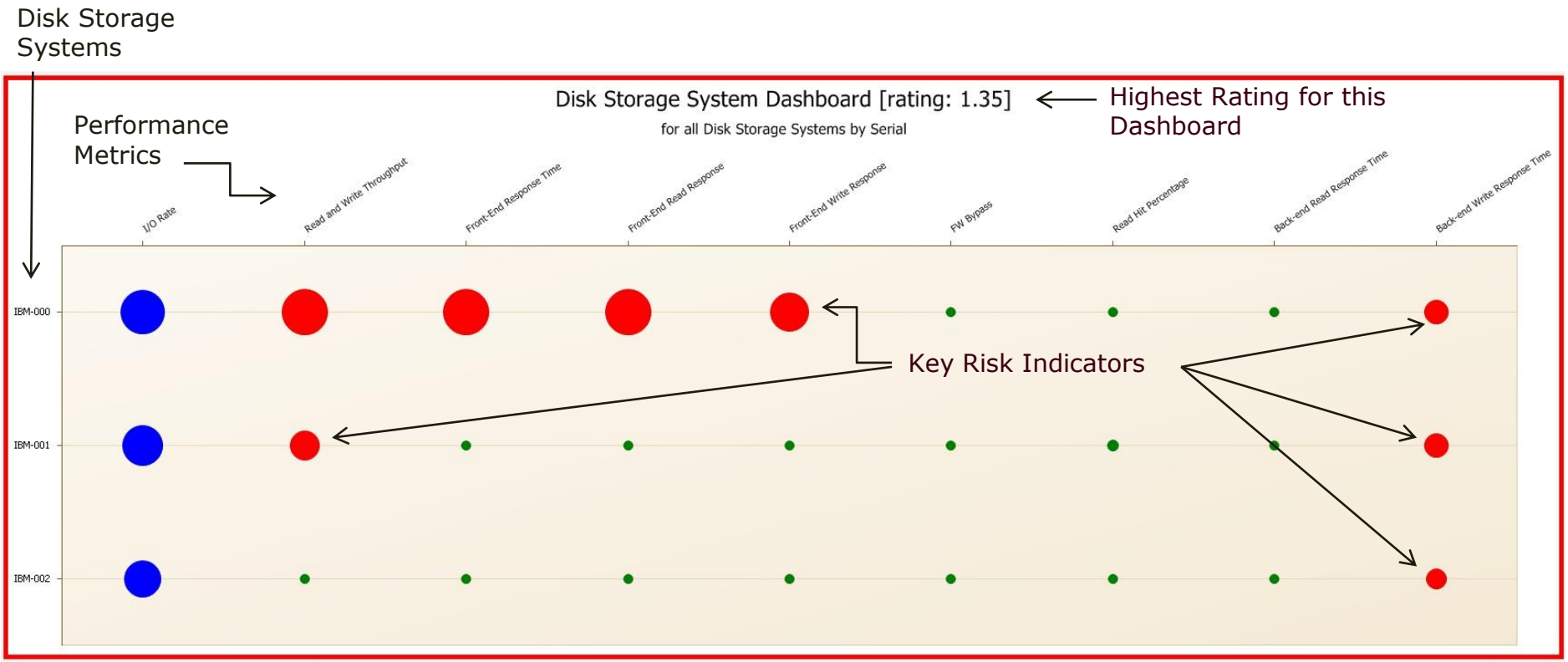
- Built-in expert knowledge automatically applied to RMF/SMF in 7 areas
- Protects availability by assessing risk every day, every device, every data center
- Automated analysis of hardware rules vs. peak workloads is the only way to constantly fulfil ITIL v3 definition Capacity Management:
  - *The Process responsible for ensuring that the Capacity of IT Services and the IT Infrastructure is <u>able to deliver agreed Service Level Targets</u> in a Cost Effective and timely manner… <u>considers all Resources required to deliver the IT Service</u>…*

Availability Risk Analysis via SaaS

- Good fit for SaaS, frequently updated HW knowledge
- Allows for very quick deployment (~24 hours)
- Okay for security - no PII in infrastructure measurement data
- Easy report distribution, data manipulation off host
- Easy augmentation with specialized/expert consultants

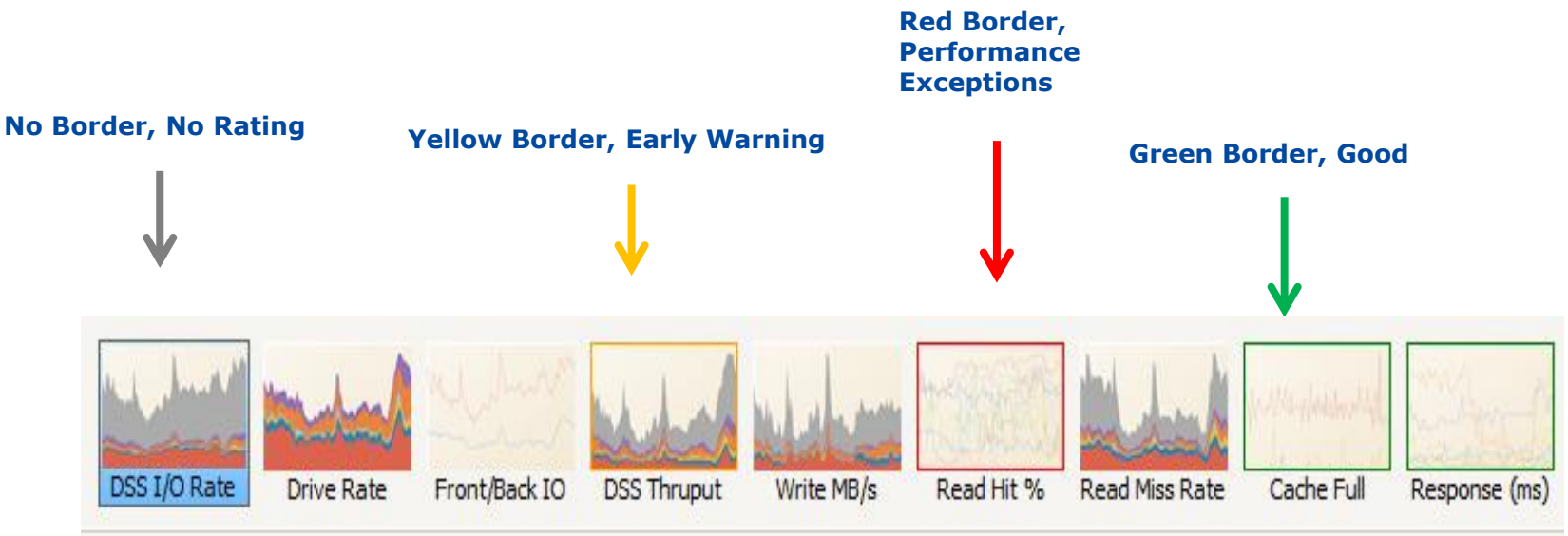


Data Center Views of Key Risk Indicators



Consolidate individual ratings on infrastructure resources into data center views to see risk across enterprise at a glance

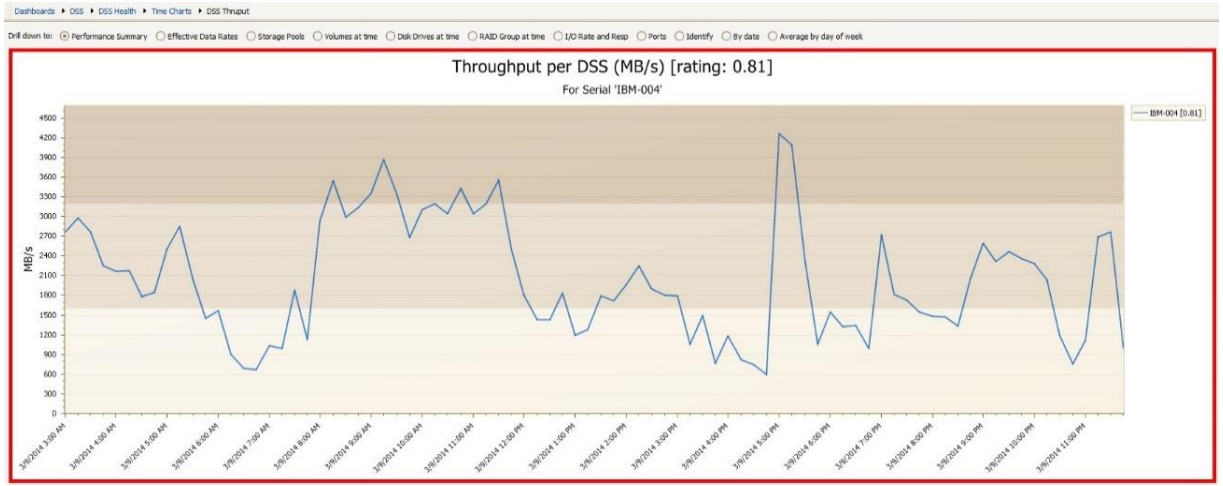
Visualizing Risk to Continuous Availability



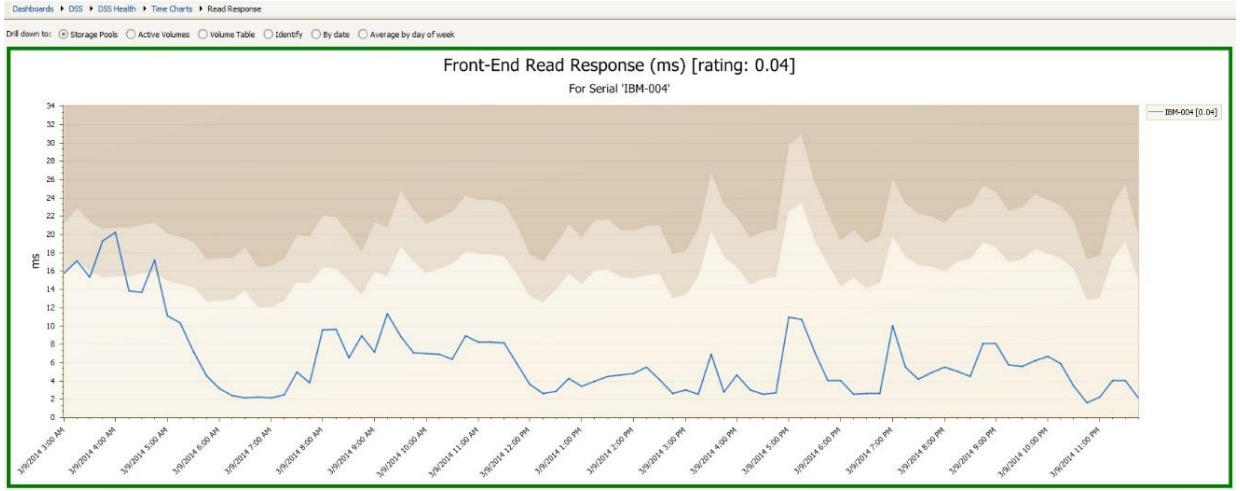
Automatically rate key metrics according to built-in expert knowledge, to obtain intelligence about threats you can use to protect availability

Rate Risk using Contextual Knowledge

A three level rating system based on hardware capabilities



A three level, dynamic rating based on both workload characteristics and hardware



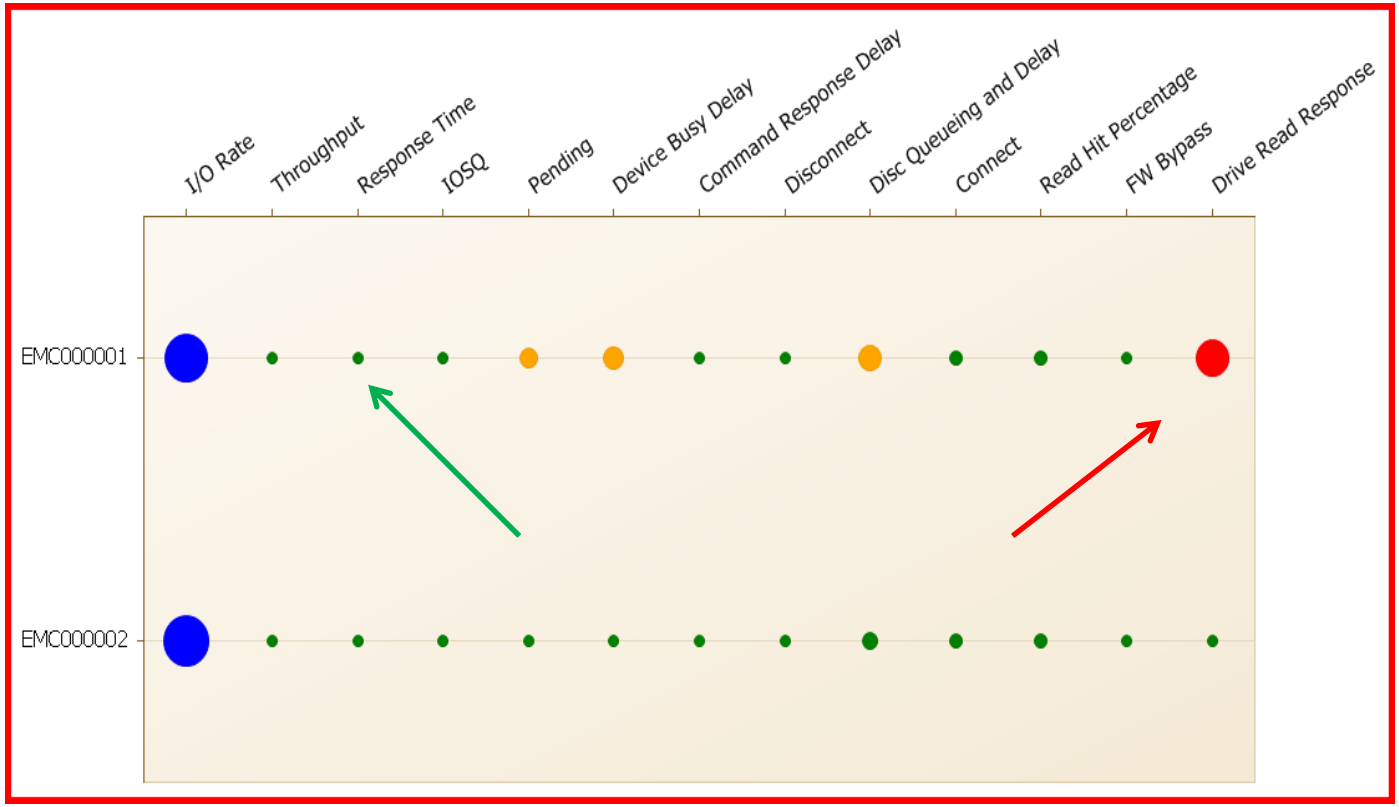
Example: DASD

Disk Storage System Dashboard [rating: 0.49]

Rating based on DSS data using DSS Thresholds

Response Time on first storage array is rated green – no discernable problem to end-users yet.

But threat to availability exists in an underlying metric (Lead Measures)

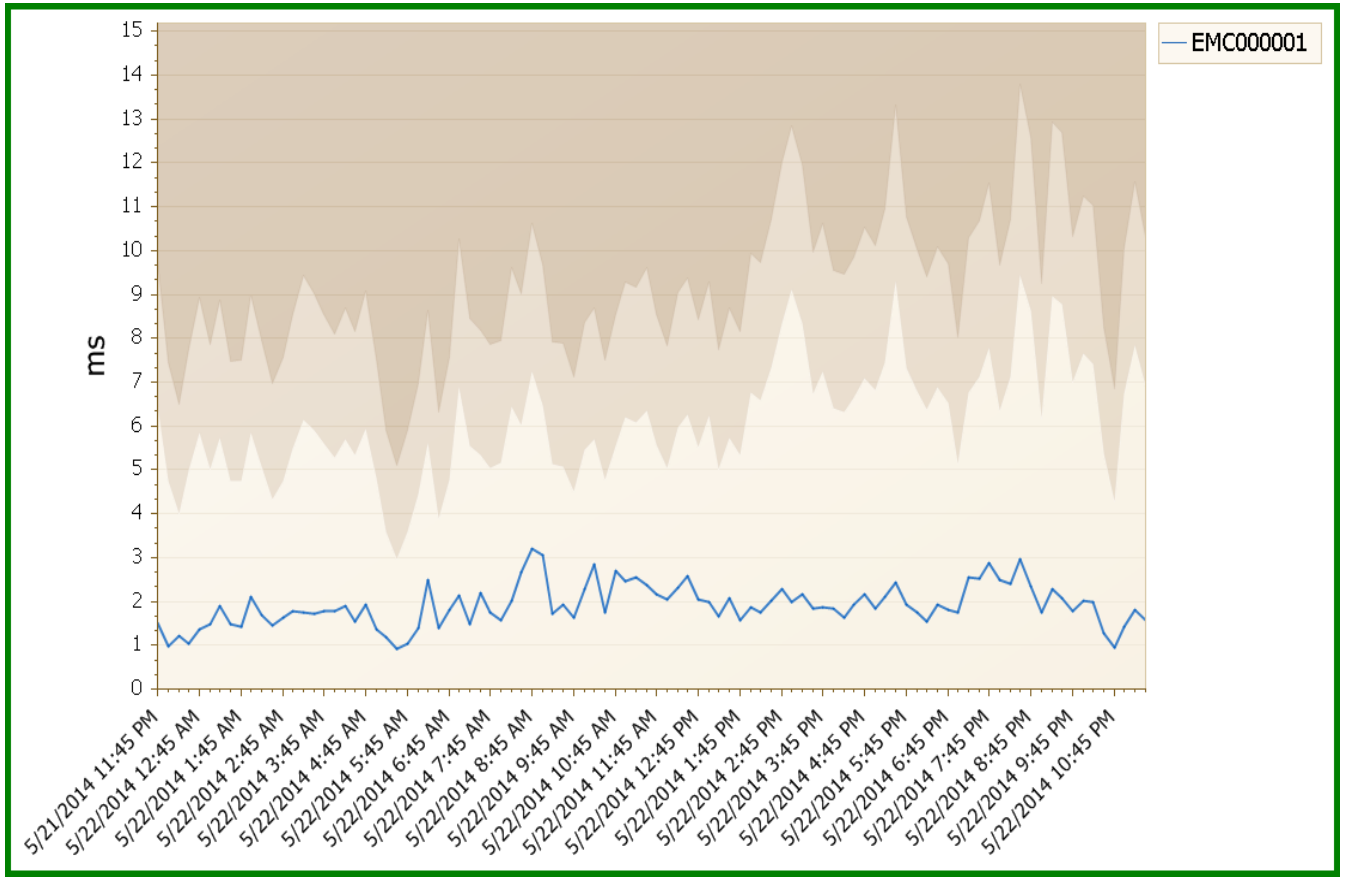


Response Time (ms) [rating: 0.00]

Rating based on DSS data using DSS Thresholds

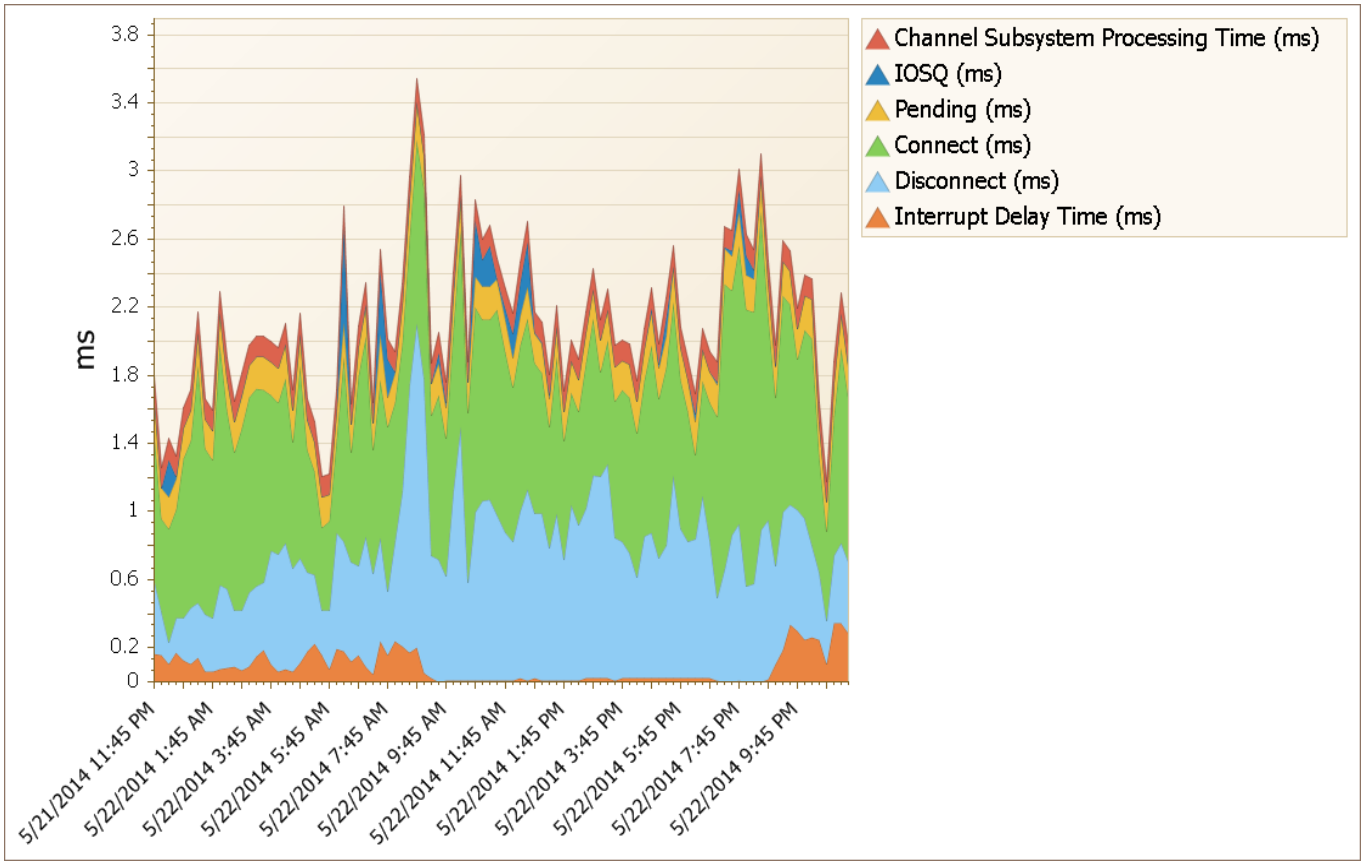
Response time is a lag measure

But seeing the different background thresholds gives an idea of what can be expected for that type of workloads on that particular array



Break down Response Time Components (ms)

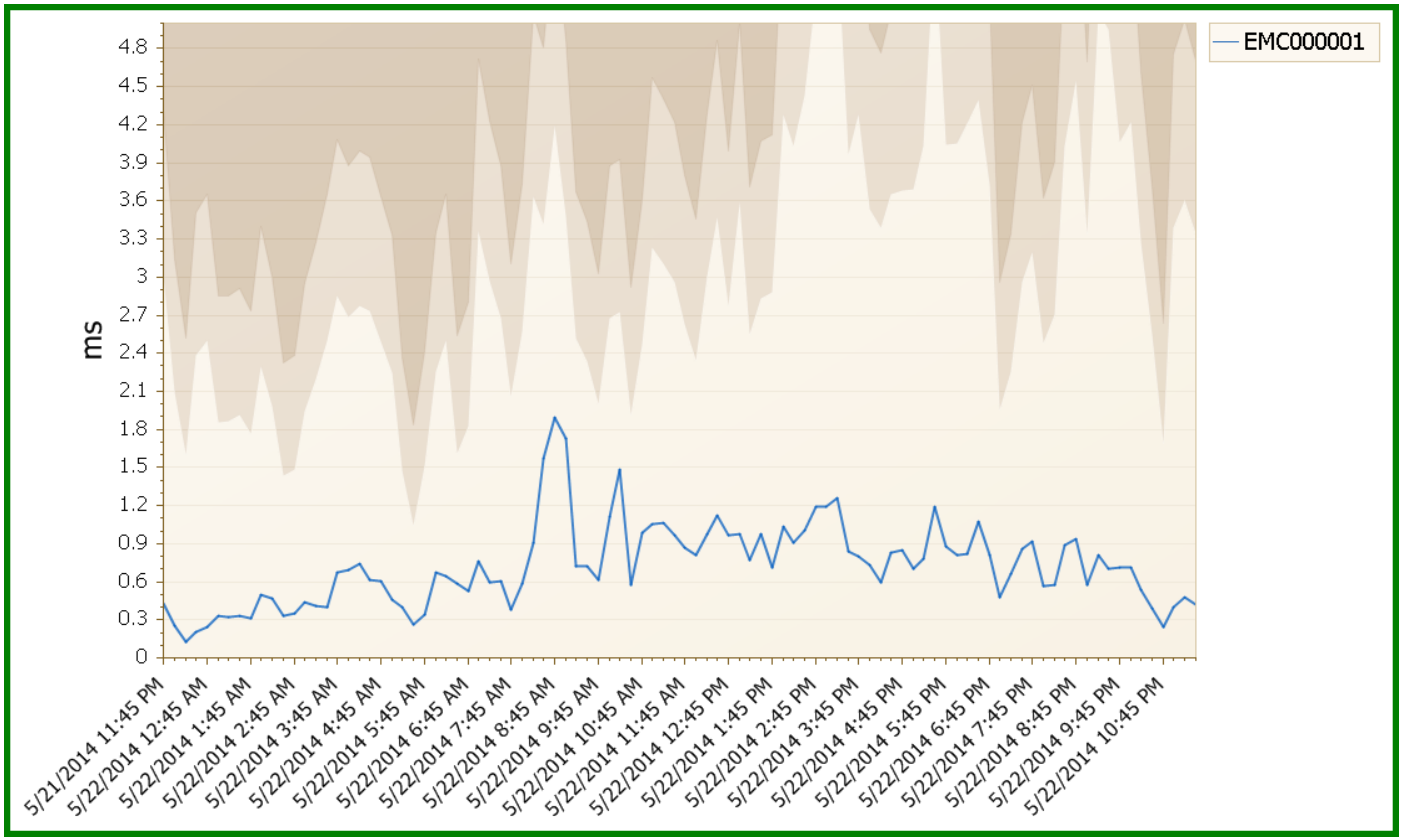
Breakdown of response time into its components allows identification of largest contributors



Disconnect (ms) [rating: 0.00]

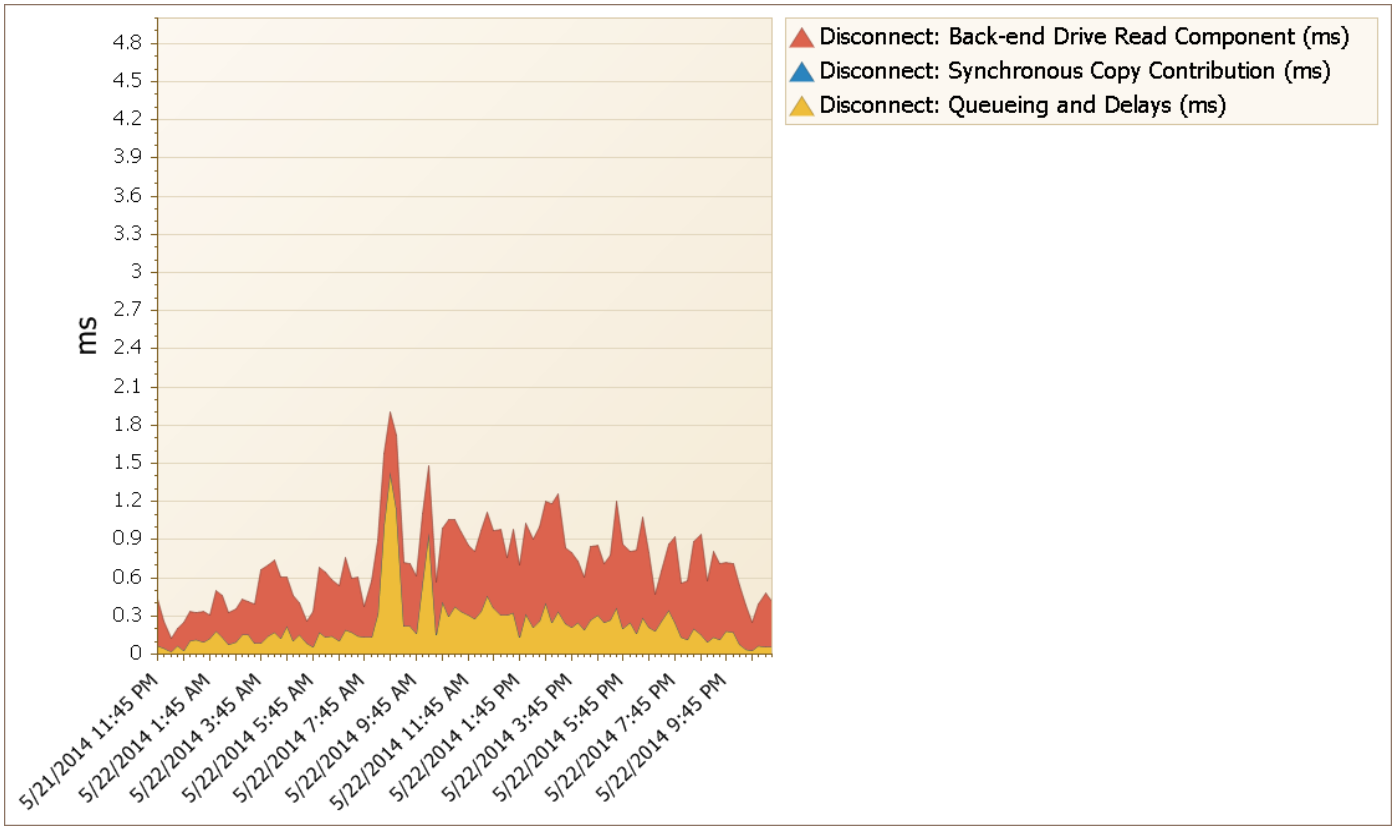
Rating based on DSS data using DSS Thresholds

Overall, Disconnect Time is not yet out of range for this array



Disconnect time components (ms)

Built-in knowledge enables a further breakdown of disconnect time into its components



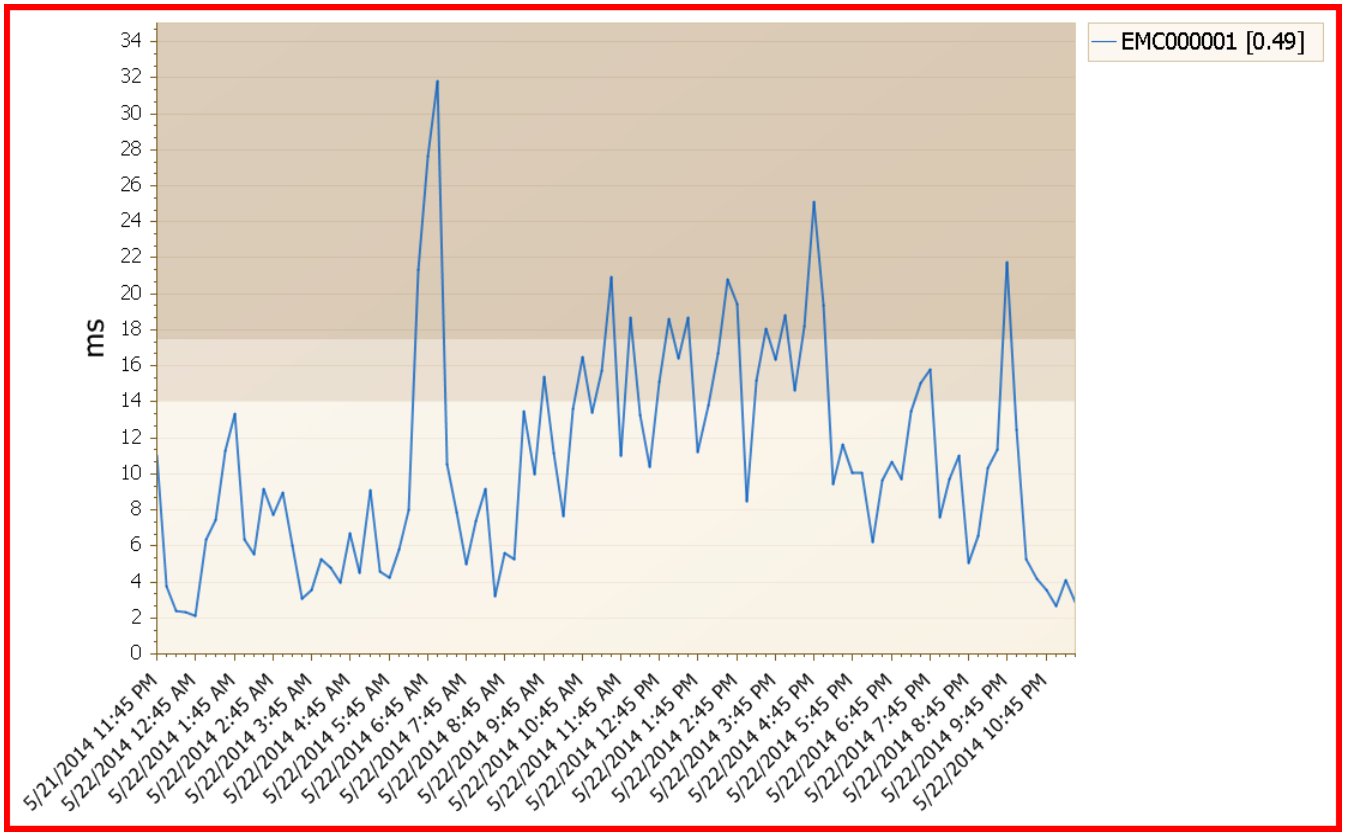
Drive Read Response (ms) [rating: 0.49]

Rating based on DSS data using DSS Thresholds

What was identified on the exception report was a deeper issue:

Back-end drives are starting to become saturated.

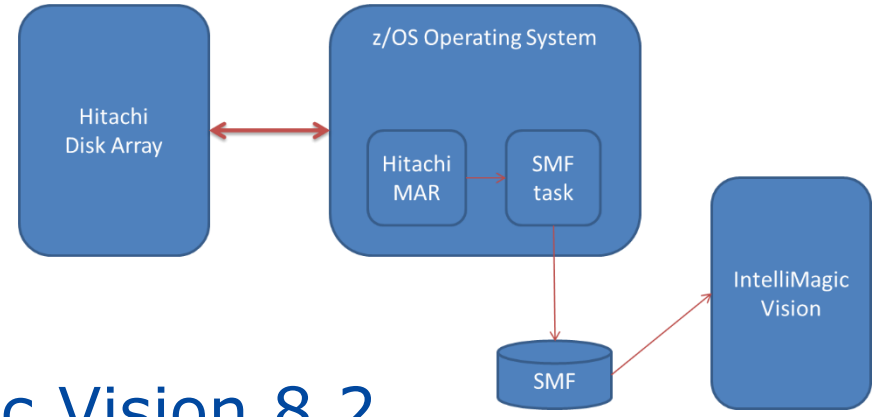
This will soon show up in response time that can impact production users



Example: New HDS SMF Records

Hitachi Mainframe Analytics Recorder

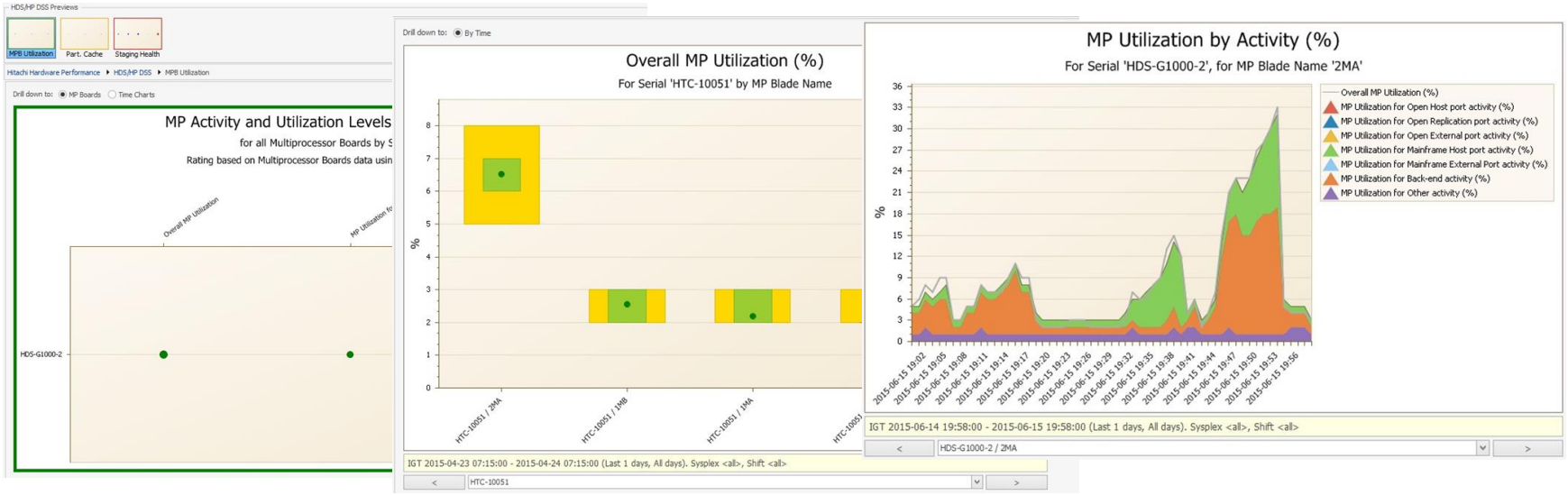
- New SMF Records about:
  - Internal components of the HDS G1000
    - Multiprocessor Boards
    - Cache Usage
    - RAID Groups
    - Ports
    - More (to come)



- Supported by IntelliMagic Vision 8.2
  - Adds built-in expert knowledge to data interpretation
  - Produces intelligence about threats to storage availability
  - Automatic warnings early, before production disruption

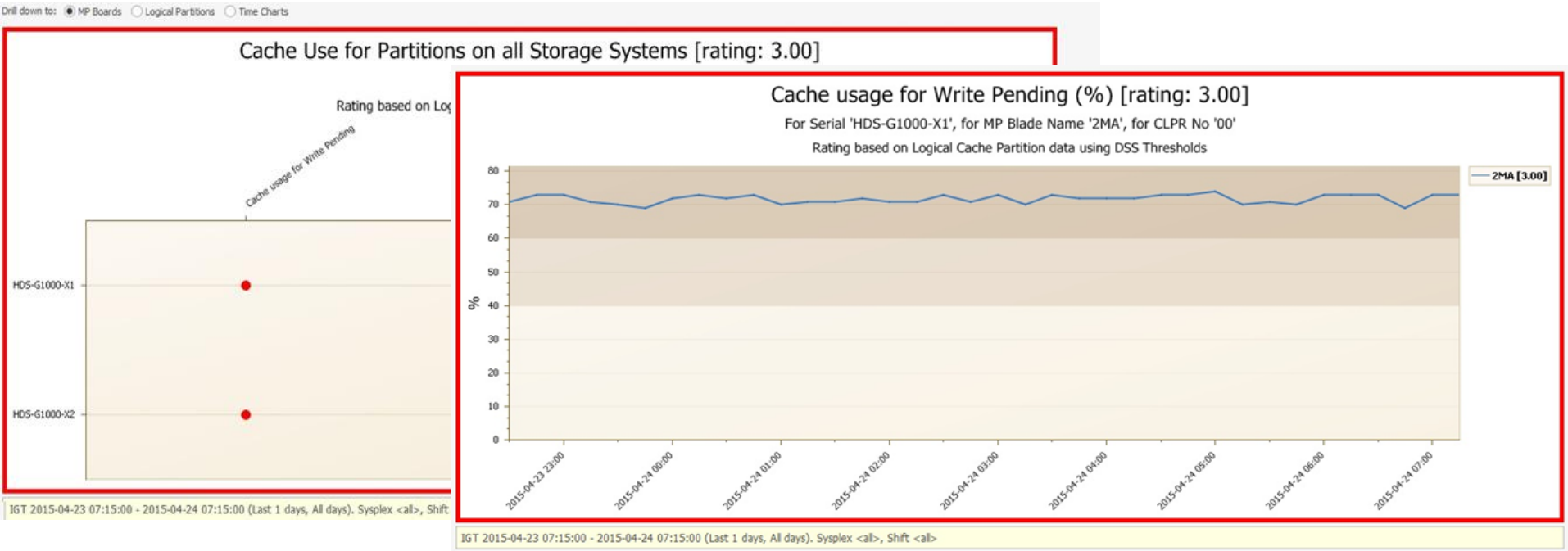
Hitachi Mainframe Analytics Recorder

- Storage System Multiprocessor Boards
  - Enough spare capacity for growth? For blade fail over?
  - Balance between blades?
  - Breakdown of activity causing high utilization



Hitachi Mainframe Analytics Recorder

- Storage System Cache Usage
  - Enough memory/bandwidth/destage capability?



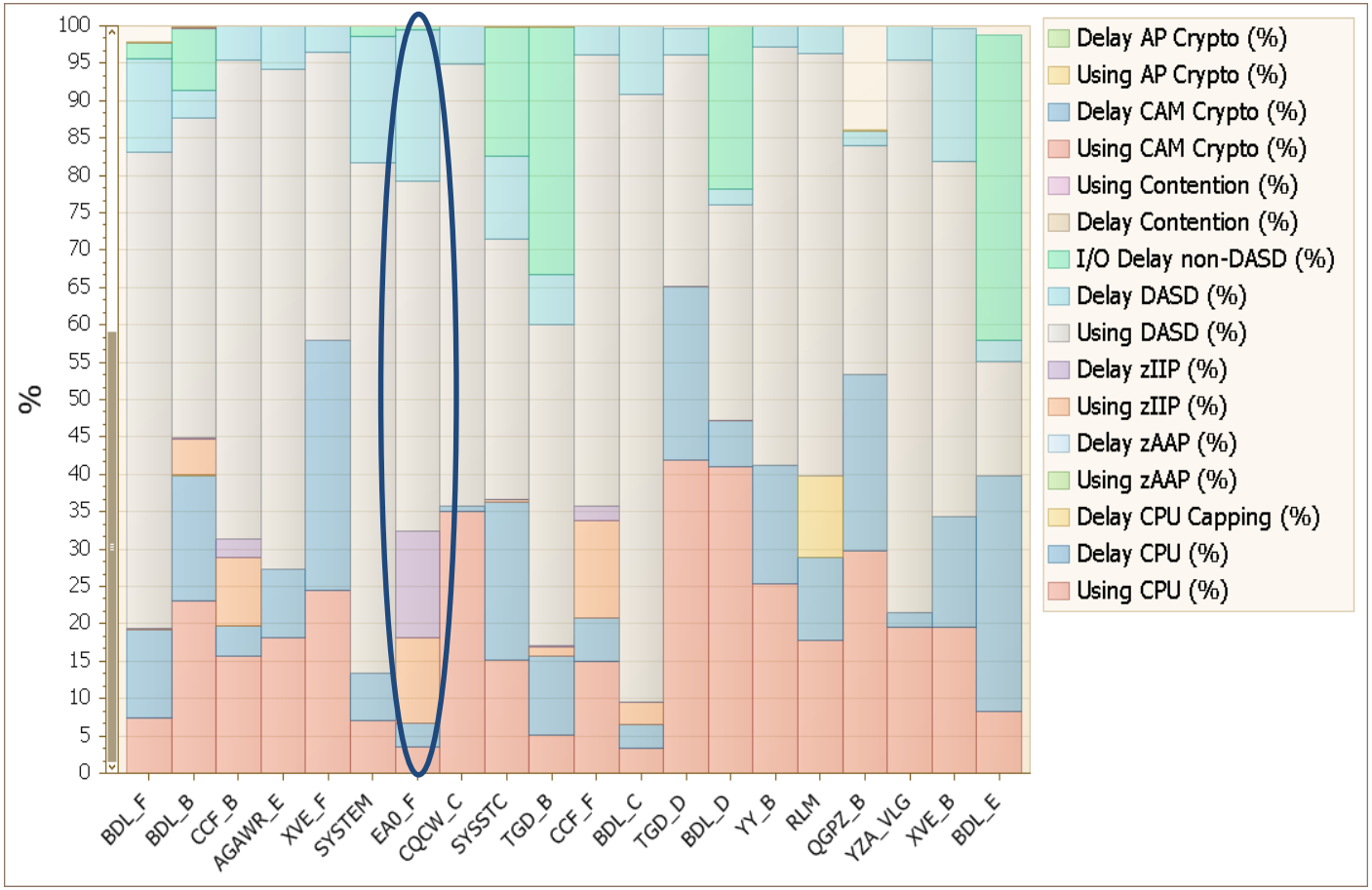
Example: CPU vs. IO

Using and Delay components per service class (%) (top 20)

for all Service Classes by Service Class

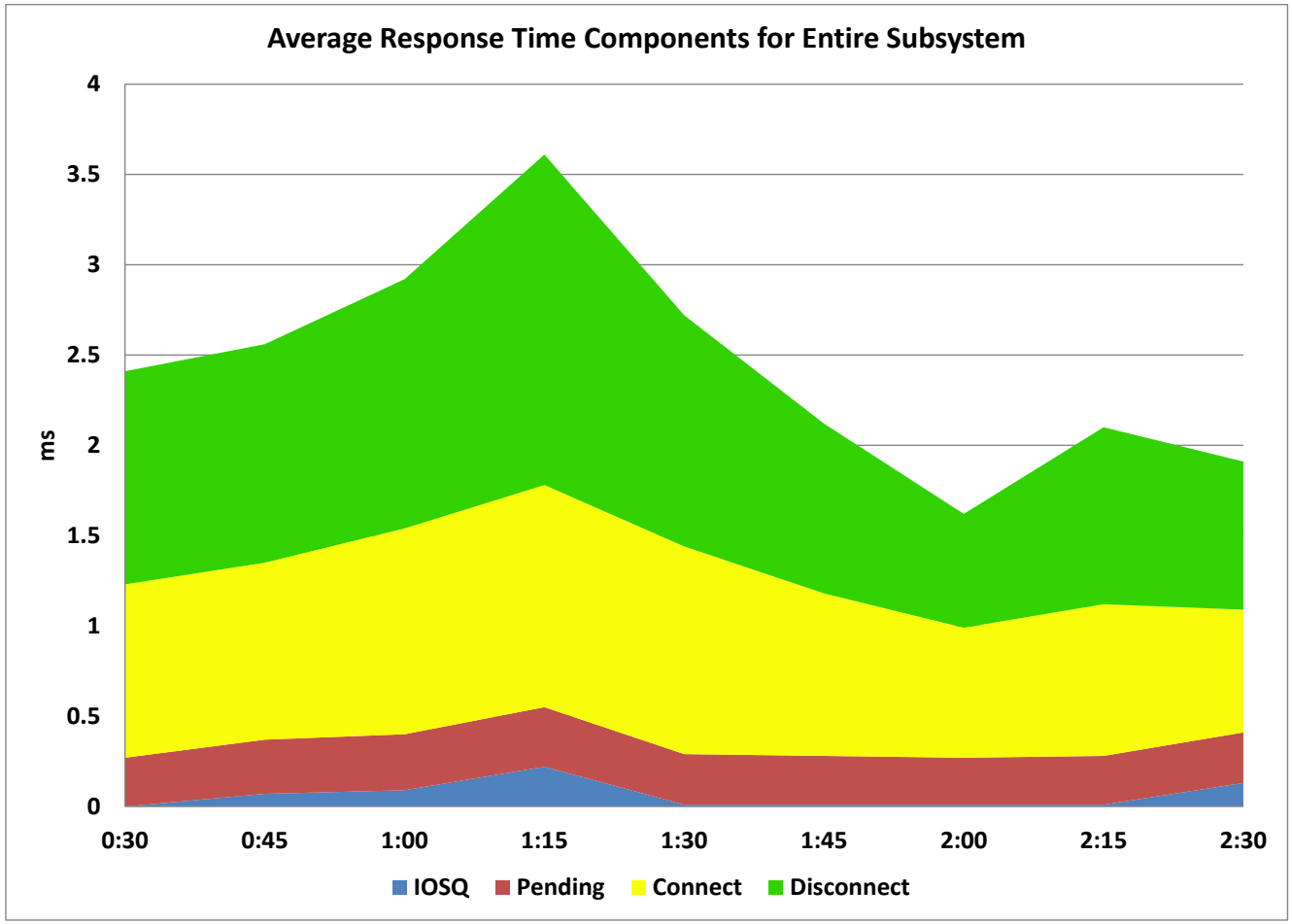
Premise:
Faster execution is needed.

Question:
For the select service class(es), is it cheaper to obtain the needed performance win with upgraded CPU or storage?



~65% of Time Spent on Using/Waiting on DASD

Is it the time spent waiting on DASD already the best in class, or is there room for improvement?



Compare Options for Run Time Improvement

	CPU Using	CPU Delay	DASD Using & Delay	Total Seconds	Run Time savings
Before	1196	1523	3915	6634	na
After CPU Upgrade	**416**	**265**	3915	4596	15%
After Storage Upgrade	1196	1523	**1027**	3746	**44%**

Model:

1. upgrading CPU to best available

vs.

2. upgrading storage to next generation

Other Examples:

Replication, CPU, WLM, CF, XCF, Virtual Tape…

Some other examples can be seen in these sessions:

17664: Opening Your Eyes to How Your Tape Environment Is Really Performing
Thursday, August 13, 2015: 11:15 AM-12:15 PM
Europe 3 (Walt Disney World Dolphin)

17956: Lunch & Learn: New Value from RMF/SMF – How to Better Protect Availability with Built-in Expert Knowledge
Thursday, August 13, 2015: 12:30 PM-1:30 PM
Southern Hemisphere 5 (Walt Disney World Dolphin)

17665: Processor Reporting: RMF and Hardware Instrumentation Services (HIS)
Friday, August 14, 2015: 10:00 AM-11:00 AM
Asia 3 (Walt Disney World Dolphin)

Conclusion

Availability intelligence uses expert knowledge in interpretation of the data

Offers new protection of continuous availability at the primary site:

1. Avoid Incidents
2. Accelerate Fixes

"Any sufficiently advanced technology is indistinguishable from Magic"

Arthur C. Clarke, 1962

Thank You

www.intellimagic.com