Avoiding Storage Service Disruptions with Availability Intelligence

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www.intellimagic.com
Today’s Agenda

1. “Availability Intelligence” for the storage infrastructure
   – For EMC, IBM, HP, HDS block storage, and Cisco/Brocade Fabric
2. Modeling storage performance
3. Avoiding and resolving problems
4. Availability Intelligence as a Service
1. Availability Intelligence for Data Storage
We are inspired by creating intelligence that illuminates the risks hiding inside your IT infrastructure.

“Any sufficiently advanced technology is indistinguishable from magic”
Arthur C. Clarke, 1962
Storage Availability Today: Either Good or Bad

<table>
<thead>
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<th>Stress &amp; Focus</th>
<th>Brain Status</th>
<th>Service Level</th>
<th>Risk</th>
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<tr>
<td>Little</td>
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Availability Intelligence
The Missing Stage: About to Be Bad

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<td>Engaged</td>
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<tr>
<td>Panic</td>
<td>Scattered</td>
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Seeing Threats to Continuous Availability

• Question: Which has better intelligence to avoid outages:
  – A 20 thousand Dollar automobile; or
  – A SAN storage infrastructure costing millions of Dollars?
Incidents Leading to Application Unavailability

Response for Unpredictable:
• Find the problem quicker
• Accelerate the problem fix

Response for Predictable:
• Avoid incident with proactive action

[CATEGORY NAME]
Increasing the Predictable Portion

What would be the impact on:
1. Your IT staff?
2. Your Employees?
3. Your Customers?
IT Infrastructure Availability Monitoring Today

Your existing monitors look at symptoms here, only **after** users experience problems

Easy metric to get, but is an effect, not a cause
Monitoring with Availability Intelligence

Availability Intelligence identifies risk **here**, before response time suffers.

- **Easy metric to get, but is an effect, not a cause.**
- **Requires evaluating every data point with expert domain knowledge about every component.**
Changing the Outcome - Avoiding Disruptions

Most infrastructure “fires” can be prevented by intervening here.
What is Availability Intelligence?

**What:** Foreknowledge about hidden threats to availability

**Why:** To better protect continuous availability at primary site by
1. Avoiding incidents (make more of them predictable)
2. Accelerating the resolution (reduce MTTR)

**How:** Use built-in **expert domain knowledge** in automatic analysis of the performance and configuration data
What Availability Intelligence Requires

• It is **not** enough to only have:
  – Easier, nicer graphs, visualizations
  – Statistical analysis (as common w/ ITOA - IT Operations Analytics)

• Rather, understanding what the data means for **risk** requires:
  – HW component knowledge (as gained from performance modeling)
  – Good or Bad? and rate the risk of unavailability
  – How to derive new, meaningful metrics out of the raw data
  – Best practices to configure, manage infrastructure
  – How to visualize the risk and problems in the infrastructure
Illuminating Threats Inside the Storage Arrays

**Lead Measures**
- Within Array
- Between Arrays
- Application Workloads
- Config or Failure

**Lead Measures**
- Adapter Utilization
- Fibre Switch Errors
- Disk Device Loads
- FW Bypass, etc.

**Lag Measure**
Storage Array Response Times

Measures:
- Imbalance?
- Changes?
7 Areas to Apply Expert Domain Knowledge

**Benefits**
1. Avoid Incidents
2. Accelerate fixes

**Sample actions:**
- Rebalance work
- Fix lost redundancy
- Isolate change
- Correct error
- Hardware upgrade
The Power of Knowing Constantly with Automation

• Assessing risk every interval, for every device, in every data center

• ITIL v3 definition Capacity Management is not achievable w/o automation:
  – The Process responsible for ensuring that the Capacity of IT Services and the IT Infrastructure is able to deliver agreed Service Level Targets in a Cost Effective and timely manner... considers all Resources required to deliver the IT Service...
Data Center Rollups of KRI’s - 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

What does the data mean for your infrastructure availability? Automatic rating of key metrics according to built-in expert knowledge, to obtain intelligence about threats you can use to protect availability.

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Rating the Risk using Expert Domain Knowledge

Based on straight thresholds where appropriate (like hardware limits)

Based on dynamic thresholds where the limits also depend on workload characteristics
2. Modeling Storage Performance
IntelliMagic Direction

• Predictive model for exact storage configurations

• What we model:
  – Separate hardware and workload
  – Predict what happens on new storage system hardware
  – Predict what happens when workload changes

• What can we do (may require services too):
  – Model to other SAN box, other drive technology
  – Model Cache size
  – Model Automatic tiering, Help assess drive mix
    • based on volume data
  – Model Compression impact (IBM SVC)
Storage Performance Modeling Concepts

Essentially the goal is to solve the following equation:

Configuration + Workload → Performance
Abstraction of the Configuration

- Host Adapters/Directors
  - Process
  - Cache
  - Device Adapters/Directors
  - Disk Storage
Abstraction of the Workload
IntelliMagic Direction: Under the Covers
Model Merge and Migrate Options

- Using different configuration options
  - For example, VMAX 40K, HDS VSP, DS8870 (16 core)
Predict scalability

- Project the growth different configurations can safely handle
3. Avoiding and Resolving Problems
3.1 Case Study: “Run Away Query”
Front-end Dashboard – Warning High Front-end Read Response Time
Drill Down to the Multi-Charts
VOLUME-000119, VOLUME-000118, VOLUME-000063, VOLUME-000196 doing ~100 MB/sec
Who is Doing the Work and is it Necessary?
Storage Pool Front-end Dashboard After an Index was Added
Run-Away Volumes are Gone!
3.2 Case Study: “Fabric Contention”
How Do You Quickly Identify Strained Fabric Ports?
3.3 Case Study: “Auto-tier Confusion”
HP 3PAR – Adaptive Optimization

Common Provisioning Groups (CPGs): Grouping of similar LDs for provisioning

- Tier 0 CPG: CPG_DB_SSD_R5_3plus1_AO
- Tier 1 CPG: CPG_DB_450gb_R5_3plus1_AO
- Tier 2 CPG: CPG_900gb_R6_6plus2_AO

Performance: Biases moving data to the fastest tier
Balanced: Balances between performance and cost
Distribution of IOPS Across AO/CPGs
Auto-tiering – How well balanced is it?

Drive Read I/O Rate (ops/s)
For Serial 1 HP3PAR1 by Drive Name

450 GB 10K RPM Drives
SSD Drives
900 GB 10K RPM Drives
# HP 3PAR Case Study Summary

<table>
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<tr>
<th>Finding</th>
<th>Recommendations</th>
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<td>1. Too much workload on 450s</td>
<td>1. Enable the <em>Tier 1 Warning Limit</em> and set it to a lower amount of space than is currently in use for the Tier 1 CPG. This should force capacity from the 450 GB 10K RPM drives to the 900 GB 10K RPM drives.</td>
</tr>
<tr>
<td>2. Not enough workload on 900s or SSDs</td>
<td>2. Set Cost mode for BASE_ESX_AO</td>
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4. Availability Intelligence as a Service
Availability Intelligence as a Service

- Incorporates frequently updated hardware knowledge
- Very quick time to results (~24 hours)
- Okay for security - no PII in infrastructure measurement data
- Easy dissemination of intelligence visualizations
- Easy access to expert consultants
IntelliMagic

- Creating the world’s best intelligence about performance and availability risk in your infrastructure
- 20+ year history of delivering solutions for deep infrastructure analysis
- Privately held, financially independent
- Customer centric, responsive
- Solutions used daily in some of the world’s largest data centers
Example Customer – Schaeffler
76,000 Employees; 180 Locations; 50 Countries

Thomas Ehmke:
“IntelliMagic Vision proactively and centrally monitors storage performance and SLAs. Potential problems are discovered early, analyzed and prevented from developing any further. Competently and reliably.”

Thomas Ehmke from Schaeffler
Conclusion

Outsmart Unavailability with the world’s best intelligence about the current levels of risk hiding in your infrastructure.

A new layer of protection to better maintain continuous availability.

Easily accessible via SaaS.

For questions/more details, contact: Brent.Phillips@intellimagic.com

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IntelliMagic Vision as a Service Architecture