Improve Service levels with enhanced data analysis

Scenarios for analytics on System z

Mike Baskey, Distinguished Engineer, Tivoli z Architecture
IBM

August 6th, 2012
Session: 11886
Analytics is being touted as next generation of Autonomic Computing

- Log Analytics requirements gaining attention and usage
  - Processes existing log data to provide insights on problems before they happen
  - Vendors like Splunk emerging

- Performance (streaming) analytics being leveraged to deal with volumes of data which are beyond human abilities
  - Better qualities of service, advanced workload optimization, and efficient resource consolidation

- Real-time analytics needed for decision making due to constantly changing environment
  - Requires automation with intelligence
Analytics has become a major driver for IBM, including acquiring a number of key companies.

why is this happening
what if these trends continue
what will happen next
(that is, predict)
what is the best that can happen
(that is, optimize)

IBM is driving the future of integrated analytics through organic development, acquisitions and our strategic partnerships.
Analytics can address a large number operational areas to reduce risk and decrease costs.

- **Development and Test Lifecycle**
  - Debug root cause of failures & performance problems.

- **Report & Data Mining**
  - Are there orphaned VMs? (e.g. in Business systems but not OSS?)
  - What is optimum workload allocation across infrastructure?

- **Optimize & Refine**
  - What happens when adding resources?

- **Monitor & Manage Risks**
  - What resource is sick?
  - Identify and predict faults and performance degradations in physical/logical infrastructure

- **Operations**
  - When will this asset fail?

- **Schedule**
  - What’s best Scheduling of asset maintenance?

- **Deploy**
  - Move from “reactive” management to fixing things before they break.

Advanced analytics over operational data to detect problems before they become service affecting.
Operations challenge: Balancing need to manage more with improved service levels & lower costs

“...multi-dimensional relationships between dynamic infrastructure and changing business services are too complex for IT staff to continue reacting to event storms and constantly tweaking static monitoring thresholds.” *

“40% of unplanned downtime due to operator error” **

* Source: PNA, 2008

** Source: Gartner, March 2009

Challenge:

• Create and maintain increasing numbers of thresholds and situations in constantly changing IT environment.
• Minimize number of alerts that operators must handle

Service Assurance Analytics approach:

Intelligent or ‘Predictive Events’ that result from speeding ability to detect abnormal trends before end users and mission critical applications impacted
Predictive Analytics enable IT organizations to move from reactive to proactive management

"Analytics leverage data in a particular functional process (or application) to enable context-specific insight that is actionable." - Gartner

Move sensing and alerting, and eventually actions earlier

- Advance warning of service impact, deterioration or outage
- Realistic service baselines
- Avoidance of expensive and time-consuming false alerts
- Detection of service impacts not identified by fixed thresholds alone
- Swifter diagnosis of events and patterns
- Identification of underlying root cause to implement fixes

IDC study: Predictive analytics initiatives show an average ROI of 145%, in comparison to 89% for non-predictive analytics*

Analytics has become more tightly linked to Operational Monitoring and problem resolution.

Move from just monitoring to predicting and resolving before problems become outages.

- **Receive trouble tickets. Fault!**
  - React to user report

- **Gather alerts**
  - React to events, before user report

- **Gather & Correlate alerts**
  - React to events, w/ improved RCA

- **Add performance monitor**
  - React to performance changes

**Static Thresholds**
- Set reasonable thresholds
- Create alerts when violated

**Linear Forecasting**
- Linear prediction
- One metric

**Dynamic Thresholds**
- Forecasting
- Earlier Detection based on history

**Nonlinear Forecasting**
- More accurate prediction of single metric

Complete your sessions evaluation online at SHARE.org/AnaheimEval
Detect problems before they impact business with Tivoli Analytics and Service Performance (TASP)

- Supplies multi-domain, agnostic analytics
  - Leverage existing monitoring systems
  - Analyzing metrics from physical and virtual environments
- Uses analytics to learn normal operational behavior across infrastructure
- Learns mathematical relationships between metrics:
  - Across physical and virtual elements of the service delivery stack,
  - Network elements, hypervisors and applications, & end user views
- Detects problems before business impacted
- Sends anomaly events to management consoles
Increase availability by replacing manual threshold management with automated TASP Analytics

**Operational Benefit:**
- Increased reliability
  - No more missed problems because threshold was not set or was set at suboptimal value

**Financial Benefit**
- Reduced labor/management cost
- Reduced number of missed problems

**Factors:**
- Number of resources being monitored
- Labor costs
- Number of problems due to management gaps today
- Average revenue loss due to fault
Prediction and Early detection of problems allows mitigating action before they affect service

Operational Benefit:
• Advanced warning of problems allows mitigating actions to be taken avoiding service disruption
• Early action prevents additional related problems from occurring

Financial Benefit
• Reduced revenue impact
• Reduced problem cascades

Factors:
• Number of faults
• Average time to detect today
• Average improvement in detection time with TASP
• Average revenue impact of fault
Key challenge in large z accounts addressed by analytics is “Sick but not dead”

- Relationship automatically identified between KPIs for CPU use, inbound requests and coupling I/O

- CPU usage rises while other metrics are stable. Contention!

- Alert at red triangle; operator action to recycle server shortly afterward
TASP works with business focused capability to provide enhanced operational visibility

Tivoli’s solutions:

- See anomalous conditions
- Prioritized for business impact
- Associated with environmental data

**TASP - Tivoli Analytics and Service Performance**
Tivoli provides most complete set of operational analytics capability

In context of the application or environment

Consolidated Outcomes
- Outage Avoidance
- Optimization
- Insight/Visibility
- Root Cause Analysis
- Repair

Cross-Domain analytics
- Capacity Planning
- Non-linear trending & base-lining
- Streaming real-time anomaly detection
- Semi-structured Data
- Pattern Based
- Event Correlation

Domains
- IT Infrastructure Management
- Non-IT Infrastructure
- Application Management
- Asset Management
- Others

Data Sources
- Transaction data
- Performance data
- Events
- Logs
- Configuration
- Topology
- Symptom/Best Practices

Complete your sessions evaluation online at SHARE.org/AnaheimEval
Analytics products need to have certain key capabilities to provide business value

- Ability to search and index massive volumes of operational unstructured data from various sources
- Out of the box correlation with structured data to get comprehensive diagnostic capabilities.
- Reduce and bound amount of data copied and indexed – easier to budget
  - Federated access to various data sources
  - Filter at source where agents are used
- Dynamic expert advice, built from support documents, and other relevant sources for quick problem resolution.
- Continuous delivery of content developed in a community model
  - Separation of content from framework to build / deliver client, industry or scenario specific use cases
  - Notification to systems administrator
Analytics data combined and analyzed based on a number of sources

• Different options for structured, unstructured and stream data
• Log data – patterns, problems, diagnostics
  – Start with syslog in many cases
• Structured data – historical trends, placement, capacity
  – Start with SMF data, Tivoli Data Warehouse
• Trends which can be detected better with analytics
  – Deviation from steady state (requires learning process)
  – Anomalies in input stream pattern (e.g. DOS attack)
  – Combination of performance and event data (e.g. Sick But Not Dead)
Analytics can provide knowledge and value to many roles within organizations

**Developer**

*Debugs programs in distributed environment and using log messages*

**Subject Matter Expert**

*Uses expert knowledge to diagnose problems in a domain, for e.g. WebSphere performance tuning expert*

**Operations**

*Macro level problem diagnosis using existing domain knowledge built by SMEs*

**Support Engineer**

*Handed specific problem from the operations team*

**Content Creation**

*Build content using help from developers and SMEs and available support documentation*
How analytics systems are organized impacts ability to quickly find and fix problems

- Wide variety and huge volumes of structured and unstructured data
- Frame arbitrary queries on indexed data to answer questions and visualize results

**Analytics**

- **Transformations, correlations on search results**
- **Annotation Engine** (author/apply annotation rules)

**Structured Data**

- **Search Engine**
- **Data Mashup Service**
- **Exploratory Data Visualization**

**Unstructured Data (logs, trouble tickets)**

- **Symptoms**
- **Knowledge base of Navigation Patterns**

**Knowledge base of Navigation Patterns**

**Index data**

**Structured Data**

- **Search Engine**
- **Data Mashup Service**
- **Exploratory Data Visualization**

**Annotations**

- **Annotation Engine** (author/apply annotation rules)
Analytics content can be obtained from a number of manual and automated sources

Root cause analysis
- (a) Operations wants to manually search logs for patterns
- (b) Operations wants to search logs based on key data
  - Leveraging known structured data sources helps to narrow down and locate otherwise undetected problems in huge volumes of logs
    - Using existing topology, configuration and event data sources

Problem resolution
- Operations needs to see Expert Advice or support document links to help solve a problem observed in logs

Problem detection
- Operations or Development wants to watch for known patterns in logs
- When there is a “hit”, wants additional context from various data sources to help diagnose problem faster.
Real World Examples of where to obtain information to perform analytical analysis

• **Root Cause Analysis**
  • Manually search for patterns in App Server / Database logs.
  • Use event to focus on specific log entries in a time period around that event.
  • Use event and topology to search specific logs within a time period to locate an error/warning category message.
  • Use transaction trace to search specific App Server and DB logs during time period to show errors and warnings in context

• **Problem Resolution**
  • Show doc links in Infocenter, Google, any indexed expert advice when “hits” are found in logs.

• **Problem Detection**
  • Watch for App Server and Database error/warning messages in logs and correlate with system and middleware measurement data in Warehouse in UI to provide context.
  • Application just logged a “foobar” message, show transactions that occurred in same time period.
Tivoli provides System z with significant analytics monitoring and management capability

- Log Analytics helps identify problems before they happen
  - Start identifying key data sources

- Performance (streaming) analytics lead to better qualities of service and workload/resource optimization
  - Determine who needs to see data and what decisions to make

- Real-time analytics eventual goal to support automation
  - Identify required parameters and factor in business value

Learn More:
Using Tivoli Analytics for Service Performance to improve ROI Webcast:
Tivoli System z Sessions at SHARE

Monday
11:00 11207: Automating your IMSplex with System Automation for z/OS Platinum 7
1:30 11832: What’s New with Tivoli System Automation for z/OS Elite 1
1:30 11896: Problem Solving with Consolidated Logs Grand Salon A
3:00 11886: Improve Service Levels with Enhanced Data Analysis Elite 1

Tuesday
9:30 11792: What’s New with System z Monitoring with OMEGAMON Elite 1
11:00 11791: Tuning Tips To Lower Costs with OMEGAMON Monitoring Platinum 8
1:30 11900: Understanding Impact of Network on z/OS Performance Grand Salon A

Wednesday
9:30 11835: Automated Shutdowns using either SA for z/OS or GDPS Elite 1
Noon 12109: Maximize System Availability and Performance - Lunch & Learn Salon 2
1:30 11479: Predictive Analytics and IT Service Management Grand Salon E/F
1:30 11899: Top 10 Tips for Network Perf. Monitoring w/ OMEGAMON Platinum 9
4:30 11836: Save z/OS Software License Costs with TADz Elite 1

Thursday
8:00 11887: Learn How To Implement Cloud on System z Grand Salon E/F
9:30 11905: Using NetView for z/OS for Enterprise-Wide Mgmt and Auto Grand Salon A
11:00 11909: Get up and running with NetView IP Management Grand Salon A

Friday
9:30 11630: Getting Started with URM APIs for Monitoring & Discovery Elite 1
Thank You

Complete your sessions evaluation online at SHARE.org/AnaheimEval