Using Advanced Analytics Technologies to Support Improved Decision-Making

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Tivoli Cloud & Analytics Executive

Pulse2012

Meet the Experts. Optimise your infrastructure.

May 31 – June1

Sheraton on the Park Hotel, Sydney

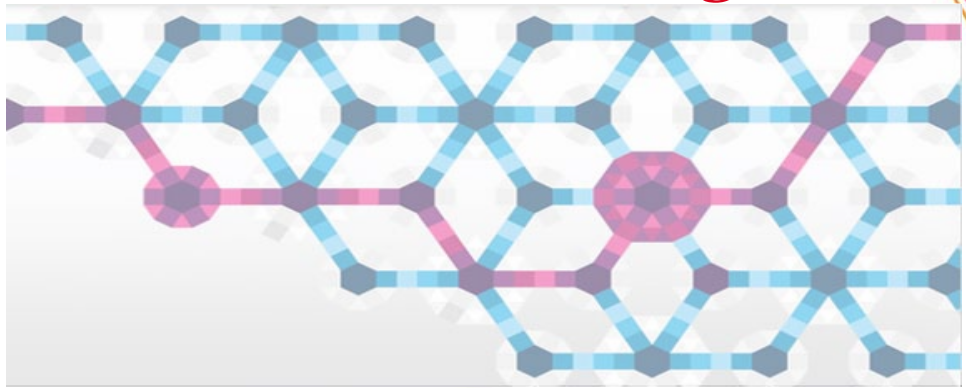
IBM & Tivoli are Investing in Analytics (Big Data) so you can make Critical Decisions with Better Insight

Why is this happening

What if I add this load

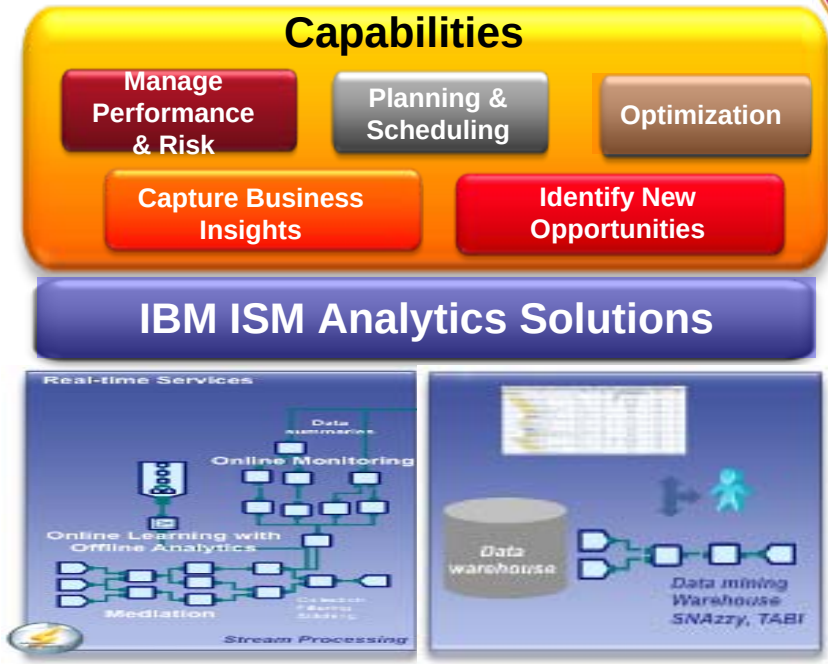
What will happen next (that is, **Predict**)

What is the best that can happen (that is, **Optimize**)



IBM Service Management Analytics Solutions

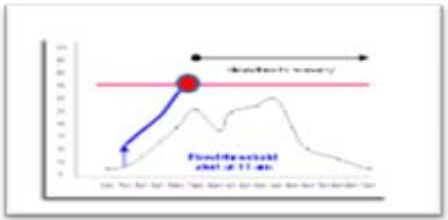
- *Warehouse Based or Real-Time Streaming*
- *Manage Performance & Risk:* Minimize service disruptions & outages
- *Planning & Scheduling:* Make the best use of limited resources
- *Optimization:* Tear out cost & improve efficiency
- *Capture Business Insights:* Make smarter decisions with a broader perspective
- *Identify New Opportunities:* Enable intelligent profitable growth



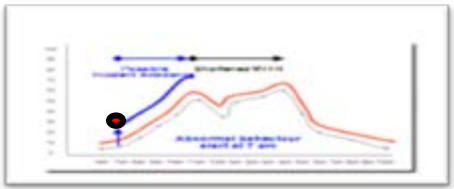
Real-Time Streaming Analytics

Warehouse Analytics

Monitoring, Event & BSM Analytics

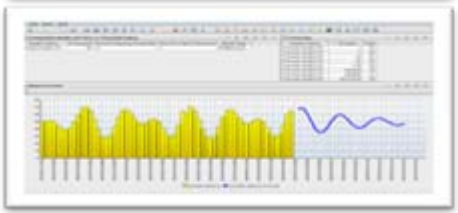


Static Thresholds
(single metric - univariate)



Dynamic Thresholds
(univariate)

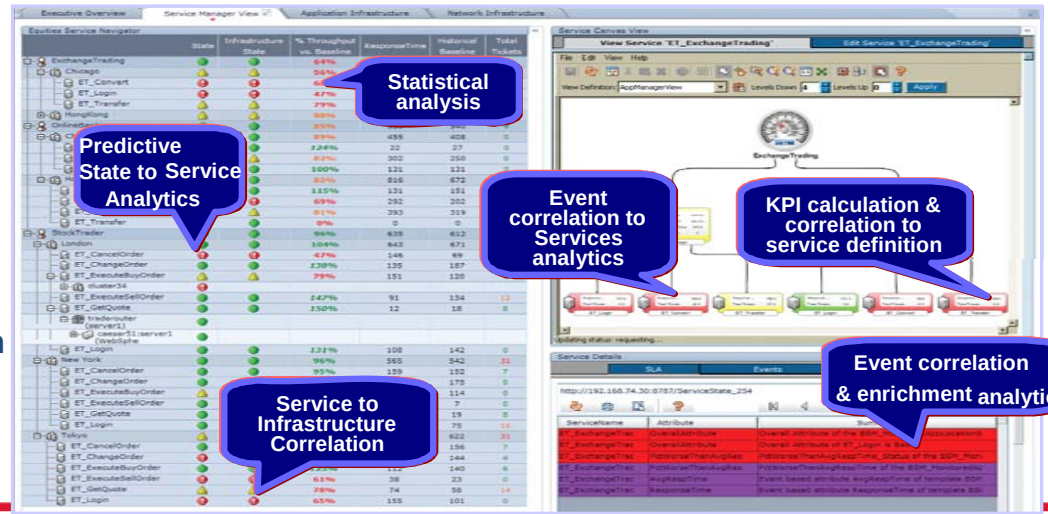
Linear Prediction
(univariate)



Non-Linear Prediction
(mostly univariate)

Where we are (available capability)

- Dynamic Baselining & Forecasting
- Dynamical Thresholds using baseline info
- Linear & Non-Linear Trending
- Current State/Predictive State
- Streaming Analytics of Network Data
- Derived Attributes – Creates new ones
- Visible Multi-domain correlation



Analytics for Better Utilization – Reclaim Resources

Capacity Planner Optimized Environment Plan - Viewer - Mozilla Firefox: IBM Edition

File Edit View History Bookmarks Tools Help

https://sapm-rhx64e.tivlab.raleigh.ibm.com:16311/tarf/servlet/component?b_action=cognosViewer&ui.action=run&ui.object=%2fcontent%2fpackage[%40name%3d'IBM Tivoli Capacity Analytics

Tivoli Integrated Portal | Capacity Planner Optimize...

Viewer - Capacity Planner Optimized Environment Plan

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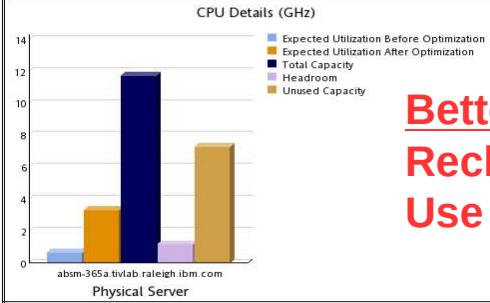
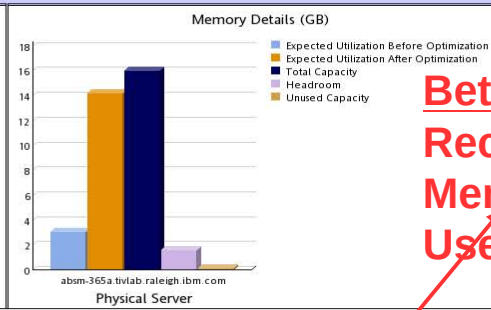
Physical Server : absm-365a.tivlab.raleigh.ibm.com **Capacity Efficiency Index : 62**





Better Utilization
Reclaim Reserved CPU
Use to run more VM's

Better Utilization
Reclaim Reserved Memory
Use to run more VM's

Physical Server	CPU Frequency (GHz)	Number Of CPUs	Total Memory Capacity (GB)	Total CPU Capacity (GHz)	Model	Architecture
absm-365a.tivlab.raleigh.ibm.com	2.93	4	16.00	11.72	eServer xSeries 365 -[88626RX]-	Intel(R) Xeon(TM) MP CPU 3.00GHz

Virtual Machines :

Virtual Machine	Number Of vCPUs	Current Reservation CPU (GHz)	Recommended Reservation CPU (GHz)	Current Reservation Memory (GB)	Recommended Reservation Memory (GB)	Performance Risk Index	OS	Middleware Name
absm-rhx32c (CAM Managing Server)	2	1.481	0.393	3.023	2.534		Red Hat Enterprise Linux 5 (32-bit)	ITCAM
absm-win32b	1	0.776	0.500	1.778	2.119		Unavailable	Sharepoint
ITMfVE2	4	1.496	0.513	0.512	2.616		Red Hat Enterprise Linux 5 (64-bit)	Apache
Maximo-EM-7.1.1.7 (mx7vm)	2	0.890	0.431	1.777	2.119		Microsoft Windows XP Professional (32-bit)	Maximo
sapm-rhx32b	1	0.366	0.110	0.746	0.346		Red Hat Enterprise Linux 5 (32-bit)	WAS
sapm-rhx32c	1	1.127	0.308	0.500	0.281		Red Hat Enterprise Linux 5 (32-bit)	Apache
sapm-win2008b	2	1.260	0.472	1.778	1.197		Microsoft Windows Server	IIS

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Done

Analytics for Cost & Capacity Optimization

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Viewer - Capacity Planner Optimized Environment Plan

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Capacity Planner Optimized Environment Plan

Report As Of : Oct 3, 2011 4:48:22 PM

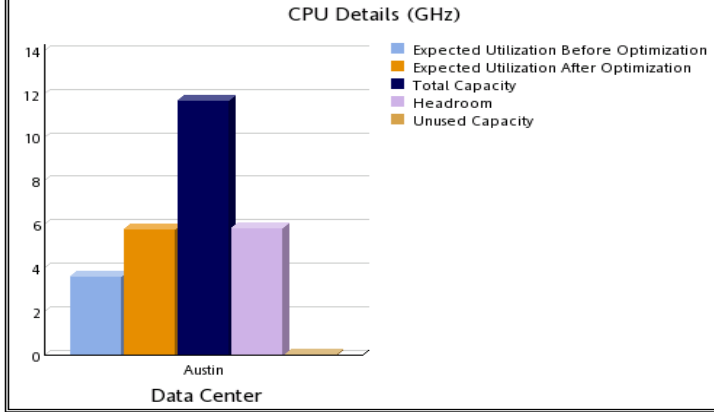
About this report

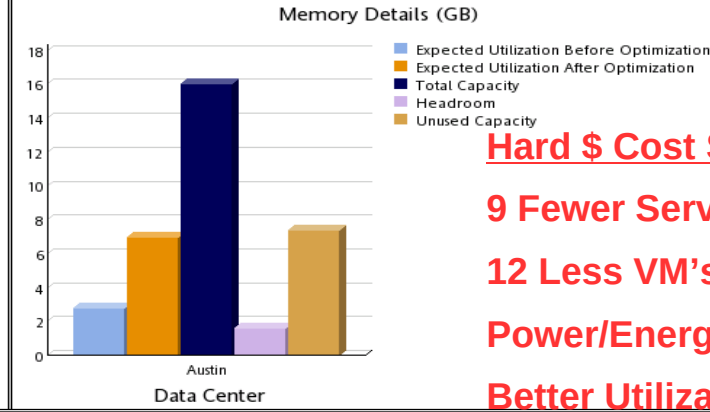
	Current		Recommendation	
Physical Servers	16		7	
Virtual Machines	53		41	
	CPU (GHz)	**Memory (GB)**	**CPU (GHz)**	**Memory (GB)**
Total Capacity	132.32	171.79	109.30	99.81
Total Reservation	2.96	0.00	39.67	58.11
Total Unused Capacity	87.72	163.42	22.13	31.72
Capacity Efficiency Index	95.12		31.78	

Headroom values are not accounted in the summary table capacity calculations.

Detailed Placement

Data Center : Austin — **Capacity Efficiency Index : 46**





Hard $ Cost Savings

9 Fewer Servers Needed

12 Less VM's

Power/Energy Savings

Better Utilization

What If I'm Adding More Load, Can my Environment Handle?

RESOURCES NEEDED FOR ADDITIONAL WORKLOADS - AVERAGE DEPLOYED VM PROFILE

Resource	VM Profile based on average resource used by all VMs on this cluster	Resources Needed by Additional VMs	Available Cluster Capacity(before applying Buffer)	Buffer	Available Cluster Capacity(after applying Buffer)	Capacity Needed
CPU (GHz)	0.235	1.177	44.96	2	42.96	0
Datastore Space Usage (GB)	0	0	211.759	5	206.759	0
Memory Usage (MB)	1,221.087	6,105.433	9,020.455	256	8,764.455	0

Where we are Focusing Analytics Next

The Problem:

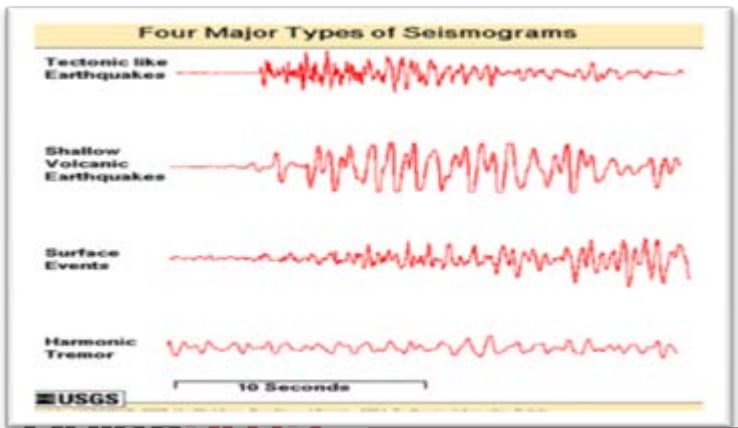
$'s Lost through Service Disruptions which should have been Avoided

- Missed, Misinterpreted or Events Received Too Late
- Many tools but many are Resource/Single Metric Focused (Univariate)
- Not enough time, resources & complete service understanding to correlate completely
- Requires many people & groups to collaborate effectively
- Not Obvious Resource Inter-relationships

Goal – Create a Seismograph for IT

- Predict/Identify Emerging Issues (Early Warning)
- Self Learning – Arbitrary Set of Eyes
- Analyze Performance Data in Real Time
- Identify Metric Inter-relationships
- Hardware Agnostic
- Detect anomalies as they deviate from normal
- Leverage Monitoring Investment, Tivoli & 3rd Party

if the service is down it's already too late...



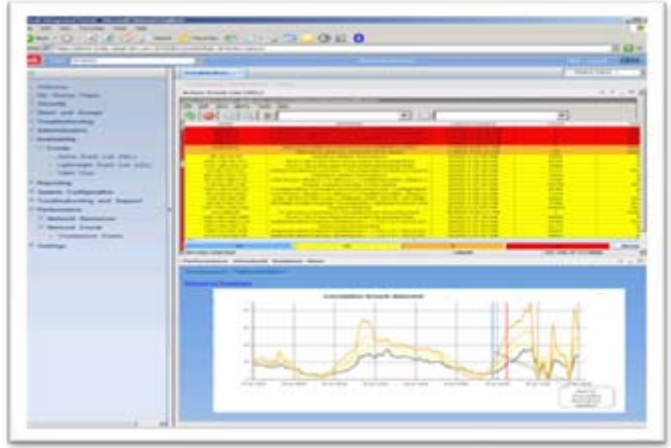
Predict: Eruption forecasting using seismic energy..

How we Solve the Problem!

- Bringing “Watson” Intelligence into your Business

Proactive and self-learning Early Warning Performance/BSM Intelligence

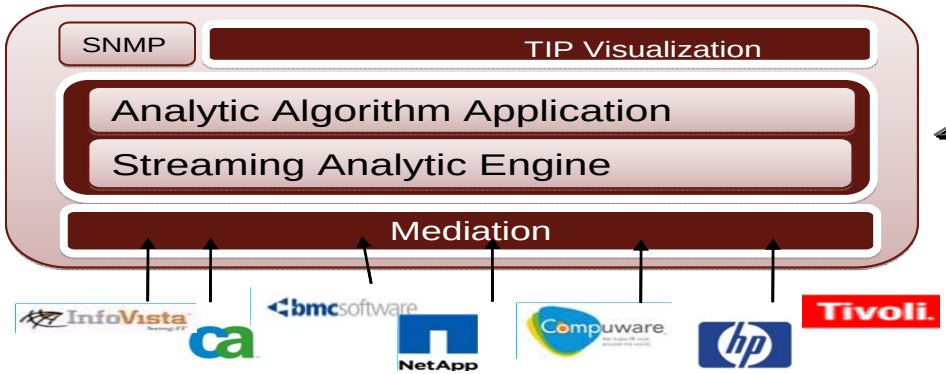
- *Powerful “Watson developed” analytic algorithms, combining uni & multivariate approaches*
- Leverages Performance to Automatically learn normal operational behaviour & how metrics behave together
- Advance Warning/Swifter Diagnosis of Service Impact & Reduces expensive and time consuming false alerts
- Detects service impacts that are not identifiable by fixed thresholds alone.
- Identification of Underlying Root Cause, Better MTTR



Examples of Problems We Solve!
- Bringing "Watson" Intelligence into your Business

- Detecting Memory Leaks
- Environmental conditions affect IT infrastructure
  - So we can move workloads dynamically to safer environments
- Unexpected Multi-Application contention





Raw Performance Data

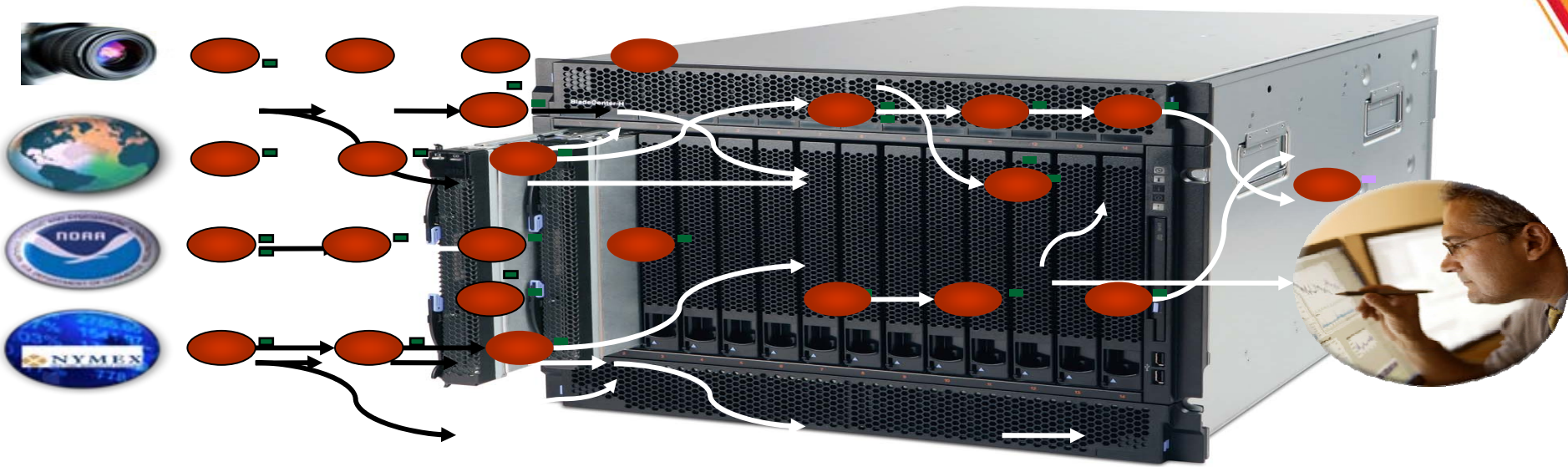
TBSM or 3rd Party BSM

OMNIbus or 3rd Party Event Engine

Event Data

Real-Time Streaming analytics engine

Continuous Ingestion → Continuous Complex Analysis in Microseconds



- Processes millions of events per second with very low latency
- Used in finance, defense, manufacturing, law enforcement, etc.

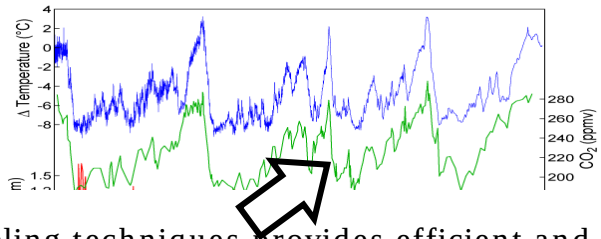
The Brain - Real-Time IT Operational Analytics

- Granger causality
  - First introduced by the Nobel prize winning economist, Clive Granger

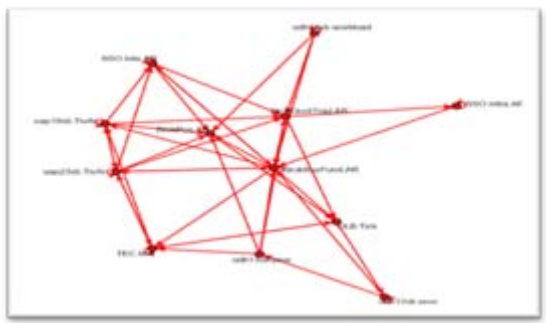
- Definition: a time series x is said to "Granger cause" another time series y, if and only if regressing for y in terms of both past values of y and x (1) is statically significantly better than that of regressing in terms of past values of y only (2)

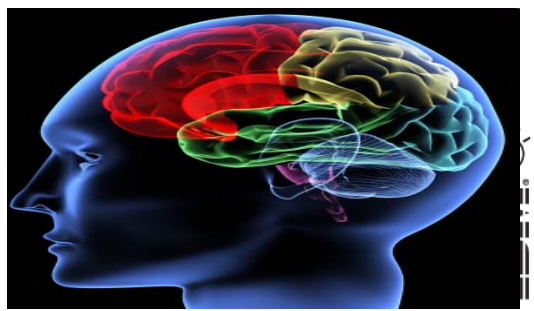
$$y_t \approx A \cdot \vec{y_{t-1}} + B \cdot \vec{x_{t-1}} \qquad (1)$$

$$y_t \approx A \cdot \vec{y_{t-1}} \qquad (2)$$



- Combination of Granger Causality and cutting-edge modeling techniques provides efficient and effective methodology for Granger causal modeling of a large number of time series variables

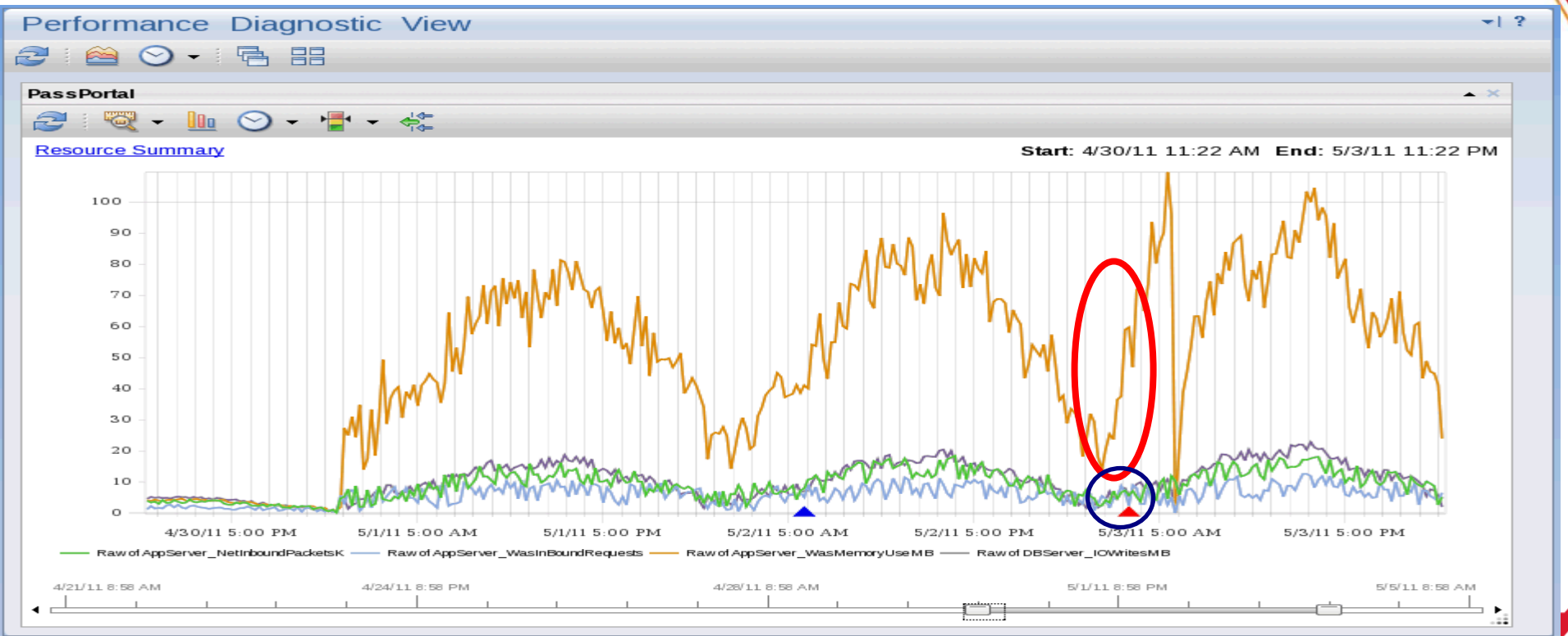




How Multi-Variate Analytics Identifies Early Warning Signs

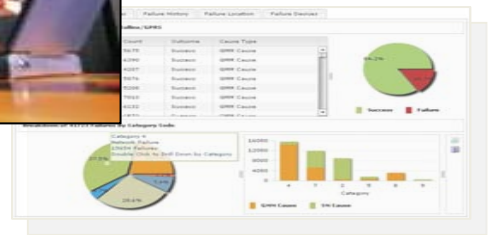
4 metrics learned relationship:

- WAS Appserver Net Inbound Packets
- WAS Appserver Inbound Requests
- WAS Memory Use
- DB Server IO Writes



Replacement of Manual Threshold Management with Automated Analytics.

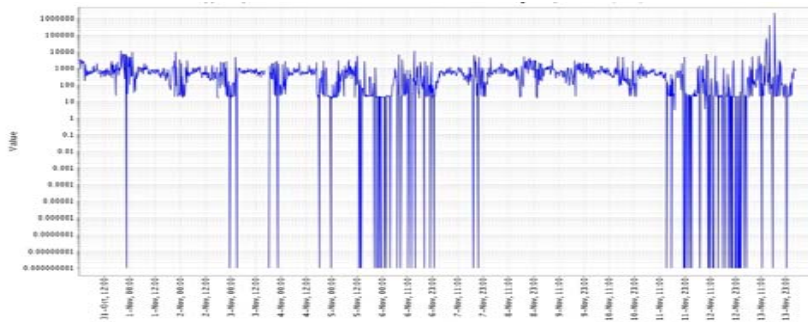
Benefit:
Increased reliability – no more missed problems because a threshold was not set or was set at a suboptimal value



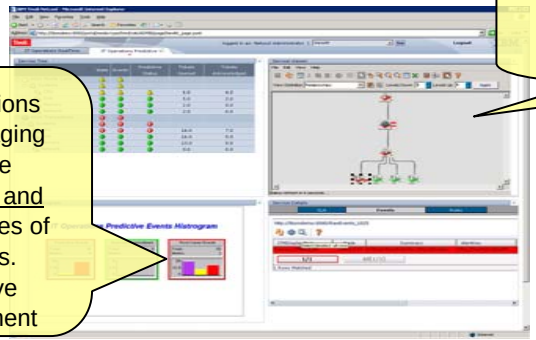
Financial Benefit

Reduced labor/management cost
Reduced number of missed problems

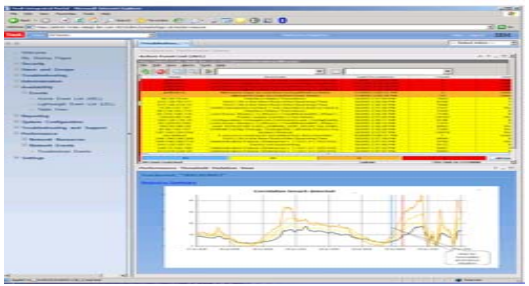
Factors:
- **Number of resources being monitored**
- **Labor costs**
- **Number of problems due to management gaps today**
- **Average revenue loss due to fault**



Visualize Predictive Analytics in Business Context



Integrated Analytics Dashboard



Analytics User Interface

BSM helping further drive IT Operations by aligning Correlated Actual and Predictive States into Business Reprioritized actions

IT Operations now managing from the Predictive and Actual states of Services. Proactive Management

Visualize Results (TBSM)

Add Service and Operations Context (Impact)

Insert anomaly events and their associated KPI relationships

Learn normal behaviour and alert on anomalies (Analytics)

Historical Data

Real-time Data

Topology, Configuration, Fault, Maintenance Data

Tivoli's solutions allows you see anomalous conditions priortized for business impact associated with other environmental data, such as faults, configurations changes, maintenance activities, etc...

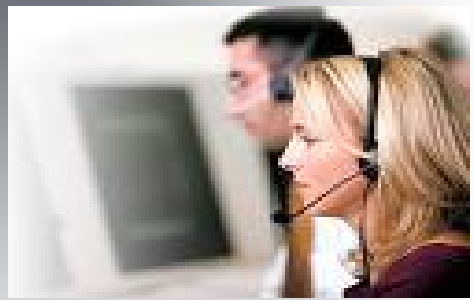
Introducing the
IBM Network Analytics Solution

Provide subscriber, product and network insight throughout the enterprise on a platform that is simple to deploy with a time to value measured in weeks

The Real Value of Customer Insights from Analytics for Telcos

Analytics has the power to transform the Telco industry:

Customer Care And Experience Management



- Customer Retention
- Customer Satisfaction
- Customer Engagement
- Customer Interaction
- Customer Experience Management

Network Prioritisation And Cost Management

- Investment Decisions
- Customer Centre Optimisation
- Network Optimisation

Marketing And Campaign Management

- Customer Lifetime Value
- Campaign Optimisation
- Upsell/Cross Sell Analysis

Analytics to Optimize Energy Management

INFORMATION TECHNOLOGY

FACILITIES & PROPERTY

ASSETS

DISCOVER
Measure, collect, and benchmark energy information to identify opportunities

MANAGE
Monitor, trend, and manage energy to control costs and risks

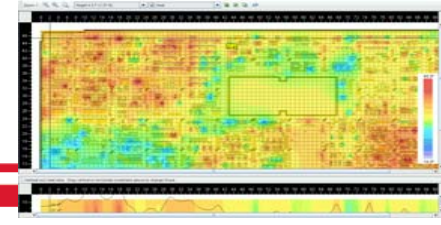
OPTIMIZE
Optimize assets and infrastructure for energy efficiency

REPORT
Track and verify energy efficiency for compliance and stakeholders

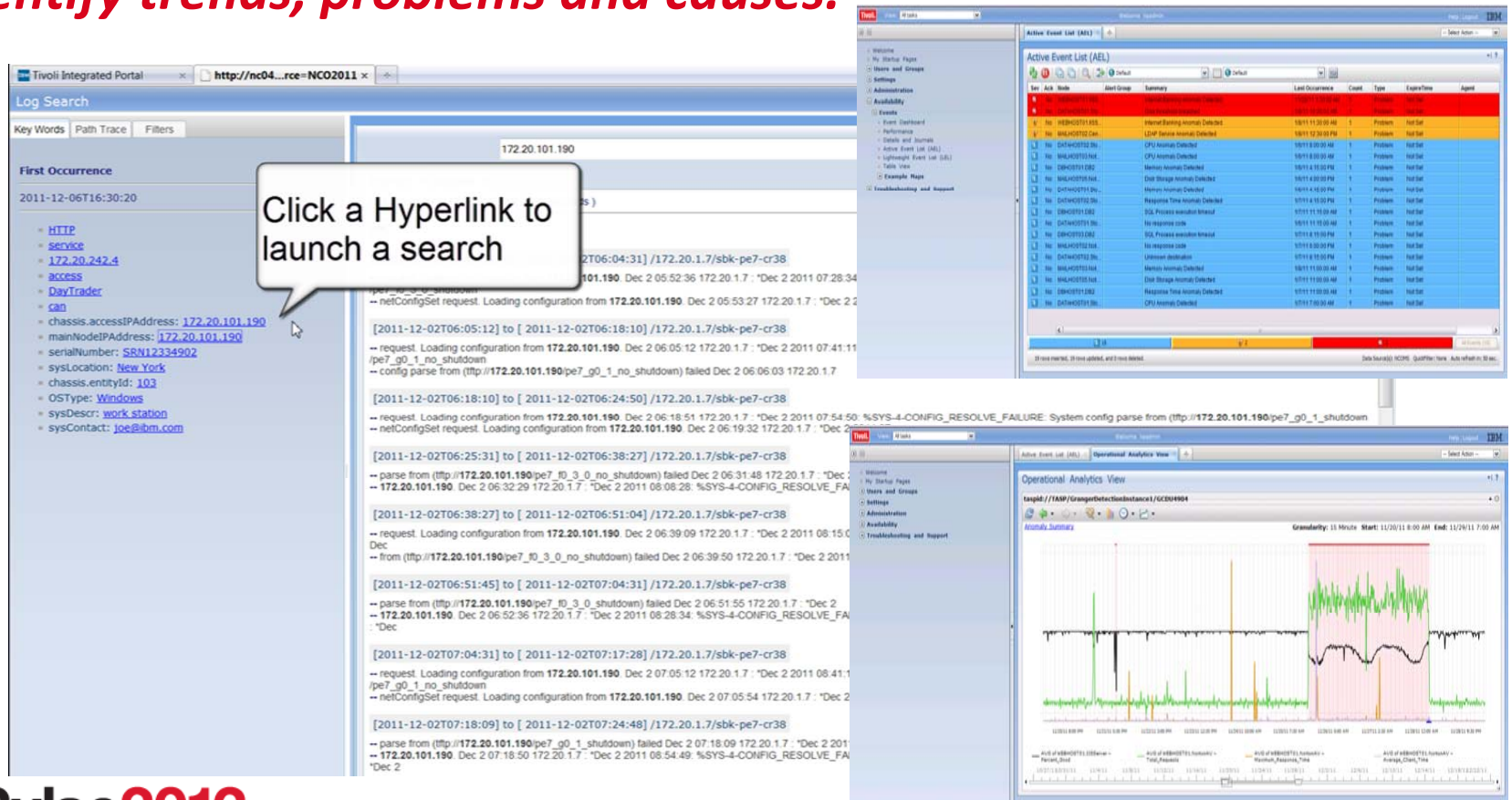
GOALS

- ✓ Cost Reduction & Avoidance
- ✓ Remove Operational Barriers
- ✓ Manage Risk and Streamline Compliance

…yields an efficiency gain of 30% for power & cooling costs alone.



Search and Correlate structured and unstructured data and identify trends, problems and causes.



Summary

- Improve your Critical Decisions with Better Insight by:
  - Avoiding Service Disruptions - by Predicting & Mitigating threats/failures before they happen in realtime dynamic environments
  - Cost Optimization – getting the best use of my environment
  - Making Monitoring Better - Getting the best from your monitoring investments, by detecting emerging problems that would otherwise go missed.
  - Self Learning - Reducing human burden of analyzing large volumes of data in complex environments through self learning automatic analytics.
  - Identifying New Opportunities – driving new revenue, improved campaigns

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