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A Mission-Critical Approach to Managing DB2 in the z Enterprise

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OMEGAMON XE for DB2 Performance Expert on z/OS

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SHARE in Boston

Abstract

- DB2 for z/OS is behind many mission-critical transaction-based applications and data-mining style applications alike. Meeting performance objectives for both may require different approaches but overall enterprise performance objectives can't be compromised. This session explores how to marry different monitoring strategies without managing totally divergent monitoring tool implementations.

- This session will cover transactional-cross-enterprise monitoring; the monitoring and management for mining/warehousing queries that are accelerated through IBM DB2 Analytics Accelerator; and monitoring Stored Procedures to lower the footprint for DRDA apps and even offloading such workloads to zIIPs.

Mission-Critical Monitoring

- Mission-critical refers to any factor of a system (equipment, process, procedure, software, etc.) whose failure will result in the failure of business operations. That is, it is critical to the organization's 'mission‘.

- With today’s “do less with more” mantra, we have time only to focus on elements critical to your business – the “mission-critical” elements.

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Agenda

- Mission-Critical
- Monitoring blueprint
- DB2 for z/OS in the Enterprise
- Advanced techniques for critical components
- Summary, take-aways, and conclusion

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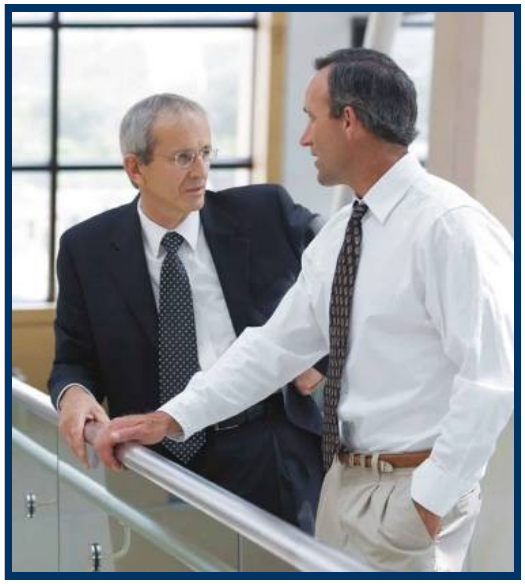
In today's economic environment, clients tell us they face three key demands:

1. Higher service expectations
   - Improve efficiencies across the business
   - Respond to new opportunities quickly
2. Rising cost pressures
   - Shorten ROI and lower costs
   - Add value now!
3. Ever-increasing complexity
   - New technologies, new opportunities
   - Faster rate of change



➢ while acting with a sense of speed and urgency

- A mission-critical approach is the best way to meet these demands

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What is mission-critical to your organization?

- What are today's CIOs charged with?
  - IT's contribution to profit
  - Customer satisfaction
  - Security – protection of your intellectual capital
  - Accuracy – sound business decisions
  - Availability – are the doors open for business?
  - Performance – response time
  - Efficient use of IT resources (ROI)

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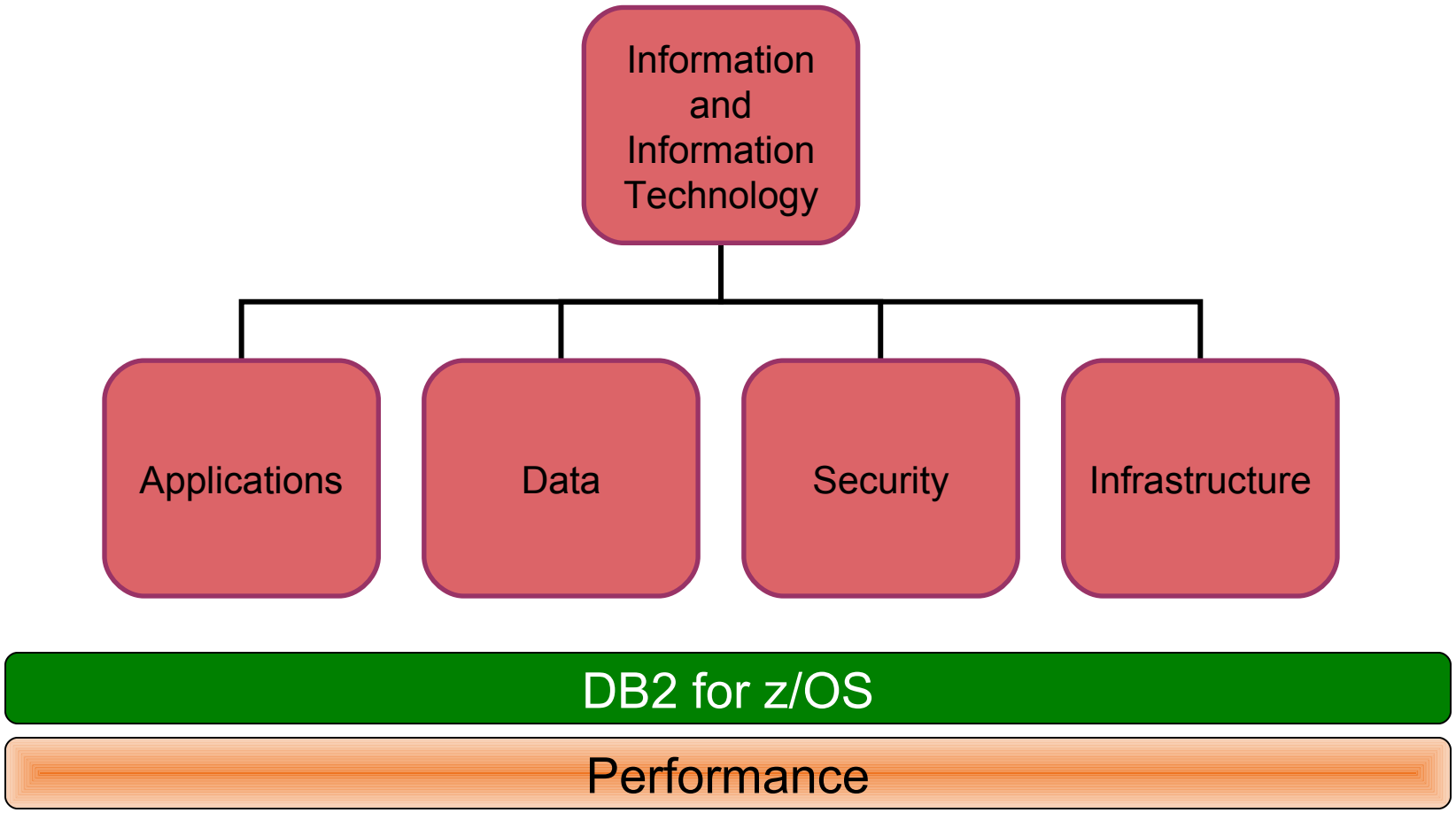
A CIO's org may look roughly like this



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Basics and Best Practices for monitoring Performance

- How can those charged with managing IT's assets contribute to those three key demands?
  - With a low-cost, mission-critical methodology for protecting your investment, focused on:
    - Enterprise health
    - Integrated problem management
    - Support for trend analysis
    - Application lifecycle support
    - Security / Accountability
  - A simple, seamless, executive-level view that
    - Highlights opportunities for improved efficiencies and maximized capacity
    - Ensures the best-possible customer satisfaction

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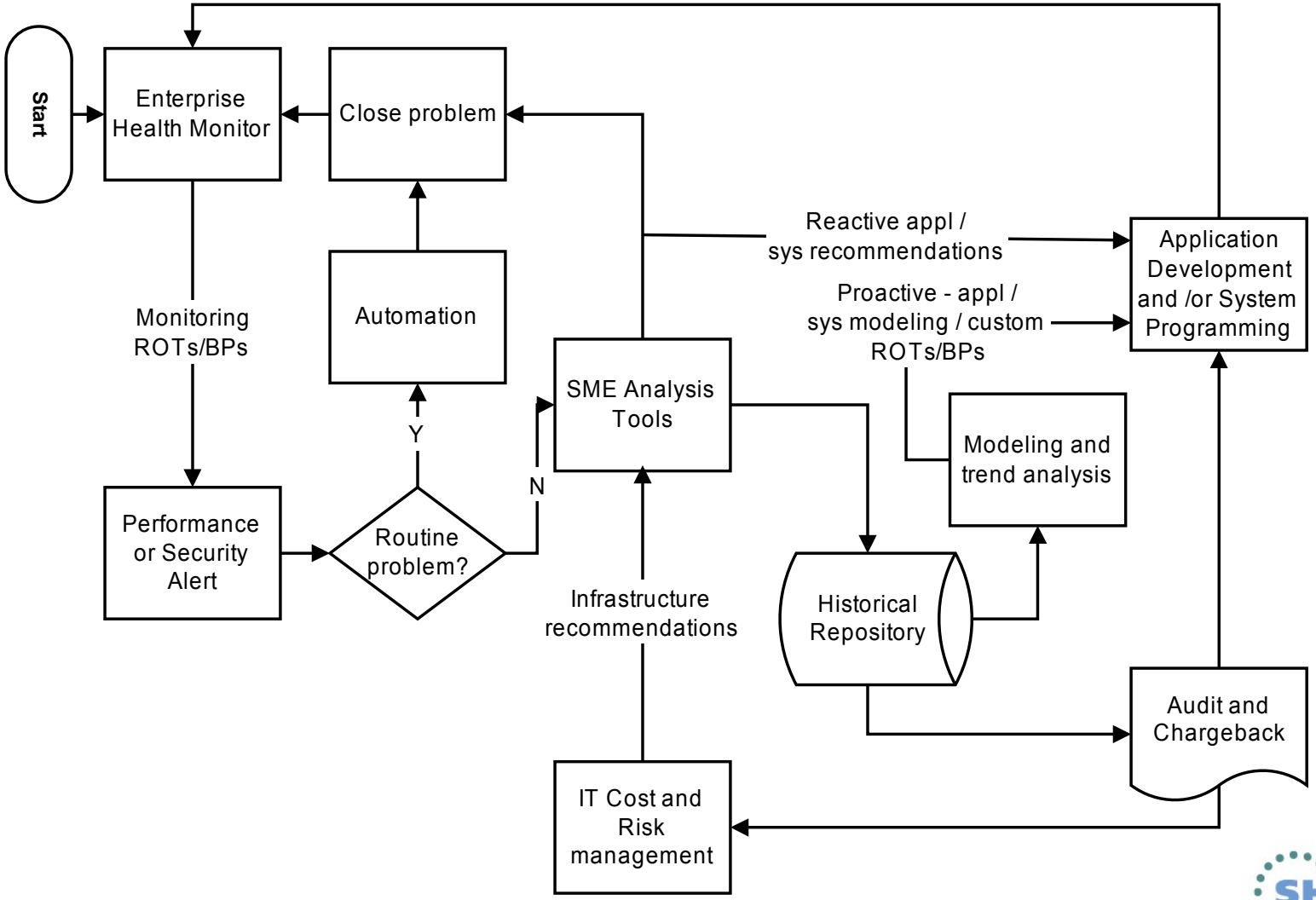
A Best Practice monitoring blueprint proposal



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Monitoring DOs

- FOCUS ON WHAT'S **MISSION-CRITICAL**
  - DO develop and watch **KPIs** (Key Performance Indicators)
  - DO keep a watchful eye on the **end-user experience** – especially external customers
  - DO understand the performance of heavily **reused components**
  - DO monitor your **hardware assists** (zIIPs / zAPPs / Accelerators) and analyze their ROI and capacity
  - DO keep an **historical** performance database
    - And analyze this data on a prescribed basis

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Monitoring DON'Ts

- DON'T over monitor.
  - Avoid unnecessary collection overhead
- DON'T capture and store data you won't use
  - Avoid unnecessary noise and wasted storage

➢ DON'T make your DO list too long

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IBM DB2 for z/OS tools to support mission-critical DB2 application monitoring

- Enterprise Health via the **Tivoli Enterprise Portal** web UI
- Response time monitoring for distributed front-ends with the **Extended Insight** feature from OMEGAMON DB2 Performance Expert
- Ensure peak performance of key business logic components with OMEGAMON DB2's Expert stored procedure analysis and **SQL Dashboard**
- Analytics Accelerator ROI analysis support with OMEGAMON DB2 Performance Expert
- Historical trending support for DB2 via the OMEGAMON DB2 Performance Expert **Performance Database** (PDB)
  - Focused storage management with the **Buffer Pool Analyzer**

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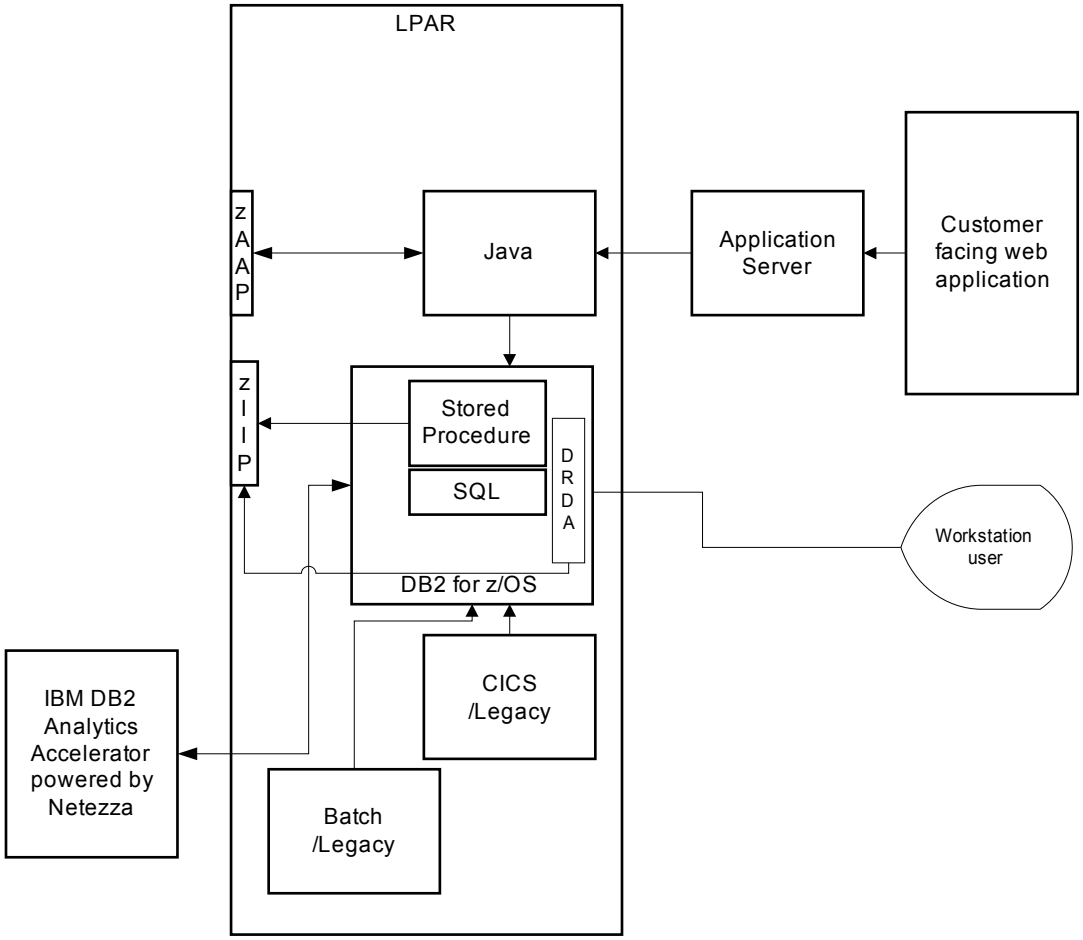
DB2-centric application architecture



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Types of application workload serviced by DB2 for z/OS

- **Transactional** applications require sub-second response time
- **Data-mining** / analysis applications
  - Remember when **hours** used to be acceptable?[1]
- DB2-based **Legacy** "inboard" (or host) applications still drive core business processes that haven't changed for decades
  - Use traditional ways to monitor
- **Distributed** and **web** applications drive the way we deliver value to the consumer and "open" the relationship between consumer and provider
  - Use advanced ways to monitor

[1] **Accelerators** like the **IBM DB2 Analytics Accelerator** support "near-transactional" application performance for "train of thought" analysis on almost incomprehensible volumes of data

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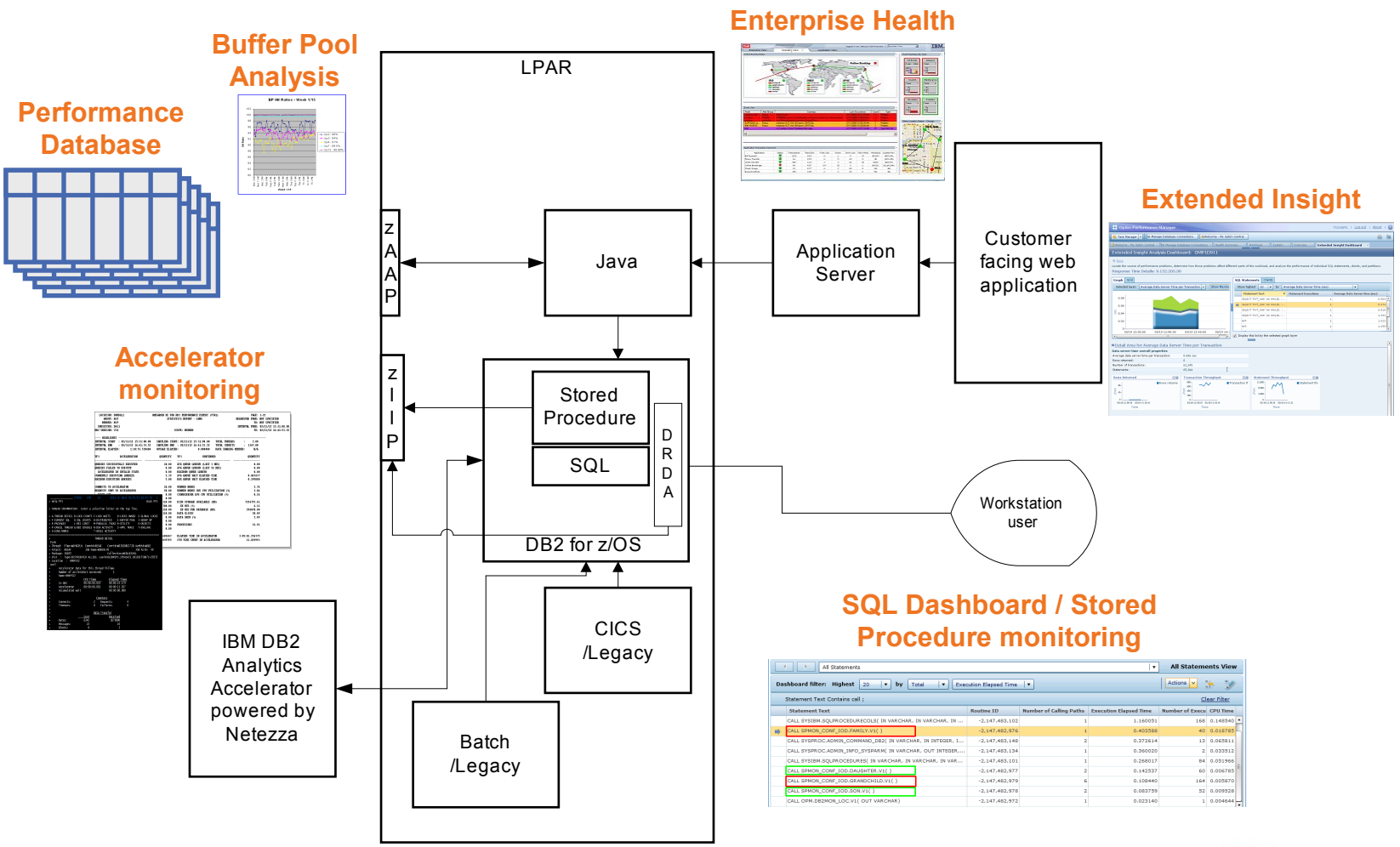
DB2-centric application architecture with mission-critical monitoring overlays



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Enterprise / landscape monitoring

- Tivoli Transaction Tracking and the Enterprise Portal
  - At a glance potential trouble-spot identification
  - Portal to overall enterprise health
  - Alerts and automation
  - Integrated problem ticket management

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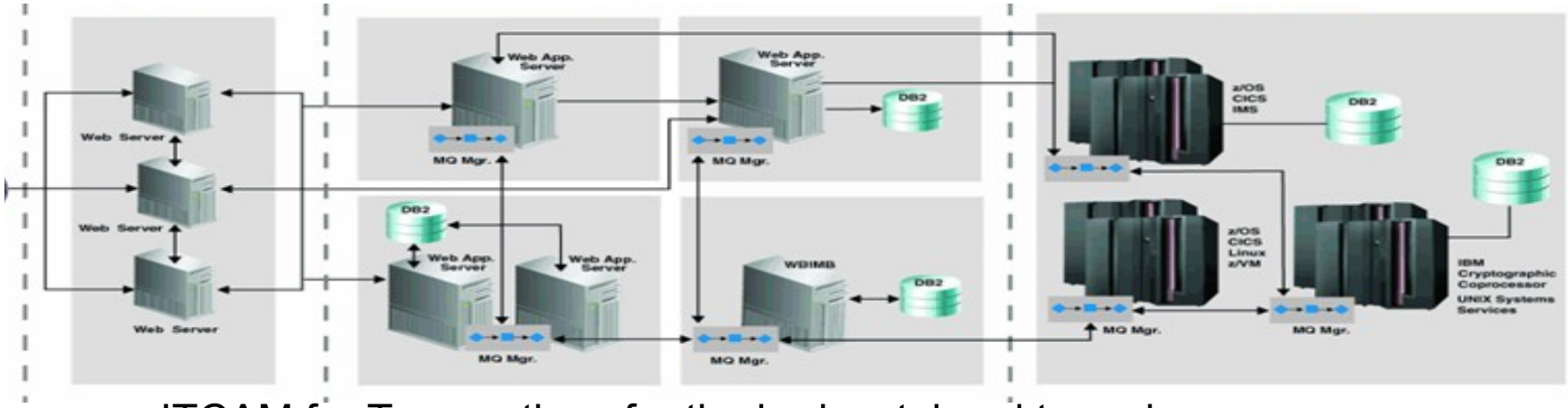
Application Performance Management Workflow ITCAM for Transactions and OMEGAMON

Sense → **Isolate** → **Diagnose** → **Repair**

Sense	Isolate	Diagnose	Repair
Detect that a threshold has been breached and that a problem occurred, or is about to happen	Pinpoint the problem to a specific part of the environment and hand-off to the appropriate specialist	Drill down into the details and get to the root cause of the problem	Fix the faulty component, validate the fix and roll back into production



ITCAM for Transactions for the horizontal end to end

OMEGAMON for vertical deep dive in context

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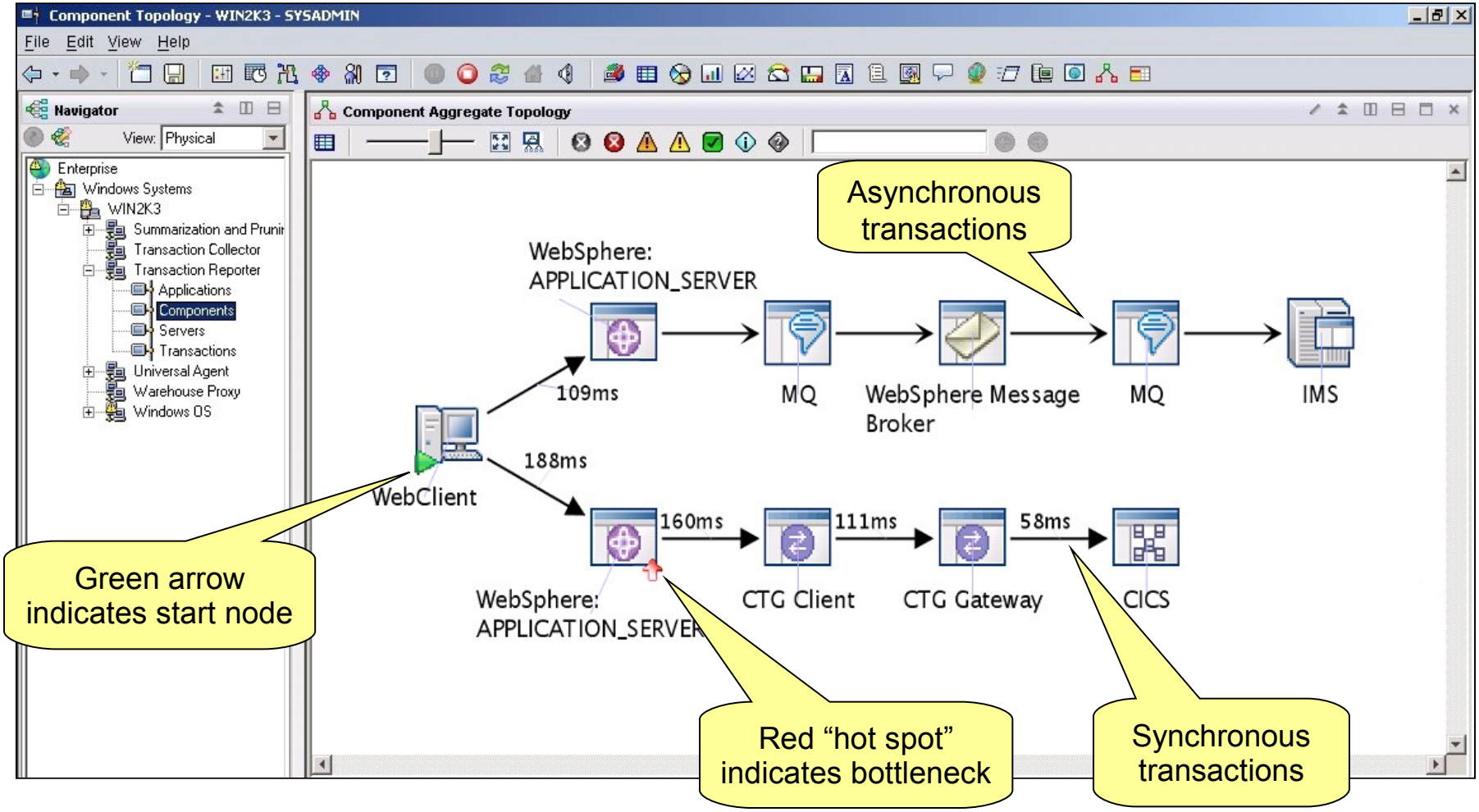
Transaction Tracking Topology



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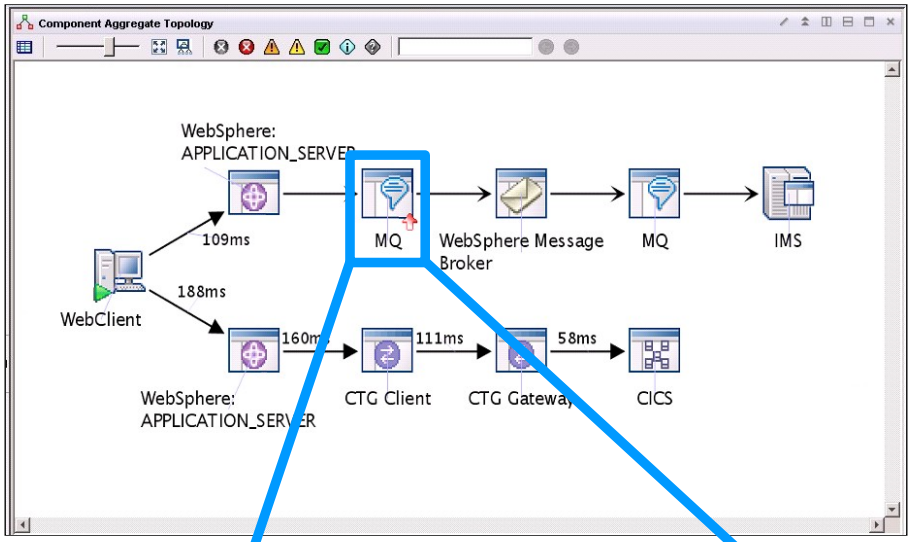
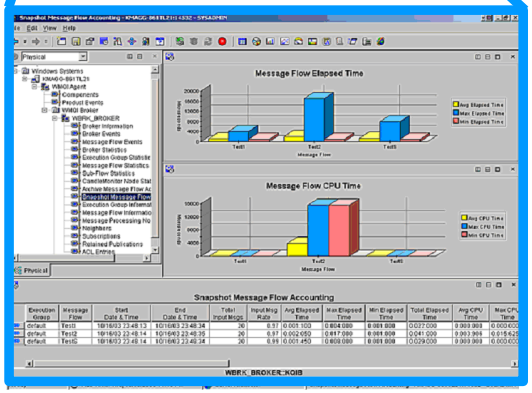
Drill to the next level of detail



ITCAM for Transactions



OMEGAMON XE for Messaging

- Uses Dynamic Workspace Links to launch in context into appropriate SME tool.
- Launch destinations depend on type on data source, e.g.:
  - DB2 => OMEGAMON for DB2
  - MQ => OMEGAMON XE for MSG
  - WAS => ITCAM for WAS
  - CICS => OMEGAMON for CICS
  - IMS => OMEGAMON for IMS
- Where appropriate, will drill down to specific workspace (ie. In MQ, Queue Manager drilldown links to the Queue Manager Status Workspace for the specific Queue Manager).

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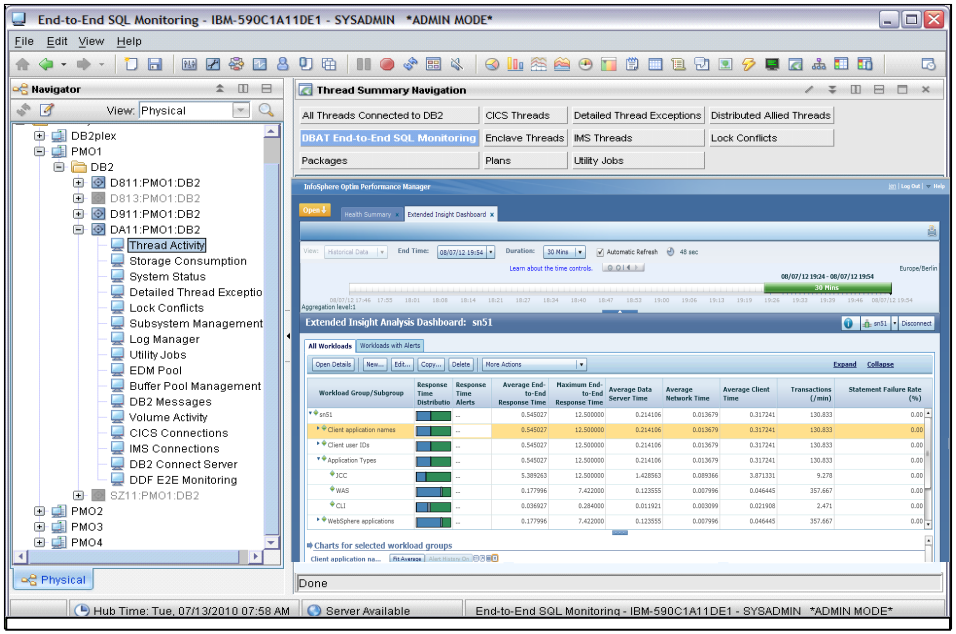
Get an initial look at what's going on behind the scenes

- The physical view provides a combination of out-of-the-box as well as customizable views to focus your team on metrics that are key to operating DB2 for z/OS or any middleware component



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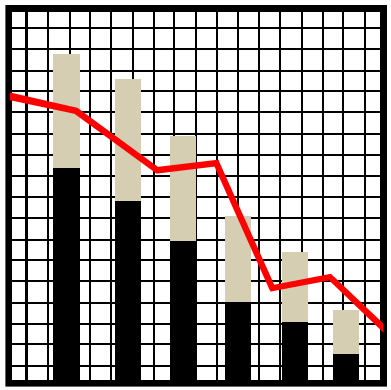
Why is performance critical for your distributed apps?

- Your internal and external customer “self-service” tools coming to DB2 from “distributed” end-points reduce costs to the business plus bring your business closer to your customer
- Web technology provides a portal to “everyone” for personal and sensitive corporate data
- These types of users are accustomed to fast response times. This has to work or - THESE CUSTOMERS WILL WALK



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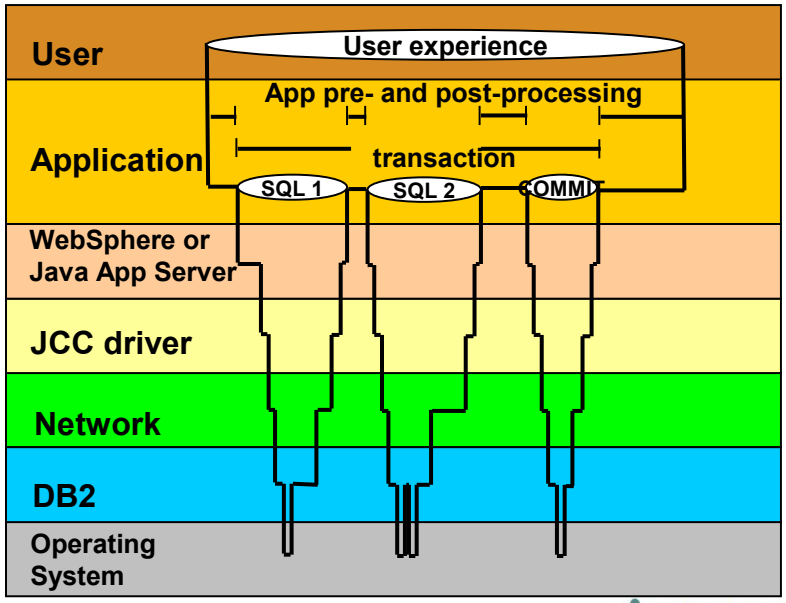
Where's my DB2 application spending its time?

- **OMEGAMON XE for DB2 PE's Extended Insight** is an advanced way to monitor the database workload (SQL) of your applications and solutions
  - Get total response times and response time breakdown (appl, driver, network, data server) per defined workload/cluster (e.g. per system, application, user)
  - Compare workload from various servers / applications
  - Select a time period for analysis
  - Get top SQL statements per defined workload
  - Identify top clients contributing in the workload



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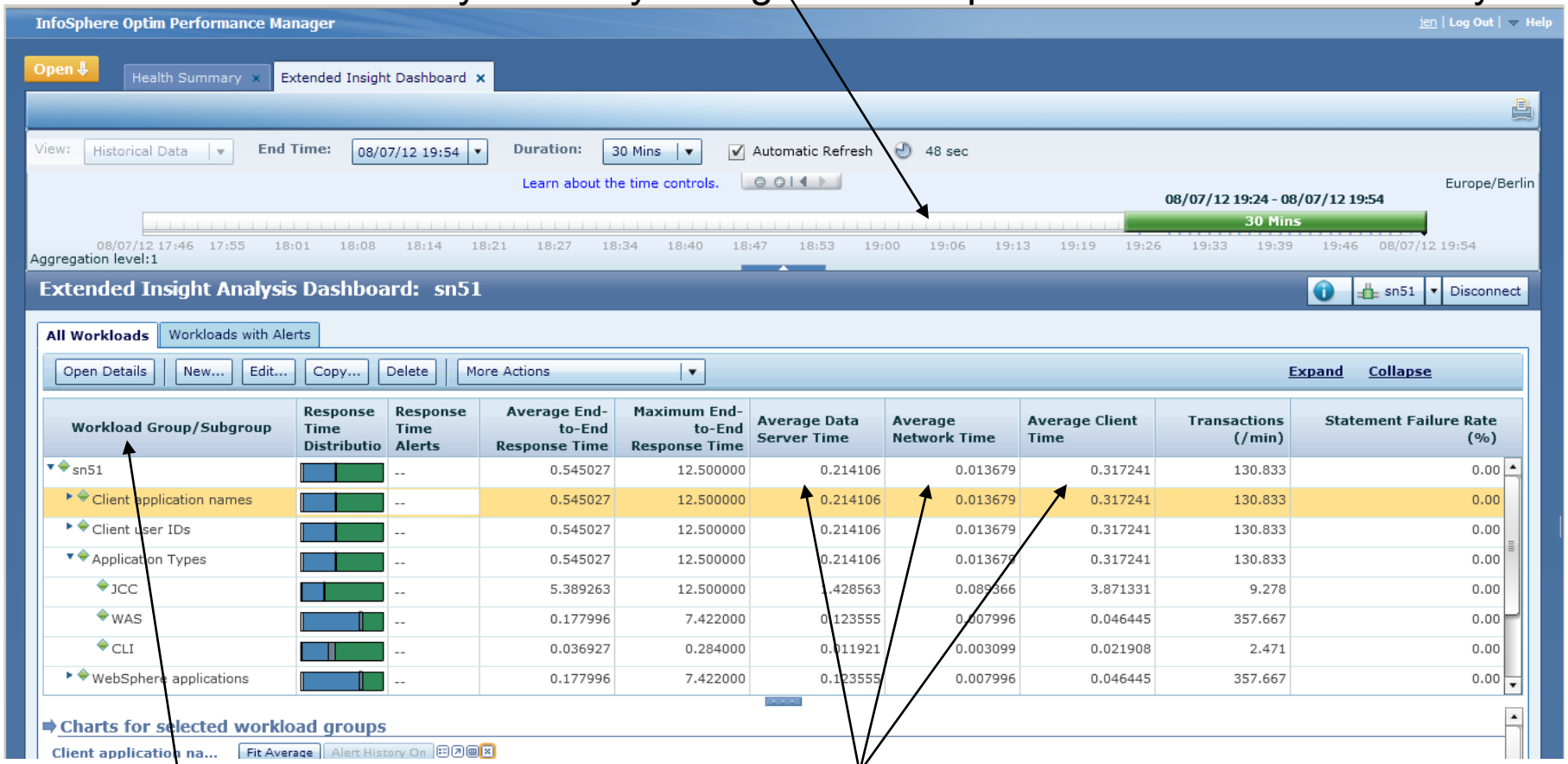
Extended Insight Analysis Dashboard

Dynamically change the time period and duration for analysis



Compare response time break down for different workloads

Workload Clusters represent client applications (pre-defined or custom)

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Extended Insight Feature summary

- An advanced way to monitor the DB2 for z/OS database workload (SQL) of your distributed applications and solutions
  - Get response times and time breakdown (appl, driver, network, data server) per defined workload/cluster, e.g. per system, per application, per user
  - Easily understood user interface using generic application terminology

If it's not DB2, as a DBA you're done!

If it is DB2…

- Get top SQL statements per defined workload
- Identify top clients contributing in the workload
- Optionally, launch and integrate with:
  - Optim Query Workload Tuner
  - IBM pureQuery
  - ITCAM for WebSphere applications accessing DB2 via JDBC
  - Optim Configuration Manager

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Application architecture creates opportunity and risk

- Reuse makes a lot of sense – economically and for quality
- Centralization of program logic to centers of competency should ensure accuracy
- Centralization may also create single points of failure and / or bottlenecks

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What is a stored procedure?

- A user-written program that can be called by an application with an SQL CALL statement.
- A compiled program that is stored at a DB2 server
- Can execute business logic and SQL statements
- Can call another stored procedure
- Stored procedure types:
  - External high level language procedures COBOL, PL/I, C, C++, Assembler, REXX, and Java
  - External SQL procedures
  - Native SQL procedures introduced by DB2 9 for z/OS

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Why are application programmers using Stored Procedures?

- Modularity in application development
- Data will be processed always in a consistent way according to the rules defined in the stored procedure
- Improved application security
- Reusability
- Application integration solutions / Enforcement of business rules
- Reduced network traffic for distributed applications
- Cost of ownership reduction → zAAP and zIIP exploitation for SPs written in Java and Native SPs

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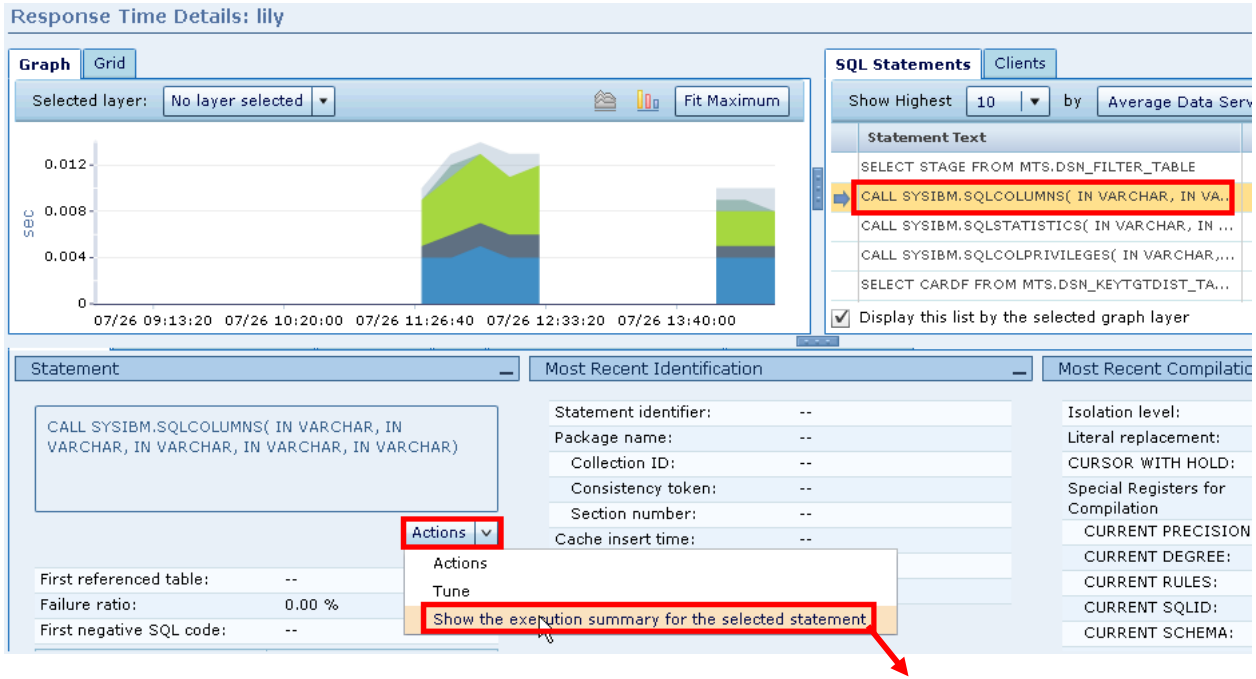
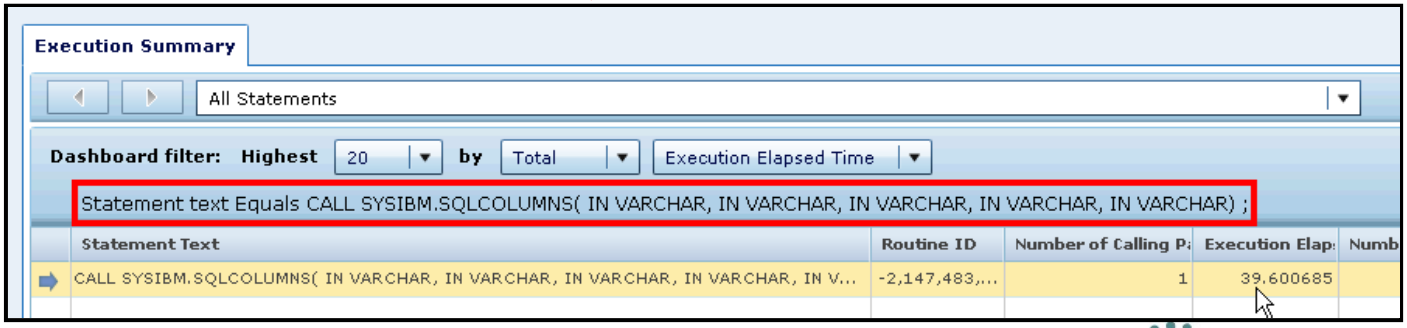
Stored procedure monitoring in the OMEGAMON DB2 PE “SQL Dashboard”





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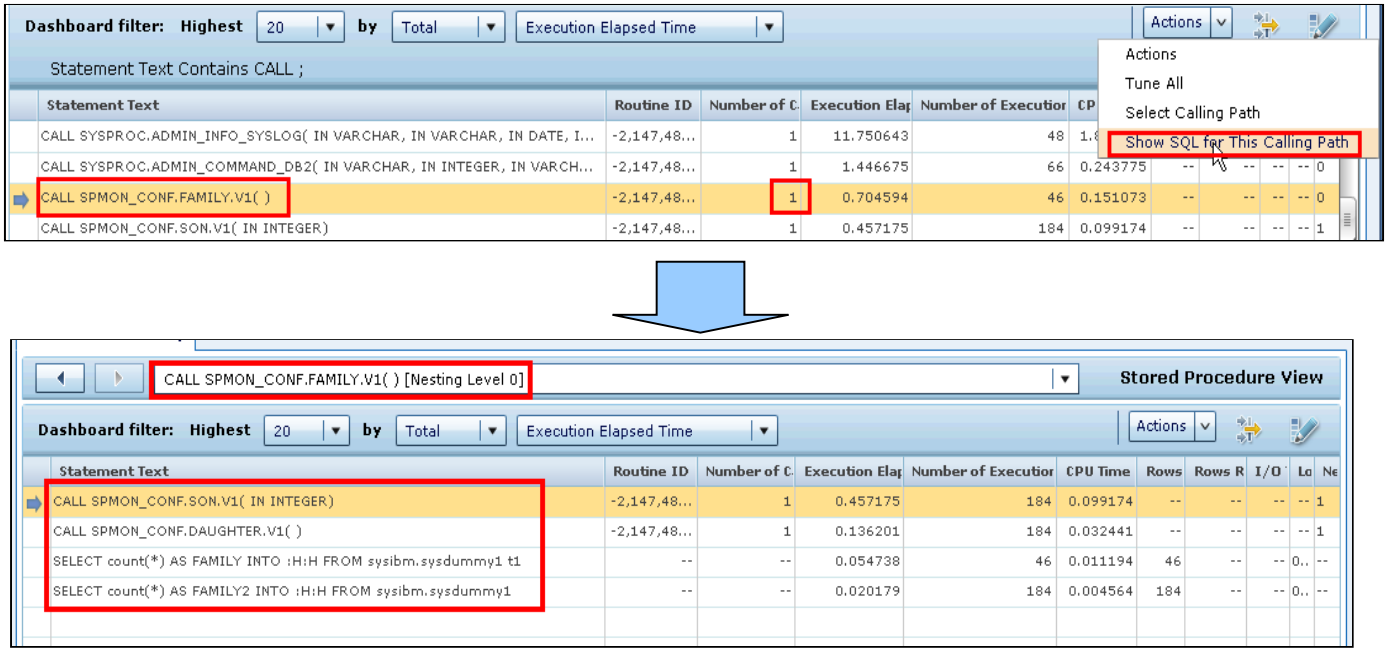
Drill into the SQL executed by the SP



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Stored procedures – mission-critical application design technique

- Many-to-many relationships between applications
- Have the potential to be reused millions of times daily

➢ A key tuning opportunity

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Analytics for a significant competitive edge

- Mission-critical analytics can be data intensive analytics but are crucial to translating data into a competitive advantage
  - Organizations are using analytics to outperform their competition
  - More users across the organization want access to business critical analytics applications
  - Business critical analytic applications **demand low latency, high qualities of service and performance**
- The IBM DB2 Analytics Accelerator delivers the competitive edge for “train of thought” analysis

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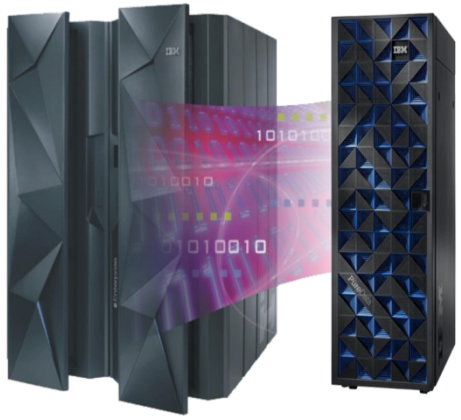
The IBM DB2 Analytics Accelerator

- What is it?
  - A high performance appliance that integrates Netezza technology with zEnterprise technology, to deliver dramatically faster business analysis
- What does it do?
  - Speed up complex queries up to 2000x
  - Lowers the cost of long term storage
  - Minimizes latency of data
  - Improves security and reduces risk
  - Complements existing investments



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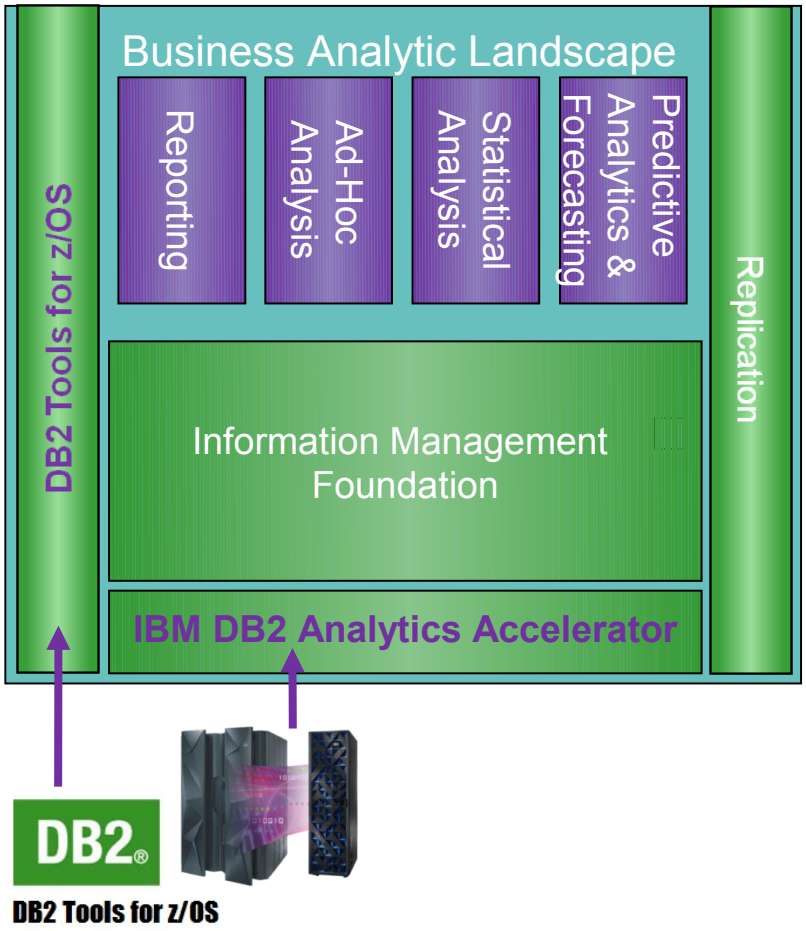
The role of DB2 Tools and the Analytics Accelerator

- DB2 Analytics Accelerator
  - Integrates **Netezza** technology with **zEnterprise** technology to deliver dramatically faster query acceleration
- DB2 Tools for z/OS
  - Help optimize and manage accelerated analytic queries and applications



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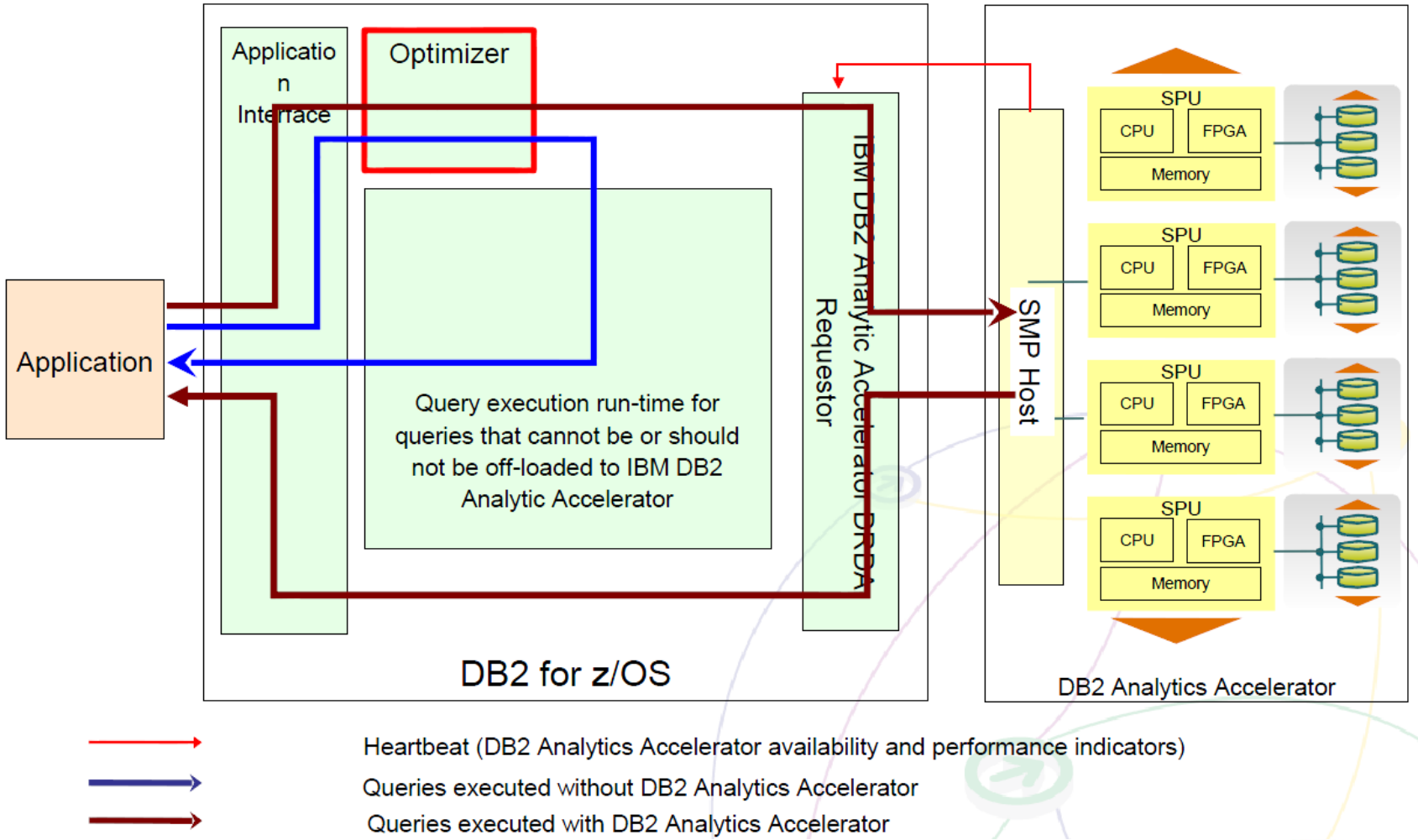
Query Execution Process Flow



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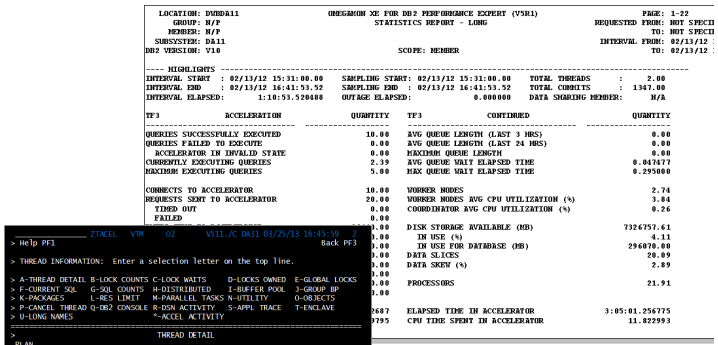
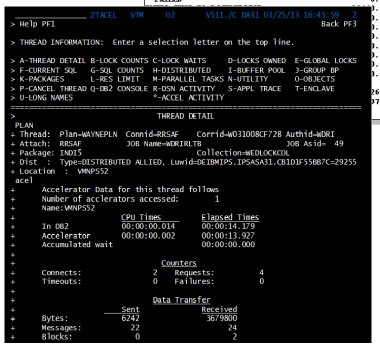
Understand the IBM DB2 Analytics Accelerator with OMEGAMON DB2 Performance Expert

- Understand appliance utilization and what other opportunities may exist to maximize ROI
- Immediate feedback on accelerated query performance via online monitoring
- Detailed performance measurements via online and comprehensive batch reporting of the accelerator and its applications
- Analyze performance trends with accelerator specific performance metrics saved to a performance database
- Chargeback reporting for usage accountability

Statistics batch report showing Accelerator performance metrics





Real time display of a thread with accelerated queries

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Historical analysis

- Background capture of performance data for post-analysis is a mission-critical monitoring technique

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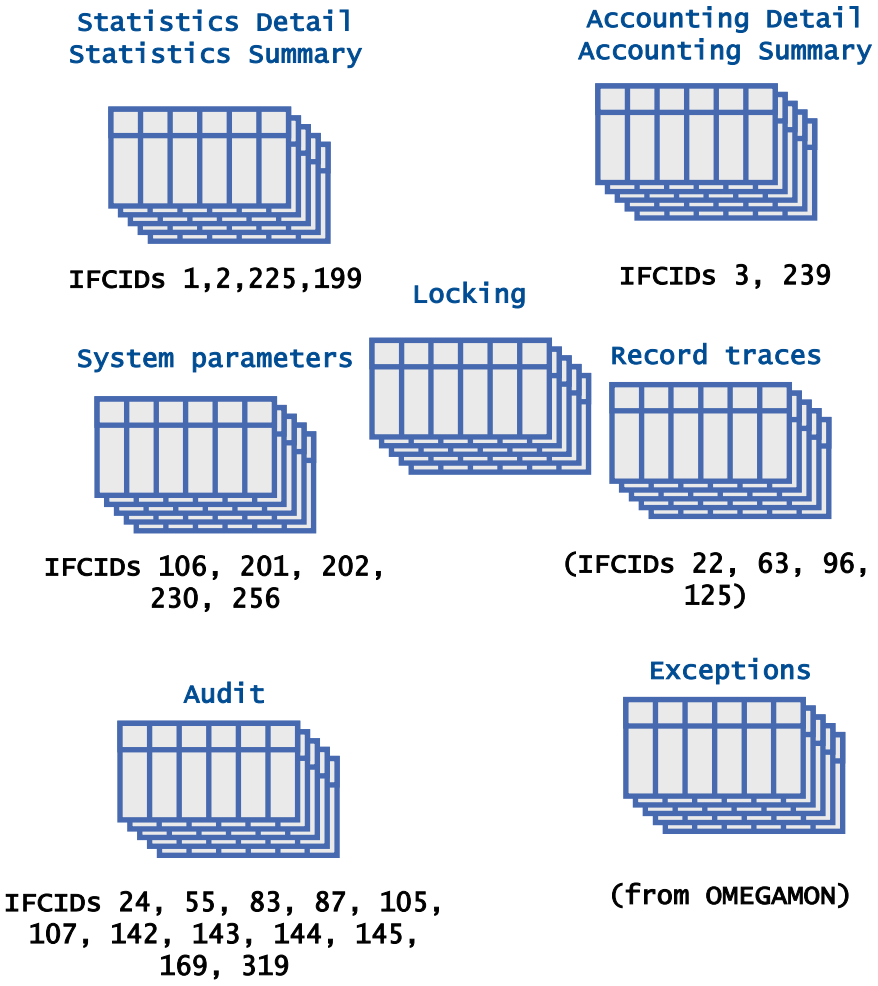
The historical performance database – Analyze Trends and Plan for the Future



- Why a performance database?
  - Can help determine if DB2 is being a good z/OS neighbor
  - Identify good and bad application and DB2 system trends
  - Use to compare application performance before and after changes
  - Can help identify patterns regarding security

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Some key performance queries using the PDB

- **Deadlock / timeout trending:**
  - Provides an overall summary of locking issues
  - Provides insight into tablespace hot-spots
- **Perform Lock Analysis to:**
  - Identify those applications that are most likely to have the largest number of deadlocks / timeouts
  - Use the lock rate to determine if the GBPs are appropriately sized
- **GETPAGE / CPU analysis provides us:**
  - Two primary vehicles for reducing application CPU usage and improving efficiency and elapsed times
- **Accelerator analysis**
  - Compare application performance pre and post acceleration
- **Exception scenarios**
  - Queuing is an indicator of resource constraints
  - Failures are a pre-cursor to major application performance issues / DB2 system issues
- **STC monitoring:**
  - Provides a summary view of the overall system health
  - Monitor trends to see if ZPARMS / application need to be tuned

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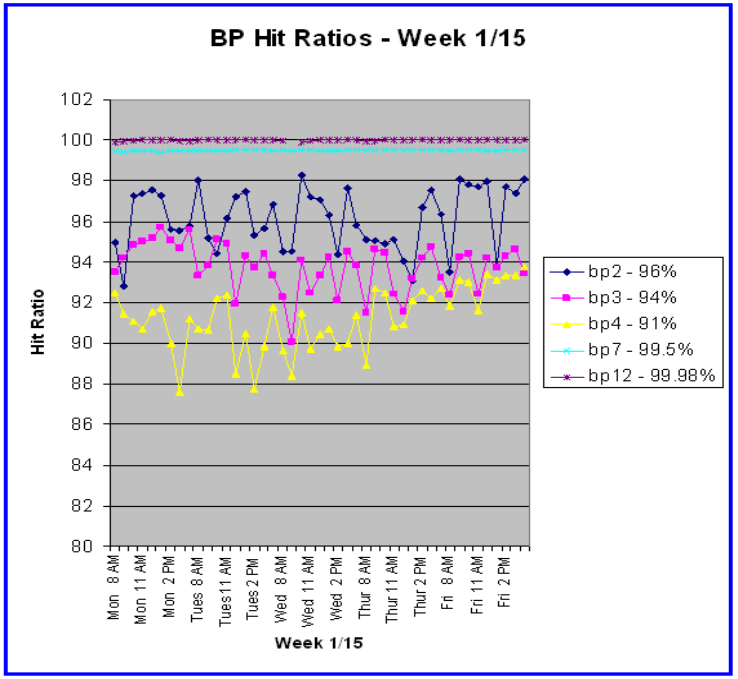
Buffer pool / storage management with the PDB and Buffer Pool Analyzer

- Buffer Pool Tuning
  - **Information gathering:** Gather the buffer pool hit ratios and DB2 elapsed time for production applications.
  - **Frequency**: Could be collected weekly and plotted in spreadsheet graphing tools for week to week comparison.
  - **Buffer Pool Analysis:** Use IBM Buffer Pool Analyzer (BPA) to simulate moving objects to different buffer pools and change buffer pool sizes.
  - **Effectiveness:** The Performance database provides the flexibility to make changes to the buffer pools and then compare the effect of these changes from week to week.



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Use the Performance Database to…

- Pro-actively identify potential application performance problems
- Effectively forecast and monitor application CPU and transaction growth rates
- Identify and assess the impact of application changes

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Where does the rest fit?

- Everyday spot checking
- Daily customer-support troubleshooting
- Experience and expertise-based monitoring and analysis practices

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Hardware and software are perfect and never need tuning

- So why monitor?
  - Monitoring is a good and necessary management technique
- Your business is built on applications that are critical to staying competitive and in business
  - These applications are a significant investment
  - The middleware to run them is a significant investment as well
  - Can you afford not to keep a watchful eye on them?

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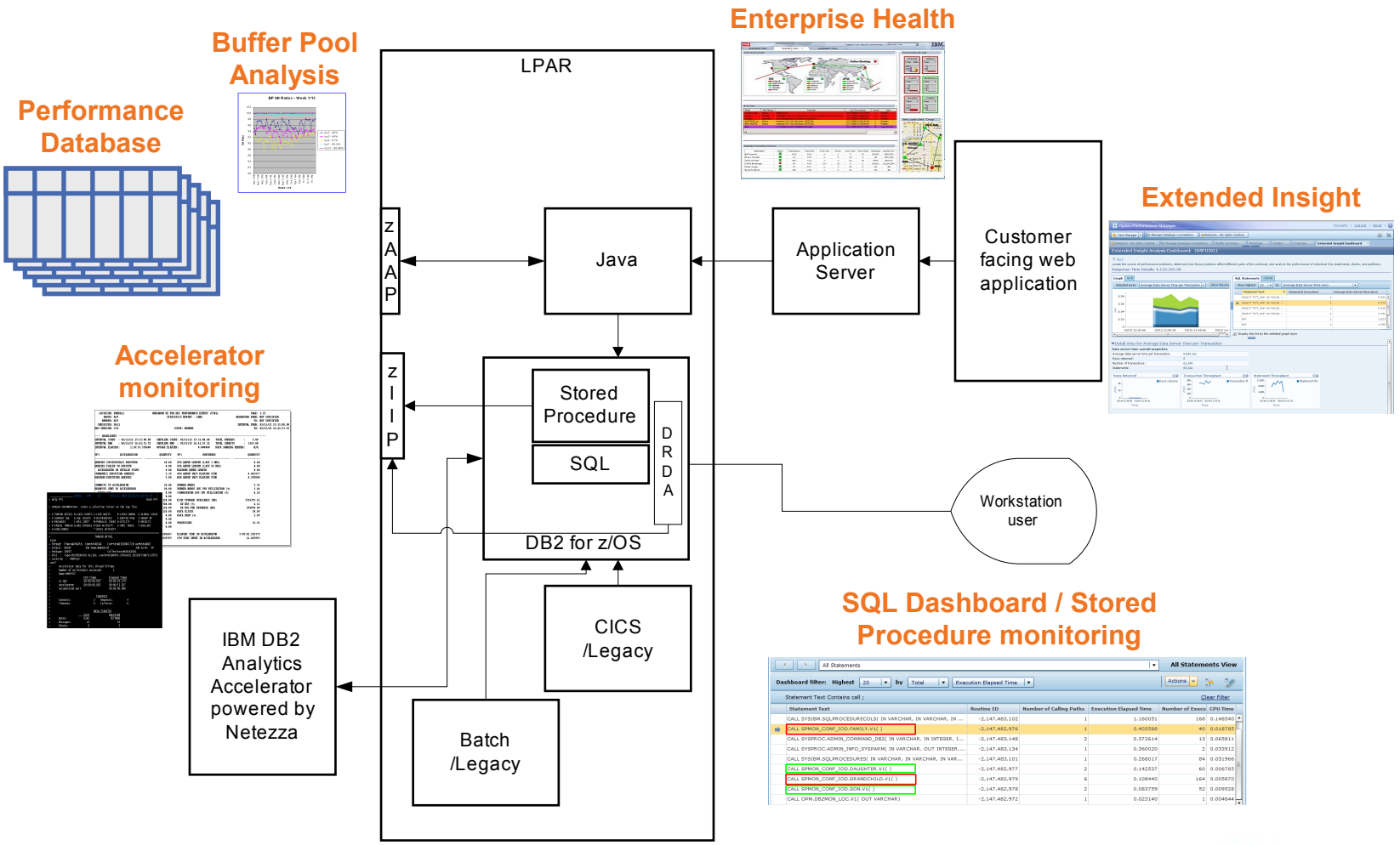
DB2-centric application architecture with mission-critical monitoring overlays



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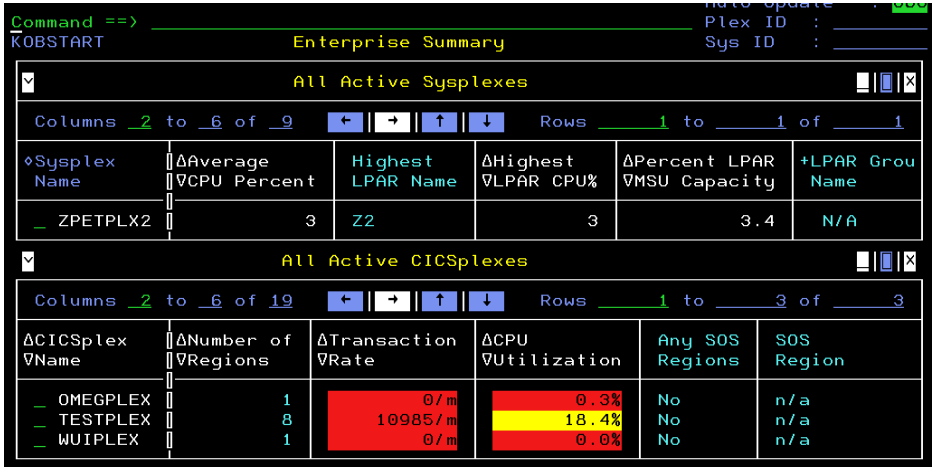
Mission-critical DB2 for z/OS application elements to monitor

- Overall enterprise health
- End-user response time satisfaction
- SQL and Stored procedures
- Query Acceleration
- Performance Analysis support
  - Storage usage (buffer pool analysis)



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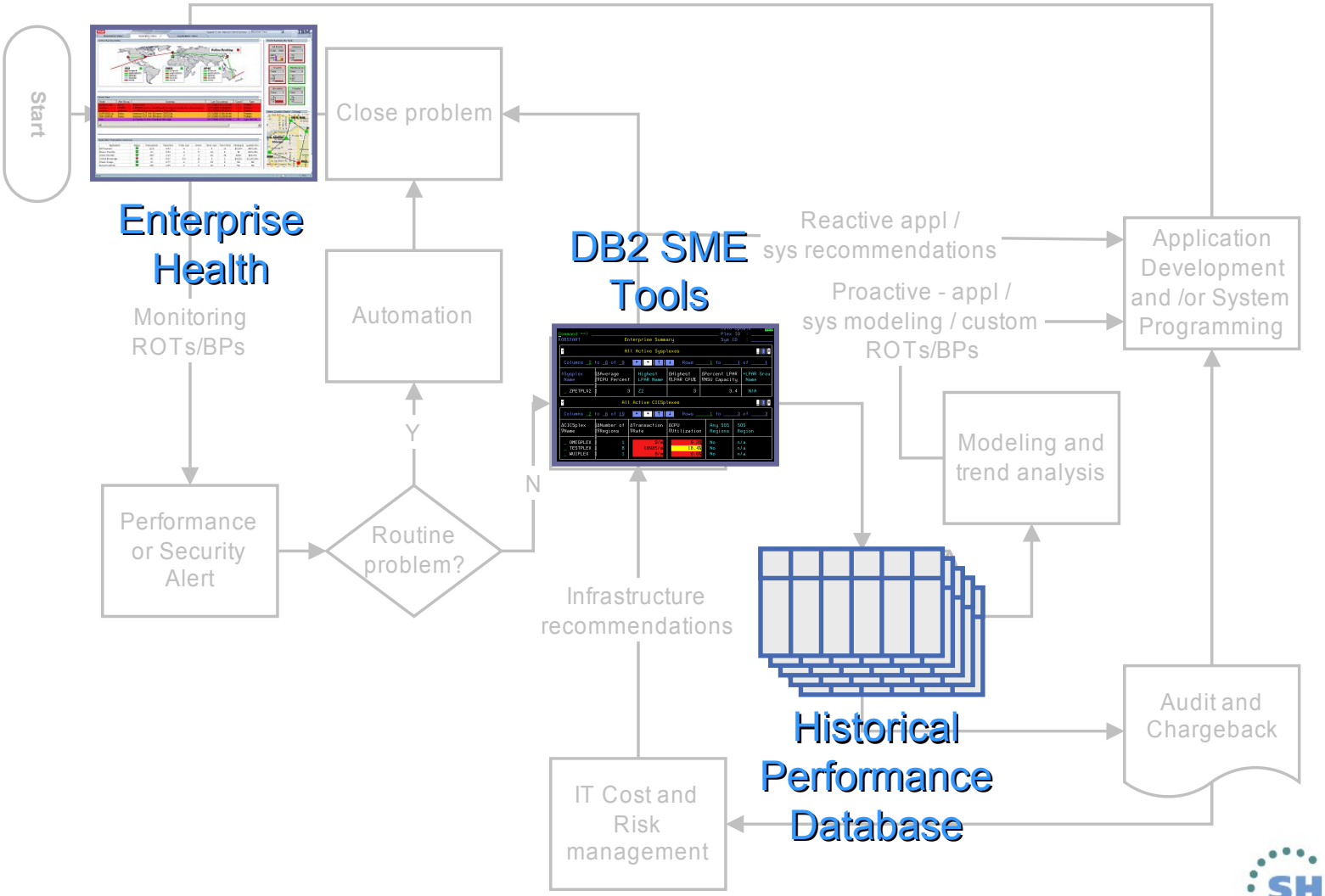
A Best Practice monitoring blueprint proposal



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Conclusion and Takeaways

- You don't need nor want complex methods to ensure your mission-critical IT assets are safe and sound
  - Take a "less-is-more" approach
- Integrate Expert Tools for what's mission-critical in your enterprise
- A focused, low-cost monitoring approach will enable IT to support corporate objectives by ensuring systems deliver on:
  - Customer satisfaction
  - Security
  - Accuracy
  - Availability
  - Speed
  - Return on Investment

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OMEGAMON delivers mission-critical monitoring

Challenge

- Expanding growth of applications accessing DB2 for z/OS from distributed platforms
- Lack of visibility and understanding of how different segments of transactions affected response time
- Rising levels of dynamic SQL suspected of increasing response time
- Challenged in managing performance trends from a historic perspective

Solution

- IBM Tivoli OMEGAMON XE for DB2 Performance Expert on z/OS
- IBM DB2 10 for z/OS

Business Benefits

- Lowered CPU requirements by up to 15 percent, resulting in lower overall software costs
- New insights through increased response time visibility enabling the optimization of execution parameters of a variety of transactions
- Enhanced knowledge of performance rates of dynamic SQL as well as transaction consumption rates within their web application server
- Enhanced capacity planning and trend analysis capabilities via historical performance tracking

"By improving the performance and efficiency of the Kela database processing capabilities, we're now better able to meet the growing demand for social services among our main constituency, the citizens of Finland."

Jarmo Männikkö, Database Senior System Programmer, Kela

Complete your sessions evaluation online at SHARE.org/BostonEval

Thank you!

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