



G07

Introduction to Autonomic Computing

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IBM Design Center for e-business on demand

zSeries Expo

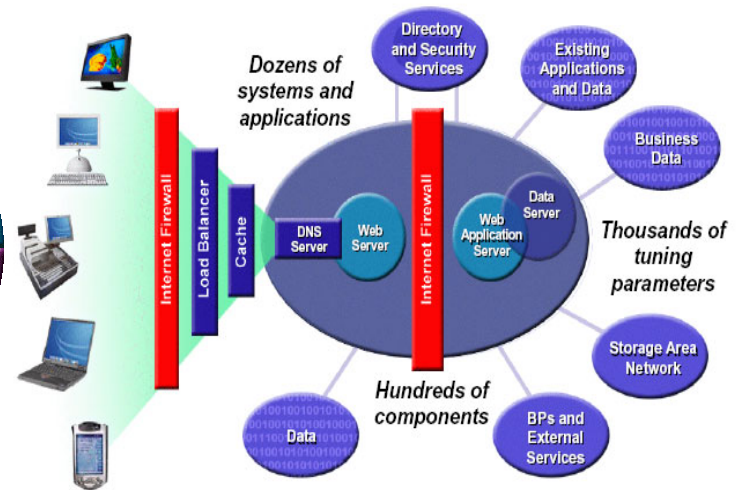
Nov. 1 - 5, 2004

Miami, FL



Autonomic Computing Is

A continuously evolving and dynamic state that establishes the correct balance between what is managed by a person and what is managed by the system



Focus on business, not infrastructure

Self-managing Systems

Self-managing systems that deliver:

**Increased
Responsiveness**

Adapt to dynamically
changing environments

Business Resiliency

Discover, diagnose,
and act to prevent
disruptions



**Operational
Efficiency**

Tune resources and
balance workloads to
maximize use of IT
resources

**Secure Information
and Resources**

Anticipate, detect,
identify, and protect
against attacks

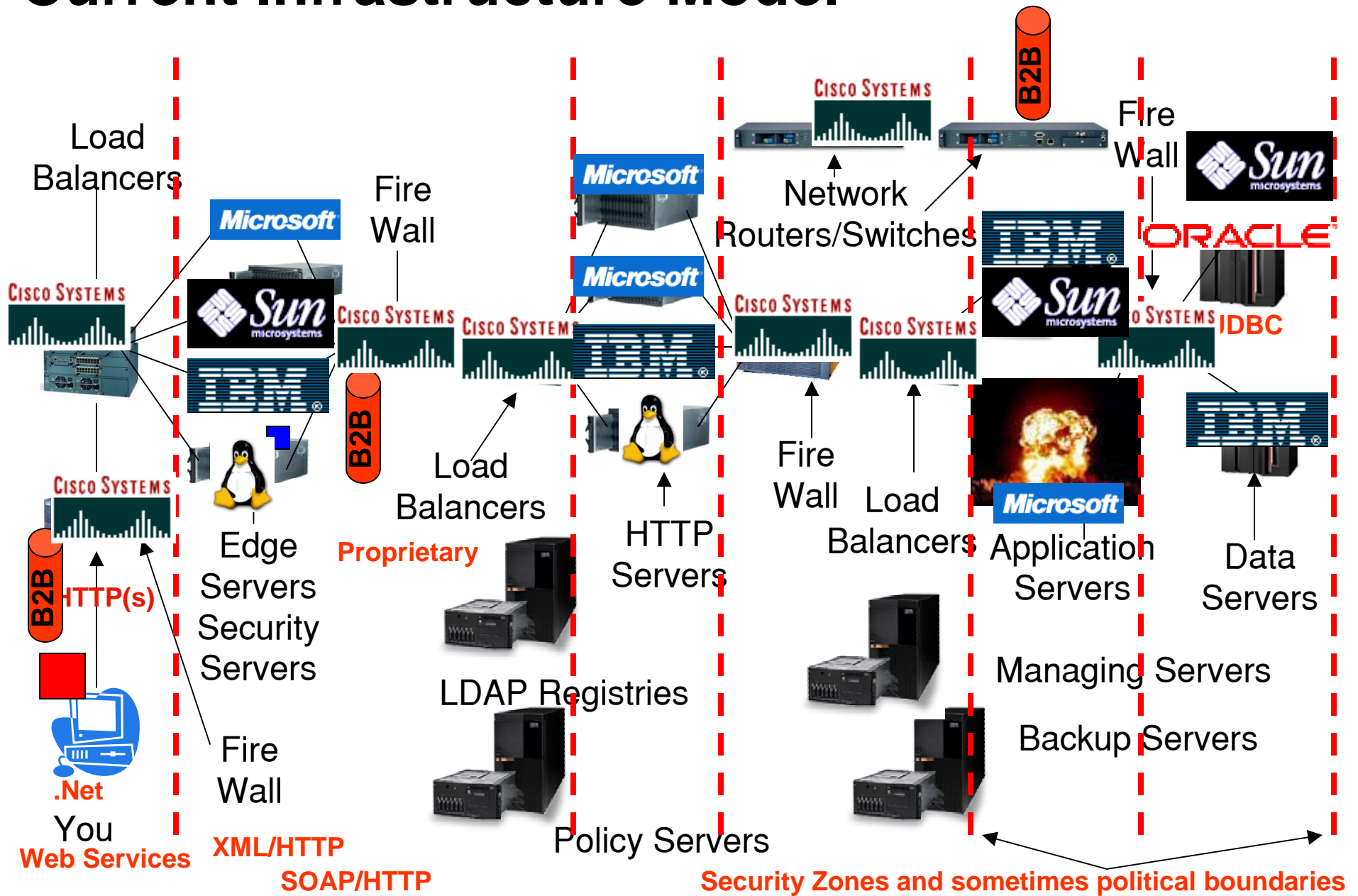
“Autonomic computing allows companies to operate more efficiently and achieve more from their existing IT environments, enabling increased responsiveness, business continuance and availability.” —Rick Sturm

Old Infrastructure (less than 20 years ago)



Problems and management were pretty simple “Way back when”. The terminal was connected to the server, maybe a control unit, in between, but the connection and application either worked or it didn’t, there weren’t a lot of places to look, if something was wrong.

Current Infrastructure Model



Current Monitoring/Management Process

- Usually done at the server level and some subsystem level using
 - Tivoli
 - BMC
 - Candle
 - Etc.
- Network components usually done separately
- “Applications” usually aren’t monitored or are not tied in
- Correlation of failure and request are not easy

System 390 Mainframes (for over 10 years)

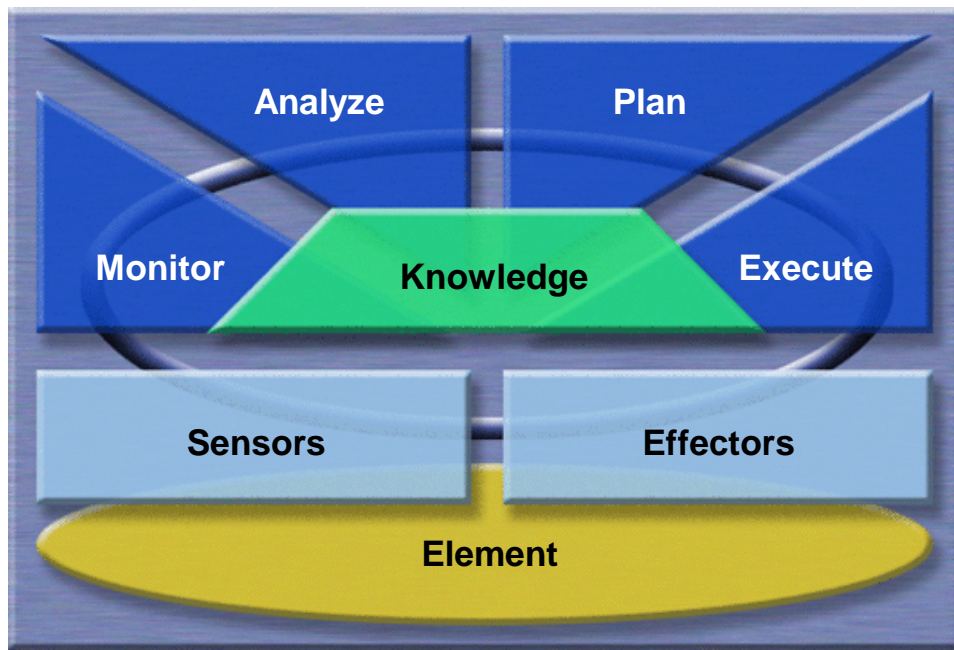
- Memory Sparing
- CPU Sparing
- If either the Memory or CPU fails
 - The bad element is taken out of service
 - The spare is placed in service
 - IBM is notified (by phone) to come repair the system
- This technology is now being placed in other server lines

Autonomic Computing Deployment Model

	Basic Level 1	Managed Level 2	Predictive Level 3	Adaptive Level 4	Autonomic Level 5
Characteristics	Multiple sources of system generated data	Consolidation of data and actions through management tools	System monitors, correlates and recommends actions	System monitors, correlates and takes action	Integrated components dynamically managed by business rules/policies
Skills	Requires <i>extensive, highly skilled</i> IT staff	IT staff <i>analyzes and takes actions</i>	IT staff <i>approves and initiates actions</i>	IT staff <i>manages performance</i> against SLAs	IT staff <i>focuses</i> on enabling business needs
Benefits	Basic Requirements Met	Greater system awareness Improved productivity	Reduced dependency on deep skills Faster/better decision making	Balanced human/system interaction IT agility and resiliency	Business policy drives IT management Business agility and resiliency

Manual **Autonomic**

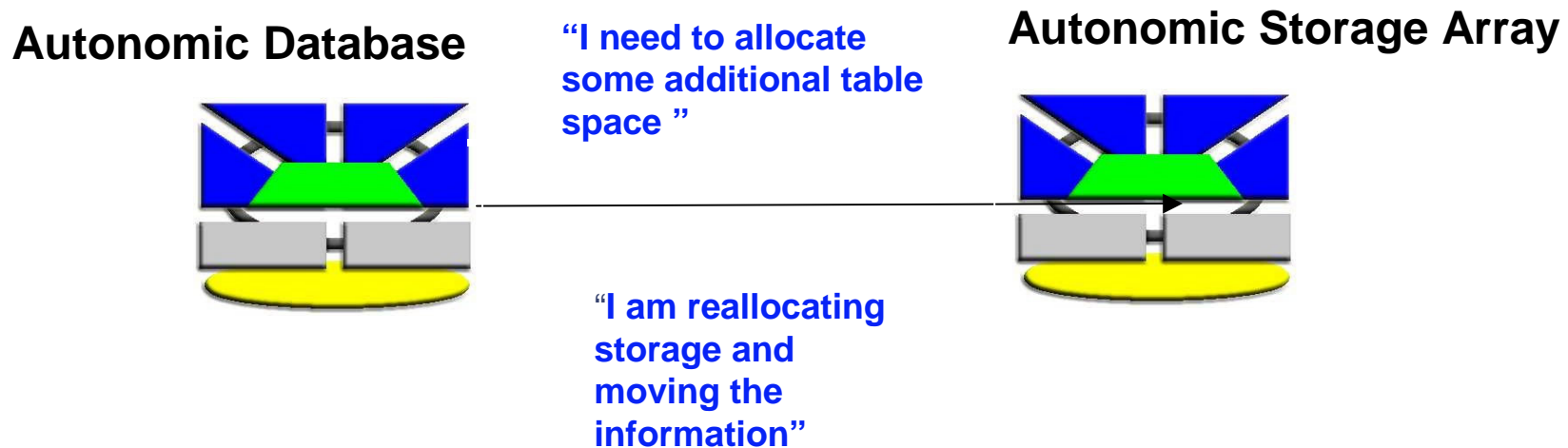
Core Building Blocks for an open architecture



- An **autonomic element** contains a continuous control loop that monitors activities and takes actions to adjust the system to meet business objectives
- Autonomic elements learn from past experience to build action plans
- Managed elements need to be instrumented consistently

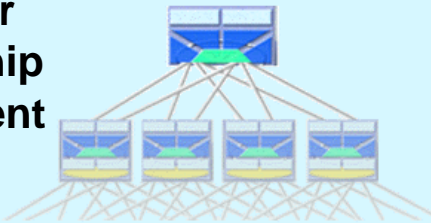
How do we make components autonomic?

- Autonomic elements have two management tasks
 - They manage themselves
 - They manage their relationships with other elements through negotiated agreements

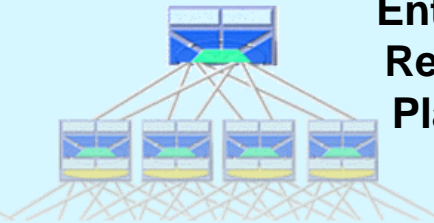


Multiple Contexts for Autonomic Behavior

Customer Relationship Management

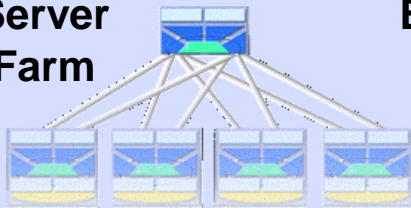


Enterprise Resource Planning

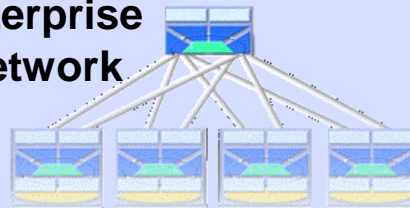


Business Solutions
(Business Policies, Processes, Contracts)

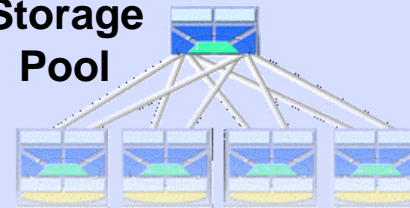
Server Farm



Enterprise Network



Storage Pool



Groups of Elements
(Inter-element self-management)



Servers



Storage



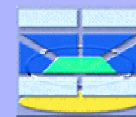
Network Devices



Middleware



Database



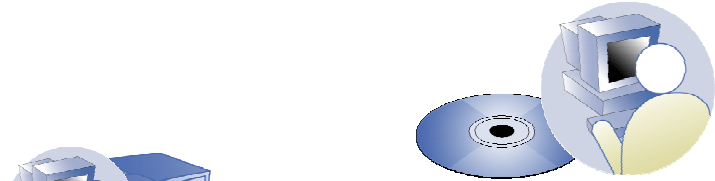
Applications

System Elements
(Intra-element self-management)

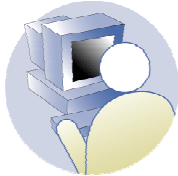
Standards based solutions

- Some standards already exist
 - HTTP, XML, Web Services etc.
- Need new ones
 - New event/log format standard (proposed by IBM)
 - CBE (Common Base Event) format
 - XML based
 - Extendable
 - Vendor neutral
 - Generic Log Adapters to convert existing logs to CBE format on the fly
 - Tools to work with the new standard (IBM's is Eclipse based)

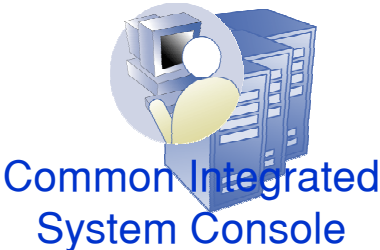
Autonomic Technologies



Autonomic Management Engine



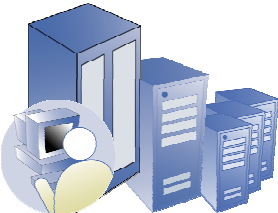
Solution Install



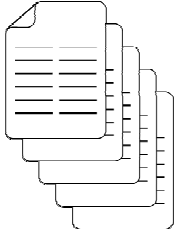
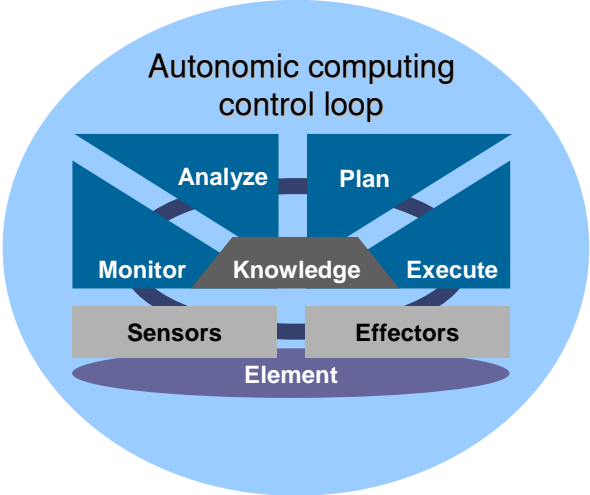
Common Integrated System Console



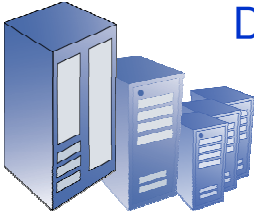
Unified Policy Management



Tivoli Intelligent Orchestrator



Self-Healing/Problem Determination



Heterogeneous workload management

Autonomic Computing core technologies innovation provides building blocks that enable key on-demand capabilities

Solution Install

Customer pain point:

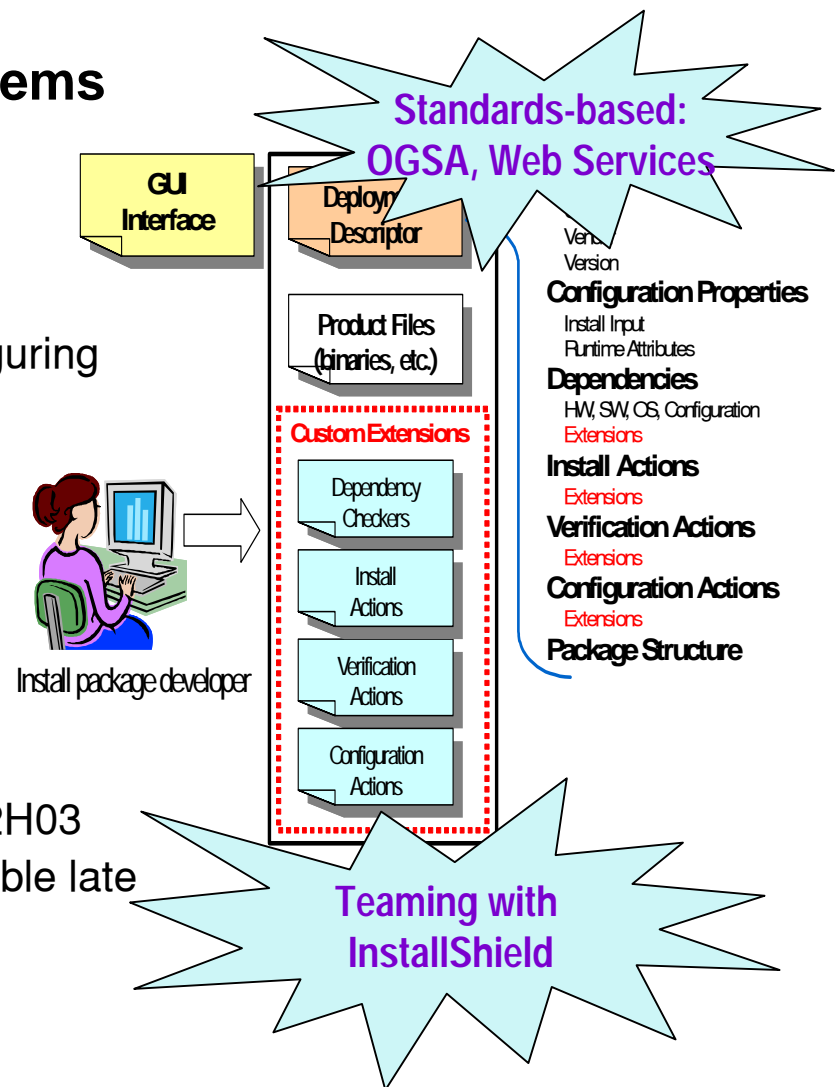
Difficulty of deployment in complex systems

Value:

- One consistent software installation technology across all products
- Consistent and up-to-date configuration and dependency data, key to building self-configuring autonomic systems
- Reduced deployment time with less errors
- Reduced software maintenance time, improved analysis of failed system components
- Component-based product install

Delivery:

- ISMP V5 currently available
- Component-based install available in ISMP V6 2H03
- Dependency mgmt API for solution config available late '03/early '04



Integrated Solutions Console for Common System Admin

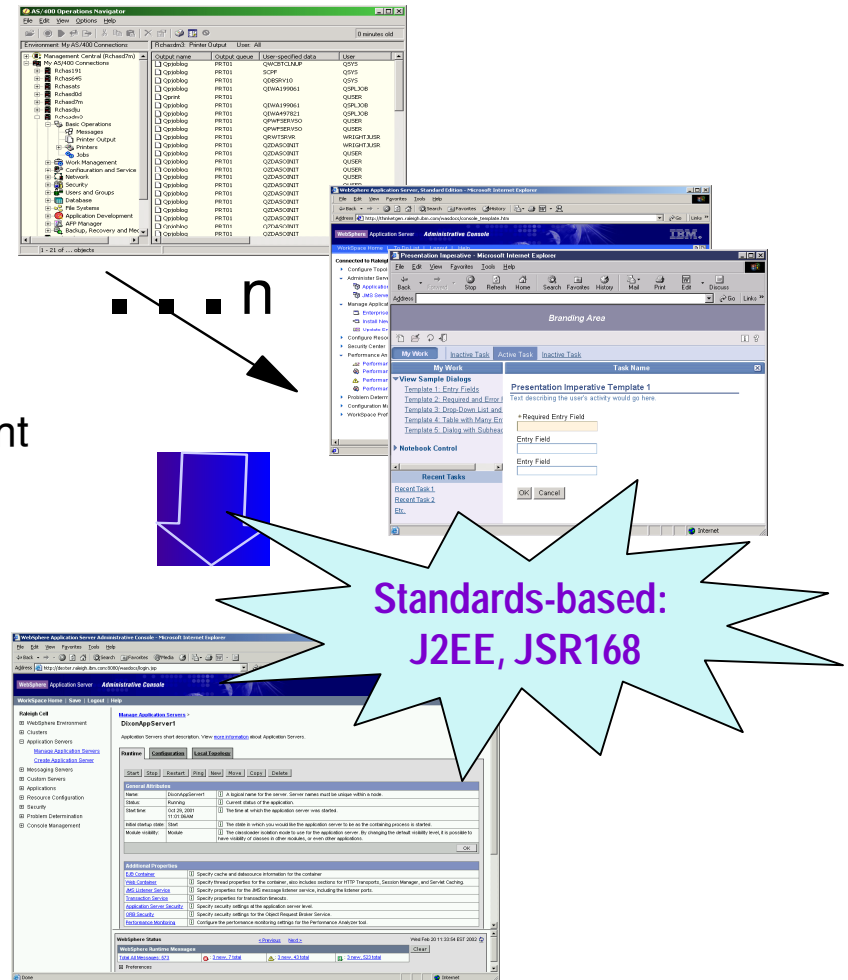
Customer pain point:
Complexity of operations

Value:

- One consistent user interface across product portfolio
- Common runtime infrastructure and development tools based on industry standards, component reuse
- Provides a presentation framework for other autonomic core technologies

Delivery:

- Rollout by IBM server, storage and software products beginning 2H03
- Toolkit available for customers and ISV's within products as they roll out
- Check out ITM Health Monitor, or zPM



Policy Tools for Policy-based Management

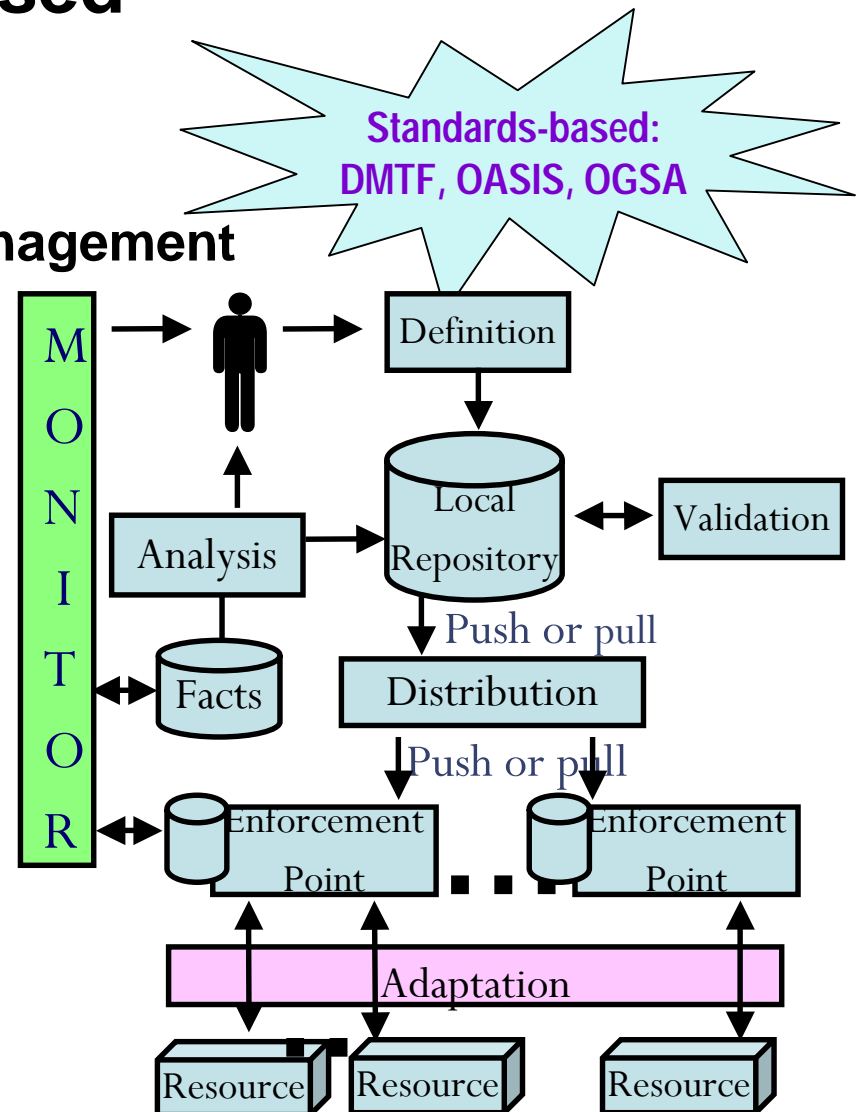
Customer pain point:
Complexity of product and systems management

- **Value:**

- Uniform cross-product policy definition and management infrastructure, needed for delivering system-wide self-management capabilities
- Simplifies management of multiple products; reduced TCO
- Easier to dynamically change configuration in on-demand environment

- **Delivery:**

- In early development stages of policy building blocks such as policy specification standards and WS-Policy enablement
- Some components available on alphaWorks in late 2003



Business Workload Manager for Heterogeneous Workload Mgmt eWLM

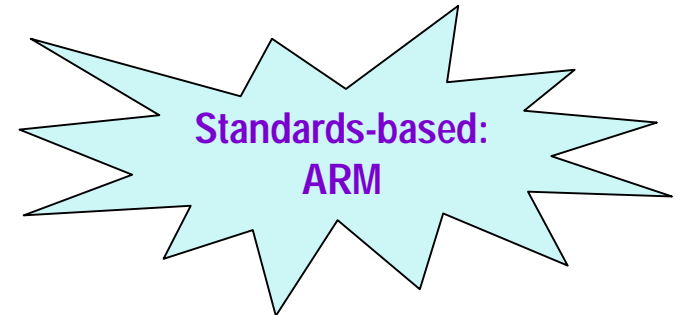
Customer pain point: Unable to definitively determine cause of bottleneck in system

- **Value:**

- Response time measurement and reporting of transaction processing segments
- Dynamic learning of transaction workflow topology through servers and middleware
- Drill-down through service class reporting to identify bottleneck processes

- **Delivery:**

- Initial function rollout 2H04 (Now, part of VE)
- ARM instrumentation demo available on alphaWorks



Monitoring Engine for Autonomic Monitoring

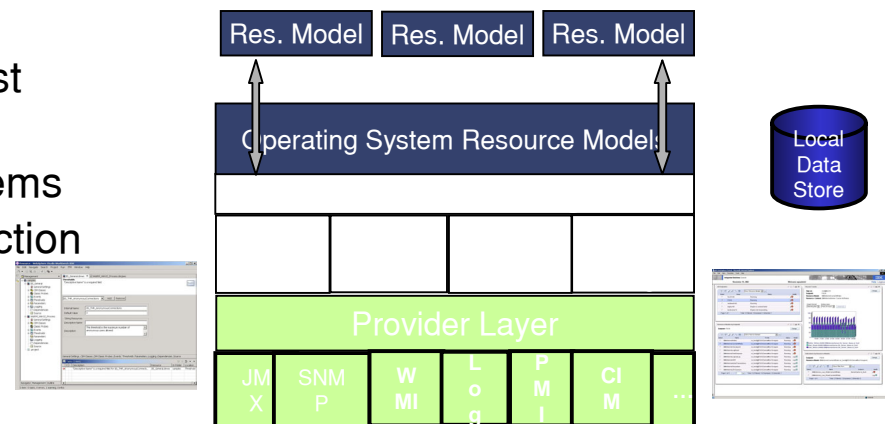
Customer pain point: Difficult to determine problem's root cause required to take corrective action

- **Value:**

- Root cause analysis for IT failures - not just surfacing symptoms
- Server level correlation of multiple IT systems
- Applies intelligent, automated corrective action

- **Delivery:**

- ITM available today
- Rollout across IBM products beginning 2H03
- Resource Model Builder available on alphaWorks now
- New release of ITM and RM Builder coming in 3Q03



**Standards-based:
CIM, SNMP, WMI, JMX**

Log and Trace Tool for Problem Determination

Customer pain point:

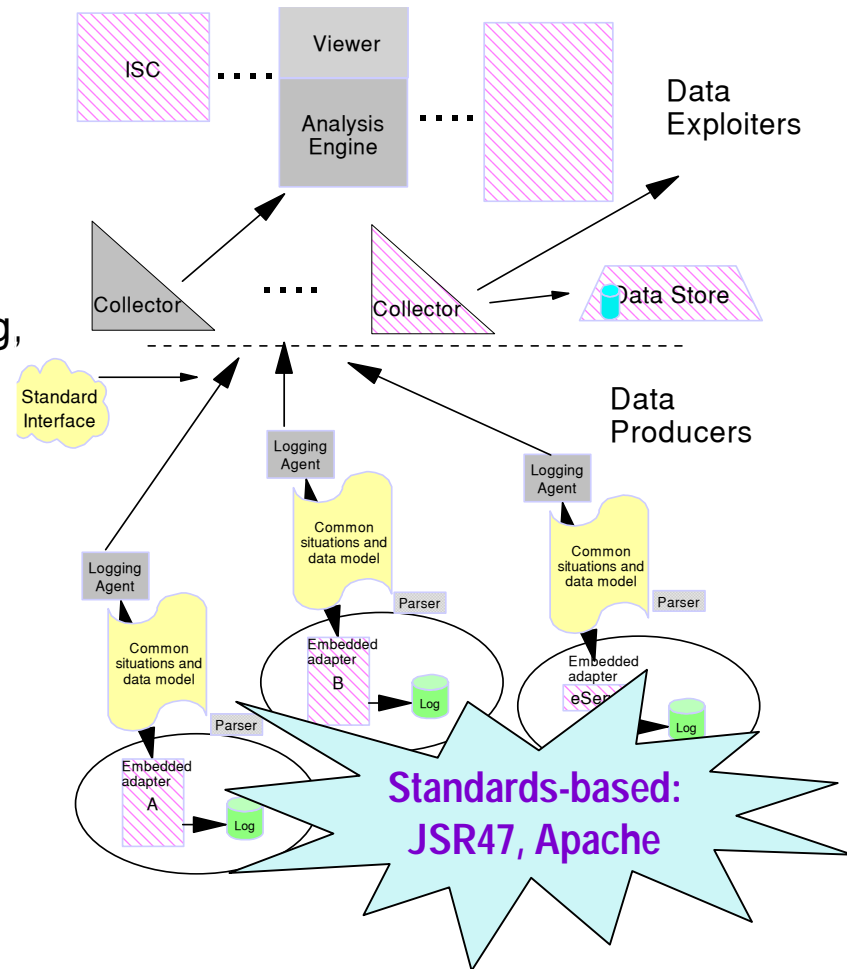
Difficulty in analyzing problems in multi-component systems

- **Value:**

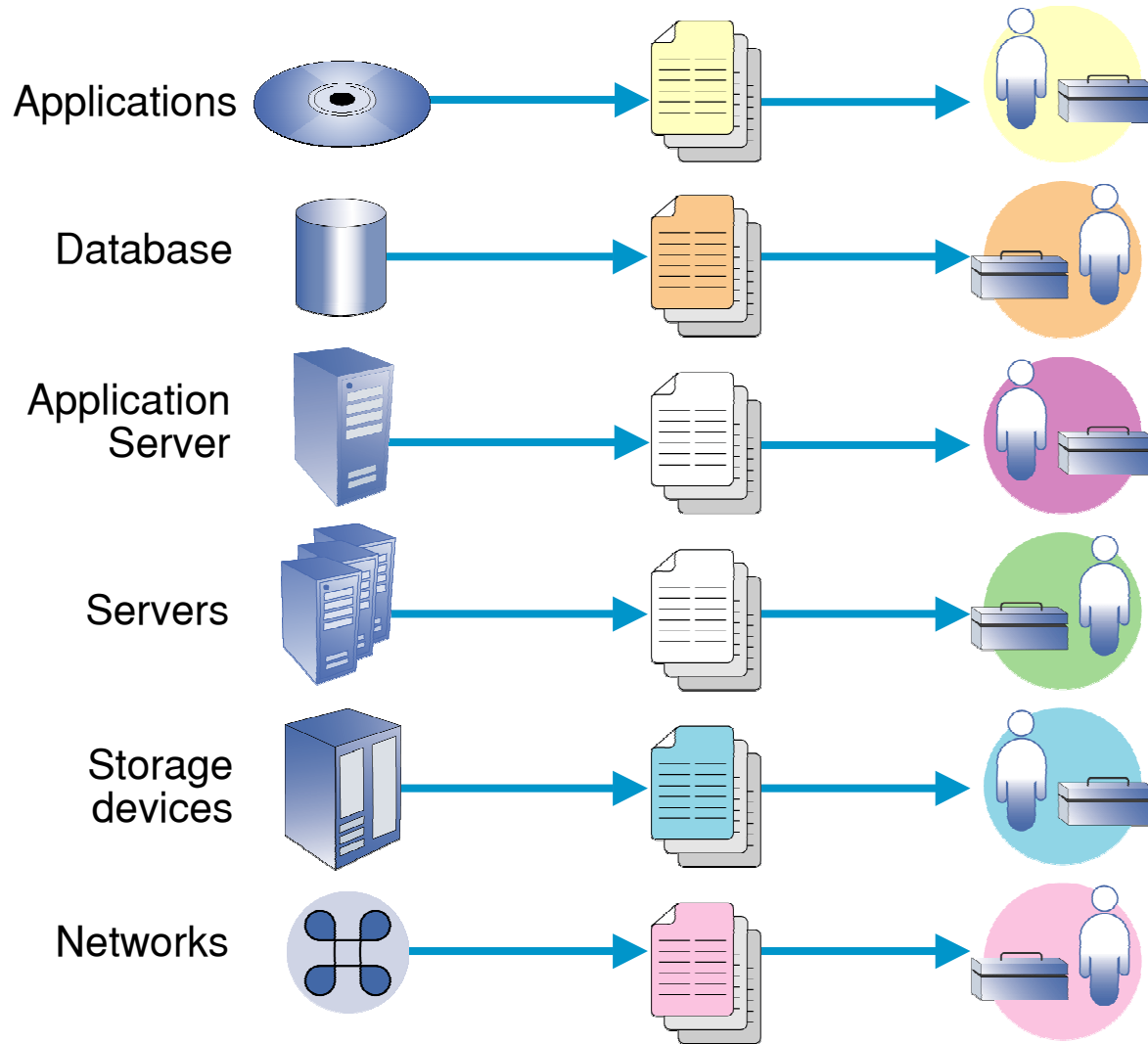
- Reduced time spent in problem analysis
- Central point of interaction with multiple data sources
- Introduces standard interfaces and formats for logging and tracing, key to building self-healing, self-optimizing autonomic system capabilities
- Correlated views of data

- **Delivery:**

- Rollout by IBM server, storage and software products beginning 2H03
- Initial tool available on alphaWorks
- Eclipse-based version available in April
- Based on CBE (Common Base Event format Standard)

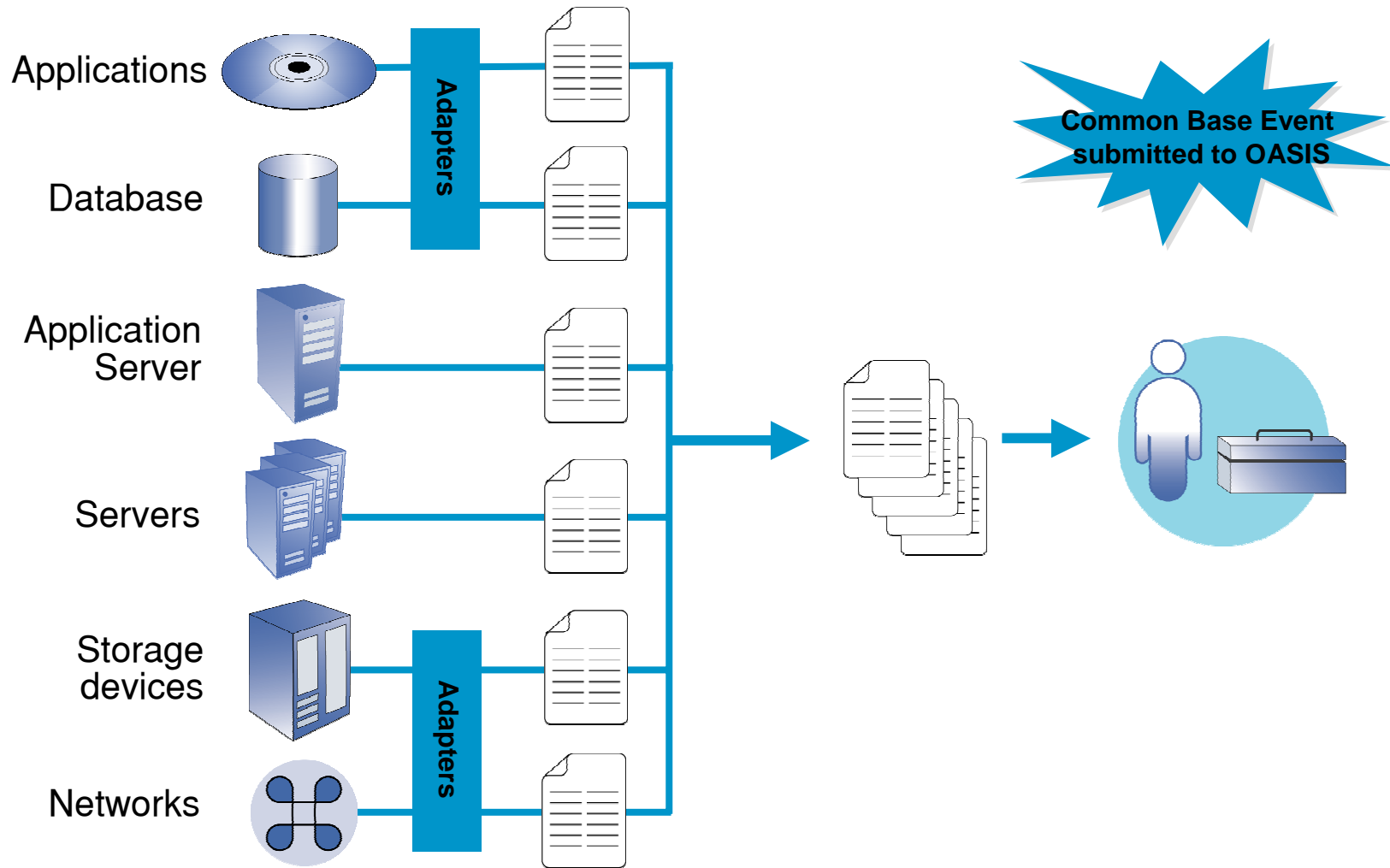


Log format today

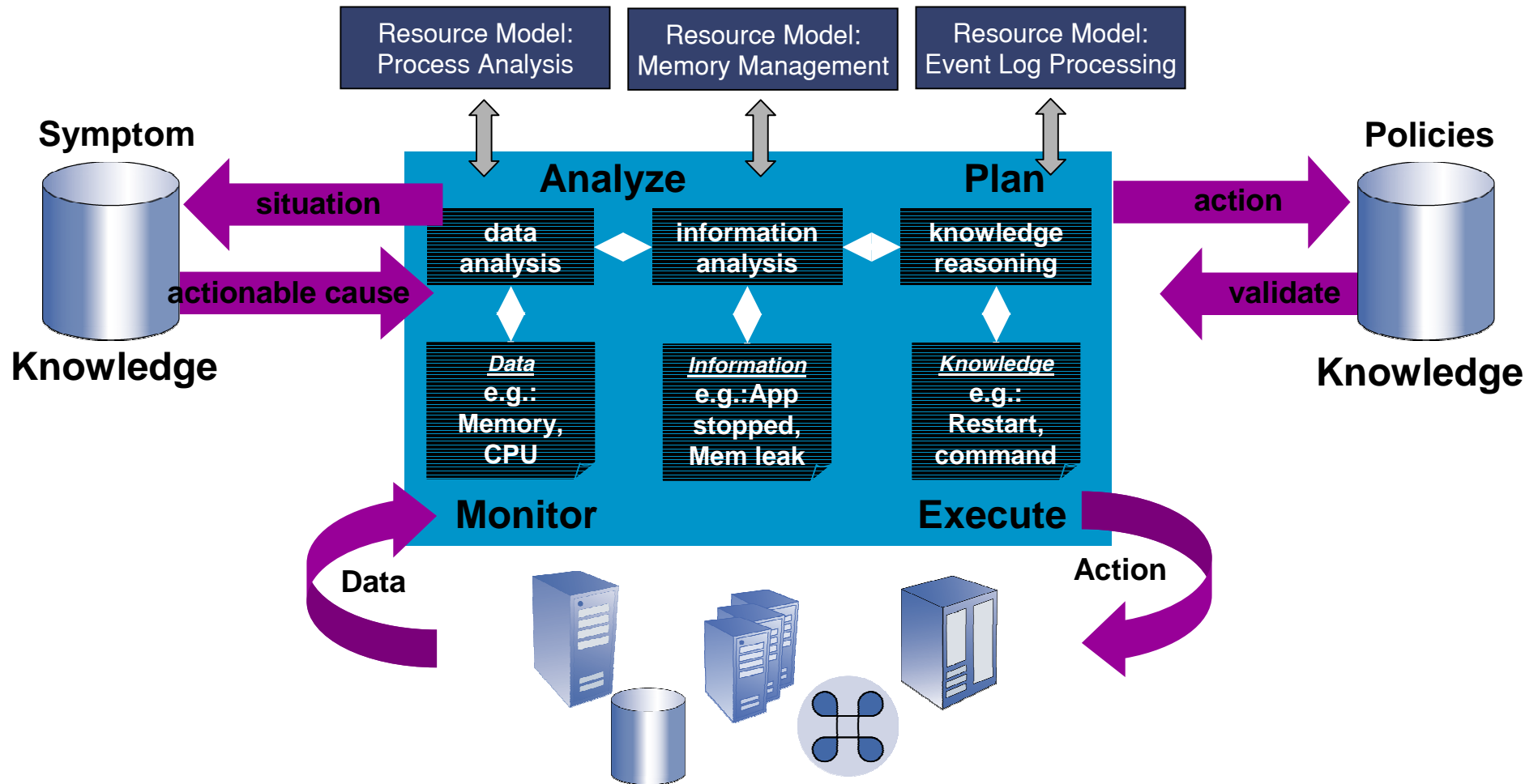


- Disparate pieces and parts
- Tools focused on individual products
- No common interfaces among tools
- No synergies in building tools OR in creating log entries

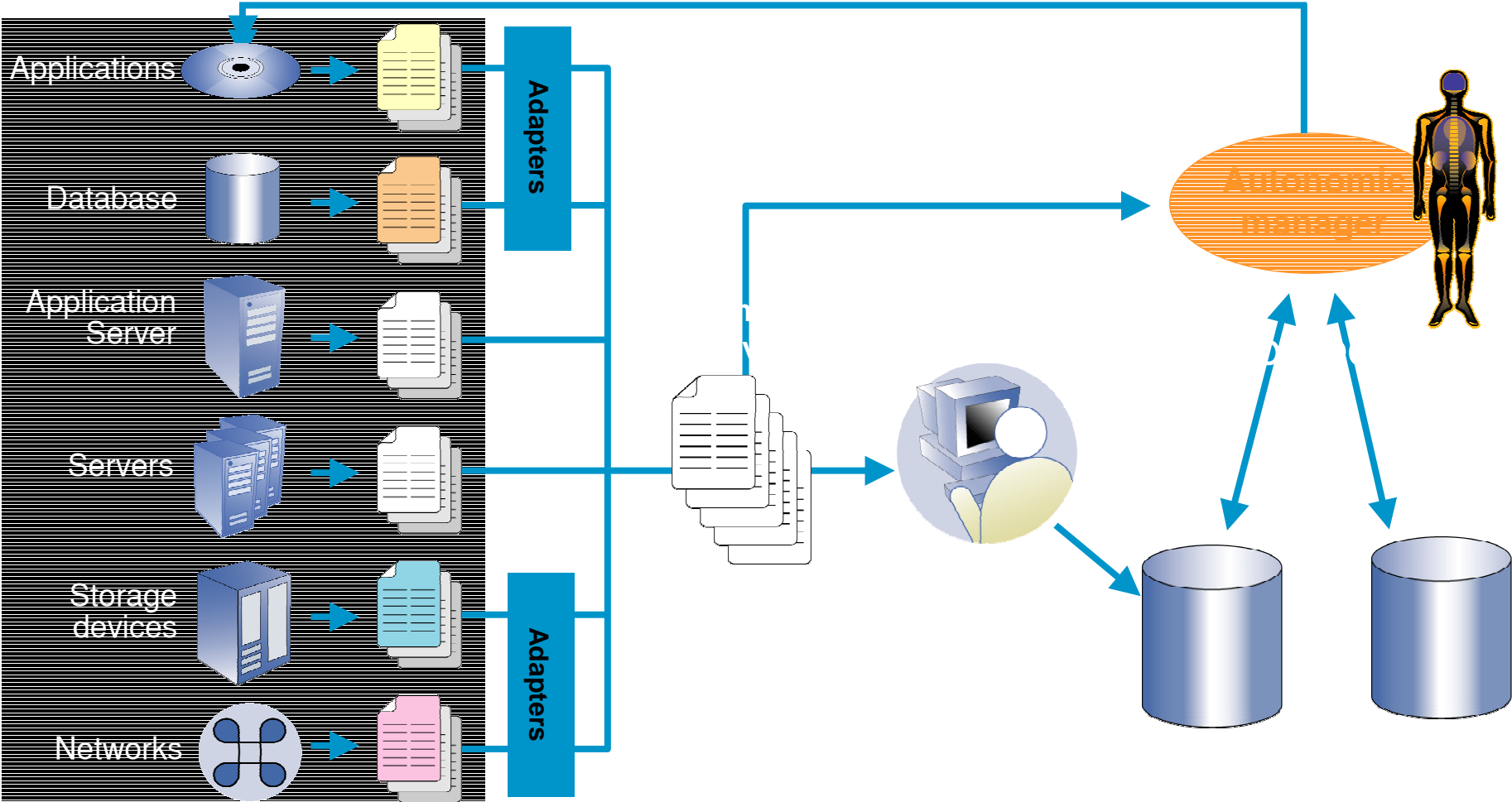
Log format tomorrow



Autonomic manager directions



Autonomic computing self-healing systems



Introducing: An Autonomic Computing Toolkit

Customer pain point: How to implement end-to-end autonomic solutions

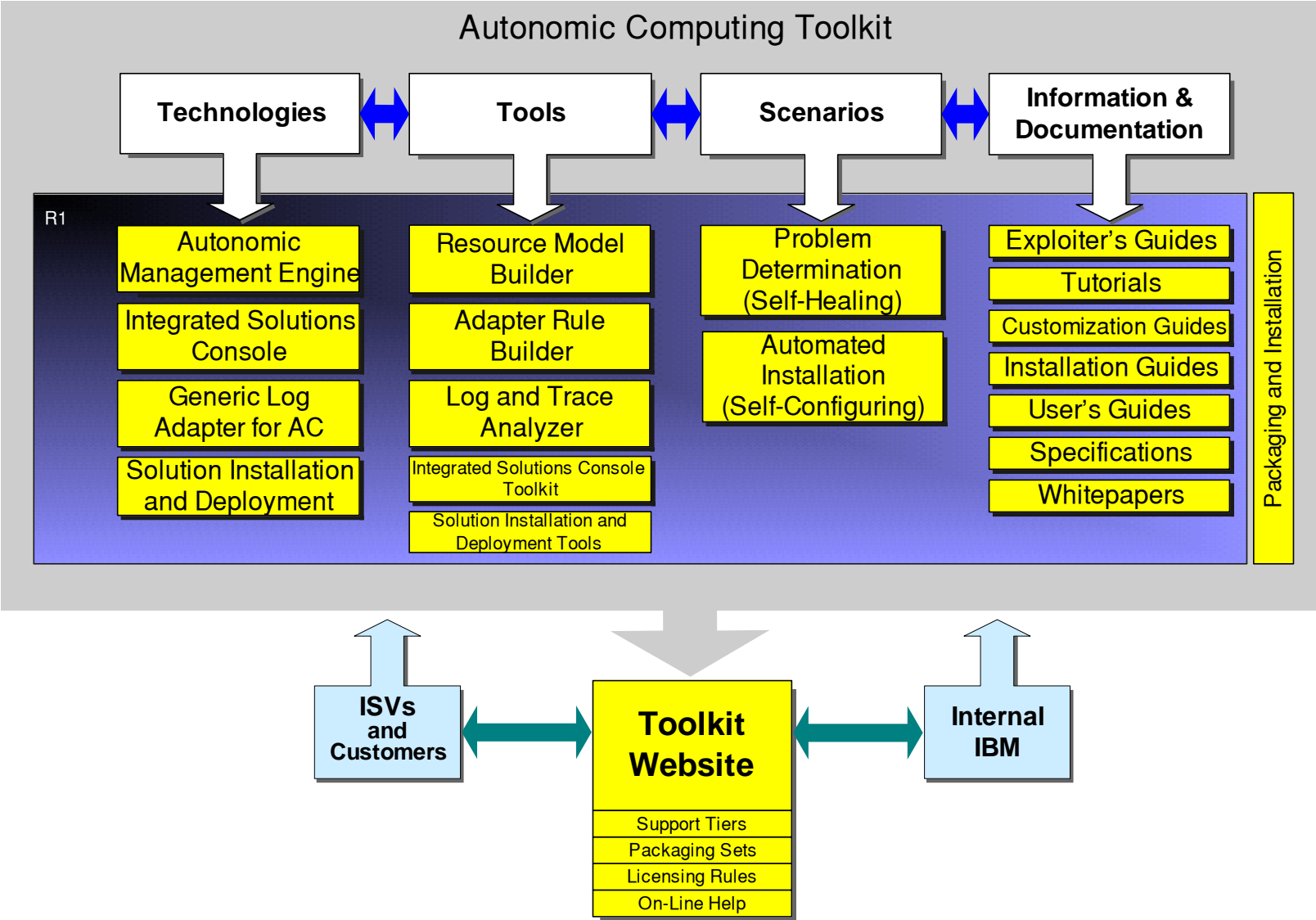
Value:

- A complete implementation of a null autonomic manager which can be customized to meet your needs
- Components to simplify the incorporation of autonomic functions into applications
 - Building blocks for self-management
 - Monitoring, analysis, planning and execution components
 - Including autonomic computing technologies, grid tools, and services
- **Pluggable**
 - Defines interfaces and provides implementations for each major toolkit component
- Detailed examples and documentation for all components

Delivery:

- Now

AC toolkit components



When will these technologies show up

- Available Now (or within 2 months)
 - Virtualization Engine (VE) (ISC & eWLM)
- In Plan
 - Tivoli Portal Manager has ISC in Plan
 - CBE Formatted logs in DB2, WebSphere, etc. products
 - Tivoli using Generic Log Adapter, CBE formatted events, Autonomic Management Engine, ISC is in plan

Autonomic computing toolkit

ibm.com/autonomic

The image displays two screenshots of the IBM website's Autonomic computing section. The left screenshot shows the main page with a navigation menu on the left and a featured article titled "Autonomic storage in an on demand environment". The right screenshot shows a resource center page with a search bar, navigation tabs, and a list of links.

Left Screenshot: IBM.com/autonomic

- Header: IBM logo, Home | Products & services | Support & downloads | My account
- Section: **Autonomic computing** - Creating self-managing computing systems
- Text: "Imagine a world where computers fix their own problems before you even realize something is wrong. IBM is building that world with a range of autonomic computing capabilities across all of our product lines, helping you control an increasingly complex and expensive IT environment with computing systems that are self-managing, resilient, responsive, efficient, and secure."
- Featured Article: **Autonomic storage in an on demand environment**
Autonomic storage system: Create integrated storage environment more →
Text: "Autonomic storage systems help businesses manage IT resources, improve productivity, and enhance the quality of services provided by IT groups by using self-managing and self-diagnostic techniques. [Learn](#) how storage products leveraging these technologies can help you cut costs, improve flexibility, enhance ROI, and boost your core business performance."
- Navigation: Select a country, About IBM Autonomic Computing, Products and services, Library, News, Events and education, Press releases, Success stories, Business Partners, Contact us.
- Related links: On demand business, Grid computing, developerWorks, alphaWorks, IBM Research - Autonomic computing, Autonomic Computing.

Right Screenshot: IBM.com/developerworks/autonomic

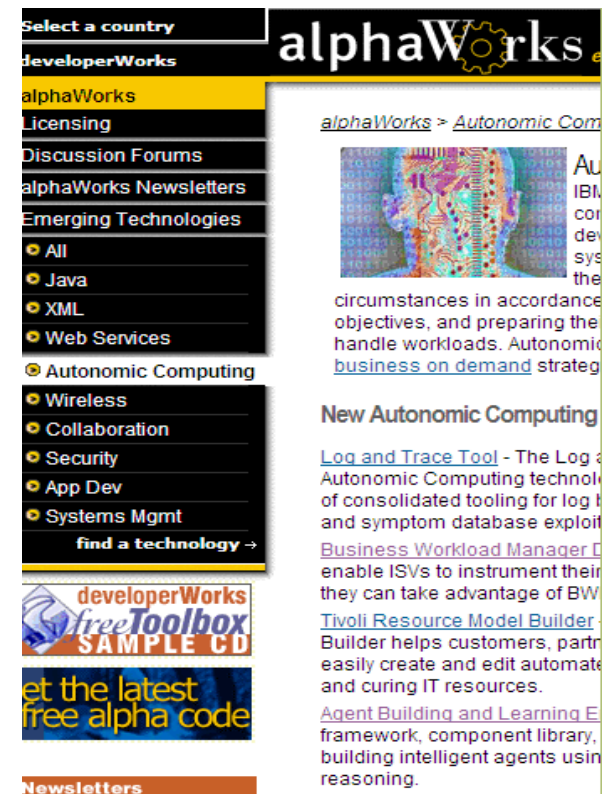
- Header: IBM logo, Search for: [input] within All of [input] Search
- Navigation: IBM home | Products & services | Support & downloads | My account
- Section: **Autonomic computing Resource center**
- Text: "The complexity of systems worldwide and the way they interact creates a shortage of IT professionals with the ability to manage it all. This brings about a need for a change. Enter autonomic computing."
- Navigation: Overview | Autonomic computing basics | Core technologies | Toolkit
- Text: **Note to Autonomic Computing Toolkit Beta users:** For up-to-date news about the Beta code, see the [Toolkit page](#).
- Text: **Note about downloads:** The Autonomic Computing Toolkit is in the Beta phase; therefore, downloads are available only if you have a keycode. If you do not have a keycode and would like to apply for one, please send email to acbtol@us.ibm.com.
- Section: **Where do I start?**
Choose the link that best describes your situation and we'll give you a recommended list of technical materials that will get you started quickly.
- Navigation: Select country / region, developerWorks, DB2, eServer, Lotus, Rational, Tivoli, WebSphere, Grid computing, Java™ technology, Linux, Open source projects, Web architecture, Web services, Wireless technology, XML.

ibm.com/developerworks/autonomic

Autonomic Computing alphaWorks Zone

- One way to get started developing autonomic solutions now

- Available on alphaWorks:
 - Log and Trace Tool
 - Business Workload Management Demo
 - Tivoli Resource Model Builder
 - Agent Building and Learning (ABLE)
 - IBM Grid Toolbox
 - Web Services Tools
- Coming in 2H03 – components from:
 - Autonomic Computing Toolkit
 - Solution Install
 - Policy-based Management
 - and more!



The screenshot shows the alphaWorks website interface. At the top, there is a navigation bar with "alphaWorks" and "developerWorks" logos. Below the navigation bar, there is a sidebar menu with the following items: "alphaWorks", "Licensing", "Discussion Forums", "alphaWorks Newsletters", "Emerging Technologies", "All", "Java", "XML", "Web Services", "Autonomic Computing", "Wireless", "Collaboration", "Security", "App Dev", and "Systems Mgmt". A "find a technology" search bar is located at the bottom of the sidebar. The main content area features a header "alphaWorks > Autonomic Computing" and a large image of a human head with binary code. Below the image, there is a paragraph of text: "circumstances in accordance objectives, and preparing the handle workloads. Autonomic business on demand strateg". A section titled "New Autonomic Computing" contains several links: "Log and Trace Tool - The Log of Autonomic Computing technol of consolidated tooling for log and symptom database exploit", "Business Workload Manager D enable ISVs to instrument their they can take advantage of BW", "Tivoli Resource Model Builder - Builder helps customers, part easily create and edit automate and curing IT resources.", and "Agent Building and Learning E framework, component library, building intelligent agents using reasoning."

Summary

- Autonomic Computing is evolutionary
- The journey has started
- There are some core capabilities and technologies that make up an Autonomic Computing Infrastructure
 - Log and Trace, Problem Determination
 - Common User Model
 - Monitoring
 - Common Install
 - Policy
 - Complex Analysis
 - Workload Management