The Autonomic Computing Vision

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Agenda

- Autonomic Computing Overview
- Autonomic Computing Attributes
- Levels of Autonomic Computing Maturity
- Technical considerations for driving adoption of Autonomic Computing
Complex heterogeneous infrastructures are a reality.

Dozens of systems and applications

Hundreds of components

Thousands of tuning parameters

Existing Applications and Data

Directory and Security Services

Business Data

Data Server

Web Application Server

BPs and External Services

Web Server

DNS Server

Firewall

Load Balancer

Cache

Data

Storage Area Network

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"Most of my costs are really pure maintenance and operations – keeping the processes running that keep the ship afloat. Our development budget suffers."

"Y2K and 9/11 have forced us to look at what we have – and we have too much complexity."
Autonomic vision – self-managing systems

“Intelligent” open systems that…
- Manage complexity
- Know themselves
- Continuously tune themselves
- Adapt to unpredictable conditions
- Prevent and recover from failures
- Provide a safe environment

Providing customers with…
- Increased return on IT investment
- Improved resiliency and quality of service
- Accelerated time to value
Autonomic Computing helps solve customer challenges

- Operational speed too slow, IT flexibility too limited
- Privacy, security and business continuity
- Management of complex, heterogeneous environments too hard
- Swamped by the proliferation of technology and platforms to support
- The inability to manage the infrastructure seamlessly
- IT asset utilization is way too low
- Operational cost too high, efficiency too low
Autonomic computing attributes

Self-managing systems that deliver:

- Increased Responsiveness
  Adapt to dynamically changing environments

- Operational Efficiency
  Tune resources and balance workloads to maximize use of IT resources

- Business Resiliency
  Discover, diagnose, and act to prevent disruptions

- Secure Information and Resources
  Anticipate, detect, identify, and protect against attacks

- Self-Managing Systems
  Self-Configuring, Self-Optimizing, Self-Healing, Self-Protecting
An example of something that is NOT self-healing...

Unable to open desktop file. Notes may have terminated abnormally in an earlier session. Please logoff or shut down the operating system before running Notes again.
Self-configuring Example: DB2 Configuration Advisor

Performance as Percentage of DBA tuned Solution

DB2 Configuration Advisor Results
Self-healing Example: IBM Electronic Service Agent

Service agent detects a hardware problem

Fully Automatic

Sends error symptoms to IBM

Data Catcher

Problem Database

Sends Symptoms for Diagnosis

Electronic Response

Dispatch CE

Voice Support

Analysis of Problem Record
Self-optimizing Example: Enterprise Workload Management

- ARM standard for measuring response time of a transaction
- Workload balancing & routing
- Cross platform reporting
- Policy-based for various classes of users & applications
Self-protecting Example: IBM Tivoli Risk Manager

Automate incident response
### Levels of Autonomic Computing Maturity

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

- Manual ➤ *Evolution, not Revolution* ➤ Autonomic
An analogy - Camera “Autonomics”

- **Exposure**: Shutter / Iris, Weighted, Weighted, Average, Spot, Database Look-up
- **Focus**: Lens Ring, Center Spot, Eye Control
- **Film Advance**: Lever, Add-on Motor Drive, Integrated Motor Drive, Single Shot, Multi-Shot, Movie

- 70’s, 80’s, 90’s, 00’s
  - Function has grown dramatically
  - Automation has responded
  - User control has increased
Starts with Architecture

- Architecture
  - Open standards
  - Technology
Delivering Core Technologies

- Architecture
- Technology
- Open standards
Based on open standards and industry best practices

- Architecture
- Technology
- Open standards
Autonomic Computing Toolkit

Technologies:
- Autonomic Management Engine
- Generic Log Adapter
- Integrated Solutions Console
- Solution Installation and Deployment

Scenarios:
Illustrations of how the technologies work together and how they can be used in realistic solutions

Tools:
- Resource Model Builder
- Adapter Rule Builder
- Log and Trace Analyzer
- ISC Toolkit
- Solution Installation and Deployment Tools

Documentation:
Detailed individual technology and tooling documentation, as well as documentation to help you begin developing autonomic solutions, customized to your products
Summary

- Autonomic Computing is an analogy to the human autonomic system
- Autonomic Computing will be an evolutionary process towards more self-managing IT systems and resources
- The Autonomic Computing architecture draws from “closed loop” control systems
- Autonomic Computing can be accelerated by having a common set of core technologies
- Open standards adoption will be critical to the success of Autonomic Computing
Homework

Papers in this issue describe a variety of research projects in which the concepts of autonomic computing are being developed.

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