

What is Autonomic Communications?

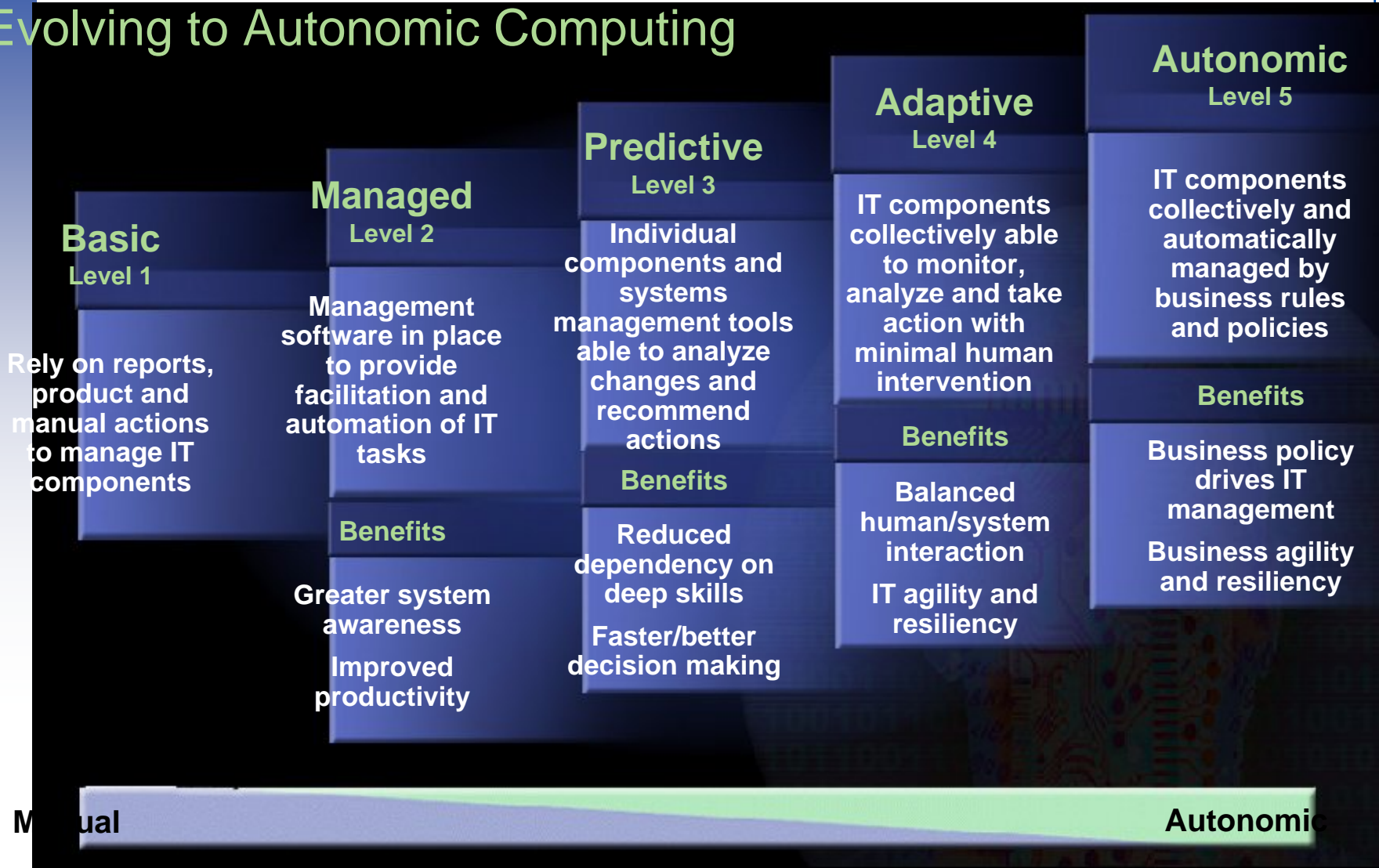
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Main Contention

Adaptive and context-aware isn't autonomic!

- Context-aware:
 - a) use variety of sensors to obtain richer context.
 - b) Express adaptive behavior of application as function of context.
- Adaptive distributed computing/communication:
 - a) Grid applications—resource discovery, binding and scheduling
 - b) Wireless MAC/network layers—e.g., 802.11e, Channel-state dependent scheduling, centralized AP behavior.

Evolving to Autonomic Computing



The Four Principles of Autonomic

<i>Self-Configuring</i>	Ability to dynamically configure itself "on the fly" and initialize itself in the context of the overall system; includes the ability to influence relevant changes in other products in the environment.
<i>Self-Healing</i>	Ability to recover from a failing component by first detecting improper operations (either proactively through predictions or otherwise) and then initiating corrective action without disrupting applications.
<i>Self-Optimizing</i>	Ability of systems or components to efficiently maximize resource allocation and utilization to meet end-user needs without human intervention.
<i>Self-Protecting</i>	Ability of a component to detect hostile or intrusive behavior as it occurs and take autonomous actions to make itself less vulnerable.

What's Missing in Autonomic Networking/Communications?

- a) Self-Healing
- b) Self-Protecting

**But communications cannot be autonomic,
connectivity can**

Themes of Autonomic Communications Research

- Role/Capability based Addressing of Resources.
 - Different propagation levels of different attribute descriptors (link-neighbors, organizational domain, location).
 - Enables more effective resource-discovery as networks scale.
- Robust control theory techniques for uncertain decision making.
 - NOT optimizing based on complete models.
 - More non-linear control/fuzzy control models.
- Better monitoring tools for wireless networks.
 - Very little research on 802.11/802.16 anomalies and their control.
 - Programmable MACs/devices open future networks to unknown forms of disruption.

For an Autonomic Infrastructure, We Need

- Standardized description of network resources and capabilities
 - Appropriate scoping of capabilities and description.
 - Description of resources by association with human owners.
- Development of better instrumentation for wireless network performance monitoring.
- Ability to execute mobile agent code.
 - Solve trust and capability concerns.