Welcome to
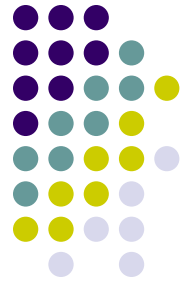# SENG 480B / CSC 485B / CSC 586B
Self-Adaptive and
Self-Managing Systems

Dr. Hausi A. Müller

Professor

Department of Computer Science

University of Victoria

http://courses.seng.uvic.ca/courses/2013/summer/seng/480b
http://courses.seng.uvic.ca/courses/2013/summer/csc/485b
http://courses.seng.uvic.ca/courses/2013/summer/csc/586b

Announcements

- A3
  - Due Thu, July 11
- Midterm grading
  - 3/4 done ☺
  - Should be graded by Tue, July 16
- Group presentations of A3
  - Tue, July 16
  - Undergrads should present
- Grad student presentations
  - July 23 – July 31
- Review for final exam
  - Wed, Aug 7

- Last day of classes
  - Wed, Aug 7
- Final exam
  - Tue, Aug 13, 9:00-12:00 am in ECS 124
  - Closed books, closed notes
  - Materials: entire course
  - Format: like midterm

Graduate Student Research Paper Presentations

- Garlan, D., Cheng, S.-W., Huang, A.-C., Schmerl, B., Steenkiste, P.: Rainbow: Architecture-Based Self-Adaptation with Reusable Infrastructure. *IEEE Computer* 37(10):46-54 (2004) — **Angela Rook, July 23**

- Kramer, J., Magee, J.: Self-Managed Systems: An Architectural Challenge. In: *ACM /IEEE International Conference on Software Engineering 2007 Future of Software Engineering (ICSE),* pp. 259-268 (2007) — **Pratik Jain, July 23**

- Oreizy, P., Medvidovic, N., Taylor, R.N.: Runtime Software Adaptation: Framework, Approaches, and Styles. In: *ACM/IEEE International Conference on Software Engineering (ICSE 2008),* pp. 899-910 (2008) —**Alessia Knauss, July 24**

- Brun, Y., Di Marzo Serugendo, G., Gacek, C. Giese, H. Kienle, H.M., Litoiu, M., Müller, H.M., Pezzè, M., Shaw, M.: *Engineering Self-Adaptive Systems through Feedback Loops.* SE for Self-Adaptive Systems, pp. 48-70 (2009) — **Samra Ramandeep, July 24**

- Kaushik, R.T., Cherkasova, L., Campbell, R.H., Nahrstedt, K.: Lightning: self-adaptive, energy-conserving, multi-zoned, commodity green cloud storage system, *ACM International Symposium on High Performance Distributed Computing (HPDC 2010),* 332-335 (2010) — **Andi Bergen, July 26**

Graduate Student Research Paper Presentations
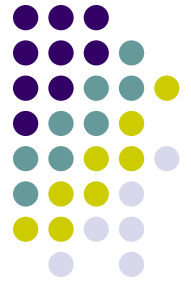
- Villegas, N.M., Müller, H.A., Tamura, G., Duchien, L., Casallas, R.: A framework for evaluating quality-driven self-adaptive software systems. In: *Proc. 6th Int. Symposium on Software Engineering for Adaptive and Self-Managing Systems (SEAMS 2011),* pp. 80-89 (2011) — **Lorena Castaneda, July 30**

- Ebrahimi, S., Villegas, N.M., Müller, H.A., Thomo, A.: SmarterDeals: a context-aware deal recommendation system based on the SmarterContext engine. *CASCON 2012:* 116-130 (2012) — **Nina Taherimakhsousi, July 30**

- McKinley, P.K., Sadjadi, M., Kasten, E.P., Cheng, B.H.C.: Composing Adaptive Software. *IEEE Computer* 37(7):56-64 (2004) — **Carlos Gomez, July 31**

- Tewari, V., Milenkovic, M.: Standards for Autonomic Computing, *Intel Technology Journal,* 10(4):275-284 (2006) — **Nitin Goyal, July 31**

Guidelines for Grad Presentations
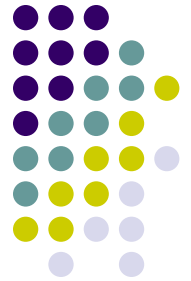
- Format of presentation
  - Presentation 15-20 mins
  - Q&A 5 mins
  - Practice talk (!)
- Slides
  - High quality
  - Submit slides 2 days before presentation to instructor for approval
  - Submit final slides 1 day after presentation for posting on website

- Talk outline
  - Motivation
  - Problem
  - Approach
  - Relation to what we heard in the course so far
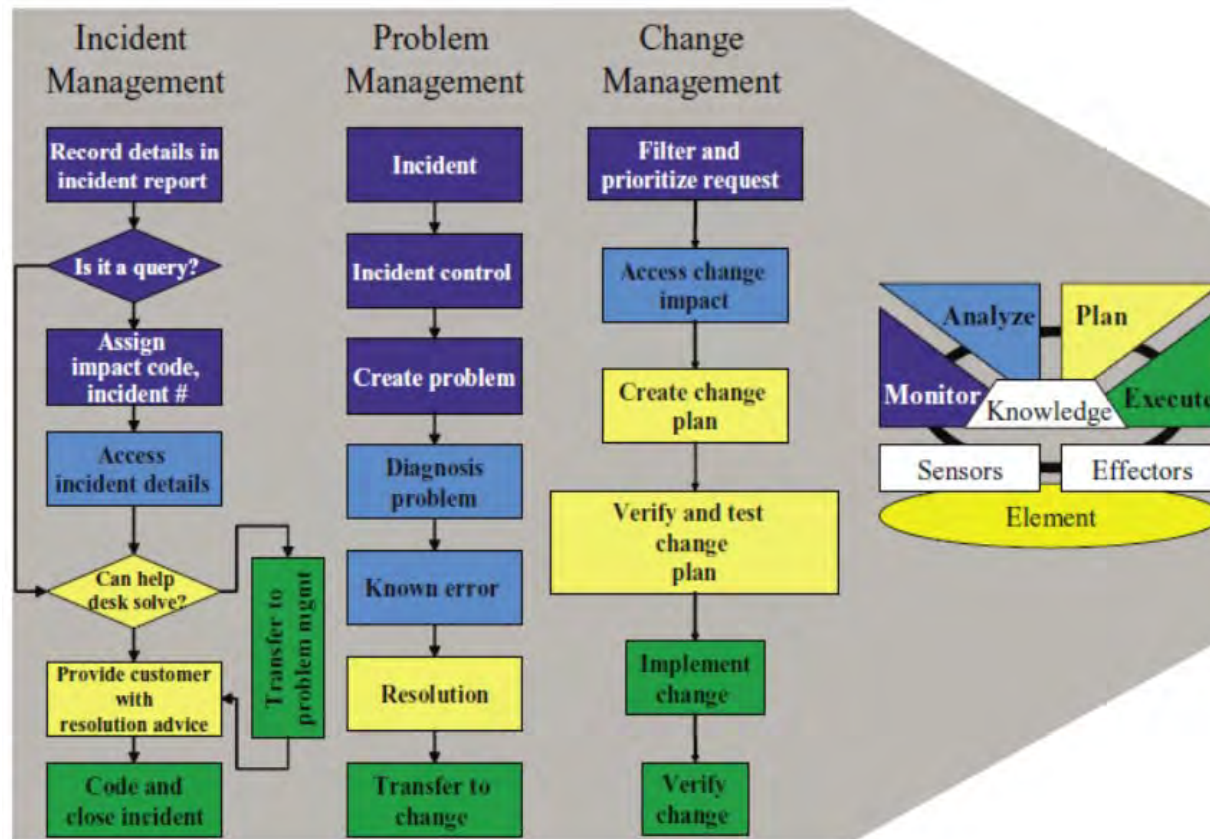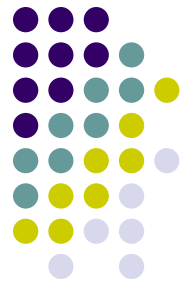 - Contributions of the paper
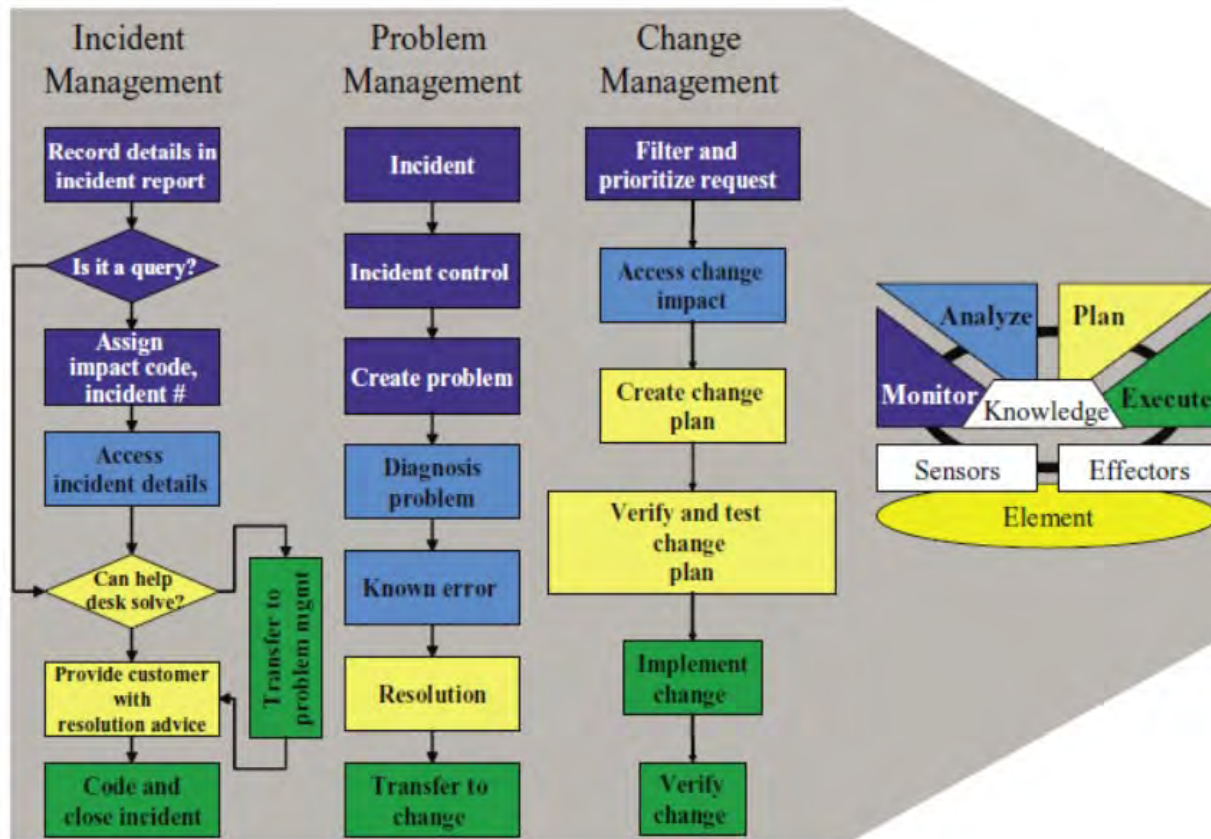
ACRA
AC Reference Architecture
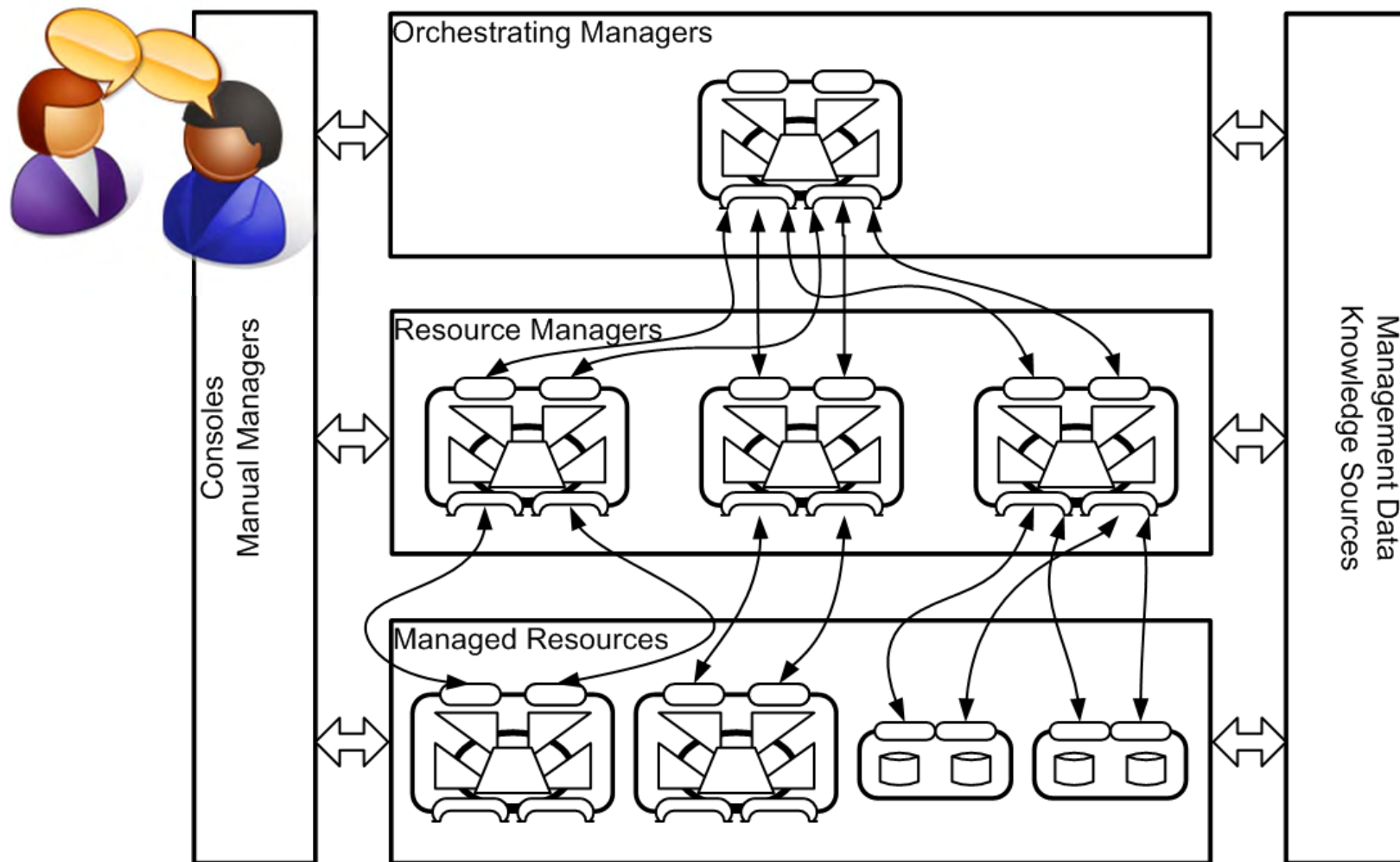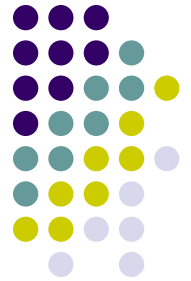
MAPE-K Loop
Standards & Interfaces
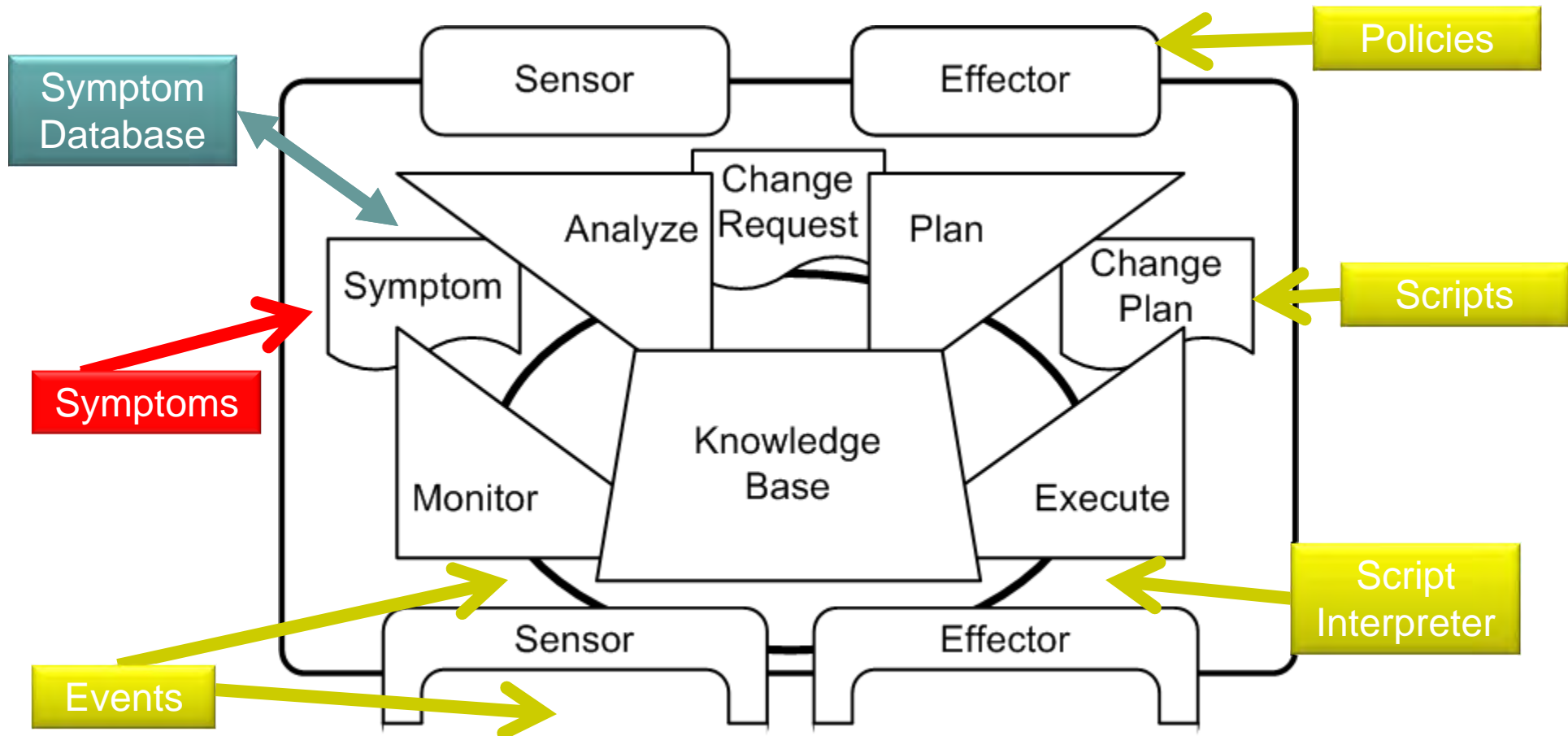
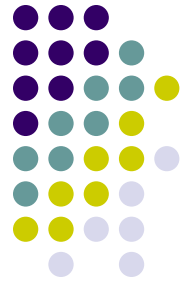# How Autonomic Computing Affects IT Processes

# How Autonomic Computing Affects IT Processes

- Discuss the challenges involved in automating these management processes *incrementally* using autonomic computing technology
- Sketch the four MAPE phases including K

IBM: An Architecture Blueprint for Autonomic Computing, 4th Ed. 2006

# Information Technology Infrastructure Library (ITIL)

- ITIL is a set of practices for IT service management (ITSM) that focuses on aligning IT services with the needs of business

- ITIL 2011 is published in a series of five core publications, each of which covers an ITSM lifecycle stage

- ITIL underpins ISO/IEC 20000 (previously BS15000), the International Service Management Standard for IT service management

- ITIL describes processes, procedures, tasks and checklists that are not organization-specific, used by an organization for establishing integration with the organization's strategy, delivering value and maintaining a minimum level of competency

- It allows the organization to establish a baseline from which it can plan, implement, and measure

- It is used to demonstrate compliance and to measure improvement

Information Technology Service Management (ITSM)
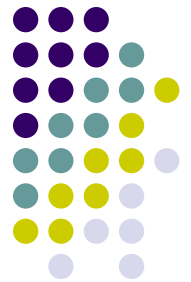
- Underlying elements
  - ITIL: IT Infrastructure Library®
  - ITIL Best Practices Standard: ISO/IEC 20000-1:2005
  - CMDB: Configuration Management Data Base
 - Autonomic Computing Architecture
  - Key standards

IBM: IT Service Management Standards: A Reference Model for Open Standards-Based ITSM Solutions, April 2006
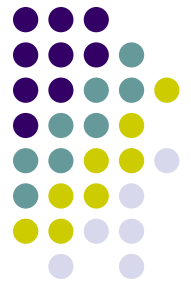
The "Four C" Business Pressures

- **Change**
  - Variability in market demands, workloads and service levels

- **Compliance**
  - The need to conform to regulations and security requirements and provide audit capabilities

- **Complexity**
  - Heterogeneity of resources, composite applications and traditional functional silos for managing them
    - Silos: vertical towers of specialized expertise and tools associated with managing one slice of the IT environment—servers, network, applications, databases

- **Cost**
  - Increases in the time and expense required to manage and administer the IT system—in conflict with the business pressure to reduce the cost of doing business

IBM: IT Service Management Standards: A Reference Model for Open Standards-Based ITSM Solutions, April 2006

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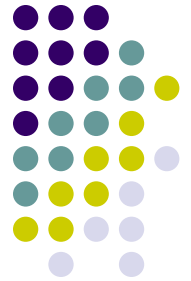
ITSM: Integrating the Silos

The goal of ITSM is to integrate silos to realize horizontal IT services

- Availability management
- Change management
- Service level management
- Security management
- Incident management
- Release management

Horizontal integration

- Enables the business of IT to be managed in a service-oriented manner
- Employs service-oriented architecture (SOA) to deliver the IT services that are relevant to the business they serve.
- Provides interoperability in a heterogeneous environment

Characteristics of integration

People

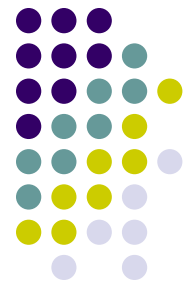- Interconnected and productive (no longer in silos)

Processes

- Based on best practices, automated and customizable

Information

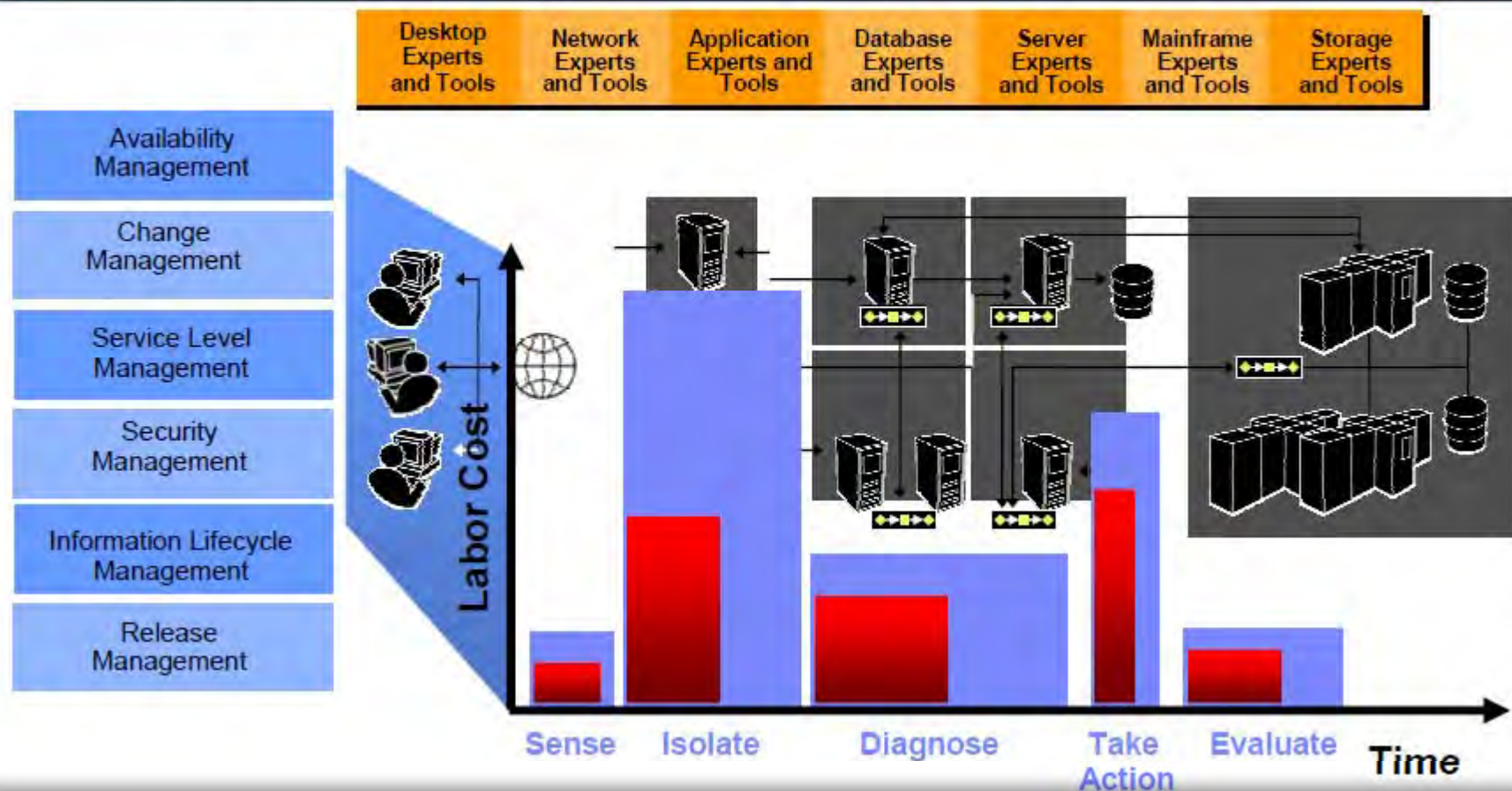- Standardized, federated and secure
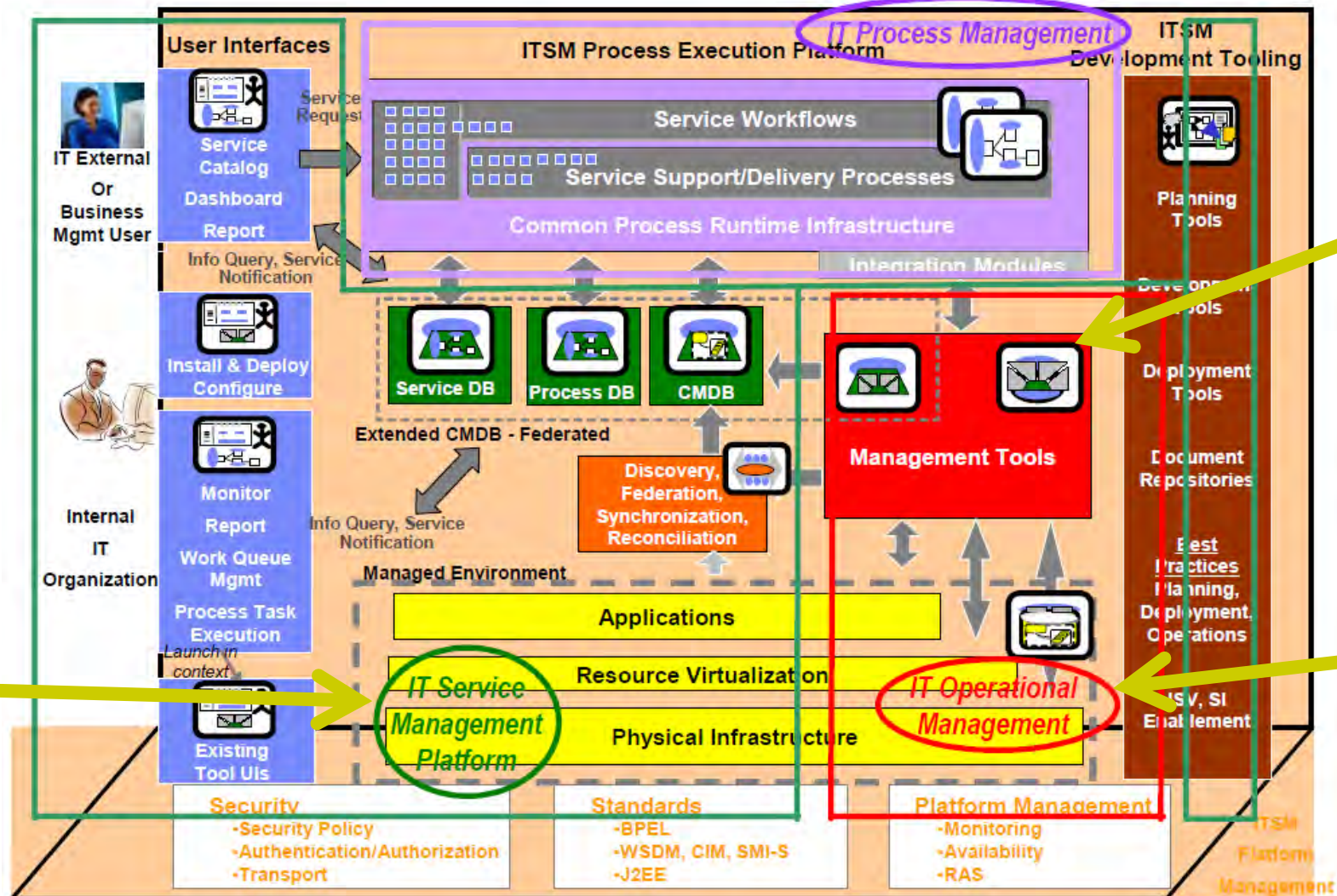
Technology

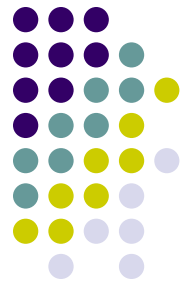- Integrated, virtualized and role-based

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Integration Across Silos

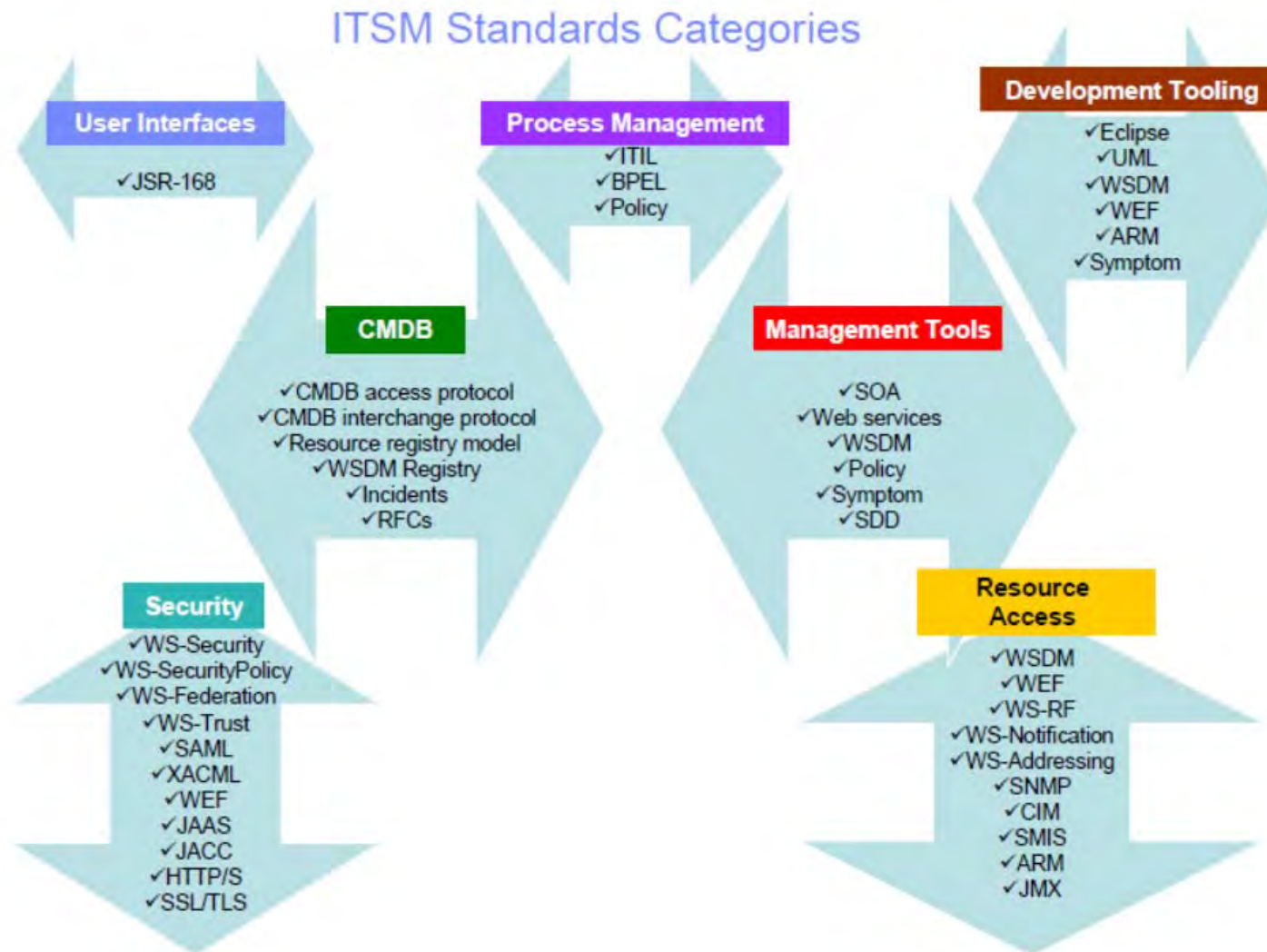Managing composite applications across IT silos is major challenge

ITSM Architecture

ITSM Standards

ITSM Standards Categories

User Interfaces
✓JSR-168

Process Management
✓ITIL
✓BPEL
✓Policy

Development Tooling
✓Eclipse
✓UML
✓WSDM
✓WEF
✓ARM
✓Symptom

CMDB
✓CMDB access protocol
✓CMDB interchange protocol
✓Resource registry model
✓WSDM Registry
✓Incidents
✓RFCs

Management Tools
✓SOA
✓Web services
✓WSDM
✓Policy
✓Symptom
✓SDD

Security
✓WS-Security
✓WS-SecurityPolicy
✓WS-Federation
✓WS-Trust
✓SAML
✓XACML
✓WEF
✓JAAS
✓JACC
✓HTTP/S
✓SSL/TLS

Resource Access
✓WSDM
✓WEF
✓WS-RF
✓WS-Notification
✓WS-Addressing
✓SNMP
✓CIM
✓SMIS
✓ARM
✓JMX

Change of Perspective

Traditional Applications	Future Applications
Designed to last	Designed to change
Tightly coupled	Loosely coupled, agile and adaptive
Integrated silos	Composed of Services
Code-oriented	Process-oriented
Long development cycle	Interactive and iterative development
Cost centered	Business centered
Middleware makes it work	Architecture makes it work
Favors homogeneous technology	Favors heterogeneous technology