Agile Governance for SOA-Based Military Systems of Systems

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Outline

- Background
- Net Centric operations
- Service Oriented Architecture (SOA)
  - Modeling and Simulation
- Systems of Systems (SoS)
- Co-evolutionary development
  - Agile development strategy
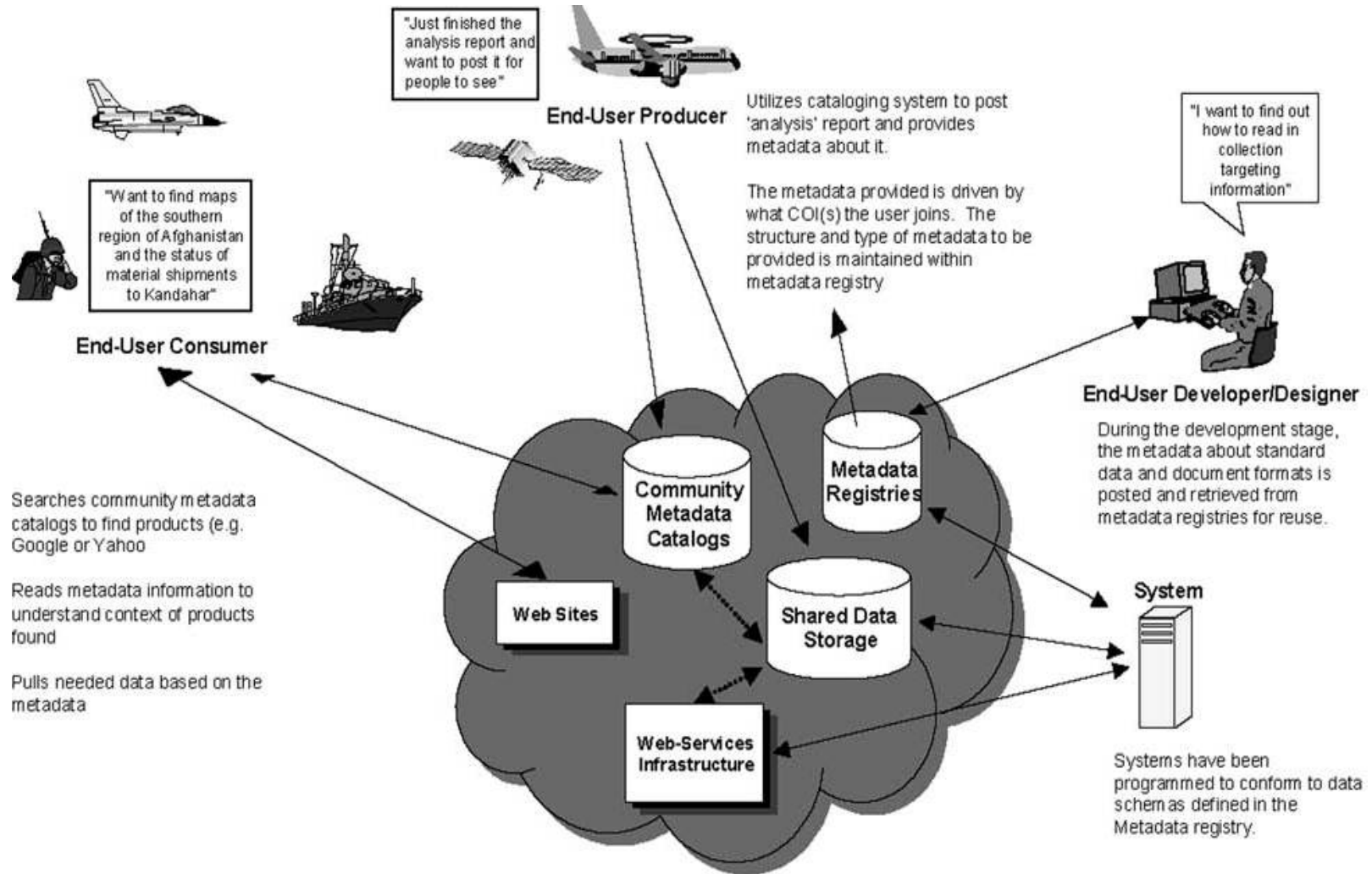- Governance
  - Agile Governance for SOA (AGSOA)

Background

- **ARCES** Program (**A**pplied **R**esearch in **C**omputing **E**nterprise **S**ervices)
  - Research contract: AF ESC to Villanova
- Addresses inhibitors and threats to emerging **SHARED** military IT applications
  - Modeling and simulation
  - Compression
  - Communities of interest; granularity of information
  - Security
  - Strategies for effective co-evolutionary development

Presentation Focus

- Not modeling and simulation
  - Very interesting and successful results
  - Net-Centric Validation Conference
    - September 27-28, 2007 at Villanova
- But **why** some Net-Centric warfare developments are not moving as rapidly as expected
- And how to deal with the problem

Net Centric Warfare

"Just finished the analysis report and want to post it for people to see"

End-User Producer

Utilizes cataloging system to post 'analysis' report and provides metadata about it.

The metadata provided is driven by what COI(s) the user joins. The structure and type of metadata to be provided is maintained within metadata registry

"I want to find out how to read in collection targeting information"

"Want to find maps of the southern region of Afghanistan and the status of material shipments to Kandahar"

End-User Consumer

Searches community metadata catalogs to find products (e.g. Google or Yahoo

Reads metadata information to understand context of products found

Pulls needed data based on the metadata

Community Metadata Catalogs

Metadata Registries

Web Sites

Shared Data Storage

Web-Services Infrastructure

End-User Developer/Designer

During the development stage, the metadata about standard data and document formats is posted and retrieved from metadata registries for reuse.

System

Systems have been programmed to conform to data schemas defined in the Metadata registry.

Ubiquitous Network and Services that support the "enterprise"

Net Centricity → SOA

- Net centricity is evolving to the more fluid service oriented architecture (SOA) based systems

However,

- Net centricity does not imply SOA
  - Can be server to server based
  - Can be client/server based

A SOA Primer

- Naturally systems of systems
- Complex interdependencies
- Require overarching governance structure
  – Better imagined as a foundation
- Distributed development
- Co-evolutionary (multiple overlapping spirals with short time frames)

Understanding Co-Evolutionary Development
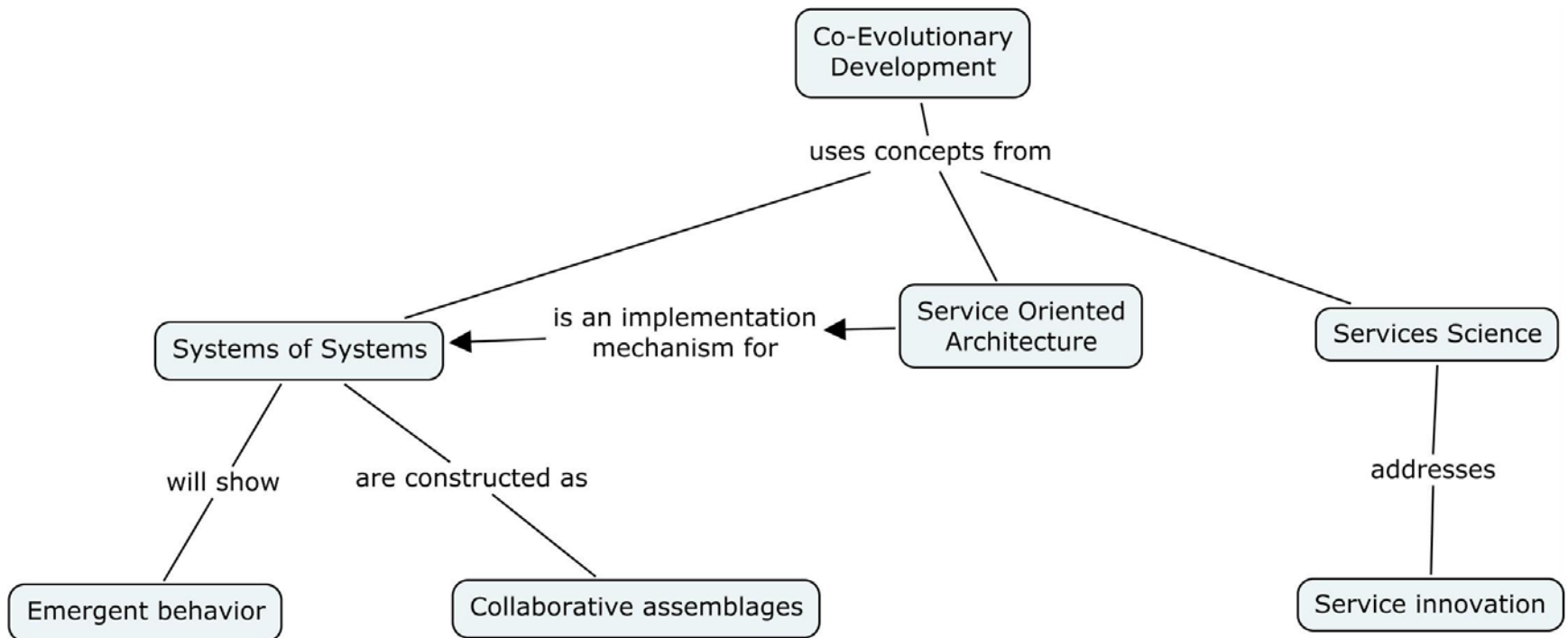
A SOA Primer (2)

- Example: Create a delivery tracking and support system through a combination of services
  - Traffic.com
  - Google Earth
  - Mom's Mileage Management (MMMgood.biz)
- *Notes*
  - Delivery service depends on real-time view
  - Shared resource
  - Large number of simultaneous consumers / providers

SOA's Systems of Systems Engineering Challenge

- By definition, SOA systems are
  - interdependent
  - greater than the sum of the parts
- But interdependence creates
  - novel risks to stakeholders
  - especially to service providers
    - difficult to measure and reward performance, value, or blame
    - difficult to troubleshoot
    - difficult to resolve problems

SOA-based Military Systems

- Publish and subscribe paradigm
- Perpetual interdependencies
- AF-ICE (Integrated Collaborative Environment)

Systems Integration Issues

- Complex, multi-owner systems of systems
- Emergent requirements
- Rapid change
- Reused components
- High assurance of qualities of safety, security, reliability, availability, maintainability, performance, adaptability, interoperability, usability, scalability

See references: Barry Boehm, October, 2007

SOA Governance

Actions taken to
- establish
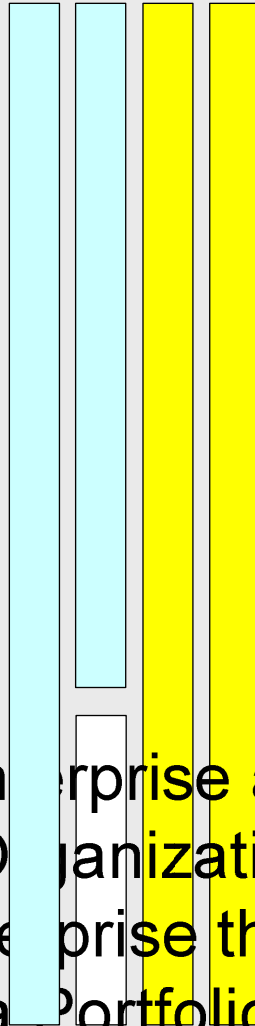- interpret
- enforce

Rules for
- *development*, which is distributed
- *implementation*, which requires cooperation of many natural competitors (co-opetition)
- *operation*, which depends on services managed by many parties

Governance as foundation
vs.
Governance as supervision

Life Cyc
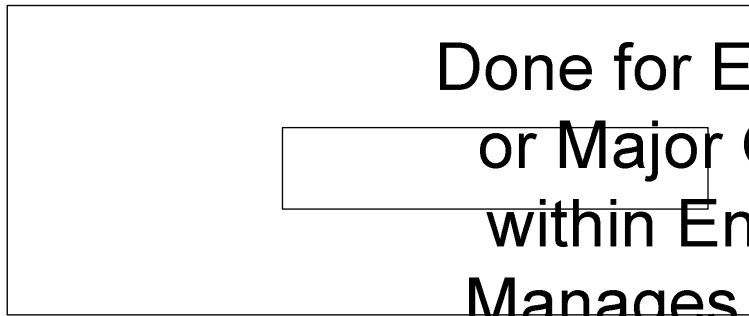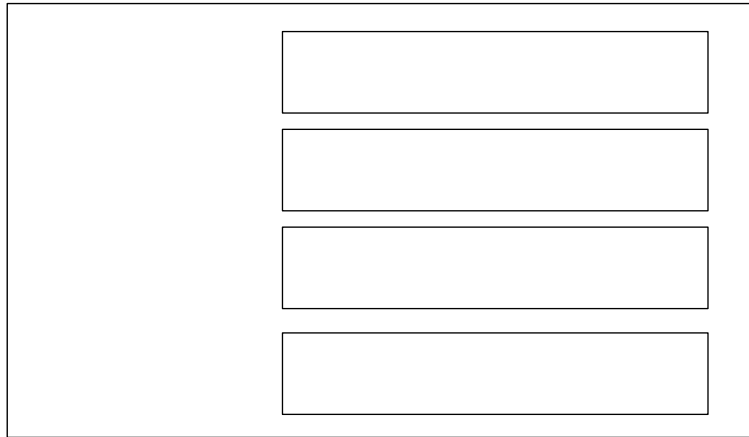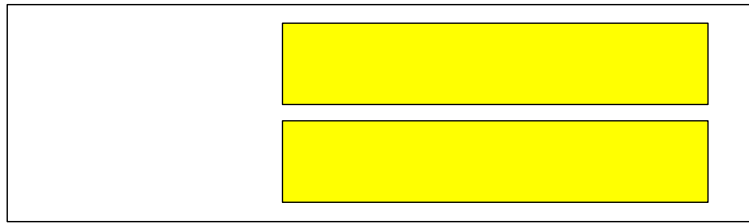
Federate

Stra

Done for Enterprise and/ or Major Organization within Enterprise that Manages a Portfolio of Capabilities and Investments

Federate

Arch

SOA Governance Challenges/Tasks

- Security infrastructure
- Service versioning
- Service funding
- Co-evolutionary development
- Performance monitoring and load balancing
- Business process re-engineering
- Business continuity planning
- Disaster recovery

Agile Governance for SOA

- Constant incremental change management and improvement in governance actions
- 30-day sprints
- Constant communication with stakeholders
- Stakeholders are:
  - Service providers
  - Large system integrators
  - Small system integrators
  - System users

AGSOA Influence

- Provides rules and services that are constantly being adapted to
  - Changes in technology
  - Changes in customer needs
  - Changes in external environment
  - Changes in the installed and documented base of software

AGSOA

- Governance as a Service
  - to multitude of projects
  - vetting of standards
  - qualifying open source and off-the-shelf systems
- Compare with Software as a Service (SaaS)

Effective Governance Components

- Adaptation to changing social, cultural, technical and business complexities
  - Gmail vs. Hotmail
- Trust management and resolution for stakeholders
  - Intellectual property sharing and valuation
- Conflict arbitration and resolution
  - Reaching agreement on platform releases for widely varied requirements

Example: AGSOA for Security

- Sets rules
- Collect metrics
  - for incentives, accountability and risk management
- Contracts services

AGSOA for Security
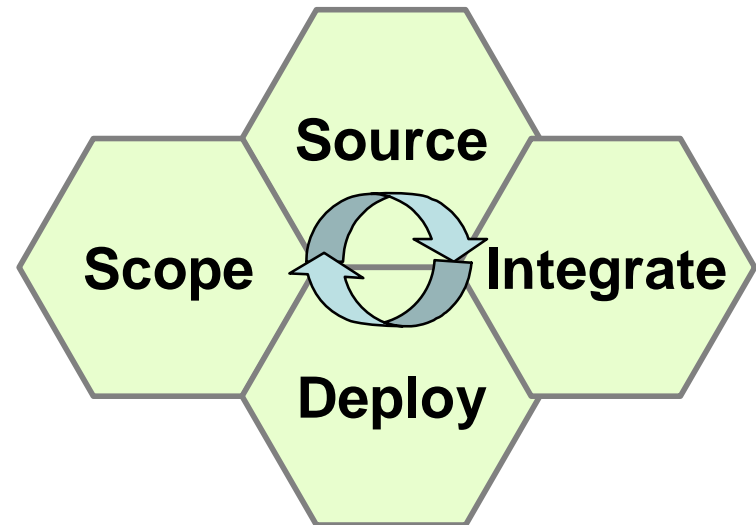
AGSOA may demand expertise- and resource-sharing across business and technical boundaries

- Multiple simultaneous AGSOA teams likely

- A "super-team" may be dynamically created to solve an interim problem with resources drawn from other teams

- Resources expected to be returned when task is accomplished

AGSOA Team

Dynamic allocation of tasks

AGSOA Team (*task B*)

AGSOA Team (*task A*)

AGSOA Team (*task C*)
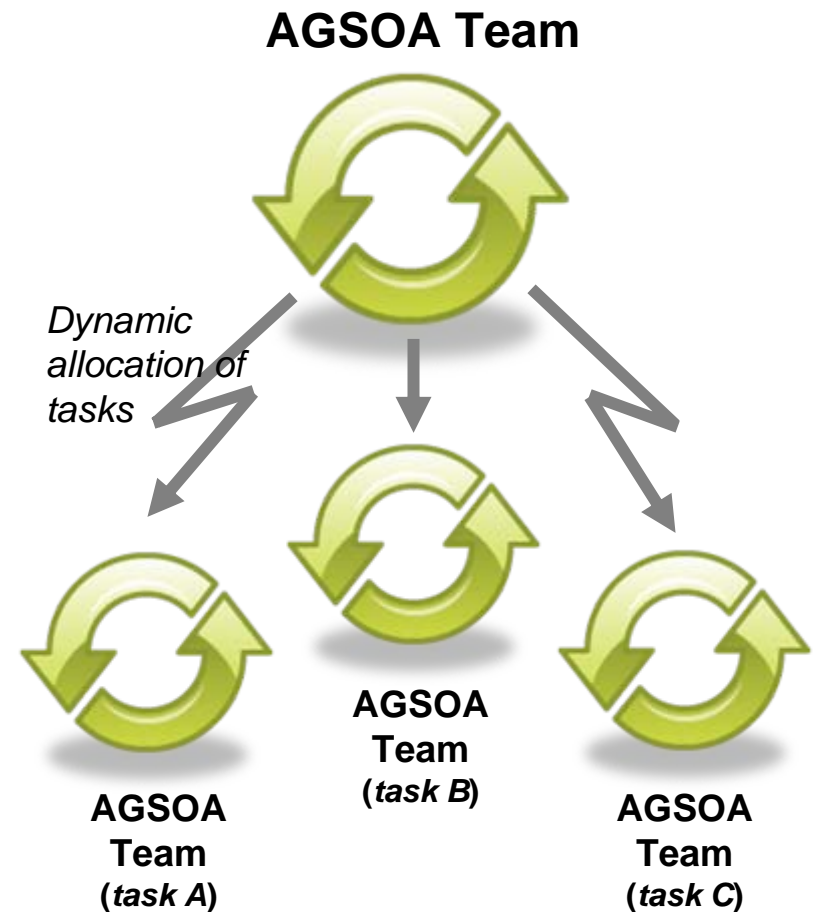
Why Agile Governance for SOA?

- Tasks/goals of Net-Centric Warfare are agile
  - to meet rapid enemy re-configuration
  - to seize emergent targets of opportunity
- Traditional SOA Governance (for Retail and Manufacturing) presumes
  - longer time frames (months vs. days)
  - more stable goals
  - better defined rewards

Why Agile (2)

- Agile SOA governance assumes governance tasks, priorities, and resources
  - will be tuned at least as frequently as Net-Centric Warfare goals change
  - will accommodate unexpected technology problems
    - capacity overload
    - patch bugs

AGSOA Examples

- Porting Tri-Services IM and Email to iPhone

  – New contracting (now dealing with Apple)

  – Continuing V&V (responding to frequent iPhone revisions)

- Shifting secure "Munitions on Target" resources to shared SOA platforms

  – Contracting with dozens of contractors for interface design and V&V that affects hundreds of mission critical platforms

AGSOA Governance Services

Examples include:

- Providing contract negotiation across many disparate applications that need to share a common resource
    - Identity management systems, for example
- Integrating large numbers of disparate simultaneous projects and project milestones that cross vendor boundaries but must work together in a SOA system
- Managing shared *Software as a Service* resources to ensure that stakeholders are fairly compensated or charged in an accurate or timely fashion

Different projects will need and consume differing amounts of AGSOA services at differing times in their project lifecycle, centralized and shared for efficiency, but AGILE to meet unique needs.

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