More Than IT

Extending SOA to the Entire Enterprise

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Where Are We Today?

- SOA adoption within IT systems—some adoption, but not universal
- Semantic standards
- OWL, WSDL-S
- Rarely adopted in operational systems
- Process / workflow standards
- BPMN, BPEL
- Chiefly design-time artifacts
- Limited process automation across systems or programs

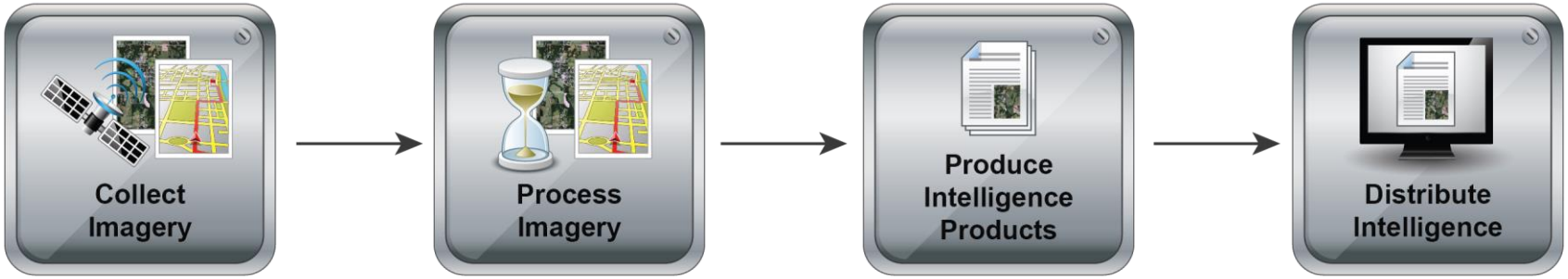
Limitations of the Current Situation

- Very few all-electronic processes
  - Most processes are either mixed or all-human
- Business processes captured in design artifacts
  - Models see limited operational use
  - Workflows are built into tools
    - Applications
    - SOPs
- Focus is on improving information systems, but most business processes are overlooked

Toward a Solution

- Apply SOA tenets across DoD, to all capabilities
  - Every capability is a service that can be used by others
  - What's missing is a service and interface description
- Expand upon existing standards to enable interoperability across all capabilities
  - OWL-S expanded to describe non-electronic services
  - Improve capability visibility, reuse, and gap identification

A Simple Example



- Collect imagery, process as needed, produce and distribute finished intelligence
- *Who* does something is not as important as *what* is done

Describing Physical Services

- Conceptually similar to web services
  - Inputs, outputs, preconditions, effects
  - One provider can offer many operations
- Key differences:
  - Involvement of people
    - More flexibility
    - Results / QoS more variable
  - Physical transfer of inputs and outputs
    - Not ubiquitous
    - Possible secondary costs / impacts

Describing Operations

- The semantic problem of describing web service operations also applies to physical services
  - Ambiguity is a problem
  - Descriptions must be machine-processable
- Effects of flexibility
  - Easier to describe operations
  - Harder to describe exhaustively
- Several possible solutions
  - Universal Core (UCore): applicable to DoD, but limited
  - North American Industry Classification System (NAICS): applicable in North America, but geared toward industry
  - UN Standards Products and Services Code (UNSPSC): international, but geared toward industry

Describing Inputs and Outputs

- As with operations, semantics are still an issue
- The bigger issue is the range of possible values
  - For web services, everything has to be 1s and 0s
  - For physical services, inputs and outputs can be *anything*:
    - Digital: satellite imagery to be interpreted
    - Specification: engineering drawing used by machinist to produce a part
    - People: patient visiting a doctor for a diagnosis

Describing Inputs and Outputs (cont)

- Second-order considerations
  - Transportation, safety…
  - Location: *where* becomes a consideration
- Solutions
  - Inputs / Outputs
    - We do not have a vocabulary that can completely eliminate ambiguity; we can only reduce it
    - Distinguish between physical and electronic data
    - Physical: distinguish between living and inanimate
    - Living: Linnaean taxonomy
    - Inanimate: tie to operation description
  - Second-order considerations

Describing Quality of Service

- Web services QoS and Service Level Agreements
  - An ongoing area of research, but generally understood
  - Measured in terms of availability, data rate, etc.
- Physical services are different
  - Warranty / guarantee may be adequate where applicable
  - May be a sliding scale, perhaps multi-dimensional
  - Intangibles
- Solutions
  - Some common metrics exist: cost, responsiveness, accuracy
  - Community or historical ratings

The Complete Picture

- Unified service description framework
  - Electronic services
  - Physical services
- Automated workflow composition capability
  - Given a process described in BPMN, find and select appropriate service combinations that can complete the process
  - Process tasks with no available service are capability gaps

Why All-Encompassing SOA?

- We live in a world of services
- Every day, most people interact with over 40 service systems
  - Utilities, transportation, information, etc.
  - Most are not electronic
- DoD is no different
  - At the macro level:
    - XVIII Airborne Corps owns no heavy fixed wing transport aircraft
    - US Marine Corps operates no ocean-going ships
  - At the micro-level:
    - Infantry platoon has no organic intelligence support
    - Fighter squadron owns no airborne tankers