

Informational Interoperability: Overview of Day 1 Issues

Interoperability Workshop

April 11-12, 2007

Dallas, TX

— Information Interoperability: Key Issue

Title: Business Interface Definitions: Managing Scalability, Heterogeneity and Flexibility

Description: Each IT surface should support multiple business contexts while occulting domain-specific details.

Reasoning: Foreign systems must be able to easily communicate with little effort.

The scale of the Grid ensures heterogeneity, in version as well as product. Extracting maximum utility and value from each device and system requires adaptive re-use of each service in new systems. Systems shall leverage and re-use existing open enterprise and business standards whenever they are available.

Recommendations:

- Reduce centrality of Meg A Watt Example (which implies traditional single purpose closed solutions) by either eliminating or adding other examples
- Add examples of existing open standards, whether W3 or enterprise, that should be [re]used. Perhaps this is an extension to 2.2.1 under Semantic Understanding. Examples might include:

- ICAL as the standard for exchanging scheduling information
- BPEL (or WS-BPEL) as the standard for transmitting process decisions
- SAML, XAML, or others of the WS-Security suite for authorizing processes and charges
- EFT standards for fund transfers / Energy Transfers)
- WS-Notification, WS-Event Coordination et al.
- ISO 15926 Information Exchange in Oil/Gas/Power

—○ Information Interoperability: Key Issue

Title: Robust System Interfaces

Description: System interfaces that are robust, flexible, and discoverable and encourage connectivity between systems without breaking the entire system.

Reasoning: Allow new industries and markets to innovate and extend the energy operating space. Products and systems that haven't been envisioned but could benefit the electric grid system need to know how to connect ,“plug-in” to the architecture. Desire to maintain integrity of critical systems with proper use of security and authorization.

Recommendations: Outreach to other stakeholder organizations that are involved with similar issues. Inter- and intra- industry.

Well documented and published interfaces and framework to enable disparate groups to use a common semantic perspective

— Information Interoperability: Key Issue

Title: Need for consistent semantics and abstraction models

Description: A common enterprise semantic model that drives various types of implementations and a common way to model and describe the business and methods for the automation of business processes.

Reasoning:

- A common enterprise semantic model instead of the traditional approach of having separate projects for each of these. Furthermore, this common model should be based on industry standard information models
- Use common semantics between the interfaces to application and data stores (independent of middleware being employed). Reference IEC 61968 and 61970.
- A need to articulate how standards for modeling business processes (BPMN) and information models (UML) can work together with minimal re-entry of information

Recommendations:

- Reuse of established information models such as NBIMS (National Building Information Model Standards), OAG (Open Applications Group for ERP), etc
- A common enterprise semantic model to be realized in an Ontology (OWL), which has consistent semantics with other forms of information exchange, data persistence, and viewing.

— Information Interoperability: Key Issue

Title: Rework Business Context Section

Description: There is a discontinuity between the Semantic Understanding layer and the Business Procedures layer – current Bus Context layer doesn't establish enough guidance/structure to bridge the two

Reasoning: In addition to the data context addressed in the current text, there is also a need to address the functional context

- In effect, the Bus Context layer needs to define an abstract application model that can be used to define how the Business Procedures above it are captured

Recommendations: Recommendations

- The current text discusses the Bus Context impact on the information models below – some parallel language should be added to address the Bus Context impact on the functions/services derived from the Business Procedures layer above
- Need to identify more than just the OWL reference – is there really nothing out there that we can refer to for more background
 - Perhaps UN/CFACT core components methodology
- May consider renaming along the lines of “integration” layer of some sort



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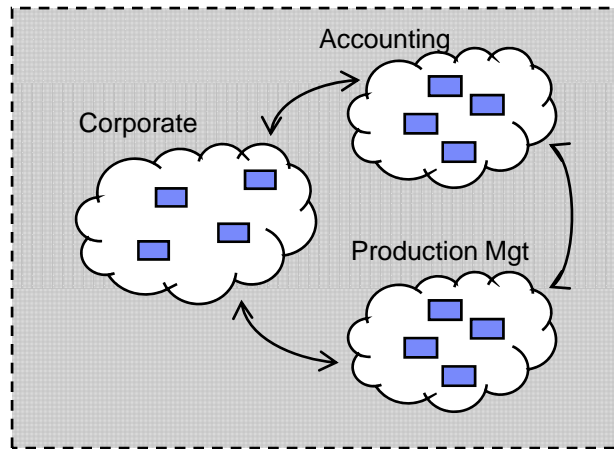
Loosely-Coupled, Event-Based Application Abstraction for Business Context

Ron Ambrosio, IBM T.J. Watson Research Center

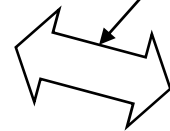
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Operational Integration Today

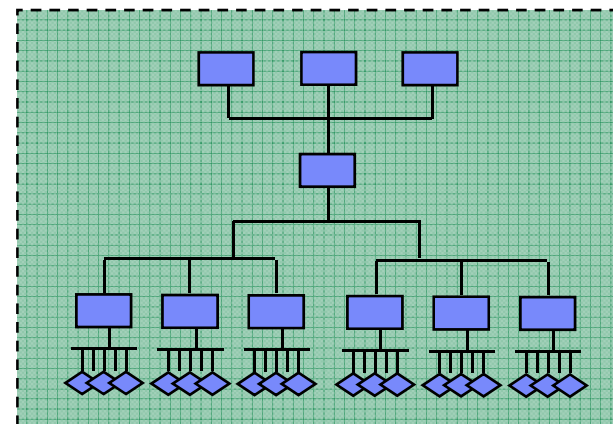
Conventional Enterprise Computing



Traditional operations integration (MES, ERP, Database, ...)



Conventional Operational Control



SCADA

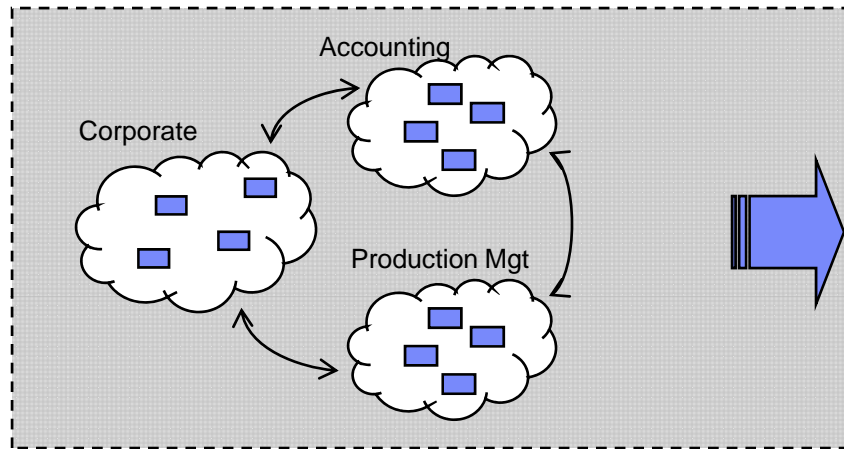
Gateways

Controller
Fieldbus
Device

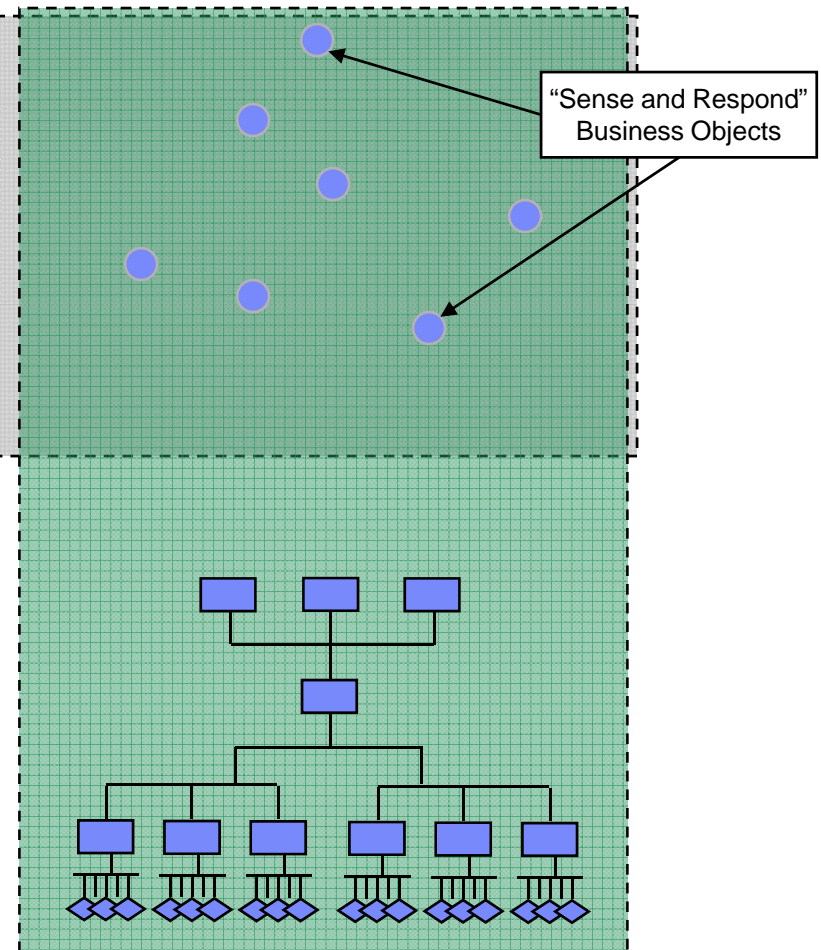
- Today's environment:
- Enterprise & embedded control domains are loosely coupled
 - Different programming models

Create Business Value through Operational Integration

Conventional Enterprise Computing



Integrated Business Automation



Closed-loop methods are emerging in the enterprise:

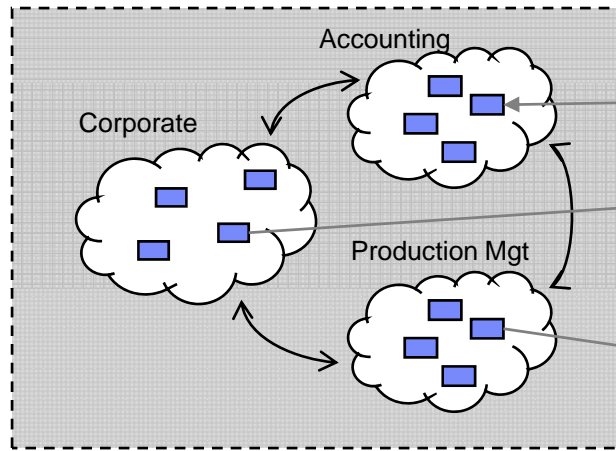
- Same "Sense & Respond" paradigm as embedded control systems

Enables unified view of enterprise and operational processes:

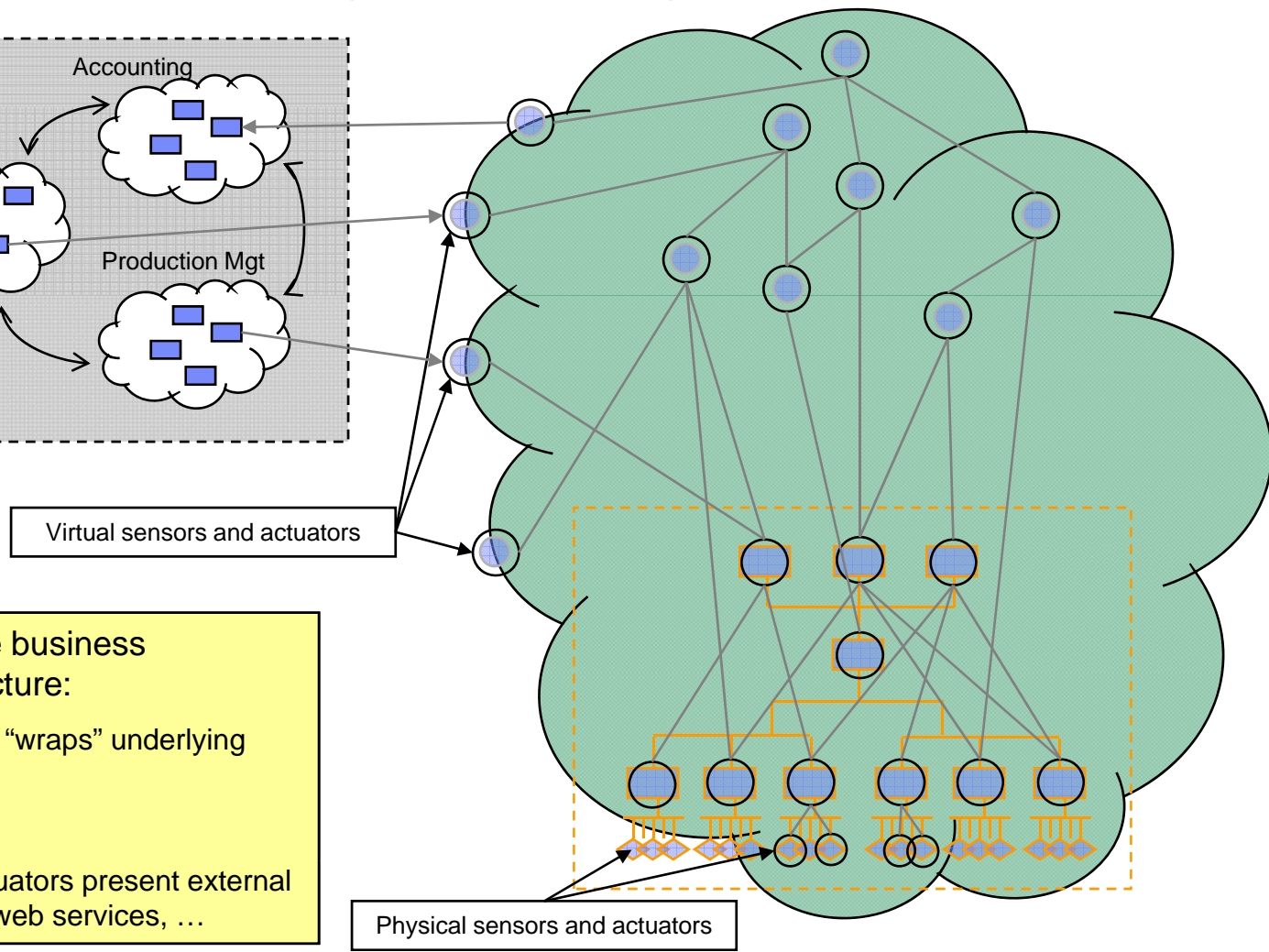
- Common programming abstraction
- Shared or interoperable infrastructure

Establish a Flexible Integration Model based on Event Bus

Conventional Enterprise Computing



Integrated Business Automation



Creates a complete business automation architecture:

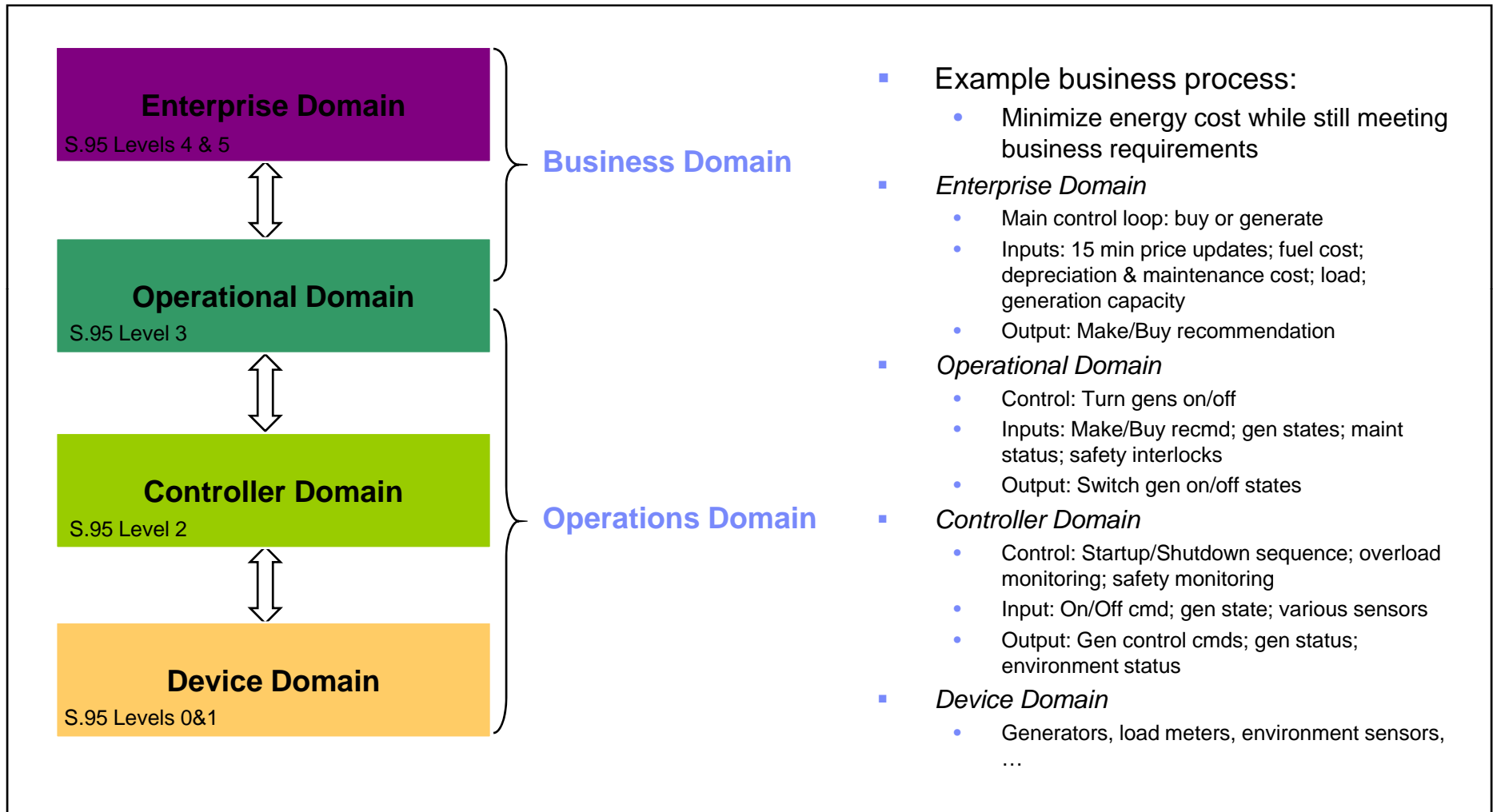
- Thin integration layer “wraps” underlying components
- Integrated event bus
- Virtual sensors & actuators present external interfaces via portals, web services, ...



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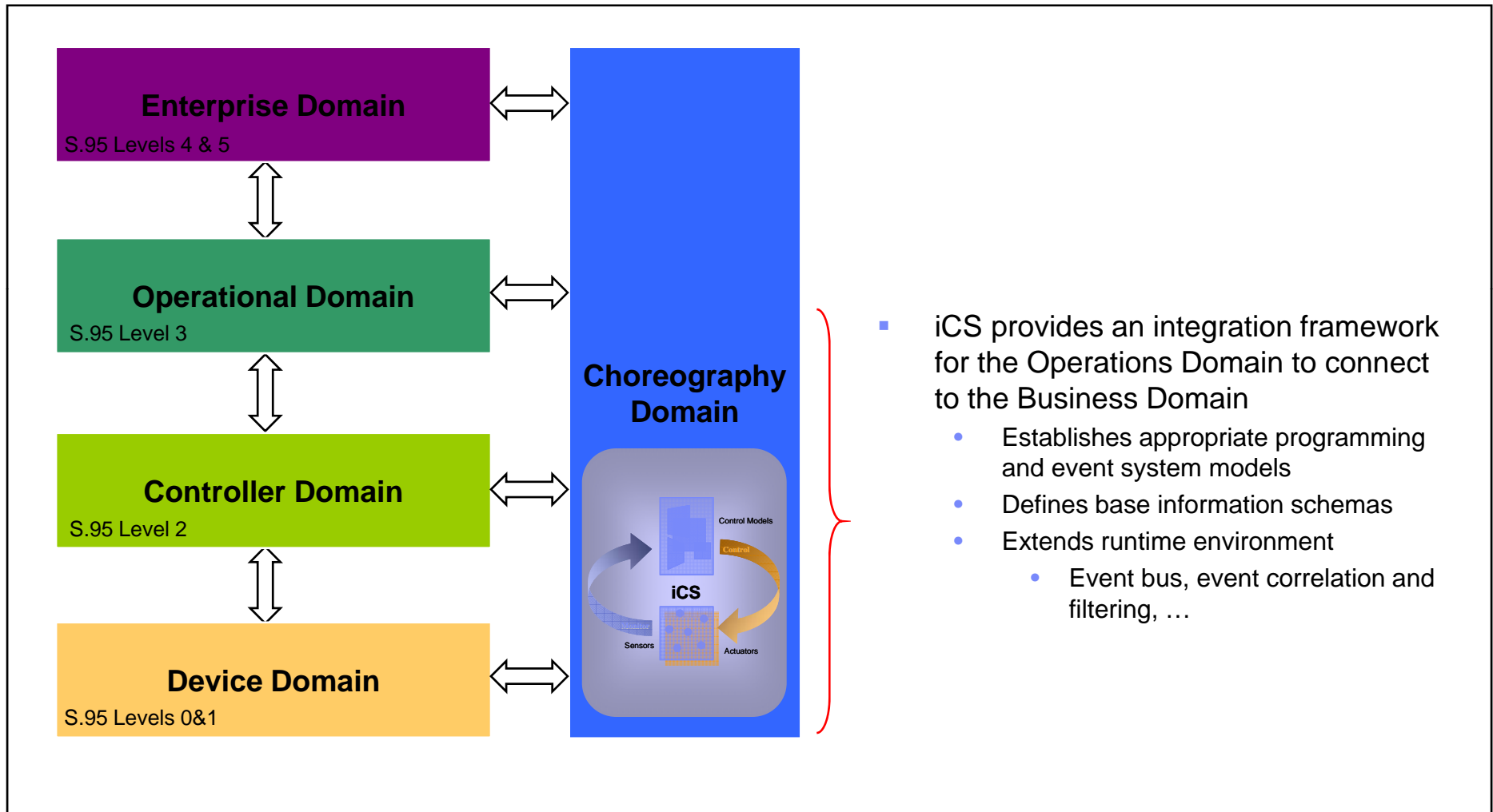
Need for Choreography Domain

Business Choreography

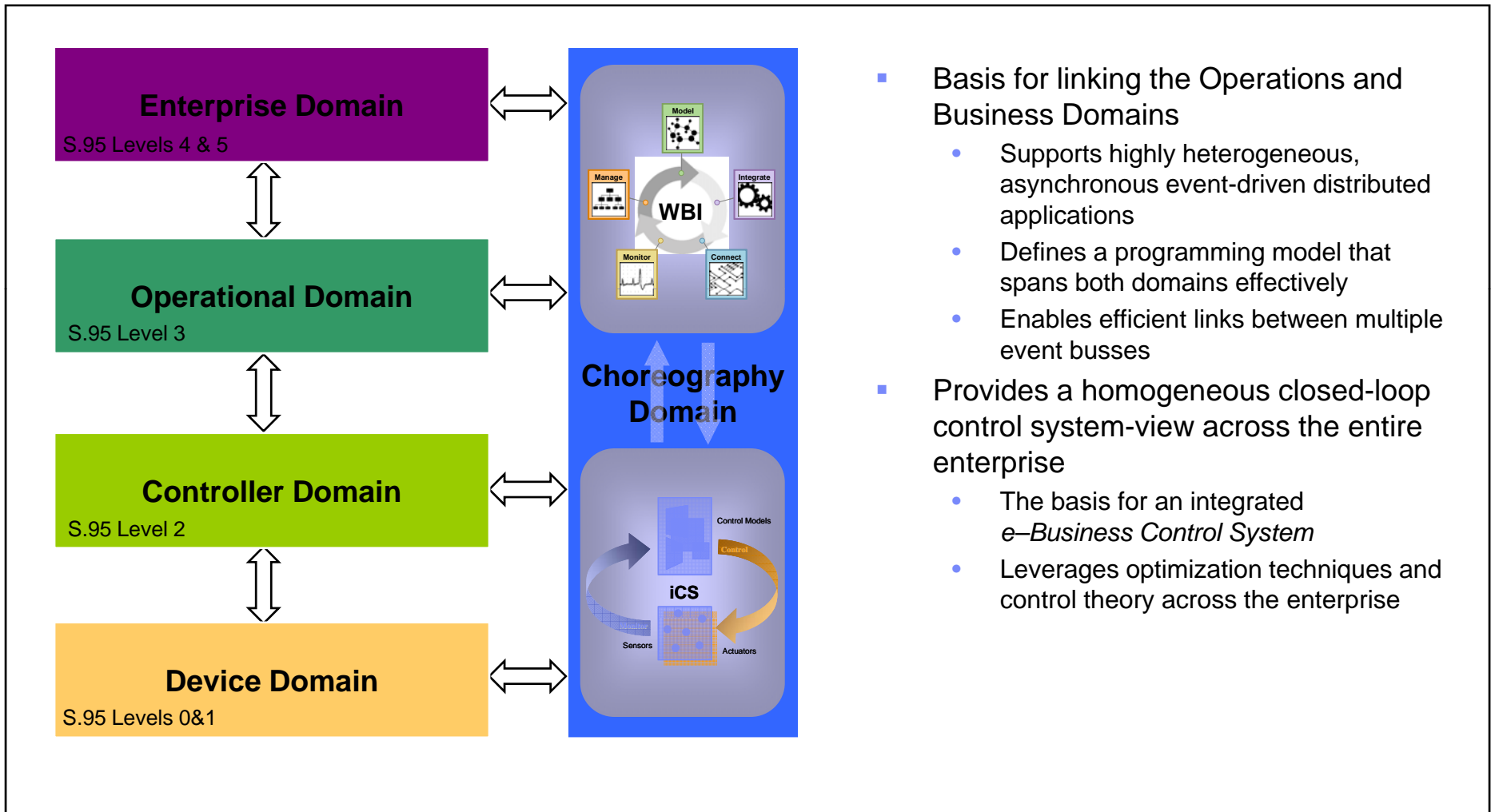


- Example business process:
 - Minimize energy cost while still meeting business requirements
- *Enterprise Domain*
 - Main control loop: buy or generate
 - Inputs: 15 min price updates; fuel cost; depreciation & maintenance cost; load; generation capacity
 - Output: Make/Buy recommendation
- *Operational Domain*
 - Control: Turn gens on/off
 - Inputs: Make/Buy recmd; gen states; maint status; safety interlocks
 - Output: Switch gen on/off states
- *Controller Domain*
 - Control: Startup/Shutdown sequence; overload monitoring; safety monitoring
 - Input: On/Off cmd; gen state; various sensors
 - Output: Gen control cmds; gen status; environment status
- *Device Domain*
 - Generators, load meters, environment sensors, ...

Business Choreography

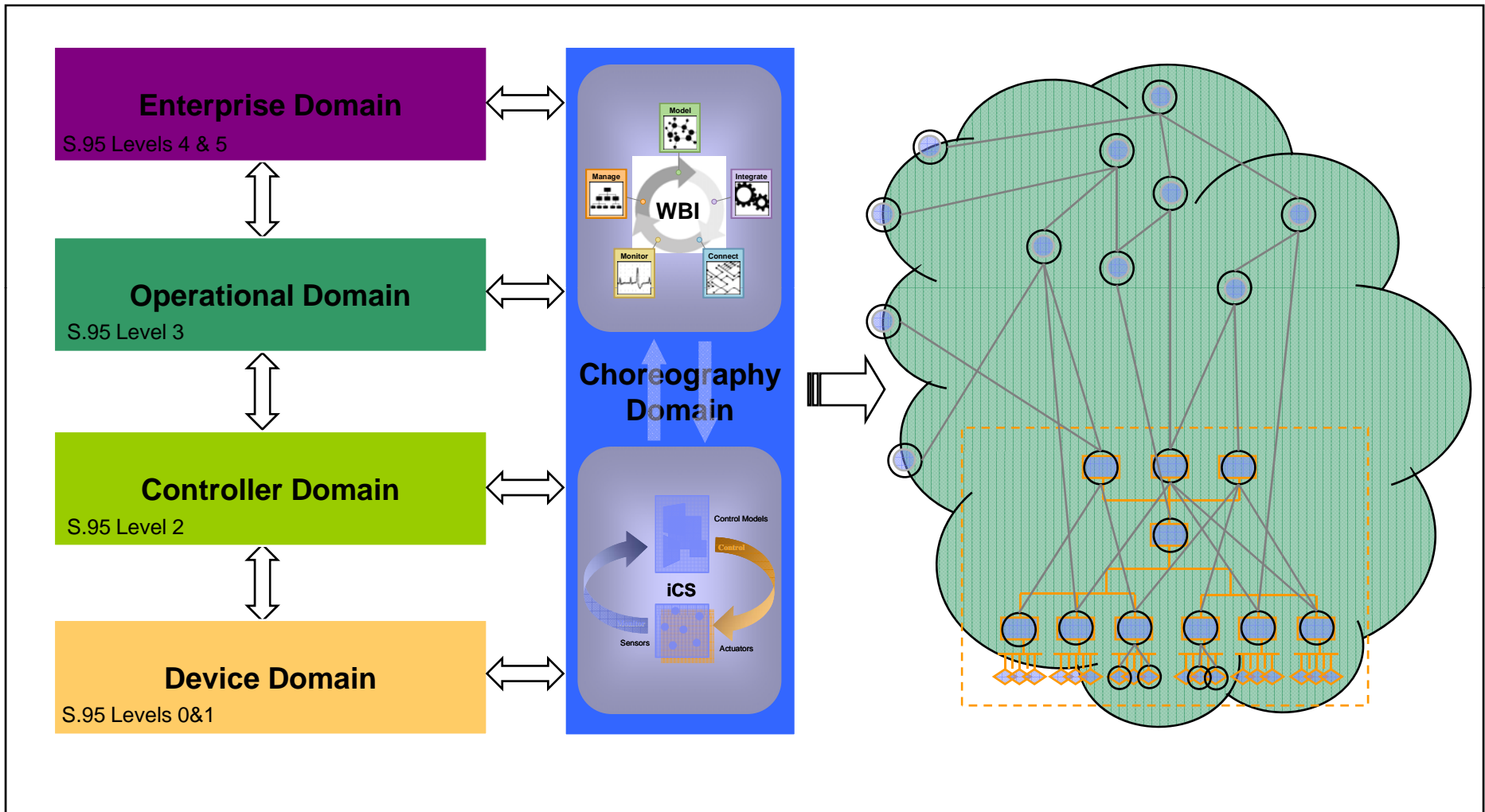


Business Choreography



- Basis for linking the Operations and Business Domains
 - Supports highly heterogeneous, asynchronous event-driven distributed applications
 - Defines a programming model that spans both domains effectively
 - Enables efficient links between multiple event busses
- Provides a homogeneous closed-loop control system-view across the entire enterprise
 - The basis for an integrated *e-Business Control System*
 - Leverages optimization techniques and control theory across the enterprise

Business Choreography



Issues captured for other Breakout Teams

—○ Cross-Cutting Issues: System Design and Architecture

- Issue: Graceful degradation needs to be supported
- Unanticipated redundancy in complex system designs can have catastrophic consequences
 - Example of multiple critical systems in New Orleans all depending on a single path to the Internet backbone
- Recommendations
 - Captured as input for the Cross Cutting group

- **Cross-Cutting Issues:**
System Design and Architecture
 - Issue: Methods/Tools for populating the content of the various layers
 - Layers are likely to be influenced significantly by adjacent layers – would be useful to take advantage of that
 - Recommendations
 - Captured as input for the Cross Cutting group

—○ Cross-Cutting Issues: Information Security

- Access to Information
- Security Assertions
- Non-repudiation

- Cross-Cutting Issues:
Privacy and Liability
 - Access to Information
 - Liability Management
 - Enforceable Contracts

- Organizational Interoperability Issues
 - Issue: Enablement of Virtual Companies / Virtual Enterprises