

Case Study: Semantic Integration as the Key Enabler of Interoperability and Modular Architecture for Smart Grid at Long Island Power Authority (LIPA)

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Overview

- Real-life Case Study of LIPA Architecture and integration approach in their Smart Grid Program
- Our Story:
 - LIPA Smart Grid Architecture approach
 - Semantic Integration as the Key Enabler of Modular / pluggable architecture
 - A real-life solution change scenario (switching from one solution provider to another one / (“unplug” one and “plug” another system)

LIPA Model-driven Architecture

Business Drivers

- Establish a loosely-coupled SOA architecture through :
 - Leveraging an Exchange Model (EXM) for model-driven “development”, that ...
 - mediates all interfaces through a LIPA Enterprise Semantic Model (ESM), ...
 - which is based on available industry standards (e.g. CIM)
- Use of a model-driven design and development process to:
 - Speed development process
 - Improve reusability
 - Improve governance and change management
- Require that any new vendor applications:
 - Conform to LIPA end points (canonical interfaces, staging areas) as much as possible / practical
 - When not possible, conform to applicable industry standard interface
 - Publish interfaces / APIs so that knowledge of underlying database structures is not required for integration (transactional or analytical)

Key Elements of LIPA Semantic Integration

- Centrally Managed Semantic (Data) Model
 - Heterogeneous interfaces mediated through common model
 - Based on industry standards (IEC CIM is the key reference model)
- Centrally Managed Semantic Mapping and Business Rules
 - Integrate & Reuse Business Rules, transformations, mappings
 - Automate gap analysis, documentation
- Centrally Managed Development and Run-Time Deployment
 - Generate ready-to-go SOA services
 - Continuous testing
 - Deploy into any runtime environment
 - Automate impact analysis on change

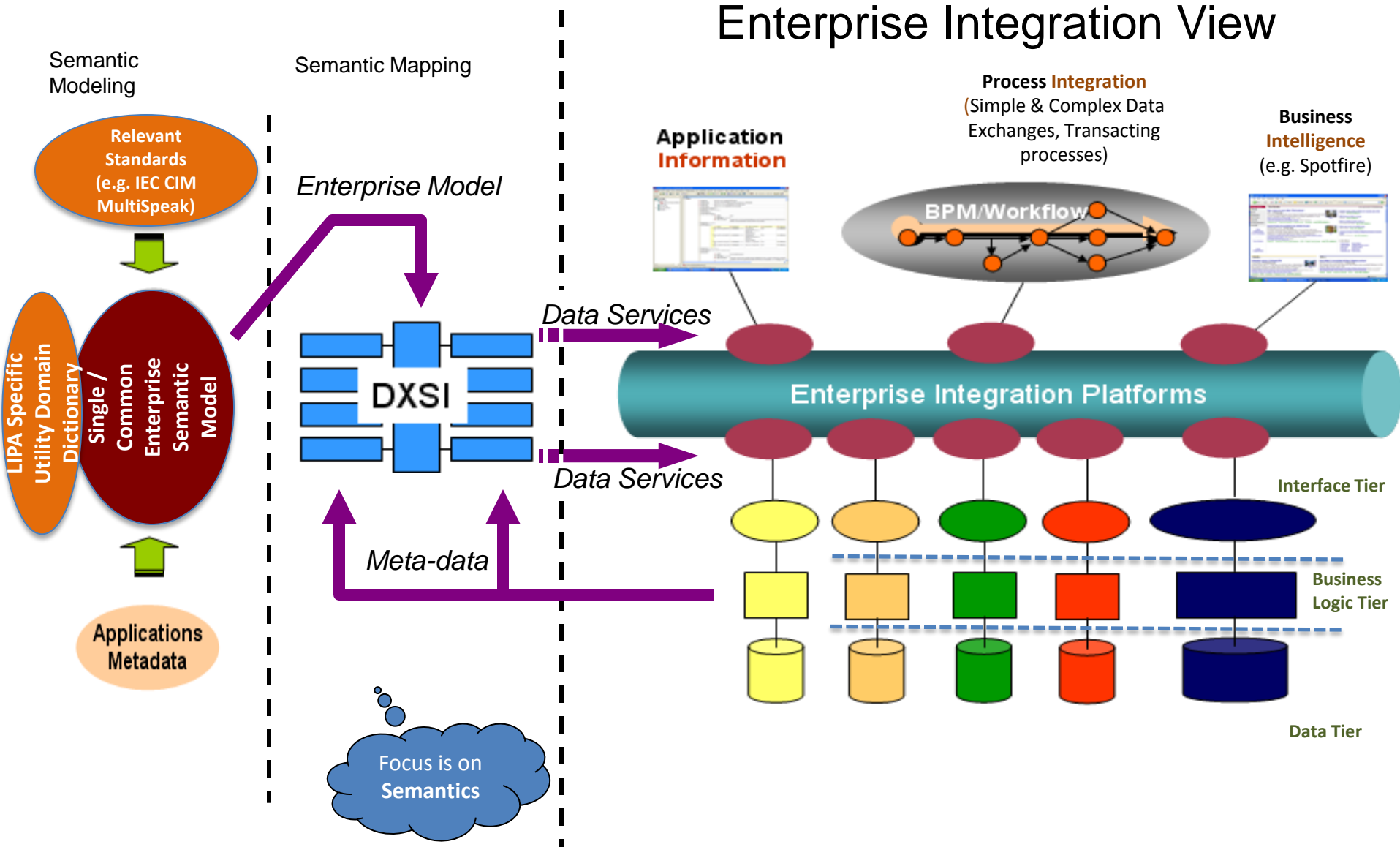
LIPA Model-driven Architecture Benefits

- Reduce cost of implementations and integrations
 - including maintenance / change management
- Reduce risk to implementations and integrations
- Increase speed of implementations and integrations
- Improve ability to solve business problems by choosing best of breed applications and services
- Avoid vendor- and technology lock-in's
- Support Multiple Service Providers
- Architecture:
 - “Near Plug and Play”, Flexibility, Agility & Portability
 - Consistent semantics for data in-flight and persisted data stores
 - Event-driven
 - Flexibility of Business Intelligence Options
 - Open to new technology, solutions, applications

Foundation – Model-driven process

- LIPA has adopted a model-driven process for defining, designing, developing and deploying:
 - Services on the Enterprise Service Bus
 - Persistent data stores for analytics (ODS, Data Warehouse, Datamart)
- The Model-driven approach leverages industry standards (e.g. EC CIM) wherever possible to:
 - Promote reusability
 - Accelerate development cycles
 - Facilitate visibility, governance and change management
- Four key models
 - Enterprise Semantic Model
 - Service Model
 - Exchange Model
 - Data Model
- Process & Governance

Model-Driven Information, Integration & Intelligence



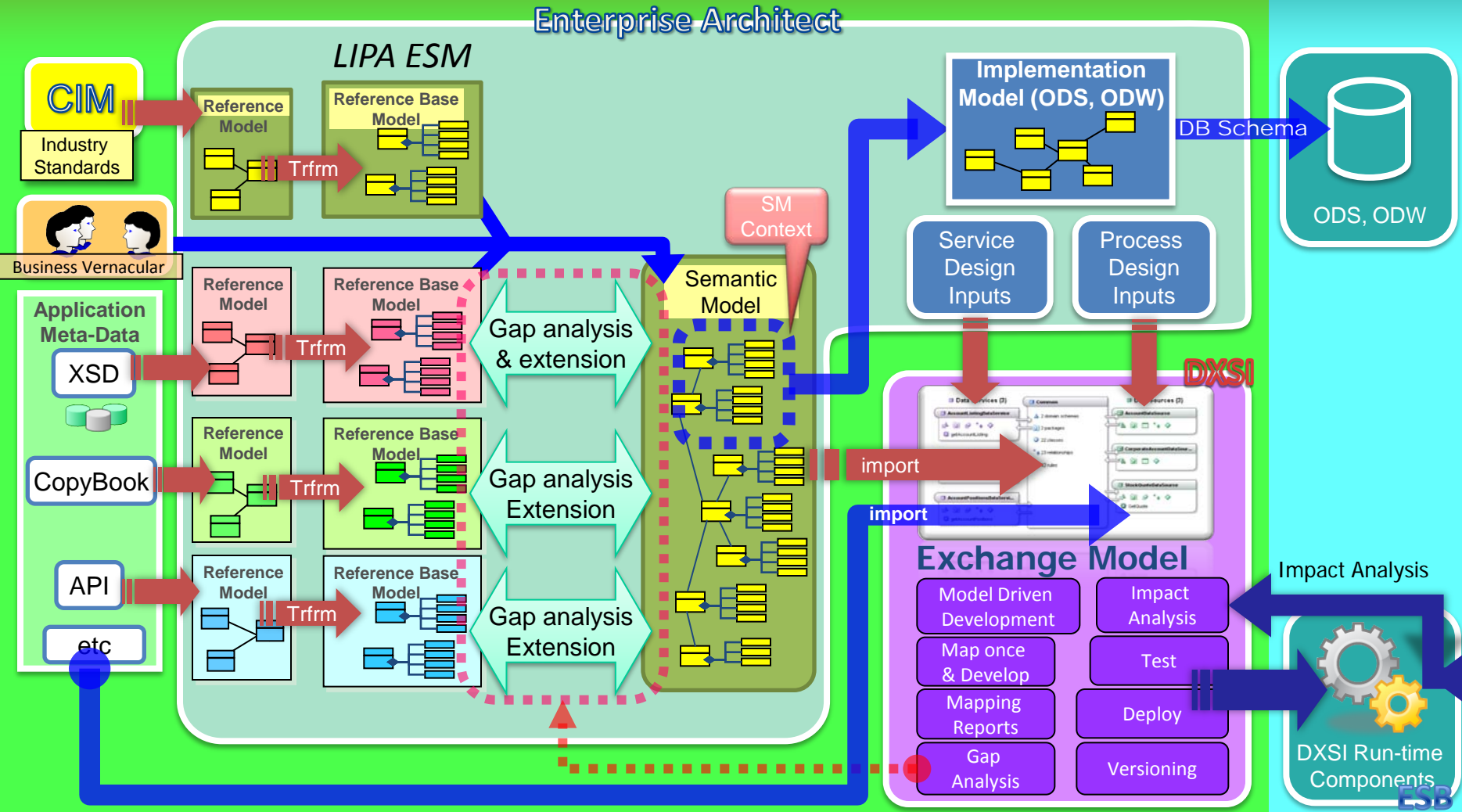
Model Driven Development

Integration Services & Data-store Design

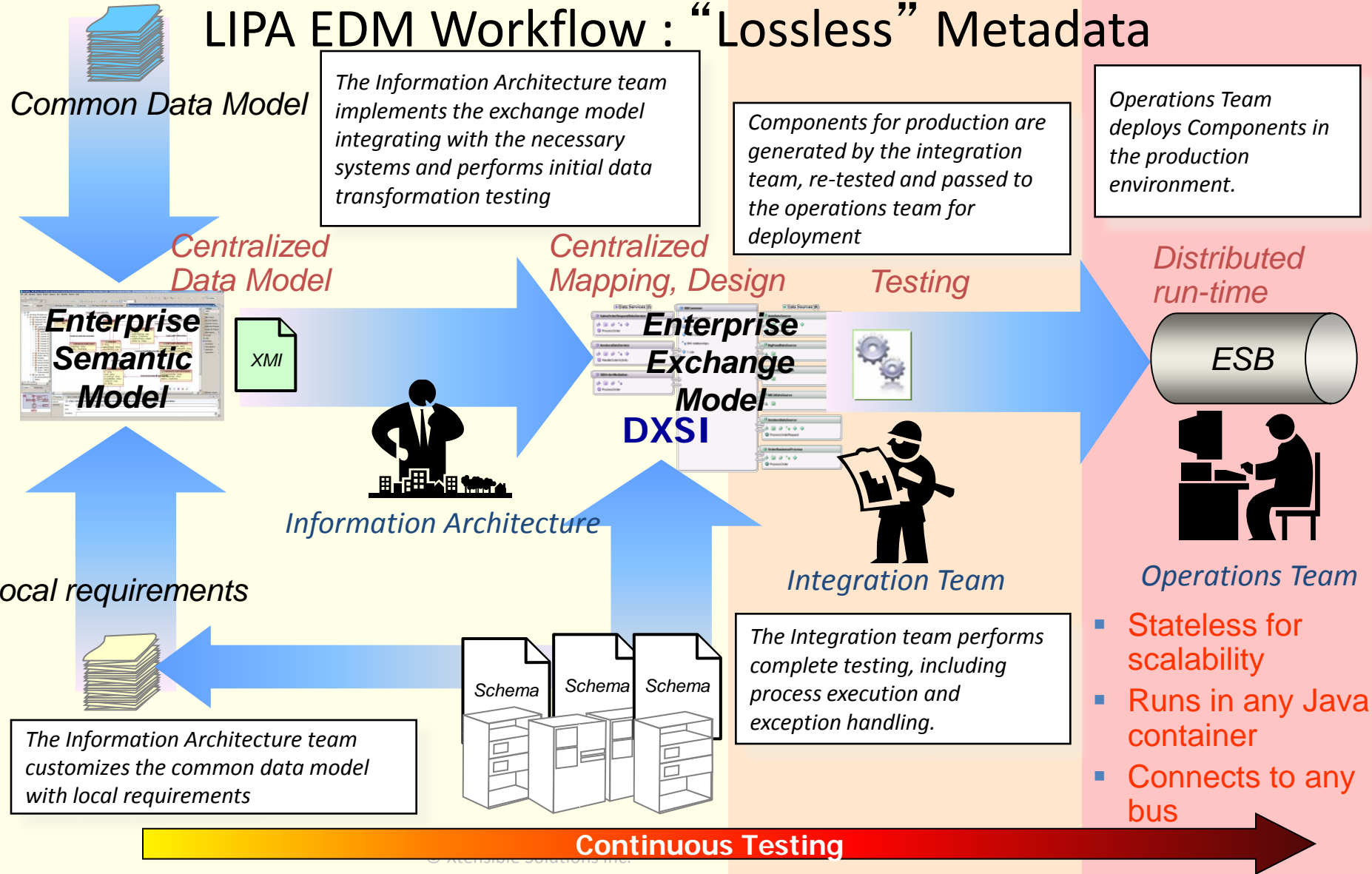
Design – Develop – Deploy Cycle (information perspective)

Design- & Development

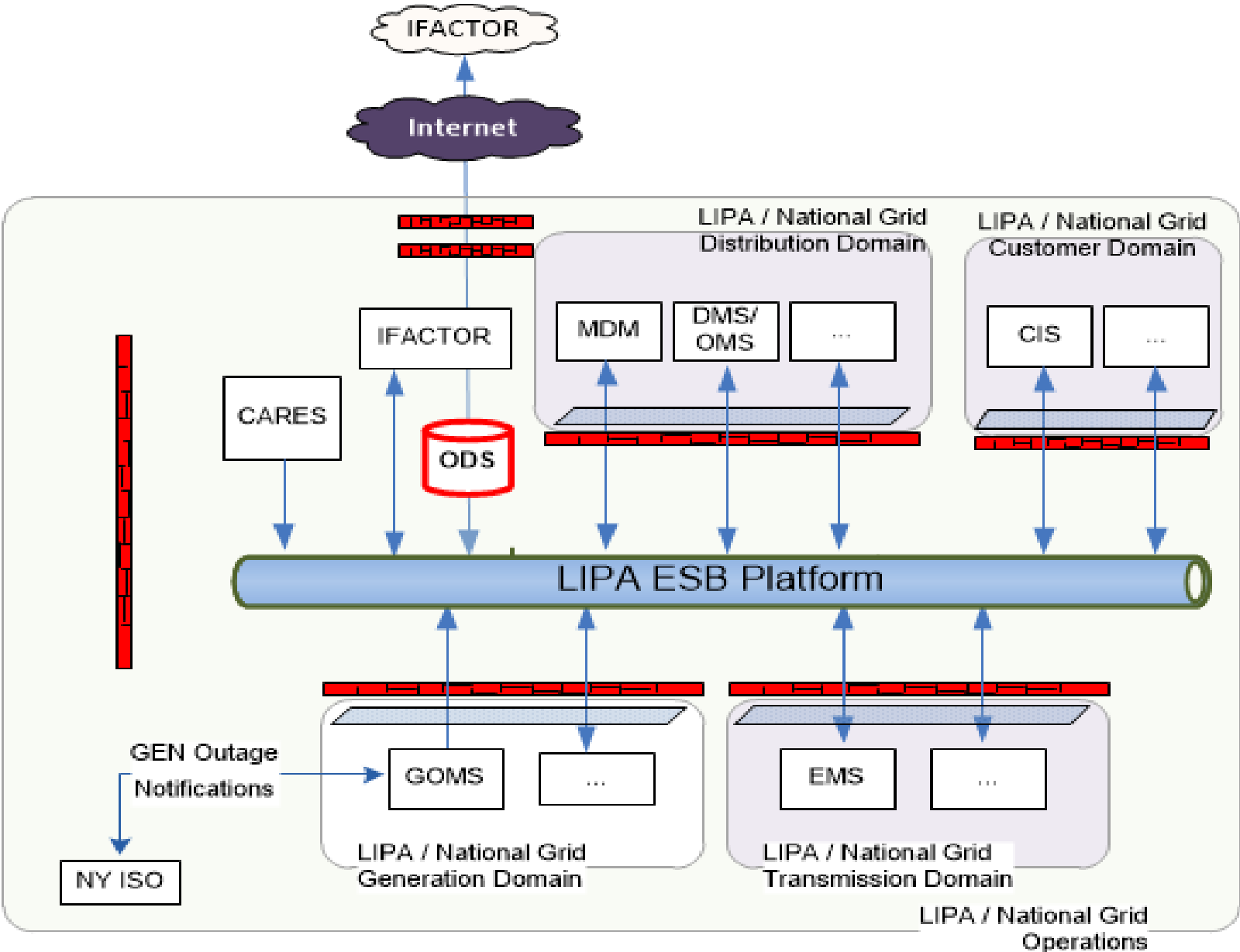
Run-Time



LIPA EDM Workflow : "Lossless" Metadata

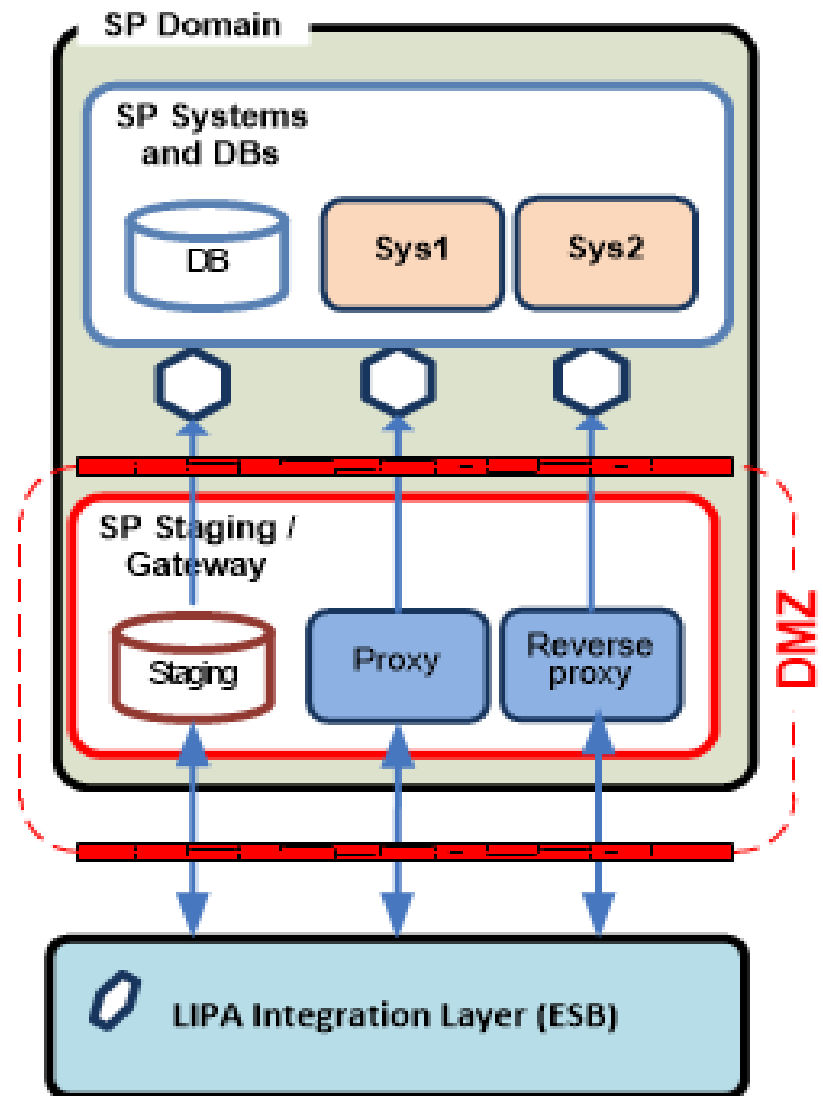


LIPA ESB Platform by Business Domain

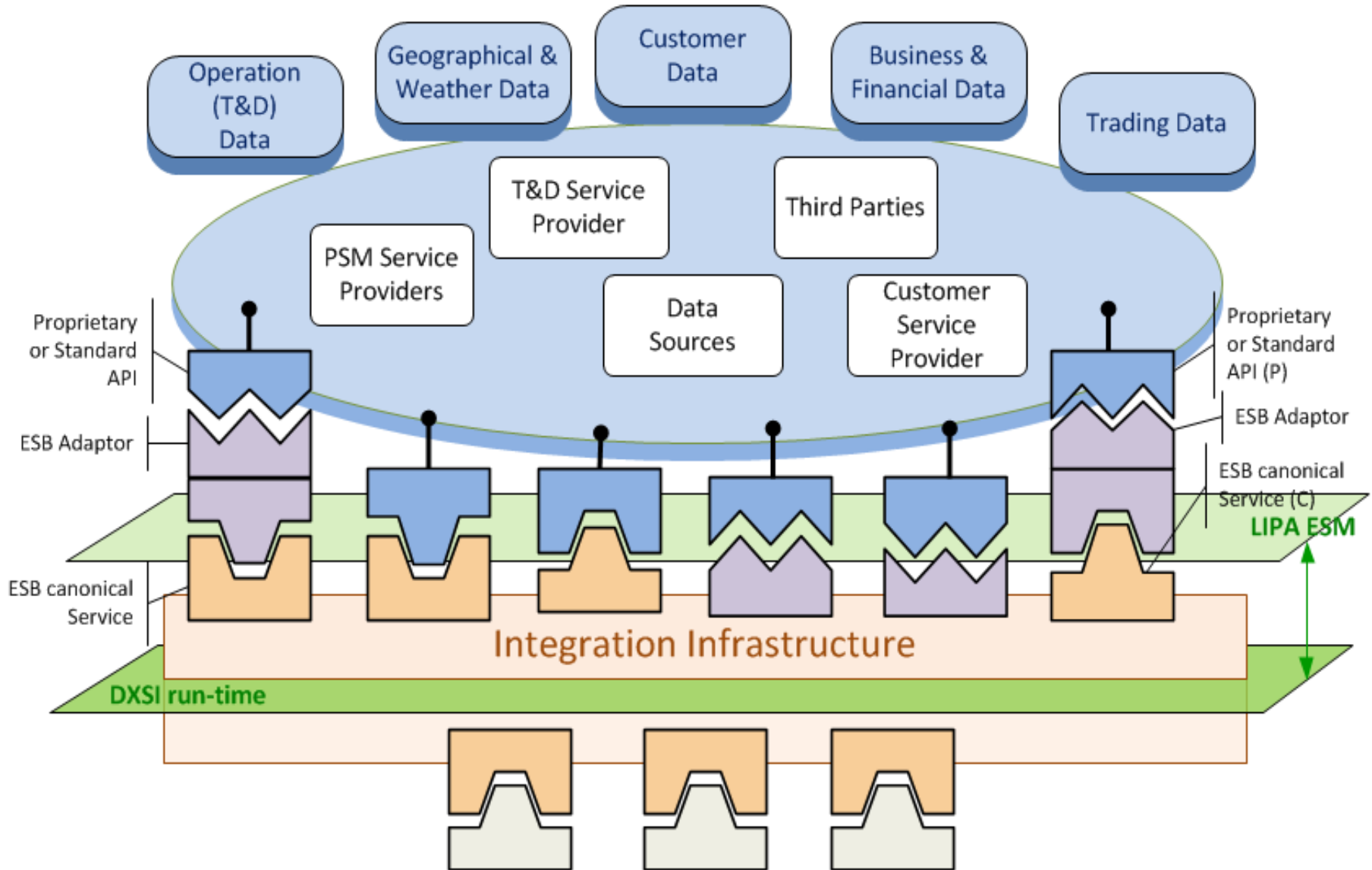


LIPA SP Integration-Ready Gateway

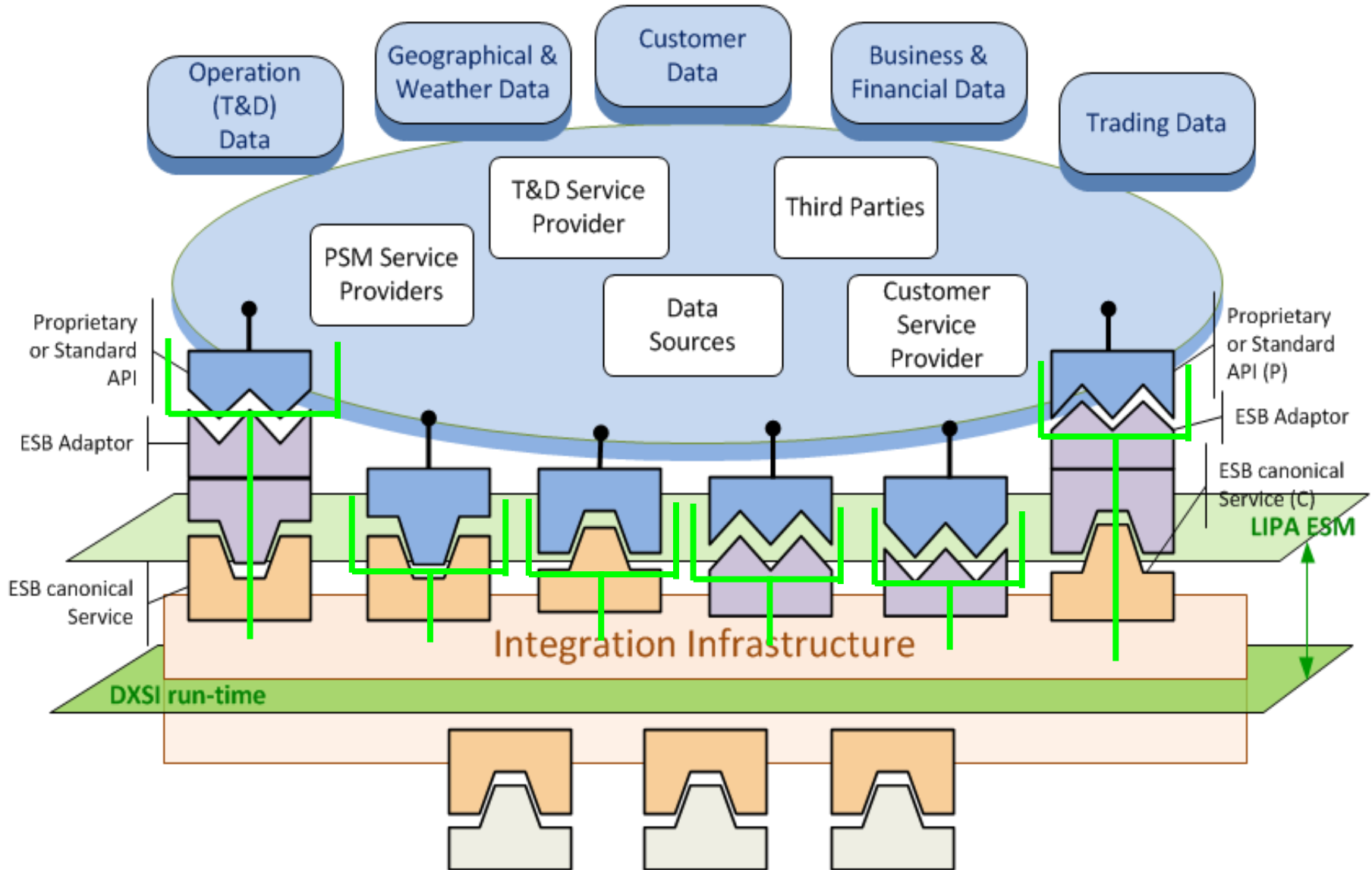
- Energy Trading
 - LIPA and three service providers
 - Repeatable patterns and solutions
 - Staging areas
 - “Privacy” of participant’s internal data and systems
 - Parallel development
 - Ready for future “plug and play”
 - Centrally managed data model
 - Plans to introduce event-driven patterns
- T & D
 - OMS, MDM, ODS / ODW, Customer Communication projects data exchanges
 - Centrally managed data model
 - Repeatable patterns and solutions
 - Event-driven patterns
 - Use of Semantic Integrator DXSI and Sonic ESB
 - Ready for future “plug and play”
 - Proxy/Reverse proxy
 - Secures access to façades of canonical and adaptor-enabled service
 - Host SP queues, if applicable



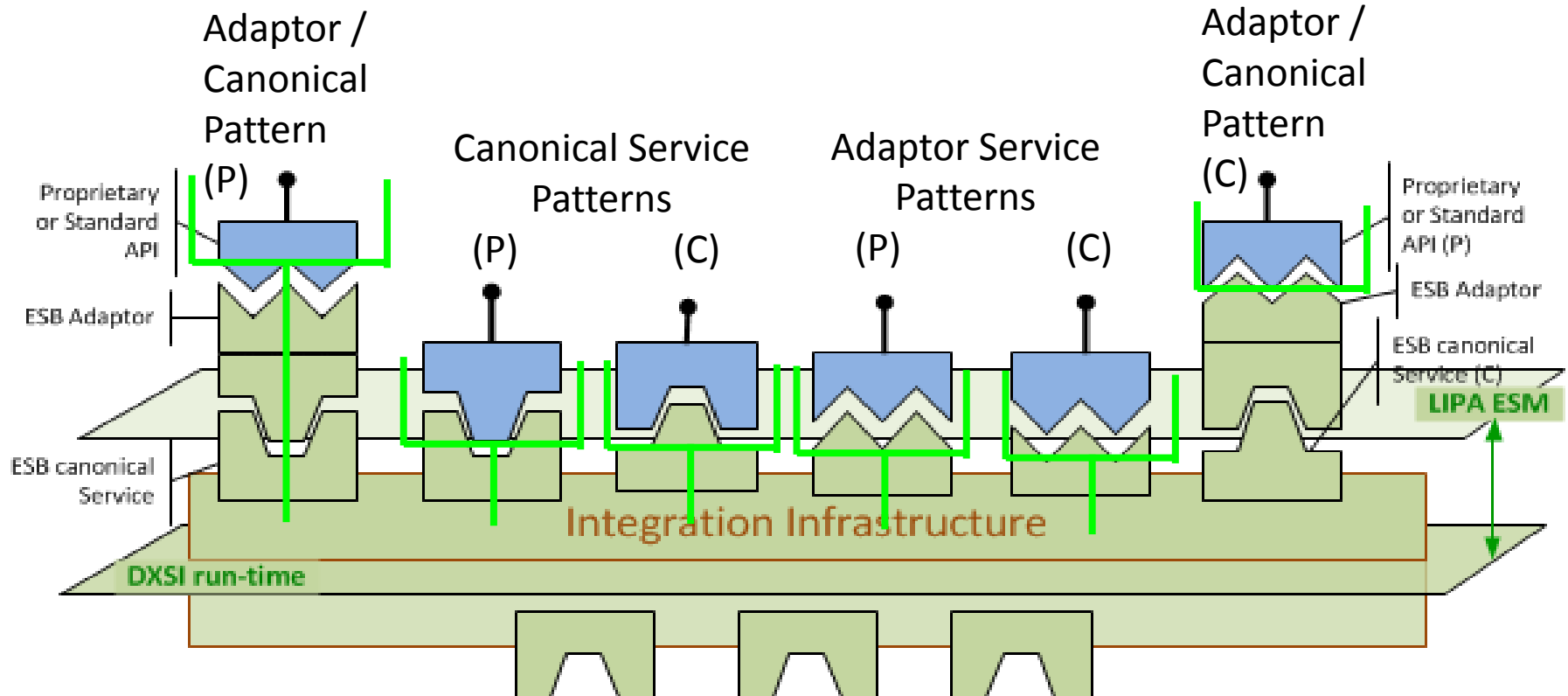
Key Integration Patterns



Key Integration Patterns - Pluggable Endpoints

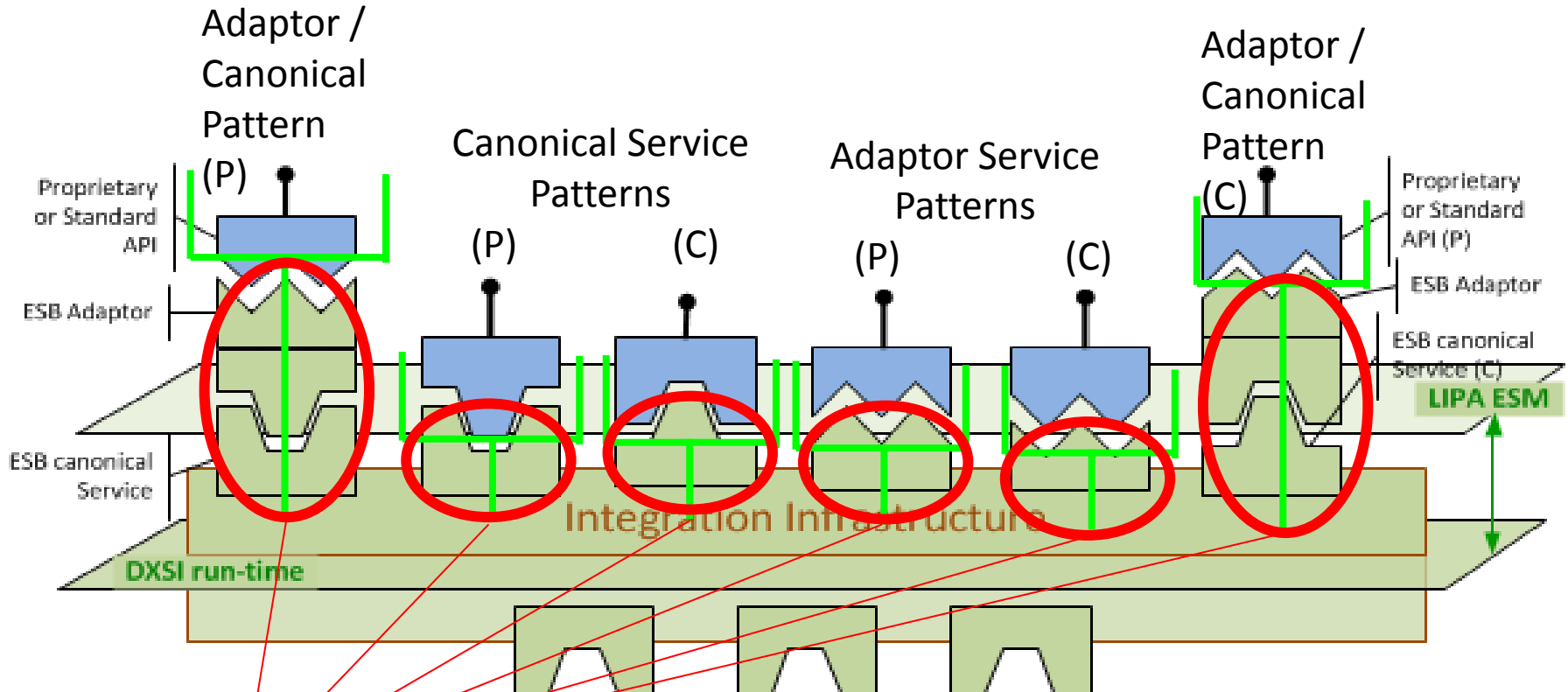


Key Integration Patterns – Integration Ready infrastructure



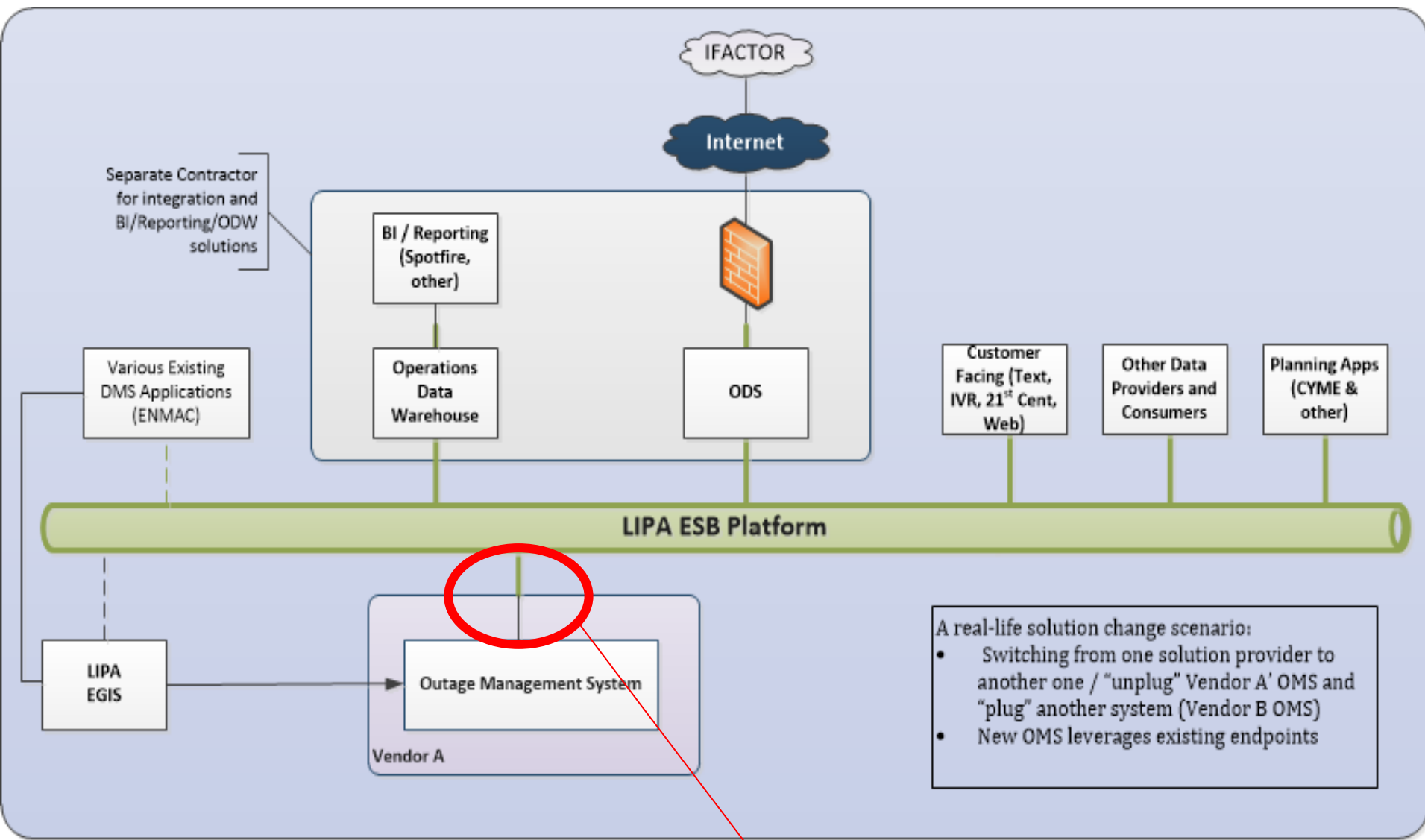
 Integration Ready – Plug-n-play

Key Integration Patterns – Library of Endpoints



Library of integration-ready / pluggable endpoints and services increases by each project

Solution Change Scenario: From Vendor A to Vendor B



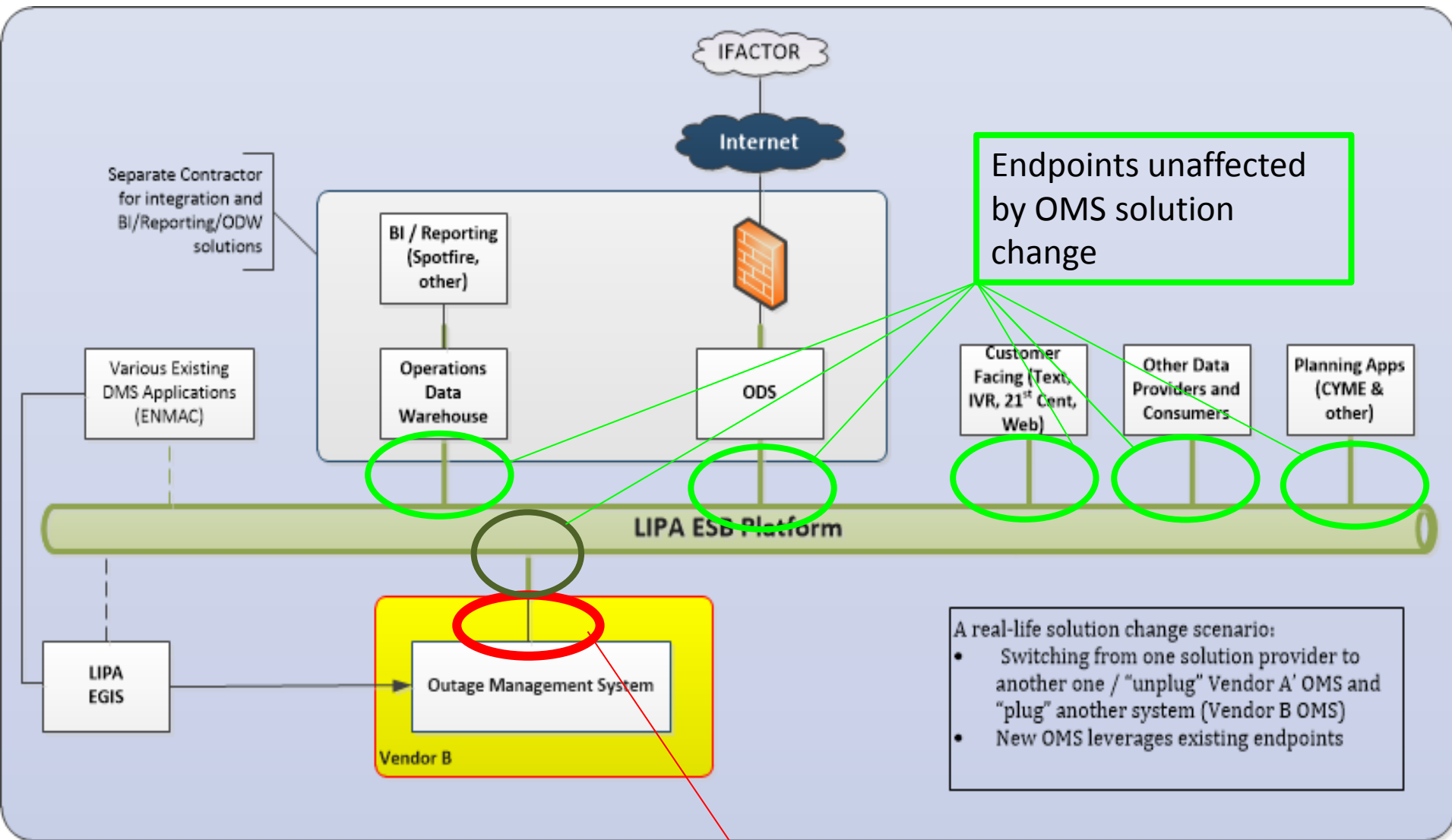
A real-life solution change scenario:

- Switching from one solution provider to another one / "unplug" Vendor A' OMS and "plug" another system (Vendor B OMS)
- New OMS leverages existing endpoints

Unplug OMS Solution from Vendor A

Legend: - - - Post Phase 1 — Re-usable Interfaces

Solution Change Scenario: From Vendor A to Vendor B



Key Take-Away Points

- Innovative Integration approach with benefits of
 - “Near Plug and Play” for systems and Analysis Solutions
 - Model Driven Development, End-to-End
 - Benefits of automation for integration, testing, maintenance, updates
 - Significantly Lower Life Cycle Cost and more effective system deployments
- Model-driven approach that leverages Industry Standards (CIM) for interoperability
- Scalable (Structured, planned, model-driven approach)
- Semantic understanding is guaranteed (explicit, not implicit) ;
 - availability of strongly typed syntactical interfaces is not a requirement for success any more
- Easier updating and tracking of standards development
- Modular / pluggable architecture has been proven in a real-life change scenario

Thank You

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