Topics

- Real-world Case Study of how LIPA are using a Model-Driven approach, leveraging an Enterprise Semantic Model (ESM) to:
  - Implement Semantic Integration
  - Implement Persistent Data Stores (e.g. for Analytics, Data Warehouses)
- Our Story:
  - LIPA Smart Grid Business Drivers (Why?)
  - Target Architecture and Enablers (What?)
  - Semantic Integration Approach (How?)
  - Persistent Data Stores (How?)

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. 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

ODW Conceptual Technical Architecture

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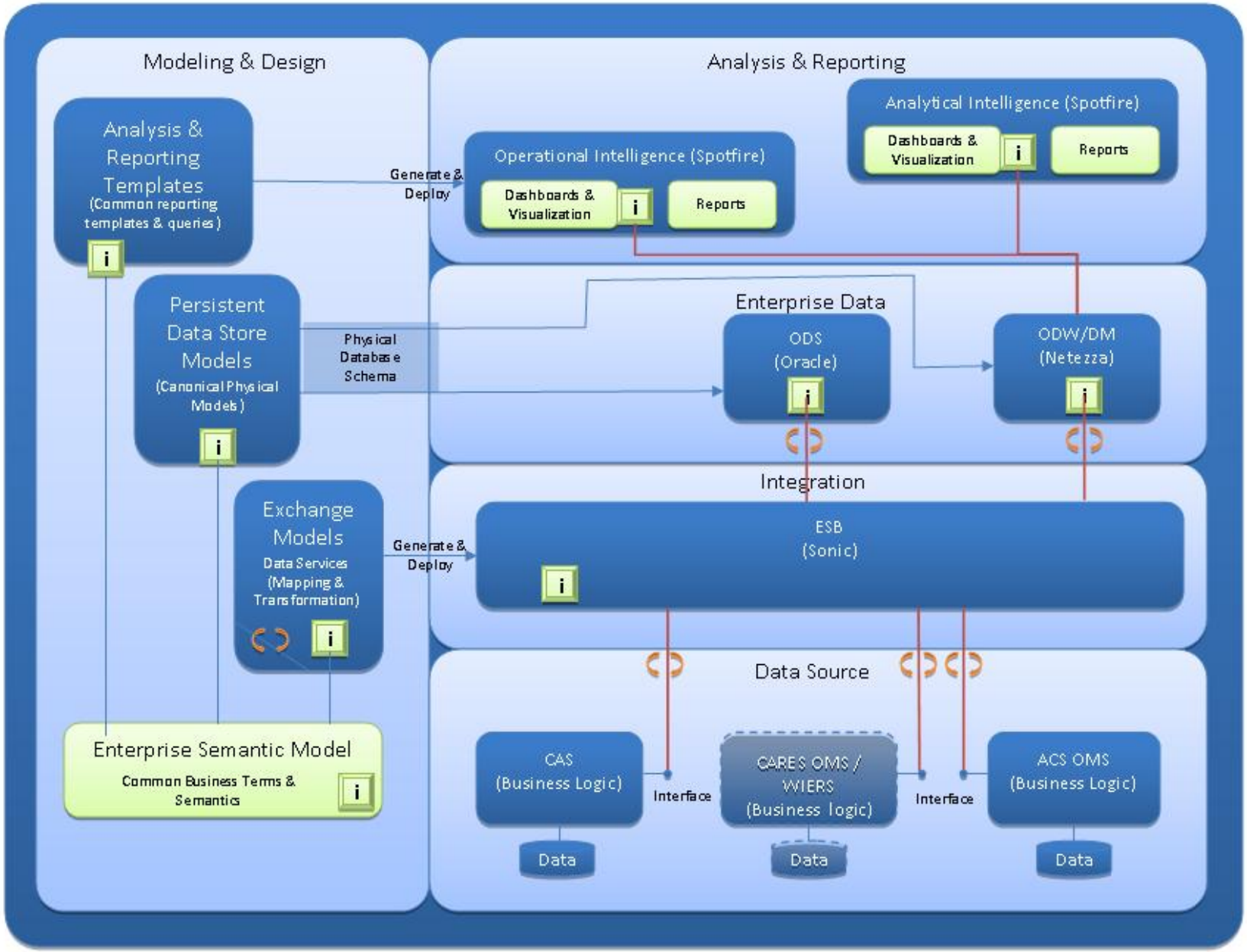

LIPA Smart Grid Road Map

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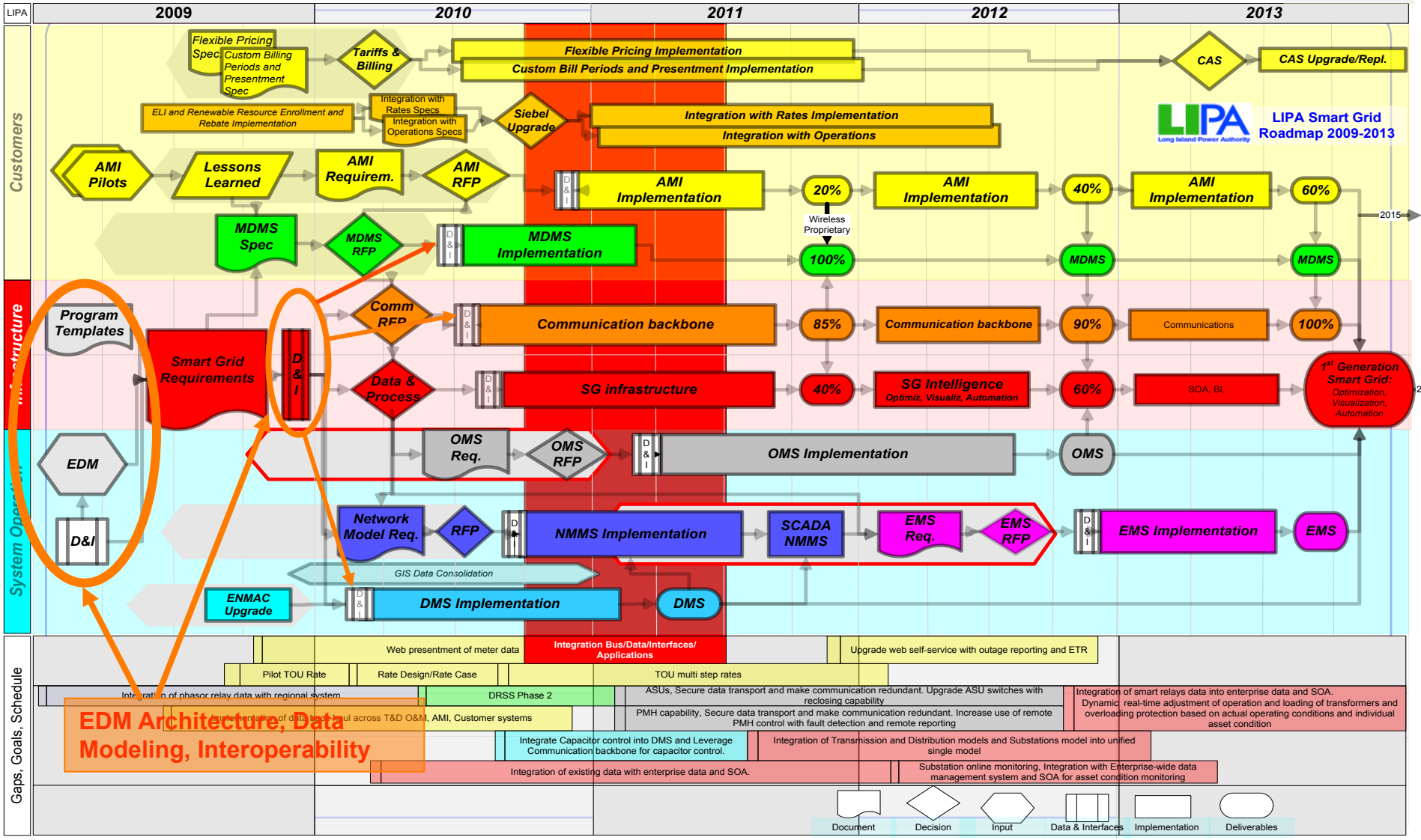


LIPA Standards & Model Driven Approach

LIPA Model-driven Architecture Business Drivers

- 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 for analytics
  - Event-driven
  - Flexibility of Business Intelligence Options
  - Open to new technology, solutions, applications

LIPA Model-driven Architecture Business Drivers

- Accomplish this by:
  - Establishing 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)
  - Using a model-driven design and development process to:
    - Speed development process
    - Improve reusability
    - Improve governance and change management
  - Require that any new vendor applications:
    - Where possible, conform to LIPA canonical interfaces
    - When not possible, conform to some industry standard interface
    - Publish interfaces / APIs so that knowledge of underlying database structures is not required for integration (transactional or analytical)

LIPA Model-Driven approach

- End-to-End Model-Driven approach
- Paradigm Shift compared with the conventional approach
- Bridges the gap (chasm?) between design, development and run-time
- Increased Agility, Responsiveness, Speed
- Decreased Time, Cost, Risk
- Enabler for implementation of new functionality, processes and analytics solutions

LIPA Integration & Standards History

- LIPA started pilot projects in utilizing industry standards for interoperability of systems in 2000
- LIPA Recognized the need for an innovative model-driven approach in 2007
- LIPA's New Model-Driven Approach :
  - Enables semantic integration through the use of a common semantic model
  - Supports "automated" maintenance, testing, and updates of enterprise data model across company systems

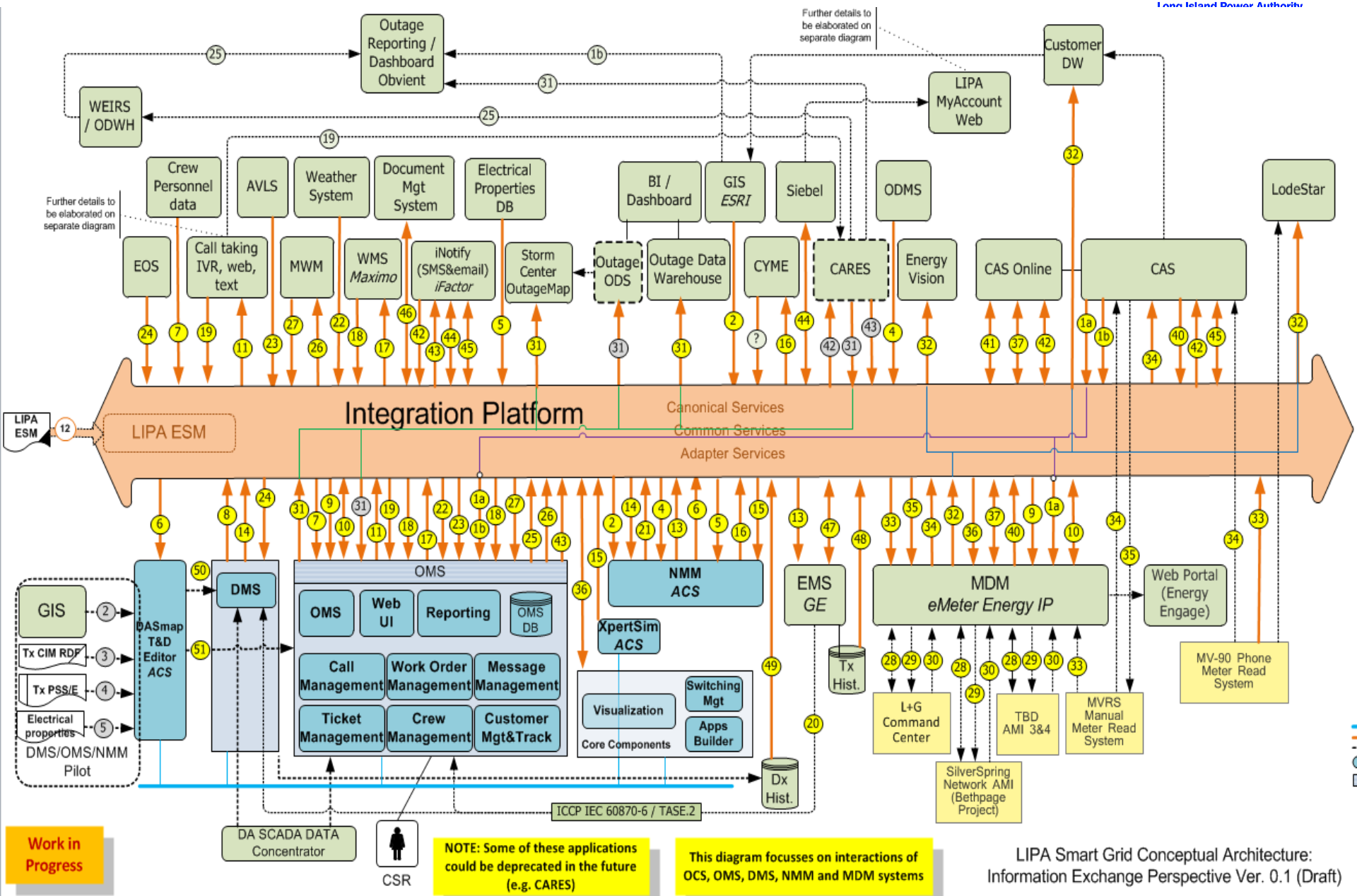
Projects Track Record

- Projects comprised integration solutions and persistent data stores (ODS's and Data Warehouses)
- The LIPA Model-Driven Semantic Integration approach has consistently performed under budget and on time under complex and challenging conditions.
- Trend of reduced cost and improved delivery speed is based on:
  - Model-driven approach + governance + processes + tools for
    - "automated/integrated" development, testing, implementation, and maintenance of the model
  - Reuse of data and interfaces across company systems and SOA

Projects Track Record

- Projects completed & in-flight include:
  - Energy Trading Solution
  - Customer Outage Communication (Web Outage Map)
  - Customer Outage Communication (Text Messaging)
  - Meter Data Management
  - Outage Management (OMS – in progress)
  - Customer Consumption Data integration

LIPA Smart Grid Conceptual Architecture



Model-driven Workflow : “Lossless” Metadata

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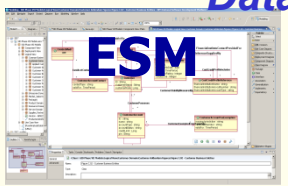
ESM (Semantic Model)

CIM

Centralized Data Model



XMI

Information Architecture

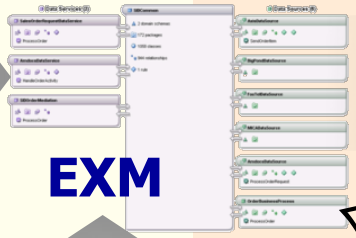
Local requirements

Extend and enhance the common data model with local requirements

EXM (Exchange Model

Implement the Exchange Model integrating with the necessary systems and performs initial data transformation testing

Centralized Mapping, Design



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Perform complete testing, including process execution and exception handling.

Run-time components are generated, re-tested and passed to the operations team for deployment

Testing

Integration Team

Operations Team deploys components in the production environment.

Distributed run-time

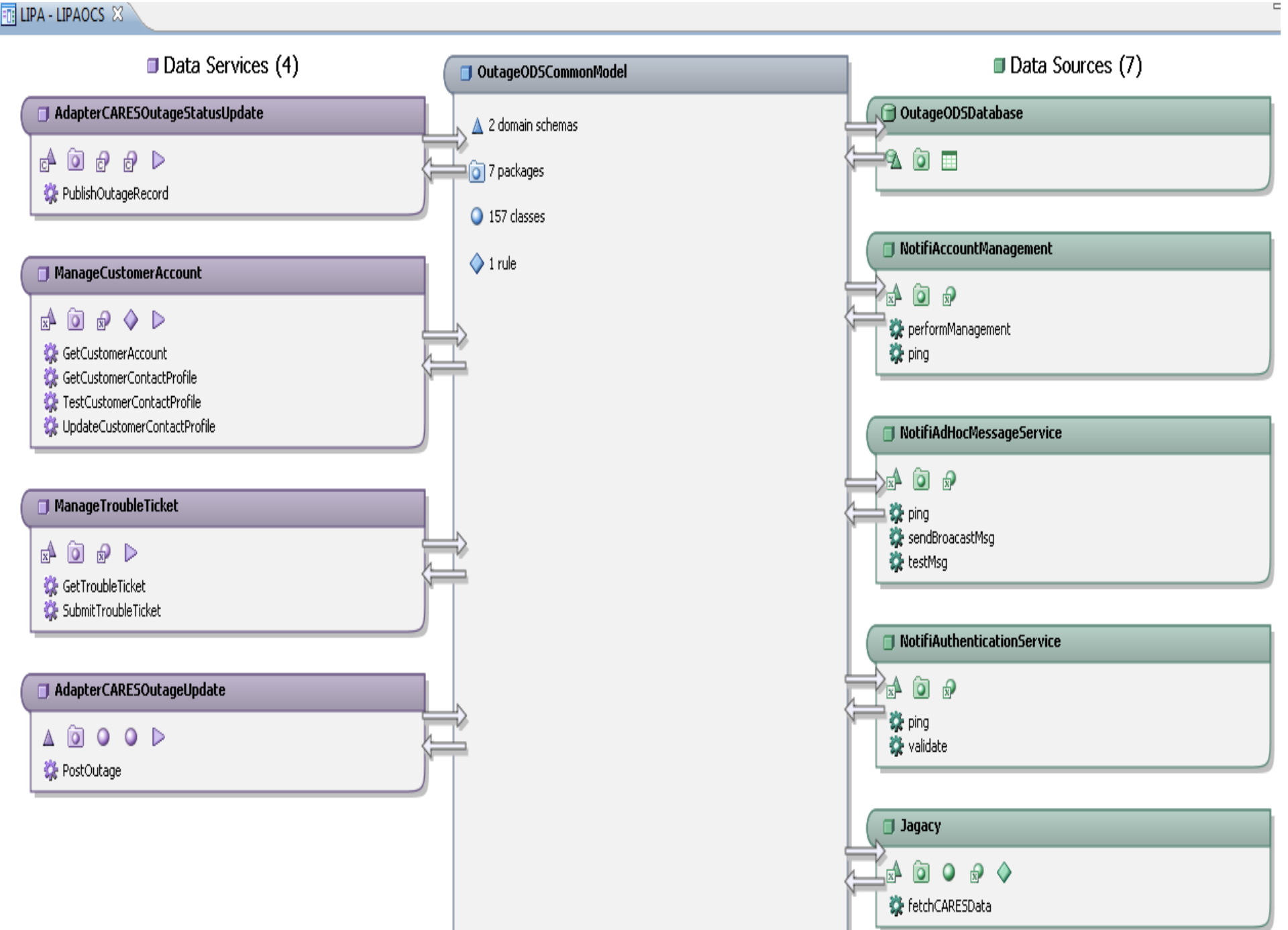
Operations Team

- Stateless for scalability
- Runs in any Java container
- Connects to any bus

Continuous Testing

Key Elements of LIPA Semantic Integration

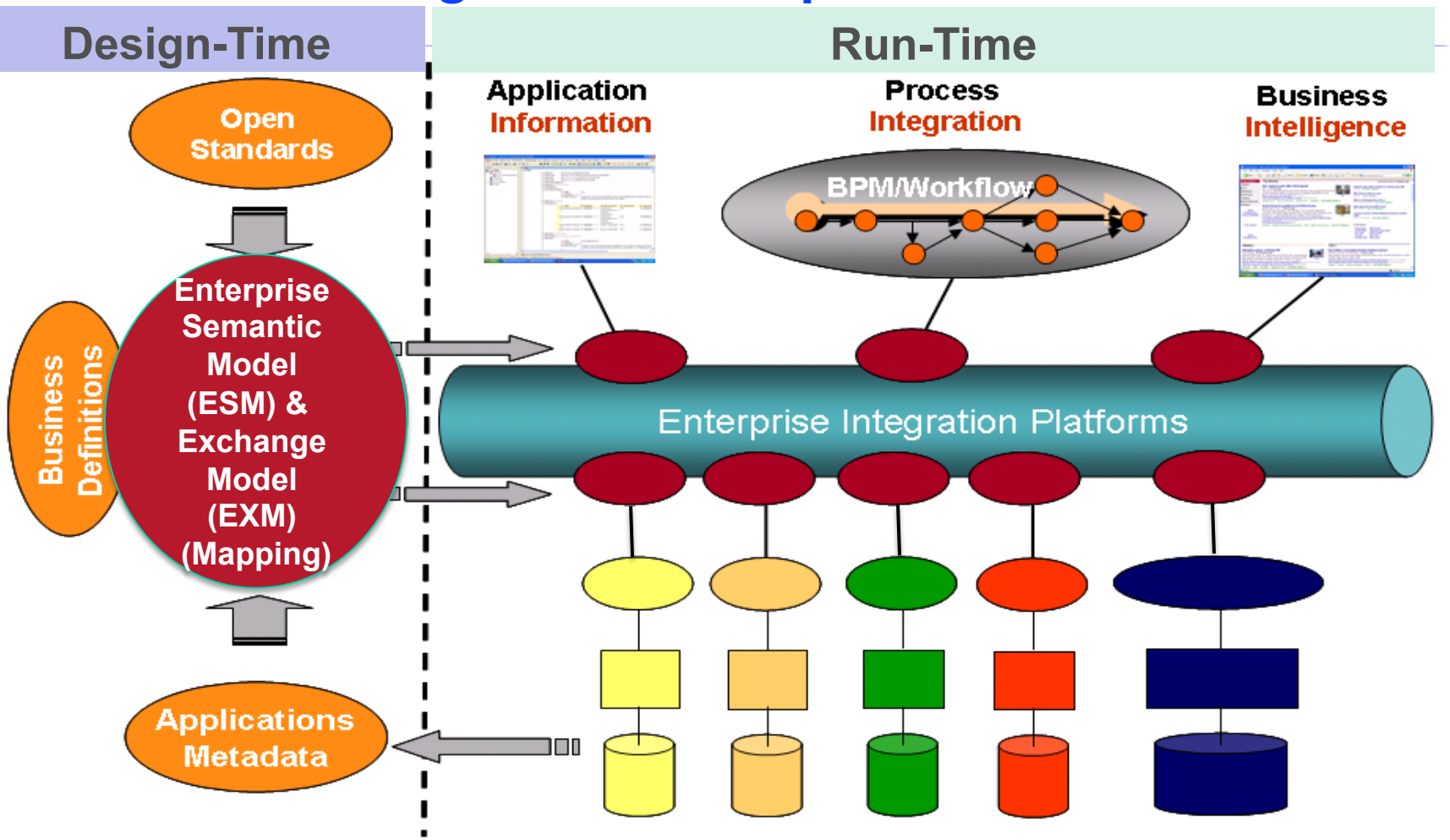
- Centrally Managed Semantic (Data) Model (ESM)
  - Heterogeneous interfaces mediated through common model
  - Based on industry standards (IEC CIM)
- Centrally Managed Exchange Model (EXM)
  - Semantic Mapping and Business Rules
  - Integrate & Reuse Business Rules, transformations, mappings
  - Automate gap analysis, documentation
  - Centrally Managed Mapping and Run-Time Deployment
  - Generate ready-to-go SOA services (Deploy the Model, No code written)
  - Continuous testing
  - Deploy into any Java runtime environment
  - Automate impact analysis on change


LIPA - LIPAOCS
Data Services (4)
AdapterCARESOutageStatusUpdate
PublishOutageRecord
ManageCustomerAccount
GetCustomerAccount
GetCustomerContactProfile
TestCustomerContactProfile
UpdateCustomerContactProfile
ManageTroubleTicket
GetTroubleTicket
SubmitTroubleTicket
AdapterCARESOutageUpdate
PostOutage
OutageODSCommonModel
2 domain schemas
7 packages
157 classes
1 rule
Data Sources (7)
OutageODSDatabase
NotifiAccountManagement
performManagement
ping
NotifiAdHocMessageService
ping
sendBroacastMsg
testMsg
NotifiAuthenticationService
ping
validate
Jagacy
fetchCARESData

Semantic Integration Value Proposition

- Make all run-time interoperability decisions at semantic layer
  - Configuration rather than coding
    - Automate implementation
  - Simplified testing
    - Test mappings, transformation and business rules using design-time tool (DXSI)
  - Effective change management, maintenance and updates!!!

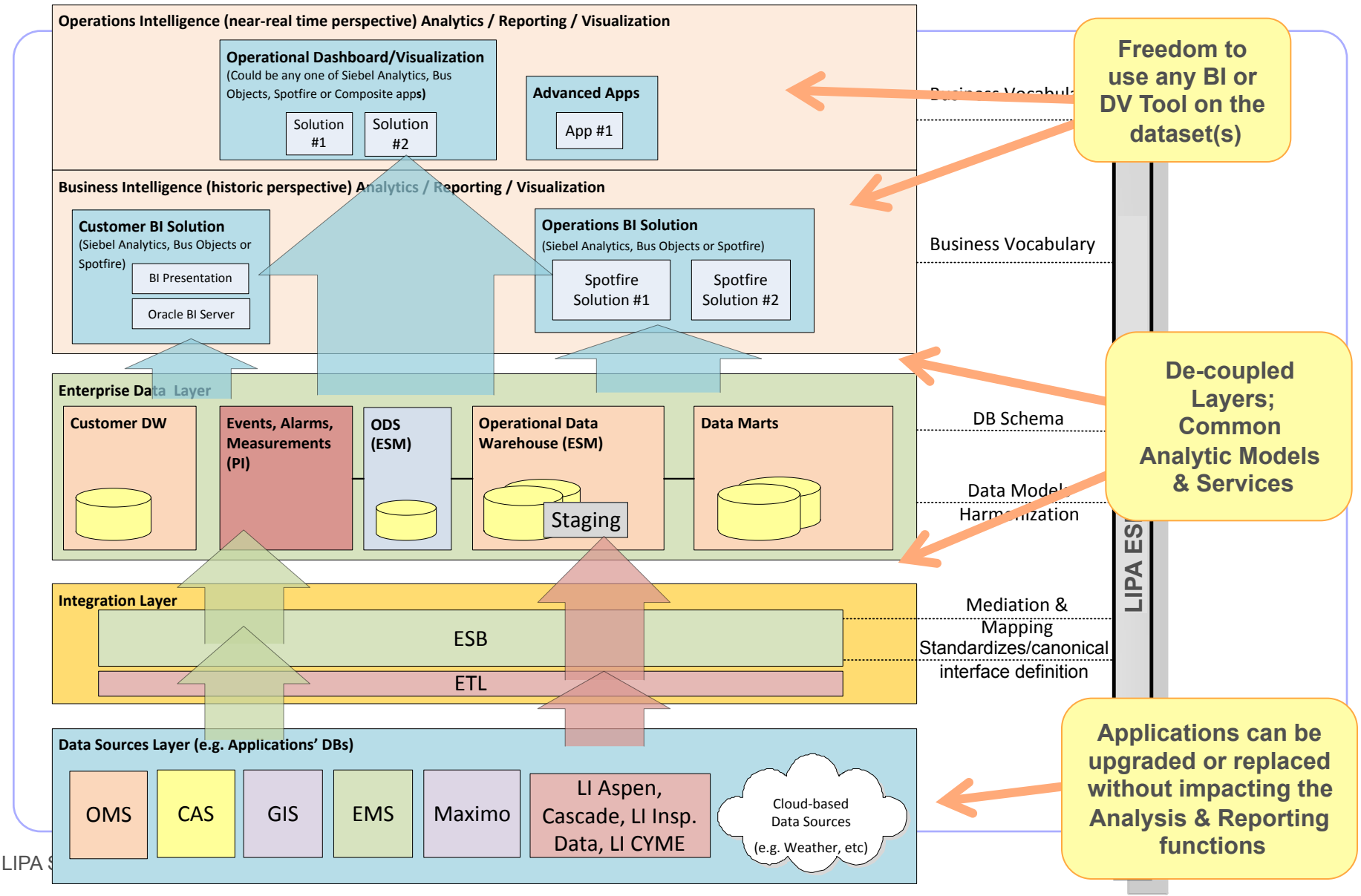
LIPA ESM and Integration Concept



LIPA Data Warehouse, BI and Reporting Business Drivers

- LIPA Data Warehouse Key Requirements and Drivers
  - Provide business users with rapid, reliable and consistent access to information for making business decisions
    - Business Intelligence (Historic perspective) uses ESM-based data warehouse
      - Provide data mining features at ODW or DM level for various analyses (e.g. statistical, time series)
    - Operational Intelligence (near-real-time perspective, which includes Visualization tools) utilize ESM-based near-real time data store, ESM-based data warehouse and Canonical data services .
  - Gain efficiencies by eliminating need for business users to reconcile semantic interpretation of data
  - Show value in near-term but build to support future
    - Support both event-driven and batch-oriented data and process integration, as required.
    - Leverage existing and future data services for ensuring minimal latency between data in applications and the data warehouse / datamart / ODSs'

Logical View of LIPA Analytics Vision



Model Driven Approach
Integration Services & Persistent Datastore (Database)
Design – Develop – Deploy Cycle (information perspective)

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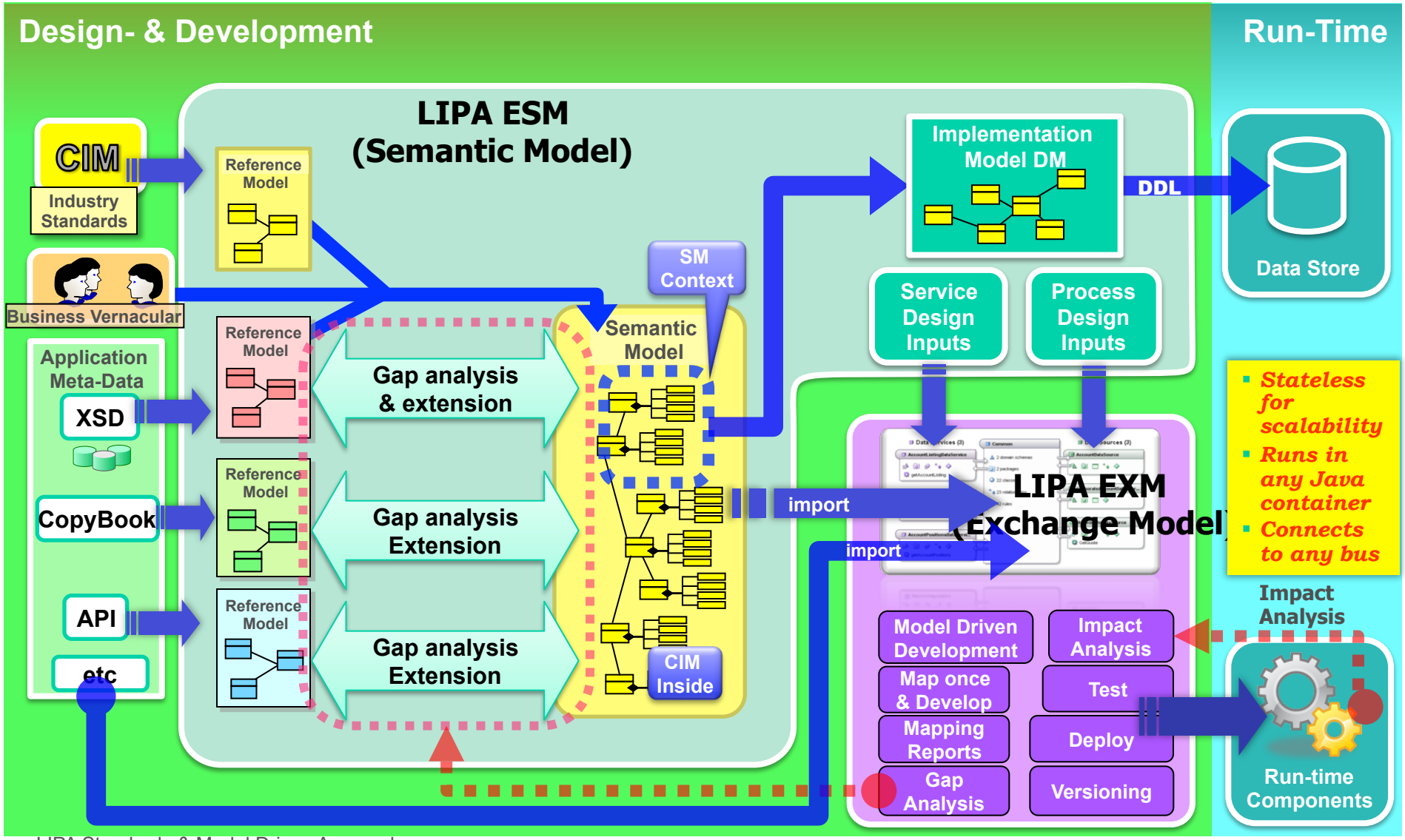
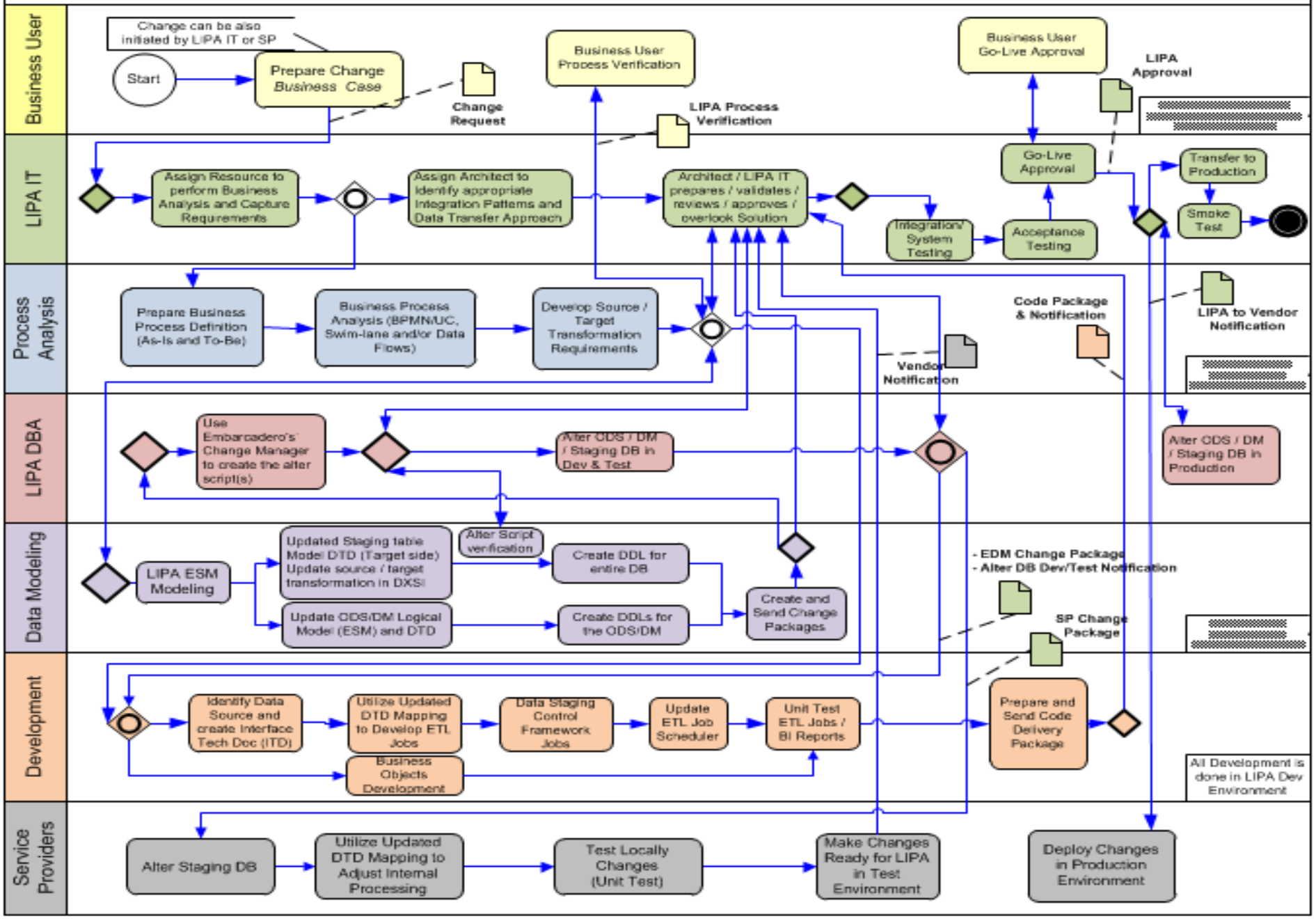


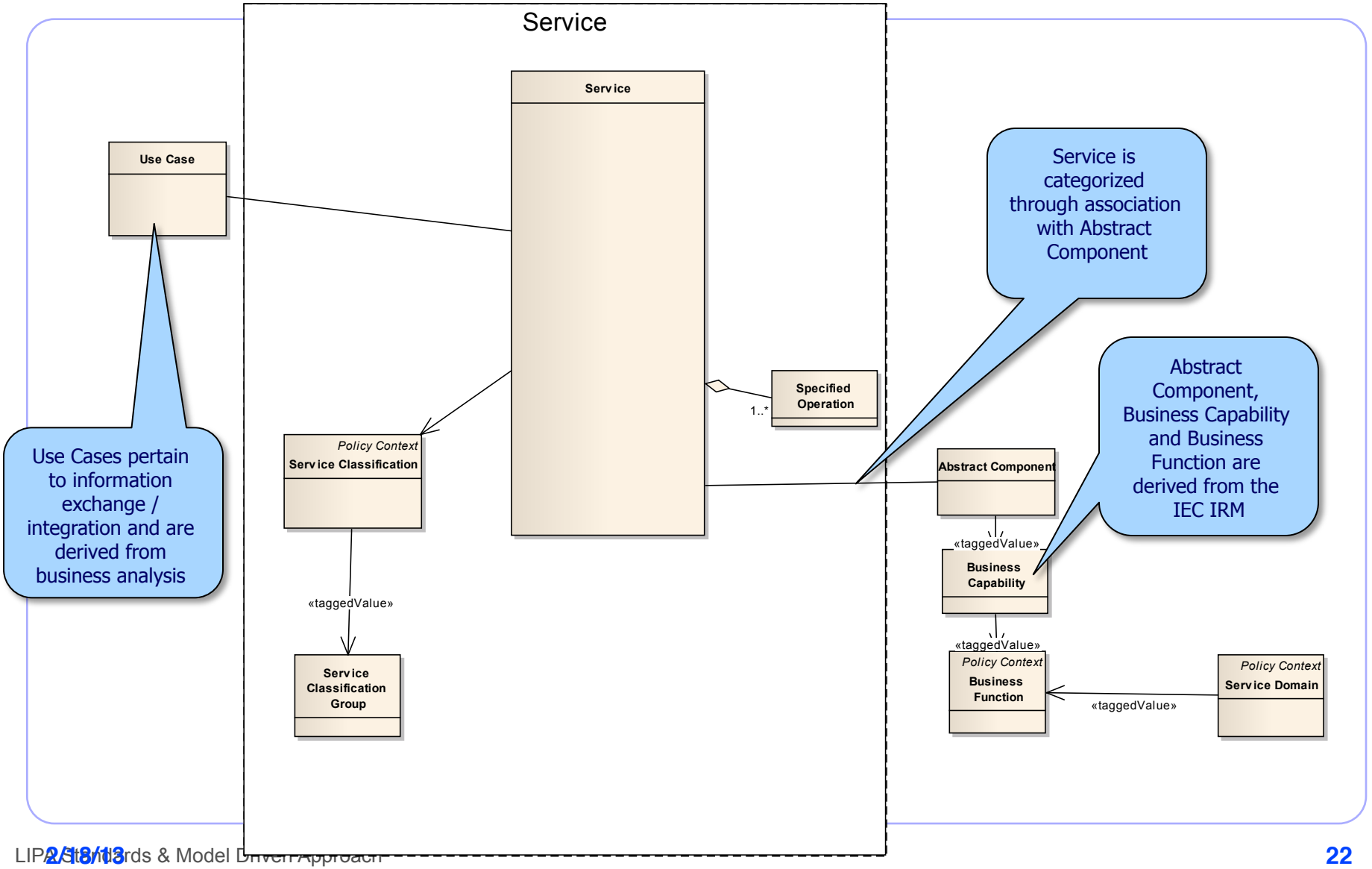
Governance and Change Management

- Guiding Principles
  - Models are central to all governance and change management activity
  - Automated processes will be used to reduce effort and errors
- Change Management
  - Version and Source Control – Process for managing and packaging changes to services
  - Defect Fixing
  - Enhancements
- Governance – Process for managing all of the above and insuring highest quality and reusability
  - Design Time – checks and controls to insure best possible design prior to implementation
  - Runtime – enforcement of defined policies

LIPA Enterprise Data Management – Change and Release Management Process



Meta Model for Service Model Realized in the LIPA Service Taxonomy



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

Thank You

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