Smart Grid Reference Architecture (SGRA)
Applied Information Management

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SGRA Goals

- SCE, Cisco and IBM assembled a team of Smart Grid architects and engineers in 2010 to develop a Smart Grid reference architecture with the following goals:
  - Support NIST activities in the Smart Grid Architecture Committee to develop an reference architecture that ties standards and services to a utility, smart grid architecture
  - Develop a reference architecture that provides the building blocks for the utility companies to start developing their own Smart Grid architectures
  - Identify Smart Grid architecture patterns that the should be considered in making Smart Grid investments and system design decisions
  - Provide high-level design and procurement guidance to utilities and vendors
  - SGRA developed to inform multiple stakeholders

Developing Utility Company Smart Grid Architectures

NIST SGAC Reference Architecture

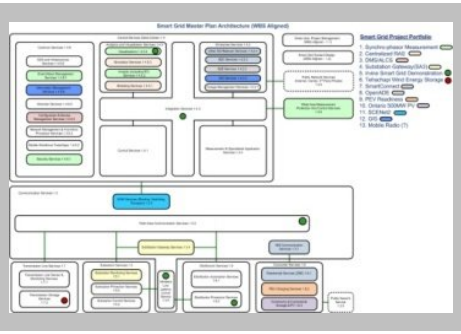
Standards

SCE/Cisco/IBM Smart Grid Reference Architecture

Services

IEEE P2030 Smart Grid Reference Architecture & other SDO guidance

Interfaces



Utility Smart Grid Solution Architecture

Business Unit Portfolio Architectures
(CSBU, TDBU, PPBU, Generation, etc.)

SGRA document summary

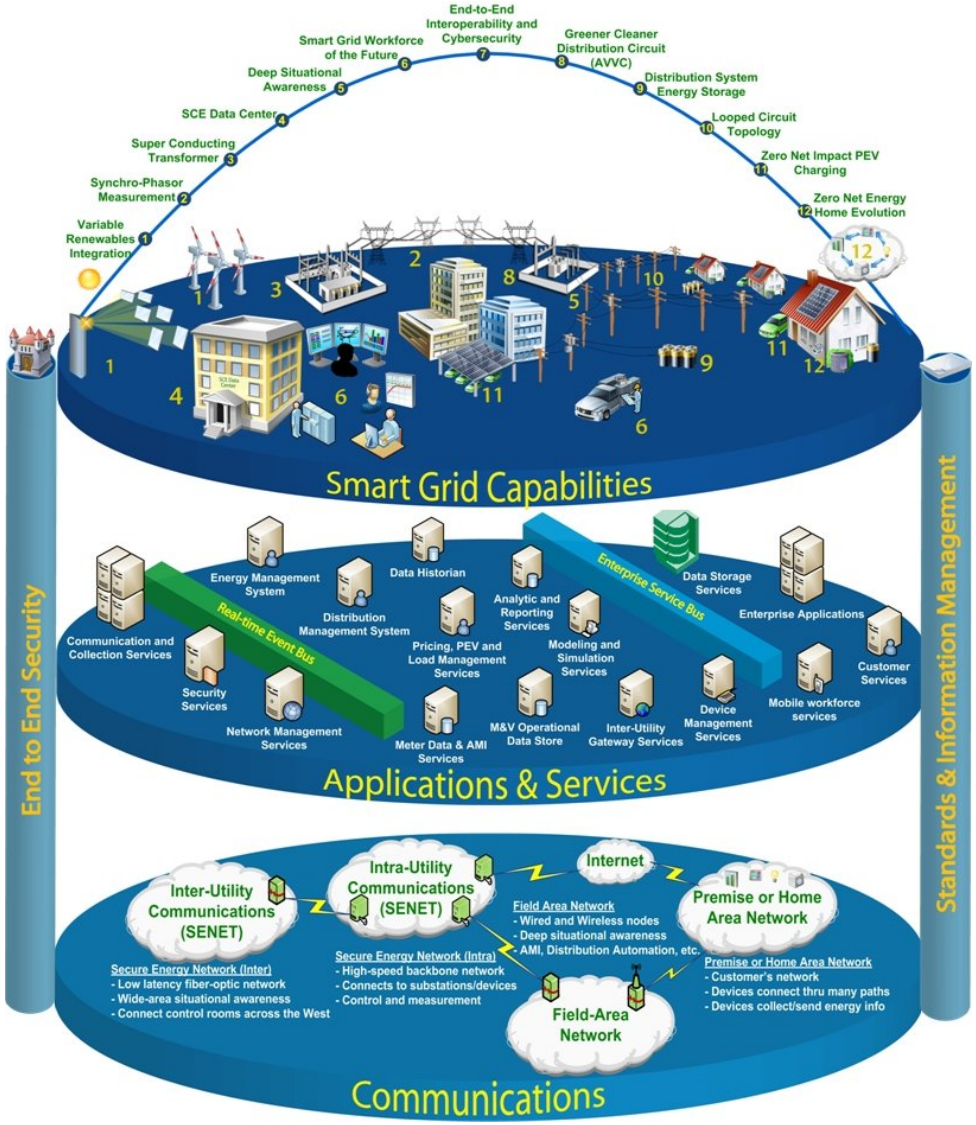
1& 2. Smart Grid Architecture Introduction – Describes architectural goals and principles,

3. Smart Grid Technology Roadmap – Describes motivations and stages of Smart Grid evolution and functionality and architecture maturity levels necessary to progress to a fully realized smart grid vision

4. Smart Grid Foundational Services – Describes the foundational elements and services necessary to successfully deploy and manage integrated Smart Grid capabilities

5. Smart Grid Reference Architecture Views – Describes the organization of Smart Grid services necessary to provide the scalability, flexibility and manageability to accommodate Smart Gid requirements and evolutions

SGRA Layered Architecture Principles



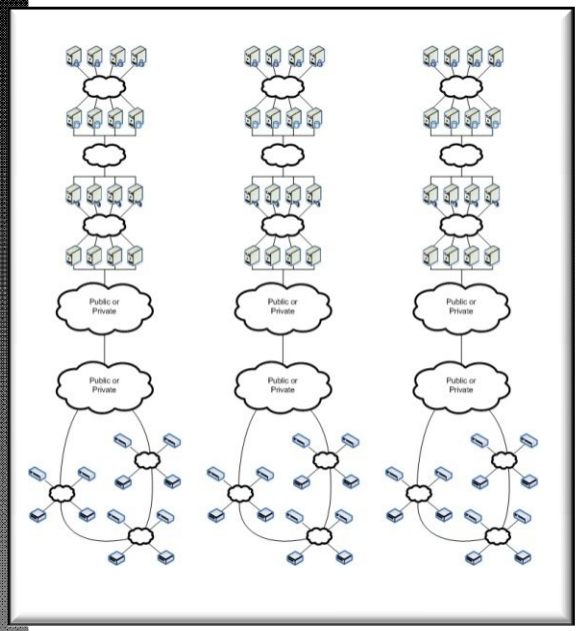
- Operational capabilities are supported by applications and common services
- Services are available to devices at the edge of the network and are event driven
- Communications design allows for connectivity across multiple network domains
- Security is end-to-end
- Architecture is supported by common semantic models and standards

SGRA Architecture Views

- Smart Grid Business Services
- Security Systems Architecture
- Communications Systems Architecture
- Analytics Systems Architecture
- Data Management Systems Architecture
- Smart Grid Management Systems Architecture
- Control Systems Architecture
- Applications Systems Architecture

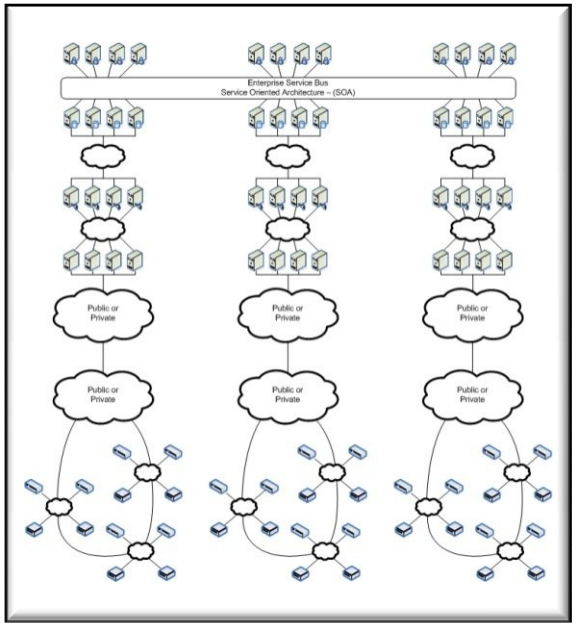
SGRA System of Systems Architecture Evolutions

Silos



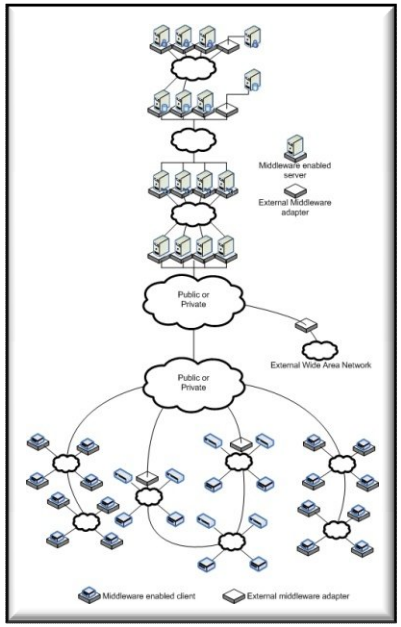
Current-state

ESB



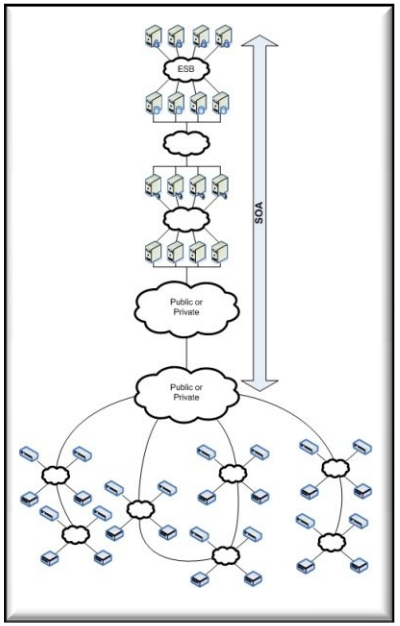
Typical SI Approach

Adapter-based



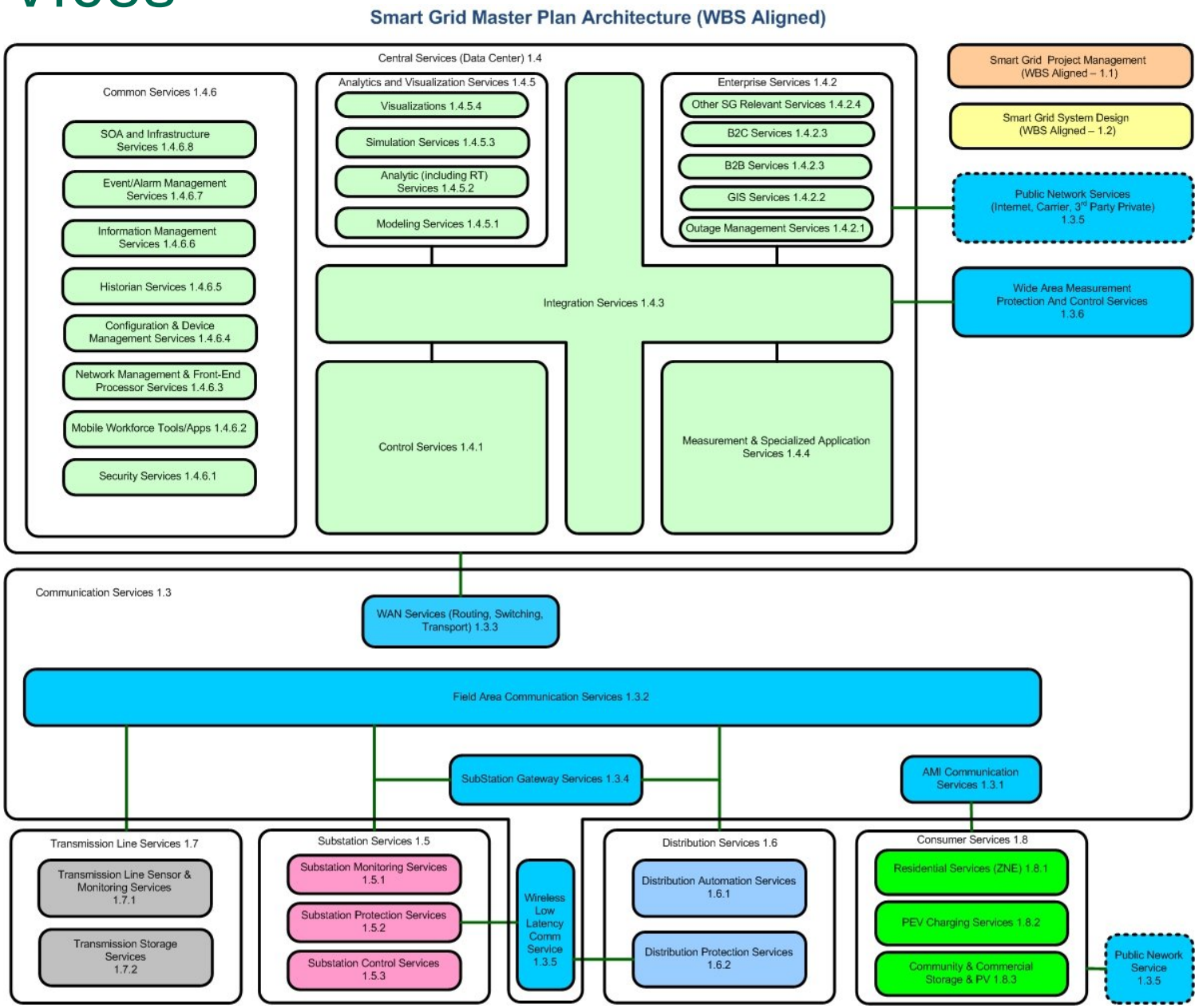
DoD-style approach

Common

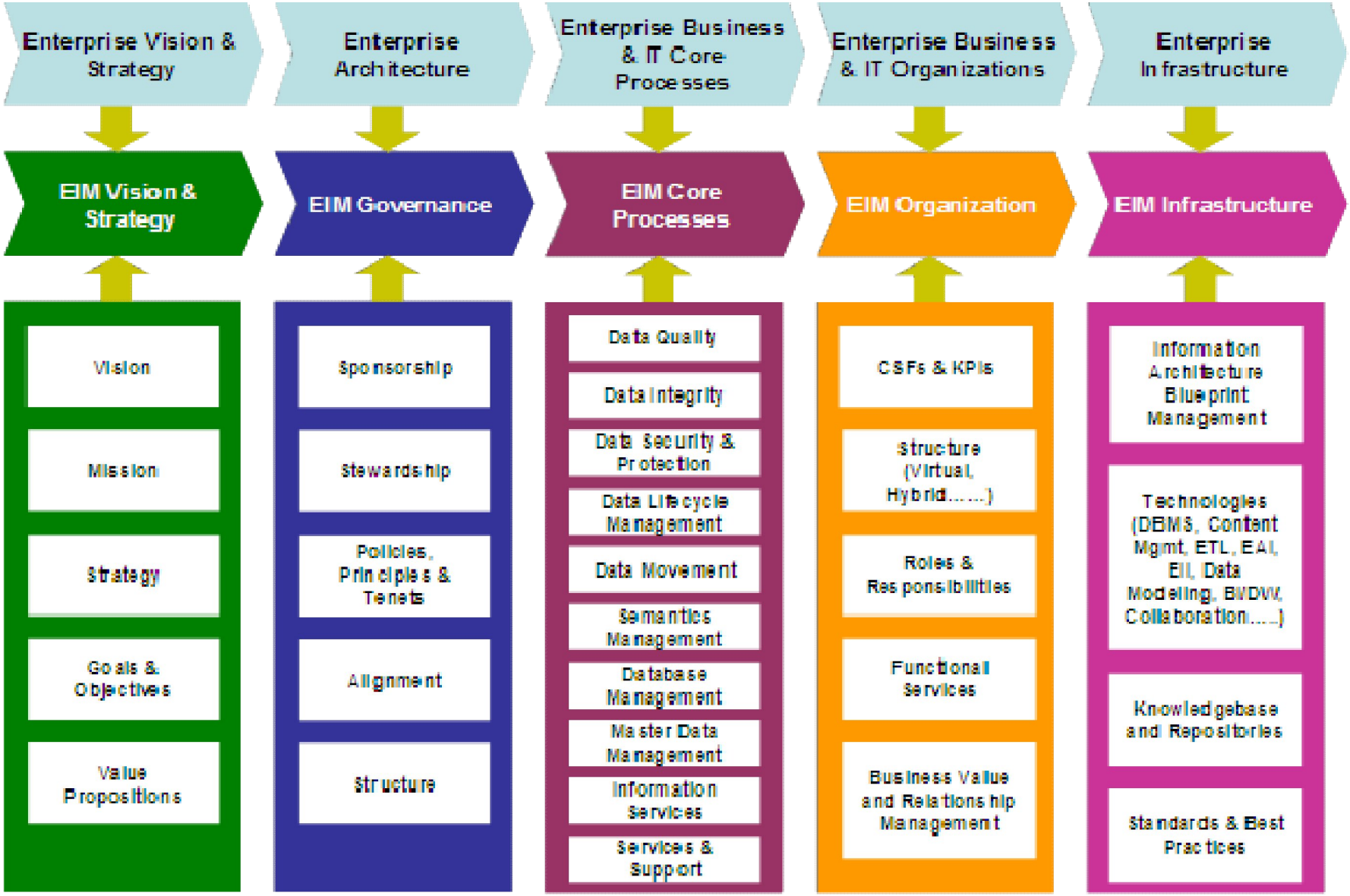


Standards –based Internet-style

Broadly applying SG Architecture Common Services



A clear EIM strategy is required to support an event-driven common services architecture

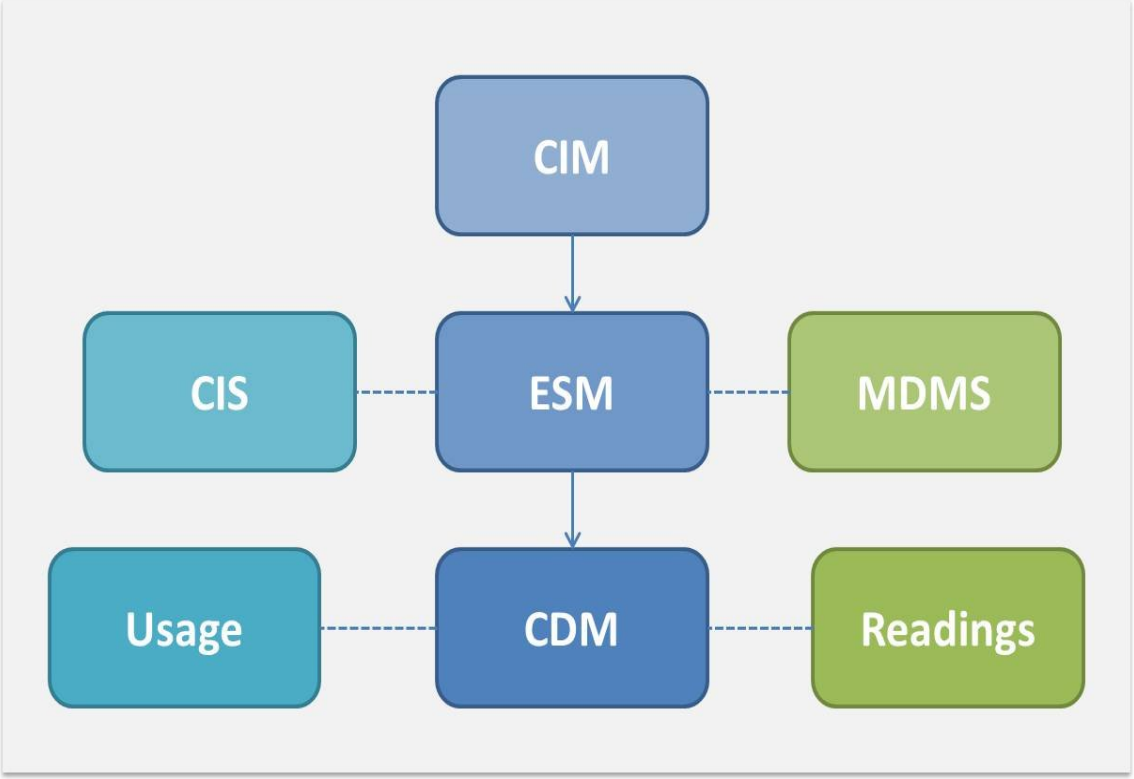


Information Model Relationships and Inheritance

Common Services Architectures require a high degree of design discipline across all systems that participate

A clear approach to information management and system integration fosters reuse and reduces complexity

Common Information Model standards serve as the semantic root for SCE's Enterprise Semantic Model and Canonical Data Model



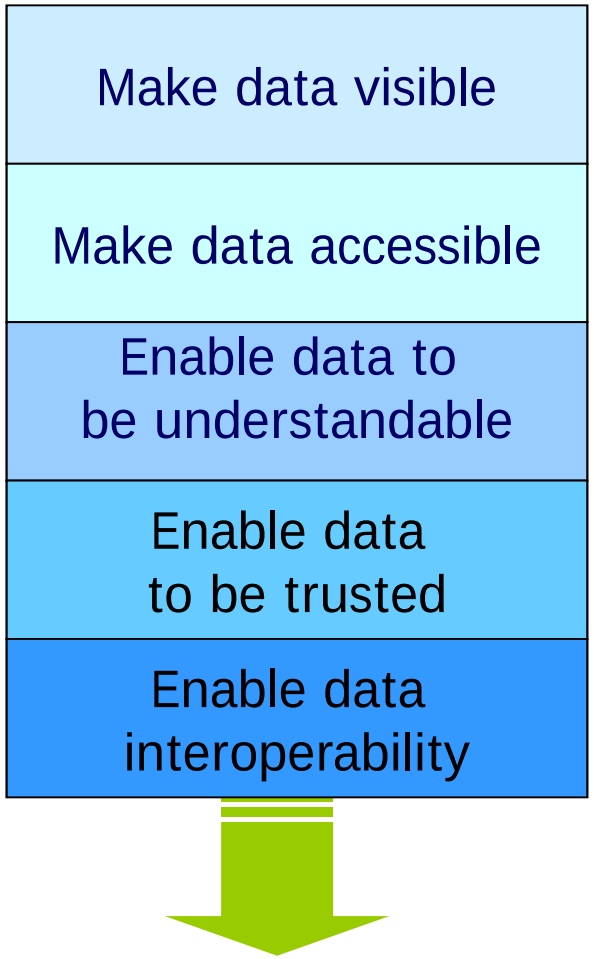
Tools: Rational Suite, EA and MDI
(*Note: It's not the tools, it's how you use them*)

Keys to Success – Enterprise Semantic Model

- Enterprise Information Driven – The ESM utilizes internal models, metadata, and terminology already in use in SCE's enterprise. Existing models and common vernacular, whether or not they are documented, are the most important sources for ESM development.
- Actively Managed & Stable– ESMs are non-static in nature and must allow semantics to evolve toward greater clarity as existing business information evolves or new information is introduced.
- Openly Accessible – The ESM must provide open access to business-critical information about semantics, data restrictions, entity refinement, and constraints targeting specific business contexts.
- Semantic Traceability – Semantic traceability and lineage are important correlation across internal information or to non-ESM semantics.
- Industry Standards Aware – By providing mechanisms to systematically take advantage of applicable industry standard models such as the CIM, data types, and code lists as input, a robust ESM incorporates standard and broadly adopted semantics.
- Business Context Capable - The ESM must support data exchange and information sharing within a particular business context.

Goals of a practical EIM implementation

Goals:



To make the right decisions at the right time

Actions:

- Make Data Assets Available to the Enterprise:
  - Use semantic models to describe and advertise data assets
  - Create data asset repositories and organize by community-defined structure (ontology).
  - Post data assets to shared space where Enterprise users can access it
- Make System Data and Processes Available to the Enterprise:
  - Define and register the format and semantics of system data and processes
  - Provide reusable/easy-to-call access services to make system data and processes available to the Enterprise

Courtesy DOD office of CIO

Questions?