

Aspects of Interoperability

OMG, STEP & XML as Examples

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RM/ODP

- **Reference Model for Open Distributed Processing**
- **ISO/IEC 10746-1 ODP Reference Model Part 1** presents an overview of RM-ODP
- Among other things, it discusses ***System Viewpoints***
- Each Viewpoint has associated **Language(s)** used to describe the System from its viewpoint
 - **Remind me** to say something further about this.

RM/ODP Viewpoints

- **Enterprise** Viewpoint is concerned with the *purpose, scope and policies* governing the activities of the specified system within the organization of which it is a part;
- **Information** Viewpoint is concerned with the *kinds of information* handled by the system and *constraints on the use and interpretation* of that information;
- **Computational** Viewpoint is concerned with the *functional decomposition* of the system into a *set of objects that interact at interfaces* - enabling system distribution;
- **Engineering** Viewpoint is concerned with the *infrastructure required* to support system distribution;
- **Technology** Viewpoint is concerned with the choice of *technology* to support system distribution.



RM/ODP we can all Understand

American Premise:
*Everything goes
down better with
Ketchup*

(well... except for California
where it is Mayonnaise)

RM/ODP with respect to Ketchup

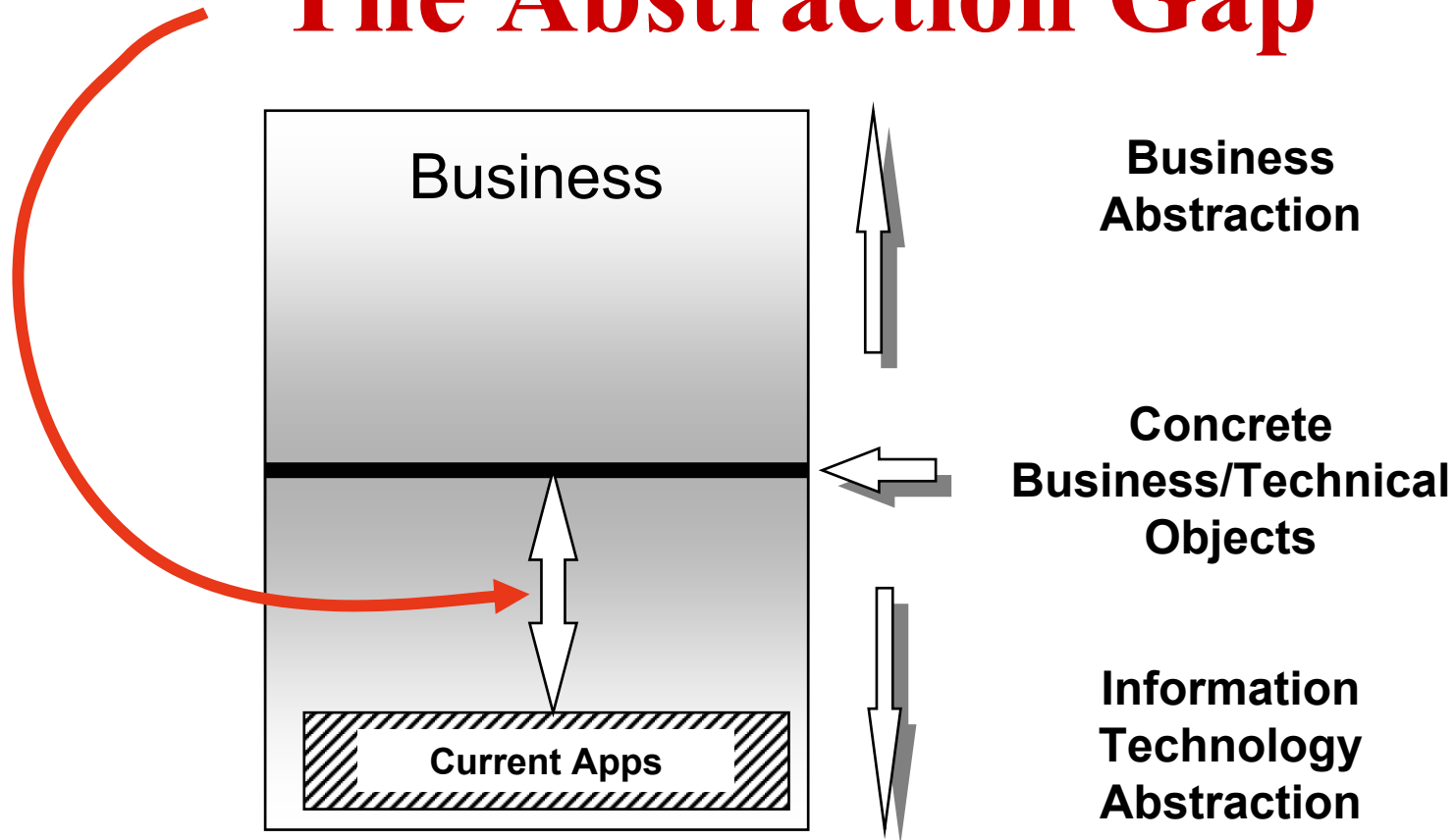
- **Enterprise** viewpoint: **What's it good for?**
It makes food taste better.
- **Information** viewpoint: **What's it made of?**
Bottle, Cap, Sauce
- **Computational** viewpoint: **How do I use it?**
Take off the cap, turn bottle upside down.
- **Engineering** viewpoint: **How do I make it?**
Cook the sauce, put the sauce in bottle.
- **Technology** viewpoint: **What do I make it out of?**
Glass Bottle, Tomatoes, Vinegar, Sugar, Metal Cap.

Note that we can vary the specs in any of the viewpoints, while keeping the others relatively unchanged.

Enterprise Viewpoint of Interoperability

- **What are the Objects of our Business & How do they Behave?**
- **When I give you a “Part Description”,**
 - *Do you know what you’re getting?*
 - *Will it be useful to you?*
- **Application Activity Models of STEP**
- **PDM Enablers Specification of the OMG**

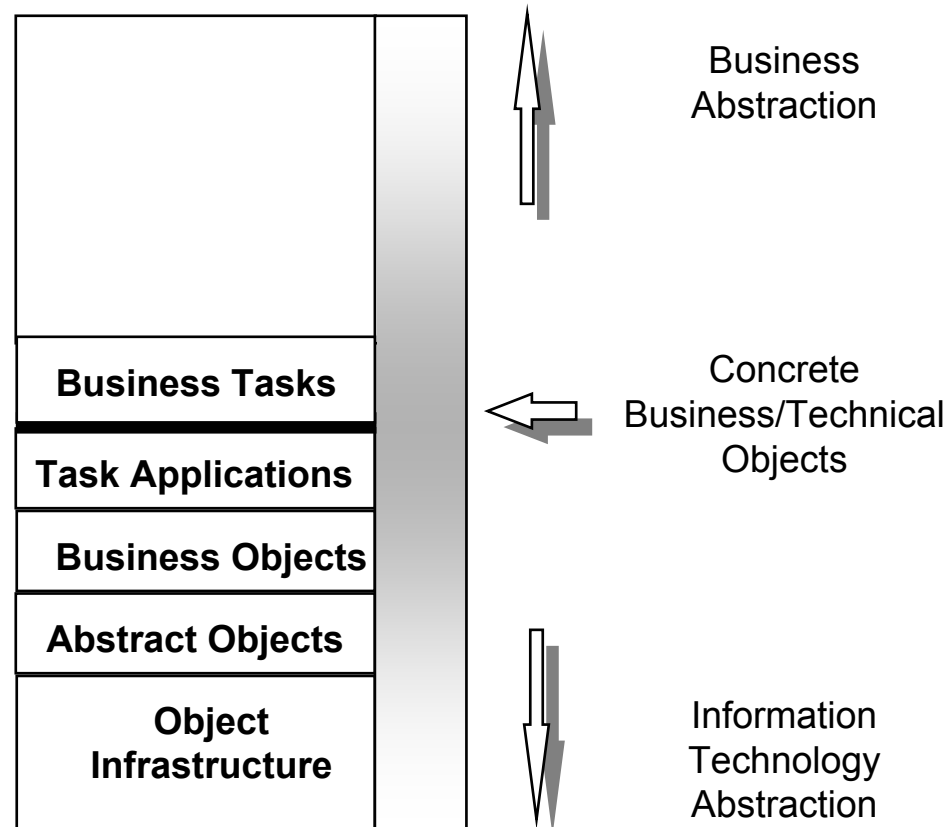
The Abstraction Gap



Spanning the Abstraction Gap

- Object Technology permits the definition of large granularity objects with complex methods.
- Objects can be defined with a one to one correspondence with the [business objects](#).
- Application programming can be done in terms of the [business](#) objects.
- Application programming does not require tedious, detailed, [field-level programming](#).
- Reprogramming the infrastructure is proportional in effort to Re-Engineering the Business Process.

Spanning the Abstraction Gap



Informational Viewpoint of Interoperability

- **Our Businesses are based on an Enterprise Viewpoint.**
- **The Objects of our Business are described through the Informational Viewpoint**
 - **STEP Application Resource Model**
 - **STEP PDM Schema**
- **Described using Semantic Languages**
 - **UML (Unified Modeling Language)**
 - **STEP EXPRESS**

Computational Viewpoint of Interoperability

- The Interfaces to our Systems
- The Core Business of the Object Management Group
- Represents the View of the System from Outside
- For Example the OMG PDM Standard is NOT a model of PDM's, it is a model of **INTERFACES**

RM/ODP Viewpoints of STEP & OMG PDM

RM-ODP Viewpoint	OMG PDM Enabler Specifications	STEP Specifications
Enterprise	Mfg. White Paper, PDM Enablers RFP	Application Activity Model (AAM)
Information	by Customer, or STEP	Application Reference Model (ARM) Application Interpreted Model (AIM) (PDM Schema)
Computational	PDM Enablers	Out of Scope
Engineering	CORBA, OMA IDL language mappings	STEP file exchange structure STEP data access interface and C, C++, Java or OMG IDL mapping
Technology	by PDM Enablers Vendors	by STEP Processor Vendors

From: "STEP and OMG Product Data Management Specifications: A Guide for Decision Makers"

Outline of “STEP and OMG Product Data Management Specifications: A Guide for Decision Makers”

- 1. Introduction
- 2. The Organizations
 - 2.1 The Object Management Group (OMG)
 - 2.2 The ISO Subcommittee on Industrial Data
- 3. The Standards
 - 3.1 Intent of PDM Enablers
 - 3.2 Intent of STEP PDM Schema
- 4. Relationships Between the Standards
 - 4.1 The Roles of Separate Specifications
 - 4.1.1 Introduction to RM-ODP Viewpoints
 - 4.1.2 Viewpoints for PDM Enablers and STEP
 - 4.2 Complementary Aspects of the two Standards
 - 4.3 Semantic comparison between the two Standards
- 5. Usage - Applying the Two Standards to Business Scenarios
 - 5.1 Release of a contracted design
 - 5.2 PDM Enabled Applications
 - 5.3 Product Structure Viewer
 - 5.4 Gradual Migration to new PDM Systems
 - 5.5 Concurrent Parallel Operation
 - 5.6 Digital Mockup / Collaborative Design
 - 5.7 Federated PDM

Contributing Organizations

“STEP and OMG Product Data Management Specifications: A Guide for Decision Makers”

- ATI
- The Boeing Company
- ERIM
- Enovia
- EuroSTEP Limited
- Ford
- IBM Corporation
- INSO Corporation
- Metaphase/SDRC
- MSC.Software Corporation
- NCMS
- PDES Inc.
- ProSTEP GmbH
- NASA
- NIST

Submission Contacts

“STEP and OMG Product Data Management Specifications: A Guide for Decision Makers”

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Engineering Viewpoint of Interoperability

- **The Infrastructure Required for Distributed Systems**
 - CORBA, OMA
 - IDL language mappings
 - STEP file exchange structure
 - STEP data access interface
 - C, C++, Java or OMG IDL mapping

Technology Viewpoint

- **Executables**
 - **UNIX Binaries for this or that**
 - **Interpreted Java**
 - **CGI**
- **Wires & Stuff**
 - **Ethernet**
 - **Twisted Pair**
- **Etc.**

XML

Tagged Data Formats

- **Tagged Data Formats of Antiquity**
 - RTF
 - ROFF
 - RUNOFF
 - yada yada yada ...
- **And Then... SGML**
 - Standard Generalized Markup Language
 - ISO 8879 1986

SGML

- **Started as GML, IBM's General Markup Language**
- **First Published in 1980**
 - Major adopters included the US Internal Revenue Service (IRS) and the US Department of Defense (CALs)
- **ISO Standard in 1986**
- **Highly Flexible Markup Language**

SGML Distinctive Characteristics

- **Descriptive Markup** rather than Procedural - the Tagged Data Concept
- **Document Type Definitions (DTD's)** - Allows Defining and Constraining Tag Sets and Rules
- **Hardware/Software Independence** - Completed through String Substitution... SGML Entities (Character Set Independence).

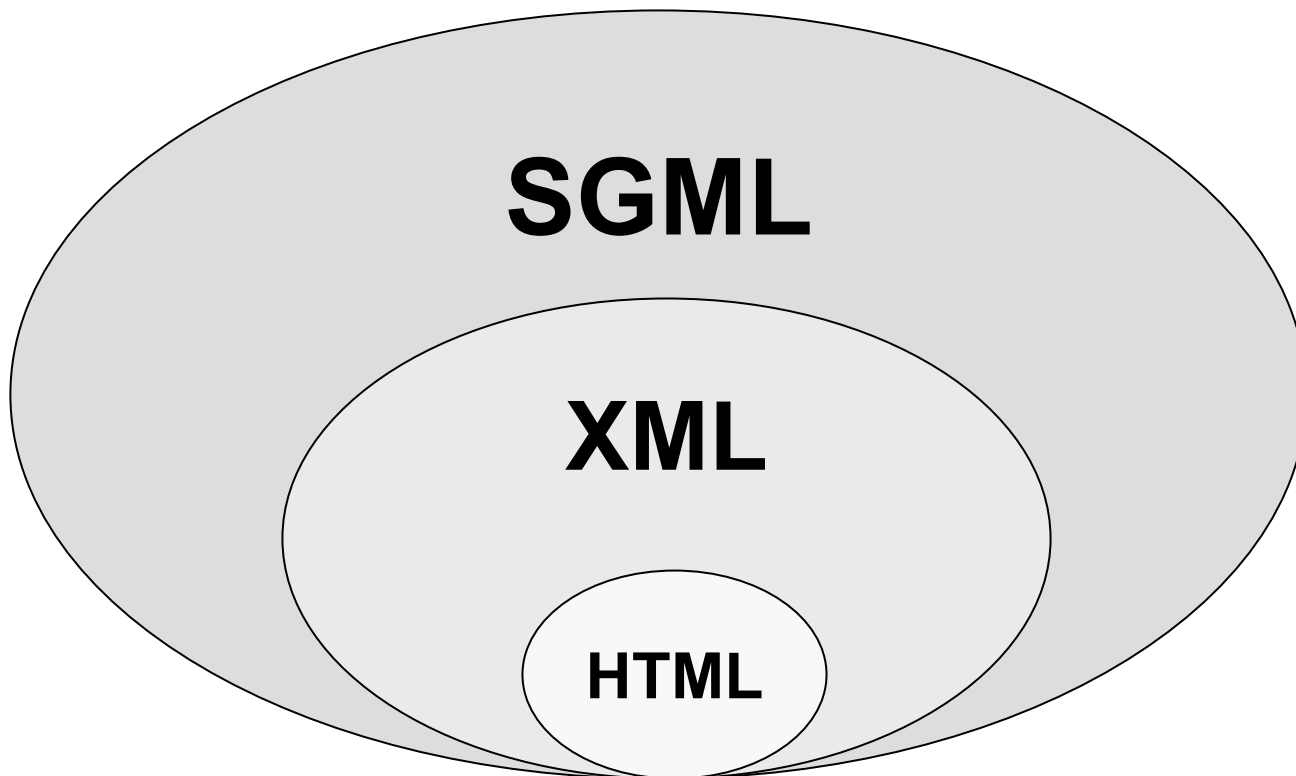
HTML

- Tim Berners-Lee of CERN A Single SGML DTD (i.e., there are no DTD's)
- Thought by SGML Pioneers to be **Laughably Constrained & Therefore Inconsequential yuk. yuk.**
- Defined with a Couple of Other Silly Things
 - URL's
 - HTTP

XML

- **The SGML Pioneers were in part correct - HTML was (in the long run) too confining**
- **XML Reintroduces simplified versions of SGML concepts that HTML dropped**
- **Fostered by the World Wide Web Consortium (W3C)**
 - **Expansion of Style Sheets, Inter-File References,**
 - **Semantics & Instance Expression**
 - **Document Object Model (DOM)**

Modern Tagged Data Formats



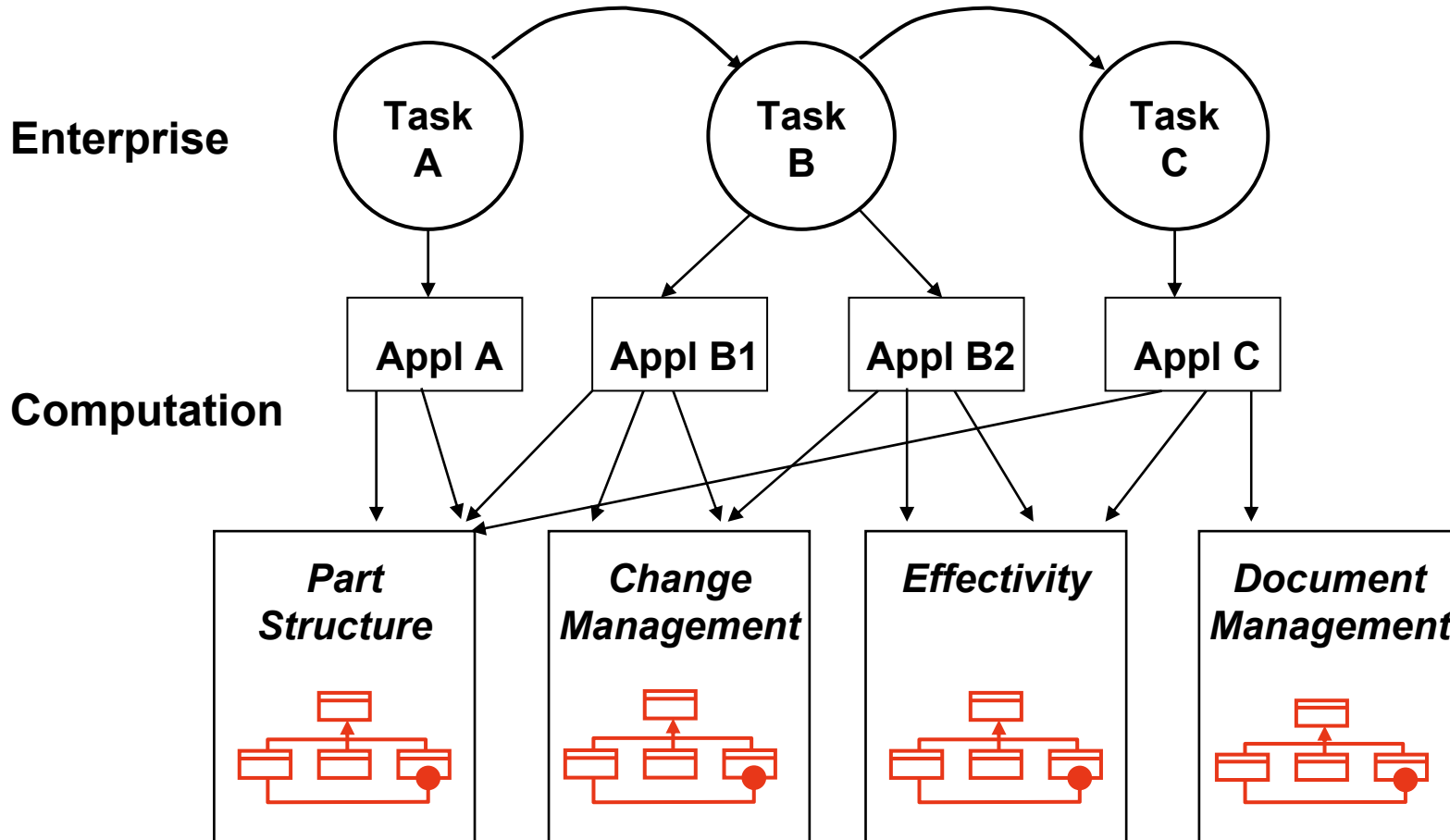
Consortia Embracing XML DTD Writer's

- **Open Applications Group (OAG)**
 - **Business Object Document**
 - **Specifies Semantics for Integration**
 - **Verb/Object Format based on XML DTD's**
- **Organization for the Advancement of Structured Information Standards (OASIS)**
 - **Industry Advocate & Watch Dog for Interoperability of XML**
 - **Grew out of CGM interests**
- **RosettaNET**
- **Object Management Group (OMG)**

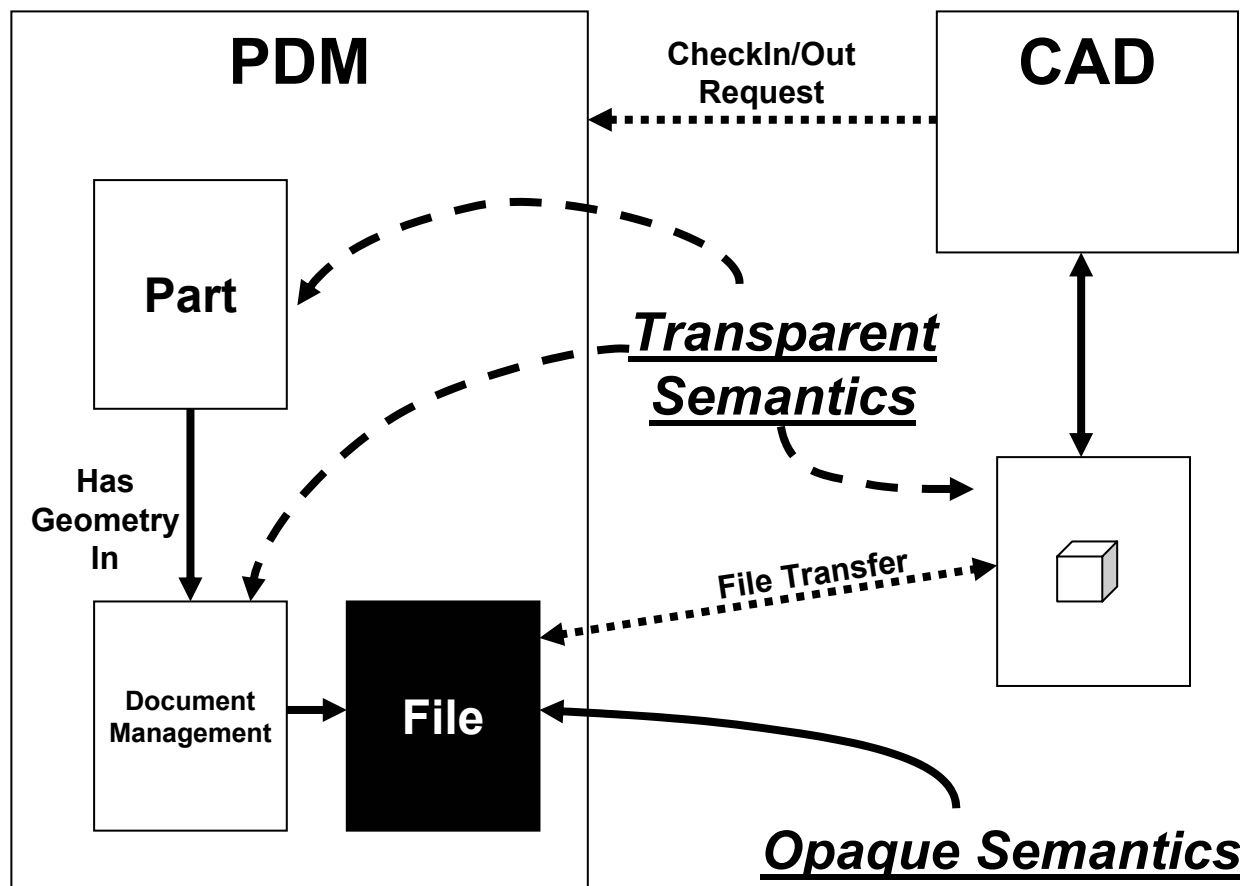
RM/ODP Viewpoints of XML

RM-ODP Viewpoint	XML
Enterprise	DTD Author's Organizational Charter
Information	XML DTD's
Computational	Out of Scope (Except for Verbs) Style Sheets?
Engineering	XML Files
Technology	Not addressed

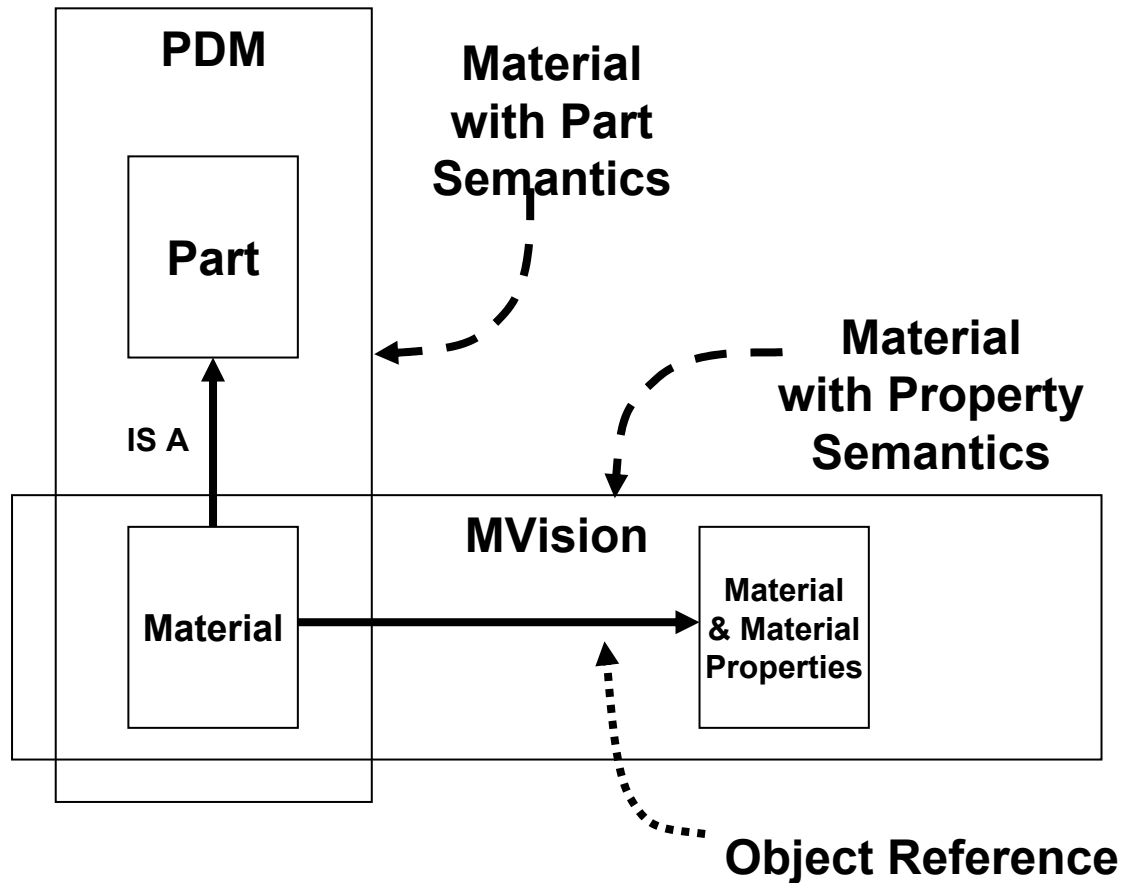
PDM Components



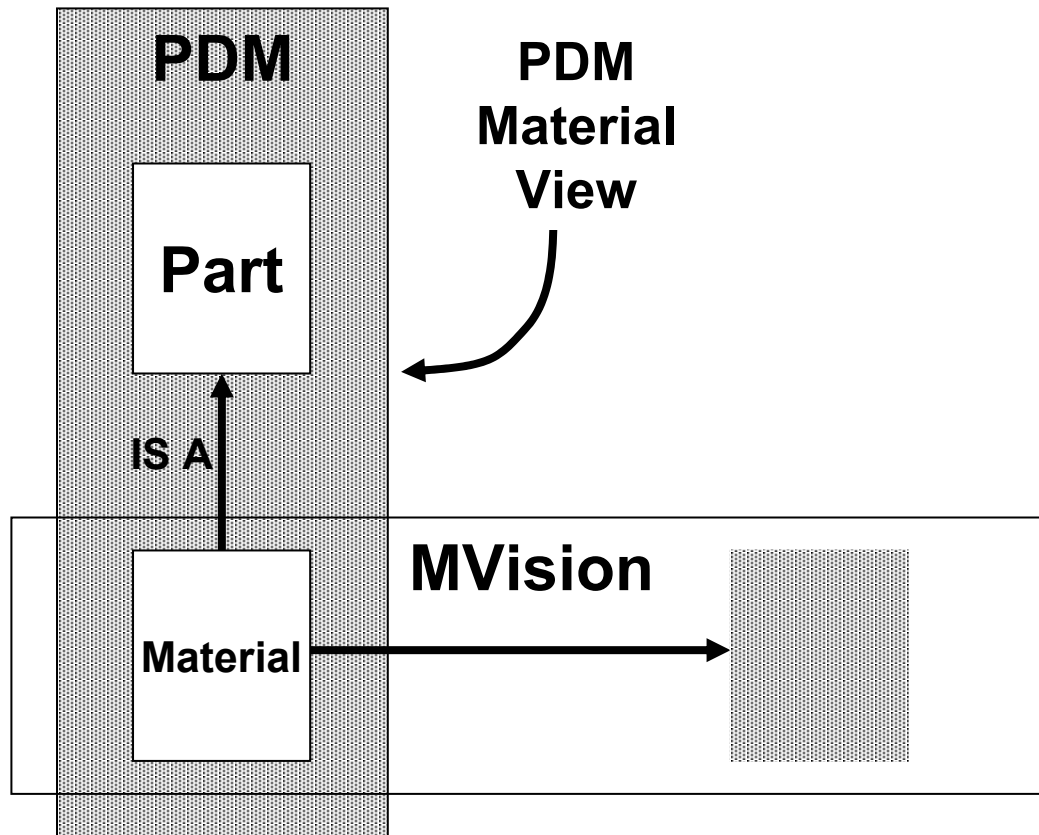
Traditional PDM “Integration”



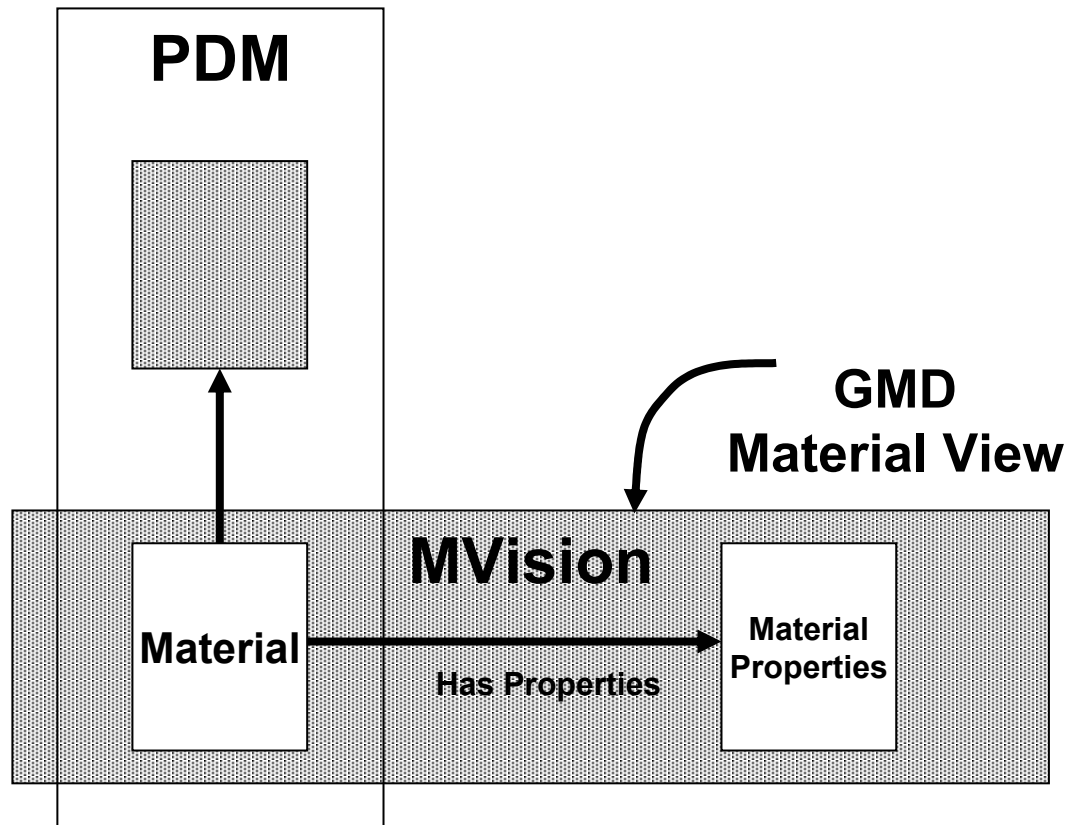
Semantic PDM Integration



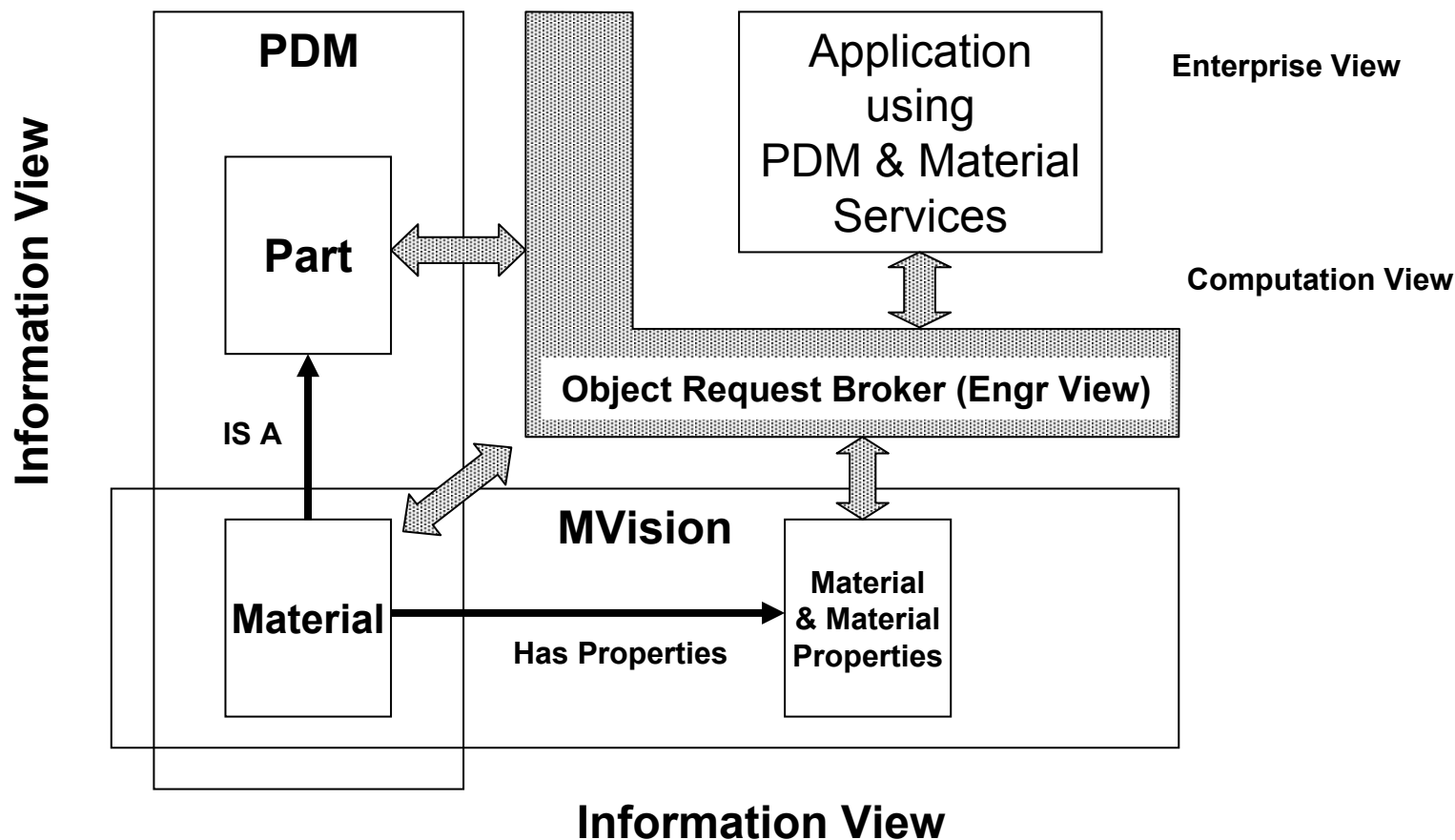
Legacy PDM Views



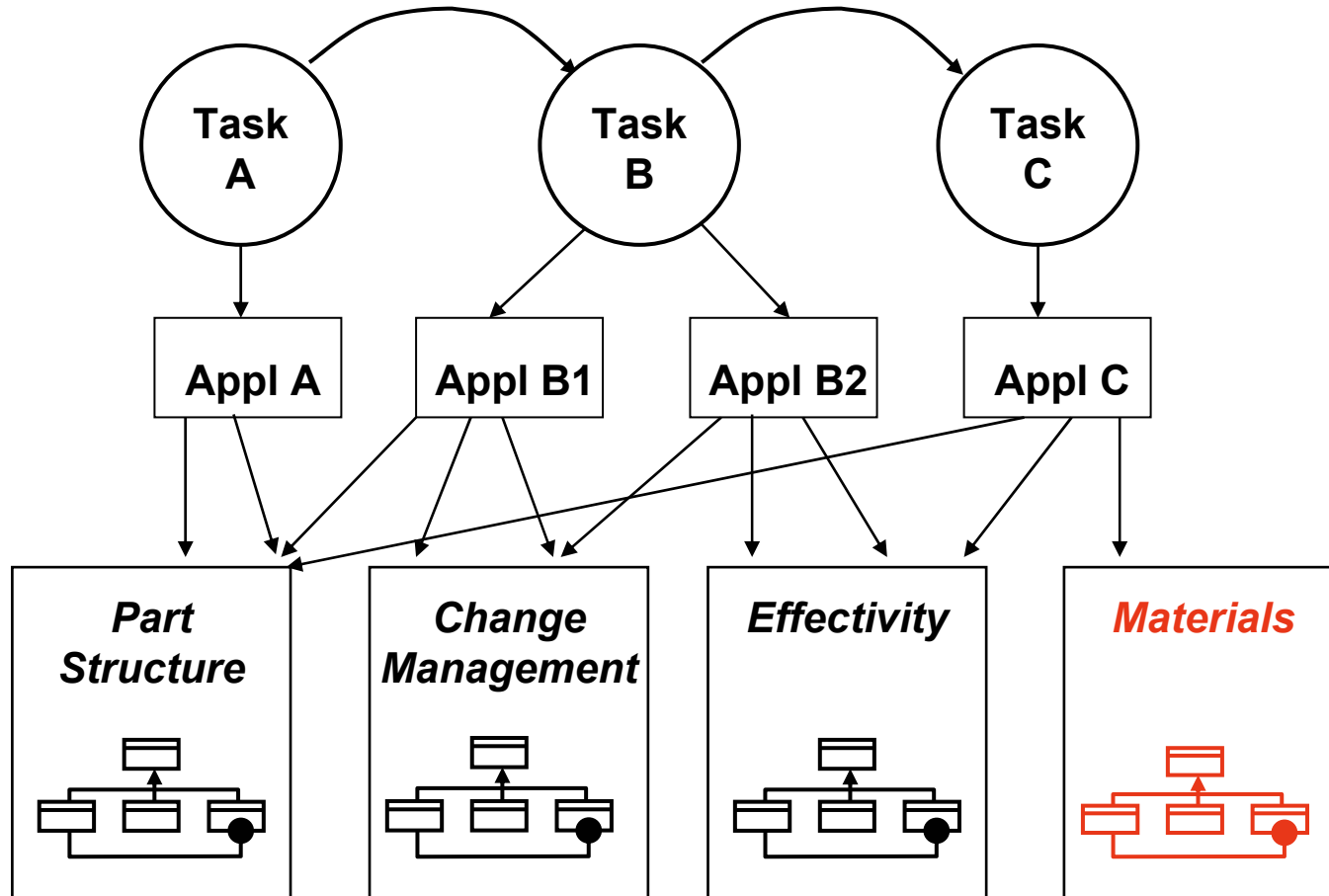
Legacy MVision Views



Integrated (Federated) Views



Extensibility Due to Isolation of Views



URL's for Reference - 1

- **Object Management Group**
 - <http://www.omg.org/>
 - <http://www.omg.org/homepages/mfg>
(Manufacturing Domain Task Force)
- **Open Applications Group**
 - <http://www.openapplications.org/>
- **RosettaNET**
 - <http://www.rosettanet.org/>
- **Organization for the Advancement of Structured Information Standards (OASIS)**
 - <http://www.oasis-open.org/>

URL's for Reference - 2

- **World Wide Web Consortium (W3C)**
 - <http://www.w3.org/>
- **“STEP and OMG Product Data Management Specifications: A Guide for Decision Makers”**
 - <http://www.omg.org/cgi-bin/doc?mfg/99-10-04>