

Enterprise and Networked Enterprise Model Driven, Service-Oriented Contract Systems

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**SOA, MDA and Web Services Workshop:
Integrating the Enterprise, and Beyond
Fairfax, VA, USA
March 27 - 30, 2006**

Mathet Consulting, Inc.

- Integrated, Interoperable and Cooperative (Collaborative) Systems Architecture and Engineering
- Global and Local Perspectives
- “Business” and Technology Unification
- Networks of Systems / Systems of Networks including software, enterprises, networks of enterprises, and “open” / global systems
- Embed MDA, SOA, and WS
- “Unification” of a number of critical disciplines at the theoretical level and in systems architecture and engineering practice including economics, law, technology, knowledge

- Member IEEE and OMG

Abstract

- This presentation will focus on model driven, service-oriented, enterprise and networked enterprise contracts and contract systems. It will take a full-lifecycle systems approach to these systems showing how the synergy between the model driven approach and the service-oriented approach enables enterprises to maximize its value in constantly changing economic, legal and technology environments. Topics for discussion will include in the context of MDA and SOA:
 - Business and technology contracts / service level agreements
 - Mapping business services to technology services
 - Contract system services
 - Contract system infrastructure including trans-modal (inter-) enterprise service buses
 - Web Services technology for contract systems
 - Contract systems interoperability
 - Enterprise economic maneuverability, legal accountability and liability

Introduction and Background

**MDA, SOA, and Web Services:
Delivering the Integrated Enterprise
Orlando, Florida
March 21-24, 2004**

The Multi-context Integration, Interoperability and Collaboration Problem Within and Between Enterprise, Federation and Internet Systems

*Enterprise and Networked Enterprises
Model Driven, Service-Oriented Contract Systems*

Community of Practice

Supply Chain

Problem Domain

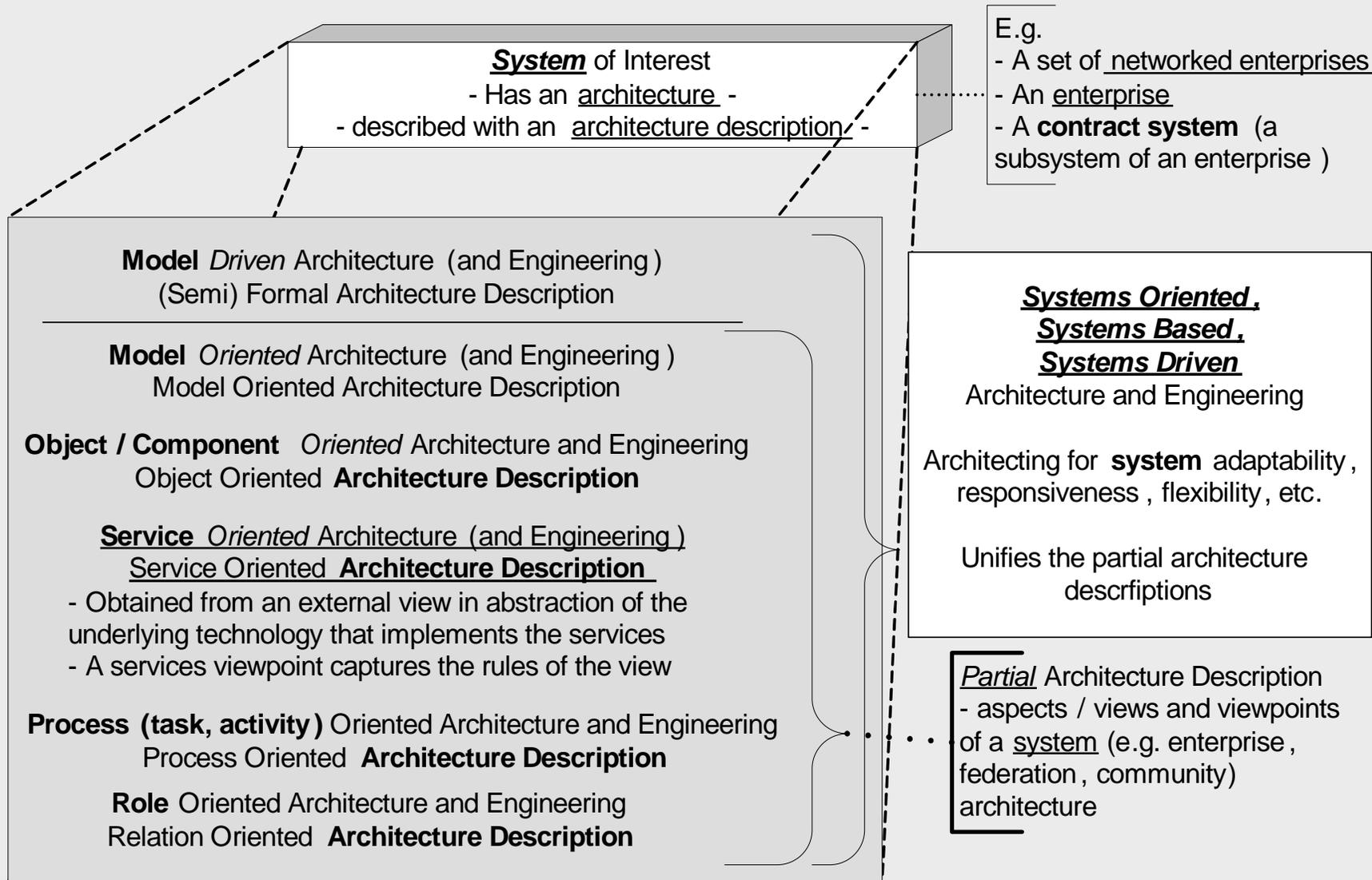
Problem Domain

Knowledge Domain

Industry Domain

Embedded Modeling Systems -
may be shared or non-shared

A Systems Approach



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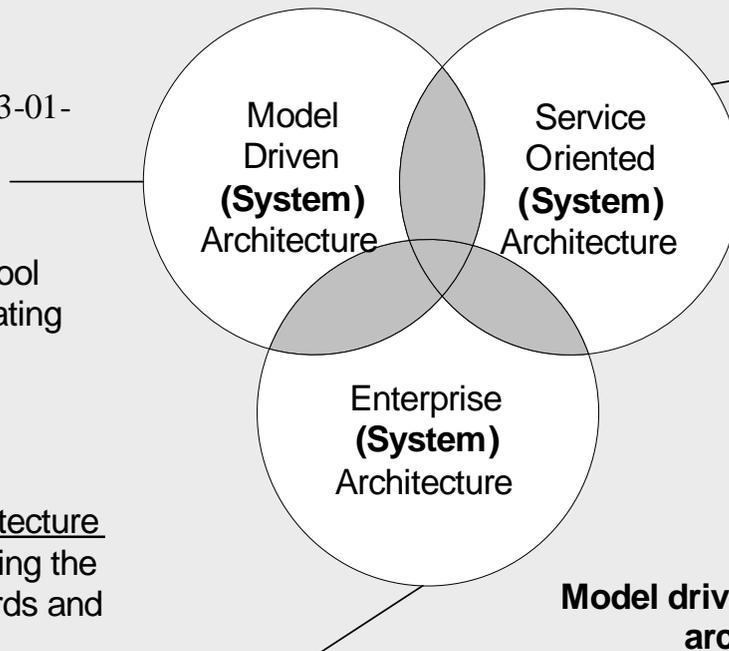
MDA X SOA X EA

- “An approach to IT system specification that separates the specification of functionality from the specification of the implementation of that functionality on a specific technology platform”

(www.omg.org/docs/ab/03-01-03)

- Three senses :

1. An architecture (description) for MDA Tool Sets (a platform for creating system architectures)
2. An architecture (description) for OMG standards
3. An (IT) system architecture (description) created using the MDA approach, standards and tool sets



An architecture (description) for an enterprise system

1. An architecture exhibiting the service provider -registry -service requestor pattern and implemented with web services technology (e.g. SOAP, XML)

2.

- A partial architecture (description) of a system focused on services
- An external view in abstraction of the underlying technology that implements the services .
- the view is focused on the service products produced from sets of functions
- A services viewpoint, which may be a metamodel, captures the rules of the view

Model driven, service oriented enterprise architecture (description):

-An architecture (description) for an enterprise system that exhibits model driven and service oriented features

Enterprise Aspects

(Business) Processes –

- Enterprise Threads of **Action**
- Represented by algorithms / heuristics
- “programming in the large”

“The (business) system defined by the executing process is the application”

The enterprise OS – SOA infrastructure / Technology Services

Enterprise

Enterprise Interface

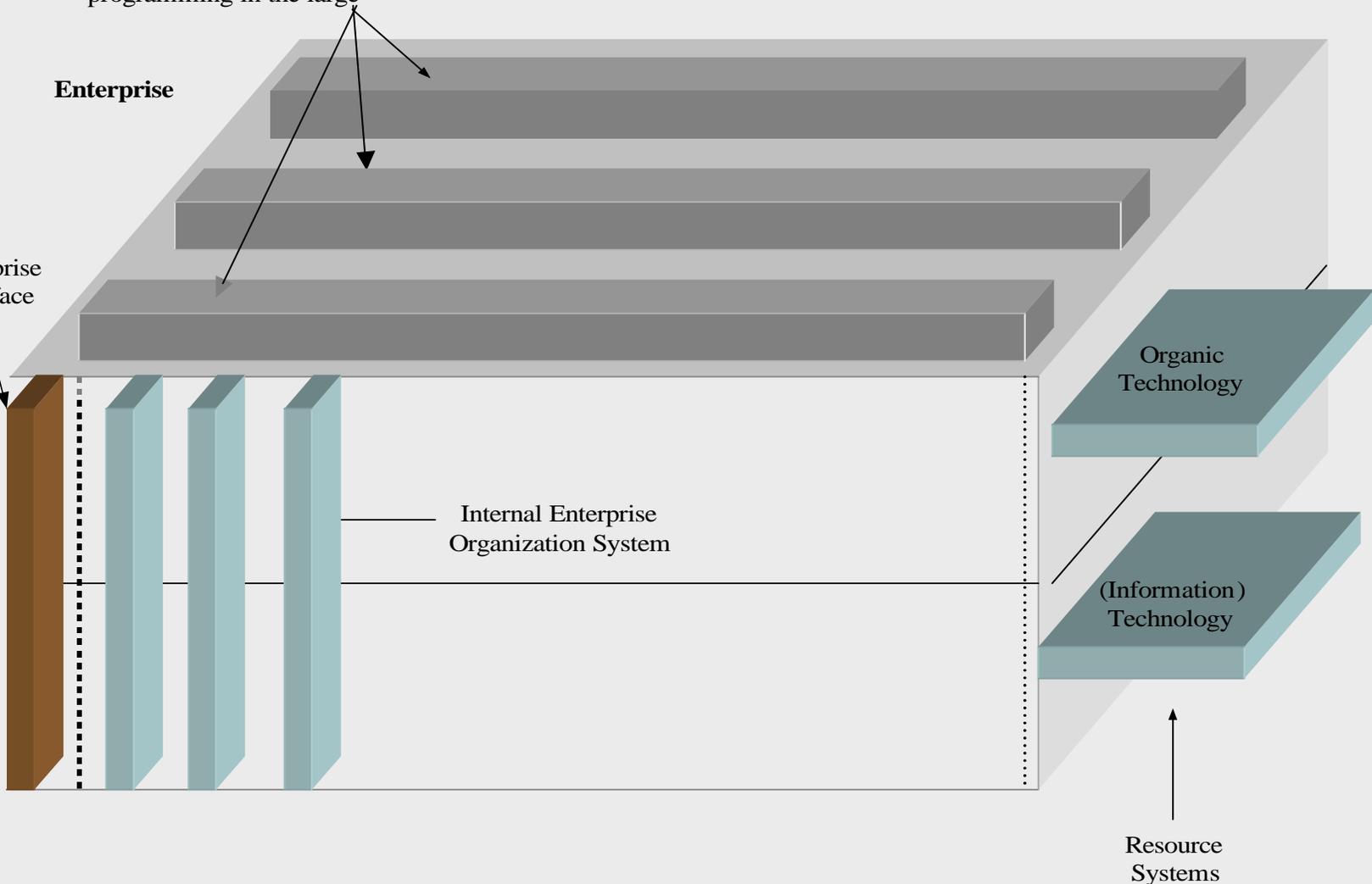
Internal Enterprise Organization System

Organic Technology

(Information) Technology

Resource Systems

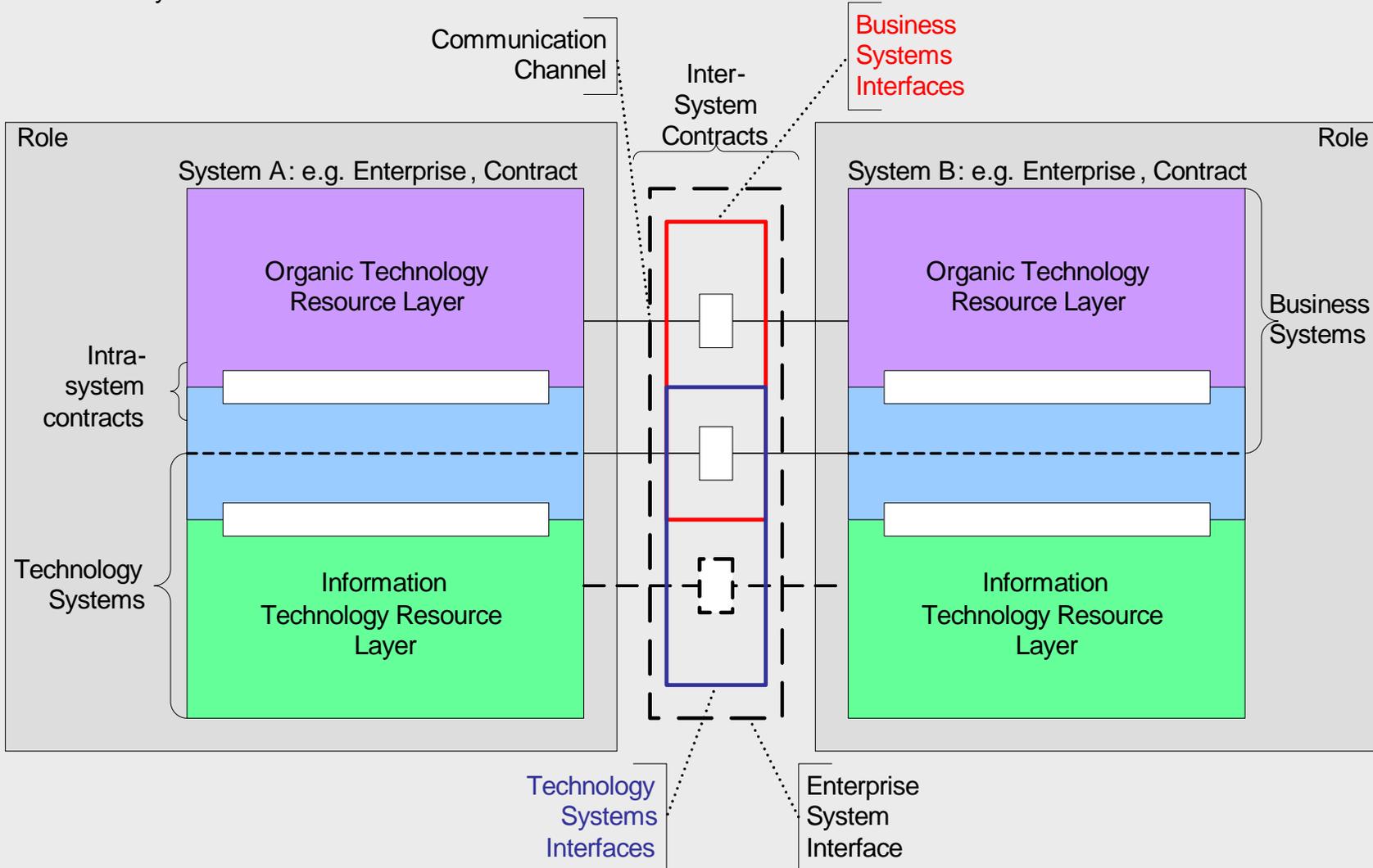
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Large Grained Interfaces / Contracts

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Model Driven, Service-Oriented Contract Systems

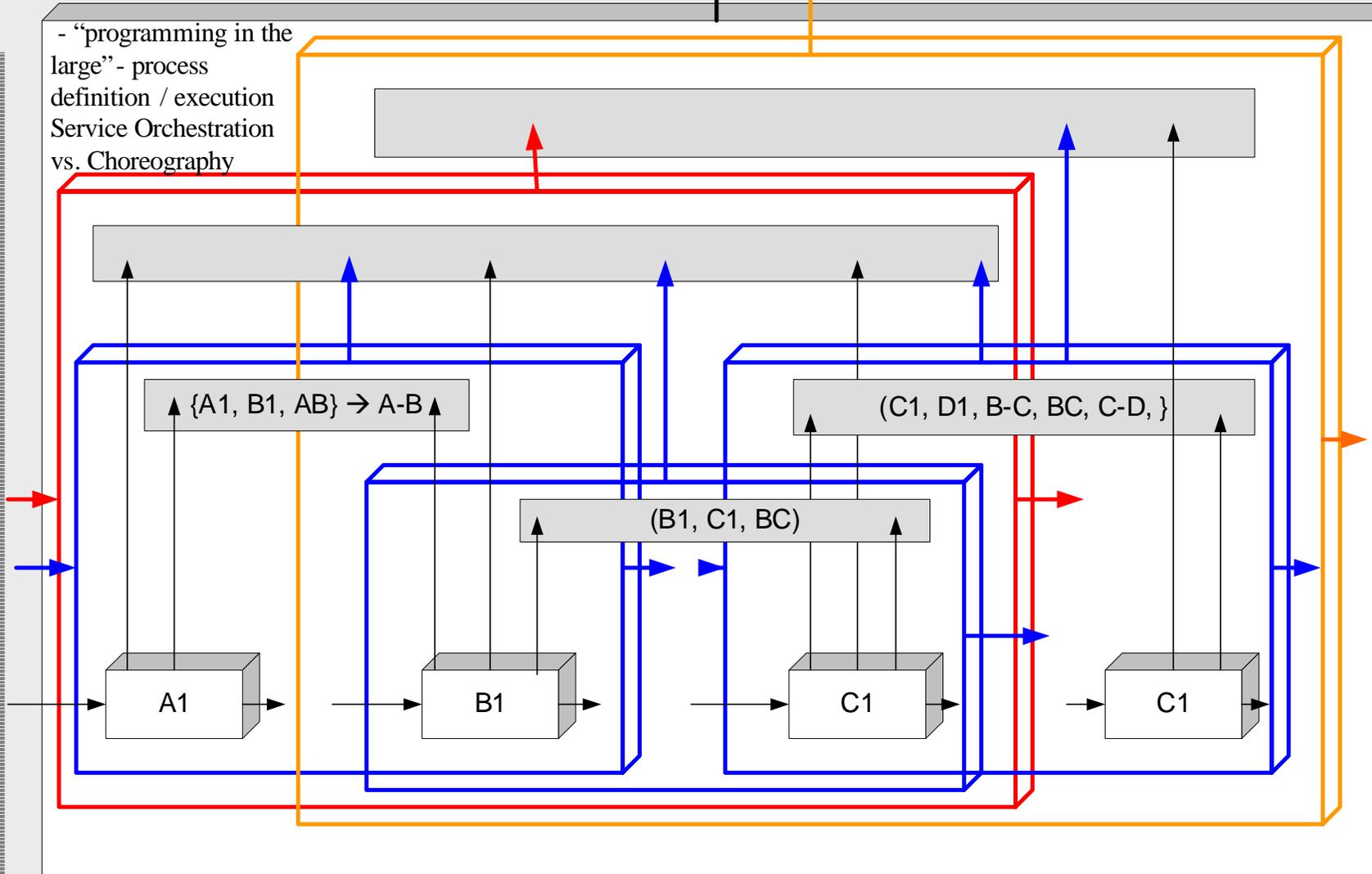
Networked System AB



Systems, Virtual Systems and Services

Enterprise and Networked Enterprises
Model Driven, Service-Oriented Contract Systems

- "programming in the large" - process definition / execution
Service Orchestration vs. Choreography



Systems / components interact at peer levels and in terms of super - subsystems

Contracts / agreements may exist for every interaction

Many contracts / contract provisions may be in the form of parameterized templates (e.g. QoS) – enables dynamic configuration . Others may be more complex

Why Contracts and Contract Systems

Together they are an intersection point , within and between :

- economic systems
 - legal systems
 - (inter-) enterprise systems
 - communities of practice
- locally and globally

- They define , constrain (inter-) enterprise “ecosystems” .

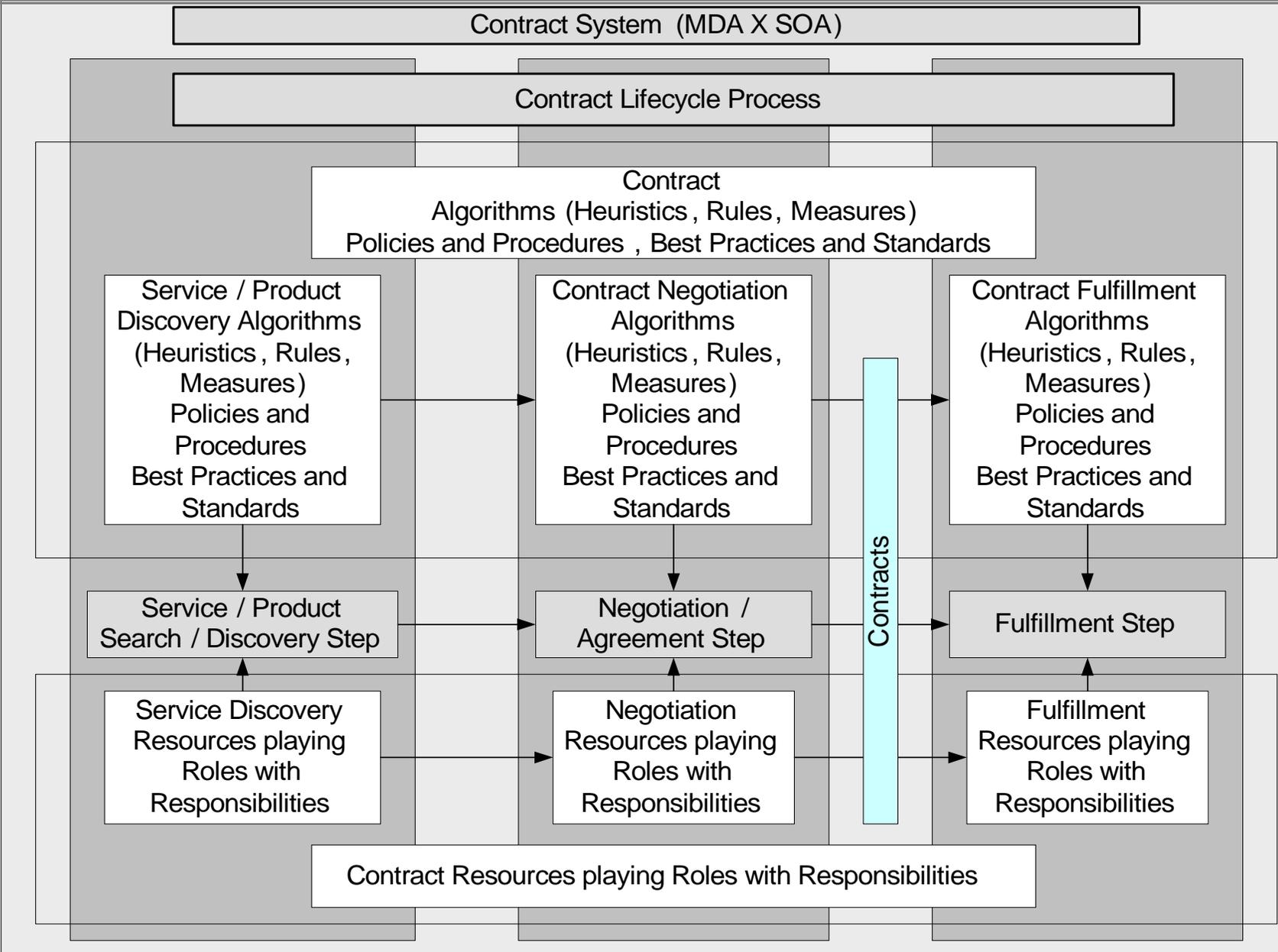
The basis of a modern model of global and local competitive economy is the *fulfillment of needs* of the members of these economic communities (ecosystems) .

- are unifying mechanisms : value, goals and objectives , processes and services , interfaces, agreements, security and privacy , quality, logic and language , law, economics, communities, etc.)
- are a (the) key contributor for business – IT alignment within enterprises and between enterprises at the business and IT levels of interactions .
- are concerned with governance (authorities , duties, obligations , responsibilities , consequences , etc.: this is NOT management)

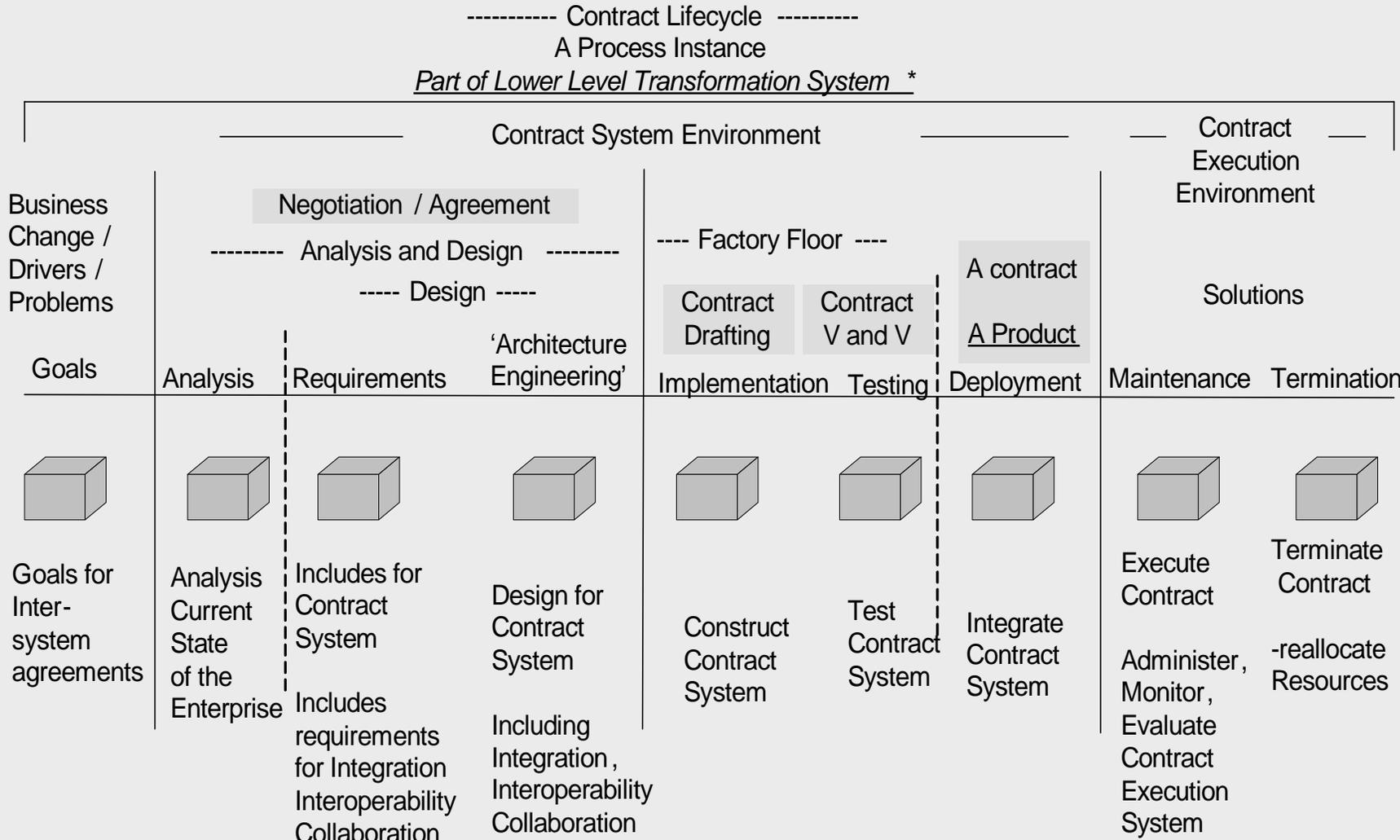
Contract systems and contracts may be considered to be a part of a larger Integration , Interoperability and Collaboration System that is ubiquitous and pervasive

Contracts and Contract Systems

Contracts: Lifecycle



Contracts: Lifecycle



Contracts: Perspectives

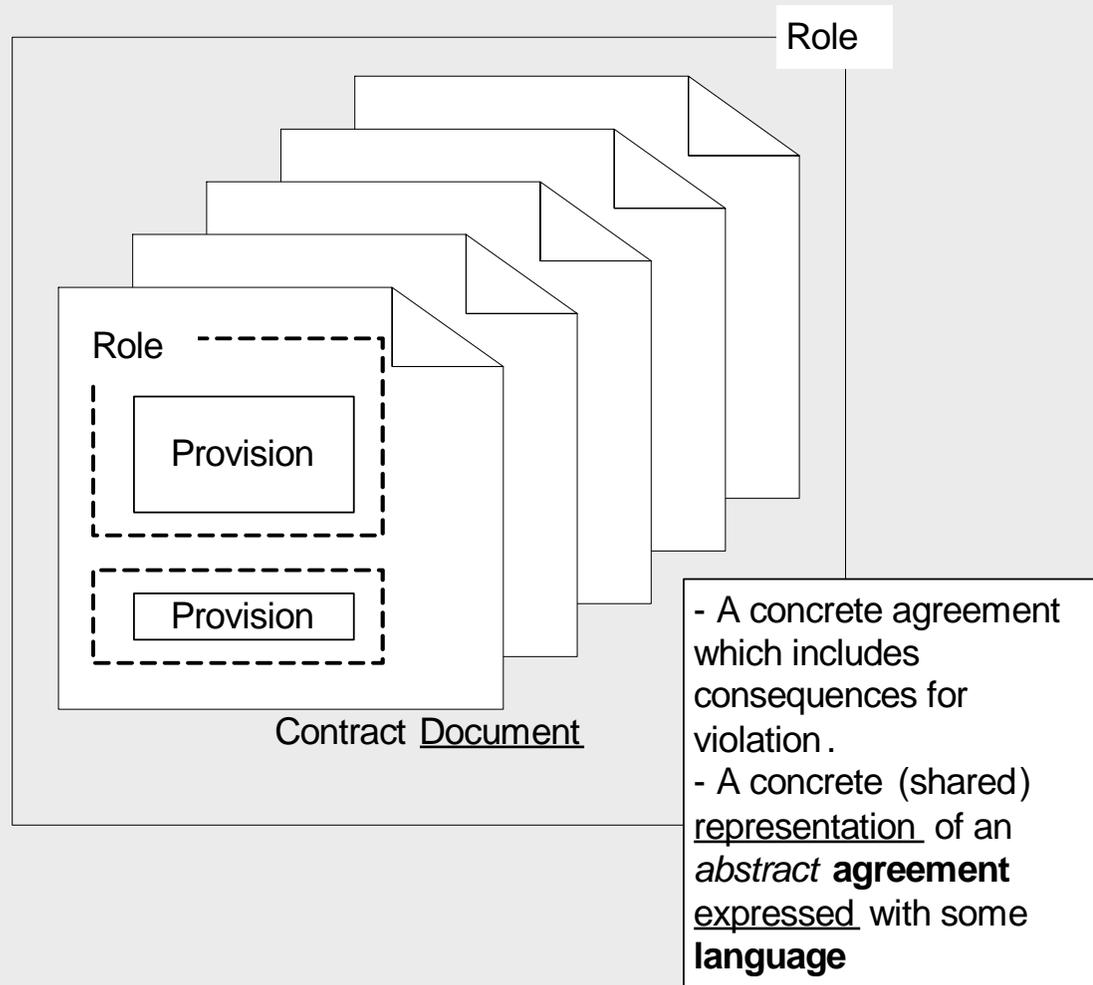
'Contract' Semantics

Perspective	General Description
 Object / Component Perspective (including applications)	E.g. "Design -by-Contract' . 'Contracts' as pre - and post-condition assertions that are placed within classes . The 'contract document' is part of the class specification .
 Service Oriented Perspective	E.g. Service / Service Level Agreements , ITIL. Business Services – Technology Services Mapping . External view of components operating in context with other components . May deal with assertions associated with output between components . The 'contract' document is external to components .
 Process (task, activity) Perspective	Organization work process . Mapping organization goals / objectives with business services
 Project (task, activity) Perspective	Service provider contracts with Statements of Work . E.g. Contracts with technology vendors
 Role Perspective	A 'contract' specifies the <u>expectation</u> of behavior in a purposeful interaction with consequences for failure to fulfill role
 Economic / Finance Perspective	Finance contracts , Business contracts
 Legal Perspective	Legal Rights , Obligations , duties, authorities , consequences . A 'contract' in the Role sense with legal consequences . Business contracts , statute , trade , etc.
 Systems Perspective	All of the above integrated into a whole – contract ontology utilized by contract systems within and between enterprises

Modified from Abrahms and extended

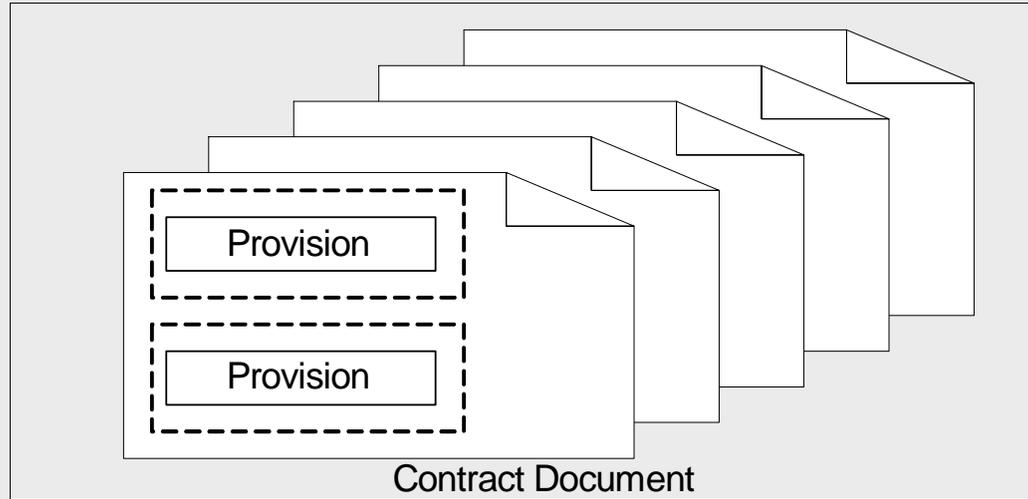
Contracts: Interaction Representation

Object / Component Perspective (including applications)
Service Oriented Perspective
Process (task, activity) Perspective
Project (task, activity) Perspective
Role Perspective
Economic / Finance Perspective
Legal Perspective
Role Perspective
Systems Perspective



Contracts: Provision Types – Business Value

Enterprise and Networked Enterprises
Model Driven, Service-Oriented Contract Systems



Contracts may be included by reference

Provisions classified by role types
(Daskalopulu, et. al)

- Descriptive
- Prescriptive
- Procedural
- Algebraic
- Effective

X

Provisions classified by interaction
type (e.g.)

- Enterprise – Enterprise
- Work Organization – Work Organization (internal to enterprise)
- Business - Technology
- Technology - Technology

X

Provisions classified by topics
E.g.

- Service / Product
- Process
- Quality
- Performance
- Security / Privacy
- Roles
- Value
- Etc.

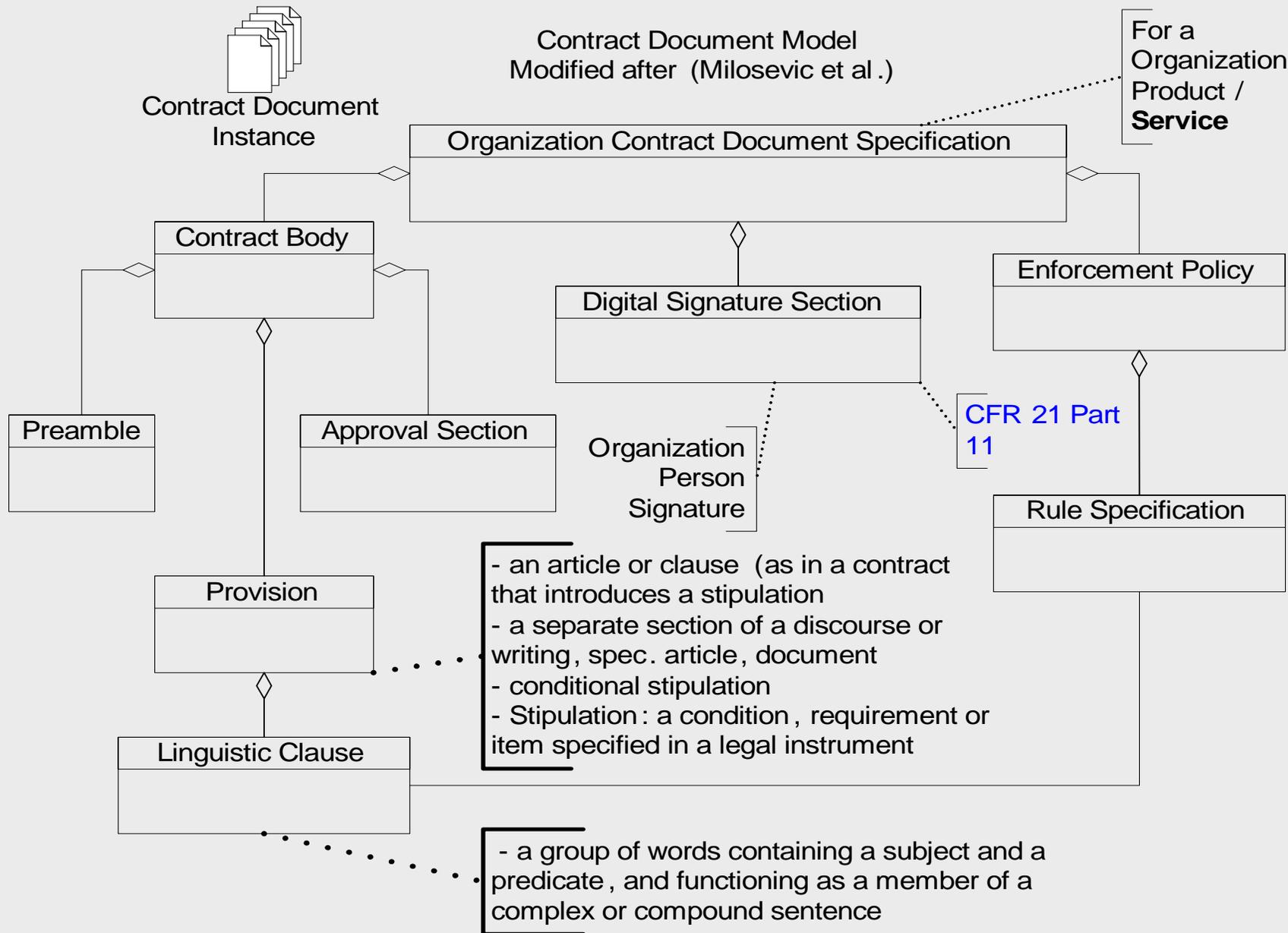


Rights, obligations, permissions, consequences, duties, violations, powers (authority)

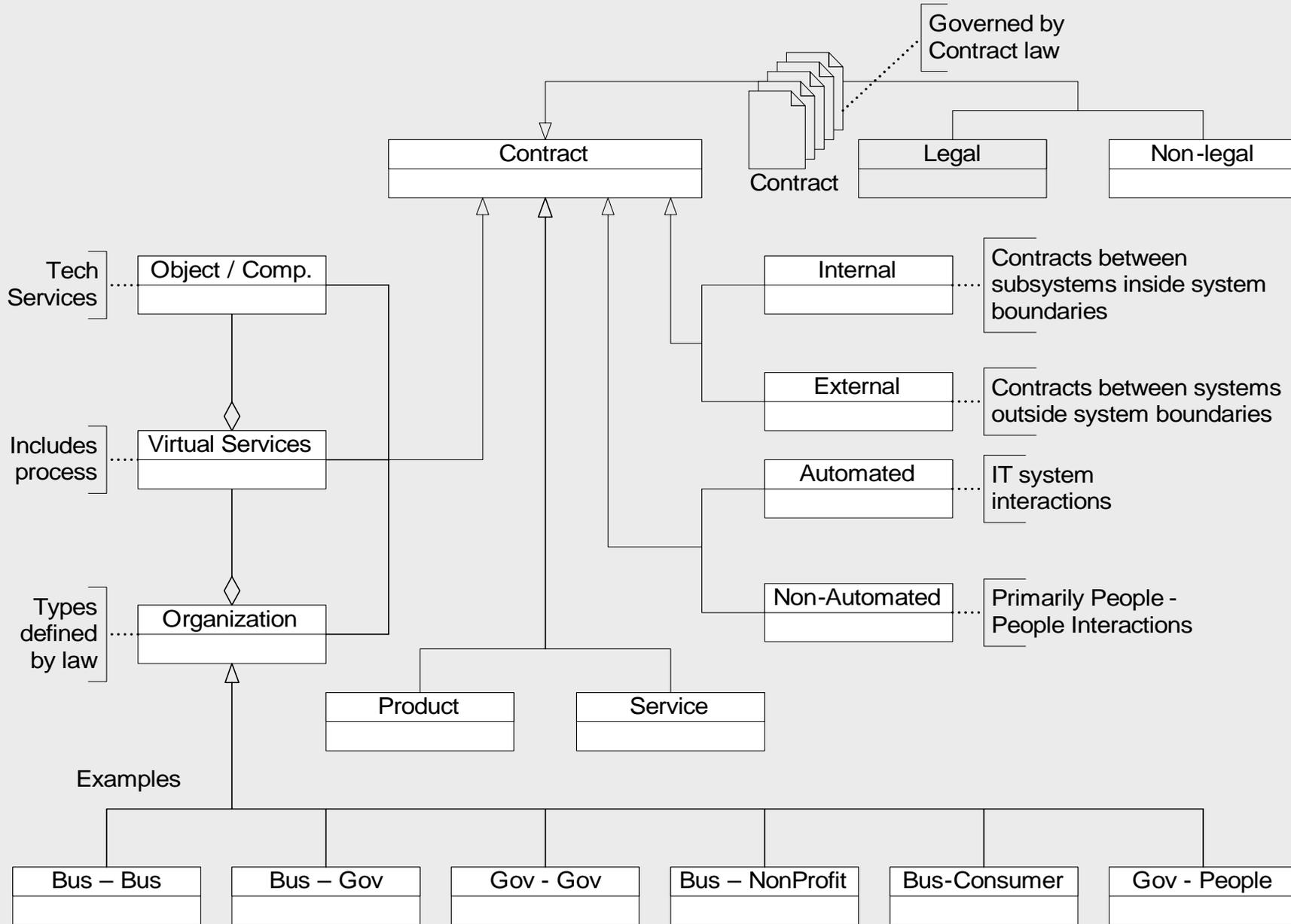
***There is an expectation that contract fulfillment satisfies some business goal.
Contract fulfillment has some expected (economic) value***

Contract Document

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Model Driven, Service-Oriented Contract Systems



Contracts: Types



Contracts: Registry / Repository

Contract Registry / Repository

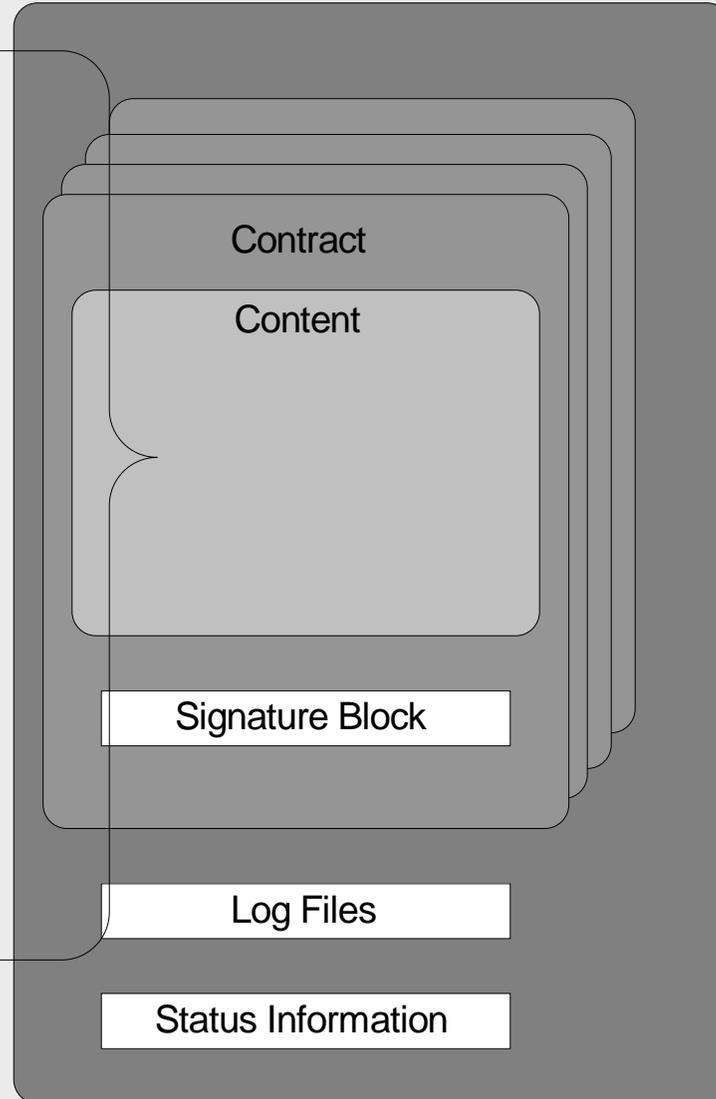
Provisions classified by interaction type (e.g.)

- Enterprise – Enterprise
- Work Organization – Work Organization (internal to enterprise)
- Business - Technology
- Technology - Technology

Provisions classified by topics
E.g.

- Service / Product
- Process
- Quality
- Performance
- Security / Privacy
- Roles
- Value
- Etc.

Including **current value** of service under contract

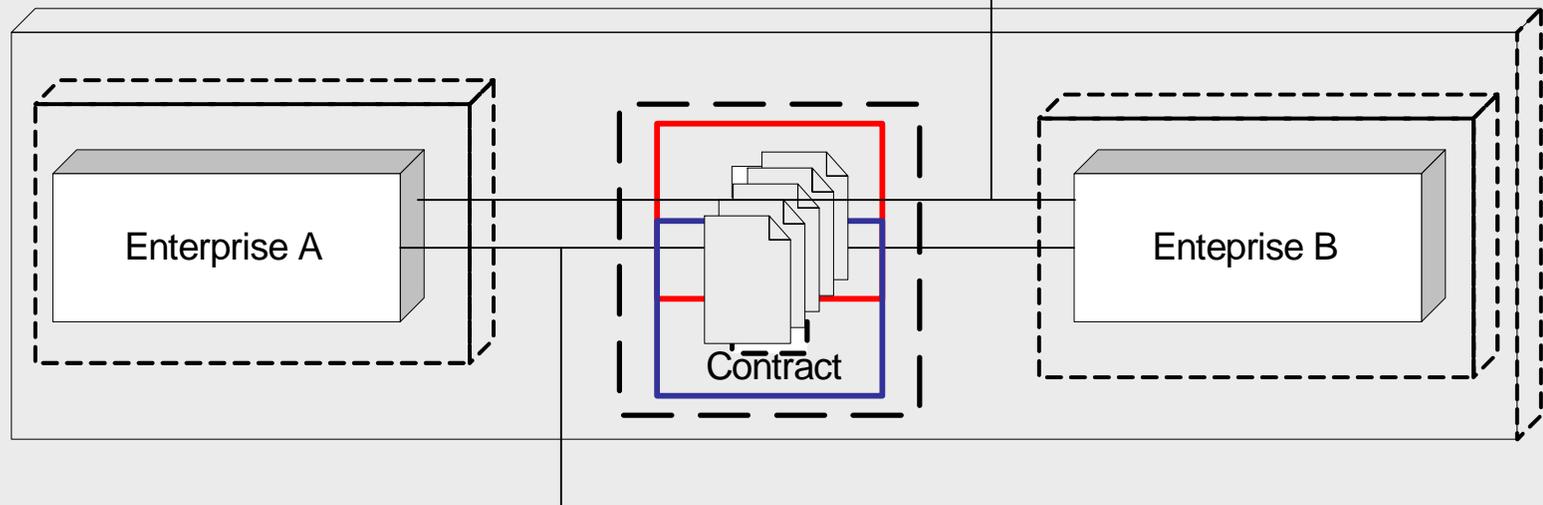


XML Documents

Contracts: Legal and Economic Relationships

An **economic relationship** (a *type of relationship*) **governed** by law as embodied by the contract (legal agreement)

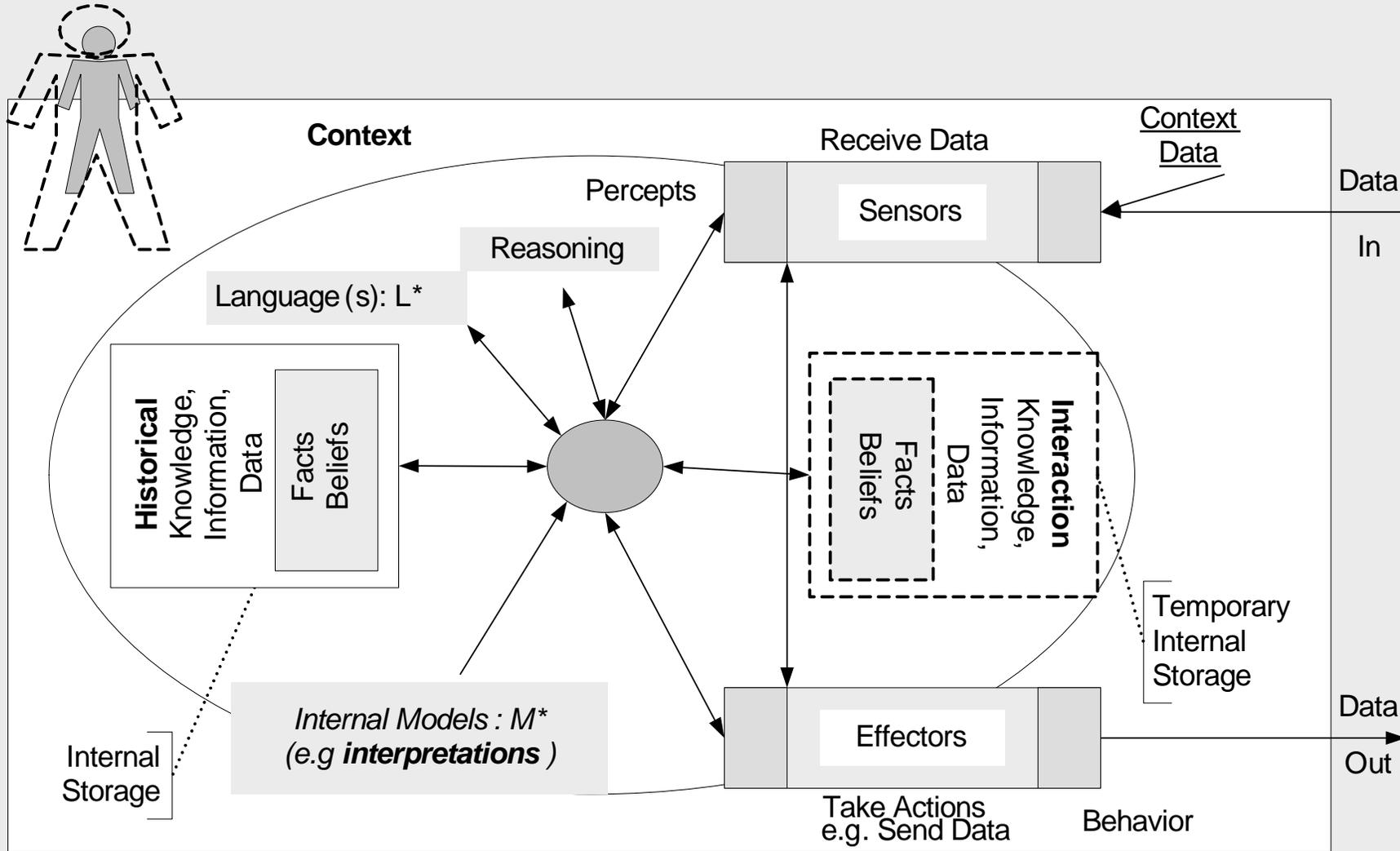
- this relationship is concerned with (inter-)actions with respect to some product / service
- relationship attributes include strength , flexibility , durability , etc.
- each party in the agreement **hypothesises** (at time T_0) that execution of the agreement will be of some **value** V_0 . The actual value may differ
- execution (fulfillment) has two parts : creation of product / service , delivery



A legal relationship (a *type of relationship*) **governed** by law as embodied by the contract (legal agreement)

- Rights, Duties, Powers, Obligations, Permissions, Violations, Legal Consequence
- this relationship constrains strategies , responses to changing environmental conditions

Negotiation



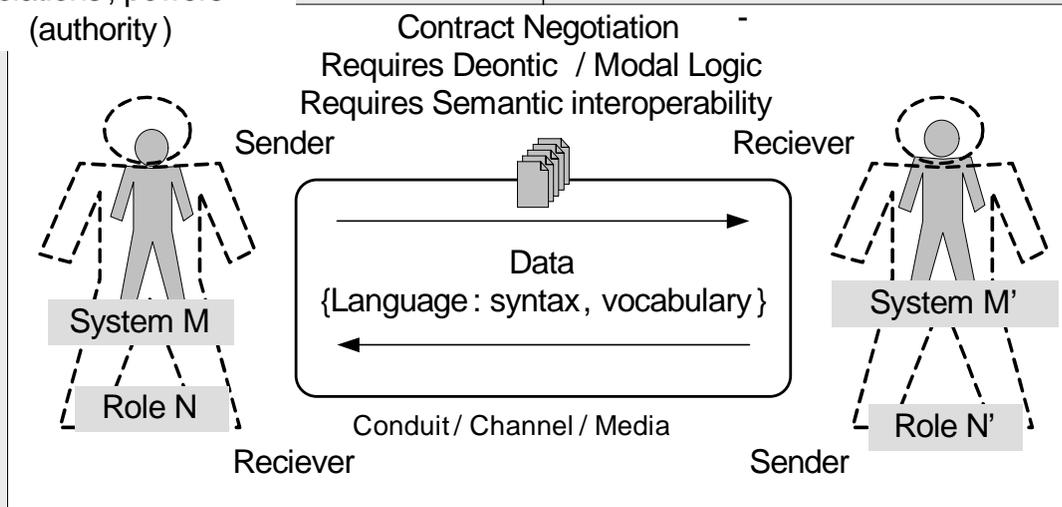
Negotiation

Rights, obligations, permissions, consequences, duties, violations, powers (authority)

Contract

Contract has a role
- contract is passive, role is assigned (role may be different among the parties)
The contract has **value**

Take Actions
↑
Make Decisions
↑
Process Data
↑
Receive Data



Receive Data
↓
Process Data
↓
Make Decisions
↓
Take Actions

“Instance” of an *emergent* Contract Negotiation System
Produces a service to all parties involved in negotiations
The parties are part of a group

There are 2..N members / parties in a negotiation group

Agents may be aware of enterprise history, goals, strategies, current state including existing contracts
→ contract negotiated must be consistent with all of above

Negotiation Styles

Competitive, Cooperation, Collaboration,
Compromising, Accommodating, Avoiding

Each negotiation style results in some level of utility on both the individual basis and at the systematic level (ecosystem levels)

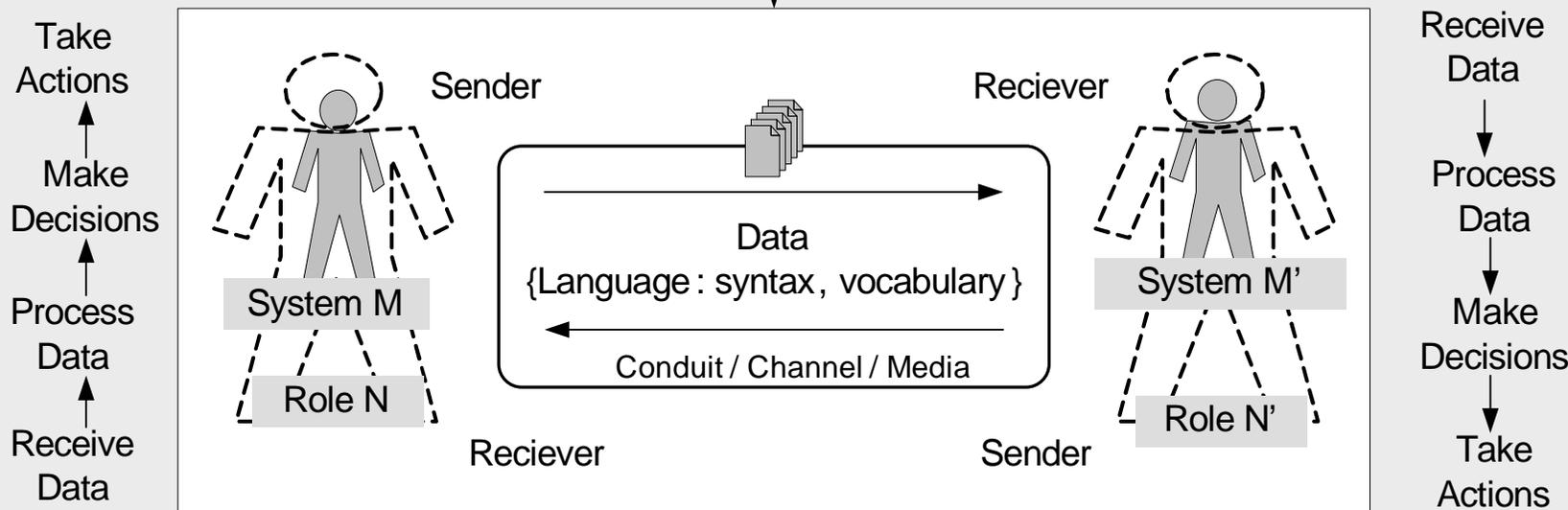
There is an efficiency associated with each style to reach a given level of utility

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Contract Fulfillment

Contract Fulfillment

The contract governs the interaction.
Especially true with legal contracts



“Instance” of an *emergent* / “programmed” Contract Fulfillment System
Produces a service to all parties involved in the interaction
The parties are part of a group

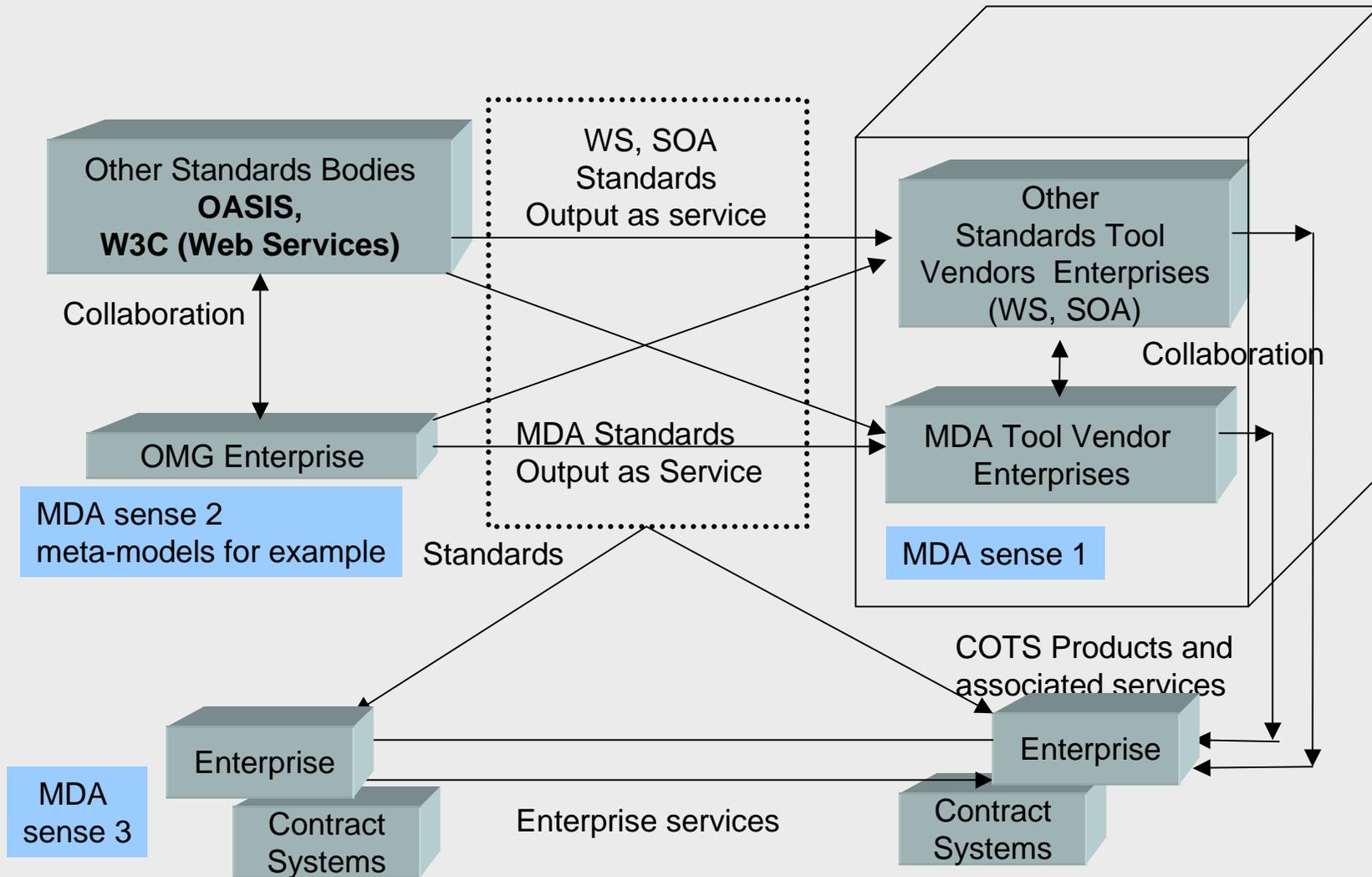
The (business) services have value

Services are managed
Services are governed . If a contract is in place , including rights , obligations , permissions , consequences , duties, violations , and powers (authority), then the **contract governs the interaction**

Model Driven, Service Oriented Contract Systems

Model Driven Service Oriented Vendor and Standards

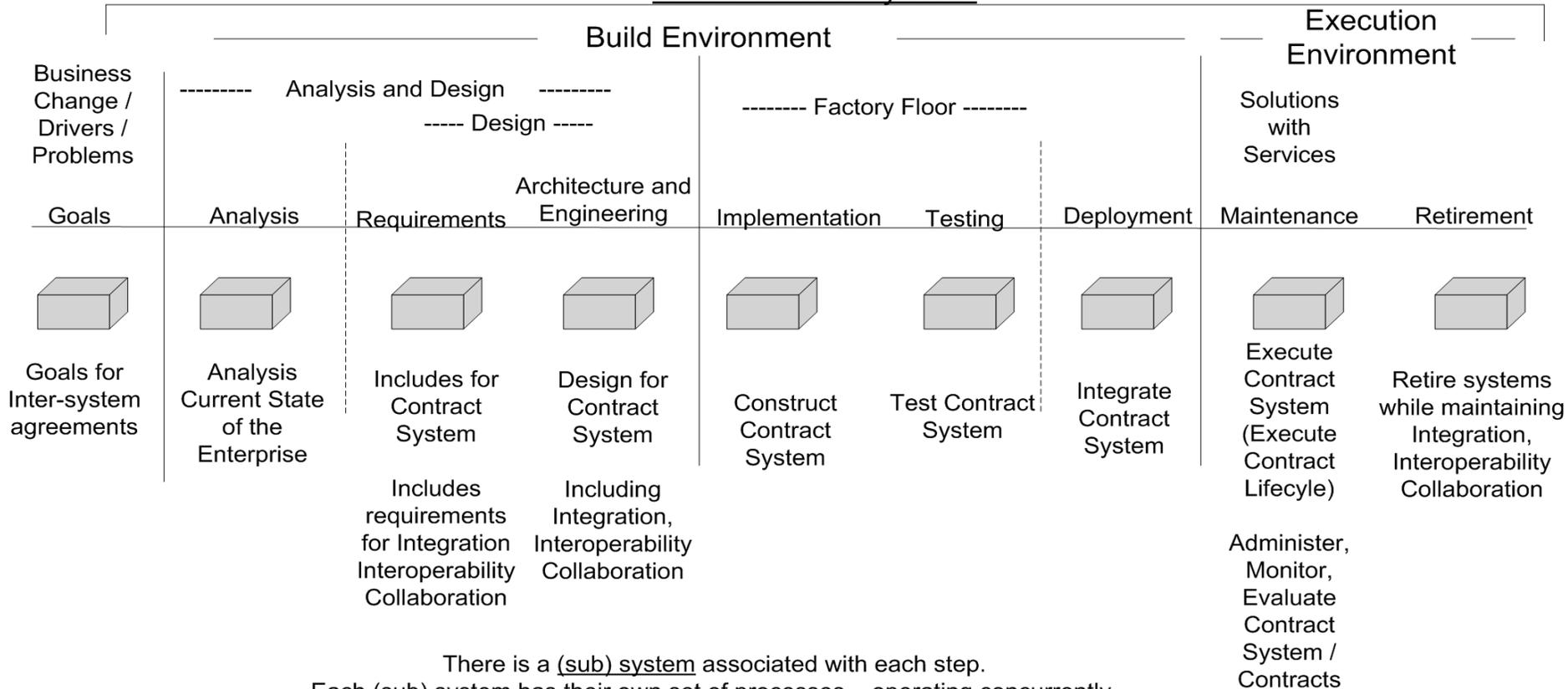
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Model Driven – SOA Enterprise Architecture and Engineering

System Lifecycle (e.g. Contract Systems)

A Process Instance
*A part of an Upper-Level
 Transformation System**



There is a (sub) system associated with each step.
 Each (sub) system has their own set of processes – operating concurrently.
 These systems are loosely coupled, highly coherent.

Each (sub) system has a role.

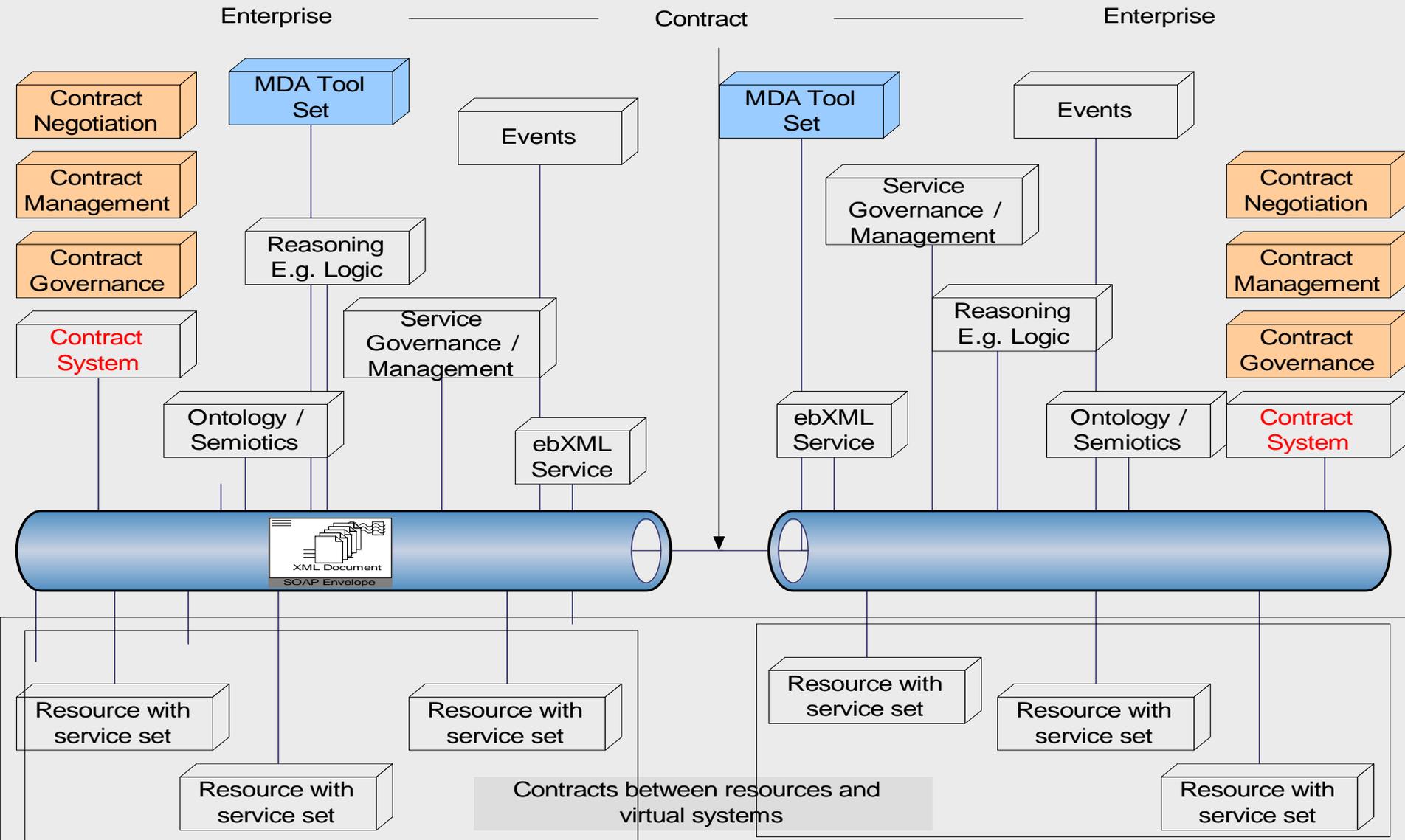
Each (sub) system provides services to other systems with multiple feed-forward and feedback loops and control points.

All (sub) systems are operational systems – including those in the Build Environment

All (sub) systems are model-driven, service-oriented

The Enterprise System is continuously evolving through, in part, continually evolving contract systems and contracts

Contracts Systems, MDA, Service Bus



MDA Standards

Business Process Modeling Notation
Business Process Definition Metamodel
Semantics Business Vocabulary and
Rules
Ontology Definition Metamodel
EDOC
MOF
UML Infrastructure
UML Superstructure
OCL
Query View Transformation
CWM
Business Motivation Model
Organizational Structure
SysML
- Basically all standards

WS Standards

BPEL4WS (Business Process Execution Language for Web Services) 1.1 [IBM, BEA, Microsoft: Specification] à
WSBPEL (Web Services Business Process Execution Language [OASIS: BEA, Hewlett-Packard, IBM, IONA,
Microsoft, NEC, Oracle, SAP, SeeBeyond, Sun, Tibco, webMethods]
Common Base Event [IBM: Specification]
DNS Endpoint Discovery (DNS-EPD) [IETF: Committee Draft]
JSR 172 – J2ME Web Services [JCP: Specification]
JSR109 – (Web Services for J2EE) 0.3 [JCP: Public Draft]
SOAP (Simple Object Access Protocol) 1.2 [W3C: Specification]
UDDI (Universal Description, Discovery and Integration) 3.0 [OASIS: Specification]
WS-Addressing [IBM, BEA, Microsoft: Specification]
WS-Atomic Transactions [IBM, BEA, Microsoft: Specification]
WS-Attachments [IETF, IBM and Microsoft: Specification]
WS-BaseNotification [IBM, Sonic Software, TIBCO Software, Akamai Technologies, SAP AG, Computer
Associates International, Fujitsu Laboratories of Europe, Globus, Hewlett-Packard: Specification]
WS-BrokerNotification [IBM, Sonic Software, TIBCO Software, Akamai Technologies, SAP AG, Computer
Associates International, Fujitsu Laboratories of Europe, Globus, Hewlett-Packard: Specification]
WS-BusinessActivity [IBM, BEA, Microsoft: Specification]
WS-Coordination [IBM, BEA, Microsoft: Specification]
WS-Eventing [IBM, BEA, Computer Associates, Sun Microsystems, TIBCO Software: Specification]
WS-Experience Language (WSXL) 2.0 [IBM: Specification]
WS-Federation Language [IBM, BEA, Microsoft, RSA, Verisign: Specification]
WS-Federation: Active Requestor Profile [IBM, BEA, Microsoft, RSA, Verisign: Specification]
WS-Federation: Passive Requestor Profile [IBM, BEA, Microsoft, RSA, Verisign: Specification]
WS-I Attachments Profile 1.0 [WS-I: Working Draft]
WS-I Basic Profile 1.0 [WS-I: Specification]
WS-I Basic Profile 1.1 [WS-I: Working Draft]
WS-I Simple SOAP Binding Profile 1.0 [WS-I: Working Draft]
WS-Inspection 1.0 [IBM, Microsoft: Specification]
WS-Manageability – Concepts [IBM, Talking Blocks, Computer Associates: Specification]
WS-Manageability – Representation [IBM, Talking Blocks, Computer Associates: Specification]
WS-Manageability 1.0 [IBM, Talking Blocks, Computer Associates: Specification]

Standards – cont.

WS-MetadataExchange [IBM, BEA, webMethods, Microsoft, Computer Associates, Sun Microsystems, SAP AG: Working Draft]
WS-Notification [IBM, Akamai Technologies Inc., Globus Alliance, Hewlett-Packard, SAP AG, Sonic Software Corporation, Tibco Software Inc.: Specification]
WS-PolicyAssertions [IBM, BEA, Microsoft, SAP AG: Specification]
WS-PolicyAttachments [IBM, BEA, Microsoft, SAP, Sonic Software, Verisign: Specification]
WS-PolicyFramework [IBM, BEA, Microsoft, SAP, Sonic Software, Verisign: Specification]
WS-Provisioning [IBM: Specification]
WS-ReliableMessaging [IBM, BEA, Microsoft, TIBCO: Specification]
WS-ResourceLifetime [IBM, Globus Alliance, Hewlett-Packard: Specification]
WS-ResourceProperties [IBM, Globus Alliance, Hewlett-Packard: Specification]
WS-SecureConversation [IBM, BEA, Computer Associates, Layer 7 Technologies, Microsoft, Netegrity, Oblix, OpenNetwork, Technologies, Ping Identity Corp, Reactivity, RSA Security, Verisign, Westbridge Technology: Specification]
WS-Security 1.0 [OASIS: Open Standard]
WS-Security Addendum [IBM, Microsoft, Verisign: Supplemental Information]
WS-Security Kerberos Binding [IBM, Microsoft: Specification]
WS-SecurityPolicy [IBM, Microsoft, RSA, Verisign: Specification]
WS-Topics [IBM, Sonic Software, TIBCO Software, Akamai Technologies, SAP AG, Computer Associates International, Fujitsu Laboratories of Europe, Globus, Hewlett-Packard: Specification]
WS-Transactions [IBM, BEA, Microsoft: Specification]
WS-Trust [IBM, BEA, Computer Associates, Layer 7 Technologies, Microsoft, Netegrity, Oblix, OpenNetwork Technologies, Ping Identity Corp., Reactivity, RSA Security, Verisign, Westbridge Technology: Specification]
WSDL (Web Services Description Language) 1.1 [W3C (IBM and Microsoft: note)]
WSDL (Web Services Description Language) 1.2 [W3C (IBM and Microsoft: working draft)]
WSRP (Web Services for Remote Portals) 1.0 [OASIS: Open Standard]

Vendors and Products (may be incomplete)

Web Services Suites

Actional Corporation (Actional SOA Command and Control)
Magic Software Enterprises (iBOLT Integration Suite)
Novell (Novell exteNd Enterprise / Professional Suite)
ReadiMinds Systems and Services Pte Ltd. (ReadiMinds WebServices Applications Suite – WSS)
Sonic Software Corporation (Sonic ESB)
Systinet Corporation (Systinet Product Suite)

Web Services Desktop Integration

NetEdge Software, Inc. (Web Services Enabler)
RatchetSoft, LLC (Ratcht – X)

Web Services Management

Actional Corporation (Actional SOAPstation)
AmberPoint, Inc. (AmberPoint Mangement Solutions)
Blue Titan Software, Inc. (Network Director and Data Director)
Computer Associates Internaltional, Inc. (Unicenter Web Services Distributed Management – WSDM)
Confluent Software, Inc. (Confluent Evolution Service Manager)
Digital Evolution, Inc. (Digital Evolution Service Manager)
Flamenco Networks (Web Services Management) – acquired by Digital Evolution, Inc.
IBM
Infravio, Inc. (Web Services Management System)
Itellix Software Solutions (Wisiba)
webMethods Inc. (webMethods Fabric)
WestGlobal (mScape)

Web Services Development Tools

Above All Software, Inc. (Above All Studio)
Altova GmbH (xmlspy)
Ascential Software Corporation (Enterprise Integration Suite)
Attachmate Corporation (myEXTRA! Smart Connectors)
BEA Systems, Inc. (BEA WebLogic Workshop)
ClientSoft, Inc. (ServiceBuilder)
Commerce One Operations, Inc. (Conductor Composite Manager)
Compuware Corporation (UNIFACE)
FusionWare Corporation (FusionWare Integration Server)
GT Software, Inc. (Ivory Web Services)
IBM (Eclipse, Websphere)
InterSystems Corporation (Ensemble)
IONA Technologies (Artix)
iWay Software (iWay Web Services)
Pantero Corporation (Shared Data Services Suite)
Rogue Wave Software, Inc. (Lightweight Enterprise Integration Framework – LEIF)
Seagull Software Systems, Inc. (Trnasidiom and LegaSuite)
SeeBeyond, Technology Corporation (The SeeBeyond Integrated Composite Application Network – ICAN – Suite)
Strikelron, Inc.
Swingtide, Inc.
TIBCO Software, Inc. (TIBCO Business Works)
Verity, Inc. (Ultraseek)
Vultus, Inc. (Webface Solution Suite)
WDI (Redbern)
WebCollage, Inc. (WebCollage Syndicator)
webMethods Inc. (webMethods Glue)

Vendors and Products (may be incomplete – cont.)

Web Services Orchestration

ActiveBPEL (ActiveBPEL)
Active Endpoints, Inc. (ActiveWebFlow)
Collaxa, Inc. (Collaxa BPEL Server – acquired by Oracle Corporation)
Commerce One Operations, Inc. (Conductor Composite Manager)
Corticon Technologies, Inc. (Corticon Decision Management Platform)
Dralasoft, Inc. (Dralasoft Workflow)
IBM Corporation (WebSphere Business Integration Modeler)
Metastorm, Inc. (e-Work)
Novell, Inc. (Novell exteNd Enterprise Suite)
OpenStorm Software, Inc. (Service Orchestrator)
Oracle Corporation (Oracle BPEL Process Manager – formally the Collaxa BPEL Server)
ReadiMinds Systems and Services Pte Ltd. (ReadiMinds WebServices Applications Suite – WSS)
SeeBeyond, Technology Corporation (eInsightBusiness Process Manager)
Sonic Software Corporation (Sonic orchestration Server)
WebV2, Inc. (WebV2 ProcessCoupler)

Web Services Security

BEA Systems, Inc. (BEA Weblogic Enterprise Security)
Commerce One Operations, Inc. (Conductor Composite Manager)
DataPower Technology, Inc. (XML Security Gateway)
Digital Evolution, Inc. (DE Management Server)
Forum Systems, Inc. (XML Sentient)
Layer 7 Technologies, Inc. (SecureSpan)
Netegrity, Inc. (TransactionMinder)
Reactivity (Reactivity XML Firewall)
RSA Security, Inc. (RSA BSAFE Secure – WS)
Sarvega, Inc. (XML Guardian Security Products)
Teros, Inc. (Teros Web Services Security Gateway)
Vordel Limited (VordelSecure and Vordel SOAPbox)
Actional Corporation (XML Message Server) – formerly Westbridge XML Message Server

Web Services Testing

iTKO Corporation (LISA)
Parasoft Corporation (SOAPtest)
Mindreef, Inc. (SOAPScope)
Segue Software, Inc. (SilkPerformer Component Test Edition)

XML Data Routers, Message Routers, and Adapters

Appligent, Inc. (APConductor)
BEA Systems, Inc. (BEA Weblogic Integration)
Commerce One Operations, Inc. (Conductor Composite Manager)
Kanemea, Inc. (Web Messaging Platform)
NEON Systems, Inc. (Shadow z/Services)
Novell, Inc. (Novell exteNd Enterprise Suite)
Sarvega, Inc. (XML Context Router)
SeeBeyond, Technology Corporation (eWay Intelligent Adaptors)
Actgional Corporation (XML Message Server) – formerly the Westbridge Message Server

XML Accelerators

DataPower Technology, inc. (XML Accelerator)
Sarvega, Inc. (XML Speedway Accelerator)
Tarari, Inc. (RAX Content Processor and XML Content Processor)

Contact Information

Mathét Consulting, Inc.

MC

Integrated,
Interoperable and
Collaborative Systems

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