SERES: Semantic days 2010

31.May; by Geir Jevne

Presentation schedule

Agenda 1: Background, ownership, short term goals and challenges

Agenda 2: Responses to presented challenges

Agenda 3: Presentation of SERES with demonstrations

Agenda 4: Publishing semantics from SERES

Agenda 1

Background, ownership, short term goals and challenges

Semantics: a building block of interoperability –

"ease the burden of collaboration"

Semantics play an important role at all levels in the framework model

1. For organizational Interoperability: semantic eases communication between people and the things they do (business, private, legal, cultural)

2. Data-about-data; terms and definition, understanding the use of data, ownership and behavior of data – described in a manner data support 1 and 3

3. Technical interoperability: semantic and syntactical definition of process and data supports implementation on technological frameworks and services.
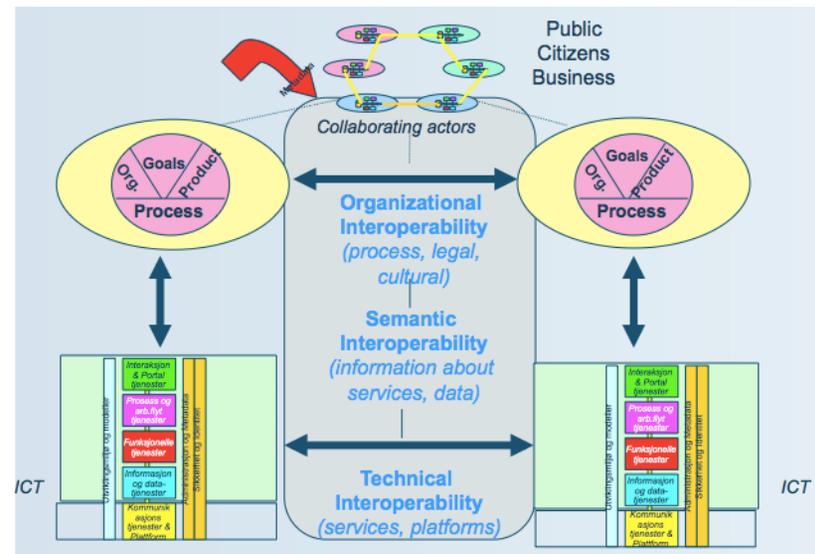
FAOS report: Interoperability framework model

SERES: Background and ownership

- The Brønnøysund Register Center (BR) is by the Norwegian Ministry of Trade and Industry (NHD) assigned the role as the coordinator of all reporting between industry and government and between sectors and service organizations.
    - BR is the owner of SERES
    - BR is the owner of Altinn (Alternative reporting)
- SERES: Semantic Register Electronic Services
- SERES is built to respond to the vision and strategies of the Brønnøysund Register Center, and provide mechanisms in support of simplification and improvements that ease the burden of reporting and collaboration and facilitate cost effectiveness and efficiency
- SERES is a metadata system for capturing, modeling, use, administration and control of metadata used to define and specify services that simplifies public sector

Brønnøysund Register Center (BR)

- The Register of Reporting Obligations of Enterprises (Oppgaveregisteret (OR)):
  - Support electronic reporting/exchange of data
    - Provide data definitions for electronic reporting and support production of XML form definitions (XSDs)
  - Give overview over reporting obligations to business and industry, for example
    - Coordinate and simplify reporting obligations
    - Advice to prevent unnecessary registration of information
    - Provide overview of the information the various registers and agencies require from business and industry
    - Avoid redundant reporting and encourage reuse of data
  - Provide various statistics on reporting
  - Link reports and its data to laws and regulations
  - Deliver tools that support the above

## Problem statement: OR and OR – legacy; SERES challenge

- OR: Tasks and tool support intended for paper reports
- OR: Tasks and tools extended to support electronic reporting in Altinn
  - Data definitions and organization
    - Flat file structure – data definitions implementation specific
      - **Explosion of instances – for example 450 different addresses!**
      - **Semantic meaning and value?**
      - **Reusability?**
    - Is the data search effective?
      - **identify identical data, overlapping data, and overlapping reports?**
      - **Is legal information linked or linkable to data definitions?**
- Production of data and XSDs for Altinn – ORdb, ORsys, ORetat & ORnet ; Excel spreadsheets
- SERES Challenge: new system need to guarantee seamless migration and clear semantics

SERES: short term goals

For Altinn (and OR):

1. Support electronic reporting/exchange of data
   - Model existing production data in Altinn I and migrate data for seamless use in Altinn II
     - Support definition of new electronic forms and/or services
     - Support change of existing electronic forms and/or services
   - Production of messages and message specification; e.g. XSDs
2. Support Oppgaveregisteret
   - Reporting obligations: coordination and simplification; advisory, reporting duties
   - Reporting statistics
   - Laws and regulations: linkage to schemas/ services and their data
3. Deliver tools for administration, control, presentation and production of solutions
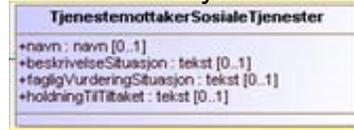
SERES: Challenge #1 – Metamodel
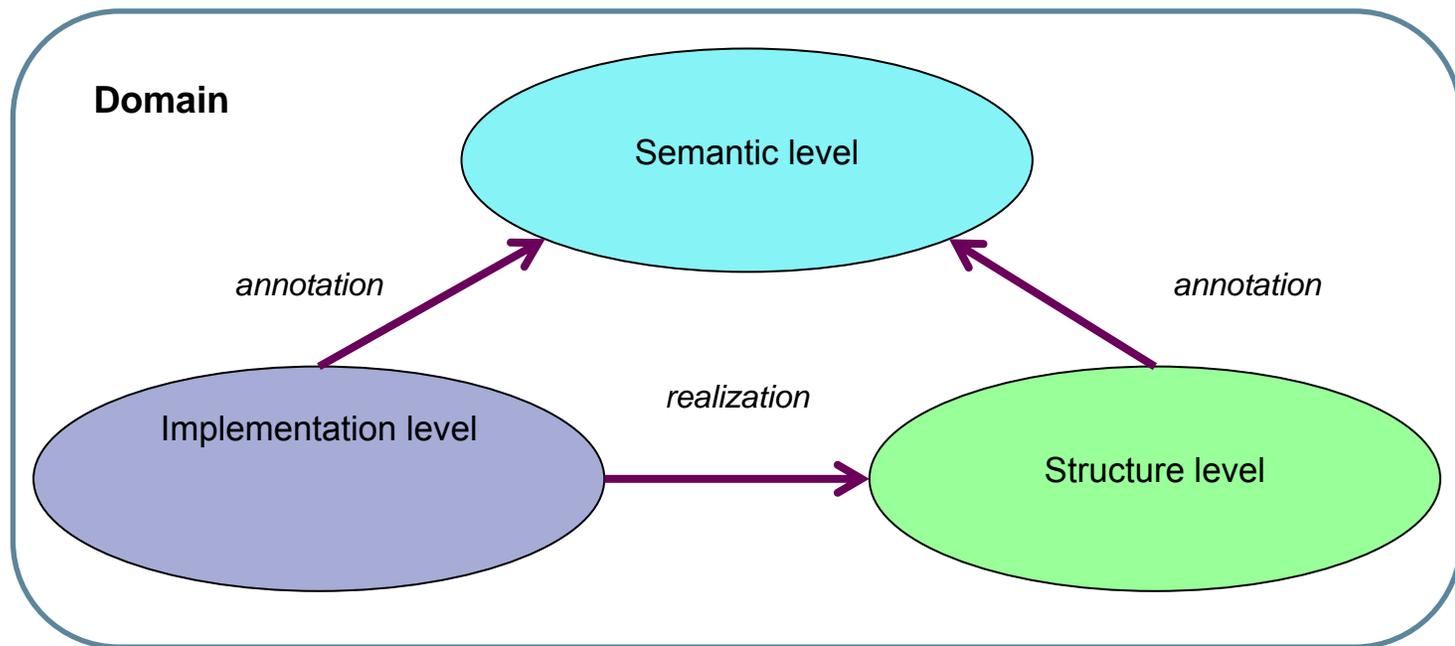
SERES: Semantic interoperability

- The <u>semantic level</u> describes terms and their definition used in services and/or in public reporting – for example Address Business, Person, Salary etc.
    - General terms are related to other use related terms and their definition - for example Address is related to Business address
    - Only terms used in data exchange, services and/or collaboration between business and the public, between citizens and the public and between public agencies are described
    - Terms and their definitions are independent of implementation issues, such as technology, number of characters, presentation, but terms are pointed to from the implementation level
- The <u>structure level</u> describes reusable structures with properties that proposes implementation content independent of implementation – for example Person has properties such as name, address, employer, date of birth, number of birth (social security number); properties may be selected for implementation
    - In SERES structures and properties are separated from terms and definition, but structures may <u>*point to terms*</u> and definition and <u>*realize implementation*</u>
- The <u>implementation level</u> describes data for implementation and messages to be implemented using these data
    - Implementation may point to and reuse terms and definitions and/or be realized by structures and properties that also are reusable

SERES: Challenge # 2 – Data different across organizations & systems

Different needs and areas of responsibility give raise for different data content and data structure, different data formats and different naming conventions on the semantic level (terms and term definition).
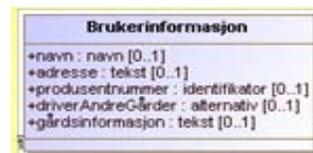
Helsetilsynet

TjenestemottakerSosialeTjenester

+navn : navn [0..1]
+beskrivelseSituasjon : tekst [0..1]
+fagligVurderingSituasjon : tekst [0..1]
+holdningTilTiltaket : tekst [0..1]

Folkeregisteret

Person

-id : identifikator
-fødselsdato : dato
-fornavn : navn
-mellomnavn : navn
-etternavn : navn
-kjønn : kode
-statuskode : kode
-reservasjon : kode
-sivilstand : kode
-språk : Språk
-statsborgerskap : Land
-umyndiggjort : kode

Sosial- og helsedirektoratet

Tjenestemottaker

+fornavn : navn [0..1]
+mellomnavn : navn [0..1]
+etternavn : navn [0..1]
+adresse : tekst [0..1]
+fødselsnummer : identifikator [0..1]
+død : tidspunkt [0..1]
+sivilstand : Sivilstand [1]
+husstand : Boforhold [0..1]
+privatUlønnetHjelp : PrivatUlønnetHjelp [1]
+tilrettelagtBolig : alternativ [0..1]
+boligtype : Boligtype [0..1]

Mattilsynet

Brukerinformasjon

+navn : navn [0..1]
+adresse : tekst [0..1]
+produsentnummer : identifikator [0..1]
+driverAndreGårder : alternativ [0..1]
+gårdsinformasjon : tekst [0..1]

Barne-, ungdoms-, familieetaten

Flyktning/Asylsøker

+navn : navn [0..1]
+nasjonalitet : Nasjonalitet [0..1]
+fødselsnummer : Fødselsnummer [0..1]
+kjønn : Kjønn [0..1]
+ankomstdatoNorge : tidspunkt [0..1]
+ankomstdatoKommune : tidspunkt [0..1]
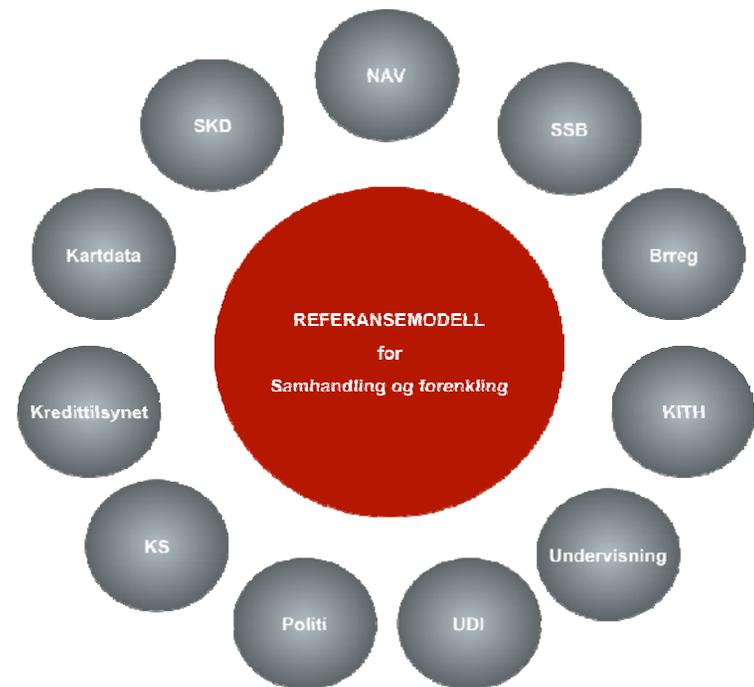
SERES: Challenge # 2: Transformation between nodes

- Problem illustration:
  - Service owner 1: Runs productions with own data
  - Service owner 2: Runs his productions the same way
  - Service owner 3: as above
- How can they work together?
  - Hardwire point-2-point transformations
  - Metamodel, reusable transformations; e.g. reference Object Management Group's (OMG's) Common Warehouse Metamodel (CWM)
    - Initially work on own data & transform data between grey nodes; complexity n*(n-1); n=number of nodes
    - Use metamodel knowledge and transform via "Referansemodell"; complexity 2*n; n=numbers of nodes

# SERES: Semantic interoperability – transformation between nodes

- Problem example:
  - System 1: you/me defined with: First, Middle and Last name
  - System 2: you/me defined with: Name
  - System 3: you/me defined with: Last, First name

- SERES may offer:
  - Transforming data between users and their business systems while maintaining the quality and exact content of the data
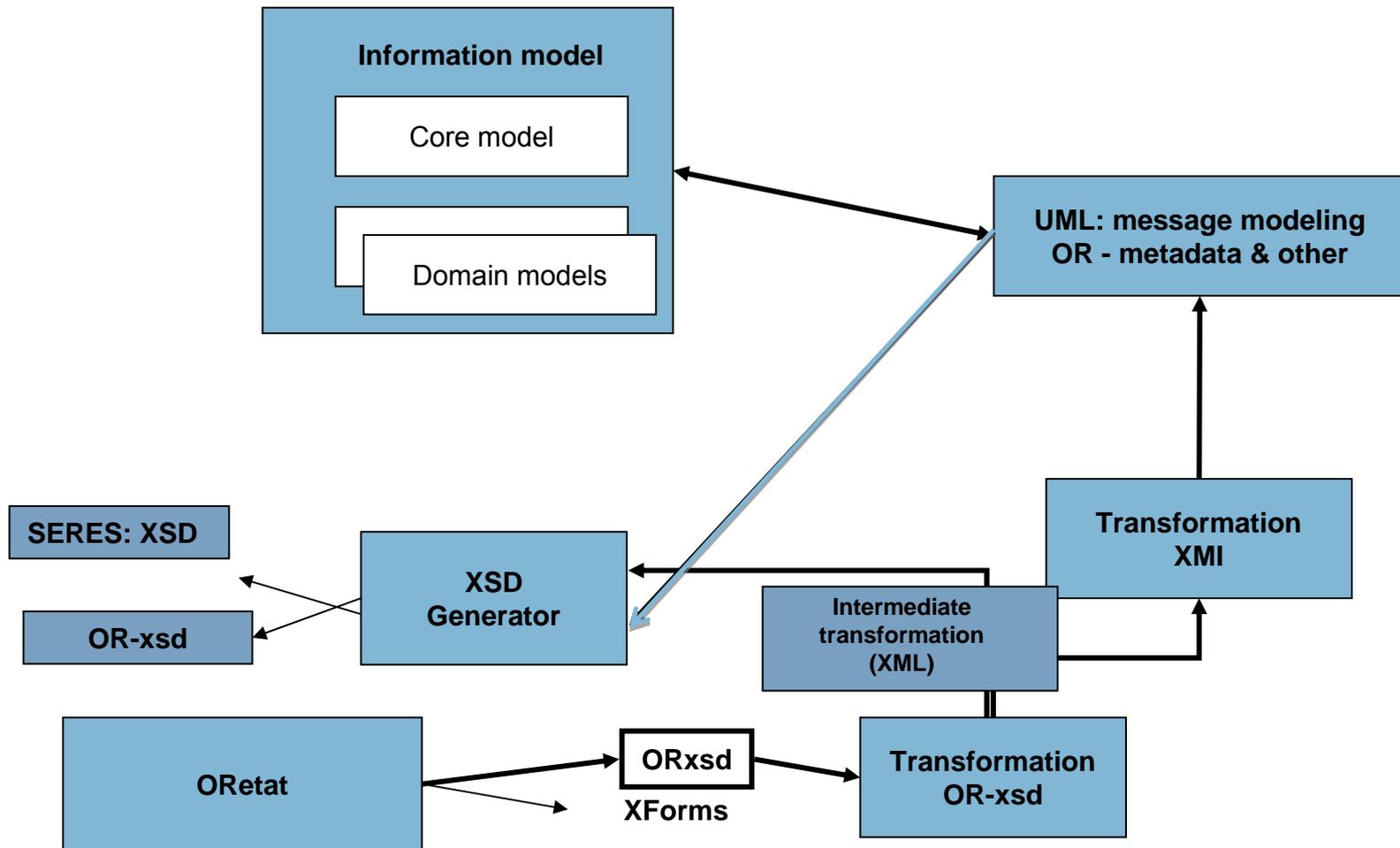 - Transformation rules are reusable metadata
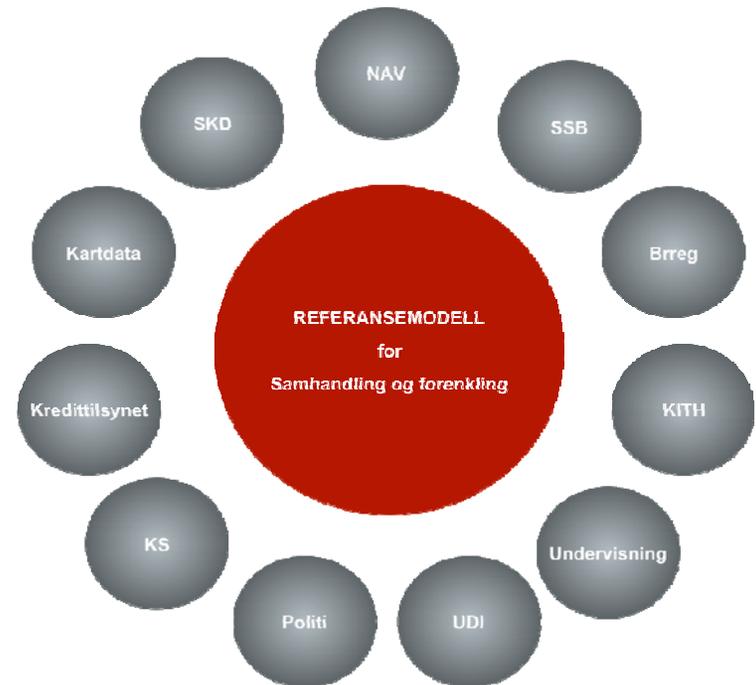
SERES: Challenge #3 – Avoiding "as-is" business interrupts

- SERES is an operational system maintaining existing authority and data and servicing existing solutions:
- Alternative metadata capture:
  - Top-down
    - **"Correct" semantic definition of a domain**
    - **Risk: Forget important definitions – domain competence**
    - **Constructed terms**
    - **Potentially «slow-to-market»**
  - Evolution
    - **Detect and unpack what is on the wire**
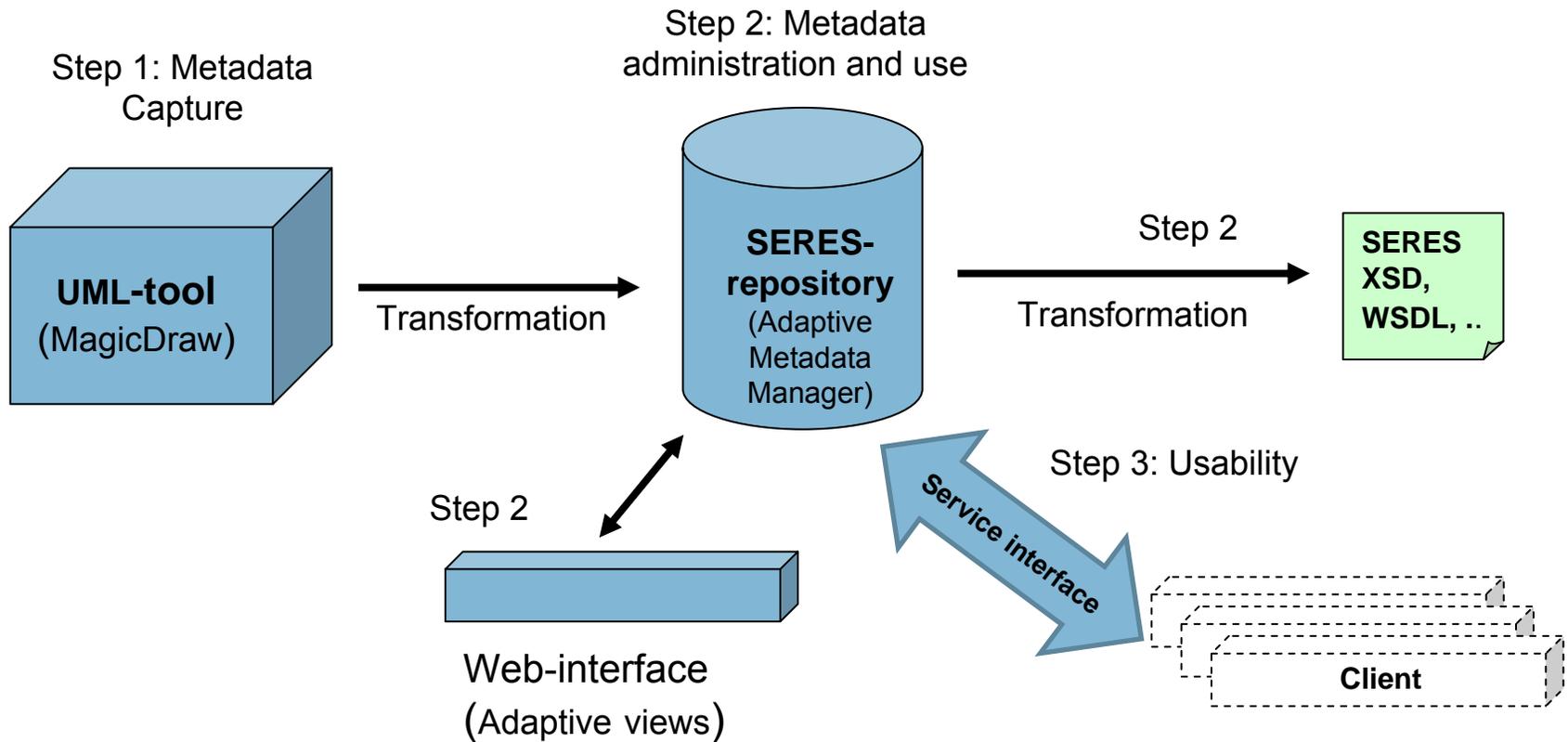   - **Risk: miss the big picture («draw the dots»)**

Recommended approach: Effective metadata are derived from the data source; i.e. The physical data!!!!
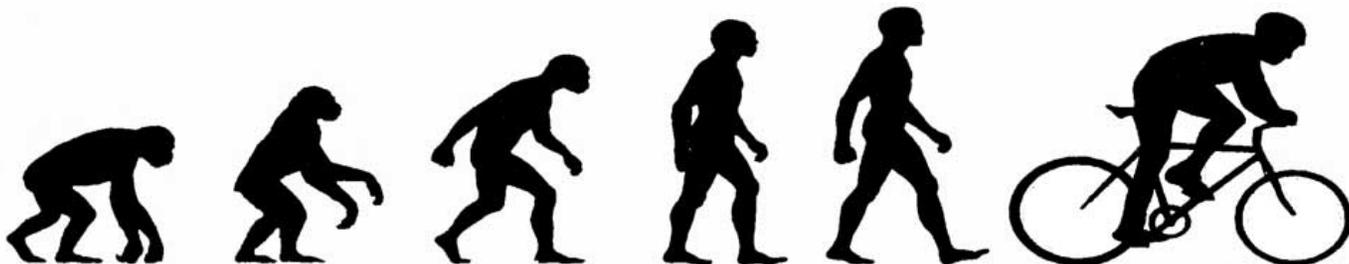
SERES: Challenge #3 – approach and solution

SERES: Top level architecture and incremental approach

Step 1: Metadata
Capture

Step 2: Metadata
administration and use

UML-tool
(MagicDraw)

Transformation

**SERES-
repository**
(Adaptive
Metadata
Manager)

Step 2

Transformation

**SERES
XSD,
WSDL, ..**

Step 2

Web-interface
(Adaptive views)

Step 3: Usability

Service interface

Client

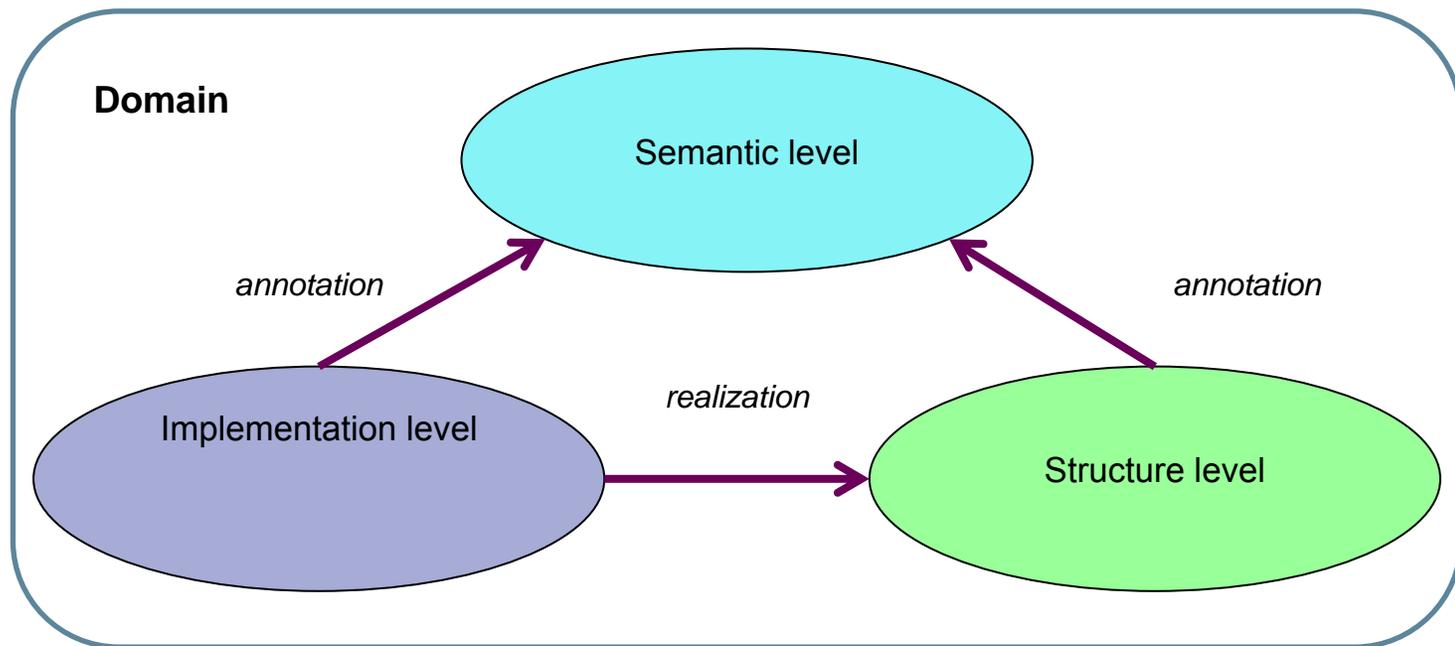# SERES: Respond to challenges and emerging trends

- ## Semicolon, presentation
  - The global world → **collaboration and interoperability**
  - Stove-piped organizations, databases and business systems → **collaboration and interoperability**
  - Data and information explosion **&** data and information quality → **governance crises**
  - ICT capacity challenges → **new paradigms and life cycle of systems**
    - Increasing complexity
    - Development and maintenance costs
    - Manpower and competence
  - New "solutions" → **"can we get away with legacy" or "yesterday"**?
    - Proactive use of already collected data for control – "business intelligence"?
    - Increased frequency of data collection – "business intelligence"?
    - Introduction of business "business process management" (BPM), "event driven architectures" (EDA) and "business activity monitoring" (BAM)?
    - Service oriented architectures (SOA)?
  - Do we understand what is going on in our business and in our legacy systems – keeping it tidy?
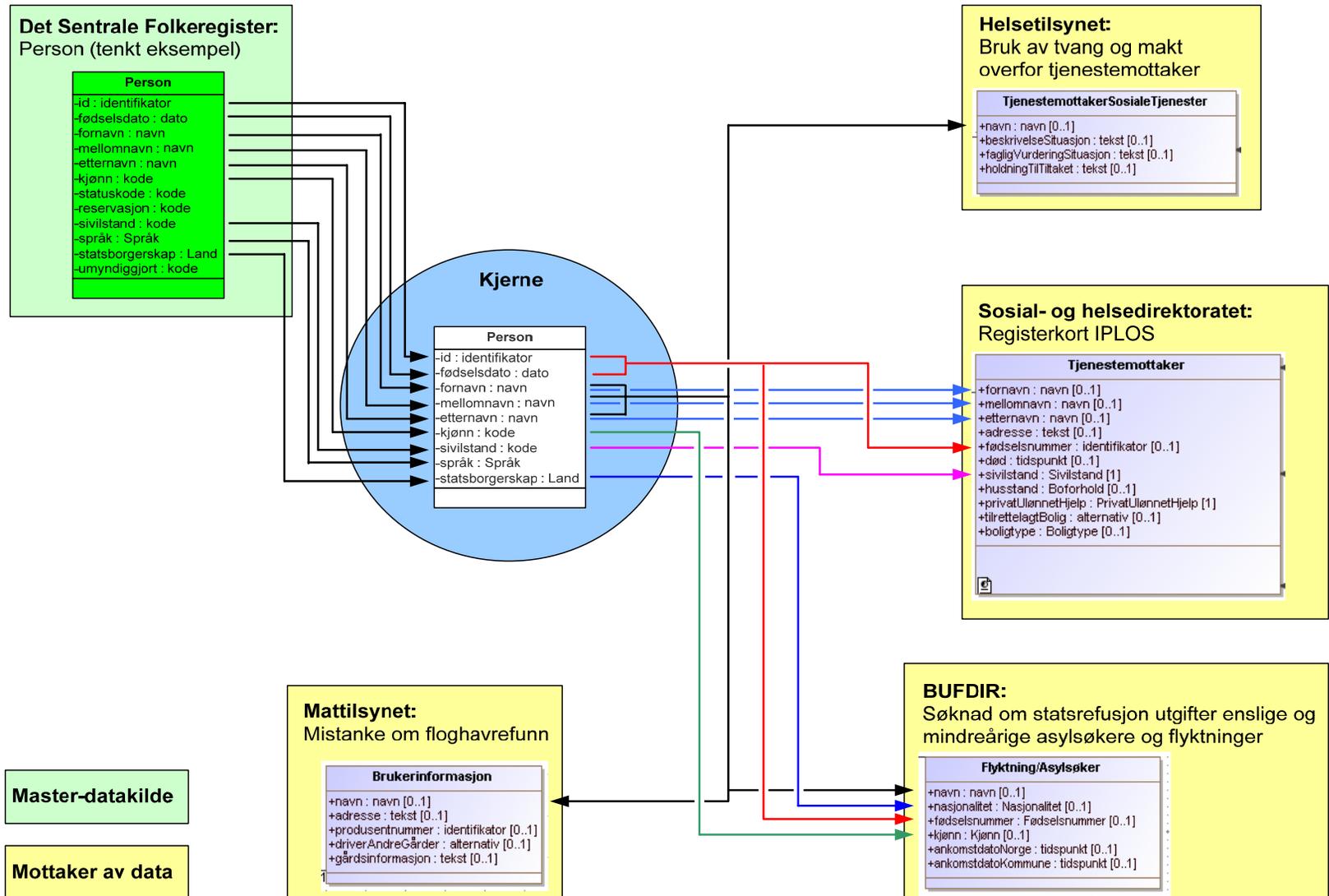
SERES: Trends and challenges

- **Challenge #4: Collaboration and interoperability**
  - **Metadata, semantic, transformation and transformation approach ("hub-spoke")**
- Challenge #5: Governance crises and orchestration
  - New approaches governance (data overflow and data quality)
  - Can we get away with legacy or more of yesterday?
- Challenge #6: New paradigms and life cycle of systems
  - They way we do things
  - Introduction of WS and/or SOA

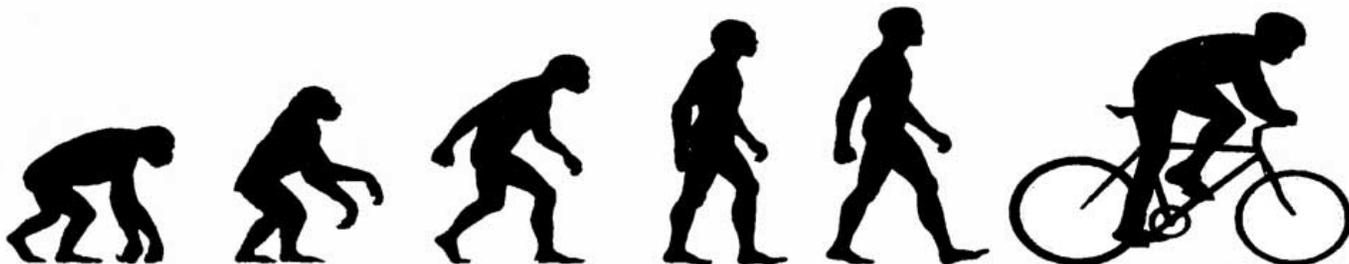# SERES: Challenge #4: Metadata and semantics

Refer to: Challenge #1

Domain

Semantic level

Implementation level

Structure level

annotation

annotation

realization

Brønnøysundregistrene

Det Sentrale Folkeregister:
Person (tenkt eksempel)

Person
- -id : identifikator
- -fødselsdato : dato
- -fornavn : navn
- -mellomnavn : navn
- -etternavn : navn
- -kjønn : kode
- -statuskode : kode
- -reservasjon : kode
- -sivilstand : kode
- -språk : Språk
- -statsborgerskap : Land
- -umyndiggjort : kode

Helsetilsynet:
Bruk av tvang og makt
overfor tjenestemottaker

TjenestemottakerSosialeTjenester
- +navn : navn [0..1]
- +beskrivelseSituasjon : tekst [0..1]
- +fagligVurderingSituasjon : tekst [0..1]
- +holdningTilTiltaket : tekst [0..1]

Kjerne

Person
- -id : identifikator
- -fødselsdato : dato
- -fornavn : navn
- -mellomnavn : navn
- -etternavn : navn
- -kjønn : kode
- -sivilstand : kode
- -språk : Språk
- -statsborgerskap : Land

Sosial- og helsedirektoratet:
Registerkort IPLOS

Tjenestemottaker
- +fornavn : navn [0..1]
- +mellomnavn : navn [0..1]
- +etternavn : navn [0..1]
- +adresse : tekst [0..1]
- +fødselsnummer : identifikator [0..1]
- +død : tidspunkt [0..1]
- +sivilstand : Sivilstand [1]
- +husstand : Boforhold [0..1]
- +privatUlønnetHjelp : PrivatUlønnetHjelp [1]
- +tilrettelagtBolig : alternativ [0..1]
- +boligtype : Boligtype [0..1]

Mattilsynet:
Mistanke om floghavrefunn

Brukerinformasjon
- +navn : navn [0..1]
- +adresse : tekst [0..1]
- +produsentnummer : identifikator [0..1]
- +driverAndreGårder : alternativ [0..1]
- +gårdsinformasjon : tekst [0..1]

BUFDIR:
Søknad om statsrefusjon utgifter enslige og
mindreårige asylsøkere og flyktninger

Flyktning/Asylsøker
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- +kjønn : Kjønn [0..1]
- +ankomstdatoNorge : tidspunkt [0..1]
- +ankomstdatoKommune : tidspunkt [0..1]

Master-datakilde

Mottaker av data

*Cost-efficient and effective collaboration require the right information, to the
right time and the right place, and with the right definition information*

SERES: Challenge #4 - business interrupts (ref. Challenge #3)

- SERES is an operational system maintaining existing authority and data and servicing existing solutions:
- Alternatives:
  - Top-down
    - **"Correct" semantic definition of a domain**
    - **Risk: Forget important definitions – domain competence**
    - **Constructed terms**
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  - Evolution
   - **Detect and unpack what is on the wire**
    - **Risk: miss the big picture («draw the dots»)**

Recommended approach: Effective metadata are derived from the data source; i.e. The physical data

SERES: Trends and challenges

- Challenge #4: Collaboration and interoperability
  - Metadata, semantic, transformation and transformation approach ("hub-spoke")
- **Challenge #5: Governance crises and orchestration**
  - **New approaches governance (data overflow and data quality)**
  - **Can we get away with legacy or more of yesterday?**
- Challenge #6: New paradigms and life cycle of systems
  - They way we do things
  - Introduction of WS and/or SOA

SERES: Challenge #5: Governance crises and orchestration

Quantity & Complexity of information

The governance crisis point

Human ability to deal with quantity & complexity of information

Solution: SOA?
ZAPTHINK: don't try: governance must be addressed at the same time; governance → metadata
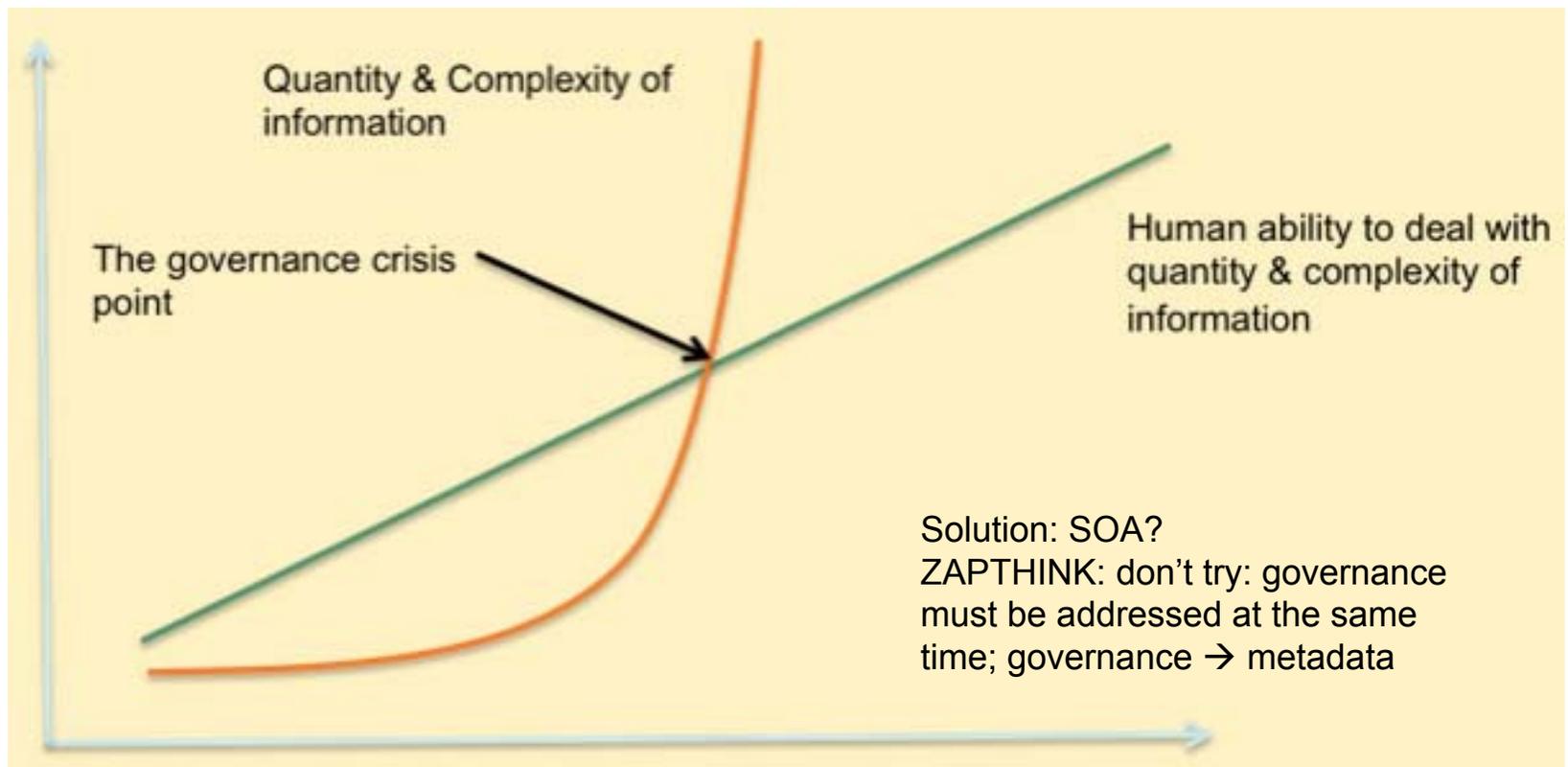
Advanced SOA: Strategic Return on Strategic Investment?

Brønnøysundregistrene

Power

- Business-IT Alignment
- BAM
- B2B
- Enterprise Re-Use
- Scalability
- IID
- Internet
- Client Server

Advanced Arch: SOA + EDA

Enterprise SOA

Basic WS

Domain of NOW

Investment

SOAP | Distributed Components | Business Services | Business Events | Integrated Svcs&Events
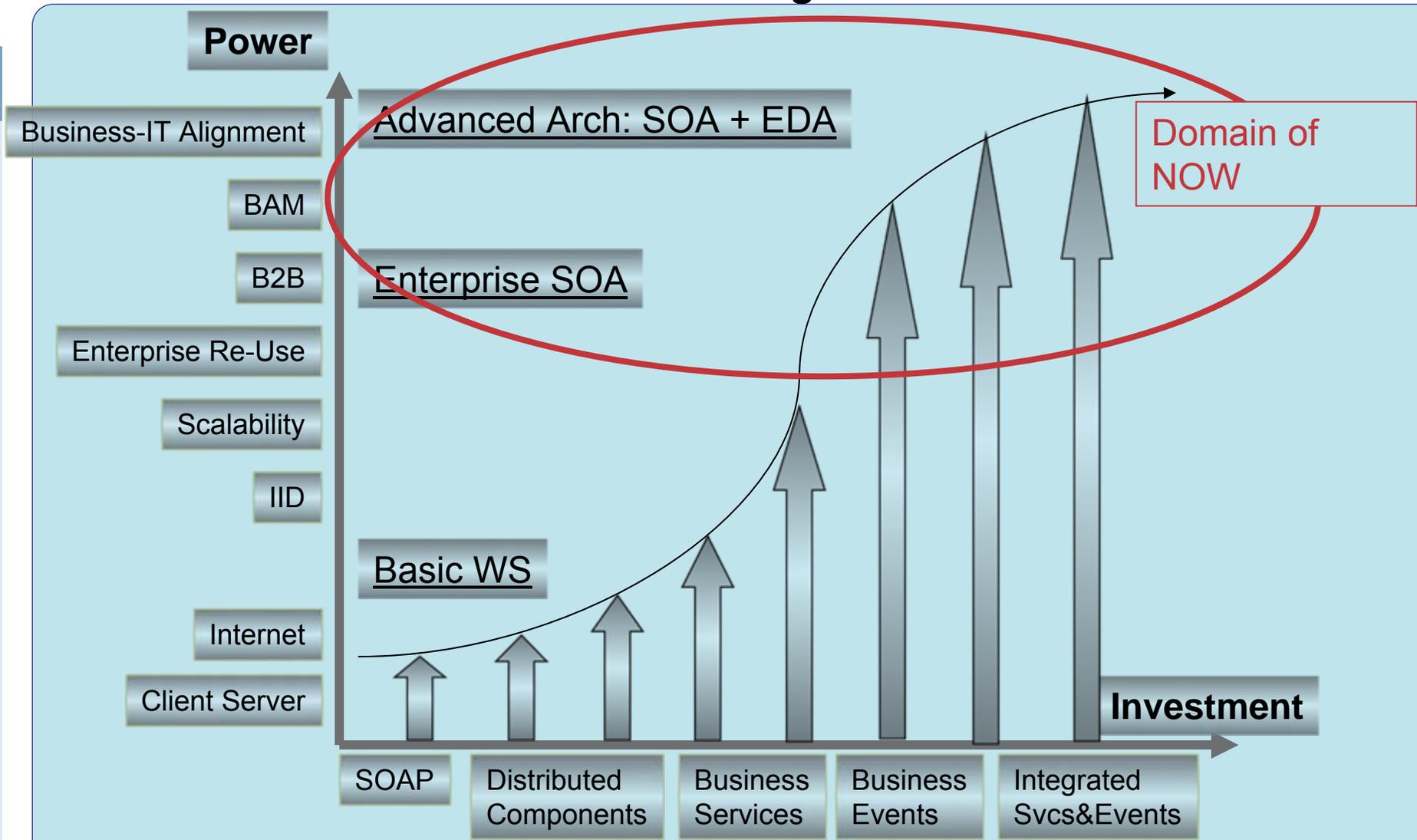
From: Yefim Natis, VP and Distinguished Gartner Analyst, Guest Speaker at TIBCO's SOA_SFO Seminar February, 2006

Brønnøysundregistrene
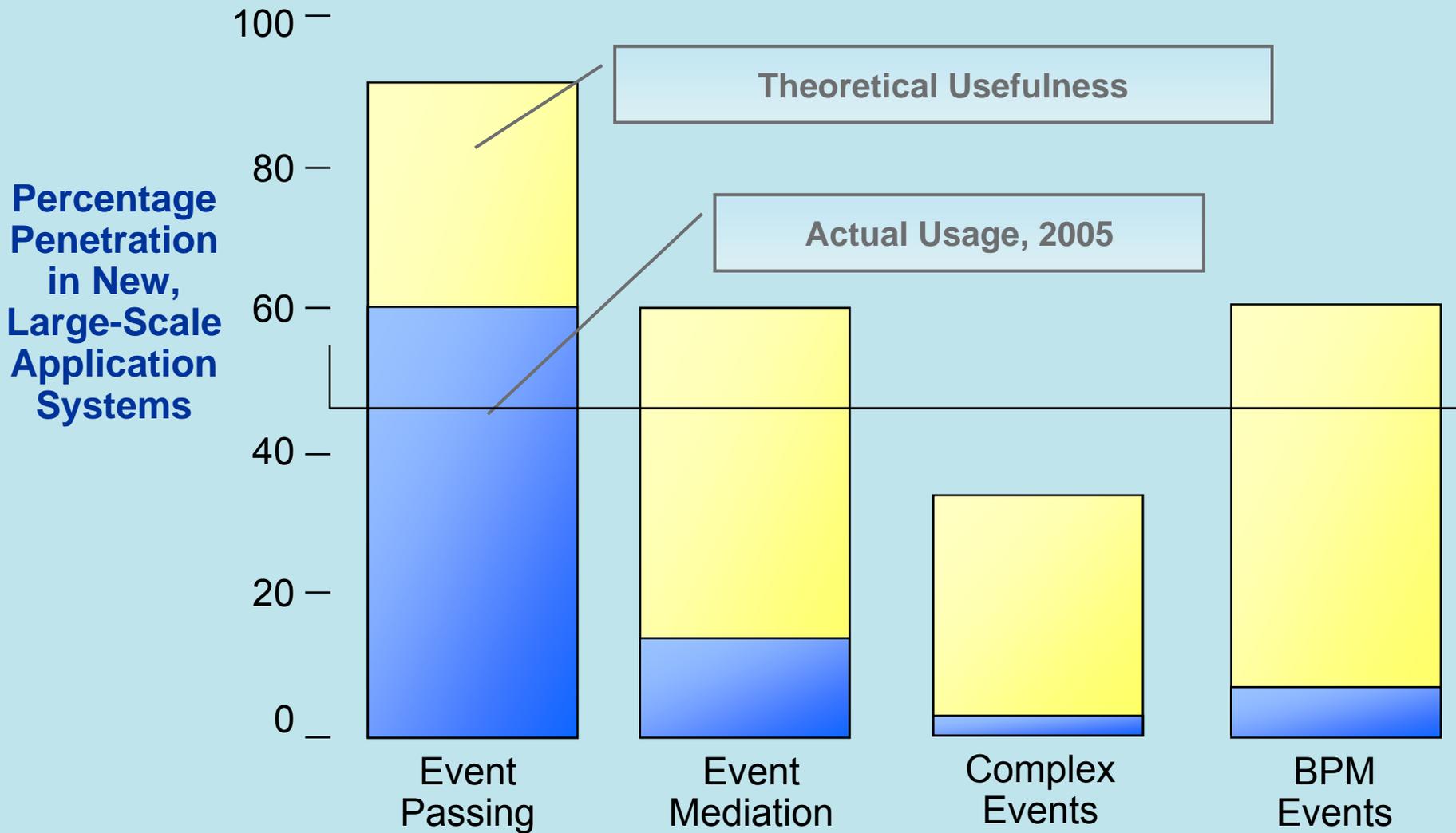
Gartner's R.Schulte on Complex Event Processing (CEP)

Millions of Dollars

Percent

Market Size ($M) — Market Growth (%)

Source: Gartner (August 2009)

Emerging need for metadata, including semantics
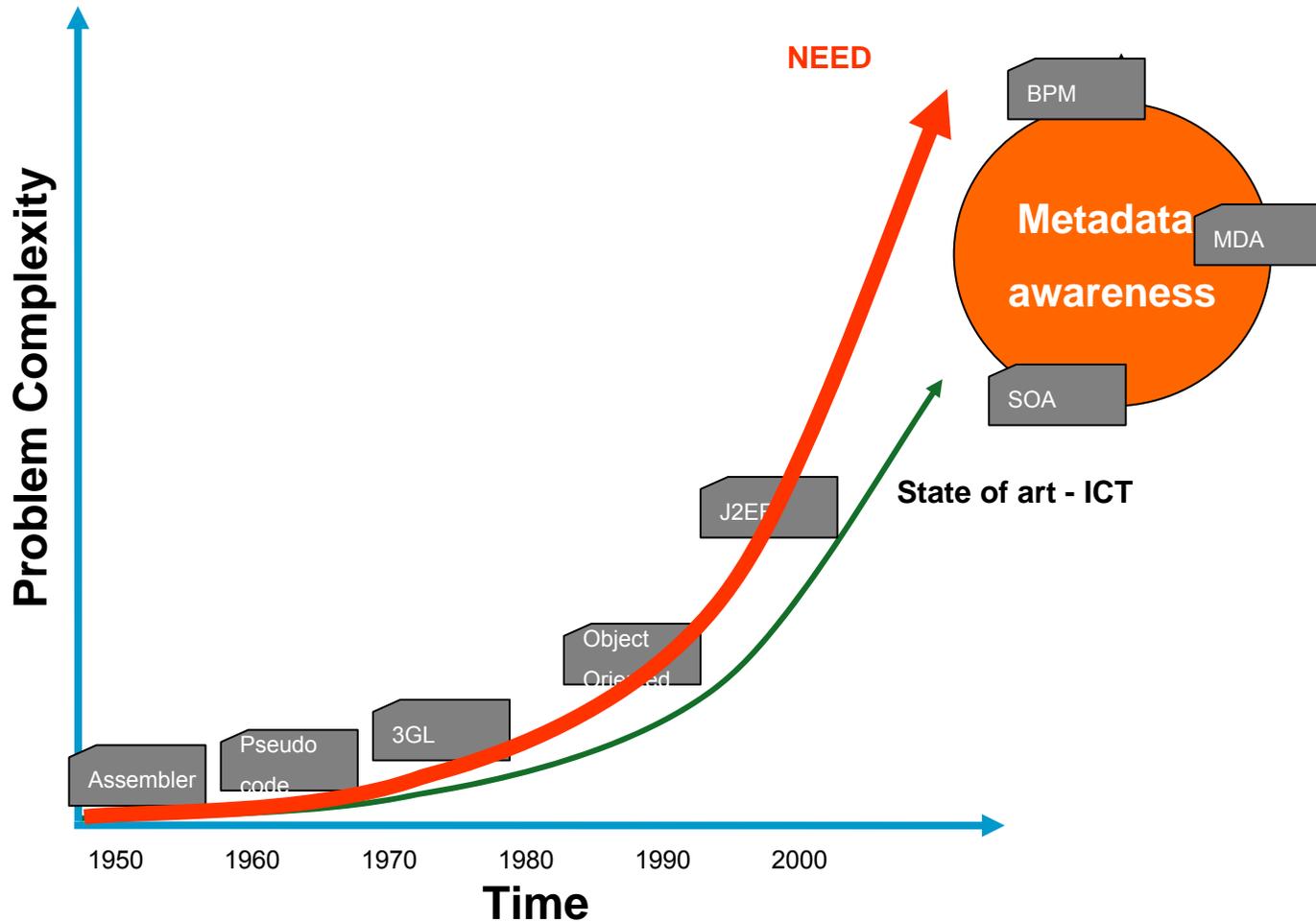
SERES: Trends and challenges

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- **Challenge #6: New paradigms and life cycle of systems**
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SERES: Challenge #6 – Model Driven Approach *(ref. challenge #5)*
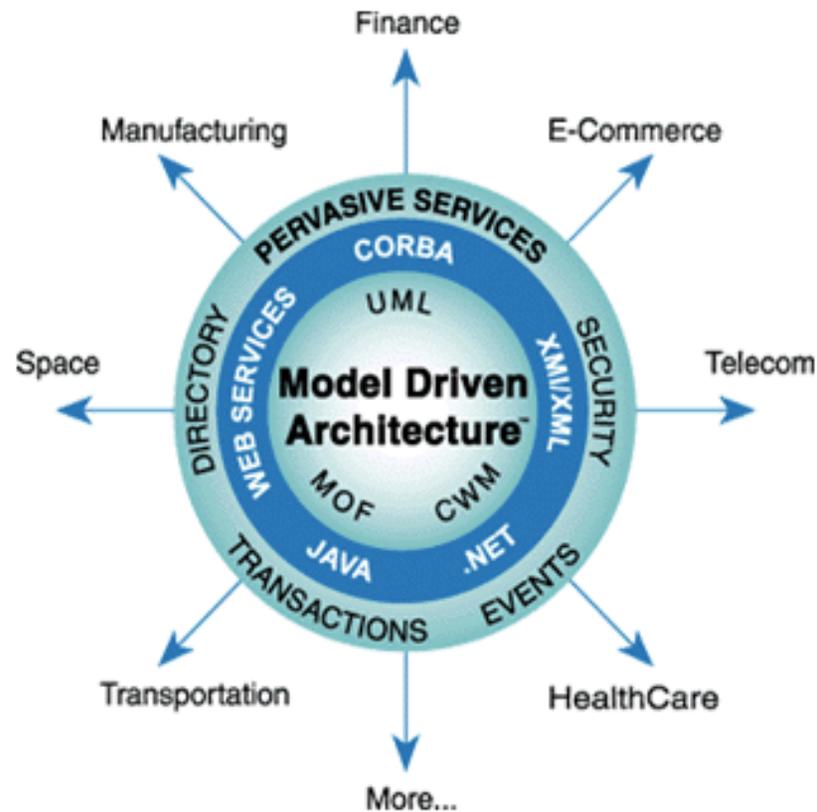
NB: the intent is present one approach - not to enforce this specific solution!

Forrester's definition:

► An iterative approach to software development where models are the source of program execution with or without code generation.

Execute

Program execution

Transform

MODELS

Code

Re-engineer
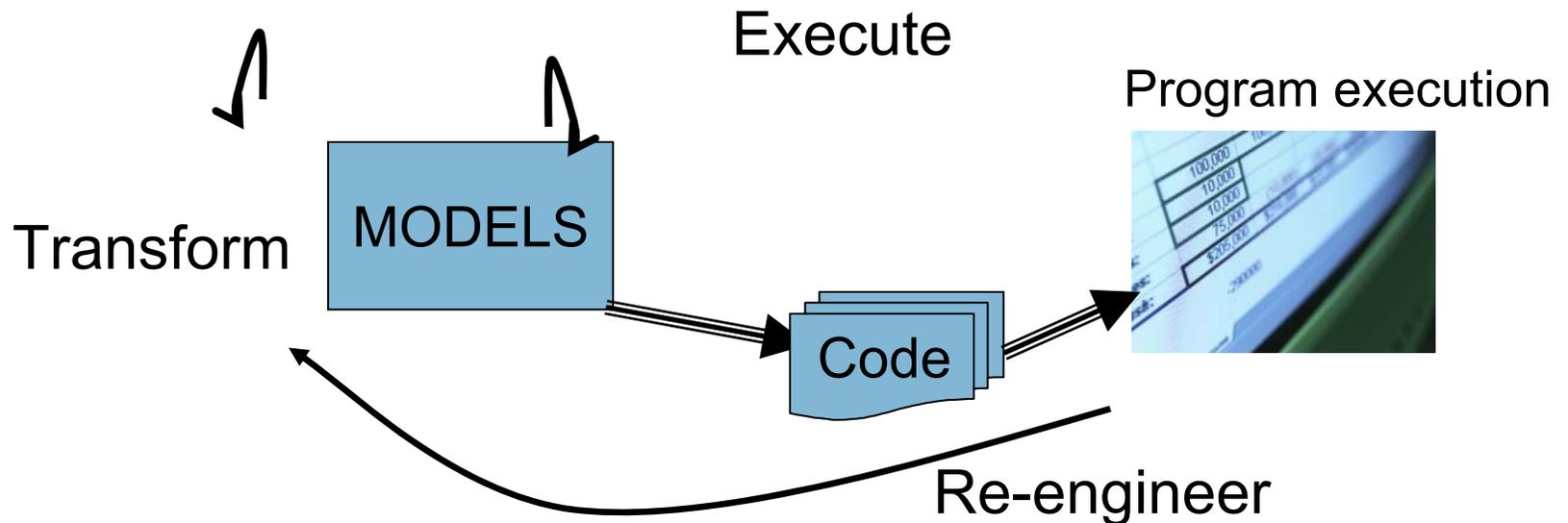
Source: April 17, 2007, "The State Of Model-Driven Development"

Software modeling is changing and so is MDD

We've seen this situation play out before:

Price + complexity

Object modeling tools

CASE tools

Ontology

Semantics

Model-driven development

BPMN/ DSLs/frameworks

Disruptive technology

Minis/Unix PCs	OO programming/ Web	SOA/open source	Business
80s	90s	00s	10s Time

Time
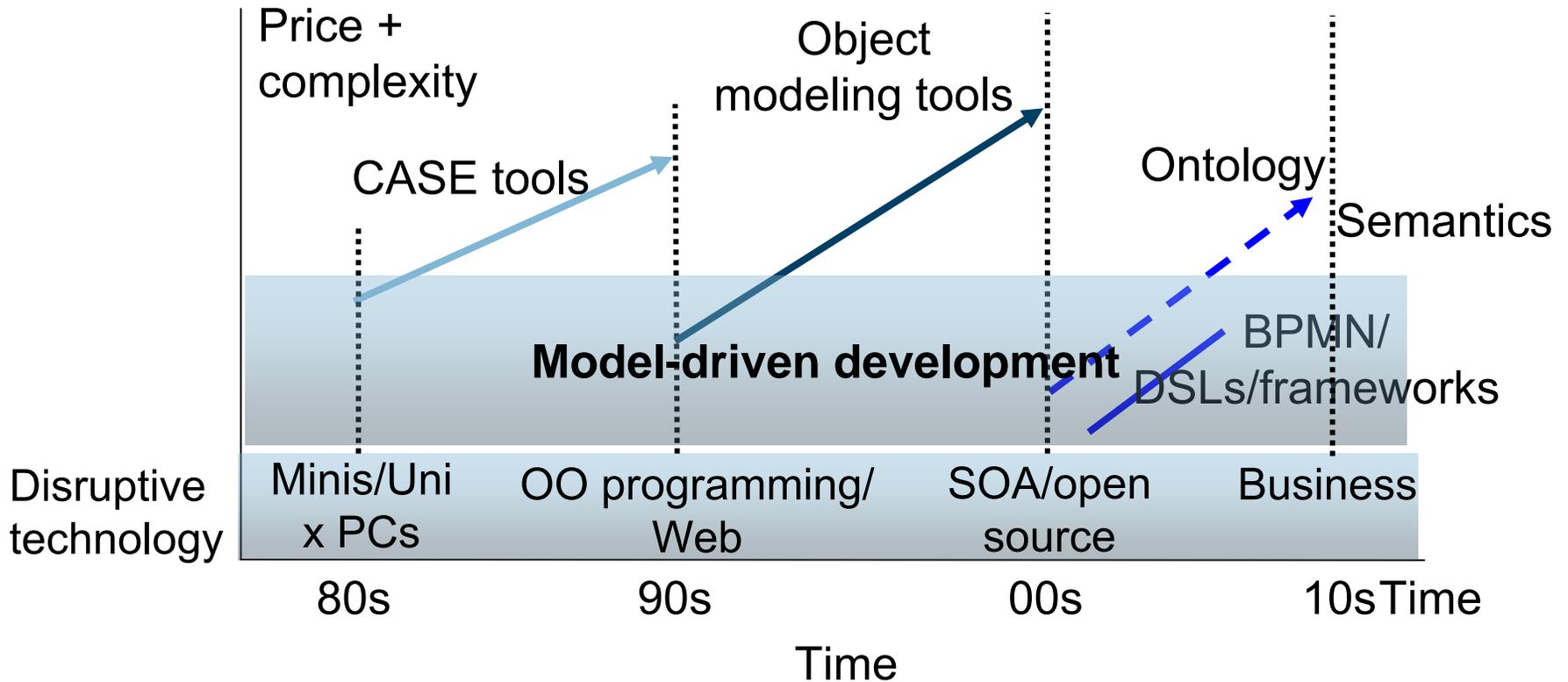
The big picture: automating the SW supply chain

Model-driven users

Dynamic Applications builders

Consumers
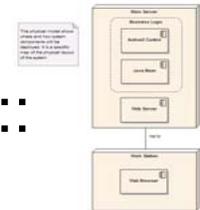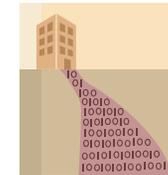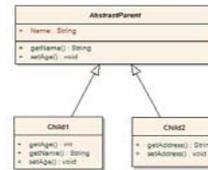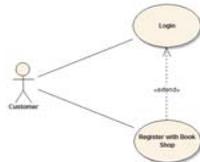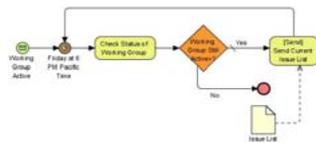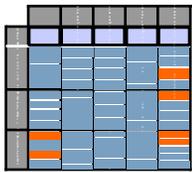
Various notations and tools

Standards

| Metadata | Transformation models | Mappings | Code gen. |
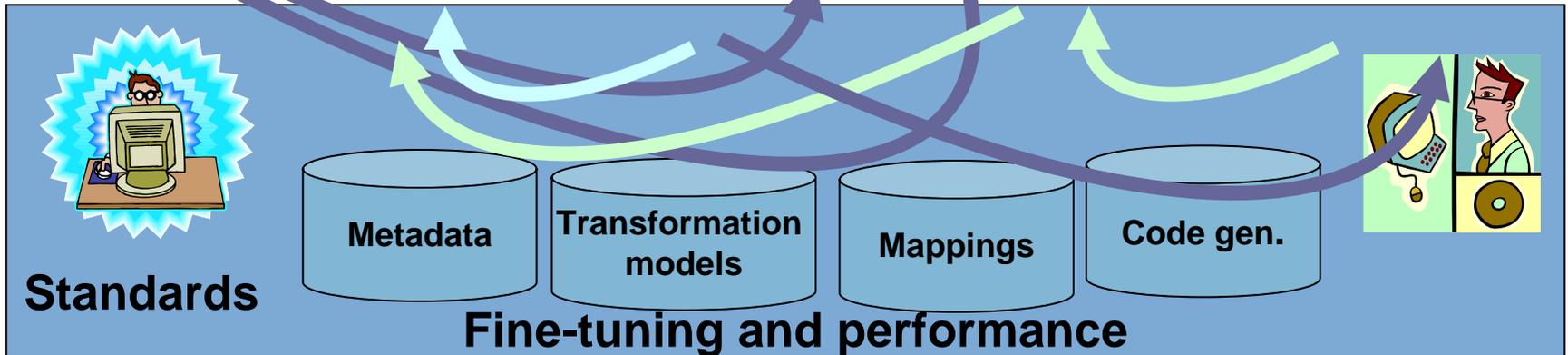
Fine-tuning and performance

Producers

SERES: Challenge #6 – Model driven approach – one example

- MDA based Model Driven Process Orchestration of WS was proven to be an *organizational principle* for generating agile and flexible mission capabilities.
- MDA solutions may be a *foundational technology* providing the infrastructure for building composite applications that orchestrate how the exposed web services can be combined in support of a particular business scenario
- A MDA solution proved to be a service solution in it self
- A MDA solution yields 70 % reductions in design, 20% reduction in development, 10% reductions in integration and conservative 10%+ reductions in operations compared to existing best practice solutions
- *Source: Use of a MDA solution in Federal Government case (Department of Defense Information Systems – Net Enabled Command Capability)*

- ZAPTHINK: Metadata is the life blood of SOA; www.zapthink.com

<u>S</u>uccess <u>I</u>mperatives for Application Development

- Select application development technologies and partners for current projects

- Modernize development and delivery practices to improve throughput – (promise of MDD and MDA)

- Maximize the business impact of projects and portfolios

- Adopt architectures that can evolve in lockstep with business needs – (promise of MDD and MDA)

- Design rich, dynamic applications that support the way people actually work
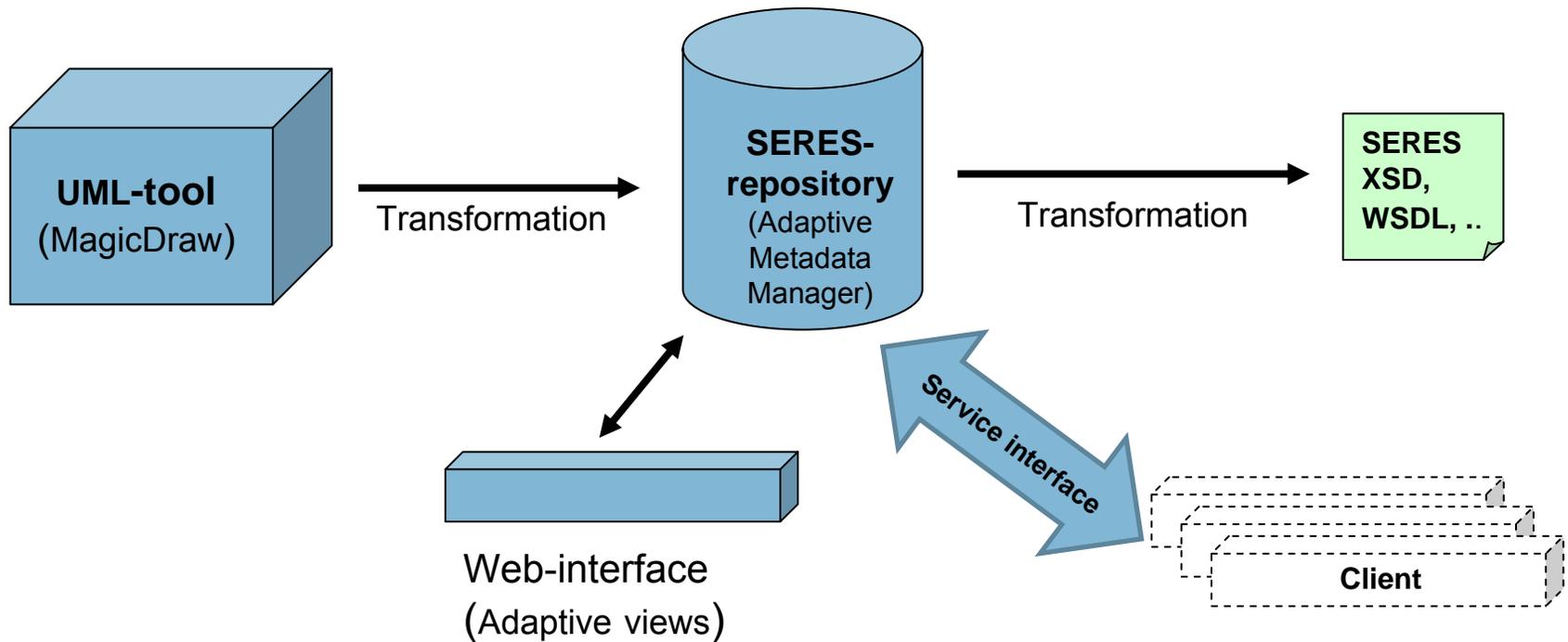
Aligning Business and IT Value

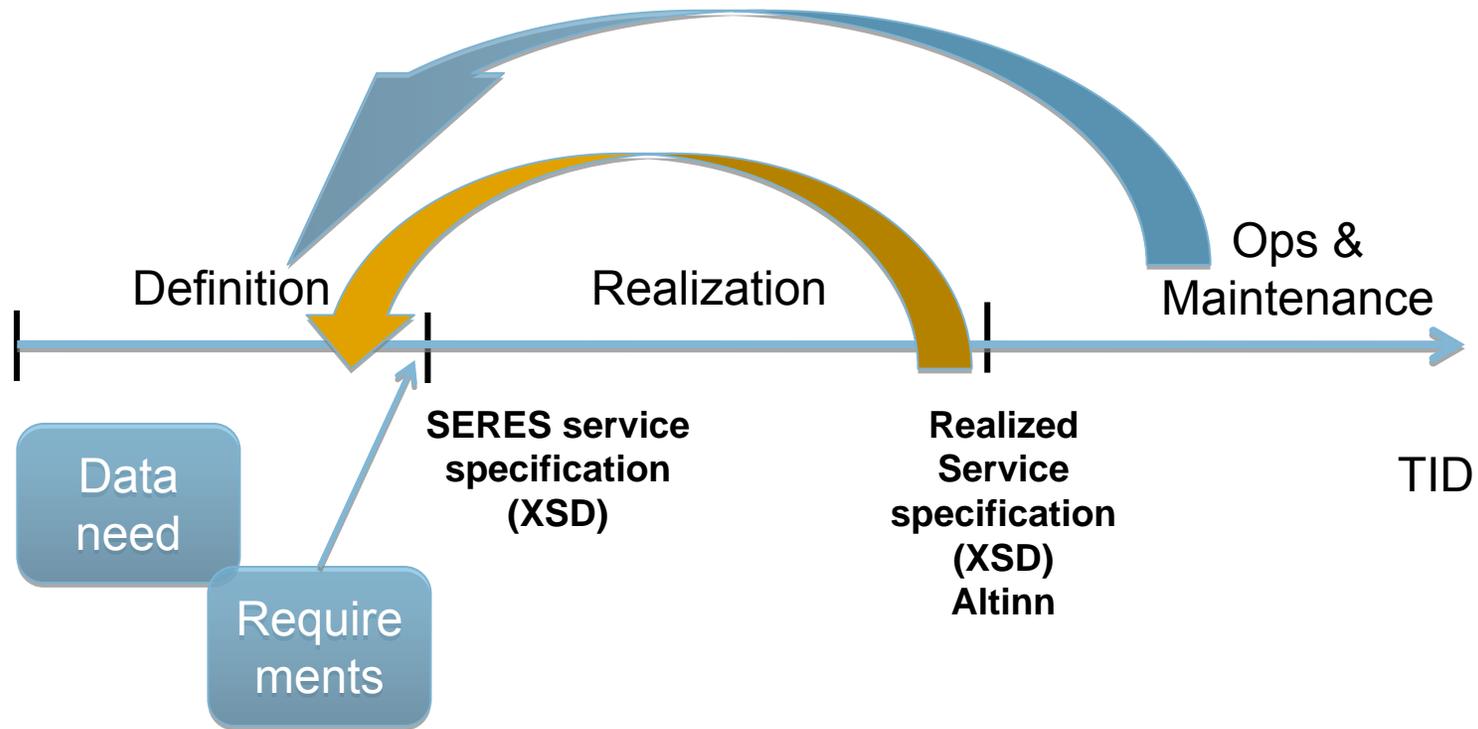| Aligned Business and IT Value		
Efficiency	**Effectiveness**	**Edge**
Cost Savings	_Return on Assets_	_Return on Investment_
▪ Doing the job faster, cheaper or with fewer resources	▪ Improved performance and productivity ▪ Increased return on assets and attainment of assets	▪ Flexibility and agility resulting in growth and new value capture ▪ Reducing complexity and mitigation of business risks
Impact of Model Driven Enterprise Integration Technology		
▪ 20-80% labor hours ▪ 20-90% less cycle time ▪ 20-75% less operating costs ▪ 25-80% less set-up and development time ▪ 20-85% less development cost	▪ 50-500% quality gain ▪ 2-50X productivity gain ▪ 2-10X greater number or complexity of concurrent projects, product releases & units of work handled ▪ 2-25X increased return on assets	▪ 2-30X revenue growth ▪ 20-80% reduction in total cost of ownership ▪ 3-12 months positive return on investment ▪ 3-300Xpositive ROI over 3 years

* Source TopQuadrant

Agenda 3

Presentation of SERES with demonstrations

SERES: Top level architecture and incremental approach

UML-tool (MagicDraw)

Transformation

SERES- repository (Adaptive Metadata Manager)

Transformation

SERES XSD, WSDL, ..

Web-interface (Adaptive views)

Service interface

Client

SERES – short term goals and functions

Definition

Realization

Ops &
Maintenance

Data need

Require ments

SERES service specification (XSD)

Realized Service specification (XSD) Altinn

TID

SERES:
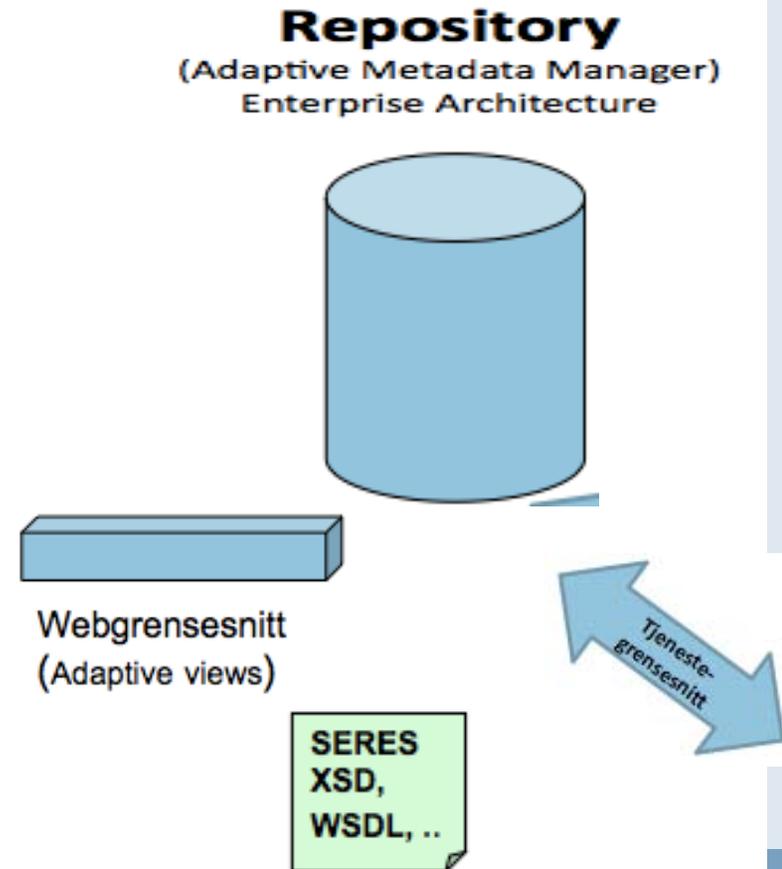 ✓**Data focus**
  ✓**Reuse focus**
   ✓**National focus on simplification**
   ✓**Focus on effectiveness and efficiency**

Functions- /areas of use
(main building block)

A. **Authentication and authorization**
B. **Search, analyses & reporting**
C. **Task control / multi user control**
D. **Configuration management, change control & version control**
E. **Model validation**
F. **Modeling all levels**
G. **Generation message specifications**
H. **Extending/ tailoring of basic functions**
I. **Model integration**
J. **Integration external users, e.g. Clients and Altinn**

Repository
(Adaptive Metadata Manager)
Enterprise Architecture

Webgrensesnitt
(Adaptive views)

Tjeneste-grensesnitt

SERES
XSD,
WSDL, ..

Functions / areas of use (integrated solution)

A. XSD to UML transformation

B. UML modeling profile for SERES (tailored to metamodel); bottom-up process

C. UML service modeling top down tailored to metamodel

D. Domain integration

E. Hub integration – integration of domains and/or "base data"

UML-verktøy
(MagicDraw)
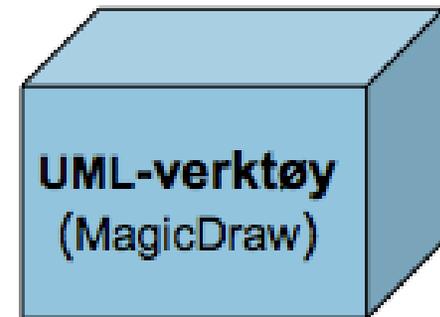
Functions /areas of use:

Standalone client
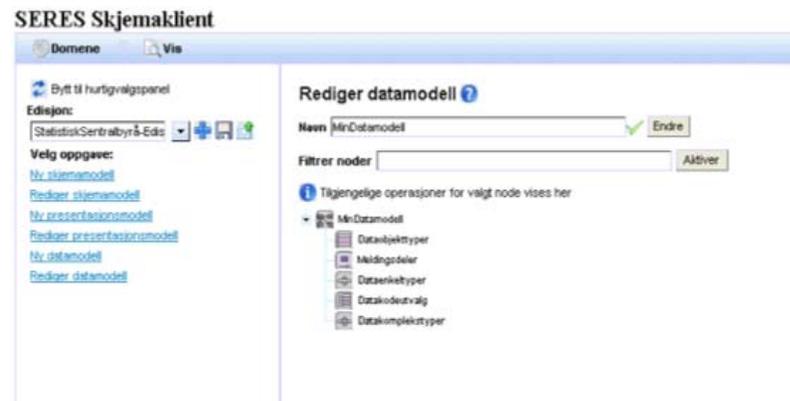
A. Metadata presentation "compact form" – domain model
B. Search and analyze metadata
C. Revision and quality control of metadata, mainly terms, term definition and related properties
D. Validation and consistency checks
E. Production of messages and message specifications (XSDs)
F. Capture of OR-metadata (Excel)
G. Pedagogical aid

"Tykk" Skjemaklient
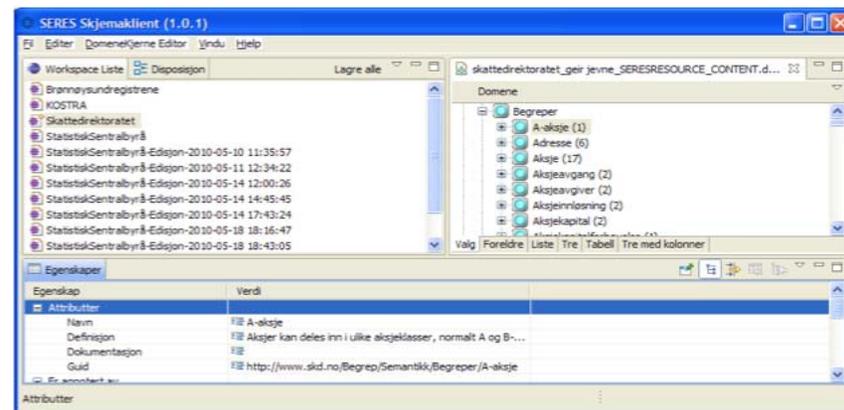
SERES XSD, WSDL, ..

Functions- /areas of use: Thin client (under test)

"Tynn" Skjemaklient

A. Highly automated production of of service-/form solutions

B. Service for service approach

C. New solutions / modification of existing

D. Reuse of metadata

E. Definition of new metadata