# Mision / Vision

## Objectives

Distributed systems / micro services access to shared data. Shared data consistency / inference. Ontology matching. Integration (EAI / ESB). Introduction of new features / products integrating over existing (linked) data with Semantic capabilities and enhancements.

ToDo.

## Description

Distributed Knowledge Base. Functional Syndicated Application Integration Framework. Plug existing backends (applications / datasources / services) via Connector(s) in an EAI / ESB fashion. Provide semantic augmentation of learned applications metadata (data / schema / behavior).

ToDo.

# Use Cases

Domains: Use cases domains abstractions (problem "spaces" / ontologies) enabling domain translation / exchanges / integration.

Semantic components:

BI / EAI smart dashboards / reports / workflows / process / activity / indicators inference / prediction / execution. Abstract upper ontology application models. QA, polls, learning, profiles, guided task wizards / editors. Goal. Purpose. Forms. Templates. Model context to fulfill (roles / rels).

ToDo.

## Problem

Hypermedia Use Cases (Ontology Levels). Integration / Augmentation / Alignment / Annotation of distributed resources. (Augmented) Content type driven. Encoding / Addressing (links / browse / parts / rels / roles). Microformats (embedding). Wiki like abstract representation (indexes).

ToDo.

## Solution

Integration by Augmentation.

Integration by Extension.

Declarative Application Design.

Domain Business Modelling. Integration. Syndication. General purpose business domains upper ontologies for ad-hoc application building overs existing domains.

ToDo.

# Approach

Develop Protocol (APIs) to facilitate Enterprise Application Integration (EAI) by means of Semantic technologies and Machine Learning. Ontology matching driven data, schema, behavior inference / aggregation / matching. Reasoning and learning over different consolidated backends alignments for applications interoperation.  
  
Distributed P2P (Blockchain DIDs) approach of data synchronization between peers for ease of deployment patterns election and datasources integration (client APIs, microservices, etc.).

Integration by Augmention: sources / back ends. Model I/O materialized in source (plugged) application / services backends. Framework inferences augment original (source) applications and services.

Integration by Extension: Extended functionalities data / schema / behavior exposed as services external to source (plugged) applications. Sync (Augment / link) sources. Declaratively stated via Model descriptions. Discoverable, browseable (HAL / REST).

Declarative Application Design.

Features / Approach:

Data / Schema / Behavior Abstraction:

Source inputs of Connector(s) (plugged backends, applications, datasources) and data comming from declaratively stated Model interactions (Message IO) is rendered in a layered Model of Statement(s), each one representing: Input, Data (instance: Statement, class: Entity), Schema (instance: Kind / Role, class: Class) and Behavior (instance: Flow, class: Behavior) layers.

Layers are implemented as an RDF Quads hierarchy aggregating each one on top of another. The idea is that aggreagating Data according some criteria one could enable us to infer the Schema that those Data belongs to and that aggregating Schema and Data one could enable us to infer the Behavior (operations) that correspond to the Data manipulation in that corresponding Behavior layer class / instance.

Several types of Model(s) exists: Facets, each one preserving this layered structure. Model Facets have corresponding Layers and those layers are populated by corresponding Data, Schema, Behavior conforming Ontology Levels for each Facet. Facets abstract Model(s) inputs regarding this aspects: Source (Functional) Data, Semiotic and Dimensional Model Facets.

Facets are also populated in what are called Ontology Levels, which are Facet data, schema, behavior statements aggregated from feedback from the data, schema and behavior corresponding instance layers of the Facet Models themselves again into the input layer thus allowing for further describe upper ontology abstractions. These upper abstraction may be grouped into: Backend / Source (Data : plain inputs), Grammar / Session / Context (Schema : schema layer feedback inputs) and Interaction (Behavior : behavior layer feedback inputs).

The idea is to infer Schema (classes and instance of classes / relations) operating over Data layer. Then, by aggregating Data and Schema, infer Behavior (classes and instances of operations / functions). This Aggregation, together with Alignment and type Activation mechanisms comprehend the Model core Augmentations.

Protocol (deployment):

Functional "Dialog" Augmentation.

Semantics Protocol (Dataflow Message).

Applications:

Hypermedia Dataflow Activation (reactive / event driven knowledge based contents). Dataflow layers.

Distributed: Consistency. Inference of distributed state. Event sourcing. Trust. Reconciliation.

Connected application sources (backends: EAI / ESB) and declaratively stated application models.

ToDo.

## Features

### Ontology matching

Determine whether two identifiers refer to the same entity, whether two relations are the same and which results corresponds to instances of the same actions.

ToDo.

### Augmentation Protocol

Functional declarative way of stating Augmentation Transforms over Messages / Resources matching / populated by input Templates performing output Mappings Augmentation reflecting input, model and behavior state.

ToDo.

### Reactive / Event Driven

Message based Augmentation Events Dataflow. Augmentation Mapping Dataflow allowing to embed dynamic state in Model entities (including Mappings Augmentations themselves).

ToDo.

# RDF Introduction: Graphs, Triples, Quads

ToDo.

# RDF Quads for Object Graph Representations

As RDF Quads encodes four URI values (CSPO Statement) an Object - RDF Quad elemental mapping could be implemented regarding an RDF Quad Statement CSPO as follows:

(C: Context, S: Occurrence, P: Attribute, O: Value);

where Context (C) is the URI of an Object Class identifier, Occurrence (S) is the URI of an Object Class Instance identifier and, aggregating same Class / Instance pairs, Attribute (P) and Value (O) are, respectively, Class Instance member (name, domain / range) and values for the aggregated (S) Object of Class (C).

Contexts. Occurrences, Attributes, Values: Roles of Meta Resource(s) in contexts.

Subject in Statement has Predicate and Object Attribute / Value (roles).

Predicate in Statement has Subject and Object Attribute / Value (roles).

Object in Statement has Subject and Predicate Attribute / Value (roles).

Value as Occurrence of Attribute in Attribute Occurrence Context.

Context Kind (signature): Subject Kind and Object Kind Attribute / Value (roles).

Subject / Occurrence / Context / Role : Attribute, Value. Concepts. Semiotic Metamodel. Dimensional Encoding: each type as each (pair) kind. Pairs (tags / facets).

Meta Model: Layers Resource relations:

Instance, class, metaclass, occurrence, role. DOM, Actor / Context / Role.

Layer Context: Statement class. Aggregates same Context Statement(s). Next layer metaclass (Occurrence)..

Layer Occurrence: Statement Context metaclass. Aggregates same Context / Occurrence Statement(s). Previous layer context.

Layer Attribute: Statement Context Ocurrence Attribute (occurrence). Previous layer Occurrence.

Layer Value: Statement Context Occurrence Attribute Value (role). Previous layer Attribute.

Layer Aggregation begins with Model initial Statement having a new Context (class) “pushing” previous CSPO right, being the new class the new layer Context and CSP becoming SPO:

(C, S, P, O) : (N, C, S, P).

Functional / Object Oriented Resource API (Model, Statement, Semiotic, Dimensional layers, Meta Resources).

ToDo.

# Models

Models aggregates Message input IO / Connectors data into corresponding knowledge Facets (Functional, Semiotic, Dimensional). Model is a layered structure of RDF Quads which follow the base (Functional) Model structure:

OntResource is the class responsible for aggregating different URIs referring the same entities (Ontology Matching).

Resource : Functional (Monad) OntResource wrapper.

(Context : Resource, Occurrence : Resource, Attribute : Resource, Value : Resource);

(Statement, Occurrence, Attribute, Value);

(Entity, Statement, Occurrence, Attribute);  
(Role, Entity, Statement, Occurrence);  
(Class, Role, Entity, Statement);  
(Flow, Class, Role, Entity);  
(Behavior, Flow, Class, Role);

Models have layer statements in which statement context (Facet Roles) classes are a hierarchy from Resource to Behavior and where context role instances follow a hierarchy of a dynamic type system (Kinds).

Input Layer (Resource).

Data Layer (Statement instance, Entity class).

Schema Layer (Kind / Role instance, Class class).

Behavior Layer (Flow instance, Behavior class).

The idea is to infer Schema (classes and instance of classes / relations) operating over Data layer. Then, by aggregating Data and Schema, infer Behavior (classes and instances of operations / functions). This Aggregation, together with Alignment and type Activation mechanisms comprehend the Model core Augmentations.

ToDo.

## Model Abstraction

### Models: Layers

What my attempts where about in the beginning was to match different URIs or, for example, database identifiers which refer to the same entity (in different databases / ontologies, for example) to perform some kind of "ontology matching".  
  
Then I've tried to develop a mechanism for using RDF Quads for encoding an object graph (and a layers class hierarchy) using Contexts to denote the class of an instance, Subjects to denote class instances and attributes (members) and values: Predicates / Objects.

Then I've realized that some basic type inference could be performed with, for example, aggregating Subjects with the same predicates (Subject Kinds). Idem for Predicates, Objects and Contexts. I've also realized that plain "facts" statements could be aggregated in the previously mentioned class hierarchy to abstract further, from plain data, instance / class layers of what I call data / schema / behavior layers. Higher layers (i.e.: Behavior) "aggregate" lower layers.

Quads are "reified" as Resource(s). Also, Resource is a functional wrapper reactive and event driven of an URI. And an URI could be implemented with whatever backend which could produce or consume events (databases, services, etc.). Resource layers hierarchy (Context) is to be implemented by an actor / role type object pattern according the hierarchy layer level it corresponds (and declaratively stated in a Model of Meta Resources).  
  
Layers shape is as follow:  
Resource : Functional URI wrapper.

(Context : Resource, Occurrence : Resource, Attribute : Resource, Value : Resource);

CSPO Names are according roles (Meta Resource) in the Model. For example: layer Occurrence is parent layer class.  
  
Each layer abstract instances of its own contexts instances.

Input Layer: (CSPO layer):

(Transaction, someOne, buys, someProduct);

Statement (data layer instance):

Inputs regarding the same context are aggregated into data layer instance.

(Statement, Occurrence, Attribute, Value);  
(transactionStatement, someOne, buys someProduct);

Entity (data layer class):

Aggregated Statement and Occurrence Statement occurrences reified into an Entity along with its Occurrences Attributes.

(Entity, Statement, Occurrence, Attribute);

(someTransaction, transactionStatement, someOne, buys);

Role / Kind (schema layer instance):

Aggregated Entity and Statement Entity occurrences reified into a Role / Kind along with its Statements and Occurrences.

(Role / Kind, Entity, Statement, Occurrence);  
(someBuyer, someTransaction, transactionStatement, someOne);  
  
Class (schema layer class):

Aggregated Role and Entity Role occurrences reified into a Class along with its Entities and Statements.

(Class, Role, Entity, Statement);  
(Person, someBuyer, someTransaction, transactionStatement);  
  
Flow (behavior layer instance):

Aggregated Class and Role Class occurrences reified into a Flow along with its Roles and Entities.

(Flow, Class, Role, Entity);  
(someBuy, Person, someBuyer, someTransaction);  
  
Behavior (behavior layer class):

Aggregated Class and Role Class occurrences reified into a Behavior along with its Classes and Roles.

(Behavior, Flow, Class, Role);  
(Buy, someBuy, Person, someBuyer);

Then, each Model aggregates its Statements in the form (for example):

(Model Impl, Buy, someBuy, Person); Interaction / Meta Model.  
  
This "aggregations" are part of what I call "Augmentation(s)": Aggregation, Alignment and Activation are ones of those, which are functional transforms described declaratively in an object graph Meta Model. The act of applying an Augmentation implies one source Message Resource (context layer), one matching Template Resource (input signature) an Augmentation (Interaction functor) a Transform Resource (output signature) and a resulting (set of) Message Resource(s) materialized as further layers instances / Messages to be “parsed” by further corresponding Augmentations of matching Template signatures (dataflow).

ToDo.

### Models: Facets

Models have “Facets” which renders the different ways Model data / schema / behavior could be regarded and used for different purposes, from application development to Business Intelligence and Ontology Matching.

Facets are models implemented the same way other models are with Model Resource Contexts and layers and from the same data. Each Facet implements its own Resource URI wrapper (same URIs, ontology matching, provenance of aligned URIs, Facet pivoting). Then, each Facet has its own Model Context Resource class hierarchy having Augmentation / Dataflow functors as Model Resource(s) does.

#### Functional Model Facet:

(Context : Resource, Occurrence : Resource, Attribute : Resource, Value : Resource);

(Statement, Occurrence, Attribute, Value);

(Entity, Statement, Occurrence, Attribute);  
(Role, Entity, Statement, Occurrence);  
(Class, Role, Entity, Statement);  
(Flow, Class, Role, Entity);  
(Behavior, Flow, Class, Role);

(Model, Behavior, Flow, Class);

#### Semantic / Semiotic Model Facet:

(Context : Resource, Occurrence : Resource, Attribute : Resource, Value : Resource);

(Attributes, Occurrence, Attribute, Value);

(Object, Attributes, Occurrence, Attribute);  
(Concept, Object, Attributes, Occurrence);  
(Sign, Concept, Object, Aytributes);  
(Context, Sign, Concept, Object);  
(Interaction, Context, Sign, Concept);

(Model, Interaction, Context, Sign);

#### Dimensional Model Facet:

(Context : Resource, Occurrence : Resource, Attribute : Resource, Value : Resource);

(Properties, Occurrence, Attribute, Value); Data (Properties: distance / facts).

(Value, Properties, Occurrence, Attribute); Info (Properties distance between Occurrence / previous and Occurrence / next).  
(Measure, Value, Properies, Occurrence); Knowledge.  
(Unit, Measure, Value, Properties);  
(Dimension, Unit, Measure, Value);  
(Concept, Dimension, Unit, Measure);

(Model, Concept, Dimension, Unit);

ToDo.

### Models: Levels

Models have “Ontology” Levels. Levels are Layers (of the Model) which are feed into its input Layer with (instance) Statements aggregated from initial input data (Data Level) aggregated into subsequent layers. Schema Level instances feeds the Model input conforming a Session (context / grammars) ontology Level. Then, behavior Level instances feeds the Model input conforming an Interaction (behavior) ontology Level.

#### Model Source Level (Backend)

Input Statements coming from plain RDF Quads aggregated according Data / Schema / Layers Augmentation(s). Base facts Model Level.

ToDo.

#### Model Session Level

Aggregate Source (Backend) Level Schema layer Statements as Model Session level Data layer input. Reify Schema (roles / grammars).

ToDo.

#### Model Interaction Level

Aggregate Session Level Behavior layer Statements as Model Data level Data layer input. Reify behaviors (context / interactions).

Declarative application protocol use case upper ontology levels (Action… Gesture, etc).

ToDo.

## Meta Resources

Meta Resources are used by a Model Meta Model for describing models. Some of them are:

URI

Resource

Context / Context

Subject / Occurrence

Predicate / Attribute

Object / Value

Statement

Model

Kind

ContextKind

SubjectKind

PredicateKind

ObjectKind

Message

Template

Augmentation

Transform

Class

Metaclass

Instance

(Augmentation, Template, Mapping, Transform);

Model declared as Interaction Model Augmentation (matching Messages) in Interaction Model. Flows:

Message

Model (Functor)

Augmentation (Addressable Interaction)

Template (Message)

Mapping (Functor)

Transform (Message)

Model (Functor)

Message

Interaction Model: Model Events (Augmentation).

Augmentation: Event. Signature. Declarations / Occurrences. Domain, Input / Mapping, Transform / Range, Output.

Embeddings: Message Match Event Signature. Tempate matching / Transform rendering. Dataflow.

Embeddings: Meta Model Augmentation, Template, Mapping, Transform Meta Resources (input layer). Meta Model Source, Session, Interaction levels.

Model OntResource Augmented with Event Transform aggregates new Event Mapping.

ToDo.

## Meta Model

Meta Model: encode Layers, Contexts, Kind / Roles hierarchies (subject, context, occurrence, roles, atributes, values / metaclass, class, instance relations / meta resources) and Facets using corresponding Facets implementations of base Model Meta Resources.

URI(s);

OntResource; Merged URI(s) wrapper.

OntResource hierarchy: layers statement contexts. Facets DOM, Actor / Role.

Resource (OntResource Context Roles hierarchies Monad wrapper);

Resource (OntResource CSPO / Contexts hierarchies Monad wrapper);

Role (Model CSPO Context Roles hierarchies type classes) : Resource;

Statement (Resource, Resource, Resource, Resource) : Resource;

Kind (Statement\*) : Resource;

Class (Kind\*) : Resource;

Context (Class\*) : Resource;

Hierarchy: class (Object / Value) as superclass Context.

Object: class (extension);

ContextStatement: super class (intention); Context Role.

(Resource, ?, ?, ?);

(Role, Resource, ?, ?);

(Statement, Role, Resource, ?);

(Kind, Statement, Role, Resource); Data (Resource Kind).

(Class, Kind, Statement, Role); Schema (Role Class)

(ContextStatement, Class, Kind, Statement); Interaction (Statement ContextStatement).

State Facet / Layer / Level / Augmentation / Model Resource Mappings.

Functional API: Message IO. Mappings.

Interaction Model (Interaction Level):

(Augmentation, Template, Mapping, Transform);

Dataflow: Order, Flows (Mappings, hierarchies).

State order (in context class hierarchies axes), comparison relations, iterations, flow, events, causal relations, units, enums, equivalence, etc.

Data order: Resource Kind hierarchies.

Schema order: Role Class hierarchies.

Interaction order: Statement Context hierarchies.

(Augmentation, Template, Mapping, Transform);

Model declared as Interaction Model Augmentation (matching Messages) in Interaction Model. Flows:

Message

Model (Functor)

Augmentation (Addressable Interaction)

Template (Message)

Mapping (Functor)

Transform (Message)

Model (Functor)

Message

Interaction Model: Model Events (Augmentation).

Augmentation: Event. Signature. Declarations / Occurrences. Domain, Input / Mapping, Transform / Range, Output.

Embeddings: Message Match Event Signature. Tempate matching / Transform rendering. Dataflow.

Embeddings: Meta Model Augmentation, Template, Mapping, Transform Meta Resources (input layer). Meta Model Source, Session, Interaction levels.

Model OntResource Augmented with Event Transform aggregates new Event Mapping.

ToDo.

## Interaction Model

(Augmentation, Template, Mapping, Transform);

Model declared as Interaction Model Augmentation (matching Messages) in Interaction Model. Flows:

Message

Model (Functor)

Augmentation (Addressable Interaction)

Template (Message)

Mapping (Functor)

Transform (Message)

Model (Functor)

Message

Interaction Model: Model Events (Augmentation).

Augmentation: Event. Signature. Declarations / Occurrences. Domain, Input / Mapping, Transform / Range, Output.

Embeddings: Message Match Event Signature. Tempate matching / Transform rendering. Dataflow.

Embeddings: Meta Model Augmentation, Template, Mapping, Transform Meta Resources (input layer). Meta Model Source, Session, Interaction levels.

Model OntResource Augmented with Event Transform aggregates new Event Mapping.

Encoding. Addressing (contents, signatures, contexts). Events publish / subscribe. Dynamic subscriptions / bindings. Subscription, reactive Meta Resource(s). Message flow mechanism: from Model to base layers.

Match Message subjects to Templates, Augmentations and Transforms roles (bound by CK signatures dataflow). Message inputs: Models.

Interaction Model for Encoding / Addressing (Mapping : Event routes) Dataflow metadata.

Augmentation: Described in Interaction Model. Encode Message, Template, Augmentation and Transforms roles (Meta Resources). Data, Session, Interaction Levels (Message, Template, Transform, Augmentation statements declaration realization).

Augmentation. Aggregation Meta Model: Describe layers contexts compositions. Alignment Meta Model: Describe augmented attributes (by kinds clustering). Activation Metamodel: Describe Kinds / Roles activation (by attributes aggregations).

ToDo.

## Dataflow: Mapping

Interaction Model declares Events (Augmentations) which have a functional Mapping between its domain (Template) and range (Transform). An Augmentation Context Kind correspond to this Mapping “signature”. Dataflow binds input Message(s) to domain Template by pattern matching and resolving any input Message references (Addressing).

Outputs are resolved by pattern matching with Transform, Message and existing Model data. Augmentations may play the role of “placeholder” Resource(s) which are bound to context aware Augmentations thus rendering Transforms into Model entities (including Mapping Augmentations themselves).

Model declared as Interaction Model Augmentation (matching Mappings) in Interaction Model. Flows:

Message

Model (Functor)

Augmentation (Addressable Interaction)

Template (Message)

Mapping (Functor)

Transform (Message)

Model (Functor)

Message

Interaction Model: Model Events (Augmentation).

Augmentation: Event. Signature. Declarations / Occurrences. Domain, Input / Mapping, Transform / Range, Output.

Embeddings: Message Match Event Signature. Tempate matching / Transform rendering. Dataflow.

Embeddings: Meta Model Augmentation, Template, Mapping, Transform Meta Resources (input layer). Meta Model Source, Session, Interaction levels.

Model OntResource Augmented with Event Transform aggregates new Event Mapping.

ToDo.

# IDs: Encoding / Addressing

Message - Model - Template (data) - Augmentation (functor) - Transform (interaction) - Model - Message.

Encoding, IDs: magic numbers (MIME types : Context Kinds), metaclass, class, instance, context, CSPO, etc. relations "contextual slots" for IDs. Resource resolution, Operation (primes, encoded lattice, slots context relations) factors in Meta Model relations. Encode order, hierarchies, temporal, causal (reified), containment, etc. relations into IDs encoding. Ontology matching: encoded IDs roles in context aggregation / learning.

Explain URI, Resource, Layers, Model, Kinds, etc. APIs. Meta Resources. Meta Model. Hierarchies. Order. Iteration. Flows.

Model, URIs, Resource, Contexts Functional APIs. Meta Model / Resources encoding. Mappings.

IDs: Addressing / Encoding. Semantic (signature, contents, context) resolvable / discoverable identifiers.

Ontology Matching:

Ontology Matching: IDs, Addressing, Encoding. Functional, Semiotic, Dimensional (Facets). Layers. Levels. Meta Resource / Model. Sets. Value as occurrence of attribute. metaclass / class / instance IDs.

Ontology Matching: Encode: order, iteration, flows, units, relations, events, enums, etc.

Messages CRUD / Invocation semantics. Dialog. Prompts.

Encoding: Cons lists. Trees. Huffman / Prefix codes. RDF List serialization. Meta Resources / Models declarative Encoding, Addressing, Mappings, Transforms (Immutable sequences, dataflow Mapping: Template / Augmentation / Transform functional streams).

Kinds, Signatures. Contents. Contextual metadata. Sets (bitstring cuads). Lattices.

(C (S (P (O, Nil))));

(C2 (C (S (P, Nil)));

Models:

URI(s);

OntResource; Merged URI(s) wrapper.

Resource (OntResource CSPO / Contexts hierarchies Monad wrapper);

Message (Resource Monad wrapper); Request / Response Encoding.

Template / Transform (Message blueprints) domain / range : Message.

Augmentation : Functor.

Mappings: Declarative IO signatures: Context Kinds Templates / Transforms. Subscriptions / routes. Dataflow.

Encoding: Template Message augmentation (inputs).

Encoding: Declarative functors behavior encoding statements. Mappings (subscription / routes).

Encoding: Transform Message augmentation (outputs).

(Augmentation, Template, Mapping, Transform);

Dataflow: Order, Flows (Mappings, hierarchies).

Message (Resource Monad wrapper) : Statement; Request / Response Encoding.

Template / Transform (Message blueprints) domain / range : Message.

Augmentation : Functor.

Mappings: Immutable Resources Message based Augmentation bindings. Dataflow subscription routes: Signatures / CKs (Augmentation(s) functional streams).

Subject Kind: Subjects stream. Object Kind: Objects stream.

Encoding: Template Message augmentation (inputs).

Encoding: Declarative functors (Augmentation) behavior encoded in statements. Mappings (subscription / routes).

Encoding: Transform Message augmentation (outputs).

Interaction Model (Interaction Level):

(Augmentation, Template, Mapping, Transform);

Dataflow: Order, Flows (Mappings, hierarchies).

ToDo.

## Models / Meta Model IDs

IDs:

URI(s);

OntResource; Merged URI(s) wrapper.

OntResource hierarchy: layers statement contexts. Facets DOM, Actor / Role.

Resource (OntResource Context Roles hierarchies Monad wrapper);

Statement : Resource quad, Resource.

Message (Resource Monad wrapper); Request / Response Encoding.

Template / Transform (Message blueprints) domain / range : Message.

IDs:

A: OntResource.

B: CSPO Role.

C: Statement : OntResource Occurrence.

D: Kind CSPO Instances.

E: Class : Kind CSPO Classes.

F: ContextStatement : Context Role.

Meta Model:

A: (Resource, ?, ?, ?);

B: (Role, Resource, ?, ?);

C: (Statement, Role, Resource, ?);

D: (Kind, Statement, Role, Resource); Data (Resource Kind).

E: (Class, Kind, Statement, Role); Schema (Role Class)

F:.(ContextStatement, Class, Kind, Statement); Interaction (Statement ContextStatement).

ID: (F (E (D (C (B (A, Nil))))));

Cons lists. Binary Trees. Huffman / Prefix codes. RDF List serialization. Meta Resources / Models declarative statements Encoding, Addressing.

Kinds, Signatures. Contents. Contextual metadata.Lattices. Roles.Sets (bitstring cuads). Definitions (elements). Operations. Rules. Categories. Groups.

Statement: (ID (ID (ID (ID, Nil))));

(C (S (P (O, Nil))));

ToDo.

## Resolution: graph criteria / query

ToDo.

## Sorting / Order / Comparisons

Order / comparisons: tree representation ordered by Context Role class hierarchy, instances hierarchies and aggregation hierarchies. Resources order (IDs). Statements order (Statement IDs). Comparison criteria (choose relevant IDs). ToDo.

Semantic resolution: Query Resource(s) satisfying “criteria” (i.e.: Object(s) for predicate) IDs by IDs resolution pattern:

Query Resources by role in context.

Query Resources by attributes / values.

Query Resources by identity / type.

ToDo.

# Model Functional APIs

## Resource Monad

Monadic wrapper for which Augmentation (Functor Events) are declared into Interaction Model. Model(s) themselves are Augmrntation(s). Augmentation Statement Context Kind defines Event “signature”: Resource input / output Event domain / range. Output from an Event application (Transform) may feed back Model triggering further events (Dataflow). Augmentation Template, Mapping and Transform may behave as placeholder for Dataflow rendering of Meta Models.

ToDo.

## Reactive / Events (Resource Monad)

Model Resources react to events according Message matching event “signature”.

ToDo.

## Meta Resources

Declare Meta Model Meta Resources as Interaction Model Augmentations, Mappings, Templates and Transforms. Model(s) (Facets) are “root” Augmentations over input Message Statements. Further Dataflow and Meta Model Interaction Resources embeddings shapes Meta Model instances.

ToDo.

## Meta Model

Meta Resources built Model which instantiates Interaction Model statements into layered Facets Models.

ToDo.

## Streams (Context, Kinds, etc.)

Context Kind: Functional stream of Context Statements (Occurrences).

Subject Kind: Functional stream of Subject Statements (Occurrences).

Predicate Kind: Functional stream of Predicate Statements (Occurrences).

Object Kind: Functional stream of Object Statements (Occurrences).

ToDo.

# Messages

Messages: Mappings. Meta Resources / Model Message based Model interactions (Subscriptions / Mappings).

Messages: Message semantics (Augmentation: Verbs, CRUD, Behavior) according Message structure / pattern (dialog / prompts).

Messages: Dataflow Template matches signatures (Session level, enrichs Message with Model / Dialog prompts / contents). Augmentation Functor applied over Message contents (Interaction level). Transform matching output signature emits (Session level, populated / prompts) output Message.

Messages: Dataflow. Subscriptions. Reactive Model. Dynamic subscriptions / bindings. Events publish / subscribe between Model Resource. Mappings.

Mappings: Declarative IO signatures: Context Kinds Templates / Transforms. Subscriptions / routes. Dataflow.

Messages: Mappings. Meta Resources / Model Message based Model interactions (Mappings : Subscriptions).

Messages: Message semantics (Augmentation: Verbs, CRUD, Behavior) according Message structure / pattern (dialog / prompts).

Messages: Dataflow Template matches signatures (Session level, enrichs Message with Model / Dialog prompts / content alignments). Augmentation Functor applied over Message contents (Interaction level). Transform matching output signature emits (Session level, populated / prompts) output Message.

Messages: Dataflow. Subscriptions. Reactive Model. Dynamic subscriptions / bindings. Events publish / subscribe between Model Resource. Mappings.

ToDo.

## Message Monad

Encode Model Events Interactions (Augmentation) inputs (Template) and outputs (Transform) wrapping corresponding Resource(s).

ToDo.

## Reactive / Events (Message Monad)

(Augmentation, Template, Mapping, Transform);

Model declared as Interaction Model Augmentation (matching Messages) in Interaction Model. Flows:

Message

Model (Functor)

Augmentation (Addressable Interaction)

Template (Message)

Mapping (Functor)

Transform (Message)

Model (Functor)

Message

Interaction Model: Model Events (Augmentation).

Augmentation: Event. Signature. Declarations / Occurrences. Domain, Input / Mapping, Transform / Range, Output.

Embeddings: Message Match Event Signature. Tempate matching / Transform rendering. Dataflow.

Embeddings: Meta Model Augmentation, Template, Mapping, Transform Meta Resources (input layer). Meta Model Source, Session, Interaction levels.

Model OntResource Augmented with Event Transform aggregates new Event Mapping.

ToDo.

## Model Functional APIs

ToDo.

## IDs: Encoding / Addressing

Encoding: Template Message augmentation (inputs).

Encoding: Declarative functors behavior encoding statements. Mappings (subscription / routes).

Encoding: Transform Message augmentation (outputs).

(Augmentation, Template, Mapping, Transform);

Dataflow: Order, Flows (Mappings, hierarchies).

IDs: Addressing / Encoding. Semantic (signature, contents, context) resolvable / discoverable identifiers.

ToDo.

## Persistence

Messages: Events IO / Persistence: Saga Activation / Passivation populating Node local Quad store / persisting peers via DIDs ([ont.io](http://ont.io)) semantic (resolvable / discoverable) identifiers.

Interaction Model: aggregated Meta Model interactions (performed / inferred / possible) declared Models events (saga pattern).

Augmentations: Interaction Model Mappings execution / persistence / retrieval. Reactive model via representation of IDs: Mappings (signatures) dataflow inferred Augmentations.

Persistence: (activation / passivation): IDs / Meta Model / Facets from Interaction Model events (Messages) from Node IO. Interaction Model: Main Model(s) Message IO.

Messages: Saga Activation. Interaction Model (Meta Model). Aggregated (Interaction) Meta Model interactions (performed / inferred / possible) emitted as Model event Messages (Saga pattern). Mappings.

Saga Activation / Passivation populating Node local Quad store / persisting peers via DIDs ([ont.io](http://ont.io)) semantic (resolvable / discoverable) identifiers.

Messages: Saga Activation. Interaction Model (Meta Model). Aggregated (Interaction) Meta Model interactions (performed / inferred / possible) emitted as Model event Messages (Saga pattern). Mappings.

Messages: Saga Passivation. Model layers data routed by Mappings as event Message into (Interaction) Meta Model. Message inputs: Models. Mappings. Populate.

ToDo.

# Augmentation

Interaction Model Event. Matches Message signature (domain Template / range Transform) performing Mapping. Dataflow: Transform output matches another Event signature. Embedding: OntResource augmented with new referenced aligned / matched Model entity.

Augmentations defined as declarative Mappings in Interaction Model encoding Context (layer) inputs matching signatures and augments current / previous layer emmiting mapping transforms.

Functors: Meta Model declarations / Context classes / instance declarative implementations. Aggregation type: invocation over each CSPO / Context roles.

Functor applied to context: Aggregation.

Functor applied to subject: Alignment.

Functor applied to predicate: Activation.

Functor applied to object: members traversal.

Reactive Context Kind (matching signatures) dataflow.

Message - Model - Template (context) - Augmentation (interaction) - Transform (data) - Model - Message.

Implementation API: Node / Container. Services (URIs Context Kind signatures resolution).

Core Services: Activation Augmentation (Naming).

Core Services: Alignment Augmentation (Index).

Core Services: Aggregation Augmentation (Registry).

Core Services: RDF / OWL Backend (endpoint, reasoning, persistence).

Core Services: DIDs Persistence (sync Node state: events sourcing).

Core Services: Protocol (I/O). Node, Session, Intetaction levels. Base Connector Augmentation API. Event driven URIs dialog / prompts protocol adapters.

Explain Context layers Aggregation Augmentation. Example: Role(s) for each CSPO. Entity in Statements. Meta Model. Meta Resources.

Explain Context layers Alignment Augmentation. Meta Model. Meta Resources.

Explain Context layers Activation Augmentation. Meta Model. Meta Resources.

Explain Augmentation. Context : Functor<Template, Transform>; Template, Transform : Context Kind (Levels: Data, Session, Interaction / Functor instance / execution contexts?).

Functors: Meta Model declarations / Context classes / instance declarative implementations. Aggregation type: invocation over each CSPO / Context roles.

Functor applied to context: Aggregation.

Functor applied to subject: Alignment.

Functor applied to predicate: Activation.

Functor applied to object: members traversal.

Message. For each layer perform each Functor: (Object : aggreg, Kind : activ, Attr : align, Obj : onto).

Augmentation:

Functors: Augmentation declaration: Meta Model definitions (Context class / instances). Message: dataflow matches Template signatures: interactions. Apply Augmentation Functors over Message contents (interactions enrich Message with Models contents: ontology matching / Levels / Facets). Materialize / emit dialog / prompts Message (enrich Message from Models / reactive IO events).

Augmentation: Context / Functors. Message Resource(s) / Meta Resource(s) (nested / wrapped) elements determines flow Template Transform results / behaviors (CRUD, Functor invocations). Message IO performs Augmentations. Ontology levels resolution (Templates / Transforms / Augmentatiom levels: matching patterns / dialog prompts in Ontology levels).

ToDo.

## Reactive / Events (Functors)

Augmentations: aggregate / align / activate (classify) sources of ontology matched data / schema / behavior enabling semantic layers interoperation.

Aggregation: Infer input data streams data, schema, behavior class / instance context layers.

Alignment: Infer layer missing / deducible attributes and values.

Activation: Infer layer CSPO Kind / Roles. Basic type system.

Aggregation (Augmentation): Apply each Context (layer) Functor on inputs (from input layer) and emits Transform, matching corresponding (next) layer. Next layer Context and SPO according functional mapping declared by Meta Resource types on augmented layer.

Alignment (Augmentation): ToDo.

Activation (Augmentation): ToDo.

ToDo.

## Interaction Model

(Augmentation, Template, Mapping, Transform);

Model declared as Interaction Model Augmentation (matching Messages) in Interaction Model. Flows:

Message

Model (Functor)

Augmentation (Addressable Interaction)

Template (Message)

Mapping (Functor)

Transform (Message)

Model (Functor)

Message

Interaction Model: Model Events (Augmentation).

Augmentation: Event. Signature. Declarations / Occurrences. Domain, Input / Mapping, Transform / Range, Output.

Embeddings: Message Match Event Signature. Tempate matching / Transform rendering. Dataflow.

Embeddings: Meta Model Augmentation, Template, Mapping, Transform Meta Resources (input layer). Meta Model Source, Session, Interaction levels.

Model OntResource Augmented with Event Transform aggregates new Event Mapping.

ToDo.

## Message

Augmentation Event input (Template) / output (Transform) declaration / instance (Mapping).

ToDo.

## Template

(Augmentation, Template, Mapping, Transform);

Model declared as Interaction Model Augmentation (matching Messages) in Interaction Model. Flows:

Message

Model (Functor)

Augmentation (Addressable Interaction)

Template (Message)

Mapping (Functor)

Transform (Message)

Model (Functor)

Message

Interaction Model: Model Events (Augmentation).

Augmentation: Event. Signature. Declarations / Occurrences. Domain, Input / Mapping, Transform / Range, Output.

Embeddings: Message Match Event Signature. Tempate matching / Transform rendering. Dataflow.

Embeddings: Meta Model Augmentation, Template, Mapping, Transform Meta Resources (input layer). Meta Model Source, Session, Interaction levels.

Model OntResource Augmented with Event Transform aggregates new Event Mapping.

ToDo.

## Mapping

Mappings / Augmentation Context Kind.

ToDo.

## Transform

ToDo.

## IDs: Encoding / Addressing

Contextual / patterns embedding metadata / resolution. Augmentation occurrences Dataflow sources / context sync.

ToDo.

# Dataflow

(Augmentation, Template, Mapping, Transform);

Model declared as Interaction Model Augmentation (matching Messages) in Interaction Model. Flows:

Message

Model (Functor)

Augmentation (Addressable Interaction)

Template (Message)

Mapping (Functor)

Transform (Message)

Model (Functor)

Message

Interaction Model: Model Events (Augmentation).

Augmentation: Event. Signature. Declarations / Occurrences. Domain, Input / Mapping, Transform / Range, Output.

Embeddings: Message Match Event Signature. Tempate matching / Transform rendering. Dataflow.

Embeddings: Meta Model Augmentation, Template, Mapping, Transform Meta Resources (input layer). Meta Model Source, Session, Interaction levels.

Model OntResource Augmented with Event Transform aggregates new Event Mapping.

ToDo.

## Messages

ToDo.

## Mapping

ToDo.

## Augmentation

ToDo.

# Ontology Matching

ToDo.

## Ontology Merge

Ontology matching. Dataflow: sort statements. Units. Equivalences. Distances / events (order). Services (Augmentation / Context Functors Meta Model mappings / transforms).

Explain ontology matching: data, schema, behavior alignments. Layers. Levels. Facets. Meta Resources / Model. IDs, Encoding / Addressing.

Encoding. Functional, Semiotic, Dimensional (Facets). Layers. Levels. Meta Resource / Model. Sets. Value as occurrence of attribute. metaclass / class / instance IDs.

Functionsl / Semiotic / Dimensional layers / levels examples / alignments.

Model, URIs, Resource, Contexts Functional APIs. Meta Model / Resources encoding. Mappings.

IDs: Addressing / Encoding. Semantic (signature, contents, context) resolvable / discoverable identifiers.

Ontology Matching:

Ontology Matching: IDs, Addressing, Encoding. Functional, Semiotic, Dimensional (Facets). Layers. Levels. Meta Resource / Model. Sets. Value as occurrence of attribute. metaclass / class / instance IDs.

Ontology Matching: Encode: order, iteration, flows, units, relations, events, enums, etc.

ToDo.

## Alignments (data / schema / behavior).

Ontology matching (Data, Schema, Behavior alignments):

Data alignment:  
  
Determine if two instances (example: records) of two different backends or services refer to the same entity (Customers : John D. / Employees : John Doe).  
  
Schema alignment:  
  
Determine, for example, meaning and equivalences between diverse (aggregated / composite) schemas (equivalent classes / tables, equivalent attributes / columns, equivalent roles / relations).  
  
Behavior alignment:  
  
Determine meaning and equivalences between (aggregated / composite) behavior contexts and behavior contexts invocations / interactions (Appointment / Interview, anAppointment / anInterview. Behavior flows aggregated from backends / services learning).

ToDo.

## IDs: Encoding / Addressing

Ontology Matching:

Ontology Matching: IDs, Addressing, Encoding. Functional, Semiotic, Dimensional (Facets). Layers. Levels. Meta Resource / Model. Sets. Value as occurrence of attribute. metaclass / class / instance IDs.

Ontology Matching: Encode: order, iteration, flows, units, relations, events, enums, etc.

ToDo.

# Implementation

Persistence:

Interaction Model: aggregated Meta Model interactions (performed / inferred / possible) declared Models events (saga pattern).

Languages, Patterns, APIs, Frameworks. (Container, Node, Model, Service, etc.).

Deployment / Implementation:

Protocols:

XML / XSL. Event bus (encoding / discovery). Addressing (node / model / ontology levels, topics / queues).

Implementation: Spring / Vert.x.

Spring: Vert.x / APIs Factories. Services.

Core Messaging / Event Bus backend Service Bean.

Persistence: Topic / Subject wrapping ont.io DIDs Saga (Semantic IDs) Messaging pattern.

Core Meta Resource / Meta Model. Mappings. Service Bean.

Core Model Facets / Levels / Layers Functional Service (streams: Augmentation) APIs.

Message: Augmentation (Encoding) request / response. Mapping: routes / contexts (dataflow).

Index, Registry, Naming Hypermedia Service Beans. Backend, Session, Interaction Levels: Functional Service stream APIs Beans.

DOM (Dynamic Object Model) OGM (Object Graph Mapping). Beans API. JAF (JavaBeans Activation Framework). REST / Client OO APIs. Service Bean.

Apache ServiceMix / JBoss Fuse.

Karaf. Bundles.

OSGi wrapper for Spring / Vert.x. declarative services. Event bus. Discovery (Semantic IDs). Camel.

CXF. Endpoints. Servicr Connectors.

ActiveMQ

Camel. Backend Connectors.

ToDo.

# Client APIs / Connectors

## Services

Message APIs: Augmentation / Dialog Protocol. Connectors. Services.

Hypermedia APIs: Augment, Extend, Declare. REST. Extended Content Type signatures Activation / Dataflow. Services.

Wiki like abstract representation / protocol. Template rendering. Services.

DCI Activation DOM OGM. REST. API Client. Services.

ToDo.

URIs, Resource, Contexts Functional APIs

Services:

Registry.

Naming.

Index.

Connectors (URIs):

JDBC.

Meta Model:

URI;

Resource (URI\*);

Role (Model CSPO hierarchies) : Resource;

Statement (Resource, Resource, Resource, Resource) : Resource;

Kind (Statement\*) : Resource;

Class (Kind\*) : Resource;

Context (Class\*) : Resource;

Hierarchy: class (Object / Value) as superclass Context.

Object: class (extension);

Context: super class (intention);

(Kind, Statement, Role, Resource); Data (Resource Kind).

(Class, Kind, Statement, Role); Schema (Role Class)

(Context, Class, Kind, Statement); Interaction (Statement Context).

State Facet / Layer / Level / Augmentation / Model Resource Mappings.

Functional API: Message IO. Mappings.

State order (in context class hierarchies axes), comparison relations, iterations, flow, events, causal relations, units, enums, equivalence, etc.

Data order: Resource Kind hierarchies.

Schema order: Role Class hierarchies.

Interaction order: Statement Context hierarchies.

Resource / Message Monad Events: Augmentations. Mapping: Endpoint. Events: Implement Message / Resource / URIs Protocols.

Services. Connectors. URIs APIs.

Endpoints (Events Mapping) messaging interface.

ToDo.

# Deployment

Protocol plugins (Protocol Service) Connectors. Runtime. Core Services. Endpoints. Dataflow.

JavaScript (browser) / NodeJS Core.

Endpoints. Connectors (OData, HAL, OGM, Spring, ServiceMix / Fuse).

Browser (JavaScript) / NodeJS / Connectors.

Applications. Use Cases.

Levels. Gestures / Actions (Services / UX). Rendering (REST APIs / Dynamic UX).

Deployable entity: Node. Publish / Subscribe signatures (interface). Augmentation / Mappings Interaction Model (Runtime). Models, Facets, Services, etc. ToDo.

ToDo.