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**Aggregation**

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**Augmentation Services**

**ToDo**

**Use Cases**

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).

Solutions:

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.

Domains: Use case. Problem "spaces" / domain translation / exchanges / integration.

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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).

Hypermedia Activation. Addressing. Link extended content types resources elements / parts with other resources addressed elements.

**Resource API**

Model Functional APIs. Reactive streams. Meta Resource factory (Template / Transform dataflow placeholders).

Resource<T> : T extends OntResource (Context Roles hierarchy, normalized aligned URIs wrapper).

Functor<Resource<T>, Resource<T>>;

Message<Resource<T>>;

Resource<T> : T extends OntResource (Context Roles hierarchy, normalized aligned URIs wrapper).

Functor<Resource<T>, Resource<T>>;

Message<Resource<T>>;

**Models**

Models aggregates input I/O / Connectors data into corresponding knowledge Facets (Functional, Semiotic, Dimensional) layers (Data, Schema, Behavior).

Base Model structure / Context layers hierarchies is as follow:

OntResource (URIs).

Resource : Functional URI 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 layers in class / instance roles (except for input layer) and each upper layer aggregates functionally over the previous classifying and aggregating previous layers statements as parts of the Model.

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.

Model API:

URI(s);

OntResource; Merged URI(s) wrapper (Ontology Matching).

Resource (OntResource CSPO / Contexts hierarchies Monadic functional wrapper);

Statement (Resource Quad) : Resource.

Kind. Context Facets hierarchy roles.

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

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

Augmentation : Functor<Template, Transform>.

Mappings: Augmentation Context Kind declarative IO signature. Templates / Transforms. Subscriptions / routes. Dataflow.

Encoding: Template Message augmentation (inputs).

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

Encoding: Transform Message augmentation (outputs).

Interaction Model Layer:

(Template, Mapping, Transform, Model);

(Augmentation, Template, Mapping, Transform);

Dataflow: Order, Flows (Mappings, hierarchies).

**Meta Resources**

(Template, Mapping, Transform, Model);

(Augmentation, Template, Mapping, Transform); Meta Resources.

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

Transform result adds new Context / Occurrence, merges existing Context Occurrence in Model with new Statements (prompts / embeddings). Dataflow.

Augmentation: Event (Augmentation) emits new dataflow Message Transforms from Template Mappings.

Augmentation: Input Templates prompts. Dialog, Meta Resource embedded Templates / Mappings / Augmentations in input Message / output Transform.

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.

**Model 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).

One also could Augment Resource(s) in a functional manner, using reactive event driven APIs so, for example applying "Person" class to "Employee" role could shield a Resource set of people being working for someone. The ultimate goal is to be able to "plug" as much "backends" connectors as posible into distributed peers which exposes protocols / APIs for knowledge driven hypermedia applications.

**Kinds**

Kinds (Application):

Kind: Basic type inference. Applied over layers CSPO during Activation Augmentation. An Occurrence Attributes / Values, aggregated for its URI and Context, determines Kind "members" (Attribute) and Kind instance member values (Value).

Super Kind / sub Kind hierarchy relationship is given by a set of Kind Attributes being super set / sub set of each other.

Examples.

SubjectKind (meta Resource): For a given URI occurring as Subject (Occurrence) across a set of Statements (Contexts), its aggregated Predicates (Attributes) defines its "Kind" and its Attribute values determines the given Kind instance "members" values.

ObjectKind (meta Resource): for a given URI occurring as Object (Value) over a set of Statements, Subject (Kind Attribute), Predicate (Kind Value).

PredicateKind (meta Resource): for a given URI occurring as Predicate over a set of Statements, Object (Kind Attribute), Subject (Kind Object).

ContextKind: SubjectKind (Attribute), ObjectKind (Value). Context (Statement) "signature" (dataflow inputs / outputs activation: domain / range).

**Functional Model**

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);

**Semiotic Model**

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

(Attributes, Occurrence, Attribute, Value);

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

(Model, Interaction, Context, Sign);

**Dimensional Model**

(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, Properties, Occurrence); Knowledge.  
(Unit, Measure, Value, Properties);  
(Dimension, Unit, Measure, Value);  
(Concept, Dimension, Unit, Measure);

(Model, Concept, Dimension, Unit);

Dimensional alignment / aggregation layers (lower resource alignment layers):

(Value, Distance, Prev, Next : in Units); (Measure, Value...) (Unit, Measure, Value,...); (Resource, Unit, Measure, Value); Marriage event example.

Model Contexts: Meta Resources / Contexts hierarchies. Models:

Data: Source / Interaction, Schema: Encoding / Grammar, Behavior: Dimensional / Measures (marriage).

Example:

(Value, Previous, Distance, Next); Person, Single, Marriage, Married; Man, Single, Marriage, Husband; Woman, Single, Marriage, Wife.

Order layers statements. Hierarchies (contexts / kinds). Parent / child relationships (steps). Order type relationships: husband: single / marriage / married.

(Value, Previous, Distance, Next); Person, Single, Marriage, Married; Man, Single, Marriage, Husband; Woman, Single, Marriage, Wife.  
(Measure, Value, Previous, Distance);  
(Unit, Measure, Value, Previous);  
(Dimension, Unit, Measure, Value);  
(Concept, Dimension, Unit, Measure);  
(Resource, Concept, Dimension, Unit);  
(Statement, Resource, Concept, Dimension);

Value, Previous, Distance, Next. Dimension, Unit, Measure, Value (aggregated ordered statements layers).

Value -> distance(prev, next); ordering;

Assert knowledge: 1h -> 60min;

dom-lun-mar-mie-jue-vie-sab (orders);

1mt -> 100cm;

etc.

Comparison / order: Alignments (prev, curr, next asserted knowledge). Next hour, location, city, country, next distance at next time at current speed. Event sourcing / tracking: married -> marriage occurred.

Sort: cause / effect, temporal, etc. Messages align, functional map, fold, etc. Primitives. Encode layered statements ordering. Complement / supplement concepts definitions.

Encoding / Dimensional example: role in context. X is Y for Z in W.

(W (Z (X (Y))));

(Marriage (Role (Man (Husband))));

(Hour (Minute (1 (60))));

Encoding, Dimensional, Meta Model. Units. Events. Order. Relations. Comparison. Input layers. Augmentation.

Events metamodel (TBD):

**Model Levels (upper ontologies)**

Source: Data / Facts

Session: Grammar / Contexts

Interaction: Gestures / Actions

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.

Examples: Source, Session, Interaction declarative application protocol use case upper ontology levels (Action… Gesture, etc).

Metagraph / Grammar (sample):

(Kind, SuperKind, Attribute, Value);

(Occurrence, Kind, SuperKind, Attribute);

(Context, Occurrence, Kind, SuperKind); (attributes / links bindings).

(Resource, Context, Occurrence, Kind); State Resource Kind in occurrence context (context / role bindings).

(Statement, Resource, Context, Occurrence); State Resource URIs occurrences / Resource class IDs (classification bindings).

(Interaction, Statement, Resource, Context);

(Action, Interaction, Statement, Resource);

Interaction / Model?

Action / Schema?

**Interaction Layer**

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

Transform result adds new Context / Occurrence, merges existing Context Occurrence in Model with new Statements (prompts / embeddings). Dataflow.

Augmentation: Event emits new dataflow Message Transforms from Template Mappings.

Augmentation: Input Templates prompts. Dialog, Meta Resource embedded Templates / Mappings / Augmentations in input Message / output Transform.

Model OntResource Augmented with Event Transform aggregates new Event Mapping.

(Template, Mapping, Transform, Model);

(Augmentation, Template, Mapping, Transform);

(Model / Template): class / superclass (intension / extension).

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

Message

(\*) Model (Augmentation Functor)

Template (Message) : populate / prompt

Mapping (Functor)

Transform (Message) : populate / prompt

(\*) Model (Augmentation Functor)

Message

(\*): Feedback.

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 Layer. 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).

**Meta Model**

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:

Context: class (intention);

Object: super class (extension);

(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.

**IDs : Encoding / Addressing**

Encoding of interaction layer matches Message(s) with Model (Levels) contents (patterns / hierarchies / dialogs).

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))));

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.

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.

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).

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.

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).

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

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)));

Encoding / Dimensional example: role in context. X is Y for Z in W.

(W (Z (X (Y))));

(Marriage (Role (Man (Husband))));

(Hour (Minute (1 (60))));

Encoding, Dimensional, Meta Model. Units. Events. Order. Relations. Comparison. Input layers. Augmentation.

**Messages**

Monadic Functional Statement (Resource) wrapper.

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

Augmentation result: Message / interaction layer matching / populated Transform Statement. Template, Mapping, Transform Augmentation Meta Resources.

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.

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.

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

Resolve Message matching Resource from behavior layers / matching kinds from Model / data layers.

(Kind, SuperKind, Attribute, Value);

(Occurrence, Kind, SuperKind, Attribute);

(Context, Occurrence, Kind, SuperKind); (attributes / links bindings).

(Resource, Context, Occurrence, Kind); State Resource Kind in occurrence context (context / role bindings).

(Statement, Resource, Context, Occurrence); State Resource URIs occurrences / Resource class IDs (classification bindings).

(Interaction, Statement, Resource, Context);

(Action, Interaction, Statement, Resource);

Example: a message composed of a kinds CSPO matches statements “instances” of those specifications (statements whose CSPO have matching kinds). A message with three CSP kinds and a (potentially unknown) object URI retrieves matching resources having that object value into corresponding property kinds. An statement of plain (potentially unknown) URIs instantiates / updates and augments new / known resources added to models and returns an augmentation transform result.

Interaction Model: Context of Messages model for a given interactions session / dialog state. Message invocation requests: Statement(s) building Resource invocation graph with layers matching Message patterns. Layers graph invocation patterns matching from higher to lower layers resources fulfilling higher layers templates. Variables, wildcards, placeholders.

Dialog arguments resolutions example: higher layer Resource / Message request / invocation instantiates in Interaction Transform context corresponding lower layer graph statements to be “populated” to fulfill request. Message IO of “forms” (Messages) inter-peers (originating peer  
acting as “server”) for initial requested peer to “ask” for form elements to be populated (interaction context “dialogs”). Resolution may propagate to other peers (content aware addressing dataflow routes dispatch: P2P resources address encodings, matching forms models requests). Nested interactions.

Explain messages (resource resolution). Grammar. Match model Resource(s). Compound nested CSPO statement contexts defines result behaviors. Message CSPO contexts may define create, retrieve, update or delete operations (passing 'null' for example for resource / statement to be deleted).

Explain transforms (message application). Transform: Resource stream result of Message application over resolved Resource(s)). Input statements: Message(s) / Resource(s) (from input message or to be populated or populated in dialog) and "goal" Message / Resource aggregating a model from Resource MetaGraph with Message / Resource bindings.

**Dataflow**

Interaction Layer 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 Layer Augmentation(s) (matching Messages) in Interaction Model. Flows.

Transform result adds new Context / Occurrence, merges existing Context Occurrence in Model with new Statements (prompts / embeddings). Dataflow.

Augmentation: Event emits new dataflow Message Transforms from Template Mappings.

Augmentation: Input Templates prompts. Dialog, Meta Resource embedded Templates / Mappings / Augmentations in input Message / output Transform.

Model OntResource Augmented with Event Transform aggregates new Event Mapping.

(Template, Mapping, Transform, Model);

(Augmentation, Template, Mapping, Transform);

(Model / Template): class / superclass (intension / extension).

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

Message

(\*) Model (Augmentation Functor)

Template (Message) : populate / prompt

Mapping (Functor)

Transform (Message) : populate / prompt

(\*) Model (Augmentation Functor)

Message

(\*): Feedback.

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.

Message routing / discovery resolution. Context Kind Signatures.

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).

**Augmentation**

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

Transform result adds new Context / Occurrence, merges existing Context Occurrence in Model with new Statements (prompts / embeddings). Dataflow.

Augmentation: Event emits new dataflow Message Transforms from Template Mappings.

Augmentation: Input Templates prompts. Dialog, Meta Resource embedded Templates / Mappings / Augmentations in input Message / output Transform.

Model OntResource Augmented with Event Transform aggregates new Event Mapping.

(Template, Mapping, Transform, Model);

(Augmentation, Template, Mapping, Transform);

(Model / Template): class / superclass (intension / extension).

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

Message

(\*) Model (Augmentation Functor)

Template (Message) : populate / prompt

Mapping (Functor)

Transform (Message) : populate / prompt

(\*) Model (Augmentation Functor)

Message

(\*): Feedback.

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 Layer. 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).

**Services**

Services: Augmentation interaction layer and their corresponding Model(s).

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.

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, Interaction 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.

Service URIs:

Service URIs: Context Kind (inputs / outputs domain / range). Example: predictions, classification, clustering, regression. Index / Naming / Registry "contexts" (facets).

Extended content types activations on domain / range (verbs, augmentations). Example: image, face, coords.

Functional Resource Model / Context / Attributes / Kind design / implementation. Serialization (Encoding / Models). Signatures. Reactive. Augmentation. DOM, Actor / Context / Role. APIs: Augmentation. Meta Resources.

Index

Naming

Registry

Service (URIs APIs). Index. Naming. Registry. Custom (signatures : Context Kind).

**Ontology Matching**

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.

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).

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. Dataflow.

**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**

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.

**Deployment**

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

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

**ToDo**

Interaction Layer in Meta Model. Rendering (Meta Model Message IO Augmentation): Aggregation, Alignment, Activation of Meta Model / Model Facets (sync / merge). Ontology Matching.

Encoding / Meta Model:

Resource;

Role (CSPO);

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

Kind (Statement\*) : Resource;

Class (Kind\*) : Resource;

Context (Class\*) : Resource;

Hierarchies:

Context: class (extension);

Object: super class (intension);

Meta Model Layers:

(Template, Mapping, Transform, Model);

(Augmentation, Template, Mapping, Transform);

A: (Resource, Augmentation, Template, Mapping);

B: (Role, Resource, Augmentation, Template);

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

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

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

F:.(Context, Class, Kind, Statement);

Contexts (example):

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

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

Contents (example: F occurrence contents):

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

IDs: DIDs. Resource Addresses. Occurrences Context / Content Encoding. Template / Transform Mapping Augmentation routes discovery (patterns).

Encode IDs: Contextual occurrence metadata. Declarative (Meta) Resources. Enable algorithmic Ontology Matching, Augmentation / Rendering and Service encoded Resource resolution.

Encoding: XML / XSL. IDs: nested lists, XSL to / from RDF Quads. Template matching. Ontology Matching / Rendering / Augmentation encoded mapping transform Augmentation algorithms.

Functional API:

Resource<OntResource>;

Message<Resource>;

Template<Message, Kind>;

Transform<Message, Kind>;

Mapping : Functor<Template, Transform>;

Render possible Mapping : Augmentation signature (Context Kind).

Mapping Kinds: Template Resource Kind mapped to Transform Resource Kind. Dataflow. Monadic map / unit /bind.

Message: dialog prompts. CSPO Kind Mapping. Resolve Mapping according contexts. Posible Augmentations: variables, placeholders, expressions. Perform possible Augmentations (CDI) Dataflow from Meta Model Interaction Layer rendered input Messages. Monadic map / unit / bind.

Order: same Augmentations Context, concatenated Template(s) / Transform(s). Hierarchies: Context: class (extension); Object: super class (intension);

Encoding / Dimensional example: role in context. X is Y for Z in W.

(W (Z (X (Y))));

Examples:

(Marriage (Role (Man (Husband))));

(Hour (Minute (1 (60))));

Encoding, Functional, Semiotic, Dimensional, Meta Model. Units. Events. Order. Relations. Comparison. Input layers. Augmentation.

Ontology Matching:

Facets / Levels (Schema):

Functional: (Class, Role, Entity, Statement);

Semiotic: (Context, Sign, Concept, Object);

Dimensional: (Dimension, Unit, Measure, Value);

Werk: Deployment, Platforms. Messaging. Persistence. RDF Backend. Functional Message Driven Model APIs.

Reactive Dataflow (Resource Interaction Layer: Message Augmentation). Functional content Activation (Context Kinds: domain / range; order).

Services Endpoints: APIs (DCI Dialog). OGM. OData. HAL. Index. Naming. Registry. Connectors.

DIDs: Endpoints, Ontology Matched URIs. P2P. Persistence.

Encoding (Dataflow): Monads / Functional / MapReduce (Augmentation Transform Template Mapping / Ontology Matching map / reduce events: Properties dot notation graph encoding) IO. Connectors / Persistence streams.

Architecture. Services: Model, API, Endpoints (Messaging, Connectors: Services). Dataflow: Services bindings (Service Model).

Implementation:

Architecture. Configuration: Bus, Services (Model, APIs), Connectors (Interaction APIs, Implementation). Dataflow: Services bindings signatures / interactions (Service Model APIs).

Services: Model, APIs, Reactive Dataflow Protocol (Bus Dialog Services Model Messaging).

Connectors: Functional Services APIs. Reactive Services APIs I/O. Interactions integration (adapters) APIs. Levels abstraction.

Configuration: Main peer process. Spring, Vert.x, ServiceMix, others.

Bus: Resource publish / subscribe. Topics, Queues.

Bus: Signatures. Service Model exported domain / range (Services interface).

Services: Bus Resource publish / resolve (Service discovery). Message Activation performs Services Augmentations (knowledge / behavior transforms).

Services (Dataflow signature interfaces from Service Model): Source (poll / feed) Service. Sink (output / dest). Processor (consumer / producer).

Connectors: Services Resource I/O events translation (routing). Integration gateways / facades.

Connectors: Persistence (DIDs), Reasoning / Inference, Integration (DBs, services, apps), Clients (HAL, OData, OGM) etc.