## Application:

Workflows (Domain Goals) general purpose ontology matching integration framework.

The idea is basically that if you have: A) an ERP, B) a CRM, C) Drive or similar and D) an issue tracker / workflow / BPM or similar you see a "syndicated" dashboard that allows you to browse "annotated" hypermedia aligned and matched about the state of the processes in each of them.

After that if you act in A certain behavior the relevant / entailed changes are reflected in B, C and D (according to the processes and flows of the business domains of the applications that you have integrated) and that, through a “virtualized” model, have a homogeneous / aligned view (google JBoss Teiid, as an eventual back end, for example) of the domains you have.

All this through a back end of graphs (triple store), functional programming, "ontology matching", inferences and even Machine Learning in layers from the model to the functional view and various types of clients / APIs of applications or services.

Then there was the issue to export to a "standard" format (WS- \* / StratML, Swagger, GraphQL or an "Object Graph Mapper") the metadata that allows to consume or create endpoints / services / clients "declaratively" on the "inference" of what would be the APIs or interfaces and their flows (google REST HATEOAS or REST HAL) from what was integrated. All this goal / purpose driven: metadata about the processes / domains and their objectives.

There are particular cases (WS- \* / StratML, for example) that would serve both as "input" for the description of domains orchestration and for formatting the "output" of some type of description / interfaces.

### Features:

Data, Information, Knowledge exchange: data / schema / behavior Augmentation of virtualized and syndicated / aligned business domains. Business domains applications purpose / problem "spaces" interactions / translations. Addressable interactions: event sourcing. Purpose modelling: Business Domains.

Products And Services Community Exchange Network. Resource Oriented Knowledge Computing. Purpose driven Needs / Goods / Products Goals interactions.

Semantic Hypermedia Browser: declarative front-end / services. Forms / Flows. Annotation, Augmentation & other Domains.

Domains Workflow. Layer Contexts Domains. Domains Workflows (Domain Goals) general purpose ontology matching integration framework.

Levels: Upper / Onto Matching: reify Resource upper layers as Resource and aggregate into lower layers. Reified Entity, Relationship, Flow, Domain as upper layers and aggregated downwards (Rules / Productions). Productions dataflow (domain / range). From UI Gesture to backend operations.

### Domain Component Model:

Runtime configured (model: triple store, controller: object layer, view: functional layer) for Message parsing and Augmentations executions.

#### Model:

Triple Store. Meta Model Schema (RDF / RDFS). Upper Ontology. Primitives.

##### Meta Model Quads schema:

Message : Object

(Object, Object, Object, Object);

Value : Message

(Value, Occurrence, Attribute, Value);

Field : Value

(Field, Value, Occurrence, Attribute);

ID : Field. occurrence (PK) : Object

(ID, Field, Value, Occurrence);

Context : ID. instance (table) : Context

(Context, ID, Field, Value);

Role : Context. metaclass (CSPO)

(Role, Context, ID, Field);

Resource : Role. class. Monad Value (instance)

(Resource, Role, Context, ID);

Kind : Resource. selector / transform (Functor mapping). Monad Value Type (metaclass / role)

(Kind, Resource, Role, Context);

Statement : Kind (context)

(Statement, Kind, Resource, Role);

Relation : Statement. Kind Grammar (Productions). Monad Instance (occurrence)

Entity : Kind Grammar (Rules). Monad Type (class)

(Relation, Statement, Kind, Resource);

Relationship : Relation

(Relationship, Relation, Statement, Kind);

Flow : Relationship

(Flow, Relationship, Relation, Statement);

Domain : Flow

(Domain, Flow, Relationship, Relation);

#### Controller:

Resource Layers object hierarchy API.

Controller: Resource Layers object hierarchy API. Named Transforms (Resource URI Service interface / implementation bindings) dataflow: signatures pipelines. Triple Store object graph (DTOs).

Functional Layers Domain model / transforms (events / controller). Named Transforms (Resource URI Service interface / implementation bindings) dataflow: signatures pipelines.

##### Triple Store object graph (DTOs):

Value

Sign

Object

Context

Role

Resource

Kind

Statement

Relation

Entity

Relationship

Flow

Domain

TBD.

#### View:

Layers Domain hierarchy (Functional API).

Monads AST / Parser Builder. Monads: Parsing / Matching, Zippers. Introduction. API: Augmentations, Transforms / Mappings. Traversal. Dataflow.

Layers Monads / Parser Monads (Messages : Rules / Productions). Functional events dataflow (selector signatures : Layer instance Activation).

Domain Declarations: populate layers from Semiotic Context layer Domain description layers resources: Service Resources I/O layers matching / producing semiotic statements for Domain I/O.

##### DOM / AST Hierarchy:

Message<Object[]>;

Value<Message[]>;

Attribute<Value[]>;

Occurrence<Attribute[]>;

Value<Occurrence[]>;

Field<Value[]>;

Object<Field[]>;

Context<Object[]>;

Role<Context[]>;

Resource<Role[]>;

Kind<Resource[]>;

Statement<Kind[]>;

Relation<Statement[]>;

Entity<Relation[]>;

Relationship<Entity[]>;

Flow<Relationship<Entity[]>;

Domain<Flow[]>;

Functional Model Monads wraps Meta Model Layers DTOs which represents an endpoint / interface for its Resource URI type and instance.

### Augmentations:

Domain Controllers (DTO) handled Functional Model API Transforms.

#### Aggregation:

Clustering stream. Registry. Attribute Roles in Contexts. Populate schema quad layers.

Productions: Layers down through the contexts hierarchy are "productions" of previous layers.

Rules: Layer contexts aggregates previous layers contexts as their subjects matching / aggregating same subjects / predicates / objects.

Layers conform a hierachy of which Value is root and Domain is the last Layer in the inheritance chain.

Layers Resource Context / DOM API. Levels (inheritance hierarchy reification). Upper / Lower Layer Roles. Transforms. Bindings (contexts resolution by reference model matchings).

#### Activation:

Classification stream. Naming. Attribute Types in Contexts. Populate model Kinds.

Kinds: (Context : Kind, Resource, Attribute, Value);

Hierarchies: Resource reified Kind as Kind Resource (sub Kind).

Kinds layouts:

(S, P): OK; (P, O): SK, (O, S): PK; (SK, OK): CK;

Role: Sets. Layers CSPO Resource types.

Type Promotion (roles). Order (dataflow). Reified Relation / Relationship (Production / Rule) context roles / interactions. Matching.

#### Alignment:

Regression stream. Index. Attribute Values in Contexts. Align / complete missing information.

Model reification: Role Context. Addressable Augmentations (Object extension which is result of Context intension).

Kinds: Streams of corresponding Roles.

Semiotic Layer: (Augmentation, Subject, Predicate, Object);

Reference Model: Map Reduce. Reified Layers. Levels.

### Message I/O:

Reactive event driven Message matching / processing / emission of aggregated results.

Message matching domain layer context instance is subject to the augmentations of regular input values at its corresponding layer (levels) and is populated with an aggregated response of which augmentations gave as result.

Message Layer : Upper Model Layer Context. Semiotic (Domains) Layer Contexts: Resources performing domains business logic.

Message: Perform Augmentations as with source Domains data (Message Layer Context type, Prompts / Assertions: TBD).

Dataflow: streams, domain / range, endpoints, routes, pipelines. Message I/O (prompts: model / client). Bus: Message dispatch. From Aggregation Dataflow matching context subject, kind, resources. Semiotic layer encodes domains graph dataflow.

Meta Model parsing (by Functional API): Layer Rules (inference prescriptions) / Layers Productions (inference propositions). Parse Message as corresponding Layer Context (for which Message proposition is true for prescriptions).

Transforms: Kind (transform: Relation Productions of Entity Kinds). Dataflow: Result Transform matching rules signatures.

Build Message graph via navigation of the model (Forms / Flows HATEOAS APIs, Kinds domain / range). Transform mapping: Kind prompts: apply Rule Kind to Production Resource: Productions.

### Component Domains:

Functional event driven Domains configures models behaviors. Domain types: service resources, interfaces (transforms), signatures (dataflow).

I/O / Persistence Domain.

Sets Augmentations Domain.

FCA Augmentations Domain.

Endpoints I/O Domain.

Predictions Domain.

Dimensional Domain.

Registry Domain.

Index Domain.

Naming Domain.

Business Domains: business specific domain types.

#### I/O / Persistence Domain:

Events (event sourcing). Backends. Peers. DIDs.

Semiotic (Functional Message Signature): (PersistenceType, PersistenceSubject, PersistenceMember, PersistenceValue);

Type Kind: Domain Service Handler. Domain signatures (domain / range: Subject Kind / Object Kind). Domain graph mappings context handler: function P(S) : O.

Subject Kind: domain persistence resource types (employee).

Member Kind: persistence members resource types (employee/salary;ARS).

Value Kind: range resource types (salary;ARS).

Reify Persistence semiotic predicates as Relationship Relations (Values as Relation Resources). Align domain / range with domains / primitive types (Member Kind, salary;ARS).

Event sourcing:

(PersistenceContext, PersistenceContext, PersistenceMember::new, PersistenceSubject);

(PersistenceContext, PersistenceContext, PersistenceMember::delete, PersistenceSubject);

(PersistenceContext, PersistenceSubject, PersistenceMember::delete, PersistenceSubject);

#### Sets Augmentation Domain:

Semiotic mappings population. Augmentations: Aggregation (layers), Alignment (ontology), Activation (layers dataflows). Render Resource hierarchies.

Semiotic (Functional Message Signature): (SetContext, SetParent, SetSubject, SetChildren);

Context Kind: Domain Service Handler. Domain signatures (domain / range: Subject Kind / Object Kind). Domain graph mappings context handler: function P(S) : O.

Parent Kind: domain resource types (resource).

Subject Kind: attribute resource types (resource/resource).

Children Kind: range resource types (resource).

Reify Sets semiotic predicates as Relationship Relations (Values as Relation Resources).

Sets API: Augmentations, Transforms / Mappings. Traversal (Context, Statement, Kind, Resource).

#### FCA Augmentations Domain:

Semiotic mappings population. Augmentations: Aggregation (layers), Alignment (ontology), Activation (layers dataflows). Objects / attributes objects / concepts traversal. Render Resource hierarchies.

Semiotic (Functional Message Signature): (FCAContext, FCASubject, FCAAttribute, FCAValue);

Context Kind: Domain Service Handler. Domain signatures (domain / range: Subject Kind / Object Kind). Domain graph mappings context handler: function P(S) : O.

Subject Kind: domain resource types (resource).

Attribute Kind: attribute resource types (resource).

Value Kind: range resource types (resource).

Reify FCA Context semiotic predicates as Relationship Relations (Values as Relation Resources).

FCA API: Augmentations, Transforms / Mappings. Traversal (Concepts, Objects, Attributes, Products).

FCA / VSM (Vector Space Model) Meta Model Context Encoding:

Attributes: Resource URIs. Polygon side lengths (class).

CSPO Roles (scaling): polygon sides (metaclass).

CSPO scaling: ordered side position.

Polygon sides dot-notation ordered sides lengths: Resource Layer Statement IDs (instance).

Sides dot-notation sum: side in context (occurrence).

Normalization: Resource URI attributes embeddings / primes quad polygon sides lenghts.

Nested Resource encoded attribute values (layers hierarchy): sides lengths concatenation (ordered dot notation) sum (occurrence).

Graph navigation (layers / transforms: concepts / objects containing / contained in concepts / objects attributes IDs / lengths).

FCA Contexts. Encoding. Flows. Order (types: dataflow signatures domain / range, instances: dimensional attributes).

#### Endpoints Domain:

Streaming I/O Dataflow.

Semiotic (Functional Message Signature): (EndpointContext, EndpointSubject, EndpointRequest, EndpointResponse);

Context Kind: Domain Service Handler. Domain signatures (domain / range: Subject Kind / Object Kind). Domain graph mappings context handler: function P(S) : O.

Subject Kind: domain resource types / referrer (employment).

Request Kind: request resource types (person).

Response Kind: response range resource types (employee).

Reify Endpoint semiotic predicates as Relationship Relations (Values as Relation Resources).

Augmented Resources Contexts / Interactions Services.

Forms / Flows (Grammar / Protocol Builder. Prompts). Resource augmentation endpoints. Forms / Flows browsing APIs. DCI: Declarative Forms / Flows.

OGM / Client Drivers Services.

REST: Current / referrer. Rel. HREF. Link body. Metadata. Endpoint Domain.

Monads: Reify available Transforms as activable Resources (Function addresses). REST / HATEOAS HAL.

Prompts / Dialogs: Function arguments (values / options) shown as link addresses in Transforms navigation Flows. Activation browse of Resources in Transform context.

Chained Activations for complete contexts resolution / flows. Complete layers productions rendering / navigation from higher to lower layers.

Browse: request address content representation (extracted from current state) embedding current state representation as request context body. Model matches address and returns augmentation using request body as argument / context.

#### Predictions Domain:

Semiotic (Functional Message Signature): (PredictionType, PredictionSubject, PredictionItem, PredictionValue);

Type Kind: Domain Service Handler. Domain signatures (domain / range: Subject Kind / Object Kind). Domain graph mappings context handler: function P(S) : O.

Subject Kind: domain resource types (image).

Item Kind: prediction resource types (image/face).

Value Kind: range resource types (face).

Reify Prediction semiotic predicates as Relationship Relations (Values as Relation Resources).

#### Dimensional Domain:

Semiotic Layer: (DimensionType, DimensionSubject, DimensionItem, DimensionValue);

Type Kind: Domain Service Handler. Domain signatures (domain / range: Subject Kind / Object Kind). Domain graph mappings context handler: function P(S) : O. Time example (contains / before).

Subject Kind: domain resource types (hour; dayOfWeek) : 1. Monday.

Item Kind: dimensional resource types (hour/minutes; dayOfWeek/dayOfWeek) relations: contains / before.

Value Kind: range resource types (minutes; dayOfWeek) : 60. Tuesday.

Data / Key Value: Price.

Information / Schema: Tuples. Price variation.

Knowledge / Behavior: Values relations. Monthly price increase.

Upper Ontology: relations / primitives.

Reify Dimension predicates as Relationships Relations (Values as Relation Resources).

Example: Marriage.

Predicates:

:aHusband :marriedWith :aWife

:marriedWith rdfs:domain :Male

:marriedWith rdfs:range :Female

Relationship:

(aMarriage : Relation, anStatement : marriageStatement, aKind : husbandRole, aResource : aHusband);

(aMarriage : Relation, anStatement : marriageStatement, aKind : wifeRole, aResource : aWife);

(Marriage : Relationship, Marriages : Relation, anStatement : marriagesStatements, aKind : marriageRole);

Predicates / Relationships, Relationships / Predicates entailment. Dimensional: inference / relation types / restrictions.

Encode order / hierarchies / relations (parent / child, prev / next, etc.) / iterations / conditionals / jumps.

Dimensional Domain: dimensions, units, measures, values. Comparisons, relations. State. Events (marriage example). Verbs (action, passion, state). Order (data / schema / behavior).

#### Registry Domain:

Key / Value for graph contexts, nodes, predicates.

Semiotic (Functional Message Signature): (RegistryType, RegistrySubject, RegistryKey, RegistryValue);

Type Kind: Domain Service Handler. Domain signatures (domain / range: Subject Kind / Object Kind). Domain graph mappings context handler: function P(S) : O.

Subject Kind: domain node resource types (person).

Key Kind: registry resource types (person/age;int).

Value Kind: range value resource types (age).

Reify Registry semiotic predicates as Relationships Relations (Values as Relation Resources). Align domain / range with primitive types (Key Kind, age;int).

#### Index Domain:

Indexing of graph contexts, nodes, predicates.

Semiotic (Functional Message Signature): (IndexType, IndexTerm, IndexScope, IndexValue);

Type Kind: Domain Service Handler. Domain signatures (domain / range: Subject Kind / Object Kind). Domain graph mappings context handler: function P(S) : O.

Term Kind: domain node resource types (resource).

Scope Kind: dimensional resource types (resource/resource).

Value Kind: range value resource types (resource).

Reify Index semiotic predicates as Relationships Relations (Values as Relation Resources).

#### Naming Domain:

Terms translation in contexts for graph contexts, nodes, predicates. Alignment / matching.

Semiotic (Functional Message Signature): (NamingType, NamingSubject, NamingContext, NamingValue);

Type Kind: Domain Service Handler. Domain signatures (domain / range: Subject Kind / Object Kind). Domain graph mappings context handler: function P(S) : O.

Subject Kind: domain node resource types (term).

Context Kind: dimensional resource types (term/term).

Value Kind: range value resource types (term).

Reify Naming semiotic predicates as Relationships Relations (Values as Relation Resources).

### Domains Dataflow:

Layers Dataflow: Augmentation. Rules / Productions matching (Reference Model / Kinds Aggregation).

Semiotic Dataflow: Object Kind matches Subject Kind of Context Kind signatures. (Sucessive Layers Dataflow).

### Ontology Matching:

Upper Ontology. Grammars. Primitives.

Matching: Resource occurs as context / occurrence / atribute / value or class / occurrence / context / metaclass / instance in equivalent occurrence contexts (kinds / order / shapes / type hierarchies).

Meta Model encodes mappings for equivalence / relations hierarchies for entities instance occurrences in roles in contexts for concepts recursively till upper onto / primitive terms / relations.

Reify relation from / to predicates (semiotic) / relation entity (expanded relation entity / roles statements). Dimensional measures / state events. Shapes: transforms / rules.

FCA Ontology Matching: Upper ontology / primitives. Reference Model objects / attributes encoding. Encoding (scaling): lattice concepts relations / transforms traversal.

Semiotic mappings population. Augmentations: Aggregation (layers), Alignment (ontology), Activation (layers dataflow transforms: context products).

Reference Model Contexts.

Meta Model Layers Contexts.

Alignments (Reference Model types / values):

Data Alignment: key / val.

Schema / Information Alignment: tuples.

Behavior / Knowledge Alignment: dimensional.

### Appendix:

#### Reference Model:

##### Encodings:

(Type, Object) Key / Value.

(Context, Subject);

(Subject, Predicate);

(Predicate, Object);

Reference Model: Key / Value de-referenceable (for matching / embedding purposes) URIs having as host the peer that identified the Resource. DIDs resolution. Cons cells encoding for Domain Component Model I/O.

Quads Encoding: (Context, Occurrence, Attribute, Value). Kinds. OGM. Sets / FCA. Context, Metaclass / Role, Class, Instance, Occurrence (Context).

Matching: Addressable / Browseable Encodings (FCA / Sets) / Identifiers. Order, Dimensional / hierarchical relations (attribute sets). Root Layers (Reference Model) traversal.

Functional: Selectors (TBD)

#### FCA Domain Contexts:

Semiotic (Functional Message Signature): (FCAContext, FCASubject, FCAAttribute, FCAValue);

##### Reference Model Context:

FCA Lattice (concepts / objects / attributes): (types / values) x (types / values). Encoding (IDs): ontology matching enabling type / instance calculations / traversal / transforms.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Value | Value | Value | Value |
| Object | X |  |  |  |
| Object |  | X |  |  |
| Object |  |  | X |  |
| Object |  |  |  | X |

##### Meta Model Context:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Resource A | | | |
|  | Context | Subject | Predicate | Object |
| Resource B | X |  |  |  |
| Resource C |  | X |  |  |
| Resource D |  |  | X |  |
| Resource E |  |  |  | X |

Encoding: FCA Scaling. FCA Context objects and attributes are corresponding CSPO Contexts types scaling enclosed Context types instances. A potential encoding of axes objects and attributes (rows and columns) would be a bitstring of length 4 x n, being n the length of an instance identifier for each quad Context encoded in its corresponding bitstring quad space (4 is for CSPO quad types instances identifiers segments). Then, navigation should be allowed from a pair of object / attribute to another object / attribute: (type, object) x (type, object): (type, object).

##### Layers Context:

For each layer context statement build tables which axes correspond to each context CSPO context types. Aggregate CSPO types / values in the form shown below (nested contexts).

Values intersections are instances of corresponding types. Example:

(RoleA x StatementB: KindC) : Kind RoleA plays in StatementB.

Rules are of the form:

(TypeA, TypeB) > AggregatedKindResources;

For example, in Relation lattice:

(someRoleA, someKindB) > AggregatedRelationResources;

Relation matrix:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Relation | Kind | Role | Statement |
| Relation | Relation | Kind | Role | Statement |
| Kind | Kind | Relation | Statement | Role |
| Role | Role | Statement | Relation | Kind |
| Statement | Statement | Role | Kind | Relation |

Matrices for other layers (Kind, Role, Statement, Resource, Context) contexts follows the same principles.

Nested Contexts:

Reifying one aggregated layer SPO layer (for example: Kind in the previous table) has original context matrix axes in the corresponding SPO layer (Subject in this case):

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Kind | Relation | Statement | Role |
| Kind | Kind | Relation | Statement | Role |
| Relation | Relation | Kind | Role | Statement |
| Statement | Statement | Role | Kind | Relation |
| Role | Role | Statement | Relation | Kind |

The purpose of this is to retrieve enough concepts (FCA) metadata to populate concepts / objects / attributes conforming a Lattice of related Resources and those relations values (as in the above example).

Layout: The aggregated statements have as Contexts the occurring SPOs in a Context layer statement and its SPOs are the occurrence Context and the other SPOs in the occurring statement. For a Context in an aggregated statement occurring as (SPO) in the occurrence statement, occurrence statement Context is its (SPO) and its aggregated (SPO) is occurrence statement (SPO).

Layout: Having a Context layer, a matrix (FCA context) of the form (CSPO x CSPO) is built for aggregation of models. The aggregated statements (rows / columns) have as Contexts the CSPOs (occurrences) of an axis and and its SPOs are given from the types / values of the context layout. For an aggregated Context statements / matrix, the original context is located in the (SPO) axis from the (SPO) which it was taken from the original Context matrix.

Augmentations: TBD.

Aggregation:

Activation:

Alignment:

Transforms (products / encoding) Dataflow:

Use cases:

Use FCA Lattice for sorting / ontology matching / augmentations / query / ontology browsing.

Aggregation: Complete contexts objects / concepts / attributes by FCA / inference.

Inference example: (Statement x Statement): Relations between both Statements.

Learning: ML embeddings for types / values / concepts.

TBD: (metaclass, class, occurrence, instance) relations / atttributes.

TBD: Set oriented intension (C) / extension (O) and relations between sets.

TBD: Discover IDs / encoding techniques enabling algorithmic translation of models operations.

#### Sets Domains:

Semiotic (Functional Message Signature): (SetContext, SetParent, SetSubject, SetChildren);

Augmentations:

Aggregation:

Kinds: (Context : Kind, Resource, Attribute, Value);

Hierarchies: Resource reified Kind as Kind Resource (sub Kind).

Kinds layouts:

(S, P): OK; (P, O): SK, (O, S): PK; (SK, OK): CK;

Role: Sets. Layers CSPO Resource types.

Layers Aggregation:

Productions: Layers down through the contexts hierarchy are "productions" of previous layers.

Rules: Layer contexts aggregates previous layers contexts as their subjects matching / aggregating same subjects / predicates / objects.

Activation:

Resource Context: Kind.

Alignment: Kind Attribute / Value Resource Statements. Shapes (inference of Attribute Value by context, class, metaclass, instance occurrences.

Transforms. Dataflow.

Sets Layout and encoding bitstring mask format:



#### To Do / Items:

* Test Browser (Forms / Flows HATEOAS debug console):
* Facets: Browse / Stream Model.
* Model: Browse / Stream.
* Messages: Build / Augmentation Response (Browse / Stream Model).
* Patterns:
* Master / Detail.
* Inheritance.
* Categories. Ordered Sets. Order relation. Inclusion properties / relations.
* Item: Inventory / Product. Order / LineItem.
* Others.
* Controller: DTOs:
* Aggregated super Contexts occurrences collection.
* Statements expanded view (occurrences traversal).
* Transforms:
* DTO: Mapping (Function). From DTO Layer type to DTO Context Layer occurrences type. Stateful Transforms.
* View: Monads:
* Layer Monad::of(Layer Monad hierarchcally compatible DTO);
* Layer Monad::flatMap(Layer hierarchically compatible DTO) : DTO Context Layer occurrences type Layer Monad.
* Layer Monad::value : DTO;
* Matching: Selectors.
* Traversal: Layers Contexts.
* Augmentations:
* Aggregation: Occurrences (clustering).
* Activation: Attributes (classification).
* Alignment: Values (regression).