# Encoding

ResourceURNs: Uniform identifiers across occurrences. DID URN. Endpoint. ResourceURN Statements: uniform functional metadata (contextual type / name, relations / aggregated occurrences). IDs Encodings.

Templates / Monads / Sets Interfaces. Graph layout. Traversal (Quads Monads). Set Membership Function: Interfaces CSPOs Types Matching Signatures.

Interface types differentiate in their CSPOs return value types (CSPOs type signatures: sets membership function).

Input / Canonical: Match Interfaces / Signatures: (Context, Occurrence, Attribute, Value);

Attribute / Value Roles in matching interface context. Order / hierarchy encoding: functions (sorted wrapped functional collections: wrappers set comparators / aggregation in axis).

Interface Quads Matching determine Sets (intersections) membership.

Hashing: IResourceURN, IOccurrence, IKind, IResource. Nested recursive URNs aggregations. Aggregations / Order / Mappings / Traversal APIs.

ResourceURN Occurrence, Kind, Resource Bindings Augmentation Service APIs:

## Encoding Layers

### Addressing Sail

* ResourceURNs DIDs:
* URN: DIDs. Endpoint APIs: Statements types / sets (Resource, Kind, Statement, Mapping, Transform OntResources hierarchy) content types / classes: Functional APIs. OntResource (DOM DTOs) quads representations references other DIDs, handle resolution, interactions, etc. via other DIDs endpoints and Resource Monad API.
* Method: did:ont:[ID]
* ID : OntClassName (Sets) ":" [HashedQuad];
* HashedQuad : [HashedURN] ":" [HashedURN] ":" [HashedURN] ":" [HashedURN];
* HashedURN : "[" HashedQuad "]" | HashedCSPOString;
* HashedCSPOString : Context ":" Subject ":" Predicate ":" Object;
* URN::ontResource (traversal parsed representation).
* OntResource::URN.
* Encoding: methods
* Hashing: four segments identifiers. Sets, binary octal digit order operable hashing (4 bit per segment). Aggregation: Statements graph layout. Occurrences. S-Expressions, MonParsec, CoSQL, map-reduce.
* URN: Encoded quad. Hashing: traversal, discovery, resolution. Merkle tree (DLT / Events). Encode typing / naming in context, about DID State Statements (hashing metadata):
* Occurrence ResourceURN : (ResourceURN, Occurrence, Kind, Resource);
* Kinds: Aggregate Attributes.
* State: Aggregate Kinds Resources Attributes / Values.
* Hierarchy: Kinds Attributes set (super) subset (sub) Kinds relationship.
* Order. Aggregation: Kinds / States lattice / tree. Populate / encode ResourceURNs order in contexts.

### Matching Sail

* DCI Context Model:
* DCI Relationship Contexts: Data / Schema / Behavior Model. DCI / MVC / Relationships Upper onto matching: gestures / flows.
* Metaclasses: PredicateKind SubjectKinds / ObjectKinds.
* Relationship: (Relationship, SubjectKind, PredicateKind, ObjectKind);
* PredicateKind of SK / OK. Employment(Employer, Employee); Employment (Employee, Position);
* Relation : (Relationship, Statements / Context, Role, Occurrence);
* Role : (Relation, Resource, Occurrence, Metaclass : Kinds);
* Occurrence : (Role, Relation, Context / Relation Statements, Resource);
* Discrete N-ary Relationship Aggregated Statements:
* Aggregated Statements traversal: expanded SPO form.
* Context: (Relationship : Predicate Kind, Relation : Statements, Role : Kind, Player : Resource);
* Predicate Kind of Reified S SK, O OK. (Relationship: Employment, Roles: Employee SK, Employer OK). Employment PK aggregated by Subjects and Objects Kinds. Relation Statements: Aggregated SK, PK, OK by Contexts Statement Kinds.
* (Working, workingRelationStmt, employer, IBM);
* (Working, workingRelationStmt, employee, John);
* Dimensional Relationships:
* (Dimension : Relationship, Measure : Relation, Unit : Kind, Value : Resource);
* (Time, oneHourStmt, minutes, 60);
* Distance Dimension: PK of Time SK / Meters OK. Define Dimension in terms of Relationship Kinds.
* Dimension Measure Statements: Domain PK Statements. Kind interface for Functional Transforms.
* Unit: PK Measure SK / OK Statement Kinds (SK / OK Members).
* Value: Dimension Measure Statement Kind Resource.
* Dimensional Order / Comparison: OrderKinds. Templates (populate).
* Order: Comparisons.

### Persistence Sail

## Encoding Layers Object Model

ResourceURN : (ResourceURN, Resource, Occurrence, Kind);

ResourceURN aggregates Resource Occurrences Kind. Encodings.

KindURN : (ResourceURN, Kind, Occurrence, Resource);

ResourceURN aggregates Kind Occurrences Resources. Encodings.

OccurrenceURN : (ResourceURN, Occurrence, Kind, Resource);

ResourceURN aggregates Occurrences Kinds Resources. Encodings.

SubjectResourceURN : (ResourceURN, Resource, Occurrence, SubjectKind);

Functional APIs:

Resource::getOccurrences

Resource::getKinds

Occurrence::getResources

Occurrence::getKinds

Kind::getResources

Kind::getOccurrences

Encoding:

IDs: Resource, Occurrence, Kind. ResourceURNs aggregation / order encoding.

Graph / Tree List Parent / Child hierarchical encoding / hashing.

Functional Data Flow. ResourceURN Events. Message Logs Streams / Traversal (Index Persistence Events Graph Interfaces):

(Occurrence, Kind, Resource)

(Occurrence, Resource, Kind)

(Kind, Occurrence, Resource)

(Kind, Resource, Occurrence)

(Resource, Occurrence, Kind)

(Resource, Kind, Occurrence)

Quads / SPOs hierarchical list encoding.

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Dataflow (value expressions). Signatures (events subscriptions: domain / range). Encode Order.

Hashing: IResourceURN, IOccurrence, IKind, IResource. Nested recursive URNs aggregations. Order / Mappings / Traversal.

Input / Canonical: Match Interfaces / Signatures: (Context, Occurrence, Attribute, Value); Attribute / Value Roles in matching interface context. Order / hierarchy encoding / functions (sorted wrapped functional collections: wrappers set comparators / aggregation axis).

# Augmentations

## Augmentations Layers

* Interfaces (Sets / CSPOs Roles). Kinds aggregate Resources, Resources aggregate Occurrences, Occurrences aggregate Kinds.
* IContext : measurement contexts. Statement (data / state), Mapping (schema), Transform (behavior) contexts.
* Reification: members of Kinds / Occurrences implements super sets types. Kinds of type implements that type. ToDo: resource or occurrence interfaces in statements signatures. Class patterns (multiple interfaces).
* Abstract interfaces: ISubject, etc. Align interfaces to CSPO roles (traversal / graph layout)
* Order:
* StatementKind: PK(SK, OK). Relationship(Roles). Context, State, Mapping, Transform Kinds.
* SK(PK, OK)?
* OK(PK, SK)?
* Statement: abstract assertions (parsed / inferred). Mapping: abstract schema. Transform: abstract behavior. Relationships (dimensional / discrete): core model / ontology, Statement, Mapping, Transform synchronized (input / inferred Statement Events are fully parsed from CSPO Sets Layer).
* Order. States (Statements), Flows (Mappings), Events (Transforms). Kinds hierarchy tree / lattice (FCA). Action / Passion / State order. Kinds / Mappings domain / range Aggregation, Activation, Alignment. Comparisons. DCI / MVC / Relationships / Dimensional Aggregated upper onto matching gestures / flows.
* Inputs / Canonical: Match Interfaces / Signatures: (Context, Occurrence, Attribute, Value); Attribute / Value Roles in matching interface context. Order / hierarchy encoding / functions (sorted wrapped functional collections: wrappers set comparators / aggregation axis).
* DCI Context Model:
* DCI Relationship Contexts: Data / Schema / Behavior Model. DCI / MVC / Relationships Upper onto matching: gestures / flows.
* Metaclasses: PredicateKind SubjectKinds / ObjectKinds.
* Relationship: (Relationship, SubjectKind, PredicateKind, ObjectKind);
* PredicateKind of SK / OK. Employment(Employer, Employee); Employment (Employee, Position);
* Relation : (Relationship, Statements / Context, Role, Occurrence);
* Role : (Relation, Resource, Occurrence, Metaclass : Kinds);
* Occurrence : (Role, Relation, Context / Relation Statements, Resource);
* Discrete N-ary Relationship Aggregated Statements:
* Aggregated Statements traversal: expanded SPO form.
* Context: (Relationship : Predicate Kind, Relation : Statements, Role : Kind, Player : Resource);
* Predicate Kind of Reified S SK, O OK. (Relationship: Employment, Roles: Employee SK, Employer OK). Employment PK aggregated by Subjects and Objects Kinds. Relation Statements: Aggregated SK, PK, OK by Contexts Statement Kinds.
* (Working, workingRelationStmt, employer, IBM);
* (Working, workingRelationStmt, employee, John);
* Dimensional Relationships:
* (Dimension : Relationship, Measure : Relation, Unit : Kind, Value : Resource);
* (Time, oneHourStmt, minutes, 60);
* Distance Dimension: PK of Time SK / Meters OK. Define Dimension in terms of Relationship Kinds.
* Dimension Measure Statements: Domain PK Statements. Kind interface for Functional Transforms.
* Unit: PK Measure SK / OK Statement Kinds (SK / OK Members).
* Value: Dimension Measure Statement Kind Resource.
* Dimensional Order / Comparison: OrderKinds. Templates (populate).
* Order: Comparisons.

### Aggregation Sail

* Aggregations: ResourceURNs Source IRIs Sets / Layers streams / events (Resources, Occurrences, Kinds) parse / Occurrences population.

### Alignment Sail

* Alignments: Aggregation traversal: ResourceURN URN IDs Model population. Merge / Matching, order / relations / contexts. Encoding (methods).

### Activation Sail

* Activations: Relationship Models I/O (DCI Layers / expanded SPO Aggregations feedback). DIDs URN hashing / generation (HATEOAS Endpoints). Data Flow.

## Augmentation Layers Object Model

* Interfaces (Sets):
* Resources:
* ISubject : IResource
* IPredicate : IResource
* IObject : IResource
* Occurrences:
* IContext : ISubject, IPredicate, IObject, ISubjectKind, IObjectKind, IPredicateKind
* Kinds:
* ISubjectKind : IKind, IPredicate,  IObject
* IPredicateKind : IKind,  ISubject,  Object
* IObjectKind : IKind, IPredicate, ISubject
* IContextKind : IKind, ISubject, IPredicate, IObject
* Resource<Sets>
* SubjectResource : Subject<Resource>, Resource<Subject> : Resource
* Input (SubjectKind): (SK, C, P, O)
* Output (SubjectResource): (S, C, PK, OK)
* PredicateResource : Predicate<Resource>, Resource<Predicate>
* Input (PredicateKind): (PK, C, S, O)
* Output (PredicateResource): (P, C, SK, OK)
* ObjectResource : Object<Resource>, Resource<Object>
* Input (ObjectKind): (OK, C, P, S)
* Output (ObjectResource): (O, C, PK, SK)
* Kind<Sets> : Resource
* SubjectKind : Kind<Subject>, Subject<Kind>
* Input (SubjectContext): (C, SK, PK, OK) / Composite SK(PK, OK) Statement
* Output (SubjectKind): (SK, C, P, O)
* PredicateKind : Kind<Predicate>, Predicate<Kind>
* Input (PredicateContext): (C, PK, SK, OK) / Composite PK(SK, OK) Mapping
* Output (PredicateKind): (PK, C, S, O)
* ObjectKind : Kind<Object> , Object<Kind>
* Input (ObjectContext): (C, OK, PK, SK) / Composite OK(PK, SK): Behavior
* Output (ObjectKind): (OK, C, P, S)
* Context<Sets> : Kind
* SubjectContext : Context<Subject>, Subject<Context>
* Input: (C, S, P, O)
* Output (SubjectContext): (C, SK, PK, OK) / Composite SK(PK, OK) Statement
* PredicateContext : Context<Predicate>, Predicate<Context>
* Input: (C P, S, O)
* Output (PredicateContext): (C, PK, SK, OK) / Composite PK(SK, OK) Mapping
* ObjectContext : Context<Object>, Object<Context>
* Input: (C, O, P, S)
* Output (ObjectContext): (C, OK, PK, SK) / Composite OK(PK, SK): Behavior.
* CSPO Inputs. Hierarchy (classes) populate aggregations upwards from CSPO Contexts. Layer produced statements from aggregation of previous layer productions.
* Kind<Kind<Subject<Context>>> : StatementKind: Resource. Kind of Kind: SK(PK, OK). Contexts Kinds
* Contexts: Resources, Kinds, Occurrences: Statement (relation data), Mapping (schema), Transform (behavior) Contexts: composite Kinds: SK(PK, OK), PK(SK, OK), OK(PK, SK) respectively.
* SubjectContext: Statement. Data. SK(PK, OK).
* PredicateContext: Schema. PK(SK, OK).
* ObjectContext: Behavior. OK(PK, SK).

# Services

## Services Layer

### Registry Service Sail

* Registry Service:
* ResourceURNs Statements bindings:
* Registry::resolve(ResourceURN) : dispatch to matching signatures:
* Registry::resolve(ResourceURN) : Resource
* Registry::resolve(ResourceURN) : Kind
* Registry::resolve(ResourceURN) : Occurrence
* Registry::resolveResourceURN(Resource, Occurrence, Kind) : Resource ResourceURN
* Registry::resolveResourceURN(Kind, Occurrence, Resource) : Kind ResourceURN
* Registry::resolveResourceURN(Occurrence, Kind, Resource) : Occurrence ResourceURN

### Naming Service Sail

Naming Service:

Input IRIs Encoding / Hashing. Input IRIs Matching. Endpoints (Messages Signatures). Semantic Hashing: DIDs. HATEOAS: Workflow states / referrers.

### Index Service Sail

Index Service / Logs:

Query Graphs of ResourceURN Nodes / Messages. Events driven Persistence.

## Services Layers Object Model

Services Layer Functional Dynamic Object Model:

DOM DCI HATEOAS. Functional. Traversal: Prompts / Transforms: Dialogs.

Bus Signatures Dataflow Sail. Dynamic Monads. Zippers, Transforms from domains. Dynamic Services functional domain / range signatures / subscriptions matching.

Functional Data Flow. ResourceURN Events. Message Logs Streams / Traversal (Index Persistence Events Graph Interfaces):

(Occurrence, Kind, Resource)

(Occurrence, Resource, Kind)

(Kind, Occurrence, Resource)

(Kind, Resource, Occurrence)

(Resource, Occurrence, Kind)

(Resource, Kind, Occurrence)

Monads:

ResourceURNMonad<ResourceClass : IResourceURN, etc.>

ResourceMonad<ResourceClass : ISubjectResource, etc.>

KindMonad<KindClass : ISubjectKind, etc.> Monad

OccurrenceMonad<OccurrenceClass : ISubjectOccurrence, etc.> Monad

* Proof of Concept: Achieve REST Facade (synchronized) of Relationships given inputs from a system backend:
* Inputs: Aggregate SPO into CSPO: Aggregates Contexts Type / Table / Class Kinds. Aggregate PK Cols, Cols : Occurrence, Val : Resources.
* Inputs (Rel / Graph): (Type / Table / Class, PK : Resource, Col : Occurrence, Val : Resource).
* Inputs (Rel / Graph) FKs: Val : Resource equivalent PKs.
* Input / Canonical: Match Interfaces / Signatures: (Context, Occurrence, Attribute, Value);
* Encoding / Matching:
* Functional Context:
* Metaclass
* Class
* Instance
* Context
* Occurrence
* Role
* Hierarchy: Roles / Primitives (upper / aggregated hierarchy).
* Input / Canonical: Match Interfaces / Signatures: (Context, Occurrence, Attribute, Value); Attribute / Value Roles in matching interface context. Order / hierarchy encoding.
* Upper Ontology: Need, Product, Good, Purpose. Goal.
* Upper Ontologies: From Primitives to Forms / UI Gestures.
* Units of Measurement (continuos) APIs /  Ontology.
* Discrete (events) APIs / Ontology. Relationships.
* Cube Statements:
* (Fact, Axis, Measure, Value);