

Query Gateway Ontology Support — Design

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Implementation status: Section 1 (pass realm/tenant into planning) is implemented: QueryPlanner and MorphiaUtils accept an optional variableMap; QueryGatewayResource builds variableMap from SecurityContext or from the request realm and passes it to convertToPlannedQuery in find() and deleteMany().

Integration

test:

`QueryGatewayResourceIT.find_with_hasEdge_receives_tenant_context_and_returns_200.`

Delete prevention: Query Gateway delete and deleteMany now enforce the same referential integrity as MorphiaRepo: `DeleteValidationService` runs before each delete (back-reference check for `@TrackReferences` and all `PreDeleteHook` beans, e.g. ontology `BLOCK_IF_REFERENCED`). On violation the gateway returns 409 (ReferentialIntegrity or DeleteBlocked). `deleteMany` loads matching entities (capped by `quantum.queryGateway.deleteMany.maxMatches`, default 2000), validates each, then deletes only those ids.

This document describes how to add ontology support to the Query Gateway API (`POST /api/query/find`, `POST /api/query/plan`, and related endpoints) so that callers can use ontology edge predicates (`hasEdge`, `hasOutgoingEdge`, `hasIncomingEdge`, and optionally `hasEdgeAny`, `notHasEdge`) in the query string and get correct, tenant-scoped results.

Chapter 1. Current State

1.1. Query Gateway

- **QueryGatewayResource** (quantum-framework) exposes:
 - `POST /api/query/find` — executes a BI-API query and returns a Collection envelope (rows, offset, limit).
 - `POST /api/query/plan` — returns mode (FILTER vs AGGREGATION) and expand paths.
 - `GET /api/query/rootTypes`, `POST /api/query/save`, `POST /api/query/delete`, `POST /api/query/deleteMany`.
- For FILTER mode, the gateway calls `MorphiaUtils.convertToPlannedQuery(req.query, root, limit, skip, sortFields)` and then applies `planned.getFilter()` to `ds.find(root)`. No realm or variable map is passed into planning.

1.2. Planner and Filter Building

- **QueryPlanner.plan(query, modelClass, limit, skip, sortFields)** (quantum-morphia-repos):
 - In FILTER mode it calls `MorphiaUtils.convertToFilter(query, modelClass)` — the two-argument overload that passes `null, null` for context (see `MorphiaUtils.convertToFilterWContext`).
 - In AGGREGATION mode it builds a root filter by calling `MorphiaUtils.convertToFilter(filterOnly, modelClass)` again without context.
- **MorphiaUtils.convertToFilter(queryString, modelClass)** delegates to `convertToFilterWContext(queryString, null, null, modelClass)`. When `pcontext` and `rcontext` are null, the listener is created as `new QueryToFilterListener(modelClass)` — i.e. no `PrincipalContext`, so no `variableMap`.
- **QueryToFilterListener** (quantum-morphia-repos) already implements:
 - `enterHasEdgeExpr`, `enterHasOutgoingEdgeExpr`, `enterHasIncomingEdgeExpr` — they read `tenantId` from `variableMap` (keys `pTenantId` or `tenantId`), then use CDI to look up `OntologyEdgeRepo` and call `srcIdsByDst(tenantId, predicate, dst)` (or the inverse for `hasIncomingEdge`). If `variableMap` is null or `tenantId` is blank, the ontology lookup is skipped and the listener pushes `Filters.eq("_id", "none")` (fail closed, no results).
- Conclusion: When the gateway runs a find with a query that contains `hasEdge(...)`, the filter is built with **no variableMap**, so **tenantId is null** and ontology lookups never run with a valid tenant. Result: `hasEdge` in the gateway effectively returns no rows for ontology-predicate queries.

1.3. Grammar

- **BI-APIQuery.g4** (quantum-models) already defines:
 - `hasEdgeExpr: hasEdge(predicate, dst)`

- `hasOutgoingEdgeExpr: hasOutgoingEdge(predicate, dst)`
- `hasIncomingEdgeExpr: hasIncomingEdge(predicate, src)`
- It does **not** define `hasEdgeAny(predicate, [id1, id2, ...])` or `notHasEdge(predicate, dst)`. Those exist only in **ListQueryRewriter** (quantum-ontology-policy-bridge) and are used by `OntologyAwareResource`, not by the BI-API parser.

1.4. Documentation

- `ai-agent-integration.adoc` and `QueryHintsProvider` state that "for the generic query gateway find, use attribute filters; for ontology-constrained lists, use the resource's ontology list endpoint." So the docs currently direct agents **away** from using ontology predicates in the gateway.

Chapter 2. Goals

1. **Enable ontology edge predicates in the gateway find** — When the request has a valid realm (or principal context with tenantId), `hasEdge`, `hasOutgoingEdge`, and `hasIncomingEdge` in the query string should resolve via `OntologyEdgeRepo` and return the correct entity set for that tenant.
2. **Single integration point** — Agents and UIs can use `POST /api/query/find` with ontology predicates instead of being directed to per-resource ontology list endpoints when they want relationship-based filtering.
3. **Optional: `hasEdgeAny` and `notHasEdge`** — Parity with `ListQueryRewriter` and `OntologyAwareResource` constraint semantics (e.g. "invoices for any of these customers", "exclude this org").

Chapter 3. Design

3.1. 1. Pass realm/tenant (or full variable map) into planning (required)

Problem: The gateway never passes realm or PrincipalContext into the planner, so the filter is built with no variableMap and hasEdge gets no tenantId.

Approach:

- **QueryGatewayResource.find(FindRequest req):**
 - Resolve realm as today: `String realm = resolveRealm(req.realm);`
 - Build a **variable map** for planning:
 - If `SecurityContext.getPrincipalContext()` is present, use `MorphiaUtils.createStandardVariableMapFrom(pcontext, resourceContext)` so that `pTenantId`, `tenantId`, `principalId`, etc. are set (and ontology + permission rules behave as in other resources). Pass a minimal `ResourceContext` for the gateway (e.g. `area=integration`, `functionalDomain=query`, `action=find`).
 - Else, build a minimal map with at least `pTenantId` and `tenantId` set to `realm`, so ontology lookups have a tenant even when the request is not fully authenticated (e.g. server-to-server with realm in the body).
- **MorphiaUtils** (quantum-morphia-repos):
 - Add overloads that accept an optional variable map and pass it into the listener: `* convertToFilter(String queryString, Class<?> modelClass, Map<String, String> variableMap) → if variableMap != null, use convertToFilter(queryString, variableMap, new StringSubstitutor(variableMap), modelClass); else current behavior (null context).` * Existing `convertToFilter(String, Map<String,String>, StringSubstitutor, Class)` already builds a listener with that variableMap; reuse it.
- **QueryPlanner** (quantum-morphia-repos):
 - Add an overload `plan(String query, Class<T> modelClass, Integer limit, Integer skip, List<SortSpec.Field> sortFields, Map<String, String> variableMap).`
 - In FILTER mode: call `MorphiaUtils.convertToFilter(query, modelClass, variableMap)` instead of `convertToFilter(query, modelClass).`
 - In AGGREGATION mode: when building the root filter from the stripped query, call `convertToFilter(filterOnly, modelClass, variableMap)` so that any `hasEdge` in the filter part is also tenant-scoped.
- **MorphiaUtils:**
 - Add `convertToPlannedQuery(String query, Class<T> modelClass, Integer limit, Integer skip, List<SortSpec.Field> sortFields, Map<String, String> variableMap)` that calls `planner.plan(..., variableMap).`
- **QueryGatewayResource:**

- In `find()`, build `variableMap` as above, then call `MorphiaUtils.convertToPlannedQuery(req.query, root, limit, skip, sortFields, variableMap)` (or a new overload that takes `variableMap`). In `deleteMany()`, do the same when building the planned query for the delete filter.

Result: `hasEdge` / `hasOutgoingEdge` / `hasIncomingEdge` in the gateway find query will receive a `tenantId` and `OntologyEdgeRepo` will return the correct source IDs for that tenant. No change to `QueryToFilterListener` ontology logic; only the gateway and planner must pass the map through.

3.2. 2. Optional: Add `hasEdgeAny` and `notHasEdge` to BIAPI grammar and listener

Goal: Align gateway query syntax with `ListQueryRewriter` and `OntologyAwareResource` (e.g. "receivables for any of these customers", "orders not in this org").

- **BIAPIQuery.g4** (quantum-models):

- Add rules, e.g.:


```
* hasEdgeAnyExpr: HASEDGEANY LPAREN
  predicate=(STRING | QUOTED_STRING | VARIABLE) COMMA dstList=valueListExpr
  RPAREN;
  notHasEdgeExpr: NOTHASEDGE LPAREN
  predicate=(STRING | QUOTED_STRING | VARIABLE) COMMA
  dst=(STRING | QUOTED_STRING | VARIABLE | OID | REFERENCE) RPAREN; *
```
- Add tokens: `HASEDGEANY: 'hasEdgeAny'; NOTHASEDGE: 'notHasEdge';`
- Add to `allowedExpr`: `hasEdgeAnyExpr | notHasEdgeExpr`.

- **QueryToFilterListener** (quantum-morphia-repos):

- Implement `enterHasEdgeAnyExpr`: resolve `tenantId` from `variableMap`; for each value in `dstList`, call `OntologyEdgeRepo.srcIdsByDst(tenantId, predicate, dst)` and take the union of IDs; push `Filters.in("_id", objectIds)` (or `Filters.eq("_id", "none")` if empty). Reuse the same CDI/reflection pattern as `hasEdge` so that `quantum-ontology-mongo` remains an optional dependency.
- Implement `enterNotHasEdgeExpr`: resolve `tenantId`; get source IDs for that (predicate, dst); then push `Filters.nin("_id", objectIds)` (entities whose id is **not** in the set that have the edge). If the set is empty, do not restrict (all entities pass the `notHasEdge` clause).

- Regenerate ANTLR lexer/parser after grammar changes; add/update unit tests for the new expressions.

Priority: Can be done in a follow-up once `realm/variableMap` wiring (design 1) is in place and `hasEdge` works in the gateway.

3.3. 3. Documentation updates

- **planner-and-query-gateway.adoc:**

- In "Request/Response: `/api/query/find`", state that the query string may include ontology edge predicates: `hasEdge(predicate, dst)`, `hasOutgoingEdge(predicate, dst)`, `hasIncomingEdge(predicate, src)`. When the application includes `quantum-ontology-mongo`

and the request has a valid realm (or principal context with tenantId), these predicates restrict results to entities that have the corresponding ontology relationship in the current tenant. If realm/tenant is missing or ontology is not wired, hasEdge-style predicates evaluate to no results (fail closed).

- **ai-agent-integration.adoc** and **QueryHintsProvider**:
 - Update the ontologyEdges / didYouKnow text to say that the **query gateway find** supports hasEdge / hasOutgoingEdge / hasIncomingEdge when a realm (or principal) is present; agents can use these in the same query string as attribute filters and expand(...). Optionally mention hasEdgeAny and notHasEdge if implemented.
- **ontology.adoc** (or rest-crud):
 - Add a short subsection that the Query Gateway (**POST /api/query/find**) honors ontology edge predicates in the BIAPI query when the request supplies a realm or the principal context has a tenantId; OntologyEdgeRepo (quantum-ontology-mongo) must be on the classpath.

3.4. 4. Optional: Ontology context via gateway

- Some clients may want "ontology edges for entity X" without calling a resource-specific endpoint. Options:
 - (a) Do not add a gateway endpoint; keep using **GET /{basePath}/id/{id}/ontology** per OntologyAwareResource.
 - (b) Add **GET /api/query/ontologyContext?rootType=...&id=...** (or POST with body) that resolves rootType to a collection, looks up OntologyContextEnricher (or OntologyEdgeRepo), and returns the same shape as the existing ontology context response. This requires the gateway (or a shared service) to depend on quantum-ontology-mongo and to know how to get DataDomain from the request (realm/principal). Low priority unless we want a single discovery surface for agents.

Recommendation: Omit (b) for the first iteration; document that ontology **context** (edges for one entity) remains on OntologyAwareResource detail endpoints.

Chapter 4. Dependencies and Backward Compatibility

- **quantum-framework** already depends on `quantum-morphia-repos`. It does not depend on `quantum-ontology-mongo` or `quantum-ontology-policy-bridge`. `QueryToFilterListener` uses CDI + reflection to resolve `OntologyEdgeRepo` and `OntologyAliasResolver`, so when those beans are not present, `hasEdge` fails closed (no results). No new compile dependency is required for the gateway; applications that want ontology in the gateway must include `quantum-ontology-mongo` (and typically `quantum-ontology-policy-bridge`) as today.
- Passing a `variableMap` from the gateway into the planner is backward compatible: when `variableMap` is null, behavior stays as today (`convertToFilter(query, modelClass)` with no context). Existing callers of `convertToPlannedQuery` without `variableMap` are unchanged.

Chapter 5. Implementation Order

1. Phase 1 — Realm/variableMap in gateway (required):

- MorphiaUtils: add `convertToFilter(query, modelClass, variableMap)` (delegate to existing overload when `variableMap != null`).
- QueryPlanner: add `plan(..., Map<String, String> variableMap)` and use `convertToFilter` with `variableMap` in both FILTER and AGGREGATION paths.
- MorphiaUtils: add `convertToPlannedQuery(..., Map<String, String> variableMap)`.
- QueryGatewayResource.find(): build `variableMap` (from `PrincipalContext` or minimal map from `resolveRealm`), call `convertToPlannedQuery(..., variableMap)`.
- QueryGatewayResource.deleteMany(): same when building the filter for the delete query.
- Test: integration test that POST `/api/query/find` with query containing `hasEdge(predicate, dst)` and valid realm returns expected rows when ontology edges exist.

2. Phase 2 — Docs:

- Update `planner-and-query-gateway.adoc`, `ai-agent-integration.adoc`, `QueryHintsProvider`, and `ontology/rest-crud` as in section 3.

3. Phase 3 — Optional `hasEdgeAny` / `notHasEdge`:

- Grammar + listener + tests; then document.

4. Phase 4 — Optional ontology context endpoint: Only if required; otherwise keep context on `OntologyAwareResource`.

Chapter 6. Summary

| Item | Action | |-----|-----| | **Realm/tenant in planning** | Gateway builds variableMap (from PrincipalContext or minimal { pTenantId, tenantId } = realm) and passes it into MorphiaUtils.convertToPlannedQuery / QueryPlanner.plan. MorphiaUtils and QueryPlanner gain overloads that accept variableMap and pass it to convertToFilter. | | **hasEdge in find** | No change to QueryToFilterListener; once variableMap contains tenantId, existing hasEdge/hasOutgoingEdge/hasIncomingEdge logic works. | | **hasEdgeAny / notHasEdge** | Optional: add to BIAPI grammar and QueryToFilterListener so gateway find supports the same semantics as ListQueryRewriter. | | **Documentation** | State that gateway find supports ontology edge predicates when realm/tenant is set and quantum-ontology-mongo is on the classpath; update agent hints. | | **Ontology context** | Leave on OntologyAwareResource; no gateway endpoint in first iteration. |

This design adds ontology support to the query gateway API in a minimal, backward-compatible way by threading the existing realm/principal context into the filter-building path so that ontology edge predicates already implemented in QueryToFilterListener receive a tenantId and behave correctly.