

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.