

Req6-1-6-3 vs Req6-4 Proposal – Comparison

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Summary

- **Req6-1-6-3 (implemented)**: provide *downward query* (structural + expanded) and *upward paths* (segments), with deep bbox and TooManyResults guardrails.
- **Req6-4 (proposal)**: add *detailed path edges* and *direct parent/child queries* to make debugging and fanin/fanout analysis practical.

Comparison Table

Item	Req6-1 (query_down structural)	Req6-2 (query_up_paths)	Req6-3 (query_down expanded)	Req6-4 (proposal)
Primary use	From a root cell, list instance records by depth (arrays not expanded)	From TOP, list paths to a target cell (segments)	From a root cell, list instance records by depth (arrays expanded)	Debug/analysis: detailed paths + direct parent/child queries
Direction	Down	Up (from TOP)	Down	Up + local (parents/children)
Array handling	1 record per array instance	Path traversal sees instance edges; does not expose per-array element	Expands regular arrays to per-element records with <code>expanded_index</code>	Proposal includes both: detailed edges and (optionally) expanded variants
Output core	<code>instances[]</code> records	<code>paths[]</code> (segments)	<code>instances[]</code> records (expanded)	<code>paths[]</code> with edge details + <code>parents[]</code> / <code>children[]</code> convenience endpoints
Path context	Each record has <code>path</code> (segments) from query root to the parent cell containing the instance	Each path is <code>segments=[gds, TOP, ..., target]</code>	Each record has <code>path</code> (segments) from query root to the parent cell	Proposal adds edge list per path (each edge carries instance metadata)
BBox	Deep bbox (all layers) per instance record	Not included	Deep bbox (all layers) per expanded element record	Required; especially useful on per-edge records and parent/child queries
TooManyResults guardrail	<code>limit</code> (default 10k) → error <code>TooManyResults</code> with clear message	<code>max_paths</code> (default 10k) → error <code>TooManyResults</code>	<code>limit</code> (default 10k) → error <code>TooManyResults</code>	Applies to <code>max_paths</code> / <code>limit</code> similarly; requires clear message/comment
Multi top cell	Not required (root is explicit cell)	Error if multiple/no top cell	Not required (root is explicit cell)	For TOP-based queries: still error ; for local queries (parents/children) can be independent (needs final decision)
Typical questions answered	"From this cell, what do I instantiate within N levels?" "Where is this cell used (as a path from TOP)?" "How many physical instance elements exist under this root (bounded by limit)?" "Show me the exact chain and transforms/bboxes along each path" + "Who are my direct parents/children?"			

Req6-4 Proposed Methods (draft)

6-4.1 `hier.query_up_paths_detailed`

- Input: `cell` (target), `mode` (structural/expanded), `max_paths`
- Output: list of paths, each containing:
 - `segments`: `[gds, TOP, ..., target]`
 - `edges`: per-step instance descriptors (parent-child), including trans/array/bbox (+ `expanded_index` when applicable)

6-4.2 `hier.query_parents`

- Input: `cell`, `mode`, `limit`

- Output: direct parents with instance metadata.

6-4.3 `hier.query_children`

- Input: `cell`, `mode`, `limit`
- Output: direct children with instance metadata.