Executive White Paper
Gangplank
"Operationalizing AI to Bridge Mission Data Silos"

Integrate across existing mission systems
Federate distributed operational data
Accelerate operational decision-making

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1 Executive Summary

Modern mission and enterprise environments depend on rapidly correlating fragmented data across operational systems, APIs, geospatial services, sensor platforms, and partner networks. Yet most organizations still operate within disconnected data ecosystems that require specialized technical expertise and manual integration to access critical information.

Gangplank addresses this challenge by providing an AI-assisted federated operational data access and semantic normalization layer capable of rapidly onboarding, querying, and correlating disparate data sources across distributed environments.

Rather than functioning as a standalone replacement platform, **Gangplank integrates directly into existing operational architectures and mission systems,** enabling interoperability and data access within the tools and workflows already in use.

Built to support modern operational environments, Gangplank enables agencies and organizations to:

- Rapidly onboard and normalize new data sources
- Reduce custom integration overhead
- Federate queries across distributed systems
- Preserve source-of-truth ownership and governance
- Enable AI-assisted interoperability across mission environments
- Expose fragmented data through a unified query surface

The platform combines AI-assisted onboarding, semantic field normalization, protocol abstraction, federated query orchestration, and multi-dimensional analysis to create a scalable bridge between legacy systems and emerging AI-enabled workflows.

2 The Operational Challenge

Data Silos Are Everywhere

A typical mission environment may contain operational geospatial layers in ArcGIS, logistics and sustainment data exposed through REST APIs, ISR feeds accessible through STAC catalogs, partner-system intelligence feeds, infrastructure status services, and mission planning data distributed across multiple disconnected platforms. Each environment introduces unique authentication models, query methods, response structures, and operational workflows, making cross-system analysis increasingly difficult.

Specialized Knowledge Required

Finding data across these systems requires technical expertise. An analyst who wants to know "*Which operational assets are associated with this geographic region?*" or "*Which feeds and entities are associated with this corridor?*" needs to understand which system holds the data, how to authenticate, what query format to use, and how to interpret the response. This creates bottlenecks and excludes non-technical stakeholders from direct data access.

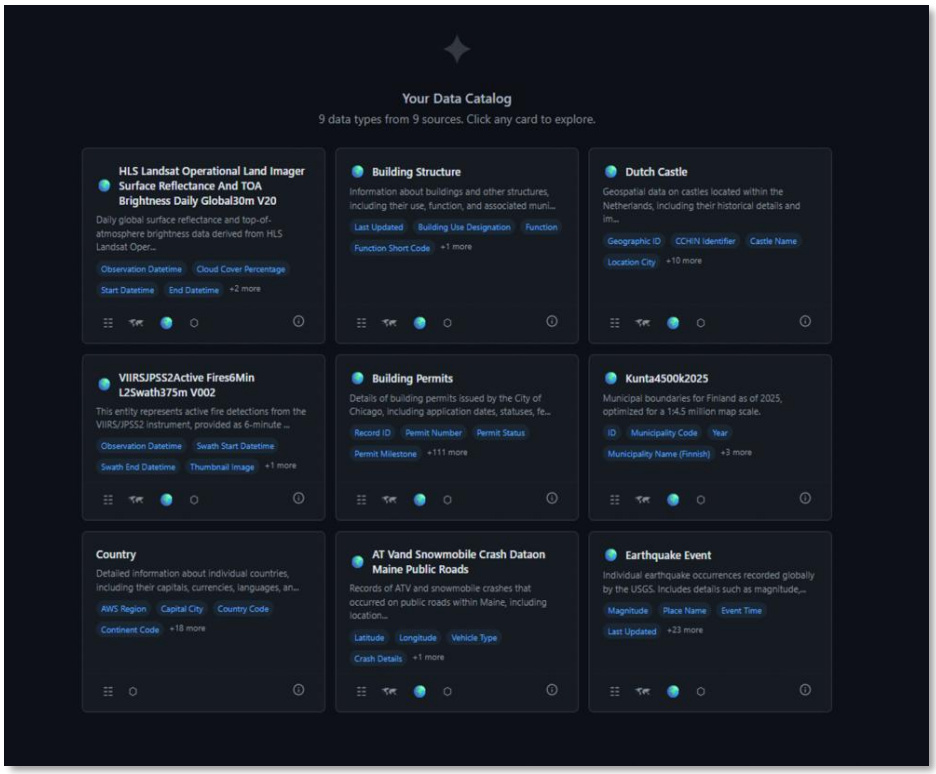
No Unified View
Even when data can be accessed, there is often no unified operational picture across distributed systems. Correlating ISR feeds, geospatial operational layers, infrastructure data, partner-system intelligence, and mission event streams frequently requires manual effort across multiple disconnected tools as well as protocol-specific expertise.

3 The Solution: Gangplank

Gangplank is a federated operational interoperability and semantic normalization layer designed to integrate directly into existing architectures, rather than function as a standalone system.

It handles the complexity of connecting to, querying, and normalizing data across APIs and distributed environments, while enabling interoperable data access within existing tools, workflows, and operational interfaces.

Geospatial data receives first-class support through maps, globes, and location-aware queries, but Gangplank works equally well with non-spatial data sources and operational systems.



The Data Catalog shows all connected data types at a glance, with field previews and direct-access view mode buttons.

Federated Operational Data Access

Rather than relying on centralized ingestion pipelines or custom middleware development, Gangplank abstracts heterogeneous systems behind a unified operational query and interoperability layer. Key capabilities include, but are not limited to:

- Zero-code onboarding of new data sources through AI-assisted endpoint discovery and schema mapping.
- No-ingest architecture that preserves source-of-truth ownership and eliminates duplicated datasets.

- Protocol abstraction across REST, GraphQL, ArcGIS, OGC, STAC, WFS, and other operational interfaces.
- Field-level semantic normalization for geographically and operationally aware querying.
- Federated multi-source query orchestration through a unified operational interface.
- Elasticsearch-compatible and GraphQL outbound interfaces for enterprise and AI interoperability.

Natural Language Queries

Users interact with Gangplank through a chat interface. They can ask questions like:

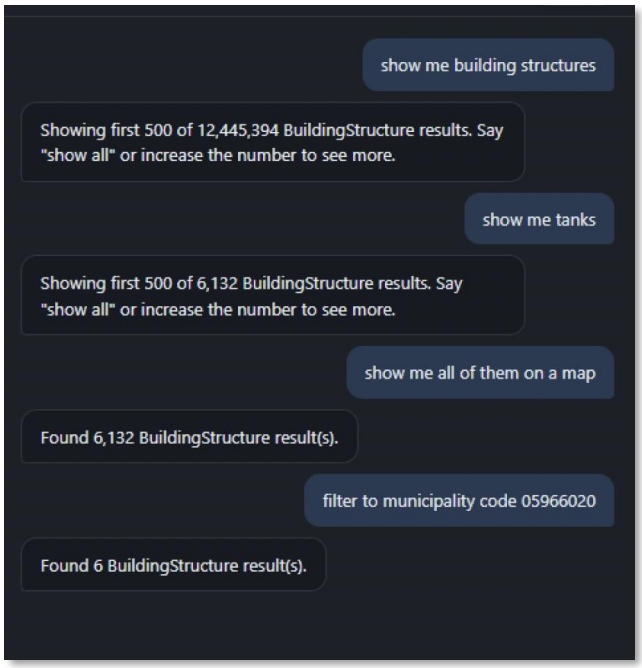
"Display all events associated with this corridor."

"Identify infrastructure dependencies within this region."

"Filter to just tanks, then show them on a 3D globe"

"Sort by event time descending"

There is progressive filtering through conversation, so each message builds on the previous query context.



The AI translates these natural language requests into the appropriate API calls for each data source, handles authentication, pagination, and response normalization automatically.

Key Differentiators

Capability	Traditional Approach	Gangplank
Query Interface	Protocol-specific APIs, custom code per source	Natural language chat; works across all sources
Onboarding	Weeks of integration work per source	Under 5 minutes; AI-assisted
Analysis	Per-source geo/temporal implementation	Unified: geospatial, temporal, and relational analysis
Visualization	Separate tools for maps, tables, graphs	Instant switching between table, map, globe, relationship graph
Users	Developers only	Anyone who can type a question
Context	Each query starts from scratch	Conversational; filters build on previous results
Authentication	Managed per-user per-source	SSO via Keycloak; source auth handled centrally

4 Operational Intelligence & Mission Data Use Cases

4.1 Operational Intelligence Fusion

Gangplank enables rapid federation and normalization of fragmented operational, geospatial, intelligence, and partner-system data across distributed mission environments, supporting mission planning and multi-INT fusion workflows.

This approach reduces the time analysts and planners spend manually locating, correlating, and normalizing data across disconnected systems, accelerating multi-INT analysis and operational decision-making workflows.

Gangplank reduces the overhead associated with integrating and querying disparate mission feeds by providing:

- Rapid onboarding of new mission data sources without custom integration development
- A shared ontology and relationship graph across connected data sources
- Unified access to REST APIs, GraphQL, ArcGIS, and other services
- Geospatial, temporal, and relational analysis from a single interface
- Support for multi-INT data correlation and operational intelligence workflows

4.2 Mission Planning & Operational Coordination

Gangplank supports mission planning and operational coordination by enabling teams to rapidly assess operational environments, infrastructure dependencies, geospatial constraints, and mission-relevant activity across distributed environments without leaving existing workflows or operational tools.

Potential mission planning workflows include:

- Assessing facilities, infrastructure assets, and transportation routes
- Correlating operational activity across geographic regions
- Evaluating terrain and geospatial constraints within areas of interest
- Correlating imagery and sensor feeds to support mission preparation
- Identifying infrastructure dependencies and logistical considerations
- Analyzing operational patterns and activity across geographic regions and time windows

Operators and analysts can progressively refine operational context through conversation while rapidly pivoting between map, table, globe, and relationship-based analytical views.

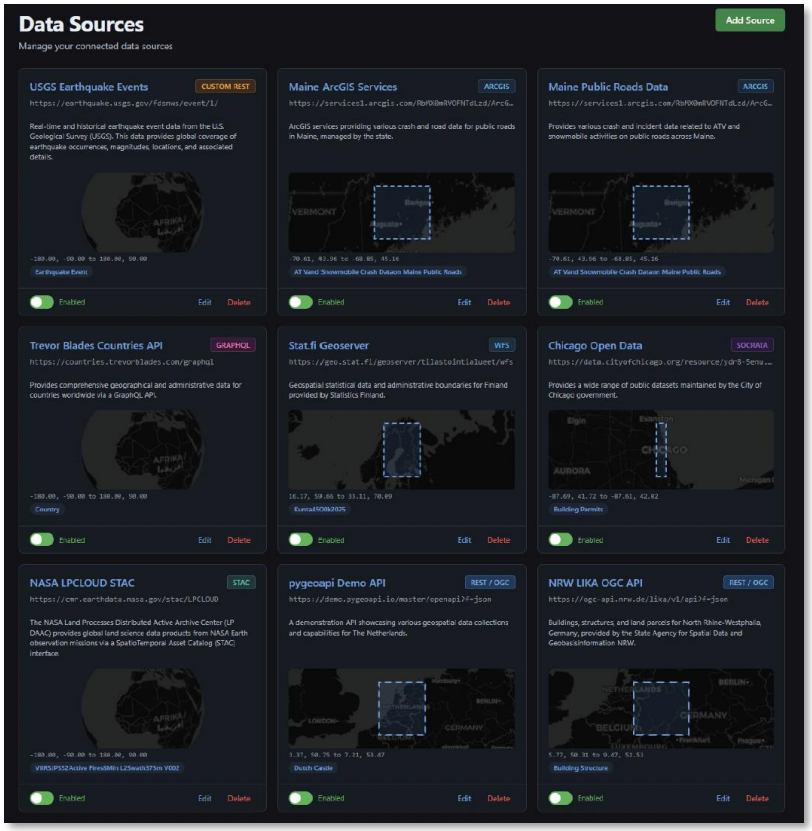
Example Queries:

"Display all imagery and sensor feeds associated with this location."

"Show infrastructure assets within 10 miles of the operational corridor."

5 Unified Adapter Architecture

Gangplank uses an adapter-driven architecture that abstracts heterogeneous APIs behind a single operational query framework.



Each supported protocol implements a common interface that standardizes query execution, authentication, geospatial operations, response mapping, pagination, and data correlation across otherwise incompatible systems.

The platform supports nine (9) data source protocols out of the box: REST with OpenAPI (Swagger), Custom REST API, OGC, ArcGIS, GraphQL, STAC Catalog, Socrata / SODA, WFS, and Auto-detect.

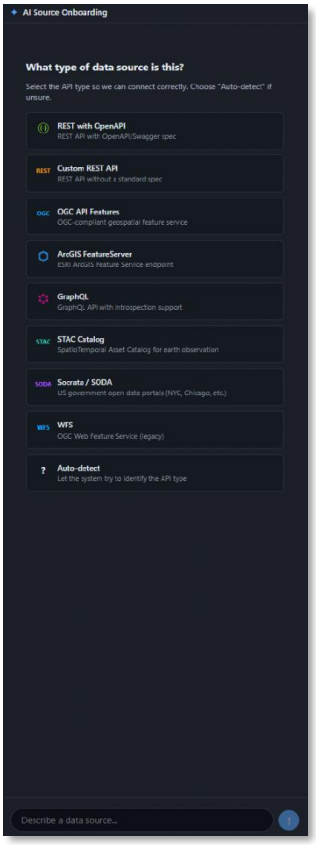
6 AI-Assisted Onboarding and Operational Querying

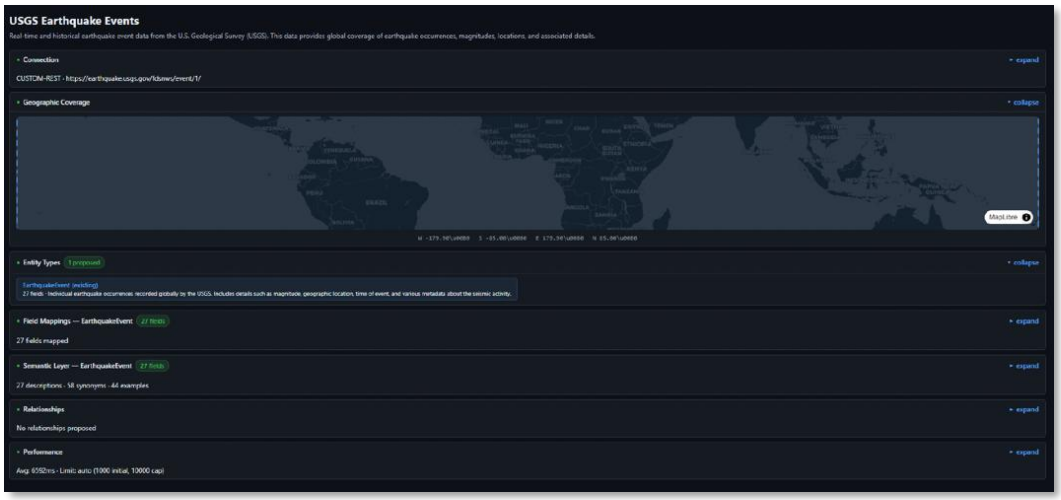
Adding a new data source takes under five (5) minutes.

For well-known protocols (e.g., ArcGIS, OGC, STAC, Socrata, GraphQL, WFS), the system automatically discovers schemas, fields, capabilities, and spatial extent.

An AI generates human-readable field labels, descriptions, and synonyms so users can search naturally.

After onboarding, every data source shows a complete configuration preview including connection details, geographic coverage, entity types, field mappings with the full semantic layer, and performance characteristics.





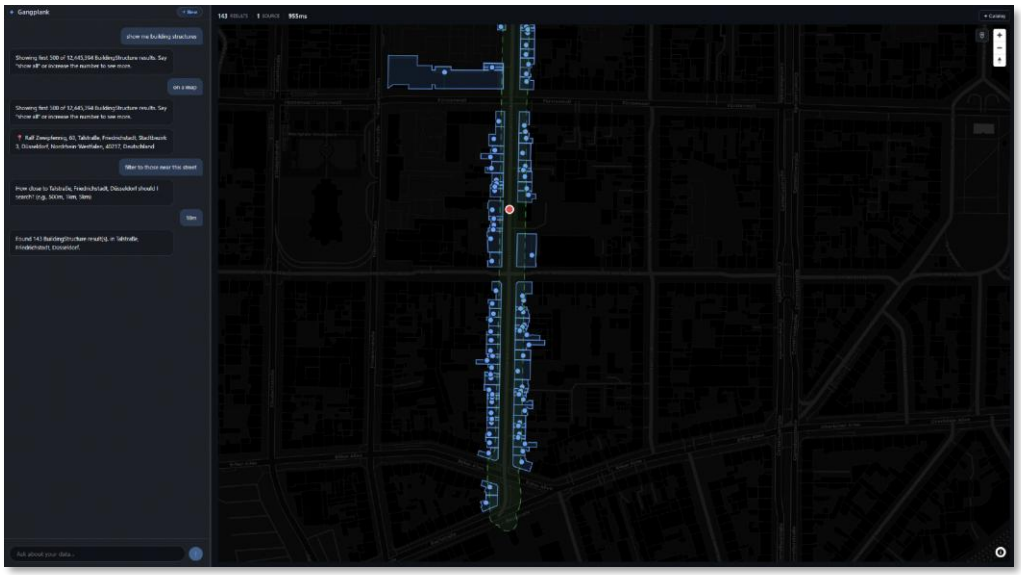
Example operational feed: 27 fields mapped, 58 semantic synonyms generated, and geospatial metadata normalized automatically during onboarding.

7 Multi-Dimensional Analysis & Visualization

Gangplank supports three (3) dimensions of analysis: geospatial (where), temporal (when), and relational (how entities connect), with four (4) visualization modes switchable instantly through chat or UI controls.

7.1 Geospatial Analysis (The Where)

Drop a pin anywhere on the map to instantly reverse-geocode to a street address, then ask *"show me buildings on this street"* or *"within 60m of this pin."* The system understands context at every geographic level: street, neighborhood, city, state, country. Bbox, polygon, and radius searches are translated automatically to each source's native geo query format.



Pin dropped on Talstraße in Düsseldorf; 143 buildings found within 10m of the street, displayed on the map with the search boundary.

7.2 Temporal Analysis (The When)

Filter and sort by time across any source. *"Show me earthquakes from the last 30 days, sorted by magnitude"* or *"permits filed between January and March."* Temporal fields are detected automatically during onboarding, and the query engine translates date filters to each protocol's native format: ISO 8601, Unix timestamps, or SoQL date expressions.

7.3 Relational Analysis (How Entities Connect)

The relationship graph view reveals connections between entities that aren;t visible in tables or maps. When data from multiple sources shares common identifiers, locations, or time windows, Gangplank can surface those relationships visually, turning isolated records into a connected intelligence picture.

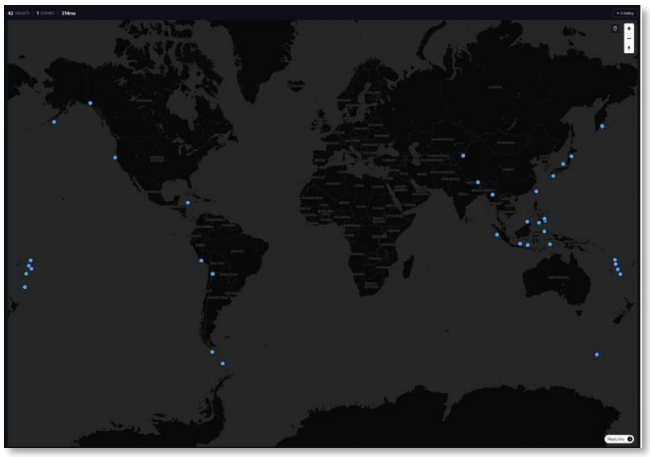
7.4 Visualizations

- **Table:** Sortable, filterable data tables with smart column formatting. URL fields render as clickable links, image fields as inline thumbnails, dates in locale format.

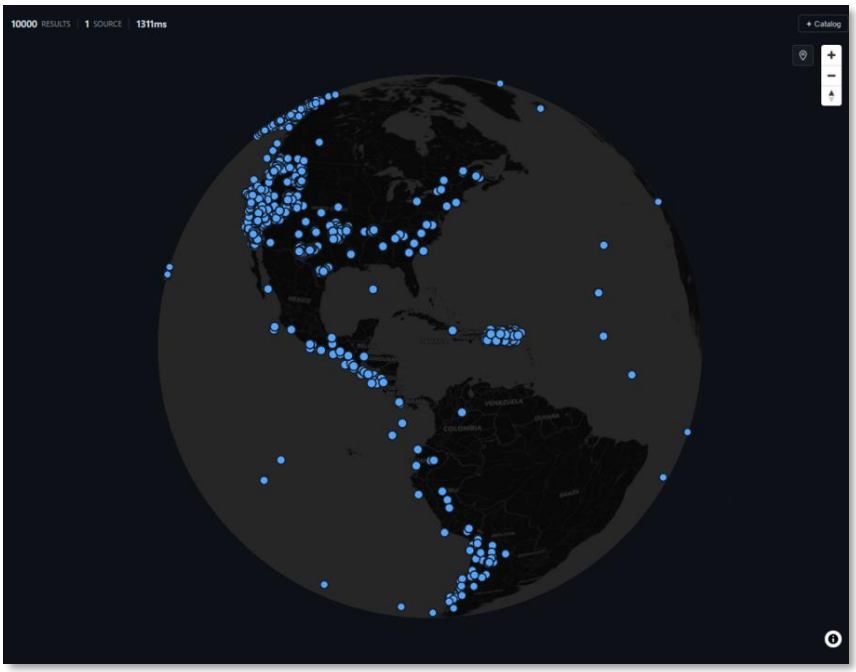
- **2D Map Visualization:** Results plotted on a dark-themed MapLibre map with interactive markers. Pin drop for location-based queries. Polygon and radius search boundaries drawn automatically.

- **3D Globe Visualization:** Full 3D globe projection for worldwide datasets. Interactive rotation and zoom. Ideal for presenting global data to stakeholders.

42 earthquake events with >7, sorted by event time, with clickable URLs and formatted dates.



Earthquake events plotted globally on a 2D map; 42 results from a single query.



10,000 earthquake events on a 3D globe, showing global seismic activity at a glance.

8 Security & Data Governance

Gangplank operates as a pass-through operational query layer rather than a centralized data repository. Source data remains within existing systems, while Gangplank securely brokers access, normalization, and visualization across connected environments. This approach:

- Reduces data duplication
- Preserves authoritative source ownership
- Minimizes storage overhead
- Supports existing governance models
- Simplifies integration across distributed systems

Authentication and access management are centrally controlled through Keycloak-based Single Sign-On (SSO) and Role-Based Access Controls (RBAC), while source-specific credentials remain encrypted at rest.

9 Deployment Architecture

The architecture supports rapidly evolving mission environments, where operational systems, partner integrations, and distributed data feeds must be onboarded and operationalized with minimal engineering overhead.

Gangplank deploys as a lightweight, containerized application architecture consisting of three primary components: **NestJS API Server**, **React Frontend**, and **Keycloak Authentication Instance**.

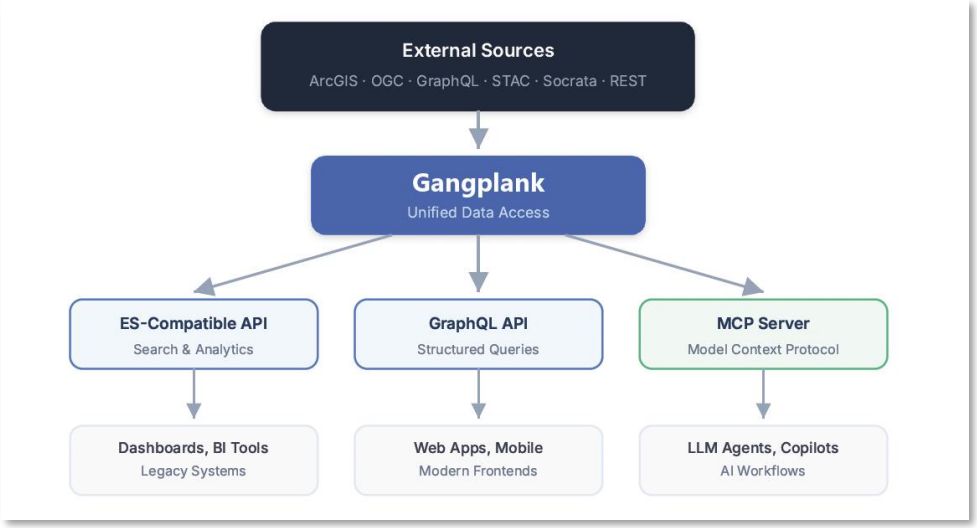
This modular deployment model enables agencies and organizations to rapidly deploy, scale, and integrate Gangplank within existing operational environments.

No protocol-specific tooling. No data silos. No waiting for developers to write integration code.

10 A Bridge Between Legacy Systems and AI

Gangplank serves as a bridge between existing enterprise systems and emerging AI-enabled operational workflows. The platform exposes normalized data through **Elasticsearch-compatible APIs, GraphQL interfaces**, and **Model Context Protocol (MCP).**

Connect a data source once to Gangplank, and it's immediately available to every consumer: human users via chat, legacy systems via ES/GraphQL, and AI agents via MCP.



As organizations adopt AI-assisted workflows and machine-assisted analysis, Gangplank provides a scalable operational data federation and interoperability layer capable of supporting modern mission operations and AI-enabled decision environments.