

**COMPOSABLE INTEROPERABILITY TECHNOLOGY**

## Semantic Gateway

**Gateways** Provide interoperability and communication transparency among disparate systems or data links

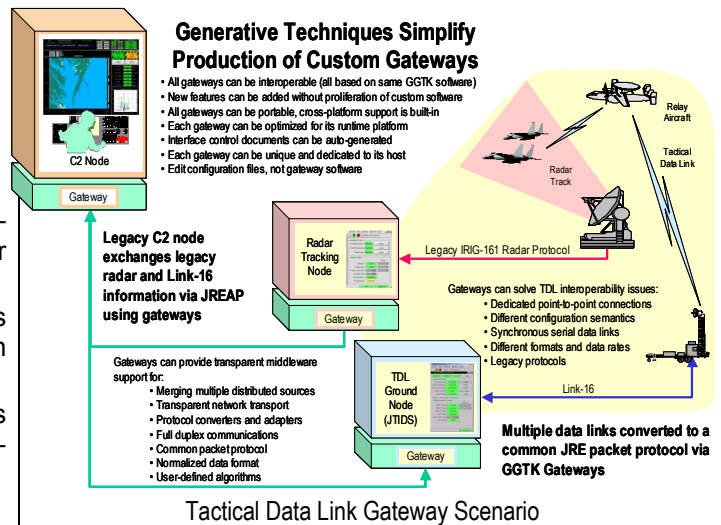
- Gateways interconnect at least two different systems and operate on their data formats and/or communications protocols
- They provide information transfer that preserves the meaning and relationships of the information exchanged at every connection
- Gateways enable different communication nodes to exchange information transparently without requiring the systems to be modified or replaced

### Problem

The traditional approach to gateway development has caused a proliferation of custom point-solutions. Solving interoperability issues by building individual gateways from the ground-up has been the norm for both government and industry. The typical solution is to provide another simple dedicated gateway that can be created quickly and relatively inexpensively, but is not easily maintained or reused. The overall result of achieving system interoperability is a proliferation of unique gateways and a high aggregate cost.

### Solution

Command and Control Technologies developed an innovative composable architecture for C3I gateway systems that provides a platform-independent software toolkit for producing enhanced communication gateways. This Semantic Gateway approach simplifies interoperability of new and legacy systems by leveraging semantic specifications that describe data transport formats and exchange rules. Software product line architecture methods ensure large-scale system reuse and enable complete component-based gateways to be auto-generated directly from high-level metadata specifications.



### Benefits

#### Provides System Interoperability

- Enables interoperability via an adaptive gateway architecture that transparently connects disparate communication nodes and data links to exchange common data and semantic information without creating the usual N(N-1) interface problem

#### Extends the Life of Legacy Assets

- Provides a practical migration strategy for existing and stove-piped legacy systems to transition to new information exchange technologies so they can evolve, interoperate, and merge into the future C3I system-of-systems without requiring a major redesign or replacement

#### Minimizes Gateway Production Costs

- Addresses operational needs by organizing all gateway assets and production capabilities into an intuitive integrated environment that can produce complete operational gateways with significant cost savings since no additional software development effort is required
- Addresses system development needs by providing a platform-independent gateway development framework of reusable modules and configuration tools that are easily adapted to varying applications. This approach simplifies production, testing

and deployment of even the most complex gateway solutions. The framework preserves the capability for large-scale reuse, but is flexible enough to enable extensive developer-level customization

- Employs generative techniques to produce reusable platform-independent gateway components as well as complete operational gateways directly from user-defined XML metadata specifications

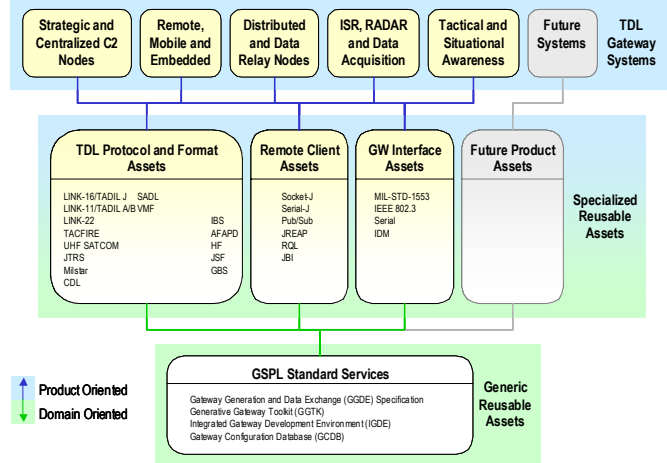
**Semantic Gateway**

Command and Control Technologies worked with the USAF and the DoD Objective Gateway concept to map domain knowledge into architecture and processes that captured high-level strategies for large-scale software generation and reuse. The CCT Semantic Gateway is the product of a comprehensive gateway development approach to attain Tactical Data Link interoperability:

- A gateway reference architecture that supports large-scale reuse across families of composable gateways within the military tactical communications domain
- A robust metadata specification that defines robust language and semantics for describing gateway communications
- A software generator that auto-generates gateway components directly from high-level semantic specifications, minimizing the need for traditional gateway software development, customization, and maintenance

The Gateway Product Family provides a set of products that share common features, pieces of functionality and architectural concepts. A significant characteristic is the strategic development of reusable elements that form the foundation of the gateway product line.

Common features establish mandatory requirements for reusable Link-Generic or Link-Specific assets that provide the standard services required for all gateways in the product line. Variations establish requirements for optional and alternative capabilities. Variations are methodically designed and implemented as optional



Example Gateway Product Family

and alternative assets to be reused for future gateways.

The Gateway Reference Architecture constrains the evolution of the product family by identifying categories of components that are structurally significant. It describes the (abstract) style upon which every gateway is built, the rules for interaction of the various components and the abstract framework that holds them together. Important to the product line approach, it describes the mapping of common features into the various products of the family, and the commonality and variability patterns.

The Generative Gateway Toolkit supports a component-based software generation approach to produce a set of reusable gateway assets. The toolkit supports platform-specific optimizations that maximize system performance and throughput by generating code that minimizes runtime parameterization and optimizes computer CPU utilization for the specific HW platform.

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