

IDEAS Group Model for Interoperability

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The IDEAS Group

- International **D**efense **E**nterprise **A**rchitecture **S**pecification for exchange
- Australia, Canada, UK, USA, NATO (observer)

Objective — To deliver a unified specification for the exchange of architectural documentation and artefacts between coalition partners.

Coalition

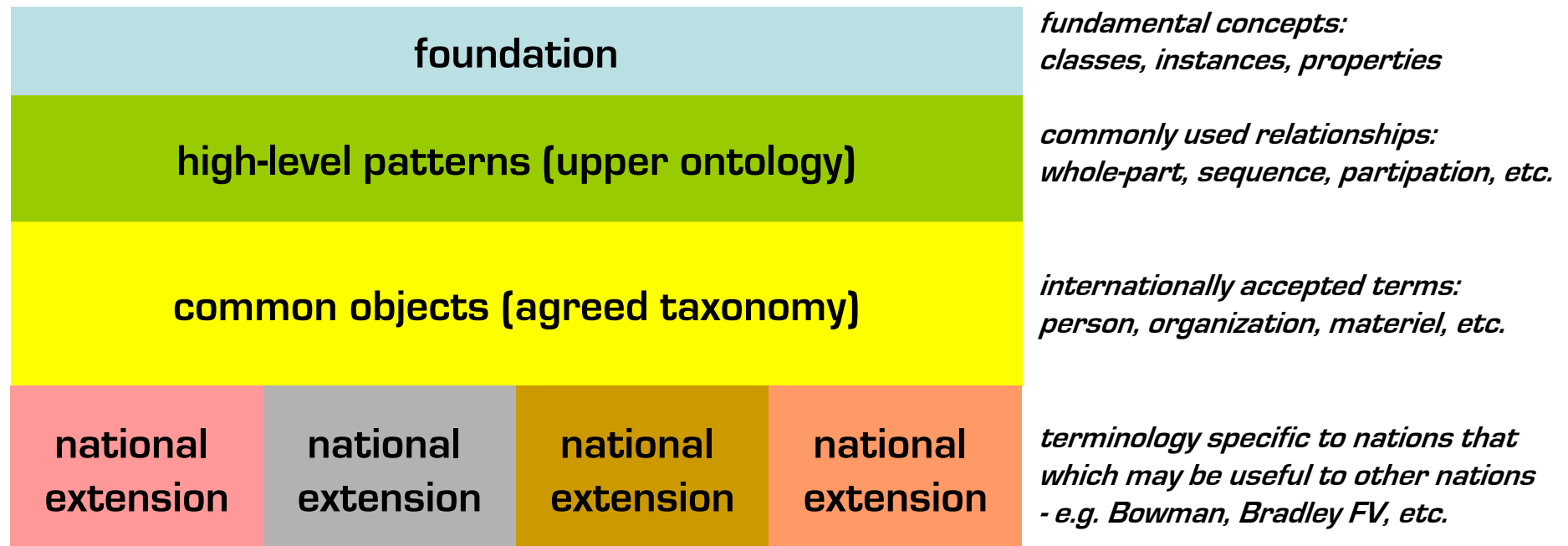
- Australia, Canada, UK and USA have a history of military coalition
- Each nation is pursuing its own version of net-centric warfare
- Need for some degree of international net-centricity
 - Shared situational picture
 - Collaborative Engagement Capability
 - etc.
- Each nation is developing its own architectural framework
 - Requirement to share architectural information between nations to enable interoperability at the operational and system levels

Approach

1. Individually evaluate existing architecture data models to determine the degree of compatibility between the data models, and provide recommendations for the way ahead in developing the architectural exchange specification.
2. Identify gaps and deficiencies with respect to the IDEAS requirements, and recommend solutions – i.e. rationalise raw requirements into a formal model.
3. Define the technical approach for IDEAS implementation and usage—the candidates include XMI and XML. The possible use of web services and semantic web technology for interoperability
4. Pilot implementation and interoperability test cases.
5. Establish an international IDEAS change management process.

Structure

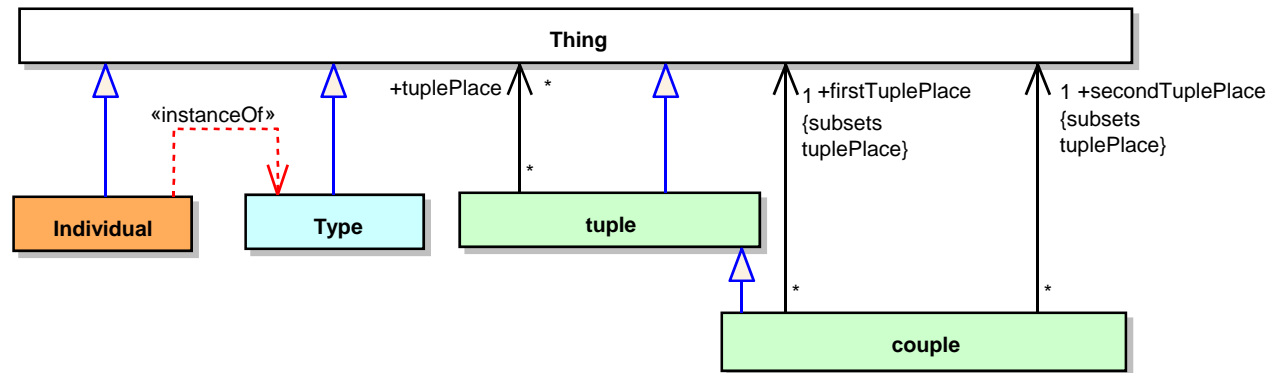
- Layered approach
 - Starting from first principles to ensure common understanding at the most fundamental level
 - Reaching down to country-specific definitions whose meaning may need to be understood by other nations



Foundation

- The nations involved were using different modelling paradigms:
 - Entity-Relationship
 - Object-Oriented (inc. UML Meta-Models)
 - Ontology
- All of these modelling approaches are based on formal logic and set theory, but each is subtly different – especially as users tend to adopt a given “style”
 - These differences were making it hard to establish a common approach between the nations – there was too much scope for misunderstanding between parties
- To mitigate these problems, the IDEAS Model defines a foundational layer (based on IEEE Candidate Upper Ontologies such as SUMO & ISO15926)

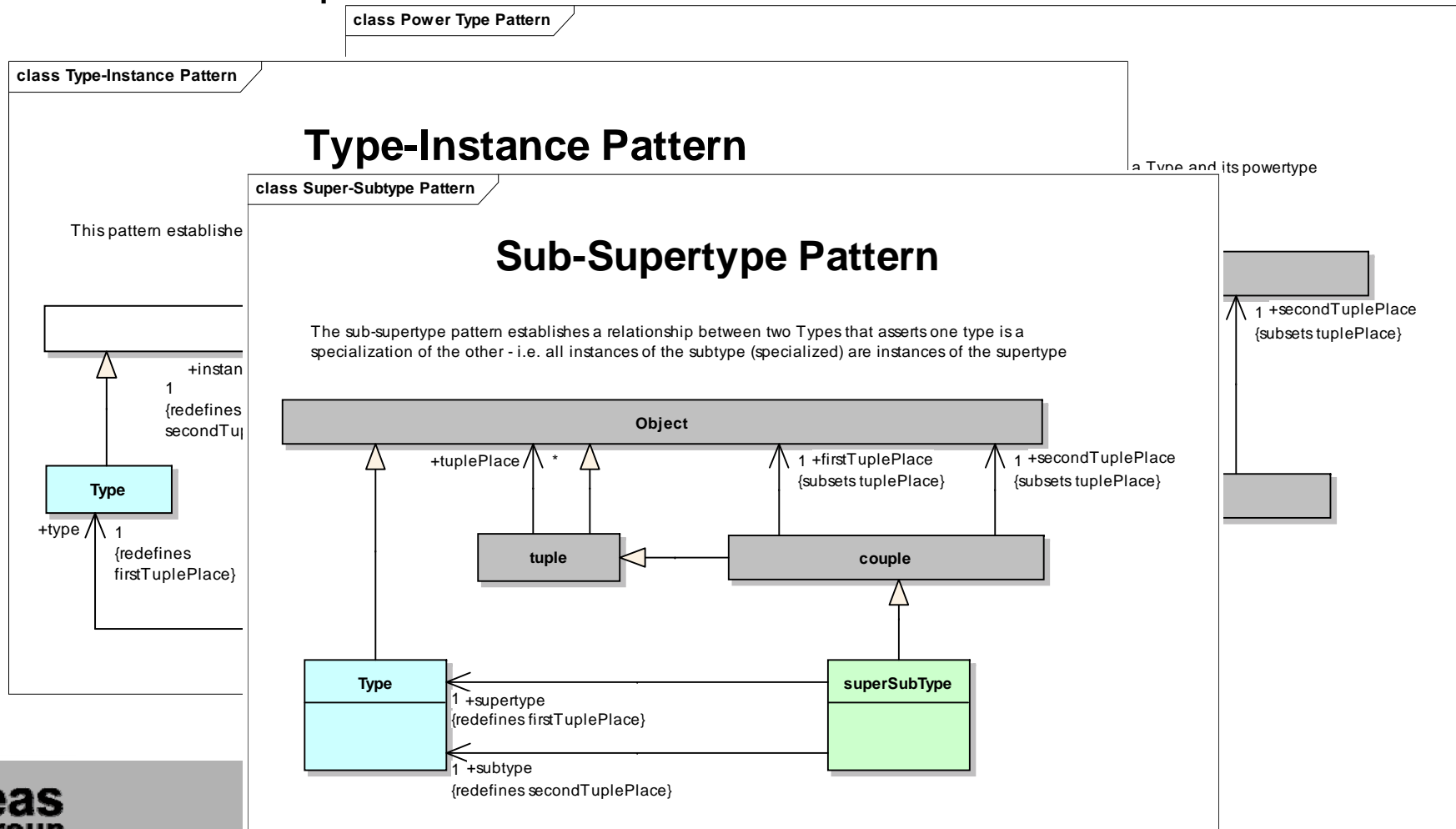
Foundation Elements



- Terminology used is very formal
 - Not for end-user use
 - Purpose is solely to establish a formal mathematic foundation to the model
- Key objects are:
 - Element – an individual thing – e.g. USS Theodore Roosevelt
 - Type – a class of thing – e.g. Nimitz Class carrier
 - Tuple/Couple – relationships between objects – e.g. USS Theodore Roosevelt is a instance of a Nimitz class vessel

Foundation Patterns

- The foundation level also establishes fundamental relationships:

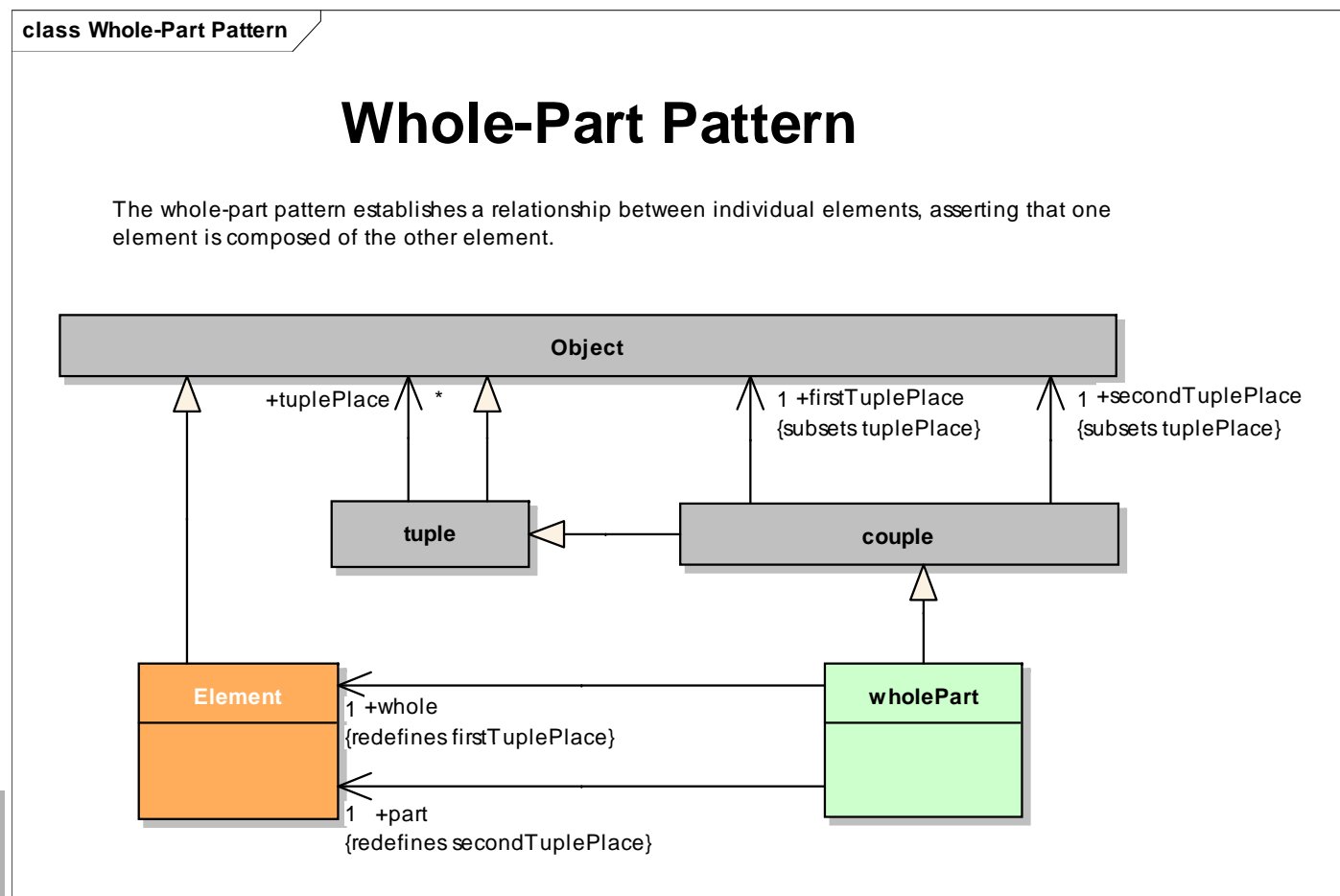


High-Level Patterns

- To assist in the development of the IDEAS model, the nations have adopted the BORO (Business Object Re-Engineering Ontology) methodology - <http://www.boroprogram.org>
- This methodology is particularly useful for IDEAS because it starts with “legacy” models and gradually develops a common model.
- As existing models and data are subjected to the methodology, high-level patterns start to emerge.
- So far (this is at an early stage) only one pattern has been formally documented (whole-part)
- ...though several others have been recognised (e.g. sequence, ownership, communication, connection, etc.)

High-Level Patterns – Whole-Part

- Probably the most common of all patterns
 - e.g. system-subsystem, process-subprocess, organization-suborganization

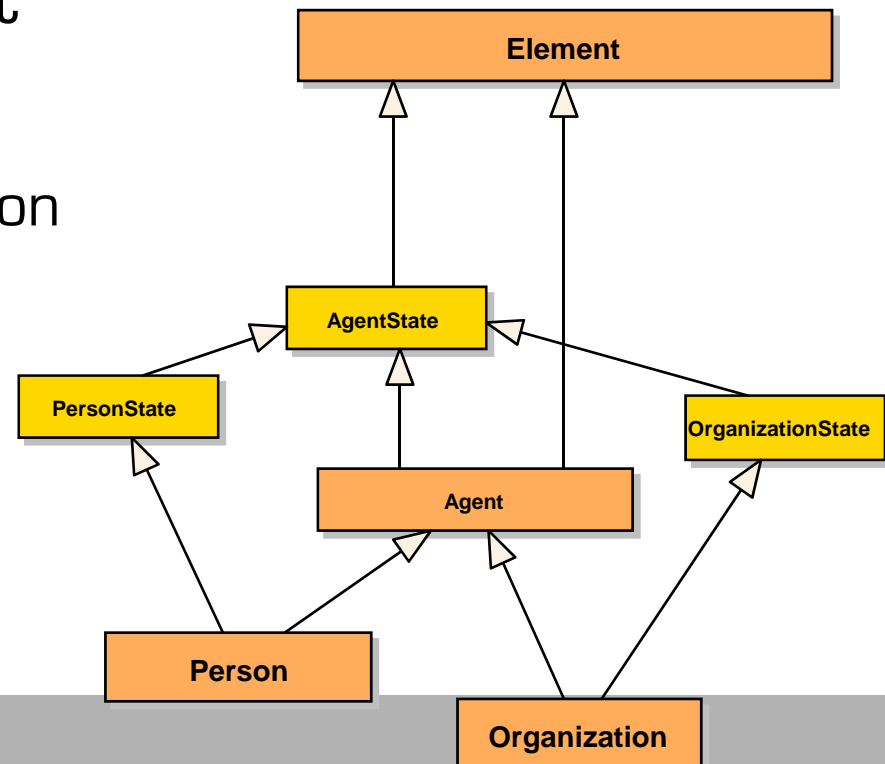


Common Objects

- Some concepts are common to all architectures
- The IDEAS Group is identifying the common concepts and placing them in the appropriate part of the model (i.e. under the appropriate part of the foundation)
- This work is also exposing the high-level patterns
- The big surprise has been how many concepts are not commonly understood between the nations (esp. operational node, system & capability)

Common Objects – Person & Organization

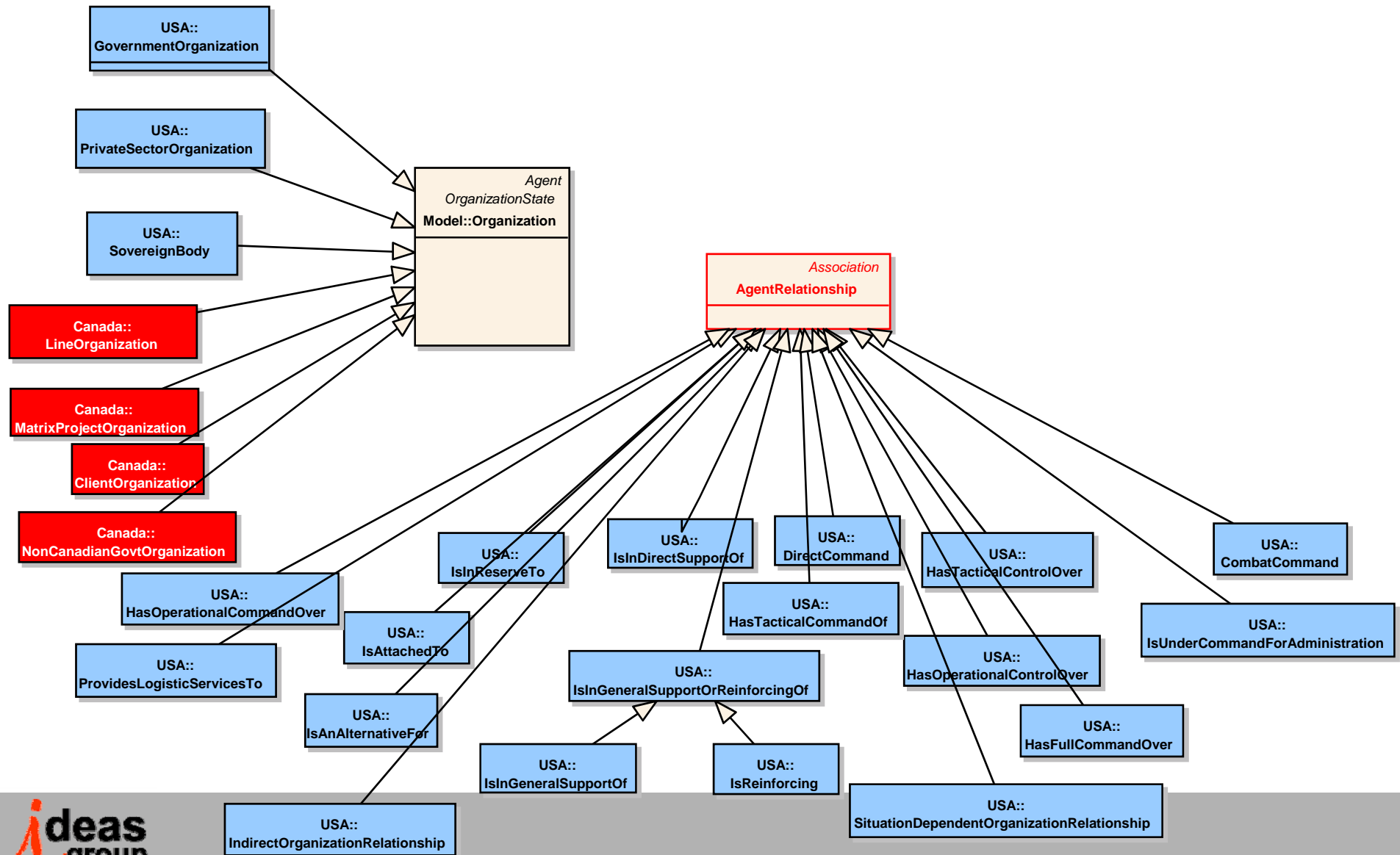
- These elements are key to the operational views.
- The IDEAS Model adds the concept of states to allow for changes over time (e.g. OV-6b)
- All descend from Element
- Agent:
 - Something capable of action
 - (could be op node ?)



National Extensions

- To enable international interoperability, it is necessary for each nation to have some understanding of the others' terminology
- Hierarchical nature of IDEAS means that these nation-specific terms descend from common objects, hence nations can always refer back to a common level of understanding – e.g. a Bradley FV is a light battle tank, Bowman is a tactical radio system, etc.
- This work is also likely to generate requirements for new common objects to bridge the semantic gap between nations
- ...and will also drive the discovery of common high-level patterns

National Extensions Example (work in progress)



www.ideasgroup.org

