

Ontology & Enterprise Architecture

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Introduction

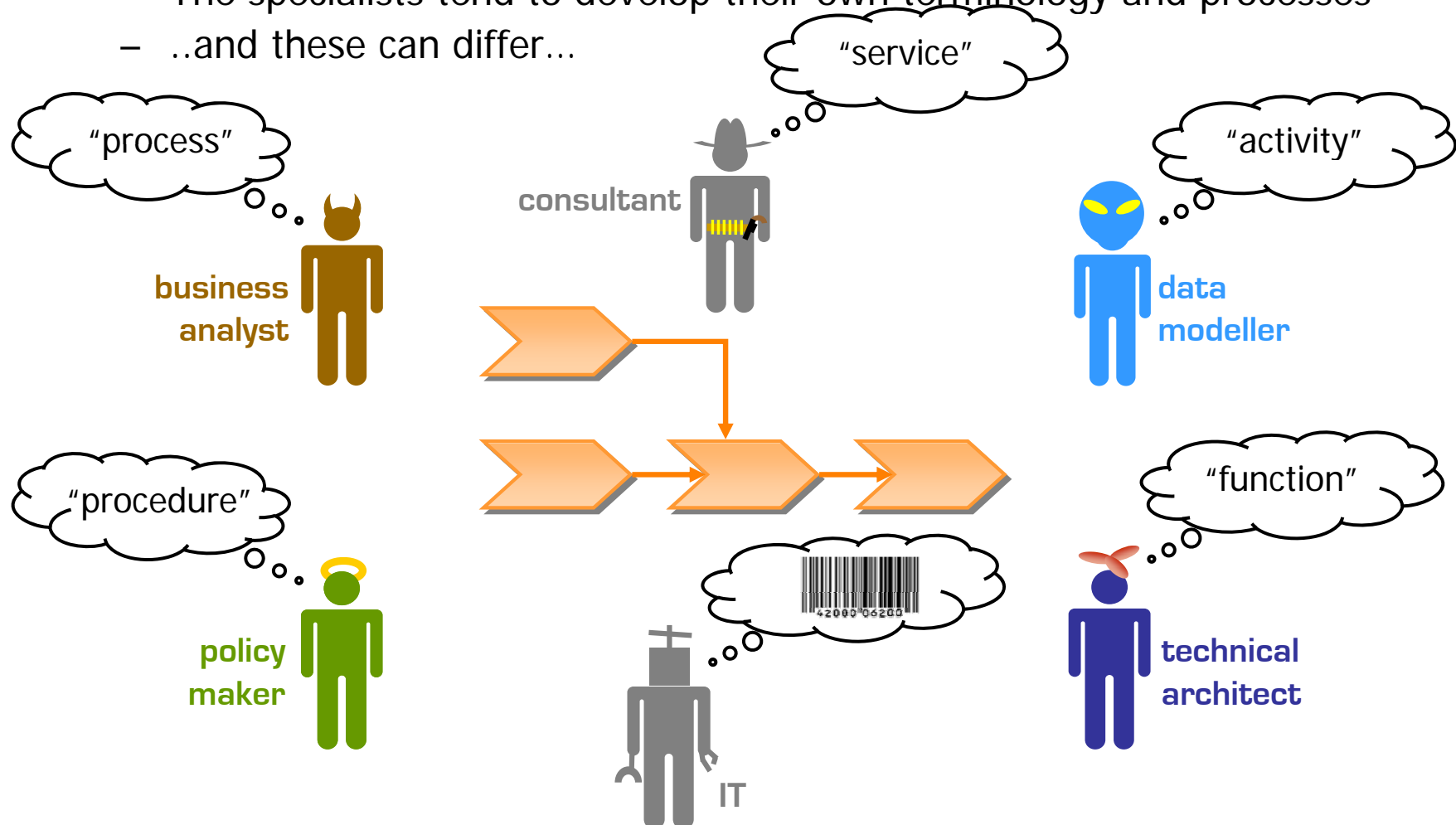
- Semantic issues with Enterprise Architecture
 - Examine some of these issues
- Ontology can be a difficult subject
 - Especially for those immersed in information theory
 - Basic introduction to some of the concepts
- The IDEAS Group
- The BORO Methodology

Enterprise Architecture

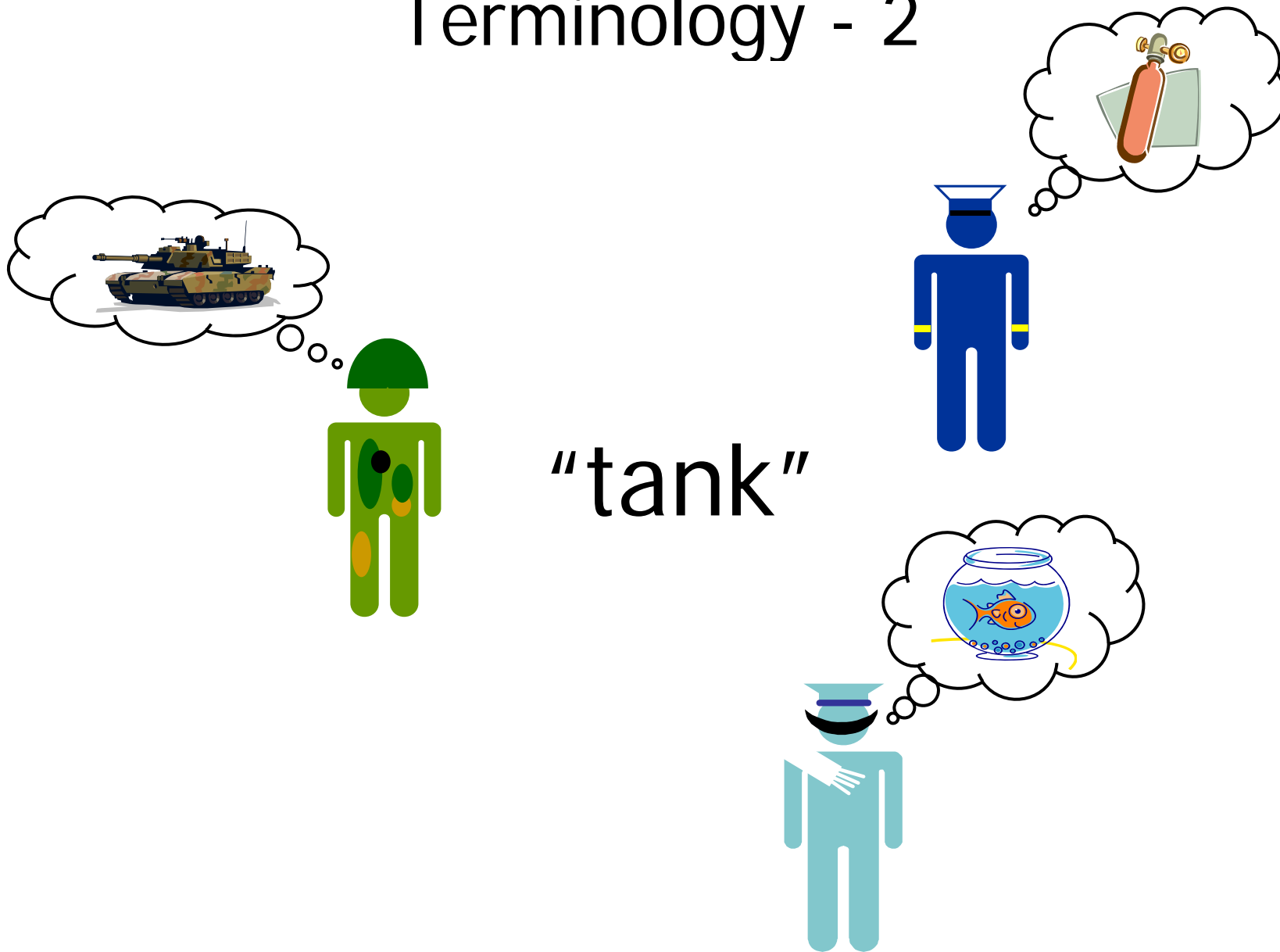
- Multi-Disciplinary
 - Policy, Process Modelling, Information, Data, Apps, Networks, etc.
- Different levels of abstraction
 - Types of people (posts), types of organization, types of systems, etc.
 - Actual systems, locations, etc.
- Need a way to
 - ...say what exists, or what could exist
 - ...tie it all together

Terminology

- Large Enterprises have specialist groups and departments.
 - The specialists tend to develop their own terminology and processes
 - ..and these can differ...

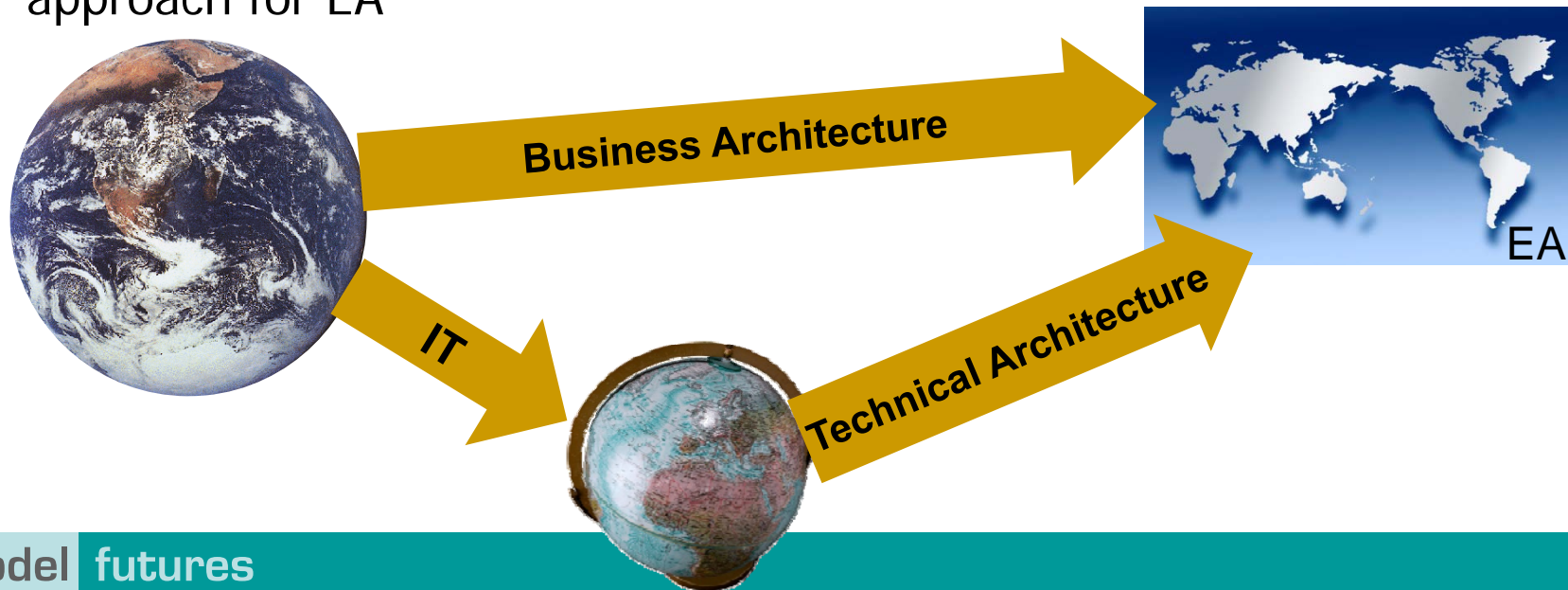


Terminology - 2

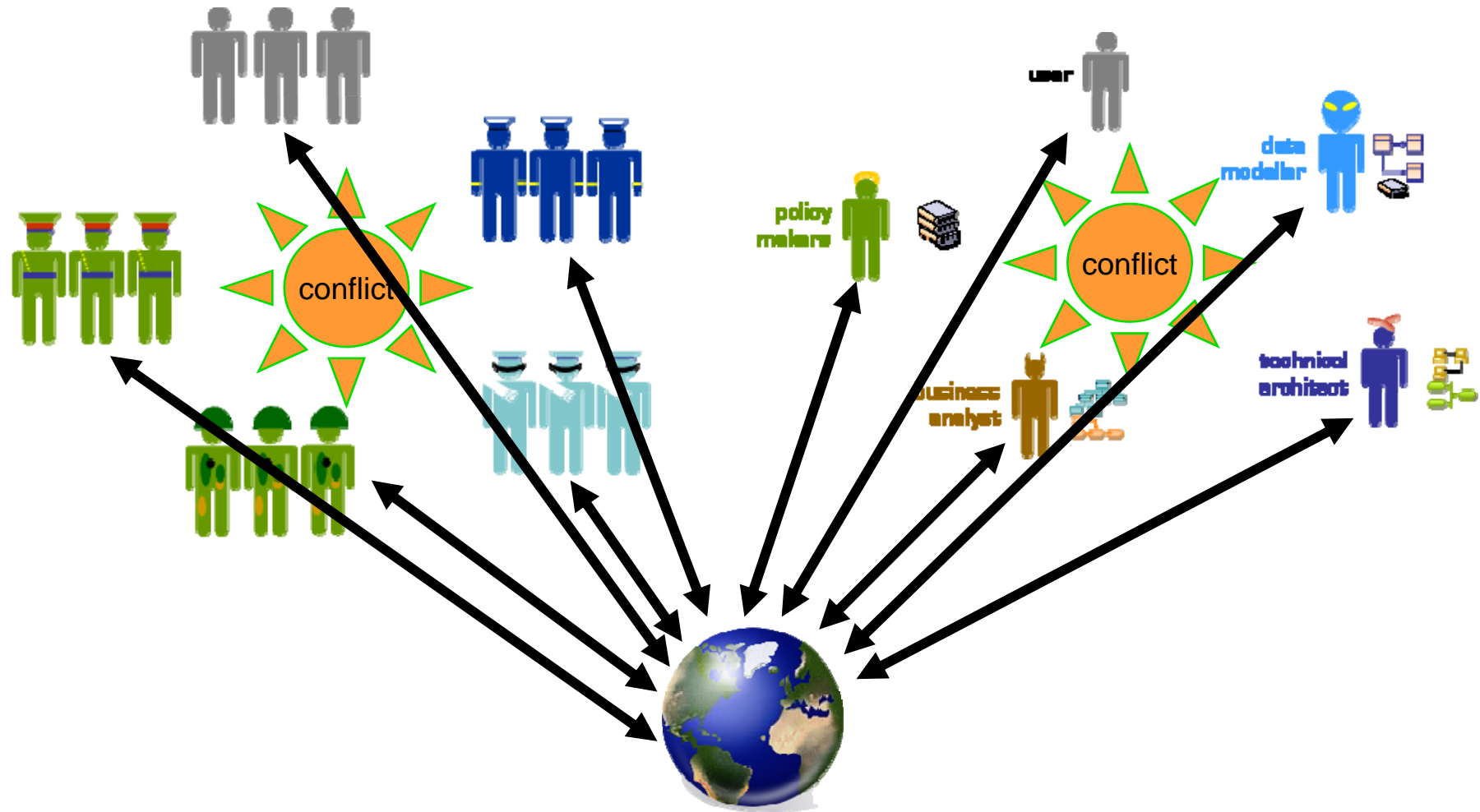


EA & The Real World

- Very easy to say that EA is just about modelling
 - But, the models tend to describe actual systems, processes, etc.
 - Some aspects of an EA are “live” data – e.g. site data is business data to the facility managers
- Even models have impact on the daily business
 - Data models (which are usually part of the EA) are partial representations of the real world
 - Those same real world things may also be represented in other model – e.g. org structures, system deployments that are also part of the EA
- In other words, stratification of model and data is too simplistic an approach for EA



Ontology & Information Conflict



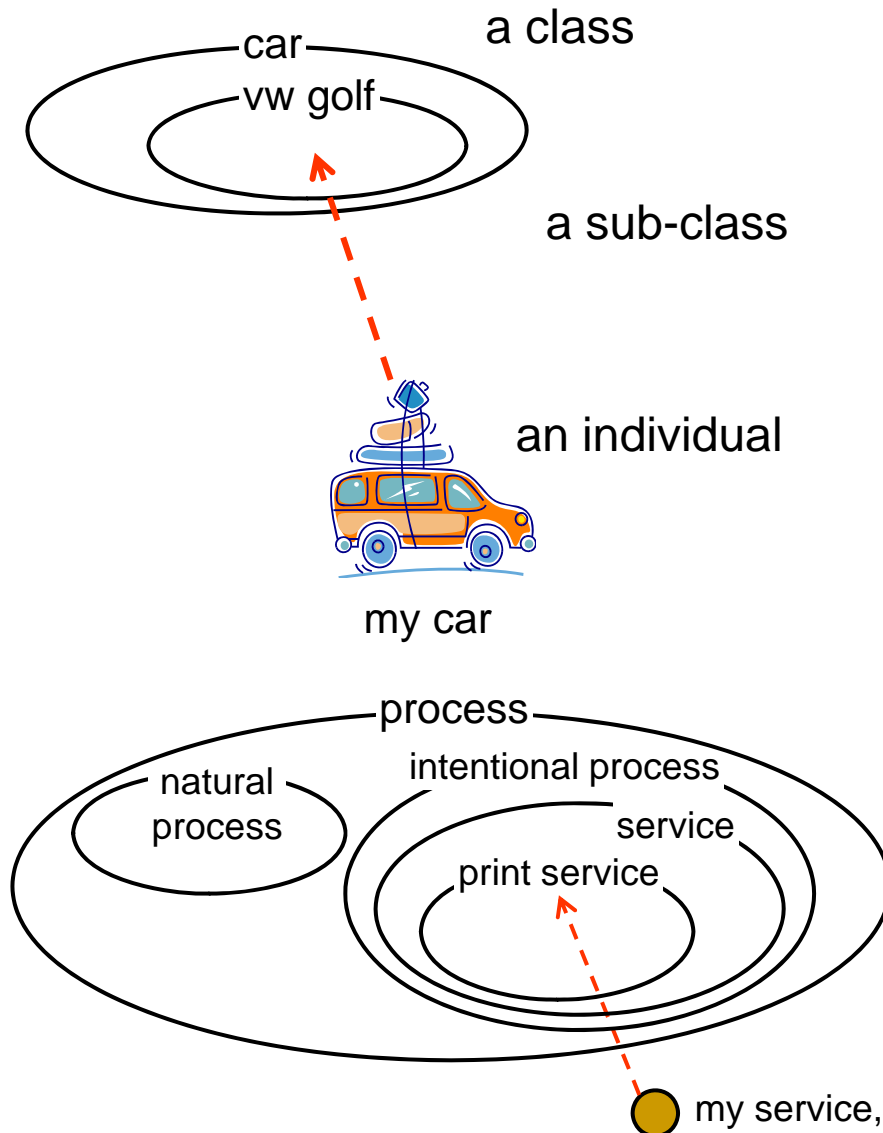
Ontology

- Currently much hype about ontology
 - But how much do people really understand about it ?
- There are two main types of ontology that appear in IT:



- Formal ontology – usually based on AI concepts of machine “reasoning”. Built for a purpose to enable a machine to make “decisions”.
 - Philosophical ontology – using the best discoveries of mathematics and philosophy to create a model which best describes the things we’re interested in
- The interest for EA is the latter, as we’re seeking to have a common understanding

Key Ontological Concepts



- Useful to know a few terms before explaining more...

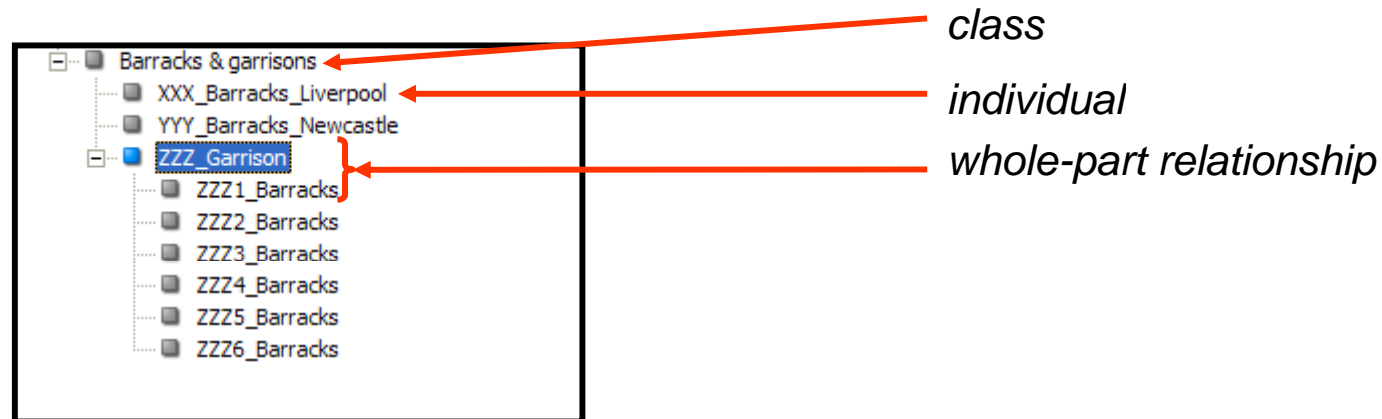
- Where would the service reference model fit ?
 - Classes of service
 - Specialise from process

Taxonomy

- But surely if we just need common understanding, all we need is a taxonomy?
 - True up to a point, but all we then have are names, with no idea about their true meaning
 - A traditional taxonomy – e.g. IPSV or the UK Defence Taxonomy is a structure of broader and narrower terms:



Taxonomy & Ontology

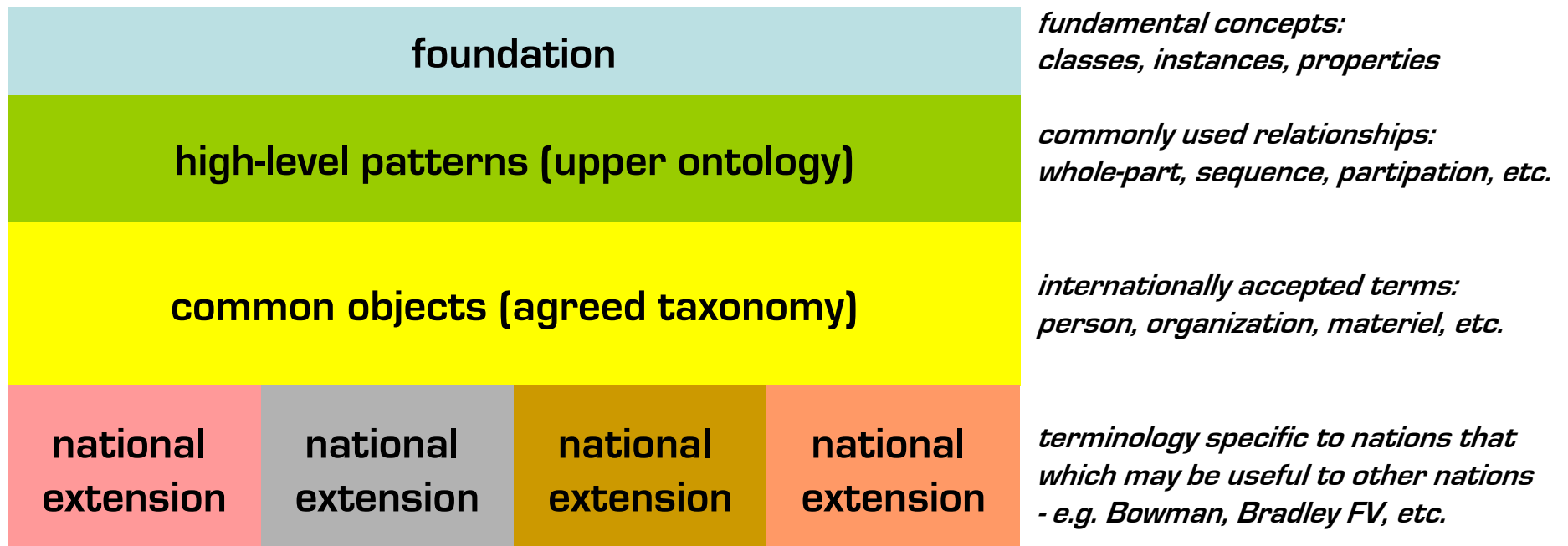


- Above shows a typical taxonomy short-cut
- An ontology would distinguish between all of these.
- In addition, a well-founded ontology can provide a good deal more functionality

- Consisting of representatives from the defence departments of four countries:
 - Australia, Canada, UK, USA
 - + Sweden and NATO as observers
- Goal is to develop a common model for interoperability of defence enterprise architecture
- Adopted the BORO Methodology



- 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

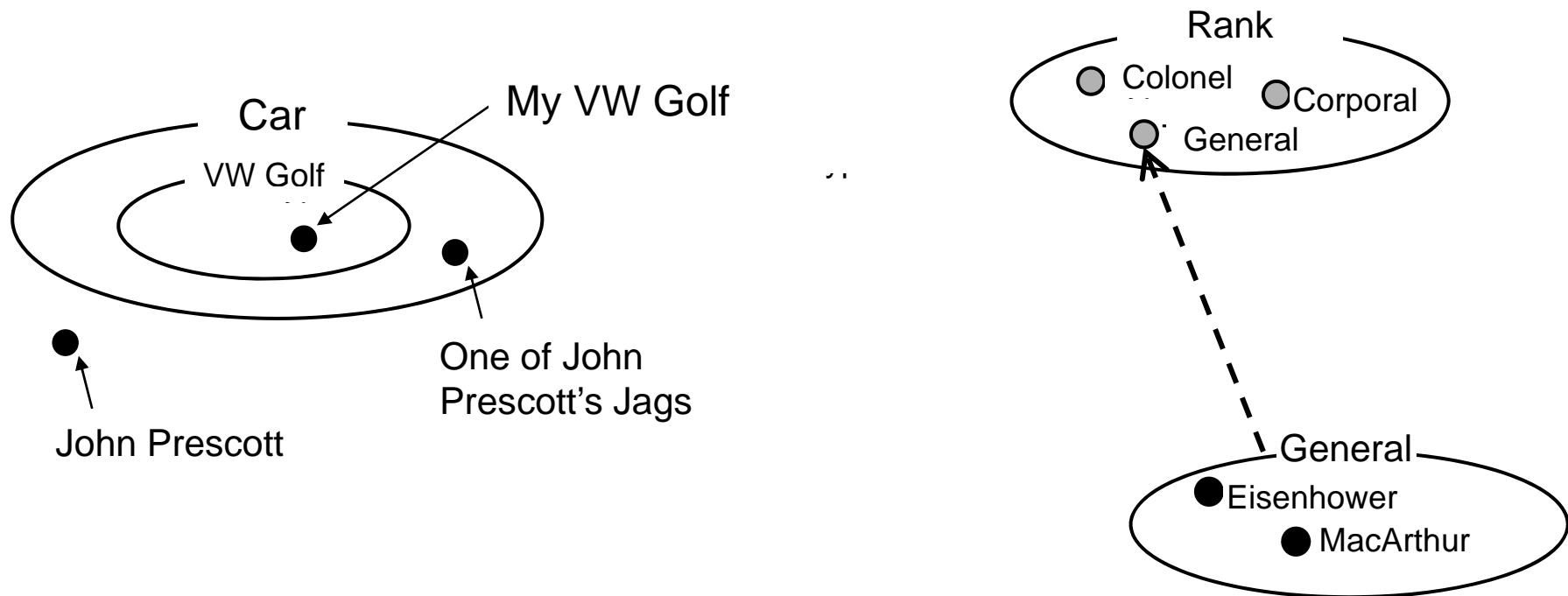
- The nations involved were using different modelling paradigms:
 - Entity-Relationship
 - Object-Oriented (inc. UML Meta-Models)
 - Ontology
- All of these modelling approaches are based on formal logic and set theory, but each is subtly different – especially as users tend to adopt a given “style”
 - 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)

The Language of Ontology

- Before we can begin the training, it is important that everyone has a common understanding of the tools and language of the ontologist
- Founded in Set Theory and Formal Logic
 - **Types** (also known as “classes”, “categories”, “sets”)
 - **Elements** (also known as “individuals”)
 - **Tuples** (also known as “relationships” or “associations”)
- Tips:
 - Always try to ground your thinking by taking it back to concrete examples – esp. when dealing with types, work with example individuals that are instances of those types.
 - Draw it as a Venn Diagram (notation to follow)

Venn Diagram Notation

- The typical Venn diagram is slightly enhanced to deal with the case of types that are instances of types



The BORO Methodology

- BORO
 - “Business Object Reference Ontology”
 - A methodology for developing business models
- *Ontology* is the study of what exists
 - BORO provides a formal, step-by-step method to develop an ontology
 - Ensures that there is no scope-creep due to modelling alone (can't prevent stakeholders from widening the scope though)
 - Provides a way of de-conflicting several stakeholder views (cf Soft Systems)
 - Aims to get at the essence of the information requirements
 - Results in a formal ontology
 - Tends towards simplification – establishes high-level patterns that repeat throughout the model

The BORO Process

- Does it exist in space & time ?
 - i.e. can you kick it (now, in the past or in the future)
 - INDIVIDUAL
 - This is the crucial BORO criteria for identity that ensures there can be no debate about semantics.
- If not, is it a type of Individual, or a type of type of individual ?
 - TYPE
 - What is it a type of ? Always trace back down to individuals – again, this de-conflicts semantics for types.
- If not, does it relate other Types or Individuals ?
 - TUPLE

Generalisation

- The basic BORO process establishes the ontic categories
 - This is the first essential stage
 - However, this has not built us an ontology
- Need to establish the hierarchy – i.e. a taxonomy
 - ...and this is where the difference with BORO becomes apparent
 - Because the basic ontic categories have been established, the hierarchy that is built is clean.
 - ...and strange things start to happen – high level patterns start to emerge
 - ..some of them are quite surprising

What does BORO let us do ?

- Compare systems
 - BORO works best with real (legacy) data.
 - The dirtier the data the better – works on the assumption that most data quality problems stem from the fact that systems do not do what the users want, so they shoe-horn in the data they actually need.
 - Comparison is guaranteed accurate provided the BORO method and criteria for identity are rigidly followed.
- Integrate systems
 - Once we know how the systems' data is related, we can automate the conversion between them
- Build the next generation of systems
 - Implement the high-level patterns – everything else is data
 - Universal applications

BORO Example - Standards

- What is a standard ?
 - A document ?
 - The act of ratifying an agreement ?
 - The class of acts which conform to a standard ?
- Deal with each of these cases one by one
 - Take each back to the criteria of identity
 - Work out the types
 - Work out the tuples
- Pattern starts to emerge
 - As more business data from other subject areas is analysed, it becomes apparent that Standard is just a special case of a more general end-to-end agreement pattern.

Unlearning-1

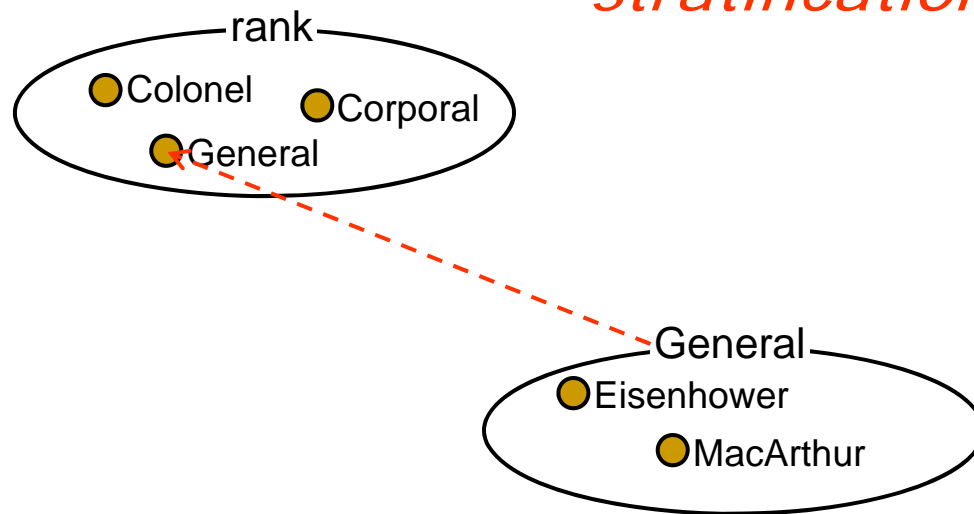
- IT professionals have a lot to “unlearn” before they can work with ontologies

1 - Need to stop thinking about the representation of the thing, and think about the actual thing

Unlearning-2

- IT professionals have a lot to “unlearn” before they can work with ontologies

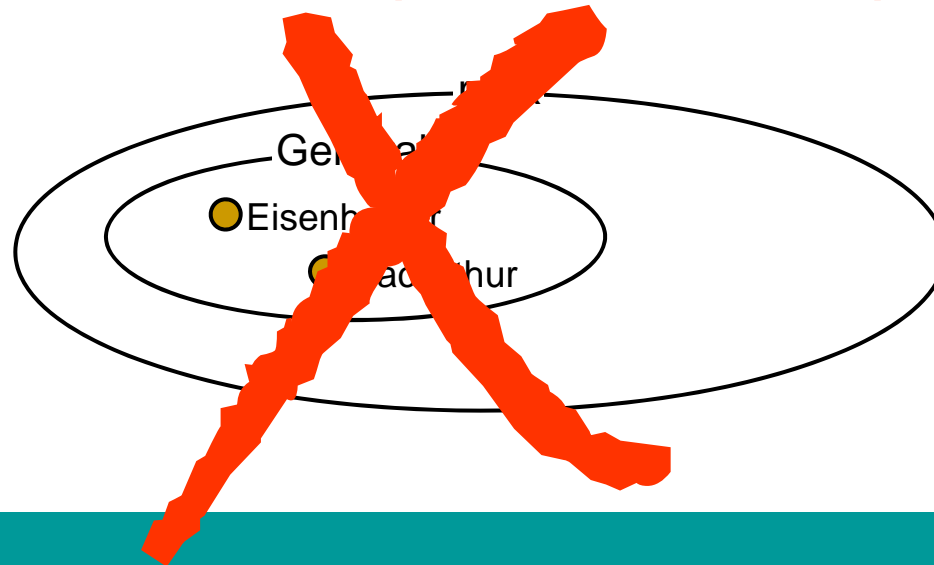
2 – Need to forget the type-instance (class-object) stratification



Unlearning-3

- IT professionals have a lot to “unlearn” before they can work with ontologies

3 – Need to be careful not to mix type-instance relationships with sub-super



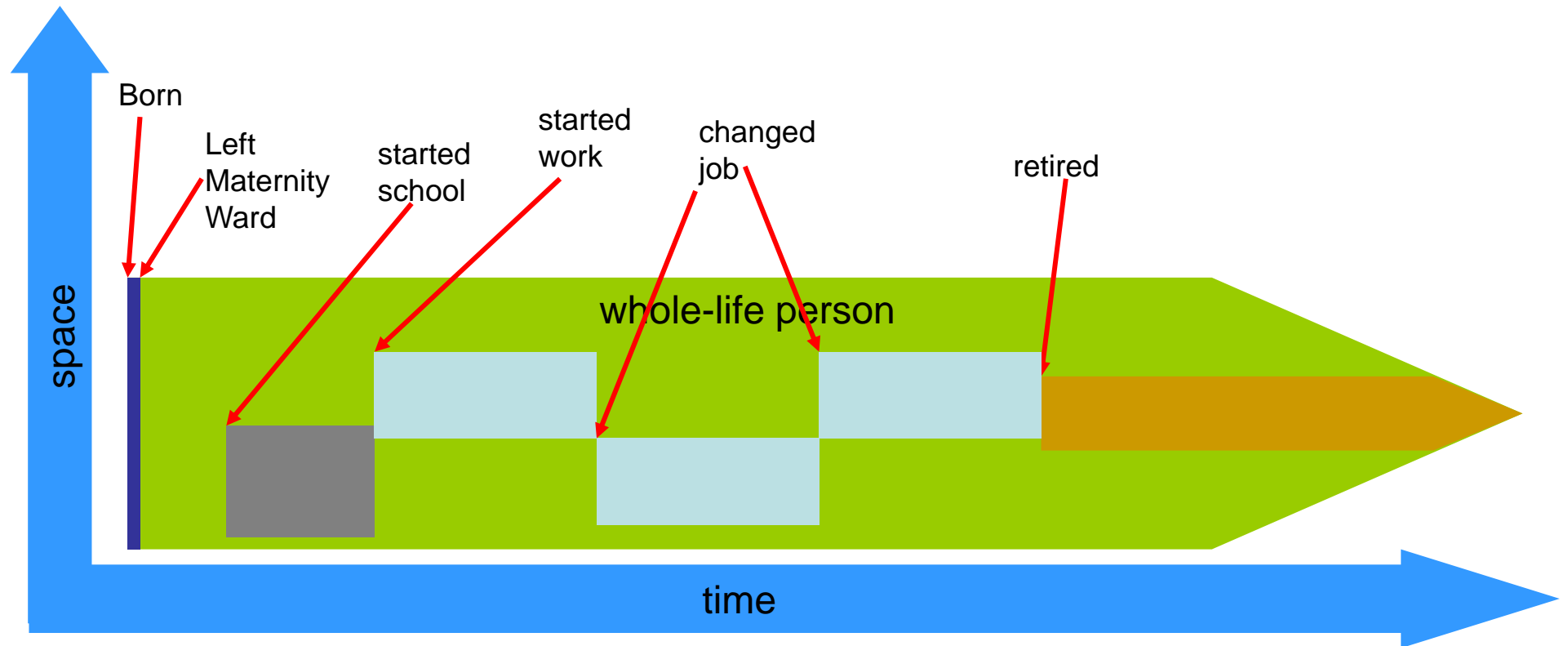
Unlearning-4

- IT professionals have a lot to “unlearn” before they can work with ontologies

4 – Need to let go of obsessions about names – the elements position in the ontology defines what it is, not its name

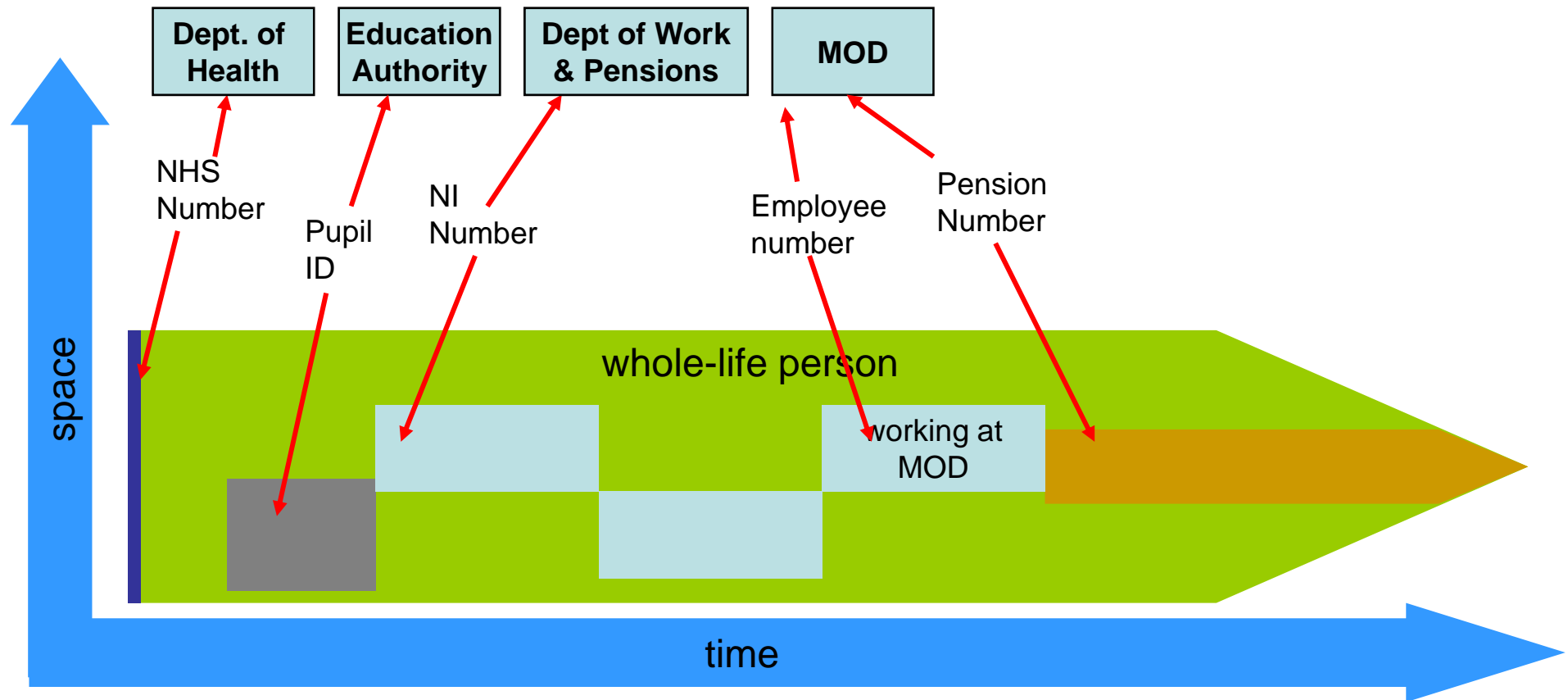
Managing Change Over Time

- One type of ontology approach deals particularly well with the tricky subject of time – the 4D ontology
- Distinguished between whole life things and the states they have throughout time – e.g. a person



Managing Identity

- A good ontology will identify the states of the individual
- It will also say who owns the identification scheme used



Last Slide

- What does ontology do for me ?
 - Provides a single coherent reference model for the whole enterprise
 - Supports the enterprise architect
 - Supports the applications and data
- What do I require ?
 - Need to decide type of ontology to use
 - Can I re-use anything out there – e.g. IDEAS, ISO15926, SUMO
- More than taxonomy
 - Ontology is not about words
 - It's about identifying the nature of things – the relationships between elements do more to identify them than the names do
- What Next ?
 - Try it !
 - Choose a subject area and model it
- Links
 - <http://www.boroprogram.org/> <http://www.ideasgroup.org>