**Systemic Framework for
Enterprise Architecture & Transformation**
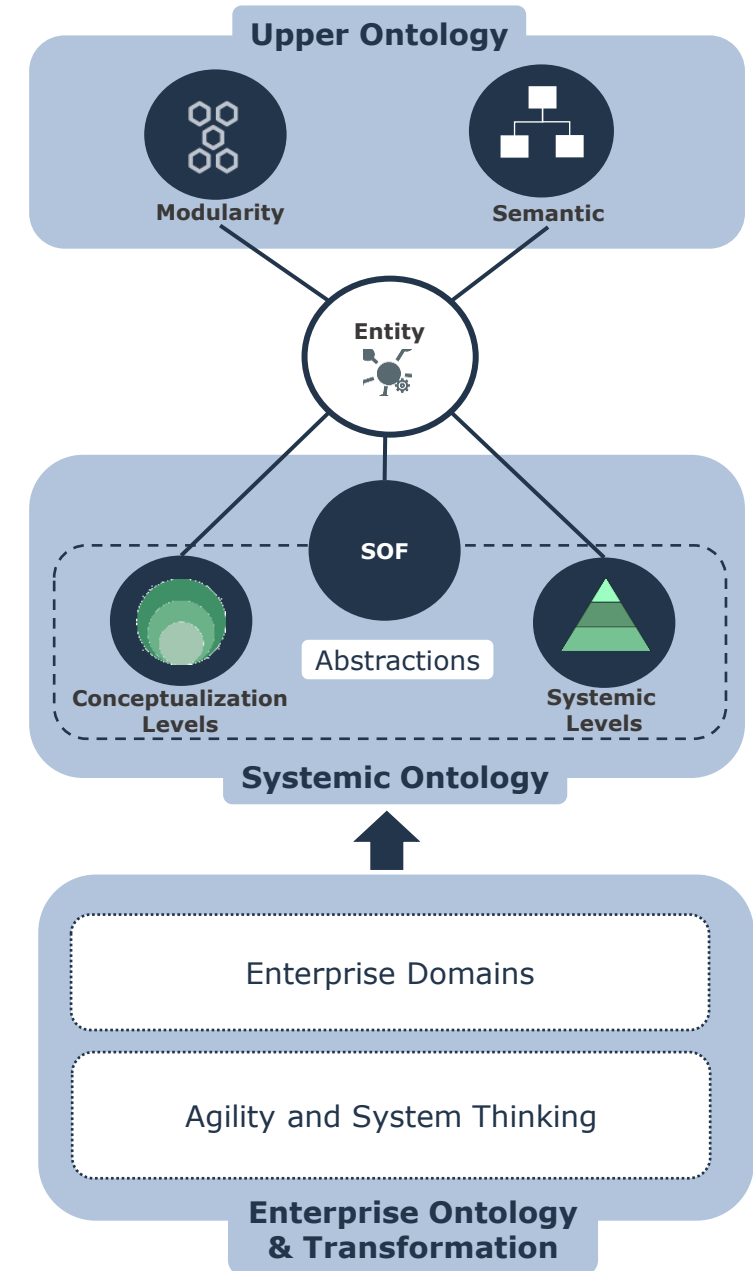
Conceptualization Levels

Introduction

- This document is an integral component of the SysFEAT architectural framework. It provides foundations to address the <u>challenges posed by Enterprise Architecture in the 21st century</u>, which include :
  - Increasing complexity in system structures and behaviors.
  - Growing intricacy in architecture, management and governance of these systems.
  - The mission of the framework is to demystify these complexities, ensuring they are comprehensible to a broad audience, thereby facilitating the design and management of complex-systems across all scales, from micro-systems to enterprise level systems.

- Enterprise Modeling refers to the overarching language and conceptual framework used to describe, understand, and communicate the complex structures and dynamics of an enterprise.

- It integrates both the operating aspects of the enterprise (how it functions and interacts within its ecosystem), the transformational aspects (how it evolves and sustains over time through initiatives, asset management) and how these transformations are governed to ensure effectiveness, efficiency and reliability.

- The following slides present the foundations of enterprise modeling.

Foundations of enterprise modeling

- **Modularity** provides the syntax for building robust, manageable, and scalable architectures, based on the principles of composability and packaging.

- **Semantic** provides robust capabilities for classifying and composing entities, from time-bound entities (individuals) to families of concepts, enabling effective representation of meaning.

- The **Systemic Operating Framework (SOF)** serves as the overarching language that describes why and how a system operates and interacts within its ecosystems.

- **Abstractions** organizes systems and concepts in degree of abstractions, including systemic levels and conceptualization levels.

- **Enterprise Domains** formalize the various disciplines that make-up EA, ranging from enterprise road-mapping to System ArcDevOps.

- **Agility and System Thinking** ensure that the enterprise evolves and sustains over time through governed initiatives, architected for flexibility and responsiveness in complex and dynamic business environments.
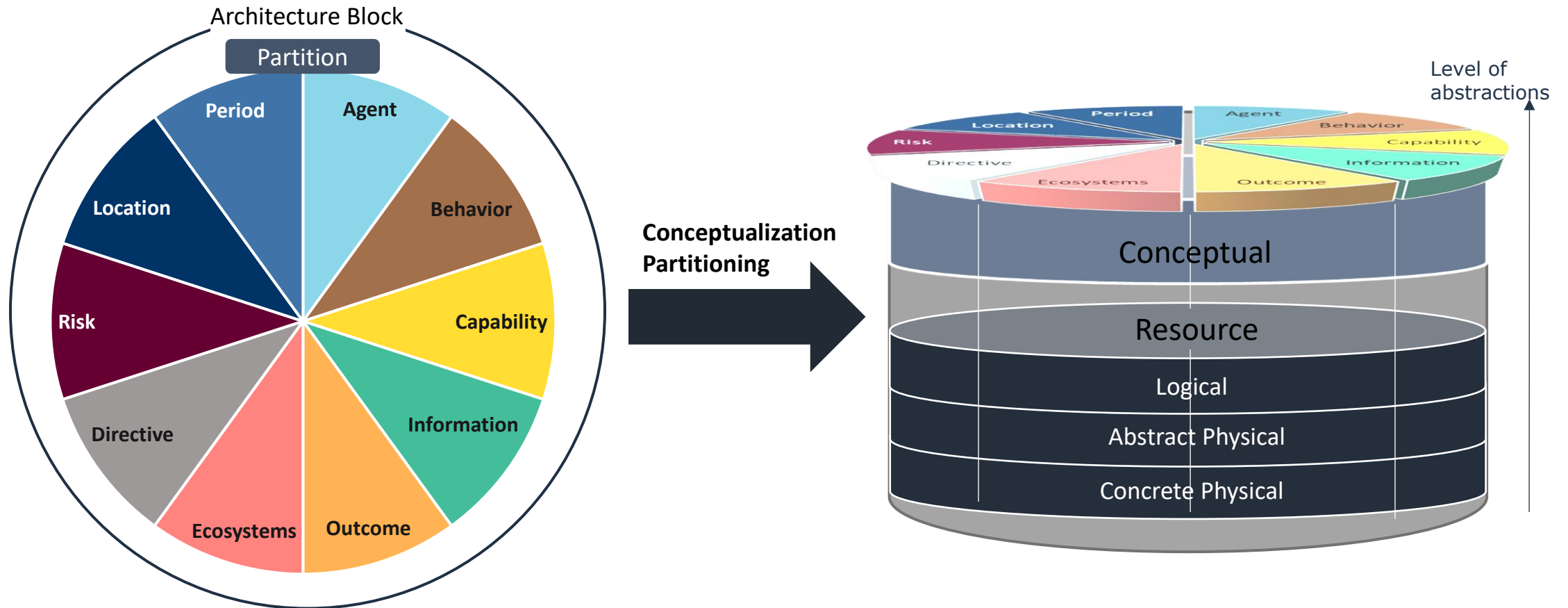
Conceptualization Levels and abstractions

- To establish a stable and concise definition of a domain problem, one effective approach is to abstract the domain until its essential and enduring characteristics are clearly identified.

- Abstract model serves as a reference for more concrete realization of this abstraction model.

- Aligning architectures across these abstraction levels involves conducting a gap analysis between a reference model and the solution(s) that realize it.

- This alignment process examines discrepancies through realization relationships, which articulate how solutions implement the reference model. By nature, reference models remain more abstract than the solution models derived from them.
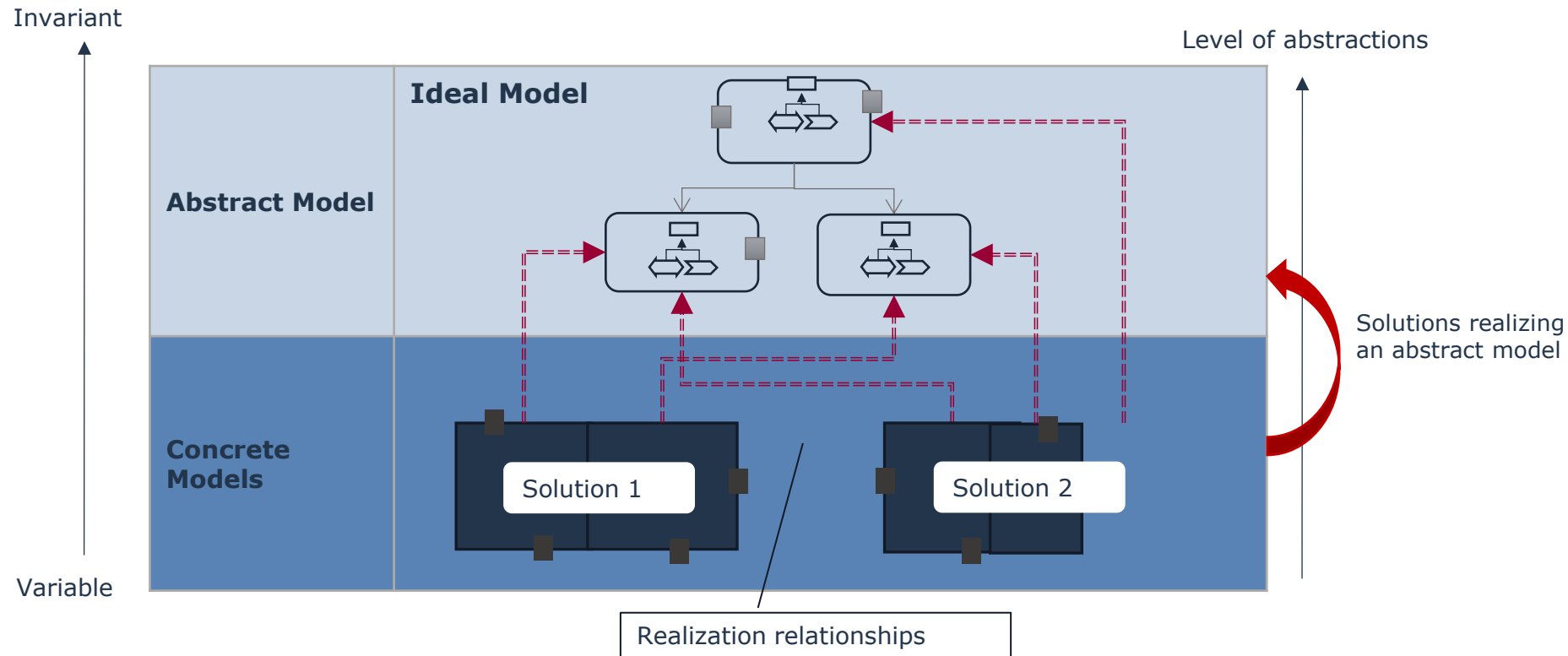
Partitioning of Architecture Assets

- Conceptualization levels represent a kind of abstraction where a more abstract model serves as a reference for more concrete realization of this abstraction model

Conceptualization Levels in the Architecture Framework

- One way to get a stable and concise definition of a domain problem is to abstract this domain up to the point

- Conceptualization levels are kinds of Conceptualization levels, distinct from systemic levels

- In the architectural design process, conceptual levels serve to offer a multi-tiered framework for envisioning and guidance., where more general levels, considered as invariants, are used as requirements for more specific levels.

- Each level of conceptualization is a generalization of a model of entities of a given reality, expressing common characteristics of these entities in order to:
  - provide a simplified representation (in the more general sense)
  - unify their manipulation.

- Each level is applicable to the different types of resource to be modeled (software, hardware, organizational), from its most concrete dimensions (sometimes called physical levels) to its most abstract dimensions (sometimes called logical levels).

- The most abstract level is the conceptual level where any notion of resource is ignored. For example, the "vision" function is at the conceptual level, while the eye is at the resource level. We can have logic models of the eye and several physical models of eyes.
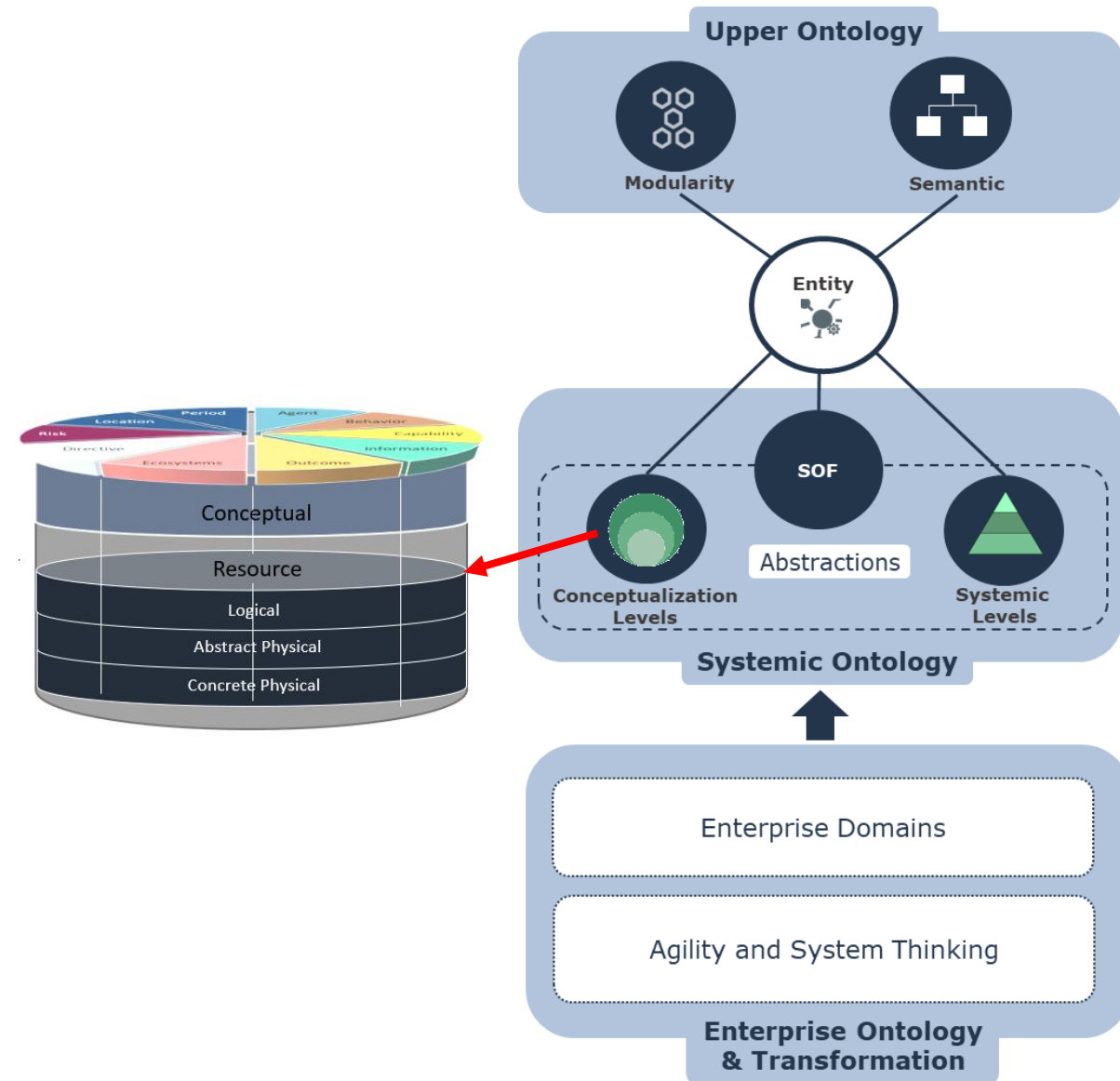
Why do we need conceptualization levels

- Architecture dimensions provided by the EA GRID can be sliced by conceptualization concerns

- Enterprise architects: Architects need to establish "invariants" to ensure functional consistency across the company's assets. They use the articulation of conceptual, logical, and physical levels to this end;

- These dimensions (the "vertical" slices of pie chart in the left-hand view in the figure below) are analyzed according to different levels of conceptualization (horizontal Levels in the right-hand view):

- Conceptual: analysis of the architecture from the sole point of view of an ideal functional division of labor of the company, regardless of the resources used. For example, for the ability to travel in space, it will require the functions of propulsion, life support, landing, etc. ;

- Resource: analysis of the resource architecture in order to achieve the functional goals of the systems studied. The "resource" level is further divided into:

- Logical level: analysis of resources independent of concrete solutions. One may have chosen nuclear propulsion without yet knowing the physical details of this system;

- Physical-abstract level: analysis of the flows and interactions of physical systems from their functional perspective, independent of physical laws;

- Physical-concrete level: analysis of physical systems in all their physico-technical dimensions (mechanics, electronics, thermodynamics, real time, respiration, etc.) and organic (physiology, microbiology, etc.).

Architecture Alignment – Information Model example

- Conceptual Information Models are more abstract than Physical Data Models.
- Mapping Relationships trace back physical data entities to business concepts that they are the implementation of.
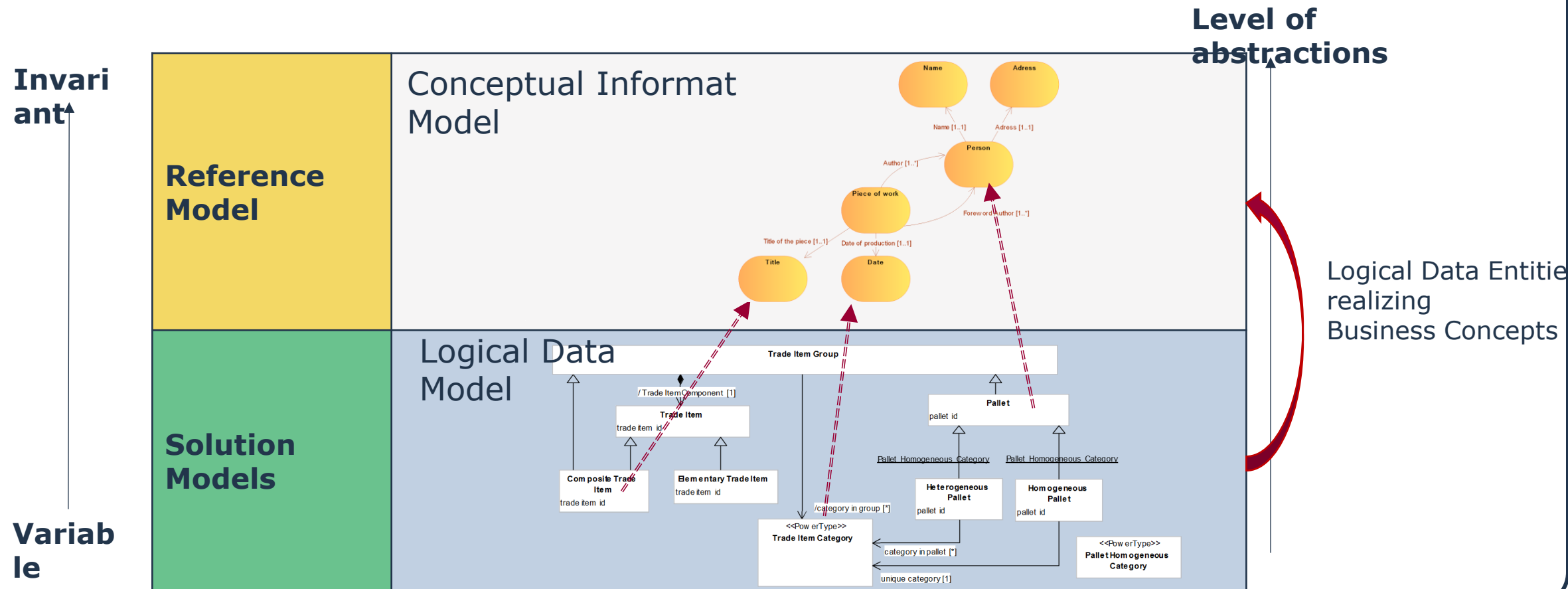
Operating Alignments

- Operating Models define how the enterprise operates.
- They can be defined at a conceptual level:
    - Business Operating Model.
- They can be defined at a solution level:
    - Resource Operating Model.
- Business Operating Alignment aims at providing the best fits between Resource Operating Models to their reference Business Operating Model.
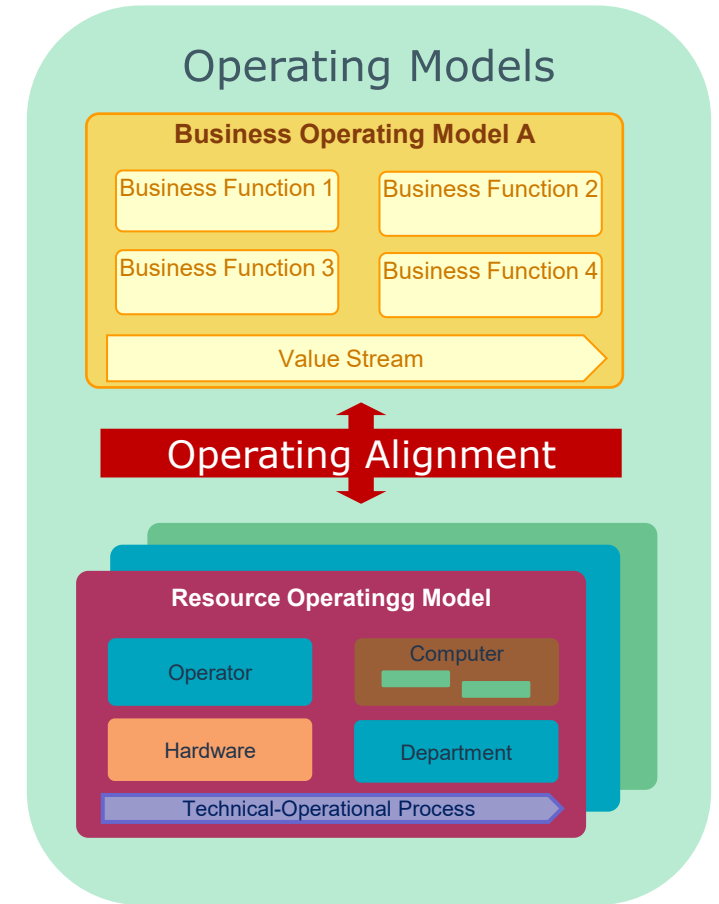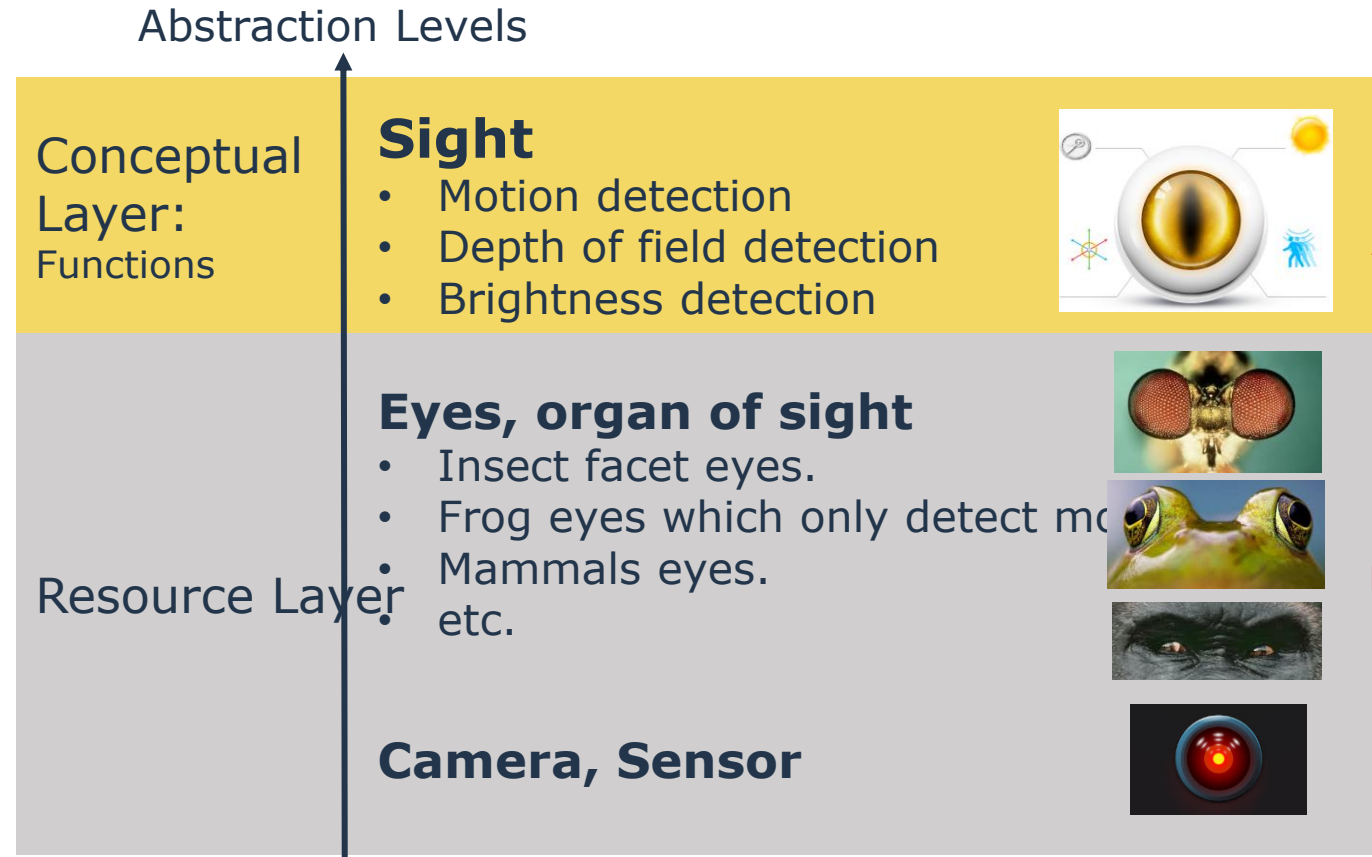
Agenda - the GRID

 Click here for direct access to the GRID

- Challenges in mastering EA concepts & approaches

- Models & Representations of the Enterprise

- Modeling Language Essentials

- Enterprise Description - Capabilities and Operating Models

- Enterprise Description - Functional Alignment & Conceptualization Levels
  - Various kinds of alignment?
  - The Case of Conceptual, Logical, Physical
  - EA Layers & the GRID
  - Method for Strategic Alignment of Resources

Architecture Alignment –Conceptual Functions vs Resources

- In EA analysis, the conceptual layer is a level of abstraction of the Enterprise where there is no commitment to physical resources (Sight versus Eyes). It is often called the "business layer".

- For instance, it is possible to describe capabilities, business functions, business exchanges and business information of the banking domain or the defense domain without committing to people, hardware and software used to operate.

- The term "function" is often used to represent the conceptual layer sometimes called the "functional layer".

- => This creates confusion between business functions and
  - Business Processes,
  - Business Capabilities,
  - Functionalities.

Abstraction Levels

Conceptual Layer: Functions

Sight
- Motion detection
- Depth of field detection
- Brightness detection

Resource Layer

Eyes, organ of sight
- Insect facet eyes.
- Frog eyes which only detect mo
- Mammals eyes.
- etc.

Camera, Sensor

Operating Reso
realizing
a conceptual
reference mode

Conceptual, Logical, Physical & abstraction

- The resource layer itself is often divided in a logical layer and a physical layer.
- In fact, the Logical/Physical split can be applied recursively at many layers:
 - What looks like a Physical Application in HOPEX is a "logical" view from a programmer viewpoint.
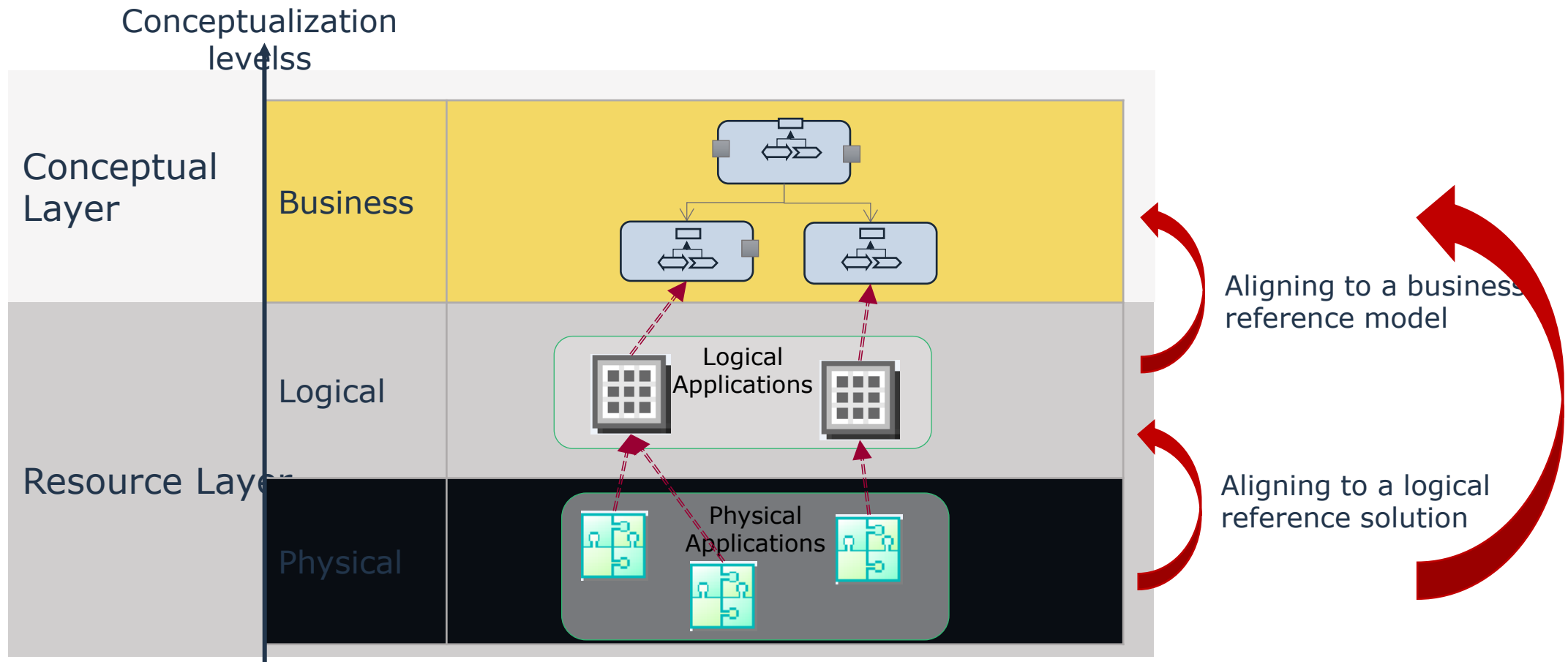
Alignment - Resource Usage Alignment

- A second type of "alignment", is a set of resources "making use" of another set of resources.
  - Human Resources make use of Enterprise Artifacts.
    - For instance, a salesperson uses a configured smart-phones for registering sales.
  - Enterprise Artifacts make use of Technical Artifacts.
    - For instance, an ordering application makes use of DBMS storage

- These relationships ARE NOT, realization relationships. In ArchiMate, they are represented by "used-by" relationship (ArchiMate looks at these relationships the opposite way)
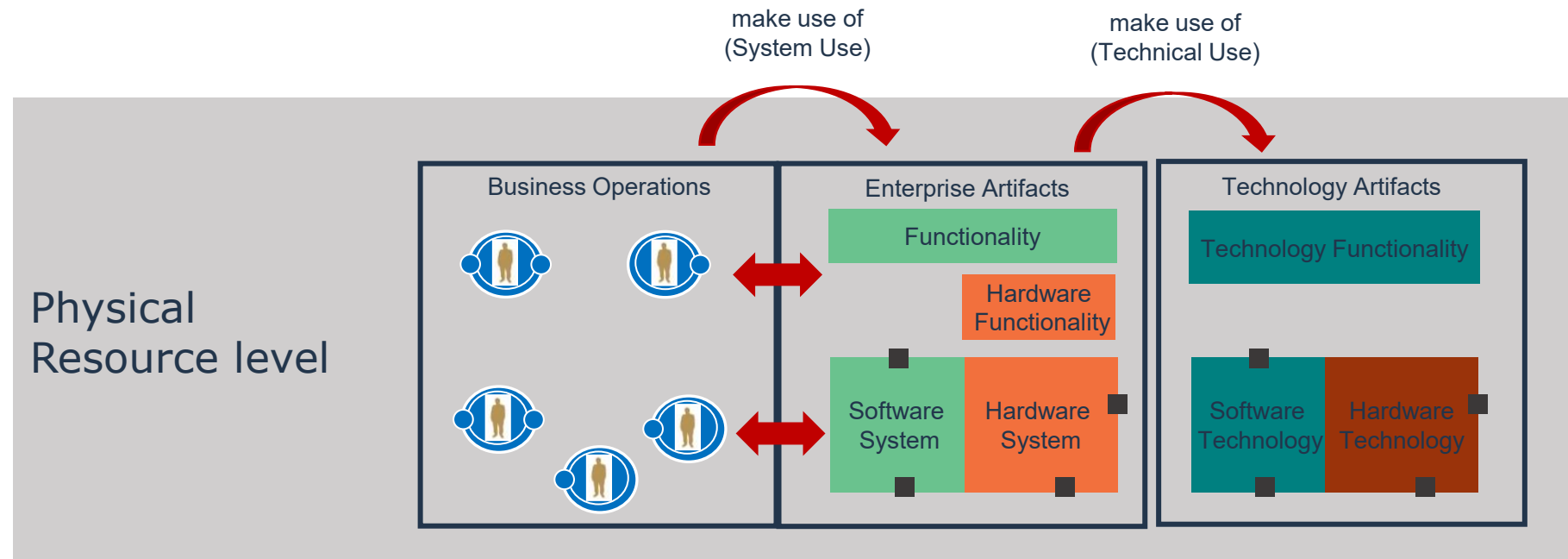
Artifact Usage Pattern

- The pattern provides concepts to describe artifact usage by Agents and/or Processes

- It is used to ensure functional alignment between Artifact Resources and their user Agents.
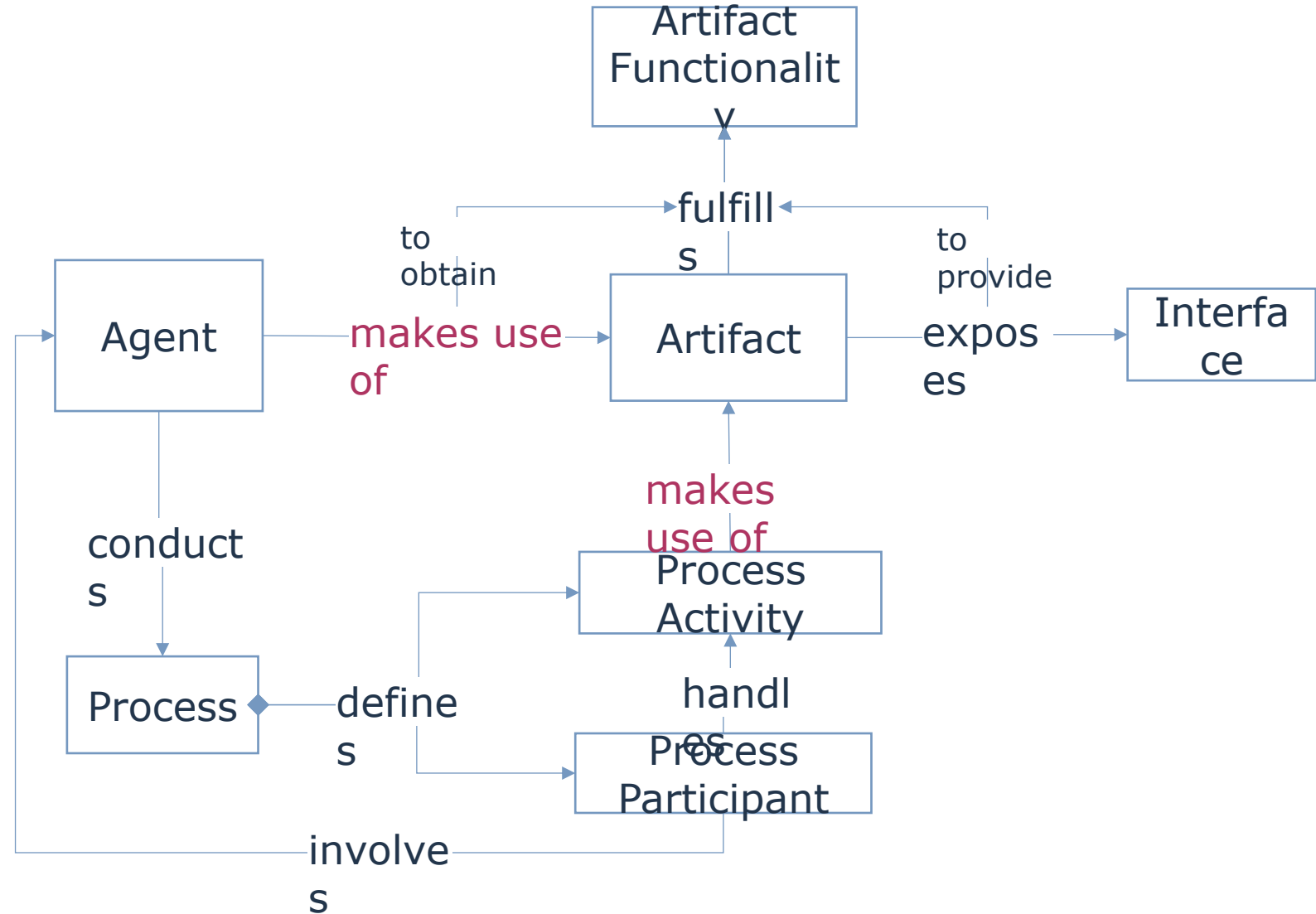
Alignment between Organization and Non-Human Systems

- Human resources make uses of artifacts.
- Artifacts are used by human resources.
- This relationship IS NOT, a realization relationship.
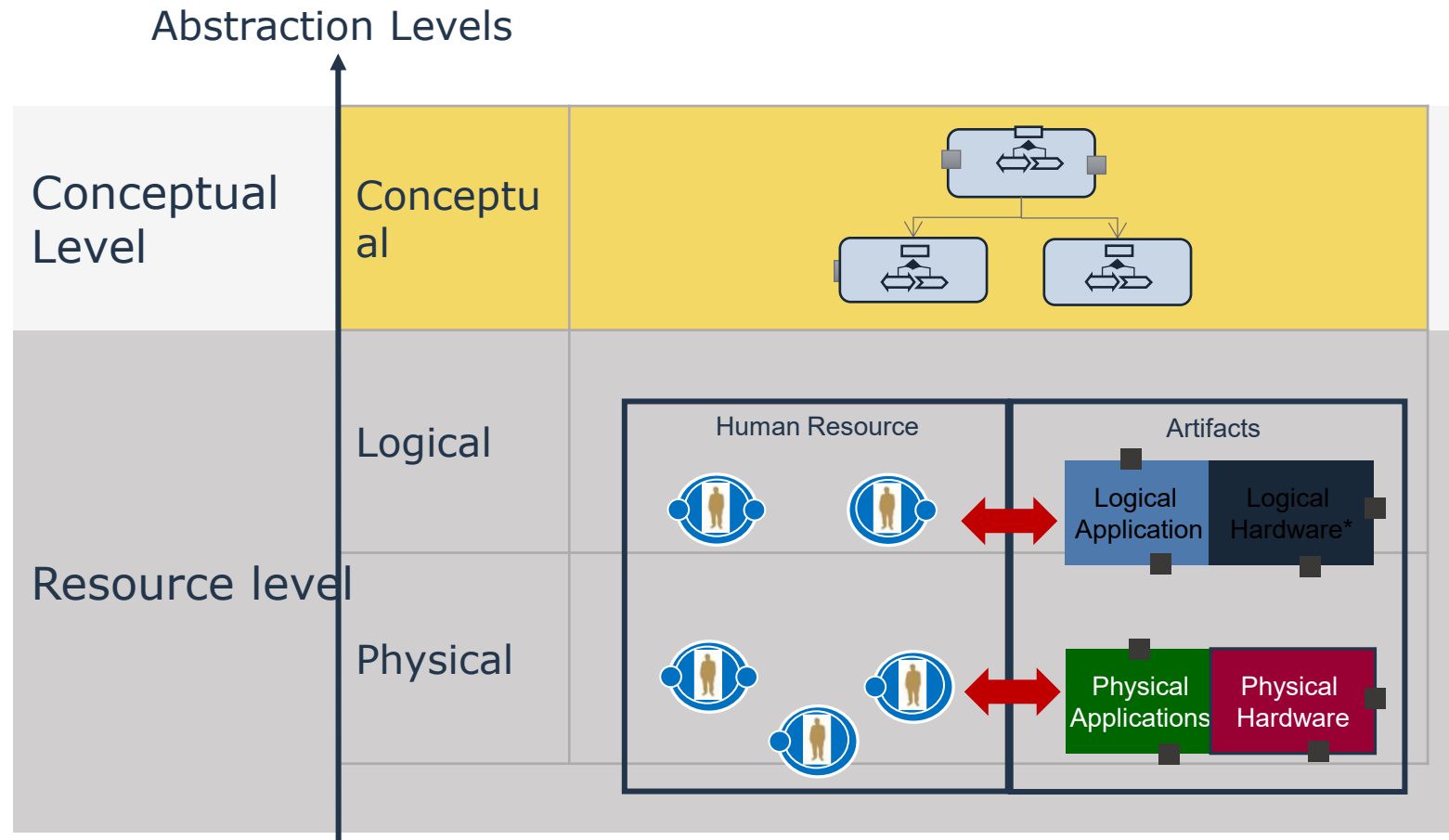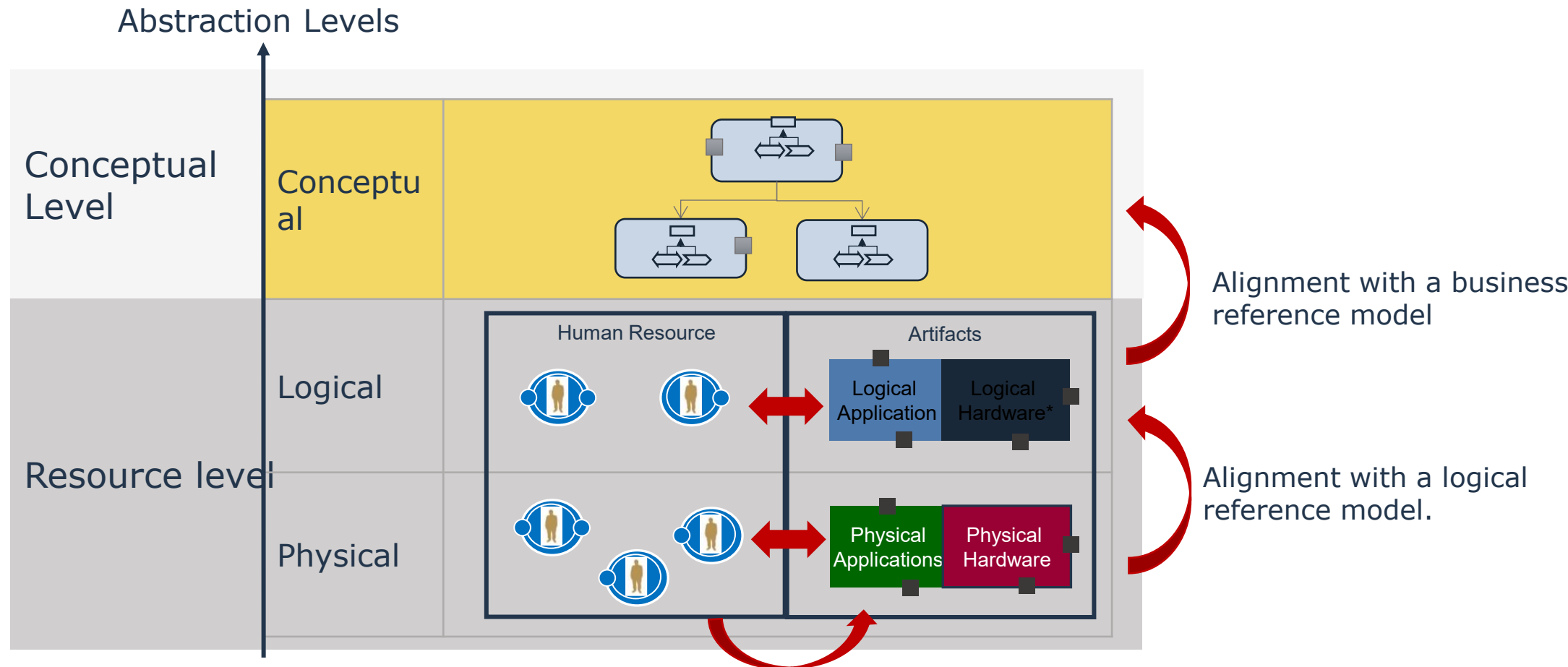
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Conceptual Level

Conceptual Level - Definition

- The conceptual level abstracts the description of the architecture of the enterprise (capabilities, agent, behavior, information, rules) up to a point that is independent from any actual resources (human resource, software resource, hardware resource).

- The goal is to concentrate on the fundamental characteristic that make-up the invariant of a specific domain: how does banking work, how does pharma work, …

- It comprises three domain models:
    - The conceptual operating model serves as a strategic framework for the enterprise, directing its functional division of labor to fulfill its missions and purposes.
    - The conceptual data model serves as the foundation for building an enterprise's glossary. It provides semantic context to Enterprise Assets, enhancing understanding and usage across the enterprise.
    - The conceptual capability model:

Conceptual Operating Model

- A Conceptual Operating Model serves as a strategic framework for the enterprise, directing its functional division of labor to fulfill its missions and purposes.

- This model provides an ideal configuration of key Activity Domains and their value-added behaviors (Value Streams) to deliver enterprise Business Outcomes.

- Unlike a reflection of the current state of operations, a Conceptual Operating Model envisions the ideal operation landscape. It is a blueprint for the optimal functioning of Business Operations.

- While it is sometimes referred to as a "business capability" model (see Gartner reference below), a **Conceptual Operating Model** is not to be confused with a Business Capability Map. Despite their shared aim of framing business operations, they are different tools and serve distinct purposes:

Conceptual Capability Model

Work in Progress

Conceptual Data Model

Work in Progress