



Developing a conceptual architecture model

Mr. Henry M. Mottesheard (NGA)

Dr. Tim Eveleigh (GWU)

Mr. Lance Page (Ctr)

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Many objectives and methods to construct architectures

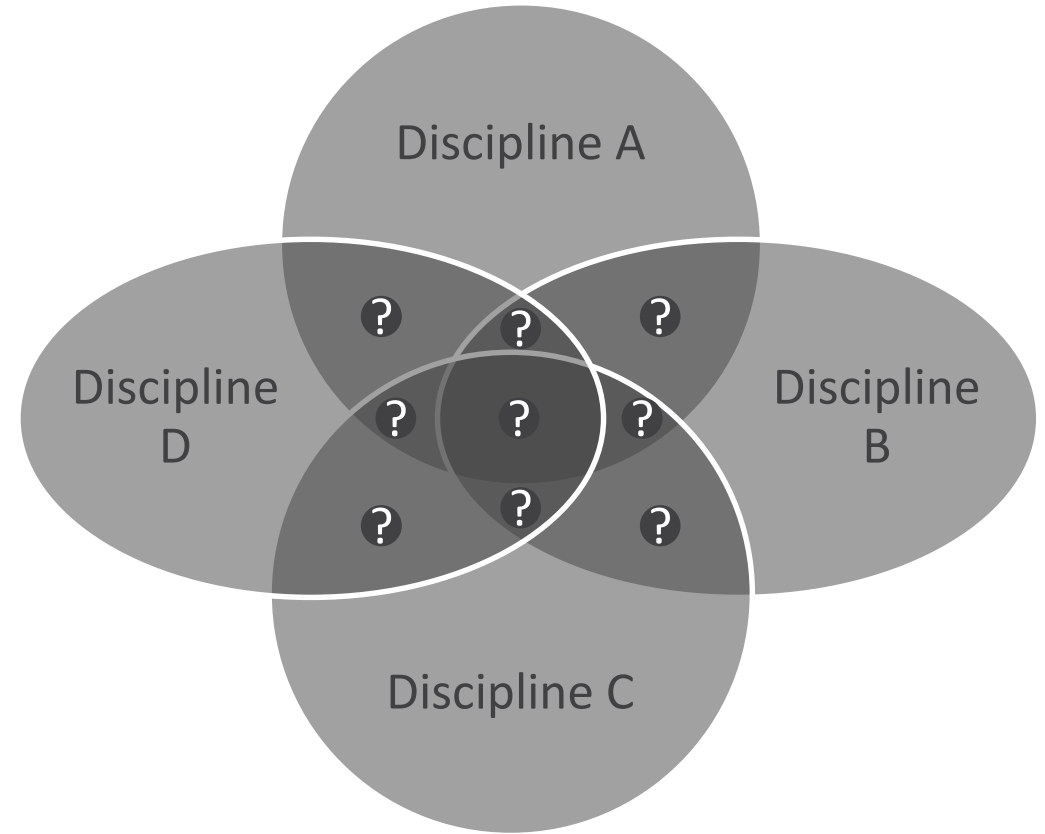
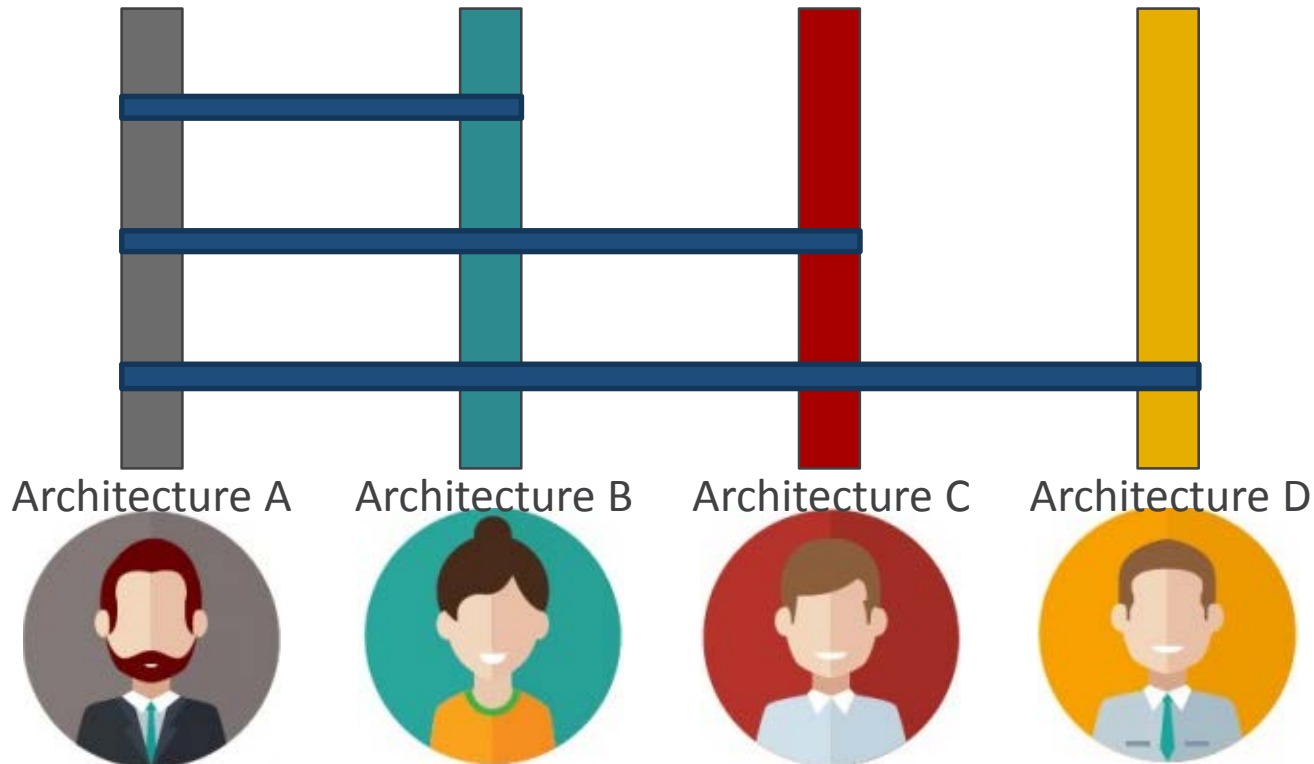


Numerous frameworks (frmwk) identify systemic processes for developing architecture

- DoDAF: Department of Defense Arch. Frmwk
- FEAF: Federal Enterprise Arch. Frmwk
- ICPAG: Int. Com. Prog. Arch. Guide
- JARM: Joint Arch. Ref. Model
- MoDAF: Ministry of Defense Arch. Frmwk
- NAF: NATO Arch. Frmwk
- TOGAF: The Open Group Arch. Frmwk
- Zachman: The Zachman Frmwk

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Dependent commonality?



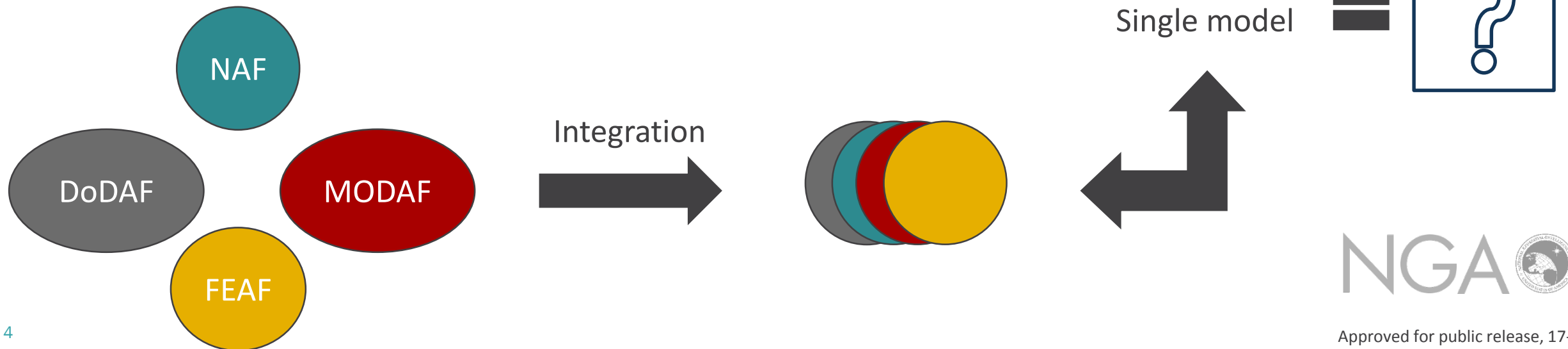
Architecture frameworks rely on groups of users adhering to deterministic architectural structure(s) (frameworks).

Works well when identifying a unique system, or, when multiple components of an organization (e.g., DoD) use a specific framework type.

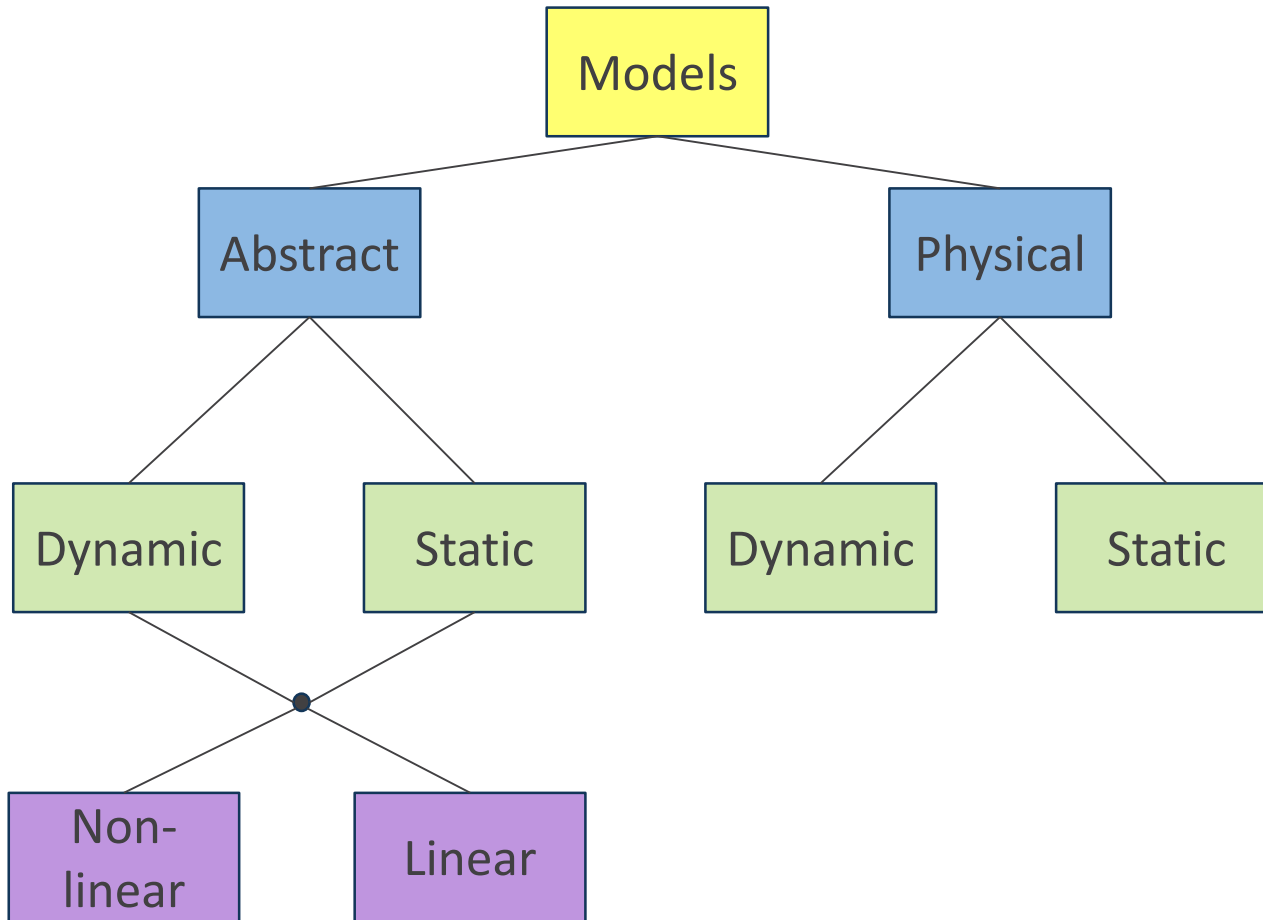
Challenges with deterministic architectures

Literature reviews on architecture show:

- Attempts to integrate multiple models “raises several challenges of model coherence, consistency and traceability” (Antunes, 2013).
- Even with coherent (singular) “architecture descriptions there still exists a need for a single model type and notation for modeling the semantics between entities” (Nurminen, 2007).



Demystifying the abstract

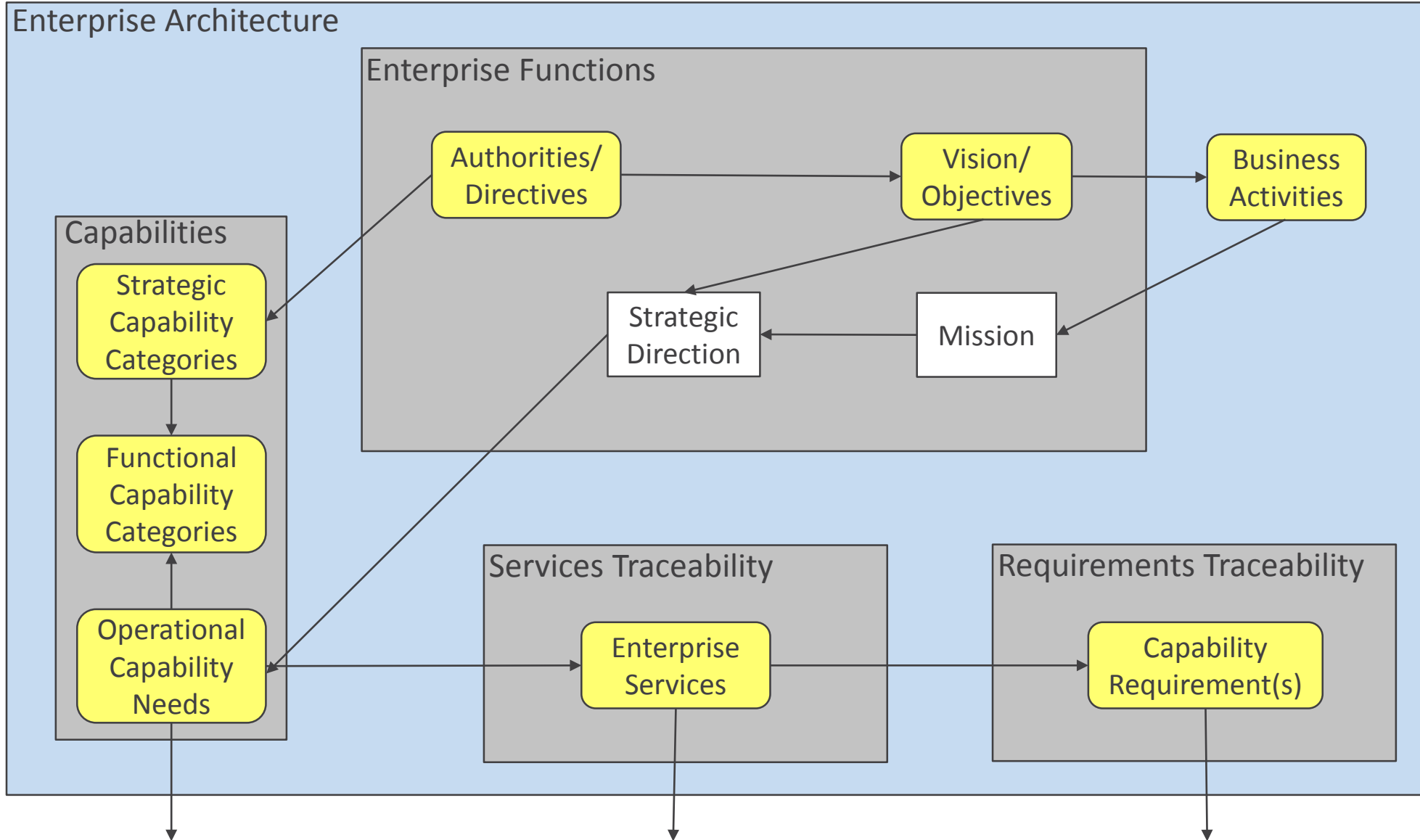


Abstract modeling benefits:

- Allows for exploration of To-Be architecture prior to procurement.
- Explores macro enterprise and business linear and non-linear relationships for future impacts to the physical architecture (system of systems).

*Forrester, Industrial Dynamics, Fig. 4-1, 1961, MIT.

Conceptual architecture model – Enterprise meta-ontology

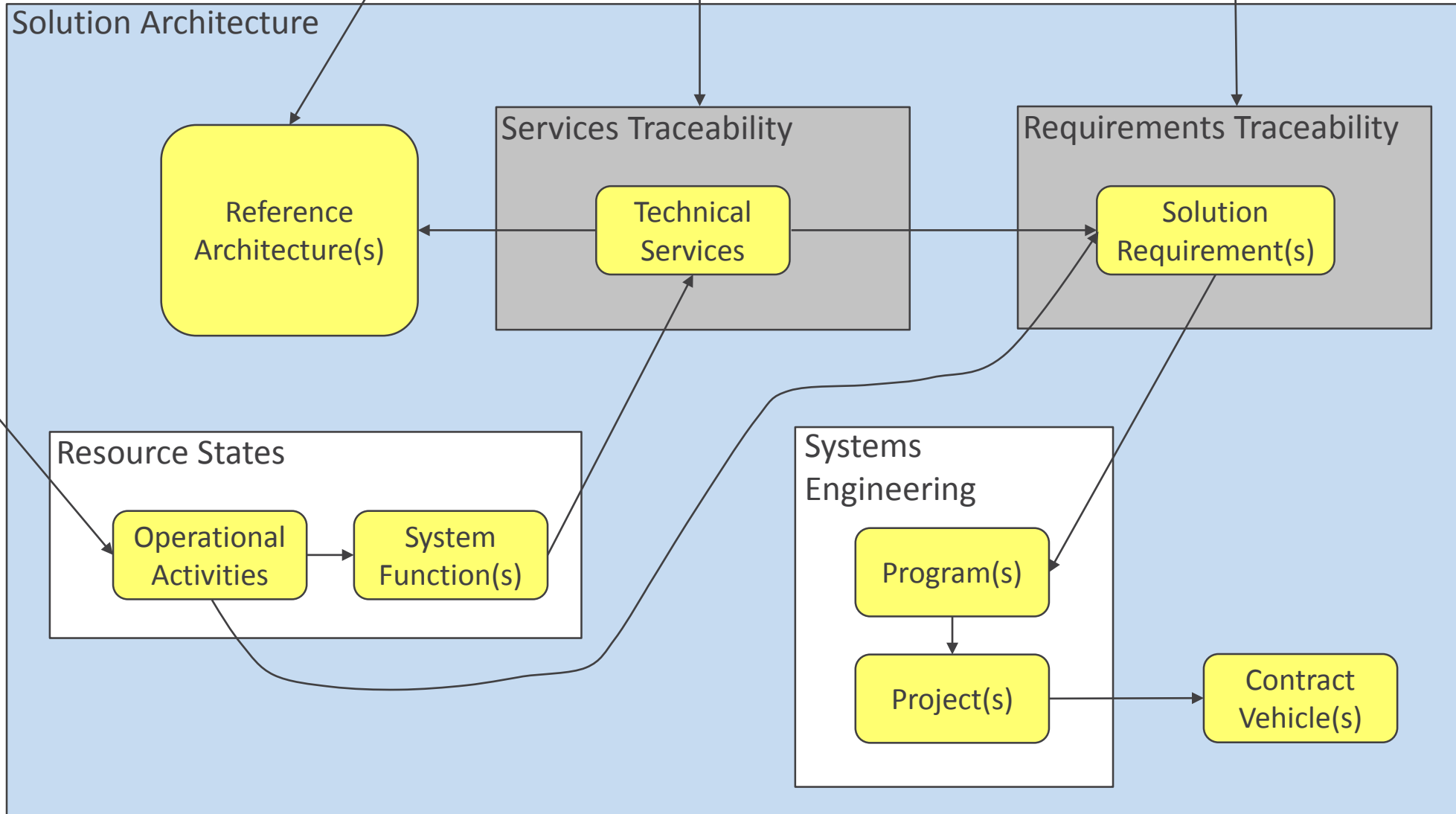


*Partial entity relationship model

*Mottesheard, Eveleigh, Page, 2017



Conceptual architecture model – Solution meta-ontology



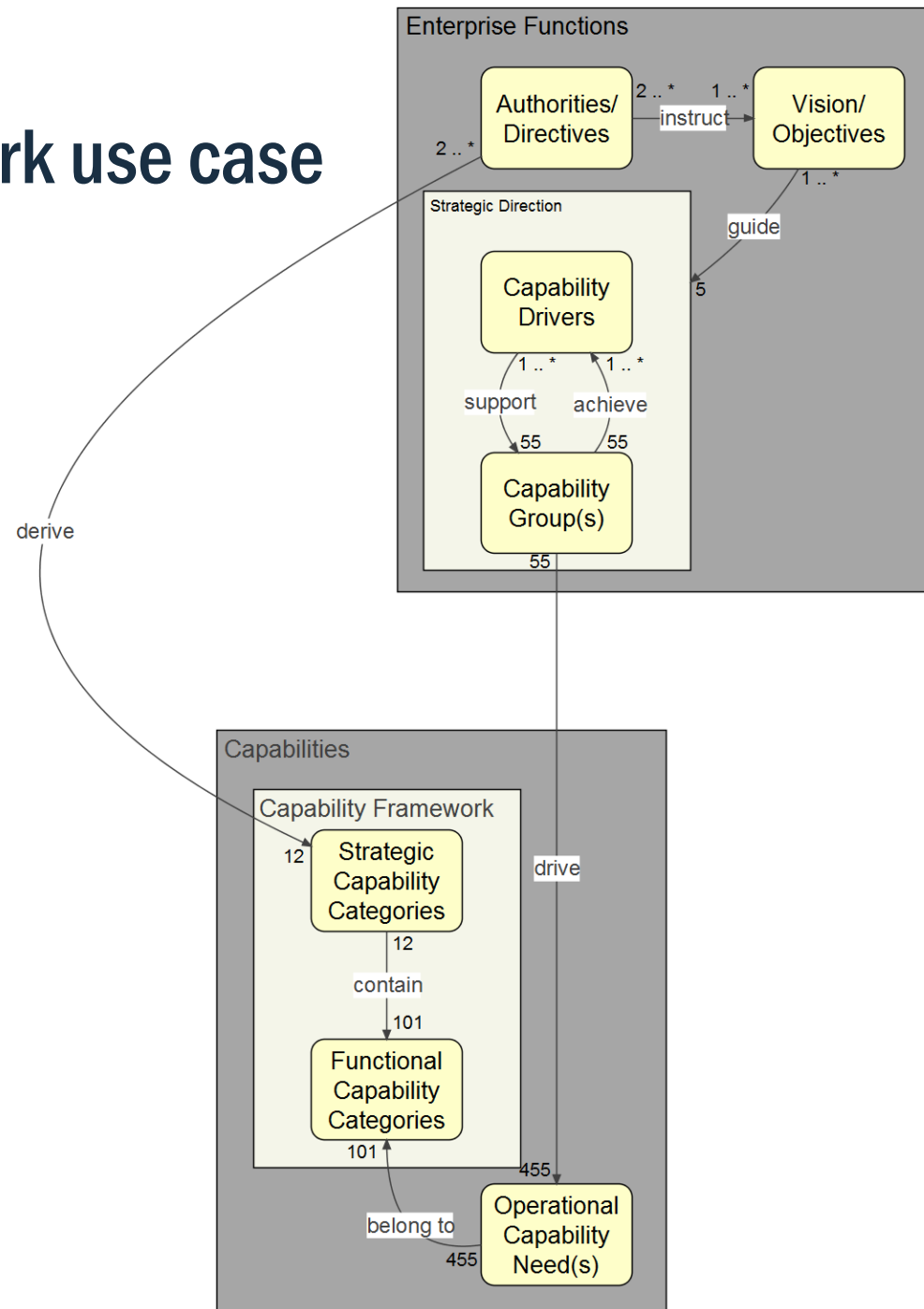
*Partial entity relationship model

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Example – Capability framework use case

- 2 or more – Authorities & Directives (Title 10, Title 50 US Code)
- 5 – future Agency Strategic Direction identified in the FY16-FY22 Planning Guidance
- 12 – Strategic Capability Categories
- 101 – Functional Capability Categories
- 455 – Operational Capability Needs



Limitations

Ontological:

- Mediation among subcommittees to express semantic reasoning across architectural components

Procedural:

- Concept is currently limited to one Agency (NGA)
- Data to validate model and show non-linear architectural relationship for investment/divestment decision making needs to occur

Cultural:

- Challenge in forming and using upper level ontologies to map/reason between lower-level (deterministic) architectures

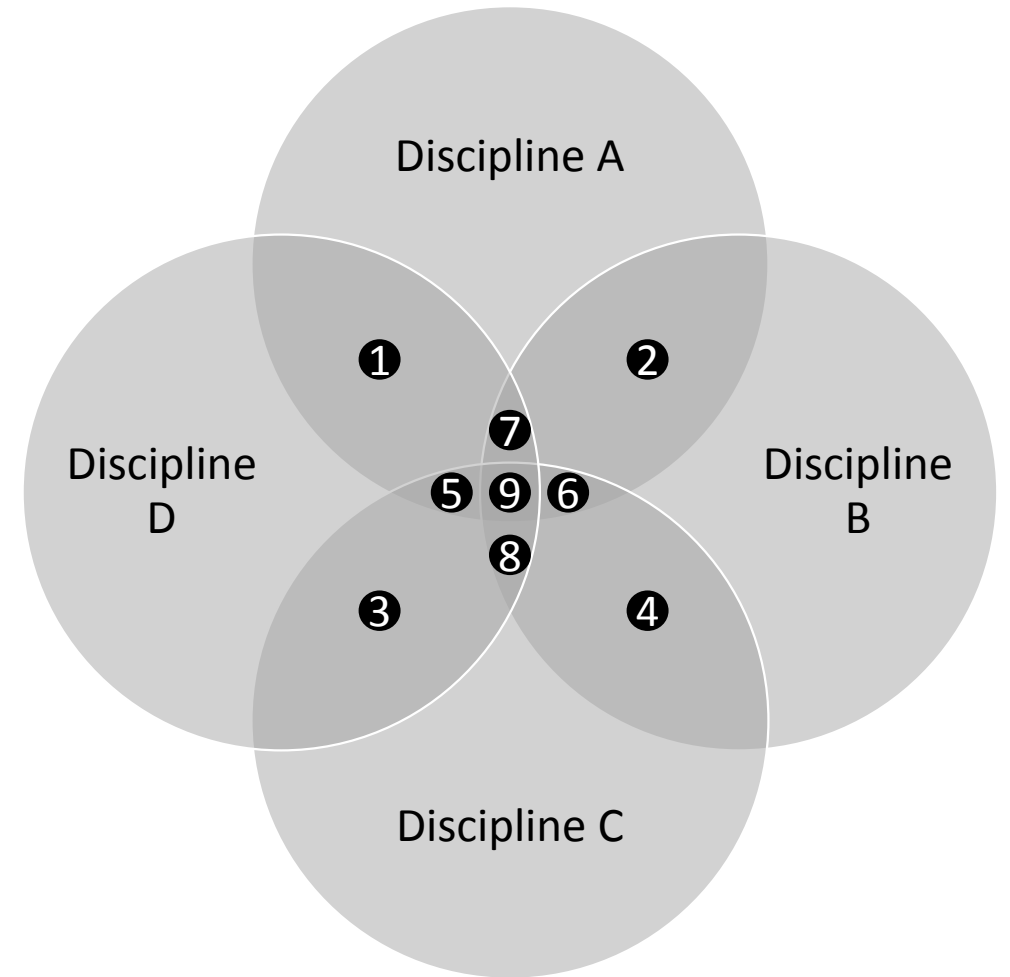
Next Steps

- Continue to define ontological entities and relationships within the model.
- Collaborate with organizations to collect data and model outcomes
- Utilize architecture tools (e.g., Core, Trous) to begin modeling relationships

Summary

- Architectures are complex and dynamic
- As non-linear approaches to services and sharing agreements evolve across entities, how can one effectively evaluate similar architectural components within disparate architectures?

Questions?



- Sources & References provided in backup.
- Please see the “Developing a conceptual architecture model” entity relationship diagram in the lobby through the remainder of the working group.



Presentation Sources

- Antunes, Goncalo, et al. "Using Ontologies for Enterprise Architecture Analysis." *Enterprise Distributed Object Computing Conference Workshops (EDOCW)*. IEEE, 2013.
- Forrester, Jay Wright. *Industrial Dynamics*. Boston: MIT, 1961.
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- *ibid.*, Enclosure A: Identification of capability requirements and capability gaps, pg. A-11, Section 6: Studies repository, subsection b.
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Additional References (2 of 2)

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