Jheronimus Academy of Data Science

TOSCA *Intent* Models: Goal-Modelling for Infrastructure-as-Code

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What are we up to here today?

- DevOps in a Nutshell
- TOSCA in a Nutshell
- Research Problem & Scope
- TOSCA Intent-Modelling Explained
- Outlook and Future Work
- Conclusions

DevOps

- **What is it:** “Practices or tools that bridge the gap between development and operations”
- **Goal:** Creates a collaborative mindset where a single team performs Dev and Ops
  →the team **must** contain differentiated competences, background, etc.
- **Requires:**
  - Culture management;
  - Automation tools;
  - Organisational as much as technical metrics
  - Continuous sharing artifacts, procedures, languages, approaches…

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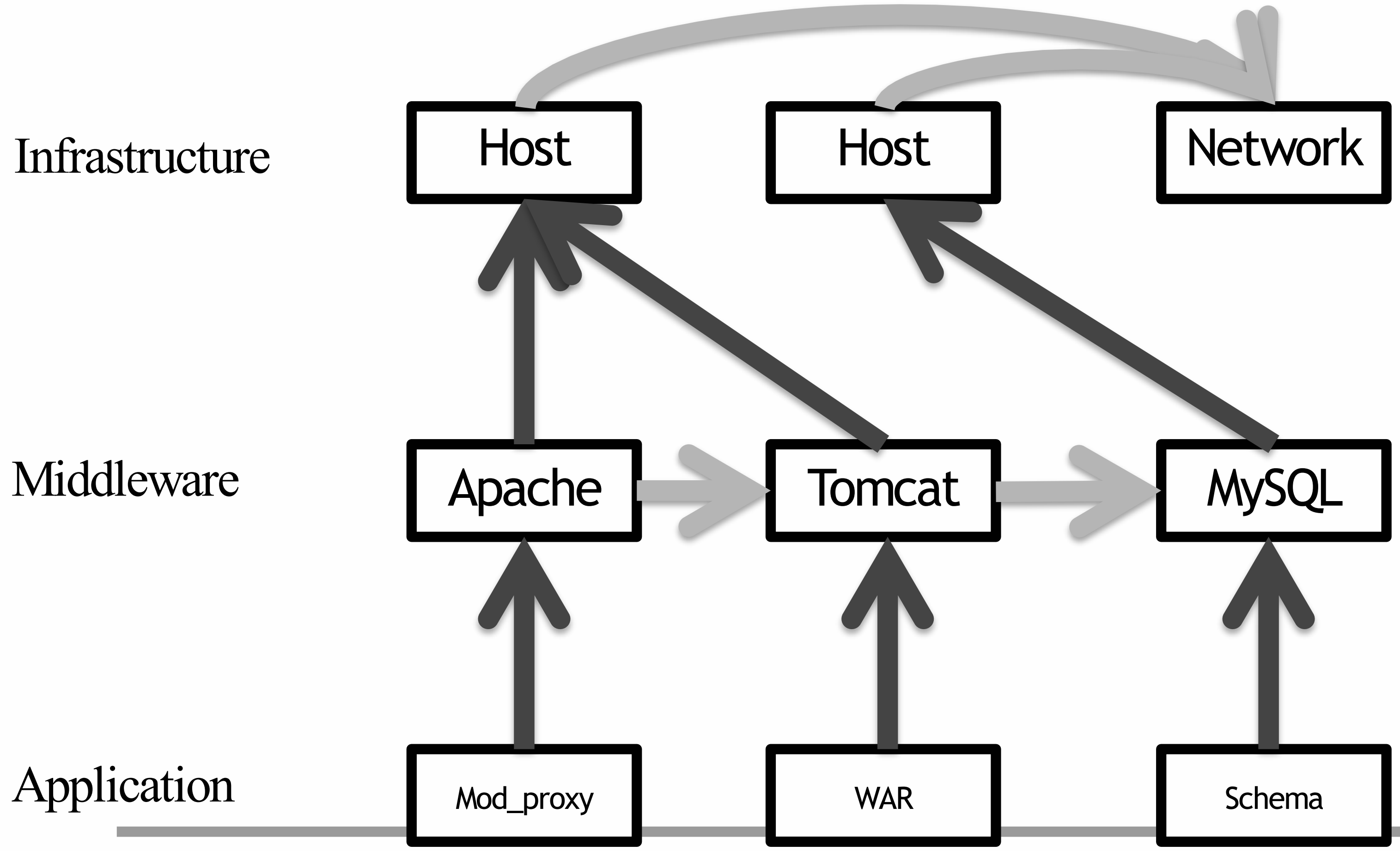
Infrastructure-as-code!

TOSCA in a Nutshell

- OASIS Standard for infrastructure-as-code

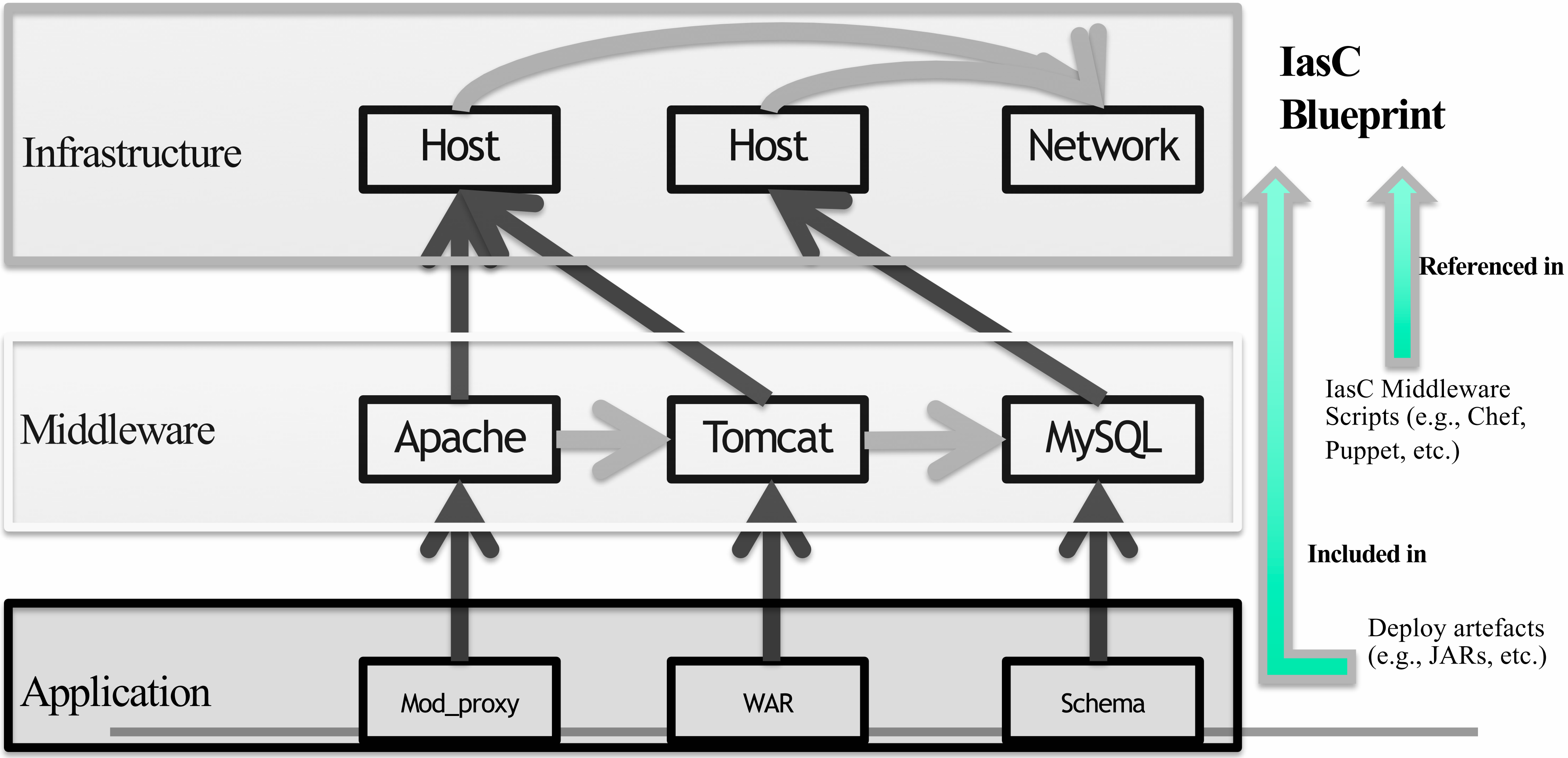
Towards standard Infrastructure Code

➔ **An Application Deployment Topology**, i.e., “a graph of physical artefacts that need support for several lifecycle phases (e.g., procurement, installation, configuration, deployment, undeployment, teardown, etc.)” [6]



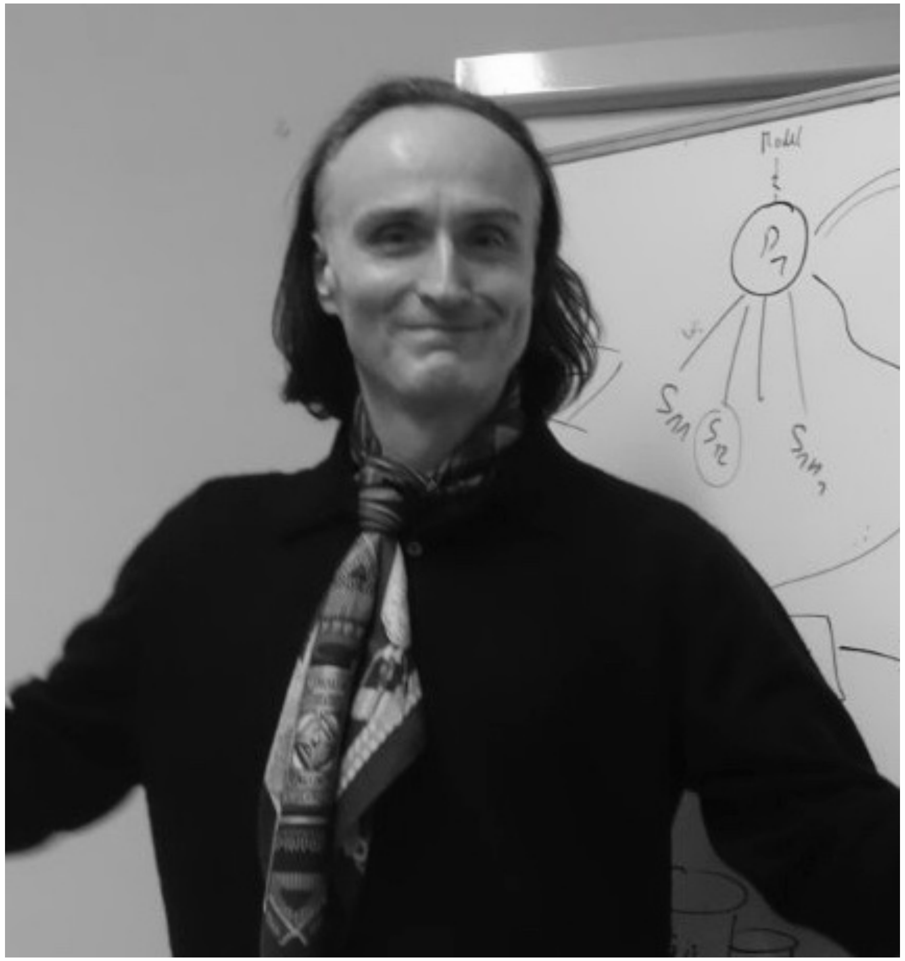
Towards standard Infrastructure Code

➔ **Infrastructure-as-code**, i.e., "a blueprint detailing physical artefacts, all scripts for all lifecycle phases and all artefacts needed for deployment" [6]



TOSCA in a Nutshell

- OASIS Standard for infrastructure-as-code
  - (btw, thanks Frank!)



Research Problem & Scope

- **Problem statement**
  - Suppose you want to recommend TOSCA to your friends or foes…

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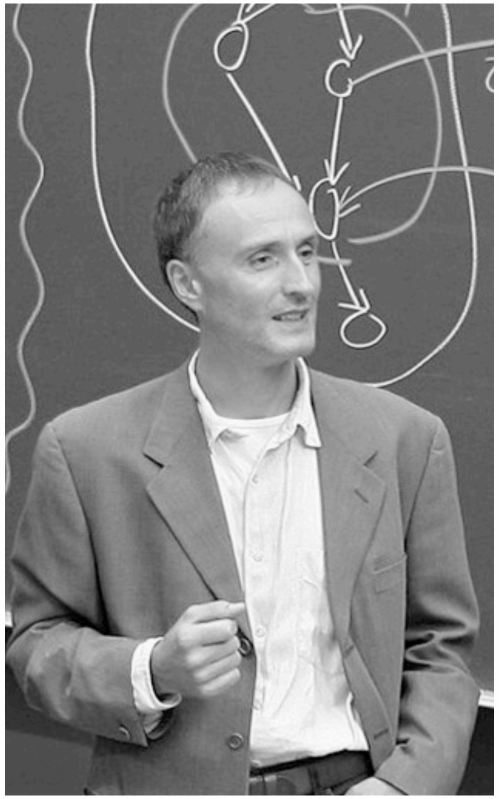
Our Frank



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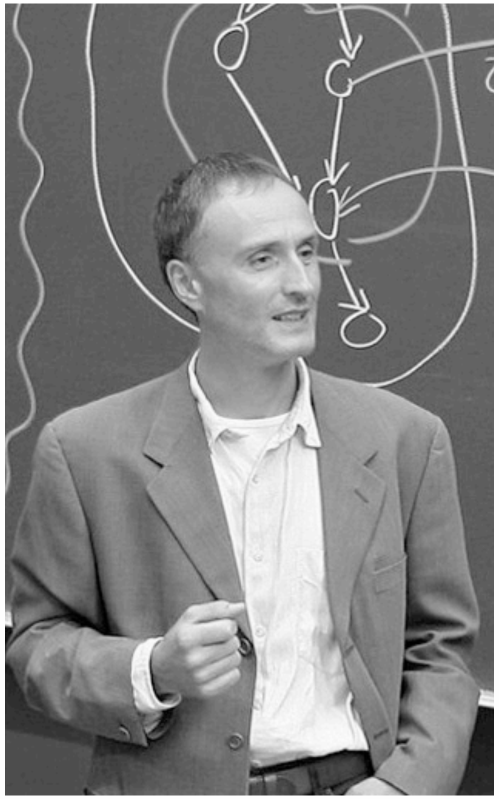

➡

another Frank (not as friendly as ours)

Research Problem & Scope

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myself

→

Average EU FP7, H2020 reviewer

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    RQ: What is its intended *design* and *programming* model?

Why is this important?

1. *If you know the *design model* you can automate it, prepare process models for it…*

2. *If you know the *programming model*, you can extend it, play around with it, design tools for it…*

TOSCA Intent-Modelling Explained

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<BUT… you would be wrong!>

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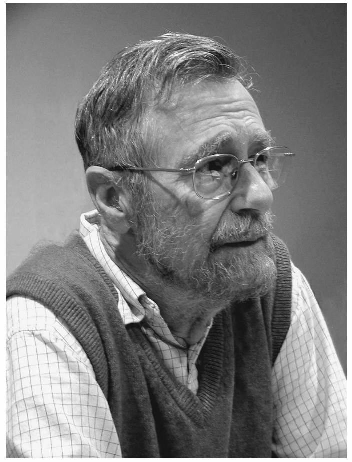
<the formalists would be making this guess, I think ☺>



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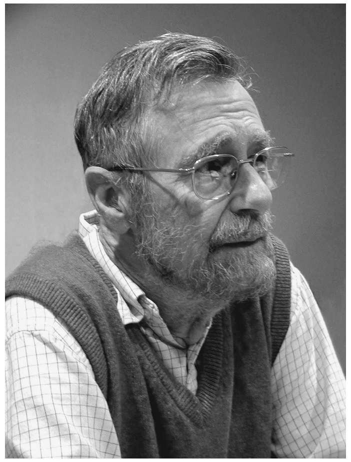
<Wrong again! [but almost right, let's say 50%]>



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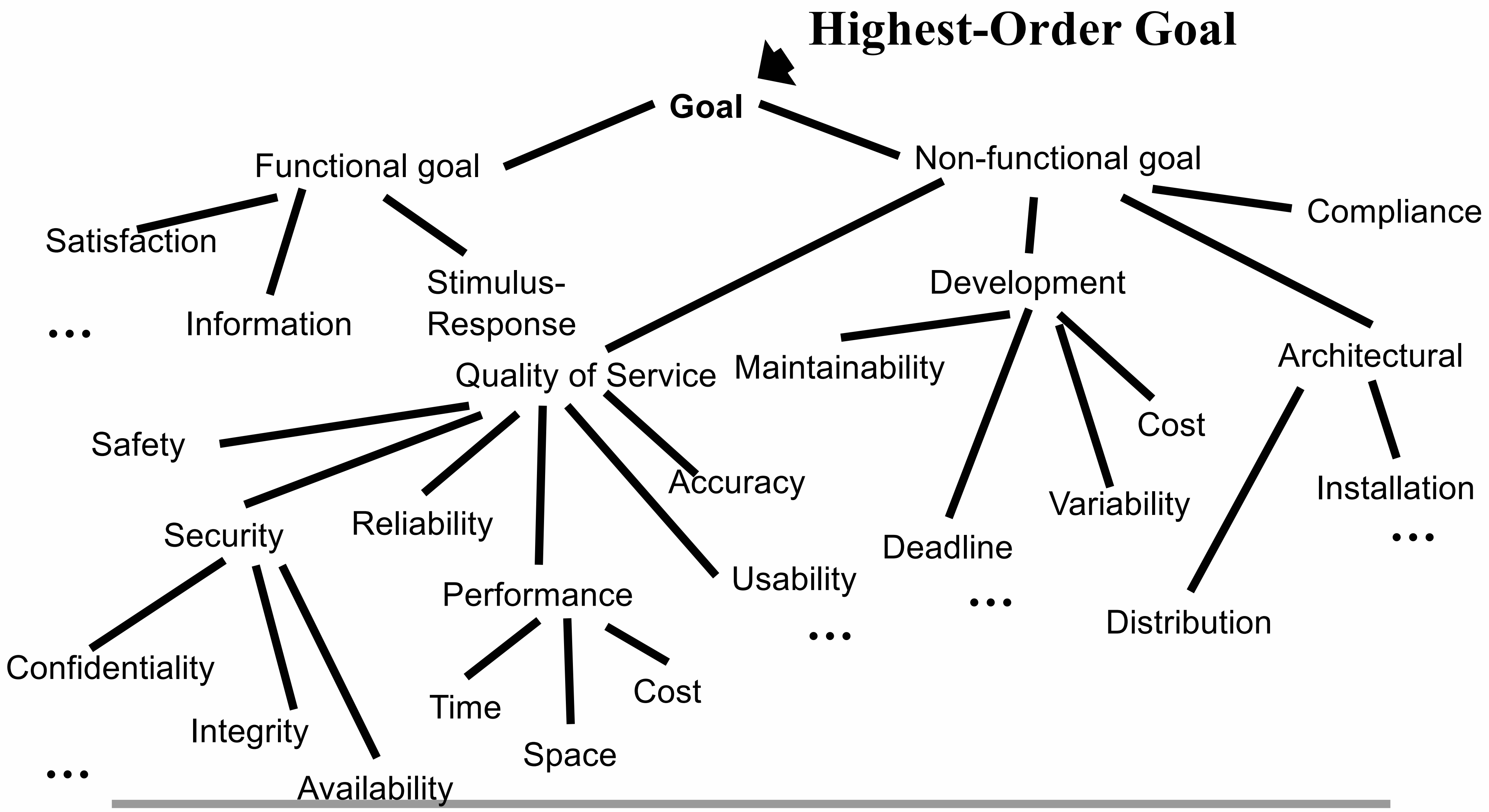
TOSCA vs. Goal-Modelling



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- **Intent modelling!**

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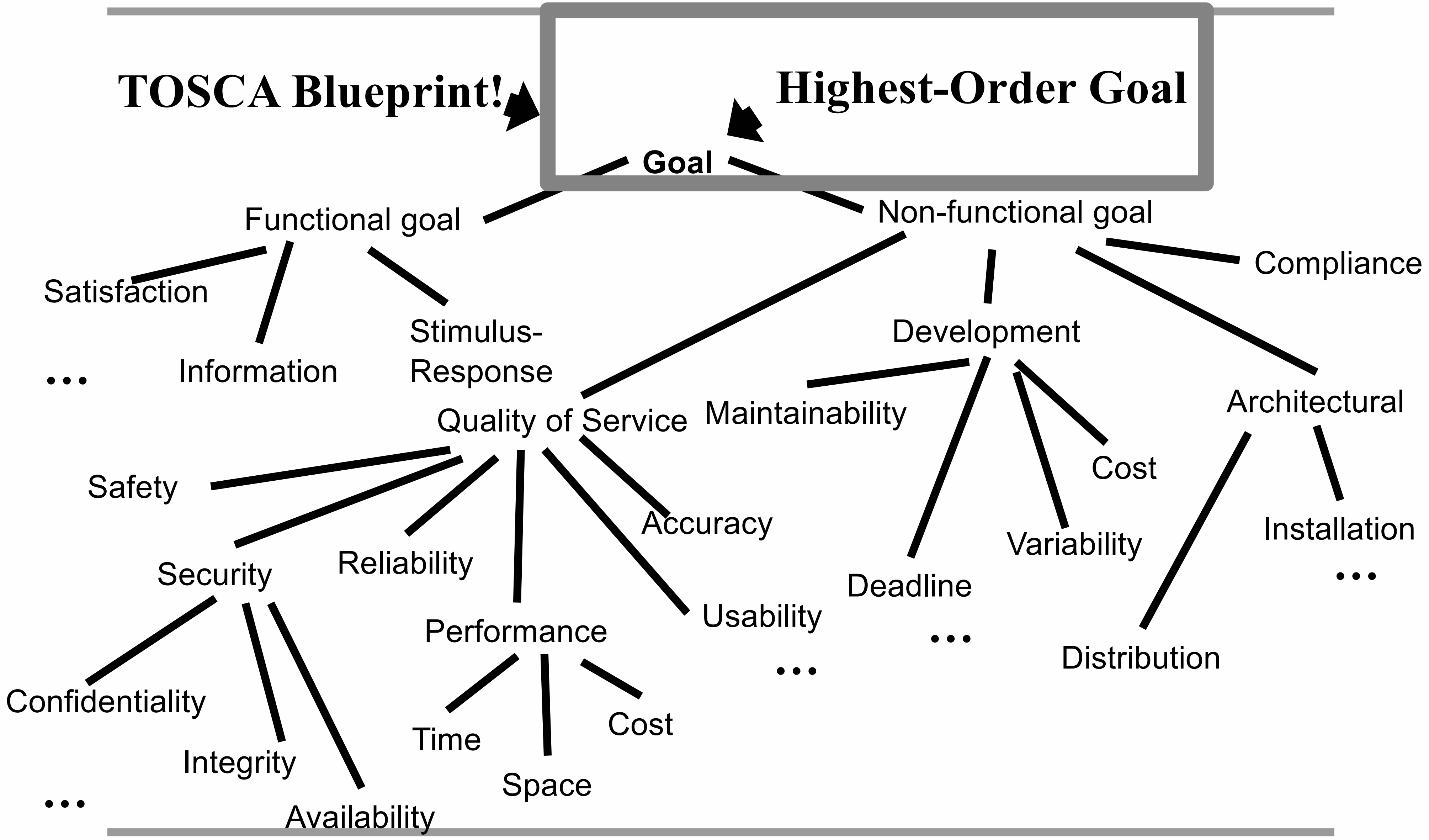
TOSCA vs. Goal-Modelling



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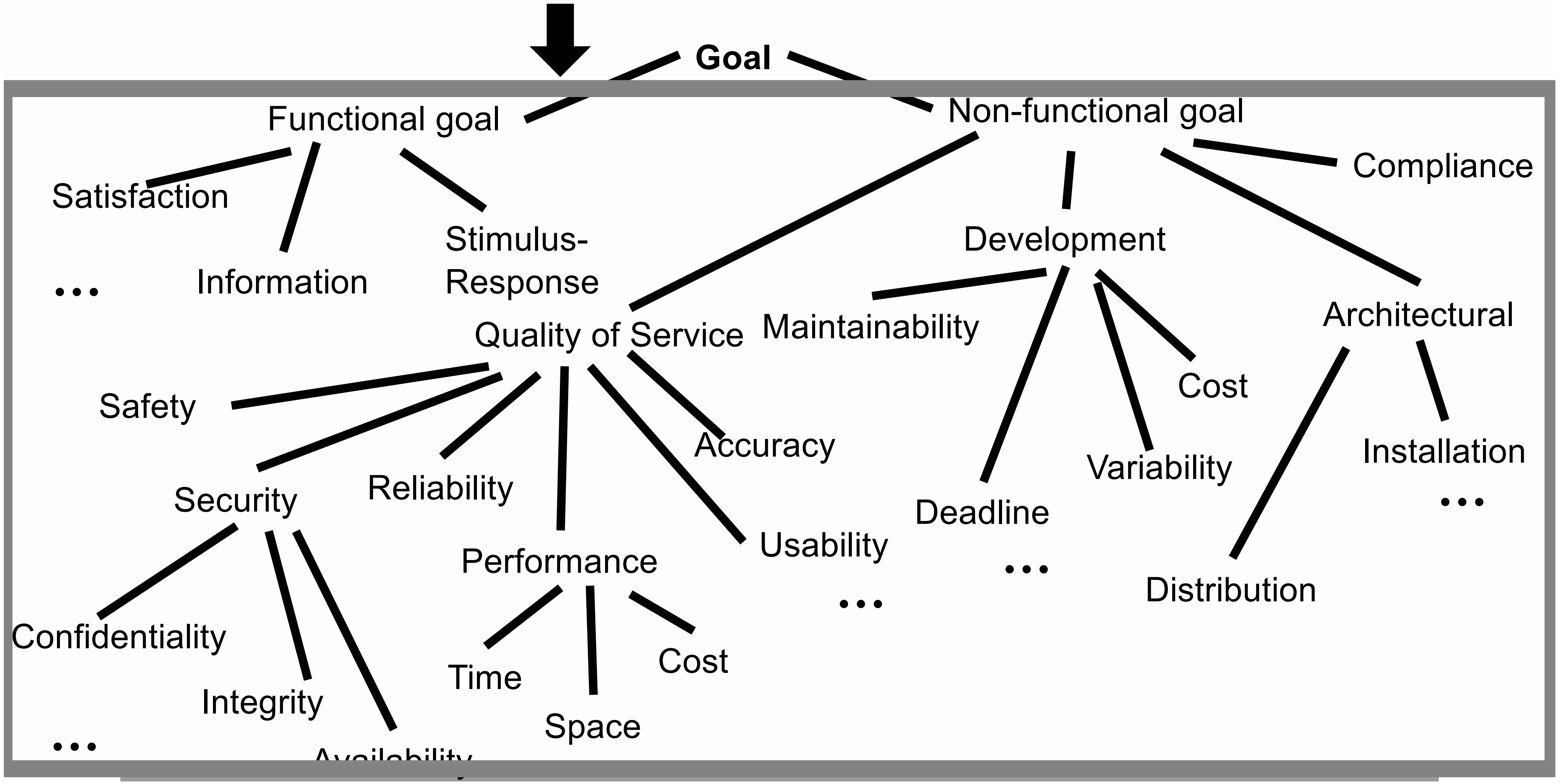
This is left to the orchestrator

TOSCA vs. Goal-Modelling

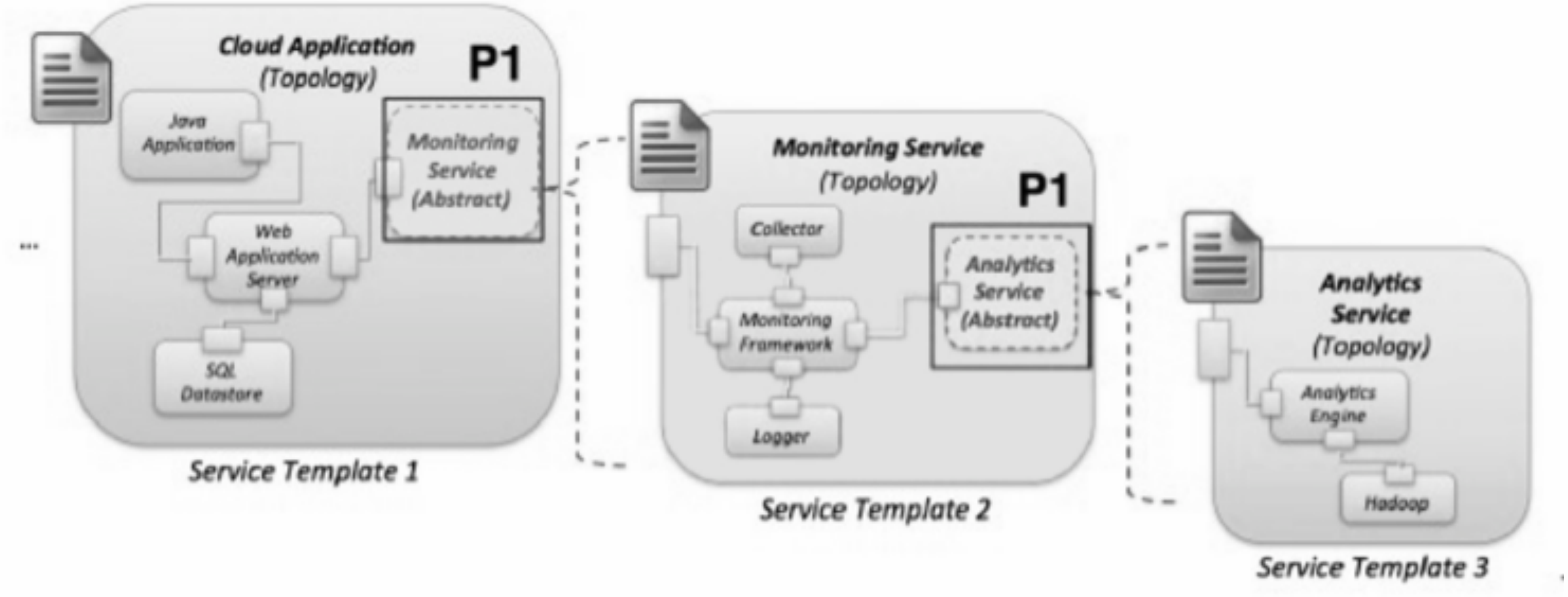
TOSCA Orchestrator!



TOSCA Intent-Modelling: what does it mean?

- Empowering the **language** to empower the **orchestrator**

TOSCA Intent-Modelling: what does it mean? Here's an example!



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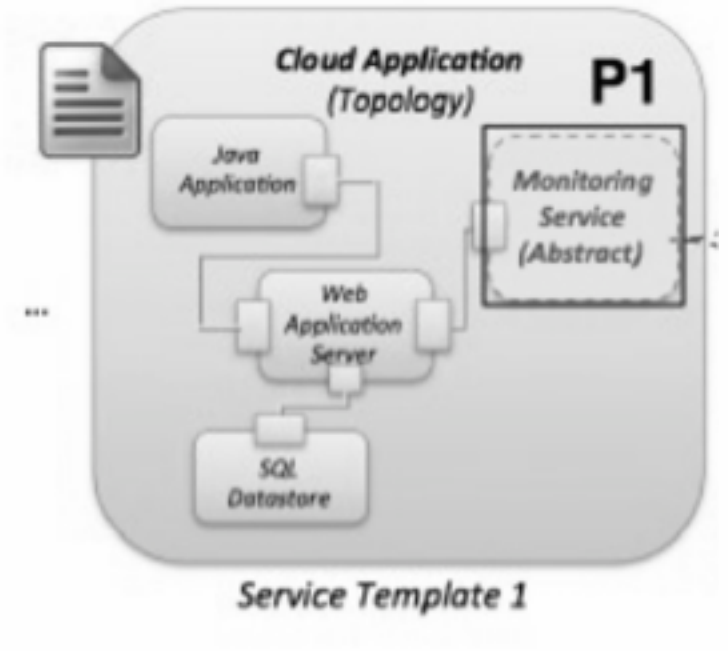

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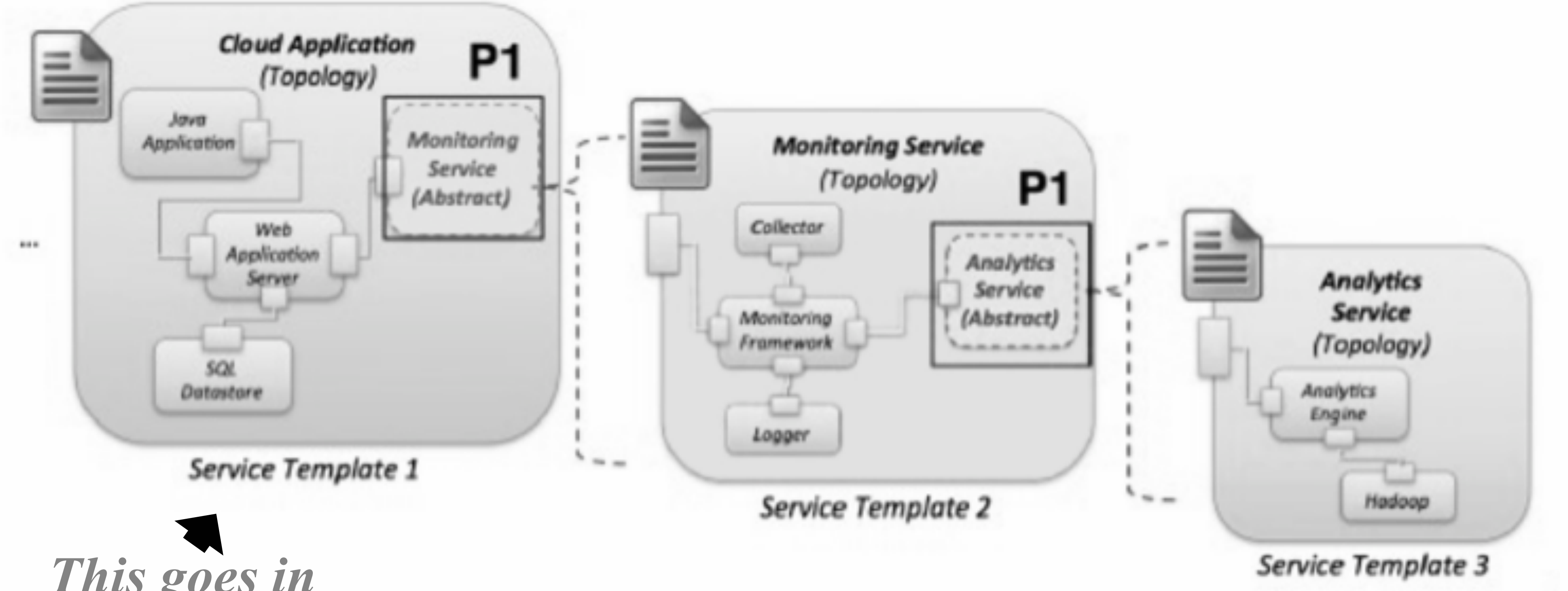

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Some Intuitive Properties

- **Substitutability**
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Substitutability. *Orchestrator can change any node as long as highest-level goal is maintained and policies are upheld*

This is really nothing new (i.e., SoC lecture from Wolfgang this morning… thanks Wolfgang!)

Some Intuitive Properties

- Substitutability
- **Opportunistic Hierarchization (instance modelling)**
- Resource-Based Intent Evolution

Opportunistic Hierarchization. *Orchestrator creates a hierarchy dynamically at run-time by* ***approximating*** *as much as possible the higher-level goal.*

Some Intuitive Properties

- Substitutability
- Opportunistic Hierarchization (instance modelling)
- **Resource-Based Intent Evolution**

Intent Evolution. *Orchestrator maintains an intent as a steady-state, i.e.,* ***automated maintenance****!*

Conclusions

- Designing and programming for TOSCA involves intent modelling
- Intent modelling means empowering the orchestrator
- Several interesting properties emerge but many are not that new
  - E.g., for services design, QoS assessment/analysis, …
- **But some are *extremely * interesting and may need further research!**

That’s all folks!

Any Questions?

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