



University of Stuttgart

Department of Business Administration

Chair of Information Systems 1 – Prof. Dr. Hans-Georg Kemper

Applying TOGAF 9.1 to Develop Intelligent Traffic System Architectures

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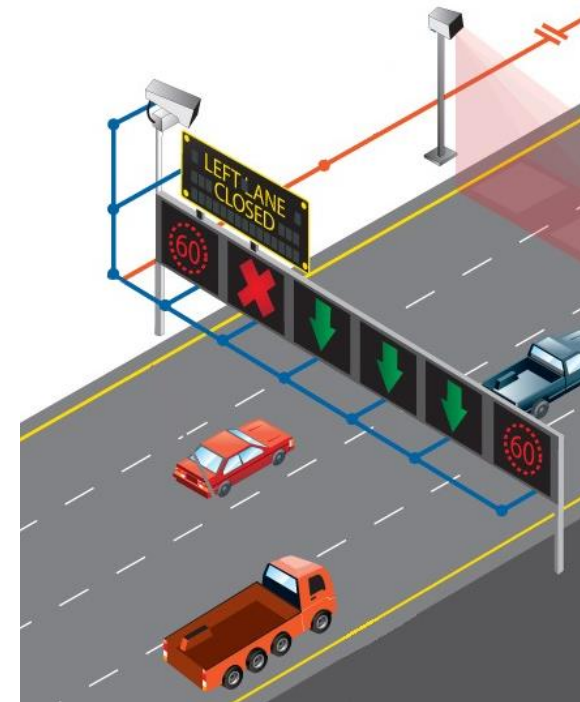


Outline

- Introduction to Intelligent Traffic Systems (ITS)
- Development of Reference Architectures for ITS
- Application of TOGAF 9.1
- Key Learnings and Takeaways
- Discussion

Introduction to Intelligent Traffic Systems (ITS)

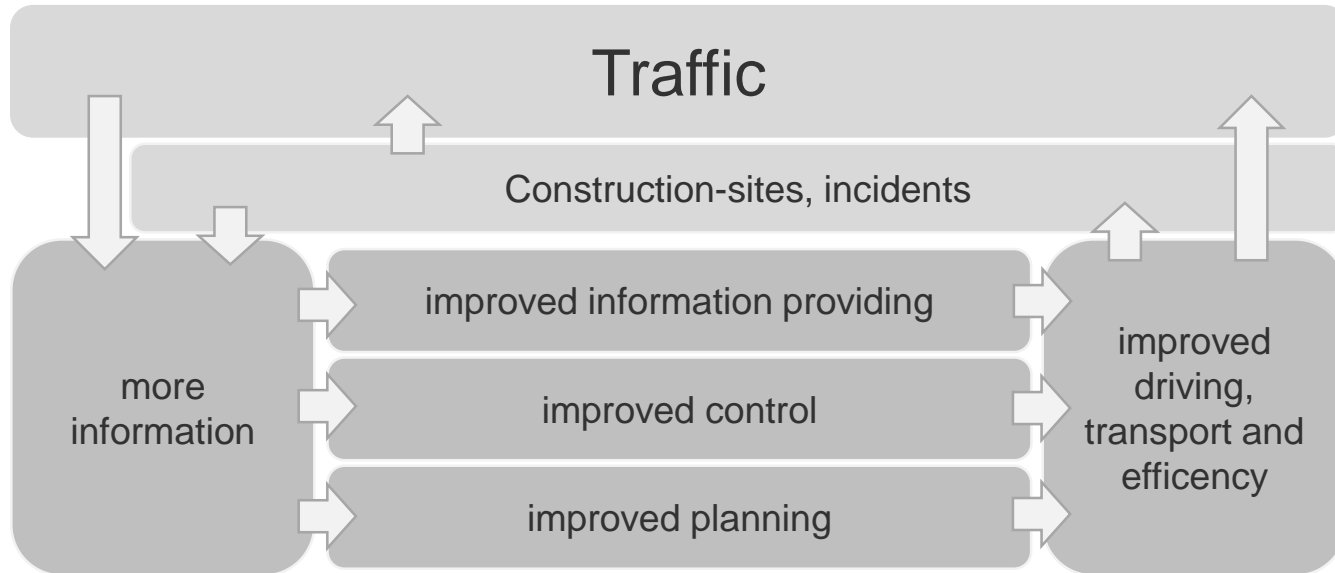
- Overall traffic related goals (EU/Federal Ministry of Transport)
 - Reduced emissions
 - Reduced congestion
 - Safe and reliable travels
 - on-time transport
 - Smooth and uninterrupted traffic
- Sharing and distribution of information are key to achieve this



Source: Ruggedcom (2016)

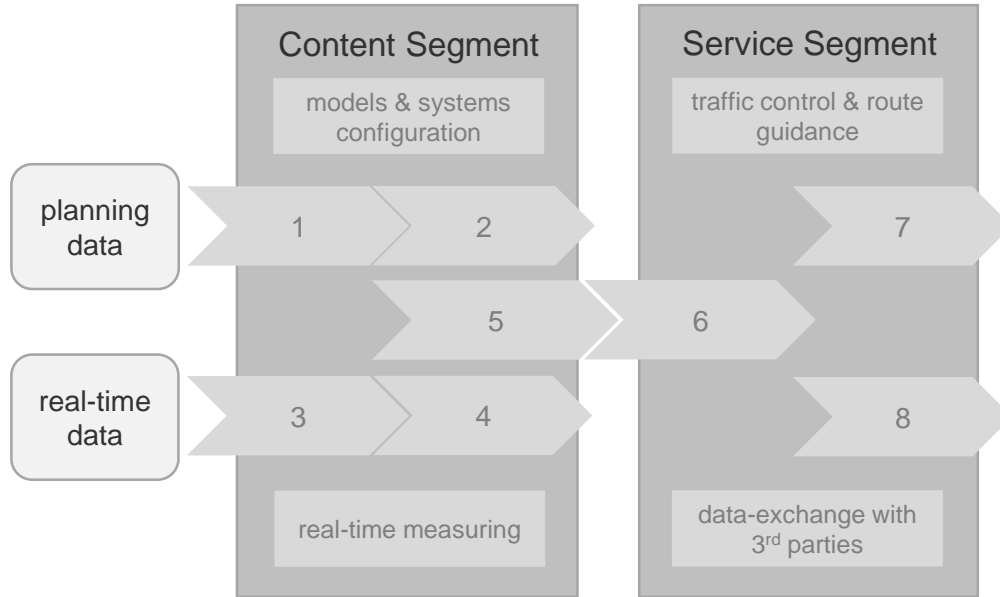
Introduction to Intelligent Traffic Systems (ITS)

The benefit for traffic



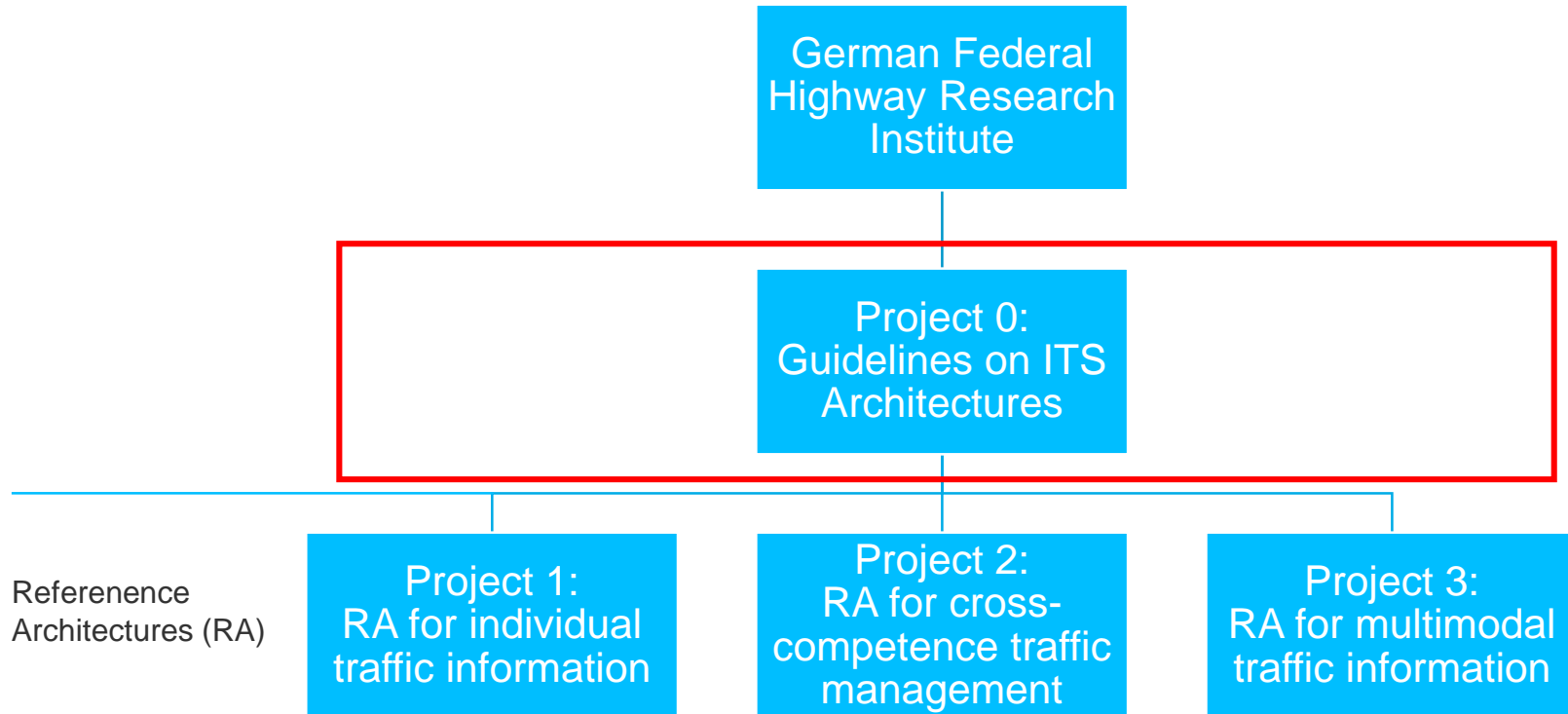
Example of ITS – Traffic Management

Value chain



Development of Reference Architectures for ITS

Project Structure

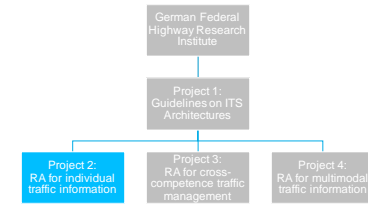


Reference Architecture for ITS - Project 1

Reference Architecture for individual traffic information

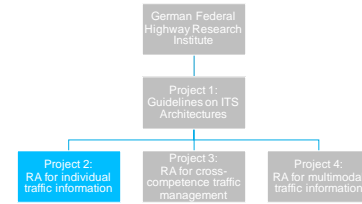
- Goals:

- fulfill requirements of local and national/continental service providers
- integrate heterogeneous grown systems from different sectors
- concretion of the ITS-Architecture defined by project 0
- optimal usage of street, traffic and travel information
- support communication between cars and traffic infrastructure



Reference Architecture for ITS - Project 1

Reference Architecture for individual traffic information



Individual traffic information about:

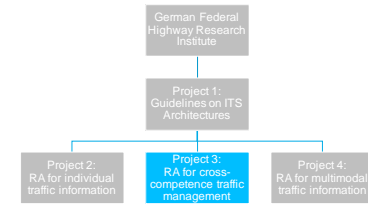
- road work,
- detours

in a specific time period and federal state.

Source: Movi (2016)

Reference Architecture for ITS - Project 2

Reference Architecture for cross competence traffic management

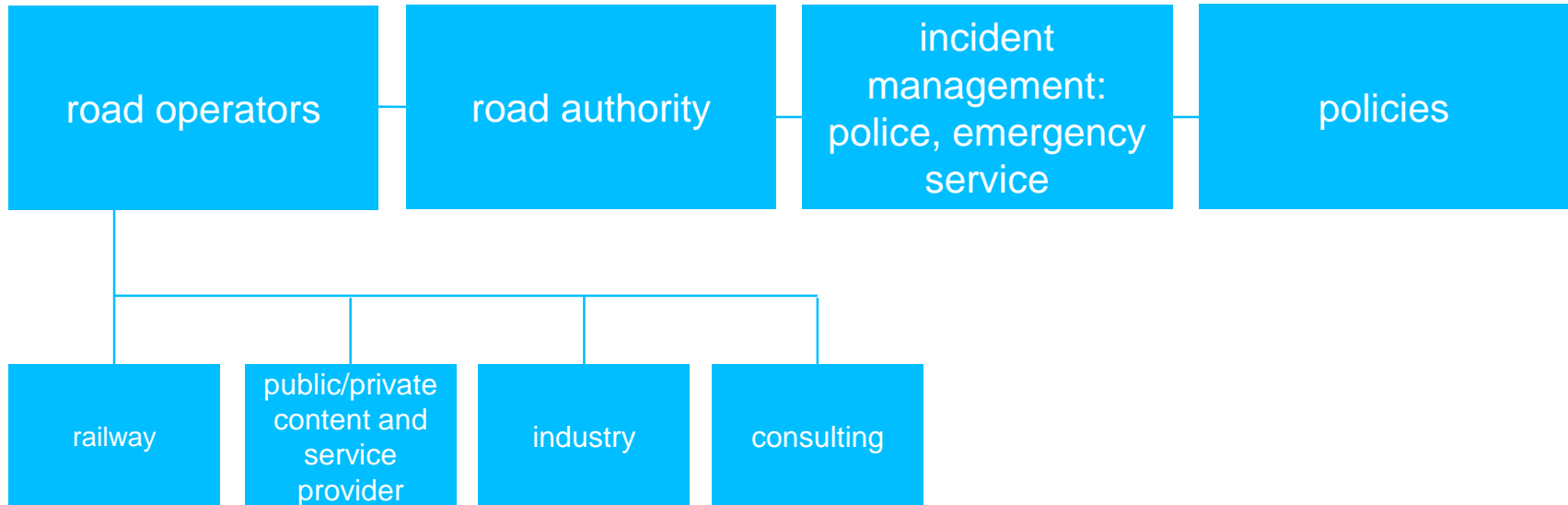
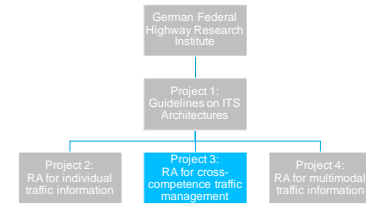


- Goals:

- regional and nationwide cooperation and collaboration between road operators and service providers
- harmonized ITS-services
- deduction of requirements for cross competence traffic management
- reduction of travel time
- traffic jam prevention

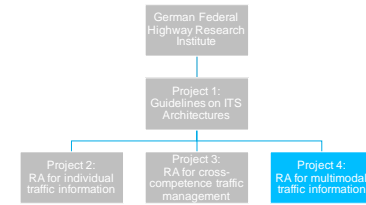
Reference Architecture for ITS - Project 2

Reference Architecture for cross competence traffic management



Reference Architecture for ITS - Project 3

Reference Architecture for multimodal traffic information

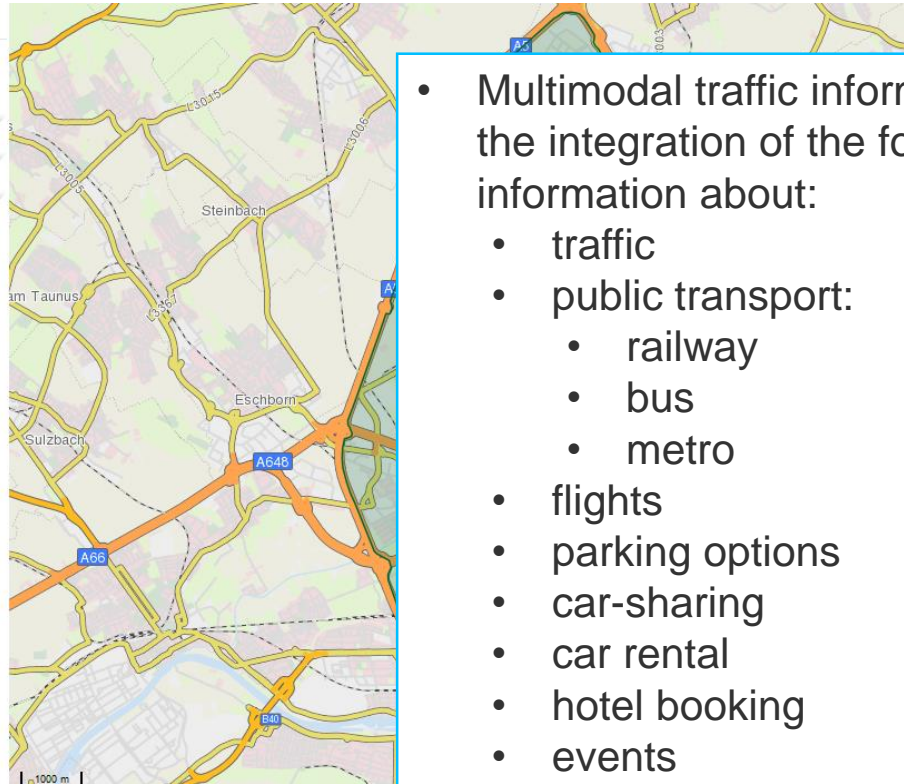
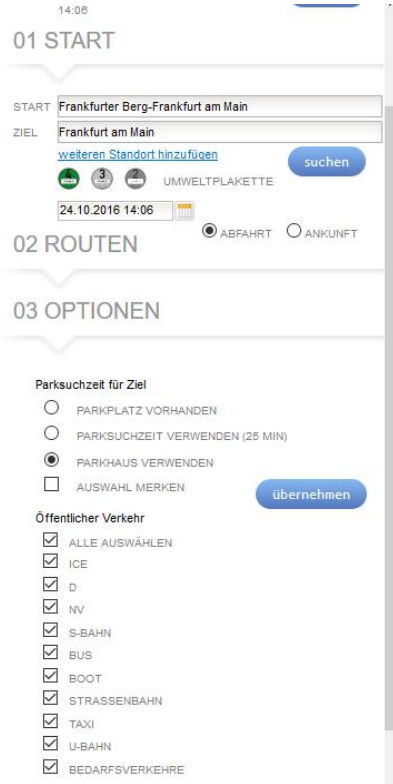


- Goals:

- sustainable composition of value
- generic definition of single access points for multimodal services
- implementation of real ITS-Applications for content providers, service providers and service operators
- plan and adapt multimodal travel chains for wayfarers
- simplify booking and purchasing

Reference Architecture for ITS - Project 3

Reference Architecture for multimodal traffic information

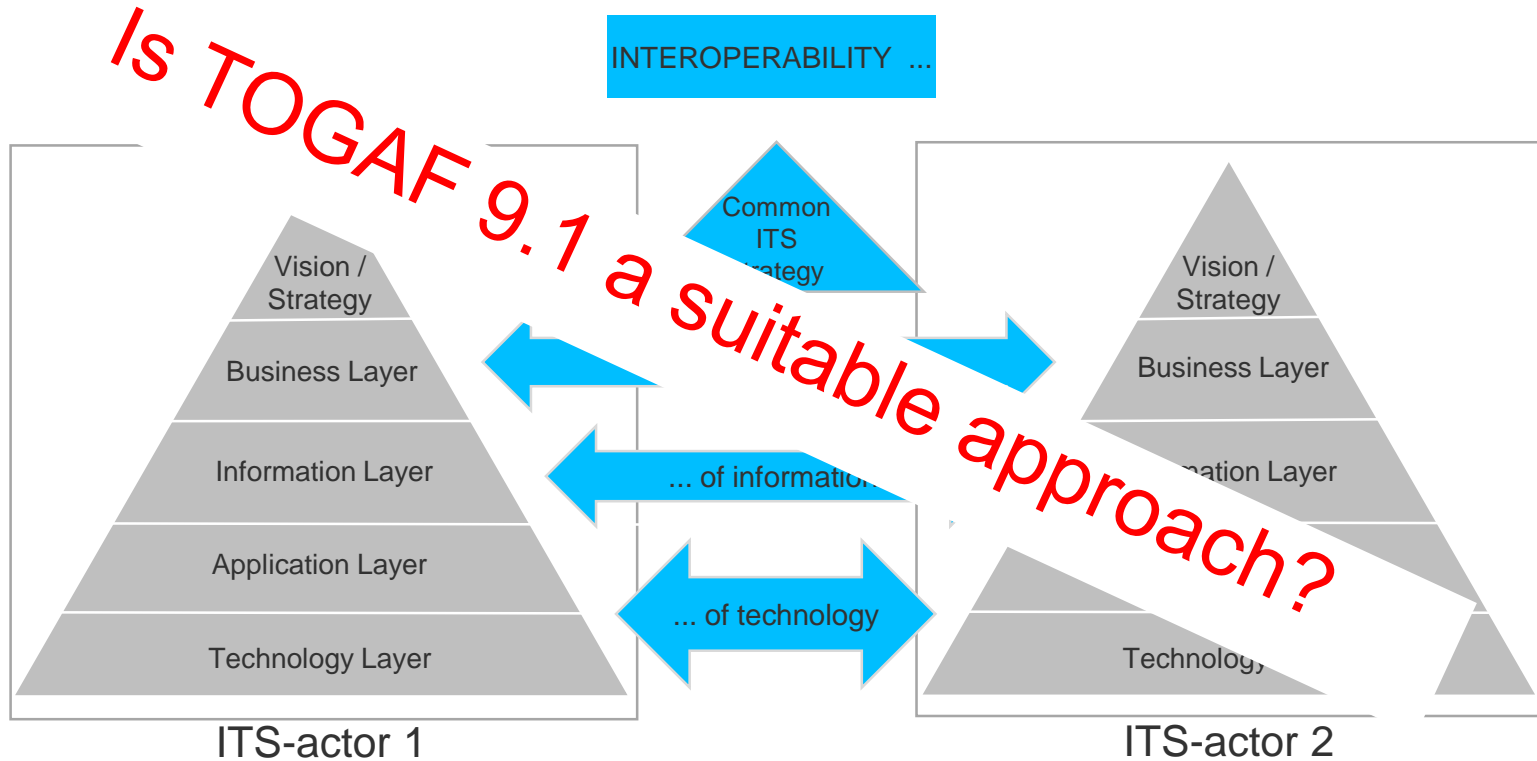


• Multimodal traffic information means the integration of the following information about:

- traffic
- public transport:
 - railway
 - bus
 - metro
- flights
- parking options
- car-sharing
- car rental
- hotel booking
- events
- ...

Source: Vielmobil (2016)

Multiple Companies involved – Focus on Interoperability



Why TOGAF 9.1?

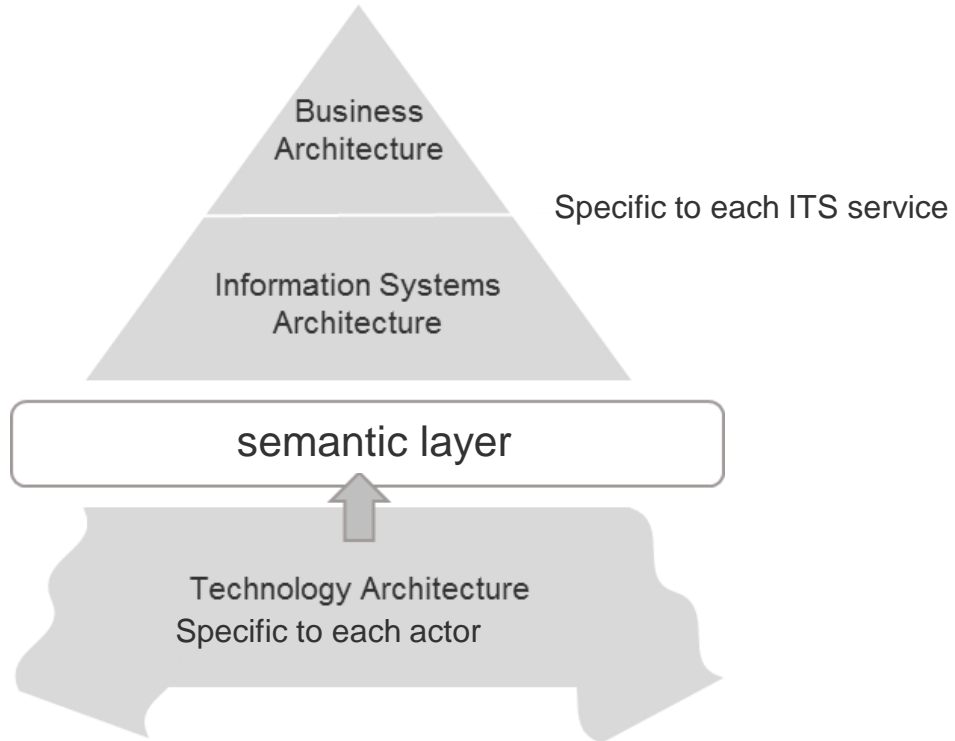
- Existing solutions are focused primarily on data layer and data exchange
 - Data Marketplace (MDM – Mobility Data Marketplace)
 - Datex II (a standard for information exchange between traffic management centers)
- Business Layer (e.g. processes, capabilities, roles) is missing

→ TOGAF 9.1 provides a hollistic approach

Architectural Vision – Potential Approach

The challenge is using TOGAF not for developing an enterprise-wide architecture, but for developing an overall architecture for public projects.

- Developing guidelines for IT-Infrastructure and Technology is not feasible
- A solution could be a semantic layer where participating stakeholders have to provide access to their infrastructure or have to use certain interfaces

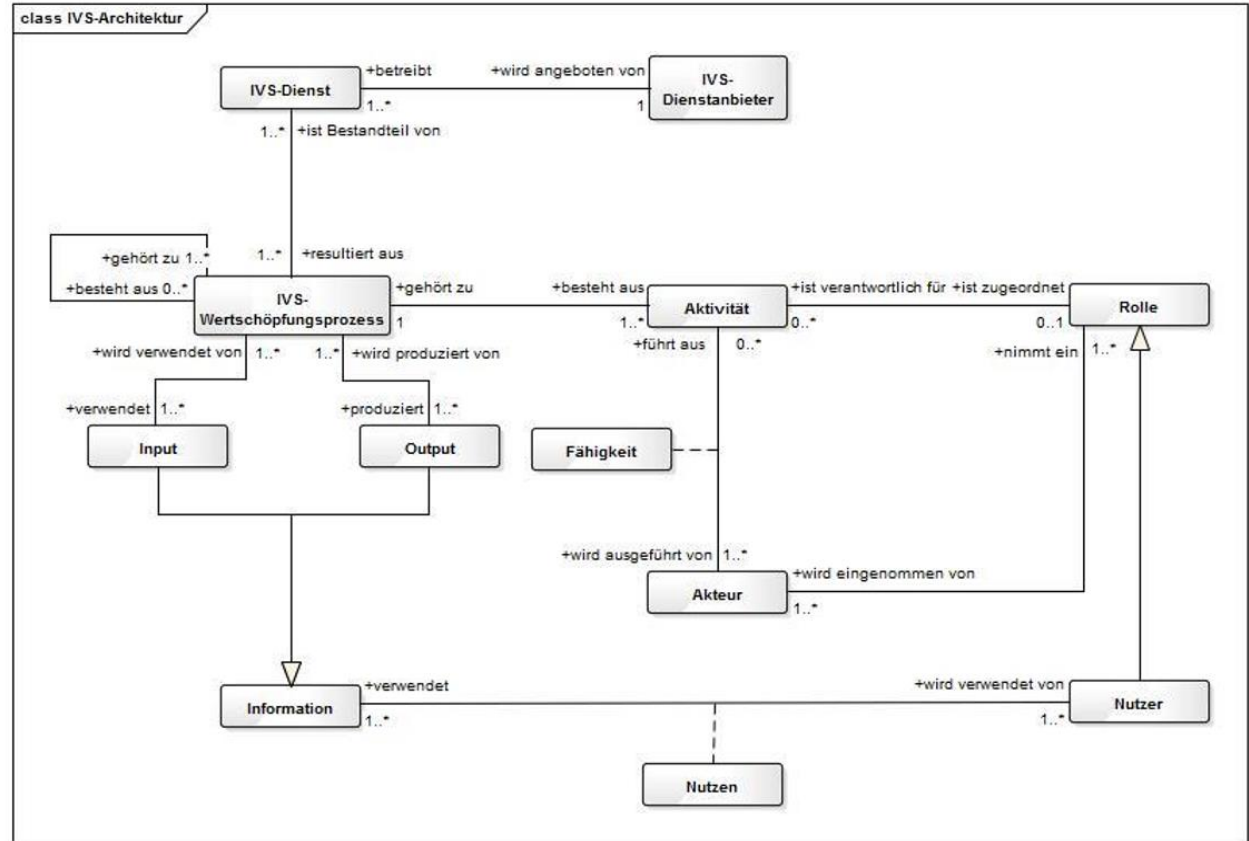


Application of TOGAF 9.1– Tailoring the ADM

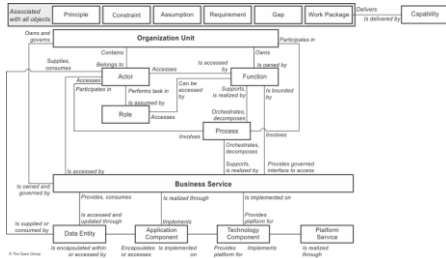
| Step | TOGAF | Tailoring ITS-Architectures | Instruction | Artefacts {c=catalogue, m=matrix, d=diagram}, o=other deliverables | Suggestions for ITS-Reference-Architectures | Suggestions for ITS-Architectures of real ITS-Services |
|------|--|---|---|---|--|---|
| 1 | Select Reference Models, Viewpoints, and Tools | Select Reference Models, Viewpoints, and Tools for describing the ITS-Business Architecture | Select Reference Models, Viewpoints, and Tools for describing the ITS-Business Architecture; Background information and Techniques for illustrating the ITS-value chain and value-added networks; illustrating ITS-Governance and ITS-Business Processes | Project-specific solution | Select Reference Models, Viewpoints, and Tools for describing the ITS-Business Architecture for a ITS-Service category | Select Reference Models, Viewpoints, and Tools for describing the ITS-Business Architecture for a ITS- Service category |
| 2 | Develop Baseline Business Architecture Description | Describing the Baseline ITS-Business Architecture | <ul style="list-style-type: none"> •Baseline of the ITS-Business Architecture •Template: Building Block ITS-Business Process | <ul style="list-style-type: none"> •Project-specific solution •D:ITS-Role-matrix •O: ITS-Governance •C:ITS-Business Process •D: ITS-Business Process diagram | •Describing the Baseline ITS-Business Architecture | Describing the Baseline ITS-Business Architecture for a special ITS-Service Category |

Application of TOGAF 9.1 – Meta Model

ITS META MODEL

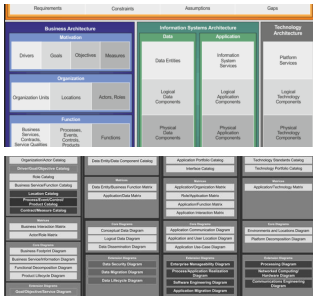


TOGAF 9.1 CONTENT META MODEL



Application of TOGAF 9.1 – Architecture Building Blocks, Artifacts and Deliverables

| Role | <RoleName> | | | |
|--------------------------|-----------------------|----------------------|-------------------------------------|--|
| Stereotype | | | | |
| Goals | | | | |
| Involvement in processes | | | | |
| ... | ... | | | |
| Data Flow | Partner 1 | Partner 2 | Partner 3 | |
| Partner 1 | xxx | Route recommendation | Traffic situation (e.g. congestion) | |
| Partner 2 | Planned arrival times | xxx | | |
| Partner 3 | | | xxx | |
| | | | | |



Key Learnings and Takeaways

- Focus on (and challenges regarding)
 - benefits of architectural work,
 - business architectures and
 - capabilities
- No access to the existing architectures from the different stakeholders → Gap Analysis not feasible
- Lots of (potential) stakeholders (e.g. railway, federal state, communes, different companies) have to be taken into account
- Additional steps/concepts needed: glossary, ITS domain

→ **In general, it is possible to use TOGAF for developing company-crossing architectures.**



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Thank you!



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