



Technische Hochschule
Ingolstadt

TOWARDS MULTI-DOMAIN MULTI-TENANT SITUATIONAL AWARENESS SYSTEMS



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ROADMAP

What we are going to present

- **Relevance of multi-domain multi-tenant situational awareness**
- **State of the art**
- **Issues with current systems**
- **How to overcome these issues**
- **Conclusion & Outlook**



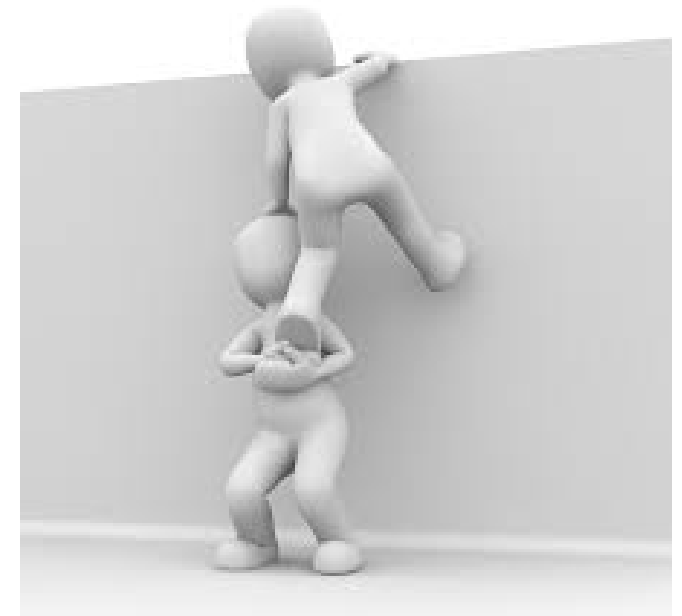
OVERVIEW AND MOTIVATION

Multi-domain Multi-tenant Situational Awareness

- **Situational Awareness is mission critical**
- **Situations might require different entities to act and interact**
- **Different entities use incompatible systems**
- **Research is done by each entity independently**

Consequences

- **In many fields we take decisions in uncertainty**
- **To speed up interaction, common tools with automated information exchange are needed**
- **Furthermore, data has limited access (e.g. different security levels)**



MULTI-DOMAIN MULTI-TENANT SITUATIONAL AWARENESS

Multi-Domain

- **“Orchestration of necessary activities, across all domains and environments”**
- **Rescue and humanitarian operations**
- **Police operations**
- **Military and information operations**
- **Political, environmental, social, economical and further domains**



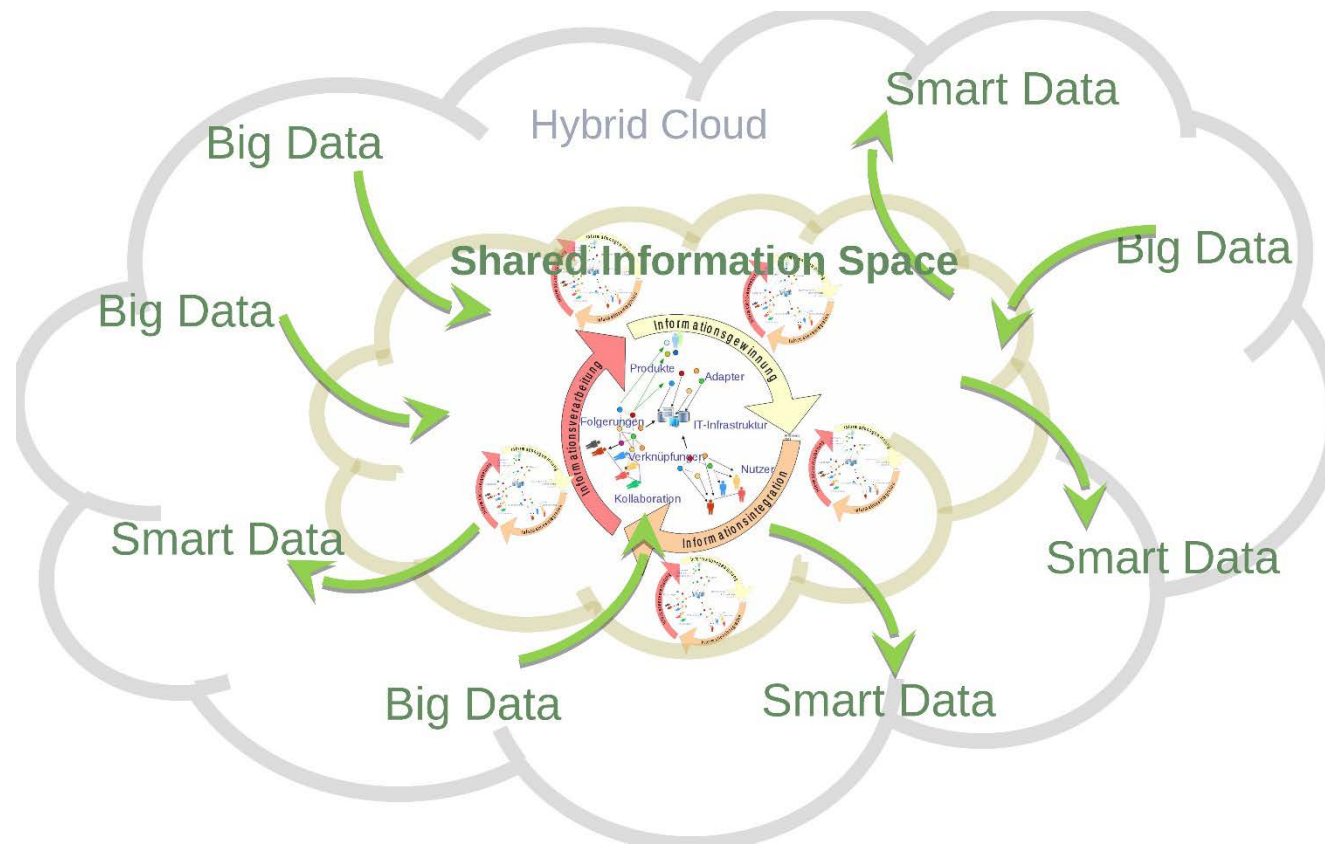
Multi-Tenant

- **Enables several clients to commonly use and share a single set of resources**
- **Separation of data**

Awareness

- **“Awareness is an understanding of the activities of others, which provides a context for your own activities” (Dourish, Bellotti 1992)**

STATE OF THE ART: THE "SHARED INFORMATION SPACE"

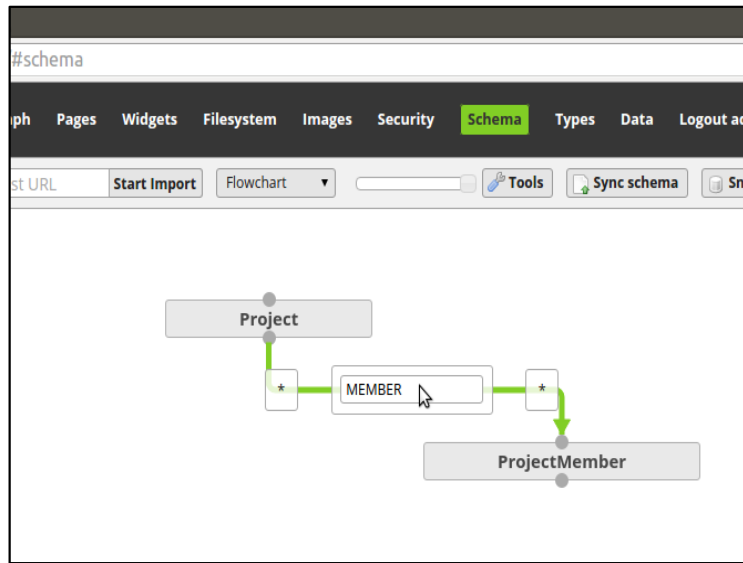
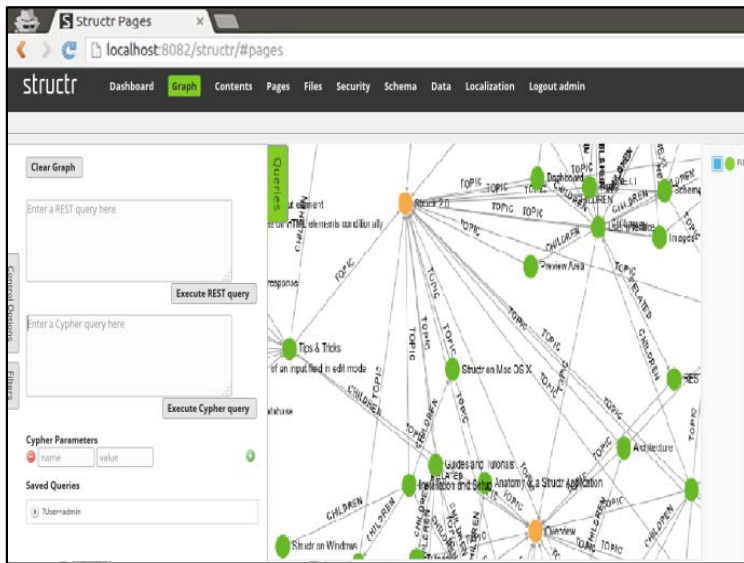


SIS
[6]

- **Core techniques:**
 - **Distributed, but unique data source**
 - **Multi level security**
 - **Microservices [3]**
- **Not only technique:**
 - **Information management**
 - **Decision making**
- **Goal:**
 - **Sensemaking**
 - **Data mesh**
 - **Low code**

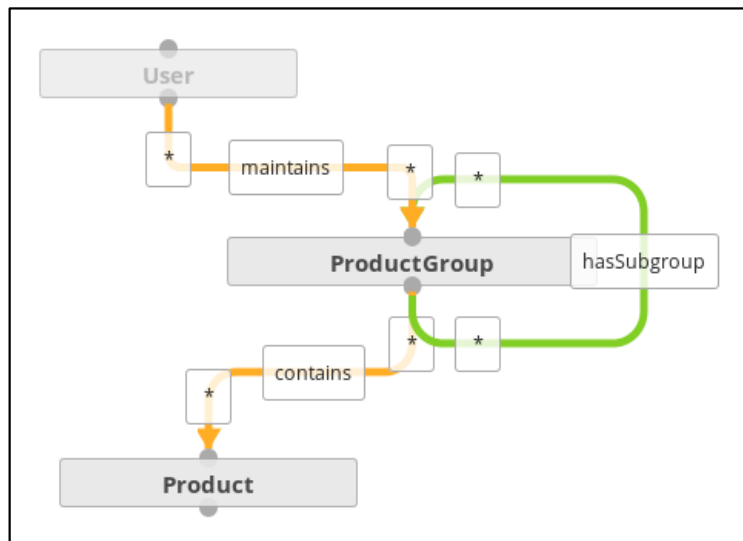
**Information pushes decision making towards superiority:
Hence, we need the SIS for seamless information sharing.**

STATE OF THE ART: IT IS LIVE FOR DATA, MODELS, RENDERING

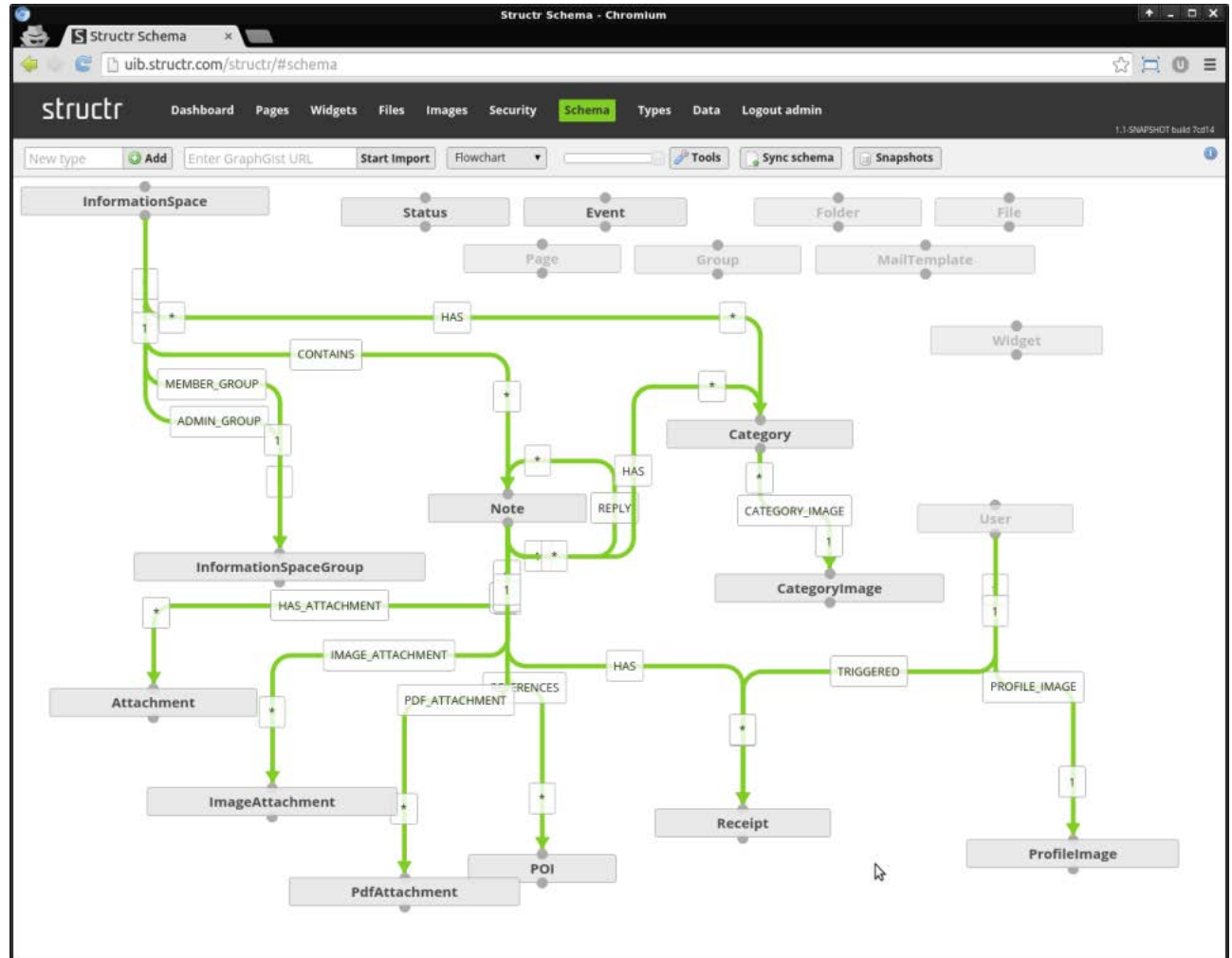
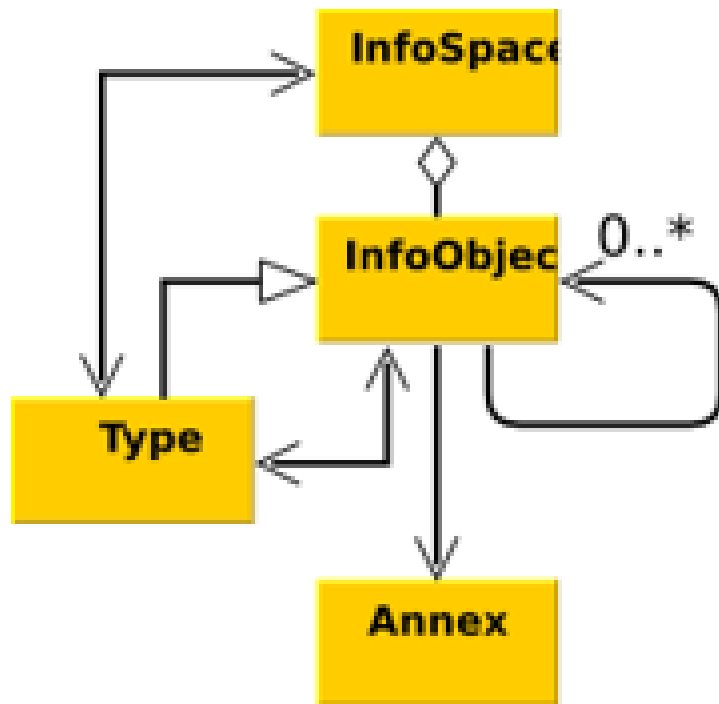


#	First Name	Last Name
1	Mark	Otto
2	Jacob	Thornton
3	Larry	the Bird

```
$ curl -i -HX-User:admin -HX-Password:secret
http://<hostname>:<port>/structr/rest/users?name=admin
HTTP/1.1 200 OK
Set-Cookie: JSESSIONID=wecd8ce161qb1m06g6v1c2r1j;Path=/
...
{
  "query_time": "0.002020017",
  "result_count": 1,
  "result": [
    {
      "type": "User",
      "name": "admin",
      "firstName": null,
      "lastName": null,
      "id": "f02e59a47dc9492da3e6cb7fb6b3ac25"
    }
  ],
  "serialization_time": "0.000170156"
}
```



STATE OF THE ART: INFORMATION MODEL AND PROPERTY GRAPH



Performance, Dynamics, Granularity

STATE OF THE ART: MICROSERVICE AND LOW CODE

Low Code foster MicroServices & Flows

The screenshot shows the Strucr low-code editor interface. The top navigation bar includes 'Dashboard', 'Pages', 'Code', 'Files', 'Schema', 'Flows', and 'Data'. The 'Pages' tab is active. The main workspace is divided into three panels: a left sidebar with a 'Page Tree' and 'Filters' (Name, Category), a central preview area showing two 'Project' cards with Bootstrap 5 layouts, and a right sidebar with an 'HTML Palette' and 'Shared Comp.' (Unused Elements). The preview area displays two identical project cards, each with a blue icon and the text 'With Bootstrap 5, we've created a fresh new layout for this template!'.

The screenshot shows the Strucr low-code editor interface with the 'Flows' tab active. The top navigation bar includes 'Dashboard', 'Pages', 'Code', 'Files', 'Schema', 'Flows', and 'Data'. The main workspace is divided into two panels: a left sidebar with a 'Flows' tree showing a 'getAllProjects' flow, and a central flow design area. The flow design area shows a 'TypeQuery' node connected to a 'Return' node, which is connected to an 'ExceptionHandler' node, which is connected to a 'Log' node. The flow is named 'getAllProjects' and is highlighted in green.

<https://strucr.com>

PROTOTYPE

Issues

- **No Data Exchange between different security levels**
- **Similar requirements result in different code, logic and data base layouts → incompatible systems across domains**
- **Wheel is being re-invented everywhere**

Requirements

- **Provide Data Exchange across different privacy / security contexts**
- **Provide a generalized tool box with semantic customization**
- **Cross platform / cross domain implementation to support different use-cases**

Our approach

- **Implementation based on a GraphDB**
- **Uses Low-Code-Environment for new capabilities**
 - **Affordable late-customization by user**

Conclusion and Outlook

- **Technology allows to support several operations at once and in one scope (domain)**
- **Prototype is promising**
 - **Performance, dynamics, granularity**
 - **Single domain with multiple branches to be transformed to multi domain**
- **Unsolved issue:**
 - **Multi-domain vocabulary management (tooling)**
 - **Cross-Domain / Cross-Security-Context data exchange**
 - **Privacy preserving data exchange**

THANKS



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