Concept of a Portal for the Integration of COP-Objects from Heterogeneous Sources

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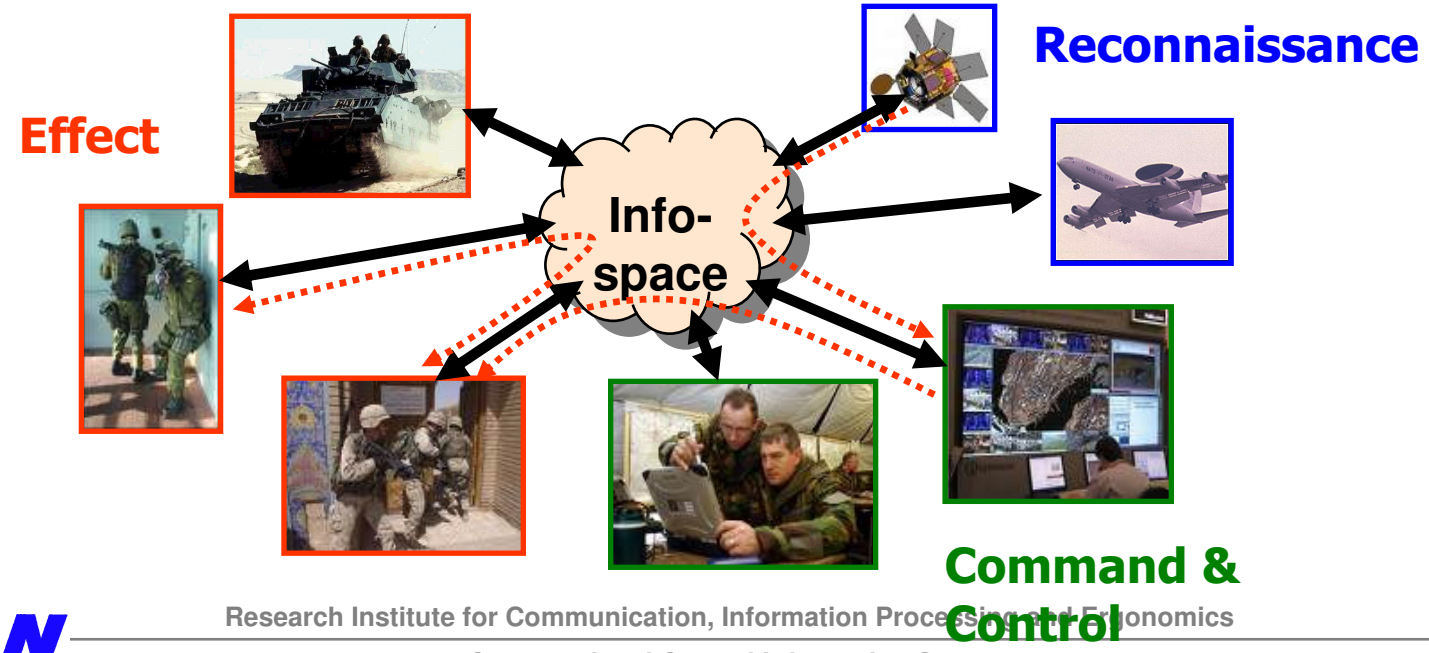
Integration of heterogeneous systems

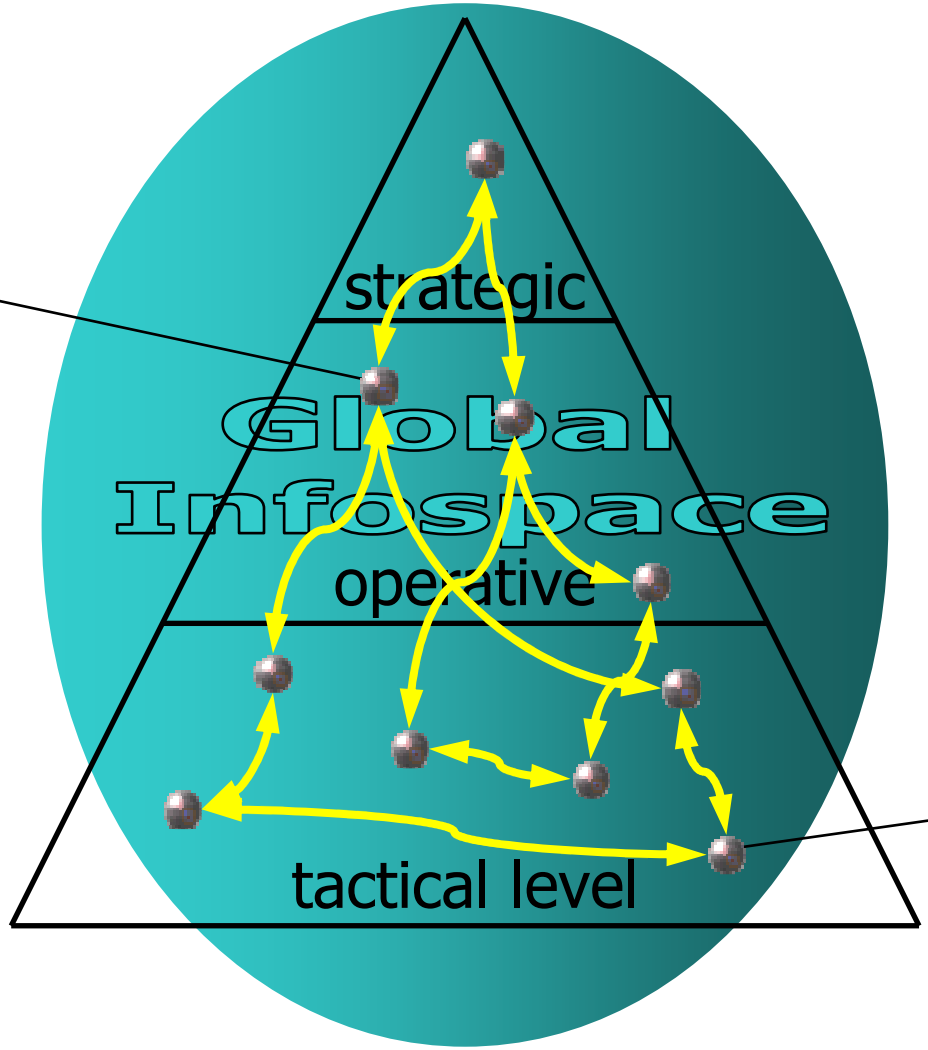
C2IS should support **network-centric operations (NCO)**

- C2IS must provide a **global infospace** connecting all participating elements
- Joint, combined, interagency operations (JIMP) → multi-disciplinary teams
- **Agility** requires being able to respond to emerging situations
- **Heterogeneous** systems to be included



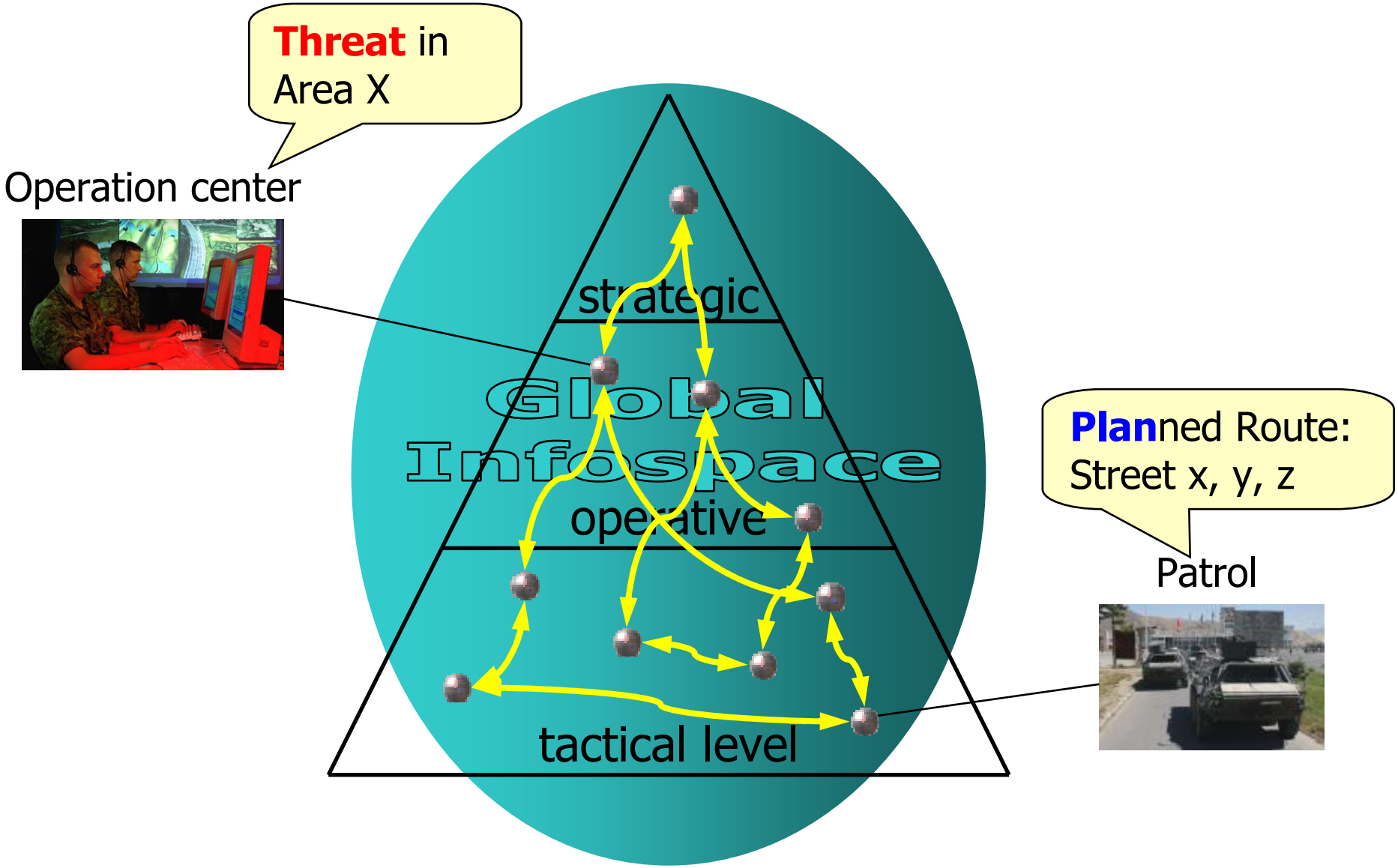
Integration of heterogeneous systems - Example

Operation center

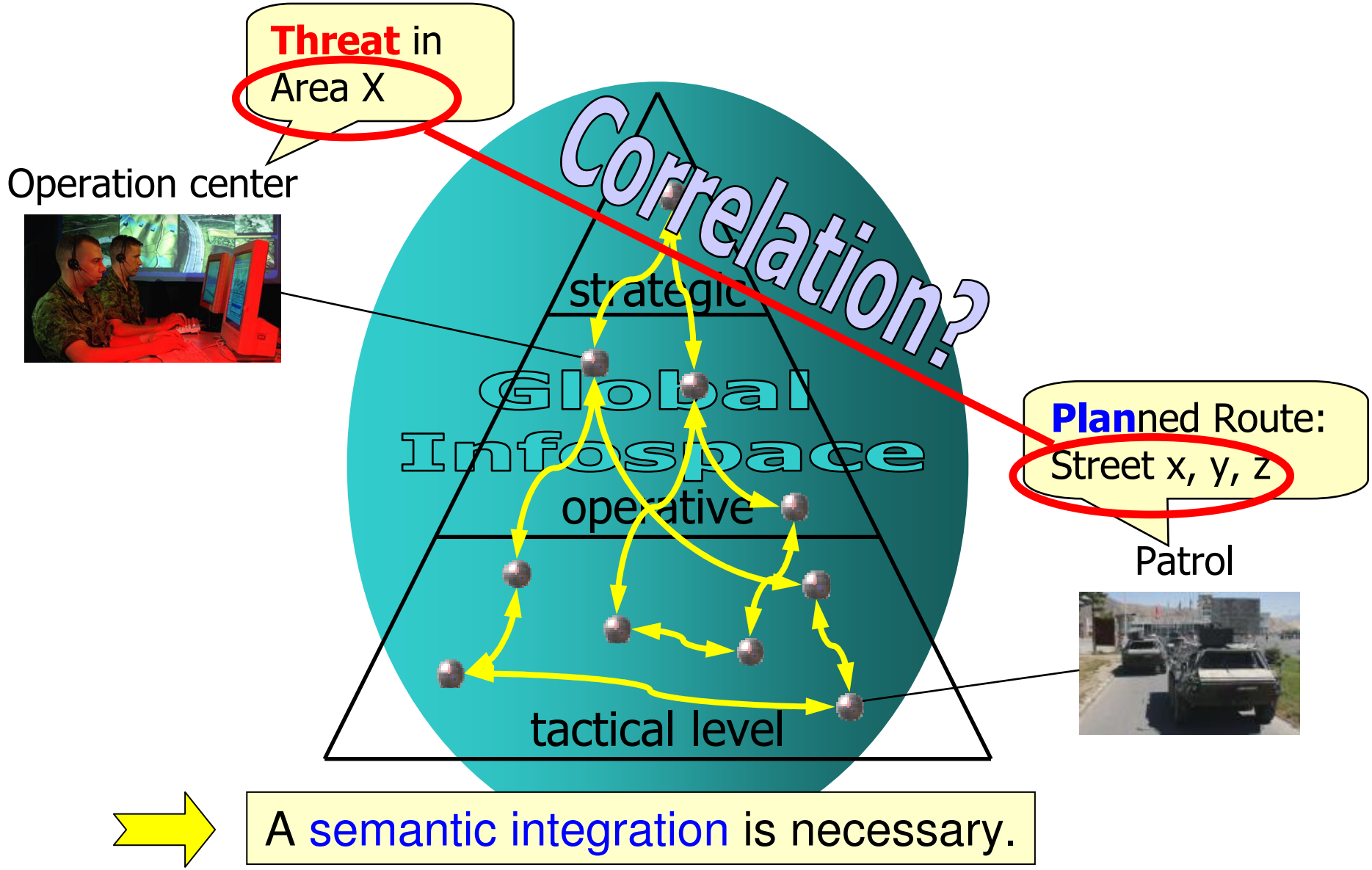


Patrol

Integration of heterogeneous systems - Example



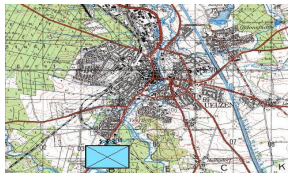
Integration of heterogeneous systems - Example

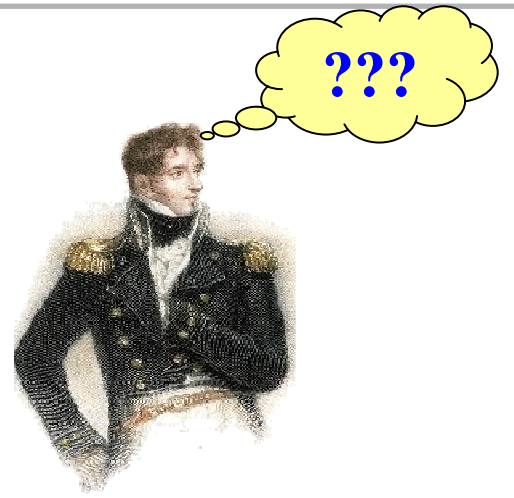


A semantic integration is necessary.

Integration of heterogeneous systems

Is this proper integration?





Legacy systems and COTS products do not allow for an easy semantic integration:

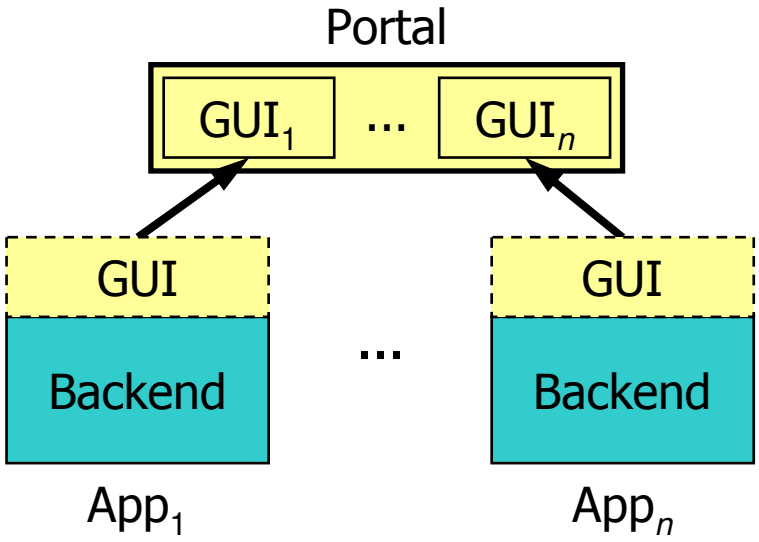
→ different business and logic data models

→ heavy heterogeneous data to be integrated

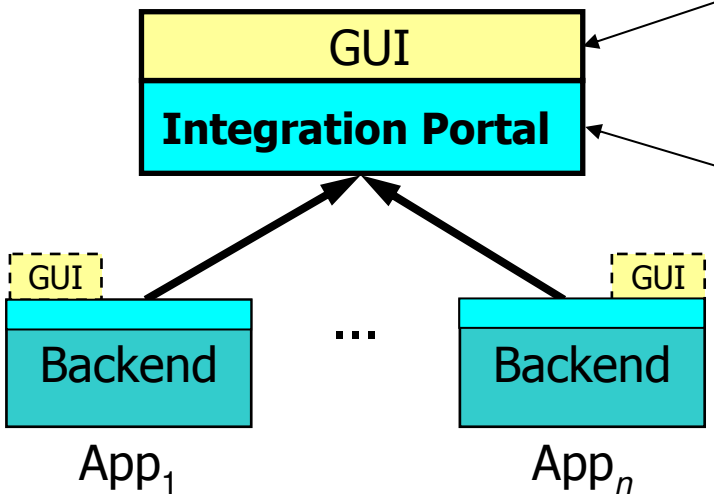
→ various formats and standards for communication, data storage, etc.

Portal technologies – Main idea

- System = collection of applications
- **Own GUI** for each application → integration on „**pixel-level**“
- Disadvantages:
  - **Workflow: application driven**
    (import → edit → store)
  - Difficult adaption to COP
  - **Inconsistent**, **fragmented**
    & misleading **visualization**
    - Different views, symbols, positions



Integration portal – Main idea



COP views of different services are combined within a common situational picture and service-crossing function calls are supported

Integration of C2 applications at the visualization (presentation) layer

No ‚semantic' integration at the business objects layer. Harmonization of logical data models of services is not required!

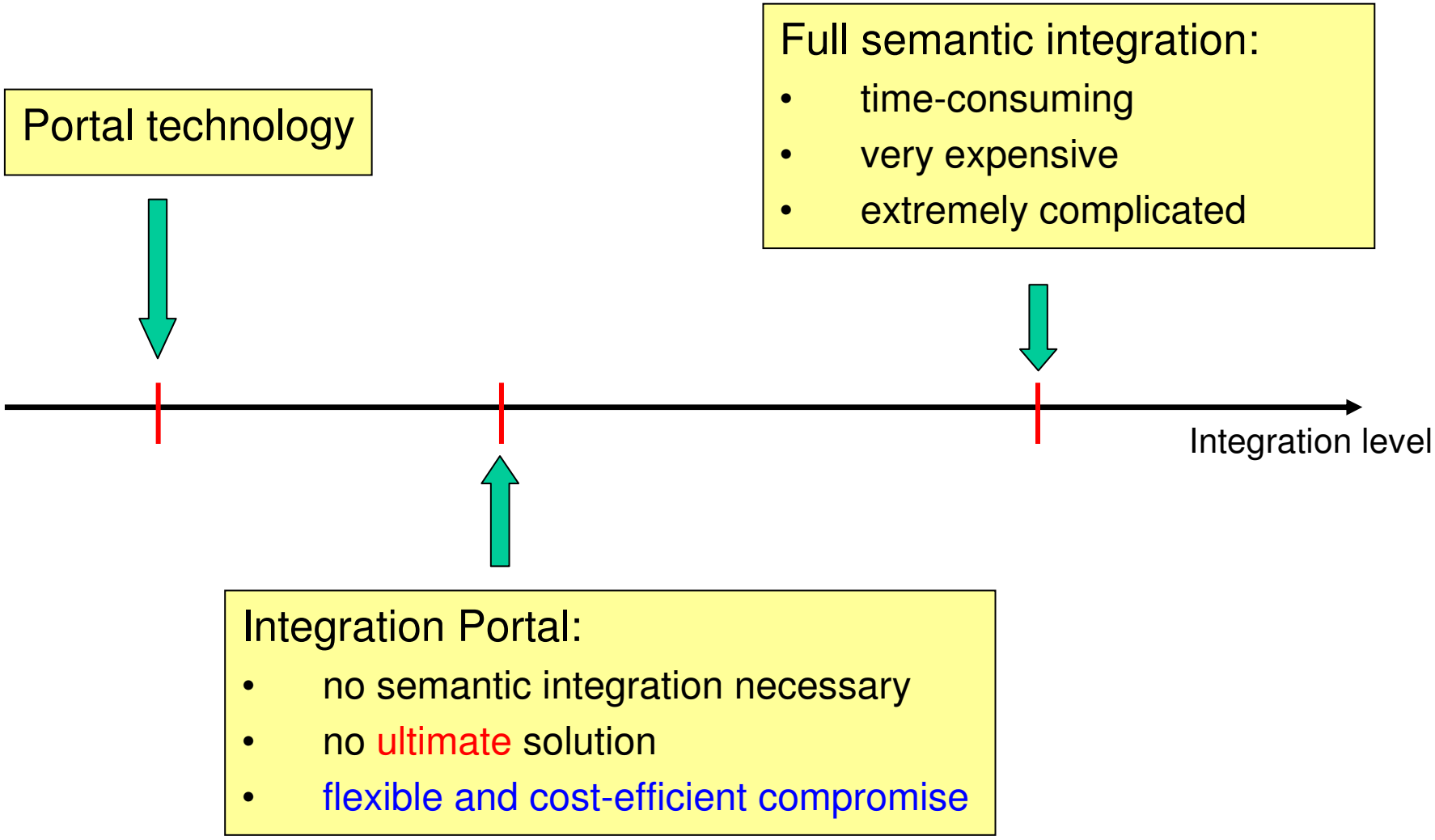
The integration idea: consolidation of the visualization data from the business objects of services and their appropriate visualization at a common presentation layer.

Integration portal – Pros

Advantages of the integration portal:

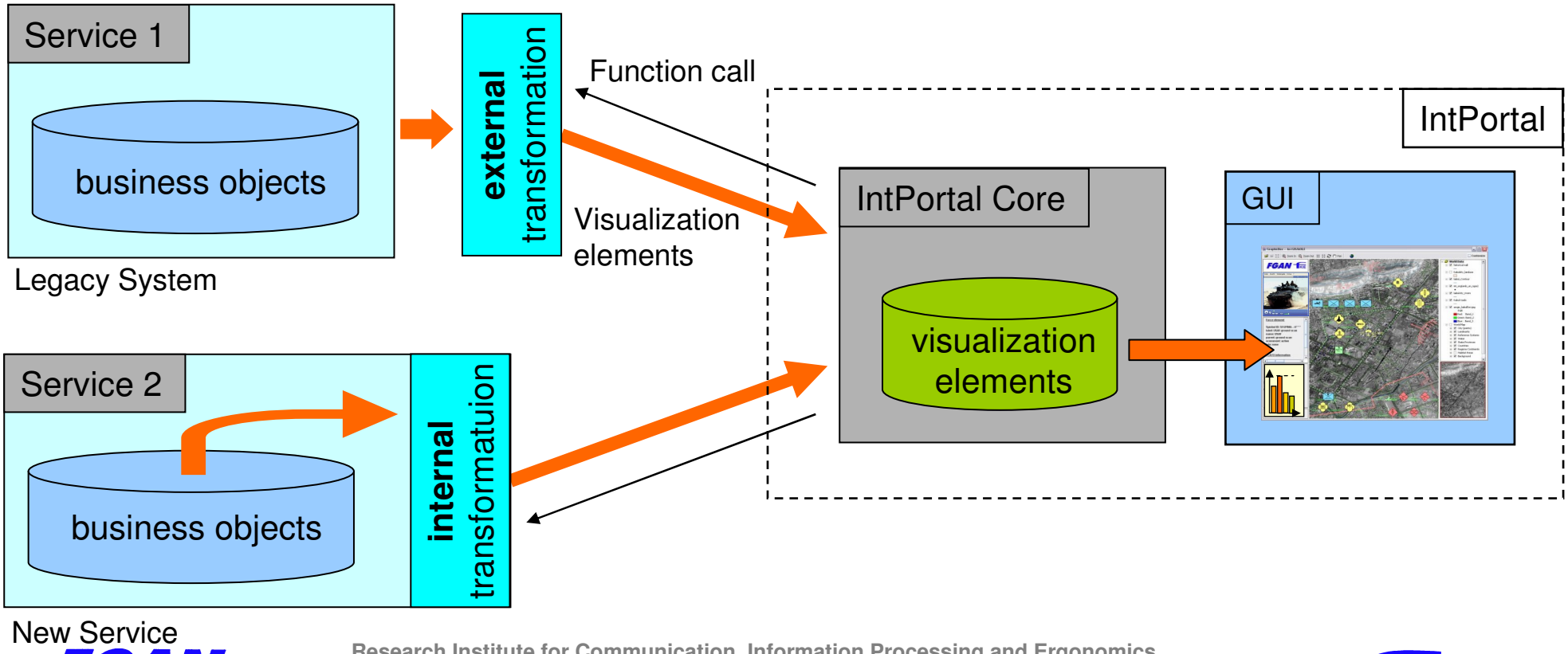
1. Central integrated user interface based on COP
   - homogeneous overall view (uniform data visualization)
   - Misinterpretation and misunderstandings decreased
2. Better support for application-crossing business processes
   - more intuitive and efficient realization of business processes of the user
   - increased user acceptance
3. Encapsulation of GIS
   - elimination of redundant visualization components of C2IS
   - uniform presentation of spatial data
   - easy of exchangeability of GIS
   - product-independent integration of GIS (usage of open source possible)

Portal technology vs. Integration portal

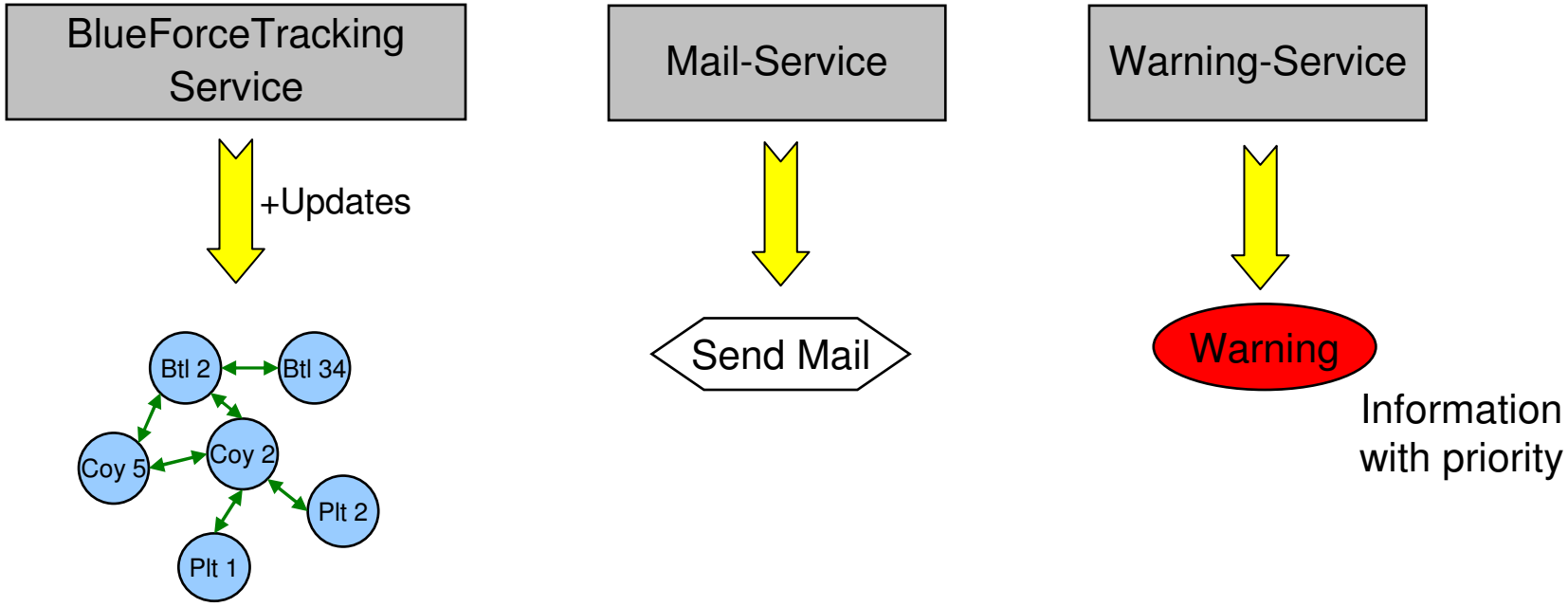


Integration portal – Integration concept

- services pass visualizable data of their business objects to integration portal
- integration portal presents only visualization elements
  - abstract, plattform independent objects
- transformation of business objects into visualization elements required



Integration portal – Example of service integration



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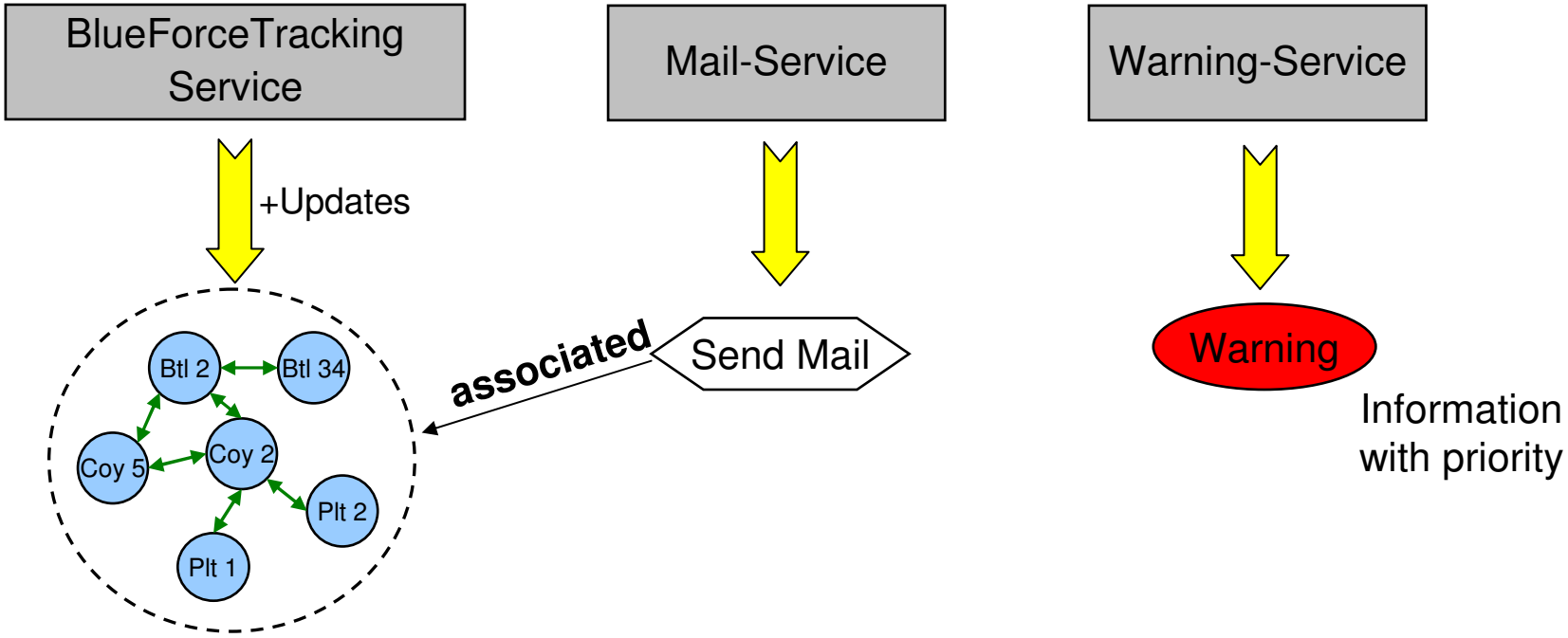

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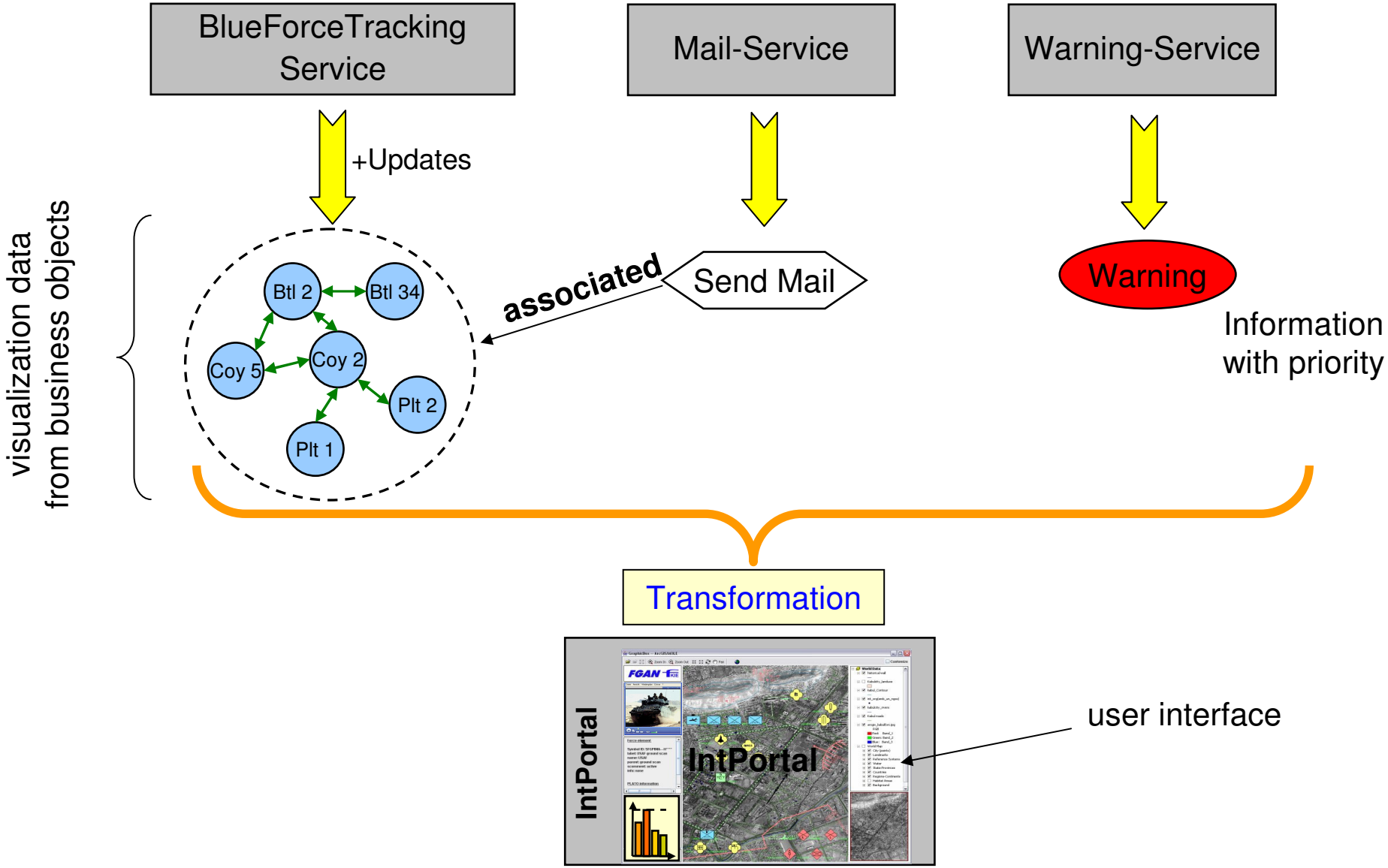
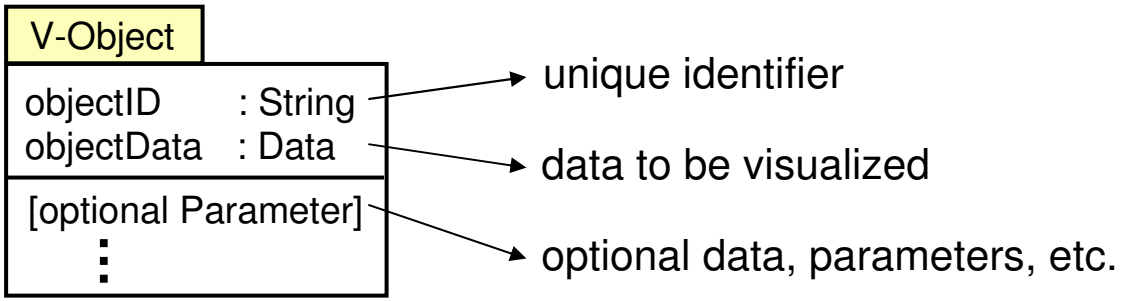
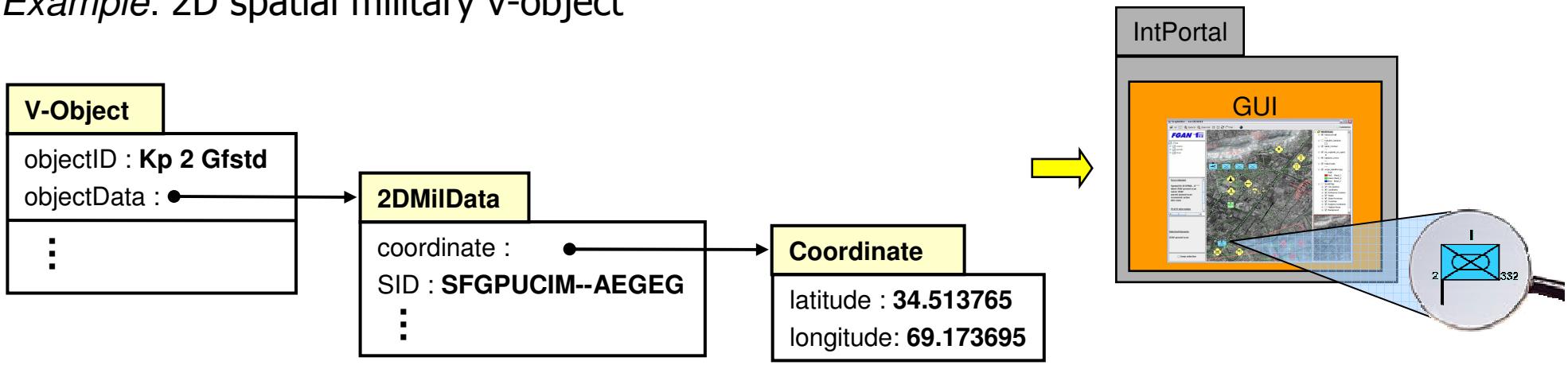


Visualization elements – V-objects

V-Objects: abstract objects for visualization data of services visualized in the integration portal

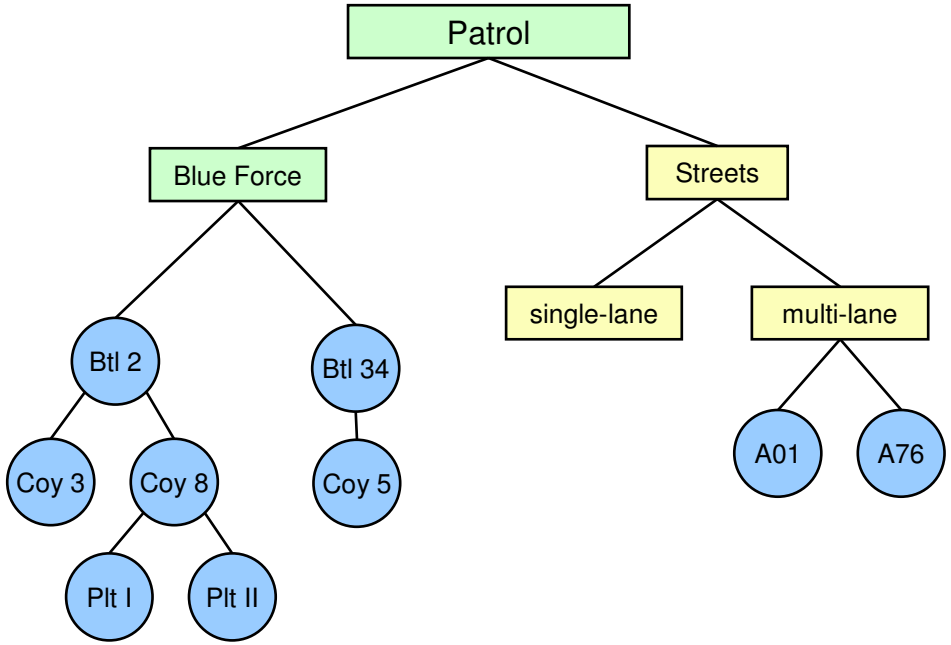


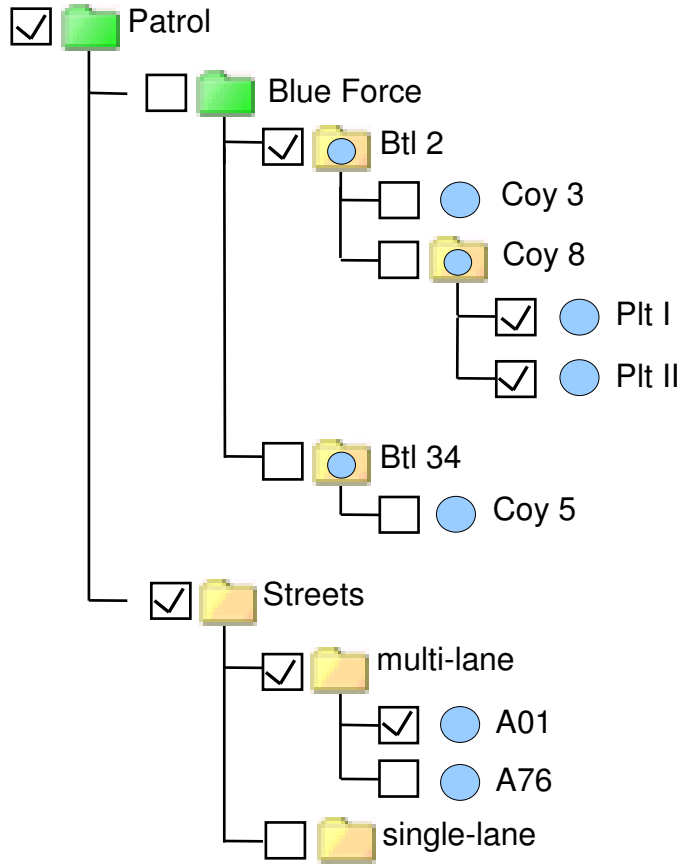
Example: 2D spatial military v-object



Visualization elements – Information groups

Information groups: represents structured groupings of thematic-related v-objects

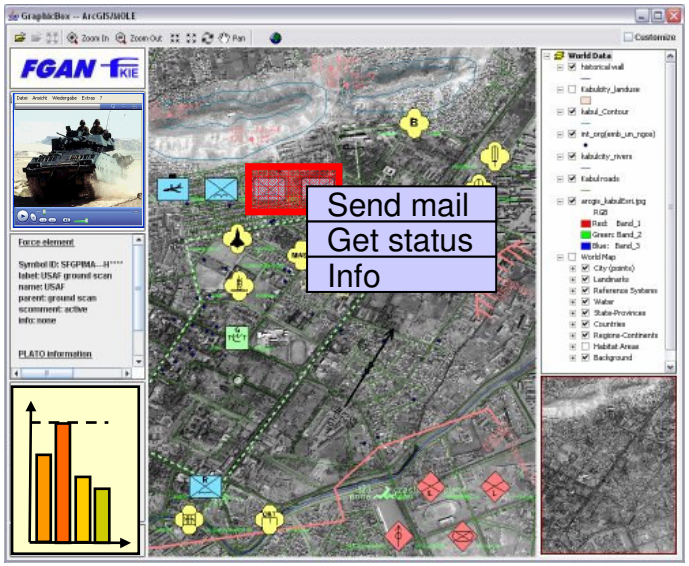




- important structuring-tool
- possesses structure and linear order on its nodes
- two types of nodes: v-objects and groupings

Visualization elements – Service-functions

Service-functions: defined by some service,
can be called by the user in the context of v-objects in the GUI,
but are implemented and executed by the service itself



- thematic-related v-objects constitute groups with similar functionalities
- services assign their functions to groups which semantic they know
- need for service-crossing standardization of description for information-groups

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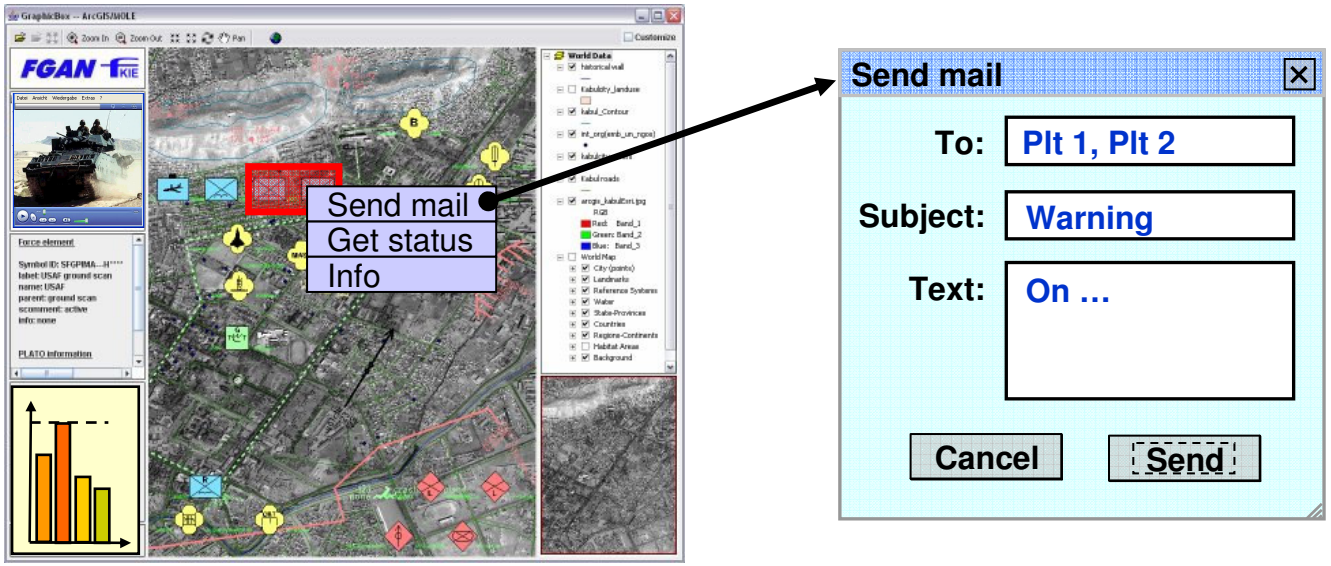

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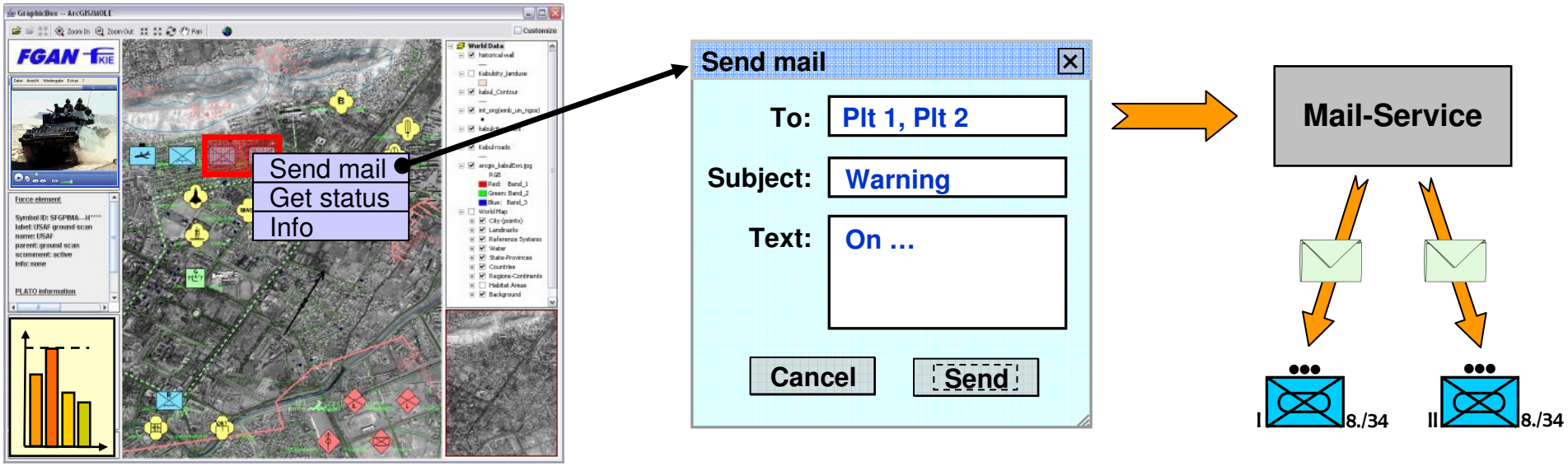

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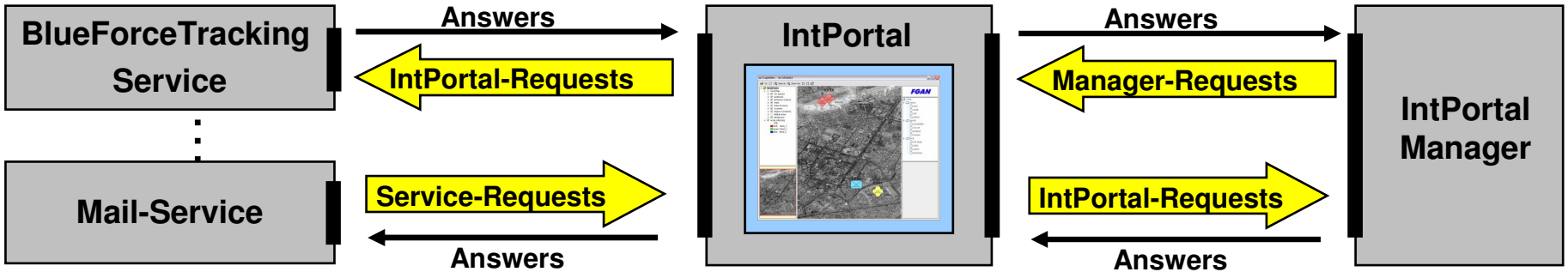
Architecture of the Integration portal – Interfaces

Communication IntPortal ↔ Services based on Requests and Answers



Service-Requests: Service → IntPortal

- add, modify, and delete-requests for visualization elements

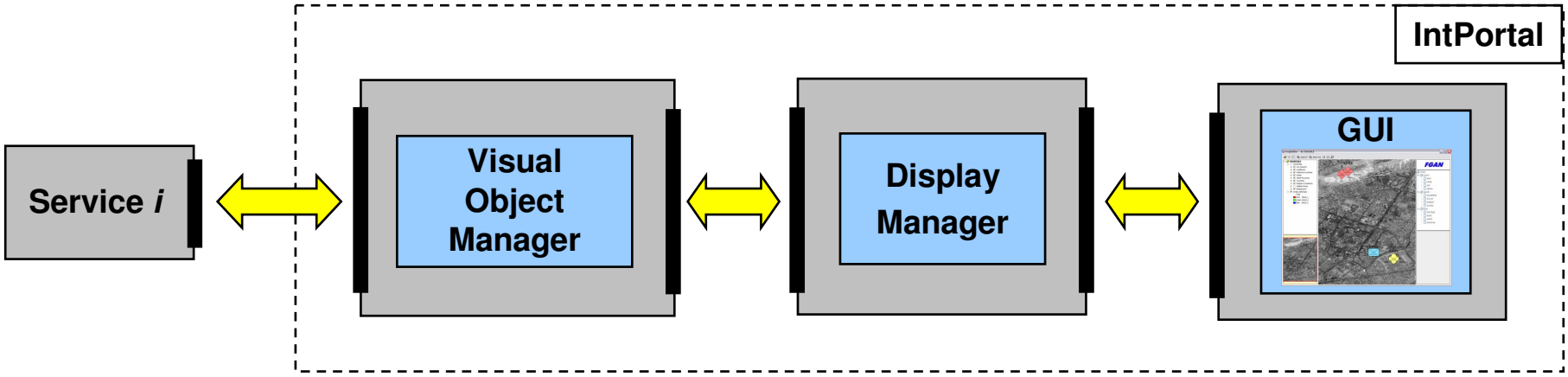
IntPortal-Requests: IntPortal → Service, or IntPortal → IntPortal Manager

- for handling of user calls to service-functions
- support the maintenance of the integration portal (e.g., log-off procedure)

Manager-Requests: IntPortal Manager → IntPortal

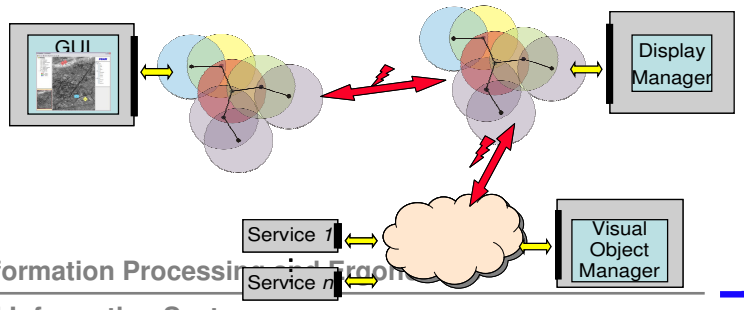
- manage the instantiation and initialization of the integration portal

Architecture of the Integration portal – Main components



- **Visual Object Manager**: consistency-preserving processing of service-requests
- **Display Manager**: efficient maintenance of visualization elements and their preparation for visualization
- **Graphical User Interface**: ergonomic presentation & interaction with the user

Advantage: the components can be distributed in the network according to the actual available resources



Integration portal – Solutions for Resource Conflicts

Priority strategy:

- enables for priority-based handling of requests
- defines the processing order of requests
- realized by dedicated components of integration portal: mediators

Update strategy:

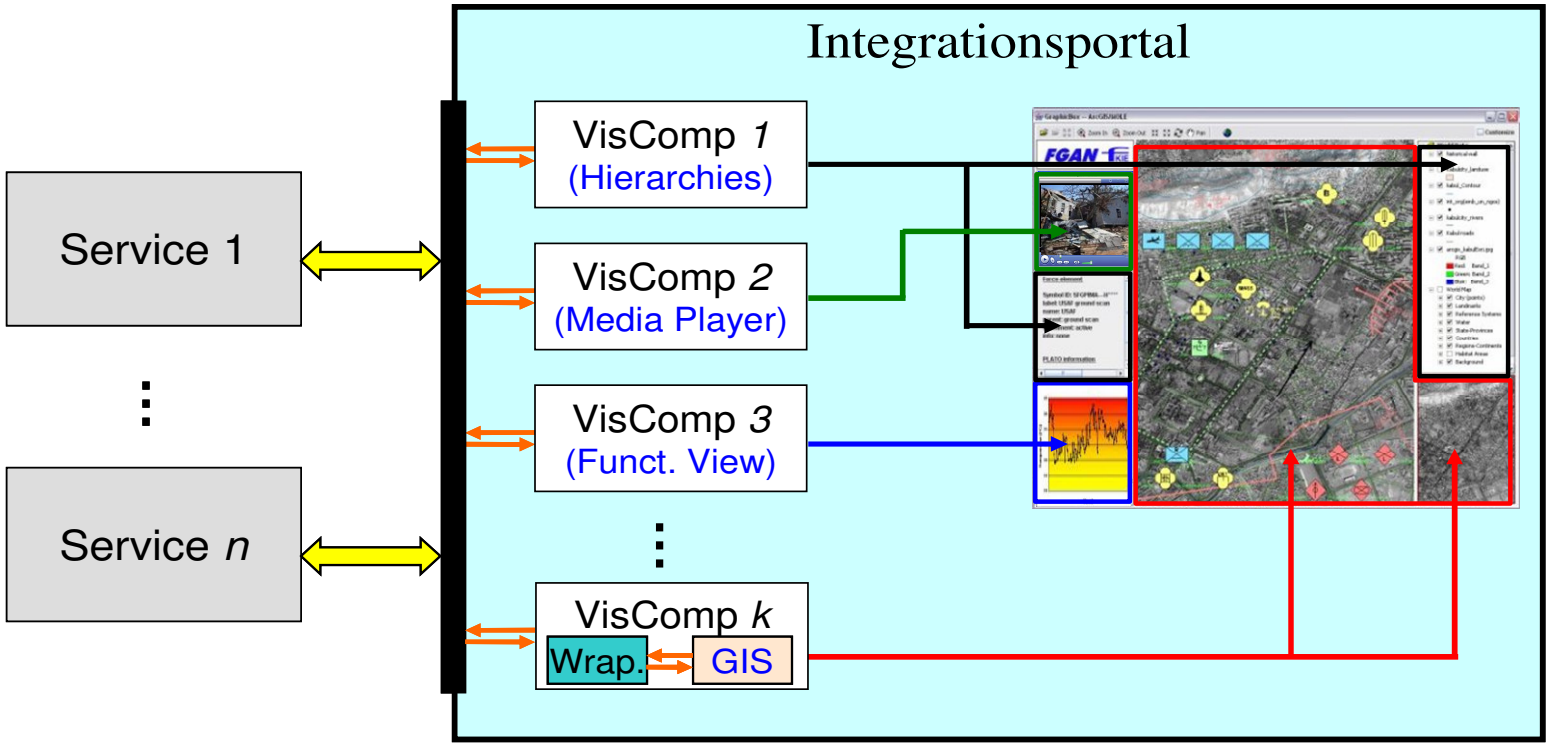
- makes sure that only the actual data is visualized
- no more actual data is deleted or moved to history
- implemented in request-mediators

Example: Split priority strategy

- Every request gets from services two different priority-values:
  - Request-priority: valid among all requests of one service
  - Service-priority: valid among all services (cross-service)
- Values allowed for priorities are given the services by some instance of access-control-service

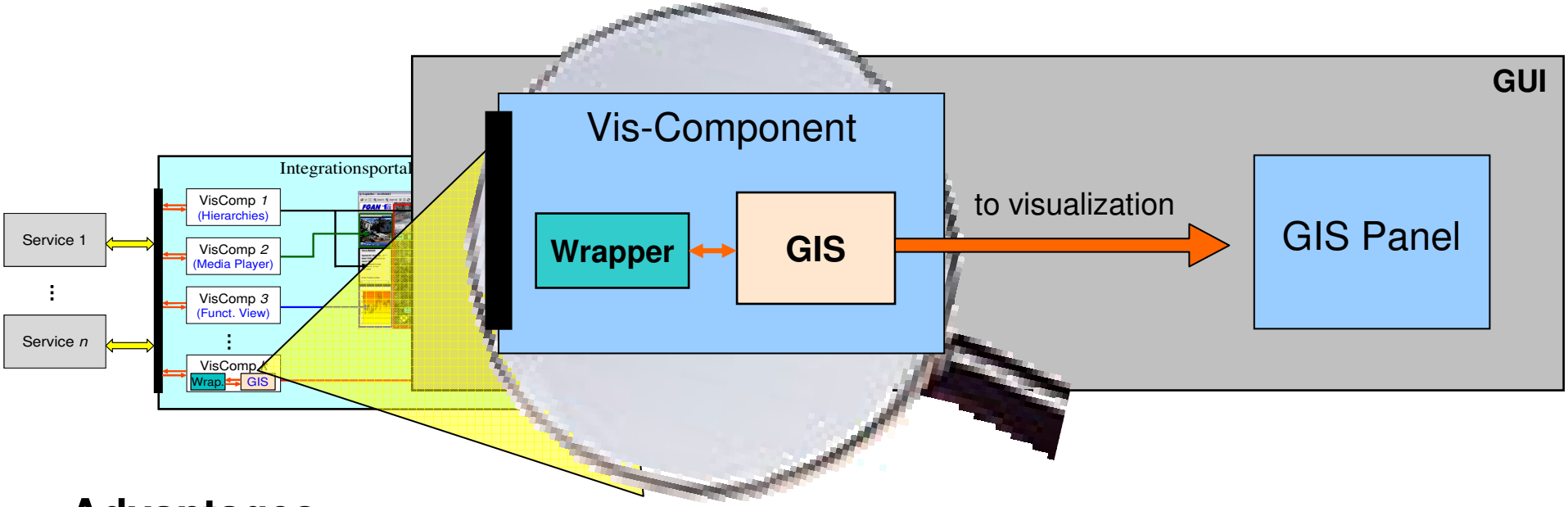
Integration portal – Visualization components

- Specific **visualization components**
  - As plug-ins
  - Fill their corresponding panels
- Highly **flexible**, adaptable to various data types



Integration portal – Encapsulation of GIS

- visualization of spatial data via GIS
- encapsulation of GIS via appropriate visualization components



Advantages:

- Elimination of redundant visualization components of C2IS
- Uniform visualization of spatial data
- Product-independence
- Easy exchangeability of GIS (even open source GIS possible)

Summary

- New integration concept for COP
  - based on integration of visualization elements
  - heterogeneous sources of data
  - modular architecture

- Integration portal as alternative solution for integration
  - Allows reuse of existing systems and services
  - Interesting compromise between portal technology and semantic integration
  - Step towards fully integrated, single system

- Collaboration
  - Shared and integrated handling of COP-objects from heterogeneous sources
  - Hiding underlying complexity from the user
  - Increased effectiveness through natural, service-crossing workflows

Thank you for your attention!