

Adaptive Logistics



Overall Goal

In the BRIDGE concept case Adaptive Logistics we characterize large-scale emergency management operations as Complex Dynamic Multi-Agency Distributed Systems. We explore how we can coordinate the efforts deployed by all the systems' human participants and artificial components, in such a way that the BRIDGE system-of-systems as a whole displays coherent, goal-directed behaviour, realizing its goals effective and efficiently.

Main Functionality

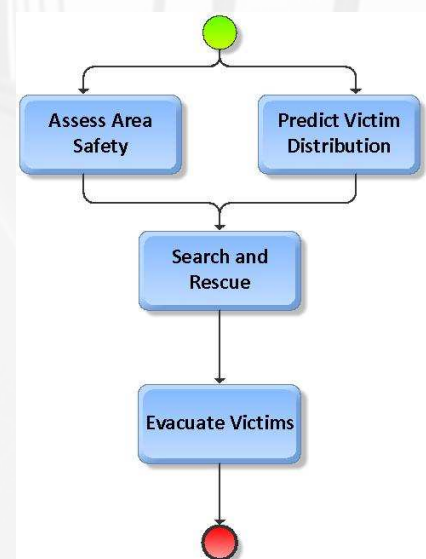
To organize a dynamic multi-agency collaboration we use workflows (or more specific: a 'WorkFlow Generation and Management (WFGM) sub-system'). To organize this collaboration the WFGM sub-system requires *system awareness* and *specific capabilities* to plan, instantiate, monitor and adjust activities. Advanced Logistics establishes a collaboration between various BRIDGE system components, including DEIN, Situation aWare Resource Management (SWARM), the Risk Analyser Modeller and Advanced Situation Awareness - Prediction Modelling.

System Awareness

The purpose of system awareness information is to make explicit what the capabilities of the emergency management responders and their technical systems are: what roles, causes and effects exist in the operation domain and what does the overall emergency management operation currently tries to achieve.

The component does this by:

- Gathering knowledge regarding the capabilities and constraints of participating entities and their own characteristic approaches to resource deployment
- Exchanging information regarding plans and intentions
- Searching for collaboration opportunities
- Dynamically keeping track of the current goals of the system



Collaborative Planning

Mechanisms

In BRIDGE we explore the deployment of three WFGM mechanisms that collaboratively compute workflows to coordinate the BRIDGE efforts:

- **COMPASS/SMDS** deploys a classic reasoning algorithm, iteratively constructing workflows that achieve a given system goal. From the generated workflows, the best matching the systems' current requirements is selected. This approach will yield good results for new complex goals that can not be pre-planned.
- **CoWS** uses templates describing relevant domain information to construct workflows. The templates contain gaps that need to be filled in with other templates or services. This approach will show good results in environments where certain complex tasks occur frequently and can be specified at design time.
- **ATOM** uses an opportunistic approach to planning and execution: based on a survey of the current situation and rough notion of how to achieve a goal, only the first (or, alternatively, next) step(s) are planned and executed. The planning of later steps is delayed, based on the idea that the situation may change. In BRIDGE we will use ATOM to coordinate the deployment of resources.

The WFGM mechanisms interact using the BRIDGE Annotated Workflow Language (BRAWL).

Workflow Processes

- **Instantiation:** Once a workflow has been selected for execution, the WFGM system needs to configure the resources in the BRIDGE system of systems to execute that workflow.
- **Monitoring:** Monitoring helps ensure the system accomplishes what it actually needs to accomplish and to detect failure to accomplish or deviation from agreed-upon qualities.
- **Adjustment:** In case the monitoring mechanisms detect an (immanent) failure, the WFGM system has a number of options, depending on the nature and severity of the failure: Ignore, Reconfigure, Regenerate, Escalate, Reject.

Features Visible in Demo III

During the BRIDGE demo in Stavanger we will demonstrate, using an operational workflow, how we can establish a collaboration between various BRIDGE system components. For simplicity, some of these services may be simulated as their interoperability was already demonstrated in BRIDGE Review/Demo I in Flums.

Contact: Thales Nederland BV
Bernard van Veelen
Bernard.vanVeelen@D-CIS.NL
Tel.: +31 652 48 45 30

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