



Dynamic Process Integration Framework (DPIF)

The main objective of the DIADEM project is to create an ICT system for collaborative situation assessment and decision making that supports effective protection of the population and the environment against chemical hazards in industrial areas. This requires reasoning based on large quantities of information which is typically very heterogeneous and can be obtained via sensor networks, the existing communication infrastructure, such as mobile phone networks, Internet and databases. While such information can be very useful, its exploitation requires substantial domain expertise. No single expert has the required knowledge or the capability to use all the available information, while full automation of the situation assessment processes is usually not possible or acceptable.

Dynamic Process Integration Framework

Dynamic Process Integration Framework (DPIF) supports efficient solutions to the above mentioned challenges in a relevant class of applications. The DPIF approach supports collaborative situation assessment by seamlessly combining automated reasoning processes and cognitive capabilities of professionals from multiple, geographically distributed organizations, each contributing specific expertise and processing resources. This is achieved through:

- Automatic creation of information flows between different experts and automated processes. *The system delivers the right information to the right experts/processes at the right time.*
- Integration of arbitrary automated reasoning processes; DPIF supports an evolutionary approach to automation.
- Seamless integration of existing decision support tools.

With the help of the DPIF approach, large quantities of heterogeneous information can efficiently and reliably be analyzed.

DPIF Principles

DPIF is a novel approach to collaborative analysis in large scale situation assessment problems [2]. The DPIF provides a uniform communication/collaboration infrastructure allowing seamless combination of heterogeneous information processing capabilities provided by human experts or implemented with the help of arbitrary automated solutions.

A human expert is integrated into a DPIF-based analysis system with the help of a dedicated software agent, an assistant that (i) collects all information relevant for the expert, (ii) disseminates the expert opinion/estimates and (iii) triggers the expert's attention.

Such an agent continuously runs on an arbitrary server. Each expert communicates with the personal DPIF assistant via a graphical user interface which can run on arbitrary networked computers and PDAs (see Figure 1). In other words, the DPIF makes the expertise and analysis capabilities globally accessible.

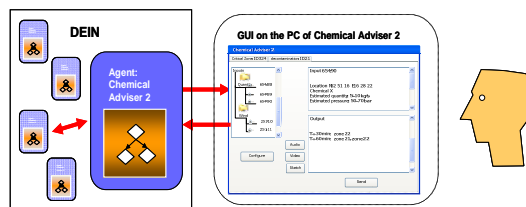


Figure 1: A graphical user interface supports communication between an expert and the dedicated DPIF agent (blue rectangle).

Moreover, DPIF autonomously creates information flows in large systems of collaborating experts and automated processes (see Figure 2).

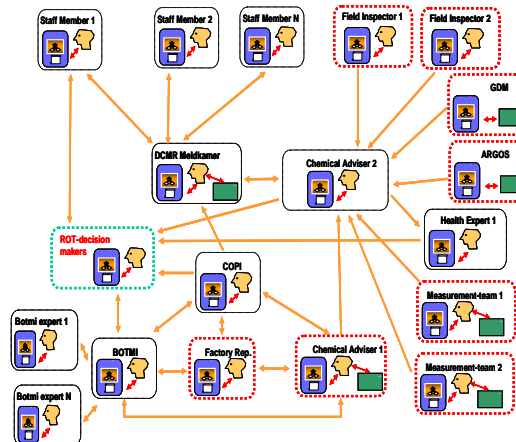


Figure 2: A simplified example of an information flow between different collaborating experts and automate tools using DPIF agents (blue rectangles).

The system implements advanced negotiation, which supports automated creation of connections between experts by using multiple criteria and advanced protocols [3,4]. This can significantly reduce the time and the effort required to form a system of experts and automated tools for a particular emergency management problem.

Efficient Setup and Maintenance

The DPIF approach supports efficient creation and maintenance of complex collaborative systems for advanced situation assessment. This is achieved by allowing the experts and designers of automated services to specify their own capabilities and the needed information. No centralized authority is required to create a rich repository of service descriptions supporting runtime service discovery and composition.

The recently introduced OntoWizard [1] tool helps the users to specify their own expertise and information needs in a natural language. These descriptions are mapped to rigorous service descriptions (i.e. ontologies) used by the DPIF agents for automated creation of information flows between the relevant service providers. This approach is especially relevant for an important class of organizations involved in large scale crisis management which typically rely on a collaboration between many experts with heterogeneous and complementary domain knowledge.

Moreover, the installation of the DPIF components does not require any significant modifications of the standard systems or programming skills. The system is implemented on top of the existing communication and computing re-sources, such as conventional computers and PDAs. In addition, the DPIF supports interfaces with standard communication systems, such as Internet and mobile phone networks.

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Project

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