

A-WARE

Scope

The scenario that best describes the use of A-Ware technology is the one that sees a researcher or an engineer in their daily work, solving complex and challenging problems. The most familiar interface they need is the common Web browser through which one can design and run workflows (business processes often involving the launch of complex computations or simulations working on large dataset), which are flows of both tasks and data, no matter how complex and resource demanding. The A-Ware project addresses the challenge of simplifying the way to access distributed resources through Grid-based systems: computing power, algorithms, large amount of storage for Academic and Industry Research. The uptake and use of those systems in business and society will improve their problem solving capabilities and A-Ware will help to foster all that.

Today new Information and Communication Technology (ICT) instruments have enabled the creation and the usage of interoperable services for Grids, but the complexity of Grid technologies hinders the exploitation of all potential benefits.

The A-Ware Project will harness the Grid computing across Europe, changing the perspective from the complexity of distributed systems to the point-and-click model of the Web, bringing advanced tools and solutions directly to the desktop of end users of industrial and scientific communities.

Advances

A-Ware is a reaction to the complexity of building clients for Grid middleware. Our solution was to essentially split the client, some of it is still left on the client machine (suitable for running in a browser), and the rest is moved to a server. The part which has moved to a server, knows about my sites, my preferences, applications, etc. It is a "Grid HOME", a natural place for aggregate-like functionality, such as, workflow, search, etc.

A-Ware technology presents a Web-based workflow framework that provides all the capabilities to design and develop workflows implementing business processes on top of basic and consolidated business tasks exploiting Grid resources. Basic services and newly defined workflows are then exposed as high level services to end users by the A-Ware Portal layer. The Web based interaction provided by the A-Ware Portal provides the user with an easy and familiar Web browser interface thus improving users' productivity as a single entry point to distributed resources.

Concerning A-Ware architecture and technology infrastructure, another major advance is represented by the middleware relying on an Enterprise Service Bus (ESB): a highly scalable and robust SOA based component for the integration and management of applications (both legacy and open source) and Grid resources. Software resources (applications) found in the Grid are exposed as high-level application services (HPC Software-as-a-Service),

and it is at this level that the engineer or scientist is able to interact.

A-Ware framework has in its extensibility one of its major technological advancement:

- **Workflow independency.** The A-Ware initial targets are BPMN and BPEL, but the whole infrastructure can be plugged with other workflow languages and engines;
- **Grid independency.** The ESB component provides an abstraction layer over multiple Grid execution environments enabling A-Ware to integrate other Grid middlewares;
- **Connectivity independency.** The ESB provides a uniform environment where internal normalized messages can be exposed through different external protocols thus facilitating the integration of external software systems.

Moreover, the strong commitment of the A-Ware project for standards adoption (BPEL, BPMN, SVG, JBI, etc.) decreases the dependency from specific technologies and software vendors thus preserving and increasing the ROI of the solution.

Positioning in global context

With respect to existing workflow products, A-Ware innovations work to a significant commercial advantage. Although there are other workflow frameworks, A-Ware technology enhances modularity, flexibility and improves architecture components decoupling in a "driven-by-standards" methodology.

A-Ware has an almost niche potential in the workflow marketplace. While workflow applications, portals, portal frameworks exist in abundance, A-Ware solution while integrating the workflow systems and Web portal worlds is able to offer special, unique characteristics:

- Grid integration: the first targeted middleware is UNICORE 6 but the A-Ware architecture makes provisions for integrating other OGSA-* compliant Grid middleware;
- Web portal interface that covers all the aspects of the workflow life cycle, from design to grounding and deployment, from submission to monitoring;
- Standards based solution: the adoption of BPMN as graphical notation, BPEL 2.0 as workflow language and other W3C technology standards enhances interoperability among different group of users and the re-use across different software systems.

The access and the usage of the Grid infrastructure by means of the Grid Portal allows users to make effective exploitation of the company's own hardware and software. The same exploitation that helps companies remain competitive.

Technicalities aside, the companies represented by A-Ware (NICE, Fujitsu, Airbus) are uniquely positioned to promote the technology on a global context by taking a definitive commercial approach.

Contribution to standardization and interoperability issues

g-Eclipse is more than just a tool – it is a veritable toolbox for Grid computing within the Eclipse. The project has been an active consumer of standards and interoperable solutions, testing their specification by implementation in challenging scenarios and feeding the experience back to the relevant owners. The project has made direct contributions to the activities of standards bodies, particularly the Open Grid Forum

Target users / sectors in business and society

Potential users are both service provider and end-user. The former can exploit the framework to expose applications, in particular Grid applications as services and make them easily accessible via web interfaces. The latter is able not only to invoke the provided services through a user-friendly web portal, but also to orchestrate them, designing a workflow through a graphical tool, to monitor his/her own activities and to reuse the designed service composition at various levels of abstraction.

Overall benefits for business and society

The results of the A-ware project will increase the competitive advantage of strategic European industry by improving the accessibility, visibility and industrial value of scientific computational resources through easy to use Grid technology and the European research Grid empowered e-Infrastructure. The benefits of this are made visible by the validation of the approach using a challenging scenario drawn directly from the AirBus business.

Examples of use

The main use case for the project comes from an aircraft company. Its engineers need to orchestrate different software applications, running in a heterogeneous environment, in order to perform an analysis of the noise inside the pilot cabin of the aircraft. This is achieved through a simulation involving multiple acoustic and geometrical parameters simultaneously. The existing solution implied manual “orchestration” through executing shell scripts, checking files and transferring data from one machine to another.

The project has developed a system which allows engineers to design and execute the workflow representing the simulation. They can execute the whole process automatically, designing it once and running multiple times, even changing the computing resources underneath without the need to redesign the workflow.

Achievements

A-Ware technology prototype:

- Web portals (based on EnginFrame and GridSphere technology)
- Service Bus to host components required to interact with the Grid
- Workflow repository
- Workflow designer
- Libraries to manage workflow modelling

All the aforementioned pieces of software are free and open source with the exception of EnginFrame technology.

Publications:

- Unicore Summit 2006 paper: A One-Stop, Fire-and-(almost) Forget Dropping-off and Rendezvous Point – Euro-Par 2006 Workshops proceedings – Springer.
- Unicore Summit 2007 paper: A Business-Oriented Workflow Management System – Euro-Par 2007 Workshops proceedings – Springer.
- Unicore Summit 2007 paper: UNICORE/w3 - Euro-Par 2007 Workshops proceedings – Springer.



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