Human-Centered Autonomous and Assistant Systems Testbed

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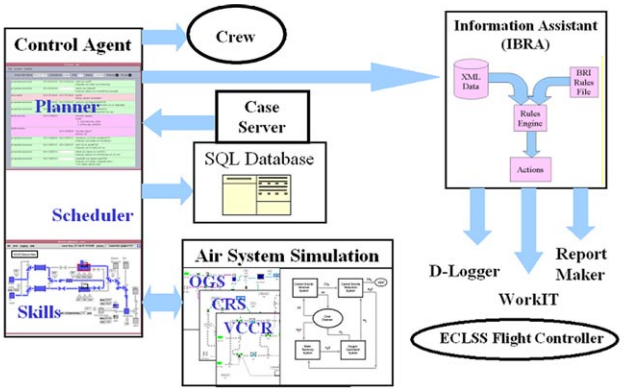
This project has developed a concept and prototypes for an integrated Web-based tool set with underlying databases for agent-supported collaboration. This tool set, a Team Work Center, is designed for collecting and distributing information on events and issues during missions. Key elements of the tool set are a console logger, a report generator, a notifier, and an issue management tool. The tool provides capabilities to create a workspace for each issue and to organize and access files, links, tasks, actions, notes, and status logs. Software agents, intelligent monitors, notifiers, workspaces and tool integration ensure the right information gets to the right team member at the right time. The Team Work Center tools are independently useful tools that interoperate via simple application programming interfaces (APIs). The simple APIs support long-term flexibility by allowing a smooth evolution of capabilities, including tool replacement and interfaces to new or external tools for operations support. The tools also use several customization strategies that change data rather than application code for smooth evolution and flexibility. The tools can be embedded in socio-technical systems where evolution and adaptation are needed to serve the needs of diverse operations groups and to support their collaboration.



Both human team members and software agents use the tool set. Intelligent monitoring assistants carry out customizable instructions to monitor data and automatically collect, present, and distribute information from diverse sources. One of these information sources can be an Intelligent System Management agent that provides control and health management for a subsystem as well as the capability to interact with the Team Work Center and operators. Such an infrastructure can support team coordination and decision making and supervisory control of autonomous agents. Intelligent monitoring assistants will make it easier to incrementally automate some team tasks that support situational awareness and coordination.

Human-centered prototyping methods have been used in a spiral incremental development process. The WorkIT workspace tool, which is the most mature prototype, is WorkIT Version 5. The Team Work Center suite has been successfully used and evaluated in NASA Extreme Environment Mission Operations undersea missions via topside support from the Johnson Space Center Exploration Planning and Operations Center control room. The evaluated tool suite includes WorkIT 5, a console logger, a report generator, and a Viewport portal into the tools.

The tools are also being used and evaluated by biomedical engineers in the International Space Station Mission Control Center and Mission Evaluation Room. A demonstration with a simulated autonomous life support subsystem has shown that it is feasible and effective to use this architecture of software agents and tools to support operations teams and to help them interact successfully with autonomous systems.