T-Zero™

Real-Time Automation for Time Critical Distributed Processes

Task Sequencing and Automated Process Control

TZero™ is a real-time software application for automating complex time-critical mission processes, and a plug-in application for CCTK. The core purpose of T-Zero is consistent and repeatable process automation and synchronization of distributed mission systems and operations personnel to achieve time/event coordinated mission objectives. It enables a small number of operators to manage complex systems and mission processes to a high degree of consistency.

As a real-time CCTK application, T-Zero utilizes CCTK C2 Services for publication of end-item commands and process state, and acquisition of process instrumentation data, events, state, and mission time.

The T-Zero is a client/server application that executes process control sequences in a real-time Sequencer-Engine, and a network distributed multi-user graphical client that provides an HMI for operator's process interaction and process/mission situation awareness via a visually animated Multi-level Gannt Chart.

T-Zero Includes a high-level executable meta-language for defining automated mission critical processes (Process Control Language (PCL)). The language facilitates organizing mission processes into hierarchical organized tasks and events that are sequenced in time and by order of execution. It facilitates user defined logic for evaluation of real-time information driven constraints, task dependencies and execution states for gating process flow, branches, and variable control actions running in the T-Zero Sequencer-Engine.

The T-Zero Sequencer-Engine executes the PCL timeline scripts in real-time using one or more user defined real-time mission clocks (CDT, MET, etc.). As the clock increments, the engine steps through the time-order PCL, resolving tasks state and order of execution by continuously evaluating real-time data from CCTK, user input, and other tasks and processes state. PCL tasks defined to include control can send commands to open a valve, start a pump, activate cameras, or start other timeline sequences. Branching timelines include logic to evaluate overall mission conditions, or operational readiness to start a new or alternative sequence, such as abort-mission, secure fueling system, proceed to flight-plan B. While the Sequencer-Engine processes and executes the timelines, it serves real-time process state data and accepts operator dialog/responses to/from the LAN/WAN attached clients participating in the process.

The T-Zero Client is a multi-platform graphical Java application that connects to a running T-Zero Sequencer-Engine to first load an active timeline with a Gannt task-verses-time

view of operations process, then present continuous task progress status using task-bar color dynamics in conjunction with an animated time marker showing current timeline progress. The client will nominally keep the current time in view, but the operator can interactively hide/expose task roll-ups and scroll back and forward in time. Hyperlinks can be associated with tasks to make technical reference materials readily available in the process context. Graphical dialogs support operator input and decision making in the process flow. Dialogs can also be integrated over the WWW via SMS and Email web distribution.

Major Features:

- Real-time Process Sequencer (Engine)
- Process Control Language
- LAN/WAN Client/Server Architecture - CCTK Application
- Multi-platform Java client
- Real-time data and commanding
- Reactive control logic
- Real-time decision branching
- User interactive animated visual timeline

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