



TSE • Tactical Simulation Environment

Tactical Simulation Environment (TSE) is a test bed which integrates the System Under Test (SUT) and realises a Network Enabled Capability (NEC). TSE enables coherent integration of sensors, mission systems, support capabilities and decision-makers. The system offers the possibility to exchange tactical data among command & control (C2)-, weapon-, and simulation systems through an IP-based Tactical Data Link (TDL, in particular Link 16). TSE supports the operator, integrator as well as the decision maker in integration, whether in national or coalition armed forces.

Problem Statement

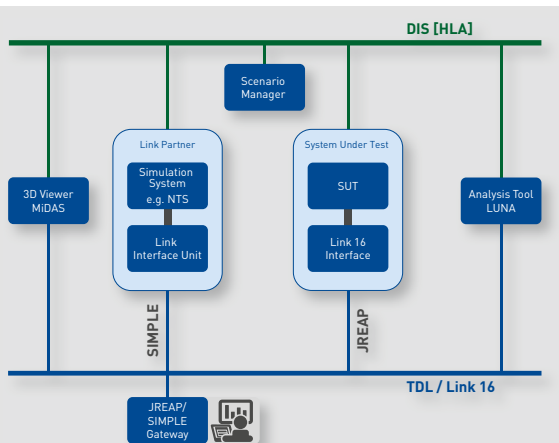
The complexity, availability and cost of testing and operating tactical weapon system platforms and tactical communications systems drives the need for innovative and cost-effective solutions that simulate and combine mission system platforms.

Complex acquisition programmes must interface to existing legacy systems via tactical data communication systems. Such programmes require test beds to verify complex mission systems which rely on the data exchange via TDL networks. TDL rely on bearer technology to connect participants.

Alternatively, TCP/IP-based range extension networks may also be built in order to negate the need to rely on expensive communications connectivity between the participants.

Communication standards define the message formats, protocols, and bearer characteristics needed to ensure an exchange of digital tactical data. A system capable of stimulating, interrogating, and interpreting the messaging data is required. The system must be able to capture and provide all of the planning data while displaying the scenario during pre and post analysis. TSE is such an environment.

TSE utilises components of the system to support the interrogation, stimulation, analysis, and evaluation of the wider system communication network as well as local nodes and message protocols. The system identifies potential interoperability issues in advance enabling a rectification prior the system verification and entry into service.



Use Case

TSE is used to stimulate, test, and evaluate the SUT, simulation model or new NEC concepts. The system also exchanges and analyses tactical data between the link partners and the SUT.

The SUT and a link partner (e.g. NTS, LIU) generate a common operational picture (COP) on the basis of all simulated objects (entities) by identifying, tracking, and correlating them. TSE enables the operator to analyse and evaluate the process to generate the COP efficiently.

The modularity and scalability of the system makes it possible to allow multiple simulation models with individual configurations to participate in the test.

TSE test bed components can be integrated into existing networks to support large exercises.

System Breakdown/Components

The **Air Force Scenario Manager (AFSM)** delivers the planning component of the TSE system. AFSM was originally designed for the development, test and simulation for the German Luftwaffe for the planning and scenario analysis of air operations, Ballistic Missile Defence and related countermeasures. AFSM provides the complex scenario and entities for the simulation and sends the entities to the DIS (Distributed Interactive Simulation) or HLA (High Level Architecture) based simulation network.

The **Mission Display and Analysis System (MiDAS)** receives and extracts data from various data sources via the simulation network, TDL and/or the weapon system platform in order to merge and display the data in multiple views and screens for mission control and evaluation.

The **Naval Tactical Simulation (NTS)** contains generic models of the weapon system platform, sensor packages, effectors and a Combat Direction System (CDS). It is connected to the simulation network based on the DIS or HLA interface standards.

The **Link Interface Unit (LIU)** enables a simulation system to participate in the TDL network. The combination of LIU and NTS serves as a link partner for the SUT within the TSE network. As such, they exchange data between the simulation (HLA, DIS) and the TDL (Link 16) world.

The Link-Using-System Utility for Network Analysis (**LUNA**) monitors, displays, records and replays the message data exchange on the simulation and TDL networks. LUNA allows the operator to drill into the data exchange in order to test and verify the issue at hand.

The **JREAP-SIMPLE-Gateway (JSGW)** enables the reliable data exchange between any TDL system representing a valid SIMPLE or JREAP node on the network. The implemented protocol stacks are compliant with MIL-STD 3011 (Annex C) and STANAG 5602, respectively. Also network monitoring is supported.

Key Advantages

- Tests new systems and components which are still under development or about to enter service
- Generates synthetic entities and threats on the simulation network for all participants connected to the network
- Simulates, tests, and supports a Network Enabled Capability (NEC)
- Analyses and monitors the Simulation and the Tactical Data Link simultaneously in real time on the same screen
- Records, plays back, and displays the simulation and TDL data
- Provides a *link partner* for the SUT
- Simulation capability for functions related to C2- and weapons systems
- Compatible with complex tactical communication standards (STANAG 5511, 5516, 5518, 5602) and simulation standards (IEEE 1278.1, 1516-2010)
- Cost effective, modular and scalable synthetic environment for verification and testing

References

NATO ALTBMD ITB (Active Layered Theatre Ballistic Missile Defence Integration Test Bed), NATO ACCS (Air Command and Control System), SuTBw (Simulation and Test Environment of the German Armed Forces), Simulation Centres of the German Air Force and of the German Navy (SimZLw, SimZM), AFIT (Air Force Institute for Technology, ITWL, Poland), various industrial customers.

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