DEFENCE R&D DÉFENSE

Defence R&D Canada – Valcartier

High Capacity Tactical Communications Network (HCTCN) TD

- High Capacity Tactical Mobile Radios
- Tactical Networking
- Information Management

Tactical Communication Environment

On the tactical battlefield, the means of communication between vehicles or dismounted soldiers is generally a line-of-sight radio operating in the VHF or UHF band. The advent of digital command and control systems in the tactical domain offers the promise of increased battlefield awareness through systematic and automated distribution of relevant data. To deliver on this promise, it must be possible to distribute digital data over the radio system with high fidelity and with a timeliness appropriate to the operation. Initial experience with passing tactical data in digital form over Army radios has highlighted the inadequate data capacity of the wireless channels.

HCTCN TD

The High Capacity Tactical Communications Network Technology Demonstration (HCTCN TD) project will demonstrate selected technologies in the fields of wireless communications and information management that can increase the limited capacity of tactical communications systems.
This information sheet describes the Information Management segment of the project that is being carried out at DRDC Valcartier.

Tactical Information Exchange

In the tactical domain, sharing information in digital form on an "all-informed" basis is highly desirable to avoid a single point of failure and to ensure continuity of operations. Under this exchange model, nodes try to maintain exact copies of each other's database via asynchronous data replication ("fully synchronized" data base content).

Tactical Radio Environment

When communication channels have low and variable throughput and unreliable connectivity, maintaining full synchronization can be impossible. It is likely that, over time, the databases will drift out of synchronization. Users will believe that they are sharing the same situation picture, when, in fact, they are not. Such a characteristic, if detected, can undermine confidence in the system. Undetected, this characteristic may have deadly consequences.
In such a communications environment, it is important to build into the command and control system intelligent information management strategies that can adapt to changing battlefield and network conditions without user intervention so as to optimize the flow of priority and high-value information between nodes regardless of the state of the communication channel.

Low Bandwidth Testbed

At DRDC Valcartier, a test bed is being implemented under the HCTCN TD project to study the impact of information management techniques on the quality and timeliness of data distributed across a tactical radio net. The testbed supports a discrete event simulation of a network of tactical command and control nodes. Simulated tactical nodes are linked by wire to a central server node. The server node synchronizes simulation execution and controls a high-fidelity software-based performance

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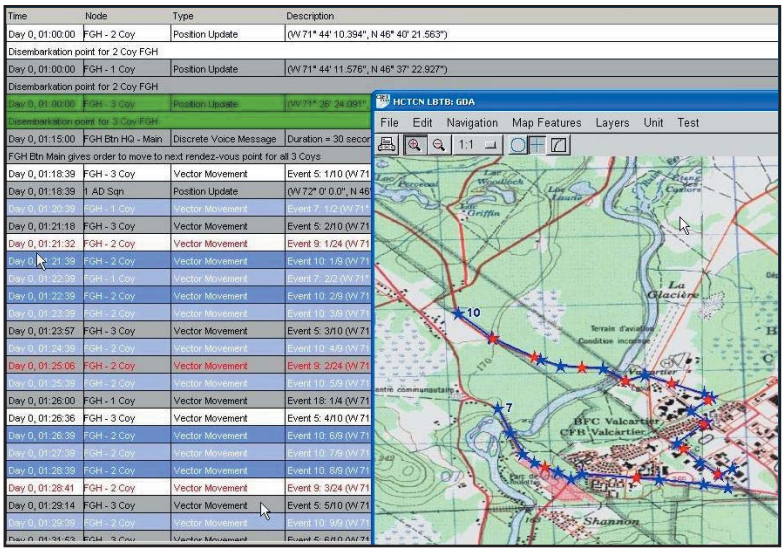
model of the wireless communication system. Tactical communication scripts are executed which require data transmissions to be passed between simulated nodes through the communications system simulator. The simulated nodes have real databases and reproduce relevant functionality of true tactical command and control nodes (e.g. a geo-referenced map display with moveable icons).
The test bed permits a second mode of operation in which a radio is interfaced to each node and the scripted data communications are broadcast over the radio system.

The information management techniques being studied will exploit and act on data in the local database within a tactical node. The techniques take two basic forms - (a) those which optimize transmission efficiency, and (b) those which limit what is transmitted and/or when it is transmitted. A data compression algorithm would fall into the first category. A rule which inhibits the broadcast of an "own position" report from a vehicle whose position has not changed would fall into the second category.

- ability to monitor and display the simulated behaviour of the radio network over time;
- management modules providing a high degree of configurability for the scenario script, communications system model and the selected metrics.



Scenario Script Manager Tool

Simulated Tactical Environment

The testbed's main strength lies in its ability to characterize communications system performance over time and to correlate that performance with the quality of the tactical situation picture shared across network nodes. The low bandwidth testbed will provide the Army with a flexible tool for evaluating the probable impact of tactical radio system performance on Army command and control business processes.

The testbed has several key elements:

- automated software tool for creating and managing the communication event script that drives the simulation;
- ability to pause an executing communication script, compare database content across participating nodes, and record results before continuing;
- ability to re-run scripts with information management techniques "on" or "off";
- high fidelity performance model of a combat net radio system;

For more information

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