Annex E – TERMS OF REFERENCE

Task Group on
Information Management over Disadvantaged Grids
IST-030/RTG-012
15 December, 2000

I. ORIGIN

A) Background

The Research and Technology Organization (RTO) Information Systems Technology (IST) Panel recognized the challenge inherent in distributing timely and relevant tactical information as digital data using a mobile wireless communication system characterized by low and variable throughput and unreliable connectivity. In order to address that problem, the Panel authorized in October 1999 the formation of an Exploratory Team on Information Management over Disadvantaged Grids. . The Exploratory Team met at DGA HQ in Paris in May 2000 and concluded that the problem of Information Management over Disadvantaged Grids should be addressed through formation of a Task Group under the IST Panel.

B) Military Benefits

Mobile communication is an important military requirement. Voice communications still occupy a pre-eminent place in Army operations. Present-generation digital data communications at the tactical level (below Brigade) are accomplished using radio systems designed primarily with voice in mind. Data throughput tends to be very limited (less than one kbit/second is not uncommon) and highly variable. Digital C2 systems offer the promise of increased battlefield awareness. To deliver on this promise, the communication backbone must be capable of distributing relevant sets of digital data among participating C2IS nodes accurately and with a timeliness that permits friendly commanders to act within the decision cycle of the enemy commanders. Satisfying data distribution requirements of completeness, accuracy and timeliness when the communication system is characterized by low and variable throughput and highly unreliable connectivity represents a considerable challenge. Realistically, the limitations of the mobile wireless communications network will make it impossible to satisfy fully all of these requirements all of the time. Dynamic trade-offs between these factors will be required. A key factor in managing these tradeoffs is a set of adaptive protocols within each C2IS node which exploit current information about the constantly-evolving situation picture contained in the node's database, and information about the current state of the communications network, to optimize the timeliness and relevance of information passed between nodes. Commercial data replication products do not provide protocols with the sophistication required for the demanding wireless military environment. In general, the products assume the presence of reliable high bandwidth links between databases and/or an environment in which as much time as necessary can be taken to synchronize database content. Neither of these assumptions are valid on the tactical battlefield.

II. OBJECTIVES

1) Area of research and scope of activity – investigation of adaptive information management schemes, implemented in the nodes of tactical command and control systems, to mitigate the effects of low bandwidth, variable throughput, unreliable connectivity and energy-constrained nodes imposed by the mobile wireless communications grid that links the command and control nodes.

2) Specific goals:

   a) Identify the characteristics of mobile wireless communications grids which pose a challenge to the timely and accurate distribution of tactical information over the grids;

   b) Investigate how the application layer can acquire and exploit information about the state of the communications grid;

   c) Investigate and identify information management protocols specific to the application layer which can respond to changing network and battlefield conditions to optimize the timely flow of relevant information over such grids;

   d) Investigate techniques for implementing the protocols in the application layer, such as the use of database triggers and exploitation of COTS or MOTS (e.g., NATO ATCCIS) data replication mechanisms;

   e) Identify measures of effectiveness (MoE) that can be used to evaluate the operational impact of these techniques; and

   f) Investigate how advances in mobile wireless communications and database technology may influence the problem.

3) Expected deliverables:

   a) A prescription for adaptive information management schemes, and methods for implementing the schemes, in tactical command and control nodes, to counteract the communication grid characteristics of low and variable throughput, unreliable connectivity, and energy-constrained nodes.

   b) An analysis of the potential gain, in throughput of relevant information, to be achieved by use of each technique, or by combinations of techniques.

   c) Reports, technical reports, conference papers, publications documenting the analysis of information management techniques and methods for their implementation in tactical command and control nodes.

4) Overall duration of Task Group should be not more than three years.

III. RESOURCES

A) Membership

Representatives from government (civilian and military) and industry with expertise on the topics of data replication in low bandwidth military environments, tactical communication systems, or mobile wireless communications. Knowledge and expertise on the following topics is also pertinent: communication protocols, Army common data models (e.g. ATCCIS Generic Hub), tactical messaging (Army organization, procedures, communication patterns, and message types), data compression schemes, and measures of performance or measures of effectiveness for the information distribution component of military command and control systems.

Canada, United States, Germany, and Poland have agreed to participate in the Task Group. The Team Leader and Lead Nation will be chosen at the first meeting of the Task Group.

B) National and/or NATO Resources Needed

Participating nations agree to fund travel for their national representatives to attend two meetings of the Task Group per year over the three year lifetime of the Task Group. It is expected that national representatives will be able to devote sufficient time between meetings to complete successfully the mutually-agreed Programme of Work.

Nations may be required to furnish information concerning the performance characteristics and/or architecture of their tactical communication systems.

C) RTA Resources Needed

Nil.

IV. SECURITY LEVEL

Most work will be unclassified. However, if details of the performance and/or architecture of national tactical communication systems are divulged, the classification of this part of the activity could be up to NATO SECRET.

V. PARTICIPATION BY PARTNER NATIONS

Partner nations will not be invited to participate in the Technical Team.

VI. LIAISON (WITH OTHER NATO BODIES)

The TGonIMDG should liaise with the following NATO bodies:

- IST Panel:
  - Information Management Challenges in Achieving Coalition Interoperability (IST-022/RSY-007);
  - Military Communications (IST-023/RSY-008); and
  - Awareness of Emerging Wireless Technologies (IST-ET-020).
- NATO Tri-Service Group on Communications and Electronics, Project Group 6, developers of STANAG for 'Tactical Communications Systems for the Land Combat Zone – Post 2000' (TACOMS Post-2000).
- NATO Permanent Working Group on Army Tactical Command and Control Information System (ATCCIS).