

Chapter 1 – INTRODUCTION

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 command and control 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 command, control and information system (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. These protocols must exploit current information about the constantly-evolving situation picture contained in the node's database, as well as information about the current state of the communications network, with the goal of optimizing the timeliness and relevance of information passed between nodes. Commercial 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. This assumption is not valid on the tactical battlefield.

The Research and Technology Organisation's (RTO) Information Systems Technology (IST) Panel recognized the challenge inherent in distributing timely and relevant tactical information as digital data over a disadvantaged communication grid (i.e., over a mobile wireless communication network characterized by low and variable throughput, unreliable connectivity and energy-constrained nodes). 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 RTO Headquarters 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.

Task Group 12 on 'Information Management over Disadvantaged Grids' was formed in January 2001. The Task Group consisted of four countries: Canada, Germany, Poland and United States, with the Chairman being provided by Canada. The objective of the Task Group was the following:

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.

The Task Group limited the scope of its study to the tactical wireless domain for a Land Force operating in a "national" context (i.e., issues related to multinational coalition interoperability were not addressed). The Task Group also decided that the impact of security requirements on information exchange protocols was a large topic that lay beyond the scope of the Task Group's mandate. Therefore, security-specific considerations (for example, managing exchange across classified and unclassified domains) were not addressed in this study.

