

12TH ICCRTS
ADAPTING C2 TO THE 21ST CENTURY

**Impact of Network Performance on the C2 Mission:
Visualization for Network Awareness**

Topics: Cognitive and Social Issues; C2 Concepts, Theory and Policy; Networks and
Networking

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ABSTRACT

At a national level, the transfer of intelligence related data is occurring over larger and larger computer networks. While this greatly improves the speed of data transfer, it introduces additional demands on the intelligence operations center. Going from the field to the command center via a network exposes data to choke points and dropped nodes within the network, which can lead to delayed or lost information. Any problem within the network will have an impact on the larger intelligence mission. The operations team is thus responsible for making decisions about how to control this process given the current state of the network world. In essence, managing this large information network becomes a command and control problem. Any visualization created to assist operators in the overall monitoring of these types of complex networks must allow operators to detect problem areas while providing adequate *Observability* of the impact of such problems on the intelligence mission in order to support their decision to direct attention to a particular problem area while preserving the overall monitoring. An example of one such network visualization that enables more effective, real-time network monitoring is described in this paper, highlighting the cognitive support provided to the intelligence operations center command team. This visualization allows operators to monitor over 20 times the number of nodes which could be monitored in the previous system, while also providing explicit *Observability* of network information that was previously hidden in individual drill down screens for each node. It is currently estimated that over 20,000 parameters can be monitored at one time with this new visualization. Additionally, the new visualization reveals relationships within the network, allowing operators to easily identify mission relevant functions that will be affected by any network complications and to make more effective C2 decisions in response to these complications. Cognitive Systems Engineering provided the necessary work domain insights and associated representational design techniques that enabled the development of an innovative solution to the long-standing networking monitoring need “What are the impacts of these network anomalies on our current missions?” The fundamental decision support provided by this visualization is applicable to a wide variety of C2 applications, including monitoring large-scale tactical information networks. The underlying, generalizable design principles used in this visualization are discussed as a means of enabling their use by other C2 decision support designers.

STRUCTURE FOR FULL PAPER

The full paper will be organized around the Cognitive Systems Engineering (CSE) principles used in the design of a Network Monitoring display. Specifically, the discussion will address the impact of intelligence collection and transmission on C2 capabilities, the common problems encountered in network monitoring, the CSE principles that must be taken into account in order to overcome these problems, and the impact that implementing these principles has on the end design of the system.