Research on Information Sharing Method for Future C2 in Network Centric Environment

Dr. Heng Wang

Science and Technology on Information Systems Engineering Laboratory
Nanjing, P.R.China
Email: puchengew@yahoo.com.cn, niree.wanagh@gmail.com
Outline

◆ Background & motivation
◆ Our proposed methods
◆ Simulation experiments
◆ Measurement of information sharing
Background & motivation
Background & motivation

- **NCW (Network Centric Warfare)**
  - provides the theory of warfare in the Information Age
  - presents a kind of operation pattern in future
Command and Control (C2) in network centric environment has become one of the research hotspots. For example, Net-Enabled Command Capability (NECC).
Information sharing is one of the important issues of future C2.

information sharing is foundation and core of realizing shared situation awareness and generating COP, and further supports decision-making.
How to organize and share information on demand for C2 missions to support the generating of high-quality battlefield situation in network centric environment?

- many uncertainties
  - existence or not?
  - where to find?
  - content is complete or consistent?
  - …

- such uncertainties have brought great challenges to information sharing in network centric environment
Background & motivation

❖ Our work

▪ Propose information sharing method from systematology view
▪ Propose information sharing method based on Pub/Sub
▪ Give the measurement framework of information sharing
Our proposed methods
Our proposed methods

- **Basic idea**
  - improve the information value during its evolving through information sharing
  - reduce information uncertainty and increase information exploitability and information

![Information Value Chain Diagram](image)
Our proposed methods

Basic idea

Information sharing

- Location and discovery
- Information filtration
- Information dissemination

Measurement of information sharing for future C2

Massive, dynamic, uncertain C2 information in network centric environment

- Target information
- Deployment information
- Environment information
- Command information
- ...
Our proposed methods

- Information sharing method based on Pub/Sub

- Metadata mechanism and information publish model
Simulation experiments
Experiments environment

- The simulation experiments are run in network environments.
- Bandwidth of link can be adjusted as 100Mbps or 2Mbps by using a "bandwidth controller" equipment.
- Information provider (or information source) is act as a Radar simulator that simulates the generation of real-time Radar target information.
Experiment 1: the average packet loss rate

- Our proposed method
- The existing method

The rate of simulator, i.e., the number of packets (packet/sec)

The average packet loss rate (%)

The rate of simulator (1000 to 4500 packets/packet/sec).
 Experiment 2: the delay caused by disseminating

![Graph showing the delay of dissemination (ms) vs. the number of information users. The graph compares the performance of our proposed method and the existing method. The proposed method shows lower delay as the number of users increases.](image-url)
Experiment 3: the CPU occupancy caused by “Transport service” and “Dissemination Service”
Experiment 4: the average packet loss rate with different bandwidths (2Mbps/100Mbps)
Measurement of information sharing
Measurement of information sharing

Metric framework of information sharing

Information Reach
- Geographic Range of Sharing
- Persistent Degree of Sharing
- Sharing Degree
- Sharing Latency
- Quality of Transmission

Information Richness
- Completeness
- Correctness
- Currency
- Accuracy
- Consistency

Information Exploitability
- Creditability
- Relevance
- Timeliness
- Understandability
- Applicability

Information Countermeasures
- Privacy
- Nonrepudiation
- Fault tolerance
- Anti-interference
Thank You!