Decision-Acquisition System Based on a Common Decision-Exchange Protocol

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Topic 2: Networks and Networking (including standards)
Presentation Topic Outline:
Common Decision-Exchange Protocol (CDEP)

- What is and what is not the CDEP?
- Why is CDEP important?
- Decision support vs. decision acquisition
- Characteristics of decisions & the decision-making process
- Design of a decision-acquisition system
- Examples: How to use a CDEP-based decision-acquisition system
  - Information gathering
  - Decision options
  - Advantages and disadvantages of alternatives
  - Capture confidence levels at various stages
- Future directions for applications
Common Decision-Exchange Protocol (CDEP): What it is and what it is not.

• CDEP is a proposed open-standard format to represent decisions & decision-making process on networks for:
  ▪ Information exchange
  ▪ Situational awareness
  ▪ Training

• CDEP is an XML- and REST-based protocol for representing generic human decisions in a simple, interoperable format.

• CDEP is not yet an accepted open standard.

• CDEP is not primarily a decision-support system.

• A decision-acquisition system is needed to instantiate CDEP and realize its benefits.
Why is the CDEP Important to the War Fighter?

▼ CDEP will enable war fighters to:

- Track and manage the decision-making process better.
- Maintain a network-accessible archive of the decisions and the decision-making process.
- Understand and anticipate commanders’ decision styles.
- Automate data acquisition for time-management metrics in command centers.
- Improve information sharing across networks.
- Support better and faster decision making.
Why is the CDEP Important?

▼ A CDEP-based decision-acquisition system will:

- Provide concise, generic, structured assessments and decisions that enable “drill down.”
- Support pedigree and confidence.
- Enable approvals and vetting.
- Help track the options considered.
- Link to previous decisions.
- Capture features of decisions and the decision-making process.
- Enable expert systems to
  - extract features
  - construct a decision-style profile for various decision makers.
Characteristics of Decisions & Process

What to Information Capture?

- What was the decision?
- Who made the decision and when?
- Who participated? Who was consulted & brought into the decision-making process?
- What options were considered?
- What were the criteria, pros, and cons?
- Why was the selected option chosen?
- How was the decision made, e.g. individual decision, majority vote, consensus, expert opinion?
- What was the context for this decision?
- What was the confidence level at various stages?
Stages The Decision-Making Process

What states in the decision-making process need to be captured? For example:

- Not yet started
- Gathering information
- Evaluating, analyzing and fusing information
- Listing of alternatives
- Paring down the list
- Selecting an alternative
- Preparing decision product
- Communicating the decision
- Gathering feedback regarding the decision
- Finished.
CDEP supports training, planning, operations, and other functions.
<?xml version = "1.0" encoding = "UTF-8"?>
<decisions>
  <decision>
    <question> What is a good base platform for the search and rescue mission? </question>
    <description> RADM Jones needs a ship for search and rescue in the Indian Ocean. </description>
    <decision confidence>Low</decision confidence>
    <state>Gathering Info</state>
    <eventInfo>
      <who>http://www.spawar.navy.mil/code90/people/RADM_Jones.xml</who>
      <when>2008-04-15T13:00-08:00</when>
    </eventInfo>
  </decision>
</decisions>
CDEP-Based Decision-Acquisition System
XML Message Example 2: Options

<decisions>
  <decision>
    <guid>http://www.spawar.navy.mil/code90/decisions/114.xml</guid>
    <question> What is a good of base platform for the search and rescue mission?</question>
    <description> RADM Jones needs a ship for search and rescue in the Indian Ocean.</description>
    <options>
      <option>
        <idea>USS Valley Forge</idea>
        <description> Aegis ship is fully SAR-mission capable.</description>
        <selected>false</selected>
      </option>
      <option>
        <idea>USS Sentry</idea>
        <description> Mine sweeper is partially SAR-mission capable.</description>
        <selected>false</selected>
      </option>
    </options>
    <decision confidence>Medium</decision confidence>
  <state>Analyzing Info</state>
</decision>
</decisions>
CDEP Example 3: Alternative 1
XML-Coded Advantages & Disadvantages

<option>
  <idea>USS Valley Forge</idea>
  <description>USS Valley Forge could perform search and rescue.</description>
  <selected>false</selected>
  <pros>
    <pro>
      <title>Capable</title>
      <description>USS Valley Forge is a very mission-capable ship</description>
    </pro>
    <pro>
      <title>Available</title>
      <description>USS Valley Forge is available for mission.</description>
    </pro>
  </pros>
  <cons>
    <con>
      <title>Distance</title>
      <description>USS Valley Forge is 50 NM away from search area.</description>
    </con>
  </cons>
</option>
<option>
  <idea>USS Sentry</idea>
  <description>USS Sentry is 15 NM from the search area.</description>
  <selected>true</selected>
  <pros>
    <pro>
      <title>Capable</title>
      <description>USS Sentry is a mission-capable ship</description>
    </pro>
    <pro>
      <title>Available</title>
      <description>USS Sentry is available for mission.</description>
    </pro>
    <pro>
      <title>Distance</title>
      <description>USS Sentry is 15 NM from the search area.</description>
    </pro>
  </pros>
  <decision confidence>High</decision confidence>
</option>
CDEP supports training, planning, operations, and other functions.
Challenges and Obstacles to Efficient and Automated Decision Acquisition

- A CDEP-based decision-acquisition system needs to be unobtrusive. The main risk: No one will use it if it distracts the decision maker, particularly if it requires too much manual input.

- Automation at the level of intelligent software is needed to avoid irritating the decision maker. This requires an advanced expert system, such as a KASER for knowledge acquisition.

- The system will need to detect topics and fill in the XML format automatically.

- The human-computer interface must learn what the decision maker is doing and detect the stage(s) of the decision-making process automatically.

- The system must function on a network as a network service so that multiple users, both expert and novice, can access it.
Directions for Future Research & Development

1. Develop a CDEP-based decision-acquisition tool to capture the following aspects of the decision process:
   ▼ The users’ general decision styles
   ▼ The information users need to perform their tasks including the pedigree metadata to reduce uncertainty in situational awareness
   ▼ The alternatives under consideration
   ▼ The level of certainty at each stage of the process
   ▼ The reasoning the decision maker used to arrive at decisions.

2. Install the system on a secure network to archive decisions and recall them for training and future decision support.
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