C2 framework for interoperability among an air component command and multi-agency systems

Henrique Costa Marques
José Maria Parente de Oliveira
Paulo Cesar Guerreiro da Costa
GOAL

• To present a $C^2$ Framework for interoperability among an air component command and multi-agency systems
SUMMARY

• Introduction
• JFAC C² Process
• C² Framework for JFAC
  – Air Component WS Applications
• Study Case
• Challenges
• Conclusions
introduction

• C² system:
  – Exists to speed up the decision process and optimize the expected results;
  – Is a support tool for the decision makers;

• C² process:
  – Brazilian Armed Forces peculiarities;
  – Focus on JFAC;
introduction

• ITA’s C² Group:
  – Support of C⁴I Center at George Mason University;
  – Research aimed to increase the current level of automation in JFAC’s processes;
  – MAAP process definition;
JFAC C² Process

- Joint Air Tasking Cycle
  - AOD
  - JIPTL
  - MAAP
  - ATO/ACO

JP 3-30
JFAC C² Process

• Master Air Attack Plan - MAAP
  – Relies on a common operational picture (Information Fusion);
  – Planning based on AOD and JIPTL inputs;
  – Highly dependent on subject matter experts;
  – Time-consuming process;
  – Error-prone;
  – Output: Weaponeering and Allocation
JFAC C$^2$ Process

• Humanitarian Relief Operations
  – Relies on a common operational picture (Information Fusion);
  – Planning based on AOD and Prioritized List of Locations and Activities as inputs;
  – Highly dependent on subject matter experts;
  – Time-consuming process;
  – Error-prone;
  – Real-Time implications
  – Output: Allocation
C² Framework for JFAC

• MAAP requires a successful interpretation of the commander’s intent;
• Simulation and Optimization before ATO production;
• A rigorous semantic alignment between the simulation language and the terms adopted by the doctrinal body of the operational level is a nonnegotiable requirement;
• Interoperability issues;
C² Framework for JFAC

- SOA architecture;
- Semantic Services (SWS);
- JC3IEDM Exchange Data Model;
- Information providers outside the network;
- Security, bandwidth and distributed registry issues;
- Academic environment (laboratory);
C² Framework for JFAC

Framework's High-level diagram
C² Framework for JFAC

- Air component WS Applications
  - Data Fusion;
  - JC3IEDM Support;
  - Security;
  - Task automation
    - Commander´s intent extraction (BML);
    - Scenario extraction (MSDL);
    - JIPTL;
    - COA´s Description;
    - Simulation;
    - COA´s Scored List;
Study Case

• Flood scenario
  – Itajaí’s valley – Santa Catarina 2008 – Brazil;
Study Case

• Small Numbered Air Force;
• Air coordination;
  – Supply corridor;
  – Air transportation assets;
  – Routs and communication;
• Transport Request by several agencies;
• Allocation centralized in Civilian Defense;
Study Case

- Web services implemented utilizing the domain ontology;
- J2EE platform;

**Goal:** Publish to all involved organizations the available assets, location of all support installations and schedule of the assets movement
Challenges

• Development within an academic environment
  – Ensure synergy and coherence among distinct projects;
  – The framework is under development;

• Grammar definition in Portuguese language for BML implementation
  – Doctrinal aspect instead of scientific (extra obstacle);
Challenges

• Security services being performed under a strong non-academic aspect
  – Requirement: interoperability with multi-agencies systems (Gov. and Non Gov.);

• Discovery process through a non-hierarchical topology of services
  – Research on the use of upper ontologies such as UCORE, PR-OWL;
Conclusions

• Academic effort to aggregate state-of-the-art technologies for C4I systems interoperability;
• First results provided a positive indication to establish a common architecture for the Brazilian Ministry of Defense;
• Recommendations
  – Assignments of multi-services comittes to establish the Portuguese BML´s Grammar;
  – Security policies to provide access for multi-agency systems;
Contact

Henrique Costa Marques – hmarques@ita.br
José Maria Parente de Oliveira – parente@ita.br
Paulo Cesar Guerreiro da Costa – pcosta@gmu.edu