AGILITY CHALLENGES AND SOLUTIONS FOR C2 SOFTWARE

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BRAZILIAN ARMY

1. **Introduction**
   - **C2 in Combat (C2Cmb) Project**
   - **Brazilian Army Current Issues**
2. **C2Cmb Software Evolution**
   - **Challenges and Solutions**
3. **Agility concerns in C2Cmb software**
4. **Intrusion Automatic Alert System**
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Introduction

- **C2 in Combat (C2Cmb) Project:**

  – **Brazilian Army's Current Tactical C2 Project;**

  – **Two segments: C2 software and telecommunications infrastructure;**

  – **Aims to improve the agility of Brazilian Army operational performance.**

Distributed Architecture

Runs on Windows / Linux platforms

Some C2Cmb Software Original Requirements

Designed to operate even over HF networks

Introduction

Constantly Training

To become efficient while not engaging defiant military threats

UN Peace Missions

Brazilian Army Current Scenario

Non-military operations

Natural disaster support, law and order guarantee operations, etc.

How C2Cmb software can be suitable to improve agility in operations other than tactical level conventional warfare?

- **New challenges to overcome...**

Flexibility to provide and manage different features and perspectives in order to match each operational scenario
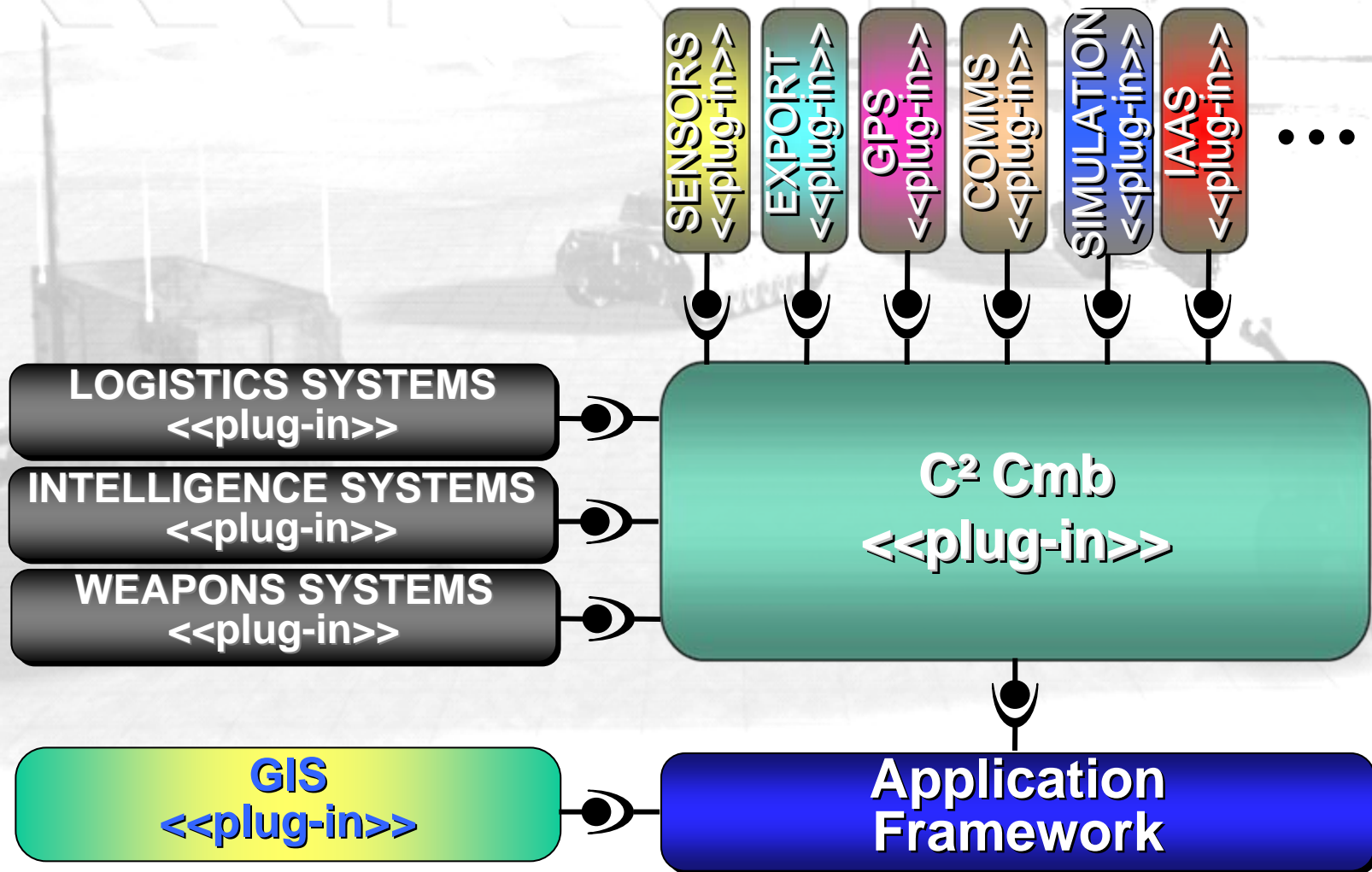
...and the proposed solutions

NEW ARCHITECTURE BASED ON AN APPLICATION FRAMEWORK WITH PLUG-IN SUPPORT

- **Framework Architecture:**

- **New challenges to overcome...**

Migration from rigid hierarchical communication structures to edge ones

...and the proposed solutions

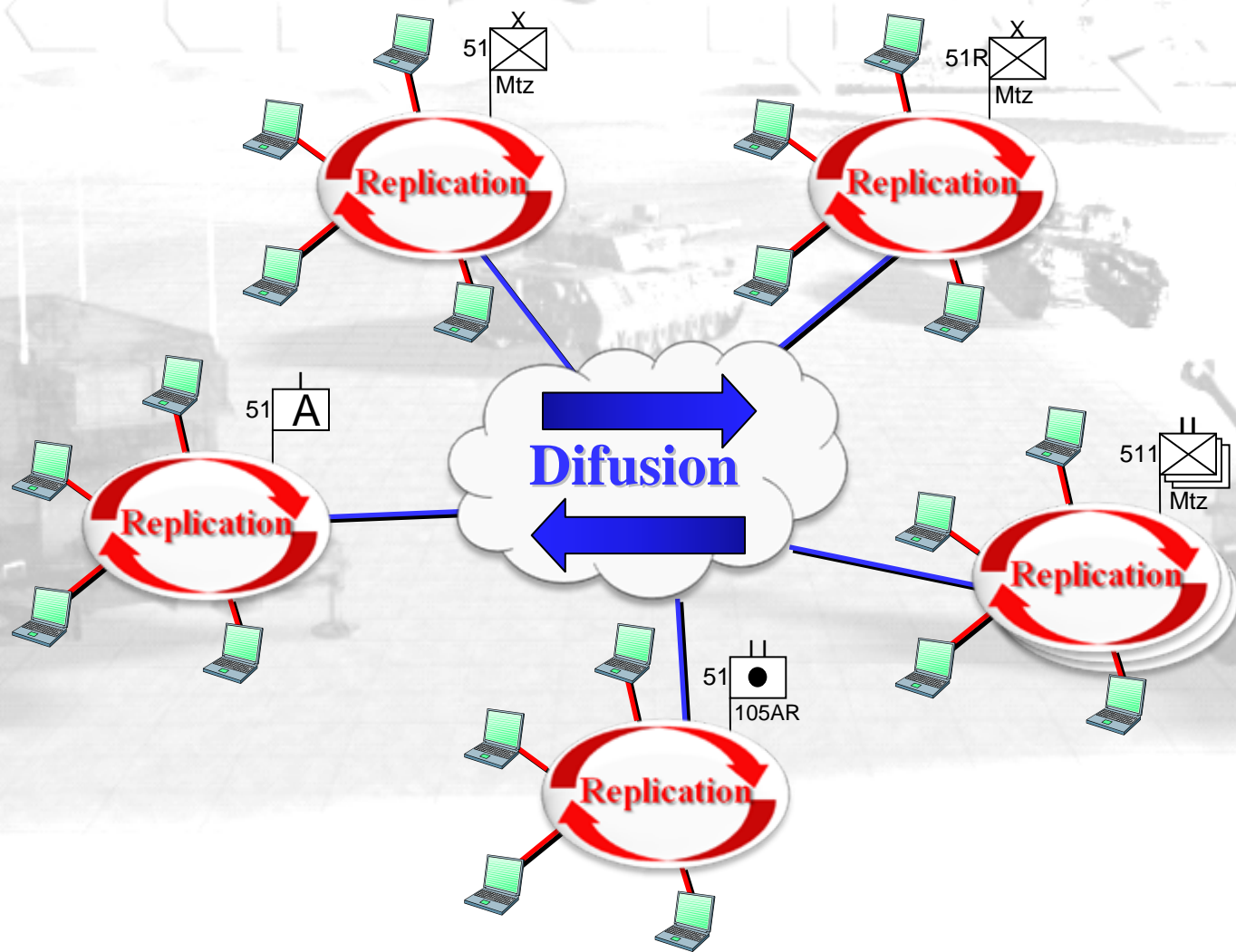**INTERNODE DIFFUSION MECHANISM BASED ON MIP/DEM* AND INTRANODE REPLICATION MECHANISM**

* MIP/DEM: Multilateral Interoperability Programme/ Data Exchange Mechanism (http://www.mip-site.org)
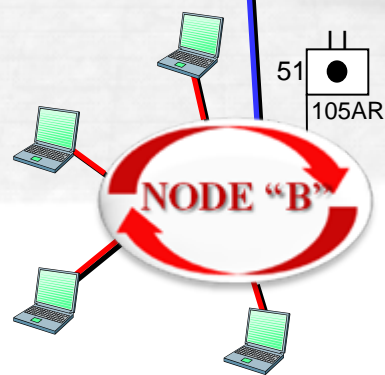
- **C2Cmb Distributed Concept:**
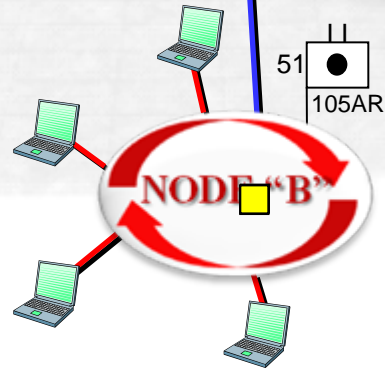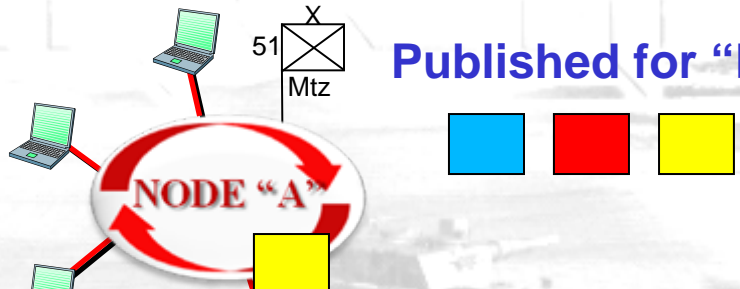
C2Cmb Software Evolution

- **C2Cmb Data Exchange:**

Published for "B":

Signed from "A":

- **C2Cmb Data Exchange:**

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Published for "B":

Signed from "A":

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- **New challenges to overcome...**

Capability to promote interoperability with other military and non-military systems
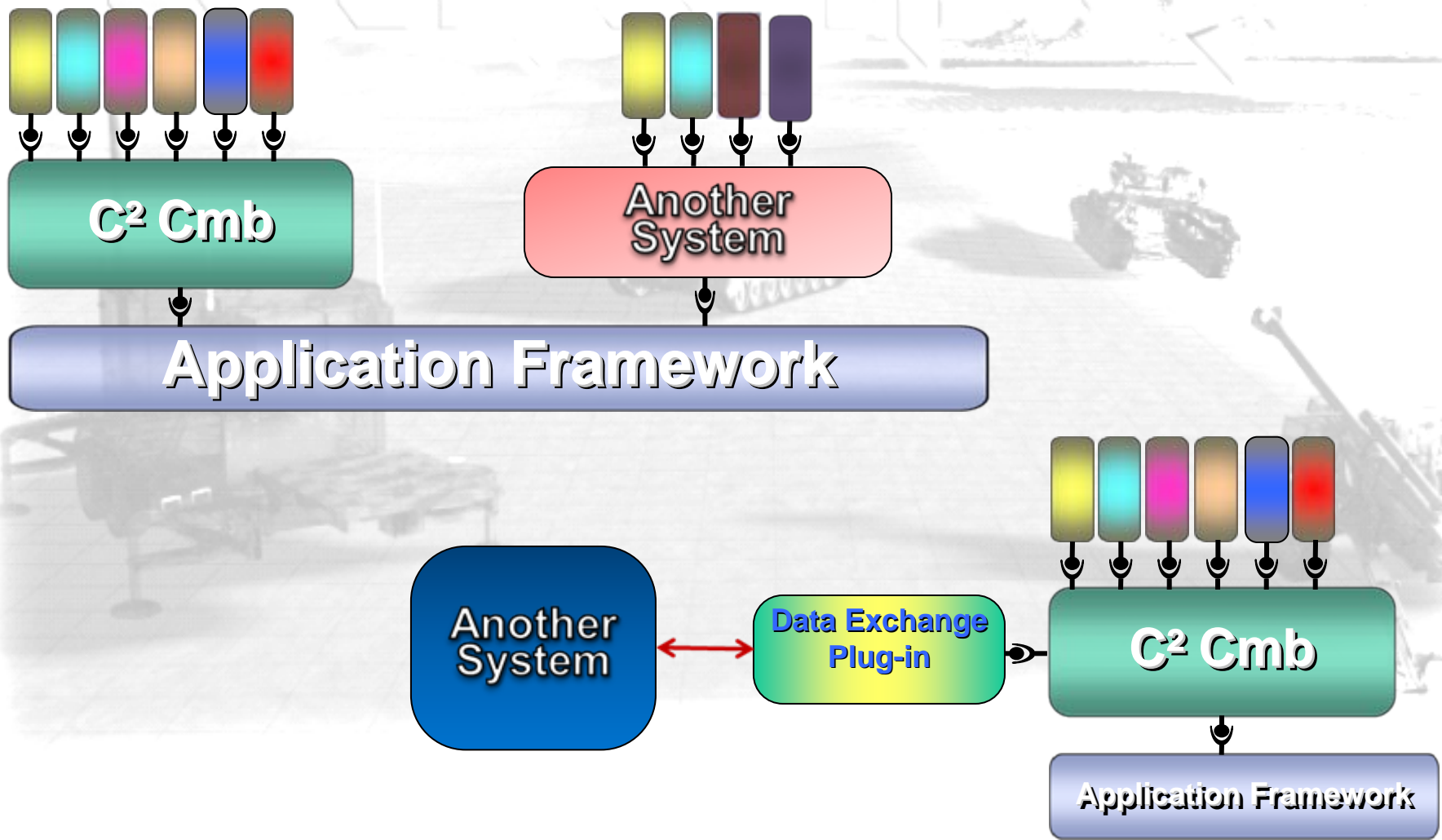
...and the proposed solutions

APPLICATION FRAMEWORK- BASED SOFTWARE or SPECIALLY WRITTEN PLUG-INS

- **Interoperability**

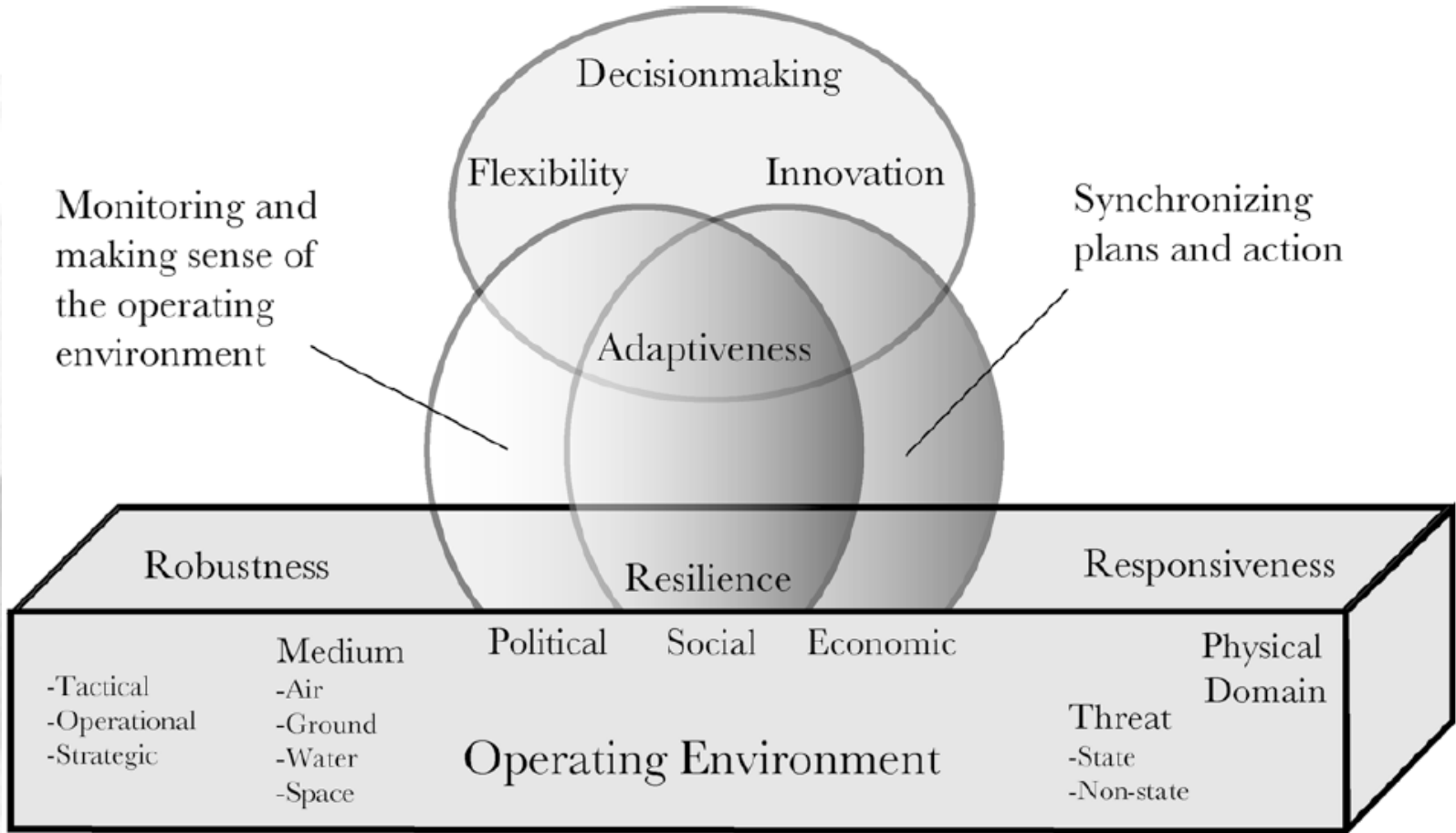- ## The Six Aspects of Agility:

Decisionmaking

Flexibility   Innovation

Monitoring and making sense of the operating environment

Synchronizing plans and action

Adaptiveness

Robustness   Resilience   Responsiveness

Medium   Political   Social   Economic   Physical Domain
-Tactical   -Air
-Operational   -Ground   Threat
-Strategic   -Water   Operating Environment   -State
-Space   -Non-state

Source: Alberts, Power to the Edge

Is the new C2Cmb Software better achieve the Six Aspects of Agility?

Agility Concerns in C2Cmb Software

Responsiveness

– C2Cmb packages are short enough to be timely effective transmitted even by low rate means.

– The internode communication mechanism will reduce the useless traffic in the network and the UDOP achieved with the ongoing information will help users react faster to information inputs.

Robustness

– Plug-ins may be loaded or unloaded depends on the nature of the mission and the resources employed.

Adaptation

– C2Cmb does not presume fixed actors, roles or network structures, which means that plug-ins can turn it more suitable to an specific situation or condition.

AGILITY

Flexibility

– Plug-ins may modify the software's behavior and appearence in order to achieve rapid recognition of changes in battlespace.

Innovation

– Interoperability support to other systems, such as combat simulators, allow information gathering to help the decisionmaker to learn from past mistakes.

Resilience

– The distributed architecture assures that a computer lost can be overcame by replacing and synchronizing a new one in the same node.

– C2Cmb security features also minimizes enemies' actions against the system.
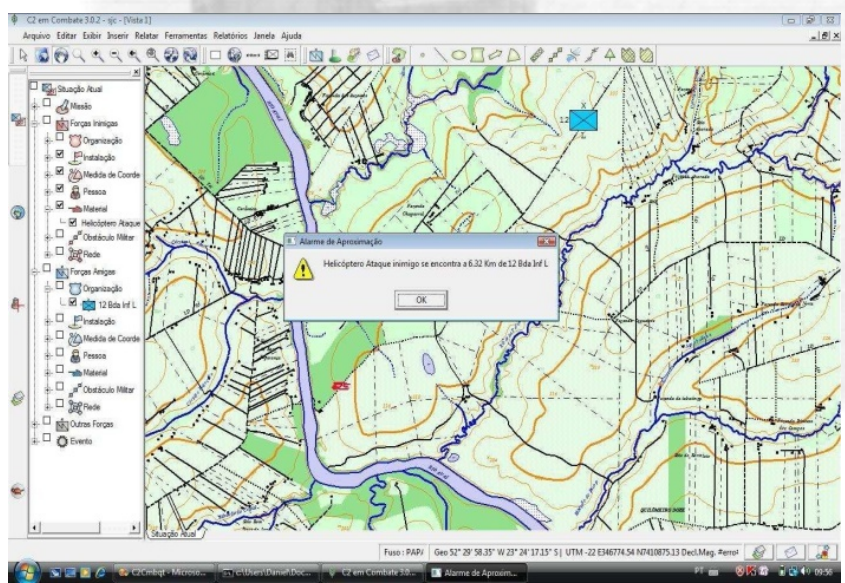
- **IAAS is a plug-in for C2Cmb that monitors data stream to provide automatic call attention alerts when critical events occur**

- **IAAS' s users are able to define which sorts of events should be monitored and adjusted when alerts are triggered**
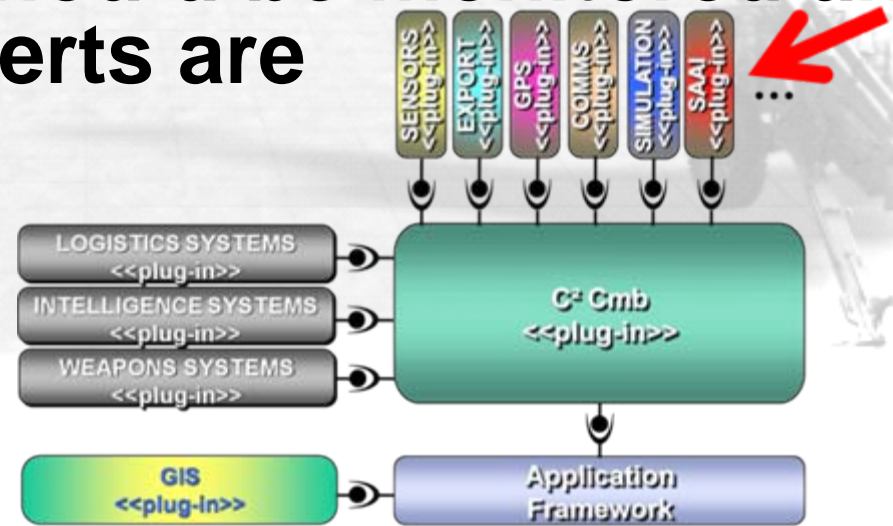
Intrusion Automatic Alert System

- **An experiment was developed to evaluate if IAAS increases situation awareness under changeable workload conditions**

- **15 Brazilian Army Infantry Soldiers operated C2Cmb with IAAS plug-in and filled the SAGAT questionnaire**

C2Cmb with

IAAS plug-in

SAGAT

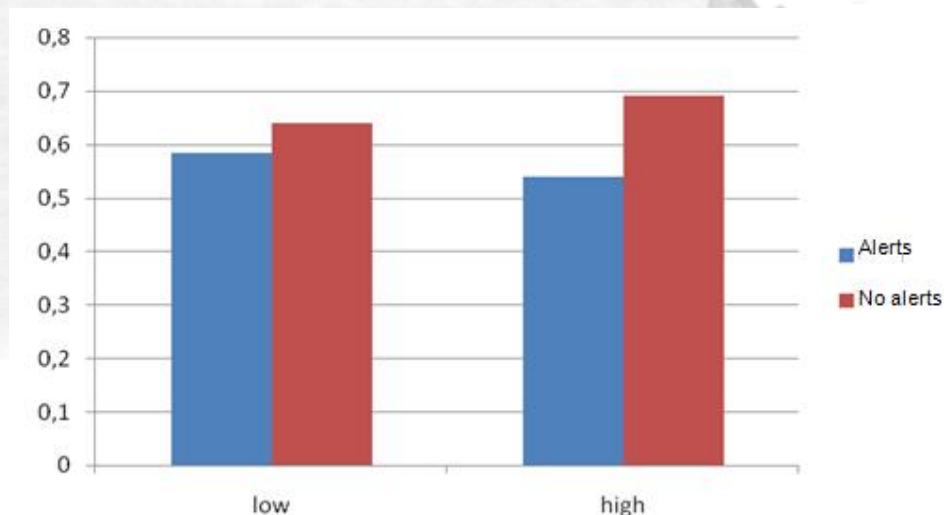**Questionnaire**

- **Results:**

  – **Alerts did not seem to affect situation awareness as a whole**

  – **Under high workload conditions alerts decreased situation awareness**

  – **Curiously, most of operators considered that IAAS influenced their performance in a positive way**

Experiment

results

Conclusion

- **C2Cmb new architecture increases the opportunities to improve C2 agility:**

  - **Selection of most suitable set of plug-ins according to the situation in order to build UDOP and increase situation awareness**

  - **Network traffic optimization to achieve faster responses**

  - **Framework to build other applications with native interoperability with C2Cmb without excluding other possible forms of data exchange**

Conclusion

- **Although IAAS plug-in first conception did not achieve the expected results, it shows the importance of such initiatives to master C2 agility in complex endeavors and under intense pressure**