



18th ICCRTS

“C² in Underdeveloped, Degraded and Denied Operational Environments”

Paper 114

C² SYSTEM ENGINEERING FOR THE ADVERSITIES OF THE AMAZON ENVIRONMENT

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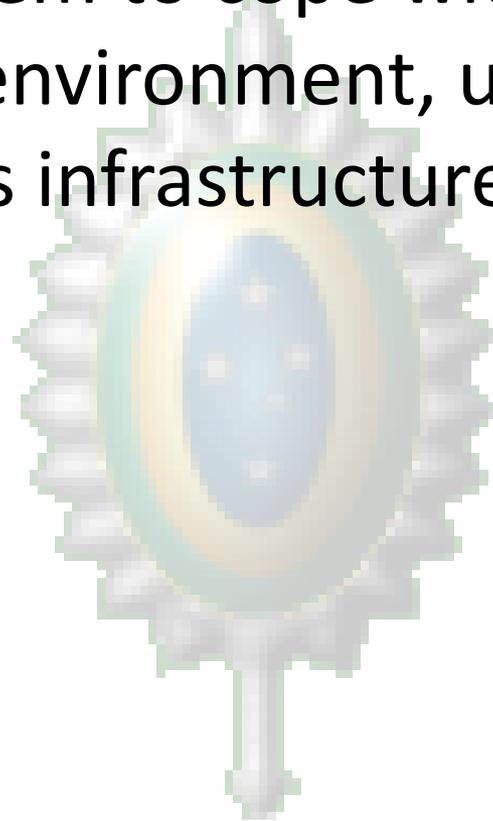
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OBJECTIVE

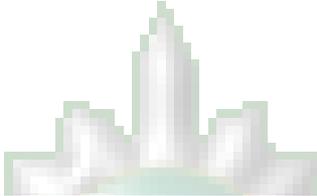
- To present a proposal for structuring a command and control system to cope with the adversities of the Amazon environment, under the poor communications infrastructure



OUTLINE

1. Introduction
2. Area Characterization
3. C² Approaches
4. Systems Engineering
5. C² Solutions
6. Infrastructure
7. Conclusion





Introduction

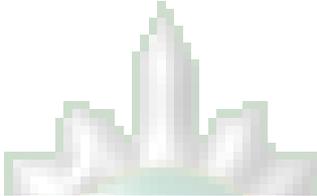
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INTRODUCTION

“Arduous is the mission to develop and to defend the amazon. However, much more difficult it was for our ancestors to conquer it and to keep it”

General Rodrigo Octávio

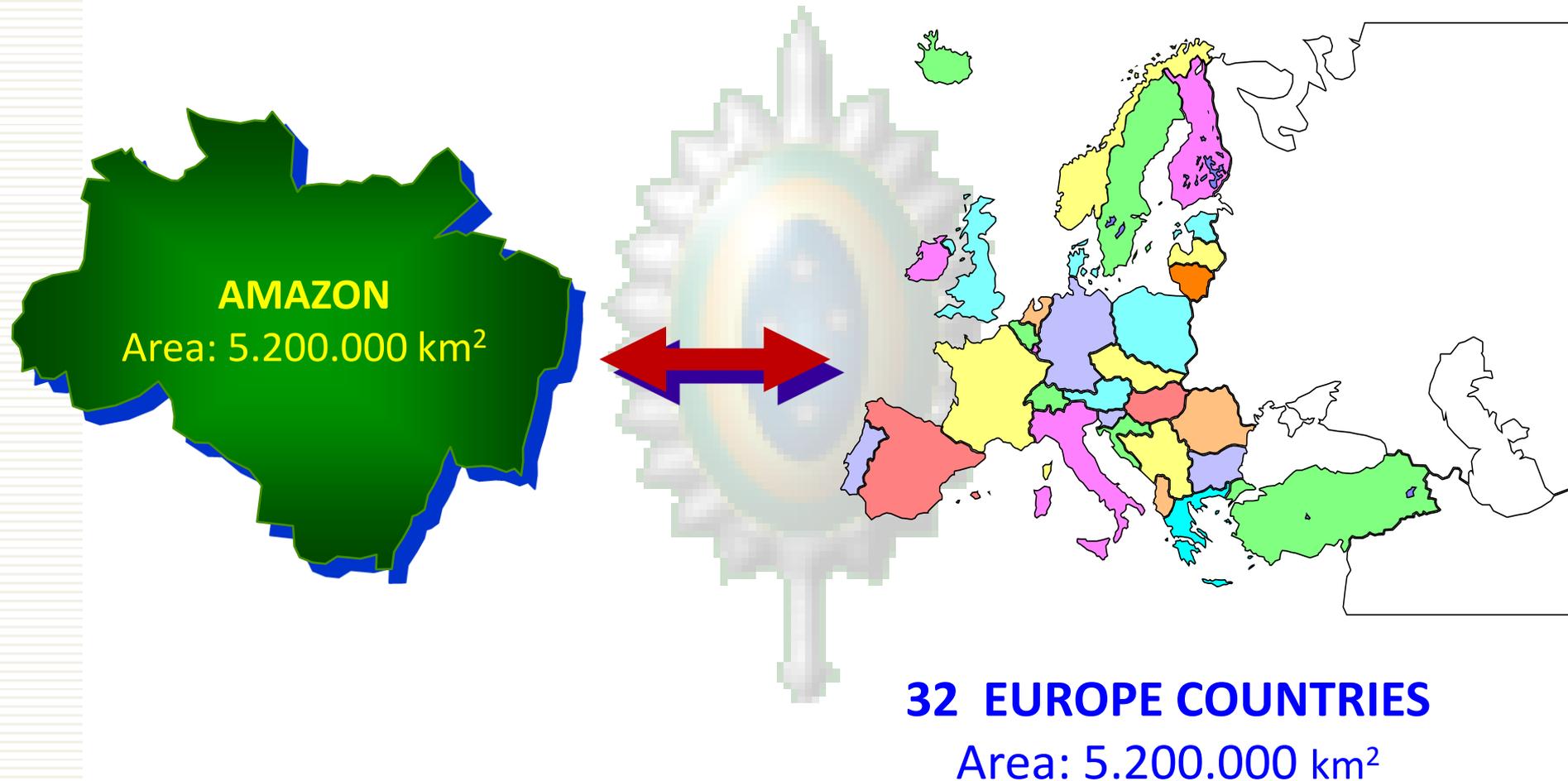


Area Characterization

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AREA CHARACTERIZATION

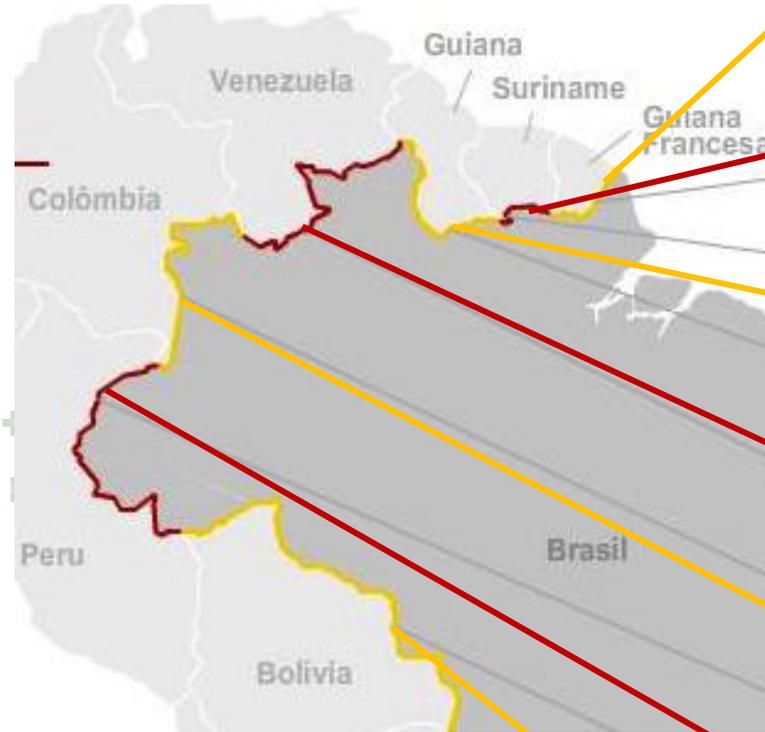
- Amazon Size



AREA CHARACTERIZATION

• Amazon Border Extension

MEXICO-USA BORDER: 2,500 Km



 French Guyana
730,4 km

 Suriname
593 km

 Guyana
1606 km

 Venezuela
2199 km

 Colombia
1644,2 km

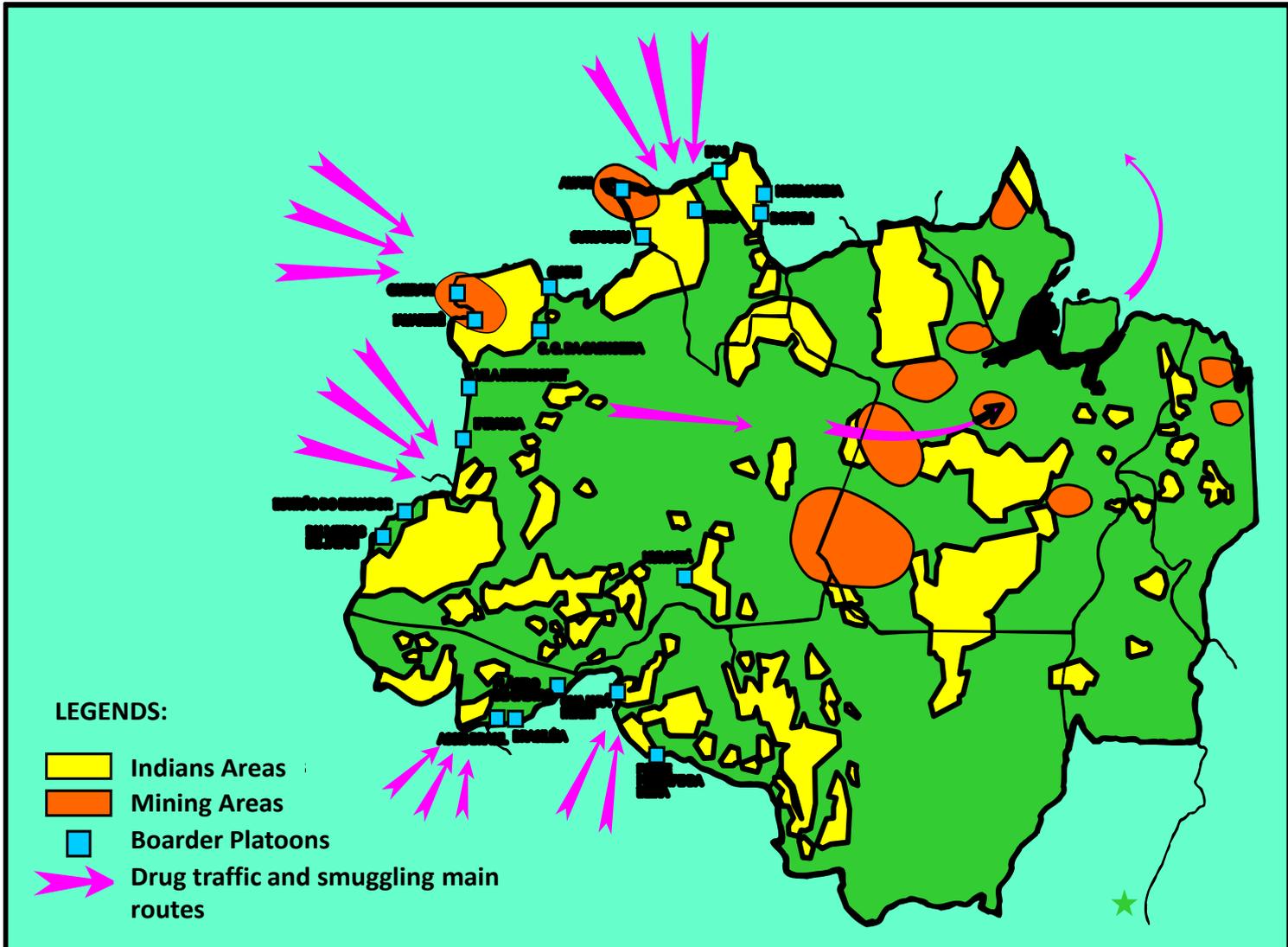
 Peru
2995,3 km

 Bolivia
3423,2 km

13,191.1 km

AREA CHARACTERIZATION

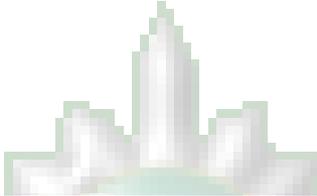
- Some Amazon Issues



AREA CHARACTERIZATION

- Some boarder crimes

Crimes	State					
	MT	RO	AC	AM	PA	AP
Smuggling	X	X		X		X
Drug traffic		X	X	X	X	X
Trafficking in persons			X			X
Trafficking in weapons and ammunition	X	X	X	X		X
Cargo and vehicles theft	X	X		X	X	X
Child sexual exploitation		X	X	X		X
Refuge for criminals	X	X	X	X		
Tax evasion						X
Environmental crimes	X	X	X	X	X	X
Gunmen			X	X	X	
Sex tourism						X

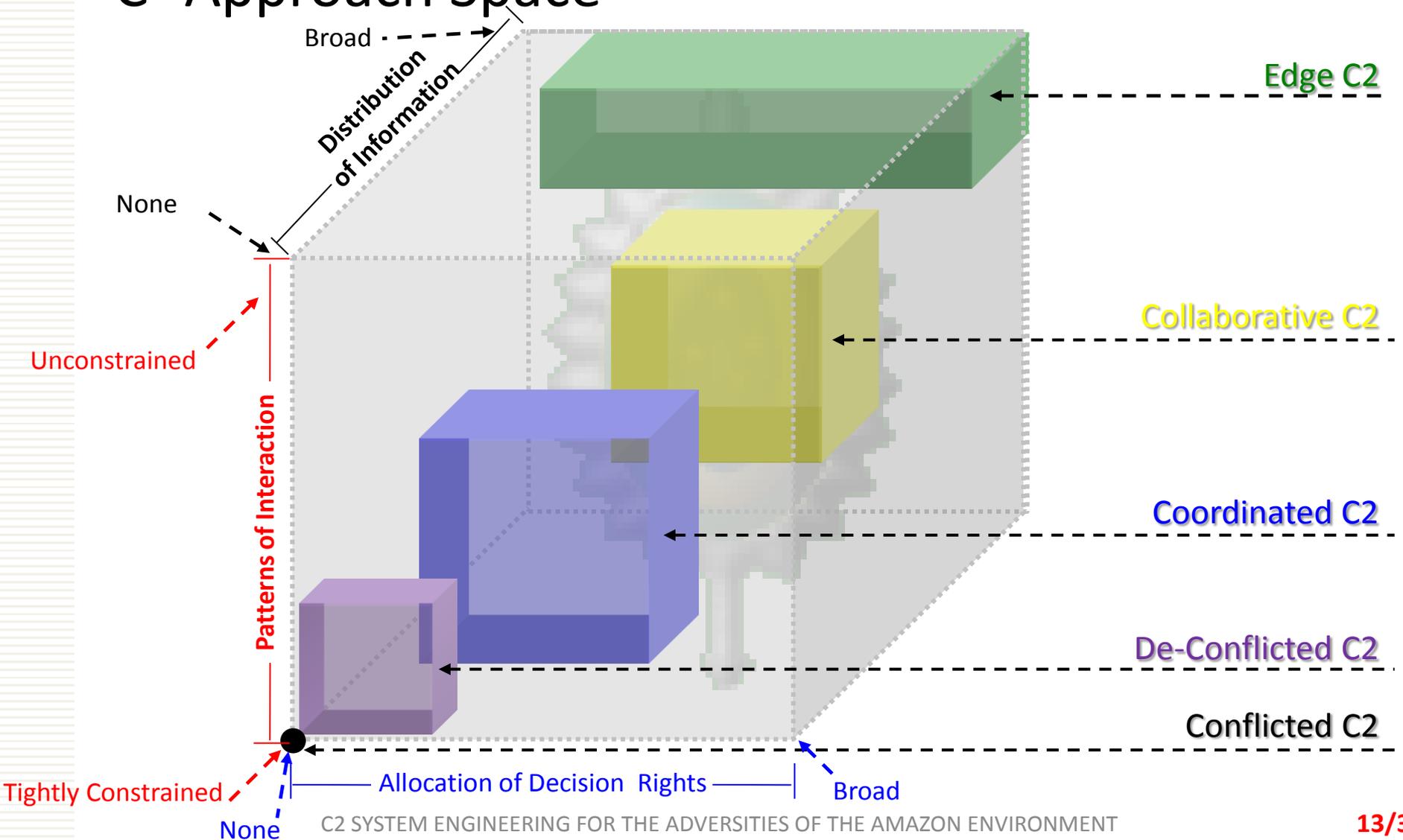


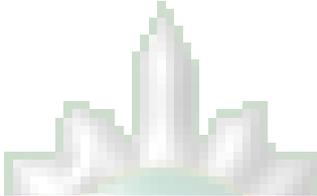
C² Approaches

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C² APPROACHES

• C² Approach Space





Systems Engineering

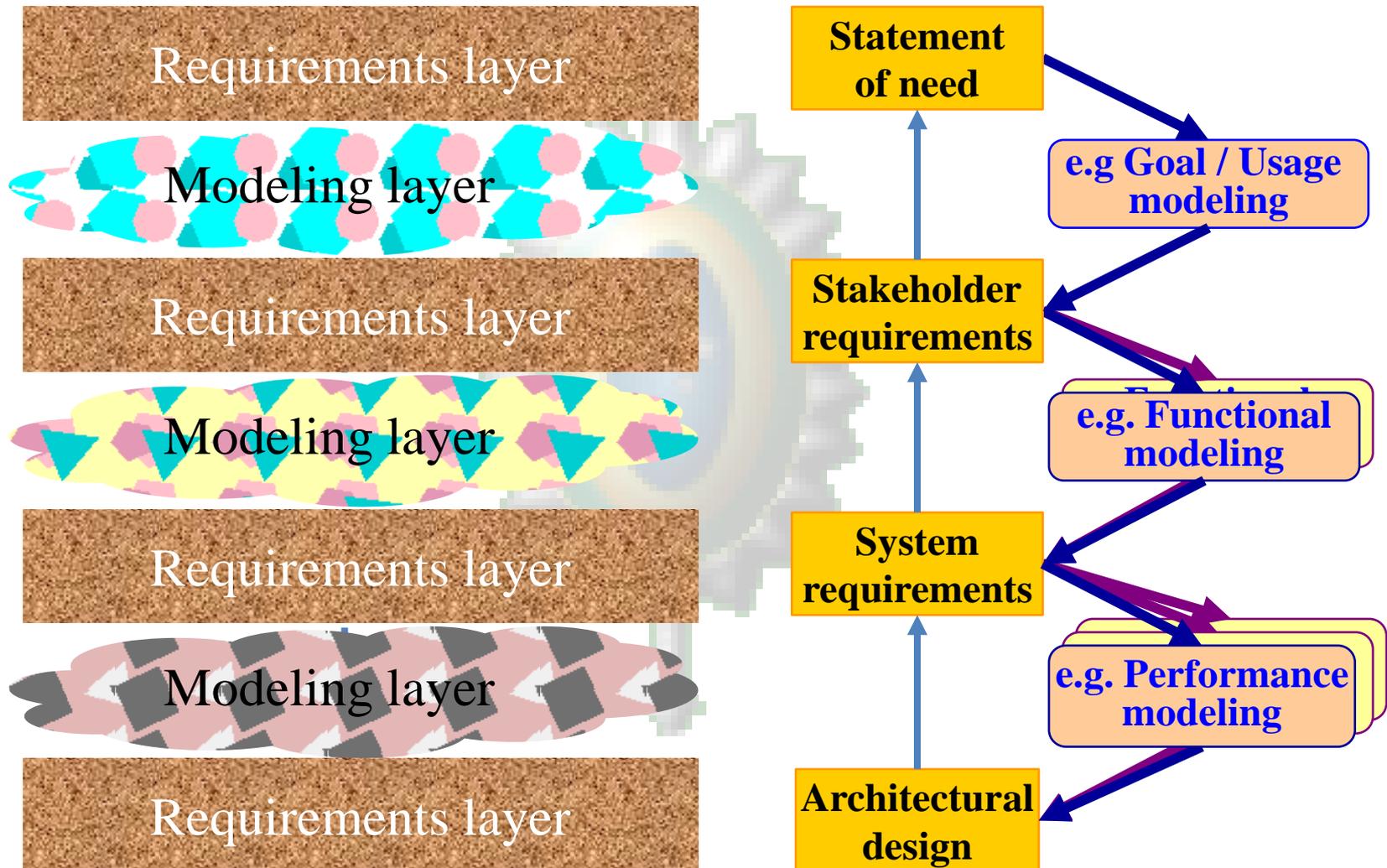
C² SYSTEM ENGINEERING FOR THE ADVERSITIES OF THE AMAZON ENVIRONMENT

SYSTEMS ENGINEERING

- It is a mix of:
 - Human resources
 - Project and business management
 - Rational decomposition
 - Studies of transactions
 - Requirements traceability
 - Integration, testing, verification and validation
 - Operation and decommissioning of systems at the end of the life cycle.

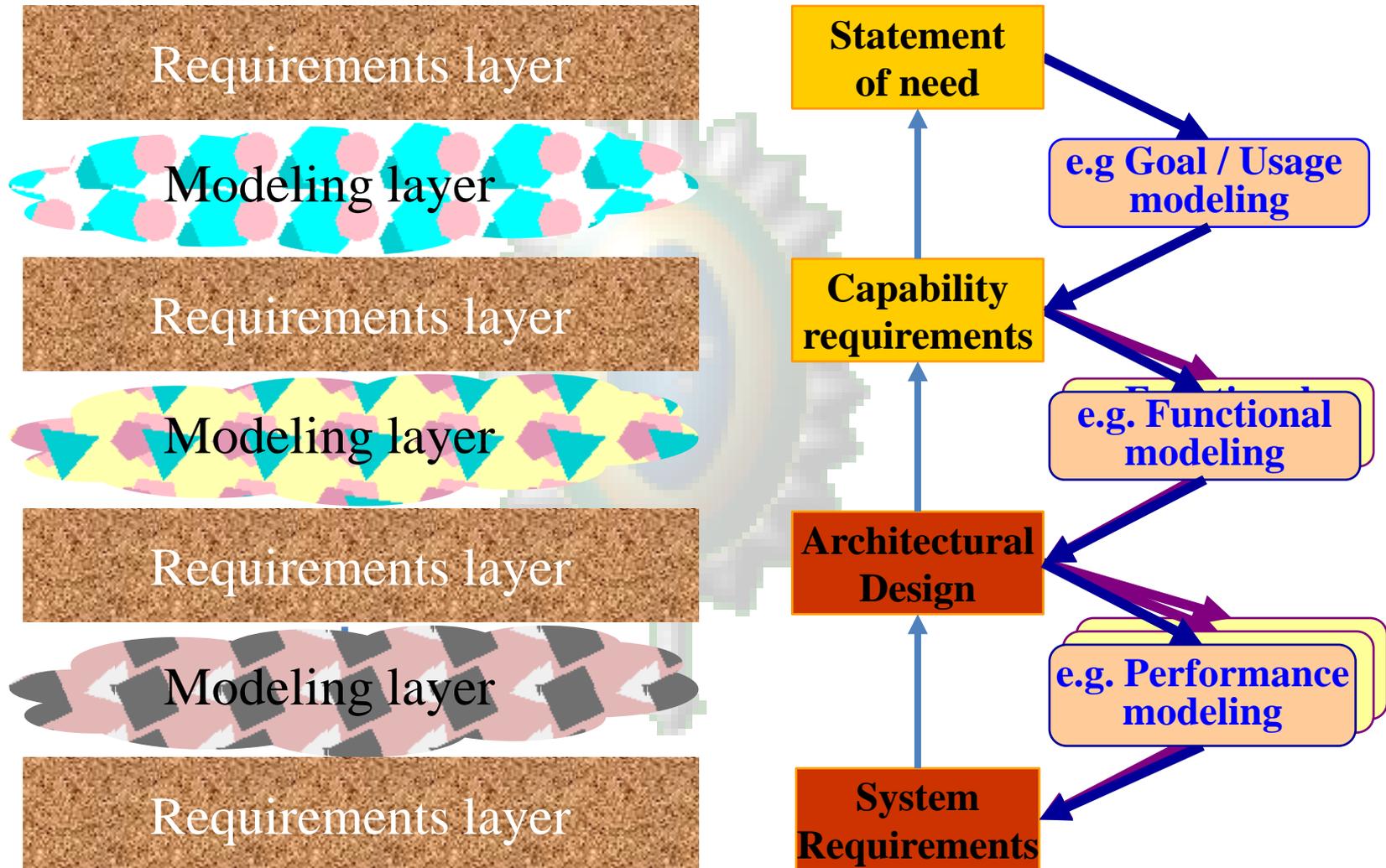
SYSTEMS ENGINEERING

- Traditional SE



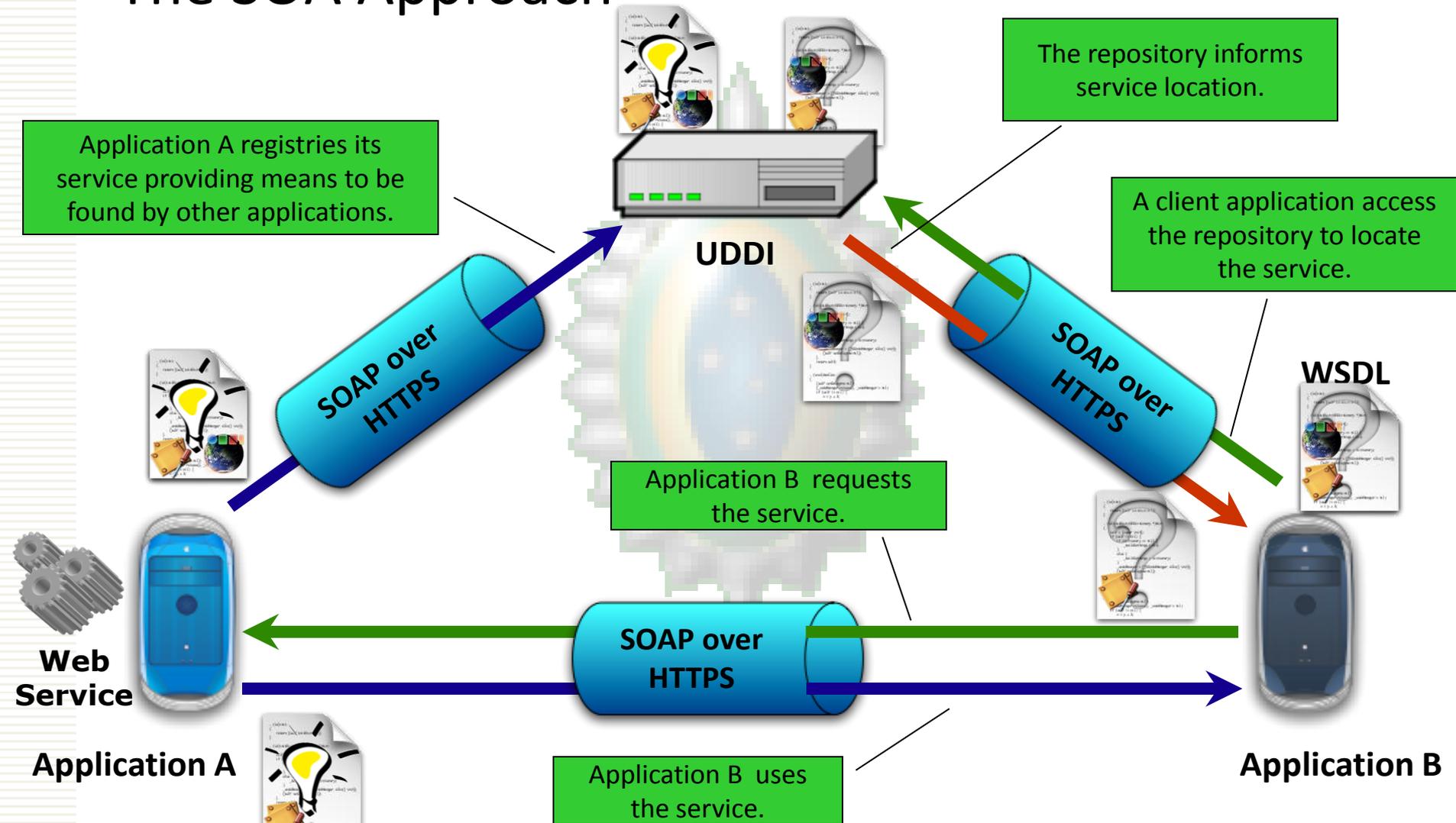
SYSTEMS ENGINEERING

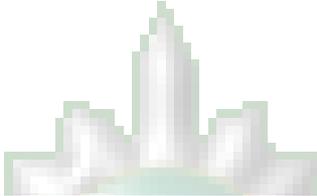
- DoDAF Perspectives



SYSTEMS ENGINEERING

• The SOA Approach



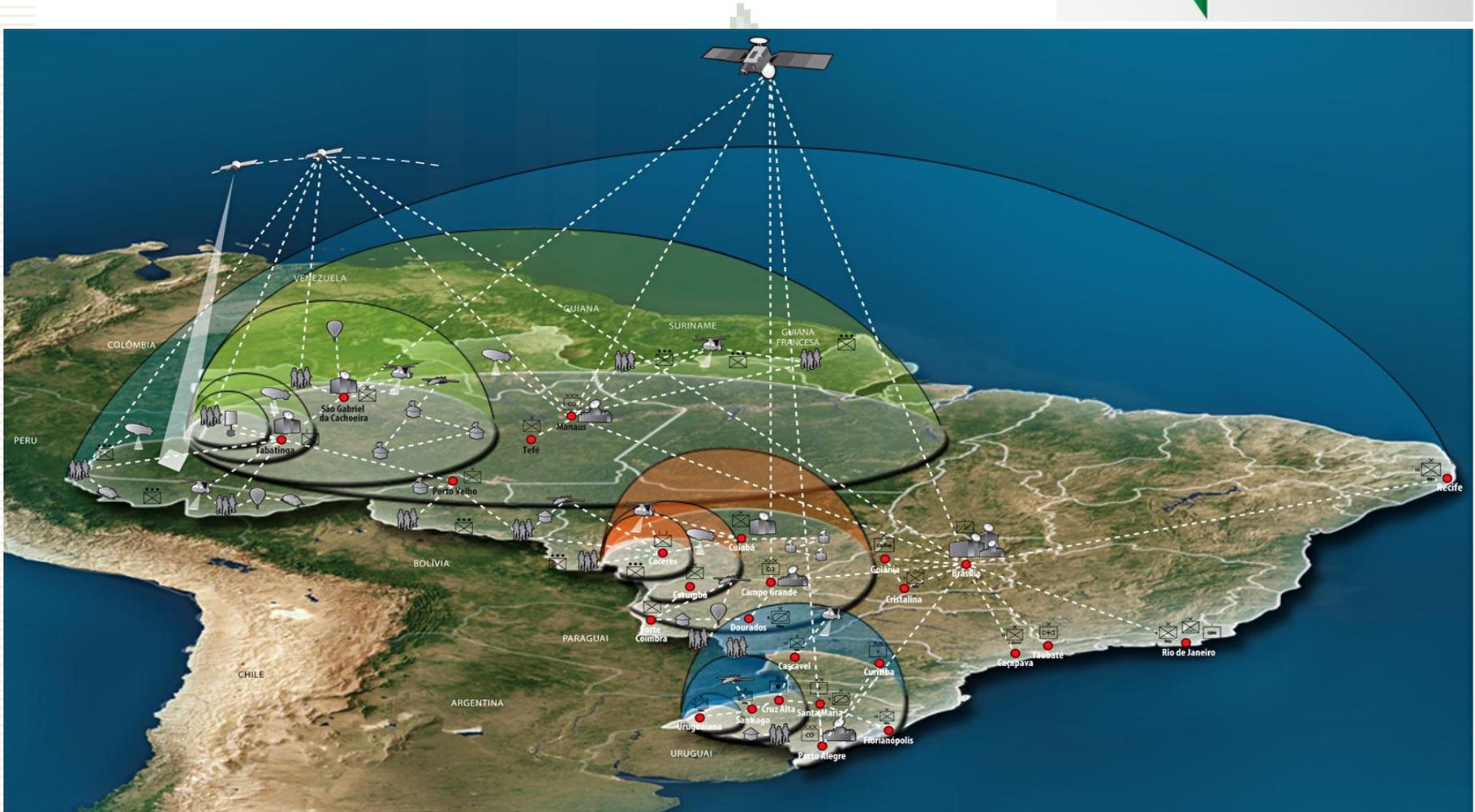


C² Solutions

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C² SOLUTIONS

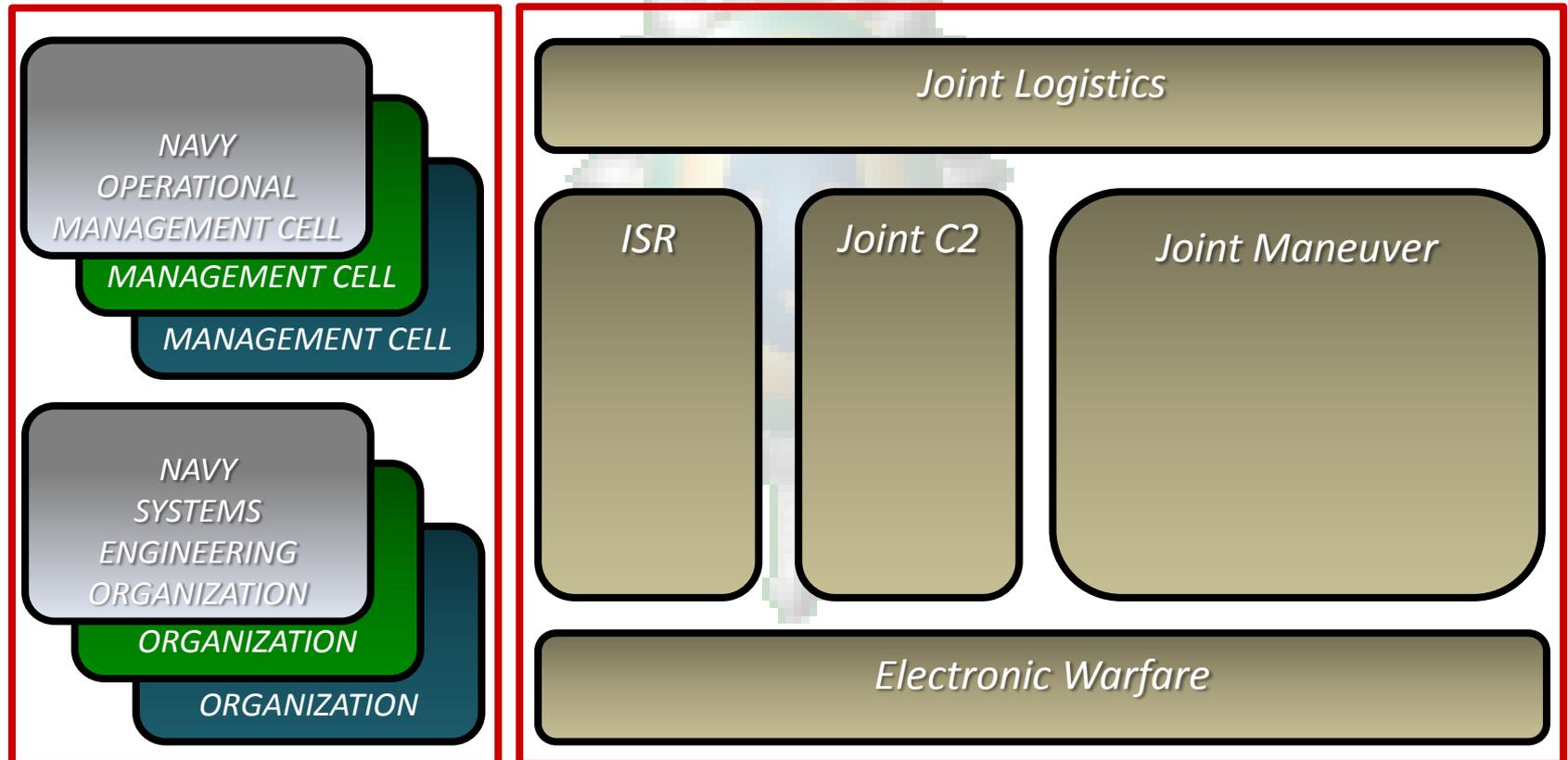
- Integrated Border Monitoring System



C² SOLUTIONS

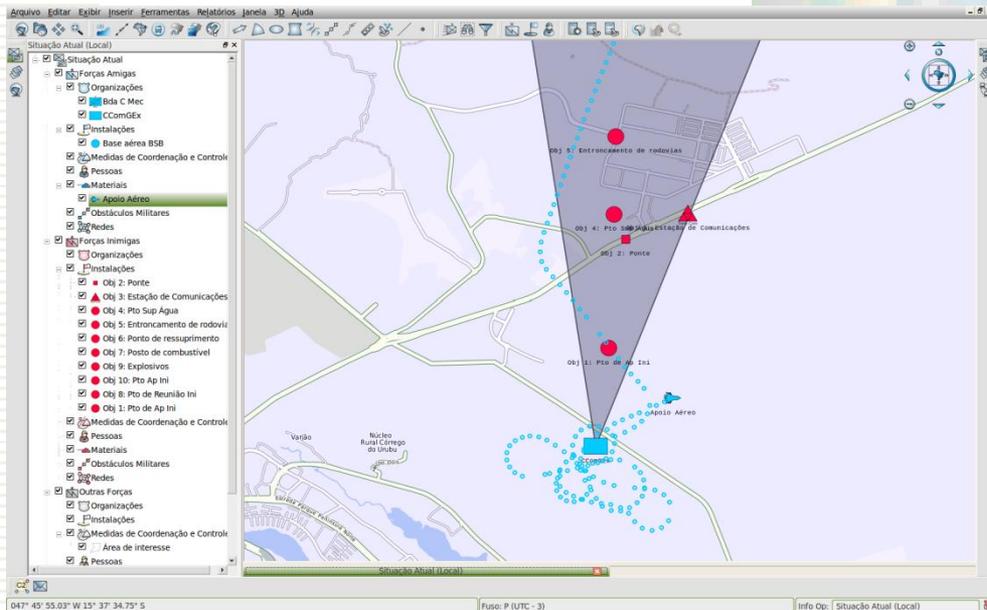
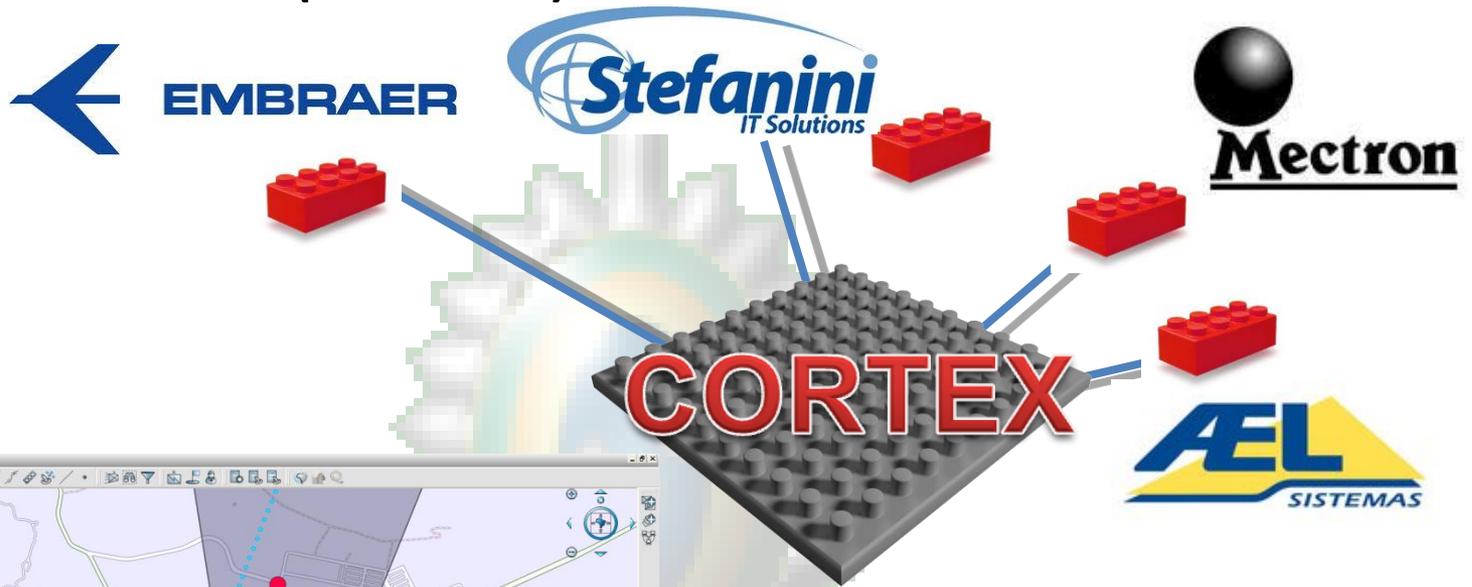
- SISTED (Architectural Design)

Joint Interoperability Management Cell



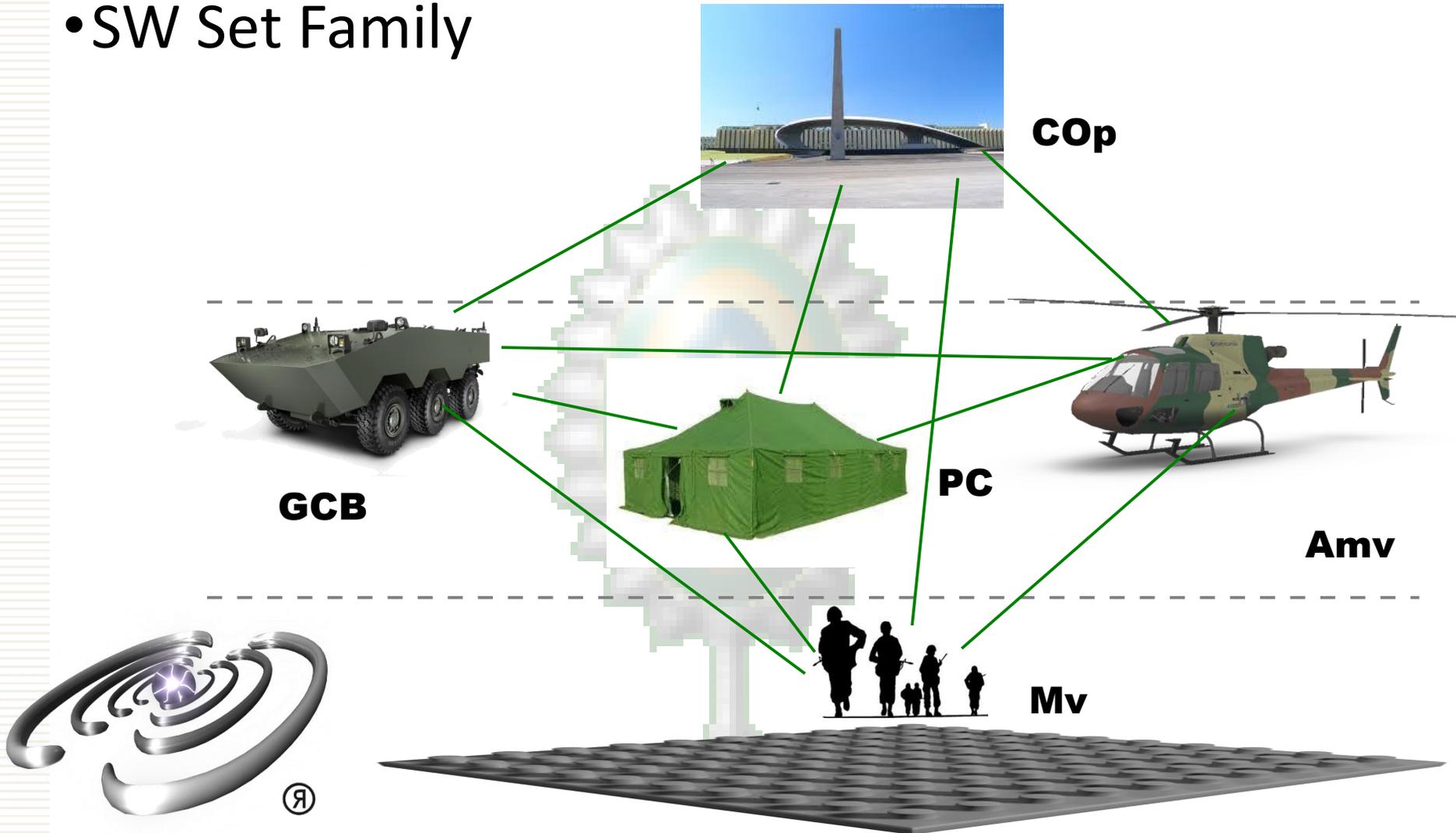
C² SOLUTIONS

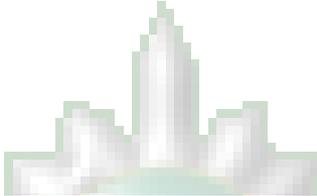
• C² in Combat (C²Cmb)



C² SOLUTIONS

- SW Set Family



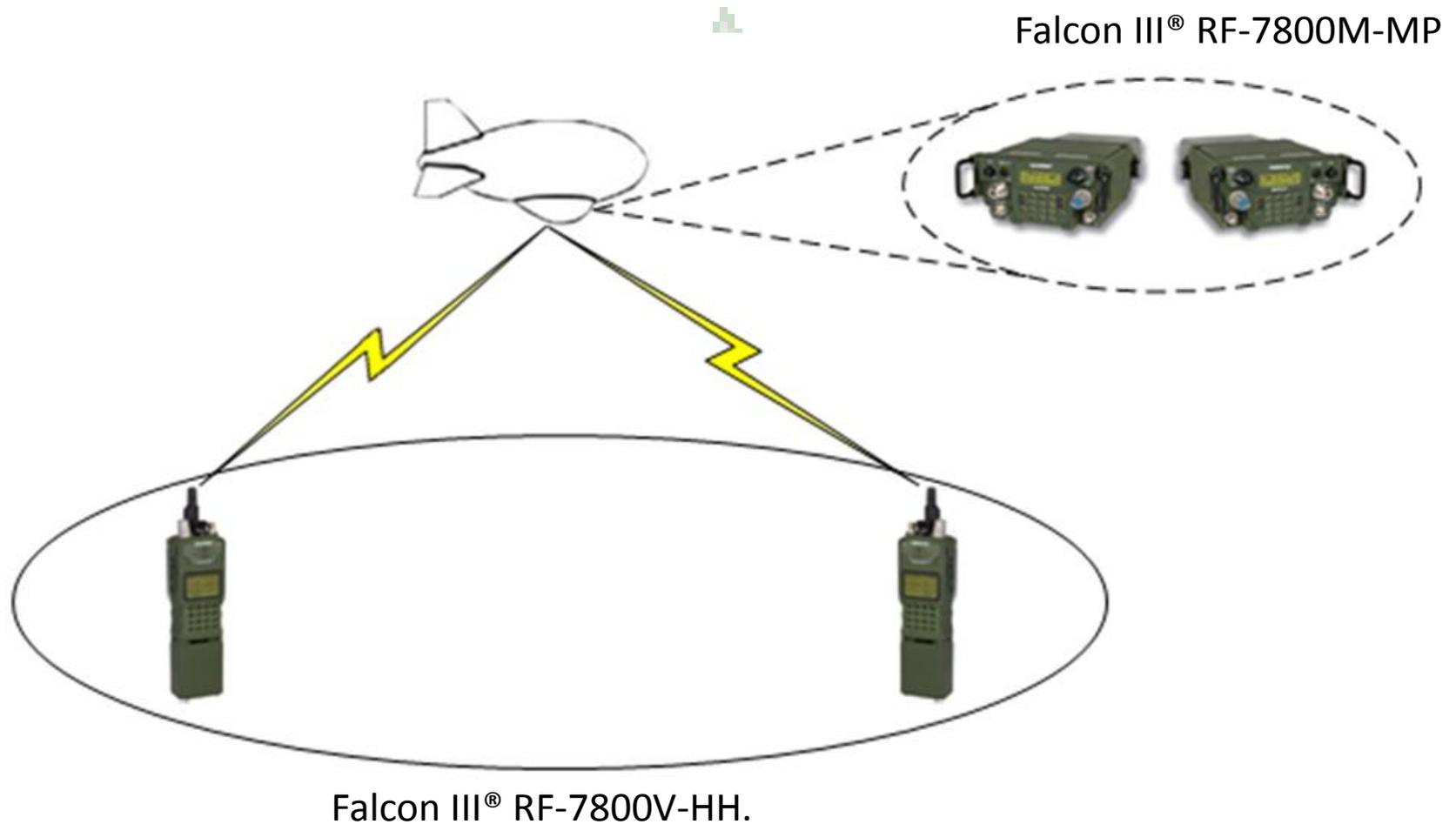


Infrastructure

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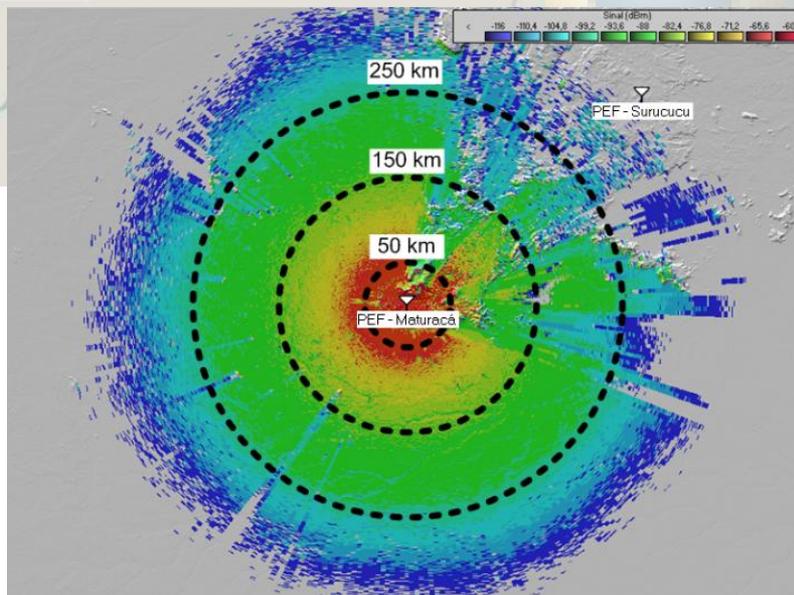
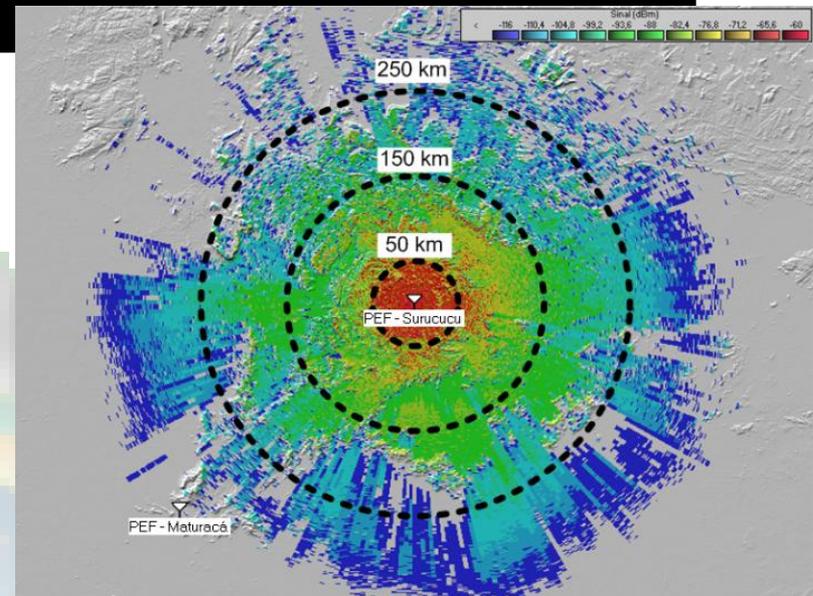
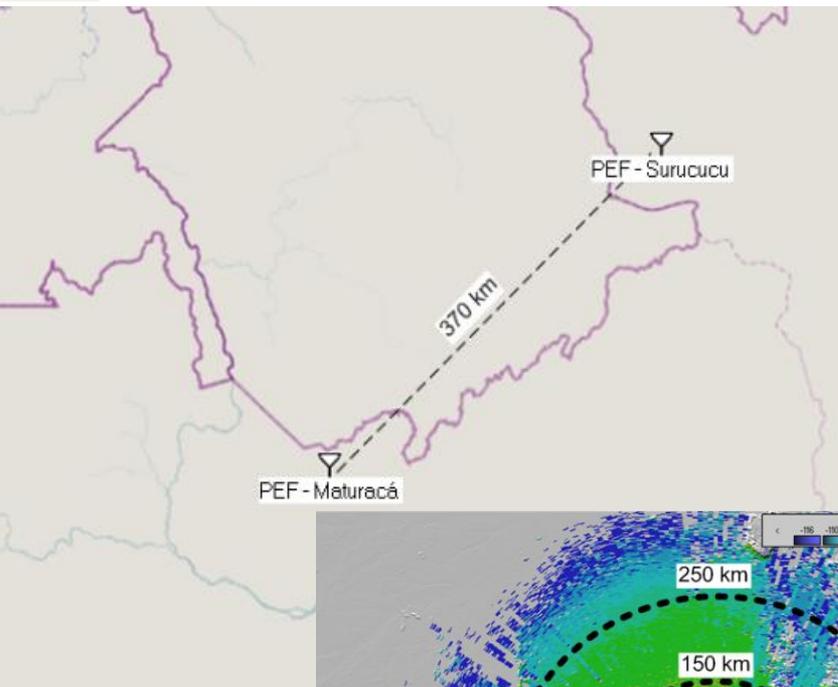
INFRASTRUCTURE

- Thetered Aerostat



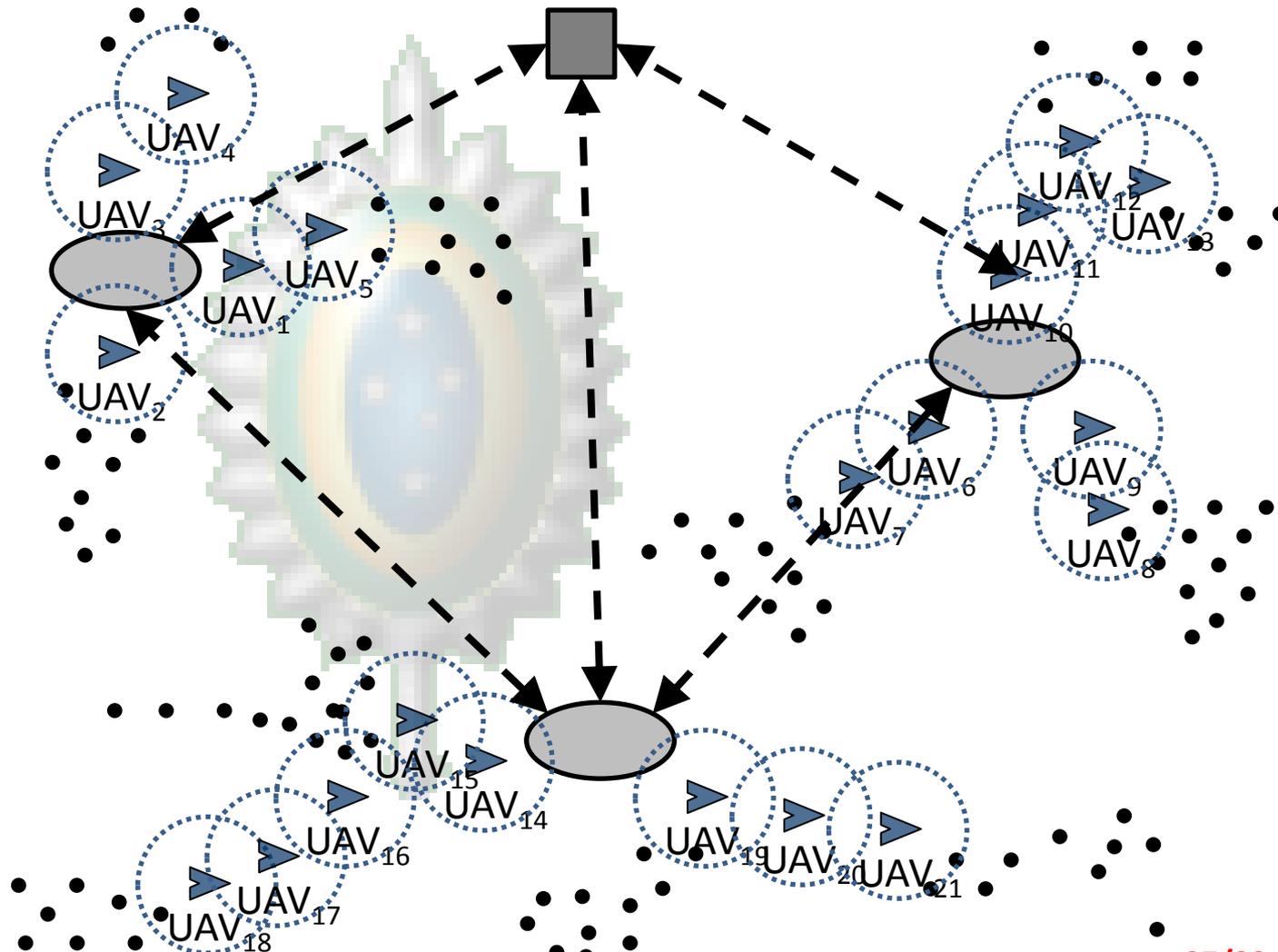
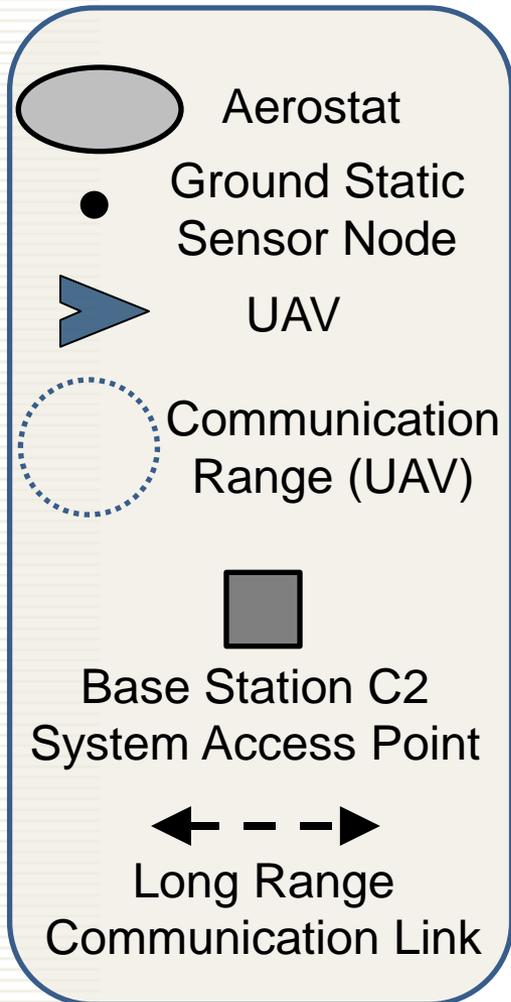
INFRASTRUCTURE

- Thetered Aerostat



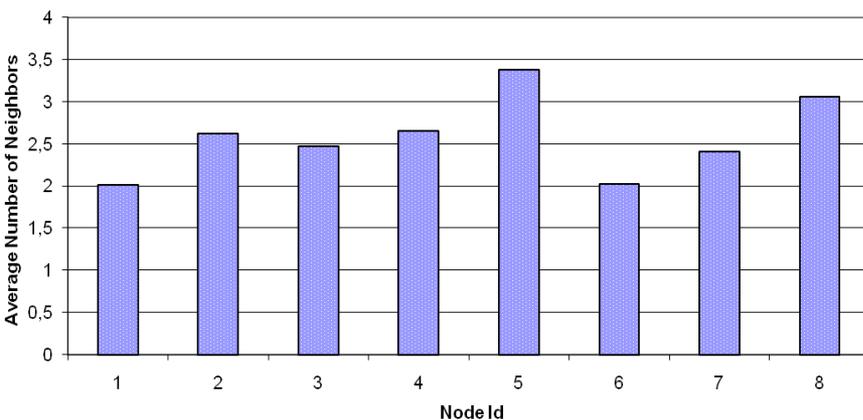
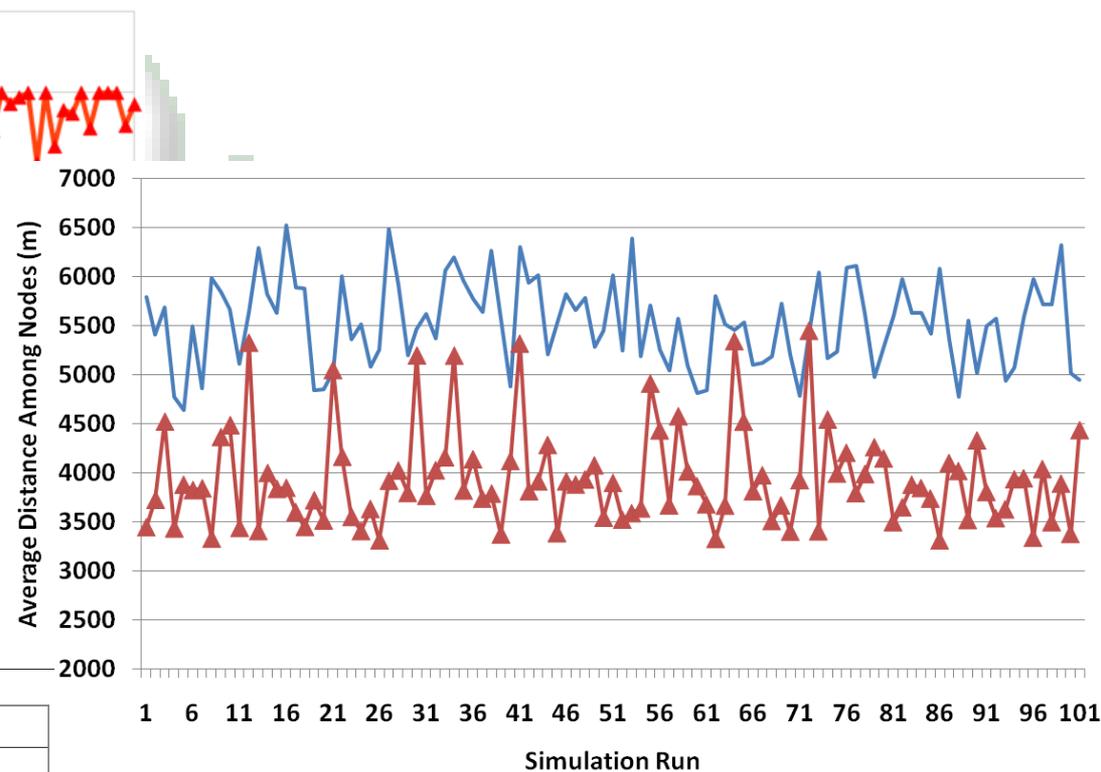
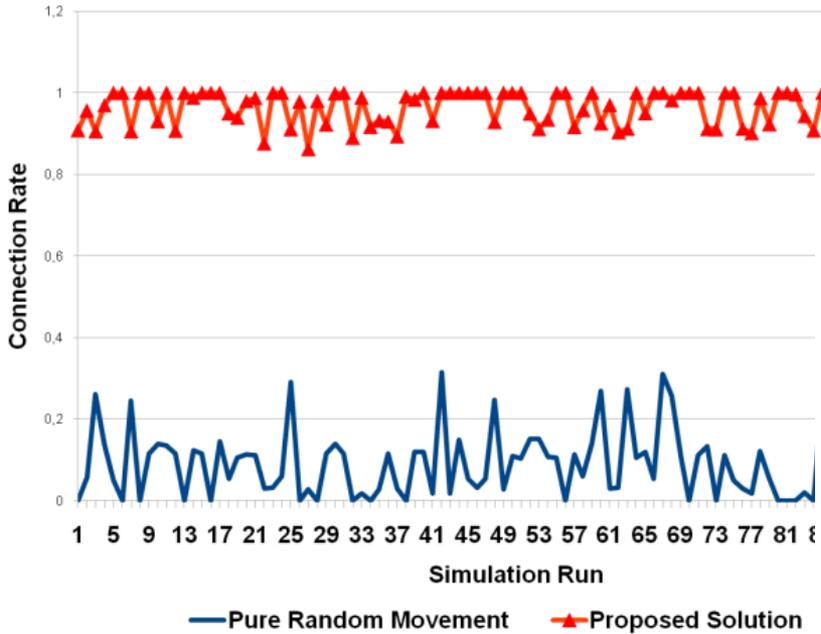
INFRASTRUCTURE

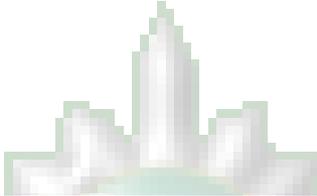
• Wireless Sensors Network



INFRASTRUCTURE

• Wireless Sensors Network





Conclusion

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ENVIRONMENT**

CONCLUSION

- As communication is a severe issue within the Amazon region, and to provide sensors and radio communications based on satellite solution would be cost prohibitive due to the large area, the joint utilization of wireless sensor networks and aerostats was investigated.
- The results obtained point to a very interesting and cost effective solution that can improve dramatically the SA in Amazon region.

CONCLUSION

*“Technology is not the issue.
It’s how we put it together.”*



**Gen. Koen Gisbers, Deputy Commander,
NATO Allied Command Transformation.**



BRASIL

C2 SYSTEM ENGINEERING FOR THE ADVERSITIES OF THE AMAZON ENVIRONMENT