



**Joint Framework for Measuring C2 Effectiveness**  
23-26 January 2012 | JHU Applied Physics Lab, Laurel, MD

# Terms of Reference

## Working Group 3: Operations Analysis for Systems of System within a Networked C2 Context

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## Background and Working Group 3 Vision

Because networked C2 systems are actually “systems of systems” this working group will examine the difficulties of applying operations research techniques to them in this context. Networked systems exhibit behavior that is complex and defies the usual techniques of measuring effectiveness at discrete points. This working group will explore the correct approaches for measuring and assessing network behaviors and the effectiveness of the network.

The scope of the working group discussion will consider operations research techniques and measures of effectiveness appropriate to networked C2 systems and system of systems in the context of a C2 network model that considers physical, information, and cognitive aspects of the problem space. The scope will also include consideration of how to measure the effectiveness of the C2 network in achieving the desired C2 mission outcomes based on intended use. WG3 will out-brief findings and actionable recommendations to the overall MORS Workshop to provide its input to the workshop report.

## Objectives

Objective 1: Understand the impact of the application of traditional operational research techniques to networked C2 systems.

Objective 2: Develop inputs to the C2 Metrics Framework for networked C2 systems and “systems of systems” to measure and assess network behaviors.

Objective 3: Identify and categorize families of C2 measures of effectiveness useful for networked C2 systems.

## Working Group 3 Organization

Working Group 3 Chair	Clyde Smithson, Johns Hopkins Applied Physics Laboratory
Working Group 3 Co-Chair	Marjorie Greene, Center for Naval Analysis

## Working Group Operations

In the agenda, WG3 has five working group sessions (nearly 17 hours) to recommend approaches for measuring and assessing C2 network behaviors and the effectiveness of the C2 network.

On Tuesday January 24, WG3 participants will hear presentations on defining measures of effectiveness and defining system/system of systems behaviors for a C2 network. Presentations will be 30-35 minutes long and be immediately followed by a discussion

of appropriate OR techniques and to create candidate C2 network MOE families and behavior types. Discussion should also include relationship to the intended use of the network and how the network helps achieve the desired C2 mission outcome.

On Wednesday January 25, WG3 participants will hear presentations on and discuss the construction of a conceptual model of the C2 network system, with extensions to system of systems, in terms of a layered network model including a physical layer, information layer, and cognitive layer. Presentations will be 30-35 minutes long and be immediately followed by a discussion. It is expected that this discussion will be the main linkage to WG1, the C2 Metrics Framework, and WG3, Analysis of Human Decision Making in a Networked Environment. A key discussion should address the human decision maker as inside or outside of the boundary of the C2 network. The outcome of this session should be a boundary diagram of the C2 network describing relevant entities and relationships with a discussion of how MOEs might be applied and behaviors assessed. WG3 efforts will be out-briefed at the end of this day.

On Thursday January 26, WG3 will develop the C2 Network briefing to be presented at the WG3 out-brief session in the afternoon. WG3 will provide the synthesis group a written report for inclusion in the MORS Joint Framework for Measuring C2 Effectiveness final report.

## Agenda

Monday, 23 January 2012		
1200-1600	Early Registration	MORS Staff
1300-1600	Tutorials	Tutorial Chair
	Mission Command and Mission Command Systems Measurements	TRAC speaker
	Workshop Integration and Synthesis Process	Terry McKearney, Michael Pafford
Tuesday, 24 January 2012		
0715-0800	Continental Breakfast and Registration	MORS Staff
0800-0810	Plenary Session Kickoff and Welcome	Trena Lily, MORS President
0810-0815	Proponent's Welcome	Ms. Pamela Blechinger, Director, TRAC-FLVN
0815-0855	Keynote Address	TBD – flag/SES level with J6 and ORSA background, or NII background
0855-0910	Charter to Working Groups	Lee Lehmkuhl, Terry McKearney
0915-1130	WG3 Session 1 – Problem Space Exploration	Clyde Smithson, Marjorie Greene
0915-0940	Introductions, Objectives, and WG3 Operations	Clyde Smithson, Marjorie Greene
0940-1010	Presentation 1 – Defining MOEs in C2 Network Context	Clyde Smithson
1010-1050	Brainstorming/Discussions	WG3
1050-1100	Break	
1130-1300	Lunch with speaker	Speaker TBD.
1300-1630	WG 4 Session 2 – Problem Space Exploration	Clyde Smithson, Marjorie Greene
1300-1330	Presentation 2 – Defining C2 Network Behaviors	Attendee
1330-1410	Brainstorming/Discussions	WG3
1410-1430	Break	
1430-1500	Presentation 3 – OR Techniques Applied to C2 Network Analysis	Attendee
1500-1540	Brainstorming/Discussions	WG3
1540-1600	Break	
1600-1630	Daily Wrap-up	Clyde Smithson, Marjorie Greene
1730-2000	Social	MORS Staff

Wednesday, 25 January 2012		
0715-0800	Continental Breakfast and Registration	MORS Staff
0800-1130	WG 3 Session 3 – Presentations and Potential Solutions	Clyde Smithson, Marjorie Greene
0800-0820	Review	Clyde Smithson, Marjorie Greene
0820-0855	Presentation 4 – C2 Network/SoS Conceptual Model	Attendee
0855-0940	Brainstorming/Discussions	WG4
0940-1000	Break	
1000-1035	Presentation 5 – Developing C2 Network/SoS MOEs	Attendee
1035-1120	Brainstorming/Discussions	WG4
1120-1130	Break	
1130-1300	Lunch	TBD
1300-1630	WG 3 Session 3 – Presentations and Potential Solutions	Clyde Smithson, Marjorie Greene
1300-1330	Presentation 6 – Capturing C2 Network Behaviors	Attendee
1330-1410	Brainstorming/Discussion	WG
1410-1430	Break	
1430-1500	Presentation 7 – Case Study: Analysis of a C2 Network	Attendee – possibly Dr. James Engler from JHUAPL. Discussion of BMDS network analysis.
1500-1540	Brainstorming/Discussion	WG3
1540-1600	Break	
1600-1630	Daily Wrap-up	Clyde Smithson, Marjorie Greene
Thursday, 26 January 2012		
0730-0800	Continental Breakfast and Registration	MORS Staff
0800-1200	Working Group 3 Session 5 – Outbrief Development	Clyde Smithson, Marjorie Greene
0800-0850	Summarize Findings for C2 Network Problem Space	WG3
0850-0910	Break	
0910-1000	Summarize Findings for C2 Network Measures and Behaviors	WG3
1000-1020	Break	
1020-1100	Prioritize Solutions	WG3
1100-1150	Develop Recommendations for Joint Framework	WG3

1150-1200	Break	
1200-1300	Working lunch in Working Group sessions	MORS Staff
1300-1330	Working Group 1 Outbrief	LTC Gerry Benard
1330-1400	Working Group 2 Outbrief	Working Group 2 Chair
1400-1420	Break	MORS Staff
1420-1450	Working Group 3 Outbrief	Clyde Smithson, Marjorie Greene
1450-1520	Working Group 4 Outbrief	Jennifer Ockerman, Sylvia Acchione-Noel
1520-1550	Synthesis Group Outbrief	Mike Pafford
1550-1630	Wrap up and Conclusion.	Trena Lily, Lee Lehmkuhl, Terry McKearney, MORS Staff
<b>Friday, 27 January 2012</b>		
0800-1200	Working Group and Synthesis Chairs gather to prepare final report draft	Lee Lehmkuhl, Terry McKearney

To educate workshop attendees and support WG3 discussions, tutorials and posters are encouraged. Our intent is to identify one or more Tutorials about recent efforts in OR techniques used in the analysis of C2 networks to be presented on Monday, January 23. If there is interest in demonstrating a method, tool, measure, and/or analysis, please contact the WG3 chair about the potential for conducting a tutorial. We also intend to provide a wall space for posters about the measurement of decision making in the common area outside the working sessions. WG3 attendees who offer content in the form of tutorials and posters should ensure the content aligns with objectives of WG3.

## Security Procedures

This workshop will be conducted at the UNCLASSIFIED level. Participation from non-U.S. experts involved in the issues of networked command and control is invited.

## Facilities

This workshop will be conducted at the Kossiakoff Center, Johns Hopkins Applied Physics Laboratory in Laurel, MD.

The conference hotel for the workshop will be the Columbia Sheraton, 10207 Wincopin Circle, Columbia, MD  
(877) 207-9358.