



Joint Framework for
Measuring C2 Effectiveness

23-26 January 2012 | JHU Applied Physics Lab, Laurel, MD



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Working Group 1

Deriving Operational Metrics for Networked C2

Chair: LTC Gerry Benard, TRAC

Co-chair: Mr Bruce Gorski, MITRE

Mentor: Mr Don Kroening, Booz Allen Hamilton

Resident: Mike Tavares, TRAC

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WG 1 Participants

Name	Organization	Email	Phone
Bruce Gorski	MITRE	bgorski@mitre.org	913-946-1908
Gerry Benard, LTC, FA49	TRAC-Fort Leavenworth	gerry.benard@us.army.mil	913-684-9179
Don Kroening	Booz Allen Hamilton, Leavenworth	kroening_don@bah.com	913-684-4493
Kim DeWitt	US STRATCOM	dewittk@stratcom.mil	402-294-4215
Wade Roberts	Boeing Phantom Works	wade.m.roberts@boeing.com	253-208-0991
Peter Asenstorfer	DSTO, Australia	peter.asenstorfer@defence.gov.au	+6129381-0071
Nick Westbury	DSTL, UK	ncwestbury@dstl.gov.uk	+44-2392-53-7583
Kevin Jones	JS J7 JCW	kevin.l.jones@HR.JS.MIL	757-203-6643
Dale Johnson LCDR	OPNAV N81F	dale.f.johnson@navy.mil	703-614-2086
Todd Minners, LTC, FA49	Army Test and Evaluation Executive	todd.minners@us.army.mil	703-545-1154
Joe Quartararo	CJCS-J7-JCOA	joseph.quartararo@HR.js.mil	757-203-7372
Eric Buck	OSD-CAPE	eric.buck@osd.mil	703-695-0119
Tom Reid	Booz Allen Hamilton	reid_thomas@bah.com	619-278-4964
David Scalsky	Booz Allen Hamilton	scalsky_david@bah.com	443-360-6123
Mike Tavares	TRAC-Fort Leavenworth	michael.j.tavares.civ@mail.mil	913-684-9178
John Looney	Naval Postgraduate School	jplooney@nps.edu	757-444-3919
Shelley Peterson	Lockheed Martin SSC	shelley.peterson@lmco.com	408-431-2276
Yves Forcier, LTC	CFD Ottawa	Yves.forcier@forces.gc.ca	613-996-3624
Dick Polin	IDA	rpolin@ida.org	703-845-2285
Rick Staats	MITRE	rstaats@mitre.org	703-983-7261

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WG 1 Purpose and Objectives

To propose a framework for assessing Command and Control (C2) Metrics for military forces conducting operations in a networked environment.

Objectives:

- Objective 1: Understand the current C2 Metrics Frameworks the different services use today. **Amber** (future action)
- Objective 2: Develop an overarching C2 Metrics Framework. **Green** (work-in-progress)
- Objective 3: Identify and/or develop high level example measures that further define the C2 Metrics Framework. **Amber** (future action)



WG 1 Key Term

Command and Control (JP1-02, amended through NOV 2011): The exercise of authority and direction by a properly designated commander over assigned and attached forces in the accomplishment of the mission. Command and control functions are performed through an arrangement of personnel, equipment, communications, facilities, and procedures employed by a commander in planning, directing, coordinating, and controlling forces and operations in the accomplishment of the mission. Also called **C2**. (JP 1)

C2 System

Measures Framework

Hierarchy of Measures

JIC Attributes

JCA C2 Functions



WG 1 Questions and Principles

How do we measure C2 capabilities in order to improve effectiveness of operations?

Principles:

- Complete
- Drive to a purpose
- C2 analysis (broad, spans DOTMLPF – agile)
- Transcend processes (e.g. acquisition, others)
- Use C2 functions as a context for developing the framework



WG 1 Assumptions

- Analysis will always be comparative in nature.
- A base case will be defined.
- Analysis of this nature is in context of a mission and a scenario is needed.
- WG 1 mapping of the SEP 2005 JIC attributes to the 2011 JCA C2 Functions is acceptable.
- Analysis will be accomplished using a design of experiments (DoE) or campaign of analysis.



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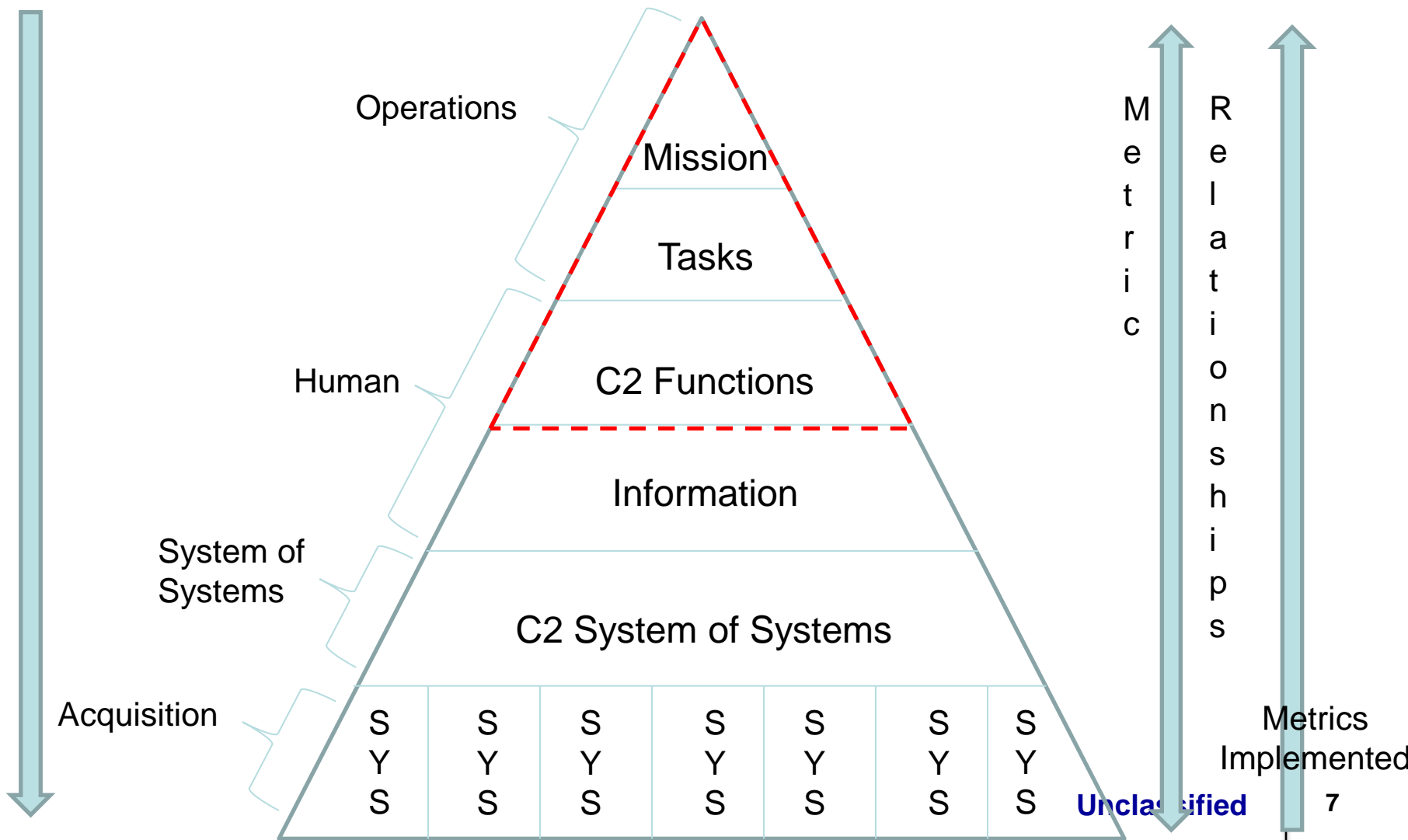
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C2 Metrics Framework

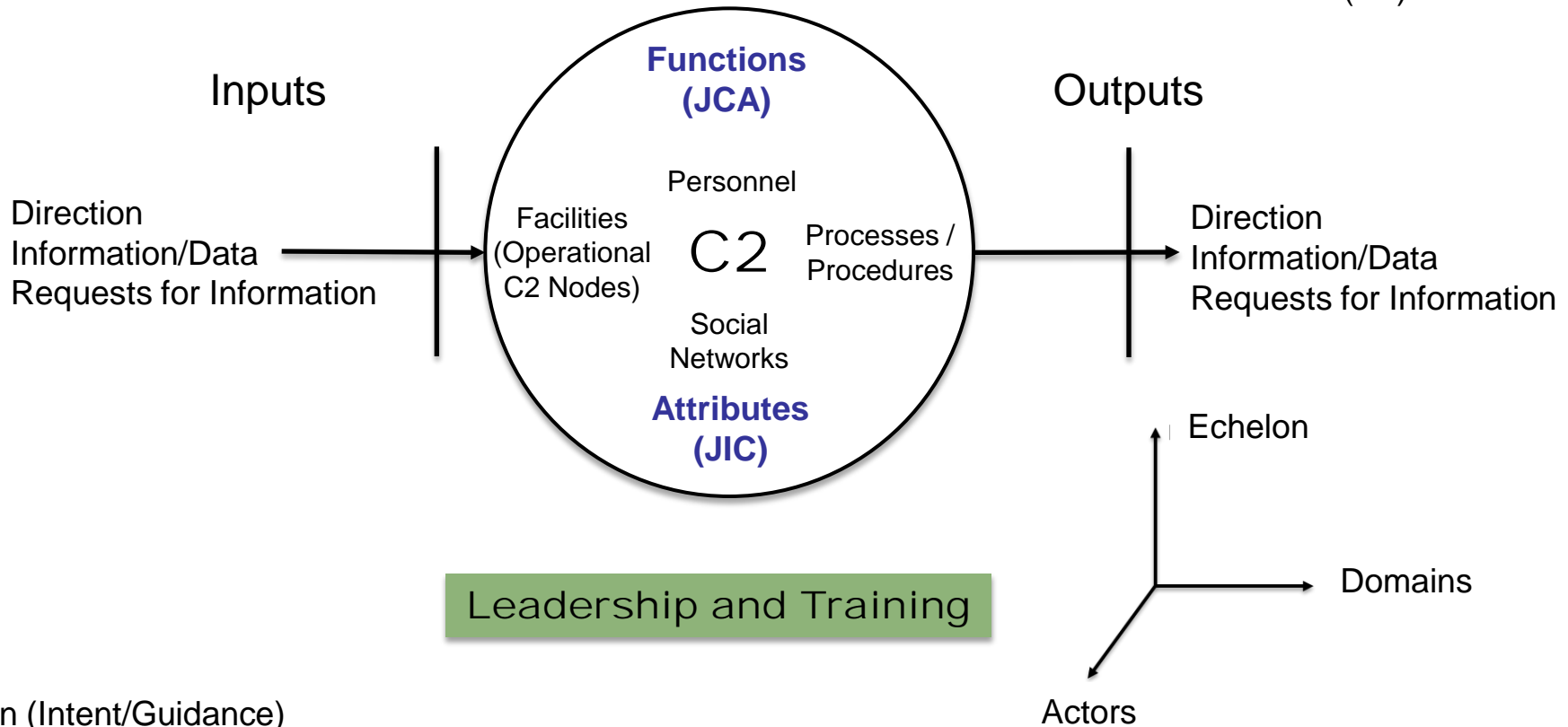
Metrics Derived





C2 Conceptual Model

- C2 System
- Personnel (C2)
 - Equipment (S / SoS)
 - Communications (S / SoS)
 - Facilities (C2 / S / SoS)
 - Procedures (C2)



Direction (Intent/Guidance)
 Information (Plans/Orders/Observations)
 Requests for Information (PIR, CCIR, EEFI)



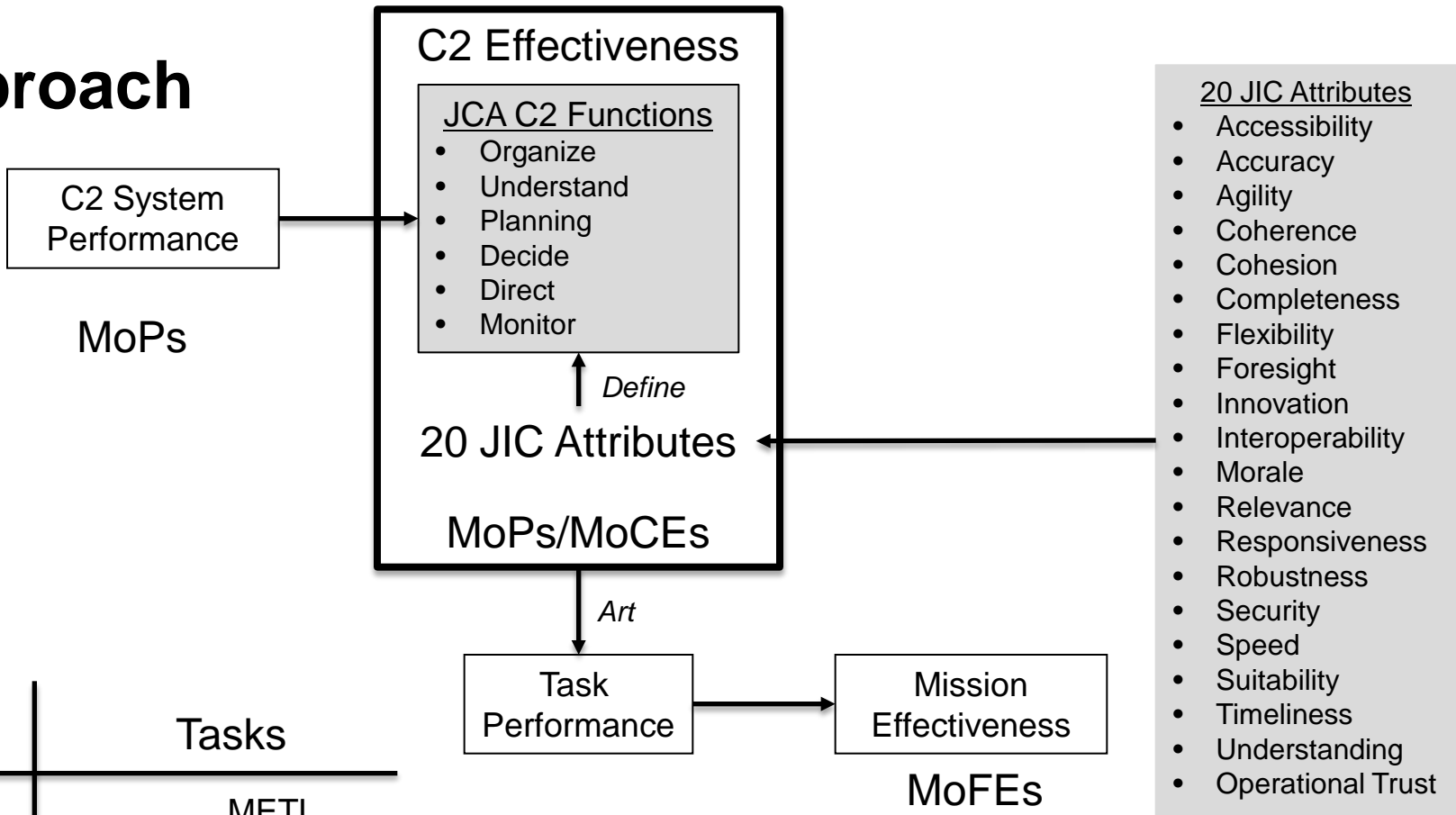
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Approach



20 JIC Attributes

- Accessibility
- Accuracy
- Agility
- Coherence
- Cohesion
- Completeness
- Flexibility
- Foresight
- Innovation
- Interoperability
- Morale
- Relevance
- Responsiveness
- Robustness
- Security
- Speed
- Suitability
- Timeliness
- Understanding
- Operational Trust

Attributes can be mapped to:

- C2 System
- C2 Tasks
- C2 Task outputs

MoP

Tasks

METL

Sources:

- Throughput
- Latency
- Connectivity
- Accuracy

- OPORDs
- OPLANs
- Scenario
- UJTL

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C2 Effectiveness

JCA Functions

using

20 JIC Attributes

Task Performance

METL

Sources:

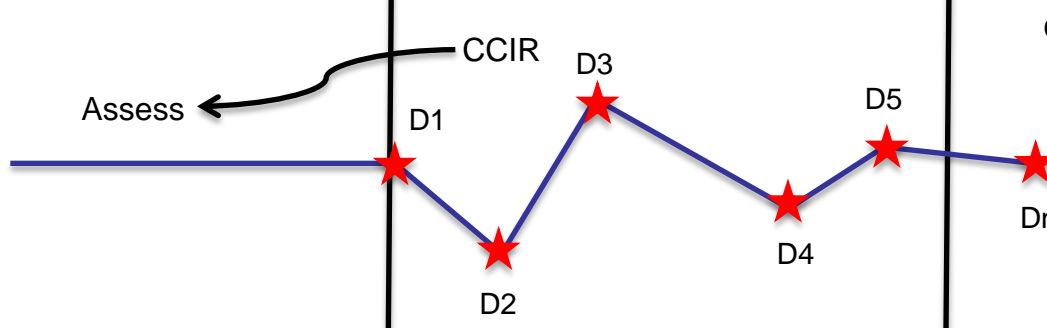
- OPORDs
- OPLANs
- Scenario
- UJTL

Mission Effectiveness

FM 7-15 Mission Success

- Meets higher Commander's intent
- Meets specified timeline
- Meets Commander's risk assessment:
 - Fratricide
 - Collateral damage
 - Opportunity cost
- Minimum expenditure of resources
- Unit can continue mission or be assigned future missions and operations

Plan
D1
D2
D3
D4
D5
Dn...



Decisions define initial plan and tasks. As the operation progresses decision making changes the plan (operation).



WG 1 Illustrative Thread (1 of 2)

- Setting: MLS 2.0 Phase IIIC-1, 1st SBCT
- Mission: Destroy enemy base camp
- Cases:
 - Base Case: WIN-T INC 1
 - Future Case: WIN-T INC 2 +
- Tasks:
 - 1st IN BN: Clear OBJ
 - FA BN: Destroy by fire
 - 1st SPT BN: Priority of support to 1-36 IN BN
 - 1st BDE: C2
 - 1st DIV: C2 (division assets in fight)



WG 1 Illustrative Thread (2 of 2)

MoFE:

- To what extent was the enemy base camp destroyed*? (Completeness, Percent)
- Did the operation meet the timeline from the operations order? (Timeliness, Time in hours)
- What were the Blue losses? (Completeness, Number/Percent)
 - Force remaining
 - Leadership remaining
- Was Blue able to exploit opportunities such as reacting to high value targets and new intelligence resulting from the attack? (Flexibility, Percent)
- What was the Blue force posture for follow-on missions? (Robustness, Number/Percent)
 - Combat power remaining
 - Operational readiness of equipment
 - Fuel remaining
- What was the number of civilian casualties (MoPE)? (Accuracy, Number)



5.2 Understand. The ability to individually and collectively comprehend the implications of the character, nature, or subtleties of information about the environment and situation to aid decision-making.

•5.2.1: Organize Information: (Compile, distill, and disseminate information)

- Accessibility
 - Accuracy*
 - Coherence*
 - Cohesion*
 - **Completeness*** - Number of times a commander asked for information which has not been compiled
 - Interoperability
 - Operational Trust
 - **Relevance*** - Number of times a commander questions the importance or applicability of information provided
 - Robustness
 - Security*
 - Suitability*
 - Timeliness*
 - Understanding*
- **Actual measure would depend on the analysis issues being addressed and scenario**
 - **A measure is not a standard (defined later depending on the study issue)**



WG 1 Summary

- Measuring the performance of C2 tasks is the MoCE the community is seeking but...MoCE more often than not, still need to be linked to the MoFE (art of analysis)
- Mapped JCA Tier 3 tasks to the appropriate JIC attributes



WG 1 Future Actions

- Collaborate monthly (email); convene quarterly (distributed environment)
- Ensure consistency with other measure frameworks:
 - Navy: OPNAV 81 (Dr Jerry Smith), NPS-DISE (Dr Shelley Gallup), Navy Warfare Development Command (TBD, Gerry Horton)
 - Air Force: (TBD)
 - OSD: C4IPD (Eric Buck)
 - J-8: Deputy Director C4 (John Costello)
- Research if additional information is available for the JCA.
- Map the SEP 2005 JIC attributes to the 2011 JCA C2 Functions down through tier 4 as appropriate
- Refine JIC attributes (ensure orthogonal and measureable)
- Collect and develop C2 measures used today, and link to framework
- WG 1 present at next MORS; recommend C4ISR composite group host four sessions to continue effort
- Obtain buy-in from senior decision makers



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WG 1 Final Thoughts

- This is a wicked problem!
- More work to do



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BACK-UPS



5.1 Organize. The ability to align or synchronize interdependent and disparate entities, including their associated processes and capabilities to achieve unity of effort.

- 5.1.1: Establish and Maintain Unity of Effort with Mission Partners:
 - Accessibility: % partners able to access to mission essential information
 - Agility: Time to reorient organization in response to new tasking
 - Coherence: Organizational products reflect commanders intent
 - Cohesion: % of personnel believe organization/team members value their individual contributions to mission
 - Flexibility: % of organization that correctly react/recover to a steady state condition after disruption
 - Interoperability: % of information exchanges occurring between partners
 - Operational Trust: % mission orders not executed due to lack of trust of leader by subordinates
 - Responsiveness: Time to return to previous capability level after disruption
 - Robustness: % Forces/units that can perform in multiple operating environments
 - Speed: Operations succeed without delay due to degraded resources/information/etc.
 - Understanding: % of personnel able to describe commanders intent



5.1 Organize (cont).

- 5.1.2: Structure Organization to Mission:
 - Accessibility: % of units/subordinates having access to shared resources
 - Agility: % Forces that can effectively operate in a decentralized operation
 - Cohesion: % of forces that believe they understand their role in the organization
 - Completeness: Organization has all components needed to complete mission
 - Flexibility: % of command staffs that can operate anywhere in the battlespace
 - Interoperability: Ability to access and use partner assets/resources
 - Operational Trust: % of forces that believe the organization as formed engenders trust among partners
 - Responsiveness: % of unplanned opportunities that can be exploited in near real time with minimal mission disruption
 - Robustness: % Forces/units that can perform in multiple operating environments
 - Security: Force protection is sufficient to maintain a XX% mission capability rate
 - Suitability: % of personnel who believe the organization is structured to meet mission requirements



5.1 Organize (cont).

- 5.1.3: Foster Organizational Collaboration:
 - Accessibility: Required mission information is available to all partners
 - Agility: Time to form ad hoc WGs to meet new mission requirements
 - Coherence: % of partners able to describe commanders intent
 - Cohesion: % partners that believe they understand their roles and responsibilities within the organization
 - Flexibility: Commanders at all levels can quickly select a COA without being locked into it.
 - Innovation: % of partners that believe they have the freedom to exchange information to gain full understanding of commander's intent
 - Interoperability: % of partners able to provide services/resources to and accept services/resources from other partners
 - Morale: % partners that believe organization fosters enthusiasm, confidence, or loyalty with regard to the mission
 - Operational Trust: % personnel that have trust in the organization
 - Responsiveness: % personnel that believe organizational collaboration improves ability to respond to mission changes
 - Robustness: % partners that can collaborate in a degraded environment
 - Understanding: % partners that understand commanders intent and mission requirements



5.2 Understand. The ability to individually and collectively comprehend the implications of the character, nature, or subtleties of information about the environment and situation to aid decision-making.

•5.2.1: Organize Information: (Compile, distill, and disseminate information)

- Accessibility
- Accuracy*
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- **Completeness*** - Number of times a commander asked for information which has not been compiled
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- Security*
- Suitability*
- Timeliness*
- Understanding*

• **Actual measure would depend on the analysis issues being addressed and scenario**

• **A measure is not a standard (defined later depending on the study issue)**



5.2 Understand. The ability to individually and collectively comprehend the implications of the character, nature, or subtleties of information about the environment and situation to aid decision-making.

•5.2.2: Develop Knowledge and Situational Awareness: (Understand implications, analyze information and define knowledge structure)

- **Accuracy*** - **Difference between actual situation and the perceived situation**
- Coherence*
- Cohesion*
- Completeness*
- **Foresight** - **% of future implications predicted which came to pass**
- Operational Trust
- Relevance*
- Robustness
- Security*
- Suitability*
- Timeliness*
- Understanding*



5.2 Understand. The ability to individually and collectively comprehend the implications of the character, nature, or subtleties of information about the environment and situation to aid decision-making.

•5.2.3: Share Knowledge and Situational Awareness: (Define associated community, establish collective meaning and prepare and distribute context)

- Accessibility:
- Accuracy*
- Coherence*
- **Cohesion*** - % of units which require the shared situational understanding that are provided it
- Completeness*
- Interoperability
- Operational Trust
- Relevance*
- Robustness
- Security*
- Suitability*
- **Timeliness*** - Difference between the time the commander was provided the situational awareness and the time at which he/she needed it to make a decision
(standard is different by echelon)
- Understanding* -



5.3 Planning. The ability to establish a framework to employ resources to achieve a desired outcome or effect.

- 5.3.1: Analyze Problem:
 - Attribute 1: Understanding
 - Attribute 2: Completeness
 - Attribute 3: Foresight
 - Attribute 4: Accessibility
 - Attribute 5: Accuracy
 - Attribute 6: Relevance
 - Attribute 7: Speed
 - Attribute 8: Coherence
- 5.3.2: Apply Situational Understanding:
 - Attribute 1: Accuracy
 - Attribute 2: Understanding
 - Attribute 3: Relevance
 - Attribute 4: Timeliness
 - Attribute 5: Completeness
 - Attribute 6: Foresight
 - Attribute 7: Accessibility
 - Attribute 8: Robustness
 - Attribute 9: Coherence



5.3 Planning (cont). The ability to establish a framework to employ resources to achieve a desired outcome or effect.

- 5.3.3: Develop Strategy:
 - Attribute 1: Flexibility
 - Attribute 2: Coherence
 - Attribute 3: Foresight
 - Attribute 4: Interoperability (Collaboration)
 - Attribute 5: Understanding
 - Attribute 6: Timeliness
 - Attribute 7: Completeness
 - Attribute 8: Accuracy
 - Attribute 9: Relevance
 - Attribute 10: Robustness
 - Attribute 11: Innovation
 - Attribute 12: Responsiveness
 - Attribute 13: Speed
 - Attribute 14: Timeliness
 - Attribute 13: Suitability
 - Attribute 14: Operational Trust



5.3 Planning (cont). The ability to establish a framework to employ resources to achieve a desired outcome or effect.

- 5.3.4: Develop Courses of Action:
 - Attribute 1: Coherence
 - Attribute 2: Flexibility
 - Attribute 3: Foresight
 - Attribute 4: Understanding
 - Attribute 5: Timeliness
 - Attribute 6: Interoperability (Collaboration)
 - Attribute 7: Accessibility
 - Attribute 8: Completeness
 - Attribute 9: Agility
 - Attribute 10: Relevance
 - Attribute 11: Robustness
 - Attribute 12: Innovation
 - Attribute 13: Speed



5.3 Planning (cont). The ability to establish a framework to employ resources to achieve a desired outcome or effect.

•5.3.5: Analyze Courses of Action:

- Attribute 1: Foresight
- Attribute 2: Understanding
- Attribute 3: Timeliness
- Attribute 4: Completeness
- Attribute 5: Relevance
- Attribute 6: Accuracy
- Attribute 7: Robustness
- Attribute 8: Innovation
- Attribute 9: Suitability



5.4 Decide. The ability to select a course of action informed and influenced by the understanding of the environment or a given situation.

•5.4.1: Manage Risk:

- Accessibility: How did limits on access to relevant information increase risk at each echelon?
- Accuracy: Which types of information needed highest accuracy to enable cdrs to reduce risk?
- Completeness: How sensitive was risk level to information completeness?

•5.4.2: Select Actions:

- Foresight: How did ability to predict probable future states reduce time needed to make decisions?
- Speed: What was impact of fast or slow selection of actions on mission outcomes?
- Suitability: to what degree did the selected actions add to successful mission accomplishment?

•5.4.3: Establish Rule Sets:

- Understanding: Did the cdrs selection of rule sets reflect good understanding of the mission?
- Suitability: Were the rule sets appropriate for the tasks they applied to?
- Security: How did the established rules reduce or increase operational security?

•5.4.4: Establish Intent and Guidance:

- Interoperability: to what extent did the guidance consider interoperability?
- Innovation: How original was the guidance compared to that of other commanders?
- Morale: Did the intent provide sense of purpose and confidence in the future?

•5.4.5: Intuit

- Suitability: How well did the Cdr assess that the plan was likely to be effective?
- Agility: Was the cdr able to modify the plan in a timely manner when the situation changed?



5.5 Direct. The ability to align or synchronize interdependent and disparate entities, including their associated processes and capabilities to achieve unity of effort.

- 5.5.1: Communicate Intent and Guidance:
 - Attribute 1: Accessibility
 - Attribute 2: Completeness
 - Attribute 3: Interoperability
 - Attribute 4: Relevance
 - Attribute 5: Robustness
 - Attribute 6: Timeliness
 - Attribute 7: Understanding
- 5.5.2: Issue Orders:
 - Attribute 1: Accessibility
 - Attribute 2: Coherence
 - Attribute 3: Completeness
 - Attribute 4: Interoperability
 - Attribute 5: Relevance
 - Attribute 6: Timeliness
 - Attribute 7: Understanding
- 5.5.3: Establish Success Criteria:
 - Attribute 1: Completeness
 - Attribute 2: Flexibility
 - Attribute 3: Relevance
 - Attribute 4: Understanding
- 5.5.4: Synchronize:
 - Attribute 1: Agility
 - Attribute 2: Coherence
 - Attribute 3: Flexibility
 - Attribute 4: Interoperability
 - Attribute 5: Responsiveness
 - Attribute 6: Speed
 - Attribute 7: Understanding
 - Attribute 8: Operational Trust



5.5 Direct. The ability to align or synchronize interdependent and disparate entities, including their associated processes and capabilities to achieve unity of effort.

- 5.5.5: Lead:
 - Attribute 1: Agility
 - Attribute 2: Cohesion
 - Attribute 3: Flexibility
 - Attribute 4: Foresight
 - Attribute 5: Morale
 - Attribute 6: Responsiveness
 - Attribute 7: Understanding
 - Attribute 8: Operational Trust
- 5.5.6: Manage Risk:
 - Attribute 1: Agility
 - Attribute 2: Flexibility
 - Attribute 3: Foresight
 - Attribute 4: Responsiveness
 - Attribute 5: Security
 - Attribute 6: Suitability
 - Attribute 7: Understanding
 - Attribute 8: Operational Trust



5.6 Monitor. The ability to adequately observe and assess events/effects of a decision.

- 5.6.1: Assess Compliance with Guidance: The ability to determine if performance adheres to established parameters and expectations.
 - Accessibility / Robustness: Percentage of time that each key data source is available
 - Accuracy / Completeness: Number of critical items of information that are missing (or wrong)
 - Coherence: **Sample Measure**
 - Interoperability: Percentage of key data sources that can be shared (Unified Action Partners environment)
 - Security: Percentage of critical items of information that are protected
 - Speed / Timeliness: Latency of critical information in shared situational awareness



5.6 Monitor. The ability to adequately observe and assess events/effects of a decision.

- 5.6.2: Assess Effects: The ability to analyze, track, and measure the results of actions taken.
 - Accessibility / Robustness: Percentage of time that each key data source is available
 - Accuracy / Completeness: Number of critical items of information that are missing (or wrong)
 - Interoperability: Percentage of key data sources that can be shared (Unified Action Partners environment)
 - Security: Percentage of critical items of information that are protected
 - Speed / Timeliness: Latency of critical information in shared situational awareness
 - Understanding: **Percentage of critical items of information for which there are no unanswered information requests**



5.6 Monitor. The ability to adequately observe and assess events/effects of a decision.

- 5.6.3: Assess Achievement of Objectives: The ability to determine when the desired end-state has been reached.
 - Accessibility / Robustness: Percentage of time that each key data source is available
 - Accuracy / Completeness: Number of critical items of information that are missing (or wrong)
 - Coherence: **Sample Measure**
 - Interoperability: Percentage of key data sources that can be shared (Unified Action Partners environment)
 - Security: Percentage of critical items of information that are protected
 - Speed / Timeliness: Latency of critical information in shared situational awareness
 - Understanding: **Sample Measure**



5.6 Monitor. The ability to adequately observe and assess events/effects of a decision.

- 5.6.4: Assess Guidance: The ability to determine if direction is achieving the desired end-state and is appropriate for the situation.
 - Accessibility / Robustness: Percentage of time that each key data source is available
 - Accuracy / Completeness: Number of critical items of information that are missing (or wrong)
 - Coherence: **Sample Measure**
 - Flexibility: **Sample Measure**
 - Foresight: **Sample Measure**
 - Innovation: **Sample Measure**
 - Interoperability: Percentage of key data sources that can be shared (Unified Action Partners environment)
 - Responsiveness: **Sample Measure**
 - Security: Security: Percentage of critical items of information that are protected
 - Speed / Timeliness: Latency of critical information in shared situational awareness
 - Suitability: **Sample Measure**
 - Understanding: **Percentage of critical items of information for which there are no unanswered information requests**



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Accessibility – The ability of all levels of command (strategic, operational, and tactical), at any time and from anywhere, to pull or push relevant data and information that is the basis for shared SA. Additionally, access to a standardized joint application tool set at austere and robust, fixed and mobile sites will enhance decision-making capabilities supporting rapid, efficient, effective command and control.

Accuracy – Conforming precisely to fact or truth. A system with this attribute provides error free (or within a range of acceptable error) measurements or data via credible, dependable and reliable sources. Accuracy and trust may exist due to prior performance and/or specific integrity assurance measures that have been adopted.

Agility – The ability to respond effectively and in a timely manner to changing circumstances against a thinking and adaptive enemy, from anywhere in the battlespace, at any time, even when the networks and command structure are degraded. Agility includes both “flexibility” and “responsiveness.” Agility enables organizations, systems or processes to react and adapt to changing situations and conditions, such as performing C2 during operational transition and reorganization/reconstitution; while airborne, afloat, or “on the move”; or in response to enemy actions.

Coherence – The systematic or logical integration of numerous diverse elements, relationships, and values in order to achieve clarity or a desired end. In the C2 domain, coherence is enhanced through understanding of the mission and commander’s intent and guidance and through collaboration.



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Cohesion – A characteristic of an organization that means having well-defined roles and group norms, common goals, a positive identity, good working relationships, shared responsibility, respect, positive energy, trust, cooperation, unity, good communication, pride in membership and synergy. An indicator of the amount of cohesiveness is the frequency of “we” and “our” statements vice “I,” “me,” and “mine.” In a cohesive organization, everyone is striving toward the same objective. Member goals coincide with the organization’s goals, and there are no hidden agendas.

Completeness – Having all components, parts, or steps critical to complete an operation. Complete information enables timely, appropriate decision making.

Flexibility – Ability to command and control operations from anywhere in the battlespace, at any time, in a variety of situations and conditions, without loss of effectiveness. Flexible and adaptive systems/processes take into account a thinking and adaptive enemy and enable course corrections with minimal disruption since they are built to respond to multiple situations or events. From a planning standpoint, commanders at all levels can quickly select a COA without being locked into it. From an organizational standpoint, this attribute enables a timely, effective response to an altered and/or unforeseen operating environment. Such operating environment changes, often caused by adversary actions, may require modifying organizational structures, workflows, and decision-making processes.



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Foresight – The ability to predict probable future states in order to recognize and exploit opportunity. Foresight may be based on extrapolation from current conditions combined with an understanding of likely actions. This includes the ability of the commander to define, assess, and anticipate enemy actions and develop appropriate COAs, branches, and sequels.

Innovation – Performing tasks in new ways or by using new, advanced, or original ideas, solutions, or concepts. This attribute is characterized by a proactive approach. This attribute is often found in organizations that (1) offer abundant freedom to exchange information to gain full understanding of commander's intent, and (2) are empowered to take action. Solutions featuring this attribute may alter or even eliminate current procedures.

Interoperability – The ability of systems, units, and forces to provide services to and accept services from other systems, units, or forces. This also includes the ability to use the services to operate effectively together.

Morale – Often described as esprit de corps, morale is the enthusiasm, confidence, or loyalty of an individual or group with regard to the function or task at hand. In a group, it is a sense of common purpose. For an individual, it is the level of individual psychological well-being based on that sense of purpose and confidence in the future.



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Operational Trust – The aggregate level of trust from each person and earned from each entity (person, object, system) to accomplish a mission or endeavor. Complex operations using interdependent forces require a level of operational trust in order to gain operational efficiency and effectiveness. Operational trust refers to the sum of a variety of trust perspectives including (but not limited to) commander/subordinate, subordinate/commander, peer/peer, operator/equipment and warfighter/tactics.

Responsiveness – Readily reacting to or recovering from changing situations and conditions in real time and near real time. The effective use of responsive and resilient planning, execution and assessment enables rapid deployment or redirection of assets when various “windows of opportunity” occur. Ideally, systems with this attribute are designed to function at their normal operational standard upon recovery from or reaction to changing situations and conditions.

Robustness – Retaining near-full operational capability in a degraded environment due to great strength, durability, survivability, interdependency, resiliency, a distributed nature, or a combination thereof. Can operate in several environments and perform effectively across a range of conditions, situations, and missions. Organizations and systems with this attribute can function during a disturbance; provide surplus capability to improve service reliability and quality; recover from or adjust to malfunctions or changes; and disperse resources performing services throughout a large area.



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Security – A condition that results from the establishment and maintenance of protective measures that ensure a state of inviolability from hostile acts or influences. (*Joint Publication 1-02*) Security includes preventing loss, destruction, exploitation, or denial of use of information or of a system by establishing, maintaining, and implementing protective measures and risk management.

Speed – The appropriate pace of tasks and decision making. At times, the appropriate speed is rapid. When deliberate methodical actions are required, a slower speed may be required. To obtain the appropriate speed of command, subordinate forces must be enabled to synchronize actions among themselves, without restrictive direction from above.

Suitability – The degree to which a plan, decision or action is appropriate for the task or situation. Suitability extends beyond mere feasibility to an assessment that the plan, decision or action is likely to be effective for the task or situation.

Timeliness – Occurring at a suitable or opportune moment; well-timed. Timeliness is situation dependent. It reflects the relationship between the age of an information item and the tasks or missions it must support.

Understanding -- Having the capacity for rational thought or inference, and the ability to comprehend the meaning and importance of focus areas the commander designates and the direction of his intent. Having the ability to grasp the commander's guidance and apply it to operations. SA enables situational understanding -- knowing what the enemy is doing and knowing why he is doing it.



Joint Framework for Measuring C2 Effectiveness

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Capability

Integrated Capability

C2 Functions*

- Organize
- Understand
- Plan
- Decide
- Direct
- Monitor (assess)
- Lead

Durable
Maintainable ?
Secure

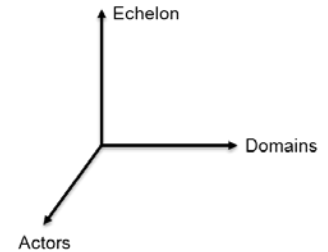
JIC**

- Accessibility
- Accuracy
- Agility
- Coherence
- Cohesion
- Completeness
- Flexibility
- Foresight
- Innovation
- Interoperability
- Morale
- Relevance
- Responsiveness
- Robustness
- Security
- Speed
- Suitability
- Timeliness
- Understanding
- Operational Trust

Operational Effectiveness (OE)

- MoFE/MoPE
- Effect on Mission Outcome

Needs Scenario Context
Intent
End State
Assumptions
Time Desired
Risk (mission, force)
Opportunities



Resource Management (Use/Apply/Reserve)
Leadership
Command Climate
Teams
Mutual Trust

How well do the C2 functions perform?
How do we measure the performance of C2 functions? (outputs, internal)

* Source: Joint Capability Area - C2

** Source: Joint Integrating Concept (JIC)

Echelon: Corps, Division, Brigade, Battalion, Company, Platoon, Squad, Team, Service Person

Domains: PMESII (TBD needs additional definition)

Actors: Government, Non-government, Military, Agencies (TBD needs additional definition)

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C2 Functions

The C2 function encompasses a number of tasks, including the following (JP3 2011):

- (1) Establish, organize, and operate a joint force HQ.
- (2) Command subordinate forces.
- (3) Prepare and, when required, modify plans, orders, and guidance.
- (4) Establish appropriate command authorities among subordinate commanders.
- (5) Assign tasks and operational areas as needed.
- (6) Prioritize and allocate resources.
- (7) Manage risk.
- (8) Communicate and maintain the status of information.
- (9) Assess progress toward accomplishing tasks, creating conditions, and achieving objectives.
- (10) Coordinate and control the employment of joint lethal and nonlethal capabilities.
- (11) Coordinate, synchronize, and when appropriate, integrate joint operations with the operations and activities of interorganizational partners.
- (12) Conduct PA from the operational area.



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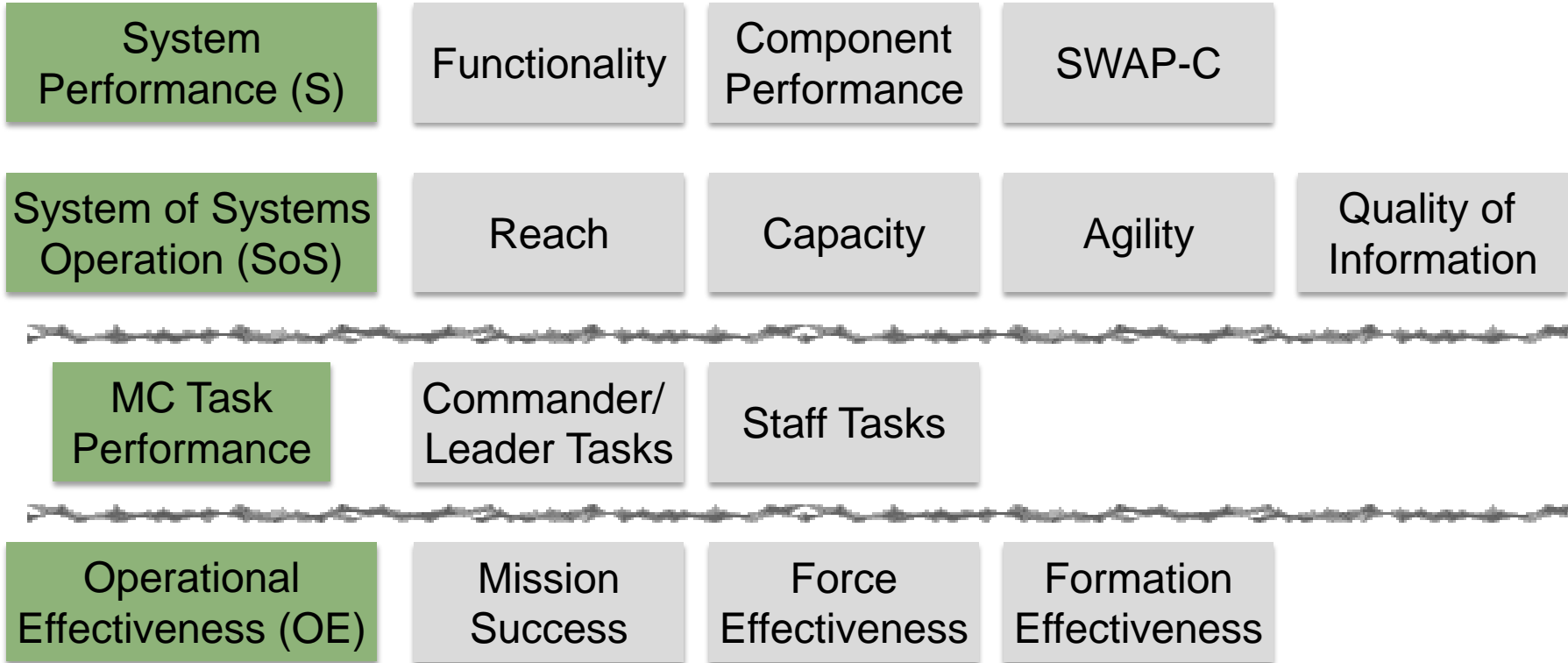


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Issues

EEAs

Army Issues and Measures Framework



- As the essential elements (in the gray boxes) are assessed, their benefits, burdens, and DOTMLPF considerations must be identified.
- Network Operations (NetOps) implications must also be considered.



WG Terms

Command and Control (JP3 AUG 2011): C2 encompasses the exercise of authority and direction by a commander over assigned and attached forces to accomplish the mission. The JFC provides operational vision, guidance, and direction to the joint force.

Command and Control (JP1-02, amended through NOV 2011): The exercise of authority and direction by a properly designated commander over assigned and attached forces in the accomplishment of the mission. Command and control functions are performed through an arrangement of personnel, equipment, communications, facilities, and procedures employed by a commander in planning, directing, coordinating, and controlling forces and operations in the accomplishment of the mission. Also called **C2**. (JP 1)

Command and control system (JP1-02, amended through NOV 2011): The facilities, equipment, communications, procedures, and personnel essential to a commander for planning, directing, and controlling operations of assigned and attached forces pursuant to the missions assigned. (JP 6-0)



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FM 7-15 AUTL Mission Success

**Higher commander's intent
of what the force must do
and the conditions.**

Specified timeline.

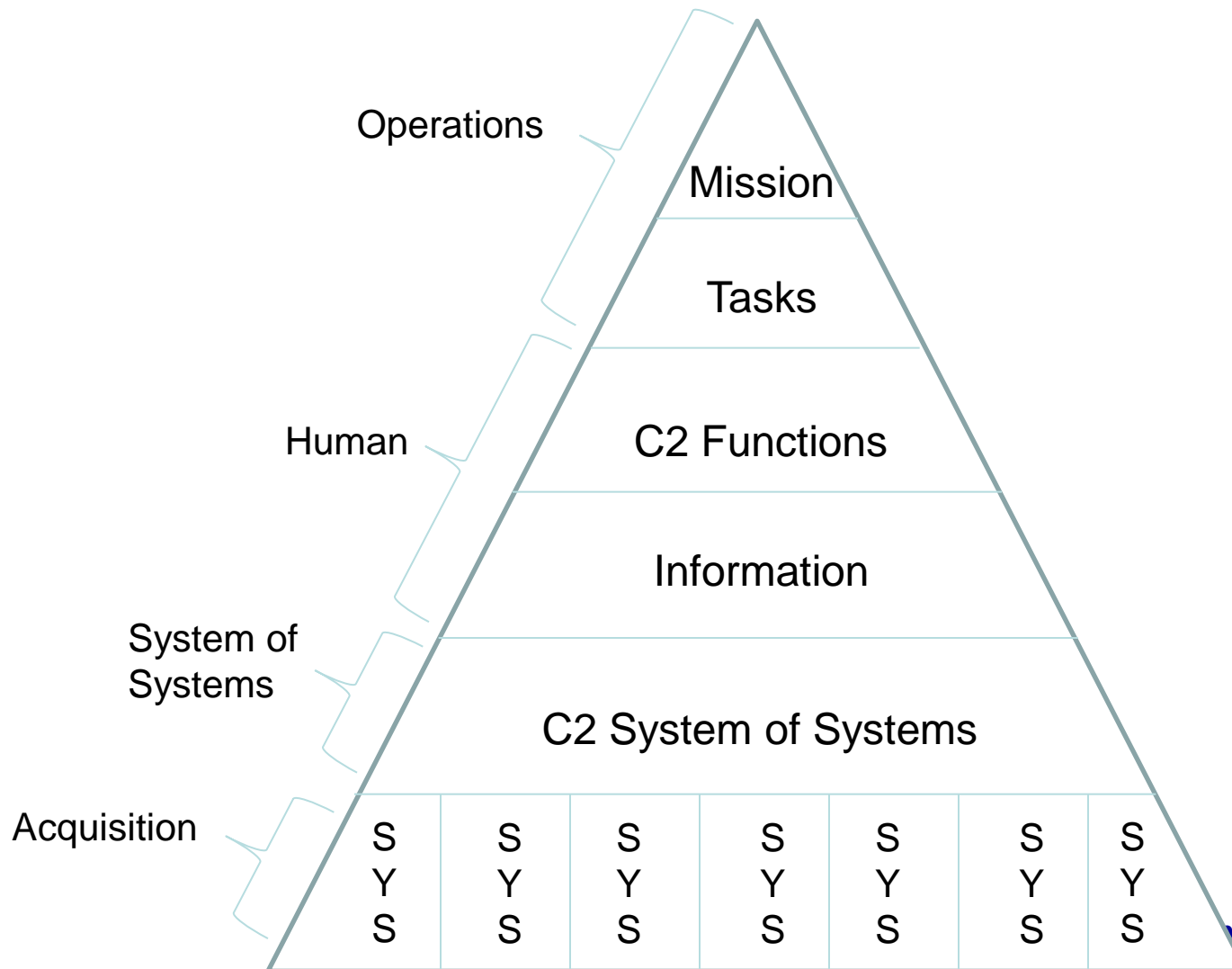
**Commander's risk
assessment for fratricide
avoidance and collateral
damage.**

**Minimum expenditure of
resources.**

**Unit's capability of
continuing or being
assigned future missions
and operations.**

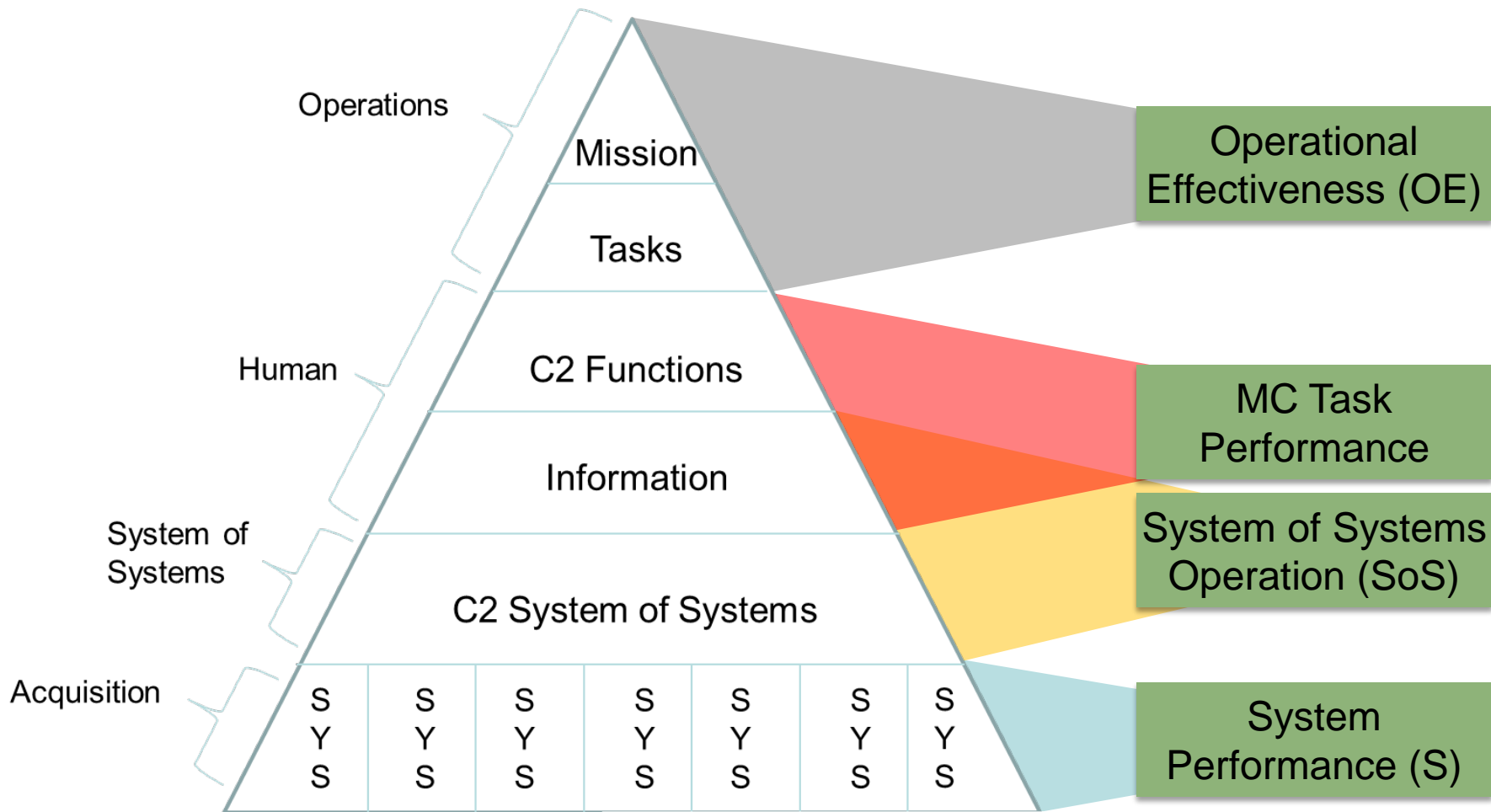


C2 Metrics Framework





C2 Metrics Framework





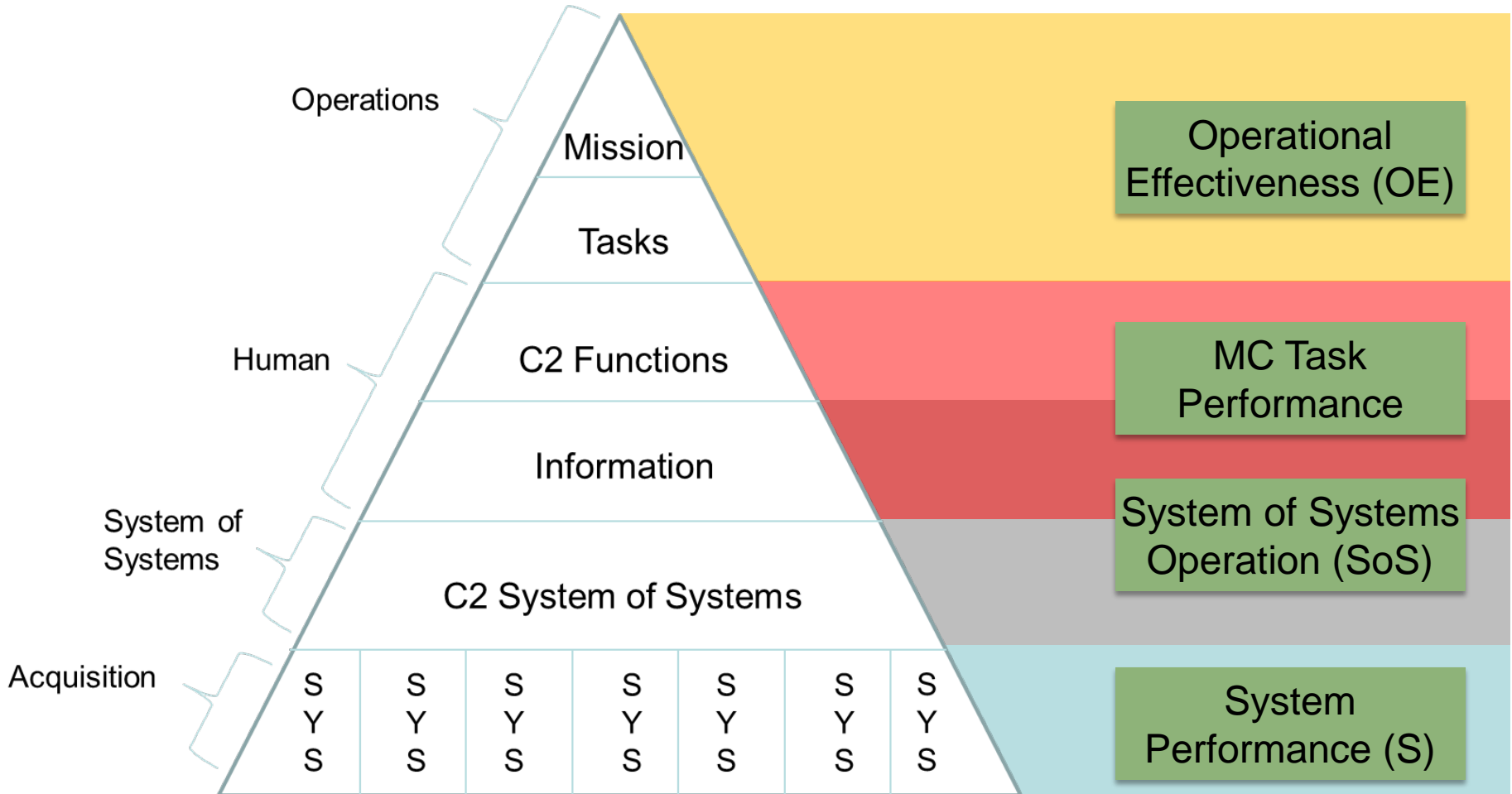
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C2 Metrics Framework





C2 Metrics Framework

