

23<sup>rd</sup> International  
Command and Control  
Research & Technology Symposium  
6-9 November, Pensacola, Florida, USA

2018

## CALL FOR PAPERS

for up-to-date Symposium Information and Registration go to:  
<http://internationalc2institute.org/23rd-iccrt-s-information-central>

## Multi-Domain C2

### History of the ICCRTS

In 1995, the US DoD Command and Control Research Program (CCRP), within the Office of the Secretary of Defense, organized the first International Command and Control Research and Technology Symposium (ICCRTS) at the National Defense University in Washington, D.C. This meeting built upon a series of meetings during the 1970s by the Office of Naval Research and the Massachusetts Institute of Technology that brought together interested researchers to exchange ideas on command and control (C2), its measurement and assessment, and the impact of new technologies on C2 processes.

While the initial meeting was modest in size (63 participants) and included only a handful of non-U.S. participants, ICCRTS has grown substantially, to include participants from many nations. This Symposium series provides an unparalleled opportunity for professional researchers, academics, active duty and reserve officers, and policymakers to interact with one another, understand the state of the art of C2, and influence the state of the practice among coalition partners.

ICCRTS has evolved to focus on (a) leading-edge issues involving new concepts in C2 and Cyber (b) new technologies and their potential impact on C2 and the conduct of Cyberspace Operations, and (c) feedback and evidence from experiments, exercises, and real-world operations. The Symposium is also an important forum for discussion of coalition and collective C2 issues and for examining the complex endeavors (hybrid warfare, counter terrorism, stabilization, operations, disaster relief) involving a variety of entities including military, civilian, government, international organizations, Private Voluntary Organizations (PVOs) and Non-Governmental Organizations (NGOs).

When Government funding was no longer available, a true test of the value of this activity was at hand. The efforts of the international research community to ensure that its annual symposium and the body of literature associated with the CCRP would endure provide evidence of their importance to the community.

The non-profit International Command and Control Institute (IC2I) has assumed responsibility for the organization and running of future ICCRTS as well as the responsibility for hosting the research community's website and research archives. This website can be found at: [internationalc2institute.org](http://internationalc2institute.org)

In 2016, in a Public-Private partnership, the UK MoD joined with IC2I and researchers from around the world to plan and host the 21<sup>st</sup> ICCRTS in London, UK in September 2016. This event was co-located with the 8th Knowledge Systems for Coalition Operations (KSCO) 2016. In 2017, the US Army Research Laboratory (ARL) joined with IC2I to our host the 22<sup>nd</sup> ICCRTS at the Army's Institute for Creative Technologies at USC.

## Theme: Multi-Domain C2

ICCRTS themes, over the years, have served to highlight C2-related challenges that needed attention. Participants are encouraged, not required, to consider the theme in the preparation of their submissions.

Success in Military and Civil-Military endeavors increasingly depend upon being able to operate coherently and respond with agility to developments in multiple domains. In addition to the traditional military domains of operations, air, land, maritime, and the domains of space and cyber are now critical to meet mission challenges. Individually and collectively, operations in these various operational domains are designed to create effects in the physical, cognitive, social, economic, and information spaces. This year's theme was selected because there is an urgent need to understand the applicability of a variety of C2 Approaches to the unique characteristics of each of these individual operational domains and to harmonize C2 between and among these domains to ensure coherent operations and force agility. The continued proliferation of cyberattack tools and capabilities that pose a persistent and increasingly sophisticated threat to our networks and systems and the increasing utilization of automation and software agents and robots that operate with some degree of autonomy to create the battlefield "Internet of Intelligent Things" add complexity to the challenge of Multi-Domain C2.

## Submission Categories

Technical Papers remain the focus of ICCRTS. However, in an effort to better serve the various needs of a diverse community, the 2018 ICCRTS will experiment with different kinds of sessions that provide an opportunity for increased participation and exchange of information. Thus, this Call for Papers invites interested parties to submit proposals in the following categories:

- Technical Papers – professional journal quality; reporting on research and analysis efforts.
- Concept Papers – short paper outlining work-in-progress, an idea, or research proposal designed to solicit feedback and/or stimulate discussion.
- Tutorial Presentations – primers on C2-related concepts, theory, and practices.
- Demonstrations – hands-on exposure to a tool or capability.
- Product Presentations – discussion of capabilities and evidence of operational effectiveness.

The review and acceptance process and criteria differ for submissions in each of these categories.

	Proceedings - Maximum Pages	Presentation Time
Technical Papers	20 pages not including figures and references	20 minutes for presentation 5 minutes for questions
Concept Papers	5 pages not including figures and references	10 minutes for presentation 5 minutes for discussion
Tutorials	n/a	30 or 60 minutes
Demonstrations	n/a	30 minutes
Product Presentations	n/a	15 minutes

## Topics of Interest

The 23rd ICCRTS will be comprised of tracks on various topics that explore C2 from a number of different perspectives. Authors are asked to think about this year's theme as they prepare their technical and concept papers and discuss the theme in the context of their research and analyses. However, any submissions that contribute to a critical examination of C2-related subjects are always welcome.

### **Topic 1: Operational Issues: Multi-domain and Coalition Command and Control**

This topic explores the varied C2 challenges associated with working with many different mission partners from a number of different perspectives (e.g. human, social, cultural, technology, activities). How can these environments be better understood? What are their unique C2-related needs, gaps in capability? What are the lessons learned and best practices for working with a mix of different mission partners including: Ministries, Departments, Bureaus, Agencies, Governments, Special Operations, and Conventional Forces?

### **Topic 2: C2 Concepts, Theory, Policy, and Approaches**

This topic is concerned with exploring the evolution of C2 concepts, theory, policy and approaches driven by the need to integrate C2 of Cyber and C2 of Autonomy and enhance C2 Agility to meet the challenges of a complex, connected, and contested environment.

### **Topic 3: Battlefields of the Future and the Internet of Intelligent Things**

This topic is concerned with the challenges associated with operating in a variety of contested and inter-related battlefield domains (physical, cyber, cognitive) with and in the presence of robustly networked augmented humans, robots and systems. These developments are likely to have a profound impact on many military C2, processes, and procedures. This topic will explore both operational and technical issues.

#### **Topic 4: Cognitive and Socio-technical Challenges**

This topic is concerned with the challenge of organizing, orchestrating, and leveraging a variety of humans, teams, organizations, intelligent entities and systems to improve understanding, shared understanding, decision-making, and collaboration to create a variety of synergistic effects in multiple domains. This topic also includes ways of enhancing the agility of these entities.

#### **Topic 5: Highly Connected, Automated, and Autonomous Forces**

This topic is concerned with understanding the impact of rapid developments and deployments of networking and information-related technologies on the state of the art and practice of C2. These technologies include the continued evolution of networked ubiquitous sensors and collectors, embedded automation, and autonomous systems.

#### **Topic 6: Interoperability, Integration and Security**

This topic is concerned with the challenges of working with a wide range of partners (Joint, Interagency, Multinational, and Public organizations) that are inter-related and inter-dependent in a multitude of different ways in a connected battlespace. Secure interoperability, enabling effective integration between and among partners is essential and must be achieved at different levels (human, technology, processes) between and among different set of entities.

#### **Topic 7: Human Information Interaction**

This topic is focused on the relatively new research area focused on operators and the numerous ways in which they interact with information to improve C2. Interaction encompasses mechanisms for querying / searching, visualization, comprehension, sharing, and exploitation of information across multiple modalities (visual, auditory, somatosensory) in real, virtual, and augmented/mixed reality environments. This topic also welcomes papers on components (e.g., intelligent agents) that help to improve the information interaction process.

#### **Topic 8: Methodology, Experimentation, Analysis, Assessment and Metrics**

This topic is concerned with approaches for designing and undertaking experiments, developing scenarios, defining metrics and conducting analyses that are related to any aspect of command and control. These include networking, management or governance, information sharing, trust, shared awareness, shared understanding, decision-making, planning, execution, and assessment of ongoing operations.

#### **Topic 9: Knowledge Systems**

This topic explores the requirements for, the design of, the employment of, and the assessment of the effectiveness knowledge systems in a variety of mission contexts. This topic includes theory and practice focusing both on theoretical, experimental, and methodological papers as well as case studies, prototype evaluations and applications.

## Topic 10: Cyberspace Challenges

Operating in a contested Cyberspace presents a unique set of C2-related challenges. These include developing appropriate cyberspace situation awareness, understanding the implications of loss, interruption, or compromise of the cyber-related capabilities that support C2, and C2 of cyberspace operations.

Should you find that your proposed submission does not easily fit into any of these areas or cuts across areas, please contact us at [iccrts@internationalc2institute.org](mailto:iccrts@internationalc2institute.org) or further guidance regarding your submission.

## Submission, Review and Acceptance Process

***All submissions shall be reviewed and feedback provided on an on-going basis.  
Early submissions are encouraged.***

Thank you for your interest in contributing to the 23rd ICCRTS. If accepted, your professional paper will be posted on the International C2 Institute's C2 and Cyber Research Portal ([www.internationalc2institute.org](http://www.internationalc2institute.org)) where ICCRTS archives can also be found.

## Submission Platform

As was the case last year, ICCRTS will use EasyChair to manage all submissions (technical papers, concepts papers, demonstrations, submissions, product presentations). Authors need to first create a free EasyChair account and then will be directed to the submissions page.

EasyChair sign up and abstract submission instructions can be on the IC2I Website ([www.internationalc2institute.org](http://www.internationalc2institute.org)) by going to **23<sup>rd</sup> ICCTRS Information Central**

If you have any problems, please contact us at: [info@internationalc2institute.org](mailto:info@internationalc2institute.org) The link to the 23<sup>rd</sup> ICCRTS (2018) section of EasyChair is:

**<https://easychair.org/conferences/?conf=23rdiccrts>**

## Types of Submissions

Submission requirements, criteria for acceptance, and key dates are different for each type of submission:

- Technical Papers – professional journal quality; reporting on research and analysis efforts
- Concept Papers – short paper outlining work-in-progress, an idea, or research proposal designed to solicit feedback and/or stimulate discussion
- Tutorial Presentations – primers on C2-related concepts, theory, and practices
- Demonstrations –hands-on exposure to a tool or capability
- Product Presentations – discussion of capabilities and evidence of operational effectiveness

## Key Dates

	Technical Paper	Concept Paper	Tutorial	Demonstration	Product Presentation
Last date to submit Technical Paper Abstracts	15 MAR 18	n/a	n/a	n/a	n/a
Feedback on Abstracts to be provided by	15 APR 18	n/a	n/a	n/a	n/a
Last date to provide submissions	15 MAY 18	1 JUL 18	1 JUL 18	1 JUL 18	1 JUL 18
Feedback / Decision on submissions to be provided by	15 JUN 18	15 JUL 18	1 AUG	1 AUG 18	1 AUG 18
Last date for Final submissions	15 JUL 18	15 AUG 18	1 SEP 18	1 SEP 18	1 SEP 18
Decisions regarding Final submissions to be provided by (if not previously accepted without revisions)	15 AUG 18	1 SEP 18	15 SEP 18	15 SEP 18	15 SEP 18
Last date to submit presentations	15 OCT 18				

*The submission process is different for the different types of submissions. Please pay careful attention to the requirements for the type of submission.*

## Submission Process for Technical Papers

All Technical Paper submissions require the submission of an abstract.

Step 1: Identify the main topic of your paper. If it does not neatly fit into one of the topics in the Call for Papers, pick the topic that you feel is the best fit.

Step 2: Provide information about all authors (affiliations and complete addresses) and identify those that the submission correspondence will be sent to (corresponding author(s)).

Step 3: The title and abstract of your paper should be entered as plain text and three keywords for the abstract must be provided. Abstracts should be no longer than 250 words.

Step 4: If you want to submit the full paper at this time, you can upload it in the “Uploads” section of the EasyChair website.

Step 5: If, after a review of your abstract (see acceptance criteria below), it is determined that your paper is appropriate for ICCRTS, you will be invited to submit a draft of the paper for peer review. Some of these invitations will include suggestions that are designed to improve your paper and increase the probability that it will be accepted.

Step 6: Submit a draft paper for peer review. Please provide a cover sheet with your paper. This sheet should contain the name of the symposium, the topic of your paper, the title of your submission and author(s) information (affiliations and complete addresses). Please refrain from using ALL CAPS. If your paper contains multiple authors, the agency that each person is affiliated with must appear with their name.

Open the paper beginning with an abstract paragraph. Abstracts should be no longer than 250 words. If this abstract is not the same as the one provided during the abstract submission step, please update the plain text abstract window on the EasyChair website accordingly.

Only PDF format will be accepted. Paper page limit is 20 pages (not including appendices, endnotes, or references). There is no fixed template for the paper; however you must ensure that all text is legible.

When reporting any set of statistical results, make sure that any data used are fully reported (central tendency, distribution, number of cases in the analysis, confidence intervals, etc.). These may be presented in the body of the paper, or in an appendix.

When reporting experimental results, you must provide sufficient information to permit the experiment to be repeated, as per accepted scientific method. This means providing an overview of the experimental design (within-subject, between-subject, Latin square, etc.), describing statistical processing methods used (ANOVA, Regression Analysis, etc.), the measure of statistical

validity for any conclusions you draw (in the body of the paper), and the implications of your conclusions. Any statement on statistical validity must be contained in the body of the paper.

References can be acknowledged as footnotes throughout the text, or as a list at the end of your document.

Step 7: You will receive peer review feedback on your paper (see Technical Paper Acceptance Criteria below). At this time, your paper will be Accepted with or without suggestions for improvement (go to Step 10; Conditionally Accepted provided you revised in accordance with reviewer feedback (go to Step 8); Accepted as a Concept Paper (go to Step 10) ; or Rejected.

Step 8: For Conditionally Accepted Papers, submit a revised paper that incorporates reviewers' feedback.

Step 9: You will receive peer review feedback on your revised paper. At this time your paper will be Accepted as a Technical Paper or Accepted as a Concept Paper.

Step 10: Provide your presentation slides.

#### Technical Paper Acceptance Criteria

The following criteria will be used by track chairs, peer reviewers, and symposium staff in their review process:

- The paper is appropriate for the theme and topics of Symposium.
- The paper is intellectually stimulating.
- The literature review is adequate/appropriate.
- The research design is adequate/appropriate.
- The data analysis is adequate/appropriate.
- The conclusions are reasonable.
- The paper advances the state of knowledge.
- The paper is logical and consistent.
- The paper's argument is persuasive.
- The writing is clear and readable.

Technical Papers will not be accepted if:

- Topics stray from the conceptual focus of the Symposium.
- Attempts are made to promote or sell specific goods and/or services.
- Claims are unsubstantiated or facts are inaccurate.
- Scientific merit is lacking.
- Writing/explanations are poor.



## Submission Process for Concept Papers

Concept Paper submissions do not require an abstract.

Step 1: Identify the main topic of your paper. If it does not neatly fit into one of the topics in the Call for Papers, pick the topic that you feel is the best fit.

Step 2: Provide information about all authors (affiliations and complete addresses) and identify those that the submission correspondence will be sent to (corresponding author(s)).

Step 3: The title and abstract of your paper should be entered as plain text and three keywords for the abstract must be provided. Abstracts should be no longer than 250 words.

Step 4: Submit the Concept Paper by uploading it in the “Uploads” section of the EasyChair website.

Step 5: You will receive peer review feedback on your Concept Paper (see Concept Paper Acceptance Criteria below). At this time, your Concept Paper will be Accepted (with or without suggestions for improvement) or Rejected.

Step 6: You may submit an updated version of your Paper.

Step 7: Provide your presentation slides.

### Concept Paper Acceptance Criteria

The following criteria will be used by track chairs, peer reviewers, and symposium staff in their review process:

- The paper is appropriate for the theme and topics of Symposium.
- The paper is intellectually stimulating.
- The arguments are reasonable.
- The writing is clear and readable.

Concept Papers will not be accepted if:

- Topics stray from the conceptual focus of the Symposium.
- Attempts are made to promote or sell specific goods and/or services.
- Claims are unsubstantiated or facts are inaccurate.
- Scientific merit is lacking.
- Writing/explanations are poor.

## Submission Process for Tutorials

Step 1: Do not use EasyChair for Tutorial submissions. Provide the following information in an email to [info@internationalc2insititue.org](mailto:info@internationalc2insititue.org)

1. Tutorial Title
2. 250 words description of tutorial objectives and intended audience
3. Presenter Name, affiliation, and contact information
4. Short Bio with qualifications of presenter
5. Tutorial Outline with read-ahead material (if any)

Step 2: You will receive feedback on your proposed Tutorial Session. At this time, your tutorial will be Accepted (go to Step 5); Conditionally Accepted subject to revisions specified; or Rejected.

Step 3: Submit revised tutorial proposal.

Step 4: You will receive feedback regarding your revised proposal. At this time your tutorial will be Accepted or Rejected.

Step 5: Provide your Presentation Slides and any read-ahead specifications.

## Submission Process for Demonstrations

All demonstrations must have a government Sponsor.

Step 1: Do not use EasyChair for Demonstration submissions. Provide the following information in an email to [info@internationalc2insititue.org](mailto:info@internationalc2insititue.org)

1. Demonstration Title
2. 250 words description of the nature of the demonstration and intended audience
3. Presenter Name(s), affiliation(s), and contact information
4. Description of the Demonstration

Step 2: You will receive feedback on your proposed Demonstration Session. At this time, your Demonstration will be Accepted (go to Step 5); Conditionally Accepted subject to revisions specified; or Rejected.

Step 3: Submit revised Demonstration proposal.

Step 4: You will receive feedback regarding your revised proposal. At this time your Demonstration will be Accepted or Rejected.

## Submission Process for Product Presentations

Step 1: Do not use EasyChair for Product Presentation submissions. Provide the following information in an email to [info@internationalc2insititue.org](mailto:info@internationalc2insititue.org)

1. Product Title
2. 250 words description of the nature of the product and its intended users
3. Presenter Name(s), affiliation(s), and contract information
4. Description of the Product's Technical Capabilities, limitations, Users
5. A description of the evidence that the product has value

Step 2: You will receive feedback on your proposed Product Presentation (see Product Demonstration Acceptance Criteria below). At this time, your Product Presentation will be Accepted (go to Step 5); Conditionally Accepted subject to revisions specified; or Rejected.

Step 3: Submit revised Product Presentation information.

Step 4: You will receive feedback regarding your revised proposal. At this time your Product Presentation will be Accepted or Rejected.

### Product Presentation Acceptance Criteria

The following criteria will be used in the review process:

- The Product Presentation is appropriate for the theme and topics of Symposium.
- The value of the product to the User community is clearly articulated and makes sense
- The technical aspects are clearly explained.
- The case arguments are reasonable.
- The writing is clear and readable.

Product Presentation will not be accepted if:

- Attempts are made to promote or sell specific goods and/or services.
- Claims are unsubstantiated or facts are inaccurate.
- Scientific merit is lacking.
- Writing/explanations are poor.

## Public Release of the Information

The ICCRTS is an open, unclassified, international meeting with many nations present. Authors are responsible for ensuring that papers are unclassified for public release and should not present sensitive material. Papers and presentation material presented at the conference will be posted to the CCRP site for public use. For this reason, proprietary information should be avoided in all ICCRTS submissions: abstracts, papers, and presentations. All ICCRTS papers and presentations must be unclassified, and any potentially sensitive material removed. Multiple versions will not be accepted.

## Copyrights

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## Inquiries

Please continue to monitor the conference website at: [www.internationalc2institute.org](http://www.internationalc2institute.org) for updates and the latest information. If you have any questions about the preparation or