

# E-CARGO and Role-based Collaboration

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## **ABSTRACT**

Role-Based Collaboration (RBC) is a computational methodology that uses roles as the primary underlying mechanism to facilitate collaboration activities. It consists of a set of concepts, principles, models, processes, and algorithms.

RBC and its Environments - Classes, Agents, Roles, Groups, and Objects (E-CARGO) model have been developed to a powerful tool for investigating collaboration and complex systems. Related research has brought and will bring in exciting improvements to the development, evaluation, and management of systems including collaboration, services, clouds, productions, and administration systems. RBC and E-CARGO grow gradually into a strong fundamental methodology and model for exploring solutions to problems of complex systems including Collective Intelligence, Sensor Networking, Scheduling, Smart Cities, Internet of Things, Cyber-Physical Systems, and Social Simulation Systems.

E-CARGO assists scientists and engineering to formalize abstract problems, which originally are taken as complex problems, and finally points out solutions to such problems including programming. The E-CARGO model possesses all the preferred properties of a computational model. It has been verified by formalizing and solving significant problems in collaboration and complex systems, e.g., Group Role Assignment (GRA). With the help of E-CARGO, the methodology of RBC can be applied to solve various real-world problems. E-CARGO itself can be extended to formalize abstract problems as innovative investigations in research. On the other hand, the details of E-CARGO components are still open for renovations for specific fields to make the model easily applied. For example, in programming, we need to specify the primitive elements for each component of E-CARGO. When these primitive elements are well-specified, a new type of modelling/programming language can be developed and applied to solve general problems with software design and implementations.

In this talk, the speaker examines the requirement of research on collaboration systems and technologies, discusses RBC and its model E-CARGO; reviews the related research achievements on RBC and E-CARGO in the past years; illustrates those problems that have not yet been solved satisfactorily; presents the fundamental methods to conduct research related to RBC and E-CRAGO and discover related problems; and analyzes their connections with other cutting-edge fields. This talk aims to inform the audience that E-CARGO is a well-developed model and has been investigated and applied in many ways. The speaker welcomes queries, reviews, studies, applications, and criticisms.

As case studies of E-CARGO, GRA and its related problem models are inspired by delving into the details of the E-CARGO components and the RBC process. GRA can help solve related collaboration problems with the help of programming and optimization platforms. All the related Java codes can be downloaded by GitHub: <https://github.com/haibinnipissing/E-CARGO-Codes>. The speaker welcomes interested researchers and practitioners to use these codes in their research and practice and contact the speaker if there are any questions about them.

**Keywords:** Collaboration, Methodology, Model, E-CARGO, Role-Based Collaboration, Object, Agent, Role.

## **Audience**

Decision-makers, researchers, practitioners, graduate and senior students of computer science, computer engineering, information systems, systems engineering, industrial engineering, management, and computational economics and social science.



**Dr. Haibin Zhu** is a Full Professor and the Coordinator of the Computer Science Program, the Founding Director of the Collaborative Systems Laboratory, a member of Arts and Science Executive Committee, Nipissing University, Canada. He is an affiliate professor of Concordia Univ. and an adjunct professor of Laurentian Univ., Canada. He received his PhD degree in computer science from the National Univ. of Defense Tech. (NUDT), China. He was the chair of the Department of Computer Science and Mathematics, Nipissing University, Canada (2019-2021), a visiting professor and special lecturer in the College of Computing Sciences, New Jersey Institute of Technology, USA (1999-2002) and a lecturer, an associate professor and a full professor at NUDT (1988-2000). He has accomplished (published or in press) over 280+ research works including 49 IEEE Transactions articles, six books, five book chapters, four journal issues, and four conference proceedings. He is a fellow of *I2CICC* (International Institute of Cognitive Informatics and Cognitive Computing), a senior member of *IEEE*, a senior member of *ACM*, a full member of *Sigma Xi*, and a life member of *CAST-USA* (Chinese Association of Science and Technology, USA).

He is serving as Vice President, Systems Science and Engineering (SSE) (2023-), a member-at-large of the Board of Governors (2022-), and a co-chair (2006-) of the technical committee of *Distributed Intelligent Systems* of *IEEE Systems, Man and Cybernetics (SMC) Society (SMCS)*, SMCS Primary Representative, *IEEE Systems Council*, Editor-in-Chief of *IEEE SMC Magazine* (2022), Associate Editor (AE) of *IEEE Transactions on SMC: Systems* (2018-), *IEEE Transactions on Computational Social Systems* (2018-), *Frontiers of Computer Science* (2021-), and *IEEE Canada Review* (2017-). He was AE of *IEEE SMC Magazine* (2015-2021), Associate Vice President (AVP), SSE (2021), IEEE SMCS, a Conference (Co-)Chair and Program (Co-)Chair for many international conferences, and a PC member for 150+ academic conferences.

He is the founding researcher of *Role-Based Collaboration* and the creator of *the E-CARGO model*. His research monograph *E-CARGO and Role-Based Collaboration* can be found <https://www.wiley-vch.de/en/areas-interest/engineering/electrical-electronics-engineering-10ee/systems-engineering-management-10ee9/e-cargo-and-role-based-collaboration-978-1-119-69306-2>. The accompanying codes can be downloaded from GitHub: <https://github.com/haibinnipissing/E-CARGO-Codes>. He has offered 30+ keynote and plenary speeches for international conferences and 80+ invited talks internationally. His research has been being sponsored by NSERC, IBM, DNDC, DRDC, and OPIC.

He is listed as “Most Influential Robotics Trailblazers, Making Wave in The Industry – 2024”, *InsightsSuccess Magazine*, the recipient of the best paper award in international collaboration from the 25<sup>th</sup> Int’l conf. on CSCWD, Hangzhou, China, 2022, the meritorious service award from IEEE SMC Society (2018), the chancellor’s award for excellence in research (2011) and two research achievement awards from Nipissing University (2006, 2012), the IBM Eclipse Innovation Grant Awards (2004, 2005), the Best Paper Award from the 11th ISPE Int’l Conf. on Concurrent Engineering (ISPE/CE2004), the Educator’s Fellowship of OOPSLA’03, a 2<sup>nd</sup> class National Award for Education Achievement (1997), and three 1<sup>st</sup> Class Ministerial Research Achievement Awards from China (1997, 1994, and 1991).

His research interests include Collaboration/Complex Systems, Human-Machine Systems, Computational Social Systems, Collective Intelligence, Multi-Agent Systems, Software Engineering, and Distributed Intelligent Systems.