INFORMATION-CENTRIC NETWORKING


BI Jun


Luca Muscariello


ZHANG Beichuan

Information-Centric Networking (ICN) is an emerging direction in Future Internet architecture research, gaining significant tractions among academia and industry. Aiming to replace the conventional host-to-host communication model by a data-centric model, ICN treats data content as the first class entity in network architecture. It not only brings benefits in application development, content distribution and security, but also challenges in almost every front of networking.

Over the last few years many research efforts in ICN have been carried out and made significant advances in the design, evaluation, and understanding of ICN architectures. A global research and development community for ICN has been formed, and a number of specific architectural proposals have been formulated.

Focusing on the development of ICN, this Special Topic Issue contains a collection of papers on Information-Centric Networking architecture topics, specific algorithms and protocols, as well as results from implementations and experimentation.In particular, this Special Topic Issuecontains a collectionof papers that will provide both the oretical advances andpractical experiences for ICN. We received 16 manuscripts in response to our call for papers, and we have accepted 4 papers for this Special Topic Issue.

In addition to call for papers, the journal also invited an ICN survey paper, "*A Survey on Information-Centric Networking: Rationales, Designs and Debates*", by JIANG Xiaoke *et al*.,. Unlike previous ICN survey papers, this paper first discusses the rationales and motivations of ICN (Information Centric Networking), then reveals three fundamental functions of ICN: Naming the content, retrieving the content, and securing the content. After briefly intruding and comparing different design choices adopted by major ICN proposals, this paper presents the most debatable topics in ICN, including naming structure and caching location.

The second article, "*Exploring Content Popularity in Information-Centric Networks*", is authored by Andriana Ioannou *et al*., presents that the demployment of caches maybe accomplished using content-based criteria - content popularity. To achieve this goal, the authors propose four dynamic algorithms that calculate content popularity on per chunk basis and per object basis. Based on the evaluation results, chunk-based approaches provide more accurate content popularity calculations than object based approaches.

The third article, "*Caching Algorithm with a Novel Cost Model to Deliver Content and its Interest over Content Centric Networks*", by SU Zhou, *et al*., studies how to design an efficient caching algorithm to deliver both the content and the corresponding interest in information centric networks. In particular, a novel cost model is developed according to the characteristics of content centric distribution, content store, and pending interest table. Simulation results prove that the proposal can outperform the conventional methods where the resources of information centric networks can be efficiently used.

The fourth article, "*Design and Implementation of Not So Cooperative Caching System*", by HU Xiaoyan, *et al*.,

examines the in-network caching problem from a new, interesting angle. The premise is that caching nodes are self and rational; they will cooperate in caching for each other if and only if they can benefit from this cooperation, which is realistic across ISPs but haven't received any attention in past research. This paper presents a solution to this "no-so-cooperative caching" problem with implementation and testbed deployment.

The last article, "G*eometric Name Routing for ICN in Dynamic World*", by SUN Yanbin *et. al*., presents an important improvement to routing on flat data names. A recently proposed routing scheme is to combine Geometric Routing, which is coordinate-based greedy routing, with Distributed Hash Table (DHT) to achieve better scalability. This paper proposes novel techniques that make the geometric routing and DHT system be able to handle topology changes without wide-spread changes to the network.

Biographies

BI Jun, received his BS, CS, and Ph.D. degrees in Dept. of Computer Science and Technology at Tsinghua University. He was a postdoctoral scholar at Bell Laboratories Research and a research scientist at Bell Labs, USA. Currently, he is a full professor and director of Network Architecture & IPv6 Research Division, Institute for Network Sciences and Cyberspace at Tsinghua University. His current research interests include Internet Architecture and Protocols. He is the leading expert (PI) of a major Future Network project supported by China "863" High-tech program: Future Network architecture and INnovation Environment (FINE). He is co-chair of AsiaFI (Asia Future Internet Forum) Steering Group. He served as TPC Co-Chair of ACM SIGCOMM sponsored International Conference on Future Internet, and Co-Chairs of a number of Future Internet related workshops/Tracks at INFOCOM, ICNP, MobiHoc, and ICCCN, especially the Co-Chair of INFOCOM NOM (Named Oriented Mobility) Workshop. He served on Organization Committee or Technical Program Committees of SIGCOMM, ICNP, INFOCOM, CoNEXT, etc. He is a senior member of IEEE, a senior member of ACM, a distinguished member of CCF (China Computer Federation), and a senior member of CIC (China Institute of Communications)

Luca Muscariello, received his Master of Science and Ph.D in communicationengineering from the Politecnicodi Torino, Italy. His graduate research has been performed at Politecnico in Italy, France Telecom R&D in France and VTT in Finland on traffic measurements, characterization and modeling. He is currently a senior research scientist at OrangeLabs Networks as expert on future networks with major focus on information-centric networking. He works at Orange on various aspects of innovations including in-network caching, latency reduction and congestion control in FTTH and LTE networks as well as network traffic engineering. He is also research associate at the French national institute for technological research SystemXand a permanent member of the LINCS laboratory in Paris where he coordinates research on information-centric networking. He was TPC co-chairof ACM Value Tools 2013, TPC co-chair of ACM SIGCOMM ICN 2014and general co-chair of ACM SIGCOMM ICN 2014. He is a member ofthe ACM and a senior member of the IEEE and SEE.

ZHANG Beichuan, is an Associate Professor in the Department of Computer Scienceat the University of Arizona. His research interest is in Internet routingarchitectures and protocols. He has been working on Named Data Networking, greennetworking, inter-domain routing, and overlay multicast. He received the firstApplied Networking Research Prize in 2011 awarded by ISOC and IRTF, and the best paperawards at IWQoS in 2014 and IEEE ICDCS in 2005. Dr. Zhang received Ph.D. from UCLA (2003) and B.S. from Peking University (1995). He is a member of ACM and IEEE.