Alternatives to TCP/IP

Abstract: The goal of the tutorial is to provide the audience with an introduction to the concepts, motivation and state of the art of the Recursive InterNetwork Architecture (RINA)[1], one of the most promising alternatives to TCP/IP. This tutorial is split into two parts: the first one will be dedicated to the theory and concepts behind RINA, while the second will explain real-world use cases that motivate its deployment and introduce the RINA stack under development by the FP7 IRATI and PRISTINE projects. To conclude the session a live demonstration of the IRATI prototype will be carried out.

The first part will start by exploring the lessons to be learned from the past. Most of the shortcomings of the Internet architecture stem from early design decisions that were made at the infancy of computer networking. The talk will briefly examine these decisions and their consequences for today's Internet. The tutorial will proceed with an introduction to RINA, guiding the audience through the concepts and theoretical underpinnings of RINA. It will start with an overview of the architecture, explaining how recursion generalizes to all forms of distributed computing. The talk will then analyze how RINA deals with naming and addressing, routing, data transfer, flow allocation, security and network management. The first part will conclude looking at other alternatives to TCP/IP and analyzing how they compare to RINA.

The second part will initially focus on RINA deployment considerations. The goal of this initial talk is to provide answers to the questions of "how can RINA be deployed?" by introducing a few scenarios that motivate RINA adoption. The lecture will also address some of the different ways in which RINA could be seamlessly deployed interoperating with the current systems and technologies. Having examined deployment scenarios, it will be time to concentrate on implementation strategies. RINA can be implemented in multiple ways for different target hardware platforms in a variety of operating environments. This tutorial will mainly focus on the RINA implementation of the IRATI[2] project, currently also being extended by the PRISTINE[3] project. It will give an overview of the software architecture and design decisions, glancing at the engineering problems and solutions applied to provide the first full-fledged RINA prototype. The last lecture will be devoted to presenting and explaining the various experiments that the IRATI project has been carrying out with the RINA prototype using the infrastructure provided by the OFELIA[4] project.

Presenters:
John Day, Boston University (USA)
Lou Chitkushev, Boston University (USA)
Eduard Grasa, Fundacio i2CAT (Spain)
Francesco Salvestrini, Nextworks (Italy)
Dimitri Staessens, iMinds (Belgium)

John Day is an adjunct professor in the Computer Science Department at Boston University Metropolitan College. He has been involved in research and development of computer networks since 1970 when he was involved in the design of transport and upper layer protocols for the ARPANET as well as the Internet. Mr. Day has developed and designed protocols for everything from the data link layer to the application layer. Mr. Day was in charge of the development of the OSI Reference Model, Naming and Addressing and a major contributor to the upper layer architecture and was a member of the Internet Research Task Force's Namespace Research Group. He has been a major contributor to the development of Network Management Architecture, working in the area since 1984 defining the fundamental architecture currently prevalent and designing high performance implementations, and fielded a network management system in the mid-80's that was 10 years ahead of comparable systems. Recently Mr. Day has been turning his attention to radically new network architectures that scale indefinitely and described in his book Patterns in Network Architecture: A Return to Fundamentals.

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[1] http://rina.tssg.org, http://csr.bu.edu/rina, http://irati.eu/education
[2] http://irati.eu
[3] http://ict-pristine.eu
[4] http://www.fp7-ofelia.eu

Mr. Day has been giving lectures on networking for 35 years. The first course he taught on networking was at UIUC (University of Illinois at Urbana-Champaign) in 1980. Prof. Day currently teaches networking and Operating Systems at Boston University and has been doing so for the past 8 years. He has given numerous talks at conferences and companies around the world on subjects ranging from networking to the cartography of 17thC China. He is a IEEE SeniorMember.

Lou Chitkushev is associate professor of computer science and associate dean at Boston University Metropolitan College, where he served as a Chairman of the Computer Science Department from 2006 until 2013. He is a co-founder and a Co-Director of the Center for Reliable Information Systems and Cyber Security (RISCS) at Boston University which promotes and coordinates research on reliable and secure computational systems and infrastructure and information assurance education. He is a founding member of the RINA Laboratory at Boston University and has been part of the RINA research team focusing on network security. Prof. Chitkushev was part of the team which established Boston University as a National Center of Academic Excellence in Information Assurance Education and Research by the National Security Agency and US Department of Homeland Security. Throughout his career Dr. Chitkushev has taught and made academic contributions in the areas of data communications, advanced Internet technologies, medical informatics, and network security. He has served on international telecom standard bodies and has been a review panelist for the NSF.

Prof. Lou Chitkushev has been teaching for more than two decades in the areas on data communication, computer networks and information security. He has developed and directed graduate programs in Telecommunications and Information Security at Boston University.

Eduard Grasa is a graduate in Telecommunication Engineering of the Technical University of Catalonia (UPC, July 2004) and Ph.D. (UPC, February 2009). In 2003 he joined the Optical Communications Group (GCO), where he did his thesis on software architectures for the management of virtual networks in collaboration with i2CAT, which he joined in 2008. He has participated in several national and international research projects, including UCLP, HULP, FP6 PHOSPHORUS, FP7 FEDERICA, FP7 OFELIA, DREAMS, HPDMnet, IaaS Framework. His current interests are focused on the Recursive Internetwork Architecture (RINA), a clean-slate internetwork architecture proposed by John Day. Dr. Grasa is nowadays leading the RINA team at the Distributed Applications and Networks Area (DANA) of i2CAT. He is currently the

technical lead of the FP7 IRATI project, where a RINA prototype for Linux over Ethernet is being researched; and also the technical lead of the FP7 PRISTINE project.

Dr. Eduard Grasa has spoken about his work at around 10 international events such as iGrid 2005, the TERENA Networking Conference 2007, 2009, 2011, ONDM 2008, WWIC 2011, CFI 2012, GFI 2012 and the two international RINA workshops in 2013 and 2014.

Francesco Salvestrini, a technical leader at Nextworks, graduated in Computer Engineering at the University of Pisa, Italy, in 2001. He has been involved in consultancy activities for major industrial customers with main focus on the design and development of high-performance embedded carrier grade systems. He designed and developed solutions for: Marconi Communications, Marconi Selex, Marconi OTE, Alcatel, Ericsson and Juniper. He has experience in designing and developing system software and network protocols for carrier-grade equipments in embedded real-time multitasking environments. His past research activities focused on IP-QoS/MPLS architectures. He participated in several FP5, FP6 and FP7 projects (MOICANE, PHOSPHORUS, GEYSERS, CHANGE) and his current research activities cover the Software Defined Networking (SDN), Network Functions Virtualization (NFV) and future network architectures. Mr. Salvestrini is currently leading the software design and implementation activities of the FP7 IRATI project, as well as the FP7 RINA Software Development Kit work in PRISTINE.

Francesco Salvestrini has been a presenter at the RINA Workshop 2014 and at the Software Defined Networks for Future Networks and Services 2013. He has also given specialized lectures on IP architectures and network protocols to network operators (Wind) and equipment vendors (Ericsson, NSN/Technolabs, Alcatel Lucent).

Dimitri Staessens received his M.Sc. Degree in numerical computer science in 2004 from Ghent University, Belgium and finished a PhD on survivability aspects of optical networks in 2012. This was performed in European projects such as NOBEL, DICONET and NoE's e-photon/One and BONE. His current interests are in the control and management of networks, Software Defined Networking and future network architectures funded through FP7 SPARC, Cityflow, IRATI and PRISTINE. Dr. Staessens has presented his work at over 20 international events including conferences such as IEEE ICC, ECOC, OFC and workshops such as RNDM, DRCN, LANMAN and IEEE ANTS. He has also assisted Lab Sessions in Discrete Mathematics at Ghent University (2006-2010).