

Title: Laying the groundwork for field trials of RINA in the EU

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Keywords: Recursive InterNetwork Architecture, Network Programmability, Networks Functions Virtualization

Session format: Presentations

Session objectives: Update on the state-of-the-art in RINA theory, prototypes, and immediate application areas

Abstract:

Some of the challenges faced by network service providers stem from early design and implementation decisions made at the infancy of data communications. Due to its groundbreaking potential, the Internet exploded from a small lab experiment to a full-scale production research network within a couple of years. Some opportunities for including key research results at crucial stages were abandoned in favor of fast global deployment. RINA, the Recursive InterNetwork Architecture, is an attempt at network design drawing from the experiences from 40 years of TCP/IP deployment, building on the premise that “Networking is IPC and IPC only” [1][2].

This session complements the keynote talk by John Day, providing updates on the research efforts funded by the European Commission through the final call in the Seventh Framework Programme (FP7) (IRATI and PRISTINE) and the Geant 3 plus(IRINA) project.

The IRATI project (01/2013-12/2014) Investigated RINA as an alternative to TCP/IP, focusing on a datacenter deployment, evaluating the simplifications that RINA promises for application mobility between physical infrastructures. In order to achieve this, an ambitious prototyping effort was undertaken, implementing a RINA stack in OS/Linux [3]. This talk will present an

overview of the overall software architecture and the partitioning of components between user-space and kernel space (Data transfer, data transfer control and shim IPC Processes), the librina framework which abstracts out the kernel functionalities and the user space daemons: the IPC Process and the IPC Manager.

Another use case for RINA, focusing on the challenges faced by NRENs was investigated in the GN3+ Open Call IRINA project (10/2013-03/2015). Incorporating the results from a brief survey among NRENs, the project's use case was developed focusing on three aspects: the network topology comprising of the NREN networks interconnected via the GEANT backbone, the services currently deployed on these networks and the impact of future requirements over the selected services. The IRINA use case involves the simulation of three different NREN types (a Large NREN based on RENATER, a medium NREN based on RoEduNet2 and a small NREN based on AMRES) and three different services (i.e. HD Video conferencing (based on RENATER SeeVogh/RMS), point to point VPN services and Cloud storage (based on SURFDrive+). The final experimental results from both the IRATI and IRINA projects will be presented.

The PRISTINE project (01/2014-06/2016) sees virtualization as a fundamental attribute of the architecture itself. PRISTINE intends to design and implement the innovative internals of this clean-slate architecture that include programmable functions for security of content and application processes, supporting QoS and congestion control in aggregated levels, providing protection and resilience, facilitating more efficient topological routing, and multi-layer management for handling configuration, performance and security. It aims to demonstrate the applicability and benefits of this approach and its built-in functions in three use-cases driven by service and distributed cloud providers, investigating how programmable networking requirements from the SDN, NFV and, more recently, SFC (Service Function Chaining) efforts, which increase competitiveness in the ISP ecosystem, can be fulfilled in the RINA architecture. This will ensure that the applications and tools developed by PRISTINE will be deployable in field trials.

Acknowledgements:

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References:

- [1] John Day, *Patterns in network architecture: A return to fundamentals 2007*, Pearson Education
- [2] John Day, Ibrahim Matta, Karim Mattar, *Networking is IPC: A Guiding Principle to a Better Internet*, Proceedings of the 2008 ACM CoNEXT Conference, 2008

[3] Sander Vrijders, Dimitri Staessens, Didier Colle, Francesco Salvestrini, Eduard Grasa, Miquel Tarzan, Leonardo Bergesio, *Prototyping the Recursive InterNet Architecture: The IRATI project approach*, IEEE network, March 2014

[4] <http://irati.eu>

[5] <http://www.geant.net/opencall/>

[6] <http://www.ict-pristine.eu>

proposed speakers:

Investigating RINA as an alternative to TCP/IP	Eduard Grasa, i2CAT	15'
Prototyping RINA for OS/Linux	Francesco Salvestrini, NeXtworks	20'
Investigating RINA as the next generation NREN and GEANT architecture	Dimitri Staessens, iMinds	05'
Experimental evaluation of RINA for datacenter and NREN environments	Dimitri Staessens, iMinds	20'
Programmable networking using RINA	Miguel Ponce de Leon, WIT-TSSG	15'
An ISP perspective on RINA	Diego Lopez, Telefonica I&D	15'

Vitae:

Miguel Ponce de Leon (WIT-TSSG) has participated in over 30 national & international research projects, and has authored papers in future networking, communication network management, Smart Grid & Living Labs. Currently Miguel is coordinator of the ICT PRISTINE project and has been primary investigator for the research projects ICTPanLabs II, ICT Perimeter, ICT OpenLab, ICT 4WARD, ICT EFIPSANS, ICT Autol, and FI PPP FINESCE. Miguel is also involved in commercialising research, most recently in innovating a new PaaS for realtime communications. Miguel has participated in standards activities, where he has been a representative to ETSI and TMForum, and on the Advisory Council of ISOC.

Eduard Grasa (Fundacio i2CAT) graduated in Telecommunication Engineering at the Technical University of Catalonia (UPC, July 2004) and got his Ph.D. (UPC, February 2009). In 2003 he joined the Optical Communications Group (GCO), where he did his thesis on virtual networks in collaboration with i2CAT, which he joined in 2008. He has participated in several international research projects such as OFELIA, FEDERICA or MANTYCHORE. His current interests are focused on the Recursive Internetwork Architecture (RINA). He is currently the technical lead of the FP7 IRATI and FP7 PRISTINE projects, researching and prototyping RINA.

Francesco Salvestrini (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. His past research activities focused on IP-QoS/MPLS architectures. He participated in several FP5, FP6 and FP7 projects (e.g. MOICANE, PHOSPHORUS, GEYSERS, CHANGE) and his current research activities cover the Software Defined Networking (SDN), Network Functions Virtualization (NFV) and future network architectures. He is currently leading the software design and implementation activities of the FP7 IRATI project, as well as the RINA Software Development Kit work in FP7 PRISTINE.

Dimitri Staessens, (Ghent University-iMinds) received his M.Sc. Degree in numerical computer science in 2004 from Ghent University, Belgium. Since 2005 he has been working at the "Internet Based Communications Networks and Services group" and finished a PhD on survivability of optical networks in 2012. This work led to over 30 publications and 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, where he is active in FP7-funded projects on RINA.

Diego Lopez (Telefonica I+D) joined Telefonica I+D in 2011 as a Senior Technology Expert on network middleware and services. He is in charge of the Technology Exploration activities within the GCTO Unit of Telefónica I+D. Before joining Telefónica he spent some years in the academic sector, dedicated to research on network service abstractions and the development

of APIs based on them. He is focused on network virtualization, infrastructural services, network management, new network architectures, and network security. Diego is participating in the ETSI ISG on Network Function Virtualization (chairing its Technical Steering Committee), the ONF, and the IETF WGs connected to these activities.