Deliverable-7.2

First stage dissemination and standardisation activities, report and plans

Deliverable Editor: Francesco Salvestrini, Nextworks (NXW)

Publication date:	27-October-2014
Deliverable Nature:	Report
Dissemination level (Confidentiality):	CO (Restricted to consortium)
Project acronym:	PRISTINE
Project full title:	Programmability In RINA for European supremacy of virTualised NEtworks
Website:	www.ict-pristine.eu
Keywords:	Dissemination, Standardisation, plan, report
Synopsis:	This deliverable provides the plans and detailed reports on the project' first stage dissemination and standardisation activities.

The research leading to these results has received funding from the European Community's Seventh Framework Programme for research, technological development and demonstration under Grant Agreement No. 619305.

Disclaimer

Abstract

This deliverable describes the project' first-stage works performed in Work Package WP7. It provides the initial plans and detailed reports on the dissemination (task T7.1) and standardisation (task T7.2) activities. The document is structured into two main sections: section 1 provides the dissemination plans and reports while section 2 presents the standardisation plans.

Table of Contents

Acronyms 5
1. Introduction 8
2. Dissemination 9
    2.1. Dissemination actions 10
3. Standardisation 23
    3.1. IRTF / IETF 23
    3.2. ETSI 25
    3.3. ISO 26
    3.4. Per-partner plans 26
4. References 28

Acronyms

CSA
Coordination and Support Action

DIF
Distributed IPC Facility

EAB
External Advisory Board

ETSI
European Telecommunications Standards Institute

FIRE
Future Internet Research and Experimentation

FIA
Future Internet Assemblies

FN
Future Network

IEC
International Electrotechnical Commission

IEEE
Institute of Electrical and Electronic Engineers

IETF
Internet Engineering Task Force

ICCRG
Internet Congestion Control Research Group

IG
Interest Group

IP
Internet Protocol

ISG
Industry Specification Group

ISO
International Organization for Standardization

IRTF
Internet Research Task Force

JTC
Joint Technical Committee

MoU
Memorandum of Understanding

NCRG
Network Complexity Research Group

NFV
Network Functions Virtualization

NFVRG
Network Functions Virtualization Research Group

NMRG
Network Management Research Group

PSOC
Pouzin Society

QoS
Quality of Service

R&D
Research and Development

RG
Research Group

RINA
Recursive InterNetwork Architecture

SDN
Software Defined Networking

SDO
Standards Development Organization

STREP
Specific Targeted Research Project

TCP
Transmission Control Protocol

UDP
User Datagram Protocol

VNF
Virtual Network Functions

VNRG

Virtual Networks RG

WG

Working Group

WP

Work Package

ZOOM

Zero-touch Orchestration, Operations and Management

1. Introduction

Given the immature nature of RINA, dissemination is the key measure for achieving impact for a project like PRISTINE, maximising exposure within the scientific, professional, standardisation communities and general public to foster interest in RINA. Therefore, a detailed and well-designed dissemination plan must be established, identifying the available communication media and the activities required to ensure that the project results reach the widest audience possible.

Regarding standardisation, PRISTINE will leverage the presence of key partners within Standards Development Organisations (SDOs) to raise awareness for the project and to introduce relevant project foreground when crossover of the technological development is possible. As part of its work, PRISTINE will also improve existing RINA specifications and contribute new ones in the areas of congestion control, resource allocation, routing, authentication, access control, encryption and management.

This document presents the project' initial plans and actions the partners agreed to follow in order to ensure that the aforementioned objectives can be achieved.

2. Dissemination

PRISTINE is an ambitious project that strives towards the development of new performance enhancing functions and protocols in a variety of research domains, which include: DIF congestion control, distributed resource allocation techniques, topological addressing and associated routing mechanisms, strategies for authentication and access control, distributed DIF internal security mechanisms, support of multi-homing for load balancing and failure recovery, and multi-layer management (i.e. DIF configuration, performance, and security management in multi-layer systems). Significant efforts within the project will be devoted to disseminate the results obtained, using the different media available, which are the matter of the following sections. The dissemination plan presented in this document aims at identifying and organising the relevant activities that would allow to achieve the highest visibility for the project results, maximum impact - at both European and global scale - and raise awareness about RINA among R&D communities, industry and relevant stakeholders.

The dissemination targets of PRISTINE include all sectors, institutions, organisations and individuals that are interested in the research carried out in PRISTINE, would contribute to its work, or that can affect or be affected by this research. Therefore, the target audience for the dissemination of project results is identified at the following levels:

- Corporate level. This is aimed at the industrial partners that will use the tangible project results within their companies across different sectors, as well as the industrial members of the External Advisory Board (EAB).
- Consortium level. Intra-consortium dissemination enables all project partners to use and expand the technologies and tools developed within the project.
- Special communities. This is targeted at Interest Groups (IGs) and stakeholders who are directly related with the project. These will be identified during the course of the project, but initially the following groups will be taken into consideration: datacenter operators, network service providers and distributed application providers that implement their own communication overlays (e.g. p2p applications, Skype, etc.). IG dissemination can provide a unique vehicle for project promotion and further exploitation.
- Wider level. This type of dissemination is addressed to the broader scientific R&D community, European/world Industry
- Wider public. Those who are interested and will benefit from the project.

2.1. Dissemination actions

In this section, the dissemination activities that are planned for PRISTINE as well as the overall dissemination strategy will be presented. In each of the following sub-sections, planned activities are described in detail.

2.1.1. Project logo and graphical identity

In the first weeks of the project, options regarding the project logo as well as the overall graphic identity were proposed to the partners and one of these was agreed; the choice has been presented as part of the deliverable D1.1. The project's web site, described in detail in deliverable D7.1, has been developed according to this identity. All the materials (i.e. templates for deliverables, presentations and documents linked to project communication) made available to the public as well as the materials presented to the European Commission will follow the agreed graphical identity.

2.1.2. Project brochure, leaflet and poster

A factsheet leaflet for the project was designed, presenting the project's overview, goals, expected outcomes, as well as the technical approach and the key issues that will be addressed. The factsheet leaflet is hosted on the EC site [pristine-leaflet].

The poster for the project has been designed, printed and made available through the PRISTINE web site [pristine-poster]. It includes the project's main information, structure, goals, and representative pictures. It is intended to be used as one of the media to advertise and at the same time present the project in conferences, workshops and meetings.

In addition, a 4-page project brochure is under preparation to be delivered in M12, at a date which will allow the inclusion of the first project outputs. It will be put online and printed for dissemination through project partners and on the occasion of events the project will contribute to.

2.1.3. Social networking

In order to improve the visibility of the research carried out, PRISTINE is making use of social networks. Thus, special accounts for the project in the Twitter [pristine-twitter] and Slideshare [pristine-slideshare] communities have been created. The project will use Twitter to post short messages relevant to the project's content, such as results and events, while it will use Slideshare to share presentations, tutorials and videos. Another social media that the project will make use of is its blog, which can be accessed from the project site [pristine-homepage], as already presented in deliverable D7.1.

2.1.4. Publications in conferences and journals

Project results, innovations, or any outcome deemed interesting for the networking research community will be submitted for publication in scientific peer-reviewed journals and conferences relevant to the topics of the research activity during the project. Live demonstrations in selected events will be specially sought, as a way to maximise the impact of the project work. Since this is a collaborative project, the submission of papers jointly written by project partners will be encouraged. Therefore, the partners plan to target the following well-known conferences and journals:

Table 1. Conferences

Name [a]	**Web site**	**Target audience** [b]
IEEE RNDM	http://www.rndm.pl/2015/index.html	Special communities, wider level
IEEE GLOBECOM	http://www.ieee-globecom.org/	Special communities, wider level
Network of the Future Conference	http://www.network-of-the-future.org/	Special communities, wider level
TERENA Networking Conference	https://tnc2015.terena.org/	Wider level
IEEE INFOCOM	http://infocom2015.ieee-infocom.org/	Special communities, wider level
ACM SIGCOMM	http://www.sigcomm.org/events/sigcomm-conference	Special communities, wider level
IFIP IEEE IM	http://im2015.ieee-im.org/	Special communities, wider level
IEEE NOMS	http://www.ieee-noms.org	Special communities, wider level

Name [a]	Web site	Target audience [b]
CNMS	http://www.cnsm-conf.org/	Special communities, wider level
HotNets Workshop	http://www.sigcomm.org/events/hotnets-workshop	Special communities, wider level
SDNFlex 2015	https://www.netsys2015.com/workshops-tutorials/sdnflex/	Special communities, wider level
ACSAC 2015: Annual Computer Security Applications Conference	https://www.acsac.org/	Special communities, wider level
ACM CCS 2015: 22nd ACM Conference on Computer and Communications Security	http://www.sigsac.org/ccs.html	Special communities, wider level
2015 SSP IEEE 36th Symposium on Security & Privacy	http://www.ieee-security.org/TC/SP2015/	Special communities, wider level

[a] Name of journal, conference, …

[b] Corporate level, consortium level, special communities, wider level

Table 2. Journals

Name [a]	Web site	Target audience [bb]
IEEE Network	http://www.comsoc.org/netmag	Wider level
Elsevier Computer Networks	http://www.journals.elsevier.com/computer-networks/	Wider level
IEEE Communications Magazine	http://www.comsoc.org/commag	Wider level
IEEE Communications letters	http://www.comsoc.org/cl	Wider level
Journal of the ACM	http://jacm.acm.org/	Wider level
IEEE Journal on Selected Areas in Communications	http://www.comsoc.org/jsac	Wider Level

Name [a]	Web site	Target audience [bb]
Future Generation Computer Systems	http://www.journals.elsevier.com/future-generation-computer-systems/	Wider level
Communications of the ACM	http://cacm.acm.org/	Wider level
Journal of Network and Systems Management	http://www.springer.com/computer/communication+networks/journal/10922	Wider level
Computer Communications	http://www.journals.elsevier.com/computer-communications/	Wider level
IEEE Transactions on Network and Service Management (TNSM)	http://www.comsoc.org/tnsm	Wider level
IEEE TNSM special issue "Efficient Management of SDN and NFV-based Systems	http://ieee-tnsm.org/index.html	Wider level
IEEE Comm. Magazine Network and Mgmt. series	http://www.comsoc.org/files/Publications/Magazines/ci/cfp/cfpcommagnetworkmanagementseries.html	Wider level

2.1.5. Submitted publications

The following sections report the publications submitted so far.

Article no. 1

Journal: IEEE Communications Magazine

Title: Security in RINA: authentication, access control and confidentiality in a multi-layer emerging recursive internetwork architecture

Submission: Oct. 1st 2014

Abstract:

Security in the current Internet has proven a complex topic often attributed to the fact that security was not a requirement in the Internet's original trusted environment. However, we argue that it is the fixed Internet's layering structure and proliferation of independently

designed but operationally interdependent protocols what makes Internet security so brittle. This paper discusses security aspects of RINA, the Recursive InterNetwork Architecture, an emerging network architecture that is based on i) having flexible layering, ii) providing maximum commonality in its structure and iii) achieving flexibility and adaptability through programmability of each layer's functions. The structural and functional properties of RINA make it inherently more secure than the current Internet. Existing techniques for authentication, authorization and confidentiality are sufficient to allow RINA to provide a foundation for distributed computing that is more secure, robust and less complex than the current Internet.

Article no. 2

Conference: IFIP IEEE IM

Title: The future of SDN: there is no network - and the two items still missing today

Submission: Oct 3rd 2014

Abstract:

Software Defined Networks (SDN) has taken the world by storm. Only a few years old as technology, most of the big players have SDN in their product portfolio or in their strategic roadmap. SDN has changed the way we virtualize the network fabric in data centers, provided new features for cloud computing, and arguably plays a big role in facilitating Network Function Virtualization (NFV). Looking ahead, SDN has the potential to make the network disappear altogether, similar to Mark Weiser's vision for computing. However, while SDN's main contribution is a new south-bound interface for TCP/IP flow control, little work has been done on the north-bound interface for the interaction with and the management of an SDN network. Two essential items are still missing. First, SDN does currently not provide means to expose network capabilities to applications (e.g. a QoS cube), thus it fails to bridge the gap between the network and services. Second, SDN does not help to advance network management while introducing many new challenges for it. In this paper, we start discussing the disappearing network and discuss how to address the two missing items in the progress. Our contribution is to examine the Recursive InterNetworking Architecture (RINA) as an evolutionary step for SDN, which we present in the form of three use cases.

2.1.6. Planned papers

The following sections report the submissions planned for the next 9 months.

ACM SIGCOMM 2015

Datacentre networking

The goal of the paper is to define the datacentre networking problem space, introduce how to address it with RINA and compare with current technological solutions using TCP/IP, network virtualization, SDN. It will be based on work from T2.1 and lead by ATOS.

Distributed Cloud

The goal of the paper is to define the general problem of constructing private network overlays on top of public layers - such as the Internet -, introduce Nexedi as the example use case and illustrate how it can be addressed with RINA. A comparison against other alternatives for overlay networking (current Nexedi's solution, other alternatives) will be made. The article will be based on work from T2.1, lead by Nexedi and i2CAT.

RINA Simulator

Deployment of new technologies should be always preceded by thorough validation, verification and testing phases. This paper will present current design of the PRISTINE' RINA Simulator, it will discuss the differences between RINA and TCP/IP stacks, and their impact on the computation systems. It will be based on work from T2.4 and lead by FIT-BUT.

IEEE TNSM special issue "Efficient Management of SDN and NFV-based Systems" or SDNFlex 2015

The publication will report the results of the NFV/Service chain use case, based on the work from T2.1 and it will be led by TID/BISDN.

Elsevier Computer Communications Journal

Paper (review/tutorial) with an overview of current RINA development status and PRISTINE research challenges. It will be based on work from T2.2 and lead by i2CAT.

SIGCOMM 2015, OSDI 2015

Network programmability paper, based on work from T2.3 and lead by Nextworks.

DRCN 2014, RNDM 2015

The paper will be based on the D4.1 contributions on high availability. It will describe the core architectural components needed for flow liveness, resilient routing and high-availability,

detailed descriptions of the policies involved and an evaluation of how the implementation of such solutions in RINA compares to their traditional deployment in IP networks. Based on D4.1, T4.3 and lead by iMinds/Nextworks.

ACSAC 2015, ACM CCS 2015, 2015 IEEE SSP

With ever increasing interconnectivity and emerging services and applications, there is a demand for much better security, resilience and protection that is being offered by the current Internet. RINA, the Recursive InterNetwork Architecture, is an emerging clean-slate programmable networking approach, entring on Inter-Process Communication (IPC) paradigm. In this paper, we elaborate on design and development of the innovative internals of RINA clean-slate architecture at the design level, focusing on the programmable functions for protection of content, application and IPC processes. Based on WP4 and lead by THALES.

CNSM 2015

This paper will be based on a RINA policy package manager that provides a collection of software tools designed to automate the process of installing, upgrading, configuring and removing management policies for configuring DIFs in a consistent manner. Based on WP5 and lead by WIT-TSSG.

HotNets 2015

This paper will show how aggregate-based congestion control in RINA works, and explain why it has the potential to be much more efficient than the Internet's TCP congestion control. Based on WP3 and lead by UiO.

Network of the Future Conference

The goal of this paper is to present different approaches to enhance routing with RINA. We will present how topological addressing schemes can be used in the three use cases of Pristine project, and show their benefits. Based on WP3 and lead by IMT-TSP.

2.1.7. Organisation of workshops

Organization of workshops is amongst the dissemination actions planned in PRISTINE. The objective of these workshops will be to disseminate the RINA theory, the project results and live demonstrations of the work carried out as well as symposiums around the work of PRISTINE and RINA specifications. In particular, three PRISTINE workshops have been planned. The first one was organised and completed successfully, the second one is to be held jointly with the final workshop of the IRATI project, and the last one will be organised at the end of the project:

- The first workshop took place in Dublin, Ireland on 28th and 29th of January and was organised by WIT-TSSG, Pouzin Society and PRISTINE. Representatives from different organisations that had already shown interest on RINA were invited to the event. The audience was composed of a mixture of industrial organisations, academic institutions and funding bodies: OpenRoot [open-root], Internet2 [internet2], SURFNet [surfnet], NCSR Demokritos [ncsr-demokritos], NetAffair [net-affair], Boston University [bu], TRIA Network Systems [tria], Imperial College London [imperial], Cisco Systems [cisco], NORDUnet [nordu-net], PNSol [pnsol], Interoute [interoute], and Juniper [juniper]. They have been presented with the latest results of the research and development activities around RINA. A tutorial on the RINA reference model and the theory behind it was given and PRISTINE project was presented. After a round of questions and discussion with the audience, it was the turn for a panel of the implementers of the IRATI prototype. The panel, which ran for most of a day, was very useful in providing further details about the different components of the architecture, as well as in discussing how these components have been implemented and how they can be extended and used for the PRISTINE work. The slides for the workshop can be found in [dublin].

- The second workshop will be a joint workshop with the IRINA GEANT3 project [irina] which will be held in Ghent on January 28th and 29th, 2015. The workshop will allow partners of both projects to expose their works and receive feedback from the audience. These insights will be invaluable, coming from relevant players in the networking industry and academia.

- The exact days and location of PRISTINE’s third and final workshop have not been defined yet. More likely it will be scheduled during 2016, at the end of the project. It is intended to put together the different targeted groups (industry, academia and the general public) to present the project outcomes. These results will be presented during the workshop as presentations, videos, and live and interactive demonstrations. Key stakeholders in the field (representatives of key initiatives, manufacturers, service providers) will be invited and have an opportunity to share their views on the project, alternative solutions, etc. A key aim of this workshop will be the presentation of the exploitable results, as well as discuss and refine partners' exploitation plans.

Moverover, for the summer of 2015 (June 2015) preliminary plans are in place to host a week long RINA module as part of an Irish Telecommunications Graduate Initiative [tgi] which is undertaken by a consortium of leading Irish Universities and Institutes of Technology to greatly enhance the experience of students studying for PhD’s in topics related to Telecommunications. The PRISTINE project has been invited to provide some lecture hours and lab sessions in relation to the projects activities for this RINA module.

2.1.8. Participation in target events

Events in the areas of Networking and Future Internet are targeted by PRISTINE to achieve the maximum visibility and dissemination of its work. The project will actively participate in and contribute to the Concertation activities organised at Future Internet Research and Experimentation (FIRE Conference and Workshops), Future Internet (FI Assembly) and ICT programme (ICT Conference) levels. The objective is to provide input to common activities and receiving feedback, contributing advice and guidance and receiving information relating to FIRE community building as well as tools and platforms and ICT programme implementation, standards, policy and regulatory activities, relevant national or international initiatives, etc. Special attention is given to events organised by the European Commission, at various levels, where the project will also play an active role. The project intends to participate and contribute to FIRE events, conferences and workshops; Future Internet Assembly (FIA); and Future Network & Mobile Summits. With these principles in mind, PRISTINE has already attended the following events:

- On 30th January 2014 it was present at a FIRE event, the SDN Concertation Workshop organised by the CITYFlow and OFERTIE FP7 projects. During the workshop PRISTINE exposed its position towards SDN, arguing that, without a fundamental theory of computer networking the SDN promises of commoditisation of network devices and programmability will be very hard to achieve.
- On 2-7th March 2014 several representatives from PRISTINE attended the IETF 89 in London, UK. The first BOF on TAPS was held at this meeting; TAPS is of interest to PRISTINE as it tries to free applications from the binding to specific Internet transport protocols.
- On 17-20th March 2014 in Athens, Greece, PRISTINE was present in the Future Internet Assembly event, in which the PRISTINE project was presented.
- On 8th April 2014 the EC created a conference bridge to allow people across the EC to share information on Europe's participation in the Global Multistakeholder Meeting on the Future of Internet Governance [netmundial-homepage] which took place in Sao Paulo, Brazil, on 23-24 April 2014. PRISTINE took advantage of the opportunity and attended the event.
- On 20-25th July 2014 several representatives from PRISTINE attended the IETF 90 in Toronto, CA. The second BOF on TAPS was held at this meeting; TAPS is of interest to PRISTINE as it tries to free applications from the binding to specific Internet transport protocols. At the time of writing, the WG on TAPS has been formed. The effort to create TAPS was led by a PRISTINE participant.
- On 17-18th September 2014, PRISTINE representatives attended the European Conference on the Future Internet in Munich, Germany.

Apart from the already attended events, PRISTINE partners plan to attend to the following ones:

Table 3. Other dissemination events

Name	Place	Type [a]	Target audience [b]	Dates
IETF91	Honolulu, Hawaii	IETF/IRTF Meeting	Special communities	November 2014
IEEE Globecom 2014	Austin (Texas)	Conference	Special communities, wider level	December 2014
Future Network Conference 2015	Dallas (Texas)	Conference	Special communities, wider level	June 2015

[a] e.g. workshop, meeting within a WG

[b] corporate level, consortium level, special communities, wider level

2.1.9. Interaction with other ICT projects

PRISTINE work can greatly benefit from the collaboration with running projects in the Future Networks Unit and other related areas, such as FIRE. The goal is not only the exchange of information, but also the creation of any possible synergies on the development of the technical work. During the project lifetime, PRISTINE will identify and pursue new collaboration opportunities with other FP7 projects and/or international initiatives.

In the Future Networks domain [fn-projects] the following projects have been identified, given their focus.

Table 4. Target Future Networks domain projects

Name	Website	Scope of collaboration
IRATI [a]	http://www.irati.eu	Collaboration on the development of the stack and policies
RITE [a]	http://riteproject.eu	Collaboration on congestion control and latency reduction techniques
IDEALIST [b]	http://www.ict-idealist.eu	Collaboration on resource allocation strategies
T-NOVA [a]	http://www.t-nova.eu/	Network Functions as-a-Service over Virtualised Infrastructures

Name	Website	Scope of collaboration
UNIFY [b]	http://www.fp7-unify.eu/	Progress on NFV related research

[a] STREP project

[b] IP project

The dialogue between PRISTINE and the IRATI project will provide PRISTINE with the required software baseline to build upon. At the moment, PRISTINE is committed to participate in the open source community that the IRATI project will be creating since one of the common interests of the projects resides in the software stack that they will be sharing. RITE and IDEALIST already showed interest in PRISTINE, as reflected by their letters of support. UNIFY (Unifying Cloud and Carrier Networks) is pushing the state of the art on SDN/ NFV service orchestration using network programming models. The architecture-independent aspects relating to capabilities of the programming framework and service development should be monitored as they are of interest to the NFV use case of PRISTINE.

2.1.10. Phd and MSc theses

PhD and MSc theses are important means for the dissemination of PRISTINE results in academia, with the potential to involve other academic institutions and the people working in them. In line with this, other universities and research centres that cooperate with the members of the consortium might be contacted with the ultimate goal of encouraging them to adopt RINA research topics and introduce them into the subjects taught in their institutions.

Table 5. PhD and/or MSc theses

Partner	Type	Duration	Topics
CREATE-NET	MSc	Q1 - Q4 OF 2015	Network Virtualization in Recursive Architectures; Mobility management of WiFi Networks in Recursive Architectures
FIT-BUT	PhD	Q3 2009 - Q4 2014	Internet alternative architectures and routing paradigms
iMinds	MSc	July 2014 - June 2015	Porting socket-based distributed application to RINA
iMinds	PhD	Sep. 2012 - estd. Q4 2016	Routing and resiliency in the Recursive InterNetwork Architecture

Partner	Type	Duration	Topics
WIT-TSSG	MSc	Oct. 2014 - Sept. 2015	Load balancing applications using RINA

2.1.11. Internal dissemination within the partners organisations

PRISTINE partners will disseminate the project results to other groups within their organisations, potentially including customers in the case of industrial partners. It will be necessary to take actions aiming at ensuring a good diffusion of information and documentation among the project partners with the aim of sharing the developed know-how. The internal dissemination will be achieved mainly through internal workshops and meetings.

The following table lists the internal dissemination activities carried out by PRISTINE partners so far.

Table 6. Internal dissemination

Partner	Date	Description
FIT-BUT	21/10/14	Project was briefly presented to research and PhD students at the Third Annual Conference of IT4Innovations National Supercomputing Center, http://www.it4i.cz/. FIT-BUT is a member of IT4I consortium
FIT-BUT	6/3/14	Presentation about RINA principles for research group members meeting [fit-meeting]
FIT-BUT	20/2/14	Presentation about RINA principles for BSc and MSc students of CCNP courses [fit-ccnp-courses]
WIT-TSSG	5/8/14	Presentation about RINA and PRISTINE for research group members attending a Pecha Kucha session [wit-tssg-pecha-kucha]
IMT-TSP	7/10/2014	Presentation of RINA at UCOOL Workshop. UCOOL is a STIC-AMSUD collaborative project between French and South American universities [imt-ucool]

2.1.12. External Advisory Board

Beyond the project partners, the External Advisory Board (EAB) is the industrial community that is closer to PRISTINE. EAB members - Deutsche Telekom, Cisco, Colt, Interoute, Telecom Italia, and Boston University - are a group of industrial partners and research experts that in

addition to having already shown their interest in the project, may be exposed to the project achievements. This is an excellent dissemination opportunity for PRISTINE, specially given the different nature of the companies in the EAB: equipment vendors (Cisco Systems), telecom operators (Deutsche Telekom and Telecom Italia), and IT services (Colt and Interoute).

PRISTINE results will be presented and discussed to the EAB at least 3 times during the project. The first meeting between PRISTINE and the EAB will take place during the first quarter of 2015. PRISTINE plans to take advantage of the organization of a RINA workshop to conduct a face-to-face meeting with the EAB representatives.

2.1.13. Other dissemination activities

PRISTINE's partners are also disseminating the project ideas using other channels than the traditional ones presented in the previous subsections, such as:

- PRISTINE representatives had a conference call with a Senior Analyst at Heavy Reading [heavy-reading] on the topic of RINA and PRISTINE and it's potential impact on the Networking world; a presentation was given and a blog post will be put together on the discussion.
- On 15th May 2014, a PRISTINE representative from the University of Oslo gave an invited presentation in the Karlsruher Institute of Technology, in Karlsruhe, Germany. The presentation's title was "Better transport" [better-transport] and focused on the problems the current Internet design represents for congestion control, several research lines to improve it, and how RINA and PRISTINE can improve and be improved by this research.

3. Standardisation

PRISTINE will actively try to influence established Standard Development Organizations (SDOs) so that they adopt some of the solutions developed within the project and incorporate them within current technologies when possible. Examples of these contributions will be the work on aggregate-based congestion control, which will be submitted to the IRTF Internet Congestion Control Research Group (ICCRG); the reduction in operational complexity brought by RINA networks, which should be of interest to the newly chartered IRTF Network Complexity Research Group (NCRG); or PRISTINE's view about Network Functions Virtualization (NFV), which will be brought to ETSI's NFV ISG. The following sections provide details of the PRISTINE' standardisation plans.

However, PRISTINE is also committed to improving existing RINA specifications and contribute new ones in the areas of congestion control, resource allocation, routing, authentication, access control, encryption and management. All these enhanced and new specifications will be contributed to the Pouzin Society (PSOC) [psoc]. PSOC was founded to coordinate contributions to the draft RINA reference model and specifications, making sure that new knowledge is incorporated and inconsistencies are fixed. PSOC - as a small group of well-aligned people with common goals - has worked effectively on an informal basis. However, a growing number of contributors, resulting from the enhanced visibility created by FP7-funded projects IRATI [irati] and PRISTINE [pristine-homepage], BU's NSF grant, and the IRINA GEANT3 project [irina], has moved PSOC to transition to a more formal approach. A Memorandum of Understanding (MoU) defining PSOC protocols has to be signed by entities willing to become part of PSOC and gives access to the current RINA documentation and discussion channels. The specifications are stored in a github repository [psoc-github]. New and updated RINA specifications - in a variety of areas such as congestion control, resource allocation, routing, authentication, access control, encryption and management - resulting as public PRISTINE foreground will be contributed to PSOC, in order to be taken into consideration for their adoption in future official releases.

3.1. IRTF / IETF

The Internet Engineering Task Force (IETF) works on standards for the Internet. These standards are based on compatibility to the current Internet, and ways of gradually improving it - very often in very small steps. This is the opposite of what PRISTINE intends to achieve with RINA, and therefore it is hard if not impossible for this project to contribute its *outputs* to the IETF. However, since several PRISTINE partners attend IETF meetings on a regular basis, it will be easy to keep track of current activities and align developments in the project accordingly wherever this makes sense, i.e. take *inputs* from the IETF. Again, given the "baby

step" nature of IETF developments, this will not always make sense, but there are exceptions. For example, Transport Services (TAPS), a new IETF Working Group that was created due to the effort of a PRISTINE partner, will define services that should be exposed to applications rather than transport protocols. It would make sense for RINA to directly exhibit a similar set of services rather than trying to map stream (TCP) vs. datagram (UDP) socket-based applications onto the RINA service model.

The Internet Research Task Force (IRTF) is more forward-looking and research-oriented than the IETF. Similar to the IETF's Working Groups, it is organised into Research Groups (RGs). The diversity of the topics that RGs focus on is broad, ranging from the somewhat close-to-today's-network Internet Congestion Control RG (ICCRG) and Network Management RG (NMRG) to more drastic departures from today's common architectures such as Delay-Tolerant and Information-Centric Networking. It is therefore quite possible to contribute research results that PRISTINE has achieved in the context of RINA to some of these groups — e.g. congestion control results could be contributed to the ICCRG and network management results could be contributed to the NMRG. However, more visibility is achieved by the creation of a dedicated research group, and this possibility was therefore investigated.

PRISTINE has contacted the IRTF chair and learned the following regarding RG establishment:

- RGs are measured by activity. An RG needs people to be active on the mailing list and attend the meetings. Attending meetings normally requires some interest in the IETF, as IRTF RGs often meet at IETF meetings.
- Establishment happens during a 1-year phase, where a mailing list and meeting space at IETF meetings will be given to the organisers, and the activity level will be monitored. If, after this year, there is clearly enough activity, an RG will be created.

This option was internally discussed in PRISTINE. Options on the table included establishing a dedicated RINA-RG - which would probably not attract enough attention - and a more general "new architectures" RG - which would mean a lot of PRISTINE resources wasted for an activity that is only partially related to RINA. It was discussed to try nevertheless, if only for the benefit of the impact/visibility of initial activities, but then it seemed that it does not make sense to start an endeavor that we already expect to fail from the outset. There are examples of rather similar groups that have failed in the past, e.g. the Virtual Networks RG (VNRG), which essentially consisted of delegates from various research projects presenting their own work that did not fit together with any other work. Eventually, the VNRG had to close down.

Beyond these contacts, it is worth noting that the IRTF has recently launched a group on Network Functions Virtualization (NFVRG). The areas of interests of this NFVRG are well aligned with the PRISTINE goals in the NFV use case, so a report of the findings of this use

case would contribute to the build awareness about the RINA applicability to complex problems like VNF (Virtualized Network Function) internal and external orchestration, and to a cross-validation of potential further contribution to the ETSI NFV ISG.

In conclusion, PRISTINE will make sure to stay up-to-date on developments in the IETF to get inputs, and contribute some of its outputs to subtopic-specific Research Groups in the IRTF.

3.2. ETSI

PRISTINE's Network Service Provider use case analyzes RINA as an essential component of the Network Functions Virtualization (NFV) concept within an operator network. The application of RINA to the construction of VNFs and virtualized network services seems promising. Hence, standardisation activities related to NFV are highly relevant to PRISTINE.

The ETSI NFV Industry Specification Group (ISG) was created almost two years ago, promoted by a set of network operators already engaged in Network Function Virtualization technologies, with the goal of consolidating the NFV concept, building awareness among the industry and the academia, and produce pre-standardisation work aimed at the eventual production of standards related to NFV. The form of an ETSI ISG was selected because it guaranteed open participation to both members and non-members of ETSI. Since its creation, the ISG has grown to include almost 300 participating organisations and it is about to produce the first release of the NFV specifications (already available as stable drafts). Given these successful results, the NFV community is discussing a second phase for the ISG, with the goal of enhancing NFV specifications and continue to provide a common base for NFV standardisation activities.

The current structure of the ETSI NFV ISG considers three architectural Working Groups (Infrastructure, Software Architecture, Management and Orchestration) plus other three focused on non-functional requirements (Performance and Portability, Reliability, Security), and a framework for Proofs-of-Concept intended to demonstrate the applicability of NFV and help the group identify technology challenges and explore solutions.

Among the key challenges, the group is considering those related to the orchestration of the different components of a network service by means of VNFs (Virtualized Network Functions) and of each individual VNF into its components. Solving questions regarding scalability, manageability and security are essential for making NFV a feasible solution for real network problems.

PRISTINE (and RINA in general) is in the position of providing suitable solutions for these challenges, and the necessary decoupling between the supporting networking infrastructure and the services provided by the VNFs facilitate the adoption of RINA-based solutions among the network operator community.

3.3. ISO

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form a specialized entity for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of international standards through technical committees, established by the respective organisation, that collaborate in mutual interest in order to deal with particular fields of technical activity. Other international organisations - governmental and non-governmental, in liaison with ISO and IEC - also take part in the work.

In the field of information technology, ISO and IEC have established a Joint Technical Committee (JTC), the ISO/IEC JTC 1. JTC 1 can be further broken down in several subcommittees (SC) and working groups (WG), amongst which WG 7 "Network, transport and future network" of SC 6 "Telecommunications and Information Exchange Between Systems" is of particular interest to PRISTINE (and RINA in general).

The group's main concerns pivot around long-standing problems and technical aspects of the current Internet and IP based networks, such as scalability, ubiquity, security, robustness, mobility, heterogeneity, Quality of Service (QoS), re-configurability, context-awareness and manageability. The group aims at defining the Future Network (FN) as the network of the future that should provide capabilities beyond the current limitations, revolutionary services and facilities that are hard to provide using existing network technologies. The definition process makes no assumptions on specific network technologies (e.g. packet or circuit transport).

WG 7 is currently completing its requirements documents [iso29181] and will concentrate on standardising an architecture that can cope with such requirements. Therefore both the scope and the timings are well aligned with PRISTINE standardisation requirements.

3.4. Per-partner plans

The following sections summarise the per-partner standardisation related activities.

3.4.1. UiO

UiO key person Michael Welzl chairs the IRTF Internet Congestion Control (ICCRG) Research Group. This facilitates having an overview of current congestion control developments, and helps planning contributions to ICCRG from PRISTINE. UiO will mainly work on aggregate congestion control and resource allocation. The results from evaluating aggregate congestion control are deemed to be of interest to ICCRG.

3.4.2. WIT-TSSG

WIT-TSSG have been members of the Telecommunications Management Forum (TMForum) for the past 7 years and have had many inputs towards the Information Framework as standardised by the TM Forum. WIT-TSSG will explore the new blueprint being devised within the TM Forum which is looking for end-to-end management with Zero-touch Orchestration, Operations and Management, as such called the TMForum ZOOM project [zoom-project]. WIT-TSSG will be investigating whether the PRISTINE' DMS can be applied to the TMForum ZOOM project.

3.4.3. i2CAT, NXW, IMT-TSP

The partners identified the ISO SC6 Working Group 7 on Future Networks as a potential target for standardisation, since the PRISTINE architecture and more detailed topics such as resource allocation, routing, naming and addressing fall within its scope. Therefore, the partners will foster the adoption of PRISTINE' results in ISO.

3.4.4. TID

TID is mostly interested in contributing PRISTINE' results related to the NFV use case. TID aims at proposing seamless VNF and service construction to ETSI-NFV. TID also aims at supporting the introduction of PRISTINE to the SDNRG, considering a draft on RINA applicability in NFV deployment and operation for the NFVRG.

3.4.5. CREATE-NET

As part of the PRISTINE budget cut, CREATE-NET was erroneously left assigned to task 7.2 despite having only 1 PM in WP7. Thus, there are no standardisation plans for CREATE-NET - as explained in D1.2.

4. References

[iso29181] ISO-IEC TR 29181. Available online at https://www.iso.org/obp/ui/#iso:std:iso-iec:tr:29181:-1:ed-1:v1:en

[irati] The FP7 IRATI project homepage: http://www.irati.eu

[irina] The GEANT3+ IRINA project homepage: http://www.geant.net/opencall/Optical/Pages/IRINA.aspx

[psoc] The Pouzin Society homepage: http://pouzinsociety.org

[psoc-github] PSOC specifications repository (available online upon request): https://github.com/PouzinSociety/RINASpecifications

[pristine-leaflet] PRISTINE leaflet. Available online at http://cordis.europa.eu/fp7/ict/future-networks/documents/call11projects/pristine.pdf

[pristine-poster] PRISTINE poster. Available online at http://ict-pristine.eu/?page_id=263

[pristine-twitter] PRISTINE on Twitter. Available online at https://twitter.com/ictpristine

[pristine-slideshare] PRISTINE on slideshare. Available online at http://www.slideshare.net/ictpristine

[pristine-homepage] PRISTINE homepage: http://www.ict-pristine.eu

[netmundial-homepage] NEMundial homepage: http://www.netmundial.br

[tgi] Irish Telecommunications Graduate Initiative: http://www.tgi.ie

[fn-projects] Future Network projects. Available online at http://cordis.europa.eu/fp7/ict/future-networks/projects_en.html

[heavy-reading] Heavy Reading homepage: http://heavyreading.com

[zoom-project] TM Forum Zero-touch Orchestration, Operations and Management project. Available online at http://www.tmforum.org/zoom/16335/home.html

[fit-meeting] FIT-BUT Meeting. Available online at http://nes.fit.vutbr.cz/ivesely/FITBUT-RINAv3.pdf

[fit-ccnp-courses] FIT-BUT CCNP courses. Available online at http://nes.fit.vutbr.cz/ivesely/FITBUT-RINAv1.pdf

[wit-tssg-pecha-kucha] WIT-TSSG presentation. Available online at https://opensourceprojects.eu/p/pristine/publicdocuments/4/tree/trunk/presentations/pristine_PechaKucha_miguelpdl.pdf?format=raw

[imt-ucool] IMT-TSP UCOOL presentation. Available online at http://www.slideshare.net/ictpristine/pristine-ucool

[dublin] List of presentations for the 1st PRISTINE workshop. Available online at http://ict-pristine.eu/?p=227

[better-transport] Presentation in the Karlsruher Institute of Technology. Slides available online at http://heim.ifi.uio.no/michawe/research/publications/better_transport_karlsruhe-may2014.pdf

[open-root] OpenRoot homepage: http://www.open-root.eu/

[internet2] Internet2 homepage http://www.internet2.edu/

[surfnet] SURFNet homepage: https://www.surf.nl/en/about-surf/subsidiaries/surfnet

[ncsr-demokritos] NCSR Demokritos homepage: http://www.demokritos.gr/?lang=en

[net-affair] NetAffair homepage: http://netaffair.org/

[bu] Boston University homepage: http://ww.bu.edu

[tria] TRIA Network Systems homepage: http://www.trianetworksystems.com/triawww/TRIANetworkSystems.html

[imperial] Imperial College London homepage http://www3.imperial.ac.uk/

[cisco] CISCO Systems homepage: http://www.cisco.com/

[nordu-net] NORDUnet homepage: http://www.nordu.net/ndnweb/home.html

[pnsol] PNSol homepage: http://www.pnsol.com/

[interoute] Interoute homepage: http://www.interoute.com/

[juniper] Juniper homepage: http://www.juniper.net/us/en/homepage-campaign.page