METRO-HAUL

METRO High bandwidth, 5G Application-aware optical network, with edge storage, compute and low latency

Grant No. 761727

Deliverable D6.1

Year 1 report on communication, dissemination and standardisation activities

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Abstract

The METRO-HAUL Work Package 6 activity is intended to exploit the research and development activities performed by the project partners and leverage the METRO-HAUL architecture, enabling technologies and solutions developed.

This deliverable (D6.1: Year 1 report on communication, dissemination and standardisation activities) provides a summary of activity carried out during the first year of the project.

This Work Package 6 activity (project dissemination and exploitation) objectives included: creation of the project knowledge site; developing initial dissemination strategy plans and methods for project dissemination and exploitation, enabling the communication plan and method across the METRO-HAUL partners, collating and documenting Standards Development Organisation effort from METRO-HAUL partners, and development of an external education plan for defining METRO-HAUL key technologies.

The research leading to these results has received funding from the European Union Horizon 2020 Programme under grant agreement number METRO-HAUL 761727

Imprint

METRO High bandwidth, 5G Application-aware optical network, with edge storage, compute and low latency

METRO-HAUL

WP6, Dissemination and exploitation activities

T6.1., Dissemination and Project Communication)

Year 1 report on communication, dissemination, and standardisation activities

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Adrian Farrel, Old Dog Consulting

Estimation of 1 PM has been spent on the Deliverable

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Executive Summary

This document presents a condensed version of the METRO-HAUL first year dissemination and standardisation activities and describes framework, methodology and tools applied to ensure efficient coordination of technical activities related to Work Package 6 (WP6) dissemination and exploitation.

The objective of METRO-HAUL WP6 is to coordinate all the tasks related to communication, dissemination, standardization and exploitation. The specific WP6 tasks include:

- Realise an Open Knowledge Transfer
- Coordinate publications and workshops
- Coordinate Industry white papers and conference communications
- Industrial specification and Standards contributions
- Coordinate implication in Open Source projects
- Lead on relationship with 5G PPP and related initiatives
- Project coordination of the exploitation and dissemination activities

The overall first year Work Package 6 Dissemination and Standardisation achievements of METRO-HAUL are outstanding across all dissemination channels: Conferences, Journals, Workshops, and Standards Development. We provide details of the work package 6 plan, developments, and results in this report.

Document Structure

This document is structured as follows.

Introduction: this brief outline highlights the scope of the METRO-HAUL project and role of WP6 to support internal and external impact.

Internal Dissemination: outlines the methods and tools used for internal project communication and dissemination process and tracking. It also highlights the tools used for METRO-HAUL partners within the project for WP6 tasks and related effort across other work packages.

External Dissemination: describes the plan of action for external dissemination activities (website, blog, newsletter, participation at industry events, technical publications, workshops and education events, targeted to ensure a consistent and effective method to disseminate METRO-HAUL results among a wide range of industry and scientific communities.

Industry Standardisation: outlines objectives and plans for METRO-HAUL standardisation. The METRO-HAUL project team has been actively proposing new specifications and standards and contributing to existing standards. These contributions will translate into proposals (including requirements, architecture, use cases, and specifications) in variety of technical areas.

Innovation Management: this activity is intended to underline and develop the industrial impact and innovation of the project during and beyond the life of the project.

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1 Introduction

The role of and scope of the Internet has dramatically changed over the last 10 years and continues to evolve in surprising ways. Our reliance on the Internet for health, social, education, industrial and science purposes, is undiminished. Furthermore, the role of the Internet will only increase dramatically over the coming years.

The public's growing demand for and instant access to the Internet wherever they are and whenever it is lead to the need of high-capacity radio services. Invention of 5G is a natural consequence of this trend and a need to dynamically provision Internet services in a cost-effective way, within complex end-to-end scenarios, spanning multiple knowledge domains, technologies and administrative boundaries has driven the evolution of architectures and protocols for the operation of networks.

The intention of METRO-HAUL is to architect and design cost-effective, energy-efficient, agile and programmable metro networks that are scalable for 5G access and future requirements, encompassing the design of all-optical metro nodes (including full compute and storage capabilities), which interface effectively with both 5G access and multi-Tbit/s elastic core networks.

To facilitate METRO-HAUL (project) dissemination and standards, we developed a set of internal and external tools, processes and plans. Tools include internal and external websites, Wiki's and social media (general, industry and scientific) channels.

Within the first year of METRO-HAUL the project participants are developing and delivering high-quality dissemination and standardisation output. This output may be evaluated via several methods, including the number and type of conferences, journals and standards and specification contributions and leadership.

Moving forward a significant effort will be made to target high-impact publications by the project partners. We are also using methods to expand dissemination to research peers and collaborative projects also funded by the European Commission. Our objective is to establish a diverse set of industrial and academic contributions, proposals and communications to leading events and proceedings and publications.

The project also proposed a set of objectives for specification and standardisation coordination, contributions and development of proposals related to various technology layers of the project framework.

Finally, the project also intends to focus some efforts on Innovation Management within the project and externally. This is intended to underline and develop the industrial impact and innovation of the project during and beyond the life of the project.

2 Internal Disseminations

The project relies on a well-documented and "living" Wiki that is continuously updated and improved. This project Wiki (https://wiki.metro-haul.eu) aims to support all participants and WPs;

- with one-stop project administrative information hub
- for smooth communication and collaboration
- information sharing
- action tracking in each and between WPs.

The contents on this Wiki are visible to public.

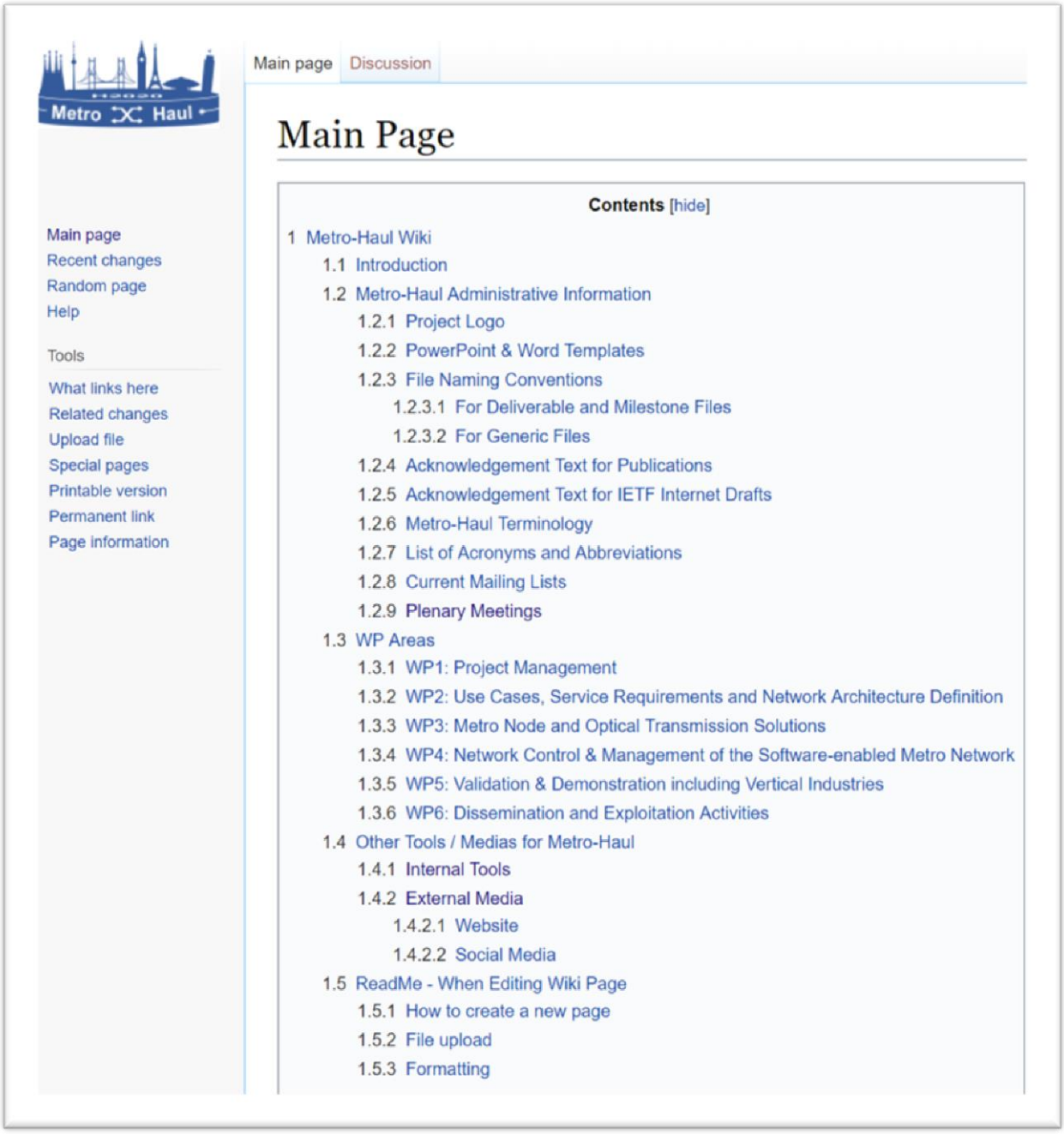


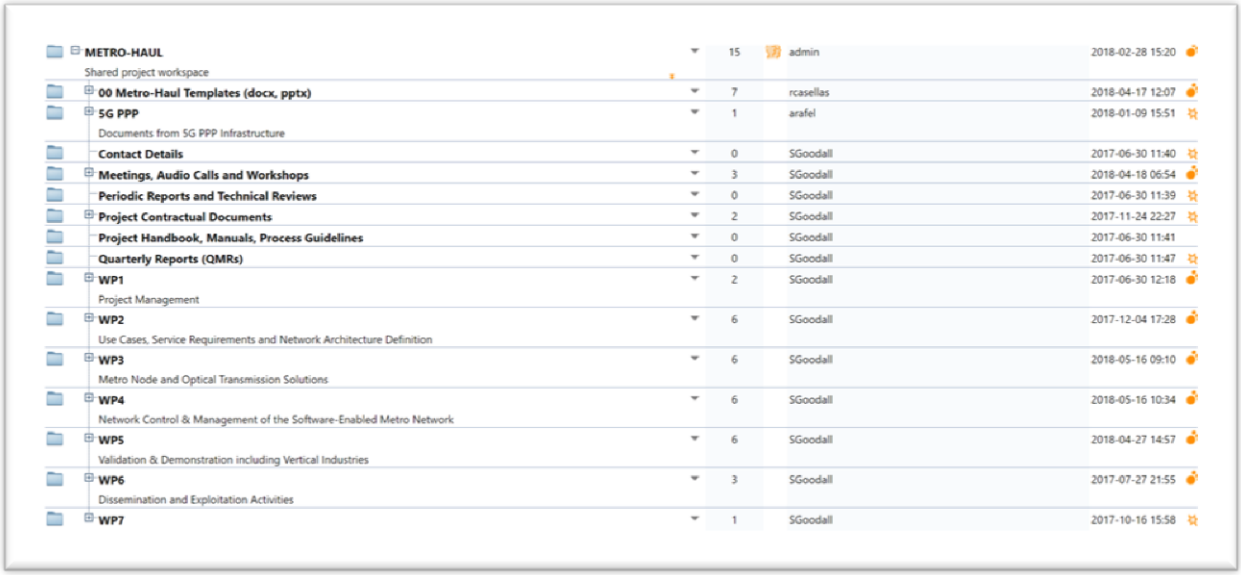
Figure 1 Metro-Haul Project Wiki

2.1 METRO-HAUL Administrative Information and Tools

A variety of useful information has been compiled and document on the project Wiki. The sections below are copied from the project Wiki.

2.1.1 Basic Support for Cooperative Work (BWCW) Platform

The main method and repository for storing project information is the Basic Support for Cooperative Work (BSCW) collaborative workspace software package for collaboration over the Web.



METRO-HAUL Shared project workspace	15	admin	2018-02-28 15:20
00 Metro-Haul Templates (docx, pptx)	7	rcasellas	2018-04-17 12:07
5G PPP Documents from 5G PPP Infrastructure	1	arafel	2018-01-09 15:51
Contact Details	0	SGoodall	2017-06-30 11:40
Meetings, Audio Calls and Workshops	3	SGoodall	2018-04-18 06:54
Periodic Reports and Technical Reviews	0	SGoodall	2017-06-30 11:39
Project Contractual Documents	2	SGoodall	2017-11-24 22:27
Project Handbook, Manuals, Process Guidelines	0	SGoodall	2017-06-30 11:41
Quarterly Reports (QMRs)	0	SGoodall	2017-06-30 11:47
WP1 Project Management	2	SGoodall	2017-06-30 12:18
WP2 Use Cases, Service Requirements and Network Architecture Definition	6	SGoodall	2017-12-04 17:28
WP3 Metro Node and Optical Transmission Solutions	6	SGoodall	2018-05-16 09:10
WP4 Network Control & Management of the Software-Enabled Metro Network	6	SGoodall	2018-05-16 10:34
WP5 Validation & Demonstration including Vertical Industries	6	SGoodall	2018-04-27 14:57
WP6 Dissemination and Exploitation Activities	3	SGoodall	2017-07-27 21:55
WP7	1	SGoodall	2017-10-16 15:58

Figure 2 Basic Support for Cooperative Work (BSCW) Portal

2.1.2 Project Logo

The MH logo image file can be downloaded from here. The cities represented in this logo are; Barcelona, Berlin, Lisbon, London, Paris, Eindhoven, Pisa, from left to right.

2.1.3 PowerPoint & Word Templates

Templates can be found in "Metro-Haul Template" folder in BSCW file repository.

2.1.4 File Naming Conventions

For an easier file version tracking, project members are recommended to follow the file naming convention as shown below.

2.1.4.1 For Deliverables and Milestone Files

The project deliverables and milestone documents should be submitted using the following format:

- Deliverable filenames: “Metro-Haul_DX.Y_vA.B_27112017.doc”
- Milestone filenames: ”Metro-Haul_MSX.Y_vA.B_27112017.doc”
- “X.Y” - Index number of the deliverable/milestone.
- “A.B” - Version number. E.g., “0.3”.
- Followed by the issue date (DDMMYYY).

2.1.5 Acknowledgement Text for Publications

The project specifies the following acknowledgement text for publications.

> *"The research leading to these results has received funding from the European Commission for the H2020-ICT-2016-2 METRO-HAUL project (G.A. 761727)."*

2.1.6 Acknowledgement Text for Standards Contributions

The following is suggested for use in your Standards Acknowledgement sections.

> *"This work was supported in part by the European Commission funded H2020-ICT-2016-2 METRO-HAUL project (G.A. 761727)."*

2.1.7 Current Mailing Lists

A set of internally accessible (by project members) mailing lists are available during the project. These are outlined in the table below and may be subscribed to via WP6 project leads.

Table 1METRO-HAUL Mailing List

Email Alias	Description
admincontacts@metro-haul.eu	For admin issues
all@metro-haul.eu	Everyone registered for the project
legalcontacts@metro-haul.eu	For legal issues
management@metro-haul.eu	Management
media@metro-haul.eu	For social media registration and account management
publications@metro-haul.eu	To provide an update on MH related publications
steeringcommittee@metro-haul.eu	Steering committee
technicalcommittee@metro-haul.eu	Technical committee
wp1@metro-haul.eu	For WP1
wp2@metro-haul.eu	For WP2
wp3@metro-haul.eu	For WP3
wp4@metro-haul.eu	For WP4
wp5@metro-haul.eu	For WP5
wp6@metro-haul.eu	For WP6

2.1.8 Publications and Deliverables Tracker

The project uses an internal online tool: http://tracker.eurescom.eu, for uploading and monitoring the status of project publications and deliverables. Project members receive a notification when a new dissemination is registered to Tracker, enabling the internal review process before the publication.

Access to the Tracker for project participants can be requested via the WP6 leaders.

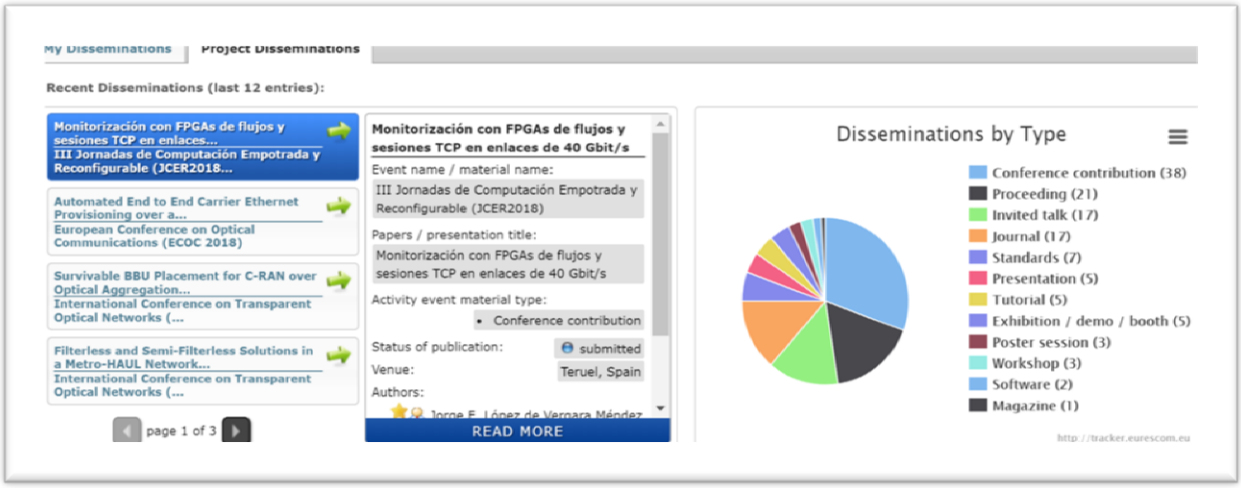


Figure 3 Internal Publications and Deliverables Tracker

2.1.9 GitLab Repository for METRO-HAUL Source Code Management

The project uses GitLab for source code management and issue tracking related to software development components of the METRO-HAUL platform and key enabling technologies. The repository may be access via https://gitlab.com/metro-haul, access is strictly controlled, and access may be requested via the WP6 leaders.

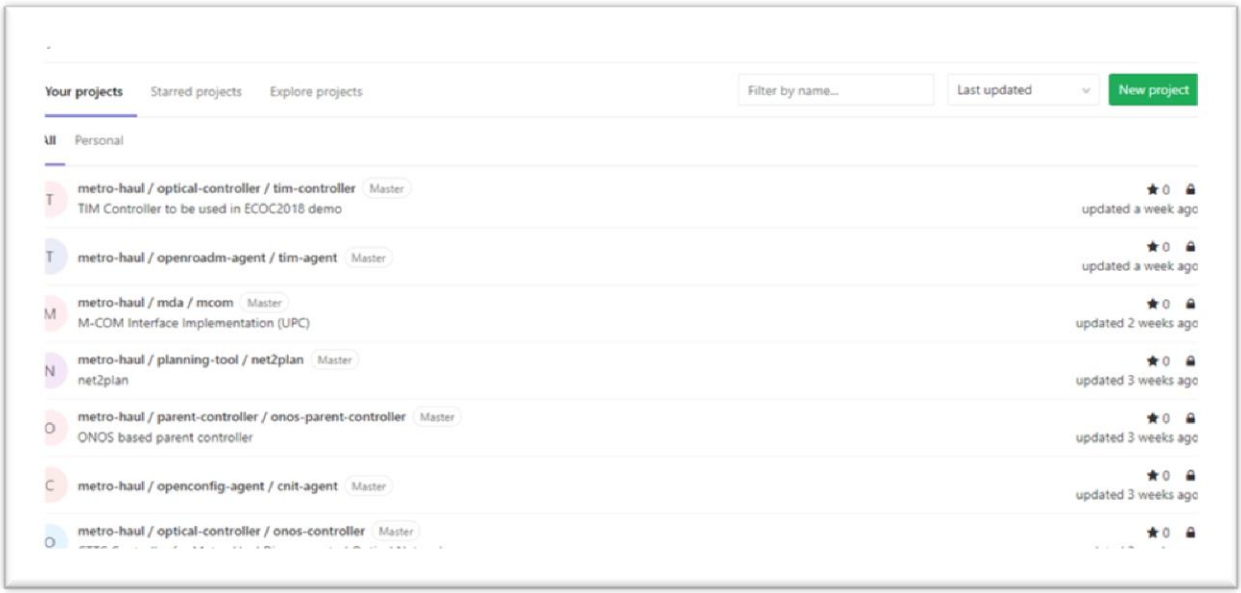


Figure 4GitLab Repository for METRO-HAUL Source Code Management

3 External Dissemination

For a complex project such as METRO-HAUL with a wide set of partners, we must manage the dissemination activities, and ensure publications, tasks and objectives are adequately planned and delivered. This should avoid inferior quality publications and inefficient use of time and resources. It is also important to avoid partial or missed tasks and objectives.

The project dissemination and Standardisation effort is split into the following sub-level areas: industry dissemination, scientific dissemination, specification and Standardisation. To achieve quality publications across the areas mentioned we use a set of processes and tools, a variety external platforms and channels, and social media platforms, in order to disseminate our output to the Industry, academia and general public.

The rest of this section describes the strategy for external project dissemination, including:

- External dissemination process and tools
- External dissemination methods and channels
- External workshops and education events.

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The rest of this section describes the strategy for external project dissemination, including:

- External dissemination process and tools
- External dissemination methods and channels
- External workshops and education events.

3.1 Project Website

The project public area is accessible for any Internet user, the website (https://metro-haul.eu/) is mainly managed and updated by WP6 contributors. These credentials are currently owned by WP6 leader's, moving forward collaborators may be given limited editorial access for technical blog updates.

The website is built around WordPress with additional capabilities as required (for dynamic social media updates, YouTube Playlists, etc.).

The frontpage of the project website is show below:

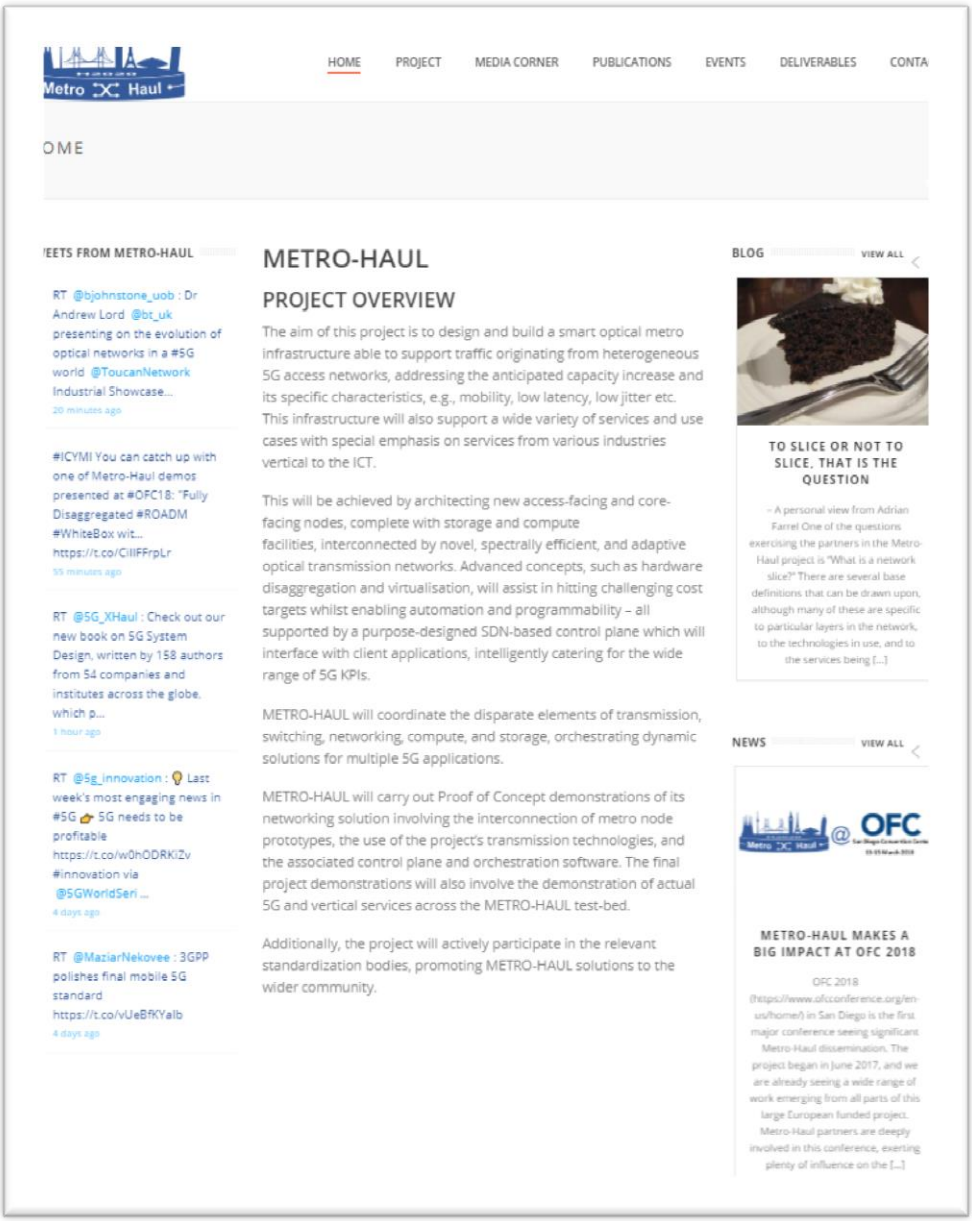


Figure 5 METRO-HAUL Public Website

3.1.1 Website Structure

The project site is split into seven major areas with sub-areas for each section:

3.1.1.1 Home

The frontpage of the website with dynamic content update, including live Tweet updates.

3.1.1.2 Project

Provides a project overview and access to four additional sub-areas: Objectives, Administrative Information, Partners and References.

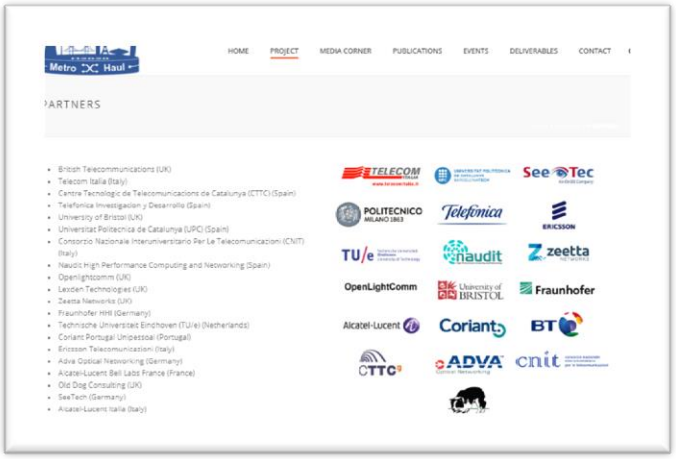


Figure 6 'Project' - 'Partners' page

3.1.1.3 Media Corner

Lists the project media channels, news articles and blog articles.

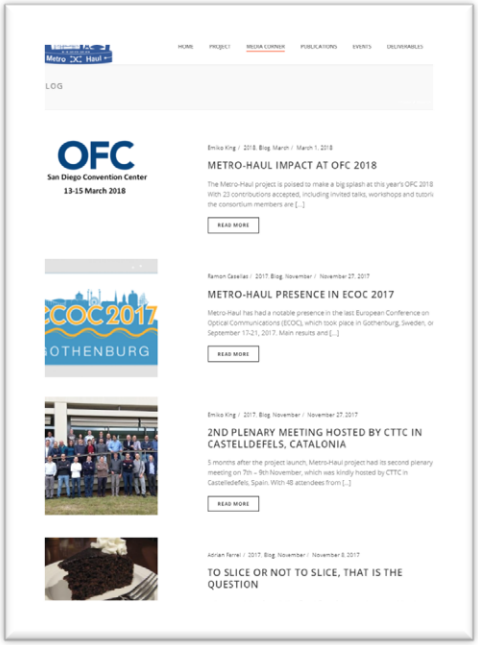
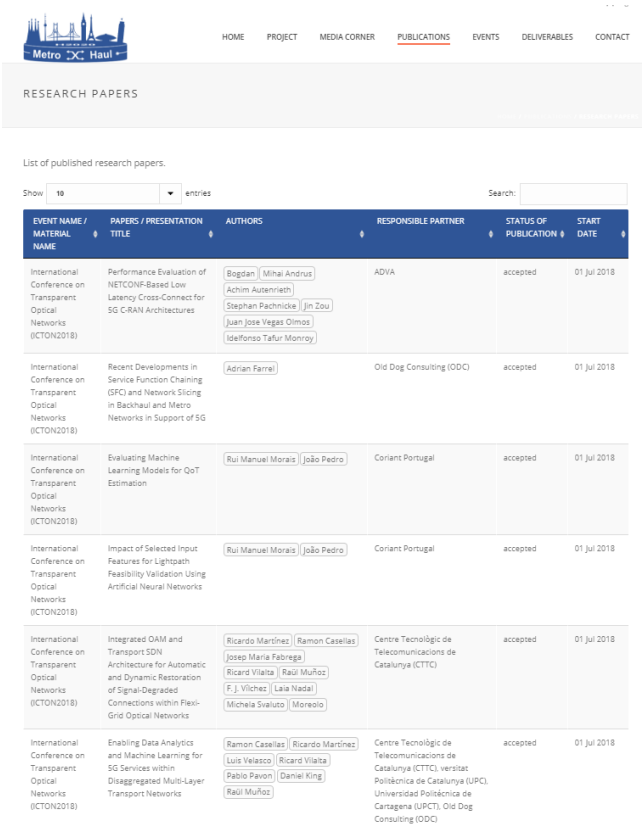


Figure 7 'Media Corner' - 'Blog' page

3.1.1.4 Publications

Provides a list of project publications, these include standards, papers and journals.



EVENT NAME / MATERIAL NAME	PAPERS / PRESENTATION TITLE	AUTHORS	RESPONSIBLE PARTNER	STATUS OF PUBLICATION	START DATE
International Conference on Transparent Optical Networks (ICTON2018)	Performance Evaluation of NETCONF-Based Low Latency Cross-Connect for 5G C-RAN Architectures	Bogdan Mihai Andrus, Achim Autenrieth, Stephan Pachnicke, Jin Zou, Juan Jose Vegas Olmos, Idelfonso Tafur Monroy	ADVA	accepted	01 Jul 2018
International Conference on Transparent Optical Networks (ICTON2018)	Recent Developments in Service Function Chaining (SFC) and Network Slicing in Backhaul and Metro Networks in Support of 5G	Adrian Farrel	Old Dog Consulting (ODC)	accepted	01 Jul 2018
International Conference on Transparent Optical Networks (ICTON2018)	Evaluating Machine Learning Models for QoT Estimation	Rui Manuel Morais, João Pedro	Coriant Portugal	accepted	01 Jul 2018
International Conference on Transparent Optical Networks (ICTON2018)	Impact of Selected Input Features for Lightpath Feasibility Validation Using Artificial Neural Networks	Rui Manuel Morais, João Pedro	Coriant Portugal	accepted	01 Jul 2018
International Conference on Transparent Optical Networks (ICTON2018)	Integrated OAM and Transport SDN Architecture for Automatic and Dynamic Restoration of Signal-Degraded Connections within Flexi-Grid Optical Networks	Ricardo Martínez, Ramon Casellas, Josep Maria Fabrega, Ricard Vilalta, Raúl Muñoz, F. J. Vílchez, Laia Nadal, Michela Svaluto, Moreolo	Centre Tecnològic de Telecomunicacions de Catalunya (CTTC)	accepted	01 Jul 2018
International Conference on Transparent Optical Networks (ICTON2018)	Enabling Data Analytics and Machine Learning for 5G Services within Disaggregated Multi-Layer Transport Networks	Ramon Casellas, Ricardo Martínez, Luis Velasco, Ricard Vilalta, Pablo Pavon, Daniel King, Raúl Muñoz	Centre Tecnològic de Telecomunicacions de Catalunya (CTTC), versitat Politècnica de Catalunya (UPC), Universidad Politécnica de Cartagena (UPCT), Old Dog Consulting (ODC)	accepted	01 Jul 2018

Figure 8 'Publications' - 'Research Papers' Page

3.1.1.5 Events

The website provides a list of both future (https://metro-haul.eu/events/) and past events that will have or had METRO-HAUL presence. The presence includes leadership, keynote, chair and/or speaking roles. Listed events can be hosted by other organisations, other 5G PPP projects, or METRO-HAUL itself or its partners, as long as METRO-HAUL shows its presence.

This Events webpage aims to serve two main purposes; first, to support Project members to help planning their annual schedule accordingly and effectively with target events, and also to provide a certain level of visibility of dissemination activities between Project partners, by listing METRO-HAUL presentations (internal dissemination). Secondly, to provide the public the information of METRO-HAUL's presence in various events (external dissemination).

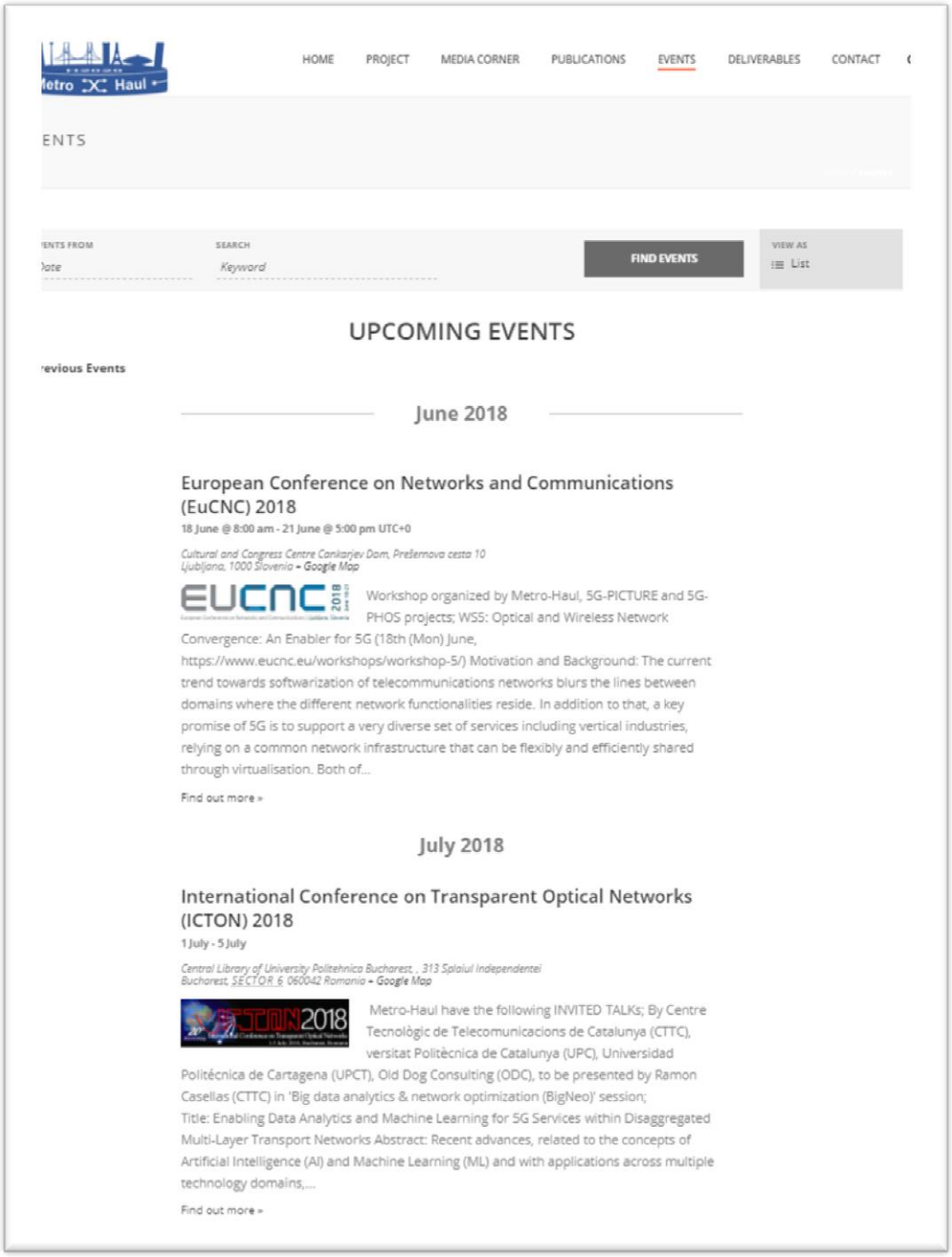


Figure 9 'Events' - 'Upcoming Events' Page

3.1.1.6 Deliverables

The list of project deliverables and planned issuing timing (https://metro-haul.eu/deliverables/).

HOME PROJECT MEDIA CORNER PUBLICATIONS EVENTS DELIVERABLES CONTACT

Search:

DELIVERABLE NO.	DELIVERABLE NAME	LEAD BENEFICIARY	DELIVERY DATE (PROJECT MONTH)
D2.1	Definition of Use Cases, Service Requirements and KPIs	Telecom Italia (TIM)	8
D2.2	Functional Architecture Specifications and Functional Definition	University of Bristol	16
D2.3	Network architecture definition, design methods and performance evaluation	Coriant Portugal	22
D2.4	Techno-economic analysis and network architecture refinement	Coriant Portugal	30
D3.1	Selection of metro node architectures and optical technology options	Telecom Italia (TIM)	12
D3.2	First validation of the METRO-HAUL node architecture and optical solutions	TU/e	24
D3.3	The Final METRO-HAUL node architecture and optical solutions	University of Bristol	36
D3.4	Final public release of SW prototype for the control and monitoring of infrastructural elements	CNIT	36
D4.1	METRO-HAUL Control and Management Requirements and Framework	CTTC	12
D4.2	Report on Implementations for METRO-HAUL Control for Resource and Service Management	UPC	23
D4.3	METRO-HAUL Support for Vertical Industries through Network Virtualization and Slicing	University of Bristol	36
D4.4	METRO-HAUL Software Final repository and standardization: Yang models, software prototypes	Old Dog Consulting	36
D5.1	Report on Vertical Use Cases Performance metrics	CNIT	9
D5.3	METRO-HAUL Control Plane Demo	Telefonica (TID)	25
D5.4	METRO-HAUL Demo 1	Fraunhofer	36
D5.5	METRO-HAUL Demo 2	BT	36
D5.6	Analysis and Performance results of the METRO-HAUL Demonstrators	CTTC	36
D6.1	METRO-HAUL Year1 report on communication, dissemination and standardisation activities	Old Dog Consulting	12
D6.2	METRO-HAUL Year2 report on communication, dissemination and standardisation activities	Old Dog Consulting	24
D6.3	METRO-HAUL Final report on communication, dissemination and standardisation activities	Old Dog Consulting	36

ıowing 1 to 20 of 20 entries

Figure 10 A list of METRO-HAUL Deliverables

3.1.1.7 Contact

The website (https://metro-haul.eu/contact/) allows submission of contact requests via an online form. It also provides a contact email (contact@metro-haul.eu) that is forwarded to WP6 leaders.

3.2 Dissemination Activities

The project will need to organise dissemination effort and events among the internal participants and in the wider industry and scientific community.

3.2.1 Internal Dissemination Coordination

The project has so far had three Plenary sessions:

1. June 2017, in Ipswich, United Kingdom (Kick-off)
2. November 2017, in Castelldefels, Spain
3. April 2018, in Lisbon, Portugal

These Plenary sessions provide an opportunity for internal dissemination activities, especially the latter sessions. In addition to the Plenary sessions we ran focused webinars and online conference calls which have been organised in "lightning talk" formats. These provided an opportunity for well attended events (where project partners had numerous contributions) to be disseminated internally and externally.

Non-confidential updates will be communicated among project partners by periodically updating the information published on the Wiki and via a planned newsletter.

The role of the WP6 leadership will be to also encourage and coordinate presentations during the plenary meetings of the Project, especially after notable events, and from the different WPs to share information on specific topics or results.

3.2.2 External Dissemination Coordination

Other dissemination effort, especially to external channels, will be carried out. This includes posting on the public section of the Project website, Blogs, Newsletters, News Articles and Press Releases, based on research output provided by the project partners. Also through the WP6 leaders' coordination, the project participants are encouraged to write articles for those mediums about their researches, trend in the technology in focus.

Whilst Blogs are used for 'informal' articles including quick overview of METRO-HAUL's presence in an upcoming event and technical discussions, News including Press Release are for project's official announcement and will be distributed to external medias (current list: https://wiki.metro-haul.eu/index.php/WP6#Media_Contacts.2FPortal_for_PR) for further distribution.

3.3 Project Dissemination Plan

The Project dissemination plan is spread over various phases on the project.

Phase 1: involves the creation of the project knowledge site; the development of dissemination strategy document(s); the identification of which SDOs to target for METRO-HAUL proposals; the publication of the early project architecture and vision documents, identifying grand research challenges; the presentation of the project concepts and gaps at a leading Industry conference; the creation of the project education programme, applicable to both industry (for industry skill-set transformation) and academia (MSc and PhD programs).

Phase 2: Publication of early findings in scientific journals ; develop education material scoping the problem space and potential enabling technologies; submission of initial technical proposals to SDOs, it is likely these will be comprised of specification and more formal standards (solution) proposals; ongoing development and wider-industry (beyond METRO-HAUL partners) collaboration

of SDO proposals; delivery of the project education programme at workshops, webinars and invited lectures on MSc and PhD programs.

Phase 3: Publication of platform techno-economics, infrastructure, experiments, services and applications, and other relevant findings; formal adoption of specification and standards, and publication as standards.

3.3.1 Planned Scientific Publications

Scientific dissemination will be split into two main threads: conferences and publications.

Conferences: Attending and presenting at academic and industry conferences will help disseminate METRO-HAUL knowledge and demonstrate key innovations.

Publications: Academic publications will be key for highlighting scientific and industry technology leadership. We expect to publish over forty journals, articles, magazines, whitepapers, specifications and standards.

3.3.2 Organisation of Planned Events

The following events and activities are currently planned; additional events may be required as the project progressed.

Project Workshops: These will be used to showcase the most successful experiments, applications, services and products tested and/or originated within the context of METRO-HAUL and overall 5G PPP community. They will contribute to demonstrating the value of METRO-HAUL across all European ICT innovators.

Joint 5G PPP workshops/sessions: The Project will participate in joint 5G PPP workshops/sessions, including the annual editions of the Net Futures and the European Conference on Networks and Communication, EuCNC, Optical Fiber Conference, 5G Global events, and ensure presentations and exhibition booths at major events.

3.4 Project Dissemination Objectives

The Project proposal defined clear aims to influence major vendors and service providers to adopt the Project principles through publications, workshops and demonstrations. These included coordinated effort:

- Scientific dissemination in peer reviewed international conferences, journals and magazines
- Contributions to SDOs
- Contributions to Open Source Project and related initiatives
- Co-organization of workshops, events, etc. (within the 5GPPP and other relevant contexts)

In addition to the standardisation of METRO-HAUL key elements and models. These were further defined as specific KPIs with a means of verification:

- Academic journals (5 in Y1, 8 in Y2 and Y3)
- Academic conference papers (5 in y1, 10 in Y2 and Y3),
- Technical workshops (organise one in Y2 and Y3),
- Industry panels and workshop involvement (one each in Y1,2,3)
- Contributions within at least 2 working groups of standardization bodies such as IETF covering > 5 actions

- 3 demonstrations of METRO-HAUL technologies including 2 with vertical 5G applications and one at the 2019 Mobile World Congress
- Definition of commercialization and exploitation plan

Table 2 Dissemination Activity and Verification Plan

Dissemination Activity and Verification Plan	Year 1	Year 2	Year 3
Publication in selected peer-reviewed Journals	5	8	8
Presentation and publication at selected conferences	5	10	10
Organisation of workshops		1	1
Participation at industry conferences and workshops	1	1	1

3.5 Education Activities

Current students moving to industrial roles need to develop the skills and knowledge necessary to design, build and deploy METRO-HAUL infrastructure. Therefore, the project will create a METRO-HAUL education programme, applicable to both industry (for industry skill-set transformation) and academia (MSc and PhD programs).

UNIVBRIS run a student / staff mentoring program which METRO-HAUL will use to educate students about the opportunities in SDN/NFV and implications for 5G technologies. The project will allocate mentors from the partners who will liaise with students to educate them on the technologies involved and introduce them to new skills:

http://www.bristol.ac.uk/engineering/ilo/partners/schemes/schemes.html.

The scheme provides a base for Internships and partners as mentor who can utilise the scheme to get internships to do specific short time tasks such as data gathering, data evaluation, modelling etc. UNIVBRIS scheme is already being used by Zeetta Networks where the mentored students are successfully being applied as Interns.

UPC run another mentoring program for undergraduates and postgraduates focused on Big Data for Networking. METRO-HAUL will use this scheme to educate students about the opportunities in Big Data analytics. In addition, extension courses targeted to industry professionals in the Barcelona metropolitan area will be organised.

Table 3 Researcher and Student Activity Plan

Researcher and Student Activity Plan (Years 1 to 3)	**Means of Verification and related Metrics**
Training material in support of under- and post-graduate courses	- 1 activity per academic partner domain.
The project will develop training material covering the METRO-HAUL technologies and made available for project partners and wider industry use e.g. operators needing to upskill	- All Partners will contribute - A total of 10 training modules will be made available for Open Access use
Webinar sessions and remote lecturing for Universities on key METRO-HAUL technologies	- Recorded delivery of the training material - 3 Remote deliveries of the training material
Scoping MSc and PhD projects for internships and secondments Key partners will help with development of research challenges and practical results for industry	- Interested Partners will provide feedback on at least 2 MSc or PhD METRO-HAUL related proposals per year
Support summer-schools and career symposiums for students on the topics related to advanced metro networks for 5G;	- Providing support on a best-effort basis
Participate (with booths) in university + Nokia open-day events, bringing the project vision to a larger young audience, including high-school students looking for ICT university studies.	- All university partners to take part in this activity + annual Nokia (Bell Labs) Open Days

3.6 Specification and Standardisation Activities

METRO-HAUL will significantly impact Specification and Standards organisations, related to optical transport data plane, control plane, resource modelling, and configuration and management. Several partners are already contributing, and leading, relevant working and steering groups, including SDN and NFV, for which architecture and interfaces are defined by SDOs such as ONF and ETSI, within the NFV ISG. Proposals for new working areas will be submitted where new groups are required. Also important are the IETF, the reference body for the standardisation of protocols for the Internet; the IRTF, including groups to coordinate pre-standardisation of research lead initiatives in the SDN area and identifying future research challenges (SDNRG) or focused on research problems associated with NFV-related topics (NFVRG). IETF groups such as SFC are also relevant. The following Table 4 summarizes targeted standardisation activities within the METRO-HAUL lifetime.

Table 4Standardisation Activity Plan

Standardisation Activity Plan	**Target Audience**	**By completion of the Project**
SDO contributions (individual drafts, working group documents, interop reports, best practices, and applicability documents.)	METRO-HAUL target SDOs, including but not limited to: IETF, IRTF, ITU-T, ONF, MEF, TMF, OASIS, OCP	4+ contribution to at least 2 SDOs and/or Working Groups covering METRO-HAUL technical topics and challenges
Contributions to Open Source projects, including code donations, documentation, bug fixes, feature requests and testing reports	Open Source Projects such as ONOS, OpenDaylight, OpenSource Mano, Open Orchestrator.	Contributions (including code, bug reports, blueprints, feature requests, etc.) to at least 2 OpenSource projects
Enabling and documenting cooperation between SDOs	METRO-HAUL target SDOs	Publishing documents that demonstrate how enabling technologies across SDOs may be combined, and feeding requirements and solution development

The plans for dissemination and standardisation will incorporate activities across academia and industry, from dissemination via leading journals and conferences, development of MSc and PhD projects, technology primers and webinars, to international specifications and standards, and participation in Open Source communities. All partners will contribute to dissemination activities, and specific ideas and partner plans are outlined below.

British Telecom (BT) will disseminate knowledge gained through this project in three ways: a) publishing in international conferences and journals. We have senior roles in conferences such as OFC (the project coordinator is General Chair of OFC 2017) and ECOC and can steer them towards a new focus on 5G, by proposing and organising workshops and special panel sessions, b) using showcase facilities to demo METRO-HAUL technologies to a wide range of senior decision makers, c) using its close university links to help promote METRO-HAUL ideas, giving keynote presentations and helping them form new courses addressing these much-needed new skills.

Telecom Italia (TIM) will hold internal workshops and training to disseminate results and receive feedback from colleagues involved in planning and operations. TIM intends to contribute to the data and control plane architecture of transport network in ITU-T where results from the project can be presented. TIM will distribute results to the scientific community including through joint publications with other partners. Regular internal workshops will disseminate project results to the relevant areas.

Centre Technologic de Telecomunicacions de Catalunya (CTTC) will target international conferences and journals, with special focus on the applicability of results to optical transport and wireless networks. CTTC personnel contribute to the IETF (CCAMP, TEAS, PCE working groups) and the ONF standards groups and is considering having increased participation in ETSI. Regarding Open Source, CTTC targets projects such as ODL, ONOS (SDN controllers), OpenStack (cloud management) and OSM (ETSI MANO implementation).

Universitat Politecnica de Catalunya (UPC) will disseminate the main results METRO-HAUL in international conferences as well as in journals and magazines. In addition, UPC will organize, at least one workshop related to monitoring and data analytics, and assist in the preparation of demonstrative videos and participate in exhibitions and demonstrations.

Fraunhofer HHI will disseminate by publishing in journals and conferences, presenting at the HHI booth on trade shows and exhibitions as well as in local educational activities (e.g. university lectures, workshops and actions towards the public). HHI will feed-back project results to decision-making processes within public and private initiatives where it is a member (e.g. Photonics21, 5G-PPP, VDE-ITG and others). HHI also supports ITU standardisation activities.

Technische Universiteit Eindhoven (TUE) will focus mainly on producing cutting-edge research targeting peer-reviewed international journals and conferences.

Coriant will disseminate results in the most renowned journals and international conferences. As a system vendor, Coriant are present and contribute to relevant bodies, such as ITU-T, OIF and OpenDaylight.

Ericsson Telecomunicazioni Italy (TEI) as system vendor partner will publish in conferences and journals. TEI personnel will contribute to the following standardisation forum: ITU-T, Photonics21 (Fabio Cavaliere, G. metro editor and Member of the Board of Stakeholder of Photonics 21).

ADVA Project results will be distributed by ADVA internally and presented to the business development and product line management teams. These teams will solicit customer feedback to new concepts and will decide on the productization. Results will be published to the scientific community as well as to potential and key customers. Results can also be carried into standardisation developing organizations, especially, ITU-T, where ADVA is a regular contributor. Results of the projects on those topics can be presented to this group.

Old Dog Consulting (ODC) have Chaired the L2SM, L3SM, SUPA and SDN Groups in the IETF, and are members of the ONF research council. They regularly contribute to other SDOs including the TMF, MEF and ITU-T. ODC will lead the standards strategy and organise standards cooperation across WPs. They will also develop METRO-HAUL education material, contributions for workshops and present concepts and technologies at industry conferences.

Zeetta will distribute results to the scientific community and will also publish demonstration and field trial results as press releases to alert customers of the new capabilities of Zeetta NetOS. Zeetta will participate in technical exhibitions and conferences demonstrating the new development contributed by the METRO-HAUL project.

4 Dissemination Impact in Year 1

All the dissemination statistics shown here are based on the dissemination data registered in Eurescom Tracker tool (http://tracker.eurescom.eu/).

We depend upon the Project members for their voluntarily report and update on their dissemination activity and its status change (e.g., published). Therefore, it must be noted that there might be a slight discrepancy between the actual and the data.

4.1 Disseminations with Publications

4.1.1 Summary

During the first year of the Project, METRO-HAUL has produced impressive 101 dissemination activities in total at the time of this deliverable document being issued.

Details of dissemination status are as follows.

Table 5 Number of Publications in Year 1

Status	Number of disseminations
Published	33
Accepted	48
Submitted	12
Draft	3*
Not Applicable	5**
Total	***101***

* Including 2 x standardisation activities and 1 x Journal.

** Including workshop and demos.

The overall first year WP6 achievements of METRO-HAUL are outstanding across all dissemination channels: Conferences, Journals, Workshops, and Standards Development. We provide details of the above publications in the following sections.

4.1.2 Disseminations by Type

Majority of dissemination activities is formed by conference contributions (75 in total) out of which 17 are invited talks.

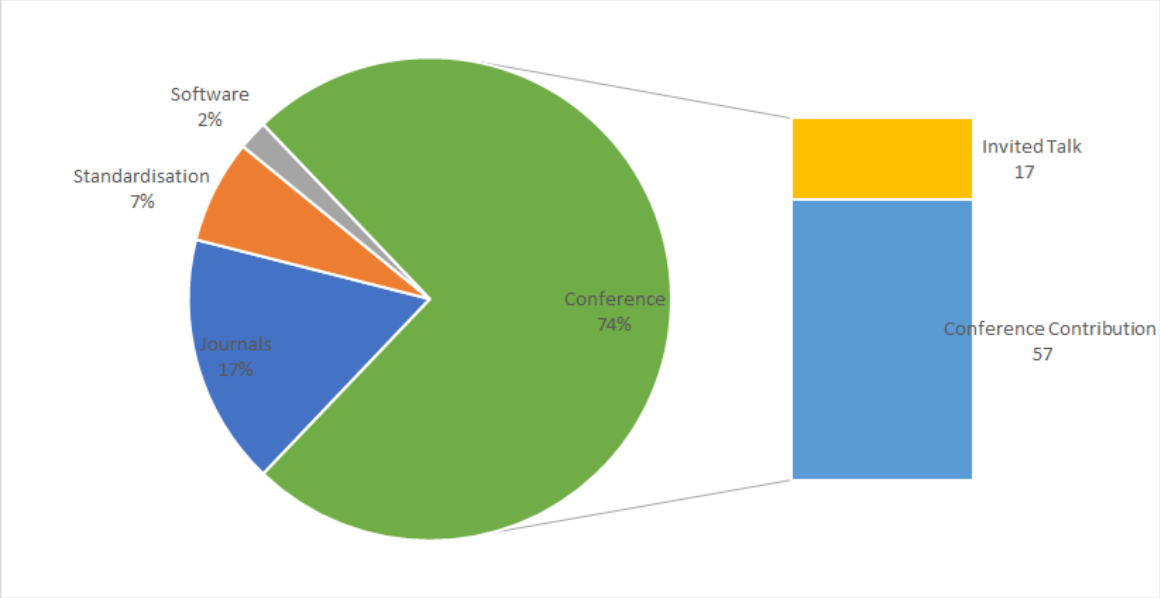


Figure 11 Disseminations by Type

4.1.3 METRO-HAUL Presence in Industry Conferences and Workshops

The below table lists (in alphabetical order) the 17 Industry conferences where METRO-HAUL will have or had a presence.

Table 6 List of Industry Conference with METRO-HAUL's Presence

Conference or Workshop Name	#
2017 International Conference on Networking and Network Applications (NaNA 2017)	1
22nd Conference on Optical Network Design and Modelling (ONDM) 2018	4
33rd ACM/SIGAPP Symposium on Applied Computing (SAC'2018), Networking track	1
ACM Internet Measurement Conference 2017	1
Elastic Networks Workshop within WWRF39	1
EUCNC2018	1
European Conference on Optical Communications (ECOC 2017)	10
European Conference on Optical Communications (ECOC 2018)	2
IEEE/IFIP Network Operations and Management Symposium (NOMS) 2018	1
III Jornadas de Computación Empotrada y Reconfigurable (JCER2018)	1
International Conference on Transparent Optical Networks (ICTON2017)	11

International Conference on Transparent Optical Networks (ICTON2018)	14
Layer123 - Zero Touch and Carrier Automation Conference 2018	1
Layer123 SDN NFV World Congress 2017	1
Optical Fiber Communications Conference and Exhibition (OFC) 2018	23
OSA Advanced Photonics Congress	1
ReConFig 2017	1

The below pie chart clearly shows that METRO-HAUL have a big impact over a few major Industry conferences, such as OFC and ICTON, with double-digit conference contributions (including invited talk, keynote speech).

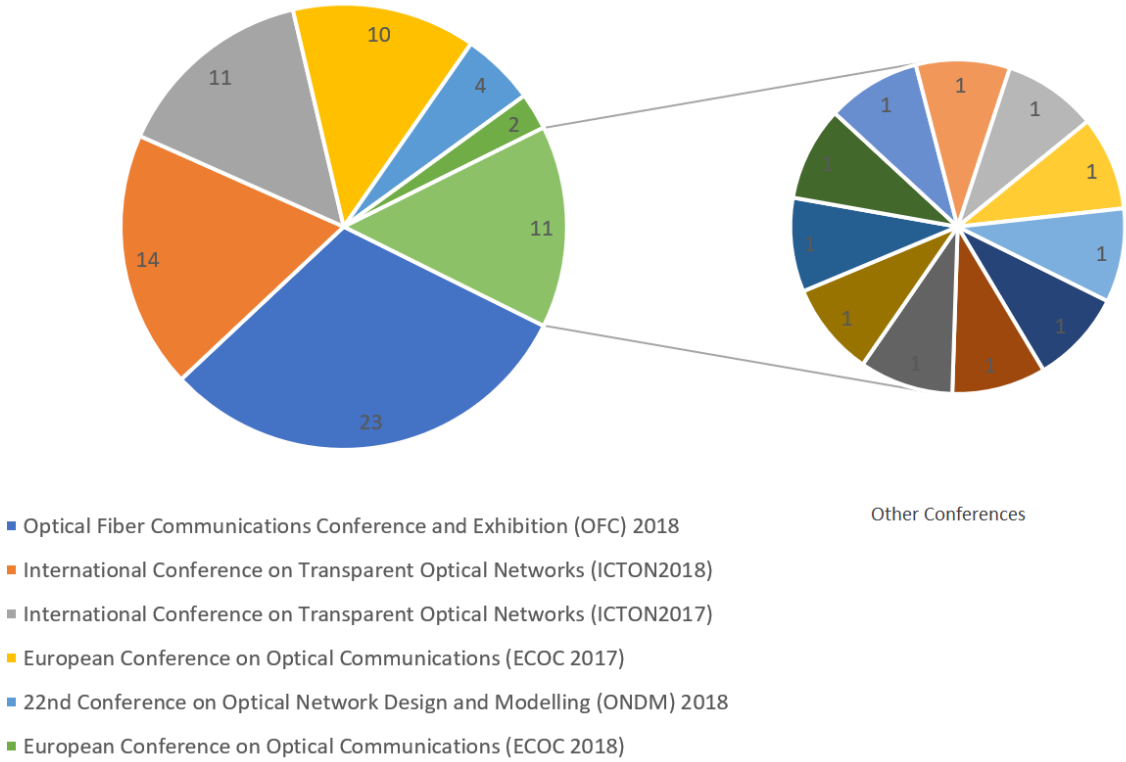


Figure 12 METRO-HAUL's Impact – Number of Conference Contributions Per Conference

Due to its size, the full list of conference contributions can be seen in Appendix 1: "Comprehensive list of Year 1 dissemination activity list" (generated with Tracker tool).

4.1.4 METRO-HAUL Publications in Journals

METRO-HAUL have 17 publications in its first year. The details are shown in the table below.

Journal	#
Computer Networks	1
IEEE Communications Letters	1
IEEE Communications Magazine	1
IEEE Photonics Technology Letters	1
IEEE/OSA Journal of Optical Communications and Networking (JOCN)	1
IEEE/OSA Journal Optical Communications and Networking (JOCN)	2
Journal of Lightwave Technology	1
Journal of Lightwave Technology (JLT)	4
Journal of Optical Communications and Networking (JOCN)	3
Optical Switching and Networking	1
Wiley Journal	1

Figure 13 List of Journals

The below table shows the full list of METRO-HAUL publications for various journals.

Table 7 List of METRO-HAUL publications in journals

Event name / material name	Papers / presentation title	Responsible partner	Authors	Status of publication
Computer Networks	On the performance assessment of 40 Gb/s off-the-shelf network cards for virtual network probes in 5G networks	Naudit	- Jorge E. López de Vergara Méndez (jorge.lopezdevergara@naudit.es) - Rafael Leira Osuna (rafael.leira@uam.es) - Guillermo Julián Moreno (guillermo.julian@naudit.es) - Ivan González Martínez (ivan.gonzalez@naudit.es) - Francisco Gómez Arribas (francisco.gomez@naudit.es)	submitted
IEEE Communications Letters	On the Need of Joint Bandwidth and NFV Resource Orchestration: a Realistic 5G Access Network Use Case	Universidad Politécnica de Cartagena (UPCT)	- José Juan Pedreño Manresa (josej.pedreno@upct.es)	Published
IEEE Communications Magazine	Revisiting Core Traffic Growth in Light of Future CDN Expansion Strategies	Universidad Politécnica de Cartagena (UPCT)	- F. Javier Moreno Muro (javier.moreno@upct.es) - Nina Skorin-Kapov (nina.skorinkapov@cud.upct.es) - Pablo Pavon (pablo.pavon@upct.es)	Draft
IEEE/OSA Journal of Optical Communications and Networking (JOCN)	Autonomic Disaggregated Multilayer Networking	UPC	- Luis Velasco (lvelasco@ac.upc.edu) - Lluis Gifre (lluis.gifre@uam.es) - Jose-Luis Izquierdo-Zaragoza (josel.izquierdo@ac.upc.edu) - Marc Ruiz (mruiz@ac.upc.edu)	Published
IEEE/OSA Journal Optical Communications and Networking (JOCN)	On the Impact of Deploying Optical Transport Networks Using Disaggregated Line Systems	Coriant Portugal	- João Miguel Santos (joao.m.santos@coriant.com) - Nelson Costa (nelson.costa@coriant.com) - João Pedro (joao.pedro@coriant.com)	Published
IEEE/OSA Journal Optical Communications and Networking (JOCN)	Machine-Learning Method for Quality of Transmission Prediction of Unestablished Lightpaths	Politecnico di Milano (PoliMi)	- Massimo Tornatore (massimo.tornatore@polimi.it) - Cristina Rottondi (Cristina.Rottondi@supsi.ch) - Alessandro Giusti (Alessandro.Giusti@supsi.ch) - Luca Barletta (Luca.Barletta@polimi.it)	published
Journal of Lightwave Technology	Control, Management and Orchestration of Optical Networks: Evolution, Trends and Challenges	Centre Tecnològic de Telecomunicacions de Catalunya (CTTC)	- Ramon Casellas (ramon.casellas@cttc.es) - Ricardo Martínez (ricardo.martinez@cttc.es) - Ricard Vilalta (ricard.vilalta@cttc.es) - Raül Muñoz (raul.munoz@cttc.es)	published
Journal of Lightwave Technology (JLT)	Cognitive Assurance Architecture for Optical Network Fault Management	ADVA	- Danish Rafique (drafique@advaoptical.com)	accepted
Journal of Lightwave Technology (JLT)	An Architecture to Support Autonomic Slice Networking	Universitat Politècnica de Catalunya (UPC), Consorzio Nazionale Interuniversitario Per Le Telecomunicazioni (CNIT)	- Luis Velasco (lvelasco@ac.upc.edu) - Alba Perez Vela (apvela@ac.upc.edu) - Marc Ruiz (mruiz@ac.upc.edu) - Filippo Cugini (filippo.cugini@cnit.it)	published

Journal of Lightwave Technology (JLT)	BER Degradation Detection and Failure Identification in Elastic Optical Networks	Universitat Politècnica de Catalunya (UPC), Consorzio Nazionale Interuniversitario Per Le Telecomunicazioni (CNIT)	- Alba Perez Vela (apvela@ac.upc.edu) - Marc Ruiz (mruiz@ac.upc.edu) - Filippo Cugini (filippo.cugini@cnit.it) - Luca Poti (luca.poti@cnit.it) - G. Meloni (gianluca.meloni@cnit.it) - Luis Velasco (lvelasco@ac.upc.edu)	published
Journal of Lightwave Technology (JLT)	An Operator's view on introduction of White Boxes in Optical Networks	Telecom Italia (TIM)	- Emilio Riccardi (emilio.riccardi@telecomitalia.it) - Paul Gunning (paul.gunning@bt.com) - Oscar Gonzalez de Dios (oscar.gonzalezdedios@telefonica.com) - Marco Quagliotti (marco.quagliotti@telecomitalia.it) - Victor Lopez (victor.lopezalvarez@telefonica.com) - Andrew Lord (andrew.lord@bt.com)	published
Journal of Optical Communications and Networking (JOCN)	Dynamic Core VNT Adaptability based on Predictive Metro-Flow Traffic Models	Universitat Politècnica de Catalunya (UPC), Consorzio Nazionale Interuniversitario Per Le Telecomunicazioni (CNIT)	- Fernando Morales (fmorales@ac.upc.edu) - F. Paolucci (fr.paolucci@sssup.it) - Marc Ruiz (mruiz@ac.upc.edu) - Filippo Cugini (filippo.cugini@cnit.it) - Luis Velasco (lvelasco@ac.upc.edu)	published
Journal of Optical Communications and Networking (JOCN)	Soft Failure Localization During Commissioning Testing and Lightpath Operation	Universitat Politècnica de Catalunya (UPC), Consorzio Nazionale Interuniversitario Per Le Telecomunicazioni (CNIT)	- Alba Perez Vela (apvela@ac.upc.edu) - Luis Velasco (lvelasco@ac.upc.edu) - Marc Ruiz (mruiz@ac.upc.edu) - Filippo Cugini (filippo.cugini@cnit.it)	accepted
Journal of Optical Communications and Networking (JOCN)	Programmable SDN-enabled S-BVT based on hybrid electro-optical MCM	Centre Tecnològic de Telecomunicacions de Catalunya (CTTC)	- Laia Nadal (laia.nadal@cttc.cat) - Michela Svaluto-Moreolo (michela.svaluto@cttc.es) - Josep Maria Fabrega (josep.maria.fabrega@cttc.es) - Ramon Casellas (ramon.casellas@cttc.es) - Francisco Gómez Arribas (francisco.gomez@naudit.es) - Ricardo Martínez (ricardo.martinez@cttc.es) - Ricard Vilalta (ricard.vilalta@cttc.es) - Raül Muñoz (raul.munoz@cttc.es)	accepted
Optical Switching and Networking	High-speed optical networks latency measurements in the microsecond timescale with software-based traffic injection	Naudit	- Jorge E. López de Vergara Méndez (jorge.lopezdevergara@naudit.es) - Rafael Leira Osuna (rafael.leira@uam.es) - Javier Aracil Rico (javier.aracil@naudit.es) - Paula Roquero (paula.roquero@naudit.es) - Ivan González Martínez (ivan.gonzalez@naudit.es)	published
Wiley Journal	Protection strategies for virtual network functions placement and service chains provisioning	Politecnico di Milano (Polimi)	- Ali Hmaity (ali.hmaity@polimi.it) - Francesco Musumeci (francesco.musumeci@polimi.it) - Massimo Tornatore (massimo.tornatore@polimi.it) - Achille Pattavina (achille.pattavina@polimi.it)	published

4.1.5 Standardisation Activity

The project is within its first year of and standards development is typical slow to start, however there have been limited dissemination activities in SDOs such as IETF, ONF, TMF, and Photonics, during the first year. There are 7 standardisation activities; 6 in Internet Engineering Task Force (IETF, https://www.ietf.org/), and 1 in MEF (Metro Ethernet Forum, http://www.mef.net/).

IETF Activity

- Transport Northbound Interface Applicability Statement
- Applicability of Abstraction and Control of Traffic Engineered Networks (ACTN) to Network Slicing
- YANG Data model for ACTN TE Performance Monitoring Telemetry and Network Autonomics

BBF Activity

- WT-411 "Definition of interfaces between Cloud CO Functional Modules" (Telefonica)
- WT-412 "Test Cases for Cloud CO Applications" (Telefonica)
- WT-413 "SDN Management and Control Interfaces for CloudCO Network Functions" (Telefonica)
- WT-416 "Use Cases and Scenarios for Cloud Central Office" (Telefonica)

ITU-T

- Participation to the ITU-T Focus Group on "Machine Learning for Future Networks including 5G" (FG-ML5G)

The below table shows the full list of the accepted and on-going IETF and MEF Standardisation activities.

Table 8 METRO-HAUL Standardisation Activities

SDO	Title	Responsible partner	Authors	Status of publication	Download Link
IETF	Applicability of Abstraction and Control of Traffic Engineered Networks (ACTN) to Network Slicing	Old Dog Consulting (ODC)	- Daniel King	submitted	https://tools.ietf.org/html/draft-king-teas-applicability-actn-slicing
IETF	Transport Northbound Interface Applicability Statement	Old Dog Consulting (ODC)	- Daniel King	accepted	https://tools.ietf.org/html/draft-ietf-ccamp-transport-nbi-app-statement-01
IETF	Analysis of Transport North Bound Interface Use Case 1	Old Dog Consulting (ODC)	- Daniel King	submitted	https://tools.ietf.org/html/draft-tnbidt-ccamp-transport-nbi-analysis-uc1-00
IETF	GMPLS Routing and Signaling Framework for B100G	Old Dog Consulting (ODC)	- Daniel King (daniel@olddog.co.uk)	submitted	https://tools.ietf.org/html/draft-merge-ccamp-otn-b100g-fwk-01
IETF	YANG data model for Flexi-Grid media-channels (draft-vergara-ccamp-flexigrid-media-channel-yang-00)	Telefonica I+D, Naudit, Old Dog Consulting (ODC)	- Jorge E. López de Vergara Méndez - Oscar Gonzalez de Dios - Victor Lopez - Daniel King	submitted	https://tools.ietf.org/html/draft-vergara-ccamp-flexigrid-media-channel-yang-00

IETF	YANG data model for Flexi-Grid Optical Networks (draft-ietf-ccamp-flexigrid-yang-00)	Telefonica I+D, Naudit, Old Dog Consulting (ODC)	- Jorge E. López de Vergara Méndez - Daniel Perdices Burrero - Victor Lopez - Oscar Gonzalez de Dios - Daniel King	draft	https://datatracker.ietf.org/doc/draft-ietf-ccamp-flexigrid-yang/
MEF	start discussion in MEF to create 5G slicing group Contributed to MEF TAPI hackathon	university of Bristol	- Reza Nejabati	draft	

The table below shows the ITU-T contributions:

Table 9 ITU-T SG15, Q.6, Topic "100G coherent interfaces for G.698.2"

ITU-T Contribution number	Meeting	Title
C-0011	Plenary, Geneva	EVM and OSNR penalty measurements for draft revised G.698.2
WD06-05	Hangzhou interim	EVM calculation for G.698.2
WD06-14	Hangzhou interim	Equalizer parameters for reference receiver in G.698.2
C-0424	Plenary, Geneva	Text proposal for draft G.698.2 defining modulation format of 100G coherent signals
Correspondence	Correspondence	Variance for Gaussian noise emulation

4.1.6 OpenSource Software

There are 2 dissemination activities in OpenSource Software area as shown in the below table.

Table 10 METRO-HAUL OpenSource Software Development Activities

Software / Area	Description	Responsible partner	Authors	Status of publication	Download Link
Open Network Operating System (ONOS)	ODTN application Code for the application	Centre Tecnològic de Telecomunicacions de Catalunya (CTTC)	- Ramon Casellas	accepted	https://wiki.onosproject.org/display/ODTN/ODTN

Open Source MANO (OSM) / European Telecommunications Standards Institute (ETSI)	Feature request to integrate WIM into OSM	University of Bristol, Telefonica I+D, Centre Tecnològic de Telecomunicacions de Catalunya (CTTC)	- Ramon Casellas	submitted	

There are several other activities related to Standardisation in Open Source communities which are work in progress, these include:

ETSI

- Supported the creation of Work Item that has evolved in ETSI NFV IFA FEAT10 (Telefonica)
- Plan to author contributions to the specifications affected by FEAT10 (Telefonica)
- Feature Proposal: Integration of OSM and WIM (CTTC)

Open ROADM

- Active participation to periodic audio calls (next release: 3.0)

ONOS Open Disaggregated Transport Network

- Remote participation to kick-off and plenary meetings
- Active participation to periodic audio calls of "Use Case team"

4.2 METRO-HAUL Website

This section provides the summary of website contents generated for external dissemination and website performance.

4.2.1 Main Contents

4.2.1.1 Blog

Blog articles (https://metro-haul.eu/media-corner/blog/, also refer section 3.1.1.3) are used to provide frequent and informal updates on project, its progress and events including plenary meetings. Currently there are 6 articles available:

Emiko King / 2017, Blog, November / November 6, 2017

METRO-HAUL PROJECT LAUNCHED

The Metro-Haul project is funded and live! Our consortium has been awarded €7.7 million by the European Commission to fund ambitious research into the application of scalable optical networks to [...]

READ MORE

Adrian Farrel / 2017, Blog, November / November 7, 2017

THE METRO-HAUL PROJECT IN OVERVIEW

The €7.7 million Metro-Haul project, funded by the European Commission has a total of 20 partners from 7 European countries. Recent estimates suggest that by the year 2025 over 1.4 billion users [...]

READ MORE

Adrian Farrel / 2017, Blog, November / November 8, 2017

TO SLICE OR NOT TO SLICE, THAT IS THE QUESTION

– A personal view from Adrian Farrel One of the questions exercising the partners in the Metro-Haul project is "What is a network slice?" There are several base definitions [...]

READ MORE

Emiko King / 2017, Blog, November / November 27, 2017

2ND PLENARY MEETING HOSTED BY CTTC IN CASTELLDEFELS, CATALONIA

5 months after the project launch, Metro-Haul project had its second plenary meeting on 7th – 9th November, which was kindly hosted by CTTC in Castelledefels, Spain. With 48 attendees from [...]

READ MORE

METRO-HAUL PRESENCE IN ECOC 2017

Metro-Haul has had a notable presence in the last European Conference on Optical Communications (ECOC), which took place in Gothenburg, Sweden, on September 17-21, 2017. Main results and [...]

READ MORE

Emiko King / 2018, Blog, March / March 1, 2018

METRO-HAUL IMPACT AT OFC 2018

The Metro-Haul project is poised to make a big splash at this year's OFC 2018. With 23 contributions accepted, including invited talks, workshops and tutorials, the consortium members are [...]

READ MORE

4.2.1.2 News & Press Release

Press release (https://metro-haul.eu/media-corner/latest-news/) is a formal article for significant update on the project. The published press release articles are also distributed to various medias in the industry (refer section 3.1.1.3).

The Project published 4 press release during the first year;

1. "Ambitious Multi-National 5G Optical Network Project Awarded €7.7m in EU Funding" (September, 2017)
2. "Bringing Flexibility to the Optical Metro Network in Support of 5G : Successful Metro-Haul Plenary Meeting Hosted by CTTC in Castelldefels" (November, 2017)
3. "Metro-Haul makes a big impact at OFC 2018" (March, 2018)
4. "Metro-Haul Holds Successful Plenary Session Addressing Implications of 5G Use Cases in Metro Optical Networks" (May, 2018)

Andrew Lord / 2018, March, News, Press Release / March 6, 2018

METRO-HAUL MAKES A BIG IMPACT AT OFC 2018

OFC 2018 (https://www.ofcconference.org/en-us/home/) in San Diego is the first major conference seeing significant Metro-Haul dissemination. The project began in June 2017, and we are already [...]

READ MORE

Emiko King / 2017, News, November, Press Release / November 20, 2017

BRINGING FLEXIBILITY TO THE OPTICAL METRO NETWORK IN SUPPORT OF 5G : SUCCESSFUL METRO-HAUL PLENARY MEETING HOSTED BY CTTC IN CASTELLDEFELS

November, 2017 The Metro-Haul project is an EU funded project that has been awarded €7.7 million to fund ambitious research into the application of scalable optical networks to future 5G wireless [...]

READ MORE

Emiko King / 2017, News, Press Release, September / September 12, 2017

AMBITIOUS MULTI-NATIONAL 5G OPTICAL NETWORK PROJECT AWARDED €7.7M IN EU FUNDING

A consortium of European companies and research institutions has been awarded €7.7 million by the European Commission to fund ambitious research into the application of scalable optical networks [...]

READ MORE

The OFC press release was particularly successful, generating 19 referral articles internationally.

4.2.1.3 Videos

There are 2 videos published during the first year (https://metro-haul.eu/media-corner/videos/). We expect the number of videos to grow as the project progresses.

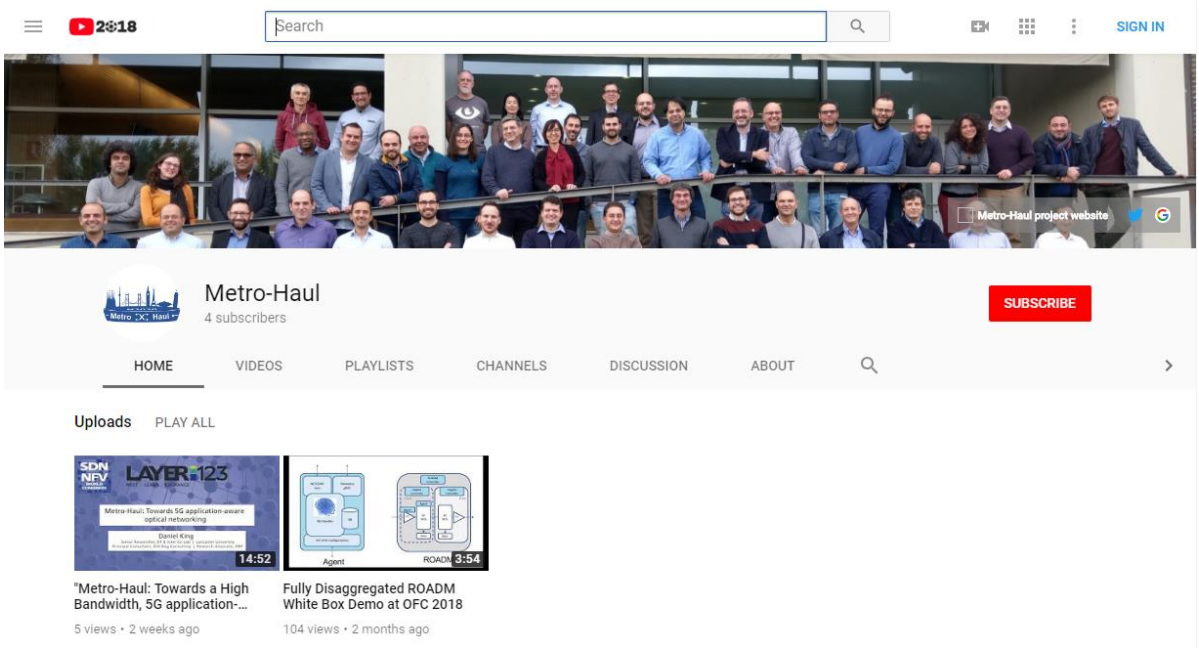


Figure 14 METRO-HAUL YouTube Channel Splash Page

4.2.2 Website Statistics

WP6 leaders monitor and analyse the METRO-HAUL website's performance using Google Analytics. This section talks through the statistics of the website performance over the first year period: between June 2017 to May 2018.

4.2.2.1 Page View Summary

The below figure shows the weekly pageviews during the first year. The METRO-HAUL website started gaining hits only a few of months after the project was kick-started.

Fair bounce rate (percentage of single page session, 52%) and exit rate ([number of exit] / [number of page views], 36%). This means that the visitors have good interactions over the website, hence indicates their interests in the contents.

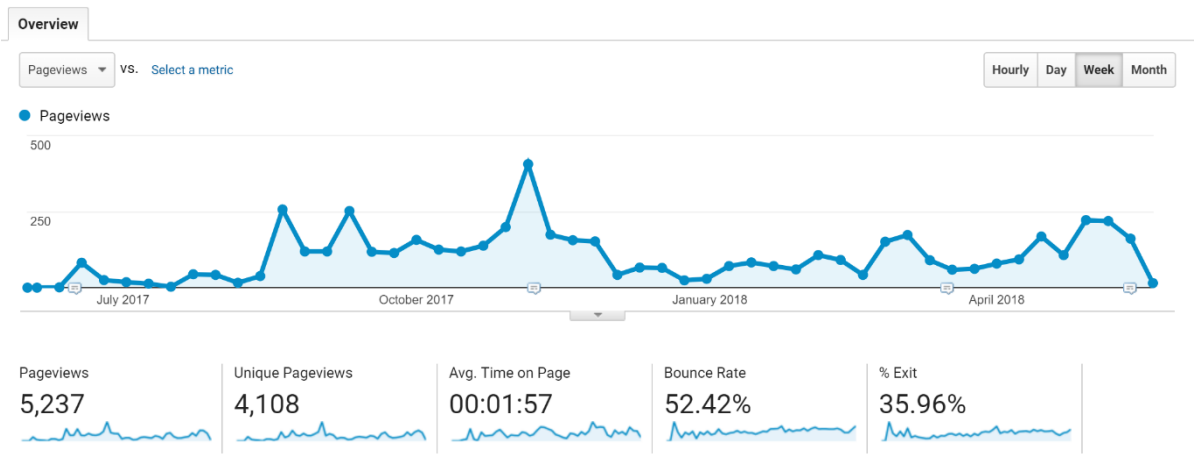


Figure 15 METRO-HAUL Website Page View Trend Over The First Year

4.2.2.2 Page View Summary

The below table and graph show which webpage gained the most views.

'Publications' pages ranked in top 10, including 'Research papers' page (ranked at 2nd), indicates that the visitors check MH's actual research outcomes. 'News' and 'Blogs' pages also gain good views.

	Page	Pageviews	Pageviews	Contribution to total: Pageviews
		5,237 % of Total: 100.00% (5,237)	5,237 % of Total: 100.00% (5,237)	
1.	/	1,208	23.07%	
2.	/publications/research-papers/	599	11.44%	
3.	/deliverables/	367	7.01%	
4.	/project/	311	5.94%	
5.	/project/partners/	241	4.60%	
6.	/2017/11/08/to-slice-or-not-to-slice-that-is-the-question/	177	3.38%	
7.	/publications/	161	3.07%	
8.	/publications/standards/	154	2.94%	
9.	/2018/03/01/metro-haul-impact-at-ofc-2018/	129	2.46%	
10.	/contact/	109	2.08%	
11.	/2017/09/12/ambitious-multi-national-5g-optical-network-project-awarded-e7-7m-in-eu-funding/	107	2.04%	
12.	/media-corner/latest-news/	106	2.02%	
13.	/events/	104	1.99%	

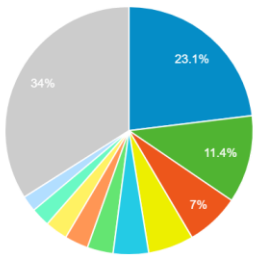


Figure 16 METRO-HAUL Website: Page View Ranking

4.2.2.3 Visitor Locations

The below table and the graph show European countries (mainly Project's participants' countries) occupy the top visitor locations, but the statistics show a good spread around the world; there are major hits from North America; US (3rd), Canada (11th); good amount of traffic coming in from Asian countries also (India (7th), Japan (12th), China (13th), Taiwan (18th)).

This indicates that METRO-HAUL is potentially generating interests over not only EU countries but globally in this particular technology area.

	1,039 % of Total: 100.00% (1,039)	1,039 % of Total: 100.00% (1,039)
1. Spain	176	16.33%
2. United Kingdom	170	15.77%
3. United States	101	9.37%
4. Italy	95	8.81%
5. Germany	78	7.24%
6. Portugal	50	4.64%
7. India	48	4.45%
8. Netherlands	38	3.53%
9. France	35	3.25%
10. Greece	34	3.15%
11. Canada	29	2.69%
12. Japan	29	2.69%
13. China	26	2.41%
14. Sweden	26	2.41%
15. Belgium	12	1.11%
16. Brazil	11	1.02%
17. Ireland	11	1.02%
18. Taiwan	8	0.74%
19. Denmark	7	0.65%
20. Poland	7	0.65%

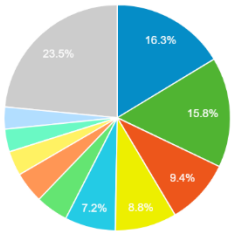


Figure 17 METRO-HAUL Website: Visitor Locations

4.2.2.4 Acquisitions

The below graph shows how and where METRO-HAUL website gains its visitors from.

Direct traffic usually means that the visitor either type in the URL directly or visit the website from bookmarks, but it is highly likely that the visitor already knows the website, hence a returning visitor.

Twitter is the main source in 'Social' category.

Top 5 referrals are; 5g-ppp.eu, cttc.es, hhi.fraunhofer.de, coriant.com, people.ac.upc.edu. This suggests that that working together with partners' PR brings have a great effect bringing in traffic to MH website.

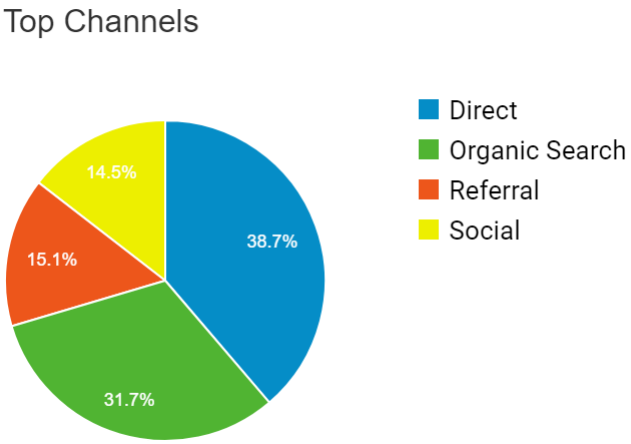


Figure 18 METRO-HAUL Website: Acquisitions

Additionally, according to Google Analytics Insight, in April 2018 the traffic from '5G-PPP.eu' had lower bounce rate; i.e., people have more interactions over different pages. It indicates that it is important to have a cooperation with 5G-PPP and its projects to have an effective dissemination.

5g-ppp.eu is performing better than other Referral traffic

Apr 1 - 30, 2018

32.02% of your site traffic is from the Referral channel. Within Referral, 5g-ppp.eu is 35.62% of sessions, and performs better on some key metrics.

Metric	This source	Other [Referral] traffic
Avg. Session Duration	00:03:30	00:01:39
Bounce Rate	34.62%	70.21%

Figure 19 5G-PPP.eu As High-Performing Referral

4.3 Social Medias

Addition to its own website, METRO-HAUL utilises various social medias in order to reach wider range of audiences, disseminating the Project activities. The list of social medias where METRO-HAUL is active are as follows.

A. Twitter (@MetroHaul)
B. YouTube (https://www.youtube.com/channel/UCnxS679kyoHgtWNLv1_4eLA)
C. LinkedIn (https://www.linkedin.com/groups/13543287)
D. Research Gate (https://www.researchgate.net/project/Metro-Haul-METRO-High-bandwidth-5G-Application-aware-optical-network-with-edge-storage-compUte-and-low-Latency)

We will look into the dissemination performance of each in the following sections.

4.3.1 Twitter

Twitter is the main social media where WP6 leaders (from ODC) actively tweets about the Project members' and organisations' activities, relating events as well as any significant events and news releases. We have 5G PPP (@5GPPP) and its relating projects mutually following each other, aiming to achieve synergy through interactions between each other (e.g., re-tweet).

According to Twitter Analytics, tweets has been an effective media to help key information being conveyed and reached to many audience, not only external ones but also the project members, particularly over a big industrial event such as OFC where METRO-HAUL made a significant impact.

We started tweeting at the project kick-off in June 2017, and we have steadily increased the number of followers. Today, we have 142 followers at the end of first year. Since QMR3, we constantly gain average of >4k impressions, except over a period of big event (e.g., OFC) where we gained close to 15k impressions, as you can see in the figure below.

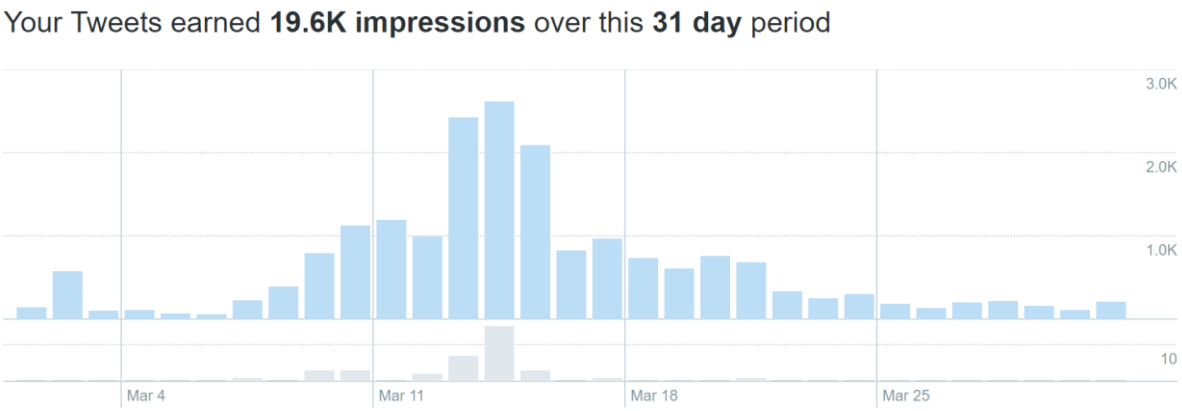


Figure 20 OFC Impact on Twitter

4.3.2 YouTube Channel

METRO-HAUL YouTube channel has been established in QMR3, after the first material become available from OFC 2018 demo in March 2018. As of the writing of this documentation, we currently have 2 videos available to public, one from OFC 2018 demo and another from Layer 123 SDN/NFV Congress 2017.

Considering the visual and audible nature of the media, we anticipate to organically gain more views as we increase the video materials, so as to establish METRO-HAUL YouTube channel.

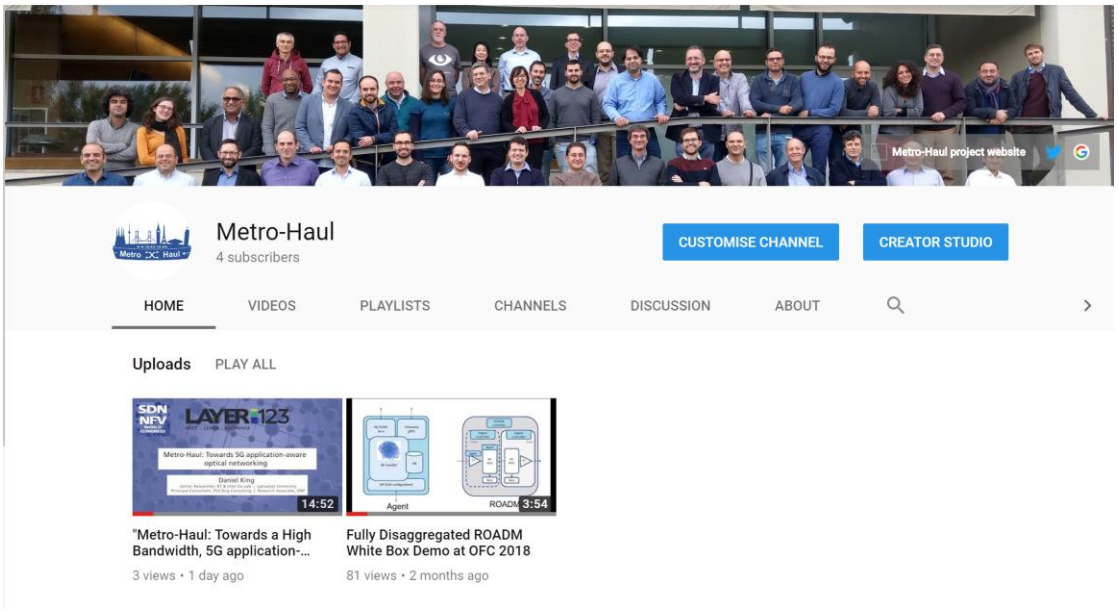


Figure 21 METRO-HAUL YouTube Channel Splash Page

4.3.3 LinkedIn Group

LinkedIn is relatively a focused media for human resource in principle based on interests in individuals' expertise. The Project has not yet utilised this media but will do so accordingly when suitable materials comes up.

4.3.4 Research Gate Project

Research Gate is more academia focused social medial, and it is entirely dependent on individuals' contributions to collate information of their research and relevance to any projects. In other words, it is beyond WP6 leaders' control and we are completely dependent on the Project member's proactive registration of their publication registration that is linking to METRO-HAUL Project. Even so, METRO-HAUL have gained 61 followers, 21 collaborations 314 reads, at the time of writing this document, and we think that is a decent dissemination effort, and we expect to grow as the Project progresses with more research outcomes becoming available.

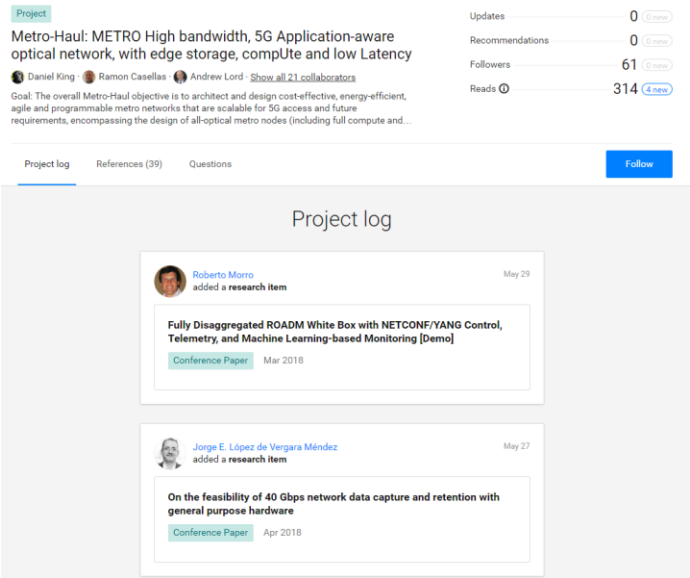


Figure 22 Research Gate Portal

5 Summary

In summary, the overall first year Work Package 6 Dissemination and Standardisation achievements of METRO-HAUL are excellent across all dissemination channels: Conferences, Journals, Workshops, and Standards Development.

The following list shows our target dissemination and verification plan for year 1, versus what was delivered:

- Target was 5 academic journals, actual was 17 Publications (detailed in Section 4.1.4 METRO-HAUL Publications in Journals)
- Target was 5 presentations and publications at selected conferences, actual has been more than 30 presentations and publications at 14 Conferences (detailed in Section 4.1.3 METRO-HAUL Presence in Industry Conferences and Workshops)
- Target was 1 industry panes and workshop involvement, actual has been 3 Workshops and more than 5 panels (detailed in Section 4.1.3 METRO-HAUL Presence in Industry Conferences and Workshops).

There are areas for improvement including development of our first Newsletter, increasing content, developing workshops, and attracting subscribers to our YouTube channel. Furthermore, coordination across other 5GPP efforts should be improved moving forward in the METRO-HAUL project.

We have also identified several disseminations stretch goals, these include:

- Online Tutorials covering enabling technologies within the METRO-HAUL project
- Development and publication of architecture at key Standards Development Organisation(s)
- Book or chapters covering the METRO-HAUL architecture and enabling technologies

Education dissemination is also an important area for METRO-HAUL and WP6 and the overall METRO-HAUL team should continue to work and support PhD and academic researchers.

Overall, we are excited with the WP6 infrastructure and processes created to support the project and our partners. We made excellent progress towards the overall project WP6 tasks and objectives and are confident with exceeding all dissemination and standardisation expectations.

6 List of acronyms

Acronym	Description
3GPP	Third Generation Partnership Project
5G PPP	5G Infrastructure Public Private Partnership
ABNO	Application Based Network Operations
API	Application Programming Interface
BBF	Broadband Forum
BER	Bit Error Rate
CORD	Central Office Re-architectured as a Data-centre
E-CORD	Enterprise CORD
ETSI	European Telecommunications Standards Institute
IETF	Internet Engineering Task Force
JSON	JavaScript Object Notation
M-CORD	Mobile CORD
NBI	North-Bound Interface
NFV	Network Functions Virtualization
NFVI	Network Function Virtualization Infrastructure
NFV-O	Network Function Virtualization Orchestrator
NFMN	Next Generation Mobile Networks (Industrial Association)
ODTN	Open Disaggregated Transport Networks
ONAP	Open Network Automation Platform
R-CORD	Residential CORD
SDO	Standards Development Organization

7 References

[1] ETSI, "Network Functions Virtualisation (NFV); Virtual Network Functions Architecture," December 2014. [Online]. Available: http://www.etsi.org/deliver/etsi_gs/NFV-SWA/001_099/001/01.01.01_60/gs_nfv-swa001v010101p.pdf

[2] OpenStack. Available: [Online] http://www.openstack.org.

[3] OpenDaylight [Online]. Available: http://www.opendaylight.org.

[4] Ryu controller [Online]. Available at https://osrg.github.io/ryu/.

[5] ONOS [Online]. Available: http://onosproject.org.

[6] P. Congdon, P. Mohapatra, M. Farrens, V. Akella, “Simultaneously Reducing Latency and Power Consumption in OpenFlow Switches,” IEEE/ACM Transactions on Networking, vol. 22, no. 3, 2014.

Appendices A Comprehensive list of Year 1 dissemination activity list

disseminations_180530.xls