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Executive Summary

This document is deliverable D8.3.3 of the CloudLightning project, a Research and Innovation Action project supported by the European Union Horizon 2020 programme under Grant Agreement Number 643946. Full information on this project, including the contents of this deliverable, is available online at (<http://www.cloudlightning.eu>).

The purpose of this document is to report on actions taken and impact achieved with regard to concertation and orchestration activities in Y3 and throughout the three years of the CloudLightning project.

The report is organised as follows. Section 1 introduces the report and summarises overall performance against planned KPIs agreed with the European Commission. Section 2 provides detailed descriptions of all concertation actions taken by the Consortium members from M1 to M36. The report concludes with Section 3.

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1 Introduction

The objective of Task 8.3 is to ensure that project's activities are well orchestrated with similar initiatives worldwide and to encompass specific activities in connection with other EU projects.

Deliverable 8.3.1 set out CloudLightning's concertation plan for the three years of the project. The Concertation Plan envisaged consortium members participating EU project concertation, contributing to international standardisation organisation activities, and liaising with policy making organisations and funding bodies. In addition, the Concertation Plan recognises the role that the External Advisory Board plays not only in project governance but concertation and stakeholder engagement. This document D8.3.3 is an update of the Concertation Progress Report (D8.3.2) submitted in M24. Table 1 below summarises the KPIs achieved at M12 and M24 as well as the original targets for M36 for the project as a whole and actual M36 performance. For the vast majority of the KPIs, the consortium met or exceeded the targets set in Y1.

It should be noted that there is significant crossover between dissemination, concertation and exploitation activities. For example, the CloudLightning consortium and the RECAP consortium are engaged on a number of collaborative cross-project activities which has resulted in two conference papers; these are reported in the Dissemination Final Report (D8.2.3) and not included in the concertation figures. Similarly, as part of the exploitation task, CloudLightning surveyed and interviewed over 300 stakeholders. For example, in the Commercialisation Options study 36 stakeholders including policy makers and funding organisations were briefed on CloudLightning and interviews. Again, these are not included in concertation figures and are reported in the Exploitation Final Report (D8.1.4).

Table 1. Concertation KPIs

KPIs	M12 Actual	M24 Actual	M36 Target	M36 Actual
Concertation Publications	2	6	2	6
Concertation Presentations and Meeting	6	14	12	23
Presentations to national stakeholders	5	10	32	20*
Briefing papers	2	4	6	6
Participation in standardisation activities	0	0	2	2**
Formal briefing events	0	0	4	4
Informal stakeholder meetings	0	0	10	11
External Advisory Board meetings	1	1	4	4

*excluding attendance at the CloudLightning events and presentations

**WIP

2 Concertation Activities

This section presents the concertation and orchestration activities executed throughout the the three years of the CloudLightning project. Concertation activities are divided into EU Project EU Project Concertation Publications, EU Project EU Project Concertation Meetings, Concertation Presentations, Presentations to National Stakeholders, Briefing Papers and Other Concertation Activities that do not fall under any of the categories.

2.1 EU Project Concertation Publications

CloudLightning actively collaborated with the participants of two relevant EU clusters: Novel approaches and technologies for Cloud resource and service management (NATRES) and Inter-cloud Challenges, Expectations and Issues. Two CloudLightning consortium members, IEAT and UCC, and six researchers from the consortium contributed to six publications over the course of the three years, primarily in Y1 an Y2. These are summarised in Table 2.

As discussed in Section 1 above, CloudLightning also directly collaborated with the Horizon 2020 RECAP project. Two peer-reviewed conference papers have been published as a result of this concertation activity. These are included in KPI counts for the Dissemination Final Report (D8.2.3).

Table 2. EU Project Concertation Publications

1	Type	NATRES Map of Challenges
	Title	Novel approaches and technologies for Cloud resource and service management (NATRES)
	Date	15/10/2015
	Authors	D. Petcu (IeAT), Z. Zhao (University of Amsterdam), P. Deussen (FOKUS), R. Prodan (University of Innsbruck), M. Rak (CeRICT/Second University of Naples), D. Vladušić (XLAB), S. Georgoulas (University of Surrey), V.Stavroulaki (WINGS ICT Solutions), I. Mavroidis (FORTH ICS), L.Lopez (ATOS), S.Kosta (University of Rome), L.Gürgen (CEA), C.Formisano (Engineering Ingegneria Informatica SpA), R.Bruschi (CNIT), C.Vassilakis (UBITECH), A. Zafeiropoulos (UBITECH)
	Publication references	https://eucloudclusters.files.wordpress.com/2015/05/map-of-challenges2.pdf
2	Type	Inter-cloud Challenges, Expectations and Issues Position Paper
	Title	Inter-cloud Challenges, Expectations and Issues Cluster Position Paper - Initial Research Roadmap and Project's Classification
	Date	15/12/2015
	Authors	B. Di Martino (Second University of Naples), M.Biancani (Interoute SpA), J.Aznar (I2CAT), D.Gallico (Interoute SpA), A.J.Ferrer (ATOS), K.Djemame (University of Leeds), E.Di Nitto (Politecnico di Milano), G.Kecskemeti (MTA SZTAKI), Z.Zhao (University of Amsterdam), F.D'Andria (ATOS), R.Woitsch (BOC), K.Kritikos (FORTH), P.Deussen (Fraunhofer), P.Massonet (CETIC), M.Villari (UNIME), J.Costa (AALTO), E.Kowalczyk (ORANGE), J. Morrison (UCC)

	Publication references	https://eucloudclusters.files.wordpress.com/2015/05/inter-cloud-pp_dec-2015.pdf
3	Type	NATRES White Paper
	Title	Novel approaches and technologies for Cloud resource and service management (NATRES) White Paper
	Date	16/04/2016
	Authors	D. Petcu (IeAT), L.Lopez (ATOS), F. Javier Nieto (ATOS), I. Mavroidis (FORTH ICS), R. Bruschi (CNIT), Z. Zhao (University of Amsterdam), C.Vassilakis (UBITECH), P.Gouvas (UBITECH), I.Matranga (Engineering Ingegneria Informatica SpA), D.Pavia (Engineering Ingegneria Informatica SpA), A.Edmonds (Zürich University of Applied Sciences), T. M.Bohnert (Zürich University of Applied Sciences), M.Fazio (University of Messina), P.Leitner (University of Zurich), E.Salant (IBM Research), D. Vladušić (XLAB), R. Prodan (University of Innsbruck), S. Georgoulas (University of Surrey).
	Publication references	https://eucloudclusters.files.wordpress.com/2015/05/white-paper.pdf
4	Type	NATRES Annual Report
	Title	Novel approaches and technologies for Cloud resource and service management (NATRES) Annual Report
	Date	01/08/2016
	Authors	D. Petcu (IeAT)
	Publication references	https://eucloudclusters.files.wordpress.com/2015/05/report-natres.pdf
5	Type	Inter-cloud Challenges, Expectations and Issues Position Paper
	Title	Inter-cloud Challenges, Expectations and Issues - Research Roadmap Update
	Date	10/10/2016
	Authors	B. Di Martino (Second University of Naples), M.Biancani (Interoute SpA), J.Aznar (I2CAT), D.Gallico (Interoute SpA), A.J.Ferrer (ATOS), K.Djemame (University of Leeds), E.Di Nitto (Politecnico di Milano), G.Kecskemeti (MTA SZTAKI), Z.Zhao (University of Amsterdam), F.D'Andria (ATOS), R.Woitsch (BOC), K.Kritikos (FORTH), P.Deussen (Fraunhofer), P.Massonet (CETIC), M.Villari (UNIME), J.Costa (AALTO), E.Kowalczyk (ORANGE), J. Morrison (UCC)
	Publication references	https://drive.google.com/open?id=0B4hHTKjZDMXGeW5UUmJkcFlPR1k
6	Type	Scalable Computing: Practice and Experience - Special Issue
	Title	Special Issue on New Approaches for Infrastructure Services in Scalable Computing: Practice and Experience
	Date	01/12/2016
	Authors	D. Petcu (IeAT), V. Casola (UNINA), A. De Benedictis (UNINA), M. Rak (UNINA), U. Villano (UniSannio), S. Meyer (UCC), J. Morrison (UCC), D. Kimovski (UIBK), N.Saurabh (UIBK), Vlado Stankovski (UniLJ), R. Prodan (UIBK), G. Iuhasz (UVT), D. Pop (UVT), I. Dragan (IeAT), T. F. Fortis (IeAT), M. Neagul (IeAT)
	Publication references	http://www.scpe.org/index.php/scpe/issue/view/134

2.2 EU Project Concertation Meetings

As part of our participation in NATRES and the Inter-cloud Challenges, Expectations and Issues clusters, CloudLightning participated in formal EC-sponsored conferences and face-to-face meetings and informal monthly telcos and discussions. Three consortium members, IEAT, UCC and DCU, and five researchers participated in these meetings.

Table 3. EU Project Concertation Meetings

1	Event	Towards secure and trusted cloud services in Europe, Workshop, CloudWatch
	Meeting Date	24/09/2015
	Location	Brussels, Belgium
	Participating Projects	Cloudwatch, A4CLOUD, ALIGNED, CLARUS, CLIPS, Coco Cloud, Cumulus, ENTICE, ESCUDO-CLOUD, MUSA, PAASWORD, PrismaCloud, SECCORD, SERECA, SLALOM, SLA-Ready, SPECS, SUPERCLOUD, SWITCH, Tredisec, TRESCCA, Witdom
	Consortium	J. Morrison (UCC)
2	Event	NATRES working group meeting, ICT 2015
	Meeting Date	22/10/2015
	Location	Lisbon, Portugal
	Participating Projects	AppHub, ARCADIA, BEACON, CloudLightning, CloudSpaces, ClouT, CloudWave, DICE, ENTICE, iKaaS, INPUT, IOStack, Mikelangelo, Mobile Cloud Networking, Mo-bizz, MODAClouds, MUSA, RAPID, SPECS, SWITCH
	Consortium	D.Petcu (IeAT)
3	Event	NATRES working group meeting, CloudScape 2016
	Meeting Date	08/03/2016
	Location	Brussels, Belgium
	Participating Projects	AppHub, ARCADIA, BEACON, CloudLightning, CloudSpaces, ClouT, CloudWave, DICE, ENTICE, iKaaS, INPUT, IOStack, Mikelangelo, Mobile Cloud Networking, Mo-bizz, MODAClouds, MUSA, RAPID, SPECS, SWITCH
	Consortium	D.Petcu (IeAT), A.Gourinovitch (DCU)
4	Event	NATRES working group meeting, Netfutures 2016
	Meeting Date	19/04/2016
	Location	Brussels, Belgium
	Participating Projects	AppHub, ARCADIA, BEACON, CloudLightning, CloudSpaces, ClouT, CloudWave, DICE, ENTICE, iKaaS, INPUT, IOStack, Mikelangelo, Mobile Cloud Networking, Mo-bizz, MODAClouds, MUSA, RAPID, SPECS, SWITCH
	Consortium	D.Petcu (IeAT)
5	Event	Inter-cloud Challenges, Expectations and Issues working group meeting, Netfutures 2016

	Meeting Date	19/04/2016
	Location	Brussels, Belgium
	Participating Projects	CloudSocket, BEACON, SSICLOPS, ENTICE, CYCLONE, CLOUDLIGHTNING, AppHub, SWITCH, ASCETiC, ModaClouds, PaaSage, SeaClouds, mOSAIC
	Consortium	D.Petcu (IeAT)
6	Event	Inter-cloud Challenges, Expectations and Issues working group meeting, CloudForward 2016
	Meeting Date	18/10/2016
	Location	Madrid, Spain
	Participating Projects	CloudSocket, BEACON, SSICLOPS, ENTICE, CYCLONE, CLOUDLIGHTNING, AppHub, SWITCH, ASCETiC, ModaClouds, PaaSage, SeaClouds, mOSAIC
	Consortium	Gabriel Gonzalez Castane (UCC)
7	Event	NESUS MC meeting and Sixth Working Group
	Meeting Date	10/03/2017
	Location	Bayreuth, Germany
	Participating Projects	http://www.nesus.eu/management-committee
	Consortium	Dana Petcu (IeAT)
8	Event	New cloud services and software for the Digital Single Market Concertation Meeting
	Meeting Date	28/06/2017
	Location	Brussels, Belgium
	Participating Projects	https://eucloudclusters.wordpress.com/future-cloud/
	Consortium	D. Petcu (IeAT), A. Gourinovitch (DCU), H. Xiong (UCC)
9	Event	Novel approaches and technologies for Cloud Resource and Service Management (NATRES) Working Group Meeting, NetFutures 2017
	Meeting Date	28/06/2017
	Location	Brussels, Belgium
	Participating Projects	https://eucloudclusters.wordpress.com/new-approaches-for-infrastructure-services/
	Consortium	A. Gourinovitch (DCU), H. Xiong (UCC)

2.3 Concertation Presentations

Relevant projects were invited to present at meetings and events organized by CloudLightning. In total six different EU-funded projects were presented at CloudLightning events (CACTOS, HARNESS, DICE, MODACLOUDS, MO-BIZZ and PROTECTIVE) and 14 presentations were given in total. In Year 3, a specific focus was placed on cloud simulation software projects. This resulted in deeper collaboration with industry and academic partners and ultimately concertation and

potential exploitation of the CloudLightning Simulator by the Horizon 2020 RECAP project. Table 4 below summarises project concertation presentations over the life of the CloudLightning project.

Table 4. Project Concertation Presentations

1	Event	The National Conference on Cloud Computing and Commerce (NC4 2015)
	Type	Presentation
	Place	Dublin, Ireland
	Organiser	DCU
	Dates	14/04/2015
	Title of presentation	CactoSim – Optimisation-aware data centre simulation toolkit
	Presenter	Sergej Svorobej (DCU)
	Project	CACTOS
2	Event	The National Conference on Cloud Computing and Commerce (NC4 2015)
	Type	Presentation
	Place	Dublin, Ireland
	Organiser	DCU
	Dates	14/04/2015
	Title of presentation	Mo-Bizz Project Overview
	Presenter	António Cruz (Portugal Telecom/SAPO)
	Project	Mo-Bizz
3	Event	The National Conference on Cloud Computing and Commerce (NC4 2015)
	Type	Presentation
	Place	Dublin, Ireland
	Organiser	DCU
	Dates	14/04/2015
	Title of presentation	Multi-Clouds: Challenges and current solutions
	Presenter	Dana Petcu (IeAT)
	Project	MODAClouds
4	Event	CloudLightning Consortium Meeting
	Type	Presentation
	Place	Thessaloniki, Greece
	Organiser	CERTH
	Dates	17/07/2015
	Title of presentation	Hardware- and Network-enhanced Software Systems for Cloud Computing

	Presenter	Georgi Gaydadjiev (Maxeler)
	Project	HARNESS
5	Event	The National Conference on Cloud Computing and Commerce (NC4 2016)
	Type	Presentation
	Place	Dublin, Ireland
	Organiser	DCU
	Dates	12/04/2016
	Title of presentation	CACTOS Prediction Toolkit - Optimisation aware simulation
	Presenter	Sergej Svorobej (DCU)
	Project	CACTOS
6	Event	The National Conference on Cloud Computing and Commerce (NC4 2016)
	Type	Presentation
	Place	Dublin, Ireland
	Organiser	DCU
	Dates	12/04/2016
	Title of presentation	Developing Data-Intensive Cloud Applications with Iterative Quality Enhancements (DICE)
	Presenter	Ioan Dragan (IeAT)
	Project	DICE
7	Event	Data Centres in Ireland Workshop
	Type	Presentation
	Place	Dublin, Ireland
	Organiser	DCU
	Dates	09/12/2016
	Title of presentation	CACTOS - Context-Aware Cloud Topology Optimisation and Simulation
	Presenter	Paul Liston (DCU)
	Project	CACTOS
8	Event	Data Centres in Ireland Workshop
	Type	Presentation
	Place	Dublin, Ireland
	Organiser	DCU
	Dates	09/12/2016
	Title of presentation	PROTECTIVE
	Presenter	Brian Lee (IeAT)

	Project	PROTECTIVE
9	Event	Simulation Workshop @NC4 2017
	Type	Presentation
	Place	Dublin, Ireland
	Organiser	DCU
	Dates	11/04/2017
	Title of presentation	CACTOS Prediction Toolkit
	Presenter	Sergej Svorobej (DCU)
	Project/Company	Cactus
10	Event	Simulation Workshop @NC4 2017
	Type	Presentation
	Place	Dublin, Ireland
	Organiser	DCU
	Dates	11/04/2017
	Title of presentation	iCanCloud
	Presenter	Gabriel Gonzalez Castane (UCC)
	Project/Company	iCanCloud
11	Event	Simulation Workshop @NC4 2017
	Type	Presentation
	Place	Dublin, Ireland
	Organiser	DCU
	Dates	11/04/2017
	Title of presentation	IBM Performance Simulation Framework for Cloud
	Presenter	Peter Altevogt (IBM)
	Project/Company	IBM
12	Event	Simulation Workshop @NC4 2017
	Type	Presentation
	Place	Dublin, Ireland
	Organiser	DCU
	Dates	11/04/2017
	Title of presentation	iFogSim
	Presenter	Mohit Taneja (WIT)
	Project/Company	iFogSim

13	Event	Simulation Workshop @NC4 2017
	Type	Presentation
	Place	Dublin, Ireland
	Organiser	DCU
	Dates	11/04/2017
	Title of presentation	Simulation for the Evolving Cloud
	Presenter	John Kennedy (Intel)
	Project/Company	Intel
14	Event	Simulation Workshop @NC4 2017
	Type	Presentation
	Place	Dublin, Ireland
	Organiser	DCU
	Dates	11/04/2017
	Title of presentation	Doopnet
	Presenter	Brian Lee (AIT)
	Project/Company	Doopnet

2.4 Presentations to National Stakeholders

The CloudLightning Consortium attempted to regularly report on the progress of the project to national stakeholders where possible. In Ireland, the primary vehicle for this was the periodic meetings of the Irish Centre for Cloud Computing and Commerce (IC4) Steering Committee on which DCU, UCC and Intel were members throughout the project. The steering committee members represent a minimum of 5 stakeholder groups identified in D8.3.1 (see Table 5) including the Irish government agencies responsible for domestic enterprise development and foreign direct investment.

Table 5. IC4 Steering Committee Members

Name	Company	Stakeholder Group
Aidan Gallagher	Inishtech	Independent Software Vendors
Anne Sinnott	Dublin City University	Higher Education Institution
Brian Lee	Athlone Institute of Technology / PROTECTIVE	Scholarly Authors, Project Consortia
Gerry Murray*	Independent Cloud Consultant	Independent Software Vendors

Joe Butler	Intel	Application Developers, Hardware Manufacturer
John Power	Ostia Solutions	Independent Software Vendors
Ken Finnegan	IDA Ireland	Funding Bodies
Liam English	Bluematrix	Independent Software Vendors
Martin Hussey	Enterprise Ireland	Funding Bodies
Michael Meagher	Microsoft	Application Developers, Cloud Service Providers
Sean Baker	Investor/Non-Executive Director	Venture Capital. Independent Software Vendors
Ronan Dalton	IBM	
Tim Roche*	University College Cork TTO	Higher Education Institution

*Left the Steering Committee during over the course of the project

Intel, NTNU, and CERTH also participated in briefings within their organisations and with local industry forums. As discussed in Section 1 above, national stakeholders were also briefed during dissemination and/or exploitation activities reported in D8.2.3 and D.8.1.4 respectively.

Table 6. National Stakeholder Presentations

1	Event	IC4 Steering Committee Meeting
	Place	DCU, Dublin, Ireland
	Stakeholders	IC4 Steering Committee Members: Sean Baker (SB), Gerard Lande (GL), Michael Meagher (MM), Aidan Gallagher(AG), Paul Killeen (PK), Claus Pahl (CP), Brian Lee (BL), Philip Healy (PH), Ken Finnegan (KF)
	Dates	10/02/2015
	Presenter	Theo Lynn (DCU), John Morrison (UCC), Tony McEnroe (DCU)
2	Event	NTNU Faculty Meeting
	Place	Trondheim, Norway
	Stakeholders	NTNU Faculty Members
	Dates	05/03/2015
	Presenter	Anne Elster (NTNU)
3	Event	IC4 Steering Committee Meeting
	Place	DCU, Dublin, Ireland
	Stakeholders	IC4 Steering Committee Members: Sean Baker (SB), Gerard Lande (GL), Aidan Gallagher(AG), Gerry Murray (GM), Liam English (LE), John Power (JP), Paul Killeen (PK), Claus Pahl (CP), Brian Lee (BL), Michael Meagher (MM) [representing Clare Dillon], Tim Roche (TR), Joe Butler (JB), Liam Brown (LB-EI)
	Dates	30/04/2015

	Presenter	Theo Lynn (DCU), John Morrison (UCC), Tony McEnroe (DCU)
4	Event	IC4 Steering Committee Meeting
	Place	DCU, Dublin, Ireland
	Stakeholders	IC4 Steering Committee Members: Sean Baker (SB), Gerard Lande (GL), Gerry Murray (GM), John Power (JP), Claus Pahl (CP), Brian Lee (BL), Aidan Gallagher (AG)
	Dates	11/06/2015
	Presenter	Theo Lynn (DCU), Tony McEnroe (DCU)
5	Event	IC4 Steering Committee Meeting
	Place	DCU, Dublin, Ireland
	Stakeholders	IC4 Steering Committee Members: Sean Baker (SB), Aidan Gallagher (AG), Paul Killeen (PK), Martin Hussey (MH), Gerry Murray (GM)
	Dates	13/08/2015
	Presenter	Theo Lynn (DCU), John Morrison (UCC), Tony McEnroe (DCU)
6	Event	IC4 Steering Committee Meeting
	Place	DCU, Dublin, Ireland
	Stakeholders	IC4 Steering Committee Members
	Dates	17/12/2015
	Presenter	Theo Lynn (DCU), John Morrison (UCC), Tony McEnroe (DCU)
7	Event	IC4 Steering Committee Meeting
	Place	DCU, Dublin, Ireland
	Stakeholders	IC4 Steering Committee Members: Sean Baker (SB), Aidan Gallagher (AG), Martin Hussey (MH), Brian Lee (BL), Michael Meagher (MM)
	Dates	09/03/2016
	Presenter	Theo Lynn (DCU), John Morrison (UCC)
8	Event	IC4 Steering Committee Meeting
	Place	DCU, Dublin, Ireland
	Stakeholders	IC4 Steering Committee Members: Sean Baker (SB), Aidan Gallagher (AG), Brian Lee (BL), Michael Meagher (MM), Joe Butler (JB), Gerry Murray (GM), Brian Lee (BL), John Power (JP)
	Dates	05/05/2016
	Presenter	Theo Lynn (DCU), John Morrison (UCC)
9	Event	Intel HPC Cloud Working Group
	Place	Virtual Conference
	Stakeholders	Bill Magro (Intel fellow, Chief Technologist - HPC Cloud Strategy), HPC Cloud working group members

	Dates	06/05/2016
	Presenter	Perumal Kuppuudaiyar (Intel)
10	Event	IC4 Steering Committee Meeting
	Place	DCU, Dublin, Ireland
	Stakeholders	IC4 Steering Committee Members
	Dates	07/07/2016
	Presenter	Theo Lynn (DCU), John Morrison (UCC)
11	Event	IC4 Steering Committee Meeting
	Place	DCU, Dublin, Ireland
	Stakeholders	IC4 Steering Committee Members
	Dates	08/09/2016
	Presenter	Theo Lynn (DCU), John Morrison (UCC)
12	Event	IC4 Steering Committee Meeting
	Place	DCU, Dublin, Ireland
	Stakeholders	IC4 Steering Committee Members
	Dates	11/11/2016
	Presenter	Theo Lynn (DCU), John Morrison (UCC)
13	Event	IC4 Steering Committee Meeting
	Place	DCU, Dublin, Ireland
	Stakeholders	IC4 Steering Committee Members
	Dates	05/01/2017
	Presenter	Theo Lynn (DCU), John Morrison (UCC)
14	Event	IC4 Steering Committee Meeting
	Place	DCU, Dublin, Ireland
	Stakeholders	IC4 Steering Committee Members
	Dates	10/05/2017
	Presenter	Theo Lynn (DCU), John Morrison (UCC)
15	Event	4th Technology Forum
	Place	Technical Chamber of Greece, Thessaloniki, Greece
	Stakeholders	General Secretariat for Research and Technology (GSRT)
	Dates	17/05/2017
	Presenter	Konstantinos Giannoutakis (CERTH)
16	Event	IC4 / IDA Meeting

	Place	Dublin, Ireland
	Stakeholders	Shane Nolan (IDA Ireland)
	Dates	14/07/2017
	Presenter	Theo Lynn (DCU)
17	Event	IC4 / EI Meeting
	Place	Dublin, Ireland
	Stakeholders	Gerard Lande (Enterprise Ireland)
	Dates	21/07/2017
	Presenter	Theo Lynn (DCU), Anna Gourinovitch (DCU)
18	Event	IC4 Steering Committee Meeting
	Place	DCU, Dublin, Ireland
	Stakeholders	IC4 Steering Committee Members
	Dates	30/06/2017
	Presenter	Theo Lynn (DCU)
19	Event	IC4 Steering Committee Meeting
	Place	DCU, Dublin, Ireland
	Stakeholders	IC4 Steering Committee Members
	Dates	07/09/2017
	Presenter	Joan Mulvihill (DCU)
20	Event	IC4 Steering Committee Meeting
	Place	DCU, Dublin, Ireland
	Stakeholders	IC4 Steering Committee Members
	Dates	02/11/2017
	Presenter	Joan Mulvihill (DCU)
21	Event	IC4 Steering Committee Meeting
	Place	DCU, Dublin, Ireland
	Stakeholders	IC4 Steering Committee Members
	Dates	25/01/2018
	Presenter	Joan Mulvihill (DCU)

2.5 Briefing Papers

As reported in D8.1.4, six briefing papers were published on the website throughout the project, two of which were written in concertation with the Horizon 2020 RECAP project. These briefing papers were downloaded 2,529 times over the course of the project. Table 7 presents the details of these briefing papers.

Table 7. Briefing Papers

1	Title	Global HPC Market
	Authors	T. Lynn (DCU), D. Kenny (DCU), A. Gourinovitch (DCU)
	Date of publication	28/10/2015
2	Title	3D Image Rendering
	Authors	T. Lynn (DCU), D. Kenny (DCU), A. Gourinovitch (DCU), A. Persehais (DCU), G.Tierney (DCU), M.Duignam (DCU), S.Keenan (DCU)
	Date of publication	24/12/2015
3	Title	Overview Of The HPC Market For Genome Sequencing
	Authors	T. Lynn (DCU), A. Gourinovitch (DCU)
	Date of publication	27/04/2016
4	Title	Drivers and Barriers to Using High Performance Computing in the Cloud
	Authors	T. Lynn (DCU), A. Gourinovitch (DCU), D. Kenny (UCC), X. Liang (DCU)
	Date of publication	16/09/2016
5	Title	The Data Center Market
	Authors	M. Callan (DCU), T. Lynn (DCU), A. Gourinovitch (DCU)
	Date of publication	24/07/2017
6	Title	Open Source Cloud Simulation Software Market Briefing
	Authors	T. Lynn (DCU), A. Gourinovitch (DCU), S. Svorobej (DCU), J. Byrne (DCU)
	Date of publication	21/12/2017

2.6 Participation in standardisation activities

While CloudLightning made use of and was impacted by a wide range of standardization efforts, opportunities to contribute to the standards setting did not materialize to the extent anticipated at the beginning of the project.

To date, CloudLightning, through UCC, is actively participating in the IEEE working group on the IEEE 2302 standard for interoperability in federation of clouds. A submission has been made in relation to an extension to the standard to address interoperability between resource managers and heterogeneous resources, including inter-cloud and clouds with heterogeneous (software and hardware) resources.

A further opportunity is being pursued beyond M36 in relation to a possible extension of TOSCA based on IEAT's work to cater for CloudLightning and architectures involving heterogeneous resources more generally. To this end, Intel has been in communications with its internal Standards Committee and has briefed the Vice Chair of the OASIS Board of Directors.

2.7 Formal Briefing Events

Four formal briefing events were held in January 2018 (M36) to present the project and evaluation results. Two events were held in London (UK) on 11 and 12 January 2018 at Enterprise Ireland's UK offices. 15 attended the first briefing event and 7 the second event. Despite the fact that these events were impacted by timing (close to the holidays and competing cloud and HPC events at the same time), the quality of the attendees and discussion was high. A data-centre specific briefing event was held on 16 January 2018 in Dublin (Ireland) at DCU with 40 attendees signed in. This briefing was focused particularly on the data center market. A fourth briefing aimed at the oil and gas sector was held in Trondheim (Norway) on 16 January at NTNU with 20 attendees. There were a number of inquiries for further information and meetings following the briefing which are being followed up. Four partners participated in the briefings including UCC, DCU, NTNU and Maxeler. Table 8 summarises the details of these events.

Table 8. Formal Briefing Events

1	Event	London Briefing #1
	Date	11/01/2017
	Place	London, UK
	Organiser	T. Lynn (DCU), A. Gourinovitch (DCU)
	Presenters	T. Lynn (DCU), J. Morrison (UCC)
	Audience size	15
2	Event	London Briefing #2
	Date	12/01/2017
	Place	London, UK
	Organiser	T. Lynn (DCU), A. Gourinovitch (DCU)
	Presenters	T. Lynn (DCU), J. Morrison (UCC)
	Audience size	7
3	Event	Data Centre Symposium
	Date	16/01/2017
	Place	Dublin, Ireland
	Organiser	T. Lynn (DCU), A. Gourinovitch (DCU), J. Mulvihill (DCU), C. Tonge (IC4)
	Presenters	S. Nolan (IDA), B. Lowry (Irish Government), D. Sandars (Uptime Institute), J. Nagle (IC4), J. Morrison (UCC), G. Connolly (Host in Ireland), M. Mortell (Equinix)

	Audience size	40
4	Event	CloudLightning HPC Industrial Brief and Workshop
	Date	15/01/2017
	Place	Trondheim, Norway
	Organiser	A. Elster (NTNU)
	Presenters	A. Elster (NTNU), A. Rustad (Statoil), M. Khan (NTNU), T. Becker (Maxeler), G. Taylor (US Naval Academy), T. Li (NTNU)
	Audience size	20

2.8 Informal Stakeholder Meetings

Throughout the project, consortium members met with stakeholders informally to discuss CloudLightning and related matters. These meetings due to their nature were difficult to capture and often discussed more than one project. Table 9 below summarises a selection of eleven such meetings for 2017.

Table 9. Informal Stakeholder Meetings (Incomplete)

1	Event	Huawei Briefing
	Place	Dublin, Ireland
	Stakeholder	Chris Woods (Huawei)
	Dates	15/03/2017
	Sustainer from consortium	T. Lynn (DCU), J. Nagle (DCU), S. Svorobej (DCU)
2	Event	Huawei Briefing
	Place	Dublin, Ireland
	Stakeholder	Derek Collins (Huawei)
	Dates	14/09/2017
	Sustainer from consortium	T. Lynn (DCU), J. Nagle (DCU), J. Mulvihill (DCU)
3	Event	Statoil Briefing
	Place	Trondheim, Norway
	Stakeholder	Eldar Sætre (Statoil)
	Dates	05/10/2017
	Sustainer from consortium	A. Elster (NTNU)
4	Event	Kane Engineering

	Place	Belfast, UK
	Stakeholder	Oonagh Mallon (Kane Engineering)
	Dates	28/11/2017
	Sustainer from consortium	T. Lynn (DCU)
5	Event	Hitachi Briefing
	Place	Dublin, Ireland
	Stakeholder	Tetsuo Iijima, Yasunori Tanaka, Ryuji Uchilada, Shingo Kakimito, Hiroki Kimura, Kumi Nakamura, Makoto Moriyama, Yoshiro Yamasaki, Kazuhiko Kikuchi (Hitachi)
	Dates	11/12/2017
	Sustainer from consortium	J. Mulvihill (DCU), J. Nagle (DCU)
6	Event	Federal University of Campina Grande Briefing
	Place	Hong Kong, China
	Stakeholder	Giovanni Farias, Francisco Brasileiro (UCGB)
	Dates	13/12/2017
	Sustainer from consortium	T. Lynn (DCU)
7	Event	Lionbridge Briefing
	Place	Mumbai, India
	Stakeholder	Yogesh Bhusane, Stanly Kadamala, Stephen Scully (Lionsbridge)
	Dates	18/12/2017
	Sustainer from consortium	T. Lynn (DCU)
8	Event	Econsultancy Briefing
	Place	London, UK
	Stakeholder	Sean Donnelly
	Dates	11/12/2018
	Sustainer from consortium	T. Lynn (DCU), J. Morrison (UCC)
9	Event	Enterprise Ireland London Briefing
	Place	London, UK
	Stakeholder	Padraic Geraghty (Enterprise Ireland)
	Dates	11/12/2018
	Sustainer from consortium	A. Gourinovitch (DCU)
10	Event	IDA Briefing

	Place	London, UK
	Stakeholder	Michelle Conaghan (IDA)
	Dates	11/12/2018
	Sustainer from consortium	T. Lynn (DCU), J. Morrison (UCC)
11	Event	DCU Meeting
	Place	Dublin, Ireland
	Stakeholder	John Mooney (Pepperdine University, LERO)
	Dates	31/01/2018
	Sustainer from consortium	T. Lynn (DCU)

2.9 External Advisory Board

The CloudLightning external advisory board was created to provide guidance on scientific and strategic matters. It has also played an important role in concertation and EAB members have both participated in studies undertaken during the project, attended events, and introduced CloudLightning members to other projects, researchers and industry partners. As per the Concertation Plan, four EAB meetings were held during the three years of the project. Additional members were added throughout the project, primarily resulting from dissemination and exploitation activities. Minutes of the meeting, including list of participants, meeting agenda, summary of discussions and recommendations, are reported in D1.5.1-D1.5.3.

Table 10. EAB Meetings

1	Event	External Advisory Board Meeting #1
	Place	Virtual meeting
	Dates	30/03/2016
	Attendees	Prof. John Morrison, Prof. Dan Marinescu, Prof. Jesus Carretero, Prof. Dieter Kranzmüller, Prof. Hiroshi Nakamura, Mr. Aidan Gallagher, Mr. Brian Boyle, Mr. Ronan Dalton, Mr. David Kenny
2	Event	External Advisory Board Meeting #2
	Place	Virtual meeting
	Dates	10/02/2017
	Attendees	Prof. Dan Marinescu, Prof. Jesús Carretero, Mr. David Kenny, Mr. Josh Simons, Ms. Alison Kennedy, Mr. Brian Boyle, Prof. John Morrison, Mr. Aidan Gallagher, Ms. Michaela Blott, Prof. John Mooney
3	Event	External Advisory Board Meeting #3
	Place	Virtual meeting
	Dates	01/11/2017
	Attendees	Dr. Christos Filelis-Papadopoulos, Prof. Dan Marinescu, Mr. David Kenny, Prof. Hiroshi Nakamura, Prof. John Morrison, Dr. Konstantinos Giannoutakis, Mr. Josh Simons, Mr. Aidan Gallagher

4	Event	External Advisory Board Meeting #4
	Place	Virtual meeting
	Dates	29/01/2018
	Attendees	Prof. Dan Marinescu, Mr. David Kenny, Prof. John Morrison, Ms. Michaela Blott, Dr. Tobias Becker, Dr. Gabriel Gonzalez-Castañe

2.10 Other Concertation Activities

2.10.1 Funding Agencies, International Standardisation Bodies and Policy Making Organisations

The project engaged with a wide range of other organisations in an effort to promote the project and to seek opportunities for knowledge transfer and collaborations. As per the Concertation Plan, over 40 funding agencies, and policy making organisations were contacted over the lifetime of the project. Many of these had formal channels for engagement and while attempts were made to engage, timing and location prevented substantive engagement.

2.10.2 Guest Blogs

In addition to formal EU project concertation activities, CloudLightning both contributed and requested blogs on related topics to CloudLightning. 12 such blogs were completed over the course of the 36 months including five EU-funded projects - CloudWatch, ExTASY, Sunfish, MCloudDaaS, and HNSciCloud – and other stakeholders including Salesforce.com, the University of Iowa, Universidad del Valle, CloudyCluster and Front Line Genomics.

Table 11. Guest Blogs

1	Type	CloudWatch Hub Service Solution Card
	Title	CLOUDLIGHTNING – Self-Organising, Self-Managing Heterogeneous Cloud
	Date	19/04/2016
	Author	D. Kenny (DCU), A. Gourinovitch (DCU), J. Morrison (UCC)
	Project/Institution	CloudWatch
	Web link	http://www.cloudwatchhub.eu/serviceoffers/cloudlightning-%E2%80%93-self-organising-self-managing-heterogeneous-cloud
2	Type	Guest Blog Post
	Title	ExTASY – A Flexible Approach to Biomolecular Simulation
	Date	13/07/2016
	Author	Iain Bethune

	Project/Institution	ExTASY (Extensible Toolkit for Advanced Sampling and analysis)
	Web link	http://cloudlightning.eu/blog/extasy-a-flexible-and-scalable-approach-to-biomolecular-simulation/
3	Type	Guest Blog Post
	Title	Effervescent Clouds: Nimble Computing Infrastructure
	Date	20/07/2016
	Author	Daniel Reed
	Project/Institution	University of Iowa
	Web link	http://cloudlightning.eu/blog/effervescent-clouds-nimble-computing-infrastructure/
4	Type	Guest Blog Post
	Title	Automating Cloud HPC Resource Management With CloudyCluster
	Date	26/07/2016
	Author	Boyd Wilson
	Project/Institution	CloudyCluster
	Web link	http://cloudlightning.eu/blog/automating-cloud-hpc-resource-management-with-cloudycluster
5	Type	Guest Blog Post
	Title	High Performance Computing in the Cloud
	Date	30/07/2016
	Author	Peter Coffee
	Project/Institution	Salesforce
	Web link	http://cloudlightning.eu/blog/hpc-in-the-cloud
6	Type	Guest Blog Post
	Title	Big Data Analytics & Multi-cloud Event
	Date	09/11/2016
	Author	MCloudDaaS / EIT Digital
	Project/Institution	MCloudDaaS
	Web link	http://cloudlightning.eu/blog/big-data-analytics-multi-cloud/
7	Type	Guest Blog Post
	Title	HNSciCloud PCP Tender Results Announcement Ceremony
	Date	1/11/2016
	Author	HNSciCloud
	Project/Institution	HNSciCloud
	Web link	http://cloudlightning.eu/blog/hnscicloud-pcp-tender/

8	Type	Guest Blog Post
	Title	Research and Innovation Management and Online S3
	Date	05/12/2016
	Author	Katharina Fellnhofer
	Project/Institution	Online S3, Research and Innovation Management GmbH
	Web link	http://cloudlightning.eu/blog/online-s3/
9	Type	Guest Blog Post
	Title	Containers Have The Potential To Take Scientific HPC To The Cloud
	Date	13/01/2017
	Author	Carlos Eduardo Arango Gutierrez
	Project/Institution	Universidad del Valle
	Web link	http://cloudlightning.eu/blog/containers-hpc-cloud/
10	Type	Conference Announcement
	Title	CloudLightning Conference @ NC4 2017 - 11 April, Dublin
	Date	21/03/2017
	Author	D. Kenny (DCU)
	Project/Institution	CloudWatch
	Web link	http://www.cloudwatchhub.eu/cloudlightning-conference-nc4-2017-11-april-dublin
11	Type	Conference Announcement
	Title	CloudLightning Conference @ NC4 2017
	Date	21/03/2017
	Author	D. Kenny (DCU)
	Project/Institution	Sunfish Project
	Web link	http://www.sunfishproject.eu/events/cloudlightning-conference-nc4-2017/
12	Type	Guest Blog Post
	Title	Getting to Grips with Sequencing Alignment
	Date	04/07/2017
	Author	Frida-Marie Holme
	Project/Institution	Front Line Genomics
	Web link	http://cloudlightning.eu/blog/genome-sequencing-alignment/

2.10.3 CloudLightning/RECAP collaboration

RECAP is a Horizon 2020 project to develop the next generation of cloud, edge and fog computing capacity provisioning via targeted research advances in cloud infrastructure optimisation, simulation and automation. It commenced in January 2017 and is coordinated by Ulm University. Other consortium members include Umea University, IMDEA Networks, SATEC, Tieto, Linknovate, DCU and Intel. RECAP is investigating how the dynamism and nature of the Internet of Everything will impact cloud and telecoms infrastructure. Specifically, RECAP posits that these systems will need to be able to accommodate greater variability in QoS levels. To address this variability, cloud systems will need to be able to pre-emptively take reconfiguration and remediation actions in a fully automatic fashion. Pre-emption (and indeed remediation) require modelling complex applications and infrastructures using much more fine-grained and accurate application deployment and behaviour models to capture load and capacity requirements, variations. RECAP believe that this can be achieved through the concerted activation of (i) the prediction of the evolution of workload and application performance; (ii) the simulation of different deployments across the cloud-to-things continuum; (iii) the optimization of the deployment given the output of historic and real-time analysis; and (iv) the relocation of services and application components to achieve the required QoS. To address (ii) above, new approaches to simulation are needed that can cater for hyperscale clouds, massive telecommunications networks such as BTs, modern apps and relatively rapid execution times.

As DCU and Intel are partners on both projects (although the allocated technical team are different), internal informal briefings made both sides aware of each other's activities. This led to collaboration between DCU, UCC (1), CERTH and Umea University (1) on two conference papers:

- Byrne, J., Svorobej, S., Giannoutakis, K. M., Tzovaras, D., Byrne, P. J., Östberg, P.-O., and Lynn, T. (2017). A review of cloud computing simulation platforms and related environments. In Proceedings of the 7th International Conference on Cloud Computing and Services Science.
- Lynn, T., Gourinovitch, A., Byrne, J., Byrne, P.J., Svorobej, S., Giannoutakis, K.M., Kenny, D., and Morrison, J. (2017) A Preliminary Systematic Review of Computer Science Literature on Cloud Computing Research using Open Source Simulation Platforms. In Proceedings of the 7th International Conference on Cloud Computing and Services Science.

Further collaboration between both projects resulted in two market briefings on the data center market and open source software simulation (based largely on the joint conference paper above).

Following the presentation of the CloudLightning Simulator at NC4, a workshop on the CloudLightning Simulator was held with many of the DCU simulator researchers in attendance. This has been followed up by frequent informal contact.

Following the release of the CloudLightning Simulator as open source software, the RECAP team has downloaded the simulator and visualisation toolkit and is currently evaluating its use for at least two use cases in RECAP. RECAP requires a simulator that can simulate massive scale, is memory efficient and can produce results quickly without loss of accuracy. The fact that the simulator has been validated against competing simulators, is open source, that the RECAP team



will have access to CERTH and DUTH through the CloudLightning Simulator open source projects provides a strong rationale for selecting the simulator. As a result of CloudLightning, DCU and CERTH have agreed an MOU to collaborate more closely together (see Final Exploitation Report (D8.1.4) and the CloudLightning Simulator will not only provide an initial basis for real concertation impact between CloudLightning and RECAP but also the basis for deepening collaboration between DCU, CERTH, DUTH, UCC, IEAT, Intel and potentially the wider RECAP consortium.



3 Concluding Remarks

This Final Concertation Report reported on the actions taken and impact achieved with regard to concertation and orchestration activities from February 2015 to January 2018 on the CloudLightning project. and throughout the three years of the CloudLightning project. For the vast majority of the KPIs, the consortium met or exceeded the targets set out at the commencement of the project.

Table 12. Concertation Targets and Expectations

KPIs	M36 Target	M36 Actual
Concertation Publications	2	6
Concertation Presentations and Meeting	12	23
Presentations to national stakeholders	32	20*
Briefing papers	6	6
Participation in standardisation activities	2	2**
Formal briefing events	4	4
Informal stakeholder meetings	10	11
External Advisory Board meetings	4	4

*excluding attendance at the CloudLightning events and presentations

**WIP

CloudLightning, as a consortium, was an active participant in two of the EU clusters and engaged in a wide range of formal and informal concertation activities. Furthermore, additional impact was achieved through engagement with other EU projects and stakeholders through newsletters, blogs as well as other dissemination and exploitation activities reported in D8.2.3 and D8.1.4. In particular, CloudLightning is having a real impact on the Horizon 2020 RECAP project where its foreground IP, the CloudLightning Simulator, is likely to be extended and used for at least two uses cases. This initial concertation with the RECAP project has already resulted in publications aimed at both academic and managerial audiences and a deepening collaboration between partners involved.