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ONTIC D1.1: Deliverable Planning for the Next Period #1

Bruno ; Ordozgoiti, Alberto Mozo, Alexandru Mara, Bo Zhu, Sandra Gómez, Philippe Owezarski, Alejandro Bascuñana, Patricia Sánchez, Miguel Ángel Monjas, Manuel Lorenzo, et al.

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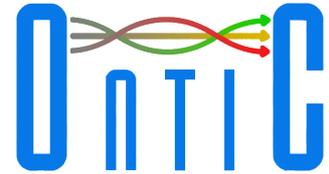
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Online Network Traffic Characterization

Deliverable Planning for the Next Period #1 ONTIC Project (GA number 619633)

Deliverable D1.1
Dissemination Level: RESTRICTED

Authors

Bruno Ordozgoiti, Alberto Mozo, Alexandru Mara, Bo Zhu, Sandra
Gómez
UPM

Philippe Owezarski
CNRS

Alejandro Bascuñana, Patricia Sánchez, Miguel Ángel Monjas, Manuel
Lorenzo
Ericsson

Miguel Angel López
SATEC

Daniele Apiletti
POLITO

Stefanos Anastasiou
ADAPTIT

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	2015.1.16	UPM	1st draft version
2015.1.16 0.1	2015.1.22	UPM	Added first contributions by other partners
2015.1.22 0.2	2015.1.29	UPM	First version ready for review
2015.1.29 0.5	2015.1.29	SATEC	Review
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Quality Assurance:

Name	
Quality Assurance Manager	Alberto Mozo (UPM)
Reviewer #1	Daniele Apiletti (POLITO)
Reviewer #2	Miguel Ángel López (SATEC)



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1. Purpose of the Document

The purpose of this deliverable is to provide an overview of the activities carried out so far in order to assess the overall progress of the project. Based on the observed progress and evolution, the planning for the next period might be subject to slight adjustments in order to ensure that the project maintains its high potential impact.

As stated in the DoW, this document will include, specifically:

- Project status
- Compliance with planning milestones
- Current and potential project issues, problems and risks
- Plans and actions for the next reporting period



2. Scope

This document contains a high-level overview of the activities carried out so far. It is not intended to provide a detailed description of how these activities have been accomplished. Such a description can be found in the corresponding deliverables.



3. Intended Audience

The intended audience includes every partner of the ONTIC project.



4. Suggested Previous Readings

The ONTIC DoW should provide enough background to understand the goals of the project and the activities through which these objectives are meant to be attained.



5. Executive Summary

This deliverable provides a detailed description of the progress made so far by each partner. A comprehensive enumeration of both completed and ongoing tasks is presented. In addition, this document presents the issues encountered by each partner as well as those that could surface during the second year.

Section 6 presents the project status at the task level. The situation of the work plan activities and the expected outcomes of each task described in the DoW is indicated.

Section 7 contains a detailed description of the activities that each partner has already completed, those that are currently being carried out and those that are planned for the next reporting period.

Section 8 examines the level of compliance of the project with the first milestone, set for M12. The results obtained so far on each work package are analysed in terms of their conformity with this milestone.

Section 9 describes issues found so far, as well as the solutions proposed. Additionally, this section presents potential issues identified by the partners of the project.

The contents of this document will serve as a basis to refine the planning for the subsequent periods.



6. Project Status

In this section, we show the ONTIC project status by the month M12 classified by work-package and task. The actual status of each activity and expected outcomes is presented. Activities in progress are accompanied by an estimated completion percentage as perceived by participating partners. Note that these figures are meant to be only illustrative.

6.1 Work Package WP1 Management

6.1.1 Task T1.1 Administrative Project Management

Work Plan	
Activity Description	Status (Completed/In Progress/Not Started)
Cover administrative aspects of the project management.	IP (33%)
Preparation of a Consortium Agreement: The Consortium Agreement will be drawn up and signed by partners to address intellectual property, exploitation rights, regulations and safety before the project start.	C
Administrate the budget in order to match the plans approved by the General Assembly.	IP (33%)
One Kick-off meeting at the beginning of the project.	C
General Assembly Meetings - every six months.	IP (33%)
Project Board Meetings - every month.	IP (33%)

Expected Outcomes		
Description	Status (Completed/In Progress/Not Started)	Target Deliverables
Ensured efficiency and optimized outcomes from the involved partners	IP	D1.1, D1.2
Efficient project administrative and financial monitoring	IP	D1.1, D1.2
Documents connected with the project from the consortium to the EC, including reporting documents, cost statements etc.	IP	D1.1, D1.2



6.1.2 Task T1.2 Content and Quality Management

Work Plan	
Activity Description	Status (Completed/In Progress/Not Started)
Draft the project quality plan	C
Supervise the development and exchange of working documents as well as control the quality of the material.	IP (33%)
Supervise the dissemination of the results in conferences, journals and workshops.	IP (33%)
Re-evaluate the status and schedule of the project periodically.	IP (33%)
Risks identified will be reported to the coordinator for management and mitigation.	IP (33%)
Quality checks will be performed upon approval of deliverables.	IP (39%)

Expected Outcomes		
Description	Status (Completed/In Progress/Not Started)	Target Deliverable
Work Efficiency	IP	D1.3
Visibility of the Project	IP	D1.3
Scientific Value of the Project	IP	D1.3
Reporting documents	IP	D1.3

6.2 Work Package WP2 Big Data Network Traffic Summary Dataset

6.2.1 Task T2.1 Requirements and Functionalities of a Big data Architecture for Network Traffic Summary dataset

Work Plan	
Activity Description	Status (Completed/In Progress/Not Started)
Definition of Big Data solution capabilities for ONTIC analytics and ONTS dataset.	C
Mapping between supported ONTIC analytics and ONTS dataset to data requirements.	C
Design of ONTIC Big Data Architecture.	C



Expected Outcomes		
Description	Status (Completed/In Progress/Not Started)	Target Deliverable
ONTIC Big Data Architecture requirements	C	D2.2 D2.3, D2.6 (pending)

6.2.2 Task T2.2 Design of Traffic Summary Dataset Provisioning Subsystem

Work Plan	
Activity Description	Status (Completed/In Progress/Not Started)
Survey of capabilities of different measurement technologies including NetFlow, port replication and optical splitting among others.	C
Topology, routing, and traffic analysis of network to identify candidate locations for measurement instrumentation.	C
Techno-economic study for each candidate location to decide the appropriate measurement technology.	C
Design and implementation of a software component to generate summary records by extracting statistical information from network packets.	C
Design and implementation of a software component to move and store summary records from sampling points to the Big Data platform.	C
Integration and final testing of Provisioning Subsystem.	IP (90%)

Expected Outcomes		
Description	Status (Completed/In Progress/Not Started)	Target Deliverable
Design of the Architecture of a Provisioning System for Traffic Summary dataset.	C	D2.4 D2.5, D2.6 (pending)
Implementation and Testing of Provisioning System for Traffic Summary dataset.	IP	D2.4 D2.5, D2.6 (pending)



6.2.3 Task T2.3 Deployment, Configuration and Provisioning of Big Data Network Traffic Summary Dataset

Work Plan	
Activity Description	Status (Completed/In Progress/Not Started)
Deployment and configuration of local instances of a Big Data platform based on T2.1 Big Data Architecture.	IP (80%)
Deployment and configuration of local instances of a Provisioning Subsystem based on T2.2.	C
Test and validation of joint operations of Provisioning Subsystem and Big Data platform local instances.	NS
Provisioning of ONTS dataset by deploying a Big Data platform and a Provisioning Subsystem in SATEC core network.	IP (33%)
Progressive migration of ONTS dataset records from SATEC Big Data platform to EMC AWS Big Data cluster.	NS

Expected Outcomes		
Description	Status (Completed/In Progress/Not Started)	Target Deliverable
Big Data platform and Provision Subsystem deployed, integrated and fully operative in SATEC core network.	IP	D2.1, D2.2, D2.4. D2.3, D2.5, D2.6 (pending)
ONTS dataset totally provisioned with trillions of network traffic summary records obtained from the core network of SATEC. These records will be initially stored in SATEC Big Data platform and later migrated to EMC AWS Big Data Cluster.	IP	D2.1, D2.2, D2.4. D2.3, D2.5, D2.6 and D2.7 (pending)

6.3 Work Package WP3 Scalable Offline Network Traffic Characterization System

6.3.1 Task T3.1 Scalable algorithms for unsupervised learning

Work Plan	
Activity Description	Status (Completed/In Progress/Not Started)
Unsupervised learning algorithms identification and analysis.	IP (90%)



Definition of improvements and novel unsupervised learning techniques.	NS
Design and development of unsupervised learning algorithms.	NS
Unsupervised learning algorithms assessment and experimental evaluation.	NS

Expected Outcomes		
Description	Status (Completed/In Progress/Not Started)	Target Deliverable
Definition of the limitations of existing algorithms and identification of novel techniques	C	D3.1
Massively scalable clustering algorithms for offline network traffic characterizations	NS	D3.2
Experimental evaluation of the algorithms	NS	D3.3

6.3.2 Task T3.2 Scalable algorithms for supervised classification

Work Plan	
Activity Description	Status (Completed/In Progress/Not Started)
Available classification algorithms identification and analysis.	IP (90%)
Definition of improvements and novel classification techniques.	NS
Design and development supervised classification algorithms.	NS
Classification algorithm assessment and experimental evaluation.	NS

Expected Outcomes		
Description	Status (Completed/In Progress/Not Started)	Target Deliverable
Definition of the limitations of existing algorithms and identification of novel techniques	C	D3.1
Massively scalable classification algorithms for offline network traffic characterizations	NS	D3.2
Experimental evaluation of the algorithms	NS	D3.3
Define standard assessment metrics to evaluate algorithm performance.	NS	D3.3



6.3.3 Task T3.3 Scalable algorithms for correlation analysis

Work Plan	
Activity Description	Status (Completed/In Progress/Not Started)
Available correlation-discovery algorithms identification and analysis.	IP (90%)
Definition of improvements and novel correlation analysis techniques.	NS
Design and development of correlation analysis algorithms.	NS
Correlation analysis algorithms assessment and experimental evaluation.	NS

Expected Outcomes		
Description	Status (Completed/In Progress/Not Started)	Target Deliverable
Definition of the limitations of existing algorithms and identification of novel techniques	C	D3.1
Massively scalable algorithms for offline network traffic correlation analysis	NS	D3.2
Experimental evaluation of the algorithms	NS	D3.3

6.3.4 Task T3.4 Scalability evaluation on enterprise-grade cloud environment

Work Plan	
Activity Description	Status (Completed/In Progress/Not Started)
Scalability evaluation definition in terms of performance metrics.	NS
Selection of the cloud provider.	NS
Dataset loading to the cloud storage of the selected provider.	NS
Distributed analysis execution.	NS
Experimental evaluation.	NS



Expected Outcomes		
Description	Status (Completed/In Progress/Not Started)	Target Deliverable
Definition of the performance metrics to evaluate the scalability of the algorithms	NS	D3.2, D3.3 (pending)
Experimental scalability evaluation results	NS	D3.3 (pending)

6.4 Work Package WP4 Scalable Online Network Traffic Characterization System

6.4.1 Task T4.1 Architecture Design of online classification systems for ISP traffic flows

Work Plan	
Activity Description	Status (Completed/In Progress/Not Started)
Analyse data structure as provided by the network traffic dataset for designing the intelligent scheduler.	IP (60%)
Analyse the parallelization capabilities of algorithms designed in tasks 3.1, 3.2, 3.3, 4.2 and 4.3, and design the related parallelization/synchronization mechanisms.	NS
Definition of the assessment metrics of the system performance.	NS

Expected Outcomes		
Description	Status (Completed/In Progress/Not Started)	Target Deliverable
The architecture for running in an integrated and parallel way all the functions for the online classification system with real-time constraints (in D4.1).	C	D4.1
Experimental parameters for evaluating the entire online classification system (in D4.2)	NS	D4.2



6.4.2 Task T4.2 Traffic Pattern evolution Subsystem

Work Plan	
Activity Description	Status (Completed/In Progress/Not Started)
Set up the system connected to the flowing data.	IP (50%)
Define the algorithmic processing that has to be applied on the data.	IP (30%)
Check if the system is able to identify the patterns (clusters).	NS
Tune the system if required.	NS
Add additional machines to the cluster and check the scalability.	NS

Expected Outcomes		
Description	Status (Completed/In Progress/Not Started)	Target Deliverable
Scalable architecture able to process the traffic data as it is flowing (in D4.1)	C	D4.1
Visualization tool	NS	D4.3 (pending)
Parameter optional (Number of clusters, radius, min density threshold, window time, etc.	NS	D4.2 (pending)

6.4.3 Task T4.3 Network Intrusion Detection Subsystem

Work Plan	
Activity Description	Status (Completed/In Progress/Not Started)
Available systems identification and analysis.	IP (90%)
Design of a robust clustering algorithm for anomalies and intrusions detection coping with the curse of high dimensionality.	IP (33%)
Design of an autonomous method for anomalies abnormality ranking.	IP (33%)
Design and development.	IP (33%)



Expected Outcomes		
Description	Status (Completed/In Progress/Not Started)	Target Deliverable
Definition of the limitations of existing anomalies and intrusion detection systems and issuing novel techniques.	IP	D4.2
Massively scalable, efficient, and dimensionality insensitive clustering algorithm for anomalies and intrusion detection.	IP	D4.2
Autonomous ranking for anomalies abnormality, and automatic defense filtering rules generation for security device online configuration.	IP	D4.2
Experimental evaluation of the subsystem on scalability, robustness, accuracy and temporal efficiency.	NS	D4.3

6.4.4 T4.4 Subsystems Integration and Testing

Work Plan	
Activity Description	Status (Completed/In Progress/Not Started)
Integrate the algorithms developed in tasks 3.1, 3.2, 3.3, 4.2 and 4.3, and the architecture issued in task 4.1.	NS
Develop the visualization subsystem.	NS
Test the full system and evaluate its global performance level.	NS
Issue some demo on some specific use cases.	NS

Expected Outcomes		
Description	Status (Completed/In Progress/Not Started)	Target Deliverable
An integrated system for real evaluation	NS	D4.3
Demos on some specific use cases	NS	D4.3



6.5 Work Package WP5 Implementation, Integration and Verification

6.5.1 Task T5.1 Integration of Offline and Online Network Traffic Characterization Systems

Work Plan	
Activity Description	Status (Completed/In Progress/Not Started)
Integrate ONTIC online and offline mechanisms.	NS
Parameterize and characterize mechanisms, techniques and algorithms to be used by data mining developers in other application domains.	NS
Set up the ONTIC framework for developing autonomous, proactive and scalable characterization systems.	NS

Expected Outcomes		
Description	Status (Completed/In Progress/Not Started)	Target Deliverable
An integrated online and offline network traffic characterization system	NS	D5.3 (pending)
An open source framework for developing highly scalable autonomous characterization systems.	NS	D5.10 (pending)

6.5.2 Task T5.2 Verification and Field Trials

Work Plan	
Activity Description	Status (Completed/In Progress/Not Started)
Define scenarios and roadmap of global verification and field trials.	IP (33%)
Select final scenarios for implementation in experimental driven approach.	NS
Use cases definition. Prototypes design, implementation and set-up. Global verification and fields trials to demonstrate the operation of online and offline ONTIC mechanisms and techniques.	IP (20%)
Evaluate the concepts and identify the most significant problems to indicate further research.	IP (50%)



Expected Outcomes		
Description	Status (Completed/In Progress/Not Started)	Target Deliverable
Integration of key project results in the test-bed environment.	NS	D5.1 D5.2, D5.3, D5.4, D5.5, D5.6, D5.10 (pending)
A set of scenarios for the validation of key ONTIC concepts.	IP	D5.1 D5.2, D5.4, D5.5, D5.6 (pending)
Evaluation of the concepts and identification of topics for further research.	IP	D5.1 D5.2, D5.3, D5.4, D5.5, D5.6 (pending)

6.5.3 Task T5.3 Standardization and Regulatory Activities

Work Plan	
Activity Description	Status (Completed/In Progress/Not Started)
Definition of ONTIC standardization strategy. Analysis of existing standardization Work Items that is relevant to the context of the project solution design and aim of the project.	IP (90%)
Identify which standardization bodies are most relevant to ONTIC objectives. Define the field of contribution for each standard.	IP (90%)
Actively participate in the standardization work in the relevant standardization bodies	IP (33%)
Using the outcomes of the research and experimentation of ONTIC for shaping standardization efforts.	NS
Analysis of the International and European regulatory framework.	IP (90%)
Identification and analysis of legal problems linked to the implementation of the system.	IP (33%)
Evaluation of regulatory impacts of the project architecture and solution.	IP (10%)
Build and disseminate recommendations for future regulation activities.	NS

Expected Outcomes		
Description	Status (Completed/In Progress/Not Started)	Target Deliverable
Document describing ONTIC standardization strategy.	IP	D5.7 D5.3, D5.8, D5.9, D5.10 (pending)



Detailed report for summarizing ONTIC standardization effort.	IP	D5.7 D5.8, D5.9 (pending)
Document describing ONTIC regulatory aspects with recommendations to relevant regulatory institutions.	IP	D5.7 D5.8, D5.9 (pending)

6.6 Work Package WP6 Exploitation, Dissemination and Standardization

6.6.1 Task T6.1 Dissemination, Training and Public Awareness

Work Plan	
Activity Description	Status (Completed/In Progress/Not Started)
Create the project branding (templates, colours and fonts to be used), produce a project logo of professional quality and use it consistently on its web site and its communications.	C
Prepare the initial set of communication materials (flyers, posters, pop-up stand and banner).	C
Create the project website, under the .eu domain.	C
Prepare and maintain a dissemination plan including conferences, publication possibilities and clustering activities.	IP (90%)
Disseminate the adoption of ONTIC outcomes to other application domains (e.g. bioinformatics, genomic, medicine, physics, social sciences, finances, marketing).	IP (33%)
Install publication repository including tutorial and training material.	NS
Coordinate and support the joined publication of project partners and external user group participants.	NS
Presentation of project results at booths at conferences including proofs of concept of the context aware service platforms developed in the project.	IP (33%)
The ONTIC consortium commits to issuing press releases within one month of the start of the project, as well as to issuing at least two press releases per year on all important milestones and events. The project should identify which specific partners will undertake this action. Such press releases will target the local or national press of the partner entrusted with this task. The press release will describe the goals of the project in simple, jargon free language and whenever possible highlight the benefits to the region/country and the importance of the local partner being part of a EU consortium. A PDF scan of the collection of published press releases will be included as annex to deliverables D6.4, D6.5 and D6.6.	IP (33%)
EC may set in motion Support Actions addressing e.g. best practices and standards work, technology transfer and cross-disciplinary training, research roadmaps and technology foresight, in areas especially relevant for the objective of this project. Therefore, ONTIC partners shall undertake - when invited - to contribute to and participate in focused concertation actions,	IP (33%)



themed seminars or special interest groups, for example the European Data Forum.	
All presentations, contributions and publications (also online publications and web sites) even partially funded by the project shall include the project logo and prominently acknowledge the grant under which the project is funded, using the standard text in Article II.30.4 of the Grant Agreement.	IP (33%)
Details of all publications even partially funded by the project shall be uploaded to some specific and agreed Bibliographic social networks such as http://www.citeulike.org/ , http://www.mendeley.com or http://www.bibsonomy.org/ . Every such publication must be tagged with the project identification "ONTIC 619633".	IP (33%)
Whenever such Bibliographic social networks allow for a catalogue of publications to be retrieved by tag or published as an RSS feed, the project's web site should expose such a catalogue.	IP (33%)
All presentation materials for which this is appropriate shall be published on the project's web site under a Creative Commons licence (http://creativecommons.org/) or another appropriate license.	IP (33%)
All open source software produced by the consortium shall be published on publicly available software repositories such as http://sourceforge.net/ , http://github.com/ or http://osor.eu .	NS
All data sets for which this is appropriate shall be published on the project's web site under a Creative Commons licence (http://creativecommons.org/) or another appropriate license.	NS

Expected Outcomes		
Description	Status (Completed/In Progress/Not Started)	Target Deliverable
Public project presentation	C	D6.1
Project Website	C	D6.2
Dissemination plan including conferences and journals.	IP	D6.4 D6.5, D6.6 (pending)
Publication repository for conference papers, presentations, journal papers, standard contributions and patents.	IP	D6.8 D6.9, D6.10 (pending)
Networking with stakeholders	IP	D6.3, D6.4 D6.5, D6.6 (pending)
Project Showcase	NS	D6.7 (pending)



6.6.2 Task T6.2 Exploitation and IPR management

Work Plan	
Activity Description	Status (Completed/In Progress/Not Started)
Awareness-raising and sensitizing activities	IP (33%)
IP identification, protection and mediation	IP (33%)
Market and application studies	IP (33%)
Exploitation roadmap	IP (33%)
Business development	IP (33%)

Expected Outcomes		
Description	Status (Completed/In Progress/Not Started)	Target Deliverable
Clear IP situation for each technology	IP	D6.4 D6.3, D6.5, D6.6 (pending)
Exploitation roadmaps and clear paths to market entry for the major technologies	IP	D6.4 D6.3, D6.5, D6.6 (pending)

6.6.3 Task T6.3 Impact Management

Work Plan	
Activity Description	Status (Completed/In Progress/Not Started)
Establishment of the Advisory Board (AB).	C
Management of the AB.	IP (33%)
Identify additional stakeholders and players like manufacturers, application developers and research institutions.	IP (33%)
Prepare information and support material for the information of the potential stakeholders in the domains of Big Data and Network management.	IP (33%)
Monitor and evaluate the impact of the project's activity and give feedback to the relevant work packages and tasks, mainly task 1.2 on quality management.	NS



Expected Outcomes		
Description	Status (Completed/In Progress/Not Started)	Target Deliverable
Fully and complete answer to stakeholders needs.	IP	D6.4 D6.5, D6.6 (pending)
High market and research impact of the project results.	IP	D6.4 D6.5, D6.6 (pending)
Integration of current market trends and need into project framework	IP	D6.4 D6.5, D6.6 (pending)



7. Key Activities Declared by Each Partner

The ONTIC partners participate in all work packages to a certain extent. However, each partner develops key activities in specific work packages, tasks and deliverables. Firstly, each partner summarizes the activities already completed in which they have been involved during the first year. Secondly, the ONTIC partners identify and declare specific key activities that are still in progress or that they plan to be involved in during the second year. These activities should not be considered as definitive and their contents and adequacy to specific ONTIC tasks and work packages will be discussed in the 2nd Plenary Meeting to be held in February 2015 in Turin.

7.1 Ericsson

7.1.1 Activities Completed

7.1.1.1 WP1/WP5

Level of adherence to the Agile methodology:

- The project team has worked on the **use cases refinement**, taking inputs from potential stakeholders. The initial use cases have been **adapted to the Agile's User Stories** format, as **this is the way the requirements will be managed in the project**.
- The project has provided a set of **initial high level user stories (Epics)** and a second level of more detailed user stories, being ready to be used as a guide for the implementation along the second and third years.
- Big Data Research and Development activities have been focused on the **Big Data platform and dataset extraction task, development of a first Policy Governance Function mockup, etc.** The outputs generated by the R&D activities along this first year of project will be used as a base to implement the provided User Stories.
- **User Stories will be continuously refined** along the following year of the project incorporating new inputs from the market. This principle is key in Agile methodologies. The changes will be incorporated on the User Stories as the whole project executes the so-called "sprints", and provides as an output to be checked with potential stakeholders.
- The **Quality of Experience concept**, including QoS and congestion control, has been developed in several workshops, speeches, conferences, etc. There is a general agreement about the importance of this concept in the Telecom and IT space.

7.1.1.2 WP6

Exploitation activities:

- **A first business analysis of the proposed scenarios** has been provided. It focuses on the justification of why the market is ready for receiving the proposed new solutions and the general strategy from the partners to reach it. The business analysis has been focused on the **telecom and IT markets**
- There have been internal dissemination activities and **engagement activities with key players in the field**.
- The **QoE virtuous circle concept has been delivered**. The need for automatizing the prediction and policies setup and actuation has been identified.
- **A high level network control and optimization architecture** has been proposed, so that it becomes the foundation for the ONTIC use cases.



- Some preliminary ONTIC outcomes have been protected as a patent application.

Implementation activities:

- Ericsson will show at the end of the first year review a **first mockup of the PGF functionalities**, part of the overall architecture.

Standardization activities:

- Identification of 3GPP working groups where the ONTIC results could be applied or where to align the ONTIC outputs: User Plane Congestion (UPCON).
- UPCON follow-up. Attendance to 3GPP meetings.

7.1.2 Activities in Progress

7.1.2.1 WP5

- **Task 5.2 Verification, Use Cases and Field Trials [M1---M36]:** Ericsson will lead the continuous development and prioritization of the user stories and the related backlogs. Ericsson will also coordinate the landing of the already defined use cases into the first version of the different prototypes
- **Task 5.2 Verification, Use Cases and Field Trials [M1---M36]:** Development of the Policy Governance Function to be integrated in the Prototypes. Close coordination with the analytics and the policy enforcement nodes.
- **Task 5.3 Standardization and Regulatory Activities [M01---M36]:** 3GPP UPCON follow-up

7.1.2.2 WP6

- **Task 6.2 Exploitation and IPR management [M01---M36]:** Continuous engagement with the market in order to enrich the user stories and to get new requirements, synchronizing activities between research and development activities and the business activities.
- Task 6.2. Supporting other partners to identify ONTIC outcomes that could be protected by means of patent application.

7.1.3 Plans and Actions for the Next Reporting Period

7.1.3.1 WP5

Level of adherence to the Agile methodology:

- The project will work in Sprint Cycles. Early in the second year the project will define the Sprint durations and will prioritize the backlog that later on will be implemented by the partners.
- The outputs generated from the Sprints will be used as tools to engage with potential receivers of said solutions.
- The project will work in the market side receiving inputs from the market and refining the proposed user stories
- The implementation of the scenarios will be done by prioritizing the backlog and splitting these detailed user stories into affordable tasks.
- At the end of this reporting period, the project will deliver a first version of the PoCs for provided use cases

Business Analysis activities:

- The project will provide more details on the exploitation side by incorporating more information from the inputs received from the market.
- The project will work on the standardization side.



7.2 UPM

7.2.1 Activities Completed

7.2.1.1 WP1

UPM has contributed actively in the edition and reviewing of D1.1 deliverable.

7.2.1.2 WP2

This work package deals with designing, deploying, managing and provisioning with real ISP network flows a Big Data Network Traffic Summary dataset named ONTS (ONTIC Network Traffic Dataset). To this end, UPM has designed, implemented and deployed a fully operation version of the dataset capture and provisioning subsystem which is running at Interhost (SATEC) facilities since month M04. These activities have been carried out in tasks T2.2 and T2.3. Finally, UPM has contributed actively in the edition and reviewing of D2.2 and D2.4 deliverables

7.2.1.3 WP3

The main goal of this work package is to design high scalable offline machine learning algorithms to traffic characterization. In particular, UPM has focused their research work in the context of unsupervised clustering algorithms. Regarding this objective we have studied and identified the strengths and weaknesses of the most predominant paradigm for horizontal parallelizing offline machine learning and data mining algorithms, the so-called Map-Reduce approach. Current platforms implementing this paradigm (e.g. Hadoop and Spark) have been studied in depth regarding the iterative nature of the clustering algorithms. In addition, we have identified and studied the existing Map-Reduce versions of the most cited offline clustering algorithms. These activities have been carried out in task T3.1. UPM has contributed actively in the edition and reviewing of D3.1 deliverable.

7.2.1.4 WP4

Work Package 4 focuses on the design of scalable online traffic characterization algorithms. UPM have devoted their efforts to conducting a thorough review of the state of the art on online clustering, classification and forecasting algorithms. The identified mechanisms have been considered for their possible applications to the problem of congestion control. UPM have also identified the basic requirements for the design of online algorithms and has designed a high-level architecture for an online traffic pattern evolution subsystem. The results of this work have materialized as significant contributions to deliverable D4.1.

7.2.1.5 WP5

UPM have compiled a comprehensive state of the art of algorithms for congestion control in diverse network environments. The key issues concerning this problem have been identified, and the possible advantages of using big data analytics have been described. In addition, UPM have identified the key technologies and concepts in the field of quality of service management. This work constitutes the bulk of UPM's significant contributions to deliverable D5.1. UPM have also helped in the identification of relevant standardization bodies and their activities related to big data analytics and network technologies.

7.2.1.6 WP6

During the seventh month of the ONTIC project, the first BigDap workshop took place. UPM hosted the event, and its members served as organizers, reviewers and chairmen. UPM also contributed to the workshop with two papers, and produced a proceedings volume containing all the accepted papers. In order to provide a full description of the workshop, UPM edited deliverable D6.8.



In addition to the BigDap workshop, UPM have also carried out several dissemination activities. Specifically, UPM have set up the website and accounts on different social networks, issued different press releases and produced a factsheet. Additionally, UPM have contacted a dozen of industrial and academic entities who have shown a keen interest on the activities being carried out within the project. These contributions are thoroughly described in deliverable D6.4.

7.2.2 Activities in progress/Plans and Actions for the Next Reporting period

7.2.2.1 WP1

UPM is in charge of the project coordination. The main activities we have developed during this year in this work package are the overall project management and coordination and the follow up to ensure that the project achieves successfully its stated objectives on time, within budget and with the expected level of quality. These activities are included in tasks T1.1. and T1.2 and will be developed during the whole life of the project.

7.2.2.2 WP2

UPM has designed and implemented specific feature engineering mechanisms to adapt and prepare the contents of the ONTS dataset to the specific data formats that will be used in WP3 and WP4. Specifically, WP3 will process network flows instead of raw packets and so, we are in the process of customizing Tstat, an open source tool that aggregates network packets into flows. Some scalability problems have arisen when TeraByte sized data files are manipulated, and we are considering using other open source options to cope with this problem. These activities are included in tasks T2.2 and T2.3.

We have designed a full set of experiments to determine the actual performance and scalability of the state-of-the-art Map-Reduce frameworks in order to know which is the best option to run the machine learning and data mining algorithms we are going to adopt in the three ONTIC Use Cases. Preliminary experiments will be run on Hadoop and Spark platforms installed in a local cluster at UPM. Later, the AWB cluster provided by EMC and Google Cloud will be used to test real scalability. These experiments correspond to activities included in task T2.1.

7.2.2.3 WP3

After having identified the state of the art on offline unsupervised clustering algorithms and the existing map-reduced versions of them, UPM will focus in the design and implementation of new proposals for clustering algorithms that increase the current performance by a factor of 10.

7.2.2.4 WP4

After having identified the state of the art on online unsupervised clustering algorithms and the existing streaming versions of them, UPM will focus on the design and implementation of new proposals for online clustering algorithms that increase the current performance by a factor of 10. In addition, online forecasting algorithms will be designed and implemented to be applied in network congestion prediction scenarios.

7.2.2.5 WP5

UPM has been involved mainly in two use cases: Use case 2 (Proactive Congestion Control and Prediction) and Use Case 3 (Dynamic QoS Management). Although these use cases are more or less related they have enough complexity to be studied in a separate way. With regard to the use case #2, we are defining a simple network congestion model to apply predictive machine learning algorithms on it. In the next period we will focus on designing and implementing a forecast algorithm for congestion control scenarios. Regarding the use case #3 we have proposed an architectural model for dynamic QoS management using



analytics that was based on a previous Ericsson proposal. In addition, we have also studied the problem of mapping QoE to QoS parameters. However, in the next period, we will focus nearly all of our efforts to use case #2.

7.2.2.6 WP6

The extensive research on the state of the art conducted by UPM provides an accurate understanding of the open issues in the different problems to be addressed by ONTIC. Research on these issues has great potential to materialize in scientific papers, patent applications, contacts with industry and academia, contributions to the Big Data PPP and the rest of dissemination and exploitation activities declared in WP6. UPM target numerous prestigious international conferences and scientific journals whose topics are highly relevant to the goals of ONTIC. A non-comprehensive list of these is presented in deliverable D6.4.

7.3 Polito

7.3.1 Activities in Progress

7.3.1.1 WP3

WP3 consists of three main design and development tasks (T3.1, T3.2, and T3.3), which started in M03 and will end in M33, and an experimental evaluation task (T3.4), which is not started yet. Each of the design and development tasks addresses a very different class of data mining techniques:

- T3.1 addresses unsupervised clustering
- T3.2 focuses on supervised classification,
- T3.3 aims at extracting correlations by means of association-rule mining.

Hence, the structure and contribution of each task is similar in structure, but different in content. All tasks contributed to D3.1 (Available algorithms identification) with different content depending on the specific class of algorithms.

7.3.2 Plans and Actions for the Next Reporting period

7.3.2.1 WP3

During the next reporting period, WP3 activities will shift from mainly focusing on algorithm identification and analysis to the design and development phase, according to the work plan.

Each of the ongoing tasks will contribute on a very different class of data mining techniques:

- T3.1 addresses unsupervised clustering
- T3.2 focuses on supervised classification,
- T3.3 aims at extracting correlations by means of association-rule mining.

Results will be collected into the Deliverable D3.2 (Scalable algorithms for offline network characterization) at M24.

7.4 CNRS

7.4.1 Activities in progress

7.4.1.1 WP4

Three tasks started in WP4. Task 4.1 aims at designing the architecture of the online classification systems for ISP traffic flows. This task is currently well advanced. The software architecture and all its modules have been defined as well as the kind of information that is required as input and the information that is produced. This software



architecture just requires further formalization for the interfaces between modules, and will certainly be refined depending on the results of tasks 4.2 and 4.3.

Task T4.2 is devoted to the traffic pattern evolution subsystem. A quite complete state of the art on the topic has been proposed. Based on this, the specific architecture for this subsystem has been issued, as well as the basics of the algorithms to be further designed and developed in the next reporting period.

Task T4.3 is devoted to the network anomaly and intrusion detection subsystem. Similarly to T4.2, a state of the art on the topic has been issued. A detailed software architecture has been proposed as well as a preliminary algorithm. The evaluation of this algorithm has been started on a limited amount of traffic traces just to serve as a proof of concept.

7.4.1.2 WP5

Task 5.2 includes the design and development of the 3 use cases. Use case #1 relates to anomaly detection. This use case has been completely defined according to the selected methodology and formalism. The different scenarios for this use case have been clearly defined.

7.4.2 Plans and Actions for the Next Reporting Period

7.4.2.1 WP4

During the next reporting period, WP4 will mainly focus on task 4.2 devoted to the traffic pattern evolution, and task 4.3 on network anomaly detection. For these two tasks, algorithms will be developed, and test performed on the traffic data collected thanks to the capture system defined and developed in the framework of WP2.

Task 4.2 will mainly focus on the design of traffic pattern evolution techniques and the enhancement of existing ones.

In task 4.3, our research will focus on 3 aspects:

- How to improve the scalability of the detection and classification algorithm?
- How to provide an abnormality score for the identified classes of traffic for an autonomous decision from the system of what is legitimate from what is not.
- How to extend the current system toward a distributed system for improving classification and detection accuracy?
- How to integrate root cause analysis mechanisms for improving the automatic decision making of the anomaly detection system?

Task T4.4 on subsystem integration and testing will be launched. During the next reporting period, it will mainly focus on the testing of the system on large amount of traffic data.

WP5

The work on use case #1 will continue in the framework of T5.2. It will consist in transferring the results from WP4 to WP5 in terms of development and integration.

7.5 SATEC

7.5.1 Activities Completed

7.5.1.1 WP6

All the tasks of this WP6 are active during the entire life of the project (from month 1 to month 36), but during the first year of the project we worked on getting all partial results are reflected in the following deliverables:

- **Deliverable D6.1 (Public Project Presentation according to the EU specifications)**



- **Deliverable D6.2 (Project Website)**
- **Deliverable D6.3 (Exploitation Strategy)**
- **Deliverable D6.4 (Exploitation and Dissemination Plans)**
- **Deliverable D6.8 (Big Data Analytics Workshop #1)**

7.5.2 Activities in progress

7.5.2.1 WP6

The WP6 has kept open its three tasks during the first year of the project and the three will continue to progress until the end of the project:

- **Task T6.1 Dissemination, Training and Public Awareness** [from month1 to month 36]: which will continue with the dissemination planned activities. This task will contribute in the next period to the development of the deliverables D6.5 (Progress on Exploitation and Dissemination Plans - Part I) and D6.9 (Big Data Analytics Workshop #2)
- **Task T6.2 Exploitation and IPR management** [from month1 to month 36]: which will continue with the exploitation and IPR activities as described in the deliverable D6.3 (Exploitation Strategy). This task will contribute in the next period to the development of the deliverable D6.5 (Progress on Exploitation and Dissemination Plans - Part 1)
- **Task T6.3 Impact Management** [from month1 to month 36]: which will continue with the activities focused in the positioning of ONTIC in different application domains. This task will contribute in the next period to the development of the deliverable D6.5 (Progress on Exploitation and Dissemination Plans - Part 1)

7.5.3 Plans and Actions for the Next Reporting Period

7.5.3.1 WP4

During the next period SATEC plans to work in the transfer the results of WP4 to develop software modules which are going to implement: network anomalies detection algorithms and intrusion detection algorithms.

7.5.3.2 WP5

During the next period SATEC plans to work in the design of a computing architecture (online and distributed) to be used in the implementation of use case #1.

7.5.3.3 WP6

During the next period SATEC plans to continue working in activities related with dissemination and exploitation specially trying to carry ONTIC results to other domains such as: IoT (Internet of Things), Smart Cities, M2M (Machine to Machine), e-Health, etc.

7.6 EMC Spain

7.6.1 Activities Completed

EMC Spain has carried out the following activities during the first year:

- Collaboration with the rest of the partners gathering requirements for the ONTIC Big Data architecture (Deliverable D2.1: Requirements Strategy), and helping to define initial Big Data Architecture and provisioning sub-system: (Deliverables *D2.2: ONTIC Big Data Architecture* and *D2.4: Provisioning Subsystem*)



- Working closely to UPM partner in the installation/configuration of a laboratory with HADDOP cluster, SPARK and Pivotal HAWQ, which will be used for testing and doing a comparative study between these different frameworks.
- One of the reviewers for deliverables *D3.1: Available algorithms identification*, *D5.1: Use Case requirements*, *D6.2: Project website* and *D6.8: Big Data analytics workshop #1*
- Contributions to deliverables *D6.3: Exploitation Strategy* and *D6.4: Exploitation and Dissemination Plans*
- As a member of the Program Committee for the first international workshop on Big Data celebrated in Madrid on September 2014, helping in reviewing and evaluating one of the papers sent to the committee.
- Created awareness and visibility of the ONTIC project inside EMC through internal channels.

7.6.2 Activities in Progress

EMC Spain will be involved in the following activities that have not been completed yet in the next year:

- Keep working closely with the rest of the partners in the different WPs, giving support on all of them specially where knowledge and expertise of the EMC team is more valuable.
- Completing tests and benchmarking of Big Data frameworks in UPM laboratory.
- ONTIC project awareness and visibility, as this is an ongoing process that will last until the end of the project

7.6.3 Plans and Actions for the Next Reporting Period

- EMC activities during the next period will be focus, but not only, in WP2, developing and testing the Big Data Architecture defined during the first year.
- Related with WPs 3 and 4, EMC will provide support in evaluating and testing algorithms when available over the UPM laboratory.
- For WP5, EMC will increase his support to the rest of the partners involved in this WP, defining and moving forward in use cases design and development.
- And finally, for WP6, EMC will keep working on give visibility, internally and in our partners/customer, about ONTIC project progress and results.

7.7 Adaptit

7.7.1 Activities Completed

7.7.1.1 WP2

- Installation and maintenance of a local Big Data testbed (Hadoop cluster) in the Google cloud.
- **Deliverable D2.1 (Requirements strategy):** Documenting the requirements on the Big Data architecture. Editing and contributions. Has been completed since M4.
- **Deliverable D2.2 (ONTIC Big Data Architecture):** Contributions on the Big Data architecture (storage, processing components). Editing of the deliverable. Completed in M12
- **Deliverable D.2.4 (Provision subsystem capabilities):** Provisioning system capabilities; editing of and contributions on Deliverable D2.4 completed in M12

7.7.1.2 WP4

- Review of Deliverable D.4.1.

7.7.1.3 WP5

- Contribution on SotA for use case 3 on dynamic QoS provisioning.

7.7.1.4 WP6

- Updated company's Web-site with Ontic information; issue of an announcement about the participation of the company in Ontic to be distributed by targeted e-mail campaigns and through publications of Ethos Media, reaching Greece and South East Europe.
- Co-authoring of a technical paper, "A Telecom Analytics Framework for Dynamic Quality of Service Management" appeared in Big Dap'14 conference.

7.7.2 Activities in Progress

7.7.2.1 WP2

- Investigation of and experimentation with configuration options for Hadoop (number of worker nodes, CPU, RAM per node).
- Integration and testing of processing components for creating traffic summary records.

7.7.2.2 WP3

- Study of offline techniques for traffic classification according to multiple, dynamically-defined, criteria.
- Study of offline techniques for calculating time-varying usage metrics of classified traffic in a parallel computing platform.

7.7.2.3 WP4

- Study of efficient techniques for online calculation of usage metrics in a time series fashion for different traffic mixes

7.7.2.4 WP5

- Study of use cases on dynamic congestion and QoS management.

7.7.2.5 WP6

- Internal meetings with pre/sales teams for exploiting Ontic participation into commercial activities.
- Preparation of a meeting with First Data Hellas for a pilot project on Big Data analytics for cloud infrastructure monitoring.
- Promotion of Ontic activities in our stand at the Mobile World Congress in Barcelona in February 2015.

7.7.3 Plans and Actions for the Next Reporting Period

7.7.3.1 WP2

- Deployment and configuration of the project Big Data platform in our local testbed; execution of validation and performance tests.
- Test of joint operations of the provisioning system and our Big Data platform.
- Support of the migration of dataset records from the SATEC Big Data platform to EMC AWS Big Data cluster.



7.7.3.2 WP3

- Specification, design and implementation of parallel-computing optimized offline techniques for traffic classification and calculation of related usage metrics.
- Evaluation of the developed algorithms in our cloud-based Big Data platform and in available commercial environments in collaboration with other partners.

7.7.3.3 WP4

- Specification, design and implementation of online techniques for traffic classification and calculation of time-evolving related usage metrics, involving multiple cluster instances and aggregation points.
- Evaluation of the developed algorithms through simulations and in large-scale test environments in collaboration with other partners.

7.7.3.4 WP5

- Integration of the developed offline and online traffic classification mechanisms in a comprehensive system suite.
- Design, implementation and testing of prototypes on the specified Big Data architecture for the defined use cases.
- Support experimentation in the target test environments.

7.7.3.5 WP6

- Meetings with customers and industrial partners for promoting solutions utilizing Ontic expertise; the arrangement of two such meetings is already in progress.
- Writing of technical papers.
- Continuous exploitation of Ontic results into commercial activities.



8. Compliance with Planning Milestones

This section discusses the level of compliance of each work package with the first milestone (MS1).

8.1 WP2

WP2 has progressed according to plan. The overall design of the Big Data Architecture can be verified using D2.2. The Provisioning Subsystem can be verified using D2.4. Deliverables D2.1, D2.2 and D2.4 have been produced according to schedule.

8.2 WP3

Deliverable D3.1 establishes the fundamental requirements and the key issues for the design of an offline network traffic characterization system. D3.1 has been produced according to schedule.

8.3 WP4

WP4 is perfectly compliant with the planned roadmap, and reached the first milestone MS1. The first deliverable D4.1 has been produced according to schedule.

8.4 WP5

D5.1 provides a general overview of the ONTIC scenarios and related user stories, which allow for the verification of an initial version of the Use Cases, as stated in MS1. User stories will be used throughout the project to collect requirements. This deliverable provides an introduction to the proposed architecture, as well as a summary of the related SoTA and the first version of the working backlogs.

D5.7 provides an overall vision about the different standardization bodies that could be targets for the ONTIC outcomes. Goals of the first year have been reached and the second year needs of more effort to reach the proposed goals.



9. Current and Potential Issues/Problems/Risks

9.1 WP2

The deployment, operation and maintenance of the Provisioning Subsystem has presented several issues. The trace capturing process has been hampered by hardware compatibility and driver issues of the network traffic card. We are planning to use the native API of the card to build a homemade driver instead of the standard libpcap library, which we have used so far.

We have also experienced several scalability problems with open source tool Tstat, which is being used to group network packets into traffic flows. We are searching for open-source alternatives that do not face the same problems when handling big data files.

9.2 WP3

So far, the activities of WP3 have focused mainly on state-of-the-art algorithms identification, and no problem has arisen. Therefore, WP3 did not present issues or problems during the reporting period.

9.3 WP4

Dealing with WP4, everything is in line with the planned work. No unplanned difficulties appeared during the first year of the project, and we are very confident given the quality of our first results on the results we will get until the end of the project.

9.4 WP5

The ambition level defined in deliverable D5.7 is really challenging. We are proposing to refine and reduce the scope of the associated task and allocate more resources to it.

Due to the different profiles of the partners involved in the project (coming from the academic, industrial and service worlds) a proper synchronization of all the business and technological activities included in deliverable D5.2 is required to reach the success. Agile processes and tools will help to achieve these targets.

Regarding the use cases, ONTIC is facing a challenging business and technological scenario. This situation is forcing partners to redefine user stories and the targets defined for them. This is something that should be managed properly to assure the success in the project outcomes.

9.5 WP6

The activities of task T6.1 have not presented any issues during the reporting period and some of specific outcomes (for example networking with stakeholders) are progressing faster than expected. The activities of tasks T6.2 and T6.3 have not presented any issues during the reporting period.