5G European Validation platform for Extensive trials

Deliverable D7.6
Report on Training activities after Year 2

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Executive Summary

This deliverable provides an overview of the training activities in year 2 of 5G EVE as well as plans for upcoming training in the experimentation phase of year 3. We review the basic objectives for training activities in 5G EVE and then describe the first two training events targeting users from companion H2020 ICT-19/22 projects that occurred in May and June 2020. We then describe the plans for the next training events as well as methods for customized training support for the experimentation phase during the third year of the project.

1 Introduction

The training activity in 5G EVE is part of the Training task (T7.3) in the Community Building workpackage (WP7) whose main objective is to provide end-users guided hands-on experience for using the facilities, especially those from partners representing vertical industries within 5G EVE and afterwards from associated projects in the context of ICT-19 and ICT-22 calls. The activity furthermore facilitates the collection of measurements and guides the analysis and dissemination of results derived from them. It provides also several means to train *within* the 5G EVE community, in particular to allow for interoperability between the facilities in different geographic locations and joint experimentation across sites. The actual means for training varies from facility to facility but includes a combination of workshops, tutorials, webinars, online collaborative documentation, community mailing lists and online real-time interactions using tools such as *slack*[1]. The most important aspect of real-time tools is that they allow direct interaction with maintainers of the facilities. In order to be effective, the content provided by these methods should be useful and easily-accessible. Moreover, the methods should contribute to the sustainability of the facilities beyond the timeframe of the 5G EVE project, in order to foster both academic and international collaboration in industry-driven initiatives such as OPNFV, ORAN and ONAP.

For a more detailed set of objectives of T7.3 please consult D7.5 [2].

In the following sections we begin by providing overviews of the first two online training events which were held in the form of webinars. The first webinar was an overview of the experimentation methodologies used by 5G EVE to allow external users to devise and run experiments on 5G EVE infrastructure. It also provided technical details on the different sites in 5G EVE. The second webinar covered a pedagogical use-case allowing users to gain hands-on experience on the 5G EVE portal followed by a real 5G vertical use-case. Both were carried out on the Spanish site.

We then provide a description of the currently envisaged webinars for the upcoming months on the French and Italian sites. Finally, we provide information regarding the interactive training activities that will be used to assist users during the experimentation phase in the remainder of 5G EVE timeframe and after the project's lifetime through companion projects.

[1] Slack (www.slack.com) Is an interactive tool for managing teamwork. It is organised in channels providing a single place for messaging, tools and files. It is particular suited for technical interaction.

2 First online Training Webinar

The first training webinar was held on May 6 2020. It was a three-hour fully online live event using the Webex conferencing tool. It was attended by 75 participants, coming for the most part from companion projects in ICT-19 call. A complete list of attendees is given in the Appendix.

2.1 Overview of Content

This training webinar provided a detailed look at the 5G EVE infrastructure. It was targeted to end-users of the facilities and in particular companion ICT-19 projects. The first part of the training webinar provided a detailed description of the 5G EVE Portal which is the main entry point for users to define, run and collect measurements from an experiment making use of one or several of the 5G EVE sites. In particular, attendees first learned how to define their experiment both from the perspective of the service under test and the networking configuration. Then the parameterization and reservation system were described. This was followed by the execution method using the portal's virtual environment allowing for execution and monitoring of the user's experiment. Finally, we gave examples of how results can be assessed for the purpose of key-performance indicator (KPI) extraction and tuning of service parameters.

The second part of the training webinar provided an architectural overview of a subset of the 5G EVE sites from Spain, Italy and France, which will be used in subsequent training activities. This overview focused on the underlying capabilities for experimentation and KPI measurement. We then provided examples of how software is deployed on the infrastructure and how measurements are collected. Some information about on-boarding Virtualized or Containerized Network Functions (VNF/CNFs) on individual sites for custom configurations of 5G EVE was also be provided.

The targeted audience was technically-inclined users of 5G EVE from ICT-19 and other projects, SMEs, vertical industry actors. The full set of slides are available on the 5G EVE website along with an audio-video recording.

2.2 Detailed Agenda

The agenda was as follows:

- Introduction to 5G EVE objectives (~10 min)
- Overview of the 5G EVE Portal Architecture and Usage (~20 min + questions)
- Overview of the 5G EVE Interworking Layer (~20 min + questions)
- Italian Site Presentation (~20 min + questions)
- Spanish Site Presentation (~20 min + questions)
- Greek Site Presentation (~20 min + questions)
- French Site Presentation (~20 min + questions)
- Upcoming Trainings (~10 min + questions)

The speakers were:

- Raymond Knopp: EURECOM, France
- Pablo Serrano Yanez-Mingot, Gines Garcia Aviles: UC3M, Spain
- Ignacio Berberana: IMDEA Networks, Spain
- Claudio Casetti: Politecnico di Torino (CNIT), Italy
- Vangelis Kosmatos: Wings ICT-Solutions, Greece
- Velissarios Gezerlis: OTE, Greece

3 Second online Training Webinar

The second online training webinar provided an introduction to running experiments on the Spanish Site. It consisted of two separate parts. The first was purely pedagogical in nature and used to introduce attendees to the use of the 5G EVE portal for deploying an end-to-end service. The chosen example was a simple web-server but included step-by-step instructions which are reproducible by external users of 5G EVE. This exercise can be used as an example to follow when a new external experimenter wishes to create, deploy and retrieve measurements in more customized experiments using 5G EVE.

The second example was a demonstration of the use of 5G EVE 5TONIC infrastructure for the Segittur smart-tourism use-case (see deliverable D2.4 [1]). This is an example of the integration of a vertical application scenario, real-time 360° video retrieval on the Ericsson non-standalone 5G infrastructure at 5TONIC. This should be seen as an example of how a full vertical service can be integrated on the facility, in particular end-user application equipment and remote measurement retrieval.

3.1 Detailed Agenda

- Overview of this session (R. Knopp 5 min)
- Web server example (J. Garcia-Reinoso, 45 min + questions)
- Segittur Use-case (TBD, 45 min + questions)

The speakers were:

- Raymond Knopp : EURECOM, France
- Jaime Garcia Reinoso, Pablo Serrano Yanez-Mingot: UC3M, Spain
- Isaac Quintana Fernandez, Diego San Cristobal :Ericsson

3.2 Pedagogical example

The first example is a so-called “Hello World” example to introduce a first-time experimenter with the 5G EVE infrastructure to the use of the portal to create an end-to-end experiment. The pedagogical use-case is a simple user-client and web-server as shown in Figure 1.

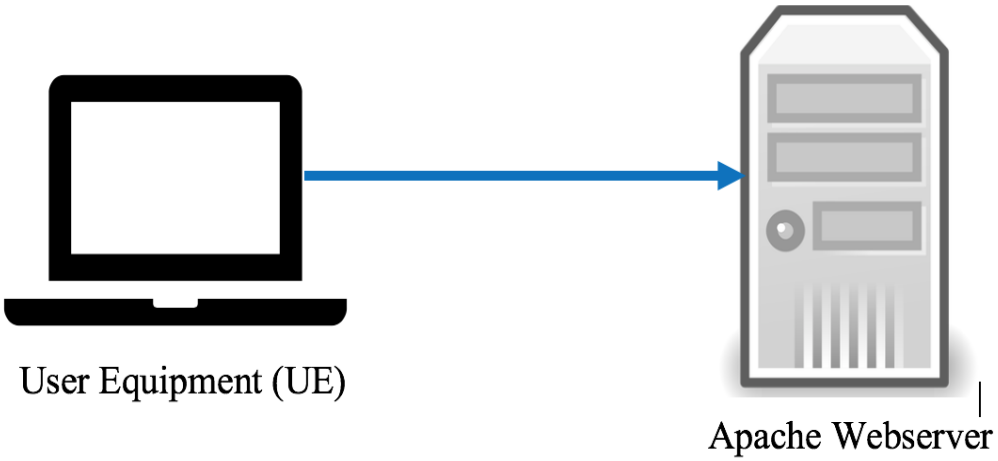


Figure 1: 5G EVE Hello-world Example

It is a very simple use case for training purposes which did not make use of a context blueprint. From the perspective of an experiment developer it shows how to

1. Onboard a vertical-service blueprint (VSB)
2. Onboard a test-case blueprint (TCB)
3. Onboard an experiment blueprint (ExpB)

From the perspective of the experimenter it shows how to

1. Create an Experiment Descriptor
2. Schedule an experiment
3. Deploy an experiment
4. Analyse the results of the experiment

A subset of the characteristic slides are provided in the Appendix.

3.3 Segittur Real-Time 360° video retrieval 5G Use-Case

The use case to be validated concerned streaming up 180-degree video being recorded at an event over a 5G Access network where the event is hosted to a remote server in Amazon Web Services (AWS) responsible for world-wide rendering to end-users who enjoy an immersive experience of such event, through virtual-reality glasses. The business motivation for adopting 5G in this use case is twofold:

- Counting on a high-reliability high-throughput network for transmitting at the needed speed the vast amount of data being recorded with a 180 or 360 degree camera: 50 Mpbs for 180-degree, and 100 Mbps for 360-degree
- Removing dependencies with wired infrastructure (not flexible and very expensive, if available at all) at the facilities where the event is hosted

The use case is shown in Figure 2.

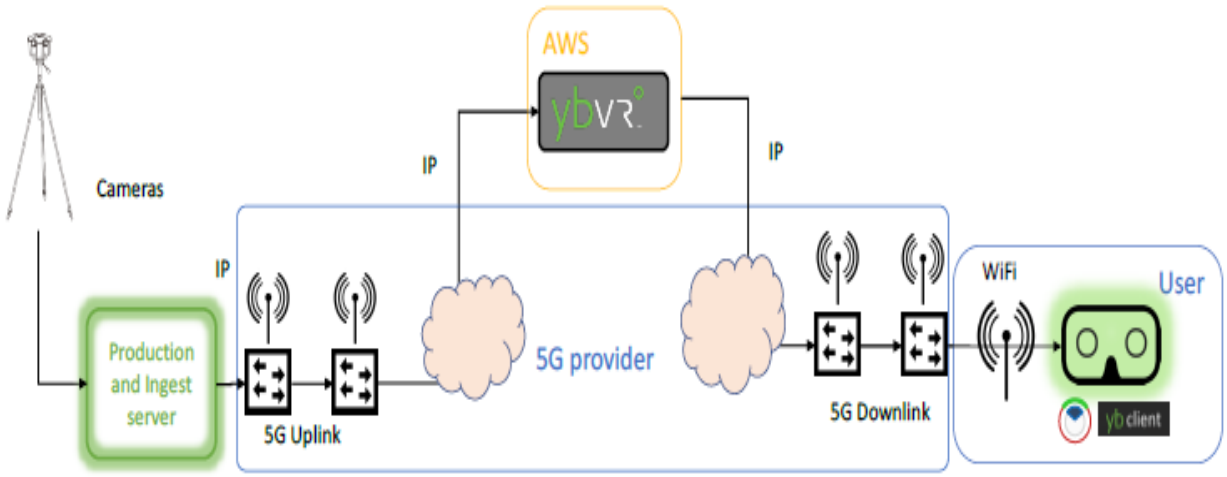


Figure 2: Sigittur Real-Time Video 5G Use-Case

The tutorial presented background on the setup at 5TONIC which included a full 5G non-standalone (NSA) radio-access network and Core network from Ericsson in the lab as shown in Figure 3 along with a camera and P&I server (YBVR) , an external AWS Server (YBVR) and dynamic probes measuring user data-rate (uplink) and end-to-end user-plane latency. An explanation on how this particular experimental setup is described using the 5G EVE blueprints was given. Then the presentation covered the description of the experimentation setup using the 5G EVE portal. This was followed by a detailed overview of how measurements can be collected using the setup for real-time and offline analysis.

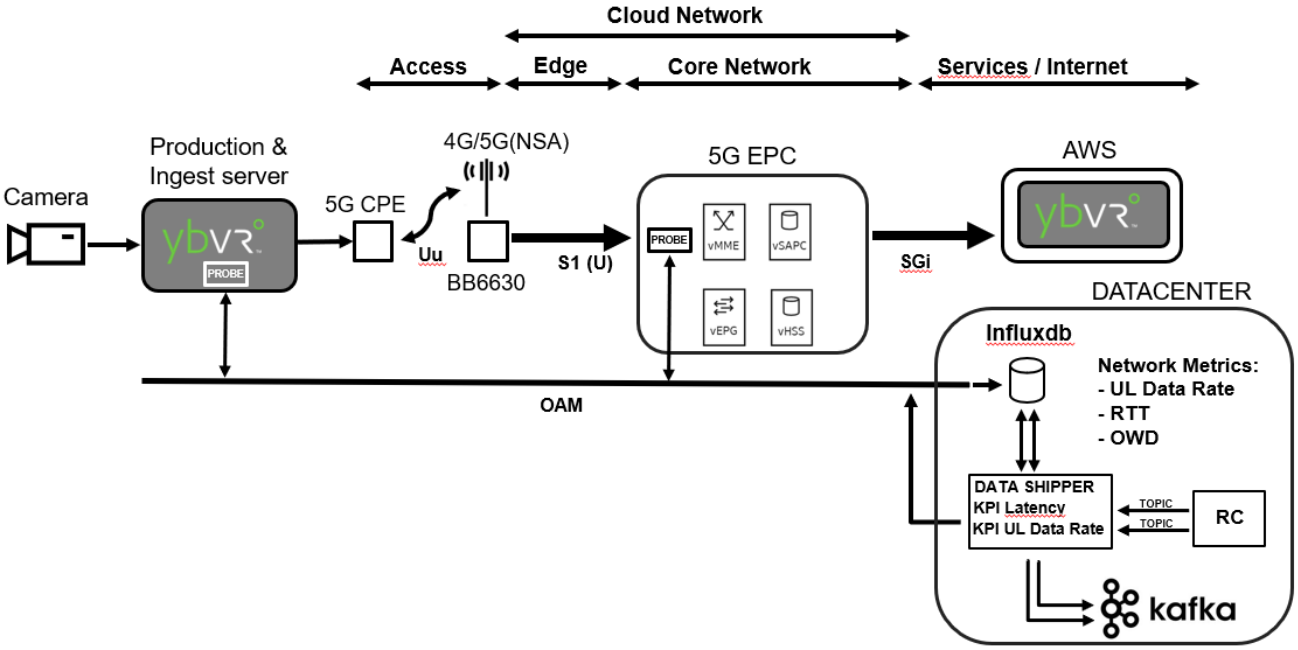


Figure 3: 5TONIC 5G setup

The full set of slides are available on the 5G EVE website along with an audio-video recording. A selected of slides and snapshots from the training session are shown in the Appendix.

4 Upcoming Webinars

The objectives of upcoming webinars is to strengthen the external communities operational knowledge of the 5G EVE infrastructure, in particular for the French, Italian and Greek sites which were not covered in the second online training webinar. More generally, in a first instance starting in Q4 2020, we will organize a similar webinar to the one conducted on the Spanish site in June 2020 but targeting the Italian and French sites. The main objective is to show experimenters how to use the two infrastructure components. In order to ensure that experiments can be run by users external to 5G EVE, the experiments will be run by the responsible parties from T7.3, as if they were external users, which was not the case for the Spanish Training. This will be feasible starting in July and will allow sufficient time for the presenters to familiarize themselves with the 5G EVE infrastructure.

These training sessions aim to reinforce understanding of 5G EVE experimentation services through hands-on sessions with users from ICT-19 and other H2020 projects, on a case-by-case basis in order to cover the needs of particular use-cases and user requirements. This is described later in Section 5. These will include remote sessions, webinar + interactive sessions. In the Q4 of 2020 we will complete the basic training of the remaining sites, in particular those in France and Italy which are already described below.

One new and fundamental key aspect will to be show the interconnection between the 5G EVE sites to show the features of the 5G EVE interworking layer.

4.1 French/Italian Site Training

At least one comprehensive training session for the using the French and Italian sites is planned for the Q4 of 2020 after full integration of the 5G EVE Interworking Layer with the portal and site orchestrators is completed. The objective of this training event will be similar to the one done on the Spanish site in June and, at the same time, highlighting the different network infrastructure components of the new sites. We describe a few use-cases that will be used in the training.

4.1.1 Italian Use-Case

The training session will initially show the experiment design, request and execution phases on the 5G EVE portal, providing the details on how to compile the vertical service blueprints and the context blueprints and how to provide the necessary network service descriptor. It will then focus on the Smart Transport use case, showing first of all the point of view of the experimenter as it tracks a number of devices under 5G coverage and gathers information about urban mobility (position, speed, heading of the people carrying the smartphones). It will then demonstrate, from the point of view of the data manager, how the information collected by the smartphones is sent to the VMs deployed for the experiment execution and visualised on a Web Service supporting the work of the data manager.

4.1.2 360° video retrieval 5G Use-Case on French Infrastructure

After an initial demonstration planned in July 2020, an explicit training webinar will be organized to show external users how to collect measurements from this scenario. The Radio infrastructure in Rennes is used in conjunction with orchestration and service components in Paris.

4.1.3 ONAP + OpenShift Integration Webinar

A 45-minute technically-oriented training webinar will be organized in collaboration with the Linux Networking Foundation. This will focus on the integration of ONAP with the real-time Kubernetes-based (OpenShift) infrastructure of a portion of the French site. This webinar will highlight technical innovations for automatic deployment of both Core Network and radio-access network elements on real-time container-based cluster. The objective of this training event is to promote the use of 5G EVE in the greater community for the benefit of testing.

5 Support in Y3 during the experimentation phase

In order to support users of 5G EVE on case-by-case basis the training team will organize interactions with site-managers and 5G EVE technology developers in order to facilitate access and use of the infrastructure. We briefly describe here our plans regarding the methodology for training users in real-time.

To this end, using the commonplace tool *slack*, we will setup channels which allow parties internal and external to 5G EVE to

- Interact via chat in real time
- transfer of code snippets, figures, files, screenshots and other typical bits of information useful to understand the behavior of 5G EVE
- Launch audio-video conferences

The important feature of slack is its ability to organize such real time interactions and allow people to join channels and more importantly review a channel's history to retrieve information. This will enable the 5G EVE site owners and management to track and measure interactions between 5G EVE and external/ internal partners. It will also allow sharing information about 5G EVE among users/sites, of course subject to confidentiality constraints, which can be useful to reuse information between different experimentation efforts. People on a particular channel would include teams from several projects (5G EVE and companions) which collaborate during experiment setup/running and measurement analysis. Specifically channels would allow information to be private to group or shared to whole 5G EVE slack workspace, or upon invitation only. Common channels would be used for information pertinent to everybody in the 5G EVE ecosystem. Topics for common slack channels would be

- Software deployment
- Configuration of infrastructure
- measurement collection
- Feedback to site maintainers

These would comprise the information already given in the context of 5G EVE webinars but in an interactive format to allow users to quickly solve technical issues.

We envisage this to be the means for continual point-to-point interactions starting during the summer of 2020 and for duration of 5G EVE. The channels should remain active during the course of the companion ICT-19/20/42/56/52 using 5G EVE infrastructure. In addition, we expect that this could be an avenue for achieving sustainability of the infrastructure since interactions should live on for a few years after the end of 5G EVE.

6 Conclusions

This deliverable provided an overview of the training activities in year 2 of 5G EVE as well as plans for upcoming training in the experimentation phase of year 3. We reviewed the basic objectives for training activities in 5G EVE and then described the first two training events targeting users from companion H2020 projects that occurred in May and June 2020. We then described the plans for the next training events as well as methods for customized training support for the experimentation phase during the third year of the project.

Appendix. A: Training events attendees

The list of the webinars attendees from the first two training events is reported in Table 1 and Table 2 for May 6th and June 23rd respectively.

Table 1: List of participants for May 6th training event

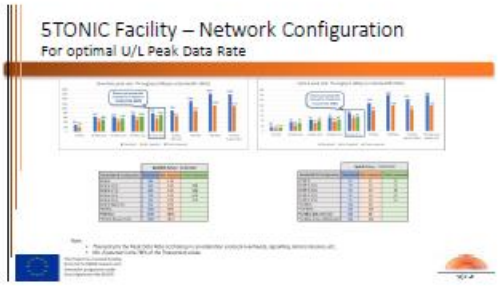
First Name	Surname	First Name	Surname	First Name	Surname	First Name	Surname
Ikhsan P	Purnomk	Manuel	Fuentes	Eleni	Rigani	Kostas	Tsagkaris
Antonis	Gotsis	Diego	San Cristobal	Kiril	Antevski	Ginés	García Avilés
Fabio	Ubaldi	Migue	Catalan	Koteswararac	Kondepu	Tilemachos	Doukoglou
Konstantin	Tomakh	Ricard	Vilalta	Carlos	Guimarães	Christina	Lessi
SONIA	CASTRO	Soumya	Datta	Andres	Garcia Saave	Giorgos	Tsiouris
Felipe	Vicens	Fons	de Lange	Vlasis	Barousis	Panayiotis	Verrios
Vittoria	Mignone	Davide	Desirello	Denis	Kucherenko	Evangelos	Kosmatos
Francesco	Curci	Mir	Ghoraishi	Fabrizio	Falese	abhimanyu	gosain
Jorge	Baranda	Daniel	Corujo	Domenico	Cacciola	Ioannis	Belikaidis
Angelos	Streklas	Silvia	provvedi	Josep	Mangues-Baf	Konstantinos	Chelidonis
Zbigniew	Koper	Albert	Banchs	anna	sessler	Winnie	Nakimuli
Mauro	Castagno	Mamadou M	Balde	Belkacem	Mouhouche	Christos	Ntogkas
Luca	Vignaroli	Nikos	Papagiannop	Eduardo	Garro	Ioannis	Chondroulis
Iwona	Wojdan	Jani-Pekka	Kainulainen (	Galini	Tsoukaneri	Iason	Bitchavas
Ian	Hay	Sara	Cuerva	Simon	Fletcher	EWELINA	SZCZEKOCKA
Emil	Kowalczyk	Maurizio	Cecchi	Pascal	ALLAIN	Christophe	Burdinat
ANTONIS	GEORGIOU	Eleni	Giannopoulo	Thomas	Ferrandiz		
EWELINA	SZCZEKOCKA	Javier	Morgade	Philippe	moravie		
Konstantinos	Tzalas	Roberto	Viola	Sofiane	Imadali		
Andrea	Sgambelluri	Mauro	Boldi	bessem	sayadi		
Anthony	Dunne	Vera	Stavroulaki	Marco	Randazzo		
Christophe	Burdinat	fabrizio	moggio	Velissarios	Gezerlis		
Janusz	Pieczerak	Evelyne	Duquennoy	Ignacio	Berberana		
Carlos	Barjau Esteva	Milon	Gupta	Pablo	Serrano		
Josep	Mangues	Yoharaaj	D	Vassilis	Foteinos		

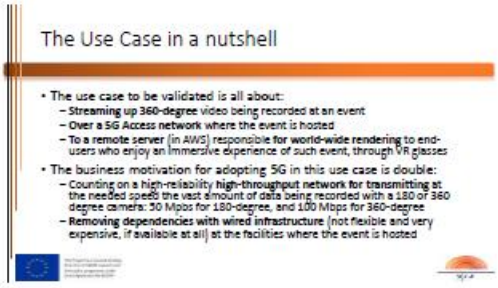
Table 2: List of participants for 23rd of June training event

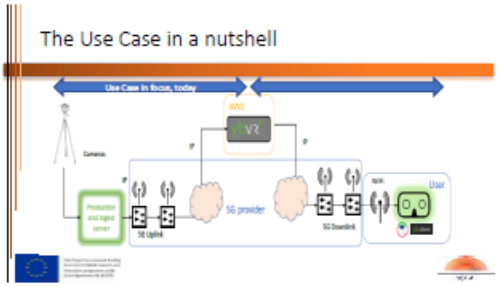
First Name	Surname	First Name	Surname
Javier	Morgade	Abhinav	Tiwari
Roberto	Viola	RAM	YADAVA
Maurizio	Cecchi	JITENDRA	ARYA
JAYANTH	PANDEY	Boldi	Mauro
arvind	tiwari	elena	vitelaru
Gaurav	Agarwal	Maurizio	Cecchi
Vinit	Patel	Gurhan	Boz
Brajesh	Mishra	Sudhir	Chawla
Indrajit	Singh	Zbigniew	Koper
Mahesh	Savkur	Diego	San Cristobal
Varun	Maurya	Rodolphe	Legouable
Anurag	Srivastava	THEODORA	POLITI
Shyamal	Biswas	Dorota	Inkielman
Pradeep	Verma	Iwona	Wojdan
shilpi	Gadi	EWELINA	SZCZEKOCKA
Himanshu	Saini	Nitin	Raj
Pablo	Serrano	RAM	YADAVA
Ojaswi	Kumar	Ignacio	Berberana
Abhishek	Kumar	Miguel	Torres
Purushottam	Guha	Marion	GUERNALEC
Ketan	Basra	Isaac	Quintana Fernández
Vineet	Tiwari	Fernando	Beltran
Sindhu	Suta	Manuel	Lorenzo
Abhishek	Tiwari	José	Borrás Muñoz
Anamika	Tiwari	FLorian	Kaltenberger
Monika	Tiwari	Francesco	Curci
Lourdes	de Pedro Redondo		
Nishant	Tiwari		
Jaime	Garcia		
Adam	Kapovits		

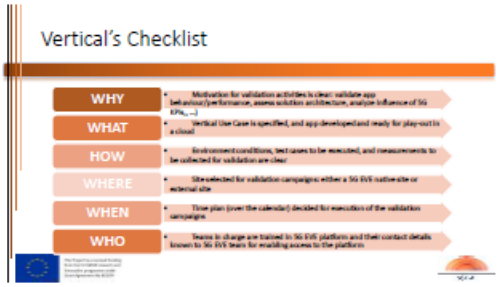
Appendix. B: Examples of Training Slides

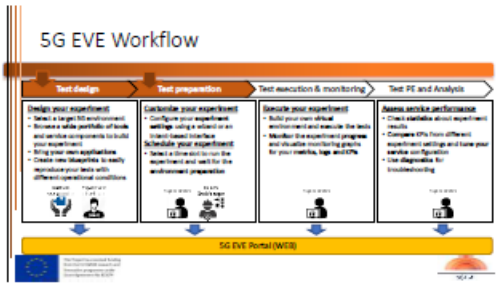
In the following a set of slides that were presented during the webinars is reported. The full presentation sets and the videos of the webinar recordings are available on the official 5G EVE Internet website.

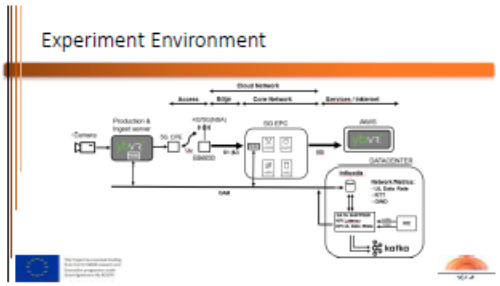


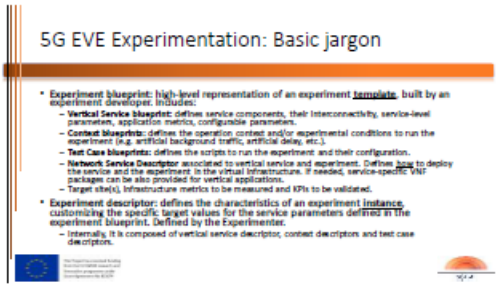


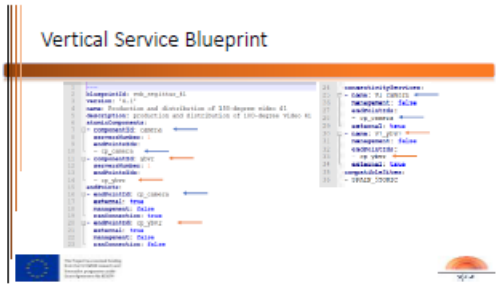

The Use Case in a nutshell
Use Case in focus, today
AWS
V2
Camera
Production and ingest server
5G provider
5G Uplink
5G Downlink
WAN
User

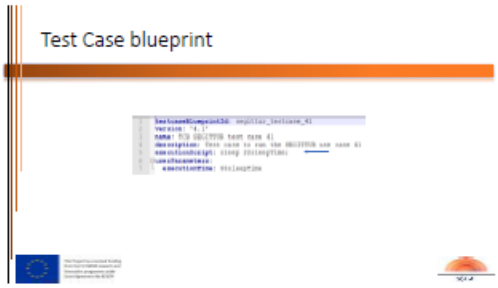

Vertical's Checklist
WHY
WHAT
HOW
WHERE
WHEN
WHO


5G EVE Workflow
Test design
Test preparation
Test execution & monitoring
Test PE and Analysis
5G EVE Portal (WEB)

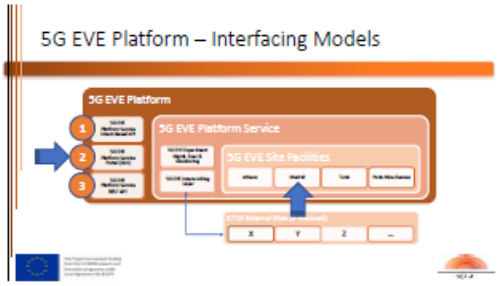

Experiment Environment
Cloud Network
Access
Edge
Core Network
Services / Internet
Production & Ingest server
Camera
5G EPC
AWS
V1
V2
DATACENTER
kafka

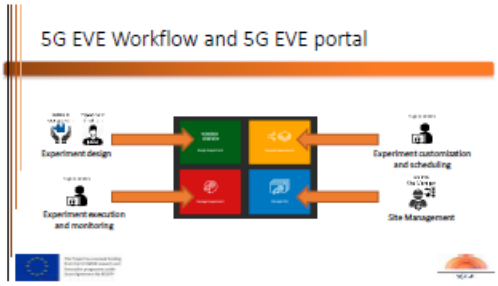

5G EVE Experimentation: Basic jargon
Experiment blueprint: high-level representation of an experiment template, built by an experiment developer. Includes:
Vertical Service blueprint: defines service components, their interconnectivity, service-level parameters, application metrics, configurable parameters.
Context blueprints: defines the operation context and/or experimental conditions to run the experiment (e.g. artificial background traffic, artificial delay, etc.).
Test Case blueprints: defines the scripts to run the experiment and their configuration.
Network Service Descriptor associated to vertical service and experiment. Defines how to deploy the service and the experiment in the virtual infrastructure. If needed, service-specific VNF packages can be also provided for vertical applications.
Target site(s), infrastructure metrics to be measured and KPIs to be validated.
Experiment descriptor: defines the characteristics of an experiment instance, customizing the specific target values for the service parameters defined in the experiment blueprint. Defined by the Experimenter.
Internally, it is composed of vertical service descriptor, context descriptors and test case descriptors.

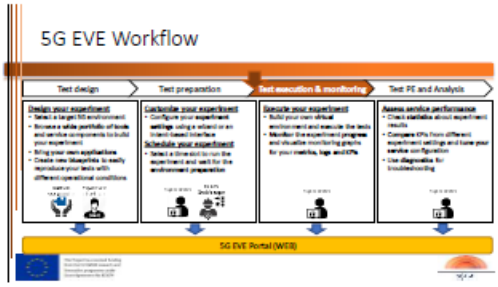

Vertical Service Blueprint

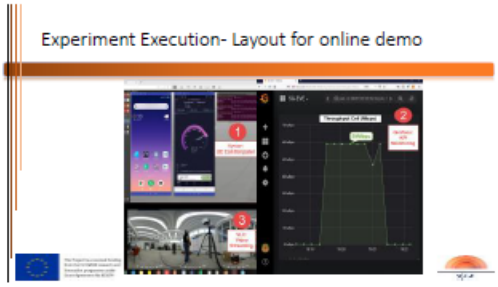

Test Case blueprint


Experiment blueprint


5G EVE Platform – Interfacing Models
5G EVE Platform
5G EVE Platform Service
5G EVE Site Facilities


5G EVE Workflow and 5G EVE portal
Experiment design
Experiment customization and scheduling
Experiment execution and monitoring
Site Management


5G EVE Workflow
Test design
Test preparation
Test execution & monitoring
Test PE and Analysis
5G EVE Portal (WEB)


Experiment Execution- Layout for online demo

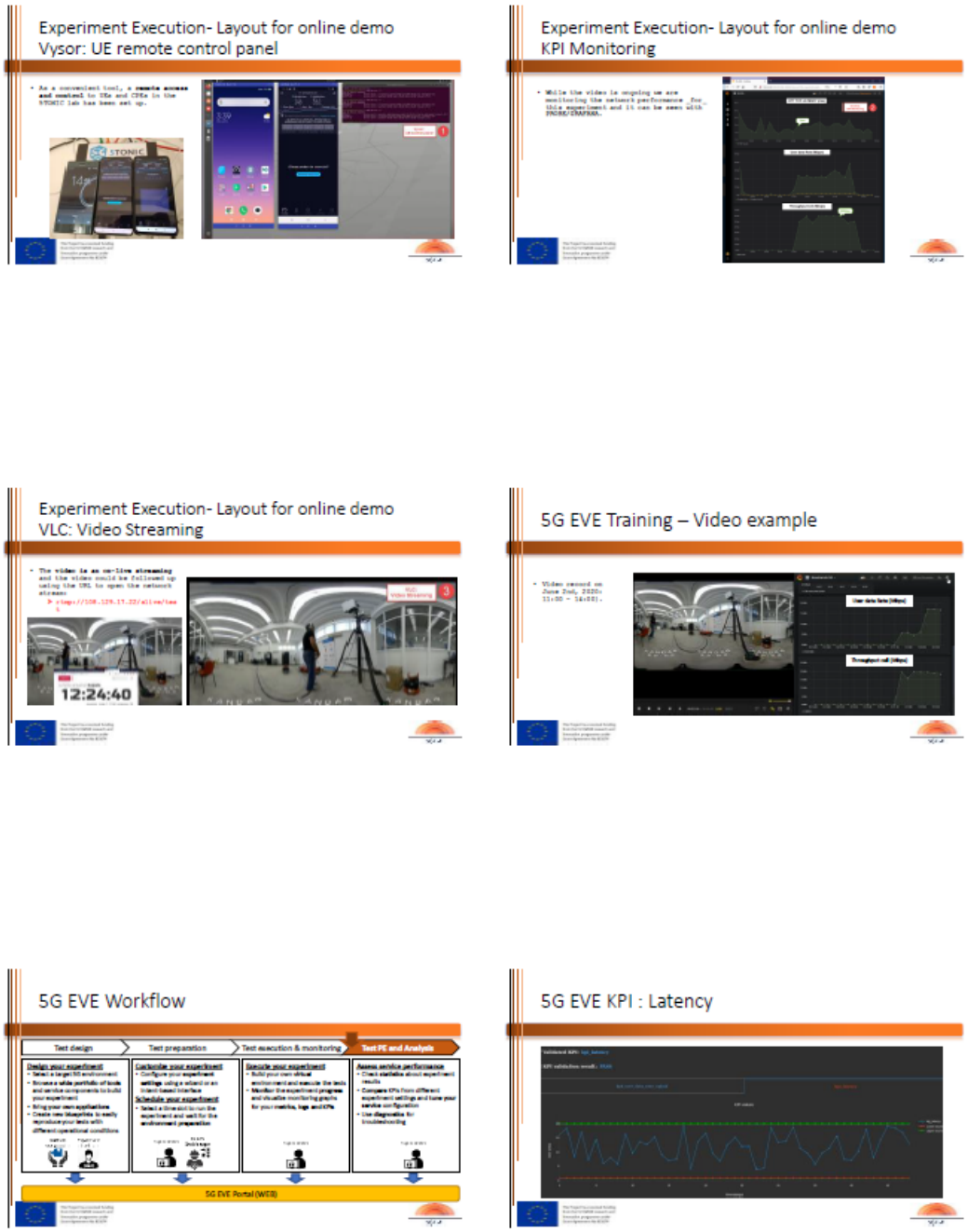


Figure 4 Slide-set for the webinar presentations.

References

[1] H2020 ICT-17 5G-EVE Deliverable D2.4, "*Initial pilot test and validation*", June 2020
[2] H2020 ICT-17 5G-EVE Deliverable D7.5, "*Report on Training Activities after Year 1*", June 2019