



Deep AR Law Enforcement Ecosystem



Enhancing LEA decision making by employing AR capabilities

Jose L. Diego, Valencia Local Police (Spain)

10th June 2022, Vilnius



This project has received funding from the European Union's Horizon 2020 Research and Innovation programme under Grant Agreement No 883297.

Outline



- 1 • Introduction
- 2 • Planning and progress
- 3 • Methodologies
- 4 • Results
- 5 • Impacts
- 6 • Summary and highlights



1

Introduction



DEEP AR LAW ENFORCEMENT ECOSYSTEM



WP6: LEAs training activities

How can a LEA be familiarised with AR technology and how we can train specific profiles to introduce them in this framework?

Topic: H2020 -SU-FCT02-2019
Type of action: RIA



1

Introduction



OBJECTIVE 1

Realize training of technologically non-expert LEA end-users in the use of the DARLENE WECN devices and interfaces decision support, while enhances European cities resilience, without compromising citizens' fundamental rights and privacy.

OBJECTIVE 2

Implementation of training workshops and seminars at EU level as a basis to encourage exchange of expertise, sharing and collaboration among LEA training centres across Europe within a joint security network **in using the DARLENE tools and applications** to co-create and modify training methods and scenarios.

OBJECTIVE 3

To train instructor trainers of DARLENE WECN users in order to organize the pilot demonstrators and to train external end-users.

OBJECTIVE 4

To inform both internal and external LEAs on the technological merits, innovation and competitive advantages provided by the DARLENE system, and in doing so, gather valuable feedback

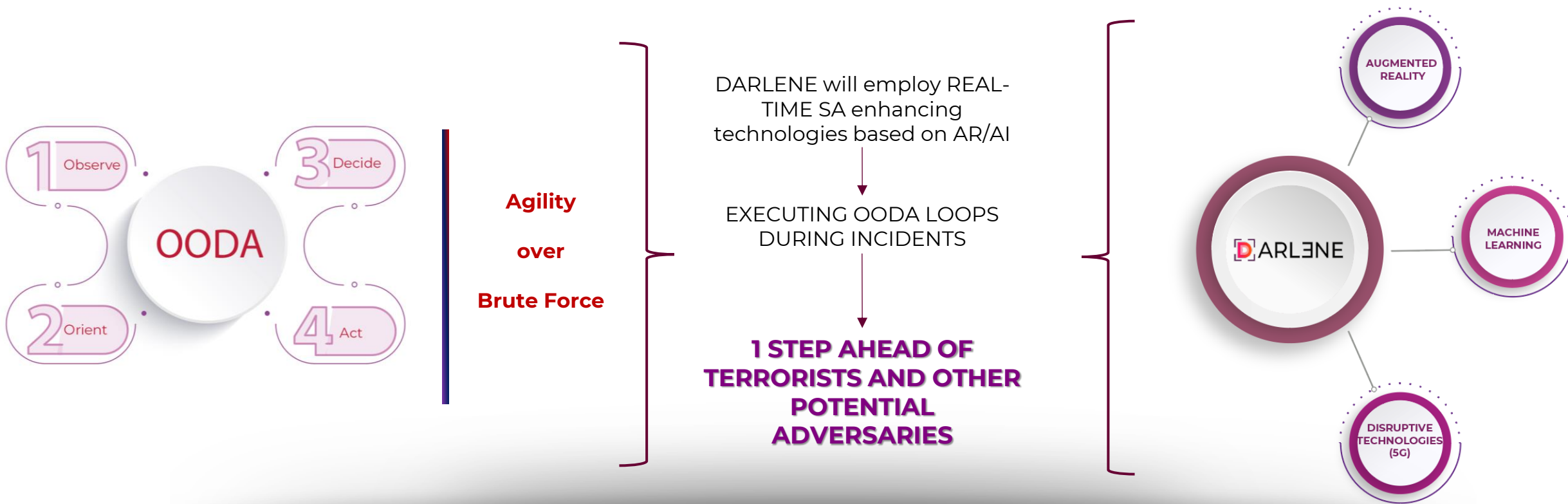


1

Introduction



DARLENE: SITUATIONAL AWARENESS + ADVANCED TECHNOLOGY





1

Introduction



WECN/PCEN

DARLENE Wearable/Police Car Edge Computing Node (WECN/PCEN)

01

DARLENE ML Cloud

5G new radio (5G NR), radio access network (RAN), edge/fog computing, network functions virtualization (NFV), context-aware services, network slices management and orchestration (MANO), computation offloading

02

Command & Control

3D Mapping technologies, 3D reconstruction of indoor spaces from multi-RGB input, 3D rendering...

03

 **DARLENE**
SOLUTIONS

DARLENE LEA Services

"X-Ray" Identification
Friend or Foe technology,
Augmented Surveillance

04

Adaptive visualization

Online/offline adaptation, adaptive and adaptable visualisation features...

05

Multi-modal AR interaction framework

Recognition and monitoring of user interaction, distributed processing, reasoning mechanisms, computer, sensor and actuator networks, computer vision algorithms, voice recognition, hands gesture...

06



1

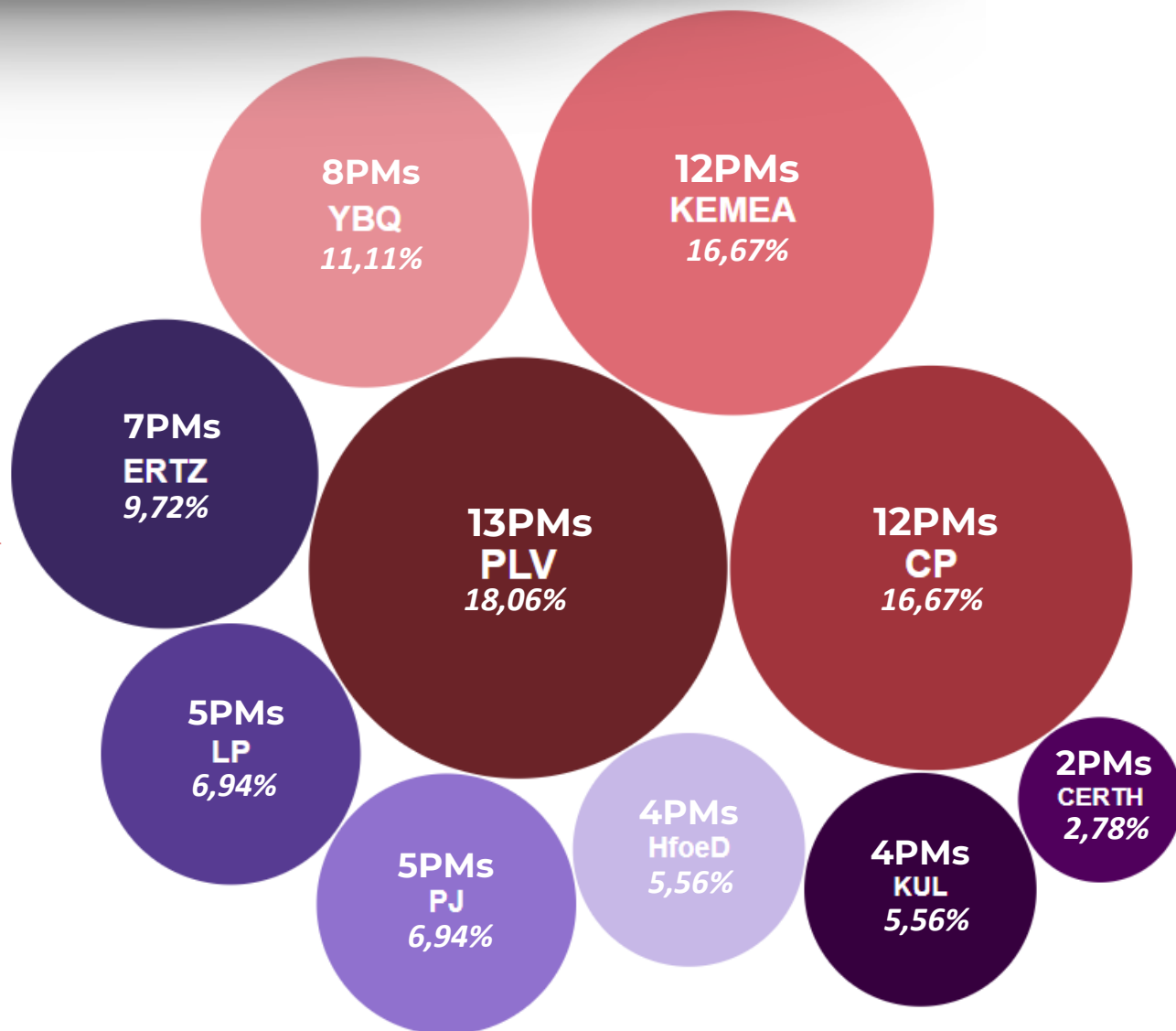
Introduction



WP6 8,1% (72PMs)

WP6 contributors

WP6 leader





4

DARLENE elements: IA, AR



a



b

Showcasing DARLENE solutions utilized in various contexts

a).- Segmenting and enhancing officer SA

b).- Identification friend-or-foe technology, for officer planning action behind cover



4

DARLENE elements: IA, AR

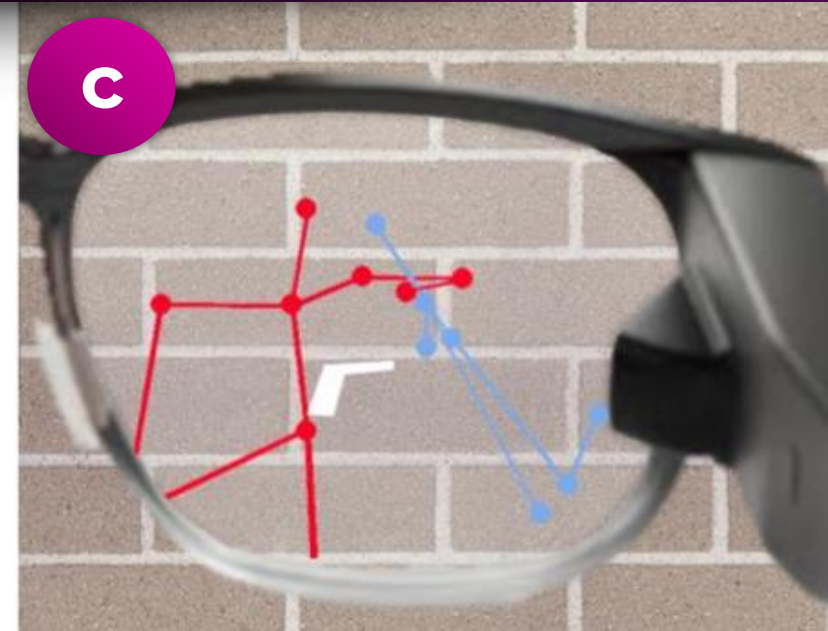


Showcasing LEAs capacities using DARLENE solutions in Use Case #1 (Larnaca Int. Airport)

a).- Crisis management and healthcare provision after cyber-attack or terrorist incident

b).- Criminal/terrorist apprehension

b).- Possible explosives threat neutralization



Showcasing LEAs capacities using DARLENE solutions in Use Case #2 (Markopoulos training facility)

a).- Demonstrates armed perpetrator holding hostage, occurring on the other side of the wall.

b).- Shows how security camera feed is used to determine the pose of the two individuals, the direction the weapon is pointing and a color coded skeleton visualization.

c).- Shows actual view from the DARLENE AR wearable headset, showcasing data even while through the solid wall.



2

Planning and progress



1 2 3 4 **5** 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 **36**

Start month: 5 (Jan'21)

End month: 36 (Aug'23)

Tasks

T6.1: Training, planning and demonstration

T6.2: Workshop and seminar organization

- **T6.2.1:** Training of Trainers (ToT) of partner end-users' instructors
- **T6.2.2:** Training of LEA end-users and stakeholders in each country

T6.3: External LEA feedback

Deliverables

D6.1 & D6.2 (M12 & M25): DARLENE platform handbook and tutorial content

D6.3 & D6.4 (M22 & M36): Training evaluation report 1st and 2nd version

D6.5 (M36): Training of LEA end-users and stakeholders report

D6.6 (M36): External LEA feedback evaluation report

Milestones

MS11: Training of Trainers completed **(M24)**



2

Planning and progress



1 2 3 4 **5** 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 **25** 26 27 28 29 30 31 32 33 34 35 36

Start month: 5 (Jan'21)

End month: 25 (Sep'22)

DESCRIPTION

Planning and preparation of training activities, which will include:

- **Revising and detailing** the exact **timing and scheduling, technical contents**, identifying lectures/instructors, trainees and methodology of each work session in face-to-face, remote and evaluation workshops and seminars in the end-user partner countries
- Checking and arranging the necessary **logistics**

Leader & contributors

Leader: PLV

Contributors: CERTH, KUL, KEMEA, YBQ, ERTZ, PJ, HfoeD, CP, LP

Deliverables

D6.1 (M12): DARLENE platform handbook and tutorial content – 1st version

D6.2 (M25): DARLENE platform handbook and tutorial content – 2st version



2

Planning and progress



1 2 3 4 **5** 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 **25** 26 27 28 29 30 31 32 33 34 35 36

Start month: 5 (Jan'21)

End month: 25 (Sep'22)

Training preparation will further include:

- a) A DARLENE WECN device handbook and tutorial, consisting of a **printed manual and interactive software to be distributed to instructors, trainees and interested users** as both a PC and mobile application (D6.1)
- b) A DARLENE prototype tutorial kit to be set up within the premises of target partner end-users in order to launch training sessions (D5.X)
- c) An off-line self-evaluation **form** to be filled by trainees and end-users for feedback gathering, possible system improvement and customization
- d) **Web and printed informative material** for the presentation of the training workshops and seminars

DETAILS

WP7 LINK

* During this Task, the DARLENE partners will produce the different training material of the DARLENE technology having regard of legal procedures, privacy and ethical principles



2

Planning and progress



1 2 3 4 5 6 **7** 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 **36**

Start month: 7 (Mar'21)

End month: 36 (Aug'23)

DESCRIPTION

This Task will deal with the main activities focused on **training**, which will consist of **two phases**, handled as sub-tasks (**T6.2.1, T6.2.2**)

Leader & contributors

Leader: KEMEA

Contributors: CERTH, KUL, PLV, YBQ, ERTZ, PJ, HfoeD, CP, LP

Deliverables

D6.3 (M22): Training of LEA end-users and stakeholders report – 1st version

D6.4 (M36): Training of LEA end-users and stakeholders report – 2st version

WP6: overview



1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36



Starting month: 5 (Jan'21)

Ending month: 36
(Aug'23)

Tasks

- T6.1:** Training, planning and demonstration
T6.2: Workshop and seminar organization
- **T6.2.1:** Training of Trainers (ToT) of partner end-users' instructors
 - **T6.2.2:** Training of LEA end-users and stakeholders in each country
- T6.3:** External LEA feedback

Deliverables

- D6.1 & D6.2 (M12 & M25):** DARLENE platform handbook and tutorial content
D6.3 & D6.4 (M22 & M36): Training evaluation report 1st and 2nd version
D6.5 (M36): Training of LEA end-users and stakeholders report
D6.6 (M36): External LEA feedback evaluation report

Milestones

- MS11:** Training of Trainers completed **(M24)**

WP6: roadmap



WP6



T6.1



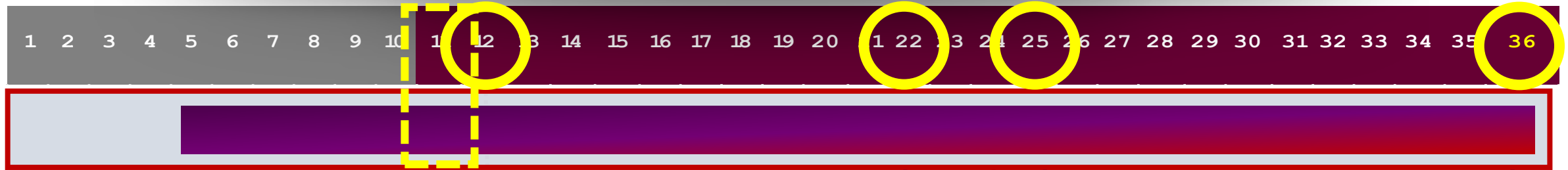
T6.2



T6.3

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36

WP6: roadmap



KEMEA
D6.1

Aug'21

PLV
D6.3

KEMEA
D6.2

PLV
MS11

Aug'22

PLV
D6.4

KEMEA
D6.5

ERTZ
D6.6

Deliverables

D6.1 & D6.2 (M12 & M25): DARLENE platform handbook and tutorial content

D6.3 & D6.4 (M22 & M36): Training evaluation report 1st and 2nd version

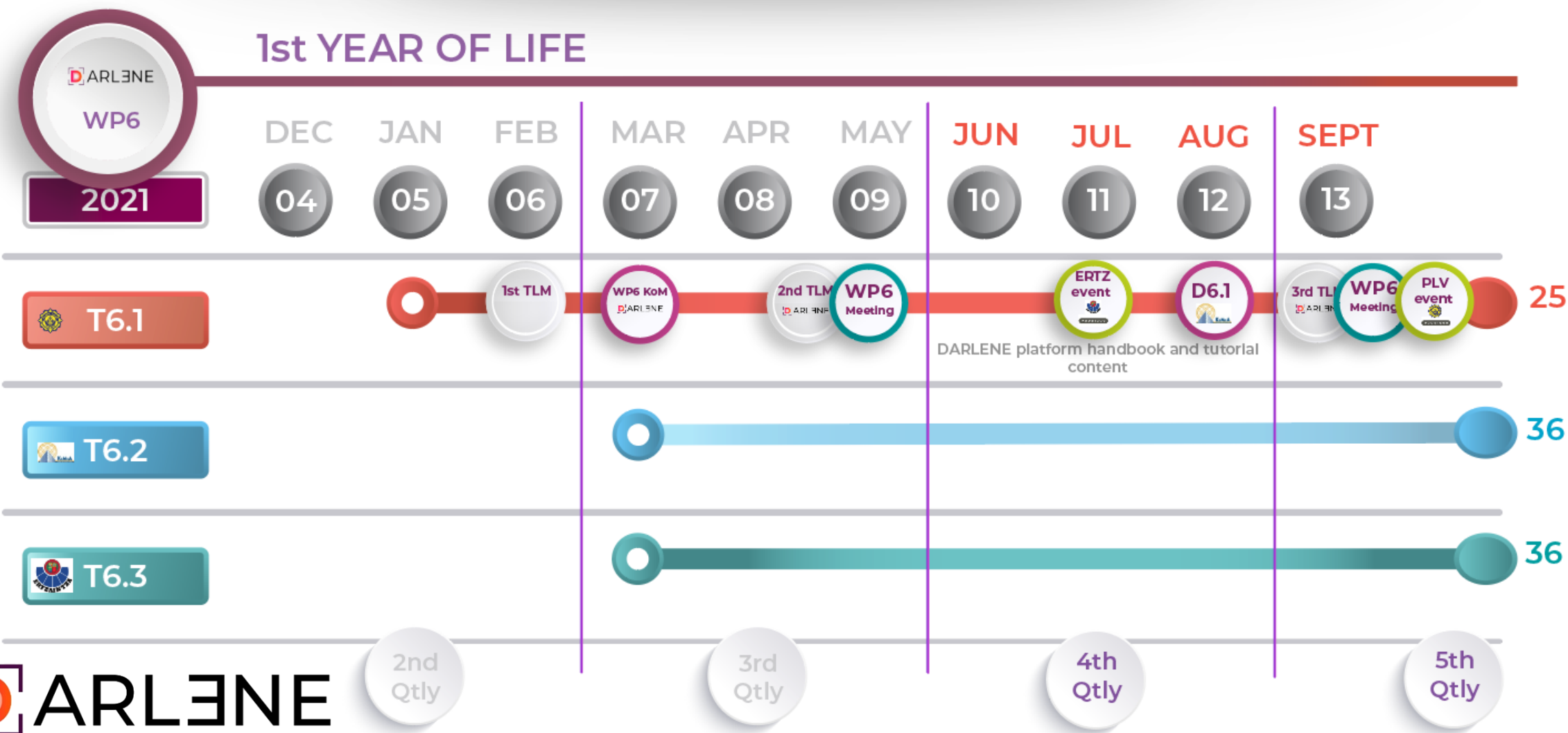
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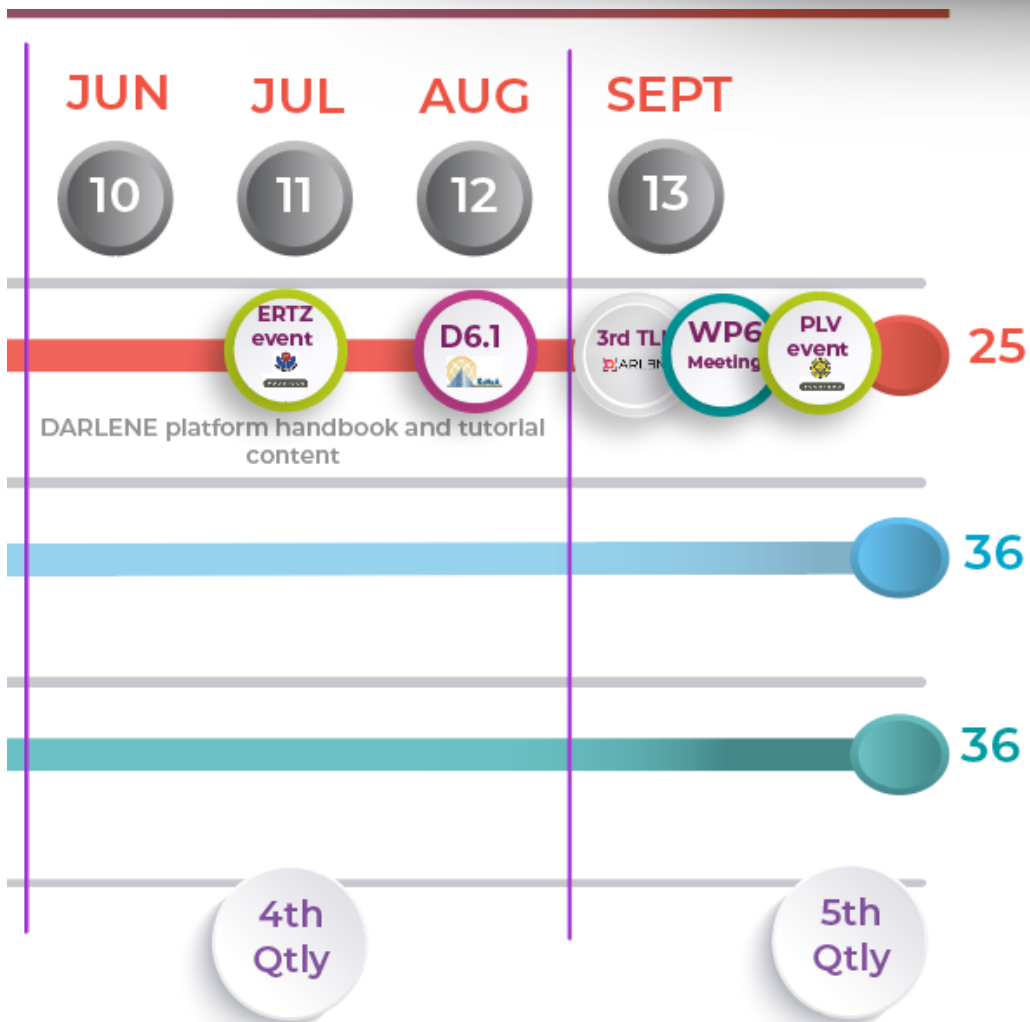
Milestones

MS11: Training of Trainers completed (M24)

[WP6] T6.1: Progress & status



[WP6] WP6: Progress & status



- T6.1: Continuous work regarding planning of activities
- **T6.2: Planning of the T6.2.1 and T6.2.2, regarding ToT and working in the D6.1**
- **T6.3: Gathering ever feedback that is provided in both dissemination and workshop event (i.e. Bilbao and València events)**

[WP6] WP6: Progress & status



[WP6]: BILBAO event



WP6 Task Leaders (end-users) meeting

In order to discuss WP6 terms, the task leaders and end-users (ERTZ and PLV) planned a face-to-face meeting in June 2021, which has been carried in July.



[WP6]: BILBAO event



Date:
July. 14th, 2021

Partners:



[WP6]: BILBAO event



Date:
July. 14th, 2021

Partners:



Thanks to Mr. Pietru and Mr. Antonio (YOUBIQUO), all the technical details of the solution were described, as well as the main functionalities, to an audience of 30 people, from the most representative areas of the BRIMO



[WP6]: BILBAO event



Date:
July. 14th, 2021



- The event was held in July, 14th 2021 in the HQ of the BRIMO (ERTZAINTEA) in Iurreta (Bilbao)
- Thanks to the combined effort of ERTZ-YOUBIQUO-PLV we received a fruitful feedback from the involved police officers (11 questionnaires)

Partners:



[WP6]: BILBAO event



Date:
July. 14th, 2021



- Both ERTZAINTEA and PLV presented the project, introducing the main activities within the WP6, in order of putting in situation about the ToT and the workshop that has to be held following the T6.2.2 content.

Partners:



[WP6]: BILBAO event



Date:
July. 14th, 2021



- The ergonomics, dimensions and weight were tested, as well as beta functionalities, during an exercise carried out by several BRIMO (ERTZ) police officers.
- All was recorded, and once the permissions had been approved we will share all multimedia material with the consortium
- Thanks to the combined effort of ERTZ-YOUBIQUO-PLV we received a fruitful feedback from the involved police officers (11 questionnaires)

Partners:





 ARLENE

[WP6] WP6: Progress & status



WP6



Date:
Sept. 30th, 2021



Partners:



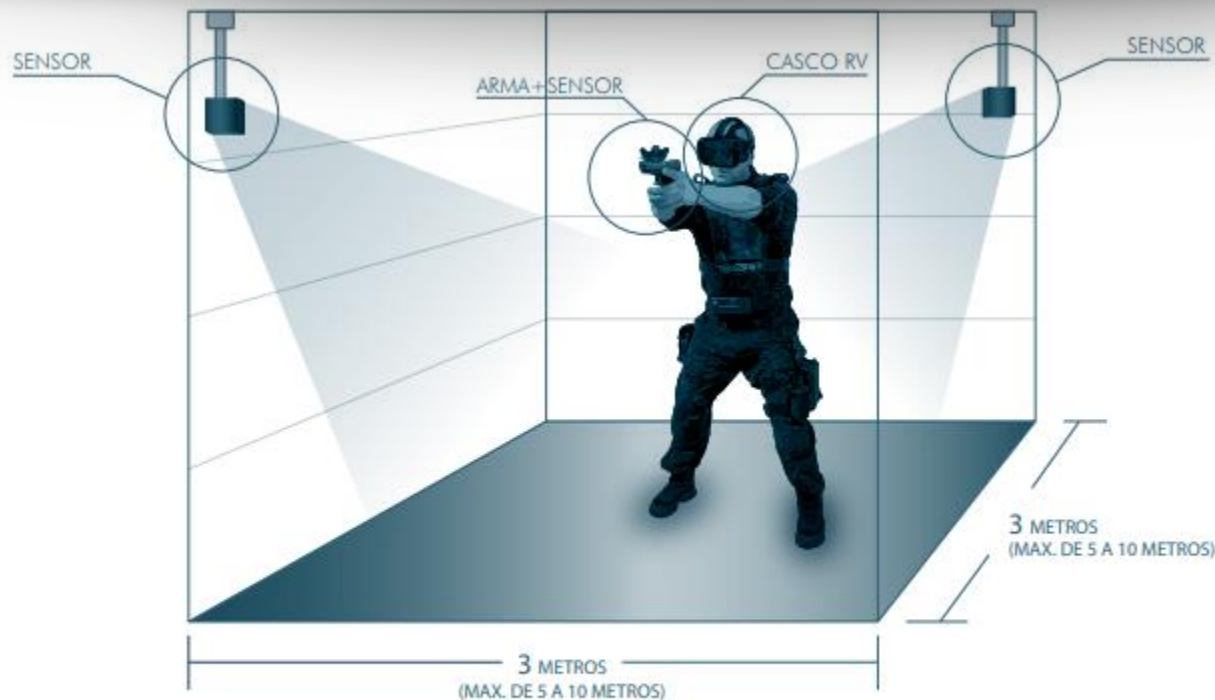
- From PLV, we have organized a combined event in which VR glasses (from a company called "LAST MONKEY") and DARLENE will be presented to a specialized audience, mainly LEAs.



WP6



Date:
Sept. 30th, 2021



Partners:



- LAST MONKEY works only in VR, addressed to train police officers; they don't work in AR, so the combined event seems to be very attractive to LEAs and a good opportunity for a dissemination event.





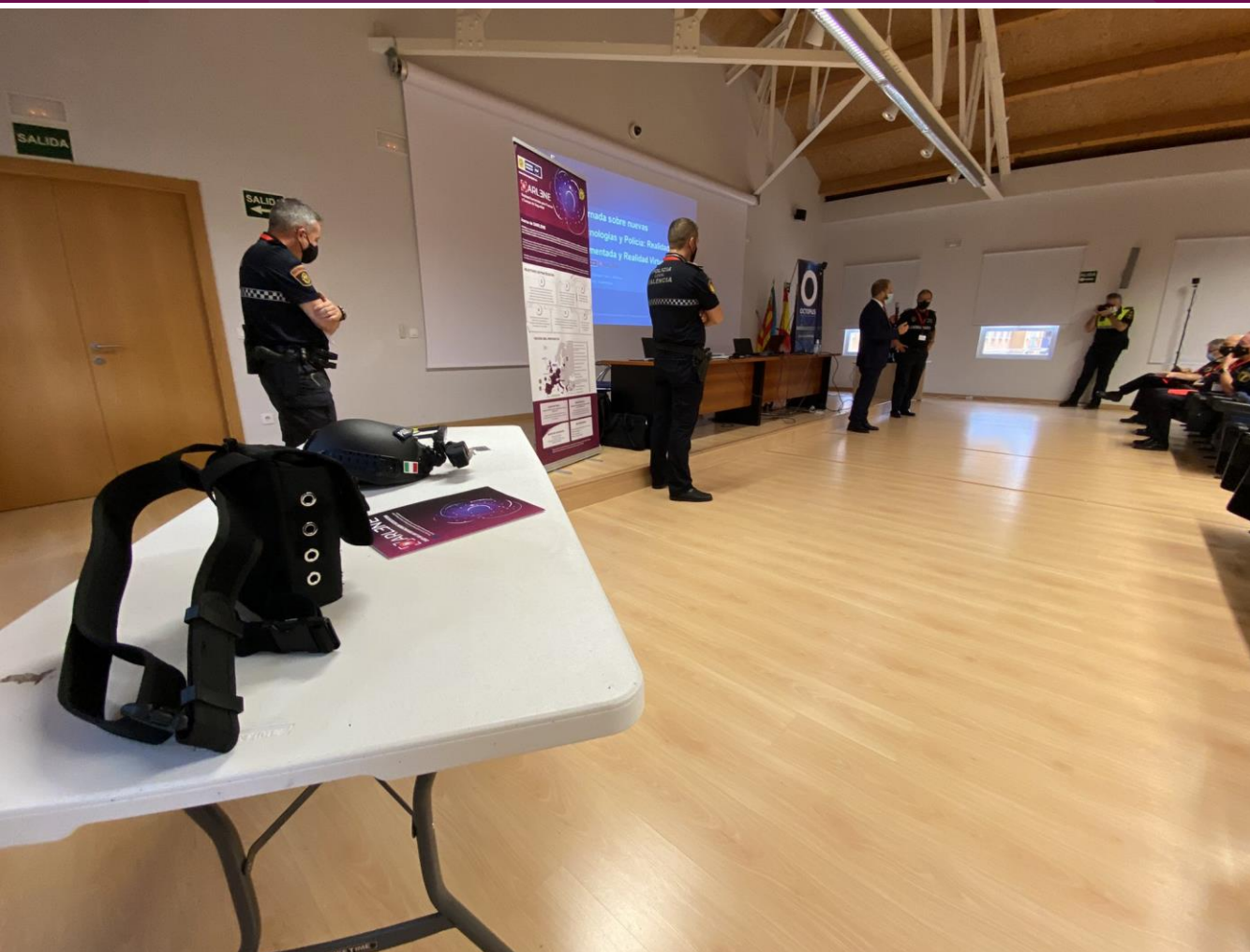
Date:
Sept. 30th, 2021

- Although at an early stage, from PLV we think that it could be a great opportunity to show our advances.
- The attendance of the partners of the consortium will be more than welcome; YOUBIQUO has confirmed their attendance and also ERTZAINTEA.
- The event is thought to be carried out in a morning shift, at the PLV HQ
- The expected audience, always depending on the COVID-19 situation, is between 60 – 80 people, and external audience will be invited.

Partners:



[WP6] WP6: Progress & status





Jornada sobre nuevas tecnologías aplicadas a las FFCCS
Proyecto Europeo DARLENE (Realidad Aumentada)
Simulador Táctico OCTOPUS (Realidad Virtual)

Organiza: Sección de Proyectos Europeos – Policía Local de València.

OCTOPUS

REALIDAD VIRTUAL
ENTRENAMIENTO TÁCTICO POLICIAL



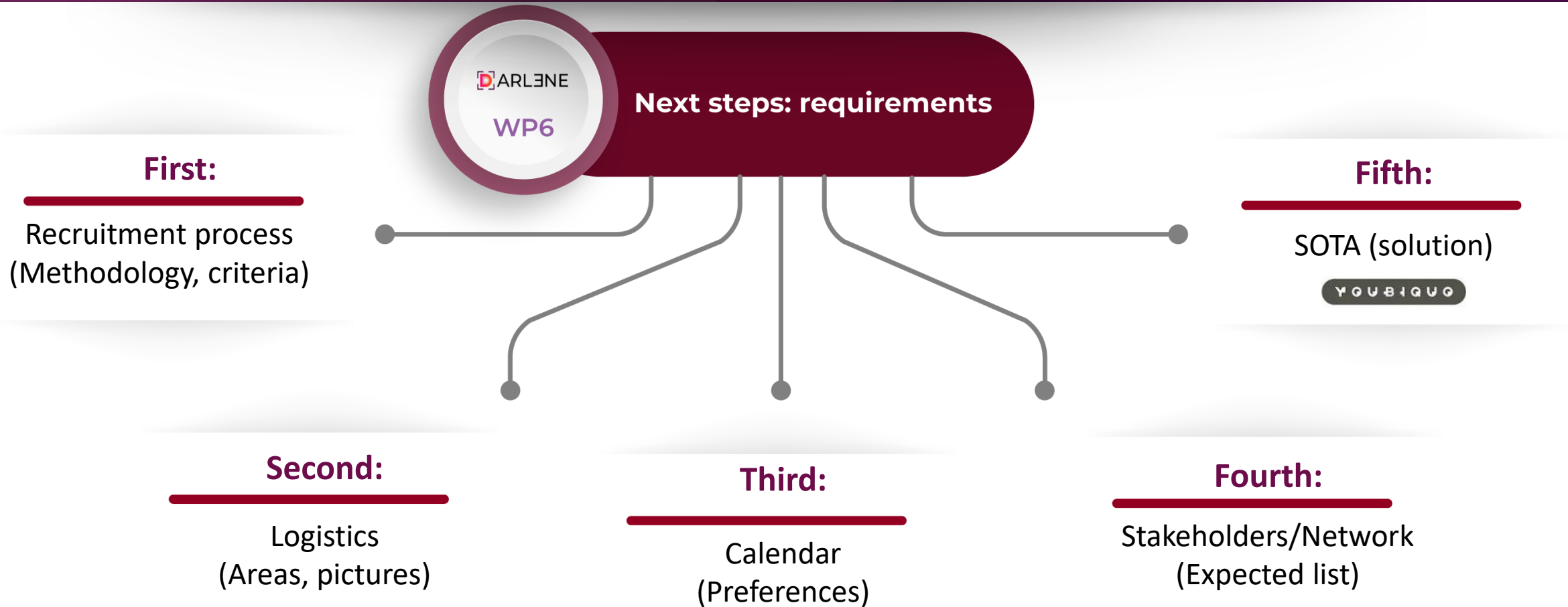
30 DE SEPTIEMBRE

<https://twitter.com/policialocalvlc/status/1448558520278913026?s=20&t=sqP4C2Y5vNc9FATVhjUUwQ>

[WP6] WP6: Progress & status



[WP6] T6.1: Next steps



[WP6] T6.1: Next steps



Date:
Sept (mids), 2021

(3rd TLM) Partners:



**(WP6 meeting)
Partners:**



- Among the WP6 task leaders, the progress of the WP6 tasks will be discussed, as well as the next steps to be taken.
- Within the WP6 meeting, we will analyse the recruitment of trainers done and the planning of the ToT
- The requirements of YOUBIQUO, regarding which ecosystem will need the solution from each end-user, will be also analysed.



[WP6] WP6: Progress & status



[WP6] WP6: Progress & status



[WP6] WP6: Progress & status



[WP6] WP6: Progress & status



[WP6] WP6: Progress & status



[WP6] WP6: Progress & status



[WP6] WP6: Progress & status



[WP6] WP6: Progress & status



T6.3: External LEA feedback

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36



Start month: 7 (Mar'21)

End month: 36 (Aug'23)

DESCRIPTION

- After the end of T6.2.2 -> Each end-user partner will **report** on its action and the feedback received from external end-users and stakeholders
- The project team will collect the end-user partners' reports in order to elaborate an external LEA evaluation report
- The external LEA evaluation **will be analyzed and discussed** by the project team **in a one-day workshop to be held in one of the LEA partners' country**

Leader & contributors

Leader: ERTZ

Contributors: PLV, KEMEA, PJ, HfoeD, CP, LP

Deliverables

D6.5 (M36): Training of LEA end-users and stakeholders report

D6.6 (M36): External LEA feedback evaluation report

T6.3: External LEA feedback

1 2 3 4 5 6 **7** 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 **36**



Start month: 7 (Mar'21)

End month: 36 (Aug'23)

PARTNERS INVOLVED IN TASK 6.3

Short name of participant	KEMEA	ERTZ Task leader	PJ	HfoeD	PLV WP leader	CP	LP	
MMs in T6.3 Total 17	2	4	1	2	3	4	1	



T6.3: External LEA feedback

1 2 3 4 5 6 **7** 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 **36**

Start month: 7 (Mar'21)

End month: 36 (Aug'23)

WRITTEN ON THE PROPOSAL:

After the implementation of **sub-task 6.2.2**, each end-user partner will report on its action and the feedback received from external end-users and stakeholders. Reports will include **the contacts activated with other LEAs and stakeholders, their comments, suggestions and interest toward the prototype platform**. The project team will collect the end-user partners' reports in order to elaborate an external LEA evaluation report, which will be jointly discussed and analysed **by the project team in a one-day workshop to be held in one of the LEA partners' country**. The analysis will highlight possible system improvements, customization and enhancement of commercialization and dissemination opportunities.



T6.3: External LEA feedback

1 2 3 4 5 6 **7** 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 **36**

Start month: 7 (Mar'21)

End month: 36 (Aug'23)

NEXT STEPS:

- Finish all the recopilation of inputs performed by KEMEA regarding:
 - *AR product visualisations: - 3 options
 - police patrol car
 - * Short questionnaire to select the Graphical User Interface components that should appear in the AR glasses.(ranking of components).
 - *Short questionnaire to distribute among our experts (12 responses each LEA) for the identification of End User requirements for the development of user friendly and effective applications (functionalities).
 - * One to one evaluation sessions for the preliminary evaluation of the DARLENE decision-making algorithm results.



T6.3: External LEA feedback

1 2 3 4 5 6 **7** 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 **36**



Start month: 7 (Mar'21)

End month: 36 (Aug'23)

- Putting together inside the consortium all the results of the previously mentioned open processes.
- Decide which of the results share with external LEAs and stakeholders and in which aspects their feedback is more relevant.
- Open questionnaires to external Leas and stakeholders and gather their inputs.
- Work on tasks 6.2.1 (ToT) and 6.2.2 (Training of LEA end-users and stakeholders in each country)





Deep AR Law Enforcement Ecosystem

Training Workplan

DARLENE Stakeholder Board workshop



This project has received funding from the European Union's Horizon 2020 Research and Innovation programme under Grant Agreement No 883297.

WP6 Breakdown

WP6 - LEA Training Activities

T6.1 Training planning and demonstration

T6.2 Workshop and seminar organization

T6.2.1 Training of Trainers (ToT)

F2F ToT

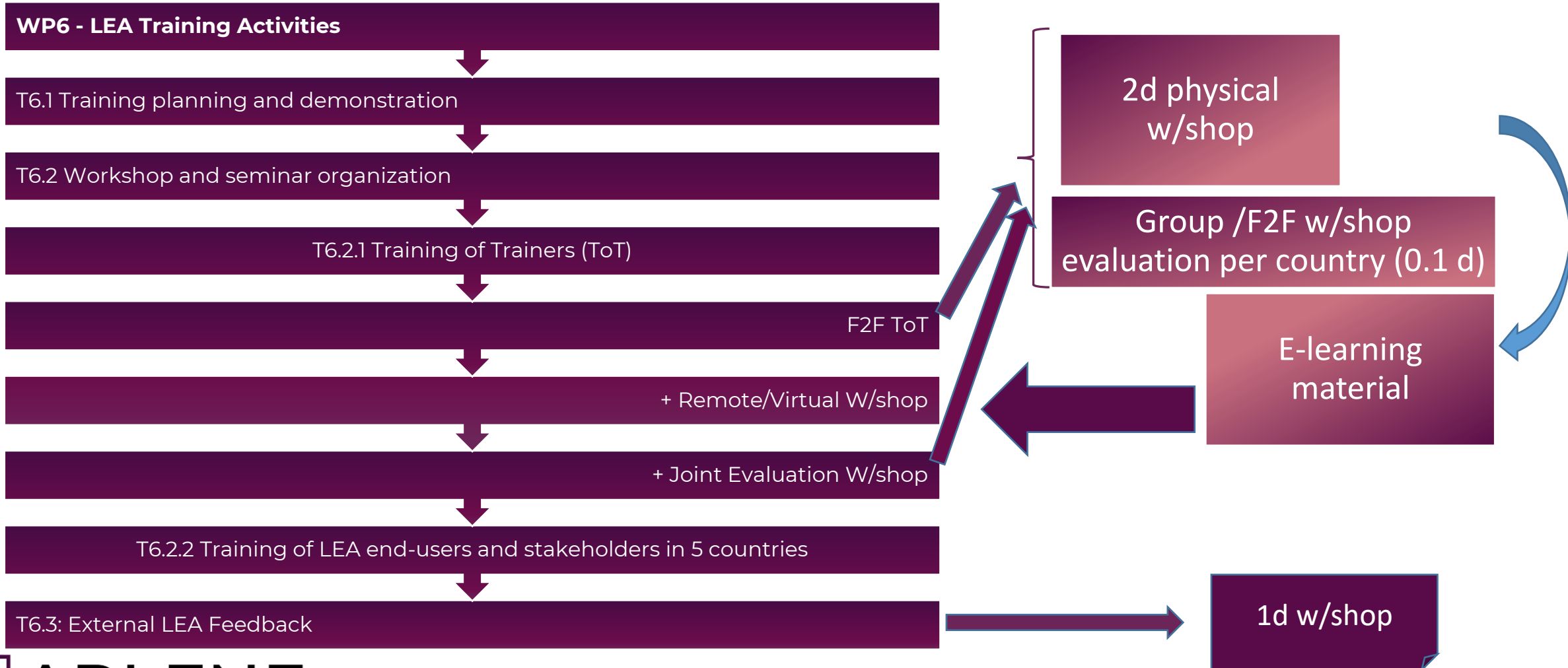
+ Remote/Virtual W/shop

+ Joint Evaluation W/shop

T6.2.2 Training of LEA end-users and stakeholders in 5 countries

T6.3: External LEA Feedback

Task Interdependencies



T6.2.1 Training of trainers (2D workshop + evaluation)

- Day-1 DARLENE Seminar

#	Presentation Focus	Training Hours
1	DARLENE overview and Value added for LEAs	1-1.5
2	Legal challenges and DARLENE safeguards	0.5-1
3	WECN & SG glasses	1
4	DARLENE Functionalities	2

- Day-2 DARLENE Guided experienced workshop

#	Presentation Focus	Training Hours
1	Overview of DARLENE Toolkit	0.5
2	HANDS on sessions with Local scenarios	4
3	Workshop Evaluation w/ survey	0.5

DAY-1 Detailed

- i. DARLENE Project Overview
- ii. DARLENE Objectives \ Benefits to LEAs
- iii. DARLENE Architecture overview and use of technologies (AI, ML, AR, Edge Computing, 5G,)
- iv. DARLENE Functionalities
 - 1. Situational Awareness
 - 2. Identification (Persons, Objects....)
 - 3. Detection (Persons, Objects, Situation, Behaviour....)
 - 4. Mapping (Location, distance to target, Use of blueprints....)
 - 5. Navigation (Optimal route to incident,...)
 - 6. Assist/support decision making (Priority actions, Decision Trees, ...)
 - 7. Command and Control Operations - Overview
 - 8. Communication utilities (Between Law Enforcement agents, etc.)

Day-2 Detailed

- i. Introduction to DARLENE prototype Tutorial Kit (DpTK)
- ii. Experience with DpTK on
 - 1. Situational Awareness
 - 2. Identification (Persons, Objects....)
 - 3. Detection (Persons, Objects, Situation, Behaviour....)
 - 4. Mapping (Location, distance to target, Use of blueprints....)
 - 5. Navigation (Optimal route to incident,....)
 - 6. Assist/support decision making (Priority actions, Decision Trees, ...)
 - 7. Command and Control Operations
 - 8. Communication utilities (Between LE agents, etc.
 - 9. UC on Crisis Management & health care provisioning
 - 10. UC on suspect apprehension
 - 11. UC on explosive neutralization
 - 12. UC on neutralization of perpetrators in public spaces
- At the end of the second day a **Debriefing & Evaluation session** should take place

Remote/Virtual W/shop

- From the material presented in the Physical meetings
- From the feedback provided at the end of each physical training e-learning material will be produced.
- The material and the feedback provided will be used to produce e-learning classes for the trained Trainers who will teach/present DARLENE solution to affiliated LEAS.

E-learning Structure (1/3)

Introduction

- a) DARLENE Project Overview*
- b) DARLENE Objectives and Benefits to LEAs*
- c) DARLENE Architecture overview and use of technologies (AI, ML, AR, Edge Computing, 5G, others, ...)*
- d) Ethics and Legal considerations for AR in LEA environment*

Technologies & Applications

- a) Augmented Reality*
- b) 3D Mapping*
- c) 5G / Edge Computing*
- d) Machine Learning*
- e) Wearable sensors*

E-learning Structure (2/3)

DARLENE Functionalities (LEA Services)

- a) *Active/Few-shot Learning*
- b) *"Multi-person 2D/3D pose estimation in real time"*
- c) *Real-time semantic/instance segmentation*
- d) *Situational Awareness*
- e) *Identification (Persons, Objects, etc.)*
- f) *Detection (Persons, Objects, Situation, Behaviour, etc....)*
- g) *Mapping (Location, distance to target, Use of blueprints....)*
- h) *Navigation (Optimal route to incident,...)*
- i) *Assist/support decision making (Priority actions, Decision Trees, ...)*
- j) *Command and Control Operations*

E-learning Structure (3/3)

DARLENE Platform / DARLENE prototype tutorial kit

a) Introduction to DARLENE prototype Tutorial Kit (DpTK)

b) Experience with DpTK on

- I. DARLENE Wearable Edge Computing Node (WECN) Devices: AR glasses*
- II. DARLENE Wearable Edge Computing Node (WECN) Devices: Smart Band*
- III. DARLENE GUI toolkit for augmented heads-up display*
- IV. DARLENE application for augmented C2 operations*
- V. DARLENE Police Car Edge Computing Node (PCEN)*

Use Cases

a) UC on Crisis Management & health care provisioning

b) UC on suspect apprehension

c) UC on explosive neutralization

d) UC on neutralization of perpetrators in public spaces

e) UC on other Generic policing challenges (e.g., riots control, etc.)

T6.2: Workshop and seminar organization - T6.2.1: ToT



1 2 3 4 5 6 **7** 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 **36**

Start month: 7 (Mar'21)

End month: 36 (Aug'23)

1st PHASE: T6.2.1

This Task will deal with the main activities focused on training, which will consist of **two phases**, handled as sub-tasks:

1. **T6.2.1: Training of Trainers (ToT)** of partner end-users' instructors (the ones involved in Platform demonstration and user evaluation {WP5}). They will become **the instructors for the training of LEA end-users and stakeholders in each country**. Through the planned ToT the instructors will be trained in the use of the DARLENE WECN interfaces, undergoing a three-phase course:
 - I. **Face-to-face ToT in each end-user partner country** (lecture seminar -**40h & 5 instructors per partner**- and a workshop (**40h**). Total: **400h for 25 instructors**
 - II. Remote and virtual ToT workshop among end-user partners using the DARLENE platform
 - III. **Joint evaluation workshop**, taking place at the end of each phase of the ToT

T6.2: Workshop and seminar organization - T6.2.2: Training LEAs



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Start month: 7 (Mar'21)

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2st PHASE: T6.2.2

- All instructors trained in sub-task 6.2.1 -> employed to **demonstrate the DARLENE developed solution to relevant stakeholders**
- Each end-user partner will organize presentations and training material, both physical and on-line, with other external end-users utilizing the DARLENE tutorial kit
- Partners will contact **security agencies, inviting them in open, one-day training workshops**
- Each end-user partner will organize both face-to-face and remote training workshops with interested end users (25 participants per partner) = **125 trainees** in total
- An off-line evaluation form will be filled out by trainees at the end of this phase

T6.3: External LEA feedback



1 2 3 4 5 6 **7** 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 **36**

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Leader & contributors

Leader: ERTZ

Contributors: CERTH, KUL, PLV, YBQ, KEMEA, PJ, HfoeD, CP, LP

Deliverables

D6.5 (M36): Training of LEA end-users and stakeholders report

D6.6 (M36): External LEA feedback evaluation report

WP6: Deliverables & MS



1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36

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KEMEA
D6.1

PLV
D6.3

KEMEA
D6.2

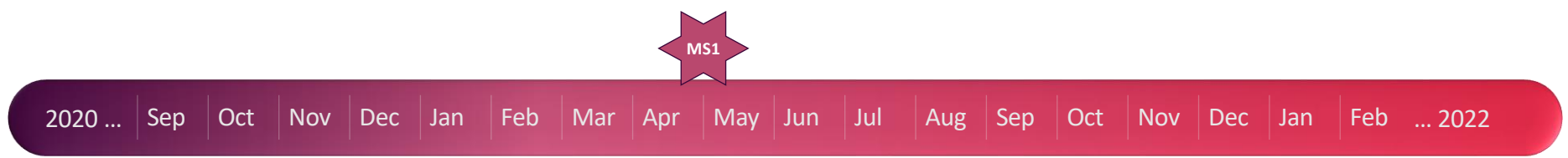
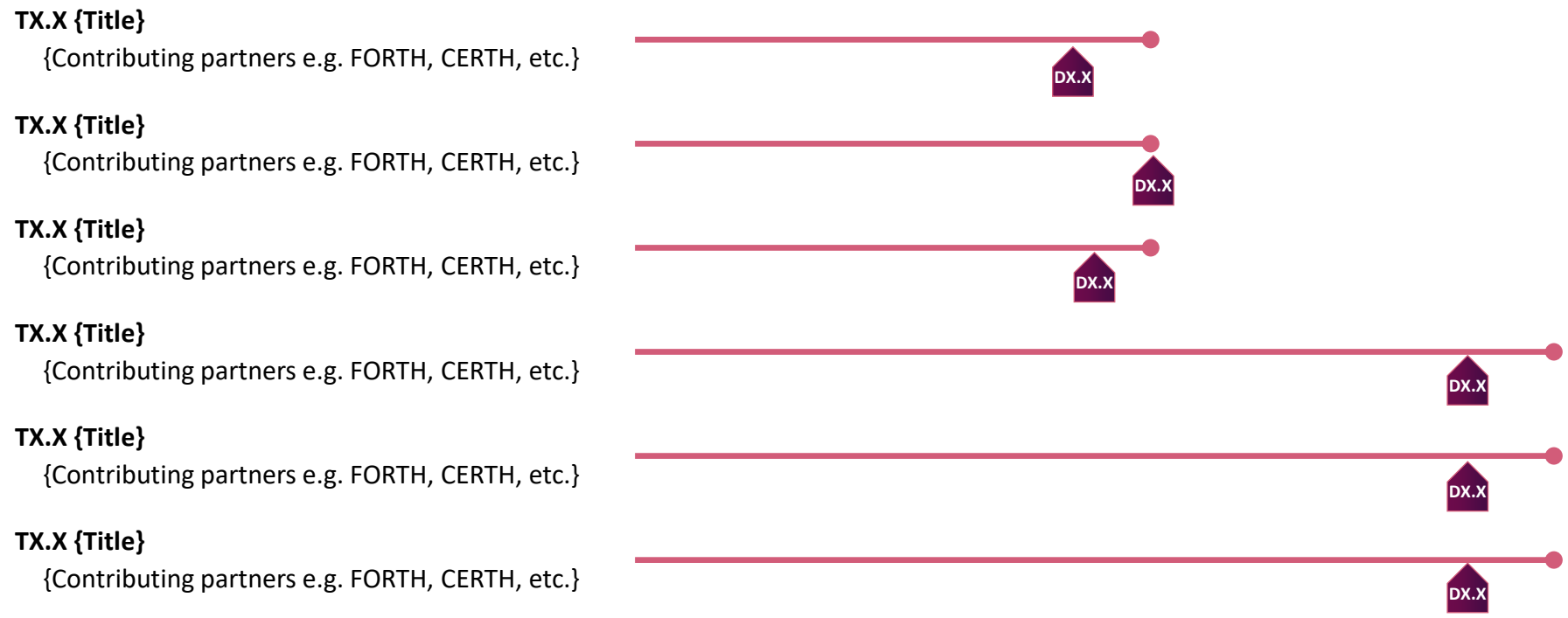
PLV
MS11

PLV
D6.4

KEMEA
D6.5

ERTZ
D6.6

Active tasks in the reporting period



Thank you!

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Questions - Discussion



Thank you for your attention!

