



TESLA PROJECT:  
AN INSTRUMENT TOWARDS ONLINE QUALITY ASSURANCE  
Barcelona [15/11/2018]



Agència  
per a la Qualitat  
del Sistema Universitari  
de **Catalunya**

Dr. Anna Elena Guerrero - TeSLA Coordinator (UOC)  
Dr. Xavier Baró - TeSLA Technical Member (UOC)



Project Number: 688520 – TESLA – H2020-ICT-2015/H2020-ICT-2015 Agreement Number: 688520

# INDEX

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- Project Overview
- TeSLA System
- Demo
- Next steps
- Open questions

# TESLA MAIN GOAL

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Innovation Action, with **Large Scale Pilots**. From January 2016 to March 2019.



To define and develop **an e-assessment system**, which ensures learners **authentication and authorship** in online and blended learning environments while avoiding the time and physical space limitations imposed by face-to-face examination.



TeSLA covers teaching and learning processes as well as **quality, ethical, legal and tech** aspects.

# AUTHENTICATION

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# AUTHORSHIP

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# CONSORTIUM

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18 Partners (130 members) + 50 external experts

8 Universities

3 Quality Agencies

4 Research Centers

3 Enterprises



# PROJECT WORK PACKAGES

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WP 1. Project Management (UOC).

WP 2. Requirements and modeling of the educational model (UOC).

WP 3. Data privacy and ethics (Namur).

**WP 4. Quality assurance in online higher education (AQU).**

WP 5. Design and implementation of trusted assessment mechanisms (Lplus).

WP 6. Integration of the framework in learning environments (Watchful).

WP 7. Design and development of pilots (SU).

WP 8. Pilots evaluation (OU).

WP 9. Communication, dissemination, liaisons and exploitation (protOS).

## WP4 QUALITY ASSURANCE IN HIGHER EDUCATION

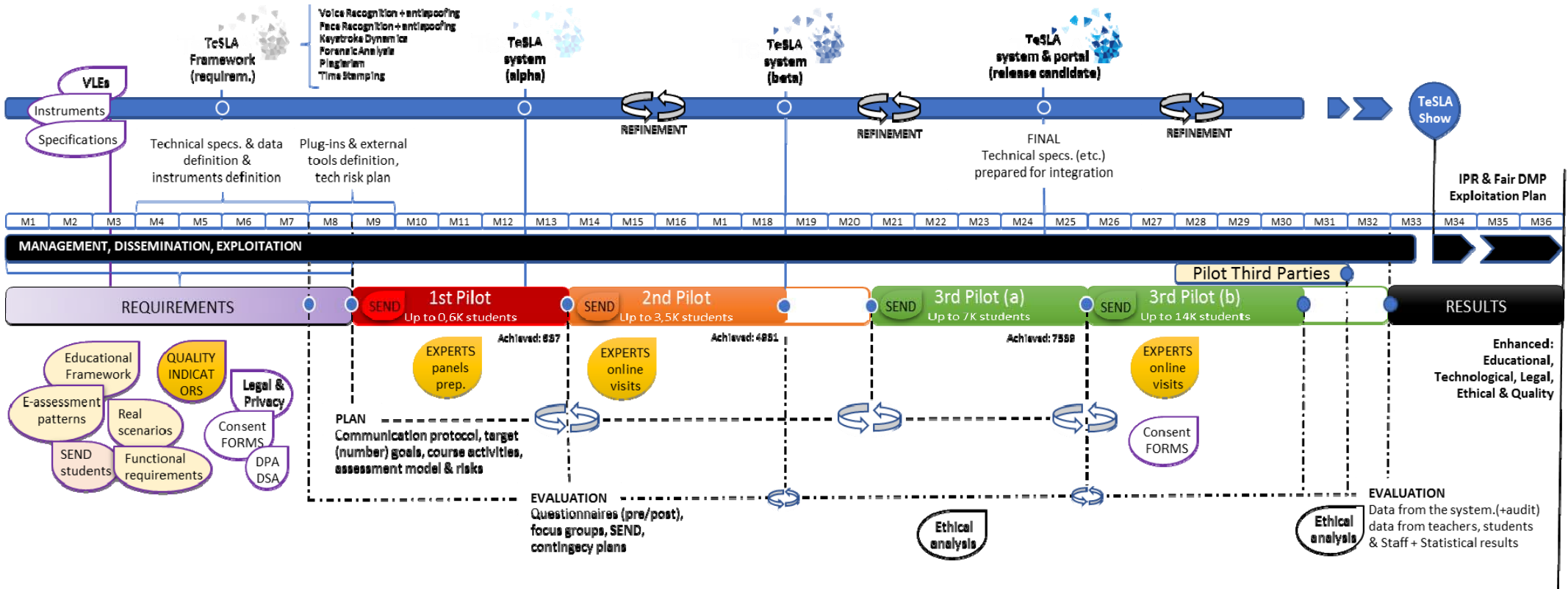
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The main goal of this WP is to assure and guarantee the quality of e-assessment processes in Higher Education. It includes:

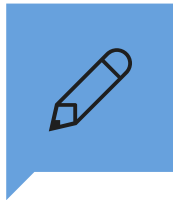
- **Define the quality aspects that must be followed** during the project development to be aligned with the aims of the quality assurance agencies responsible for the Higher Education System.
- Establish the **quality parameters of learner assessment** in online Higher Education (considering ESG).
- **Guarantee that the proposed model of e-assessment fits the criteria defined by quality agencies to be accredited.**
- ...



# PROJECT TIMELINE



## SOME FIGURES



### A) Learners & Teachers

Learners (unique): **22.941 (SEND incl.)**  
Teachers: 500 aprox.

### B) Fields

Computer Science  
Education & Psychology  
Economics, Law, etc



### C) Instruments/learners

VR: 2.799  
FR: 11.989  
KS: 4.923  
FA: 5.416  
PL: 9.978  
Total: 35.105



### D) VLEs

Moodle, Blackboard  
yOUlearn, Koppa  
Own VLE

### E) Legal, Ethical & Quality

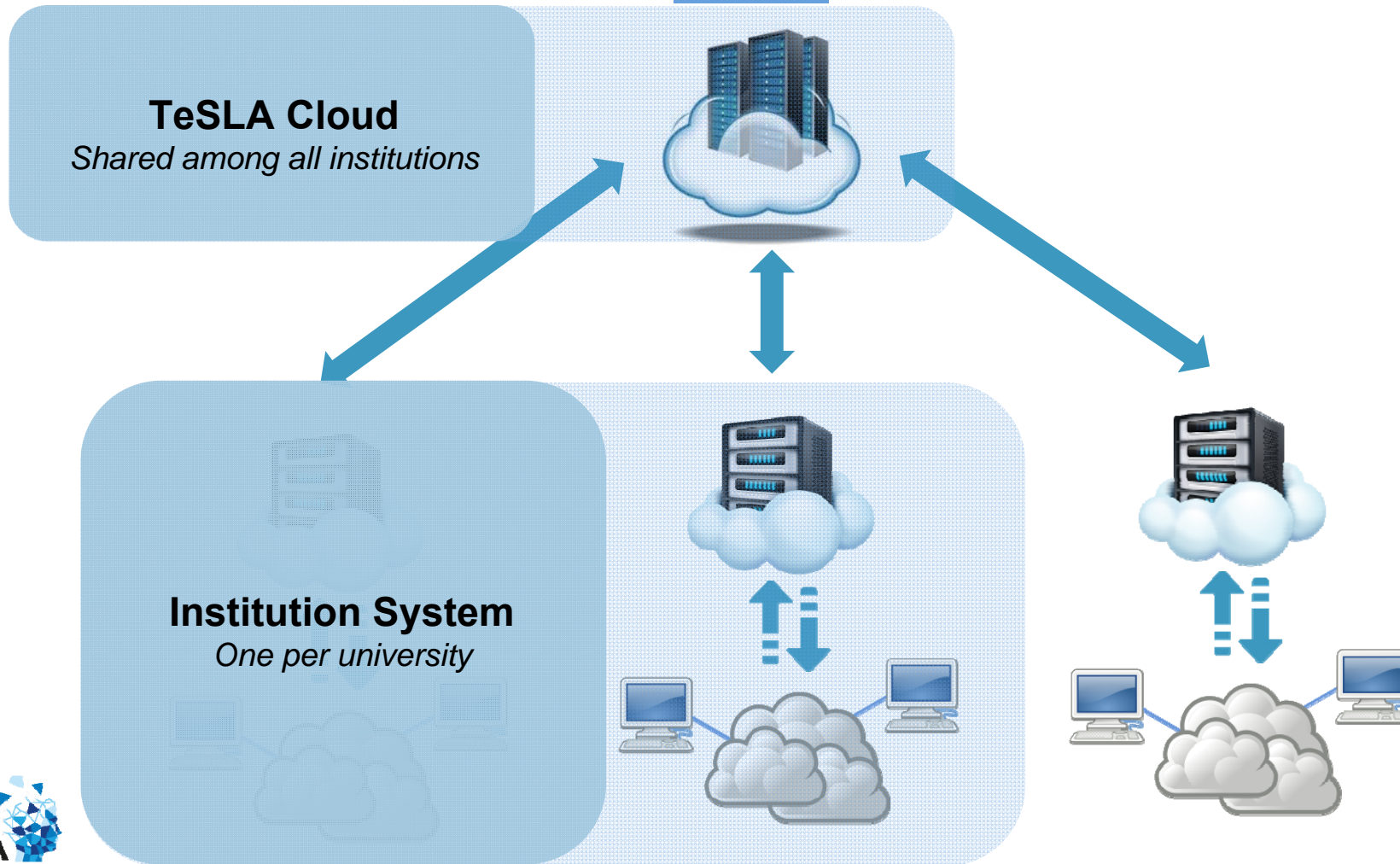
Legal framework  
Ethical recommendations  
FAQs and Roadmap  
Quality framework for e-assessment



### F) Third parties ofTeSLA

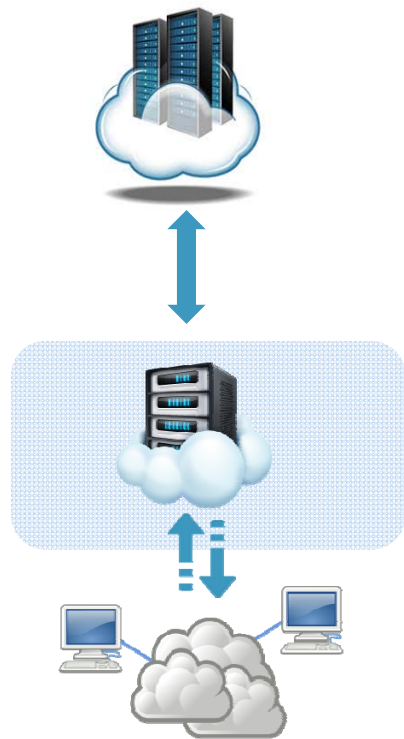
Tech providers (2)  
HEIs (5)

# TESLA SYSTEM



# TESLA SYSTEM

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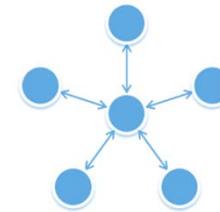


## INSTRUMENTS

- Instruments provide to TeSLA their analysis capabilities.
- TeSLA defines a standard instrument interface.

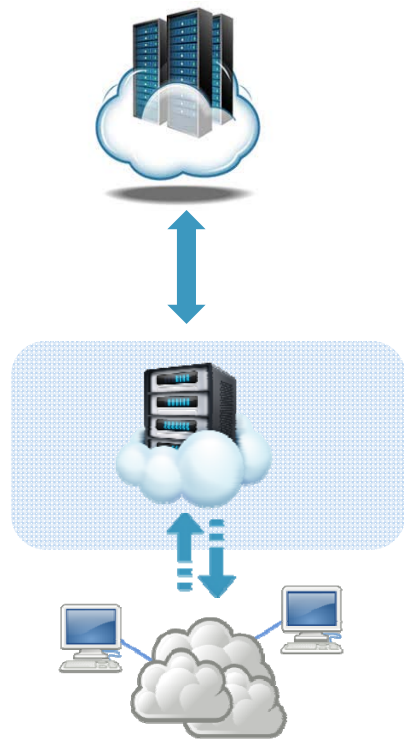


- TeSLA system can be seen as a hub to connect any instrument.



# TESLA SYSTEM

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## INSTRUMENTS

- TeSLA project was tested with instruments using only standard hardware:
  - Microphone
  - Webcam
  - Keyboard
- Not standard hardware can allow to include new instruments:
  - Fingerprint readers
  - Digital Tablets for handwriting
  - Official digital certificates / e-Passport



# TESLA SYSTEM

## DOCUMENT ANALYSIS

Involves the analysis of written material using a qualitative analysis package that describes discourse and its interpretation

AUTHORSHIP

### Plagiarism tools



Analyses written material and detects similarities among various written documents



### Forensic analysis

Determines the authorship verification and authorship attribution of written documents based on the comparison of current documents with stored data

## BIOMETRICS

Allow the clear identification of humans based on some specific physical characteristics or special behaviour

AUTHENTICATION

### Facial recognition



Analyses facial expressions in two stages: facial detection and recognition



### Voice recognition

State-of-the-art audio description method. Speaker segmentation and cluster grouping

### Keystroke dynamics



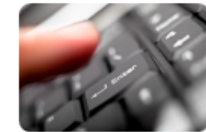
Measures how the user writes in regards to pressure and time-based measuring

## SECURITY TECHNIQUES

Deploy a security service provided by a layer of communicating systems

CONFIDENCE

### Timestamp



Generates a sequence of encoded information identifying when an event is recorded



### Digital signature

Guarantees the authenticity of a digital message or document by a mathematical scheme

# BIOMETRIC MODEL

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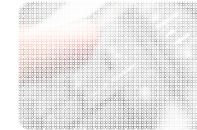
Measures how the user writes in regards to pressure and time-based measuring

## SECURITY TECHNIQUES

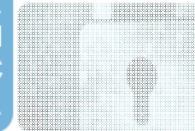
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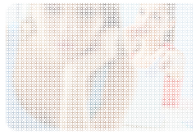
# ONLINE DATA GATHERING

## DOCUMENT ANALYSIS

Involves the analysis of written material using a qualitative analysis package that describes discourse and its interpretation

AUTHORSHIP

### Plagiarism tools



Analyses written material and detects similarities among various written documents



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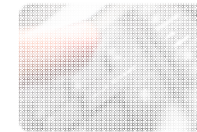
Measures how the user writes in regards to pressure and time-based measuring

## SECURITY TECHNIQUES

Deploy a security service provided by a layer of communicating systems

CONFIDENCE

### Timestamp



Generates a sequence of encoded information identifying when an event is recorded



### Digital signature

Guarantees the authenticity of a digital message or document by a mathematical scheme






# OFFLINE DATA GATHERING


**DOCUMENT ANALYSIS**  
 Involves the analysis of written material using a qualitative analysis package that describes discourse and its interpretation

**Plagiarism tools**



Analyses written material and detects similarities among various written documents

**Forensic analysis**




Determines the authorship verification and authorship attribution of written documents based on the comparison of current documents with stored data

AUTHORSHIP


**BIOMETRICS**  
 Allow the clear identification of humans based on some specific physical characteristics or special behaviour

**Facial recognition**




Analyses facial expressions in two stages: facial detection and recognition

**Voice recognition**



State-of-the-art audio description method. Speaker segmentation and cluster grouping

**Keystroke dynamics**




Measures how the user writes in regards to pressure and time-based measuring

AUTHENTICATION


**SECURITY TECHNIQUES**  
 Deploy a security service provided by a layer of communicating systems

**Timestamp**



Generates a sequence of encoded information identifying when an event is recorded

**Digital signature**

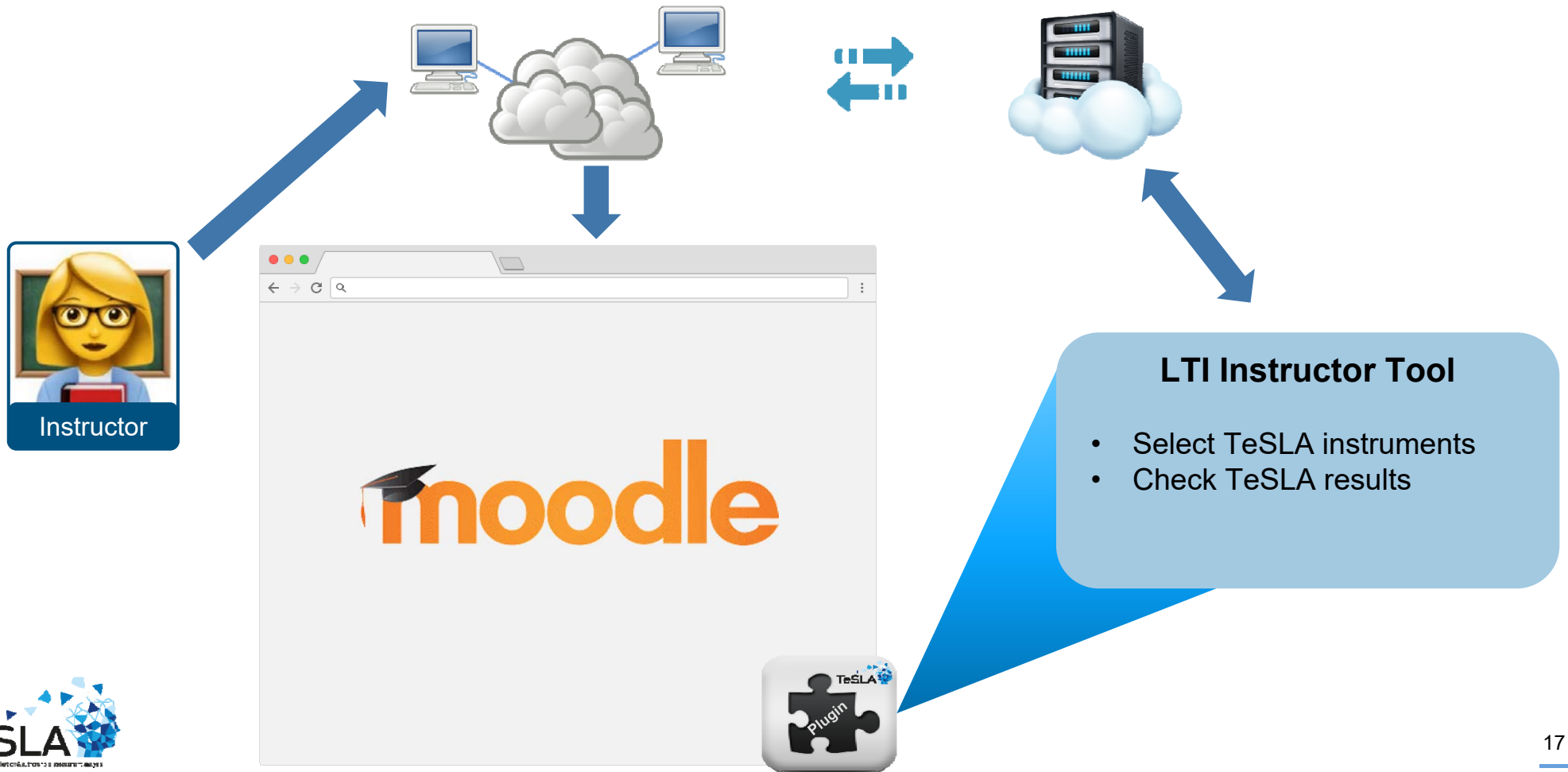


Guarantees the authenticity of a digital message or document by a mathematical scheme

CONFIDENCE



# INSTRUCTOR TOOL- ACTIVITY CONFIGURATION



# INSTRUCTOR TOOL- ACTIVITY CONFIGURATION



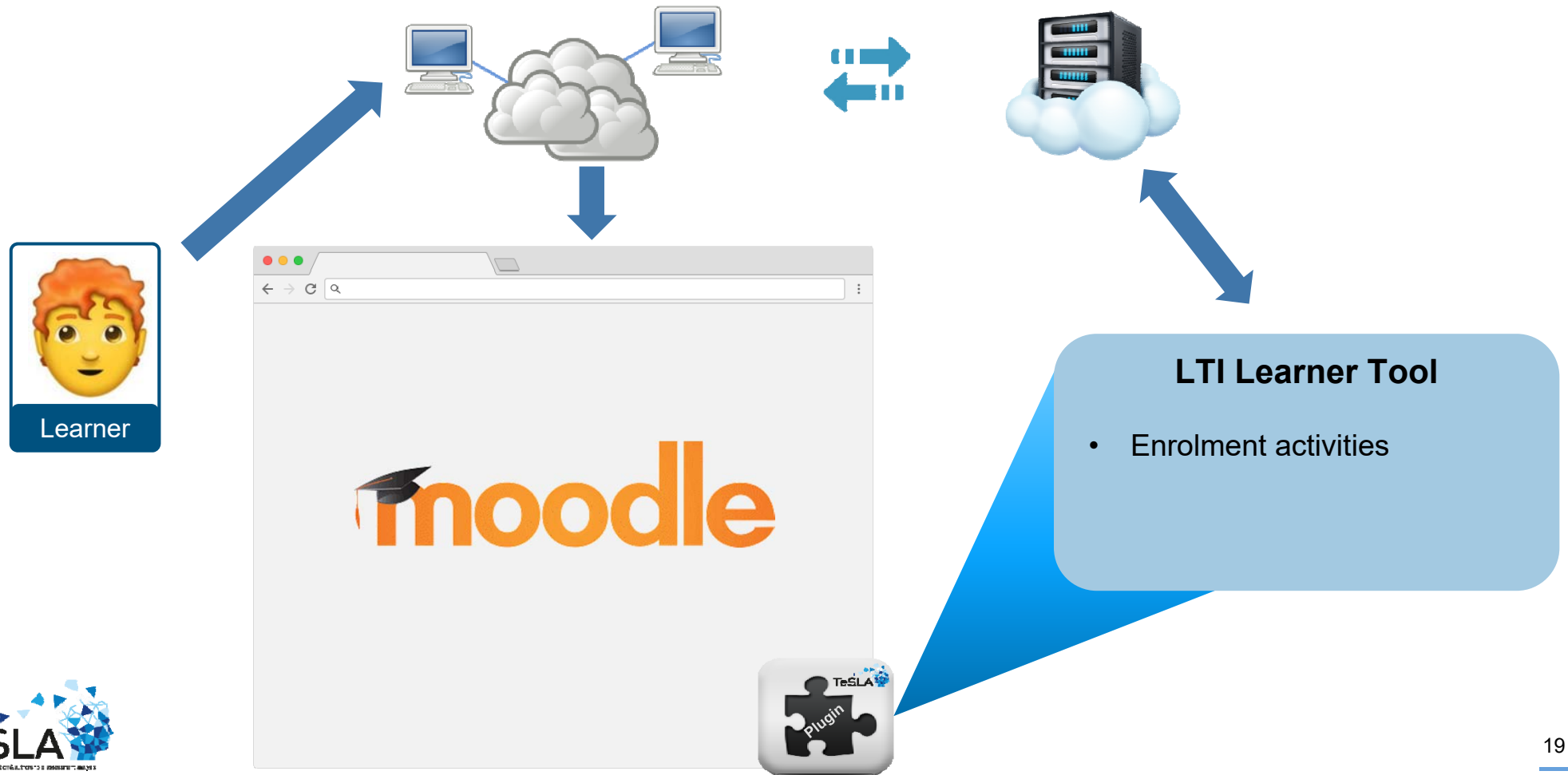
## Configure TeSLA available instruments on activity

Tesla Instructor Tool / Configure TeSLA available instruments on activity 36

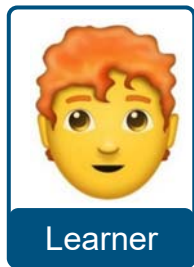
Instrument	Settings	Required	Alternative instruments
Face Recognition and Verification	Enabled <input type="checkbox"/>	Required <input type="checkbox"/>	(1) --- <input type="text"/>
Face Presentation Attack Detection	Enabled <input type="checkbox"/>	Required <input type="checkbox"/>	(2) --- <input type="text"/>
Automatic Speaker Verification	Enabled <input type="checkbox"/>	Required <input type="checkbox"/>	(3) --- <input type="text"/>
Voice Presentation Attack Detection	Enabled <input type="checkbox"/>	Required <input type="checkbox"/>	(4) --- <input type="text"/>
Keystroke Dynamics	Enabled <input type="checkbox"/>	Required <input type="checkbox"/>	(5) --- <input type="text"/>
Plagiarism Detection	Enabled <input type="checkbox"/>	Required <input type="checkbox"/>	(6) --- <input type="text"/>
Authorship Verification	Enabled <input type="checkbox"/>	Required <input type="checkbox"/>	(7) --- <input type="text"/>
Time Stamp And Document Signing	Enabled <input type="checkbox"/>	Required <input type="checkbox"/>	(8) --- <input type="text"/>



# LEARNER – ENROLMENT ACTIVITY



# LEARNER – ENROLMENT ACTIVITY (FR)



TeSLA

Face Recognition   Voice Recognition   Keystroke Dynamics   Forensic Analysis

instructions

Stand in front of your screen with a webcam facing towards you.

It is important to make sure the following:

- Make sure that the camera is correctly capturing the whole face without leaving any parts outside of the image boundaries.
- It is also important to make sure that the camera is approximately facing your face with horizontal direction, i.e. the camera is approximately at the same height as your eyes/nose.
- Make sure that the activity is performed in an environment with reasonable lighting conditions (neither too bright nor too dark).
- Follow the instructions on the video at a similar speed. The final duration of the video will be of about 10 seconds.
- Please push Start button to start capturing the video. When ready, push Stop button to stop recording. Activity will close automatically.

Select video device:

Follow the video instructions  
In order to enroll face recognition

0:00 / 0:07

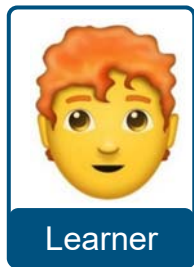
Start

Status face model: 0%

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# LEARNER – ENROLMENT ACTIVITY (VR)



TeSLA

Face Recognition   Voice Recognition   Keystroke Dynamics   Forensic Analysis

**instructions**  
Stand in front of your screen with a webcam facing towards you  
**It is important to make sure that:**  
Your microphone is connected and working  
There is no ambient noise.  
It will be three questions for enrolment and five audio samples sent per question, each sample will last less than 15 seconds  
Please, keep talking about the question asked, the tool will be sending samples frequently and you will see the enrolment percentage or the status messages.  
Select audio device:

**Follow the instructions**  
In order to enroll voice recognition  
What are your reasons for enrolling to this course or study?

Start Stop

0:00 / 0:00

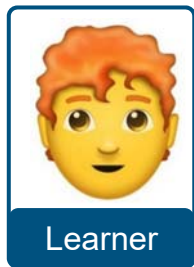
0%

Status voice model

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# LEARNER – ENROLMENT ACTIVITY (KD)



TeSLA

TeSLA


Face Recognition | Voice Recognition | **Keystroke Dynamics** | Forensic Analysis


instructions  
In order to enroll keystroke dynamics, talk about yourself.

Type text into the text area

0%

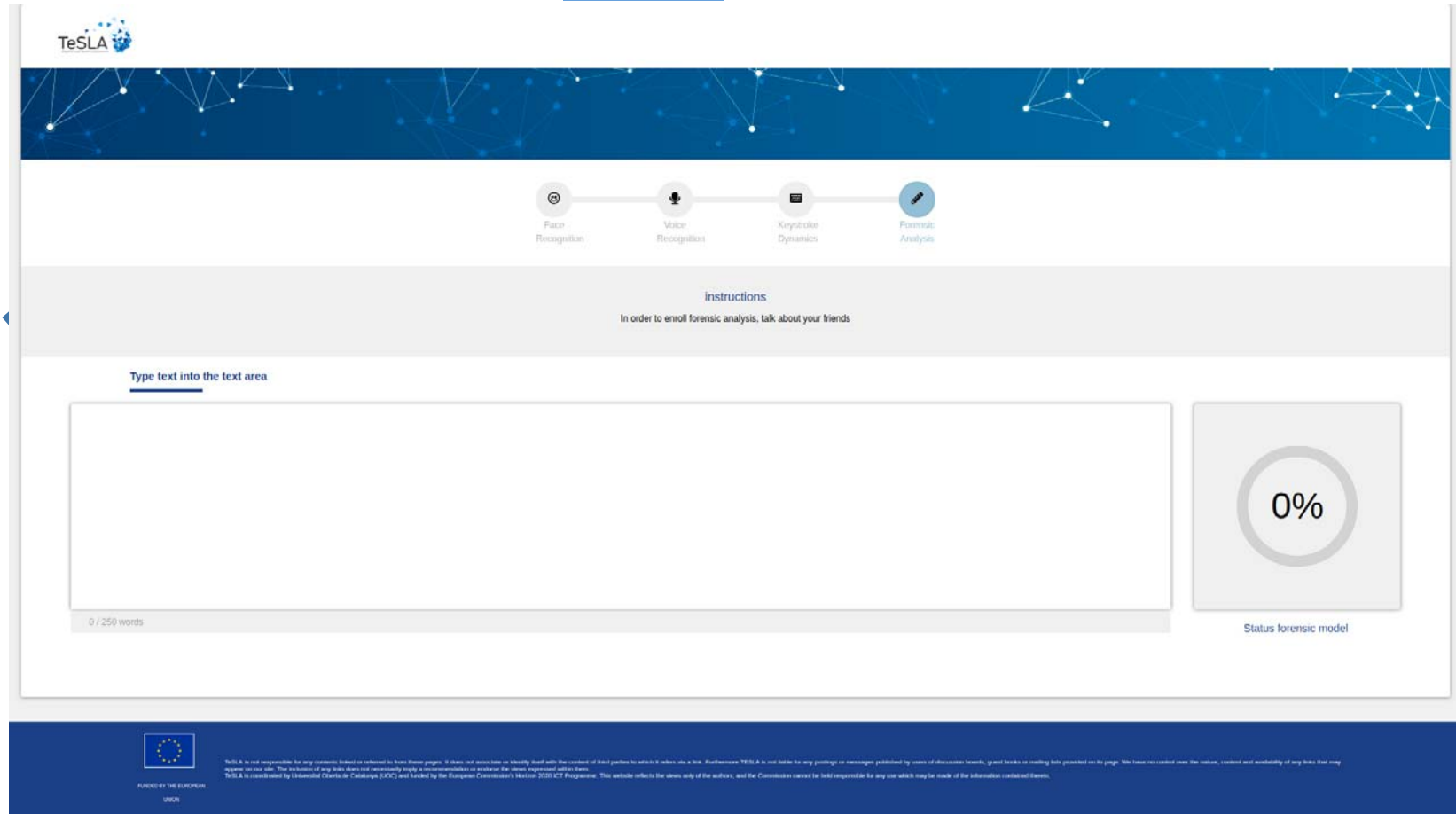
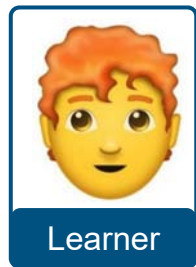
Status keystroke model

  
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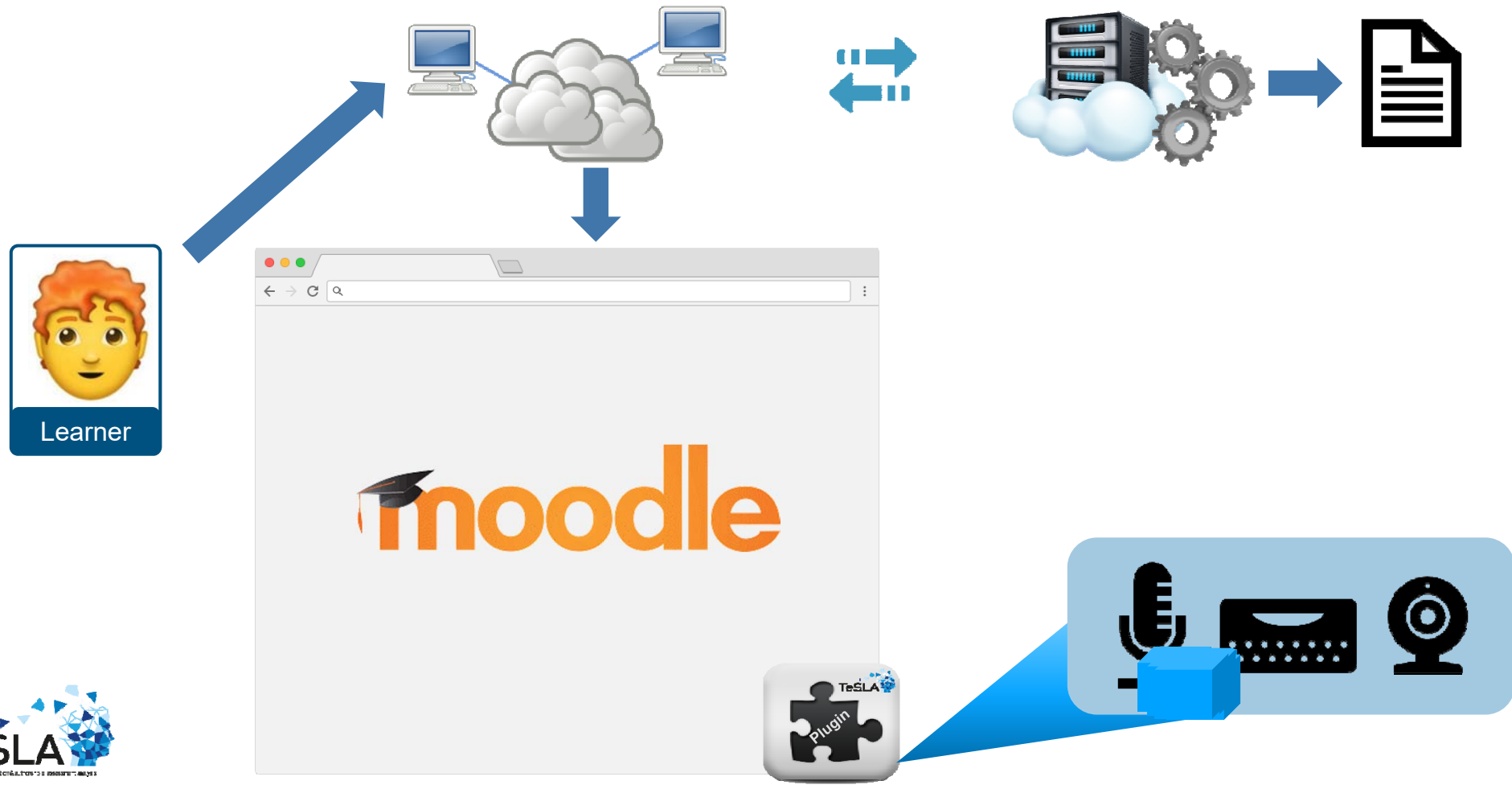
# LEARNER – ENROLMENT ACTIVITY (FA)



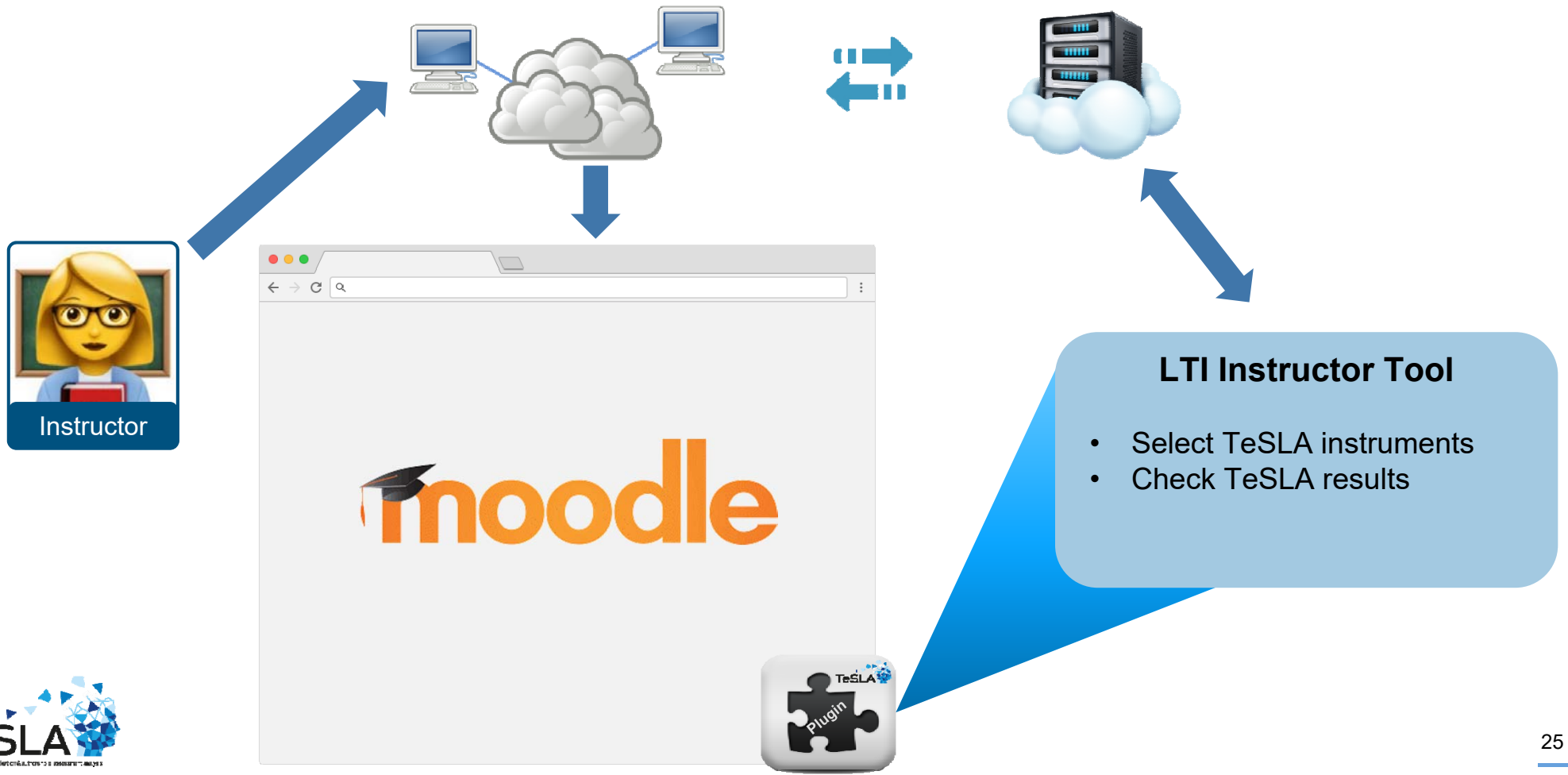
The screenshot shows the TeSLA learner interface for an enrolment activity. At the top left is the TeSLA logo. Below it is a navigation bar with four icons: Face Recognition, Voice Recognition, Cryptologic Dynamics, and Forensic Analysis. The 'Forensic Analysis' icon is highlighted. Below the navigation bar is an 'Instructions' section with the text: 'In order to enroll forensic analysis, talk about your friends'. Below the instructions is a large text input area with the prompt 'Type text into the text area' and a character count '0 / 250 words'. To the right of the text area is a progress indicator showing '0%' and the label 'Status forensic model'. At the bottom of the interface is a footer with the European Union flag and the text 'FUNDED BY THE EUROPEAN UNION'. A small 'Plugin' icon is visible at the bottom center of the page.



# LEARNER – ASSESSMENT ACTIVITY



# INSTRUCTOR TOOL- ACTIVITY RESULTS



# INSTRUCTOR TOOL- ACTIVITY RESULTS

## Resultats TeSLA. -

Tesla Instructor Tool / Resultats TeSLA -



Cercar estudiant

Només es mostraran els instruments configurats o els alternatius.

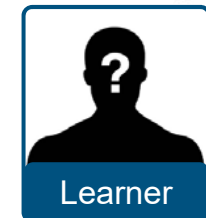
Resultat de l'avaluació	Data d'inici	Data final	Auditoria
0.0%	mayo 31º 2018, 5:41:27 pm	mayo 31º 2018, 5:41:45 pm	<a href="#">Més informació</a>
66.5%	mayo 31º 2018, 5:41:29 pm	mayo 31º 2018, 5:41:46 pm	
0.0%	mayo 31º 2018, 5:41:33 pm	mayo 31º 2018, 5:41:46 pm	<a href="#">Més informació</a>
0.0%	mayo 31º 2018, 5:41:36 pm	mayo 31º 2018, 5:41:47 pm	<a href="#">Més informació</a>
69.3%	mayo 31º 2018, 5:41:39 pm	mayo 31º 2018, 5:41:47 pm	
0.0%	mayo 31º 2018, 5:41:42 pm	mayo 31º 2018, 5:41:48 pm	<a href="#">Més informació</a>
71.3%	mayo 31º 2018, 5:41:45 pm	mayo 31º 2018, 5:41:48 pm	
68.7%	mayo 31º 2018, 5:41:59 pm	mayo 31º 2018, 5:42:19 pm	
69.7%	mayo 31º 2018, 5:42:03 pm	mayo 31º 2018, 5:42:19 pm	
58.6%	mayo 31º 2018, 5:42:05 pm	mayo 31º 2018, 5:42:20 pm	
53.8%	mayo 31º 2018, 5:42:06 pm	mayo 31º 2018, 5:42:20 pm	

# TESLA LIVE DEMO



- We need a volunteer:
  - Perform an assessment activity as a learner
  - Face Recognition will be used to verify identity
- All TeSLA system is in the laptop, including the VLE
  - No data will be sent outside
  - Data will be removed after the event

We need  
**YOU!**



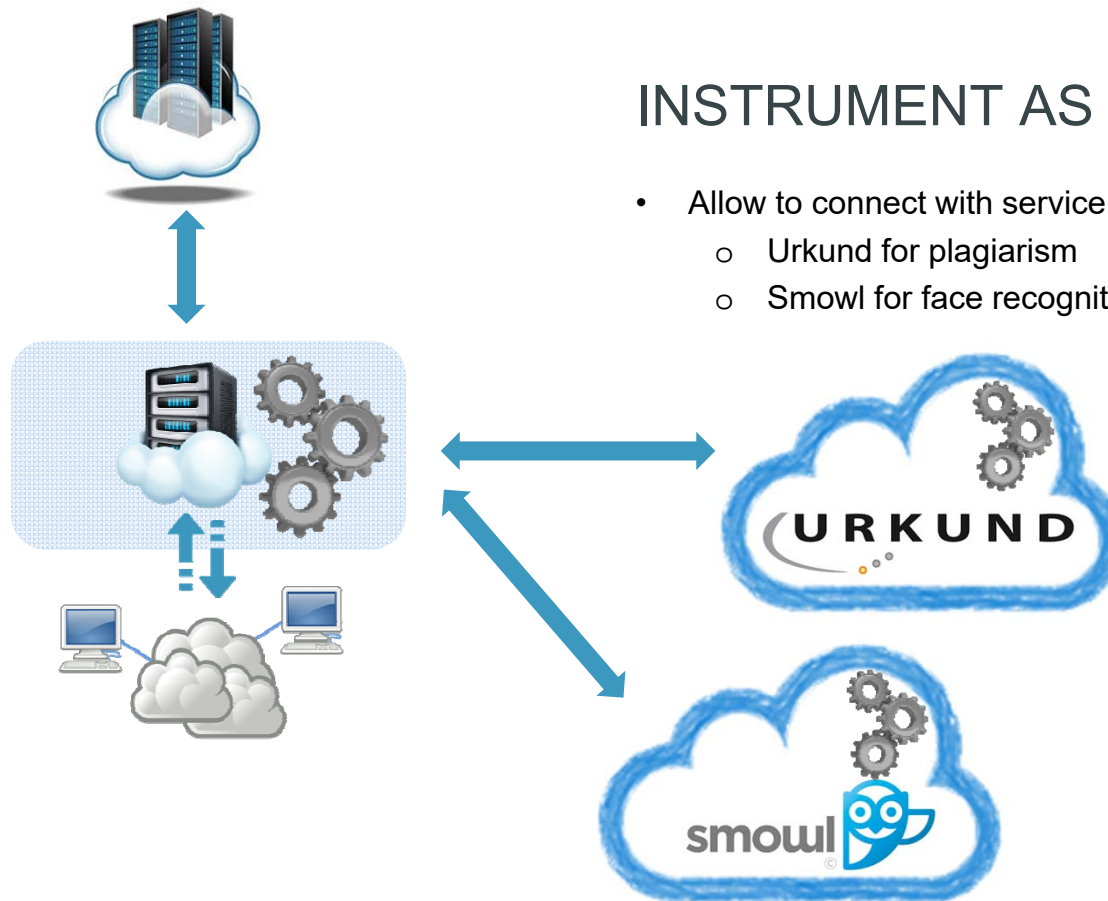
## NEXT STEPS

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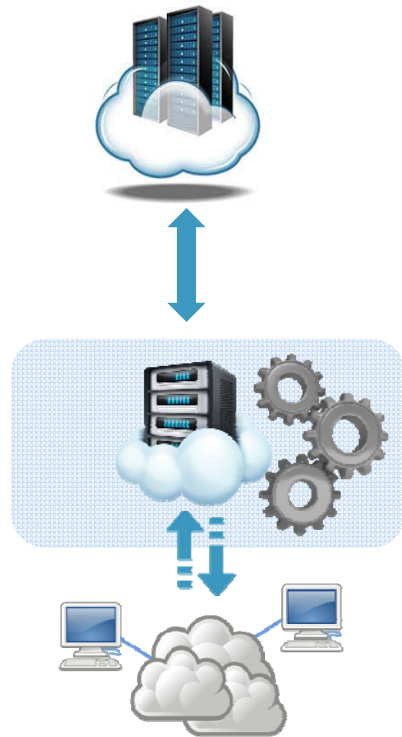
## INSTRUMENT AS A SERVICE

- Allow to connect with service providers:
  - Urkund for plagiarism
  - Smowl for face recognition



## NEXT STEPS

---



## INSTRUMENT RESULTS REPORT

- Allow to merge all information reported by all instruments:
  - Analyse instrument results on the whole activity/course/degree
  - Merge results for all available instruments
  - Generate a report with final suggestion
  - Provide elements for final decision

# NEXT STEPS



Join summary (All available information)

Summary at instrument level. Only types valid for each instrument

Semestre 2017/2

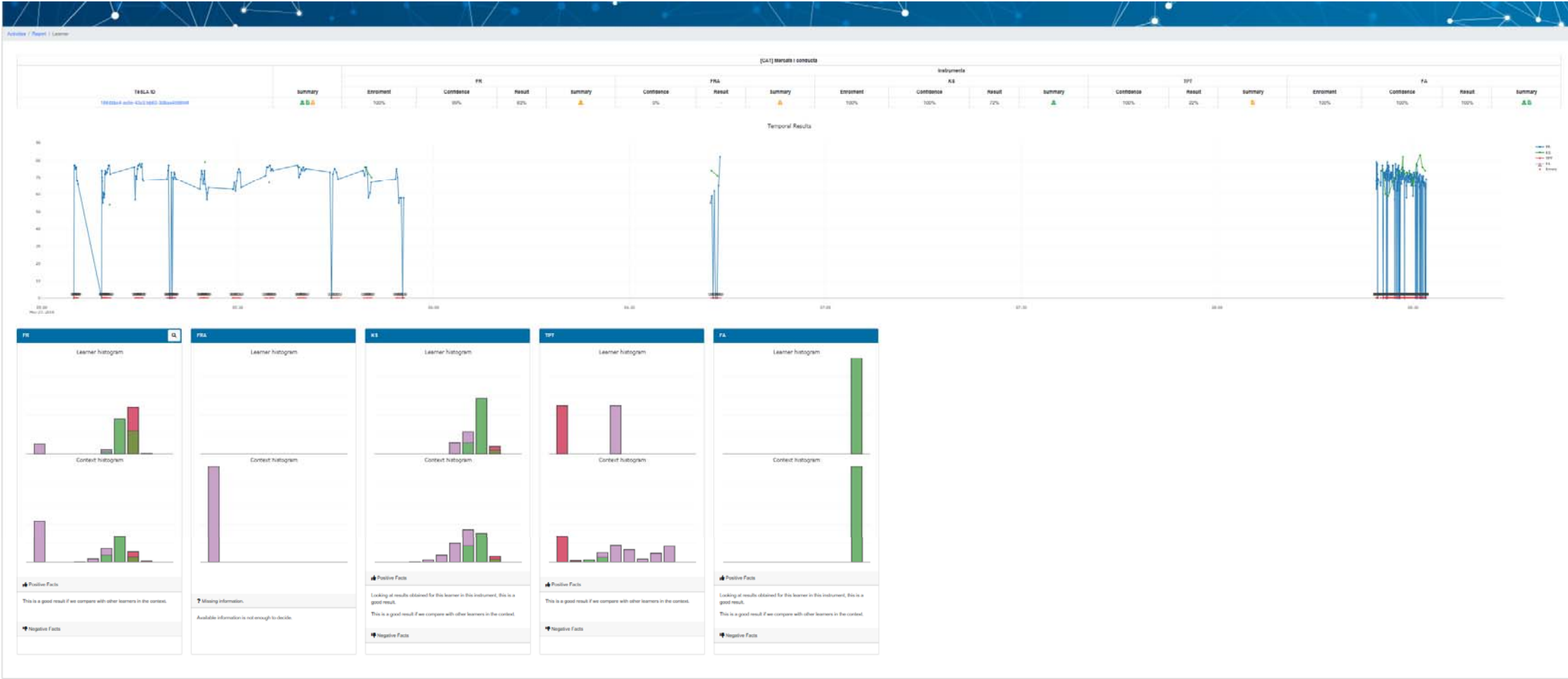
TeSLA ID	Summary	Enrolment	Confidence	Result	Summary	Confidence	Result	Summary	Enrolment	Confidence	Result	Summary	Confidence	Result	Summary	Enrolment	Confidence	Result	Summary
009818c7-df44-4a1f-9524-30a8b34d064b		-	-	-		-	-		100%	100%	70%		-	-		-	-	-	
0225ea9f-be5c-457b-94f3-f506bcc0832f		-	-	-		-	-		-	-	-		100%	60%		-	0%	-	
036c5545-11eb-4bc5-b9f2-4d0b58d06836		-	-	-		-	-		-	-	-		100%	83%		-	0%	-	
038165ea-7a04-454a-8030-cb08816dc41		-	-	-		-	-		100%	100%	72%		-	-		-	-	-	
04ae7156-ab5d-4e38-b90d-c02fbc0e8d8d		-	-	-		-	-		-	-	-		100%	60%		-	0%	-	
0642e3b7-232b-4cad-8189-411529222		-	-	-		-	-		-	-	73%		-	-		-	-	-	
08112186-3b53-4ab6-bb6f-6870fca8d3cc		-	-	-		-	-		-	-	-		100%	31%		100%	100%	100%	
085b9c5f-4e00-4ac6-ba19-482eb56f3687		-	-	-		-	-		-	-	-		100%	43%		-	0%	-	
0861b2d4-f488-49d6-ae40-50efc5de457d		-	-	-		-	-		-	-	39%		-	-		-	-	-	
08b14b41-b01e-4a1f-8795-7a7d8da8b39c		-	-	-		-	-		-	-	-		100%	58%		100%	100%	100%	
08dd64b3-22a6-46c2-bfe4-05c46168226b		-	-	-		-	-		-	-	-		100%	0%		100%	100%	100%	
08e722ad-49f1-498a-bdc3-9ec3158b54b1		-	-	-		-	-		100%	100%	68%		-	-		-	-	-	
09453b97-4167-429f-a7de-40fa6c8bfdd0		-	-	-		-	-		100%	100%	57%		-	-		-	-	-	
09d3297a-d693-49ed-b6b7-00c3379c0cc3		-	-	-		-	-		-	-	-		100%	52%		-	0%	-	
09f0fde2-e6b4-4082-9b57-507fbd385ac7		100%	100%	0%		0%	-		100%	100%	69%		-	-		-	-	-	
0a13f888-fb67-4933-88f9-34e7cbb518f3		-	-	-		-	-		-	-	-		100%	93%		-	0%	-	
0a5063be-d2c1-45db-98b3-eba2b1a7adca		0%	0%	-		0%	-		100%	100%	65%		-	-		-	-	-	
0a8cc322-5220-49e0-94b3-e56f1d4cb83d		-	-	-		-	-		-	-	-		100%	40%		-	0%	-	
0af3a4dc-8401-4949-8772-189ffe02eed7		100%	100%	4%		0%	-		100%	100%	72%		-	-		-	-	-	
0c7f4035-207f-4081-a3a5-055bd5f8931b		-	-	-		-	-		100%	100%	68%		-	-		-	-	-	

- 1) This will be the name of the learner in LTI
- 2) Allows to see the detailed information

- Information about learner Identity
- Information on the document contents (authorship)
- Security Information (Anti-spoofing tools)

- No information available
- We have a good confidence that everything is correct
- Information is not good enough or is contradictory (Review)
- Information tell us that probably is a cheating case

# NEXT STEPS

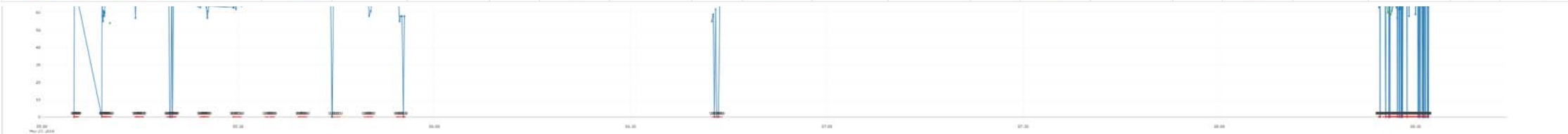




# NEXT STEPS

## [CAT] Mercats i conducta

TeSLA ID	Summary	Instruments																	
		FR			FRA			KS			TPT			FA					
		Enrolment	Confidence	Result	Summary	Confidence	Result	Summary	Enrolment	Confidence	Result	Summary	Confidence	Result	Summary	Enrolment	Confidence	Result	Summary
16645bc4-ac9e-43c3-bb63-306ea495694f		100%	99%	63%		0%	-		100%	100%	72%		100%	22%		100%	100%	100%	



**FR**

Learner histogram

Context histogram

**Positive Facts**  
This is a good result if we compare with other learners in the context.

**Negative Facts**

**FRA**

Learner histogram

Context histogram

**Missing information.**  
Available information is not enough to decide.

**KS**

Learner histogram

Context histogram

**Positive Facts**  
Looking of results obtained for this learner in this instrument, this is a good result.  
This is a good result if we compare with other learners in the context.

**Negative Facts**

**TPT**

Learner histogram

Context histogram

**Positive Facts**  
This is a good result if we compare with other learners in the context.

**Negative Facts**

**FA**

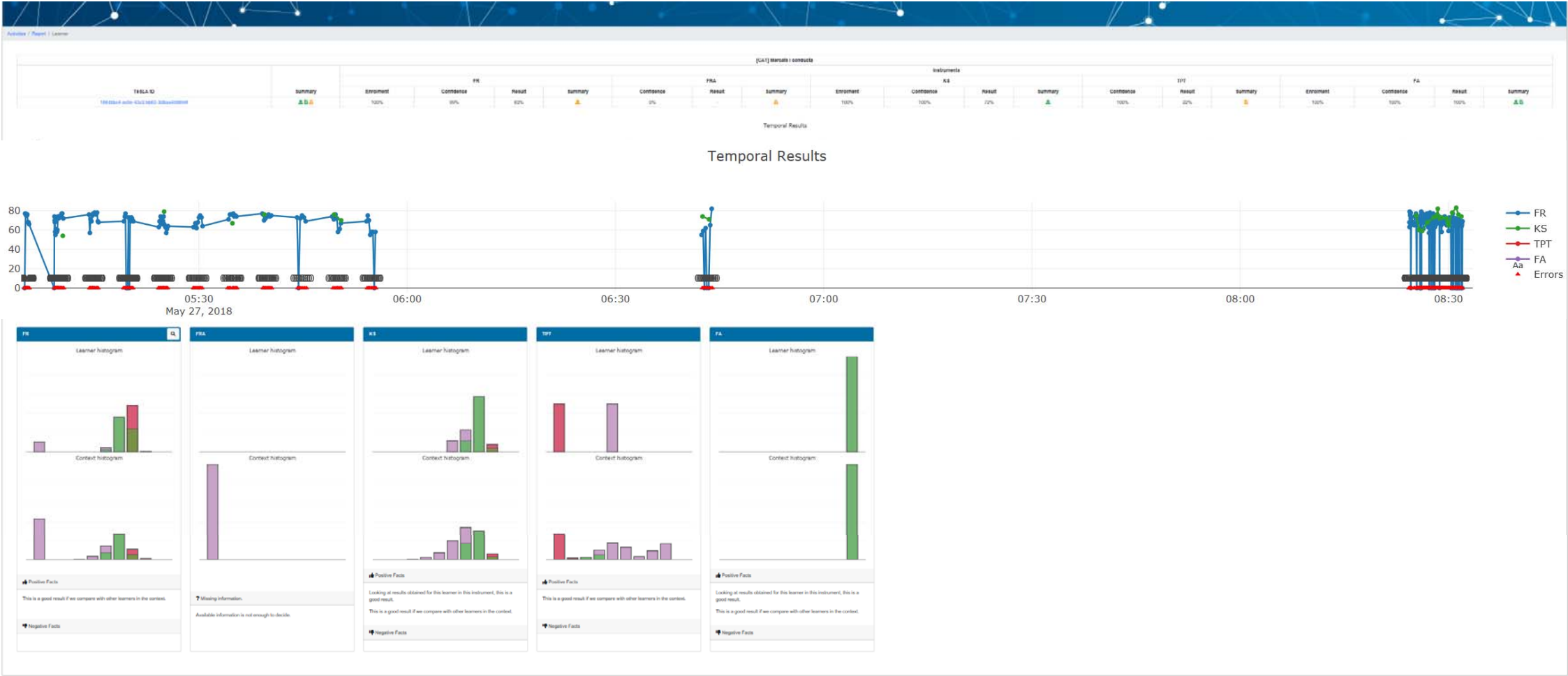
Learner histogram

Context histogram

**Positive Facts**  
Looking of results obtained for this learner in this instrument, this is a good result.  
This is a good result if we compare with other learners in the context.

**Negative Facts**

# NEXT STEPS



# NEXT STEPS

Activities / Report / Learner

[C41] Marsella / consulta

Instrumente

Instrumente	FR	FRA	KS	TPT	FA
summary	100%	80%	97%	72%	100%
Enviament	100%	100%	100%	100%	100%
Competencia	82%	97%	72%	100%	100%
Result	100%	80%	97%	72%	100%
summary	100%	80%	97%	72%	100%
Enviament	100%	100%	100%	100%	100%
Competencia	82%	97%	72%	100%	100%
Result	100%	80%	97%	72%	100%
summary	100%	80%	97%	72%	100%

Temporal Results

### FR

Learner histogram

Context histogram

**Positive Facts**

This is a good result if we compare with other learners in the context.

**Negative Facts**

### FRA

Learner histogram

Context histogram

**Missing information.**

Available information is not enough to decide.

### KS

Learner histogram

Context histogram

**Positive Facts**

Looking at results obtained for this learner in this instrument, this is a good result.

This is a good result if we compare with other learners in the context.

**Negative Facts**

### TPT

Learner histogram

Context histogram

**Positive Facts**

This is a good result if we compare with other learners in the context.

**Negative Facts**

### FA

Learner histogram

Context histogram

**Positive Facts**

Looking at results obtained for this learner in this instrument, this is a good result.

This is a good result if we compare with other learners in the context.

**Negative Facts**

# NEXT STEPS

Feedback / Report / Learn

[G4] Marsella - somesta

Instrumente

Instrumente	KS	IFT	Fa
Environent	100%	100%	100%
Compence	100%	100%	100%
Result	100%	100%	100%
summary	100%	100%	100%

TEGLA ID: 198234-4-4323432-3434343434

summary

0 100 200 300 400 500 600 700 800 900 1000

00:00 00:01 00:02 00:03 00:04 00:05 00:06 00:07 00:08 00:09 00:10 00:11 00:12 00:13 00:14 00:15 00:16 00:17 00:18 00:19 00:20 00:21 00:22 00:23 00:24 00:25 00:26 00:27 00:28 00:29 00:30 00:31 00:32 00:33 00:34 00:35 00:36 00:37 00:38 00:39 00:40 00:41 00:42 00:43 00:44 00:45 00:46 00:47 00:48 00:49 00:50 00:51 00:52 00:53 00:54 00:55 00:56 00:57 00:58 00:59 01:00

Marsella / Report / Learn / IT

Learned face

01 02 03 04 05 06

Learned face

07

Face mask

08

Face mask

09

No face detected

We were not able to detect any face on this image. It can be because the face is too small, or because the camera is not in front of the camera.

10

Learned histogram

Context histogram

Positive Facts

This is a good result if we compare with other learners in the context.

Negative Facts

Learned histogram

Context histogram

Missing information

Available information is not enough to decide.

# Thank you!



TeSLA Project:  
<http://tesla-project.eu>

Follow us on Twitter:  
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[xbaro@uoc.edu](mailto:xbaro@uoc.edu)



Trust-based Authentication & authorship e-assessment analysis

THANK YOU FOR YOUR ATTENTION



# USER ROLES

## TeSLA Admin

- TeSLA cloud management and monitoring
- Software versions management
- Licence management
- Institution access management

## Institution Admin

- Institution cloud management and monitoring
- Apply software updates
- Scale system according to assessment needs

## Learner

- Accept Informed Consent
- Perform enrolment activities
- Perform assessment activities

## Instructor

- Select instruments for activities
- Review TeSLA results for each activity

## Institution Roles

- Legal
  - Manage content and versions of the Informed Consent [GDPR]
- Data management
  - Remove learner data [GDPR]
  - Remove old activities data [GDPR]
- SEND
  - Define SEND categories
  - Manage learners SEND data
- Result analysis [Alpha]
  - Statistical information
  - Global access to TeSLA results for learners (Course, Semester, Degree , ...)