

NDT Products available

Augmented\Virtual Reality



NDT Products available

P.3.1.3 Marko



Code	Name	Description	Use cases	Benefits
P.3.1.3	Marko	Mobile APP, AR based, for smart phones to provide safety/operating contents	• DY800	<ul style="list-style-type: none"> • Reduction of field activities duration • Improvement of safety during assets operation

Type	Business impact	Deployment cost	Relevance	Picture
Technical specifications / System / Product	High / Medium / Low	High / Medium / Low	High / Medium / Low	



Development status	Type of action	I&N unit affected	Technical reference
Solution prototyping and validation / Industrialization & System integration / Roll-out	Integration in Enel internal processes / System integration and deployment / Product deployment in the field	O&M / ND / NCO / HSE / Q&PT / BD / GP	Marco Altigieri



NDT Products available

P.3.1.8 Virtual Reality for training





Code	Name	Description	Use cases	Benefits	
P.3.1.8	Virtual Reality for training	<ul style="list-style-type: none"> Virtual Reality system for training 	<ul style="list-style-type: none"> Change of isolator Others 	<ul style="list-style-type: none"> Improvement of training activities through an immersive case experience through VR 	
Type	Business impact		Deployment cost	Relevance	Picture
Technical specifications / System / Product	High / Medium / Low		High / Medium / Low	High / Medium / Low	
Development status	Type of action		I&N unit affected	Technical reference	
Solution prototyping and validation / Industrialization & System integration / Roll-out	Integration in Enel internal processes / System integration and deployment / Product deployment in the field		O&M / ND / NCO / HSE / Q&PT / BD / GP	Marco Altigieri	

NDT Products available

P.3.3.3 NetNav



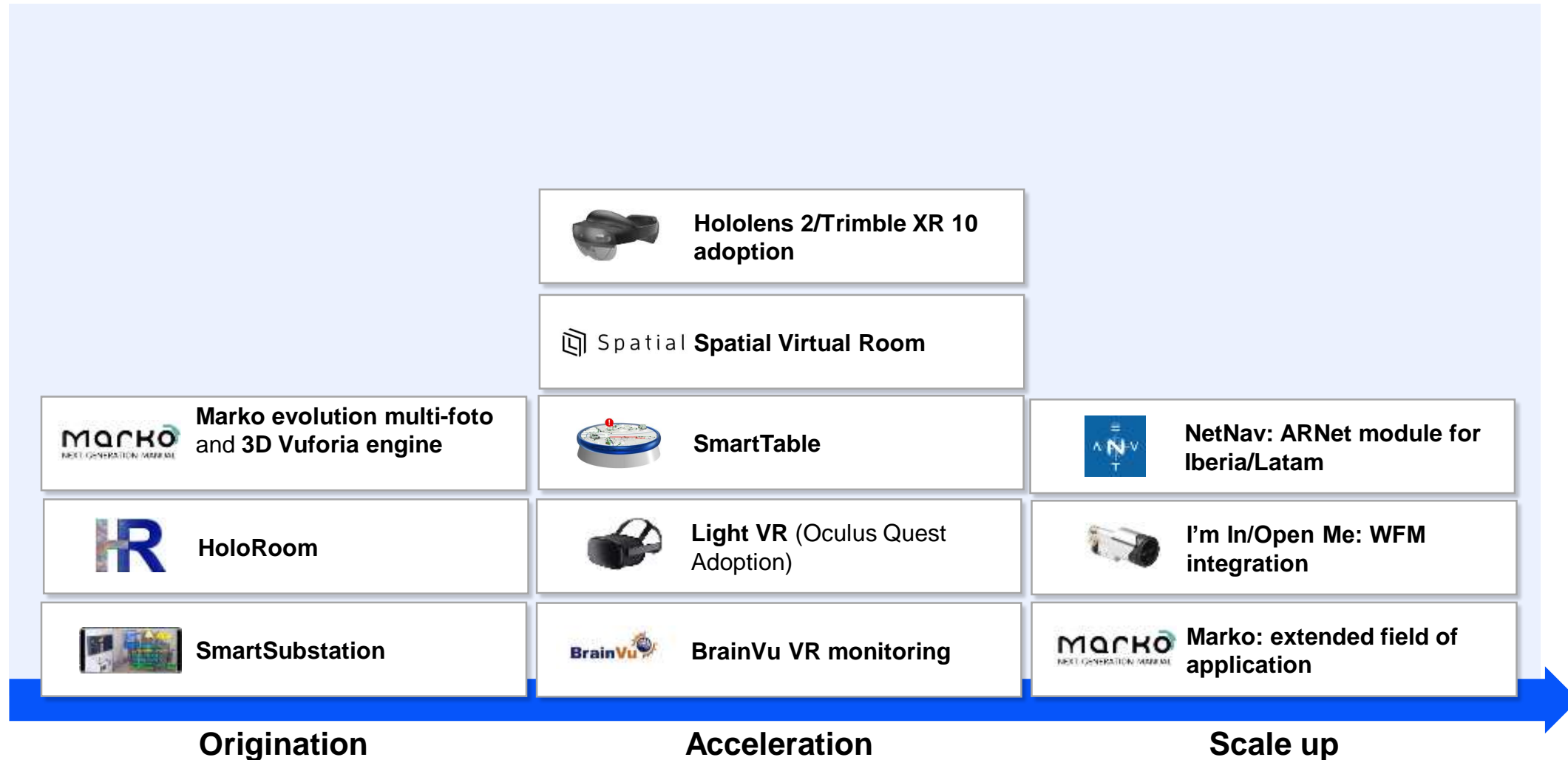
Code	Name	Description	Use cases	Benefits
P.3.3.3	NetNav	Mobile cartography system for smart phones	<ul style="list-style-type: none">• SCADA real time update from the field• LV cartography update through WFM smart phones	<ul style="list-style-type: none">• Actual network status and temporary additional power sources shown• Enhancement of performances and potential of on field surveys
Type	Business impact	Deployment cost	Relevance	Picture
Technical specifications / System / Product	High / Medium / Low	High / Medium / Low	High / Medium / Low	 
Development status	Type of action	I&N unit affected	Technical reference	
Solution prototyping and validation / Industrialization & System integration / Roll-out	Integration in Enel internal processes / System integration and deployment / Product deployment in the field	O&M / ND / NCO / HSE / Q&PT / BD / GP	Marco Altigieri	



Human Interfaces

State of the art

HI initiatives in Global Infrastructures & Networks





Scale up

Scale up initiatives



NetNav: ARNet module for Iberia/Latam



I'm In/Open Me: WFM integration



Marko: extended field of application

NetNav

ARNet adoption in Iberia and Latam.



Business challenge

Iberia is using a specific version of **NetNav** that is not compliance with the usage of **ARNet** (augmented reality projection of the power net) that can be a powerful tool for field workers in case of disasters.

Solution

Develop a specific version of ARNet capable to read the data from NetNav Spain and act like the version nowadays running in **Italy**.
Due Latam countries are using the same NetNav version of Iberia this will lead to the capability of use ARNet in Latam countries too.
A **demo App** has already been developed and successfully tested

Needs I&N Iberia

Owner

Company Arcoda

Location Spain 

Project Timeline



Marko/MCM

Extended coverage .



Business challenge

On field workers have recently witnessed that the **availability** of on field **documentation**, related to their tasks, it's more relevant than the **Remote Assistance**. So they asked for detailed documentation on several tasks and an easy way to retrieve it.

Solution

Marko and **MCM** bundle is already the right solution for the fieldworkers need. It requires the developing and uploading of the contents on the central consoles. Documentation will be developed/delivered on two main topics:

- On field documentation for Primary Substation (NDT initiative in Stream 3)
- Electrical Connector in Zone Reggio Emilia

Needs NT&I

Owner

Company weAR

Location Italy



Project Timeline



I'm In/Open Me

WFM integration



Business challenge

In **Iberia** pilots on **I'm In/Open Me** apps were positive. In 2020 the project will be scaled up. It's now mandatory to integrate the Apps with the Work Force Management environment.

Solution

Applications must be integrated with **MobAuth** WFM authentication tool and with **SecureBeat** to provide users profiling.
A specific meeting has been held in Barcelona to present MobAuth integration methods
The same development will be extend for **Italy** e-Intro/Open me solution in 2020.

Project Timeline



Needs I&N Iberia
Owner
Company Cibernos

Location Spain



Origination/Acceleration

Origination/Acceleration initiatives



SmartGlasses: HMT1 feedback, Hololens 2 arrival, Eyesight Raptor v1 light set

 **Spatial:** Licensing and development



Teams: new functionalities and opportunities



SmartTable: evolution



Marko: new recognition engine



SmartSubstation: first steps



HoloRoom (Mesa de Operacion)



Light VR: Oculus Quest



BrainVu VR: BrainVu test

SmartGlasses

RealWear HMT1 and FieldBit Pilot Test.



Deepening

Business challenge

Prove on field benefits adopting Remote Assistance and Remote Quality Control

Solution

1. Acquire x monocular SmartGlass (**RealWear** HMT1) and y **FieldBit** remote assistance software licenses.
2. Set two different pilots in Omega and Reggio Emilia with z workers in order to collect the feedback from a real on field experience

The pilots proved good results on software but a very **negative** outcome from the **HMT1** usage on field. Based on fieldworker experience such smartglass can't be used on daily operations.

Needs	I&N Italia
Owner	Mirco Kildani
Company	FieldBit

Location	ITA 
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Project Timeline



SmartGlasses

Hololens 2



Deepening

Business challenge

Test new Microsoft Hololens 2 capabilities and Enel smartglass requirements (both for use on field and in office)

Solution

Acquire 4 **Hololens 2** (delivered in Nov 2020) and 2 **XR10** to perform hardware and software tests
It has been agreed the order of **21** Hololens 2 and **31** XR10 to be delivered at the beginning of 2020.

At a first glance **pros/cons** of Holo 2 are the following:

Pros

- Easy to wear and readiness in viewing
- Interface
- FOV

Cons

- Brightness
- Aliasing
- Apps porting from Hololens 1 requires a good effort

Project Owner GI&N NT&I. + BL

Owner

Company Microsoft

Location ITA 

Project Timeline



SmartGlasses

EverySight Raptor V1



Deepening

Business challenge

For many **Remote Assistance** on field purposes **AR** is **sufficient**. Moreover a device lighter and easier to wear is requested from workers

Solution

Start to test light smartglass capable to be worn almost like ordinary sunglasses. **Rokid** solution has been prompted for some year but are not on the market yet. **Raptor v1** smartglass from **EverySight** are already in production and could be a suitable solution.

Raptor v2 should be available in 2021 providing v1 functionalities but with a lighter hardware, more similar to sunglasses.

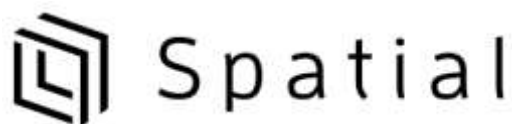
Project Timeline



Project Owner	GI&N
Owner	
Company	EverySight
Location	ITA 

Spatial

Licensing and developments



Deepening

Business challenge

Start **Spatial** usage in Virtual Room and define requirements for future integration in **HoloRoom** project (see specific slide)

Solution

Acquire 60 licenses for 1 year
Licenses will be available in 2020. The product runs on **Hololens 2**, gaining a much more intuitive **user interface** and new **functionalities**.
From January 2020 a beta version, capable to run on Oculus Quest devices, has been released and it is currently under testing.

Project Timeline

Origination
Jan 2019

Licenses purchase
Dec 2019

Licences expiration¹⁷
Dec 2020

Project Owner

NT&I + NT Italy

Owner

Mirco Kildani

Company

Spatial

Location

ITA



SmartTable

Developments



Deepening

Business challenge

Upgrade the **SmartTable** Demo in order to become a fixed product and add new layers

Solution

Develop a new software, running on **Hololen 2**, capable to manage all the requested layers and connected to Central System applications.

The product, together with Spatial, will be one of the pillars of **HoloRoom** (Mesa de Operacion) planned for NDT Iberia

New functionalities required are:

- Satellite map background
- Elevation profile
- Field workers geopositioning
- Log of substation entries - Alphanumeric researches
- Filtered graphic information
- Data from weather forecast system (GE)

Project Owner

NT&I

Owner

Company

Arcoda

Location

ITA/SPA



Project Timeline

Origination
Feb 2019

Development
Jan 2020

Delivery
June 2020

HoloRoom (Mesa de Operacion)

Spatial and SmartTable integration



Business challenge

A tool for **Control Rooms** able to share contents among Enel and non-Enel actors in a faster and more effective way than standar video calls.

Solution

Developing of **HoloRoom**, based on the integration of the **SmartTable** inside the **Spatial** Virtual Room (see specific slides).

HoloRoom will allow interactive meetings much more effective than video call, especially in case of crisis units that have to manage large outages and disasters. It will allow high complexity meetings, both for number of participants and stressed conditions, sharing plenty of information that can be interacted by everyone including the Power Net navigation and drill down.

It requires the SmartTable **update**, with a cost of about **300K** euro (see SmartTable slide)

Needs

I&N Iberia
NT&I

Owner

Company

Spatial,
Arcoda

Location

Spain



Project Timeline

Origination
Sep 2019

Creative Session
Jan 2020

Development
Feb 2020

Delivery
TBD

SmartSubstation

Localization engine development



Deepening

Business challenge

To provide a tool capable to easily query and display net elements inside a substation in order to correct mismatching between inventory and real framework

Solution

Develop an **AR** application that can show the net elements characteristic, static and dynamic, on a superimposed layer.

In **November** 3D scanning have been done in Piacenza in three **POC 100** substations in order to have the IoT dynamic values availability.

Two different **techniques** of user **position/orientation** determination are under test.

The output can be used both on field, allowing an intuitive and easy tool to check substation inventory and in central operation room where the user can explore a 3d model substation reading via AR the IoT values and net elements data.

Project Owner	NT&I +NT Italy
Owner	Mirco Kildani
Company	Arcoda

Location **ITA** 

Project Timeline



Light VR - Oculus Quest

New VR set adoption



IPPR

Business challenge

VR sets are very expensive. This is a limit both in extend its usage to external contractors and in allow multiple trainees to do parallel sessions.

Solution

Oculus Quest are **VR visors** characterized by:

- All in one configuration
- **Low cost** (around **500 €**)

Oculus Quest adoption will allow to redesign the spreading map of VR training scenarios both due the economies of scale and the ease of use.

Moreover, halfway through 2020 **hands recognition** will be delivered allowing an easy and intuitive interaction.

The same device, always in 2020, will be **Spatial** compliant extending the scope.

In December three Enel training **scenarios** have ported on Oculus Quest with very **positive feedback**.

Project Owner NT&I

Owner

Company H-Farm

Location ITA 

Project Timeline



Marko/MCM

.Engine evolution: multifoto and new Vuforia 3D engine adoption



Business challenge

Due the effort required for AI object recognition an application able to recognize in a fast and reliable way net elements is required. Nowadays Marko recognition works well only on target front views.

Solution

Update Marko engine in the following ways:

- Introduce a multiple foto input (3-4 shots instead of 1) allowing a recognition able to act from different view angles
- Introduce new **Vuforia Studio** 3D model recognition that compares CAD model with real objects, allowing an extremely precise AR layer projection

Both are techniques to be tested and proved in their feasibility

Needs

I&N Italy
GO&M

Owner

Company

weAR

Location

Italy



Project Timeline

Origination
Nov 2019

Development
Feb 2020

Delivery
June 2020

VR - BrainVu test

Active feedback on VR session training



Business challenge

VR sessions nowadays can't detect direct feedback on the **trainee status** and the effectiveness of the training. Such parameters can add a valuable feedback to adjust both the scenarios and the flow of tasks execution.

Solution

BrainVu technology, based on **iris scanning**, provides validated, accurate, fast and unique mental measures that **non-intrusively** and remotely capture biomarkers such as EEG, providing a tool on neurocognitive signals in the human-machine interaction process.

This can be easily used to evaluate the worker's response when involved in a VR training session. Possible compare of the results with **Elbit** sensor under test in **Leonardo-Agusta** in a similar initiative for helicopter pilots.

Project Owner GHSE
Owner Grasso
Company BrainVu

Location ITA 

Project Timeline



Teams

New opportunities



Deepening

Business challenge

Define a suitable tool for Remote Assistance

Solution

Test Teams new functionalities:

1. Microsoft Remote Assist on **Hololens 1-2**
2. Microsoft Remote Assist on **Android Smartphone**
3. Integration with **Spatial**

The first tests on point 1 and 2 were positive. Integration with Spatial (3) will be available in mid 2020

Having a unified point of entrance for calls, remote assistance, virtual rooms and teams management could greatly **improve** collaboration **performance**

Thanks

