# *Virtualization of radio networks to feed real realistic training or realize VV&A process*

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**(with special thanks to Pascal HUE and Cyril ROUVIERE)**
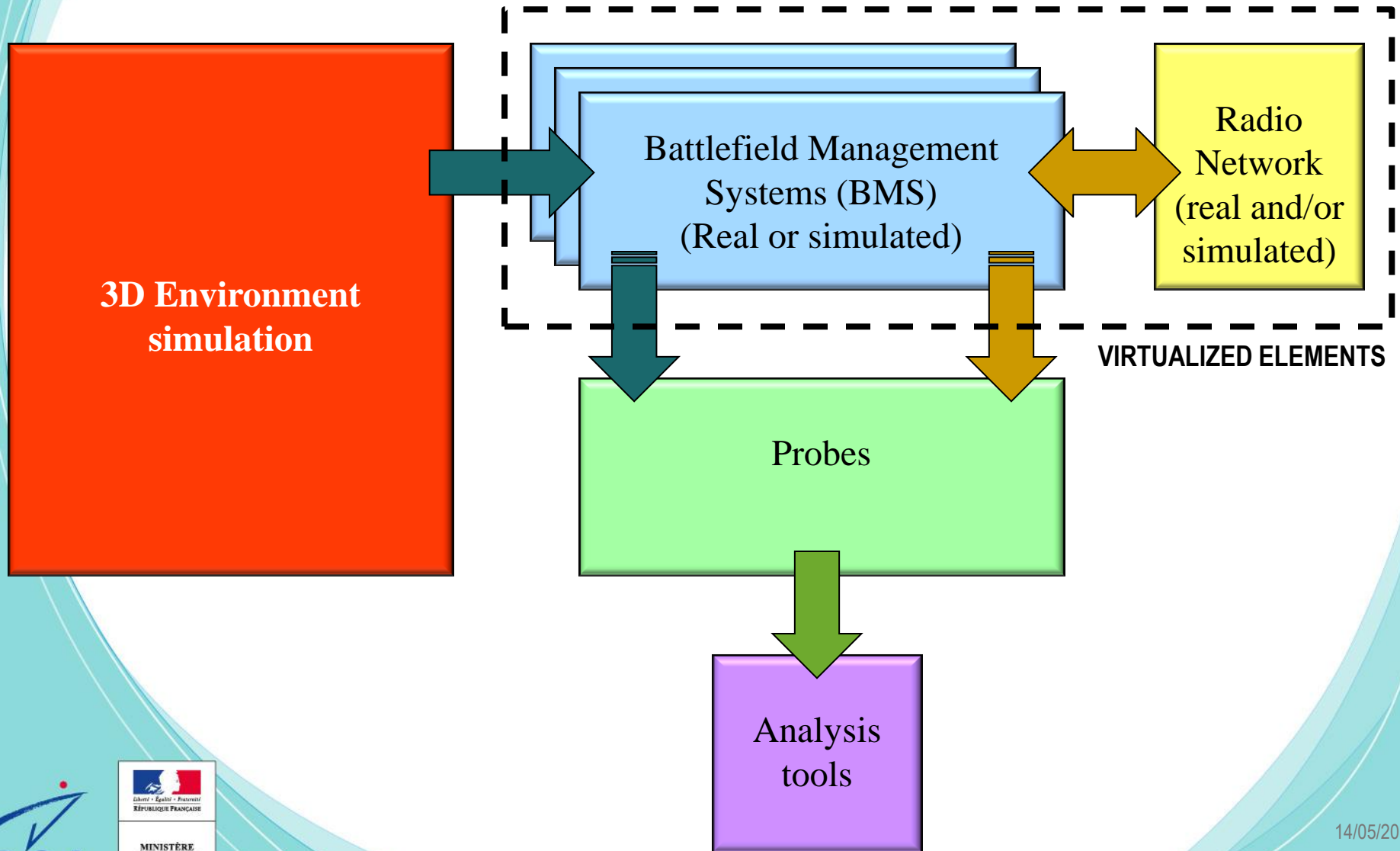
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# Problematic to solve

- **Efficient « Bottom to End » evaluation (VV&A) to prepare a « scale 1 » manouver or operation**

- **Training soldiers/crews in realistic conditions**

**→ Realistic environment needed to represent effect of numerous exchanges in a rather large network,**

- **From « Peer to Peer » to « Chain/grid » validation**

- **Effects of massive exchange on the network (MMI and data transfer)**

- **Many types of border effects not taken into account**

- **Scaling often not representative**

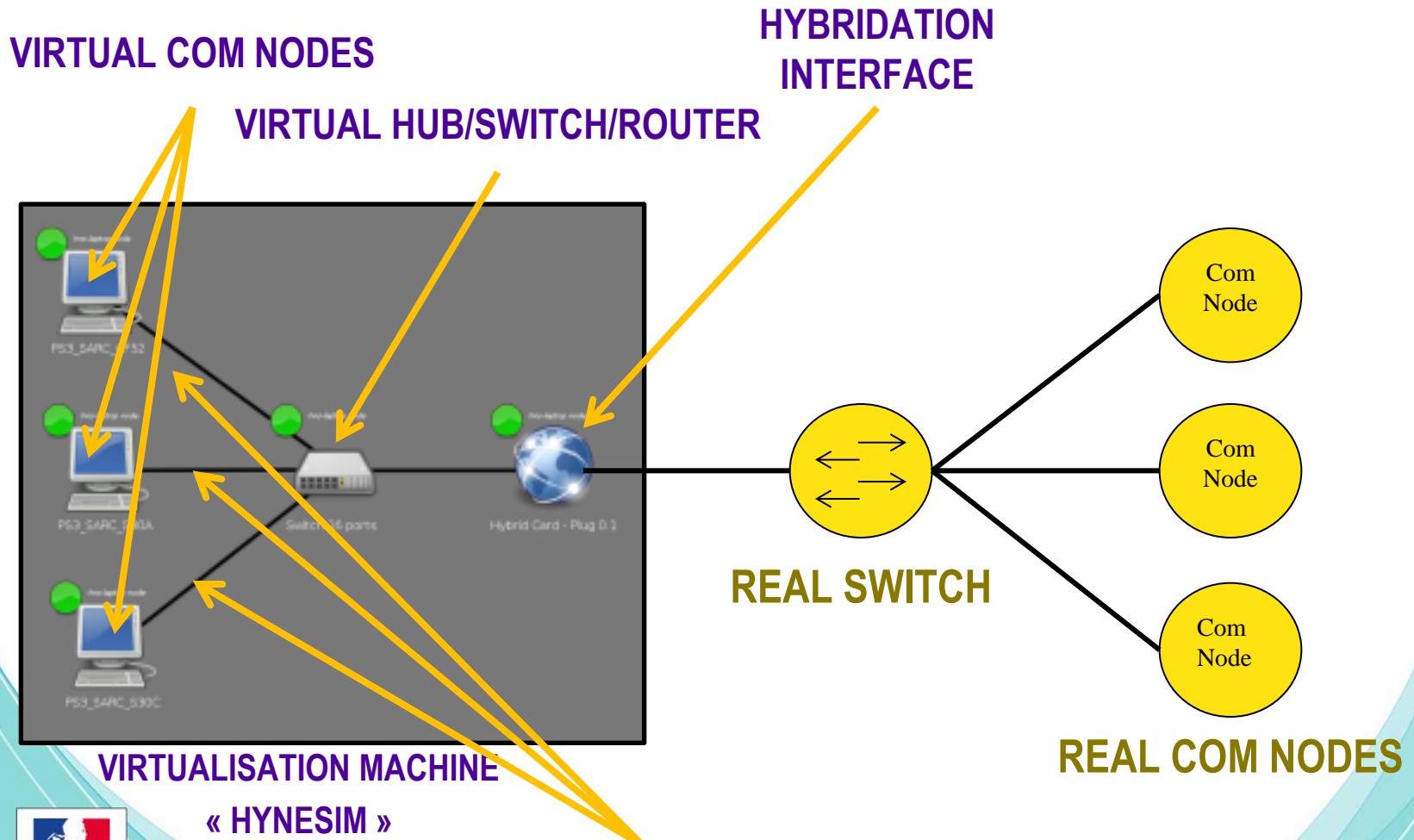- **Performances  (radio realistic effects due to 3D environments)**
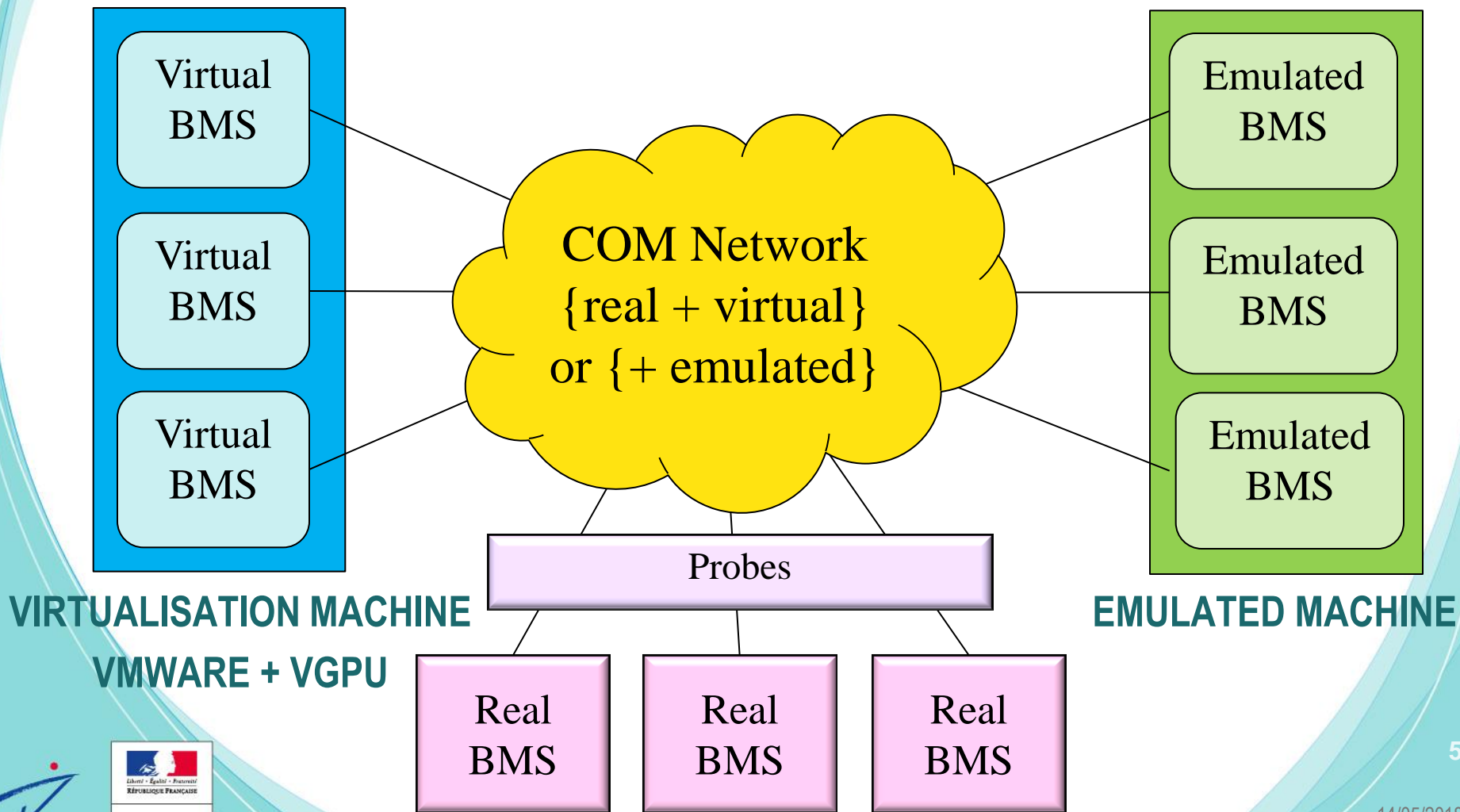
# VV&A cases
## Global organisation



3D Environment simulation

Battlefield Management Systems (BMS) (Real or simulated)

Radio Network (real and/or simulated)

**VIRTUALIZED ELEMENTS**

Probes

Analysis tools

# Virtualisation Process
## How to virtualize and to hybridize networks



**VIRTUAL COM NODES**

**VIRTUAL HUB/SWITCH/ROUTER**

**HYBRIDATION INTERFACE**

**REAL SWITCH**

**REAL COM NODES**

Com Node

Com Node

Com Node

**VIRTUALISATION MACHINE « HYNESIM »**

Simulate radio ranging and availability (via CGF)

# Virtualisation TASKS
## How to efficiently virtualise BMS



**VIRTUALISATION MACHINE**

**VMWARE + VGPU**

Virtual BMS

Virtual BMS

Virtual BMS

COM Network
{real + virtual}
or {+ emulated}

Emulated BMS

Emulated BMS

Emulated BMS

**EMULATED MACHINE**

Probes

Real BMS

Real BMS

Real BMS

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# Virtualisation main interests

- **Possible scaling to represent a real battlegroup with only 10 real personnals**

- **Quick reconfiguration of the platform to represent a new scenario :**
  - **Pool of VMs**
  - **MMI to supervize virtual network**
- **Hybridization with the real equipment**
- **Cost killed compared to real**
  - **For VV&A platforms**
  - **For training centers**

# Virtualisation limitation and validity area

- **Performances biais**
  - ➢ **Probes are not reliable in a virtualised element**
  - ➢ **Virtualised elements are only intented to generate realistic ambiant noises**

- **No hybridation between real/virtual network and simulated network**
  - ➢ **Real/virtual to sharply mesure performances of some elements**
  - ➢ **Simulated to estimate the performance of a « big » network**

- **Specific hardware/software needed compared to simulation only**

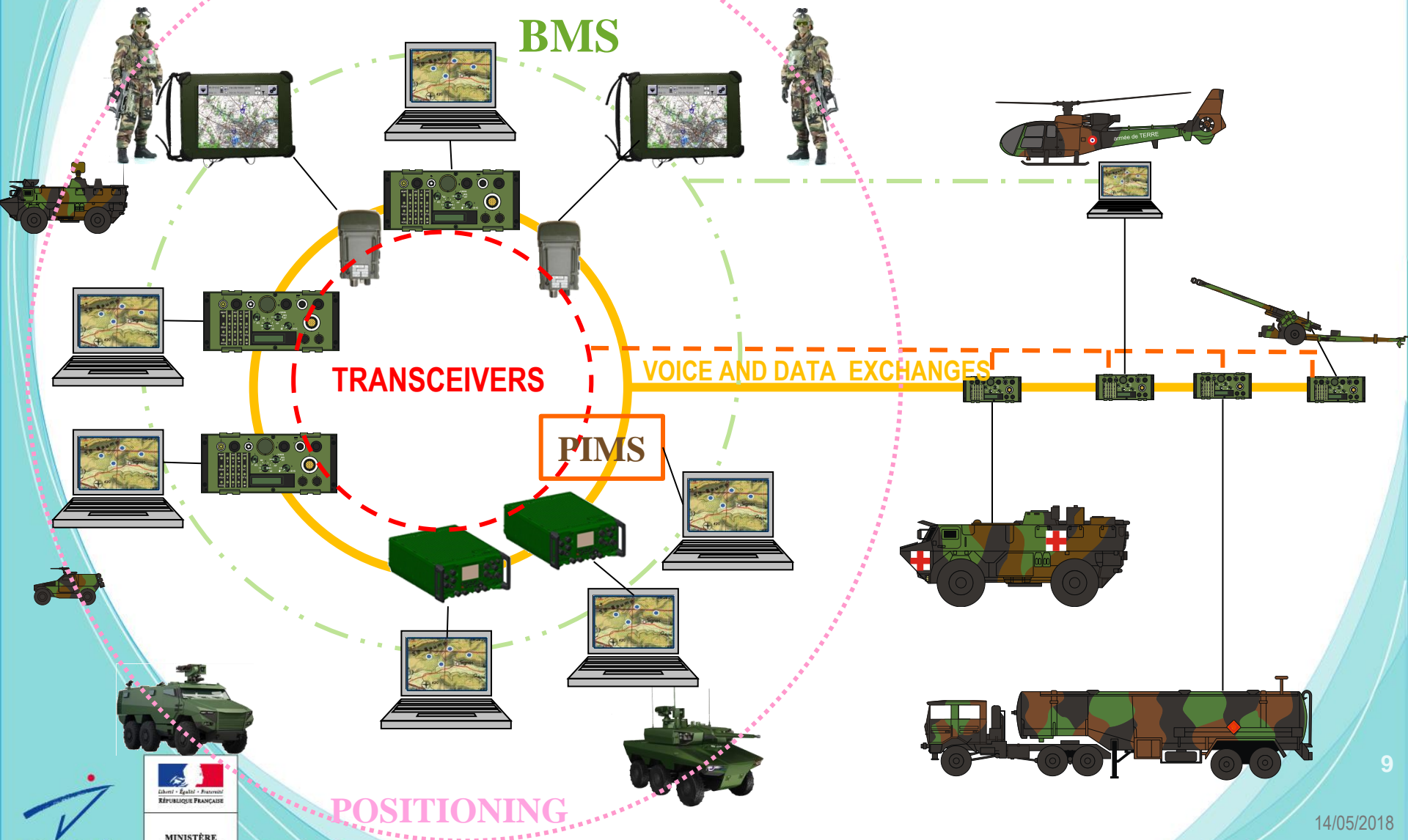DGA

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# Theory

# Or

# Reality

# ?

# How can you validate that situation?
## (around 120 connected elements)



BMS

TRANSCEIVERS

VOICE AND DATA EXCHANGES

PIMS

POSITIONING

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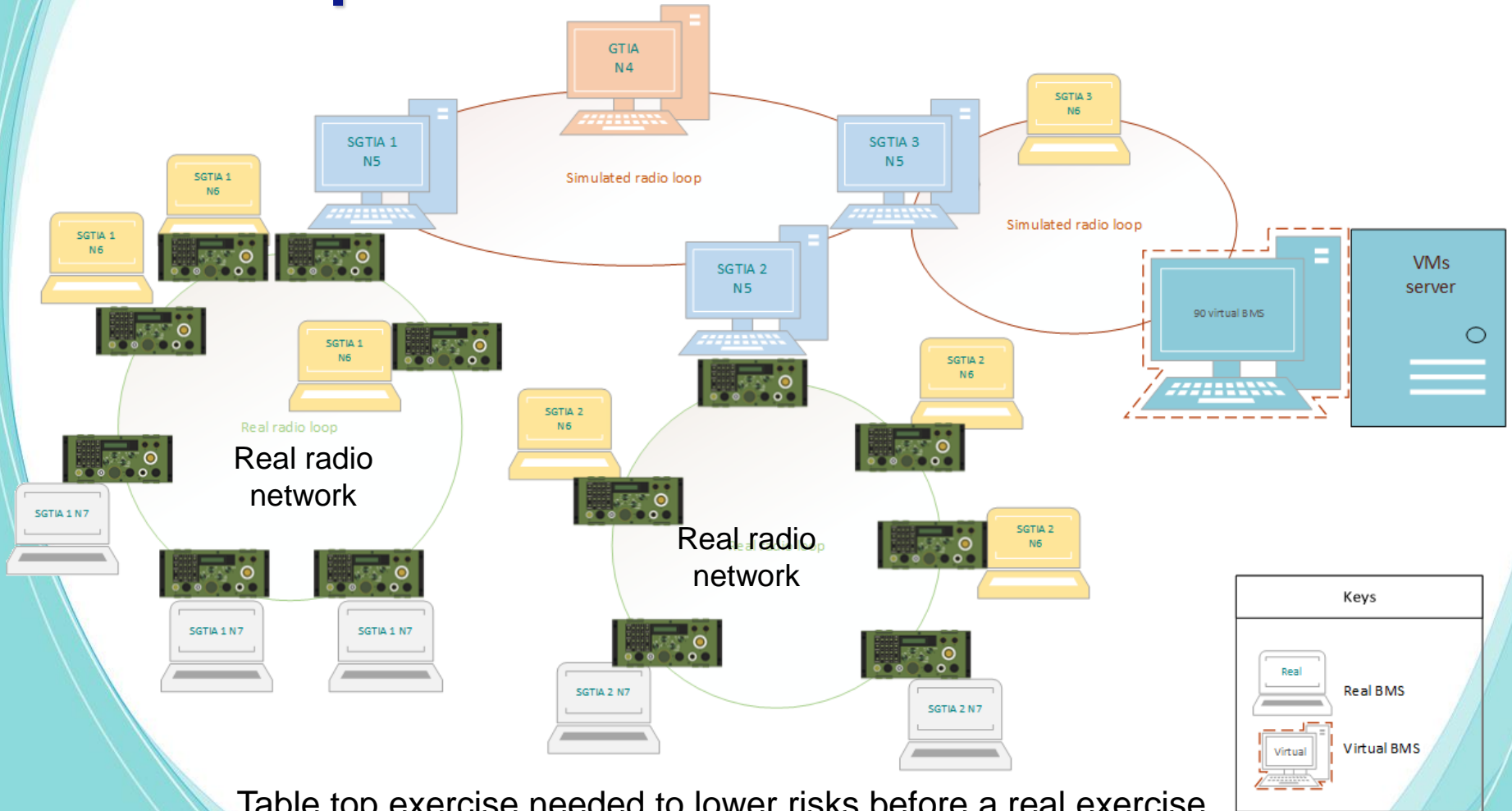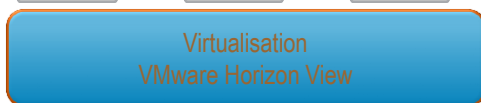# Proof of concept validated for « land C4I qualification»



Table top exercise needed to lower risks before a real exercise with army forces (incl. 300 soldiers and 120 vehicules)

Necessity to represent more than 120 elements connected to the radio network
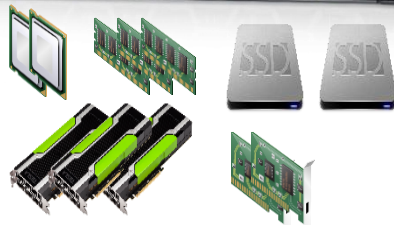
# Proof of concept : specific equipment



RDP ou PCoIP enabled terminals

APP
OS

APP
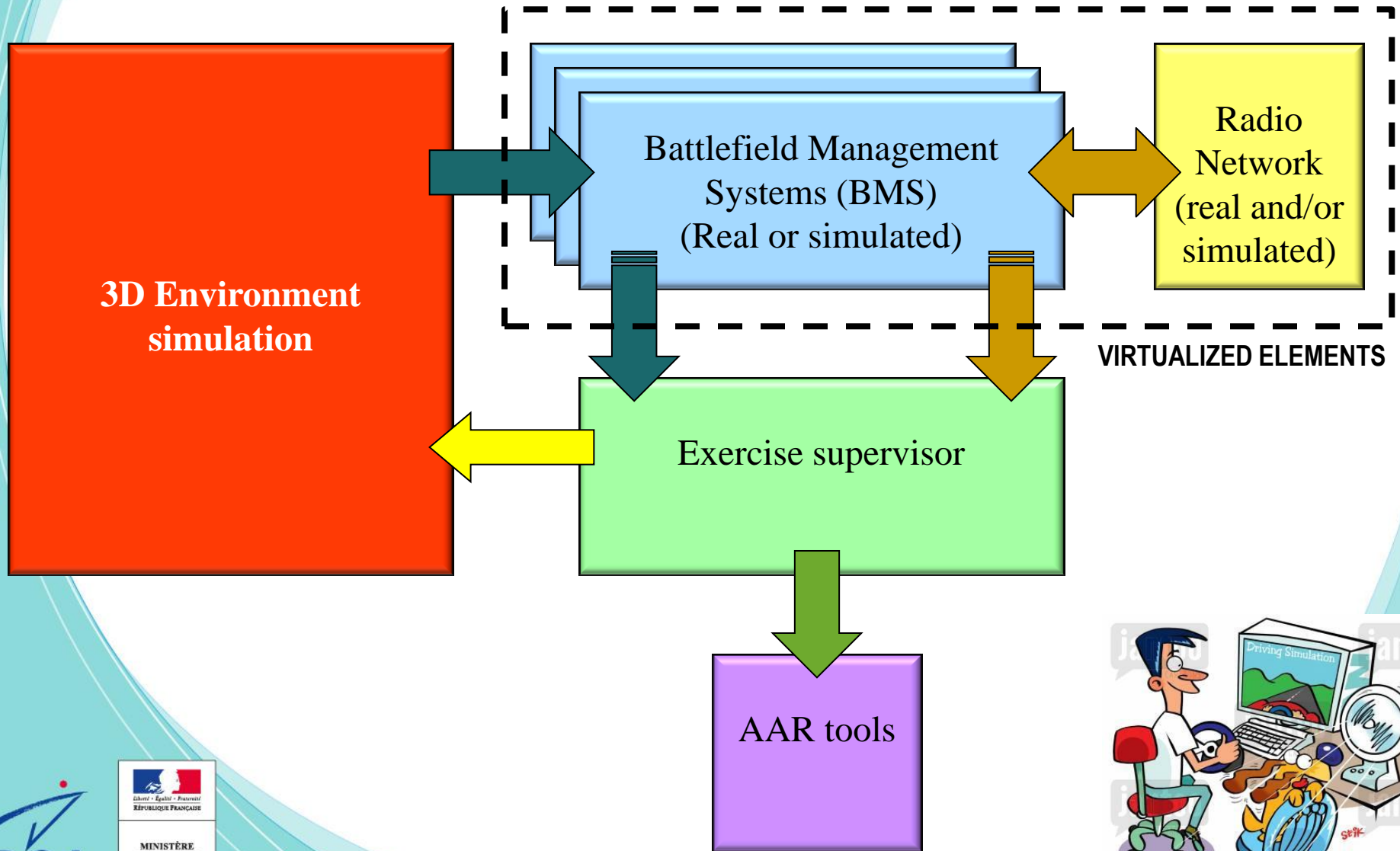OS

APP
OS

APP
OS

APP
OS

APP
OS

Virtualisation
VMware Horizon View

Virtualisation
VMware Horizon View

vmware
Horizon View

DELL
PowerEdge R740

3x Nvidia P40
+ Nvidia Grid software

# Training cases
## Global organisation



3D Environment simulation

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**VIRTUALIZED ELEMENTS**

Exercise supervisor

AAR tools

# PRO & CONS : quotation synthesis

|  | BMS Real | BMS Virtual | BMS Simul | COM Real | COM Virtual | COM Simul |
|---|---|---|---|---|---|---|
| **Performances representativity** | 5 | 4 | 1 | 5 | 4 | 3 |
| **Functionnality completeness** | 5 | 5 | 2 | 5 | 5 | 2 |
| **Large upscaling** | 2 | 4 | 5 | 1 | 4 | 5 |
| **Supervision** | 2 | 4 | 5 | 1 | 5 | 5 |
| **Probe & Spy** | 2 | 3 | 5 | 1 | 3 | 5 |
| **Internal stimulation** | 1 | 1 | 5 | 1 | 3 | 5 |

*No ideal solution, so …: Hybridation art is to create a real time architecture with a mix of all configuration in order to get all the advantages from each part (perfs measurement on real, loading with virtual, overcharge with simulated)*

**Thank you for your attention !**


**…. Questions before I leave ?**