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#### **C2 Subsystem Architecture**



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#### **Presentation outline**



- C2 Subsystem Nodes
- Platform Deployment
- C2 Software Architecture
- OCU Software Layout

#### **TOL®S** C2 Subsystem Functionalities



- C2 mission planning and execution
- Teleoperation of unmanned vehicles
- Remote control and status monitoring of unmanned systems and payloads/sensors
- Autonomous tasking of unmanned vehicles
- Situational awareness
  - Tactical map
  - Surveillance
  - Event notification / sensor track data

Intelligence

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- Command & Control (C2) Subsystem will demonstrated at "Unmanned Units Command Center (UUCC)"
- C2 Subsystem have interaction with all other subsystem.
- The UAV and Static Sensor Tower subsystems and 3D Maps/Terrain Model Generator will be simulated within UUCC.

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#### C2 Subsystem Nodes (cont.)

- UUCC is divided into four groups:
  - 1. Command Control Units
    - Commander OCU
    - UGV Operator OCU
    - World Model Knowledge Store (WMKS)
    - Video/Audio Recorder (NVR)
    - RTK Base Station
    - Emergency Stop
  - 1. Communication Units
  - 2. Simulated Subsystems
    - UAV Simulator
    - Static Sensor Tower Simulator
    - O 3D Maps/Terrain Model Generator
  - 1. Platform

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#### **OCU Software Layout**







- Monitor 1 is used for tactical and mission related information.
- Monitor 2 is used for teleoperation, remote control and status monitoring purposes.
  - Each unmanned system has its own perspective. The user can switch between different unmanned systems.

The user can define custom perspectives for multiple Transportable Autonomous patrol for Land hOrder Surveillance system – TALOS sensor surveillance or other specific purposes.

UGV Default Operational Perspective    Image: Construction of the second secon			
System Configuration HEPP      Image: Im	Image: speed of the state of the speed	Properties    Driving Camera      Diving Camera    Driving Camera      Camera Type:    Day TV ()    R ()    White Hot ()      Day TV ()    R ()    White Hot ()    Day TV ()      Day TV ()    R ()    White Hot ()    Day TV ()      Camera Type:    Day TV ()    R ()    White Hot ()      Day TV ()    R ()    White Hot ()    Day TV ()      Cons:    ()    R ()    ()    ()    R ()    ()    ()    R ()    ()	C2 Units UGV 1 - Observer Control Units Control Units Peripheral cam Platform UGV 2 - Observer UGV 3 - Interceptor Sensor Tower 1 Control Units Sensor Tower 1 Control Units Control Units Control Units Combine Control Units Control Units Control Units Control Units Control Units Control Units Control Units Control Units Control Units Combine Control Units Control Units Control Units Control Units Combine Control Units

Graphical Dashboard











### **UGV & Subsystems**

Place, Date



UGV Platform subsystems



#### **Presentation Contents**

- Dumur TAGS platform capabilities
- Onboard Sensors Layout
- User Questionnaire

Place, Date



#### Platform Capabilities Specifications



- Engine: 100hp, 3800cc quad cyl. Turbo Diesel
- Drive: Hydrostatic, Tandem Variable
  Displacement Piston Pumps, 4 High Torque
  Modular Wheel Motors.
- Dimensions: 2m(W)x3m(L)
- Weight: 1600kg
- Track footprint: 4x 42cm wide, 92cm long

Place, Date



#### Platform Capabilities Performance



Place, Date

- Ground clearance: 36cm
- Top speed: 35 km/h
- Turning radius: 0 (Pivot)
- Payload capability: 1200kg
- Traversability (all weather)
  - 30% entering/pullout slop
  - 35% side slopes
  - 50cm positive obstacles
  - 40cm deep water
  - 50cm deep snow/mud









## **Communication Subsystem**





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- Continuous and transparent communication in real time between all involved subsystems (nodes): umanned vehicles and command centers
- Security → redundancy using heterogeneous networks (mesh

o others Tran



### TALOS Communications Requirements



- Sufficient QoS and configuration priority (data rate, packet loss, latency, availability, priority) for feasible operation
- Secure network between system units.
- Capabilities of monitoring communications health
- Over the entire operational section, incl. NLOS
- Transportable (standard trailers) and deployable according to TALOS system concept.



# TALOS Network Architecture

- TALOSNet based on TALOS Base Stations (TLS) and TALOS Remote Stations (TLR).
- Additional node for demo: Escort Vehicle
- •The objective:

Construction of a heterogeneous topology incorporating multiple radio access technologies (RATs)

- Primary Communications → Mobile WIMAX
- Backup Communications → CDMA2000
- Safety Communications  $\rightarrow$  WiFi and FM





#### Communications System Implementation

Three type of nodes in the Network

1 TLS node: Unmanned Unit
 Command Centre (UUCC)

• 2 TLR nodes: Unmanned Ground Vehicles (UGVs)

2 Escort Vehicles

•Three different Networks for interconnecting the nodes:

- Primary subsystem
- Backup subsystem
- Safety subsystem



# Nodes Architecture Overview





## **Channel Architecture**



- Primary: Data (Radar, Mission, Commands), Video (Driving, Surveillance), Audio, Emergency Stop
- Backup: Data (Mission, Commands), Video (Driving), Emergency Stop

Safety: Video (Driving), Emergency Stop



## THANK YOU