The Internet Research Centre

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Next-Generation AI Agents for Real-World Applications in the ApplyAI sectors

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Defence, security and space
Use Case: Agentic MBSE for Sovereign Supply Chains

Current Model-Based Systems Engineering (MBSE) tools for space component certification suffer from reliance on non-European, legacy software for critical asset design with steep learning curves and manual requirement tracing.

Use case proposal: "Engineering-as-an-Agent"

- Agentic Orchestration: Agents that translate high-level mission requirements into verified technical specifications.
- Verification Agents: Real-time identification of design inconsistencies against ESA/ECSS standards.
- Reduce Time-to-Market by accelerating certification cycles and lower the entry barrier for SMEs.
- Underlying agentic framework designed for **horizontal transfer** to other highly regulated ApplyAI sectors like Aeronautics, Defense, and Nuclear Energy.

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Defence, security and space
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i2CAT's contribution:

- Development of Next-Gen AI Agents that democratize complex systems engineering by replacing 'user-unfriendly' legacy software with an intuitive, agent-led MBSE platform.
- Development of a transferable agentic architecture that automates compliance and requirement tracing
- Ongoing collaboration with a specialized ESA-backed EU startup

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Mobility, transport and automotive
Use Case: An agentic architecture across contexts

Next-generation AI agents act as the “central brain” for a **federated, interoperable platform that manages vehicles and infrastructure**, enabling autonomous, goal-driven decision-making and real-time adaptation.

Multimodal AI-based architecture:

- Simultaneous processing of diverse data types: visual (camera/LiDAR), textual (traffic laws/API reports), and temporal (state memory).
- Memory-augmented intelligence: real-time situational awareness (i.e.., position and trajectories of traffic actors) and lifelong learning (i.e. edge cases).
- Tool Integration: agents autonomously access external APIs (weather, infrastructure Digital Twins) to overcome the knowledge cut-off of static AI models.

Mobility, transport and automotive
Use Case: An agentic architecture across contexts

Cross-Domain implementation to demonstrate that Multimodal AI-agents can transition their reasoning logic across diverse domains

Beyond automation:

- Moving from fixed-rule algorithms to Large Multimodal Models (LMMs) to implement autonomous goal-oriented reasoning.
- High-level instruction processing.
- Sub-goal decomposition: breaking complex trips into manageable steps (perception / risk assessment / decision-making).
- Self-optimization: continuous real-time adaptation based on environmental feedback.

Deployment and scaling Through AI Factories and EDIHs, aligned with CCAM and ECAVA priorities.

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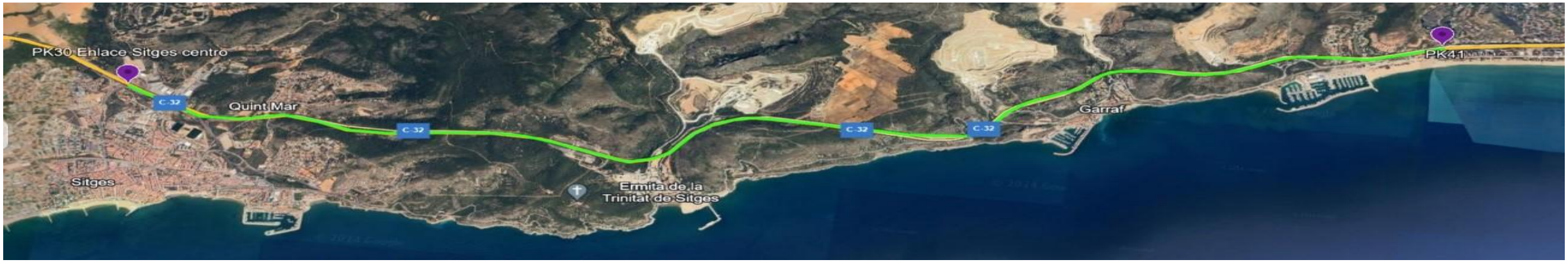
Mobility, transport and automotive
Use Case: An agentic architecture across contexts

Proposed pilot site 1: C-32 motorway (higher speed, lower complexity)

Focus: Predictive safety, traffic flow efficiency, etc. Data Source: Real-time V2X (Vehicle-to-Everything), sensor information, telemetry.

Use case deep-dive:

- Leverage digital twins for smart traffic management functionalities
- Cooperative maneuvers



Mobility, transport and automotive
Use Case: An agentic architecture across contexts

Proposed pilot Site 2: i2CAT Mobility Lab at Port of Barcelona (Low Speed, High Complexity)

Focus: Multi-agent coordination between autonomous trucks, cranes, and vessels. Data Source: Digital Twins, multi-sensor fusion. Goal: Prove the agent's transfer learning capabilities applying "safety reasoning" from the highway to the crowded port environment.

Use case deep-dive:

- Vehicle remote management during logistics operations
- Other multi-agent collaboration in global logistics

AI-agent and architecture validation:

- Interoperability of the AI-based platform across different domains.
- AI-agent performance in specific use cases: reduction of vehicles "idle time," traffic-flow efficiency, no safety incidents during "hand-over" zones, reduced fuel consumption, etc.

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Electronic communications

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