A Concept Note

Wakanda Beyond Peer Action Group

Foundational steps for an Open Source UTM

Overview

Unmanned Traffic Management (UTM) systems are pivotal for ensuring the safety and security of drone operations commercial closed-source UTM solutions present substantial challenges explained in detail in the Wakanda Beyond toolkit and summarised below. Wakanda Beyond members are interested in open UTM solutions, however they are not as easy to procure and start using as an off the shelf commercial solution. Open source UTM offers a promising alternative to overcome some of these issues. They can offer modularity, ease of maintenance, cost-effectiveness, and enhanced in-house capabilities without compromising on security e.g. by not having back door channels. Nevertheless they can be complex to implement and they generally need a greater technical knowhow on the side of the CAA.

Our objective is to support Civil Aviation Authorities (CAAs) in overcoming the conceptual, technical, and organizational hurdles in implementing sustainable open source UTM systems. We also seek to facilitate ongoing shared learning and exchange amongst peers as they navigate how to identify, procure, use and continually expand and refine an open source UTM solution.

The challenge

Open source UTM systems offer significant benefits, including low initial costs and the flexibility to tailor solutions to specific needs. However, the adoption of open source UTM requires substantial expertise. The requirements range from selecting suitable open-source UTM solutions, defining the program framework, selecting and configuring hardware, installing the open source code on their server, adapting the interfaces to receive the live datastreams from the drones, configuring display options and enabling the desired analysis features. In order for CAAs to select the appropriate solution the hardware demands for an installation and the needed software skills and maintenance tasks must be defined and priced. Many CAAs lack the necessary expertise and resources to implement and manage these systems effectively. Furthermore, unlike commercial solutions, open source UTM initiatives lack dedicated sales teams to guide informed decision-making.

Our Proposed Solution

We propose a comprehensive approach to guide CAAs through the implementation of open-source UTM systems, drawing on the collective experience of projects and companies in this space. This support spans the entire process:

A. Designing Open Source UTM Specifications: Collaborate closely with CAAs to define system specifications that align with operational needs and resources available.

B. Hardware Requirements Identification: Describe the necessary hardware, including servers, internet access, and computing power, to support the UTM system.

C. Open Source UTM Software Selection: Guide CAAs in choosing open-source software based on performance, system capability, modularity, lifecycle costs, and compliance with international standards.

D. Implementation and Skill Development: Facilitate the phased installation of UTM modules, emphasizing experience accumulation, training, and the development of local expertise.stay informed and compliant. This will lead to safer and more responsible drone use.

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How it works

Our approach to implementing open-source UTM systems unfolds through a series of targeted steps, designed to align CAAs and operators towards a unified and adaptable UTM solution. Here's our step-by-step strategy:

A. Designing Open Source UTM Specifications

1. **Collaborate with CAA:** Engage in detailed discussions with CAAs to understand their specific UTM needs, covering the scale of drone operations, desired UTM features, and regulatory compliance requirements.

2. **Define Operational Scope:** Establish how many drones should be managed within the UTM system, including classifications based on size, usage, or airspace.

3. **Feature Specification:** Determine the key features of the UTM system, such as real-time tracking, geofencing capabilities, flight authorization mechanisms, and data analysis tools.

4. **Resource Assessment:** Evaluate the resources available for the UTM project, including financial budgets, technical skills, and human resources.

B. Hardware Requirements Identification

1. **Infrastructure Needs Analysis:** Outline the hardware requirements necessary for the UTM system, including server specifications, internet connectivity, storage needs, and backup solutions.

2. **Computing Power Assessment:** Determine the computing power needed for different UTM modules, considering data processing demands and future scalability.

C. Open Source Software Selection

1. **Survey Available Software:** Research and identify potential open-source UTM software options, focusing on their performance, limitations, and compatibility with the CAA's needs.

2. **Evaluate System Capabilities:** Assess each software's capability to manage drone operations effectively, its modularity for feature customization, and alignment with international standards (e.g., ASTM, EuroCAE).

3. **Life Cycle Cost Analysis:** Consider the total cost of ownership, including installation, maintenance, updates, and potential expansions.

4. **Community and Support Evaluation:** Look into the support ecosystem for the software, including developer communities, available documentation, workshops, and training opportunities.

D. Implementation and Skill Development

1. **Pilot Module Implementation:** Begin with the installation of essential UTM modules, prioritizing those that address the most immediate needs and offer the greatest impact on operational safety and efficiency.

2. **Onboarding and Training:** Develop comprehensive training programs for CAA staff and stakeholders involved in UTM operations, ensuring they possess the skills to manage, maintain, and extend the system.

3. **Transnational Collaboration Establishment:** Create networks and working groups that bring together experts from various countries to share experiences, provide mentorship, and collaborate on common challenges.

4. **Custom Development and Extensions:** Encourage the development of custom solutions and extensions tailored to specific country needs, promoting innovation and reducing redundant efforts across the participating CAAs.

5. **Iterative Expansion and Refinement:** Adopt a "start small and scale" approach, allowing for the gradual expansion of UTM capabilities as operational experience grows and technological advancements emerge.

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Expected results

The initiative will establish a structured organization process and offer technical support designed specifically to guide Civil Aviation Authorities (CAAs) through the adoption of open-source UTM systems. This support is characterized by providing reliable, independent, and unbiased guidance tailored to each CAA's unique needs. By focusing on the development of sustainable, modular open-source UTM solutions, CAAs will be empowered to build systems that are not only optimal for their specific operational requirements but also maintainable and expandable with in-house resources. This approach ensures CAAs are equipped with the knowledge and tools necessary to implement an open UTM solution that is secure, cost-effective, and future-oriented, fostering a self-sufficient and innovative approach to unmanned traffic management.

Outcomes

✔ **Enhanced Autonomy and Independence:** CAAs will gain significant independence from proprietary UTM solutions, leading to increased control over their drone traffic management infrastructure.

✔ **Sustainable In-Country Competence:** Development of local expertise in software programming, system maintenance, and hardware integration, promoting long-term sustainability and self-reliance.

✔ **Future-Proof UTM System:** Adoption of a modular and adaptable open-source UTM system, ready for future advancements and capable of evolving with the country's needs.

✔ **Increased Safety and Security:** A significant enhancement in the safety and security of drone operations, supported by a UTM system that is perfectly tailored to the CAAs' operational and regulatory environments.

✔ **Cost-Effectiveness and Affordability:** The open-source approach ensures that the UTM system is not only sustainable but also affordable, reducing long-term costs associated with licensing, subscriptions, and proprietary software dependencies. This affordability aspect makes it feasible for CAAs to allocate resources more efficiently and invest in further innovations within the drone ecosystem.

Join us

Become part of the Wakanda Beyond Alliance, joining forces with partners dedicated to enhancing drone safety and operational efficiency across Africa and beyond.

If you share our vision for a seamlessly integrated airspace, we invite you to express your interest. Together, we can contribute to making Africa the easiest place to fly drones safely.

AN INITIATIVE OF: DRONES DOING GOOD ALLIANCE   WITH SUPPORT FROM: UKaid from the British people   sada SMART AFRICA DIGITAL ACADEMY   FRONTIER TECH HUB