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Multi-Drone Network Management for Disaster Communication Restoration: Architecture, Implementation, and Field Validation

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Abstract

In this paper, we present a reliability-aware multi-drone network management platform for restoring disrupted mobile communication services after disasters. The scientific contribution is not a new PHY/MAC scheme in isolation, but a management model that couples role assignment, relay placement, telemetry/video synchronization, and energy-aware reconfiguration, together with an explicit mapping from that model to deployable software modules. The implemented integrated control system combines a ground control system, a WebRTC/Kurento-based video transmission platform, and a oneM2M/Mobius-based data transmission platform for mission, relay, and tethered drones. Field validation with one tethered drone, one wireless relay drone, and two wireless mission drones indicates that relay-assisted operation improves both downlink and uplink SINR by 4.17 dB on average relative to direct transmission, which corresponds to a 2.61-fold increase in linear SINR and about a 20% improvement in normalized spectral efficiency. Across the seven evaluated mission points, the relay-assisted topology also expands point-wise service availability from 57.1% (4/7 points) to 100% (7/7 points). These results indicate that the proposed management architecture provides a practical basis for rapid communication restoration while also clarifying current limitations in scalability, operator workload assessment, and explicit fault-injection validation.

Keywords: UAV; disaster communication; network management; drone control; mobile communication system; reliability; fault tolerance; LTE relay

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1. Introduction

Drones combine sensing, actuation, and wireless communication in a mobile platform that can react to the environment and execute missions in real time [1,2]. This combination is particularly useful in disaster areas, where terrestrial access is limited, and communication infrastructure may be partially unavailable. In such settings, mission drones can collect live video and telemetry, relay drones can bridge broken links, and tethered drones can provide longer backhaul support [3,4]. These complementary roles make multi-drone systems attractive for communication restoration tasks, but they also turn service continuity into a management problem rather than a single-link problem.

The broader UAV network literature already provides the communication background for this setting. Surveys have discussed civil UAV networking, cellular integration, and FANET communication architectures, highlighting recurring challenges such as intermittent

links, regulatory limits, mobility-driven topology changes, and security exposure [2,4,5]. Recent application papers have also shown the usefulness of drones for disaster observation and temporary coverage support [6–8]. However, most prior studies treated communication, sensing, or coordination as separate problems. What remains less developed is the management-layer question of how heterogeneous drones should be assigned, connected, supervised, and reconfigured so that communication restoration remains usable as wireless quality and battery state evolve during the mission.

This management perspective is important because disaster response drone teams must tolerate intermittent wireless links, battery depletion, single-drone failures, and safety constraints created by shared airspace. Recent reliability and collision avoidance studies confirm that redundancy, topology selection, and safe separation directly affect whether a swarm can keep operating under degraded conditions [9,10]. A practical restoration platform therefore needs more than live video and a graphical user interface: it must maintain a viable end-to-end communication path, keep telemetry and control synchronized with operator decisions, and degrade smoothly when part of the airborne infrastructure becomes unavailable.

Representative studies on multi-drone management can be grouped into four categories [11–25]. First, control-oriented works have improved flight robustness or search coordination [11–13,16]. Second, IoT-oriented platforms support telemetry aggregation and mission management [14]. Third, AoI- or graph-based methods optimize information freshness and cooperative networking [17–19]. Fourth, learning-based studies have optimized deployment, tracking, and coordination [15,22–25]. The simulation-to-deployment feasibility issue in learning-based networking is now being studied more directly; for example, feasible multi-agent reinforcement learning frameworks have been proposed for wireless MAC coordination under implementability constraints [26]. Even with these advances, the literature still lacks an end-to-end platform that explicitly couples communication restoration, telemetry interoperability, operator supervision, and field validation within one management architecture.

The scientific contribution of this paper is therefore at the management architecture layer. We do not claim a new PHY/MAC protocol or a new end-to-end optimization algorithm. Instead, we formalize service continuity for heterogeneous mission, relay, and tethered drones in terms of role assignment, path availability, telemetry/video delivery, and energy-aware reconfiguration, and we map those abstractions to a deployable integrated control system. This model-to-deployment mapping is the main theoretical-to-practical contribution of this paper because it identifies which observable quantities are supervised, which software modules act on them, and how relay placement and fail-soft operation are coordinated in the field.

To clarify the scientific contribution of the present work, Table 1 summarizes the differences between representative prior studies and our platform. Prior studies generally focused on one of the following aspects: control robustness, learning-based trajectory optimization, or open-source swarm experimentation. In contrast, our contribution is a unified disaster recovery platform that simultaneously addresses temporary LTE restoration, oneM2M-compliant telemetry management, real-time video streaming, operator-driven mission control, and field validation with heterogeneous drone roles. The novelty of this paper is therefore not a new PHY/MAC protocol or an end-to-end reinforcement-learning controller; it lies in the formalization and implementation of a management architecture that couples communication restoration with operational supervision and in the explicit mapping between that management model and a deployable integrated control system.

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Table 1. Comparison of representative related works and proposed platform.

Reference	Disaster Restoration	Multi-Drone Management	Real-Time Video	IoT/Data Integration	Reliability Discussion	Field Validation
[14]	No	Yes	No	Partial	No	No
[15]	No	Yes	No	No	No	No
[16]	No	Yes	No	No	No	No
[17–19]	No	Partial	No	Partial	No	No
[20,21]	No	Partial	No	No	Partial	Partial
[22–25]	No	Yes	No	No	No	No
This work	Yes	Yes	Yes	Yes	Yes	Yes

To address these issues, we propose a multi-drone network management platform for restoring disrupted mobile service in disaster areas. We first formalize the management objective in terms of service continuity, relay-assisted connectivity, telemetry delivery, and resilience to drone/link degradation. We then design and implement a management platform that includes a video streaming path for environmental observation, a telemetry and command path for drone supervision, and an LTE-based relay path for communication restoration. The resulting system allows operators to supervise multiple drones while keeping the sensing, relay, and control layers logically coordinated. We evaluate the solution through field experiments, SINR-based efficiency analysis, and mission-area service availability interpretation, and we discuss its scalability, fault tolerance, and current limitations. The main contributions of this paper are as follows: First, we formulate a reliability-aware management model for heterogeneous mission, relay, and tethered drones and express the associated relay placement and service continuity objectives. Second, we implement an integrated control system that maps the management model to three coordinated modules: WebRTC-based video streaming, oneM2M-compliant IoT data management, and LTE-based relay control. Third, we provide explicit model-to-deployment and protocol-level mappings that show how supervisory variables are realized in the GCS, VTP, and DTP instead of presenting the platform as a black box implementation. Fourth, we validate the proposed system in a real-world field test site and report that the relay drone improves both the DL and UL SINR by approximately 4.17 dB, which corresponds to a 2.61$\times$ linear SINR gain, about a 20% increase in normalized spectral efficiency, and an expansion of point-wise service availability from 57.1% to 100% across the evaluated mission points.

The rest of this paper is organized as follows: In Section 2, we describe the reliability-aware system model, process flow, and management formulation of the proposed solution, and the detailed integrated control system is presented in Section 3. In Section 4, we provide the experimental setup, field results, efficiency interpretation, and limitations, and we conclude this paper in Section 5.

2. System Model

In a disaster area where part of the terrestrial mobile infrastructure is unavailable, a wireless mission drone, a wireless relaying drone, and a tethered drone can be combined as depicted in Figure 1. The wireless mission drones are equipped with imaging equipment, sensors, and communication devices. The imaging equipment includes a camera integrated with electro-optical (EO) and infrared (IR) capabilities, e.g., the EO camera offers 1080p resolution at 60 frames per second with a 10x zoom function, and the IR camera provides 240p resolution with temperature sensing capabilities, allowing it to capture video information both during the day and at night.

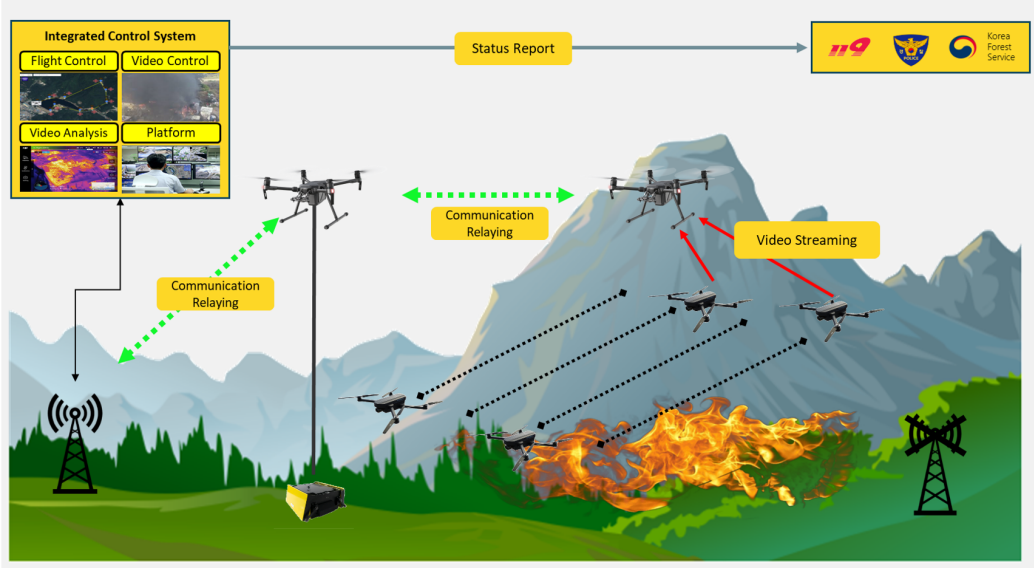


Figure 1. The network management system in a damaged mobile communication environment.

The wireless mission drones can transmit captured video directly to a base station via a mobile communication modem. However, when terrestrial coverage is degraded, there may be the widespread loss of base stations; hence, it may not always be possible to transmit captured video directly to the base station, i.e., due to the limitation of transmission power of the wireless mission drone, the transmission coverage may not be enough to reach to the base station directly. In that scenario, the wireless relaying drone can relay the captured video received from the wireless mission drones to the base station or forward it to other wireless relaying drones. The wireless relaying drone only forwards the received data to the base station or another wireless relaying drone; hence, it serves as a wireless coverage extension when direct coverage between the base station and the wireless mission drone is limited.

The wireless drones, i.e., both the wireless mission drone and wireless relaying drone, have no restrictions on their flight zones. This feature allows them to be deployed anywhere in the affected mission area. However, since the wireless drones have a battery limitation, their operational time is always limited. Hence, to overcome this battery limitation and to continuously perform missions, we use the following methods. First, we use a shiftwork system of wireless drones, i.e., if a drone's operational time is up due to a battery limitation, it returns to a charging station and another wireless drone takes over the mission from the previous drone's position. Second, we use a tethered drone that can receive continuous electrical power by wired power line; hence, it can maintain stable communication with normal base stations in its communication range. Like wireless drones, the tethered drone has a mobile transmission modem and acts as a wireless relaying drone between the normal base station and wireless drones, which expands the communication range in the disrupted coverage region.

The above configuration defines a heterogeneous airborne topology in which the mission drones mainly generate sensing traffic, the wireless relay drone extends radio coverage, and the tethered drone offers persistent backhaul connectivity. The role separation is important because the three drone classes have different operational constraints: mission drones prioritize mobility and sensing, relay drones prioritize communication continuity, and the tethered drone prioritizes long-duration service.

The proposed study analyzes multi-drone management rather than an isolated communication or control primitive. In this paper, management refers to the coordinated execution of four functions: (1) assigning drone roles, (2) maintaining an end-to-end communication

path between mission drones and the surviving infrastructure, (3) synchronizing telemetry and video streams with the operator interface, and (4) reconfiguring the topology when battery or link conditions degrade. In Figure 2, we summarize this process model and make explicit where management decisions are applied.

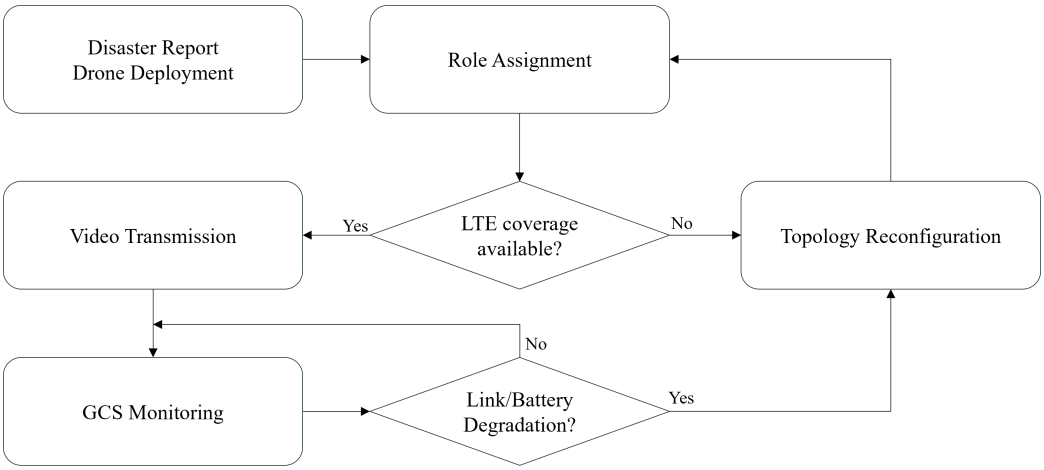


Figure 2. Process model of proposed multi-drone management system. Management decisions are applied during role assignment, relay placement, monitoring, and topology reconfiguration.

The process starts when a disaster report is received, and the drone team is deployed to the affected area. At that point, the operator or supervisory logic assigns the available drones to mission, relay and tethered roles according to the expected sensing demand, the availability of surviving infrastructure, and the need for persistent backhaul support. After the initial role assignment, the next decision checks whether a mission drone can maintain direct LTE connectivity to the surviving base station. If direct coverage is sufficient, the mission drone sends its video and telemetry streams without additional airborne relay. If direct coverage is insufficient, the system enters the relay placement stage, where the wireless relay drone is positioned to restore the end-to-end communication path between the mission drone and the tethered drone or the remaining infrastructure. Once the communication path is established, video and telemetry are uplinked to the servers and displayed through the ground control interface, so the operator can verify both mission progress and communication health in real time.

The lower half of Figure 2 represents the continuous monitoring and recovery loop that distinguishes the proposed management system from a simple streaming architecture. After transmission begins, the GCS evaluates the received information for signs of degradation, including weak communication quality, unstable relay connectivity, or battery depletion in the airborne nodes. If no degradation is observed, the current assignment is maintained, and the monitoring loop continues. If degradation is detected, the system performs topology reconfiguration, which can include relay repositioning, handover of the sensing mission to a replacement drone in the shiftwork model, or fallback to the tethered backhaul path to preserve service continuity. The output of this reconfiguration is then fed back into the role assignment stage, which means that the proposed architecture repeatedly updates the drone roles and communication structure until the mission ends. Accordingly, the figure also clarifies how the three software modules of the ICS participate in the workflow: the GCS governs monitoring and operator decisions, the VTP supports the video-streaming stage, and the DTP carries telemetry and command information needed for relay control and topology adaptation.

3. Integrated Control System

The proposed integrated control system (ICS) is composed of three coordinated modules: the ground control system (GCS), the video transmission platform (VTP), and the data transmission platform (DTP). These modules correspond to the supervisory, video, and telemetry/control planes of the management model introduced in Section 2. Table 2 summarizes the source–destination paths, payloads, and protocols that connect these modules in the implemented system.

Table 2. Protocol and function mapping in integrated control system.

Source → Destination	Payload	Technology/Protocol	Operational Role
Mission drone → VTP	Live EO/IR video	LTE uplink + WebRTC/Kurento	Real-time observation and stream synchronization for operator.
Mission/relay/tethered drone → DTP	Position, altitude, speed, battery, and communication state	LTE path + oneM2M/Mobius resource updates	Telemetry collection and state normalization for supervision.
GCS → DTP → drone	Mission path updates, altitude/speed changes, return-to-home, and relay directives	oneM2M-based command exchange over restored path	Supervisory control and topology adaptation.
GCS ↔ operator	Map, alarms, video selection, and mission status	Graphical user interface	Operator-in-the-loop monitoring and decision support.

3.1. Ground Control System

The GCS provides the operator with a unified interface for monitoring and controlling multiple drones during flight as shown in Figure 3. It displays the drone list, location, altitude, speed, battery state, communication status, and live mission video in one view. The same interface also exposes takeoff, landing, speed, altitude, return-to-home, and mission-path commands. We therefore treat the GCS as the supervisory layer of the proposed platform rather than as a standalone visualization tool.



Figure 3. An example of the graphical user interface in the ground control system.

3.2. Video Transmission Platform

The mission drone video is streamed in real time to a media server built on the Kurento media server (KMS) [27]. The KMS supports WebRTC-based multimedia transport, which allows the GCS to receive low-latency audio/video streams through a browser-oriented interface. The VTP catalogs video streams together with the associated flight traces, so the

operator can review or sort mission records by drone and time. This coupling between map-based trajectories and live video improves situational awareness during disaster-response operations.

3.3. Data Transmission Platform

The DTP implements the telemetry and command plane of the proposed model. Drone-side flight information, including path, status, and user commands, is converted into oneM2M-compliant resources by an integrated transmission unit composed of an LTE interface and a data transformation component based on nCube-Thyme V2.5 software. Those resources are then transmitted to the data server through the Mobius platform, which provides oneM2M-based data communication and management between devices and applications [28,29].

In operational terms, Mobius acts as the intermediary between the drones and the GCS for both state monitoring and command delivery. The DTP therefore normalizes heterogeneous drone-side information, delivers control commands from the GCS, and exposes the communication state needed for relay reconfiguration. This data-path integration is one of the practical novelties of the present work because it allows the same management loop to govern both communication restoration and mission supervision.

The software-in-the-loop (SITL) tool can feed the same interfaces with virtual drone data before real deployment. This does not replace large-scale field validation, but it provides a low-risk path for testing additional nodes, alarm logic, and relay-reconfiguration workflows before extending the real system.

4. Experimental Results and Discussion

In this section, we provide the real-world experimental results and a model-based discussion of their implications. The field campaign was designed to verify whether the proposed ICS can actually restore a usable communication path and synchronize video and telemetry under a relay-assisted topology. Because the field dataset was collected for platform validation rather than exhaustive stress testing, the following discussion separates measured results from analytical interpretation and current limitations.

4.1. Experimental Setup

The proposed solution was evaluated at a flight training ground in Korea, which is a designated drone flight demonstration area authorized by the government. This site offers an appropriate environment for controlled field experiments because it is wide, relatively flat, and free of nearby tall buildings that would otherwise dominate the radio path. Table 3 summarizes the configuration used in the field validation.

We used four drones to evaluate the proposed ICS platform as follows: one tethered drone for relaying communication to the base station, one wireless relaying drone between the wireless mission drones and the tethered drone, and two wireless mission drones for sensing and video transmission. The tethered drone was positioned within direct communication range of the surviving LTE base station. The two wireless mission drones, equipped with LTE communication modems and video recording equipment, are deployed to the area where the mobile communication system is assumed to be damaged. These drones transmit real-time video of the site to the media server, and they also transmit status data needed for control to the data server. The wireless relay drone was deployed to relay communication between the tethered drone and the wireless mission drones. Without this relay, the communication quality of the mission drones would degrade because of the long effective distance to the remaining infrastructure. Because direct LTE service was unavailable at three of the seven evaluated mission points, we additionally defined point-

wise service availability as the fraction of mission points where bidirectional connectivity and operator-side supervision remained available during the trial.

Table 3. Experimental configuration used for field validation.

Item	Configuration
Test site	Government-authorized drone flight training ground in Korea with open terrain and no tall buildings nearby
Surviving infrastructure	One normal LTE base station reachable by tethered drone
Drone topology	One tethered drone, one wireless relay drone, and two wireless mission drones
Mission-drone payloads	LTE communication modem and real-time video recording/streaming equipment
Relay strategy	Direct LTE transmission when feasible; otherwise, a wireless relay drone forwards traffic to the tethered drone or the remaining infrastructure
Software stack	GCS for supervision and control, Kurento/WebRTC for video delivery, and oneM2M/Mobius for telemetry and command management
Measured baseline	Direct transmission without the wireless relay drone
Primary evaluation metrics	Downlink/uplink SINR at comparable points, point-wise service availability across the mission area, and normalized spectral-efficiency interpretation
Not measured in this campaign	End-to-end latency, packet loss, jitter, synchronized control delay, and operator workload statistics
Validation scope	Field verification of integrated operation and communication restoration, followed by analytical interpretation with explicit discussion of current evidence limits

4.2. Integrated Operation in the Field

Figure 4 shows that the proposed integrated control system operated properly under GUI-based supervision at the real-world experimental site. The GUI allows monitoring of the drones' flight paths and positions. Furthermore, it provides real-time video streaming captured by the wireless mission drones. On the GUI screen, we can check each drone's current status, i.e., altitude, speed, and other metrics, and we can control the drones effectively. This field observation is important because it verifies the end-to-end management loop described in Section 2: mission data are generated by the mission drones, forwarded through the relay path when needed, and then visualized and acted upon through the GCS. Thus, the experiment indicates not only that the subsystems can run independently but also that the proposed integration is operationally coherent.

4.3. Communication Restoration Efficiency

We evaluate the communication-relaying functionality of the proposed drone system using a scenario in which part of the surviving infrastructure provides weak or incomplete direct coverage. For the four points where both direct and relay-assisted links are available, we compare average downlink (DL) and uplink (UL) SINR. For the full seven-point mission area, we additionally report point-wise service availability. To interpret the practical meaning of the SINR gain, we also compute the normalized spectral-efficiency bound $\eta = \log_2(1 + \gamma)$, where γ is the linear-scale SINR.

As summarized in Table 4, the relay-assisted case improves the average DL SINR from 20.73 dB to 24.90 dB and the average UL SINR from 21.58 dB to 25.75 dB, which corresponds to an increase of about 4.17 dB in both directions. This gain is equivalent to a 2.61× increase in linear SINR, about a 19.97% increase in downlink normalized spectral efficiency, about a 19.21% increase in uplink normalized spectral efficiency, and a service availability increase from 57.1% (4/7 points) to 100% (7/7 points). These derived values do not replace a full throughput, latency, or packet-loss benchmark, but they provide a broader interpretation of the available field evidence than the average SINR alone.

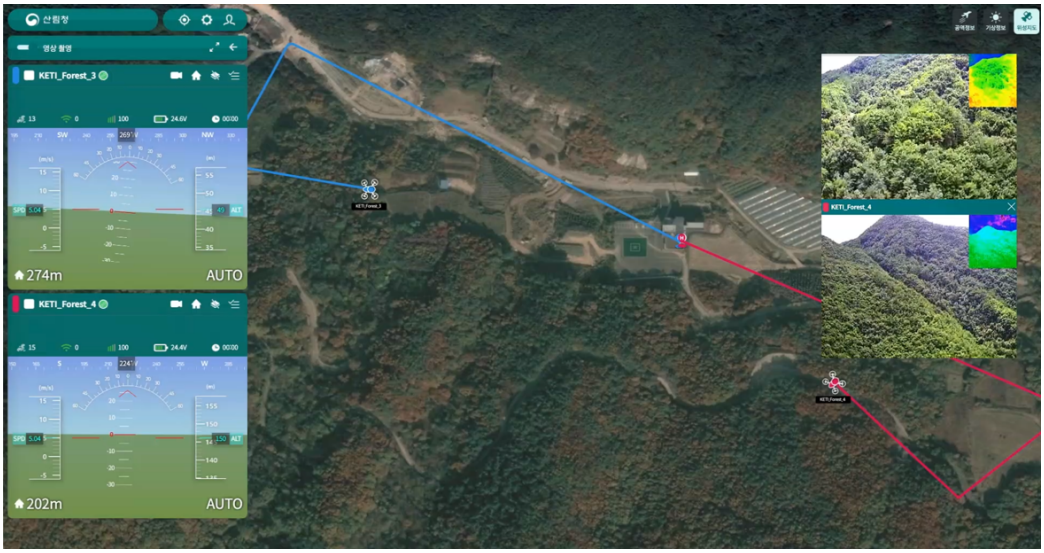


Figure 4. Screenshot of graphical user interface of proposed integrated control system.

Table 4. Communication metrics for direct and relay-assisted transmission, with SINR-based metrics averaged over four comparable points and service availability reported over seven mission points.

Scenario	DL SINR (dB)	UL SINR (dB)	DL η (bit/s/Hz)	UL η (bit/s/Hz)	Service Avail. (%)
Direct transmission	20.73	21.58	6.90	7.18	57.1
Relay-assisted transmission	24.90	25.75	8.28	8.56	100.0
Gain	+4.17	+4.17	+19.97%	+19.21%	+42.9 pp

These field observations indicate that the proposed ICS uses the relay drone effectively to restore communication in a partially disrupted infrastructure setting. The numerical baseline in this study is intentionally simple: direct transmission without the relay drone. This baseline isolates the effect of the proposed relay-assisted management strategy in the field. Broader benchmarking against fixed ground relays, mesh relays, or full aerial-base-station architectures would further strengthen this study. However, such comparisons remained outside the scope of the present paper because matched field measurements under common bands, traffic models, and relay geometries were not yet available.

4.4. Scalability, Reliability, and Operational Limitations

The field validation in this paper was limited to one tethered drone, one wireless relay drone, and two mission drones. Therefore, the present results should be interpreted as proof of deployable integration rather than final statements about large-scale swarm performance. Still, the system model provides a useful scalability interpretation. If each mission drone generates a video rate r_v and a telemetry rate r_t, and each relay drone mainly contributes telemetry/control traffic, the aggregate ingress load can be approximated as

$$B_{\text{tot}} \approx |\mathcal{M}|(r_v + r_t) + |\mathcal{R}|r_t, \tag{1}$$

which indicates that the video plane grows approximately linearly with the number of mission drones. This observation explains why relay placement and monitoring become increasingly important as the swarm grows and why the SITL-ready DTP is useful for future scale-out validation. Under a centralized operator, monitoring effort also scales with the number of streams and alarms. A first-order approximation is

$$L_{\text{op}} \propto |\mathcal{M}| + |\mathcal{R}| + N_{\text{alarms}}, \tag{2}$$

where N_{alarms} is the number of concurrent topology or communication events requiring attention. We did not estimate the proportionality coefficients in user studies, so the operator-in-the-loop claim in this paper is limited to functional integration rather than validated workload reduction.

From a reliability perspective, the measured four-drone experiment validates only the first step of the fail-soft strategy discussed in Section 2. The tethered drone improves persistence on the backhaul side, and the wireless relay drone improves local communication quality. However, the current paper does not claim exhaustive redundancy testing under multiple simultaneous drone or link failures. Such validation requires extended SITL campaigns, explicit fault injection, and larger field deployments. Accordingly, the reliability discussion in this paper should be read as a design rationale supported by partial field evidence rather than as a statistically complete failure campaign.

Operational safety is also constrained by the physical environment. For example, in an actual wildfire, strong convective smoke plumes, dense particulates, and floating embers can destabilize UAV flight and degrade sensing quality. The current platform should therefore be operated in a stand-off manner, with conservative altitude limits, geofenced exclusion zones around the plume core, and fallback or return-to-home triggers when visibility or communication quality rapidly deteriorates. Dense-smoke operation was not validated in the present field campaign, and dedicated plume-aware flight control remains for future work.

Practical deployment is also constrained by regulation, security, and interoperability requirements. Airspace rules can limit hover altitude, tether length, and beyond-visual-line-of-sight operation. Likewise, secure onboarding of drones and ground applications is required to reduce the risk of spoofed telemetry or unauthorized commands, and interoperability with public safety communication systems remains an open engineering task. These aspects are important for real deployment, but they were not validated in the current campaign.

Finally, the present study focused on deterministic operator-in-the-loop management rather than learning-based optimization. This choice was made to prioritize transparency, predictable behavior, and field deployability during emergency communication restoration. Nonetheless, the learning-based methods in [15,22,23,25] are highly relevant for future extensions, especially for automated relay placement, collision-aware swarm coordination, adaptive resource allocation, AI-assisted alarm prioritization, and integration with emerging 5G/6G non-terrestrial networking architectures.

5. Conclusions

In this paper, we presented a reliability-aware multi-drone network management platform, i.e., an integrated control system, for restoring disrupted mobile communication services after disasters. The main contribution is the management-layer formulation and its explicit mapping to GCS, VTP, and DTP responsibilities, rather than a new low-level communication protocol. The proposed model captures service continuity, path availability, and energy-aware fail-soft operation, and the corresponding implementation path is made explicit through the protocol-mapping table and the accompanying system description.

Field validation with one tethered drone, one wireless relay drone, and two mission drones indicates that the relay-assisted topology can improve the average DL and UL SINR by 4.17 dB relative to direct transmission. This corresponds to a 2.61× linear SINR gain, about a 20% increase in normalized spectral efficiency, and an expansion of point-wise service availability from 57.1% to 100% across the evaluated mission points. The same field trial also indicates that the GCS, VTP, and DTP operate coherently enough to support real-time supervision and topology adjustment in a limited deployment.

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This study still has clear limitations. It does not provide large-swarm validation, explicit fault injection experiments, synchronized latency or packet loss measurements, or human factor analysis of operator workload. Accordingly, our claims are limited to deployable integration and first-order communication restoration evidence in a four-drone field setting. Future work will extend the evaluation with larger SITL-supported swarms, autonomous relay placement, secure and interoperable publi -safety integration, and resource management aligned with emerging 5G/6G non-terrestrial networking developments.

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Data Availability Statement: Data are contained within the article.

Conflicts of Interest: The authors declare no conflicts of interest.

Abbreviations

The following abbreviations are used in this manuscript:

DL	Downlink
DTP	Data transmission platform
EO	Electro-optical
GCS	Ground control system
ICS	Integrated control system
IR	Infrared
KMS	Kurento media server
LTE	Long-term evolution
SINR	Signal to interference and noise ratio
SITL	Software in the loop
UL	Uplink
UAV	Unmanned aerial vehicle
VTP	Video transmission platform
WebRTC	Web real-time communication

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