Progress Evaluation 2

Remotely Controlled Car via LTE or Wi-Fi

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Progress of Current Milestone (Progress Matrix)

Task	Completion %	Christian	Joseph	Nicholas	Donoven
1. Secure Channel Implementation	85%	50%	0%	25%	10%
2. UI + Telemetry Expansion	80%	0%	70%	0%	10%
3. Network & Replay Protection	75%	35%	0%	35%	5%
4.Documentation Updates	100%	25%	25%	25%	25%

Discussion of Each Accomplished Task

- Task 1: Secure Channel Implementation

Implemented a 12-byte packet header carrying sequence numbers and timestamps. Developed a XOR-based cipher for outgoing data to obscure packets. Added a replay-window mechanism to reject duplicate or outdated packets.

- Task 2: UI + Telemetry Expansion

Enhanced the operator interface with a color-changing telemetry bar and a rolling graph showing the last 30 seconds of telemetry data.

- Task 3: Network & Replay Protection

Resolved major cross-platform bug (Windows sent 4-byte, Pi expected 8-byte values). Standardized to uint32_t. Verified sequence tracking and timestamp parsing with successful end-to-end encryption/decryption tests.

- Task 4: Documentation Updates

Updated Design Document sections describing the secure channel, replay protection, and telemetry visualization.

Contributions of Each Member

- Christian Prieto:

Made network and crypto integration on Raspberry Pi; documented replay window logic.

- Joseph Digafe:

Developed UI telemetry features, adding a color-changing telemetry bar and a rolling graph showing the last 30–60 seconds of telemetry data.

- Nicholas Shenk:

Used libcamera and other libraries to create a multithreaded camera stream, compressed to jpeg for sending via UDP. Made sure compression and latency were as ideal as possible for LTE usage.

- Donoven Nicolas:

Tested Windows builds, fixed struct alignment, updated failover and resilience documentation.

Plan for Next Milestone

Task	Nicholas	Christian	Josep	Donoven
Video Streaming Integration	Pi camera + encoder linkage	Assist capture performance	UI decoding & test LTE	Add the controls to the UI
Telemetry & Control Loop Finalization	Replay testing	UDP timing	Controller loop integration	Replay testing
Failover + LTE \	LTE fallback scripts	Wi-Fi ↔ LTE test	Delay meter + logs	Wi-Fi ↔ LTE test

Discussion of Planned Tasks

1. Video Streaming Integration: We will connect the Pi Camera capture pipeline to an H.264 encoder and transported frames over encrypted UDP to the operator UI for decoding and display. The stream uses a 12-byte packet header (sequence + timestamp) with MTU-safe packetization and a jitter buffer to smooth playback. At 720p/30, the UI will expose FPS, bitrate, and latency overlays.

2. Telemetry & Control Loop: We will stablize a 50–100 Hz control loop with normalized/clamped inputs, panic stop, and a rover-side dead-man watchdog. Each command carries a sequence number and timestamp and is validated by a replay window to drop duplicates/out-of-window packets.

3. Failover + LTE Testing: We will design and execute scenarios covering Wi-Fi drop → LTE fallback, LTE handoffs/IP changes, and burst-loss conditions. The app will surface drop/reconnect/rekey events with toasts, while a delay meter and structured logs record reconnect time, freeze duration, and path statistics.

Meetings & Feedback

Client Meeting: Oct 20, 2025

Faculty Advisor Meetings: Oct 1, 2025 and Oct 27, 2025

Faculty Advisor feedback:

Task 1: crypto stream with AES-CTR

Task 2: HMAC

Task 3:

Task 4:

Evaluation by Faculty Advisor

Faculty Advisor Signature: _____ Date: _____

Evaluation by Faculty Advisor

Faculty Advisor: detach and return this page to Dr. Chan (HC 209) or email the scores to pkc@cs.fit.edu

Member	0	1	2	3	4	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10
Nick Shenk																
Christian Prieto																
Joseph Digafe																
Donoven Nicolas																

Faculty Advisor Signature: _____ Date: _____