



Embedded Voice & LoRa Communication Project Timeline

Role: Embedded Software Team Leader

Company: Elebel

Target MCU: STM32F405RGT6

Modules Used:

- **LoRa:** RYLR898
- **Voice:** SA818SU Audio Module

Goal:

Send **commands via LoRa** and **voice via walkie-talkie module** from one STM32F405 to another.



Work Schedule

- **Days/Week:** 5
 - **Hours/Day:** 8
 - **Total:** 40 hours/week
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Project Duration & Phases

Estimated Duration: 6–7 Weeks



Week 1 – Project Planning & Initial Setup

Tasks:

- Requirements analysis and protocol planning.
- Study RYLR898 and SA818SU datasheets.
- Setup STM32 project using STM32CubeMX (HAL/LL drivers).
- Initialize UARTs for LoRa and Audio modules.
- Prepare development tools (e.g., serial terminal, logic analyzer, test audio).

Deliverables:

- STM32 environment ready.
 - Basic UART communication established.
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Week 2 – LoRa (RYLR898) Communication

Tasks:

- Implement AT command-based UART communication with RYLR898.

- Establish two-way communication between two STM32 boards.
- Add error handling and acknowledgment protocol.
- Design simple command structure (JSON or byte packet).

Deliverables:

- Reliable LoRa command exchange working.
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✓ Week 3 – SA818SU Voice Module Integration

Tasks:

- Understand and control TX/RX modes using GPIO.
- Connect headset/mic and test with another SA818SU.
- Implement GPIO-based PTT (push-to-talk) control.
- Verify audio transmission quality.

Deliverables:

- Full-duplex voice transmission working under STM32 control.
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✓ Week 4 – Command Protocol Implementation

Tasks:

- Design command structure (control, status, request types).
- Implement command parser and dispatcher on STM32.
- Add retries, CRC, and basic protocol features.
- Create abstraction layer for easier extension/testing.

Deliverables:

- Fully working structured command protocol.
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✓ Week 5 – System Integration

Tasks:

- Combine LoRa and voice functionality.
- Implement task switching/state machine for both modules.
- Add indicators for system status (LEDs, serial debug).
- Ensure coordination between command and voice modes.

Deliverables:

- Integrated system with command + voice capabilities.
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✓ Week 6 – Testing, Optimization, Documentation

Tasks:

- Field test communication range and quality.
- Add UART DMA or IRQ to optimize performance.
- Add fault recovery and watchdogs.
- Document code structure, usage, and test cases.

Deliverables:

- Fully validated and documented firmware.

🔧 Week 7 (Optional) – Future-Proofing

Tasks:

- Add command-line interface (CLI) for debugging.
- Add RTOS (FreeRTOS) for modular task handling.
- Add OTA or debug bootloader (if needed).

Deliverables:

- Production-ready system with advanced features.

📊 Summary Table

Week	Tasks	Deliverables
1	Planning, setup, UART init	Environment & drivers ready
2	LoRa module	Basic LoRa comm
3	Voice module	SA818 voice works
4	Protocol design	Structured LoRa commands
5	Integration	LoRa + voice coordination
6	Testing, docs	Final testable product
7	(Optional) Additions	CLI, RTOS, UI

📎 Notes

- Use UART-based AT commands for RYLR898 and SA818SU.
 - Use GPIOs for TX/RX (PTT) control for SA818SU.
 - Start simple, then refactor and add abstraction/RTOS if time allows.
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