RF (2.4GHz) Transceiver Module

Objective

There is a need to transfer real time data (GPS location, trip information) about the equipments (shovels, dumpers, trucks) to the control room from any location of the mine effectively and in an automated manner.

Expected feature set

- Real time data transfer
- Long range devices, so that less number of devices required for managing the entire mine
- Scalable system

Solution

The adverse geographical location was not feasible for having wired solution. Also GSM, GPRS connectivity had not been getting across the entire mine.
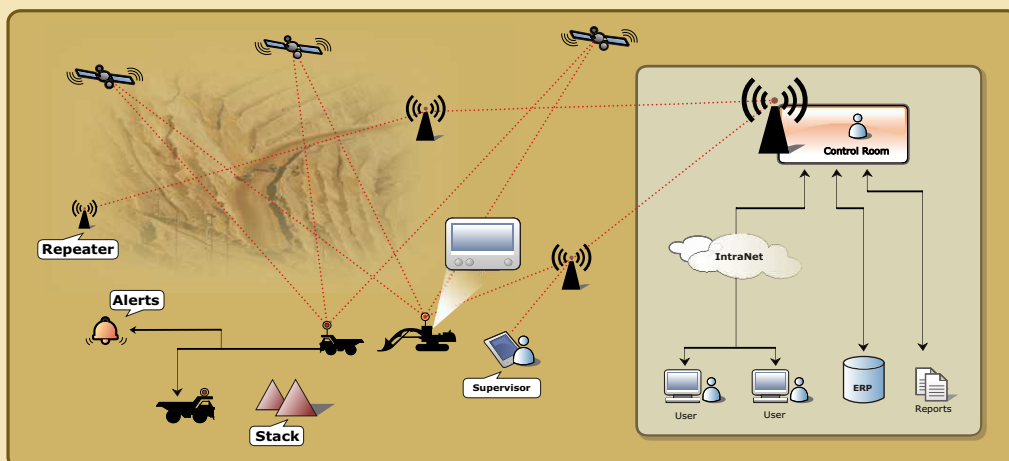
Hence 2.4 GHz radio network has been created for data transfer. "RF transceiver module" has been designed and developed to transfer the asynchronous serial-data stream over-the-air between devices.

All the devices (dumpers, shovels, trucks) have been equipped with "RF transceiver module" for transferring data wirelessly.

Technology

Processor   : Philips ARM7TDMI processor
RF Transceiver   : Texas Instruments CC2500
Programming Language   : C and assembly

Feature

- Engineered to provide an easy-to-use wireless solution that yields reliable, long range and low cost wireless links.
- Achieved long range with the help of power amplifiers. It has helped in covering the entire mine area using fewer RF devices.
- Carrier Sense Multiple Access-Collision Avoidance mechanism (CSMA-CA) algorithm to avoid collisions
- Mesh algorithms to avoid communication break. A communication break may occur in case a device is not working or device is not within range, or in the shadow zone.
- Can configure the module as end device or repeater.
- Efficient mechanism to drop duplicate packets and "endless" packets.
- "Store and forward" mechanism when RF connectivity is not available
- Multipoint-to-multipoint RF architecture
- Low power consumption
- Configurable RF baud rate (9600 bps to 115 kbps)
- Can configure parameters (RF modulation type, baud rate and channel numbers) through RF
- Completely scalable system
- Robust system

Architectural Overview

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