# P25 Digital & Analog Voting

## ↗ FEATURES AT A GLANCE

- Supports Voting of P25 radios
- Votes based on Bit Error Rate (BER)
- Uses existing MT-4E hardware — no changes required

Based on the versatile MT-4E radio platform, the CODAN™ P25 digital voting system offers an enhanced level of functionality for conventional P25 applications.
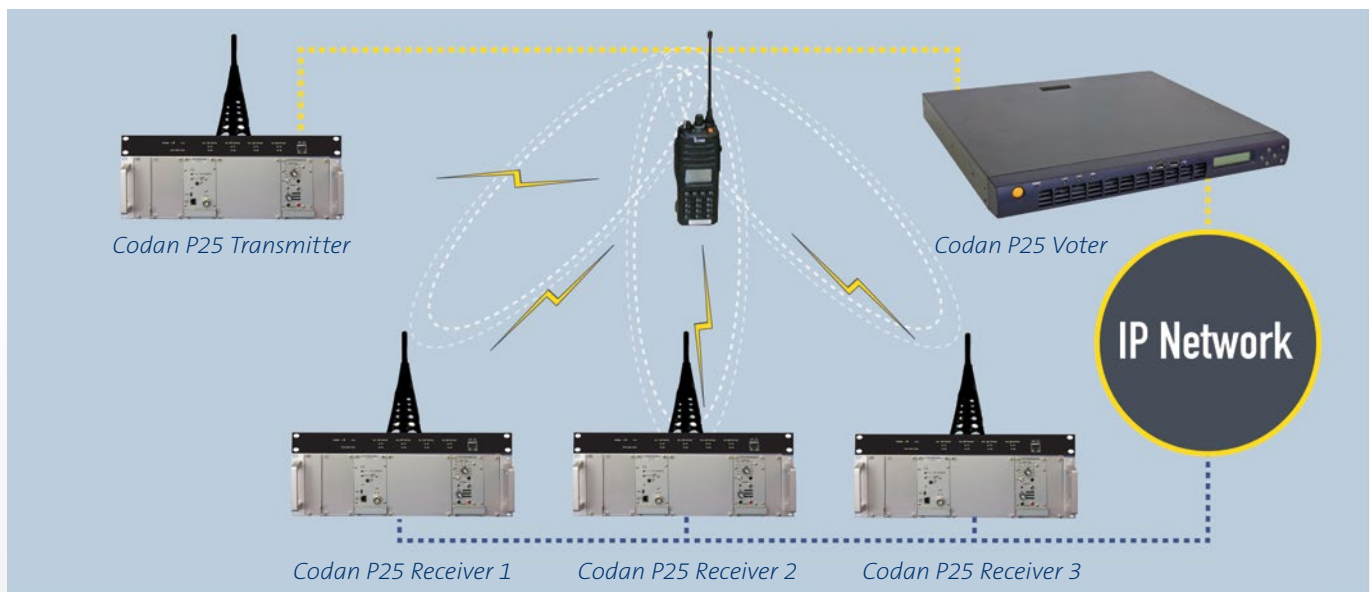
### APPLICATION

In a typical radio installation (analog or digital P25), a single receiver is assigned per site/frequency to serve a particular coverage area. When extended or improved coverage is required, multiple receivers can be installed on the same frequency. In this case, when the Subscriber Unit transmits, many (and possibly all) of the receivers may hear the transmission, depending on the location of the Subscriber Unit.

The receiver voting system determines and selects the "best" received signal from all the signals received by the various receivers. The best signal is then rebroadcast from the base station transmitter. This allows improved talk-back capability between mobiles in the field. Each local receiver's received signal is back-hauled to the voter and transmitter base station via IP links (Microwave or wired).

### THE SOLUTION

As shown in the diagram below for a 3 site voted system with a single transmitter, each receiver receives the signal from the Subscriber Unit. These signals are then evaluated and compared and the best possible representation of the signal received is passed to the Codan P25 voter.



*Codan P25 Transmitter*

*Codan P25 Voter*

IP Network

*Codan P25 Receiver 1*     *Codan P25 Receiver 2*     *Codan P25 Receiver 3*

## P25 VOICE SELECTION

Each P25 traffic packet received includes an indication of the Bit Error Rate (BER) detected by the receiver. This error rate is defined by Forward Error Correction (FEC) encoding and is used by the voting logic to determine the relative quality of packets in the case that multiple streams are received. This process is performed continuously as the quality of the received RF signal varies at each of the different receivers as a result of Subscriber Unit movement within the coverage area, atmospheric conditions, or other factors that impact the integrity of an RF signal.

## ANALOG VOICE SELECTION

An analog voice signal has no error detection, therefore the only measure of quality is given via the signal strength (RSSI). The Codan Voter has a "good quality threshold" for analog signals which defines the quality level above which no switching will be done. This is intended to reduce unnecessary switching of analog channels.

## HARDWARE REQUIREMENTS

The Codan Voting System is based on the versatile and proven MT-4E conventional radio system. P25 Voting requires no changes to existing MT-4E radios and is supported in all the P25 frequency bands (VHF, UHF, T-Band, 700 and 800 MHz). Each Receiver site consists of a Codan Receiver subrack along with the Codan Voter.

The voting application runs on an industrial PC which then receives all the voted received signals and sends the result to the transmitter site. The industrial PC also provides the system configuration and system monitoring statistics. The maximum software configuration is 4096 receivers, with 64 voted channels.

## VOTING MANAGEMENT

Typically, each voted channel will be configured to monitor and vote on all transceivers. The first receiver to receive RF activity and forward on the corresponding data is assigned as the "active" receiver. The Voter will look to switch to other active receivers with the same signal if the quality indicator is superior.

## CODAN RADIO COMMUNICATIONS

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