The detail description of the data streams using in our LMR Paper.

Fall 2020

Updated: Aug 2020

The stream data was collected from different sensors located at 7 remote sites. At each remote site, the incoming data was continuously pushed to the outposts (edge nodes) before sending it to the cloud. For this study, we access the data stream for nearly 3 months (from April 29th to July 24th 2019). The data rates of the sensors are various (i.e. 15 minutes to half-hour update intervals).

The data stream can be described as one of the following:

- Data stream from site related sensor: This sensor measures motion, temperature, humidity, and wind information at the remote site. Furthermore, it continuously reads and monitors the cellular network signal strength data, detects asynchronous event, and observes non-contact alternate current at the remote site. These data were collected every 2.5 minutes. More information can be found in Table 1.

Table 1: Raw Site related sensor Data

Column Name	Description
outpost_id	edge device RimotRF serial id
tempActualC	Temperature information at the site
hum	Humidity information at the site
motion	Motion information at the site
motioncommSignalStatus	Cellular network signal strength information
siteACMains	Non-contact Alternate current (NCAC) sensor information
windInKph	Wind sensor information
windAvgInKph	Wind sensor information
windConn	Wind sensor variable indicating whether sensor is connected or not to the edge device
windConnevent	Asynchronous edge device site event information
thTime	Latest temperature and humidity sensor payload timestamp
motTime	Latest motion sensor payload timestamp
siteACMainsTime	Latest NCAC sensor payload timestamp
windTime	Latest wind sensor payload timestamp
createdAt	Overall site payload timestamp updated before publishing to cloud

- Data stream from a RF sensor: It collects important data related to VSWR in order to see how efficiently radio-frequency power is transmitted from a power source into a load, through a transmission line. Forward power and reflected power values are also collected to measure the power delivered to the load. It can also detect if the RF sensor is active or not. These data were pushed to the edge nodes every 15 minutes. More information is available in Table 2.

Table 2: Raw RF sensor Data

Column Name	Description
outpost_id	edge device RimotRF serial id
transmitter_id	RF sensor hardware serial id
vswrHigh	RF sensor VSWR values
vswrMedian	RF sensor VSWR values
vswrLow	RF sensor VSWR values
fwdPwrHigh	RF sensor forward power values
fwdPwrMedian	RF sensor forward power values
fwdPwrLow	RF sensor forward power values
refPwrHigh	RF sensor reflected power values
refPwrMedian	RF sensor reflected power values
refPwrLow	RF sensor reflected power values
runtick	RF sensor variable indicating whether sensor is active or not
rfTime	Latest RF sensor payload timestamp
createdAt	Overall RF sensor payload timestamp updated before publishing to cloud

- Weather data: This data stream was provided by a 3rd party organization. We have used an available API to feed the needed weather data every hour into our Analytics Everywhere platform.
- GPS data stream: This data stream was not collected regularly based on the data rate as the other data streams. Instead, it was an event-triggered data stream. The GPS information of the remote sites were collected and transmitted to the edge whenever their locations changed.
- Data stream from Repeater Diagnostics, Alarm & Control (RDAC) sensor: In our platform, we used MOTOTRBO to read RDAC information. Some of the main repeater diagnostic data include repeater status, available channels, transmit power status. For repeater alarm reporting data, it can detect and report high how efficiently radio-frequency power which is transmitted from a power source, through a transmission line, into a load VSWR, low and high RF PA voltage, AC power failure, and RF PA/System overheating. Additionally, the control function of this sensor allow us to change channels, enabled or disabled status, and change transmit power level. This RDAC sensor was operated continuously and sent data to the edge nodes every 3 minutes. See Table 3 for more information.

Table 3: Raw RDAC Data

Column Name	Description
outpost_id	edge device RimotRF serial id
transmitter_id	Mototrbo/RDAC sensor RimotRF serial id
rdac_serial_id	Motorola repeater hardware serial id (unique)
radio_id	repeater radio id
radio_name	repeater radio name may represent site name which is monitored
signal_mode	repeater signalling mode
firmware_version	firmware version which is currently installed in the repeater
rf_band	repeater RF band
rx_freq	repeater receive frequency
tx_freq	transmitter frequency
createdAt	Overall Mototrbo tombstone sensor payload timestamp updated before publishing to cloud
vswr	VSWR value reported by the repeater to the Mototrbo sensor
vswr_status	variable indicating VSWR status
pa_tempC	variable indicating VSWRPower amplifier temperature reported by the repeater to the mototrbo sensor status
pa_temp_status	variable indicating Power Amplifier temperature status
modem_tempC	modem temperature reported by the repeater to the mototrbo sensor
modem_temp_status	variable indicating modem temperature status
output_power	Repeater output power reported by the repeater to the mototrbo sensor
output_power_status	variable indicating repeater output power status
repeater_state	Repeater state information