

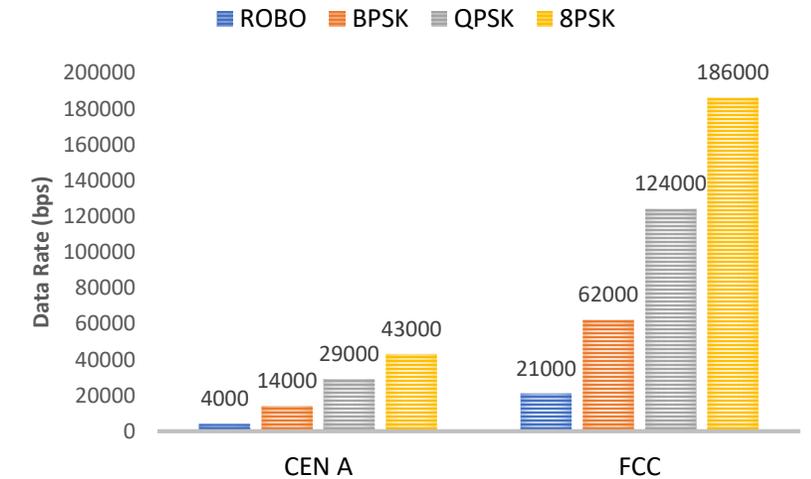
Hybrid G3-PLC/RF PoC in India

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G3-PLC/RF KEY FEATURES

- Based on PLC channel condition, G3-PLC uses 4 different transmission modes. Hence, various data rates are offered based on the operation mode.
 - If PLC channel is not available (Due to noise or attenuation) G3-PLC hybrid automatically select RF link for the communication.
- The RF channel allows a data rate of 50 kbits.
- G3-PLC/RF Mesh routing allows using intermediate nodes to reach longer distances. Each device can use **PLC** as well as **RF** for communication.
- Depending on the actual field condition, data transmission is sent over the best available channel.

DATA RATE PER MOD



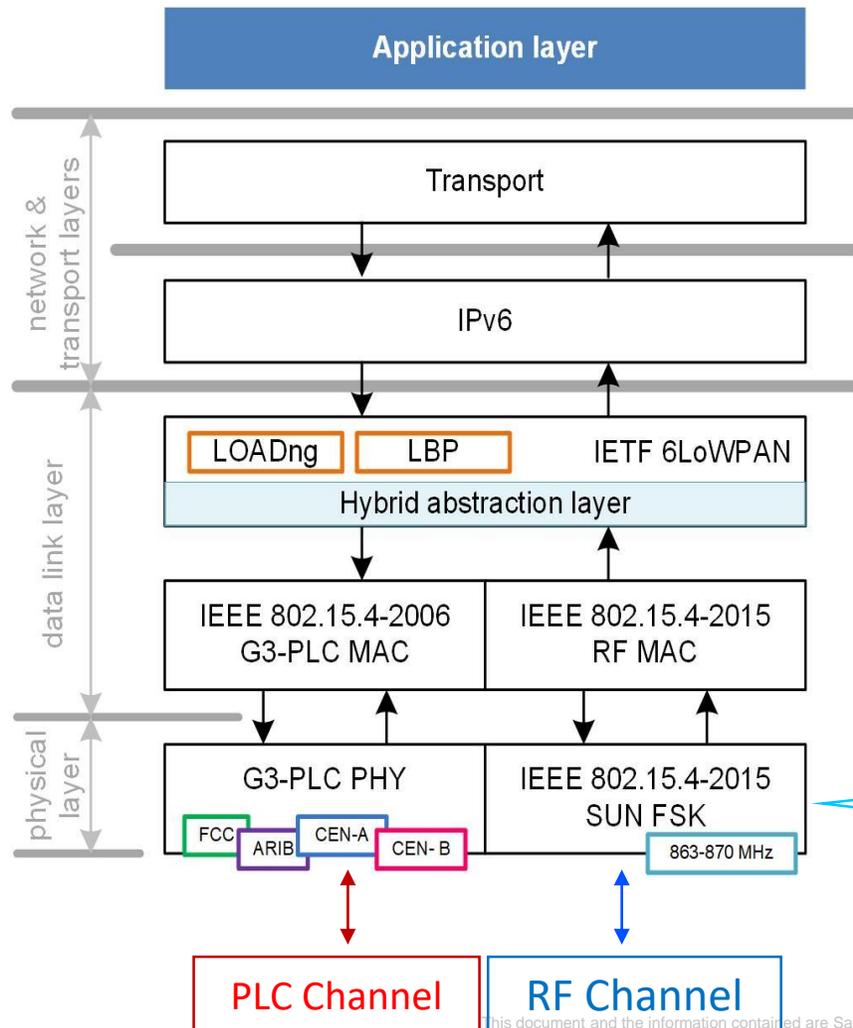
For INDIA POC FCC band is used

Hybrid G3-PLC/RF Mesh Network



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HYBRID G3-PLC/RF For Smart Grid



- Robustness In Data Communication
- High Data Rate
- IPv6 Compliant for secure Data Transport
- Security & Authentication
- Open Specification tailored to Metering & Smart Grid application Globally and Building block for future Expansion & development

A secondary radio physical layer based on [IEEE 802.15.4] SUN FSK, as a backup to the G3-PLC physical layer when needed

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Some of the Key points Using RF Technology

- Operating Frequencies.
 - Most of the countries are using ISM band frequencies some where from 860 MHz to 950 MHz.
 - Ex: Europe=866-869 MHz, Egypt= 866-869 MHz , Malaysia = 919-923 MHz
- Transmit power.
 - Transmit power varies per each country. We may have to include extra line driver for rejoin require higher TX power
 - Europe 14 dBm, India 26 dBm, Malaysia 24 dBm, Indonesia 24 dBm.
- Duty Cycle.
 - It is defined as the maximum ratio of time on the air per hour. 1% means you can transmit 36s per hour, not more. For metering it is about 2.5% to 3%
- Frequency hopping.
 - is a method of transmitting radio signals by rapidly changing the carrier frequency among many distinct frequencies occupying a large spectral band.
 - Ex ; Europe ISM band is 866-869 MHz and a device can use all frequency within 866-869 MHz for data communication simultaneously..

Field Composition and Performance

- The substation provides power to a residential area composed of 10 buildings
 - All Residential network collects power from a single feeder
 - It appears higher load is pulled from MV-LV which results in the higher PLC attenuation and noise level.
 - 20 Meters are installed in 8 buildings since 25/06
 - Multiple power cut events reported by the Meters mainly during day.
 - Both communication & collect performances have been studied
 - The RF TX power used for this POC is 8 dB lower than the authorized power by the regulation.
 - We achieved 100% consistent daily KPI through out the duration of the project.



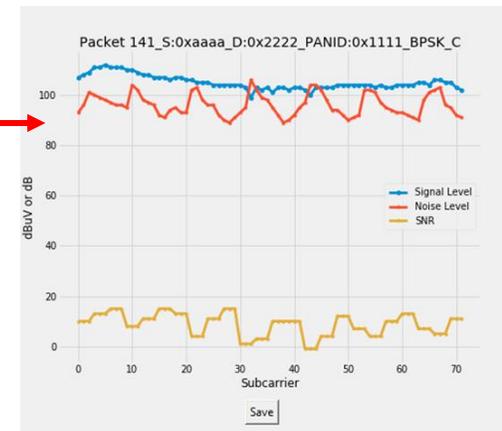
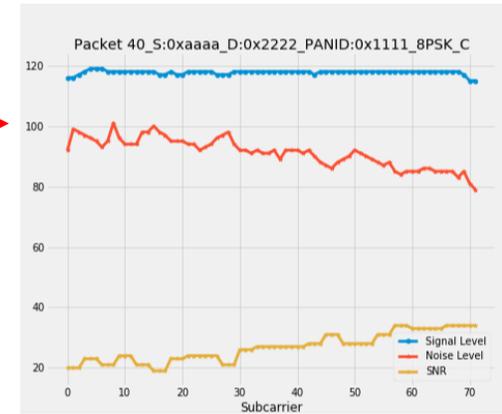
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SAGEMCOM's View on Field Composition

- Proposed POC location represents a challenging environment for both RF & PLC communications
 - High level of PLC noise, compared to other countries, is measured during Site Survey.



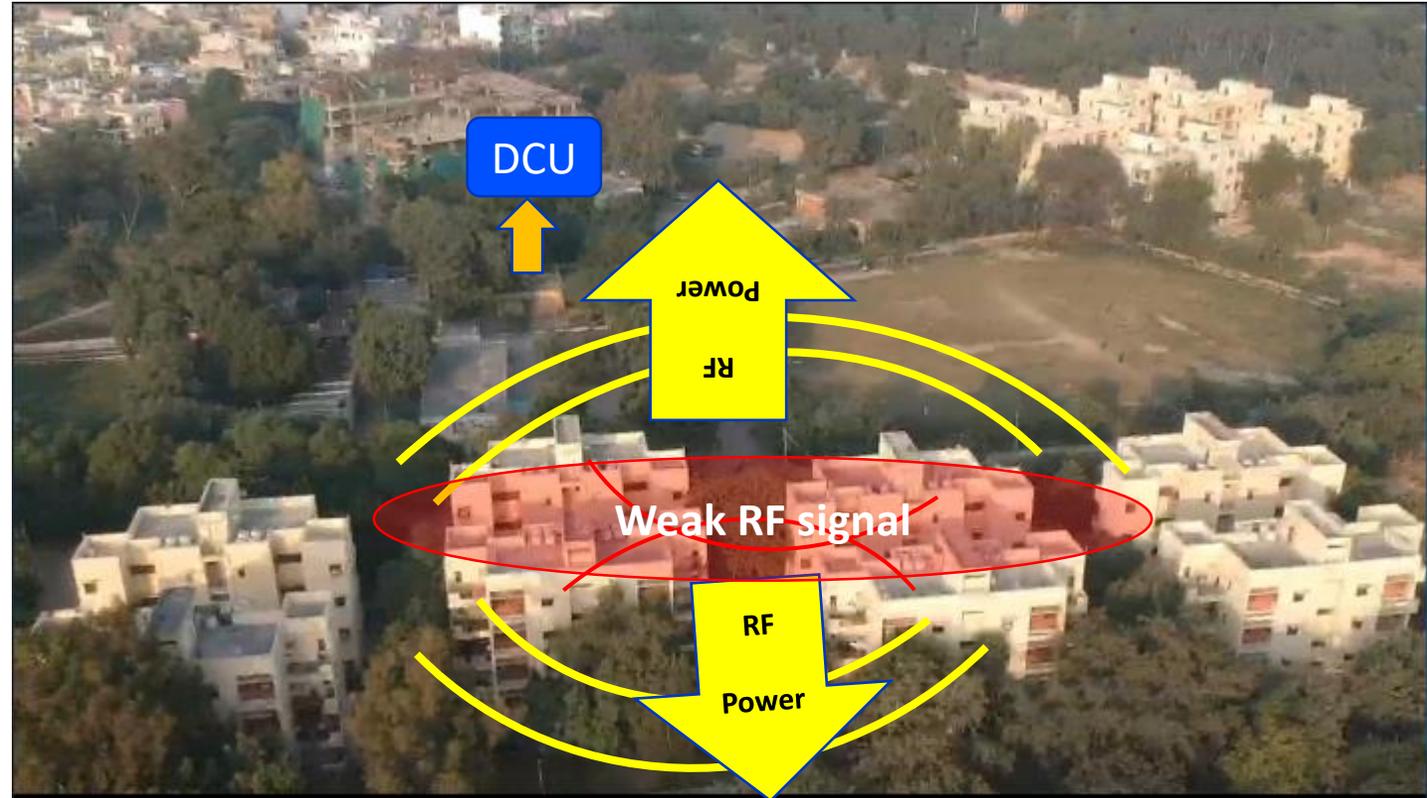
Max = 100 dBuV



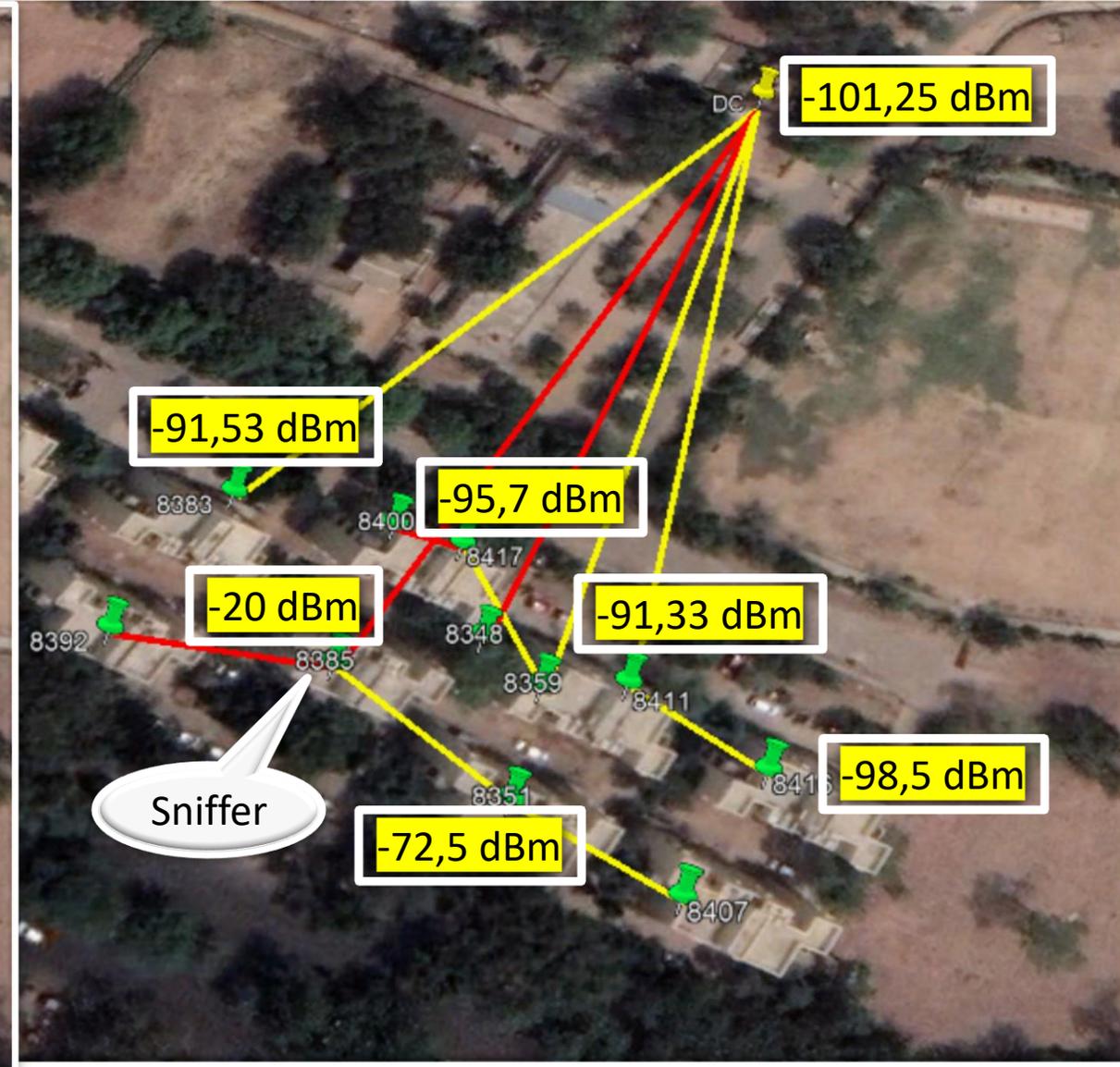
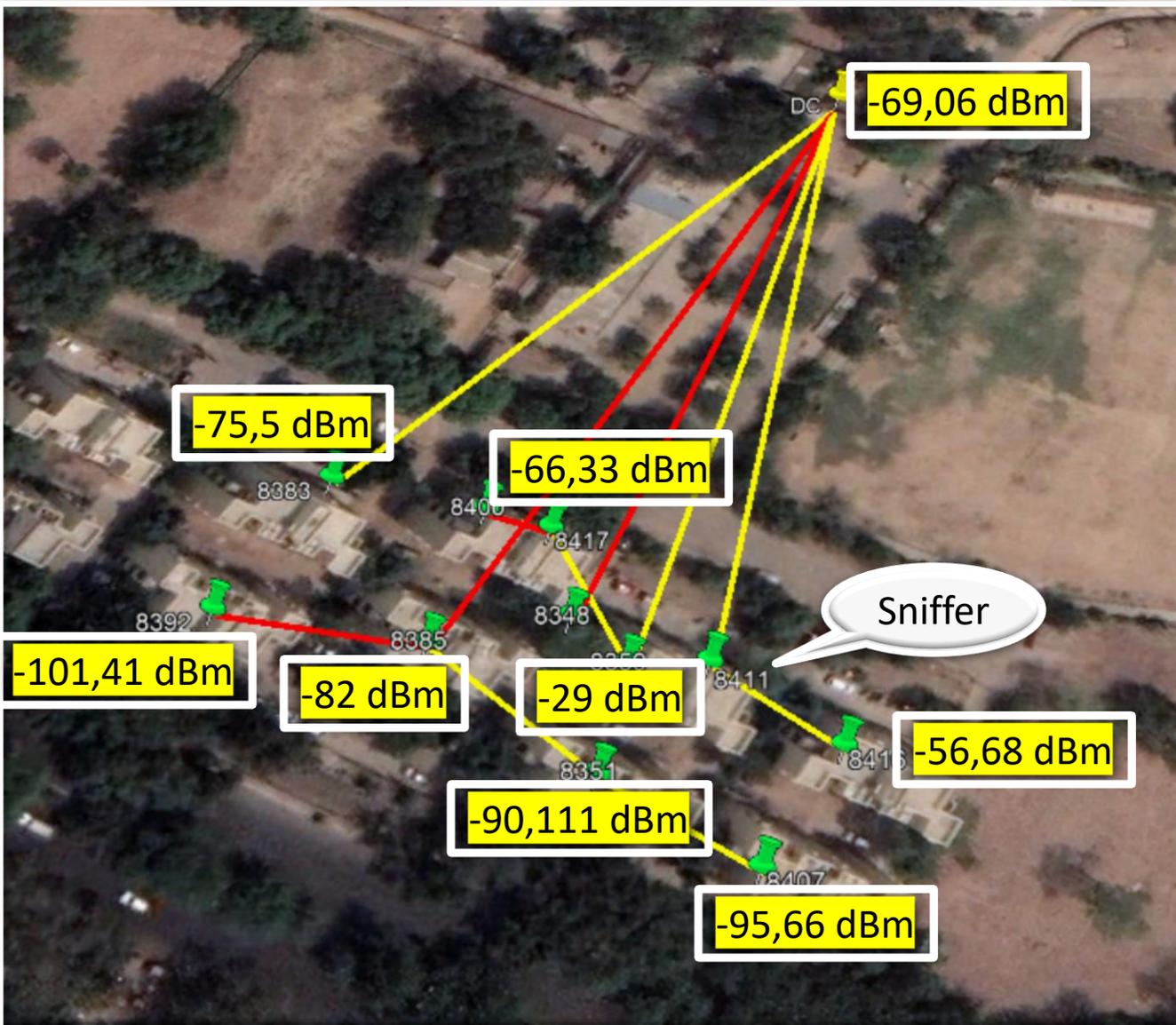
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View on Field Composition

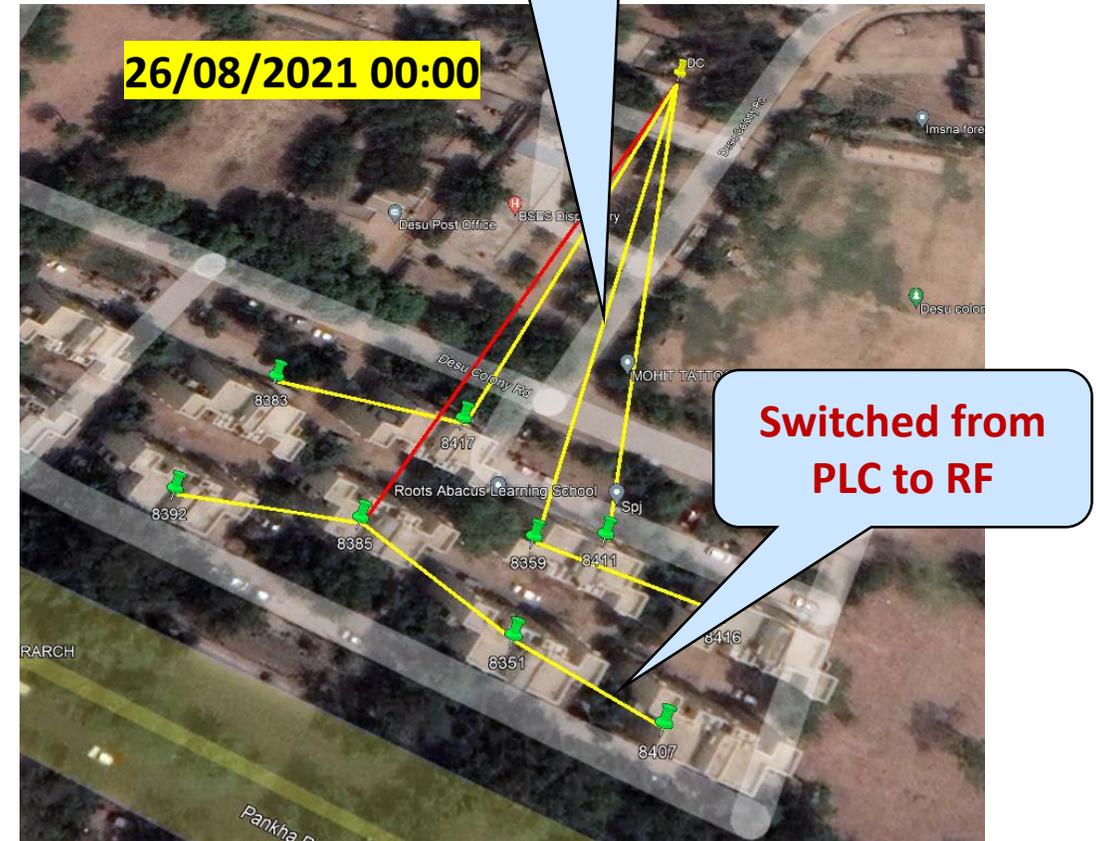
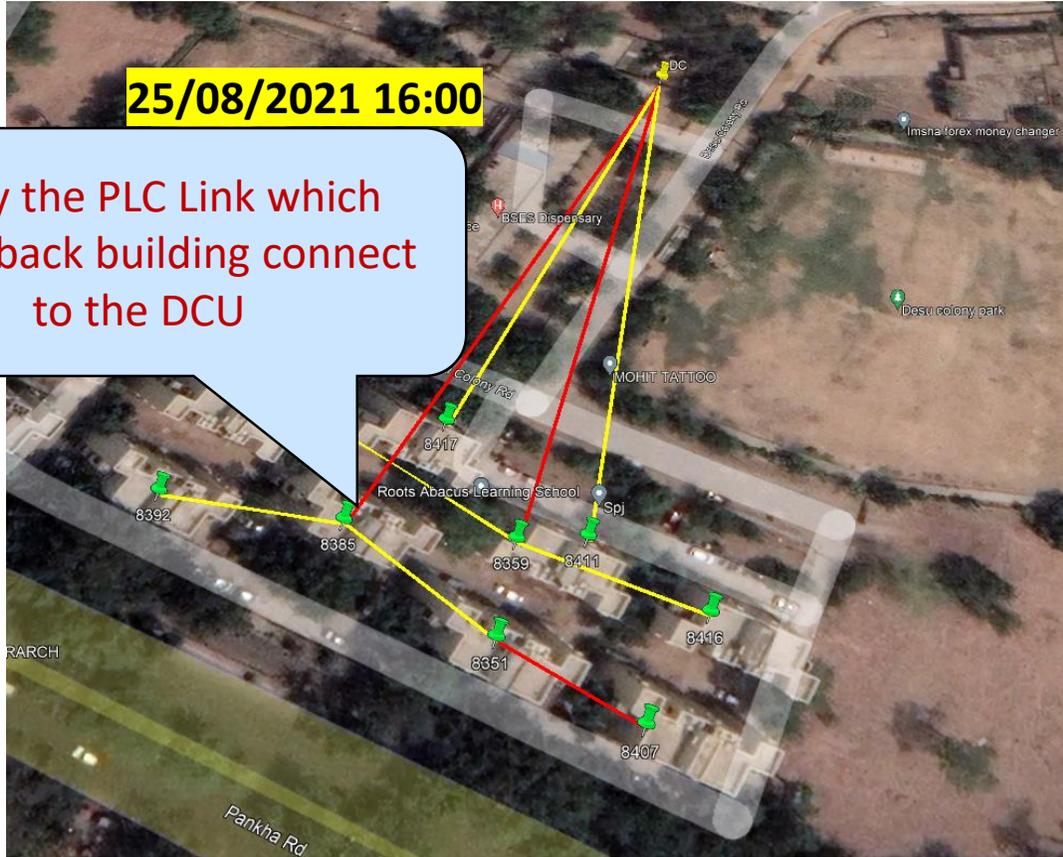
- Proposed POC location represents a challenging environment for both RF & PLC communications .
 - Front Meters have a good RF communication with DCU.
 - Obstacles create a very harsh environment for back meters to communicate in RF with the front Meters.



RF Measurements Sniffer At 385 and 411 Position

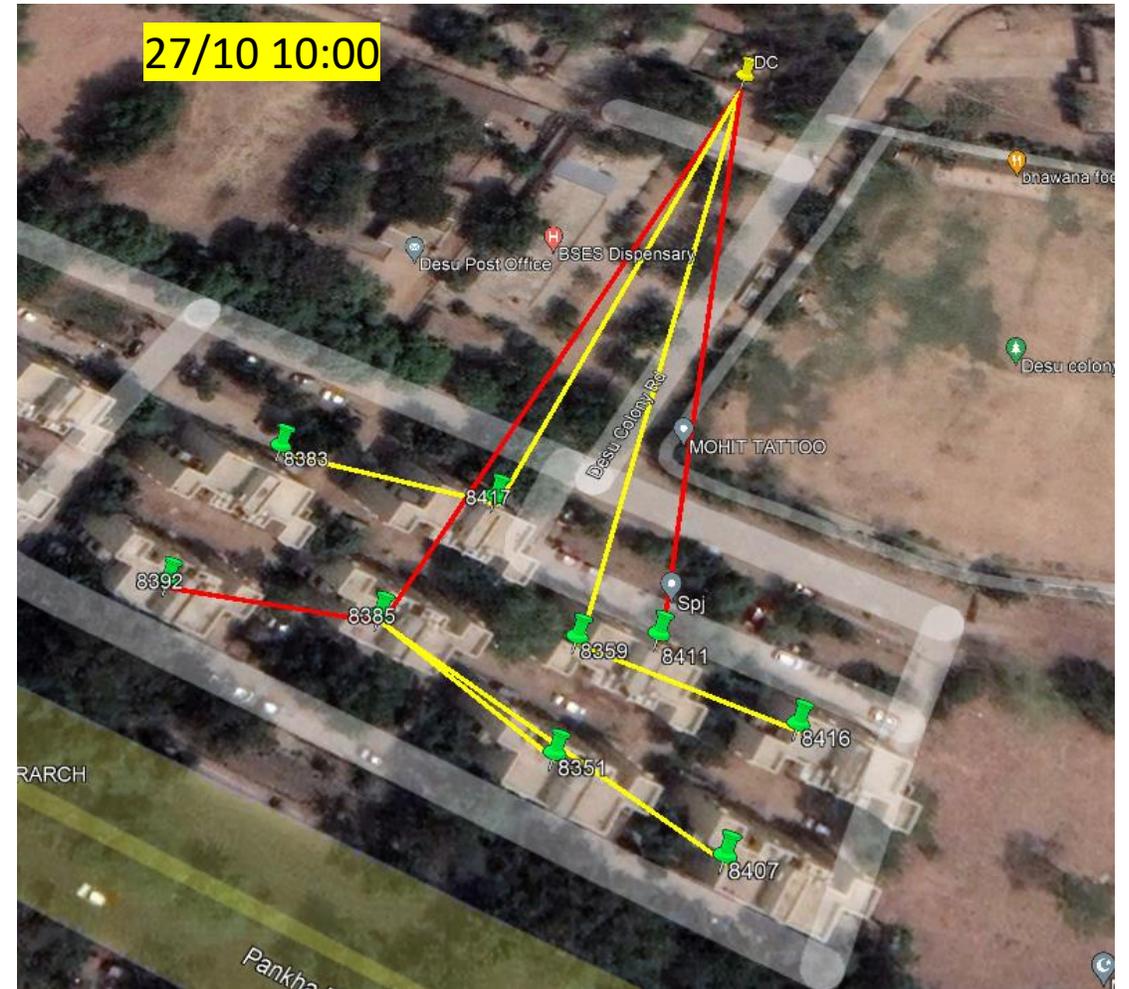
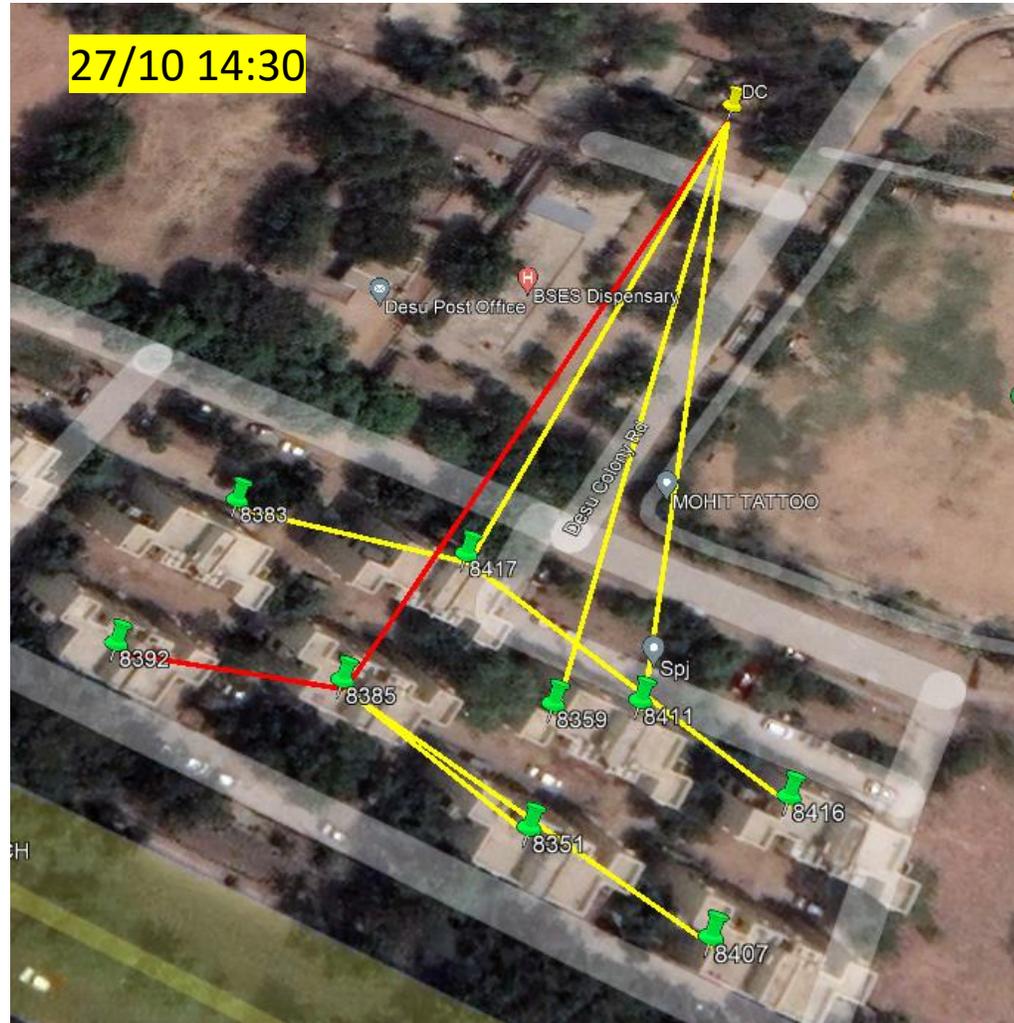


Hybrid Topology at different time frame



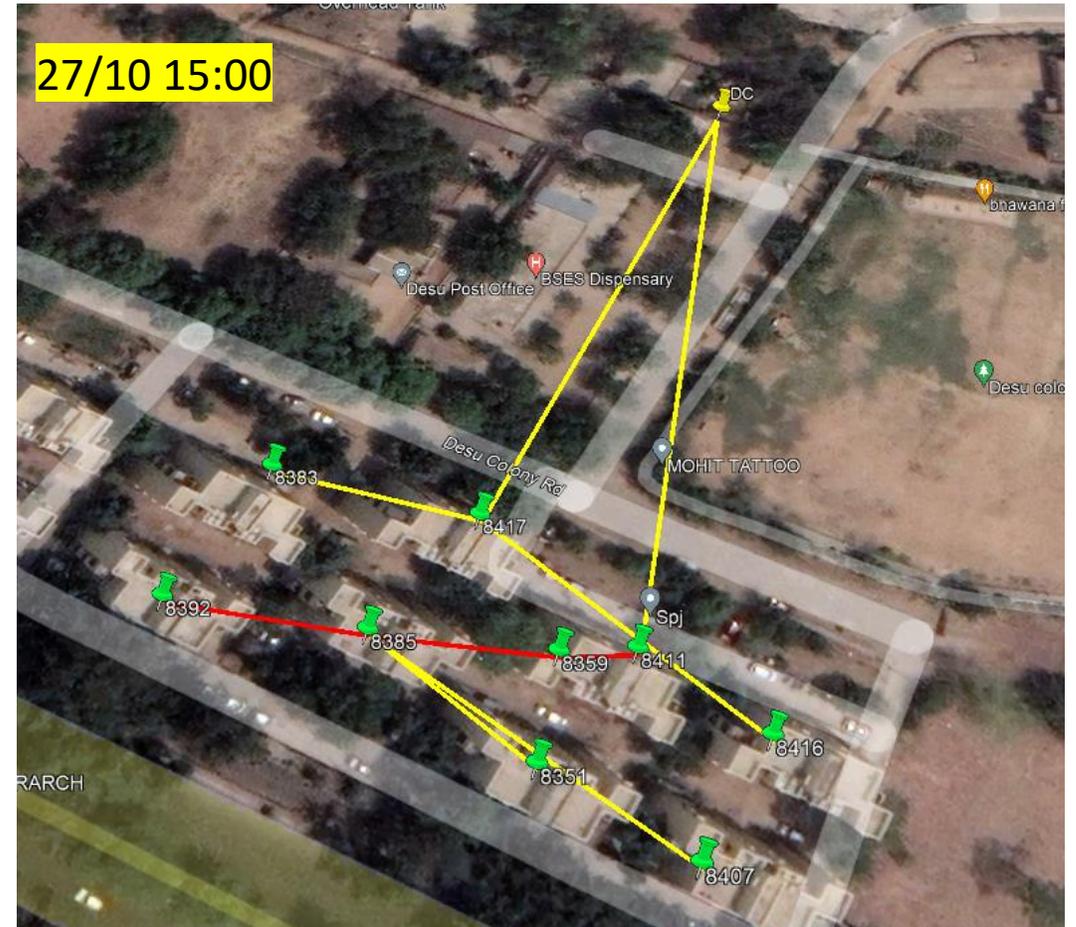
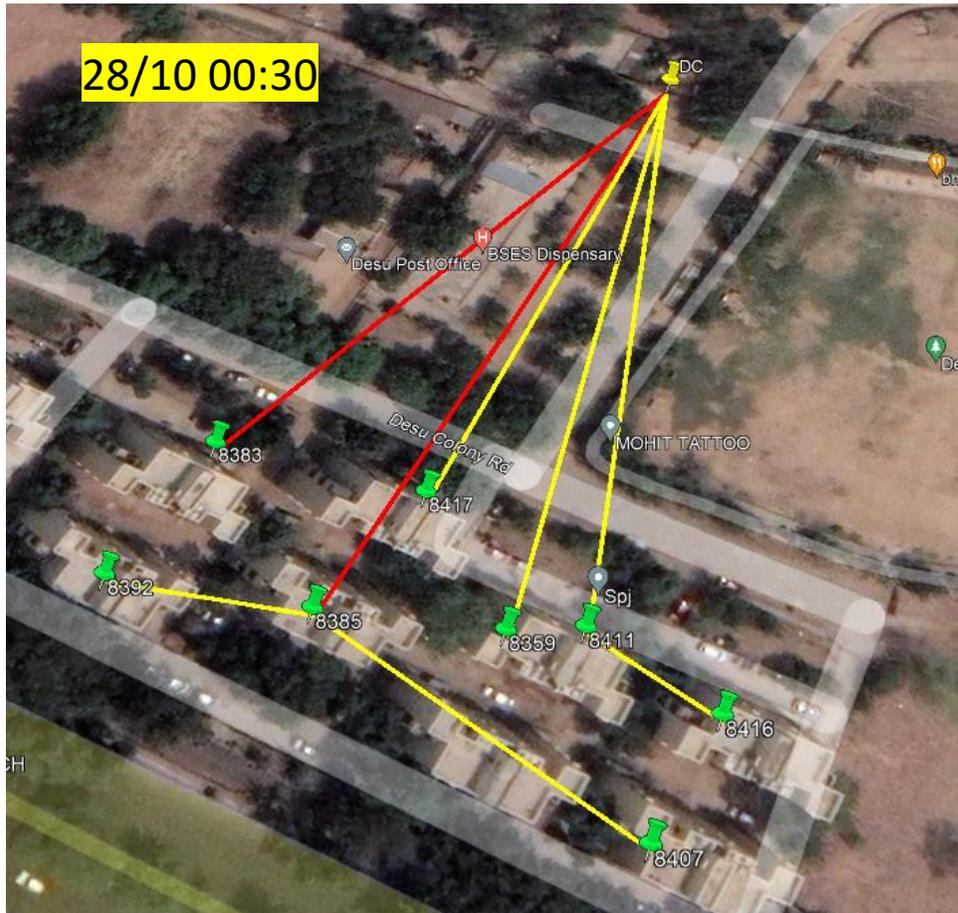
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Topology at different time of the Day



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Topology at Different Time of the Day



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LAST GASP EVENT

Manage CEP Dashboard / Manage events dashboard / Event details

Event details

Event Type	EVT_eMeter.powerFailureLastGasp	Source	M2M_SUP_DEVICE
Category	Standard	Issuer Tracking ID	
Name	Total Power Failure (Last gasp)	Description	Power Down : Indicates a complete power down of the device (Last gasp)
Severity	EXCEPTION	Comment	
Ticketing Acknowledgement	✘	Initial Event	<pre><alarm origin="178110031878" type="device" code="EVT_C_LastGasp" date="2021-11-01T12:05:41.555+01:00" xmlns="http://www.sagemcom.com/amm/hes2015/types/alarms/v1/"></pre>
Event Id	b76b3a6b-49cd-417c-aa2f- fef1e4ecaf64_1635765233		
Object type	device		
Object Id	178110031878		
Created date time	01/11/2021 12:05:41		
Effective date time	01/11/2021 12:05:41		
Registered Date Time	01/11/2021 12:13:53		

Time Information

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