Hybrid G3-PLC/RF PoC in India

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30/11/2021

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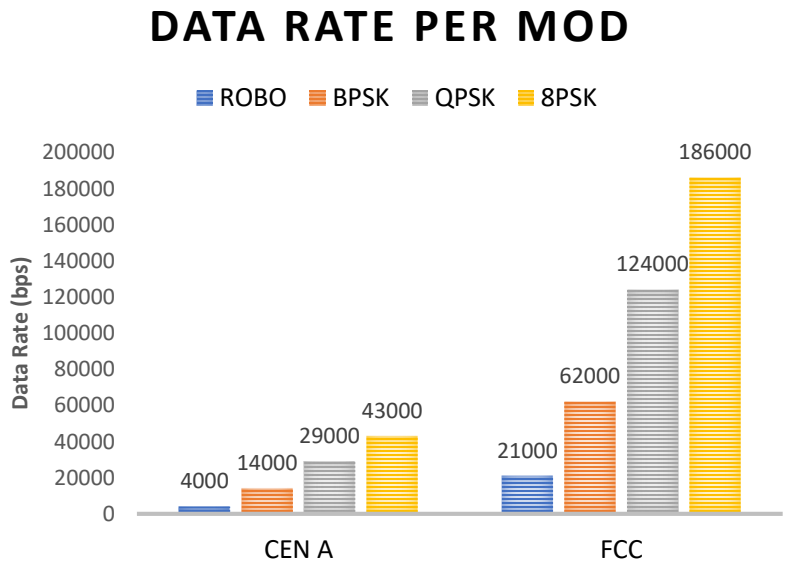
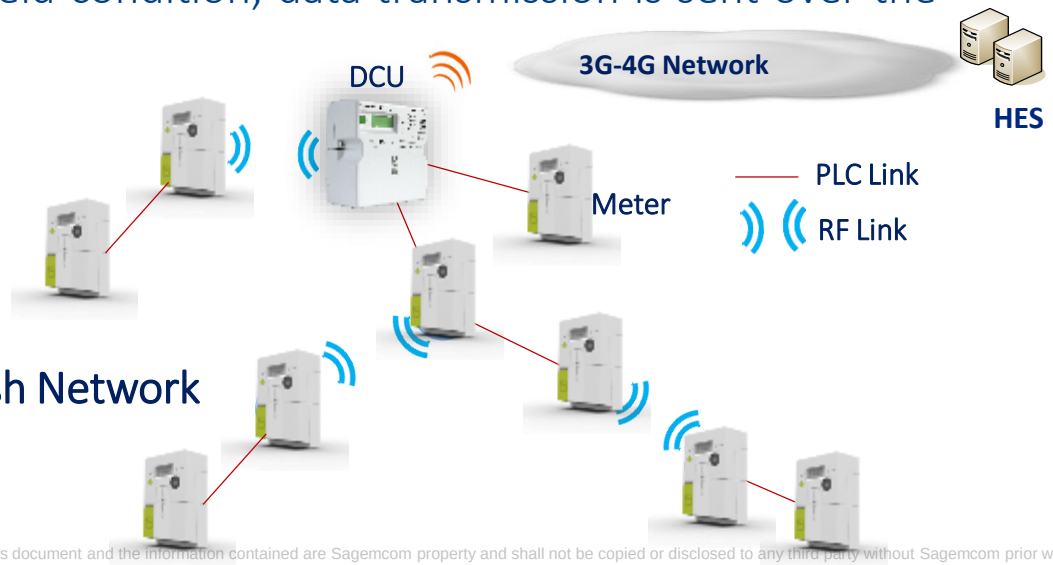
G3-PLC/RF KEY FEATURES

- 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.

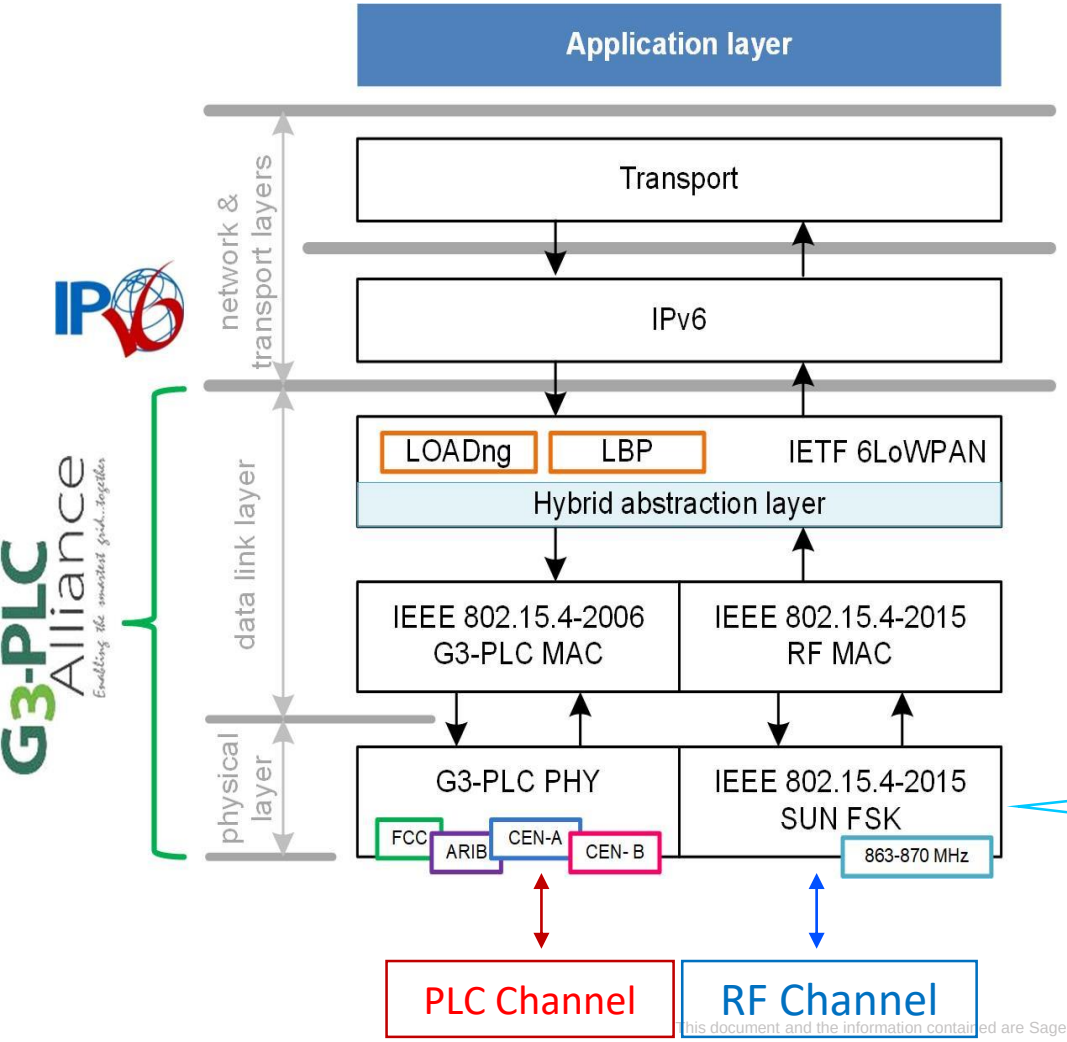


For INDIA POC FCC band is used



Hybrid G3-PLC/RF Mesh Network

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

Some of the Key points Using RF Technology

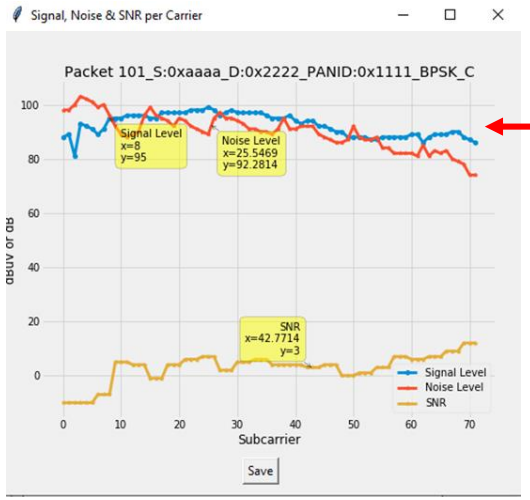
- Operating Frequencies.
  - Most of the countries are using ISM band frequencies some where from 860 MHz to 950 MHz.
    - Ex: Europe=866-869 MHz, Egypt= 866-869 MHz , Malaysia = 919-923 MHz
- Transmit power.
  - Transmit power varies per each country. We may have to include extra line driver for rejoin 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

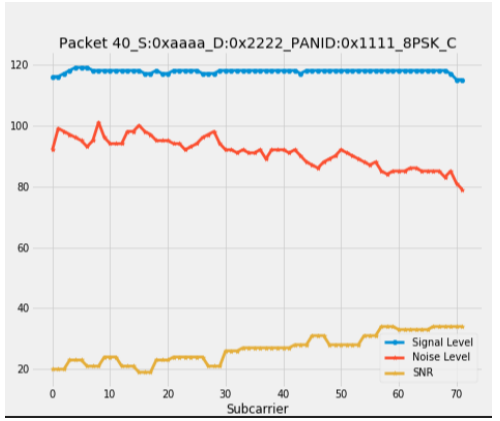
- The substation provides power to a residential area composed of 10 buildings
  - All Residential network collects power from a single feeder
    - It appears higher load is pulled from MV-LV which results in the higher PLC attenuation and noise level.
  - 20 Meters are installed in 8 buildings since 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.

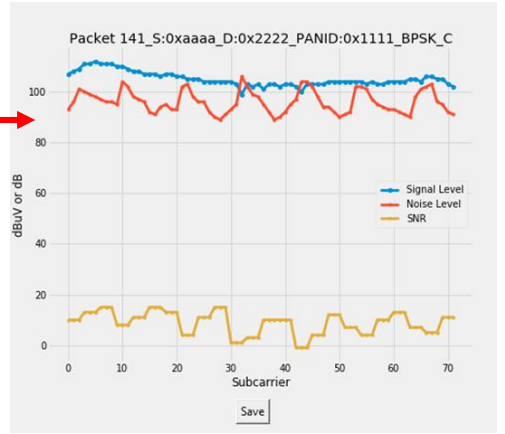
SAGEMCOM's View on Field Composition

- 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.



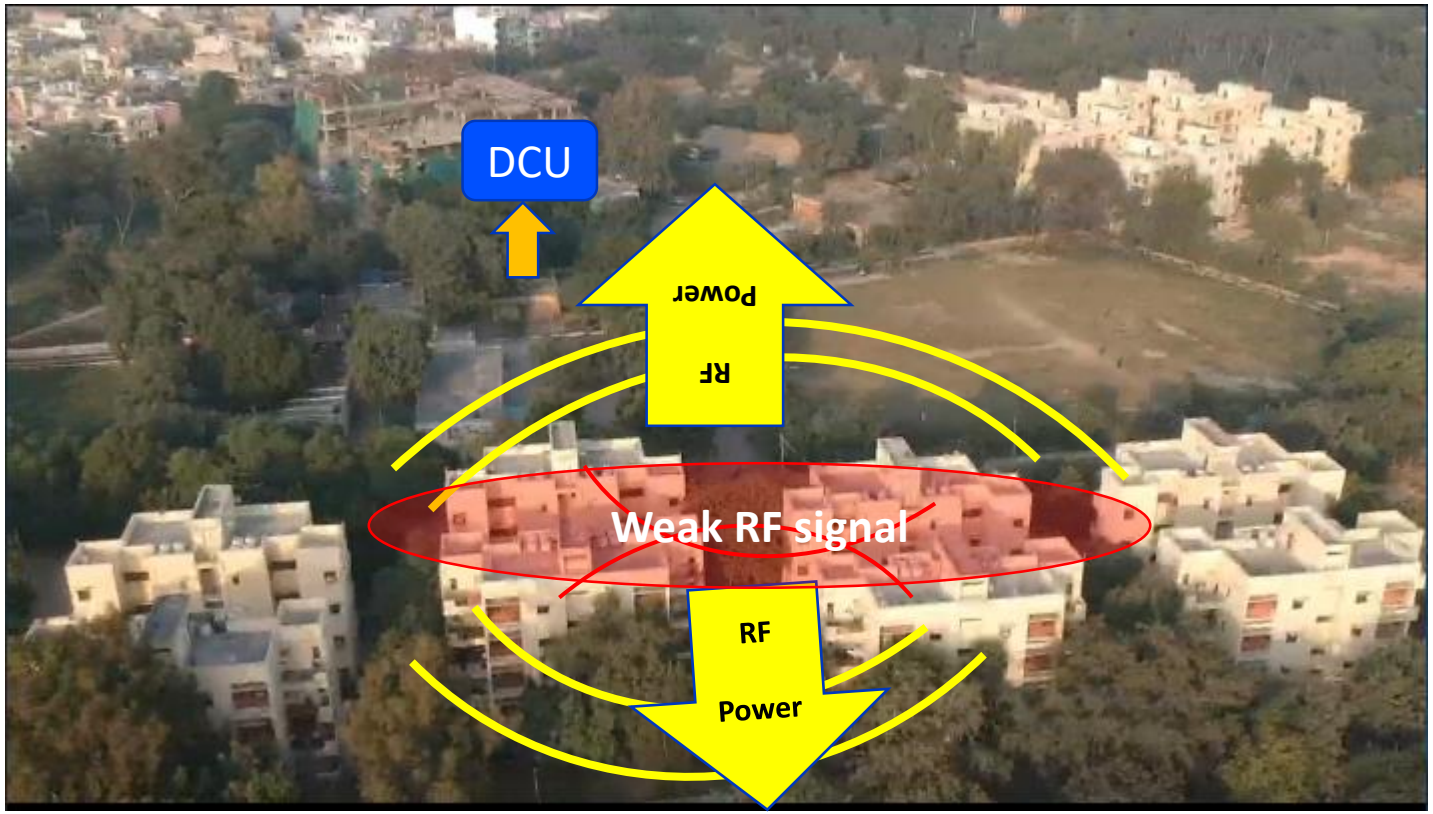
Max = 100 dBuv



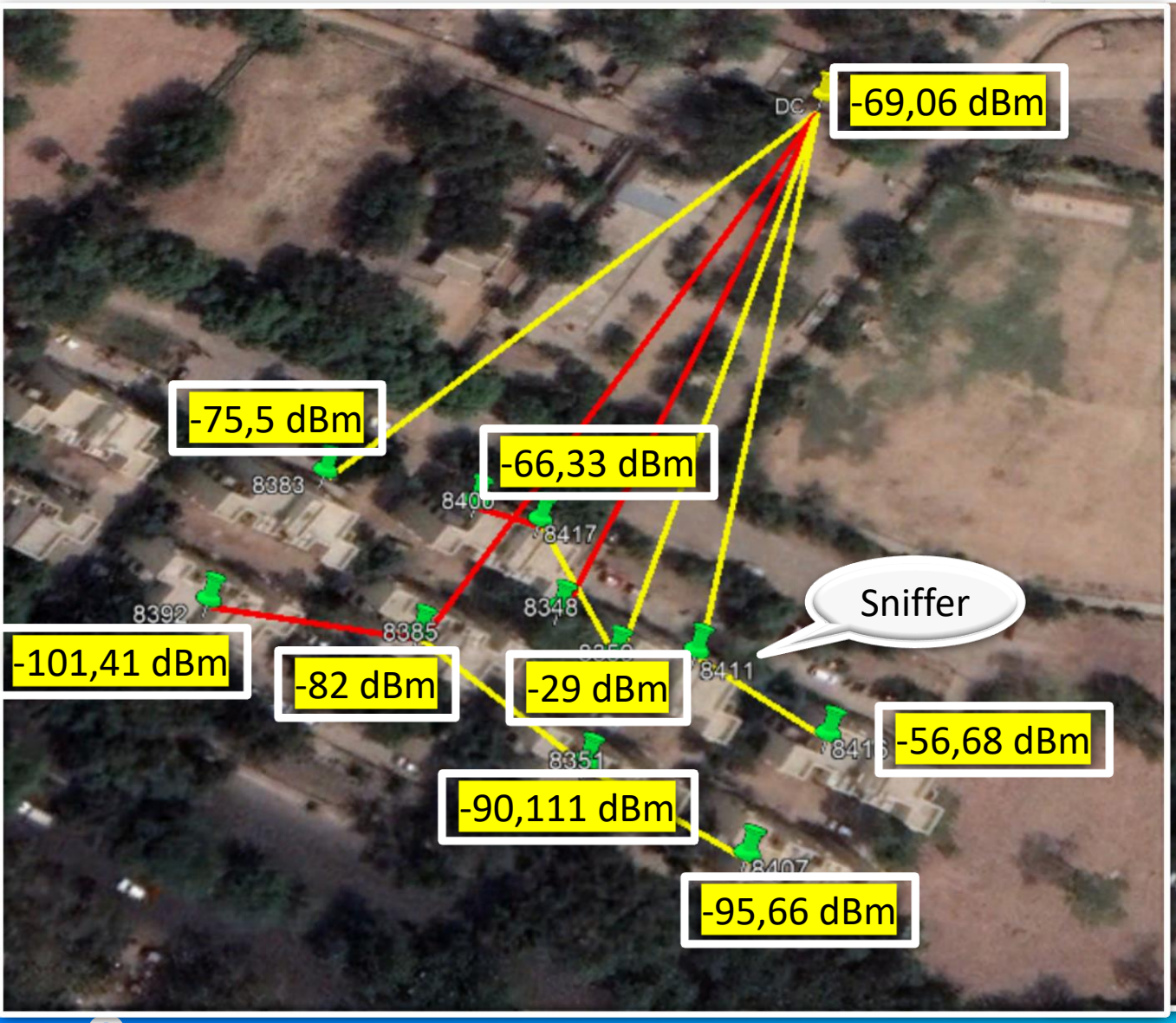


View on Field Composition

- 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.

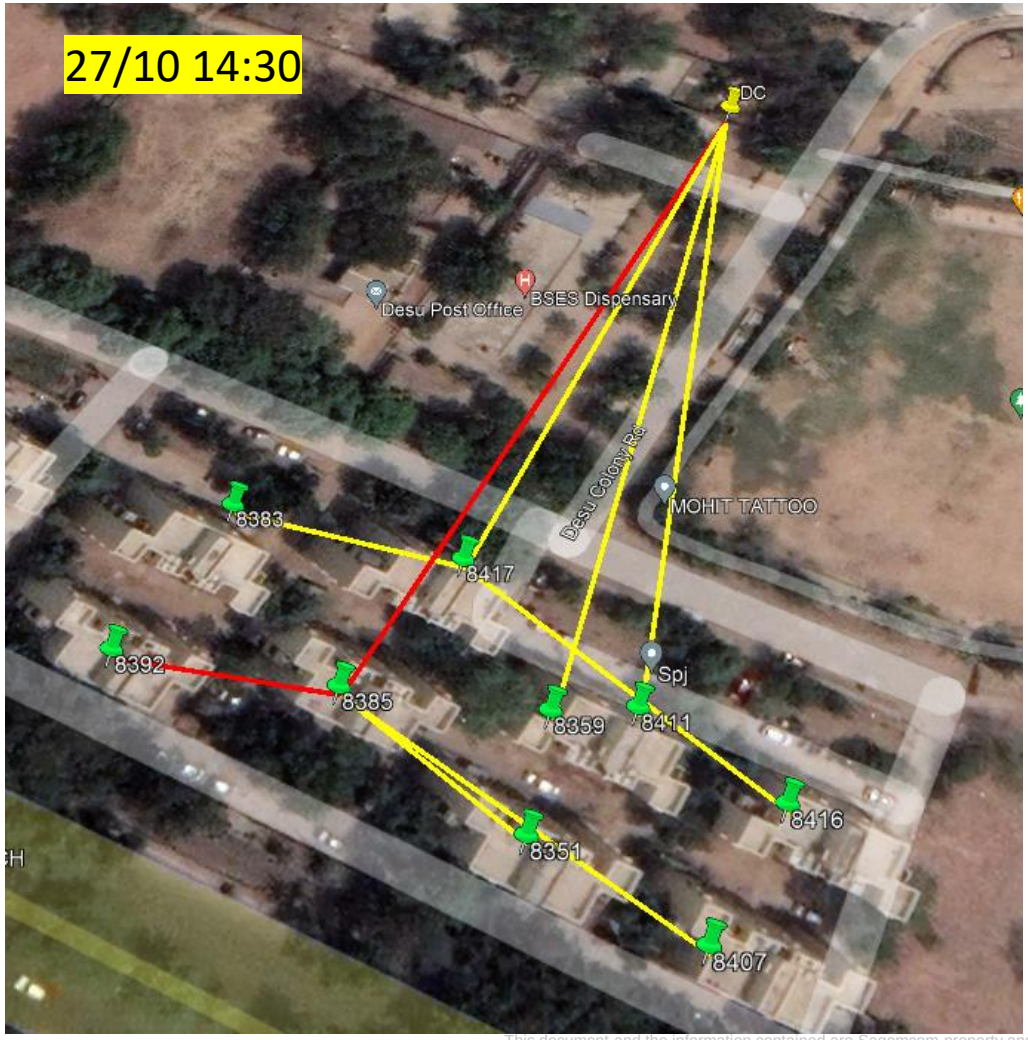


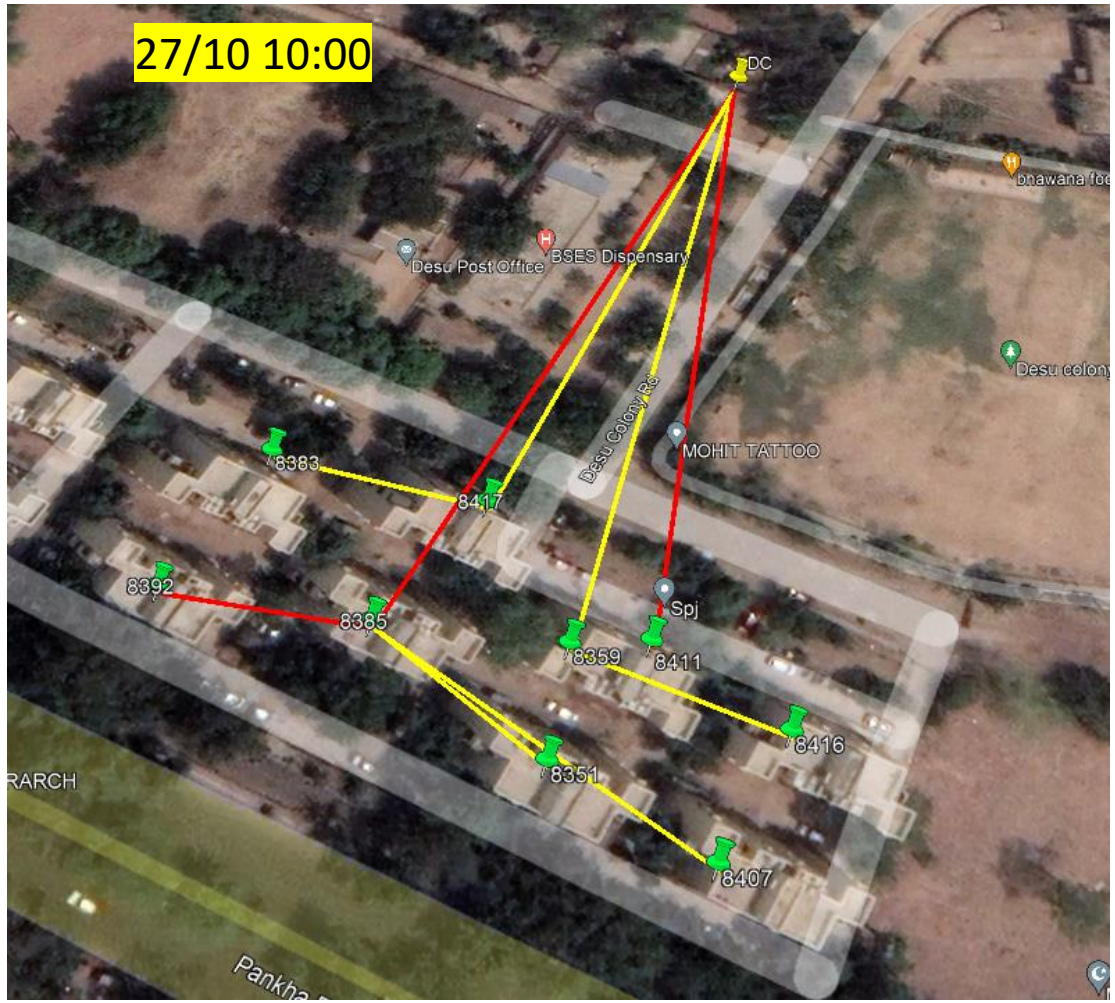
RF Mearurments Sniffer At 385 and 411 Position



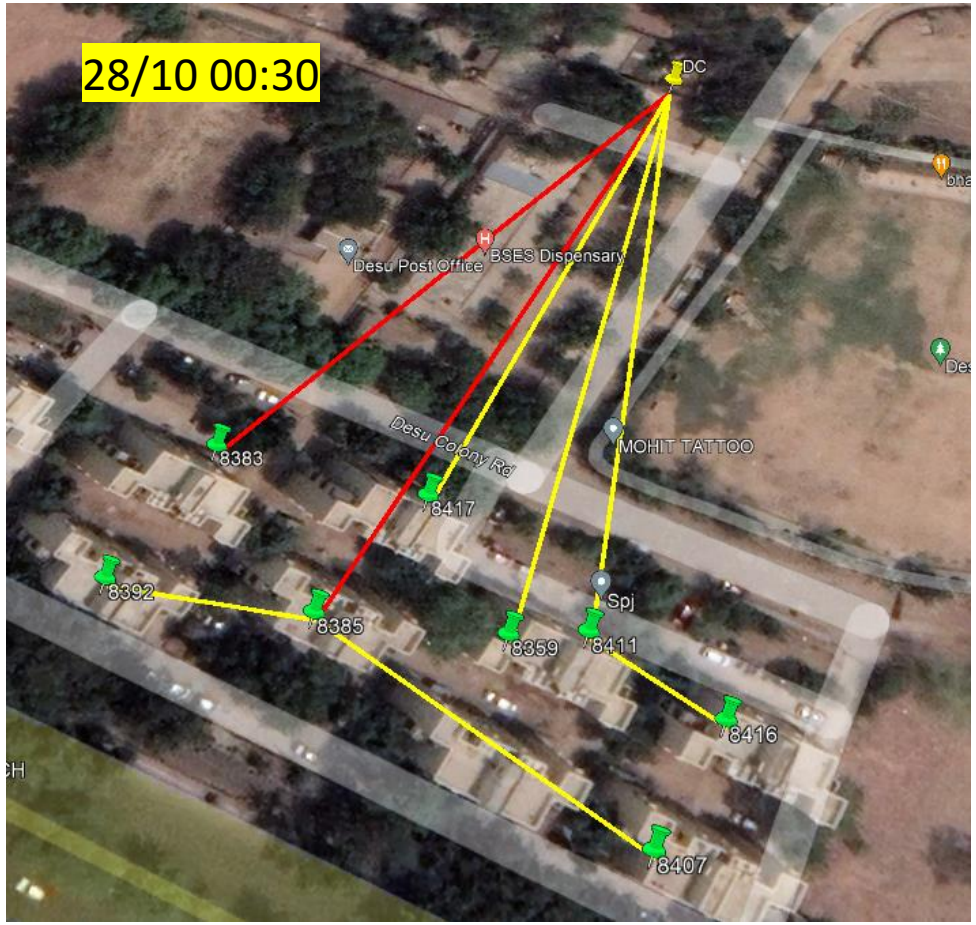
Hybrid Topology at different time frame

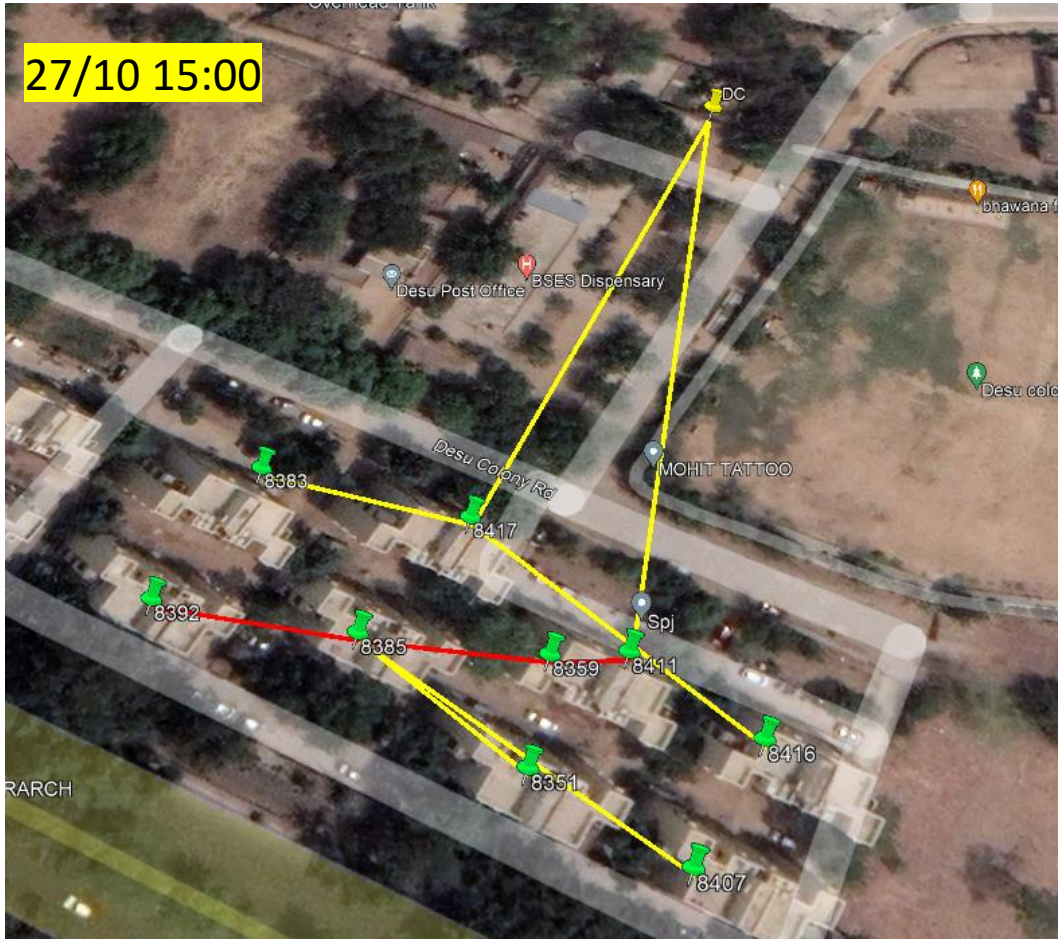
Topology at different time of the Day



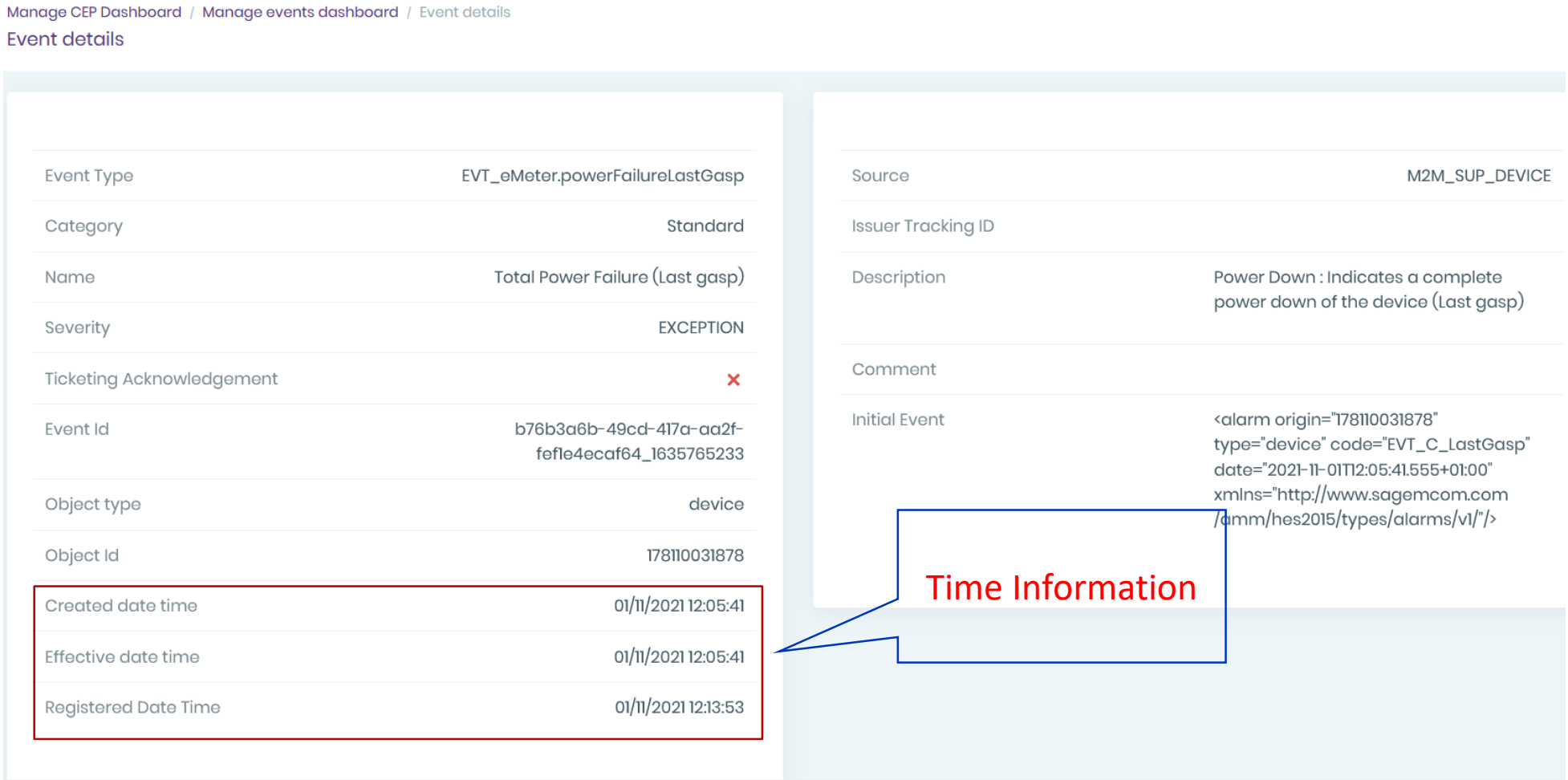


Topology at Different Time of the Day





LAST GASP EVENT



Thank You