

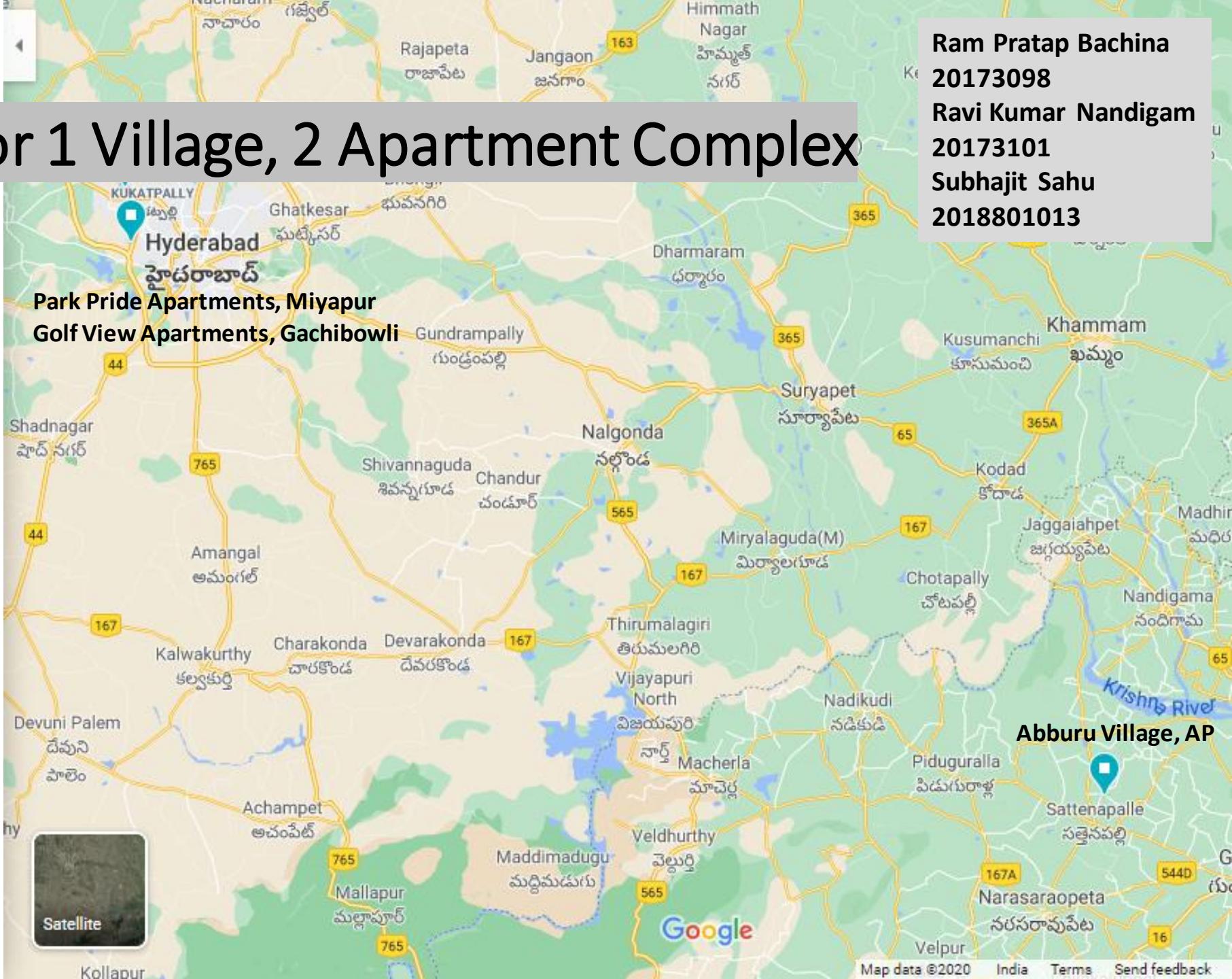
Ram Pratap Bachina
20173098
Ravi Kumar Nandigam
20173101
Subhajit Sahu
2018801013

WAN Design for 1 Village, 2 Apartment Complex

- **Abburu Village:**
- Ram Pratap Bachina
- [LAN Design](#)
- 1000 houses

- **Park Pride Apartments:**
- Ravi Kumar Nandigam
- [LAN Design](#)
- 15 flats

- **Golf View Apartments:**
- Subhajit Sahu
- [LAN Design](#)
- 384 flats



Network Requirements

- As part of **National Village Growth Programme**, the Government of India is encouraging people located in cities to directly contribute to one of the selected **villages for upgradation** in various respects (providing tax exemption). Residents at Park Pride Apartments & Golf View Apartments have chosen to contribute to **Abburu Village**.
- Abburu Village Panchayat is to be connected with a **file sharing** network with both the apartment complexes in Hyderabad, which would be used for sharing various sensitive documents. Accordingly, encrypted **WAN** must be setup such that share folders can be accessed by all parties, without it being accessible in the public internet.
- Both the Hyderabadi and village people already have a broadband connection, and desire a number of automation upgrades.
- Setup Automated Metering Infrastructure (AMI) of each location for utilities such as **electricity** and **piped gas** (where available), using existing RF-DCU, GSM/GPRS, or WiFi based smart meters.
- Install **fire detection and alarm systems** for alerting local people through loud sirens and contacting nearest fire department for extinguishing, with a 5-10 min window to prevent false alarms.
- Provide a silent **intrusion (burglar) detection system** for alerting local security / gram panchayat, as well as contacting nearest police department, with again a 5-10 min window for false alarms.
- Since Abburu village lies in **seismic zone 3**, a seismometer can be installed at village center in order to **detect earthquakes** and alert local people. Hyderabad lies in seismic zone 2.

Abburu, Andhra Pradesh 522403

Park Pride Apartments, Street Number

Golf View Apartments, Nanakaramguda

Add destination

Satellite

OPTIONS

Send directions to your phone

via NH65

56 hr

271 km

DETAILS

↑ 5,743 m ↓ 5,730 m

613 m

54 m

56 hr
271 km

Map data ©2020 India Terms Send feedback 20 km

Abburu Village, Guntur district

≡ ⛽ 🚗 🚎 🚲 🚴 🛣 X

Abburu, Andhra Pradesh 522403

BSNL Office, Sattenapalli Main Rd, Satt...

Add destination

OPTIONS

Send directions to your phone

via Abbur Rd/Sattenapalli - Bayyavaram Rd 1 hr 30 min 7.3 km

DETAILS

via Pakalapadu - Paladugu Rd 1 hr 36 min 7.8 km

via Pakalapadu - Paladugu Rd and Guntur - Sattenapalli Rd/Hyderabad - Guntur Rd/Sattenapalli Main Rd 1 hr 58 min 9.7 km

Satellite

The map shows a walking route from the BSNL Office in Sattenapalli to Abburu Village. The route starts at the BSNL Office and follows the Sattenapalli Main Road (Rd) towards the west. It then turns north onto a local road, passing through several landmarks including the KJHBM church, Sai Krishna Delux, Andhra Bank, and the Fire Station. The route continues along a mix of major roads (like NH 34, NH 167, and NH 38) and local paths, eventually leading to Abburu Village. The total distance is 9.7 km, and the estimated time is 1 hour and 58 minutes. The map also shows other nearby locations such as Shiva Temple, PVR Gardens, Post Office, Kankanala Palli, Bhimavarm, Siddi Vinayaka Ganesh Hindu Temple, Eid-gah, Nandigama, and Ramakrishnapuram.

1 hr 30 min
7.3 km

1 hr 36 min
7.8 km

1 hr 58 min
9.7 km

Abburu

Shiva Temple

PVR Gardens

Post Office

Kankanala Palli

Bhimavarm

Siddi Vinayaka Ganesh Hindu Temple

Eid-gah

Nandigama

Ramakrishnapuram

Gudipudi Rd

Pakalapadu - Paladugu Rd

Andhra Bank

Fire Station

BSNL Office

Sai Krishna Delux

KJHBM church

Post Office

Shiva Temple

PVR Gardens

Abburu

1 hr 30 min
7.3 km

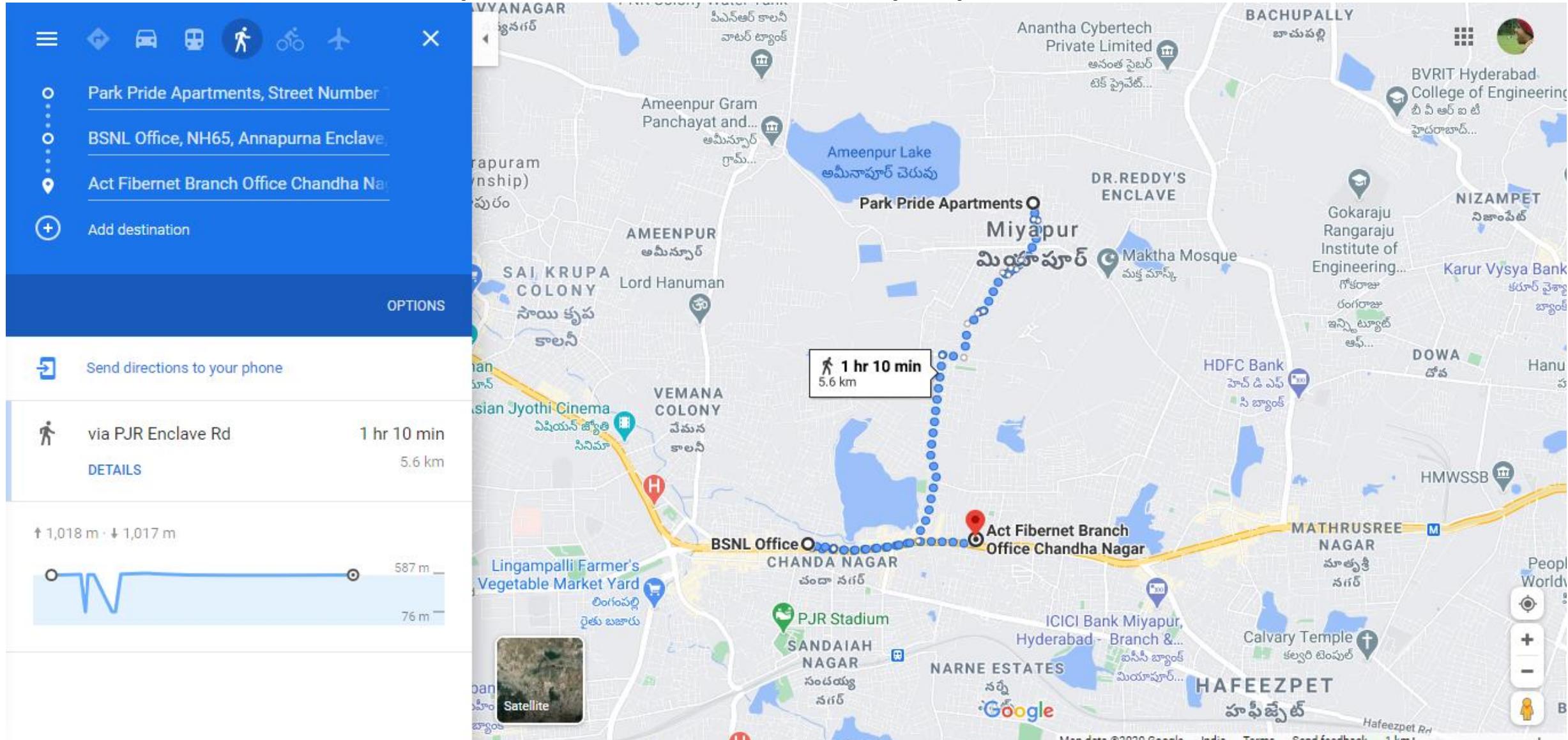
1 hr 36 min
7.8 km

1 hr 58 min
9.7 km

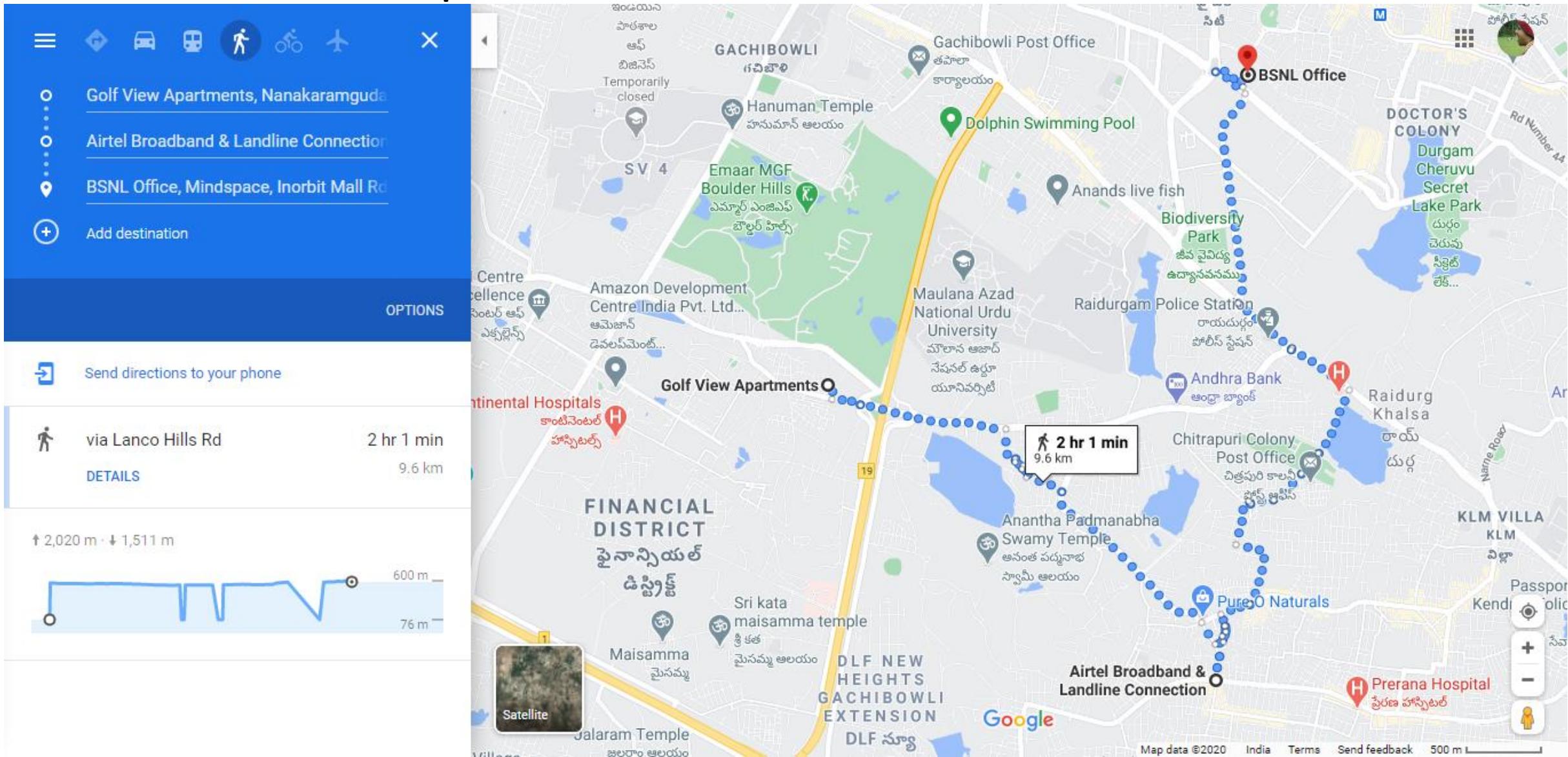
Map data ©2020 India Terms Send feedback 1 km

Google

Park Pride Apartments, Miyapur



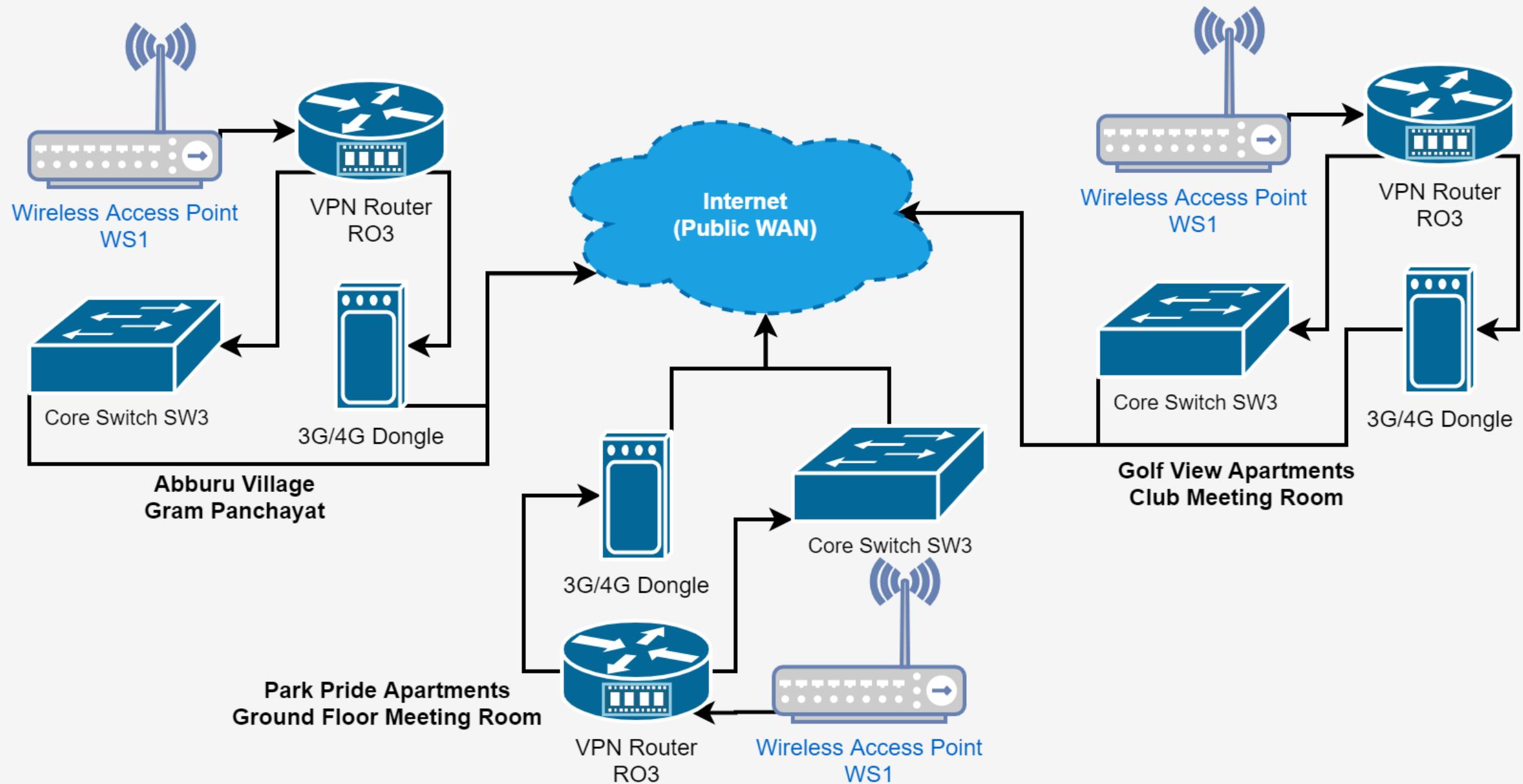
Golf View Apartments, Gachibowli



File Share WAN between locations

- At **Gram Panchayat, Abburu Village**, a small WiFi network has been created through a Wireless Access Point WS1. This AP is connected to a VPN Router RO3.
- Then VPN Router RO3 is then connected to the Central Core Switch SW3 which is connected to the ISP through optic fibre on its SFP ports.
- This VPN Router acts as a **VPN server** and allows other VPN clients to join through the Internet, thus forming a **Virtual WAN**.
- Devices connected through the VPN clients and well as devices connected through the Wireless AP here, can now share files among themselves as if they belong to the same LAN.
- At **Ground floor Meeting room, Park Pride Apartments** there is a very similar arrangement to that of Aburru village, except that the VPN Router RO3 is configured to act as a **VPN client**, and connect to the VPN server at Aburru village.
- At **Club house Meeting room, Golf View Apartments**, the arrangement is exactly same as Park Pride Apartments.
- In order to ensure good QoS, the port on which VPN Router RO3 is connected to Central Core Switch SW3 is **assigned higher priority**, than other data connections.
- Highest priority is assigned to **automated electricity metering** network.
- Sensitive documents can now be easily shared among the people, without having to resort to encrypted zip files in email.

Abburu Village + Park Pride Apartments + Golf View Apartments: File Share WAN (Central)



RO3 VPN Router

₹ 19000 x 6

- Cisco RV320 VPN Router with Web Filter:
- 2 x GbE WAN for load balancing
- 2 x USB for 2G / 3G modem (if WAN fails)
- SSL & site-site VPN
- Stateful Packet Inspection (SPI) & HW Firewall



WS1 Wireless Access Point

₹ 1700 x 3

- TP-Link TL-WA901N 450 Mbps Wireless N Access Point:
- 450 Mbps wireless N @ 2.4 GHz
- Access Point, Range Extender, Multi SSID
- Supports passive PoE (PoE injector included)
- Upto 30 m (100 ft) range



SW3 Central Core Switch

₹ 30000 x 7

- **TP-Link JetStream T1700G-28TQ Smart Switch:**
- **24 x GbE, 4 x 10GbE SFP+ slots**
- Stacking upto 6 units, **40 Gbps bidirectional BW**
- ACL, Port security, DoS defend, DHCP snooping
- **Web/CLI managed modes, SNMP, RMON**



3G/4G Dongle

₹ 2000 x 3

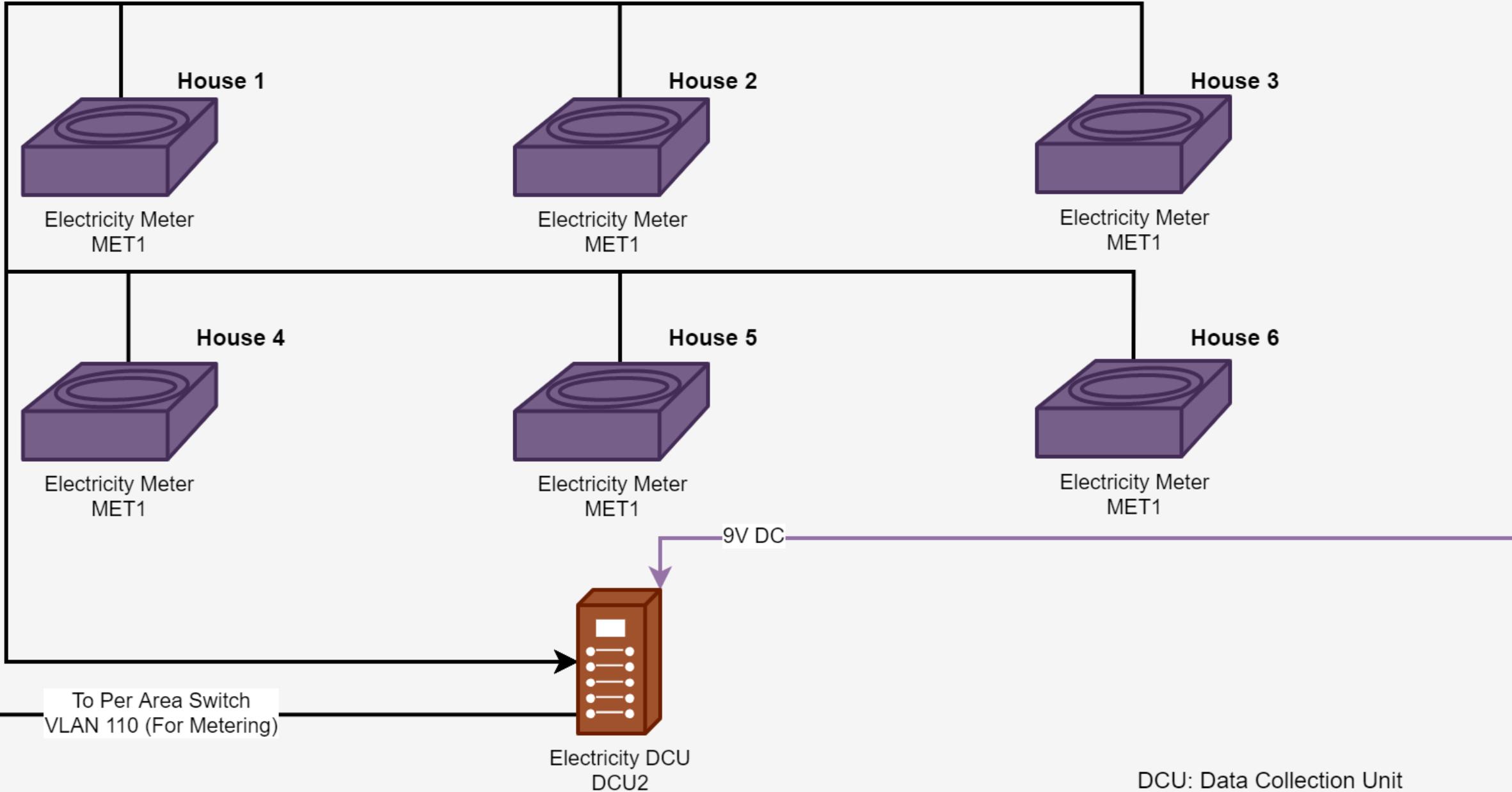
- **JioFi JDR740 Dongle 150 Mbps wireless 4G router:**
- **4G speed: upto 150 Mbps download, 50 Mbps upload**
- Expandable memory capacity: 32 GB



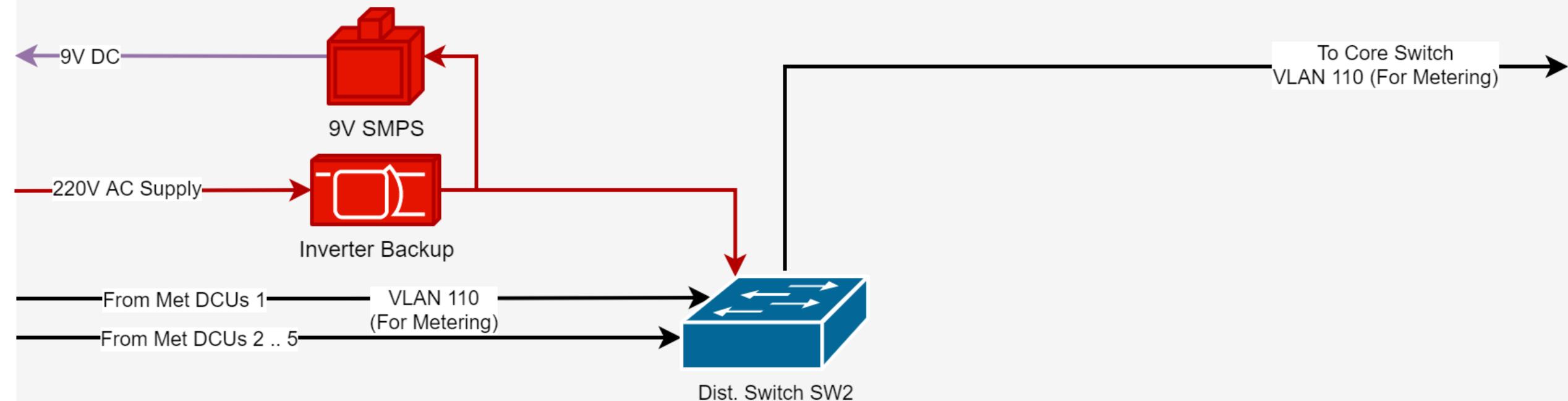
Abburu Village: Metering System

- Each house has a **gas cylinder** connection and thus has only an **electricity meter**.
- The electricity meters communicate with either wired **RS-485** or **wireless RF** mechanism with a **Data Collection Unit** (DCU) which is installed every street.
- The **DCU** is connected to **per-street managed switch** on **VLAN 110**, which is reserved for **metering** purpose.
- The per-street switch is connected to per-area **Distribution switch**, which is then connected to the central **Core switch**.
- An **Metering-cum-DHCP server** is present in Gram Panchayat connected to the Core switch on **VLAN 110**. The DHCP server is used to assign IP address to all DCUs.
- **VPN Router RO3** can act as a **VPN client** and thus form a **Virtual WAN** with electricity board's network. A **server** on their network can now **query all our metering devices**.
- The smart meters report to the power distribution company every **15 mins** through the **Metering server**.
- The metering server sends data to the power distribution company over HTTPS secure channel through **GSM/GPRS modem**.
- This is done so because GSM/GPRS modems are cheaply available, are reliable, and are **commonly used** in most smart meters used in India (e.g. Genus).
- There is also a **backup** GSM/GPRS modem that uses SIM from a different service provider in case the primary fails.
- If the **power distribution company** provides a VPN server in order to connect all metering devices in a **Virtual WAN**, this can be achieved through the VPN Router RO3.
- The VPN Router connects with all **metering devices** on **VLAN 110** and then connects to internet either through the **Central Core Switch SW3** or a **3G/4G dongle** connected to its USB port as backup.

Abburu Village: Metering System (Street)

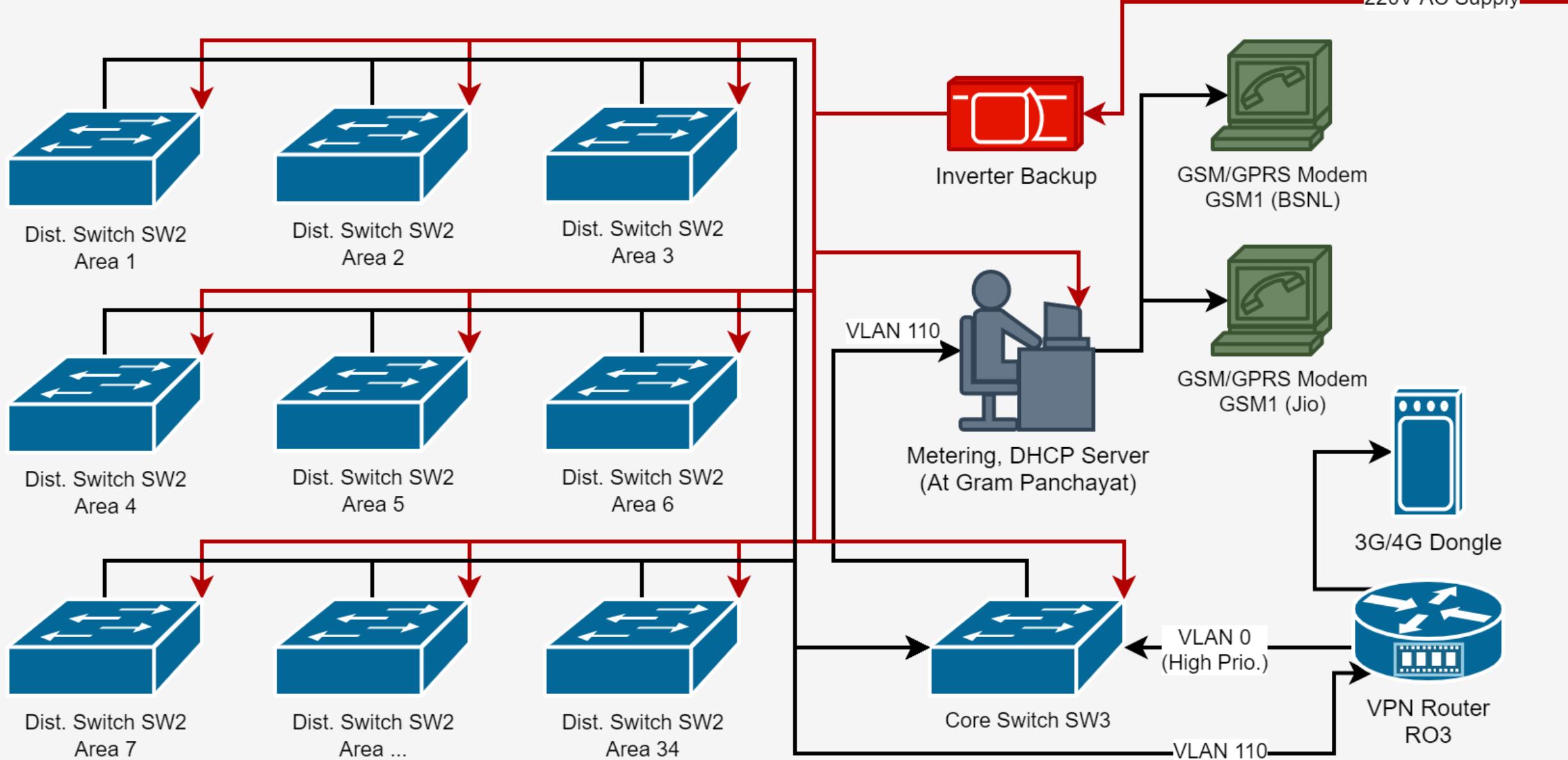


Abburu Village: Metering System (Area)



DCU: Data Collection Unit

Abburu Village: Metering System (Central)



MET1 Electricity Meter

₹? x ?

- **Saksham-125 Smart Residential Meter:**
 - Single-phase AMI system
 - Load management, Multi Rate, Time of use, Anti-theft
 - Communicates w/ Head end sys. on req. or schedule
 - Integrated GSM/GPRS modem



DCU2 Data Collector Unit

₹? x ?

- **Data Collector Unit (DCU):**
 - Integrated LPRF & GSM/GPRS communication
 - LPRF communication on demand or schedule
 - GSM/GPRS communicates with Head End System (HES)



SW2 Dist. Switch

₹ 26000 x 50

- Netgear GS748T-500INS Smart Managed Pro Switch:
- 48 x GbE, 4 x GbE SFP slots
- VLAN, QoS, IGMP snooping, Link aggregation, ACL



X, DHCP Server

₹ 28000 x 6

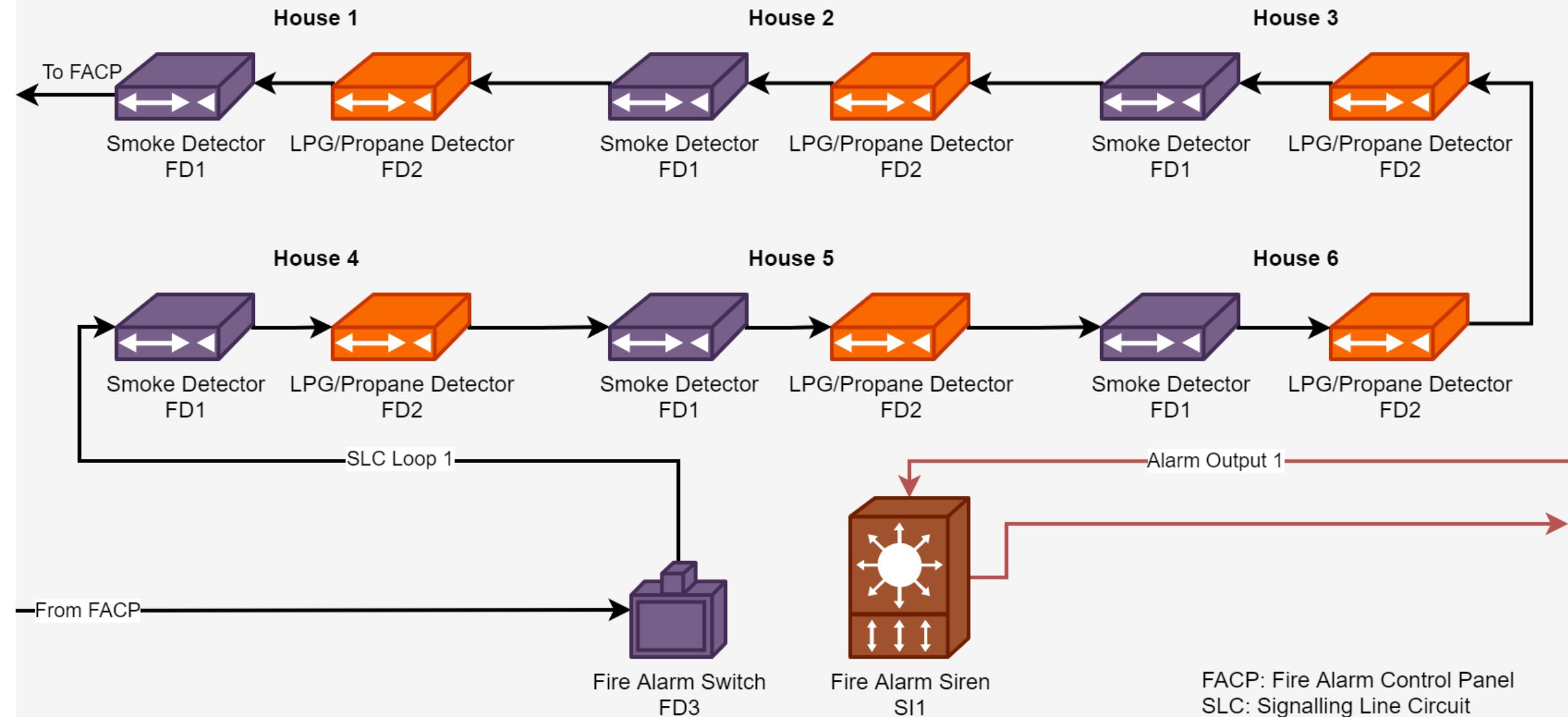
- Dell Power Edge 2950 III:
- 2U Rack mount
- 8 Core server
- 32 GB RAM
- 1 TB storage



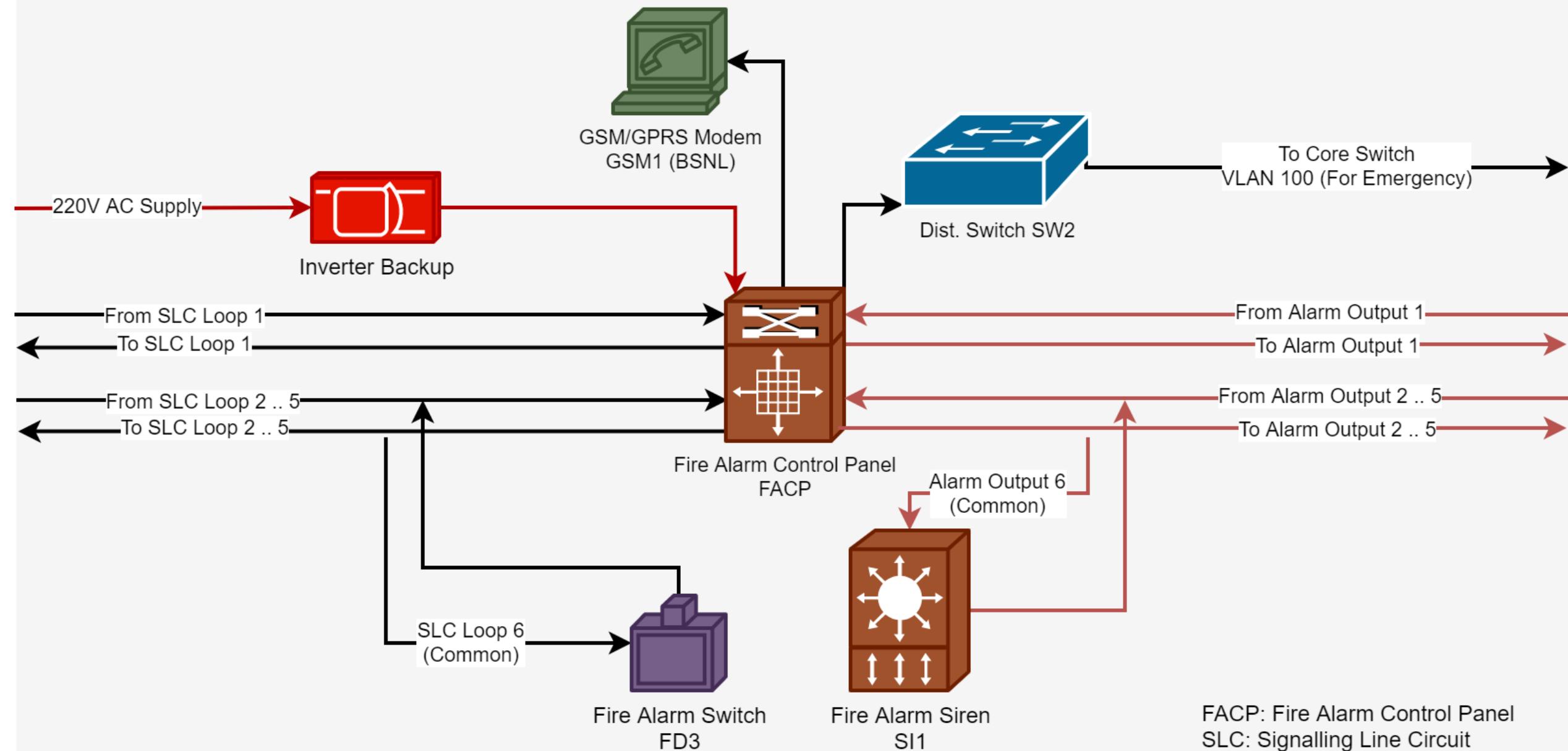
Abbru Village: Fire Alarm + Earthquake System

- We are using **Signaling Line Circuit** (SLC) based addressable **smoke detectors** and **LPG/Propane Gas sensors**. Each house is thus provided with a total of 2 sensors, and all 6 houses in a street are connected in a loop. Each street also has a **Fire Alarm switch** (manual) which can be used to manually trigger the fire alarm.
- Each street's loop (total 5 streets/area) is then connected to a **Fire Alarm Control Panel** (FACP) system which is also connected to a central **Fire Alarm Siren**. Each street is also connected to its respective Siren from the FACP.
- The FACP has a **GSM/GPRS interface** built-in through which it can be configured to send fire emergency events directly to nearby fire department at a certain **delay (5-10 min)** to avoid false alarm).
- In case there is a false alarm, the FACP's alarm can be shutdown with the delay time.
- The FACP is also connected through ethernet port to the per-area Distribution switch.
- All per-area Distribution switches are connected to the central **Core switch** (managed).
- An **Emergency-cum-DHCP server** is present in Gram Panchayat connected to the Core switch on **VLAN 100**. The DHCP server is used to assign IP address to all DCUs.
- In case a Fire alarm is triggered, the Emergency server **alerts the Panchayat**, rings the central siren, and indicates the house number of the source.
- There is also a backup GSM/GPRS module connected so that in case the one directly connected to FACP fails, the Emergency server can send the message on its behalf.
- Since Abbru lies in seismic zone 3, a seismometer is installed at Gram Panchayat, and NDRF can be contacted in case a **earthquake** is detected (unless marked false-positive in 5-10 min).

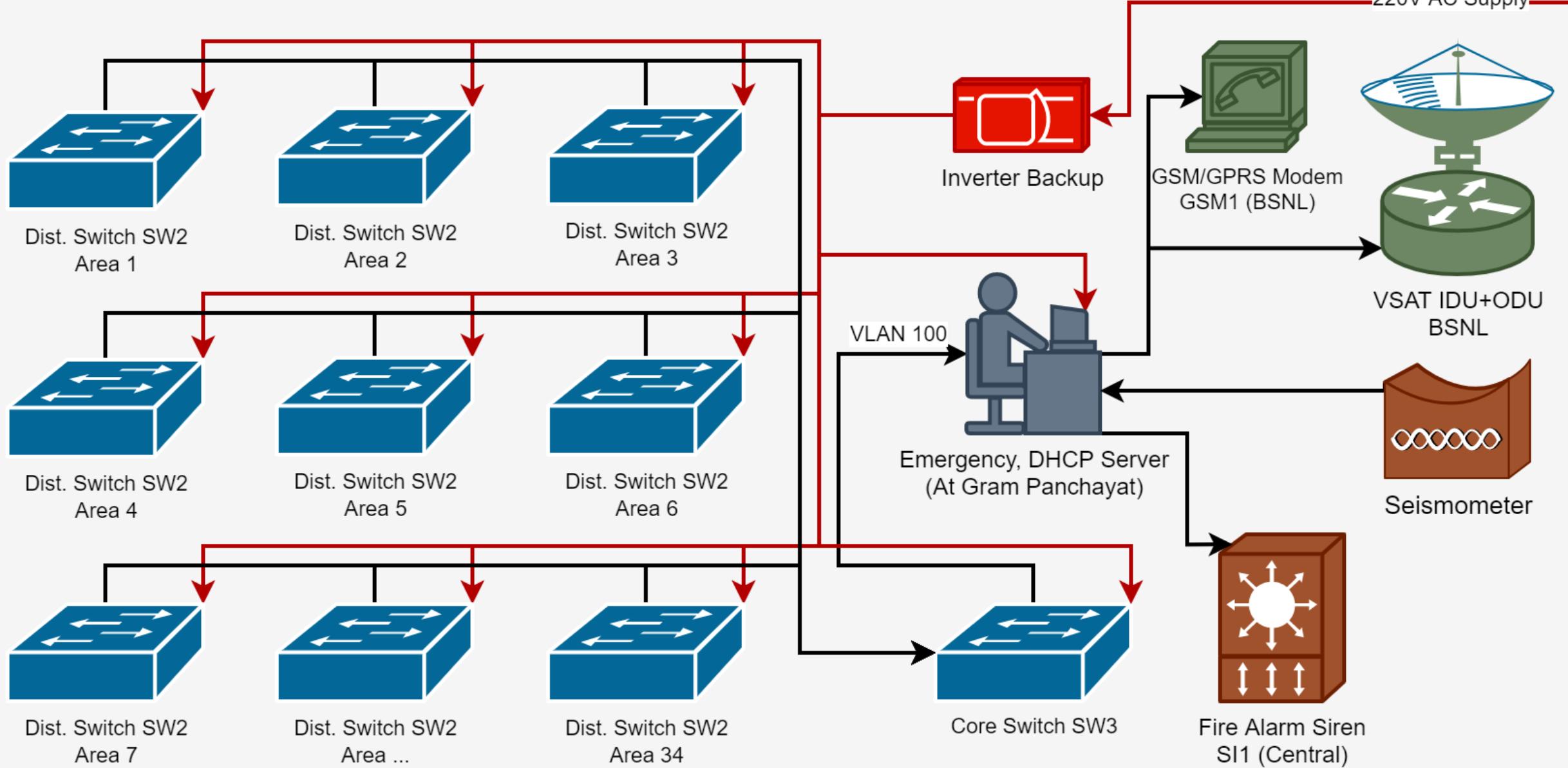
Abburu Village: Fire Alarm System (Street)



Abburu Village: Fire Alarm System (Area)



Abburu Village: Fire Alarm + Earthquake System (Central)



FD1 Smoke Detector

₹ ? x ?

- **4098-9754EA TrueAlarm Photoelectric & Heat Multi-Sensor Detector:**
- Analog photoelectric smoke & heat sensing
- Digital transmission of analog data
- Addressing dipswitch in permanently mounted base
- Automatic environmental compensation
- Fixed & Rate-of-rise heat detection



FACP Fire Alarm Ctrl. Panel

₹ ? x ?

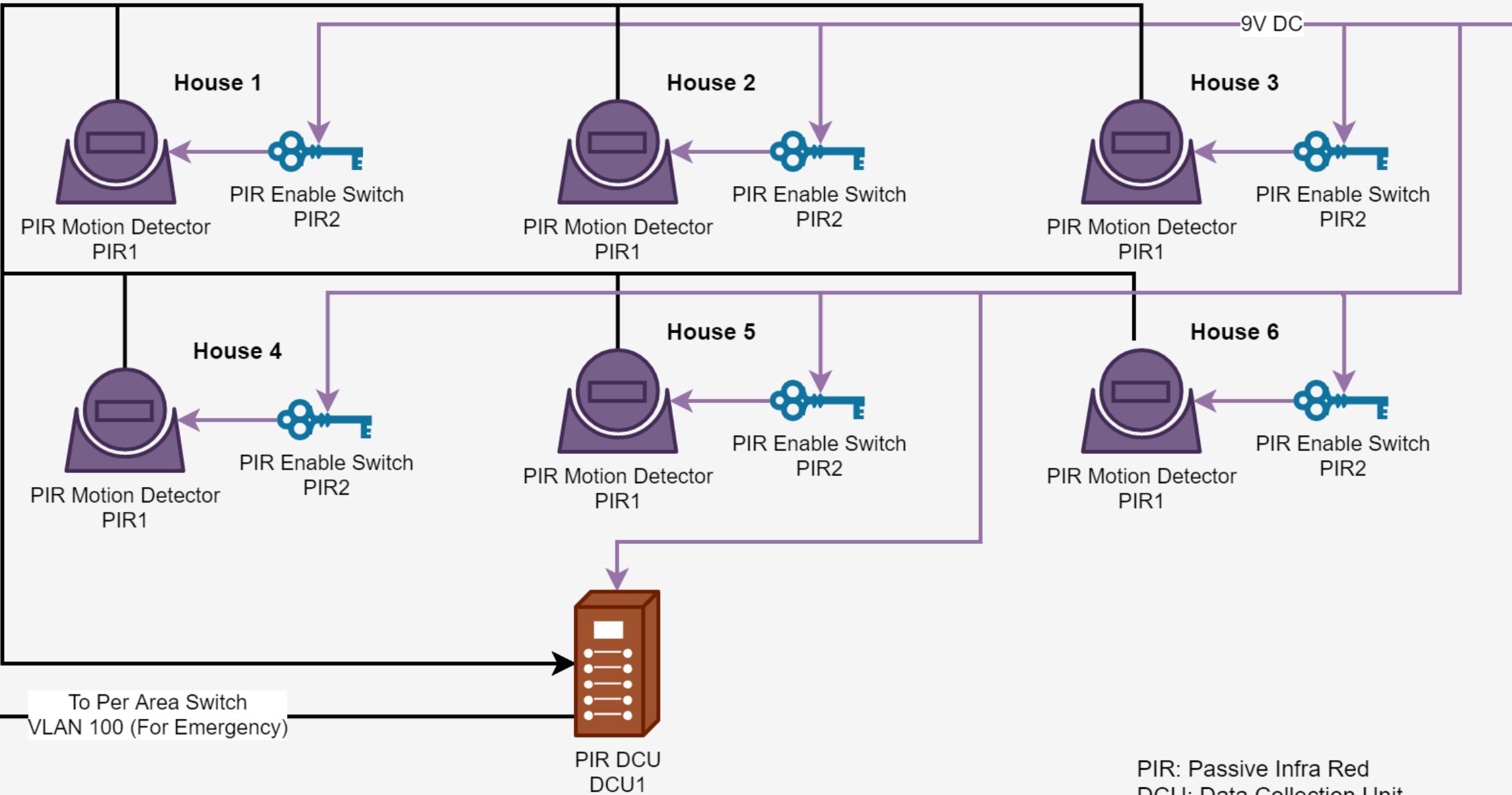
- **Simplex 4007ES Fire Control Panel:**
- Provides built-in short circuit isolation for monitoring and control of **TrueAlarm analog sensors** and IDNet communications monitoring and control devices
- Standard panel SLC provides up to **100 addressable points**
- **Battery backup** charging of up to 33 Ah



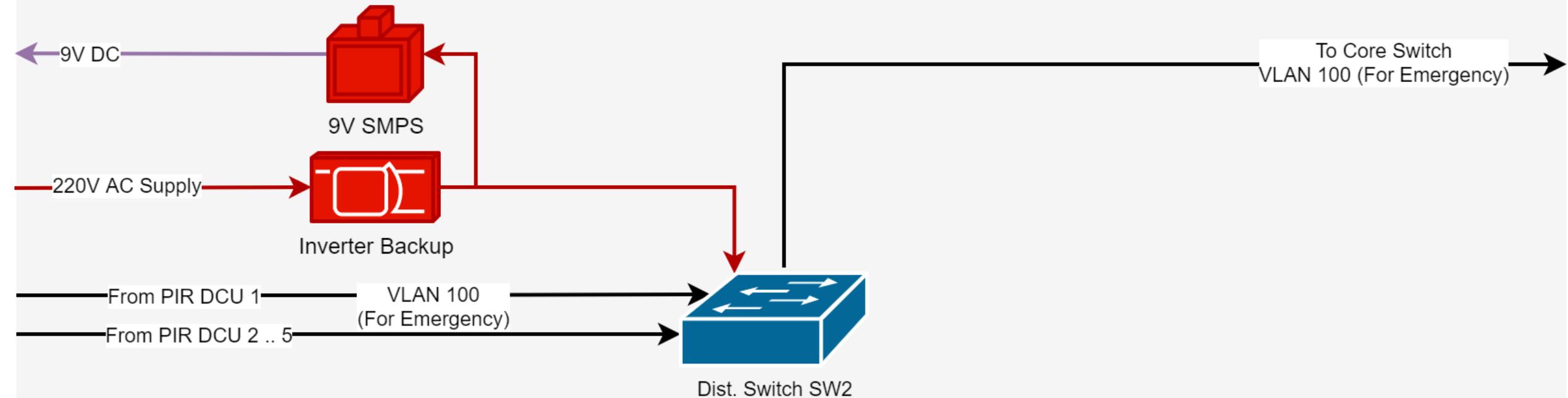
Abburu Village: Security System

- We are using simple **PIR sensors**, that are able to detect motion as our security element. The sensor triggers an event when it **detects motion**, and this is sent to a **Data Collection Unit** (DCU).
- The sensors have a trigger **enable switch** which can be turned on and off. Normally, when people are staying in the house, the switch is turned off.
- When the members are about to **leave their house** empty, they **turn on** the switch, which enables the PIR sensor. From now on, if any burglar enters the apartment, it can be detected by the PIR sensor. When residents come back, they remotely turn off the sensor.
- The **DCU** is connected with ethernet cable to a hierarchy of **managed routers**. Any motion detect **events** are sent over IP packets to an Emergency server located with the Security.
- The DCU connected port is configured as **VLAN 100**, which is reserved for all **emergency devices** of the network.
- An **Emergency-cum-DHCP server** is present in Gram Panchayat connected to the Core switch on **VLAN 100**. The DHCP server is used to assign IP address to all DCUs.
- In case an PIR sensor trigger event is detected, the Emergency server **alerts the Panchayat**, indicating the house number of the source.
- If it is not marked as **false alarm within 5-10 mins**, a message is sent to **nearest police department** through **GSM/GPRS modem** (with a backup in case).

Abburu Village: Security System (Street)

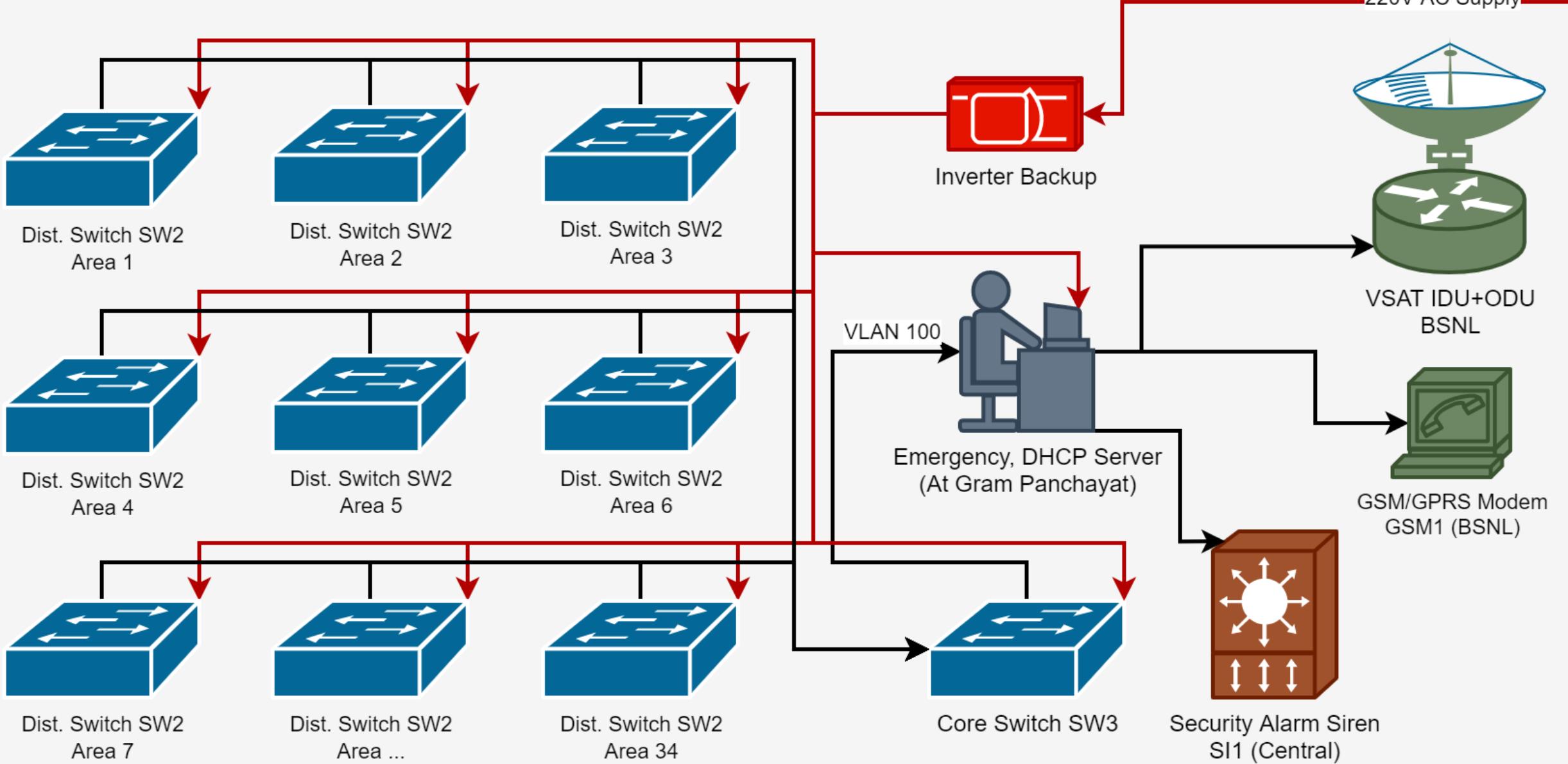


Abburu Village: Security System (Area)



PIR: Passive Infra Red
DCU: Data Collection Unit

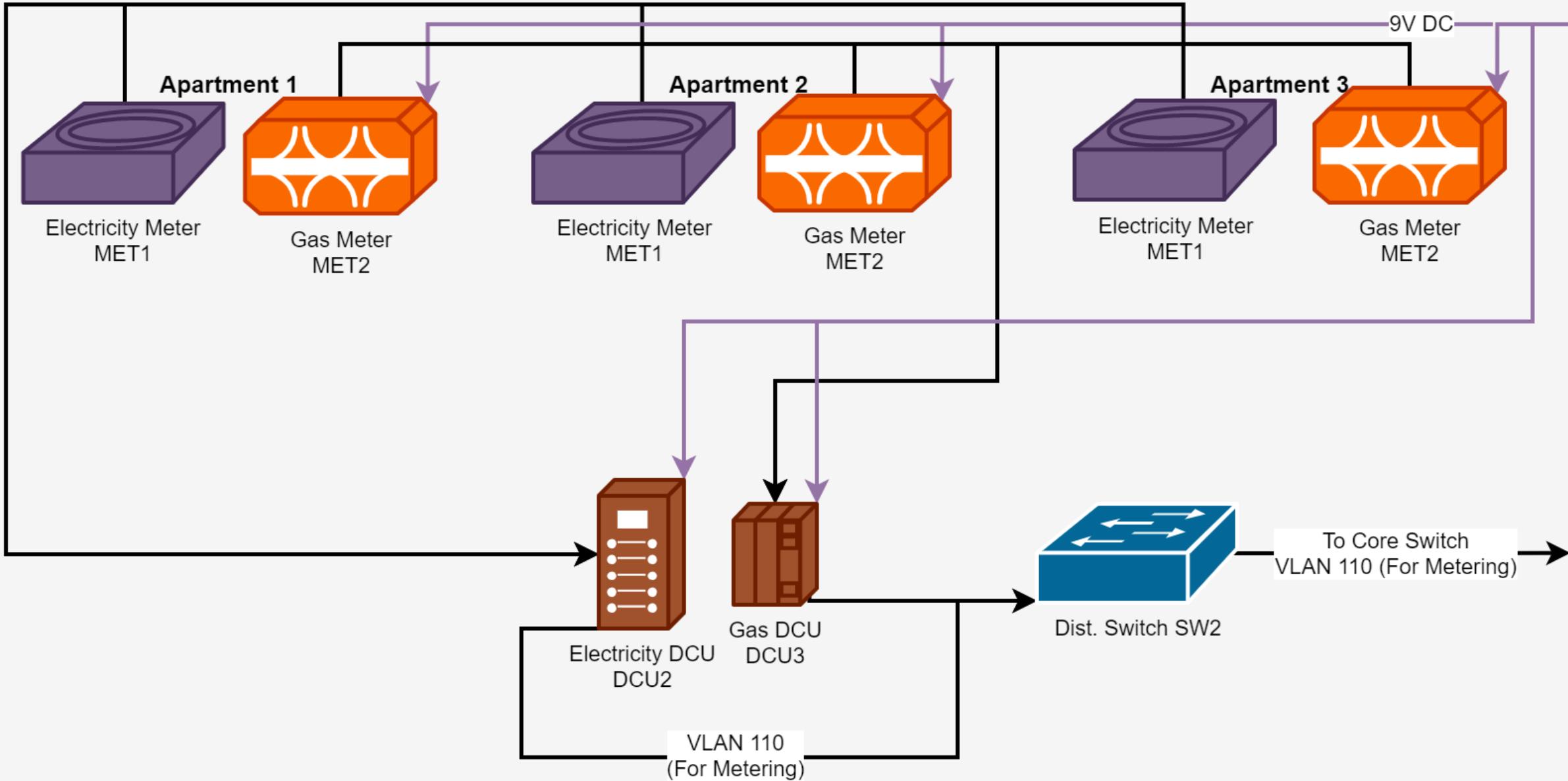
Abburu Village: Security System (Central)



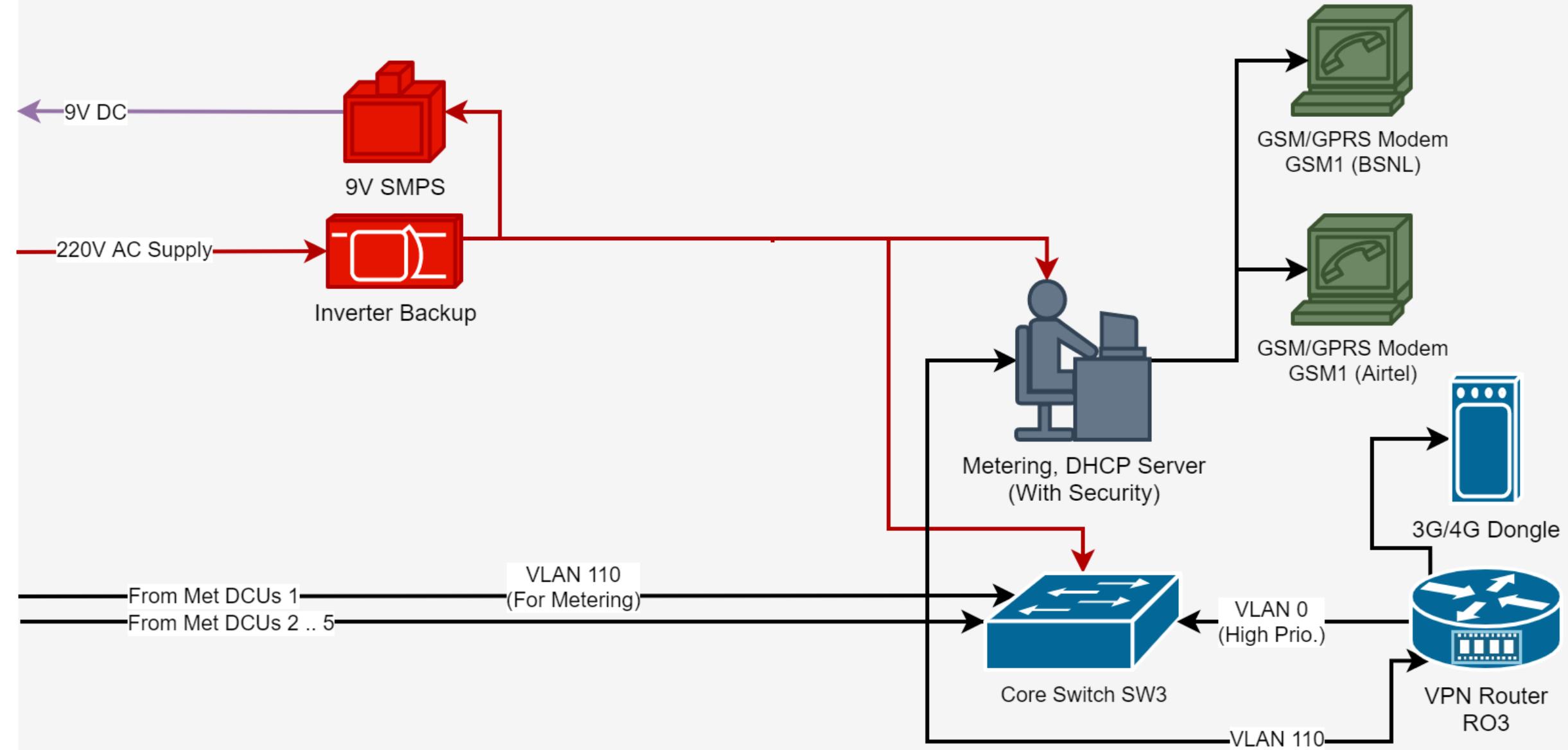
Park Pride Apartments: Metering System

- Each apartment has a **piped gas** connection and thus has a **gas meter** as well as an **electricity meter**. The gas meter operates with 9V DC power provided by an SMPS installed in first floor.
- The electricity and gas meters communicate with either wired **RS-485** or **wireless RF** mechanism with a **Data Collection Unit** (DCU) which is installed every floor.
- The **DCU** is connected to **per-floor** managed **switch** on **VLAN 110**, which is reserved for **metering** purpose. The per-floor switch is connected to the central **Core switch**.
- An **Metering-cum-DHCP server** is present in 1st floor connected to the Core switch on **VLAN 110**. The DHCP server is used to assign IP address to all DCUs.
- **VPN Router RO3** can act as a **VPN client** and thus form a **Virtual WAN** with electricity board's network. A **server** on their network can now **query all our metering devices**.
- The smart meters report to the power distribution company every **15 mins** through the **Metering server**.
- The metering server sends data to the power distribution company over HTTPS secure channel through **GSM/GPRS modem**.
- This is done so because GSM/GPRS modems are cheaply available, are reliable, and are **commonly used** in most smart meters used in India (e.g. Genus).
- There is also a **backup** GSM/GPRS modem that uses SIM from a different service provider in case the primary fails.
- If the **power distribution company** provides a VPN server in order to connect all metering devices in a **Virtual WAN**, this can be achieved through the **VPN Router RO3**.
- The **VPN Router** connects with all **metering devices** on **VLAN 110** and then connects to internet either through the **Central Core Switch SW3** or a **3G/4G dongle** connected to it USB port as backup.

Park Pride Apartments: Metering System (Floor)



Park Pride Apartments: Metering System (Central)

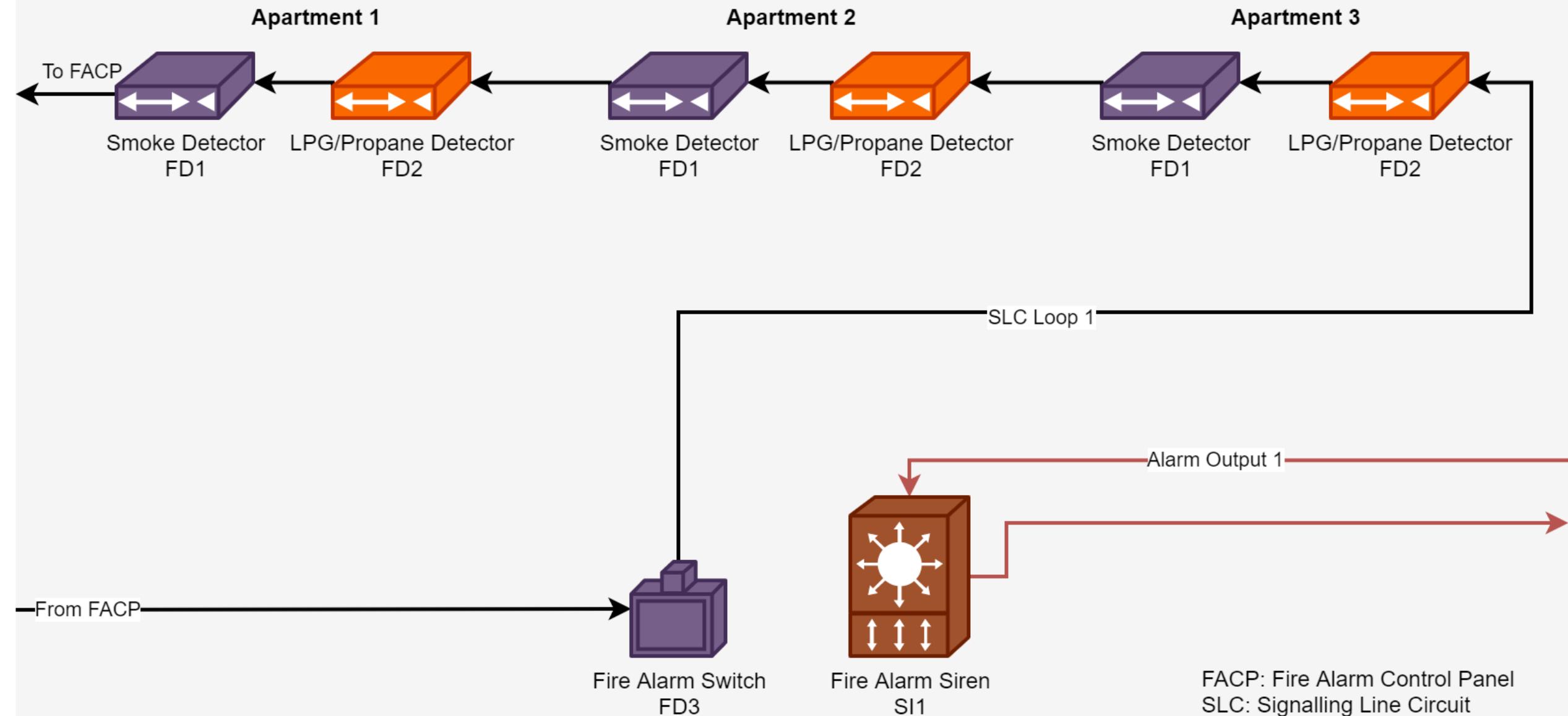


DCU: Data Collection Unit

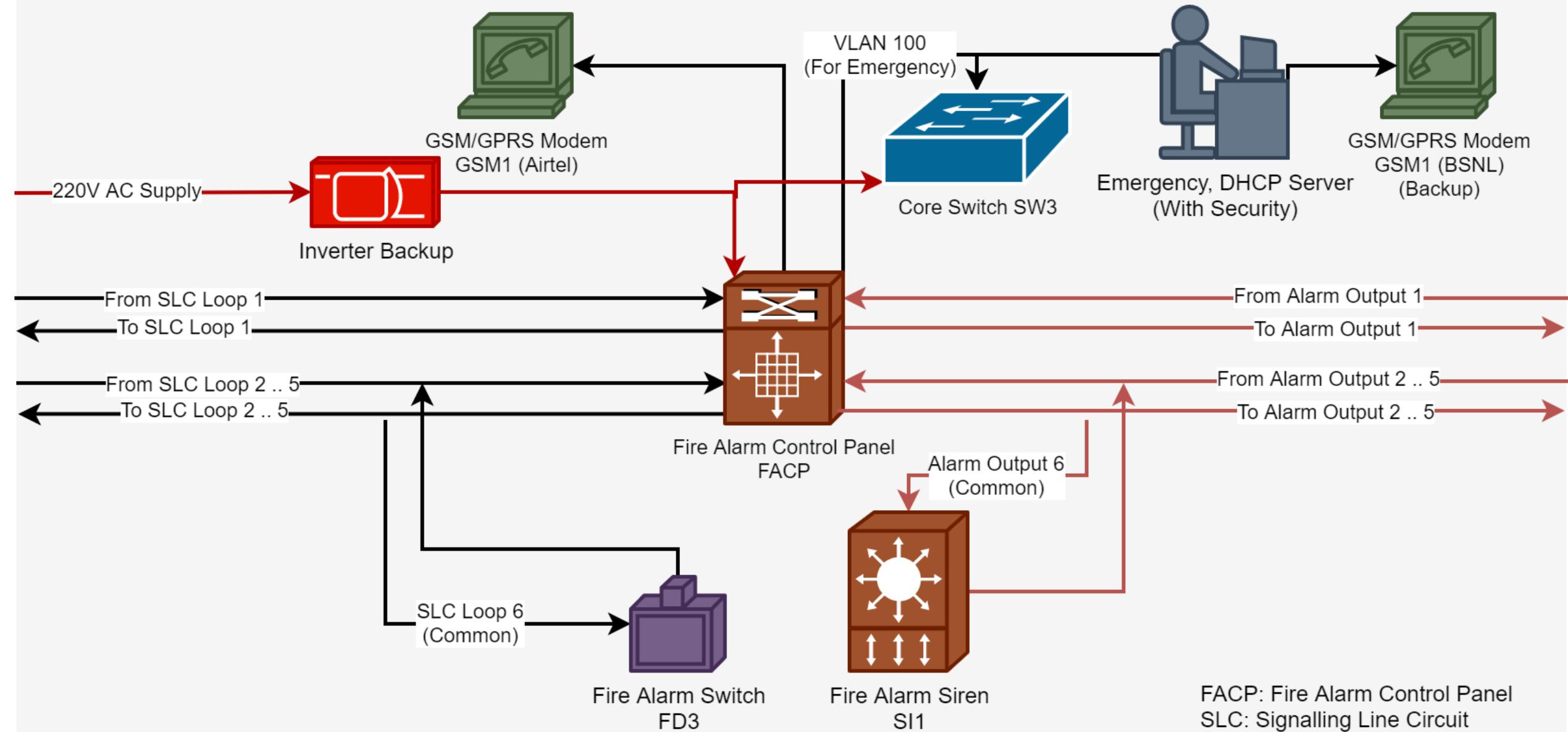
Park Pride Apartments: Fire Alarm System

- We are using **Signaling Line Circuit** (SLC) based addressable **smoke detectors** and **LPG/Propane Gas sensors**. Each apartment is thus provided with a total of 2 sensors, and all 3 apartments in a floor are connected in a loop. Each floor also has a **Fire Alarm switch** (manual) which can be used to manually trigger the fire alarm.
- Each floor's loop (total 5 floors) is then connected to a **Fire Alarm Control Panel** (FACP) system which is also connected to a central **Fire Alarm Siren**. Each floor is also connected to its respective Siren from the FACP.
- The FACP has a **GSM/GPRS interface** built-in through which it can be configured to send fire emergency events directly to nearby fire department at a certain **delay (5-10 min)** to avoid false alarm.
- In case there is a false alarm, the FACP's alarm can be shutdown with the delay time.
- The FACP is also connected through ethernet port to the central **Core switch** (managed).
- An **Emergency-cum-DHCP server** is present in 1st floor connected to the Core switch on **VLAN 100**. The DHCP server is used to assign IP address to all DCUs.
- In case a Fire alarm is triggered, the Emergency server **alerts the security**, rings the central siren, and indicates the apartment number of the source.
- There is also a backup GSM/GPRS module connected so that in case the one directly connected to FACP fails, the Emergency server can send the message on its behalf.

Park Pride Apartments: Fire Alarm System (Floor)



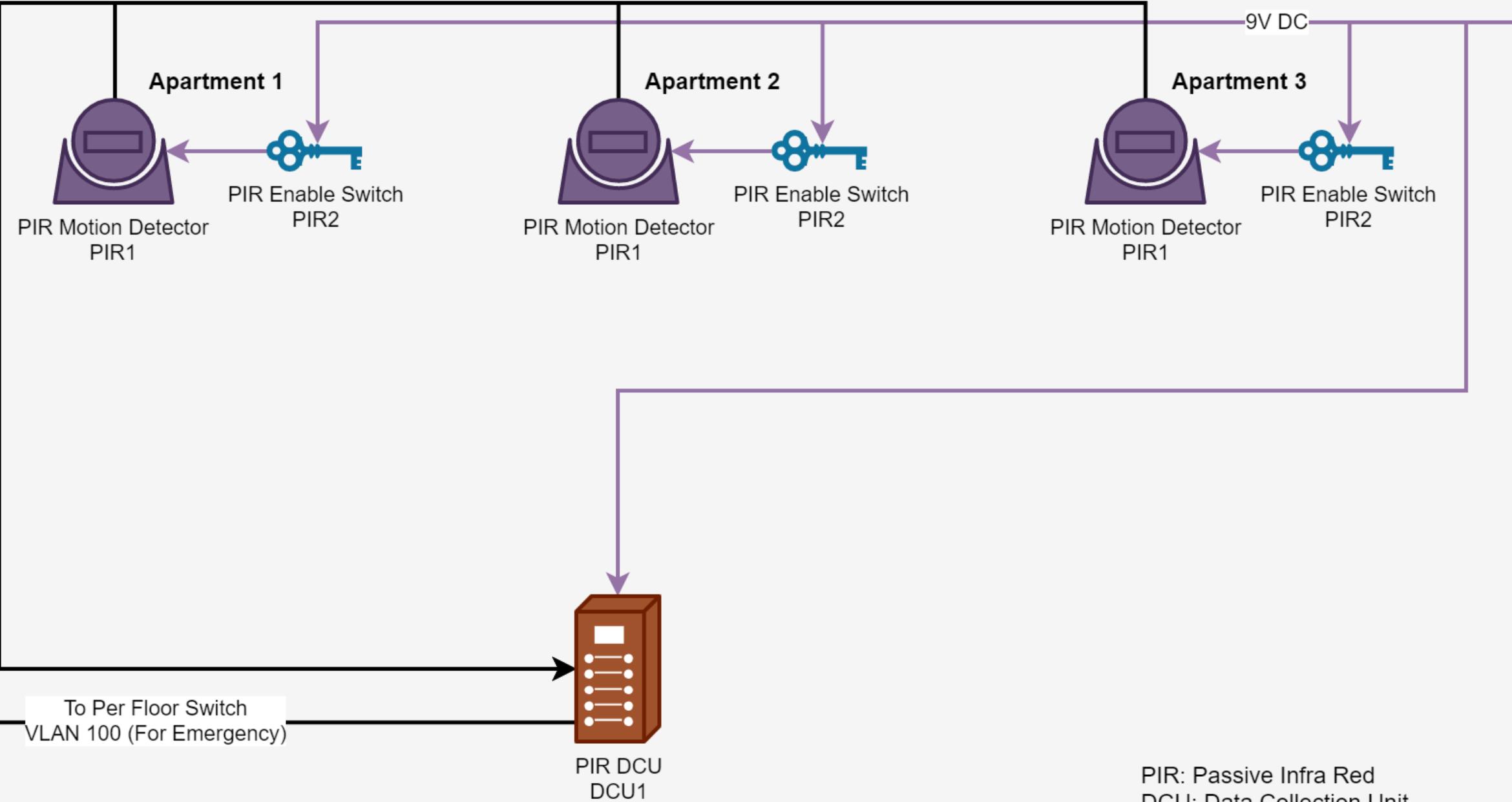
Park Pride Apartments: Fire Alarm System (Central)



Park Pride Apartments: Security System

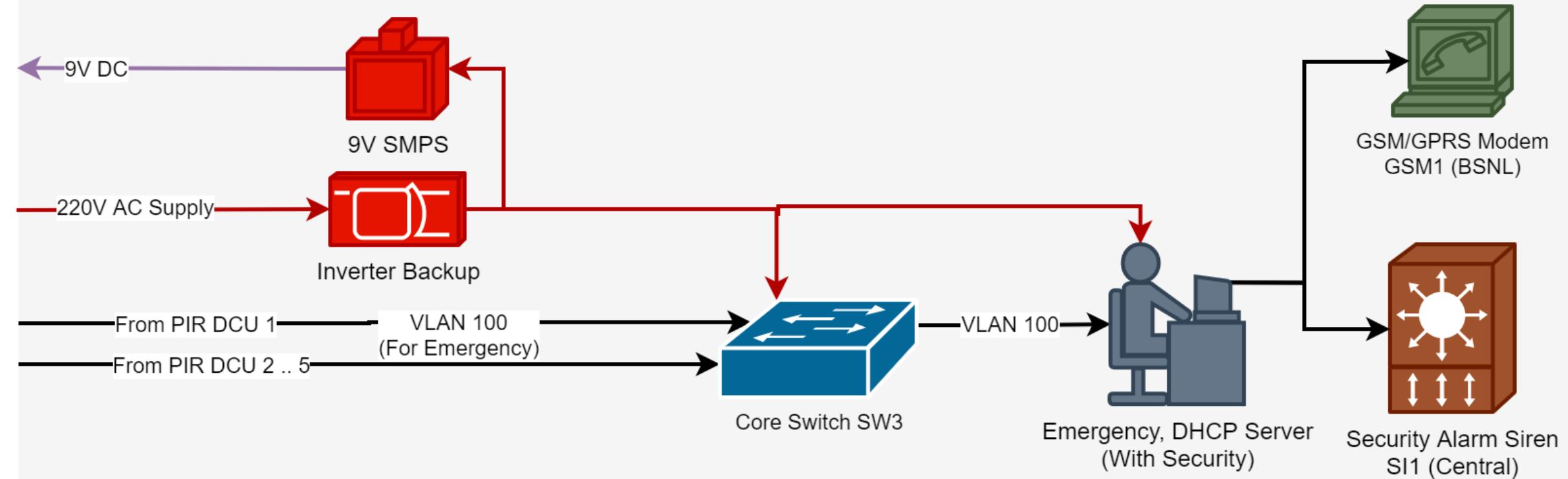
- We are using simple **PIR sensors**, that are able to detect motion as our security element. The sensor triggers an event when it **detects motion**, and this is sent to a **Data Collection Unit** (DCU).
- The sensors have a trigger **enable switch** which can be turned on and off. Normally, when people are staying in the flat, the switch is turned off.
- When the members are about to **leave their apartment** empty, they **turn on** the switch, which enables the PIR sensor. From now on, if any burglar enters the apartment, it can be detected by the PIR sensor. When residents come back, they remotely turn off the sensor.
- The **DCU** is connected with ethernet cable to a **managed router** on the floor. Any motion detect **events** are sent over IP packets to an Emergency server located with the Security.
- The DCU connected port is configured as **VLAN 100**, which is reserved for all **emergency devices** of the network.
- The managed switch is then connected with **Cat 6** cable to the central Core switch at 1st floor.
- An **Emergency-cum-DHCP server** is present in 1st floor connected to the Core switch on **VLAN 100**. The DHCP server is used to assign IP address to all DCUs.
- In case an PIR sensor trigger event is detected, the Emergency server **alerts the security**, indicating the apartment number of the source.
- If it is not marked as **false alarm within 5-10 mins**, a message is sent to **nearest police department** through **GSM/GPRS modem** (with a backup in case).

Park Pride Apartments: Security System (Floor)



PIR: Passive Infra Red
DCU: Data Collection Unit

Park Pride Apartments: Security System (Central)

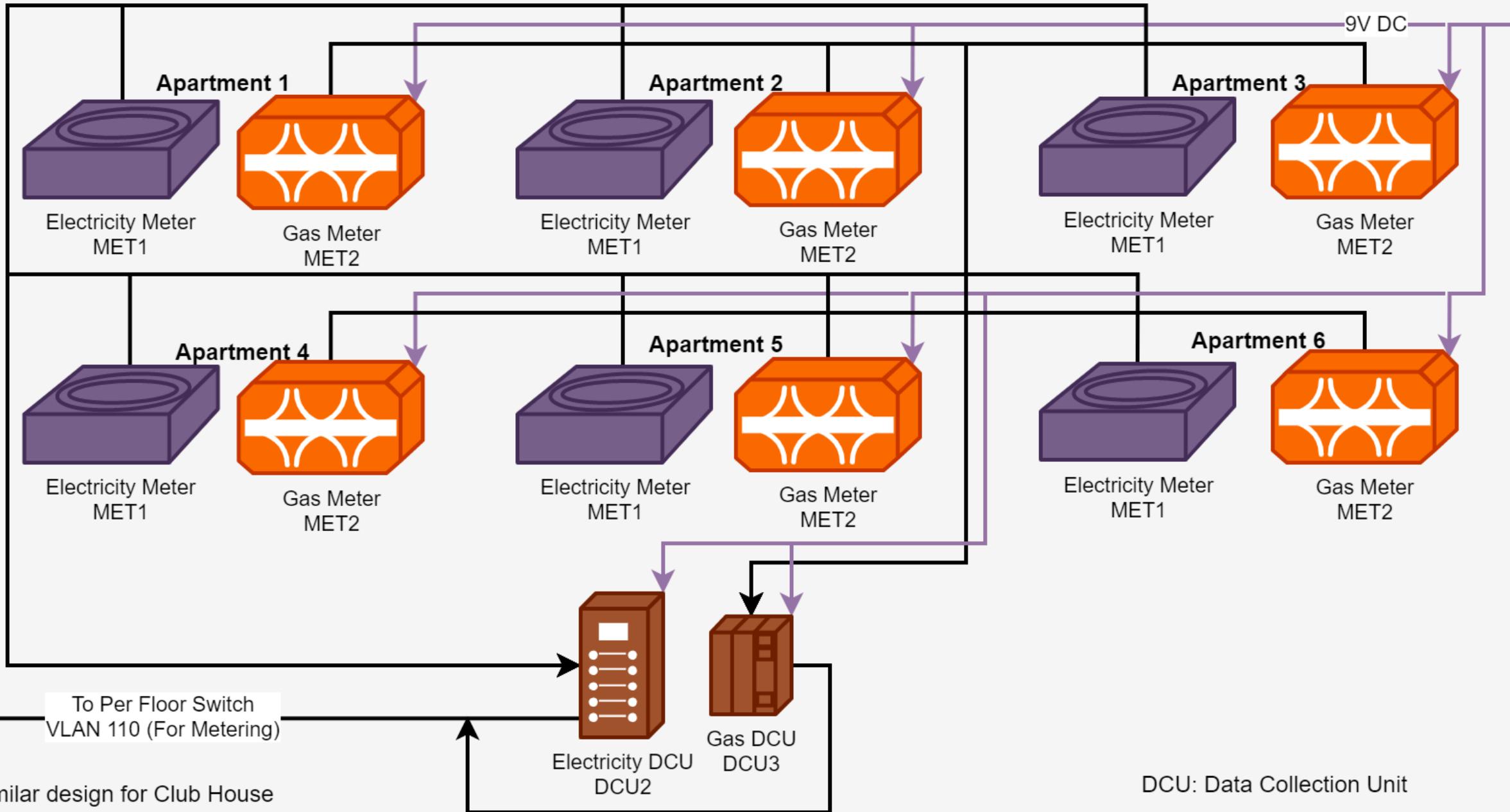


PIR: Passive Infra Red
DCU: Data Collection Unit

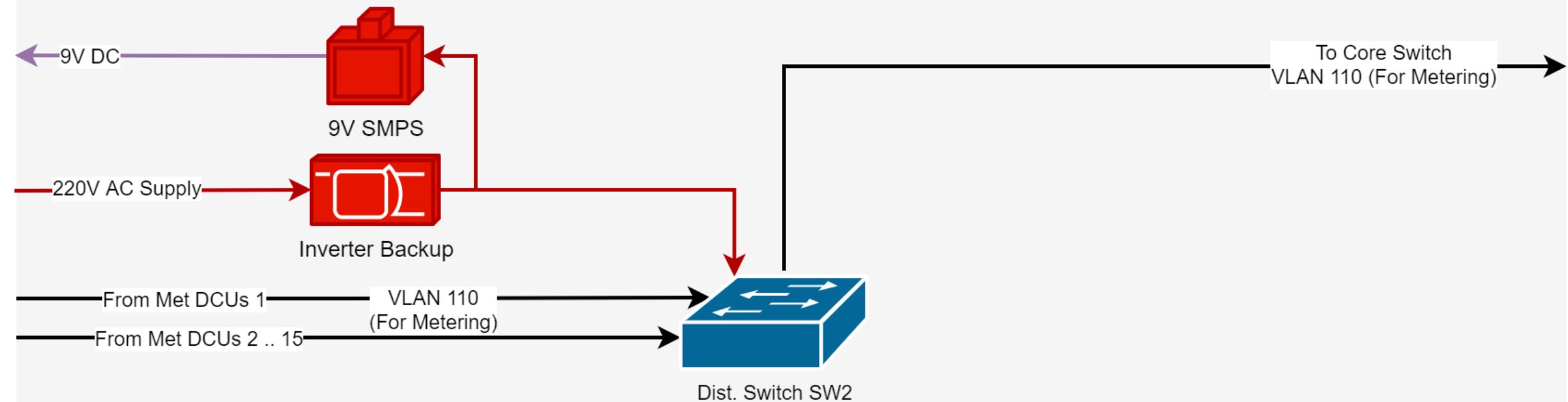
Golf View Apartments: Metering System

- Each apartment has a **piped gas** connection and thus has a **gas meter** as well as an **electricity meter**. The gas meter operates with 9V DC power provided by an SMPS installed in first floor.
- The electricity and gas meters communicate with either wired **RS-485** or **wireless RF** mechanism with a **Data Collection Unit** (DCU) which is installed every floor.
- The **DCU** is connected to **per-floor** managed **switch** on **VLAN 110**, which is reserved for **metering** purpose. The per-floor switch is connected to per-Block **Distribution switch**, which is then connected to the central **Core switch**.
- An **Metering-cum-DHCP server** is present in A-Block connected to the Core switch on **VLAN 110**. The DHCP server is used to assign IP address to all DCUs.
- **VPN Router RO3** can act as a **VPN client** and thus form a **Virtual WAN** with electricity board's network. A **server** on their network can now **query all our metering devices**.
- The smart meters report to the power distribution company every **15 mins** through the **Metering server**.
- The metering server sends data to the power distribution company over **HTTPS** secure channel through **GSM/GPRS modem**.
- This is done so because **GSM/GPRS** modems are cheaply available, are reliable, and are **commonly used** in most smart meters used in India (e.g. Genus).
- There is also a **backup** GSM/GPRS modem that uses SIM from a different service provider in case the primary fails.
- If the **power distribution company** provides a VPN server in order to connect all metering devices in a **Virtual WAN**, this can be achieved through the VPN Router RO3.
- The VPN Router connects with all **metering devices** on **VLAN 110** and then connects to internet either through the **Central Core Switch SW3** or a **3G/4G dongle** connected to its USB port as backup.

Golf View Apartments: Metering System (Floor)



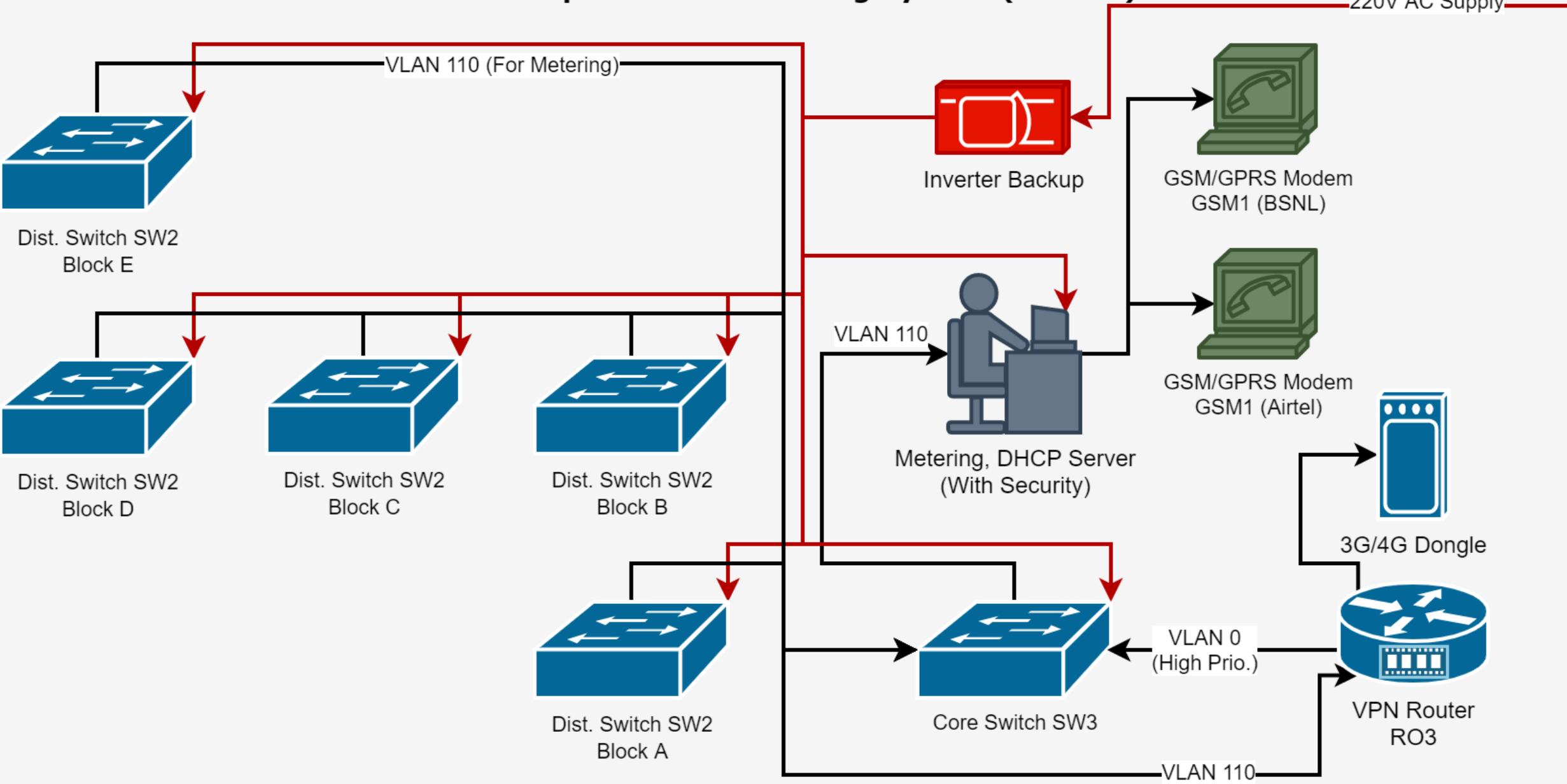
Golf View Apartments: Metering System (Block)



Similar design for Club House

DCU: Data Collection Unit

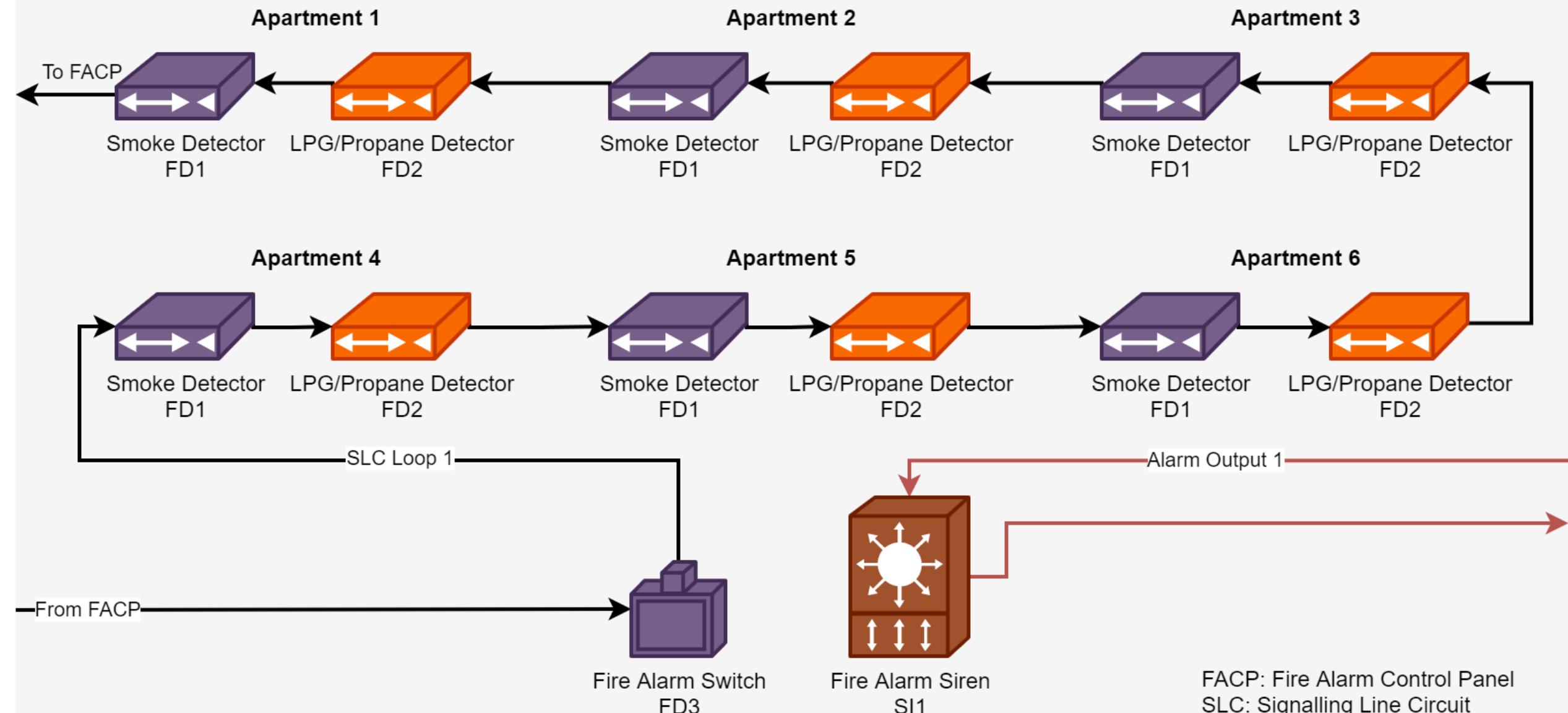
Golf View Apartments: Metering System (Central)



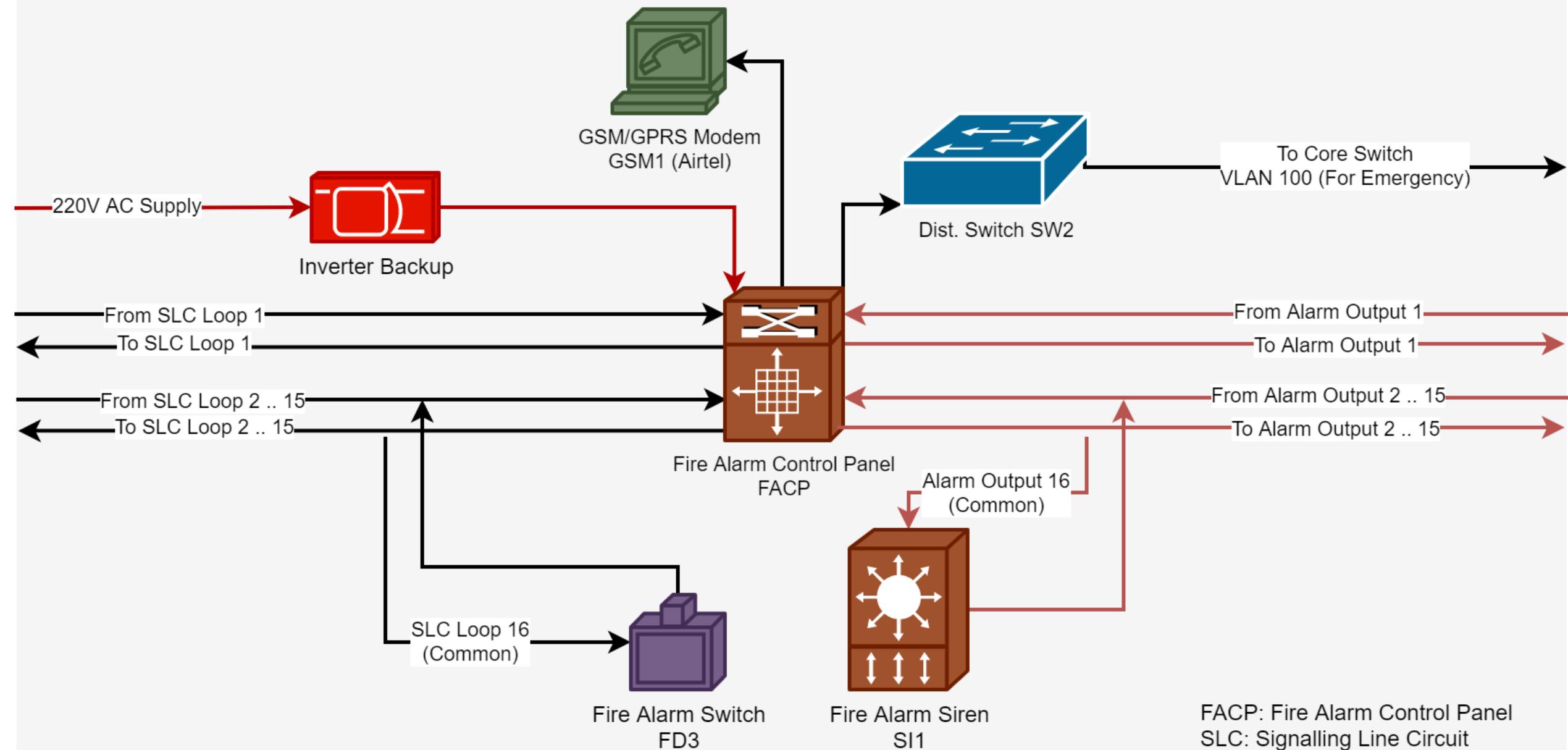
Golf View Apartments: Fire Alarm System

- We are using **Signaling Line Circuit** (SLC) based addressable **smoke detectors** and **LPG/Propane Gas sensors**. Each apartment is thus provided with a total of 2 sensors, and all 6 apartments in a floor are connected in a loop. Each floor also has a **Fire Alarm switch** (manual) which can be used to manually trigger the fire alarm.
- Each floor's loop (total 15 floors/block) is then connected to a **Fire Alarm Control Panel** (FACP) system which is also connected to a central **Fire Alarm Siren**. Each floor is also connected to its respective Siren from the FACP.
- The FACP has a **GSM/GPRS interface** built-in through which it can be configured to send fire emergency events directly to nearby fire department at a certain **delay (5-10 min)** to avoid false alarm.
- In case there is a false alarm, the FACP's alarm can be shutdown with the delay time.
- The FACP is also connected through ethernet port to the per-Block Distribution switch.
- All per-Block Distribution switches are connected to the central **Core switch** (managed).
- An **Emergency-cum-DHCP server** is present in A-Block connected to the Core switch on **VLAN 100**. The DHCP server is used to assign IP address to all DCUs.
- In case a Fire alarm is triggered, the Emergency server **alerts the security**, rings the central siren, and indicates the apartment number of the source.
- There is also a backup GSM/GPRS module connected so that in case the one directly connected to FACP fails, the Emergency server can send the message on its behalf.

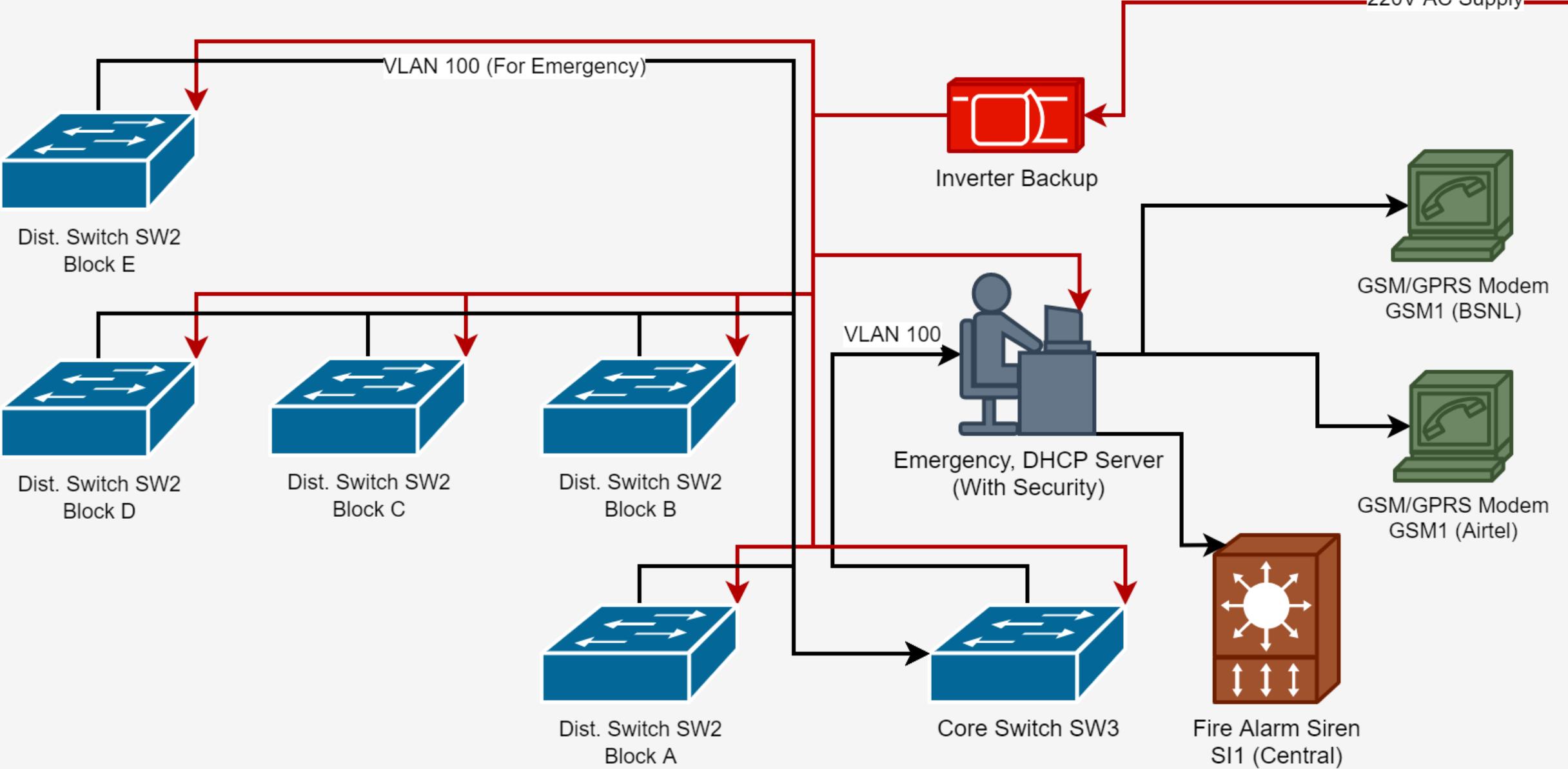
Golf View Apartments: Fire Alarm System (Floor)



Golf View Apartments: Fire Alarm System (Block)



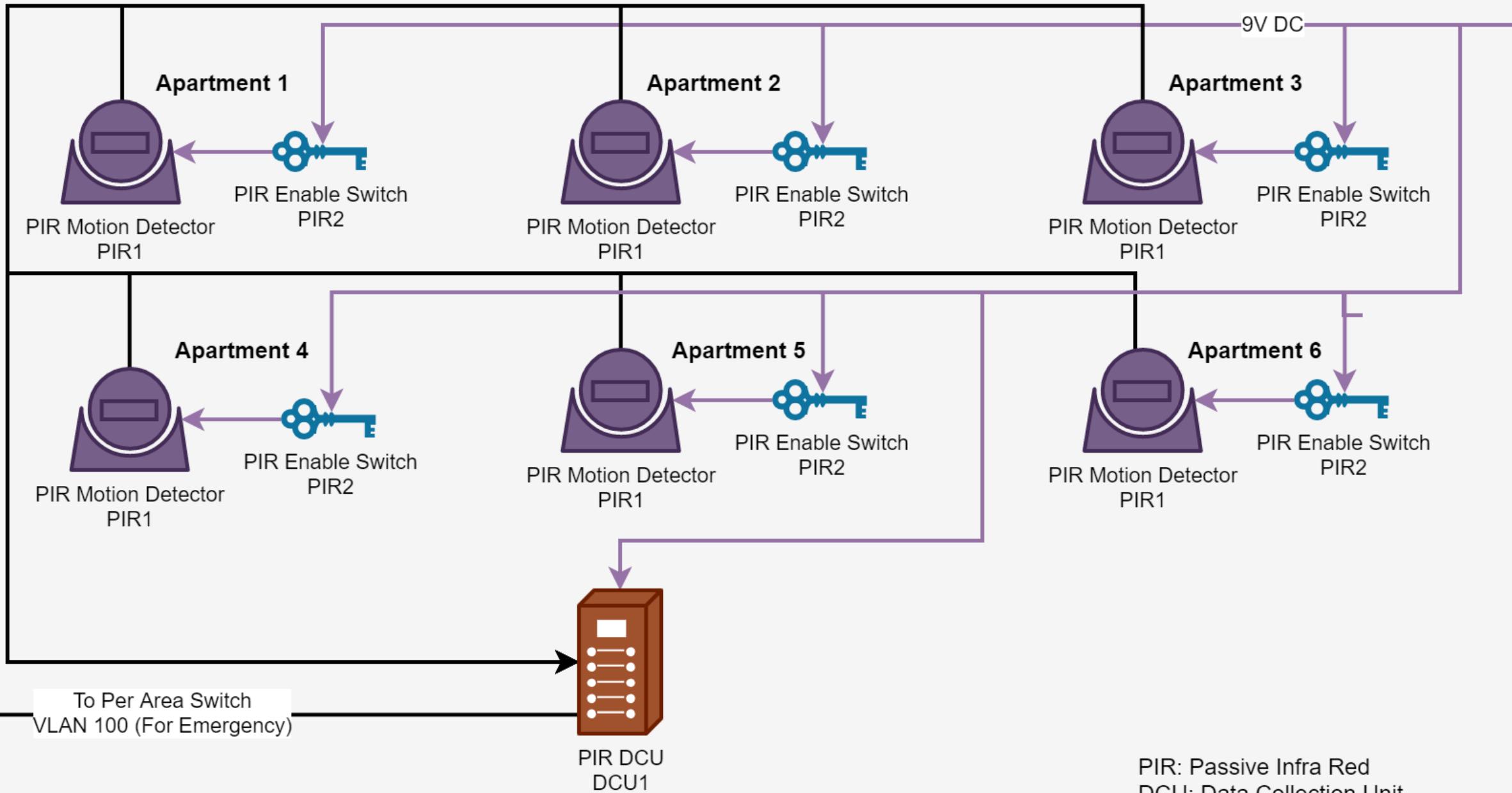
Golf View Apartments: Fire Alarm System (Central)



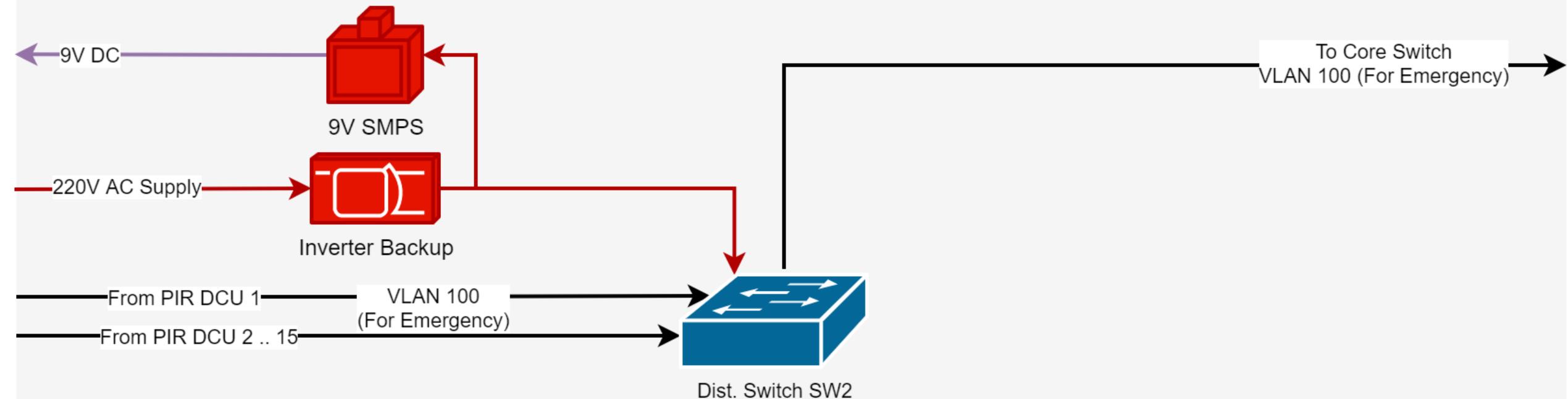
Golf View Apartments: Security System

- We are using simple **PIR sensors**, that are able to detect motion as our security element. The sensor triggers an event when it **detects motion**, and this is sent to a **Data Collection Unit** (DCU).
- The sensors have a trigger **enable switch** which can be turned on and off. Normally, when people are staying in the flat, the switch is turned off.
- When the members are about to **leave their apartment** empty, they **turn on** the switch, which enables the PIR sensor. From now on, if any burglar enters the apartment, it can be detected by the PIR sensor. When residents come back, they remotely turn off the sensor.
- The **DCU** is connected with ethernet cable to a **managed router** on the floor. Any motion detect **events** are sent over IP packets to an Emergency server located with the Security.
- The DCU connected port is configured as **VLAN 100**, which is reserved for all **emergency devices** of the network.
- The managed switch is then connected with **Cat 6** cable to the per-Block managed Distribution switch at 1st floor.
- All per-Block Distribution switches are connected to the central **Core switch** (managed).
- An **Emergency-cum-DHCP server** is present in A-Block connected to the Core switch on **VLAN 100**. The DHCP server is used to assign IP address to all DCUs.
- In case an PIR sensor trigger event is detected, the Emergency server **alerts the security**, indicating the apartment number of the source.
- If it is not marked as **false alarm within 5-10 mins**, a message is sent to **nearest police department** through **GSM/GPRS modem** (with a backup in case).

Golf View Apartments: Security System (Floor)



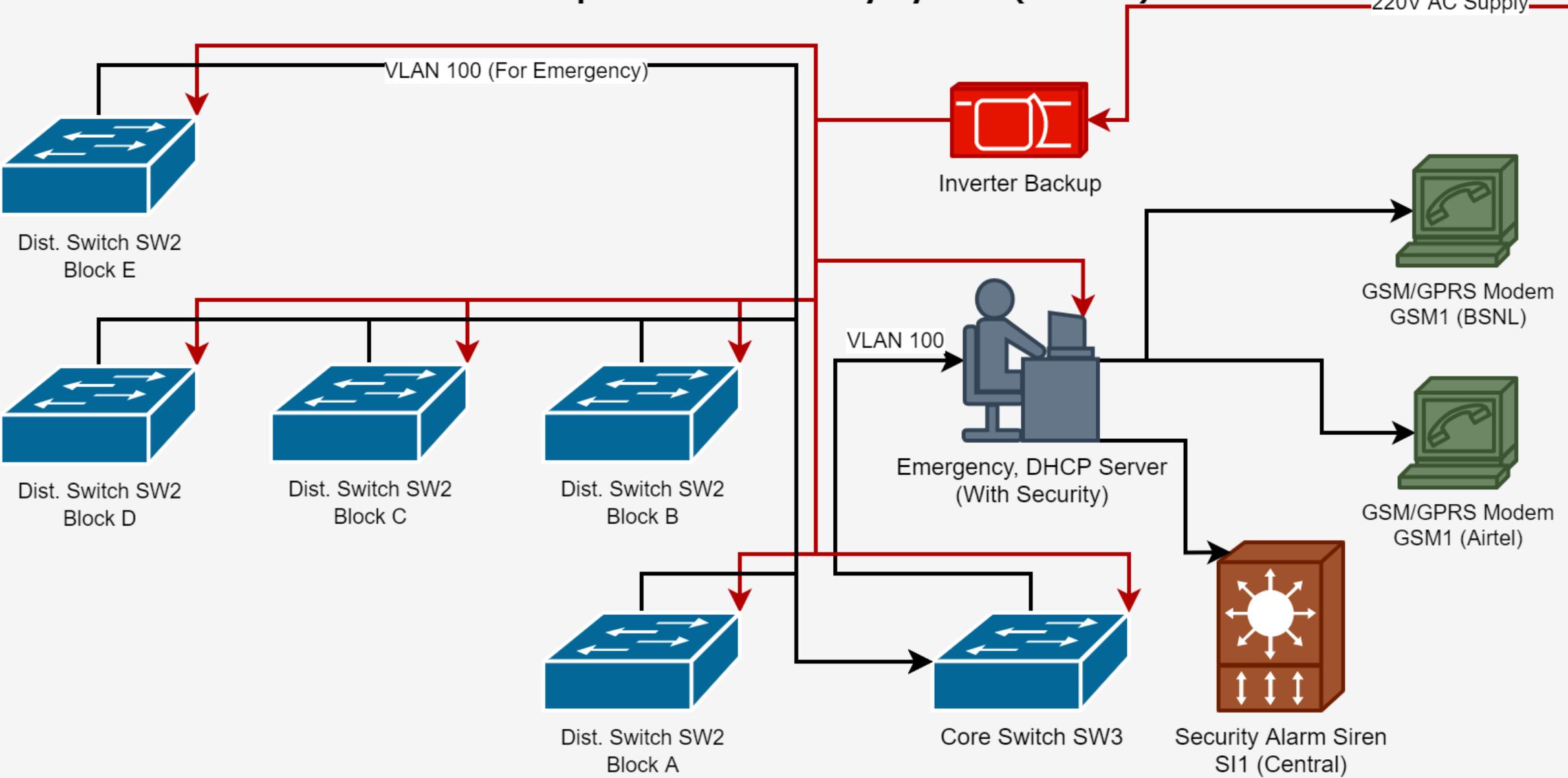
Golf View Apartments: Security System (Block)



Similar design for Club House

PIR: Passive Infra Red
DCU: Data Collection Unit

Golf View Apartments: Security System (Central)



Network Implementation (TODO)

- MikroTik CRS326-24G-2S+RM router: ₹18,000
- Ubiquiti UF-SM-10G transciever: ₹4,000
- TP-Link Jetstream T1600G-28TS switch: ₹1,90,000
- TP-Link 10GBase-LR SFP+ LC Transceiver: ₹20,000
- TP-Link TL-SG108E switch: ₹4,16,000
- TP-Link TL-WA901N WiFi AP: ₹37,500
- TP-Link TL-WR845N WiFi router: ₹6,54,500
- 2U Wall mount Cabinet Box: ₹1,10,500
- 12U Wall mount Network Rack: ₹48,000
- Cat6 RJ45 Connector Plugs w/ Hood: ₹18,000
- Cat6 Ethernet Cable (Roll): ₹1,50,000
- RJ45 Cat6 Cable Jointer: ₹3,000
- 1.5m Cat6 Patch Cable: ₹1,35,000
- M6 Cage Nuts, Washers & screws: ₹27,000
- Mass Rack 10" Tray: ₹36,000
- D-Link 24-port Cat6 Patch Panel: ₹2,70,000
- RJ45/11 Crimper, Cutter & Stripper Tool: ₹3,000
- River Fox Punch Down Tool Cat 5e/6: ₹1,500
- Moelissa MS-LT02 RJ45/11 Cable tester: ₹1,500
- **Total Cost: ₹21,43,500**

RS1 MikroTik CRS326-24G-2S+RM Cloud Router Switch

- This is the router for devices (cameras, WiFi access points) common network. It does the job of a DHCP server, assigning private IP addresses to each common net device and translating any packets forwarded to the internet to public address (NAT/PAT).
 - Single mode optical fibre connection from ISP is terminated here (from ISP's central office). This is a separate connection taken by the Golf View Society and a common internet connection for internet access provided in Club House, Gardens, Playgrounds & Footpath.
-
- 24 x 1 Gb ethernet port
 - 2 x 10 Gb SFP+ cages
 - Dual boot RouterOS / SwOS
- 1 as the central router.
 - **Quantity:** 1
 - **Cost:** ₹18000 x 1 = ₹18,000



Ubiquiti UF-SM-10G 1310nm 10km SFP+ Transceiver

- This Small Form-factor Pluggable (SFP) optical transceiver is to be inserted into the SFP+ cage of **RS1**, so that a 10Gpbs 1270/1330nm fiber line can be terminated at the router. The optical fiber must be a single-mode fiber upto 10km length. It accepts dual LC connector
- This is the router for devices (cameras, WiFi access points) common network. It does the job of a DHCP server, assigning private IP addresses to each common net device and translating any packets forwarded to the internet to public address (NAT/PAT).
- Single mode optical fibre connection from ISP is terminated here (from ISP's central office). This is a separate connection taken by the Golf View Society and a common internet connection for internet access provided in Club House, Gardens, Playgrounds & Footpath.
- 2 per block as central switch.
- **Quantity:** 2 x 5 blocks = 10
- **Cost:** ₹2000 x 2 = ₹4,000



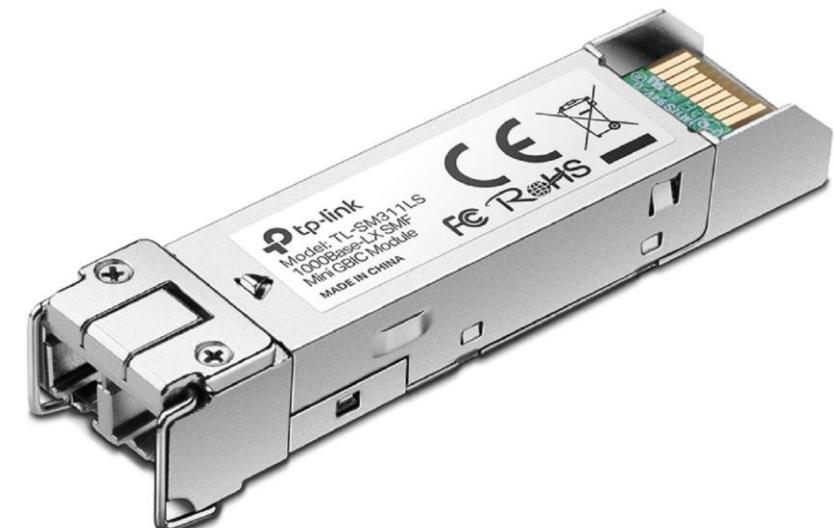
SW2 TP-Link Jetstream T1600G-28TS 24port Managed Switch

- This is the central switch that is for both personal & common net.
- In the personal net, each floor's router connect to this central switch. Single mode optical fibre connection from ISP is terminated here (from ISP's central office). This connection is kept different for each block. The ISP's DHCP assigns public IP to all home routers in each flat.
- In the common net, switches from club, basement, footpath connect here. This is installed per block, so the access switches always connect to the nearest central switch. The central switches are connected together from each block to the central router over Cat6 cable. As a whole they form a LAN behind the router.
- 24 x 1 Gb ethernet port
- 4 x SFP slots
- 2 per block as central switch.
- **Quantity:** 2 x 5 blocks = 10
- **Cost:** ₹19000 x 10 = ₹1,90,000



TP-Link 10GBase-LR SFP+ LC Transceiver

- This is used with private net central switches to connect to ISP. The connection is individually made for each block.
- Single mode optical fibre connection from ISP is terminated through (from ISP's central office) this transceiver.
- 2 per central switch of personal net.
- **Quantity:** $2 \times 5 \text{ blocks} = 10$
- **Cost:** ₹ $2000 \times 10 = ₹20,000$
- Wave Length 1310 nm
- Fiber Type 9/125 μm Single-Mode
- Max. Cable Length 10km
- Data Rate 1.25 Gbps
- Data Rate 10Gbps
- Port Type LC/UPC



SW1 TP-Link TL-SG108E 8-port GbE Unmanaged Switch

- This is an unmanaged switch that is used to make first level connections in both the personal and the common network. It then connects to the nearest central switch that is installed per block.
- 2 per floor (inc. club), 5 for basement, 5 for footpath, 1 for entry.
- **Quantity:** 2 x 14 floors x 4 blocks + 2 x 15 floors + 2 club + 5 basement + 5 footpath + 1 entry + 2 spares = 160
- **Cost:** ₹2600 x 160 = ₹4,16,000



TP-Link TL-WA901N Wireless Access Point

- This is a wireless access point without a router. It has the ability to extend WiFi. Used to provide internet connection in common areas.
- 1 in each room of club house + 15 across footpath
- **Quantity:** 4 rooms x 2 floors (club) + 15 footpath + 2 spares = 25
- **Cost:** ₹1500 x 25 = ₹37,500



TP-Link Archer A5 AC 1200 WiFi Dual Band Wireless Router

- This wireless router is provided to each flat. It is a dual band router to support more mobile devices.
- 1 for each flat
- **Quantity:** 1 x 384 flats + 1 spare = 385
- **Cost:** ₹1700 x 385 = ₹6,54,500



2U Wall mount Cabinet Box

- Holds the network devices onto the wall, for stable setup.
- 1 per floor + 2 for club + 1 for basement/block + 1 external/block + 1 entry/exit
- **Quantity:** $1 \times 14 \text{ floors} \times 4 \text{ blocks} + 1 \times 15 \text{ floors} + 2 \text{ club} + (1 + 1) \times 5 \text{ blocks} + 1 \text{ entry} + 1 \text{ spare} = 85$
- **Cost:** ₹ $1300 \times 85 = ₹1,10,500$



12U Wall mount Network Rack

- Holds the network devices onto the wall, for stable setup.
- 1 per block (for switches) + 1 for central router
- **Quantity:** $1 \times 5 \text{ blocks} + 1 = 6$
- **Cost:** ₹ $8000 \times 6 = ₹48,000$



Cat6 RJ45 Connector Plugs w/ Hood

- This is the connector for Cat6 cable with staggered pins, which helps isolate signals at the port. It also minimizes distance from cable to reduce cross-talk.
- 2 per flat, 4 + 6 per floor (camera), 2 for external long connections, 2 for external short connections, 2 for block-block connections.
- **Quantity:** $2 \times 384 \text{ flats} + 10 \times 14 \text{ floors} \times 4 \text{ blocks} + 10 \times 15 \text{ floors} + 2 \times (15 \text{ basement} + 15 \text{ footpath cam} + 15 \text{ wireless AP}) + 2 \times 2 \text{ entry/exit} + 2 \times (3 + 3 + 3) + 2 + 2 \times 4 \text{ blocks} + 400 \text{ spare} = 2000$
- **Cost:** ₹9 x 2000 = ₹18,000



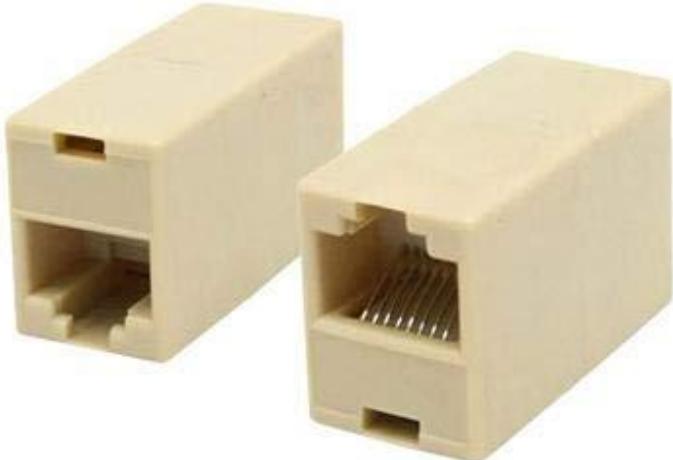
Cat6 Ethernet Cable (Roll)

- Cat 6 cable supports 10Gbps up to 55m & 1Gbps up to 100m. Unlike Cat5e cable its wire pairs are twisted tighter, and it has a central plastic pair separator to maintain inter-pair distance as mentioned in the Cat6 specification. It is used for all cabling for uniformity sake.
- Avg. 10m per flat, avg. 40m + 30m (camera) per floor, 20m for external long connections, 10m for external short connections (including club house), 60m for block-block connections.
- **Quantity:** $10 \times 384 \text{ flats} + 70 \times 2 \times 14 \text{ floors} \times 4 \text{ blocks} + 70 \times 2 \times 15 \text{ floors} + 10 \times (15 \text{ basement} + 15 \text{ footpath cam} + 15 \text{ wireless AP}) + 10 \times 2 \text{ entry/exit} + 20 \times (3 + 3 + 3) + 20 + 60 \times 4 \text{ blocks} + 310 \text{ spare} = 15000$
- **Cost:** ₹10 x 15000 = ₹1,50,000



RJ45 Cat6 Cable Joiner (Couple Plug)

- It is used to connect together 2 ethernet cables to form a longer cable. It also helps for maintaining some modularity.
- 2 per IP security camera & wireless AP.
- **Quantity:** $2 \times (15 \text{ basement} + 15 \text{ footpath cam} + 15 \text{ wireless AP}) + 2 \times 2 \text{ entry/exit cam} + 6 \text{ spares} = 100$
- **Cost:** ₹ $30 \times 100 = ₹3,000$



1.5m Cat6 Patch Cable

- It makes it easy to make a connection between a port in a patch panel to a port on a network device. It is usually made of stranded copper wire for repeated use.
- 16 needed per floor (inc. club house). 48 needed per block, central room & a few spares.
- **Quantity:** $16 \times 14 \text{ floors} \times 4 \text{ blocks} + 16 \times 15 \text{ floors} + 16 \times 2 \text{ club} + 48 \times 5 \text{ blocks} + 48 \text{ central} + 44 \text{ spares} = 1500$
- **Cost:** ₹ $90 \times 1500 = ₹1,35,000$



M6 Cage Nuts, Washers & Mounting screws for Server Rack & Cabinet

- It is used to mount network devices to racks.
- 16 needed per floor (inc. club house). 24 needed per block, central room & a few spares.
- **Quantity:** $16 \times 14 \text{ floors} \times 4 \text{ blocks} + 16 \times 15 \text{ floors} + 16 \times 2 \text{ club} + 24 \times 5 \text{ blocks} + 24 \text{ central} + 38 \text{ spares} = 1350$
- **Cost:** ₹ $20 \times 1350 = ₹27,000$



Mass Rack 10" Tray

- Used to store additional length of cables below patch panel.
- 1 needed per floor (inc. club house). 2 needed per block, central room & a few spares.
- **Quantity:** $1 \times 14 \text{ floors} \times 4 \text{ blocks} + 1 \times 15 \text{ floors} + 1 \times 2 \text{ club} + 2 \times 5 \text{ blocks} + 2 \text{ central} + 5 \text{ spares} = 90$
- **Cost:** ₹ $400 \times 90 = ₹36,000$



D-Link 24-port Cat6 Patch Panel

- It has ready to use RJ45 sockets on a panel that can be directly attached to a network rack. This helps in cable management, and allows one to easily visualize, setup and debug network connections to switches / routers.
- 1 needed per floor (inc. club house). 2 needed per block, central room & a few spares.
- **Quantity:** $1 \times 14 \text{ floors} \times 4 \text{ blocks} + 1 \times 15 \text{ floors} + 1 \times 2 \text{ club} + 2 \times 5 \text{ blocks} + 2 \text{ central} + 5 \text{ spares} = 90$
- **Cost:** ₹ $3000 \times 90 = ₹2,70,000$



RJ45/11 Crimper, Cutter & Stripper Tool

- This is a multitool that enables ethernet cables to be cut, insulation stripped, and the crimped onto a, RJ45 connector.
- Would be useful when performing network setup to the flats, per floor cabinets as well as in network rack for server room. Preferable to have one spare per block.
- **Quantity:** 5 blocks x 1 = 5
- **Cost:** ₹ $600 \times 5 = ₹3,000$



River Fox Punch Down Tool Cat 5e/6

- It helps connect LAN cable to RJ45 socket (Keystone) in a Wall socket or a Patch panel. After stripping the outer cover of the Cat6 cable & plastic pair-separator, and plugging it into a Keystone, a neat connection can be made with this tool.
- Would be useful when performing network setup to the flats, per floor cabinets as well as in network rack for server room. Preferable to have one spare per block.
- **Quantity:** 5 blocks x 1 = 5
- **Cost:** ₹300 x 5 = ₹1,500



Moelissa MS-LT02 RJ45/11 Cable tester

- It helps check if a cable is properly connected to a network device (like switch). The remote helps identify wire you have connected to, if there are too many tangled wires.
- Would be useful for debugging connectivity issues when performing network setup / management. Preferable to have one spare per block.
- **Quantity:** 5 blocks x 1 = 5
- **Cost:** ₹300 x 5 = ₹1,500

