beyond tomorrow

Smart City Conference: 5G Network Technologies, Applications and Standards

September 06, 2019

STL in numbers

Customers

- Partnering with
  8 of 10 Top Telcos
- Working with
  Top 2 Cloud Co.
- Operating in more than
  100 countries

People

- 3.1k+ Associates
- 30+ Nationalities
- Great Place to Work
  Certified

Innovation

- 4 Innovation Centres
- 90% -Y-o-Y patent filing growth in FY19
- 103% - 5-year CAGR for optical fibre cable patent portfolio growth

Financials

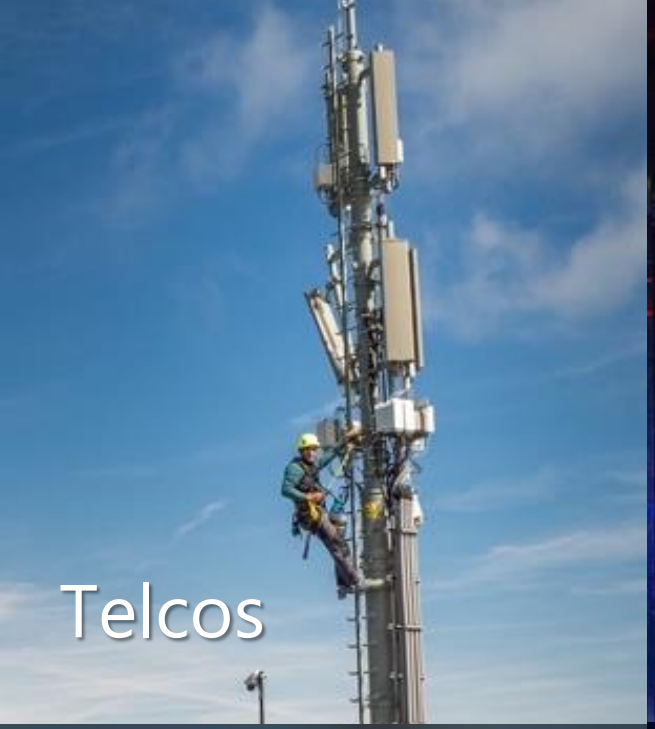
- $1.5 billion
  Order Book
- $737 million
  in revenue
- 43%
  revenue from exports

Global Footprint

- 7 Global Production Facilities
- 50 million fkm Fibre Capacity

Environment & Society

- 100%
  Recyclable Packaging Material
- STL Garv
  Rural-connectivity platform
- STL Academy
  1.5k certified youth
- Zero Waste to Landfill



Telcos

to connect each customer with the latest data applications while ensuring better experience

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30x denser networks to connect 1.2 Billion by 2025

Cloud Co.

to enable future applications and immersive content by bringing compute and storage capabilities to the edge

---

$66 Billion cumulative annual capex by top three Cloud Co.

Citizen Networks

to empower every citizen with high-quality primary connectivity

---

City governments, globally investing to “democratize broadband”

Large Enterprises

to create secure networks for the specialized enterprise use cases

---

Secure networks market to touch $250 Billion, by 2024

Enabling the largest digital inclusion in the world

CUSTOMER SEGMENT

CITIZEN NETWORKS

SMART
CONNECTED
EMPOWERED

BHARATNET

600 mn online
Impetus to bringing large populations online

2,50,000
Connecting *gram panchayats* across the country

$ 7 bn
Indian government's commitment to BharatNet

100 Mbps
Bandwidth to each *gram panchayat*

SMART CITIES

Gandhinagar

Jaipur

Kakinada

Smart City Initiative

impacting positively **325K lives** with smart IoT driven infrastructure in **Kakinada Smart City** in the state of **Andhra Pradesh**

Challenges

- 120 Km of underground optical fibre to be laid
- 350 city surveillance cameras, 400 free Wi-Fi access points and 640 smart lights to be deployed

Kakinada Smart City

- 360^0 situational awareness through fibre optic sensing and smart surveillance
- Action mobilisation through advanced CCC and video analytics

50% decrease
in crime incidents in the city of Kakinada

13k daily Wifi users
getting mission critical service support during cyclones

325k lives positively
impacted with smart IoT driven infrastructure

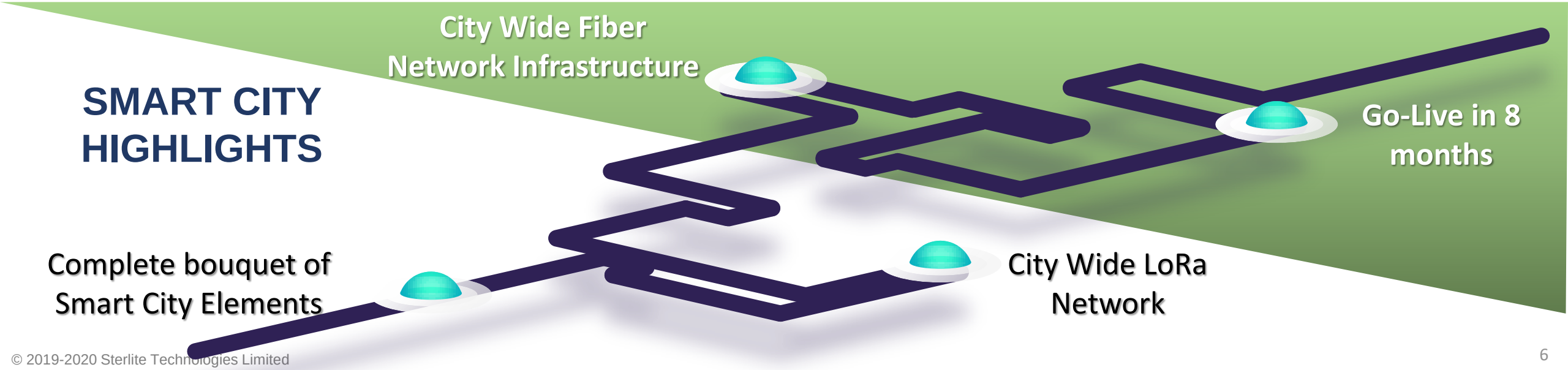
Kakinada Smart City: Complete Bouquet of Offerings

Services/Solutions Implemented → Additionally Expandable

Smart Life

Safety	Transportation	Disaster Mgmt	Clean City	Connectivity	Culture	Citizen Engagement	+
City Analytics	Emergency	Energy	Water	Environment	City Tourism	Education	+

SMART CITY HIGHLIGHTS



Gandhinagar: Smart City Services

Wi-Fi Connectivity

75% Open to sky coverage in Gandhinagar

IP Based Surveillance System

39% Reduction in Crime rate

Secured Environment & Administration

Increased Road Safety by 20%

Smart Digital Signages

Centrally Managed Dynamic Content Signage

Smart Street Lighting

40% of Energy Saving

Public Service/Ad Campaigns

Polio, Swacch Bharat Abhiyan Campaign

Mobile Apps for Citizens

One Click Access via Mobile Apps

Security, Surveillance & Event Administration

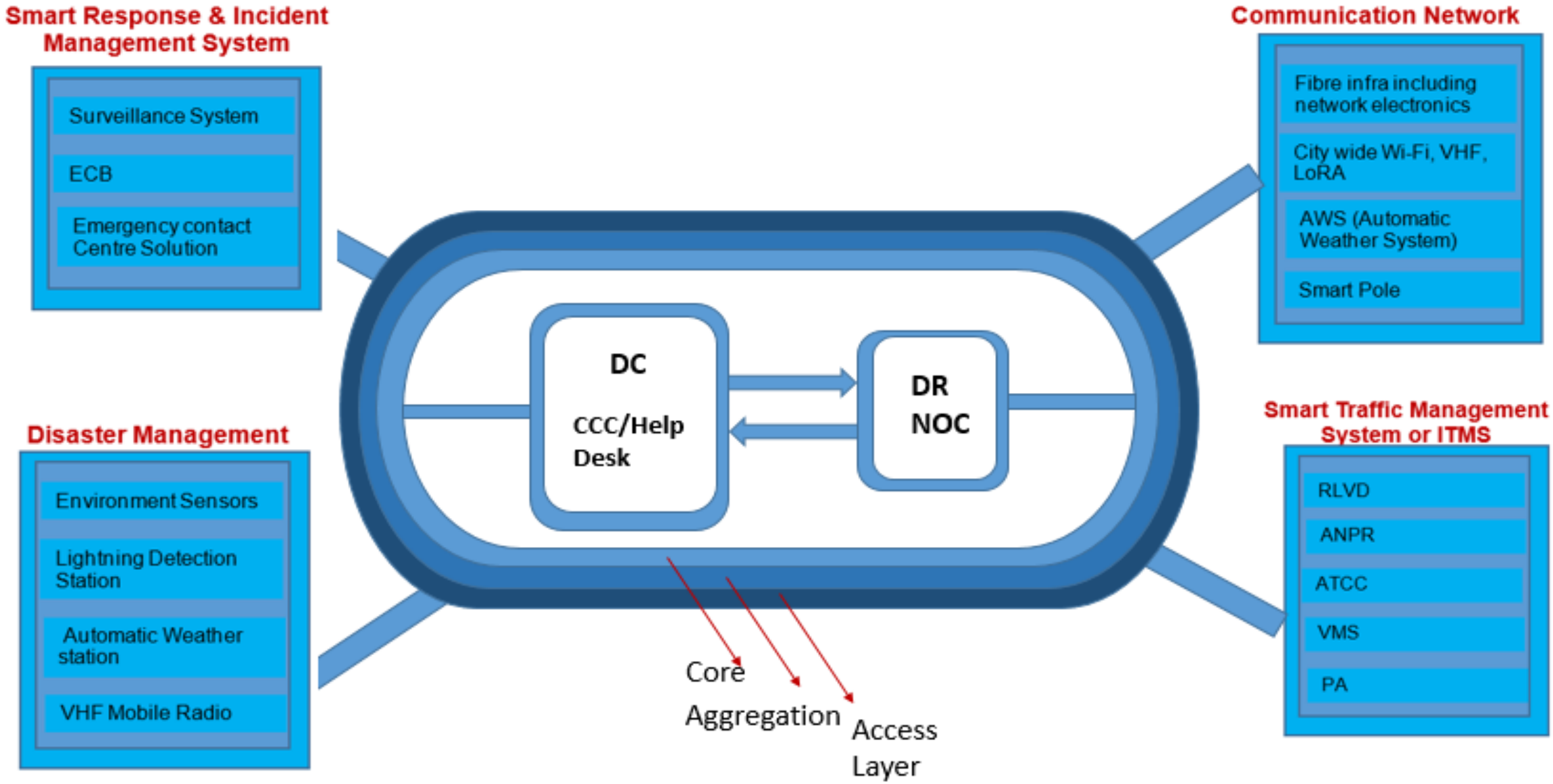
24*7 Vigil using CCTV

Public Address System

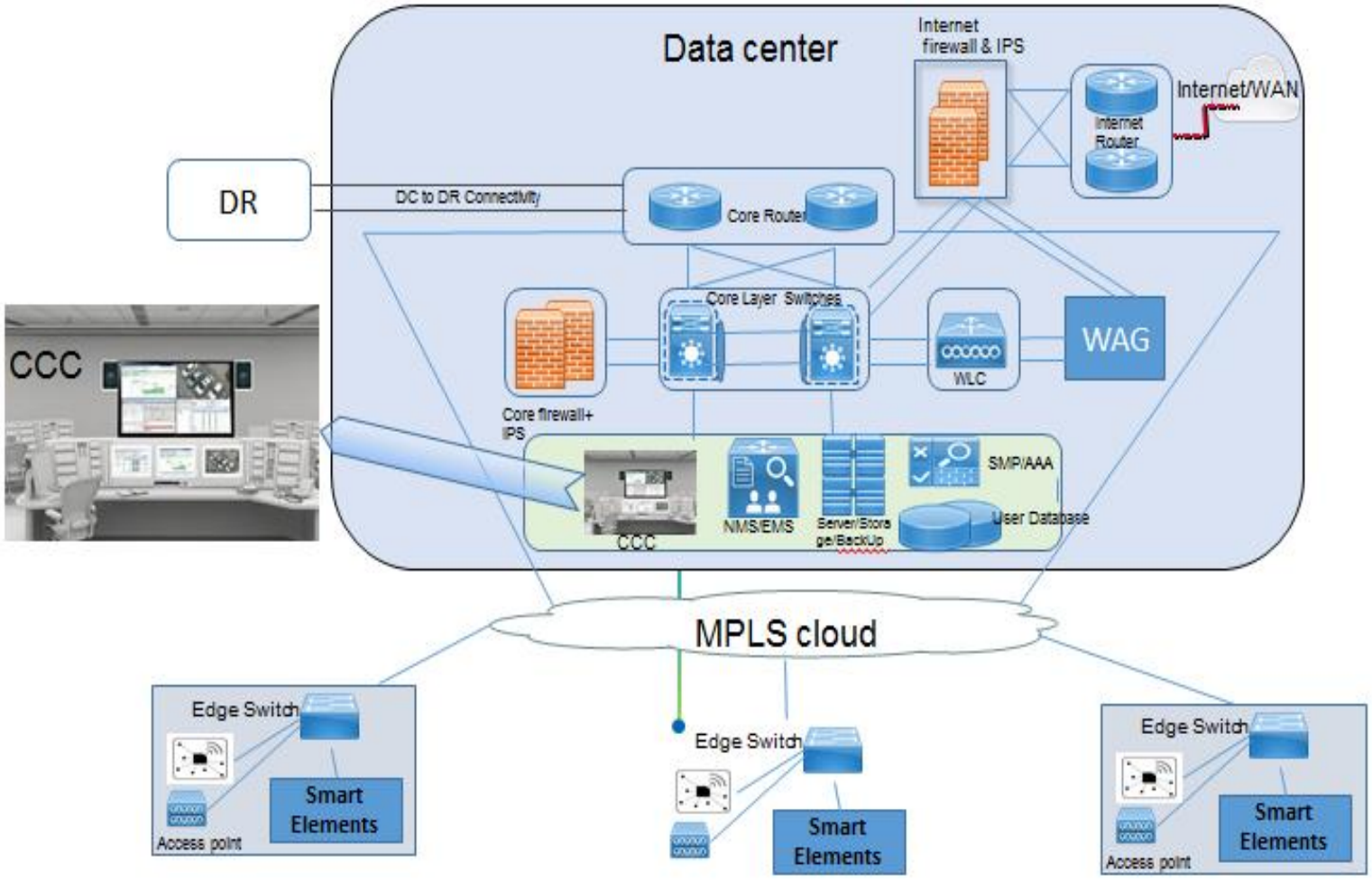
One Stop Platform for Citizens

https://www.youtube.com/watch?v=KjH31DOcEhM

Smart City Functional Elements



Data Center Architecture



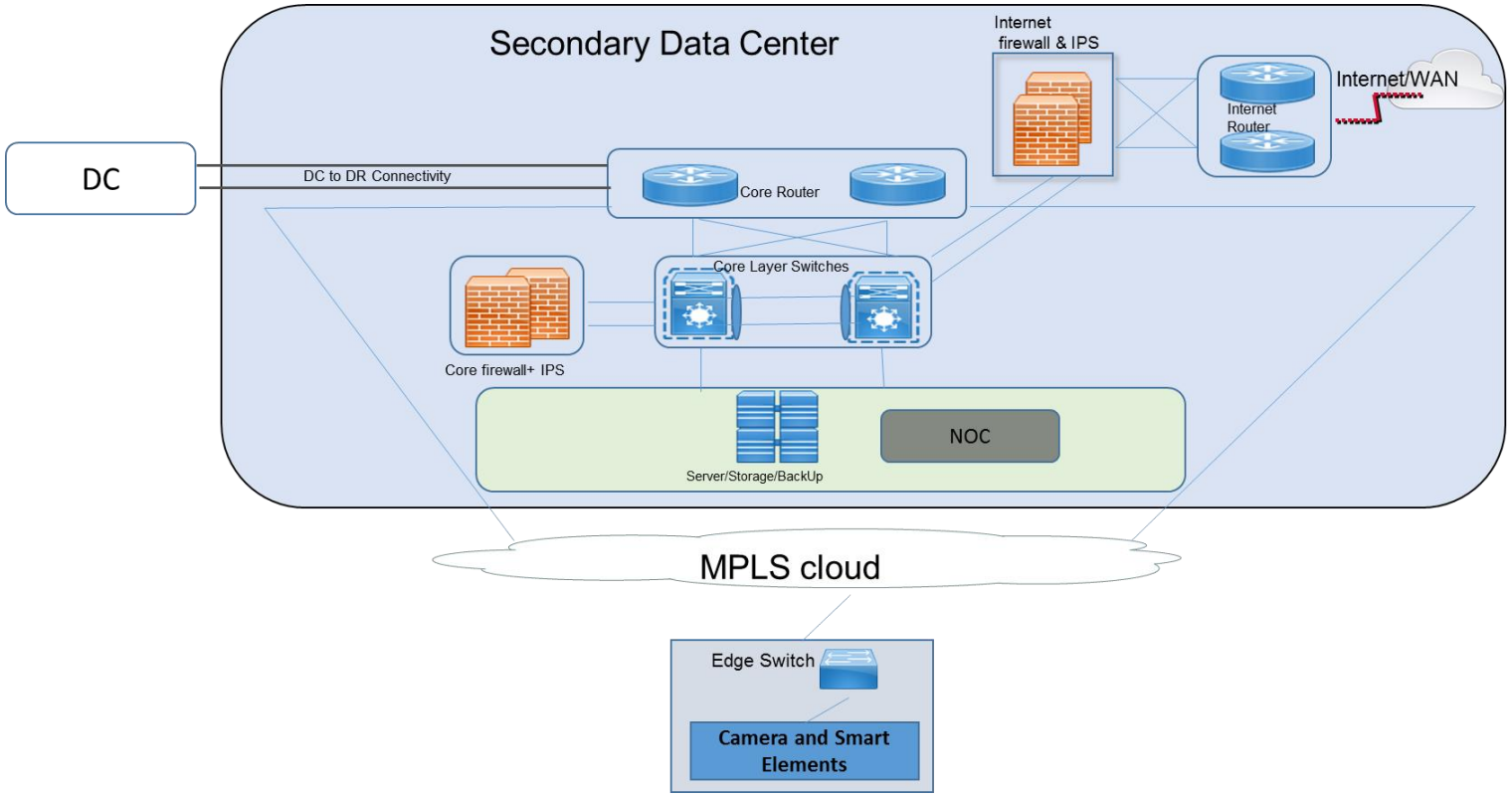
Data Center architecture designed how to ensure:

1. Scalability
2. Security
3. Resilience
4. Backup
5. Adequacy of Compute, Storage and Network

Strategies:

1. Virtualization
2. Failover of Critical Applications
3. SLA and Service Management

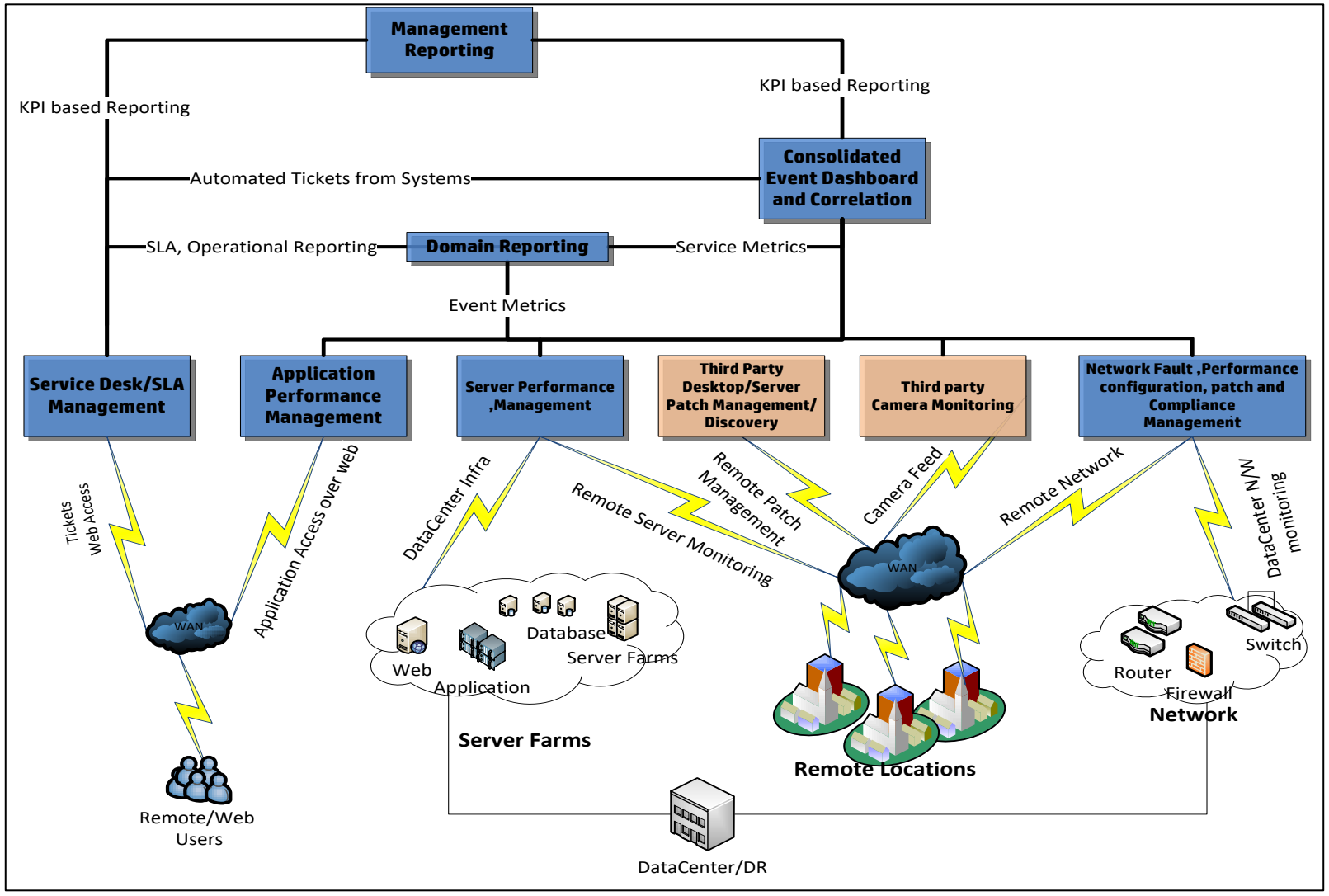
Data Recovery Center Architecture



Same layers as data center:

- Core layer-Router, switches etc.
- Access Layer: consists of TOR switches for the connectivity of servers, NOC etc.
- Security Layer: Firewall and IPS will be used to extend the security of the network
- Compute Layer: Consists of physical servers for hosting various applications.
- Storage and backup layer: To store the critical data like from cameras feeds (20%), WiFi user's database etc.

NOC Architecture



NOC designed for viewing the health and performance of all IP based elements.

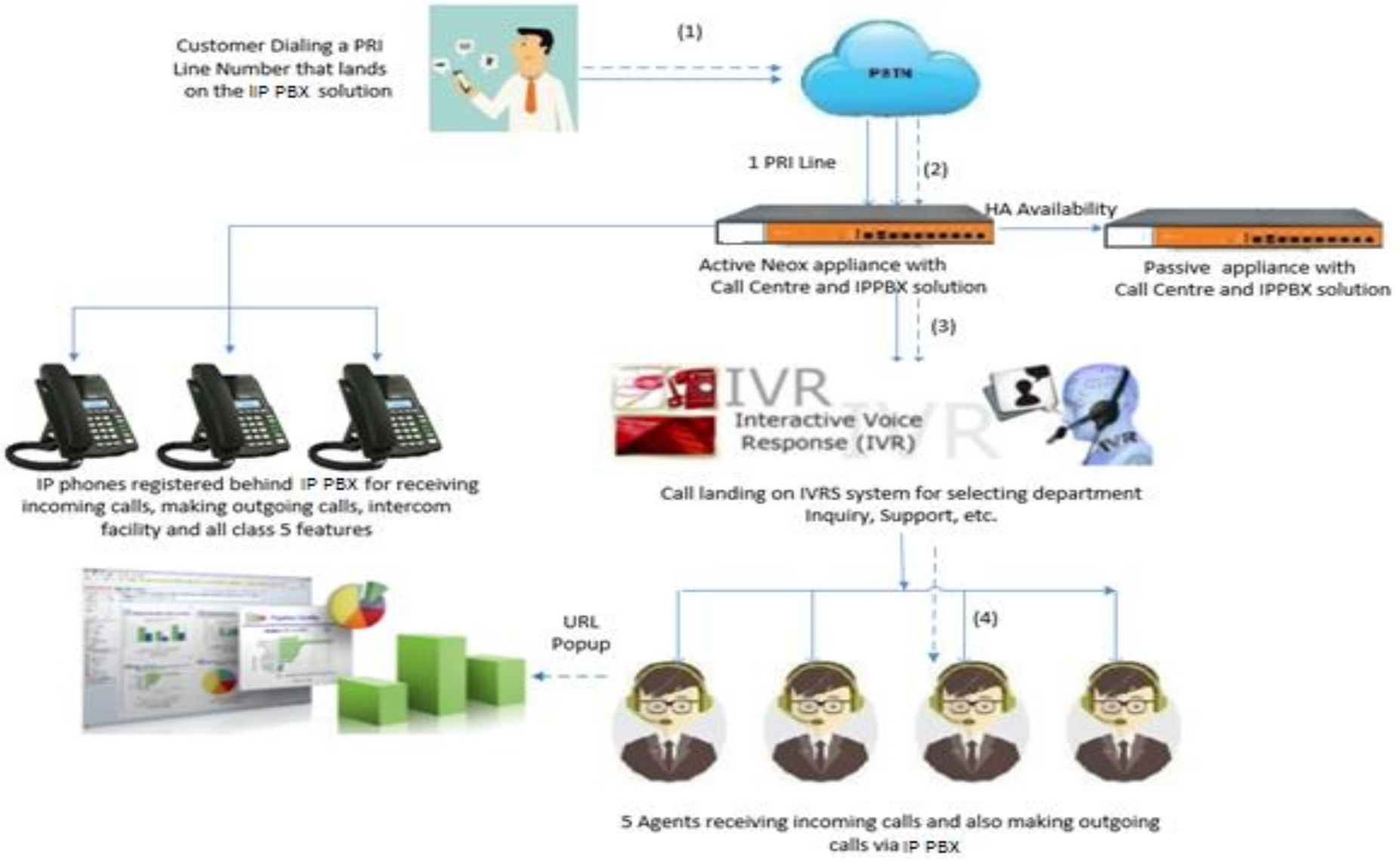
EMS installed in NOC to monitor all the elements

All the IP based field elements are integrated with EMS via Fiber network followed by Core router and LAN switches.

It generates reports for-

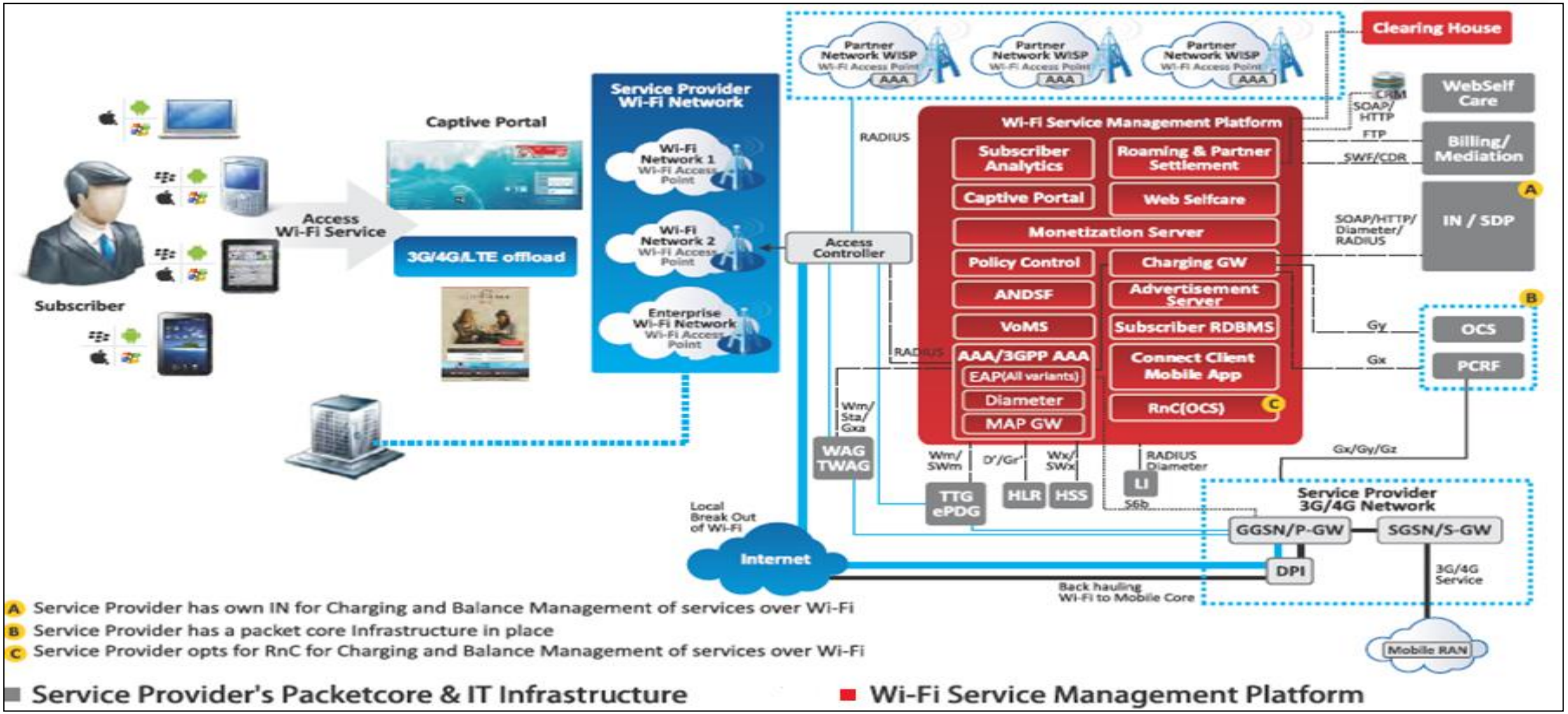
- Fault
- Configuration
- Accounting
- Performance
- Security

Helpdesk Architecture

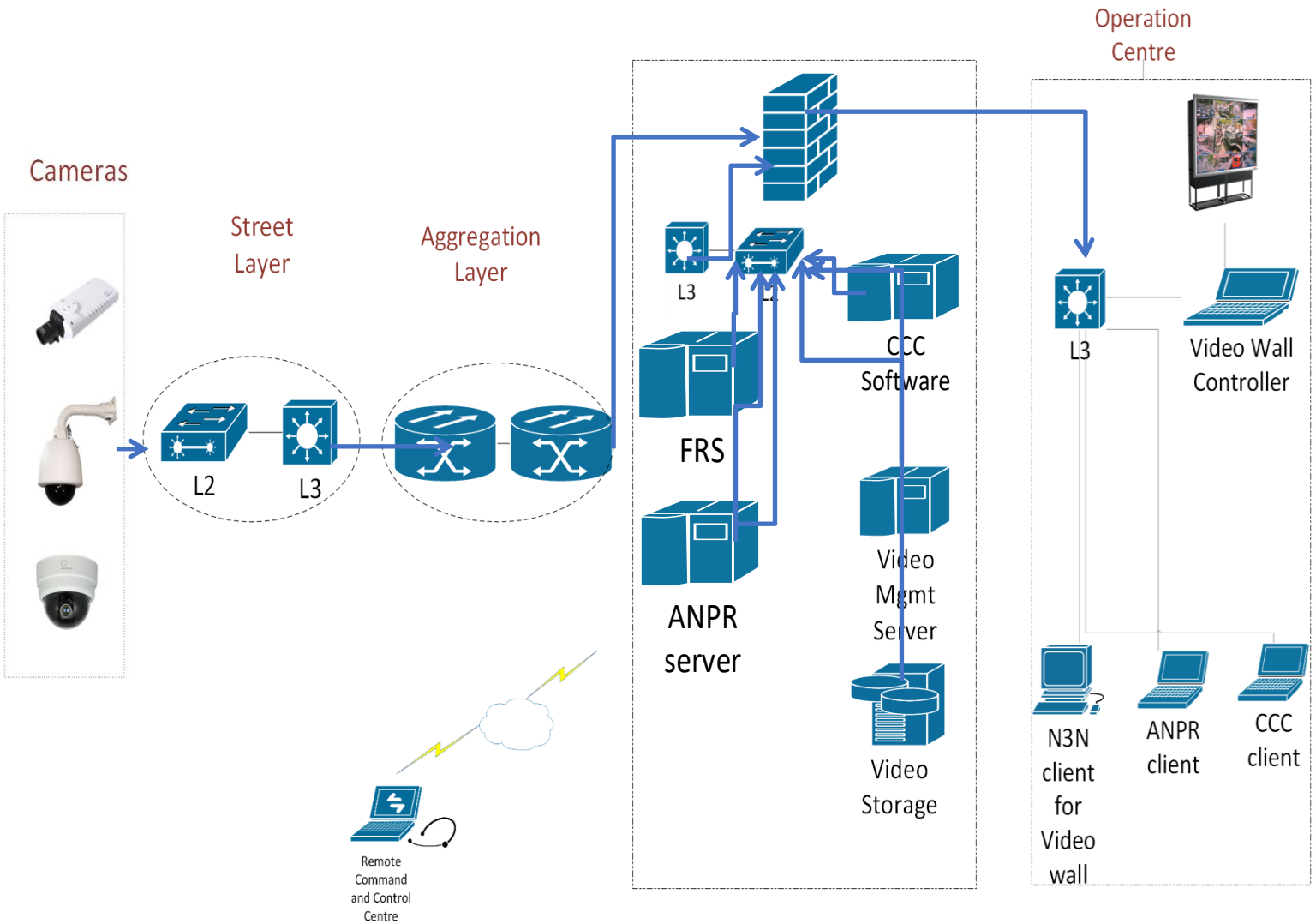


- Citizen Helpdesk solution served from Neox Appliance integrated with IP phones, IVR and PRI lines.
- Citizen Helpdesk is provided with Toll Free Number
- Five seat capacity to handle citizen grievances, queries, critical Incidents and act as a single point of contact for disaster Management.

Wi-Fi Architecture



CCTV Architecture



1. All the cameras are connected to field switches

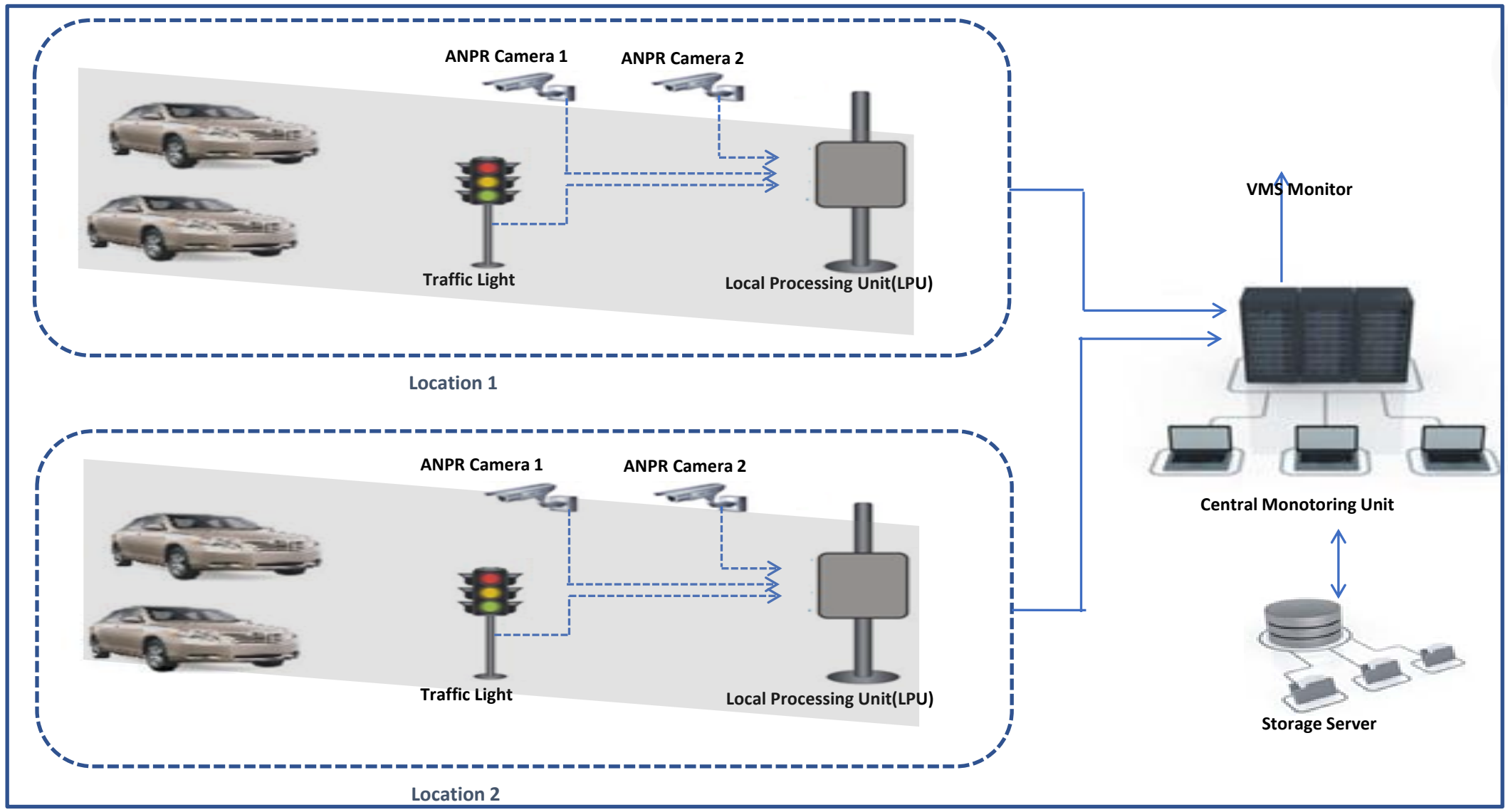
2. They are further connected to Core Routers & switches in DC and integrated with Visual Service Monitoring application

3. VSM will be consisting of Media Server, Database server, GIS etc.

4. Further VSM will be integrated with CCC Application.

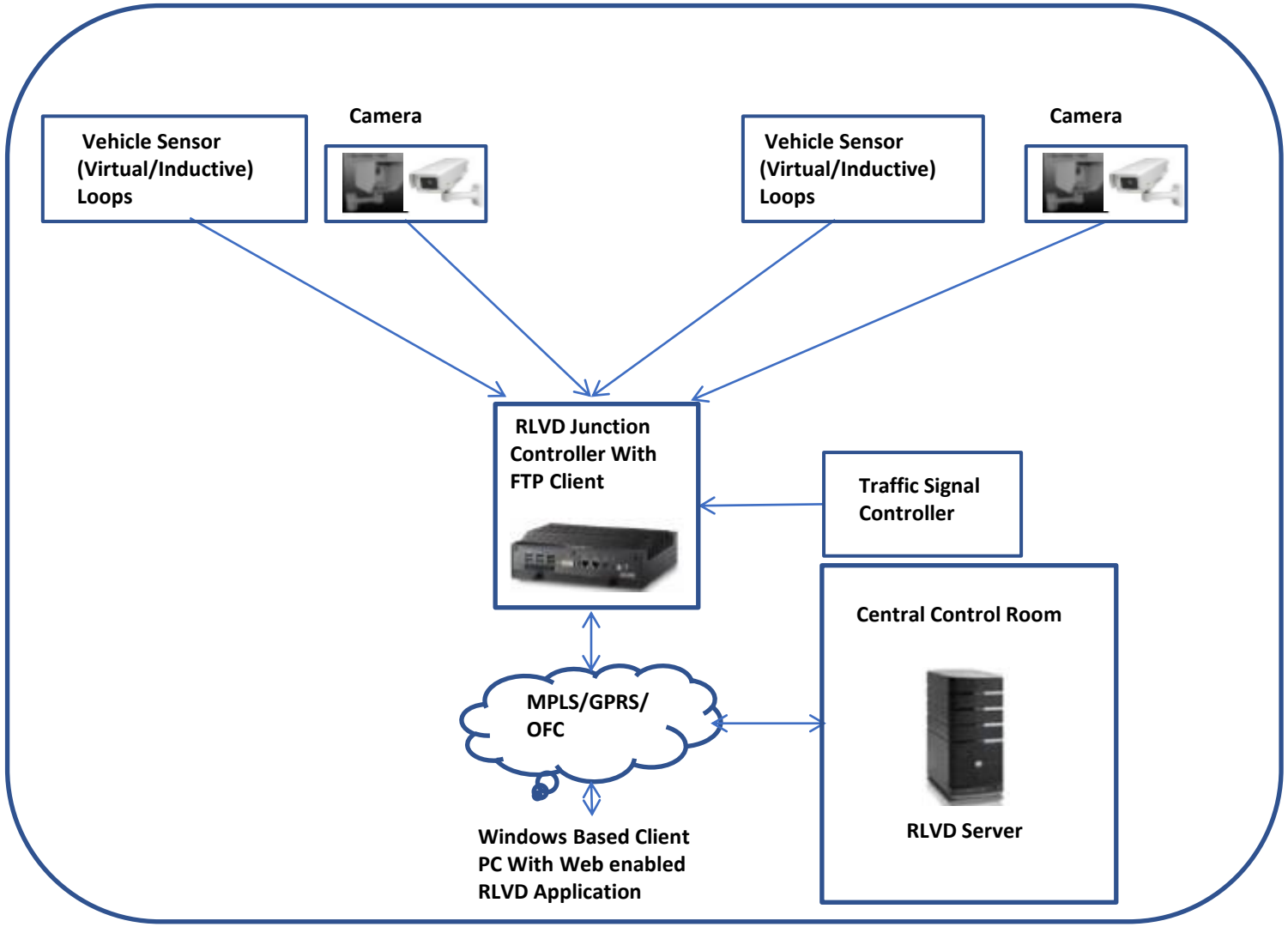
5 The feeds from all the cameras can be viewed in the video wall through this VSM Application.

Automatic Number Plate Recognition (ANPR)



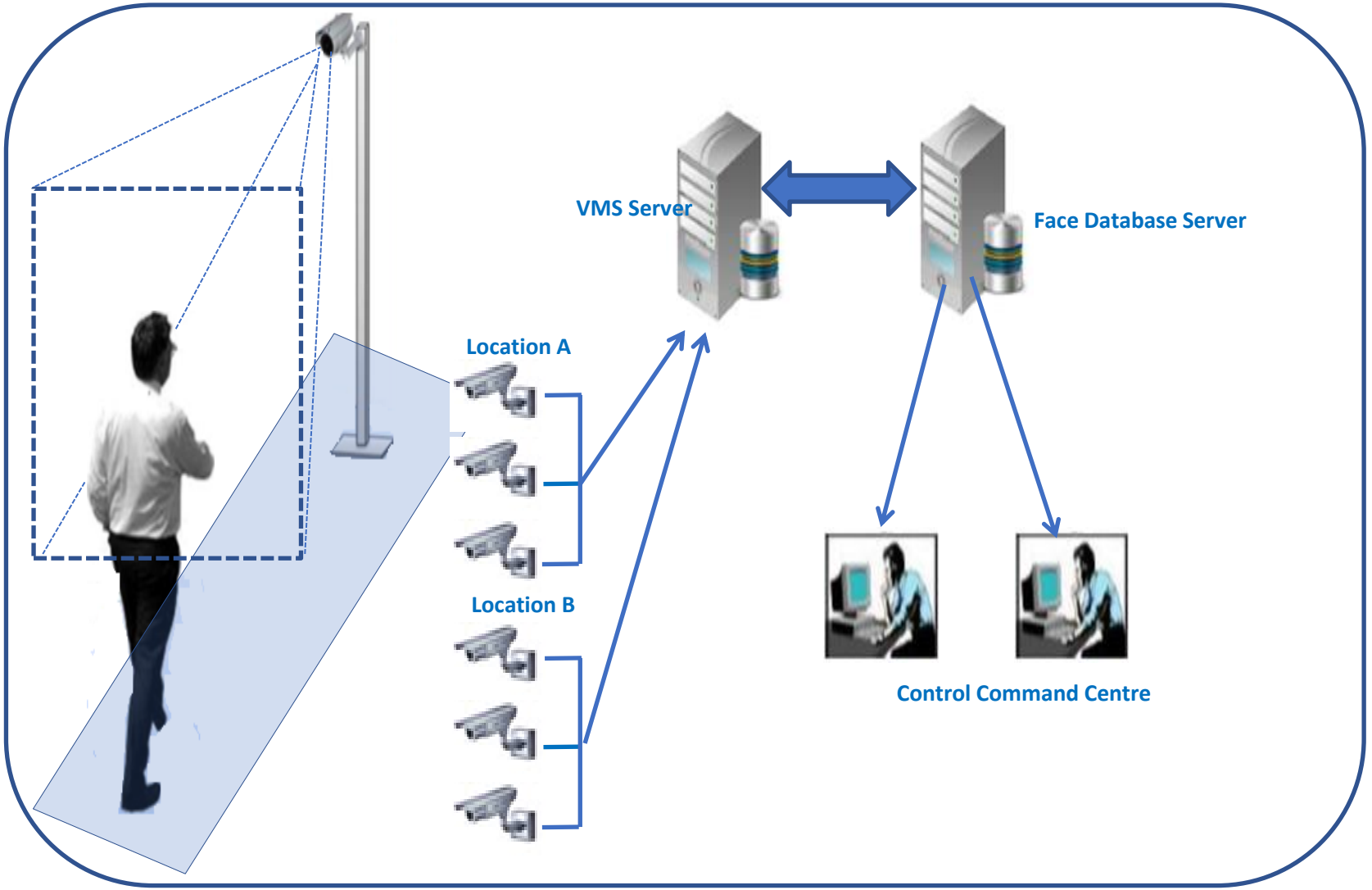
- The ANPR camera is integrated with ANPR Application
- It does real time capture and recognition of license plates
- Data is stored in local/ central database.
- It will perform :
  - ✓ Real-time alerts (hot listing/ VVIP).
  - ✓ Faster Post event analysis
  - ✓ Live view
  - ✓ Crime Pattern Analysis

Red Light Violation Detection (RLVD)



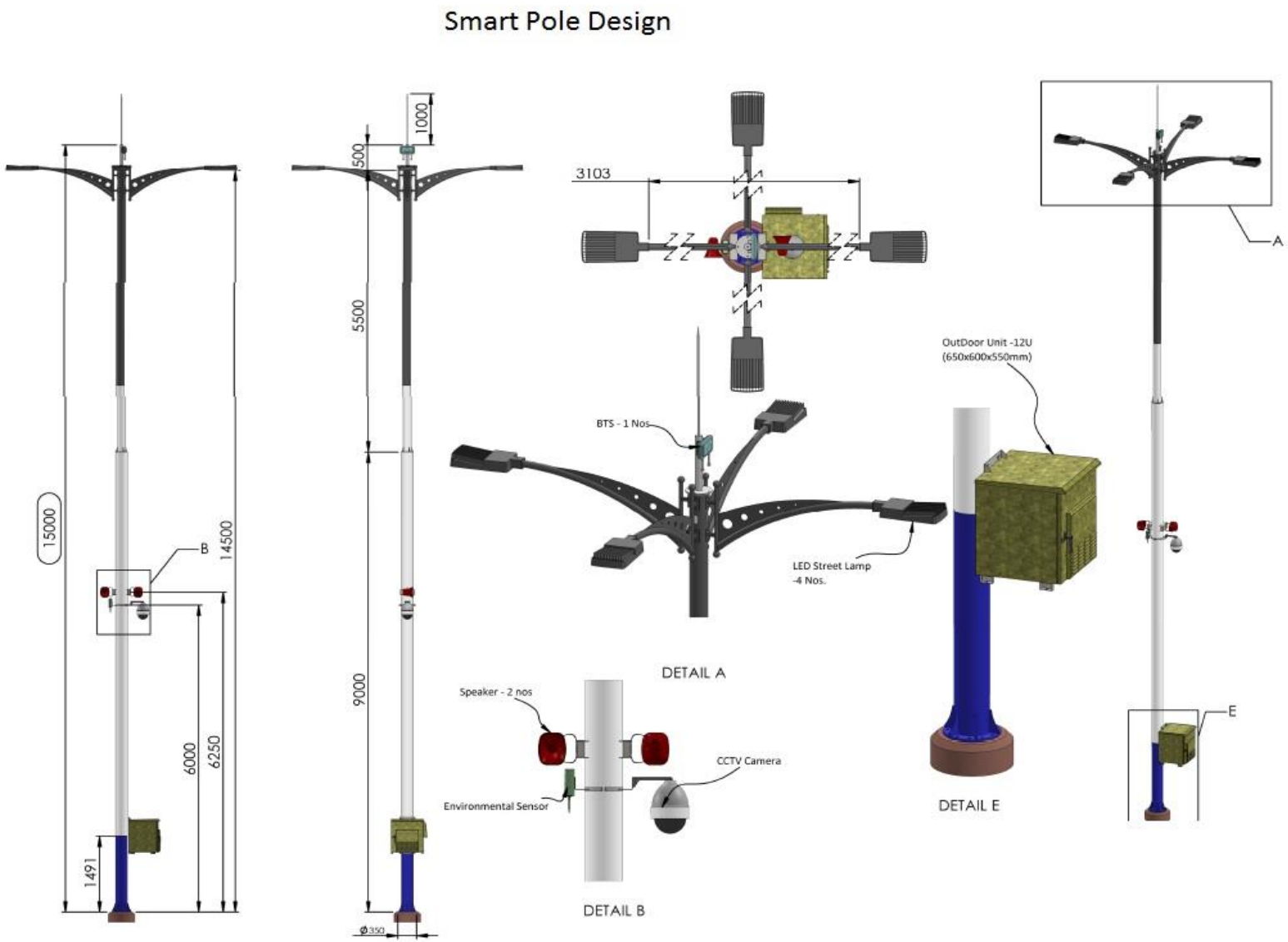
- RLVD Cameras have been integrated with RLVD junction controllers and further backhauled to fiber network
- Overview camera shows the entire violation scenario and ANPR camera captures the image of license plate of the violating vehicle
- The system takes input from traffic light and starts capturing license plates of the vehicles violating red light as soon as traffic signal turns red
- It comes with state of the art, user-friendly graphical user interface (GUI) for seamless operation. Challan can be generated either from the system itself or by using e-challan hand held device for the offending vehicle

Facial Recognition System (FRS)



- FRS cameras are connected to the FRS Application and CCC via fibre network through field switches
- These cameras are so located as to capture the face of people passing by
- The camera output is streamed to the CCC onto servers with the Face Recognition Software (FRS).

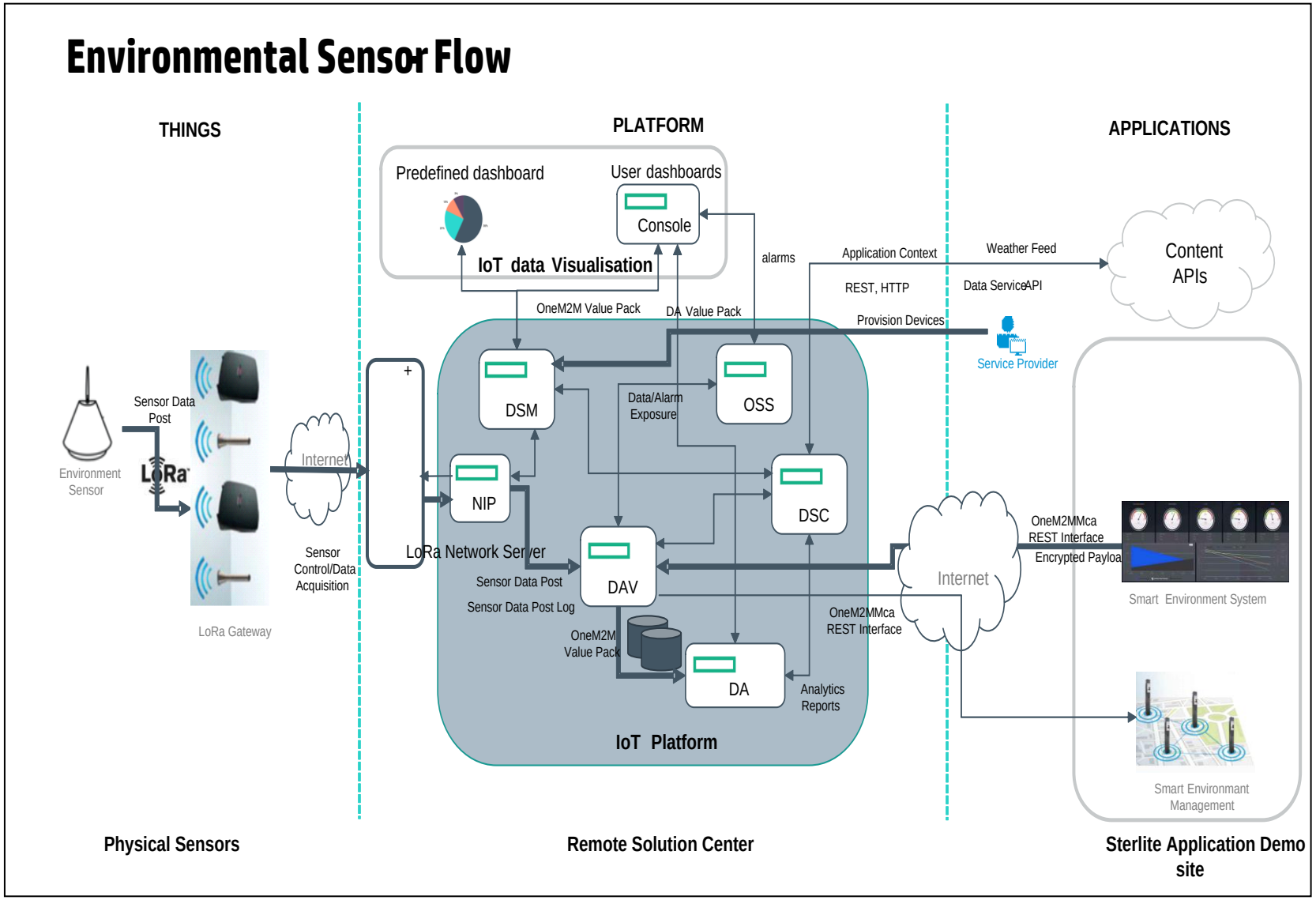
Smart Poles



- LoRa antenna at the top of pole to provide maximum coverage
- Total of 10 smart poles deployed across the major locations of the city
- Smart pole requirements:

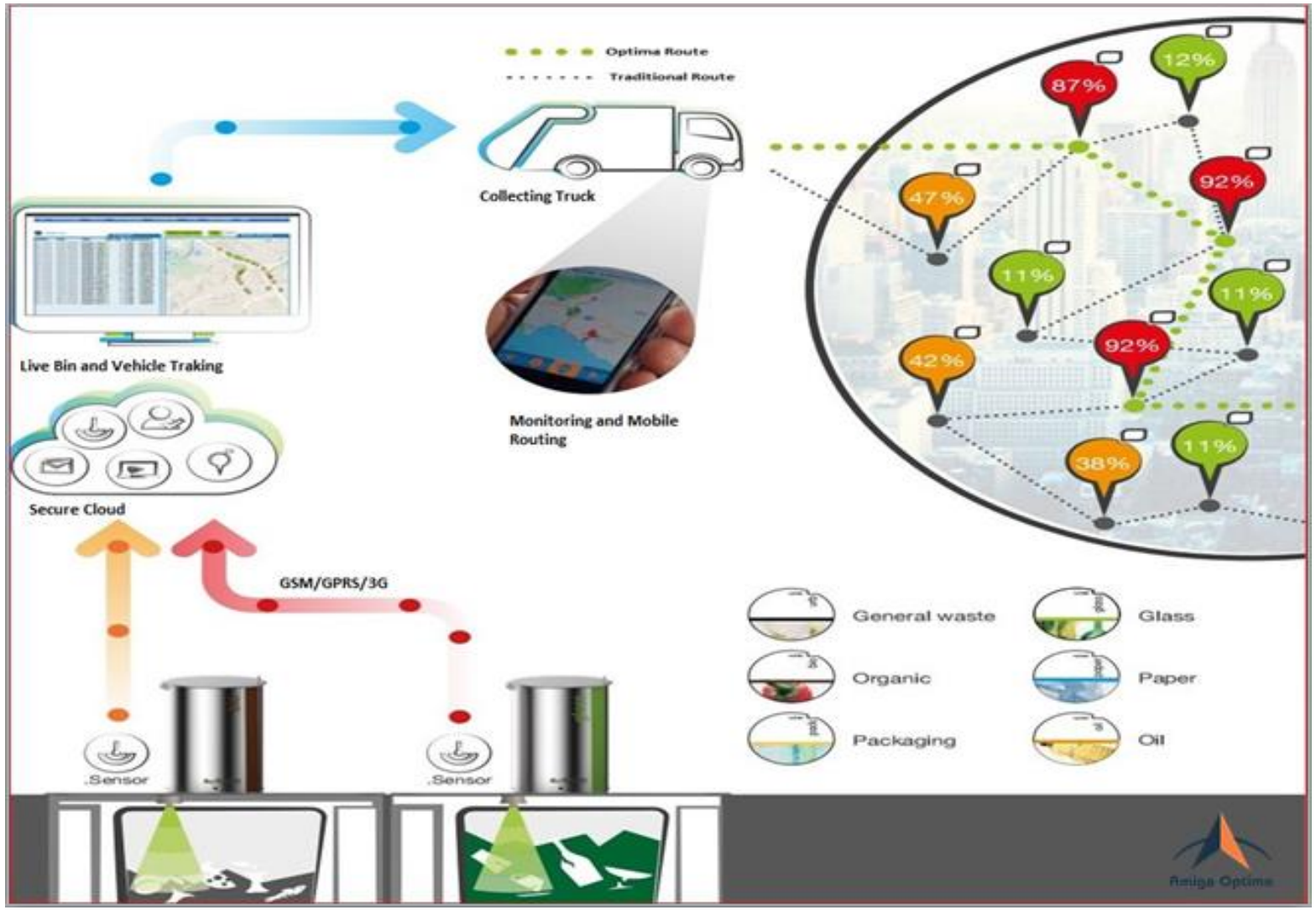
✓ Aesthetically appealing
✓ Support 4 LED luminaire of with minimum200W power
✓ Support connectivity
✓ Host environmental sensors, LoRa BTS, smart lights, camera, IP PA and Wi-Fi APs

Environmental Sensors



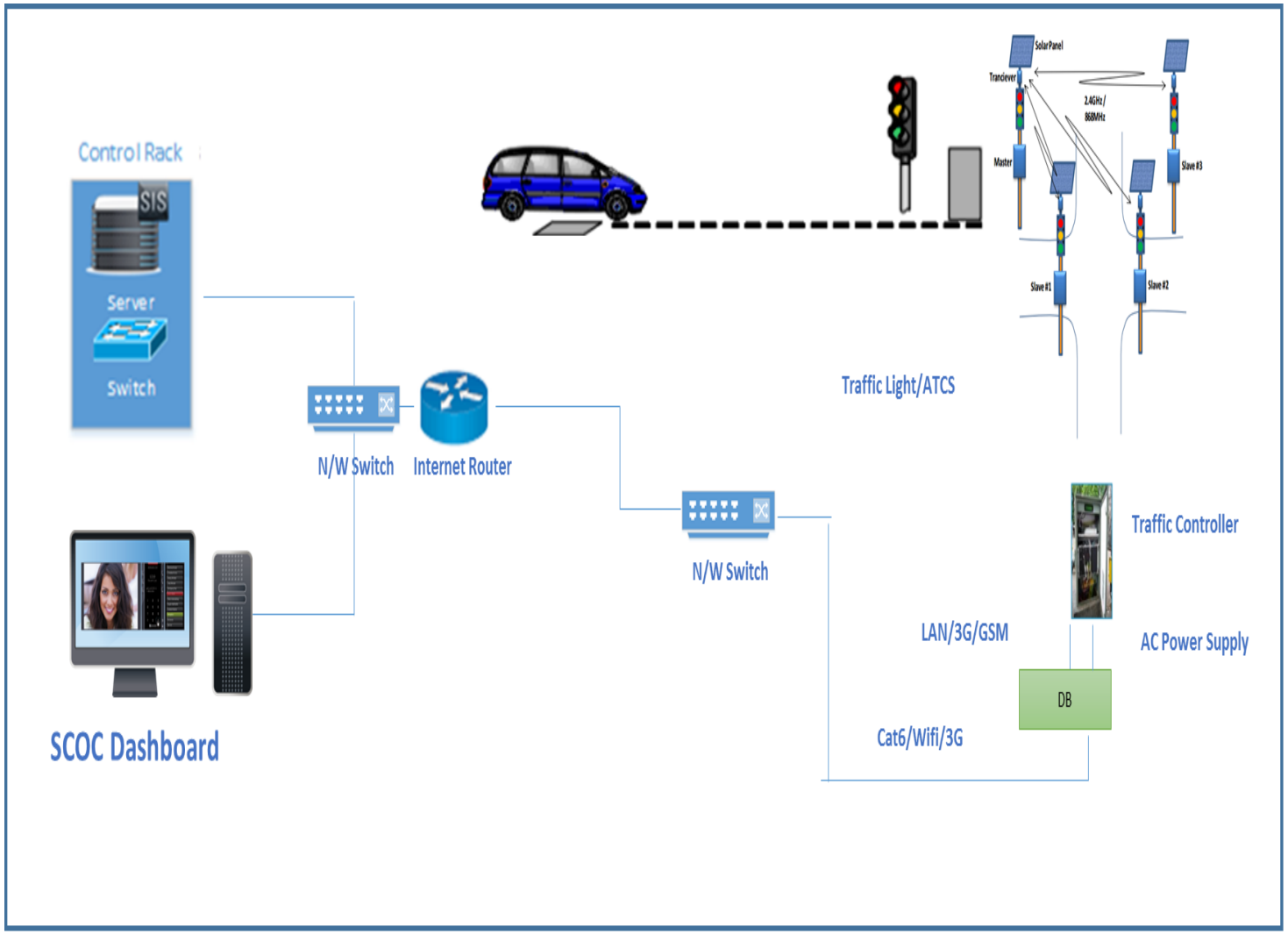
- Environmental sensors send data to LORA BTS and backhauled to CCC using GSM
- At the CCC, the data from the sensors are integrated with CCC / IOT Platform
- Environmental sensors measure various parameters like particulate, toxic gases, odors, radiation, noise, light, UV etc.

Waste Management through Automatic Vehicle Locating System (AVLS)



- A volume sensor in the bin sends a trigger to CCC over GSM when the bin fills to a specified threshold
- Once CCC receives this alert, it locates the nearest truck and generates an optimized path for collecting the waste from the bin
- The optimized path is received by the truck driver on an App
- Once the bin is emptied, volume sensor resets and an alert is sent to CCC to indicate trash collection

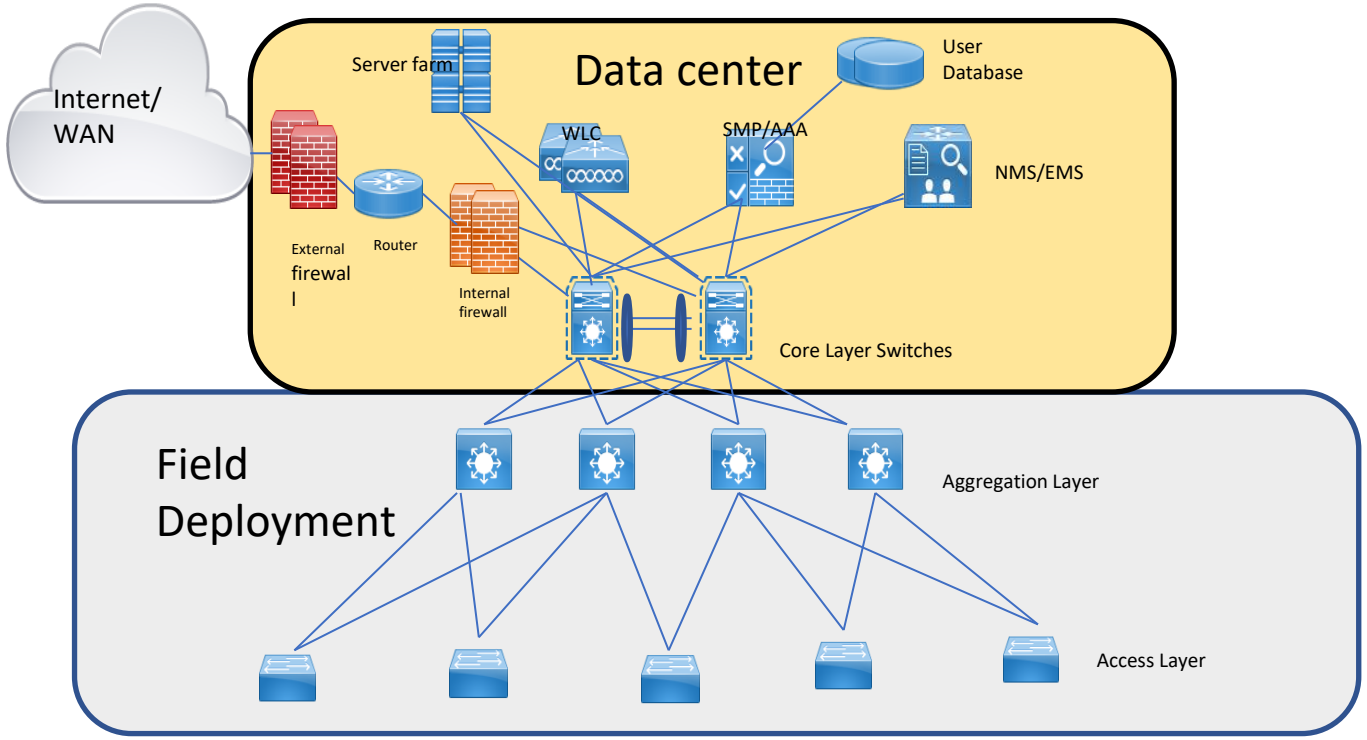
Automatic Traffic Control System (ATCS)



- The ATCS Sensor connects to a traffic controller and backhauled over fiber or GSM
- The solution works with any existing or proposed traffic signal controller and is extremely flexible in its operations
- The solution has below components :

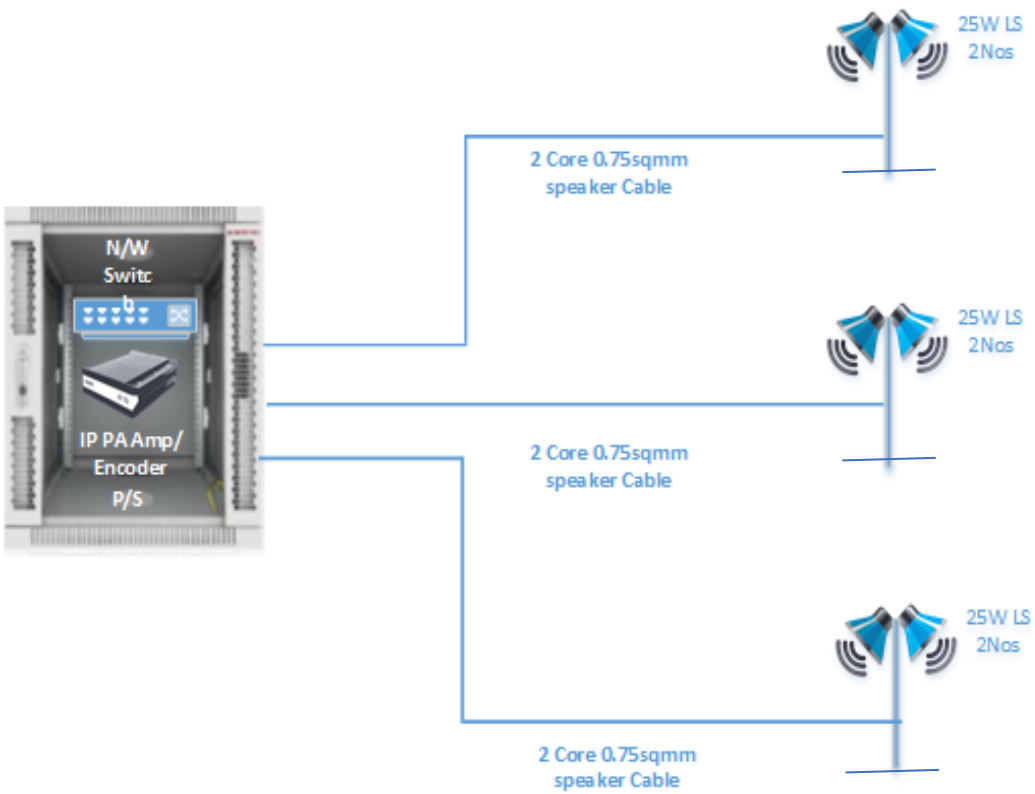
  1. Traffic Intelligence Module
  2. Traffic Intelligence Server
  3. Traffic detectors

PA System



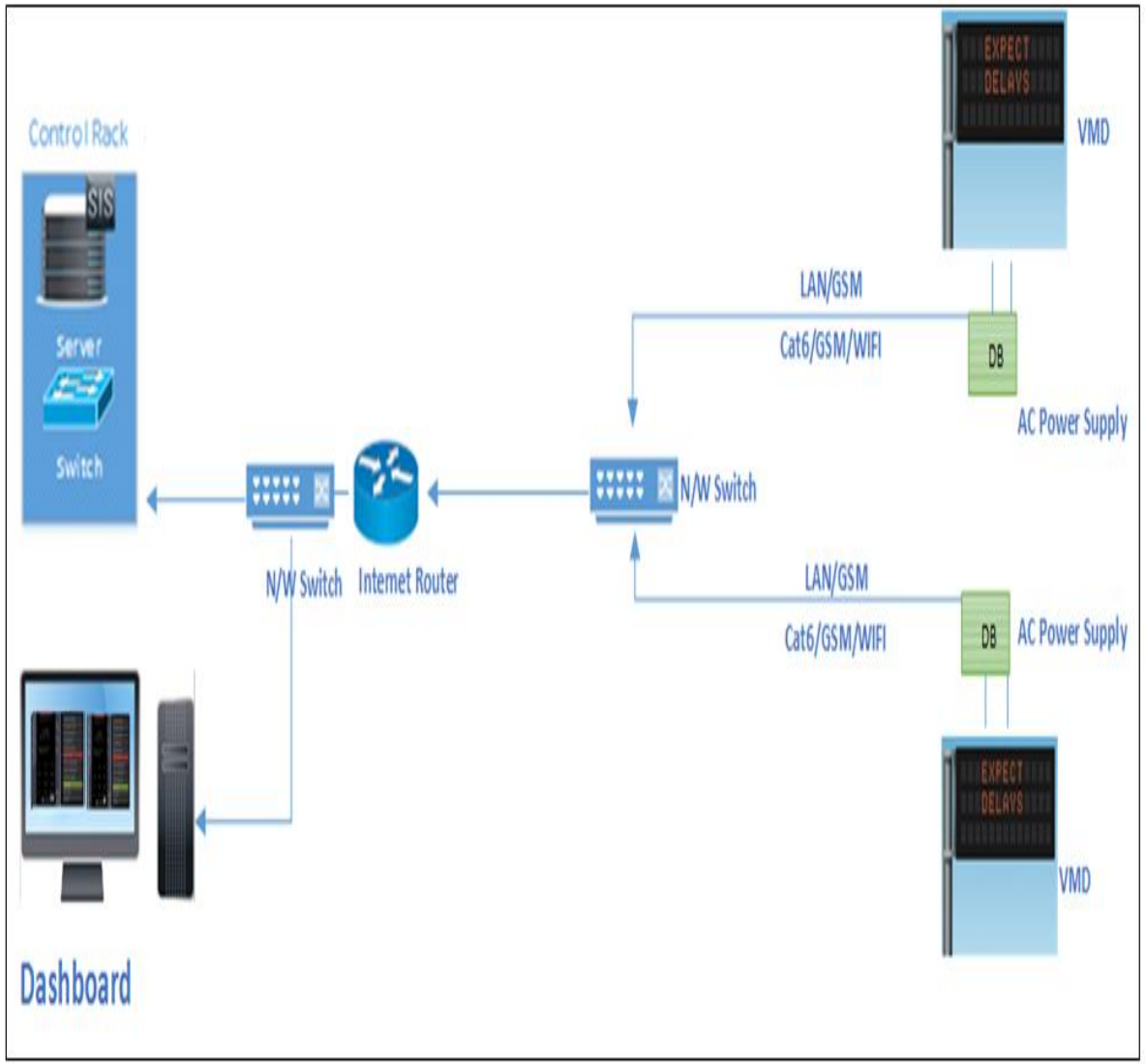
Main components of PA system:

- ✓ Speakers
- ✓ IP Amplifier
- ✓ Control desk station
- ✓ Monitoring and control software Security



Field Equipment

Variable Messaging Display (VMD)



- Public safety messages related to traffic flow, congestion, vehicle crashes, lane closures, etc.

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