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**IEEE SA P2872 Standard Working Group**  
**Interoperable and Secure Wireless Local Area Network**  
**(WLAN) Infrastructure and Architecture**  
**(ISAWANI)**

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**Chair - IEEE SA P2872 Standard WG**

**Vice Chair - IEEE SA P2061 Standard WG**

**Chair - IEEE SA Rural Communication Industry Connection Program**

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# Scope of proposed standard

This standard specifies an architecture for an **interoperable** and **secure** public **WLAN** network infrastructure to provide **seamless** connectivity for users of IEEE 802.11 networks. The network infrastructure shall consist of IEEE 802.11 Wireless **Access Points (WAPs) of different makes or models** and from **different vendors**, **backhaul** connectivity provided by different **service providers**, **authentication** and **policy infrastructures**, and **services** (such as voice, data, and video) offered by different **application service providers** through **subscription** plans.

The **network** infrastructure elements shall **interwork** with each other in a **secure** manner, and the **infrastructure** shall support **discovery** and inclusion of compliant WAPs to provide a **seamless** service for its **subscribers**.

# Summary

- PAR Approved -  
**04.03.2020**
- PAR Expiry- 31.12.2024
- Standard Ballot Type -  
Individual
- Website
  - <https://standards.ieee.org/project/2872.html>
  - <https://sagroups.ieee.org/2872/>
- **Current activity** -  
*Standard draft preparation*

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## P2872

**Submitter Email:** sandeepa@cdot.in  
**Type of Project:** New IEEE Standard  
**Project Request Type:** Initiation / New  
**PAR Request Date:** 24 Jan 2020  
**PAR Approval Date:** 04 Mar 2020  
**PAR Expiration Date:** 31 Dec 2024  
**PAR Status:** Active

**1.1 Project Number:** P2872  
**1.2 Type of Document:** Standard  
**1.3 Life Cycle:** Full Use

**2.1 Project Title:** Standard for Interoperable and Secure Wireless Local Area Network (WLAN) Infrastructure and Architecture

**8.1 Additional Explanatory Notes :** #7.3: There might be interest in the adoption and harmonization of this standard by Telecommunication Standards Development Society, India (TSDSI)  
#7.4: There might be interest in the certification of this standard by Telecommunication Engineering Centre, India (TEC)

<b>S.No.</b>	<b>Contribution &amp; Presentation</b>	<b>Contributor (Affiliation)</b>
1	<b>WANI V1.0 Framework</b>	<i>Sandeep Agrawal (C-DOT)</i>
2	<b>WANI Token flow</b>	<i>Deepankar Debnath (C-DOT)</i>
3	<b>WRIX, OpenRoaming, WBA IDs, mapping openRoaming to WANI Framework</b>	<i>Tiago Rodrigues (WBA), Bruno Thomas (WBA), Mark Grayson (Cisco)</i>
4	<b>Centralized Architecture for Public Wi-Fi Proliferation (CAWP)</b>	<i>Atul Sinha (NTIPRIT)</i>
5	<b>IEEE 802.1CF-2019 'Network Reference Model and Functional Description of IEEE 802 Access Network' and mapping to P2872 requirement</b>	<i>Max Reigel (Nokia)</i>
6	<b>Adopting components of 802.1CF in P2872</b>	<i>Sandeep Agrawal (C-DOT)</i>
7	<b>Internet Lite and Digital Public Good 4All</b>	<i>Sudhir Dixit (Basic Internet Foundation)</i>
8	<b>Unified &amp; Harmonised Architecture Imperatives for Unified Digital Infrastructure</b>	<i>Kishore Narang (Narnix)</i>

# Public Wi-Fi Ecosystem

## Users



- Users in Urban area
- Users in Rural area
- Area with Cellular & Wi-Fi Coverage
- Area with only Wi-Fi Coverage
- Usage pattern
- Multiple onboarding mechanism

## Device



- Only Wi-Fi support
- Wi-Fi + Cellular Support
- Old/legacy device
- New device (EAP-SIM support)
- Sensors
- Surveillance devices
- Connected Vehicle etc.

## Wi-Fi Network



- Legacy Access Point
- Access Point with HS 2.0 Support
- Wi-Fi AP + internet backhaul
- Wi-Fi network with Captive portal + AAA
- Wi-Fi network with CP + AAA + Telco core
- Wi-Fi standalone network
- Wi-Fi roaming enabled network
- Hybrid roaming network

## Players



- TSP, ISP, VNO etc.
- PDO (Public Data office)
- Aggregators who serves PDOs with wifi network functions
- Neutral host
- Wi-Fi APP provider
- Authentication infrastructure provider
- Roaming Hub/Clearing house
- PKI (Public Key Infrastructure)

## Public Agencies



- Lawful Agencies
- Smart City Authority
- Government/State agencies
- Data Analytics Agencies
- Disaster Authority etc.

## Applications



- General Internet (voice, data & video)
- Mobile Offload
- Public Utility
- Emergency Alerts
- Communication during disaster
- Connectivity infrastructure for Smart City (IoT, Connected Vehicle etc.)
- Wi-Fi Calling

## Deployment



- Railway stations
- Metro stations
- Village centres
- Bus Stands
- Malls
- Airports
- Tea shops
- Nook & Corner shops
- City centres
- Markets
- Community Centres etc.

## Wi-Fi Plan



- Free
  - Limited
  - **Public Utility**
- Paid
  - Prepaid
    - Voucher
    - Prepaid SIM (TSP)
  - Postpaid
    - Postpaid SIM (TSP)
    - Postpaid (ISP/Aggregator)

# Standard Requirement

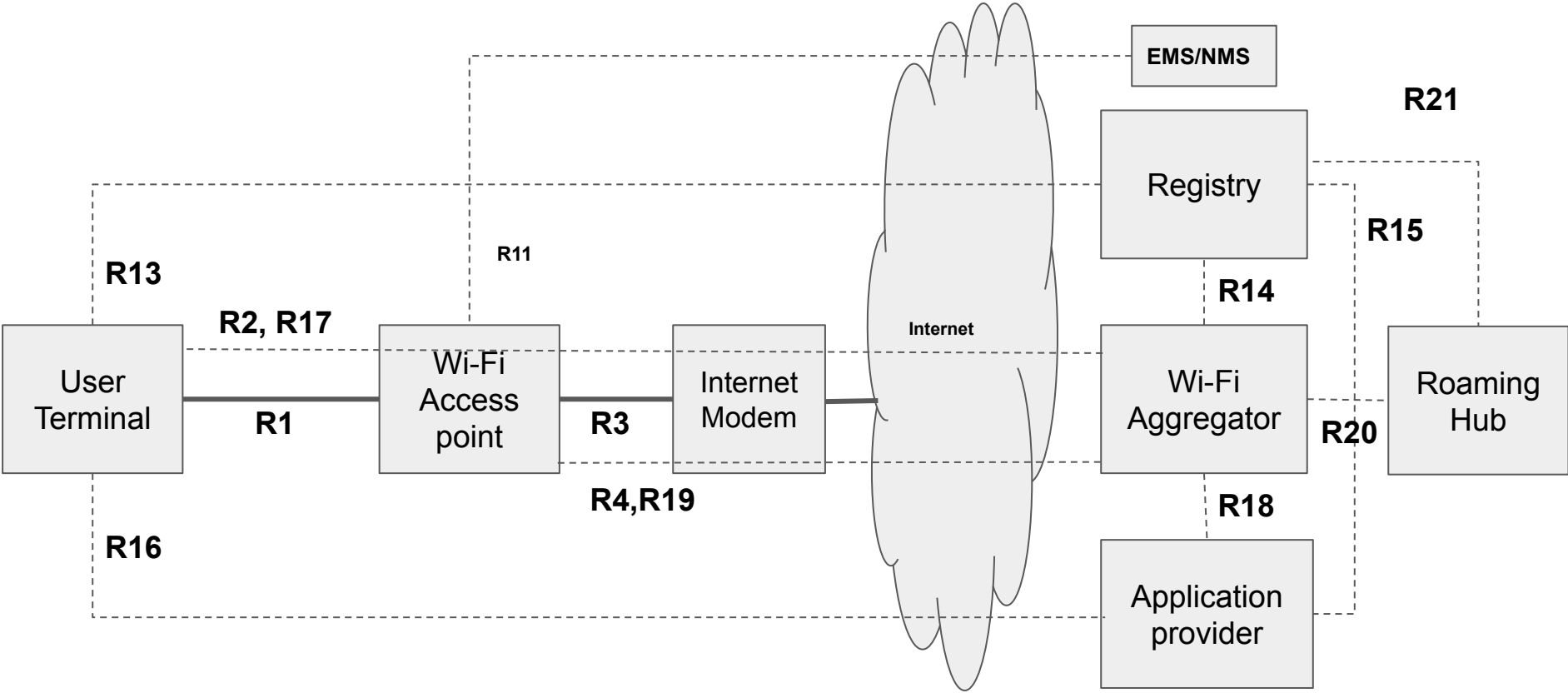
- Unbundled architecture to allow multiple players participating in the public Wi-Fi ecosystem.
- It shall allow users present in urban as well as rural areas to onboard the Public Wi-Fi with ease and in single click.
- The architecture shall not depend on the specific capability of User device as well as Access point and core elements. Legacy devices shall also seamlessly work.
- Multiple subscription plans shall be supported in the architecture to meet different usage need.
- It shall allow multiple players to interop securely.
- It shall allow smaller service providers to easily plug into the Public Wi-Fi infrastructure and provide seamless service to its subscribers and interop with bigger players such as TSPs and ISPs.
- It shall enable migration of existing Wi-Fi infrastructures to Public Wi-Fi infrastructure with ease.
- It shall provide a single window view into the Public Wi-Fi network.



# Focus areas

- **Interoperable of multiple players to operate in the ecosystem**
  - Application provider
  - Access point provider
  - Bandwidth provider
  - Wi-Fi Core network provider
  - Central Database
- **Non-Dependency of architecture on specific capability of**
  - User device
  - Wi-Fi Access Point
  - Wi-Fi core network
- **Identity of User in the network**
  - Unique Username
  - MAC ID of the User device
  - Certificates
- **Identity of multiple players in the ecosystem**
- **Security**
  - *Wi-Fi layer security*
  - Application layer security
  - Secure data exchange among multiple players
- **User Charging**
  - Voucher based data pack
  - Wallet based settlement
- **Universal Roaming**
  - Application provider centric Roaming
  - Wi-Fi provider centric Roaming
- **Settlement**
  - Commercial Settlement among all the players in the ecosystem
- **Lawful Interception Requirements**
- **Applications**
  - **High speed internet**
  - *Offload to MNO*
  - *Connection to IoT devices*
  - *Dissemination of Emergency messages*

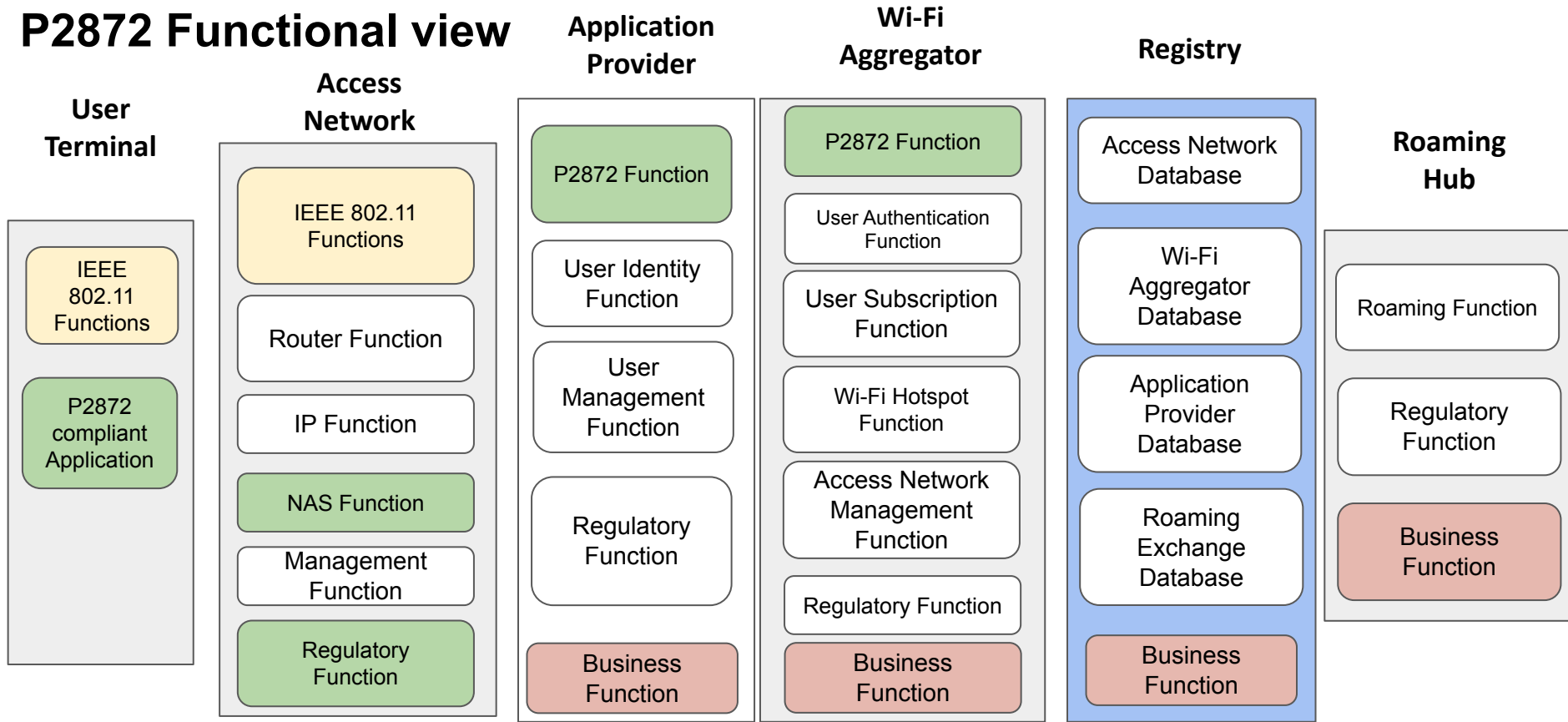
# P2872 Network Reference Model - NRM



# Reference Points

- Reference points are denoted through R#
- Two different kind of reference points
  - Forwarding path of user data frames, represented by solid lines
  - Control interfaces, represented by dotted lines
- **R1, R2, R3, R4, R11** = Applicable (Existing Reference point of IEEE 802.1CF)
- **R11** - Falls under Wi-Fi Service Provider scope if Access provider and Service provider same.
- **R12** - Not applicable when Internet backhaul provider and Wi-Fi service provider are different. Applicable when both are provided by same entity i.e., ISP (not shown in the diagram. Refer 802.1CF)
- R5, R6, R7, R8, R9, R10 - Applicable (not shown in the diagram. Refer 802.1CF)
- **R13, R14, R15, R16, R17, R18, R19** = New Reference point for defining control path in P2872
- **R20, R21** = New Reference points for defining Roaming functionality control path in P2872

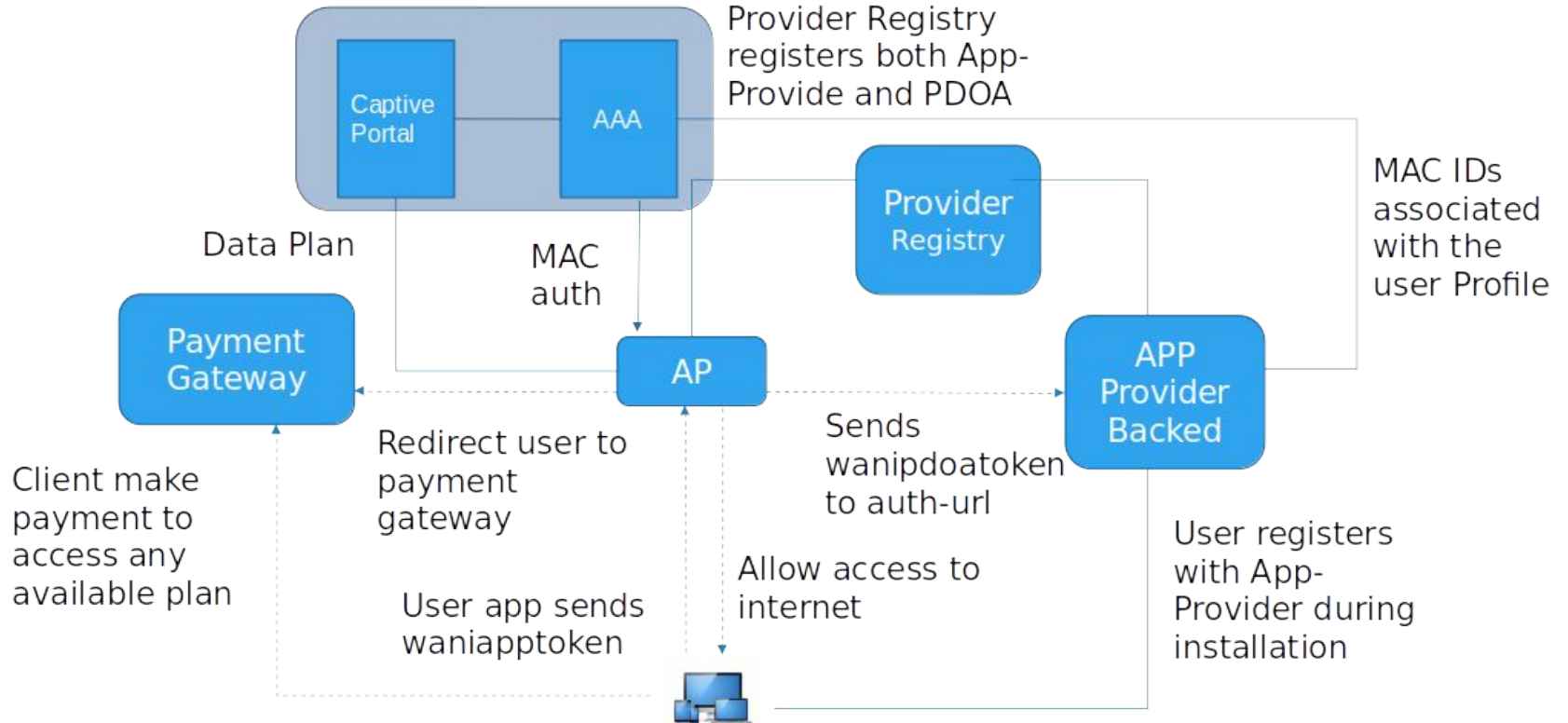
# P2872 Functional view



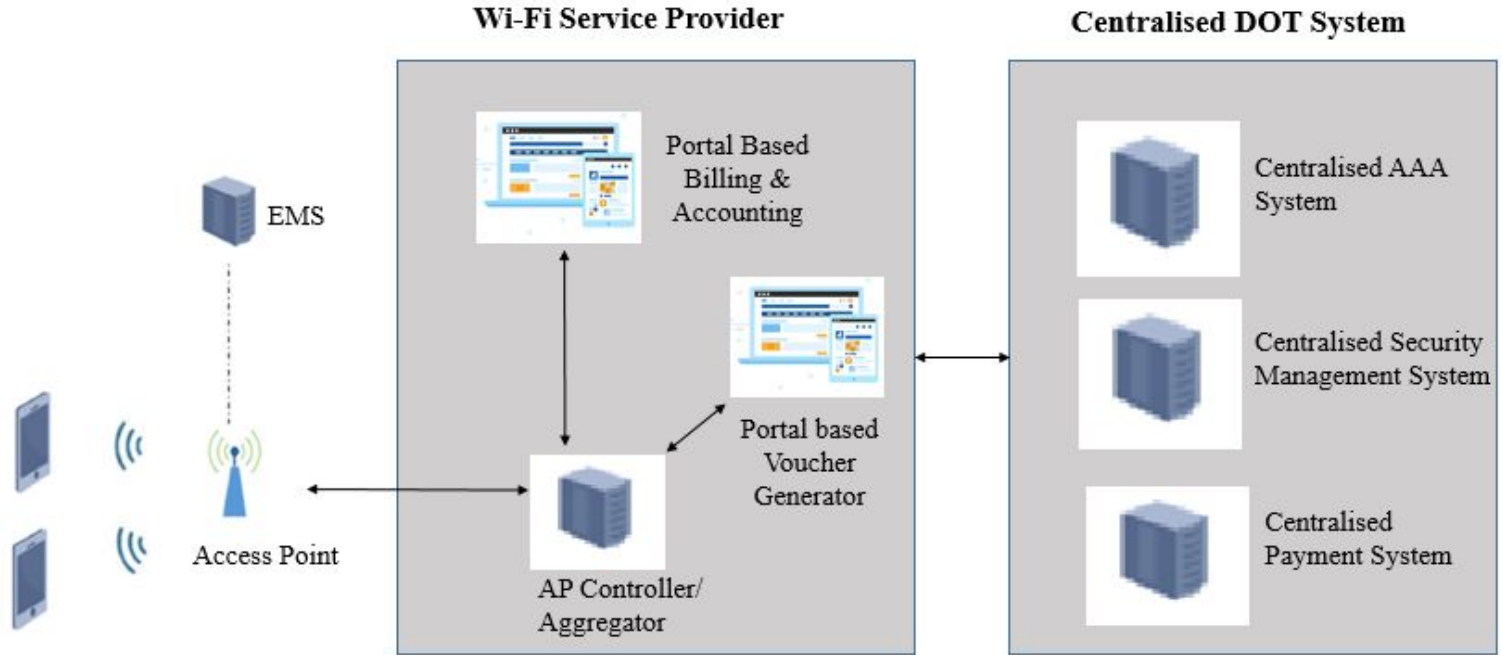
*Network functions are not dependent on Internet Service Provider. ISP function is limited to providing backhaul pipe to Access Network*

# **Contribution Highlights**

# WANI 1.0



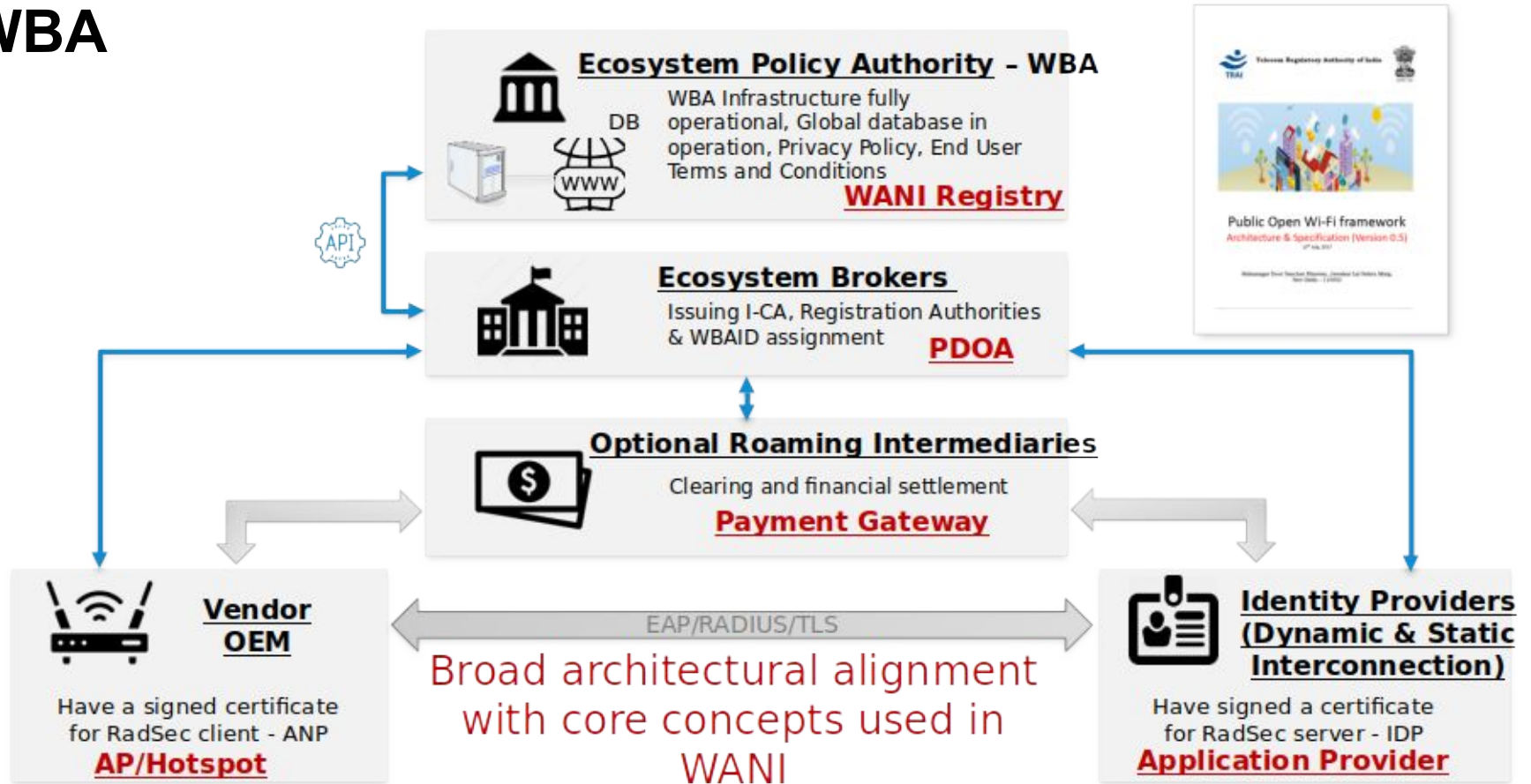
# CWAP



## Key Features:

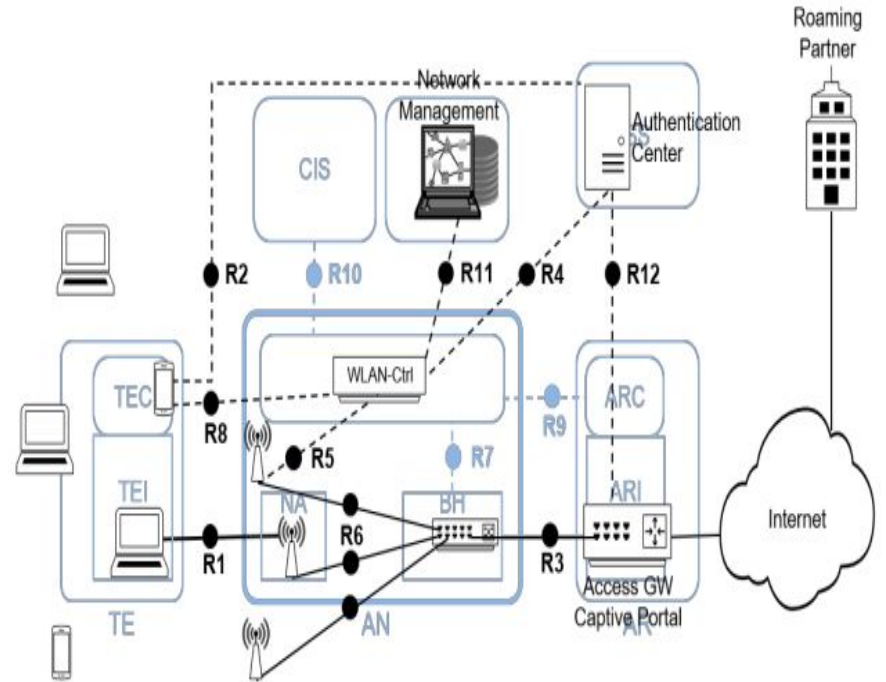
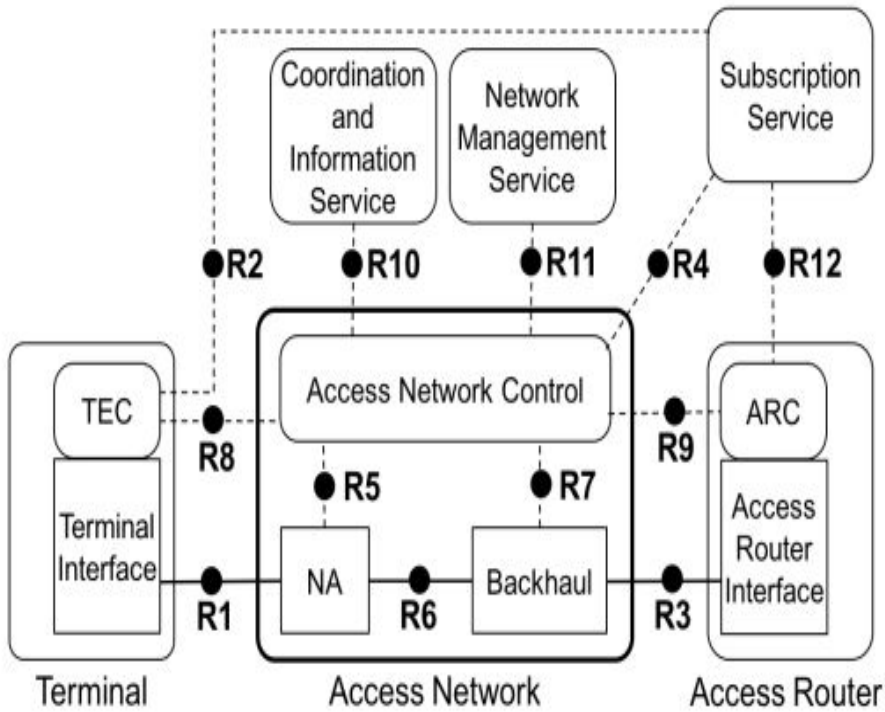
1. ***Interoperable Hotspot Ecosystem with Roaming***
2. ***Centrally Controlled Authentication, Authorization, Accounting, security and Payment***
3. ***Registration based on WiFi Service Providers (WSPs)***

# WBA

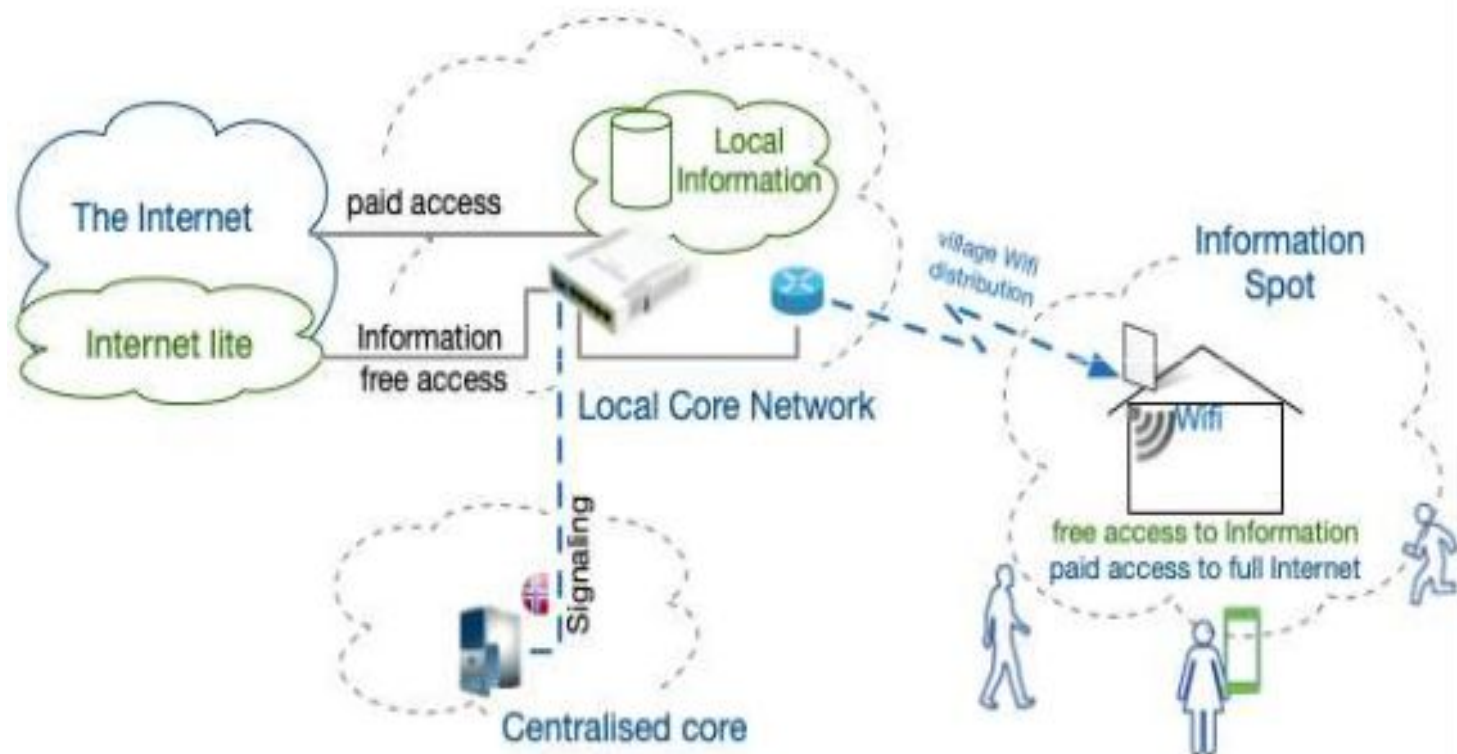




# IEEE 802.1CF



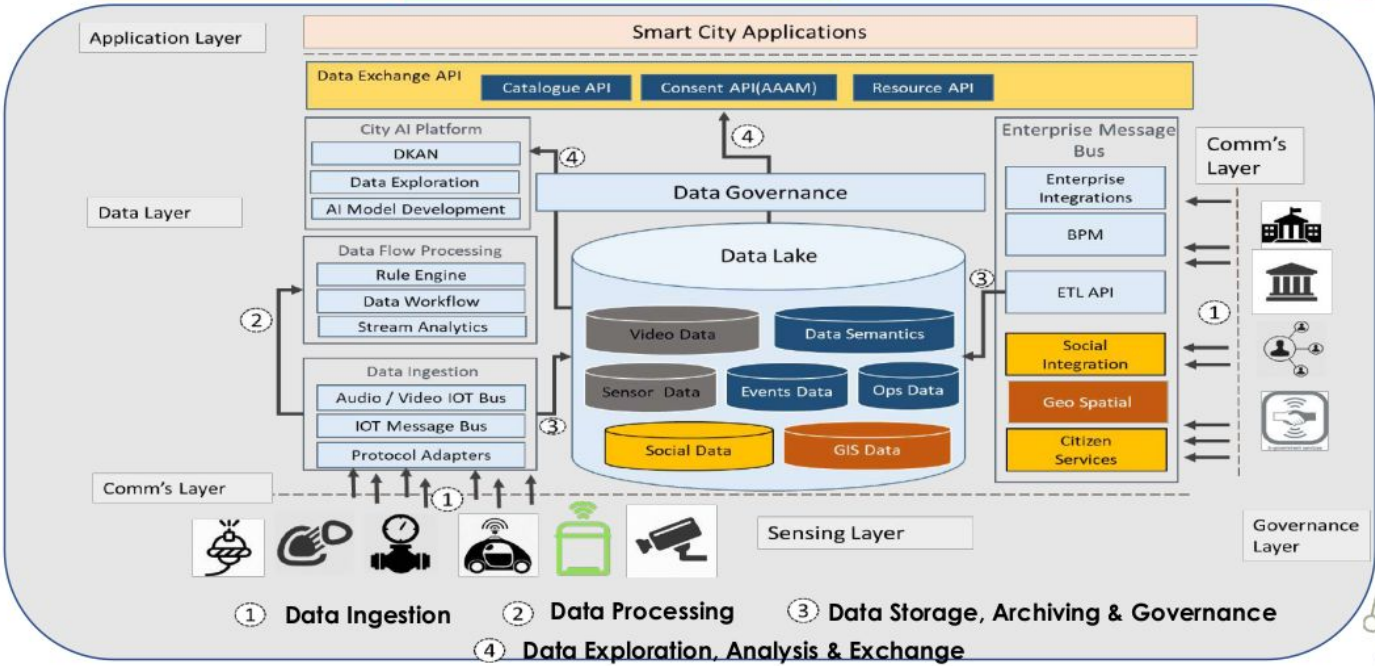
# Internet Lite



# Unified Smart City - Architecture



## Smart City ICT RA - Data Layer Architecture





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Thank You