SATYASPEAK
WTSA24-ITU Kaleidoscope – Connecting remaining 3 Billions
Bharat Mandapam,23rd Oct 2024

PM-Wifi Access Network Interface (WANI) and "HotSpot as Managed Service"-Use Case for Connecting the Unconnected

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WiFi touches **12 of the 17** UN SDGs

"Connecting the Unconnected" drives all-inclusive Development

Connecting the unconnected

"Provide universal and affordable access to the Internet" - Sustainable Development Goal 9c.

Enabling local development

1 NO POVERTY	2 ZERO HUNGER	3 GOOD HEALTH AND WELL-BEING	4 QUALITY EDUCATION	8 DECENT WORK AND ECONOMIC GROWTH
Improved access to market information and digital financial services is a proven method to lift people out of poverty.	*Access to online weather forecasts, planting, harvesting and irrigation advice improves crop yields and food security.*	*Online health resources, training and remote diagnostics are lifesaving tools for rural health care delivery.*	*Online learning materials dramatically improves access to quality education to those living in remote, resource-poor areas.*	*Internet access improves productivity and could increase yearly individual incomes in rural areas between $450 and $630.*

Addressing key challenges

Local development - *not mass migration*

Youth employment - *not youth burden*

Digital opportunities - *not digital divide*

Connected markets - *not unequal trade*

# Role of Wi-Fi to enable Last Mile Connectivity(LMC)

1. **Ubiquitous** – Each smart device (including Mobile Phones) is Wi-Fi enabled.

2. Uses unlicensed spectrum *(ISM Band)* which is free (690 MHz in 2.4GHz and 5GHz Band), more in **6Ghz** on the way.

3. All-IP Technology which is very efficient and future proof, based on open and ever evolving standards of IEEE **(802.11x)**.

4. **Plug-n-Play** Ecosystem.

5. Low Power consuming and Low Cost – overall Infra cost about **15%** of conventional licensed mobile infrastructure.

6. Potential to conserve scarce licensed spectrum through **Mobile Data Offload (MDO), Fixed Mobile Convergence (FMC),Frugal 5G(LMLC,IEEE2061-2024).**

7. **NINENP (Non- Interfering, Non-Exclusive, Non-Protected) – Free for All (1000X more efficient than Exclusive).**

8. Potential to deliver 4G and 5G type services through upgradation(**802.11ac,Wave2,802.11ax,Wi-Fi 6,Wi-Fi 6E,Be**)

9. Ideal futuristic platform for IoT, M2M and E-health, E-farming, E-education, **PM-WANI** and **Jobs and Enterprenuers** creation.

10. Wi-Fi has become a part of the **5G ecosystem** through **Release 16 & 17 of 3GPP** IMT Standardisation process and has to play a major role for 6G Ecosystem as well.

PM-WANI: PRIME MINISTER-WIFI ACCESS NETWORK INTERFACE
A Liberalised Framework for Last Mile Connectivity(LMC)

WANI – De-regulated, Unbundled and Distributed Architecture
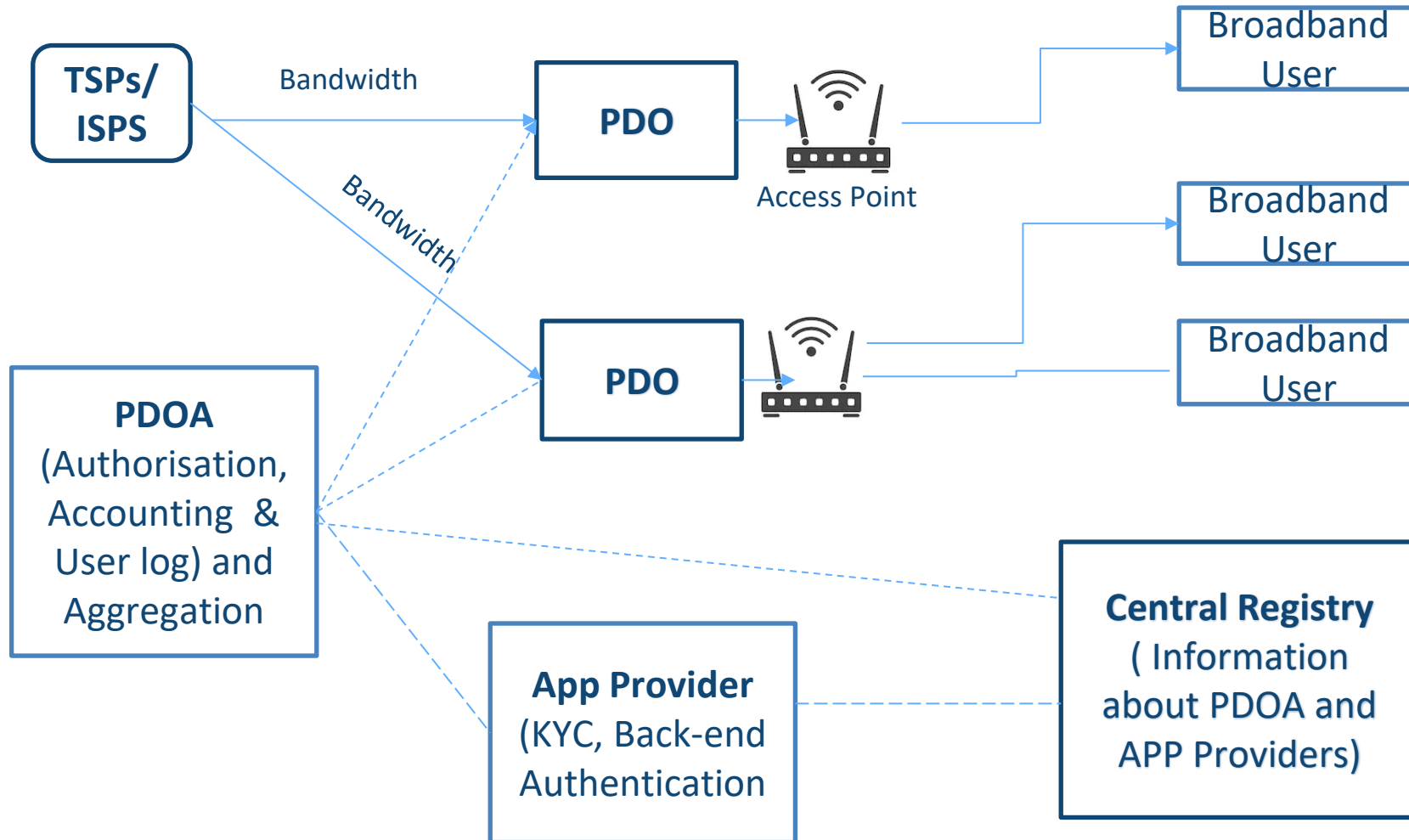
PM-WANI Ecosystem

1. PDO:

- Responsible for establishing and maintaining Wi-Fi Hotspots and delivery of Broadband services to end-users

- Procure Bandwidth from ISPs/TSPs/through PDOA.

- Act as Point of Sale(POS) for PDOA.

2. PDOA:

- PDOAs aggregate multiple WANI enabled Wi-Fi hotspots being operated by PDOs.

- Authorize and Authenticate subscriber to enable them to access Internet.

- Keep account of usage of each subscriber.

- Responsible for making available the l usage logs to Authorities.

- Security requirements met through TSP/ISPs (Licencees)
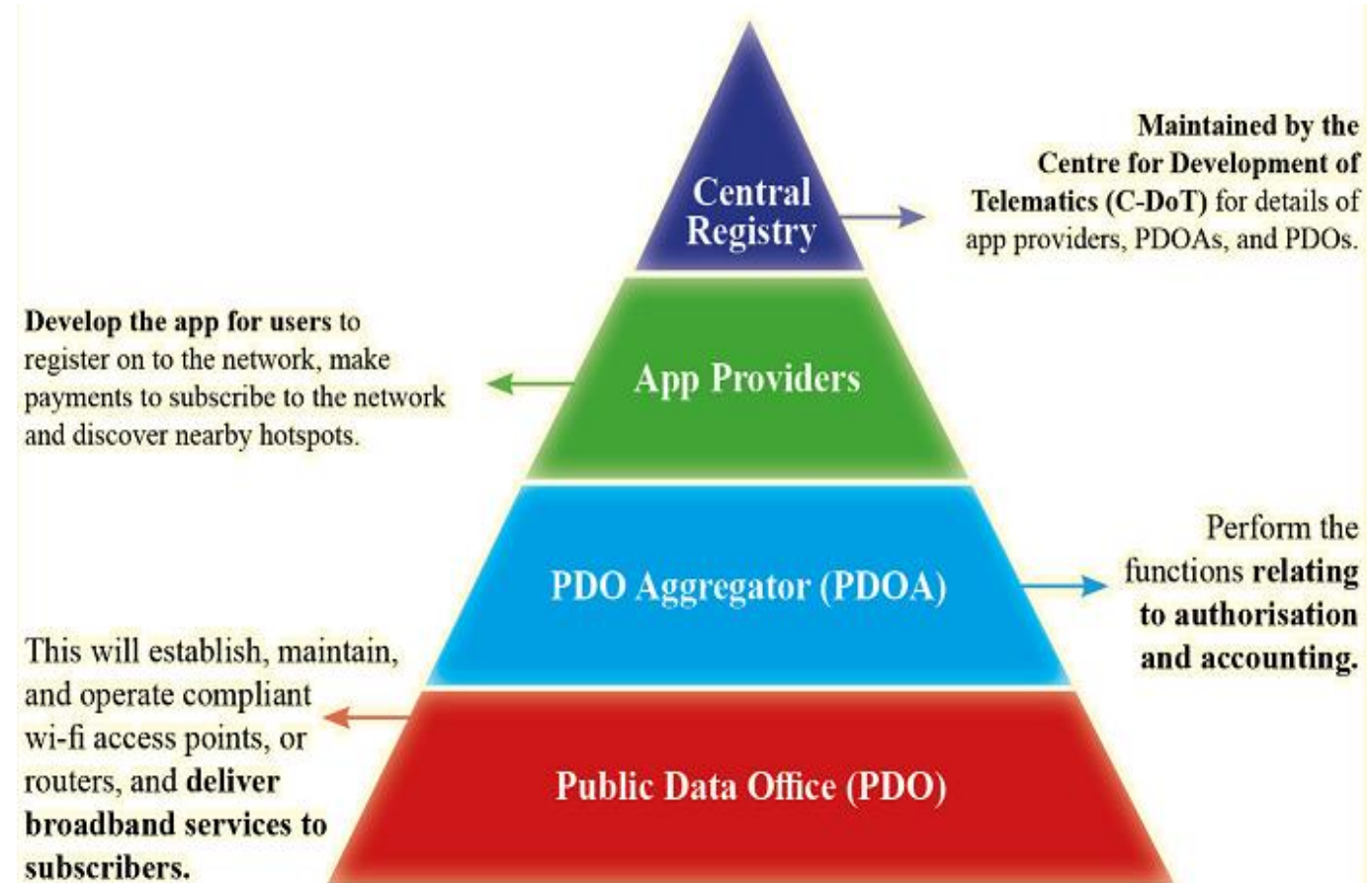
3. App Provider

Provides software application for:

- Users to create a profile and do their KYC
- Backend authentication for users to signup
- Discover WANI compliant Wi-Fi hotspots
- Connect to Wi-Fi Hotspot using the App.

4. Central Registry (Nominated by Govt., CDOT)

Mantains information about:

- PDOs, PDOAs, and App Providers

Maintained by the Centre for Development of Telematics (C-DoT) for details of app providers, PDOAs, and PDOs.

Central Registry

App Providers

Develop the app for users to register on to the network, make payments to subscribe to the network and discover nearby hotspots.

PDO Aggregator (PDOA)

Perform the functions **relating to authorisation and accounting.**

This will establish, maintain, and operate compliant wi-fi access points, or routers, and **deliver broadband services to subscribers.**

Public Data Office (PDO)

PM-WANI Framework-Salient Features

- ❑ Unique framework for WiFi Onboarding
- ❑ Users connect using registered Mobile App
- ❑ PDO operates Wi-Fi Hotspots & Service
- ❑ App Provider validates users credentials
- ❑ PDO can charge using payment gateways
- ❑ Central Registry maintains master list of PDOA & Hotspots(PDOs)
- ❑ Users can easily roam between Hotspots
- ❑ Mobile App helps users locate PM-WANI Hotspots
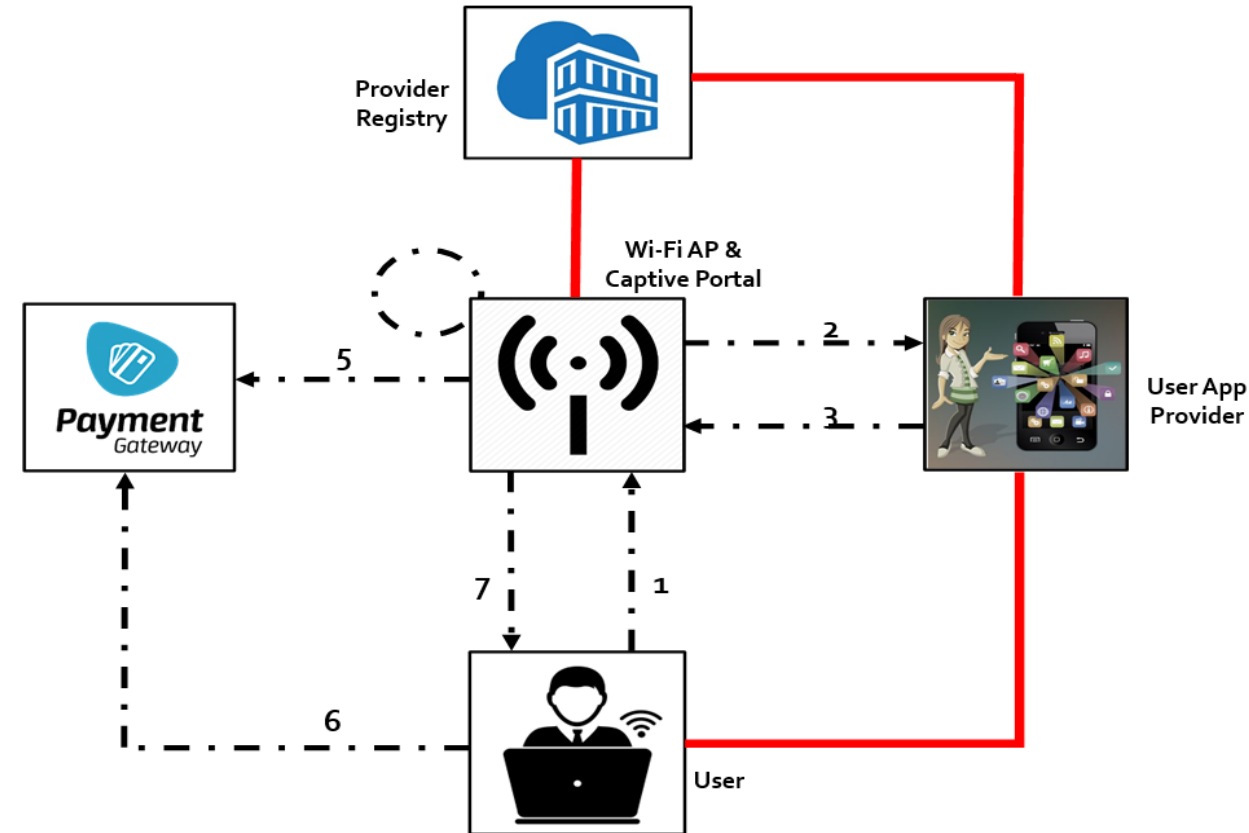
PM-WANI- Distributed Architecture
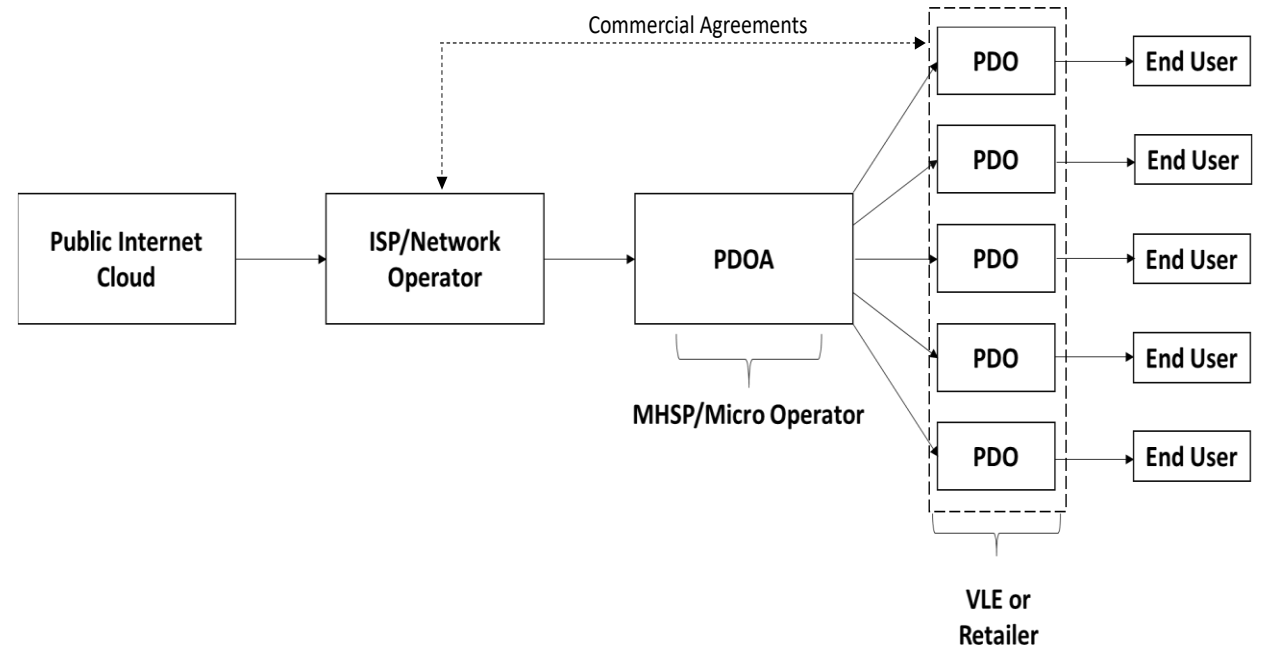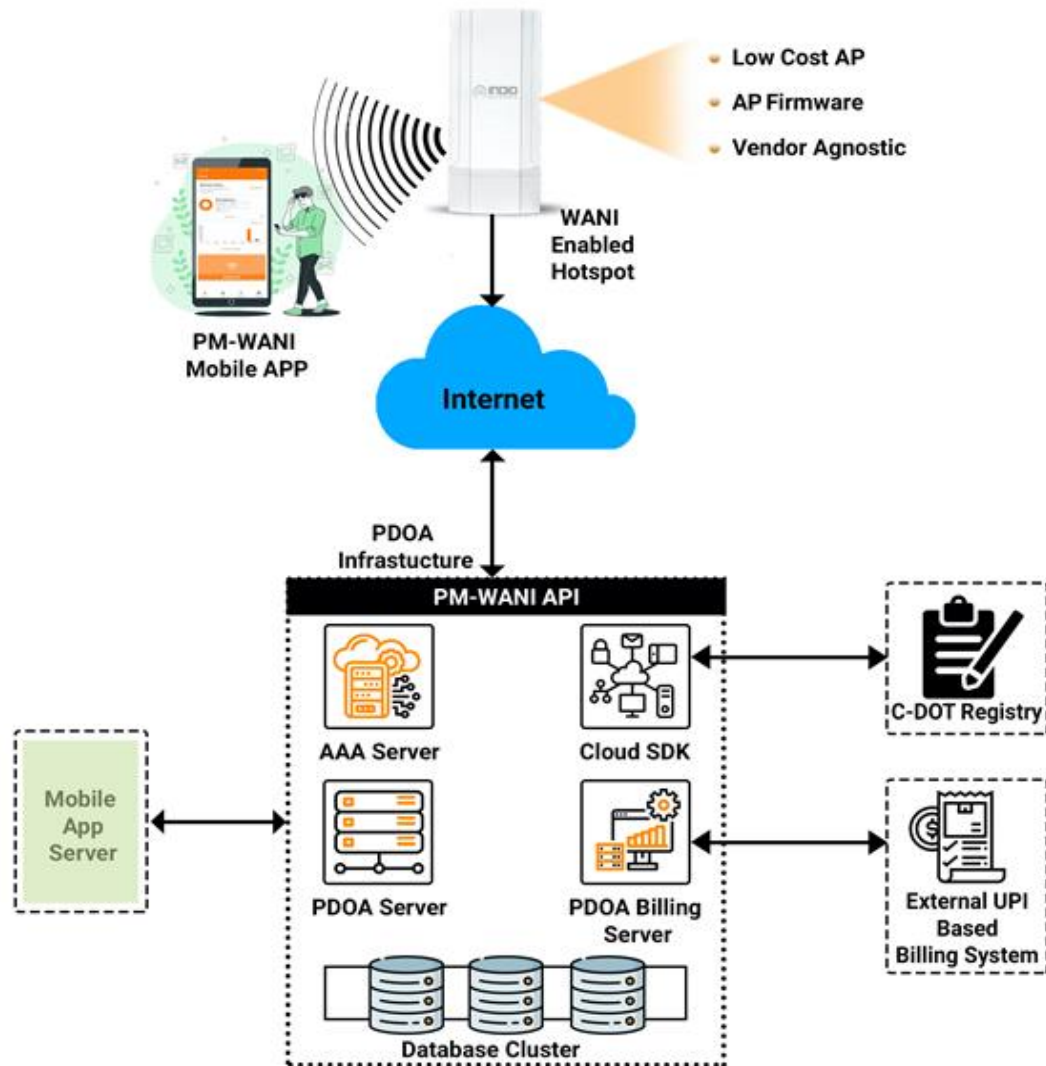
Infrastructure and Role of PDOA in PM-WANI Framework

PM-WANI- User Data Flow

User opens the App in which he has already registered which allows discovery and connection to WANI compliant Wi-Fi Access Points. Within the app, user browses for nearby WANI compliant SSIDs and then chooses the SSID to connect to;

Wi-Fi Captive Portal of the PDO initiates user authentication with App provider backend using the Token passed from the app;

App provider backend returns a signed user profile Token back to Wi-Fi Captive Portal;

Wi-Fi Captive Portal displays data packs available with their prices. User selects desired data sachet, click to confirm the terms;

Wi-Fi Captive Portal sends request for payment through their Payment Gateway;

User completes payment;

PDO activates all device MAC-IDs that were part of the signed profile and allows them to connect to the session without additional authentication. Pack is activated, and user begins browsing.

PM-WANI Access Point Discovery (APD)

User App should allow users to discover nearby WANI compliant Access Points by detecting nearby SSIDs and verifying the MAC-IDs against the SSID Registry.

In addition, optionally user App can provide location specific searches and allow users to discover "nearby" Wi-Fi hotspots without being the Wi-Fi range. SSID registry can be cached locally by app smartly for doing location level searches.

App should also optionally allow users to save "favorites", "most recent", etc. for easy selection of regular connections.

In addition, ideally App may also provide easy sorting and selection of access points based on the "Tag" attributes such as when AP is available, average speed, rating, etc. This allows users to select best AP within available selections.

App must provide a mechanism for users to rate the access points and providers.

PM-WANI User Login Process
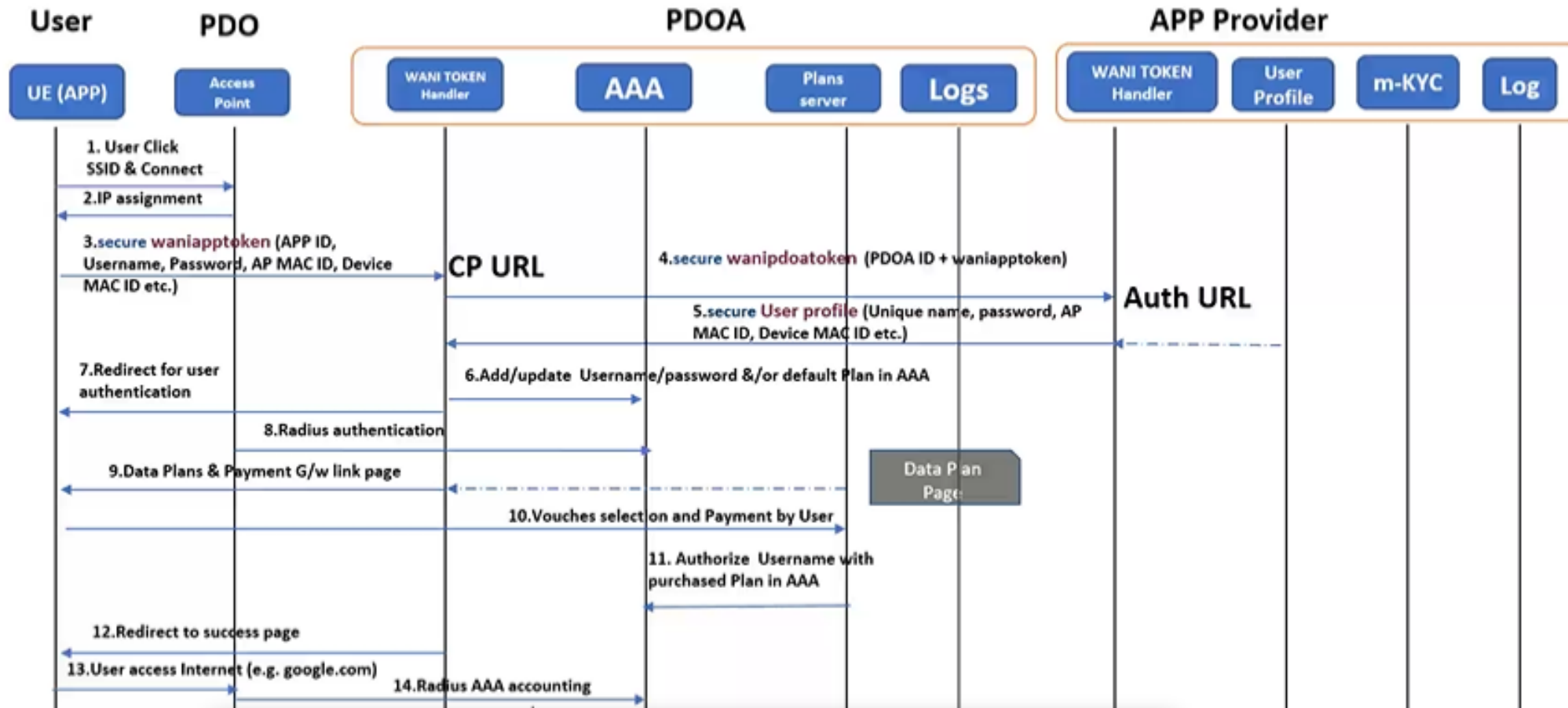
PM-WANI-- Multi-Partner Play for end-to-end Service Delivery

Deployment in India as PMWANI Program

Service Provider	Wi-Fi Access Network Infrastructure	Internet Infrastructure	Wi-Fi Core Network Infrastructure
Wi-Fi VNO	**Wi-Fi VNO**	**ISP**	**MNO**
Prepaid/Postpaid Data plans	Installation of Access point, Power, O&M	Wi-Fi VNO arranges Internet backhaul from local ISPs	providing AAA, OSS, BSS functions for Wi-Fi
VLE (Village Level Entrepreneurs) or PDO (Public Data Office)	VLE or PDO (Public Data Office)	Local ISP	Wi-Fi Aggregator or PDO Aggregator
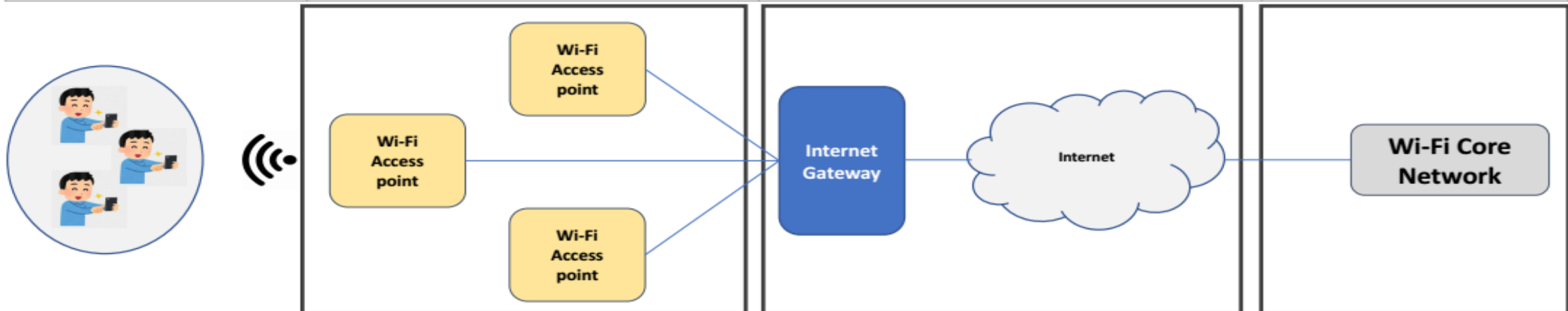
In this deployment scenario, New entity (Wi-Fi VNO) offers services by using its own Wi-Fi Access network infrastructure. Wi-FI VNO also arranges internet backhaul from local ISPs and takes service from MNO for Wi-Fi core functions.

DeWi–Blockchain based Decentralized PM–WANI Archietecture

Objective

There is a compelling Use case to adopt Blockchain technology for PDO and User registration for benefits of Decentralisation, Transparency, Efficiency and Ubiquity leading to DeWi (Decentralised Wireless/Wifi)
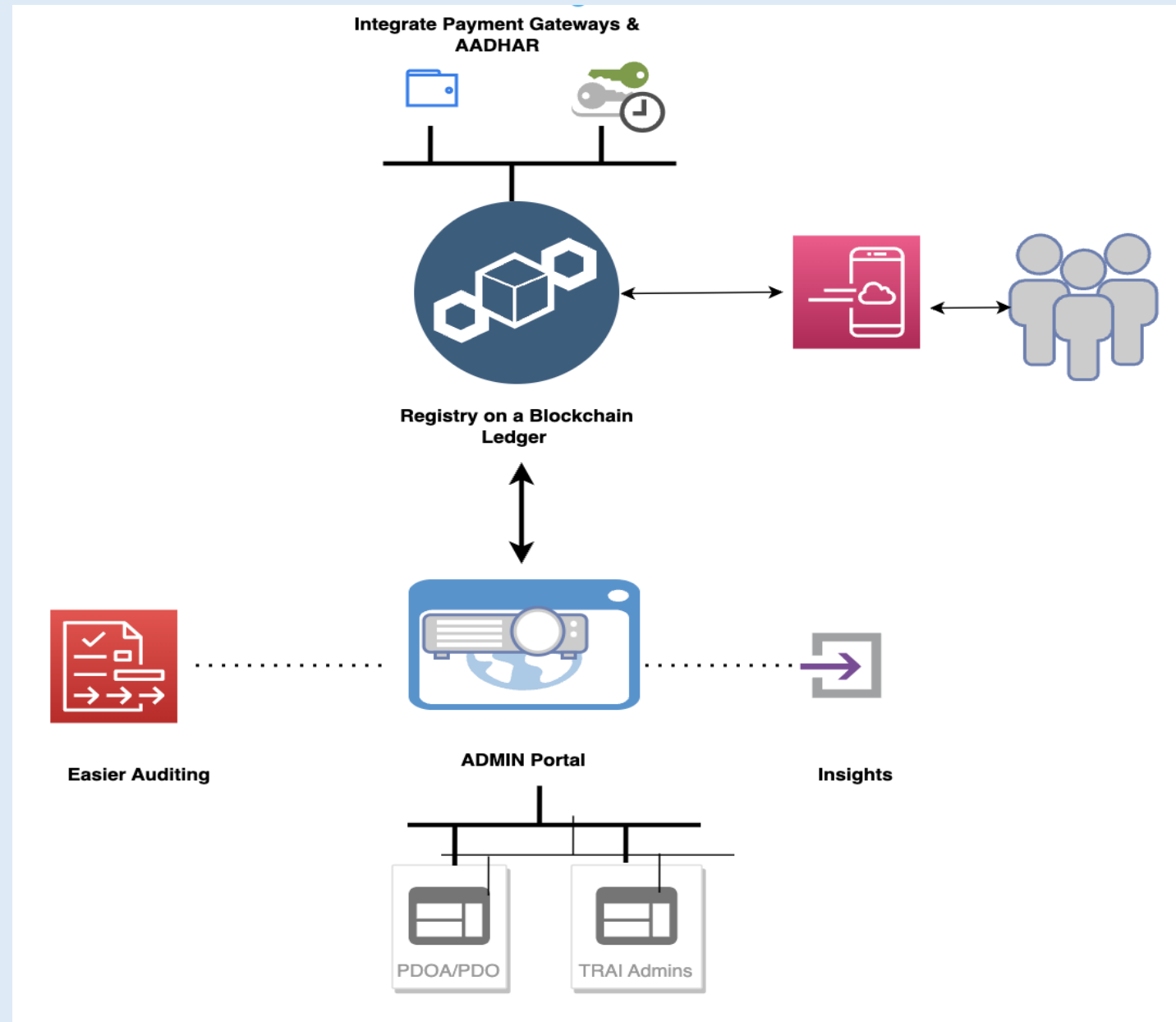
This can help to create a network of PDOs(Public Data Offices) and PDOAs(Public Data Office Aggregators) which will enable users to find and access the public Wi–fi in cost effective manner.

User Information like KYC, Identity and Package details will be stored in a Distributed Ledger and can be verified by Smart Contracts thus making it easy for the Users to connect to any PDO.
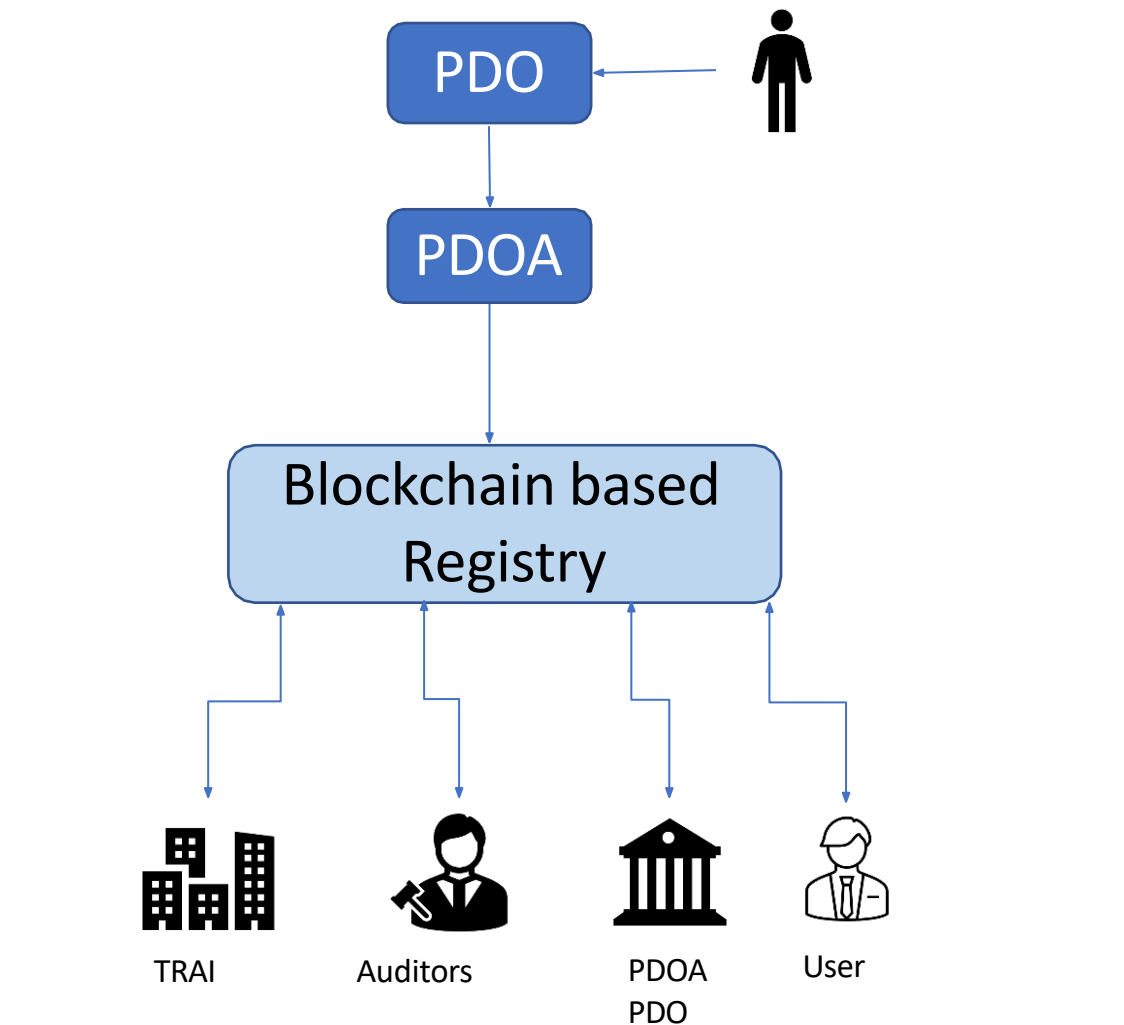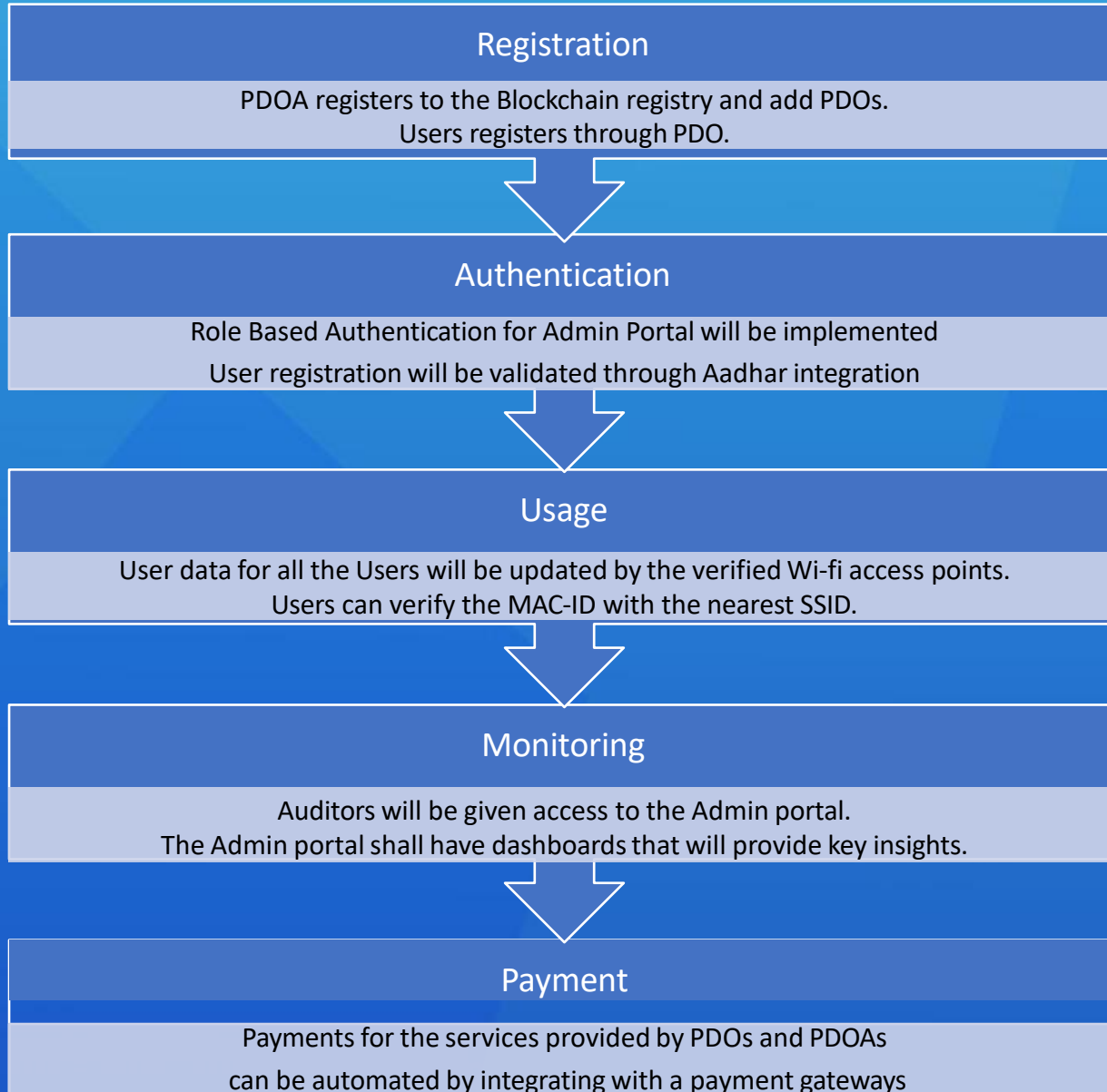
Payments can be automated among PDOs and between PDOs and PDOAs by fetching the transaction data from the Blockchain based registry.

Decentralised PM-WANI Registry- Concept

- A Blockchain based registry can be implemented which allows sharing of necessary information among all major players. The registry shall be Decentralised, future-proof and scalable.

- All interactions will be noted on Smart Contracts, with the required approvals. The admin portal shall have role-based authentication which shall provide valuable insights.

- Auditors or other approved officials an be given permission to view data by the TRAI/DoT Admin Teams.

- The portal will provide real-time information of active users to any PDO, thus eliminating re-registering process and providing a superior user experience.

- The portal will hook with AADHAR and payment gateways to enable KYC and fiat payments to the PDOAs and PDOs


Integrate Payment Gateways & AADHAR

Registry on a Blockchain Ledger

Easier Auditing

ADMIN Portal

Insights

PDOA/PDO

TRAI Admins

Flow

Registration
PDOA registers to the Blockchain registry and add PDOs.
Users registers through PDO.

Authentication
Role Based Authentication for Admin Portal will be implemented
User registration will be validated through Aadhar integration

Usage
User data for all the Users will be updated by the verified Wi-fi access points.
Users can verify the MAC-ID with the nearest SSID.

Monitoring
Auditors will be given access to the Admin portal.
The Admin portal shall have dashboards that will provide key insights.

Payment
Payments for the services provided by PDOs and PDOAs
can be automated by integrating with a payment gateways

PDO → PDOA → Blockchain based Registry

TRAI   Auditors   PDOA PDO   User

**Integration of Payment Gateways and Aadhar through external systems**

Solution Approach

- it is proposed to create a Blockchain based decentralized registry which allows sharing of necessary information among all the stakeholders/nodes.

- All the interactions will be noted on Smart Contracts, with the required validation. The Admin portal shall have role-based authentication which shall provide valuable insights.

- The portal will provide real-time information of an active User to any PDO, thus eliminating re-registering process and providing a superior User experience.

- The portal will hook with Aadhar and Payments Gateway to enable KYC and payments to the PDOAs and PDOs.

Integrate Payment Gateways and Aadhar

Blockchain Registry

ADMIN Portal

Insights

Easier Auditing

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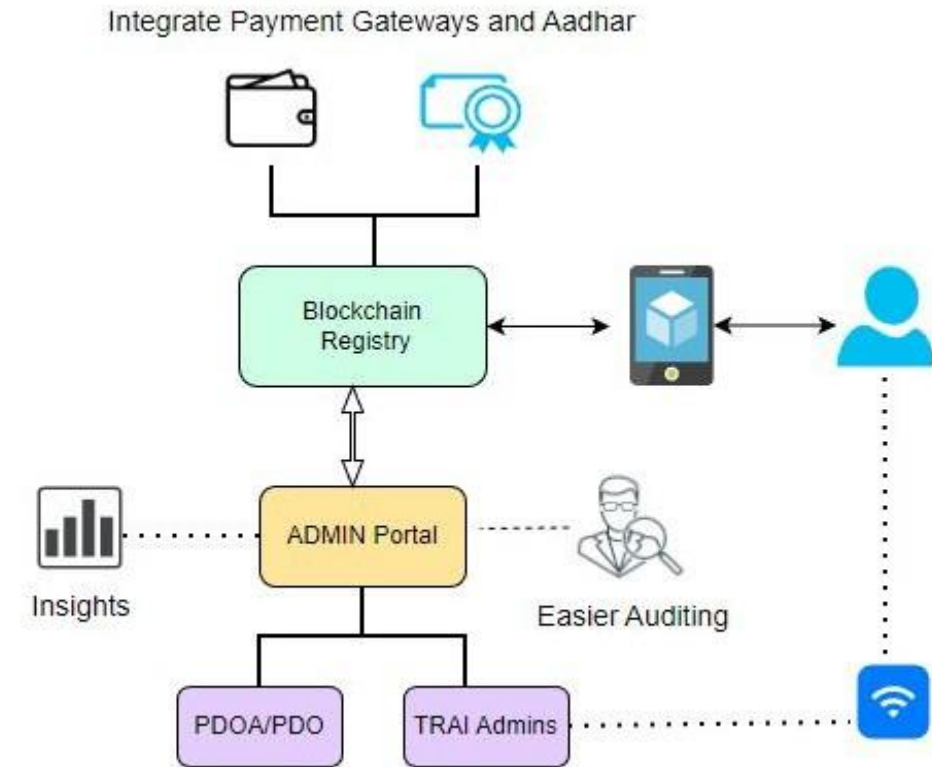
Blockchain based Decentralised Registry–High Level Architecture

- An autonomous cooperative (DAO) would create the Blockchain Platform and policies/roles for the network to operate

- The stakeholders would be given secure access as Nodes to Blockchain Platform

- Information will be shared securely between the participants
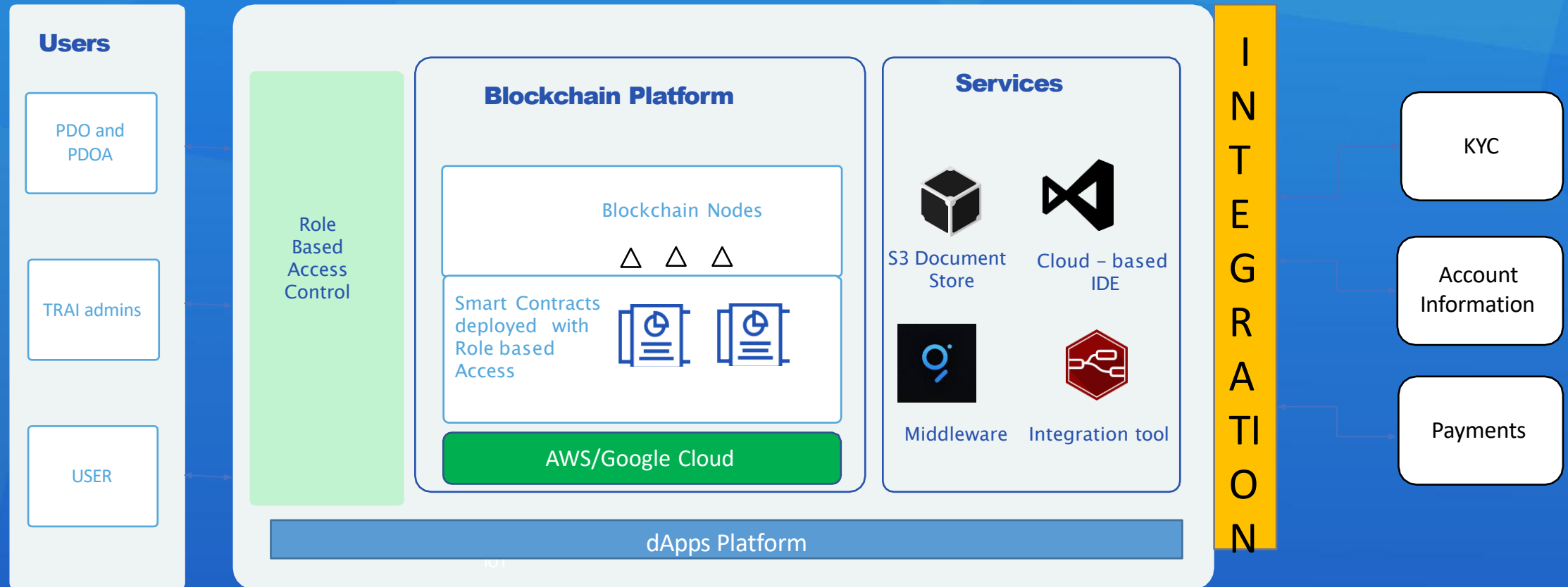
MHSP- Business Model Innovation Tailormade for Rural India

- An Innovative Business Model, Managed Hotspot Service Provider(MHSP), in revenueshare partnership with Govt.Telcos by converting 2.5 Lakh Gram Panchayats into public hotspots with an innovative Wi-Fi solution **(5L- Low Cost, Low Power, Low Maintenance, Local Control, Local Content)** which in turn, can upscale to about 6.5 Lakhs villeges across Bharat by using the modules & equipment locally sourced/manufactured.

- This Wi-Fi access solution complements the BharatNet (NOFN) project driven by the Government of India which aims to provide Broadband connectivity to masses in Rural India by providing the missing "**Last-Mile Connectivity as Managed Service**".

- The above Wi-Fi Bussiness Model Innovation has potential to create about 1Mn *Local Intrapreneurs* in Rural India; thereby creating 1Mn jobs and opportunities for more through spill-over and multiplier effect (3X).

Innovative Business Model-Managed Hotspot Service Provider (MHSP) as Public Data Office Aggregator (PDOA)

- For provisioning of Broadband in rural areas an independent infrastructure provider, MHSP (Regd. as Public Data Office Aggregator – PDOA) in revenue-share partnership with Telco/ISP, installs a 5-meter-high pole/mast mounted 5 GHz Wi-Fi backhaul radio and 2.4 GHz Wi-Fi hotspot with solar panel and Li-Ion/SMF batteries along with WLC, all in a box mounted on the mast.

- MHSP(PDOA) appoints a VLE (Village Local Entrepreneur) from local folks to function as PDO (Public data Office) for managing and monetizing the Hotspot.

- The VLE (PDO) is given basic training by the MHSP(PDOA) for regular maintenance and operation of Hotspot and to provide Wi-Fi based Broadband services to the villagers, as person on the ground.

- The VLE working as franchisee of MHSP, acts as single point of contact for all Broadband related products, services and applications.

- VLE also undertakes the task of digital literacy(e-skilling) and assisted Broadband services (such as e-governance) to the rural masses.

- VLE can also use this Wi-Fi infrastructure for generating extra revenue through other activities (such as mobile charging, providing rail-road ticketing, getting market prices of crops and assisting in doing business transactions, rural e-banking, getting e-medical services from urban health centers etc. to name a few).

Managed Hotspot Service Provider (MHSP) as Public Data Office Aggregator (PDOA)

Key stakeholders benefits of the model:

MHSP (PDOA)
- To create a sustainable social business in PPP mode.
- To make use of existing underutilized infrastructure of Telcos.
- To innovate and deploy out of box low cost solutions in a business manner.
- To add value to stakeholders as well as society.

VLE (PDO)
- Opportunity to become an Entrepreneur.
- Contributing to the village community for improving the quality of life, in addition to generate employment and livelihood for self.

Village Peoples
- Assisted Broadband services at doorstep/hands
- 24/7 connectivity to the world wide web
- Improved productivity, efficiency and life-style enhanced.

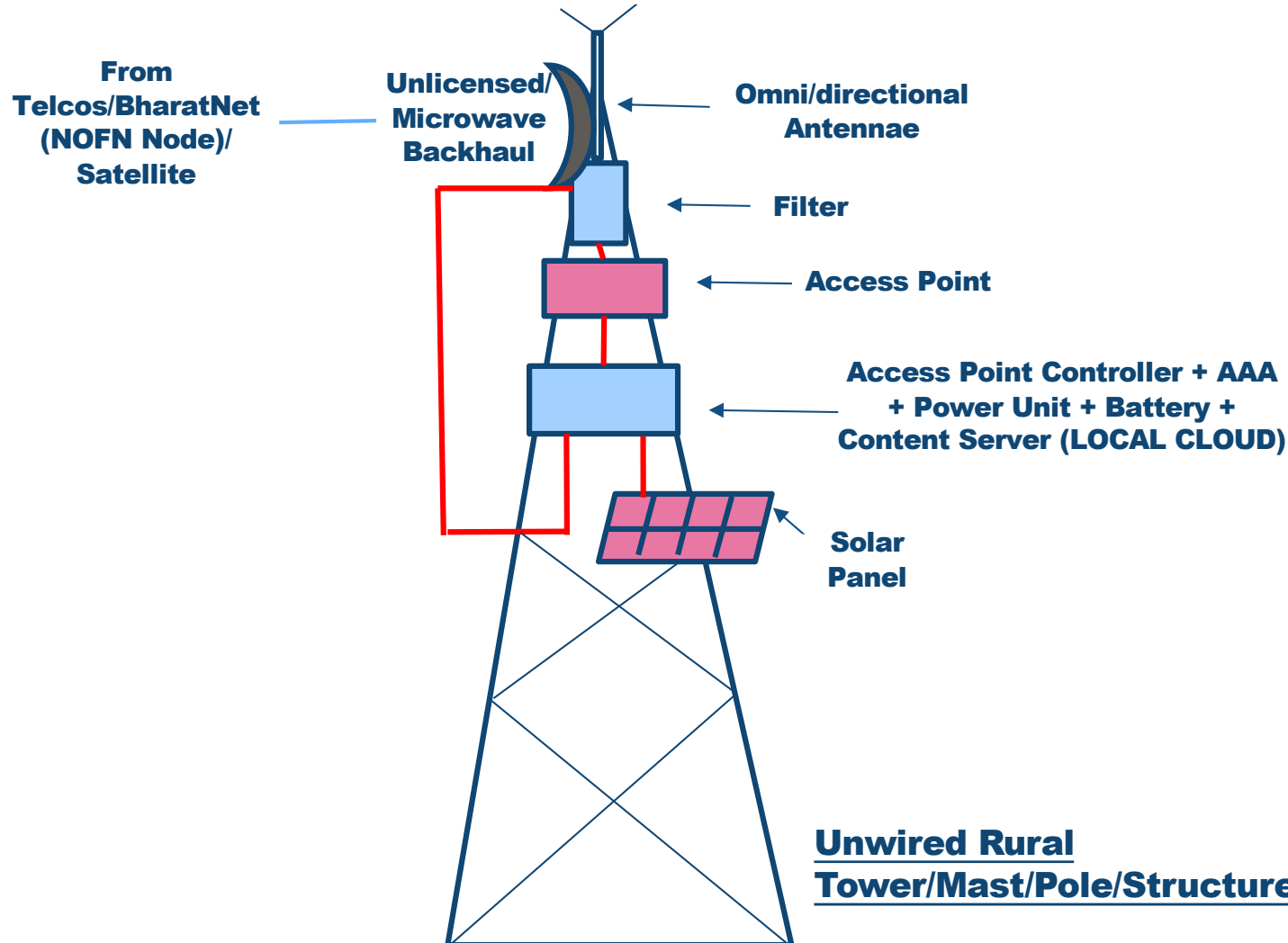# Using Multiplier effect of an idea whose time has come.- Archimedes' Principle

"Look at the world around you. With the slightest push, at just the right place, it can be tipped"

"Give me a rod (mast) long enough strong enough- and we can change the life-style of the rural folks"

Managed Hotspot Service Provider (MHSP) as Public Data Office Aggregator (PDOA)

Value Innovation to achieve Affordability - Everything on Tower (5L- Low Cost, Low Power, Low Maintenance, Local Control, Local Cloud)

From Telcos/BharatNet (NOFN Node)/ Satellite

Unlicensed/ Microwave Backhaul

Omni/directional Antennae

Filter

Access Point

Access Point Controller + AAA + Power Unit + Battery + Content Server (LOCAL CLOUD)

Solar Panel

Unwired Rural Tower/Mast/Pole/Structure (5-15m)

Rural Wi-Fi Hotspots-Great Opportunity to Create Jobs-
(Leveraging "Digital India", "Skill India", "Make in India", "Startup India")

- All the modules used in rural broadband access solution are off- the-shelf available in India.

- These can be sourced from India itself and can be manufactured locally through Small and Medium Enterprises (MSMEs).

- The modules which are already being manufactured locally are omni-directional and sector antennae, filters, outdoor cabinet, solar panels, connectors and cables, Mast and Li-ion/SMF Batteries.

- The AP Controller, Power controller, which are the specialized modules in the solution are also being manufactured in India, as the capabilities have been created.

- 100% of the rural setup could be sourced from India thereby creating a demand for around 1.5 Billion USD worth of local equipment and labour during next 3 years.(Govt. PLI scheme to be leveraged here.)

- A potential of 3 Mln. Jobs is there out of which 1Mln. could be rural Enterprenuers(VLEs).

Skillset required for Rural Broadband Intrapreneur (VLE)

Skillset	Scope	Activities
TECHNICAL SKILLS	Responsible for last mile Operations and Maintenance of Electronic, Electrical equipment and their inter-connectivity	**Electronics Skill:-** Installation, Commissioning & Maintenance of electronics equipment : Operational Knowledge of Wi-fi, Networking, Level 1 (L1) support. **Electrical Skill:-** Installation, Commissioning & Maintenance of electrical equipment such as Power Interface Unit, Battery Bank, Solar Panel etc. **Computer Skill:-** Computer/ Laptop operations, Knowledge of Smartphone, Internet, Knowledge of application software and Hardware. **Connectivity:-** OFC, GPON Connectivity - Level L1 support, Tower, Antenna, Cabling, Connectors, Hardware (Passive & Active) Connectivity.
OGANISATIONAL SKILLS	"Organisation Skills is concerned with the study of what people do in an organisation and how that Skill affects the performance of the organisation."	• Following organization guidelines, processes & procedures. • Facility Management skills. • Liaison with Gram Panchayat, Sarpanch and other Village Head. Security of the Installations/site. • Basic knowledge of accounts. • Maintenance of Records (Health, Technical)

Skillset Required for Rural Broadband Intrapreneur (VLE)

Skillset	Scope	Activities
SOFT SKILLS	Soft Skills involves several elements which differentiate them from all the other forms of communications and help in making efficient use of hard skills.	Understanding of customer requirements, Customer Handling, Correspondence and Relationship with customer, Customer care, Customer satisfaction and Complaint handling.
ENTREPREUNERSHIP SKILLS	Understanding of Business skills with *Skin-in-the-Game.* By utilization of innovative ideas must be able to generate profit, further enhancing the business by provisioning of various additional services.	• Entrepreneurship skills, Selling skills, Services provisioning and Providing prepaid charging plans. • Knowledge of products and servicing. Should be capable of running the Hot-Spot as Profit Centre.

For ISP/Telcos, the PM-WANI project will help in increasing revenue by facilitating an extra stream of revenue with 'PDOA' becoming their channel partner and extended arm to provide man-on-the -ground for customer relations and distribution. Below is how it can be done;

BSNL/RailTel/BBNL often have surplus, underutilized bandwidth lying idle in rural areas

Through the set-up of PM-WANI Hotspots (PDOs), these Telcos/ISPs can utilize this bandwidth and monetize this throughwifibased services provided by PDOAs(MHSP) and LCOs without much Capex.

Easy to set up, WANI compliant Hotspots created by PDOA with Zero-Capex for ISPs/Cable Operators will serve as an extra source of income for these ISPs as well as contributing towards a national social cause of "Connecting the Unconnected" and create rural employment/enteraprenuership.

Thank You

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(Download complete PM-WANI Framework and various Business Models in the book by author from www.digigaonfoundation.com)