ITU webinar - Digital transformation for cities and communities
Episode 8, session 2 : IoT-enabled verticals and related IoT network capabilities

Deploying Smart Services in Rural communities

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Major issues being faced by rural communities in developing countries

1. Lack of adequate infrastructure like electricity, communication/internet facility, health care, education etc. in rural areas.

2. Digital divide: there is a urban–rural digital divide. It is due to non availability/poor access of telecom and internet services in the rural areas. A lot of work has been done but more is required to be done.

   - An individual living below poverty line cannot afford a computer/smart phone to harness the benefits of e-governance and other online services. As the digital divide narrows, broader adoption of e-governance in the public domain becomes possible.

   - Economic poverty is not the only cause of digital divide. This can also be caused by the lack of awareness among the people.

3. Majority of population in rural areas depends on agriculture, animal husbandry, fisheries, dairies etc. to earn their livelihood. Income of the rural households needs to be increased.

4. Language Dominance

   The dominance of English language over the internet limits the access of non-English speaking population. Smart phones as well as the content in local language will help the use of electronic media and smart services.

PURA – Provisioning of Urban amenities to Rural Areas

{concept given by Late Dr. A P J Abdul Kalam, former President of India}

- ➢ Smart Cities are being developed across the globe to address the various challenges being faced by urban population in their daily life.

- ➢ In addition to Smart cities, it is required to create Smart infrastructure in the rural areas for providing internet facility as well as smart services to the villagers at their door step.

- ➢ Provisioning of internet facility at the household/community level will open new opportunities for the rural population in diverse fields.

- ➢ Concept of every household to have at least one smart phone with minimum required features and the internet facility may provide access to various services, thereby reducing the digital divide. Smart services will be quite helpful in a pandemic like COVID-19 scenario.

Expected smart services in various verticals in rural communities

S. No.	Vertical	Smart Applications
1	Health	Remote monitoring of a patient after surgery (e-health), remote diagnostics, medication reminders, Tele-medicine, wearable health devices, e-ICU
2	Education	Tele education, e-attendance (biometric)
3	Agriculture	Smart irrigation, livestock monitoring, weather monitoring and forecasting, sensor based precision agriculture, remote crop monitoring, remote monitoring of soil quality, smart warehousing, logistics and distribution, remotely controlled irrigation pump
4	Animal Husbandry	Animal tracking, remotely monitoring the health of an animal using wearable health devices
5	e-Governance	Citizen centric services like birth/death certificate, electronic attendance in government projects, connecting police station, banks, post offices, etc.

Expected smart services in various verticals in rural communities

S. No.	Vertical	Smart Applications
6	Food processing	Production & Storage, better food safety, wastage reduction
7	Automotive	Vehicle tracking, e-call, asset tracking
8	CCTV based real time Public Safety System	CCTV cameras at various locations across the village along with public address system, emergency/fire alert system etc.
9	Aquaculture	Water quality (dissolved oxygen, ammonia, pH, etc.) management, intelligent feeding, aquatic animal health management
10	Power Sector	Renewal energy sources like solar, biomass and connecting to smart micro grid, smart distribution network, smart metering, smart grid, electric line monitoring, gas/oil/water pipeline monitoring, smart street lighting

IoT/ICT requirements in rural communities – 1/3

1. High-speed communication network, preferably optical fibre network, to provide at least 100 Mbps in a village, for a cluster of villages, generally 2 – 3 villages. This bandwidth may be required to further increase to 1 Gbps/10 Gbps in future.

2. To provide services to the rural community at the door step, it is required to further extend the connectivity in the village or nearby villages using Wi-Fi hotspots.

3. The connectivity may be further extended to the nearby villages which are not accessible through OFC (optical fibre cable) by radio link.

4. The connectivity to hilly and remote areas may be provided using satellite links.

5. It is required to further extend the bandwidth to other location by laying OFC by telecom service providers for commissioning new mobile towers (BTS) to provide mobile coverage in the rural area.

6. Sharing of passive/active infrastructure, and also the unused spectrum in the rural areas is recommended, which will help in reducing the overall cost of the project.

7. It is recommended that one infrastructure provider install the infrastructure such as tower of 20/40/60-meter height (as per requirement), diesel generators set, battery set, and container, etc. which may be used by telecom service providers/LPWAN providers. Cost effective solar panels capable of replacing electric generators may be a solution for fast expansion of mobile network in rural area.

8. Towers and the bandwidth be also used by FM broadcasters for transmitting regional programmes. Besides entertainment, FM channels may play important role in spreading important news such as cyclone/ heavy rains weather forecast etc., to alert the people and civil agencies for moving to safer areas. It may save thousands of lives during such pandemics.

9. Role of equipment manufacturer is also very important. Due to poor electricity condition, poor condition of roads and distant location of petrol pumps in rural areas, it is quite difficult and expensive to run the rural BTS with even 90% availability. For those reasons, it is recommended that low power BTS & Transmission equipment are used to reduce the overall power consumption.

IoT/ICT requirements in rural communities – 3/3

10. Smart phones/Tablets/Laptops may be out of the budget of the economically poor households. Low cost devices with minimum features such as Wi-Fi, Bluetooth, cellular connectivity and long battery life are required to accelerate the use of technology in various applications in rural areas.

11. An eco-system may be created for the research & development of sensor based connected devices (IoT devices) to harness the advantages of using IoT in agriculture, fisheries, animal husbandry, healthcare etc. Indigenous manufacturing of such devices will make them affordable for deployment in rural areas.

12. Smart City platforms should be able to manage the emergency health services to the public of city as well as rural areas by analysing data from the connected healthcare devices as well as respond to the calls of the public, especially in a pandemic situation.

Connecting villages on high speed network
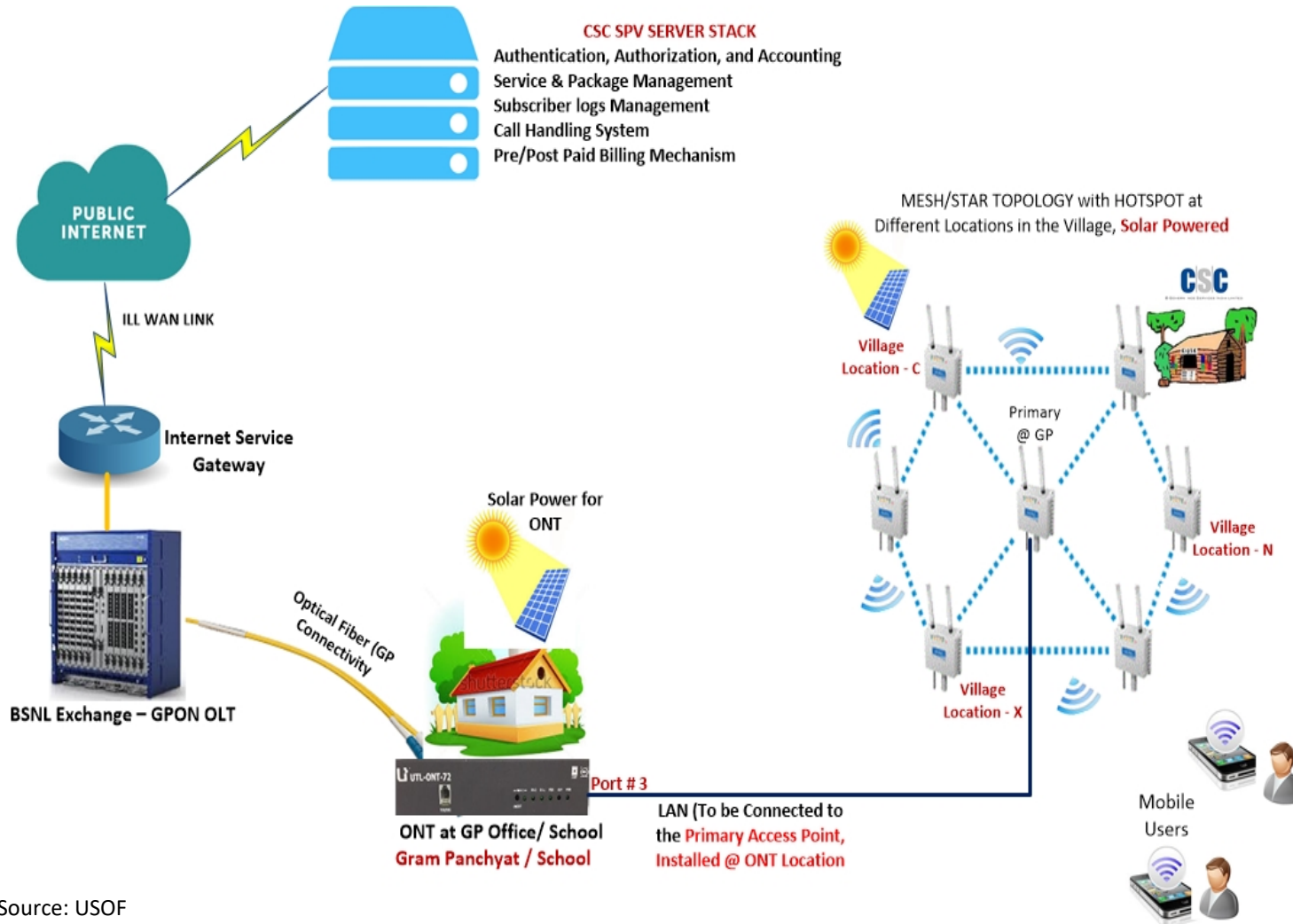
> ➤ The aim is to improve the backbone network for telecom & ICT services in the rural area, by providing services such as voice, video and data.
>
> ➤ Applications such as e-Commerce, e-Banking, e-Governance, e-Education and Tele-medicine etc. which require high speed Internet connectivity may be provided.

Source: USOF

The role of IoT and ICT in various applications in rural areas

Source: ITU

Some of the advantages for rural communities of using IoT

Healthcare

Smart devices like Thermometer, SPO2 meter, portable ECG machines with Bluetooth connectivity may be used to monitor the patients remotely by the doctors as there may be shortage of beds in the hospitals, in particular during pandemics. ITU-T Y 4408, Y Suppl. 53 may be referred.

Fisheries

IoT technology may be used to monitor the water quality as well as vital parameters (temperature, pH, turbidity, carbonates and bi-carbonates, ammonia, etc.) related to health and development of fishes in aquaculture.

Tele-education

- Smart classrooms may be created in villages having connectivity with other educational institutions around the world
- Student's drop-out rate may be reduced
- Distance and adaptive learning is possible, thus reducing the need to move to towns or cities to achieve better quality of education
- Various applications and remote participation platforms assist in organizing virtual classes

Remote health monitoring architecture
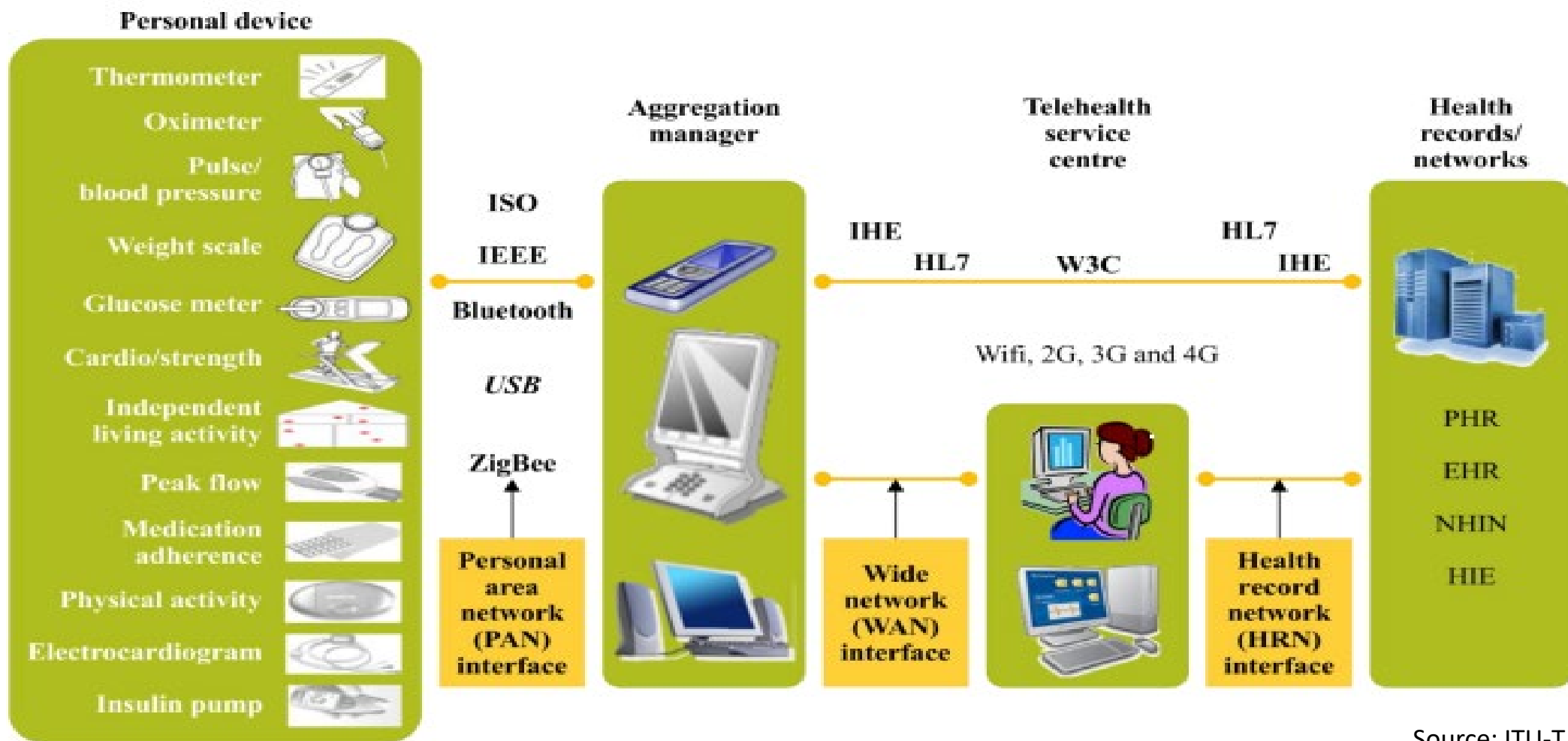
Source: ITU-T H.810

Important related standards

- ➢ Recommendation ITU-T L.1700 (2016), *"Requirements and framework for low-cost sustainable telecommunications infrastructure for rural communications in developing countries."*

- ➢ Related supplements for developing low-cost sustainable telecommunications infrastructure for rural communications in developing countries:
  - – ITU-T L Suppl. 22 using optical fiber cable,
  - – ITU-T L Suppl. 23 using radio links,
  - – ITU-T L Suppl. 29 using cellular technologies,
  - – ITU-T L Suppl. 30 using cellular network with capacity transfer,
  - – ITU-T L Suppl. 31 using satellite systems

Important related standards

➢ ITU-T Y.4450   Overview of Smart Farming based on networks

➢ ITU-T Y. 4408 Capability framework for e-health monitoring services

➢ ITU-T Y. 4110 Service and capability requirements for e-health monitoring services

➢ ITU-T Y. 4101 Common requirements and capabilities of a gateway for Internet of things   applications

➢ ITU-T Y. 4418 Gateway functional architecture for Internet of things applications

➢ ITU-T Y. 4553 Requirements of smartphone as sink node for IoT applications and services

➢ ITU-T Y.4103   Common requirements for Internet of things (IoT) applications

➢ ITU-T Y.4117   Requirements and capabilities of the Internet of things for support of wearable devices and related services

➢ ITU-T Y Suppl. 53 IoT Use cases

Takeaways

➢ Y.SRC "Requirements for deployment of smart services in rural communities" work item in progress in Q2/20 is expected to:

- provide technical guidelines to bridge the digital divide by establishing the requirements for deployment of smart services (such as e-governance, tele-health, tele-education, precision agriculture etc.) in rural communities.
- help in increasing the income of rural households.
- help in reducing frequent migration in search of better education, health care and jobs.
- improve the quality of life of rural community.

THANKS