International Network Generations Roadmap (INGR) Virtual Workshop Connecting the Unconneted

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10-year Vision

- Make future generations of networking affordable, relevant and useable so that every human being is digitally connected and reaps the benefits of access to enormous knowledge on the web, services and social networks
- The group's special focus is on digitally unconnected and under-connected sections of the society who are under-served or digitally disadvantaged both in urban and rural areas both in the developed and developing countries
- Areas of focus are: Affordable technologies; solutions and architectures; coverage; innovative yet sustainable business models; simplified human-device interfaces; use cases; simplified authentication and security; crowd sourcing and curation of local content and services
- Offer a single platform for discussions, R&D, best practices and standards for the many initiatives and projects presently ongoing in the world
- Information dissemination and digital competence building.

Scope

- Articulate the necessity along with the use cases to connect the unconnected
- Provide state of the art of CTU
- Determine requirements, including the need to be affordable and simple to use
- Propose micro-service architectures based on traditional and novel KPIs
- Community and shared networks
- Identify policy and regulatory issues
- CTU fits within the overall vision of IEEE of Technology for Humanity and FNI
- 1st edition covers all the above topics
- 2nd edition will include the role of cloud, block chain, IoT, AI, and the need of guidelines and testing to validate the various projects ongoing around the world
- The gap would probably be closed between the time period of 2025 and 2030

Today's Landscape

- Many organizations around the world have ongoing projects on bridging the digital divide but lack coordination and unified strategy => critical mass to drive standards, requirements and operator interest
- Virtual, cloud, AI and edge technologies not seriously considered
- mmWave not suitable, but Wi-Fi, white space, microwave, cellular (4G, 5G, B5G), and low orbiting satellite present viable options
- Advance antenna technologies not yet considered seriously due to CAPEX
- Inappropriate business models limiting uptake in rural and remote areas
- Growing interest in community networks and local entrepreneurship
- Legacy regulations and government policies have put brakes on broadband access for CTU

Challenges

- Low population density
- Sparse and clustered settlements
- Comparatively lower income levels
- Remote and difficult to access regions
- Lack of education and exposure to absorb digital technologies
- Local cultural and political nuances inhibiting empowerment
- Inadequate grid-based power supply
- Price-benefit comparison with urban/suburban areas

Organizations to collaborate with to create critical mass and consensus outcome
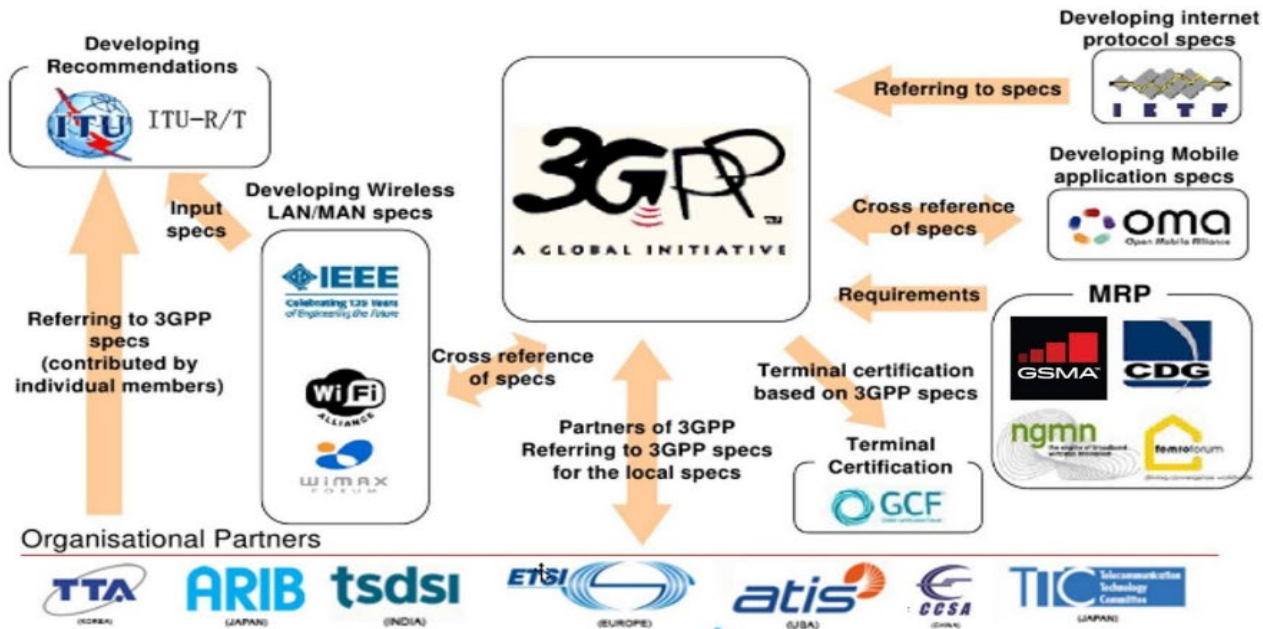
Top Needs for 10-year Vision

- Pandemic has given impetus to affordable broadband access throughout the world
- Speedy policy reforms to help reduce CAPEX and OPEX
- Creating own local content is a dream waiting to come true, requiring digital capacity building
- Concept of free access to Digital Public Goods (DPGs) championed by the United Nations is due for implementation in National Knowledge Platforms => motivating innovative architectures
- Concept of DPG Lite for free and DPG Heavy from the Internet core developed by the Basic Internet Foundation
- Cost effective backhaul and middle mile solutions
- Availability of grid or renewable energy sources
- Frugal 5G network (IEEE P2061)
- Network slicing
- Sustainable business models – Village Level Entrepreneur (VLE), Freemium, Revenue sharing, Bartering, Incentives, engagement of industry verticals
- Need passive NLOS repeaters
- TV white space (lower radio spectrum) allocation and its free use for rural connectivity

An example connectivity architecture
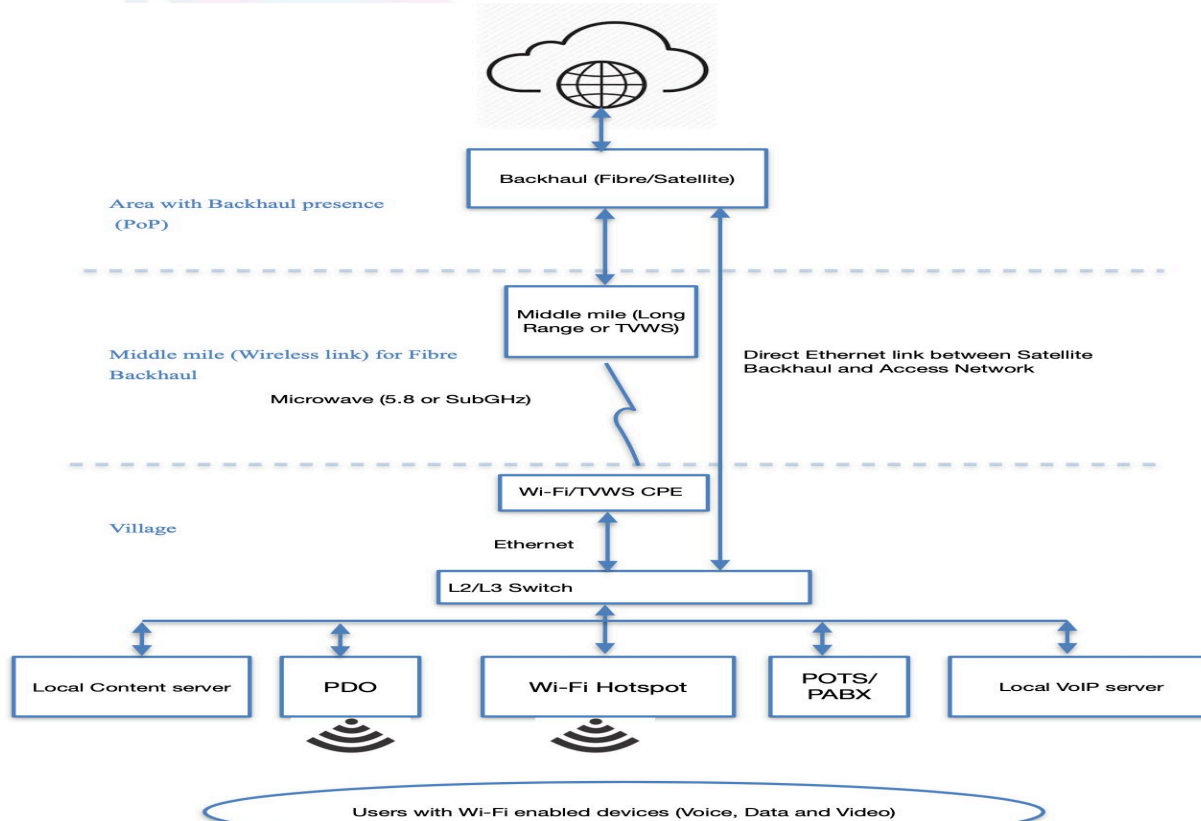
Challenges and Solutions to Meet Needs

See the Table in the CTU White Paper for full details. Here are some selected topics.

- ✓ Cost-optimized open network architecture and platform for CTU use cases
- ✓ Affordable user smart devices (i.e., smartphones and tablets)
- ✓ Backhaul and local coverage solutions to meet requirements of selected use cases
- ✓ Long range low power RF transceivers and antennas
- ✓ Spectrum refarming, especially when Wi-Fi space becomes crowded as more users/networks emerge
- ✓ CTU network slice in 5G and B5G networks
- ✓ Content management at the local level
- ✓ Simplified user authentication and security
- ✓ Simplified HCI
- ✓ Availability of power in the absence of grid
- ✓ Affordable but commercially sustainable business models
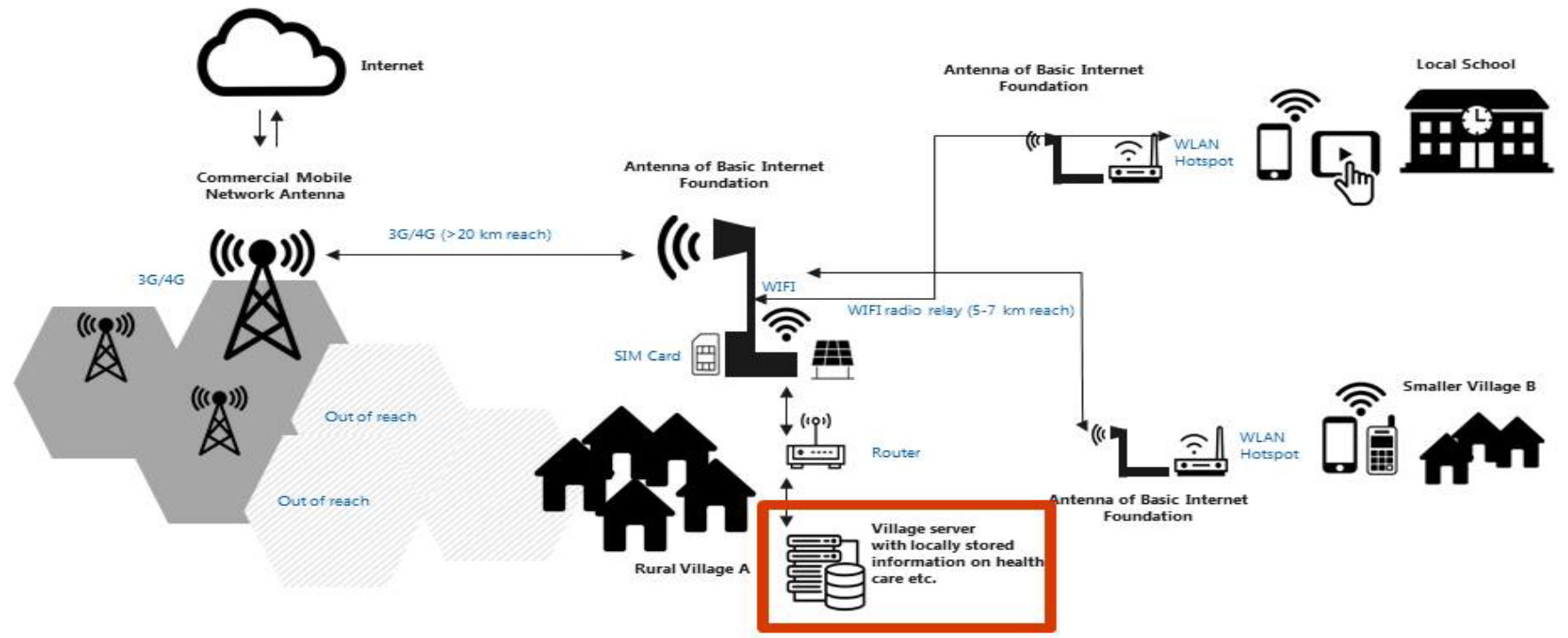- ✓ Liberalized policies and regulations

Architectural model for free access to DPGs
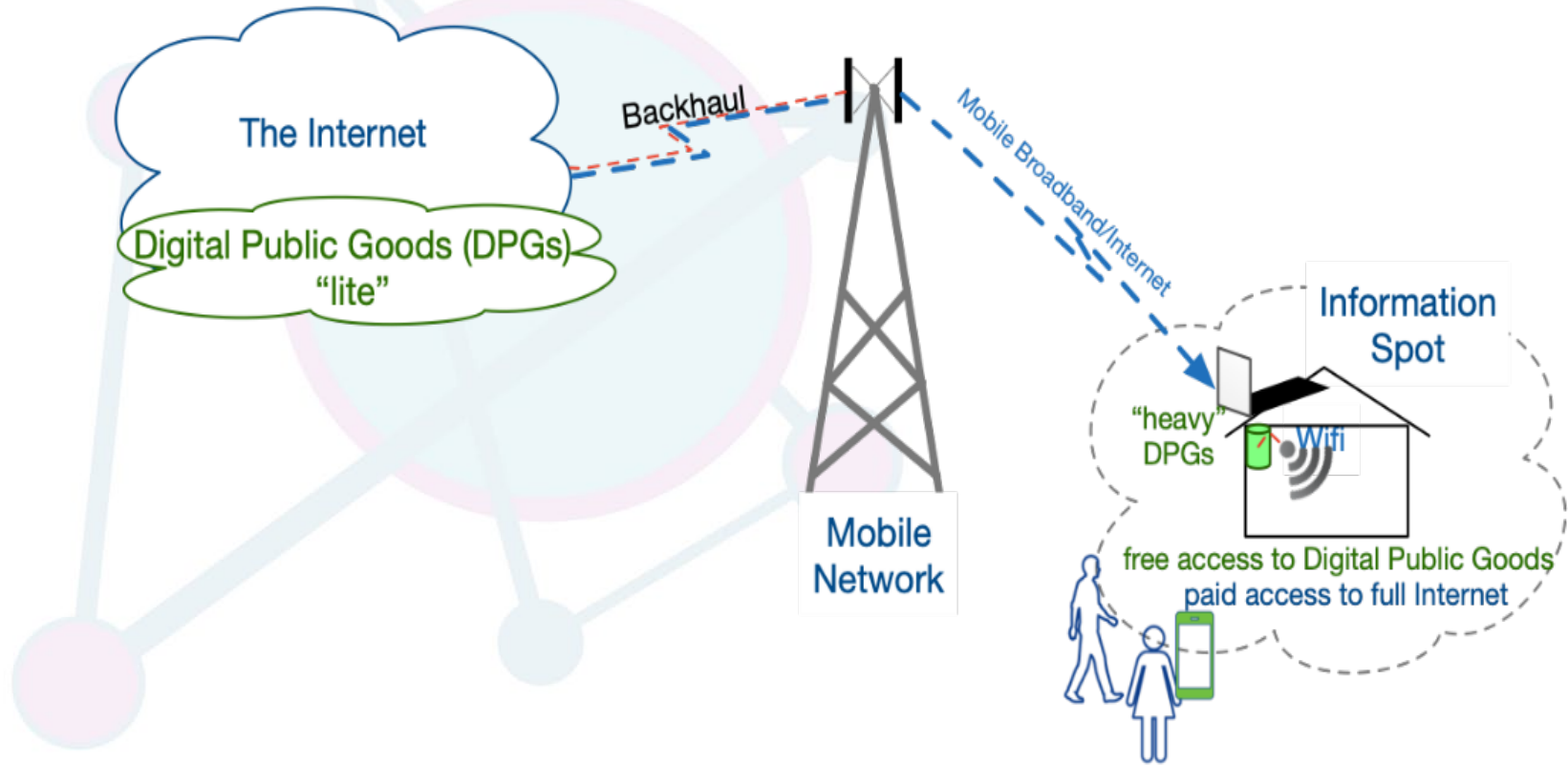
InfoInternet deployment in rural areas
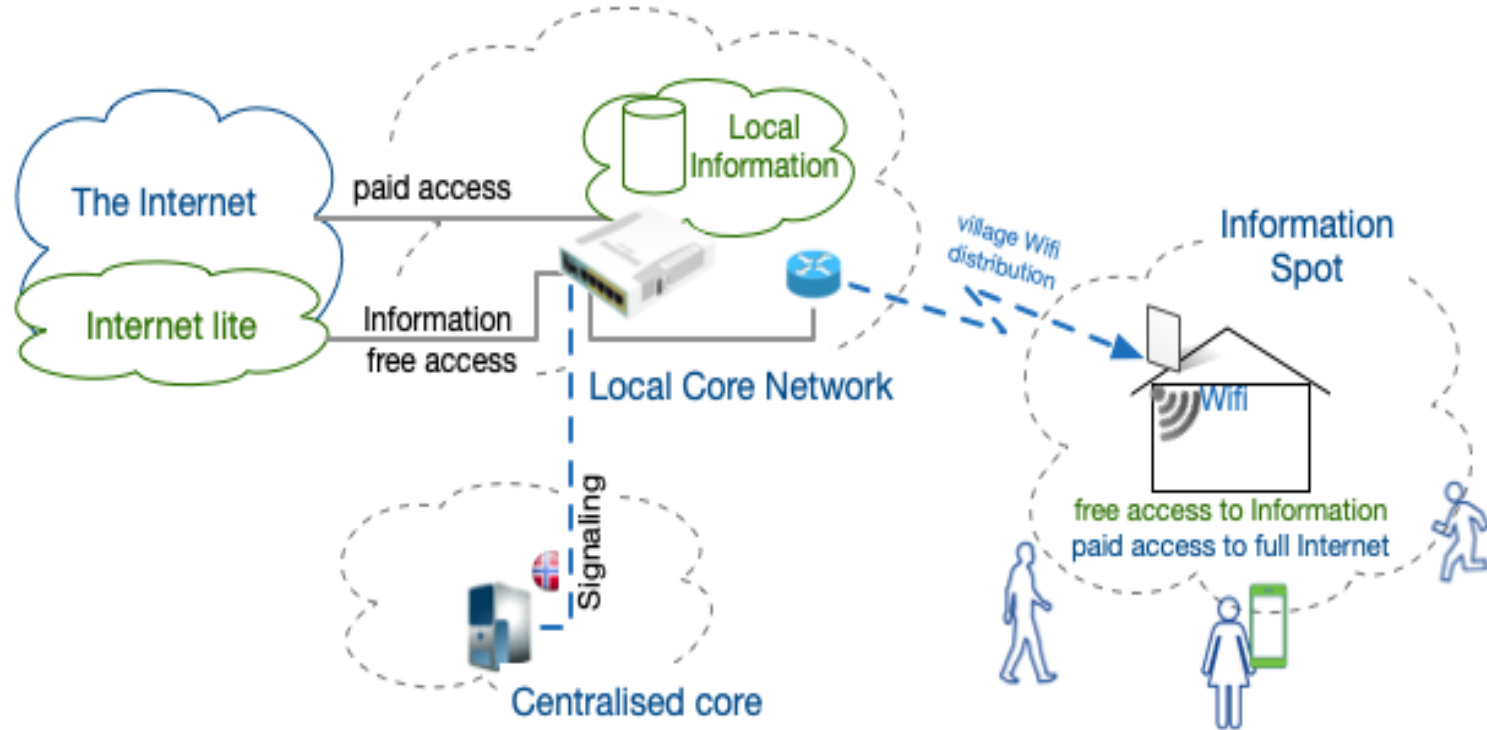
An architectural model for distributed deployment of Internet access

Stakeholders

- Several INGR working groups
- National governments
- Service providers
- Industry verticals
- Citizens/users
- NGOs, Foundations and United Nations
- National, regional and international SDOs

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Get involved!

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QUESTIONS?