# TakNet Community Network

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**IRTF GAIA**, Montreal Cananda

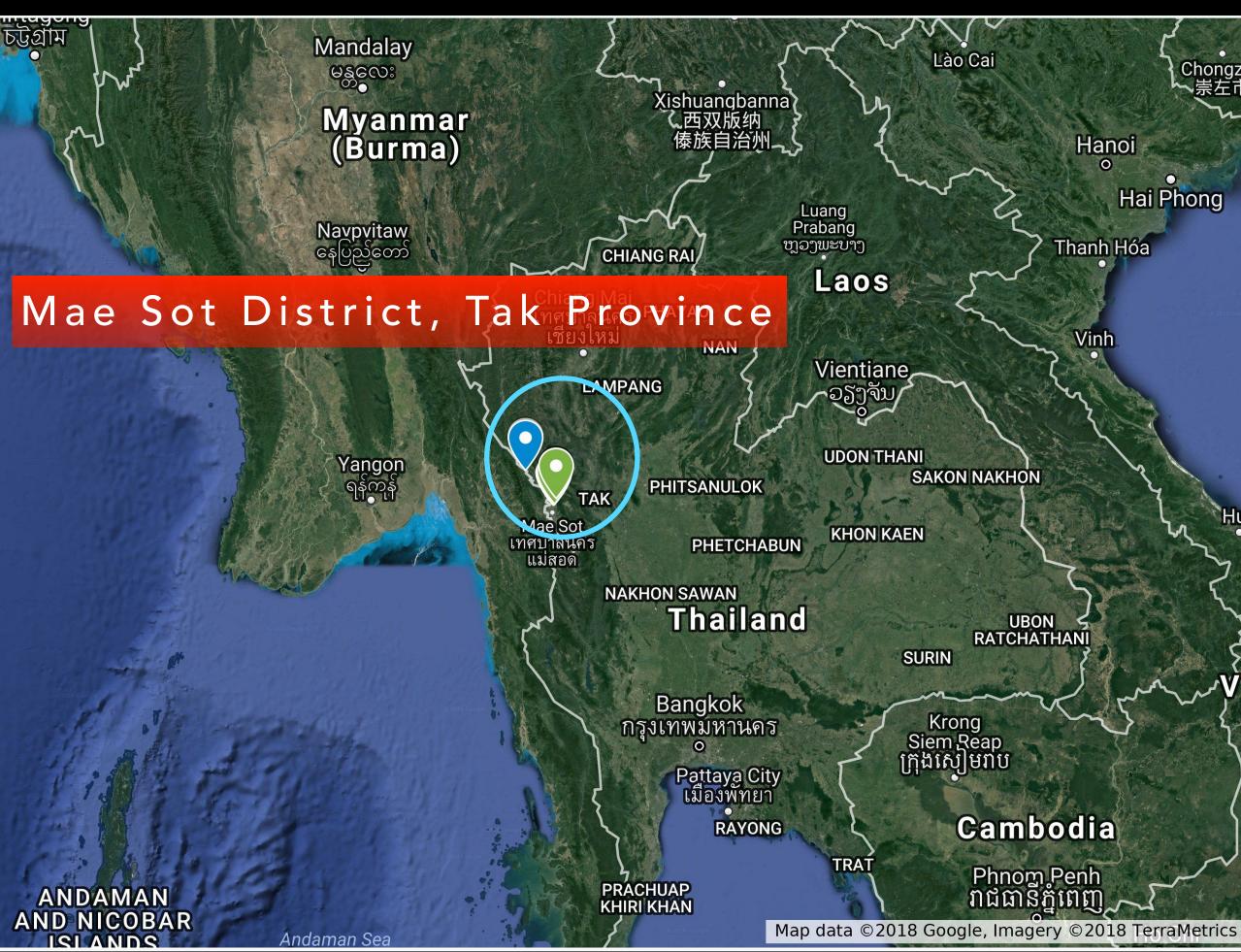


# WESHSUWANNARUGS, PREECHAI MEKBUNGWAN AND KANCHANA KANCHANASUT

17 July 2018











# Chongzuo →崇左市 TakNet: Last meters access solution Started in late 2013 15 remote communities 190 + deployed nodes 1000+ residents using our network



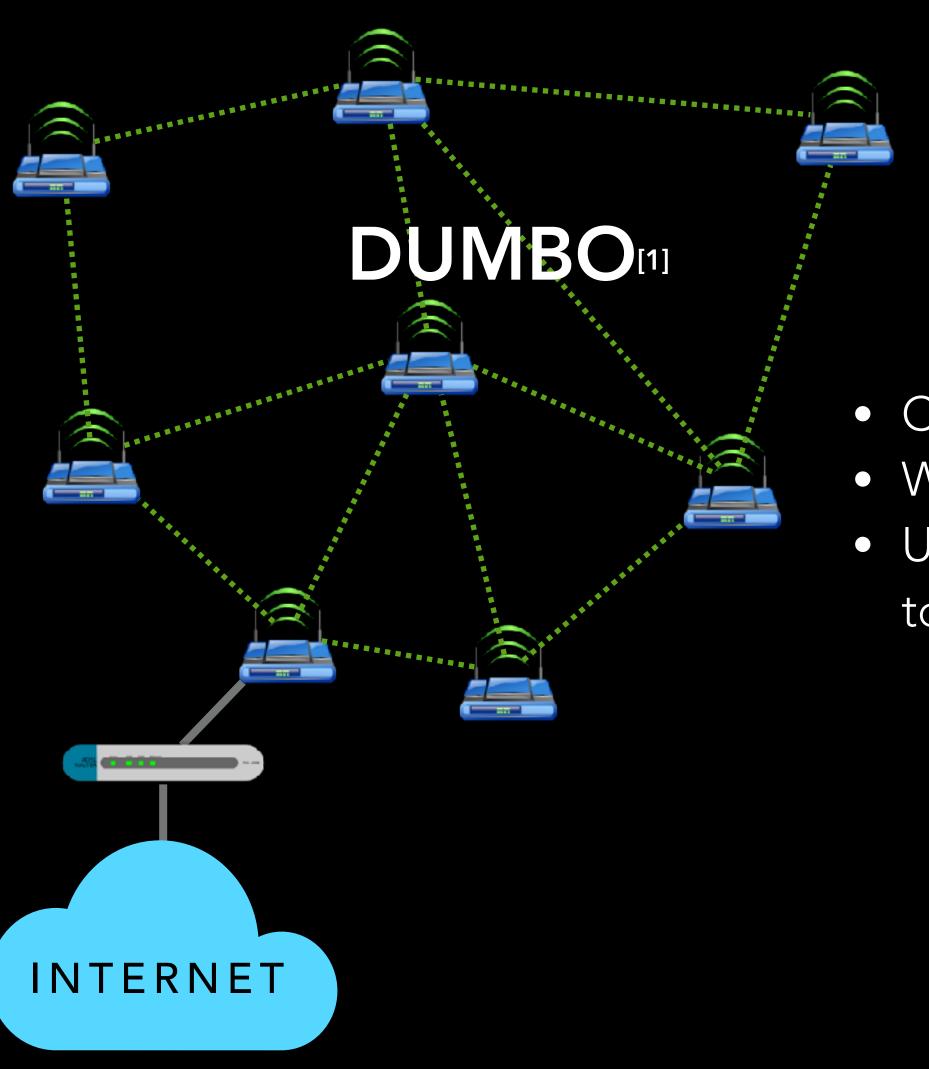








# Our Technologies





### **TPlink MR3040**

- Coverage: 50-60 m
- WiFi 2.4 GHz
- Usage: Portable, Apply to emergency situation



[1] Kanchanasut, K., Tunpan, A., Awal M.A., Das, D.K., Wongsaardsakul, T. and Tsuchimoto, Y., "DUMBONET: A Multimedia Communication System for Collaborative Emergency Response Operation in Disaster-affected Areas, International Journal of Emergency Management, Inderscience, Vol. 4, No. 4, pp. 670 – 681, 2007.



### **TPlink AC1750**

- Coverage: 100 m
- WiFi 2.4/5 GHz
- Usage: Static and Indoor



### Unifi Outdoor AP

- Coverage: upto 200 m
- WiFi 2.4/5 GHz
- Usage: Outdoor, Link to GW

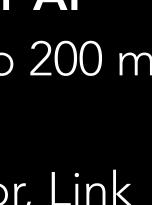
#### **Raspberry Pi**

- Micro Server
- Running local services (e.g., chat, VoD)



# Wok Extend the connectivity

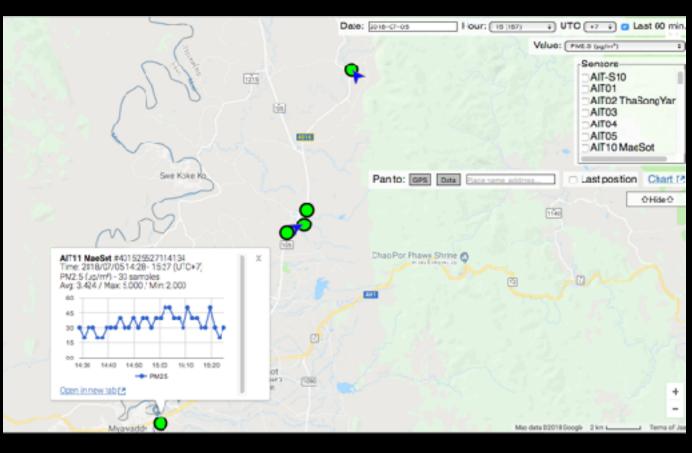
- DIY p2p antenna



# Our Services

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		Powered by COOVa*			

## Authentication



## Haze monitoring (www.canarin.net)



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Configuration							

# Network Monitoring



# HD Video Streaming



# DUMBO chat

Communicate with line accounts (No1 chat application in Thailand)



## "What we do to make TakNet sustain?"

TakNet II

# TakNetll Model

Net2Home (Micro ISP) + THNICF

intERLab R&D

### Local Community



# Deployment by local ppl





# Training the local

# TakNetll Model

Development cost

### Net2Home (Micro ISP) + THNICF

Monthly fee

Equipments &Installation cost

> Local Community Local Technician, Users





#### New products and services

#### Technical supports & Training



intERLab

R&D









# Traffic Locality in TakNet?

81% of Line users 87% have local contacts within the same village 33%  $\frac{7.6\%}{10-20\%}$  of messages f 📭 🔄 🕅 exchanged among local users<sup>[1]</sup>

# BUT !

Local traffic is not yet optimised

TakNet environment: Hill tribe, Foliage, NLOS

#### Not applicable with WiFi

[1] A. Lertsinsrubtavee, L. Wang, A. Sathiaseelan, N. Weshsuwannarugs, A. Tunpan, K. Kanchanasut, J. Crowcroft, "Understanding Internet Usage and Network Locality in a Rural Community Wireless Mesh Network", In Proceedings of ACM AINTEC, 2015

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#### No local link among villages

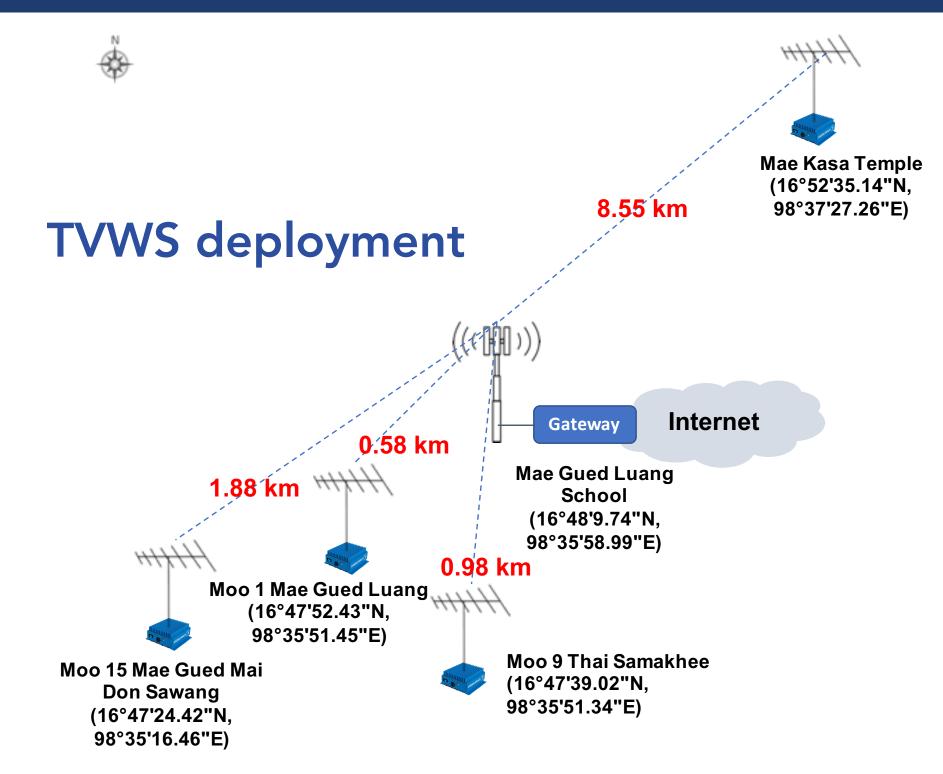




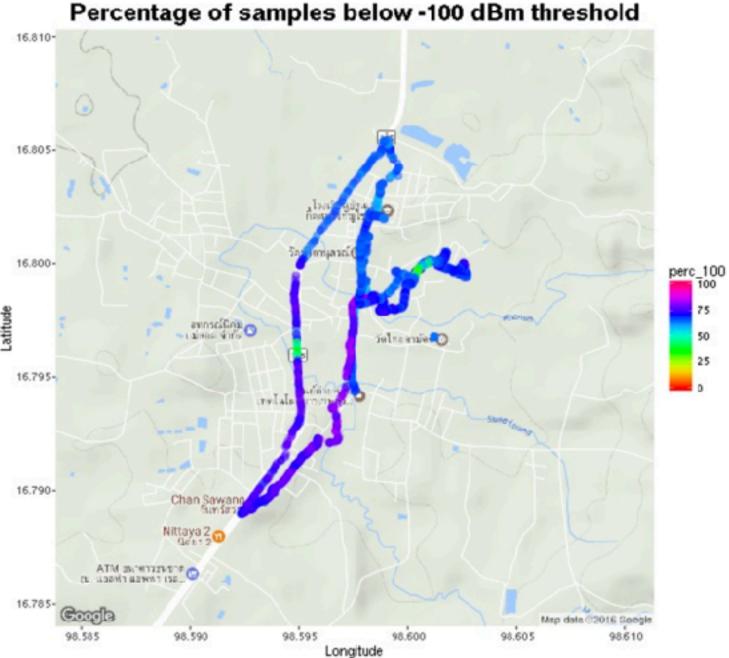


# TakNet with TVWS

- Research grant funded by Thai regulator • License: 470 - 790 MHz
- Trial experiments on TV white space
- Carry out TVWS spectrum measurements to build WSDB



👹 สำนักงาน **กสทช**. สำนักงานคณะกรรมการกิจการกระจายเสียง กิจการโทรทัศน์ และกิจการโทรคมนาคมแห่งษาติ



#### Spectrum usage in TakNet 1





# Extending the network coverage?



Imagery/Date: 1/9/2014 Lat 16.794152º Jon 98.5991

#### Some houses were abandon

- WiFi signal (Mesh) is not sufficient • Too much multi hop (3 hops max)
- NLOS





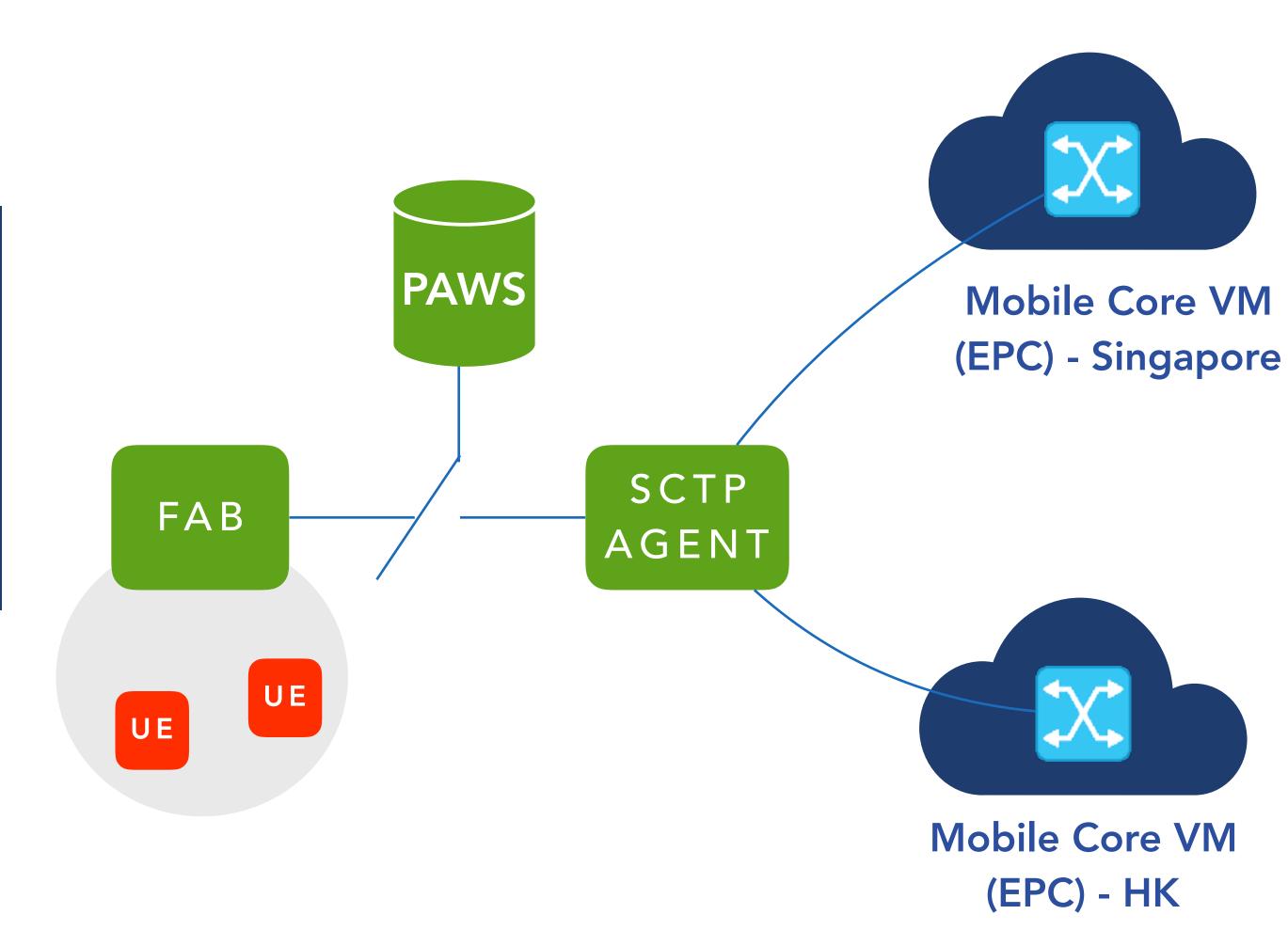
# LTE Small Cell Solution

- Collaborating with Microsoft research, UK
- Utilises the excellent radio characteristics of TVWS to cover the gap that CWMN could not support.



### Microsoft<sup>®</sup> Research

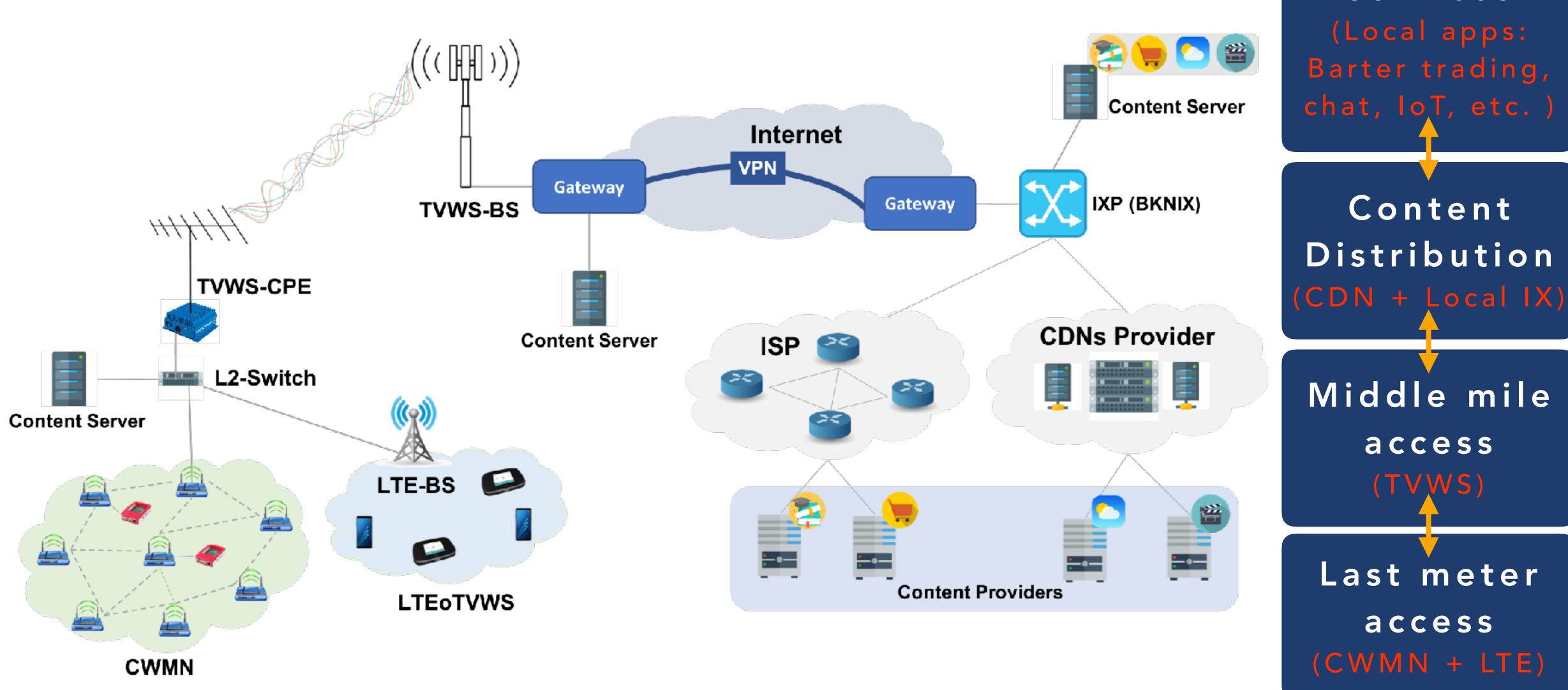


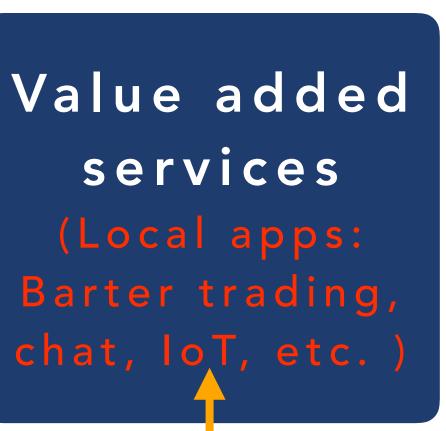


### • LTE small cell on the UHF 700 band 75/25 Mbps bandwidth maximum 16 active users • Coverage area 4 km.



# TakNetll architecture











# Takeaways

- **Strong collaboration** of three main players
  - R&D team (intERLab), Micro ISP (Net2Home) and local community's participation
- Simple technology: Technical maintenance and installation are handled by local technicians with support from the Net2Home and intERLab teams
- **Engage with local community:** Technology transfer, Create revenue for local tech, HW ownership
- TakNet is growing: 1 village/year (2013-2016), 11 villages: 2017&2018 (new model)



# Next ...

Development cost

### Net2Home (Micro ISP)

Monthly fee ...

Equipments &Installation cost

> Local Community Local Technician, Users



#### New products and services

#### intERLab R&D

Technical supports & Training











# Our Team



#### Kanchana













Preechai

**Atthaphongse Nunthaphat** Apinun



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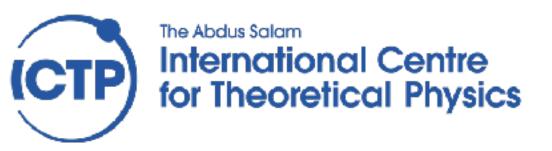
# Thank you !

มูลนิธิศูนย์สารสนเทศเครือข่ายไทย
that NETWORK INFORMATION CENTER FOUNDATION





สำนักงานกองทุนสนับสนุนการวิจัย (สกว.) The Thailand Research Fund (TRF)





### Microsoft<sup>®</sup> Research

Nisarat







# Thank you

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