

FTTR Deployment Consideration

China Unicom

2021.6

Why we promote FTTR??

- The main reasons for promoting are as follows:
 1. FTTR is a great continuation of FTTx technology, which has a mature foundation of market and industry chain in China;
 2. To solve the home network quality problem, such as network coverage, preventing network problems caused by user and his private devices;
 3. To matches the bandwidth of the 5G and ensure the users' experience and development of the fixed network;

China Unicom overall progress of FTTR

2019

- Start FTTR technology tracking;
- Propose a technical paper on ‘Analysis for FTTR technology research and application’ in CCSA;

2020

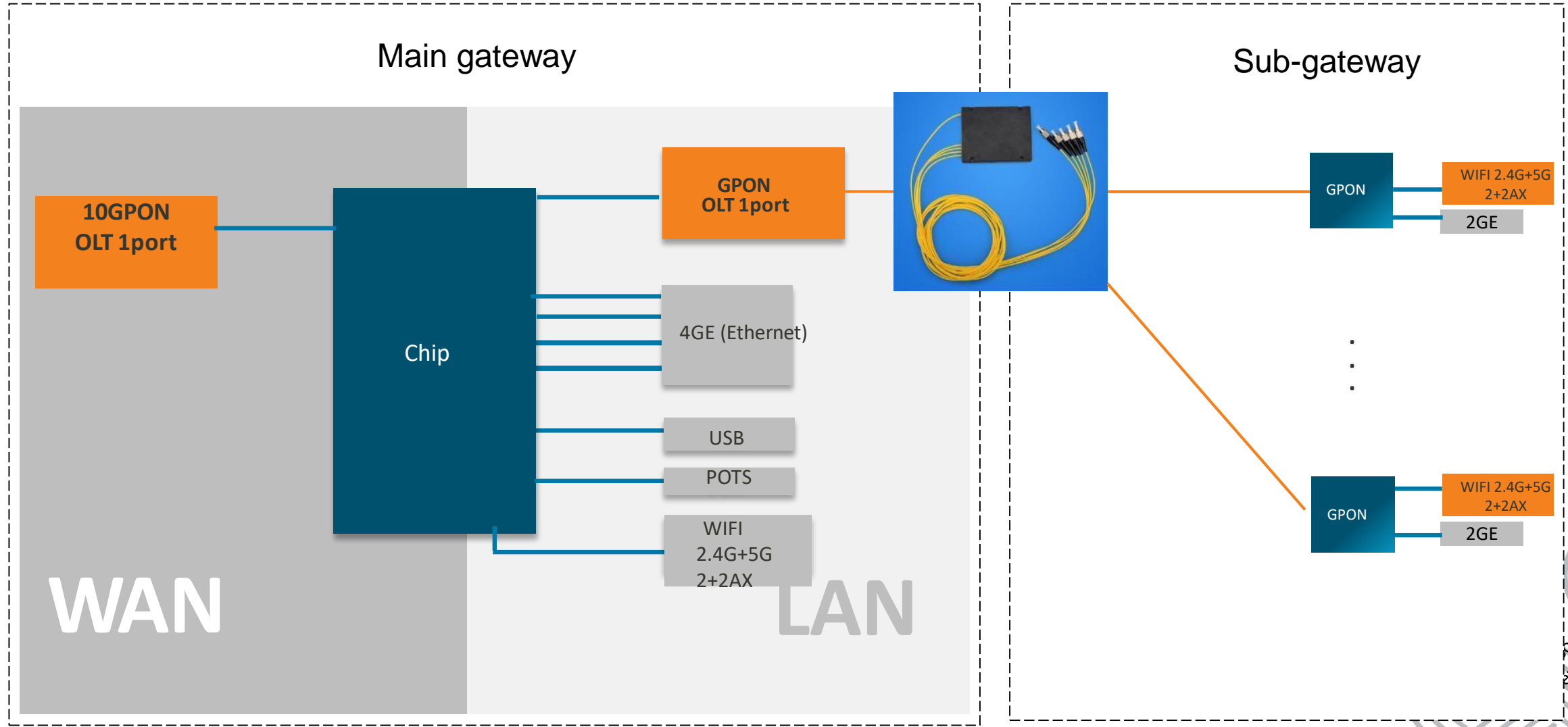
- Cooperate with Huawei to propose the FTTR project-G.fin.
- China Unicom promote the converged services—3 gigabit services, include gigabit 5G, gigabit broadband, gigabit WI-FI. The FTTR is considered the solution to ensure gigabit broadband and WI-FI;

2021

- Completed the test of FTTR equipment in laboratory;
- Propose to promote G.fin project through series standard with 4 parts;
- Propose to start FTTR standard word in CCSA;
- Some provincial branch began to officially launch FTTR services as a pilot project;

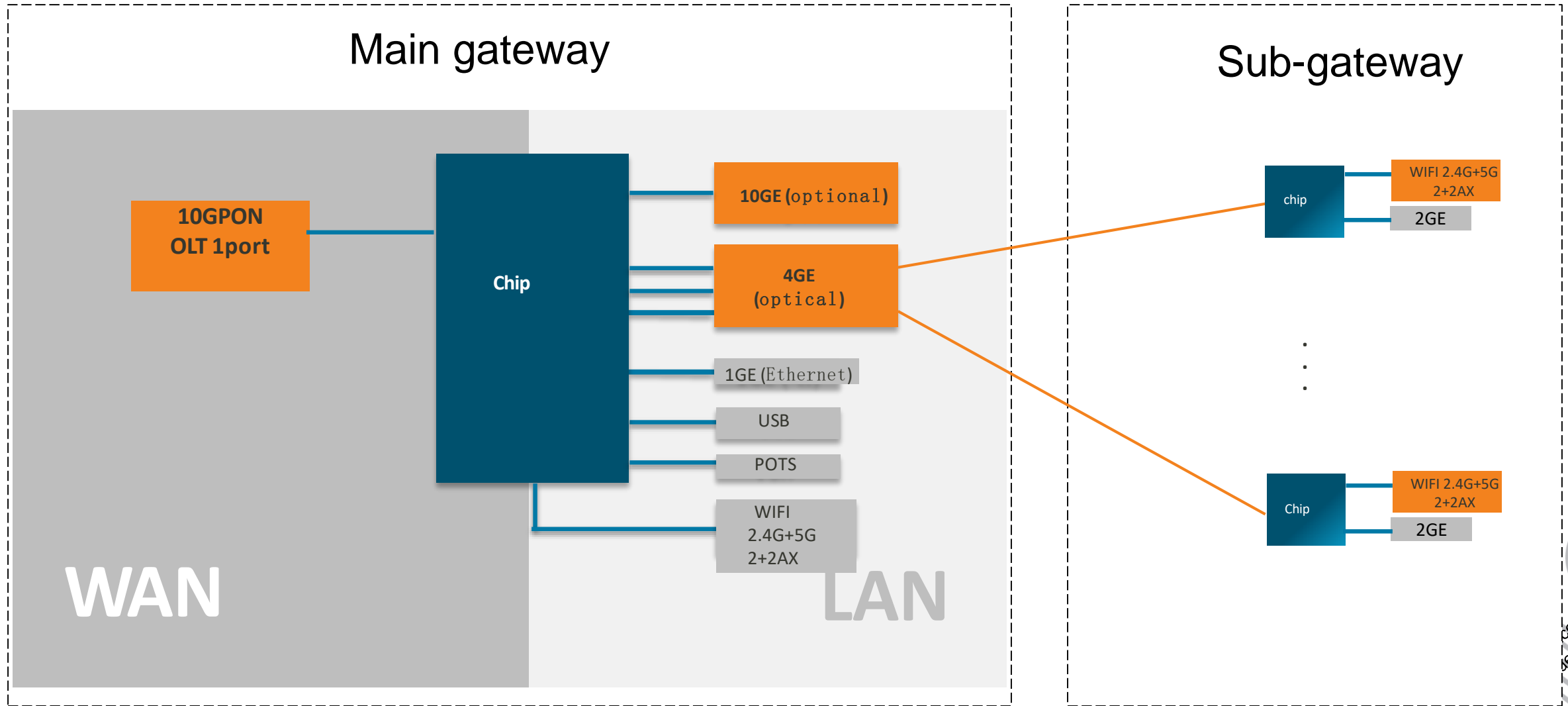
Technical Solution of FTTR in China -P2MP

- The main gateway and the sub-gateway are physically connected by P2MP (optical splitter), and the message exchange is based on the GPON-like protocol;



Technical Solution of FTTR in China -P2P

- The main gateway and the sub-gateway are physically connected by P2P , and the message exchange is based on the Ethernet protocol;



P2MP vs P2P (Performance based on lab test)

	P2MP		P2P	
Networking capability	1:2--1:16, Max 1: 16 for now		One main gateway 1:4, 2 main gateways cascaded 2:7	
Transmission rate	Device	downlink>2Gbps uplink>1Gbps Limited by GPON	Device	downlink>3.5Gbps uplink>2Gbps
	2*2 Wi-Fi6 5GHz	>1Gbps	2*2 Wi-Fi6 5GHz	>1Gbps
Power consumption	main<= 20W		main<= 18W	
	slave <= 12W		slave<= 18W	

- P2MP has better scalability in networking capabilities due to its optical splitting ;
- The P2MP master gateway and sub-gateway are based on GPON technology, which limits transmission rate;
- The P2P main gateway and the optical router of the adopt the optical interface based on the Ethernet protocol, and the rate can reach $N \text{ port} * GE < 10G$.

P2MP vs P2P (Application scenarios and technical analysis)

	P2P	P2MP
Protocol	Ethernet protocol	P2MP protocol (based on GPON protocol)
New modules for main gateway	Multiple photoelectric conversion modules	1 photoelectric conversion module, 1 PON MAC chip
Application scenarios	More suitable for four-bedroom or less apartment	No limit
Coupling	<ul style="list-style-type: none"> ➤ No coupling problem between main and sub-gateways ➤ Operators need to define additional management requirements to control 	<ul style="list-style-type: none"> ➤ There is a coupling problem between the master and sub-gateways, which need to be decoupled across manufacturers
Evolution	1G ->10G Ethernet technology	P2MP protocol, similar to GPON->XG(S)-PON technology

- As a pilot project of FTTR promoted by some provincial branches , China Unicom provide both solutions to clients and hand over the final choice to the development of market and the industry chain.

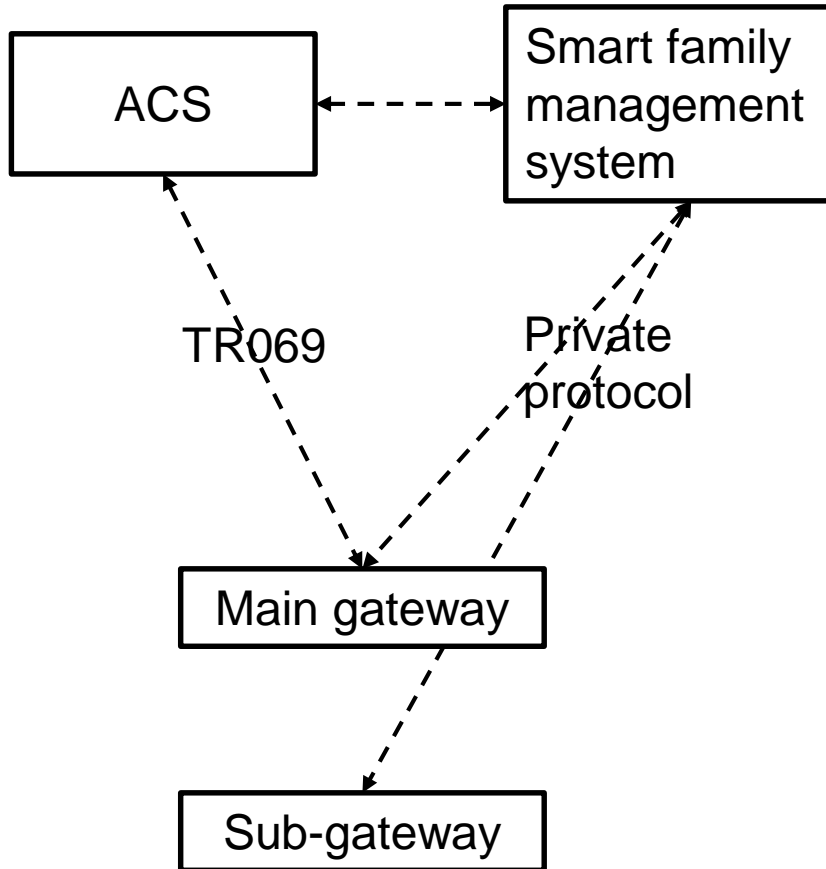
FTTR gateway management consideration

- The main reasons for gateway be managed are as follows::
 1. At present, home users generally use routers in the consumer market at home. We now lacks the means to control the home network, and it is difficult to grasp the home network situation;
 2. Strengthening the control of FTTR gateways can expand operators' affect in the home network equipment market, and at the same time, it can further help to occupy the smart home control center;
 3. Based on the analysis of access network failure in a provincial branch, the cause of home network failure exceeds 60%, which is the main point;

FTTR gateway management solutions

- The management of FTTR gateway is main concern which directly influence the users 'experience and home network quality . The main gateway will follow the existing methods based on the TR069, but the management of sub-gateway is unclear. The management method needs to obey two basic principles:
 - a. Make full use of the existing resources of China Unicom, which can be quickly implemented and applied, save the related cost;
 - b. Based on mature technology and standard, reduce the modification of equipment and platform;
- Here are two options below:
 1. Based on existing platform which was used to manage smart gateway and router, expand the function of platform to achieve the management of sub-gateway ;
 2. Extend the TR069 protocol, and still manage the sub-gateway based on TR069;

FTTR gateway management potential choice



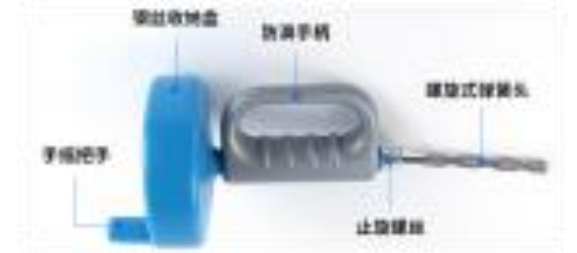
- Smart family management system is responsible to manage the plug-in of main gateway, all parts of sub-gateway and data collection.
 - The private protocol which was created a few years ago to manage smart gateway and router;
 - The gateway communicated with the system through public Internet;
- The sub-gateway will be pre-configured before deployment to ensure communication with the main gateway and system;

□ The reasons for considering not adopt ACS to manage sub-gateway are: (1) sub-gateway can be set to work at bridge mode and do not need to configure WAN interface as main gateway by ACS; (2) TR069 is not suitable for data collection, especially high frequency and large amount of data, which was used to analyzed network quality and so on.

- For now, the provincial branches who release the FTTR service as the pilot project adopt their own management solution based on its condition. Both solutions are being implemented, and also existing the situation of ignoring the management of sub-gateway. Because the FTTR service is in the early stages of development, we need to explore and practice more to figure out the answer.

FTTR market positioning and ODN retrofitting

- For now, FTTR service will cost more than normal Gigabit broadband service, which include two main parts of cost:
 - Gateway cost: the amount of sub-gateway determine the cost
 - ODN: the additional cost of in-home ODN retrofitting
- For ODN retrofitting, normally provide two ways to achieve:



- Invisible optical cables can be used for indoor wiring. The invisible optical cable is a kind of transparent sheathed optical cable, which can be pasted on the surface of the indoor wall through a hot melt glue gun to complete the laying.
- Reuse the original concealed tube, laying optical fiber through special perforation equipment

- Promote the formulation of FTTR standards;
- Finalize the gateway management mode
- In the P2MP solution, the interoperability between the main gateway and the sub-gateway needs to be promoted in the future to break the equipment barriers between manufacturers;
- Promote the inclusion of optical fiber wiring in the housing construction specifications, and formally become a kind of indoor wiring method, which can reduce the work of indoor ODN in the future;

Thanks!