

中国光纤到户 (FTTH)概况

China FTTH Overall Situation

中国上海邮电设计院有限公司

China Shanghai Post & Telecom Design Pte Ltd

各位专家，各位贵宾们
大家好

中国宽带接入的基本状况

China Broadband Users

近年来中国的宽带业务发展迅速, 互联网上网人数已达到2.21亿

截止2008年3月份宽带用户已达到7146万户,

其中:ADSL用户5658万户

March 2008- Internet user in China 221million, Broadband subscriber 71.46million

- 2002 年底宽带上网用户在全网互联网用户中仅占6.3%, 2006年底这一比例达到了66%。表明互联网的发展已步入宽带时代

In Year 2002, only 6.3% internet users are broadband subscriber. By end of 2006, the percentage has increased to 66%

- 截至2007年5月, 我国宽带接入用户数达到5824万线

May 2007-Broadband subscriber in China reach 58.24mil.

- ADSL是主要宽带接入手段, 占据我国宽带接入70%多的市场份额, 我国已成为全球最大的DSL市场



业务主导网络的发展 Applications Determine Network Development

“Home”: Fixed line operator main customer and main advantages, with popular contain, will be the attraction to development, application is the key to the FTTH development

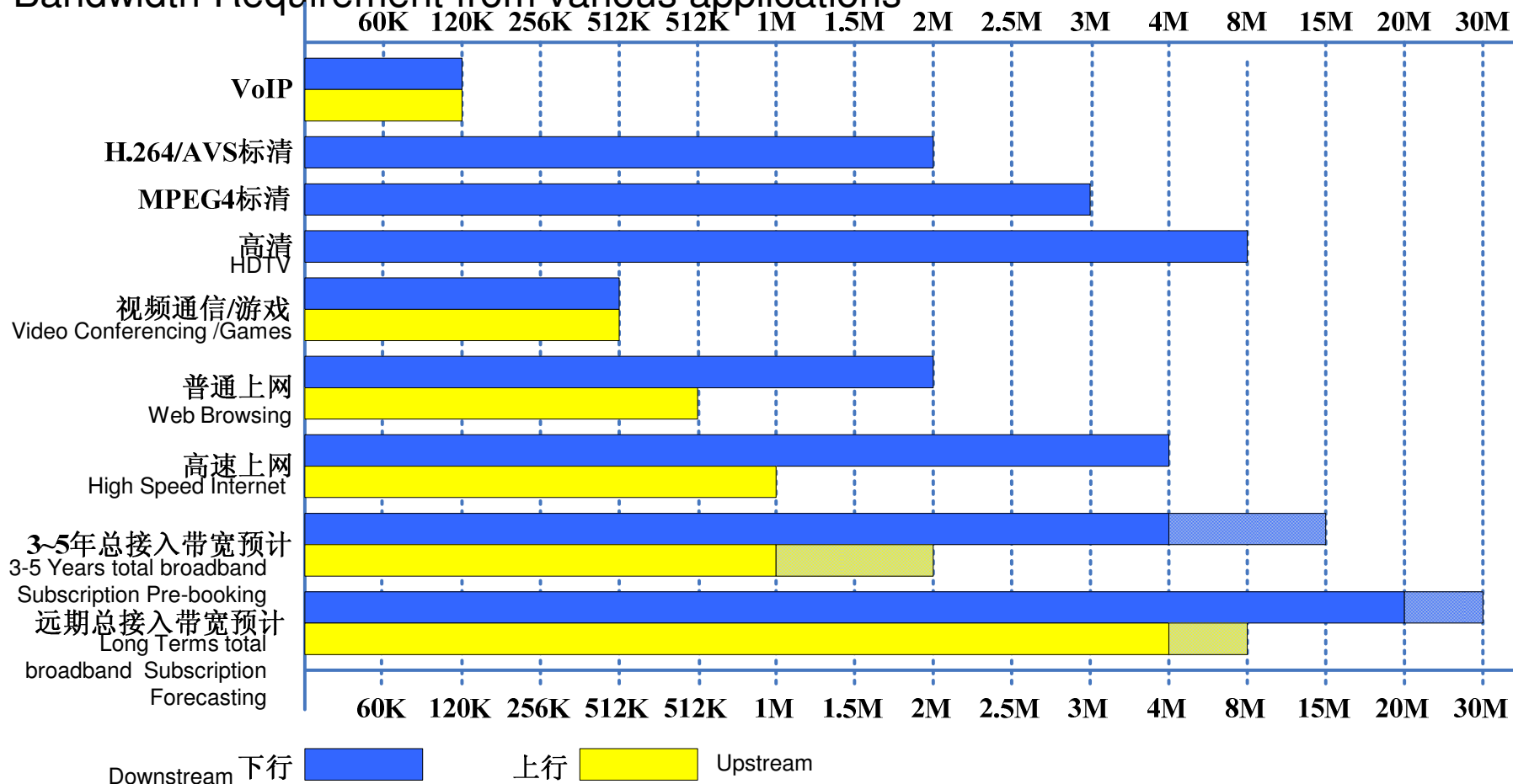
家庭网络：家庭通信、娱乐应用与信息化接近生活

Home Network: Home Communication, entertainment and informationalised



各类业务对带宽的要求

Bandwidth Requirement from various applications



随着各类业务的推广应用，用户对带宽的需求越来越高，宽带业务驱动了对现有的铜缆接入网的提速改造进程

Higher bandwidth demand from the user drive and expedite the changes in current copper connection technology

业务发展与接入带宽需求预测

Business application development and Bandwidth (BW) Demand Forecast

向用户提供可用带宽目标设定:

Targeted Bandwidth for user :

2010年实现

By 2010 to provide

高端用户提供下行带宽20Mb/s以上

20Mb/s and above for High end user

中低端用户提供下行带宽8-16Mb/s

8-16Mb/s for low medium end user

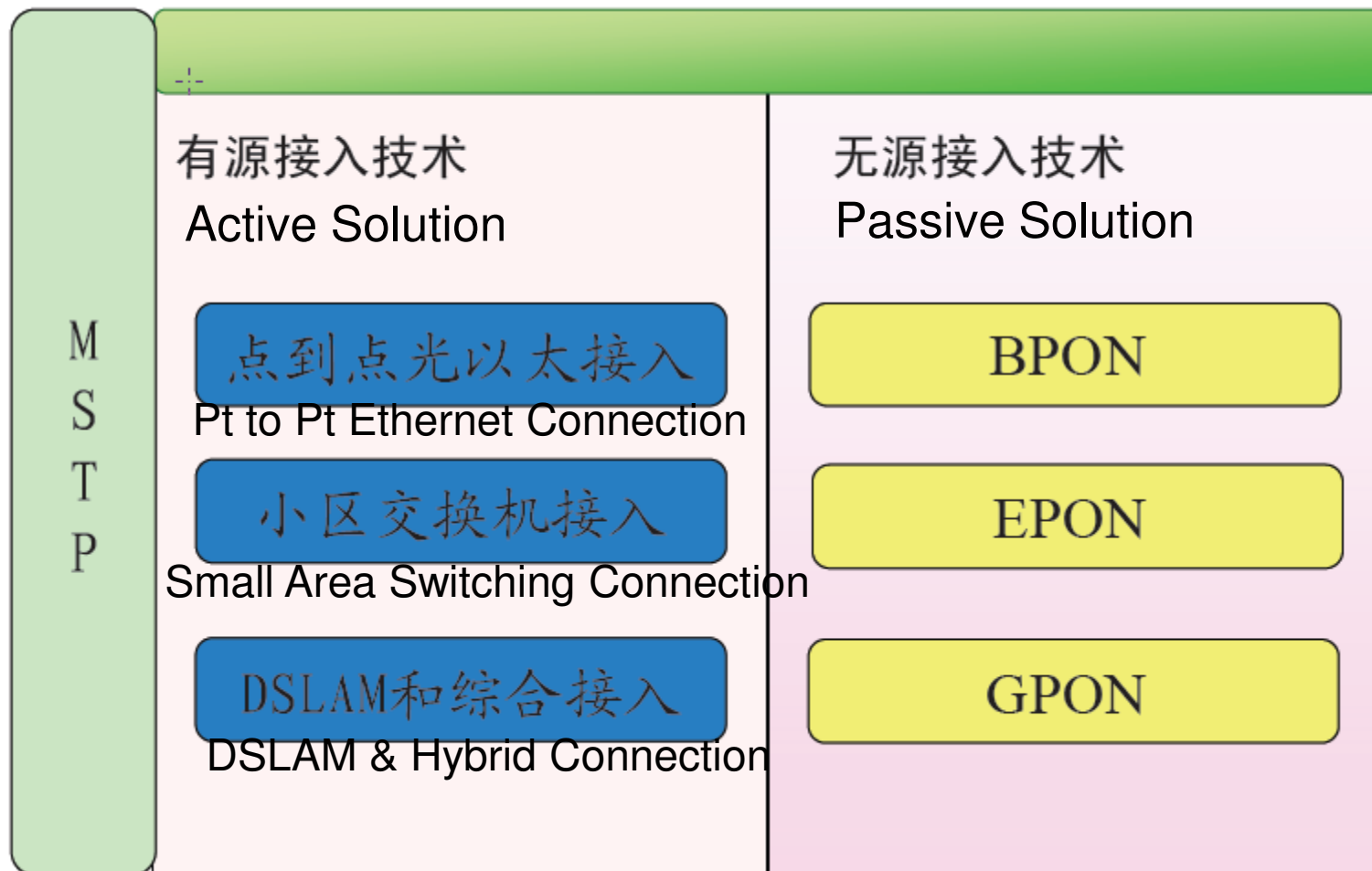
远期目标下行带宽50-100Mb/s

Long terms target - downstream speed 50-100Mb/s

业务名称 Application	下行带宽 Downstream BW	上行带宽 Upstream BW	高端用户需求 High End User Demand	中低端用户需求 Low Medium End User Demand
HDTV	6~10Mb/s	—	2路	1路HDTV 或 1-2路SDTV
SDTV	1.5~3Mb/s	—		
在线游戏 Online Game	256kb/s	256kb/s	√	√
视频通信 Video Conference	124k~2Mb/s	256k~2Mb/s	√	√
VoIP	80kb/s	80kb/s	√	√
Internet	2~6Mb/s	—	√	√

FTTX接入网采用的主要技术

FTTX Connection Main Technology



在实际应用中，具体选择哪类技术或产品要根据多方面的因素综合考虑
In the real application, reason to choose which technology base on

业务需求因素
技术成熟因素
设备成本因素
设备性能因素
网络现状因素

Application Requirement
Maturity of the technology
Equipment cost
Equipment Features
Current network condition

EPON由IEEE标准化（802.3ah），其显著优势在于产品商用较早，成熟度高，核心芯片量产大，设备成本低。

EPON is IEEE standard (802.3ah), the advantages of this technology is common commercial application, mature, mass production of the chipset, lower equipment cost

GPON由ITU-T标准化（G.984），其显著优势在其性能方面，如更高的速率和传输效率，对TDM业务的更好支持，更强的OAM功能，更高的标准化程度。

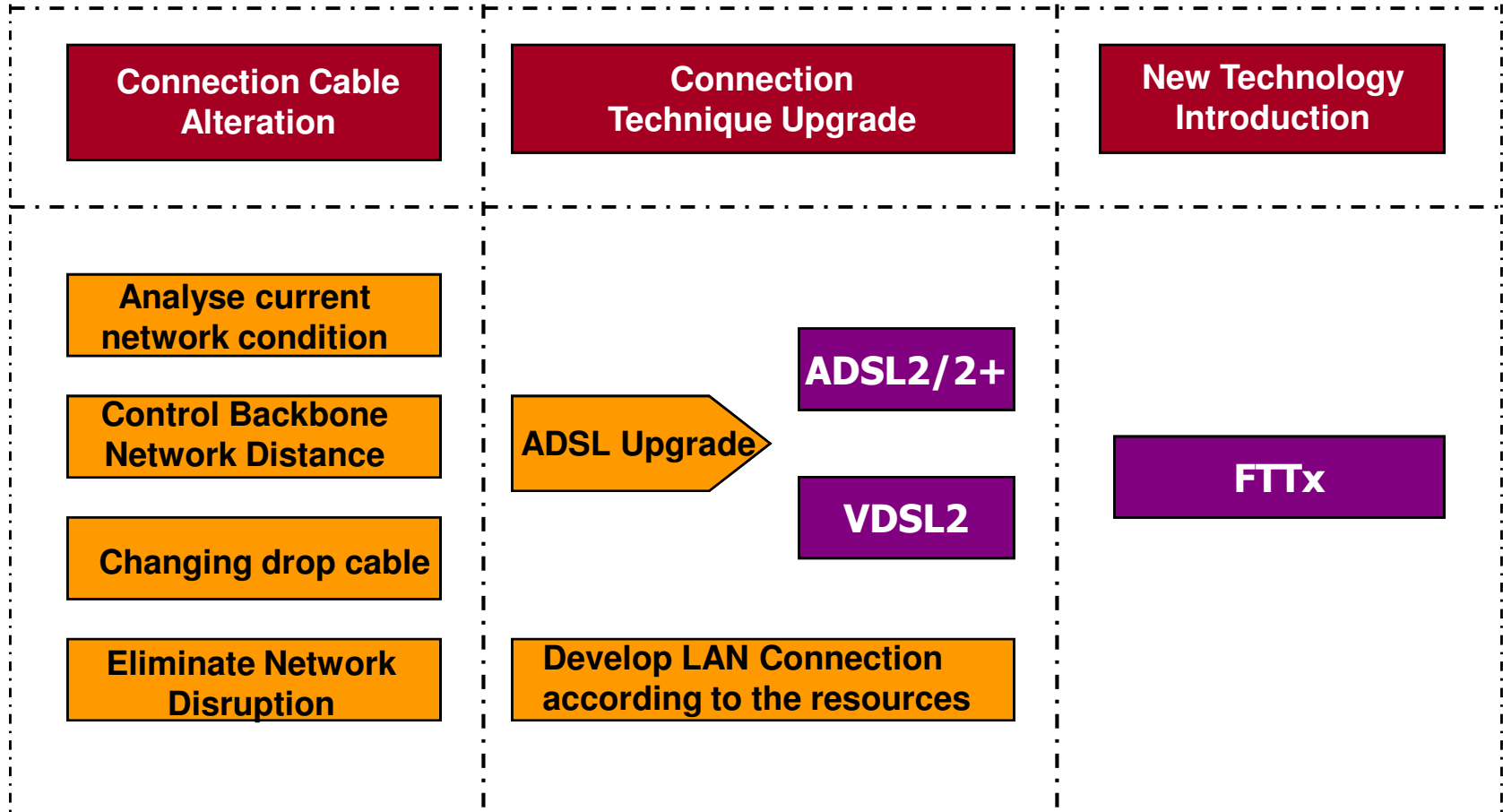
GPON is ITU-T standard (G.984), GPON advantages is it's features such as higher speed and transmission efficiency, support TDM, better OAM , higher standard

EPON与GPON是同一代技术，具有相似的系统功能和应用场景，由于EPON/GPON是采用点对多点(P2MP)方式，能够节约大量的光纤，并具有高带宽、高速率业务透明性好、标准化程度高、传输距离长，网络配置灵活，综合性高，适用于IP化网络等特点，EPON是目前宽带光接入网的主要选择。

虽然GPON性能更优于EPON，主要是传输速率高、分路比大、PON接口的告警性能和监视性能强，能够提供TDM业务，但目前还没达到大规模商用的能力，近期选用EPON，待GPON技术成熟后再推广。

EPON & GPON are same generation of technology, have the same system features and application, because both EPON/GPON are using point to multipoint style, this can save a lot of fibre cable, at the meantime provide high bandwidth, high speed, better transparency, high standard, farther transmission, flexibility, hybrid, suitable for IP network etc, EPON is a most popular choice in current market. Although GPON has better performance than EPON, mainly on higher transmission rate, higher split ratio, better fault alert and monitoring features at PON connection point, and also can support TDM, but due to it still not in mass production, so EPON is a more popular choice, but will promote GPON when it technology mature

Broadband Applications Propel Access Network Alteration and Speed Improvement



Because of the current copper cable network running over long distance and aging effect, and also the low ADSL speed, it has become a bottleneck of the broadband applications development. In year 2006, started network integration, alteration, speed improvement, moving DSLAM nearer to the end user, reduce the copper network distance, at the meantime through the upgrade of access network technology, implementing ADSL2+, increase transmission rate of the network. FTTH trial started since 2005

中国光纤到户(FTTH)的进展情况

China FTTH Current Condition

2005年现场实验阶段

2005 Trial on site

由电信运营商主导，开展多种形式的试验,在上海、广东、湖北、北京四省市进行试点

Initiated by telcos, multi types testing, in Shanghai, Guangdong, Hubei, Beijing Province

2006年技术选择阶段

2006 Choice of Technology Stage

EPON、GPON技术选择观望阶段，EPON产业链加快成熟

EPON, GPON technology under observation stage, EPON property chain expedite maturity

2006年EPON获得重大技术改进：实现芯片级互通

2006 EPON technology has a lot of improvements, chipset compatibility

中国电信EPON企业标准制定

China Telecom EPON has commercially standardised

中国光纤到户(FTTH)的进展情况

China FTTH Current Condition

2007年规模启动阶段

2007 Small Scale Launching Stage

EPON设备级互通测试, EPON规模启动阶段

EPON equipment compatibility test, EPON small scale launching stage

2008年大规模商用阶段

2008 Big Scale Commercial Deployment Stage

各地FTTB和农村信息化改造建设的需求爆炸式增长

FTTB everywhere and villages informationalised construction demand growing at booming speed

上海地区FTTH网络研究试验网情况介绍

Shanghai FTTH Network Research Introduction

主要针对三种目标用户：公寓住宅小区、商务楼、别墅区分别进行了建设，三个示范区共建设了1029户。

Targeted 3 types of user: Apartment, Commercial Building, Villa (SDU), 1029 total users in 3 trial sites

- 公寓式住宅小区，在上海第九城市小区完成320户的接入建设。

Apartment, in Shanghai no.9 city 320 users connection.

- 商务楼，在上海信息大楼完成64户的接入建设。

Commercial Building, completed 64 users connection in Shanghai Information Building

- 别墅小区，在上海汤臣高尔夫别墅完成645户的接入建设。

Villa (SDU), completed 645 users connection in Shanghai Golf Resort

- 通过网络联调测试，制定了PON技术为不同用户群提供多业务的解决方案。

Determined PON technology for different user group through the testing

- 在三个示范区开通了IPTV（1路高清电视、54路标清电视）同时还开通了高速上网、NGN语音。

Provide IPTV (1HD channel, 54 standard TV channel), high speed internet and NGN voice.

EPON的试验网络应用实现及要求

EPON Trial Network Practical Application & Requirements

- **宽带上网:** OLT向上通过FE/GE口与BAS相连, 连入IPMAN。
Broadband Internet: OLT uplink connection to the BAS through FE/GE port, and link to IPMAN.
- **语音:** 采用内置IAD的ONU, ONU上直接出POTS口, VOIP和宽带上网走不同的IP城域网路由通道。
Voice: Using build in IAD in the ONU, ONU's POTS port, VOIP and broadband internet are using different IP MAN routing .
- **IPTV:** 由骨干网边缘在驻地网进行IP受控组播, 将实时视频节目传送到用户机顶盒上, 要求EPON系统支持组播功能。
IPTV: IP streaming control through LAN near to the backbone , deliver the live telecast programme to the user's set top box, EPON system must have the capability to support video streaming

EPON的试验网络应用实现及要求

EPON Trial Network Practical Application & Requirements

- **VOD点播:** 由内容分发网络控制, 将节目内容以数据片断方式, 在骨干网上通过光链路传送到各驻地网中的MS (媒体服务器), 由驻地网中MS完成从MS端到端用户机顶盒的传送服务。

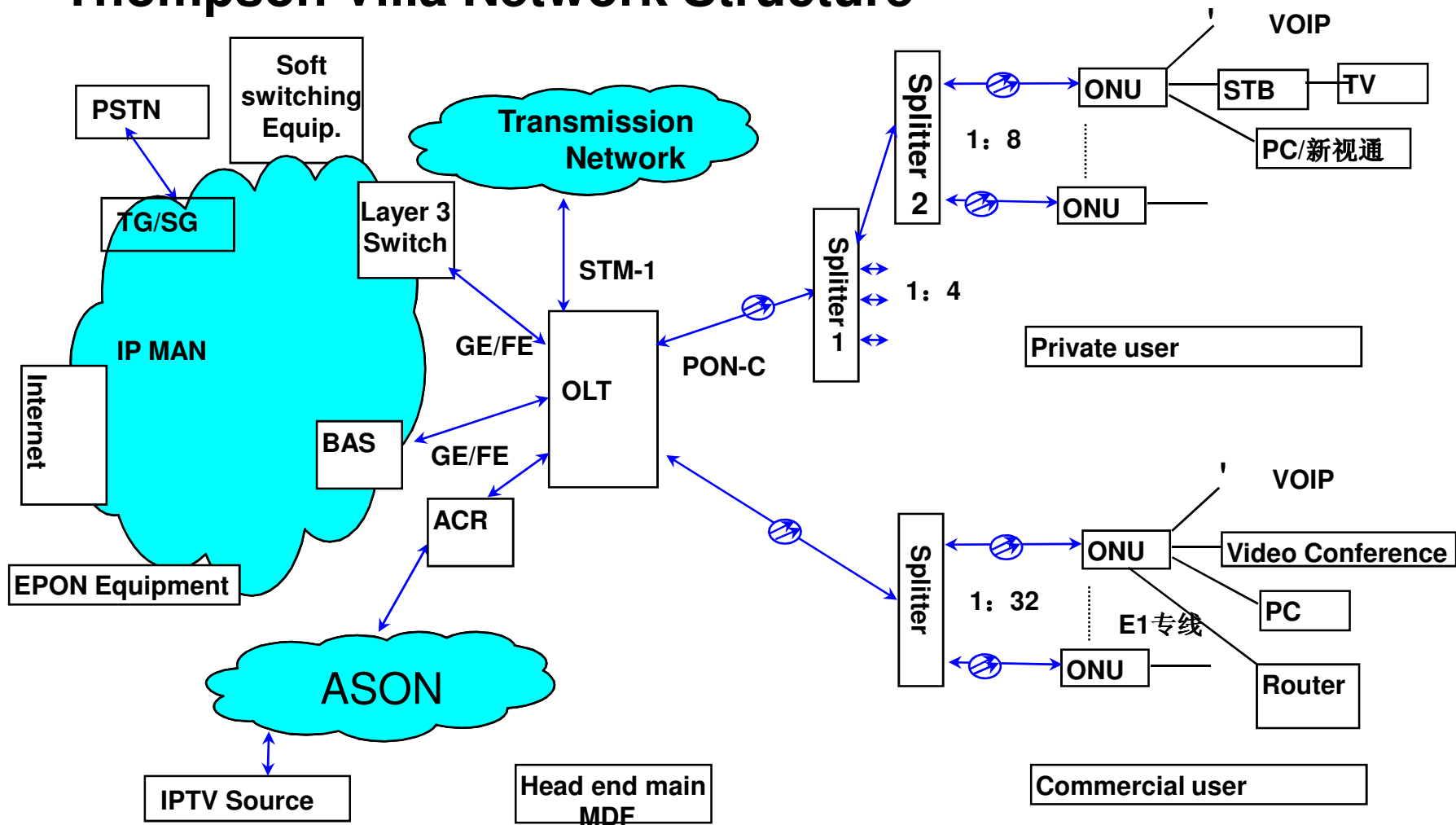
Video On Demand (VOD): From content distribute to network control, divided the programme contain to session by session, for backbone transmit to each LAN's MS (Media Server), from LAN media server deliver to the user's set top box.

- **E1专线:** 部分厂商的OLT可以支持的TDM接口包括E1和STM-1, ONU可以支持的TDM接口包括E1和V. 35。在EPON系统上开展TDM的时候, 需要开启AES-128加密功能, 保证用户数据的安全性。

E1 leased line: Some vendor's OLT can support TDM port incl. E1 & STM-1, ONU can support TDM port incl. E1 & V.35. For security purpose the AES-128 encryption feature has to be actived in the EPON system.

汤臣别墅网络结构

Thompson Villa Network Structure



· **试验网在ODN工程方面要求:**

Trial Network's ODN Requirements:

- 针对光纤的不同布放场合，采用新型铠装光缆和皮线光缆。
Using Armoured and flat cable for different deployment conditions
- 入户光缆采用冷接方式端接在光纤插座上，插座选用中国标准A86面板。
Mechanical splice for drop cable onto fibre face plate, choice is face plate – China standard A86 face plate
- 在光分路器后采用冷接子进行光纤接续，接续简单、快速，降低了环境要求。
Using mechanical splice for splicing after the splitter, easy and fast splicing, reducing environment requirement

· **用户家庭布线 In house Cabling**

- 利用已建小区用户家庭布线，采用一根五类线同时用做传输IPTV和宽带上网。
Using the existing in house cabling, provide IPTV and broadband online with a cat5 cable.

· **ONU的部署 ONU Deployment**

- ONU放置在弱电井中时，多个ONU集中放置，没有通风，无法散热，采取了在多个ONU中加装隔热板的方法，帮助散热。
ONU has been deployed in the low voltage riser, multiple ONUs have been centralised, no ventilation, no heatsink, installed heat isolation plate between the ONU for heat distribution

整个试验项目在2006年6月完成,并通过验收.达到预期的效果,制定了关于中国电信FTTH工程设计规范和验收规范
到目前全国以有20多城市先后建立了FTTH的试验网示范网或者试商用网。通过这些网络的建设，为设备的改进、解决方案的优化工程建设经年的积累、标准的制定、成本的降低等起到了很大的作用。

The whole project has been completed by June 2006, and successfully handover, achieved expected result, set the China Telecom FTTH project design, testing and commissioning standard.

Uptodate, there are more than 20 cities carried out FTTH testing network. The network construction has provided equipment improvement, solution quality improvement accumulation, setting up standard, cost reduction etc

中国住宅结构与通信网络的特点

China Residential Structure and Communication Network

1、以社区为单位，住宅密度高，用户分布集中

Community as an Unit, high density, centralised users

2、住宅类型：多层、小高层、高层和单体别墅

Type of Residential : Multi storey (upto 6 storey), small highrise (from 6 to 12 storey), highrise (more than 12 storey) and villa

3、建设模式：光缆网以社区为单位进行全面覆盖

农村光缆网以自然村为进行单位覆盖

Construction model:

Fibre network coverage is base on community as an unit

Village's coverage is base on natural village as an unit

4、光缆敷设方式：城市以地下管道为主

农村以架空为主，

Fibre Deployment method: Underground in City

Overhead in village

高层住宅

Highrise Residential



多层住宅

Multi Storey Residential



别墅住宅

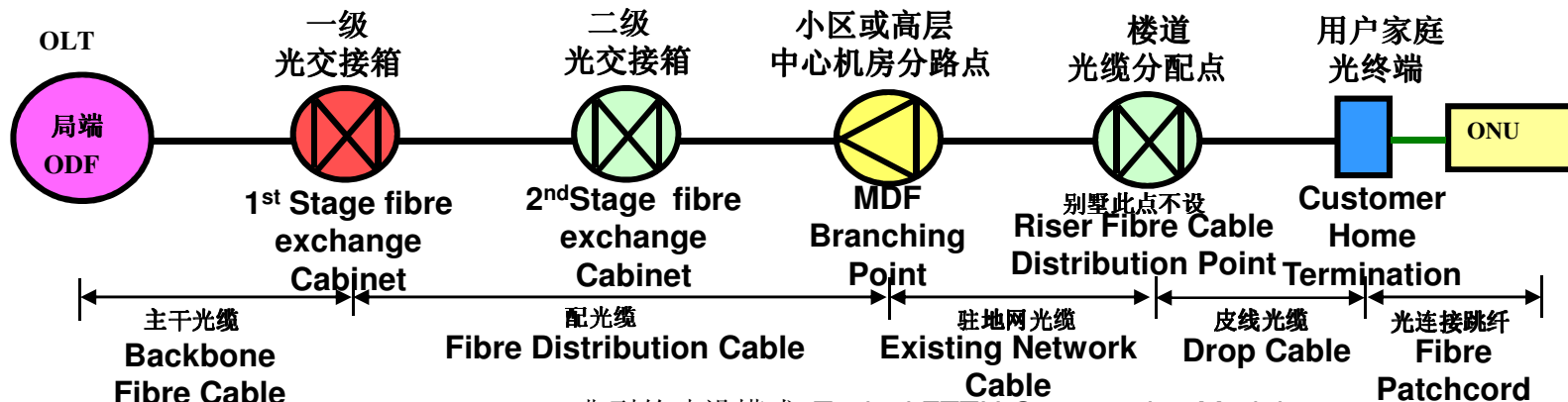
Villa/Resort Type Residential



无源光分配网络拓扑结构 (FTTH)

Passive Distribution Network Topology Structure

- Using Optical exchange, 2 stages exchange method
- 3 layers Fibre optic network structure: user backbone optical cable, distribution cable, LAN cable (community)
- Fibre splice in the optical exchange cabinet or optical distribution box
- User backbone optical cable: Ring topology, every cabinet served by 2 different route optical cable, using 96-288 core high fibre count cable.
- Distribution cable: Using star topology, 1 stage distribution cable shall not be less than 12 core, 2nd stage is using low fibre count, 2nd stage exchange using 4 nos. of closure
- LAN (Community) Optical distribution network in housing area or building, optical splitter installed at the central point of the community



FTTH典型的建设模式 Typical FTTH Construction Model

- ODN结构 (ODN Structure):

采用树形结构 Using Tree Structure

- 分光方式 (Optical splitting method):

以一级分光方式为主，也可以采用二级分光，根据用户分布密度，应用环境，选择合适的分光方式，

Mainly using single stage optical splitting method, also can use 2 stage splitting, according to the user scattering density and application environment to choose suitable splitting method

- 分路器安装原则 (Splitter Installation Rule):

光分路器安装在驻地网（社区），节省主干光缆、配线光缆的投资

Optical splitter install in LAN(community), investment saving on backbone fibre & distribution fibre

- 光分路器安装方式及位置 (Optical splitter installation method and location):

集中安装：单体别墅、高层建筑等，安装在社区的中心机房或户外机柜

Centralised Installation: SDU, highrise etc, installed in community central MDF or outdoor cabinet

分布式安装：多层建筑（6层住宅为主），安装在楼道（建筑物的公共部位）

Distributed Installation: Multi rise building (mainly 6 storey residential), install in the riser (common area in the building)

- 光交接箱安装方式及位置 (Optical Exchange cabinet installation method & location):

采用户外落地式安装，在马路边人行道、绿化带、街道、社区等处，光缆采用地下管道进入光交接箱，市区不用架空方式。二级交接箱可以以多种形式，室内室外挂墙或采用光缆接头盒放在地下管道的人孔内

Using Outdoor Standalone installation, at pedestrian street, green area, street, community etc area, fibre cable enter exchange cabinet using underground duct , overhead method not applicable in city are. Multiple types of 2 stages exchange cabinet, indoor/outdoor wall mount or closure in the manhole

- 光缆的选择 (Choice of fibre cable)

采用金属加强芯中心束管式或松套层绞式聚氯乙烯套防水型光缆，G.652D光纤，光纤的接续采用热熔接方式，光缆的终端采用具有跳接功能的光分纤箱。

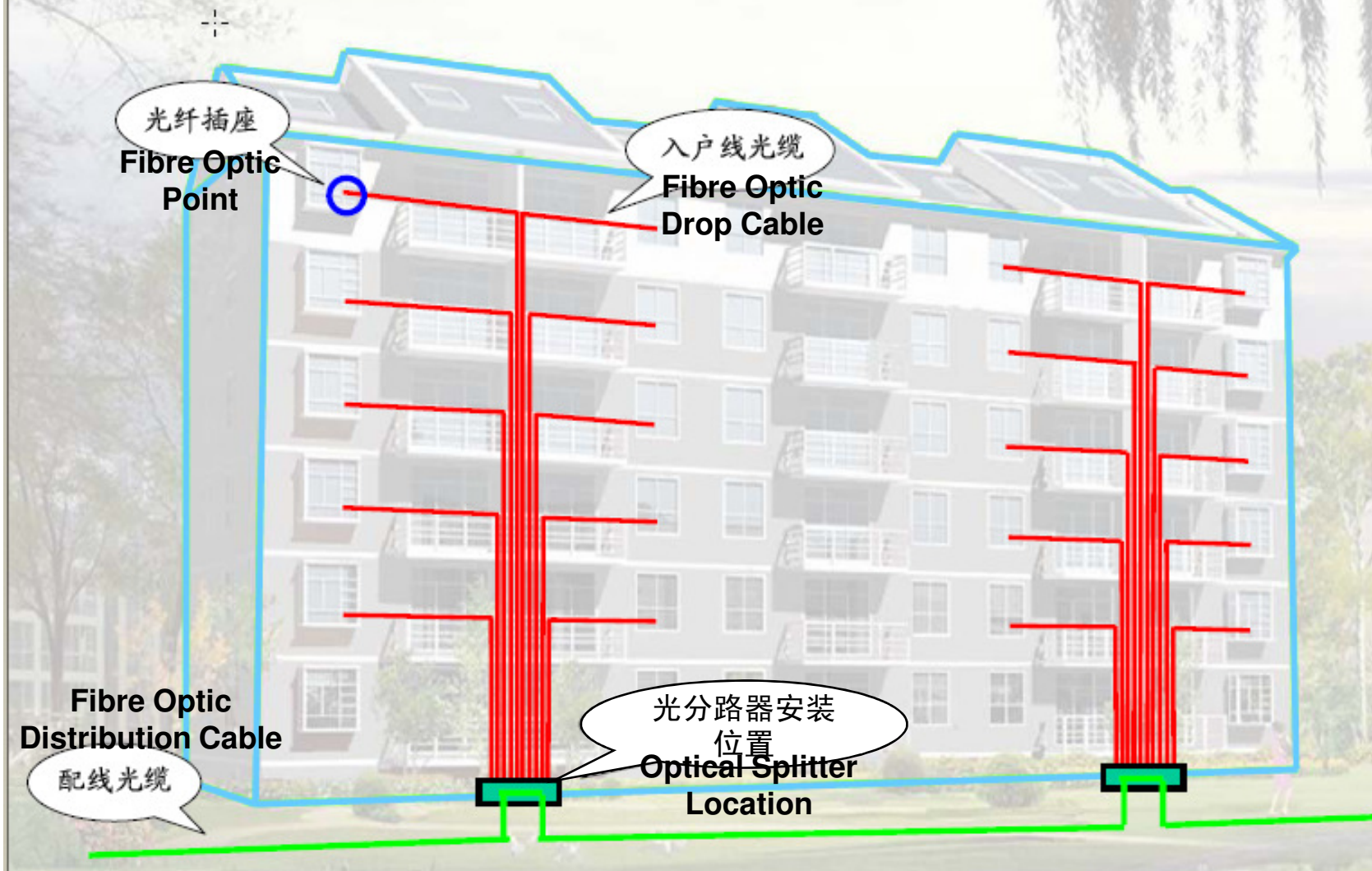
Using armoured to strengthen central or loose tube type PE type waterproof optical cable, G652D fibre, using fusion splice to join the fibre, fibre terminated at the optical distribution cabinet which has patching capability

- 入户光缆 (Drop cable):

Using single core SM flat cable, G.657A fibre, installation method can be pre-installed duct, trunking, cable tray, above ceiling, exposed duct/trunking etc method, drop cable using mechanical splice or Field Assembly connector, cable termination in customer home: china stanard A86 box, hybrid information box (incl. ONU, home gateway, router etc equipment)



多层住宅 Multi Dwelling Unit



单体别墅区光缆的敷设 SDU Fibre Optic Deployment



高层建筑 Highrise Building



当前中国FTTH发展特点

Some unique points of current China's FTTH development

➤ 中国已经进入FTTH发展阶段

China already enter FTTH development stage

➤ 基于PON的FTTH的接入技术是我们接入网建设的主导方向

PON is our main FTTH access network construction direction

➤ 由于百年不变铜缆网阻碍了各种高速数据业务的发展，固网运营商的发展遇到了瓶颈，改造的现有的铜缆网是个非常艰巨的任务

Because of the hundred years unchanged copper network has blocked the development of a lot of high speed business development, the fixed network operator facing a development bottleneck, to change the current copper network is a very difficult and challenging job

➤ 实施光进铜退的策略，将投资重心转向光接入网，严格控制铜缆投资和使用

Implementing the optical network, focus investment on optical access network, strict control the investment on copper network and usage

当前中国FTTH发展特点

Some unique points of current China's FTTH development

➤ 当前影响FTTH全面推进的主要有三方面原因

3 main reason which affected the current FTTH development

建设成本偏高的问题

High construction cost

降低建设成本是FTTH推进的动力，FTTH在建设成本上还难以与DSL竞争；
Reduce the construction cost is the force for FTTH moving forward, currently FTTH construction cost is still very hard to compete with DSL

业务需求的问题

Content Requirement Problem

光接入必须依赖的是高带宽业务，业务还有待发展和开发；同时还必须考虑用户的支付能力

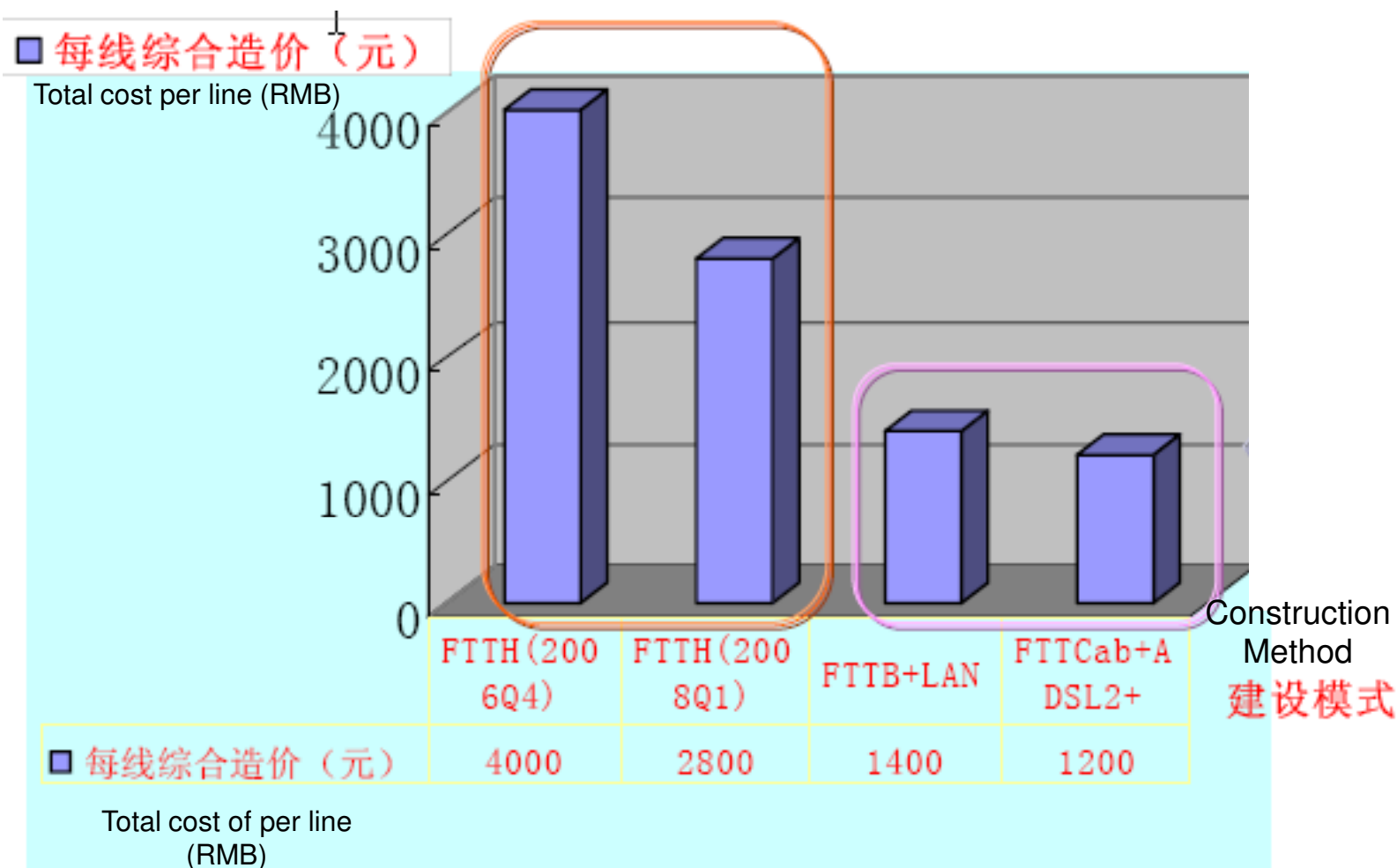
Optical access relying on the high speed broadband business, business still under development and exploration, and also have to consider affordability of the user

投资回报的问题

Return of Investment (ROI) issue

运营商对固定资产投资的控制越来越严，对投资回报的要求越来越高，也更注重短期利益，

Operator tighter control on the capital investment, higher demand on ROI, and also more focus on short term revenue

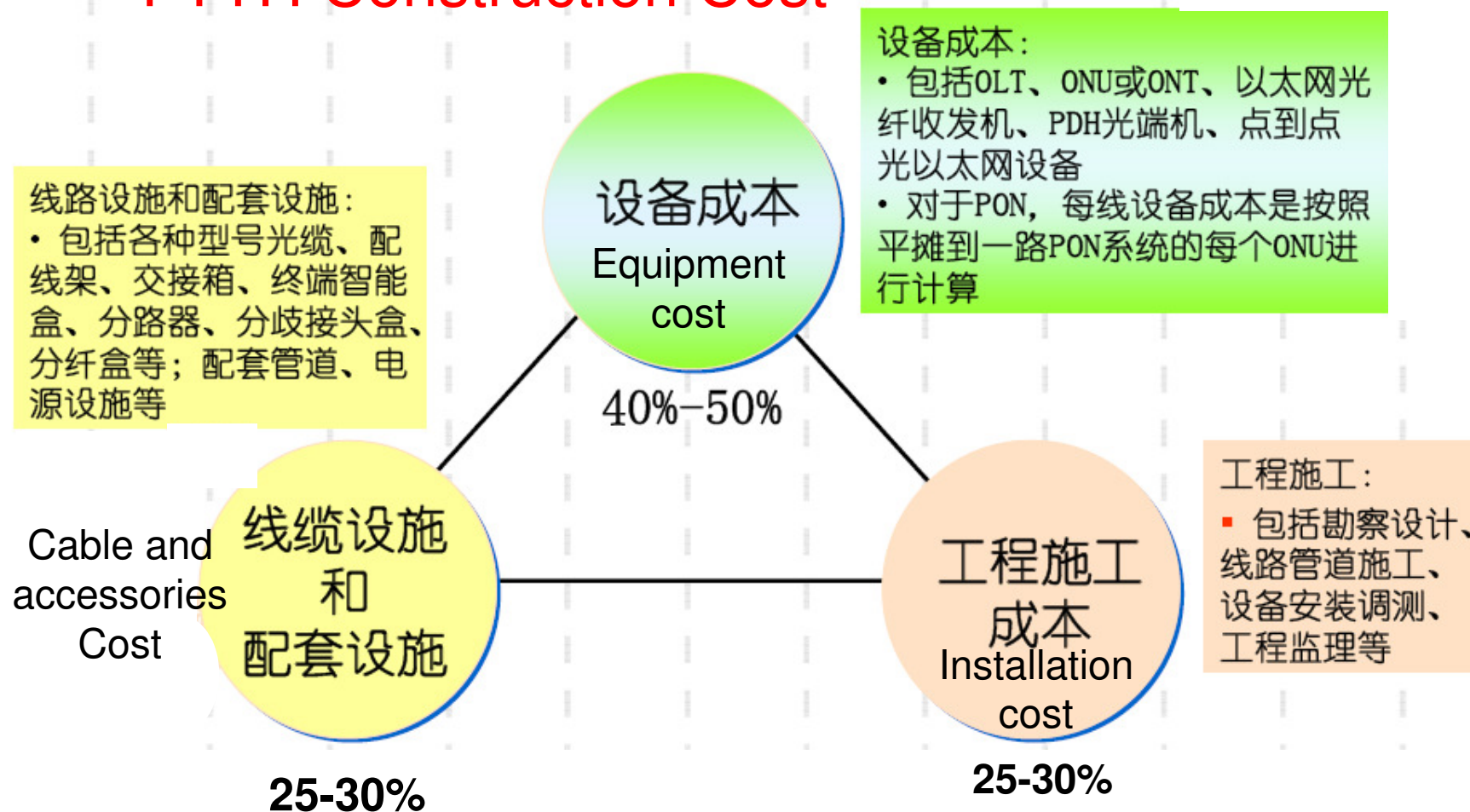


目前FTTH工程造价高于ADSL2+ 3-4倍

Current FTTH Project construction cost is 3-4 times higher than ADSL 2+

建设成本是一个敏感的问题,过高的投资成本,直接影响到FTTH的推广应用
Construction cost is a very sensitive issue, too high construction cost will affect the FTTH development

FTTH建设成本-成本构成 FTTH Construction Cost



必须寻找一个能降低FTTH建设初期投资成本的方法

Have to find a cost effective solution for FTTH initial investment

从ONU安装位置确定网络建设的模式

Determine the network construction model base on the installation location of the ONU

➤FTTH: ONU设备安装在用户家中, 光纤直接进入用户家庭, ONU设备独享, 建设成本高(一个PON口32个用户,提供30Mb/s以上带宽)

FTTH: ONU installed in the user's house, fibre straight into the user home, individual ONU, high construction cost (1 PON for 32 Users, provide above 30Mb/s broadband)

➤FTTB: 采用MDU型ONU安装在楼道, 光纤到大楼, 最后100米用五类线, ONU共享, 初期成本降低(一个PON口覆盖128-196户,提供20Mb/s带宽)

FTTB: Using MDU type ONU installed in the riser, fibre to the building, last 100m using cat5, shared ONU, lower initial investment (1PON port for 128-196users, provide 20Mb/s broadband)

➤FTTN: MDU型ONU安装在社区机房, 光纤到社区, 最后500米利用原有的铜芯电缆, 更多用户共享ONU设备, 初期成本更低(一个PON口覆盖512户,提供8-16Mb/s带宽)

FTTN; MDU type ONU installed in the community equipment room, fibre to the community, last 500m using existing copper, more user shared the ONU equipment, lowest initial investment (1PON port for 512 users, provide 8-16Mb/s broadband)

结合中国的接入网现状, 选用合适的建设模式, 控制建设初期的投资成本, 满足业务发展的需要

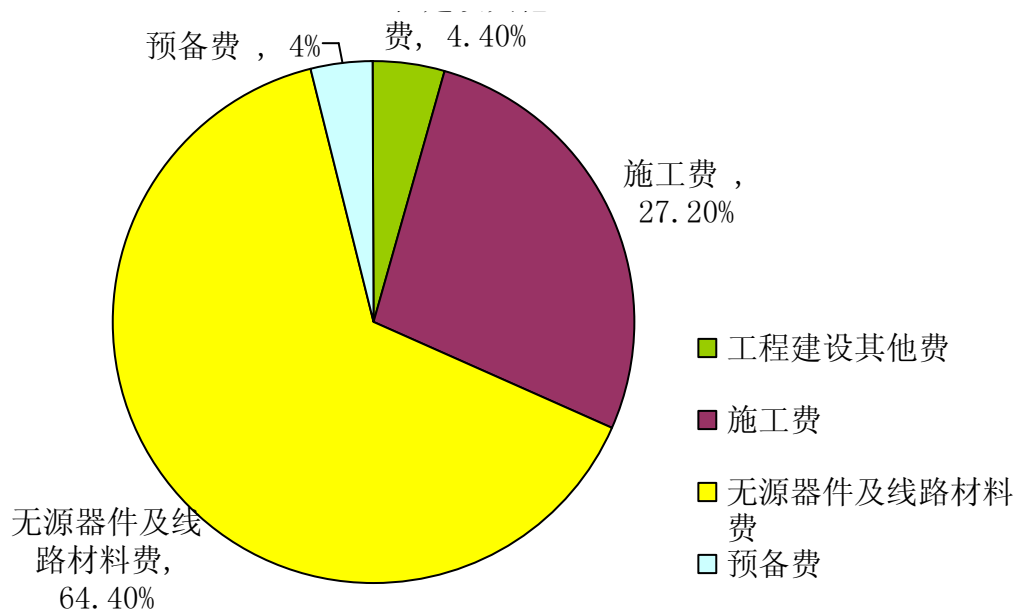
Combine current access network situation in China, choose the suitable construction model, control initial investment, fulfill the business development requirement

案例一：上海汤臣住宅区FTTH 光缆线路工程

Example 1: Shanghai Thompson Residential Area FTTH Project

ODN光分配网投资结构分析(不含设备费用)

ODN Investment Analysis (excl. active equipment cost)



无源器件及主要材料费占总投资的64.4%

Passive components = 64.4% of total investment

施工费用（包括人工费等仅占27.2%）

Installation cost (incl. labour) = 27.2%

Single stage optical splitting method, 1:32 optical splitter centralised installation, cascading fibre, every villa has 2core fibre

每户光缆线路工程平均造价
1872元/每户

Fibre routing construction cost
1872RMB/home

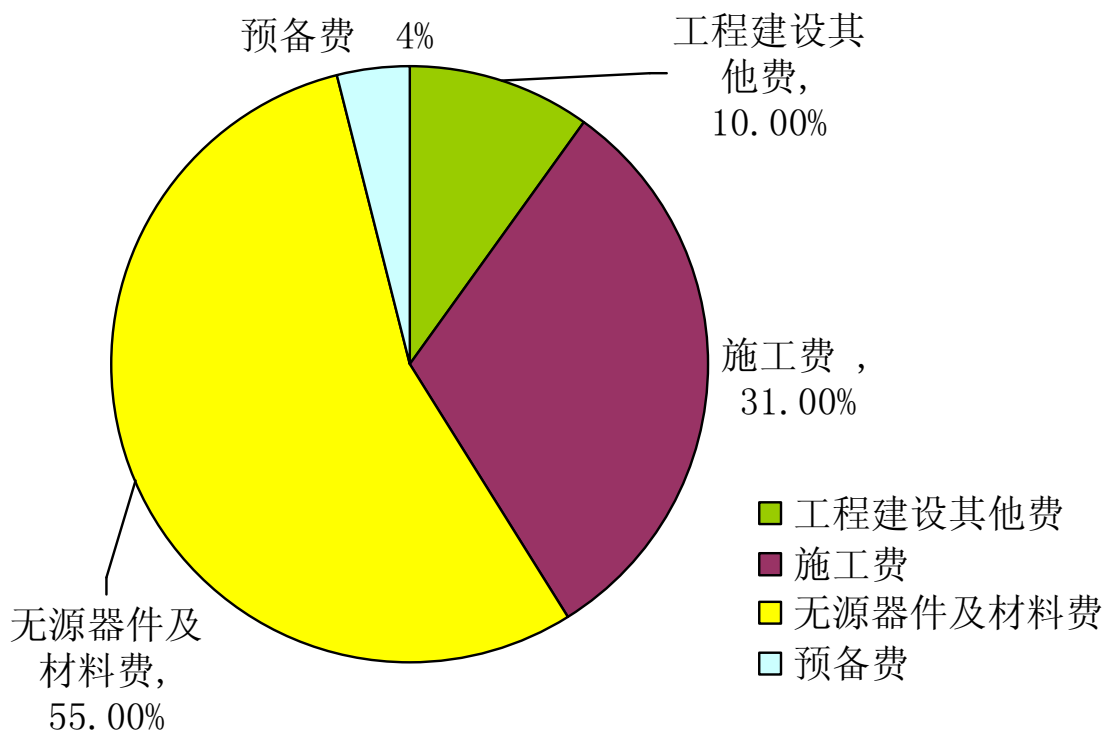
High construction cost due to the high passive components cost
Example: Optical splitter, mechanical splice, fast splice module, fibre patchcord, closure etc

案例二：上海江杨家园住宅小区FTTB（PON）光缆线路工程

Example 2 : Shanghai Jiang Yang Residential Area FTTB Project

ODN光分配网投资结构分析(不含设备费用)

ODN Investment Analysis (excl. active equipment cost)



无源器件及主要材料费占总投资的55%

Passive components = 55% of total investment

施工费用（包括人工费等仅占31%）

Installation cost (incl. labour) = 31%

Implementing single stage optical splitting method, 1:16 optical splitter centralised at community equipment room, cascading fibre, every unit has 2core fibre, MDU with build in IAD installed at the ground floor riser common area at each block, using existing cat5 cable and a pair of twisted cable to provide voice, IPTV, highspeed internet to the user

每户光缆线路工程造价

300元/每户

Fibre routing construction cost

300RMB/home

- 从前面2个案例可以看出，通过设备资源采用共享,平摊到每个用户，采用 FTTB、FTTN可以降低FTTH建设初期的投资成本，

From the above 2 examples, we can see that through sharing the equipment resources per user, using FTTB, FTTN, initial investment cost for FTTH can be reduced

- FTTH采用二级分光方式的工程建设成本要低于一级分光方式，节约管道建设投资，第二级分光器安装在楼道里时，大大减少了需要敷设的光缆数量

Construction cost for FTTH using 2 stages splitting method is lower compare with single stage splitting method, cost saving on duct, 2nd stage optical splitter in the riser, significantly reduced the no. of optic cable deployment

- 光分路器安装位置越靠近用户，建设成本越低

Location of optical splitter nearer to the end user, lower construction cost

➤FTTB、FTTN更适用于过渡期的铜缆网改造，可以充分利用现有的铜缆资源，做到物尽其用，减少初期的投资成本

FTTB & FTTN is more suitable for the transition period during the migration from copper network, can fully utilise the existing copper resources and reduce initial investment

➤采用FTTB、FTTN方式时，必须采用一级分光方式，以便于网络能平滑的过渡到FTTH。（把案例2中的MDU设备换成光分路器，网络结构改成二级分光方式，光缆不需要改动，就能实现FTTH)

When using FTTB & FTTN method, should apply single stage optical splitting method to ensure the smooth transition to FTTH in the future (using example 2, change the MDU equipment to Optical splitter, network structure change to 2 stages optical splitting, no need to make any changes on optical cable and can achieve FTTH)

光进铜退场景建设方案

Copper to fibre Construction Solution

High End Resident User



- Setting up Operator brand name
- Follow the “quality not quantity” rule, provide FTTH applications, best quality best price

New Resident Area



- Try to set higher standard, but strict cost control
- Not providing drop cable to user, suitable to implement FTTB+LAN

Existing User Improving
Speed Alteration



- Try to set higher standard, but strict cost control
- Fully utilised the existing copper network resources and end equipment, suitable to implement FTTN+DSL

Outskirt and village
Informationalise



- Looser performance requirement, strict cost control
- Has to resolved the problem of cable from POP to village always been stolen
- Suitable to implement FTTN+DSL

不同的居民用户有不同的需求特点，需要根据应用场景确定有针对性的应用方案。
Different user has different requirement, implement targeted solution
according to site condition

FTTH发展策略

FTTH Development Strategy

- 最终目标全网实现FTTH

Ultimate goal is to achieve whole FTTH network

- FTTB (PON) + LAN/DSL 、 FTTN (PON)+DSL作为过渡手段，采用资源共享方法降低初期建设投资成本

FTTB (PON) + LAN/DSL, FTTN(PON) + DSL as transition, Using sharing resources method to reduce initial investment

- 必须考虑将来如何有效地利用过渡期的投资，以最少的投入，平滑过渡到FTTH

Must consider how to effective utilise the transition period investment, using lowest investment, smoothly to the next stage - FTTH

光进铜退网络改造的实施方案

Copper to Optic Network Alteration

核心思想：城市铜缆不出楼、农村光纤到自然村。分区域分步骤实施光进铜退
Core thinking: City Copper not exiting building, village fibre to natural village, implementing optical according to area and step

由于目前FTTH当前的建设成本高, 采用FTTB方式过渡, 待设备的价格下降后, 逐步实现FTTH最终目标.

Due to the high construction cost of FTTH, using FTTB method as transition, materialise FTTH ultimate goal when equipment cost lower

➤ 新建区域停止敷设大对数出局铜缆, 以光缆取代

Stop copper deployment in new build area, replace with fibre optic cable

➤ 针对高端用户: 高档的住宅小区、别墅区实现FTTH (PON)

Targeting high end user: Implement FTTH (PON) in High end Residential Villa

➤ 针对中低端用户: 新建普通住宅小区主要采用FTTB (PON) + LAN/DSL

Targeting medium low end user: Implementing FTTB(PON) + LAN/DSL for New build houses

光进铜退网络改造的实施方案

Copper to Optic Network Alteration

- 商务楼宇采用FTTB+LAN、P2P, 农村地区FTTN(PON)+DSL

Commercial Building using FTTB+LAN, P2P, village area FTTN(PON)+DSL

老区域的铜缆网改造

Existing area copper network alteration

进行铜缆网的提速, 根据现场情况, 采用FTTN、FTTB(PON)+LAN/DSL和DSL下移方式, 缩短铜缆网的距离, 稳步实行光进铜退.

Improving the copper network speed, according to the site condition, using FTTN, FTTB(PON)+LAN/DSL and DSL moving near method, shorten the copper network distance, steady implementing migration from copper to fibre

➤OLT设备原则上采用集中安装,通常安装在局端,减少机房、电源、空调等配套设施的投资,采用集中管理方式,使整个网络成为正真的无源网络便于降低维护成本。

Generally OLT equipment using centralised installation, normally installed at the headend, reducing no. of equipment room, electricity, air-con and others equipment investment, centralised management, to make sure the whole network is real passive network to reduce the maintenance cost

➤采用FTTN方式时,采用DSL技术,末端的铜缆长度必须控制在500米以内,满足用户带宽的需求

When using FTTN method, implementing DSL technology, the last drop copper cable length must be controlled within 500m to fulfill the user broadband demand

➤MDU型ONU设备安装在住宅的楼道公用部位、社区的中心机房或户外有源机柜内,根据不同的应用场景和业务需求选择各种不同类型的MDU设备

MDU type ONU equipment has been installed in the riser common area, community's central equipment room or outdoor cabinet with electricity, choose different type of MDU equipment according to the site condition and business requirement

FTTH在实施过程中需要解决的问题

Problems To Be Solved During FTTH Implementation Process

- 安装在用户端的MDU型ONU设备（包括安装在家庭的ONU设备），由于安装的环境条件差，因此设备的防尘防湿问题，安装位置小而设备的外形尺寸过大的问题，希望生产厂商引起重视。

The equipment vendors has to take into consideration the MDU type ONU installed at the customer end (incl. ONU installed in the house), due to bad condition of the installation enviroment, equipment dust and water proof problem, small installation space and equipment size is bigger problem

- 通常用户端设备安装位置散热条件差，夏天设备在通风条件极差情况下能否长时间工作,提高设备的耐高温功能

Normally the equipment is installed in the bad heatsink location, can it work over long period of time under bad ventilation condition, equipment must be able to withstand high temperature

FTTH在实施过程中需要解决的问题

Problems To Be Solved During FTTH Implementation Process

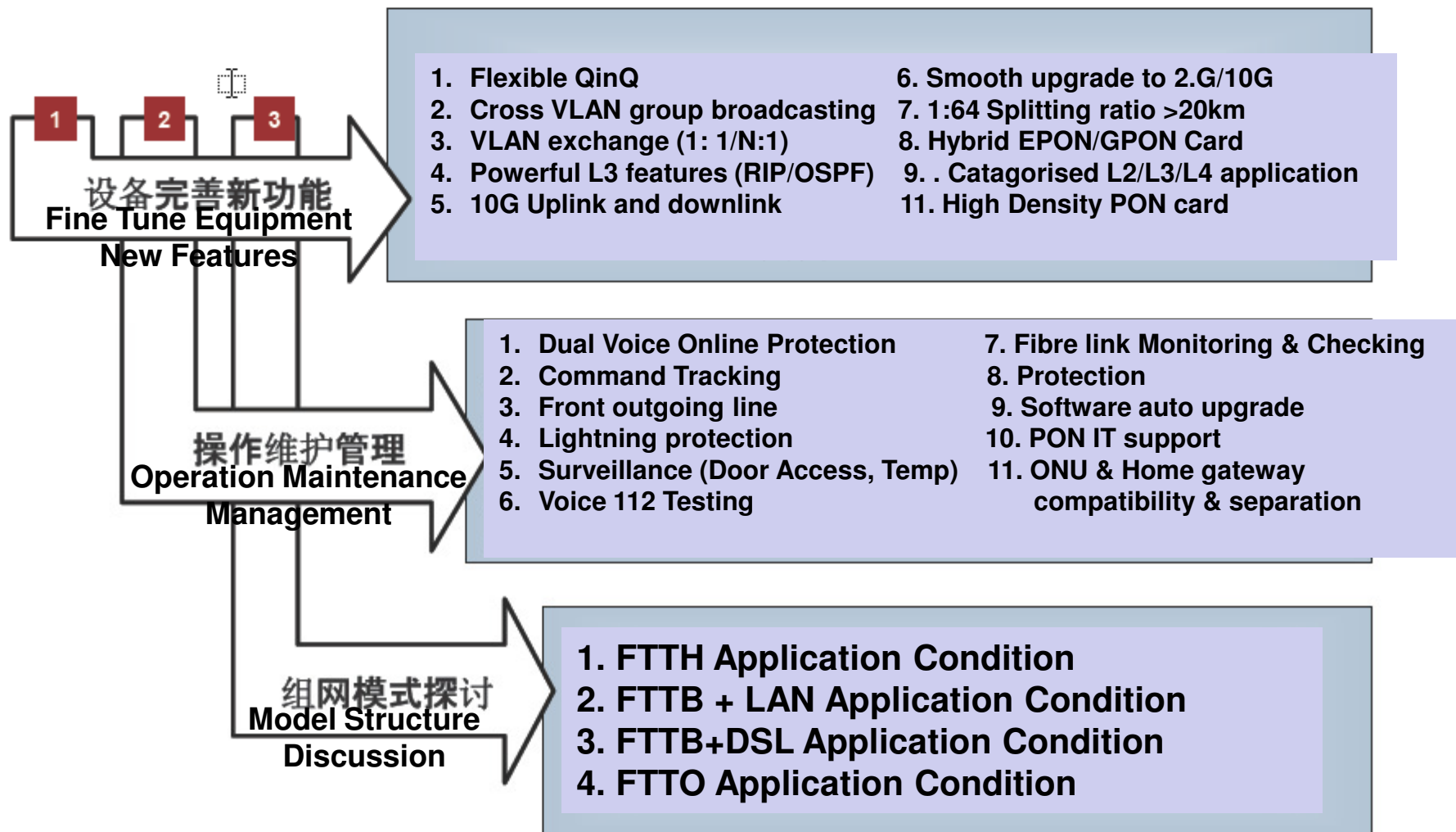
➤ ONU供电保障问题：FTTH用户当断电时造成语音通信中断。因此不间断电源的安全性、放电时间、寿命、价格和维护成本等问题。如何降低用户端设备的功耗，以减轻对后备电源的负担。

ONU Electric Supply Problem: Voice communication breakdown when electricity black out. Safety, how long the battery can last, battery life, price and maintenance cost etc of Uninterrupt Power Supply. How to reduce the user end equipment power demand, to lower burden of the to backup power supply

➤ 缺乏光缆线路故障点的确定和有效快速测试手段：如何快速区分设备和线路的故障，采用一级分光和二级分光方式，在光分路器后的光缆故障点定位。如何做到简单快捷

Lack of effective testing procedure to identify fibre route faulty point accurate: how to differentiate whether it's a equipment or cable failure, using single or 2 stages optical splitting method, identify the fault location after the optical splitter. How to do it in a easiest and quickest way

FTTH需要研究的热点问题





谢谢

Thank You