



**FIBRE-TO-THE-DISTRIBUTION-POINT SELF INSTALL**

G.FAST SUMMIT 2014 – PARIS – MAY, 22nd 2014

# FTT – what?!

- In order to offer superfast broadband to a larger customer base in a reasonable timeframe, operators have to rely on **mixed copper-fiber architectures**. This approach is becoming a solid reality **in many countries** where **it is barely impossible to push fiber up inside all the homes of all the potential customers**.
- FTTC** is basically a "**compromise**" between **broadband performances** and **architectural limits**



*"It's acceptable to offer to the customers 80 Mbps if we can use mini-DSLAMs in the cabinets and avoid drilling the last 500m into each building."*

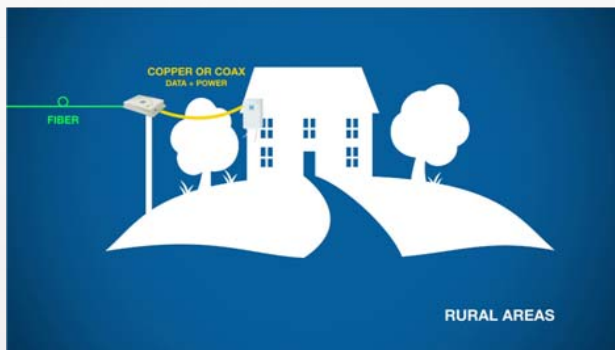
**FTTC APPROACH**

**FTTdp** is based on the idea of **complementing the "pure FTTH" approach**



# FTTdp AND REVERSE POWER FEEDING CONCEPTS

- **FTTdp** is deployed by installing "**micro-DSLAMs**" at the last copper distribution point **for single users or up to 4, 8 or more ports**, using **G.Fast over copper**
- FTTdp nodes are **not powered locally**, but **reverse powered from the customer premises over the same copper pair used for data connectivity**.
- **Reverse Power Feeding** in the FTTdp architecture is done thanks to **dedicated power supply units** (or even integrated in the CPE) placed **inside the home of the customer and connected to the telephone plug in order to inject power to the FTTdp node**.



# WE'RE IN AN UNKNOWN TERRITORY

- **Reverse Power Feeding injects power from inside the home through the existing copper wiring**, it means that the power source is inside an "unknown territory" connected to the home network.

## REGULATORY ISSUES

- In-house wiring could be operated as a **TNV-1 (or even a SELV, not exposed), which means a circuit with maximum 60V@250mA (15VA)**. A Remote Power Injector would initially inject a test signal to check that there's an authorized power drainer before entering into full operation.
- **It must stop powering if it senses there is something external present in the network in order to avoid damaging anything connected in one of the home sockets.**

## CUSTOMER PERCEPTION

- The customer needs also to be reassured that **the amount of power drained from his house is somehow "acceptable"** and similar to the power consumption of any other device they already know and own, like a set-top box or a the G.Fast modem itself.

ETSI is defining Reverse Power Feeding (RPF) architecture, suggesting a scheme derived from PoE.  
RPF won't inject power if it's not feeding the FTTdp node at the distribution point.  
FTTdp nodes have power consumption below 10W, acceptable from both an architectural point of view and a customer perception perspective.



# ...WE'RE NOT DRILLING, SO WHY ENTER THE HOMES AT ALL?

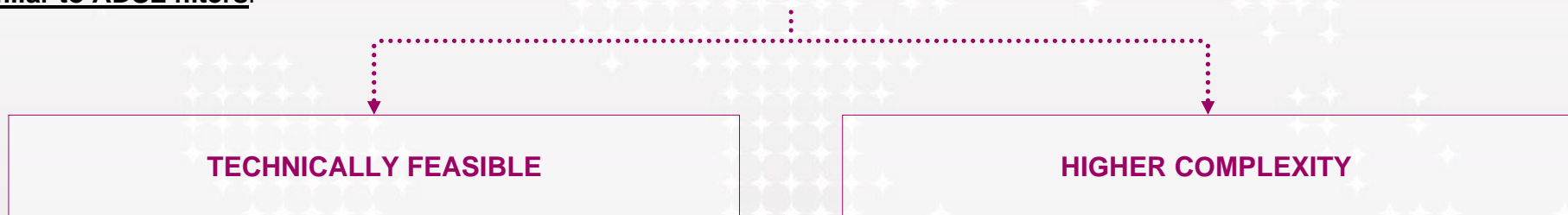
- FTTdp has been designed in order to avoid all the problems that could give uncertainty to service availability in different areas and service activation lead times.
- The **customer** must be able to **install and activate** all the new hardware needed by himself without scheduling an appointment with an engineer, **just like good old ADSL**. This will avoid:
  - **hassle for the customer** and time (4 hours appointment, need to get time away from work...)
  - **cost for the operator**
  - eventual cost for the customer
- FTTdP **needs to be deployed** as “**self-install**” for the enduser

# A “SELF-INSTALL” TECHNOLOGY

- **FTTdp** installation must feel **"just like" an ADSL** activation for a new customer.
- **Operators must feel safe sending the power supply to the customer by mail and having that customer plug it into wall by himself**
- This mandatory "self-install" requirement drives a number of technological challenges:
  - reverse powering mechanism
  - **safety concerns**
  - **migration scheme** from and to the old connectivity
- Having the customer connect the reverse power feeder by himself assumes that the **FTTdp nodes at the distribution point:**
  - Have been **installed by an engineer without contacting the customer and giving him a minimal, or completely absent, service interruption.**
  - Are able to be **transparent while unpowered**. In other words, if the customer has no reverse power feeder connected, he should be able to still use his old POTS or ADSL, at least up to the moment when he will switch to FTTdp by connecting the reverse power feeder.
  - Are able to automatically disconnect the user from his old service at start-up and to connect him back to the old service if suddenly power is lost.

# SHOULD WE CARE ABOUT POTS? AFTER ALL, IT'S "FTTH"...

- **Fibre-to-the-Distribution-Point** architecture and **Reverse Power Feeding** take into account the possibility of **maintaining POTS services** to the customer
- **ETSI work on Reverse Power Feeding includes this scenario**, proposing a solution to all the challenges that come from the coexistence of Reverse Powering and POTS signalling in the same loop: **POTS signalling has to be stopped at both the Distribution Point and Reverse Power Feeder and regenerated (different options available)**
- POTS survivability also raises a number of questions regarding how to manage the coexistence of telephones in the home network with the power injected: if the home network is not separated from the building loop, **Reverse Powering will be injected to all the sockets in the house**
- **Reverse Power Feeding “standard-to-come” proposes the possibility to use Phone Adapters, active elements Powered by the RPF that will intercept and regenerate the signalling**. This won't affect the self install requirement, as they would be **similar to ADSL filters**.



# LET'S START WITH A SINGLE PORT DEVICE, NO POTS...

- **FTTdp installation** is performed in **two asynchronous steps** in order to **grant service continuity** to the customer with the "**OLD**" service (ADSL, POTS...):
  - **AFTER** the installation of the FTTdp node at the distribution point
  - **BEFORE** the connection of the RPF in the home of the customer

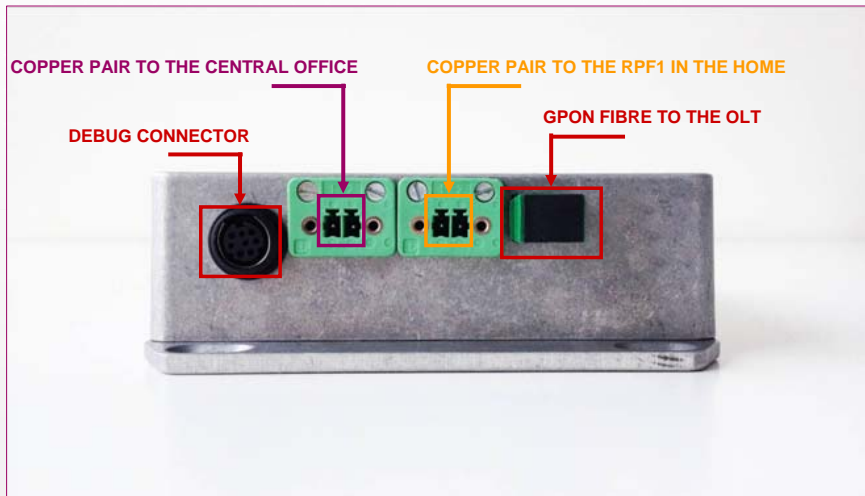


Figure1: FTTdp node connectors

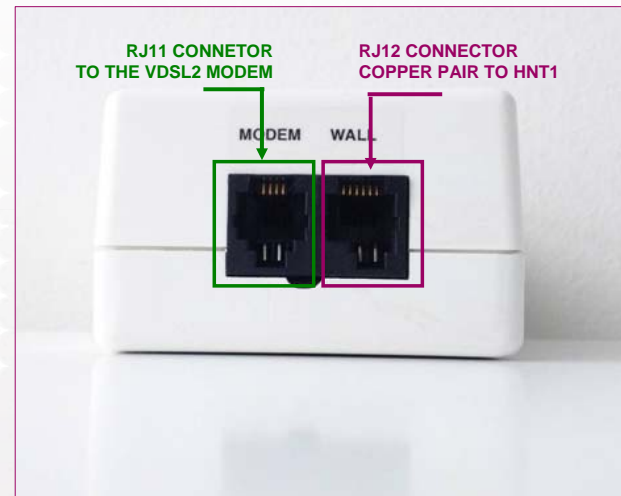


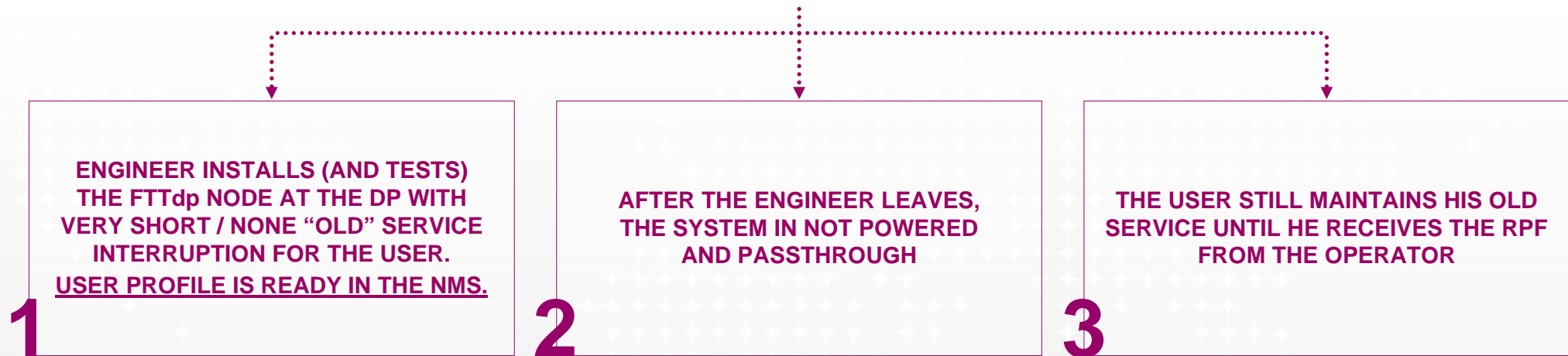
Figure 2: RPF connectors and LEDs





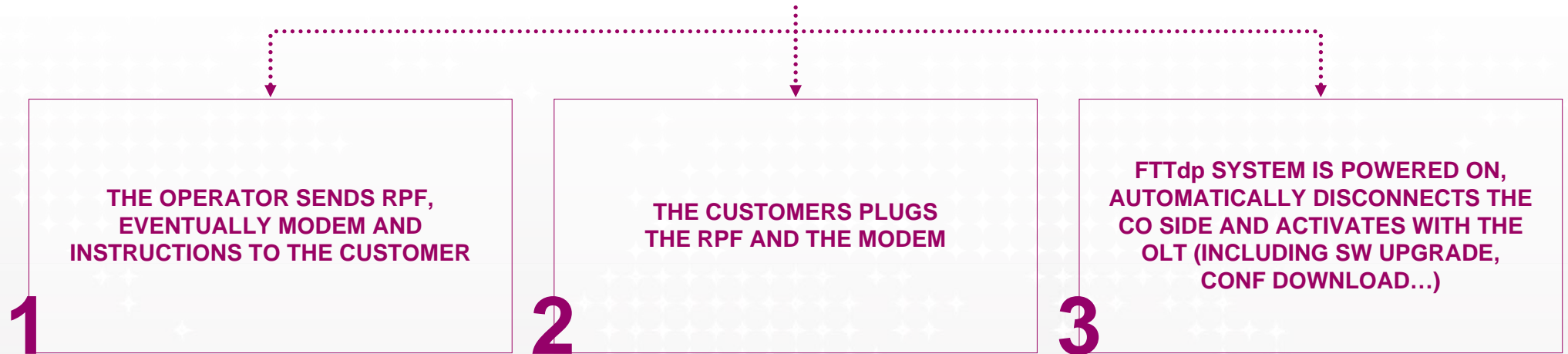
# INSTALLATION PROCEDURE STEP 1: THE DP

## FTTdp ZERO TOUCH INSTALLATION STEP 1



# INSTALLATION PROCEDURE STEP 2: THE HOME

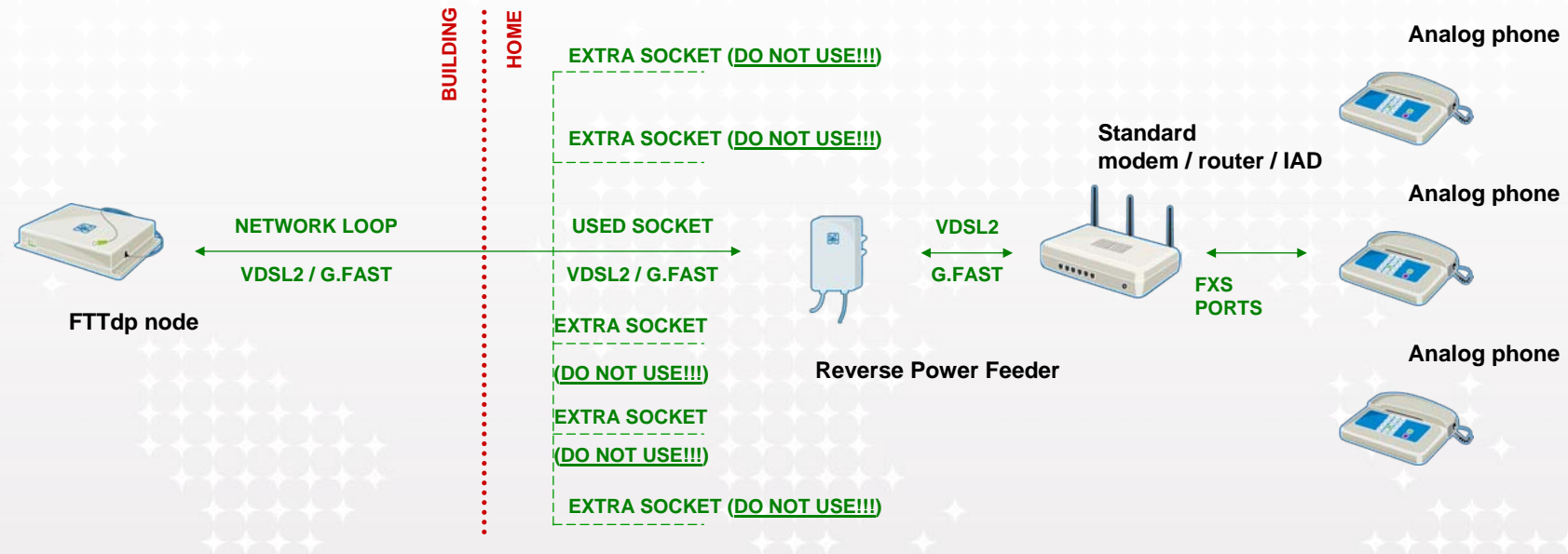
## FTTdp ZERO TOUCH INSTALLATION STEP 2



# WHAT HAPPENS IN THE HOME (WHEN NO POTS IS INVOLVED)?

- Installation can be easily performed without the need for an engineer appointment
- **Voice services** are provided through VoIP and so using FXS ports on the CPE / IAD

ANY PHONE, FAX OR DEVICE MUST BE CONNECTED TO ONE OF THE FXS PORTS OF THE VDSL2 IAD  
ANY OTHER SOCKET INSIDE THE HOME NETWORK (IF PRESENT) IS NOT WORKING AND USELESS ANYWAY



# WHAT HAPPENS IN THE HOME (WHEN NO POTS IS INVOLVED)?

## WHAT HAPPENS IF SOMETHING IS CONNECTED TO THE “EXTRA” SOCKETS?

### ANALOG PHONE, ON-HOOK

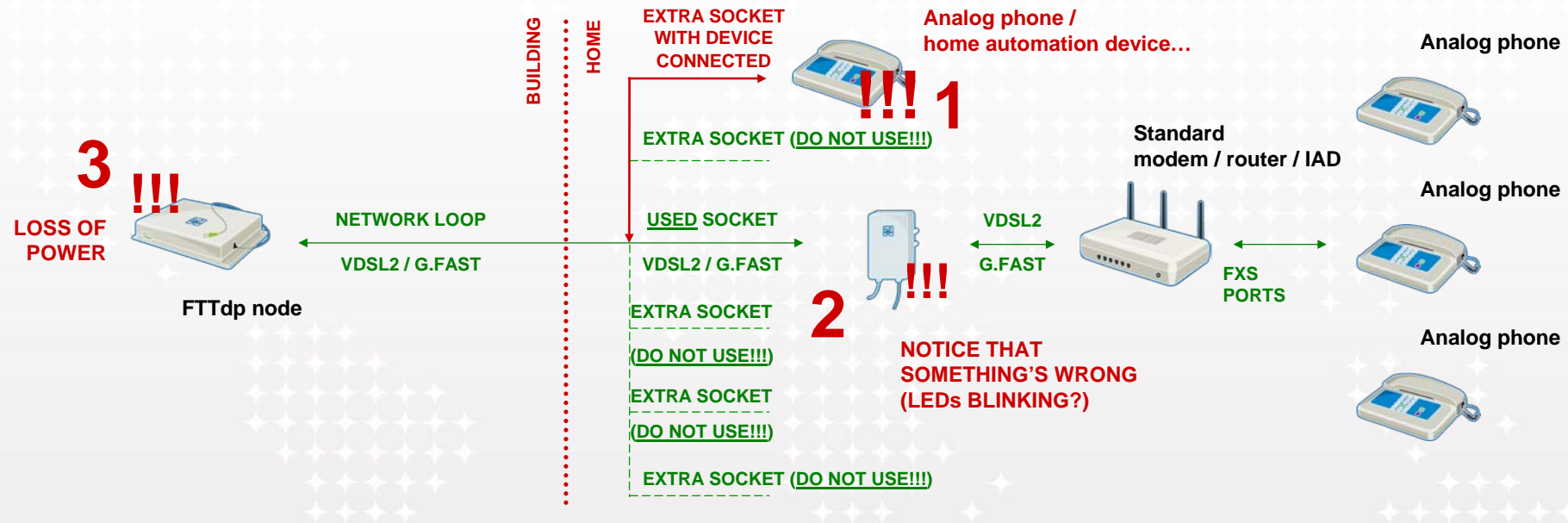
- The phone can't receive or make calls but **as soon as it stays on hook, everything works as normal**

### ANALOG PHONE, OFF-HOOK

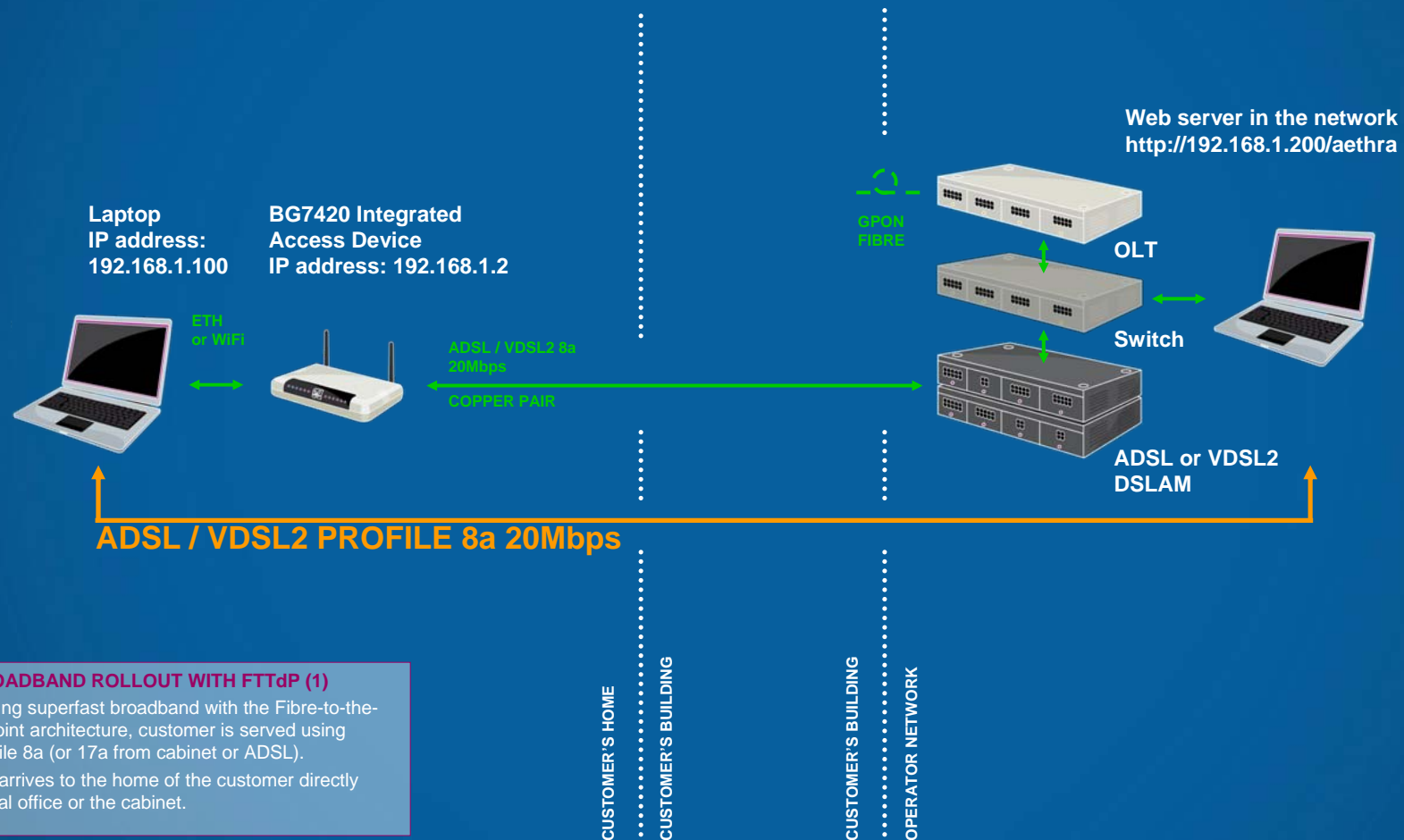
- If off hook, the phone closes the loop powering off the FTTdp node.

### HOME AUTOMATION DEVICES

- Home automation devices making service calls **MUST** be connected to the FXS ports of the IAD; door openers using off hook signals won't work anymore



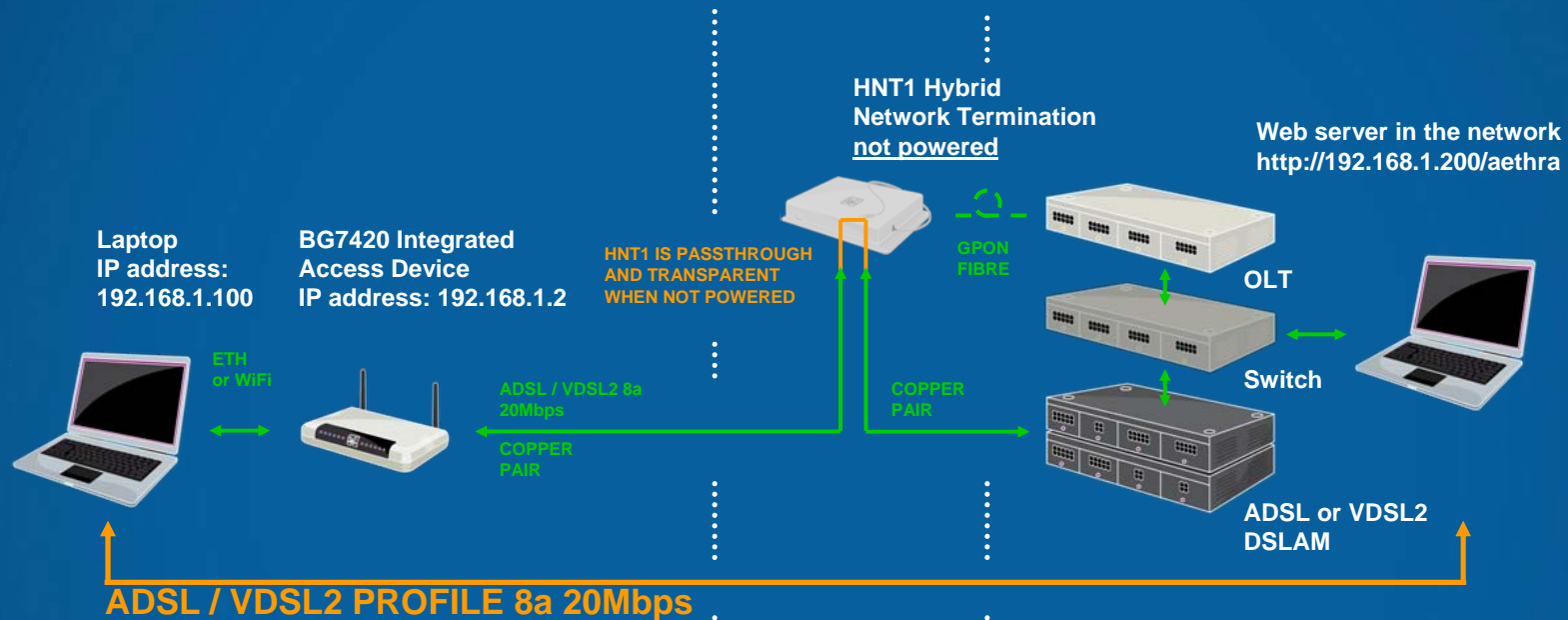
# FTTdP INSTALLATION DEMO AT OUR DESK



## SUPERFAST BROADBAND ROLLOUT WITH FTtdP (1)

- Before deploying superfast broadband with the Fibre-to-the-Distribution-Point architecture, customer is served using VDSL2 in profile 8a (or 17a from cabinet or ADSL).
- Copper cable arrives to the home of the customer directly from the central office or the cabinet.

# FTTdP INSTALLATION STEP 1



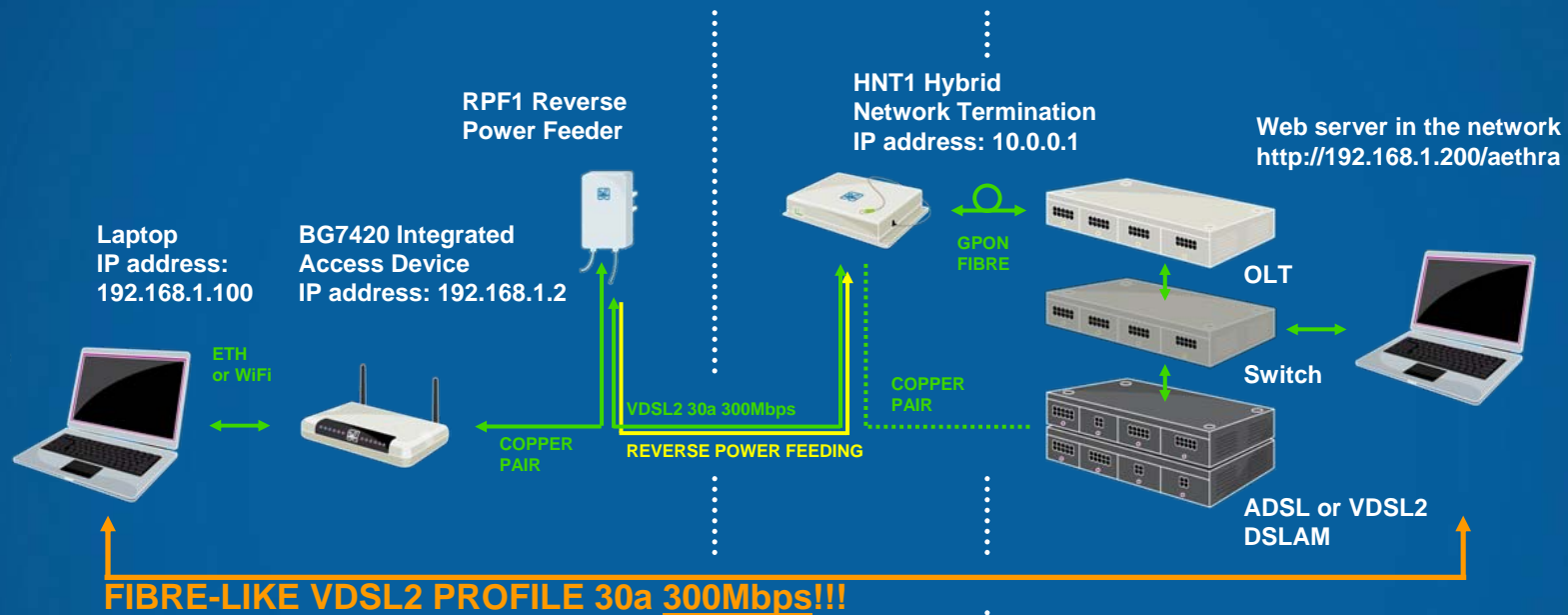
## SUPERFAST BROADBAND ROLLOUT WITH FTtdP (2)

- When fibre rollout is completed up to the basement, building floor or pole, it is possible to offer superfast broadband to the customers using FTtdP.
- Installation can be managed in two steps without:
  - drilling any further
  - scheduling an engineer appointment

## FTTdP INSTALLATION STEP 1

- The engineer installs the HNT1 board at the distribution point; the HNT1 board is still not powered
- The engineer cuts the copper pair and insert the two endings in the HNT1
- When not powered, HNT1 is passthrough; galvanic continuity of the copper pair and old service is restored.
- Service disruption for the customer due to the installation procedure is minimal and lasts less than 5 mins: just cut, reconnect and go showtime again

# FTTdP INSTALLATION STEP 2



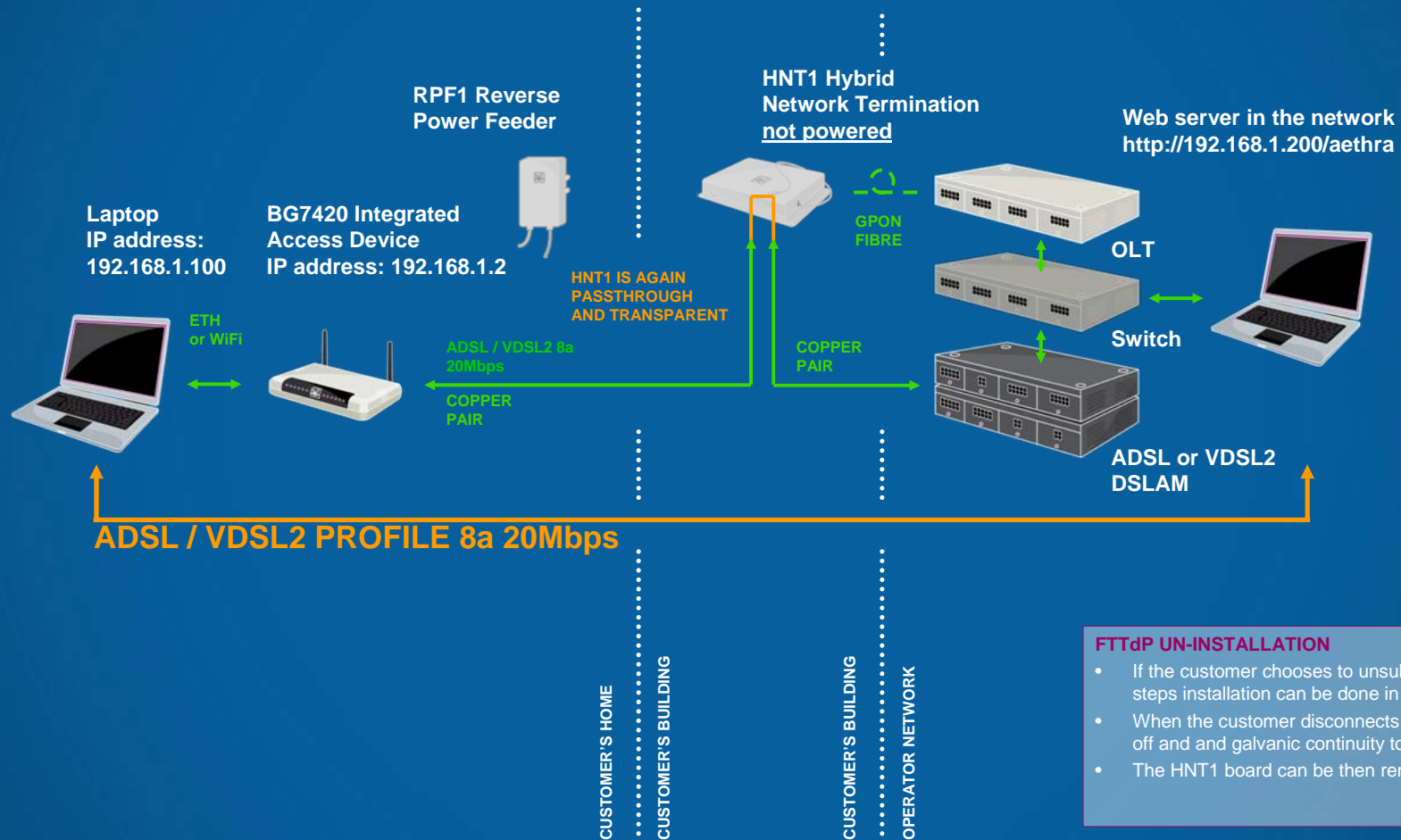
## FTTdP INSTALLATION STEP 2

- The customer receives the RPF1 and plugs it to the power socket
- The customer disconnects the modem from the master socket and connects it to the RPF1 RJ11 socket which becomes the "new" master socket

## FTTdP INSTALLATION STEP 2 (continues)

- The customer connects the RPF1 to the wall master socket using the RJ12-to-RJ11 cable provided with RPF1
- Current flows through the building loop powering the HNT1 previously installed at the distribution point
- The HNT1 disconnects the central office from the customer and start providing broadband access in VDSL2 profile 30a with 250Mbps fibre-like darates
- There is no need to change the modem

# FTTdP UN-INSTALLATION



**FTTdP UN-INSTALLATION**

- If the customer chooses to unsubscribe the service, the two steps installation can be done in reverse
- When the customer disconnects the RPF1, HNT1 is switched off and galvanic continuity to central office is restored
- The HNT1 board can be then removed to be reused



# ORANGE POLAND FTTdp FIELD TRIAL IN WARSAW

**FNN** FAST NET NEWS

**Calix**  
U.S. No. 1 fiber access vendor  
by 2-to-1 over all other vendors

**Calix**  
All other vendors: 198  
Calix: 417

Broadest ONT portfolio in the industry

HOME DSL PRIME DOCSIS REPORT FIBER NEWS INTERNETANDTELEVISION A WIRELESS CLOUD ABOUT POLICY ITU

**Latest Issue**  
France Telecom Wants Fiber to the Basement. Not All the Way Home

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**Orange and Aethra® Telecommunications test FTTdp in Warsaw.**  
Tuesday, 11 February 2014 09:14

Orange Polska is currently working with Aethra® Telecommunications to test the possibilities offered by the Fiber-to-the-Distribution-Point (FTTdp) technology. The trial will cover the last tens of meters of copper to overcome the issues...

**Technology Solutions**  
CenturyLink recently bid adieu to the Savvis brand by renaming the division CenturyLink Technology Solutions. A move that reflects the company's growing identity in the managed services, colocation and cloud services space. So what does this name change do for existing CenturyLink and Savvis customers?

**Network infrastructure 2014 market outlook: opportunities and threats**  
Changes in network usage and technology are creating opportunities and threats for network infrastructure vendors, including carrier routing and switching and optical transport systems vendors.

**EXECUTIVE INSIGHTS**  
Why it's Time for the Telecoms Industry to Embrace Carrier Ethernet Standards  
Tell your story with Executive Insights  
Submit Executive Insights

**POPULAR COMMENT THREADS**  
ADTRAN's Kevin Morgan becomes vice chair of FTTH Council Americas board  
Obama's Farm Bill provides \$50M for rural Gbps broadband  
FCC dedicates \$2B to bring broadband to schools, libraries  
Utah lawmakers propose anti-municipal broadband provider legislation

**Obama's Farm Bill provides \$50M for rural Gbps broadband**  
February 10, 2014  
Rural telcos that are looking at deploying Gbps-based broadband networks will now have more financial assistance after President Obama...

**France's Arcep creates fiber to the distribution point architecture working group**  
February 10, 2014  
Arcep, France's telecom regulator, is relying on a new working group to address the emerging fiber to the distribution point (FTTdp) concept, which allows for 200 Mbps speeds and above over existing copper by driving fiber very close to a subscriber's home or premises.

**beefs up SDN testing capabilities**  
February 10, 2014  
Aeroflex, a microelectronics and test and measurement equipment provider, is strengthening its software defined networking (SDN) capabilities by purchasing Dublin, Ireland-based Shencor Network Systems.

**Will Verizon's "One Verizon" initiative drive further**

**LightReading** Networking the Telecom Community

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NEWS & VIEWS

FEATURED CONTENT

JOHANTONIO, 2/11/2014 3:11:32 AM  
**Not Your Grandpa's Carrier Wife**  
Re: The market for wifi calling  
The idea of wifi calls is interesting. On one hand, there already are many ways to call over a wifi connection and/or a data plan (Skype, Hangouts, etc). What would make calls over carrier wifi different and more attractive?...

NASIMSON, 2/11/2014 11:07:34 PM  
**Verizon Pulls Plug on Smart-Home Service**  
Re: Re: Great idea!  
I agree. Especially in major metropolitan areas where you get squeezed into only 1 or 2 choices because of zoning.

PCHARLES09, 2/11/2014 10:53:05 PM  
**Charter Seeks to Replace TWC Board**  
Re: Re: Charter  
I agree. I don't think Verizon did a good job marketing this. When I checked it out online, it seemed like an odd add-on service. I never heard much about it otherwise. That said, I think all service providers are going...

CRAIGLEDDY, 2/11/2014 10:39:16 PM  
**Know Your Small Cell: Home, Enterprise, or Public Access?**  
Re: Re: A quick guide  
Thanks, Dan. I think any attempt to define this emerging market is helpful. It will be interesting to see how cable MSOs or other service providers attempt to use small cells in a service offering for business customers...

CRAIGLEDDY, 2/11/2014 10:10:28 PM  
**Verizon Pulls Plug on Smart-Home Service**  
Re: Re: Verizon  
I agree. I don't think Verizon did a good job marketing this. When I checked it out online, it seemed like an odd add-on service. I never heard much about it otherwise. That said, I think all service providers are going...

PZERNIK, 2/11/2014 1:00:41 PM  
**Sprint Plans Indoor, Outdoor Small Cells in 2014**  
Re: Re: Small cell & VoLTE  
Small cells are a pure capacity play, and only in urban areas. I don't think Sprint will solve any coverage issues with small cells (that will be Band 26). I do see Band 25 being very useful for in-building, small...

Phoneline's Text Message Service  
Tuesday, February 11, 2014

Verizon Launches New Triple-Play Offers  
Tuesday, February 11, 2014

Sprint Adds 58K Postpaid Subs in Q4  
Tuesday, February 11, 2014

Telias Unveils Routers for Backhaul  
Tuesday, February 11, 2014

ETB Launches FTTH With ZTE  
Tuesday, February 11, 2014

Kathrein Tackles In-Building Coverage

**Orange, Aethra Test FTTdp**  
Tuesday, February 11, 2014

Bandwidth Optimizer  
Tuesday, February 11, 2014

Netsocket Enables Virtualized Edge Networking  
Tuesday, February 11, 2014

Canon Certifies This Tech's Metaform for VOD DAI  
Monday, February 10, 2014

WOW! Names Executive Leadership  
Monday, February 10, 2014

MOORE NEWSFEEDS

**Telecom to expand operations in Japan Asia Pacific with Lenovo**  
03 December 2013 08:55

based Cubic Telecom is to expand its operations in Japan a Pacific with Lenovo, the world's largest PC vendor. This will Cubic Telecom to extend its unique global connectivity to its partners in Japan and the Asia Pacific region.

**30% on international business**  
3/3 12:13

tel

Digitech Communications, through its brand bibel, introduces its innovative sim-skin, a clever product designed to drastically reduce rates for companies looking to conduct

**Cisco VNI Mobile: FaceTime Study**  
Cisco's latest Visual Networking Index (VNI) is out, and the data usage numbers are as staggering as ever.

Global Mobile Video Growth

Mobile Data Trends in Developing & ...

Igniting the Future: Sprint Spark

INFOGRAPHIC ARCHIVE

**UPCOMING LIVE EVENTS!!**

Creating Trust in the Mobile Network  
Breakfast @ MWC  
February 26, 2014, Barcelona, Spain

Cable Next-Gen  
March 27, 2014, Denver, CO

# FTTdp TRIAL IN WARSAW: FACTS AND KPIS...

- **20 Aethra® Telecommunications HGV1 Access System deployed in a University Campus in Warsaw as a part of an Orange Poland FTTdp evaluation project**
- Started in January 2014, still ongoing (ending in June 2014)
- Test FTTdp systems stability & reliability
- Test FTTdp systems available functionalities & remote management
- **Compare user experience between FTTdp and pure FTTH** (other users in the Campus are connected in FTTH)
  - **Testing both VDSL2 profile 17a and a pre-release of profile 30a Annex P (200Mbps downstream speeds)**

## **TEST FTTdp INSTALLATION PROCESS AND CUSTOMER SELF INSTALL** **(RPFs AND MODEM GIVEN TO THE STUDENTS)**



**ENGINEER TIME AT THE DISTRIBUTION POINT TO  
INSTALL ONE SINGLE DPU IS AROUND 30min.  
(CAN ANYWAY BE OPTIMIZED)**

**NO TECHNOLOGICAL ISSUES ON THE SELF  
INSTALL PROCEDURES, JUST HUMAN ERRORS /  
“WEIRD” BEHAVIOURS  
(PEOPLE DO NOT READ MANUALS!)**

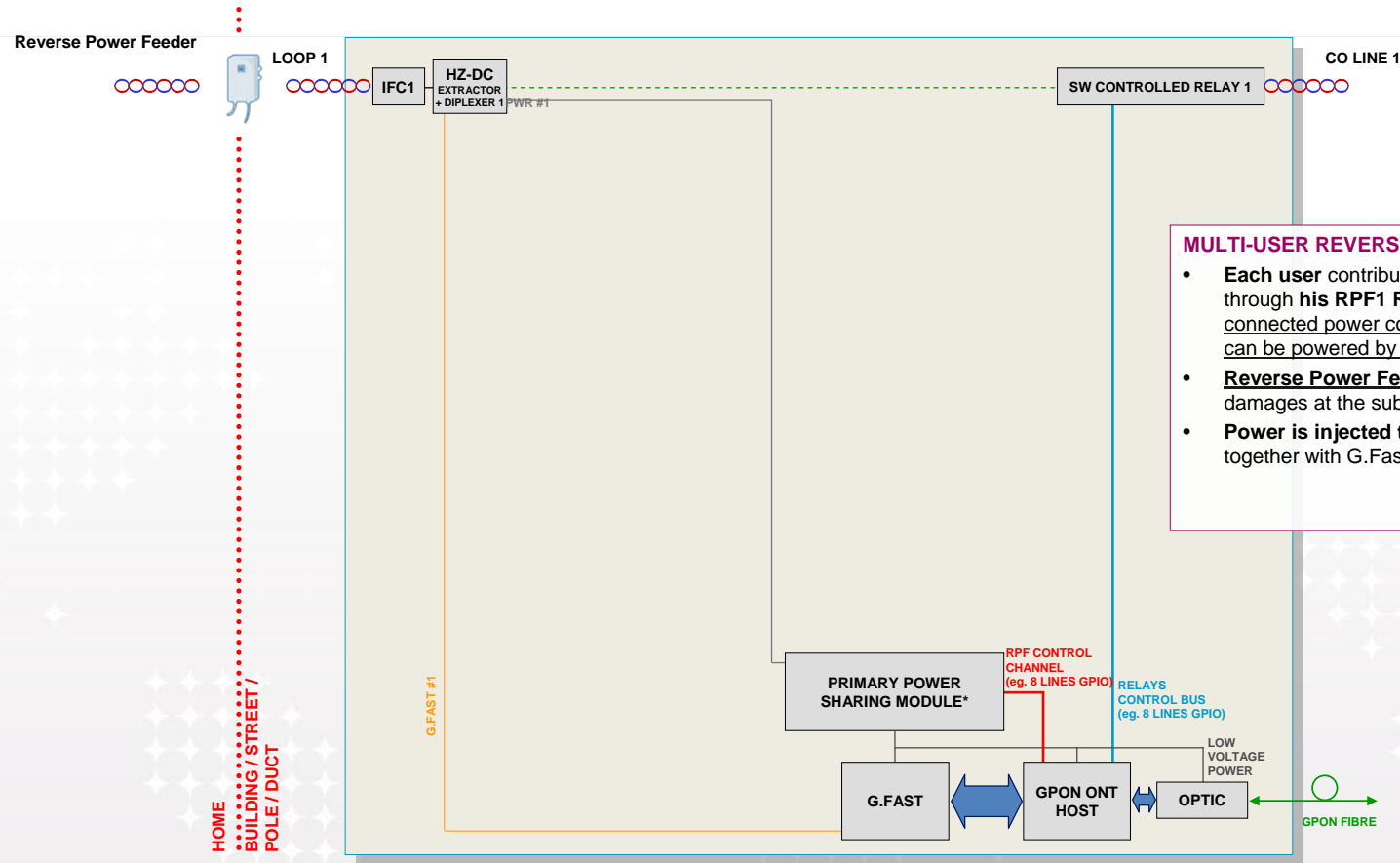
# WHAT ABOUT MULTI-PORT SYSTEMS?

- **Reverse Power Feeding** technology **MUST handle power sharing**
  - **one single reverse power feeder** unit (RPF1, what you plug to the wall in the subscriber flat / apartment) can **power up an entire board** with one channel active
  - if an **extra user** is activated, **his power feeder contributes to the feeding of the boards, sharing the power consumption with the other ones connected and so lowering it for each one**
  - **G.Fast ports are automatically de-activated if the relative RPF is disconnected**, to avoid that customers disconnecting their power feeders would still be able to have access to the service

# POWER SHARING: HOW FAIR IS FAIR ENOUGH?

- **How much power can we drain from each customer so that it can be considered “fair”?**
- Some concepts and possible approaches:
  1. If a **user disconnects his Reverse Power Feeder, he must not be able to access the service**
  2. If more than one user is connected, the **Power drained from each one of the users connected should be equally divided, regardless of the distance or quality of the cable**
  3. Other options may include:
    - Power should be drained only if the user is actually using the service (taking advantage of G.Fast low power mode)
    - Power should be drained in relationship to the actual usage of the service (“I’m using more bandwidth, I’m providing more power”)

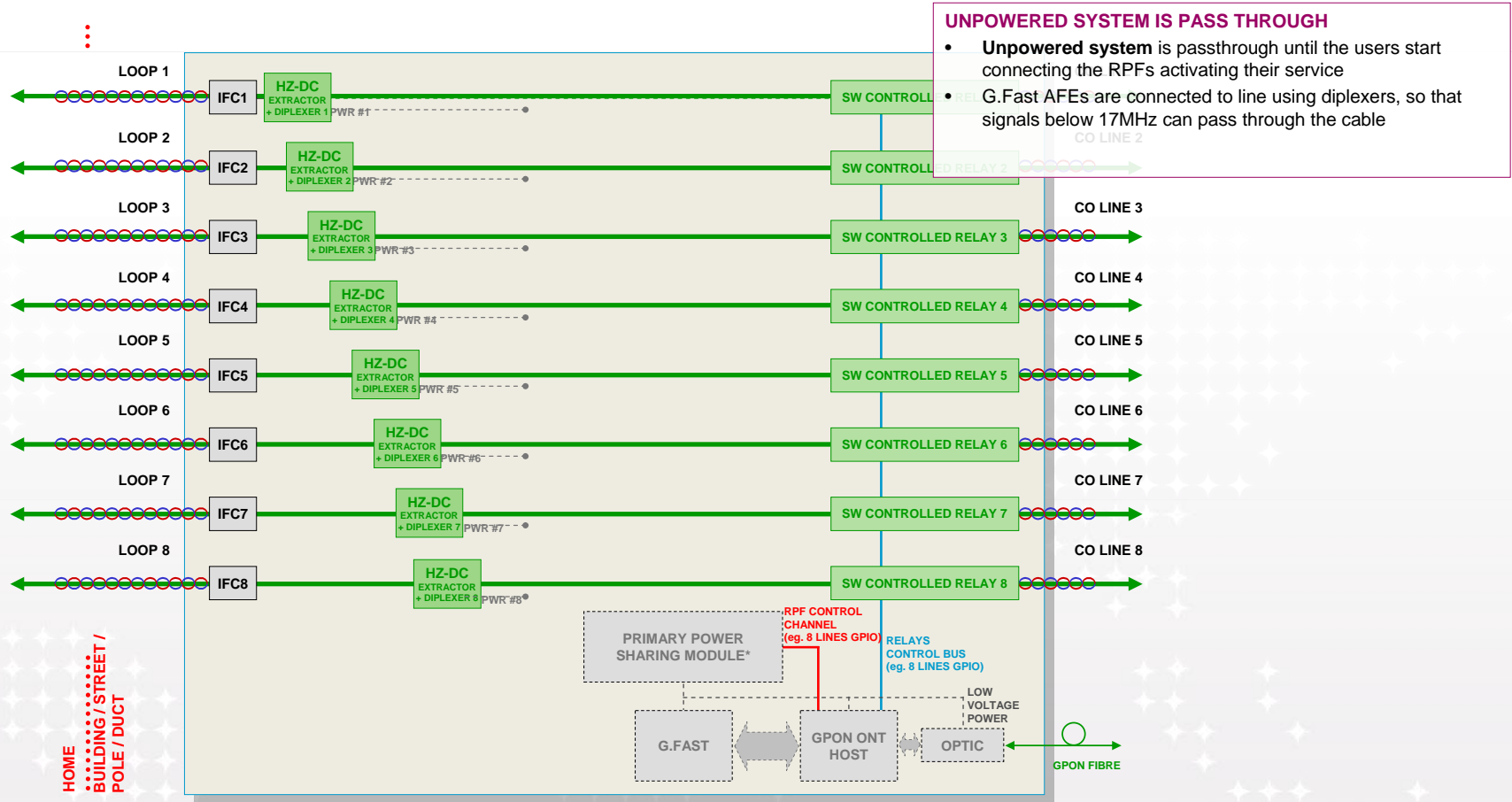
# LET'S HAVE A LOOK AT HOW IT WORKS...



## MULTI-USER REVERSE POWER FEEDING TECHNOLOGY

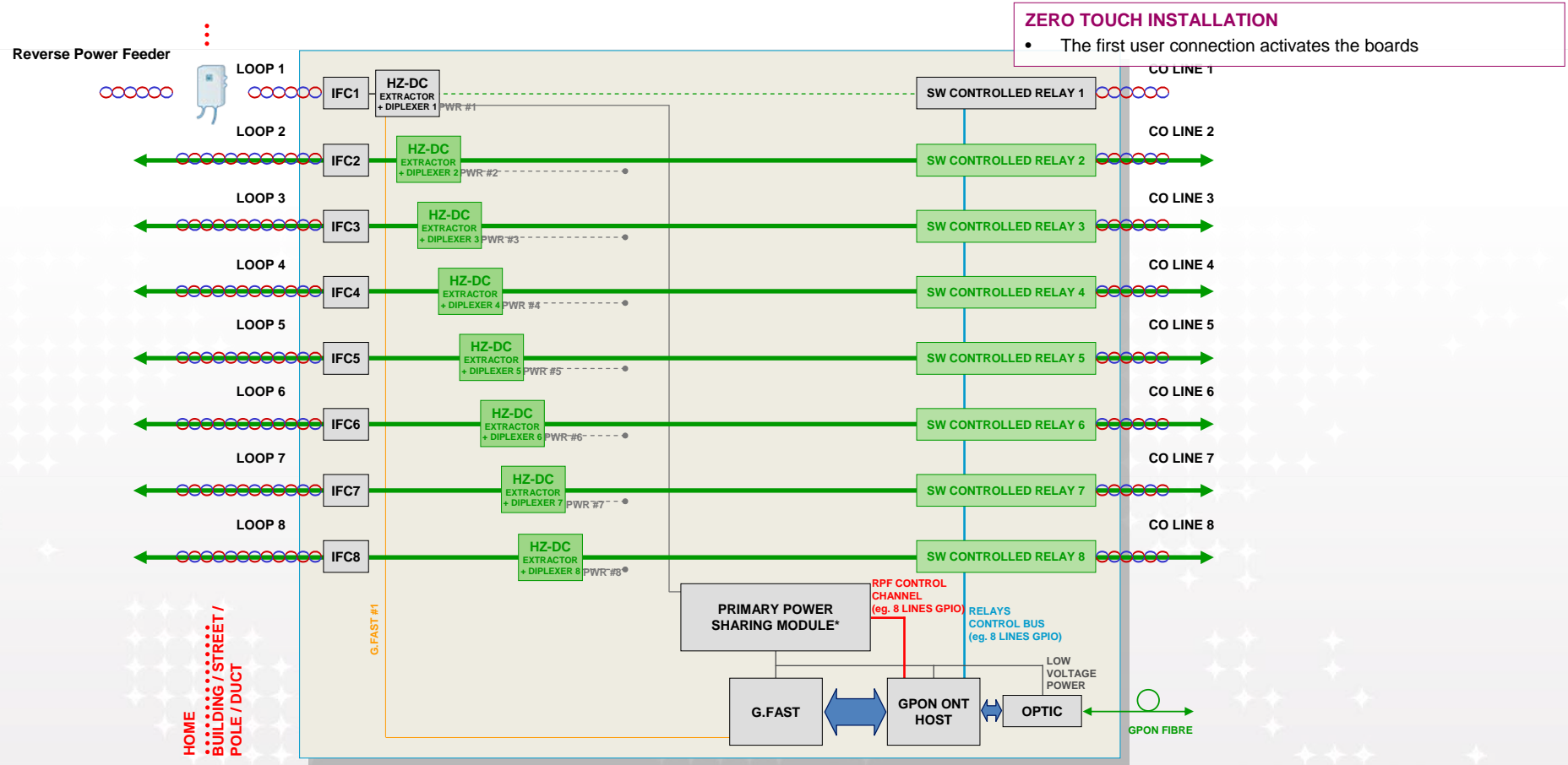
- **Each user** contributes to the powering of the HNT8 system through his **RPF1 Reverse Power Feeder**; if just one user is connected power consumption is less than 8W, so the board can be powered by just one RPF1
- **Reverse Power Feeding technology** prevent problems and damages at the subscriber apartment / flat
- **Power is injected through the building loop in DC**, carried together with G.Fast and extracted inside the HNT1 board

# LET'S HAVE A LOOK AT HOW IT WORKS...

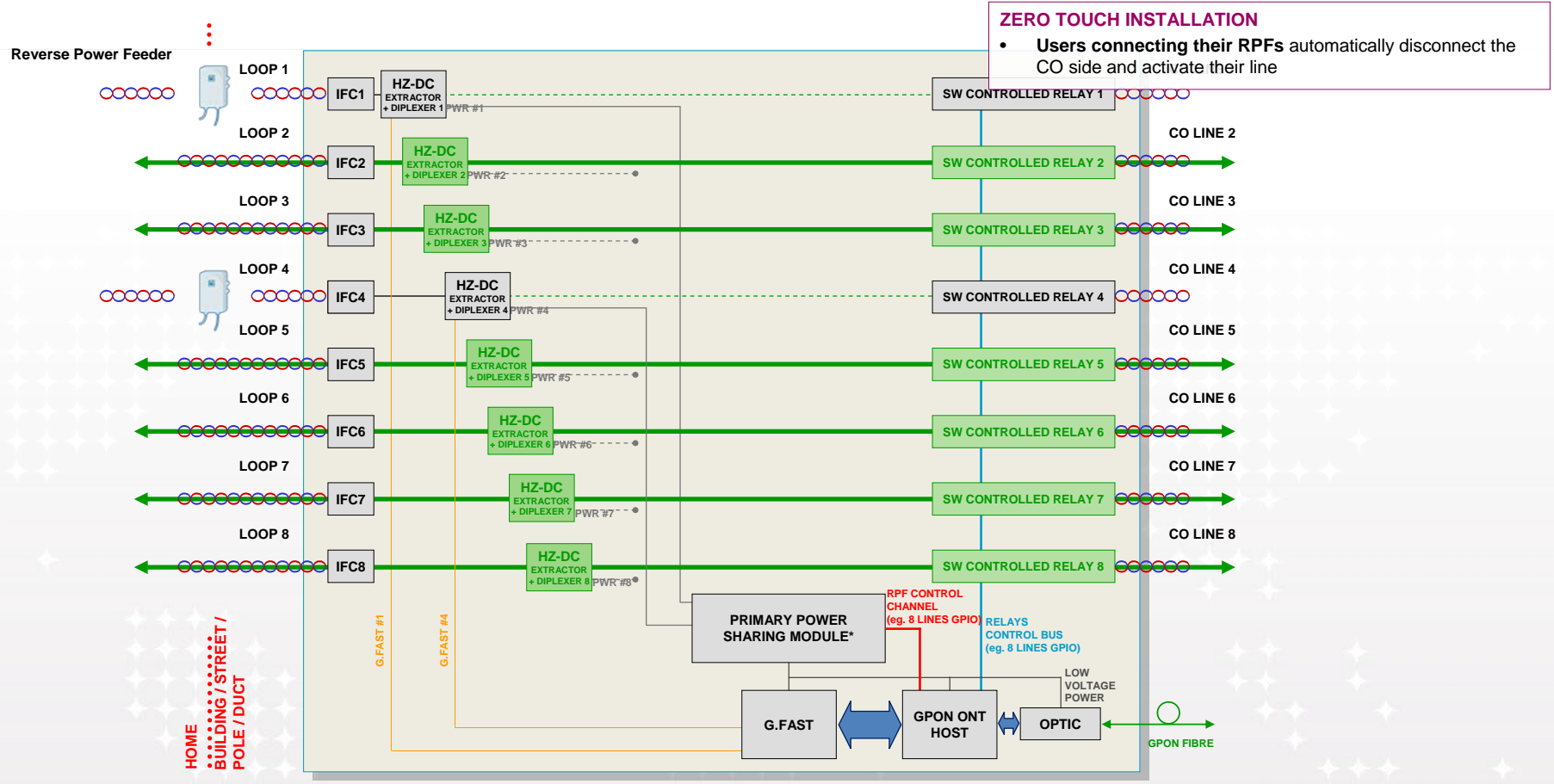




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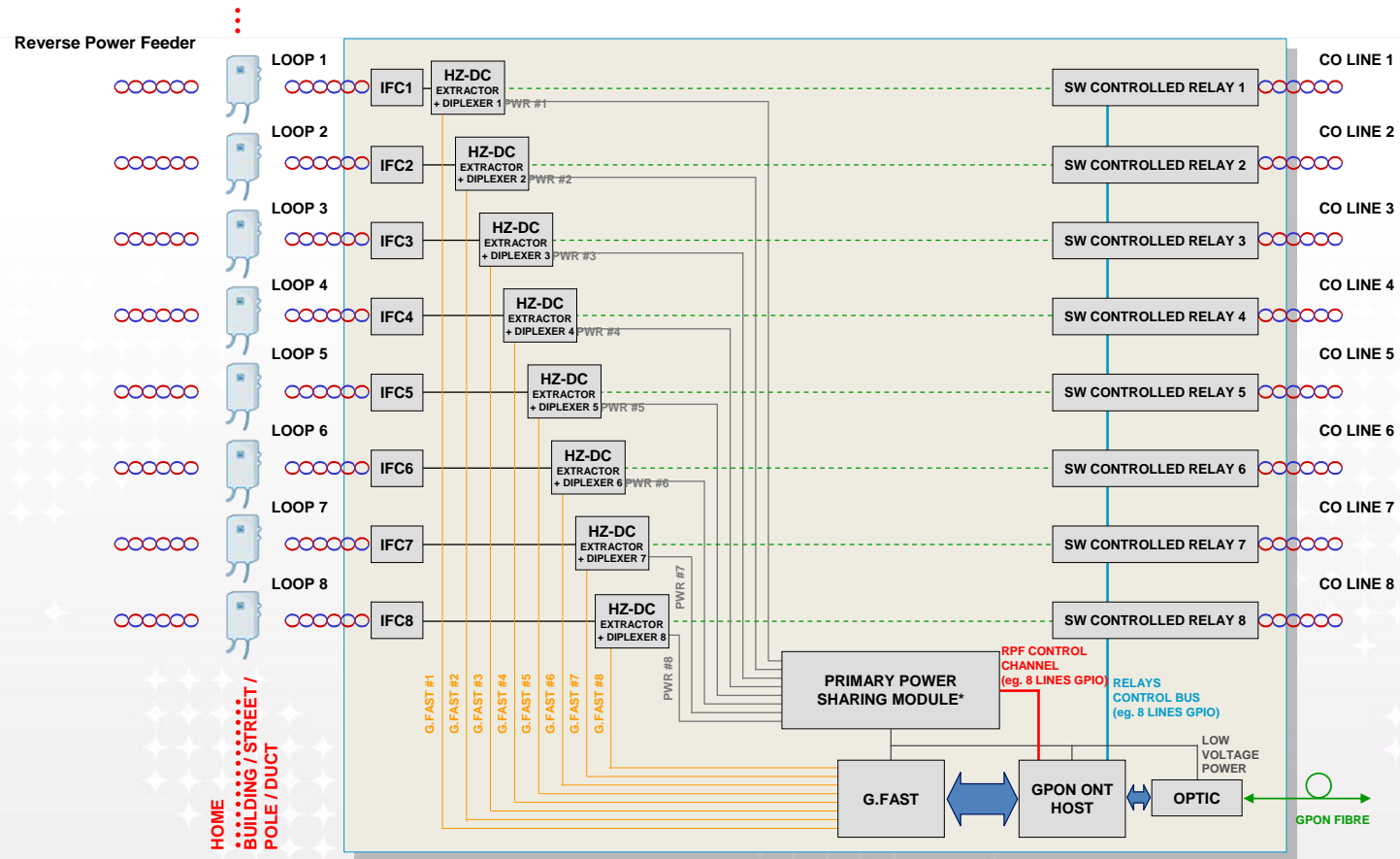


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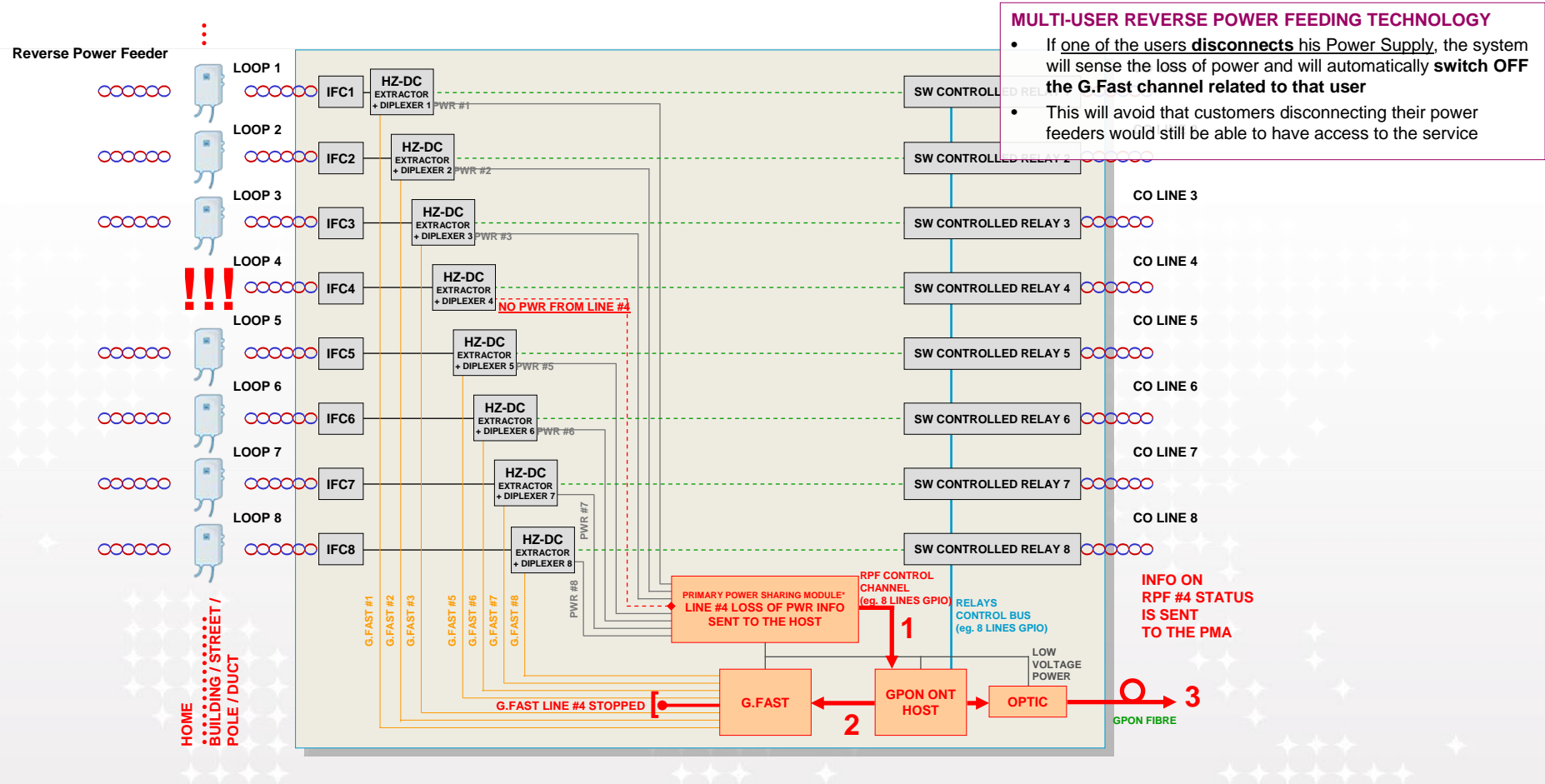




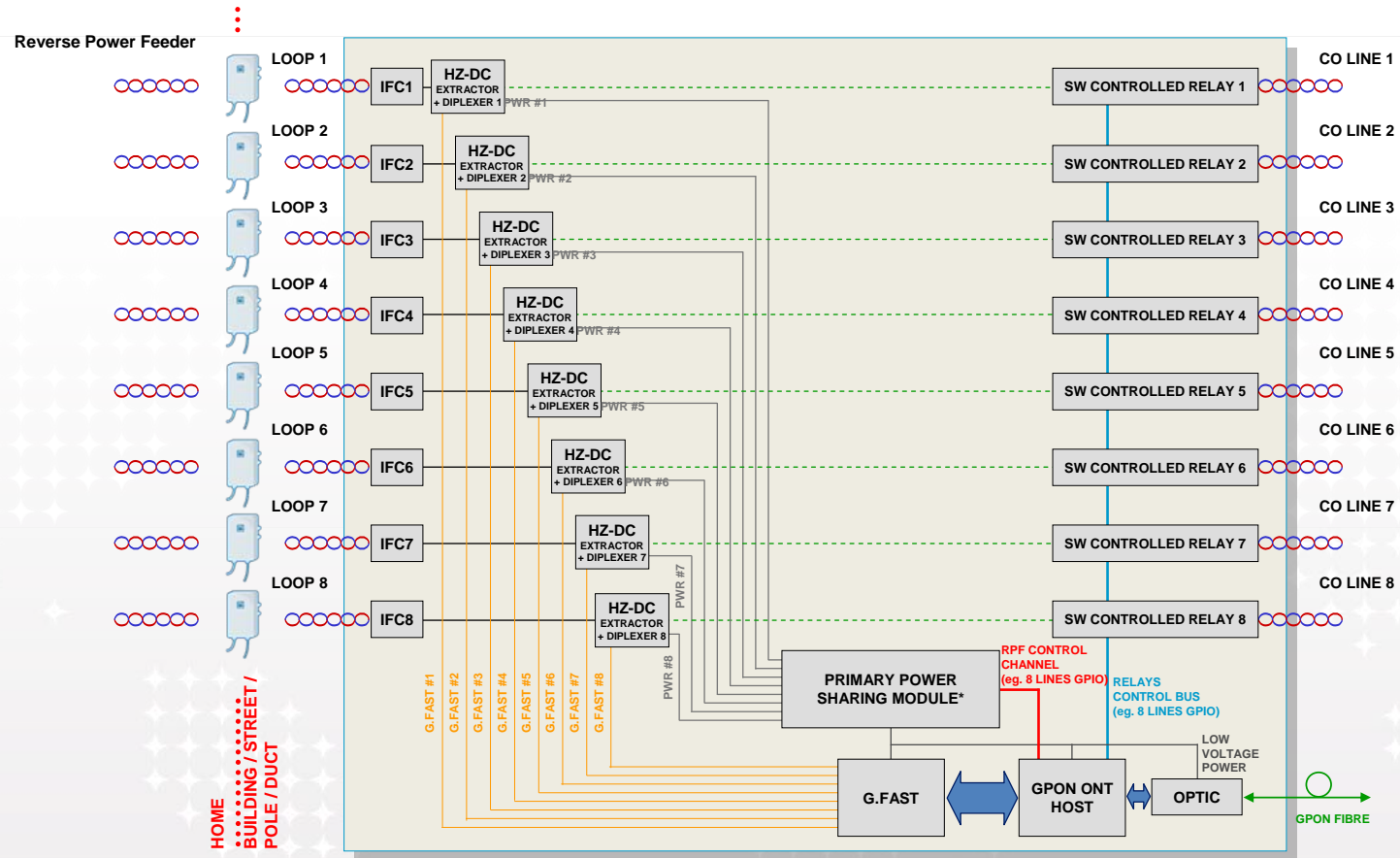
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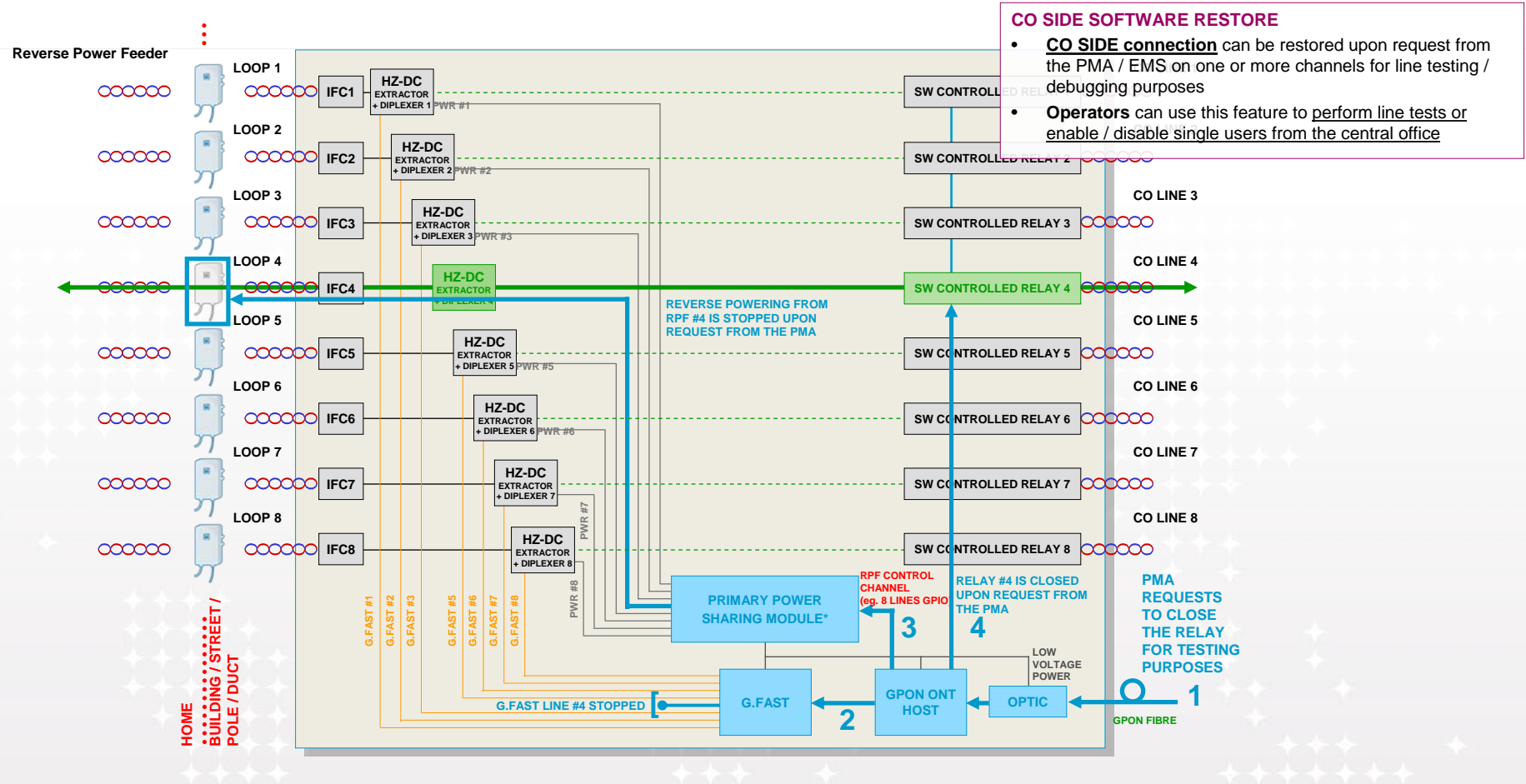
# LET'S HAVE A LOOK AT HOW IT WORKS...



# LET'S HAVE A LOOK AT HOW IT WORKS...



# LET'S HAVE A LOOK AT HOW IT WORKS...



# WE'RE HAVING FUN, SO LET'S ADD SOME MORE COMPLEXITY..



# CONCLUSIONS

- **G.Fast** and **FTTdp** have been designed to speed up the roll-out of **superfast broadband without impacting on the existing infrastructure** where the impact would raise the highest number of problems, **the home of the customer**
- **Great technological effort in order to:**
  - Give certain deployment times
  - Save money
  - Offer FTTH-like service without compromises
- **Self Install is a key point in the success of this technology**



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