

# First Mile Solutions (Task Force 2):

- Zero Touch solutions

- Operators sharing experience to drive standards



## Experience Drives Standards

- Operators share experience with new deployments of ADSL2plus and VDSL2.
- Fluctuating noise problem predications from MUSE I born out in IPTV centric services.
- Shared experience provides basis for action by TF2 partners in ITU, ETSI and DSL Forum.
- Driven partners' independent work to define noise models and test methods for use in driving standardisation requirements.
- The story is not over yet. Influence is still being brought to bear to force ADSL2/ADSL2plus and VDSL2 standards for improved immunity to fluctuating noise.
- Impact will be seen in revisions to ITU recommendations and DSL Forum testing requirements for modems.
- Look out for the TF2plus project, continuing this work beyond the end of MUSE II.

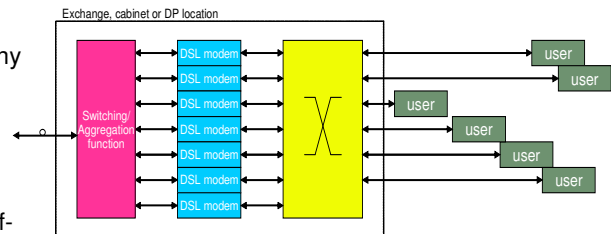
## Zero Touch

*The financial case for delivering much higher user bandwidth, by taking DSLAMs closer to the customer, rests on reducing OPEX to offset higher CAPEX. Elimination of physical operational interventions at the remote - Zero Touch service provisioning first line repair, and OAM - is the key to reducing OPEX costs despite increasing the cost of each intervention..*

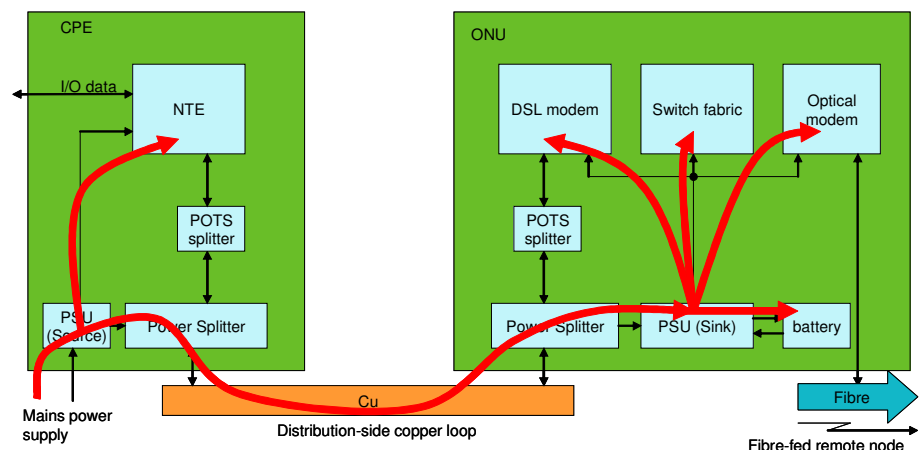
Very high service penetration makes it possible for network operators to consider proactive service provision, so that customers' lines do not require further physical attention after equipment provisioning. Zero touch service connection, and maintenance becomes feasible.

Zero Touch is of most benefit for very small remotes nodes located close to the subscriber, where physical access can be physically difficult and expensive. Manual operations on a network with potentially millions of remotes nodes are infeasible

Radical approaches have been considered, but in many ways the simplest solution seems the best. An analogue switch matrix is at the heart of providing flexibility, Local Loop Unbundling support and self-healing.



Powering of large numbers of remotes nodes is also problematic. Reverse power-feed, where the subscriber provides power to the remote unit over the copper pair in question, appears to be a good solution for the problem, but the need for life-line Telephony Service in the absence of local power is an issue.



# First Mile Solutions (Task Force 2):

- Zero Touch solutions

- Operators sharing experience to drive standards



## Zero Touch Remotes

The near 100% penetration of ADSL has created a commodity market which means that network operators will require ultra low cost OPEX to maintain profit margins. OPEX can be reduced by the use of radical first mile architectures which incorporate zero touch remote nodes. These must be flexible in deployment and service set, enable customer self-provisioning and support legacy services (POTS). Higher data bandwidths and reduced energy consumption must also be achieved within constraints arising from regulation.

EU directives require competitors to be able to have access to customers' lines from the exchange and this requires a remote node to support final drop reallocation. An obvious solution is to employ a remotely controlled analogue switch matrix.

Separation of Network Access Provider (NAP) and Loop Provider (LP) roles, driven by Local Loop Unbundling, leads to the opportunity for novel intra-provider services. An LP who installs an analogue switch matrix at a node to provide access to the plant for a remote node under LLU, can also provide an analogue switching service to the NAP.

The functionality of the switch can be logically partitioned to provide functions that can be incorporated in a 'Virtual DLSAM' owned by the NAP.

This combination allows the loop provider to provide sparing capability and it also allows the network access providers to accommodate churn in a 'Zero Touch' context.

## Experience Sharing Impact of Fluctuating Noise on DSL

### Impact of fluctuating Noise on IPTV:

- Retrans >> freeze frame or black outs
- Isolated impulses >> block artefacts

### REIN (Repetitive Electrical Impulse Noise)

It turns out that REIN, mains power related 100Hz period noise, can be 20dB more severe than previously thought.

### PEIN (Prolonged Electrical Impulse noise)

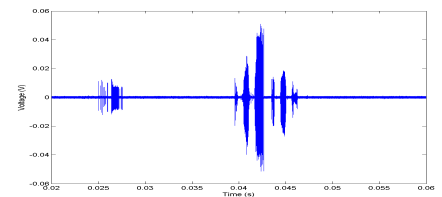
Field studies revealed that isolated impulses with lengths up to 10ms are frequent enough to pose a serious threat to DSL service stability

### RFI Ingress (From AM broadcast signals)

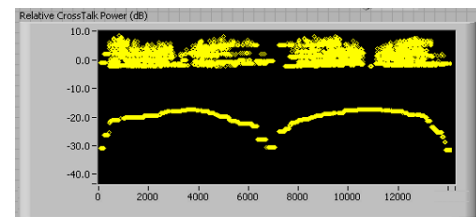
Various trials and real service experience reveals that ingress of broadcast radio signals covering a significant part of the VDSL2 spectrum can cause service instability even at modest levels, due the impact of independent noise power fluctuations over a wide band.

### Fluctuating Crosstalk

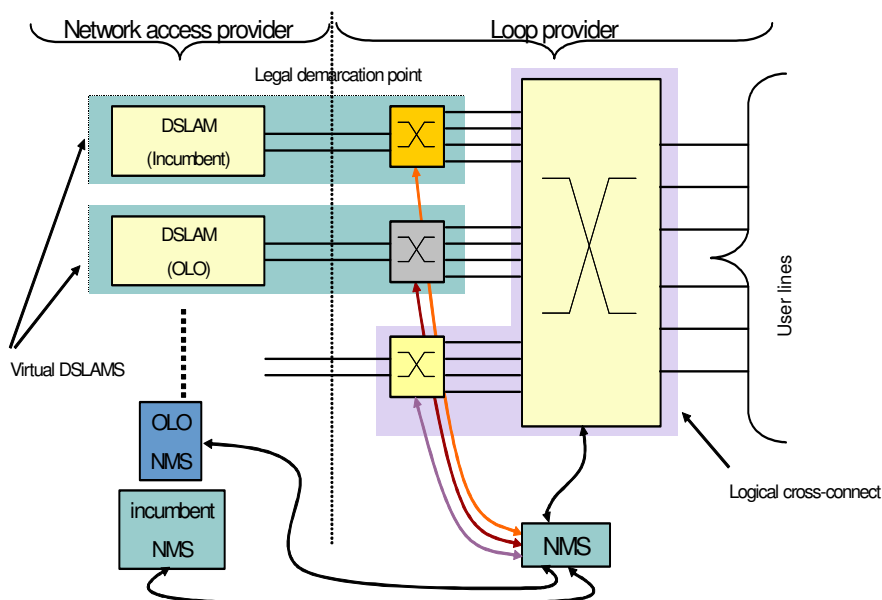
Field experience and lab tests reveal that fluctuations in crosstalk noise can cause service instability that threatens IPTV



20ms long PEIN event



Two days simulated ADSL2plus crosstalk with L2 low power mode enabled



MUSE is a European consortium of vendors, operators and universities, active from January 2004-March 2008. The aim is cooperation on research and development of future, low cost, multi-service access networks.

MUSE is partly funded from the FP6 programme of the European Commission and this study on Zero-touch service provisioning is one of its deliverables (DTF2.5).

More information on MUSE and this task force can be found on the MUSE website:

[www.ist-muse.eu](http://www.ist-muse.eu)

December 2007