xDSL Based EFM

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Shahar Bar-Or (shahar@ metalink.co.il)

Supporters

- Steven Haas, Infenion
- Klaus Fosmark , Firstmile Systems

Outline

- What's inside an EFM termination unit?
- Advantages of adopting a few xDSL standards
- Overview of currently available xDSL PHYs

What does EFM PHY require?

- **Single pair** non- loaded voice grade copper

distance >= 2500ft and speed >= 10Mbps aggregate
(Study group objectives)

- **Multi-Pair** and link aggregation
- **High Bandwidth**

✓ >= 21.5 Mbps downstream (3 simultaneous video streams + voice + data)

✓ >= 3 Mbps upstream, would like enough for an upstream video Feed *(A Carrier's Perspective, Charles Cook, Quest, Oct 2001, LA)*

What does EFM PHY require?

- **Cost**
  "Cost - low cost, in fact" *(Local Operator Perspective, Carlos Ribeiro CTBC Telecom September, 2001)*
- Availability of choices for the physical layer *(Carlos Ribeiro CTBC Telecom October, 2001)*
- **Time to market!**
  "What should we do to make IEEE 802.3ah work well with IP? - Keep it as simple as possible. [….] Simple may help with time to market by allowing rapid consensus.*"*
  (ISP requirements for EFM, Fletcher Kittredge GWI, October 01)

Can we have one unit that does it all?

What does EFM PHY require?

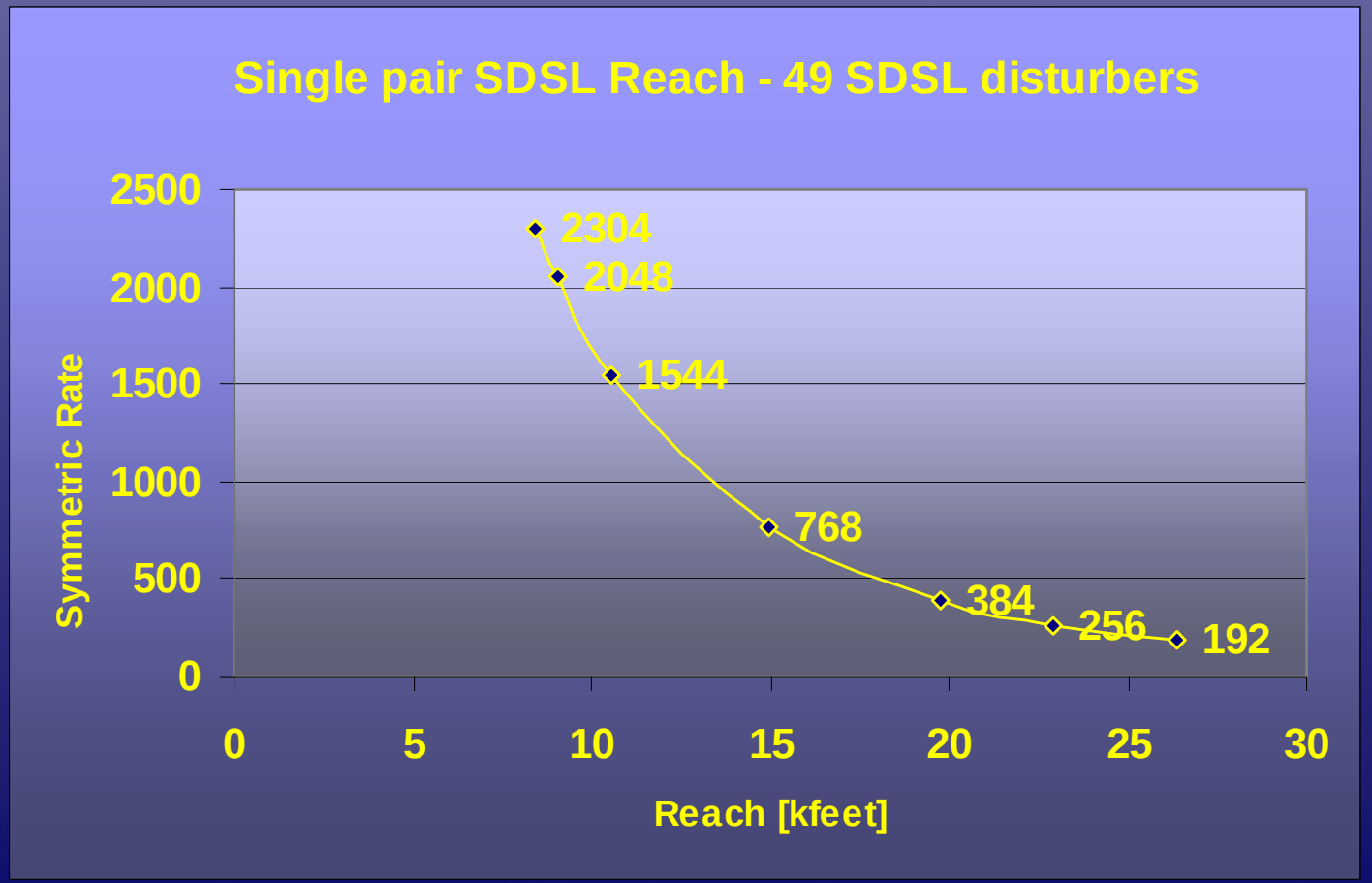
- **An EFM termination unit can contain either:**
  - Fiber modem inside
  - Coax cable modem inside
  - Twisted pair modem inside
    - Single pair chipset
    - Multi-pair chipset

Did we **intend** to have one unit that does it all ???

Existing standard twisted pair PHYs

- G.991.2 SDSL Advantages
  - Symmetric Technology primarily for Business deployment
  - Very reliable, technologically is mature and deployed as HDSL2 for T1/E1 transport in the US
  - 1 or 2 pair operation is already standard
  - Supports repeaters – practically reaches 100% of the subscribers
  - Reach > 26.4 kft on 24AWG (49DSL disturbers)
  - Aggregate Rate > 9.2 Mbps is over the ***standard*** SHDSL two pairs

Existing standard twisted pair PHYs



ITU G.991.2 SDSL guaranteed performance

Existing standard twisted pair PHYs

- ITU G.993.1\T1E1VDSL Advantages
  - Highest bandwidth per a twisted pair line
    - T1E1 guarantees 52Mbps aggregate, higher rates are also possible
  - Supports Asymmetric Rates
  - Very flexible US vs. DS rate trade-off
  - Preferred technology for a simultaneous Video, Voice and data
  - Low cost

Existing standard twisted pair PHYs

- G.992.1 ADSL Advantages
  - Widely deployed for residential applications in US and Europe
  - Supports Asymmetric Rates
  - Low cost

Advantages of adopting a few xDSL standards (or, let's not loose the freedom to choose!)

- Allowing EFM to choose various PHYs technology will enable the technology to better suite for different market needs
- It will also allow to develop a more cost-effective solution per a market niche
- Adopting already existing xDSL standards will speed-up time to market of the EFM standard as well as Ethernet based products

Motion

- Adopt the following standards for the PHY
  - ITU 991.2 (SHDSL)
  - ITU G.993.1 & T1E1.VDSL (VDSL)
  - ITU 992.1 (ADSL)