

FTTH/ODN/OTN China Conference 2011

**FOOCC**



# FTTH Technology Developments and Trends

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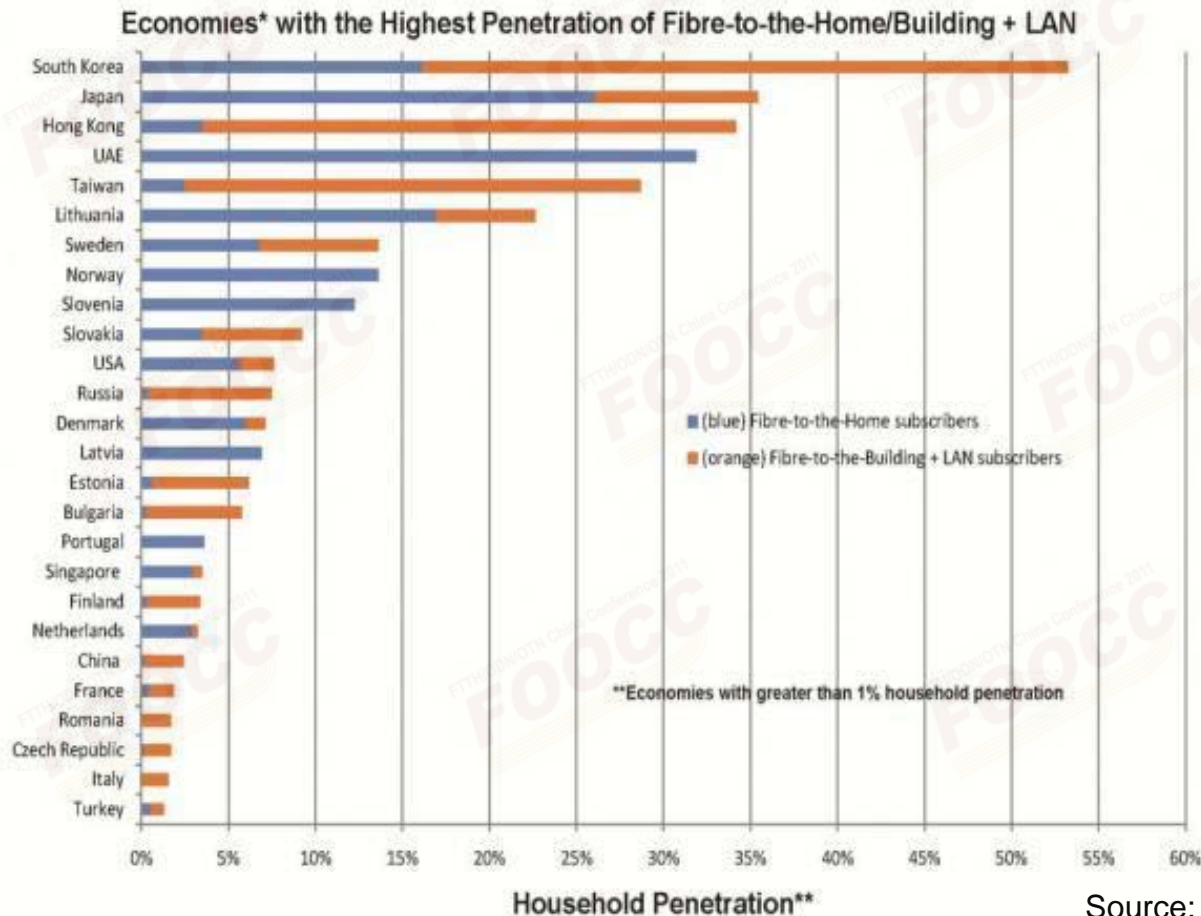
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# Agenda

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- Where we are now
- The next generation of FTTH
- Cable operators and FTTH
- Residential gateways evolve
- Transceiver-level technology advances
- Cabling and enclosure advances
- Conclusions

# FTTH popularity continues to grow



Source: FTTH Council, Feb 2011

# Three well-established technology options

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- EPON
  - Leverages IEEE standards
  - Benefits from volume production of Ethernet components for applications other than FTTH
  - Particularly popular in Asia
- GPON
  - Leverages ITU-T/FSAN standards work
  - Favored by Western carriers who helped write the standards
  - Standards generally slower to be completed than EPON, but greater transmission capacity
- Point-to-Point Ethernet
  - Also leverages IEEE standards and Ethernet economies of scale
  - Uses more fiber, so costs can be higher than PON
  - Currently provides greatest bandwidth potential
  - Most easily accommodates “open access” – where several service providers share the same network

# 10G PON comes next

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- IEEE 802.3av (10G-EPON) standards arrive first
  - IEEE P1904.1 Working Group (SIEPON) seeks system-level interoperability
    - SIEPON = Standard for Service Interoperability in Ethernet Passive Optical Networks
    - EPON system-level interoperability specifications covering equipment functionality, traffic engineering, and service-level quality of service (QoS) and class of service (CoS) mechanisms
    - Management specifications covering: equipment management, service management, and power utilization.
    - Draft 2.0 of standard due to be posted for comments this week

# GPON also moves to 10G

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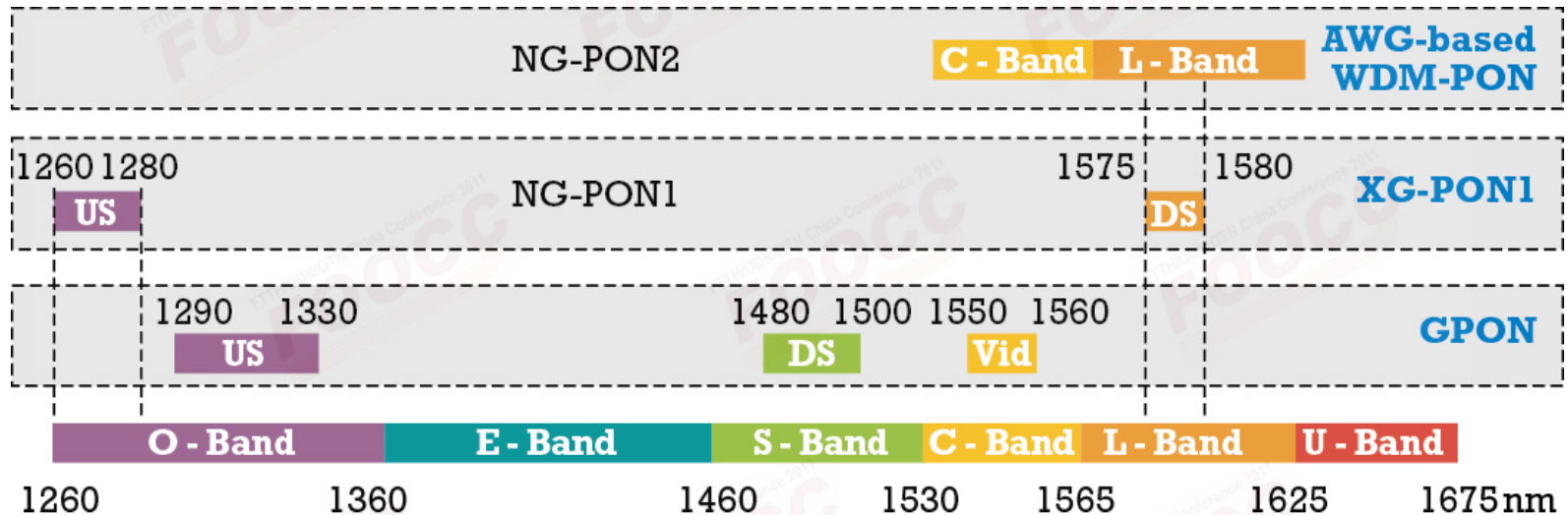
- NGPON specifications in two groups
  - NGPON1
    - XG-PON1 is asymmetrical
    - XG-PON2 symmetrical
    - Both can be applied to current infrastructure
  - NGPON2
    - “More advanced” technologies that would require infrastructure changes
      - WDM-PON an example

# Standards are similar – but not identical

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- Both offer asymmetrical (10G downstream, something less upstream) and symmetrical (10G both ways) options
  - XG-PON1 offers 2.5G upstream; 10G EPON offers 1G upstream
- Both provide potential for greater bandwidth, longer reach, and more subscribers per PON
- Can be applied to existing PON systems

# Applying XG-PON to existing GPON network



US = upstream

DS = downstream

Vid = video

Source: Ericsson

# Enabling technology is in place

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- Optical line terminal (OLT) and optical networking unit/termination (ONU/ONT) semiconductors are available
- Transceivers are becoming available as well



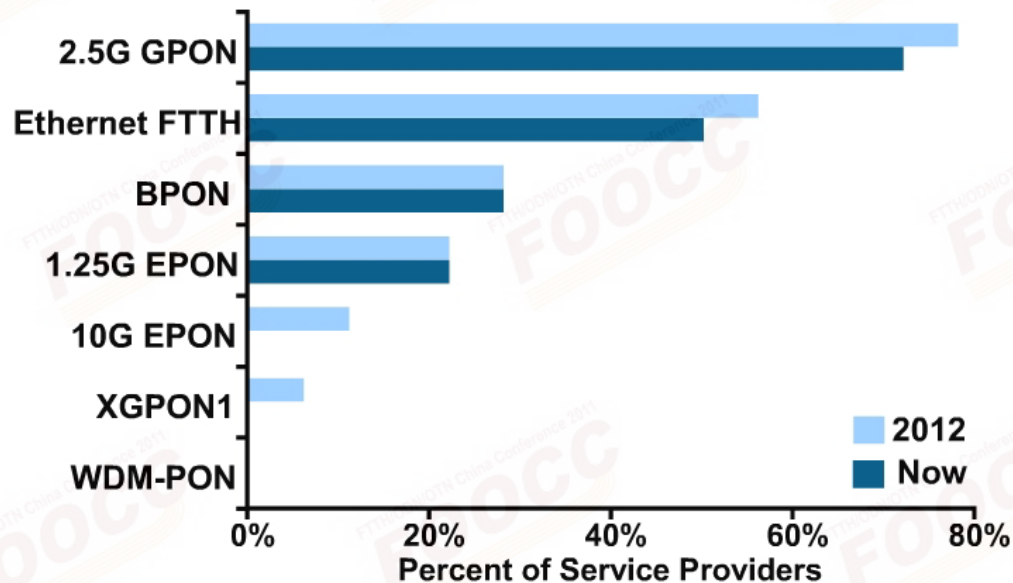
# Deployment status

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- Trials have begun
  - China Mobile, China Telecom, Verizon, Portugal Telecom, etc.
- Systems are reaching commercial availability
  - Alcatel-Lucent, FiberHome, Huawei, ZTE, others

# But when will deployments come?

FTTH broadband access technologies service providers are using and plan to use in 2012



© Infonetics Research, *Next Gen FTTH and PON Deployment Strategies: Global Service Provider Survey*, July 2011

# A word about cable TV operators

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- Cable TV operators will stay with hybrid fiber/coax networks for as long as possible
- But fiber access options are being developed
  - RF over glass
  - DOCSIS Provisioning of EPON/Ethernet (DPoE)
  - 10G EPON

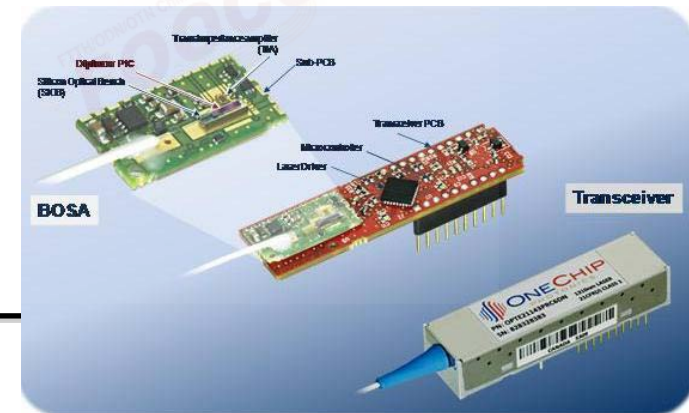
# New requirements for residential gateways

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- Drive to integrate currently separate systems
  - Routers, digital video recorders (DVRs), network attached storage
- Need to support both wired and wireless elements
- Accommodate legacy and “smart”/future home devices
- Support new services, such as home security

# Transceiver-level advances

- “PON on a stick”
  - Pioneered in China and Japan
  - Incorporate ONU functions within transceiver
  - Supports use of PONs for business services, including DPoE
- Greater levels of integration
  - PIC-based transceivers near market readiness



# Previous trends continue in cables and enclosures

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- Bend-insensitive fiber becoming standard in many cable offerings
  - More suppliers offering this technology
- Fiber management emphasizes flexibility, smaller sizes
  - Modular designs enable evolution as needs evolve

# Conclusion

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- Focus of technology development in current EPON and GPON on cost reduction
- Next-generation 10G technology here soon
  - Cost reduction also important here
- Innovation inside the residence next big area
- Cost, competition, and user requirements will drive how quickly new technology is deployed

# Thank you!

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