

100GbE / 400GbE Broad Market Potential

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Applications Ad hoc

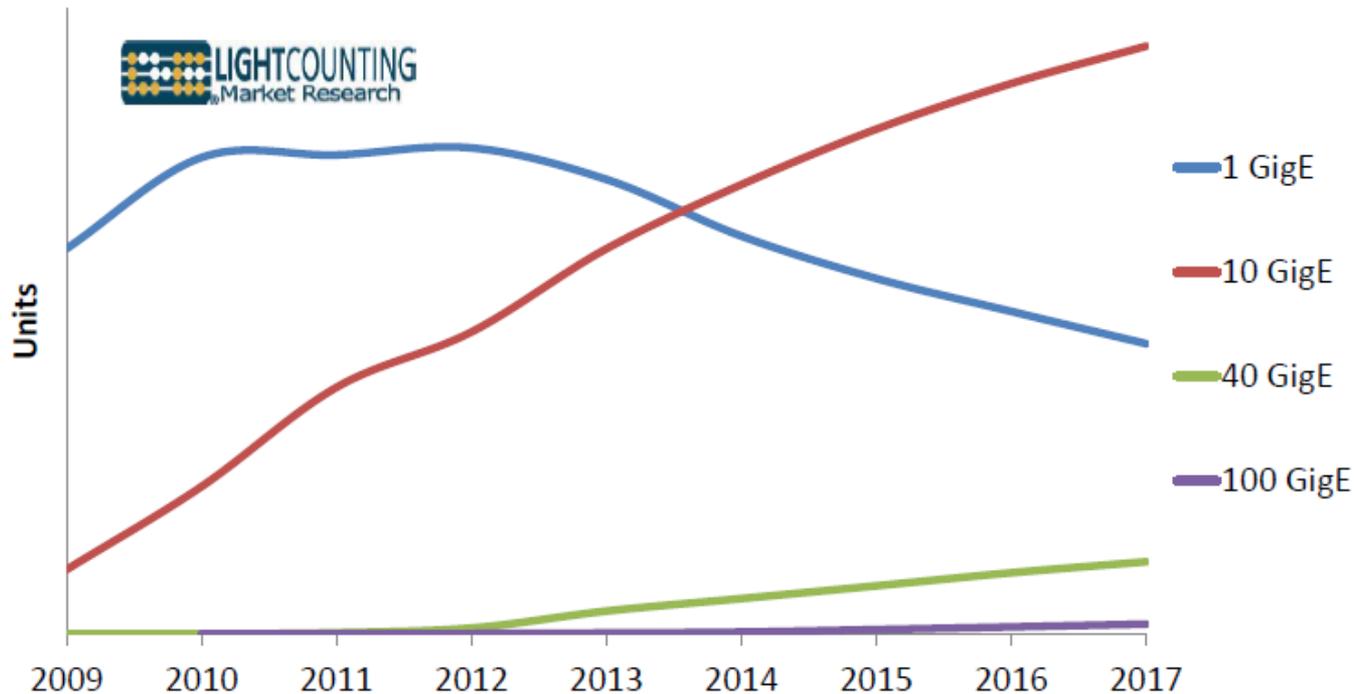
January 8, 2014

Proposed PAR

- **5.5 Need for the Project:** The project is necessary to provide solution(s) for network aggregation applications with a need for bandwidth beyond existing capabilities. These include, but are not limited to, data center, internet exchanges, co-location providers, wireless back haul, service providers, and video-on-demand delivery.

Industry Forecasts

Ethernet Optical Transceiver Unit Shipments by Data Rate



IEEE 400G Study Group 400G Applications Ad Hoc

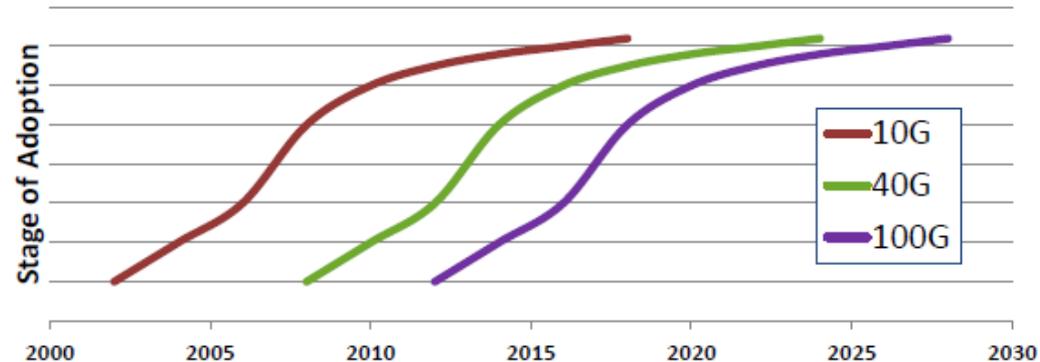
October 9, 2013

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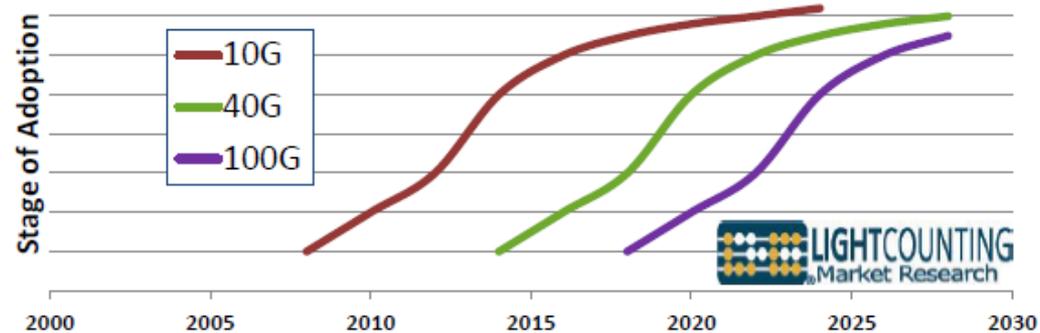
Industry Forecasts

Technology adoption curves

Telecom:
100G shipments
ramping fast now



Datacom:
10GigE still ramping
fast and 40 GigE is
just starting now.
100GigE is not
ramping yet.



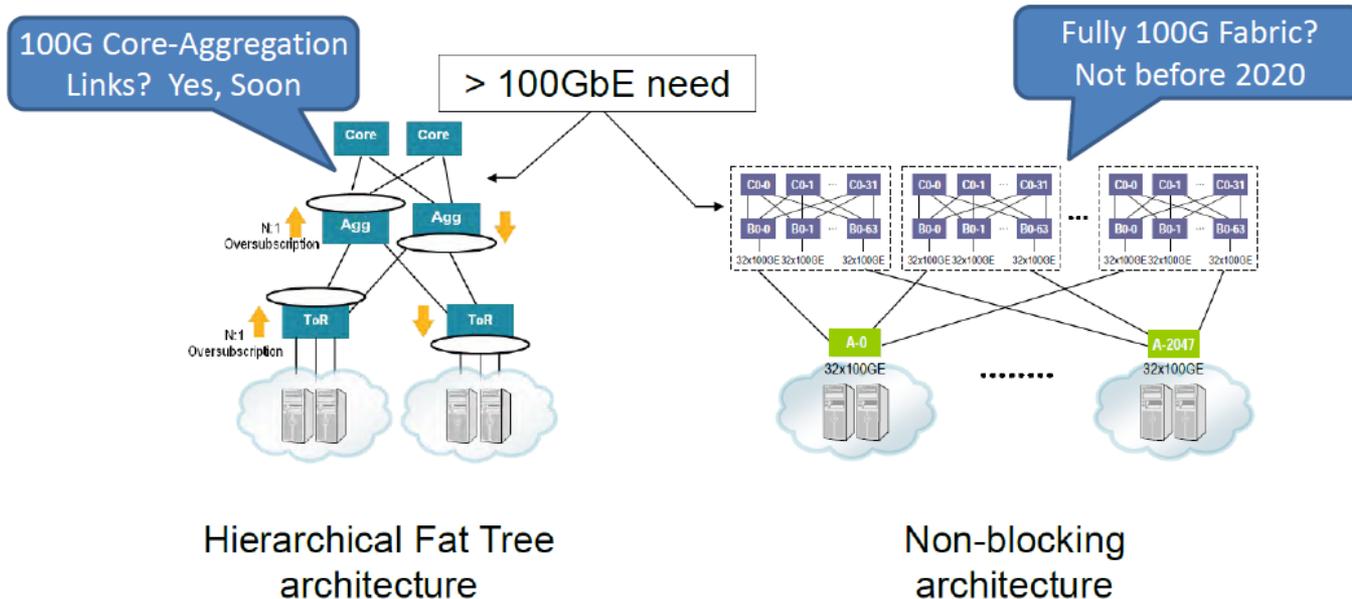
Historical and forecast data; Normalized to volume, Smoothed and Extrapolated



Looking to the Future

400G Call for Interest Slide

Data Center Architectures



Flatter Architectures Driving 4x10G Consumption; Will delay 100GigE Consumption

Source: Dale Murray, LightCounting,

http://www.ieee802.org/3/400GSG/public/adhoc/app/murray_app_01a_1013.pdf

- IEEE 802.3 400 Gb/s Ethernet Study Group Applications Ad Hoc, Jan 8, 2014

Our Challenge

- **How do we answer “Broad Market Potential”**
 - Each proposed IEEE 802 LMSC standard shall have broad market potential. At a minimum, address the following areas:
 - a) Broad sets of applicability.
 - b) Multiple vendors and numerous users.
 - c) Balanced Costs (LAN versus attached stations) [Removed from IEEE 802 5 Criteria Nov 2012]
- **Approaches to use Datacom to help justify 400GbE**
 - Remove “Data Center” from PAR?
 - Modify “Data Center” to “Data Center Service Provider Connection”?
 - Tie “Today’s Telecom” to “Tomorrow’s Data Center” and the need for a single 400GbE architecture to be leveraged in the future?
 - Leverage use of 100G breakout (we have agreed it will happen).via “broad sets of applications”?
 - Other?

Support for Breakout?

- IEEE 802 November Plenary Straw Poll:
- **Straw Poll # 8**
- I would support the objective:
 - Provide appropriate support for breakout functionality
- Results: Y 55 N 39 A 14

The Dilemma

- Determining wording of an objective has been problematic
 - “Provide appropriate support for breakout functionality”
- Expressed concerns
 - Impact on architecture?
 - Use as PMD disqualifier?
 - Support breakout to what rates?
 - Focus on do no harm?
 - We should be focusing on immediate need...

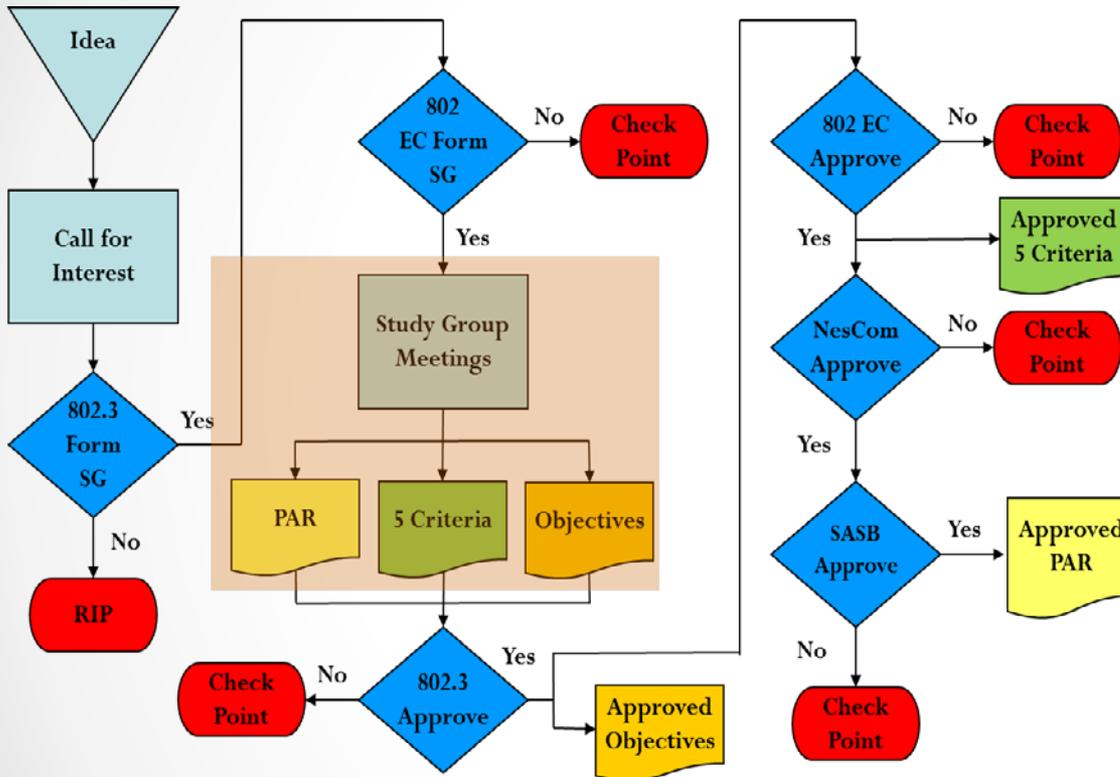
What Does “Breakout Support” Mean?

- Breakout Support is not needed by all application spaces
 - Future datacom applications envisioned to make use of “Breakout Support”
 - Telecom applications favor single fiber approaches
- Breakout Support is being deployed for Data Center applications / reaches now
- Developing “Breakout Functionality” is an architectural issue, as it is easy to envision PMD solutions of the future where it makes sense.
- Can be applicable to multiple media: twin-ax cabling, MMF, or SMF

Conclusions

- **How can datacom be leveraged to justify BMP?**
 - Breakout functionality to support 100GbE?
 - Common architecture to link “Today’s Telecom” to “Tomorrow’s Datacom”?
 - Both?
- **Potential points for inclusion in “Broad Market Potential” response(s) to address Data Center applications?**
 - Initial deployment for 400GbE will be driven by key telecom and high-bandwidth interconnection points.
 - Given deployment of servers supporting 10GbE/40GbE, later deployment of 100GbE and then 400GbE in data center networks is assumed.
 - 400GbE for datacom will leverage the same 400GbE architecture /components defined by this project.
 - Breakout functionality to 4 ports of 10GbE from a single 40GbE port is seeing significant growth, and the same scenario with 100GbE and 400GbE is envisioned. Shared volume of systems/components behind a common form factor module addressing 400GbE will be beneficial to both 100GbE and 400GbE.

Project Flow



Note: At "Check Point", either the activity is ended, or there may be various options that would allow reconsideration of the approval.

- Objectives stay within IEEE 802.3
- CSD Document reviewed by 802, and must be reviewed at multiple points within process
- What is the best way to deal with this?