

# Requirements beyond 100GE

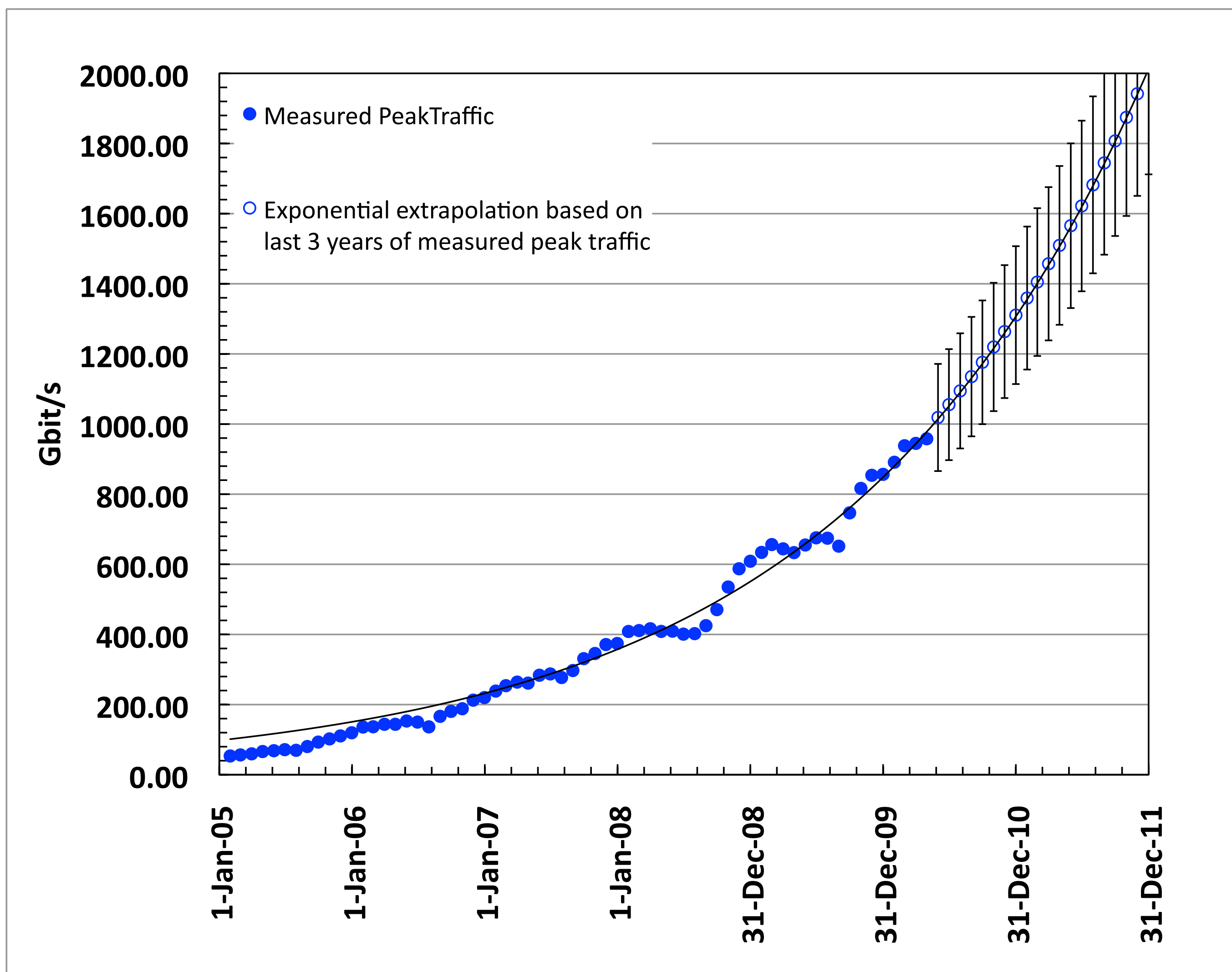
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Joint IEEE/ITU meeting  
May 2010

# AMS-IX

## *In Short*

- ▶ **Metro Ethernet Network, confined to Amsterdam**
  - ▶ **MPLS/VPLS based**
  - ▶ **Presence in 7 large datacenters (co-location facilities)**
- ▶ **Purpose: To facilitate the exchange of traffic between network operators**
  - ▶ **Internet: ISPs, Content Providers, Content distribution networks, Carriers, Hosting providers etc.**
  - ▶ **Inter-GRX: Interconnection of GRX providers to facilitate mobile roaming**



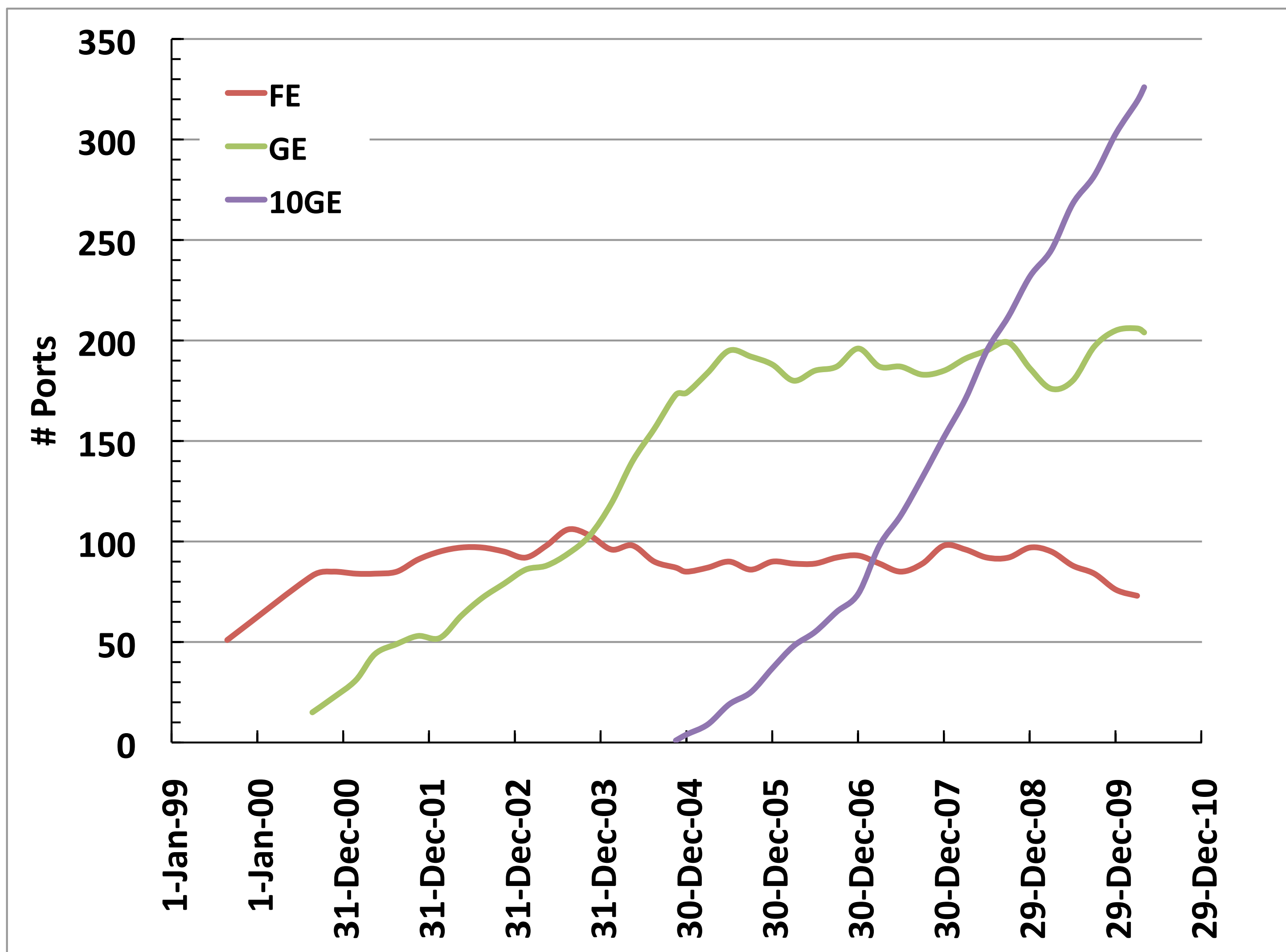
## *Customer access traffic*

# Historical and Projected Traffic



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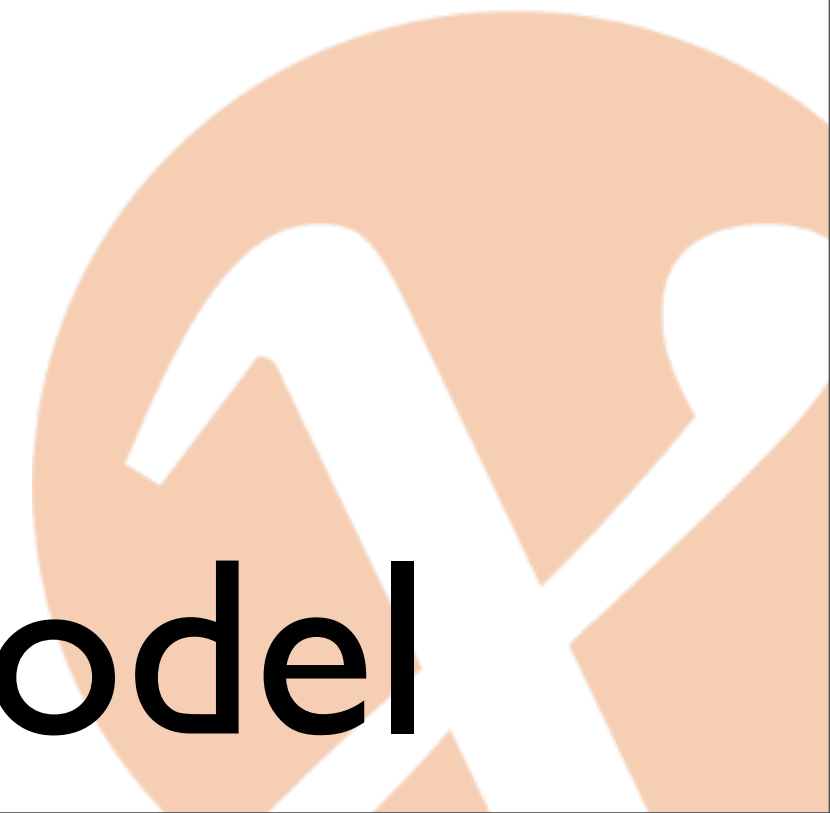
Historic traffic growth, showing zero growth during spring summer and enhanced growth during fall/winter. Exponential fit works well to predict



Total number of 10GE ports is ~4X (two per customer access plus backbone links)

## Historical Growth

# AMS-IX Access Port Growth Model

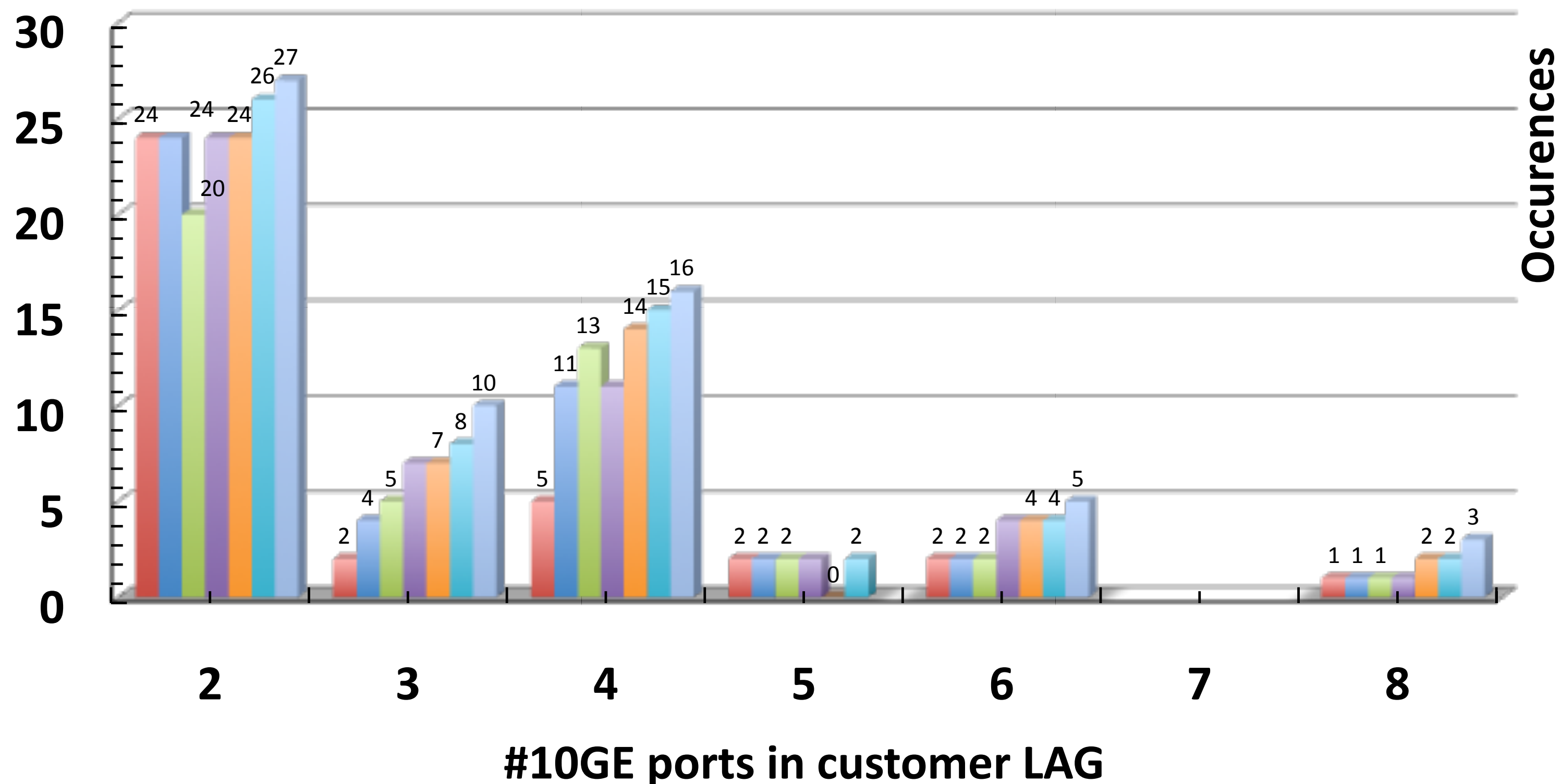


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Access port growth model. When introducing new access speed, net growth in access ports comes only from this access type. Older access speeds stay more or less constant. This does not imply that everyone, only connects on new access speed, but that on average more upgrades and new connections on new access speeds occur. This model is used to predict uptake of 100GE, see slide 7

## 10GE LAG size distribution

■ Oct 21 2008  
 ■ Mar 21 2009  
 ■ Jun 10 2009  
 ■ Oct 16 2009  
■ Jan 20 2010  
 ■ Mar 29 2010  
 ■ May 10 2010



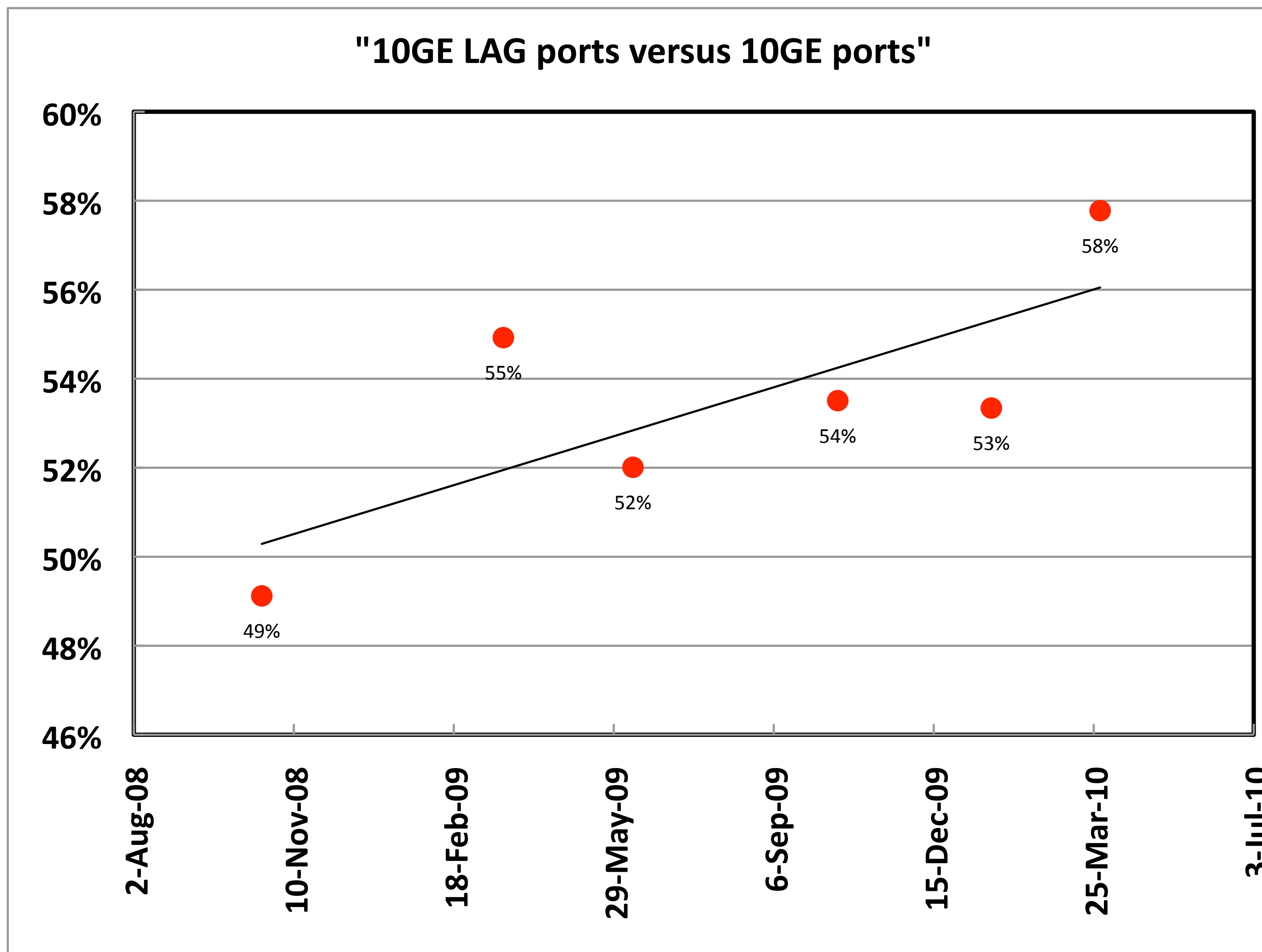
*LAG size distribution*

# AMS-IX Access Port Usage



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LAG size distribution over time. Clear evolution to larger LAGs. All connections that are now (may 2010) 30Gbs or more are candidates for upgrade to 100GE as of Q2 2011.

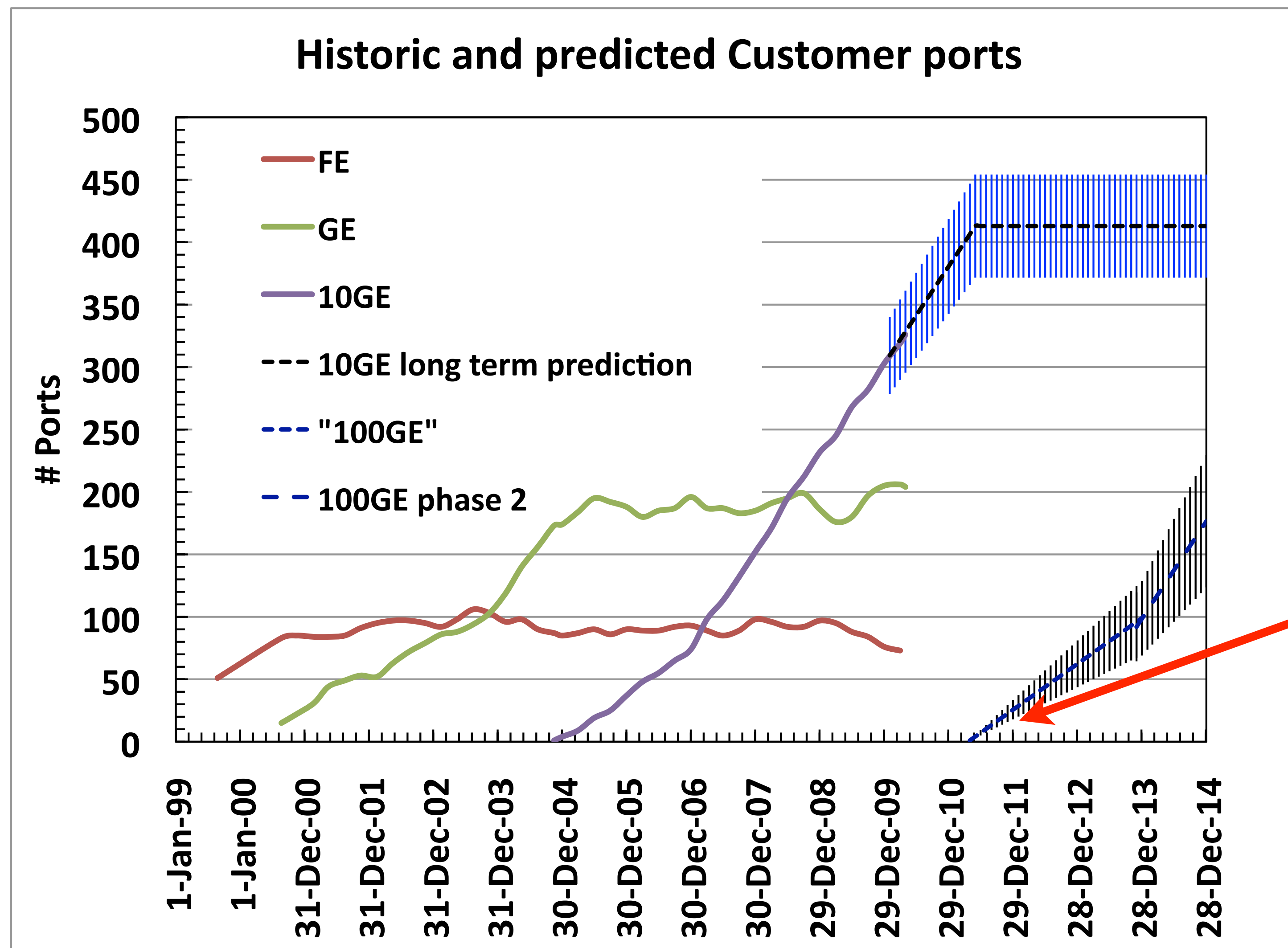


*More ports in LAG configuration:*  
**AMS-IX Access Port Usage**



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Number of 10GE access ports grown from below 50% to about 60% in 1.5 year. More and more larger and larger access ports.



If economically feasible either from a Capex or Opex perspective

*Short term projection*

# AMS-IX Access Port Growth Model

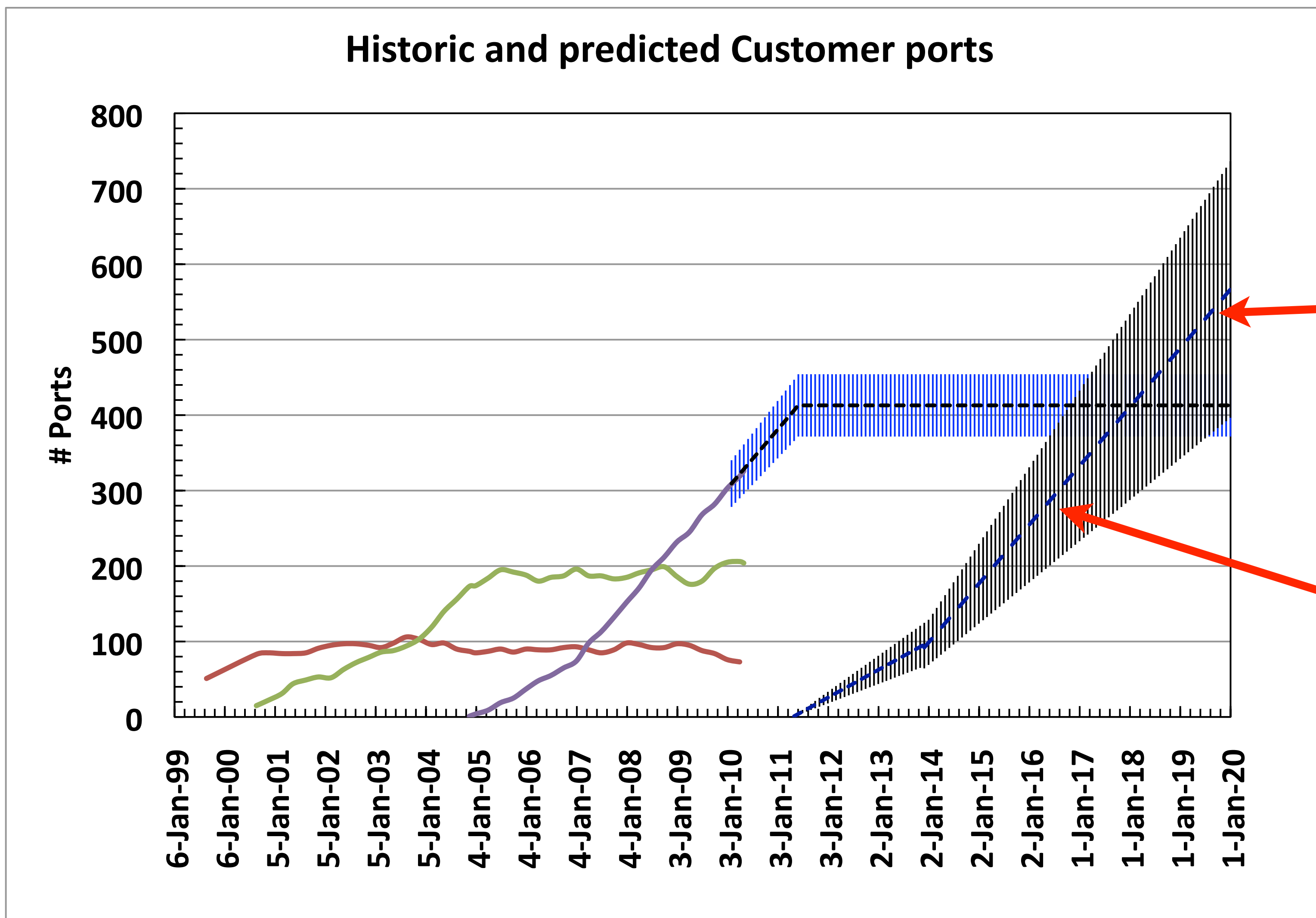
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AMS-IX access port model applied to predict 100G access uptake. Assumed we can will/can deliver 100GE access as of Q2 2011. This model is used for 4 year long term commercial strategy of AMS-IX, used in future Capex/Opex evolution (platform needs, personal) and price development.

Whether 100GE will take up as predicted depends really if it is economically feasible for customers to start using 100GE.

However, even though Capex investment in 100GE might be uneconomical, operational expense in managing single connections compared to many large scale LAGs might be more economical

Historic and predicted Customer ports

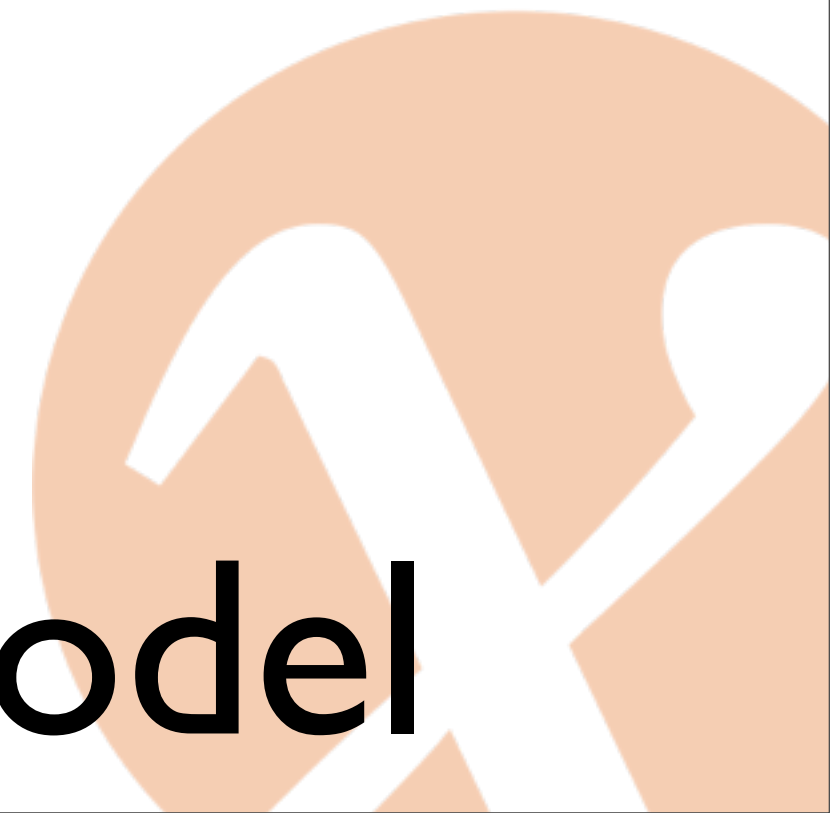


Possible TE standard 2019?

Possible 400GE standard H2 2016

*Long term forward projection*

# AMS-IX Access Port Growth Model

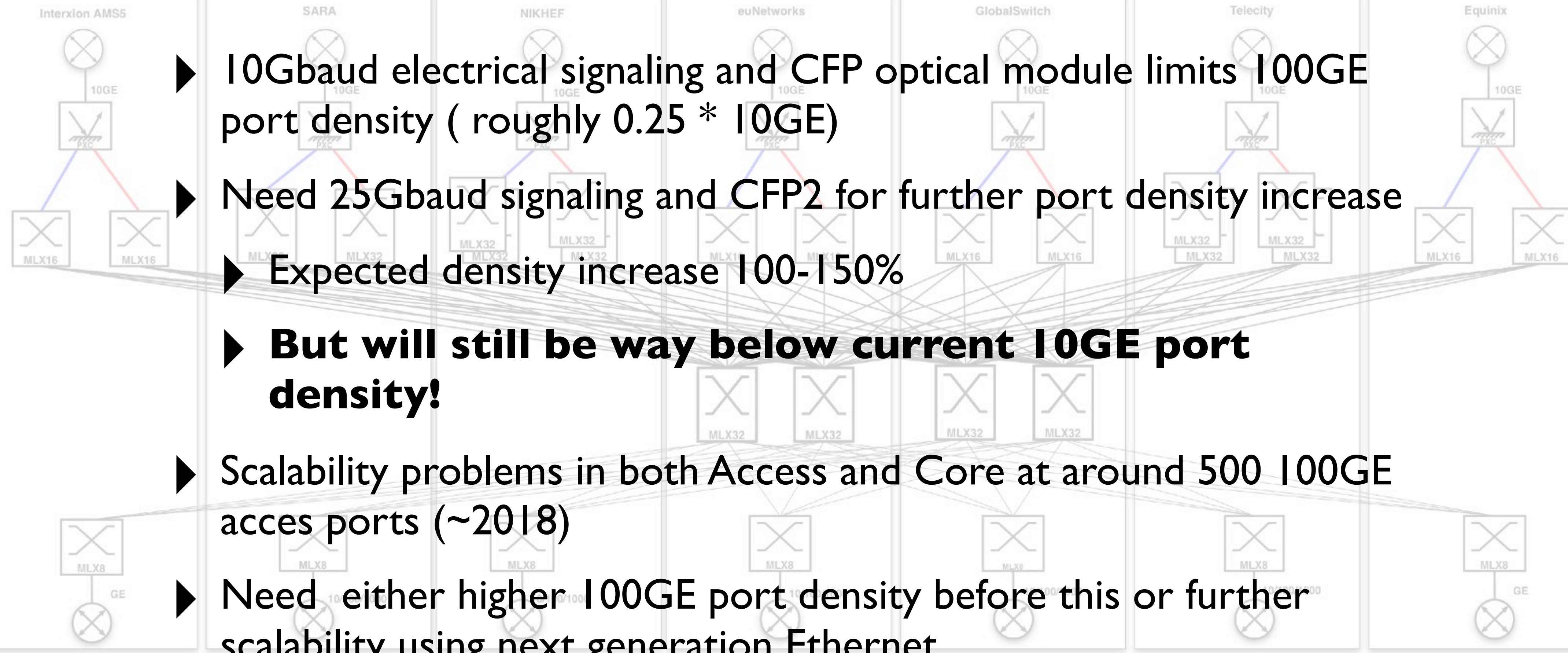


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Longer term crystal ball prediction. Indications for possible completion of TE or 400GE standards indicated. These dates from various presentations and private conversations. Because of low 100GE port density, this might give rise to scalability issues 2017 to 2018 if there is no further miniaturisation or a new standard available.



# 100GE limits and beyond 100GE Requirements



- ▶ 10Gbaud electrical signaling and CFP optical module limits 100GE port density ( roughly  $0.25 * 100GE$ )
- ▶ Need 25Gbaud signaling and CFP2 for further port density increase
- ▶ Expected density increase 100-150%
- ▶ **But will still be way below current 10GE port density!**
- ▶ Scalability problems in both Access and Core at around 500 100GE acces ports (~2018)
- ▶ Need either higher 100GE port density before this or further scalability using next generation Ethernet
- ▶ **If TE not feasible before ~ 2018 400GE is good candidate**