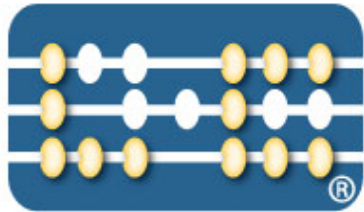


Forecast Methodology – September 2015



LIGHTCOUNTING
Market Research

LightCounting
Market Research Notes

Vladimir Kozlov • September, 2015

Summary

In summary, the key assumption of our forecast is that the growth rate of network bandwidth is correlated with growth in network traffic. Data on Internet traffic and the traffic inside datacenters (shown in [slides 10-11](#)) indicates that while the traffic continues to grow very quickly, the annual growth rate is slowing down. This trend is used as a key metric for calculating the expected volume of DWDM ports and Ethernet transceivers in 2016-2020.

Our forecast for the Ethernet transceiver market accounts for all Ethernet optical transceivers used in telecom, enterprise and datacenter applications ([slide 15](#)). Slides 12-15 illustrate the disruptive effect of mega datacenters on the Ethernet transceiver market in 2010-2014. Our key forecast assumption for the Ethernet market in 2016-2020 is shown as the blue line on slide 14. It projects that the annual growth rate of the combined bandwidth of Ethernet ports will decline gradually. It is very likely that we will see fluctuations in the actual annual growth rate in the next few years. Initial deployments of 100GbE may lead to another bump in the curve, similar to the peaks in 2010 and 2014, related to massive initial deployments of 10GbE and 40GbE, respectively. On the other hand, future economic downturns may lead to drops in the growth rate. Our forecast should average out and smooth over these fluctuations.

This forecast model worked well in the past for established markets like DWDM ([slides 6-7](#)). However, it does not fully account for disruptions like optics usage in mega datacenters ([slides 12-13](#)). We look at the mega datacenter optics market as fairly well established by now, considering that it started back in 2007 with the initial deployments of 10GbE optics by Google, which were interrupted by the financial crisis of 2008-2009.

Challenges to Forecasting

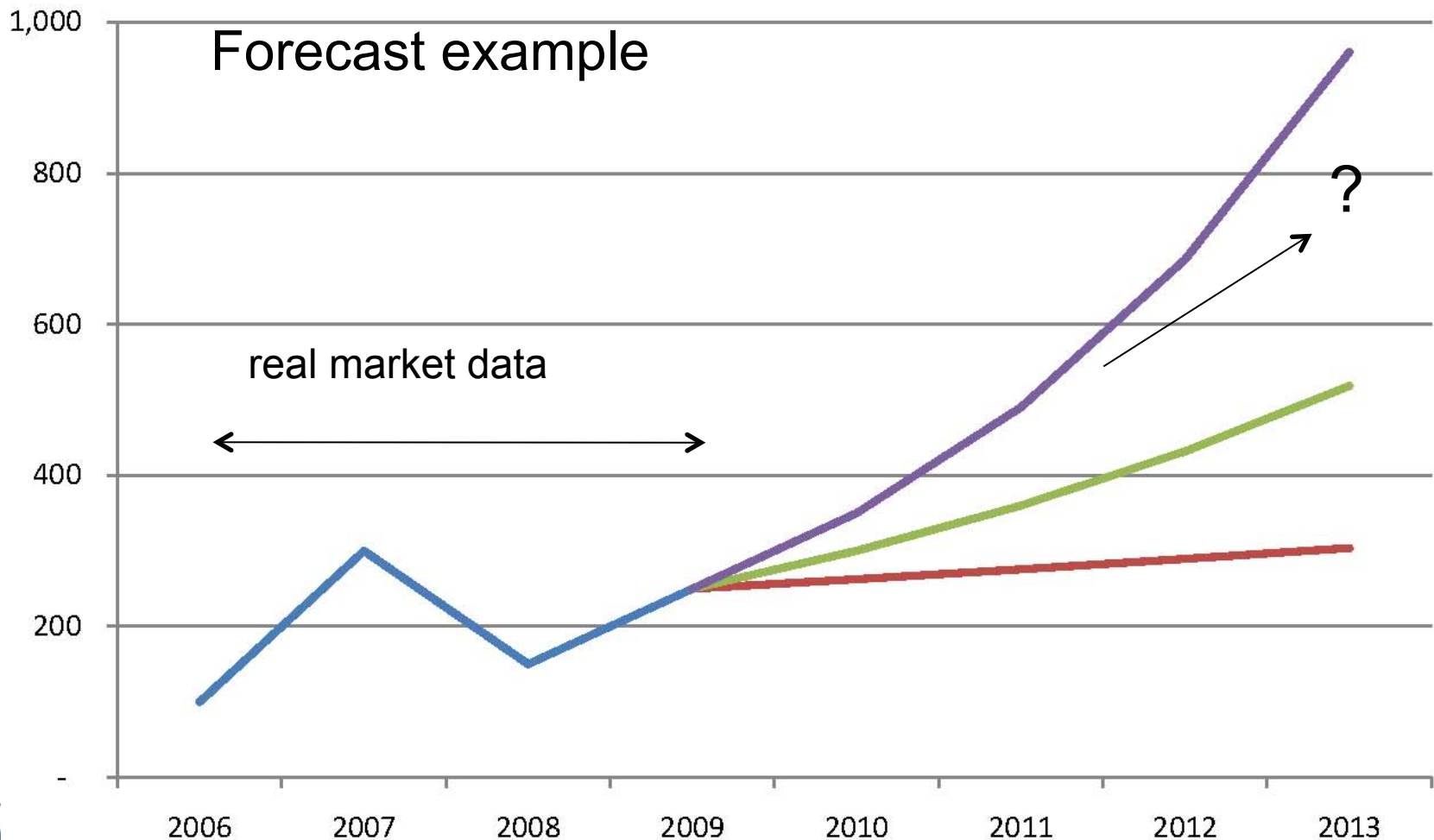
- Limited historical data on product sales
- Uncertainty about the future demand
- Diverging expert opinions
- A lot of hype in the media
- Economic cycles
- Market disruptions



"The long-range forecast includes rain, sunshine, fog, snow, mild spells and high winds - now prove that wrong!"



Key question: how fast will the market grow?

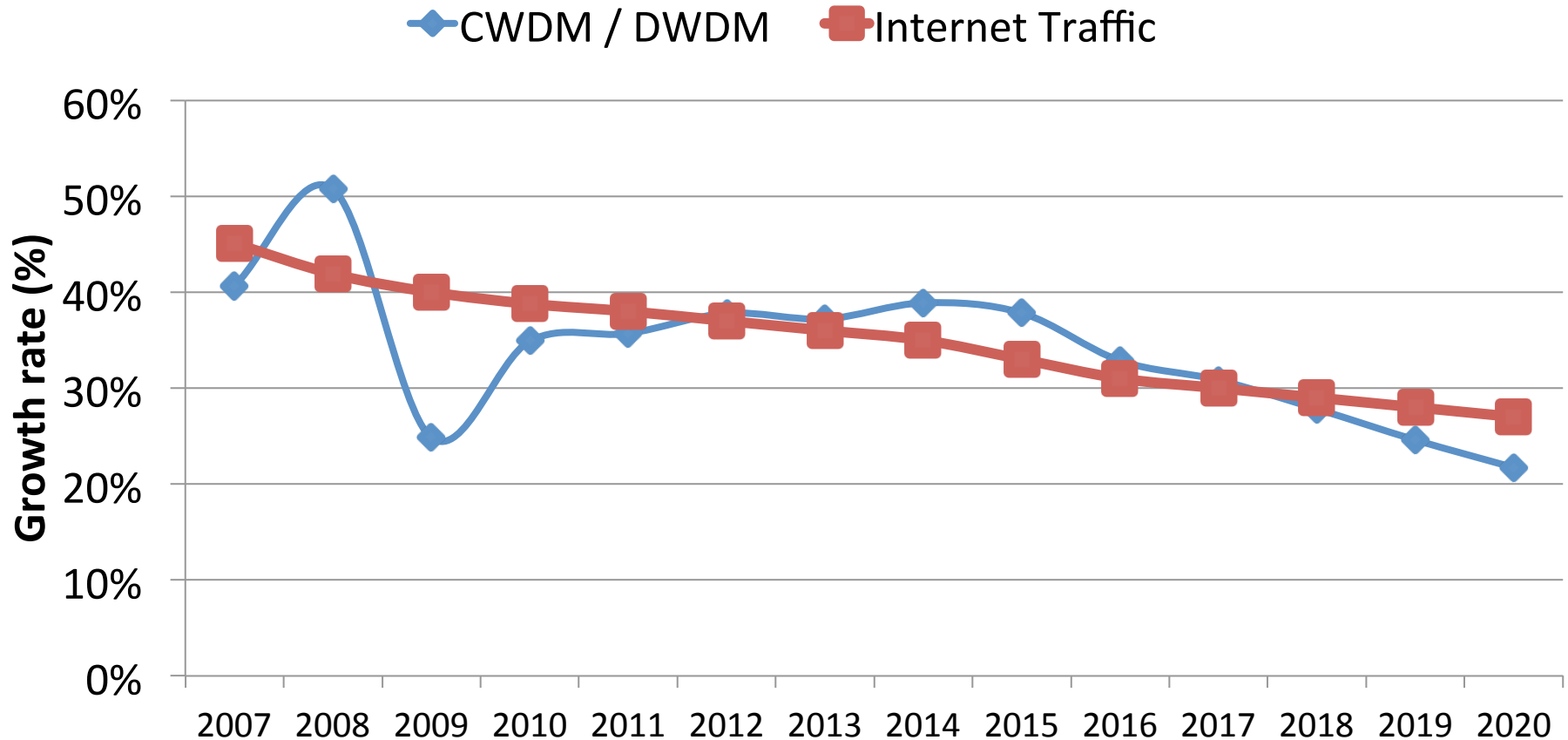


LightCounting's Approach

- Data Mining and Validation
 - Collecting data from more than 20 optical components and module vendors since 2004
 - Cross-checking shipments of lasers, laser drivers and modulators with transponders, linecards or ports
- Model Development
 - Correlating sales of optical components and network bandwidth to Internet traffic growth
- Model Validation
 - Critical reviews of previous forecast accuracy



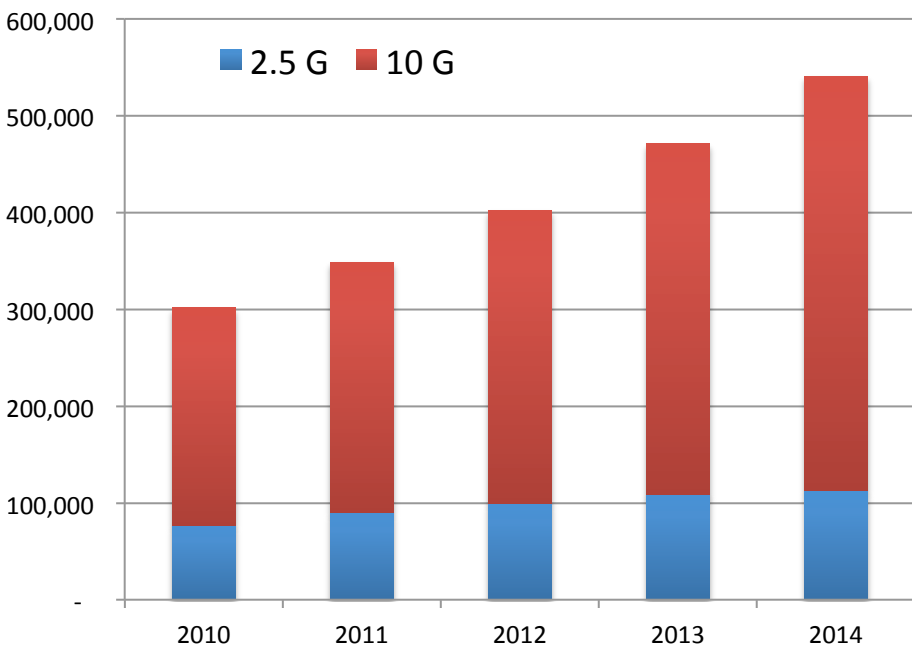
Growth rate of DWDM network bandwidth, calculated from port shipments



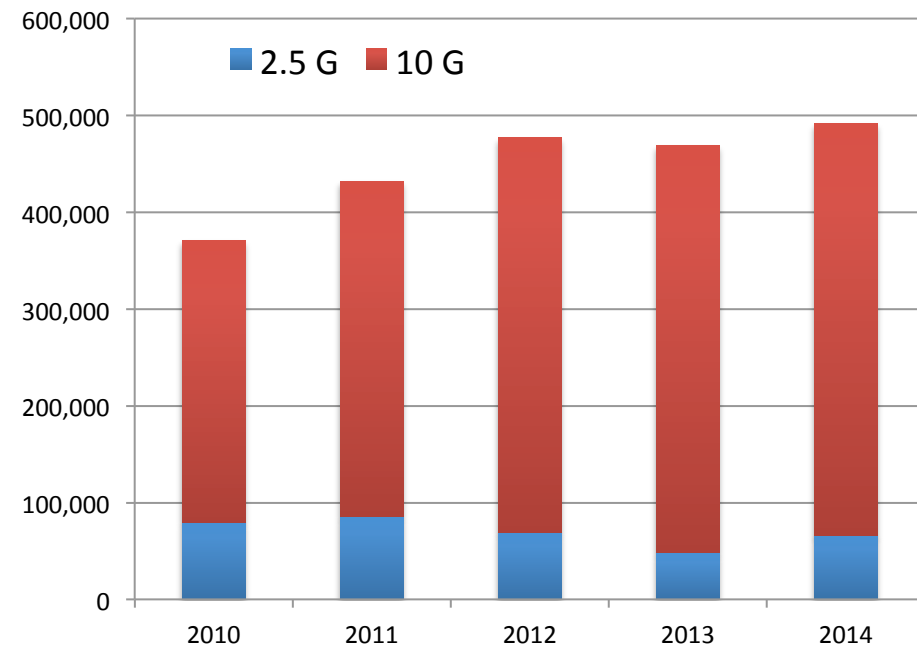
Critical Review: Established Products

2.5G and 10G DWDM ports

LightCounting's March 2010 Forecast

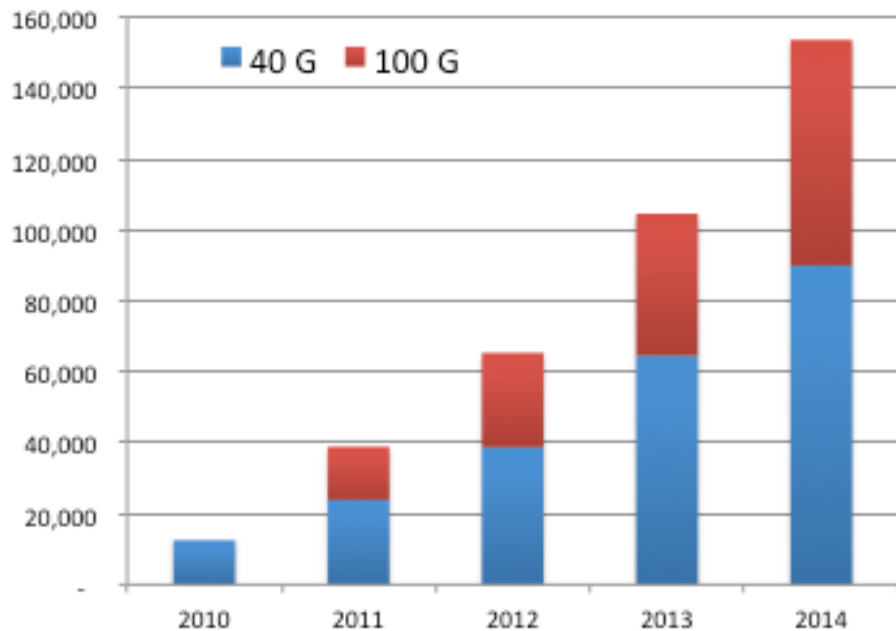


Actual data

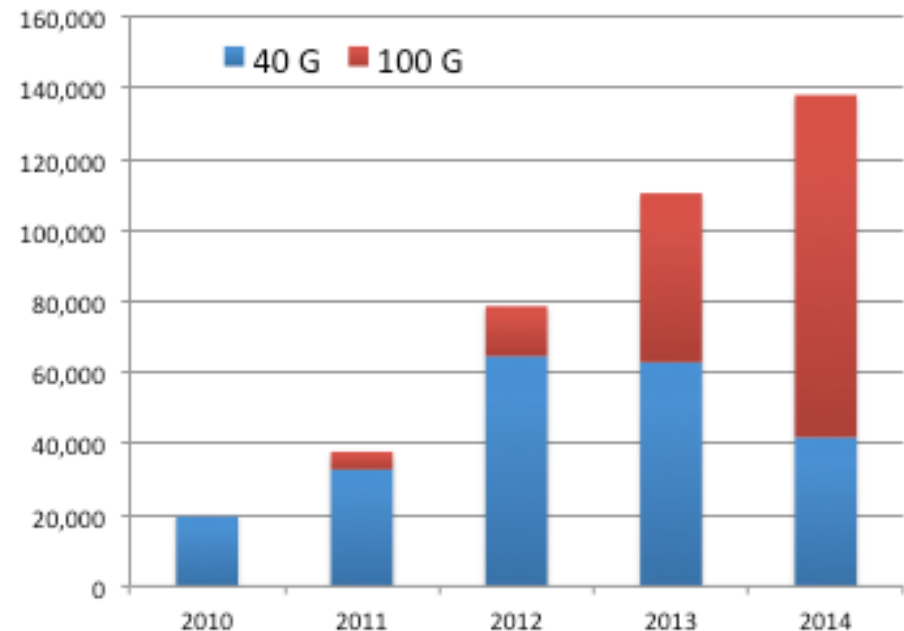


Critical Review: New Products 40G and 100G DWDM ports

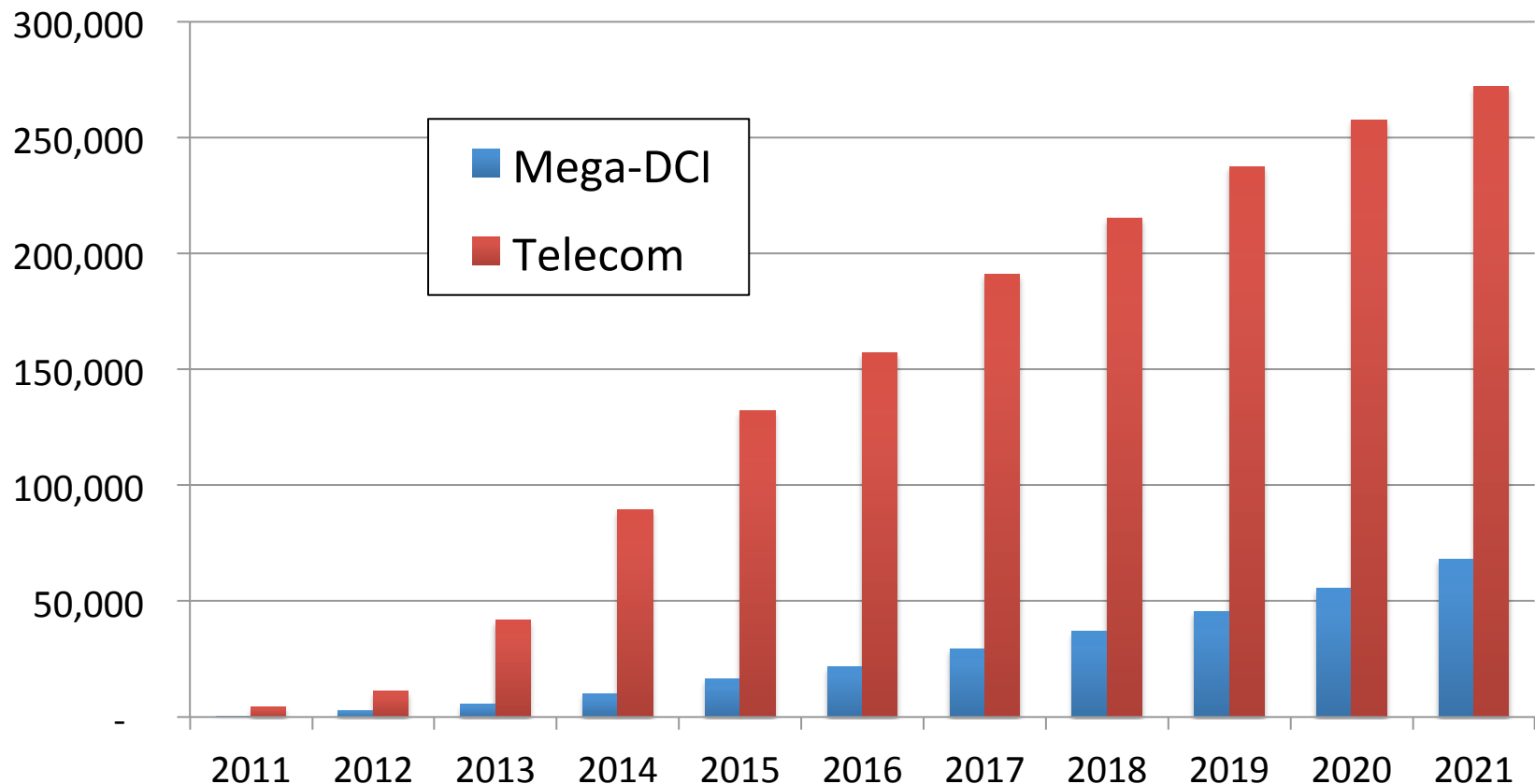
March 2010 Forecast



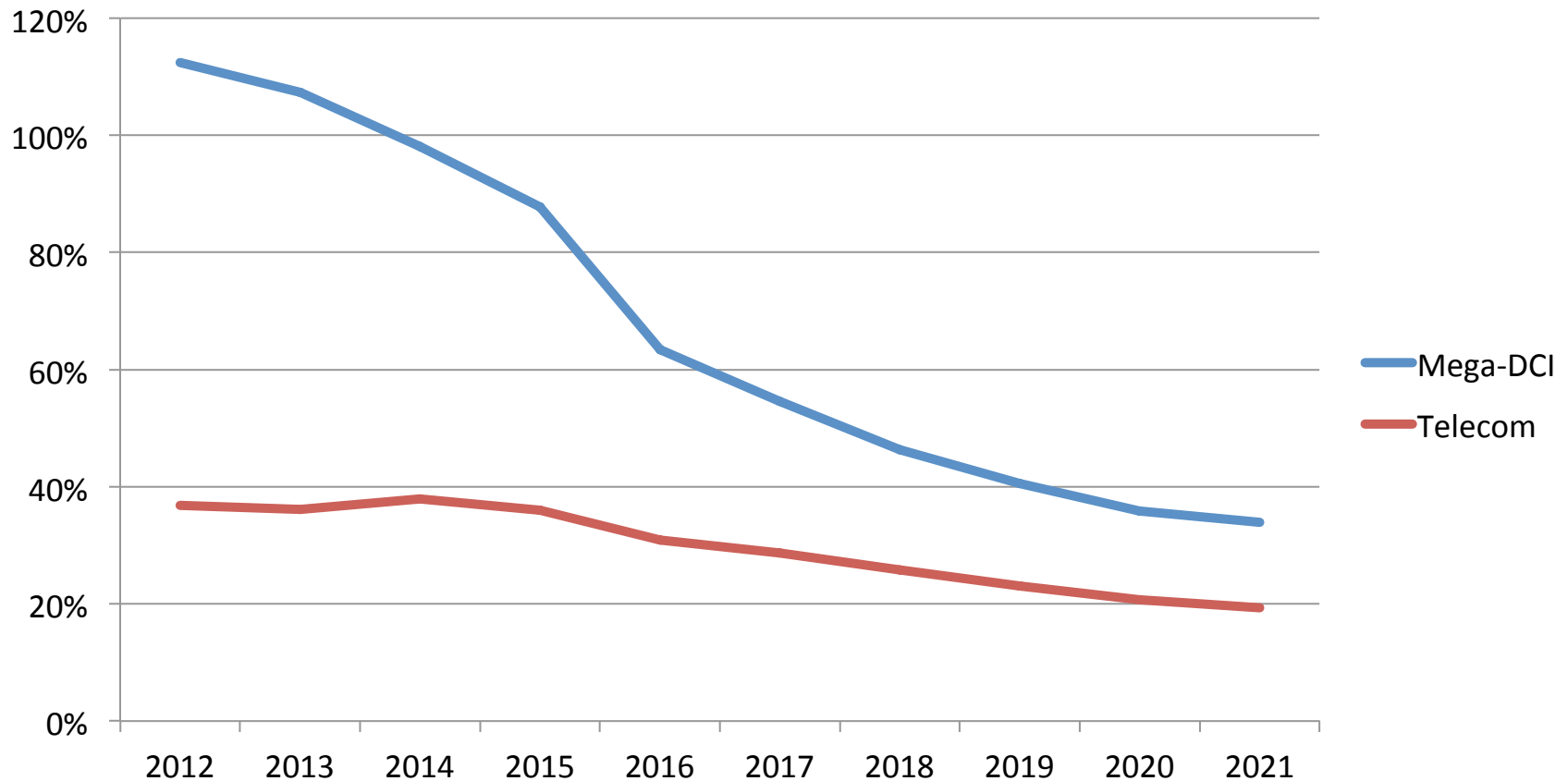
Actual Data



August 2015 Forecast for 100/400G DWDM ports by application

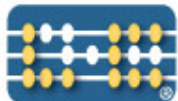
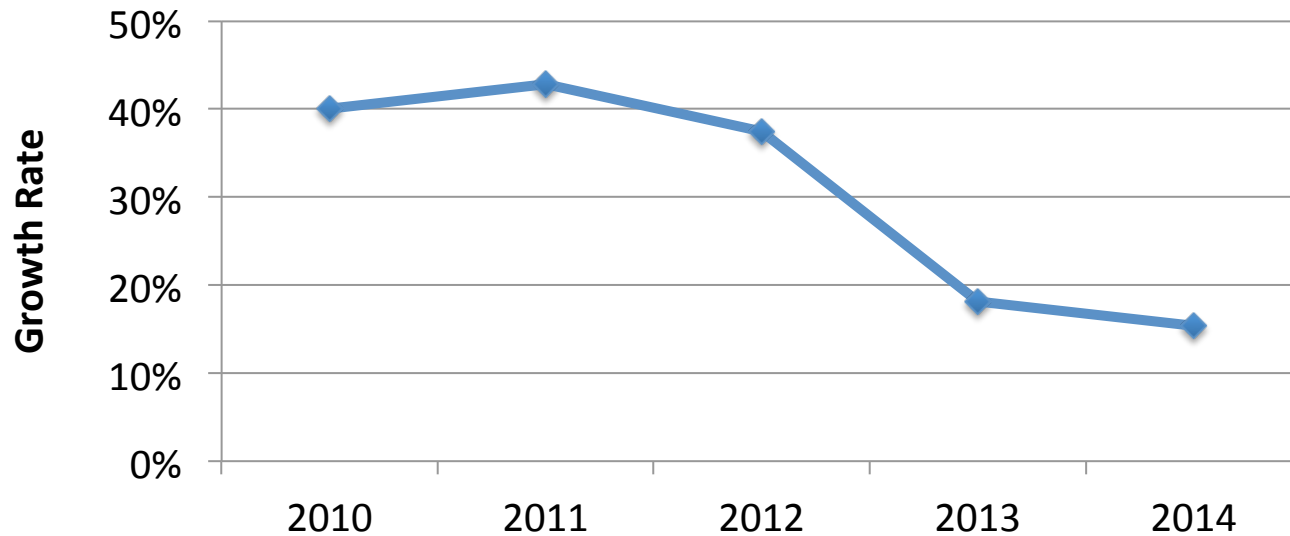
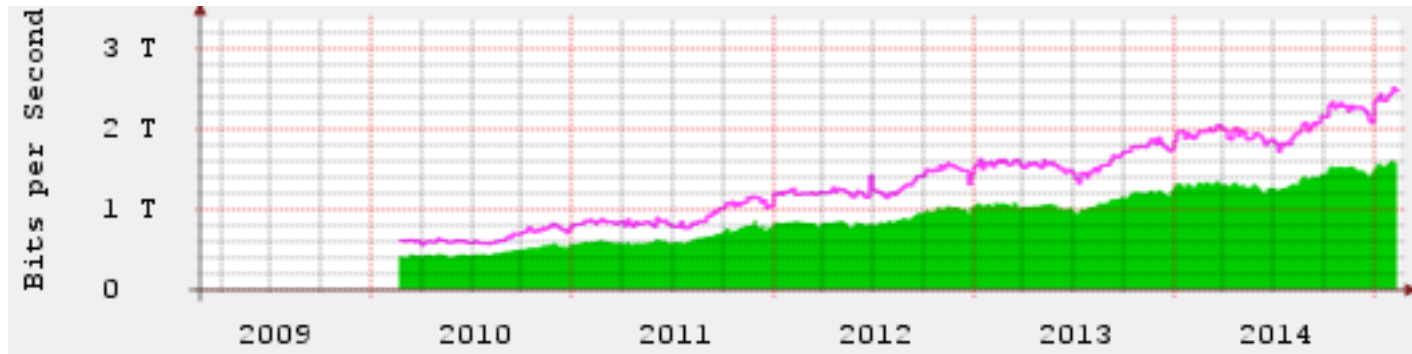


Growth Rates in Aggregated Bandwidth



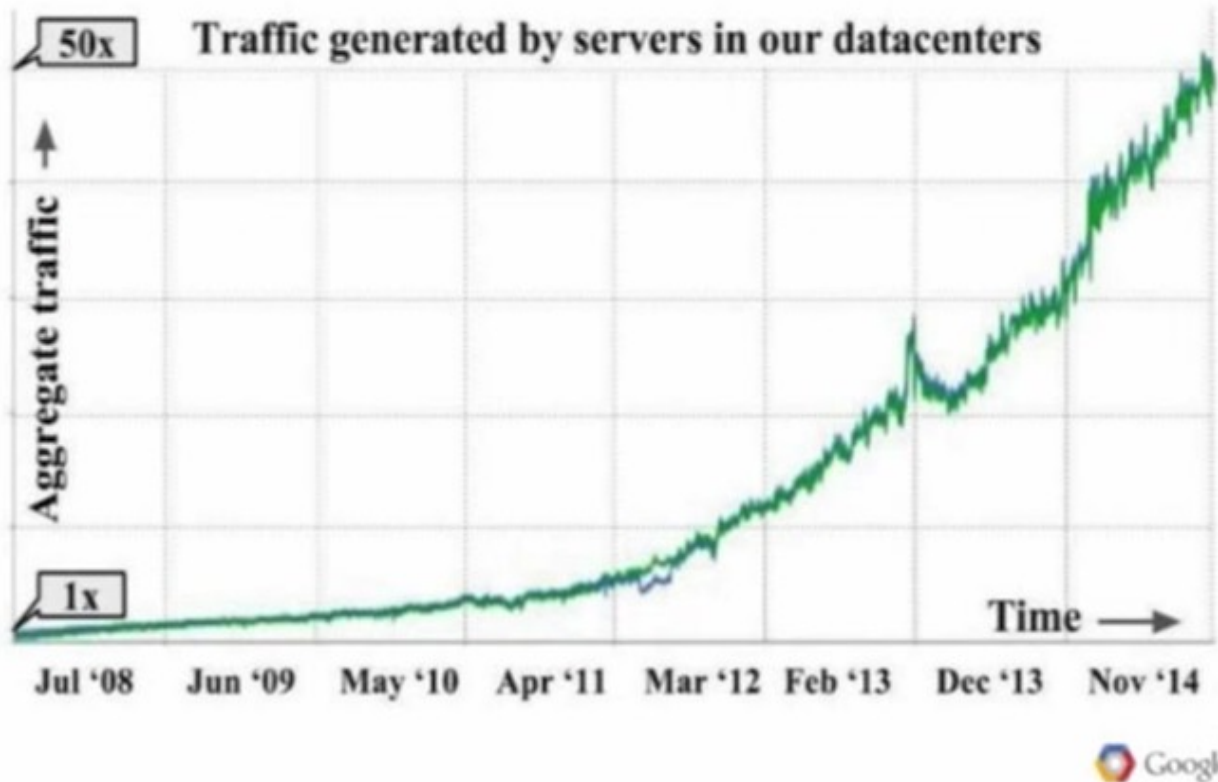
Latest data on Internet traffic growth

LINX Public Exchange Traffic

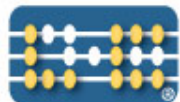


Traffic growth rate at Google

An increase of 50X over the period shown is a CAGR of 75%.

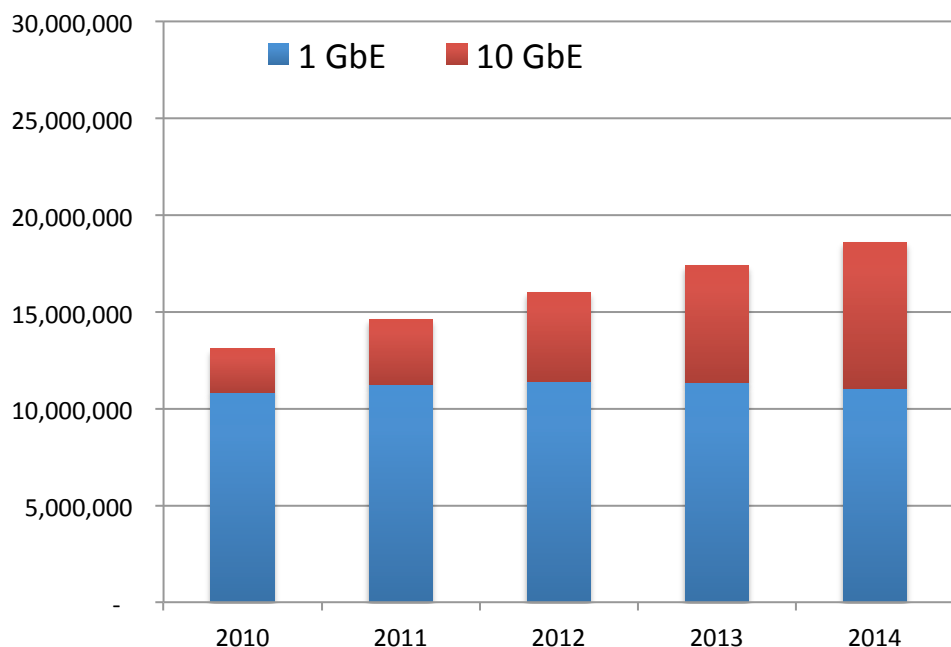


Date	Growth Rate
Jul-08	70%
Jun-09	47%
May-10	44%
Apr-11	39%
Mar-12	140%
Feb-13	75%
Dec-13	57%
Nov-14	52%

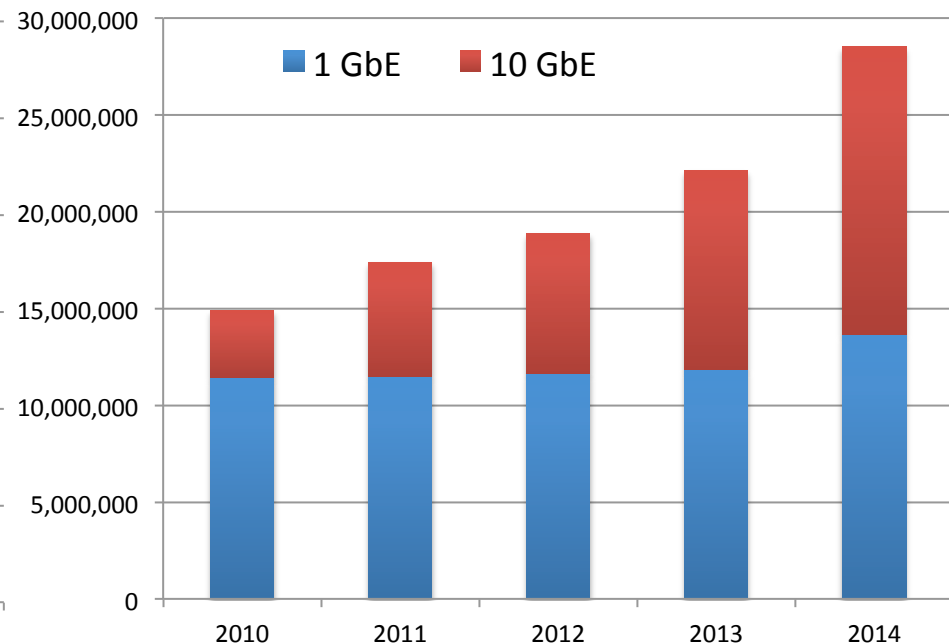


1GbE and 10GbE Transceiver shipments

LightCounting's March 2010 Forecast

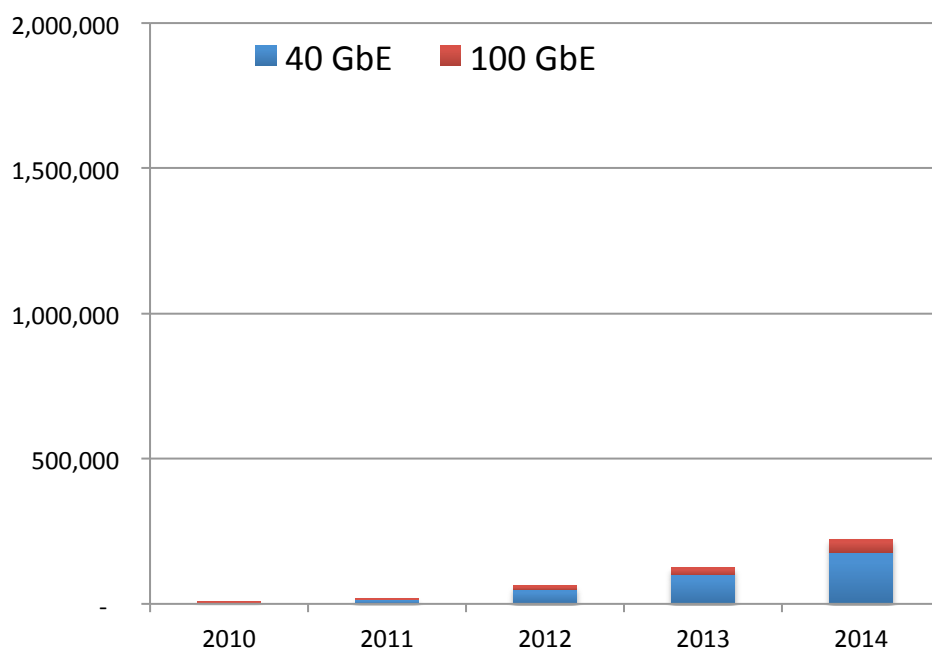


Actual data

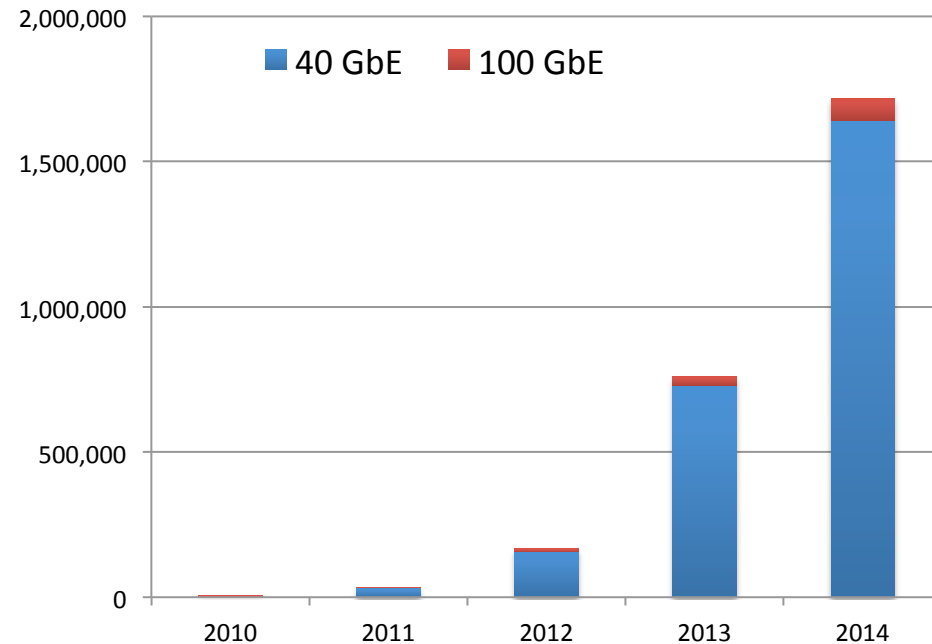


40GbE and 100GbE Transceiver Shipments

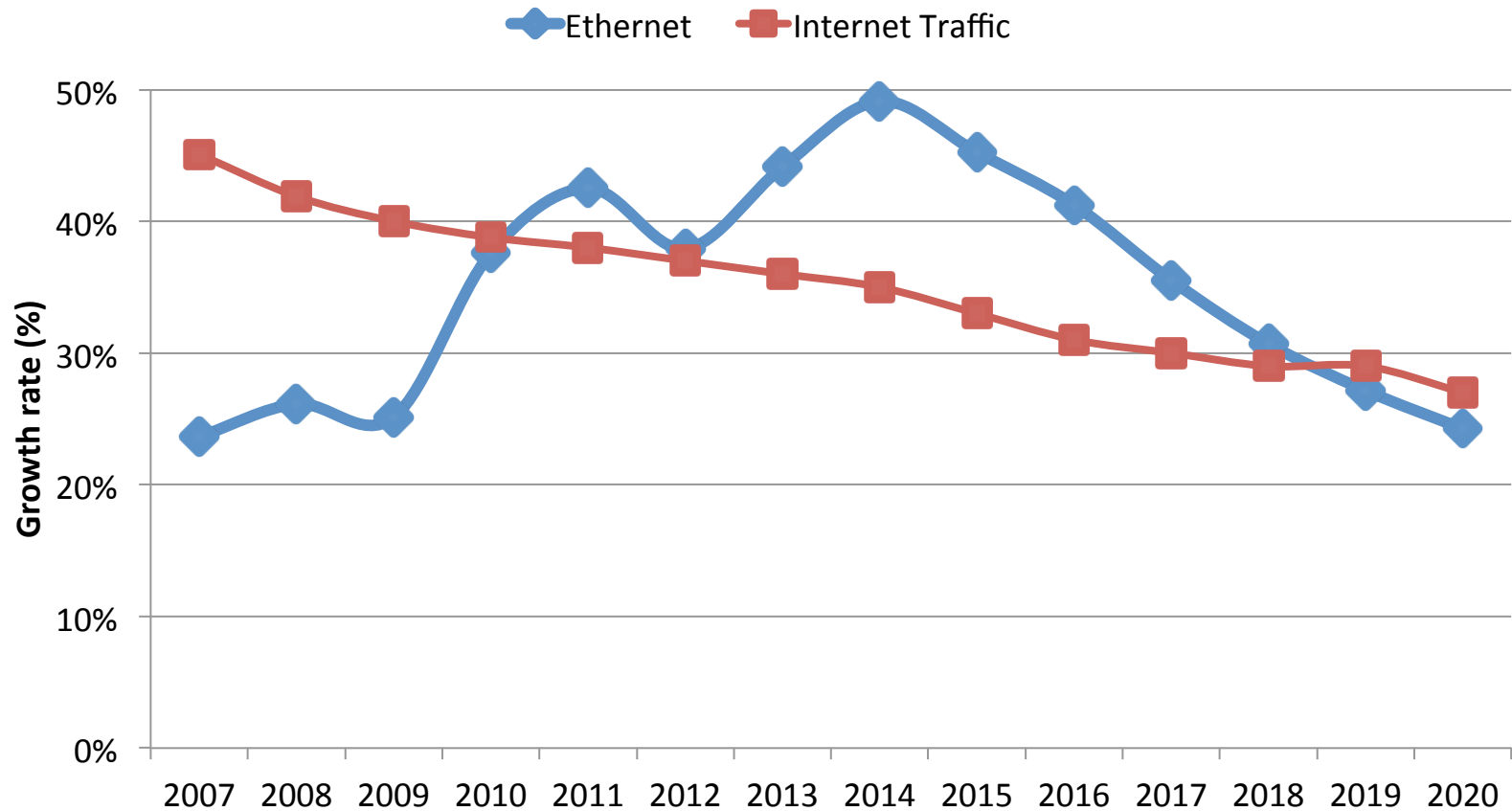
LightCounting's March 2010 Forecast



Actual data



Growth rate in aggregated bandwidth of Ethernet ports



Our latest Ethernet forecast

Revenues - total

