

Transoceanic Cable Forecasts



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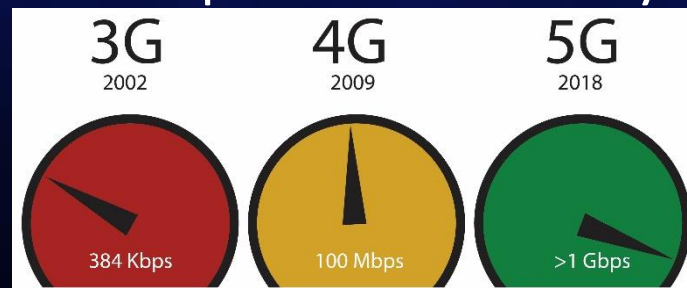


International Bandwidth Demand Growth Factors:

Mobile Broadband

Mobile broadband: increasing speeds, massive data consumption, and upcoming step-change to 5G

- “Mobile data traffic has grown 18-fold over the past 5 years,” “Global mobile data traffic grew 63 percent in 2016,” “Mobile data traffic will grow at a compound annual growth rate (CAGR) of 47 percent from 2016 to 2021” - *Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2016–2021 White Paper*
- 5G implementation in 2018-2021: potential step change from 100 Mbps to 10 Gbps: “5G will support new massive broadband applications by combining network speeds above 10 Gbps with extremely low latency.” – Nokia Networks



International Bandwidth Demand Growth Factors:

Fixed Broadband



- **Fixed broadband:** increasing speeds, massive shift to bandwidth-intensive streaming content, growth in FTTH deployment
 - Increasing speeds: “The average actual speed of UK residential fixed broadband services increased by 25% to 36.2Mbit/s in the year to November 2016.” – Ofcom
 - Bandwidth-intensive content: Streaming audio and video, including a migration to 4K, High-dynamic-range (HDR) video, will grow from 71% of traffic in 2016 to 80% of traffic in 2020. – *Sandvine 2016 Global Internet Phenomena*
 - Growth in FTTH: “At end-September 2016, there were more than 20.5 million FTTH/B subscribers in EU28, with a penetration rate of 9.4%”
– Fibre to the Home Council Europe

Content Providers



- B4 (Google's SDN WAN): most recent published traffic figures indicated 10x increase in 3.5-year period leading up to 2015:
93% CAGR
- Azure (Microsoft's WAN): As of 2017, "Over the last three years, we've grown our long-haul WAN capacity by 700 percent":
91% CAGR
- Private network traffic still forms a minority on all routes, but approaching 50% on transatlantic, transpacific, and pan-East Asian – expected to grow considerably with further infrastructure investments (Marea, PLCN, Monet)

Translating Bandwidth Demand into Cable Deployment

- Assumption: ratio of raw bandwidth demand to lit capacity: 35% (historical average)
- There is a possibility that this ratio could grow higher as bandwidth/cable supply tightens – i.e. capacity loads will be higher
- A forecast using this demand methodology, combined with a forecast of technological advancements (e.g. cable capacity) should produce a useful depiction of the marketplace, but actual deployment will be determined by:
 - Financing environment and financial health of operators/OTTs
 - Suppliers' manufacturing capacity
 - Costs of systems
 - Game theory (e.g. competitive strategies of existing cable operators)



Key Considerations in Cable Ecosystem

- Content players will retain dominance on major transoceanic routes for the near-term, but long-term position is unclear
- Financing environment: Small consortia lead investment on transatlantic/transpacific routes, but increasing participation of multilateral development banks in markets in Africa, Asia, and Latin America
- Reduced manufacturing capacities at cable system suppliers forebodes cable shortage as Shannon Limit approaches

\$70 BILLION WORTH OF INVESTMENT TO-DATE

New Submarine Cable Investment by RFS Date

Source: 2016 Undersea Cable Report (Terabit Consulting)

