Bandwidth Needs in Core and Aggregation nodes in the Optical Transport Network

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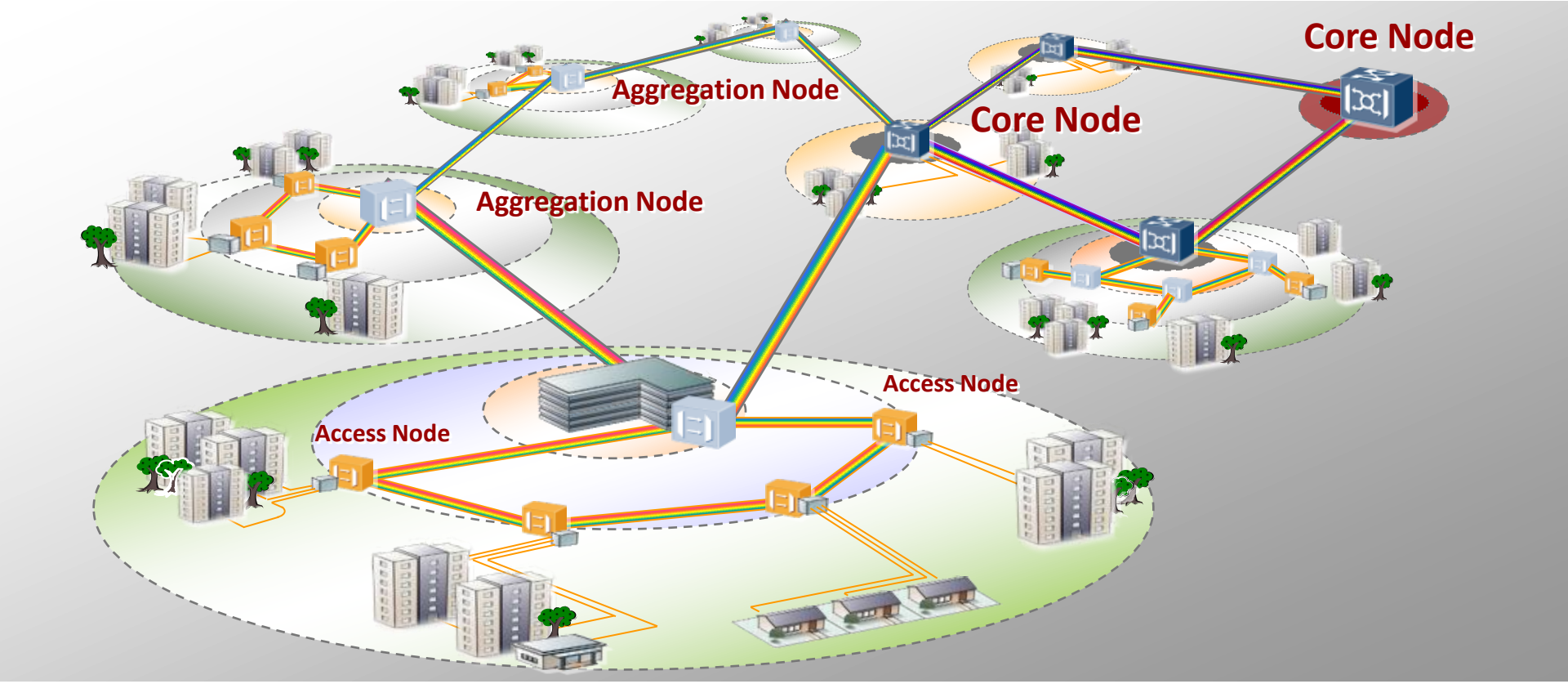
- Network scenarios
- Bandwidth needs of operators from various areas
- Examples of future demanding application
- Conclusion

Network Scenarios



- Access Node: xDSL, FTTx, 3G, WIFI…
- Aggregation Node: Aggregate the data from access node to the edge of metro networks
- Core Node: Transport data in backbone networks

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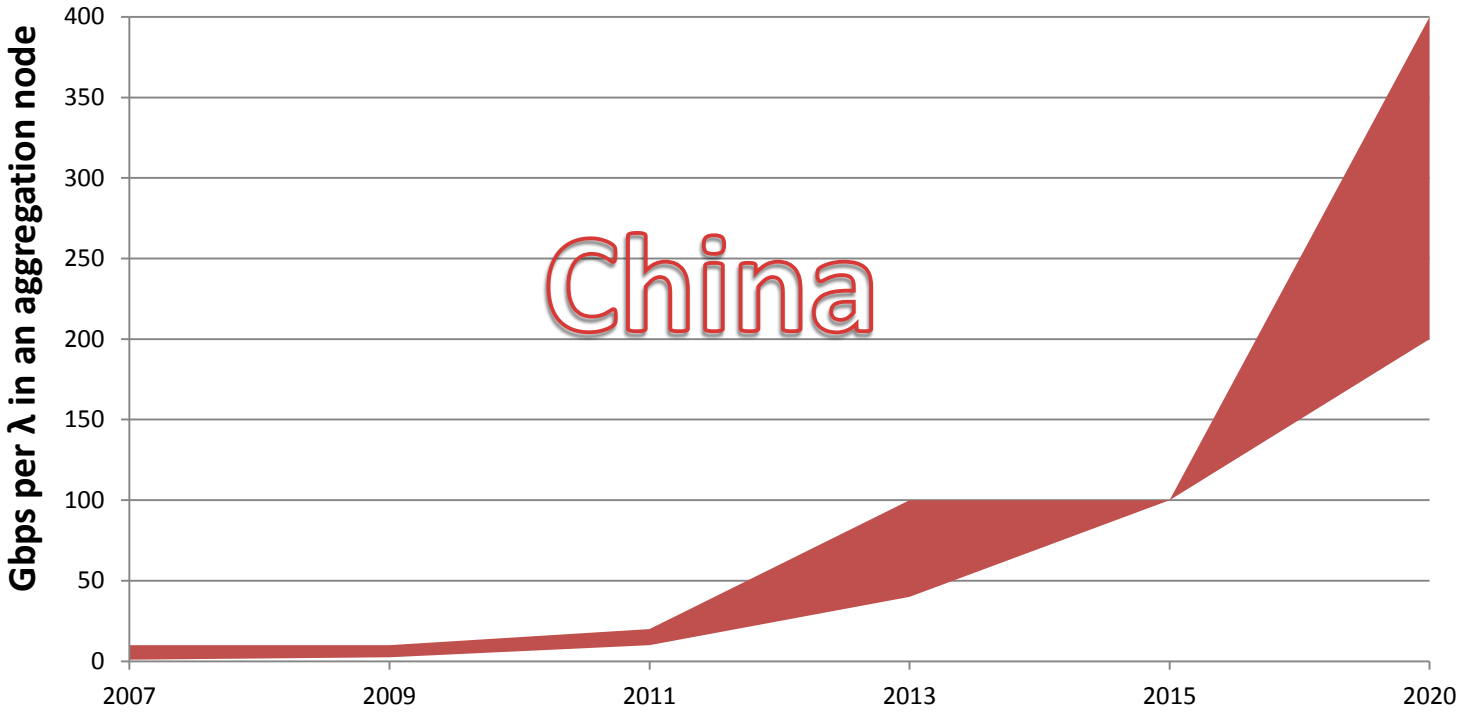
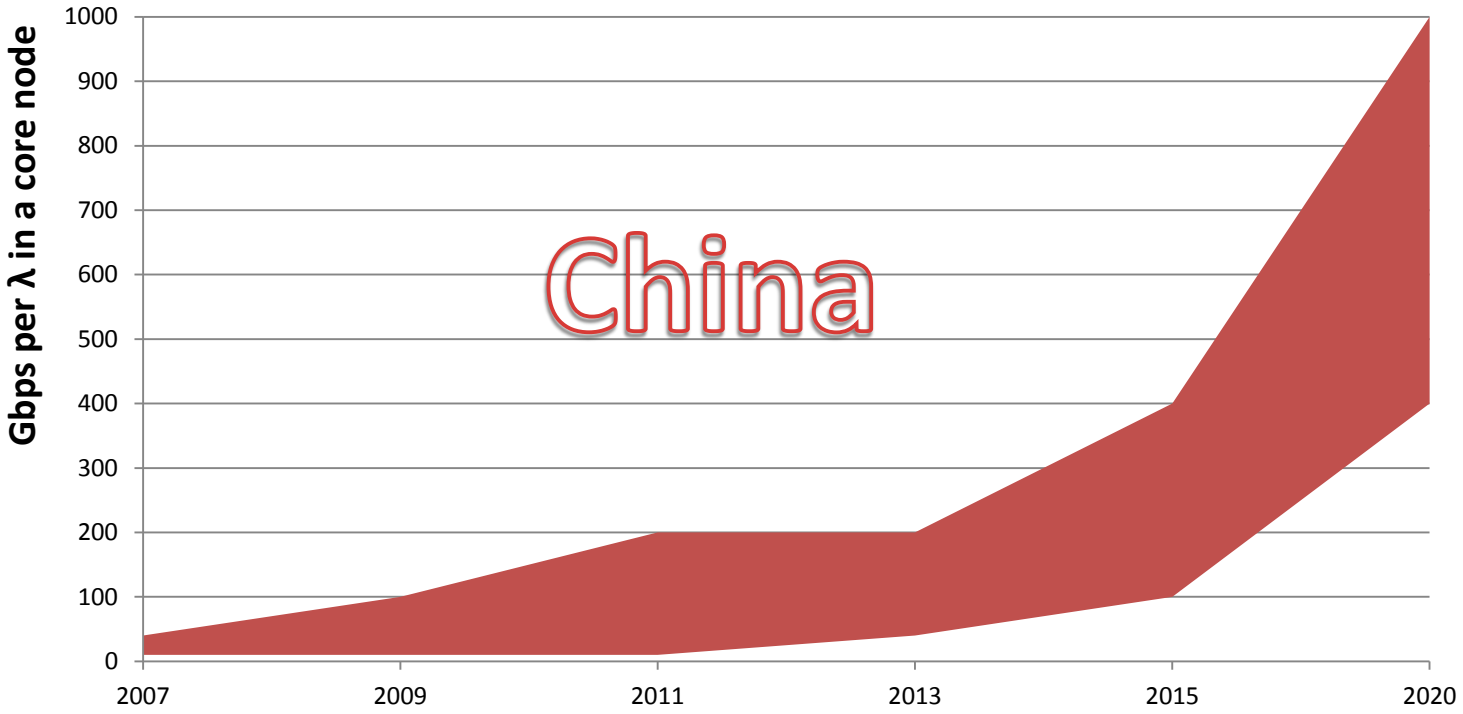
Bandwidth per Wavelength in an Aggregation Node



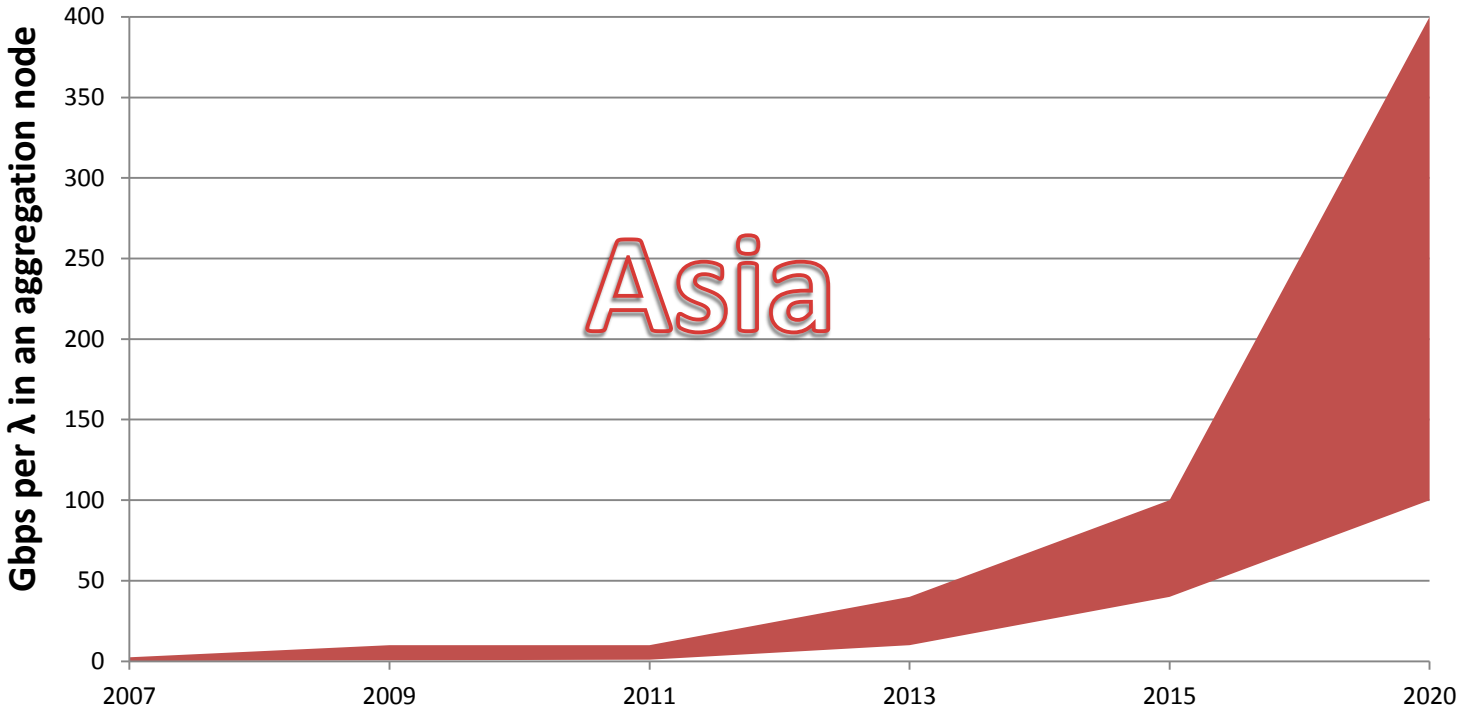
- As the networks of three Chinese operators are not the same, the bandwidth per wavelength in an aggregation node varies.
- The bandwidth per wavelength in an aggregation node is expected to converge around 100G in 2015 and is expected to be in the range of 200G to 400G in 2020.

Bandwidth per Wavelength in a core Node



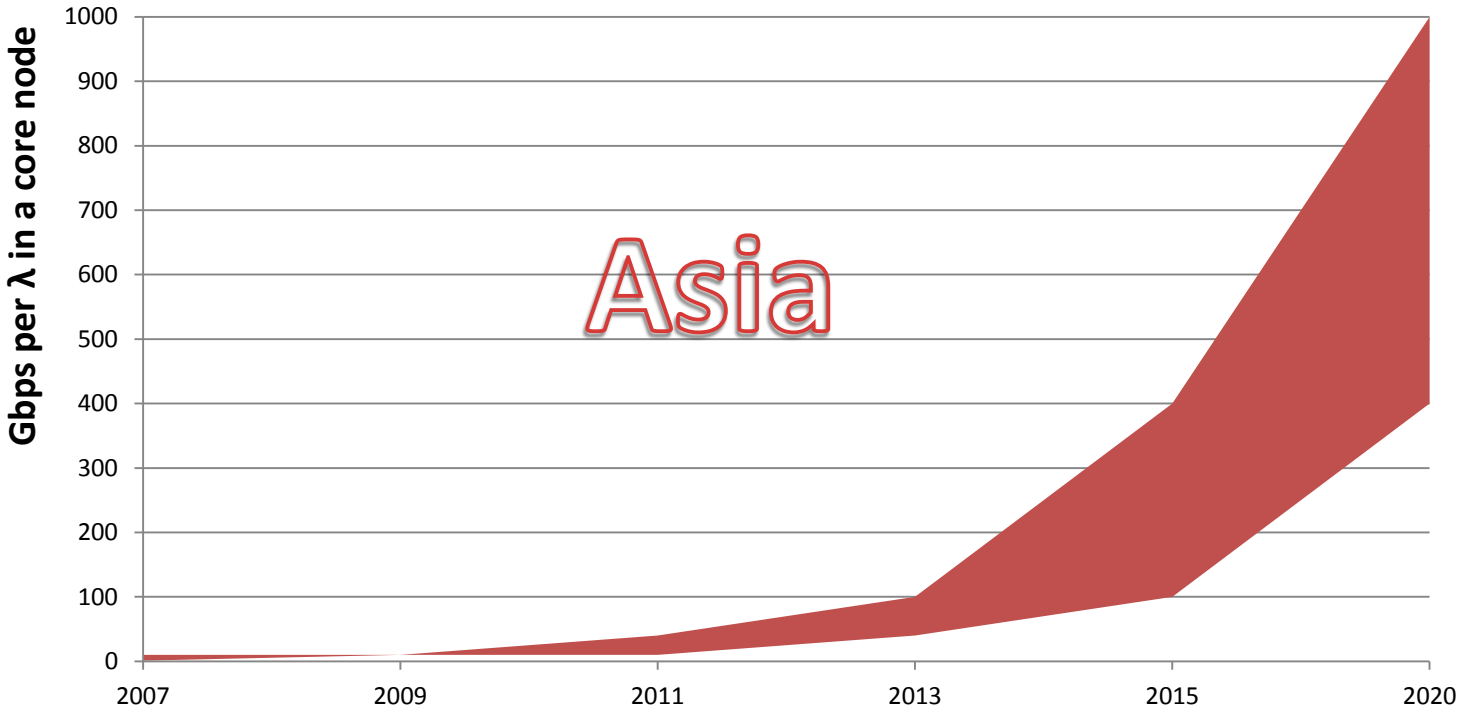
- As the networks of three Chinese operators are not the same, the bandwidth per wavelength in a core node varies.
- The bandwidth per wavelength in a core node is expected to be in the range of 100G to 400G in 2015 and is expected to be in the range of 400G to 1T in 2020.

Bandwidth per Wavelength in an Aggregation Node



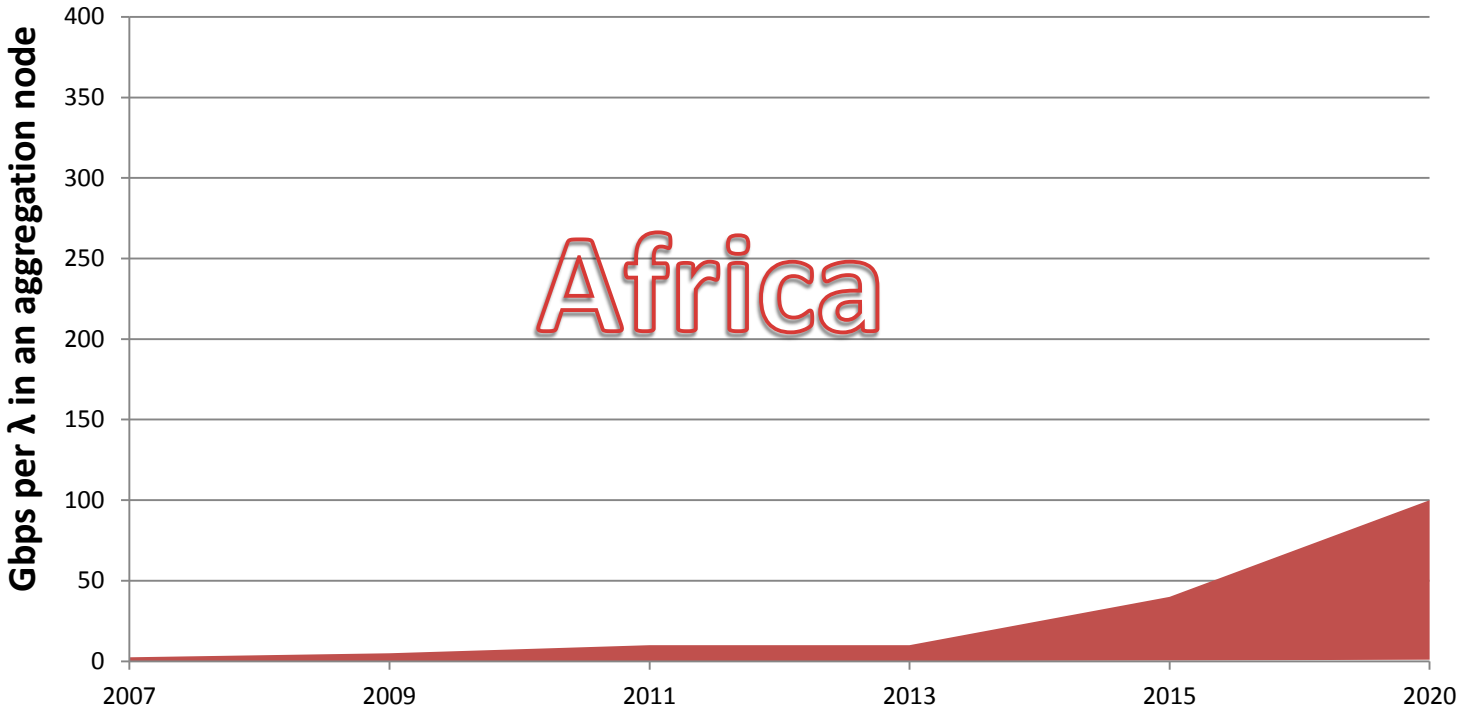
- As the developments of Asia countries are so different, the bandwidth per wavelength in an aggregation node varies a lot from 2011.
- The bandwidth per wavelength in an aggregation node is expected to be in the range of 40G to 100G in 2015 and is expected to be in the range of 100G to 400G in 2020.

Bandwidth per Wavelength in a core Node



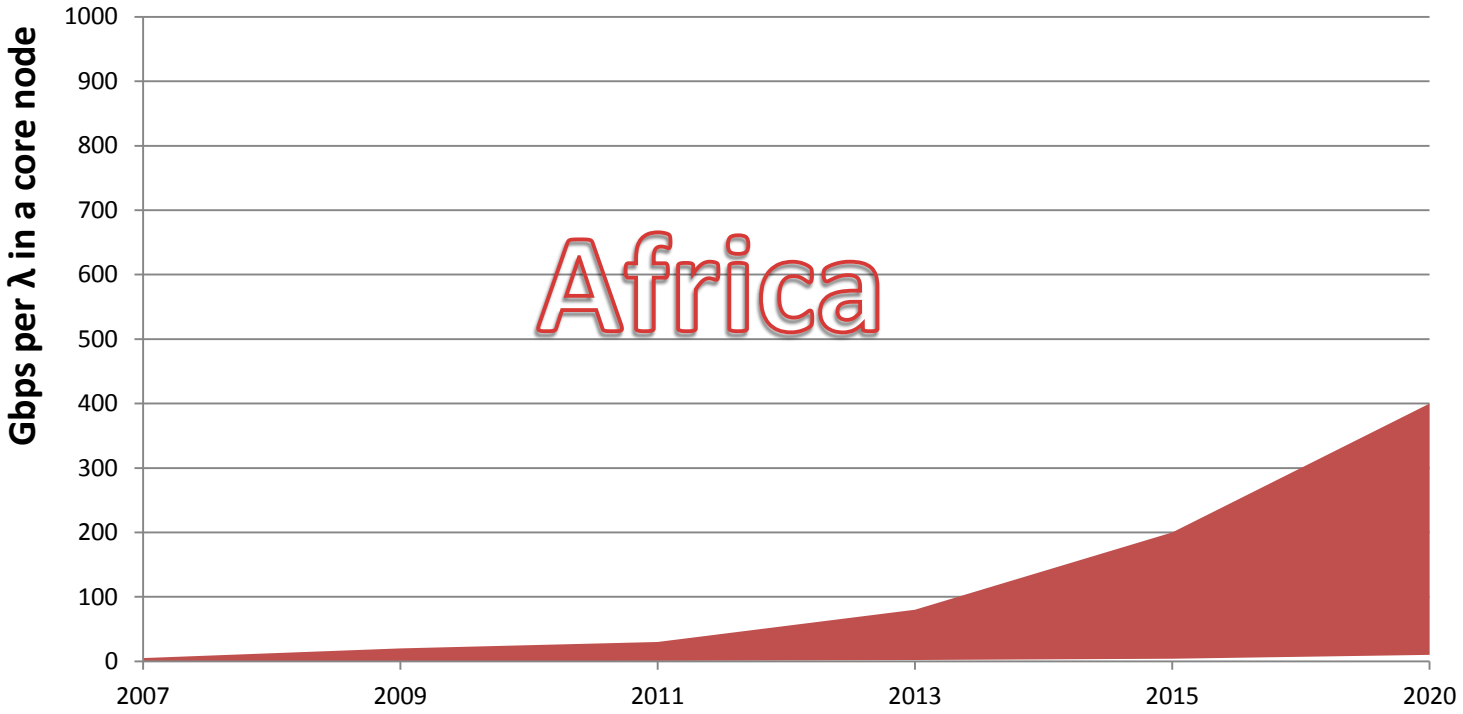
- As the developments of Asia countries are so different, the bandwidth per wavelength in a core node varies a lot from 2011.
- The bandwidth per wavelength in a core node is expected to be in the range of 100G to 400G in 2015 and is expected to be in the range of 400G to 1T in 2020.

Bandwidth per Wavelength in an Aggregation Node



- Due to huge economic difference, Africa shows a much lower rate of increase for bandwidth demand compared to Asia. The difference is also very large.
- The bandwidth per wavelength in an aggregation node is expected to be maximum 40G in 2015 and is expected to be maximum 100G in 2020.

Bandwidth per Wavelength in a core Node



- Due to huge economic difference, Africa shows a much lower rate of increase for bandwidth demand compared to Asia. The difference is also very large.
- The bandwidth per wavelength in an core node is expected to be maximum 200G in 2015 and is expected to be maximum 400G in 2020.

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Example of future demanding application - downloading

Today HD movie download

Example: Bluray format Lord of the Rings Triology Extended version

About 200G Bytes

Estimated downloading time:

@5Mbps	**3.7days**
@10Mbps	**1.9days**
@100Mbps	**4.4hrs**
@1Gbps	**26.7Min**

Example of future demanding application - UHDTV

ITU-R Recommendation for new TV-format: UHDTV

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Ultra High Definition Television (UHDTV) nearing reality

ITU experts create enhanced television viewing experience

Geneva, 14 October 2011 – Ultra High Definition Television (UHDTV) took an important step towards becoming reality when experts reached agreement on most of the pertinent technical characteristics of this exciting new standard for television. UHDTV marks a leap forward beyond the current standards for High Definition Television (HDTV).

The experts, which include scientists and engineers from around the world, have been working together for several years in the ITU Study Group on Broadcasting Service (ITU-R Study Group 6) to jointly develop and agree on the technical specifications that will successfully create 'UHDTV'.

A demonstration of UHDTV was provided by the Japanese public service broadcaster NHK at ITU earlier this month. The screen displayed a staggering 33 Million pixels, compared to a maximum 2 million pixels for the highest quality HDTV screens on offer today.

In September 2011, a trial UHDTV link was arranged between London and Amsterdam and plans are under way to cover part of the 2012 London Olympic Games in UHDTV for screening at public venues around the world.

Today HDTV 1080*720 (0.7 Million pixels)

UHDTV: 7680*4320 (33 Million pixels)

Filesize of UHDTV is about 47 times larger than that of HDTV!!!

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Conclusion

- The bandwidth needs for aggregation node and core node in transmission networks are growing fast from 2011.
- The bandwidth demand of core node in China and other Asia countries will reach maximum 400G in 2015 and will approximately reach 1T in 2020.
- Growing speed of Africa is lower than these in China and other Asia countries. It will reach maximum 200G in 2015 and will approximately reach 400G in 2020.
- This rate of increase in bandwidth is consistent with observations from other organizations.
- Market will require OTN speeds beyond 100Gbps.

Thank You

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