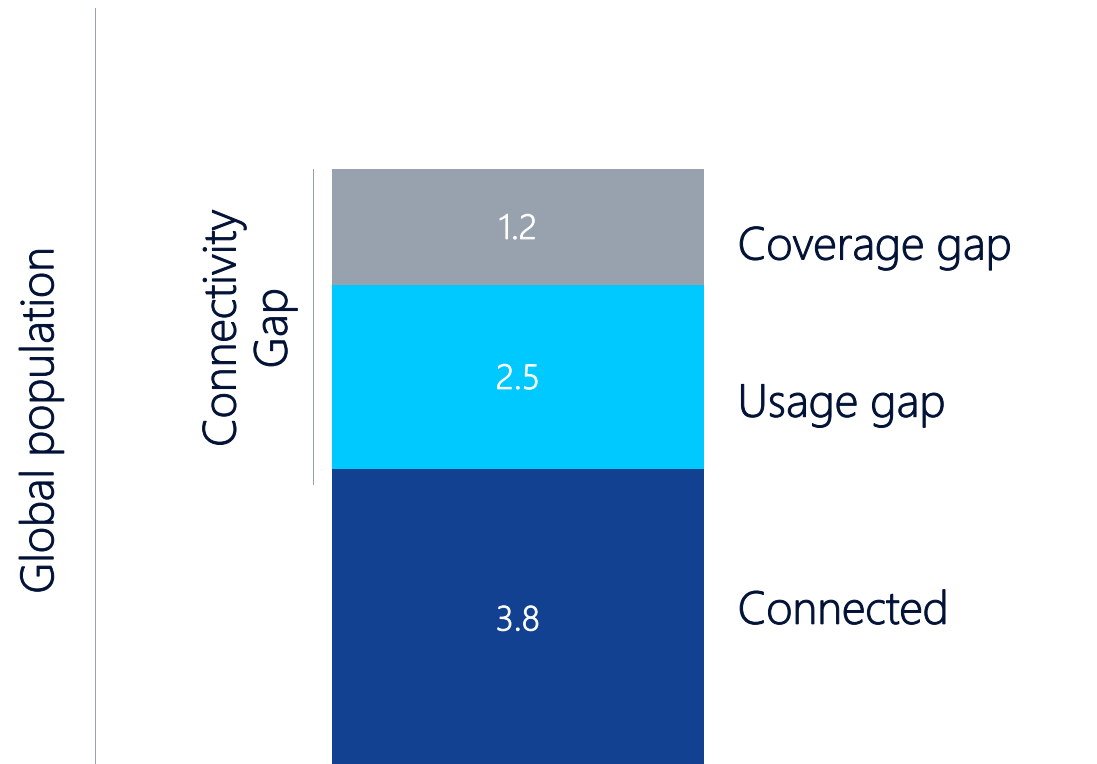


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Panel 2 - 5G for Remote Areas: Challenges and Opportunities

- Wilson Cardoso (Ph.D)
- November 2018

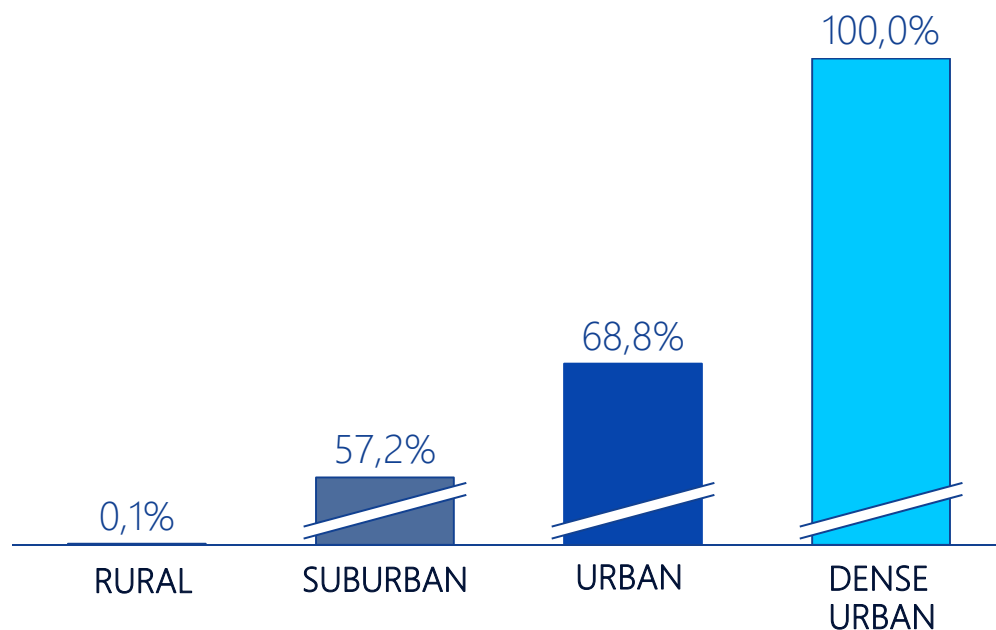
The reality today



Source: Nokia, GSMA – Enabling Rural Coverage 2018

Is it all about economics? 5G is becoming an urban system

Revenue for 5G coverage in different customer environments by 2021



Considerations:

- Revenues and utilization based on Brazilian market averages from 1H2018
- Considered introduction of applications in line with 3GPP releases

Source: Nokia, A.-M. Kovacs, "Regulation In Financial Translation", may 2014

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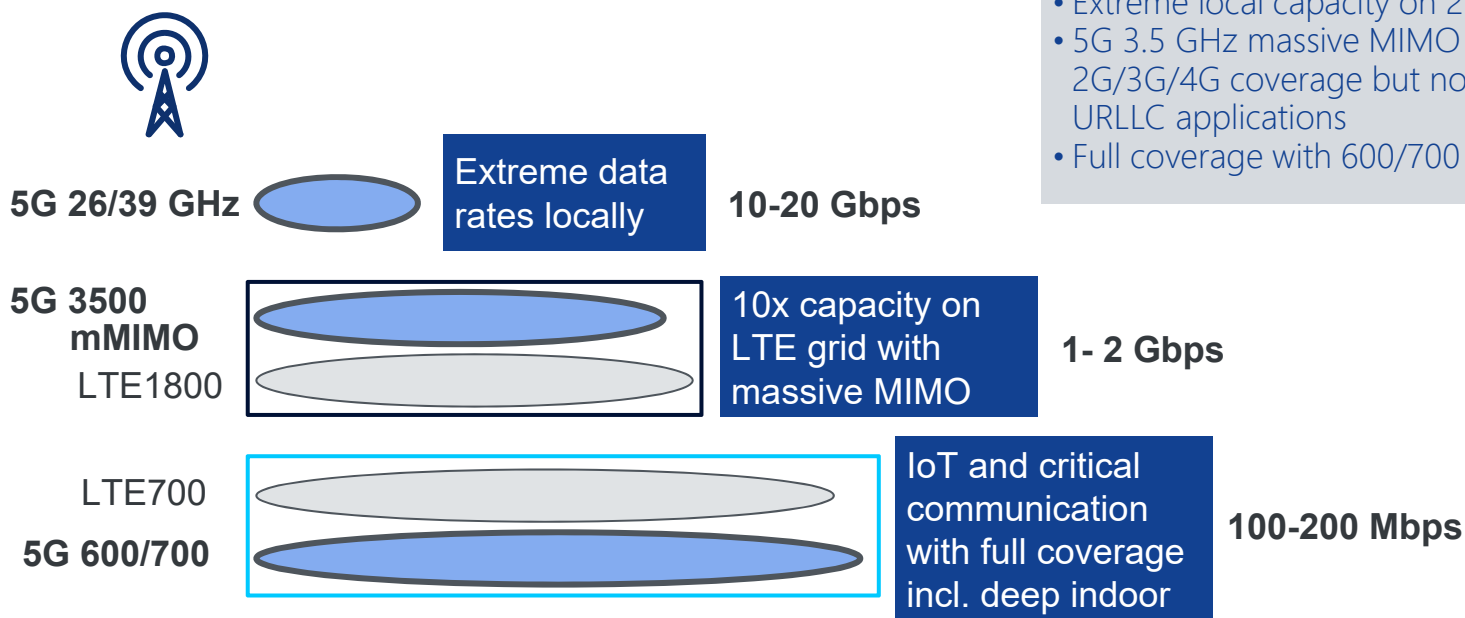
Rural connectivity = increased productivity

Challenge 1 : different devices and different needs.



5G Deployment – coverage options

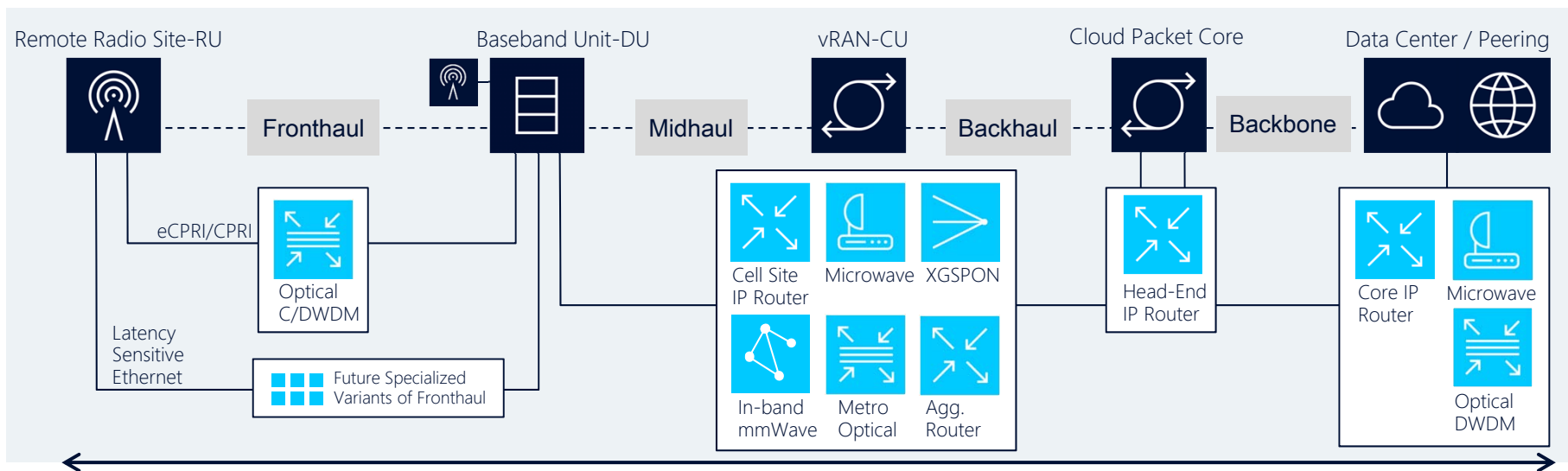
Challenge 2: create real connectivity options



- Extreme local capacity on 26/39 GHz
- 5G 3.5 GHz massive MIMO matching 2G/3G/4G coverage but no support for URLLC applications
- Full coverage with 600/700 MHz

5G “Anyhaul” is critical for Rural deployment

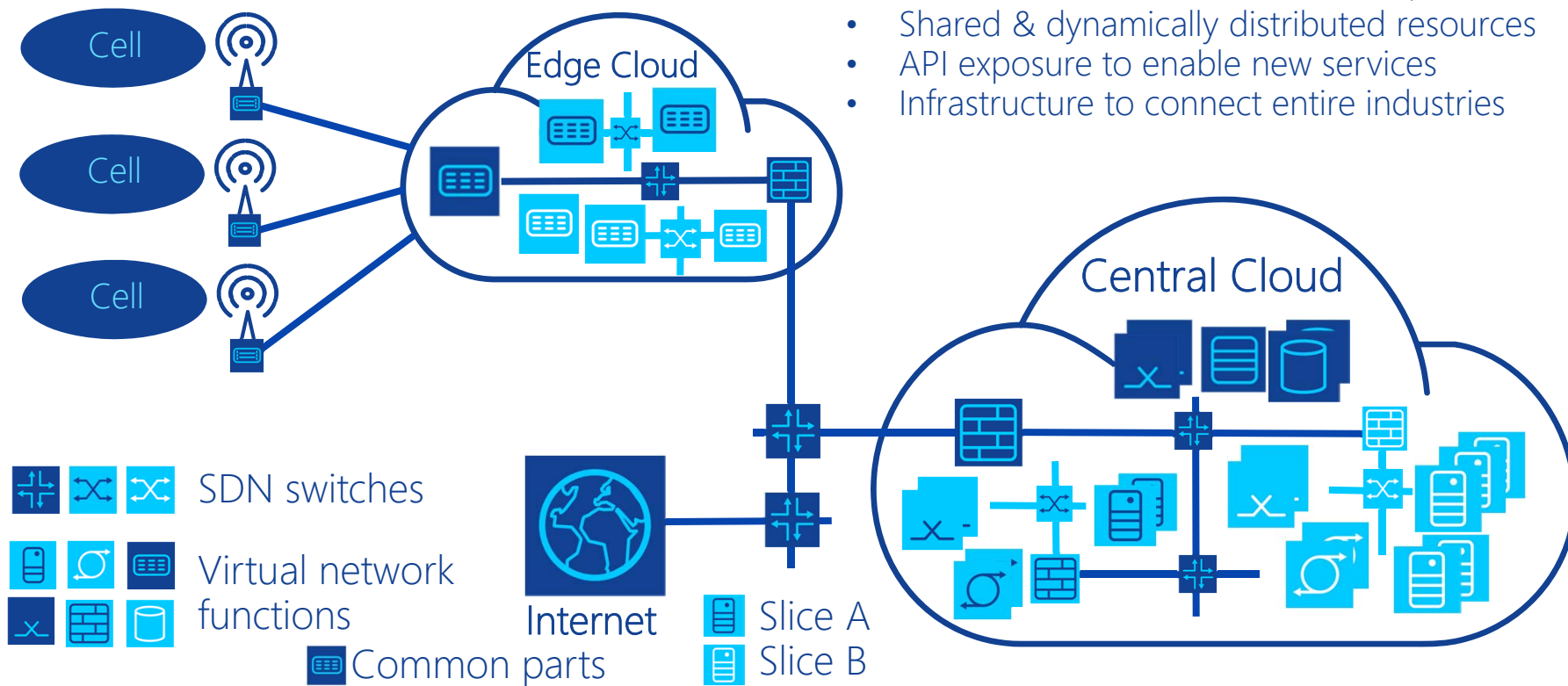
Challenge 3: how create an affordable transmission path



Edge cloud and Centralized RAN can reduce further the costs

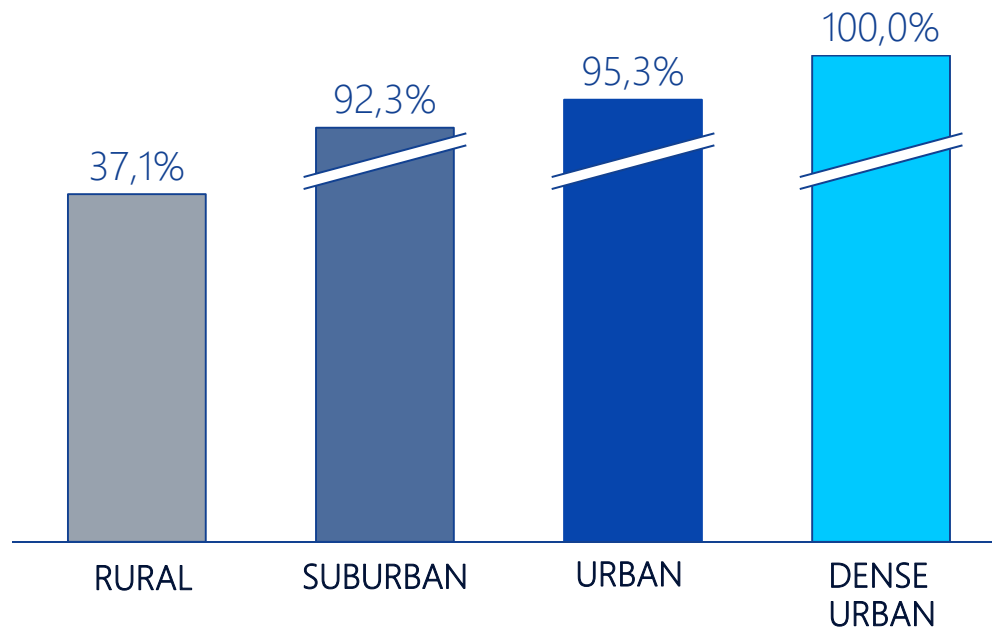
Challenge 4: create a distributed content

- Massive increase in # devices & throughput
- Much wider attack surface with IoT, VNF & MEC
- Shared & dynamically distributed resources
- API exposure to enable new services
- Infrastructure to connect entire industries



Is it all about economics? 5G is becoming an RURAL system

Revenue for 5G coverage in different customer environments > 2021



Considerations:

- Revenue increase based on high utilization of eMTC and cMTC.

Source: Nokia, A.-M. Kovacs, "Regulation In Financial Translation", may 2014

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Summary and final recommendations

- Coverage depends on many parameters per use case. It should not be about coverage, it should be about providing the right connectivity.
- Rural coverage at high frequencies is challenging. Use available technology to improve coverage for rural areas in stead of focussing on top performance locally only.
- Flexibility and scalability in the architecture is key for a gradual implementation of 5G. A major overhaul in fixed (including wireless) infrastructure is needed. Incorporate this in the 5G approach
- Cheap energy efficient battery powered relay stations with sleeping modes
- Joint operation with TV broadcast services may increase revenue and reduce TCO