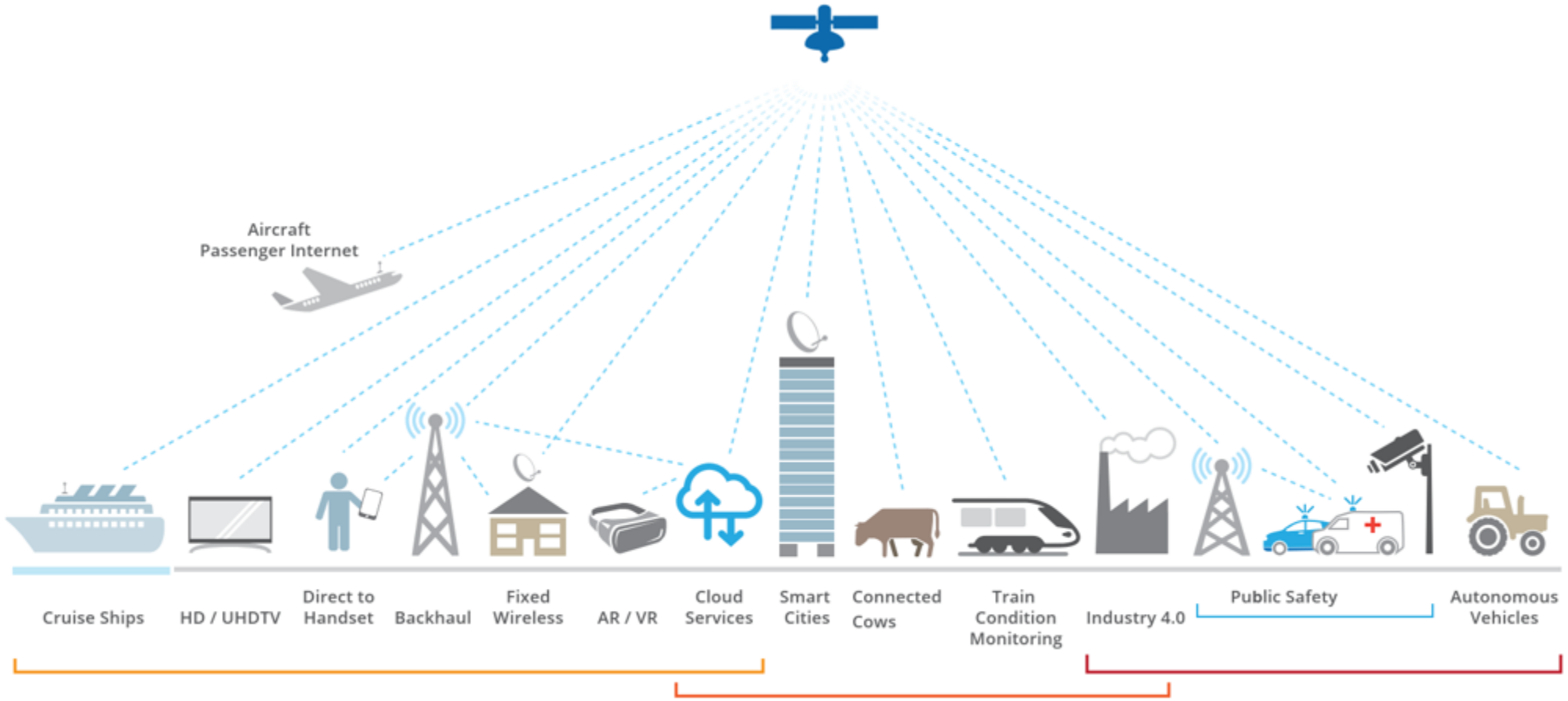
5G and Satellite – where are the market opportunities?

COMTECH EF DATA™

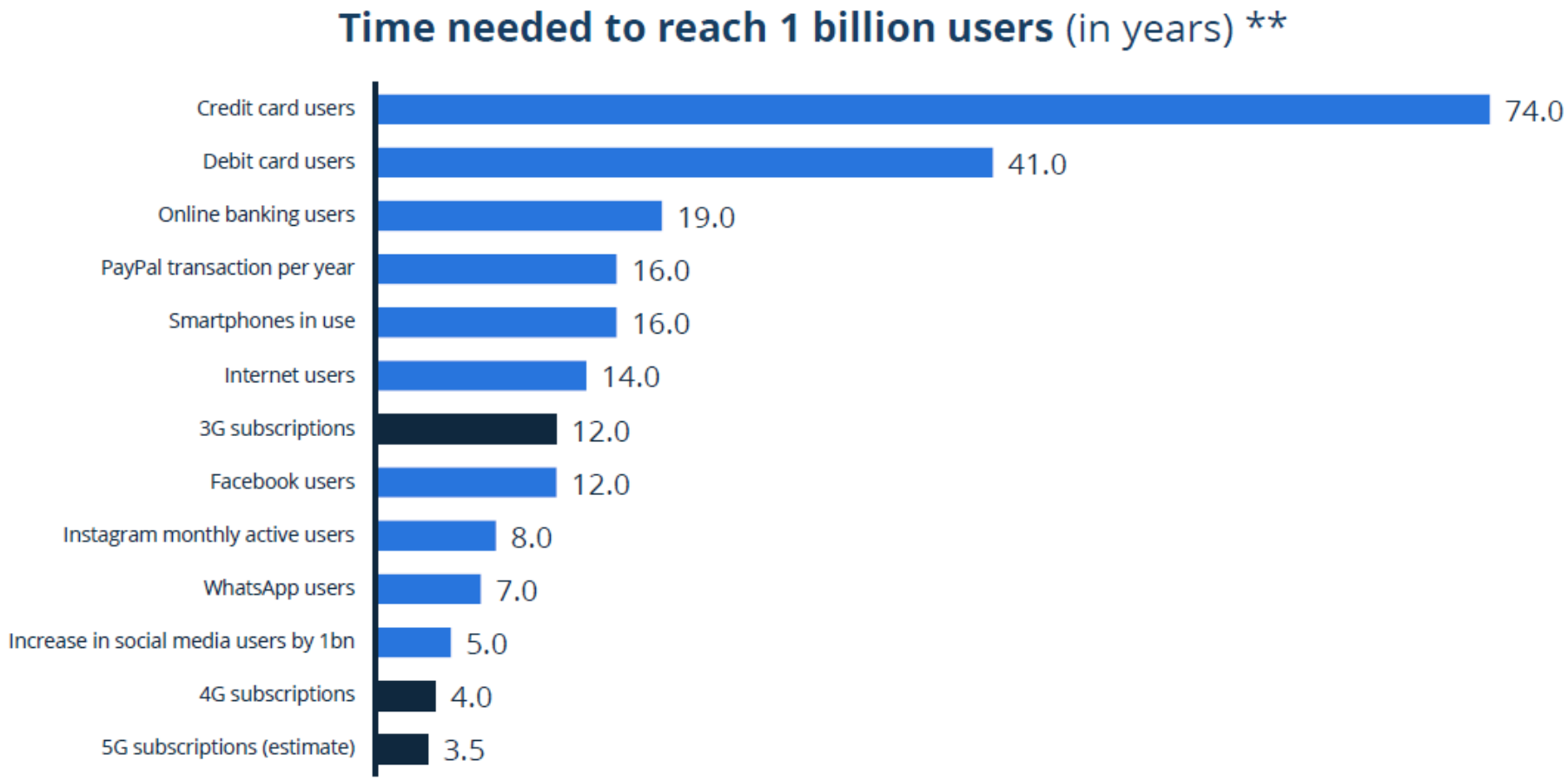
5G + Satellite enabling key use cases



Source: ESOA

5G empowers a massive ecosystem

5G expected to have an unprecedented speed in uptake

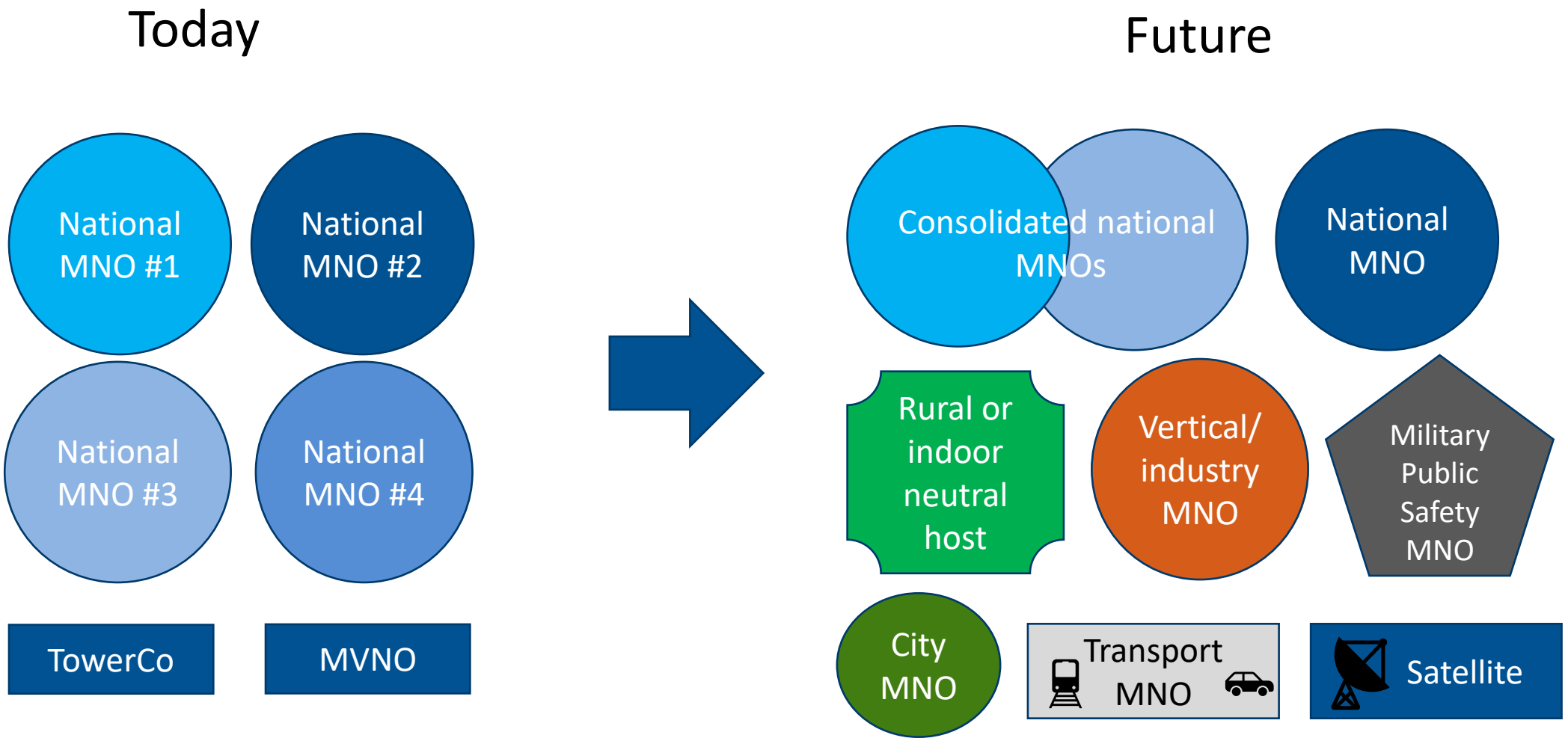


Source: Statista

5G will drive transformation of Telecom itself

Today

5G will drive transformation of Telecom itself



5G Satellite integrated solutions

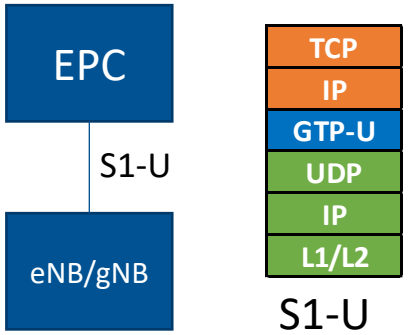
- Satellite has several potential roles to play in 5G
  - Like 2G, 3G and LTE today traditional backhaul will be the first market to materialize -> enhanced mobile broadband (eMBB)
  - Non Terrestrial Networks (NTN) looks to integrate 5G protocols and waveforms within the 3GPP framework in to HAPS, LEO, MEO and GEO
    - L and S band getting an early start. MediaTek early with prototype chipsets.
    - Target use cases center around massive machine type communication (mMTC) and eMBB
  - Broadcast scenarios (caching, content contribution and distribution) are also being discussed but there has been many “false starts” in the past.
  - Remember - just because something makes it in to a standard doesn’t ensure commercial success…

Deployment options for eMBB over satellite

Three different flavors of 5G backhaul

5G Non Standalone

- In 5G NSA (option 3) transport between eNodeB/gNodeB and Core (EPC) is using a LTE based S1-U interface for payload
- GTP acceleration applies



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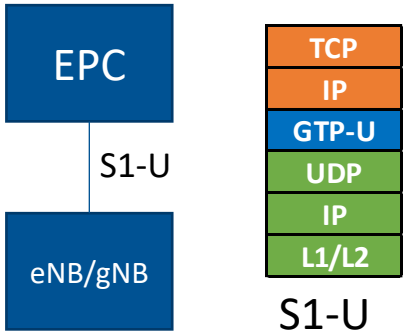

S1-U

5G Standalone

- In 5G SA transport between gNodeB and Core (UPF) is using a N3 interface for payload. Protocol stack is similar to S1-U
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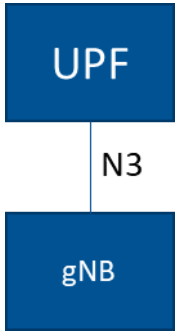

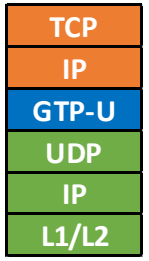

N3

Three different flavors of 5G backhaul

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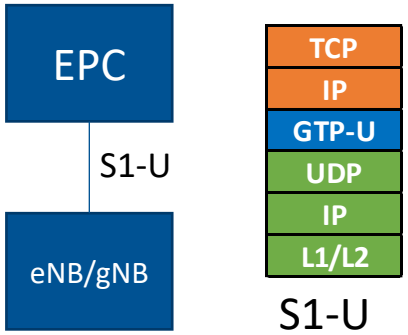

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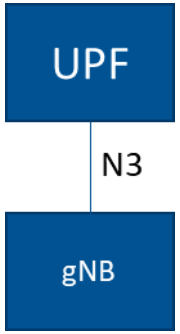
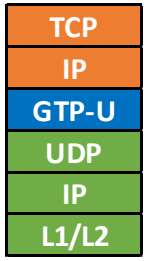
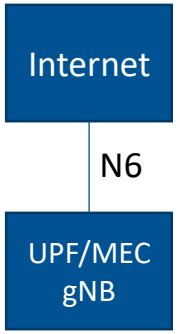


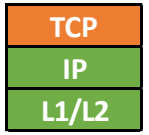


N3

5G + MEC

- In the 5G + Mobile Edge Compute use case gNodeB and UPF is co-located and backhaul to the Internet is using N6 interface
- TCP acceleration applies





N6

Demonstrating the benefits of content delivery over satellite

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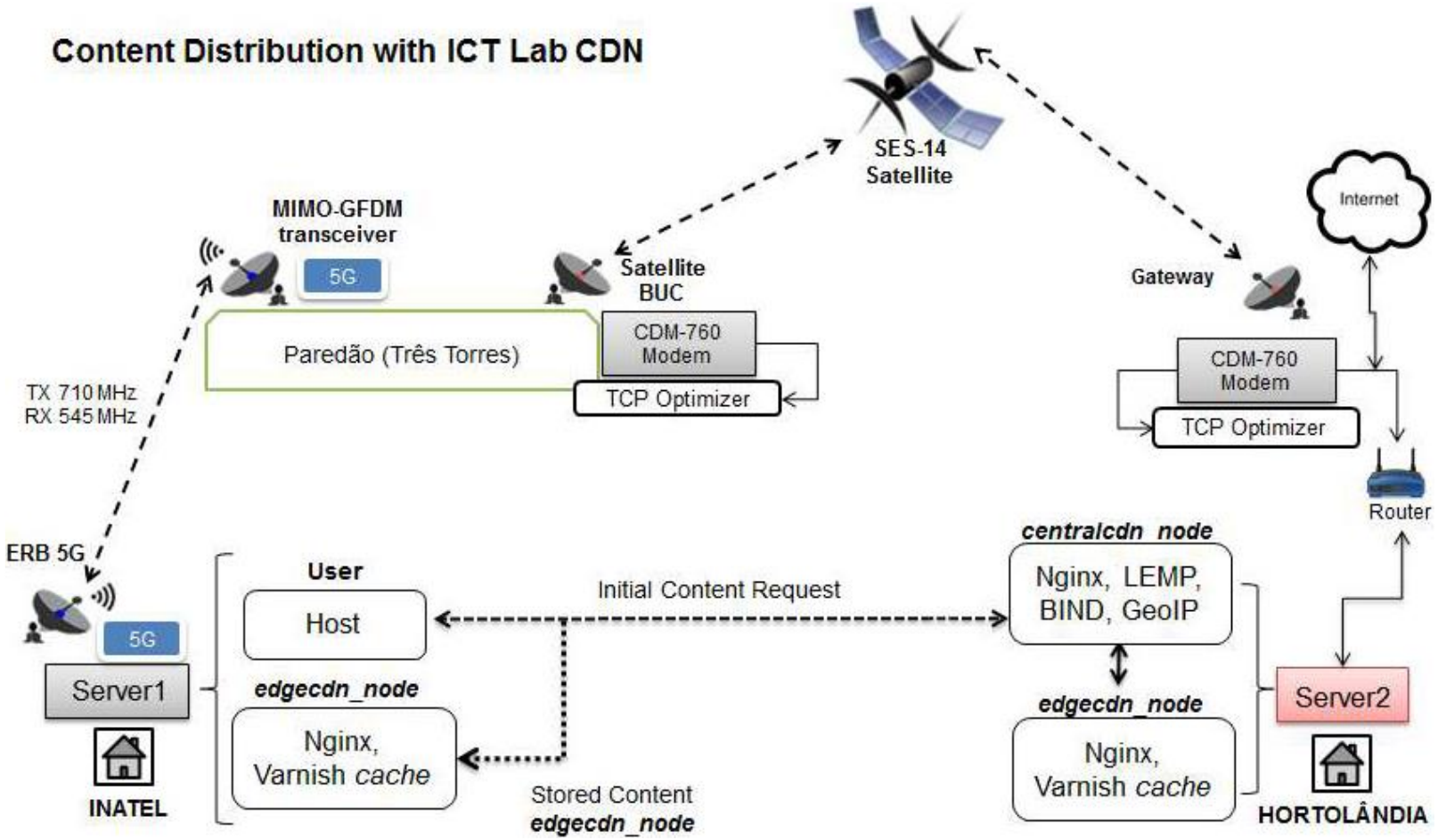
INATEL Brazil 5G Trial – Trunking with CDM-760



- ✓ **Typical Comtech MNO Trunking solution: Optimizer Memotec FX and modem CDM-760**
- ✓ **Satellite SES-14. Uplink in Ka and Return in Ku-Band**
- ✓ **Supporting Inatel Content Distribution Study via 5G Hybrid Connection Terrestrial / Satellite**

Summary

- eMBB is a proven business case and the commercial value of satellite already demonstrated and well understood by Telcos
- mMTC is a golden opportunity for both wireless and satellite industry. Highly complementary.
- Broadcast is technically not a problem but commercially more challenging. Outside of satellite value not fully understood.
- OSS/BSS integration, inter-working functions and Open standards has a lot of potential value, especially for constellations.

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