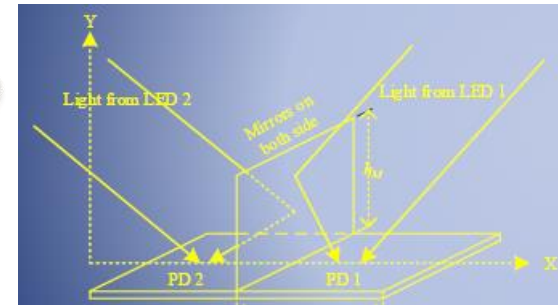


5G for Rural and Remote Areas



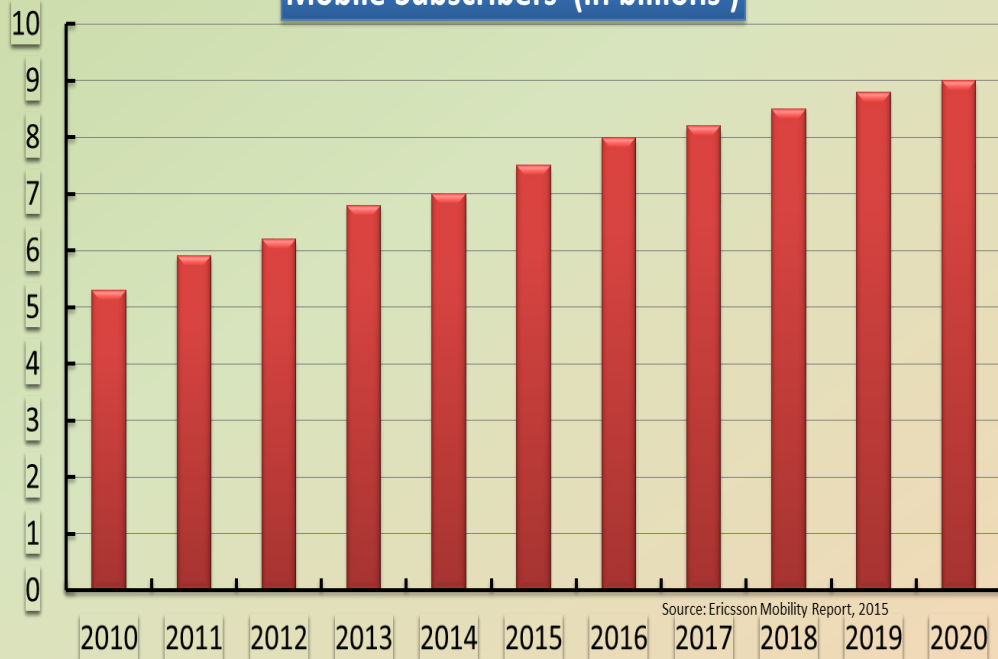
Mohamed-Slim Alouini

Communication Theory Lab. @ KAUST

<http://ctl.kaust.edu.sa>

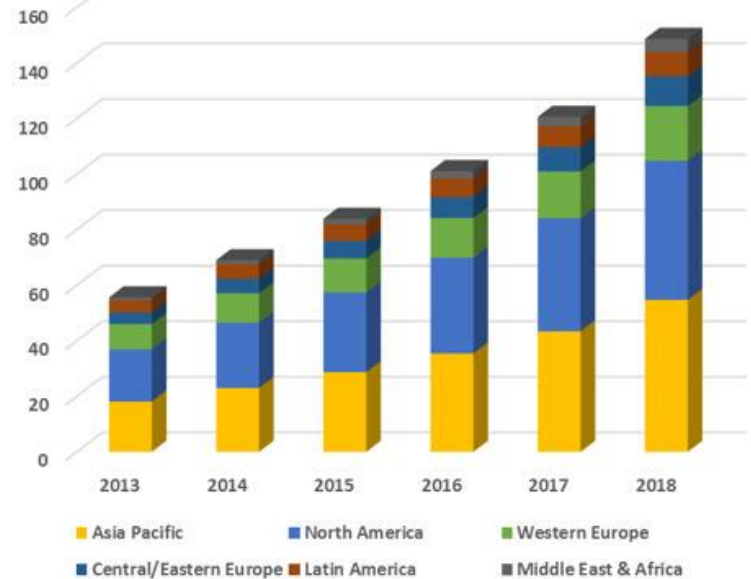
Growth of Mobile Phone Subscribers & Data Traffic

Mobile Subscribers (in billions)



Monthly IP Traffic By Region In Exabytes

Source: Cisco



Mobile internet traffic growth is pushing the capacity limits of wireless networks !

Evolution of Generations

From 1G to 5G

1980s
Analog Voice

1G



1990s
Digital Voice
SMS + Email



2G



3G
2000s

Mobile Internet
+ Positioning

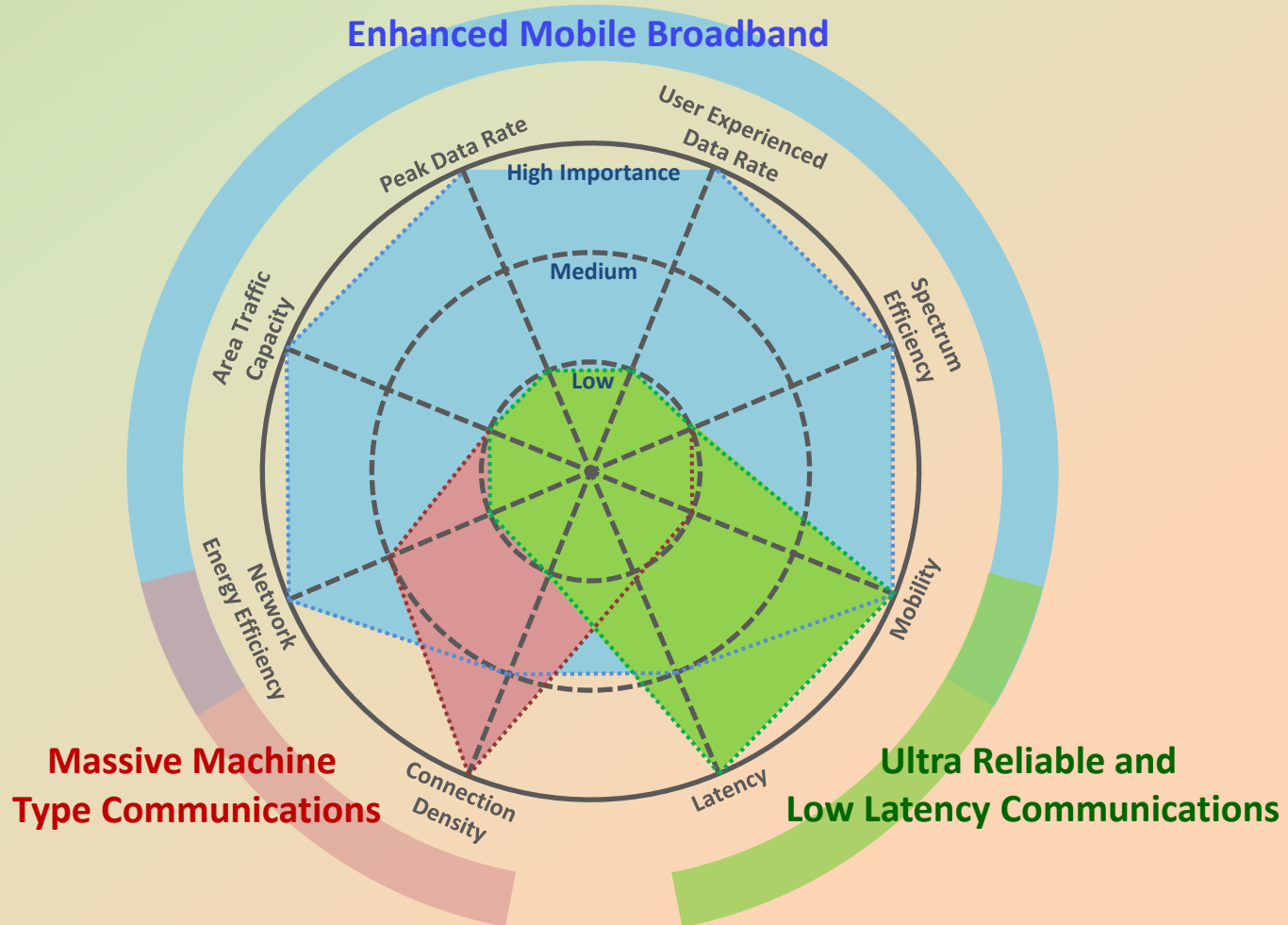


4G

2010s

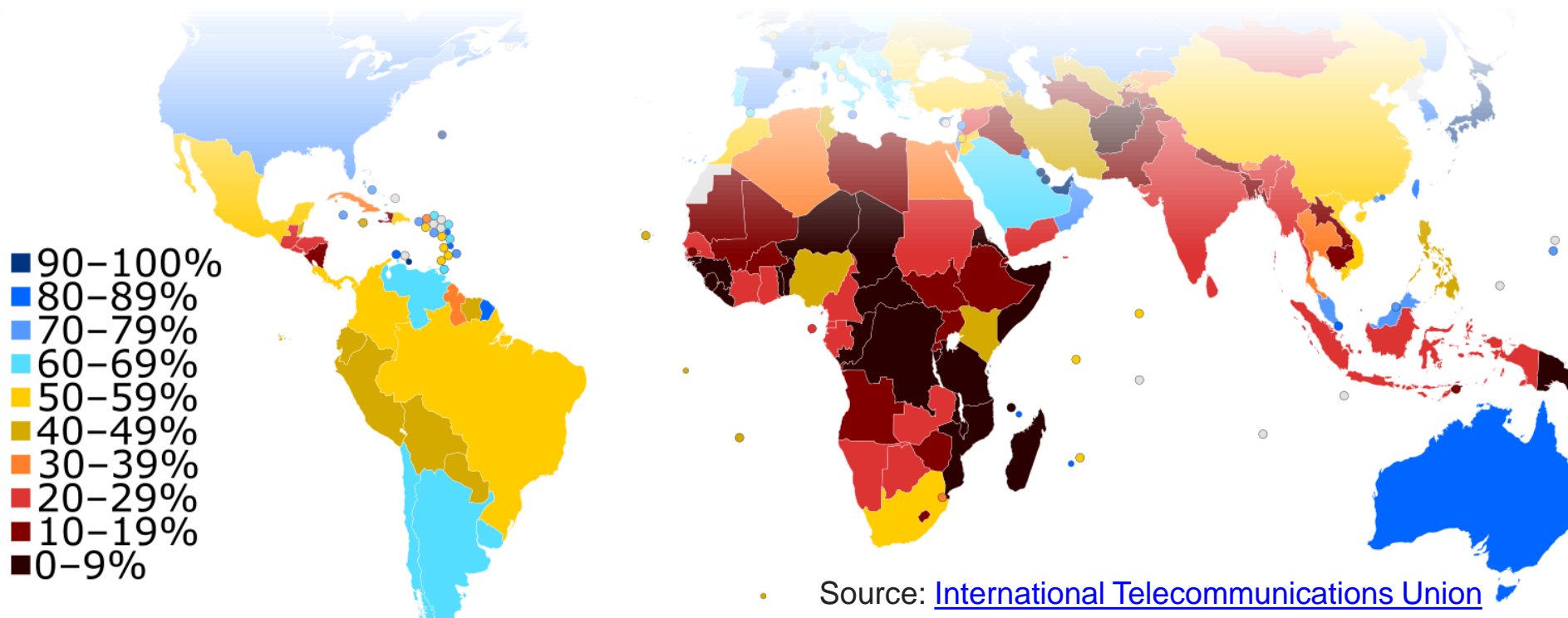
Mobile Broadband

5G Expectations: Usage Scenarios



Global Connectivity

- **Billions of people around the world are still without internet access.**
 - Cooperation needed to bring reliable internet to those without it.
 - High-quality connectivity enables richer/denser communities to share knowledge and strengthen the economies of less fortunate/dense communities.



High-Altitude Connectivity (1)

- Connecting remote communities using existing, conventional technologies such as optical fiber or microwave links on towers is often expensive and unsustainable.
- Connectivity with better channel quality and accessibility throughout the atmosphere and extend existing backhaul at lower costs.
- **Facebook Project AQUILA** (2014-2018)
 - A pioneering solar-powered drone flying 25 km up and intended to act as relay stations for providing internet access to remote areas.

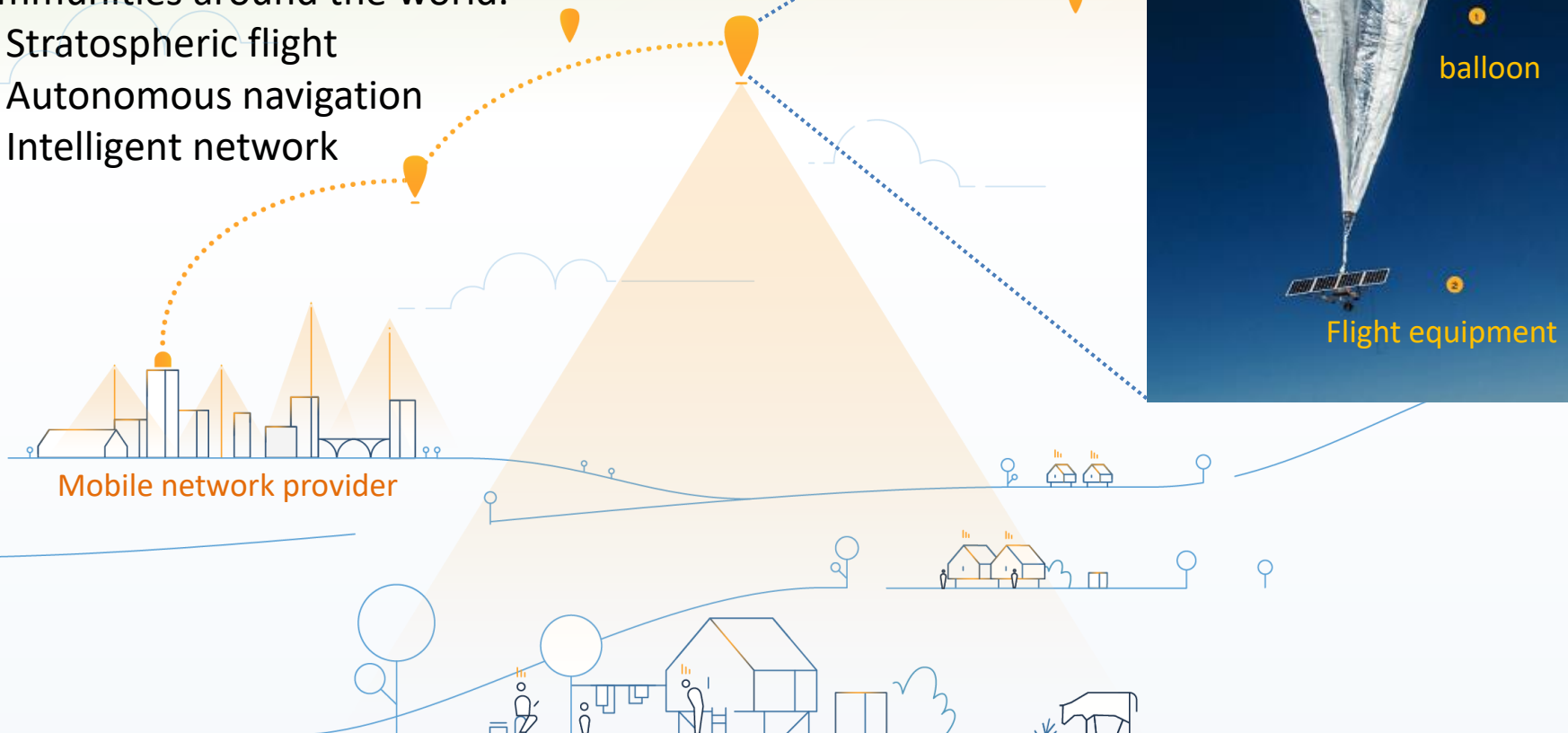


High-Altitude Connectivity (2)

• Google Project Loon

A network of balloons flying 20 km up in the stratosphere, delivering connectivity to people in unserved and underserved communities around the world.

- Stratospheric flight
- Autonomous navigation
- Intelligent network



Emergency Connectivity

After Hurricane in Puerto Rico in 2017,
Project Loon supported emergency
connectivity while mobile networks were
being recovered.



جامعة الملك عبد الله
للعلوم والتقنية

Thank You
ctl.kaust.edu.sa

