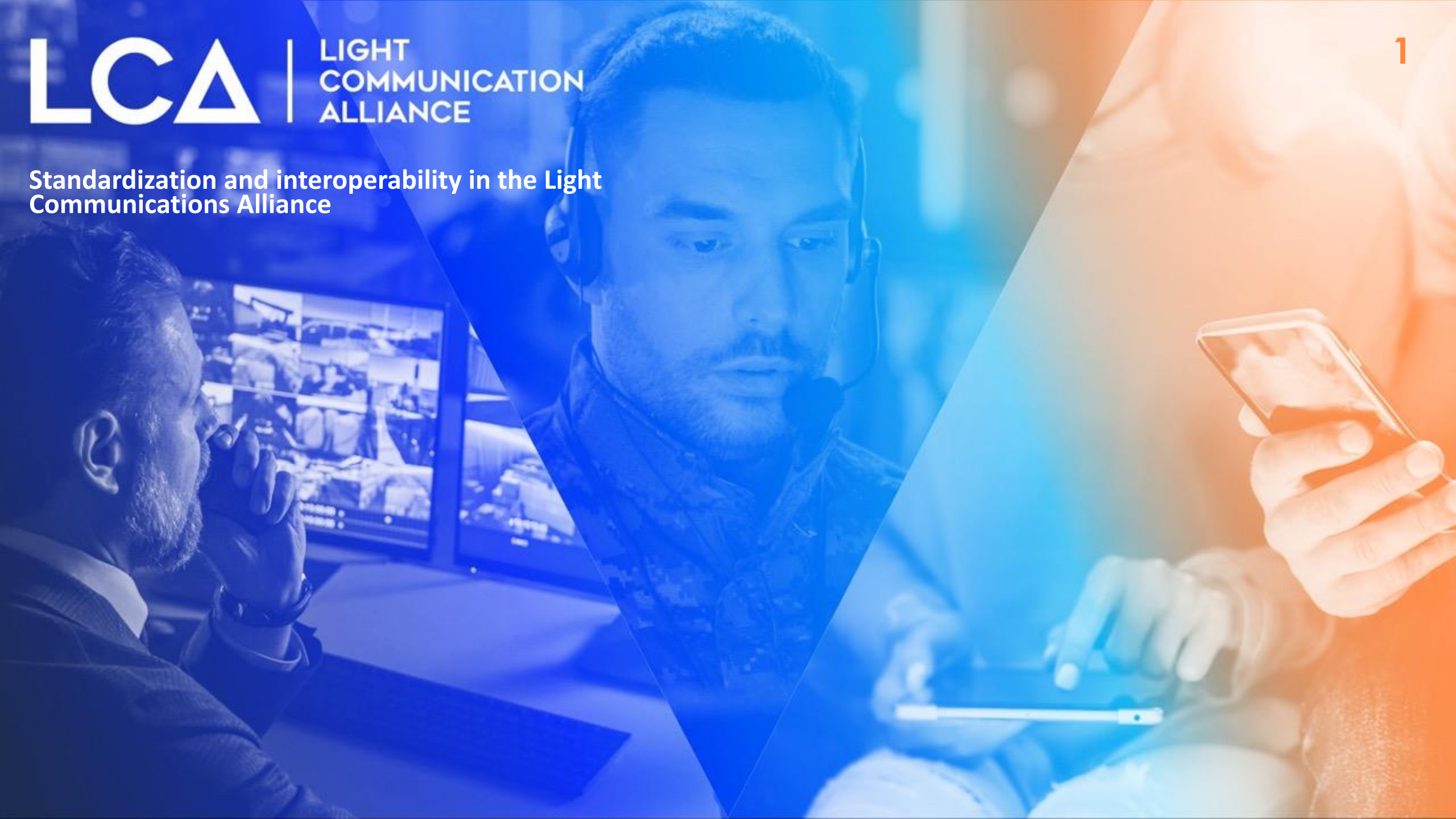
LIGHT COMMUNICATION ALLIANCE

Standardization and interoperability in the Light Communications Alliance



Outline

- LCA in a nutshell
- Taxonomy of Light Communications (LC)
- Key members and eco-system
- Light Communication standardisation
- LiFi and 3GPP
- Use Cases
- LC adoption tentative
- Conclusion

LCA

pureLiFi: PIONEERING LiFi GLOBALLY

- First to market with LiFi
- Track record of world firsts, including first commercial LiFi systems & components
- Supplying our Kitefin™ system to US Army for the largest LiFi deployment ever
- Chair IEEE task group standardising LiFi alongside WiFi as 802.11bb
- 120 years of LiFi engineering knowledge & 220 years in consumer electronics
- Track record globally with deployments and pilots across 25 different countries

Award Winning

WINNER

Silicon 100 EETimes

Scotland's Most Innovative Technology Company

Scotland IS

WIRED TRAILBLAZERS

LCA

OUR FOCUS TECHNOLOGIES

- LiFi
- OCC
- FSO

MOTIVATION

Delivering the benefits of ubiquitous Light Communications to serve people & technologies, requires a far-reaching & coherent ecosystem working at a determined pace

MISSION

Driving a consistent, focused & concise approach to market education that will highlight the benefits, use cases & timelines for Light Communications

HOW

Aligning leaders across every industry to develop or envisage business models using Light Communication systems & technologies by defining a standard of education in an efficient communication & co-operation frame.

LCA

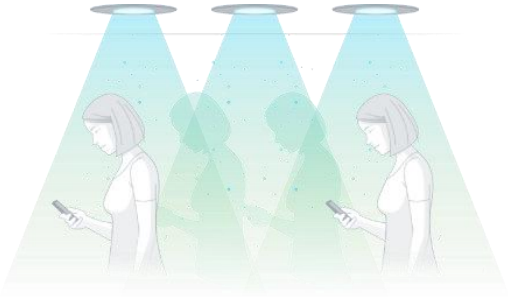
Not all light communications is LiFi. It's is important to understand the differences between these types of communications, as they all have different applications.

Optical Camera Communications

OCC

Low Speed
Geo Location
Advertisements
Notifications

Light Fidelity



LiFi

Secure high-speed mobile wireless communications

Free Space Optics

FSO

Backhaul
Long-distance communications

LCA

LiFi/OCC key players

pureLiFi
Lucibel
NavTech
OLEDCOMM
Signify
Zero 1

Applications

Crantec
pureLiFi
OLEDCOMM
Signify
Zero1

Operators

Emirates Integrated Telecommunications Company (du)
Liberty Global
Orange
Luxembourg POST

Equipement vendors

pureLiFi
BKS Digital
GETAC
Nokia
Signify
VIAVI

Networking and security

BKS
Crantec
Nokia
QRCrypto

University/Research Institute

CEA
University of Edinburg
University of Strathclyde
Institut Mines Telecom

LCA

Added Value of Light Communications

- Provide wireless communications when Radio Frequencies cannot be used
- Sensitive equipment or security concerns.
- Guarantee a stable connection to the users, e.g. automatically select the most appropriate access point to provide the required
- Guarantee continued connectivity for some sensitive applications
- Improved security with limited coverage area
- Complementary capability to a 5G and WiFi to support critical KPIs, such as speed and stability.
- Support for low latency end-to-end solutions.
- Green potential: energy efficiency and energy savings potential gains

ITU-T G.vlc/G.9991

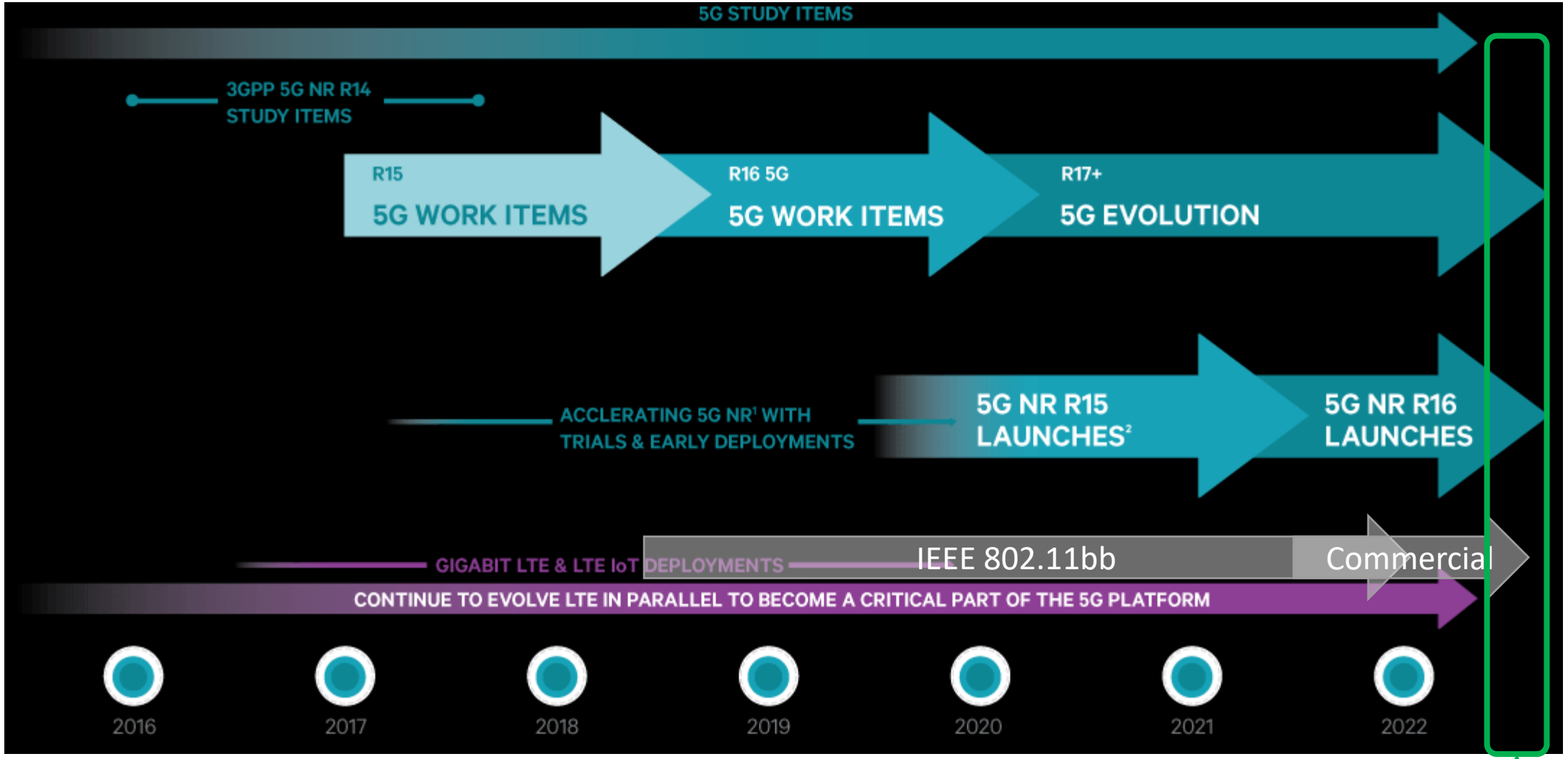
- Recommendation G.9991 (G.vlc) was finished in 2019
- performant chipsets up to 2 Gbit/s available from multiple silicon vendors
- well-established ecosystem: powerline, coax, twisted pair, POF
- G.vlc is derived from G.hn
- Main PHY is DCO-OFDM with adaptive bit-loading
- MAC with random CSMA or deterministic TDMA
- G.hn chips are software-upgradable to G.vlc
- Introducing IEEE 802.1x, interference mitigation and handover in 2021
- No specification on the light medium or OFE design (wide wavelength range)
- Real products already in the market (Signify and Oledcomm)

LCA

- Completing IEEE 802 SA letter ballot – expect release in 1H2023
- Wide spectrum range
- 3 PHY modes
- Max data rate of 2 Gbps (200 MHz channel) PER COLOUR
- OOK version, DCO-OFDM x2 including adaptive bit-power-loading
- LDPC FEC
- No common mode
- 2 MAC modes
- Not cross compatible
- Scheduled and random access
- Distributed MIMO approach
- No real products that implement the entire PHY/MAC

- Draft 4.1 (stable for product development) released to IEEE Standards Association Ballot on 5 Oct. 2022
- Billions of chipsets available and deployed globally
- Established ecosystem of technologies
- Spectrum limited to 800 – 1000 nm to facilitate interoperability
- Re-use existing 802.11 PHY modes and chipsets (WiFi-4, WiFi-5 and WiFi-6)
  - Max data rate of 2.5 Gbps (2x 160 MHz channels) PER COLOUR (WDM applicable as needed to scale data rate, e.g. 10 Gbps)
  - All DCO-OFDM based -> all PHY modes are "down shifted" to current RF versions
- MAC is the 802.11 MAC as relevant to the selected PHY modes
- Real products expected 1H2023
- Compatible with latest WiFi-6 Chipsets supporting scheduled access and QoS

3GPP Rev. 15 and Rev. 16 timeline (Qualcomm)



SYNC – LiFi and 5G

CERTIFICATION

- HomeGrid Forum has already established a certification process for G.9991
  - Key focus on the digital interoperability between various vendors
- 802.11bb certification for the chipsets is already complete within the WiFi-Alliance
- Optical Front-End certification must be considered as the next step

Market driven use cases

The industry is moving with real use cases that require LiFi to solve real problems in the industrial, enterprise and consumer spaces.

Defence

Secure network access
Office and headquarters
Field tactical deployment
Aircraft maintenance
On-board ship/aircraft
Augmented reality

Industry

Connected maintenance
Industry 4.0
Wireless robotics
Office networking
Augmented reality
Inherently safe environments

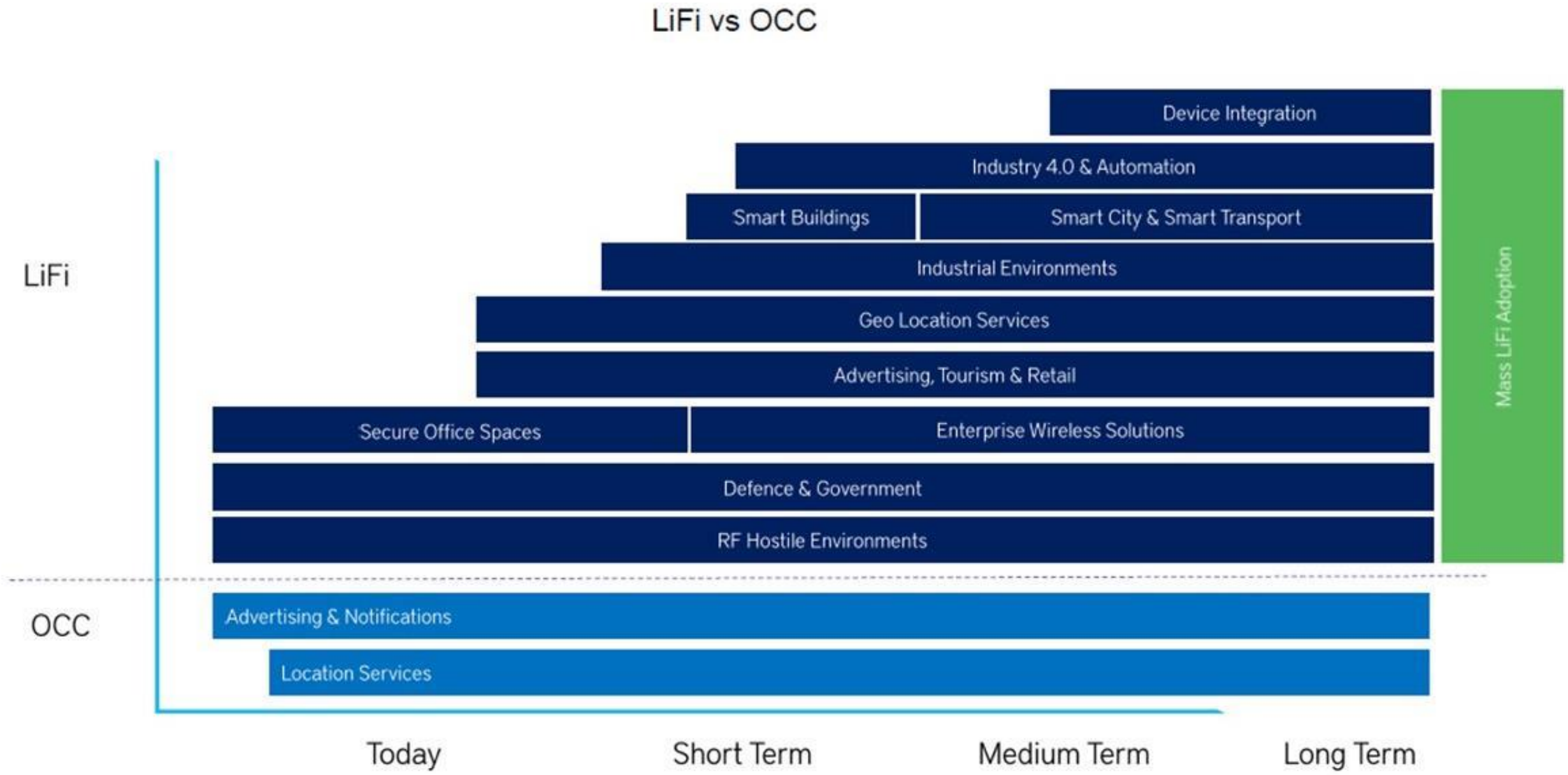
Consumer

Network bandwidth offload
Home networking
Device to device streaming
Cable replacement
Wireless docking
Augmented/virtual reality

Mobile

Phone to phone
Phone to other device
Fully mobile network access
Location based services
Seamless LiFi/RF integration
Secure transactions

Light Communication Adoption



CONCLUSION

- Market deployment started with Getac announcing the world's first integrated LiFi-enabled tablet powered by pureLiFi
- Multiple testbeds, field trials & deployments in hospitals, industry 4.0, aerospace, logistical centres, etc.
- LCA has gained 7 additional members in 2020 after the official LCA kick off meeting
- Increased visibility in the ecosystem and expanding relationship with key organizations