5G - Höher, Schneller, Weiter!

Die 5. Generation Mobilfunk

Eckhard Grass

innovations
for high
performance
microelectronics

03.01.2017

HUB – Informatik

Mitglied der Leibniz-Gemeinschaft

5G - Höher, Schneller, Weiter, …

Höhere

… Datenrate

… z.B. für Videostreaming und „Big Data“

Schneller

… Verbindungsaufbau

… und dadurch kurze Wartezeiten (taktiles Internet)

Weiter

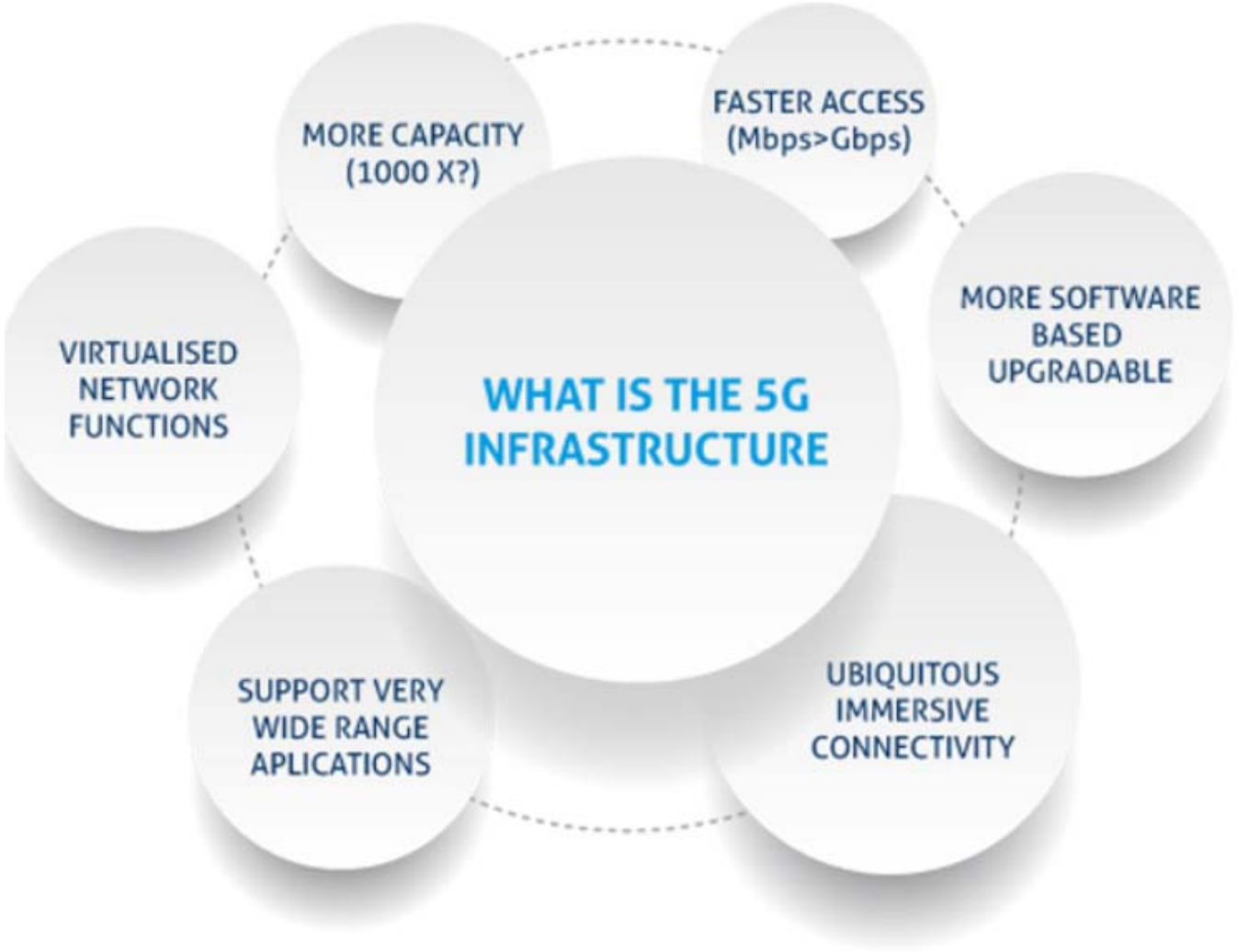
… Funkabdeckung

… auch in ländlichen Gebieten und Innenräumen

-> Geringere Kosten

… für Installation, Betrieb und Instandhaltung

5G Goals



From: https://5g-ppp.eu/about-us/

Ehrgeizige Ziele für die 5. Generation Mobilfunk …

1000 x höhere Datenrate pro geografische Zone
(z.B. 0,75 Tb/s für Stadion)

1000 x höhere Anzahl verbundener Geräte

(d.h. bis zu 1 Mio Geräte / km^2)

100 x höhere Datenrate pro Nutzer

(d.h. > 1 Gb/s)

1/10 x Energieverbrauch

(obwohl Datenrate wesentlich höher !!!)

…

5G - Main Application Scenarios

Enhanced mobile broadband (eMBB)

- High resolution video
- Augmented reality

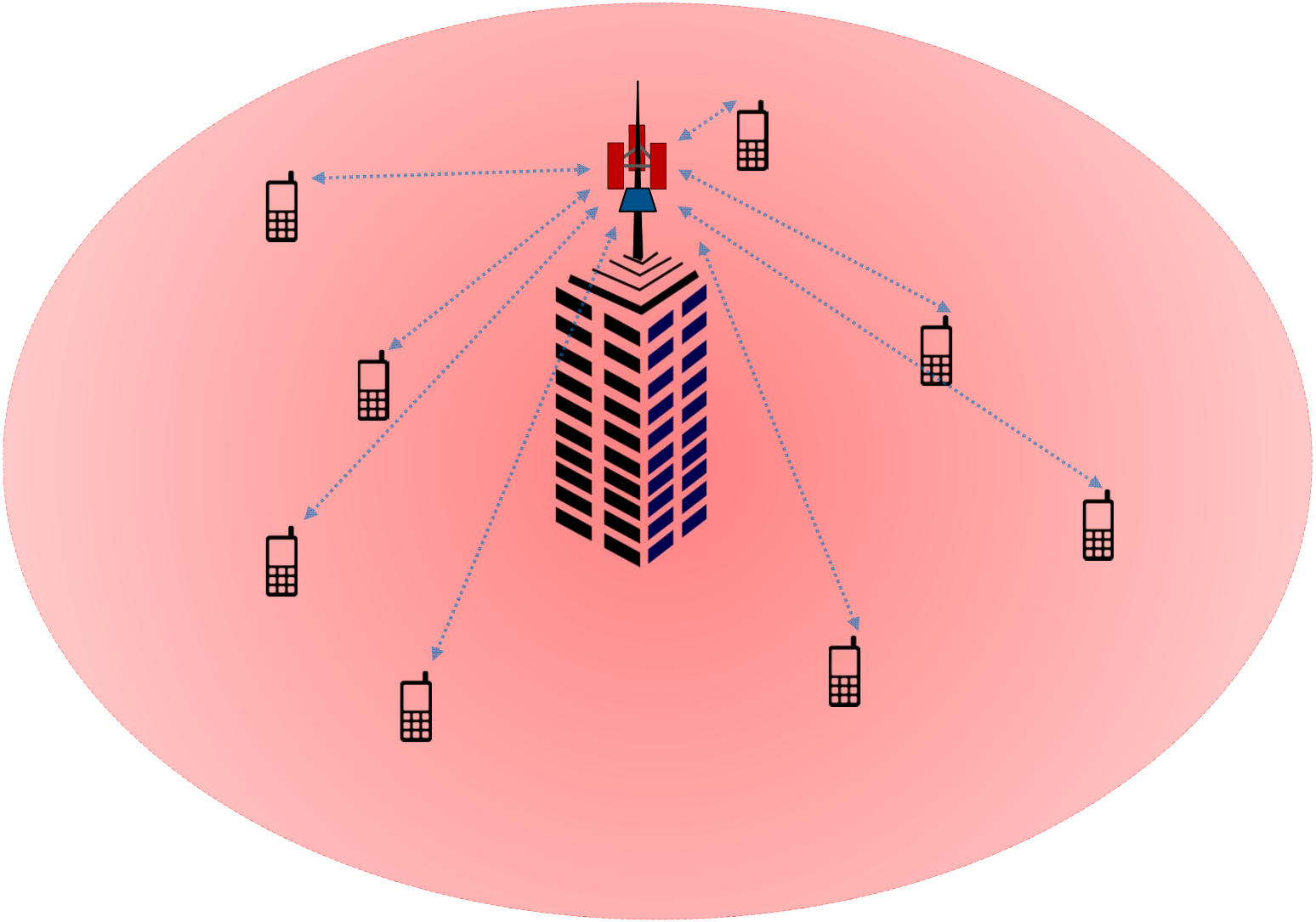
Massive machine-type communications (mMTC)

- Sensor networks (metering, environmental monitoring, …)

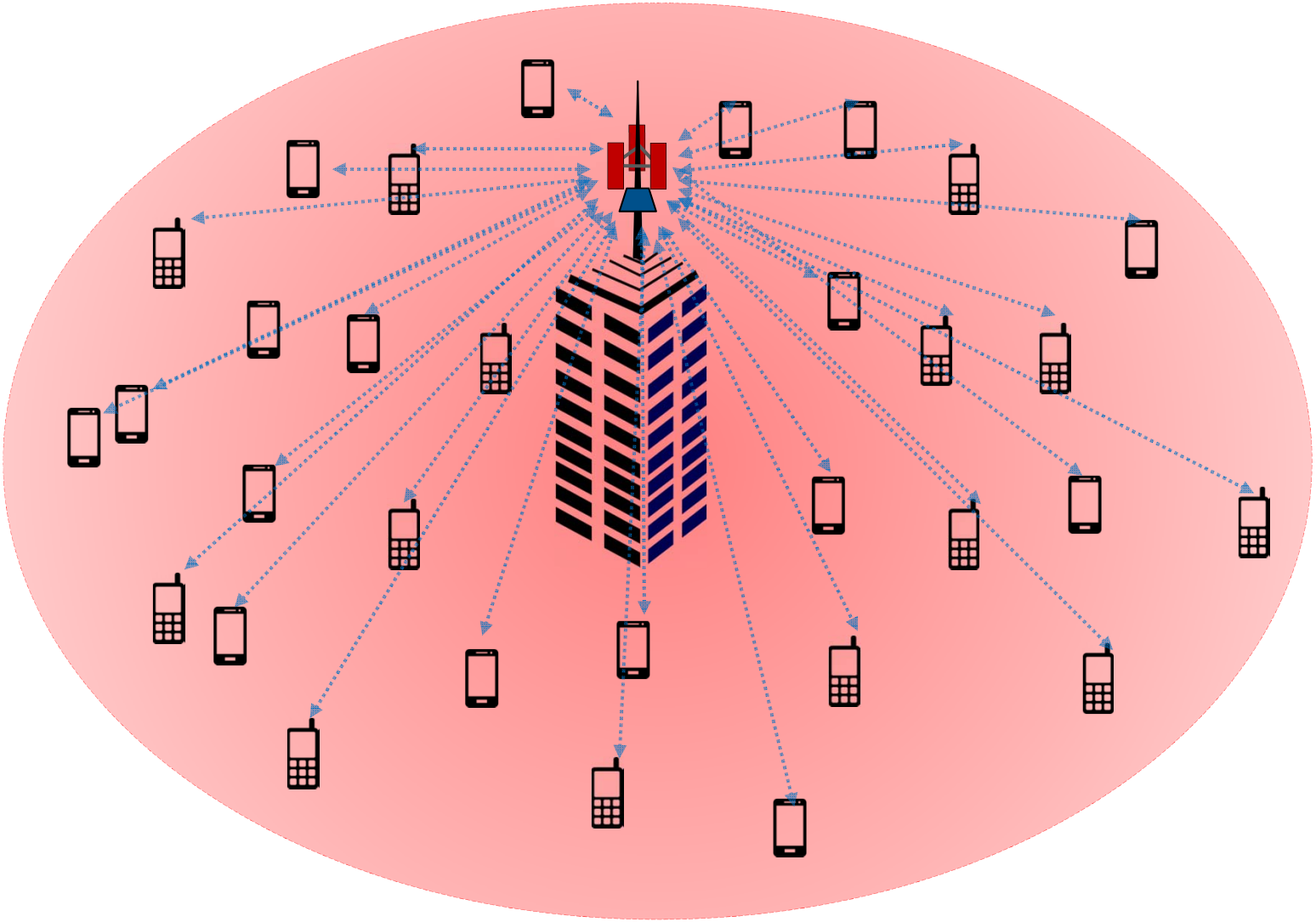
Ultra-reliable and low-latency communications (URLLC)

- Control of industrial processes
- Automotive driving
- E-health/Tactile internet

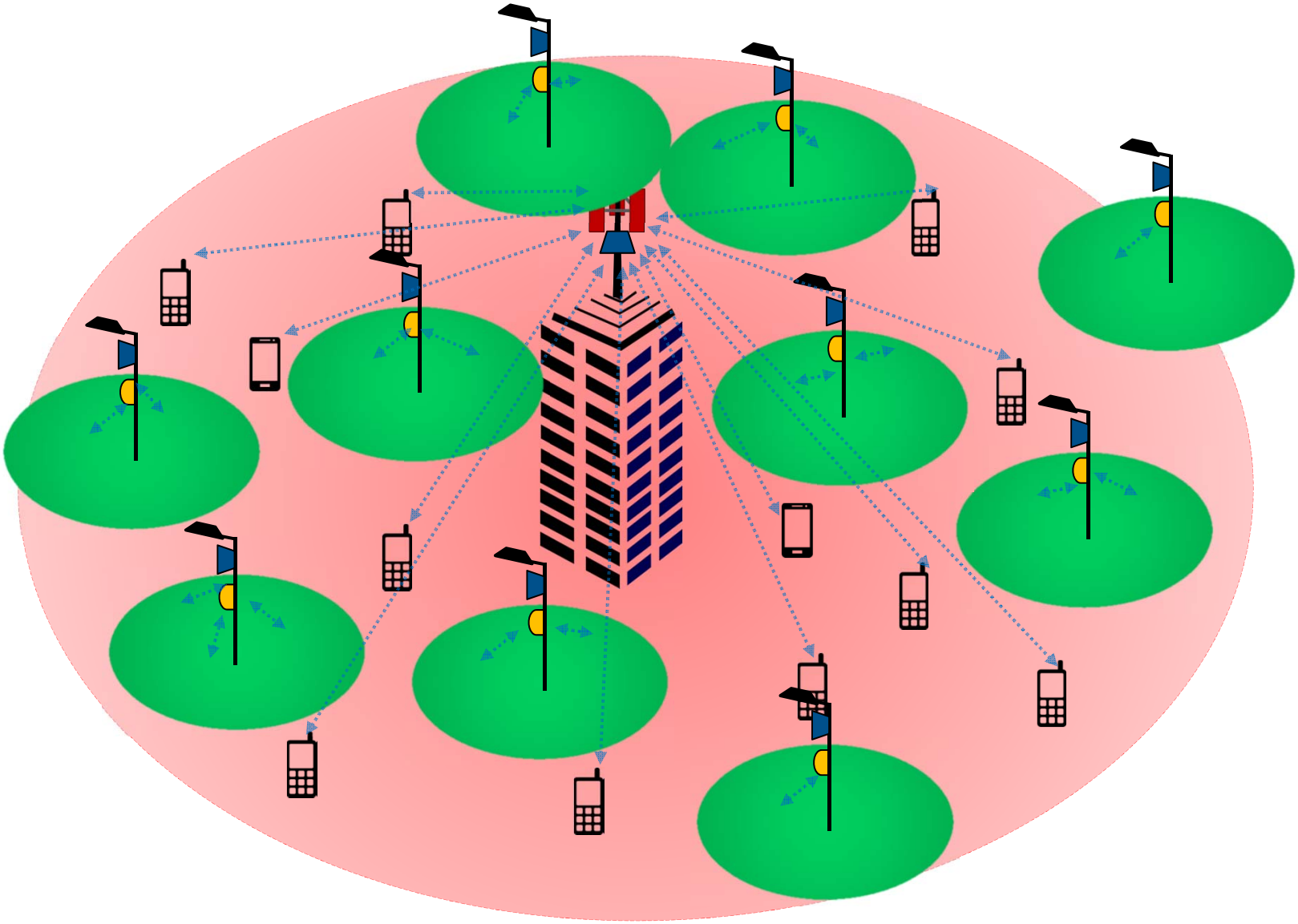
Das heutige Mobilfunknetz – Zellradius ca. 20 km



Situation heute – Funkfrequenzen sind limitiert

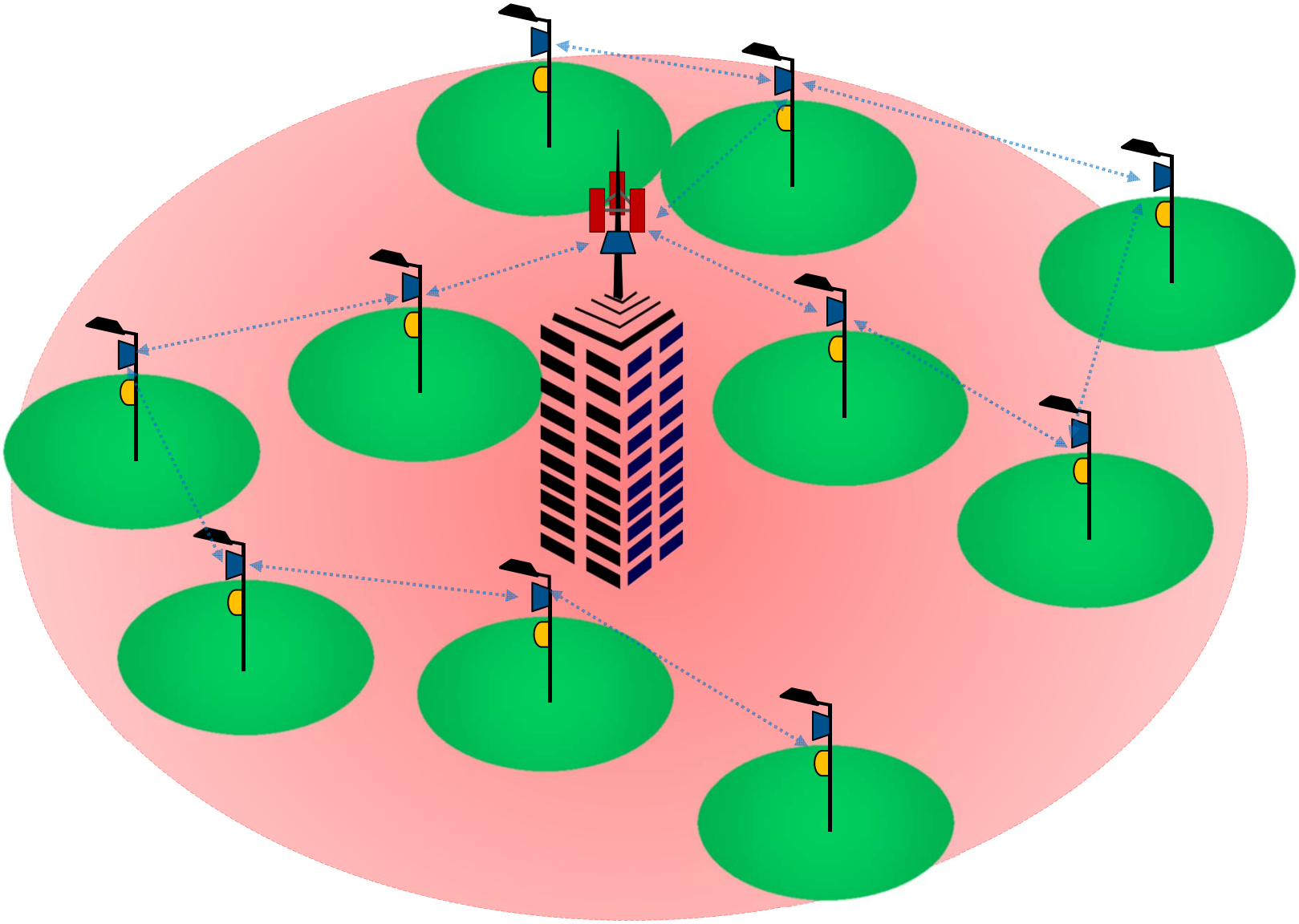


Small Cells für mehr Netzwerk-Kapazität / Fläche

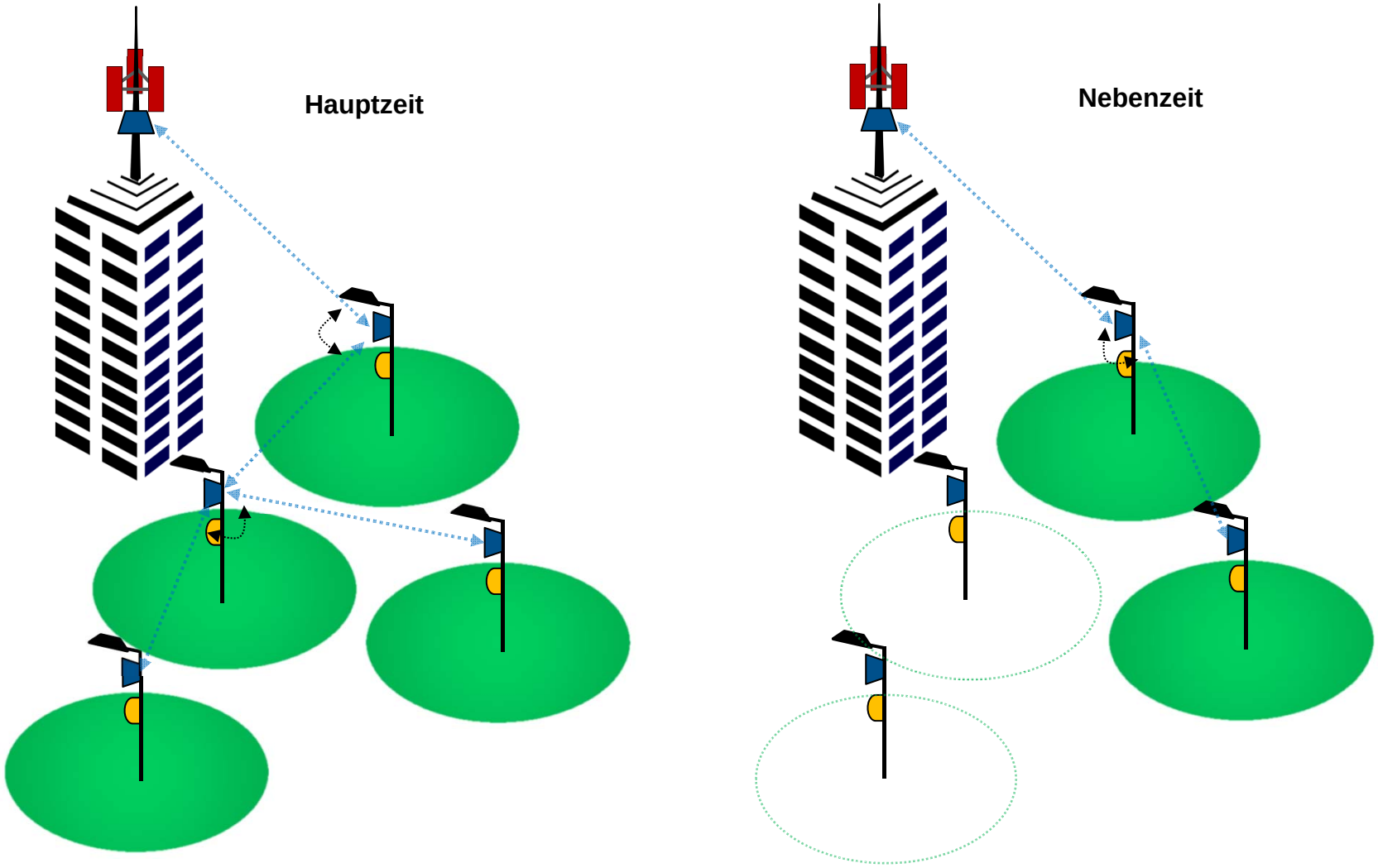


London in 10 Jahren

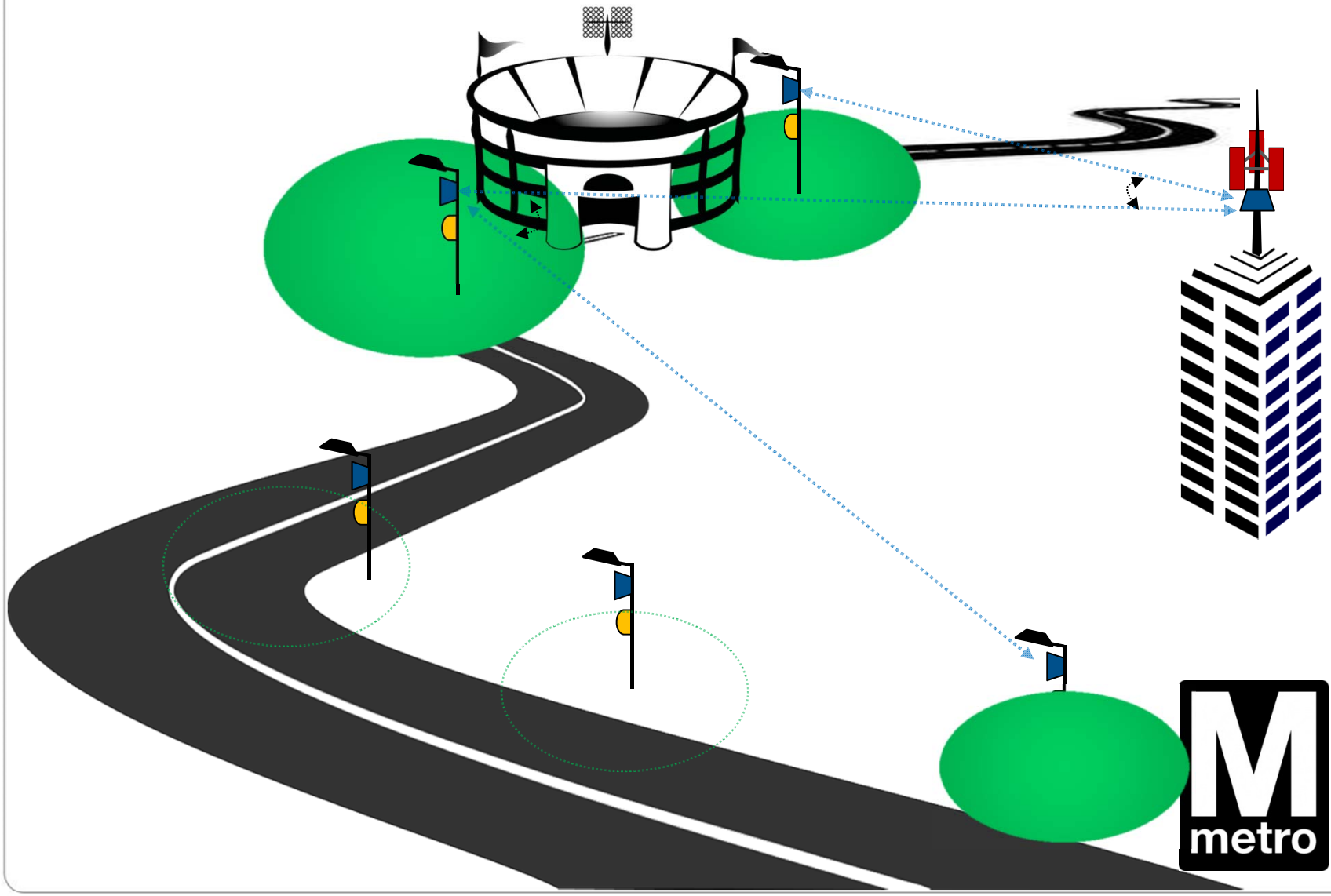
Drahtloses Backhaul – Ersatz für teure Glasfaser



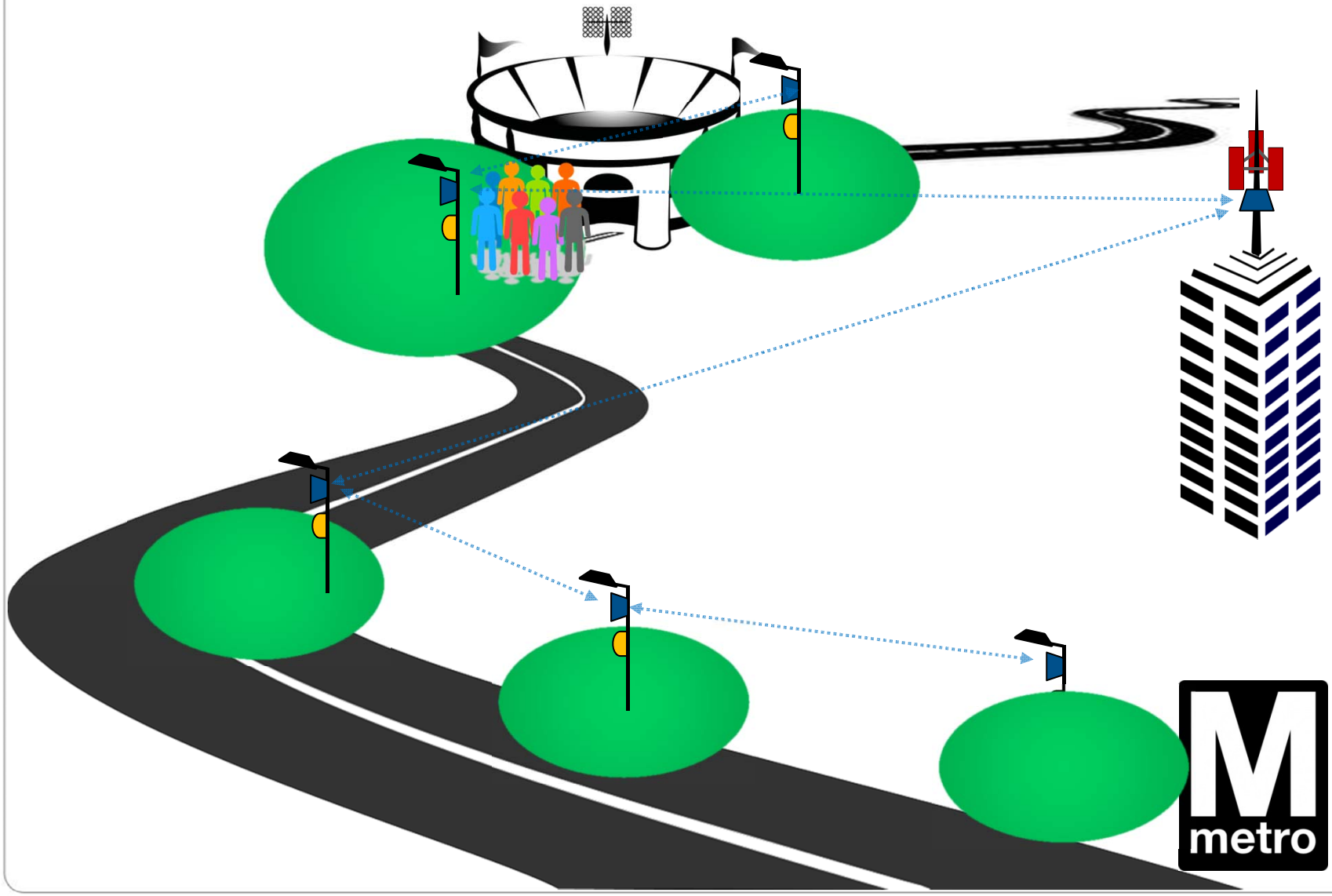
Energieeffizienzmanagement – „Schlafmodus“



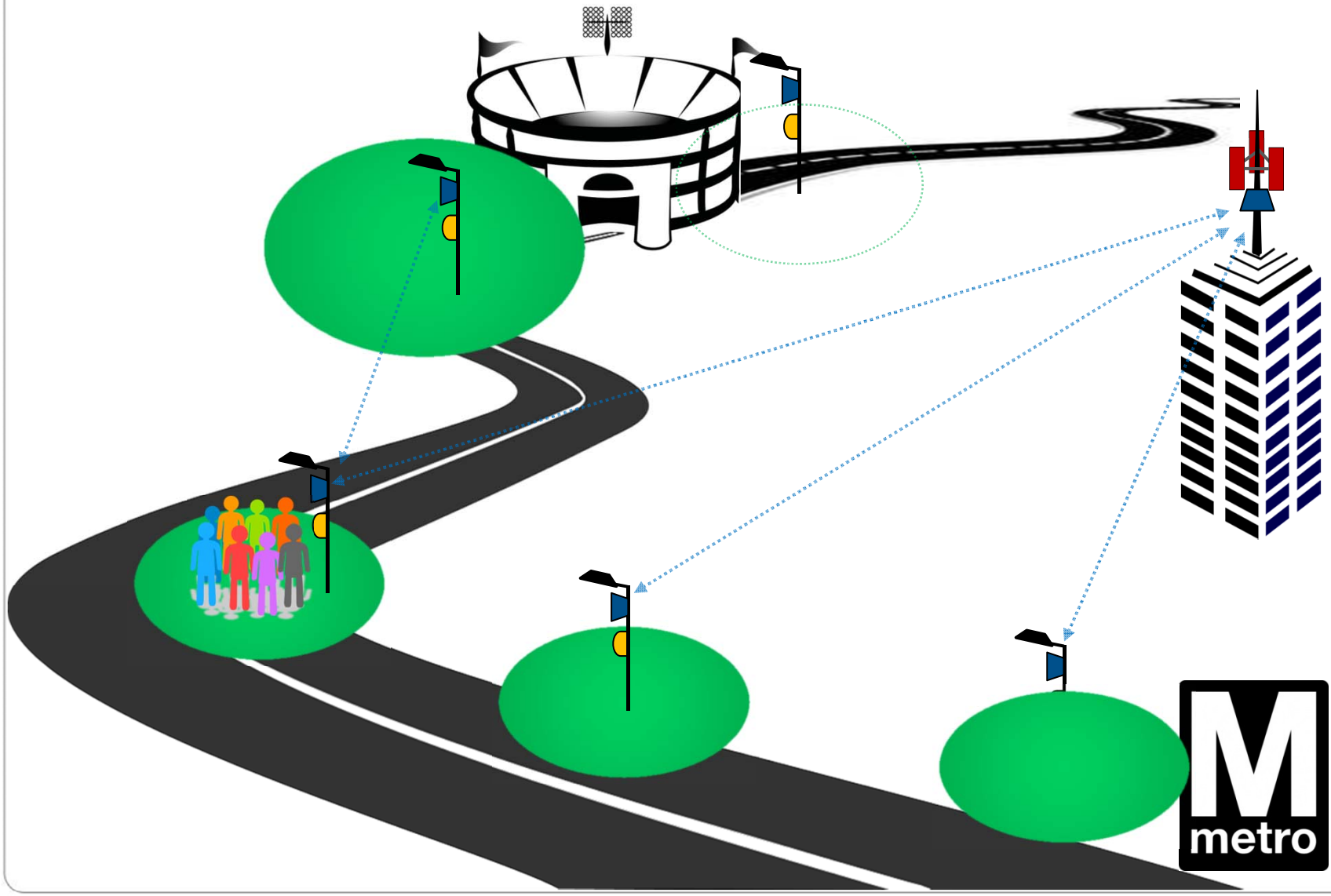
Hotspot-Vorhersage und Netzwerkrekonfiguration



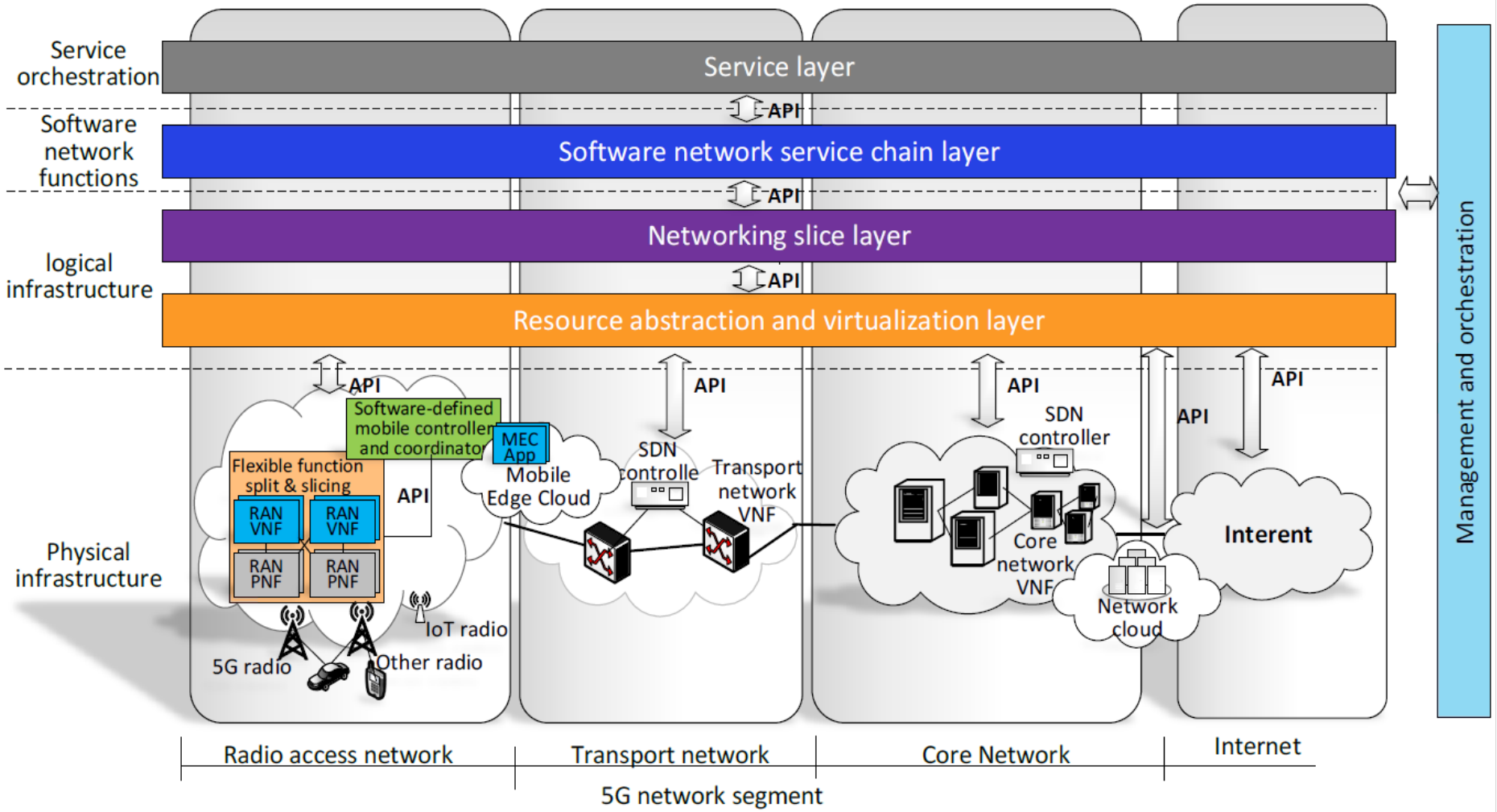
Hotspot-Vorhersage und Netzwerkrekonfiguration



Hotspot-Vorhersage und Netzwerkrekonfiguration



5G Overall Architecture

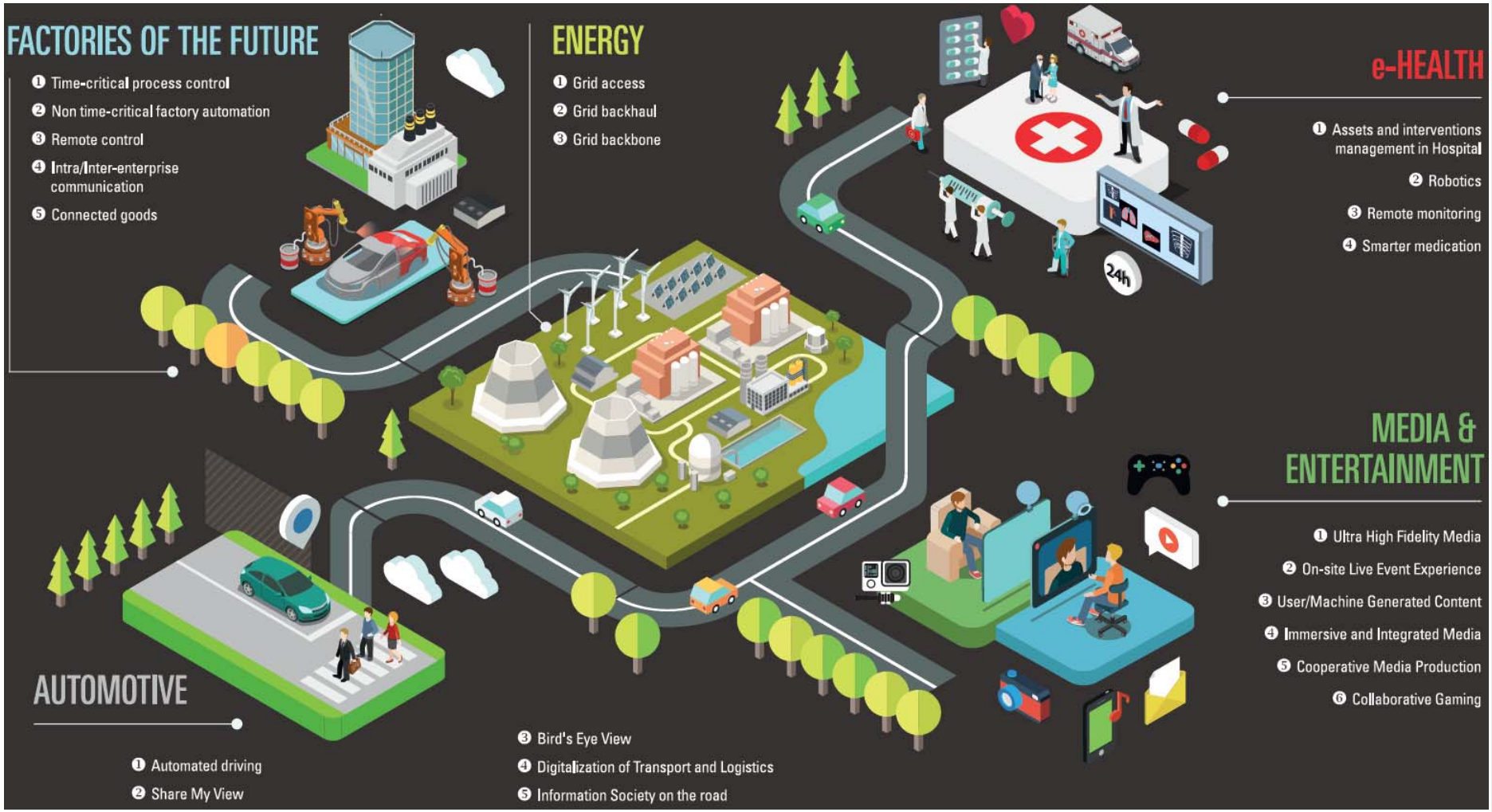


From: https://5g-ppp.eu/

5G – Some Important New Concepts

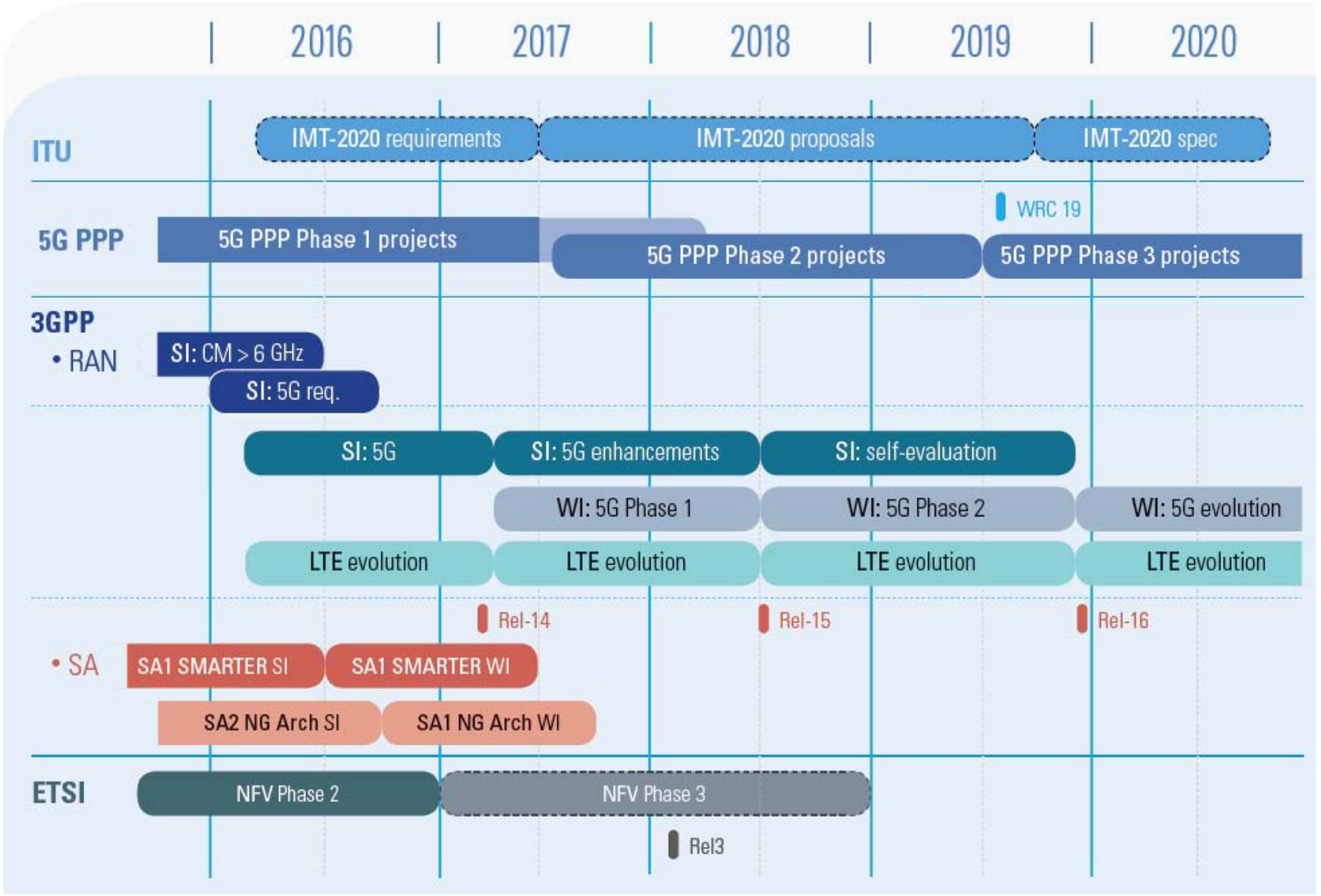
1. Network Function Virtualization (NFV)
   - Several simultaneous Network Connections which are logically isolated
2. Network Slicing
   - Operation of different network slices (by different operators) based on the same infrastructure but for different applications
3. Integration of Compute capacity into network nodes – Mobile Edge Computing (MEC)
   - Enabling low-latency applications
4. Dynamic functional splits of PHY-Layer functions between Edge <-> Cloud
   - Calculate some algorithms in the cloud if this is more efficient (FFT, Viterbi, MIMO-Matrix inversion, …)
5. Transport Classes - to characterise different types of traffic
   - Treat network traffic efficiently according to the requirements of the application (low-latency versus high data rate versus high reliability
6. Micro-licensing of spectrum
   - Allow network-slicing and short-term geographically limited services and applications

5G wird auf alle Lebensbereiche Auswirkungen haben …



Quelle 5G-PPP: https://5g-ppp.eu/wp-content/uploads/2016/02/BROCHURE_5PPP_BAT2_PL.pdf

5. Generation Mobilfunk – Zeitplan



From: https://5g-ppp.eu/

Zeit für Fragen

IHP – Leibniz-Institut für innovative Mikroelektronik
Im Technologiepark 25
15236 Frankfurt (Oder)
Tel.: +49 (0) 335 5625
Fax: +49 (0) 335 5625
E-Mail:

www.ihp-microelectronics.com

innovations
for high
performance
microelectronics

Mitglied der
Leibniz-Gemeinschaft

A10B