

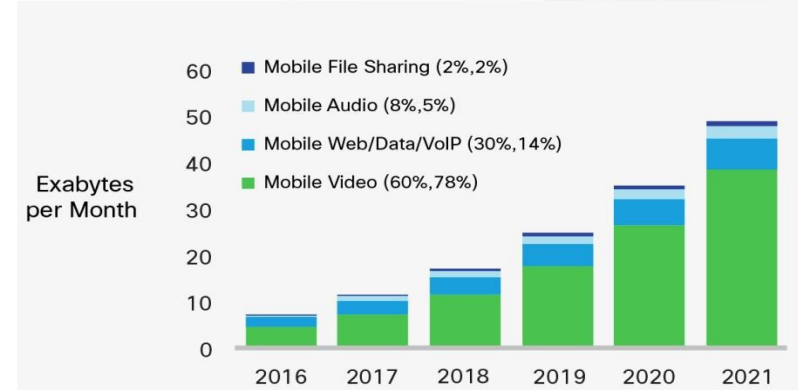
5G and Media Company

Towards 5G Broadcast

Impressive growth in data traffic

Significant portion identifiable with high quality video

3G and 4G standards extended by a broadcast specification: MBMS, Multimedia Broadcast Multicast Service



Source: Cisco VNI Mobile, 2017

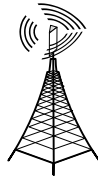
The joint activity of EBU Members in the work of 3GPP has driven the requirements for Release 14 feMBMS protocol to cope with their paradigm

- Free-to-air and **receive-only** mode
 - reception without SIM Card and contractual obligation with a network operator;
- Possibility to dedicate 100% of the available radio resources to broadcast (**stand-alone** mode)
 - overcoming the limit of 60% specified in previous eMBMS releases;
- Longer cyclic prefix (CP) of **200 μ s**, to cover ISDs (Inter Site Distances) up to about 60 km
 - the longest CP of the previous releases was 33.3 μ s

☞ This is now the pillar to build future 5G Releases of the standard.
Work is being carried out by broadcasters, with the coordination of the EBU, heavily involved, together with the industry, in the 5G research and standardisation.

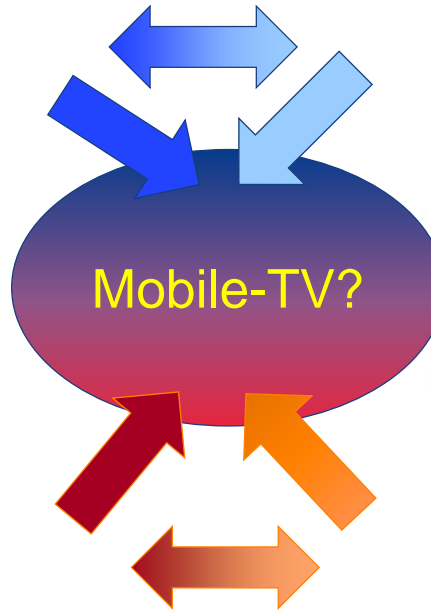
Broadcast networks

- HPHT (High Power High Tower)
 - EIRP up to many tens of kW
 - antenna heights of several hundred meters
- Coverage of large service areas by limited number of transmitters
 - Fixed roof-top reception



Mobile networks

- LPLT (Low Power Low Tower)
 - power levels <1kW
 - antenna heights: 20-30 m
- dense network of transmitters
 - wireless unicast communication for handheld user devices
 - indoor coverage even in urban areas.



Fixed-TV

- broadcasting of high quality TV content to domestic TV receivers connected to roof-top directive antennas

Event-TV

- live video events (sport, concerts) to multiple viewers in a specific area
 - temporal allocation of part of the cellular mobile network capacity to this multicast service

Release 14 allows to complement the urban coverage of cellular networks with the “umbrella coverage” of wide territories by means of broadcast networks

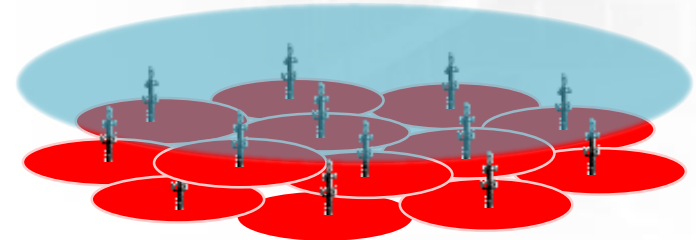


☞ **Tower Overlay** for cost-efficient distribution to mobile devices of free-to-air signals and wide-area coverage

- **HPHT network** (ISD of 50-60 km) covering rural and suburban areas, and urban areas in the vicinity (10-15 km) of transmitters;
 - *For Italy this would mean requiring <100 HPHT towers instead of >10000 LPLT cells to cover 170.000 km² rural/suburban areas*
- **complementary LPLT network** covering urban areas located farther from the HPHT transmitters
 - *not all mobile sites should be used, since the required ISD would be of about 2,5 to 4 km*



HPHT network: Tower Overlay Coverage



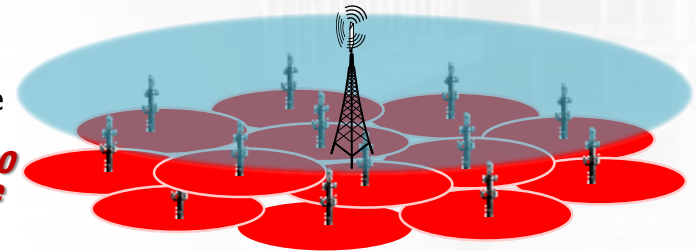
LPLT cells: unicast & multicast services

- ☞ **Tower Overlay** per una distribuzione cost-efficient verso i terminali mobile di segnali free-to-air su vaste aree



- La rete **HPHT** (nei siti della rete DTT), con distanza tra i trasmettitori dell'ordine di 50-60 km, per coprire le aree rurali e suburbane, e le aree urbane vicine ai trasmettitori (fino ad una distanza di 10-15 km);
 - Sono sufficienti molti meno trasmettitori rispetto alla rete LPLT per coprire la stessa area, il fattore di moltiplicazione è compreso tra 70 e 225, a seconda dell'EIRP consentito
 - **Per l'Italia questo significa <100 torri HPHT invece di >10000 celle LPLT per coprire 170.000 km² di aree rurali e suburbane**
- La **rete complementare LPLT** per coprire le aree urbane più lontane dal trasmettitore HPHT transmitters
 - Ulteriore riduzione del numero di celle LPLT del 25% nelle aree urbane

HPHT network: Tower Overlay Coverage



LPLT cells: unicast & multicast services



During the European Championships 2018, thanks to the **EBU**, who made available live UHD signals coming from the Berlin stadium, **Rai CRITS** and **Technische Universität Braunschweig** (TUB) have together organized a technology trial of **3GPP Rel. 14 feMBMS**, the most advanced precursor of **5G-broadcast**

The **TUB FeMBMS demonstrator** broadcast towards portable and mobile receivers in the **RAI Aosta Valley open test bed** the live signal coming from the Berlin stadium via satellite.

Up to five transmitters can be available at the same time on channel 53 (730 MHz) for the suitable network configuration

During the Feast of San Giovanni, before the Show in Piazza Vittorio Veneto that concluded the celebrations for the traditional feast on June 24, the *Rai Research Centre* organised a technology demonstration of **5G-broadcast**



The show shot by the Rai Turin TV Production Center, the TGR Piedmont regional news and RaiNews24, and integrated with images from TIM drones and other images of Turin and Piedmont in 4K by Rai Research Center were transmitted in 5G broadcast technology from the **RaiWay transmitter of Torino Eremo towards the city of Turin.**



At the *Rai Radio and Television Museum* in Via Verdi in Torino, Rai-CRITS, Comune di Torino and Tim tested mobile TV broadcast towards 5G

Participants experienced 5G broadcast on their smartphones:

- using an **experimental 5G multicast receiver developed with the University of Braunschweig**
- and an **innovative “APP” in WiFi multicast technology by Global Invacom.**

The demonstration shows the potential of **5G** for the distribution of public service media content and services.

