



5G

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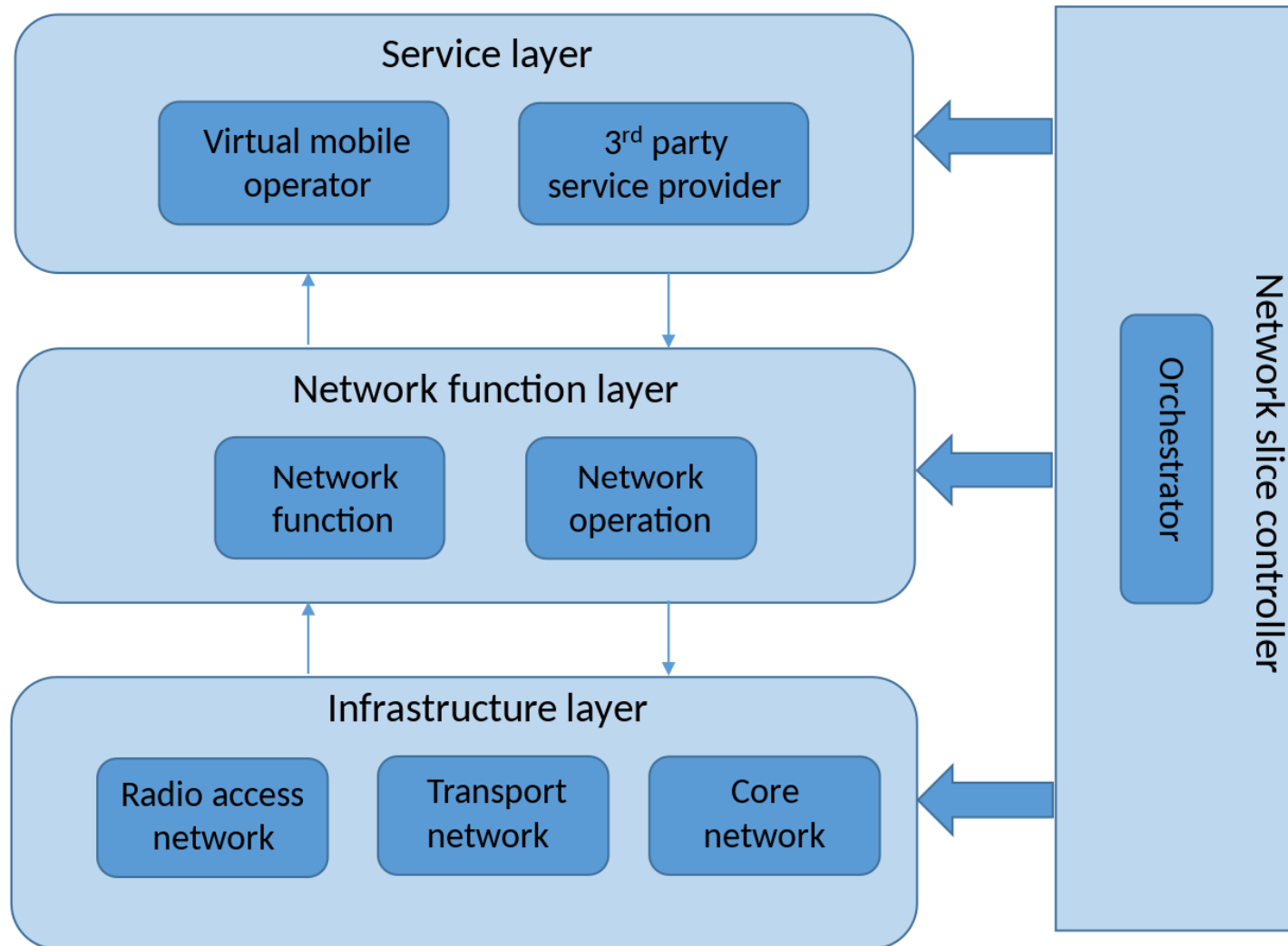
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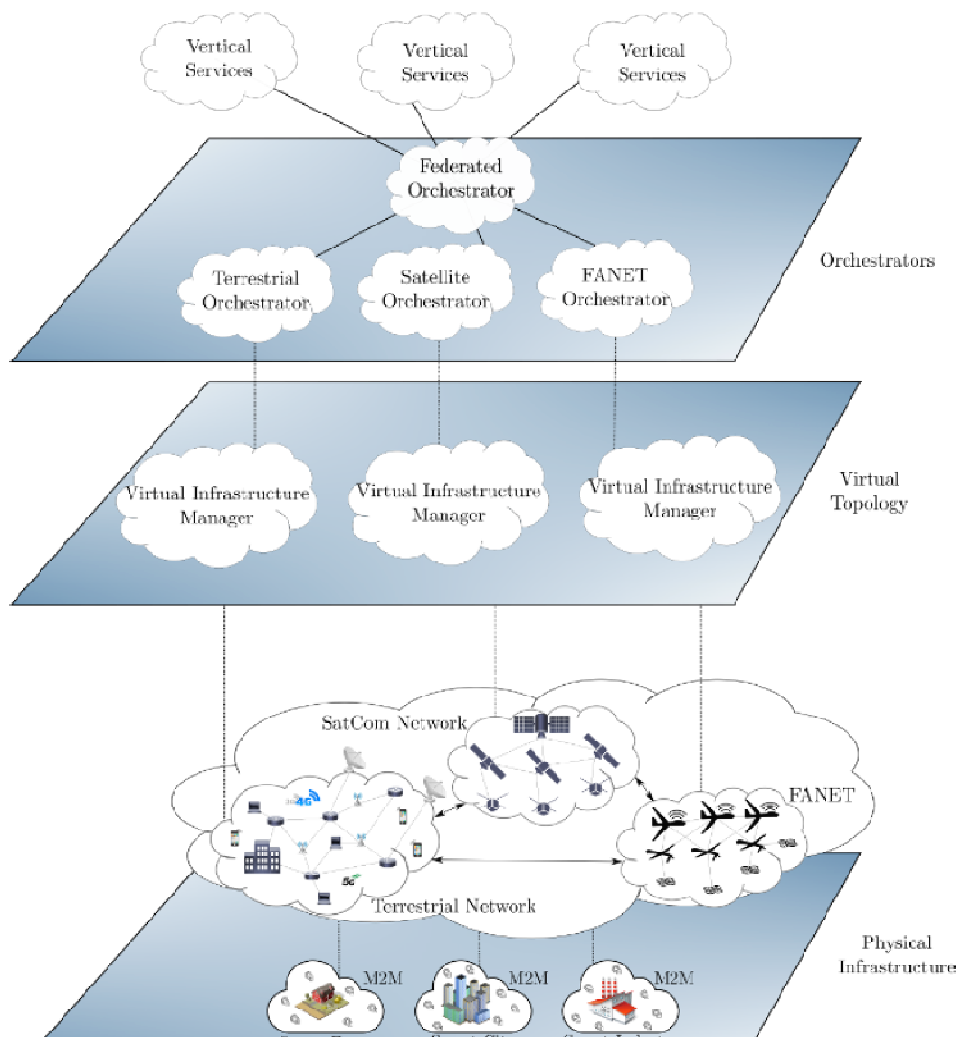
Keywords

- Connectivity.
- Ultra Reliable Low Latency Communication.
 - Edge computing. Local Cloud.
- Dense antenna deployment.
 - Beamforming.
- New frequencies.
 - Millimeter wave communication.
- Service flexibility.
 - Virtualization.
 - Network function.
 - Slicing.
- Internet of Things (massive Machine Type Communication).

Virtualization - Slicing



An example





5G – Release 15-16



Release 15

- NR
- The 5G System – Phase 1
- Massive MTC and Internet of Things (IoT)
- Vehicle-to-Everything Communications (V2x) Phase 2
- Mission Critical (MC) interworking with legacy systems
- WLAN and unlicensed spectrum use
- Slicing – logical end-2-end networks
- API Exposure – 3rd party access to 5G services
- Service Based Architecture (SBA)
- Further LTE improvements
- Mobile Communication System for Railways (FRMCS)



Release 16

- The 5G System – Phase 2
- V2x Phase 3: Platooning, extended sensors, automated driving, remote driving
- Industrial IoT
- Ultra-Reliable and Low Latency Communication (URLLC) enhancements
- NR-based access to unlicensed spectrum
- 5G Efficiency: Interference Mitigation, SON, eMIMO, Location and positioning, Power Consumption, eDual Connectivity, Device capabilities exchange, Mobility enhancements
- Enhancements for Common API Framework for 3GPP Northbound APIs (eCAPIF)
- FRMCS Phase 2



Release 17 Content Approval*

TSG SA Work Areas under discussion at SA#85 (September 2019):

- 5G System Enhancement for Advanced Interactive Services (5G_AIS)
- Cellular IoT enhancement for the 5G System (5G_MCIoT)
- System enhancement for Proximity based Services in 5GS (5G_ProSe)
- Enhancement of support for 5G LAN-type service (5GLAN_enh)
- Integration of Satellite in 5G Systems (5GSAT_ARCH)
- Architectural enhancements for 5G multicast-broadcast services (5MBS)
- Study on enhancement of support for 5G Wireless and Wireline Convergence (5WWC_enh)
- Application Awareness Interworking between LTE and NR (AALLTE_NR)
- Extended Access Traffic Steering, Switch and Splitting support in the 5G system architecture (eATSSS)
- 5G Enhancement for unmanned aerial vehicles - UAVs (EAV)
- Enhanced IMS to 5GC Integration (eIMS5G)
- Enhancement to the 5GC LoCation Services-Phase 2 (eLCS_ph2)
- Enablers for Network Automation for 5G - phase 2 (eNA_Ph2)
- Enhancement of support for Edge Computing in 5G (enh_EC)
- Enhanced support of Non-Public Networks (eNPN)
- Enhancement of Network Slicing Phase 2 (eNS_Ph2)
- Enhancement of 5G UE Policy (eUEPO)
- Architecture enhancements for 3GPP support of advanced V2X services - Phase 2 (eV2XARC_Ph2)
- Supporting Flexible Local Area Data Network (FLADN)
- Supporting Unmanned Aerial Systems Connectivity, Identification and Tracking (ID-UAS)
- Enhanced support of Industrial IoT - TSC/URLLC enhancements (IIoT)
- Support for Minimization of service Interruption (MINT)
- Multimedia Priority Service Phase 2 (MPS2)
- Support for Multi-USIM Devices (MUSIM)
- System architecture for next generation real time communication services (NG_RTC)
- Service-based support for SMS in 5GC (SB_SMS)
- Smarter User Plane (SUP)
- UPF enhancement for control and Service Based Architecture (UPCAS)
- Usage of User Identifiers in the 5G System (UUI5)

TSG RAN Work Areas under discussion For final decision at RAN#86 (December 2019):

- NR Light
- Small data transfer optimization
- Sidelink enhancements
- NR above 52.6 GHz (incl 60GHz unlicensed)
- Multi SIM operation
- NR multicast broadcast
- Coverage enhancements
- NB-IoT and eMTC enhancements
- Industrial IoT & URLLC enhancements
- MIMO enhancements
- NR for Non Terrestrial Networks
- Integrated Access and Backhaul enhancements
- Generic enhancements to NR-U
- Power saving enhancements
- RAN data collection enhancements
- Positioning enhancements

* Mainstream Rel-17 specification work will start at the beginning of 2020, with the functional freeze of physical layer aspects scheduled for the second quarter of 2021.

The ASN.1 freeze should follow in September 2021.

There are a large number of work areas to be discussed. Realistically, we will only be able to take on board a sub-set of them within Rel-17.



5G – Allocazione delle frequenze in Italia

- Fastweb
 - 26 GHz (200 MHz).
- Iliad
 - 700 MHz (2x10 MHz), 3.7 GHz (20 MHz), 26 GHz (200 MHz).
- TIM
 - 700 MHz (2x10 MHz), 3.7 GHz (20 MHz), 26 GHz (200 MHz).
- Vodafone
 - 700 MHz (2x10 MHz), 3.7 GHz (20 MHz), 26 GHz (200 MHz).
- Wind Tre
 - 3.7 GHz (20 MHz), 26 GHz (200 MHz).



Networks for IoT

- 5G New Radio
- LTE-M (for machines)
 - Bandwidth: 1.08 MHz
 - Frequency spacing: 15 kHz
 - Bit rate: 1 Mbit/s
- LTE Narrow Band-IoT
 - Bandwidth: 180 kHz
 - Frequency spacing: 15 kHz
 - Bit rate: 250 kbit/s.
- LoRaWAN