



# 5G-Infrastructure PPP Information Day

## 21<sup>st</sup> January 2016, Brussels

View point: 5G Networks are

- **“Faster, Stronger”** - An extremely flexible and highly programmable e2e compute & connect infrastructure which is application & service aware as well as time, location and context aware
- **“Higher Level Flexibility” in all segments of the network:** Radio-networks, Front / Back Haul Network & Access Network, Aggregation Network, Core networks & Software-defined clouds & Mobile edge computing → High / ever higher performant connectivity & compute environments
- **Natively leveraging Network Virtualisation / Slicing/ Network Function Virtualisation, Programmability and Softwarization technologies:**
- **Support on demand composition of network functions and capabilities**
- **Enforce required capability/capacity/security/elasticity/ adaptability/ flexibility** “where and when needed”
- **Management and Control are becoming part of the dynamic design of the software architecture**
- **Services are executed in one (or more) Slices ( i.e. a slice is made of a set of VMs)**
- **Significant reduction in management complexity and in costs of operations ( i.e. OPEX)**



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# Some Competences and Interests

**UCL is the top-rated university in the UK for research strength (REF2014).**

**UCL is ranked fourth in the world's top universities by the QS World University Rankings (2014) and number 21 in the Shanghai Ranking of World Universities (2014)**

- New potential transmission standards based on Spectrally Efficient Frequency Division Multiplexing (SEFDM) where up to 40% bandwidth saving (relative to OFDM) may be achieved at the expense of receiver complexity.
- Large Scale Antenna Systems, topologies studies and efficient waveform and receiver design through analog-digital processing



**TA2**

- Spectral sensing systems for wireless energy and bandwidth efficiency
- Massive MIMO and MIMO systems
- Radio over Fibre systems (RoF) operating in the mm-wave region; system, sub-system and circuit level design.



**TA3, TA5  
and TA9**

- mmWave communications, beamspace MIMO, antenna topologies



**TA3**

- From energy efficient to energy neutral networks through energy harvesting and balancing



**TA4**

- Data-aided waveform design for energy efficiency in the C-RAN



**TA5**

- Secure self-configurable and self-sustainable networks through energy neutrality

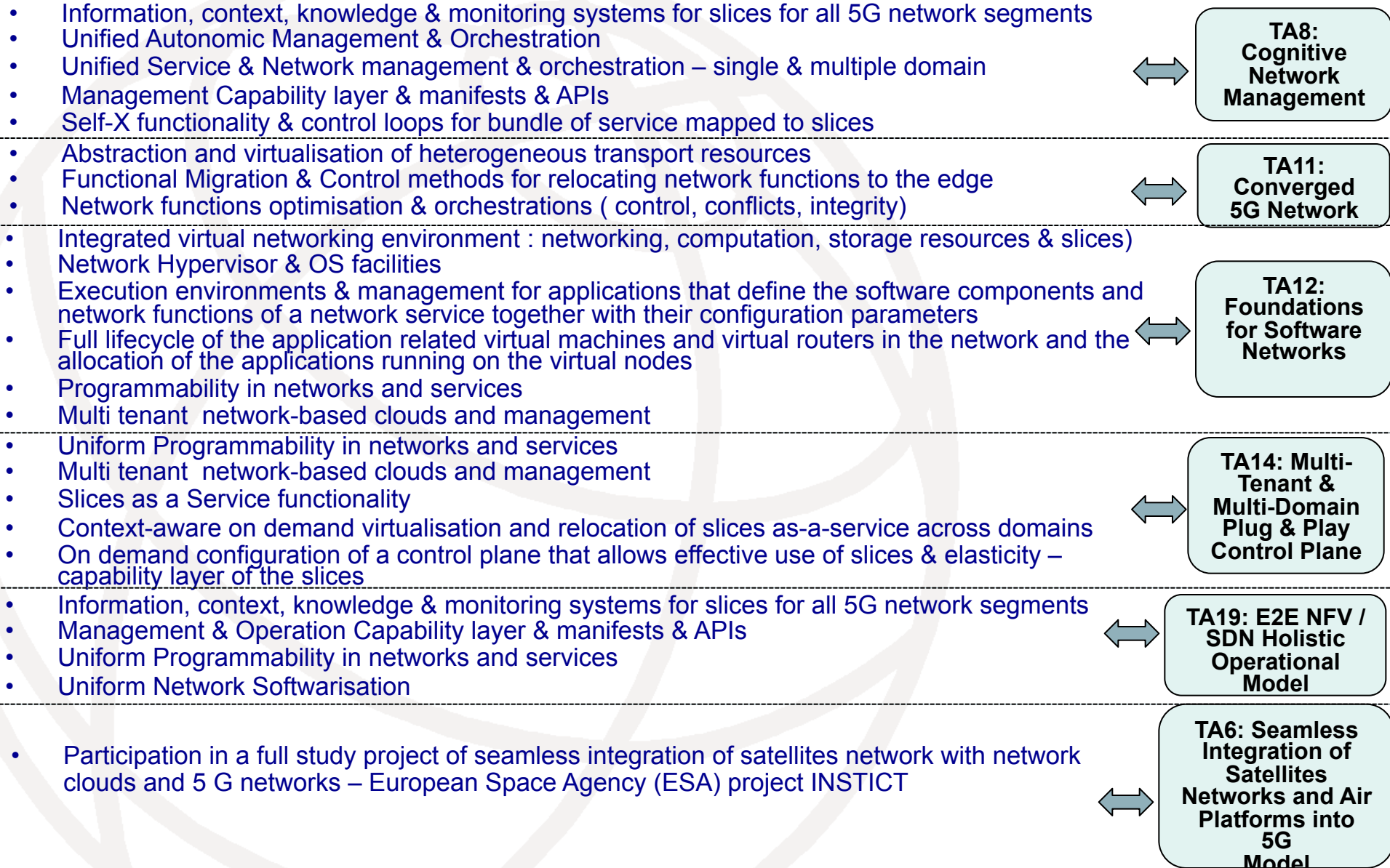


**TA8, TA13**

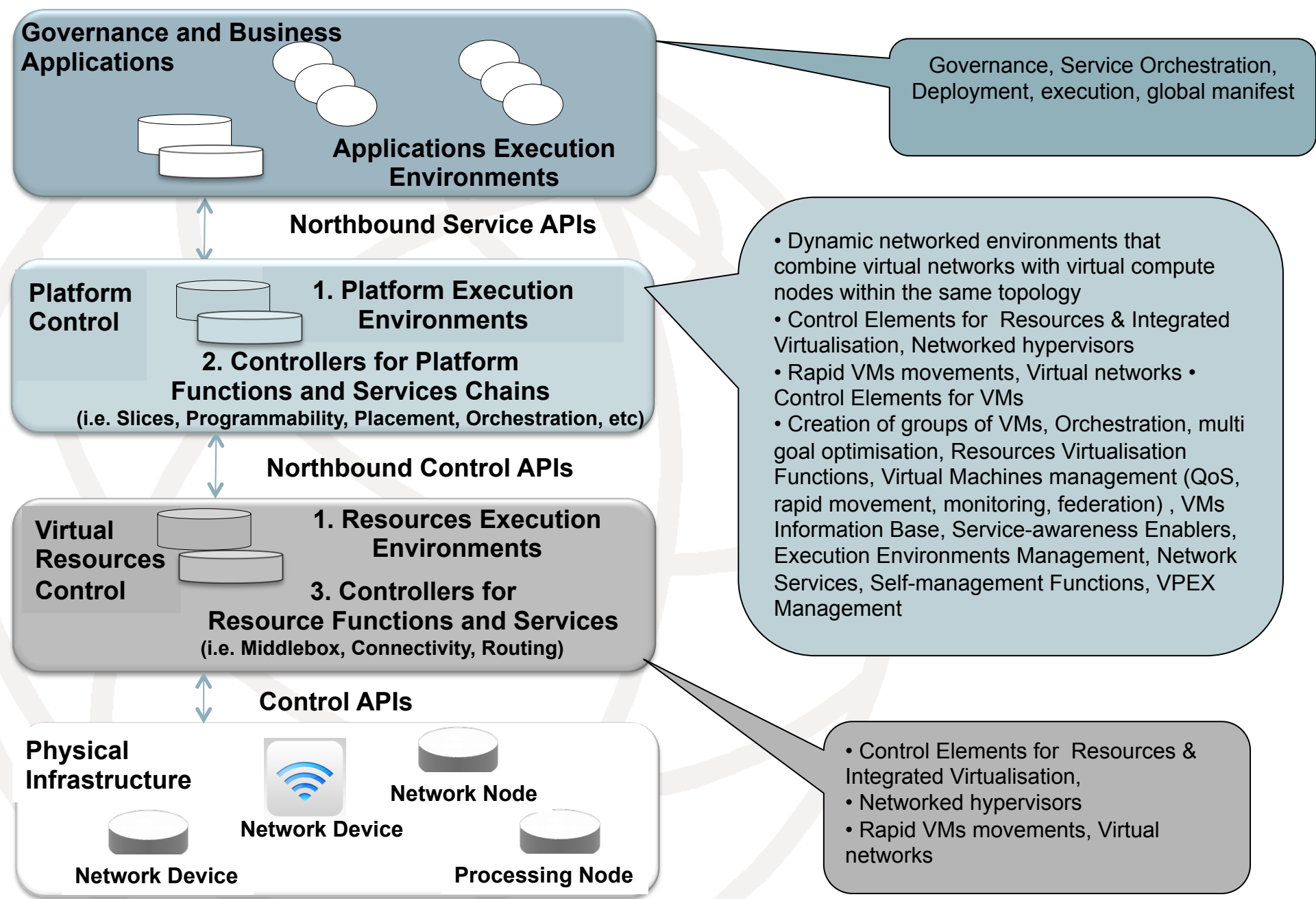
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# 5G Network Softwarisation Model (S/W stack model)



# Concluding Remarks

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- *“Higher Level Flexibility” in all segments of the network*: Radio-networks, Front / Back Haul Network & Access Network, Aggregation Network, Core networks & Software-defined clouds & Mobile edge computing → High / ever higher performant connectivity & compute environments
  - Natively leveraging Network Virtualisation / Slicing/ Network Function Virtualisation, Programmability and Softwarization technologies:
  - Support on demand composition of network functions and capabilities
  - Enforce required capability/capacity/security/elasticity/ adaptability/ flexibility “where and when needed”
  - Management and Control are becoming part of the dynamic design of the software architecture
  - Services are executed in one (or more) Slices ( i.e. a slice is made of a set of VMs)
- Significant reduction in management complexity and in costs of operations ( i.e. OPEX)
- *“Software Networks”* → Softwarization and in particular (Self) Management and Control would represent nearly 99% of the new 5G Networks & Services functionality !!!
- *“Low Operational Costs”* → Significant reduction in management complexity and in costs of operations ( i.e. OPEX)