

Network Intelligentizing for Future 6G Wireless Networks How AI will Enable Network Intelligentizing?

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Network Intelligentizing for Future 6G Wireless Networks



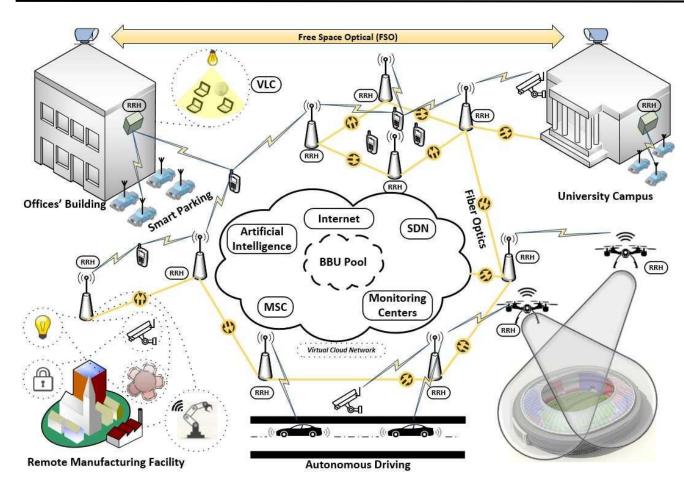


Part I

Network Intelligentizing Aspects on Future 6G Networks

What will be the future 6G network?





*The future 6G network architecture which will cover everywhere with 6G connections.

*Source: https://www.rfwireless-world.com/Terminology/

Smart connectivit	y of future	6G netwo	rks
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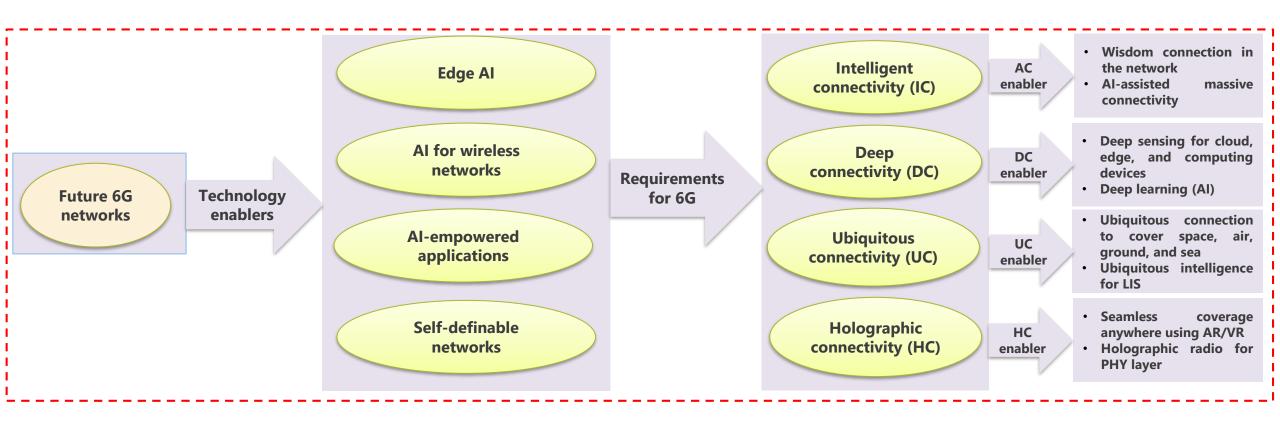
- □ Remote radio heads (RRH)
- **□** Drones
- **☐** Visible light communications (VLC)
- **□** Base stations (BSs)
- □ Network equipments mounted on moving things e.g., autonomous smart vehicles

Network architecture of future 6G

- ☐ <u>Cell-free smart surfaces</u> with ultra-high frequencies
- ☐ Temporary hotspots served by drone mounted BSs
- Network in a spray i.e., Airduct/Water-duct
- ☐ Using cars as fog/edge devices
- **☐** Water duct communications

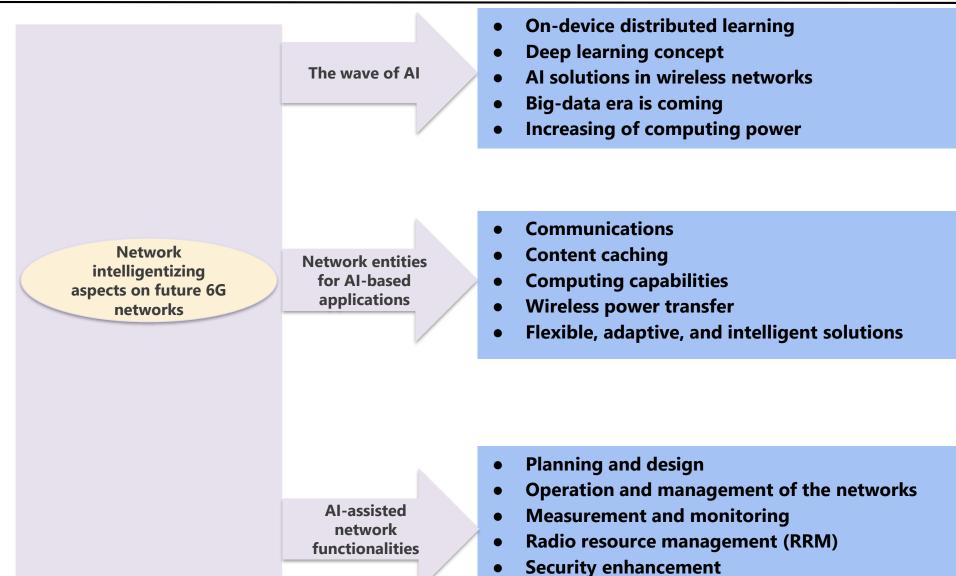
The Vision of AI in Future 6G Networks





Network Intelligentizing Aspects on Future 6G Networks





Challenges on the Wireless Communication Industry [1/2]



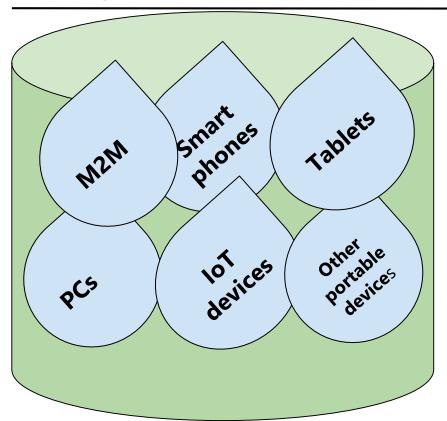
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Part II

Al enabled network revolution

Challenges on the Wireless Communication Industry [1/2]



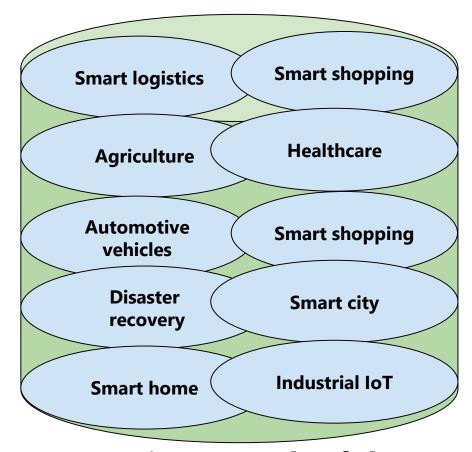


Future 6G networks

Massive growth of devices

In 2020, global IoT devices will grew to 50 billion, 6 times more than the device in 2011.

*Source: Comp TIA, CISCO



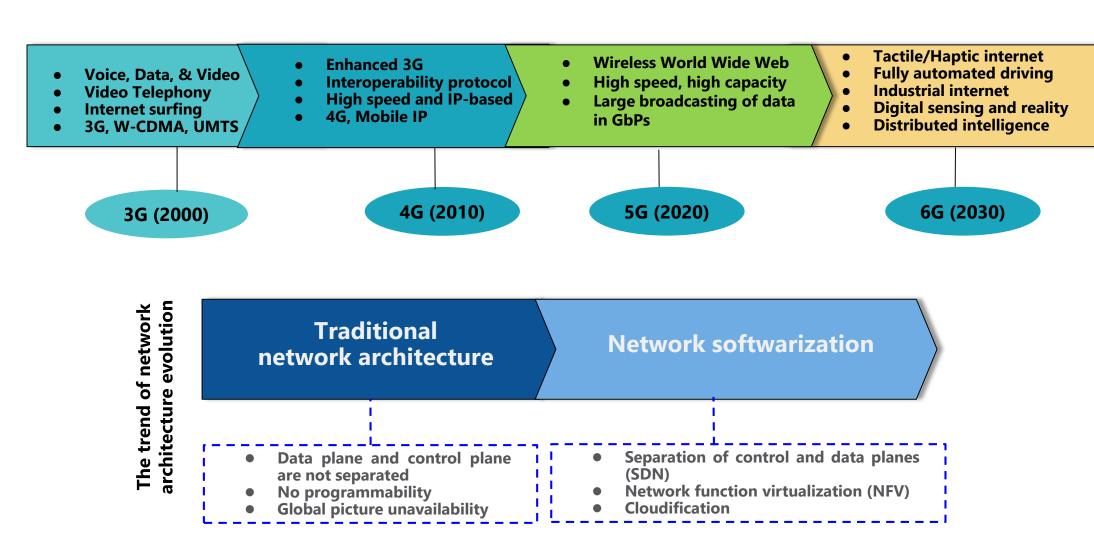
Massive growth of data

- In 2020, 35 EB per month data traffic will be generated as a mobile data traffic
- In 2020, global data amount will increase upto 40
 ZB and it is 50 times more than in 2011

Challenges on the Wireless Communication Industry [2/2]



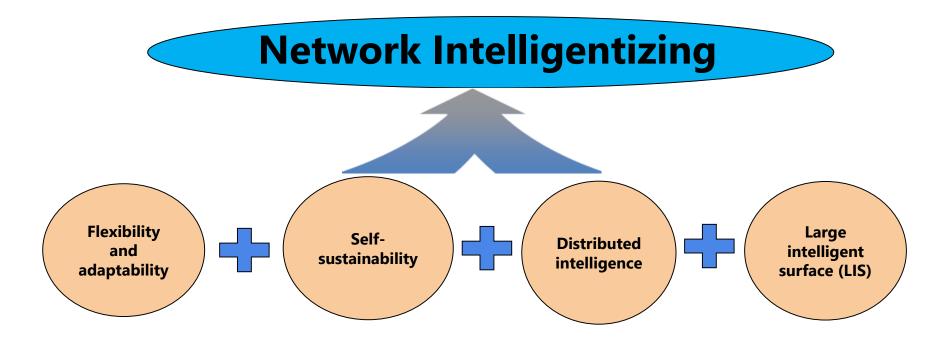




Importance of intelligentizing the future 6G networks



- ☐ Influence advanced wireless communications and mobile computing technologies
- Enable AI-enabled applications at different edge devices of the networks with limited computational capability and energy resources
- ☐ Scaling up distributed training and inference over the cloud, network edge, and end devices
- ☐ AI-enabled security enhancement
- ☐ Al could adaptively adjust and optimize the networks
- ☐ Realize fully end-to-end automated network architecture



Roadmap on network intelligentizing



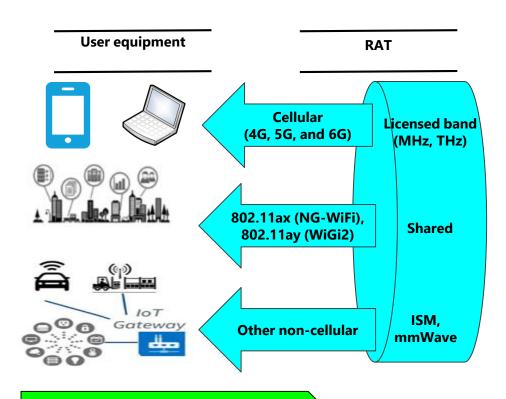


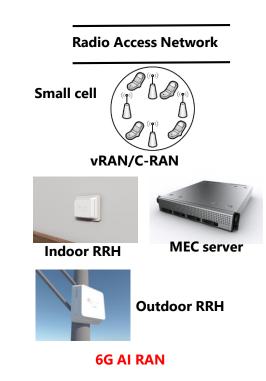
Part III

Roadmap on network intelligentizing

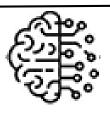
Potential of AI in Future 6G networks







Core network



6G AI Core

High performance computing

Artificial intelligence

Internet/Cloud



Al-based cloudification



Large-scale intelligent surface

Al for radio access network optimization

- Al-assisted PHY layer
- Al for network/MAC radio resource management

Al for Operation and management of the networks

- Network design and planning
- Critical network management

Application of AI in future 6G networks



AI for PHY layer

- Signal detection, classification, and compression
- Channel encoding and decoding
- Al-assisted positioning, sensing, and localization
- Channel estimation and equalization
- Al compatible edge devices

Al applications in future 6G Networks

Al for operation and management

- Dynamic network orchestration
- Dynamic slice management
- Control and policy enforcement
- Critical network management
- Measurement and monitoring
- Security enhancement

AI for MAC layer RRM

- User clustering for cell-free smart surfaces with ultra-high frequencies
- Dynamic scheduling of resources
- Adaptive power control
- Interference management

Al for higher layer RRM

- Al-assisted brokering mechanism for RAN slicing
- Slice admission control
- Slice scheduling
- Handover management
- Mobility management

Open question: How AI will enable network intelligentizing?



Al will enable network intelligentizing based on the following aspects:
Real-time conversations amongst the network entities
☐ Combination of Al-designed underlying network topologies and Al-driven SDN
☐ Intelligent operation and management of the networks
☐ AI in RAN to optimize the network resources
☐ AI-based mobile applications
☐ Intelligent wireless communication

■ Proactive maintenance



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