

5G Security: Forward Thinking

David Francis European CSO

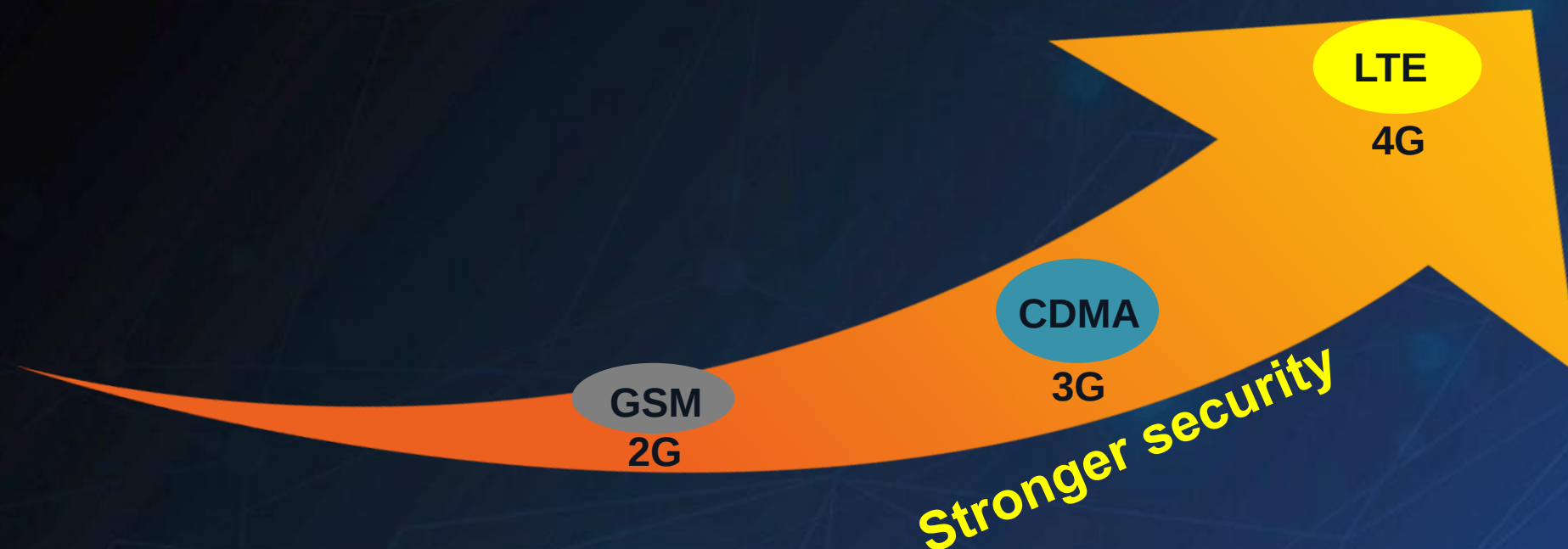
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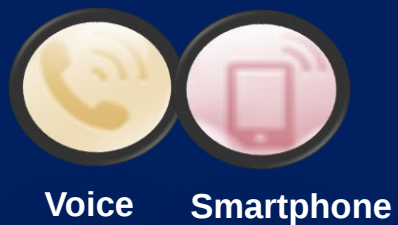
- **Security Challenges Ahead of 5G**
 - Traditional Security Practice
 - New Business Models
 - IT-Driven Network Architecture
 - Heterogeneous Access
 - Privacy Protection
- **5G Security Goals**
 - E2E Security for Vertical Industries
 - Secure Infrastructure
- **5G Security Perspectives**
 - New Trust Model and Identity Management
 - Service-oriented Security
 - Security Assessment
 - Low-Delay Mobility Security
 - User Privacy Protection
- **Summary**

Traditional Security Practice



- **Common security features**
 - Identity management: USIM
 - Authentication: Mutual authentication
 - Data encryption: hop-by-hop

Security Challenges Ahead of 5G -- 5G New Business Models



3G 4G

Mobile Internet

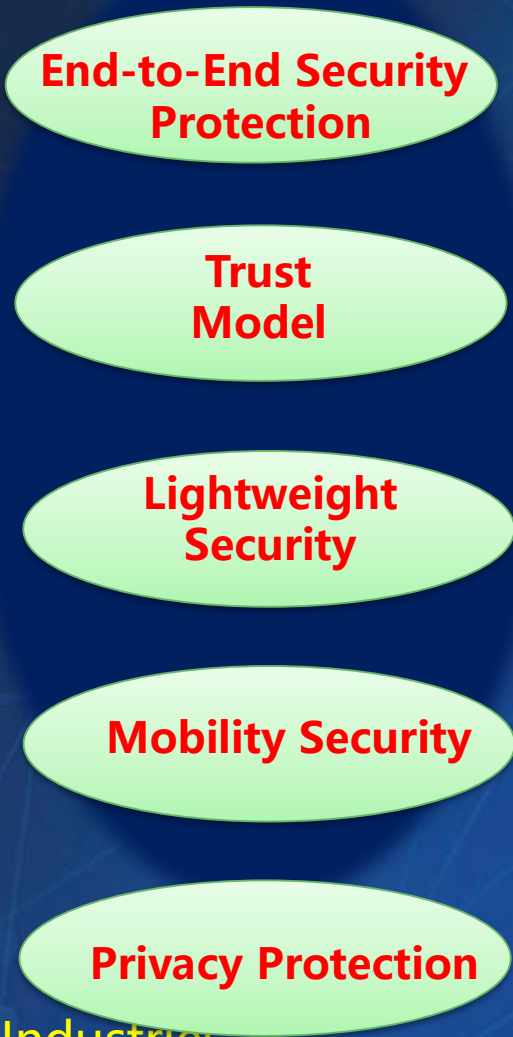
(4 Billions@2020)
Mobile Internet replaced PC Internet



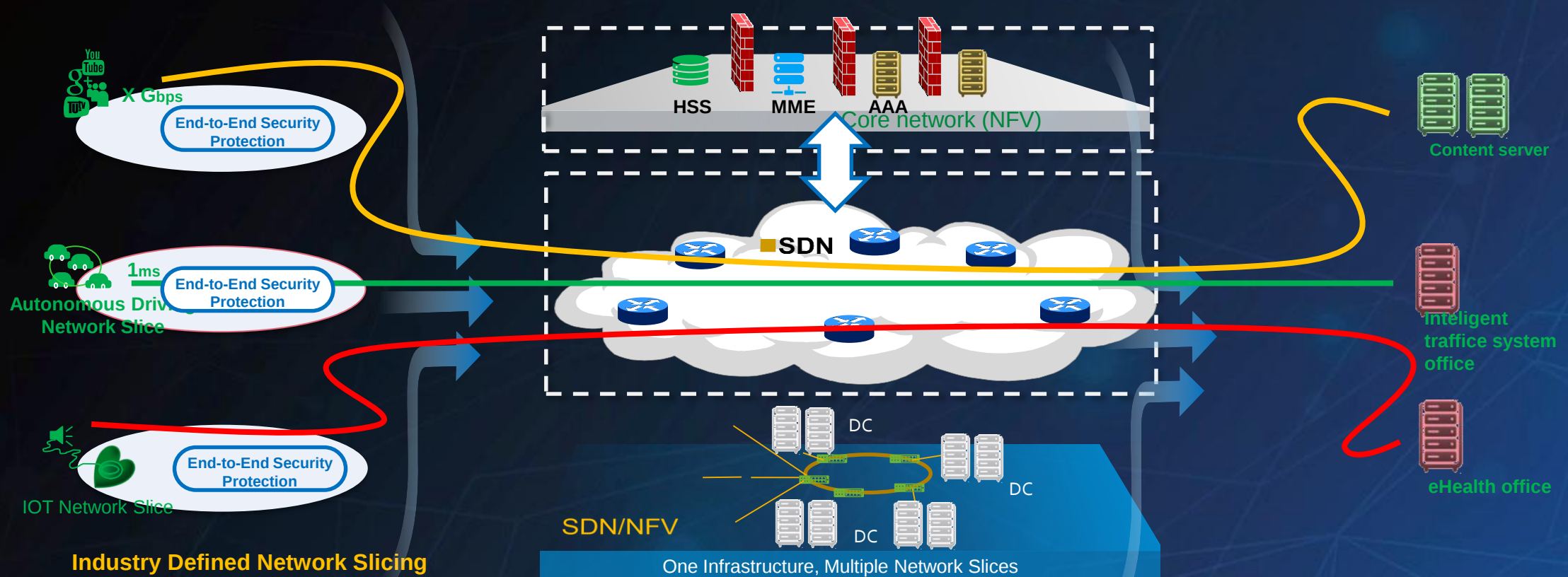
5G Service Oriented

(100Billions New Devices@2025)

New Applications, New Business Models, and even New Industries



Security Challenges Ahead of 5G -- IT-Driven Network Architecture



Industry Defined Network Slicing

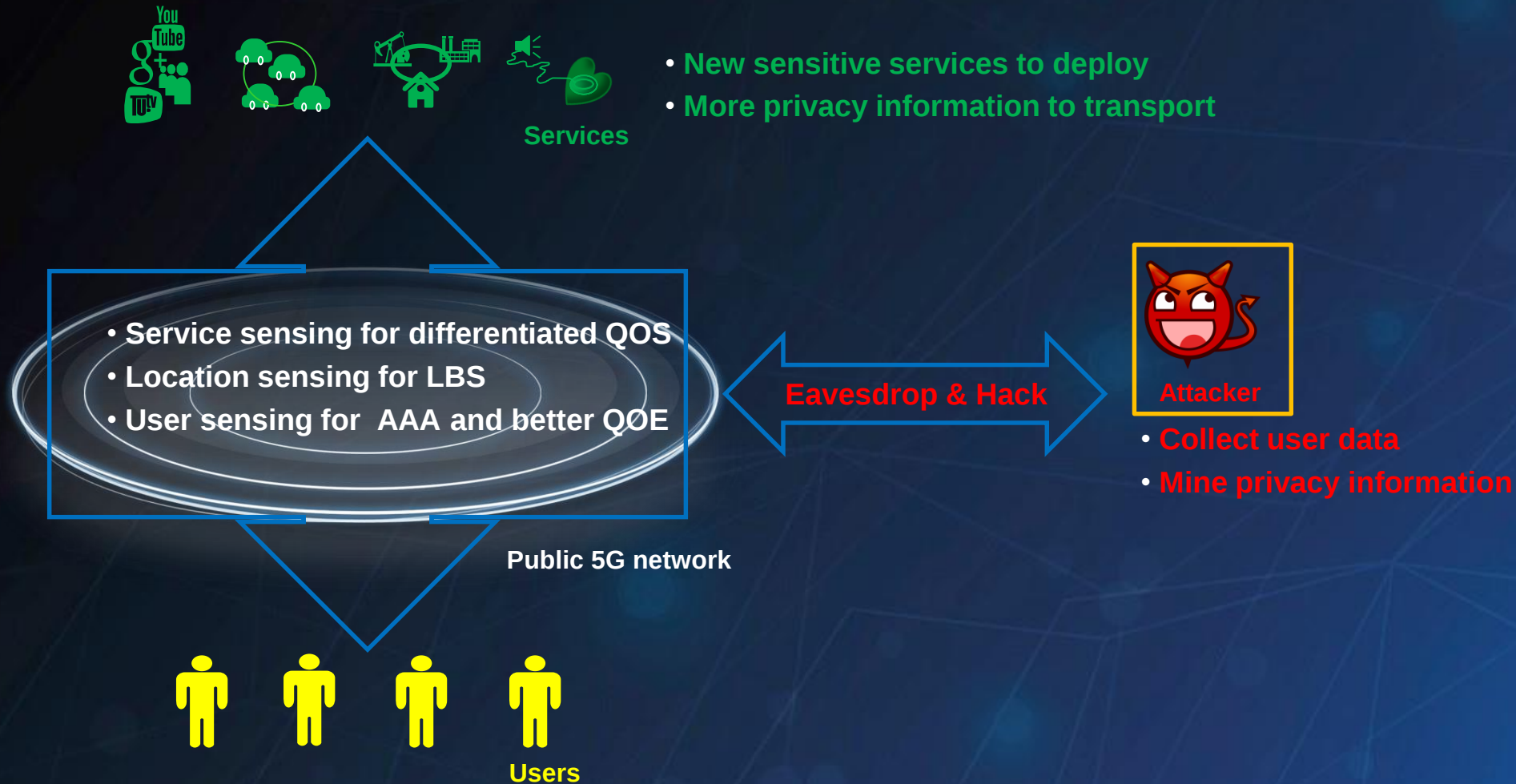
- SDN
 - Manage the isolation for control nodes and forwarding nodes
 - Keep the SDN flow table securely and correctly enforced
- NFV
 - virtual NEs isolation and security management
- Network slice isolation
 - Each virtual network slice requires differentiated security capabilities

Security Challenges Ahead of 5G -- Heterogeneous Access

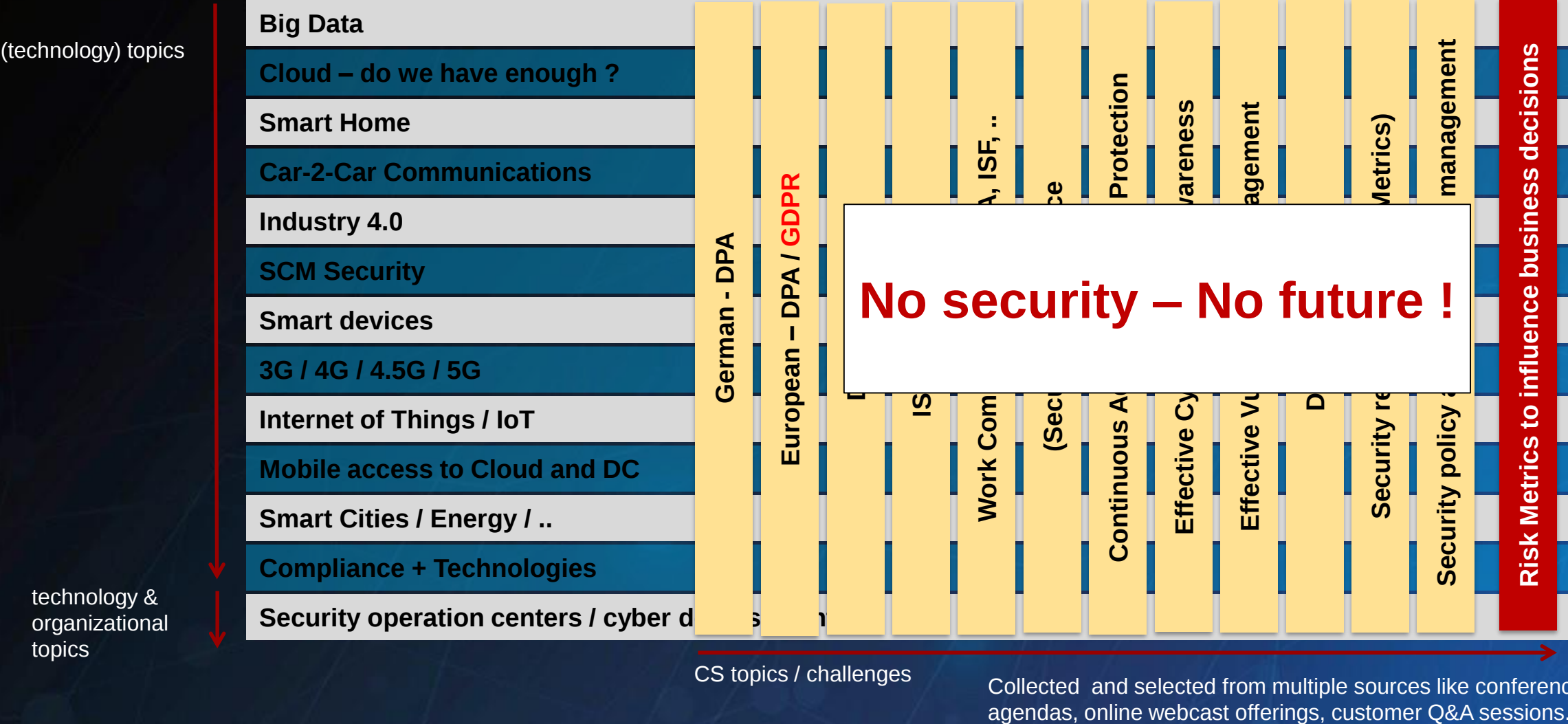
- 5G network is heterogeneous, **security design** need to consider various access technologies and different types of operators
 - **Access technologies:** 5G/LTE/3G/2G/Wi-Fi
 - **Operators:** MNO, MVNO, Local operators



Security Challenges Ahead of 5G -- Privacy Protection



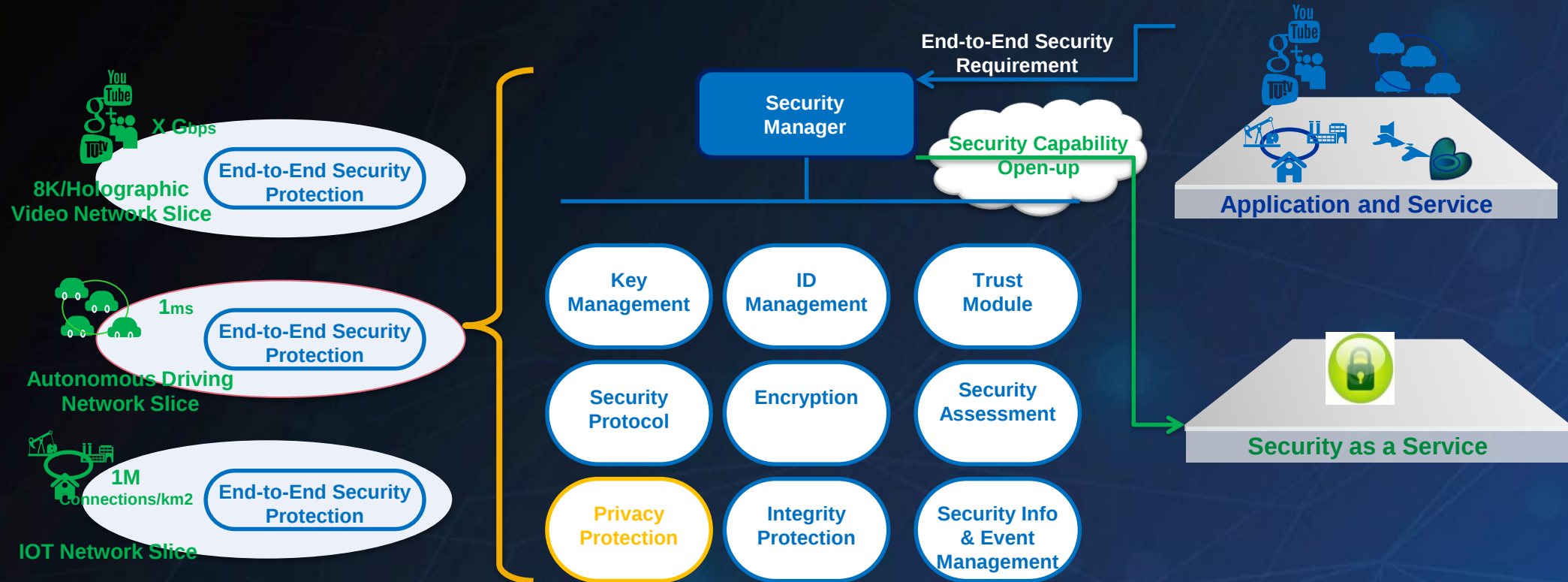
Future challenges and opportunities



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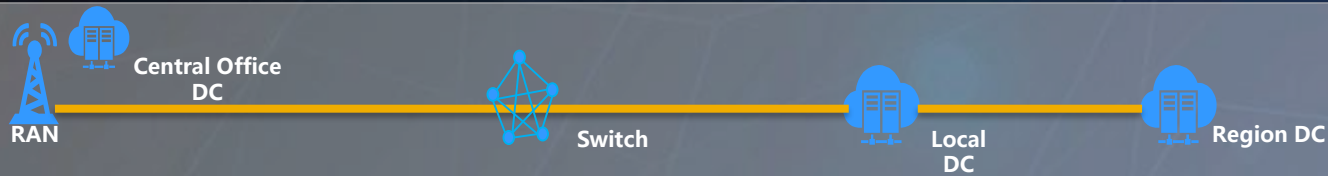
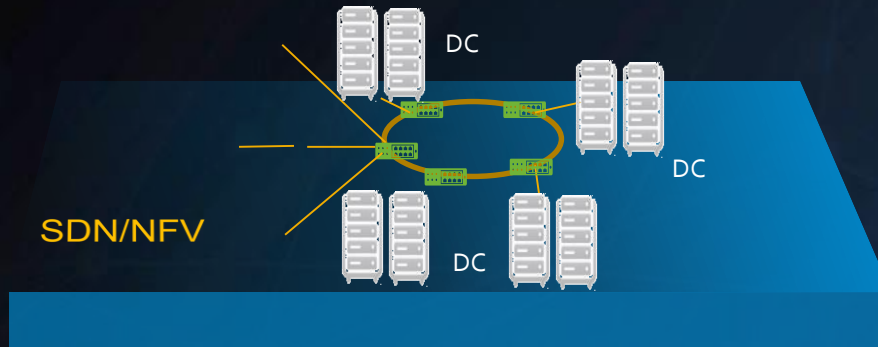
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5G Security Goals-- E2E Security for Vertical Industries



- **Differentiated**
 - E2E security design caters to different vertical industries
- **Flexibility**
 - Flexible and high efficient E2E security deployment and adaptation.
- **Privacy protection**
 - massive personal privacy data, including device identifiers, user IDs, and user preference.
- **Security as service**
 - 5G will continue to extend the user trust by opening up security capabilities as a service to individual users and vertical industries.

5G Security Goals – Secure Infrastructure



Physical Infrastructure

Diversified system level protection of IT-aware infrastructure

Identity management

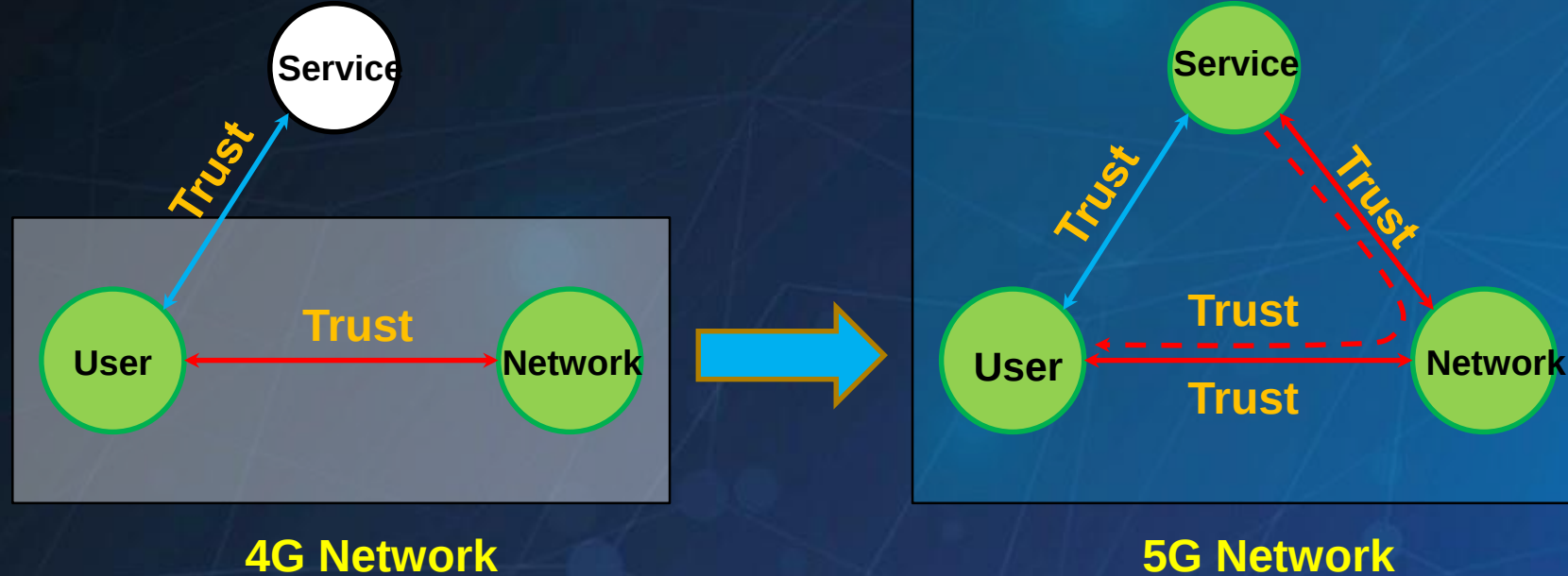
Data Protection

5G Security: Forward Thinking

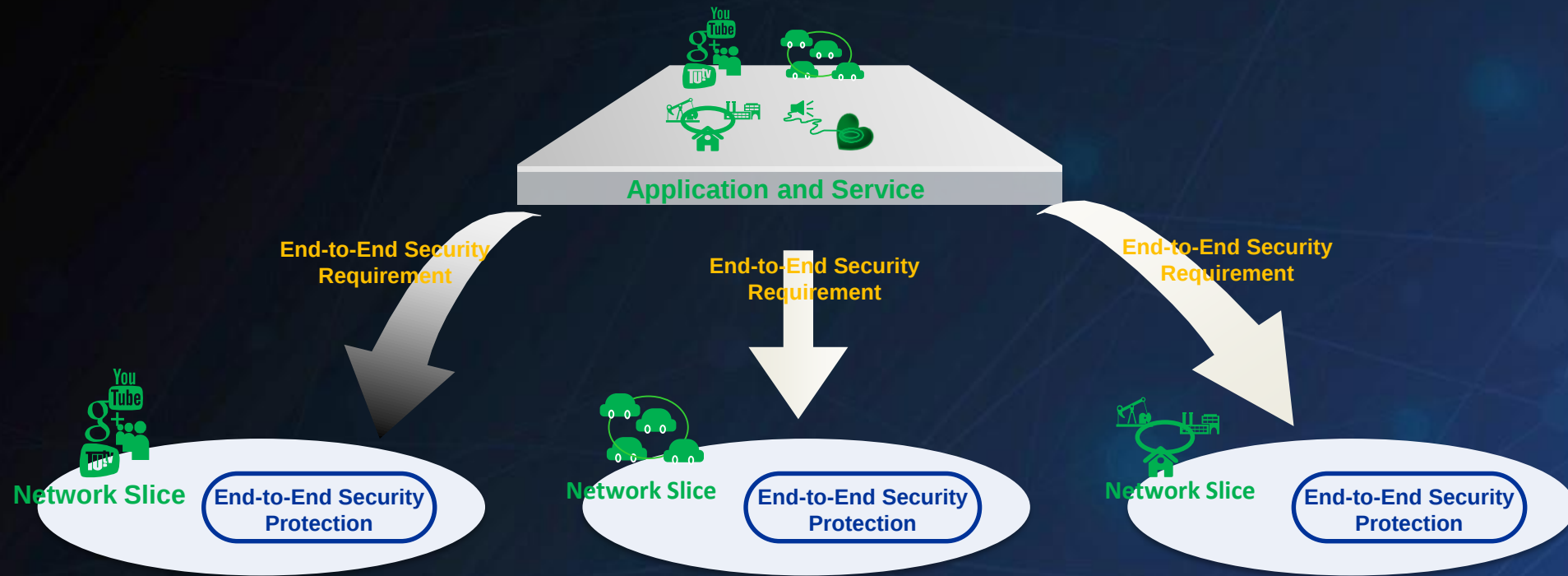
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5G Security Perspectives --New Trust Model and Identity Management

- **Authentication**
 - **Two parties → multi-parties:**
 - user, network, and service providers will be actively involved in the authentication.
 - **Flexible access and services authentication**
 - authentication by carriers alone, by service alone, or by both of them.
- **Identity management**
 - **Combination of device and service identity**
 - **From device-based to user-based management**



5G Security Perspectives--Service-oriented Security



□□ Build E2E security

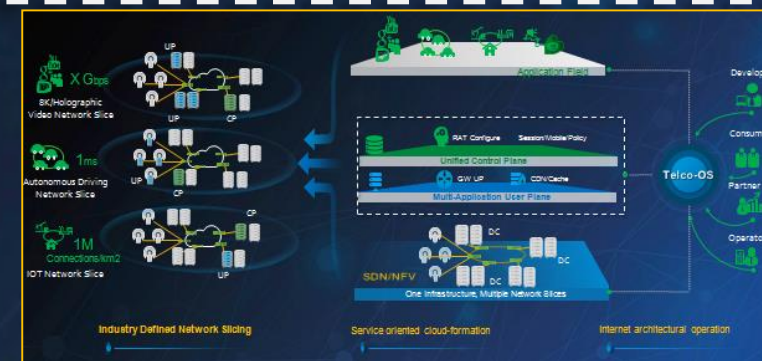
- Differentiated security for different services
- Flexible security architecture to support security attributes for different network slices
- A Uniformed security management framework for multi-vendor environment

□ Open Up Security Capabilities ,and provide security as a Service

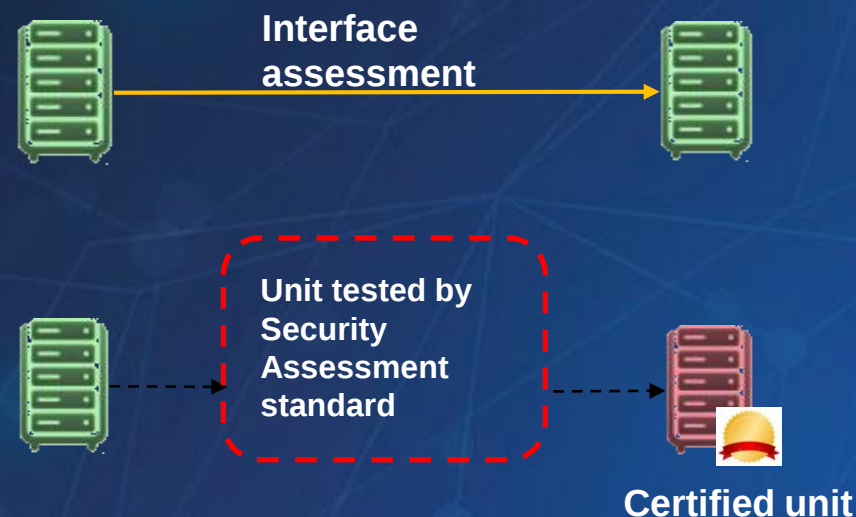
□ Isolate Virtual Network Slices

5G Security Perspectives -- Security Assessment

- Security Assessment on 5G system:
 - Assessment on **interfaces**
 - Interoperable for different vendors
 - Assessment on **network function unit**
 - Private keys storage
 - Encryption/integration protection operation
 - password length and its complexity, etc
 - Automatic verification
 - Certificate granted after success assessment



Security Assessment on 5G system



5G Security Perspectives --Low-Delay Mobility Security

■ Mission Critical Connectivity

- Autonomous driving
- Industrial automation and process control
- Remote control
 - Manufacturing
 - Medicine
 - Maintenance
- Traffic intensity monitoring

■ Security Requirements

- Low Delay
- Ultra-High Reliable
- Ultra-High Availability

■ Security Targets

- Build an efficient, lightweight, and compatible mobility security management mechanism
- High Reliability while providing QoS guarantee with a delay not more than 1 millisecond



Security Perspectives -- Privacy Protection

■ Big data techniques make privacy breach easier.

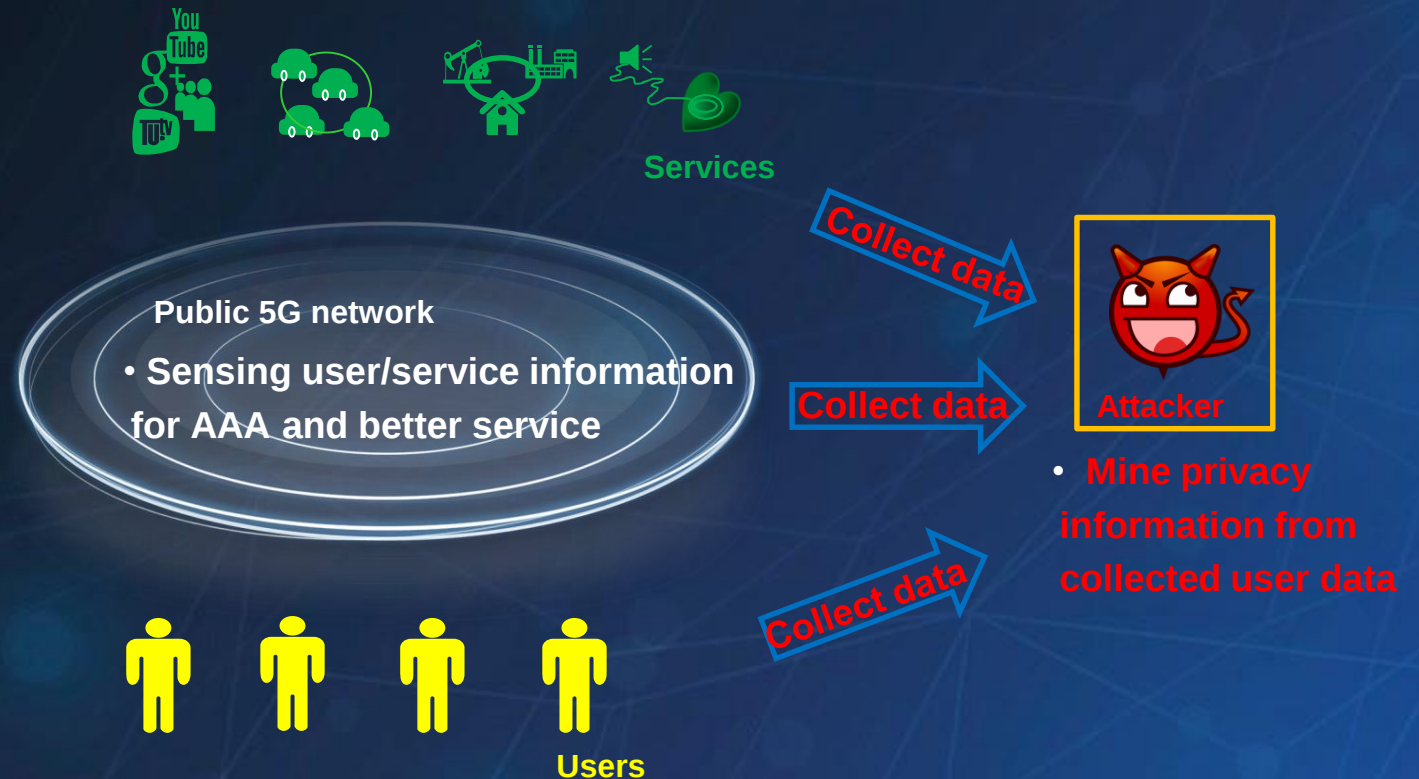
- Attacker may collect user information from multiple channels.
- Sensitive user information can be mined from seemingly harmless user information.

■ The 5G network needs to manage the use of privacy information.

- Define sensing rule clearly
- Stipulate the use, storage and deletion of user information

■ The 5G network needs to provide a more rigorous privacy protection scheme.

- Protect user information in heterogeneous access networks
- Protect user information in network functional entities from different vendors



Summary

- **Security and privacy protection need to be part of the system design at the beginning**
 - Cannot be properly built as an add-on
 - Security and privacy community need to start active dialog with 5G stakeholders
- **High level agreement can be obtained at the current stage**
 - Including service layers in the security and privacy protection solutions.
 - Extend the hop-by-hop security to end-to-end security
- **Security as services provides additional competitive strength to operators**
 - Security is not a burden
 - Security provides competitive strength in 5G
- **It 's time for security community and other stake holders of 5G to work together and come out a robust and proper security solution for 5G.**

Thank you

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