
5G USE CASES & ASSOCIATED CYBER-SECURITY CONCERNS IN DEVELOPING ECONOMIES

Webinar with CMI & WWRF

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Outline

- Preamble
- 5G Use Cases
- Associated Cyber-Security Concerns
- Recommendations (or Possible Solutions)



Preamble

- The emergence of Smartphones & Tablets coupled with broadband wireless connectivity has changed the way we live, work and socialize.
- 5G's great capabilities, such as ultra-high speed, very low latency and possibility of network sharing, will be great assets for the development of customers usages and industries use cases.
- 5G is expected to drive the mobile data growth over the next decade;
- Consumers usages and B2B use cases, from massive connectivity applications that could include asset management, logistics, smart buildings, to critical connectivity such as remote-control, automated vehicles, remote e-Health, and passing by wireless devices, virtual reality (VR) and broadcasting.

Preamble

- 5G disruptive tendencies:
 - 5G will change where and how we harness compute power and promote unforeseen product and service innovation;
 - 5G will touch nearly every organization promising new revenue potential across a myriad of industries;
 - 5G will expand usage of Edge computing, which locates network functions, applications, compute and storage closer to end-users; creating near real-time performance along with high bandwidth and low latency;
 - 5G implementation will be unique to every organization; based on their existing enterprises' networks and security architectures or models;
 - 5G footprints will be peculiar to each organization; with unique design and purpose built to that organization.

Note

5G is not a one-size fits all technology;

Preamble

- It is believed that 5G will create a wide range of brand new applications and services in cloud computing; with multiples of private and public 5G architectural cloud options;
- Which architecture an organization chooses will depend on the organization's industry, speed, and latency requirements and how each organization desires to control access to data and applications;
- For some organizations, 5G implementation will be evolutionary, as they navigate through the transition from 4G to 5G and all associated security concerns;
- ***Data is said to be the new oil;***
- How data is consumed, input, accessed (and by whom?), stored, and transported will influence an enterprise's unique footprint for protection;

Preamble



- 5G mobile communications has a number of objectives, such as achieving low latency, high data rates, increased fixed & mobile convergence, accessibility, and dense connectivity;
- 5G will also support IoT services and address the needs of different vertical markets, such as health care, automotive, transport, etc.

5G USE CASES

5G USE CASE

- 5G is expected to offer many new advantages and services, with dedicated uses to businesses:
 - Ultra-high speed, its density, the significant reduction in latency, its security and reliance, and the possibility of network slicing;
- The 5G-PPP (Fifth Generation Public Private Partnership) has defined several different use cases for 5G, including enhanced mobile broadband and critical communications;





5G USE CASE

- These different objectives and use cases have important impacts on the security aspects of the system; and
- Service-specific security requirements should be considered when designing appropriate authentication and access control mechanisms for 5G networks;
- For example, IoT with numerous devices, may access the network at the same time, and so the network must be dimensioned to handle large amount of signaling traffic and to authenticate the devices correctly to avoid DDoS attacks;

5G USE CASE

- 5G will enable innovations in smart cities or homes, intelligent vehicles, fleet management, smart farming, smart energy, augmented reality (AR), Interactive Gaming, supply chain, and IT automation by connecting billions of low-power Internet-of-Things (IoT) devices to the cellular network;
- By taking advantage of low latency, high speed, and ultra-high reliability, enterprises can one day actualize mission-critical applications such as smart grids, remote surgery, and intelligent transportation systems;





5G USE CASE

- The explosion of 5G-enabled hardware and the Apps hosted on those devices bring about yet another elevated era of highly organized, commercialized, and potentially state-sponsored threat actors;
- These groups are ready and willing to destroy, steal or hinder the data that these 5G-enabled devices utilize to further their criminal desires;
- Unlike prior improvements to the radio spectrum, the innovations that 5G brings mean that the vast amounts of data that is being created, hosted, and transmitted could potentially be probed by cyber-criminals using the very same technology that allowed the data to move in the first place.

5G USE CASE

- Moving the data processing closer to the use case applications certainly allows for near real-time, AI-enabled processing and decision making, but not without drawbacks;
 - E.g. SQL injection attacks, unencrypted data along private networks without malware sniffing Apps, etc.
- eSIM (more precisely eUICC) – embedded Universal Integrated Circuit Card – users can choose operators, with over-the-air activation methods in a secure manner.





5G USE CASE

- 5G use cases include: “wholesale wireless connectivity”, i.e. MNOs or 5G connectivity providers will sell connectivity to MVNOs (or different 3rd parties) who in turn provide services to their own end-users in B2B2C business model;
- Current IoT based use cases, use network sharing architecture, such as the following (based on types of slices offered):
- eMBB – enhanced Mobile Broadband;
- URLLC – ultra-reliable and low latency communications;
- MIoT – massive Internet-of-Things;
- V2X – vehicle to everything;

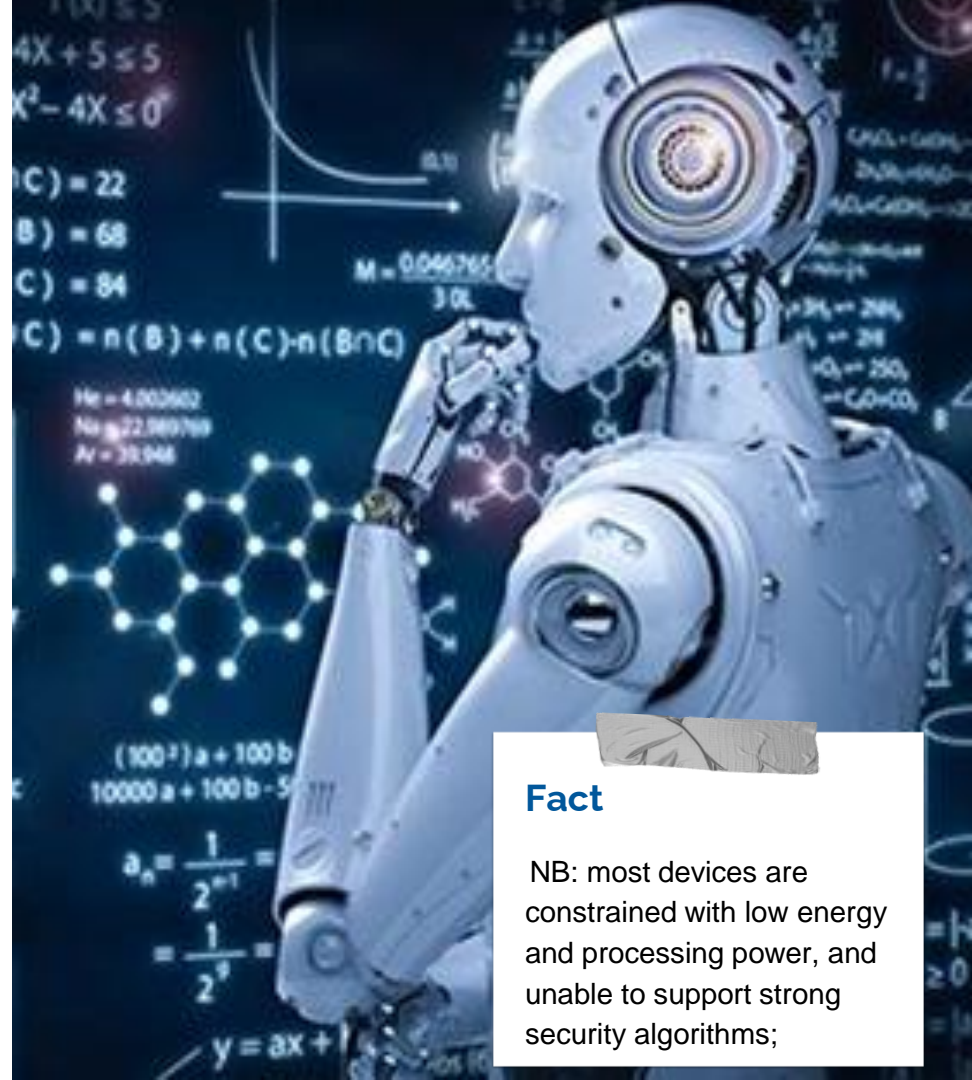
Note

These network slices only consider different QoS requirements (e.g. bandwidth, latency, etc.)

5G USE CASE

Motivated Use Cases (source: Behrad et al., 2019)

- Alice's device with ubiquitous cellular connectivity (e.g. connected vehicle); 5G embedded inside the device;
- Alice has smart home, smart light system, smart energy usage control system, smart entertainment, smart lock system; - using smart systems connected via 5G network
 - Data leakage concerns; e.g. malicious access to smart lock system is more serious than that of entertainment;
- Alice – factory manager: uses robots for production;
 - Network slice, with trust provision of security policies & accounting for robots configurations; from enrollment to decommissioning;



Fact

NB: most devices are constrained with low energy and processing power, and unable to support strong security algorithms;

Associated Cyber- Security Concerns

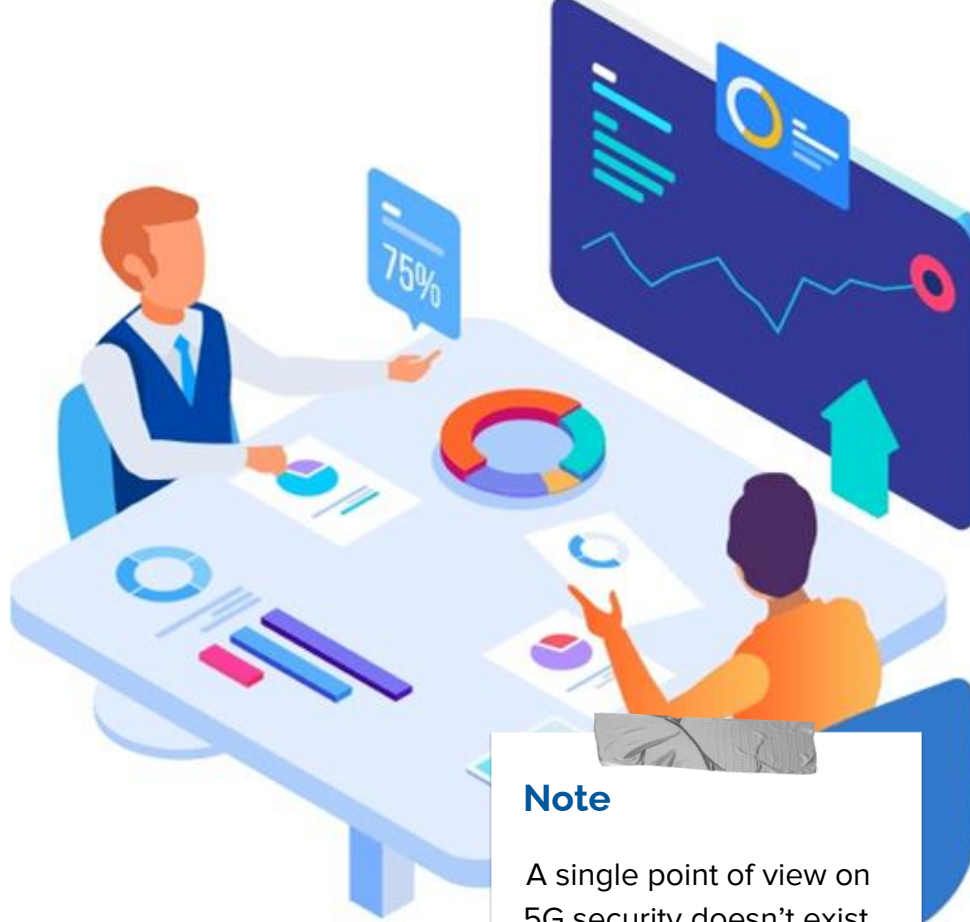
Associated Cyber-Security Concerns



- Security basics don't go away with 5G, but rather get elevated in importance. E.g. firewalls and network segmentation are still relevant;
- Data security, identity and access management, threat intelligence, and visibility are more important than ever in finding threats and shutting them down commensurate with the near real-time promise of 5G;
- Security technologies/solutions would strategically be required to assess the benefit-to-risk evaluation of data security and access management concerns juxtaposed against enhanced speed and reduced latency benefits;
- Security posture must enable a malleable 5G security architecture.

Associated Cyber-Security Concerns

- Safeguarding security vulnerabilities will require continuous and adaptive scanning and monitoring; using technologies like Zero Trust, advanced automation and analytics, AI and ML;
- Zero Trust approach is implemented for better enterprise visibility, reduced IT complexity, data protection, and support for cloud migration;



Note

A single point of view on 5G security doesn't exist yet, as 5G is still nascent!



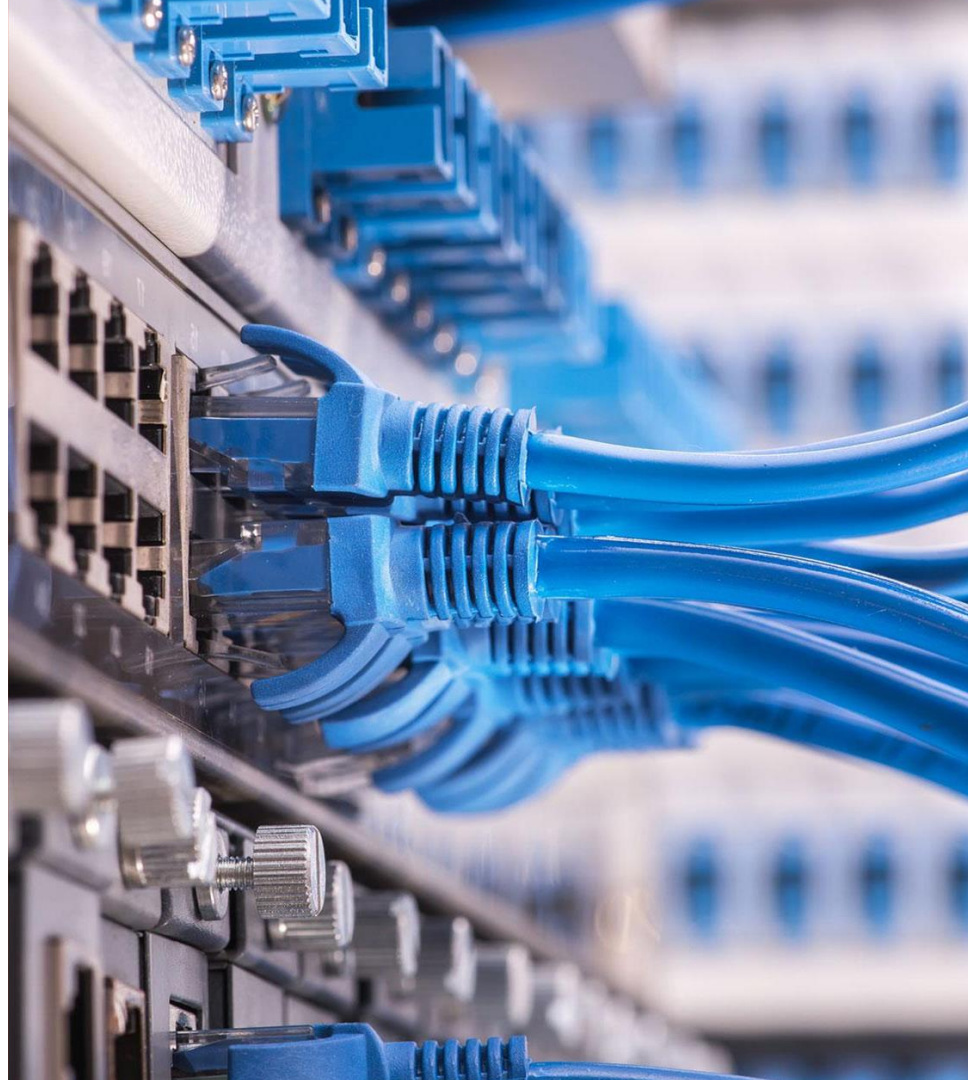
Associated Cyber-Security Concerns

- 5G ushers in a new era of network security with encryption of the International Mobile Subscriber Identity (IMSI) to protect network traffic data sent over 5G radio network;
- Highly securing 5G IoT usage is seen as an area of strong concern;
- Other concerns on consolidation of soft costs, such as time spent on upgrades and education.

Associated Cyber-Security Concerns

5G network provider responsibility for security includes:

- Device Authentication;
- RAN – 5G Core Network (SDN);
- Authentication connection to Network; Network Traffic Protection; Highly Secure Operations; Subscriber and Data Protection issues;
- 5G Global Network Infrastructure;
- Data protection and Data accessed by mobile endpoints are both significant concerns.



Recommendations

Recommendations or Possible Solution

- Software-Defined Networking (SDN) is considered as a security enabler for the future set of technologies being implemented;
- SDN enables embedding security into the design and architecture of the network; (with improved policy enforcement; anomaly detection; mitigation, etc.)
- Network slicing is a solution to meet heterogeneous requirements from different vertical markets;
- Virtualization is used to deploy preventive security measures across networks.

Recommendations or Possible Solution

Security by design in 5G enabled world must be ***deliberate and strategic*** with relevant security posture;

- To be incorporated into organization's comprehensive digital transformation road map;

In respect of IoT devices:

- Evaluate every user and verify every device;
- Establish baselines of normal behavior and activity for the network and users;
- Reduce complexity and risk to enhance security;
- Incorporate security-by-design principle into development of 5G use cases;

Recommendations or Possible Solution

Security design should incorporate automation and ability to apply security policies dynamically;

- In order to keep up with the speed and scale of 5G networks;
- Utilizing advanced technologies such as AI/ML, continuously updated threat intelligence, and other analytic capabilities can help improve rapid detection and response of new threats as networks become increasingly complex and the number of devices connecting to those networks explodes;
- Team collaboration drives a holistic approach to security and creates “security by design”...

Multi-sectorial approach cyber-security deployment in Ghana, e.g. NCA CERT, BoG CERT, CSA CERT (National), etc.

Conclusion

- We have endeavored to discuss some pertinent 5G Use Cases;
- We also discussed cyber-security concerns that are associated with these use cases and the 5G network;
- We have recommended some possible solutions necessary to mitigate some of these concerns raised;

References & Resources

- 5G Cybersecurity Impact Survey, IDC's Custom Survey, October 2020.
- 5G and the Journey to the Edge, AT&T Cybersecurity Insights Report, 10th Edition 2021, by AT&T Business
- Rolling Out 5G: Use Cases, Applications and Technology Solutions, by Badic et al., Apress, 2016.
- 5G REF Security, by Editors: Tafazolli et al., Wiley, 2021.
- Principles of Information Security, 6th Edition, 2018, by Michael Whitman & Herbert Mattord, Cengage Learning.



Thank You

Any comments, questions & contributions??
