FG-ML5G
ITU Workshop on "Machine Learning for 5G and beyond"

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08-Aug-2018

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Trends & challenges in connected health technology

"The picture of health remains vastly different in connected communities and unconnected digitally isolated communities. This holds true across access to care, quality of care and health outcome metrics."*

Patient and family engagement:

Increasing consumer engagement in their own health

Improving Outcomes:

Shift to value-based healthcare will reduce waste and increase access to all

Lowering cost of care:

Care shifting to lower-cost settings and the home with real-time anywhere monitoring

Consumerization of healthcare:

Digitization and distribution of healthcare

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The Continuum of Connected Care

From: Treatment based 'fee for service' using reactive 'textbook' diagnosis after symptoms appear
To: Algorithms and AI/ML predictive analytics within clinical support systems leveraging big data at the individual to populations health management

Healthy living **Prevention** **Diagnosis** **Treatment** **Home care**

The future requires Data; real-time, latency sensitive, 24/7/365, everywhere
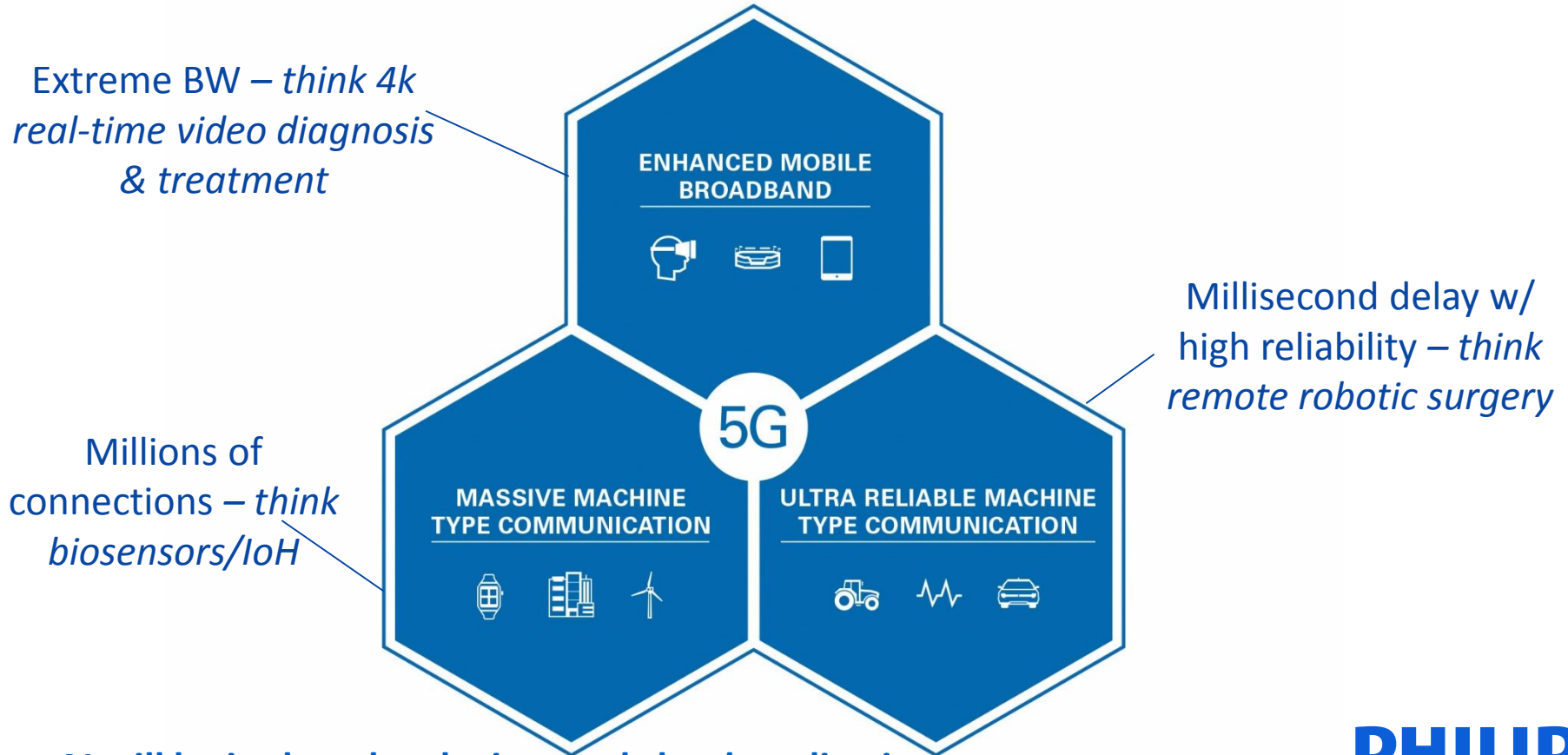
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Wireless Landscape in Healthcare today

- Wireless in Healthcare is pervasive and ubiquitous but not necessarily robust and reliable for medical use
  - Wi-Fi dominates home & enterprise today; cellular outdoor
  - Private networks or 'guaranteed' SLA is a proven value proposition

- Convergence of medical devices, new technologies, information systems and healthcare applications are driving exponential growth of the complexity of networked medical devices & systems
  - Interoperability an enabler

- Global regulatory authorities are challenged with regulating medical devices and applications as safe and effective without slowing down innovation
  - Global challenges with data privacy (e.g. GDPR)

- The lifecycle of medical devices can outlast wireless technology
  - Medical device > 10 years; Wireless technology can change every 3-5 years

- Expanded and new clinical use models (IoH) are generated from new connectivity technologies
  - Single point in time observation → continuous real-time, 24/7
  - Clinical flows are expanded beyond the walls of the hospital
  - New, emergent workflows enabled

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Internet of Health 5G related use case examples

Extreme BW – *think 4k real-time video diagnosis & treatment*

Millisecond delay w/ high reliability – *think remote robotic surgery*

Millions of connections – *think biosensors/IoH*

ENHANCED MOBILE BROADBAND

MASSIVE MACHINE TYPE COMMUNICATION

5G

ULTRA RELIABLE MACHINE TYPE COMMUNICATION
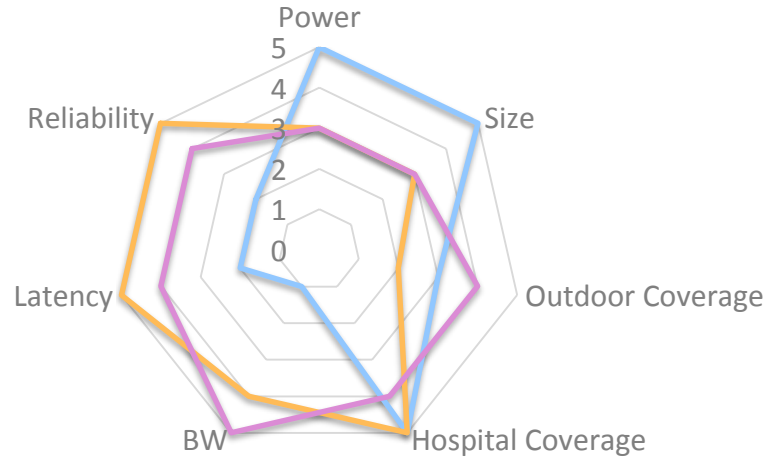
AI will be in the edge devices and cloud applications

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Healthcare 5G Requirements Analysis: Examples

Now using KPI's*

1. Power
2. Size
3. Outdoor Coverage
4. Hospital Coverage
5. Bandwidth
6. Latency
7. Reliability

Cost, clinical workflow, availability is not included

Use Case Requirement Examples

Biosensor — Robotic surgery — 4k Video

Ranking	Importance
5	Extreme
4	Strong
3	Valuable
2	Nice to have
1	Not necessary

IoH needs 'guarantee' on SLA, Patient data security & privacy, required in both transit and at rest

*KPI: Key Performance Indicator

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Opportunities in IoH: Key Takeaways

- The global demand for the promise of lower cost of care while improving outcomes drives the IoH
  - ***Without robust, reliable and ubiquitous connectivity, the promise will fall short***

- There are many requirement factors that demand varying connectivity use cases
  - *Not one radio fits all use cases*
  - *Key factors for IoH: Power, size, cost,* **clinical workflow, geographical mobility, data security and privacy** *& standard data profiles (e.g. BW, latency)*

- Relevant 5G features and capabilities
  - Mobility across the continuum of connected care
    - **Seamless mobility indoors and out** (e.g. human worn biosensors)
  - Pervasive location services
    - Find the nearest life saving device (e.g. AED) or clinician indoors our out
  - Mobile network edge computing
    - Processing power to avoid long data paths e.g. to cloud services for real-time action
  - Network slicing
    - Virtual private network with **QoS 'guarantees' to groups e.g. in-hospital medical device or emergency response vehicles**

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Thank you!

Q&A

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