Design Factors of 5G & Innovation to Medical Field

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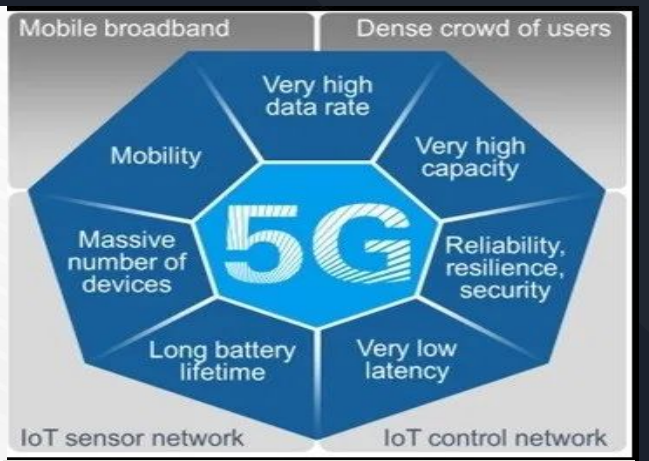
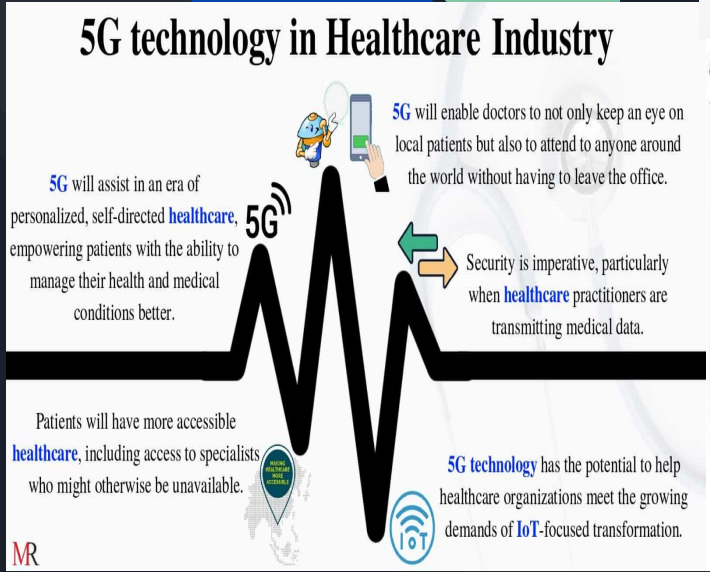
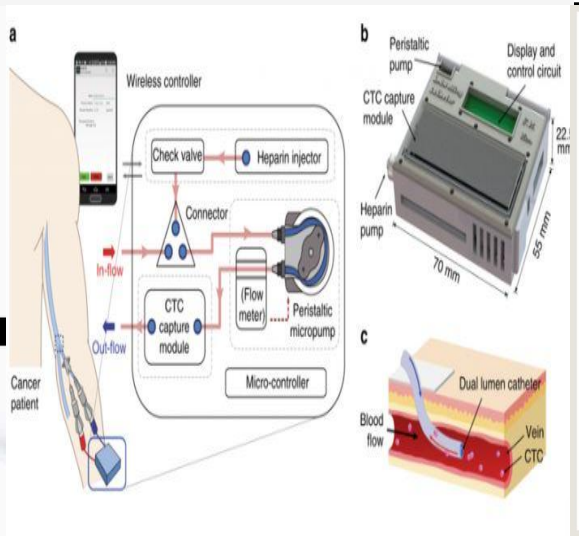
108
UMEA-SD
C-THRU
SMOKE DIVING HELMET


Mobile broadband
Dense crowd of users
Very high data rate
Mobility
Very high capacity
Massive number of devices
5G
Reliability, resilience, security
Long battery lifetime
Very low latency
IoT sensor network
IoT control network


5G technology in Healthcare Industry
5G will enable doctors to not only keep an eye on local patients but also to attend to anyone around the world without having to leave the office.
5G will assist in an era of personalized, self-directed healthcare, empowering patients with the ability to manage their health and medical conditions better.
5G
Security is imperative, particularly when healthcare practitioners are transmitting medical data.
Patients will have more accessible healthcare, including access to specialists who might otherwise be unavailable.
5G technology has the potential to help healthcare organizations meet the growing demands of IoT-focused transformation.
IoT
MR


a
Wireless controller
Check valve
Heparin injector
Connector
In-flow
Out-flow
CTC capture module
(Flow meter)
Peristaltic micropump
Micro-controller
Cancer patient
b
Peristaltic pump
Display and control circuit
CTC capture module
Heparin pump
70 mm
55 mm
c
Dual lumen catheter
Blood flow
Vein
CTC

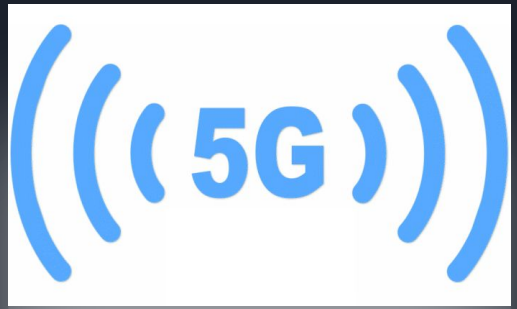
SOS
Weight
35 grams, same as 3 x 20 cent pieces
Dimensions
Height 61
Width 42
Depth 16
Waterproof
Wear in shower or the rain

Medical possibilities for today's world

- Triage screening for adverse situations such as the current COVAD-19 pandemic. A device such as our concept would have a significant impact in trending the curve downward by allowing thousands of more people to be tested for impending health situations.
- A walk thru temperature scanner with a 5G link could be used at subway entrance or testing center entrance to screen for Covid19 or similar illnesses.
- Leveraging 5G network, apps can be developed to monitor high risk population based on established COVID-19 symptoms or data sets.

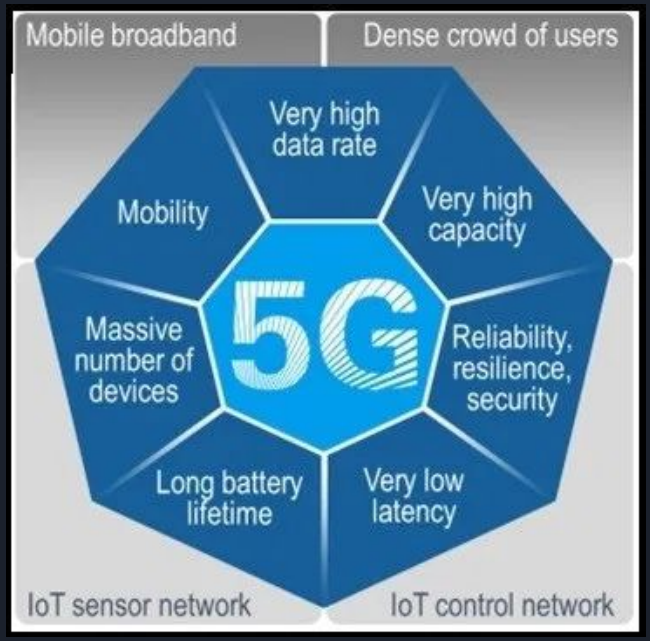
What is 5G?

- The big question is: What is 5G? We are hoping to answer that, while utilizing it to our benefit. 5G is the fifth generation wireless technology designed for digital cellular networks.
- It was deployed in 2019 after a strong run of 4G.
- International Telecommunications Union (ITU) says 5G should have a peak data rate of 20 GB/s for downlink and 10 GB/s for the uplink.
- 5G does and will integrate with LTE and it is foundational to the network.

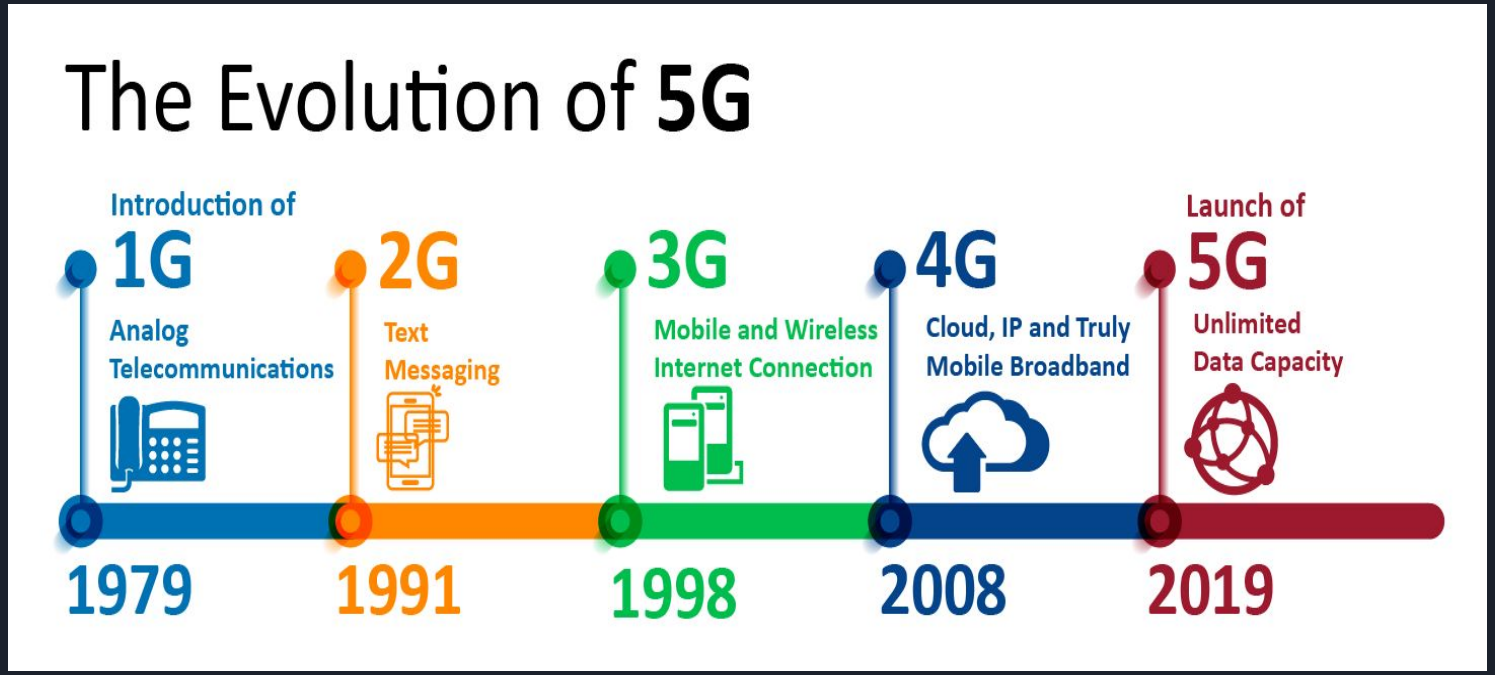


Benefits of 5G

- Very high data rate
- Very high capacity
- Much lower latency
- High speed remote work
- Increased Bandwidths
- Overall efficient and uniform platform



Iterations of Broadband



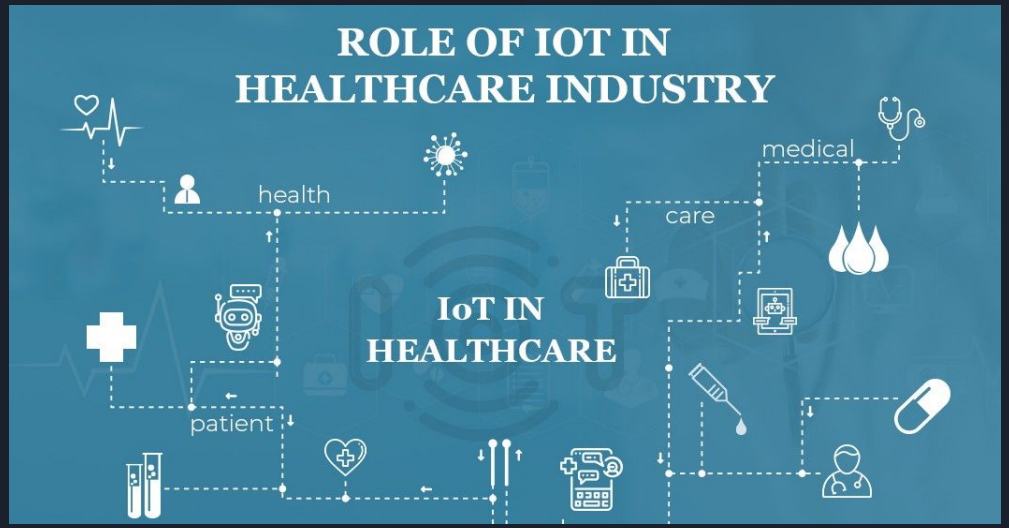
First Response with 5G

The medical field is a strong aspect of our culture and technology is truly innovating in this career. As a group we thought, what better way to utilize 5G? Incorporate it into the medical field. Many healthcare providers rely on certain devices, and in recent times, a lot of these devices have become wireless. That is where we grasped the idea of utilizing 5G for faster results and accurate data.

****Not our device****

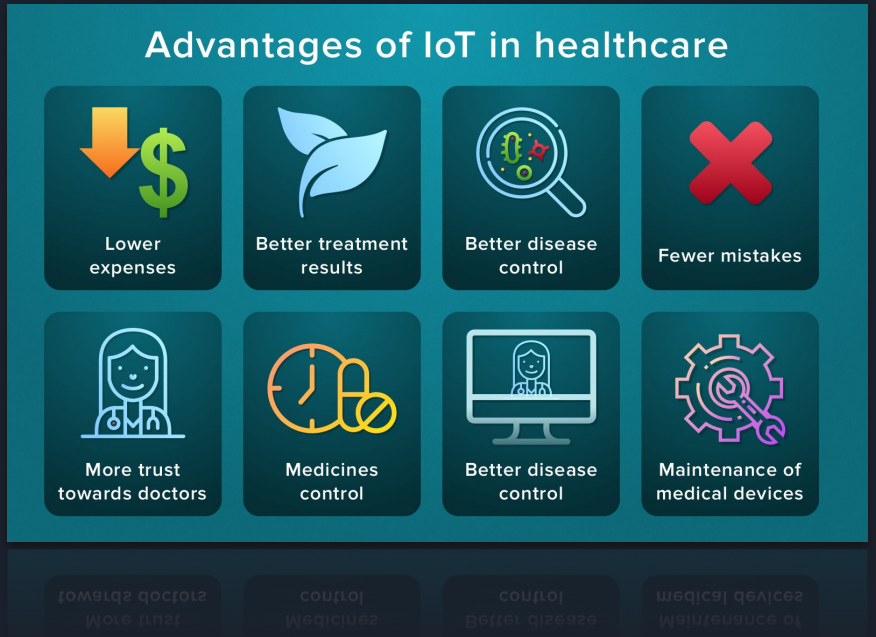
Where is 5G going within the Medical Field?

According to “Market Watch” the global investment in Internet of Things (IoT) from the medical industry should reach $410 billion by 2022! That figure will keep on growing and according to statistics, much of that investment will come directly from IoT markets.



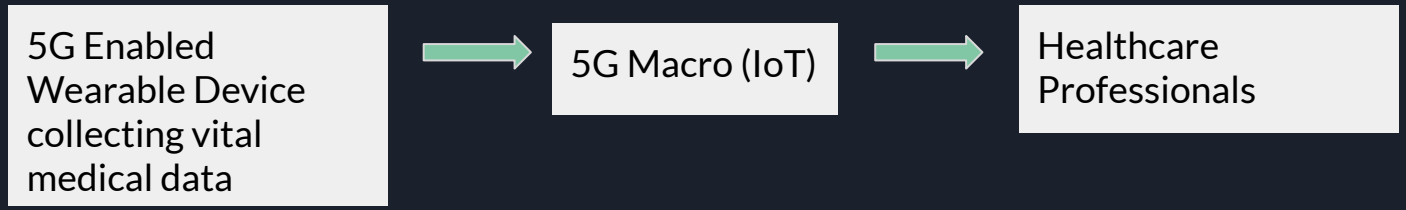
Advantages of IoT in Healthcare

With the ‘Internet of Things’, devices have an overall central place to dump their data. All of this data being dumped is than further analyzed and valuable information is extracted. When it comes to healthcare, we all would like to think that there is no room for error but that is not the case. Human error can happen quite often and it’s not an uncommon thing, but that is where IoT can benefit us. Transmitting highly valuable and sensitive data is where 5G can be utilized.



Why 5G?

Our group's main focus is to take this sensitive and highly useful data, and make sure that the real time statistics are being broadcasted to health care workers in the fastest possible way. We as a whole want to detect problems as QUICK as possible. Vital data of a patient must always be correct and accurate. With telehealth becoming more prominent, more wearable devices are being developed.



5G Wireless Speeds in Carriers

5G wireless speeds are expected to knock 4G's numbers out of the park. "Tom's Guide" recently did a cellphone prediction study where they analyzed current 4G speeds of networks and projected 5G speeds. Refer here.

5G speed: 5G vs. 4G download speeds compared

	5G	4G*
AT&T	823-957 Mbps	37.1 Mbps
Sprint	151-185 Mbps	32.5 Mbps
T-Mobile	369.9-579 Mbps (millimeter wave); 100 - 200 Mbps low-band 5G	36.3 Mbps
Verizon	713 Mbps-1.07 Gbps	53.3 Mbps

5G vs 4G : Pros & Cons

5G Pros:

- 5G Means More Bandwidth
- Less tower congestion
- New Technology Options

5G Cons:

- More towers closer together
- Broadcast Distance/Building Penetration
- Lack of Widespread Coverage
- Battery Drain/Heat

4G Pros:

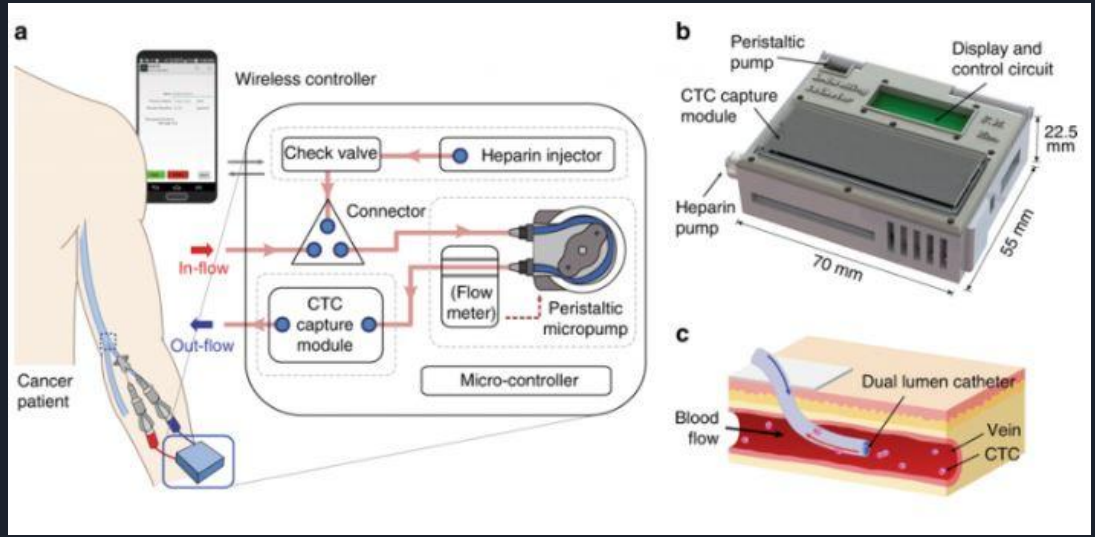
- Much higher speeds than 3G
- Widespread Coverage
- Good for Data-Intensive Tasks

4G Cons:

- Higher device prices
- Not offered globally
- Glitches and bugs are inevitable

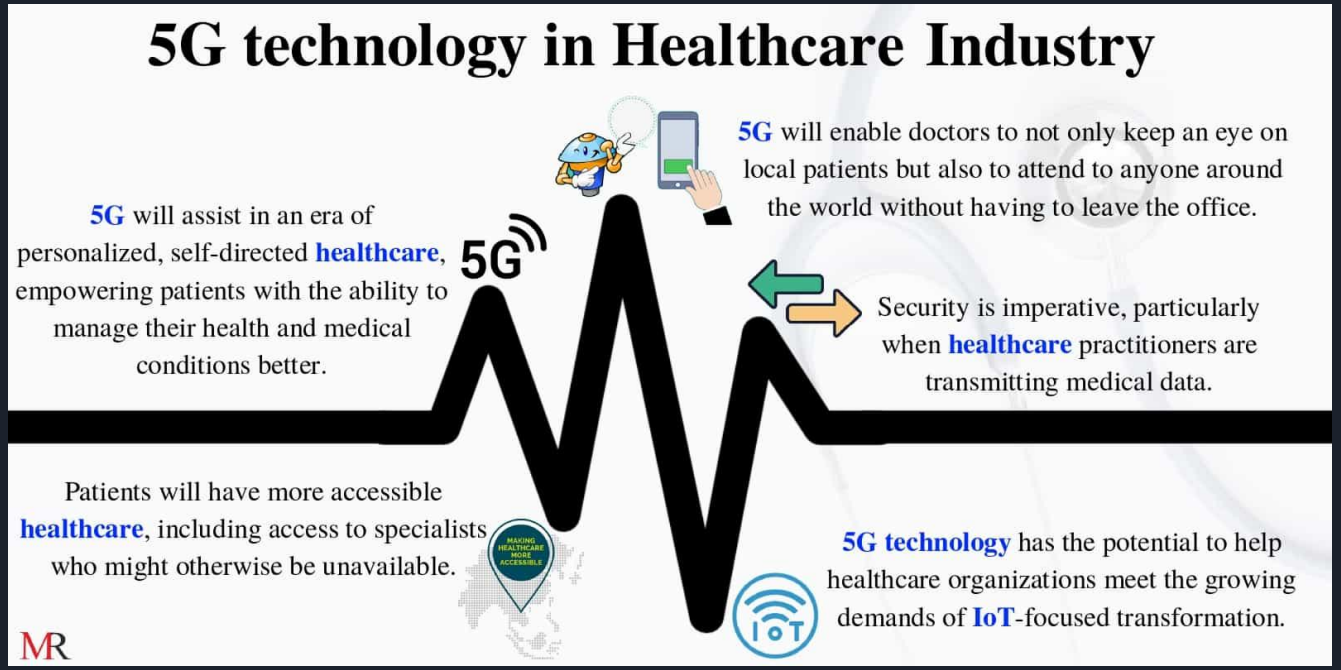
New and Emerging 5G Medical Devices

Wearable medical devices are becoming much more prevalent in today's world. With remote support now taking over our nation, our future is within this. Although our team wasn't able to create our own device, we wanted to exemplify certain devices that would benefit from this 5G implementation. University of Michigan recently created a case study in regards to a wearable device that can detect cancer cells in blood. See to the right.



Benefits of 5G for Healthcare Technology

Healthcare Industry Benefits



Telehealth Benefits

Quickly Transmitting Large Files and Better Viewing:

- There are many rural and remote areas. Over 5 billion people in our population don't have the correct healthcare resources. 5G can enable for doctors to be able to view high quality images and files of a patient. Remote diagnosis can be a thing of the future with the help of 5G.

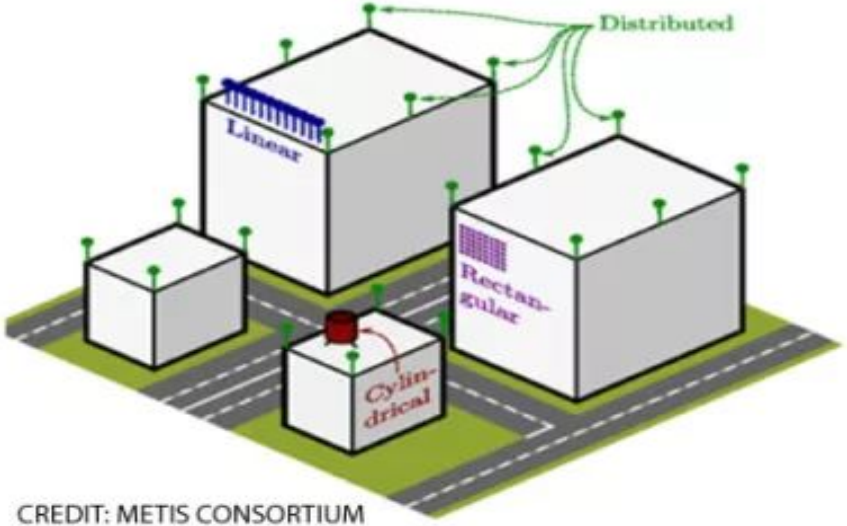
Reliable, Real Time Remote Monitoring:

- Utilizing IoT devices, healthcare providers can monitor patients and gather data used to improve overall health. 86% of doctors say that wearable devices increase patient engagement with their own health. To make it even better, wearable devices are predicted to decrease hospital costs by 16% in the next 5 years.

KEY TO 5G: COMPACT ANTENNAS

Millimeter wave signals are best for high-bandwidth, short-range applications – for instance as a replacement for HDMI cables for connecting entertainment devices. To get the technology to work on a large scale, a new kind of smart antenna will be needed – many of them.

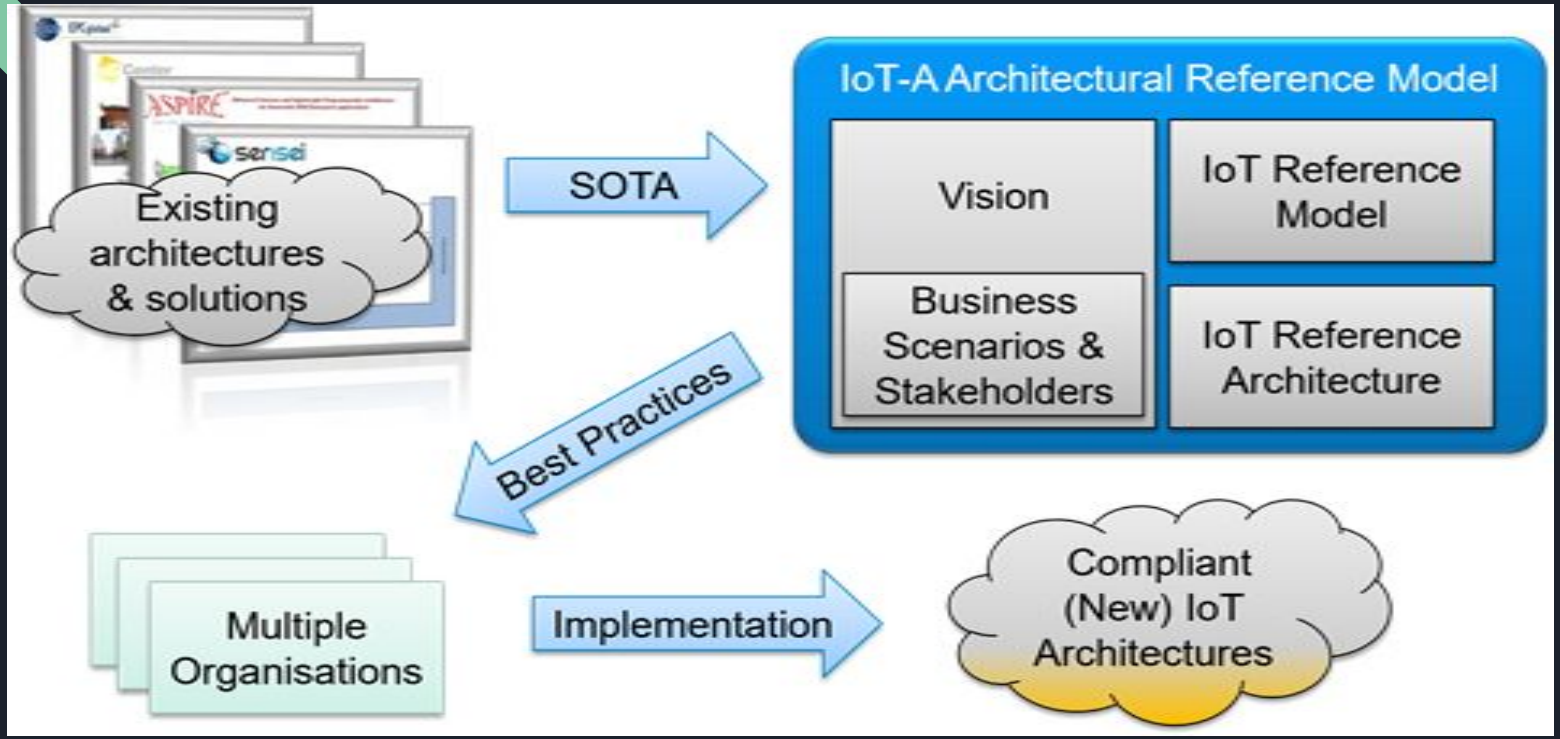
BELOW: Antennas placed in arrays to provide outdoor coverage. Antennas will also be placed indoors.



CREDIT: METIS CONSORTIUM

16-antenna arrays at the top and bottom of a prototype Samsung phone
CREDIT: SAMSUNG

IoT Reference Diagram



Myths of 5G?

- 5G Will Microwave our Brains?
- 5G Frequencies will affect Weather Predictions?
- 5G will replace 4G in the near future?
- 5G is not that big of a deal?

Connectivity for IoT

Different standards for different applications

- Wi-Fi – 1x1 802.11n
- Low Power Wi-Fi – 1x1 802.11n
- LTE-CAT-0/1
- 802.15.4
- Bluetooth Smart (BTLE)
- Bluetooth Smart Ready (BT – 4.1)
- 802.11ah

Imagination

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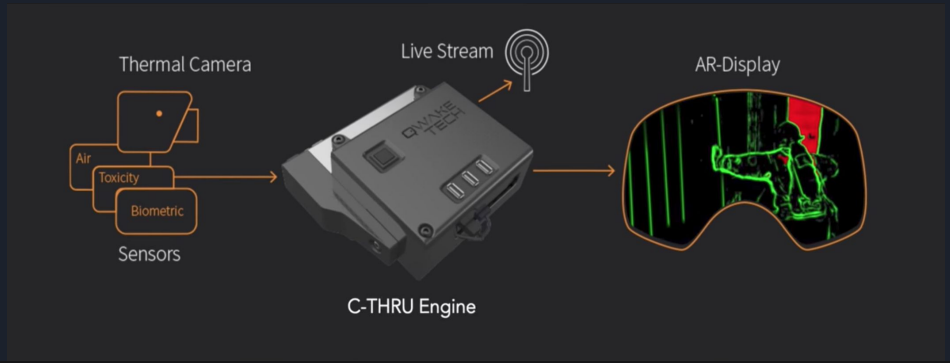
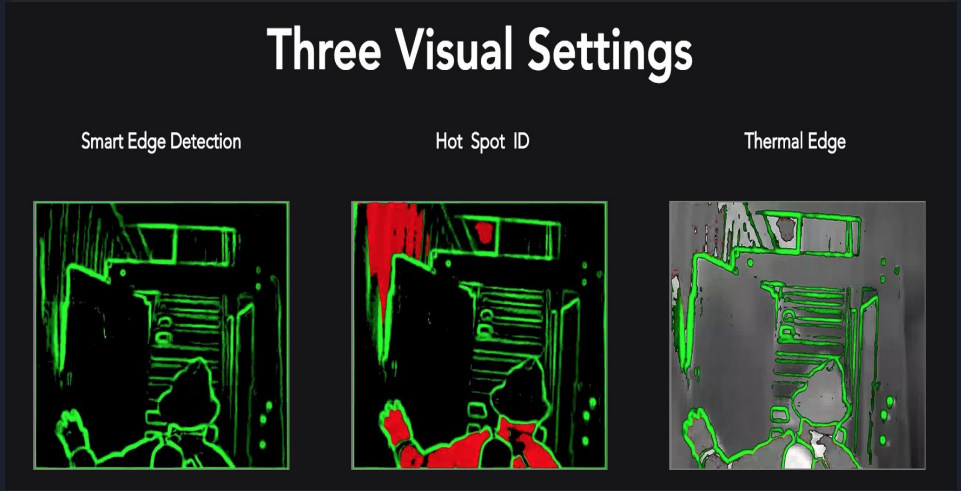
Future 5G Devices





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