Verizon and CGI U 2021 Social Innovation Challenge

Leading-Edge Technologies for a Connected Future

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Evolution of Wireless Technology

- **Analog voice**
- **Text messaging**
- **Digital voice for capacity**
- **Security**

2G

- **Data & applications**

3G

- **High speed data for phones and other mobile devices**
- **Internet of Things (CAT M)**

4G

- **Ultra-low latency**
- **Ultra-reliable transmission**
- **Massive Internet of Things scale**
- **Security by design**
- **High bandwidth (Spectrum width of hundreds of MHz)**

5G

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3G vs 4G
How 3G compares to 4G across a range of everyday mobile activities

- **Downloading a Game (20MB)**
  - 4G: 25 seconds
  - 3G: 3 minutes

- **Streaming Music**
  - 4G: 1 second buffer
  - 3G: 10 second buffer possible disruption during playback

- **Streaming SD Video**
  - 4G: 1 second buffer
  - 3G: 20 second buffer possible disruption during playback

- **Streaming HD Video**
  - 4G: 30 second buffer
  - 3G: 1-5 minute buffer disruption during playback

- **Uploading an Image**
  - 4G: 1 second
  - 3G: 25 seconds
Is It Just Faster?

Example: The Time It Takes To Download A 2hr Film

3G
FLY FROM SYDNEY TO NYC

4G
RUN A QUICK MILE

5G
ASK “HAS IT DOWNLOADED YET?”
Ultimately, driving the Fourth Industrial Revolution

First Industrial Revolution
- Water and steam power
  The work one could do was no longer constrained by that individual’s physical strength or endurance.

Second Industrial Revolution
- Electrical energy and division of labor
  Electrical energy means work can be done almost anywhere. Mass production becomes possible.

Third Industrial Revolution
- Electronics and information technology
  It becomes possible to offload mental work to machines, allowing businesses to do for thought what had been done for physical objects.

Fourth Industrial Revolution
- Cyber Physical Era
  Massive change on the back of 5G technology shifts combining for a flywheel effect. AI, Next Gen Cloud, IoT, AR/VR/MR, and 5G. Pervasive intelligence, massive sensorization and immersive/augmented capabilities.

First mechanical loom, 1784
First conveyor belt, 1870
First programmable logic controller, 1969
The real-time intelligent ecosystem, 2020
Throughput

AR/VR/4K immersive content streaming

Energy Efficiency
- Intelligent Beam Forming/Steering
- Long Life, Low Maintenance Sensors

Connected Devices
- Connected Wearables
- IoT Sensors

Data Volume
- Smart Stadiums
- HD 3D Mapping
- Intelligent Video & localized AI/ML for retail

Mobility
- In-vehicle connectivity
- Drones & AGVs/connected robots
- IoT solutions via ThingSpace

Latency
- Gaming
- Virtual Desktop

Reliability
- Autonomous Vehicles
- Secure Customer Driven Network

Service Deployment
- Real-time face recognition/language translation
- Unified comms & security offerings
5G Home
Ultra-fast internet, without the Cable.
Verizon 5G Home - Fixed Wireless Access

- Verizon 5G Home was the world’s first commercial 5G service

- It’s Internet of a different kind, ideal for people:
  - working remotely
  - schooling at home
  - streaming their favorite shows

- And it’s fast with peak download speeds of up to 1 Gbps
5G Mobile
There’s 5G. Then there’s Verizon 5G.

Ultra-fast speeds
Download an entire movie and all your favorite content in seconds.

Ultra-low lag time
Gaming and video calling become even more seamless.

A turbo boost you can share
Create a 5G-powered hot spot for all your other devices.
Evolution of content creation

TRADITIONAL

- Massive data centers
- Armies of animators
- **Hours and days needed** to produce and render a single frame of content
Evolution of content creation

EMERGING

- **Real-time** production technologies
- Advanced computer graphics
- Most sophisticated game engines and animation suites
- Augmented and Virtual Reality
Streaming Augmented Reality (AR) Content

- Live Volumetric Capture of Events
- Expanded Digital Worlds
- Complex Custom Avatars
Immersive distribution

**Stonewall Inn Riots:** The first AR SDK execution in a Verizon Media app. Initially featured on Verizon Media's HuffPost app, now in Yahoo! News and others. A small SDK (less than 10Mb), it requires light integration on a host property and fits into any application.

The experience encourages users to move around the scene and explore the environment in ways that a news story doesn't allow.
Multi-access Edge Computing
5G future factory operations

**Rapid factory reconfiguration**

With 5G, industrial robots should become smaller, lighter and more mobile, enabling rapid reconfiguration around the factory floor.

**Computing on the fly**

On a next-generation network, drones are expected to use artificial intelligence and computer vision to identify inventory and inform real-time decision-making.

**Robot patrol**

Automated guided vehicles have the potential to maintain constant sensor contact with their environments, allowing them to navigate more safely and efficiently — sometimes with the assistance of VR.

**No-code machine reprogramming**

5G network technology should improve adaptability in industrial robots, so they can be repurposed and easily taught new tasks without complex re-coding.
5G and its impact on manufacturing

**The 5G impact on intelligent automation**

With 5G enabling advancements in the Industrial Internet of Things (IIoT), factory equipment could potentially interface with workers and systems like never before.

**The 5G impact on quality assurance**

The 5G factory of the future must not only work harder, but smarter. Vast sensor networks and 5G-connected cameras could provide factory workers with unprecedented levels of actionable intelligence.

**The 5G impact on supply chain tracking**

The benefits of 5G-powered sensor and camera technology will be felt beyond production runs. From shipment to stocking, 5G could mean a vastly improved chain of custody, so manufacturers maintain closer tabs on their products throughout their journey.

**The 5G impact on AGV functionality**

Armed with 5G, autonomous guided vehicles (AGVs) could maintain constant sensor contact with their surroundings, adding precision to the path and potentially reducing the likelihood of accidents and product damage on the factory floor.
A new world of healthcare

- Demand for telehealth will soar by 64.3% in the US in 2020 as the COVID-19 pandemic disrupts the practice of medicine and the delivery of healthcare

- Video conferencing allows patients to crowdsourced the best minds in medicine by easily meeting with specialists from different clinical disciplines to determine patient treatments
Human Rights & Refining Your Idea

- Could your idea have potentially negative impacts on human rights (e.g. the right to privacy, the right to be free from discrimination)?

- Could human rights be enabled by your idea (e.g. the right to health, the right to access information)?

- How might you seek to minimize or prevent adverse impacts? You might consider how best to do this through:
  - Your concept design (e.g. developing a system using representative datasets and testing a system's impacts on diverse users or groups);
  - Your concept implementation (e.g. policies on appropriate use, training for end users).

- Looking ahead, how might you communicate with customers, users, and other stakeholders about the concept and any concerns they might have with respect to your final product or service?
We don’t wait for the future.

We build it.