

The background of the slide is a dark blue gradient. In the upper left, there is a faint, semi-transparent image of a smart meter with a digital display showing '000000'. The rest of the background is covered with a pattern of glowing blue lines and dots, resembling a network or cellular grid.

# Cellular Communications for Utilities

Presented by  
John Kretzschmar & Jon Scott



[SAMSCMETERING.COM](http://SAMSCMETERING.COM)



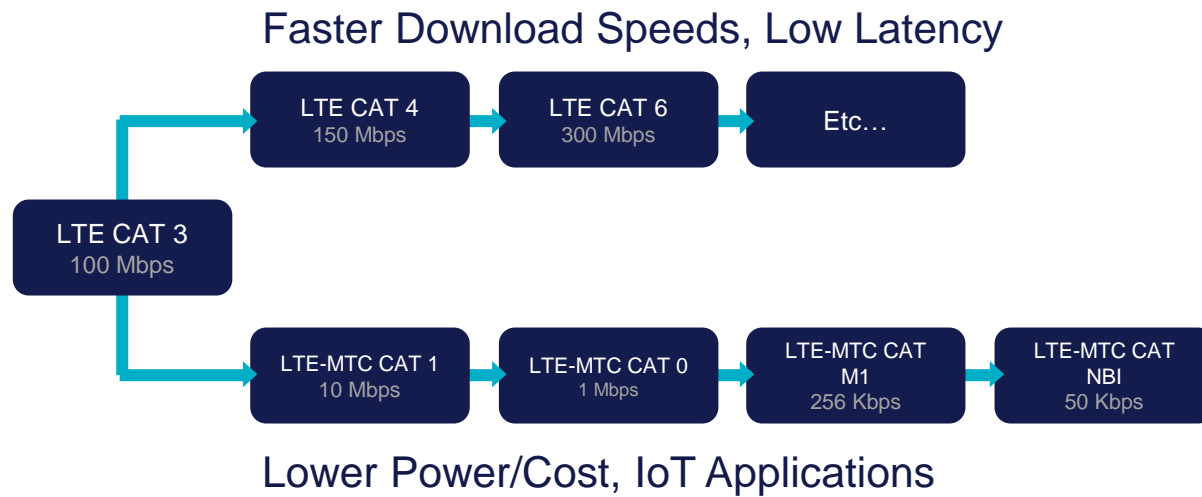
[NIGHTHAWKCONTROL.COM](http://NIGHTHAWKCONTROL.COM)

# Cellular Technology

- A communication network where the last link is wireless.
- The network is distributed over areas call 'cells' that are served by at least one transceiver.
- When joined together, these cells provide radio coverage over a wide area.
- This cellular coverage enables numerous portable devices such as phones, tablets and laptop computers to operate anywhere within the network.



# LTE Variations



# Cellular Technology

- LTE is still the cellular technology of choice around the world
- Serving over 6.6 devices as of January of this year.
- LTE offers high bandwidth connectivity with predictable latency
- It is extremely secure, has a large ecosystem of suppliers and offers a robust roadmap



# How fast is 4G LTE?

- In theory, LTE's maximum speed is 100Mbps. In practice, it tops at 15Mbps. Of course, it all depends on where you're located.
- What about LTE-A and LTE+?



# LTE-A, LTE-Advanced, 4G+, and LTE+

- LTE-A, LTE-Advanced, 4G+, and LTE+ are all acronyms for the same 4G service. It's a faster version of LTE.
- How fast is LTE-A? In theory, LTE-A data rates are up to 300Mbps. In practice, you can expect between 40 to 90Mbps.



# The Future of LTE

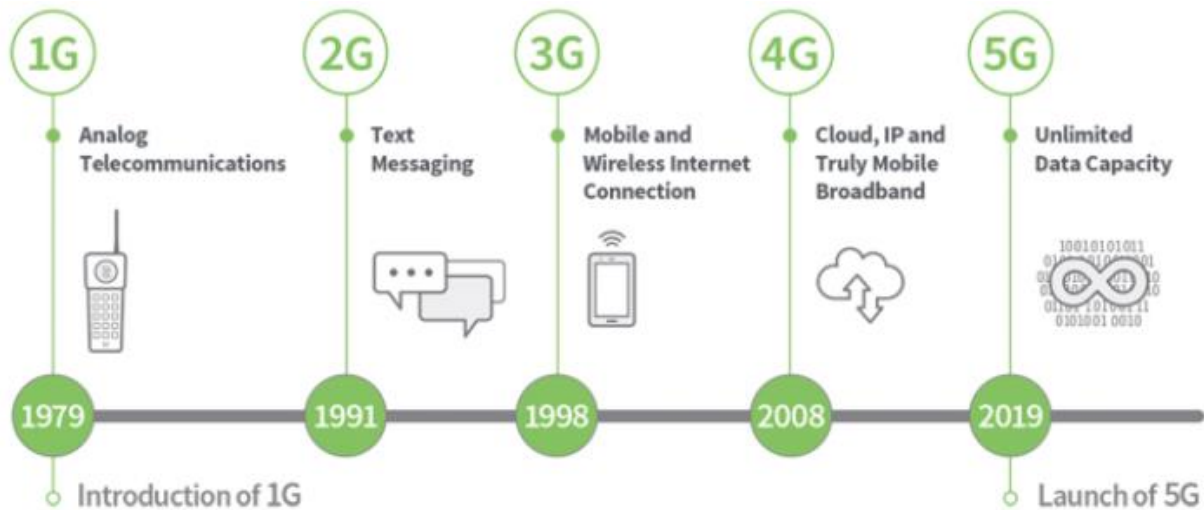
The future of 4G LTE is still bright. Some capabilities of the 5G are not available yet and will not be needed right away for existing applications that are functioning well with the bandwidth and latency offered by 4G LTE networks. 4G devices will continue to work and can often wait to upgrade to 5G.

Because 4G LTE and 5G share spectrum, and 5G devices offer failover to 4G for areas where 5G is not yet established, the migration from LTE to 5G will occur over a period of at least a decade or more.

# 5G



# Evolution to 5G Technology



# 5G Technology

- 5G brings more improvements, but it's comprised of a suite of new technologies
  - Small cells
  - Millimeter waves
  - Massive Multiple-input Multiple-output (MIMO)
  - Beamforming
  - Full duplex



# Small Cells

- Small cells are miniature cell phone towers that can be placed in inconspicuous places like light poles and the roofs of buildings
- They don't require as much power as full-sized towers, and perform better when clustered together



# Millimeter Waves

- Small cells transmit data using millimeter waves, which get their name from their narrower-than average wavelength
- They occupy frequencies in the 30-300GHz range — high enough to avoid interference from surrounding signals, but too high to pass through physical barriers
- In some cases, the leaves of trees are enough to interrupt a download



# Multiple Input Multiple Output (MIMO)

- Millimeter waves have limitations, but they're a good fit for MIMO — a wireless system that uses multiple radios to send and receive data simultaneously
- The 4G LTE networks of today support a maximum of eight transmitters and four receivers, but 5G cell towers can theoretically support dozens



# Beamforming

- More radios mean more interference; that's where beamforming comes in
- At its most basic, beamforming uses algorithms to choreograph wireless signals' movements and increase their strength by focusing them in a beam



# Full Duplex

- Full duplex helps boost the signal even further
- Most current-gen cell towers and devices cannot transmit and receive at the same time, but full duplex phones can route incoming and outgoing signals simultaneously, potentially doubling bandwidth



# 5G Limitations

- 5G won't provide nearly as much coverage as 4G LTE, or even 3G. In many ways and it will seem more like Wi-Fi than a cellular technology
- 5G transmitters will be set a closer to the ground. This requires a lot of ground coverage hardware to insure you'll have a reliable signal



# 5G Limitations

- The high frequencies and correspondingly low wavelengths of 5G will have difficulty penetrating solid objects such as walls, windows, and even trees
- For these and other reasons, industry experts expect 4G LTE to advance alongside 5G
- Collaboration is already underway on gigabit 4G LTE connectivity, and at least one carrier has said portions of its existing network reach gigabit speeds.



# Cellular Technology Roles

- Residential load control
- 3rd party access
- Industrial load control
- Interruptible programs
- Video feed from security cameras
- **Back hauling AMI data**
- **Remote disconnect/ reconnect**
- **Remote meter reads**
- **Full AMI systems**

---

# Advantages of Public Cellular AMI and Targeted Cellular Solutions

# Key Features

- Remote reads
- Remote connect / disconnect
- Outage management (With alerts)
- Voltage management (With alerts)
- Time-Of-Use and off-cycle reads
- Two-way communications networks
- Many AMI “flavors”

# Known Benefits

## Saves utility money and improves service quality

- Reconnects and transfers of service handled remotely and immediately
- Greater reading and billing accuracy
- Collect meter reads on demand
- Directly address customer complaints
- Re-reads for discontinued, move-ins, move-outs
- Allows time-based rate programs and pricing, e.g. time of Use, peak rebates

# Benefits for Operations

## Improved system

Voltage monitoring can lead to better regulation, improved capacitor and regulator placement and more accurate voltage-drop analysis

## Improved load information

Leads to better load studies and analysis, resulting in improved planning and system design

## Improved reliability monitoring

Can lead to improved outage response, proper system-protection analysis, decrease in outages and outage time, raising reliability indices

## Improved monitoring and information flow

Better management of critical assets such as transformers and capacitors

## Pinpoint and reduce system losses

# Cost Considerations

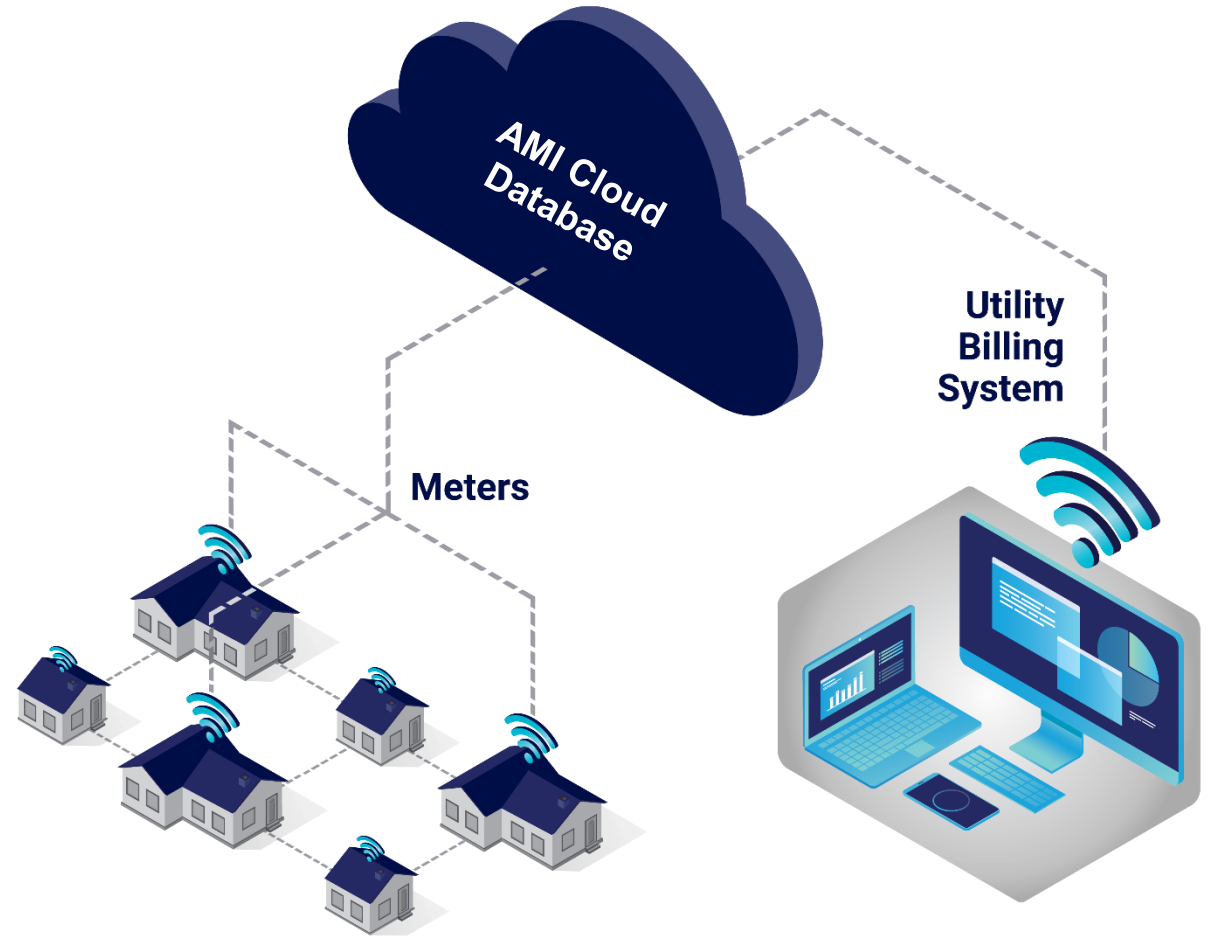
**Despite the benefits, AMI systems have been cost prohibitive for many utilities.**

- Large orders to offset their costs
- Proprietary collection networks
- Utility IT resources
- High infrastructure costs
- High software costs
- Frequency licensing fees
- Maintenance of communications system

# Cost Considerations

However, technological advances have come together that make AMI more affordable for all utilities.

- Hosted software
- Public cellular communications
- Self-healing (mesh-cellular hybrid)
- Less reliance on costly utility infrastructure



# Advantages of Public Cellular Communications

- Incrementally deploy your meters
- Freedom of meter placement
- Essential service / quick repair
- No frequency rental fees
- Zero utility infrastructure
- No maintenance costs
- Security



# Advantages of a Hosted System

- Secure data storage  
(whitepapers available)
- Does not require IT resources
- Accessible from any device
- Fully scalable to any need
- Always up to date



## CONCLUSION

# Public Cellular Communications & Technological Advances Have Simplified AMI

- Freedom to deploy on your schedule
- Does not require IT resources
- Zero upfront network and infrastructure costs
- Lower operational costs
- [Contact us today to learn more](#)





# Thank You

**John Kretzschmar**  
(864) 590-2883  
[john@samscometering.com](mailto:john@samscometering.com)

**Jon Scott**  
(404) 451-8444  
[jonathan.scott@nighthawkcontrol.com](mailto:jonathan.scott@nighthawkcontrol.com)