CODAN COMMUNICATIONS | BE HEARD

The Importance of Controlling Your Own QoS

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Robert Kwapisz
Sales Engineer, Codan Communications

QUALITY OF SERVICE IN PUBLIC SAFETY

BEING HEARD TO SAVE LIVES, INFORM, AND PROTECT

This presentation:

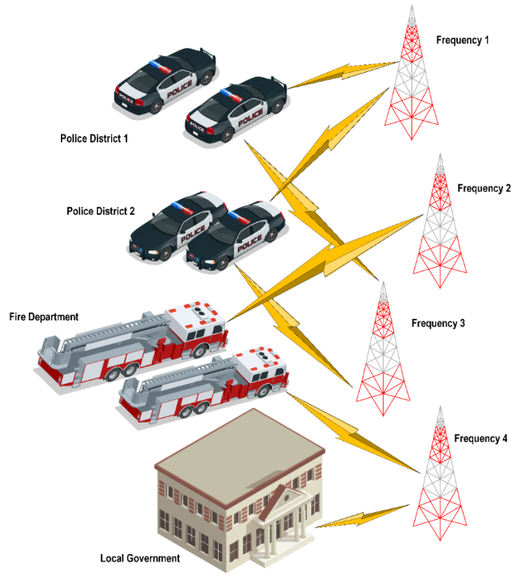
- Defines backhaul and QoS, and how they differ between RF and public IP/LTE
- Explains why QoS is important
- Explains the challenges with a shared backhaul
- Describes what goes into choosing a QoS strategy
- Presents a list of questions for consideration

WHAT IS A BACKHAUL?

RF vs. IP

RF Backhaul

- Your frequencies are your backhaul
- Managed by you
- Well-defined set of users
- Less resource competition

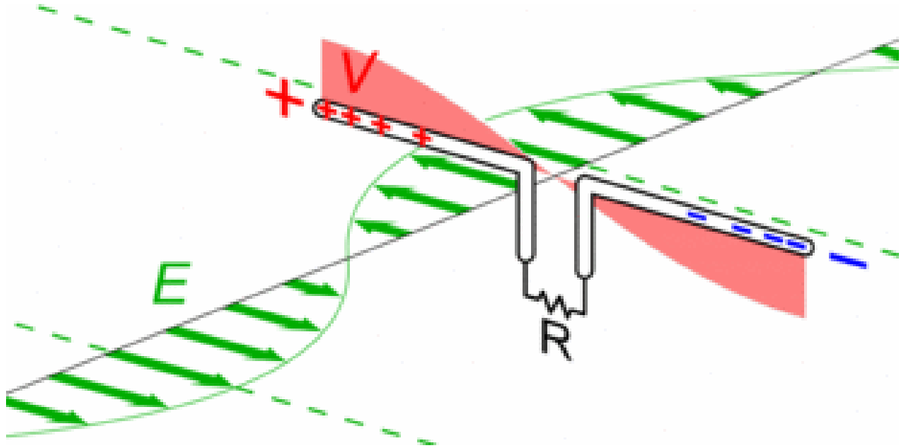


Public IP/LTE Backhaul

- A public network is your backhaul
- Managed by a third-party provider
- Larger scope of users (consumers, businesses, utilities, police, EMS, fire, etc.)
- Significant resource competition

BEING HEARD

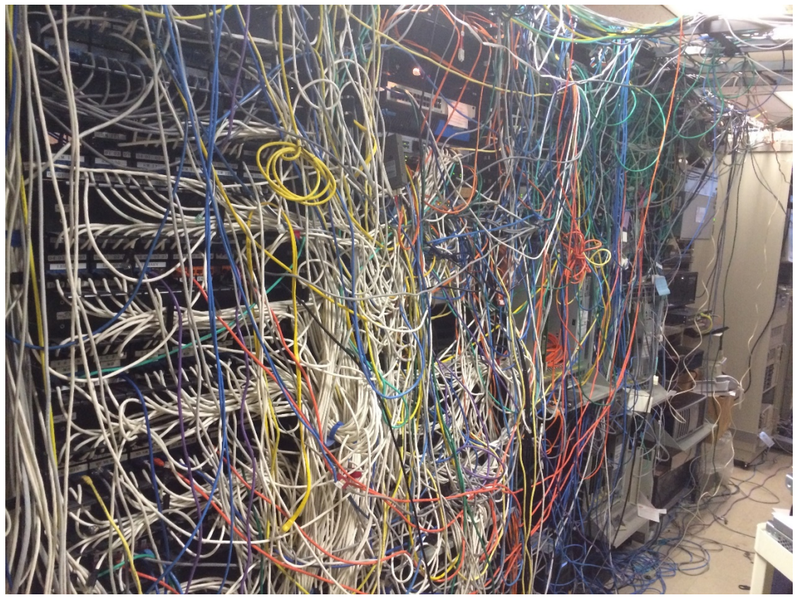
DIFFERENT CONSIDERATIONS FOR SIMILAR EXPECTATIONS



Source: Wikimedia, Chetvorno

With RF Connectivity

Being heard can come down to managing **your power**



With Shared IP Connectivity

Being heard can come down to managing **your data's competition**

WHAT IS QUALITY OF SERVICE (QoS)?

QoS – Defines the rules for your data over any backhaul

QoS Parameters	Definition
Availability	Ensuring that the network will be operational when it is needed. Typically specified as xx.xxx% (five nines, six nines, etc.)
Jitter	Variations in timing and packet order at an endpoint
Throughput	The amount of bandwidth required during typical and peak network demand
Reliability	The ability of a network to perform the operations for which it is intended
Latency	The time it takes information to travel through the network
Packet Loss	Number of packets lost or corrupted as they travel through the network
Security	What are the security needs of your information, and how secure is the data as it travels though the network?
Priority	What priority do your data types have over others, and you over others, at times of required availability?

QUALITY OF SERVICE (QoS)

MANAGING YOUR DATA'S COMPETITION

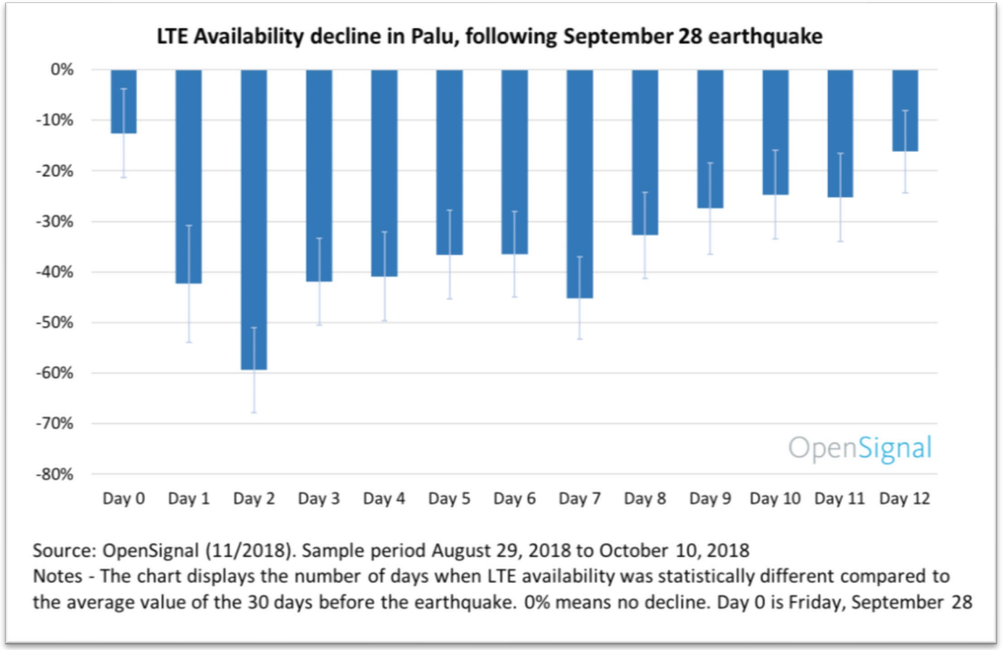
Shared Backhaul Without QoS

Managed Shared Backhaul With QoS

WHY YOU NEED QOS

Be Heard at the Right Time

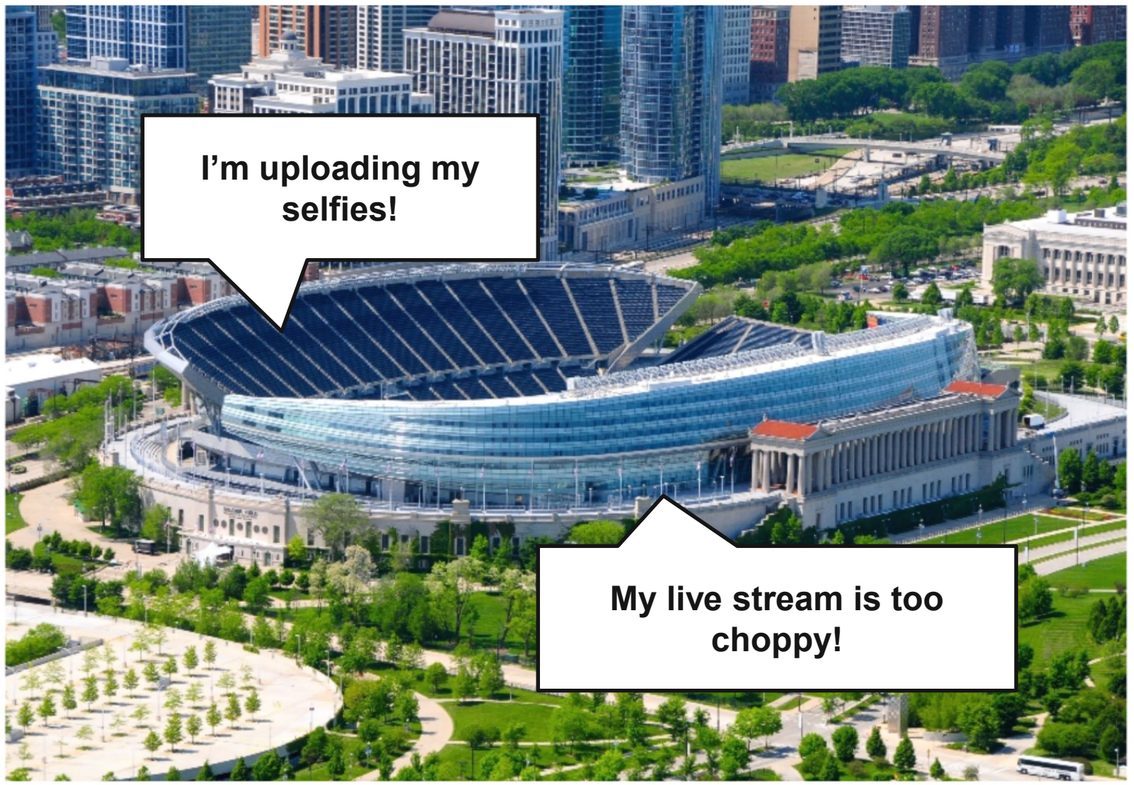
- Peak usage can be hard to predict
- Public safety requires applications and networks that are designed for **mission critical** operations
- Your need to access **mission critical** resources occurs at the same time the resources may be at capacity
- QoS gives you the confidence that you will be heard when you most need to be
  - Some incidents can physically cripple a network (downed radio/cell towers, power loss)
  - Other incidents can quickly congest a network as people try to contact friends and family, or access more news about the incident from their mobile devices
- Network congestion can continue long after a disaster, impeding search and rescue for weeks[1]

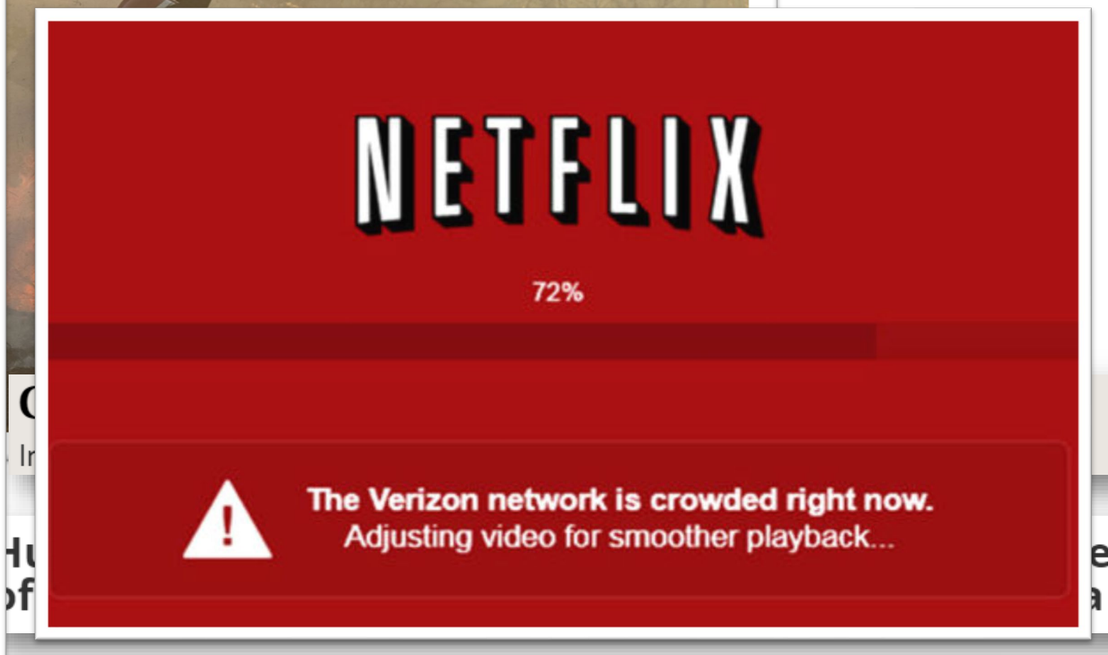


Source: OpenSignal (11/2018). Sample period August 29, 2018 to October 10, 2018
Notes - The chart displays the number of days when LTE availability was statistically different compared to the average value of the 30 days before the earthquake. 0% means no decline. Day 0 is Friday, September 28

[1] OpenSignal (November 22, 2018), *4G networks were the most affected by Sulawesi earthquake* https://www.opensignal.com/blog/2018/11/22/4g-networks-were-the-most-affected-by-sulawesi-earthquake

WHAT NO QOS MEANS





communications problems as cellphone networks jammed

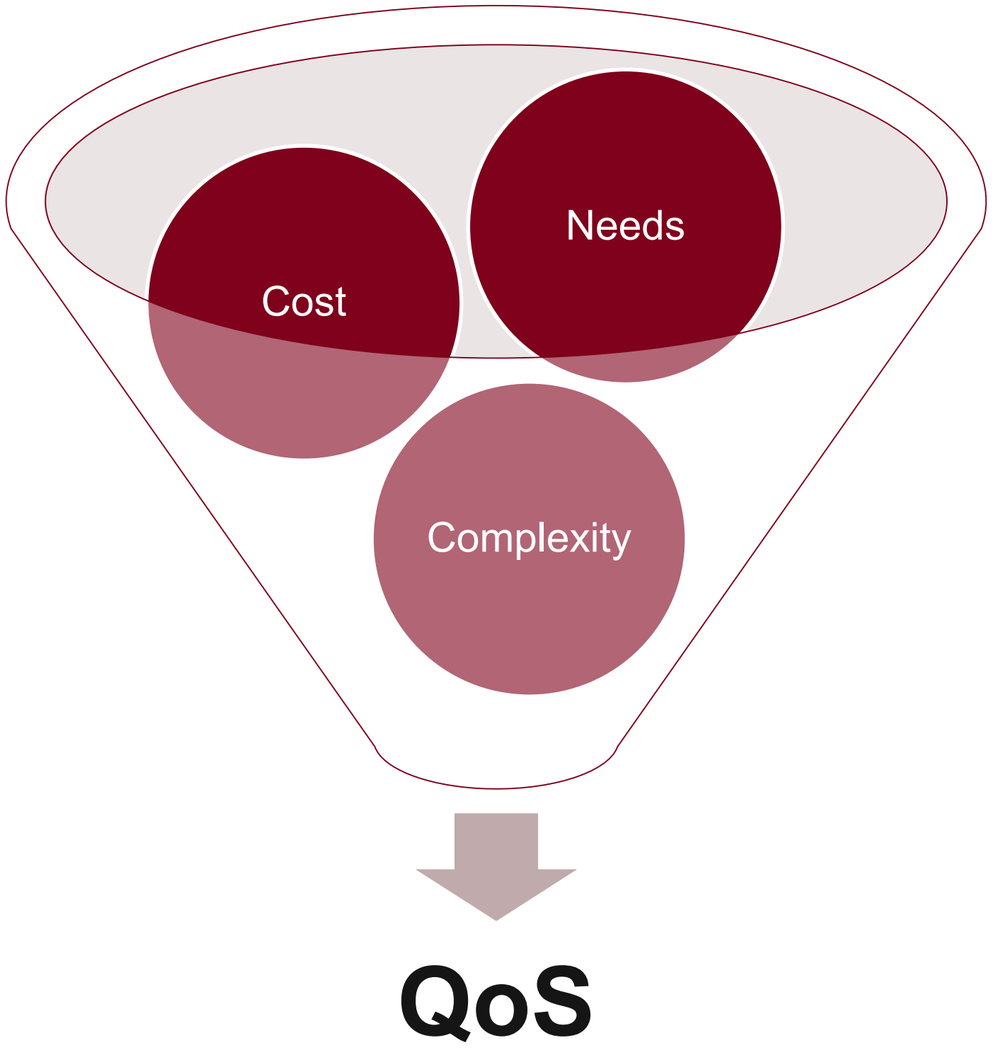
T&T offers unlimited plan deal for first responders, but it can be throttled

Verizon throttled 'unlimited' data of Calif. fire department during Mendocino wildfire

First responders join a chorus of angry Americans tired of big telecom's nonsense.

CHOOSING YOUR QOS

- **Needs**
  - What kind of QoS structure best supports your use cases?
  - What can your own network support?
  - What are your required tolerances (jitter, latency, etc.)?
  - Needs vary widely with chosen applications and impact cost
- **Cost**
  - More control means more cost
  - Need to determine resource availability vs. performance requirements
  - Better networks, better Service Level Agreements (SLAs), better applications and UEs, higher priority all cost more money
- **Complexity**
  - Some QoS architectures are simple, cheaper, but less scalable
  - Simple QoS can guarantee resources, but unused resources are wasted
  - More complex QoS allows per-hop handling of your voice/data and dynamic control (e.g., emergency pre-emption)



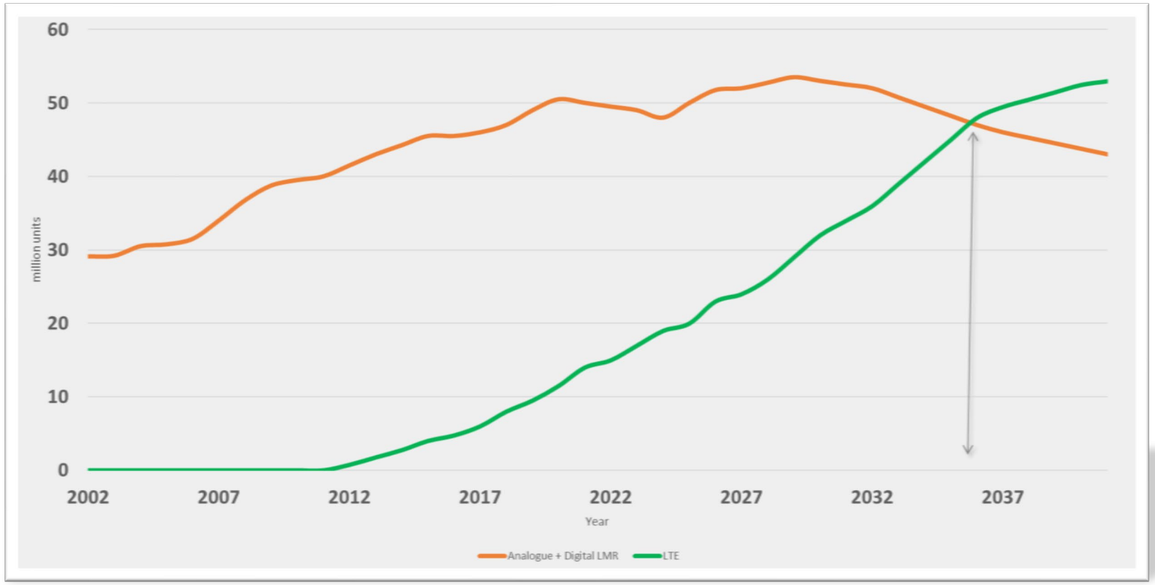
PUBLIC SAFETY QoS

Shared backhauls are an important part of a Public Safety Strategy

Carrier-based networks will co-exist with LMR networks for decades for many good reasons…

Carrier & shared networks provide:

- More options for mobile communications and deployment outside your typical coverage areas
- Opportunities for interoperability
- Methods to share additional data-types like video and database access
- Multiple paths for connectivity



Source: IHS Markit, September 2018

However, to get the most out of a shared network:

- You need to understand your QoS requirements and the provider's capabilities
- Develop a QoS strategy factoring in needs, cost, and complexity
- Have a SLA in place with the network provider to guarantee performance

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QUESTIONS YOU NEED TO ASK

Data Requirements

- What is the minimum throughput for voice and data (P25)?
- What other data will be required at the same time - video, database lookups, mapping?
- Do certain users need to be able to pre-empt others?
- Are the data requirements greater than the bandwidth of the backhaul?
- Does the data have to be secure in transit? Will other data be logically separate from it?
- What is the maximum latency, jitter, and packet loss tolerated by the various types of data?
- Is there some traffic that you simply want to control, and other traffic you are less concerned about?
- Does your carrier adhere to open standards so you can remain confident in your data's handling?

QUALITY OF SERVICE IN PUBLIC SAFETY

MORE QUESTIONS YOU NEED TO ASK

Service Level Agreement (SLA)

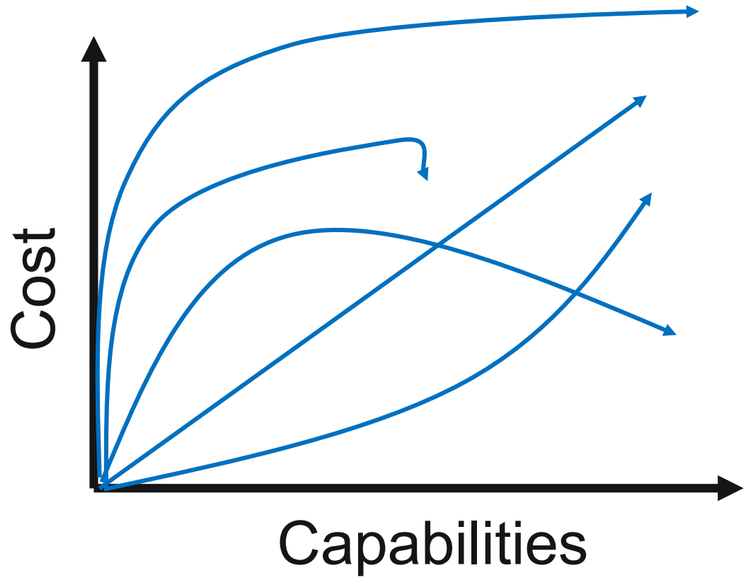
- Who else will be using the backhaul? Do they have SLAs that are in conflict/competition with your own?
- Does the SLA guarantee that your data requirements will be met at all times?
  - If not, can you agree to what data or users get higher priority, and independent of all other traffic, will those types go though?
- Does the SLA guarantee not to throttle data when you need it?
- Can you manage your users to adhere to the SLA and not use the network for non-critical communications at critical times?
  - This may require developing usage policies and coordinating with your technology teams

Costs

- What is the total cost over time of a shared backhaul versus the managing my own where I can maximize my throughput?
- What would the cost be to have a hybrid-approach to communications? That is owning my own network for some traffic, but use a shared carrier for other types?

PUBLIC SAFETY QoS

Carrier & Shared Networks allow you to <u>BE HEARD</u>, but there is no standard formula.



Which line represents your application?

It is only through reviewing your specific requirements and options available to you, that you can determine the right approach for critical communications.

OTHER READING

- NPSTC Broadband Working Group (April 17, 2012), *Priority and QoS in the Nationwide Public Safety Broadband Network*
  - http://www.npstc.org/download.jsp?tableId=37&column=217&id=2304&file=PriorityAndQoSDefinition_v1_0_clean.pdf
- CBC (March 17, 2015), *Parliament Hill shooting responders hit with communications problems as cellphone networks jammed*
  - https://www.cbc.ca/news/politics/parliament-hill-shooting-responders-hit-with-communications-problems-as-cellphone-networks-jammed-1.2997331

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Thank You

Robert Kwapisz

Sales Engineer

Codan Communications

Robert.Kwapisz@codancomms.com

250-414-6296