LTE Network Security – Private Networks

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Challenge Networks / Vocus

Introduction to Challenge Networks

- One of the leaders in private LTE network design & build in Australia
- Have 20+ deployed LTE networks both in Australia and internationally
- Recently acquired by Vocus
- A number of ‘first’s in private LTE networks:
  - First underground LTE network in mining
  - First in Oil & Gas
  - First Gold mine
  - First in Peru
  - First in Copper mine
  - First using Nokia technology
  - First to use Band1 (2100 MHz) in Australia for LTE

Why talk about it ?

- Security is becoming more topical -> Some people are getting paid lots!
- Some (in)famous examples recently
- In the area of private networks – becoming a ‘hot topic’ as the industry becomes more mature
- More edge devices being connected -> More to go wrong
- Smarter edge devices -> More to go wrong
- Different types of edge devices -> More to go wrong

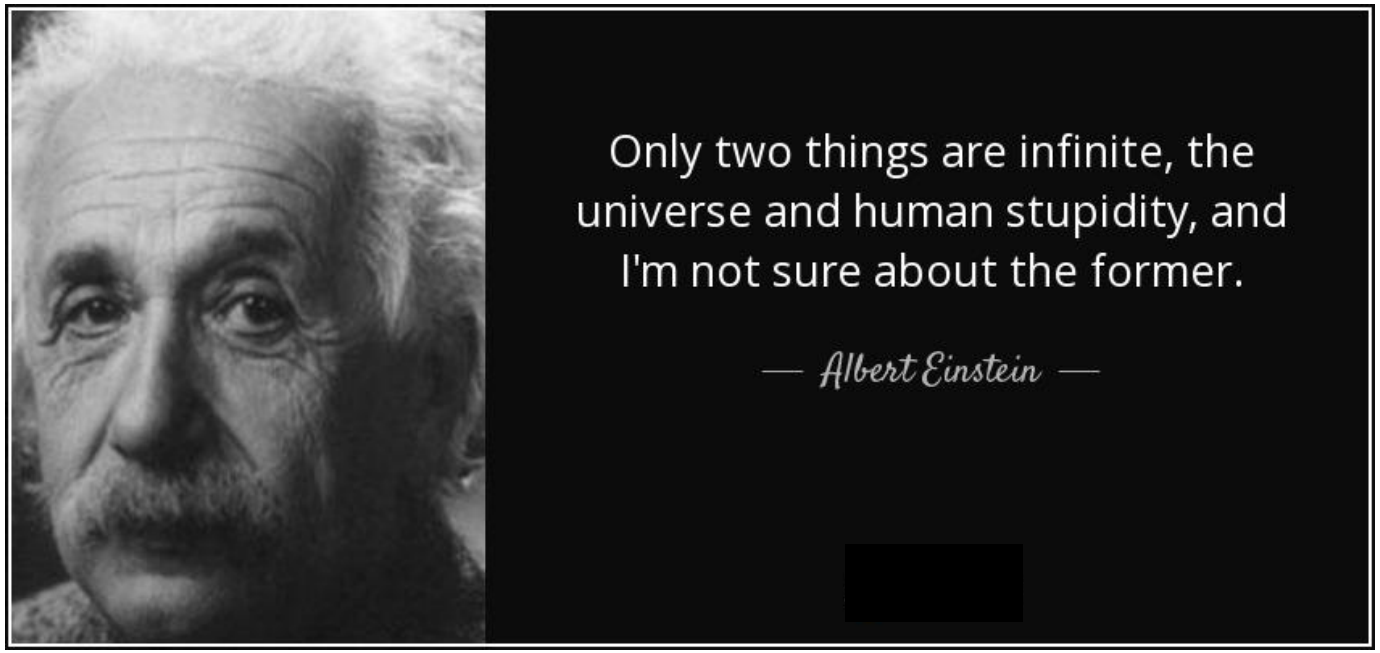
“DDos by Fridge”

What are we talking about (and not) today ?

- A huge topic – just touching on a few items !!
- Focus on private industrial networks so NOT consumer networks or public safety networks (but there is some overlap)
- Just talk about 4G (but 5G is similar)
- What are key areas to <u>not worry</u> about
- What are key areas <u>to worry</u> about
- Four specific solutions – ‘easy wins’

What are you trying to protect from ?

- Stupidity
- Ignorance
- Maliciousness
- Mistakes



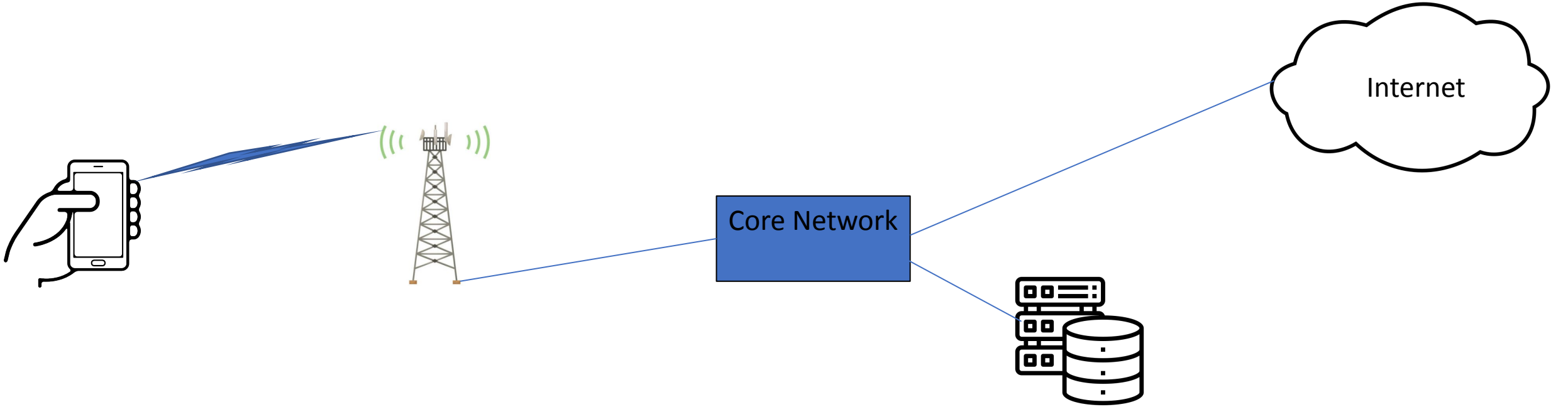
History of ‘Codebreaking’ – Brisbane ‘Central Bureau’

21 Henry St, Ascot

Opening statements

- By design, with regards to security, LTE is ‘pretty good’
- It’s better than Wi-Fi – so don’t confuse them
- LTE/4G (and now 5G) is a continually evolving protocol

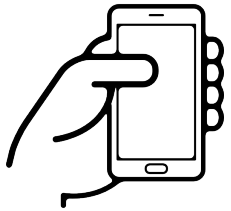
The basic network components



Device / UE | Air Interface | eNodeB | Backhaul – S1 | LTE Core | Local Servers | Internet/External Systems

Device (UE) Authentication

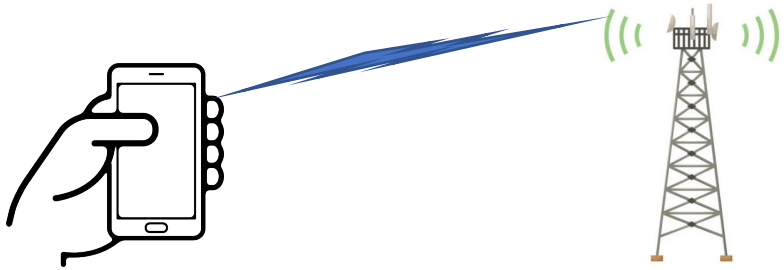
- User authentication
  - Device
  - SIM card



- Data confidentiality
- Data integrity protection
- User identity confidentiality
- Mutual Authentication

Device / UE

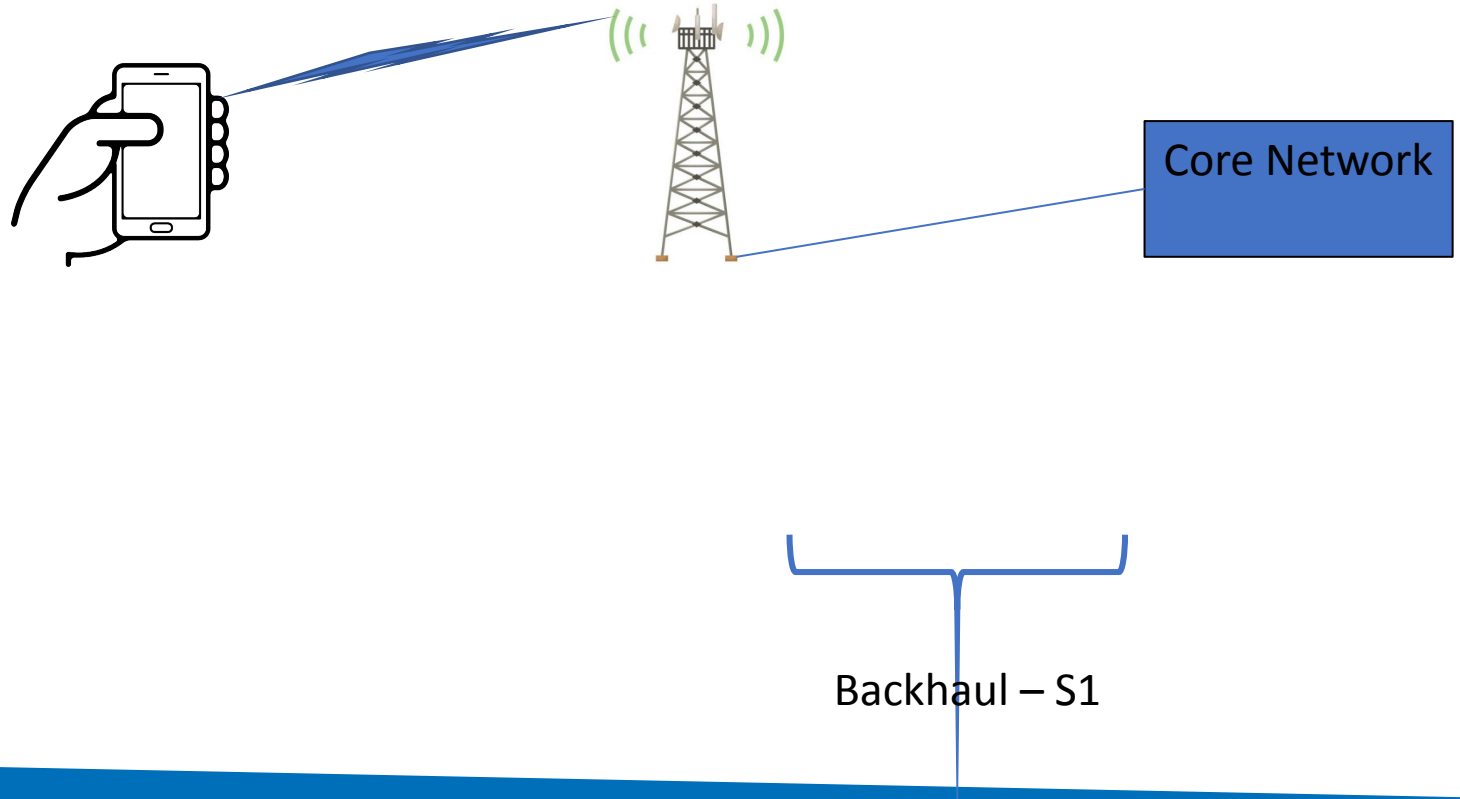
Air Interface - Uu



Air Interface eNodeB

- Encryption of Control plane & User plane
- No collision domains or limitations in Broadcast Domains
- The above has lots of positive implications

eNodeB to Core interface – S1



- The ‘backhaul’ or transmission network
- NOT by default encrypted
- May (or may not) be a problem – depends on network

A key problems / ‘Opportunities’ with private networks

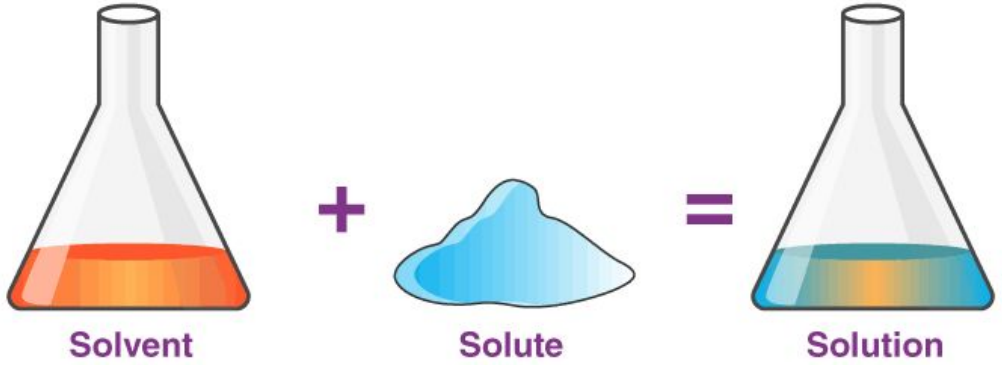
- Different users with different security profiles:
  - ‘IT users’
  - ‘OT users’

- Different user requirements:
  - QoS
  - Access control

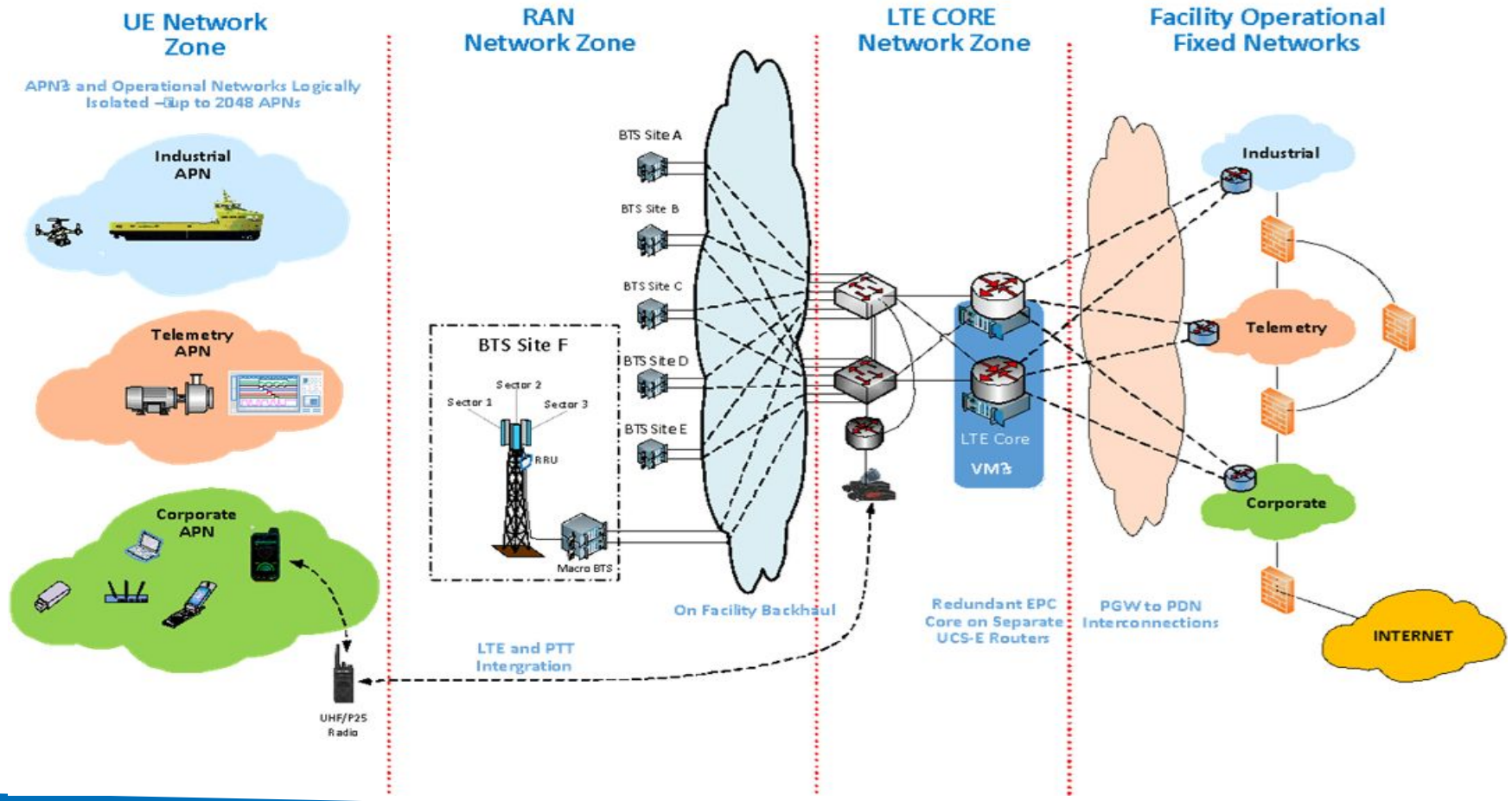
- User devices have different ‘abilities’
- Users sometimes ‘play’ with stuff
- Very specialised traffic flows

Some solution options to consider

- Core network configuration – Network slicing
- EIR – Equipment Identity Register
- Monitoring – end to end network
- MDN – Mobile Device Manager

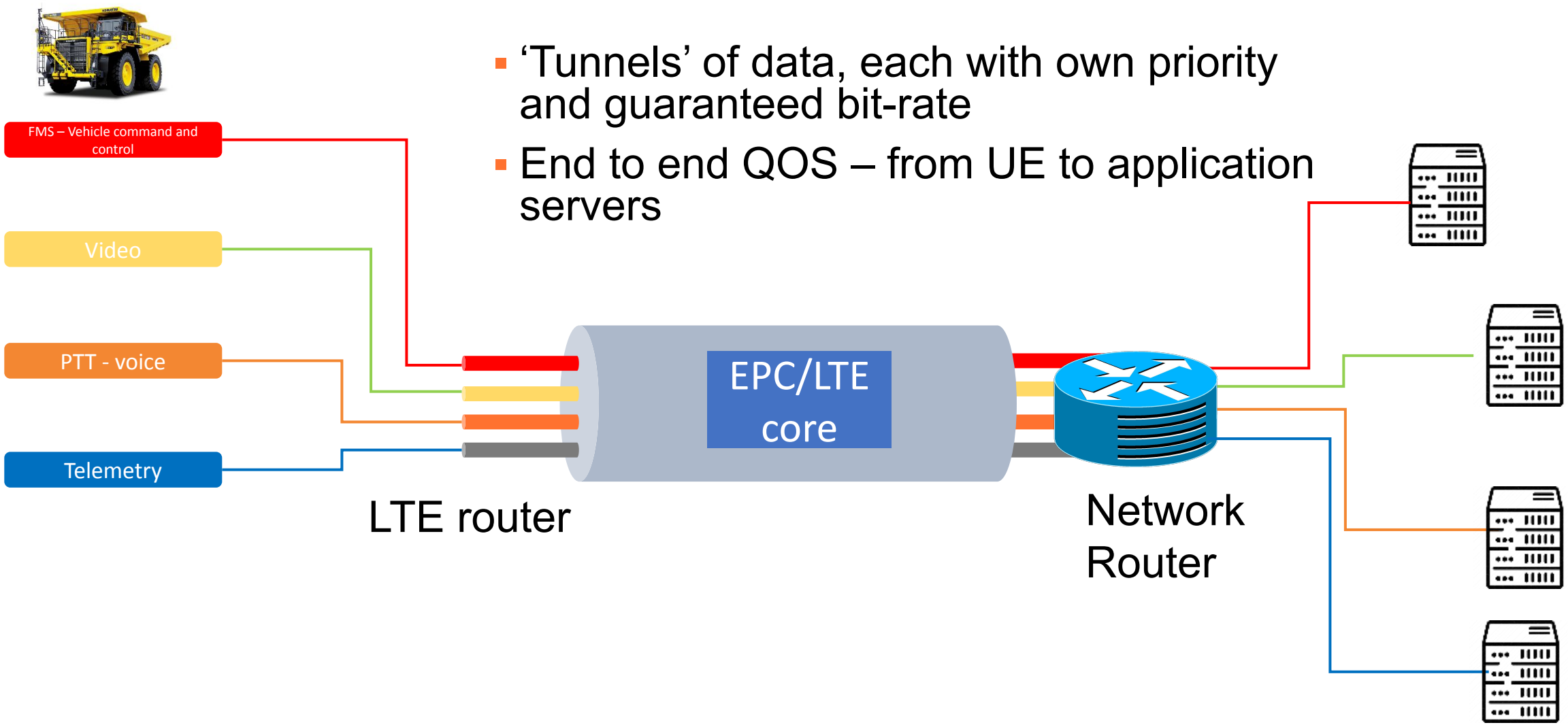


Security ‘zones’ of a private LTE network – networks within a network



End to End – Quality of Service (QoS)

- ‘Tunnels’ of data, each with own priority and guaranteed bit-rate
- End to end QOS – from UE to application servers



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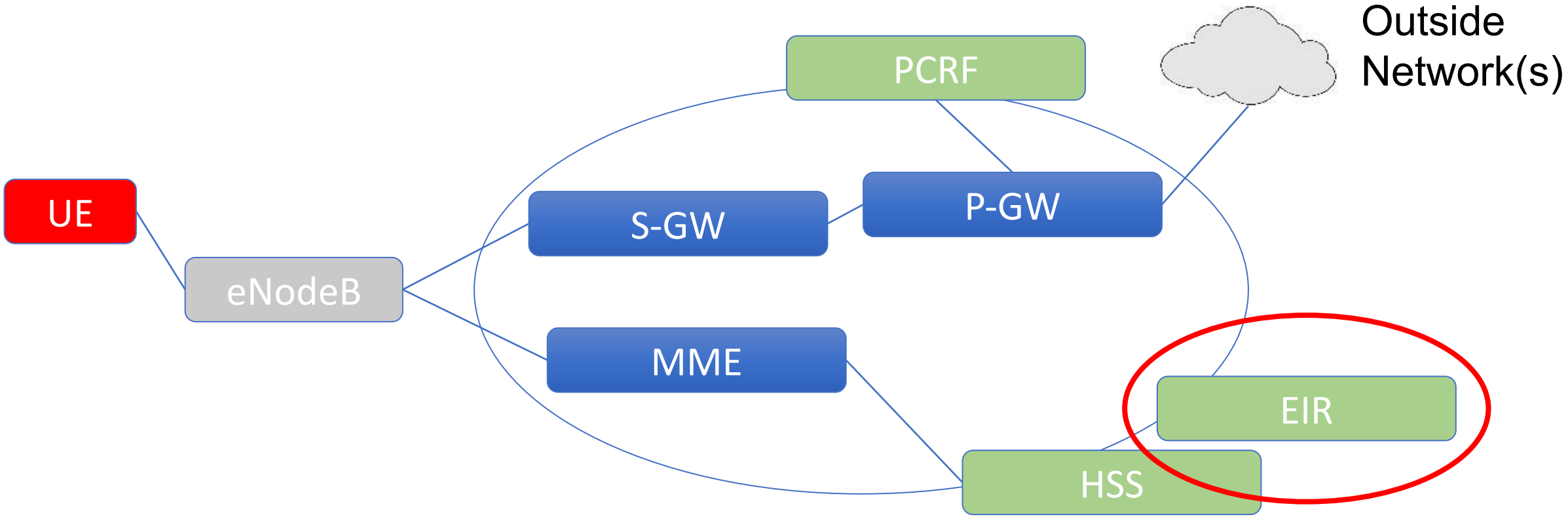
Components of the network (a bit technical)



EIR – Equipment identity Register

- Standard LTE function/system
- Used completely differently to consumer networks
- ‘Locks’ a SIM card (IMSI) to a specific Device (IMEI) or device type
- Requires some maturity from the end user and/or network owner
- Critical to implement if you multiple security domains in network

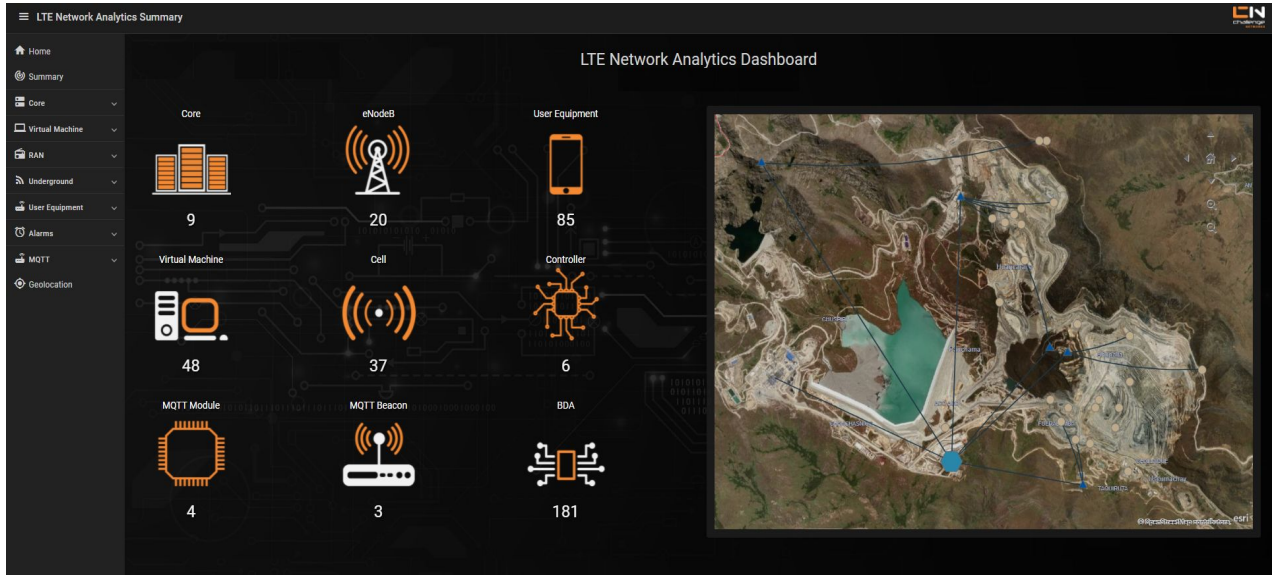
UE – MDM (mobile device Manager)

- Essentially ‘controls’ the phone.
- Really important if you have critical applications on device.

Network monitoring

- Only one thing worse than having a problem…
- Not knowing you have a problem.
- Needs to be at ‘whole of network’ & ‘UE level’

Whole of Network



UE ‘Heat map’

Questions ?