A Deeper Dive

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MORE EXAMPLES FROM MY WORK

City Lights

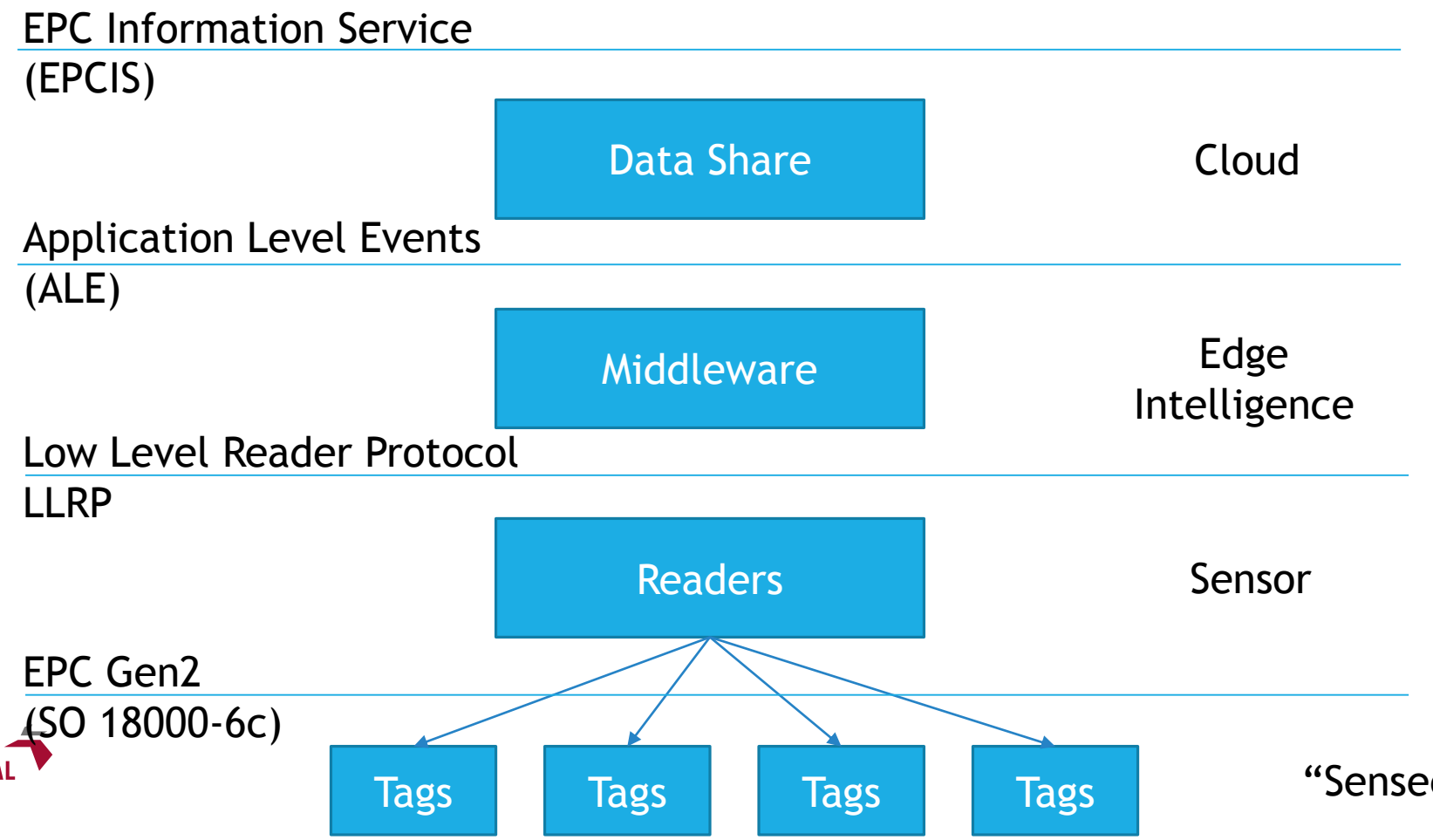
City IR Scan

Blood scanning!

Drones!

BACK TO RFID

3-tier architecture



"Sensee"

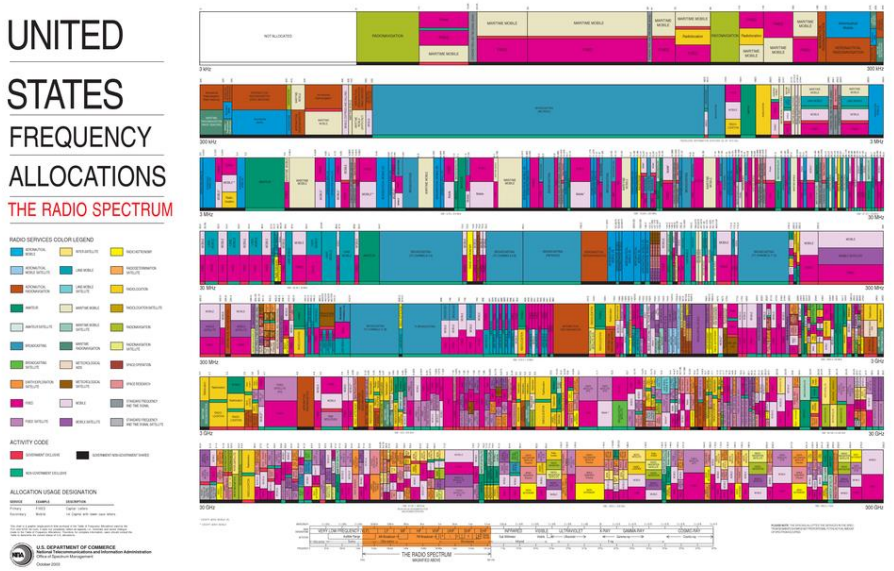
READER-TAG PROTOCOL: EPC GEN 2

Passive (others include semi-passive and active)

Operates in the UHF band 1860-1960 MHz

In US, FCC ISM Band: 1902-1928 MHz

- 4 W (36dBm) EIRP with 6dBi antenna gain
- Hop across 50 channels, lingering no longer than 40 s in each



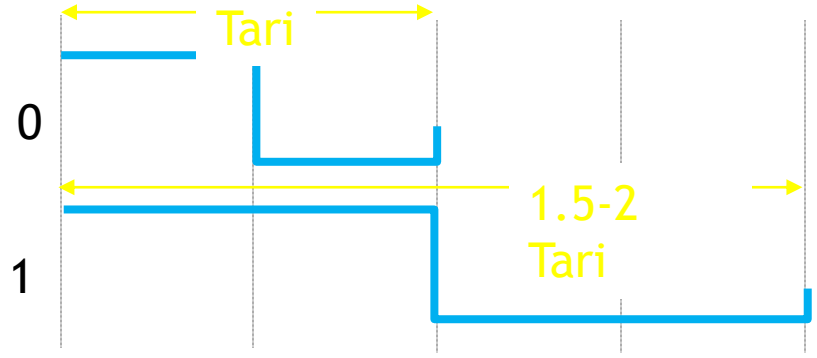
http://www.gs1.org/sites/default/files/docs/epc/uhfc1g2_1_2_0-standard-20080511.pdf

READER-TAG: PHYSICAL LAYER

Reader-Tag

Pulse Interval Encoding

Modulation: DSB-ASK, SSB-ASK or PR-ASK



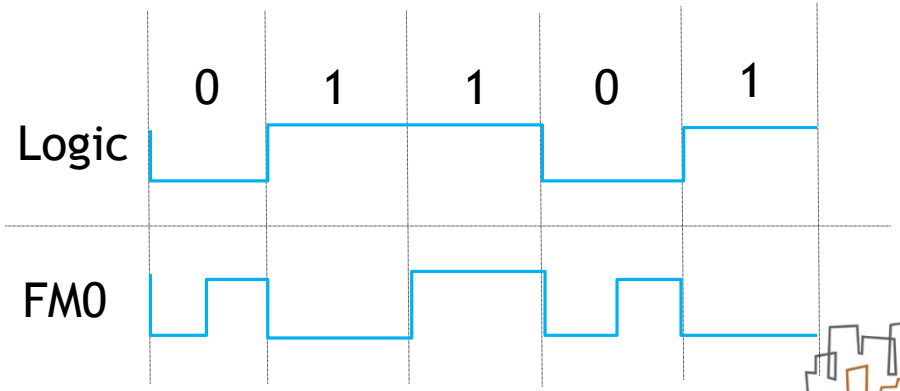
6.25μs < Tari < 25μs

Reader-Tag

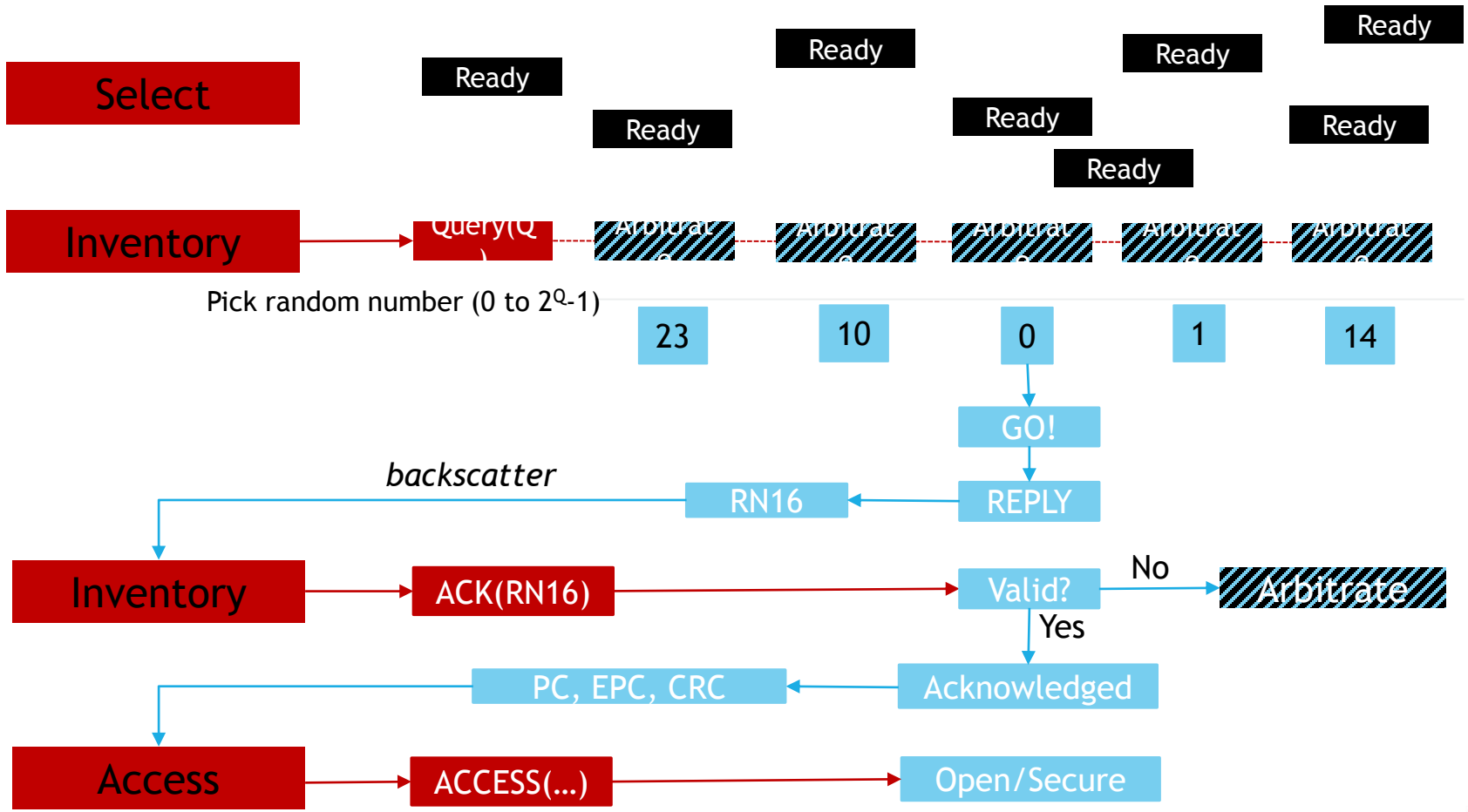
FM0 or Miller Code

ASK or PSK

5-640 kbps



READER-TAG: LOGICAL LAYER



Loosely based on: Dobkin, Daniel M. *The RF in RFID: UHF RFID in Practice*. Newnes, 2012.

SUBTLETIES

Select, Inventory, Access

Tags can be killed

Tags work on dense reader mode

Secret information in the back channel

New in Gen 2 v2

Tags can be used to detect counterfeits

Access can be controlled

Privacy can be protected

SOME LESSONS

Building a working, secure system is difficult

Starting from scratch is difficult

Increasingly today, IP is difficult.

Lessons for the future of IoT:

- Must reuse existing standards
- Must use a rational architecture
- Must use end-to-end security
- Must think about maintanability

MORE LESSONS

It is not big data
- It's lots of small data in small chunks

It's not about networking standards
- It's about architecture

Wireless protocols are highly specialized
- They will not converge quickly. Use abstraction.

Don't plug RFID into a barcode system!
- It's not business as usual. It's a new business.

It's all about the use-case. How does this technology change your workflow?

TOPICS OF RESEARCH

An array of RFID tag-based sensors

Low power, ubiquitous readers

Accurate range, bearing and location using RFID

RFID Calculus: doing Boolean math with RFID

Combining RFID with other modalities such as vision, augmented reality

THANK YOU!

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