

***No walls Factory
Floor
IIOT use cases
task Force***

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Ocado example

The image shows a screenshot of a web browser displaying a YouTube video. The browser's address bar shows the URL https://www.youtube.com/watch?v=4DKrcpa8Z_E. The browser's bookmark bar contains several items, including "1 DropSync", "4 Work", "Music", "(5350 unread) - kres", "stations | sourcelong", "Quantitative Analyst", "Kofer", "sctp", and "Mounting a WebDAV". The YouTube interface includes a privacy reminder from YouTube, a search bar with the text "tech insider andover", and a "SIGN IN" button. The video player shows a large warehouse interior with many white and yellow carts. The video progress bar at the bottom indicates the video is at 0:00 / 3:20.

Ocado example

- A successful example from the UK
- [Cambridge consultants](#) (owned by Altran) and Ocado (online grocery shop)
 - “Transforming warehouse automation with another world-first in radio design”



- “Roaming the warehouse on a grid above millions of grocery items, Ocado’s robots can assemble a typical 50-item order in five minutes.”
- “The end result is a breakthrough in radio design – the most densely packed cellular network in the world. It’s also scalable, with the capacity to handle up to 20 times the number of current movements.”

Checklist

Real	✓
Lucrative	✓
As simple as possible	✓
Not already realised	X
In the space of:	logistics

Indoor	✓
Indoor & outdoor	X
Municipal	X
Nation wide	X

- Use cases should be:

1. Real – no proof of concept. A real use case, which upon capturing requirements on private network, can be tested and deployed
2. Lucrative – the effort expended must be justified by the price of private network
3. As simple as possible – more complicated use cases can be captured in an iterative process

4. **Not already realised**

Note: Ocado use case is already realised, but SCF would benefit from:

- interference and throughput measurements
- understanding basic mitigation (possibly non-standardised) technologies

5. In the space of (not exhaustive):

- agriculture
- consumer electronics
- retail
- **logistics**
- manufacturing

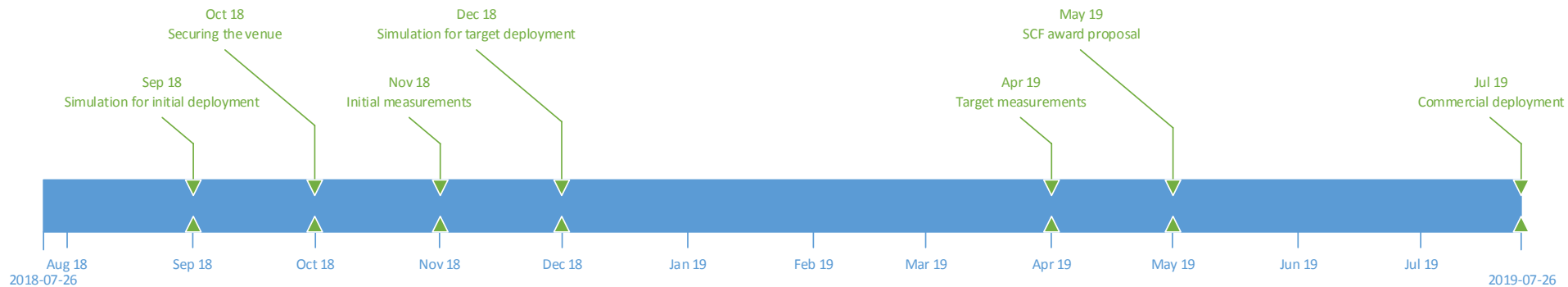
Requirements

- Venue
 - Size and material:
 - not too big: it would require too many radio nodes
 - not too small: interference pattern must not be dominated completely by reflected signals
 - 80m x 80m x 5m
 - microwave reflection by metal in construction should be significant
 - preferable there will be a small section in the venue where radio-environment can be controlled – to quickly gauge the radio equipment
 - Meeting room
 - Internet
 - Power feeds
 - Floorplan
 - Technical support

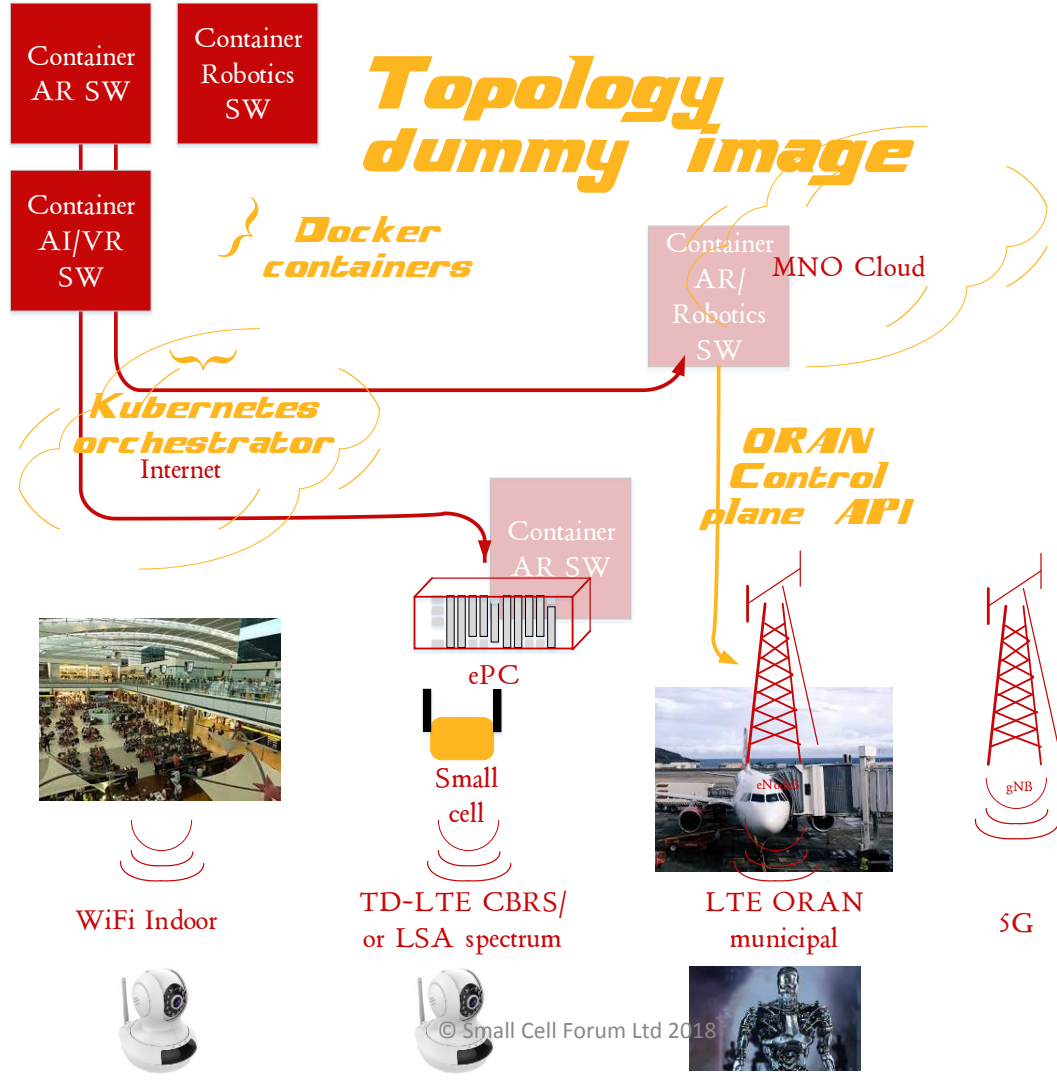
Requirements

- Simulation
 - Note: simulation can be just a paper exercise
 - 1. Determine initial and target bandwidth per square foot from the floor to radio heads
 - 2. Determine initial (static) and target velocities of UEs on the floor
 - 3. Along the test programme determine the best steps how to achieve the target
- Test programme
 - Initial bandwidth and static UEs
 - Bandwidth density, number of UEs, radio link latency, interference, jitter
 - Target bandwidth and UE velocities
 - Dependency of all variables on UE velocities, and UE pose and antenna pattern
 - Best steps to achieve the target
 - Changes in PHY (e.g. shortTTI, or FEC)
 - Changes in MAC (e.g. scheduler)

Timeline



Topology dummy image



Container
AR SW

Container
Robotics
SW

Container
AI/VR
SW

*Docker
containers*

Container
AR/
Robotics
SW

MNO Cloud

*Kubernetes
orchestrator*
Internet

*ORAN
Control
plane API*

Container
AR SW



ePC



Small
cell



LTE ORAN
municipal



5G



WiFi Indoor



TD-LTE CBRS/
or LSA spectrum



Participants