

The background of the slide is a light gray gradient with several realistic water droplets of various sizes scattered across it. The droplets have highlights and shadows, giving them a three-dimensional appearance. They are located in the top-left, top-right, and bottom-right areas of the slide.

LPWAN – The State Of Play

STEVE KARMEINSKY

SIGFOX

- “OPEN STANDARD”
 - 868MHZ LICENSE EXEMPT IN UK
 - 900MHZ IN US
 - UNB
- NODE -> NETWORK
 - UP TO 140 X 12 BYTE MESSAGES PER DAY
- NETWORK -> NODE
 - MAX 4 MESSAGES OF 8 BYTES PER DAY
- BIT PACKED FORMAT



LORA

- CHIPS/SPEC MADE BY SEMTECH
 - 868MHZ EU/900MHZ US
 - SPREADSPECTRUM
- DATA RATES 0.3 KBPS TO 50 KBPS
 - SF7 – SF12 (51 BYTES TO 222 BYTES APPROX)
- THE MODES OF OPERATION
 - CLASS-A (ALOHA TYPE)
 - CLASS-B EXTRA RECEIVE WINDOWS
 - CLASS-C ALWAYS LISTENING EXCEPT WHEN TRANSMITTING



WEIGHTLESS

- WEIGHTLESS-N
 - 868MHZ
- WEIGHTLESS-P
 - 868MHZ
- WEIGHTLESS-W
 - TV WHITESPACE



3GPP

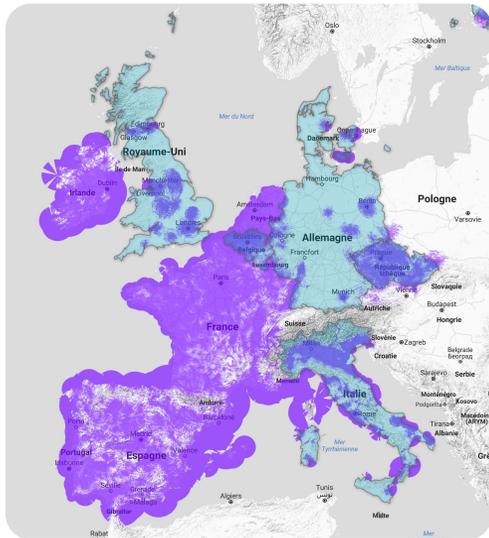
- NB-IOT
 - SPEC EARLY 2016
 - LTE/3G EXTENSION
- LTE-M
 - V13 OF 3GPP SPEC
 - BETTER SPEED/SECURITY NB-IOT
 - BETTER IN BUILDING
- CARRIERS WANT TO MONETISE



OTHER TECHNOLOGIES

- GREENWAVES, A LOW-POWER, LONG RANGE OFFERING.
- HAYSTACK, A DASH7 LOW-POWER WIRELESS NETWORK DEVELOPMENT PLATFORM.
- RPMA, ON-RAMP WIRELESS'S RANDOM PHASE MULTIPLE ACCESS.
- SYMPHONY LINK FROM LINK LAB.
- WAVIOT NARROWBAND M2M PROTOCOL.
- POTENTIALLY ALSO 802.15.4
 - THREAD
 - ZIGBEE
- WIFI 802.11AH
- ZWAVE
- BLUETOOTH 5.X

arqiva



SIGFOX IN UK

- RUN BY ARQIVA
- ROLLOUT TO 10 CITIES
 - BIRMINGHAM
 - BRISTOL
 - EDINBURGH
 - GLASGOW
 - LEEDS
 - LEICESTER
 - LIVERPOOL
 - LONDON
 - MANCHESTER
 - SHEFFIELD
- EVERYTHING UNDER NDA
 - GO TO [HTTP://MAKERS.SIGFOX.COM](http://makers.sigfox.com)

CATAPULT

Digital

THINGS CONNECTED

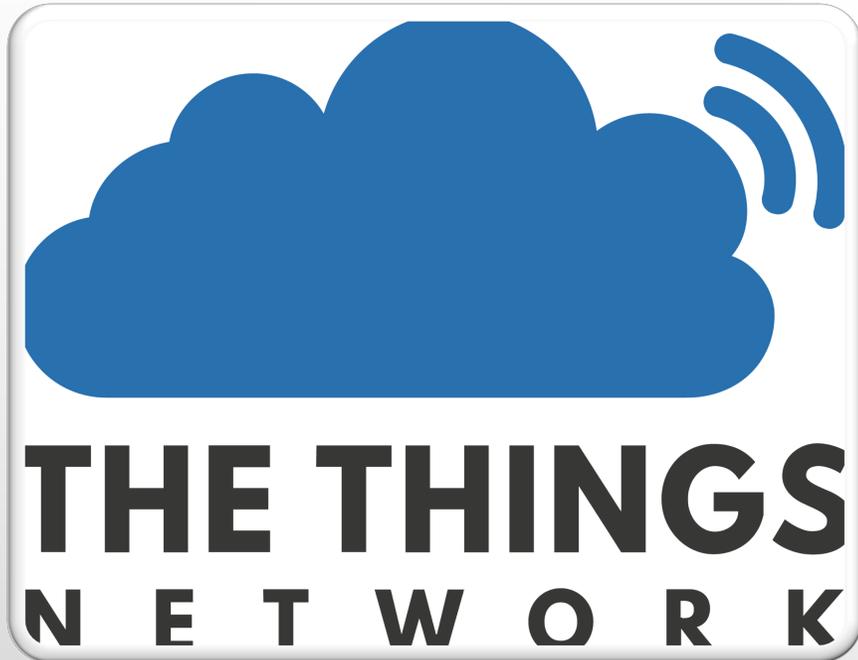
- DIGITAL CATAPULT
 - WANT TO SUPPORT SEVERAL LPWAN PROTOCOLS
 - LORA INITIALLY
 - LONDON ONLY (50 SITES IN 2017)
- PARTNERS
 - BT
 - FUTURE CITIES CATAPULT
 - EVERYNET
 - BEECHAM RESEARCH
 - ALLTHINGSTALK
 - BRE
 - IMPERIAL COLLEGE
 - KINGS COLLEGE
 - UCL
 - QUEEN MARY UNIVERSITY
- USERS HAVE TO REGISTER A VALID MOBILE NUMBER TO ACCESS NETWORK
 - ACCESS TO LIVE OR SANDBOX SERVICES

WEIGHTLESS-N

- NWAVE
 - ROLLING OUT IN LONDON
- DEV KITS AVAILABLE
 - (BASESTATION AND END-NODES)

The logo for nwave, featuring the lowercase letters 'n', 'w', and 'a' in black, and 'v' and 'e' in a bright yellow color. The letters are bold and sans-serif.

THE THINGS NETWORK



- KICKSTARTER FOR GATEWAY, NODE, ARDUINO
- LOTS OF OPEN SOURCE OUT THERE
- TTN RUN BACK-END NETWORK “ROUTER”
- GATEWAYS SIT ON ‘NORMAL ISP’ CONNECTIONS
 - ANYONE CAN REGISTER A BACKEND SERVICE
 - ANY DEVICE CAN CONNECT THROUGH ANY GATEWAY
 - INITIALLY SUPPORT 5-10K DEVICES
- NODES ARE LIMITED TO 30S TRANSMIT TIME PER DAY

LEGAL

- SPECTRUM IN THE UK IS COVERED BY THE WTA 2006
 - EXTREMELY PUNITIVE FOR THE 'CRIME'
- NO SUCH THING AS LICENSE FREE SPECTRUM
 - LICENSE EXEMPT (BIG DIFFERENCE)
 - ALL LICENSE EXEMPT SPECTRUM HAS BEEN EXEMPTED BY AN ACT OF PARLIAMENT
- 868MHZ TECHNICAL REGS EN300 220 / IR 2030
 - ALL EQUIPMENT MUST BE CE MARKED
 - TEST RANGE LESS THAN 100M
- OFCOM TEST LICENSES ARE AVAILABLE
 - £50 PER NODE

The Ofcom logo features the word "Ofcom" in a bold, red, sans-serif font. Below the text is a horizontal bar composed of several colored segments: purple, blue, yellow, red, and purple.

making communications work
for everyone