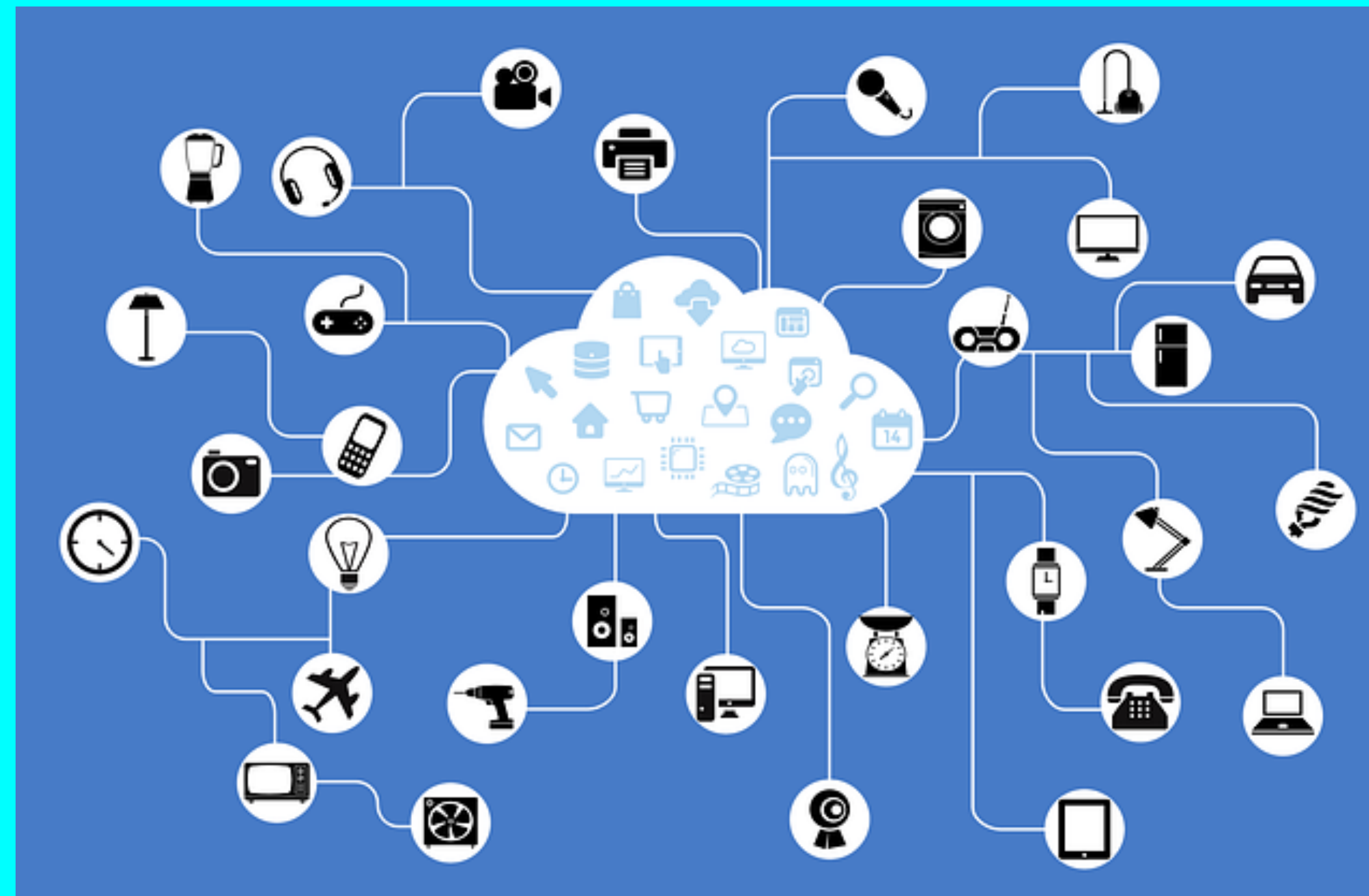


LORA / LORAWAN TUTORIAL I

IoT, LPWAN, Semtech, LoRa



INTRO

- Hi my name is Robert Lie and the main goal of this video series is to provide beginners with basic LoRa and LoRaWAN knowledge.
- For educational purpose I try to simplify things but do not expect an in-depth explanation of each subject matter. I am focussing on the concept and not the details.
- In this first tutorial I will explain why LoRa is used in IoT projects.

INTERNET OF THINGS

- The Internet of Things, or IoT, is a network of physical devices that are connected to the Internet and are able to “talk” to each other.
- The prediction is that by 2020 there will be over 25 billion devices connected to the Internet.



- There are many wireless technologies you can use to connect these devices to the Internet, such as:
 - Short-range wireless communication
 - Cellular communication
 - LPWAN communication

REFERENCES

- In this video series I will be using equations and other information taken from several sources. In my presentations these sources are referenced by the label [ref no].
1. Semtech: AN1200.22 - LoRa Modulation Basics (Revision 2, May 2015)
<https://www.semtech.com/uploads/documents/an1200.22.pdf>
 2. Semtech: SX1276/77/78/79 Datasheet (Rev. 5, August 2016)
https://www.semtech.com/uploads/documents/DS_SX1276-7-8-9_W_APP_V5.pdf
 3. Semtech: AN1200.13 - SX1272/3/6/7/8 LoRa Modem Design Guide (Revision 1, July 2013)
https://www.semtech.com/uploads/documents/LoraDesignGuide_STD.pdf

REFERENCES

4. LoRa Alliance, Inc: LoRaWAN specification
<https://lora-alliance.org/lorawan-for-developers>
5. ETSI EN 300 220-2 (V3.2.1, June 2018)
https://www.etsi.org/deliver/etsi_en/300200_300299/30022002/03.02.01_60/en_30022002v030201p.pdf
6. Semtech: ANNWS.01.2.1.W.SYS - LoRaWAN Network Server Demonstration: Gateway to Server Interface Definition (Revision 1.0 - July 2015)
7. Semtech SX1301 Datasheet (V2.4 - June 2017)
<https://www.semtech.com/uploads/documents/sx1301.pdf>

REFERENCES

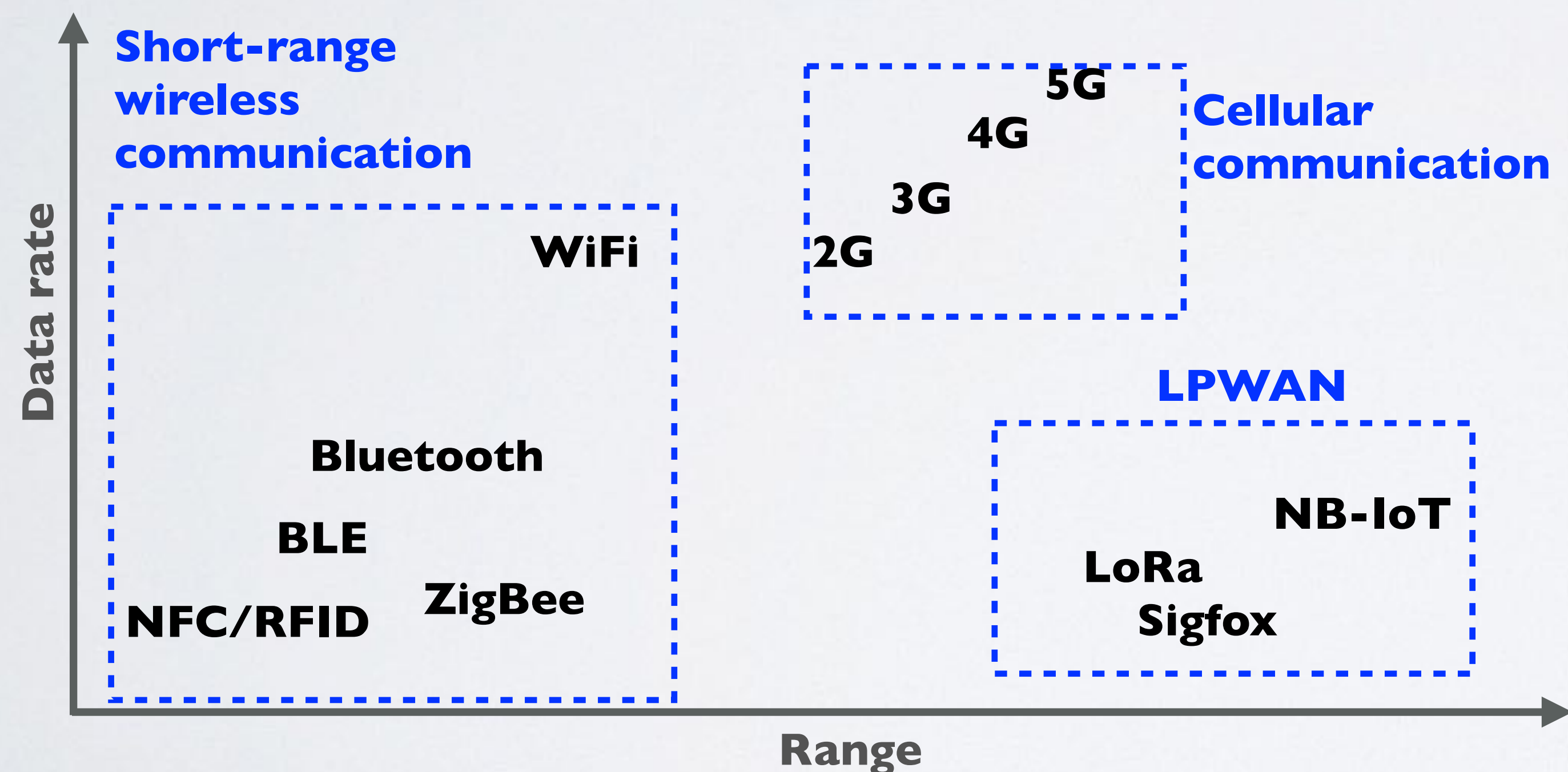
8. Semtech SX1308 Datasheet (V1.2 - June 2017)
<https://www.semtech.com/uploads/documents/sx1308.pdf>

PRESENTATION

- All my presentations used in this video series can be found here:
https://www.mobilefish.com/developer/lorawan/lorawan_quickguide_tutorial.html

LPWAN

- LPWAN stands for Low Power Wide Area Network and this type of wireless communication is designed for sending small data packages over long distances, operating on a battery. There are a number of competing technologies in the LPWAN space such as: Narrowband IoT (NB-IoT), Sigfox, LoRa and others.



- In this video series I will only be focussing on LoRa.

WIRELESS COMMUNICATION COMPARISON

Wireless Technology	Wireless Communication	Range (m)	Tx power (mW)
Bluetooth	Short range	~10	~2.5
WIFI	Short range	~50	~80
3G / 4G	Cellular	~5000	~500
LoRa*	LPWAN	2000-5000 (urban area) 5000-15000 (rural area) > 15000 (direct line of sight)	~20

* Data packages are very small

SEMTECH

- The LoRa wireless technology was developed by a French start-up company Cycleo which developed the LoRa modulation technology.
- In 2012 the Semtech Corporation (NASDAQ: SMTC) acquired Cycleo.
- The LoRa radio and modulation part is patented and its source is closed.
- Semtech has licensed its LoRa intellectual property (ip) to other chip manufacturers, such as HopeRF, Microchip, Dorji, etc.
- The word LORA is a trademark of Semtech Corporation, filed in 2015.
- More information about Semtech:
<https://www.semtech.com/lora>

LORA RANGE

- The range between LoRa sender and receiver depends on the environment the equipment operates in. Indoor coverage largely depends on the type of building material used.

Environment	Range (km)
Urban areas (towns & cities)	2-5
Rural areas (countrysides)	5-15
Direct Line Of Sight	>15

- Some notable records:
Andreas Spiess, ground to ground connection: 212 km (= 131.73 miles)
Weather balloon to ground connection: 702.67 km (= 436.61 miles)

FEW USE CASES USING LORA TECHNOLOGY

- **Smart utilities**

- Power transformer monitoring

- Water level monitoring

- Utility meter

- Fuel monitoring (monitoring fuel levels in fuel tanks for heating houses)

- **Health & Hygiene**

- Temperature / humidity monitoring

- Environmental monitoring

- Waste management (monitoring waste level in waste bins)

FEW USE CASES USING LORA TECHNOLOGY

- **Safety**

- Smart lightning

- Water level monitoring

- Radioactivity level monitoring

- Dike monitoring (prevent peat dikes from drying out)

- **Efficiency**

- Asset management (e.g. tracking containers, pallets, etc.)

- Fleet management (e.g. tracking cars, vans, trucks, etc.)

- **Agriculture**

- Monitoring animal welfare

- Monitoring plant growing conditions