

LORA / LORAWAN TUTORIAL 3

Rules & Regulations



INTRO

- In this tutorial I will explain who sets the wireless communication rules and regulations.

ISM BAND

- LoRa operates in the unlicensed ISM (Industrial, Scientific and Medical) radio band that are available worldwide.

Region	Frequency (MHz)
Asia	433
Europe, Russia, India, Africa (parts)	863-870
US	902-928

Region	Frequency (MHz)
Australia	915-928
Canada	779-787
China	779-787, 470-510

- A more detailed list can be found at:
<https://www.thethingsnetwork.org/docs/lorawan/frequencies-by-country.html>
<https://www.thethingsnetwork.org/docs/lorawan/frequency-plans.html>

ISM BAND

- In the United States, LoRaWAN operates in the 902-928 MHz frequency band.
- United States frequency allocation:
<https://www.ntia.doc.gov/files/ntia/publications/2003-allochrt.pdf>

ISM BAND

- Devices such as microwave ovens, medical equipments or baby monitors all uses the ISM band.
- ISM band advantages:
 - Anyone is allowed to use these frequencies.
 - No license fee is required.
- ISM band disadvantages:
 - Low data rate.
 - Lots of interference because anyone can use these frequencies.

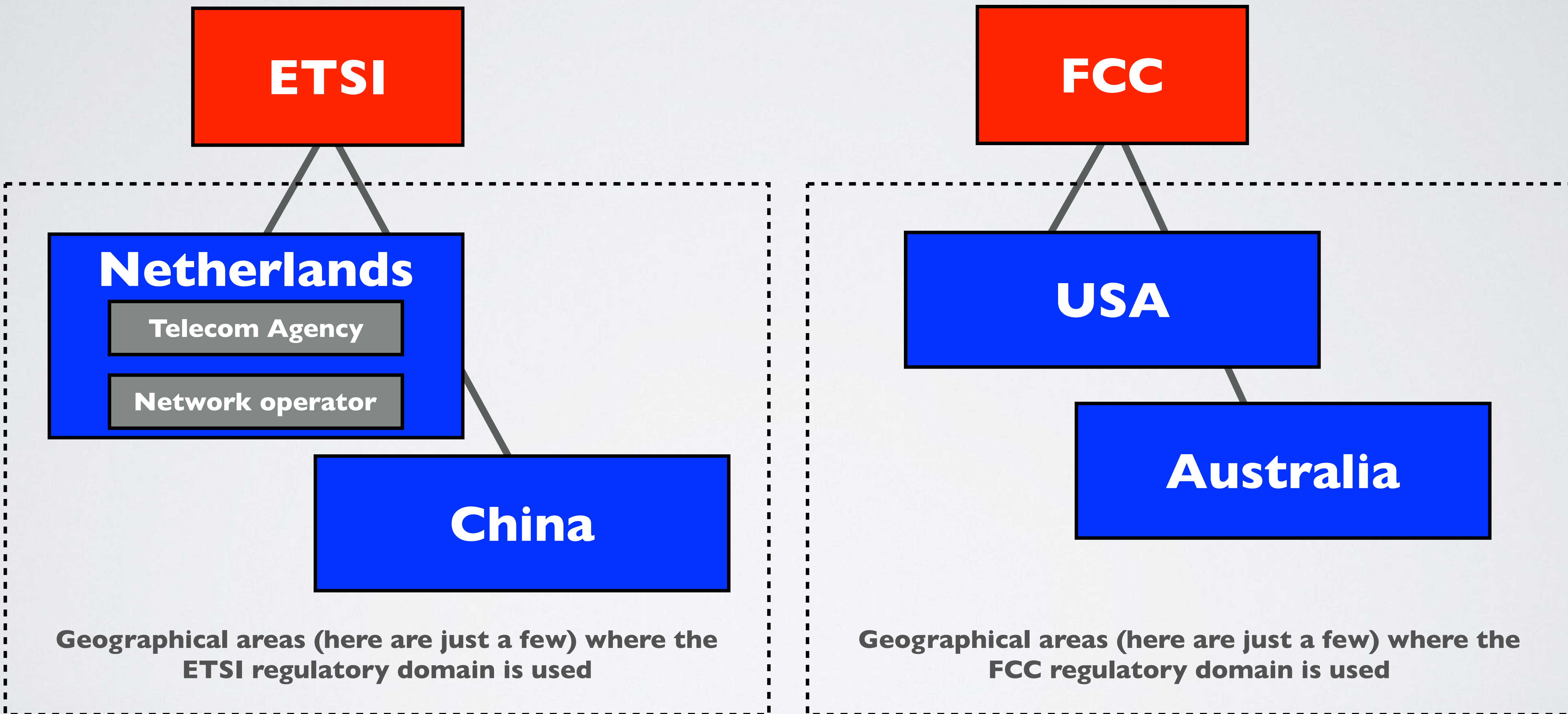
ETSI AND FCC

- Because the ISM band can be used by everyone, there must be some rules set otherwise this band will become unusable. Think of the many signal interferences.
- There are several international organisations which manage the radio spectrum to ensure safe co-existence between **all** the different radio technologies.
- In Europe the European Telecommunications Standards Institute (ETSI) creates standards which are used by local (= country) regulatory authorities.
<https://www.etsi.org/>
- In the US the Federal Communications Commission (FCC) creates these standards.
<https://www.fcc.gov/>

ETSI AND FCC

- All other countries are using the standard sets by either ETSI or FCC. Except Japan they have the Telecom Engineering Center (TELEC) and South Korea they have the Korea Communications Commission (KCC).
- For example in the Netherlands, its telecommunication regulatory authority is called the Telecom Agency (In Dutch: Agentschap Telecom) which is part of the Ministry of Economic Affairs and Climate (In Dutch: Ministerie van Economische Zaken en Klimaat).
- This regulatory authority has issued the conditions and requirements when using LoRa in the Netherlands and is based on the standards set by ETSI.
<https://www.agentschaptelecom.nl/onderwerpen/vergunningvrij-frequentiegebruik>
<http://wetten.overheid.nl/BWBR0036378/2016-12-28>

ORGANISATIONS AND REGULATORY AUTHORITIES



ISM BAND AND DUTY CYCLE

- For example in Europe when using the ISM band frequencies (863 MHz - 870 MHz) users must comply to the following rules:
 - For uplink, the maximum transmission power is limited to 25mW (14 dBm). For downlink (for 869.525MHz), the maximum transmission power is limited to 0.5W (27 dBm)
 - There is an 0.1% and 1.0% duty cycle per day depending on the channel.
- Besides these ISM band rules, the network operator (for example The Things Network) can also add additional restrictions.

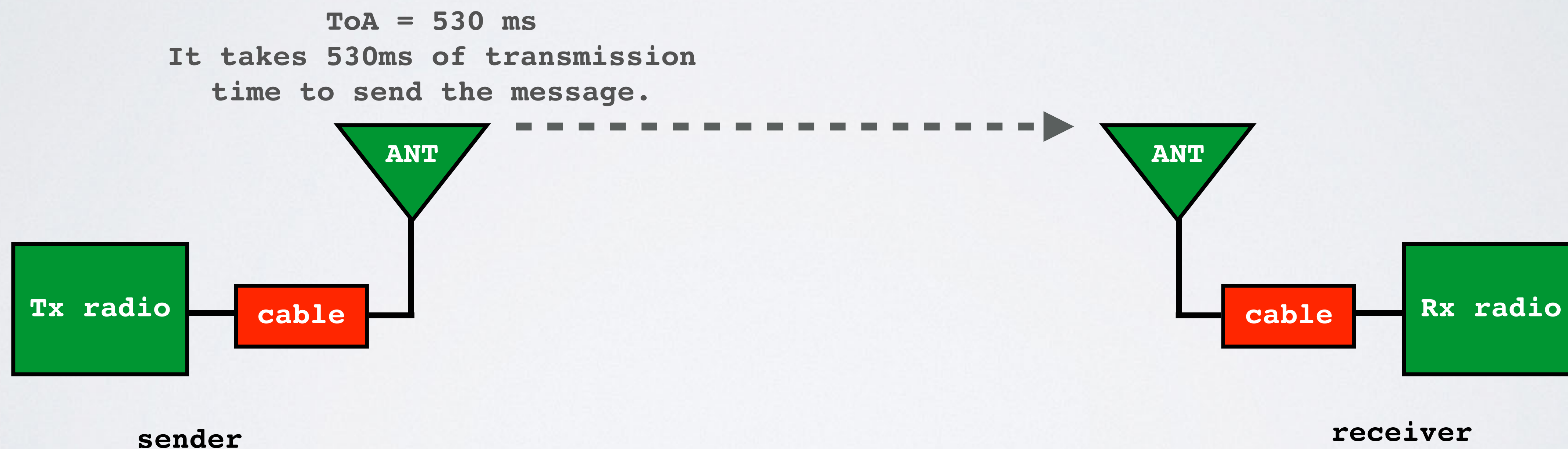
THE THINGS NETWORK (TTN) FAIR USE

- If you use The Things Network (free public community LoRaWAN network), the following fair use policy applies:
 - The uplink airtime is limited to 30 seconds per day (24 hours) per node.
 - The downlink messages are limited to 10 messages per day (24 hours) per node.
- More information about the TTN fair use policy:
<https://www.thethingsnetwork.org/docs/lorawan/duty-cycle.html>

TIME ON AIR

- Time on Air (ToA) is the amount of time that the transmitter antenna is energised and transmitting data.

Note: ToA is **not** the time from Tx to Rx.



DUTY CYCLE

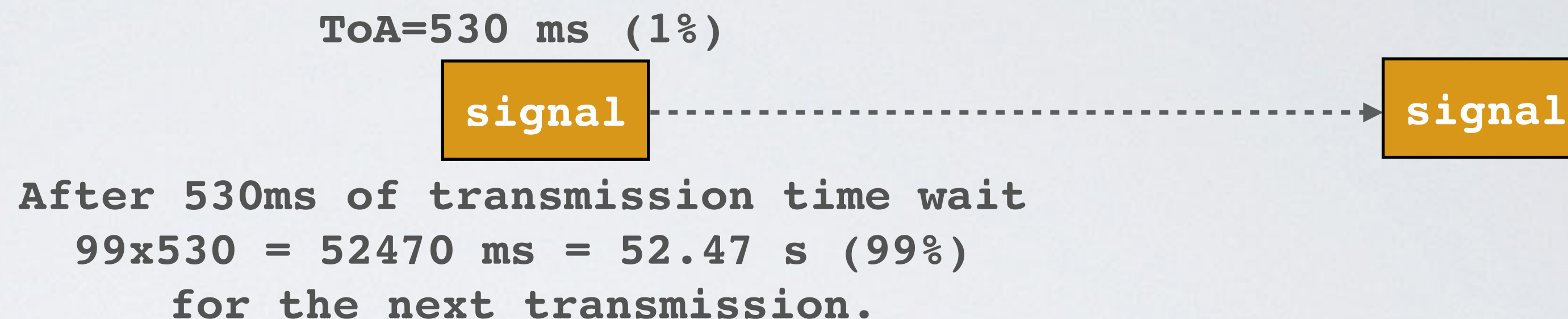
- Duty cycle is the proportion of time during which a component, device, or system is operated. The duty cycle can be expressed as a ratio or as a percentage.



- As mentioned previously in Europe there is a 0.1% and 1.0% duty cycle per day depending on the channel.

DUTY CYCLE

- For example:
Time on Air = 530 ms
Duty cycle = 1%



- For example:
Time on Air = 400 ms
Duty cycle = 0.1%

