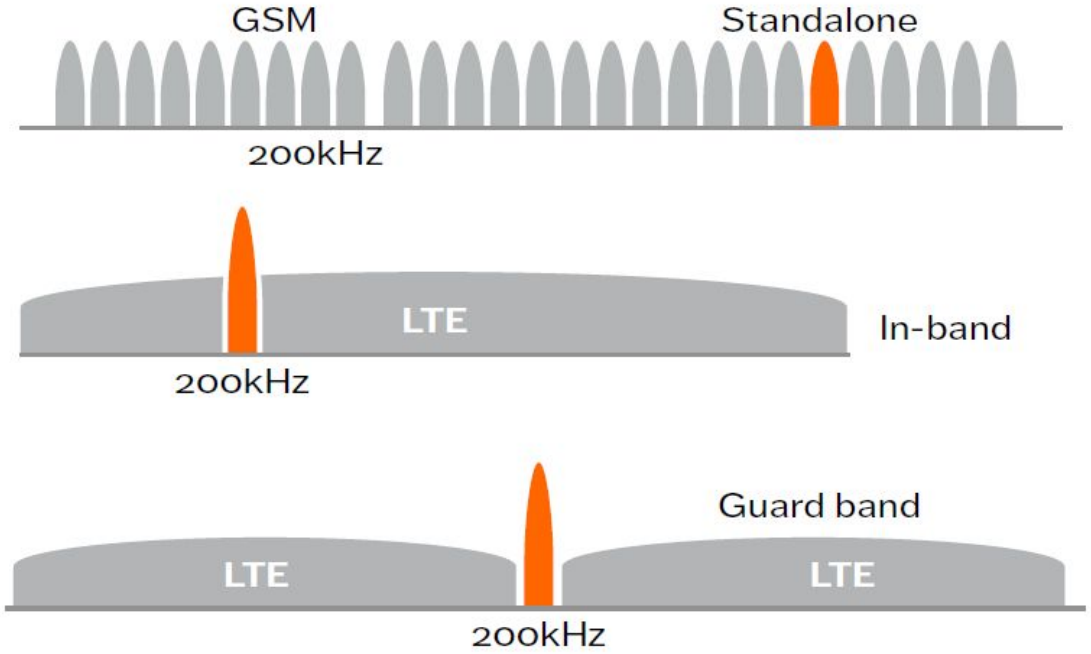
NB-IoT

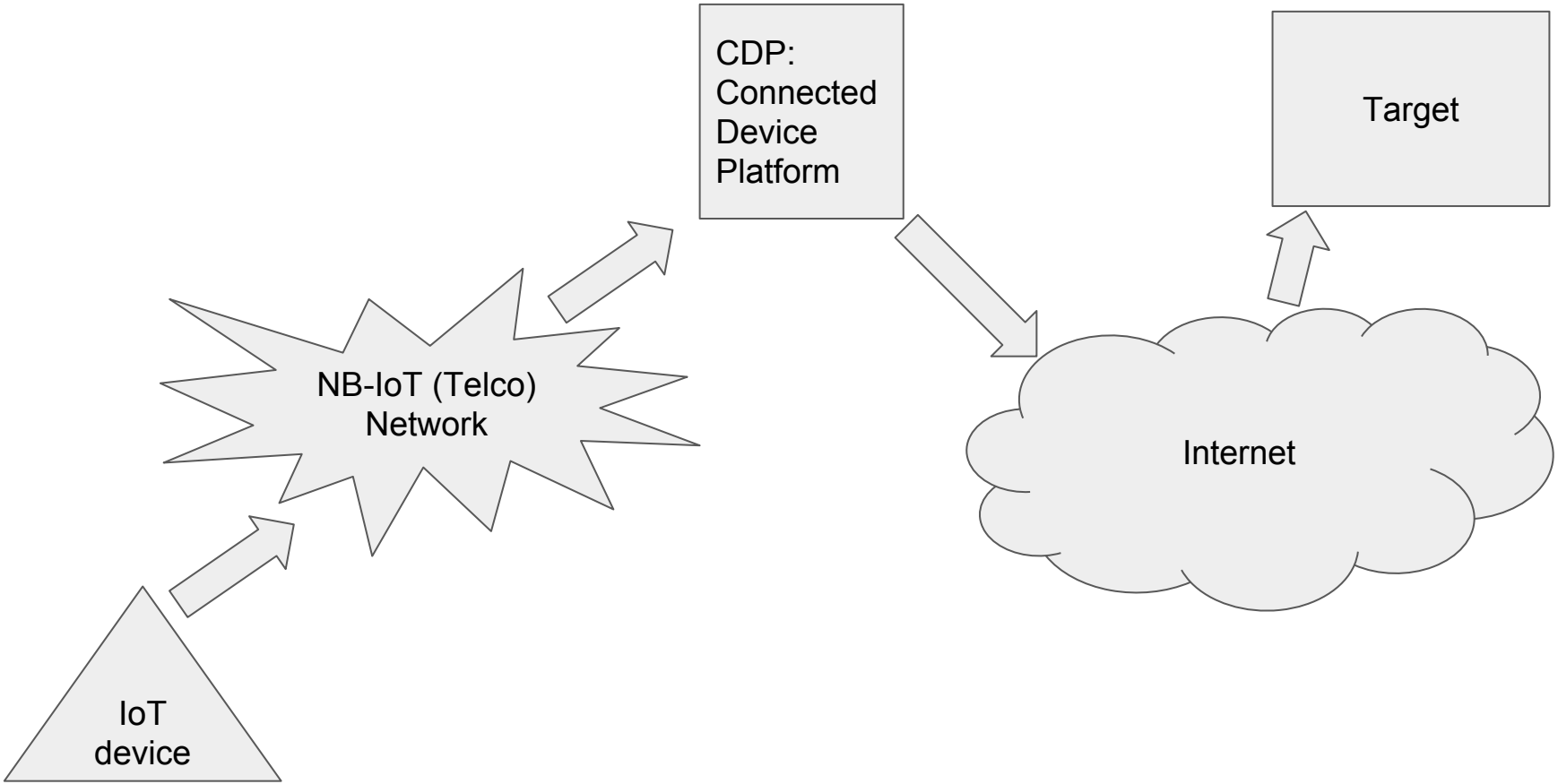
- Started in 2014 by a first 3GPP study
- Initial Specifications
  - Low device cost (<€5 per module)
  - Extended coverage (better than GSM/GPRS)
  - Large Capacity (> 40 devices per household, up to 100.000 devices per cell)
  - Long battery life (> 10 years, 1 packet a day, 200 bytes)
  - Moderate latency (< 10 seconds)
- part of LTE (4G) standards

NB-IoT

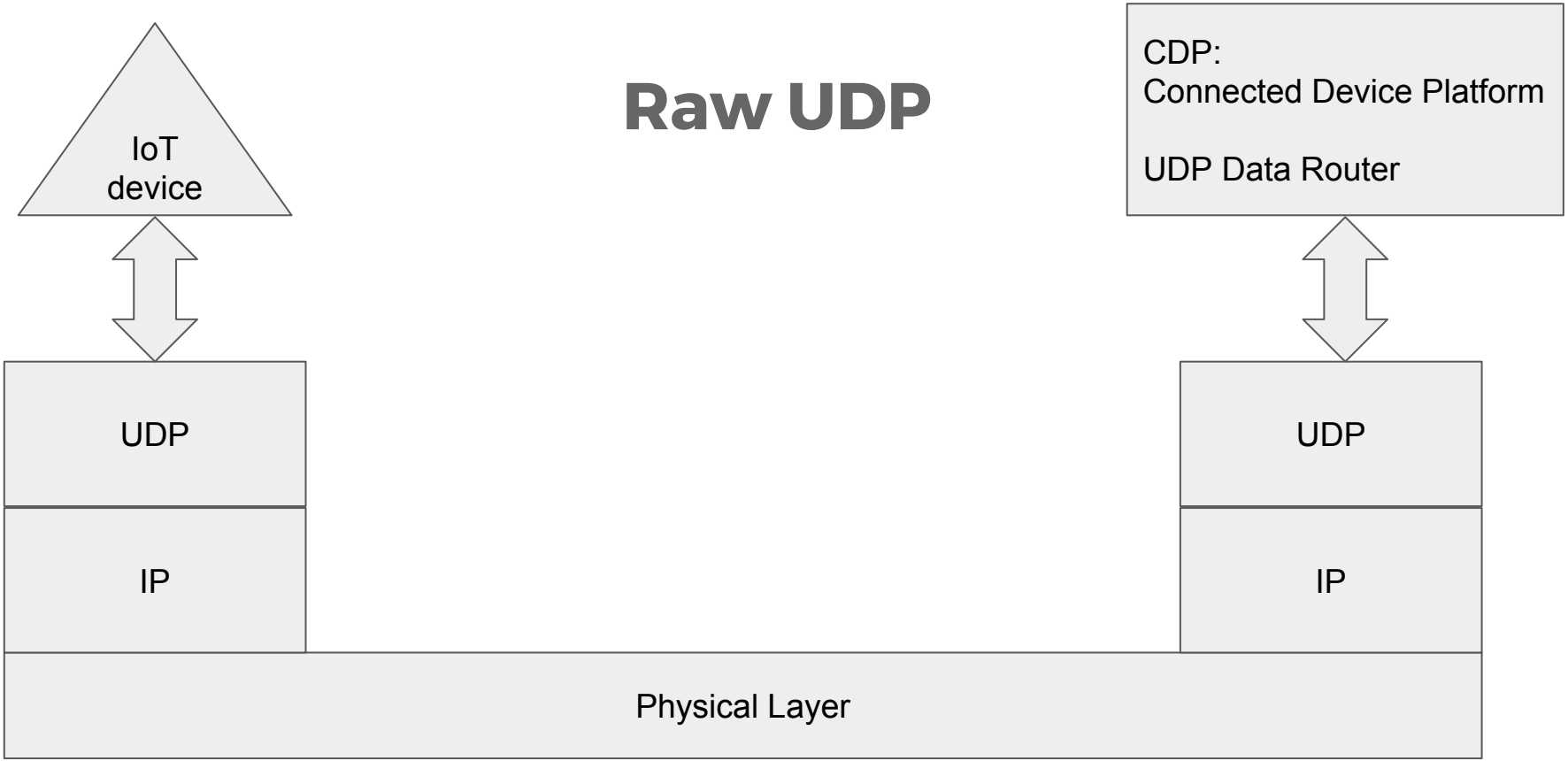
- using existing licensed spectrum
- 200 kHz bandwidth



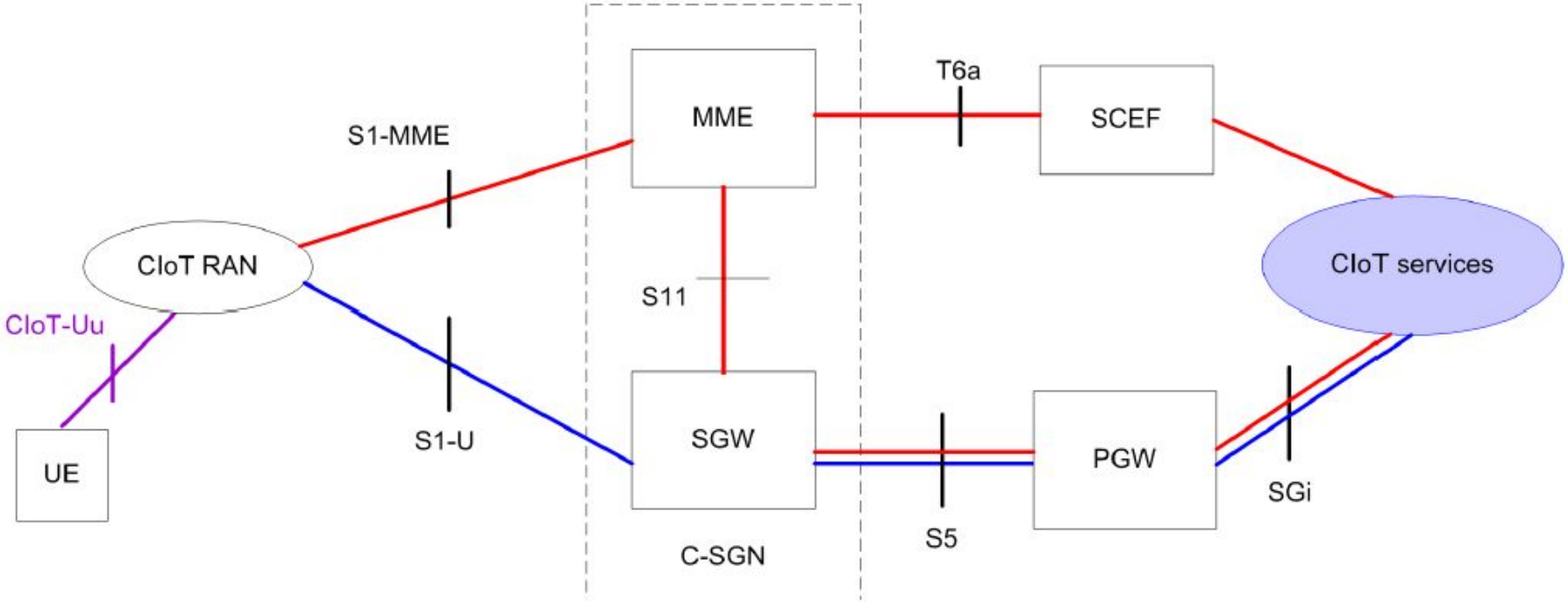
LTE Band	Uplink	Downlink
1	1920 - 1980	2110 - 2170
2	1850 - 1910	1930 - 1990
3	1710 - 1785	1805 - 1880
5	824 - 849	869 - 894
8	880 - 915	925 - 960
12	699 - 716	729 - 746
13	777 - 787	746 - 756
17	704 - 716	734 - 746
18	815 - 830	860 - 875
19	830 - 845	875 - 890
20	832 - 862	791 - 821
26	814 - 849	859 - 894
28	703 - 748	758 - 803
66	1710 - 1780	2110 - 2200

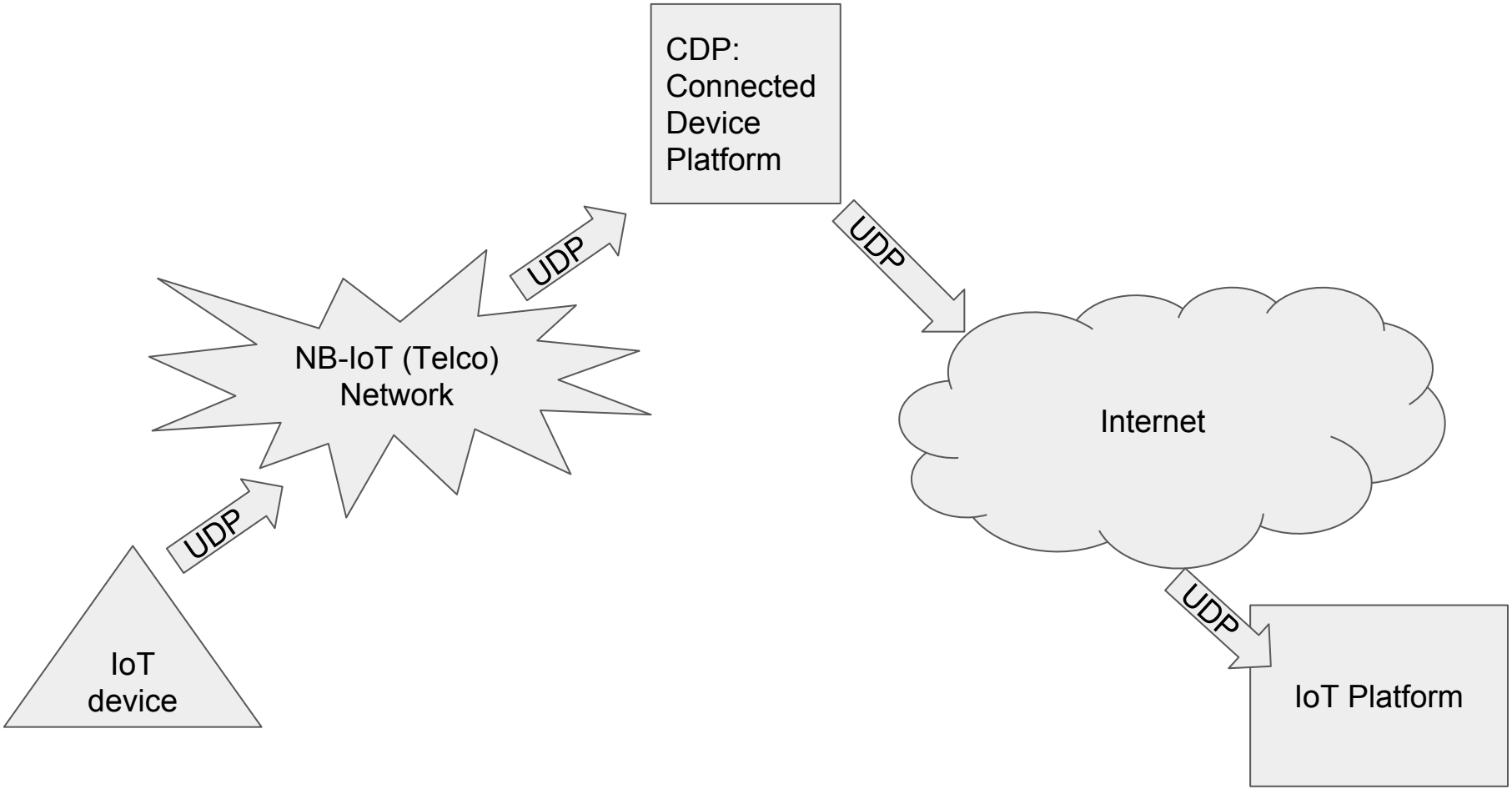

CDP:
Connected
Device
Platform
Target
NB-IoT (Telco)
Network
Internet
IoT
device

Raw UDP

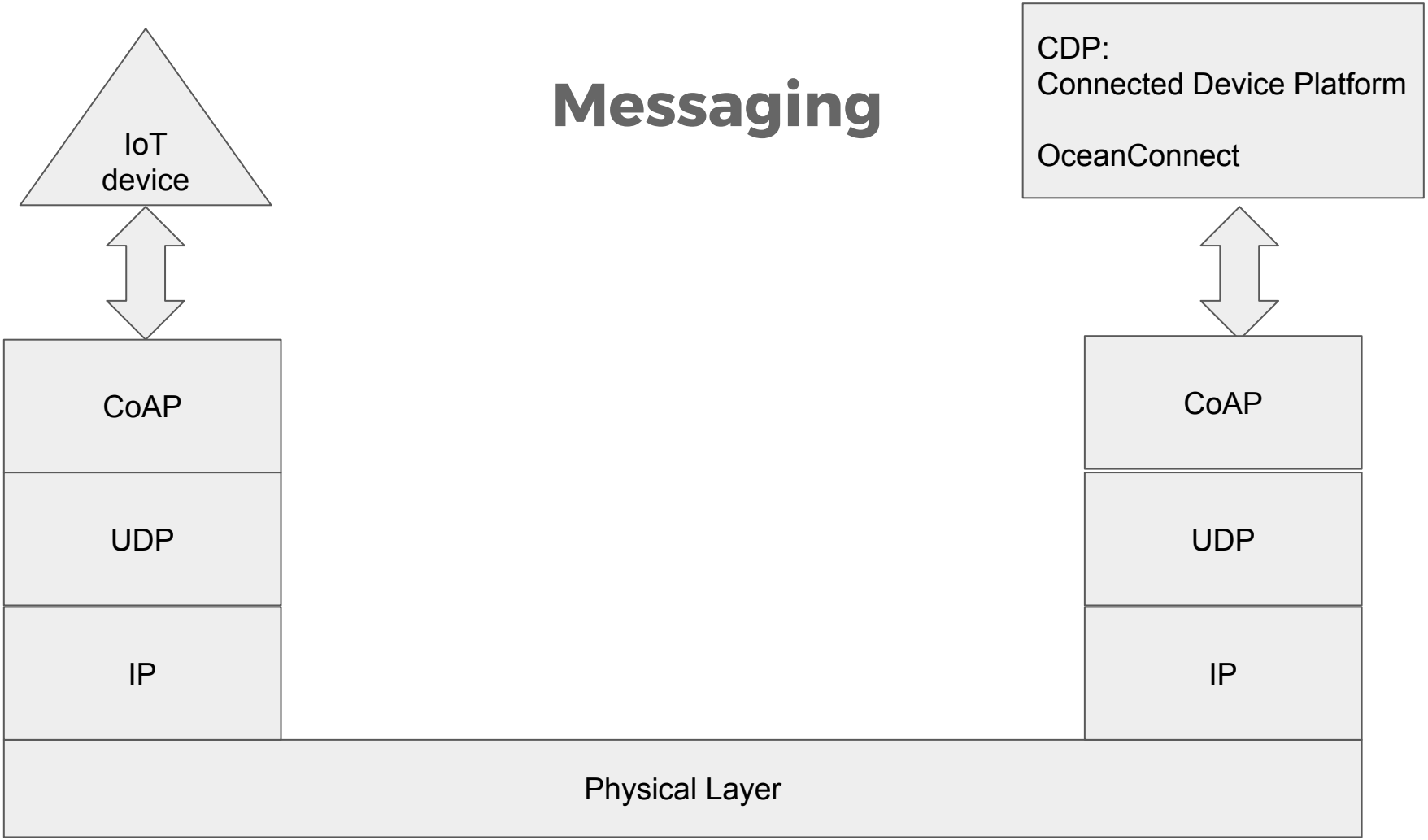

IoT
device
CDP:
Connected Device Platform
UDP Data Router
UDP
IP
UDP
IP
Physical Layer

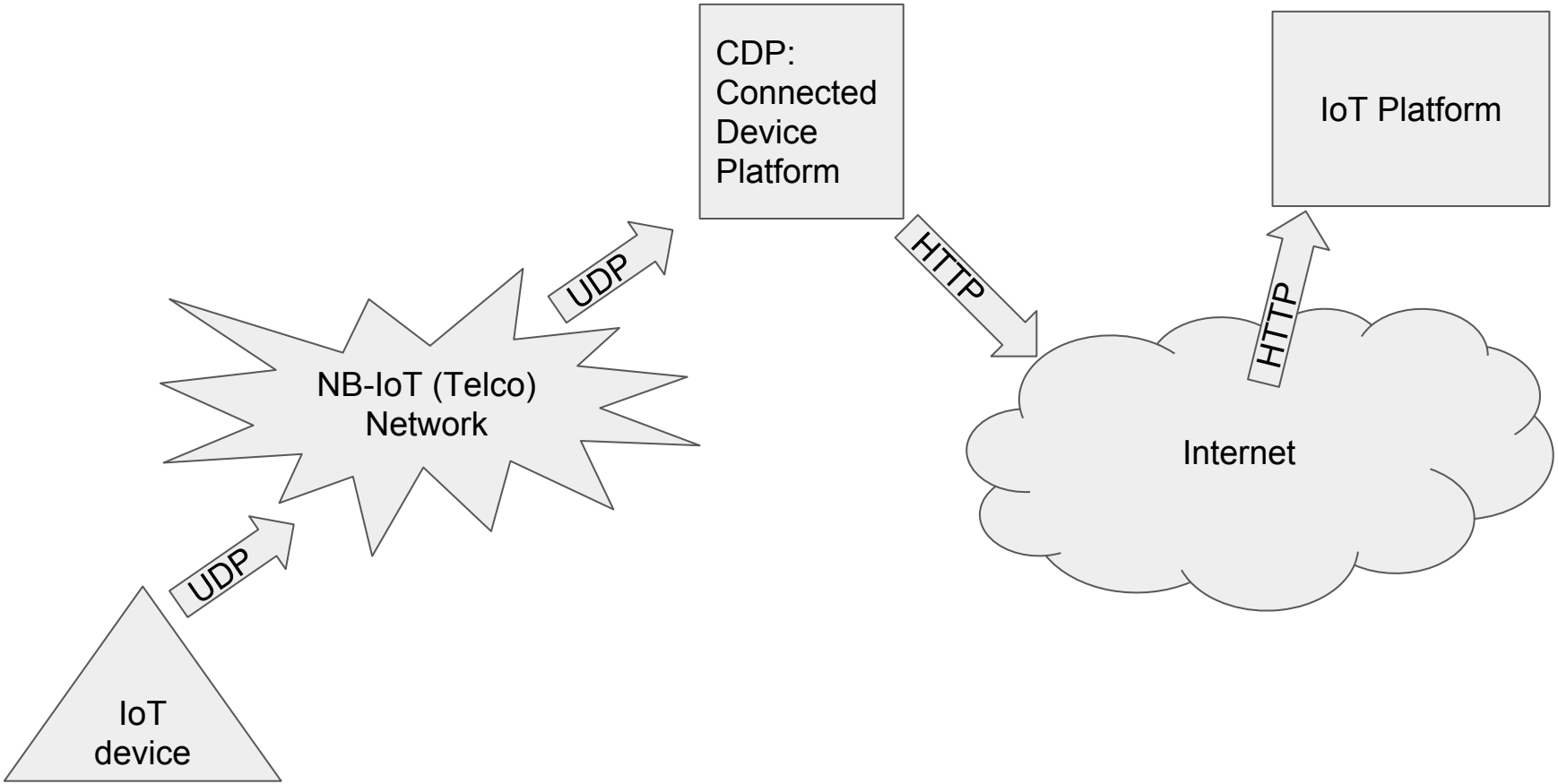
NB-IoT (LTE) Physical Layer




CDP:
Connected
Device
Platform
UDP
UDP
NB-IoT (Telco)
Network
Internet
UDP
UDP
IoT
device
IoT Platform

Messaging


IoT
device
CDP:
Connected Device Platform
OceanConnect
CoAP
UDP
IP
CoAP
UDP
IP
Physical Layer


CDP:
Connected
Device
Platform
IoT Platform
UDP
HTTP
HTTP
NB-IoT (Telco)
Network
Internet
UDP
IoT
device

AT Commands

AT+NRB

reboots the device

AT Commands

AT+NCONFIG=CR_0354_0338_SCRAMBLING,FALSE

AT+NCONFIG=CR_0859_SI_AVOID,FALSE

AT+NCONFIG?

Switches Autoconnect and Scrambling ON/OFF

* these settings are persistent (stored in NVM)

AT Commands

AT+CFUN=0	switches off radio
AT+NCDP=172.16.14.22	CDP IP address*
AT+CGDCONT=1,"IP","oceanconnect.t-mobile.nl"	set APN name*
AT+CFUN=1	switches on radio

* these settings are persistent (stored in NVM)

AT Commands

AT+CFUN=1	Radio ON
AT+COPS=1,2,"20416"	Forces an attempt to select and register with the network operator
AT+CSQ	Check signal quality (99,99 is no signal!)
AT+CGATT?	Check if device is attached to network
AT+CGPADDR	Show IP Address

AT Commands

AT+NSMI=1	Turn on Send Message Indicator
AT+NMGS=6,000000000101	Send 6 byte message
AT+NQMGS	Check outgoing message queue

AT Commands

AT+NUESTATS	Get statistics of the connection
AT+CGMM	Read module Manufacturer
AT+CGMR	Read Firmware Version
AT+CGSN=1	Read board IMEI

AT Commands

AT+NNMI=1	Turn on New Message Indicator
AT+NMGR	Check for new messages
AT+NQMGR	Check incoming message queue

Not supported yet in the All Things Talk platform

AT Commands, raw UDP

AT+NSOCR=DGRAM,17,16666,1	//Create socket
AT+NSOST=0,84.200.60.162,16666,4,4142430A	//Send UDP datagram
AT+NSORF=0,4	//Receive data on socket 0
AT+NSOCL=0	//Close socket.