SICK
Sensor Intelligence.

Protocol and Integration:
Compact & MSGPACK

Agenda

1. Where we came from (Cola A/B lmdscandata)
2. Compact (MSGPACK)
3. LiDAR
4. Wireshark plug-in

Why new formates?

- Amount of data increase → efficient data transmission
- New requirements for cyber security which may not be longer supported by CoLa

Overview

Choice of different data formats & drivers

Page is valid for:  picoScan  multiScan  LRS4000

Type	Info	Advantages	Limitations
LMDscandata	▪ TCP/IP ▪ always complete scan ▪ CoLa A/B ▪ Same channel like config.	▪ Well known ▪ Includes seconde sensor data such as outpute state	▪ quite a lot of bandwidth ▪ Not cyber secure

COMPACT (data format)	▪ available for UDP outputs segments (e.g. 30° is one segment) (LRS4000 TCP/IP complete scan)
	▪ similar to other 3D LiDAR Data format approaches
	▪ contains information like device Identification / Serial Number, time stamp and device status
	▪ Requires
	  ▪ ~5 MBit for picoScan (3 echoes)
	  ▪ ~35 Mbit for multiScan (3 echoes)
		▪ very efficient
		▪ much smaller band with needed
		▪ "memcpy" will do the job → super efficient and resource-saving
		▪ a bit like CoLa B
			▪ Data is not "self-describing"
			▪ more "difficult" to parse (needs probably more integration time on customer side)

MSGPCK (data format)	▪ available for UDP and TCP/IP(LRS4000)
	▪ outputs segments (e.g. 30° is one segment)
	▪ contains information like device Identification / Serial Number, time stamp and device status
	▪ requires about
	  ▪ ~10 MBit for picoScan (3 echoes)
	  ▪ ~70 Mbit for multiScan (3 echoes)
		▪ easy to integrate with existing "libraries"
		▪ Easy to parse
		▪ ROS drivers also uses this protocol
		▪ Each field has a kind of "speaking name" or numbering
			▪ quite a lot of bandwidth
			▪ requires more computing power, especially for parsing

Who supports what?

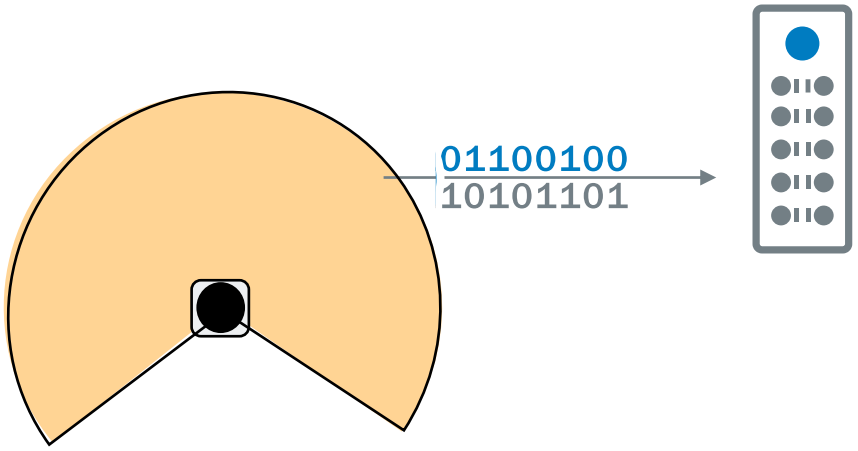
	Distance Data Compact	Distance Data MSGPACK	IMU Data Compact	IMU Data MSGPACK	TCP support	UDP support
 picoScan	✓	✓	✓	✗	✗	✓
 multiScan	✓	✓	✓	✗	✗	✓
 LRS4000	✓	✗	✗	✗	✓	✗

› Q4 2024

Dataformat

LMDscandata

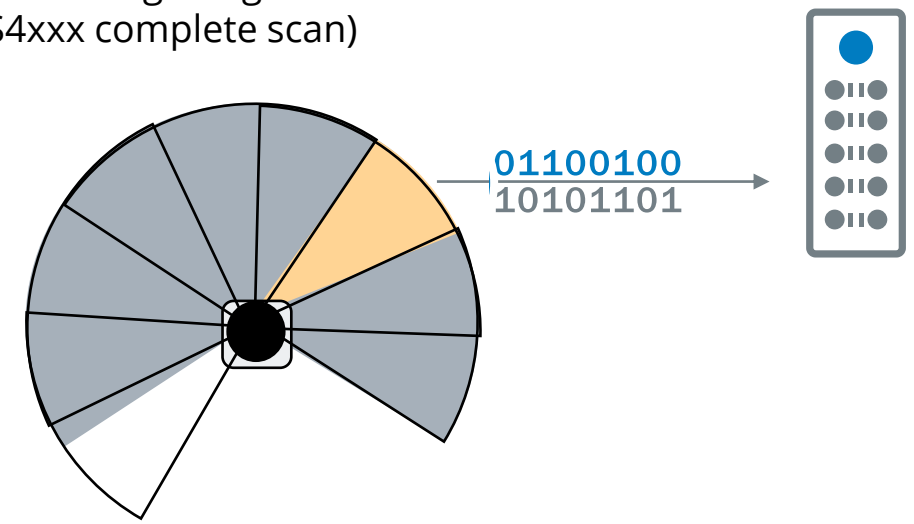
Transmit complete scan/frame



MSGPACK/Compact

Consist of several segment

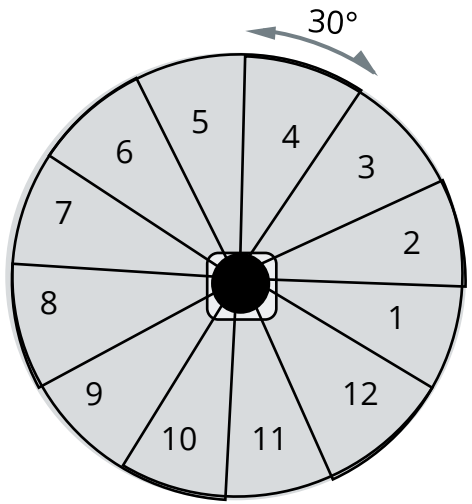
Transmit single segements
(LRS4xxx complete scan)



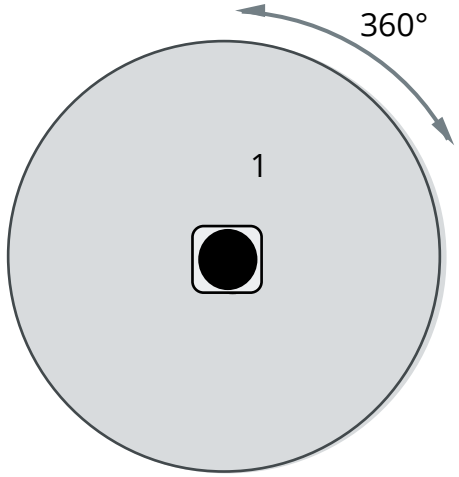
Transmission of complete scan causes a high latence at the beginning of a scan. MSG/Compact transmit each segment.

Dataformat

multiScan

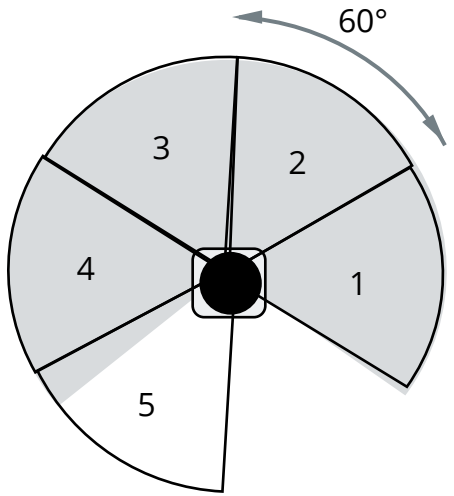


LRS4000

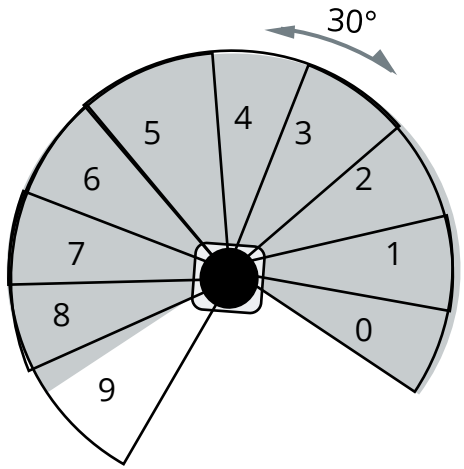


picoScan

60° segments ≥ 30 Hz

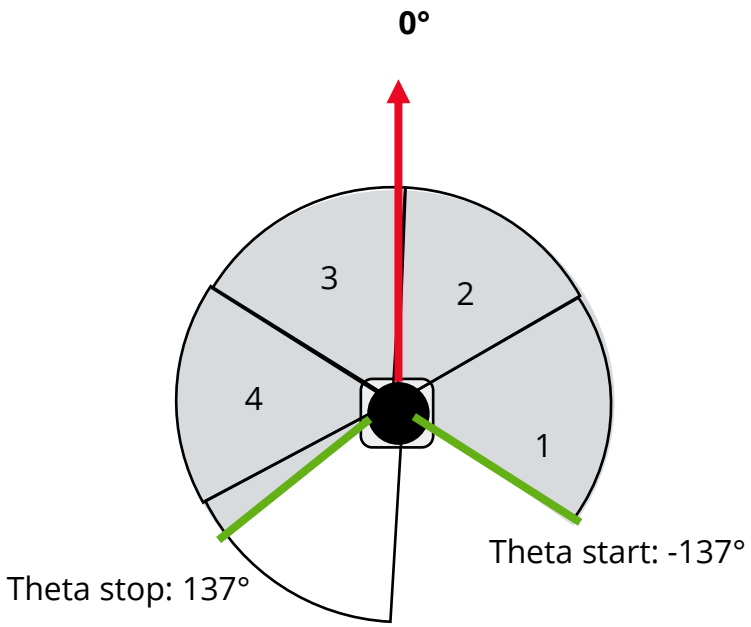


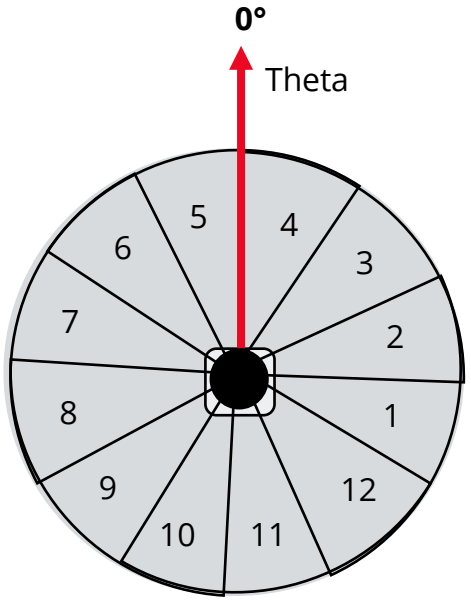
30° segements ≤ 25 Hz

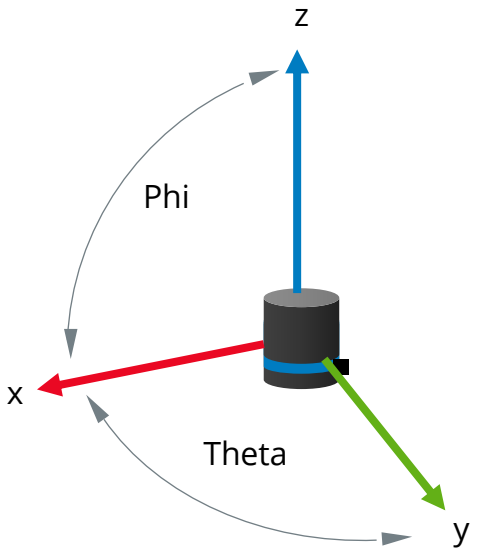


mulitScan segment size is always 30°. picoScan segement size depens on spinning frequence. Not every segement is complete filled with data .

Angle and orientation



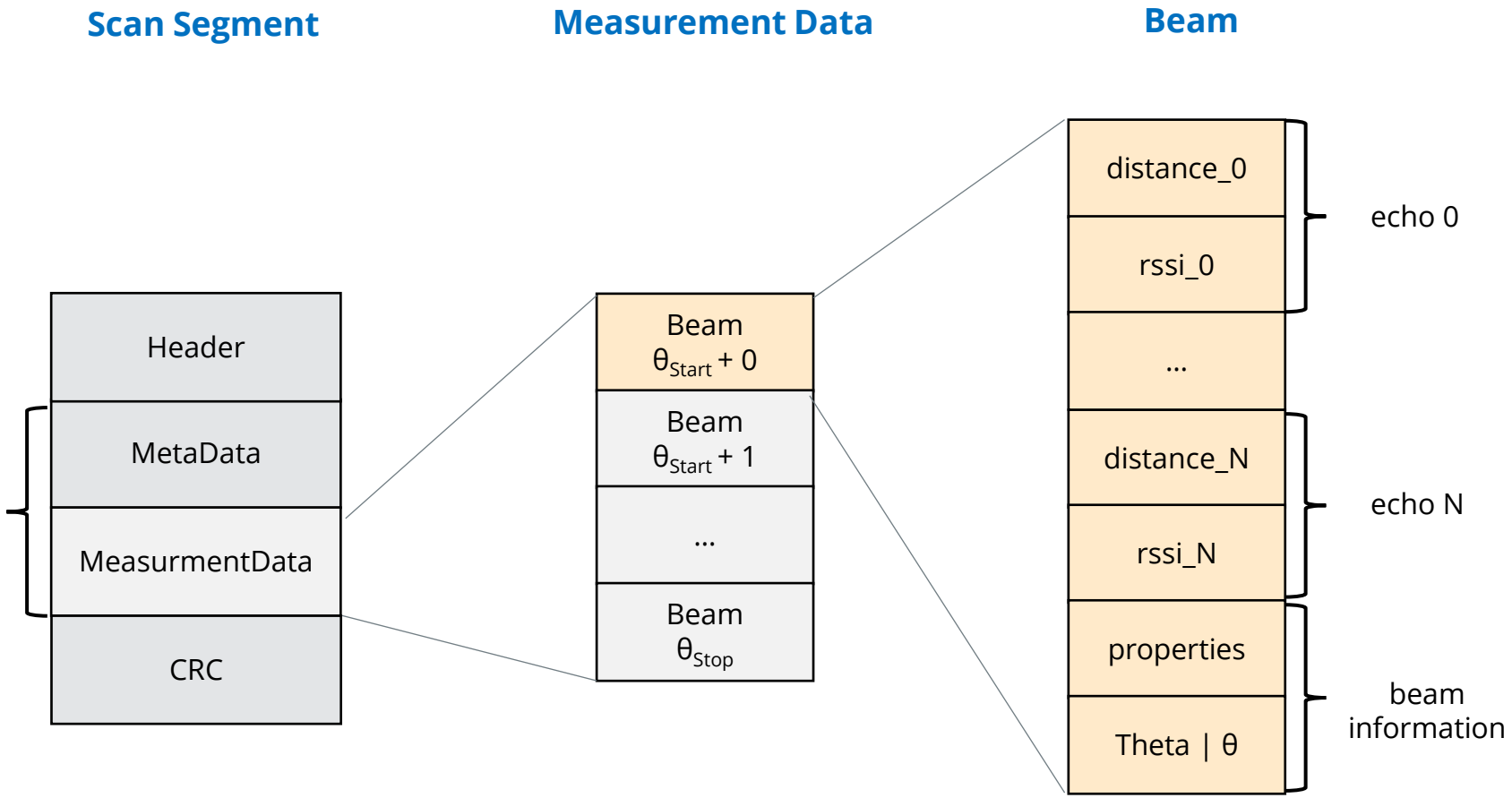




Work with Compact

MeasurementData picoScan 1/2

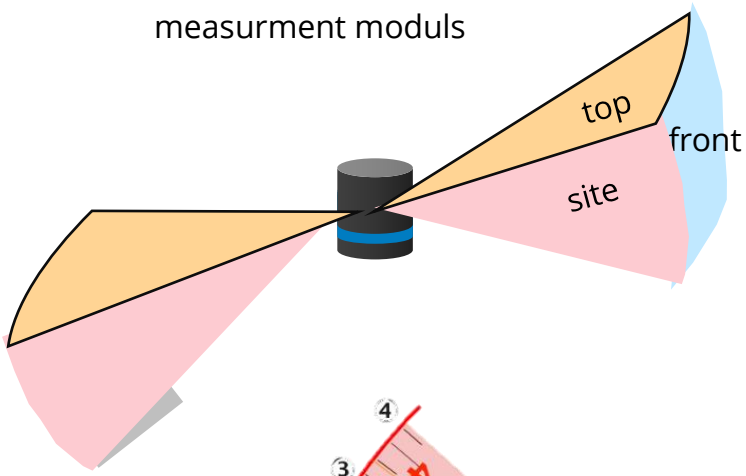
- picoScan has only a single Module on 0°

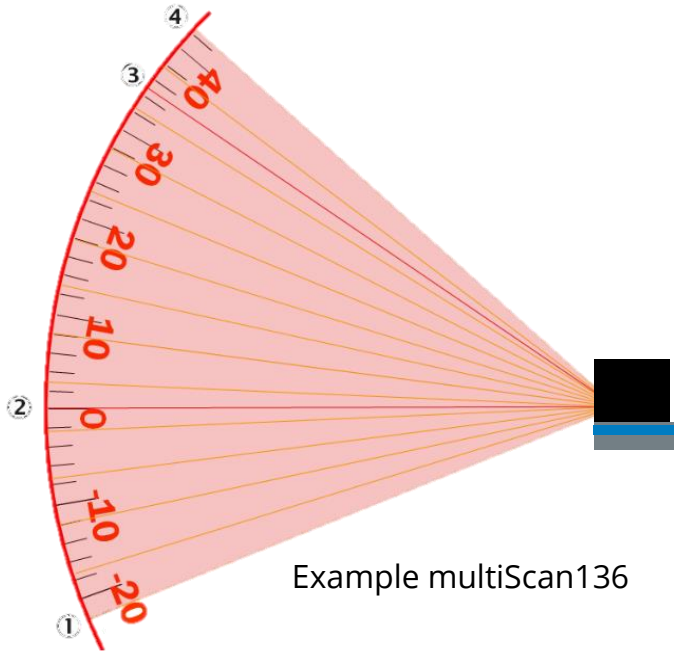


multiScan136

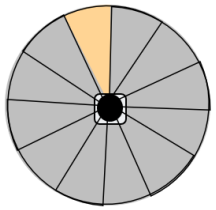
Multi layer LiDAR

Two hardware
measurment moduls



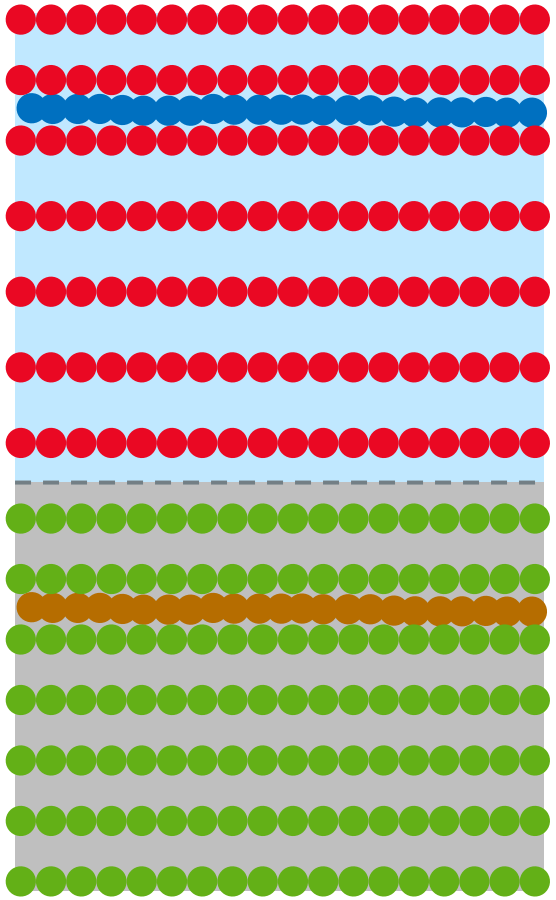


Example multiScan136



Top view

Front view



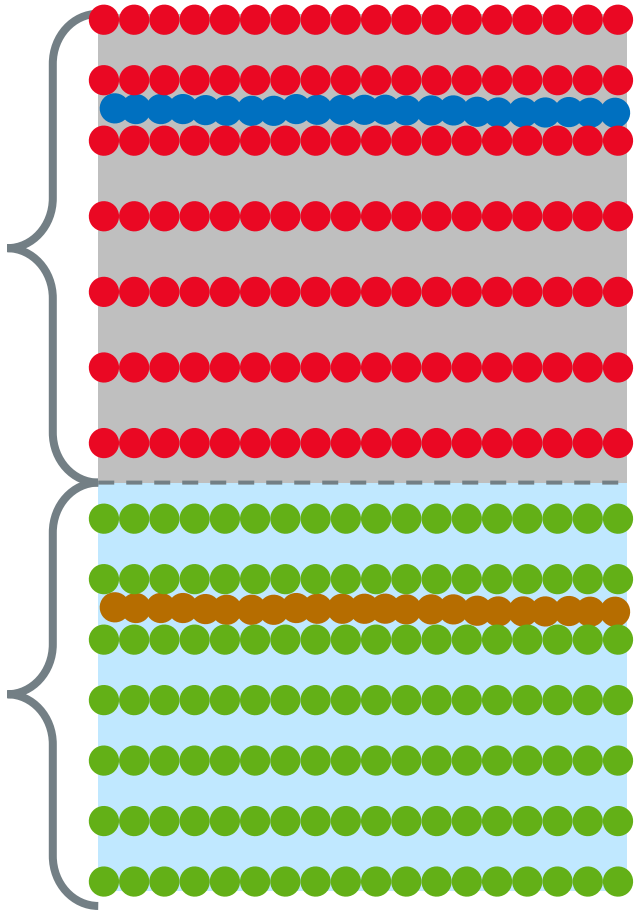
High resolution layer

High resolution layer

multiScan moduls

hardware measurement unit0

hardware measurment unit1

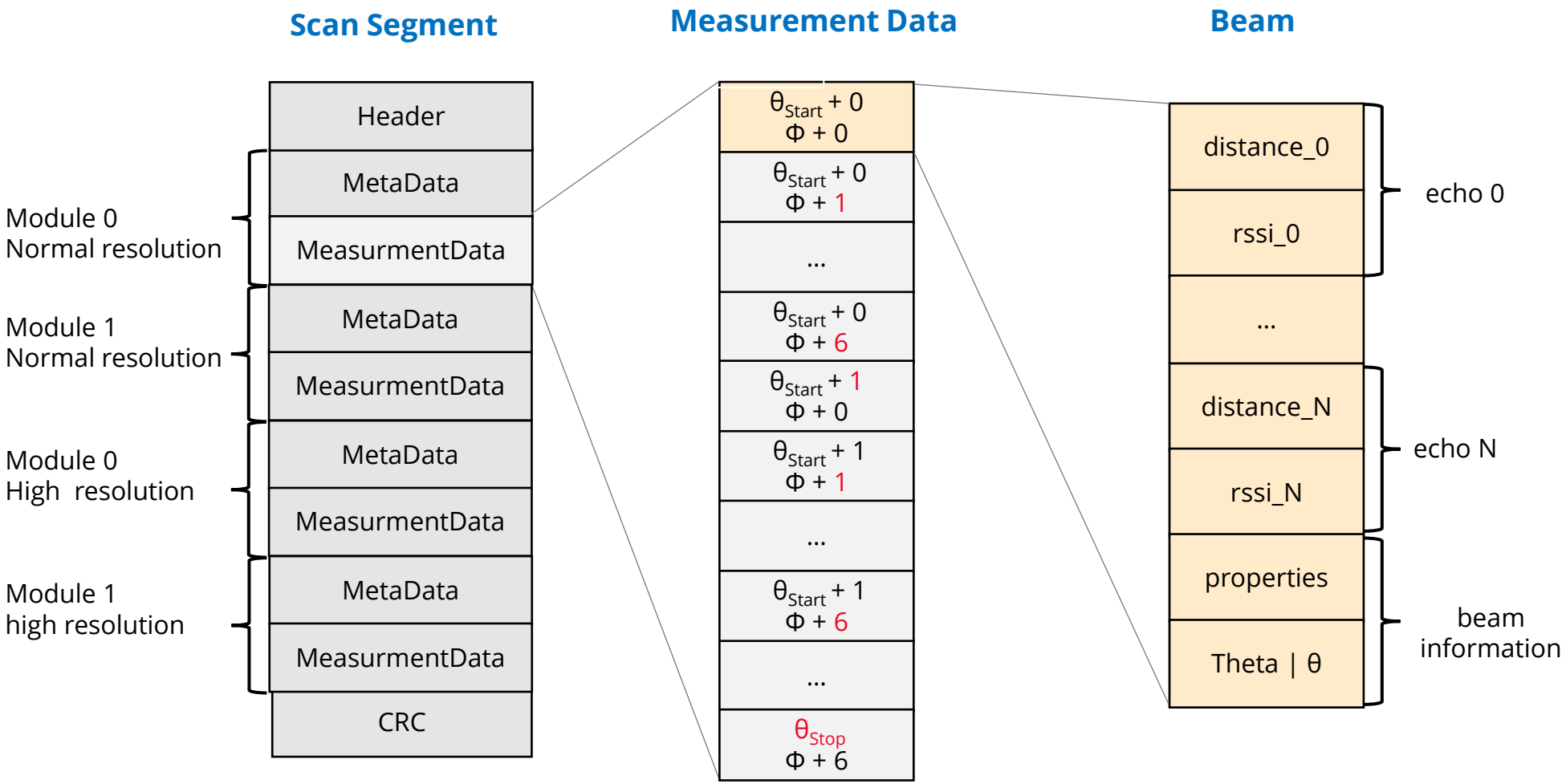


Data package

- **Header**
- Modul 0 normal resolution layer
- Modul 1 normal resolution layer
- Modul 0 High resolution layer
- Modul 1 High resolution layer
- **CRC**

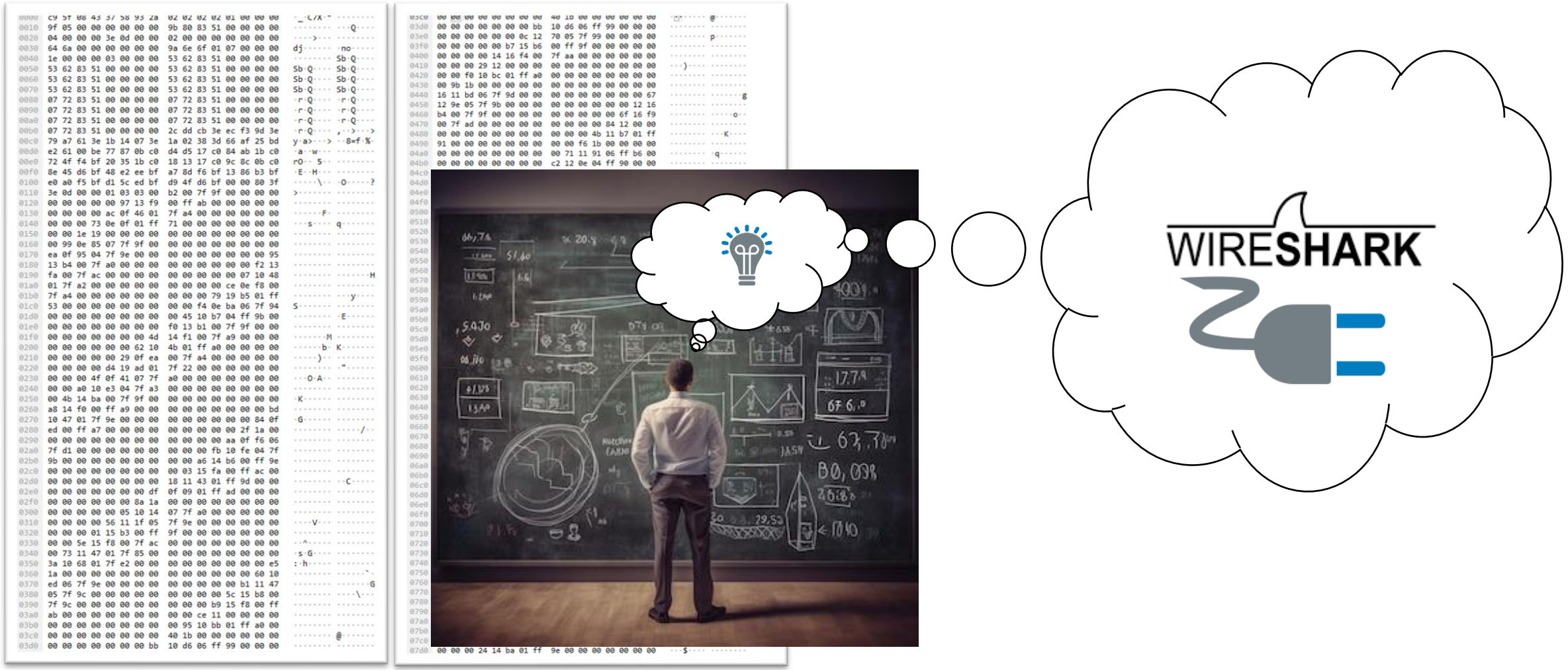
Work with Compact

MeasurementData multiScan 1/3



See chapter 5.1 & 5.3

Searching for the distance information

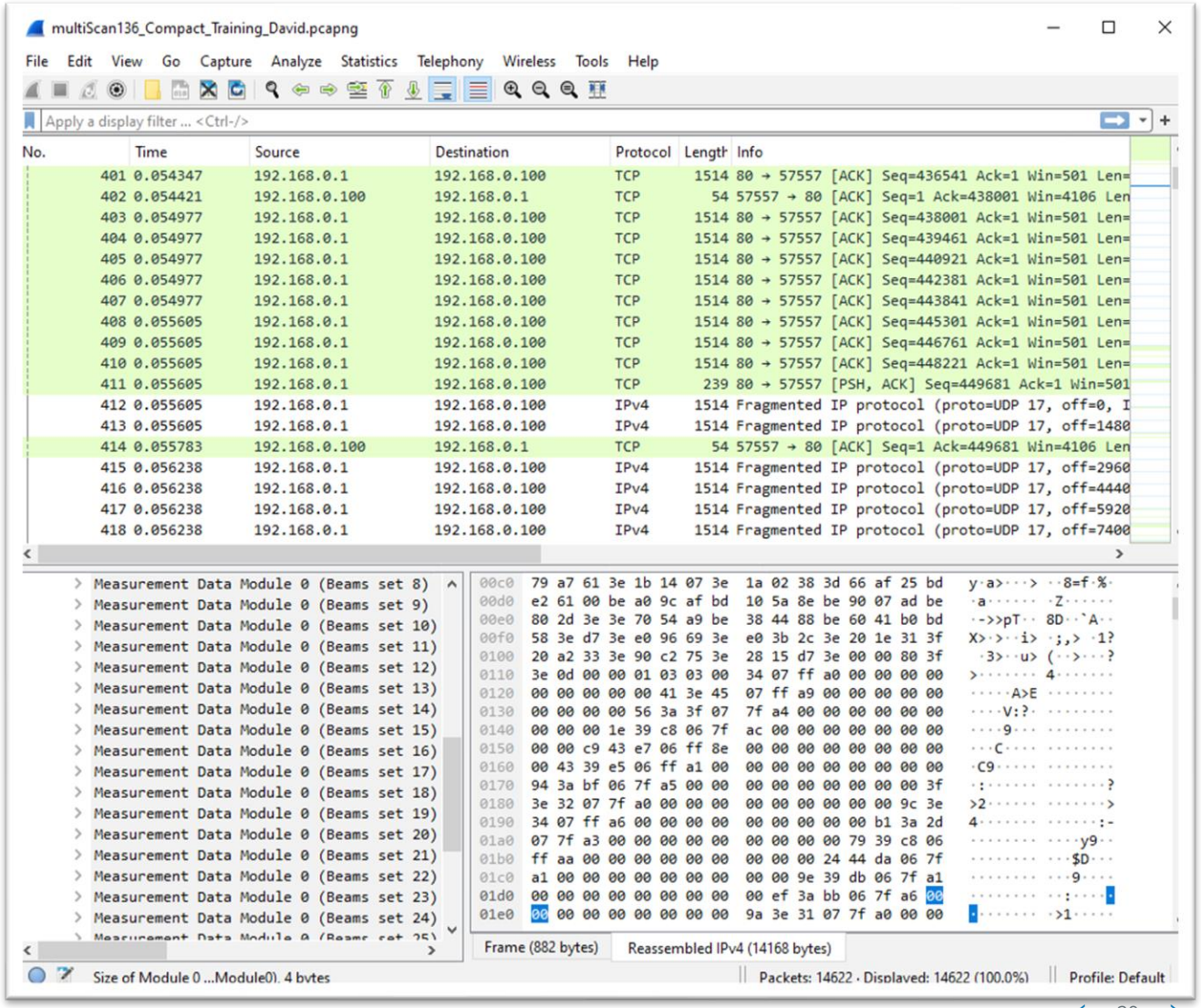


Compact & MSGPACK, Schwender, Kunkler, Waldkirch

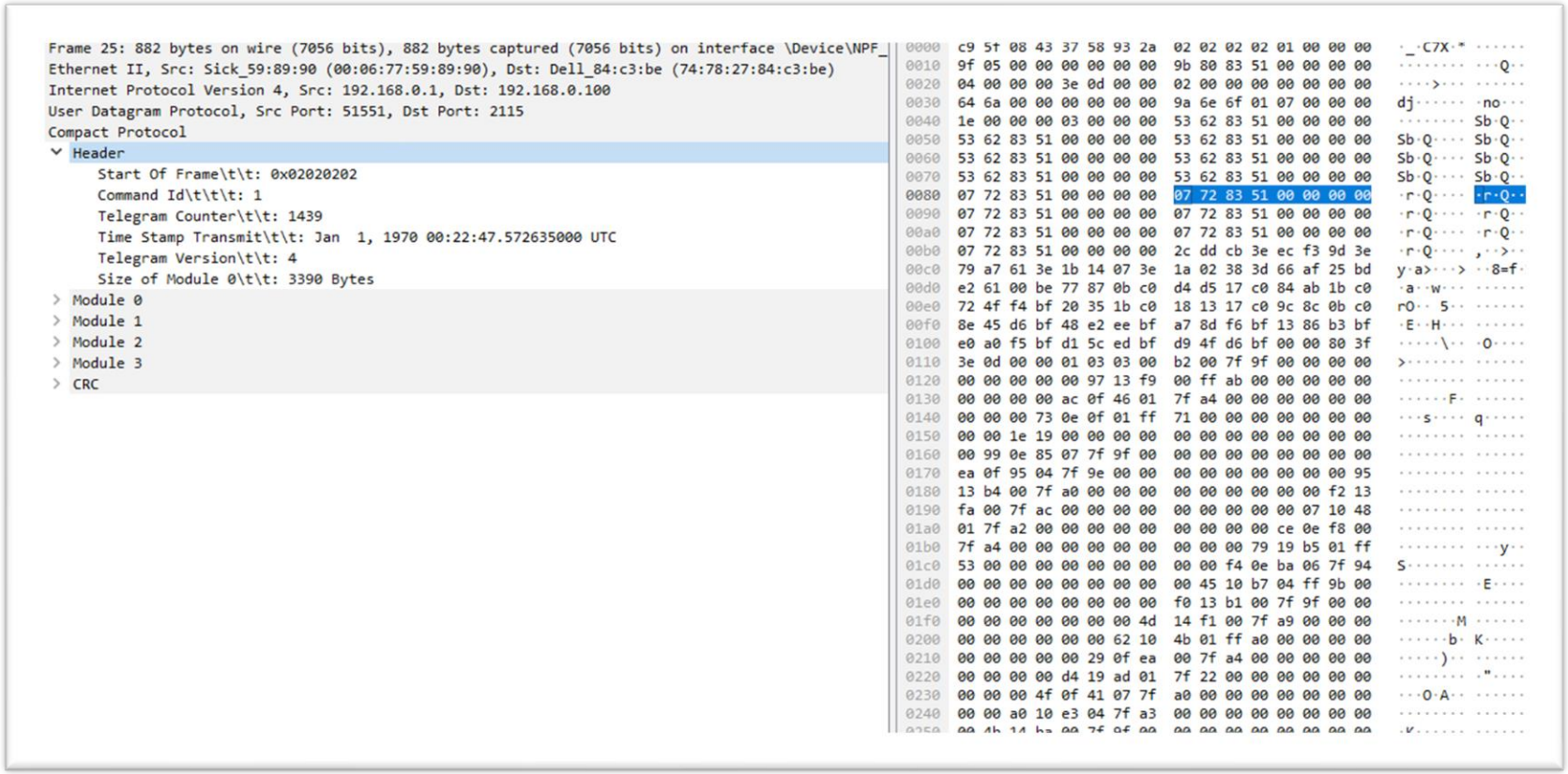
Wireshark

Whats that?

- Powerful package analysis tool
- Analysis of ethernet, bluetooth, usb, wifi traffic
- Graphical representation of data
- Well known
- SICK provides a COMPACT plug-in for easy understanding/error search



Wireshark Compact dissector

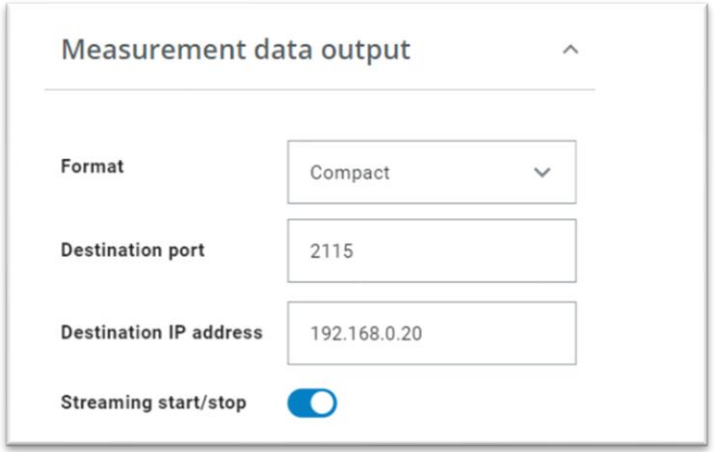


Split the package into the single information

Jump into wireshark

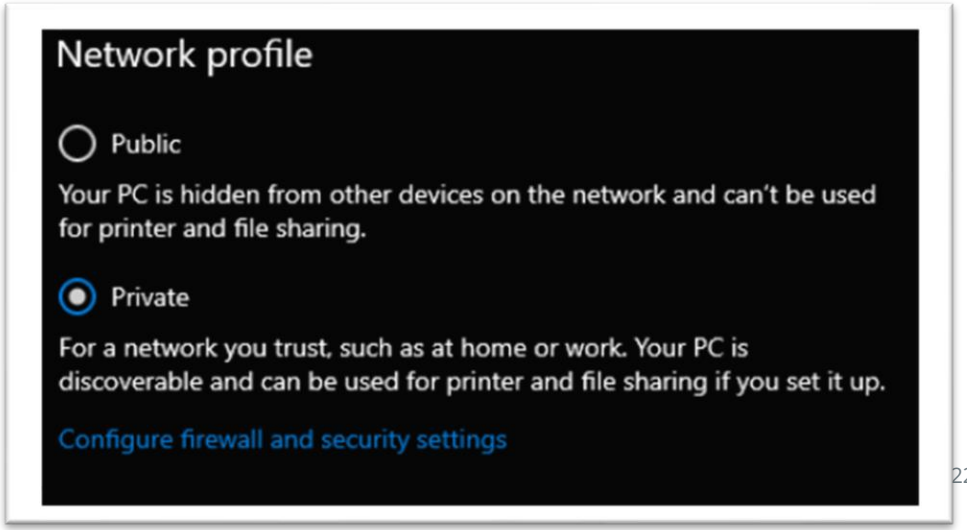
Sensor setup

1. Connect sensor to pc.
2. Open a browser and the IP address of the device.
3. Set up your device to output Compact format via UDP.
4. Change Destination IP address to the IP address of your pc.



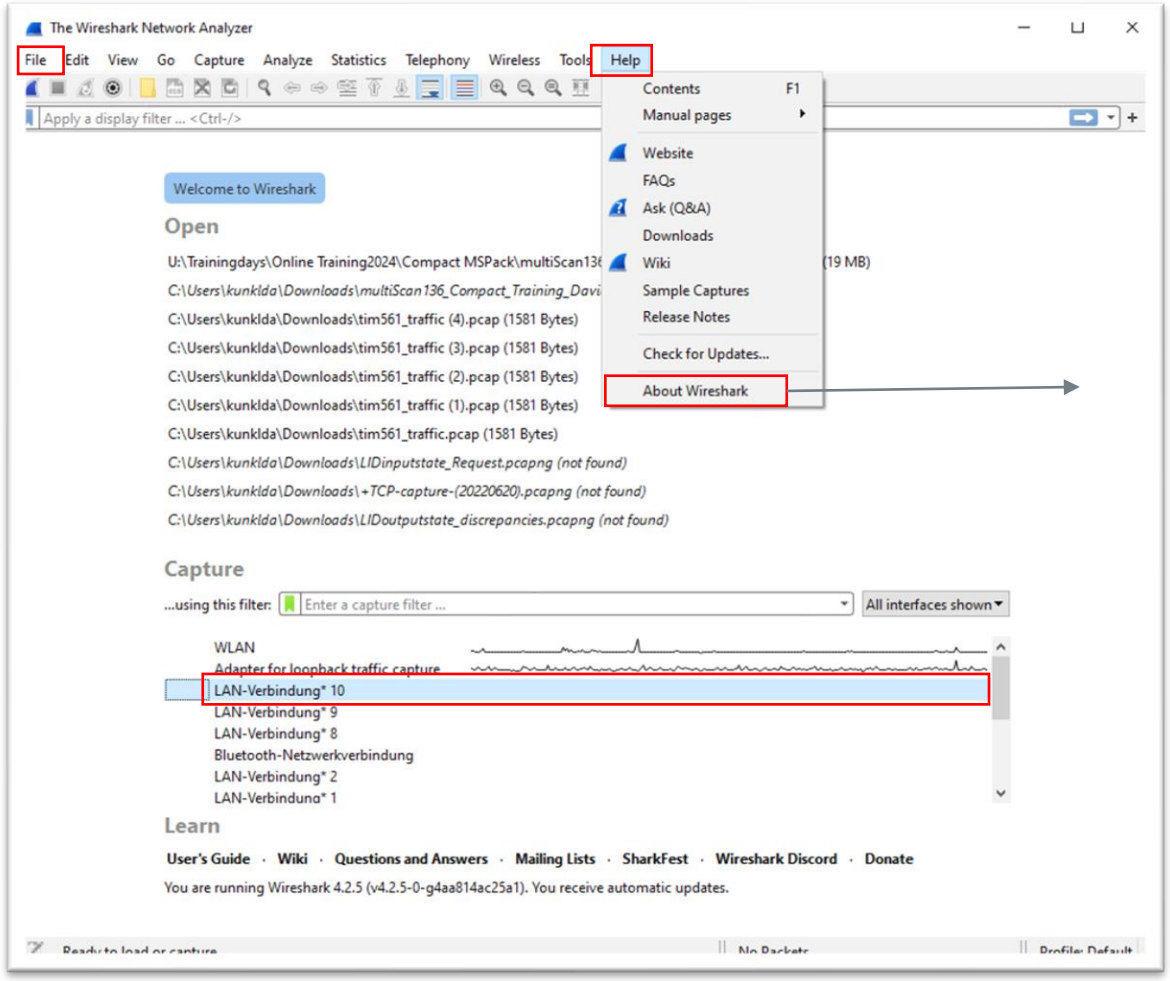
5. Make sure the ethernet settings of your PC are correct (network needs to be "private")

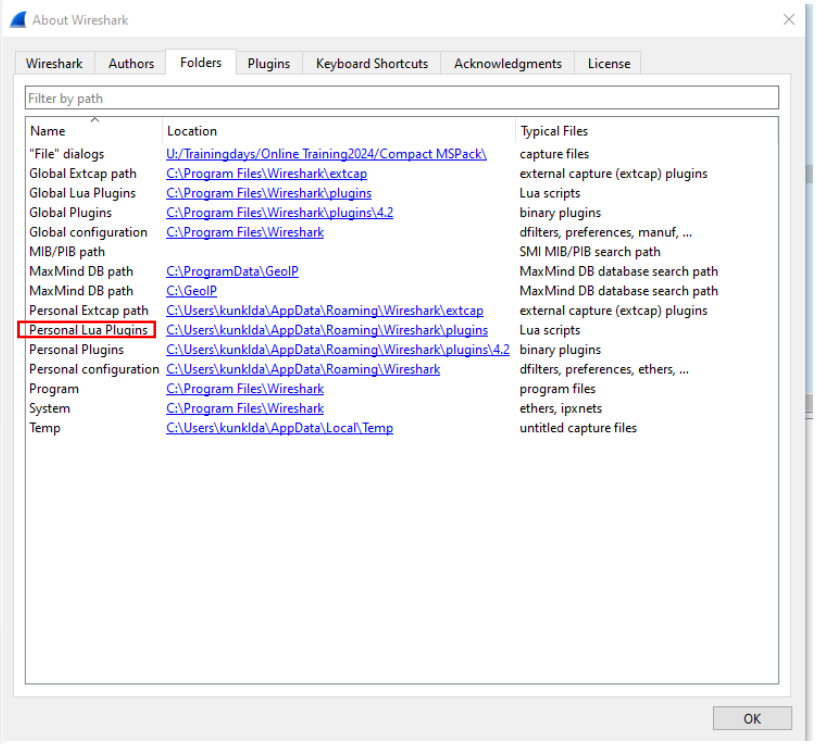
```
or with command line tool: 'get-NetConnectionProfile'

change ethernet connection
'Set-NetConnectionProfile -InterfaceIndex 18 -
NetworkCategory Private'
```



Some hints

Installing wirshark plug in



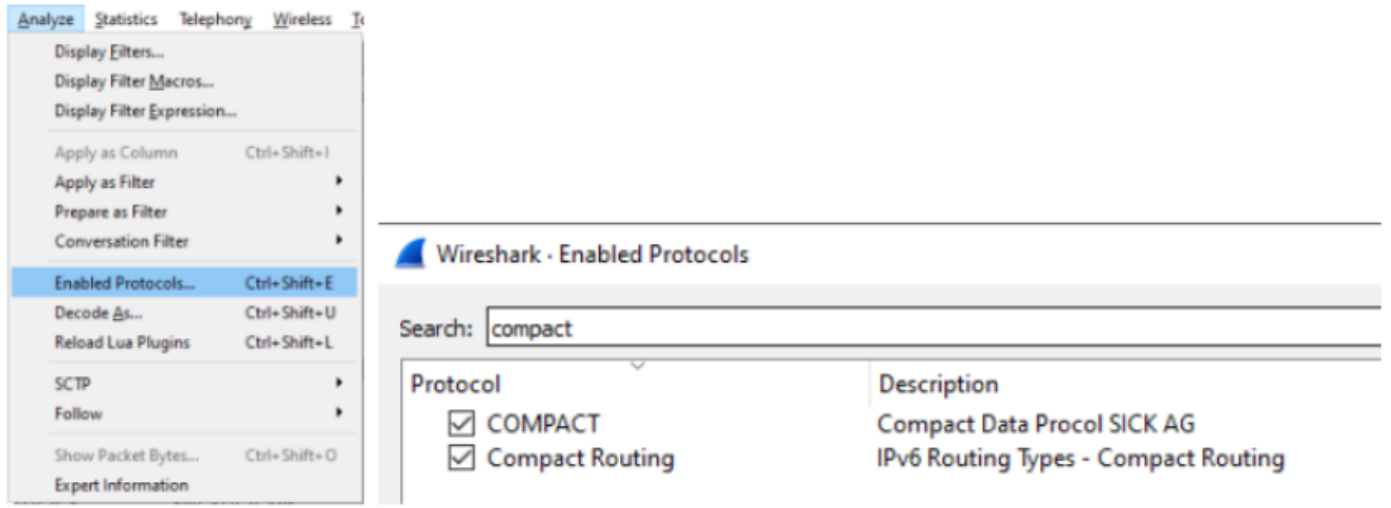


Enable plug in

- To disable the plugin use Analyze --> Enable Protocols --> uncheck

Enable/disable in GUI:

Analize→Enabled Protocols...



Hands on

TASK 1

- Installing wireshark https://www.wireshark.org/download.html
- Installing the COMPACT wirshark plug-in https://support.sick.com/sick-knowledgebase/article/?code=KA-08425
- With device: Open the device connection (just a couple of seconds)
  Without device: Open a .pcap file (see attachements)

Summary Compact

General

- Packed data with minimum overhead
- Easy to extract data from raw dumps
- Each Compact message **Header** and a **CRC**
- Depending on the device, a Segment may have more than one **Module**
- **MetaData** contain general information about the angle, time size and echos of the Segment
- **MeasurementData** contain the measured distance and RSSI value per echo plus properties and the theta value of the Beam