

# CE205 Data Structures

## Week-1

Course Plan and Communication, Course Plan and Communication, Introduction to Linear & Non-Linear Data Structure and Performance Analysis, Implementing Pointer and Objects for Data and Variables Basic of ASN.1 / BER TLV / PER TLV

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## Outline

- Data States
- Data Structure Metrics
- Data Mapping
- Data Structure Selection
- Data Structure References
- Industrial Data Standards (ASN.1,BER-TLV,etc.)
- Trends (Open API, 5G Systems etc.)

# Introduction to Data Structures



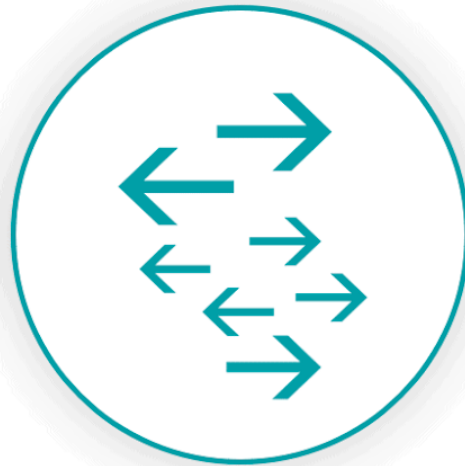
## Data States

### THE THREE STATES OF DATA

AT REST



IN TRANSIT



IN USE



## Data States

### Data-in-use

- [Data in use - Wikipedia](#)

### Data-in-transit

- [Data in transit - Wikipedia](#)

### Data-at-rest

- [Data at rest - Wikipedia](#)

## Data Structure Metrics

### Performance Analysis

- [Data Structures Tutorials - Performance Analysis with examples](#)

### Space Complexity

- [Data Structures Tutorials - Space Complexity with examples](#)

### Time Complexity

- [Data Structures Tutorials - Time Complexity with examples](#)

# Data Mapping

## Data and Variables

- C++ Data Types

## Data Structure Selection

### Linear & Non-Linear Data Structures

- [Data Structures Tutorials - Linear and Non-linear types](#)
- [Data Structure and Types](#)



## Data Structure References

### Implementing Pointer and Objects

- Check [CS50 Pointer Notes](#)
- [Week 0 - CS50](#)

## Industrial Data Standards

- ASN.1 / BER TLV / PER TLV
  - <http://lionet.info/asn1c/download.html>
  - GitHub - ucoruh/asn1c-wsl-sample: ASN.1 C WSL and Windows Execution, Debugging and Code Generation Sample
  - Open Source ASN.1 Compiler: asn1c 0.9.28

## Industrial Data Standards - Telco

- Sample Standard for ASN.1 Usage
  - [https://www.etsi.org/deliver/etsi\\_ts/125400\\_125499/125413/04.09.00\\_60/ts\\_125413v040900p.pdf](https://www.etsi.org/deliver/etsi_ts/125400_125499/125413/04.09.00_60/ts_125413v040900p.pdf)

## Industrial Data Standards - Payment

- Payment BER TLV Parser Sample
  - [TLV Utilities](#)
  - <https://paymentcardtools.com/>

## Industrial Data Standards - Telco

### ASN.1 Standartları

- ETSI
  - <https://portal.etsi.org/Services/Centre-for-Testing-Interoperability/ETSI-Approach/Specification-Languages/ASN1>
- ITU-T
  - <https://www.itu.int/ITU-T/recommendations/fl.aspx?lang=1>
- ASN.1 Book
  - <https://www.oss.com/asn1/resources/books-whitepapers-pubs/dubuisson-asn1-book.PDF>

## Network Measurement Results Data

- NMR
  - [https://www.etsi.org/deliver/etsi\\_ts/101500\\_101599/101503/08.27.00\\_60/ts\\_101503v082700p.pdf](https://www.etsi.org/deliver/etsi_ts/101500_101599/101503/08.27.00_60/ts_101503v082700p.pdf)
- GSM API
  - [https://www.etsi.org/deliver/etsi\\_ts/101400\\_101499/101476/08.04.01\\_60/ts\\_101476v080401p.pdf](https://www.etsi.org/deliver/etsi_ts/101400_101499/101476/08.04.01_60/ts_101476v080401p.pdf)
- UTRAN
  - [https://www.etsi.org/deliver/etsi\\_ts/125300\\_125399/125331/13.01.00\\_60/ts\\_125331v130100p.pdf](https://www.etsi.org/deliver/etsi_ts/125300_125399/125331/13.01.00_60/ts_125331v130100p.pdf)
- E-UTRAN
  - [https://www.etsi.org/deliver/etsi\\_ts/136300\\_136399/136331/15.03.00\\_60/ts\\_136331v150300p.pdf](https://www.etsi.org/deliver/etsi_ts/136300_136399/136331/15.03.00_60/ts_136331v150300p.pdf)

## Open Source 5G Projects

- <https://open5gs.org/>
- [5g nr development and setup](#) · [Wiki](#) · [oai / openairinterface5G](#) · [GitLab](#)

## OPEN API

- Open API Generator
  - <https://openapi-generator.tech/>
- Open API Yaml Configurations
  - [GitHub - jdegre/5GC\\_APIs: RESTful APIs of main Network Functions in the 3GPP 5G Core Network](#)
- Open API AUSF Yaml Configuration
  - [https://www.etsi.org/deliver/etsi\\_TS/129500\\_129599/129509/17.06.00\\_60/ts\\_129509v170600p.pdf](https://www.etsi.org/deliver/etsi_TS/129500_129599/129509/17.06.00_60/ts_129509v170600p.pdf)
  - [https://www.etsi.org/deliver/etsi\\_TS/129500\\_129599/129509/17.06.00\\_60/ts\\_129509v170600p0.zip](https://www.etsi.org/deliver/etsi_TS/129500_129599/129509/17.06.00_60/ts_129509v170600p0.zip)



*End – Of – Week – 1*