ITU's work on ML for 5G

IETF 106, Singapore

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https://extranet.itu.int/sites/itu-t/focusgroups/ML5G/SitePages/Home.aspx

Topics

- Background
- Update of work items in ITU
- Network AI challenge
- Students projects

Current status of ITU's work on ML for 5G

- Work items finished:
  - Machine learning in future networks including IMT-2020: use cases (Supplement 55 to Y.3170-series) – Approved.
  - Architecture framework for integration of ML in future networks including 5G (Y.3172) – Published.
  - Framework for data handling to enable machine learning in future networks including IMT-2020 (Y.3174) – in ITU approval process.
  - Framework for evaluating intelligence level of future networks including IMT-2020 (Y.3173) – in ITU approval process.

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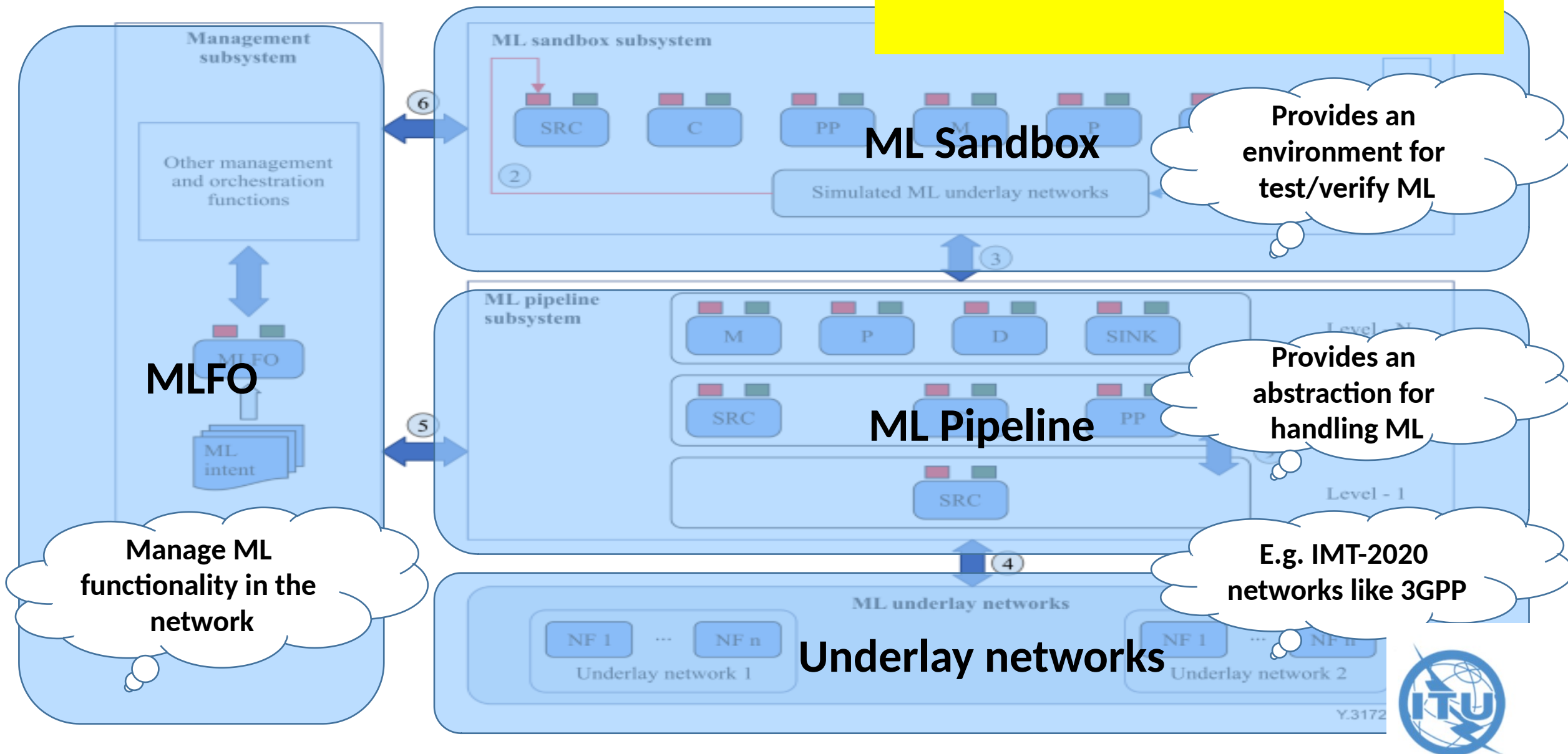Accessible via ITU-T member account
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Architecture framework

ML Sandbox

MLFO

ML Pipeline

Underlay networks

Provides an environment for test/verify ML

Provides an abstraction for handling ML

Manage ML functionality in the network

E.g. IMT-2020 networks like 3GPP

Current status of ITU's work on ML for 5G

- Work items in progress:
  - Optimization and deployment framework for ML models in future networks including IMT-2020 (ML5G-I-171R2)
  - ML marketplace integration in future networks including IMT-2020 (ML5G-I-167R5)
  - Requirements, architecture and design for machine learning function orchestrator (ML5G-I-172R2)

Liaisons + collaborations

1. MPEG (on model compression)
2. Linux Foundation for AI (on model optimization)
3. ETSI ENI (on Intelligence level)
4. ETSI ZSM
5. ORAN (on ML model metadata)
6. 3GPP

LS are published in ML5G website

And you!!

https://extranet.itu.int/sites/itu-t/focusgroups/ML5G/SitePages/Home.aspx
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- **Next meeting in March 2020**
- **Weekly conference calls of FG ML5G take place on Wednesdays**
- **Participation in FG-ML5G is free of charge and open to all.**

AI Challenge

- Global AI challenge with various partner organizations.

- Propose to use data sets and models from:
https://extranet.itu.int/sites/itu-t/focusgroups/ML5G/input/ML5G-I-184.zip

- Use cases and architecture may be used from ITU-T.
- Potential partnership with ITU-T for AI challenge

- Details are being worked out. Will share more details later via an ITU FG sharepoint link, accessible via guest account.

Student projects: PoCs

ITU is offering guidance to uni students for doing relevant projects.
List of projects is described in ITU-T FG ML5G-I-174

How to join:

fgml5g-students@lists.itu.int

- 15-20 students actively contributing at any point of time
- Across 4-5 countries

References

[1] Supplement 55 to Y.3170-series: Y.ML-IMT2020-Use-Cases "Machine learning in future networks including IMT-2020: use cases" (older version: ML5G-I-153-R1)

[2] ITU-T Y.3172 (Published as https://www.itu.int/rec/T-REC-Y.3172/en)

[3] ITU-T Y.3173 (older version: ML5G-I-151-R5)

[4] ITU-T Y.3174 (older version: ML5G-I-148-R3)

[5] ML5G-I-167R5

[6] ML5G-I-171R2

[7] ML5G-I-172R2

[8] ML5G-I-174

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Thank you!

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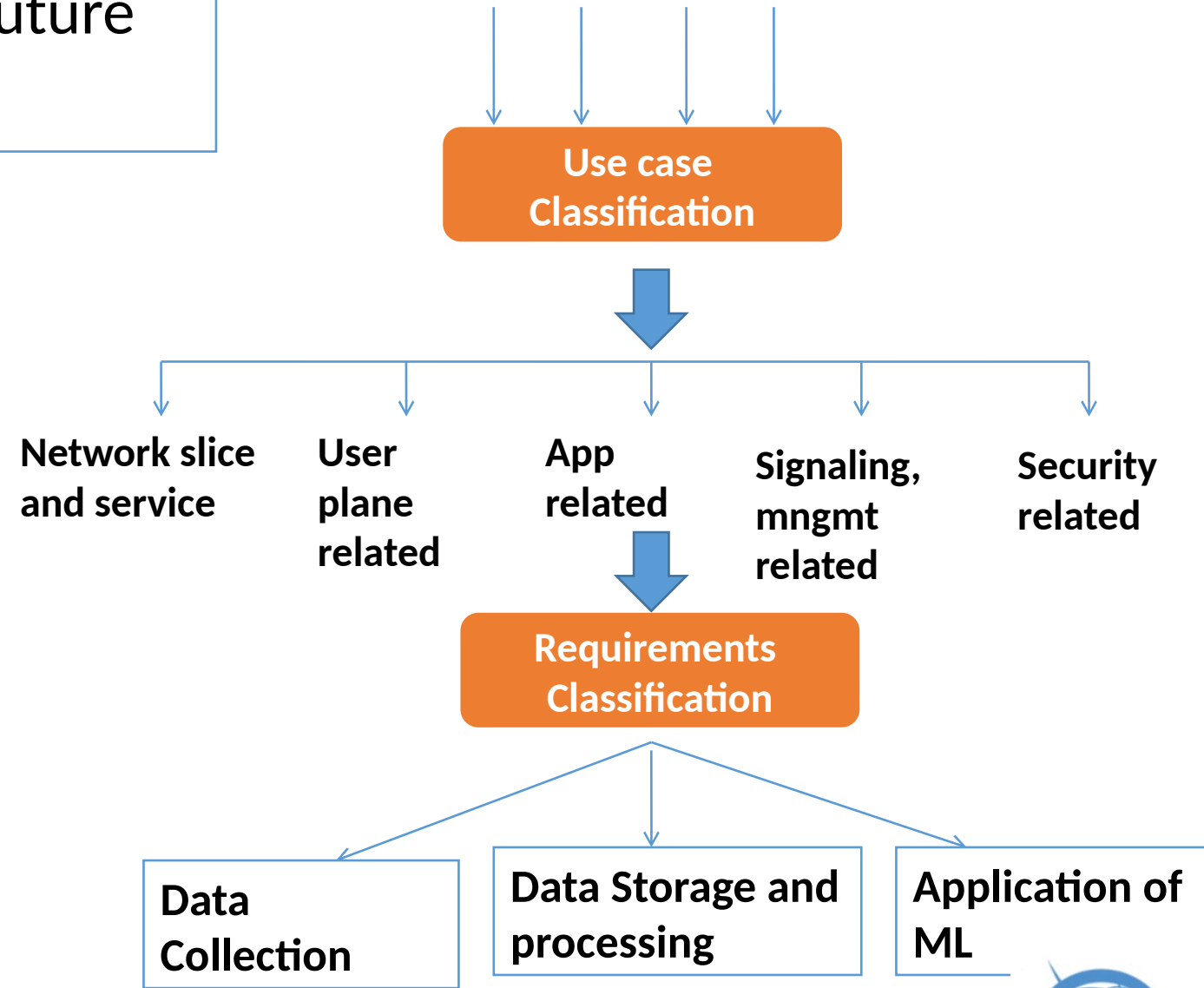# BACKUP

Use cases for ML in IMT-2020 and future networks

- More than 30 use cases submitted to the FG

- Requirements were analyzed for each, reviewed and compiled.

- Requirements are classified as "critical", "expected" and "added value".
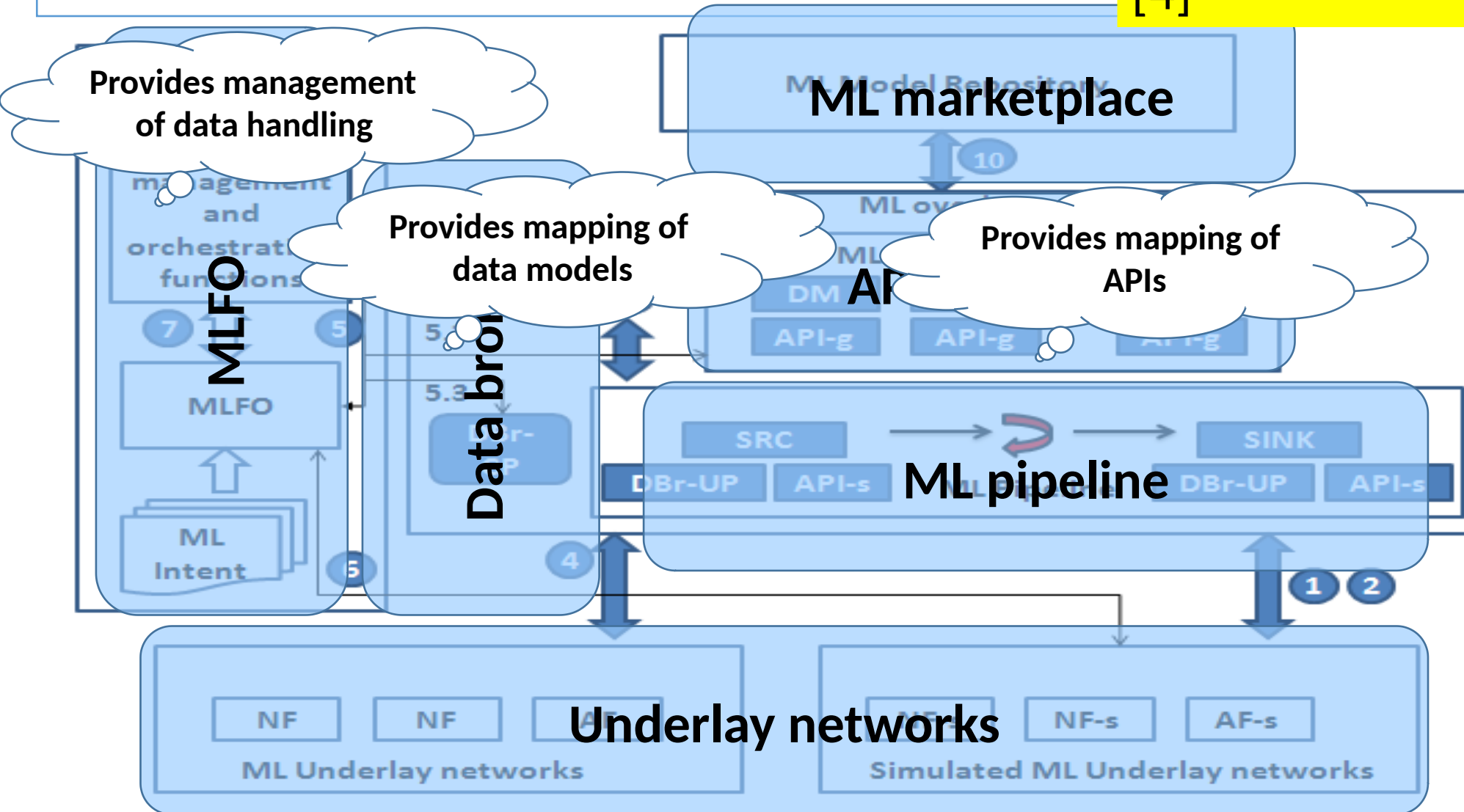
Approved by SG13 as supplement [1]

Data handling framework

Provides management of data handling

Provides mapping of data models

Provides mapping of APIs

ML marketplace

ML Model Repository

MLFO

management and orchestration functions

MLFO

ML Intent

Data broker

DBr-UP

AF

DM

API-g   API-g   API-g

ML pipeline

SRC   →   ↺   →   SINK

DBr-UP   API-s   DBr-UP   API-s

Underlay networks

NF   NF   AF-s   NF-s   AF-s

ML Underlay networks   Simulated ML Underlay networks

ML Marketplace integration

Provides Model selection and management

Provides Model search, update, and metadata

Provides Model training and optimization

ML Marketplace

MLFO

management and orchestration functions

MLFO

ML Intent

7

11

6

ML Sandbox

ML sandbox subsystem

5

3

ML pipeline

ML pipeline subsystem

14

4

Underlay networks

ML underlay networks

MLFO

NFVO

Consented by SG13 as Y.3173 [3]

ML Intent

Intelligence level evaluation

1. Parse and decide the ML functions for this ML use case

2. Parse NSD and instantiate NS (using existing methods)

Intent based creation of ML pipeline

3. Instantiate ML functions

4. Instantiate ML functions

5. Parse and decide monitoring requirements as defined in the ML intent

Monitoring of ML pipeline
Based on the dimensions

6. Monitoring configuration

7. Monitoring report [Data collection]

8. Monitoring report [Analysis]
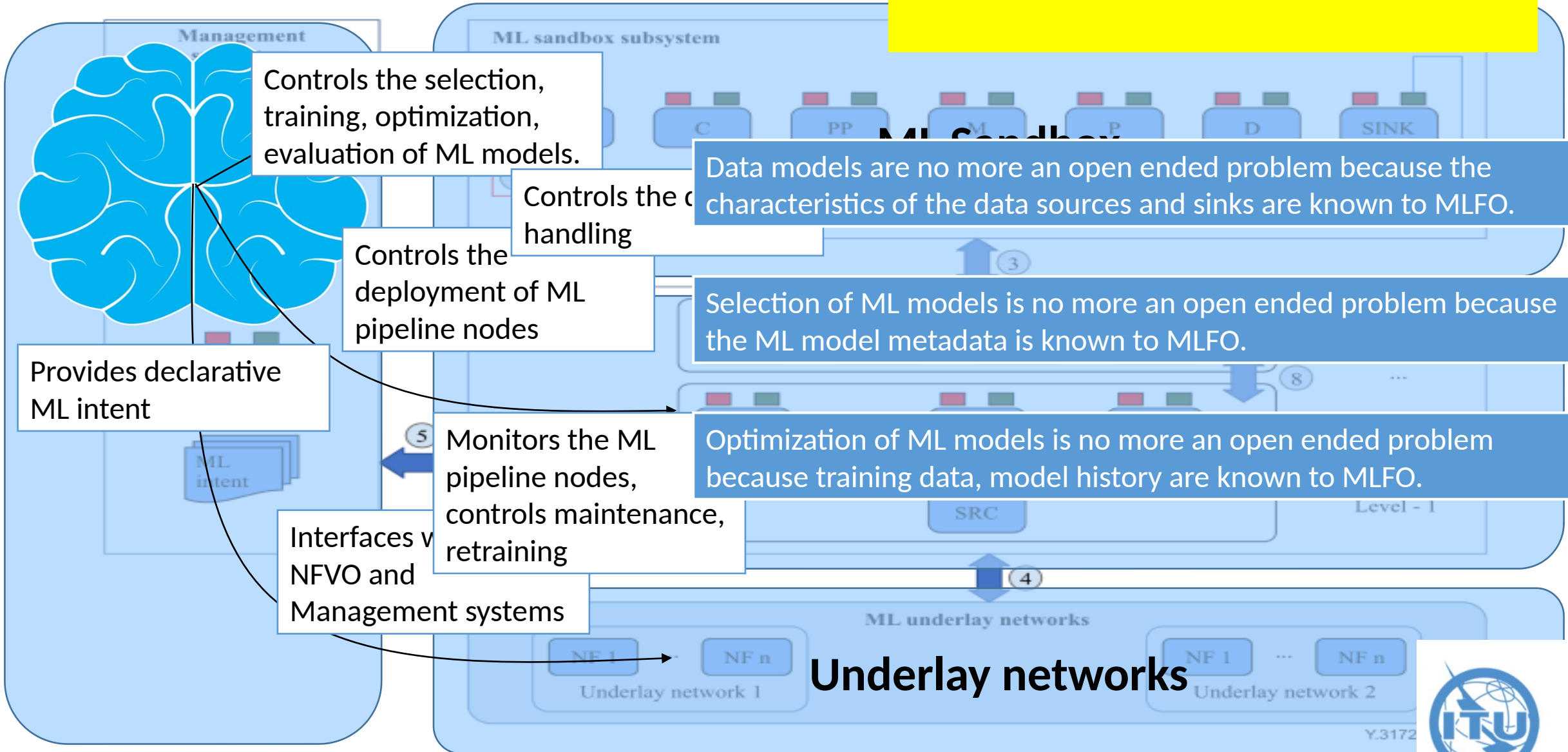
9. Monitoring report [Action implementation]

10. Measure intelligence level

Intelligence capability level

MLFO

ML5G-I-172 (in progress) [7]

Management

ML sandbox subsystem

Controls the selection, training, optimization, evaluation of ML models.

Controls the data handling

Data models are no more an open ended problem because the characteristics of the data sources and sinks are known to MLFO.

Controls the deployment of ML pipeline nodes

Selection of ML models is no more an open ended problem because the ML model metadata is known to MLFO.

Provides declarative ML intent

Monitors the ML pipeline nodes, controls maintenance, retraining

Optimization of ML models is no more an open ended problem because training data, model history are known to MLFO.

Interfaces with NFVO and Management systems

ML Sandbox

Underlay networks

C   PP   P   D   SINK

SRC

ML underlay networks

Level - 1

NF 1   NF n
Underlay network 1

NF 1   NF n
Underlay network 2

Y.3172

ITU