



# New Emerging 5G Testing Trends Driving to ITU-T P.1402

Prepared by Dr. Irina Cotanis, Technology Director, Office of the CTO

ITU-T QSDG Workshop  
Amman, Jordan – 17,18 Oct 2022

**infovista**

**KNOW YOUR NETWORK™**

# Agenda

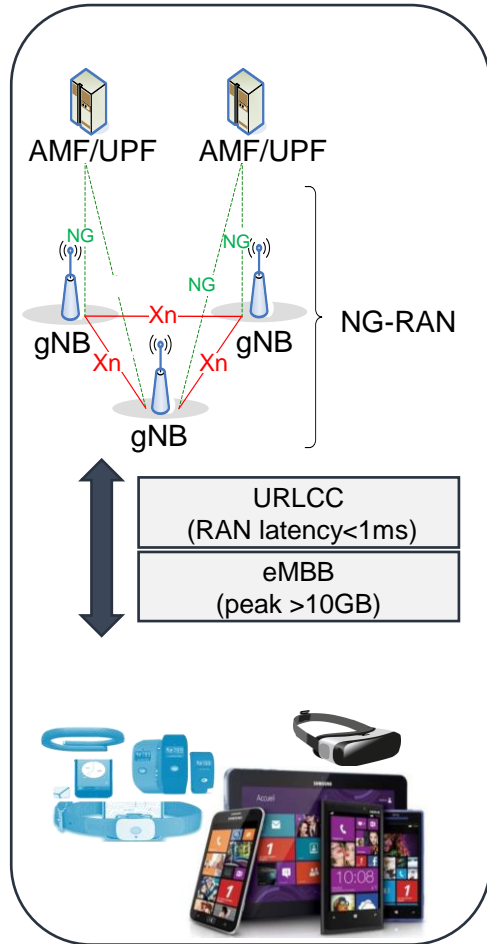
- A glance at 5G testing challenges
- New emerging 5G testing trends
- 5G testing driving to ITU-T P.1402
- Take away



# A glance at 5G testing challenges



# 5G networks enables user centric services' evolution.....



### Gaming/VR/AR/XR services

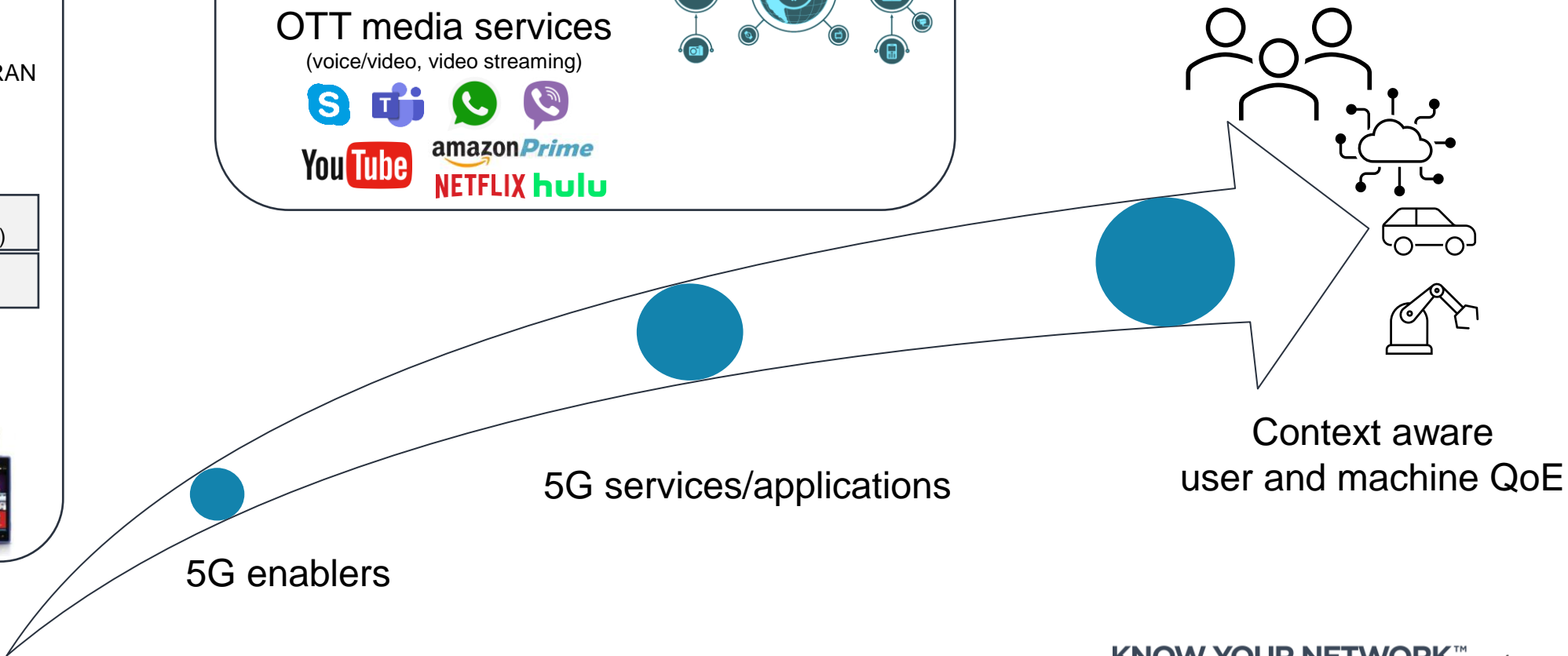
Video/Audio, Interactivity

### IoT verticals

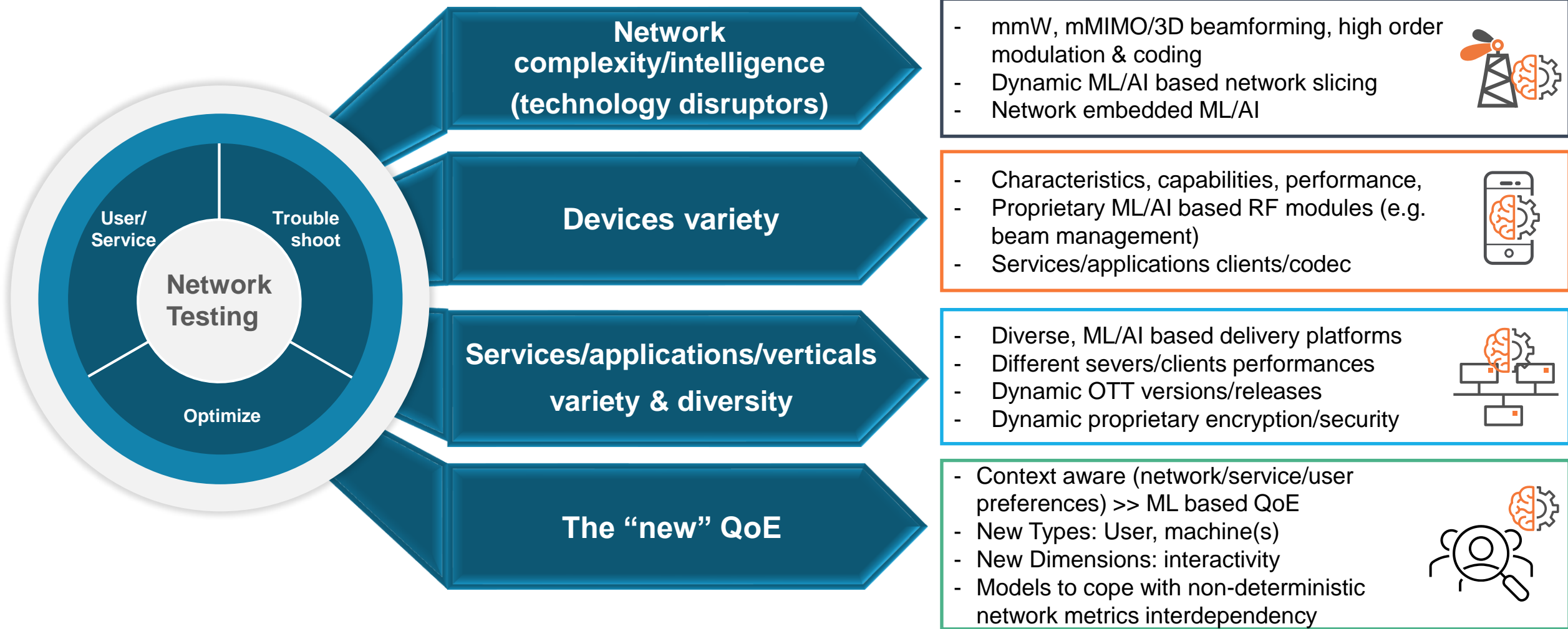
### OTT media services

(voice/video, video streaming)

**You Tube** **amazonPrime**  
**NETFLIX** **hulu**



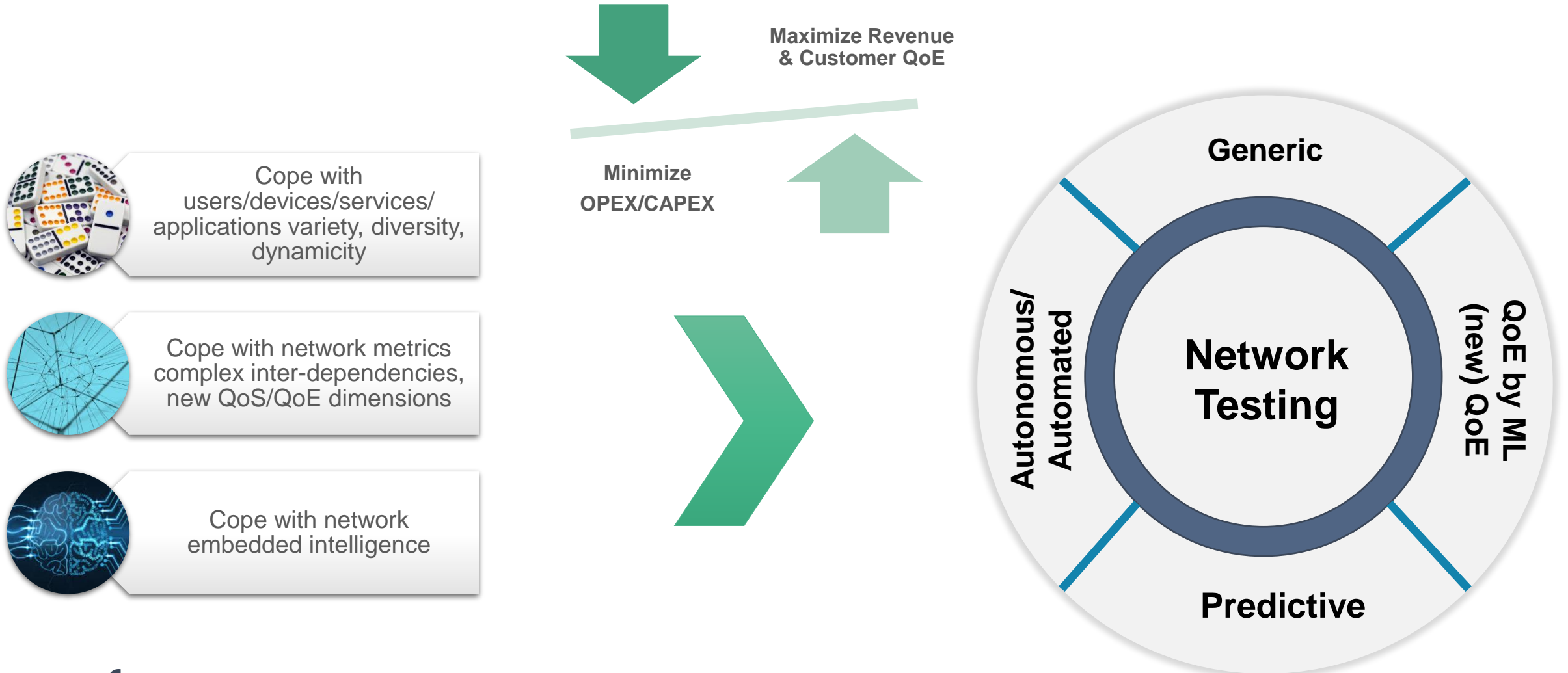
...with significant impact on network testing



# New emerging 5G testing trends



# 5G testing requirements and their derived trends





# Pillars of Generic 5G testing

**WHY  
(SCOPE)**

## OTT voice/video clients (gOTT)

Benchmark reference for OTT voice/video services performance  
(one app, one version, one device, one set of KPIs, fully controllable)

ML based jitter buffer modeling

ITU-T P.565, 565.1/sQLEAR,  
ETSI STQ 00236

## Generic service traffic patterns

Simulation of service patterns (OTT media, XR) using an “adaptive” TWAMP server & device based client

Automated traffic patterns identification  
ML based network sensing  
ML based QoE dimensions

ITU-T SG 12 WI – Questions 17/14

## Generic framework for OTT apps testing

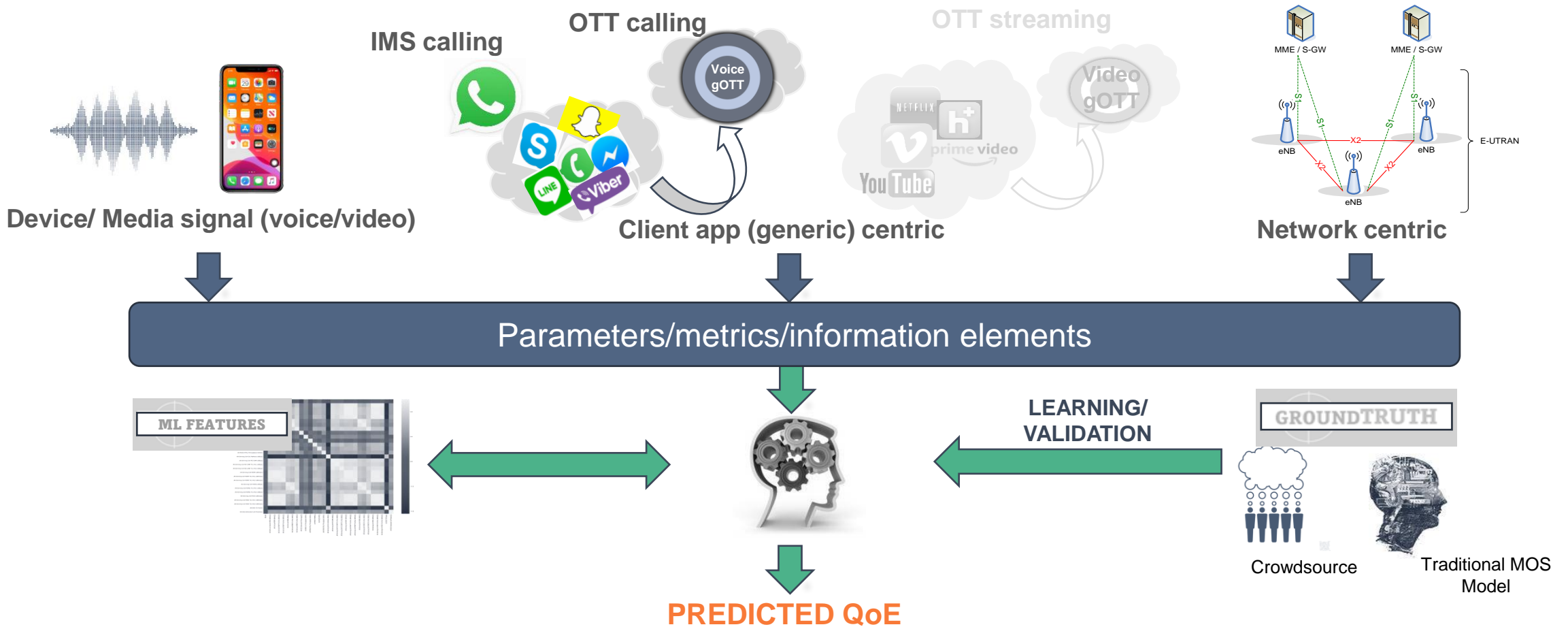
One drive, one test, one common set of normalized KPIs (ETSI based) for many OTT apps

Automated OTT streaming sessions (launch, set-up, streaming, cut off, close)



# New QoE: Rethinking QoE modelling/testing

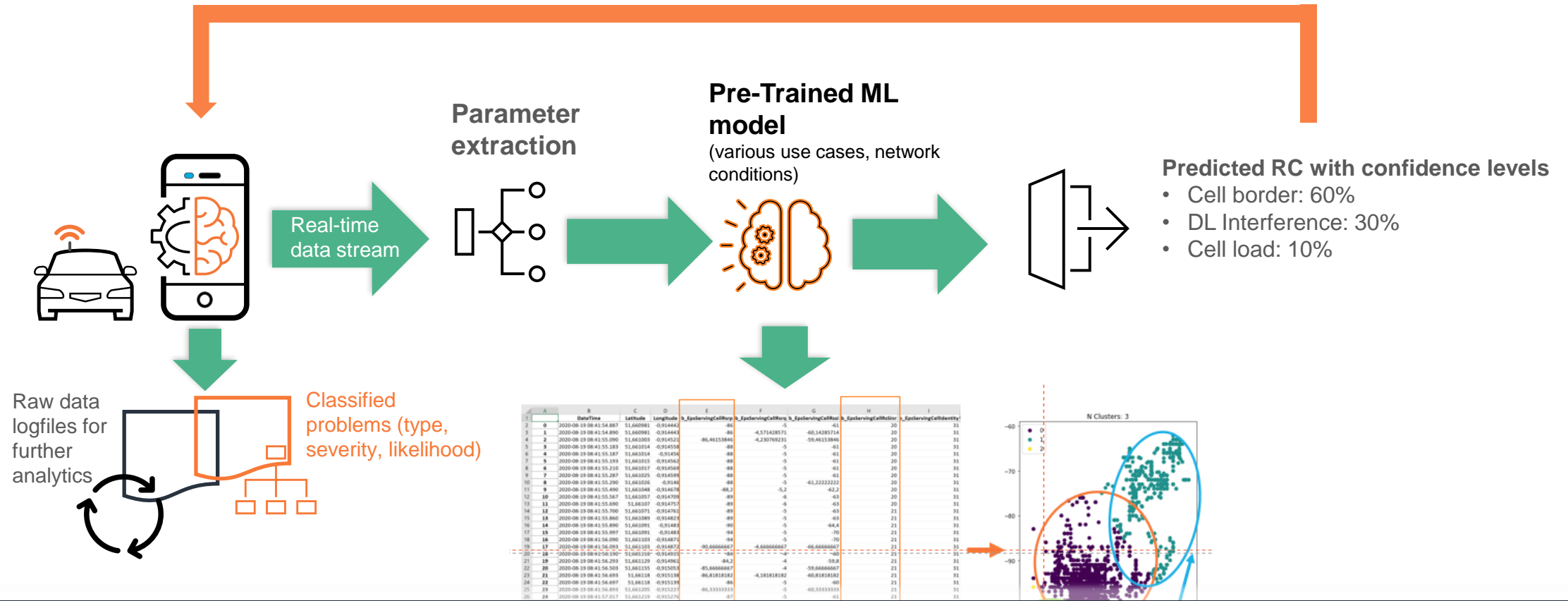
TEMS QoEbyML concept, such as sQLEAR (ITU-T P.565)



Complex, non-linear network metrics interdependencies and sophisticated client-based error concealment schemes call for ML and standardized device-based QoE modelling

# 5G Predictive testing

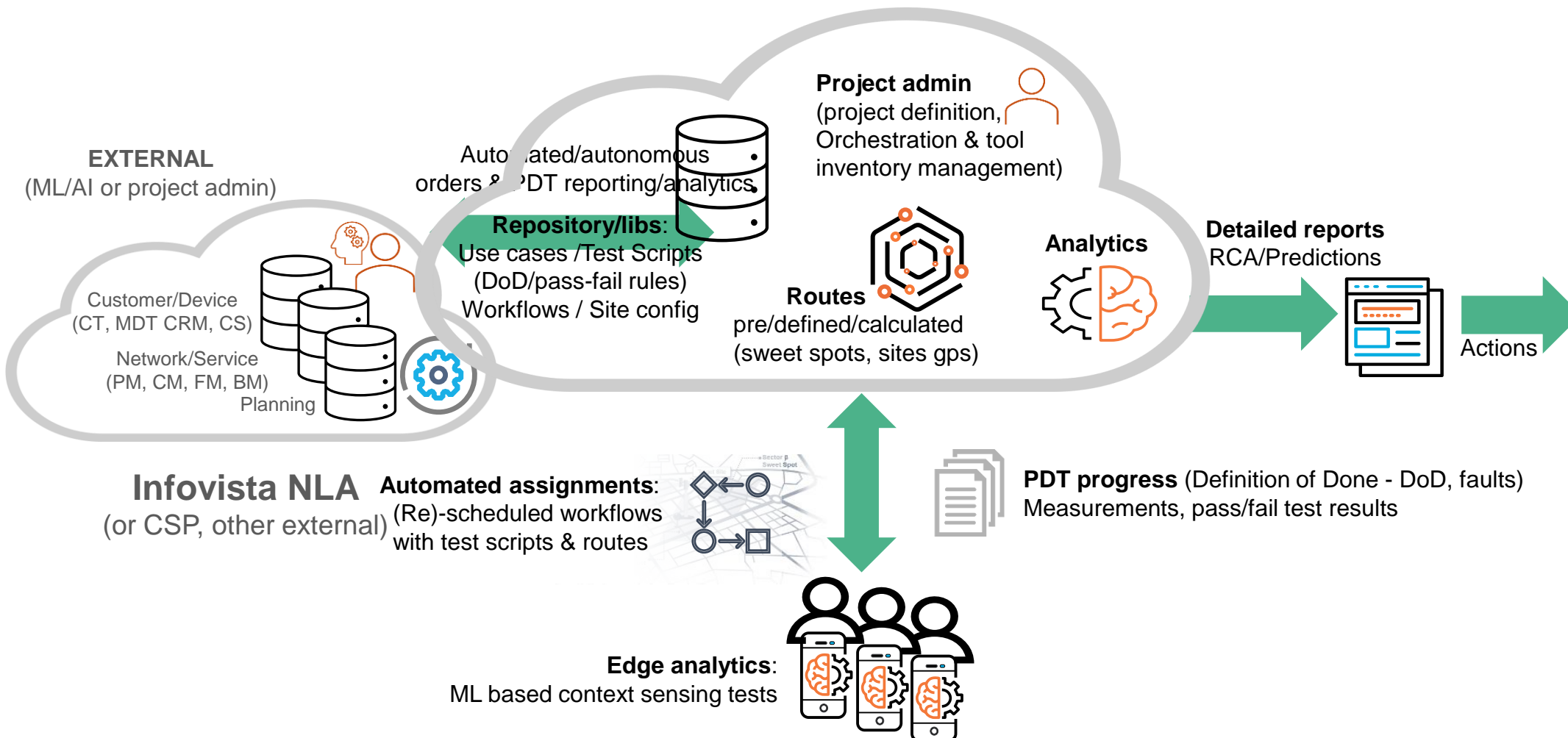
TEMS IntelTest with real time predicted RCA (classification and quantization)



ML enabled real time RC classification and likelihood for a fast, cost-efficient analytics

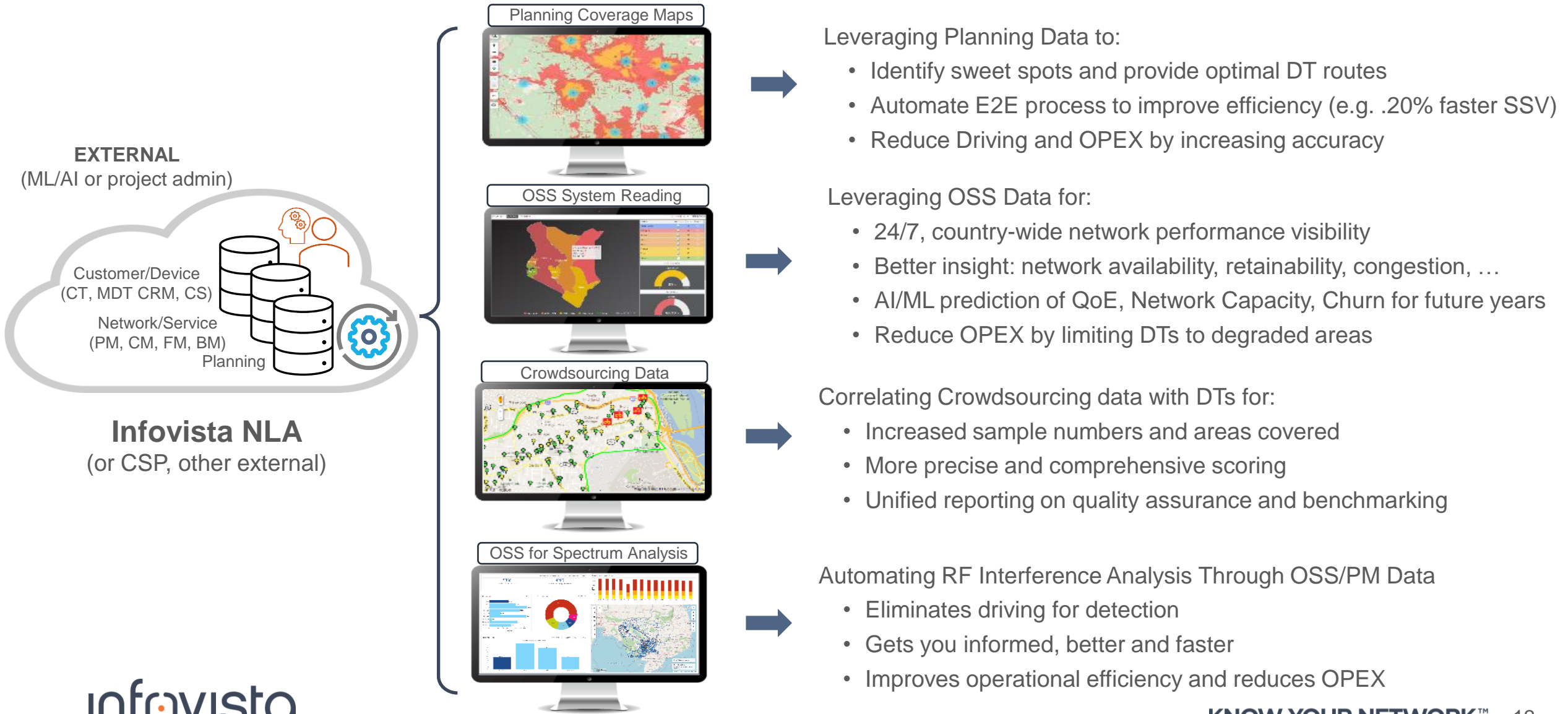
# 5G Automated & Autonomous testing

TEMS Precision Drive Testing: what/where/when it matters



ML/AI techniques required for automated/autonomous driving testing what/when/where it matters

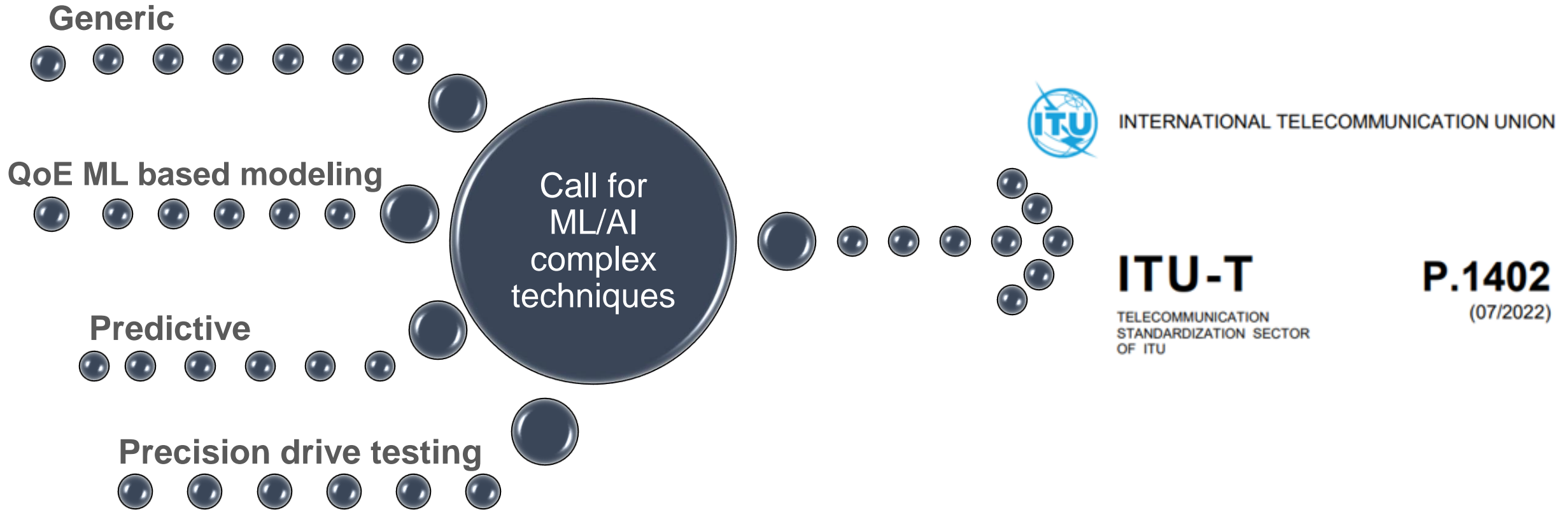
# Expand the horizon with External Data



5G testing driving to ITU-T P.1402



# 5G testing driving to ITU-T P.1402



# ITU-T P.1402

ML/AI algorithms to be applied for:

- Networks' performance evaluation, monitoring and troubleshooting techniques (overall testing)
- Voice/video QoS/QoE prediction models

Powerful techniques which inherently are very complex and therefore prone to misuse and misinterpretation and consequently showing high risks of drastically impacting their strengths and benefits.

Need to carefully follow well defined guidelines when applying ML.

→ P.1402 recommendation introducing general guidelines for applying ML within the context of SG 12 work items which are suitable to these techniques.



INTERNATIONAL TELECOMMUNICATION UNION

**ITU-T**

TELECOMMUNICATION  
STANDARDIZATION SECTOR  
OF ITU

**P.1402**

(07/2022)

SERIES P: TELEPHONE TRANSMISSION QUALITY,  
TELEPHONE INSTALLATIONS, LOCAL LINE  
NETWORKS

Statistical analysis, evaluation and reporting guidelines of  
quality measurements

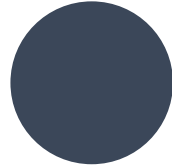
---

**Guidance for the development of machine  
learning based solutions for QoS/QoE  
prediction and network performances  
management in telecommunication scenarios**

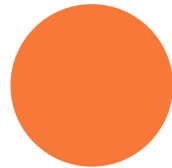


# ITU-T P.1402 Guide for Development of Machine Learning Based Solutions

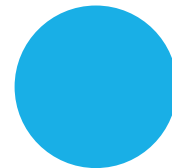
**General practices for applied ML**  
ML features selection, data validity and meaningfulness, independency between number of features and algorithm accuracy (over/under-prediction)



**Brief overview on ML**  
- Learning techniques (supervised, unsupervised, deep learning)  
- Algorithms (linear regressors/classifiers, logistic regressors, PCA, decision trees, K-means, Neuronal Networks)

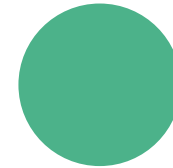


**Applied ML in ITU-T SG12**  
- Network quality diagnosis, operations - ITU-T E series  
- Voice / video QoS/QoE prediction such as in ITU-T P.565 series



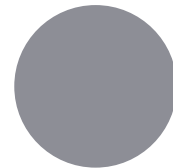
**Minimum requirements for ML based solutions**

- Training/learning databases integrity /validity testing and split process definition,
- ML feature selection,
- Algorithm performance procedure, over/under-fitting test



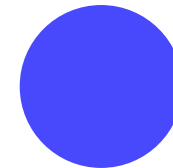
**Overview on ML optimization process**

Rules/techniques for optimization of the ML model/algorithm's parameters towards the best model defined by highest accuracy (minimal underfitting) and minimal or preferably no bias towards the learning data set (least overfitting).



**Guidance on the evaluation and validation of ML based solutions in ITU-T SG12**

Data bases selection and validation procedure for traditional and ML/AI based QoE models

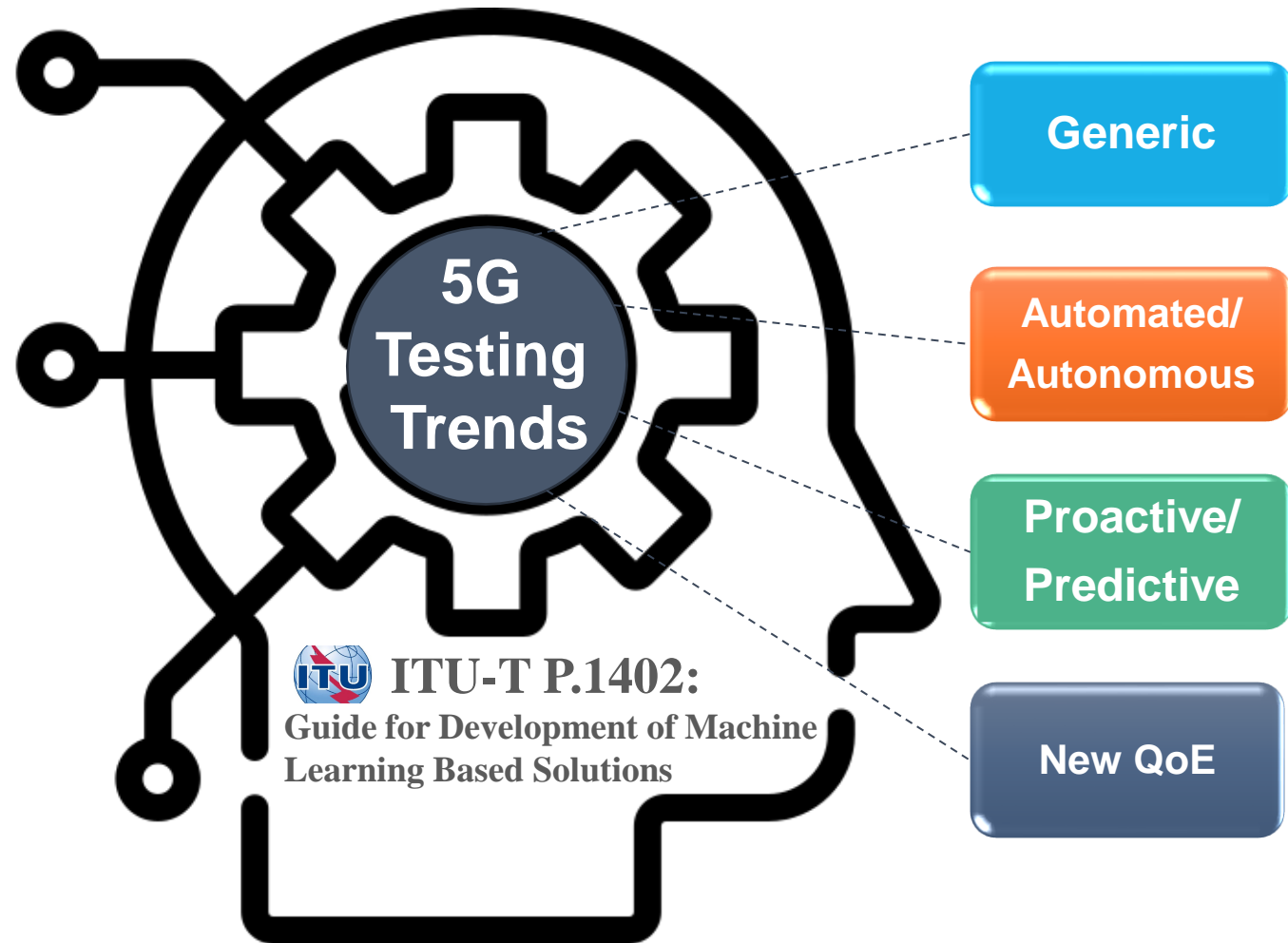


Take away



# Take away

New 5G emerging testing trends call for **ML/AI** techniques to be first proved as **reliable** and **robust**, using **standardized** guidance and rules.



# Thank you!

[www.infovista.com](http://www.infovista.com)

