ML for Mobile Operators

Dr. Salih Ergut, TURKCELL

Xi'an, China

April 25th, 2018
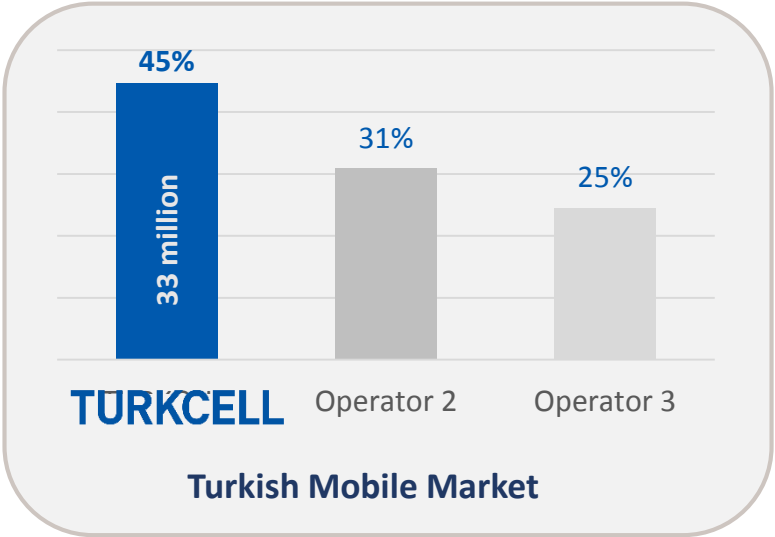
TURKCELL: Leader Operator in the Region
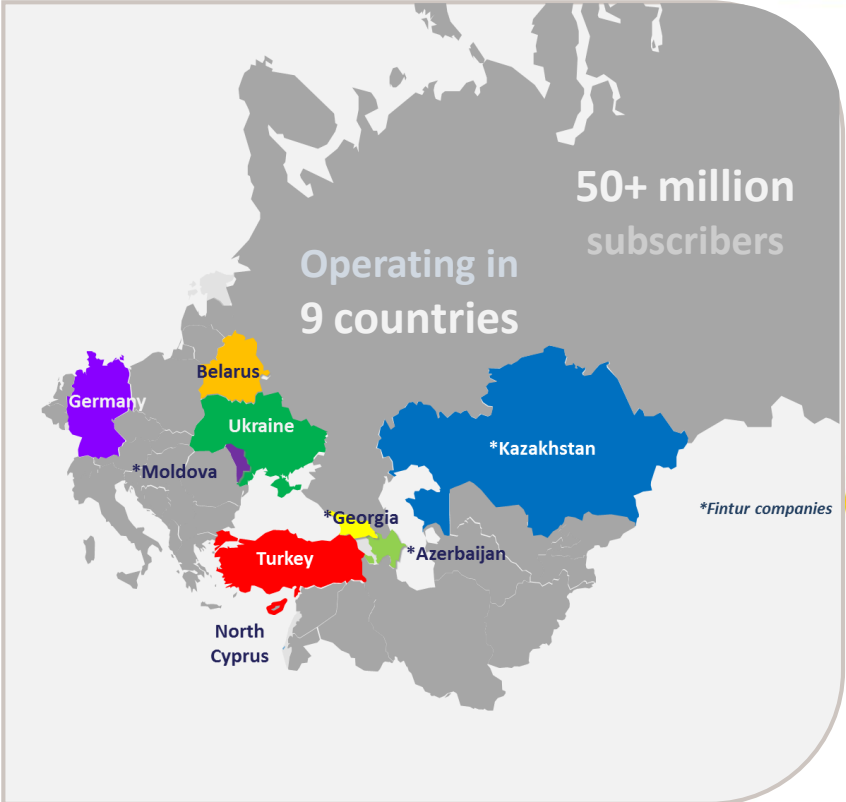
Listed on **NYSE** &
Istanbul Stock Exchange

$9.6 Billion
Market cap

45%

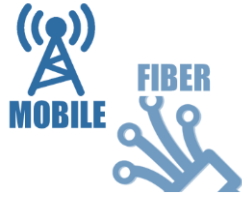**33 million**

31%

25%

TURKCELL | Operator 2 | Operator 3

Turkish Mobile Market

TURKCELL TEKNOLOJİ

- Turkcell R&D company
- ~1,000 R&D personnel
- Dedicated 5G R&D team

Operating in 9 countries

50+ million subscribers

Germany
Belarus
Ukraine
*Moldova
*Kazakhstan
*Georgia
*Azerbaijan
Turkey
North Cyprus
*Fintur companies

TURKCELL: Leader Digital Operator in the Region

Traditional
- Voice, Data, Messaging
- Broadband Internet

IPTV
- Broadband
- Mobile App

Digital Apps
- BiP (messaging)
- fizzy (music)
- lifebox (storage)

PayCell
- Mobile payment

A TURKCELL FinTech company

IoT
- Fleet tracking
- Smart meeting
- NB-IoT, CAT-M1

Lifecell
- Digital only service
- Up to 62GB monthly data

Energy
- A TURKCELL energy distribution company

Automotive
- Producing Turkey's first electric car

TURKCELL is one of the 5-company consortium to produce Turkey's first domestic electric car

Data is the new oil of digital world

Descriptive	Predictive	ML & AI

- Customer locations
- Mobility patterns
- Network performance analysis
- Investment prioritization
- Coverage holes
- …

- Churn prediction
- Next best offer
- Customer experience management
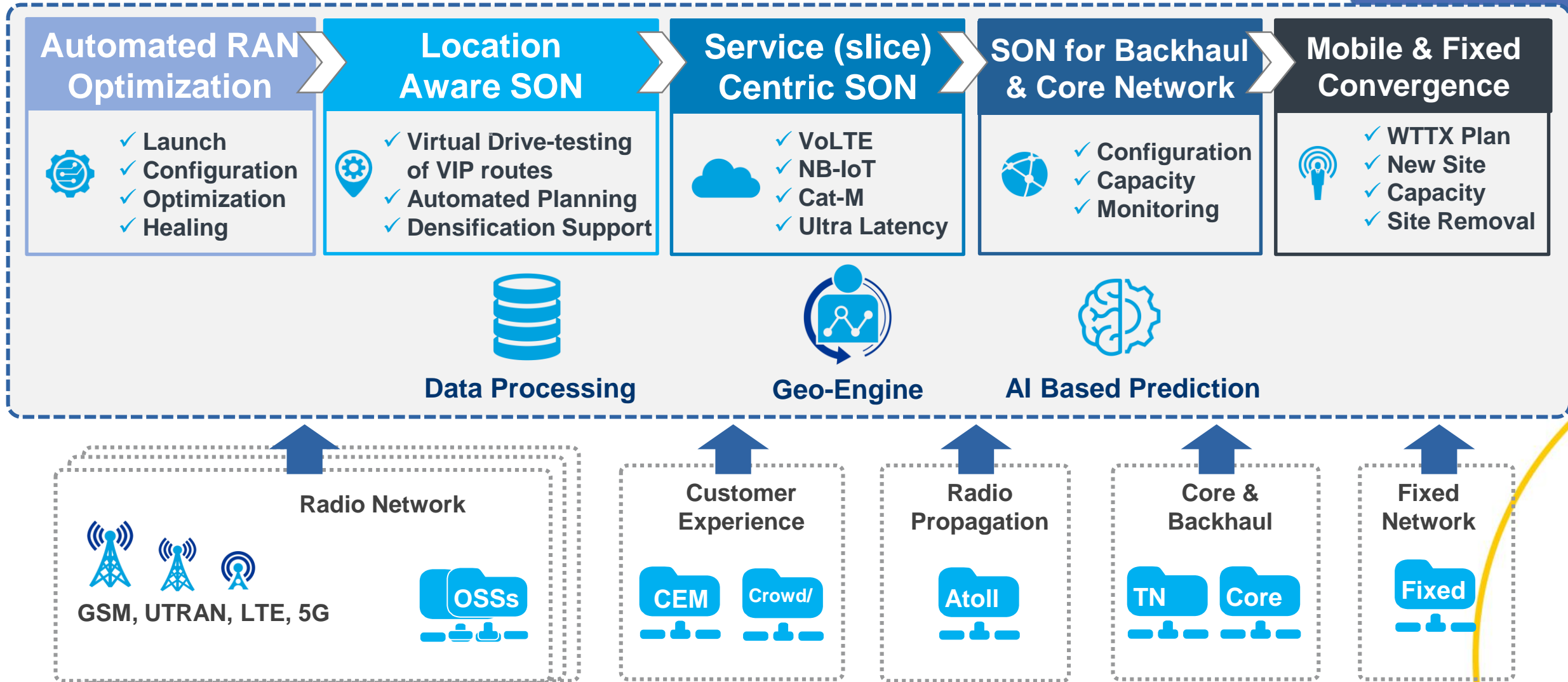- Customer segmentation
- …

5G ERA

- Wide range of use cases with diverse needs
  - eMBB – URLLC – mMTC
  - Network slicing
- Increased network complexity
  - Densification
  - Edge intelligence
  - Dynamic composition of network functions
- Flexible architectures in core and radio access
  - Virtualization
  - Softwarization
  - Cloudification

→ Increased use of ML for network orchestration, management, monitoring, …
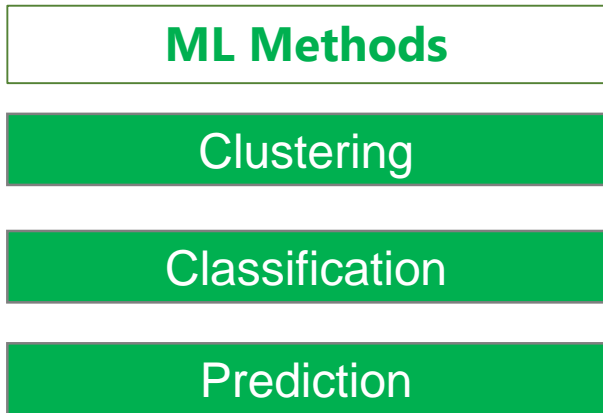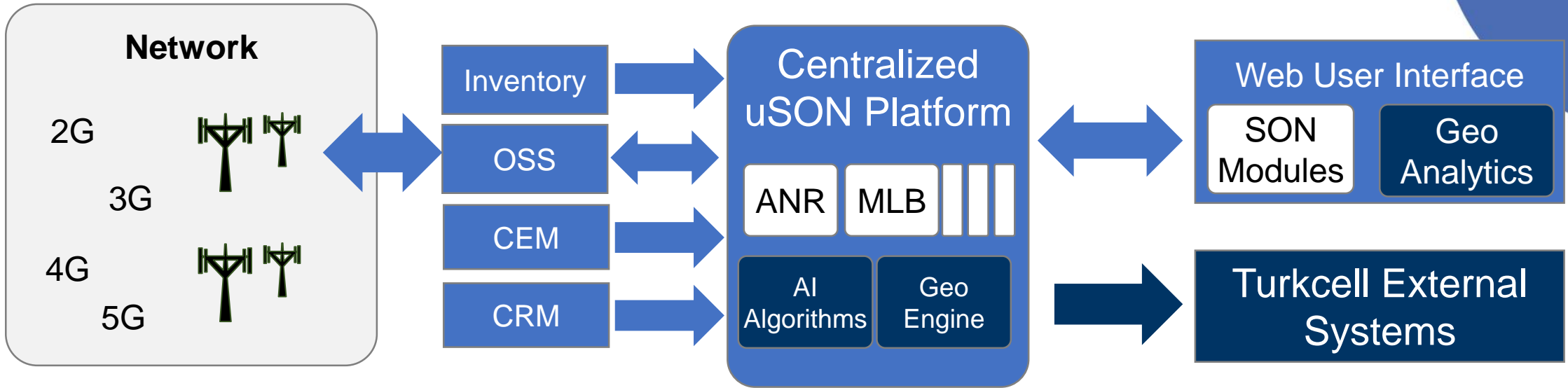
Evolution of Centralized SON towards 5G

Automated RAN Optimization	Location Aware SON	Service (slice) Centric SON	SON for Backhaul & Core Network	Mobile & Fixed Convergence
✓ Launch ✓ Configuration ✓ Optimization ✓ Healing	✓ Virtual Drive-testing of VIP routes ✓ Automated Planning ✓ Densification Support	✓ VoLTE ✓ NB-IoT ✓ Cat-M ✓ Ultra Latency	✓ Configuration ✓ Capacity ✓ Monitoring	✓ WTTX Plan ✓ New Site ✓ Capacity ✓ Site Removal

Data Processing   **Geo-Engine**   **AI Based Prediction**

Radio Network

GSM, UTRAN, LTE, 5G   OSSs

Customer Experience   CEM   Crowd/

Radio Propagation   Atoll

Core & Backhaul   TN   Core

Fixed Network   Fixed
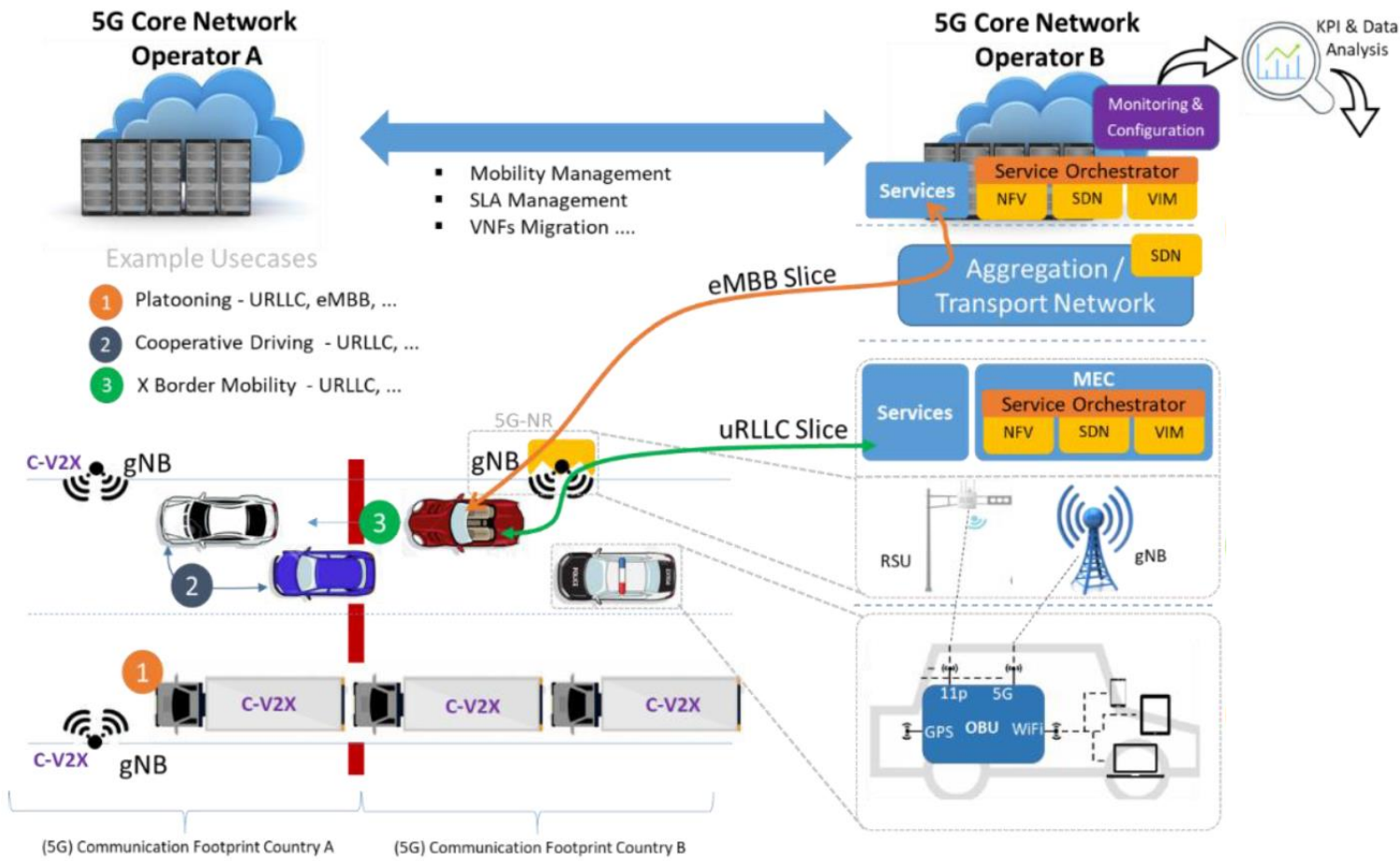
Real-time network monitoring

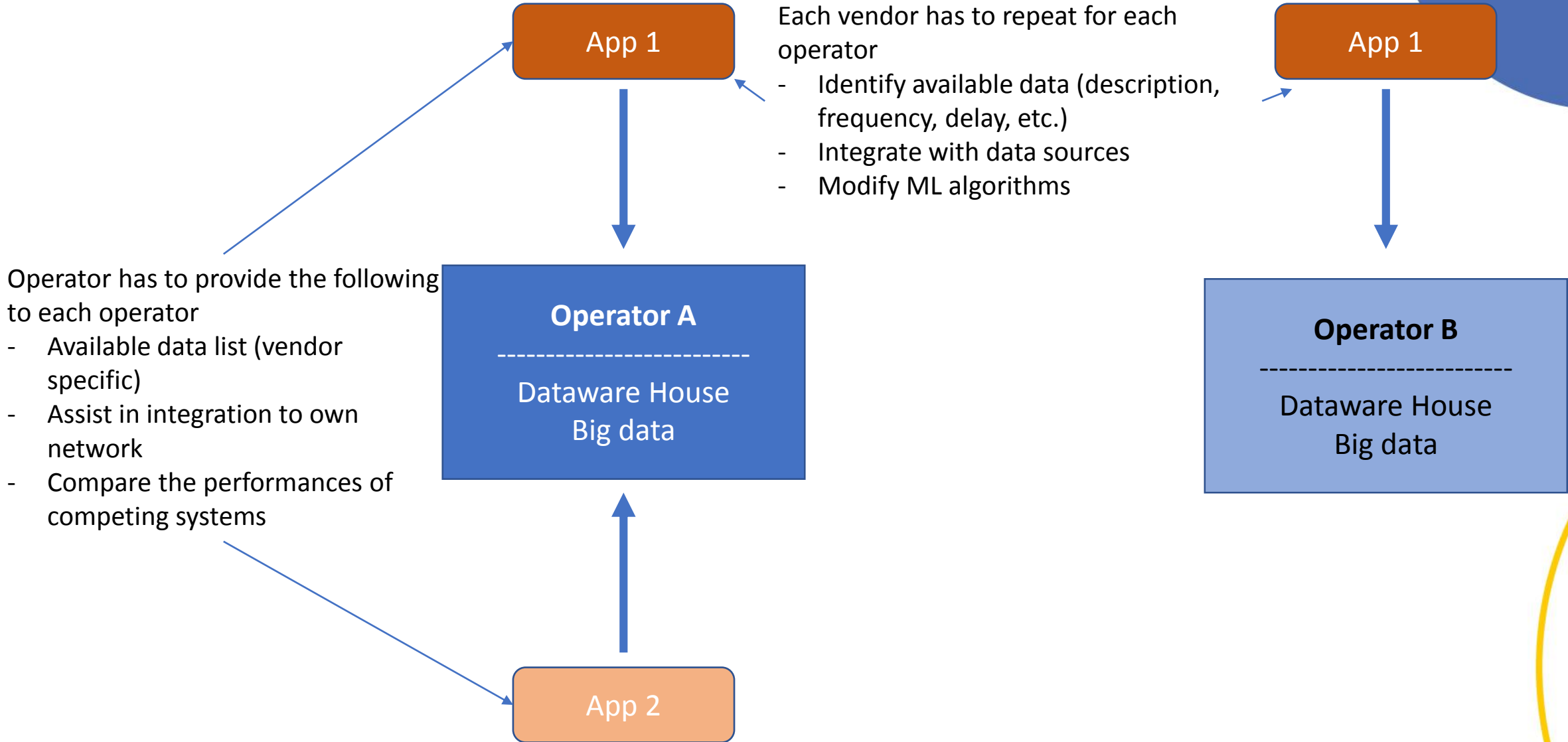Core Network

MEC

Real time
Monitoring
ML Engine

MEC
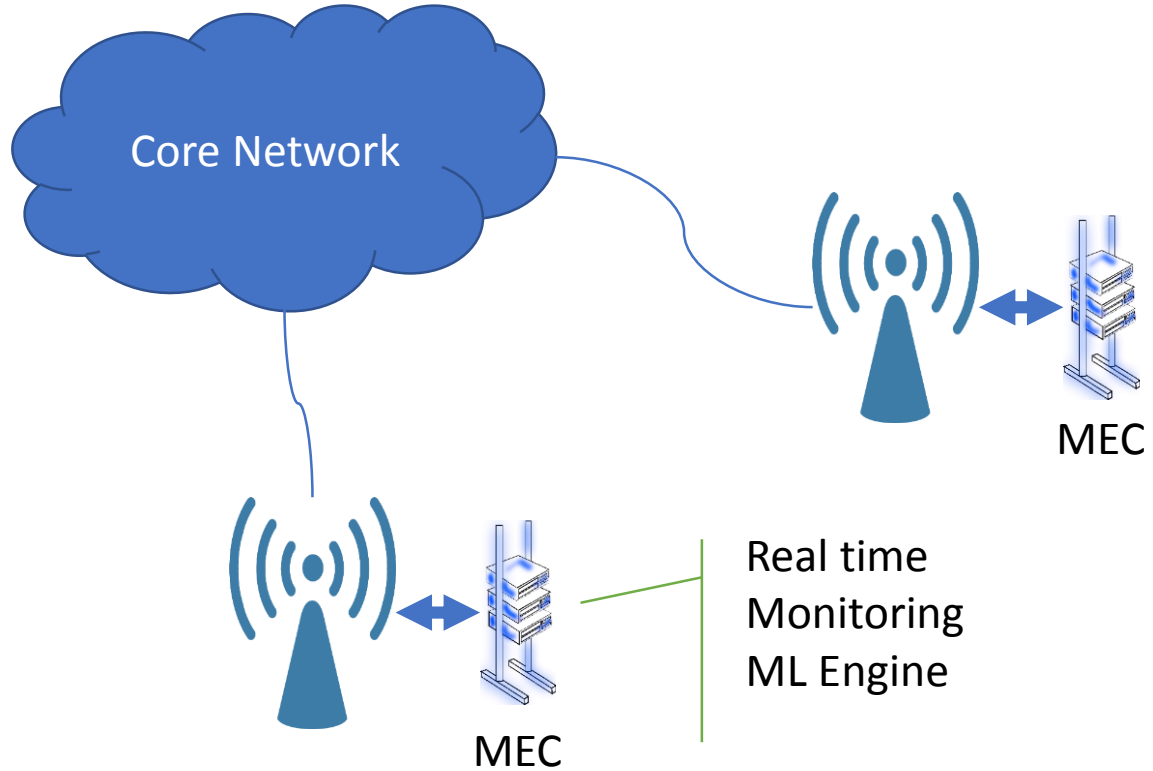
- Real time network performance monitoring is missing in today's operator network
- Critical for immediate resolution of network degradations
- Can be achieved through distributed computing at edges due to excessive traffic load of centralized solutions

- Predicted QoS is essential in URLLC applications such as platooning
- Needs to be estimated at the edge with cooperation from terminal

Data Collection in a Multi-vendor Network

App 1

Each vendor has to repeat for each operator
- Identify available data (description, frequency, delay, etc.)
- Integrate with data sources
- Modify ML algorithms

App 1

Operator A

Dataware House
Big data

Operator B

Dataware House
Big data

Operator has to provide the following to each operator
- Available data list (vendor specific)
- Assist in integration to own network
- Compare the performances of competing systems

App 2

TELECOM INFRA PROJECT

Founders

> 500 Members including Turkcell

AI and Applied ML Project Group

Focus Areas
- Network Operations, Optimization and Planning
- Customer Behavior Driven Service Optimization
- Multi-vendor Data Exchange Format

Participation Criteria
- Operators to provide data
- Vendors to open solution interfaces

Thank you