ML Use Cases, Challenges: An Operator View

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«FG on ML for Future Networks including 5G»
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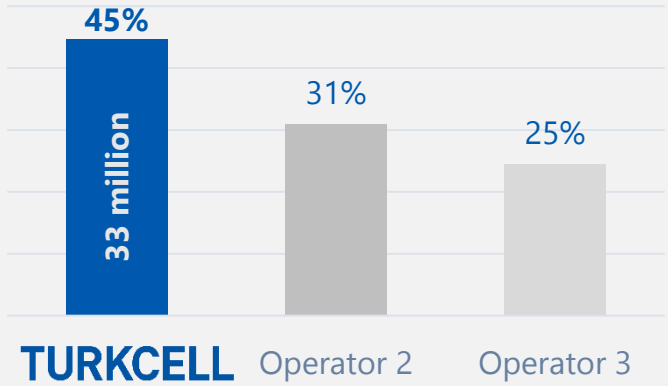
TURKCELL

TURKCELL: Leader Operator in the Region

Listed on **NYSE** &
Istanbul Stock Exchange

$9.6 Billion
Market cap



Turkish Mobile Market

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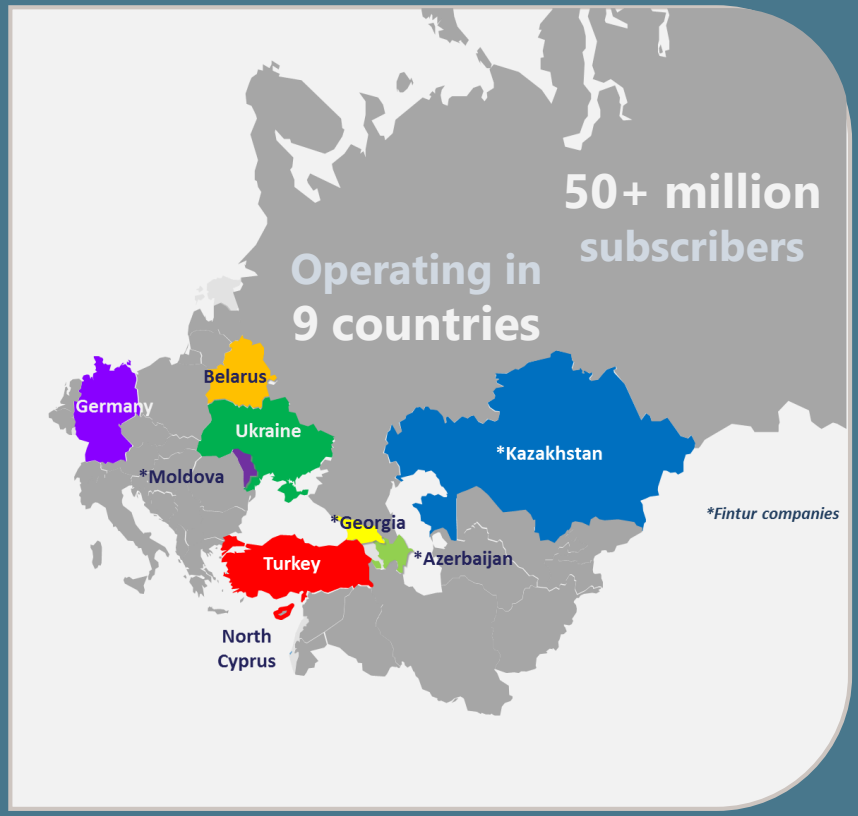
TEKNOLOJİ

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



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

FINANCELL

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

Machine Learning Applications

for Operators

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Operator Use Cases in Machine Learning

Marketing related

- Churn prediction
- Customer segmentation
- Next best action
- …

Network related

- SON
- Automated network & service management
- Near real-time performance monitoring
- Prediction using alarm logs
- Fraud detection
- …

Focus of this talk

Self-organizing Networks for Mobile RAN

SON
Network Centric

End to end Service Intelligent Network

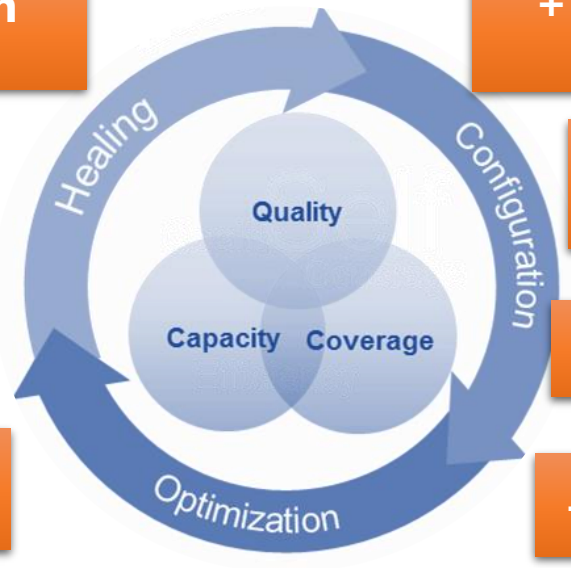
+ New Tech SON

- SDN
- NFV
- MIMO
- Active Antenna

+ Multi Domain SON

- TN
- Core

SON+
Service Centric, E2E



+ Proactive SON

+ Geolocation SON

+ AI SON

+ Slicing SON

- WTTx
- NB-IoT
- M2M

+ Smart Planning SON

Automated Network & Service Management

- ETSI launched Zero touch network and Service Management group (ETSI ZSM ISG)
  - Focus on the 5G end-to-end network and service management in a multi-vendor environment
    - network slicing management, management for future network generations
  - Automate all operational processes and tasks - delivery, deployment, configuration, assurance, and optimization
  - Define future-proof horizontal and vertical end-to-end frameworks
    - Horizontal: cross-domain, cross-technology aspects
    - Vertical: cross-layer aspects
  - ML & Standardization is key to achieve zero-touch-network
    - tools and methods based on Artificial Intelligence (AI), Machine Learning (ML) and Big Data analytics should be considered.
    - Standardization work to enable full automation

Network Performance Monitoring

Near real-time performance monitoring system that

- identifies anomalies
- notices performance degradations
- predicts customer complains using network events and KPIs

... as opposed to current offline analysis that monitoring tools

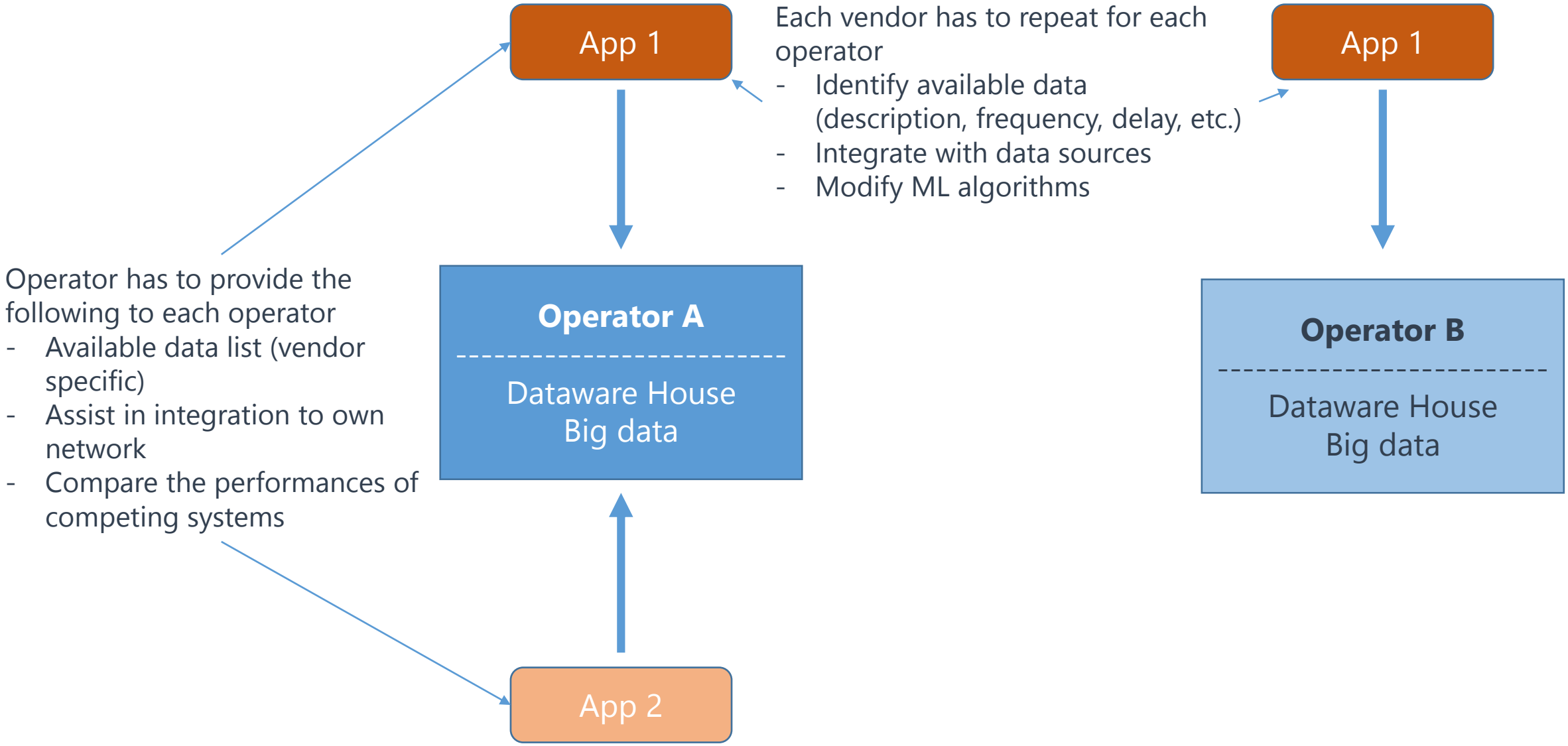
Making Sense of Network Generated Alarms

- Vast amount of alarms collected from radio to transport to core
- Filtering insignificant alarms, identifying useful patterns, creating rules
- Correlating with outside data sources
- Predicting maintenance
- Root-cause analysis

Challenges

for Machine Learning Applications

Data Collection in a Multi-vendor Network



Massive data

- Massive data collected through probes across the network
- Enabling a wide range of KPIs and logging traces
  - generates enormous of data
  - additional backhaul traffic to analyze data centrally
  - creates load on CPU, performance degradation on functionality
- Increased data collection with network densification of 5G
- Vendor specific metrics, vendor specific log formats

Data fusion

- Data fusion from multiple resources (internal & external)
- Logs/KPIs transferred to a central location to be parsed
  - Delay and increased backhaul traffic
- Distributed processing of performance indicators, selected transfer of processed parameters (summary, anomaly, etc.)

Network Orchestration

- Network becomes more flexible and much more complex with softwarization of core and radio components
- Network orchestration as opposed to management
- Coordinate multiple optimization functions and prevent them interfering with each other
- Architecture, protocol, API standardization for a multi-vendor environment

Summary

- Mobile service providers have been implementing ML based applications and more are to follow considering
  - increased complexity of network
  - varying requirements from wide-range of applications
  - opportunities for monetizing on data
- Standardization on APIs, formats, and architectures will create a foundation for ML based applications and help this transition move faster

Thanks

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