

AI/ML In the Age of 5G

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“Machine learning is a field of computer science that gives computers the ability to learn without being explicitly programmed.”

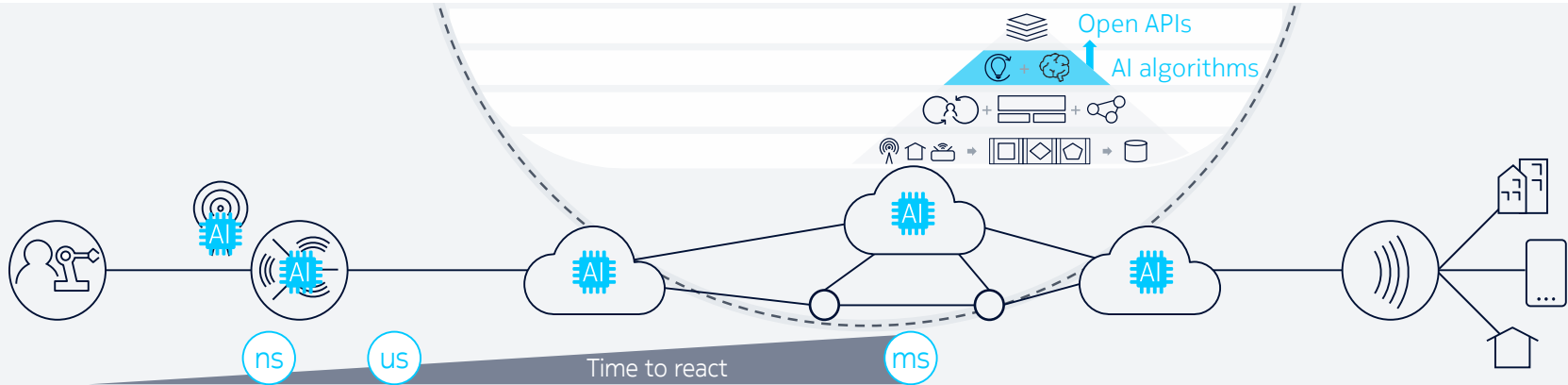
Arthur L. Samuel, 1959

Embedding AI into the Architecture

Powerful

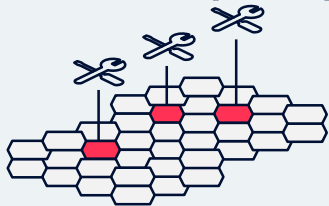
Intelligent

Open



What can AI do for Networks?

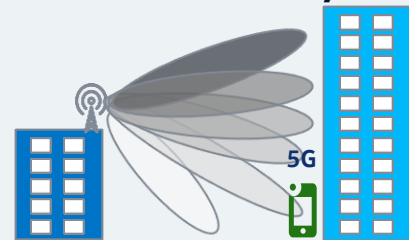
Fully automated management of network complexity



Individual network element optimized to its specific operating environment

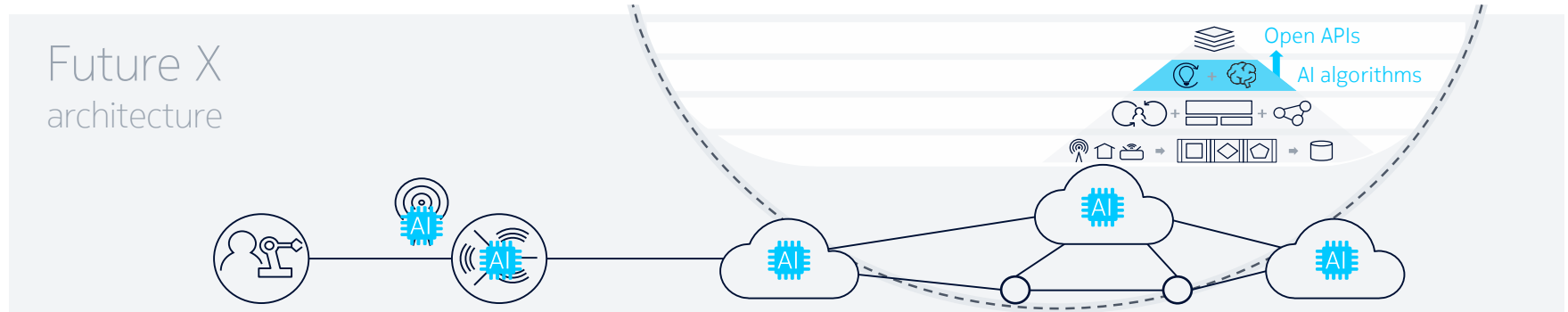


Cover all network technology generations - 2G to 5G and beyond



Nokia drives embedded AI into every node of the network

4 pillar strategy from prototyping to commercialization



Artificial Intelligence / Machine Learning foundation

People development

“Design for ML” culture from leadership to architecture

Bell Labs research

Organization wide training curriculum

Development acceleration with hosted GPU service

Hardware acceleration

Hardware acceleration on AirScale and AirFrame

Phased and focused approach

Best of breed solutions through technology partnerships

Algorithm innovation

Layer1 processing optimization

Massive MIMO optimization

Radio Resource Management optimization

Innovation concepts for RAN nodes and data centers

Use case development

Collaboration with leading operators

Network and operational data collection

Data and optimization analysis

Example R&D Areas for AI/ML in 5G

Network Technologies

Productivity

- Log parsing
 - SoC tool flow
 - In field analytics
 - Test reports
- Code review automation
- Training infrastructure
 - HW
 - APIs and Tool flows
- Software robotics (fw)
 - Test cases
 - Human in the loop SW dev

Technology

- Radio algorithms
- Radio resource management optimization
- Power and energy management
- Environment aware mMIMO scheduling
- Real time trace analysis
- Acceleration HW
- Positioning
- New software features

Network Operations

Networks

- Self Organizing Networks
 - Performance/capacity prediction
 - Anticipatory resource provisioning
- CAPEX optimization
 - Predictive maintenance
 - Automated configuration and optimization
 - Fault detection and recovery
- Security and privacy management
- Base station deployment
 - Sites, antennas, sectors etc.
- DL performance prediction
- Anomaly detection

User Plane Edge Computing

- Enabling 3rd party applications
 - Latency
 - Local data (aggregation)
 - Total energy
 - Model accuracy vs computation capacity
- HW & API development



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