NOKIA

IP Networks & Applications

Creating Value Through IP/Optical Networks

Basil Alwan
President, IP/Optical Networks

IP & Optical Networks

Primary investment domain
Secondary investment domain

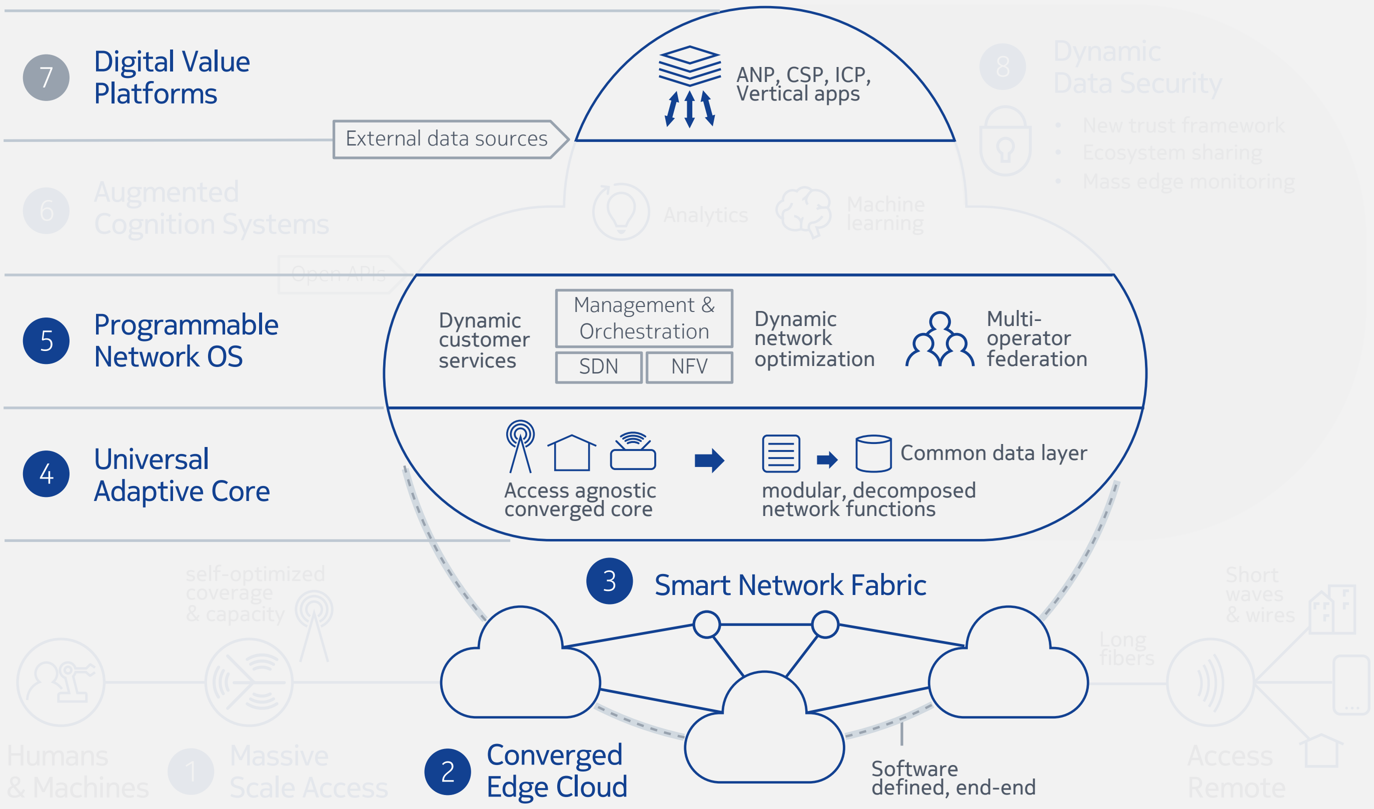
Business Group vision

- Terascale capacity at lowest TCO for all networks
- Dynamic cloud-optimized smart network (DC → WAN → Access)
- ‘Infinite’ network/path programmability & slicing

Current Portfolio Focus

2 3 4 5 7

- Terabit IP edge & core routing
- Terabit Optical networking
- Converged adaptive core
- Seamless DC & WAN SDN
- Cloud-based optimized service delivery solutions



IP / Optical Networks at a glance

€28bn

IP/Optical Primary Market

Source: Nokia estimate

€13bn

IP Routing

€10bn

Optical Transport

€5bn

Services

#2

Global Service Provider Edge Routers[1]

Source: Dell'Oro, 2Q16 4q rolling

#3

Optical Global Optical Transport[2]

Source: Infonetics, 2Q16 4q rolling

1 000+

Service Provider Customers

IP Routing and Optical complement each other

One of only 2 players globally with full IP Routing + optical solution sets

Service Providers

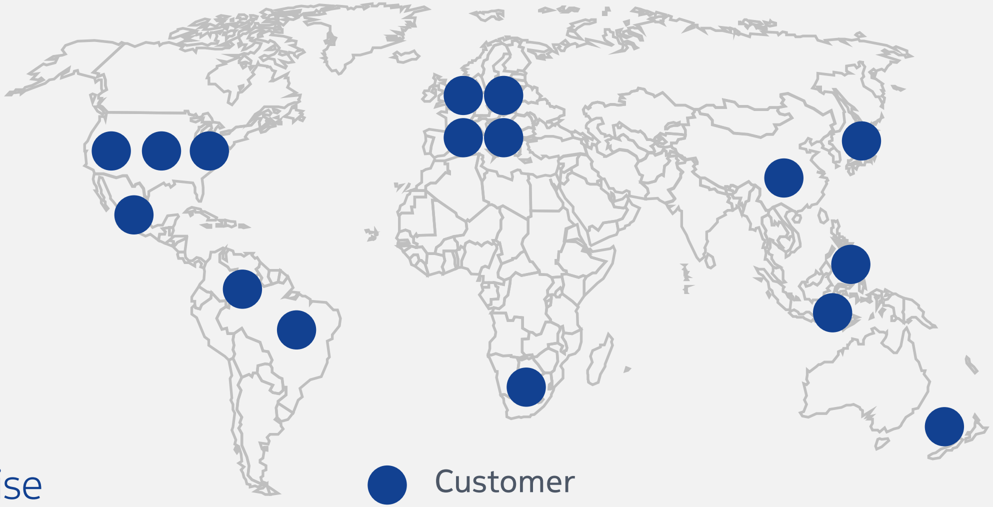
Globe
中国电信 CHINA TELECOM
telenor
américa móvil
Singtel

Utilities & Transport

DB

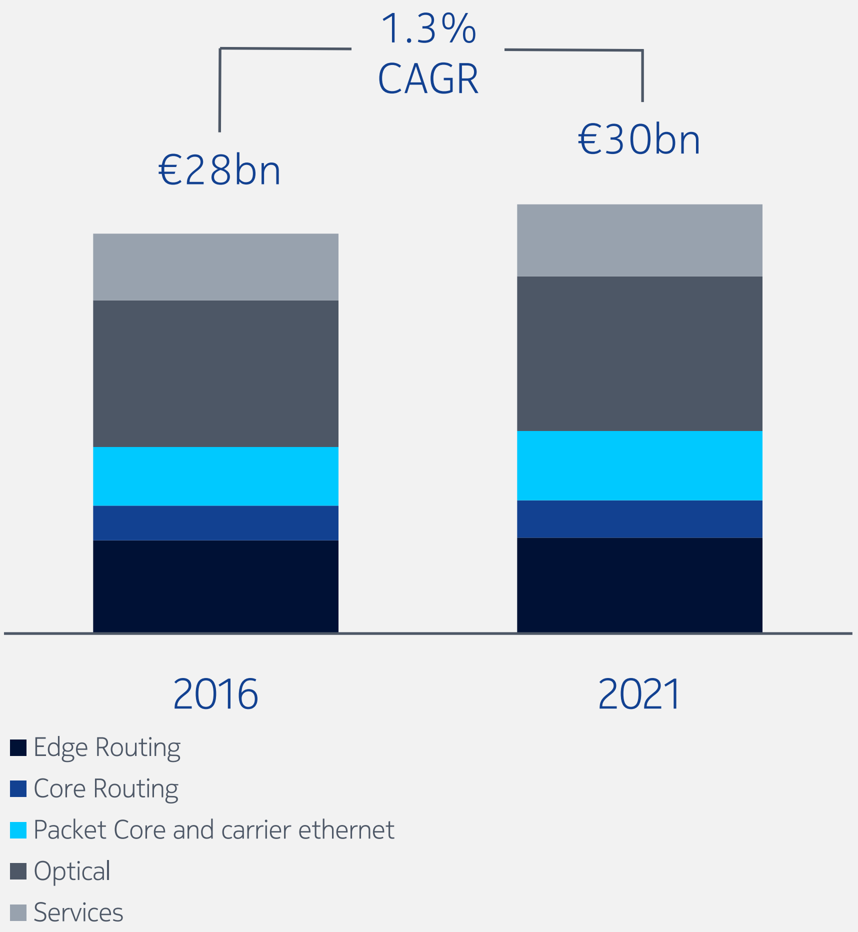
Large Enterprise

UPMC



IP/Optical Networks

Primary market outlook



Solution areas

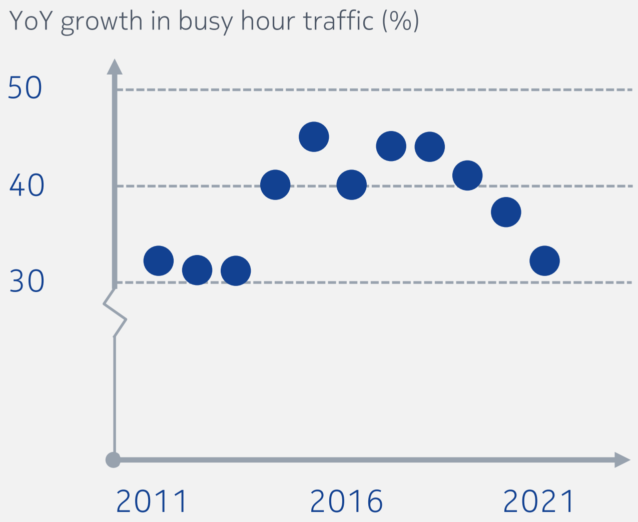
- Edge Routing
- Core Routing
- Packet Core and carrier ethernet
- Optical
- Services

Source: Nokia estimate

Market Dynamics

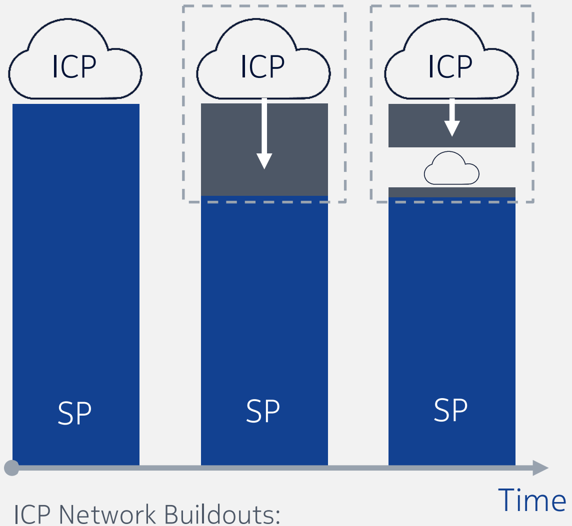
Carrier-Grade IP/Optical Networking

40% Peak Traffic Growth



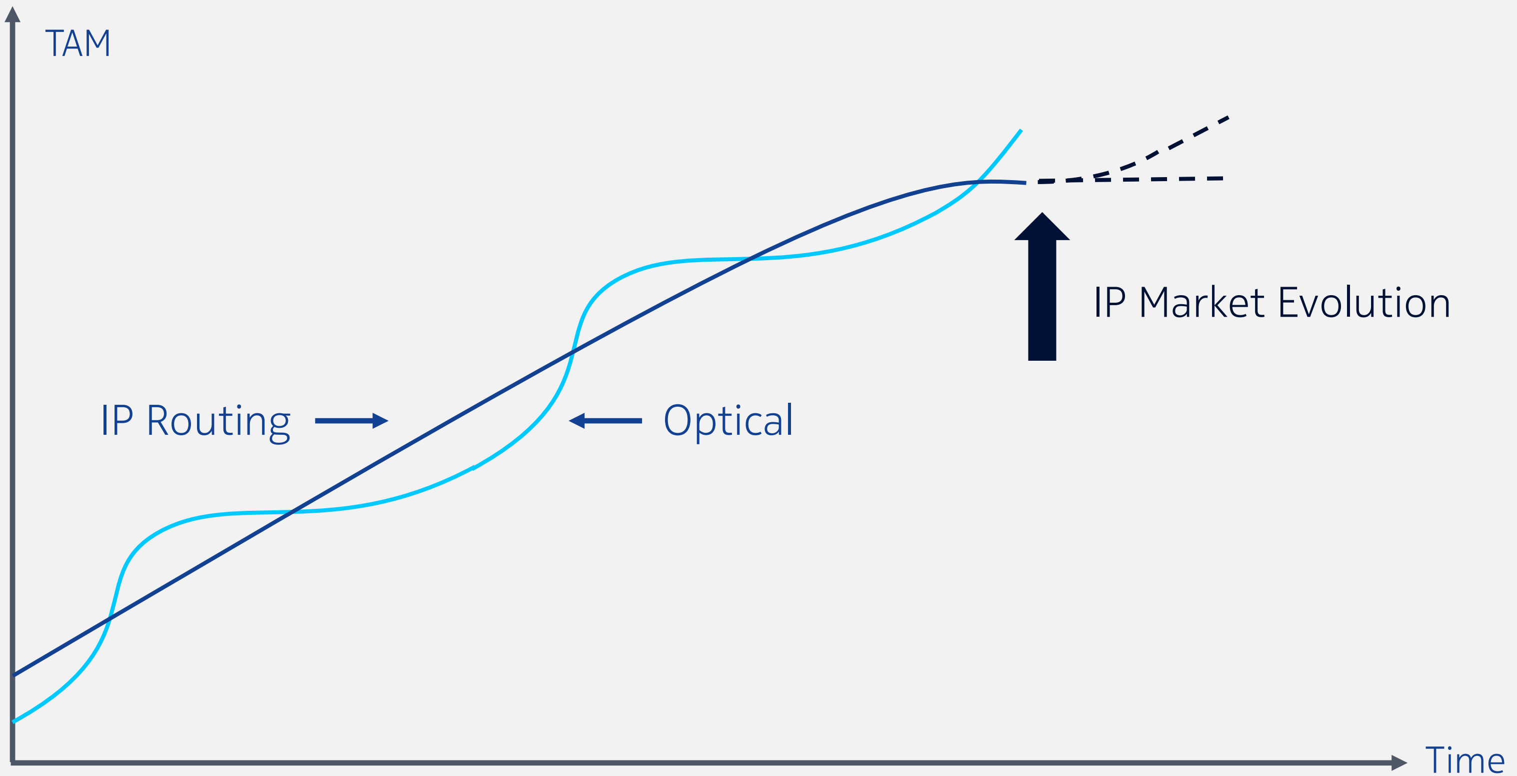
Analysys Mason, August 2016

Shifting Traffic Hand-off



ICP Network Buildouts:
QoE drives hand-off closer to consumer

IP Routing and Optical Cycles



For illustrative purposes only

Foundation: Technology Depth & Innovation

Silicon

Routing application specific integrated circuit (ASIC)

Coherent digital signal processor

Optical transport network switching ASIC

Software

Service Routing OS

Virtualization

Software Defined Networks

Systems

Purpose built platforms for each customer segment

Network Function Virtualization has begun

The (gradual) journey toward router virtualization

Targeted at full-featured, carrier-grade Service Edges

Starts small <100 Gb/s throughput

Must still pass business case hurdles

Amount of compute, space and power to deliver application performance matters

Customer Edge

Access/Aggregation

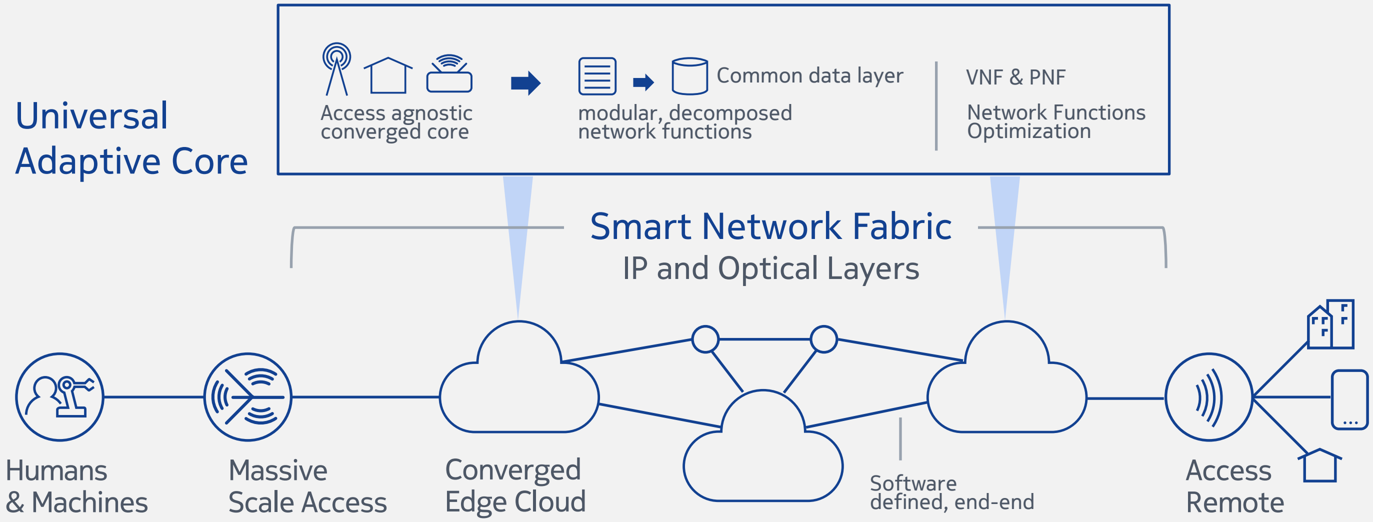
IP Service Edge (Gateway)

IP Core

Dynamic Service Gateways

Common software (all services) and flexible deployment (virtual & physical)

- Unified services across any access: fixed & mobile, licensed & unlicensed
- Foundation for converged 5G services
- Optimized architecture for IoT

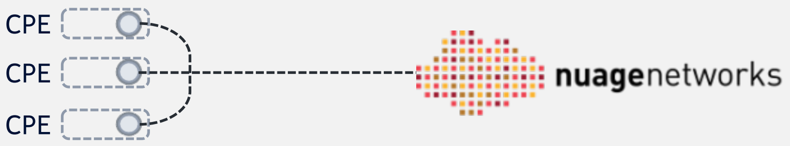


Software Defined Networks
Programmable end-to-end network OS

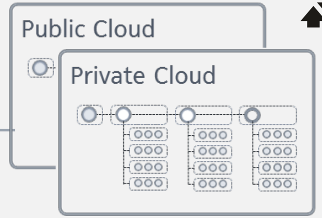
SD-WAN

BT

MyRepublic



Datacenter SDN



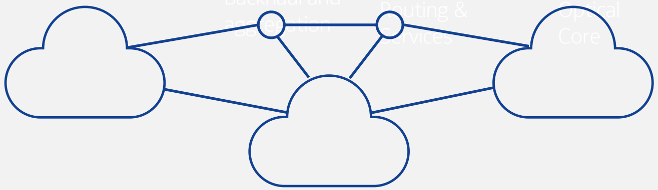
betfair

Santander

UPMC

Carrier SDN

Network Services Platform



Globe

中国电信 CHINA TELECOM

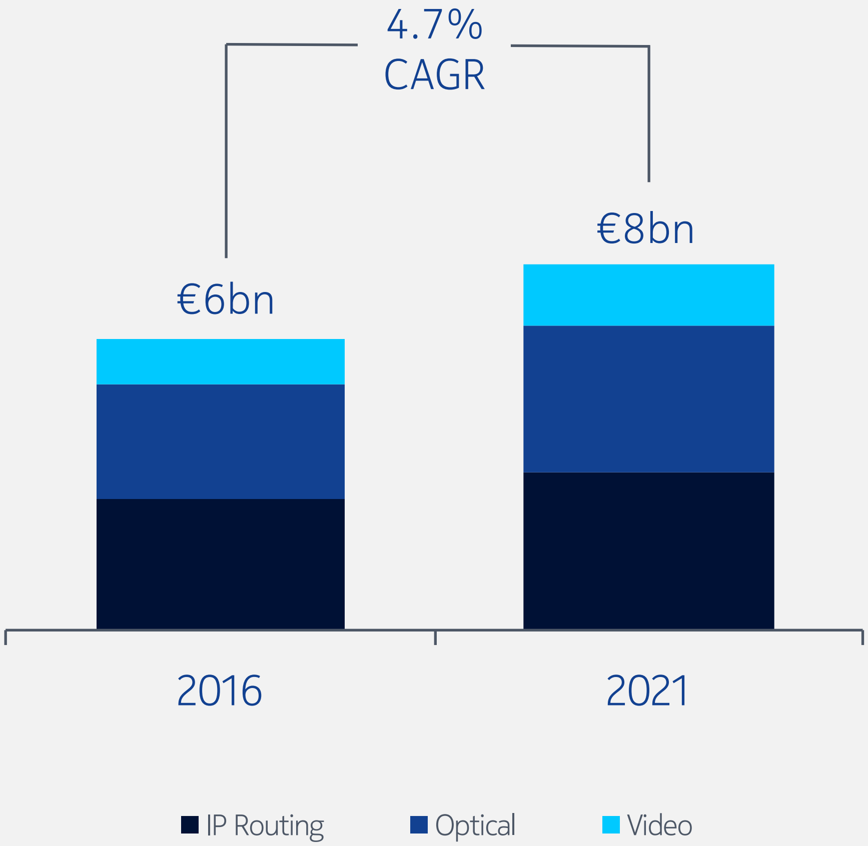
IP/Optical Networks market

High-scale, mission critical networks

Primary market	Attractive adjacencies		
Communication service providers	Public Sector & Verticals	Internet Content Providers	Technological Extra Large Enterprise

IP/Optical Networks

Market outlook for attractive adjacencies



Solution areas

- Mission Critical WAN
- Data Center Interconnect
- Data Center SDN & SD-WAN
- IP Video

Source: Nokia estimate

IP/Optical Networks: Higher returns through focused growth

Required investments already factored into long-term Networks guidance

Disciplined expansion and diversification

Primary market	Attractive adjacencies
€28bn in 2016	€6bn in 2016
5-year CAGR 1.3%	5-year CAGR 4.7%

Strong long-term business model

Net sales

Grow faster than the primary market

Long-term operating margin

Expand to double digits

Nokia will achieve the EUR 1.2 billion cost savings target

Adopt Nokia Business System

Streamline costs in packet core

Operational efficiencies with scale

IP/Optical Networks

Looking forward

2016

- Optical100G Backbone Upgrades
- Growing leadership in virtualization & SDN
- Converging packet core portfolios, ePDG/seGW
- Transition from IP resale to own product
- cDVR trends

2017

- Mainstream 100G Regional/Metro builds
- Mainstream deployments of virtualization & SDN begin
- IP/Optical Optimization with SDN trends
- Continued high design activity/growth in adjacent markets including webscale

2018

- Smart Fabric, Dynamic Converged Edge
- 400G/Terabit backbones begin
- IP/"OTT" technology disrupting business services (as with video)

Disclaimer

It should be noted that Nokia and its business are exposed to various risks and uncertainties, and certain statements herein that are not historical facts are forward-looking statements, including, without limitation, those regarding future business and the financial performance of Nokia and its industry and statements preceded by “believe,” “expect,” “anticipate,” “foresee,” “sees,” “target,” “estimate,” “designed,” “aim,” “plans,” “intends,” “focus,” “continue,” “will” or similar expressions. These statements are based on management's best assumptions and beliefs in light of the information currently available to it. Because they involve risks and uncertainties, actual results may differ materially from the results that we currently expect. Factors, including risks and uncertainties that could cause such differences can be both external, such as general, economic and industry conditions, as well as internal operating factors. We have identified these in more detail on pages 69 to 87 of Nokia’s annual report on Form 20-F for the year ended December 31, 2015 under “Operating and Financial Review and Prospects—Risk Factors“, our other filings with the U.S. Securities and Exchange Commission and in our interim report issued on May 10, 2016, our half year financial report issued on August 4, 2016, our interim report issued on October 27, 2016 and our stock exchange release covering our Capital Market Day issued on November 15, 2016. Other unknown or unpredictable factors or underlying assumptions subsequently proven to be incorrect could cause actual results to differ materially from those in the forward-looking statements. Nokia does not undertake any obligation to publicly update or revise forward-looking statements, whether as a result of new information, future events or otherwise, except to the extent legally required.

In addition to information on our reported IFRS results, we provide certain information on a non-IFRS, or underlying business performance, basis. Non-IFRS results exclude costs related to the Alcatel-Lucent transaction and related integration, goodwill impairment charges, intangible asset amortization and purchase price related items, restructuring related costs, and certain other items that may not be indicative of Nokia's underlying business performance. We believe that our non-IFRS financial measures provide meaningful supplemental information to both management and investors regarding Nokia’s underlying business performance by excluding the aforementioned items that may not be indicative of Nokia’s business operating results. These non-IFRS financial measures should not be viewed in isolation or as substitutes to the equivalent IFRS measure(s), but should be used in conjunction with the most directly comparable IFRS measure(s) in the reported results. A detailed explanation of the content of the non-IFRS information and a reconciliation between the non-IFRS and the reported information for historical periods can be found in Nokia’s respective results reports. Please see our issued interim reports for more information on our results and financial performance for the indicated periods as well as our operating and reporting structure.


NOKIA