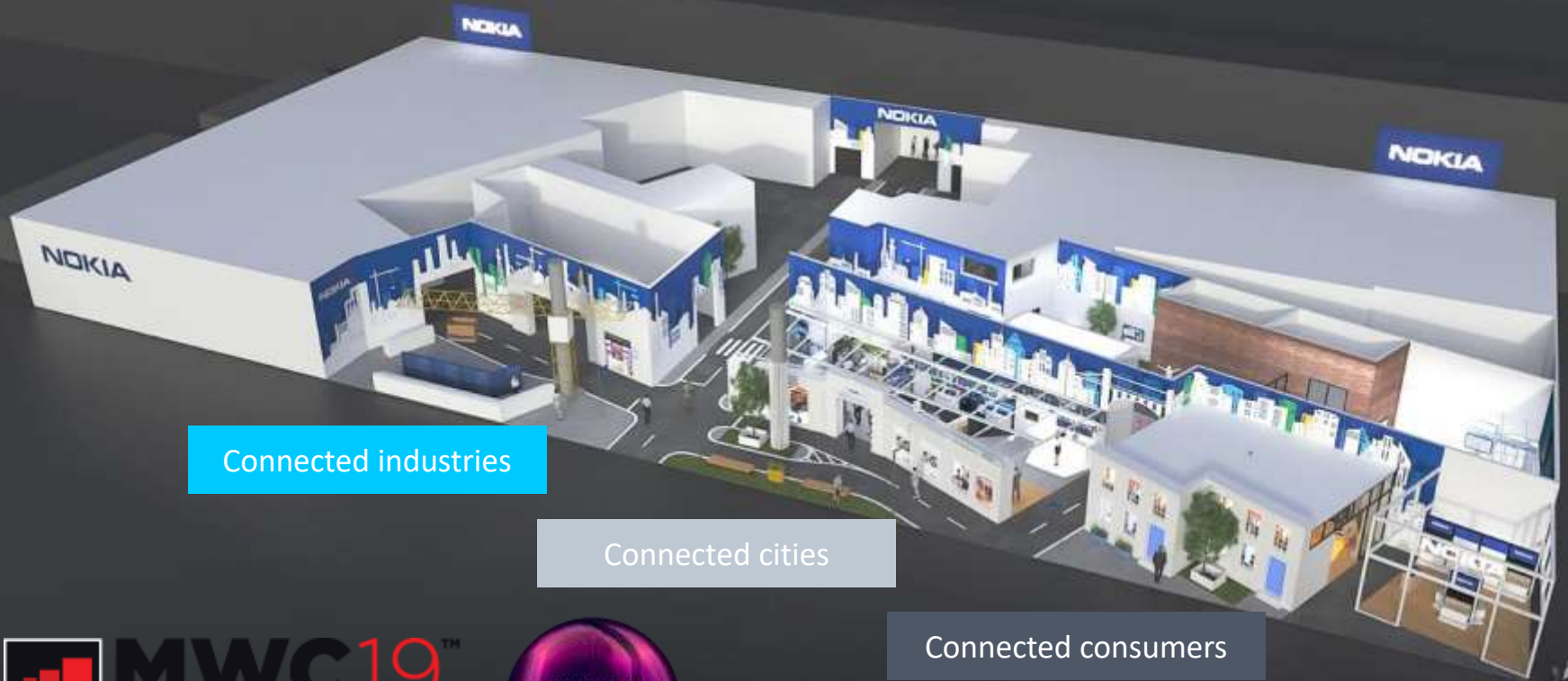


We create the technology to connect the world

NOKIA





Connected industries

Connected cities

Connected consumers

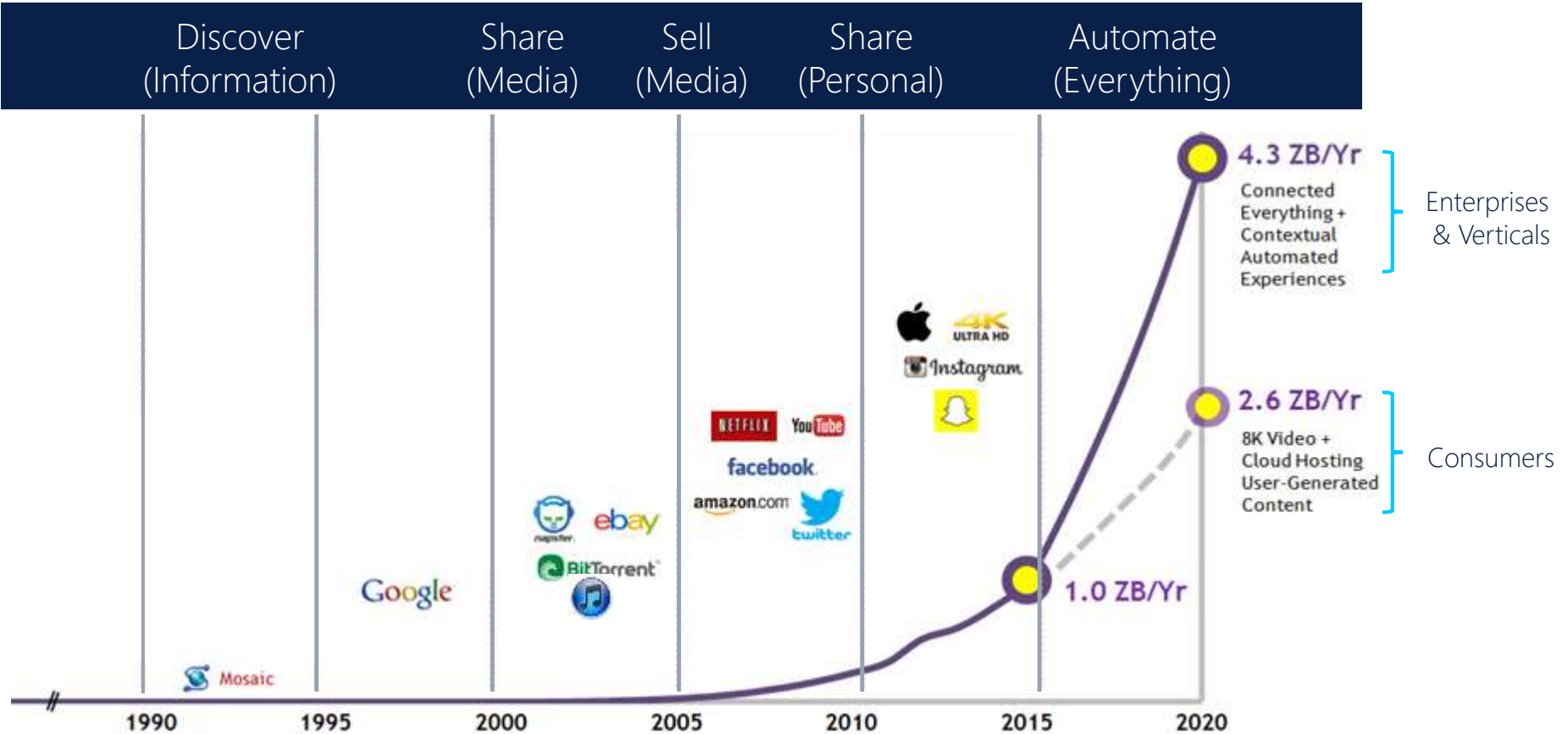


MWC19™
Barcelona

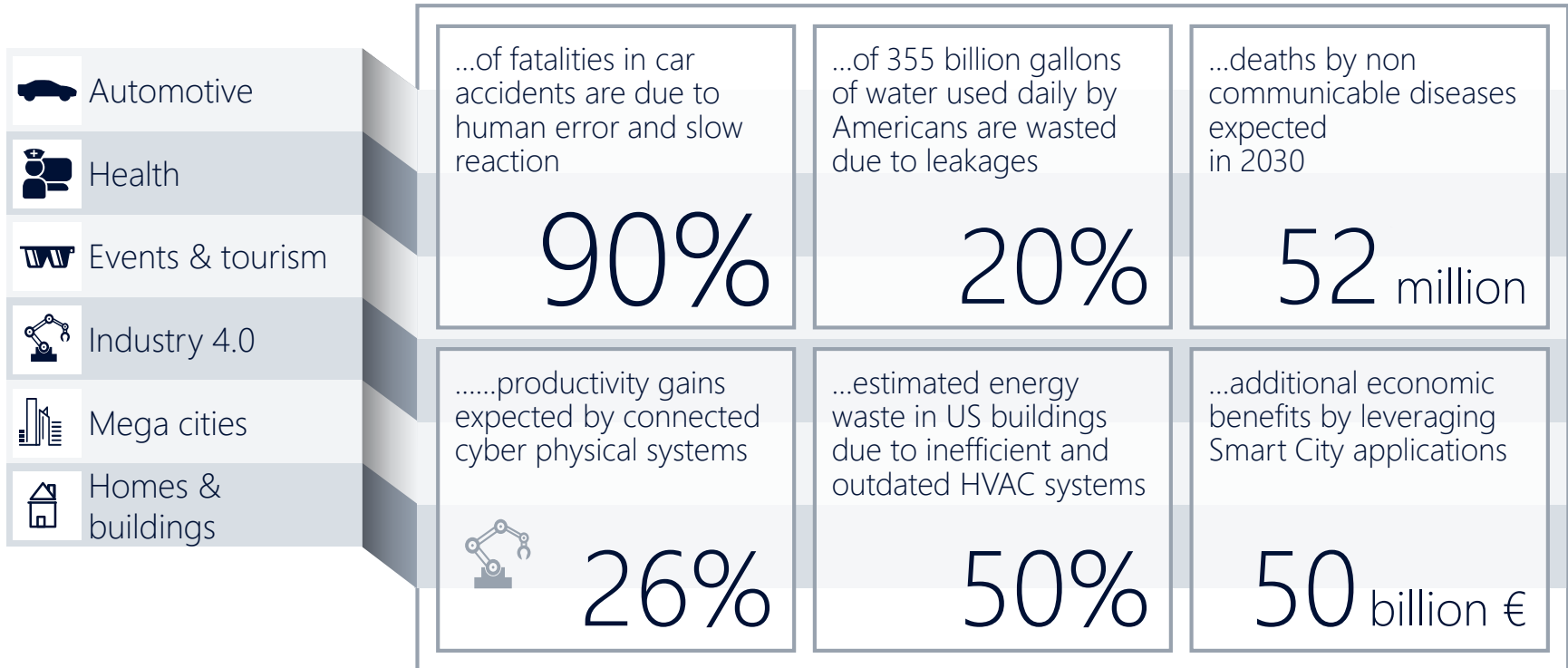


25-28 February 2019

A new networking & connectivity era



Addressing business challenges



New value creation: The industrial opportunity

Technology, Content, Finance & Insurance, Professional & Technical Services



	Share of GDP	% of Private Workforce	Share of Private-Sector IT Investment	Annual Productivity Growth (15yr avg)
Digital Industries	30%	25%	70%	2.7%

Manufacturing, Construction, Mining, Utilities, Healthcare, Hotels, Food, Transportation, Wholesale and retail trade



Physical Industries	70%	75%	30%	0.7%
---------------------	-----	-----	-----	------

Source: *The coming productivity boom*, Michael Mandel, Brett Swanson, The Technology CEO Council

New demands with extremely diverse requirements

Unleashing the potential of 5G

Growth of traffic consumers and industry



Devices
1.5 GB/day



Smart Factories
1 PB/day



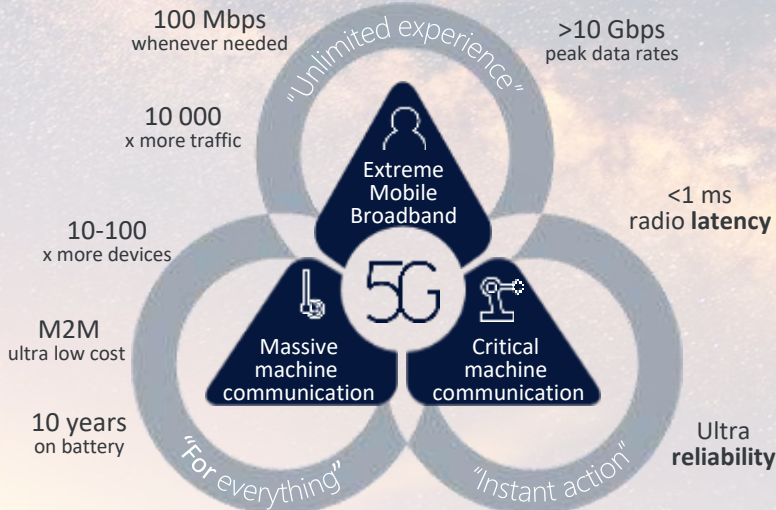
Billions of sensors
connected



Autonomous
driving

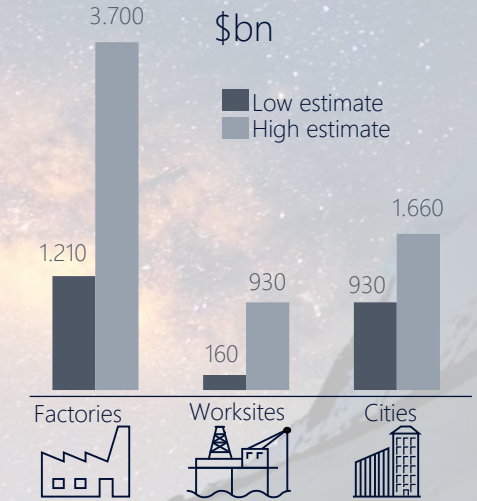
5G capabilities

The building blocks



Value creation

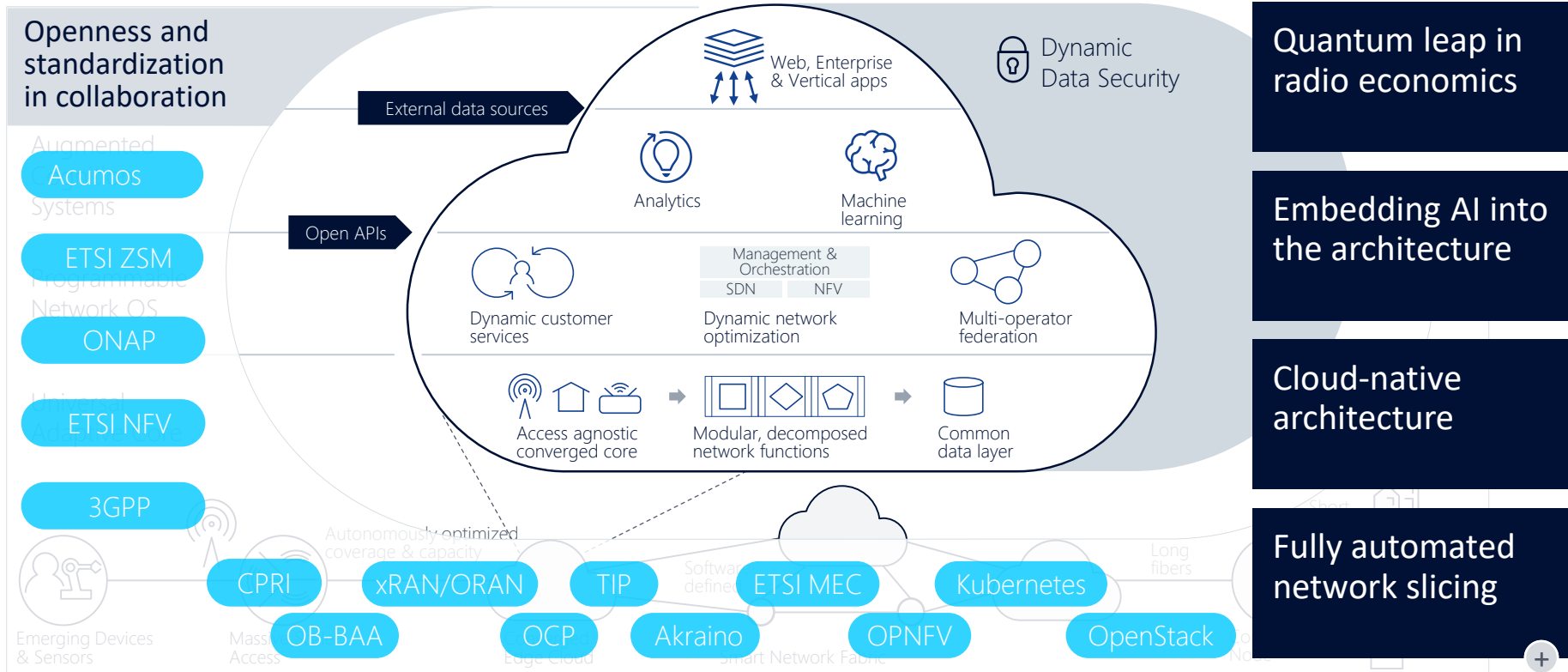
potential IIoT business in 2025**



**Source: McKinsey Global Inst.

More than radio technology

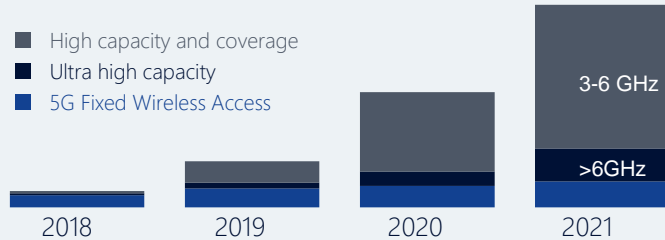
5G Future X architecture – End to end , open, cloud native and intelligent



5G market will start with extreme mobile broadband

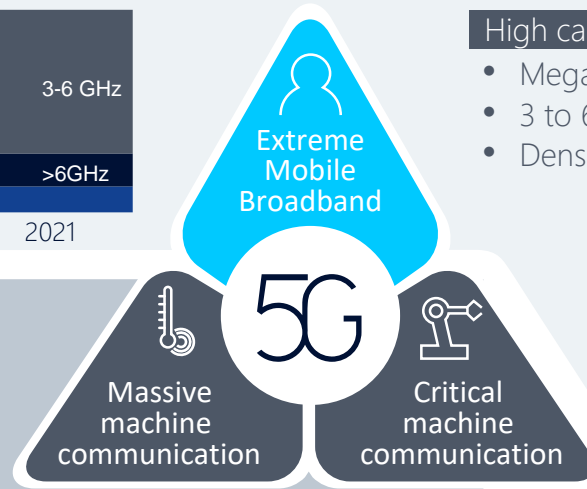
Nokia market view and derived engagement

Extreme mobile broadband market starts



Machine markets will start to develop 2022+

- Need for coverage layer and low cost devices
- Verticals not expected to be early adopters for 5G
- Earlier trials to test technology and define business models



E2E solutions for all three markets

High capacity and coverage

- Megacity capacity densification
- 3 to 6GHz ~100MHz BW
- Dense urban grid

Ultra high capacity

- Ultra dense use cases
- cm/mmWave
- Short range, LOS preferable

5G Fixed Wireless Access

- Extension of fiber access
- cm/mmWave
- Line of Sight (LOS)

Speed of innovation with the wider 5G ecosystem

GSMA GLOMO Awards 2019

5G Leadership award
Industry partnership award

5G

80+ 5G

agreements
in place

Driving the deployment of 5G

Nokia 5G trials and contracts

70+

technical
engagements
planned or on the
way in 2019



50+

technical
engagements
completed in 2018

Public commercial 5G references : DoCoMo, T-Mobile US, AT&T, Telia, Vodafone Italy, TIM San Marino, SKT, KT, Optus, rain SA

Collaborating with leading chipset and device manufacturers



3GPP compliant 5G smartphones expected to be available by 1H 2019

Piloting with leading verticals

5G smart sea port / airport



5G V2X connectivity



Smart power grids



5G industrial automation





Unleash your full potential with 5G

Technology

Policy & Regulation

Partnership

NOKIA

Copyright and confidentiality

The contents of this document are proprietary and confidential property of Nokia. This document is provided subject to confidentiality obligations of the applicable agreement(s).

This document is intended for use of Nokia's customers and collaborators only for the purpose for which this document is submitted by Nokia. No part of this document may be reproduced or made available to the public or to any third party in any form or means without the prior written permission of Nokia. This document is to be used by properly trained professional personnel. Any use of the contents in this document is limited strictly to the use(s) specifically created in the applicable agreement(s) under which the document is submitted. The user of this document may voluntarily provide suggestions, comments or other feedback to Nokia in respect of the contents of this document ("Feedback"). Such Feedback may be used in Nokia products and

related specifications or other documentation. Accordingly, if the user of this document gives Nokia Feedback on the contents of this document, Nokia may freely use, disclose, reproduce, license, distribute and otherwise commercialize the feedback in any Nokia product, technology, service, specification or other documentation.

Nokia operates a policy of ongoing development. Nokia reserves the right to make changes and improvements to any of the products and/or services described in this document or withdraw this document at any time without prior notice.

The contents of this document are provided "as is". Except as required by applicable law, no warranties of any kind, either express or implied, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose, are made in relation to the accuracy, reliability or contents of this document.

NOKIA SHALL NOT BE RESPONSIBLE IN ANY EVENT FOR ERRORS IN THIS DOCUMENT or for any loss of data or income or any special, incidental, consequential, indirect or direct damages howsoever caused, that might arise from the use of this document or any contents of this document.

This document and the product(s) it describes are protected by copyright according to the applicable laws.

Nokia is a registered trademark of Nokia Corporation. Other product and company names mentioned herein may be trademarks or trade names of their respective owners.