WILEY

WCDMA FOR UMTS

Radio Access For Third Generation Mobile Communications

Third Edition

NOKIA

Edited by

Harri Holma and Antti Toskala

WCDMA FOR UMTS

Radio Access for Third Generation
Mobile Communications

Third Edition

Edited by

Harri Holma and Antti Toskala
Both of
Nokia, Finland

John Wiley & Sons, Ltd

Other Wiley Editorial Offices

John Wiley & Sons Inc., 111 River Street, Hoboken, NJ 07030, USA

Jossey-Bass, 989 Market Street, San Francisco, CA 94103-1741, USA

Wiley-VCH Verlag GmbH, Boschstr. 12, D-69469 Weinheim, Germany

John Wiley & Sons Australia Ltd, 33 Park Road, Milton, Queensland 4064, Australia

John Wiley & Sons (Asia) Pte Ltd, 2 Clementi Loop #02-01, Jin Xing Distripark, Singapore 129809

John Wiley & Sons Canada Ltd, 22 Worcester Road, Etobicoke, Ontario, Canada M9W 1L1

Wiley also publishes its books in a variety of electronic formats. Some content that appears in
print may not be available in electronic books.

British Library Cataloguing in Publication Data

A catalogue record for this book is available from the British Library

Typeset in 10/12pt Times by Thomson Press (India) Limited, New Delhi.
Printed and bound in Great Britain by TJ International, Padstow, Cornwall.
This book is printed on acid-free paper responsibly manufactured from sustainable forestry
in which at least two trees are planted for each one used for paper production.

5

Radio Access Network Architecture

Fabio Longoni, Atte Länsisalmi and Antti Toskala

5.1 System Architecture

This chapter gives a wide overview of the UMTS system architecture, including an introduction to the logical network elements and the interfaces. The UMTS system utilises the same well-known architecture that has been used by all main second generation systems and even by some first generation systems. The reference list contains the related 3GPP specifications.

The UMTS system consists of a number of logical network elements that each has a defined functionality. In the standards, network elements are defined at the logical level, but this quite often results in a similar physical implementation, especially since there are a number of open interfaces (for an interface to be 'open', the requirement is that it has been defined to such a detailed level that the equipment at the endpoints can be from two different manufacturers). The network elements can be grouped based on similar functionality, or based on which sub-network they belong to.

Functionally the network elements are grouped into the Radio Access Network (RAN, UMTS Terrestrial RAN = UTRAN) that handles all radio-related functionality, and the Core Network, which is responsible for switching and routing calls and data connections to external networks. To complete the system, the User Equipment (UE) that interfaces with the user and the radio interface is defined. The high-level system architecture is shown in Figure 5.1.

From a specification and standardisation point of view, both UE and UTRAN consist of completely new protocols, the design of which is based on the needs of the new WCDMA radio technology. On the contrary, the definition of Core Network (CN) is adopted from GSM. This gives the system with new radio technology a global base of known and rugged CN technology that accelerates and facilitates its introduction, and enables such competitive advantages as global roaming.

Another way to group UMTS network elements is to divide them into sub-networks. The UMTS system is modular in the sense that it is possible to have several network elements of the same type. In principle, the minimum requirement for a fully featured and operational