

Index

Table of Contents

Table of Contents.....	i
List of Figures.....	v
Executive summary.....	1
1 Wide area networks for the Internet of Things.....	3
1.1 Which things will be connected to wide area networks?	3
1.1.1 Utility meters.....	4
1.1.2 Motor vehicles	4
1.1.3 Buildings.....	5
1.1.4 Low value assets – Industry 4.0 and consumer products	6
1.1.5 Future opportunities in smart cities and agriculture	7
1.2 What are the technology options?	8
1.2.1 Network architectures	8
1.2.2 Unlicensed and licensed frequency bands.....	10
1.3 Which are the leading technology ecosystems?.....	11
2 3GPP ecosystem	13
2.1 Technology characteristics.....	13
2.1.1 3GPP Release 13 – Introducing LTE-M and NB-IoT	14
2.1.2 3GPP Release 14 – IoT enhancements and V2X.....	15
2.1.3 3GPP Releases 15 and 16 – 5G phase 1 and 2.....	16
2.1.4 Network footprint.....	16
2.1.5 2G mobile networks	17
2.1.6 3G/4G mobile networks	18
2.1.7 4G-MTC mobile networks (eMTC/LTE-M and NB-IoT)	19
2.1.8 5G networks	20
2.2 Chipset vendors.....	22
2.2.1 Qualcomm.....	22
2.2.2 Mediatek.....	23
2.2.3 Unigroup Spreadtrum & RDA.....	24

- 2.2.4 Intel 24
- 2.2.5 HiSilicon 25
- 2.2.6 Sanechips Technology..... 26
- 2.2.7 Altair Semiconductors 26
- 2.2.8 Sequans Communications 27
- 2.2.9 Nordic Semiconductor 28
- 2.3 Module vendors 29
 - 2.3.1 Sierra Wireless..... 30
 - 2.3.2 Gemalto M2M 34
 - 2.3.3 Telit 39
 - 2.3.4 Quectel 42
 - 2.3.5 Sunsea Telecommunications (SIMCom/Longsung) 45
 - 2.3.6 u-blox..... 47
 - 2.3.7 Huawei..... 50
 - 2.3.8 ZTE WeLink (Gosuncn) 51
 - 2.3.9 Neoway..... 53
 - 2.3.10 Fibocom 54
 - 2.3.11 Other cellular module vendors 56
- 3 LoRa ecosystem 59
 - 3.1 Technology characteristics..... 59
 - 3.2 Network footprint 60
 - 3.2.1 Europe 61
 - 3.2.2 Asia-Pacific 62
 - 3.2.3 The Americas and Middle East & Africa..... 63
 - 3.3 Chipset and module vendors 64
 - 3.3.1 Semtech 64
 - 3.3.2 LoRa module vendors 65
- 4 Sigfox ecosystem..... 69
 - 4.1 Technology characteristics..... 69
 - 4.2 Network footprint 71
 - 4.2.1 Europe 71
 - 4.2.2 The Americas..... 72

4.2.3	Asia-Pacific	73
4.2.4	Middle East & Africa	75
4.3	Chipset and module vendors	75
4.3.1	Chipset vendors	76
4.3.2	Sigfox module vendors	76
5	802.15.4 WAN ecosystem.....	81
5.1	Technology characteristics.....	81
5.1.1	IPv6 connectivity stacks based on 802.15.4.....	82
5.1.2	Wi-SUN	82
5.1.3	ZigBee	83
5.2	Network footprint	84
5.3	Chipsets and modules.....	85
6	Vertical market segments	87
6.1	Motor vehicles	87
6.1.1	OEM connected car applications.....	87
6.1.2	Aftermarket connected car applications	89
6.2	Energy & Infrastructure.....	90
6.2.1	Smart electricity metering	90
6.2.2	Smart gas and water metering.....	92
6.2.3	Smart cities.....	93
6.3	Industry & Transport.....	94
6.4	Other	95
6.4.1	Buildings & security.....	96
6.4.2	Consumer products	96
6.4.3	Payments.....	97
7	Market forecasts and trends	99
7.1	Market summary	99
7.2	3GPP family	101
7.2.1	Cellular IoT device market forecast.....	102
7.2.2	Europe.....	104
7.2.3	Americas.....	105
7.2.4	Asia-Pacific.....	106

7.2.5 Middle East & Africa 109

7.3 LoRa..... 110

7.4 Sigfox..... 111

7.5 802.15.4 WAN 112

Glossary 115

Index

List of Figures

Figure 1.1: Top wide area IoT target segments (2018)	4
Figure 1.2: Building stock by category (EU/US 2015).....	5
Figure 1.3: Unlicensed and reserved radio frequencies available for wireless IoT	10
Figure 2.1: Comparison of LTE MTC enhancements in 3GPP Release 13	15
Figure 2.2: 3GPP cellular network connections by generation (World Q3-2017)	17
Figure 2.3: LTE-M network deployment plans (Q1-2018)	19
Figure 2.4: NB-IoT network availability by country (Q1-2018).....	21
Figure 2.5: Top cellular module vendors, by revenues and shipments (World 2017)	29
Figure 2.6: Sierra Wireless embedded modules and terminals (Q1-2018)	31
Figure 2.7: Gemalto M2M embedded modules (Q1-2018)	35
Figure 2.8: Telit M2M embedded wireless modules (Q1-2018)	41
Figure 2.9: Quectel embedded wireless modules (Q1-2018)	43
Figure 2.10: SIMCom and Longsung embedded wireless modules (Q1-2018).....	46
Figure 2.11: u-blox embedded wireless modules (Q1-2018)	48
Figure 2.12: Huawei embedded wireless modules (Q1-2018)	51
Figure 2.13: ZTE WeLink embedded wireless modules (Q1-2018).....	52
Figure 2.14: Neoway embedded wireless modules (Q1-2018)	54
Figure 2.15: Fibocom embedded wireless modules (Q1-2018).....	55
Figure 3.1: LoRa wide area network architecture	60
Figure 3.2: LoRa network operators in Europe (Q4-2017)	61
Figure 3.3: LoRa network operators in Asia-Pacific (Q4-2017)	62
Figure 3.4: List of certified LoRa modules by vendor (Q1-2018).....	66
Figure 4.1: Sigfox network architecture	70
Figure 4.2: Sigfox network partners in Europe (Q1-2018).....	72
Figure 4.3: Sigfox networks in the Americas (Q1-2018)	73
Figure 4.4: Sigfox networks in Asia-Pacific and MEA (Q1-2018).....	74
Figure 4.5: List of Sigfox module vendors by supported regions (Q1-2018)	77
Figure 5.1: Major 802.15.4 networking platforms for smart metering (2017)	84

Figure 6.1: OEM telematics attach rates in new vehicles, by region (2016/2021)	88
Figure 6.2: Projected smart meter penetration in key markets (2023)	91
Figure 7.1: Cellular/LPWA IoT device shipment forecast, by region (World 2017–2023)	99
Figure 7.2: Cellular/LPWA IoT device shipment forecast, by technology (2017–2023)	100
Figure 7.3: Cellular IoT device shipment forecast (World 2017–2023).....	102
Figure 7.4: Cellular IoT device shipments, by network technology (World 2017–2023)	103
Figure 7.5: Cellular IoT device shipment forecast (Europe 2017–2023)	104
Figure 7.6: Cellular IoT device shipment forecast (Americas 2017–2023)	106
Figure 7.7: Cellular IoT device shipment forecast (Asia-Pacific 2017–2023)	107
Figure 7.8: Cellular IoT device shipment forecast (Middle East & Africa 2017–2023).....	109
Figure 7.9: LoRa device shipments forecast (World 2017–2023).....	111
Figure 7.10: Sigfox device shipments forecast (World 2017–2023)	112
Figure 7.11: 802.15.4 WAN device shipments forecast (World 2017–2023)	113