

Index

Table of Contents

| | |
|--|----|
| Table of Contents..... | i |
| List of Figures..... | iv |
| Executive summary..... | 1 |
| 1 M2M/IoT networking and technologies..... | 2 |
| 1.1 Introduction..... | 2 |
| 1.1.1 The IoT technology stack..... | 2 |
| 1.2 Embedding cellular technology in products and systems..... | 4 |
| 1.2.1 Cellular modules..... | 6 |
| 1.2.2 Cellular IoT gateways, routers and modems..... | 7 |
| 1.2.3 SIM solutions and embedded UICC..... | 9 |
| 1.2.4 Carrier, industry and region specific certifications..... | 12 |
| 1.2.5 Cellular IoT hardware value chain..... | 15 |
| 1.3 Cellular IoT from 2G to 4G and beyond..... | 16 |
| 1.3.1 2G mobile networks..... | 17 |
| 1.3.2 3G/4G mobile networks..... | 17 |
| 1.3.3 4G-MTC mobile networks (eMTC/LTE-M and NB-IoT)..... | 19 |
| 1.3.4 5G networks..... | 21 |
| 1.3.5 LPWA networks..... | 21 |
| 1.3.6 Cost comparison for cellular and LPWA technologies..... | 23 |
| 2 Market forecasts and trends..... | 25 |
| 2.1 Market forecasts..... | 25 |
| 2.1.1 The embedded cellular module market and vendor market shares..... | 25 |
| 2.1.2 Cellular module market analysis and forecasts..... | 27 |
| 2.1.3 The cellular IoT gateway and modem market and vendor market shares..... | 29 |
| 2.1.4 Cellular IoT gateway and modem market analysis and forecasts..... | 31 |
| 2.2 Market trends..... | 35 |
| 2.2.1 Vendors move to employ vertical integration strategies in attractive niches..... | 35 |
| 2.2.2 Few new product launches of LTE-M and NB-IoT devices..... | 36 |

2.2.3 Vendors offer modularized devices for flexibility and upgradability 37

2.2.4 Leading IoT gateway providers experienced solid revenue growth in 2017 38

2.2.5 Pace of M&A activity could pick up from low levels..... 40

3 Company profiles and strategies..... 42

3.1 Cellular IoT gateway vendors 42

3.1.1 ADLINK Technology 42

3.1.2 Advantech B+B SmartWorx..... 44

3.1.3 Beijer Electronics Group 46

3.1.4 Belden 48

3.1.5 CalAmp..... 49

3.1.6 Cisco 51

3.1.7 Connected IO 53

3.1.8 Cradlepoint..... 54

3.1.9 Digi International 57

3.1.10 Encore Networks 60

3.1.11 Eurotech 62

3.1.12 Four-Faith Communication Technology 64

3.1.13 HMS Networks 66

3.1.14 InHand Networks..... 68

3.1.15 INSYS Microelectronics..... 70

3.1.16 Maestro Wireless Solutions 71

3.1.17 Matrix Electrónica 73

3.1.18 MC Technologies 75

3.1.19 Moxa..... 75

3.1.20 MultiTech Systems 77

3.1.21 NetComm Wireless 80

3.1.22 NetModule 82

3.1.23 Option..... 83

3.1.24 Red Lion Controls..... 85

3.1.25 Robustel Technologies 87

3.1.26 Sagemcom Dr. Neuhaus..... 89

3.1.27 Systech Corporation 90

3.1.28 Teltonika 92

3.2 Cellular IoT module vendors 93

3.2.1 Fibocom 93

3.2.2 Gemalto M2M 95

3.2.3 Huawei..... 100

3.2.4 Neoway..... 102

3.2.5 Quectel 103

3.2.6 Sierra Wireless..... 106

3.2.7 Sunsea Telecommunications (SIMCom/Longsung) 110

3.2.8 Telit..... 113

3.2.9 u-blox..... 116

3.2.10 ZTE WeLink (Gosuncn Technology) 119

3.2.11 Other cellular module vendors..... 121

Glossary 124

Index

List of Figures

| | |
|--|----|
| Figure 1.1: The core elements of an IoT solution | 3 |
| Figure 1.2: Cost versus time diagram for cellular technology integration..... | 4 |
| Figure 1.3: Examples of IoT modules | 6 |
| Figure 1.4: Common features in cellular IoT gateways and routers..... | 7 |
| Figure 1.5: System architecture for an end-to-end IoT solution | 8 |
| Figure 1.6: Examples of cellular IoT gateways | 9 |
| Figure 1.7: Comparison of SIM form factors..... | 10 |
| Figure 1.8: Size comparison between the 4FF and MFF2 form factor | 11 |
| Figure 1.9: Cellular hardware value chain | 15 |
| Figure 1.10: 3GPP cellular network connections by generation (World Q4-2017) | 16 |
| Figure 1.11: LTE-M network availability by country (Q3-2018)..... | 18 |
| Figure 1.12: NB-IoT network availability by country (Q3-2018)..... | 20 |
| Figure 1.13: Comparison of LPWA technologies..... | 22 |
| Figure 1.14: Cost comparison for IoT technologies (2017) | 24 |
| Figure 2.1: Top cellular module vendors, by revenues and shipments (World 2017) | 26 |
| Figure 2.2: Cellular IoT device shipment forecast (World 2017–2023)..... | 28 |
| Figure 2.3: Top cellular IoT gateway vendors, by revenues and shipments (World 2017) | 30 |
| Figure 2.4: Cellular IoT gateway shipment forecast, by region (World 2017–2023) | 31 |
| Figure 2.5: Cellular IoT gateway and modem market value, by region (World 2015–2017) | 32 |
| Figure 2.6: Changes in average selling price, by region (World 2015–2017) | 33 |
| Figure 2.7: IoT gateway shipments by cellular technology (World 2017) | 34 |
| Figure 2.8: SmartSense by Digi cellular gateways for cold chain applications | 36 |
| Figure 2.9: Examples of vendors offering modular device concepts (Q3-2018)..... | 38 |
| Figure 2.10: Financial data for leading IoT gateway and modem vendors | 39 |
| Figure 2.11: IoT gateway vendor mergers and acquisitions (2010–2018) | 41 |
| Figure 3.1: ADLINK’s IoT gateways (Q3-2018) | 43 |
| Figure 3.2: Advantech B+B SmartWorx’s routers and gateways (Q3-2018) | 45 |
| Figure 3.3: Westermo and Korenix routers and gateways (Q3-2018) | 47 |
| Figure 3.4: Hirschmann, GarrettCom and ProSoft Technology devices (Q3-2018)..... | 49 |

Figure 3.5: CalAmp cellular routers (Q3-2018) 50

Figure 3.6: Cisco cellular routers 52

Figure 3.7: Connected IO's range of cellular modems and routers (Q3-2018) 54

Figure 3.8: Cradlepoint's range of cellular routers (Q3-2018) 56

Figure 3.9: Digi International's cellular routers (Q3-2018) 59

Figure 3.10: Encore Networks' cellular IoT gateways (Q3-2018) 61

Figure 3.11: Eurotech's IoT/M2M architecture 63

Figure 3.12: Four-Faith's cellular modems and routers (Q3-2018) 65

Figure 3.13: HMS' cellular IoT gateways 67

Figure 3.14: InHand Networks' industrial communications devices (Q3-2018) 69

Figure 3.15: INSYS icom's industrial 4G LTE routers in the MRO and SCR series 71

Figure 3.16: Maestro Wireless Solutions' IoT routers and modems (Q3-2018) 72

Figure 3.17: Moxa's industrial cellular devices (Q3-2018) 76

Figure 3.18: MultiTech Systems' cellular IoT gateways, routers and modems (Q3-2018) 78

Figure 3.19: NetComm Wireless' M2M routers and modems (Q3-2018) 80

Figure 3.20: NetModule's cellular routers 82

Figure 3.21: CloudGate cellular M2M gateway 84

Figure 3.22: Robustel Technologies' IoT routers (Q2-2018) 88

Figure 3.23: Sagemcom Dr. Neuhaus' cellular M2M routers (Q3-2018) 89

Figure 3.24: Systech's SysLINK series (Q3-2018) 91

Figure 3.25: Teltonika's range of cellular routers (Q3-2018) 93

Figure 3.26: Fibocom embedded wireless modules (Q3-2018) 94

Figure 3.27: Gemalto M2M embedded modules (Q3-2018) 96

Figure 3.28: Gemalto M2M terminals (Q3-2018) 98

Figure 3.29: Huawei embedded wireless modules (Q3-2018) 101

Figure 3.30: Neoway embedded wireless modules (Q3-2018) 103

Figure 3.31: Quectel embedded wireless modules (Q3-2018) 105

Figure 3.32: Sierra Wireless embedded modules and IoT gateways (Q3-2018) 108

Figure 3.33: SIMCom and Longsung embedded wireless modules and (Q1-2018) 112

Figure 3.34: Telit M2M embedded wireless modules (Q3-2018) 115

Figure 3.35: u-blox embedded wireless modules (Q3-2018) 118

Figure 3.36: ZTE WeLink embedded wireless modules (Q3-2018) 120