The NFV, SDN & Wireless Network Infrastructure Market: 2016 - 2030 - Opportunities, Challenges, Strategies and Forecasts

Description: Service providers continue to face increasing CapEx and OpEx burdens, amid growing requirements for high-speed mobile broadband services. By eliminating reliance on expensive proprietary hardware platforms, NFV (Network Functions Virtualization) and SDN (Software Defined Networking) promise to reduce service provider CapEx. In addition, both technologies can significantly slash OpEx due to a reduction in physical space, labor and power consumption.

Driven by the promise of TCO (Total Cost of Ownership) reduction, mobile operators are aggressively jumping on the NFV and SDN bandwagon, targeting deployments across a multitude of areas. By the end of 2020, estimates suggest that NFV and SDN investments on service provider networks will account for over $18 Billion. These investments will initially focus on EPC/mobile core, IMS, policy control, CPE (Customer Premises Equipment), CDN (Content Delivery Network) and transport networks.

Spanning over 1,600 pages, the "NFV, SDN & Wireless Network Infrastructure Market: 2016 - 2030 - Opportunities, Challenges, Strategies and Forecasts" report package encompasses three comprehensive reports covering covering NFV, SDN, conventional 2G, 3G, 4G & 5G wireless network infrastructure and HetNet (Heterogeneous Network) infrastructure:

- The SDN, NFV & Network Virtualization Ecosystem: 2016 - 2030 - Opportunities, Challenges, Strategies & Forecasts
- The Wireless Network Infrastructure Ecosystem: 2016 - 2030 - Macrocell RAN, Small Cells, C-RAN, RRH, DAS, Carrier Wi-Fi, Mobile Core, Backhaul & Fronthaul
- The HetNet Ecosystem (Small Cells, Carrier Wi-Fi, C-RAN & DAS): 2016 - 2030 - Opportunities, Challenges, Strategies & Forecasts

This report package provides an in-depth assessment of NFV, SDN, network virtualization, 2G, 3G, 4G & 5G wireless network infrastructure and HetNet gear. Besides analyzing enabling technologies, key trends, market drivers, challenges, use cases, mobile operator case studies, regional CapEx commitments, regulatory landscape, standardization, opportunities, future roadmap, value chain, ecosystem player profiles and strategies, the report package also presents revenue and unit shipment forecasts for multiple submarkets including:

Conventional 2G, 3G, 4G & 5G Wireless Network Infrastructure

- Macrocell RAN Base Stations
- Macrocell Backhaul
- Mobile Core

HetNet Infrastructure

- Small Cells
- Small Cell Backhaul
- Carrier Wi-Fi
- C-RAN (Centralized RAN)
- C-RAN Fronthaul
- DAS (Distributed Antenna Systems)

NFV

- Hardware Appliances
- Orchestration & Management Software
- VNF (Virtualized Network Function) Software

SDN
The report package comes with an associated Excel datasheet suite covering quantitative data from all numeric forecasts presented in the report package.

Key Questions Answered:

The report package provides answers to the following key questions:

- How is the 2G, 3G, 4G & 5G wireless network infrastructure market evolving by segment and region?
- Which 2G, 3G, 4G & 5G technology constitutes the highest amount of spending and how will this evolve overtime?
- What is the global and regional outlook for RAN and mobile core submarkets?
- How will the market shape for HetNet infrastructure such as small cells, C-RAN and DAS?
- How will Wi-Fi fit into future network architectures for access and offload?
- What is the opportunity for mobile transport networking gear, and what new backhaul/fronthaul solutions are evolving?
- How big is the SDN, NFV and network virtualization opportunity?
- What trends, challenges and barriers are influencing its growth?
- What will the market size be in 2020 and at what rate will it grow?
- Which regions, submarkets and countries will see the highest percentage of growth?
- How are service provider led initiatives driving SDN and NFV investments?
- How does regulation impact the adoption of SDN and NFV centric networks?
- How can NFV make the VoLTE (Voice over LTE) business case work?
- How can software defined DPI (Deep Packet Inspection) complement SDN functionality?
- What level of CapEx savings can SDN and NFV facilitate for service providers?
- Do SDN and NFV pose a threat to traditional network infrastructure vendors?
- Who are the key market players and what are their strategies?
- Is there a ring leader in the SDN and NFV ecosystem?
- What strategies should enabling technology providers, network infrastructure vendors, mobile operators and other ecosystem players adopt to remain competitive?

Contents:

Report 1: The SDN, NFV & Network Virtualization Ecosystem: 2016 - 2030 - Opportunities, Challenges, Strategies & Forecasts

1.1: Introduction
1.1 Executive Summary
1.2 Topics Covered
1.3 Forecast Segmentation
1.4 Key Questions Answered
1.5 Key Findings
1.6 Methodology
1.7 Target Audience
1.8 Companies & Organizations Mentioned

1.2: An Overview of SDN, NFV & Network Virtualization
2.1 What is Network Virtualization?
2.2 What is SDN (Software Defined Networking)?
2.3 SDN Protocols
2.3.1 OpenFlow
2.3.2 BGP-TE (Border Gateway Protocol - Traffic Engineering)
2.3.3 PCEP (Path Computation Element Protocol)
2.3.4 I2RS (Interface to the Routing System)
2.3.5 VxLAN (Virtual Extensible LAN)
2.3.6 ALTO (Application Layer Traffic Optimization)
2.3.7 IETF Software Driven Networks
2.4 SDN Implementation Approaches
2.4.1 Network Virtualization Approach
2.4.2 Evolutionary Approach
2.4.3 The “Central Control” Approach
2.5 What is NFV (Network Functions Virtualization)?
2.6 NFV Enabling Technologies
2.6.1 Cloud Computing and Network Virtualization
2.6.2 Open Management and Control Protocols
2.6.3 Industry Standard High-Volume Servers
2.7 NFV Implementation Architecture
2.7.1 NFVI (NFV Infrastructure)
2.7.1.1 Hardware Resources
2.7.1.2 Virtualized Resources
2.7.2 VNFs (Virtualized Network Functions)
2.7.3 NFV-MANO (NFV-Management and Orchestration)
2.7.3.1 VIM (Virtualized Infrastructure Manager)
2.7.3.2 Orchestrator
2.7.3.3 VNF Manager
2.8 How SDN and NFV Differ from Each Other?
2.8.1 Similarities and Differences
2.8.2 Can Both Technologies Complement Each Other?
2.8.3 How Are Vendors Positioning their Solutions?
2.9 Market Drivers
2.9.1 Leveraging Generic Low-cost Hardware
2.9.2 Multi-tenancy on Same Hardware
2.9.3 Reduced Power Consumption
2.9.4 Faster TTM (Time to Market)
2.9.5 Improved Operational Efficiency & Performance
2.9.6 Centralized Provisioning and Network Control
2.9.7 Ability to Launch New Services & Virtual Networks Quickly
2.9.8 Dynamic Scaling of Services
2.9.9 Opening the Door to Multi-vendor Interoperability
2.9.10 CapEx and OpEx Reduction
2.9.11 Fast Troubleshooting and Improved Diagnostics
2.9.12 Vendor Support
2.10 Market Barriers
2.10.1 Lack of Standardization & Technology Maturity
2.10.2 Uncertain Cost-Benefits Tradeoffs
2.10.3 NFV May Slow/Delay Traffic
2.10.4 Will Multi-vendor Interoperability Really Work?
2.10.5 Co-Existence with Legacy Networks: Integration Challenges

3Chapter 1.3: SDN & NFV Use Case Scenarios
3.1 Enterprise, Data Center & Generic Use Cases
3.1.1 Network Virtualization
3.1.2 Scalable Data Centers
3.1.3 SD-WAN (Software Defined WAN)
3.1.4 Tap Aggregation
3.1.5 Dynamic WAN Re-Routing
3.1.6 Network Exchange: Interconnecting Physical Networks
3.1.7 Improved Traffic Engineering
3.1.8 Converged Storage
3.2 Service Provider Centric Use Cases
3.2.1 RAN Virtualization
3.2.2 C-RAN (Cloud RAN)
3.2.3 Wireline Fixed Access Network Virtualization
3.2.4 CPE & Home Network Environment Virtualization
3.2.5 Mobile Backhaul Virtualization
3.2.6 EPC/Mobile Core Virtualization
3.2.7 IMS & VoLTE Virtualization
3.2.8 DPI Virtualization
3.2.9 Policy Functions Virtualization
3.2.10 Virtual Routers
3.2.11 Virtualization & Control of Security Functions
3.2.12 Virtualization of CDNs
3.2.13 Service Chaining
3.2.14 Bandwidth on Demand
3.2.15 Packet-Optical Integration
3.2.16 SDN/NFV Iaas (Infrastructure as a Service)
3.2.17 VNFaaS (Virtual Network Function as a Service)
3.2.18 VNPaaS (Virtual Network Platform as a Service)

1.4: SDN & NFV Deployment Case Studies
4.1 Service Provider Deployment Case Studies
4.1.1 AT&T
4.1.2 BT Group
4.1.3 China Mobile
4.1.4 DT (Deutsche Telekom)
4.1.5 Etisalat
4.1.6 Iij (Internet Initiative Japan)
4.1.7 KDDI Corporation
4.1.8 KT Corporation
4.1.9 LG Uplus
4.1.10 NAKA Mobile
4.1.11 NTT Communications
4.1.12 NTT DoCoMo
4.1.13 PT (Portugal Telecom) /Oi
4.1.14 SingTel
4.1.15 SK Telecom
4.1.16 SoftBank
4.1.17 Telekom Austria Group
4.1.18 Telstra
4.1.19 Telefónica
4.1.20 Verizon
4.1.21 Vodafone Group
4.2 Enterprise & Data Center Deployment Case Studies
4.2.1 Baidu
4.2.2 Citigroup
4.2.3 City of Avondale
4.2.4 Equinix
4.2.5 Fidelity Investments
4.2.6 Google
4.2.7 Kanazawa University Hospital
4.2.8 Microsoft
4.2.9 Nippon Express
4.2.10 Paddy Power Betfair
4.2.11 Produban
4.2.12 Shutterfly
4.2.13 U2 Cloud
4.2.14 UBM Tech

1.5: Industry Roadmap and Value Chain
5.1 The SDN, NFV & Network Virtualization Value Chain
5.1.1 Silicon & Server OEMs
5.1.2 Pure-play SDN/NFV Specialists
5.1.3 Network Infrastructure Vendors
5.1.4 IT Industry Giants
5.1.5 Mobile Infrastructure Vendors
5.1.6 Policy, OSS, BSS & Other Software Vendors
5.1.7 Enterprises
5.1.8 Service Providers
5.1.9 Data Center Operators
5.2 The SDN, NFV & Network Virtualization Industry Roadmap: 2016 - 2030
5.2.1 2016 - 2020: Moving Towards Network Wide Orchestration
5.2.2 2020 - 2025: Large Scale Proliferation in Service Provider Networks
5.2.3 2025 - 2030: Continued Investments with 5G Rollouts

1.6: Standardization Bodies & Alliances
6.1 3GPP (3rd Generation Partnership Project)
6.2 ETSI (European Telecommunications Standards Institute)
6.3 Cloud NFV
6.4 IETF (Internet Engineering Task Force)
6.5 IRTF (Internet Research Task Force)
6.6 ITU (International Telecommunications Union)
6.7 MEF (Metro Ethernet Forum)
6.8 ONF (Open Networking Foundation)
6.9 OpenDaylight
6.10 OpenStack Foundation
6.11 ONRC (Open Networking Research Center) and ON.Lab (Open Networking Lab)
6.12 OPNFV (Open Platform for NFV)
6.13 OVA (Open Virtualization Alliance)
6.14 OMG (Object Management Group)
6.15 TM Forum
6.16 Vendor Led Initiatives & Ecosystem Programs
6.16.1 Nokia CloudBand Ecosystem Program
6.16.2 Ciena Blue Orbit Ecosystem
6.16.3 HP OpenNFV Application Partner Program
6.16.4 HP SDN Ecosystem Alliance
6.16.5 NEC SDN Partner Space
6.16.6 Intel Network Builders Program
6.16.7 Titanium Cloud Partner Program
6.16.8 Juniper Technology Partner Program
6.16.9 Red Hat NFV Ecosystem
6.16.10 Amdocs Network Cloud Ecosystem

1.7: Company Profiles
7.1 6WIND
7.2 A10 Networks
7.3 Accedian Networks
7.4 Accton Technology Corporation
7.5 Active Broadband Networks
7.6 Actus Networks
7.7 ADARA Networks
7.8 Adax
7.9 ADLINK Technology
7.10 ADTRAN
7.11 ADVA Optical Networking
7.12 Affirmed Networks
7.13 Agema Systems
7.14 Akamai Technologies
7.15 ALAXALA Networks Corporation
7.16 Albis Technologies
Allied Telesis
Allot Communications
Alpha Networks
ALTEN Calsoft Labs
AltioStar Networks
Alvarion Technologies
AMD (Advanced Micro Devices)
Amdocs
ANEVIA
Argela
Aricent
Arista Networks
Arkoon Netasq
ARM Holdings
ARRIS Group
Artesyn Embedded Technologies
ASOCS
Astellia
AudioCodes
Avaya
Barracuda Networks
Big Switch Networks
BlueCoat
Brain4Net
Broadcom
Broadpeak
BroadSoft
Brocade
BTI Systems
Canoga Perkins
Canonical
Catbird Networks
Cavium
Cedexis
Cellwise
Centec Networks
Ceragon Networks
Certes Networks
Check Point Software Technologies
Ciena Corporation
Cisco Systems
Citrix Systems
Clavister
ClearPath Networks
CloudWeaver
Cobham Wireless
Cohesive Networks
Colt Technology Services Group
Comodo Security Solutions
Compass-EOS
Comptel
Concurrent
Coriant
Corsa Technology
CSC (Computer Sciences Corporation)
Cumulus Networks
Dell
Dialogic
Docker
Dorado Software
ECI Telecom
Edgeware
Ekinops
7.80 Elemental Technologies
7.81 EMC Corporation
7.82 EnterpriseWeb
7.83 Ericsson
7.84 EXFO
7.85 Extreme Networks
7.86 F5 Networks
7.87 FibroLAN
7.88 Flash Networks
7.89 Flextronics International
7.90 Fortinet
7.91 FRAFOS
7.92 Fujitsu
7.93 GENBAND
7.94 Gencore Systems
7.95 Gigamon
7.96 GigaSpaces Technologies
7.97 Guavus
7.98 H3C Technologies
7.99 Harmonic
7.100 Hitachi
7.101 HP (Hewlett-Packard)
7.102 Huawei
7.103 HyTrust
7.104 IBM
7.105 Illumio
7.106 Imagine Communications Corporation
7.107 Infinera
7.108 Infoblox
7.109 Inocybe Technologies
7.110 Intel Corporation
7.111 Interface Masters Technologies
7.112 Intracom Telecom
7.113 Intune Networks
7.114 IP Infusion
7.115 IPgallery
7.116 iPhotonix
7.117 IPITEK
7.118 Italtel
7.119 iwNetworks
7.120 Ixia
7.121 Juniper
7.122 KEMP Technologies
7.123 Lemko Corporation
7.124 Lenovo
7.125 Lumeta Corporation
7.126 Luxoft Holding
7.127 Maipu Communication Technology
7.128 Marvell Technology Group
7.129 MatrixStream Technologies
7.130 MediaTek
7.131 Mellanox Technologies
7.132 Metaswitch Networks
7.133 Microsoft
7.134 Midokura
7.135 Mirantis
7.136 Mitel Networks Corporation
7.137 Mojatatu Networks
7.138 MRV Communications
7.139 Nakina Systems
7.140 Napatech
7.141 NCLC (NCL Communication)
7.142 NEC Corporation
7.143 NetCracker Technology
7.144 NETGEAR
7.145 Netronome
7.146 Netrounds
7.147 NetScout Systems
7.148 NetYCE
7.149 NFVWare
7.150 Nokia Networks
7.151 Nominum
7.152 NoviFlow
7.153 NTT Communications
7.154 NXP Semiconductors
7.155 Omnitron Systems
7.156 Openet
7.157 Openwave Mobility
7.158 Opera Software
7.159 Optelian
7.160 Oracle Corporation
7.161 Orchestral networks
7.162 Overture Networks
7.163 OX (Open-Xchange)
7.164 Ozono Security
7.165 Packet Ship Technologies
7.166 Padtec
7.167 Parallel Wireless
7.168 Palo Alto Networks
7.169 Panda Security
7.170 Pantheon Technologies
7.171 PeerApp
7.172 Penguin
7.173 Pertino
7.174 Pica8
7.175 Plexxi
7.176 PLUMgrid
7.177 Pluribus Networks
7.178 Polatis
7.179 Procera Networks
7.180 Qosmos
7.181 Qualcomm
7.182 Quanta Computer
7.183 Quortus
7.184 Rackspace
7.185 RAD Data Communications
7.186 Radisys Corporation
7.187 Radware
7.188 Rapid7
7.189 Realtek Semiconductor Corporation
7.190 Red Hat
7.191 Redknee
7.192 RightScale
7.193 Riverbed Technology
7.194 Ruckus Wireless
7.195 Saisei
7.196 Samsung Electronics
7.197 Sandvine
7.198 Sansay
7.199 Sencore
7.200 SevOne
7.201 Silver Peak Systems
7.202 Sonus Networks
7.203 Sophos
7.204 Sorrento Networks
7.205 SpiderCloud Wireless
7.206 Spirent Communications
7.207 StackIQ
7.208 SunTec Business Solutions
7.209 Supermicro (Super Micro Computer)
7.210 Svarog Technology Group
7.211 Symantec Corporation
7.212 SysMaster
7.213 Tango Telecom
7.214 TE Connectivity
7.215 Tejas Networks
7.216 Telchemy
7.217 Telco Systems
7.218 Telcoware
7.219 Telum
7.220 Thomson Video Networks
7.221 TI (Texas Instruments)
7.222 Tieto
7.223 TitanHQ
7.224 Trend Micro
7.225 UBiqube
7.226 Ultra Electronics AEP
7.227 UTStarcom
7.228 vArmour
7.229 Versa Networks
7.230 Veryx Technologies
7.231 Viavi Solutions
7.232 VMware
7.233 WatchGuard Technologies
7.234 Wavenet
7.235 WebNMS
7.236 Wedge Networks
7.237 Wipro
7.238 Wowza Media Systems
7.239 Xilinx
7.240 XOR Media
7.241 Xtera Communications
7.242 Xura
7.243 Zhone Technologies
7.244 ZTE

1.8: Market Analysis & Forecasts
8.1 Global Outlook of SDN, NFV & Network Virtualization Revenue: 2016 - 2030
8.2 User Base Segmentation
8.2.1 Enterprises & Data Centers
8.2.2 Service Providers
8.3 Submarket Segmentation
8.3.1 SDN Hardware & Software
8.3.2 NFV Hardware & Software
8.3.3 Other Network Virtualization Software
8.3.4 Service Provider Submarket Segmentation
8.4 SDN Submarket Revenue: 2016 - 2030
8.4.1 User Base Segmentation
8.4.2 Service Provider SDN
8.4.3 Enterprise & Data Center SDN
8.5 NFV Submarket Revenue: 2016 - 2030
8.5.1 Hardware Appliances
8.5.2 Orchestration & Management Software
8.5.3 VNF Software
8.6 Service Provider SDN Submarket Revenue: 2016 - 2030
8.6.1 SDN-Enabled Hardware Appliances
8.6.2 Orchestration & Management Software
8.6.3 SDN Controller Software
8.6.4 Network Applications Software
8.7 Enterprise & Data Center SDN Submarket Revenue: 2016 - 2030
8.7.1 SDN-Enabled Hardware Appliances
8.7.2 SDN-Enabled Virtual Switches
8.7.3 SDN Controller Software
8.8 Functional Area Segmentation for Service Provider Deployments
8.8.1 CDN
8.8.2 CPE
8.8.3 Data Center
8.8.4 EPC/Mobile Core
8.8.5 Fixed Access Networks
8.8.6 IMS & VoLTE
8.8.7 Policy, OSS & BSS
8.8.8 RAN
8.8.9 Transport & Backhaul
8.9 Regional Outlook
8.10 Asia Pacific SDN, NFV & Network Virtualization Revenue: 2016 - 2030
8.10.1 Australia
8.10.2 China
8.10.3 India
8.10.4 Japan
8.10.5 South Korea
8.10.6 Pakistan
8.10.7 Thailand
8.10.8 Indonesia
8.10.9 Malaysia
8.10.10 Taiwan
8.10.11 Philippines
8.10.12 Singapore
8.10.13 Rest of Asia Pacific
8.11 Eastern Europe SDN, NFV & Network Virtualization Revenue: 2016 - 2030
8.11.1 Czech Republic
8.11.2 Poland
8.11.3 Russia
8.11.4 Rest of Eastern Europe
8.12 Latin & Central America SDN, NFV & Network Virtualization Revenue: 2016 - 2030
8.12.1 Argentina
8.12.2 Brazil
8.12.3 Mexico
8.12.4 Rest of Latin & Central America
8.13 Middle East & Africa SDN, NFV & Network Virtualization Revenue: 2016 - 2030
8.13.1 South Africa
8.13.2 UAE
8.13.3 Qatar
8.13.4 Saudi Arabia
8.13.5 Israel
8.13.6 Rest of the Middle East & Africa
8.14 North America SDN, NFV & Network Virtualization Revenue: 2016 - 2030
8.14.1 USA
8.14.2 Canada
8.15 Western Europe SDN, NFV & Network Virtualization Revenue: 2016 - 2030
8.15.1 Denmark
8.15.2 Finland
8.15.3 France
8.15.4 Germany
8.15.5 Italy
8.15.6 Spain
8.15.7 Sweden
8.15.8 Norway
8.15.9 UK
8.15.10 Rest of Western Europe

1.9: Conclusion & Strategic Recommendations
9.1 Will SDN & NFV Disrupt the Network Infrastructure Value Chain?
9.2 Is There a Ring Leader in the SDN & NFV Ecosystem?
9.3 SDN & NFV: Building the Mobile Cloud
9.4 Buyers Will Maintain Focus on Business Agility & CapEx Reduction
9.5 Avoiding the Proprietary Trap
9.6 Will Service Providers Continue to Utilize Proprietary Hardware Platforms?
9.7 Making the VoLTE Business Case Work
9.8 Growing Adoption of vEPC (Virtualized EPC) Platforms
9.9 How Much CapEx Can Service Providers Save with SDN & NFV Investments?
9.10 Prospects of SDN & NFV Orchestration
9.10.1 Different Vendors, Different Approaches
9.10.2 Future Prospects of Harmonization
9.11 Strategic Recommendations
9.11.1 Recommendations for Silicon & Server OEMs
9.11.2 Recommendations for Network & Mobile Infrastructure Vendors & IT Giants
9.11.3 Recommendations for Pure-play SDN/NFV Specialists
9.11.4 Recommendations for Enterprises and Data Center Operators
9.11.5 Recommendations for Service Providers

Report 2: The Wireless Network Infrastructure Ecosystem: 2016 - 2030 - Macrocell RAN, Small Cells, C-RAN, RRH, DAS, Carrier Wi-Fi, Mobile Core, Backhaul & Fronthaul

2.1: Introduction
1.1 Executive Summary
1.2 Topics Covered
1.3 Forecast Segmentation
1.4 Key Questions Answered
1.5 Key Findings
1.6 Methodology
1.7 Target Audience
1.8 Companies & Organizations Mentioned

2.2: An Overview of Wireless Network Infrastructure
2.1 What is Wireless Network Infrastructure?
2.2 2G: GSM & CDMA
2.2.1 2G Trends & Developments
2.2.2 2G Market Summary
2.3 3G: W-CDMA, TD-SCDMA & CDMA2000
2.3.1 3G Trends & Developments
2.3.2 3G Market Summary
2.4 4G: LTE, LTE-Advanced & WiMAX
2.4.1 4G Trends & Developments
2.4.2 4G Market Summary
2.5 5G: IMT-2020 Technologies
2.5.1 5G Trends & Developments
2.5.2 5G Market Summary
2.6 Macrocell RAN
2.6.1 Macrocell RAN Trends & Developments
2.7 HetNet RAN
2.7.1 HetNet RAN Trends & Developments
2.7.2 Small Cells
2.7.3 C-RAN
2.7.4 DAS
2.7.5 Carrier Wi-Fi
2.8 Mobile Core
2.8.1 Mobile Core Trends & Developments
2.9 Mobile Backhaul & Fronthaul
2.9.1 Mobile Backhaul & Fronthaul Trends & Developments

2.3: Market Drivers, Barriers & Risks
3.1 Market Drivers
3.1.1 Mobile Subscriptions Growth
3.1.2 Smartphone & Tablet Proliferation
3.1.3 Growing Penetration of Mobile Broadband
3.1.4 Mobile Data Traffic Growth
3.1.5 Interest from Vertical Markets
3.1.6 Reducing the TCO (Total Cost of Ownership)
3.1.7 Replacement of Legacy Infrastructure: Continued Growth in Transport Networking
3.1.8 Advances in Spectrum Flexibility & Carrier Aggregation: Driving HetNet Deployments
3.1.9 Strategic Choice for CDMA & WiMAX Operators: Join Mainstream Ecosystem
3.1.10 Addressing Legacy Network Congestion
3.1.11 Bringing Broadband to the Masses
3.1.12 Trend Summary: Which Segments of the Wireless Infrastructure Market Will Witness Growth?

3.2 Barriers & Risks
3.2.1 CapEx Commitments
3.2.2 Spectrum Scarcity
3.2.3 RAN Sharing: A Concept Embraced by Mobile Operators
3.2.4 Operators Are Finding Innovative Ways to Address Capacity Issues
3.2.5 Social, Political, Economic and Environmental Threats
3.2.6 Country Specific Risks

3.3 Key Strategic Options for Mobile Operators

3.4 Business Case for Investments in New and Existing Technologies
3.4.1 Gain Operational Efficiencies Through Strategic Investments
3.4.2 Invest in Capacity for Increased Revenue Opportunities
3.4.3 Deliver Best User Experience
3.4.4 Reduce Competitive Threats
3.4.5 Reserve Network Capacity the M2M Opportunities
3.4.6 Increase Customer Satisfaction
3.4.7 Capitalize on Differentiation Strategies
3.4.8 Evolve Towards the Next Generation

2.4 Mobile Network CapEx Review
4.1 Global Mobile Network CapEx
4.2 Regional Split
4.3 Key Operator Commitments
4.3.1 China Mobile
4.3.2 China Unicom
4.3.3 AT&T Mobility
4.3.4 Vodafone Group
4.3.5 Verizon Wireless
4.3.6 China Telecom
4.3.7 NTT DoCoMo
4.3.8 Sprint Corporation
4.3.9 SoftBank Corporation
4.3.10 T-Mobile USA
4.3.11 KDDI
4.3.12 DT (Deutsche Telekom)
4.3.13 MTS (Mobile TeleSystems)
4.3.14 Orange
4.3.15 Telenor Group
4.3.16 SK Telecom
4.3.17 Vivo
4.3.18 TIM Brazil
4.3.19 LG Uplus
4.3.20 Telkomsel
4.3.21 Megafon
4.3.22 Bharti Airtel
4.3.23 Movistar Venezuela
4.3.24 TIM (Telecom Italia Mobile)
4.3.25 Vimpelcom
4.4 Asia Pacific Mobile Network CapEx
4.5 Eastern Europe Mobile Network CapEx
4.6 Latin & Central America Mobile Network CapEx
4.7 Middle East & Africa Mobile Network CapEx
4.8 North America Mobile Network CapEx
4.9 Western Europe Mobile Network CapEx
2.5: Mobile Network Subscriptions & Service Revenue Review

5.1 Global Mobile Network Subscriptions
5.2 Global Mobile Network Service Revenue
5.3 Segmentation by Technology
5.3.1 2G & 3G
5.3.2 FDD LTE
5.3.3 TD-LTE
5.3.4 WiMAX
5.3.5 5G
5.4 Regional Split
5.5 Asia Pacific
5.6 Eastern Europe
5.7 Latin & Central America
5.8 Middle East & Africa
5.9 North America
5.10 Western Europe

2.6: Wireless Network Deployment Strategies
6.1 Antenna & RAN Strategies
6.1.1 Single RAN vs. Overlay Deployment
6.1.2 Adopting an RRH and FTTA Design
6.1.3 Migrating Towards C-RAN Architecture
6.1.4 Optimal Antenna Selection
6.1.5 Interference Limitation Strategies
6.1.6 Managing Co-Existence with Legacy 2G/3G RF Sites
6.2 Mobile Core Strategies
6.2.1 Integration of Functions & Virtualization
6.2.2 Deployment Architecture Choices
6.2.3 Supporting Legacy Networks
6.2.4 Integration with IMS
6.2.5 Embedding DPI for Policy Enforcement & Network Optimization
6.3 Backhaul & Fronthaul Strategies
6.3.1 Architectural Impact of X2 Interface
6.3.2 LTE-Advanced Requirements
6.3.3 Growing Backhaul Capacity & Latency Requirements
6.3.4 IPsec
6.3.5 Technology Options: Fiber, Microwave & Millimeter Wave
6.3.6 Developing a HetNet Backhaul Strategy
6.3.7 Synchronization and Timing
6.3.8 Transport Network Sharing
6.3.9 Fronthaul Options: Alternatives to Dedicated Fiber

2.7: Industry Roadmap & Value Chain
7.1 Industry Roadmap
7.1.1 2016 - 2020: Large Scale LTE & HetNet Infrastructure Rollouts
7.1.2 2020 - 2025: The Cloud RAN Era - Moving Towards C-RAN and Virtualization
7.1.3 2025 - 2030: Continued Investments with 5G Network Rollouts
7.2 Value Chain
7.3 Embedded Technology Ecosystem
7.3.1 Chipset Developers
7.3.2 Embedded Component/Software Providers
7.4 RAN Ecosystem
7.4.1 Macrocell RAN OEMs
7.4.2 Pure-Play Small Cell OEMs
7.4.3 Wi-Fi Access Point OEMs
7.4.4 DAS & Repeater Solution Providers
7.4.5 C-RAN Solution Providers
7.4.6 Other Technology Providers
7.5 Transport Networking Ecosystem
7.5.1 Backhaul & Fronthaul Solution Providers
7.6 Mobile Core Ecosystem
7.6.1 Mobile Core Solution Providers
7.7 Connectivity Ecosystem
7.7.1 Mobile Operators
7.7.2 Wi-Fi Connectivity Providers
7.7.3 SCaaS (Small Cells as a Service) Providers
7.8 SON Ecosystem
7.8.1 SON Solution Providers
7.9 SDN & NFV Ecosystem
7.9.1 SDN & NFV Providers

2.8: Vendor Landscape
8.1 Vendor Outlook
8.1.1 Pricing & Growth Sustainability
8.1.2 Portfolio Diversification
8.2 Vendor Ranking
8.2.1 Macrocell RAN
8.2.2 Mobile Core
8.2.3 Small Cells
8.2.4 Carrier Wi-Fi
8.2.5 C-RAN
8.2.6 DAS
8.2.7 Backhaul & Fronthaul

2.9: Wireless Network Infrastructure Incumbents
9.1 Cisco Systems
9.2 Ericsson
9.3 Fujitsu
9.4 Hitachi
9.5 Huawei
9.6 NEC Corporation
9.7 Nokia Networks & Alcatel-Lucent
9.8 Samsung Electronics
9.9 ZTE

2.10: Macrocell RAN, Small Cell, C-RAN & Mobile Core Specialists
10.1 Accelleran
10.2 Adax
10.3 ADB
10.4 Affirmed Networks
10.5 Airspan Networks
10.6 Alpha Networks
10.7 Altiostar Networks
10.8 Arcadyan Technology Corporation
10.9 Argela
10.10 ARItel
10.11 Artemis Networks
10.12 Askey Computer Corporation
10.13 ASOCS
10.14 Athonet
10.15 Athena Wireless Communications (Google)
10.16 Axxcelera Broadband Wireless (Moseley Associates)
10.17 Brocade Communications Systems
10.18 Casa Systems
10.19 CCI (Competitive Companies, Inc.)
10.20 Contela
10.21 CS Corporation
10.22 Datang Mobile
10.23 Dongwon T&I
10.24 Femtel (Suzhou Femtel Communications)
10.25 Gemtek Technology Company
10.26 GENBAND
10.27 GWT (Global Wireless Technologies)
10.28 HP (Hewlett-Packard)
10.29 ip.access
10.30 Juni Global
10.31 Juniper Networks
10.32 Lemko
10.33 LGS Innovations
10.34 Mitel Networks Corporation
10.35 New Postcom Equipment Company
10.36 NewNet Communication Technologies
10.37 Nutaq
10.38 Oceus Networks
10.39 Panda Electronics (Nanjing Panda Electronics Company)
10.40 Parallel Wireless
10.41 Polaris Networks
10.42 Potevio (China Potevio Company)
10.43 Quanta Computer
10.44 Quelle
10.45 Quortus
10.46 Redline Communications
10.47 Sagemcom
10.48 Samji Electronics Company
10.49 SerComm Corporation
10.50 SK Telesys
10.51 SpiderCloud Wireless
10.52 Star Solutions
10.53 Sunnada (Fujian Sunnada Communication Company)
10.54 Taqua
10.55 Tecom
10.56 TEKTELIC Communications
10.57 Telum
10.58 Telrad Networks
10.59 WNC (Wistron NeWeb Corporation)
10.60 Z-Com (ZDC Wireless)

2.11: Antenna, DAS & Repeater Solution Specialists
11.1 AceAxis
11.2 ADRF (Advanced RF Technologies)
11.3 Affarii Technologies
11.4 American Tower Corporation
11.5 Arqiva
11.6 Axis Teknologies
11.7 Black Box Corporation
11.8 BTI Wireless
11.9 CCI (Communication Components Inc.)
11.10 CCI (Crown Castle International)
11.11 CCI Systems
11.12 Cobham Wireless
11.13 Comba Telecom Systems Holdings
11.14 CommScope
11.15 Corning
11.16 Dali Wireless
11.17 DeltaNode (Bird Technologies)
11.18 Ethertronics
11.19 ExteNet Systems
11.20 Foxcom
11.21 Galtronics
11.22 Goodman Networks
11.23 GrenTech (China GrenTech Corporation)
11.24 JRC (Japan Radio Company)
11.25 JMA Wireless
11.26 Kisan Telecom
11.27 KMW
11.28 Kathrein-Werke KG
11.29 MER-CellO Wireless Solutions
11.30 Microlab (Wireless Telecom Group)
11.31 MTI Mobile
11.32 Nexius
11.33 Nextivity
11.34 RF Window
11.35 RFS (Radio Frequency Systems)
11.36 Rosenberger
11.37 SOLiD (SOLiD Technologies)
11.38 Sumitomo Electric Industries
11.39 Sunwave Communications
11.40 TESSCO Technologies
11.41 Westell Technologies
11.42 Zinwave

2.12: Carrier Wi-Fi Specialists
12.1 4ipnet
12.2 ABB
12.3 Accuris Networks
12.4 Aerohive Networks
12.5 Alvarion Technologies
12.6 Aptilo Networks
12.7 Aruba Networks
12.8 Autelan
12.9 BandwidthX
12.10 Birdstep Technology
12.11 Browan Communications
12.12 BSG Wireless
12.13 D-Link Corporation
12.14 Edgewater Wireless Systems
12.15 EION Wireless
12.16 Firetide
12.17 Fortinet
12.18 Front Porch
12.19 GoNet Systems
12.20 Handlink Technologies
12.21 Meru Networks
12.22 Netgem
12.23 NETGEAR
12.24 Nomadix
12.25 Panasonic Corporation
12.26 Ro-Timak Technology
12.27 Ruckus Wireless
12.28 Senao Networks
12.29 Smith Micro Software
12.30 SpectrumMax
12.31 Syniverse Technologies
12.32 TP-LINK Technologies
12.33 Tranzeo Wireless Technologies
12.34 Ubiquiti Networks
12.35 WeFi
12.36 Zebra Technologies Corporation
12.37 ZyXEL

2.13: Enabling Technology Providers
13.1 6WIND
13.2 Ablaze Wireless
13.3 Absolute Analysis
13.4 Accelink Technologies
13.5 ADLINK Technology
13.6 ADI (Analog Devices Inc.)
13.7 Advantech
13.8 AirHop Communications
13.9 AKM (Asahi Kasei Microdevices)
13.10 Allot Communications
13.11 Amarisoft
13.12 Amdocs
13.13 Anritsu Corporation
13.14 Aricent
13.15 ARM Holdings
13.16 Astellia
13.17 ASTRI (Hong Kong Applied Science and Technology Research Institute)
13.18 Artesyn Embedded Technologies
13.19 Artiza Networks
13.20 Avago Technologies
13.21 Azcom Technology
13.22 Benetel
13.23 Blu Wireless Technology
13.24 Broadcom Corporation
13.25 Cadence Design Systems
13.26 Cavium
13.27 CeedTec
13.28 Cellwize
13.29 Celtro
13.30 Coherent Logix
13.31 Comcores ApS
13.32 CommAgility
13.33 D2 Technologies
13.34 Dell
13.35 Direct Beam
13.36 eASIC Corporation
13.37 EDX Wireless
13.38 Eoptolink Technology
13.39 ERCOM
13.40 EXFO
13.41 Federated Wireless
13.42 Faraday Technology Corporation
13.43 Finisar Corporation
13.44 GigaLight (Shenzhen Gigalight Technology Company)
13.45 GlobalFoundaries
13.46 Hisense (Hisense Broadband Multimedia Technology)
13.47 HG Genuine
13.48 IDT (Integrated Device Technology)
13.49 IMEC International
13.50 InfoVista
13.51 InnoLight Technology Corporation
13.52 Intel Corporation
13.53 InterDigital
13.54 iPosi
13.55 Ixia
13.56 Keysight Technologies
13.57 Kumu Networks
13.58 Lattice Semiconductor
13.59 Lime Microsystems
13.60 Lumentum
13.61 Macom (M/A-COM Technology Solutions)
13.62 Maxim Integrated
13.63 Mellanox Technologies
13.64 Microsemi Corporation
13.65 Mitsubishi Electric Corporation
13.66 Mobiveil
13.67 Molex
13.68 Nash Technologies
13.69 NetScout Systems
13.70 Node-H
13.71 Nomor Research
13.72 NXP Semiconductors
13.73 OE Solutions
13.74 Octasic
13.75 Optulink
13.76 P.I. Works
13.77 Pletronics
13.78 PMC-Sierra
13.79 Procera Networks
13.80 Public Wireless
13.81 Qualcomm
13.82 Qulsar
13.83 QEOS
13.84 Qwilt
13.85 RADCOM
13.86 Radisys Corporation
13.87 Rakon
13.88 Red Hat
13.89 Reverb Networks
13.90 RF DSP
13.91 Saguna Networks
13.92 SAI Technology
13.93 Sarokal Test Systems
13.94 Silicon Labs
13.95 Sistelbanda
13.96 Source Photonics
13.97 Tata Elxsi
13.98 TEOCO Corporation
13.99 TI (Texas Instruments)
13.100 Tulinx
13.101 U-blox
13.102 Vectron International
13.103 Viavi Solutions
13.104 VPIsystems
13.105 WiPro
13.106 XCellAir
13.107 Xelic
13.108 Xilinx

2.14: Mobile Backhaul & Fronthaul Vendors
14.1 3Roam
14.2 4RF
14.3 Accedian Networks
14.4 Actelis Networks
14.5 Actiontec
14.6 Actus Networks
14.7 ADTRAN
14.8 ADVA Optical Networking
14.9 Advantech Wireless
14.10 ALAXALA Networks
14.11 Albis Technologies
14.12 ALCOMA
14.13 Allied Data Technologies
14.14 Allied Telesis
14.15 Aquantia
14.16 Arris
14.17 Avanti Communications
14.18 Aviat Networks
14.19 AVM
14.20 BLINQ Networks
14.21 BluWan
14.22 BridgeWave Communications
14.23 BTI Systems
14.24 CableFree Solutions
14.25 Calix
14.26 Cambium Networks
14.27 Canoga Perkins
14.28 Carlson Wireless Technologies
14.29 CBNL (Cambridge Broadband Networks Ltd.)
14.30 CCS (Cambridge Communication Systems)
14.31 Ceragon
14.32 Cielo Networks
14.33 Ciena Corporation
14.34 Comtrend
14.35 Corecess
14.36 Coriant
14.37 DASAN Networks
14.38 DragonWave
14.39 E-Band Communications (Moseley Associates)
14.40 EBlink
14.41 ECI Telecom
14.42 Elva-1
14.43 Exalt Communications
14.44 Extreme Networks
14.45 FastBack Networks
14.46 Fiberhome Technologies
14.47 FibroLan
14.48 Genmix Technology
14.49 Gilat Satellite Networks
14.50 HFR
14.51 Huahuan
14.52 Hughes Network Systems
14.53 HXI
14.54 iDirect
14.55 Infinera
14.56 Intracom Telecom
14.57 IPITEK
14.58 Iskratel
14.59 KEYMILE
14.60 LightPointe Communications
14.61 Loea Corporation
14.62 MAX4G
14.63 Microwave Networks
14.64 MIMOtech
14.65 MRV Communications
14.66 Nexcomm Systems
14.67 NexxComm Wireless
14.68 Omnitron Systems
14.69 OneAccess Networks
14.70 Polewall
14.71 Positron
14.72 Proxim Wireless Corporation
14.73 RACOM
14.74 RAD Data Communications
14.75 RADWIN
14.76 SAF Tehnika
14.77 SIAE Microelectronics (SIAE Microelectronica)
14.78 Siklu
14.79 SkyFiber
14.80 SMC Networks
14.81 Solectek
14.82 Star Microwave
14.83 Tarana Wireless
14.84 Telco Systems
14.85 Tellion
14.86 Tellumat
14.87 Telsey
14.88 Tilgin
14.89 Trango Systems
14.90 Ubiquoss
2.15 Global Market Analysis & Forecasts

15.1 Market Definition
15.2 Decomposing the Global Wireless Network Infrastructure Market
15.3 Macrocell RAN & Mobile Core
15.4 Macrocells
15.4.1 Segmentation by Air Interface Technology
15.4.1.1 2G & 3G
15.4.1.2 FDD LTE
15.4.1.3 TD-LTE
15.4.1.4 WiMAX
15.4.1.5 5G
15.5 Mobile Core
15.5.1 Segmentation by Technology
15.5.1.1 3G Packet Core
15.5.1.2 HLR
15.5.1.3 MSS
15.5.1.4 LTE EPC
15.5.1.5 WiMAX
15.5.1.6 5G
15.6 Mobile Backhaul
15.6.1 Segmentation by Technology
15.6.1.1 Ethernet
15.6.1.2 Microwave & Millimeter Wave
15.6.1.3 Satellite
15.6.1.4 WDM
15.6.1.5 PON
15.6.1.6 Others
15.7 Small Cells
15.7.1 Segmentation by Use Case
15.7.1.1 Residential
15.7.1.2 Enterprise
15.7.1.3 Urban
15.7.1.4 Rural & Suburban
15.7.2 Segmentation by Form Factor
15.7.2.1 Femtocells
15.7.2.2 Picocells
15.7.2.3 Microcells
15.7.3 Segmentation by Air Interface Technology
15.7.3.1 2G & 3G
15.7.3.2 LTE
15.7.3.3 5G
15.7.4 Segmentation by Deployment Model
15.7.4.1 Indoor
15.7.4.2 Outdoor
15.8 Small Cell Backhaul
15.8.1 Segmentation by Technology
15.8.1.1 DSL
15.8.1.2 Ethernet
15.8.1.3 Microwave
15.8.1.4 Millimeter Wave
15.8.1.5 Satellite
15.8.1.6 Fiber & Others
15.9 Carrier Wi-Fi
15.9.1 Segmentation by Submarket
15.9.1.1 Access Points
15.9.1.2 Access Point Controllers
15.9.2 Segmentation by Integration Approach
15.9.2.1 Standalone Wi-Fi Hotspots
15.9.2.2 Managed Wi-Fi Offload
15.10 C-RAN
15.10.1 Segmentation by Submarket
15.10.1.1 RRHs (Remote Radio Heads)
15.10.1.2 BBU (Baseband Units)
15.10.2 Segmentation by Air Interface Technology
15.10.2.1 3G & LTE
15.10.2.2 5G
15.10.3 Segmentation by Deployment Model
15.10.3.1 Indoor
15.10.3.2 Outdoor
15.11 C-RAN Fronthaul
15.11.1 Segmentation by Technology
15.11.1.1 Dedicated Fiber
15.11.1.2 WDM
15.11.1.3 OTN & PON
15.11.1.4 Ethernet
15.11.1.5 Microwave
15.11.1.6 Millimeter Wave
15.12 DAS
15.12.1 Segmentation by Deployment Model
15.12.1.1 Indoor
15.12.1.2 Outdoor

2.16: Regional Market Analysis & Forecasts
16.1 Segmentation by Region
16.1.1 Macrocells
16.1.2 Mobile Core
16.1.3 Macrocell Backhaul
16.1.4 Small Cells
16.1.5 Small Cell Backhaul
16.1.6 Carrier Wi-Fi
16.1.7 C-RAN
16.1.8 C-RAN Fronthaul
16.1.9 DAS
16.2 Asia Pacific
16.2.1 Macrocells
16.2.2 Mobile Core
16.2.3 Macrocell Backhaul
16.2.4 Small Cells
16.2.5 Small Cell Backhaul
16.2.6 Carrier Wi-Fi
16.2.7 C-RAN
16.2.8 C-RAN Fronthaul
16.2.9 DAS
16.3 Eastern Europe
16.3.1 Macrocells
16.3.2 Mobile Core
16.3.3 Macrocell Backhaul
16.3.4 Small Cells
16.3.5 Small Cell Backhaul
16.3.6 Carrier Wi-Fi
16.3.7 C-RAN
16.3.8 C-RAN Fronthaul
16.3.9 DAS
16.4 Latin & Central America
16.4.1 Macrocells
16.4.2 Mobile Core
16.4.3 Macrocell Backhaul
16.4.4 Small Cells
17.13 Smart Cities: Wireless Network Infrastructure Vendors to Lead the Way
17.14 Wireless Incumbents Could Face Cloud Rivals: Thanks to SDN & NFV
17.15 Spectrum: Driving Continued Acquisitions by Incumbent Mobile Operators
17.16 Mobile Operators Will Strive for Agility
17.17 Vertical Market Opportunities
17.18 SWOT Analysis
17.19 Strategic Recommendations
17.19.1 Recommendations for Mobile Operators
17.19.2 Recommendations for Wireless Network Infrastructure Vendors

Report 3: The HetNet Ecosystem (Small Cells, Carrier Wi-Fi, C-RAN & DAS): 2016 - 2030 - Opportunities, Challenges, Strategies & Forecasts

3.1: Introduction
1.1 Executive Summary
1.2 Topics Covered
1.3 Forecast Segmentation
1.4 Key Questions Answered
1.5 Key Findings
1.6 Methodology
1.7 Target Audience
1.8 Companies & Organizations Mentioned

3.2: An Overview of Small Cells, Carrier Wi-Fi, C-RAN & DAS
2.1 An Evolving Heterogeneous Networking Ecosystem
2.1.1 The Growing Demand for Mobile Broadband
2.1.2 Is LTE the Answer to all Capacity Problems?
2.1.3 HetNets: An Evolution of Network Topology
2.2 Small Cells
2.2.1 What Are Small Cells?
2.2.2 Why Deploy Small Cells?
2.2.3 Small Cell Categories
2.2.3.1 Femtocells
2.2.3.2 Picocells
2.2.3.3 Microcells
2.3 Carrier Wi-Fi
2.3.1 Carrier Wi-Fi Integration Approaches
2.3.2 Standalone Hotspots
2.3.3 Managed Offload
2.3.3.1 SIM-based Wi-Fi Offload
2.3.3.2 RAN Integrated Wi-Fi Access
2.4 C-RAN (Centralized RAN)
2.4.1 What is C-RAN?
2.4.2 Architectural Benefits and Challenges
2.4.3 Key Architectural Components
2.4.3.1 RRHs (Remote Radio Heads)
2.4.3.2 BBUs (Baseband Units)
2.4.3.3 Fronthaul
2.5 Cloud RAN: Virtualizing C-RAN
2.5.1 Leveraging Commodity Technologies
2.5.2 Moving RAN to the Cloud
2.6 DAS (Distributed Antenna Systems)
2.6.1 What is DAS?
2.6.2 Passive DAS
2.6.3 Active DAS
2.6.4 Hybrid DAS
2.7 Alternative Options for Offloading Mobile Network Coverage and Capacity
2.7.1 Macrocell Network and Spectrum Expansion
2.7.2 Caching & Mobile CDN (Content Delivery Networks)
2.8 The Business Case: Key Market Drivers
2.8.1 Capacity & Coverage Improvement: Addressing the Mobile Data Traffic Tsunami
2.8.2 Endorsement from the Mobile Operator Community
2.8.3 In-Building & Enterprise Coverage Requirements
2.8.4 Capacity Offload in Congested Urban Environments
2.8.5 Cost-Effective Rural Coverage
2.8.6 CapEx Savings
2.8.7 Non-Expandability of Macrocell Networks
2.9 Challenges & Inhibitors to the HetNet Ecosystem
2.9.1 Interference with Macrocell Infrastructure & Spectrum Constraints
2.9.2 Conflicting HetNet Offerings
2.9.3 Fronthaul & Backhaul Investments
2.9.4 Migration from Legacy Architectures
2.9.5 Economic Constraints & Deployment Challenges
2.9.6 Security Concerns

3.3: Integration & Offloading Technology
3.1 Integrating Small Cells into the Mobile Network
3.1.1 Integration into 3G Networks
3.1.1.1 Iuh based Integration: Residential & Enterprise Femtocells
3.1.1.2 Iub: Microcells, Picocells and Femtocells
3.1.2 S1: Integration into LTE Networks
3.1.2.1 eNB Small Cell Architecture
3.1.2.2 HeNB Small Cell Architecture
3.2 Integrating C-RAN into the Mobile Network
3.2.1 CPRI (Common Public Radio Interface)
3.2.2 OBSAI (Open Base Station Architecture Initiative)
3.2.3 ORI (Open Radio Interface)
3.2.4 Ethernet
3.3 Wi-Fi: The Evolution from an Ethernet Extension to Mobile RAN Integration
3.4 Enabling Technologies for Wi-Fi and Cellular RAN Interoperability
3.4.1 ANDSF (Access Network Discovery and Selection Function)
3.4.1.1 Enabling Seamless Mobility
3.4.1.2 Commercial Availability of ANDSF Solutions
3.4.2 Hotspot 2.0
3.4.2.1 Discovery - 802.11u
3.4.2.2 Encryption - 802.11i (WPA2)
3.4.2.3 Authentication - 802.1x (EAP)
3.4.2.4 OMA (Open Mobile Alliance) DM (Device Management)
3.4.2.5 Passpoint Wi-Fi Certification
3.4.3 NGH (Next Generation Hotspot)
3.4.3.1 Working alongside Hotspot 2.0
3.4.3.2 Enabling Seamless Mobile Network Connectivity
3.4.4 I-WLAN (Interworking Wireless LAN)
3.4.5 WISPr (Wireless Internet Service Provider Roaming)
3.4.6 MSAP (Mobility Services Advertisement Protocol)
3.4.7 Wi-Fi Direct
3.5 Small Cell and Mobile Core Offloading Technologies
3.5.1 LIPA (Local IP Access)
3.5.1.1 Is LIPA Specifically for Small Cells?
3.5.1.2 Use Case Example: Local Network Multimedia Access
3.5.2 SIPTO (Selected IP Traffic Offload)
3.5.2.1 Use Case Example: Core Network Offload
3.5.2.2 The Downside: Is SIPTO Suitable for All Traffic Profiles?
3.5.3 IFOM (IP Flow Mobility and Seamless Offload)
3.5.3.1 Enabling Seamless Integration between Wi-Fi and 3GPP RANs
3.6 Wi-Fi and Cellular RAN Integration: Commercial Implementations to Address the HetNet Challenge
3.6.1 Wi-Fi Integration into Macrocell and Small Cell Base Stations
3.6.2 Policy Driven Control
3.6.3 Enabling Wi-Fi Calling: Dynamic Switching between Wi-Fi and LTE
3.7 Integration of SON (Self-Organizing Network) Capabilities
3.7.1 Enabling Plug-and-play Functionality
3.7.2 Enhancing HetNet Performance

3.4: Industry Roadmap and Value Chain
4.1 HetNet Industry Roadmap: 2016 - 2030
4.1.1 2016 - 2020: Large Scale Small Cell, Carrier Wi-Fi & DAS Rollouts
5.6.6 Healthcare
5.6.7 Military
5.6.8 Public Safety & Emergency Services
5.6.9 Public Venues
5.6.10 Residential
5.6.11 Retail & Hospitality

3.6: HetNet Backhaul & Fronthaul
6.1 Small Cell Backhaul Technology
6.1.1 DSL
6.1.2 Ethernet
6.1.3 Microwave
6.1.4 Millimeter Wave
6.1.5 Satellite
6.1.6 Fiber & Others
6.2 C-RAN Fronthaul Technology
6.2.1 Dedicated Fiber (Dark Fiber)
6.2.2 WDM (Wavelength Division Multiplexing)
6.2.3 PON (Passive Optical Network)
6.2.4 OTN (Optical Transport Network)
6.2.5 Ethernet
6.2.6 Microwave
6.2.7 Millimeter Wave
6.3 Requirements for HetNet Backhaul & Fronthaul
6.3.1 Form Factor & Environmental Hardening
6.3.2 Power Supply & Consumption
6.3.3 Installation & Provisioning
6.3.4 Integration of OAM and SON Capabilities
6.3.5 Deployment & Maintenance Cost
6.4 Key Issues
6.4.1 Backhaul Sharing: Can Small Cells and Macrocells Share Resources?
6.4.2 Coverage Challenges
6.4.3 Capacity/Peak Throughput Challenges
6.4.4 Will Millimeter Wave be the Preferred Outdoor Small Cell Backhaul Solution?
6.4.5 Is Fronthaul the Bottleneck to C-RAN Rollouts?
6.4.6 Is Ethernet a Feasible Solution for C-RAN Fronthaul?
6.4.7 Is there a Market for Satellite based HetNet Transport?
6.4.8 Assessing the Impact of the SCaaS Ecosystem

3.7: Standardization & Regulatory Initiatives
7.1 3GPP (3rd Generation Partnership Project)
7.1.1 Overview
7.1.2 HetNet Standardization Activities
7.2 3GPP2 (3rd Generation Partnership Project 2)
7.2.1 Overview
7.2.2 HetNet Standardization Activities
7.3 Broadband Forum
7.3.1 Overview
7.3.2 Key HetNet Initiatives
7.4 ETSI (European Telecommunications Standards Institute)
7.4.1 Overview
7.4.2 Small Cell Testing
7.4.3 ORI for Fronthaul
7.4.4 NFV (Network Functions Virtualization) for Small Cells & Cloud RAN
7.4.5 MEC (Mobile Edge Computing)
7.5 GSMA
7.5.1 Overview
7.5.2 Enabling Carrier Wi-Fi Roaming
7.6 HetNet Forum
7.6.1 Overview
7.6.2 Key Programs
7.7 IEEE (Institute of Electrical and Electronics Engineers)
7.7.1 Overview
7.7.2 IEEE 802.11 WLAN Standard
7.7.3 Other Standards
7.8 ITU (International Telecommunications Union)
7.8.1 Overview
7.8.2 Focus Group on IMT-2020
7.9 MEF (Metro Ethernet Forum)
7.9.1 Overview
7.9.2 Ethernet Transport for Small Cells & C-RAN
7.10 NGMN (Next Generation Mobile Networks) Alliance
7.10.1 Overview
7.10.2 P-CRAN (Project Centralized RAN)
7.10.3 Small Cell Project
7.10.4 RAN Evolution Project
7.10.5 Other Engagements
7.11 Small Cell Forum
7.11.1 Overview
7.11.2 Working Groups
7.11.3 Release Program
7.12 WBA (Wireless Broadband Alliance)
7.12.1 Overview
7.12.2 Next Generation Wi-Fi Program for Mobile Operators
7.12.3 Other Programs
7.13 Wi-Fi Alliance
7.13.1 Overview
7.13.2 Hotspot 2.0 & Passpoint Certification Program
7.13.3 Other Programs
7.14 WiMAX Forum
7.14.1 Overview
7.14.2 WiMAX Small Cells

3.8: Mobile Operator Case Studies
8.1 América Móvil Group
8.1.1 Overview
8.1.2 Key Vendors
8.1.3 HetNet Deployment Summary
8.2 AT&T Mobility
8.2.1 Overview
8.2.2 Key Vendors
8.2.3 HetNet Deployment Summary
8.3 Bharti Airtel
8.3.1 Overview
8.3.2 Key Vendors
8.3.3 HetNet Deployment Summary
8.4 BT Group
8.4.1 Overview
8.4.2 Key Vendors
8.4.3 HetNet Deployment Summary
8.5 China Mobile
8.5.1 Overview
8.5.2 Key Vendors
8.5.3 HetNet Deployment Summary
8.6 China Telecom
8.6.1 Overview
8.6.2 Key Vendors
8.6.3 HetNet Deployment Summary
8.7 China Unicom
8.7.1 Overview
8.7.2 Key Vendors
8.7.3 HetNet Deployment Summary
8.8 Chunghwa Telecom
8.8.1 Overview
8.8.2 Key Vendors
8.8.3 HetNet Deployment Summary
8.9 KT Corporation
8.9.1 Overview
8.9.2 Key Vendors
8.9.3 HetNet Deployment Summary
8.10 VimpelCom
8.10.1 Overview
8.10.2 Key Vendors
8.10.3 HetNet Deployment Summary
8.11 LG Uplus
8.11.1 Overview
8.11.2 Key Vendors
8.11.3 HetNet Deployment Summary
8.12 NTT DoCoMo
8.12.1 Overview
8.12.2 Key Vendors
8.12.3 HetNet Deployment Summary
8.13 Orange
8.13.1 Overview
8.13.2 Key Vendors
8.13.3 HetNet Deployment Summary
8.14 SK Telecom
8.14.1 Overview
8.14.2 Key Vendors
8.14.3 HetNet Deployment Summary
8.15 SoftBank Mobile
8.15.1 Overview
8.15.2 Key Vendors
8.15.3 HetNet Deployment Summary
8.16 Sprint
8.16.1 Overview
8.16.2 Key Vendors
8.16.3 HetNet Deployment Summary
8.17 Telecom Italia
8.17.1 Overview
8.17.2 Key Vendors
8.17.3 HetNet Deployment Summary
8.18 Telefónica
8.18.1 Overview
8.18.2 Key Vendors
8.18.3 HetNet Deployment Summary
8.19 Verizon Wireless
8.19.1 Overview
8.19.2 Key Vendors
8.19.3 HetNet Deployment Summary
8.20 Vodafone Group
8.20.1 Overview
8.20.2 Key Vendors
8.20.3 HetNet Deployment Summary
8.21 SingTel
8.21.1 Overview
8.21.2 Key Vendors
8.21.3 HetNet Deployment Summary
8.22 SFR
8.22.1 Overview
8.22.2 Key Vendors
8.22.3 HetNet Deployment Summary
8.23 Telenor Group
8.23.1 Overview
8.23.2 Key Vendors
8.23.3 HetNet Deployment Summary
8.24 Telstra
8.24.1 Overview
8.24.2 Key Vendors
8.24.3 HetNet Deployment Summary
8.25 Telus Mobility
8.25.1 Overview
8.25.2 Key Vendors
8.25.3 HetNet Deployment Summary
8.26 DT (Deutsche Telekom)
8.26.1 Overview
8.26.2 Key Vendors
8.26.3 HetNet Deployment Summary
8.27 MTS (Mobile TeleSystems)
8.27.1 Overview
8.27.2 Key Vendors
8.27.3 HetNet Deployment Summary
8.28 KDDI
8.28.1 Overview
8.28.2 Key Vendors
8.28.3 HetNet Deployment Summary
8.29 MegaFon
8.29.1 Overview
8.29.2 Key Vendors
8.29.3 HetNet Deployment Summary
8.30 KPN
8.30.1 Overview
8.30.2 Key Vendors
8.30.3 HetNet Deployment Summary
8.31 TeliaSonera
8.31.1 Overview
8.31.2 Key Vendors
8.31.3 HetNet Deployment Summary

3.9: Wireless Network Infrastructure Incumbents
9.1 Cisco Systems
9.2 Ericsson
9.3 Fujitsu
9.4 Hitachi
9.5 Huawei
9.6 NEC Corporation
9.7 Nokia Networks & Alcatel-Lucent
9.8 Samsung Electronics
9.9 ZTE

3.10: Macrocell RAN, Small Cell, C-RAN & Mobile Core Specialists
10.1 Accelleran
10.2 Adax
10.3 ADB
10.4 Affirmed Networks
10.5 Airspan Networks
10.6 Alpha Networks
10.7 Altiostar Networks
10.8 Arcadyan Technology Corporation
10.9 Argela
10.10 ARItel
10.11 Artemis Networks
10.12 Askey Computer Corporation
10.13 ASOCS
10.14 Athonet
10.15 Athena Wireless Communications (Google)
10.16 Axxcelera Broadband Wireless (Moseley Associates)
10.17 Brocade Communications Systems
10.18 Casa Systems
10.19 CCI (Competitive Companies, Inc.)
10.20 Contela
10.21 CS Corporation
10.22 Datang Mobile
10.23 Dongwon T&I
10.24 Femtel (Suzhou Femtel Communications)
10.25 Gemtek Technology Company
10.26 GENBAND
10.27 GWT (Global Wireless Technologies)
10.28 HP (Hewlett-Packard)
10.29 ip.access
10.30 Juni Global
10.31 Juniper Networks
10.32 Lemko
10.33 LGS Innovations
10.34 Mitel Networks Corporation
10.35 New Postcom Equipment Company
10.36 NewNet Communication Technologies
10.37 Nutaq
10.38 Oceus Networks
10.39 Panda Electronics (Nanjing Panda Electronics Company)
10.40 Parallel Wireless
10.41 Polaris Networks
10.42 Potevio (China Potevio Company)
10.43 Quanta Computer
10.44 Qucell
10.45 Quortus
10.46 Redline Communications
10.47 Sagemcom
10.48 Samji Electronics Company
10.49 SerComm Corporation
10.50 SK Telesys
10.51 SpiderCloud Wireless
10.52 Star Solutions
10.53 Sunnada (Fujian Sunnada Communication Company)
10.54 Taqua
10.55 Tecom
10.56 TEKTELIC Communications
10.57 Telum
10.58 Telrad Networks
10.59 WNC (Wistron NeWeb Corporation)
10.60 Z-Com (ZDC Wireless)

3.11: Antenna, DAS & Repeater Solution Specialists
11.1 AceAxis
11.2 ADRF (Advanced RF Technologies)
11.3 Affarii Technologies
11.4 American Tower Corporation
11.5 Arqiva
11.6 Axis Teknologies
11.7 Black Box Corporation
11.8 BTI Wireless
11.9 CCI (Communication Components Inc.)
11.10 CCI (Crown Castle International)
11.11 CCI Systems
11.12 Cobham Wireless
11.13 Comba Telecom Systems Holdings
11.14 CommScope
11.15 Corning
11.16 Dali Wireless
11.17 DeltaNode (Bird Technologies)
11.18 Ethertronics
11.19 ExteNet Systems
11.20 Foxcom
11.21 Galtronics
11.22 Goodman Networks
11.23 GrenTech (China GrenTech Corporation)
11.24 JRC (Japan Radio Company)
11.25 JMA Wireless
11.26 Kisan Telecom
11.27 KMW
11.28 Kathrein-Werke KG
11.29 MER-CellO Wireless Solutions
11.30 Microlab (Wireless Telecom Group)
11.31 MTI Mobile
11.32 Nexius
11.33 Nextivity
11.34 RF Window
11.35 RFS (Radio Frequency Systems)
11.36 Rosenberger
11.37 SOLiD (SOLiD Technologies)
11.38 Sumitomo Electric Industries
11.39 Sunwave Communications
11.40 TESSCO Technologies
11.41 Westell Technologies
11.42 Zinwave

3.12: Carrier Wi-Fi Specialists
12.1 4ipnet
12.2 ABB
12.3 Accuris Networks
12.4 Aerohive Networks
12.5 Alvarion Technologies
12.6 Aptilo Networks
12.7 Aruba Networks
12.8 Autelan
12.9 BandwidthX
12.10 Birdstep Technology
12.11 Browan Communications
12.12 BSG Wireless
12.13 D-Link Corporation
12.14 Edgewater Wireless Systems
12.15 EION Wireless
12.16 Firetide
12.17 Fortinet
12.18 Front Porch
12.19 GoNet Systems
12.20 Handlink Technologies
12.21 Meru Networks
12.22 Netgem
12.23 NETGEAR
12.24 Nomadix
12.25 Panasonic Corporation
12.26 Ro-Timak Technology
12.27 Ruckus Wireless
12.28 Senao Networks
12.29 Smith Micro Software
12.30 SpectrumMax
12.31 Syniverse Technologies
12.32 TP-LINK Technologies
12.33 Tranzeo Wireless Technologies
12.34 Ubiquiti Networks
12.35 WeFi
12.36 Zebra Technologies Corporation
12.37 ZyXEL

3.13: Enabling Technology Providers
13.1 6WIND
13.2 Ablaze Wireless
13.3 Absolute Analysis
13.4 Accelink Technologies
13.5 ADLINK Technology
13.6 ADI (Analog Devices Inc.)
13.7 Advantech
13.8 AirHop Communications
13.9 AKM (Asahi Kasei Microdevices)
13.10 Allot Communications
13.11 Amarisoft
13.12 Amdocs
13.13 Anritsu Corporation
13.14 Aricent
13.15 ARM Holdings
13.16 Astellia
13.17 ASTRI (Hong Kong Applied Science and Technology Research Institute)
13.18 Artesyn Embedded Technologies
13.19 Artiza Networks
13.20 Avago Technologies
13.21 Azcom Technology
13.22 Benetel
13.23 Blu Wireless Technology
13.24 Broadcom Corporation
13.25 Cadence Design Systems
13.26 Cavium
13.27 CeedTec
13.28 Cellwise
13.29 Celtro
13.30 Coherent Logix
13.31 Comcores ApS
13.32 CommAgility
13.33 D2 Technologies
13.34 Dell
13.35 Direct Beam
13.36 eASIC Corporation
13.37 EDX Wireless
13.38 Eoptolink Technology
13.39 ERCOM
13.40 EXFO
13.41 Federated Wireless
13.42 Faraday Technology Corporation
13.43 Finisar Corporation
13.44 GigaLight (Shenzhen Gigalight Technology Company)
13.45 GlobalFoundaries
13.46 Hisense (Hisense Broadband Multimedia Technology)
13.47 HG Genuine
13.48 IDT (Integrated Device Technology)
13.49 IMEC International
13.50 InfoVista
13.51 InnoLight Technology Corporation
13.52 Intel Corporation
13.53 InterDigital
13.54 iPosi
13.55 Ixia
13.56 Keysight Technologies
13.57 Kumu Networks
13.58 Lattice Semiconductor
13.59 Lime Microsystems
13.60 Lumentum
13.61 Macom (M/A-COM Technology Solutions)
13.62 Maxim Integrated
13.63 Mellanox Technologies
13.64 Microsemi Corporation
13.65 Mitsubishi Electric Corporation
13.66 Mobiveil
13.67 Molex
13.68 Nash Technologies
13.69 NetScout Systems
13.70 Node-H
13.71 Nomor Research
13.72 NXP Semiconductors
13.73 OE Solutions
13.74 Octasic
13.75 Optulink
13.76 P.I. Works
13.77 Pletronics
13.78 PMC-Sierra
13.79 Procura Networks
13.80 Public Wireless
13.81 Qualcomm
13.82 Qulsar
13.83 QEOS
13.84 Qwilt
13.85 RADCOM
13.86 Radisys Corporation
13.87 Rakon
13.88 Red Hat
13.89 Reverb Networks
13.90 RF DSP
13.91 Saguna Networks
13.92 SAI Technology
13.93 Sarokal Test Systems
13.94 Silicon Labs
13.95 Sistelbanda
13.96 Source Photonics
13.97 Tata Elxsi
13.98 TEOCO Corporation
13.99 TI (Texas Instruments)
13.100 Tulinx
13.101 U-blox
13.102 Vectron International
13.103 Viavi Solutions
13.104 VPIsystems
13.105 WiPro
13.106 XCellAir
13.107 Xellic
13.108 Xilinx

3.14: Mobile Backhaul & Fronthaul Vendors
14.1 3Roam
14.2 4RF
14.3 Accedian Networks
14.4 Actelis Networks
14.5 Actiontec
14.6 Actus Networks
14.7 ADTRAN
14.8 ADVA Optical Networking
14.9 Advantech Wireless
14.10 ALAXALA Networks
14.11 Albis Technologies
14.12 ALCOMA
14.13 Allied Data Technologies
14.14 Allied Telesis
14.15 Aquantia
14.16 Arris
14.17 Avanti Communications
14.18 Aviat Networks
14.19 AVM
14.20 BLINQ Networks
14.21 BluWan
14.22 BridgeWave Communications
14.23 BTI Systems
14.24 CableFree Solutions
14.25 Calix
14.26 Cambium Networks
14.27 Canoga Perkins
14.28 Carlson Wireless Technologies
14.29 CBNL (Cambridge Broadband Networks Ltd.)
14.30 CCS (Cambridge Communication Systems)
14.31 Ceragon
14.32 Cielo Networks
14.33 Ciena Corporation
14.34 Comtrend
14.35 Corecess
14.36 Coriant
14.37 DASAN Networks
14.38 DragonWave
14.39 E-Band Communications (Moseley Associates)
14.40 EBlink
14.41 ECI Telecom
14.42 Elva-1
14.43 Exalt Communications
14.44 Extreme Networks
14.45 FastBack Networks
14.46 Fiberhome Technologies
14.47 FibroLan
14.48 Genmix Technology
14.49 Gilat Satellite Networks
14.50 HFR
14.51 Huahuan
14.52 Hughes Network Systems
14.53 HXI
14.54 iDirect
14.55 Infinera
14.56 Intracom Telecom
14.57 IPITEK
14.58 Iskratel
14.59 KEYMILE
14.60 LightPointe Communications
14.61 Loea Corporation
14.62 MAX4G
14.63 Microwave Networks
14.64 MIMOTECH
14.65 MRV Communications
14.66 Nexxcom Systems
14.67 NexxComm Wireless
14.68 Omnitron Systems
14.69 OneAccess Networks
14.70 Polewall
14.71 Positron
14.72 Proxim Wireless Corporation
14.73 RACOM
14.74 RAD Data Communications
14.75 RADWIN
14.76 SAF Tehnika
14.77 SIAE Microelettronica (SIAE Microelettronica)
14.78 Siklu
14.79 SkyFiber
14.80 SMC Networks
14.81 Solectek
14.82 Star Microwave
14.83 Tarana Wireless
14.84 Telco Systems
14.85 Tellion
14.86 Tellumat
14.87 Telsey
14.88 Tilgin
14.89 Trango Systems
14.90 Ubiquoss
14.91 UTStarcom
14.92 Vubiq Networks
14.93 Wave1
14.94 Wavesight
14.95 Xavi Technologies
14.96 Yamaha Corporation
14.97 Zhone Technologies

3.15: Market Analysis and Forecasts
15.1 Global Outlook of HetNet Infrastructure Investments
15.2 Small Cells
15.2.1 Segmentation by Use Case
15.2.1.1 Residential
15.2.1.2 Enterprise
15.2.1.3 Urban
15.2.1.4 Rural & Suburban
15.2.2 Segmentation by Form Factor
15.2.2.1 Femtocells
15.2.2.2 Picocells
15.2.2.3 Microcells
15.2.3 Segmentation by Air Interface Technology
15.2.3.1 2G & 3G
15.2.3.2 LTE
15.2.3.3 5G
15.2.4 Segmentation by Deployment Model
15.2.4.1 Indoor
15.2.4.2 Outdoor
15.3 Small Cell Backhaul
15.3.1 Segmentation by Technology
15.3.1.1 DSL
15.3.1.2 Ethernet
15.3.1.3 Microwave
15.3.1.4 Millimeter Wave
15.3.1.5 Satellite
15.3.1.6 Fiber & Others
15.4 Carrier Wi-Fi
15.4.1 Segmentation by Submarket
15.4.1.1 Access Points
15.4.1.2 Access Point Controllers
15.4.2 Segmentation by Integration Approach
15.4.2.1 Standalone Wi-Fi Hotspots
15.4.2.2 Managed Wi-Fi Offload
15.5 C-RAN
15.5.1 Segmentation by Submarket
15.5.1.1 RRHs (Remote Radio Heads)
15.5.1.2 BBUs (Baseband Units)
15.5.2 Segmentation by Air Interface Technology
15.5.2.1 3G & LTE
15.5.2.2 5G
15.5.3 Segmentation by Deployment Model
15.5.3.1 Indoor
15.5.3.2 Outdoor
15.6 C-RAN Fronthaul
15.6.1 Segmentation by Technology
15.6.1.1 Dedicated Fiber
15.6.1.2 WDM
15.6.1.3 OTN & PON
15.6.1.4 Ethernet
15.6.1.5 Microwave
15.6.1.6 Millimeter Wave
15.7 DAS
15.7.1 Segmentation by Deployment Model
15.7.1.1 Indoor
15.7.1.2 Outdoor
15.8 Segmentation by Region
15.8.1 Small Cells
15.8.2 Small Cell Backhaul
15.8.3 Carrier Wi-Fi
15.8.4 C-RAN
15.8.5 C-RAN Fronthaul
15.8.6 DAS
15.9 Asia Pacific
15.9.1 Small Cells
15.9.2 Small Cell Backhaul
15.9.3 Carrier Wi-Fi
15.9.4 C-RAN
15.9.5 C-RAN Fronthaul
15.9.6 DAS
15.10 Eastern Europe
15.10.1 Small Cells
15.10.2 Small Cell Backhaul
15.10.3 Carrier Wi-Fi
15.10.4 C-RAN
15.10.5 C-RAN Fronthaul
15.10.6 DAS
15.11 Latin & Central America
15.11.1 Small Cells
15.11.2 Small Cell Backhaul
15.11.3 Carrier Wi-Fi
15.11.4 C-RAN
15.11.5 C-RAN Fronthaul
15.11.6 DAS
15.12 Middle East & Africa
15.12.1 Small Cells
15.12.2 Small Cell Backhaul
15.12.3 Carrier Wi-Fi
15.12.4 C-RAN
15.12.5 C-RAN Fronthaul
15.12.6 DAS
15.13 North America
15.13.1 Small Cells
15.13.2 Small Cell Backhaul
15.13.3 Carrier Wi-Fi
15.13.4 C-RAN
15.13.5 C-RAN Fronthaul
15.13.6 DAS
15.14 Western Europe
15.14.1 Small Cells
15.14.2 Small Cell Backhaul
15.14.3 Carrier Wi-Fi
15.14.4 C-RAN
15.14.5 C-RAN Fronthaul
15.14.6 DAS

3.16: Conclusion and Strategic Recommendations
16.1 Why is the Market Poised to Grow?
16.2 Competitive Industry Landscape: Acquisitions, Alliances & Consolidation
16.3 What is the TCO Impact of HetNet Deployments?
16.4 The Formula for Success: Selecting the Right Combination of HetNet Technologies
16.5 Offloading with TD-LTE Small Cells
16.6 The Emergence of Unlicensed LTE Small Cells
16.6.1 LTE-U vs. LAA
16.6.2 Commercial Prospects: How Big is the Opportunity?
16.6.3 Mobile Operator Commitments
16.6.4 Wi-Fi Community Concerns
16.6.5 Offloading with TD-LTE Small Cells
16.6.6 The Emergence of Unlicensed LTE Small Cells
16.6.7 LTE-U vs. LAA
16.6.8 Commercial Prospects: How Big is the Opportunity?
16.6.9 Mobile Operator Commitments
16.6.10 Wi-Fi Community Concerns
16.7 What are the Prospects of Cloud RAN?
16.8 Convergence of C-RAN and Small Cells: Distributing Baseband Intelligence
16.9 Accelerating the Transition to Military, Tactical & Public Safety LTE Networks
16.10 Standardization Driving RAN & Carrier Wi-Fi Integration
16.11 Prospects of Enterprise RAN Deployments
16.12 Network Visibility & OAM
16.13 Addressing Network Security: IPsec
16.14 Vendor Share Analysis
16.14.1 Small Cells
16.14.2 Carrier Wi-Fi
16.14.3 C-RAN
16.14.4 DAS
16.15 Strategic Recommendations
16.15.1 HetNet Infrastructure Vendors
16.15.2 Mobile Operators

List of Figures
Figure 1.1: The NFV Concept
Figure 1.2: A Comparison of SDN and NFV
Figure 1.3: C-RAN Architecture
Figure 1.4: Virtualized and Non-Virtualized Mobile Core Networks
Figure 1.5: China Mobile’s NuoVoNet NFV/SDN Program
Figure 1.6: SK Telecom’s vRAN (Virtualized Radio Access Network) Vision
Figure 1.7: The SDN, NFV & Network Virtualization Value Chain
Figure 1.8: The SDN, NFV & Network Virtualization Industry Roadmap: 2016 - 2030
Figure 1.9: Global SDN, NFV & Network Virtualization Revenue: 2016 - 2030 ($ Million)
Figure 1.10: Global SDN, NFV & Network Virtualization Revenue by User Base: 2016 - 2030 ($ Million)
Figure 1.11: Global Enterprise & Data Center SDN & Network Virtualization Revenue: 2016 - 2030 ($ Million)
Figure 1.12: Global Service Provider SDN & NFV Revenue by User Base: 2016 - 2030 ($ Million)
Figure 1.13: Global SDN, NFV & Network Virtualization Revenue by Submarket: 2016 - 2030 ($ Million)
Figure 1.14: Global SDN Hardware & Software Revenue: 2016 - 2030 ($ Million)
Figure 1.15: Global NFV Hardware & Software Revenue: 2016 - 2030 ($ Million)
Figure 1.16: Global Other Network Virtualization Software Revenue: 2016 - 2030 ($ Million)
Figure 1.17: Global Service Provider SDN & NFV Revenue by Submarket: 2016 - 2030 ($ Million)
Figure 1.18: Global SDN Revenue by User Base: 2016 - 2030 ($ Million)
Figure 1.19: Global Service Provider SDN Hardware & Software Revenue: 2016 - 2030 ($ Million)
Figure 1.20: Global Enterprise & Data Center SDN Revenue: 2016 - 2030 ($ Million)
Figure 1.21: Global NFV Revenue by Submarket: 2016 - 2030 ($ Million)
Figure 1.22: Global NFV Hardware Appliance Revenue: 2016 - 2030 ($ Million)
Figure 1.23: Global NFV Hardware Appliance & Management Software Revenue: 2016 - 2030 ($ Million)
Figure 1.24: Global NFV VNF Software Revenue: 2016 - 2030 ($ Million)
Figure 1.25: Global Service Provider SDN Revenue by Submarket: 2016 - 2030 ($ Million)
Figure 1.26: Global Service Provider SDN-Enabled Hardware Appliance Revenue: 2016 - 2030 ($ Million)
Figure 1.27: Global Service Provider SDN Orchestration & Management Revenue: 2016 - 2030 ($ Million)
Figure 1.28: Global Service Provider SDN Controller Software Revenue: 2016 - 2030 ($ Million)
Figure 1.29: Global Service Provider SDN Network Applications Software Revenue: 2016 - 2030 ($ Million)
Figure 1.30: Global Enterprise & Data Center SDN Revenue by Submarket: 2016 - 2030 ($ Million)
Figure 1.31: Global Enterprise & Data Center SDN-Enabled Hardware Appliance Revenue: 2016 - 2030 ($ Million)
Figure 1.32: Global Enterprise & Data Center SDN-Enabled Virtual Switch Revenue: 2016 - 2030 ($ Million)
Figure 1.33: Global Enterprise & Data Center SDN Controller Software Revenue: 2016 - 2030 ($ Million)
Figure 1.34: Global Service Provider SDN & NFV Revenue by Functional Area: 2016 - 2030 ($ Million)
Figure 1.35: Global SDN & NFV Revenue in Service Provider CDNs: 2016 - 2030 ($ Million)
Figure 1.36: Global SDN & NFV Revenue in Service Provider CPE Deployments: 2016 - 2030 ($ Million)
Figure 1.37: Global SDN & NFV Revenue in Service Provider Data Centers: 2016 - 2030 ($ Million)
Figure 2.288: Middle East & Africa 2G & 3G Macrocell BSC Revenue: 2016 - 2030 ($ Million)
Figure 2.289: Middle East & Africa Mobile Core Revenue: 2016 - 2030 ($ Million)
Figure 2.290: Middle East & Africa Macrocell Backhaul Revenue: 2016 - 2030 ($ Million)
Figure 2.291: Middle East & Africa Small Cell Unit Shipments: 2016 - 2030 (Thousands of Units)
Figure 2.292: Middle East & Africa Small Cell Unit Shipment Revenue: 2016 - 2030 ($ Million)
Figure 2.293: Middle East & Africa Small Cell Backhaul Revenue: 2016 - 2030 ($ Million)
Figure 2.294: Middle East & Africa Carrier Wi-Fi Access Point Unit Shipments: 2016 - 2030 (Thousands of Units)
Figure 2.295: Middle East & Africa Carrier Wi-Fi Access Point Unit Shipment Revenue: 2016 - 2030 ($ Million)
Figure 2.296: Middle East & Africa Carrier Wi-Fi Access Point Controller Unit Shipments: 2016 - 2030 (Thousands of Units)
Figure 2.297: Middle East & Africa Carrier Wi-Fi Access Point Controller Unit Shipment Revenue: 2016 - 2030 ($ Million)
Figure 2.298: Middle East & Africa RRH Unit Shipments: 2016 - 2030 (Thousands of Units)
Figure 2.299: Middle East & Africa RRH Unit Shipment Revenue: 2016 - 2030 ($ Million)
Figure 2.300: Middle East & Africa C-RAN BBU Shipments: 2016 - 2030 (Thousands of Units)
Figure 2.301: Middle East & Africa C-RAN BBU Shipment Revenue: 2016 - 2030 ($ Million)
Figure 2.302: Middle East & Africa C-RAN Fronthaul Revenue: 2016 - 2030 ($ Million)
Figure 2.303: Middle East & Africa DAS Node Unit Shipments: 2016 - 2020 (Thousands of Units)
Figure 2.304: Middle East & Africa DAS Node Unit Shipment Revenue: 2016 - 2020 ($ Million)
Figure 2.305: North America Wireless Network Infrastructure Revenue: 2016 - 2030 ($ Million)
Figure 2.306: North America Macrocell Base Station Shipments: 2016 - 2030 (Thousands of Units)
Figure 2.307: North America Macrocell Base Station Shipment Revenue: 2016 - 2030 ($ Million)
Figure 2.308: North America 2G & 3G Macrocell BSC Revenue: 2016 - 2030 ($ Million)
Figure 2.309: North America Mobile Core Revenue: 2016 - 2030 ($ Million)
Figure 2.310: North America Macrocell Backhaul Revenue: 2016 - 2030 ($ Million)
Figure 2.311: North America Small Cell Unit Shipments: 2016 - 2030 (Thousands of Units)
Figure 2.312: North America Small Cell Unit Shipment Revenue: 2016 - 2030 ($ Million)
Figure 2.313: North America Small Cell Backhaul Revenue: 2016 - 2030 ($ Million)
Figure 2.314: North America Carrier Wi-Fi Access Point Unit Shipments: 2016 - 2030 (Thousands of Units)
Figure 2.315: North America Carrier Wi-Fi Access Point Unit Shipment Revenue: 2016 - 2030 ($ Million)
Figure 2.316: North America Carrier Wi-Fi Access Point Controller Unit Shipments: 2016 - 2030 (Thousands of Units)
Figure 2.317: North America Carrier Wi-Fi Access Point Controller Unit Shipment Revenue: 2016 - 2030 ($ Million)
Figure 2.318: North America RRH Unit Shipments: 2016 - 2030 (Thousands of Units)
Figure 2.319: North America RRH Unit Shipment Revenue: 2016 - 2030 ($ Million)
Figure 2.320: North America C-RAN BBU Shipments: 2016 - 2030 (Thousands of Units)
Figure 2.321: North America C-RAN BBU Shipment Revenue: 2016 - 2030 ($ Million)
Figure 2.322: North America C-RAN Fronthaul Revenue: 2016 - 2030 ($ Million)
Figure 2.323: North America DAS Node Unit Shipments: 2016 - 2020 (Thousands of Units)
Figure 2.324: North America DAS Node Unit Shipment Revenue: 2016 - 2020 ($ Million)
Figure 2.325: Western Europe Wireless Network Infrastructure Revenue: 2016 - 2030 ($ Million)
Figure 2.326: Western Europe Macrocell Base Station Shipments: 2016 - 2030 (Thousands of Units)
Figure 2.327: Western Europe Macrocell Base Station Shipment Revenue: 2016 - 2030 ($ Million)
Figure 2.328: Western Europe 2G & 3G Macrocell BSC Revenue: 2016 - 2030 ($ Million)
Figure 2.329: Western Europe Mobile Core Revenue: 2016 - 2030 ($ Million)
Figure 2.330: Western Europe Macrocell Backhaul Revenue: 2016 - 2030 ($ Million)
Figure 2.331: Western Europe Small Cell Unit Shipments: 2016 - 2030 (Thousands of Units)
Figure 2.332: Western Europe Small Cell Unit Shipment Revenue: 2016 - 2030 ($ Million)
Figure 2.333: Western Europe Small Cell Backhaul Revenue: 2016 - 2030 ($ Million)
Figure 2.334: Western Europe Carrier Wi-Fi Access Point Unit Shipments: 2016 - 2030 (Thousands of Units)
Figure 2.335: Western Europe Carrier Wi-Fi Access Point Unit Shipment Revenue: 2016 - 2030 ($ Million)
Figure 2.336: Western Europe Carrier Wi-Fi Access Point Controller Unit Shipments: 2016 - 2030 (Thousands of Units)
Figure 2.337: Western Europe Carrier Wi-Fi Access Point Controller Unit Shipment Revenue: 2016 - 2030 ($ Million)
Figure 2.338: Western Europe RRH Unit Shipments: 2016 - 2030 (Thousands of Units)
Figure 2.339: Western Europe RRH Unit Shipment Revenue: 2016 - 2030 ($ Million)
Figure 2.340: Western Europe C-RAN BBU Shipments: 2016 - 2030 (Thousands of Units)
Figure 2.341: Western Europe C-RAN BBU Shipment Revenue: 2016 - 2030 ($ Million)
Figure 2.342: Western Europe C-RAN Fronthaul Revenue: 2016 - 2030 ($ Million)
Figure 2.343: Western Europe DAS Node Unit Shipments: 2016 - 2020 (Thousands of Units)
Figure 3.116: RRH (Remote Radio Head) Unit Shipments by Region: 2016 - 2030 (Thousands of Units)
Figure 3.117: RRH (Remote Radio Head) Unit Shipment Revenue by Region: 2016 - 2030 ($ Million)
Figure 3.118: C-RAN BBU (Baseband Unit) Shipments by Region: 2016 - 2030 (Thousands of Units)
Figure 3.119: C-RAN BBU (Baseband Unit) Shipment Revenue by Region: 2016 - 2030 ($ Million)
Figure 3.120: C-RAN Fronthaul Revenue by Region: 2016 - 2030 ($ Million)
Figure 3.121: DAS Node Unit Shipments by Region: 2016 - 2020 (Thousands of Units)
Figure 3.122: DAS Node Unit Shipment Revenue by Region: 2016 - 2020 ($ Million)
Figure 3.123: Asia Pacific HetNet Infrastructure Revenue: 2016 - 2030 ($ Million)
Figure 3.124: Asia Pacific Small Cell Unit Shipments: 2016 - 2030 (Thousands of Units)
Figure 3.125: Asia Pacific Small Cell Unit Shipment Revenue: 2016 - 2030 ($ Million)
Figure 3.126: Asia Pacific Small Cell Backhaul Revenue: 2016 - 2030 ($ Million)
Figure 3.127: Asia Pacific Carrier Wi-Fi Access Point Unit Shipments: 2016 - 2030 (Thousands of Units)
Figure 3.128: Asia Pacific Carrier Wi-Fi Access Point Unit Shipment Revenue: 2016 - 2030 ($ Million)
Figure 3.129: Asia Pacific Carrier Wi-Fi Access Point Controller Unit Shipments: 2016 - 2030 (Thousands of Units)
Figure 3.130: Asia Pacific Carrier Wi-Fi Access Point Controller Unit Shipment Revenue: 2016 - 2030 ($ Million)
Figure 3.131: Asia Pacific RRH (Remote Radio Head) Unit Shipments: 2016 - 2030 (Thousands of Units)
Figure 3.132: Asia Pacific RRH (Remote Radio Head) Unit Shipment Revenue: 2016 - 2030 ($ Million)
Figure 3.133: Asia Pacific C-RAN BBU (Baseband Unit) Shipments: 2016 - 2030 (Thousands of Units)
Figure 3.134: Asia Pacific C-RAN BBU (Baseband Unit) Shipment Revenue: 2016 - 2030 ($ Million)
Figure 3.135: Asia Pacific C-RAN Fronthaul Revenue: 2016 - 2030 ($ Million)
Figure 3.136: Asia Pacific DAS Node Unit Shipments: 2016 - 2020 (Thousands of Units)
Figure 3.137: Asia Pacific DAS Node Unit Shipment Revenue: 2016 - 2020 ($ Million)
Figure 3.138: Eastern Europe HetNet Infrastructure Revenue: 2016 - 2030 ($ Million)
Figure 3.139: Eastern Europe Small Cell Unit Shipments: 2016 - 2030 (Thousands of Units)
Figure 3.140: Eastern Europe Small Cell Unit Shipment Revenue: 2016 - 2030 ($ Million)
Figure 3.141: Eastern Europe Small Cell Backhaul Revenue: 2016 - 2030 ($ Million)
Figure 3.142: Eastern Europe Carrier Wi-Fi Access Point Unit Shipments: 2016 - 2030 (Thousands of Units)
Figure 3.143: Eastern Europe Carrier Wi-Fi Access Point Unit Shipment Revenue: 2016 - 2030 ($ Million)
Figure 3.144: Eastern Europe Carrier Wi-Fi Access Point Controller Unit Shipments: 2016 - 2030 (Thousands of Units)
Figure 3.145: Eastern Europe Carrier Wi-Fi Access Point Controller Unit Shipment Revenue: 2016 - 2030 ($ Million)
Figure 3.146: Eastern Europe RRH (Remote Radio Head) Unit Shipments: 2016 - 2030 (Thousands of Units)
Figure 3.147: Eastern Europe RRH (Remote Radio Head) Unit Shipment Revenue: 2016 - 2030 ($ Million)
Figure 3.148: Eastern Europe C-RAN BBU (Baseband Unit) Shipments: 2016 - 2030 (Thousands of Units)
Figure 3.149: Eastern Europe C-RAN BBU (Baseband Unit) Shipment Revenue: 2016 - 2030 ($ Million)
Figure 3.150: Eastern Europe C-RAN Fronthaul Revenue: 2016 - 2030 ($ Million)
Figure 3.151: Eastern Europe DAS Node Unit Shipments: 2016 - 2020 (Thousands of Units)
Figure 3.152: Eastern Europe DAS Node Unit Shipment Revenue: 2016 - 2020 ($ Million)
Figure 3.153: Latin & Central America HetNet Infrastructure Revenue: 2016 - 2030 ($ Million)
Figure 3.154: Latin & Central America Small Cell Unit Shipments: 2016 - 2030 (Thousands of Units)
Figure 3.155: Latin & Central America Small Cell Unit Shipment Revenue: 2016 - 2030 ($ Million)
Figure 3.156: Latin & Central America Small Cell Backhaul Revenue: 2016 - 2030 ($ Million)
Figure 3.157: Latin & Central America Carrier Wi-Fi Access Point Unit Shipments: 2016 - 2030 (Thousands of Units)
Figure 3.158: Latin & Central America Carrier Wi-Fi Access Point Unit Shipment Revenue: 2016 - 2030 ($ Million)
Figure 3.159: Latin & Central America Carrier Wi-Fi Access Point Controller Unit Shipments: 2016 - 2030 (Thousands of Units)
Figure 3.160: Latin & Central America Carrier Wi-Fi Access Point Controller Unit Shipment Revenue: 2016 - 2030 ($ Million)
Figure 3.161: Latin & Central America RRH (Remote Radio Head) Unit Shipments: 2016 - 2030 (Thousands of Units)
Figure 3.162: Latin & Central America RRH (Remote Radio Head) Unit Shipment Revenue: 2016 - 2030 ($ Million)
Figure 3.163: Latin & Central America C-RAN BBU (Baseband Unit) Shipments: 2016 - 2030 (Thousands of Units)
Figure 3.164: Latin & Central America C-RAN BBU (Baseband Unit) Shipment Revenue: 2016 - 2030 ($ Million)
Figure 3.165: Latin & Central America C-RAN Fronthaul Revenue: 2016 - 2030 ($ Million)
Figure 3.166: Latin & Central America DAS Node Unit Shipments: 2016 - 2020 (Thousands of Units)
Figure 3.167: Latin & Central America DAS Node Unit Shipment Revenue: 2016 - 2020 ($ Million)
Figure 3.168: Middle East & Africa HetNet Infrastructure Revenue: 2016 - 2030 ($ Million)
Figure 3.222: Global Enterprise RAN Investments: 2016 - 2030 ($ Million)
Figure 3.223: Global Small Cell Market Share by Vendor: 2015 (%)
Figure 3.224: Global Carrier Wi-Fi Market Share by Vendor: 2015 (%)
Figure 3.225: Global C-RAN Market Share by Vendor: 2015 (%)
Figure 3.226: Global DAS Market Share by Vendor: 2015 (%)

Ordering:
Order Online - [http://www.researchandmarkets.com/reports/3715589/](http://www.researchandmarkets.com/reports/3715589/)
Order by Fax - using the form below
Order by Post - print the order form below and send to

Research and Markets,
Guinness Centre,
Taylors Lane,
Dublin 8,
Ireland.
Fax Order Form
To place an order via fax simply print this form, fill in the information below and fax the completed form to 646-607-1907 (from USA) or +353-1-481-1716 (from Rest of World). If you have any questions please visit http://www.researchandmarkets.com/contact/

Order Information
Please verify that the product information is correct and select the format(s) you require.

Product Name: The NFV, SDN & Wireless Network Infrastructure Market: 2016 - 2030 - Opportunities, Challenges, Strategies and Forecasts
Web Address: http://www.researchandmarkets.com/reports/3715589/
Office Code: SCH3PUS1

Product Formats
Please select the product formats and quantity you require:

<table>
<thead>
<tr>
<th>Quantity</th>
<th>USD 4000</th>
<th>USD 5000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronic (PDF) - Single User:</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Electronic (PDF) - Enterprisewide:</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

Contact Information
Please enter all the information below in BLOCK CAPITALS

Title: ☐ Mr ☐ Mrs ☐ Dr ☐ Miss ☐ Ms ☐ Prof ☐
First Name: ___________________________ Last Name: ___________________________
Email Address: * ___________________________
Job Title: ___________________________
Organisation: ___________________________
Address: ___________________________
City: ___________________________
Postal / Zip Code: ___________________________
Country: ___________________________
Phone Number: ___________________________
Fax Number: ___________________________

* Please refrain from using free email accounts when ordering (e.g. Yahoo, Hotmail, AOL)
Payment Information

Please indicate the payment method you would like to use by selecting the appropriate box.

☐ Pay by credit card: You will receive an email with a link to a secure webpage to enter your credit card details.

☐ Pay by check: Please post the check, accompanied by this form, to:

Research and Markets,
Guinness Center,
Taylors Lane,
Dublin 8,
Ireland.

☐ Pay by wire transfer: Please transfer funds to:

Account number 833 130 83
Sort code 98-53-30
Swift code ULSBIE2D
IBAN number IE78ULSB98533083313083
Bank Address Ulster Bank,
27-35 Main Street,
Blackrock,
Co. Dublin,
Ireland.

If you have a Marketing Code please enter it below:

Marketing Code: ________________________________

Please note that by ordering from Research and Markets you are agreeing to our Terms and Conditions at http://www.researchandmarkets.com/info/terms.asp

Please fax this form to:

(646) 607-1907 or (646) 964-6609 - From USA
+353-1-481-1716 or +353-1-653-1571 - From Rest of World