

Nokia Siemens Networks FlexiPacket Microwave Smart evolution to All-IP backhaul

Nokia Siemens
Networks



Mobile broadband for 3G, WiMAX, and LTE networks:
Whatever you want to backhaul, FlexiPacket Microwave gets the
job done – efficiently, conveniently, and with remarkable economy.

The perfect launch pad

Nokia Siemens Networks offers the definitive solution for CSPs seeking to build advanced Ethernet-based mobile backhaul networks – FlexiPacket Microwave. The first software selectable choice for both packet and hybrid transport networks, its modular design affords you utmost flexibility and lets you add capacity as demand picks up by simple software configurability. This cost-effective solution comprises three basic components – FlexiPacket MultiRadio, FlexiPacket FirstMile 200 and FlexiPacket Hub.

FlexiPacket MultiRadio

Housed in an outdoor unit, this full-fledged high-capacity microwave system features a standard GE UNI interface. It provides unique interoperability in IP/Ethernet networks for everything from public, private, fixed, and mobile to access and aggregation/core applications. The unique software-programmable platform provides operation for both Hybrid and Full Packet traffic mode, thus to allow any migration path from TDM to All-IP backhaul with true “zero-touch” on the existing hardware.

FlexiPacket FirstMile 200

This cost-effective peripheral switch is optimized for backhauling networks’ tail and chain sites. It also aggregates TDM and packet traffic locally.

FlexiPacket Hub 800

This best-in-class ultra-flexible nodal/hub switch can connect up to 14 microwave directions. It aggregates any types of traffic and supports both TDM and packet transport networks.

Engineered to drive down cost

Featuring an innovative design that cuts the costs of building, operating and evolving a backhaul network, FlexiPacket Microwave is as versatile as its name suggests. Its flexible, scalable architecture comprises fully outdoor units for cell sites, indoor unit line cards, and compact nodal solutions in hub sites.

FlexiPacket Microwave

- Software-configurable full packet and/or hybrid mobile backhaul
- TCO savings by zero-footprint & green cell site solution
- Fully outdoor radio with GE UNI (MEF) standard interface
- Advanced QoS mechanism for differentiated services
- Pay-as-you-grow solution, software-programmable capacity up to 1.2 Gb/s in 56 MHz channel

Standalone or integrated

FlexiPacket MultiRadio even works without dedicated cell-site units. This standalone capability comes in very handy for tail sites where microwave radio can feed straight into the Flexi BTS' Ethernet interface. This zero-footprint solution for 3G, WiMAX, and LTE minimizes TCO by:

- Cutting CAPEX because you need less equipment: a full microwave system in an outdoor unit simply costs less than the standard indoor/outdoor setup
- Optimizing sites: With no need for a cell-site unit, you can roll out a fully outdoor site

Built to streamline and simplify

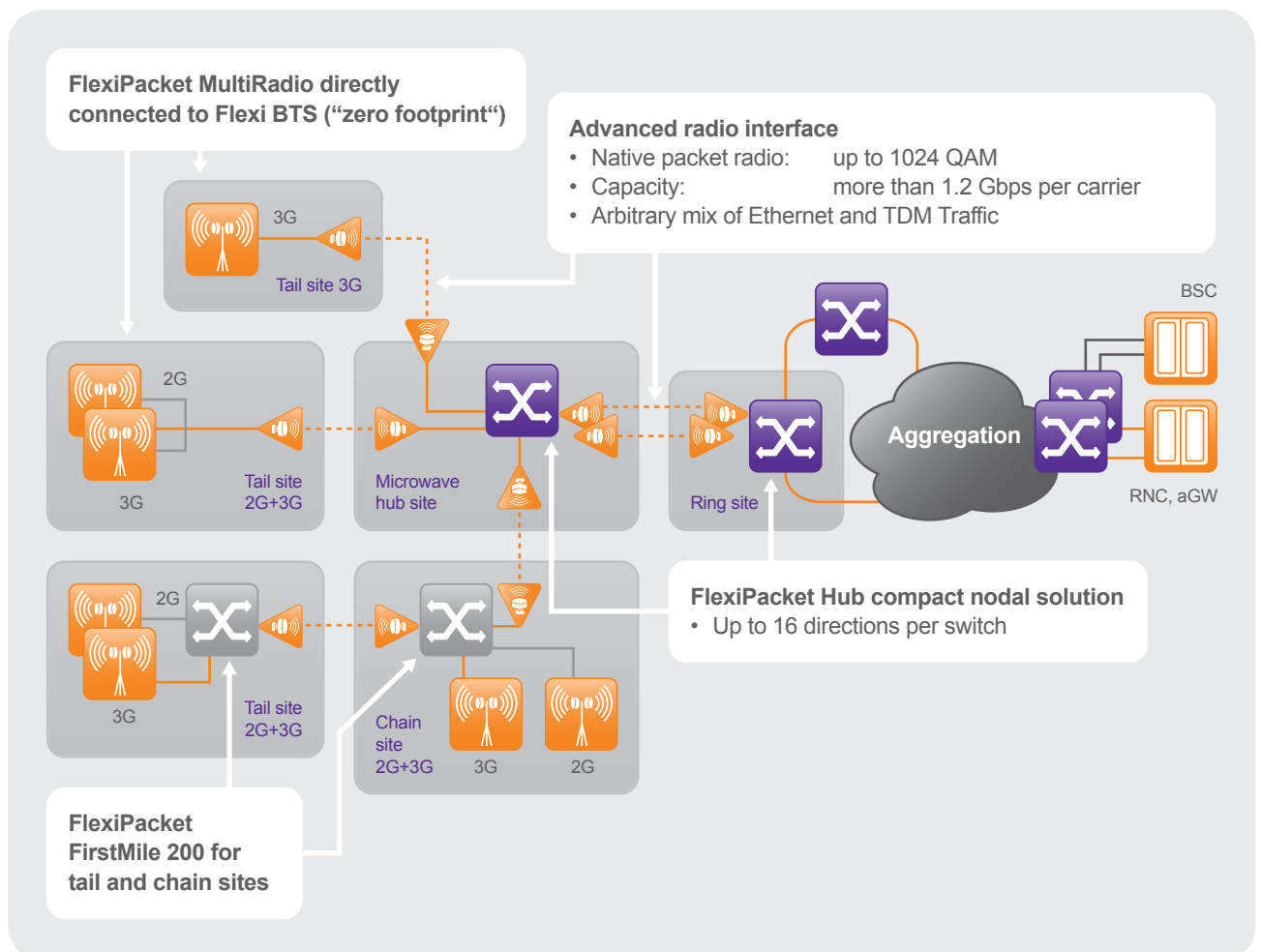
Low on up-front investments and high on operating savings, FlexiPacket MultiRadio is a

- Scalable, pay-as-you-grow solution, using the same platform for easy and fast capacity upgrade throughout the network
- Flexible, future-proof solution, providing software-configurable migration from hybrid to full packet transport

With our end-to-end management solution, operating a packet network is as easy as running a TDM network: true point&click end-to-end service provisioning translates to real OPEX savings.

Experience matters

With FlexiPacket Microwave, you not only get state-of-the-art microwave transport components but also unrivaled knowhow in mobile backhauling. Look to a leader in end-to-end mobile backhaul solutions, broadband radio access technology, and Carrier Ethernet Transport to provide the right stuff for microwave radio – Nokia Siemens Networks, your reliable partner in telecommunications.



FlexiPacket Microwave – a complete mobile backhauling solution

FlexiPacket MultiRadio (hybrid/full-packet dual traffic mode)

Well-suited for mobile, fixed, and private transport networks, this reliable and flexible microwave radio unit transports Ethernet traffic efficiently in 3.5 GHz to 42 GHz RF bands.

This packet microwave radio unit offers:

- Software-selectable hybrid and/or full packet air interface
- Full scalability supporting 3.5/7/14/28/56/112 MHz channel bandwidth and modulation from 4 to 1024 levels
- Broad frequency coverage from 3.5 to 42 GHz
- Efficient adaptive modulation that lets you boost link capacity without the need to redesign the microwave network.

The FlexiPacket MultiRadio outdoor unit connects directly to Nokia Siemens Networks Flexi BTS, which is particularly useful in 3G tail sites, as well as to any third-party indoor unit via a standard GE UNI interface. The direct connection between the Flexi BTS and FlexiPacket MultiRadio unit without an intermediary cell-site unit cuts CAPEX and OPEX, especially.

It may be used in standalone configuration – that is, without dedicated indoor units. This is particularly useful in tail sites, as it plugs straight into base stations. In 3G sites with Ethernet NodeBs, FlexiPacket MultiRadio can be connected directly to the NodeB's Ethernet interface.

The fully outdoor solution in the cell site and the compact node solution in hub sites reduce overall network CAPEX. FlexiPacket Microwave's flexible architecture offers a real pay-as-you-grow proposition for hub sites. You can add outdoor units and indoor unit line cards as you see fit.

The microwave radio unit is scalable so the same platform may be used throughout the network and software-upgraded to exceed 1.2 Gb/s capacity

per carrier. What's more the same platform allows to be software-configured thus to provide any evolutionary path for TDM to hybrid to full packet migration. Finally, Adaptive Code Modulation lets you make the most of the RF spectrum by increasing the modulation level to transport more traffic in the same radio channel.

All of the above translates in clear benefits for CSPs to maximize both investment and operating savings

Main features

- Standard electrical Ethernet interface enabling interoperability with bridges, routers and BTS or NodeB
- Fully scalable and supports 3.5/7/14/28/56/112 MHz channel bandwidths and modulation formats from 4 to 1024 QAM
- 3.5/6/7/8/10,5/11/13/15/18/23/26/28/32/38 and 42 GHz frequency coverage
- XPIC functionality to double the capacity in the same channel bandwidth
- Adaptive Code Modulation
- Japan/ANSI standard support
- Jumbo frames support
- ATPC functionality
- Service-aware radio to support differentiated QoS (8 queues scheduler CIR/EIR-based)
- Support for both IEEE1588-2008 (ToP) and Synchronous Ethernet
- More than 1.2 Gbits Ethernet throughput per carrier with XPIC
- Exceptionally compact: (238 x 168 x 238 mm hxdxw)
- Integrated antenna ranging up to 1.8 m
- Green design for reduced space and energy saving exceeding 95% (W/Mbps) wrt legacy microwave
- Carrier Ethernet Transport MEF interface (UNI)
- Hardware fully compatible with all legacy Nokia Siemens Networks microwave radios
- Protection:
 - 1 + 0
 - 1 + 1 Space Diversity / Frequency Diversity
 - 1 + 1 HSBY
 - 2 + 0 FD/XPIC (with load sharing)
 - 2 + 0 Drop/Insert and Forwarding
 - 2 + 2 FD/XPIC
 - 4 + 0 FD/XPIC



FlexiPacket E-Band Radio

Flexi Packet Radio E-Band is part of the Nokia Siemens Networks FlexiPacket Microwave family, complementing the current portfolio of Packet Microwave solutions for Mobile Backhaul applications based on Carrier Ethernet Transport (CET). Nokia Siemens Networks E-Band solution is designed to address both the needs to enable gigabit-per-second traffic backhaul, as required by coming 4G (LTE, WiMAX) and future mobile broadband access technologies, and to decouple the transport capacity growth from the cost of backhaul infrastructure.

Main Features:

- All-outdoor with multi-protocol support: 5xGb Eth and up to 4 x SDH with free capacity allocation
- Up to 1.2 Gb/s throughput in 1 GHz bandwidth tuneable RF channel
- High capacity and rain mitigation by Adaptive Data Rate and Modulation
- Easy network planning by tuneable channelization within entire 70/80 GHz band
- Carrier Ethernet services enabled through built-in Gigabit Eth Layer 2 switch

FlexiPacket FirstMile 200

Part of the FlexiPacket Microwave solution, this cost-effective switch is optimized for tail and chain sites where 3G and LTE base stations are co-located with 2G networks' BTS. It fits in the standard Flexi BTS outdoor housing, providing zero-footprint site installation and supporting extended operating temperature range.

Switching capacity:

- 8Gbps

Services:

- E-Line and E-LAN service
- E1/T1/J1 CESoPSN (RFC5086)
- E1/T1/J1 SAToP (RFC4553)

Bridging and VLAN manipulation:

- IEEE802.1ad provider bridging
- IEEE 802.1Q bridging
- MAC table size: 8K
- Support for Static MAC VLAN insertion and translation

QoS:

- Traffic classification and mapping based on port, MAC,
- VLAN ID, VLAN priority bits, IP address, DSCP, etc.
- Policing on port, VLAN, and queue
- 8 priority queues per port
- Scheduler: Strict Priority, WDRR, WRR
- Congestion Control: sRED
- Per-port and per-queue traffic shaping

Performance monitoring:

- Packet counters according to RFC2819 RMON MIB, RFC2863
- Y.1731 performance measurement

Fault detection:

Y.1731/802.1ag

Protection:

- xSTP based network protection
- 1+1 hot-standby (HSBY) nodal protection
- LAG

Clock synchronization:

- Adaptive Clock Recovery (ACR)
- Differential Clock Recovery (DCR)
- Synchronous Ethernet with and without SSM
- Clock sources:
 - Network clock via ACR/DCR
 - Line clock from any E1/T1 port
 - Synchronous Ethernet SSM
 - Internal free-run clock

Supported ODU group configurations:

- 1+0
- 1+1 HSBY



Technical data	FlexiPacket FirstMile
Ethernet ports	<ul style="list-style-type: none">• 6 10/100/1000 Base-TX Ethernet ports; RJ-45 connectors (2 ports with embedded power to FlexiPacket MultiRadio)• 1 local management port• 2 in and 2 out dry contacts
TDM ports	<ul style="list-style-type: none">• 8 E1/T1 TDM ports; RJ-48C connectors
Width x depth x height	442 mm x 210 mm x 32 mm (2/3U)
Operating temperature range	- 40 °C to +65 °C in FlexiOutdoor case
Power supply	up to 48 V DC
Power consumption	Min. 15 W

FlexiPacket Hub

Nokia Siemens Networks hub devices serve to backhaul 2G, 3G and LTE data over E-Line, E-LAN and E-Tree services. They offer advanced Ethernet processing features and circuit emulation to provide utmost flexibility for TDM traffic aggregation. Access interfaces include Fast and Gigabit Ethernet, E1/T1, and channelized STM-1. FlexiPacket Hub devices are remarkably compact, supporting up to 14 directions in one unit (FlexiPacket Hub 800) Deployed indoors, they take up far less rack space than any other nodal microwave solutions. And they can serve as a fully outdoor microwave hub site when housed in a FlexiOutdoor case. Their state-of-the-art components and support for protected configurations, TDM tributary protection, and Ethernet protection ensures unrivalled reliability.

FlexiPacket Hub 800 (Hybrid/full-packet dual traffic mode)

Designed for both small and large microwave hubs, FlexiPacket Hub 800 provides all the required flexibilities, multi-service aggregation capabilities, and reliabilities.

Switching capacity: 16Gbps

Services:

- E-Line and E-LAN service
- E1/T1/J1 CESoPSN (RFC5086)
- E1/T1/J1 SAToP (RFC4553)
- STM-1 CESoPSN and SAToP
- n x E1 ATM IMA
- STM-1 ATM IMA
- Support for packet-based microwave
- Support for hybrid microwave
- Support for both TDM and packet transport networks
- Support for n x E1 MLPPP

Bridging and VLAN manipulation:

- IEEE 802.1ad Provider Bridging
- IEEE 802.1Q bridging
- MAC table size: 16K
- Support for Static MAC
- VLAN insertion and translation

QoS:

- Traffic classification and mapping based on port, MAC, VLAN ID, VLAN priority bits, IP address, DSCP, etc.
- Policing on port, VLAN, and queue
- 8 priority queues per port
- Scheduler: Strict Priority, WDRR, WRR
- Congestion control: sRED
- Per-port and per-queue traffic shaping

Performance monitoring:

- Packet counters according to RFC2819 RMON MIB, RFC2863
- Y.1731 performance measurement

Fault detection:

- Y.1731/802.1ag

Protection:

- xSTP based network protection
- 1+1 hot-standby (HSBY) nodal protection
- LAG

Clock synchronization:

- Adaptive Clock Recovery (ACR)
- Differential Clock Recovery (DCR)
- Synchronous Ethernet with and without SSM
- IEEE 1588v2 Boundary Clock
- Clock sources:
 - Network Clock via ACR/DCR/1588v2
 - Line clock from any E1/T1 port
 - Synchronous Ethernet SSM
 - Internal free-run clock

Supported ODU group configurations:

- 1 + 0
- 1 + 1 space diversity / frequency diversity
- 1 + 1 HSBY
- 2 + 0 FD/XPIC (with load sharing)
- 2 + 0 Drop/Insert and Forwarding



Technical data	FlexiPacket Hub 800
Ethernet ports	<ul style="list-style-type: none"> • 4 x 10/100/1000 Base-T, two of which have embedded power (Power over Ethernet) • 2 x SFP (can be configured as 100/1000 Base-Fx or STM-1)
TDM ports	<ul style="list-style-type: none"> • 16 x E1/T1/J1 • 2 x SFP (can be configured as 100/1000 Base-Fx or STM-1)
System ports*	<ul style="list-style-type: none"> • 1 x 10/100/1000 Base-T out-of-band management port • 1 x 10/100/1000 Base-T DCN management port • 1 x dry contact (2-in and 2-out) • 1 x ToD output port
Two expansion slots	<ul style="list-style-type: none"> • 4-port GE card • 16 x E1/T1/J1 CES card • 2-port STM-1 card • 2-port Power Injector card (providing 2 x PoE ports) • 2-port FlexiBus card
Dimensions	• 440 mm x 240 mm x 44.5 mm (w x d x h)
Operating temperature	• - 5 °C to + 55 °C
Power supply	• - 40.5 to - 57.6 VDC (two inputs)
Power consumption	• Typical 35 W, maximum 45 W



FlexiPacket Hub 1200

Engineered for mission-critical applications at cell or hub sites, our A-1200 MEF-certified Carrier Ethernet Access Switch provides up to 10 Gbps non-blocking switching capacity in a single rack unit.

Features

- Two 1000 Base-X SFP pluggable ports and six 1000 Base-T ports
- Eight E1/T1 ports on board
- Expansion slot supports sixteen more E1/T1 or four STM-1* ports
- CESoPSN and ATMoP over IMA port groups
- PWE3 encapsulation included for GERAN and UTRAN traffic
- Advanced synchronization: Synchronous Ethernet, IEEE 1588-2008, and differential clocking
- Wire-speed performance and availability thanks to:
 - Flexible and intelligent mapping mechanisms that allow multi-services on one access interface with little delay, jitter, and loss
 - Hard QoS assurance for CIR, EIR, and priority traffic with 64 Kbps and 1 Mbps granularity
 - 50 ms service protection with guaranteed bandwidth
 - Standard OAM mechanisms and protocols (Y.1731 & 802.1ag) enable fast and precise fault detection; alarm-service correlation; Ethernet loopbacks; and round-trip delay, jitter, and packet-loss measurement



FlexiPacket Hub 2200

Part of our end-to-end packet transport solution, this modular multi-service switch provides carrier-grade Ethernet edge performance and supports a range of services and applications including Ethernet and legacy TDM. It supports two traffic interface modules and handles many radio directions (up to 16) and access interfaces, making it a perfect fit for the Large Hub. All access modules are hot-swappable. This 1.5U MEF-certified device has two redundant hot-swappable AC or DC power supplies, redundant fans, and a dry-contact interface for alarm management. It supports up to 16 FlexiPacket MultiRadio units.

Features:

Carrier-class appointments, such as:

- Redundant power supplies and N+1 fans; dry contact
- Multi-service enabled, including
- ELine, E-LAN, E-Tree, and CES services on a single device
- CES support, including E1/T1, DS3, OC3/STM-1 with 1+1 APS protection
- High bandwidth & capacity: 4x1G uplink and up to 20x1G access ports
- Supports hard QoS such as CIR, EIR, H-QoS, Shaping and WRR
- Advanced synchronization: Synchronous Ethernet, IEEE 1588-2008, and differential clocking
- Supports 50ms carrier-class protection, multi-failure protection, and in-service software upgrade (ISSU)
- Supports FlexiPacket MultiRadio unit protection

- High performance; very little delay and jitter
- Standard OAM mechanism and protocol support (IEEE802.1ag, Y.1731) detection; alarm service correlation; Ethernet loopbacks; and round-trip delay, jitter, and packet-loss measurement
- Supports FlexiPacket radio unit protection
- High performance; very little delay and jitter
- Standard OAM mechanism and protocol support (IEEE802.1ag, Y.1731) detection; alarm service correlation; Ethernet loopbacks; and round-trip delay, jitter, and packet-loss measurement

Abbreviations

APS	Automatic Protection Switching	NB	UMTS Node B
ATMoP	ATM over Packet	OAM	Operation and Maintenance
ATPC	Automatic Transmit Power Control	OC	Optical Carrier
BTS	Base Transceiver Station	OPEX	Operational Expenditure
CAPEX	Capital Expenditure	PWE	Pseudo Wire Encapsulation
CES	Circuit Emulation Services	QAM	Quadrature Amplitude Modulation
CESoP	Circuit Emulation Services over Packet Switched Network	QoS	Quality of Service
CIR	Committed Information Rate	RSTP	Rapid Spanning Tree Protocol
CSPs	Communication Service Providers	RTP	Real-Time Transport Protocol
DSCP	Differentiated Services Code Point	SAToP	Structure Agnostic TDM over Packet
E-LAN	Ethernet Local Area Network	SC	Subscriber Connector
EIR	Excess Information Rate	SFP	Small Form factor Pluggable
GbE	Gbit Ethernet	SM	Single Mode
GERAN	GSM/EDGE Radio Access Network (2G)	SMF	Single Mode optical Fiber
GSM	Global System for Mobile Communications	STM	Synchronous Transport Module
IMA	Inverse Multiplexing for ATM	TCO	Total Cost of Ownership
LAG	Link Aggregation Group	TDM	Time Division Multiplex
LTE	Long-Term Evolution	TIC	TDM Interface Card
MAC	Media Access Control	UTRAN	UMTS Terrestrial Access Network (3G)
MEF	Metro Ethernet Forum	VLAN	Virtual Local Area Network
MLPPP	Multilink Point-to-Point Protocol	WDRR	Weighted Deficit Round Robin
MMF	MultiMode Fiber	WRR	Weighted Round Robin
MSP	Multiple Section Protection	WiMAX	Worldwide Interoperability for Microwave Access
MSTP	Multiple Spanning Tree Protocol	XPIC	Cross Polarization Interference Cancellation

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