

Upgrade from R5000 to Evolution



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Introduction

To increase the wireless network throughput built on InfiLINK 2x2 / InfiMAN 2x2 families devices (R5000 series) the network can be partially or completely upgraded to the InfiLINK Evolution / InfiMAN Evolution families (Evolution series). Datasheets on these families are presented on the Infinet's website:

- [InfiLINK Evolution](#)
- [InfiMAN Evolution](#)

The document contains recommendations how to upgrade the wireless network from the R5000 series to Evolution and limitations that must be taken into account when R5000 and Evolution devices operate together in one network.

InfiLINK Evolution / InfiMAN Evolution advantages

InfiLINK Evolution / InfiMAN Evolution key features compared to InfiLINK 2x2 / InfiMAN 2x2:

- Evolution devices operate in 4.9–6.4 GHz frequency bands, which allows to use the same devices in the 5 and 6 GHz bands.
- Instant DFS technology support on firmware level. Evolution devices continuously perform background spectrum monitoring and seamlessly change channel to the least noisy frequency without link interruption, taking into account the spectrum conditions at the location of all connected devices.
- The ability to operate in the 80 MHz band increases the Evolution devices performance twice compared to R5000. Infinet devices performance data is shown in article "[Performance of the Infinet Wireless devices](#)".
- All Evolution devices support the QAM256 5/6 modulation-code scheme allowing to get a performance advantage of up to 30% compared to the R5000.
- 10 modulation-code schemes allow to adapt to the radio deterioration by performance reduction with a small steps.
- The spectrum allocated to the link is used by the InfiLINK Evolution family with maximum performance due to the spectral efficiency of 8.375 bit/s/Hz.
- InfiMAN Evolution base station sector could be integrated into existing optical networks thanks to second SFP port.

InfiLINK Evolution / InfiMAN Evolution and InfiLINK 2x2 / InfiMAN 2x2 technical parameters comparison is given in the table below:

Parameter	InfiLINK 2x2 PRO	InfiLINK 2x2 LITE	InfiLINK Evolution	InfiMAN 2x2		InfiMAN Evolution	
				Base station	Subscriber Terminal	Base station	Subscriber Terminal
Frequency range, MHz	<ul style="list-style-type: none"> • 5 GHz: 4900–6050 • 6 GHz: 6050–6425 	<ul style="list-style-type: none"> • 5 GHz: 4900–6050 • 6 GHz: 6050–6425 	<ul style="list-style-type: none"> • 5 GHz: 4900–6050 • 5+6 GHz: 4900–6425 	<ul style="list-style-type: none"> • 5 GHz: 4900–6050 • 6 GHz: 6050–6425 	<ul style="list-style-type: none"> • 5 GHz: 4900–6050 • 6 GHz: 6050–6425 	<ul style="list-style-type: none"> • 5 GHz: 4900–6050 • 6 GHz: 6050–6425 	<ul style="list-style-type: none"> • 5 GHz: 4900–6050 • 5+6 GHz: 4900–6425
Channel width, MHz	<ul style="list-style-type: none"> • 5, 10, 20, 40 	<ul style="list-style-type: none"> • 5, 10, 20, 40 	<ul style="list-style-type: none"> • 5*, 10*, 20, 40, 80 	<ul style="list-style-type: none"> • 5, 10, 20, 40 		<ul style="list-style-type: none"> • 5*, 10*, 20, 40, 80 	
Transmit power, dBm	<ul style="list-style-type: none"> • 5 GHz: up to 27 • 6 GHz: up to 23 	<ul style="list-style-type: none"> • 5 GHz: up to 25 • 6 GHz: up to 23 	<ul style="list-style-type: none"> • 5 GHz: up to 25 • 5+6 GHz: up to 25 	<ul style="list-style-type: none"> • 5 GHz: up to 27 • 6 GHz: up to 23 	<ul style="list-style-type: none"> • 5 GHz: up to 25 • 6 GHz: up to 23 	<ul style="list-style-type: none"> • 5 GHz: up to 27 • 6 GHz: up to 25 	<ul style="list-style-type: none"> • 5 GHz: up to 25 • 5+6 GHz: up to 25

Modulation coding schemes		• up to QAM64 5/6	• up to QAM64 5/6	• up to QAM256 5/6	• up to QAM64 5/6		• up to QAM256 5/6	
Throughput, Mbps	40 MHz	• up to 280	• up to 180	• up to 335	• up to 250	• up to 180	• up to 360	• up to 335
	Max value	• up to 280	• up to 180	• up to 670	• up to 250	• up to 180	• up to 800	• up to 670
Wired Interfaces		• 1xGE(RJ45)	• 1x Fast Ethernet • 2x FastEthernet (PoE out)	• 1xGE(RJ45)	• 1xGE(RJ45)	• 1x Fast Ethernet • 2x FastEthernet (PoE out)	• 1xGE(RJ45) • 1xSFP • 1xSYNC	• 1xGE(RJ45)
Proprietary technologies		• Instant DFS (models with 2 radio modules)		• Instant DFS	• Instant DFS (models with 2 radio modules) • Beamforming		• Instant DFS • Beamforming	• Instant DFS
TDD sync		• Via external synchronization hub			• Via external synchronization hub		• Via external synchronization hub	
Multiple access method		• CSMA-CA • Polling • TDMA	• CSMA-CA • Polling • TDMA	• TDMA	• CSMA-CA • Polling • TDMA	• CSMA-CA • Polling • TDMA	• TDMA	• TDMA
Consumption, W		• 20	• 15	• 15	• 20 • 35 (R5000-Qmxb)	• 15	• 30 • 35 (E5-BSQ)	• 15
Power options		• 90-240 VAC ~ 50/60 Hz • ±43..56 VDC • Proprietary PoE	• 90-240 VAC ~ 50/60 Hz • +9..56 VDC • Proprietary PoE	• 90-240 VAC ~ 50/60 Hz • ±43..56 VDC • Proprietary PoE or 802.3at	• 90-240 VAC ~ 50/60 Hz • ±43..56 VDC • Proprietary PoE	• 90-240 VAC ~ 50/60 Hz • ±43..56 VDC • +9..56 VDC • Proprietary PoE	• 90-240 VAC ~ 50/60 Hz • ±43..56 VDC • Proprietary PoE or 802.3at	• 90-240 VAC ~ 50/60 Hz • ±43..56 VDC • Proprietary PoE or 802.3at

InfiLINK Evolution / InfiMAN Evolution with InfiLINK 2x2 / InfiMAN 2x2 comparison



*-Roadmap item.

Limitations

Limitations in device configuration and design must be taken into account during the network upgrade from R5000 series to Evolution, and R5000 with Evolution devices joint operation in one network.



NOTE

InfiLINK Evolution / InfiMAN Evolution devices in the “transient” mode are guaranteed to work only with devices based on the H08 and H11 platforms of InfiLINK 2x2 and InfiMAN 2x2 families devices. Work with devices based on other platforms, for example, H05, H06 and H07 is not guaranteed.

Configuration Settings

- Firmware version

The Evolution series devices support time division multiple access technology (TDMA). The devices are delivered only with TDMA firmware. Thus, the R5000 devices must be upgraded to the TDMA firmware version. Procedure how to upgrade the network from Polling firmware to TDMA are provided in the section "[Upgrade from Polling to TDMA](#)".

- **Channel width**

The 80 MHz channel width is not supported on InfiLINK 2x2 / InfiMAN 2x2 devices.

- **Duplex modes**

The 1000BaseTX-full duplex, 1000BaseTX-full duplex manual duplex modes are not supported on the InfiLINK 2x2 LITE / InfiMAN 2x2 subscriber terminal devices.

- **Greenfield mode**

[Greenfield](#) mode is not supported on InfiLINK Evolution / InfiMAN Evolution devices. The Greenfield mode should be disabled on the R5000, as it leads to frame incompatibility at the header level.



NOTE

It should be noted that Greenfield mode disabling on R5000 devices will reduce the performance on 10-15 %. This is due to the algorithm disabling that optimizing frames transmitted via a wireless link.

- **Scrambling mode**

Scrambling mode is not supported on InfiLINK Evolution / InfiMAN Evolution devices. Scrambling mode must be disabled on R5000 devices, otherwise the data corruption process will be observed in the wireless link.

- **Bitrate TX**

- InfiLINK 2x2 / InfiMAN 2x2: 30000, 60000, 90000, 120000, 180000, 240000, 270000, 300000 (Kbps).
- InfiLINK Evolution / InfiMAN Evolution: 65000, 130000, 195000, 260000, 390000, 520000, 585000, 650000, 780000, 866700 (Kbps).

Physical connection

- **Wired Interfaces number**

- InfiLINK 2x2 LITE / InfiMAN 2x2 subscriber terminals: 2x FastEthernet (RJ45).
- InfiLINK Evolution / InfiMAN Evolution subscriber terminal: 1xGE (RJ45).

- **PoE-out**

PoE-out mode is supported only on InfiLINK 2x2 LITE and InfiMAN 2x2 subscriber terminals.

- **IDU-CPE-DC power supply**

The [IDU-CPE-DC](#) power supply can be used to power only the InfiLINK 2x2 LITE and InfiMAN 2x2 subscriber terminals.

- **CAB-SYNC cable**

To connect the AUX-ODU-SYNC device to wireless devices, specialized cables must be used:

- InfiMAN 2x2 base station / InfiLINK 2x2 PRO: CAB-SYNC cable.
- InfiMAN Evolution base station: CAB-SYNC-E cable.

CAB-SYNC and CAB-SYNC-E datasheets are presented on the Infinet company's website in the section "[Accessories](#)".

R5000 and Evolution models compliance

The table below provides recommendations for replacing the InfiLINK 2x2 / InfiMAN 2x2 models with the InfiLINK Evolution / InfiMAN Evolution.

PtP		PtMP	
InfiLINK 2x2	InfiLINK Evolution	InfiMAN 2x2	InfiMAN Evolution
R5000-Mmx/5.300.2x500.2x23	E5-ST25 / E6-ST25	Base station	
R5000-Mmx/5.300.2x500.2x26	E5-ST28 / E6-ST28	R5000-Qmxb/5.300.2x300.2x21	E5-BSQ

R5000-Mmx/5.300.2x500.2x28	E5-ST28 / E6-ST28	R5000-Mmxb/5.300.2x500.2x16	E5-BSI
R5000-Omx/5.300.2x500	E5-STE / E6-STE	R5000-Omxb/5.300.2x500	E5-BSE
R5000-Mmx/6.300.2x200.2x24	E6-ST25	R5000-Lmnb/5.300.2x500.2x16	E5-BSI
R5000-Mmx/6.300.2x200.2x27	E6-ST28	R5000-Lmnb/5.300.2x500	E5-BSE
R5000-Omx/6.300.2x200	E6-STE	R5000-Mmxb/6.300.2x200.2x16	E6-BSI
R5000-Smn/5.300.2x300.2x19	E5-ST23 / E6-ST25	R5000-Omxb/6.300.2x200	E6-BSE
R5000-Smn/5.300.2x300.2x23	E5-ST23 / E6-ST25	R5000-Smnb/6.300.2x200.2x16	E6-BSI
R5000-Smn/5.300.2x500.2x23	E5-ST25 / E6-ST25	R5000-Lmnb/6.300.2x200	E6-BSE
R5000-Smn/5.300.2x300.2x26	E5-ST25 / E6-ST25	Subscriber terminal	
R5000-Smn/5.300.2x500.2x26	E5-ST28 / E6-ST28	R5000-Smnc/5.300.2x300.2x19	E5-ST23 / E6-ST25
R5000-Smn/5.300.2x300.2x28	E5-ST28 / E6-ST28	R5000-Smnc/5.300.2x300.2x23	E5-ST23 / E6-ST25
R5000-Smn/5.300.2x500.2x28	E5-ST28 / E6-ST28	R5000-Smnc/5.300.2x300.2x26	E5-ST25 / E6-ST25
R5000-Lmn/5.300.2x300	E5-STE / E6-STE	R5000-Smnc/5.300.2x300.2x28	E5-ST28 / E6-ST28
R5000-Lmn/5.300.2x500	E5-STE / E6-STE	R5000-Lmnc/5.300.2x300	E5-STE / E6-STE
R5000-Smn/6.300.2x200.2x19	E6-ST18	R5000-Smnc/6.300.2x200.2x19	E6-ST18
R5000-Smn/6.300.2x200.2x24	E6-ST25	R5000-Smnc/6.300.2x200.2x24	E6-ST25
R5000-Smn/6.300.2x200.2x27	E6-ST28	R5000-Smnc/6.300.2x200.2x27	E6-ST28
R5000-Lmn/6.300.2x200	E6-STE	R5000-Lmnc/6.300.2x200	E6-STE

R5000 and Evolution models compliance

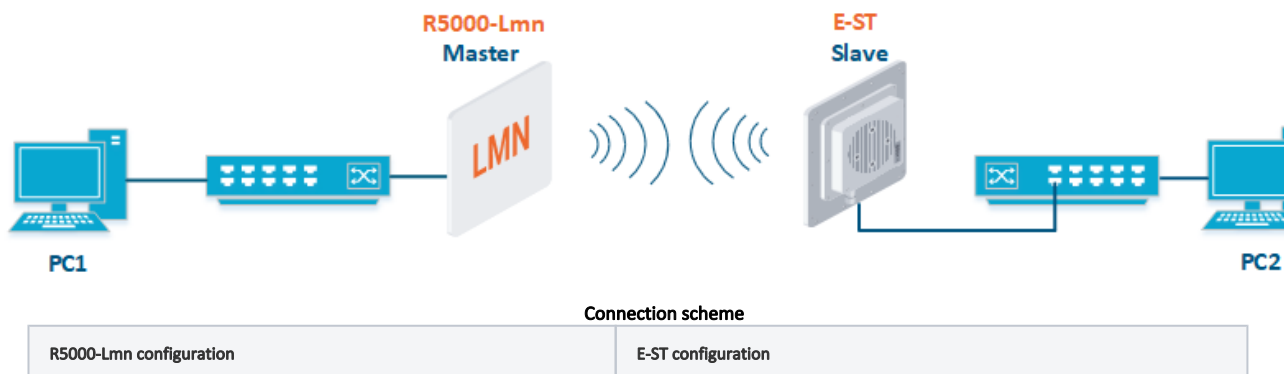
Upgrade Scenarios

Point-to-Point topology

In order to minimize the network outage due to the devices replacement we recommend to replace the device first at one end of the wireless link and then at the other. To do this:

- Configure the switching and radio parameters on the InfiLINK Evolution device that are equal to the replaced InfiLINK 2x2, except "Network SID" value.
- Enable R5000 Compatibility mode.
- Install the InfiLINK Evolution device next to the one being replaced. The directions of the antennas must match. Connect the device to the power supply network.
- On the remote device, change the "Network SID" to the value set on InfiLINK Evolution.
- The wireless link will have to be established between the InfiLINK Evolution and InfiLINK 2x2.
- Check the antennas alignment. Instructions are provided in the section "[Antenna alignment](#)".

Example of upgrading a Point-to-Point network topology



Radio	Switching	Radio	Switching
<ul style="list-style-type: none"> Type: Master. Frame Size: 5 ms. Channel width: 20 MHz. Frequency: 5800 MHz. Greenfield: disable Scrambling: disable Network SID: 10101010. Security Key: 456123. 	<ul style="list-style-type: none"> Switch#3: Data transmission Switch#100: Management in VLAN 100 	<ul style="list-style-type: none"> Type:Slave. R5000 Compatibility mode: on Channel width: 20 MHz. Frequency: 5800 MHz. Network SID: 10101010. Security Key: 456123. 	<ul style="list-style-type: none"> Switch#3: Data transmission Switch#100: Management in VLAN 100

Settings parameters

Settings via the web interface

R5000-Lmn settings

- Step 1: Upgrade to the latest TDMA firmware version. Procedure are provided in the section "[Maintenance menu](#)".
- Step 2: Check the parameters disabling:
 - Greenfield
 - Scrambling.
- The rest radio parameters and switching settings remain unchanged.

E-ST settings

- Step 1: Upgrade to the latest firmware version. Procedure are provided in the section "[Maintenance menu](#)".
- Step 2: Set the radio parameters values in the section "Basic settings " → "Link Settings".

▼ Link Settings

▼ rf6.0

General Settings

Enable Link: ☒

Type: Slave MultiBS: ☐

Mode: Fixed

R5000 Compatibility mode: On

VBR: ☐

Tx Power (dBm): 10 Auto: ☒ - 0 +

Node Name: E5-ST1

Scrambling: ☐

Trap gateway: ☐

Switch Border: ☐

Network Entry SNR (dB): Low 0 High 4

RX Attenuation (dB):

Multicast Mode: Unicast 3

Authentication Mode: public

ODR: Disabled

OTA: Passive

Log Level: normal

Extra Cost:

Join Cost:

MINT Failover: ☐ MAC:

Add Profile

1

Disable profile: ☐

Channel Width (MHz): 20

Frequency (MHz): 5800

Frequency Range List:

Tx Bitrate (Kbps): Max Auto: ☒ - 0 +

Channel Type: Dual

Network SID: 10101010

Node ID: 37429

Security Key: 456123

Copy Remove

E-ST link settings

- Step 3: In the section "Basic settings" → "Switch (MAC Switch)", configure the switching according to the table above requirements and apply the settings.

▼ MAC Switch

Enable Switch: ☒ Max. Sources: 5000 Disable STP Forwarding: ☐

	Status	Interfaces	STP	Repeater	IGMP	Flood	Inband	Mode	Description
Group # 3	Started	Ports... eth0 pass rf6.0 pass	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Normal	
Rules Default Action: permit Default QM Channel: Default Priority: Up to Create L3 Management Remove									
Group # 100	Started	Ports... rf6.0 pass vlan100 pass	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Normal	
Rules Default Action: permit Default QM Channel: Default Priority: Up to Remove L3 Management Attached to sw100 Remove									

Create Switch Group

E-ST switching settings

Network Settings

eth0 Up: ☒ Description: DHCP: ☐ Mode:

rf6.0 Up: ☒ Description: DHCP: ☐

vlan100 Up: ☒ Description: DHCP: ☐ Parent: Vlan ID: QinQ:

svi100 Up: ☒ Description: DHCP: ☐ Switch group:

E-ST network settings

- Step 4: In the section "Basic settings" → "Link Statistics on rf6.0", check the wireless connection statistics. A detailed description of the parameter values is provided in the "[Device Status](#)" section.

[Links Statistics on rf6.0 \(E5-ST1 ID: 37429\)](#)
[Links: 1](#)

Noise: -101 dBm
 ATPC: On
 Autobrate: On
 TDMA: Slave
 RX/TX Capacity: 34/34 Mbps

Status	MAC Address	Name	ID ▼	Distance (Km)	Tx Power (dBm) Rd/Tx	RSSI (dBm) Rd/Tx	SNR (dB) Rd/Tx	EVM (dB) Rd/Tx	Bitrate Rd/Tx	Retries (%) Rd/Tx	Load (Kbps) Rd/Tx	Load (Rd/Tx)
■ 00:00:25	00043522cbe8	R5000-Lmn1	03270	0	10 / 10	-52 / -44	48 / 39	-26 / -22	130 / 130	0 / 0	7 / 1	4 /

Hint: Click on link data to invoke Extended Link Diagnostics menu
 [Route Map](#)

Wireless connection statistics

Settings via the CLI

R5000-Lmn settings

- Step 1: Upgrade to the latest TDMA firmware version. Procedure are provided in the section "General Purpose Command Set" → "[flashnet](#)".
- Step 2: Check the parameters disabling:
 - Greenfield
 - Scrambling.
- The rest radio parameters and switching settings remain unchanged.

E-ST settings

- Step 1: Upgrade to the latest firmware version. Procedure are provided in the section "General Purpose Command Set" → "flashnet".
- Step 2: Configure the radio parameters and switching.

E-ST: radio and switching settings

```
rf rf6.0 band 20 transient
rf rf6.0 freq 5800 bitr max sid 10101010
mint rf6.0 -name "E5-STE1"
mint rf6.0 -type slave
mint rf6.0 prof 1 -band 20 -freq 5800 -sid 10101010 -type slave -autobitr -key "456123"
ifc svi100 up
ifc vlan100 vlan 100 vlandev eth0 up
switch group 100 add 2 vlan100 rf6.0
svi 100 group 100
ifc svi100 192.168.98.27/24
switch group 100 start
switch group 3 add 1 eth0 rf6.0
switch group 3 start
```

- Step 3: Check the wireless connection statistics with the command "mint map stat". Perform the radio link test with the command "[ltest](#)".

E-ST: Wireless connection statistics

E5-STE1#1> mint map stat
=====

Interface rf6.0 TDS

Node 000435152615 "E5-STE1", Id 37429, Nid 0, (Slave)

Freq 5800, Band 20, Sid 10101010, autoBitrate 156000/13000, Noise -100(+0)

Id	Name	Node	SNR	Bitrate	Retry	Options
			rx/tx	rx/tx	rx/tx	
03270	R5000-Lmn1	00043522CBE6	46/38	130/130	0/0	/TM/

1 active neighbors

Total load: 8/7 (rx/tx), 15 (sum) Kbps

Total nodes in area: 2

- Step 4: Save configuration.

E-ST: Save settings

E5-STE1#1> o sa



Connection scheme			
R5000-Lmn configuration		E-ST configuration	
Radio	Switching	Radio	Switching
<ul style="list-style-type: none">Type:Slave.Channel width: 40 MHz.Frequency: 5500 MHz.Greenfield: disableScrambling: disableNetwork SID: 10101011.Security Key: 123456.	<ul style="list-style-type: none">Switch#6: Data transmissionSwitch#150: Management in VLAN 150	<ul style="list-style-type: none">Type: Master.R5000 Compatibility mode: onFrame Size: 5 ms.Channel width: 40 MHz.Frequency: 5500 MHz.Network SID: 10101011.Security Key: 123456.	<ul style="list-style-type: none">Switch#6: Data transmissionSwitch#150: Management in VLAN 150

Settings parameters

Settings via the web interface

R5000-Lmn settings

- Step 1: Upgrade to the latest TDMA firmware version. Procedure are provided in the section "Maintenance menu".
- Step 2: Check the parameters disabling:
 - Greenfield
 - Scrambling.
- The rest radio parameters and switching settings remain unchanged.

E-ST settings

- Step 1: Upgrade to the latest firmware version. Procedure are provided in the section "[Maintenance menu](#)".
- Step 2: Set the radio parameters values in the section "Basic settings" → "Link Settings".

▼ Link Settings

▼ rf6.0

General Settings

Enable Link: ☒

Type: Master

Mode: Fixed

R5000 Compatibility mode: On

Max Links:

Frame Size (ms): 5 Auto: ☒ Turbo: ☒

DL/UL ratio (%): Max Range (Km): 70

STARSSI (dBm): -40

DFS: DFS Off

Tx Power (dBm): 4 Auto: ☒ - 0 +

Node Name: E5-ST1

Scrambling: ☐

Trap gateway: ☐

Switch Border: ☐

Network Entry SNR (dB): Low 0 High 4

RX Attenuation (dB):

Multicast Mode: Unicast 3

Authentication Mode: public

ODR: Disabled

OTA: Passive

Log Level: normal

Extra Cost:

Join Cost:

MINT Failover: ☐ MAC:

[Add Profile](#)

Roaming Profiles are visible on Slave mode only

Current Settings

Channel Width (MHz): 40

Frequency (MHz): 5500

Tx Bitrate (Kbps): Max Auto: ☒ - 0 +

Channel Type: Dual

Network SID: 10101011

Node ID: 37428

Security Key: 123456

E-ST link settings

- Step 3: In the section "Basic settings" → "Switch (MAC Switch)", configure the switching according to the table above requirements and apply the settings.

▼ MAC Switch

Enable Switch: ☒ Max. Sources: Disable STP Forwarding: ☐

	Status	Interfaces	STP	Repeater	IGMP	Flood	Inband	Mode	Description	
Group # <input type="text" value="6"/>	<input type="text" value="Started"/>	<input type="button" value="Ports..."/> <div>eth0 <input type="text" value="pass"/> <input type="button" value="X"/></div> <div>rf6.0 <input type="text" value="pass"/> <input type="button" value="X"/></div>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="text" value="Normal"/>	<input type="text"/>	<input type="button" value="↑"/>

Rules

Default Action: Default QM Channel: Default Priority:

	Status	Interfaces	STP	Repeater	IGMP	Flood	Inband	Mode	Description	
Group # <input type="text" value="150"/>	<input type="text" value="Started"/>	<input type="button" value="Ports..."/> <div>rf6.0 <input type="text" value="pass"/> <input type="button" value="X"/></div> <div>vlan150 <input type="text" value="pass"/> <input type="button" value="X"/></div>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="text" value="Normal"/>	<input type="text"/>	<input type="button" value="↑"/>

Rules

Default Action: Default QM Channel: Default Priority: Attached to svi150

E-ST switching settings

▼ Network Settings

eth0 Up: ☒ Description: DHCP: ☐ Mode:

rf6.0 Up: ☒ Description: DHCP: ☐

vlan150 Up: ☒ Description: DHCP: ☐ Parent: Vlan ID: QinQ:

svi150 Up: ☒ Description: DHCP: ☐ Switch group:

E-ST network settings

- Step 4: In the section "Basic settings" → "Link Statistics on rf6.0", check the wireless connection statistics. A detailed description of the parameter values is provided in the "Device Status" section.

Links Statistics on rf6.0 (E5-ST1 ID: 37428) Links: 1

Noise: -98 dBm ATPC: On Autobitrate: On TDMA: Master (Frame: 5 ms DL/UL: Auto RSSI: -40 Max Range: 70 km) RX/TX Capacity: 34/34 Mbps

Status	MAC Address	Name	ID ▼	Distance (km)	Tx Power (dBm) Rx/Tx	RSSI (dBm) Rx/Tx	SNR (dB) Rx/Tx	EVM (dB) Rx/Tx	Bitrate Rx/Tx	Retries (%) Rx/Tx	Load (Kbps) Rx/Tx	Load (Rps) Rx/Tx
00:00:19	00043622cbf6	R5000-Lmn	03288	0	8 / 4	-43 / -40 *	53 / 23	-31 / -22	240 / 90	0 / 0	10 / 0	1 / 1

Hint: Click on link data to invoke Extended Link Diagnostics menu

Wireless connection statistics

Settings via the CLI

R5000-Lmn settings

- Step 1: Upgrade to the latest TDMA firmware version. Procedure are provided in the section "General Purpose Command Set" → "flashnet".
- Step 2: Check the parameters disabling:
 - Greenfield
 - Scrambling.
- The radio parameters and switching settings remain unchanged.

E-ST settings

- Step 1: Upgrade to the latest firmware version. Procedure are provided in the section "General Purpose Command Set" → "flashnet".
- Step 2: Configure the radio parameters and switching.

E-ST: radio and switching settings

```

rf rf6.0 band 40 transient
rf rf6.0 freq 5500 bitr max sid 10101011
mint rf6.0 -name "E5-STE2"
mint rf6.0 -type master
mint rf6.0 -key "123456"
mint rf6.0 -autobitrate
mint rf6.0 -roaming leader
mint rf6.0 tdma mode=Master win=5
ifc svil50 up
ifc vlan150 vlan 150 vlandev eth0 up
switch group 150 add 2 vlan150 rf6.0
svi 150 group 150
ifc svil100 192.168.98.28/24
switch group 150 start
switch group 6 add 1 eth0 rf6.0
switch group 6 start

```

- Step 3: Check the wireless connection statistics with the command "mint map stat". Perform the radio link test with the command "[ltest](#)".

E-ST: Wireless connection statistics

```

E5-STE1#1> mint map stat
=====
Interface rf6.0 TDS
Node 000435152615 "E5-STE1", Id 37429, Nid 0, (Slave)
Freq 5800, Band 20, Sid 10101010, autoBitrate 156000/13000, Noise -100(+0)

-----
  Id          Name                Node      SNR   Bitrate  Retry  Options
-----
  03270 R5000-Lmn1             00043522CBE6 46/38  130/130  0/0   /TM/
-----

1 active neighbors
Total load: 8/7 (rx/tx), 15 (sum) Kbps
Total nodes in area: 2

```

- Step 4: Save configuration.

E-ST: Save settings

```

E5-STE1#1> co sa

```

Point-to-Multipoint topology

To increase the network throughput, we recommend:

- Replace the base station sector in accordance with the recommendations of the table in the section "R5000 and Evolution models compliance".
- Replace critical subscriber terminals.

Example of upgrading a Point-to-Multipoint network topology



Connection scheme

E-BS configuration		R5000-Lmn configuration		E-ST configuration	
Radio	Switching	Radio	Switching	Radio	Switching
<ul style="list-style-type: none">Type: Master.R5000Compatibility mode: onFrame Size: 5 ms.Channel width: 40 MHz.Frequency: 5310 MHz.Network SID: 10101010.Security Key: 456123.	<ul style="list-style-type: none">Switch#5: Data transmission в выделенном VLAN 10Switch#100: Management in VLAN 100	<ul style="list-style-type: none">Type:Slave.Channel width: 40 MHz.Frequency: 5310 MHz.Greenfield: disableScrambling: disableNetwork SID: 10101010.Security Key: 456123.	<ul style="list-style-type: none">Switch#5: Data transmission in VLAN 10Switch#100: Management in VLAN 100	<ul style="list-style-type: none">Type:Slave.R5000Compatibility mode: onChannel width: 40 MHz.Frequency: 5310 MHz.Network SID: 10101010.Security Key: 456123.	<ul style="list-style-type: none">Switch#5: Data transmission in VLAN 10Switch#100: Management in VLAN 100

Settings parameters

Settings via the web interface

R5000-Lmn settings

- Step 1: Upgrade to the latest TDMA firmware version. Procedure are provided in the section "Maintenance menu".
- Step 2: Check the parameters disabling:
 - Greenfield
 - misoctl
 - Scrambling.
- The radio parameters and switching settings remain unchanged.

E-BS settings

- Step 1: Upgrade to the latest firmware version. Procedure are provided in the section "Maintenance menu".
- Step 2: Set the radio parameters values in the section "Basic settings " → "Link Settings".

▼ Link Settings

▼ rf6.0

General Settings

Enable Link: ☒

Type: Master

Mode: Fixed

R5000 Compatibility mode: On

Max Links:

Frame Size (ms): 5 Auto: ☒ Turbo: ☒

DL/UL ratio (%): Max Range (Km): 70

STA RSSI (dBm): -40

DFS: DFS Off

Tx Power (dBm): 12 Auto: ☒ - 0 +

Node Name: E5-BSE

Scrambling: ☐

Trap gateway: ☐

Switch Border: ☐

Network Entry SNR (dB): Low 0 High 4

RX Attenuation (dB):

Multicast Mode: Unicast 3

Authentication Mode: public

ODR: Disabled

OTA: Passive

Log Level: normal

Extra Cost:

Join Cost:

MINT Failover: ☐ MAC:

[Add Profile](#)

Roaming Profiles are visible on Slave mode only

Current Settings

Channel Width (MHz): 40

Frequency (MHz): 5310

Tx Bitrate (Kbps): Max Auto: ☒ - 0 +

Channel Type: Dual

Network SID: 10101010

Node ID: 37425

Security Key: 456123

E-BS link settings

- Step 3: In the section "Basic settings" → "Switch (MAC Switch)", configure the switching according to the table above requirements and apply the settings.

▼ MAC Switch

Enable Switch: ☒ Max. Sources: Disable STP Forwarding: ☐

Group	Status	Interfaces	STP	Repeater	IGMP	Flood	Inband	Mode	Description
Group #5	Started	Ports... eth0 <input type="text" value="pass"/> rf6.0 <input type="text" value="pass"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Normal	

▼ Rules(1)

Action: QM Channel: Priority: vlan:

Help Add Rule

Default Action: Default QM Channel: Default Priority:

Group	Status	Interfaces	STP	Repeater	IGMP	Flood	Inband	Mode	Description
Group #100	Started	Ports... rf6.0 <input type="text" value="pass"/> vlan100 <input type="text" value="pass"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Normal	

▼ Rules

Default Action: Default QM Channel: Default Priority: Attached to svi100

E-BS switching settings

▼ Network Settings

eth0 Up: ☒ Description: DHCP: ☐ Mode:

eth1 Up: ☒ Description: DHCP: ☐ Mode:

rf6.0 Up: ☒ Description: DHCP: ☐

▼ vlan100 Up: ☒ Description: DHCP: ☐ Parent: Vlan ID: QinQ:

▼ svi100 Up: ☒ Description: DHCP: ☐ Switch group:

E-BS network settings

- Step 4: In the section "Basic settings" → "Link Statistics on rf6.0", check the wireless connection statistics. A detailed description of the parameter values is provided in the "Device Status" section.

Links Statistics on rf6.0 (E5-BSE ID: 37425) Links: 2

Noise: -100 dBm ATPC: On Autobitrate: On TDMA: Master (Frame: 5 ms DL/UL: Auto RSSI: -40 Max Range: 70 km) RX/TX Capacity: 139/144 Mbps

Status	MAC Address	Name	ID	Distance (Km)	Tx Power (dBm) Rx/Tx	RSSI (dBm) Rx/Tx	SNR (dB) Rx/Tx	EVM (dB) Rx/Tx	Bitrate Rx/Tx	Retries (%) Rx/Tx	Load (Kbps) Rx/Tx	Load (%) Rx/Tx
00:01:27	00043522cbb8	R6000-Lmn	03288	0	6 / 12	-53 / -45	45 / 43	-33 / -27	300 / 400	0 / 0	0 / 4	0 / 1
00:00:48 F	000435152814	E5-ST2	37428	0	4 / 12	-55 / -45	40 / 48	-28 / -25	300 / 380	0 / 0	4 / 0	1 / 1

Hint: Click on link data to invoke Extended Link Diagnostics menu

Wireless connection statistics



NOTE

Perform the E-ST settings analog with E-BS.

Settings via the CLI

R5000-Lmn settings

- Step 1: Upgrade to the latest TDMA firmware version. Procedure are provided in the section "General Purpose Command Set" → "flashnet".
- Step 2: Check the parameters disabling:
 - Greenfield
 - Scrambling.

- The radio parameters and switching settings remain unchanged.

E-BS settings

- Step 1: Upgrade to the latest firmware version. Procedure are provided in the section "General Purpose Command Set" → "[flashnet](#)".
- Step 2: Configure the radio parameters and switching.

E-BS: Radio and switching settings

```
rf rf6.0 band 40 transient
rf rf6.0 freq 5310 bitr max sid 10101010
mint rf6.0 -name "E5-BSE"
mint rf6.0 -type master
mint rf6.0 -key "456123"
mint rf6.0 -autobitrate
mint rf6.0 -roaming leader
mint rf6.0 tdma mode=Master win=5
ifc svil100 up
ifc vlan100 vlan 100 vlandev eth0 up
switch group 100 add 2 vlan100 rf6.0
svi 100 group 100
ifc svil100 192.168.98.25/24
switch group 100 start
switch group 5 add 1 eth0 rf6.0
switch group 5 vlan 10
switch group 5 start
```

- Step 3: Check the wireless connection statistics with the command "mint map stat". Perform the radio link test with the command "[ltest](#)".

E-BS: Wireless connection statistics

```
E5-BSE#1> mint map stat
=====
Interface rf6.0 TDM (5 ms DL/UL:Auto) (RSSI=-40 Dist=70)
Node 000435252611 "E5-BSE", Id 37425, Nid 0, (Master)
Freq 5310, Band 40, Sid 10101010, autoBitrate 400000/30000, Noise -100(+0)

-----
  Id          Name          Node          SNR    Bitrate  Retry  Options
-----
  03286 R5000-Lmn          00043522CBF6 47/42   300/300   0/0   /S/
  37428 E5-STE2            000435152614 47/48   300/300   0/0   /S/
-----

2 active neighbors
Total load: 9/11 (rx/tx), 20 (sum) Kbps
Total nodes in area: 3
Links fault 2, Routes fault 0
# Optimal tdma distance 2 km
```

- Step 4: Save configuration.

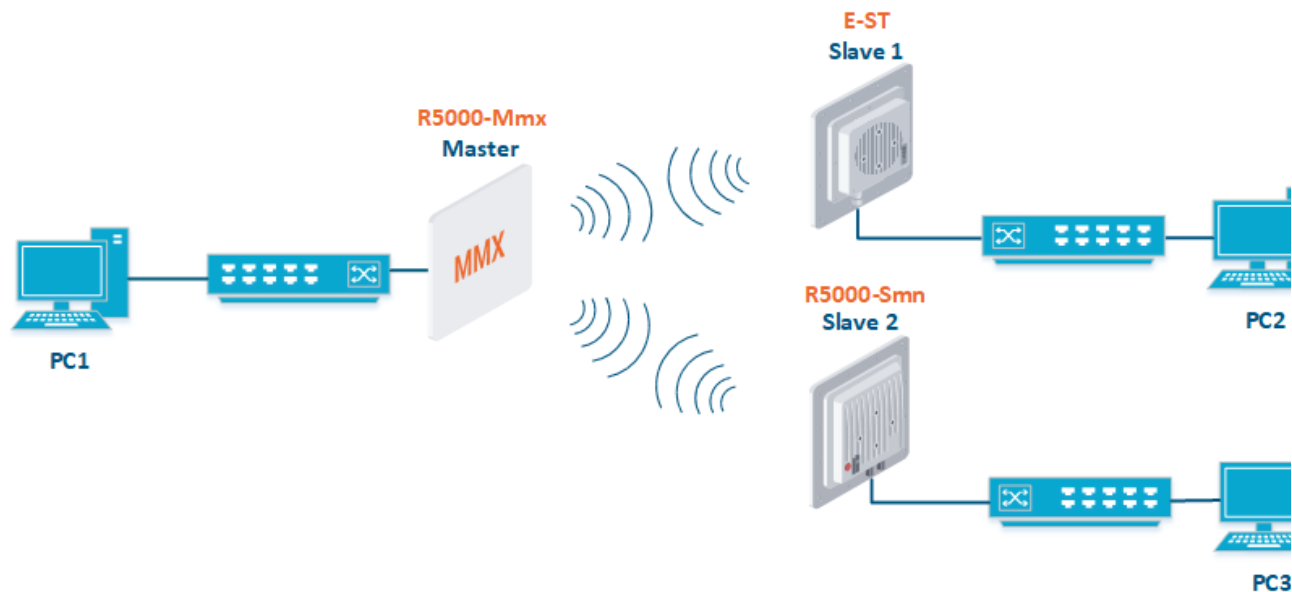
E-BS: Save settings

```
E5-BSE#1> co sa
```



NOTE

Perform the E-ST settings analog with E-BS.



Connection scheme

R5000-Mmx configuration		R5000-Lmn configuration		E-ST configuration	
Radio	Switching	Radio	Switching	Radio	Switching
<ul style="list-style-type: none"> Type: Master. Frame Size: 5 ms. Channel width: 20 MHz. Frequency: 5100 MHz. Greenfield: disable Scrambling: disable Network SID: 10101011. Security Key: 123456. 	<ul style="list-style-type: none"> Switch#7: Data transmission Switch#200: Management in VLAN 200 	<ul style="list-style-type: none"> Type: Slave. Channel width: 20 MHz. Frequency: 5100 MHz. Greenfield: disable Scrambling: disable Network SID: 10101011. Security Key: 123456. 	<ul style="list-style-type: none"> Switch#7: Data transmission Switch#200: Management in VLAN 200 	<ul style="list-style-type: none"> Type: Slave. R5000 Compatibility mode: on Channel width: 20 MHz. Frequency: 5100 MHz. Network SID: 10101011. Security Key: 123456. 	<ul style="list-style-type: none"> Switch#7: Data transmission Switch#200: Management in VLAN 200

Settings parameters

Settings via the web interface

R5000-Mmx, R5000-Lmn settings

- Step 1: Upgrade to the latest TDMA firmware version. Procedure are provided in the section "[Maintenance menu](#)".
- Step 2: Check the parameters disabling:
 - Greenfield
 - Scrambling.
- The radio parameters and switching settings remain unchanged.

E-ST settings

- Step 1: Upgrade to the latest firmware version. Procedure are provided in the section "[Maintenance menu](#)".
- Step 2: Set the radio parameters values in the section "Basic settings" → "Link Settings".

▼ Link Settings

▼ rf6.0

General Settings

Enable Link: ☒

Type: Slave MultiBS: ☐

Mode: Fixed

R5000 Compatibility mode: On

VBR: ☐

Tx Power (dBm): 10 Auto: ☒ - 0 +

Node Name: E5-ST1

Scrambling: ☐

Trap gateway: ☐

Switch Border: ☐

Network Entry SNR (dB): Low 0 High 4

RX Attenuation (dB):

Multicast Mode: Unicast 3

Authentication Mode: public

ODR: Disabled

OTA: Passive

Log Level: normal

Extra Cost:

Join Cost:

MINT Failover: ☐ MAC:

[Add Profile](#)

1

Disable profile: ☐

Channel Width (MHz): 20

Frequency (MHz): 5100

Frequency Range List:

Tx Bitrate (Kbps): Max Auto: ☒ - 0 +

Channel Type: Dual

Network SID: 10101011

Node ID: 37429

Security Key: 123456

[Copy](#) [Remove](#)

E-ST link settings

- Step 3: In the section "Basic settings" → "Switch (MAC Switch), configure the switching according to the table above requirements and apply the settings.

▼ MAC Switch

Enable Switch: ☒ Max. Sources: 5000 Disable STP Forwarding: ☐

	Status	Interfaces	STP	Repeater	IGMP	Flood	Inband	Mode	Description
Group # 7	Started	<div>Ports...</div> <div>eth0 pass X</div> <div>rf6.0 pass X</div>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Normal	
Rules Default Action: permit Default QM Channel: Default Priority: Up to Create L3 Management Remove C									
Group # 200	Started	<div>Ports...</div> <div>rf6.0 pass X</div> <div>vlan200 pass X</div>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Normal	
Rules Default Action: permit Default QM Channel: Default Priority: Up to Remove L3 Management Attached to svi200 Remove C									
Create Switch Group									

E-ST switching settings

Network Settings

eth0 Up: ☒ Description: DHCP: ☐ Mode:

rf6.0 Up: ☒ Description: DHCP: ☐

vlan200 Up: ☒ Description: DHCP: ☐ Parent: Vlan ID: QinQ:

---/

svi200 Up: ☒ Description: DHCP: ☐ Switch group:

---/

E-ST network settings

- **Step 4:** In the section "Basic settings" → "Link Statistics on rf6.0", check the wireless connection statistics. A detailed description of the parameter values is provided in the "**Device Status**" section.

Links Statistics on rf6.0 (E5-ST1 ID: 37429) Links: 1

[illegible]

Wireless connection statistics

Settings via the CLI

R5000-Mmx, R5000-Lmn settings

- Step 1: Upgrade to the latest TDMA firmware version. Procedure are provided in the section "General Purpose Command Set" → "[flashnet](#)".
- Step 2: Check the parameters disabling:
 - Greenfield
 - Scrambling.
- The radio parameters and switching settings remain unchanged.

E-ST settings

- Step 1: Upgrade to the latest firmware version. Procedure are provided in the section "General Purpose Command Set" → "[flashnet](#)".
- Step 2: Configure the radio parameters and switching.

E-ST: radio and switching settings

```
rf rf6.0 band 20 transient
rf rf6.0 freq 5100 bitr max sid 10101011
mint rf6.0 -name "E5-STE_Slave1"
mint rf6.0 -type slave
mint rf6.0 prof 1 -band 20 -freq 5100 -sid 10101011 -type slave -autobitr -key "123456"
ifc svi200 up
ifc vlan200 vlan 200 vlandev eth0 up
switch group 200 add 2 vlan200 rf6.0
svi 200 group 200
ifc svi100 192.168.98.25/24
switch group 200 start
switch group 7 add 1 eth0 rf6.0
switch group 7 start
```

- Step 3: Check the wireless connection statistics with the command "mint map stat". Perform the radio link test with the command "[ltest](#)".

E-ST: Wireless connection statistics

```
E5-STE1#1> mint map stat
=====
Interface rf6.0  TDS
Node  000435152615  "E5-STE_Slave1", Id 37429, Nid 0, (Slave)
Freq 5100, Band 20, Sid 10101011, autoBitrate 156000/13000, Noise -103(+0)

-----
  Id           Name           Node           SNR    Bitrate  Retry  Options
----- rx/tx  rx/tx  rx/tx  -----
   13660 R5000-Mmx           00043514C93C 53/44   130/130   0/0   /TM/F
-----

1 active neighbors
Total load: 5/0 (rx/tx), 5 (sum) Kbps
Total nodes in area: 3
```

- Step 4: Save configuration.

E-ST: Save settings

```
E5-STE1#1> co sa
```