



### Application and project description

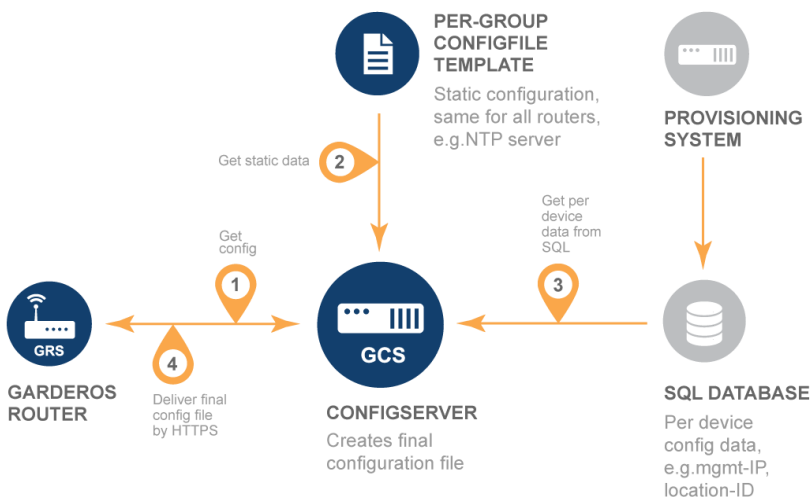
Garderos routers provide secure and reliable data connectivity for professional industrial applications in telecommunications, utility networks and intelligent traffic systems. The ruggedized routers of the Garderos R-8500 series have been designed for mobile and stationary applications which require high bandwidth and high processing power.



Fig. 1: Garderos R-8500 routers for high throughput and edge computing

### Key Features

- Optimized heat management for high performance and longevity
- Low latency and high bandwidth for data-intensive applications
- High processing power for virtualization container applications
- Hardware and software watchdogs for highest availability
- Cyber security by design: secure protocols and functions



## HARDWARE FEATURES

<b>Casing</b>	Material Dimensions (WxHxD) without / with connectors Weight Ingress protection IEC protection class Mounting	Diecast aluminum  60x110x115mm / 60x112x123mm ~0.70kg IP40 3 Integrated DIN rail clip and mounting holes for external DIN rail clip or mounting bracket
<b>Temperature range</b>		Operating temperature range depends on router model. Please see "ordering information".
<b>Interfaces on casing</b>	Power connector Ethernet connector SFP connector Serial connector  WWAN antenna connector GPS antenna connector WLAN antenna connector I/O connector SIM card slot	Phoenix 2 Pin 2-4x RJ-45 1-2x SFP 1x Mini-USB Type B (console) Phoenix 6 Pin-PCB clamp (2x RS-485 data) (optional) 1x D-Sub 9 (female) data (optional) up to 4x SMA (female) 1x SMA (female) (optional) up to 2x RP-SMA (female) Phoenix 4 Pin-PCB clamp (optional) 2x Mini-SIM (thermo-resistant) or 1x Mini-SIM + 1x MFF-SIM chip (optional)
<b>Power supply</b>	Input voltage Power consumption	12-30 VDC (9,6VDC - 36VDC tolerance) ~5-18W
<b>Overheating protection</b>		off CPU > 95°C on CPU < 87°C
<b>Serial interface</b>	Mini-USB (console) RS-485 half-duplex (data) RS-232 (data)	1x 2x (optional) 1x (optional)
<b>Digital I/O</b>	Input / Output	1x/1x or 2x/0x (optional)
<b>WAN</b>	Ethernet (see LAN)	
<b>WWAN</b>	Technology Passive GPS Dual WWAN	3G/4G/5G <sup>1)</sup> , 2G/3G/4G <sup>2)</sup> , 4G <sup>3)</sup> , 2G/4G <sup>4)</sup> 2G/3G/4G <sup>2)</sup>
<b>LAN</b>	Ethernet  Autosensing Auto-MDIX	2-4x 10/100/1000Base-T 1-2x SFP 1000Base-X
<b>WLAN</b>	Supported standards Dual WLAN	802.11ax
<b>Other features</b>	Hardware watchdog	Monitors "heartbeats" from router OS. Restarts router in case of software problems.
<b>Certifications</b>	Criteria for EMI immunity and radiation Vibration resistant Shock resistant	IEC 61000-6-2:2005 EN 60068-2-6:2008 EN 60068-2-27:2009
<b>Regulations</b>	RoHS, CE, FCC <sup>1, 2, 4)</sup>	

<sup>1)</sup> **3G/4G/5G Modul (5G Sub-6 GHz, LTE Cat19/18)**

**5G NR** n1/n2/n3/n5/n7/n8/n12/n13/n14/n18/n20/n25/n26/n28/n29/n30/  
n38/n40/n41/n48/n66/n70/n71/n75/n76/n77/n78/n79  
**LTE -FDD** B1/B2/B3/B4/B5/B7/B8/B12/B13/B14/B17/B18/B19/B20/B25/  
B26/B28/B29/B30/B32/B66/B71  
**LTE -TDD** B34/B38/B39/B40/B41/B42/B43/B48  
**LTE LAA** B46  
**WCDMA** B1, B2, B4, B5, B8, B19

<sup>2)</sup> **2G/3G/4G Modul (CAT 4, global variant\*)**

**LTE** B1, B2, B3, B4, B5, B7, B8, B12, B13, B18, B19, B20, B26, B28,  
B38, B39, B40, B41  
**WCDMA** B1, B2, B4, B5, B6, B8, B19  
**EDGE/GPRS/GSM** 850/900/1800/1900MHz

<sup>3)</sup> **4G Modul (CAT 4, European variant\*)**

**LTE/LTE450** B3, B7, B20, B31, B72

<sup>4)</sup> **2G/4G Modul (CAT M1, European variant\*)**

**LTE/LTE450** B1, B2, B3, B4, B5, B8, B12, B13, B14, B18, B19, B20,  
B25, B26, B27, B28, B31, B66, B72, B85  
**EDGE/GPRS/GSM** 850/900/1800/1900MHz

\*other variants available

## SOFTWARE FEATURES

### Operating system

- Garderos Router Software (GRS) Rel. 3.8

### Common

- IPv4, IPv6
- IPv4/IPv6 dual stack
- Multiple IP addresses per interface
- IPv6 prefix delegation

### WWAN \*)

- PPP over WWAN 4)
- Dual WAN (WWAN, Ethernet, VLAN) 1, 2, 3, 4)
- Dual WWAN (WWAN, WWAN) 1, 2, 3, 4)
- Configurable WWAN network selection 1, 2, 3, 4)
- Configurable WWAN band selection 2, 3, 4)
- Multiple APN 3)
- Intelligent APN selection 1, 2, 3)
- WWAN IPv4 1, 2, 3, 4)
- WWAN IPv6 1, 2, 3)
- WWAN dual stack 1, 2, 3)
- IPv6 prefix delegation 3)
- Dual SIM 1, 2, 3, 4)
- Modem firmware update 3)
- XCAL debugging 3)

### WLAN

- 802.11ax
- AP and client
- 8x SSID (2,4GHz) + 8x SSID (5,5GHz)
- WPA, WPA2, WPA3
- 802.11i (EAP)

### Other network interfaces

#### Bridge

- Layer 2 bridge interface
- STP, RSTP
- IP assignment static IP, DHCP, IPv6 SLAAC, PD

#### Ethernet

- Configurable link speed
- IP assignment static IP, DHCP, IPv6 SLAAC, PD
- Port mirroring
- Switching
- Switch port separation
- Switch VLANs up to 256
- Switch 802.1q VLAN tagged and untagged
- Switch with Layer 2 multicast/broadcast
- 802.1x

#### Local Loop

- Local loop interface
- IP assignment static IP, PD

#### PPPoE

- IP assignment static IP, PPPoE, IPv6 SLAAC
- PAP and CHAP
- Always on
- Time controlled session termination before provider reconnect

#### VLAN

- VLAN support (802.1q and priority tagging)
- IP assignment static IP, DHCP, IPv6 SLAAC, PD
- 802.1x

#### Routing

- Static routes (IPv4, IPv6)
- Static policy routing (IPv4, IPv6)
- Static routes to DHCP gateway (IPv4)
- Dynamic routing protocols RIPv2, OSPFv2, OSPFv3, BGPv4
- Filtering for dynamic routing protocols
- Firewall (IPv4, IPv6, packet filter, connection tracking, bridge filter)
- MAC address filter, Invalid-packet-filter
- NAT (IPv4, IPv6, PAT, 1-to-1, SNAT, port forwarding)
- Synchronous routing
- Configurable MTU
- Path MTU discovery
- TCP MSS adjustment
- Diffserv (set DSCP bits)
- QoS packet prioritization
- Reverse path filter

#### VPN

##### GRE

- GRE, GRE IPv6, GRE TAP, GRE TAP IPv6
- Configurable MTU and MTU inherit
- NHRP dynamic tunnel management

##### mGRE

- Configurable MTU and MTU inherit
- NHRP dynamic tunnel management
- NHRP IPv6

##### IPsec

- IPsec IPv4, IPv6
- IKEv1, IKEv2
- Authentication: PSK, public key, RSA and ECDSA certificate
- Tunnel and transport mode
- VTI (Virtual Tunnel Interface)
- Encryption algorithms AES, AES192, AES256, CCM+GCM, DES, 3DES
- RSA key length up to 8192 bit, elliptic curves
- Throughput (aes-sha256-modp4096) 380 Mb/s
- VPN gateway
- Min. number tunnels: 5

##### L2TP

- Unmanaged L2TPv3 tunnel
- VLAN tagged L2TPv3 tunnel

##### Open VPN

- PSK, user and certificate authentication
- Min. number tunnels: 5
- OpenVPN Layer 2 and 3
- Bridging OpenVPN Layer 2 Tunnel
- Encryption algorithms AES, AES192, AES256, CCM+GCM, Blowfish, DES, 3DES

##### MIP

- Mobile IP foreign agent

##### Router management

- USB management console
- Authentication by TACACS+, RADIUS, password file and public key
- Administrator roles
- Command line interface (CLI)
- Remote configuration file download (HTTP/HTTPS)
- Trigger based configuration selection
- OCSF
- Authentication by HTTP basic auth and certificate
- Remote software updates
- Central bulk management of routers

##### Services \*)

- Cronjob
- DHCP server (IPv4+IPv6)
- DHCP relay (IPv4+IPv6)
- DHCP snooping (IPv4)
- DHCP address pools per VLAN/interface
- DHCP secure ARP
- DHCP ARP ping before assigning lease
- DHCP accounting (RADIUS)
- Static DHCP (MAC)
- DNS server and proxy
- DynDNS client
- EST (Enrolment over Secure Transport)
- Ethernet port security (sticky MAC detection)
- Hotspot portal
- IPv6 SLAAC daemon
- LLLDP
- MQTT (I/O control) \*)
- NMEA \*)
- NTP client, server, MD5, local time source
- SCEP (Simple Certificate Enrolment Protocol)
- SNMPv2 and SNMPv3, monitoring and traps
- SNTP (Simple NTP)
- SSH client, server
- Syslog local, remote, persistent in flash
- Telnet client, server

##### Other functions

- Configurable LED (also project based)
- Hardware and software watchdogs
- LXC virtualization, busybox and Alpine (project based)
- Status monitor (ping, interface status, I/O, IPv6-RS, RX-TX, script)
- Reset to factory defaults
- Customer defined factory defaults
- Security hardening (switch off unsecure features)
- Encrypted configuration
- Secure Boot
- Serial-to-network proxy (ser2net), IPv4/IPv6, TCP/UDP
- Serial modes: Console, Off and Script
- Scripting interface
- Open APIs for network integration

\*) Prerequisite is a suitable interface.

1, 2, 3, 4) Please see "Hardware Features".

## ORDERING INFORMATION

Garderos model number:	Ethernet (10/100/1000 Base-T)	SFP (1000 Base-X)	Mini-USB Type B (Konsole)	RS-485 (rata); optional	RS-232 (data); optional	Digital I/O; optional	WLAN (802.11ax), DualBand	3G/4G/5G <sup>1)</sup> 2G/3G/4G <sup>2)</sup> 4G <sup>3)</sup> 2G/4G <sup>4)</sup>	Maximum operating temperature range (The temperature range may differ depending on the router variant)
R-8506 (2-6xLAN/WiFi6)	2-4	1-2	1	2	1	1	1		-20°C bis +65°C
R-8508 (2-6xLAN)	2-4	1-2	1	2	1	1			-40°C bis +65°C
R-8526 (2-6xLAN/4G or 5G/WiFi6)	2-4	1-2	1	2	1	1	1	1	-20°C bis +65°C
R-8528 (2-6xLAN/4G or 5G)	2-4	1-2	1	2	1	1		1	-40°C bis +65°C
R-8558 (2-6xLAN/4G/5G)	2-4	1-2	1	2	1	1		2	-40°C bis +65°C

<sup>1, 2, 3, 4)</sup> Please see "Hardware Features".

**Garderos GmbH**  
**Balanstrasse 55**  
**81541 Munich**  
**Germany**

**www.garderos.com**  
**Email: info@garderos.com**

**T: +49 89 189306-0**  
**F: +49 89 189306-98**

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