



Application and project description

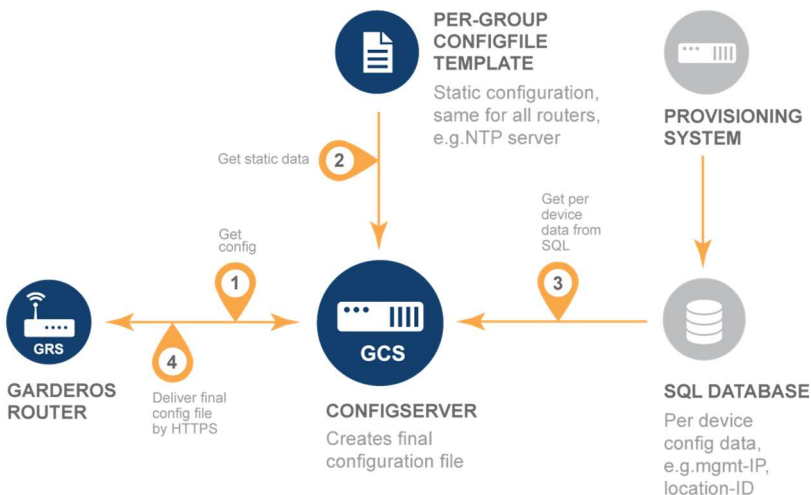
Garderos routers provide secure and reliable data connectivity for professional industrial applications in telecommunications, utility networks and intelligent traffic systems. The ruggedized routers of the Garderos R-8500 series have been designed for mobile and stationary applications which require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

Casing	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
Temperature range		Depends on router model (see "Ordering Information").
Interfaces on casing	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 (thermoresistant) or 1x Mini-SIM + 1x MFF-SIM chip (optional)
Power supply	Input voltage Power consumption Redundancy	12-30 VDC (9,6VDC - 36VDC tolerance) ~5-18W Dual power supply (optional)
Overheating protection		off CPU > 95°C on CPU < 87°C
Serial interface	Mini-USB (console) RS-485 half-duplex (data) RS-232 (data)	1x 2x (optional) 1x (optional)
Digital I/O	Input / Output	1x/1x or 2x/0x (optional)
WAN	Ethernet (see LAN)	
WWAN	Technology Passive GPS/A-GPS Dual WWAN	3G/4G/5G ¹⁾ , 2G/3G/4G ²⁾ , 4G/5G ³⁾ , 4G ⁴⁾ , 2G/4G ⁵⁾ Yes ^{1, 2, 3)}
LAN	Ethernet Autosensing Auto-MDix	2-4x 10/100/1000Base-T 1-2x SFP 1000Base-X
WLAN	Supported standards Dual WLAN	802.11ax
Other features	Hardware watchdog	Monitors "heartbeats" from router OS. Restarts router in case of software problems.
Certifications	Criteria for EMI immunity and radiation Vibration resistant Shock resistant Vehicle Approval	IEC 61000-6-2:2005 EN 60068-2-6:2008 EN 60068-2-27:2009 ECE R10 & Homologation (E24)
Regulations	RoHS, CE, FCC ^{1, 2, 5)}	

¹⁾ **3G/4G/5G Module (5G Sub-6 GHz, LTE Cat19/18)**
5G NR (NSA/SA) 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

²⁾ **2G/3G/4G Module (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

³⁾ **4G/5G Module (5G RedCap, LTE Cat4)**
5G RedCap n1/n2/n3/n5/n7/n8/n12/n13/n14/n18/n20/n25/n26/n28/n30/
n38/n40/n41/n48/n66/n70/n71/n77/n78/n79
LTE -FDD B1/B2/B3/B4/B5/B7/B8/B12/B13/B14/B17/B18/B19/B20/B25/
B26/B28/B30/B66/B70/B71
LTE -TDD B34/B38/B39/B40/B41/B42/B43/B48

⁴⁾ **4G Module (CAT 4, European variant*)**
LTE/LTE450 B3, B7, B20, B31, B72

⁵⁾ **2G/4G Module (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 ⁵⁾
- Dual WAN (WWAN, Ethernet, VLAN) ^{1, 2, 3, 4, 5)}
- Dual WWAN (WWAN, WWAN) ^{1, 2, 3, 4, 5)}
- Configurable WWAN network selection ^{1, 2, 3, 4, 5)}
- Configurable WWAN band selection ^{1, 2, 3, 4, 5)}
- Multiple APN ^{1, 2, 3, 4)}
- Intelligent APN selection ^{1, 2, 3, 4, 5)}
- WWAN IPv4 ^{1, 2, 3, 4, 5)}
- WWAN IPv6 ^{1, 2, 3, 4)}
- WWAN dual stack ^{1, 2, 3, 4)}
- IPv6 prefix delegation ⁴⁾
- Dual SIM ^{1, 2, 3, 4, 5)}
- Modem firmware update ^{1, 2, 4)}
- XCAL debugging ⁴⁾

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 ^{1, 2, 3)}
- 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, 5)} 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 (data); optional	RS-232 (data); optional	Digital I/O; optional ¹⁾	WLAN (802.11ax), DualBand	3G/4G/5G ¹⁾ 2G/3G/4G ²⁾ 4G/5G ³⁾ 4G ⁴⁾ 2G/4G ⁵⁾	ECE type approval (E24) ¹⁾	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		X	-20°C to +65°C
R-8508 (2-6xLAN)	2-4	1-2	1	2	1	1			X	-40°C to +70°C
R-8526 (2-6xLAN/4G or 5G/WiFi6)	2-4	1-2	1	2	1	1	1	1	X	-20°C to +65°C
R-8528 (2-6xLAN/4G or 5G)	2-4	1-2	1	2	1	1		1	X	-40°C to +70°C
R-8558 (2-6xLAN/4G/5G)	2-4	1-2	1	2	1	1		2		-40°C to +65°C

^{1, 2, 3, 4, 5)} See "Hardware Features".

¹⁾ Options:

- 2x Input
- 1x Input, 1x Output (NO)
- 1x Input, 1x Output (NC)

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