



Application and project description

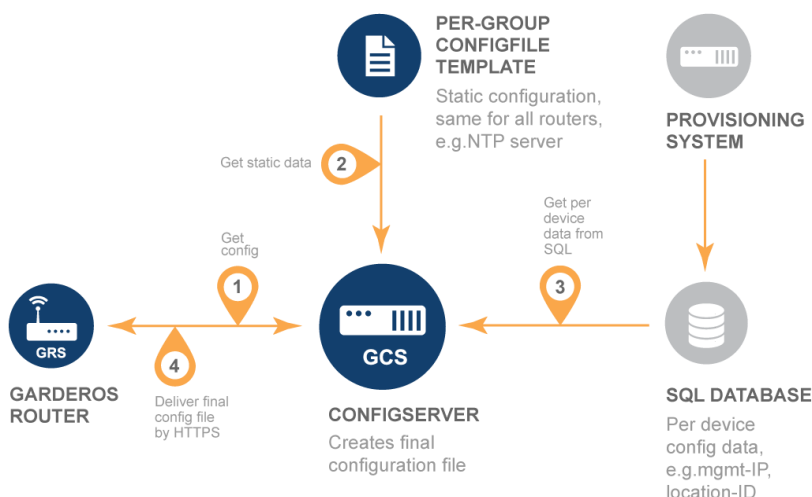
Garderos routers provide secure and reliable data connectivity for professional industrial applications in telecommunications, utility networks and intelligent traffic systems. The ruggedized routers of the Garderos R-8500 series have been designed for mobile and stationary applications which require 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	Diecast aluminium 60x110x115mm / 60x112x123mm ~0.70kg IP40 3 Depends on router model (see "Ordering Information"). CPU off > 95°C CPU on < 87°C Phoenix 2 pin 2-4x RJ-45 1-2x SFP 1x Mini-USB 2.0 Type B (console) 1x D-Sub 9 (female) data (optional) 1-2x RS-485 on Phoenix 6-pin PCB clamp (optional) up to 6x SMA (female) 1x SMA (female) (optional) up to 2x RP-SMA (female) Phoenix 4-pin PCB clamp (optional) 2x Mini-SIM (thermoreistant) or 1x Mini-SIM + 1x MFF-SIM chip (optional) 12-30 VDC (9,6VDC - 36VDC tolerance) ~5-18W Dual power supply (optional)
Temperature range Overheating protection	Ambient temperature	
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	1x 2x (optional) 1x (optional) 1x/1x or 2x/0x (optional) (see LAN) 3G/4G/5G ¹⁾ , 4G/5G RedCap ²⁾ , 2G/3G/4G ³⁾ , 4G ⁴⁾ , 2G/4G ⁵⁾ yes ^{1,2,3)} yes 2-4x 10/100/1000Base-T 1-2x SFP 1000Base-X yes yes 802.11ax yes Monitors "heartbeats" from router O/S. Restarts router in case of software problems. md5, sha1, sha224, sha256, sha384, sha512 aes, des, 3des, IEC 61000-6-2:2005 EN 60068-2-6:2008 EN 60068-2-27:2009 RoHS, REACH, CE, FCC ^{1,3,5)} yes ¹⁾
Power supply	Input voltage Power consumption Redundancy	
Serial interface	Mini-USB (console) RS-485 half duplex (data) RS-232 (data) Input / Output	
Digital I/O WAN WWAN	Ethernet Technology Passive GPS Dual WWAN	
LAN	Ethernet	
WLAN	Autosensing Auto-MDIX Supported standards Dual WLAN	
Other features	Hardware watchdog Cryptographic hardware accelerator	
Certifications	Criteria for EMC Vibration resistant Shock resistant	
Regulations	ECE vehicle type approval (E24)	

¹⁾ 3G/4G/5G Module (global variant*)

5G (NSA/SA)

LTE

WCDMA

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
B1, B2, B3, B4, B5, B7, B8, B12, B13, B14, B17, B18, B19, B20, B25, B26, B28, B29, B30, B32, B34, B38, B39, B40, B41, B42, B43, B46, B48, B66, B71
B1, B2, B4, B5, B8, B19

²⁾ 4G/5G RedCap Module (CAT 4, global variant)

5G SA RedCap

LTE

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
B1, B2, B3, B4, B5, B7, B8, B12, B13, B14, B17, B18, B19, B20, B25, B26, B28, B30, B34, B38, B39, B40, B41, B42, B43, B48, B66, B70, B71

³⁾ 2G/3G/4G Module (CAT 4, global variant*)

LTE

WCDMA
EDGE/GPRS/GSM

B1, B2, B3, B4, B5, B7, B8, B12, B13, B18, B19, B20, B26, B28, B38, B39, B40, B41
B1, B2, B4, B5, B6, B8, B19
850/900/1800/1900

⁴⁾ 4G Module (CAT 4, European variant*)

LTE

B3, B7, B20, B31, B72

⁵⁾ 2G/4G Module (CAT-M1, European variant*)

LTE

EDGE/GPRS/GSM

B1, B2, B3, B4, B5, B8, B12, B13, B14, B18, B19, B20, B25, B26, B27, B28, B31, B66, B72, B85
850/900/1800/1900

*other variants available

SOFTWARE FEATURES

Common

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

WWAN *)

- PPP over WWAN ⁵⁾
- Dual WAN (Cellular, Ethernet, VLAN)
- 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)}
- WWAN IPv4 ^{1,2,3,4,5)}
- WWAN IPv6 ^{1,2,3,4)}
- WWAN dual stack ^{1,2,3,4)}
- IPv6 prefix delegation ⁴⁾
- Modem firmware update ^{1,2,3,4)}
- XCAL debugging ⁴⁾

WLAN *)

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
- 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, ECDSA and EdDSA certificate
- Tunnel and transport mode
- VTI (virtual tunnel interface)

- Encryption AES, AES192, AES256, CCM+GCM, DES, 3DES
- RSA keys up to 8192 bits, elliptic curves
- VPN gateway

L2TP

- Unmanaged L2TPv3 tunnel
- VLAN tagged L2TPv3 tunnel

OpenVPN

- PSK, user and certificate authentication
- 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

- RS-232 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
- OCSP
- 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 (Enrollment over Secure Transport)
- Ethernet port security (sticky MAC detection)
- Hotspot portal
- IPv6 SLAAC daemon
- LLDP
- 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 LEDs (also project based)
- Hardware and software watchdogs
- LXC virtualization, busybox and Alpine (project based)
- State monitor (ping, interface state, 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

*) Prerequisite is a suitable interface.
Please see "Hardware Features".

ORDERING INFORMATION

Garderos model number:	Maximum operating temperature range (The temperature range may differ depending on the router variant)							
	3G/4G/5G 4G/5G 2G/3G/4G 4G 2G/4G	WLAN (802.11ax), DualBand	Digital I/O; optional ^{*)}	RS-232 (data); optional	RS-485 (data); optional	Mini-USB Type B (Konsole)	SFP (1000 Base-X)	Ethernet (10/100/1000 Base-T)
R-8506 (2-6xLAN/WiFi6)		1	1	1	2	1	1-2	2-4
R-8508 (2-6xLAN)			1	1	2	1	1-2	2-4
R-8526 (2-6xLAN/4G or 5G/WiFi6)	1	1	1	1	2	1	1-2	2-4
R-8528 (2-6xLAN/4G or 5G)	1		1	1	2	1	1-2	2-4
R-8556 (2-6xLAN/4G/5G/WiFi6)	2	1	1	1	2	1	1-2	2-4
R-8558 (2-6xLAN/4G/5G)	2		1	1	2	1	1-2	2-4

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