



Application and project description

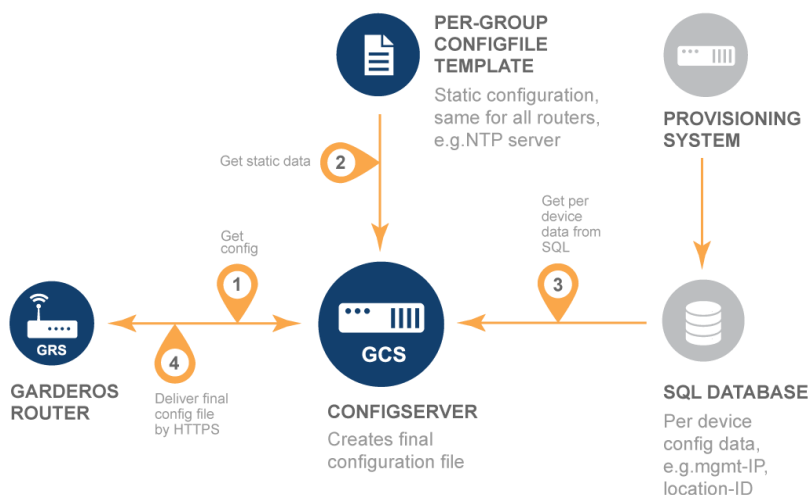
Garderos routers provide cyber-secure and reliable data connectivity for large-scale router networks in telecommunications and utility networks, as well as intelligent traffic systems. The Garderos R-7900 Series routers provide 5 LAN ports and a wide range of WAN interfaces such as: xDSL, Public Cellular and Private LTE. Configurations such as dual wireless WAN or alternatively xDSL with failover to wireless WAN are possible.



Fig. 1: Garderos R-7900 multifunctional routers optimized for smart-grid.

Key features

- Wide range of WAN interfaces
- Central administration
- Scalable to several thousand routers with one web server
- Routers periodically check for updates
- Hardware- and configurable software-watchdogs for highest availability
- Standard interfaces for easy integration into existing infrastructure
- “Cyber Security“ by design, secure protocols and functions



HARDWARE FEATURES

Casing	Material Dimensions (WxHxD) without / with Weight Ingress protection IEC protection class Mounting	Diecast aluminum 80.5x111x116mm / 80.5x111x121mm ~0.75kg IP40 3 Integrated DIN rail clip and mounting holes for external DIN rail clip or mounting bracket
Temperature range		Operating temperature range depends on router model. Please see "ordering information".
Interfaces on casing	Power connector Ethernet connector DSL connector Serial connector WWAN antenna connector GPS antenna connector I/O connector SIM card slot	Phoenix 2 pin 5x RJ-45; additional 1x RJ-45 (optional) 1x RJ-45 (depends on router model) 1x RJ-45 (console) + 2 pin PCB clamp (RS-485, data) + 1x D-Sub 9 (Female) (RS-232, data) (optional) up to 4x SMA (female) 1x SMA (female) (optional) Phoenix 4 Pin-PCB clamp (optional) 1x Mini-SIM (thermoresistant) or 1x MFF-SIM chip (optional)
Power supply	Input voltage Power consumption	12-24 VDC (9,6VDC - 28VDC tolerance) ~2-7W
Serial interface	RS-232 (console) RS-485 half-duplex (data) RS-232 (data)	1x 1x 1x (optional)
Digital I/O	Input / Output	1x/1x or 2x/0x (optional)
WAN	xDSL Ethernet (see LAN)	ADSL2+ Annex A, B, J, VDSL2, PTM/ATM, Vectoring
WWAN	Technology CDMA EVDO, 1x CDMA RUIM, non-RUIM Passive GPS	2G/3G/4G ¹⁾ , 4G ²⁾ , 2G/4G ³⁾ , CDMA ⁴⁾ CDMA ⁴⁾ CDMA ⁴⁾ 2G/3G/4G ¹⁾
LAN	Ethernet Autosensing Auto-MDix	1x 10/100BT + 4-Port 10/100BT Managed Switch + 1x 10/100BT (optional) or 5-Port 10/100BT Managed Switch (at xDSL-router types)
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	IEC 61000-6-2:2005 EN 60068-2-6:2008 EN 60068-2-27:2009
Regulations	RoHS, CE	

¹⁾ **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

²⁾ **4G Modul (CAT 4, European variant*)**

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

³⁾ **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

⁴⁾ **CDMA 450MHz Modul**

EV-DO Rev. A, B
1xRTT
R-UIM und non R-UIM

SOFTWARE FEATURES

Operating system

- Garderos Router Software (GRS) Rel. 3.7

Common

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

WWAN ¹⁾

- PPP over WWAN ^{3, 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)}
- Configurable WWAN band selection ^{1, 2, 3)}
- Multiple APN ²⁾
- Intelligent APN selection ^{1, 2)}
- WWAN IPv4 ^{1, 2, 3, 4)}
- WWAN IPv6 ^{1, 2, 4)}
- WWAN dual stack ^{1, 2, 4)}
- IPv6 prefix delegation ^{2, 4)}
- Dual SIM ^{1, 2, 3)}
- Modem firmware update ²⁾
- XCAL debugging ²⁾
- CDMA RUIIM and non-RUIIM ³⁾
- CDMA ESN and MEID authentication ³⁾

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 16
- 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 max. 41 Mb/s
- Throughput (3des-sha1-modp1024) 10 Mb/s
- Throughput (aes-sha256-modp4096) 23 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

- 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
- OSCP
- 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
- LLDP
- MQTT (I/O control) ^{*)}
- NMEA ¹⁾
- 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, 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:

^{1,2,3,4} Please see "Hardware Features".

Maximum operating temperature range
(The temperature range may differ depending on the router variant)

	Ethernet (10/100 Base-T)	Ethernet (10/100 Base-T); optional ⁴⁾	RS-232 (console)	RS-485 (data)	RS-232 (data); optional	Digital I/O; optional	xDSL	CDMA 450 Module ⁴⁾	2G/3G/4G Modul ¹⁾ 4G Modul ²⁾ 2G/4G Modul ³⁾	Maximum operating temperature range (The temperature range may differ depending on the router variant)
R-7907 (5xLAN)	5	1	1	1	1	1				-25°C to +75°C
R-7917 (5xLAN/xDSL)	5		1	1	1	1	1			-25°C to +65°C
R-7928 (5xLAN/4G)	5		1	1	1	1			1	-25°C to +75°C
R-7937 (5xLAN/xDSL/CDMA)	5		1	1	1	1	1	1		-25°C to +65°C
R-7948 (5xLAN/4G/CDMA)	5	1	1	1	1	1		1	1	-25°C to +75°C
R-7958 (5xLAN/4G/4G)	5	1	1	1	1	1			2	-25°C to +75°C
R-7968 (5xLAN/xDSL/4G)	5		1	1	1	1	1		1	-25°C to +65°C
R-7977 (5xLAN/CDMA)	5	1	1	1	1	1		1		-25°C to +75°C

Garderos GmbH
Balanstrasse 55
81541 München
Germany

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

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

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