

Phoenix Contact and JPEmbedded R-GOOSE Gateway



Overview

IEC 61850 based substations use GOOSE (Generic Object Oriented Substation Event) messages to communicate critical substation events and data between Intelligent Electronic Devices (IEDs) such as protection relays. In the first edition of the standard, it was specified as a layer 2 protocol implemented directly on top of ethernet.

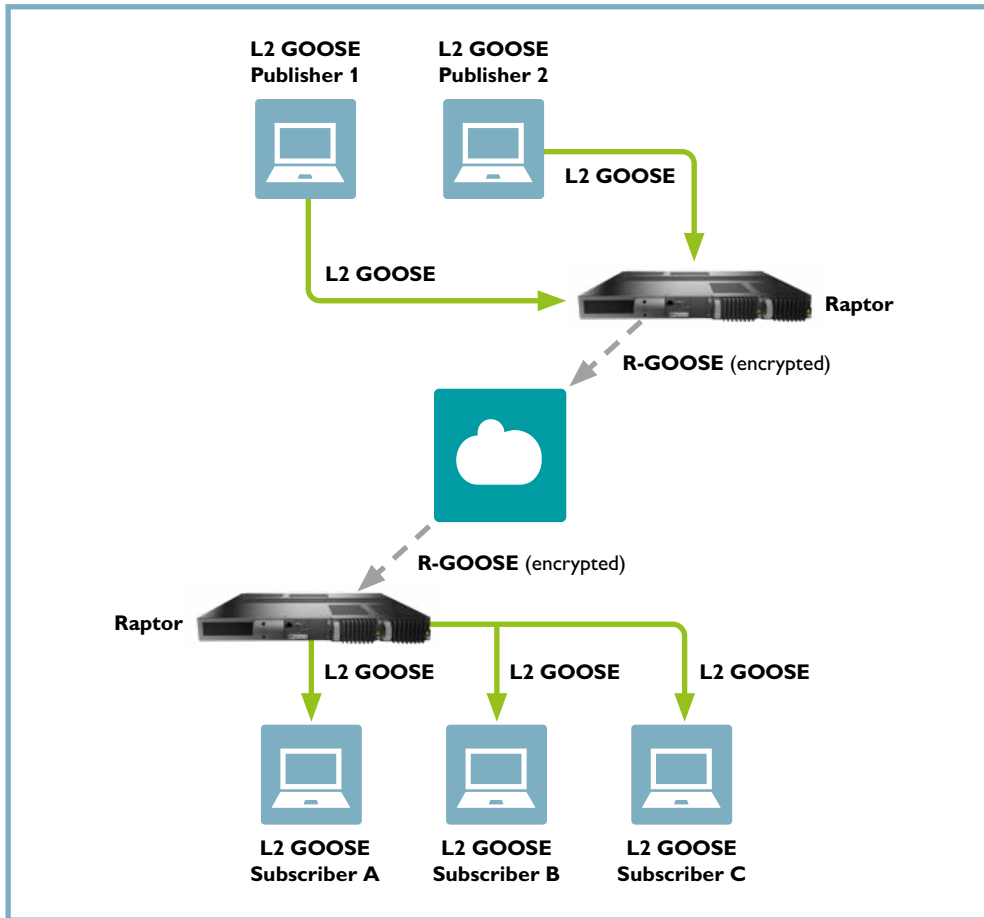
GOOSE over Ethernet has proven very good at meeting the low-latency requirements for this type of traffic. However, a limitation of this approach is that such communication is limited to the local network (LAN). With the introduction of DER and evolution of the grid towards distributed architecture, there is a need for a routable version of GOOSE. This raises the question of the cyber security of the information which is sent by an IED belonging to the critical infrastructure. A simple, yet efficient solution could be to use a gateway converting between L2 and Routable GOOSE.

Phoenix Contact has entered into a partnership with JPEmbedded to implement this functionality within a substation hardened network switch. By integrating the JPEmbedded R-GOOSE gateway software with Phoenix Contact's leading edge Raptor series L2/L3 multi service platform, we can convert between layer 2 and routable GOOSE within the same platform that performs network switching and routing functions.

Benefits	• No impact on existing IEDs deployed in the field • No need for software/firmware updates to IEDs • Flexibility and simplicity • Support for authentication and encryption as specified by IEC62351-9 • Support for both dynamic distribution of encryption keys using KDC/GDOI protocol as well as static configuration
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Solution

The Raptor is an intelligent cybersecure hardware platform with 64 Gb/s full line speed and 4 x 10Gb/s + 24 1Gb/s ports running a feature rich embedded OS. The Raptor embedded OS is an all-encompassing operating system that supports L2/L3 switching and routing on a single platform, including HSR and PRP. Its modular system of field replaceable modules, redundant hot-swappable power supplies, and ability to run third party software applications makes it a very flexible platform for today and the future. Combined with the JPEmbedded R-GOOSE Gateway, Raptor will enable a single box solution for the challenging communications problems within a 61850 substation.



The gateway is a subscriber of the ‘traditional’ L2 GOOSE messages published by the IEDs connected to the local network and publishes these received messages as UDP/IP multi-cast traffic. The gateway at the other substation reverses this process, converting back to L2 GOOSE on the LAN. This is depicted in the diagram above.

The main tasks of the gateway are:

- Extending GOOSE communications across Layer 3 WAN networks.
- Ensuring no impact on existing IEDs deployed in the field.
- Optionally encrypting the payload of outgoing R-GOOSE multicast packets.
- Providing flexibility and simplicity.

Depending on the need of specific applications, it is also possible to update some parameters of the published R-GOOSE such as application ID number, GOOSE ID string, or customizing the delay between re-send messages.

Related Products



Chassis	Description	Designation	Item No.
	FL SWITCH EP7400 Series Chassis. IEC 61850-3 / IEEE 1613, Layer 2/3 Switch, -40°C to +85°C Operating Range. Supports up to 28 ports total.	FL SWITCH EP7428R-L3F1	1144353
	FL SWITCH EP7400 Series Chassis. IEC 61850-3 / IEEE 1613, Layer 2/3 Switch, -40°C to +85°C Operating Range. Supports up to 24-ports PoE, 28 ports total.	FL SWITCH EP7428R-L3F1P	1539668
Chassis	Description	Designation	Item No.
	FL SWITCH EP7500 Series Chassis Security enabled. IEC 61850-3 / IEEE 1613, Layer 2/3 Switch, -40°C to +85°C Operating Range. Supports up to 28 ports total.	FL SWITCH EP7528R-L3F1	1539667
MCP Computing Module	Description	Designation	Item No.
	MCP Computing Module , Ubuntu, 256GB storage	FL SWITCH EP7400-MCP-L-256GB	1539661
	MCP Computing Module , Ubuntu, 512GB storage	FL SWITCH EP7400-MCP-L-512GB	1539663
	MCP Computing Module , Ubuntu, 1TB storage	FL SWITCH EP7400-MCP-L-1TB	1539665
	MCP Computing Module , Ubuntu, 2TB storage	FL SWITCH EP7400-MCP-L-2TB	1539666

About JPEmbedded

JPEmbedded is a leading provider of communication solutions for power systems, based in Kraków, Poland. The company specializes in developing innovative products, including platform-independent software libraries for protocols such as IEC 61850, DNP3, ICCP/TASE.2, and IEC 60870-5-10X, as well as network gateways that facilitate seamless translation between virtually any protocols used in the industry. Founded in 2006, JPEmbedded also offers comprehensive services in custom software and hardware design, implementation, and testing. With a strong focus on industrial communication, the company brings extensive expertise in protocols like IEC 61850, DNP3, Powerlink, Profinet, and Ethernet IP. JPEmbedded's mission is to deliver cutting-edge solutions that enhance power systems and industrial communication networks globally.

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