e-terra*powercom*

Broadband power line communication

e-terrapowercom is a broadband power line modem with integrated switch designed for communications on medium and low voltage power lines. The solution is based on broadband PLC technology with additional networking capabilities to build reliable and cost-effective communication networks utilizing existing power cables. e-terrapowercom provides a ruggedized design with superior performance suitable for a diverse range of applications such as metering, automation, asset monitoring, video surveillance and IP telephony.

Key Benefits

- Easy and fast installation using existing power cables with compact footprint and no additional infrastructure cost.
- High bandwidth providing multiple services in Ethernet IP for seamless network integration. Low latency compared to cellular technologies for real time applications.
- Dedicated and owned network eliminates dependency on telecom providers, coverage problems and leased line fees, allowing full priority and control of the data channel.
- Extends network coverage to places that radio frequencies cannot reach, such as underground chambers and substations.
- Supports a variety of network topologies such as rings, string lines and point-to-multipoint matching most of power grids architectures.

Applications

The e-terrapowercom is designed for power utilities and industrial applications, supporting the following typical applications:

Remote control and monitoring

- Remote Terminal Unities (RTU)
- IEC® 104 and Goose IEC 61850
- Smart sensors and detectors
- Remote controlled switchgears
- Access control

Advanced metering infrastructure

- Medium voltage metering
- Low voltage metering data backhauling

Extended use networks

- LAN extension
- Channel redundancy
- Backhauling for local access Wi-Fi

Multimedia connectivity

- VoIP
- Video surveillance
- Infrastructure network access

Superior design with proven performance

- Provides high signal power resulting in optimal performance
- Up to 200 Mbps* throughput and low latency data channel
- Amplifier designed for long distance coverage without repeaters
- Configurable frequencies for multiple channels use and notch to prevent interferences

Flexible built-in switching feature

- Built-in Ethernet switch reducing deployment costs
- Integrated GUI for configuration and maintenance
- Embedded monitoring and measurement tools for quicker deployment and simplified maintenance
- Fast deployment mode utilizing default pre-configurations
- Cyber security features to prevent local and remote unauthorized access

Ruggedized design with lower cost of ownership

- Industrial hardened IP-40 enclosure with no cooling fans for extended operating life
- Wide range built-in AC and DC power supply
- DIN mountable and compact footprint
- EMC certified for high voltage environments and class II electrical safety

* Maximum bandwidth depending on signal noise ratio and external factors

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Utility and Industrial Environment

Power utilities and industrials are looking for effective low cost solutions to communicate data from field devices in remote locations to control centers. The challenges of communication networks in these types of applications include:

- Assets in remote locations where cellular and other radio technology coverage is limited
- Harsh environments with variable conditions
- Easy maintenance for workforces not specialized in telecoms

- Ownership of communication network is desirable
- High network availability for critical applications
- Compatibility with existing and future applications

GE's Solution

e-terrapowercom is designed to be deployed in all grid topologies, using high power signal and active repeaters to communicate over kilometers of cables. Requiring minimum engineering design, the configuration can be fastened by loading files to the embedded easy-to-use web GUI. The built-in switch and networking features offers a flexible way to build access networks aggregating field services. The power consumption is low, allowing the device to run on batteries or alternative power sources, such as solar panels.

Key Features

4-port switch – Full featured 4-port manageable switch with Virtual LANs (VLAN), MAC address filtering, port bridging, port blocking, Quality-of-Service (QoS) and RSTP.

Networking – Using the embedded networking functions, the modem is capable of creating sub-networks, apply Network Address Translation (NAT), VPN IPSec client, port-forwarding and DHCP client/server.

Built-in splitter – One or two BPL output ports, for single or dual coupling, building by-passes to ensure continuity accross transformers and switchgears on the line.

Internal filters – Internal hardware filters, improving protection against line noise, eliminating external accessories, simplifying the deployment and reducing costs.

Universal power supply – Both AC and DC power supplies are available in the device for a wide range of applications.

Web management – An embedded web page structured to simplify configuration and maintenance all-in-one. It can also be integrated to existing centralized SNMP supervision platforms.

Monitoring view – Every device on the network provides a real-time single view, of the current dynamic topology, remote nodes information, throughputs and measured Signal to Noise Ratio (SNR).

Testing tools – Links can be tested using online tools to carry out the following checks: real TCP throughtput measurement between modems, remote ping, bridge and ARP tables and routes checks.

Utility Application Example
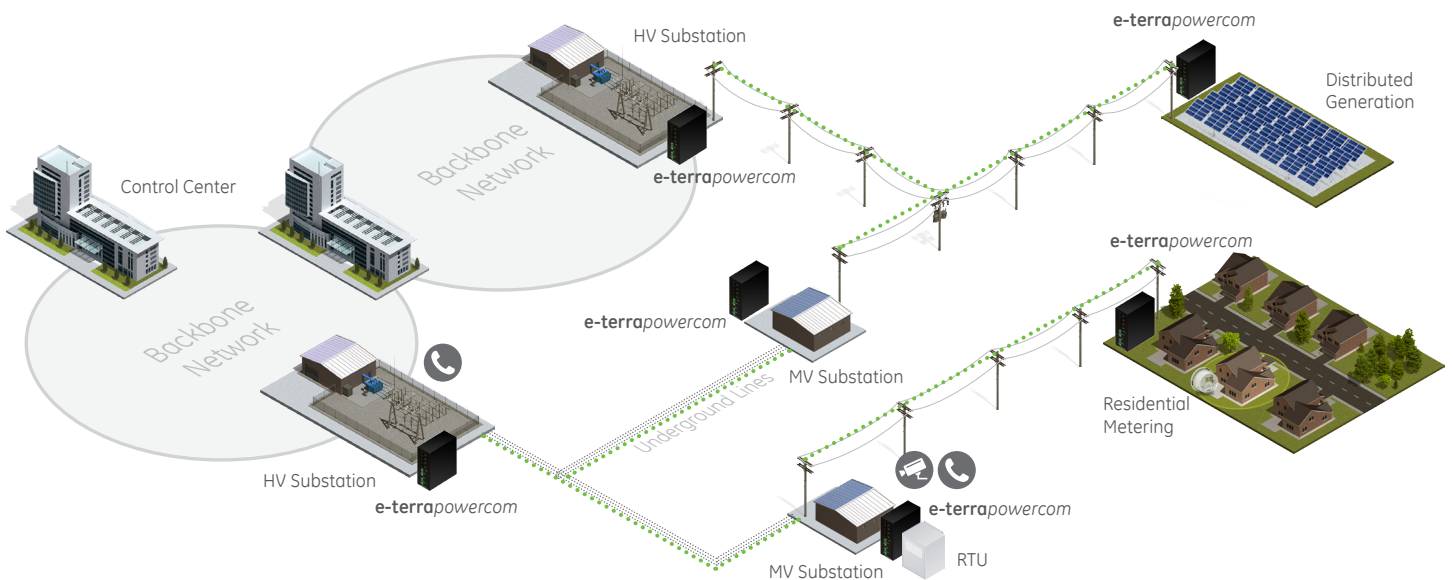
Delivering cost effective communications solution for utilities on medium voltage networks

e-terrapowercom uses power cables as a medium for digital communication necessary for automation and control of the power grid. The solution delivers a transparent IP network with Quality-of-Service (QoS) to prioritize critical applications, and uses Virtual LANs (VLAN) to separate data streams of each distinct service. In order to improve asset control and maintenance, IP video cameras and telephones can be

deployed in key substations due to the exceeding bandwidth provided. The communication system can be rolled out over a large number of substations starting from High Voltage (HV) substation to several kilometres over the grid, as it does not require heavy civil works and additional infrastructure.

Industrial Application Example
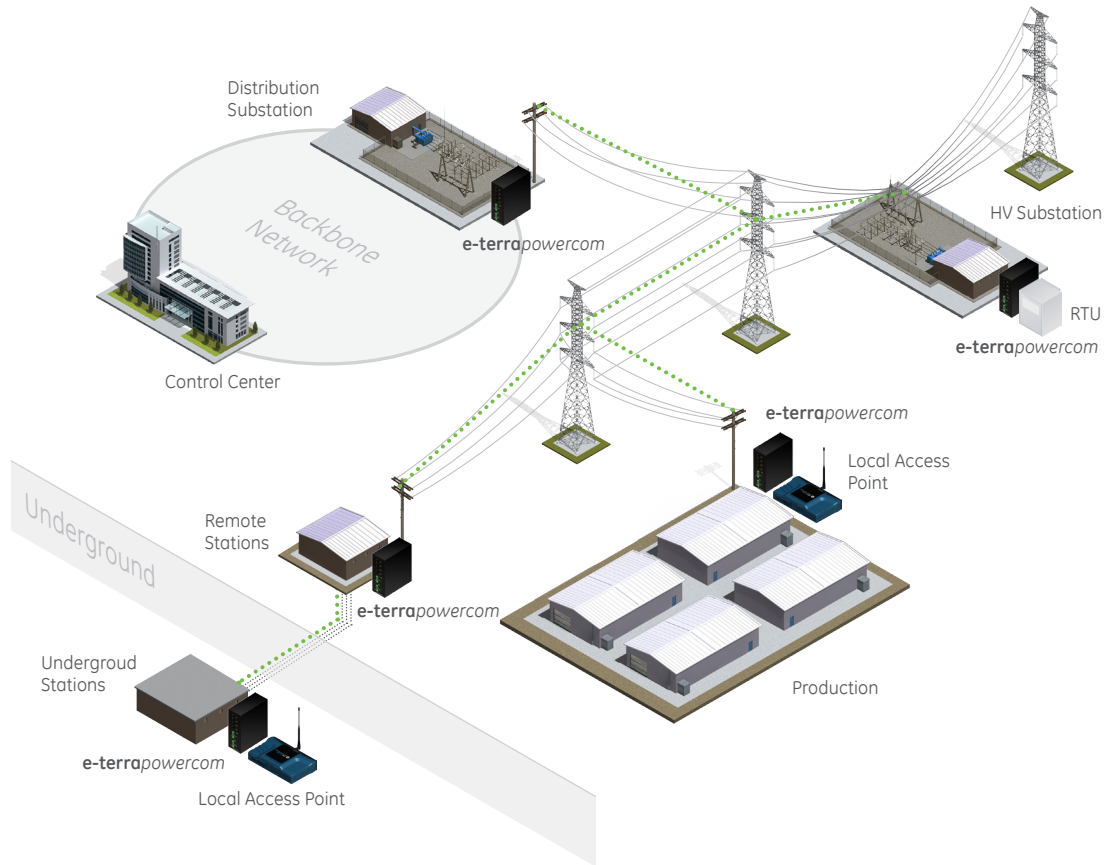
A flexible and cost-effective alternative for telecom infrastructure for industrial applications

Industries can take advantage of the power grid built to supply energy to production and machinery to create IP communication channels, using the e-terrapowercom solution. This data channel can provide backhauling for operating local networks, telemetry on remote devices, and supervision of the assets connected to the control center. In addition, environments like underground facilities often have limited radio coverage and Broadband Power Line enables connecting such areas.

E-terrapowercom Overview

Long Range Version

The e-terrapowercom is also available in a long range version, which has a higher power density in shorter frequency channel to attain longer distances or overcome noisier environments. The maximum bandwidth is reduced and it is dedicated to specific cases.

Coupling Options

The e-terrapowercom modem is connected to the electrical grid through inductive or capacitive coupling devices.

Inductive is used over insulated cables while capacitive requires a connection to a live part of the grid. Inductive is easy and fast to install, especially in cubicles and small rooms. Capacitive is mainly dedicated to overhead lines.

Technical Specifications

	BPL	LONG RANGE
Maximum raw bandwidth	200 Mbps	40 Mbps
Frequency range	2 to 34 MHz	1 to 17 MHz
Frequency modes	16	16
Modulation	OFDM	OFDM
Encryption	3DES / AES 128bits	3DES / AES 128bits
BPL power spectral density	-35 dBm/Hz	-30 dBm/Hz
Internal filters	Selectable	Selectable

NETWORKING	
Mode	Layer-2 / Layer-3
Features	Real-time monitoring Remote ping (ICMP) Static NAT MAC address filtering VLAN Access / Trunk DHCP client DHCP server QoS IPSec client SNMP v3 NTP client
Web GUI	HTTP / HTTPS
Network standards	IEEE® 802.3 IEEE 802.1p IEEE 802.1q

HARDWARE	
Ports	2x BPL 50 Ohm 4x FEth RJ-45 auto-sensing AC power cord connector DC terminal block
Operation temperature	-20°C to 65°C 5% to 95% non-condensing
Weight	680 g
Dimensions (W x H x D)	60 x 146 x 150 mm
DIN mount	Top hat rail
Ingress Protection Level	IP-40

ELECTRICAL	
AC Operating voltage	80 to 265 Vac 50/60Hz
DC Operation voltage	24 to 40 Vdc
Power consuption	6 W (Peak 12 W)

STANDARDS	
EMC	IEC 61000-6-2:2005 IEC 61000-6-4:2006 IEC 61000-6-5:2001 ANSI® C37.90.1/2/3
Operation environment	IEC 60721-3-3: 3K5 / 3M4
Safety	EN 60950 (LV Directive) / Class II

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