EPOS

The IoT Stack for Microprocessors

Internet of Things – a big Wave

Take Off with EPOS

The wave is coming!

The "Internet of Things" (IoT) is developing at a dizzy speed. Just a vision at first it is now gathering momentum becoming the next wave of technological development.

If you want to ride this wave, get ready now to pick the perfect moment to take off. Anyone who wants to proceed from vision to reality needs to act now.

New solutions – tried-and-tested standards

Between vision and success is implementation. Even the boldest vision needs a technically viable foundation. To make the most of the infinite possibilities of IPv6, you also need to decide how your applications will communicate.

With EPOS we offer you an impressive solution to solve the communication question quickly and elegantly: EPOS makes your existing devices IPv6-capable without requiring any adaptation to the hardware. Furthermore it implements a standard that has proven itself millions of times in intelligent distributed systems.

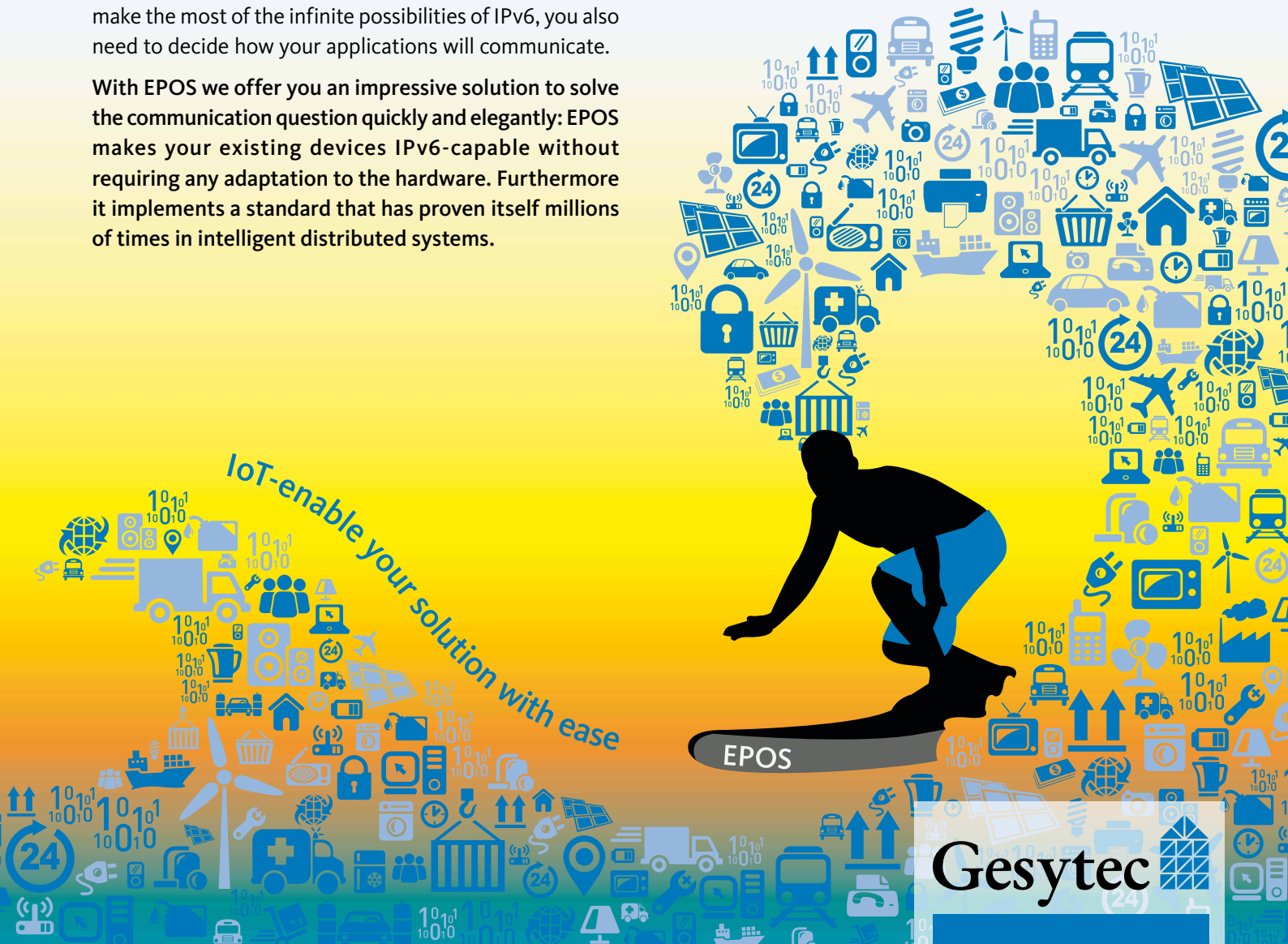
Want to make your microcontrollers IoT-capable fast? Here's the solution!

You cut

- Time-to-market
- Development risks

You gain

- Leeway for your own creativity
- Interoperability

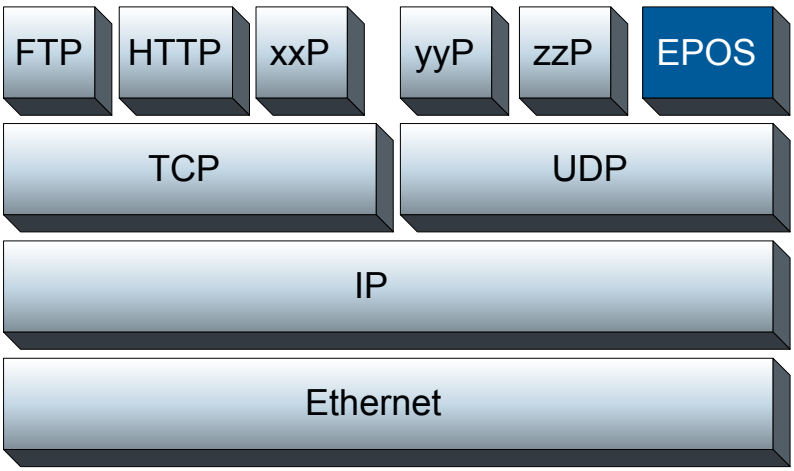


Gesytec

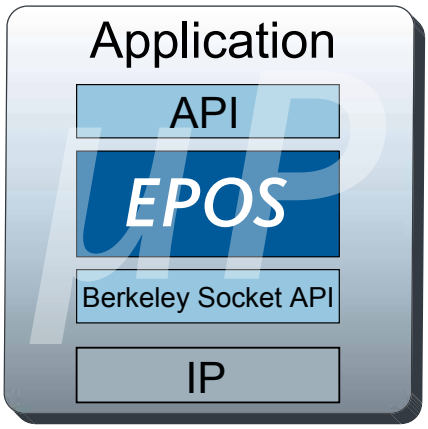
The EPOS Protocol Stack

A software IoT-enabling your devices

EPOS is a protocol stack that can easily be integrated into modern microcontrollers. EPOS is IPv4 and IPv6 compliant and provides an important basis for implementing your own solutions for use in the Internet of Things.



In a layer model of the communication, EPOS is situated, like FTP or http, between the application and the TCP/UDP transport layer.



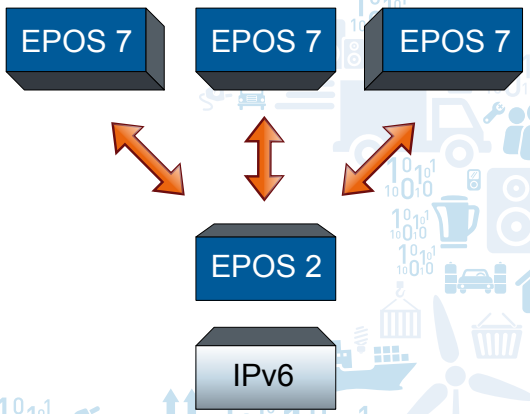
A PROTOCOL STACK SPECIALLY FOR MICROPROCESSORS

As a protocol stack for microprocessors, EPOS is small and independent of operating systems. In higher capacity systems it can also be used under embedded operating systems such as Windows or Linux.

EPOS brings together application and IP communication on a single microprocessor. To put it in a nutshell, EPOS brings the application to the Internet of Things.

Into the IP enabled ecosystem of a microprocessor EPOS integrates as a software library. A Berkeley socket API is required, a requirement which is especially well met by small IP-capable systems.

The EPOS architecture is designed to minimize utilization of resources. It has its own static and scalable memory management. Thanks to the greatest possible degree of event-orientation, temporary data storage is kept to a minimum. As a cyclically operated status machine, EPOS can do without an operating system.



Future-oriented and extensible

EPOS consists of two parts: EPOS 7 and EPOS 2. The ISO/IEC14908-1 part (EPOS 7), the part connecting to the application, is separated from the part that is used for physical communication (EPOS 2).

This allows to easily adapt systems to meet different communication requirements. If sufficient resources are available on a device, it is even possible to implement several virtual nodes in a single device.

This concept also covers the possibility of using another communication system instead of IP communication, if necessary, without having to change the application connection.

A Standard, Meeting the IoT Requirements

Interoperability in communication

As a distributed intelligent control network, LON (LonWorks) has proven itself millions of times: In applications ranging from burger bars to power plants, from metro signaling systems to submarines, from gas stations to 7 star hotels.

Reasons for its success:

- One chip integrating application and standardized communication,
- segmenting of complex applications into small, dedicated nodes,
- interoperability between devices from different manufacturers,
- media independence,
- breaking open the traditional way of thinking in different branches, and
- specific application profiles for a wide range of application areas.

Thanks to the increasing capabilities of the silicon and the addressing options offered by IPv6 it is possible now to raise the concept to a higher level. The LON concept meets the requirements of the Internet of Things.

Consequently, EPOS implements the LON protocol standard ISO/IEC14908-1 and the LON/IP standard ISO/IEC14908-4 on the network side. To permit its use with IPv6, the familiar LON/IP was adapted to handle the extended addressing.

The EPOS API provides developers with functions that enable them to work with network variables and perform general node management.

The full range of functions of LON, as an established language for intelligent networked devices, is thus available for use with the Internet of Things.

The following pictorial comparison with respect to the number of available IPv6 addresses was made by the Number Resource Organization (NRO): If all IPv4 addresses were represented by the size of a golf ball, then IPv6 would be the size of the sun. That should be enough to directly address all relevant “intelligent” devices, sensors, computers and machinery on Earth.

IPv6, the benefits

More addresses: IPv6 provides 2^128 addresses for direct connections between devices. This allows internet service providers to allocate substantial address blocks to individual users, allowing IPv6-capable devices, including applications, sensors and objects, to be provided effortlessly and cheaply in large numbers.

Increased security: The IPv6 protocol has its own safeguards for authentication, security encryption and data integrity. With IPv6, data security is moved to the network layer, making it possible to protect individual devices and applications directly.

Reduced complexity: Thanks to automatic configuration functions, configuring a network connection is as easy as connecting a cable to the computer. A link-local IP address makes it possible to communicate with directly connected hosts, printers and other devices, sensors or actuators.

Greater mobility: Thanks to these IP addresses, computers and other devices can have static interface IDs. The interface ID remains unchanged when the device is moved to a different location. Mobile IPv6 users can move from one network to another while retaining a unique IP address.

Gesytec

From Vision to Reality

Requirements met

Economy before technology

The Internet of Things (IoT) will be enabled by two things: The connectivity of an unlimited number of devices and the availability of cheap embedded processors that can be used in any device. The barrier between fantasy and reality is the ROI. Even if the technology is available, reality is controlled by money. A networked roof tile is theoretically conceivable, but who would pay for one?

Thus there are fundamental conditions to be met in order to be able to make the leap from the vision to reality, be they technical or economic.

- Due to the sheer quantity it is obvious that IoT devices need to be **small and cheap** to produce. It is thus necessary to bear the economic use of resources in mind.
- Under IPv6 there are enough addresses available. There is no reason not to use a few more devices with **small apps, dedicated to performing specific tasks**. Software handling will profit by this.
- The potential ambient conditions also need to be taken into consideration, which is another reason for **compactness**: Small cores in different shells that are suitable for the various fields of application.
- The Internet of people is one of communication. Technically, it is consistently defined throughout, but the users are more or less limited in their communication by their culture and language. If you transpose this onto the IoT, you arrive at a requirement for **generally applicable rules** in terms of language => protocol and culture => application profiles (rules governing how to handle certain things in certain situations).

The EPOS solution

- a protocol stack
- designed for microprocessors
- operating system independent
- based on globally used standards

The software that lets your devices join the IoT

How it could work – small, cheap, flexible

The increasing capabilities of processors, the growing integration of functions on a single chip, meet the first requirement to an ever-increasing degree. Each device basically needs to have two capabilities: The ability to interact with the real world and the possibility of sharing its information with others. In other words, application interfaces and a communication component.

Microprocessors with integrated IP communication, with memory, with USB, with I/O, with HMI interfaces exist already, and are suited for use as cores for compact IoT devices: Single chip solutions, that are small and flexible, without the "ballast" of an operating system; and incidentally also with integrated encryption capabilities.

While communication with the real world depends on the application, communication on the IP or IoT channel is unaffected by this. Here the best approach is to use a standardized solution. And this is where EPOS comes into play. **EPOS is specially designed for this world of IP-capable microprocessors.**

Save time and reduce risks

With the ROI in mind, anyone who concentrates on the implementation of a new application wants to avoid problems, for which solutions already exist. Using these solutions saves time and reduces development costs and risks. **EPOS is the key to getting on board the Internet of Things quickly.**

Overcome the barrier

Being capable of open communication, interoperable with apps and devices from various manufacturers – these are the keys to acceptance and added value of networked solutions. However, if the "linguistic basis" for the communication doesn't exist, the benefit of networking is lost. **EPOS can also score with its inherent, standardized communication.**

Gesytec

Gesytec GmbH
Pascalstr. 6 ◪ 52076 Aachen ◪ Germany
Tel.: +49 (0) 2408 / 944-0
Fax.: +49 (0) 2408 / 944-100
info@gesytec.de ◪ www.gesytec.com

63A0233A01 03/2014