



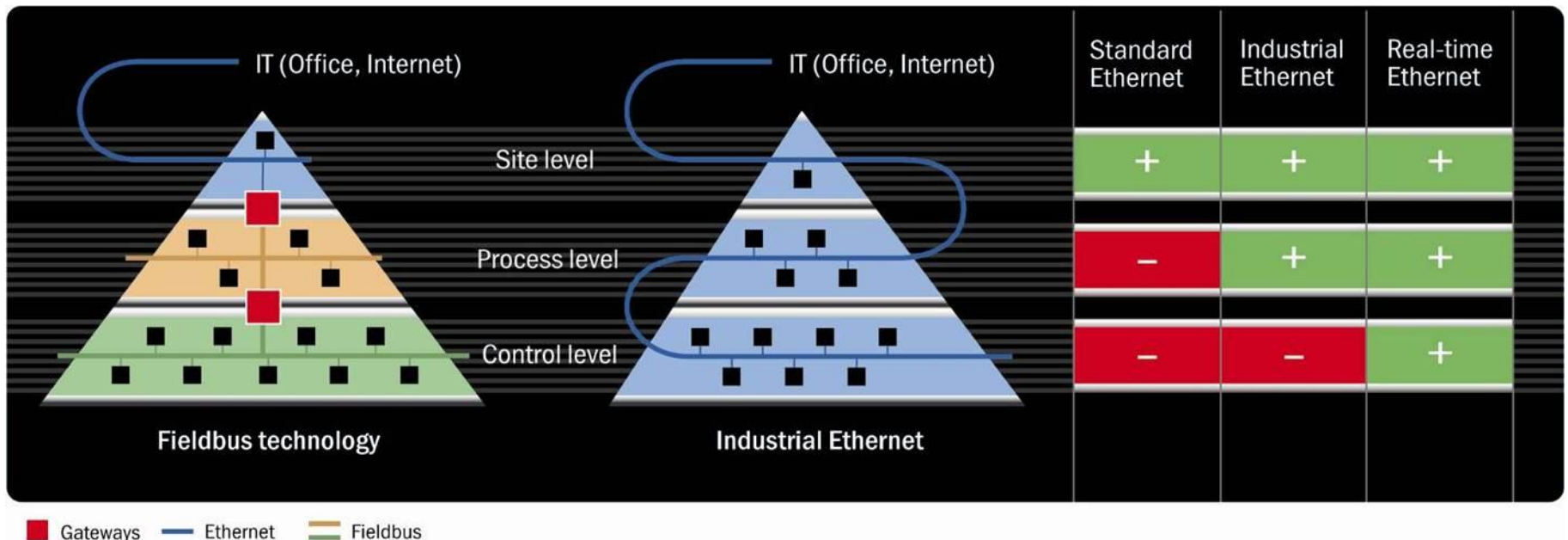
POWERLINK
Der Standard für
Industrial Ethernet

- Alte Bussysteme sind unzureichend für moderne Anwendungen
 - Geringe Bandbreite
 - Eingeschränkte Wahl der Topologie
- Ethernet ist eine sichere Investition
 - Hohe Performance, gesteigerte Produktivität
 - Herstellerunabhängig
 - Bewährte Technologie



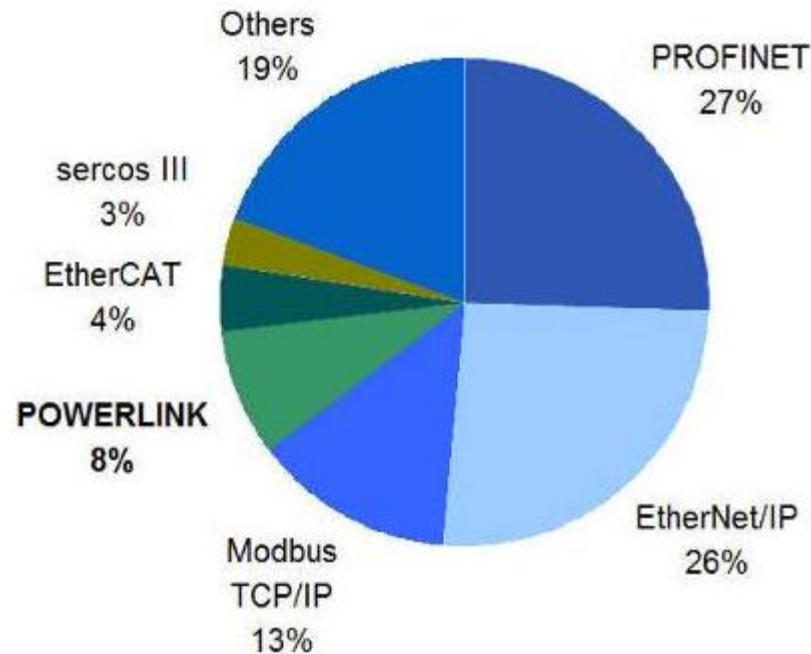
- Standard Ethernet ist nicht deterministisch
 - Geeignet für Büroanwendungen
 - Nicht für zeitkritische Anwendungen gedacht

- Real-time Ethernet wird benötigt für:
 - Kritische Prozesse, Controller und Sensor Systeme



- Maximale Performance
- Absolute Offenheit
- Basierend auf Standard Ethernet
- Entworfen für Integrated Automation
- Geringste Total Cost of Ownership

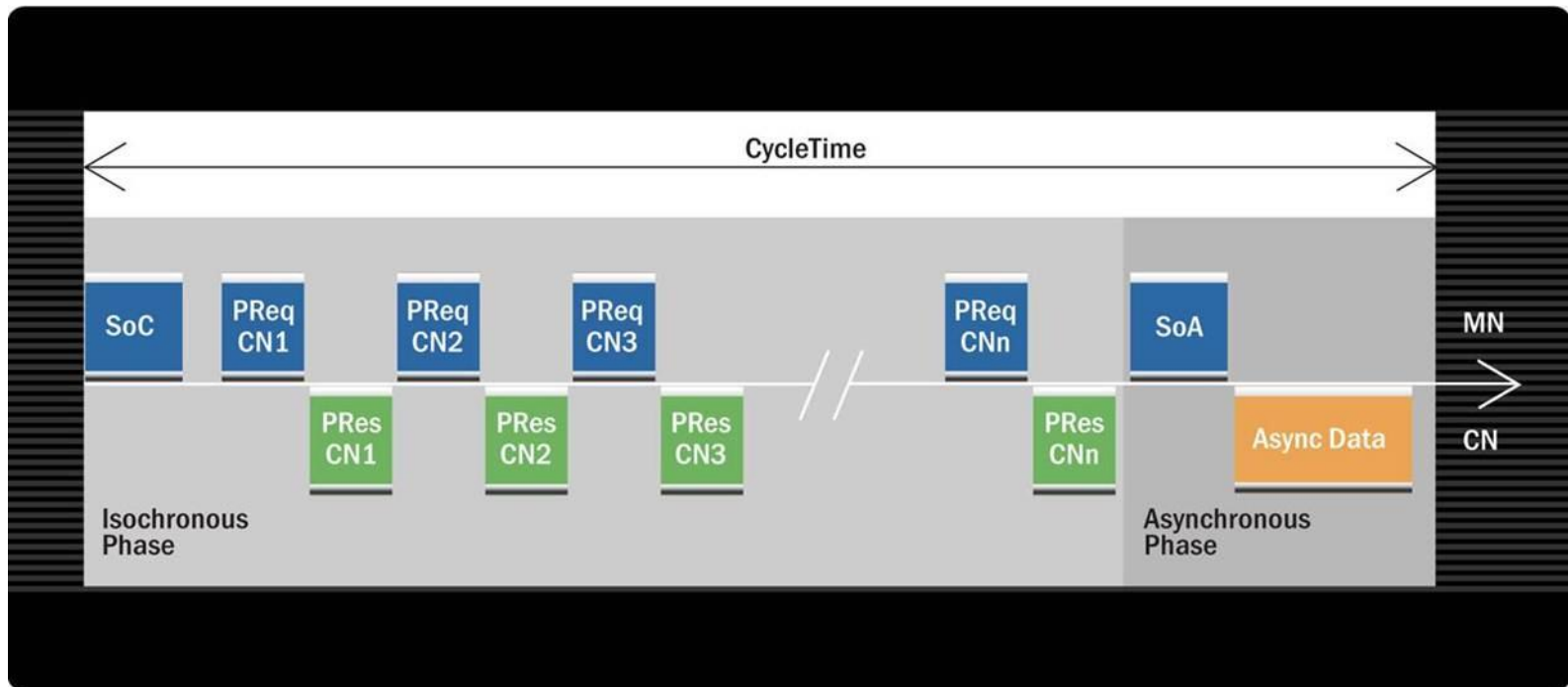
- Weltweit führend bei real-time Ethernet Anwendungen
- 2,800 OEMs setzen auf POWERLINK
- Mehr als 600,000 installierte POWERLINK Systeme



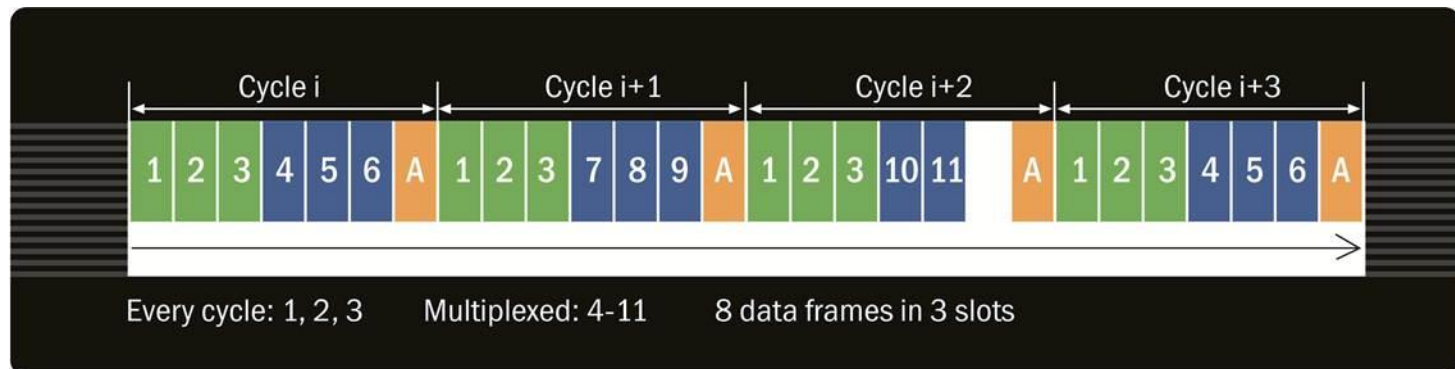
- Industrial Ethernet National Standard GB/T-27960



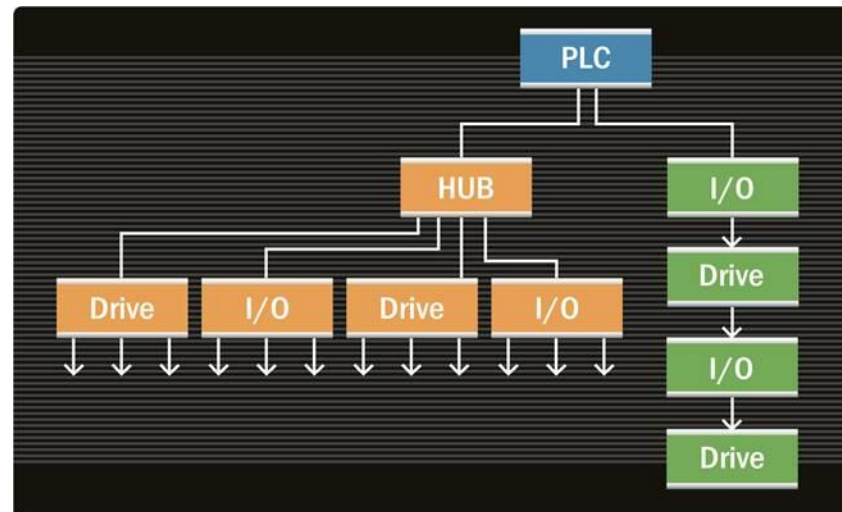
- Einfachheit
 - Einfache und robuste Funktionsweise
 - Keine komplexe Zeitsynchronisierung
 - Perfekt für industrielle Automatisierung



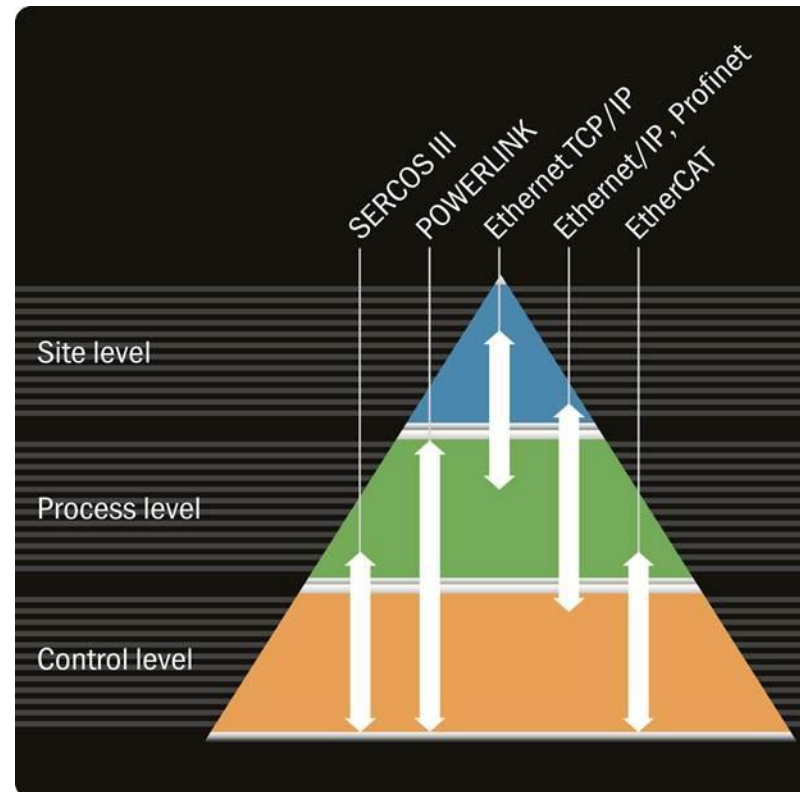
- **Querkommunikation**
 - Schnellste Axsynchronisation
 - Zentrale und dezentrale Architekturen
- **Multiplexing**
 - Dynamische Zyklusgestaltung
 - Perfekt für Integrated Automation



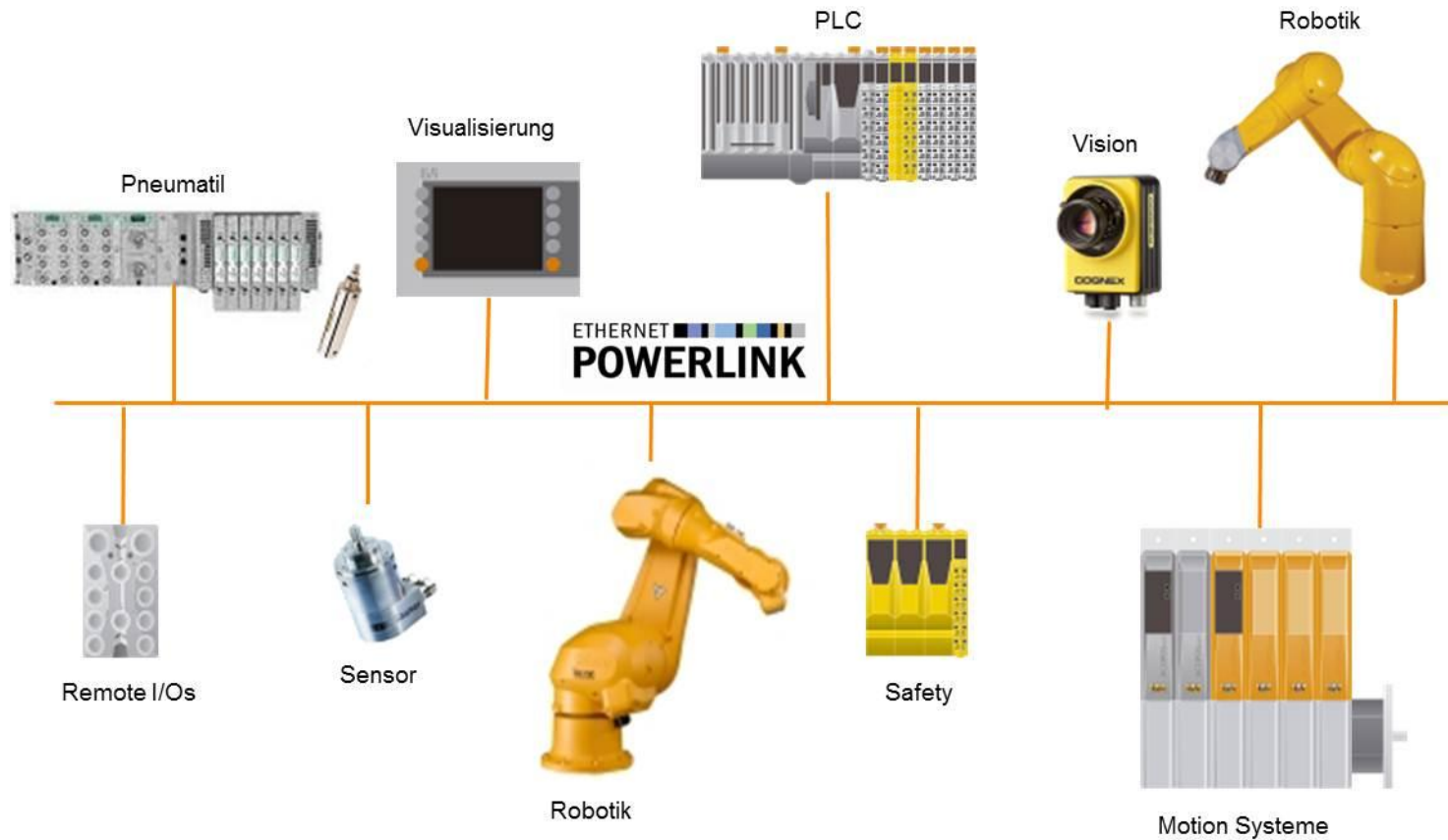
- Hot Plug
 - Gesteigerte Produktivität, Modulare Konzepte
 - Unterbrechungsfreie real-time Kommunikation
- Freie Topologiewahl
 - 100% freie Topologie: Linie, Ring, Baum, Stern
 - Einfache Systemerweiterung



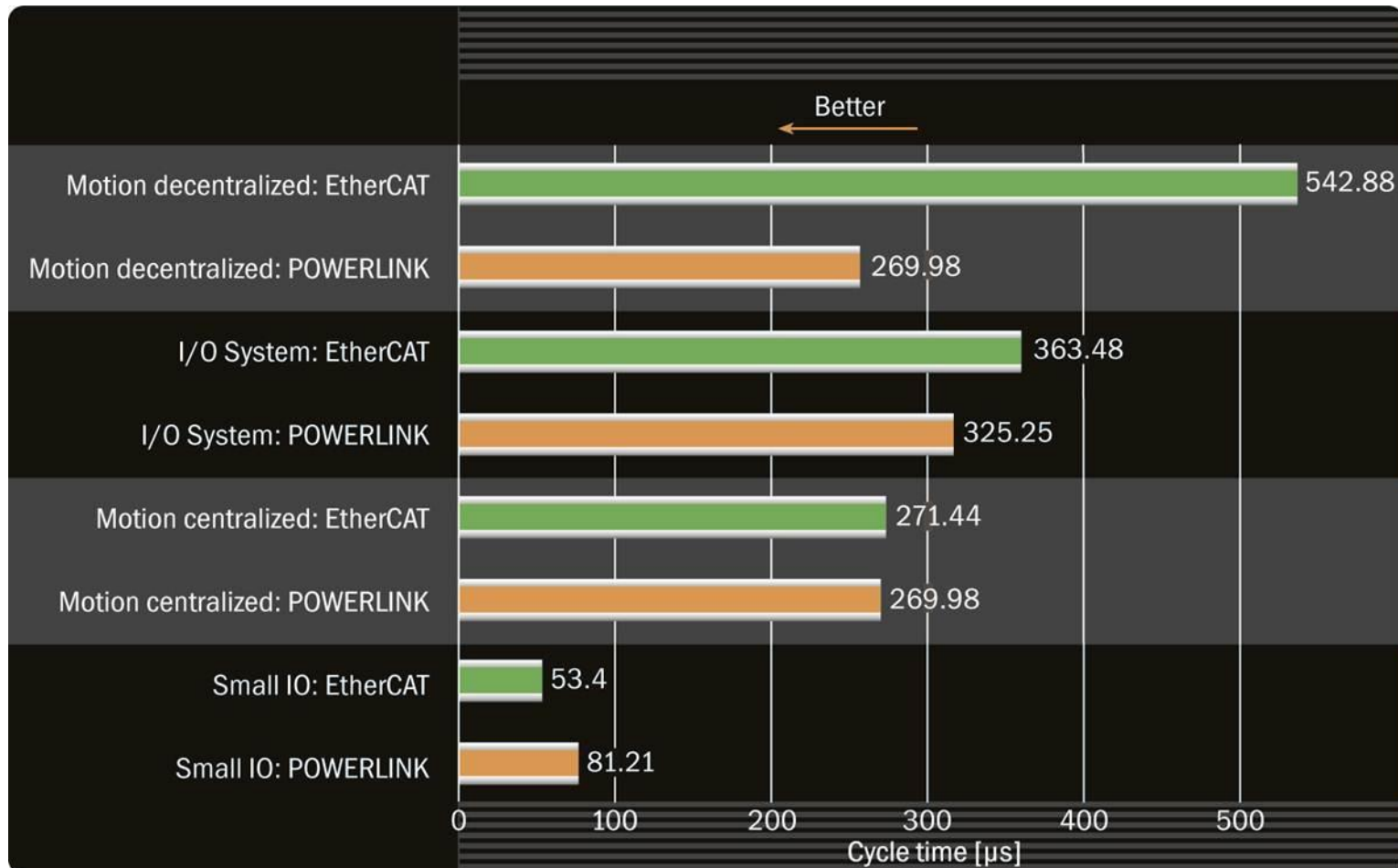
- POWERLINK erfüllt alle Netzwerkanforderungen
 - Eine Technologie vom Antrieb zum Prozesslevel



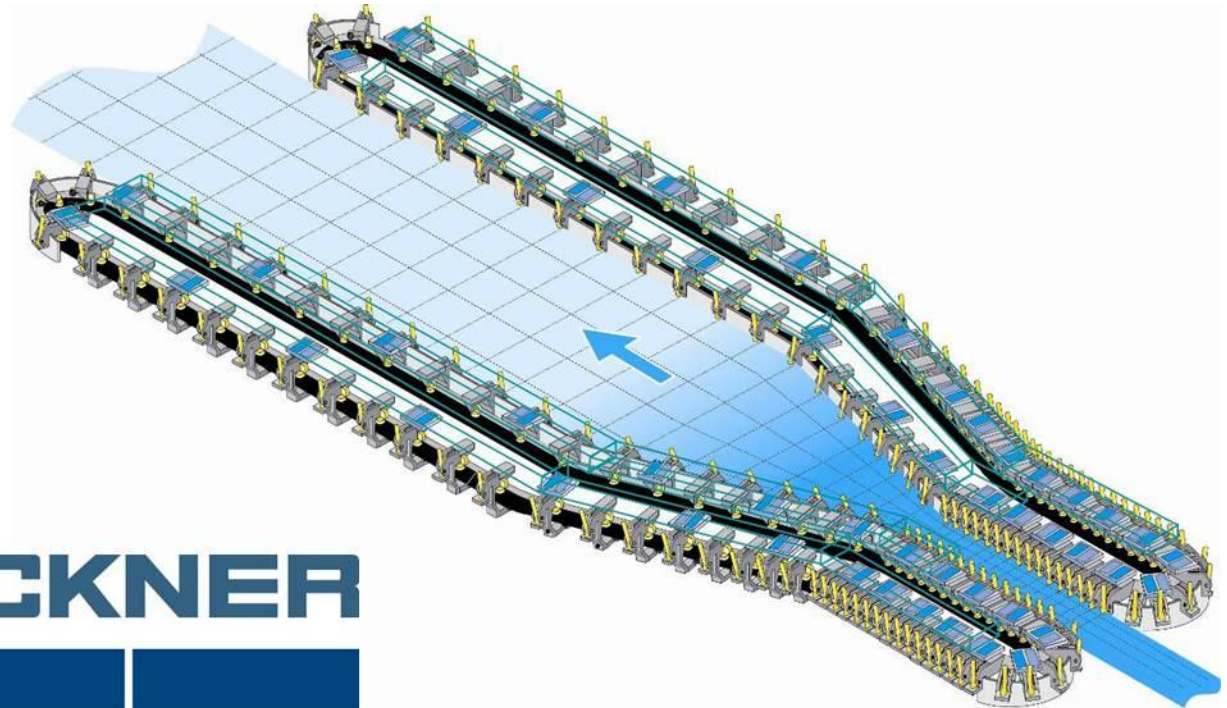
- Perfekt für Integrated Automation



- POWERLINK ist schneller als EtherCAT bei einer Mehrzahl von Anwendungen!



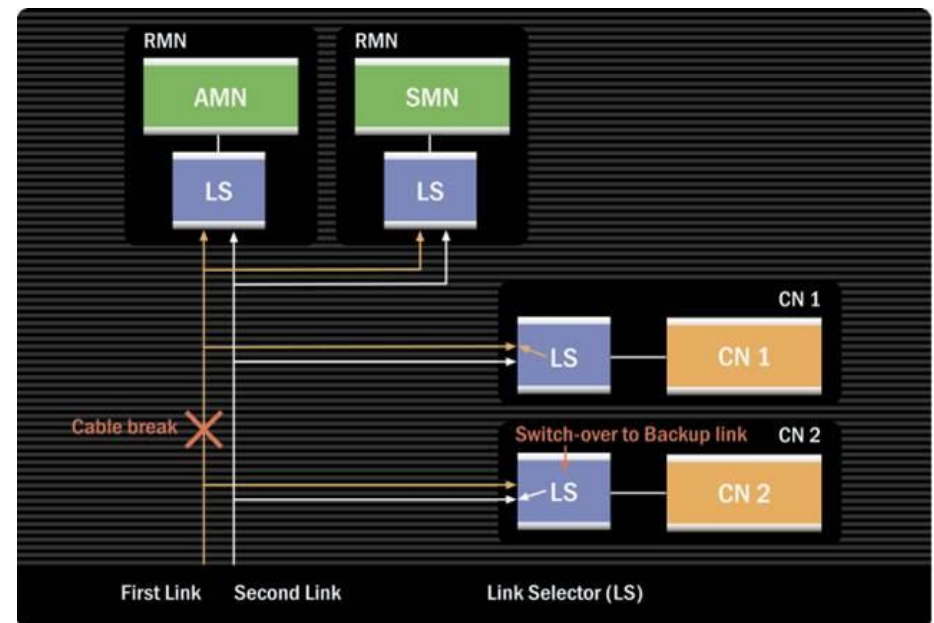
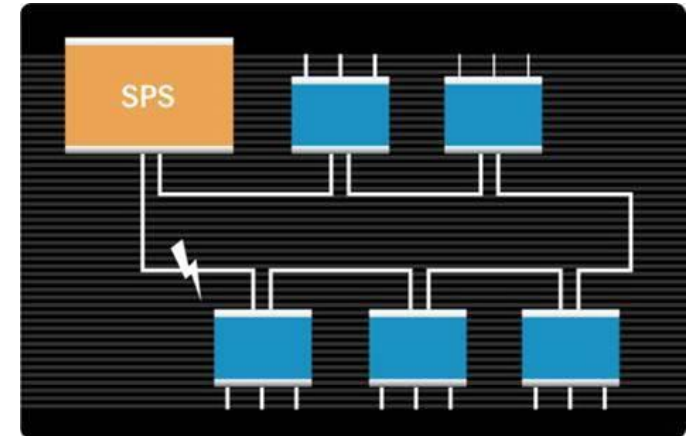
- **728 Axen in 400µs**
- ... praktisch, nicht in der Theorie!



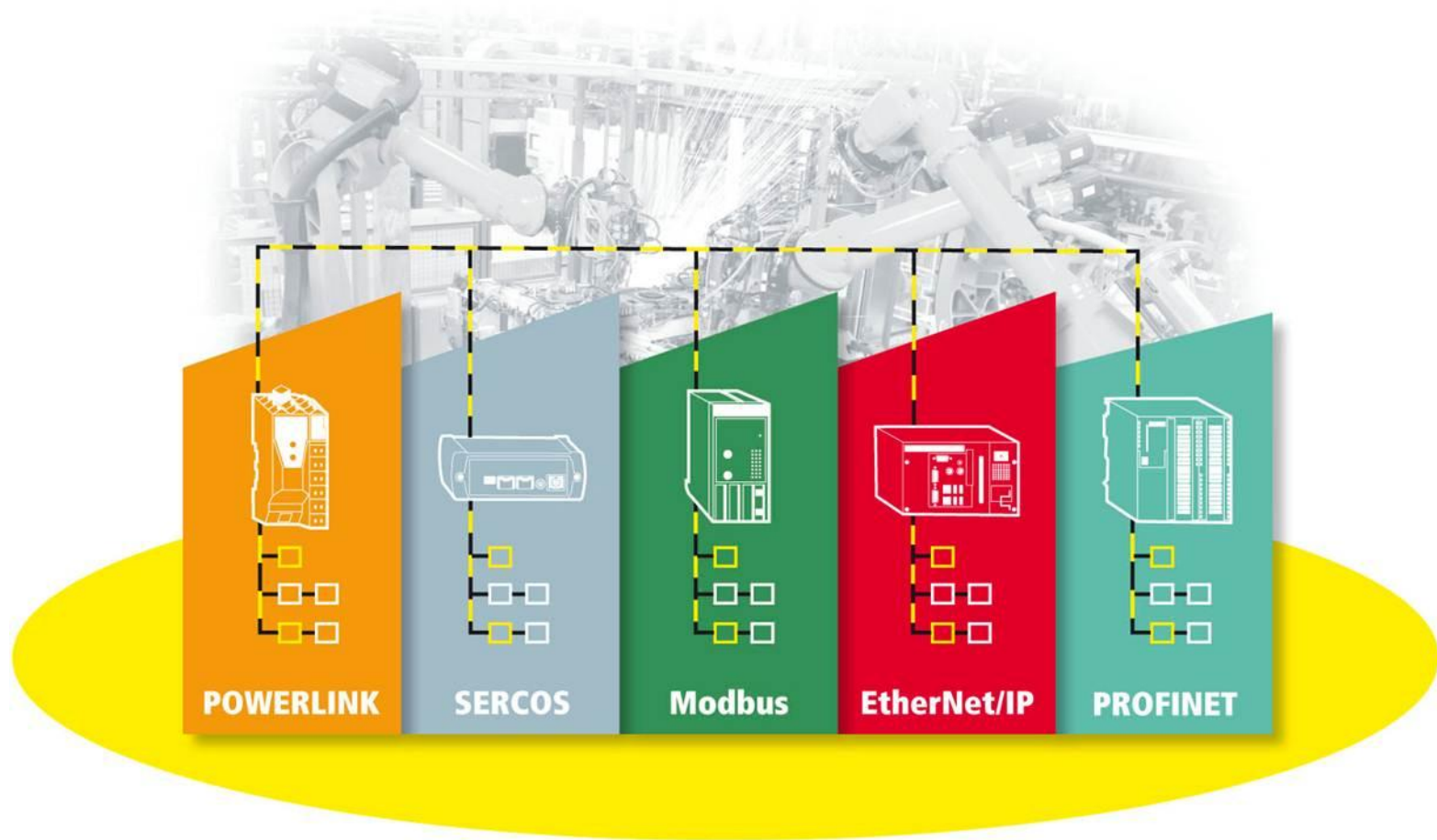
BRÜCKNER

The logo graphic for Brückner, consisting of a series of vertical bars of varying heights and widths, arranged in a row.

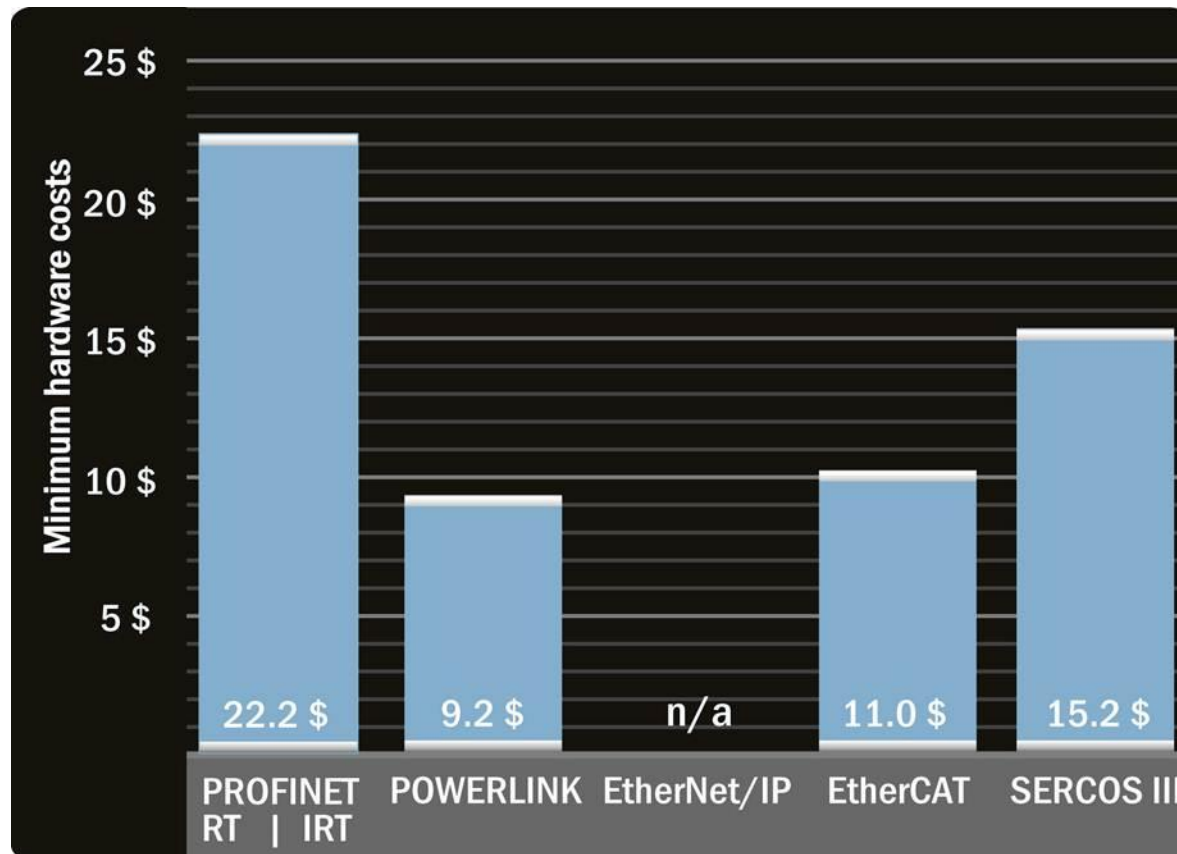
- Ring Redundanz
- Medien Redundanz
- Redundanter Master
- Keine Stillstandszeiten



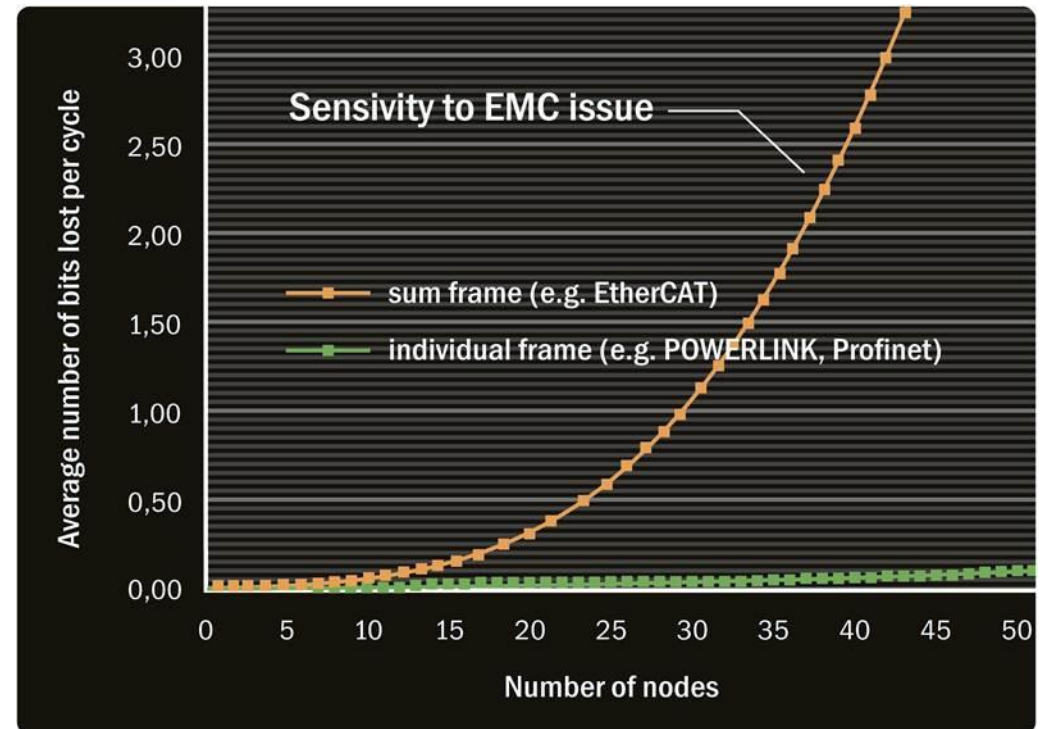
- Ein Safety Standard unabhängig vom Bussystem



- Reduzierte Total Cost of Ownership
 - Keine Lizenzen – Keine Patente
 - Kostenfreier Software Stack – Minimale Hardwarekosten



- Moderne Maschinen bestehen aus diversen Hochleistungskomponenten
- POWERLINK ist extrem störsicher gegenüber elektromagnetischen Einflüssen



- OEM
 - Hohe Performance
 - Offene Technologie
 - Einfache Integration und Diagnose

- Endkunden
 - Kostenreduzierung
 - Gesteigerte Produktivität
 - Reduzierte Stillstandszeiten

- Hersteller von Komponenten
 - Zugang zum größten Markt
 - Keine spezielle Hardware notwendig
 - Training und weltweiter Support

- Vergleich der 5 wesentlichen Systeme
- Download: <http://www.ethernet-powerlink.org/>

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INDUSTRIAL ETHERNET FACTS

SYSTEM COMPARISON

The 5 Major Technologies

PROFINET, POWERLINK, EtherNet/IP, EtherCAT, SERCOS III
How the Systems Work

The User Organizations
A Look behind the Scenes

Investment Viability and Performance
Everything You Need to Know?

Systems Roundup: The 5 Major Contenders

INDUSTRIAL ETHERNET FACTS

Communication architecture of the systems

Others	PROFINET RT / IRT	POWERLINK	EtherNet/IP	EtherCAT	SERCOS III
Supports broadcast	+	+	+	+	+
Supports multicast	+	+	+	+	+

Direct cross-traffic:
Direct cross-traffic provides crucial benefits particularly in case of very demanding real-time requirements: for fast drive controllers, axes can be synchronized easily and with extreme precision, since all position values can be distributed directly without having to go through a Master. That results in lower network load and also ensures that data (e.g. actual angle positions of axes) is available to all relevant nodes within the current cycle. On the other hand, if data must pass through a Master first, it is not only delayed by one cycle, but overall data traffic on the network is increased as well.

Others	PROFINET RT / IRT	POWERLINK	EtherNet/IP	EtherCAT	SERCOS III
Direct cross-traffic	+	+	+	+	+

With POWERLINK and SERCOS III, direct cross-traffic is a feature even for modules with exclusive slave functionality, while EtherNet/IP requires a module with summer functionality.

Heavy data to traffic:
In applications involving a large volume of process data, the time for passing through the nodes greatly impacts the overall cycle time. Data prioritization, on the other hand, enables lower cycle times. Systems that support prioritization mechanisms allow for sending high-priority data more per cycle, and putting less data with a lower priority only every n-th cycle.

Others	PROFINET RT / IRT	POWERLINK	EtherNet/IP	EtherCAT	SERCOS III
Prioritization	+	+	+	+	+

For POWERLINK, EtherNet/IP and PROFINET, variable cycle times have been firmly established in the previous specifications. SERCOS III has only recently added this feature. For EtherCAT, solutions within a specific application area are generally feasible as well.

Network load for Safety communication
Safety over Ethernet is based on a cyclic exchange of protected data between Safety nodes (emergency stop switches, drives with Safety controllers). The safeguarded procedures in this process involve data duplication and wrapping data in safe containers, which increases data rates on the network. Solutions using the summation frame method will see the frame count go up, whereas the single frame method will increase the volume of data in each of the frames that are due to be sent anyway. All in all, the theoretically superior performance of the summation frame method is canceled out.

Others	PROFINET RT / IRT	POWERLINK	EtherNet/IP	EtherCAT	SERCOS III
Safe	+	+	+	+	+

Actual cycle time
In solutions using the summation frame method, data must pass through each controller twice. If a signal has to go through many nodes, total transfer time will rise considerably as it makes its way. Raw performance data cited by the organizations supporting such solutions has to be adjusted to account for this effect. Another aspect to consider is that performance depends on implementation specifics, e.g. task classes, in the actual control systems used for an application.

Others	PROFINET RT / IRT	POWERLINK	EtherNet/IP	EtherCAT	SERCOS III
Performance	+	+	+	+	+

jitter
It is crucial for control quality on a network to ensure minimal jitter (clock deviation) and to determine signal delays very precisely. Network nodes must be synchronized as exactly as possible to this end. Competing Ethernet variants employ different mechanisms to achieve that goal. While EtherCAT uses the principle of distributed clocks, synchronization is accomplished via a simple sync signal (SDC) in POWERLINK networks.

Others	PROFINET RT / IRT	POWERLINK	EtherNet/IP	EtherCAT	SERCOS III
Jitter	+	+	+	+	+

EtherCAT, POWERLINK and SERCOS III give users a system with almost no jitter (<100 ns) at all times. On EtherNet/IP networks, jitter can be considerably reduced with special IEEE 1588 extensions in all components. Reduced jitter can also be achieved in PROFINET IRT applications.

ETHERNET 
POWERLINK
Standardization Group

www.ethernet-powerlink.org/



www.linkedin.com/groups?about=&gid=2331103



**Vielen Dank für Ihre
Aufmerksamkeit**