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**Choose certainty.  
Add value.**

## **TÜV SÜD Embedded Systems**

### **Real time enhancements in bridged IEEE 802 LANs Symposium and Discussion**

**Dr. Kai Strübbe, Head of Embedded Systems  
Dr. Karl Weber, Principal Expert Smart Grid  
TÜV SÜD AG  
Munich, 17 January 2012**

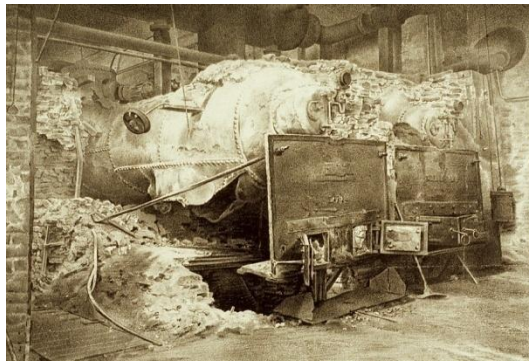
# Some words about TÜV-SÜD



Over 140 years of TÜV SÜD

On 6 January 1866, 21 operators and owners of steam boilers established a Mannheim-based steam-boiler inspection association, operating under the name of "Gesellschaft zur Überwachung und Versicherung von Dampfkesseln mit dem Sitz in Mannheim".

The aim of this private-sector regulatory initiative was to protect people and property against the risks emanating from a new, largely unknown form of technology.

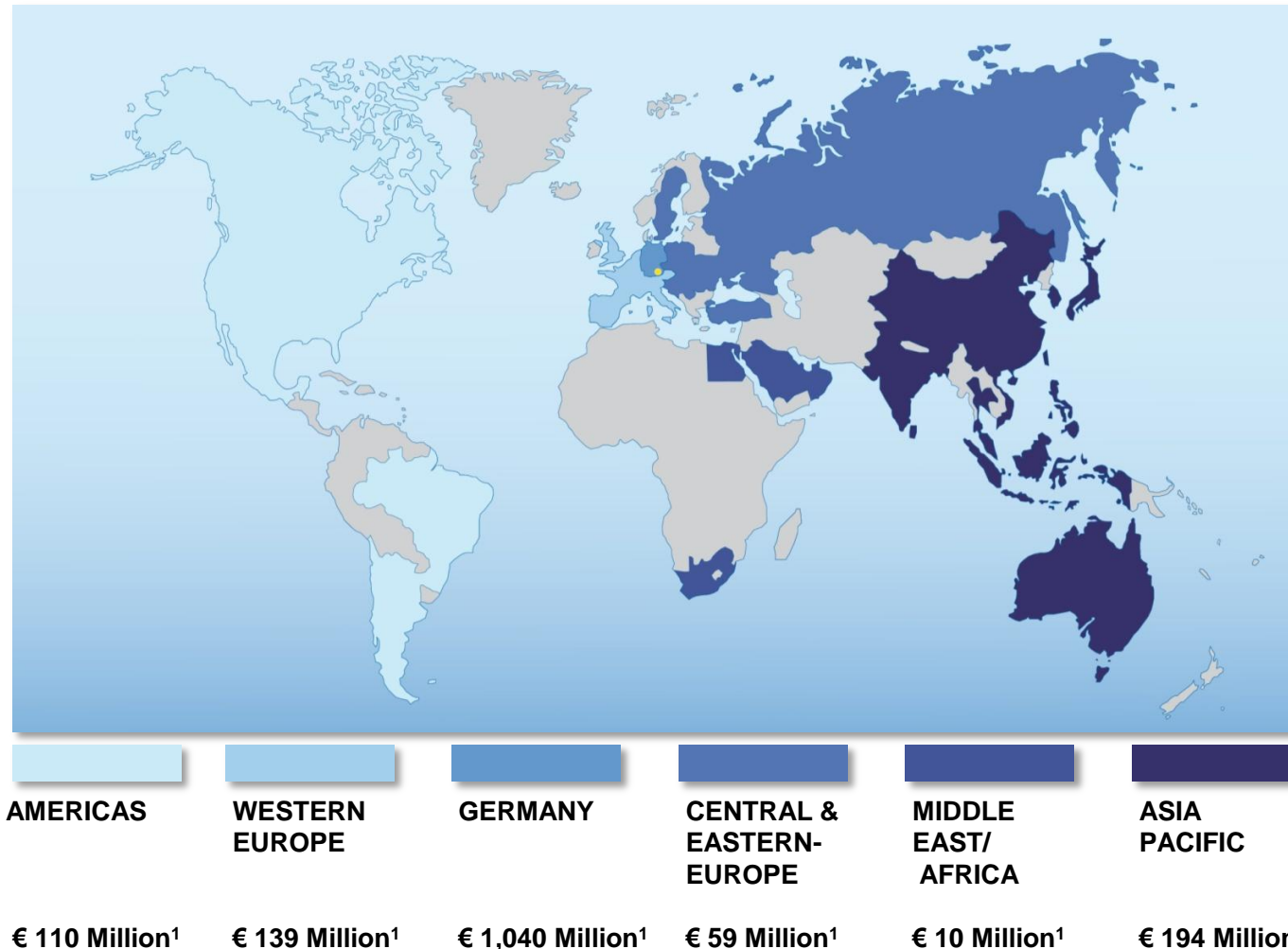


§. 1.  
Der Zweck des Vereins ist die möglichste Verhütung von Kessel-Explosionen durch periodische Untersuchungen, Einführung aller gegenwärtigen und künftigen Verbesserungen im rationellen Betriebe der Dampfmaschinen, in Feuerungsanlagen, Ersparniß von Brennmaterial, Anstellung von Indicator-Versuchen an Dampfmaschinen u. s. w., kurz, Garantie für die Mitglieder des Vereins, daß alle Fortschritte der Technik in Erzeugung und Benutzung des Dampfes ihnen zu Gut kommen werden.

# TÜV SÜD supports your organization in the world



## TÜV SÜD Global Business



- **Technical Services**
- Success in the market for over **140 years**
- Headquarters: **Munich (Germany)**
- About **600 locations** worldwide
- **16,000 experts**
- Turnover 2010: **€ 1,552 million**
- **Regions:** Americas, Western Europe, Germany, Central and Eastern Europe, Middle East / Africa, Asia Pacific

<sup>1</sup> Sales revenue in 2010

# Several Embedded Systems accidents in the US market



Accidents and risks in the automated world of USA

Industry, economy and society face new technological challenges in an **automated and connected world**:

- **Sustainable energy supply** (e.g. Renewables)
- **IT Security in industrial automation** (e.g. Stuxnet)
- **Data Protection** (e.g. payment cards, SONY)
- **Home automation** (e.g. routers and gateways)
- **Traceability of goods** (e.g. confidentiality of data)
- **Complexity** (e.g. virtual power plants)
- **Logistics** (e.g. control systems in rail transports)



## Another Stuxnet from the "Stars"?

April 25, 2011 Paolo Passeri

1 comment

According to [Jerusalem Post](#), Iran has been targeted by a Second Cyber Attack after Stuxnet. The new malware has been dubbed Stars, and, according to Iran officials, has been intercepted before it could make further damages.



## Challenges of Embedded Systems



Issues of this automated and connected world are no longer only functional safety but also:

- **Interoperability**

because of increased quantity, complexity and differences in services and communication policies (e.g. IP based vs. Outstation protocols)

- **IT security**

because the web of things will become established and connected with the internet; with new participants requiring new and different aspects for data protection, privacy and manipulation prevention

# Smart Grid is the talk of the town

**Wenn Deutschland so weiter macht,  
gehen bald die Lichter aus!**

*The lights went off, if Germany continues  
in the same way. Bild, 26-Nov-2011*

**Smart grid will eclipse size of  
Internet**

Cisco, May 2009



## Coming along with renewable energy



**Why ?**

**For what?**

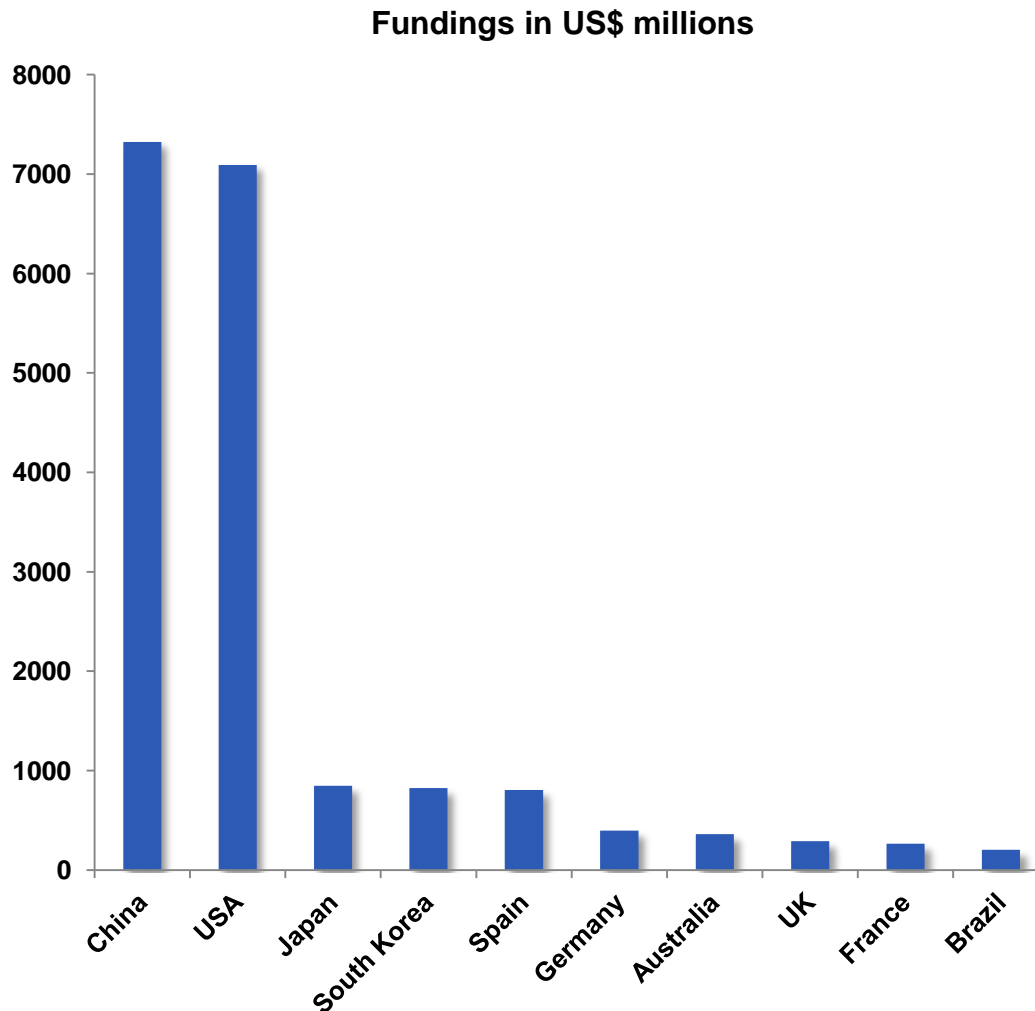
A Smart Grid makes use of communications **and** power electronics to create a system that is:

- Self healing and Adaptive
- Interactive with consumers and markets
- Optimized to make best use of resources and equipment
- Predictive rather than reactive to prevent emergencies
- Distributed (even across geographical and organizational boundaries)
- Integrated, merging monitoring, control, protection, maintenance, EMS, DMS, marketing and IT
- More secure from attack

# Top 10 Smart Grid Countries: China, Japan, Korea



## Top 10 Smart Grid Stimulus Investments by Country, 2010

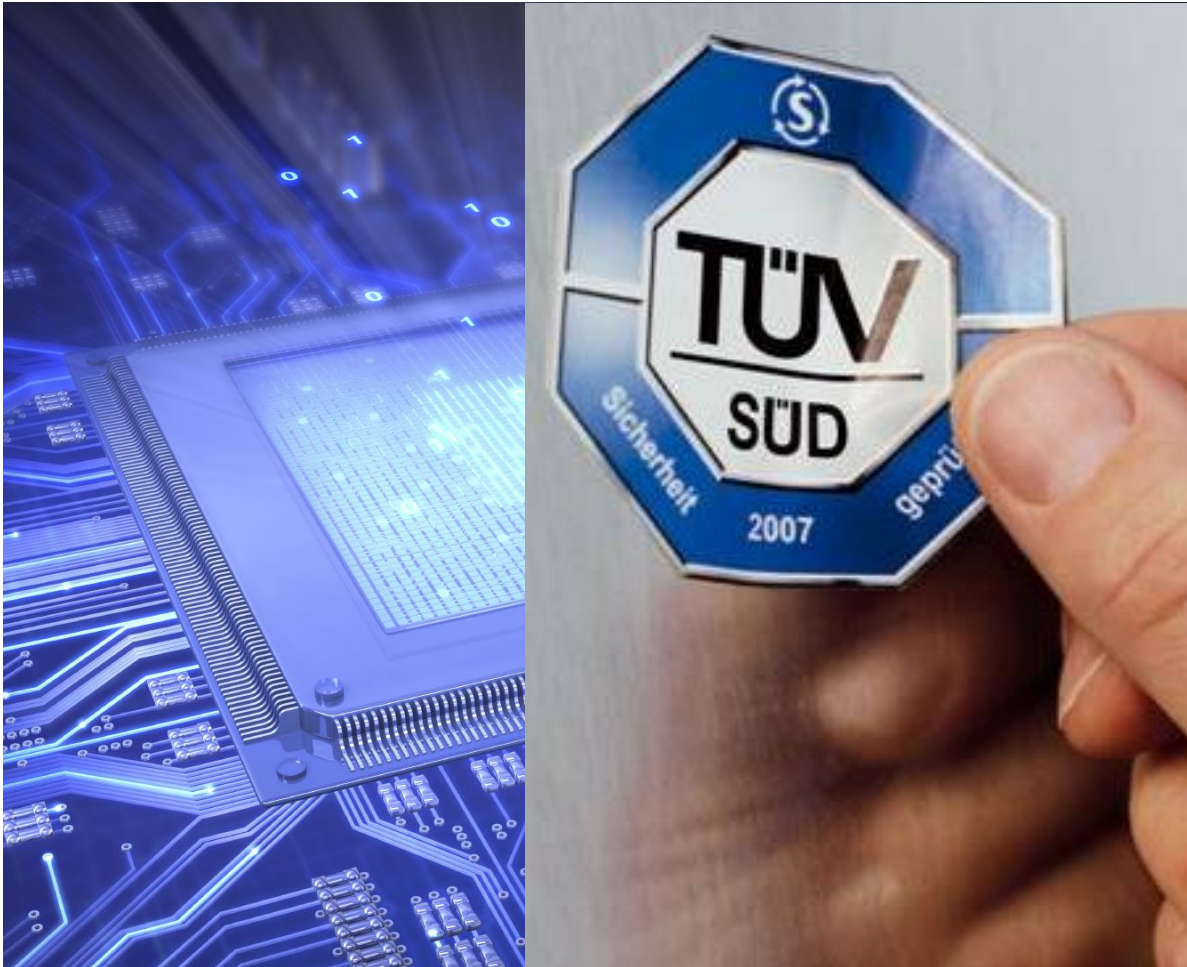


- China will be the **top-spending market** overtaking the US from around 2016
- According to a Bloomberg report (May, 2009), it's estimated that China will need to spend as much as **\$10 billion a year through 2020** to build a modern grid
- China's plans for wide-scale smart meter deployment will see it install over **360 million smart meters by 2030**
- Smart Grid investments will touch **\$99 billion in China and \$7.18 billion in South Korea** over the next decade
- **Japan and India** are also expected to launch pilot smart grid programs this year
- India has plans for over **130 million smart meters**

# Our Embedded Systems Business Approach



TÜV SÜD Embedded Systems



- Interdisciplinary specialist pools
- Cross-industry services
- Global services for all industries
- Our octagon as a symbol of safety, quality and "add-value" services
- CTCT (end to end)



## TÜV SÜD ES Products

- IEC 61850 conformance testing
- IEC 61850 interoperability testing
- IEC 61850 conformance certification
- Consulting and Training for Energy Grid Integration
- Risk analysis and RSA
- Virtual Power Plants

### Performance



- Industrial IT Security
- IT Security in transportation
- IT Security and data protection in Smart Metering
- Certification of Smart Mobile Apps

### IT Security



- Assessment and Certification of Functional Safety (IEC 61508) of grid devices

### Functional Safety



## Target groups

- Devices manufacturers and grid operators
- Electric Power Consumers, Electric Power Producers, Local Electric Power Providers

- Industrial plant operators, chemical, oil and gas industry
- Local and regional mobility operators, rail companies and rail operators
- Manufacturers of smart meters, local public energy utilities
- Smart Apps developers and vendors

- Devices manufacturers, system integrators, plant operators

# Conformance and Test



The IEC 61850 is the communication standard for the SmartGrid (extending IEEE802.1 bridging for critical applications).



The quality aspects of robust communication are the key focus in conformance testing.



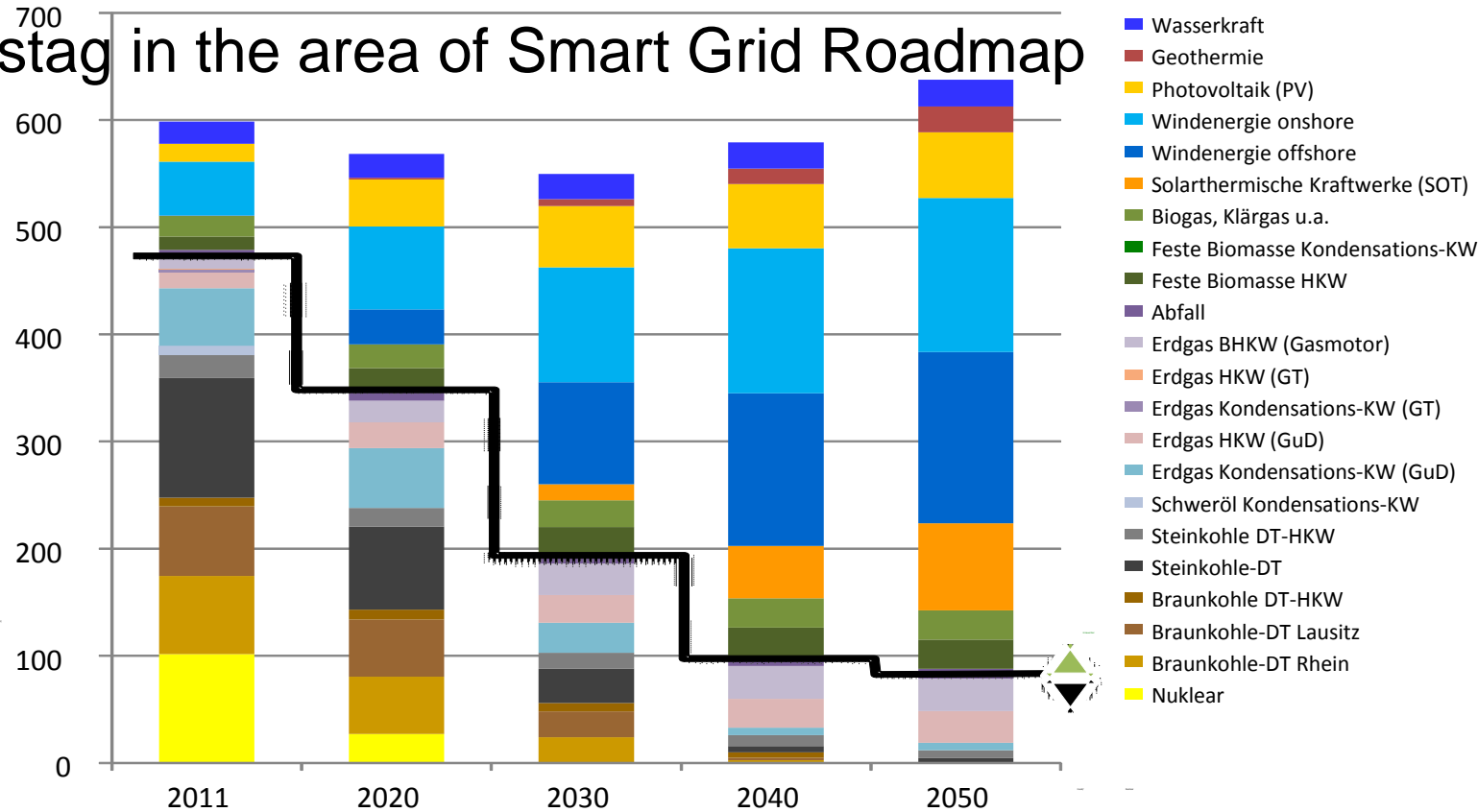
Synchronization and seamless redundancy features required for a smarter grid.



A common communication infrastructure with embedded real time and a common test policy can enhance the acceptance of smart grid



## Technical Experts at Office of Technology Assessment at the German Bundestag in the area of Smart Grid Roadmap



Training for efficient use of IEEE 802.1 networks to enable smart grid up to the end customer



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Add value.**

# **Welcome in Munich, Bavaria!**

**TÜV SÜD Embedded Systems Partner – Karl Weber**

**Challenges of future real time communication –**

**Various branches are seeking for**

**... a single Standard that can connect all devices involved**



# Challenges of a real time communication development **DESD**



- **DESD** (UNESCO Decade of Education of Sustainable Development)  
(„sustainable“ introduced by Hans Carl v. Carlowitz in 1713 „Sylvicultura oeconomica“)
- If we have to teach sustainable development we need examples:  
How can we do the sustainable development  
in regards to real time communication?
  - ➔ Emerging sustainable technologies require the communication „glue“
    - ➔ Live science, Energy, Healthcare, Mobility, Production
  - ➔ IEEE 802 has the chance to define „sustainable communication (SC)“  
which is...

The provision of a system wide infrastructure

Application oriented bridging various technologies together

A stable foundation for decades

Open for future enhancements

Efficient with short reactions

Robust and easy to handle

# Way to a common real time communication

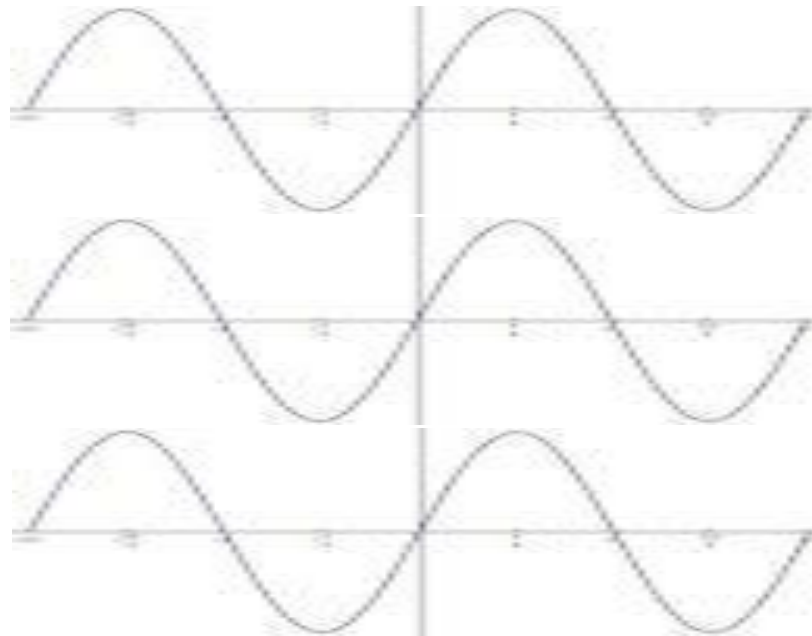


- Existing infrastructure has its benefits; shall not be replaced!
- Enhanced systems with real time capabilities shall be supported in a wide range and not just single functions
- Isochronous operation of different entities is a key technology
  - ➔ higher synchronization precision BEYOND 1 microsec
  - ➔ sync harmonization / improvement of quality control needed

Device 1

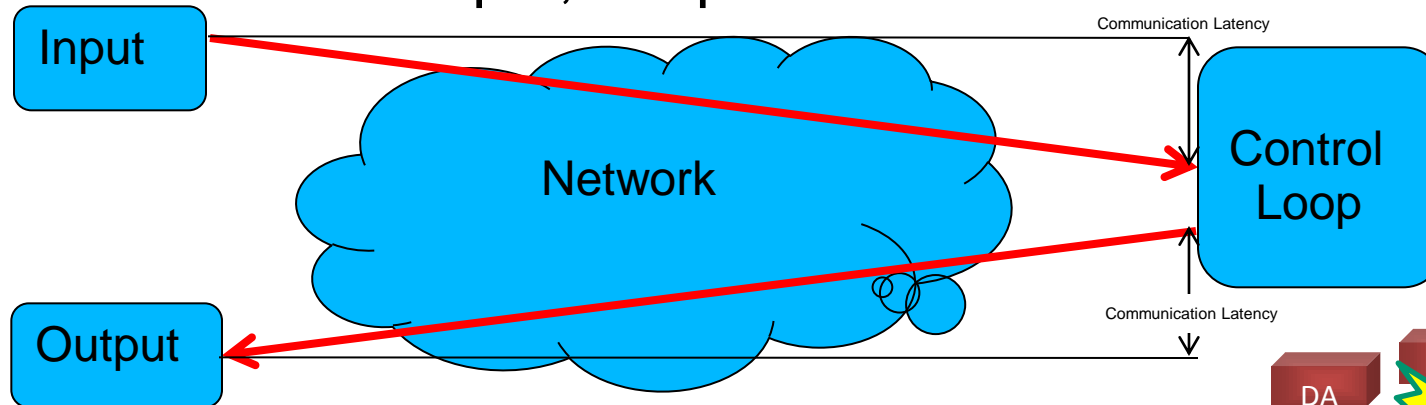
Device 2

Device 3



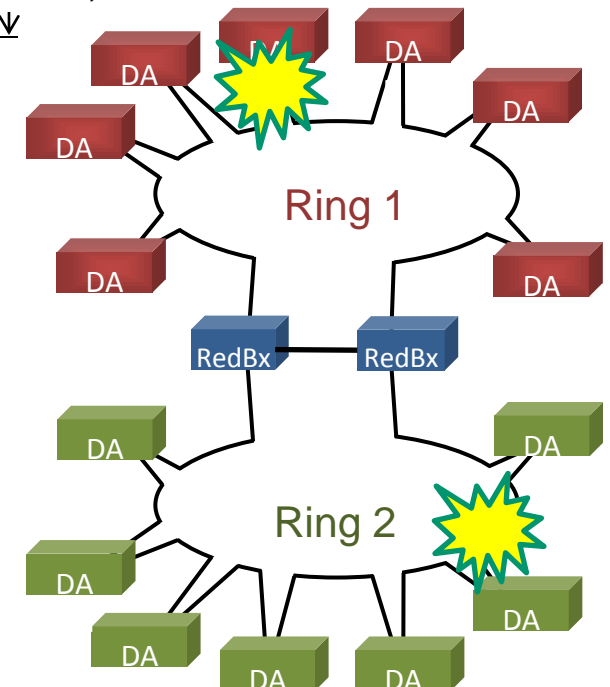
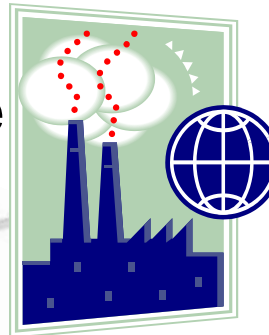
# Real time communication features

- Reaction time in 10's of micro-seconds required in some areas
  - ➔ depends on application - infrastructure delay close to 0
  - ➔ fast but not stupid, RT path selection shall avoid overload



- Robust communication can deal with
  - ➔ permanent failure of a link or a node
  - ➔ transient errors in the infrastructure
  - ➔ critical load situations

- Plug and Play and enhance without disruption with little handling effort needed with enhanced security





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# **Your expertise needed!**

**Help to make RT communication  
the standard way of interaction in  
the automation networks.**



We are pleased to help you – do not hesitate to contact us

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