

## Smart Grid and Interoperability Standards

### IEC 61850 Lite Implementation – Low cost microcontroller chip with IEC 61850 (IEC 61400-25) and IEC 61131-3

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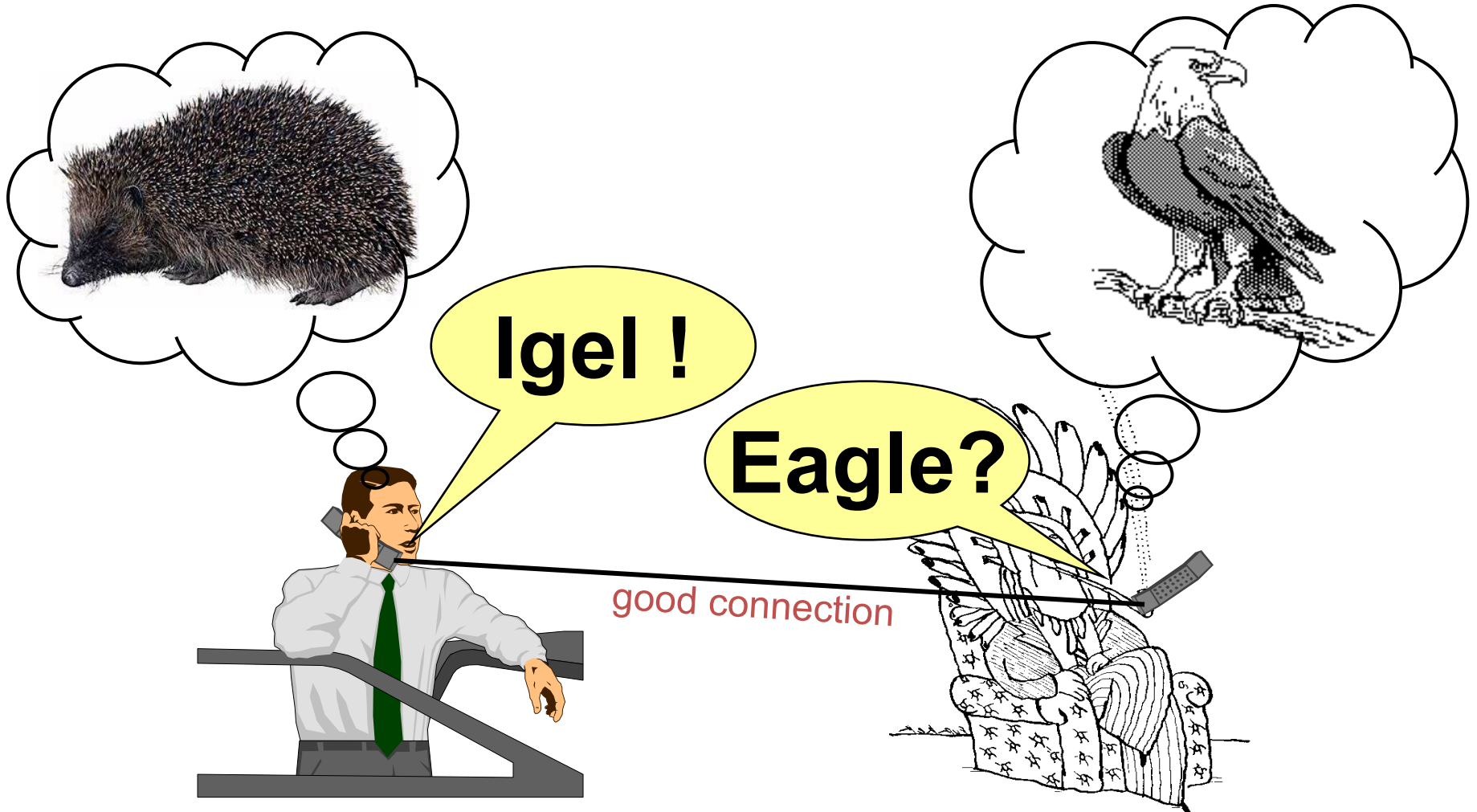
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- IEC 61850 Lite implementation (general)
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# What is IEC 61850 all about?

1. ITC
2. ITC
3. ITC
4. Teamwork
5. See number 1.

# What is IEC 61850 all about?



German speaking

# What is IEC 61850 all about?

## Standard Logical Node Class **MMXU**

**400.000 Volt**

A	Phase currents
<b>PhV</b>	<b>Phase to ground voltage</b>
<b>PhV.PhsA</b>	
<b>PhV.PhsB</b>	
...	
PPV	Phase to phase voltage
W	Phase active power
VAr	Phase reactive power
VA	Phase apparent power
TotW	Total active power
TotVAr	Total reactive power
TotVA	Total apparent power
Hz	Frequency

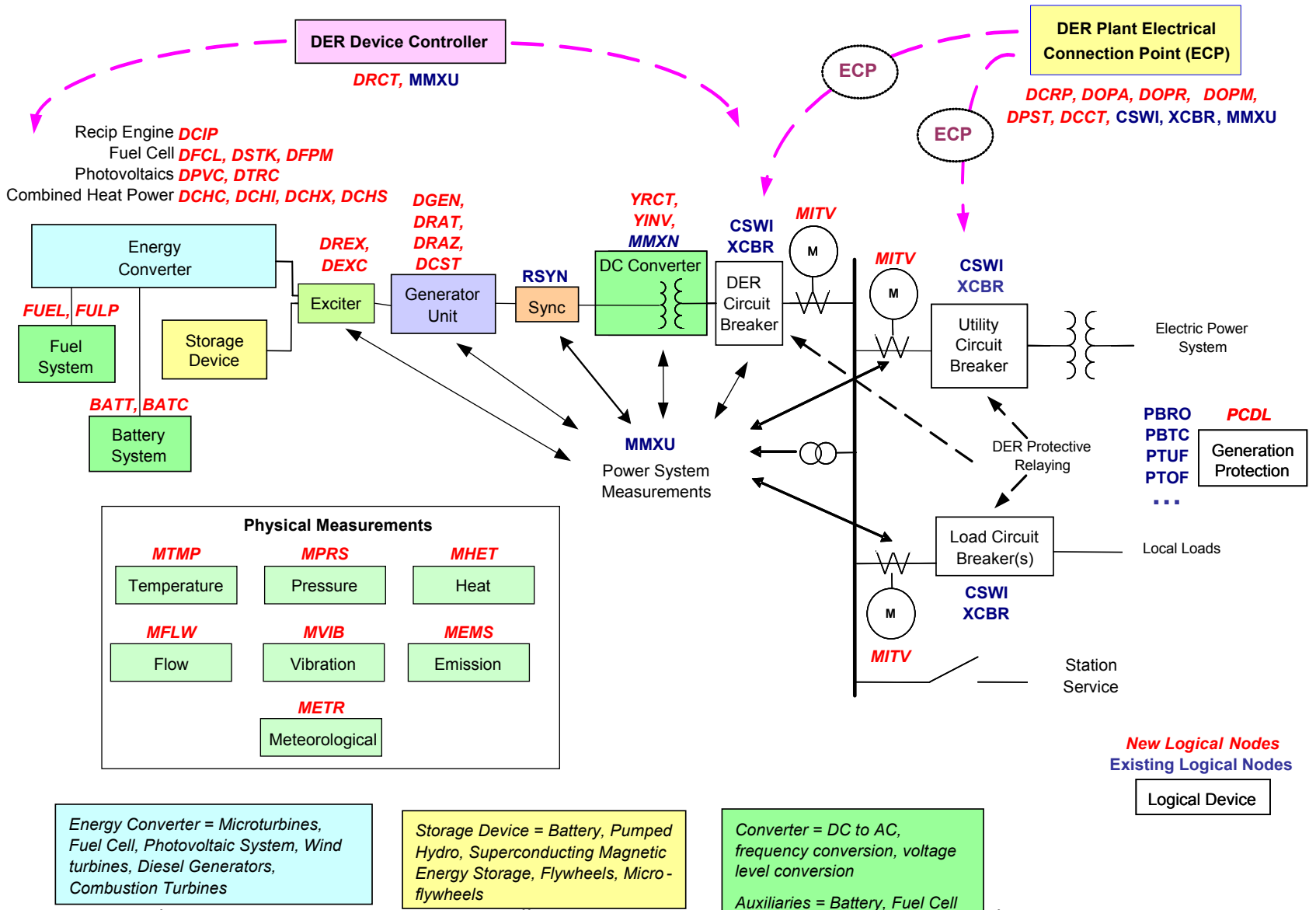


**400 Volt**



**What's the difference?  
... don't touch the line to figure it out!!**

# What is IEC 61850 all about?

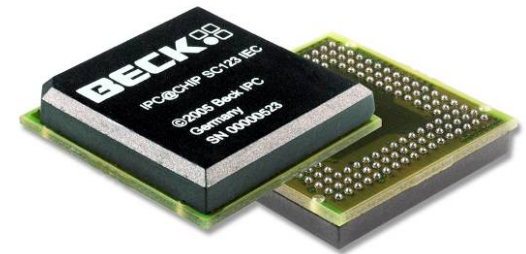


# Motivation for IEC 61850 Lite implementation

- First Implementations of IEC 61850 for **High Voltage Substations** (quite expensive, too complex, too ...)
- Mainly **two vendors** of Stack Software
- Need **simple API** (Appl. Progr. IF) for small devices
- **Reduce cost for devices** in Power Generation, Distribution, Smart Grids, ...
- **Hide details** of MMS and IEC 61850
- Get a **fast start** with **low cost** and **low risk**
- **Easy to configure** devices with SCL (System Configuration Language)

# IEC 61850 Lite implementation (general)

- SystemCorp (Perth, Western Australia) developed a complete IEC 61850 Stack from Scratch since 2007
- Main Objectives:
  - Provide **very simple API** to Application
  - Port stack to **micro-controller** (first: Beck IEC61850@Chip)
  - Run software on **many platforms**
  - **Configure Stack with SCL**
  - Provide **free software** for **getting started and evaluation**



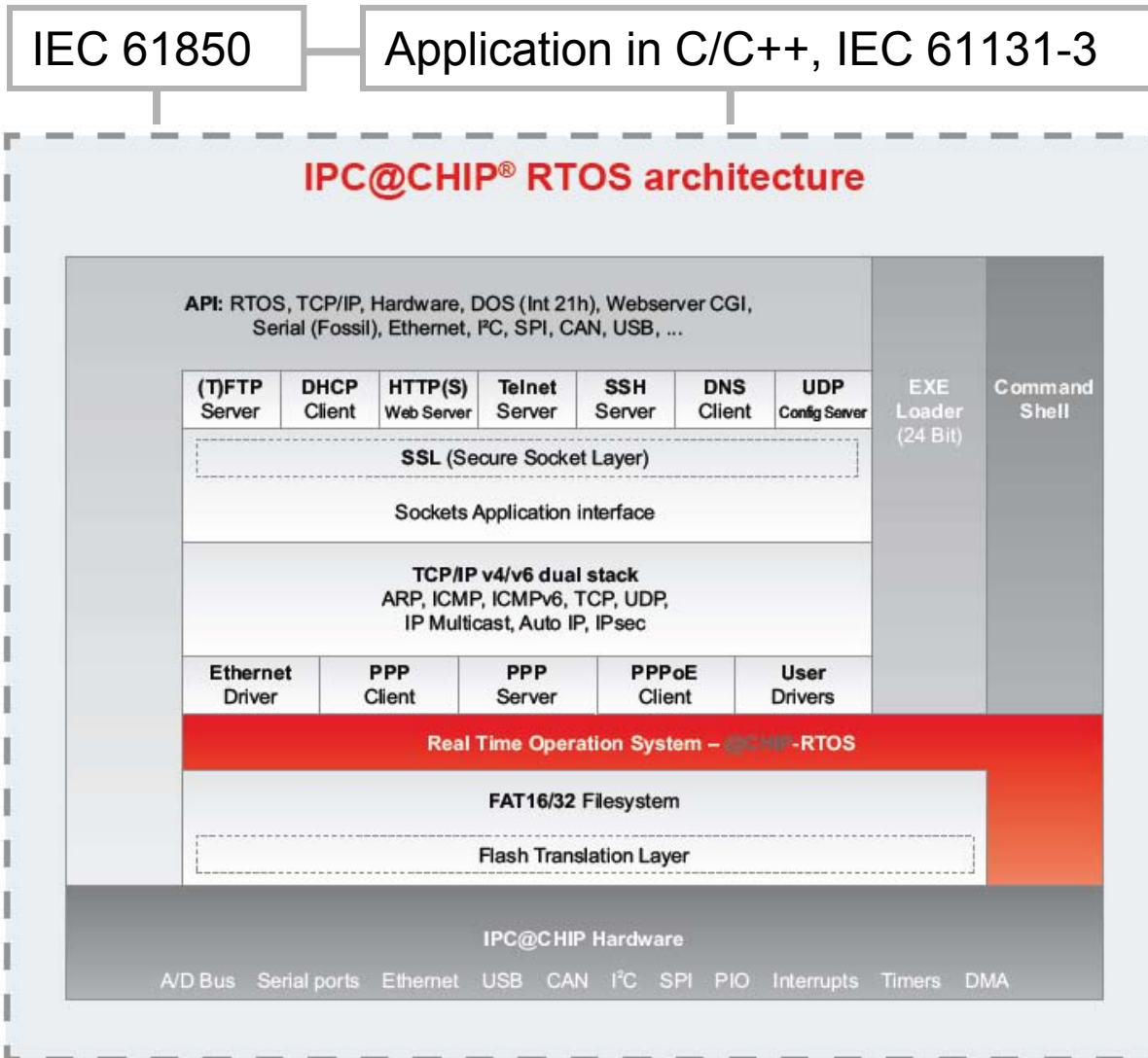


# API: Client/Server and Object Management

No	API	Purpose
1	IEC61850_Create	API to create a client or server object with call-backs for reading, writing and updating data objects
2	IEC61850_LoadSCLFile	API to read the SCD XML data to get the configuration of server or client
3	IEC61850_Start	API to start the server or client
4	IEC61850_Stop	API to stop the server or client
5	IEC61850_Free	API to delete a client or server object created

No	API	Purpose
1	<b>IEC61850_Read</b>	Read the value of a specified data attribute
2	<b>IEC61850_Write</b>	Write the value to a specified data attribute
3	<b>IEC61850_Update</b>	Update the value of a specified data attribute

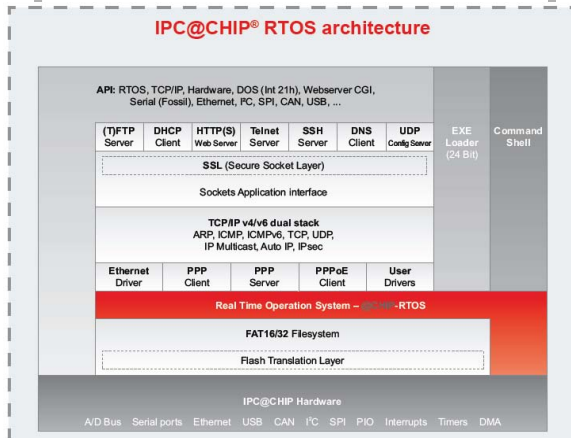
# IEC61850@Chip (Beck IPC)



# IEC61850@Chip (Beck IPC)

IEC 61850

Application in C/C++, IEC 61131-3



SC2x

Flexible, simple and powerful



SC1x3

Maximum functionality in a minimum of space



SC2x3

Maximum performance for demanding automation tasks.

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Innovative Smart Grid Technologies Europe

Karlheinz Schwarz, NettedAutomation; 2010-10-11

Wireless LAN



Bluetooth



GSM/GPRS



Graphic



IEC 61131-3

CoDeSys

EtherCAT

EtherCAT Technology Group

M2M Communication



Fieldbus



Drivers for DNP3, 101/104, Modbus, ... are available from SystemCorp

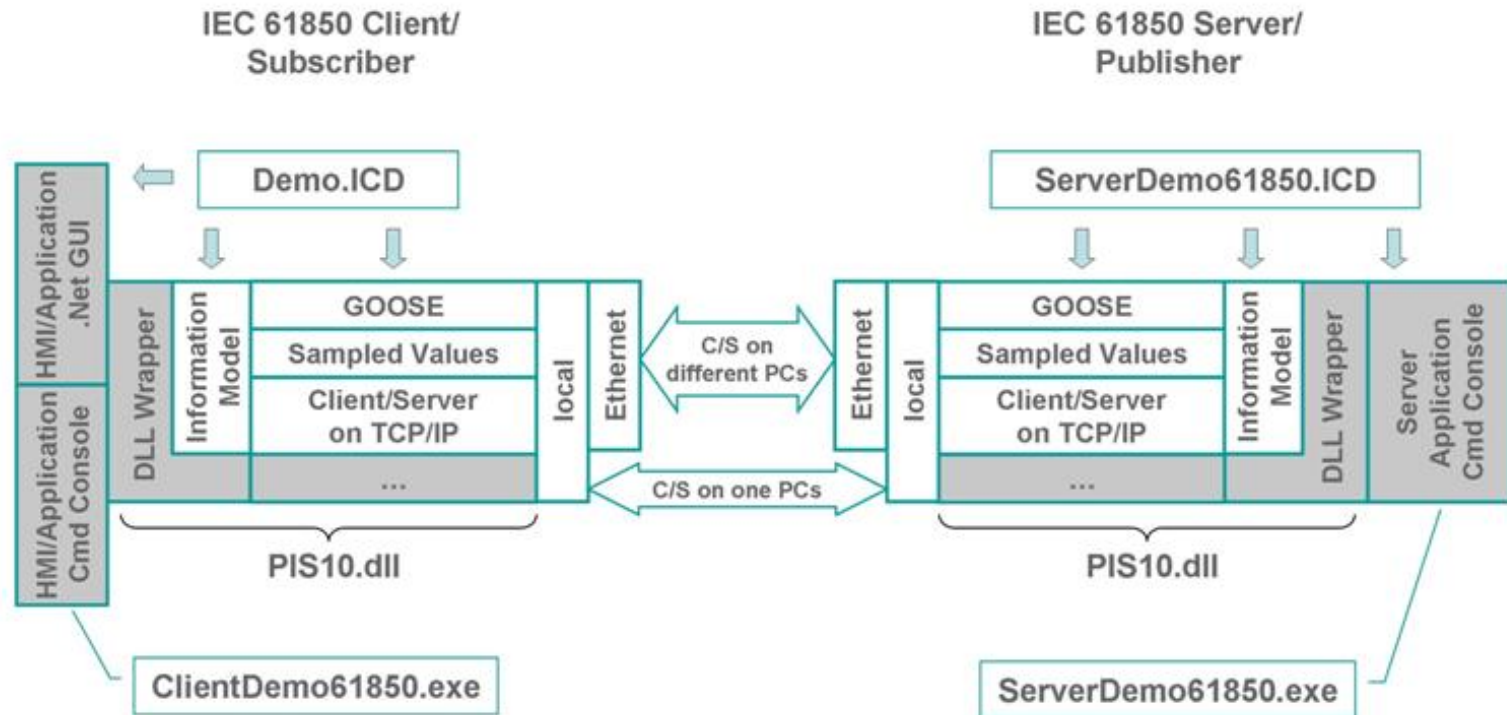
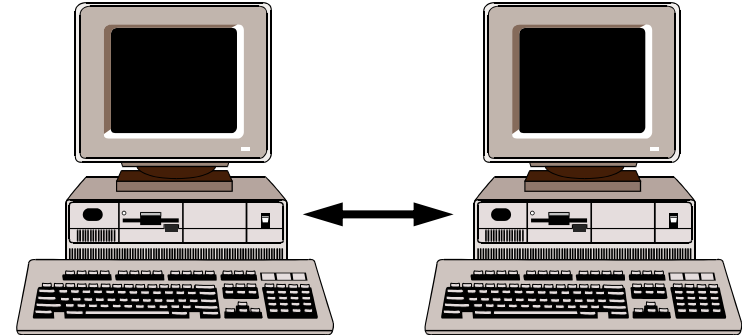
# Chip Development Kit DK61 (Beck IPC)

- Hardware
- C/C++ Compiler
- CoDeSys (IEC 61131-3)
- IEC 61850 Stack (SystemCorp):
  - Client/Server
  - Publisher/Subscriber
- Application examples
- 2 x Ethernet
- Serial
- CAN bus
- ...



# Free DLL Evaluation/Starter Kit (SystemCorp)

- IEC 61850 Stack (SystemCorp):
  - Client/Server/Pub/Sub (in DLL)
  - Same API as on Beck-IPC-Chip
- Application examples in C/C++ and C# (incl. Source Code)



# Useful links

- General
  - [www.systemcorp.com.au](http://www.systemcorp.com.au)
  - [www.beck-ipc.com](http://www.beck-ipc.com)
  - [blog.iec61850.com](http://blog.iec61850.com)
  - [www.nettedautomation.com/seminars](http://www.nettedautomation.com/seminars)
- Free IEC 61850 DLL Evaluation/Starter Kit Download
  - [www.nettedautomation.com/iec61850li/dll](http://www.nettedautomation.com/iec61850li/dll)

# Questions?

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