

# KNX and IP







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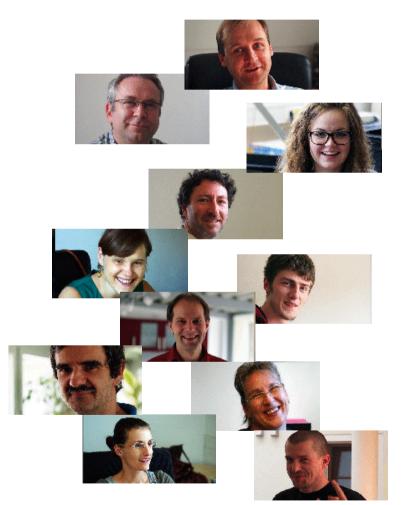
## Agenda

- Introduction
- IP as media for KNX
- KNXnet/IP
- **Network Basics**
- **Devices overview** 
  - IP Interface 730
  - Interface Function with the ETS
  - IP Router 750
  - Routing Table
  - Installation of the KNX/IP-Router
  - IP BAOS 771 / 772
    - IP Interface 740 wireless
    - IP Linemaster 760
- **Example of an Installation**
- Remote Control
- Starting / Troubleshooting
- Future Prospects



## About us

- Founded in 2001
- Management
  - Dr.-Ing. Th. Weinzierl, CEO
- 20+ Employees
  - 10 Developers
  - Quality management
    - ISO9001
  - **Own office building**





## Where to find us

- Burgkirchen an der Alz
- Germany
  - **South-East of Bavaria**
  - About 100 km East from Munich
  - About 50 km North from Salzburg





## Focus: KNX

- 15+ years of experience
- Shareholder in KNX Association cvbl
- Active in the KNX System Group
  - **Complete support of the KNX Standard** 
    - Technology
    - Solutions
    - Products
    - Accredited KNX Test Lab





#### Services

#### Consulting Development

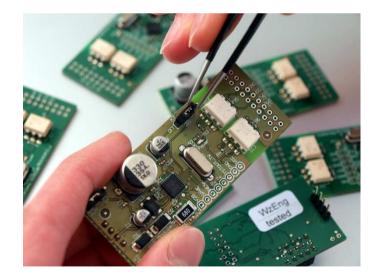
- Hardware
  - Firmware
    - For 8, 16 and 32 Bit Micros
- Software
  - For Windows and Linux

#### Testing

- EMC, CE
- KNX accredited Test Lab
  - System Software
  - Interworking

#### Production

- With external partners





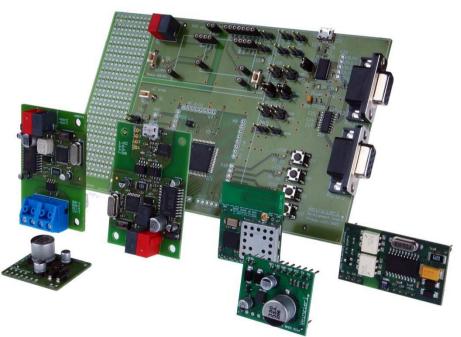
## **KNX Modules**

#### **KNX Transceiver Modules**

- KNX TinySerial 810
- Frontends for KNX-RF

## KNX BAOS Modules with certified Stack

– KNX BAOS 820 (TP)
– KNX BAOS 822 (TP)
– KNX BAOS 2830 (RF)

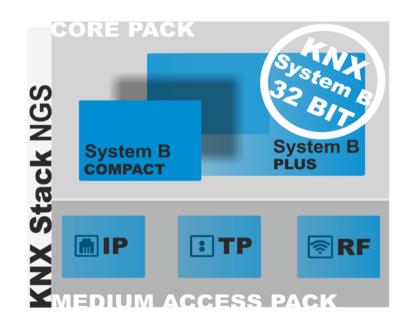




## **KNX Stack Implementation NGS**

- Professional solution for high volume products
  - Modular
    - Twisted Pair TP
    - Radio Frequency RF
    - Ethernet / KNXnet/IP
  - Scalable
    - Compact
    - Plus

#### Development HW Tools





## **KNX Development Tools**

#### Net'n Node

Bus Monitor and Analyzer

#### TraceMon

Optimized debug support

#### kScript

- Model driven design
  - Script based system
  - Automated generation of
    - **ETS** product entries

#### **kDrive** SDK

- For tool development
- Bus access and services
- Free and commercial versions



## **kScript**

**k**Drive



## **KNX** Devices

#### KNX IP

- Router, Interfaces
  KNX USB
  - Interfaces TP/RF
  - **KNX** Gateways
    - EnOcean - RS-485







## **IP as Media for KNX**

#### **IP: Internet Protocol**

- Widespread basis for communication applications
  - Data exchange
  - Email
  - Telephone (VoIP)

# Media Ethernet commonly available in buildings

Reduction of the installation effort

- **Connection to the Internet** 
  - Available almost everywhere



## **IP as Media for KNX**

#### Usage as Interface

- Access from every point in the network possible
- Access is also possible via the internet
- Alternative for RS232 / USB interface

-> KNXnet/IP *Tunnelling* 

#### Usage as fast backbone

Replacement of line-/area coupler through IP Router

-> KNXnet/IP *Routing* 

**Clarification with example (topology)** 



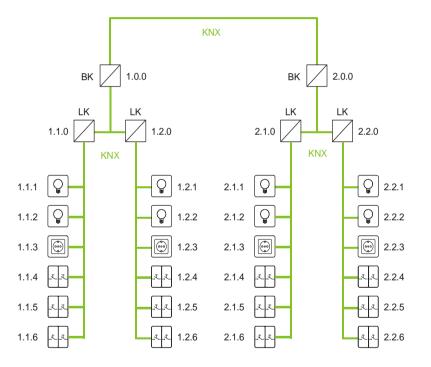
## **KNX-Topology**

#### **Common Installation**

- Usage of
  - Line couplers
  - Area couplers

#### **Problem: Backbone**

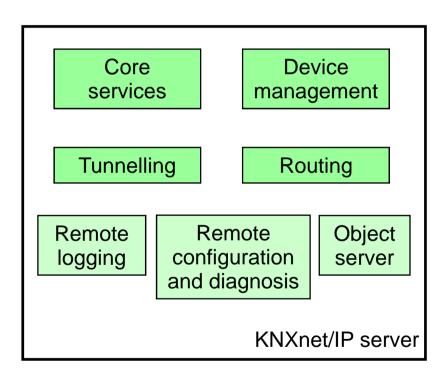
- Routing for Visualisation
- Central function
- Slow
- Telegram loss possible
- **Solution: KNX/IP-Router**





## **KNXnet/IP Requirements**

Finding and discovering of KNXnet/IP-Devices
Core services
Configuration of KNXnet/IP-Devices
Device management
Bus access (ETS)
Tunneling
Line / Area Coupling
Routing



#### Part of the KNX Standard!



## **Network Basics / Media**

#### 10Base-T

- IEEE802.3i
- Twisted Pair (CAT-3)
- Length per segment: 100m

#### 100Base-TX

- IEEE8002.3u
  - Twisted Pair (CAT-5)
  - Length per segment: 100m

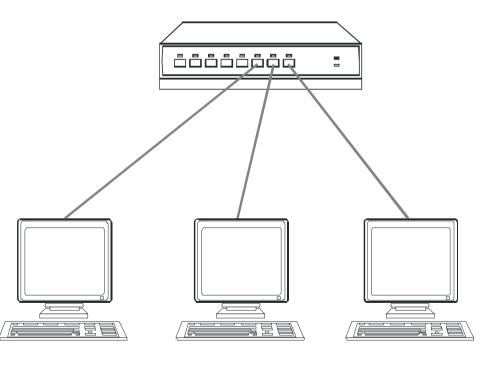




## **Network Basics / Topology**

#### Star

- Connection of the segments to:
  - Hub
  - Switch





#### Addressing of a Device in the Network

- MAC-Address (Media Access Control)
  - Unique in the World
  - Unchangeable (fixed to the Hardware)
  - Length 6 Bytes
  - Syntax: 00-50-C2-55-40-00

#### **IP-Address (Internet Protocol)**

- Awarded by the Administrator
- Length 4 Bytes (IPv4)
- Syntax: 192.168.1.1
- Subnetworks



- IP-Addressing
  Splitting to Subnetworks
  Splitting of the IP-Address to
  - Net-ID
  - Host-ID

IP-Address: Host-ID: 192.168.1.25 0.0.0.25



#### Subnetworks

- Usage of personal IP-Addresses
  - Are not used in public
  - Class B: 172.16.0.0 to 172.31.255.255
  - Class C: 192.168.0.0 to 192.168.255.255

#### **Gateway-IP-Address**

 When a user is beyond the Subnetwork, it's necessary to have a gateway.

-> Remote access



#### Multicast-Addressing

- One transmitter multiple receivers
- IP-Address area:
  - 224.0.0.0 to 239.255.255.255
- Reserved for KNXnet/IP:
  - 224.0.23.12

#### **Multicast MAC**

- 23 Bits of the IP-Address are mapped on 01-00-5E-00-00-00
- Example: 224.0.23.12
  - MAC: 01-00-5E-00-17-0C



## **Network Basics / Port**

- Address element (Transport Layer)
  - Assignment to corresponding Service (in Application Layer)
  - Length 2 Bytes

#### **Reserved Ports**

- 21 FTP Data Transferring
- 80 HTTP Webserver
  - 110 POP3 Access to Email-Server
- 3671 KNXnet/IP Building Information

#### **Dynamic Ports**

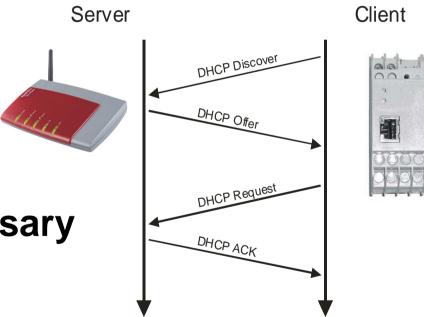
- Variable usable
- Not fixed to an application
- Interval from 49152 to 65535





## **Network Basics / DHCP**

- Dynamic Host Configuration Protocol
- **Central placing of** 
  - IP-Address
  - Subnetwork
  - Gateway-IP-Address
  - **DHCP-Server** necessary
    - Contained in common
    - DSL-Routers





## **Network Requirements**

**TP-Cable (at least CAT-3) with RJ-45-connector** 

#### Free Bandwidth

Hardly ever critical

#### Multicast

Port

3671

- Routing of Multicast-Telegrams
  - Multicast-IP-Address
    - 224.0.23.12
    - Probably more



#### **Overview: our KNX IP Devices**

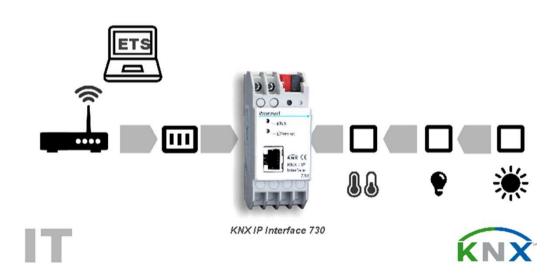




## **KNX IP Interface 730**

# Interface to KNX (Tunneling) e.g. for the ETS







## **KNX IP 730: Parameter - General**

#### Device Name

- Identification of the KNX/IP-Interface
- e.g. "first floor"

#### IP-Address assignment – manual – automatical (DHCP)

General	Device name	KNX IP Interface 730
IP-Configuration 1	Device hame	Kink IP Interface 750
IP-Configuration 2	Ip Address assignment	manual



## **KNX IP 730: Parameter - General**

#### IP-Address

 IP-Address of the KNX/IP-Interface

Device: 1.1.1 KNX IP Interface 730			
General	IP-Address		
IP-Configuration 1			
IP-Configuration 2	Byte 1	192	
	Byte 2	168	
	Byte 3	1	
	Byte 4	35	
Device objects / Parameters / Commi	ssioning /		



## **KNX IP 730: Parameter - General**

#### **IP-Subnetwork**

- For decisions about Destination Address
  - Communication
     Partner
  - Gateway

#### IP-Gateway-Address

- For external communication

General	IP-Subnet		
IP-Configuration 1 IP-Configuration 2	Byte 1	255	-
	Byte 2	255	
	Byte 3	255	
	Byte 4	0	
	IP-Gateway Address		
	Byte 1	0	
	Byte 2	0	
	Byte 3	Ö	
	Byte 4	0	



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## **Usage as Interface (ETS)**

- Interface to KNX
- Replacement for an USB / RS232 Interface
- Usage of Tunnelling (KNXnet/IP)
- **Point-to-point-Connection**
- Accessible by every PC in the network
- Minimum ETS 3.0c required
- **Group monitor / Bus monitor**

855:	Data poi	nt type: Rav	(one byte or m	ora) 💌 Valu	. 0								
				ule) • valu	ie: U		C Send	cyclically	/ Delay time[sec]:	0	Write	Read	R
	Service	Flags Pri	o Source.adr	Dest.adr	Rout	Туре	DPT	Info					
01-18 17:22:51.80	0 Start							Record	ing was started, Ho	ost=Florian-P	C, Connection	=USB, Mod	de=l
1-18 17:22:53.96	5 from bus	Lov	v 1.1.30	0/0/1	6	Write	Raw (up to 6 bit)	501					
1-18 17:22:54:42	5 from bus	Loy	v 1.1.30	0/0/1	6	Write	Raw (up to 6 bit)	500					
1-18 17:22:54.79	3 from bus	Low	v 1.1.30	0/0/1	6	Write	Raw (up to 6 bit)	501					
1-18 17:22:55.14	1 from bus	Lov	1.1.30	0/0/1	6	Write	Raw (up to 6 bit)	\$00					
	)1-18 17:22:53.96 )1-18 17:22:54.42 )1-18 17:22:54.79	11-18 17:22:51.800 Start 11-18 17:22:53.965 from bus 11-18 17:22:54.425 from bus 11-18 17:22:54.793 from bus 11-18 17:22:55.141 from bus	11-18         17:22:53.965         from bus         Low           11-18         17:22:54.425         from bus         Low           11-18         17:22:54.793         from bus         Low	1-18 17/22:53.965 from bus Low 11.30 11-18 17/22:54.425 from bus Low 11.30 11-18 17/22:54.793 from bus Low 11.30	11-18 17:22:53 965 from bus Low 11.30 0/0/1 11-18 17:22:54 425 from bus Low 11.30 0/0/1 11-18 17:22:54.793 from bus Low 11.30 0/0/1	11-18 17:22:53.965 from bus         Low         11.30         0/0/1         6           11-18 17:22:54.425 from bus         Low         11.30         0/0/1         6           11-18 17:22:54.793 from bus         Low         11.30         0/0/1         6	11-18 17:22:53.965 from bus Low 11.30 0/0/1 6 Write 11-18 17:22:54.425 from bus Low 1.1.30 0/0/1 6 Write 11-18 17:22:54.793 from bus Low 11.30 0/0/1 6 Write	11-18 17-22:53.965 from bus Low 1.1.30 0/0/1 6 Write Raw (up to 6 bit) 11-18 17-22:54.425 from bus Low 1.1.30 0/0/1 6 Write Raw (up to 6 bit) 11-18 17:22:54.793 from bus Low 1.1.30 0/0/1 6 Write Raw (up to 6 bit)	N1-18 17:22:53.965 from bus         Low         11.30         0/0/1         6         Write         Raw (up to 6 bit)         501           11-18 17:22:54.425 from bus         Low         11.30         0/0/1         6         Write         Raw (up to 6 bit)         500           11-18 17:22:54.793 from bus         Low         11.30         0/0/1         6         Write         Raw (up to 6 bit)         501	11-18 17-22:53.965 from bus         Low         11.30         0/0/1         6         Write         Raw (up to 6 bit) \$01           11-18 17:22:54.425 from bus         Low         11.30         0/0/1         6         Write         Raw (up to 6 bit) \$00           11-18 17:22:54.793 from bus         Low         11.30         0/0/1         6         Write         Raw (up to 6 bit) \$00           11-18 17:22:54.793 from bus         Low         11.30         0/0/1         6         Write         Raw (up to 6 bit) \$01	11-18 17:22:53.965 from bus Low 11.30 0/0/1 6 Write Raw (up to 6 bit) \$01 11-18 17:22:54.425 from bus Low 11.30 0/0/1 6 Write Raw (up to 6 bit) \$00 11-18 17:22:54.793 from bus Low 11.30 0/0/1 6 Write Raw (up to 6 bit) \$01	11-18 17:22:53.965 from bus Low 11.30 0/0/1 6 Write Raw (up to 6 bit) 501 11-18 17:22:54.425 from bus Low 11.30 0/0/1 6 Write Raw (up to 6 bit) 500 11-18 17:22:54.793 from bus Low 11.30 0/0/1 6 Write Raw (up to 6 bit) 501	11-18 17:22:53.965 from bus Low 1.1.30 0/0/1 6 Write Raw (up to 6 bit) \$01 11-18 17:22:54.425 from bus Low 1.1.30 0/0/1 6 Write Raw (up to 6 bit) \$00 11-18 17:22:54.793 from bus Low 1.1.30 0/0/1 6 Write Raw (up to 6 bit) \$01



## **Usage as Interface (ETS)**

- Parameterising of the network options
  Settings: Communication
  - Automatic search of all available interfaces
  - Choose the desired interface
     (Settings -> Communication)

	Configured connections	
	👃 KNX IP BAOS 771 - 192.168.142 (IP)	
	👼 KNXnet/IP Routing - Intel(R) 82562V-2 10/100-Netzwerkverbindung - 224.0.23.12 (IP-Routing)	
	🕹 KNXnet/IP Tunnelling - 192.168.1.220 (IP)	
	Individual address: 15.15.250 IP address: 192.168.1.220	Test Select Local settings
	RS.232 FT1.2 (FT1.2 on COM1)	
1	RS.232 Standard (COM1)	
è	🕰 USB (USB)	
ŝ.,	🚓 USB UP (USB)	
1		



## **Usage as Interface (ETS)**

#### Choice of the 2. individual Address

- Is used for bus connection
- Has to be configured manually
- Saved in the Device
- Must not already be in use
- Has to fit topologically

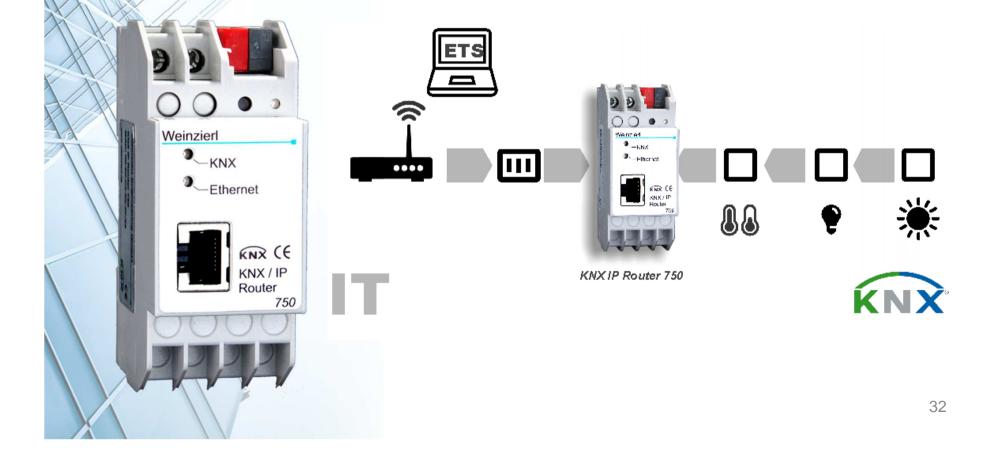
4 Local Interface Settin	ngs	X
Local interface settings	5	
Mask version:	\$091A	
Individual Address:	1.1.255	Address free?
		<u>QK</u> <u>Cancel</u>



## **KNX IP Router 750**

Interface to KNX (Tunneling), e.g. for the ETS

Line coupler functionality (Routing)





## **KNX IP 750: Parameter - General**

#### Device Name

Identification of the KNX/IP-Router

• e.g. "first floor"

#### Monitoring of bus voltage

#### **IP-Address** assignment

– manual

- automatical (DHCP)

General	Device name	KNX IP Router 750
P-Configuration 1	Device hand	
touting (KNX -> IP)	Monitoring of bus voltage	enable 🔹
touting (IP -> KNX)		
Group telegrams 16 to 31 (IP -> KNX)	IP-Address Assignment	automatic (DHCP) 🔹



## KNX IP 750: Parameter – IP Config.

#### IP Routing Multicast Address

Used for Routing-Telegrams

#### IP-Address

- IP-Address of the KNX/IP-Router
- Used for Tunnelling-Telegrams

General	IP Routing Multicast addresse		
IP-Configuration 1			0
IP-Configuration 2	Byte 1	224	
Routing (KNX -> IP)			
Routing (IP -> KNX)	Byte 2	0	
Group telegrams 16 to 31 (IP -> KNX)			
	Byte 3	23	
	Byte 4	12	
	IP-Address		
	Byte 1	0	
	Byte 2	0	
	Byte 3	0	
	Byte 4	0	



## KNX IP 750: Parameter – IP Config.

#### IP-Subnetwork

- For decisions about Destination Address
  - Communication Partner
  - Gateway

#### IP-Gateway-Address

 For external communication

General IP-Configuration 1	IP-Subnet		
IP-Configuration 2	Byte 1	0	
Routing (KNX -> IP) Routing (IP -> KNX)	Byte 2	D	-
Group telegrams 16 to 31 (IP -> KNX)	Byte 3	0	-
	Byte 4	0	
	IP-Gateway address		
	Byte 1	0	
	Byte 2	D	
	Byte 3	0	
	Byte 4	0	



## **KNX IP 750: Parameter – Routing**

#### Group Telegrams

- (Main Groups 0 to 13)
  - Block
  - Route
  - Filter

#### **Group Telegrams**

(Main Groups 14 and 15)

- Block
- Route

#### **Group Telegrams**

- (Main Groups 16 to 31)
  - Block
  - Route (next page)

Routing (KNX -> IP)	Routing (KNX >> IP)         Group telegrams (main groups 16 to 31)         Froute         Froute           Routing (IP -> KNX)         Group telegrams (main groups 16 to 31)         block         •           Group telegrams 16 to 31 (IP -> KNX)         Individual addressed telegrams         route         •           Broadcast telegrams         route         •         •           Acknowledge (ACK) of group telegrams         only if routed         •	General IP-Configuration 1	Group telegrams (main groups 0 to 13)	filter	•
Bouting (K0X -> IP)         Group telegrams (main groups 16 to 31)         block:         •           Group telegrams 16 to 31 (IP -> KNX)         Individual addressed telegrams         route         •           Broadcast telegrams         Routing (ACK) of group telegrams         route         •           Acknowledge (ACK) of group telegrams         only if routed         •	Bouting (K0X -> IP)         Group telegrams (main groups 16 to 31)         block         •           Group telegrams 16 to 31 (IP -> KNX)         Individual addressed telegrams         route         •           Broadcast telegrams         Routing (ACK) of group telegrams         route         •           Acknowledge (ACK) of group telegrams         only if routed         •	IP-Configuration 2	Group telegrams (main groups 14 and 15)	route	•
Group telegrams 16 to 31 (IP -> KNX) Individual addressed telegrams Broadcast telegrams Acknowledge (ACK) of group telegrams Acknowledge (ACK) of individual addressed only if routed  Acknowledge (ACK) of individual addressed only if routed	Group telegrams 16 to 31 (IP -> KNX) Individual addressed telegrams Froute Froute Froute Acknowledge (ACK) of group telegrams Acknowledge (ACK) of individual addressed only if routed	Routing (KNX -> IP)			
Individual addressed telegrams route   Broadcast telegrams route  Acknowledge (ACK) of group telegrams only if routed  Acknowledge (ACK) of individual addressed only if routed	Individual addressed telegrams route   Broadcast telegrams route  Acknowledge (ACK) of group telegrams only if routed  Acknowledge (ACK) of individual addressed only if routed	Routing (IP -> KNX)	Group telegrams (main groups 16 to 31)	block	•
Acknowledge (ACK) of group telegrams only if routed   Acknowledge (ACK) of individual addressed only if routed	Acknowledge (ACK) of group telegrams only if routed   Acknowledge (ACK) of individual addressed only if routed	Group telegrams 16 to 31 (IP -> KNX)		route	•
Acknowledge (ACK) of individual addressed only if routed	Acknowledge (ACK) of individual addressed only if routed		Broadcast telegrams	route	•
			Acknowledge (ACK) of group telegrams	only if routed	•
				only if routed	•



# Individual addressed Telegrams

- Block
- Route
- Filter
- Broadcast Telegrams
  - BlockRoute

General	Group telegrams (main groups 0 to 13)	filter	•
IP-Configuration 1			
IP-Configuration 2	Group telegrams (main groups 14 and 15)	route	•
Routing (KNX -> IP)			
Routing (IP -> KNX)	Group telegrams (main groups 16 to 31)	block	•
Group telegrams 16 to 31 (IP -> KNX)	Individual addressed telegrams	route	•
	Broadcast telegrams	route	•
	Acknowledge (ACK) of group telegrams	only if routed	•
	Acknowledge (ACK) of individual addressed telegrams	only if routed	•



### Acknowledge of group telegrams

- Always
- Only if routed

### Acknowledge of individual addressed telegrams

- - Only if routed
- Always
- Answer using NACK

-Configuration 2         Group telegrams (main groups 14 and 15)         route <ul> <li>route</li> <li>group telegrams (main groups 16 to 31)</li> <li>block</li> <li>block</li> </ul>	neral -Configuration 1	Group telegrams (main groups 0 to 13)	filter	•
Isouting (IP -> KNX)     Group telegrams (main groups 16 to 31)     block <ul> <li>Individual addressed telegrams</li> <li>Broadcast telegrams</li> <li>Individual addressed telegrams</li></ul>	P-Configuration 2	Group telegrams (main groups 14 and 15)	route	•
Group telegrams 16 to 31 (IP -> KNX) Individual addressed telegrams Broadcast telegrams Individual addressed telegrams Indiv	(WOMEN THE REPORT OF THE PARTY	Group telegrams (main groups 16 to 31)	block	
Broadcast telegrams route				
Acknowledge (ACK) of group telegrams only if routed		Broadcast telegrams		•
		Acknowledge (ACK) of group telegrams	only if routed	•
Acknowledge (ACK) of individual addressed only if routed			only if routed	*



### Group telegrams (main groups 16 to 31)

- Enable
- Disable

### **Paired routing**

- Reserved Addresses
  - Only for special applications (e.g. Easy)
  - Not available in ETS

Device: 1.1.0 KNX IP Router 750		
General IP-Configuration 1	Group telegrams (main group 16 and 17)	enable 🔹
IP-Configuration 2 Routing (KNX -> IP)	Group telegrams (main group 18 and 19)	enable •
Group telegrams 16 to 31 (KNX -> IP) Routing (IP -> KNX)	Group telegrams (main group 20 and 21)	enable •
Group telegrams 16 to 31 (IP -> KNX)	Group telegrams (main group 22 and 23)	enable •
	Group telegrams (main group 24 and 25)	enable •
	Group telegrams (main group 26 and 27)	enable •
	Group telegrams (main group 28 and 29) Group telegrams (main group 30 and 31)	enable 🔹
	Group talograms (main group so and s1)	enable •

Device objects / Parameters / Commissioning /



- Group telegrams (main groups 0 to 13)
  - Block
  - Route
  - Filter
  - Group telegrams (main groups 14 and 15)
    - Block
    - Route
- Group telegrams (main groups 16 to 31)
  - Block
  - Route (next page)

Routing (KNX -> IP)         Group talegrams (main groups 16 to 31)         Induce           Building (IP -> KNX)         Group talegrams (main groups 16 to 31)         block
Routing (IP -> KNX)         Group telegrams (main groups 16 to 31)         block           Individual addressed telegrams         filter
Individual addressed telegrams filter
Broadcast telegrams route
Repetition of group telegrams enable
Repetition of individual addressed telegrams enable
Repetition of broadcast telegrams enable



### Individual addressed Telegrams

- Block
- Route
- Filter

### **Broadcast Telegrams**

- Block - Route

eneral	Group telegrams (main groups 0 to 13)	filter	•
-Configuration 1		( the second sec	)
-Configuration 2	Group telegrams (main groups 14 and 15)	route	•
outing (KNX -> IP)			
outing (IP -> KNX)	Group telegrams (main groups 16 to 31)	block	•
	Individual addressed telegrams	filter	•
	Broadcast telegrams	route	•
	Repetition of group telegrams	enable	•
	Repetition of individual addressed telegrams	enable	•
	Repetition of broadcast telegrams	enable	•
		endule	



### **Repetition of Group telegrams**

- Block
- Enable

### Repetition of individual addressed telegrams

- Block
- Enable
- **Repetition of Broadcast-Telegrams** 
  - Block
  - Enable

General P-Configuration 1	Group telegrams (main groups 0 to 13)	filter	•
IP-Configuration 2 Routing (KNX -> IP)	Group telegrams (main groups 14 and 15)	route	•
Routing (IP -> KNX)	Group telegrams (main groups 16 to 31)	block	•
	Individual addressed telegrams	filter	•
	Broadcast telegrams	route	•
	Repetition of group telegrams	enable	•
	Repetition of individual addressed telegrams	enable	•
	Repetition of broadcast telegrams	enable	•



### Group telegrams (main groups 16 to 31)

- Enable
- Disable

### Paired routing Reserved Addresses

- Only for special applications (e.g. Easy)
- Not available in the ETS

General IP-Configuration 1	Group telegrams (main group 16 and 17)	enable	•
IP-Configuration 2	Group telegrams (main group 18 and 19)	enable	•
Routing (KNX -> IP) Routing (IP -> KNX)	Group telegrams (main group 20 and 21)	enable	•
Group telegrams 16 to 31 (IP -> KNX	) Group telegrams (main group 22 and 23)	enable	•
	Group telegrams (main group 24 and 25)	enable	•
	Group telegrams (main group 26 and 27)	enable	•
	Group telegrams (main group 28 and 29)	enable	•
	Group telegrams (main group 30 and 31)	enable	•

WEINZIERL

# **ETS – Filter Table**

- Reduction of telegram traffic
- Automatically created by ETS
  - **Preview function**



Topology 🔻			
🕂 Add Areas 👻 🏄 Del	ete 🛛 👫 New Dynami	c Folder	_
Im Topology     Dynamic Folders     Donamic Folders     Deschone-Bereich     10 Backbone-Bereich     11 Bereich (Koffer)     H 10 Hauptlinie     11.1 Power supply     11.10 KNX IP Power     11.10 KNX IP Power     11.12 Unany     C. Switch left     12 Switch - Cf     2 Switch - Cf     12 Loner S     12.2 Power     12.2 Novich - Cf     12.2 Novich	e Seite) unit N 125/01 (230 Edit Parameters Download Unload Info Reset Device Preview Filter Table Compare Device Transfer Parameters and I Unlink Add to Favorites Add to Favorites Add to Products Add to Products Add Delete Cut Copy Paste Special Paste	Number A Name (	Dbject Function Description



6

Informatio

▲ Properties

Number of devices: 4 Manual filter table entries

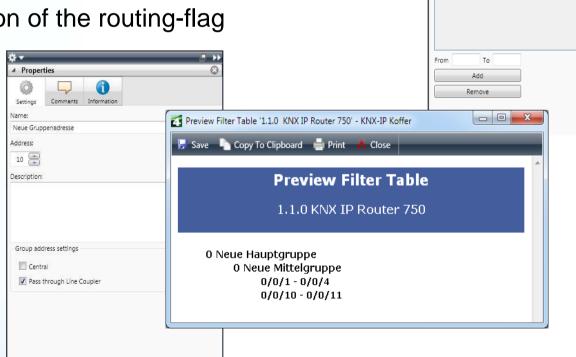
Settinas

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Comments

# **ETS – Filter Table**

- Manual assignment of Group addresses
  - Drag&Drop 1
  - Drag it to the corresponding line
    - Activation of the routing-flag





# Why use a Filter Table?

### Routing IP -> KNX (TP)

- From a faster network (10MBit/s) to a slower network (9600 Bit/s)
- Around 1000 times slower
- Filter table indispensable
- Buffering of telegram bursts
- KNX/IP-Router 150 buffers (FIFO)
- Approx. 3 second buffer
- Routing-Lost-Message

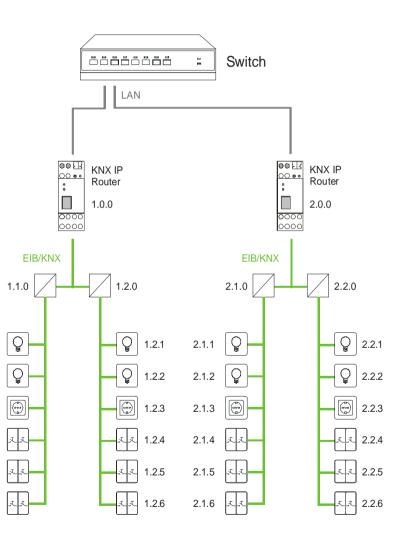




### **KNX/IP-Router as Area Coupler**

- Replacement of Area Couplers
  - Preservation of Line Couplers
  - Addressing:
    - x.0.0 (x: 1..15)

Warning: KNX/IP Router addresses must not conflict!

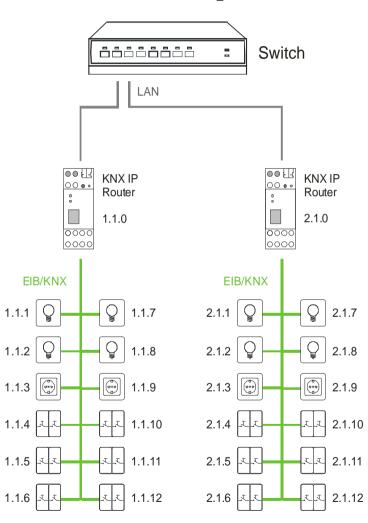




### **KNX/IP-Router as Line Coupler**

- Replacement of Line Couplers
- No Area Couplers essential
- Addressing:
  - x.y.0 (x, y: 1..15) – 225 Lines

Warning: KNX/IP Router addresses must not conflict!



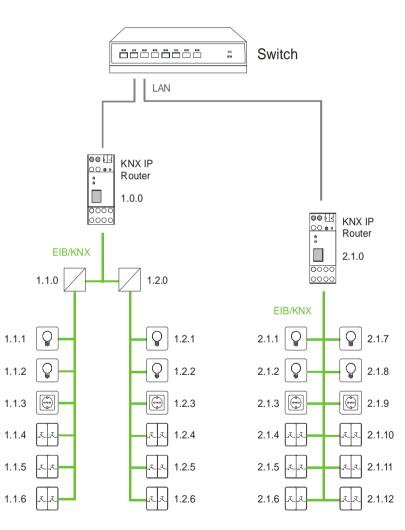


# **Mixed Installation**

### Usage of KNX/IP-Routers as

- Line Couplers
- Area Couplers

### Extension of existing installations





# **KNX IP BAOS 771 / 772**

- Bus Access and Object Server
- Interface to KNX (Tunnelling), e.g. for the ETS
- **Object server functionality**





# **KNX IP BAOS 771 / 772**

- Support of 1000 data points (KNX IP BAOS 772), respectively 250 data points (KNX IP BAOS 771)
- Binary Protocol based on UDP/IP respectively TCP/IP
- Web Service Protocol based on JSON (Java Script Object Notation)
- Add easily access to the KNX IP BAOS in your web pages
- SDK (Software Development Kit) available
- Windows
- Linux
- Apple (Mac OS X, iOS)
- Tools



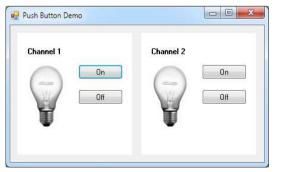
# How to connect to KNX IP BAOS?

- Native written applications
- Link a already built-in Ethernet device to KNX
  - E.g. Audio actuator
  - PLC (Programmable Logic Control)

Usage together with the BAOS SDK (Software Development Kit)

Easy start (no client-side implementation of the KNX BAOS Binary protocol necessary)

C++, C#, VisualBasic.net





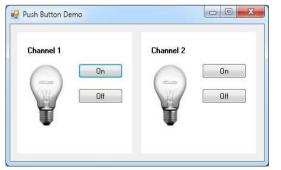
# **Connect to BAOS - Binary Services**

- Native written applications
- Link a already built-in Ethernet device to KNX
  - E.g. Audio actuator
  - PLC (Programmable Logic Control)

Usage together with the BAOS SDK (Software Development Kit)

Easy start (no client-side implementation of the KNX BAOS Binary protocol necessary)

C++, C#, VisualBasic.net



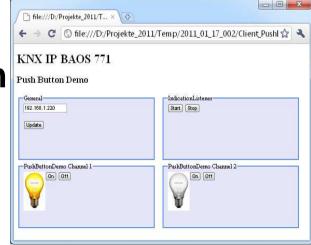


# **Connect to BAOS – Web Services**

- To be used within web applications
   Based on JSON (Java Script Object Notation)
   Perfect for web programmers
- Applicable on mobile devices
  - iOS (iPhone, iPad)
  - Android based mobile phones

API (Application Program

Demo incl. usage of API available





# **KNX IP BAOS Parameter - Common**

### Device Name

- Identification of the KNX/IP BAOS
- e.g. "first floor"

### IP-Address assignment

- manual
- automatical (DHCP)

# Sending of indications

- Activated
- Disabled

Common	Device name	KNX IP BAOS 771	
Datapoints 1 to 10	Device name	KNA IP BAUS 7/1	
Datapoints 11 to 20	IP address assignment	DHCP	•
Datapoints 21 to 30			
Datapoints 31 to 40	Sending of indications	Activated	-
Datapoints 41 to 50	=	·	
Datapoints 51 to 60			
Datapoints 61 to 70			
Datapoints 71 to 80			
Datapoints 81 to 90			
Datapoints 91 to 100			
Datapoints 101 to 110			
Datapoints 111 to 120			
Datapoints 121 to 130			
Datapoints 131 to 140			
Datapoints 141 to 150			
Datapoints 151 to 160			
Datapoints 161 to 170			
Datapoints 171 to 180			
Datapoints 181 to 190			
Datapoints 191 to 200			
Datapoints 201 to 210			



### **KNX IP BAOS Param. – IP Config.**

# IP address IP-Address of the – KNX IP BAOS

Common	IP address		
IP configuration 1			
IP configuration 2	byte 1	192	
Datapoints 1 to 10			
Datapoints 11 to 20	byte 2	168	
Datapoints 21 to 30	E		
Datapoints 31 to 40	byte 3	1	
Datapoints 41 to 50		-	_
Datapoints 51 to 60	byte 4	220	
Datapoints 61 to 70			
Datapoints 71 to 80			
Datapoints 81 to 90			
Datapoints 91 to 100			
Datapoints 101 to 110			
Datapoints 111 to 120			
Datapoints 121 to 130			
Datapoints 131 to 140			
Datapoints 141 to 150			
Datapoints 151 to 160			
Datapoints 161 to 170			
Datapoints 171 to 180			
Datapoints 181 to 190			
Datapoints 191 to 200			



# KNX IP BAOS Param. – IP Config.

### IP Subnetwork

- For decisions about Destination Address
  - Communication Partner
  - Gateway

# IP Gateway Address

- For external communication

Common	IP subnet		
P configuration 1			
P configuration 2	byte 1	255	
Datapoints 1 to 10			
Datapoints 11 to 20	byte 2	255	
Datapoints 21 to 30	E		
Datapoints 31 to 40	byte 3	255	
Datapoints 41 to 50			
Datapoints 51 to 60	byte 4	0	
Datapoints 61 to 70	IP gateway address		
Datapoints 71 to 80	IF galeway address		
Datapoints 81 to 90	byte 1	0	
Datapoints 91 to 100			
Datapoints 101 to 110	byte 2	0	
Datapoints 111 to 120			
Datapoints 121 to 130	byte 3	0	
Datapoints 131 to 140			
Datapoints 141 to 150	byte 4	0	
Datapoints 151 to 160			
Datapoints 161 to 170			
Datapoints 171 to 180			
Datapoints 181 to 190			
Datapoints 191 to 200	*		



# **KNX IP BAOS Param. – Data points**

### Type of datapoint

Select datapoint type (DPT)

### **Description of datapoint**

- String to identify datapoint, e.g. "Light Living Room"

Common		DOT 01 Discourt 1 hit	1
IP configuration 1	Type of datapoint 1	DPT 01 - Binary - 1 bit	•
IP configuration 2	Description of datapoint 1	Light Living Room	
Datapoints 1 to 10			2
Datapoints 11 to 20	Type of datapoint 2	DPT 03 - Dim up/down - 4 bits	•
Datapoints 21 to 30	E		
Datapoints 31 to 40	Description of datapoint 2	Dimmer Living Room	
Datapoints 41 to 50	Type of datapoint 3	DPT 09 - Float value - 2 bytes	•
Datapoints 51 to 60			
Datapoints 61 to 70	Description of datapoint 3	Temperature	
Datapoints 71 to 80	<b>—</b>	DPT - Unknown - 1 byte	
Datapoints 81 to 90	Type of datapoint 4	DPT - Ofichown - 1 byte	
Datapoints 91 to 100	Description of datapoint 4	Value	
Datapoints 101 to 110			
Datapoints 111 to 120	Type of datapoint 5	Disabled	•
Datapoints 121 to 130	B CHARLES IN		
Datapoints 131 to 140	Description of datapoint 5		
Datapoints 141 to 150	Type of datapoint 6	Disabled	•
Datapoints 151 to 160			
Datapoints 161 to 170	Description of datapoint 6		
Datapoints 171 to 180		Disabled	
Datapoints 181 to 190	Type of datapoint 7	Lisabied	•
Datapoints 191 to 200	Description of datapoint 7		1



# **Mounting and installation**

- Rail mounted device
  - External Power Supply
    - 12 V to 24 V, AC
    - 12 V to 30 V, DC
  - 2 KNX
  - 3 Learning key
  - 4 Learning LED
  - **5** KNX LED (Bus voltage / Traffic)
  - **6** Ethernet LED (Link / Traffic)
  - Ethernet-Connection (RJ45)

### **Power-over-Ethernet**

No external power supply necessary



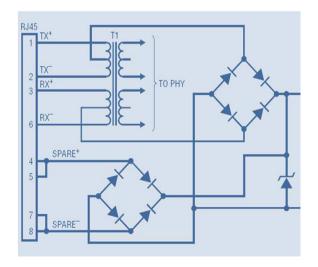


# **Power over Ethernet PoE**

- Power Supply via ethernet cable
- IEEE 802.3af

### **Reduce power supply requirements**

- Power supply unit
- Wiring
- Lower installation cost
- Available power up to 15 W
- Usage:
  - VoIP-Phones
  - WiFi-Access-Points
  - Cameras





### **Power over Ethernet PoE**

### Energy provider

- Power Sourcing
   Equipment (PSE)
- e.g. Switch

### Energy consumer

- Powered Device (PD)
- KNX/IP-Router







# **KNX IP Interface 740** *wireless*

- Interface to KNX (Tunneling), e.g. for the ETS
- WiFi (integrated WiFi access point)





### KNX IP 740 wireless - Benefits

### Supported by ETS

### Usage of common network components

- Notebooks already equipped with WiFi
- Initial start up possible by one Person
  - Installer can move around the building almost freely
- **Encryption possible (WPA2)**





# **KNX IP 740 Parameters - General**

### Device Name

- Identification of the KNX/IP-Interface
- SSID (WLAN)

### **WLAN** encryption

- Disabled
  - Enabled

General			
	Device name	KNX IP Interface 740	
	11/1 ANI annualities		
	WLAN encryption	disabled	•



# **KNX IP 740 Parameters - WLAN**

### **Authentification mode**

 WPA2-PSK
 (Wi-Fi Protected Access 2, PreShared Key)

Key

 63 characters available

Device: 1.1.2 KNX IP Interface 740			
General	Authentification mode	WPA2-PSK	
WLAN encryption	Addicidentification mode	WALTER	
	Key (max. 63 characters)		
evice objects / Parameters / O	Commissioning /		



### KNX IP 740 – What's in the box

- KNX IP 740
- **Plastic case**
- Wall power supply
- Antenna
  - Screwing terminal
  - **Documentation**

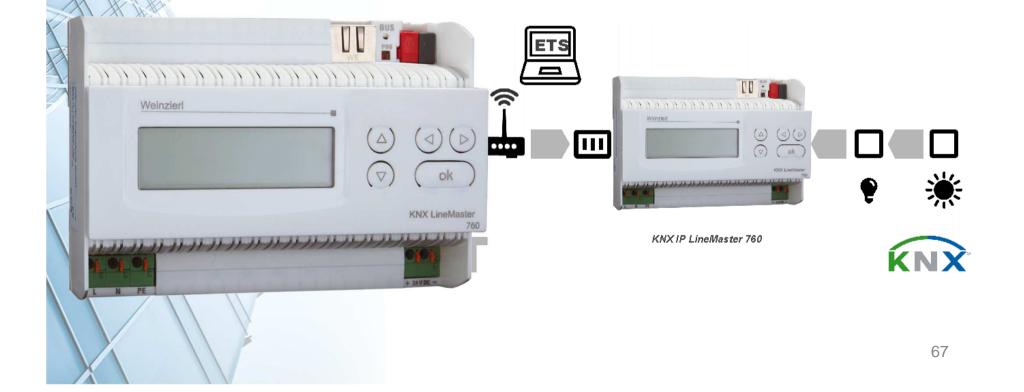






# **KNX IP LineMaster 760**

- Power supply including choke
- Interface to KNX (Tunneling), e.g. for the ETS
- Line coupler functionality (Routing)





# **KNX IP 760 - Diagnostics**

- Reset of a line
- Data memory
  - Operating hours
  - Overcharge,
     Electrical surge

### **Operating data**

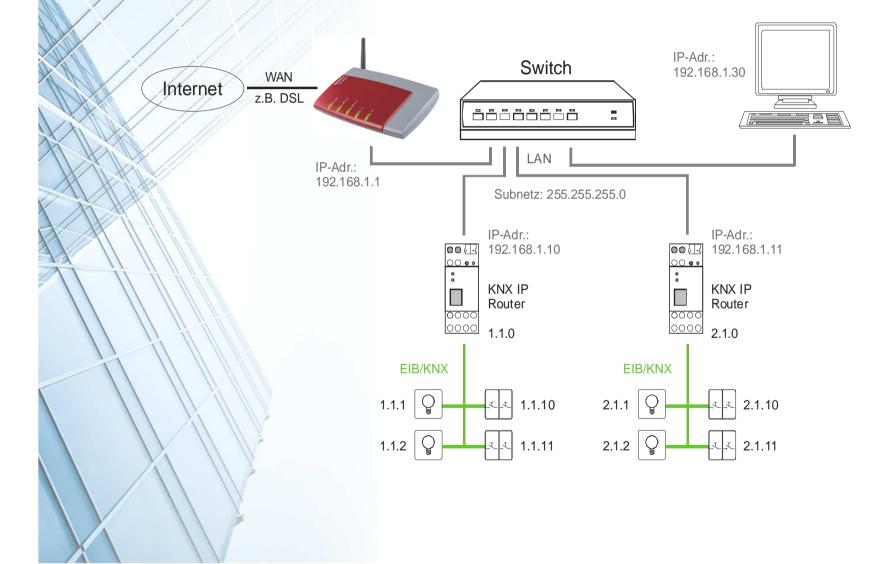
- Bus voltage
- Bus current
- Temperature

#### ETS data base based on KNX IP Router





# **KNX IP 760 - Installation Example**





# **Remote Control (NAT)**

- KNX/IP-Router works as server
- Available beyond the private Network
- **IP-Address** has to be known
  - Static
  - Dynamic Domain-Name-System (DNS) entry
    - e.g. DynDNS.com
  - NAT (Network Address Translation)
- Routing to a private Network
- Implemented in common DSL-Routers
- **Possible with ETS from version 3.0f**



# **Remote Access (VPN)**

- Access via NAT: unsecure
- Usage of VPN (Virtual Private Network)
- Common VPN-Routers available
- Connecting by PC to external VPN
- More effort during Installation



# **Optical Media**

- Bridging of distances > 100 m
  - Electrical Decoupling (Lightning protection)
  - Usage of optical fiber
    - Multimode
      - Range < 2 km
      - Monomode / Singlemode

MC102XL FAST ETHERNET MEDIA CON

• Range < 40 km

### Media converter



### **Future Prospects**

#### KNX over IP increasingly more important KNX/IP-only Devices

- No TP1 Connector
- Replacement of Ethernet / IP by KNXnet/IP as protocol
- Interworking KNX
- Management KNX
  - Initial start up via ETS
- Databases like TP1-Devices
- Link to multimedia
- Task-Force-IP: Specification done

#### **Expansion of KNXnet/IP**

- Remote logging
- Configuration and diagnosis
- Object server
- Security





# KNX and IP

Thank you for your attention.