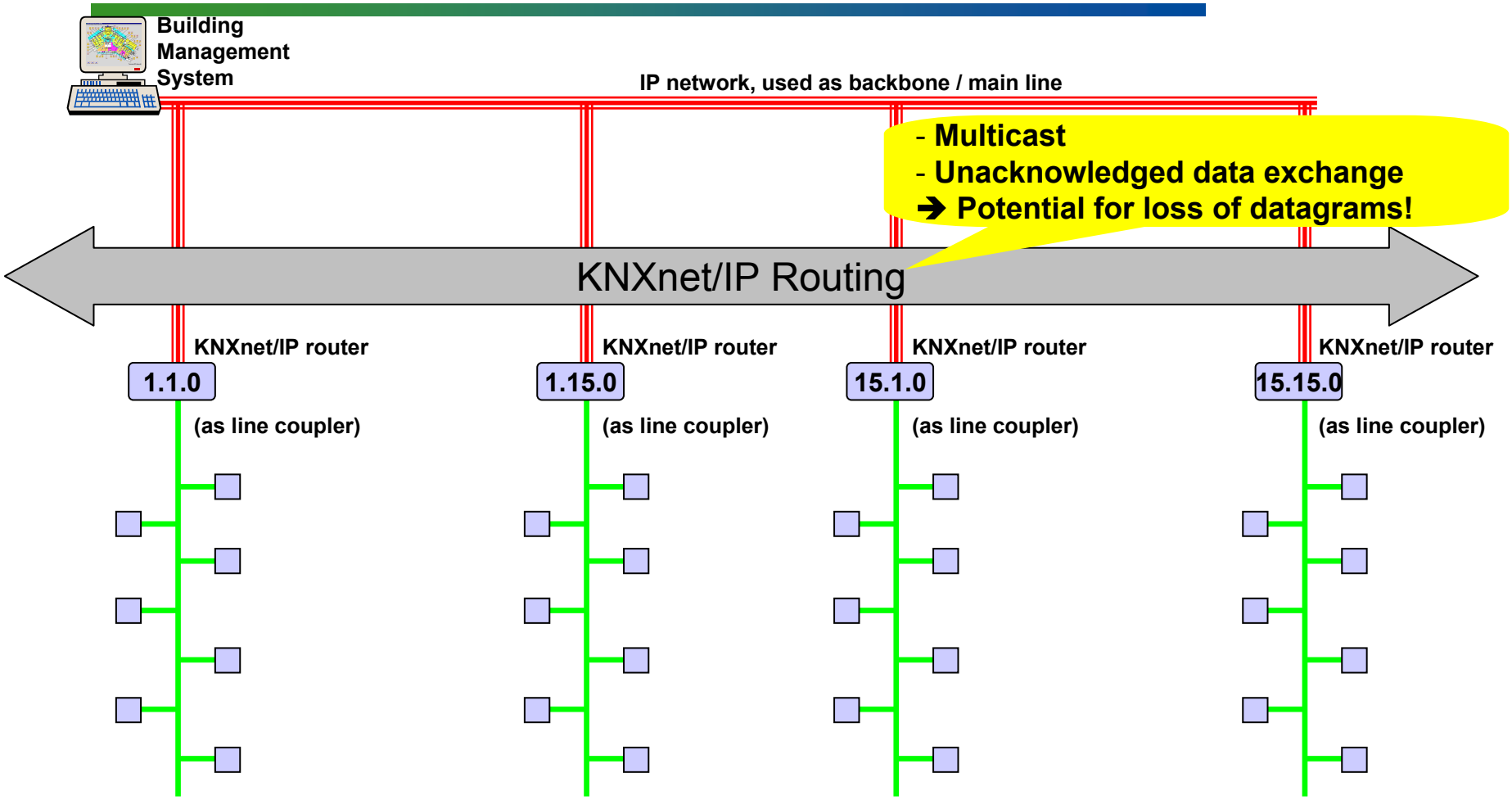
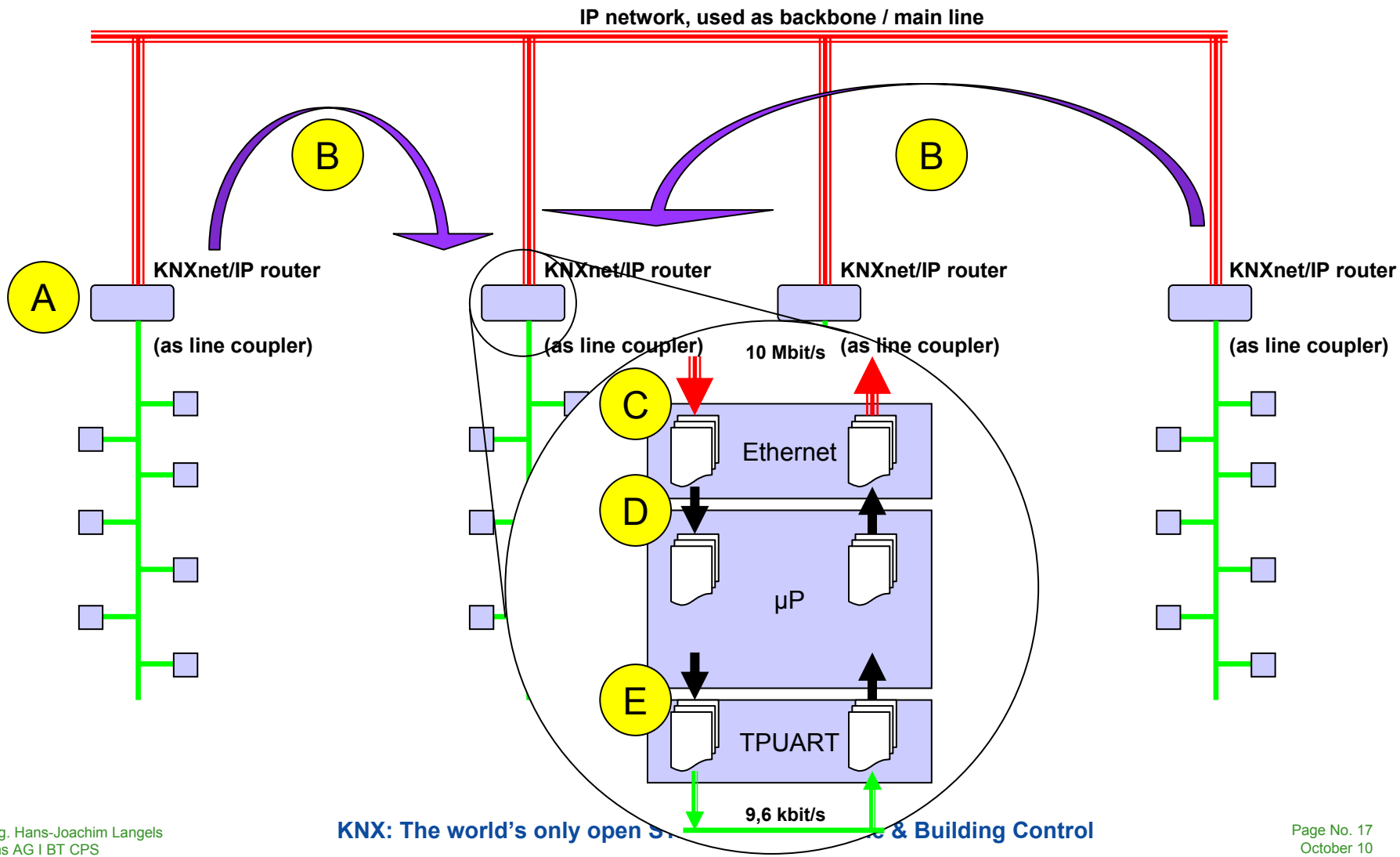
Potential issues for KNX IP



Potential issues for KNX IP



Potential issues for KNX IP

A
- Routing from KNX subnetwork to KNXnet/IP Routing Multicast Address

B
- Transmission across the IP network

C
- Reception from the IP network

D
- Interface within KNXnet/IP router or KNX IP device between Ethernet interface and microprocessor

E
- Interface within KNXnet/IP router to KNX subnetwork

or

- Interface within KNX IP device between KNX IP communication stack and application

Potential issues for KNX IP

A

- **Routing from KNX subnetwork to KNXnet/IP Routing Multicast Address**

- **Because Ethernet has at least 1000 times the transmission capacity of a KNX TP (PL, RF) subnetwork, routing TO KNXnet/IP is not an issue.**
- **KNXnet/IP routers can only transmit a maximum of 50 telegrams per second to their subnetwork (KNX TP, PL, RF).**

- ***"Any KNX IP device or KNXnet/IP router (including ETS) SHALL limit the transmission of KNX IP ROUTING_INDICATION datagrams to a maximum of 50 datagrams per second within one second."***
- ***"A KNX IP device or KNXnet/IP Router SHALL always pause its transmission on an assigned multicast address for at least 5ms after it transmitted a ROUTING_INDICATION datagram."***

Potential issues for KNX IP

B

- **Transmission across the IP network**

- **If KNX IP datagrams are lost in an IP network this cannot be detected by the sender because multicast datagrams are not acknowledged.**

➢ **Any communication with supervisory systems (including visualizations) or ETS should use KNXnet/IP Tunneling.**

Potential issues for KNX IP

C

- **Reception from the IP network**

- **An issue with the Ethernet interface performance cannot be removed by whatever protocol measures would be applied.**

➢ **It is the responsibility of the manufacturer to select an Ethernet interface that is suitable for the network data rate (e.g. 10 Mbit/s).**

Potential issues for KNX IP

D

- Interface within KNXnet/IP router or KNX IP device between Ethernet interface and microprocessor

- Datagrams may be lost without detection by the KNXnet/IP router or KNX IP device if datagrams are received by the Ethernet interface but cannot be quickly enough transmitted to or processed by the microprocessor.

➢ It is the responsibility of the manufacturer to select and design hardware, firmware, operating system, and/or application software suitable for KNX IP performance.

Potential issues for KNX IP

C

- **Reception from the IP network**

D

- **Interface within KNXnet/IP router or KNX IP device between Ethernet interface and microprocessor**

➢ **Test cases to measure the performance of KNX IP devices and KNXnet/IP routers are defined.**

- **Requirement:**
  "*A KNXnet/IP Router or KNX IP device SHALL be able to receive and process up to the KNX Network - respectively Application Layer at least 1000 ROUTING_INDICATION frames per second.*"
- **Recommendation:**
  "*Any KNX IP device or KNXnet/IP Router SHOULD be capable of receiving and processing at least 12750 ROUTING_INDICATION datagrams per second on an assigned multicast address.*"

Potential issues for KNX IP

- Interface within KNXnet/IP router to KNX subnetwork

E or

- Interface within KNX IP device between KNX IP communication stack and application

- Flow control needs to be introduced for KNXnet/IP routers and KNX IP devices to avoid the loss of datagrams due to overflowing queues in KNXnet/IP routers and KNX IP devices.

➢ ROUTING_BUSY is introduced for a receiving device to indicate to all other devices that its incoming queue is filling up and it may loose datagrams if they do not stop sending.

ROUTING_BUSY

- **ROUTING_BUSY is intended to take care of potential datagram losses due to temporary datagram rate differences between the IP network and a KNX subnetwork.**

KNXnet/IP header

7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
HEADER_SIZE_10 (06h)								KNXNETIP_VERSION (10h)							
ROUTING_BUSY (0532h)															
HEADER_SIZE_10 + 6															

BusyInfo

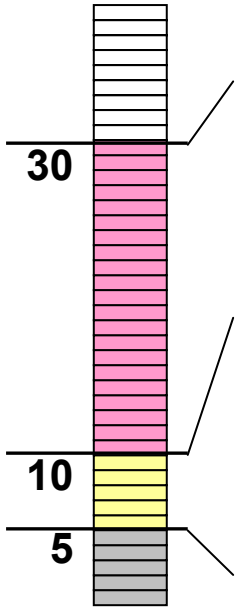
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Structure Length (1 octet)								DeviceState (1 octet)							
ROUTING_BUSY_WAIT_TIME (in milliseconds) (2 octets)															
ROUTING_BUSY_CONTROL_FIELD (2 octets)															

Minimum: 20ms
Maximum: 100ms (typical)

Default value: 0000h (= all KNX IP devices)
Other values: reserved for future use

ROUTING_BUSY Flow Control

Recommendations based on a system simulation assuming that up to 255 devices send 50 ROUTING_INDICATION datagrams per second:



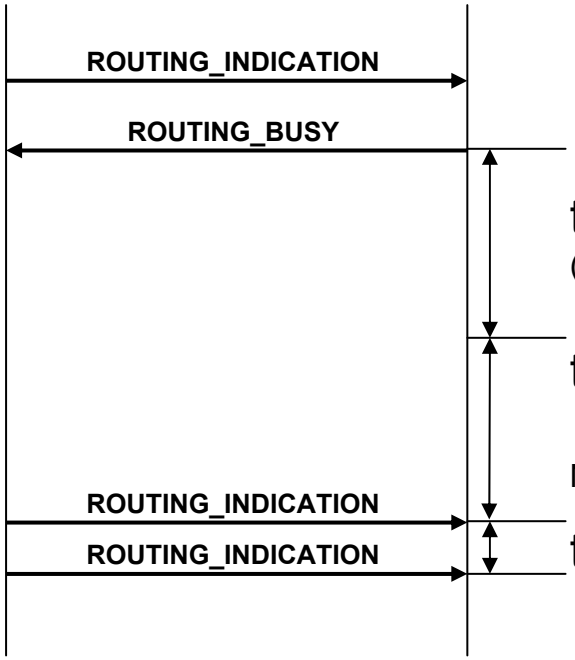
The incoming (from KNX IP) queue SHOULD be able to hold at least 30 messages.

The threshold for sending a ROUTING_BUSY frame to all KNX/IP devices and KNXnet/IP Routers SHOULD be set at ten messages in the incoming queue.

The threshold for sending a ROUTING_BUSY frame with the individual address from the last ROUTING_INDICATION frame SHOULD be set at five messages in the incoming queue.

ROUTING_BUSY

- **ROUTING_BUSY provides**
  - time to empty the queue from KNX IP to a KNX subnetwork
  - a random restart of transmissions to avoid a flooding effect after the wait time t_w has expired



t_w <= 100 ms
(depends on ROUTING_BUSY_WAIT_TIME received with ROUTING_BUSY)

t_{random} <= $t_{random, max}$ = N * 50 ms
(N = number of ROUTING_BUSY received;
N is decremented every 5 ms after [t_{random} + N * 100 ms] expired)

t >= 5 ms

- **Filter tables in KNXnet/IP Routers MUST be activated!**