Bezpečná průmyslová kritická komunikační infrastruktura

–

jak ano a jak ne…

Jiří Kasner, kasner.jiri@colaut.cz

COLSYS AUTOMATIK

HIRSCHMANN
A BELDEN BRAND

Základní předpoklady a jejich častý skutečný stav – na co se podíváme v přednášce.

- Vím, co v rámci KKI mám nasazeno a provozuji.
- Vím, jakým způsobem KKI provozuji a jaké služby je schopná mi poskytnout.
- Vím, jak mám KKI zabezpečenou a proč.
- Vím o místech, která jsou problematická a proč.
- Mám promyšlené a vyzkoušené postupy pro případ vzniku poruchy nebo chyby.
- Mám promyšlené a vyzkoušené postupu pro zotavení se po napadení.
- Mám dokumentaci skutečného provedení a co vlastně má obsahovat.
- Periodicky provádím kontroly, školení a obnovení znalostí u všech, kteří mají v různých úrovních pracovat s mojí KKI.

COLSYS AUTOMATIK

HIRSCHMANN
A BELDEN BRAND

Vím, co v rámci KKI mám nasazeno a provozuji – reálný stav věci.

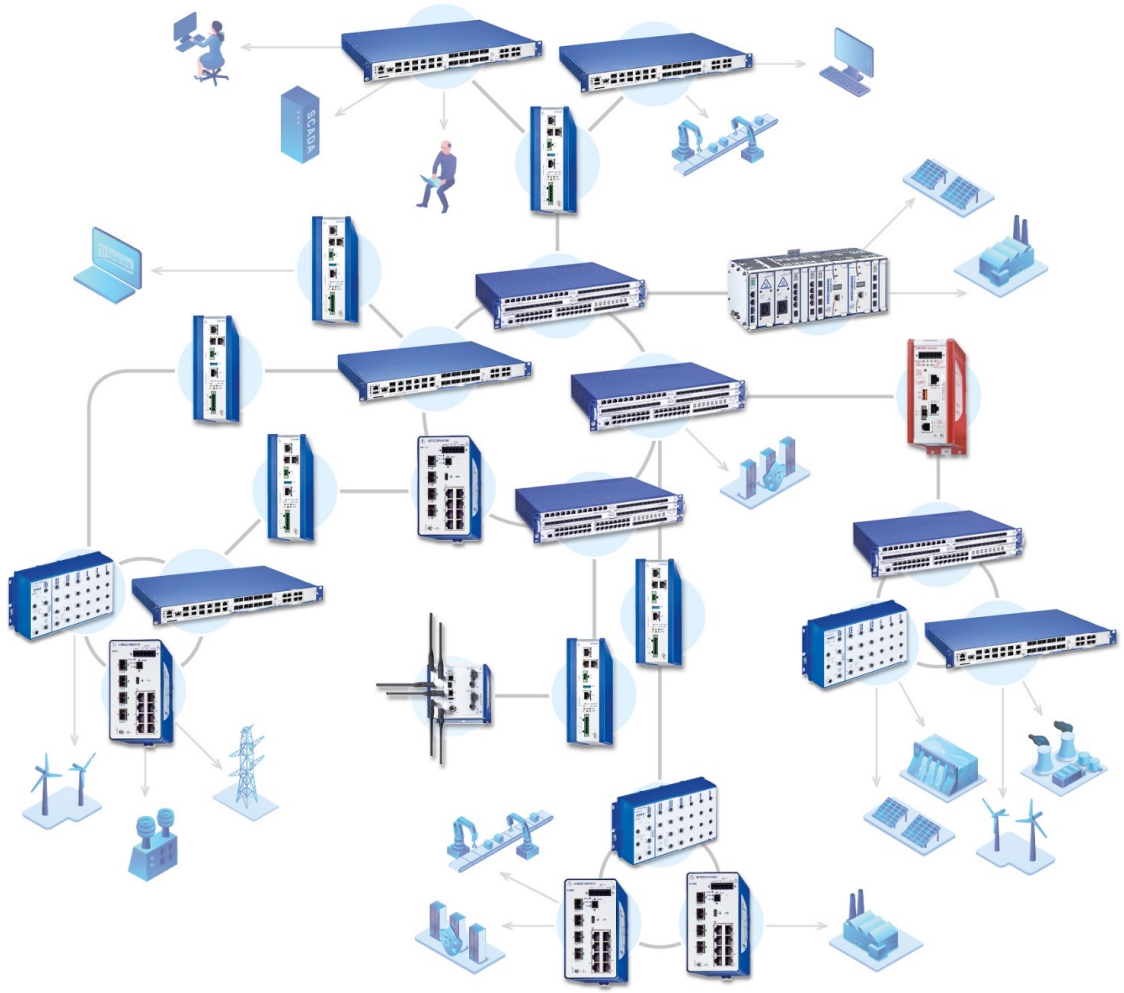
- Aktivní + pasivní části KKI.
- Co, kde, kudy…
- Jak aktivní jsou ty aktivní části?
- Komunikační schémata.
- Copak mi to po té síti běhá?
- Platí ta moje komunikační schémata?
- Vím, jakým způsobem se dozvídám o poruchách či chybách?
- Dohled.
- Archivace událostí.
- Auditní logy.

COLSYS AUTOMATIK

HIRSCHMANN
A BELDEN BRAND

Vím, jakým způsobem KKI provozuji a jaké služby je schopná mi poskytnout.

- Efektivní přenosové kapacity.
- Typová konfigurace komponent.
- Sdílené prostředí × jednotlivé sítě pro každý systém???
- Standardní provozní stavy.
- Parametry připojení jednotlivých systémů.
- Úzká hrdla.
- Hranové prvky.

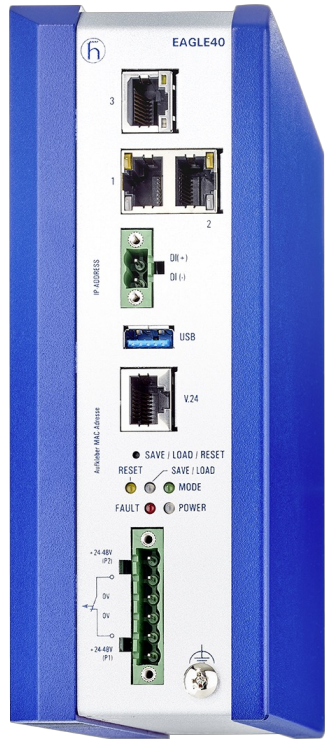


COLSYS AUTOMATIK

HIRSCHMANN
A BELDEN BRAND

Vím, jak mám KKI zabezpečenou a proč.

- Safety × security – a proč v tomto pořadí.
- Jak se zabezpečení KKI dotýká koncových zařízení.
- Co se starými systémy?
- Vlastnost × nastavení – není to stejné!
- Vnitřní a hranová bezpečnost.
- Hardening konfigurace.



COLSYS AUTOMATIK

HIRSCHMANN
A BELDEN BRAND

Vím o místech, která jsou problematická a proč.

Mám promyšlené a vyzkoušené postupy pro případ vzniku poruchy nebo chyby.

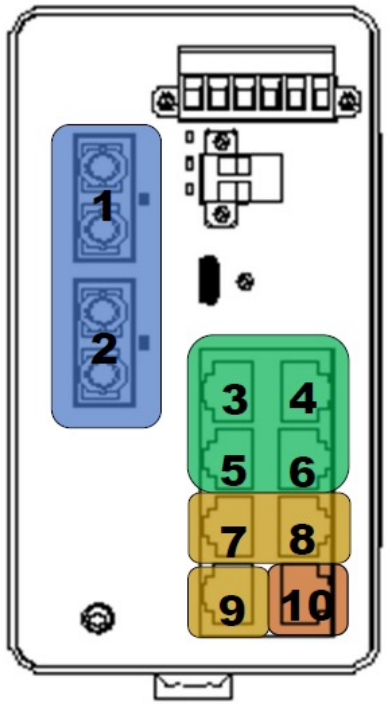
Mám promyšlené a vyzkoušené postupy pro zotavení se po napadení.

COLSYS AUTOMATIK

HIRSCHMANN
A BELDEN BRAND

Mám skutečnou DSP (?)

		port on/off	popis kabelů	PVID				Packet type
	1	ON		PVID1	T	T	T	admitOnlyVlanTagged
	2	OFF		PVID1	T	T	T	admitOnlyVlanTagged
	3	ON		PVID3	--	--	U	admitAll
	4	ON		PVID3	--	--	U	admitAll
	5	ON		PVID3	--	--	U	admitAll
	6	OFF		PVID3	--	--	U	admitAll
	7	ON		PVID2	--	U	--	admitAll
	8	OFF		PVID2	--	U	--	admitAll
	9	OFF		PVID2	--	U	--	admitAll
	10	ON		PVID1	U	--	--	admitAll




```
! BRS40-0020 Configuration

! Version: HiOS-2A-09.0.02

! Build Date: 2022-03-22 08:23

network hidiscovery mode read-only
network management access web timeout 3

vlan database
vlan add 10
vlan add 17
vlan add 90
vlan add 100
name 1 ADMIN
name 10 ZAT
name 17 OPERATOR
name 90 SIEMENS
name 100 SERVIS
igmp-snooping vlan-id 1 mode
igmp-snooping vlan-id 10 mode
igmp-snooping vlan-id 17 mode
igmp-snooping vlan-id 90 mode
igmp-snooping vlan-id 100 mode
igmp-snooping vlan-id 1 querier mode
igmp-snooping vlan-id 10 querier mode
igmp-snooping vlan-id 17 querier mode
igmp-snooping vlan-id 90 querier mode
igmp-snooping vlan-id 100 querier mode
exit
network parms 172.17.1.150 255.255.0.0 172.17.1.250
network protocol none
! dot1x mac-authentication-bypass password  ""
configure
no device-status trap
dns cache adminstate
! config remote-backup username ******
! config remote-backup password ******
config envm load-priority usb disable
no http server
igmp-snooping mode
igmp-snooping querier mode
passwords max-login-attempts 5
passwords login-attempt-period 15
[redacted]
sntp client server add 1 172.17.1.147 port 123 description [redacted]
sntp client server mode 1 enable
sntp client operation
system conta[redacted]
system locat
system name

snmp trap add [redacted]:162
snmp trap mode

interface 1/1
no auto-negotiate
name "PATER HTD - Optika"
vlan participation include 10
vlan tagging 10
vlan participation include 17
vlan tagging 17
vlan participation include 90
vlan tagging 90
vlan participation include 100
vlan tagging 100
exit
```

COLSYS AUTOMATIK

HIRSCHMANN
A BELDEN BRAND

Periodicky provádím kontroly, školení a obnovení znalostí u všech, kteří mají v různých úrovních pracovat s mojí KKI.

- Je moudré se věnovat sledování zranitelností a vlastnostem vlastních aktiv v rámci KKI.
- Obdobně je moudré si uvědomovat, že struktura rizik a opatření se v čase mění nebo může měnit.
- Některá opatření jsou často na papíře krásná, v reálném provozu KKI však neúčinná nebo naopak proti logice věci s opačným výsledkem.
- Pozor na vztah IT a OT – typicky nejsou použitelná opatření z jednoho pro druhé a naopak.
- A ne všichni musí vědět všechno – důležitost rolí a rozumného přístupu typu „zero trust“.

COLSYS AUTOMATIK

HIRSCHMANN
A BELDEN BRAND

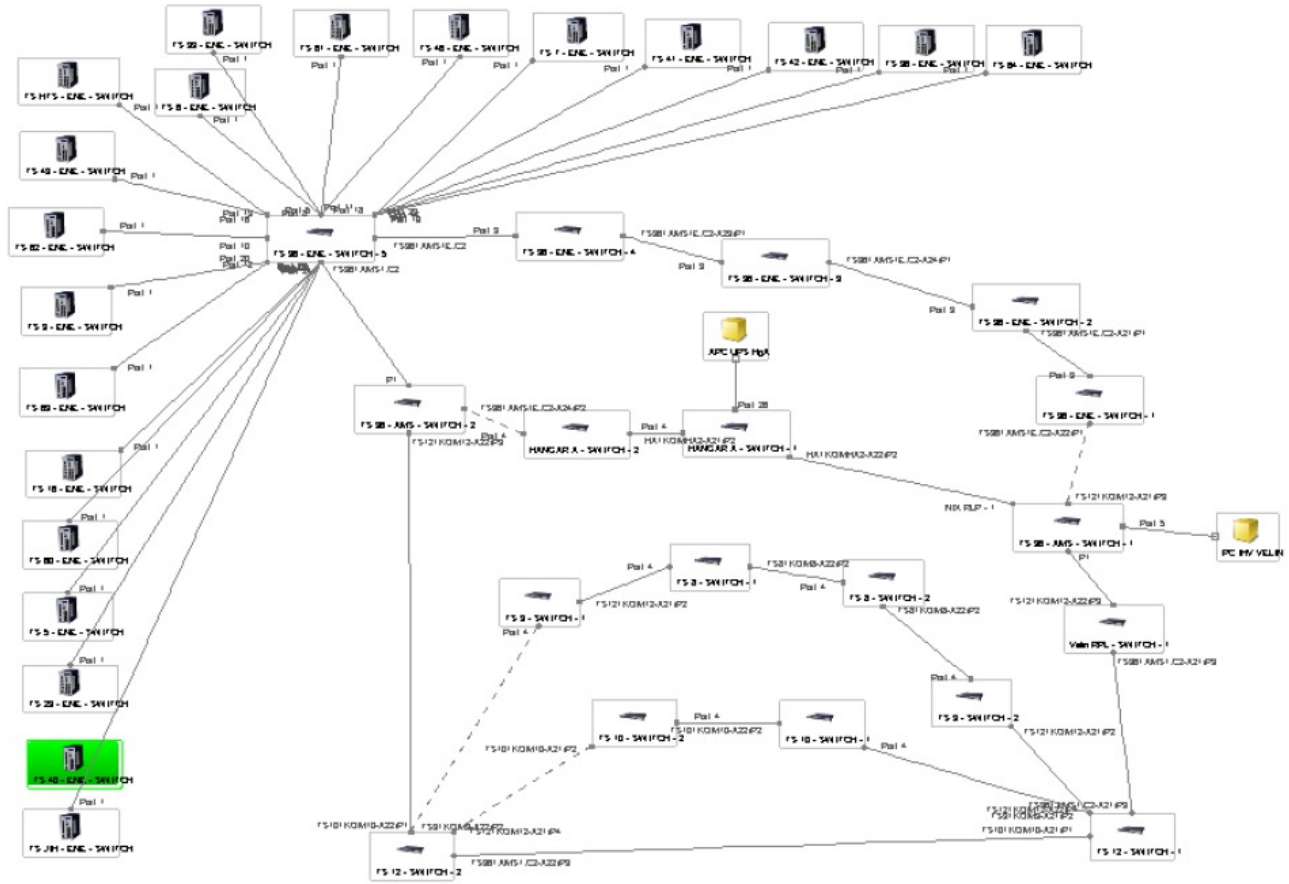
Příklady a ukázky řešení.

COLSYS AUTOMATIK

HIRSCHMANN
A BELDEN BRAND

Type	Status	Name	IP Address	MAC Address	Product	Chassis	Serial Nr.	System Name	Location	Contact	Firmware Version	Chassis Name	Configuration Signature	PSM up to date
	✔	172.17.50.224	172.17.50.224	64:60:38:7E:22:AC	BRS	BRS20-1200	942170999041308637	[redacted]	[redacted]	ASR	HiOS-2A-08.3.00		32C2099FF2987255DC6172A4EAC2BFD9A7183867	☒
	✔	172.17.50.225	172.17.50.225	64:60:38:7E:22:8C	BRS	BRS20-1200	942170999041308636			ASR	HiOS-2A-08.3.00		0F37CA25EDA1F4DF738B39D829AD63EE6C829B95	☒
	✔	172.17.50.227	172.17.50.227	64:60:38:7E:22:6C	BRS	BRS20-1200	942170999041308635			ASR	HiOS-2A-		8D302BF9D13	

2021-06-09 09:22:10



Audit Trail

System Information

Product	BRS20-04009999-STCZ99HHSEA
Release	HiOS-2A-09.0.05
Hardware version	0103
Serial number	942170999000001057
Firmware software release (RAM)	HiOS-2A-09.0.05 2022-12-19 14:34
Firmware software release (FLASH)	HiOS-09.0.05 2022-12-19 14:34
Firmware software release (BAK)	HiOS-09.0.04 2022-11-03 14:57
Bootcode software release (FLASH)	HiBOOT-07.4.00 2018-11-13 14:26
Management IP	192.168.173.152
IPv6 Link Local Address	fe80::6660:38ff:fe0b:a5b0
MAC[Range: 32]	64:60:38:0B:A5:B0
System Name	BRS20
System Up Time	34 days 1 hrs 0 mins 23 secs
System Date and Time (local time zone)	2023-03-23 08:34:38
System operating hours	1054 days 20 hrs 9 mins 47 secs
Power1	PRESENT
Power2	PRESENT
Current temperature	47 °C
Configuration state (running to NVM)	OK
ACA (envm/USB) Status	notPresent
Service shell admin status	enabled

```
1894: Notice Mar 23 2023 08:34:26 [0x001400c6] HTTP(S) Login via web interface successful for user 'admin', role 'Administrator', from '192.168.173.61'.
1893: Notice Mar 23 2023 07:33:52 [0x00030004] SNMP Set by admin: sysContact.0 = Hirschmann Automation and Control GmbH
1892: Notice Mar 22 2023 13:37:29 [0x00030004] SNMP Set by admin: sysContact.0 = Hirschmann Automation and Control GmbH
1891: Notice Mar 22 2023 08:44:42 [0x00030004] SNMP Set by admin: sysContact.0 = Hirschmann Automation and Control GmbH
1890: Notice Mar 16 2023 08:55:47 [0x001400c7] HTTP(S) Logout via web interface successful for user 'admin', role 'Administrator', from '192.168.173.61'.
1889: Notice Mar 16 2023 08:55:36 [0x001400c6] HTTP(S) Login via web interface successful for user 'admin', role 'Administrator', from '192.168.173.61'.
1888: Notice Mar 16 2023 07:33:06 [0x00040003] CfgMgr Action copy config running-config remote result=ok user='admin' Ready
1887: Notice Mar 15 2023 08:15:18 [0x00040003] CfgMgr Action copy config running-config remote result=ok user='admin' Ready
1886: Notice Mar 14 2023 08:15:23 [0x00040003] CfgMgr Action copy config running-config remote result=ok user='admin' Ready
1885: Notice Mar 3 2023 10:07:59 [0x00040003] CfgMgr Action copy config running-config remote result=ok user='admin' Ready
1884: Notice Mar 2 2023 10:08:00 [0x00040003] CfgMgr Action copy config running-config remote result=ok user='admin' Ready
1883: Notice Mar 1 2023 10:05:19 [0x00040003] CfgMgr Action copy config running-config remote result=ok user='admin' Ready
1882: Notice Feb 28 2023 10:05:19 [0x00040003] CfgMgr Action copy config running-config remote result=ok user='admin' Ready
1881: Notice Feb 27 2023 07:46:18 [0x00040003] CfgMgr Action copy config running-config remote result=ok user='admin' Ready
1880: Notice Feb 24 2023 13:16:46 [0x00040003] CfgMgr Action copy config running-config remote result=ok user='admin' Ready
1879: Notice Feb 24 2023 09:46:49 [0x00030004] SNMP Set by admin: sysContact.0 = Hirschmann Automation and Control GmbH
1878: Notice Feb 24 2023 07:37:39 [0x00040003] CfgMgr Action copy config running-config remote result=ok user='admin' Ready
1877: Notice Feb 23 2023 07:23:27 [0x00040003] CfgMgr Action copy config running-config remote result=ok user='admin' Ready
1876: Notice Jan 1 2022 01:19:29 [0x0001000a] System time set to 2023-02-17 07:54:03.
1875: Notice Jan 1 2022 00:00:21 [0x0001000b] System timezone offset changed from 0 to 60. Time is now 2022-01-01 01:00:21.
1874: Notice Jan 1 2000 00:00:42 [0x0001000a] System time set to 2022-01-01 00:00:00.
1873: Notice Jan 1 2000 00:00:42 [0x0003001d] Selected firmware HiOS-09.0.05 build 2022-12-19 14:34.
1872: Notice Jan 1 2000 00:00:42 [0x0003000a] System started.
1871: Emergency Jan 2 2022 00:35:43 [0x0001000d] System power is failing.
```

COLSYS AUTOMATIK

HIRSCHMANN
A BELDEN BRAND

	Time	Source	Destination	Protocol	Length	Info
1	0.000000	Micro-St_60:f0:78	Broadcast	ARP	60	Who has 192.168.1.107? Tell 192.168.1.106
2	0.000375	SiemensN_9c:fa:14	Micro-St_60:f0:78	ARP	60	192.168.1.107 is at 08:00:06:9c:fa:14
3	0.000494	192.168.1.106	192.168.1.107	TCP	62	1298 → 102 [SYN] Seq=0 Win=64240 Len=0 MSS=1460 SACK_PERM
4	0.001272	192.168.1.107	192.168.1.106	TCP	60	102 → 1298 [SYN, ACK] Seq=0 Ack=1 Win=560 Len=0 MSS=1460
5	0.001409	192.168.1.106	192.168.1.107	TCP	60	1298 → 102 [ACK] Seq=1 Ack=1 Win=64240 Len=0
6	0.001927	192.168.1.106	192.168.1.107	COTP	76	CR TPDU src-ref: 0x0001 dst-ref: 0x0000
7	0.003224	192.168.1.107	192.168.1.106	TCP	60	102 → 1298 [ACK] Seq=1 Ack=23 Win=560 Len=0
8	0.015027	192.168.1.107	192.168.1.106	COTP	76	CC TPDU src-ref: 0x4431 dst-ref: 0x0001
9	0.015558	192.168.1.106	192.168.1.107	S7COMM	79	ROSCTR:[Job] Function:[Setup communication]
10	0.017968	192.168.1.107	192.168.1.106	TCP	60	102 → 1298 [ACK] Seq=23 Ack=48 Win=560 Len=0
11	0.022095	192.168.1.107	192.168.1.106	S7COMM	81	ROSCTR:[Ack_Data] Function:[Setup communication]
12	0.022394	192.168.1.106	192.168.1.107	COTP	61	DT TPDU (0) [COTP fragment, 0 bytes]
13	0.022665	192.168.1.106	192.168.1.107	S7COMM	87	ROSCTR:[Userdata] Function:[Request] -> [CPU functions] -> [Read SZL] ID=0x0132 Index=
14	0.023884	192.168.1.107	192.168.1.106	TCP	60	102 → 1298 [ACK] Seq=50 Ack=55 Win=560 Len=0
15	0.024758	192.168.1.107	192.168.1.106	TCP	60	102 → 1298 [ACK] Seq=50 Ack=88 Win=560 Len=0

```
> Frame 1: 60 bytes on wire (480 bits), 60 bytes captured (480 bits)
v IEEE 802.3 Ethernet
    > Destination: SiemensN_01:04:85 (08:00:06:01:04:85)
    > Source: SiemensN_01:04:61 (08:00:06:01:04:61)
      Length: 14
    > Trailer: 040200000100000000940000a68100840000006e002c0365002e036520033211
v Logical-Link Control
    > DSAP: ISO Network Layer (0xfe)
    > SSAP: ISO Network Layer (0xfe)
    > Control field: U, func=UI (0x03)
v ISO 8473/X.233 CLNP ConnectionLess Network Protocol
      Inactive subset
v ISO 8073/X.224 COTP Connection-Oriented Transport Protocol
      Length: 9
      PDU Type: AK Data Acknowledgement (0x06)
      Destination reference: 0x0018
      Your TPDU number: 0x0000009c
      Credit: 0x0001
```

```
> Frame 3: 60 bytes on wire (480 bits), 60 bytes captured (480 bits)
> IEEE 802.3 Ethernet
v Logical-Link Control
    > DSAP: Spanning Tree BPDU (0x42)
    > SSAP: Spanning Tree BPDU (0x42)
    > Control field: U, func=UI (0x03)
v Spanning Tree Protocol
      Protocol Identifier: Spanning Tree Protocol (0x0000)
      Protocol Version Identifier: Spanning Tree (0)
      BPDU Type: Configuration (0x00)
    > BPDU flags: 0x00
    > Root Identifier: 32768 / 1 / 00:0f:34:09:36:00
      Root Path Cost: 12
    > Bridge Identifier: 32768 / 1 / 00:0f:34:17:9b:00
      Port identifier: 0x8018
      Message Age: 3
      Max Age: 20
      Hello Time: 2
      Forward Delay: 15
```

```
> Frame 1: 64 bytes on wire (512 bits), 64 bytes captured (512 bits)
v IEEE 802.3 Ethernet
    > Destination: RichardH_03:46:7b (00:80:63:03:46:7b)
    > Source: RichardH_03:46:7c (00:80:63:03:46:7c)
      Length: 50
v Logical-Link Control
    > DSAP: SNAP (0xaa)
    > SSAP: SNAP (0xaa)
    > Control field: U, func=UI (0x03)
      Organization Code: 00:80:63 (Richard Hirschmann Gm
      Protocol ID: 0x0800
v Data (42 bytes)
      Data: 05fc002a0000000001110000000000000000000000000001600ff0302000000000000…
      [Length: 42]
```

```
> Frame 39: 80 bytes on wire (640 bits), 80 bytes captured (640 bits)
> IEEE 802.3 Ethernet
> Logical-Link Control
> HP NIC Teaming Heartbeat
```

	Time	Source	Destination	Protocol	Length	Info
1	0.000000	173.215.12.105	173.215.12.123	MSMMS	1453	Request to resend packet(s):
2	0.003208	173.215.12.105	173.215.12.123	TCP	78	1756 → 1754 [PSH, ACK] Seq=1
3	0.003257	173.215.12.123	173.215.12.105	TCP	86	1754 → 1756 [PSH, ACK] Seq=1
4	0.007385	173.215.12.105	173.215.12.123	MSMMS	1456	Request to resend packet(s):
5	0.013161	173.215.12.105	173.215.12.123	TCP	78	1756 → 1754 [PSH, ACK] Seq=25
6	0.013557	173.215.12.123	173.215.12.105	TCP	86	1754 → 1756 [PSH, ACK] Seq=33
7	0.016259	173.215.12.105	173.215.12.123	MSMMS	1432	Request to resend packet(s):
8	0.023185	173.215.12.105	173.215.12.123	TCP	78	1756 → 1754 [PSH, ACK] Seq=49
9	0.023235	173.215.12.123	173.215.12.105	TCP	86	1754 → 1756 [PSH, ACK] Seq=65
10	0.023882	173.215.12.105	173.215.12.123	MSMMS	1109	Request to resend packet(s):
11	0.033167	173.215.12.105	173.215.12.123	TCP	78	1756 → 1754 [PSH, ACK] Seq=73
12	0.033293	173.215.12.123	173.215.12.105	TCP	86	1754 → 1756 [PSH, ACK] Seq=97
13	0.043164	173.215.12.105	173.215.12.123	TCP	78	1756 → 1754 [PSH, ACK] Seq=97
14	0.043241	173.215.12.123	173.215.12.105	TCP	118	1754 → 1756 [PSH, ACK] Seq=12
15	0.048115	173.215.12.105	173.215.12.123	MSMMS	1455	Request to resend packet(s):
16	0.053332	173.215.12.105	173.215.12.123	TCP	78	1756 → 1754 [PSH, ACK] Seq=12

```
> Frame 4: 66 bytes on wire (528 bits), 66 bytes captured (528 bits)
> Ethernet II, Src: Rockwell_2a:b6:6a (00:00:bc:2a:b6:6a), Dst: IPv4mcast_40:61:c0 (01:00:5e:40:61:c0)
v Internet Protocol Version 4, Src: 10.20.15.6, Dst: 239.192.97.192
      0100 .... = Version: 4
      .... 0101 = Header Length: 20 bytes (5)
    > Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
      Total Length: 52
      Identification: 0x901f (36895)
    > 000. .... = Flags: 0x0
      ...0 0000 0000 0000 = Fragment Offset: 0
      Time to Live: 1
      Protocol: UDP (17)
      Header Checksum: 0xbeff [validation disabled]
      [Header checksum status: Unverified]
      Source Address: 10.20.15.6
      Destination Address: 239.192.97.192
v User Datagram Protocol, Src Port: 2222, Dst Port: 2222
      Source Port: 2222
      Destination Port: 2222
      Length: 32
      Checksum: 0x2b01 [unverified]
      [Checksum Status: Unverified]
      [Stream index: 0]
    > [Timestamps]
      UDP payload (24 bytes)
v EtherNet/IP (Industrial Protocol)
    > Item Count: 2
v Common Industrial Protocol, I/O
      Data: 4e2905000000
```

7	1.292465	192.168.1.178	192.168.1.177	TCP	60 5413 → 1828 [ACK] Seq=32 Ack=6 Win=8164 Len=0
8	1.423667	192.168.1.178	192.168.1.177	TCP	85 5413 → 1828 [PSH, ACK] Seq=32 Ack=6 Win=8164 Len=31
9	1.554276	192.168.1.177	192.168.1.178	TCP	54 1828 → 5413 [ACK] Seq=6 Ack=63 Win=64766 Len=0
10	2.345414	192.168.1.178	192.168.1.177	TCP	60 5413 → 1828 [PSH, ACK] Seq=63 Ack=6 Win=8164 Len=5
11	2.538669	192.168.1.177	192.168.1.178	TCP	54 1828 → 5413 [ACK] Seq=6 Ack=68 Win=64761 Len=0
12	2.538837	192.168.1.178	192.168.1.177	TCP	85 5413 → 1828 [PSH, ACK] Seq=68 Ack=6 Win=8164 Len=31

```
> Frame 5: 402 bytes on wire (3216 bits), 402 bytes captured (3216 bits)
> Ethernet II, Src: HewlettP_8a:65:5a (00:18:fe:8a:65:5a), Dst: HewlettP_bb:27:bf (00:15:60:bb:27:bf)
> Internet Protocol Version 4, Src: 195.250.135.250, Dst: 192.168.1.194
v Transmission Control Protocol, Src Port: 443, Dst Port: 2907, Seq: 147, Ack: 548, Len: 348
    Source Port: 443
    Destination Port: 2907
    [Stream index: 0]
    [Conversation completeness: Incomplete (12)]
    [TCP Segment Len: 348]
    Sequence Number: 147    (relative sequence number)
    Sequence Number (raw): 183574409
    [Next Sequence Number: 495    (relative sequence number)]
    Acknowledgment Number: 548    (relative ack number)
    Acknowledgment number (raw): 2548363330
    0101 .... = Header Length: 20 bytes (5)
  > Flags: 0x018 (PSH, ACK)
    Window: 64886
    [Calculated window size: 64886]
    [Window size scaling factor: -1 (unknown)]
    Checksum: 0x51d2 [unverified]
    [Checksum Status: Unverified]
    Urgent Pointer: 0
  > [Timestamps]
  > [SEQ/ACK analysis]
    TCP payload (348 bytes)
v Transport Layer Security
  v SSLv3 Record Layer: Application Data Protocol: Hypertext Transfer Protocol
      Content Type: Application Data (23)
      Version: SSL 3.0 (0x0300)
      Length: 343
      Encrypted Application Data: 3505fda9916a0bc58c0e14c5cde5d284db040451cb33a0dc099689a78ff421c298e6754f…
      [Application Data Protocol: Hypertext Transfer Protocol]
```

```
> Frame 28: 1140 bytes on wire (9120 bits), 1140 bytes captured (9120 bits)
> Ethernet II, Src: VCSVideo_01:33:20 (00:07:5f:01:33:20), Dst: HewlettP_da:df:9f (00:14:c2:da:df:9f)
> Internet Protocol Version 4, Src: 192.168.1.149, Dst: 192.168.1.125
> Transmission Control Protocol, Src Port: 80, Dst Port: 1505, Seq: 11968, Ack: 1243, Len: 1086
> [8 Reassembled TCP Segments (9688 bytes): #18(202), #19(1400), #21(1400), #22(1400), #24(1400), #25(1400), #27(1400), #28(1086)]
v Hypertext Transfer Protocol
  > HTTP/1.0 200 OK\r\n
    Server: VCS-VideoJet-Webserver\r\n
    Connection: keep-alive\r\n
    Content-Type: text/html\r\n
    Accept-Ranges: bytes\r\n
    Last-Modified: Wed, 07 Mar 2001 16:20:20 GMT\r\n
  > Content-Length: 9486\r\n
    Expires: 0\r\n
    \r\n
    [HTTP response 2/3]
    [Time since request: 0.067966000 seconds]
    [Prev request in frame: 5]
    [Prev response in frame: 12]
    [Request in frame: 15]
    [Next request in frame: 39]
    [Next response in frame: 91]
    [Request URI: http://192.168.1.149/]
    File Data: 9486 bytes
v Line-based text data: text/html (229 lines)
    <html>\r\n
    \r\n
    <head>\r\n
    <meta http-equiv="Content-Type" content="text/html; charset=windows-1252">\r\n
    <title>Hirschmann R-VIP - Operation</title>\r\n
    <base target="Seiten">\r\n
    <input type=hidden value="                                                    " id=jpg>\r\n
    <link rel=stylesheet Type="text/css" href="vcs01.css">\r\n
    <script language="JavaScript">\r\n
    <!--\r\n
    var stand=false;\r\n
    var starting=false;\r\n
```

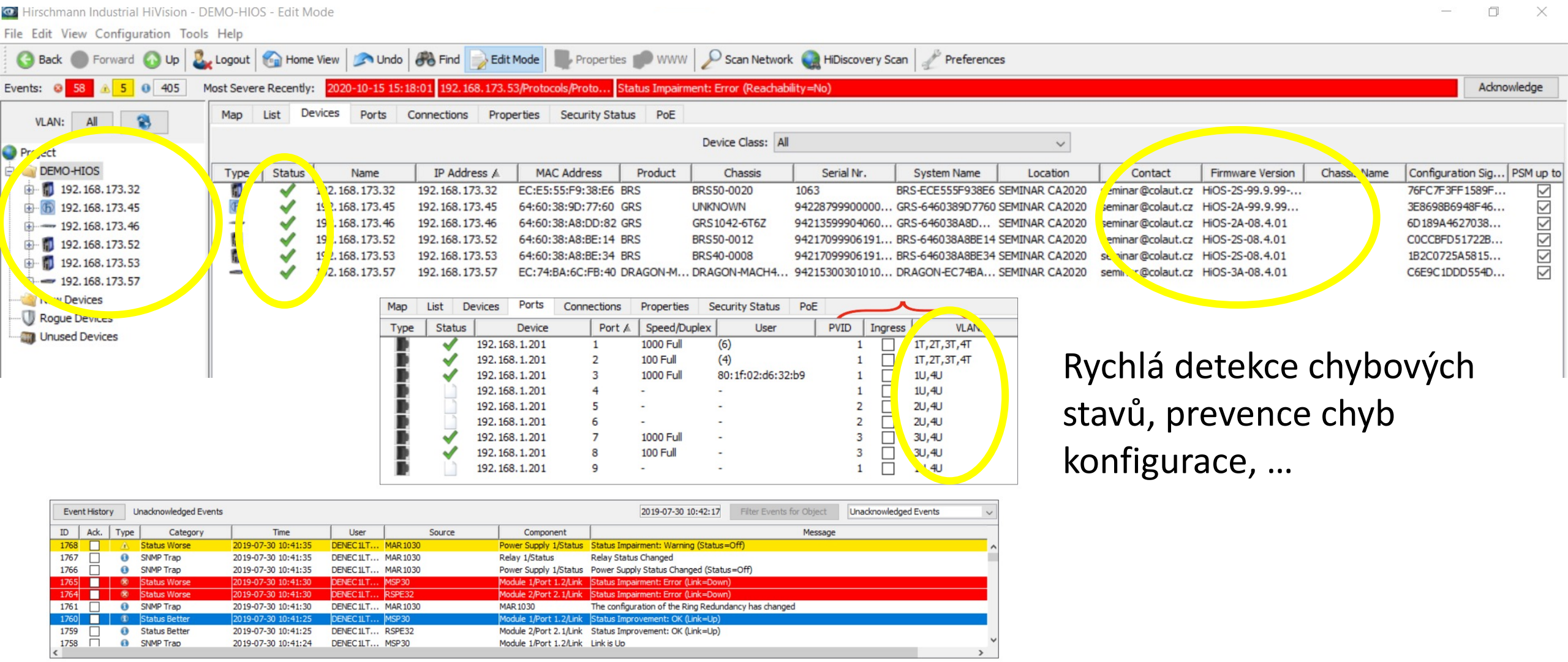
ID	Ack.	Type	Category	Time	User	Source	Component	Message
877			Application Info	2023-03-23 08:42:49	kasner.jiri	Industrial HiVision		Industrial HiVision Started: kasner.jiri/JIRI-P51
876			User Intervention	2023-03-23 08:42:47	JIRI-P51$	Industrial HiVision Service		Industrial HiVision Login, User: kasner.jiri / Host Name: host.docker.internal
875			Status Better	2023-03-23 08:42:03	JIRI-P51$	192.168.173.152	Protocols/Protocol SN…	Status Improvement: OK (Reachability=Yes)
874			Status Worse	2023-03-23 08:41:49	JIRI-P51$	192.168.173.152	Protocols/Protocol SN…	Status Impairment: Error (Reachability=No)
873			Status Better	2023-03-23 08:38:57	JIRI-P51$	192.168.173.152	Protocols/Protocol SN…	Status Improvement: OK (Reachability=Yes)
872			Status Worse	2023-03-23 08:38:49	JIRI-P51$	192.168.173.152	Protocols/Protocol SN…	Status Impairment: Error (Reachability=No)
871			Status Better	2023-03-23 08:36:02	JIRI-P51$	192.168.173.152	Protocols/Protocol SN…	Status Improvement: OK (Reachability=Yes)
870			Status Worse	2023-03-23 08:35:49	JIRI-P51$	192.168.173.152	Protocols/Protocol SN…	Status Impairment: Error (Reachability=No)
869			Status Better	2023-03-23 08:32:52	JIRI-P51$	192.168.173.152	Protocols/Protocol SN…	Status Improvement: OK (Reachability=Yes)

```
> Frame 26: 74 bytes on wire (592 bits), 74 bytes captured (592 bits) on interface \Device\NPF_{6AC63646-3EAD-437D-A50B-74B543C872AE}, id 0
> Ethernet II, Src: Dell_46:f5:77 (90:b1:1c:46:f5:77), Dst: JuniperN_ff:20:09 (00:10:db:ff:20:09)
> Internet Protocol Version 4, Src: 10.18.2.11, Dst: 10.50.131.100
v Internet Control Message Protocol
    Type: 0 (Echo (ping) reply)
    Code: 0
    Checksum: 0x2693 [correct]
    [Checksum Status: Good]
    Identifier (BE): 1 (0x0001)
    Identifier (LE): 256 (0x0100)
    Sequence Number (BE): 11976 (0x2ec8)
    Sequence Number (LE): 51246 (0xc82e)
    [Request frame: 25]
    [Response time: 0,000 ms]
  v Data (32 bytes)
      Data: 6162636465666768696a6b6c6d6e6f707172737475767761626364656667686 9
      [Length: 32]
```

```
0000  00 10 db ff 20 09 90 b1  1c 46 f5 77 08 00 45 00   ···· ···· ·F·w··E·
0010  00 3c 2b a7 00 00 80 01  75 67 0a 12 02 0b 0a 32   ·<+····· ug·····2
0020  83 64 00 00 26 93 00 01  2e c8 61 62 63 64 65 66   ·d··&··· ..abcdef
0030  67 68 69 6a 6b 6c 6d 6e  6f 70 71 72 73 74 75 76   ghijklmn opqrstuv
0040  77 61 62 63 64 65 66 67  68 69                    wabcdefg hi
```

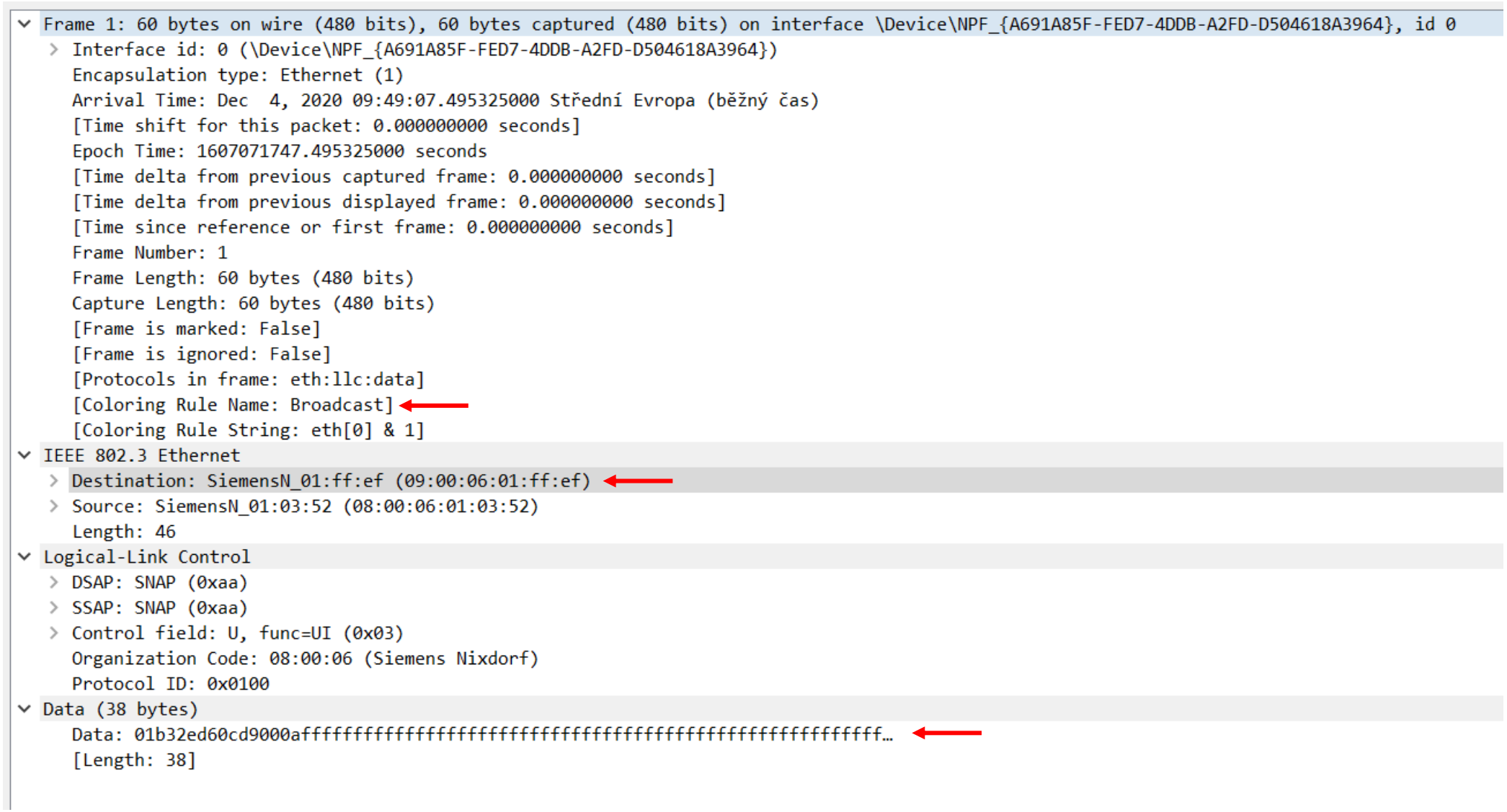
COLSYS AUTOMATIK

HIRSCHMANN
A BELDEN BRAND



Rychlá detekce chybových stavů, prevence chyb konfigurace, …

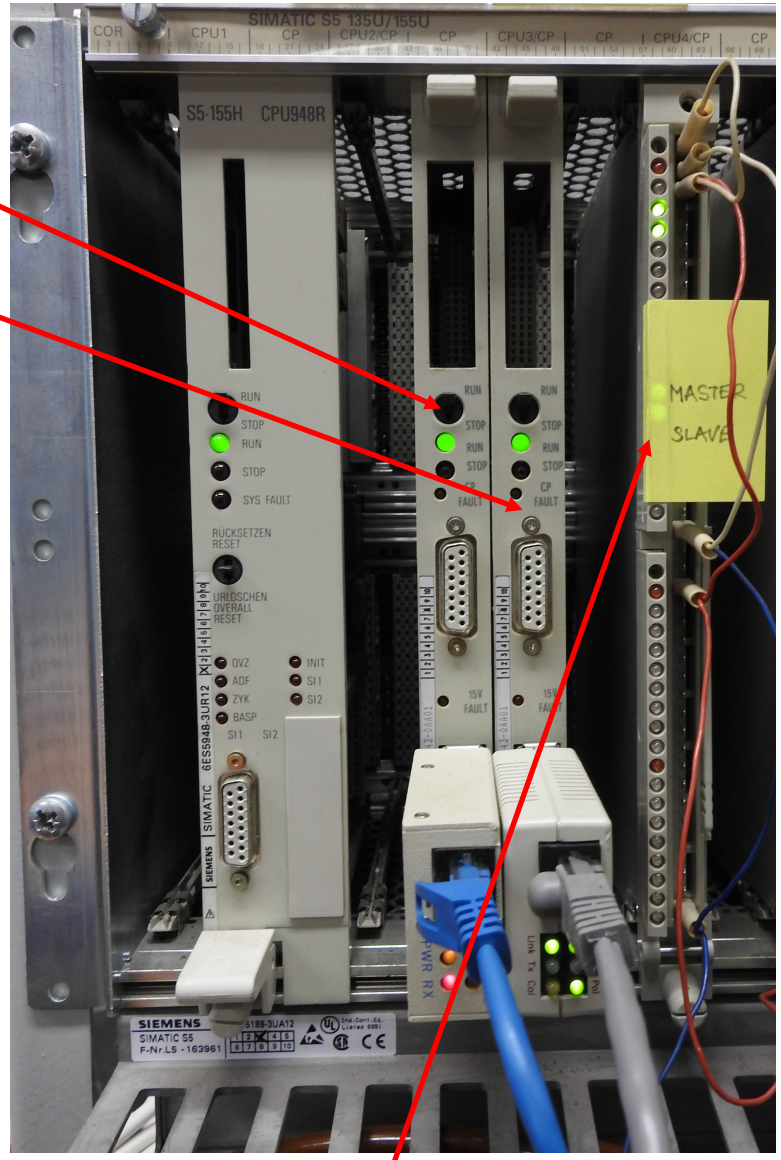
TXP time telegram identification on L2 / LLC



SIMATIC S5 CPU + 2x CP143

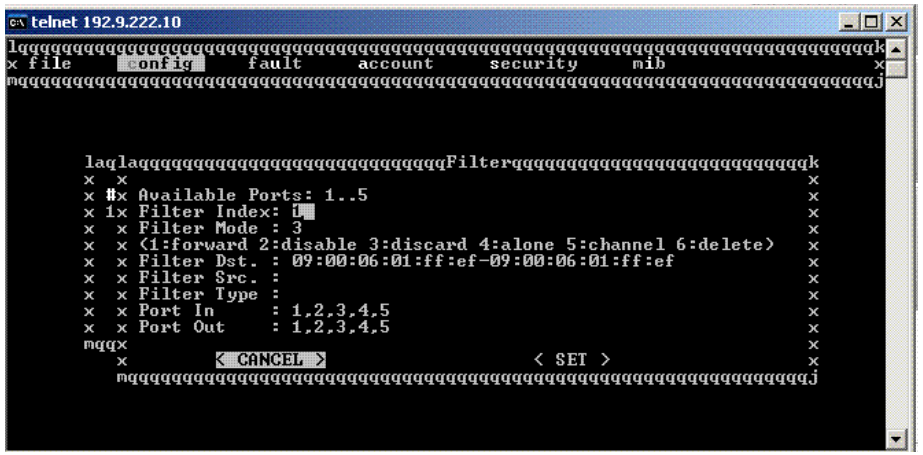
left: MASTER

right: SLAVE or MASTER
depending on time telegrams
delivery / existence from M to S

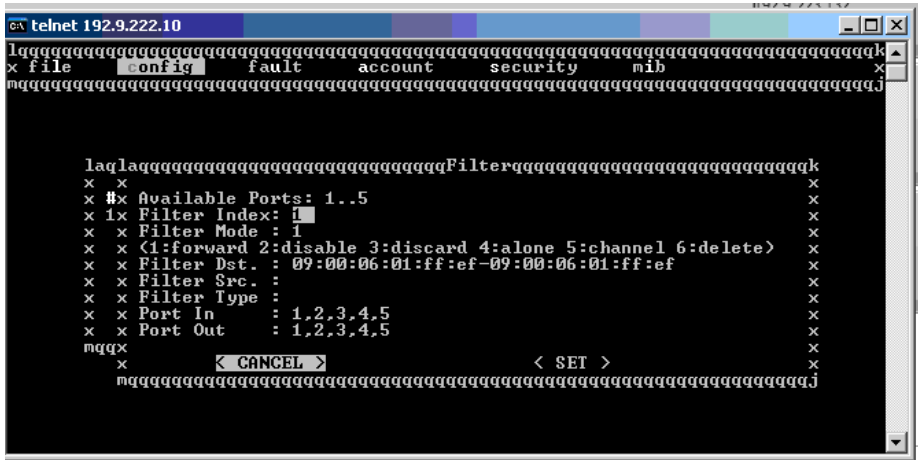


LEDs detecting MASTER / MASTER / SLAVE

MR8 rules configuration for TXP



filter ON



filter OFF

COLSYS AUTOMATIK

HIRSCHMANN
A BELDEN BRAND

SIMATIC S5 CPU + 2x CP143

LED1: MASTER1
LED2: MASTER2
LED3: SLAVE2

MASTER + MASTER
time telegram is NOT available from MASTER
bridge is working with valid rules
L2 MC 09:00:06:01:FF:EF is fully blocked on all ports of BRIDGE

MASTER + SLAVE
time telegram is available
from MASTER
(inside TB/PB or when
BRIDGE has no rules)

COLSYS AUTOMATIK

HIRSCHMANN
A BELDEN BRAND