



TECHNISCHE HOCHSCHULE
OSTWESTFALEN-LIPPE
UNIVERSITY OF
APPLIED SCIENCES
AND ARTS

Welcome

to Advanced Topics in Algorithms

Results ATA - Exercises 3

?

Team	Exercise 1	Exercise 2	Exercise 3	Exercise 4	Exercise 5
Jonas Lisa					
Nice					
Elite					
Kevin					
AtoMos					

?

Next deadline: 11/11/2022

Subject: ATA E4 [TEAMNAME]

Only one PDF



Overview of Exercises

■ Exercises 01: Basics

- Exercise 1: Development Environment
- Exercise 2: Overview of Extensions
- Exercise 3: Algorithm Description of A*
- Exercise 4: Deep Packet Inspection



■ Exercises 02: ML

- Exercise 1: Plot Reference Functions
- Exercise 2: Symbolic Regression (2D Case)
- Exercise 3: Regression with Polynomial Features (2D Case)
- Bonus Exercise 4 (n-dimensional Case)

■ Exercises 03: ML

- Exercise 1: K-Means
- Exercise 2: K-Means and Images
- Bonus Exercise 3: Regression with Polynomial Features (2D Case)
- Bonus Exercise 4 (n-dimensional Case)
- Bonus Exercise 5 (Implement K-Means)

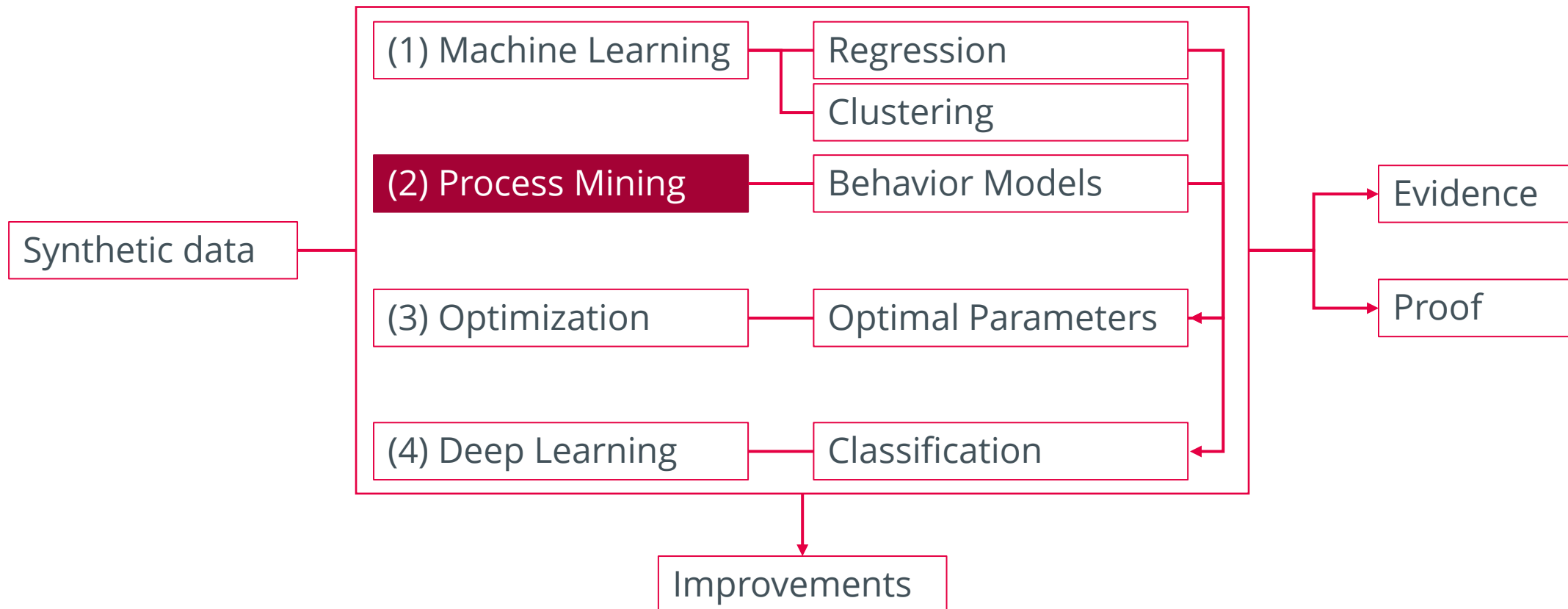
Next deadline: 11/11/2022

Subject: Overview_[TEAM]

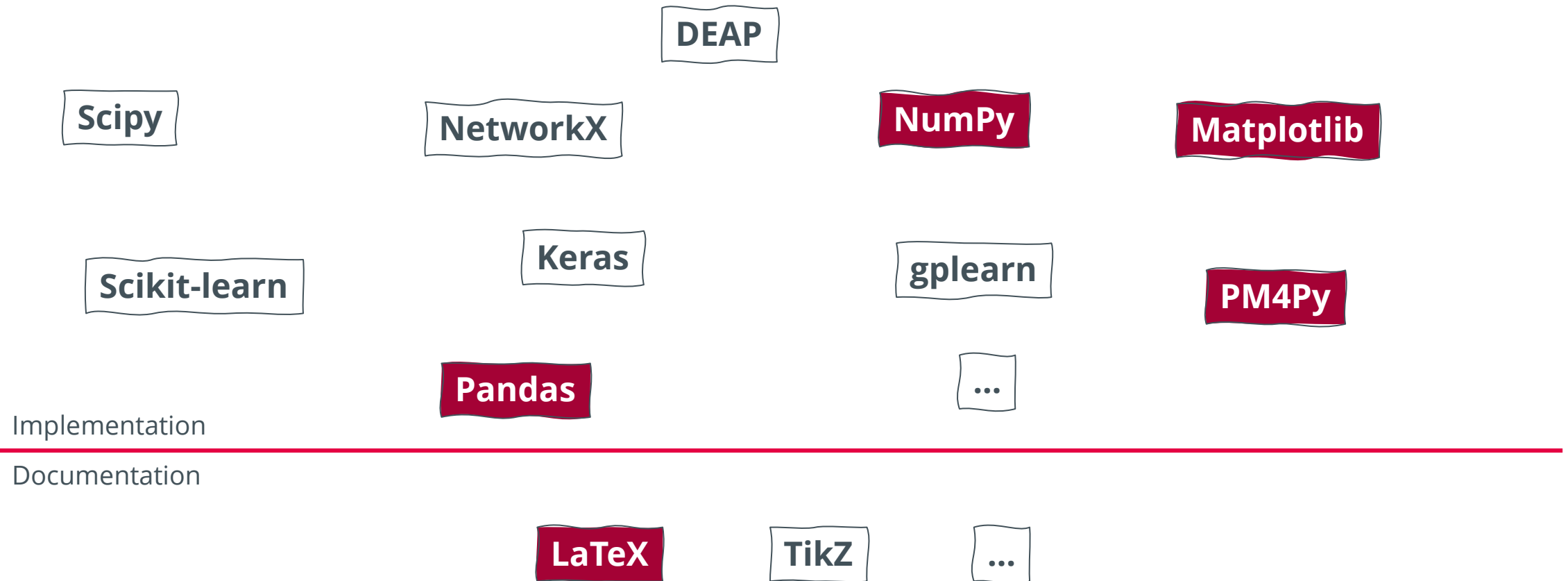
List of team members

Exercises (PDF) with
correct titles and identifier

Overview: Advanced Topics in Algorithms



Overview: Practical Part



Produce Coffee

(1) Power on



Activity	Timestamp
power on	12:00:00

--	--

(2) Take Pad



Activity	Timestamp
power on	12:00:00
take pad	12:05:00

--	--

(3) Add Pad



Activity	Timestamp
power on	12:00:00
take pad	12:05:00
add pad	12:05:30

--	--

(4) Close

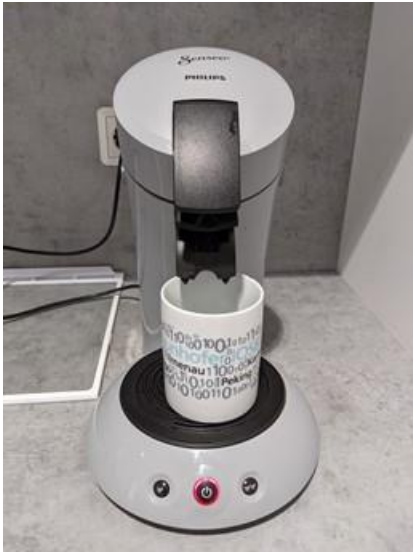


Activity	Timestamp
power on	12:00:00
take pad	12:05:00
add pad	12:05:30
close	12:05:40

--	--

Produce Coffee

(5) Start



Activity	Timestamp
start	12:05:45

(6) Produce



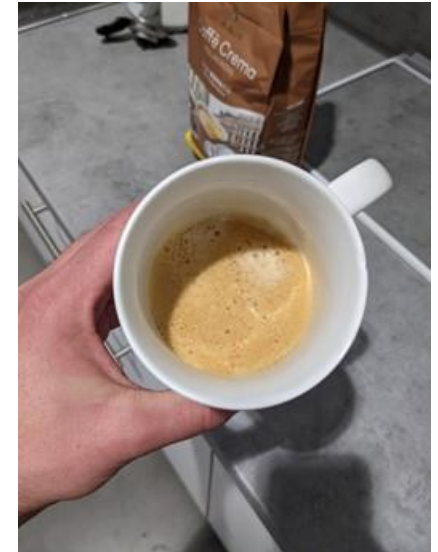
Activity	Timestamp
start	12:05:45
produce	12:07:00

(7) Remove Pad



Activity	Timestamp
start	12:05:45
produce	12:07:00
remove pad	12:07:30

(8) Enjoy



Activity	Timestamp
start	12:05:45
produce	12:07:00
remove pad	12:07:30
enjoy	12:20:00

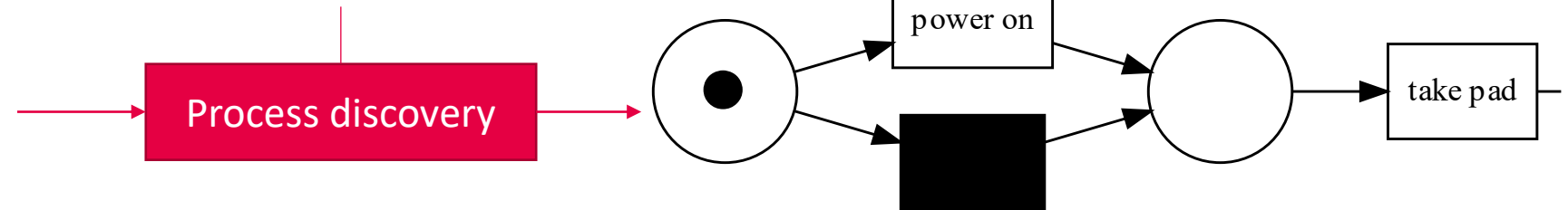
Process Mining

Event log*

Case	Activity	Timestamp
1	power on	12:00:00
1	take pad	12:05:00
1	add pad	12:05:30
1	close	12:05:40
1	start	12:05:45
1	produce	12:07:00
1	remove pad	12:07:30
1	enjoy	12:20:00
2	power on	12:45:00
...		

Petri Net

- Alpha miner
- Heurist miner
- Inductive miner



*IEEE XES is a standard format describing how event logs are stored
<http://www.xes-standard.org/>

Excuse: Deep Packet Inspection

0_normal_run_1.pcap

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

Apply a display filter ... <Ctrl-/>

No.	Time	Source	Destination	Protocol	Length	Operation	Info
1	0.000000	Hirschma_5c:46:4a	Spanning-tree-(for-...	STP	60		RST, Root = 32768/0/ec:74:ba:5c:46:40 Cost = 0 Port = 0x8006
2	0.000417	Hirschma_5c:46:4b	Spanning-tree-(for-...	STP	60		RST, Root = 32768/0/ec:74:ba:5c:46:40 Cost = 0 Port = 0x8007
3	0.199438	Hirschma_5c:46:48	LLDP_Multicast	LLDP	273		MA/ec:74:ba:5c:46:40 MA/ec:74:ba:5c:46:48 120 SysN=192.168.0.141 SysD=Hirschmann Rail Switch Power - SW: HIOS-2S-PRP-07
4	0.930132	Siemens_ad:78:fc	PN-MC_00:00:00	PN-DCP	60		Ident Req, Xid:0x1020002, NameOfStation:"bk9103-1"
5	0.930132	Siemens_ad:78:fc	PN-MC_00:00:00	PN-DCP	60		Ident Req, Xid:0x1020002, NameOfStation:"bk9103-1"
6	0.932825	Beckhoff_2b:ae:e8	Siemens_ad:78:fc	PN-DCP	132		Ident Ok, Xid:0x1020002, NameOfStation:"bk9103-1", Dev-Options(9), DeviceVendorValue, Dev-Role, Dev-ID, IP, MAC
7	1.116081	Hirschma_5c:46:48	LLDP_Multicast	LLDP	273		MA/ec:74:ba:5c:46:40 MA/ec:74:ba:5c:46:48 120 SysN=192.168.0.141 SysD=Hirschmann Rail Switch Power - SW: HIOS-2S-PRP-07
8	1.208735	::	ff02::16	ICMPv6	110		Multicast Listener Report Message v2
9	1.496733	::	ff02::16	ICMPv6	110		Multicast Listener Report Message v2
10	1.517053	Hirschma_5c:46:40	Broadcast	ARP	60		Who has 192.168.0.141? (ARP Probe)
11	1.517323	Hirschma_5c:46:40	Broadcast	ARP	60		Who has 192.168.0.141? (ARP Probe)
12	1.528741	::	ff02::1:ff98:e49	ICMPv6	86		Neighbor Solicitation for fe80::6841:e60a:ac98:e49
13	1.700483	Hirschma_5c:46:40	Broadcast	ARP	60		Who has 192.168.0.141? (ARP Probe)
14	1.700483	Hirschma_5c:46:40	Broadcast	ARP	60		Who has 192.168.0.141? (ARP Probe)
15	1.833188	Hirschma_5c:46:4a	Spanning-tree-(for-...	STP	60		RST, Root = 32768/0/ec:74:ba:5c:46:40 Cost = 0 Port = 0x8006
16	1.833798	Hirschma_5c:46:4b	Spanning-tree-(for-...	STP	60		RST, Root = 32768/0/ec:74:ba:5c:46:40 Cost = 0 Port = 0x8007
17	1.846887	Siemens_ad:78:fc	Broadcast	ARP	64		Who has 192.168.0.2? Tell 192.168.0.1
18	1.883742	Hirschma_5c:46:40	Broadcast	ARP	60		Who has 192.168.0.141? (ARP Probe)
19	1.883980	Hirschma_5c:46:40	Broadcast	ARP	60		Who has 192.168.0.141? (ARP Probe)
20	2.067031	Hirschma_5c:46:40	Broadcast	ARP	60		Who has 192.168.0.141? (ARP Probe)
21	2.067321	Hirschma_5c:46:40	Broadcast	ARP	60		Who has 192.168.0.141? (ARP Probe)
22	2.255461	Hirschma_5c:46:40	Broadcast	ARP	60		ARP Announcement for 192.168.0.141
23	2.255461	Hirschma_5c:46:40	Broadcast	ARP	60		ARP Announcement for 192.168.0.141
24	2.568233	fe80::6841:e60a:ac9...	ff02::16	ICMPv6	110		Multicast Listener Report Message v2
25	2.571766	fe80::6841:e60a:ac9...	ff02::16	ICMPv6	90		Multicast Listener Report Message v2
26	2.573863	fe80::6841:e60a:ac9...	ff02::2	ICMPv6	62		Router Solicitation
27	2.575726	fe80::6841:e60a:ac9...	ff02::16	ICMPv6	130		Multicast Listener Report Message v2
28	2.951745	fe80::6841:e60a:ac9...	ff02::16	ICMPv6	130		Multicast Listener Report Message v2
29	3.143738	fe80::6841:e60a:ac9...	ff02::16	ICMPv6	130		Multicast Listener Report Message v2
30	3.313524	fe80::6841:e60a:ac9...	ff02::fb	MDNS	208		Standard query response 0x0000 PTR, cache flush fedora-carsten.local AAAA, cache flush fe80::6841:e60a:ac98:e49
31	3.666339	Hirschma_5c:46:4a	Spanning-tree-(for-...	STP	60		RST, Root = 32768/0/ec:74:ba:5c:46:40 Cost = 0 Port = 0x8006
32	3.666339	Hirschma_5c:46:4b	Spanning-tree-(for-...	STP	60		RST, Root = 32768/0/ec:74:ba:5c:46:40 Cost = 0 Port = 0x8007

< Frame 1: 60 bytes on wire (480 bits), 60 bytes captured (480 bits)

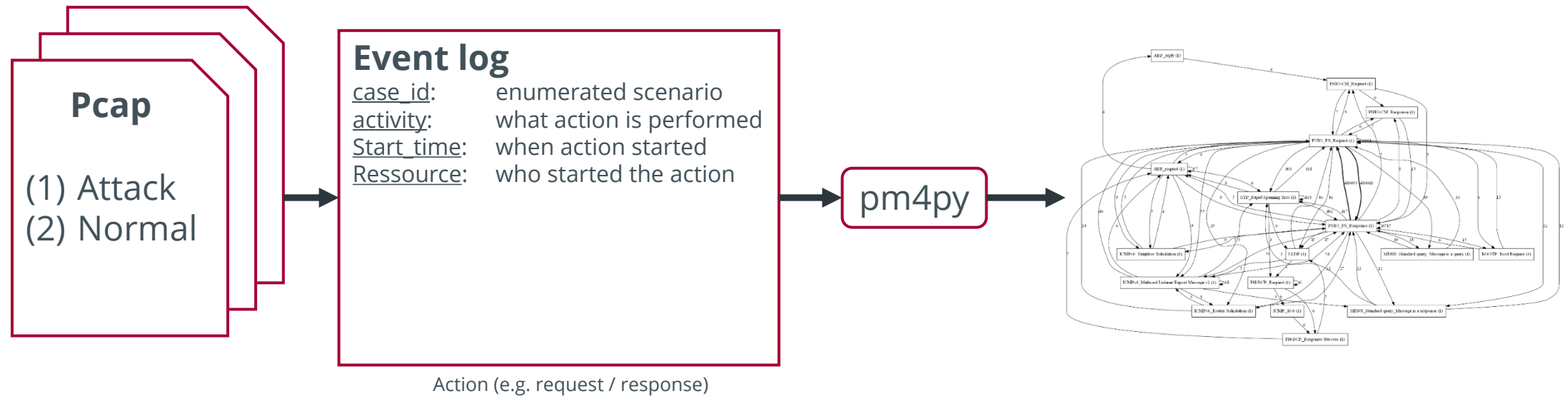
- > IEEE 802.3 Ethernet
- > Logical-Link Control
- > Spanning Tree Protocol

```

0000 01 80 c2 00 00 00 ec 74 ba 5c 46 4a 00 27 42 42 .....t..FJ.'BB
0010 03 00 00 02 02 0e 80 00 ec 74 ba 5c 46 40 00 00 .....t..F@..
0020 00 00 00 00 ec 74 ba 5c 46 40 80 06 00 00 14 00 .....t..F@....
0030 02 00 0f 00 00 00 00 00 00 00 00 00 .....F....
  
```

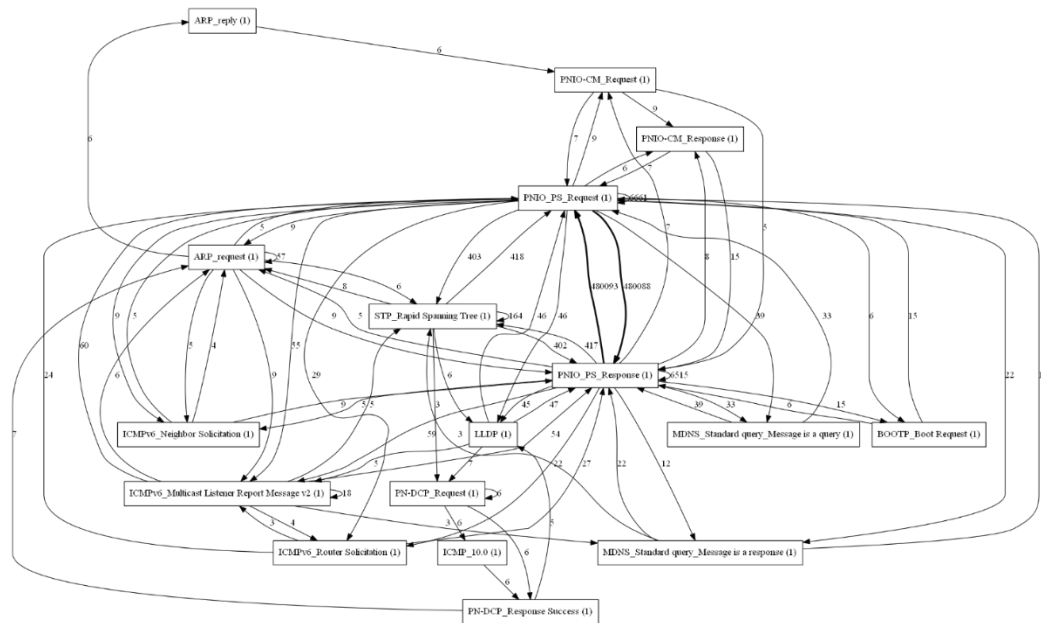
0_normal_run_1.pcap | Packets: 117240 · Displayed: 117240 (100.0%) | Profile: Default

Excuse: Deep Packet Inspection

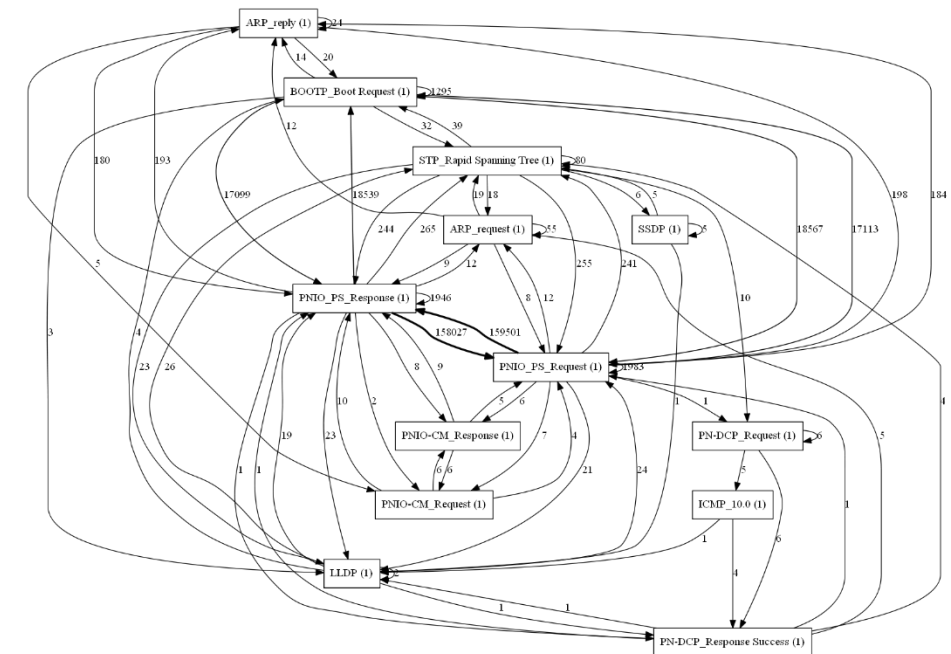


Excuse: Deep Packet Inspection

Normal



ARP CP





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Thank you!