SHARING AND AUTOMATION FOR PRIVACY PRESERVING ATTACK NEUTRALIZATION

Demonstration of large-scale endpoint profiling

SAPPAN @ CSIRT-MU

Tomas Jirsik and Michal Pavuk

(Masaryk University)

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Agenda

- Data Sources
- Endpoint Profiles
- Sample Use cases
- Visual Exploration of the Profiles

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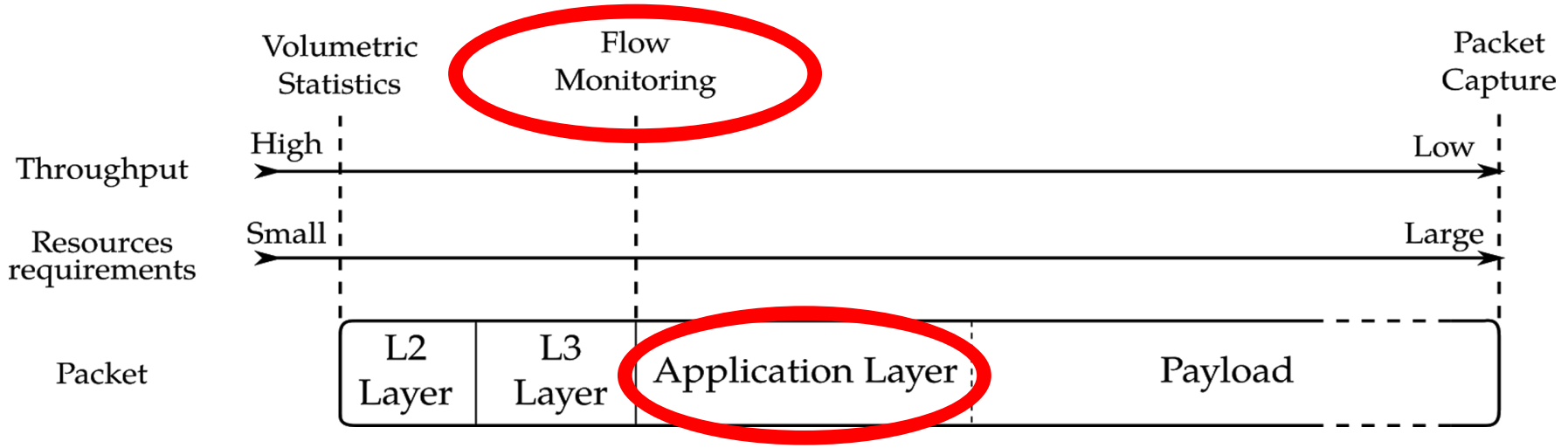
Data source – Network Telemetry




```
Date first seen          Duration Proto      Src IP Addr:Port          Dst IP Addr:Port   Flags Tos  Packets    Bytes      pps      bps    Bpp Flows
2020-05-14 23:54:29.556   275.212 TCP      [redacted]:34801 ->      [redacted]:443    ....AP...    0       12      828        0       24     69     1
2020-05-14 23:58:46.186     0.000 UDP      [redacted]:5287  ->      [redacted]:53     ........     0        1      103        0        0    103     1
2020-05-14 23:58:40.989     0.000 UDP      [redacted]:123   ->      [redacted]:49268  ........   184        1       76        0        0     76     1
2020-05-14 23:58:43.425     0.000 UDP      [redacted]:123   ->      [redacted]:50982  ........   184        1       76        0        0     76     1
2020-05-14 23:56:51.713   112.003 ICMP     [redacted]:0     ->      [redacted]:771    ........     0        3      168        0       11     56     1
2020-05-14 23:58:43.107     0.000 UDP      [redacted]:55954 ->      [redacted]:88     ........     0        1      207        0        0    207     1
2020-05-14 23:54:30.349   299.371 TCP      [redacted]:443   ->      [redacted]:49423  ....AP.S.    0       26     3.3 K       0       90    129     1
2020-05-14 23:54:59.748   298.399 TCP      [redacted]:9999  ->      [redacted]:40716  ....AP...    0       85    17.4 K       0      476    209     1
2020-05-14 23:59:58.776     0.000 UDP      [redacted]:54101 ->      [redacted]:53     ........   184        1       97        0        0     97     1
2020-05-14 23:59:59.811     0.000 UDP      [redacted]:42330 ->      [redacted]:53     ........     0        1       67        0        0     67     1
Summary: total flows: 10, total bytes: 22.2 K, total packets: 132, avg bps: 551, avg pps: 0, avg bpp: 172
Time window: 2020-05-14 23:53:49 - 2020-05-15 00:04:59
Total flows processed: 2605, Blocks skipped: 0, Bytes read: 1048505
Sys: 0.082s flows/second: 31559.7    Wall: 0.007s flows/second: 327179.1
```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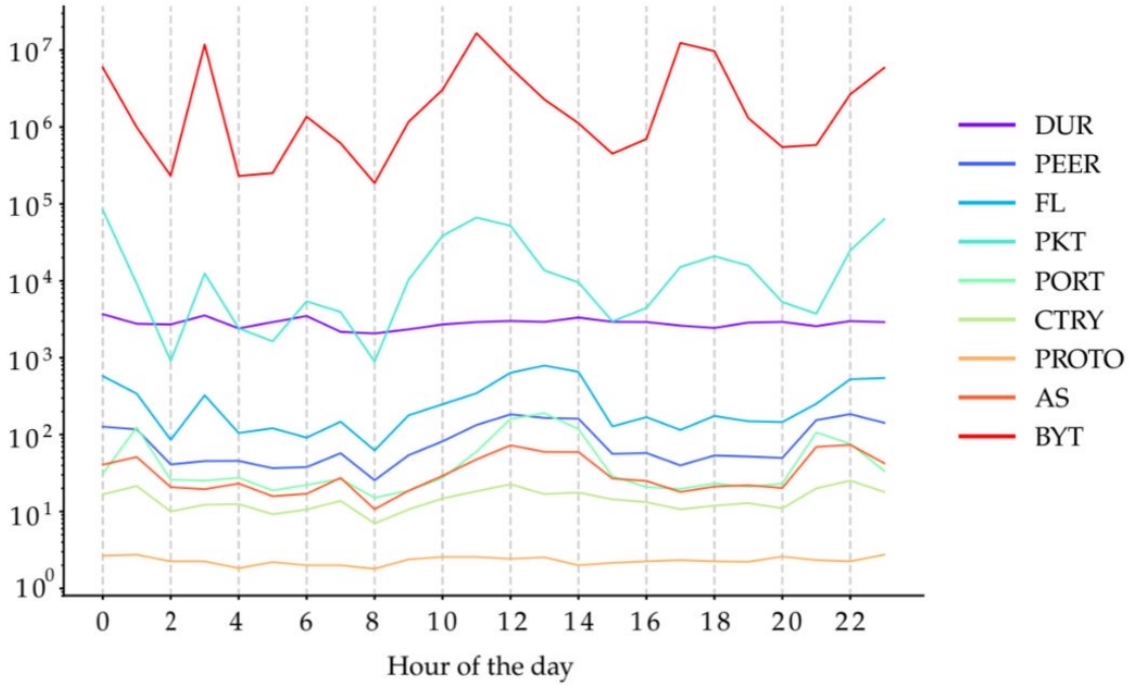
Endpoint profile – network telemetry

HOST-RELATED IP FLOW FEATURES

Type	Name	Aggregation
Aggregations	# of flows (FL)	src IP
	# of packets (PKT)	src IP
	# of bytes (BYT)	src IP
	Flow duration (DUR)	src IP
Distinct counts	# of peers (PEER)	src IP, dst IP
	# of ports (PORT)	src IP, dst ports
	# of protocols (PROTO)	src IP, dst ports
	# of AS numbers (AS)	src IP, dst AS number
	# of countries (CTRY)	src IP, dst country



Additional features

- Day/night ratios
- In/Out ratios
- Aggregations over extended time period
- Top N statistics

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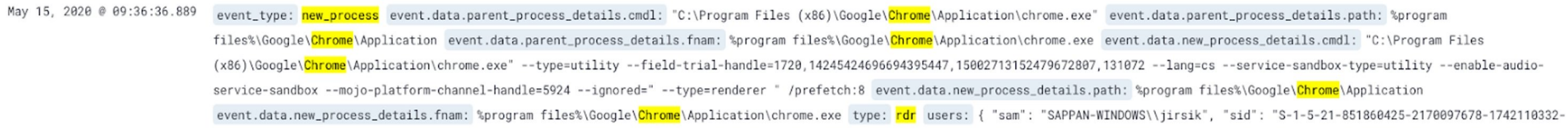
Data source – Endpoint Telemetry

- System Logs
- Events by F-Secure
  - new/open/stop process
  - module load
  - create thread
  - registry write
  - file access
  - network connection
  - powershell events
  - OS security events



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Endpoint profile – endpoint telemetry

F-SECURE events

- process tree

Aggregate stats:

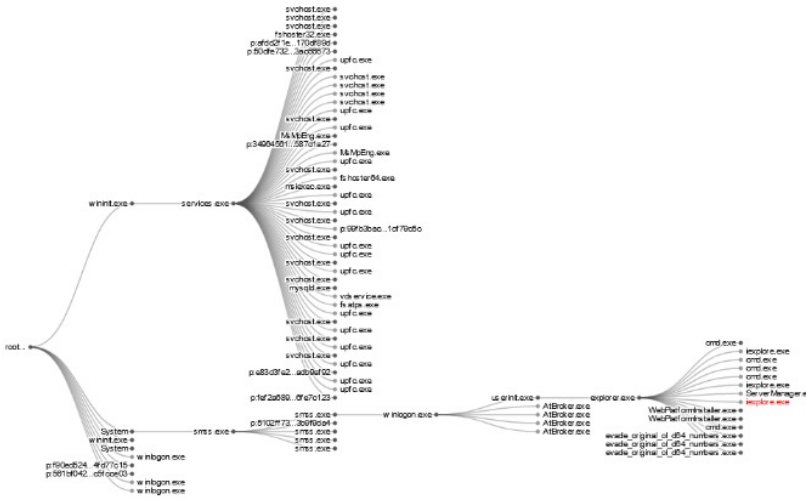
- num_logs -> total number of logs
- num_logons -> num of logs with event ID 4624 (An account was successfully logged on)
- num_dst_tasks -> number of distinct tasks which generated the logs
- num_dst_sources -> number of distinct sources which generated the logs
- num_wsa -> number of events where source is Microsoft-Windows-Security-Auditing

Host OS:

- name -> e.g. Windows 10 Education version build

Top stats:

- tasks: top 5 tasks which generated the most logs
- sources: top 5 sources which generated the most logs



Process

6148	not elevated
GPID:	p:724f3d69017254d91c08bedc682df65b
Name:	iexplore.exe
Path:	%program files%\internet explorer
Command:	"C:\Program Files\internet explorer\iexplore.exe"
User:	SAPPAN-WINDOWS\obrecht
SHA1:	5d5586e4273110d48f2cd8b19a91e8853de5e02c

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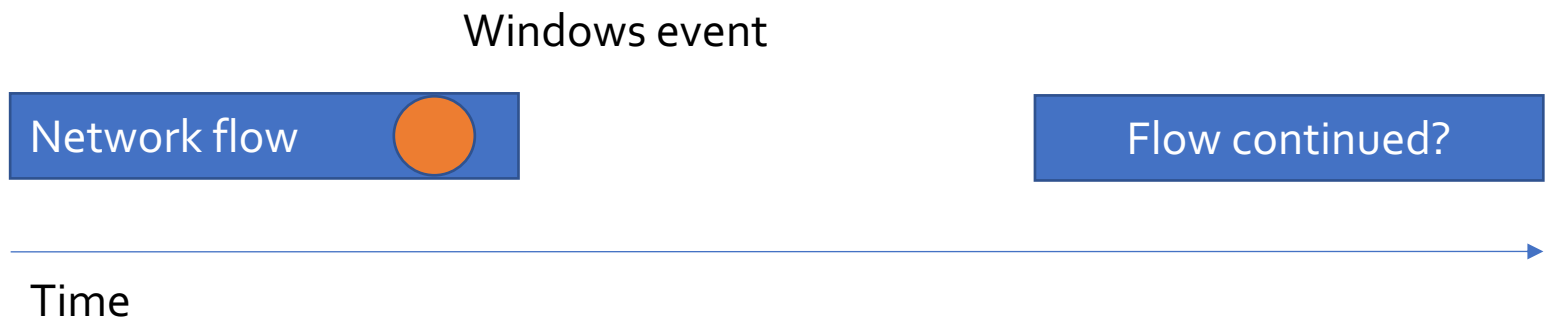
Data Correlation

- Based on common attributes
  - Source & Destination IP and ports
  - Sliding time window
- Problems
  - Not all network events are logged
  - Reuse of the source ports by the OS



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How can be the profiles used?

- **Clustering of profiles**
  - identification of groups with similar properties
  - different purpose
  - segmentation
  - variability (security)
- **Classification**
  - profile assignment
- **Long Term Observations**
  - history of host behaviors
- **Visual Analytics**
  - explorative analysis
  - get understanding

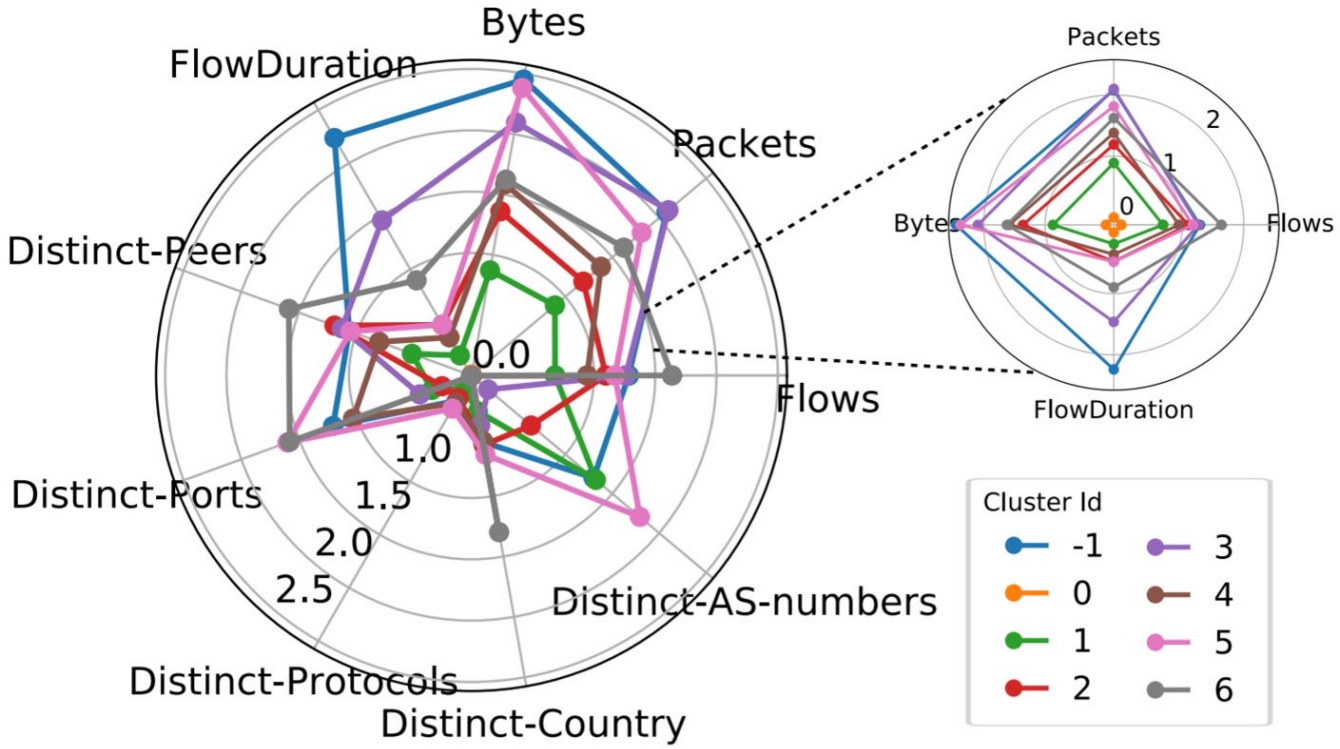

Fig. 9. Representation of clusters of hosts with similar variability of behavior characteristics.

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Profile Usecase I

Temporal patterns in behavior

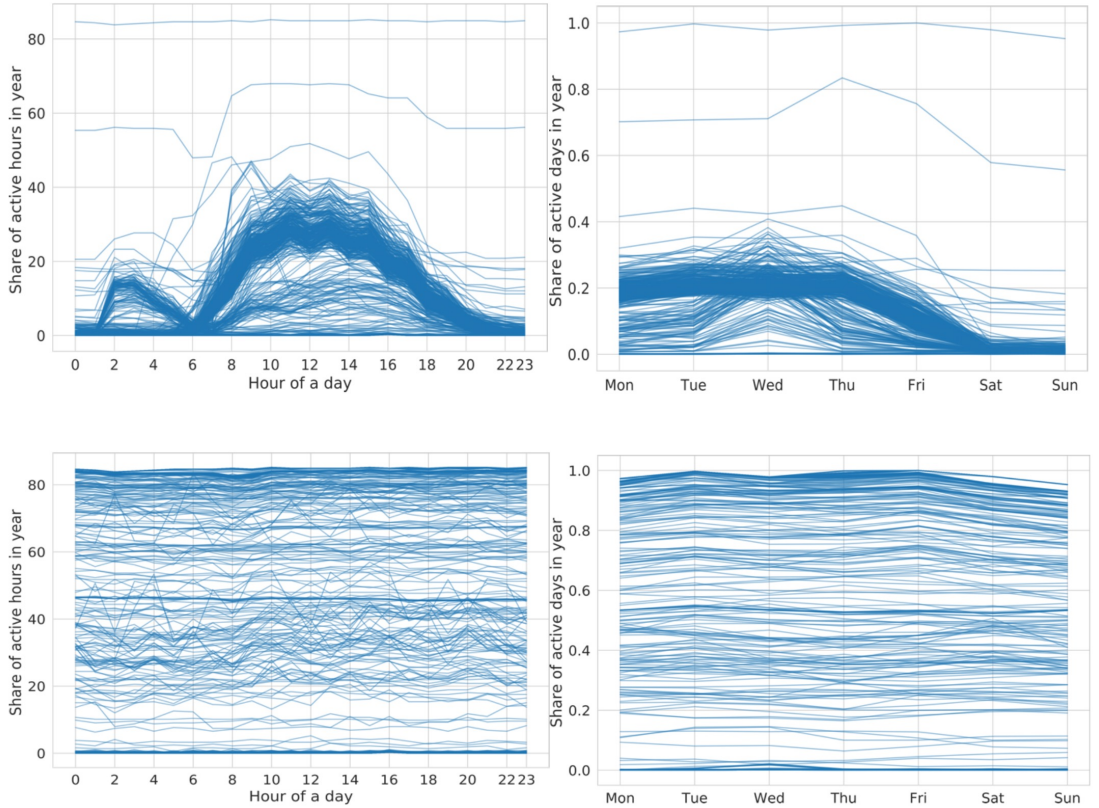

Figure 9:Temporal patterns present in workstation's (above) and server's (below) behavior during a day (left, in %) and week (right, in 0-1)

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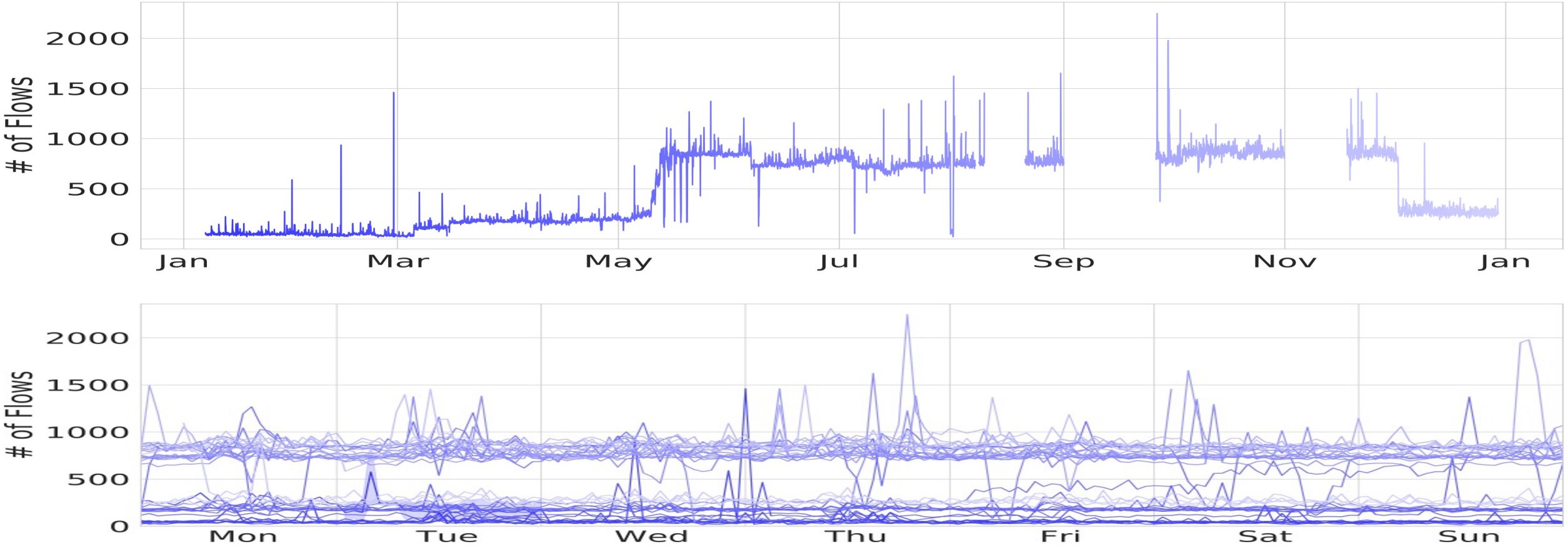
Profile Usecase II

Detection of the increasing usage



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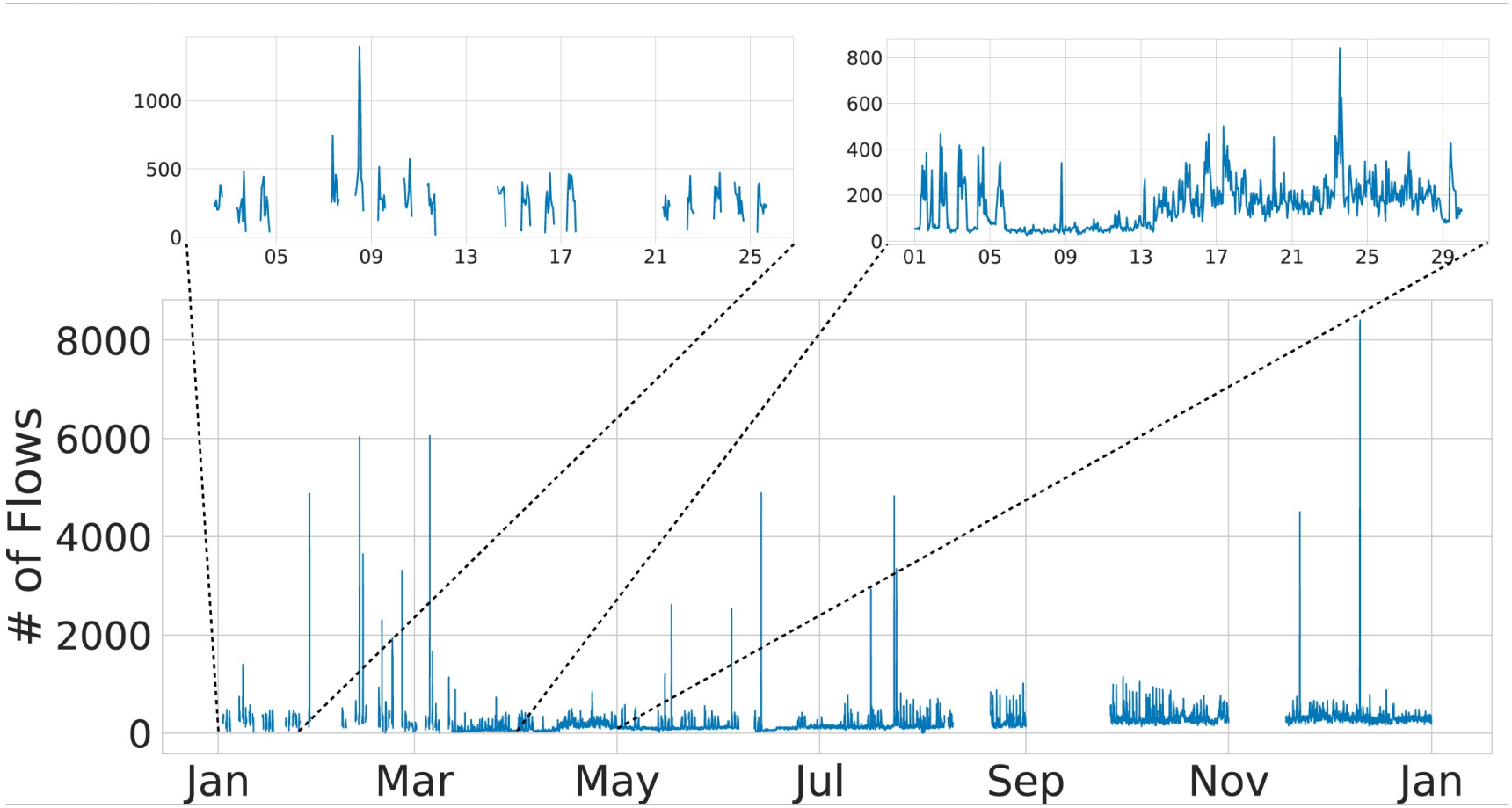
Profile Usecase III

Detection of the change in behavior



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Profile Usecase IV

Detection of the anomalous activity

- Example of the scanning detection
  - High number of flows
  - High number of distinct peers
  - Unchanged number of distinct ports

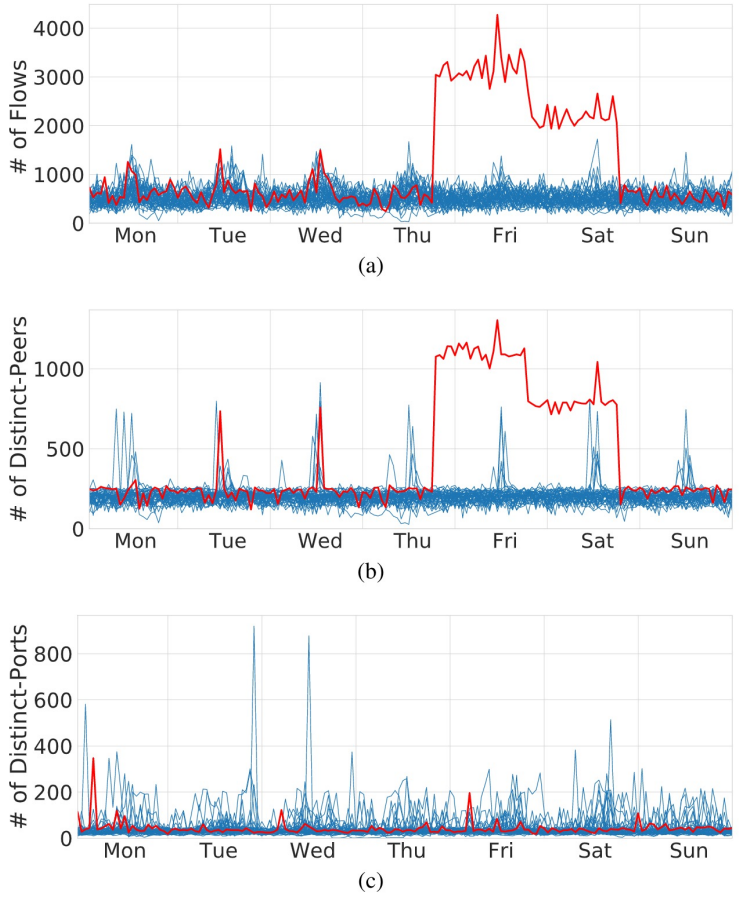

Fig. 14. Use case 3: Suspicious activity in week profile *(host 133.250.178.62)*, (a) number of flows, (b) number of distinct peers, (c) number of distinct ports.

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On-going: Automated Response

- Simple playbook for Phishing attacks
- The complexity is primarily within the performed actions
- Tip of the iceberg
  - Determine if quarantined email is Phishing
  - Get distributed OSINT for *IP*, *domain*, *file*
  - Search all traffic and logs for observables from 6 months ago
  - Block *IP* via FlowSpec, Block *domain* via DNS RPZ
- Orchestration is not overly hard, but also not trivial
  - We use *Apache Airflow* for our prototypes
  - Other engines are available

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Let’s get in touch

https://sappan-project.eu

https://csirt.muni.cz/

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