

SCRUB **NetFlows**

A Software Tool for Multi-Field Multi-Level NetFlows Anonymization

<<http://scrub-netflows.sourceforge.net/>>

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CANINE (Flocon'05) a NetFlows Converter/Anonymizer



- **CANINE: Converter and ANonymizer for Investigating Netflow Events**

<http://security.ncsa.uiuc.edu/distribution/CanineDownload.html>

- **Converter**
 - Cisco V5 & V7, ArgusNCSA, CiscoNCSA, NFDump
- **Anonymizer**
 - 5 NetFlow fields (multi-field)
(1) IP, (2) Timestamp, (3) Port, (4) Protocol, (5) Byte Count
 - Multiple options for each field (multi-level anonymization)
- **Java GUI – easy to use point-and-click**

SCRUB NetFlows (Flocon'08)

New & Improved NetFlows Anonymizer

- **ASCII-based PERL code**
 - works on any NetFlows format converted to ascii
 - optimized code (multi-threaded parallelization)
- **Anonymizes more NetFlow fields (10>5)**
 - adding support for additional fields is minimal
 - (6) TimeStamp (first/last pkt) (7) TOS (8) TTL (9) TCP Flags (10) Packet Count
- **Improved/More anonymization options per field**
 - Fixes Crypto-PAn IP address anonymization flaw
 - Working on tailoring semantics to low/medium/high
- **Command line operation**
 - UNIX friendly, consistency with other SCRUB* tools
 - cascaded streaming operation available via piping

SCRUB-NetFlows

Multi-Level Anonymization Options

- Black Marker (filtering/deletion)
- Pure Randomization (replacement)
- Keyed Randomization (replacement)
- Annihilation/Truncation (accuracy reduction)
- Prefix-Preserving Pseudonymization (IP address)
- Grouping (accuracy reduction)
 - Bilateral Classification
- Enumeration (time, adding noise)
- Time Shift (time, adding noise)

Example: Timestamp Field (First/Last Pkt)

- Black Marker
 - replacement of field with a predefined constant (0)
- Random Time Shift
 - increments given time by a random value within a user defined window
- Enumeration
 - sorts entries by timestamp, applies black-marker
- Distance-preserving pseudonymization
 - preserve distance between two timestamps
- More
 - including pure/keyed randomization, truncation, unit annihilation

Addressing Crypto-PAn Flaw in SCRUB-NetFlows

- Crypto-PAn is widely used for prefix-preserving pseudonymization
 - flaw discovered – attacker can reverse-engineer the original prefix mapping in a given dataset
- Our use of Crypto-PAn
 - Begin with two separate instances of Crypto-PAn with two distinct keys: Crypt1 and Crypt2
 - Determine network and host portion of IP address
 - Run Crypt1 and Crypt2 on the IP address
 - Return the network of Crypt1 concatenated with the host given by Crypt2

Example usage

- Anonymizations done on one line of an Argus NetFlow
 - The program is told to black marker the source IP, randomize the destination IP, and black marker the first timestamp

```
$ ./scrub-netflow.pl -r ArgusData_146_78 -w AnonData -o "srcip bm dstip rand firsttimestamp bm"
Anonymizing ARGUS format
$ tail -n 1 AnonData
01 Jan 71 01:01:01 02 Oct 03 14:00:50 udp 10.10.10.11.1118 -> 39.7.114.87.55525 6 0
4856 0 INT

$ tail -n 1 ArgusData_146_78
02 Oct 03 14:00:00 02 Oct 03 14:00:50 udp 132.156.189.139.1118 -> 228.154.76.120.55525 6
0 4856 0 INT

$ █
```

Anonymization for Sharing: The Privacy vs. Analysis Tradeoff



while anonymization protects against information leakage it also destroys data needed for security analysis

- Zero-Sum? (more privacy \leftrightarrow less analysis & vice versa)
- We are now making measurements of the tradeoff
 - another story but we can talk off-line

Summary

- Critical need for security data sharing between organizations
- Anonymization can provide safe security data sharing
 - Multi-Field: prevent information leakage
 - Multi-Level: no one-size-fits-all anonymization solution
- *SCRUB-NetFlows* as part of a data sharing infrastructure (*SCRUB**) supporting multiple data sources
 - NetFlows is not the only data source of interest
- No “One-Size-Fits-All” anonymization policy
 - multi-level anonymization options can/should be tailored to requirements of sharing parties to optimize tradeoffs
 - privacy/analysis anonymization tradeoffs need to be characterized

SCRUB* References

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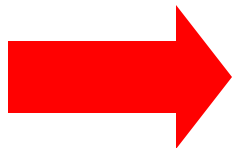
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