User survey regarding the needs of network researchers in trace-anonymization tools

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Abstract

To understand the needs of network researchers in an anonymization tool, we conducted a survey on the network researchers. We invited network researchers world-wide to the survey by sending invitation emails to well-known mailing lists whose subscribers may be interested in network research with collecting, sharing and sanitizing network traces.

1 Survey set-up

Network traces, which record the activity of network users, are an important tool in computer networking research. It remains a difficult challenge to capture such traces, primarily because it is difficult to obtain permission from the network operator. It is even more difficult to share network traces with others, because of privacy concerns.

We hope increase network-trace sharing by making it safer and easier to "sanitize" network traces, that is, to remove sensitive identifiable information. Sanitization always involves a challenging trade-off between sanitization effectiveness (providing anonymity for network users and secrecy for network operational information) and research usefulness (since only the information retained can be used by the researcher).

We set out to survey network researchers to determine what experience they had with collecting, sanitizing, or using network traces. We asked about 30 questions regarding collecting, sharing and sanitizing network traces, using sanitization tools, and evaluating sanitization results. The survey takes 5-15 minutes but the survey participant can stop earlier if he or she wishes. In the end, 108 people participated in the survey. We conducted our survey during the period from May 21, 2009 to October 27, 2009.

2 Survey results

According to their responses, 84% of the participants have collected network traces and 88% of the collected traces contain some sensitive information. More than 83% of the participants agree that protecting personal information is a major concern when sharing the traces with others and this issue is considered to be an obstacle. About 55% of the participants who have collected their own traces, have experience of sanitizing the traces. Among them, only 39% used third-party tools while about 71% of people used their own software. Regarding the verification of sanitization result, 84% of 38 responders answered that they did not use any quantitative metrics to measure the strength of the sanitization. Also, 76% of the responders thought that the sanitization they applied will limit the usefulness of network traces. About half of 86 participants have never heard or used any sanitization tools. The tools that participants reported to have heard or used for sanitization, include TCPdpriv, TCPurify, Crypto-PAn, AnonTool, tcpmkpub, FLAIM, CANINE, CoralReef, PktAnon, Tcpdump Anonymizer, traceanon, WDCap, in the order of most uses.

Figures 1–20 show the details of the survey results, including the actual questions, response statistics and summary of the responses.

3 Summary and conclusion

This information from the survey feedback will help us to refine our ideas about expressing sanitization goals and research usefulness goals, about new anonymization methods, and about new metrics. The information will also help us to develop the NetSANI framework.[1]

Acknowledgements

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[1]http://www.cs.dartmouth.edu/~dfk/papers/index.html#netsani

Have you ever collected network traces for your research?

Answer Options	Response Percent	Response Count
Yes	83.5%	96
No	16.5%	19
answered question		115
skipped question		0

Figure 1: (Question 1) 84% of the participants have collected network traces

What kinds of network traces have you collected? (check all that apply)

Answer Options	Response Percent	Response Count
NetFlow log	23.1%	21
Pcap trace	74.7%	68
NCSA Unified Format	0.0%	0
IEEE 802.11 (such as Prism or Radiotap header, or raw	39.6%	36
Bluetooth	7.7%	7
Authentication log	8.8%	8
Syslog	24.2%	22
NONE	2.2%	2
Other (please specify)	22.0%	20
answered question		91
skipped question		24

Figure 2: (Question 2) 75% of the participants who have collected network traces, collected pcap traces.

Sometimes network traces contain sensitive information - identifiable information linked to a network user (such as IP address and MAC address) or information of proprietary or operational significance (such as the location or structure of the network, or identity of important servers). Did the traces you collected contain any sensitive information?

Answer Options	Response Percent	Response Count
Yes	87.8%	79
No	12.2%	11
answered question		90
skipped question		25

Figure 3: (Question 3) 88% of the participants who have collected network traces, responded that the collected traces contain some sensitive information.

Have you shared your traces with other researchers outside your organization?

Answer Options	Response Percent	Response Count
Yes	43.2%	35
No	56.8%	46
answered question		81
skipped question		34

Figure 4: (Question 5) 43% of the participants who have collected network traces, shared their traces with other researchers.

Do you intend to share the traces with other researchers outside your organization?

Answer Options	Response Percent	Response Count
Yes	65.2%	43
No	34.8%	23
answered question		66
skipped question		49

Figure 5: (Question 7) 65% of the participants who have collected network traces, intend to share the traces with other researchers outside their organizations.

Why you do not want to share the collected traces with other researchers outside your organizations? (check all that apply)		
Answer Options	Response Percent	Response Count
Protecting personally identifiable information	76.2%	16
Protecting proprietary or operational information	28.6%	6
Competitive issues	19.0%	4
Legal issues	61.9%	13
Other (please specify)	28.6%	6
answered question		21
skipped question		94

Figure 6: (Question 8) 76% of the participants who have collected network traces responded that they do not want to share the traces with other researchers outside their organization, because they need to protect personally identifiable information.

When you plan to share the traces, what will be your major concern(s)? (check all that apply)		
Answer Options	Response Percent	Response Count
Protecting personally identifiable information	83.7%	36
Protecting proprietary or operational information	62.8%	27
Competitive issue	25.6%	11
Legal issues	60.5%	26
Other (please specify)	11.6%	5
answered question		43
skipped question		72

Figure 7: (Question 9) 84% of the participants who have collected network traces responded that their major concern in sharing the traces with other researchers outside their organization is protecting personally identifiable information.

Generally, "sanitizing" network traces means processing the traces to remove the sensitive information or reduce the degree of its sensitivity. Did you sanitize the network trace?		
Answer Options	Response Percent	Response Count
Yes	54.5%	42
No	45.5%	35
answered question		77
skipped question		38

Figure 8: (Question 10) Only 55% of the participants who have collected network traces sanitized the traces.

How do you sanitize network traces? (check all that apply)

Answer Options	Response Percent	Response Count
Manually editing the traces	12.2%	5
Using your own software	70.7%	29
Using third-party tools	34.1%	14
Other (please specify)	7.3%	3
	answered question	41
	skipped question	74

Figure 9: (Question 11) 71% of the participants who have sanitized their traces used their own software. 34% of the participants who have sanitized their traces used third-party tools.

How satisfied are you with the sanitization tool(s) you used

Answer Options	(1) Least satisfied	(2)	(3)	(4)	(5) Most satisfied	Rating Average	Response Count
Satisfaction degree	5	9	8	9	9	3.20	40
					answered question		40
					skipped question		75

Figure 10: (Question 13) On average, the participants who have sanitized are satisfied with their sanitization tools; score 3.2 out of 5.

After sanitizing network traces, have you verified that your sanitization result is correct?

Answer Options	Response Percent	Response Count
Yes	76.3%	29
No	23.7%	9
	answered question	38
	skipped question	77

Figure 11: (Question 15) 76% of the participants who have sanitized network traces have verified that their sanitization result is correct.

How difficult was it to verify the sanitization result?

Answer Options	(1) Very easy	(2)	(3)	(4)	(5) Very difficult	Rating Average	Response Count
Difficulty degree	5	6	9	5	4	2.90	29
					answered question		29
					skipped question		86

Figure 12: (Question 16) On average, the participants who verified their sanitization result, found it difficult to do so; score of 2.9 out of 5.0.

Do you have any quantitative metric to measure the strength of the sanitization (such a metric indicates how well the sanitization removes or reduces sensitive information)?

Answer Options	Response Percent	Response Count
Yes	15.8%	6
No	84.2%	32
	answered question	38
	skipped question	77

Figure 13: (Question 17) 84% of the participants who verified their sanitization result did not use any quantitative metric to measure the strength of the sanitization.

Do you think the sanitization you applied will limit the usefulness of network traces?

Answer Options	Response Percent	Response Count
Yes	76.3%	29
No	23.7%	9
	answered question	38
	skipped question	77

Figure 14: (Question 19) 76% of the participants who verified their sanitization result agree that the sanitization they applied limits the usefulness of the network traces.

Do you have any quantitative metric to measure how much the sanitization actually reduced the usefulness of your network trace?

Answer Options	Response Percent	Response Count
Yes	7.9%	3
No	92.1%	35
answered question		38
skipped question		77

Figure 15: (Question 20) 92% of the participants who have verified their sanitization result did not use any quantitative metric to measure how much the sanitization actually reduced the usefulness of their network trace.

Have you ever used network traces for your research?

Answer Options	Response Percent	Response Count
Yes	61.1%	11
No	38.9%	7
answered question		18
skipped question		97

Figure 16: (Question 22) 61% of 18 respondents have used network traces for their research.

How did you obtain the network traces? (check all that apply)

Answer Options	Response Percent	Response Count
Direct request to data authors	54.5%	6
Downloading from online network data archives (like	100.0%	11
Collecting your own traces	0.0%	0
answered question		11
skipped question		104

Figure 17: (Question 23) All of 11 respondents have obtained the network traces by downloading from on-line network data archives.

What kinds of network traces have you used? (check all that apply)

Answer Options	Response Percent	Response Count
NetFlow log	18.2%	2
Pcap trace	27.3%	3
NCSA Unified Format	0.0%	0
IEEE 802.11 (such as Prism or Radiotap header, or raw	72.7%	8
Bluetooth	27.3%	3
Authentication log	9.1%	1
Syslog	27.3%	3
Other (please specify)	18.2%	2
	answered question	11
	skipped question	104

Figure 18: (Question 24) 72% of 11 respondents have used IEEE 802.11 network traces. 27% of the respondents have used pcap traces or syslog.

Sometimes network traces contain sensitive information - identifiable information linked to a network user (such as IP address and MAC address) or

Answer Options	Response Percent	Response Count
Yes	45.5%	5
No	54.5%	6
	answered question	11
	skipped question	104

Figure 19: (Question 25) 55% of 11 respondents noticed some sensitive information in the traces they collected.

Have you heard or used the following sanitization tools? (check all that apply)

Answer Options	Response Percent	Response Count
Crypto-PAn	22.1%	19
TCPurify	26.7%	23
TCPdpriv	27.9%	24
CANINE	9.3%	8
AnonTool	22.1%	19
tcpmkpub	17.4%	15
FLAIM	15.1%	13
NONE	48.8%	42
Other (please specify)	10.5%	9
	answered question	86
	skipped question	29

Figure 20: (Question 27) 49% of 86 respondents have never heard of, nor used, any of these sanitization tools

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