Transparency and Information Sharing in Digital Forensics

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whoami

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- Background from R&E networks
- Open source enthusiast

The plot for today

Imaginary incident: You need to triage and investigate 42 computers (laptops, servers, Windows, Linux, MacOSX) across 16 countries with a team of 8 investigators working in multiple timezones.. Oh, and in one of the Windows boxes we suspect that there can be evidence hiding in a VSS volume.. and we also need memory dumps.

This is a complex case. We need good tooling, effective information sharing and solid collaboration in order to solve this quickly.

Collection

- Does my tooling support this?
- Do I need a dongle in every remote location?
- Does the license cover this?
- 16 countries you say.. Maybe call in support?
- Windows, Mac and Linux..?
- What about memory?
- I really need this data as soon as possible..

Result of collection

After some (long) time, involving 20+ people I have managed to collect some artifacts from some of the Windows boxes. I also managed to get full disk images of a couple of computers (Windows, Macs and Linux). None of the laptops though, we have to wait until they come back to the office..

Processing

- My tool can extract timestamp information!
- But only for some file formats, and only for Windows..
- No support for encrypted (BitLocker) Windows disk images. No VSS support.
- I need an extra license for Mac support.
- No automation, so we have to do it by hand. This is gonna take time..
- We only have 2 licenses for 2 workstations..

Analyzing

- Ok, we got some data processed. Let’s start working!
- But we only have 2 workstations with our software. One in each timezone.. and we have 8 analysts..
- Ok, one will do analysis and one will keep track of notes. Then we rotate..
- How can we collaborate and share information/knowledge about the case within the team?

Result

- We got some data to analyze, but it took some time and effort to coordinate.
- No memory dumps
- We could only process the Windows artifacts.
- It took a long time because we had to do it by hand.
- We didn’t really utilize all analysts.
- Information sharing within the team was not great.

My ideal tooling

- The suite versus the toolbox e.g. SIFT
- Does not get in the way of the analysis!
- Cross platform support
- Supports one-off scripts and automation.
  - Shouldn't be tied to a vendor's product
  - No dongle!
- Easily adaptable and extendable.
- Support collaboration.
- Be transparent all the way.

Let’s try the toolbox approach

Same imaginary incident, different approach.

GRR Rapid Response for collection and triage

- Open source Incident Response Framework
- Fully fledged response capabilities handling most incident response and forensics tasks
- Remote Live Forensics
- Support for Linux, Mac OS X and Windows clients
- Secure communication infrastructure designed for Internet deployment (HTTP)
- Scalable back-end to handle very large deployments

Why GRR?

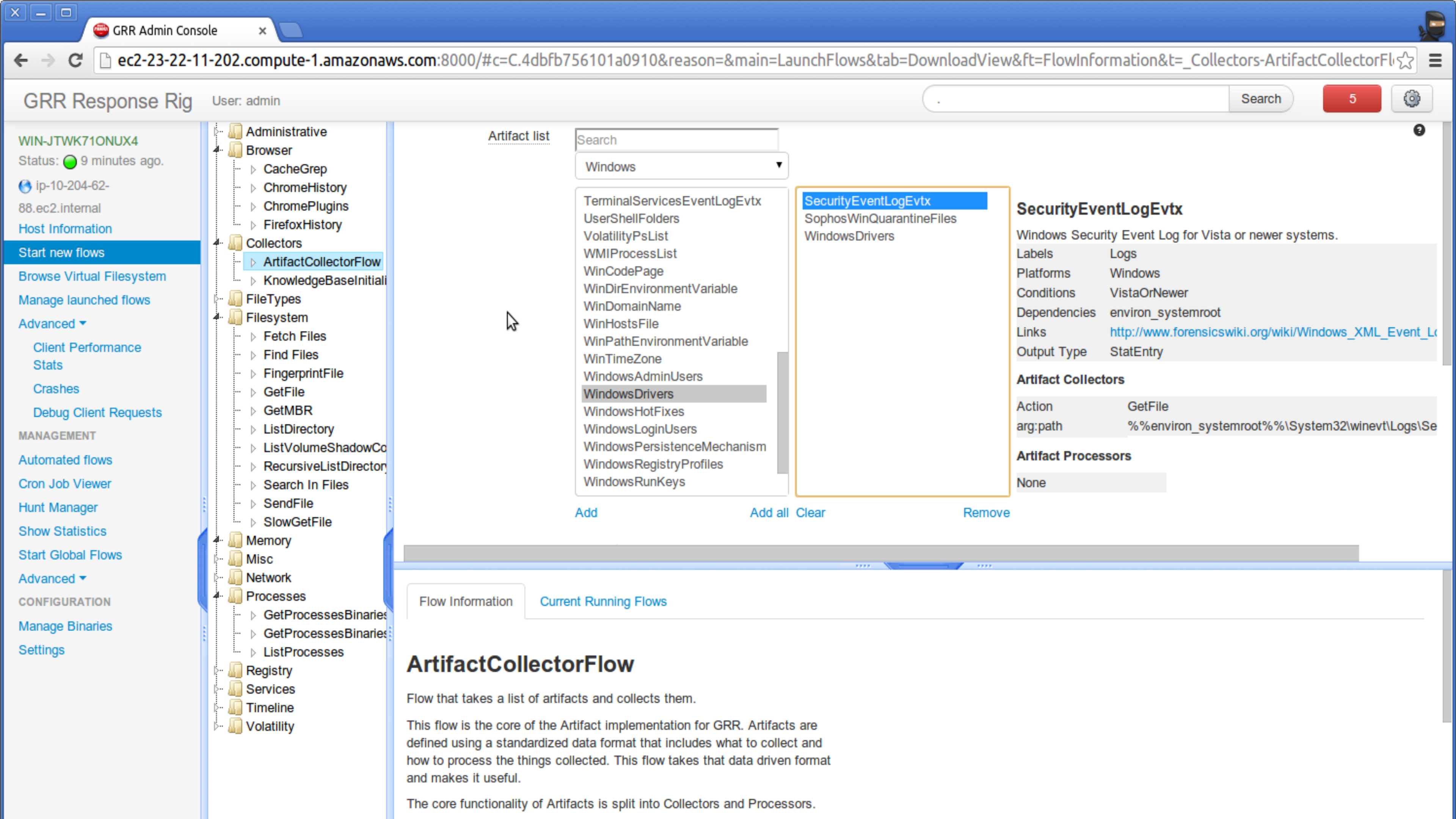
- ***Tell me if this machine is compromised***
  - (while you're at it, check 20000 of them)
- ***Joe saw something weird, check his machine***
  - (p.s. Joe is on holiday in Sweden and on 3G)
- ***Forensically acquire 42 machines for analysis***
  - (p.s. they're in 5 continents and only 2 are Windows)

GRR Flows

- To run an analysis on the client, we run flows
  - e.g. GetFile, ListDirectory, ListProcesses, GetMemory
- Requests and Responses
- State machine
- Do not take up server resources while waiting for the client
- Scales well. The individual states in the flow can be made by different machines

GRR Hunts

- Run flows on many clients
  - Or subset of the fleet, e.g. only Windows machines
- Find malicious code and abnormal behavior amongst the entire fleet of clients
- Fast triage
  - Look for Indicators of Compromise



SecurityEventLogEvtx

Windows Security Event Log for Vista or newer systems.

Labels	Logs
Platforms	Windows
Conditions	VistaOrNewer
Dependencies	environ_systemroot
Links	http://www.forensicswiki.org/wiki/Windows_XML_Event_L
Output Type	StatEntry

Artifact Collectors

Action	GetFile
arg:path	%%environ_systemroot%%\System32\winevt\Logs\Se

Artifact Processors

None

ArtifactCollectorFlow

Flow that takes a list of artifacts and collects them.

This flow is the core of the Artifact implementation for GRR. Artifacts are defined using a standardized data format that includes what to collect and how to process the things collected. This flow takes that data driven format and makes it useful.

The core functionality of Artifacts is split into Collectors and Processors.

Plaso for processing

- Open source timelining tool.
- Modular and flexible
- Targeted analysis or the kitchen sink approach
- Easy to automate and script

Plaso architecture

- Preprocessing
  - Collect information about the image.
    - e.g. timezone, hostname, users etc..
- Collection
  - Find all the files to process
- Extraction
  - Parse the files and store all the events
  - Community effort
- Storage & Output

Information sharing

- Different shapes and forms
  - Within team
  - Within organisation
  - Between organisations
  - Between tools
- Let our tools work for us
  - Encourage information sharing and collaboration
  - Make information sharing part of the design

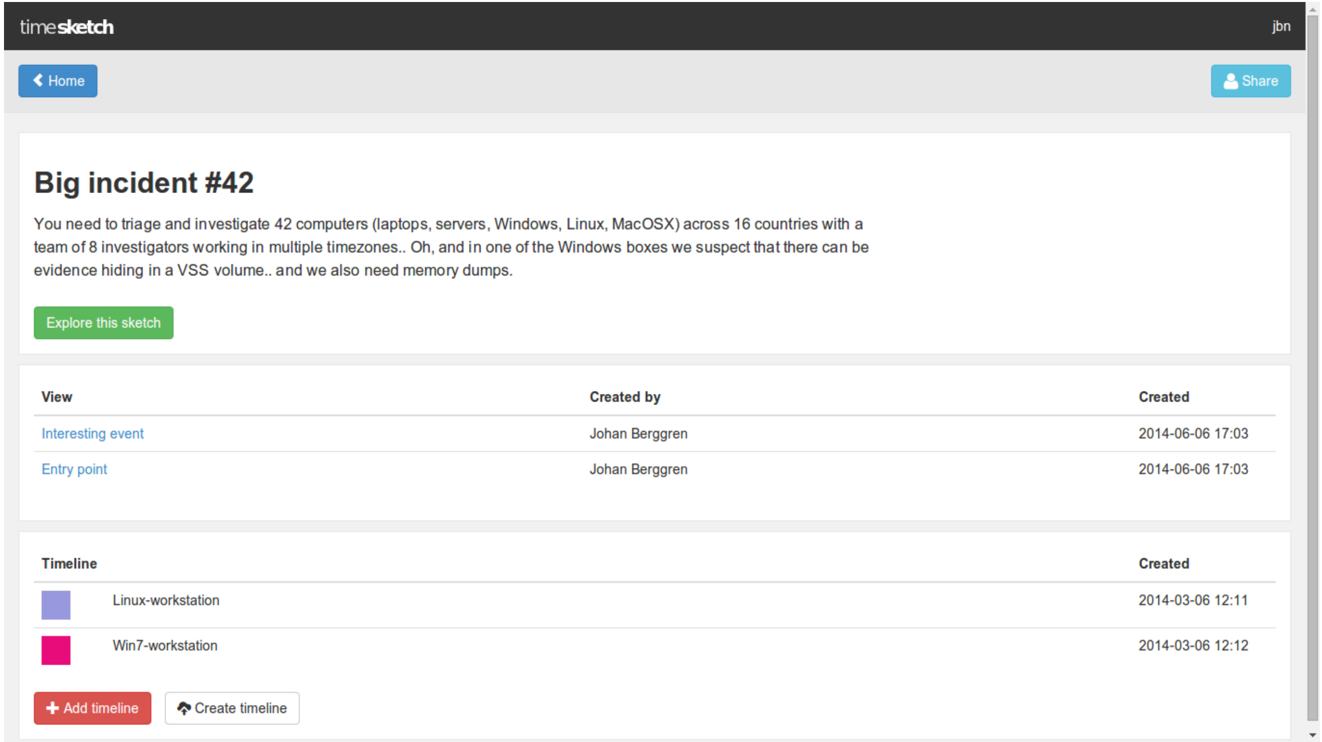
Timesketch

- Collaborative forensic timeline analysis
- Web based tool to analyse timeline data
- Modelled around collaboration and information sharing
  - Users can work simultaneously on the same data
  - Annotate
  - Share findings

Timesketch architecture

- WebUI
    - Focuses on collaboration
    - You share information while you are analyzing
- HTTP RESTful API
    - Add authn and authz
- Backend storage and search
    - Fast
    - Search across indexes

Sketch



Big incident #42

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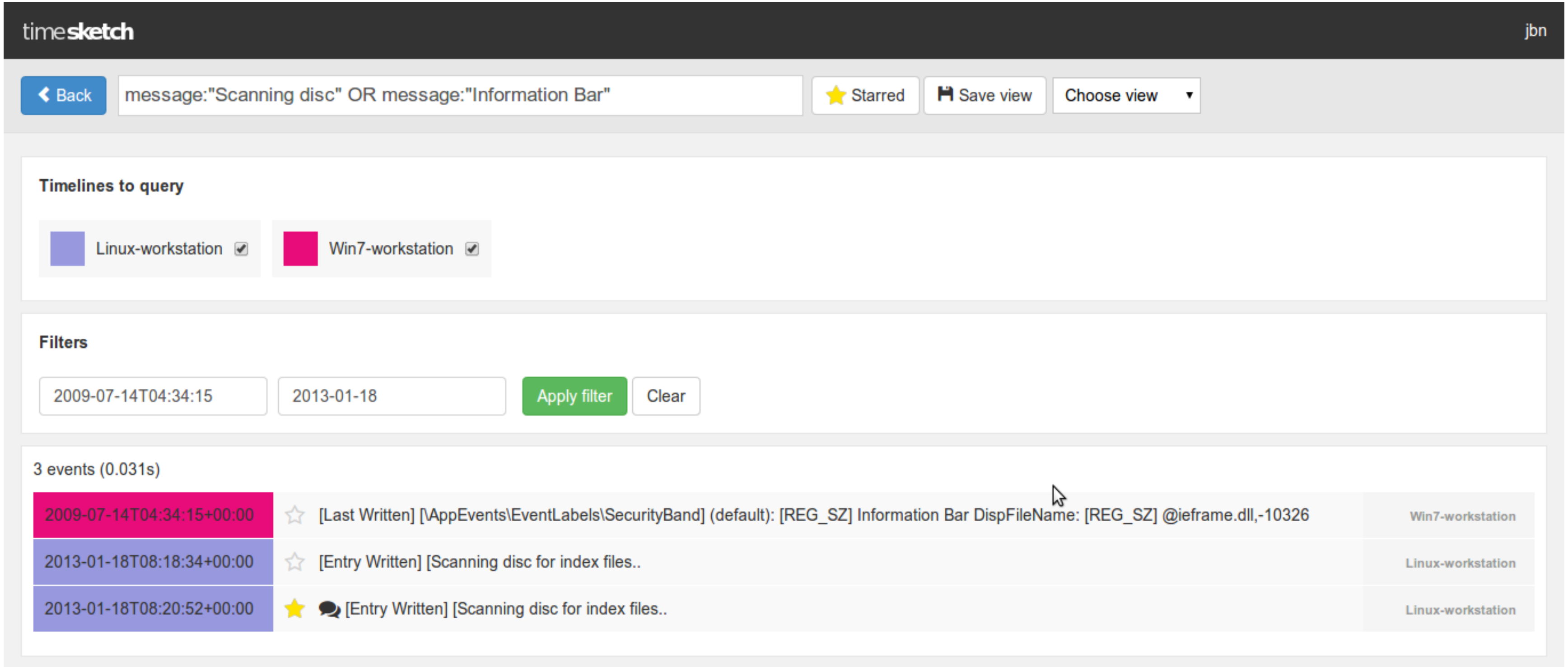
View	Created by	Created
Interesting event	Johan Berggren	2014-06-06 17:03
Entry point	Johan Berggren	2014-06-06 17:03

Timeline		Created
🟪	Linux-workstation	2014-03-06 12:11
🟥	Win7-workstation	2014-03-06 12:12

Multiple timelines



message:"Scanning disc" OR message:"Information Bar"

Timelines to query

Linux-workstation ☑ Win7-workstation ☑

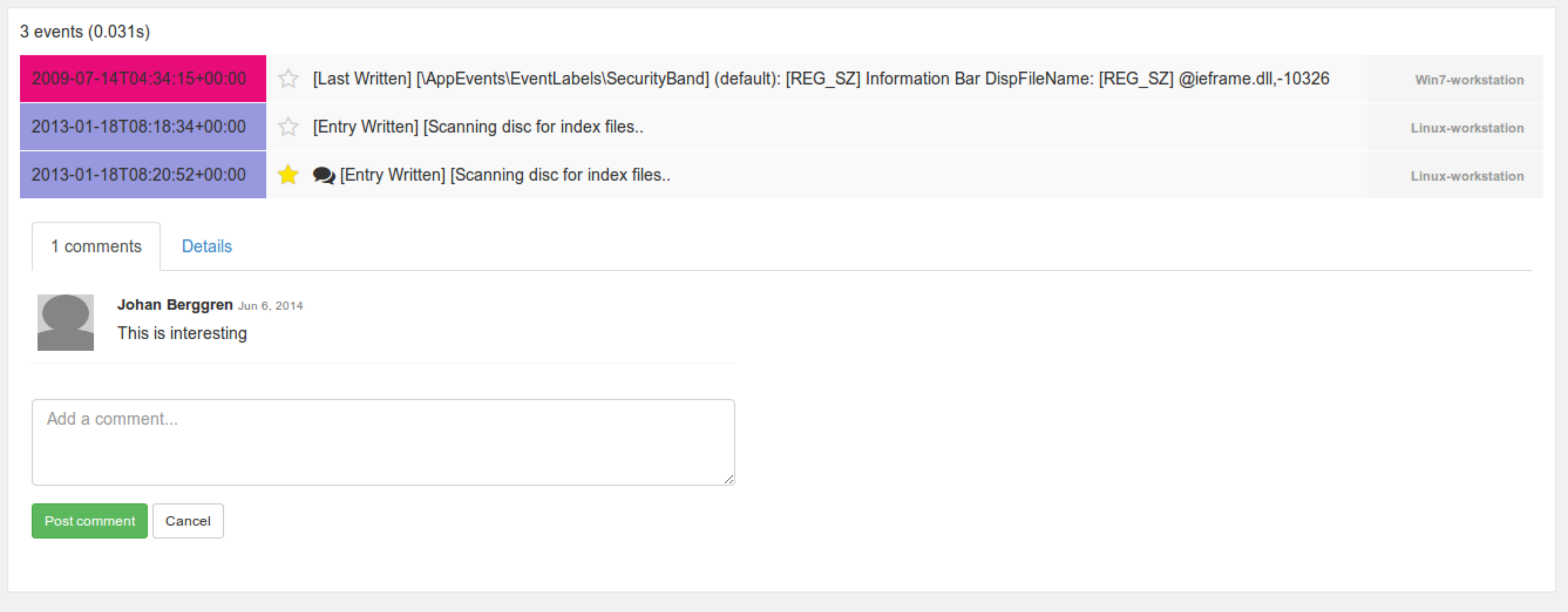
Filters

2009-07-14T04:34:15 2013-01-18 Apply filter Clear

3 events (0.031s)

2009-07-14T04:34:15+00:00	☆	[Last Written] [\AppEvents\EventLabels\SecurityBand] (default): [REG_SZ] Information Bar DispFileName: [REG_SZ] @ieframe.dll,-10326	Win7-workstation
2013-01-18T08:18:34+00:00	☆	[Entry Written] [Scanning disc for index files..	Linux-workstation
2013-01-18T08:20:52+00:00	★	[Entry Written] [Scanning disc for index files..	Linux-workstation

Annotations



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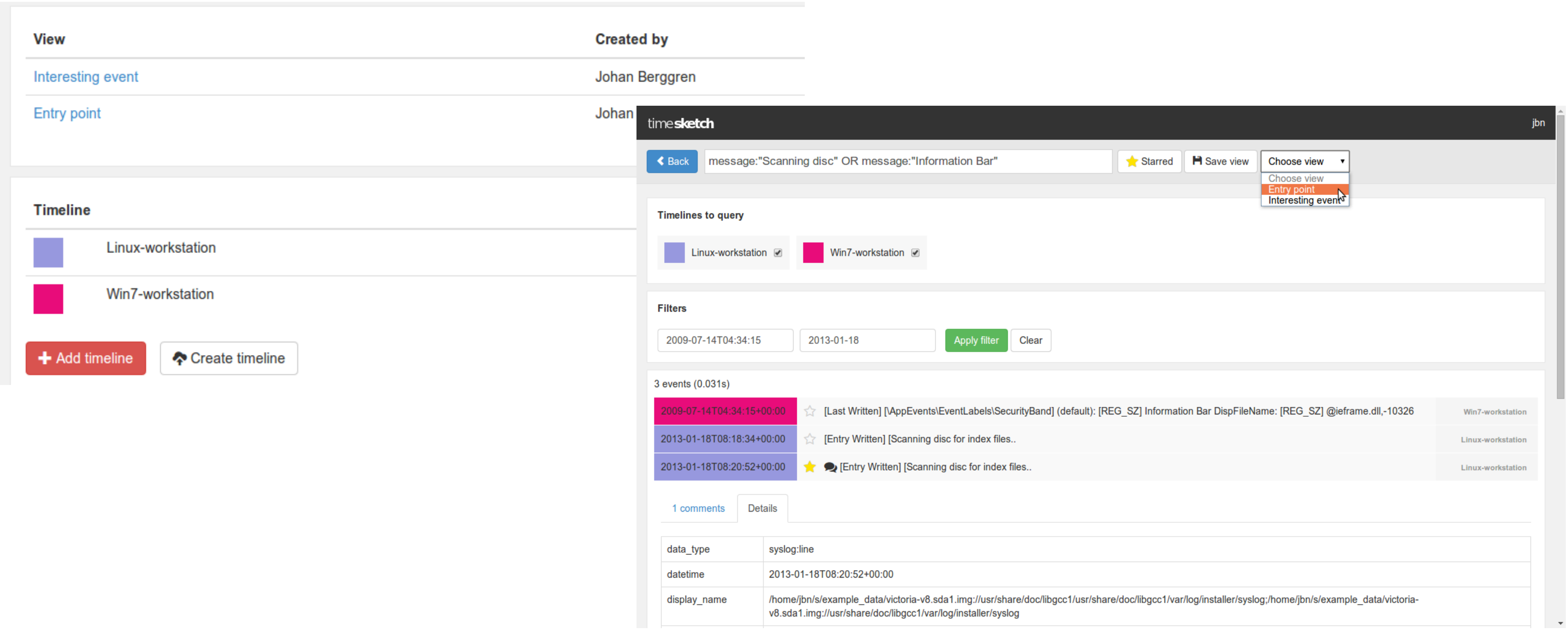
Johan Berggren Jun 6, 2014

This is interesting

Share views



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data_type	syslog:line
datetime	2013-01-18T08:20:52+00:00
display_name	/home/jbn/s/example_data/victoria-v8.sda1.img://usr/share/doc/libgcc1/usr/share/doc/libgcc1/var/log/installer/syslog;/home/jbn/s/example_data/victoria-v8.sda1.img://usr/share/doc/libgcc1/var/log/installer/syslog

Result

- We were able to quickly triage.
- We collected the data we needed fast.
- We processed all the data.
- Most of the collection and processing was automated.
- All analysts worked in parallel and shared their findings with timesketch.

Information sharing, moving forward

- Even more central in the tools design
- Stories
  - Mix data with narrative
  - Let the data explain the story
  - Build context around events
- Knowledge sharing
  - forensicwiki.org
  - Artifacts to glue tools together

Artifacts

- Artifacts (examples)
  - Windows Application Event Log
  - A (Windows Registry) Run Key
  - A process
  - A mutex
  - Browser history
- Artifact definitions
  - Share artifact knowledge with the community
  - Integrate with tools
  - Data driven

Artifacts in our toolbox

- Collection based on artifacts (e.g. GRR)
- Extraction and processing with artifacts (e.g. Plaso)
- Overlay your data with artifact descriptions to aid in analysis (e.g. Timesketch)

What about transparency?

- Open source
  - Verify the result from our tools
  - Understand why the data is presented to you
  - Add transparency to the process
  - **Keep your team motivated**
    - Developing open source software can be a motivator!
    - “Free” education.

Conclusion

- Incident Response at scale is hard.
- Relying on a single monolithic product can sometimes be a limiting factor.
- Open source forensics have come a long way.
- Open source drives motivation and innovation.
- Open source adds transparency.
- Collaboration and information sharing should be part of the tools design.

Questions?

References

* Swiss army knife **(Creative Commons)**

http://en.wikipedia.org/wiki/File:Wenger_EvoGrip_S17.JPG

* Plaso logo **(Used with permission)**

https://lh6.googleusercontent.com/Imix4Wnn8v__wXcv4vXdXwzOzlFuiV6i5uVvUm2_8F6FMY7Qjze-qcHLiugFjwsOdNn9s5aVrk94diS2kRumQPPPZZHLzNq1VdSk8vSuoHrqPwCot1RoifA6UMU

* GRR screenshot (**Used with permission**)

http://wiki.grr.googlecode.com/git/Screenshot%20from%202013-11-18%2018:36:13.png

* Timesketch screenshot (**Used with permission**)