Cuckoo != Insanity

Why a little Cuckoo should be part of your Incident Response Process

Chris Henderson

- @enruhe_
- Security Engineer
- Arctic Wolf Networks
- Focus on Blue Team for Small to Medium size companies
- GNFA - GCIH - GCIA - GSEC

Projects

- OpenVAS
- UserAgent String Baselining
- The Hive
  - Incident Response Platform
- https://arcticwolf.com/company/careers/

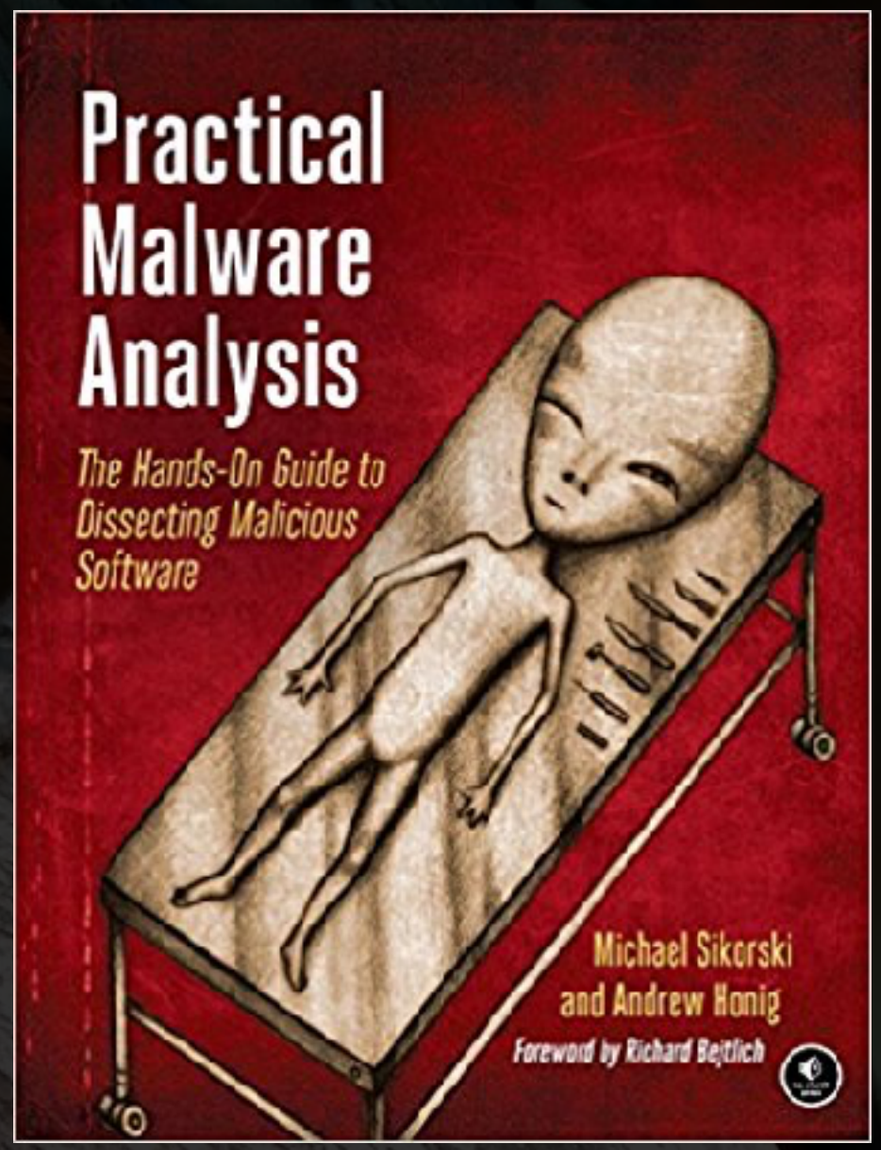
Community - CFP

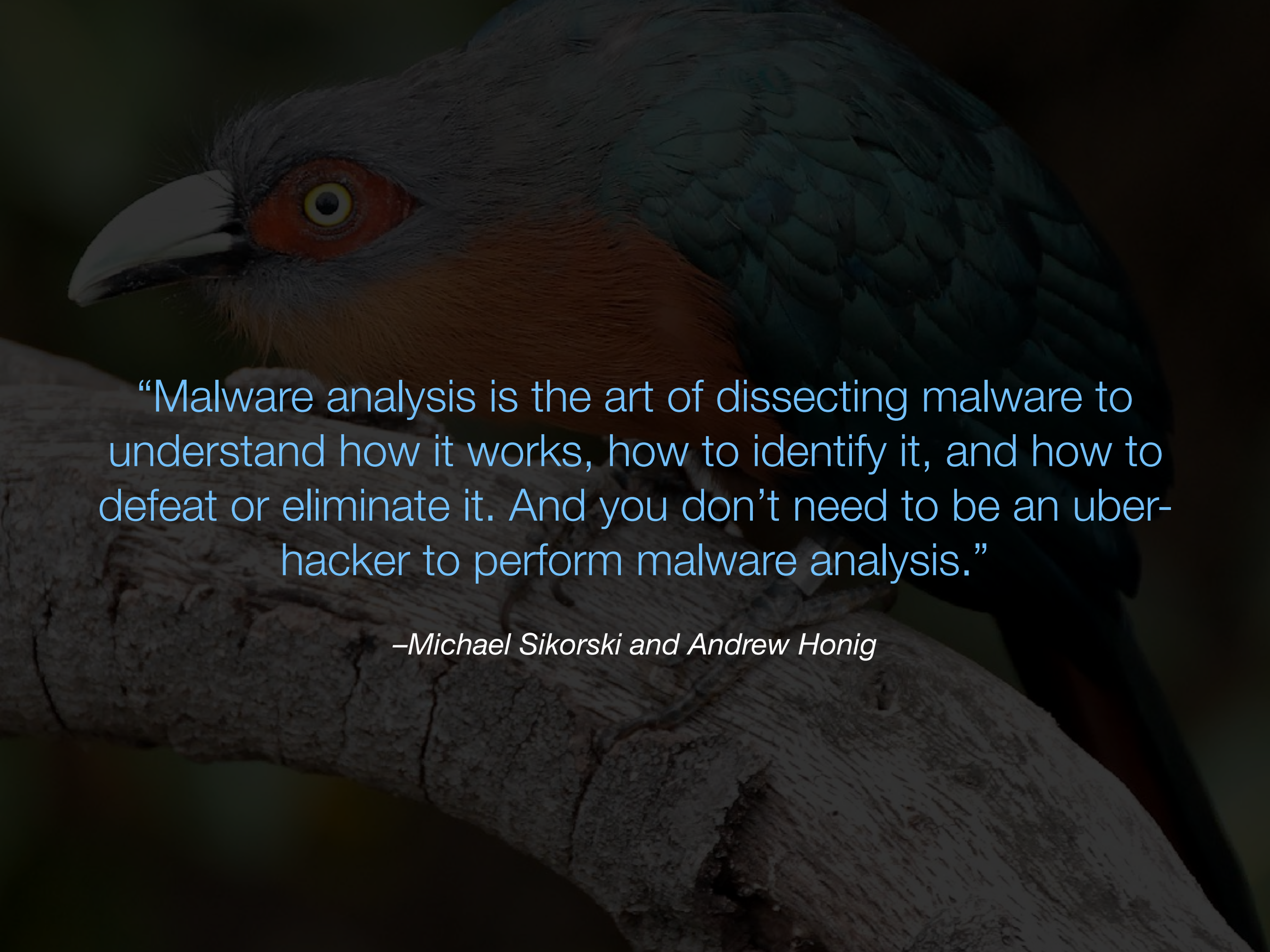
HACKWEST™

SALT LAKE CITY BSIDES

Malware

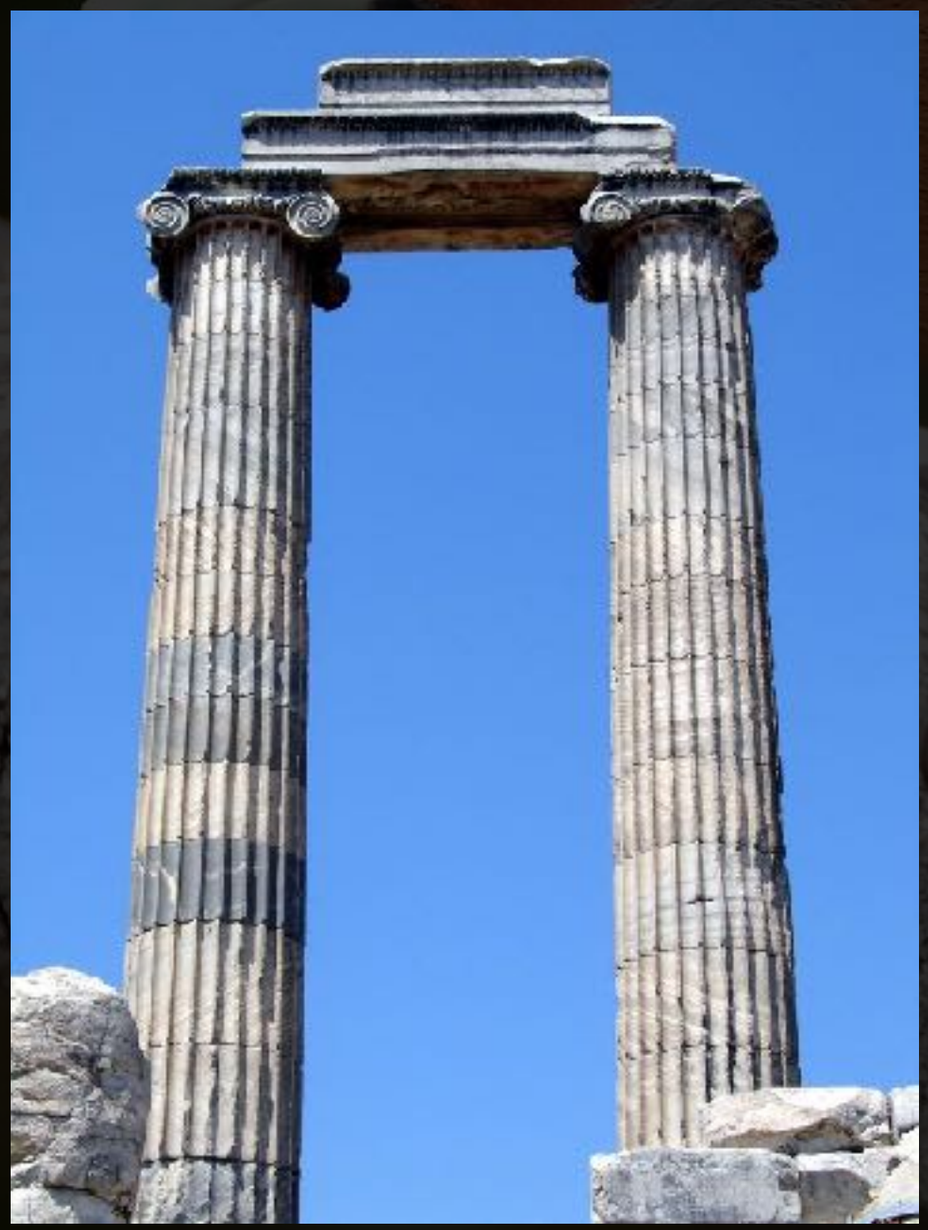
Any software that does something that causes harm to a user, computer, or network can be considered malware, including viruses, trojan horses, worms, rootlets, scareware and spyware.




“Malware analysis is the art of dissecting malware to understand how it works, how to identify it, and how to defeat or eliminate it. And you don’t need to be an uber-hacker to perform malware analysis.”
–Michael Sikorski and Andrew Honig


“With millions of malicious programs in the wild, and more encountered every day, malware analysis is critical for anyone who responds to computer security incidents.”
–Michael Sikorski and Andrew Honig

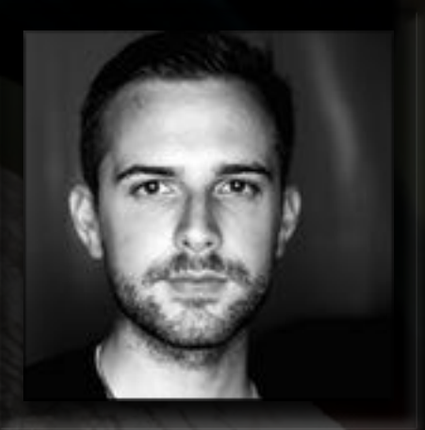
Analysis Techniques



- ***Static Analysis*** - involves examining the malware without running it.
- ***Dynamic Analysis*** - involves executing the malware

cuckoo

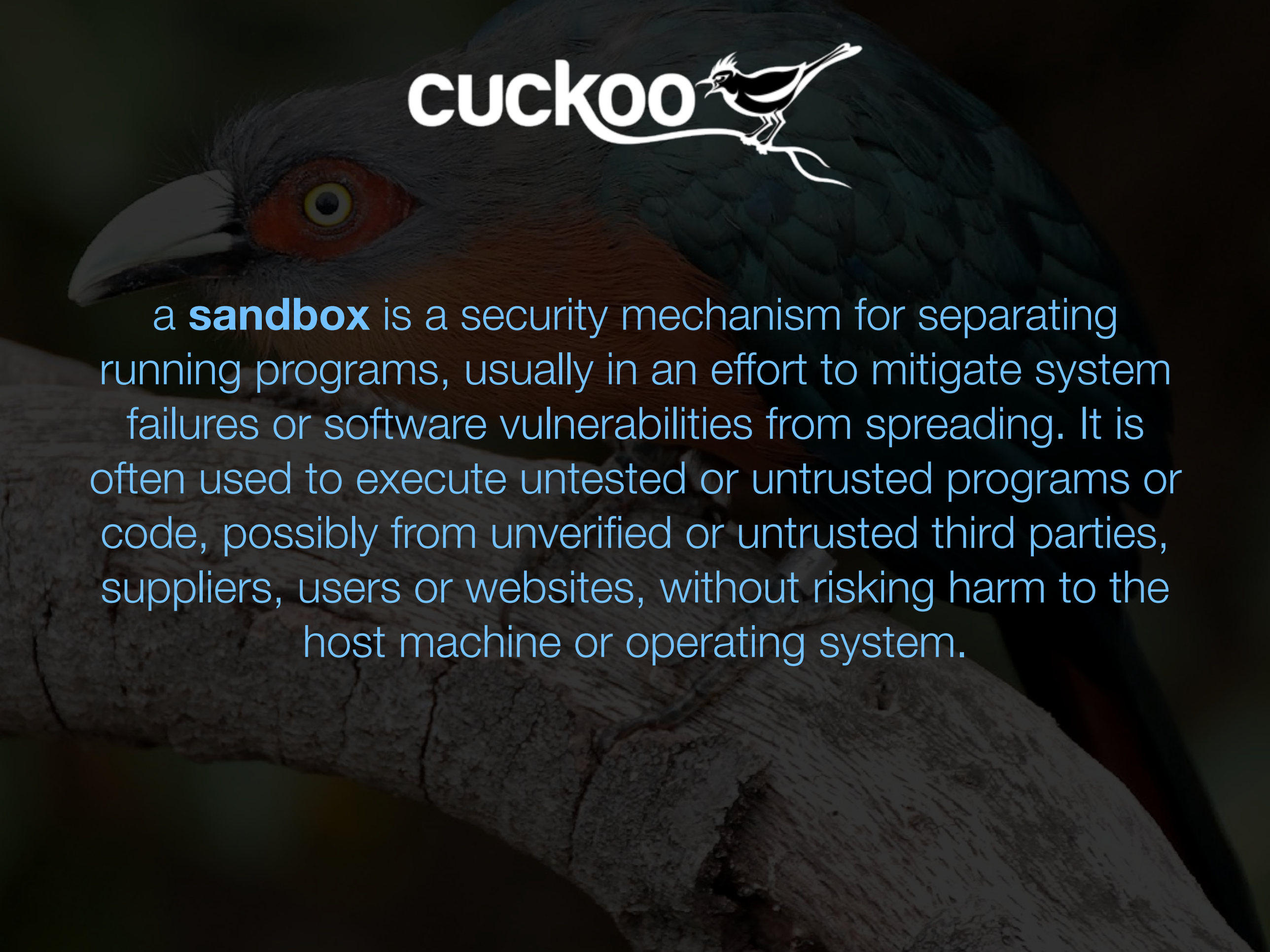
- Began as a Google Summer of Code Project in 2010
- Part of the Honeynet Project
  - http://www.honeynet.org/
- Originally designed by Claudio Guarnieri
  - @botherder



- Open Source

“In these evolving times, detecting and removing malware artifacts is not enough: it's vitally important to understand how they operate in order to understand the context, the motivations, and the goals of a breach.”

–*CuckooSandbox.org*



a **sandbox** is a security mechanism for separating running programs, usually in an effort to mitigate system failures or software vulnerabilities from spreading. It is often used to execute untested or untrusted programs or code, possibly from unverified or untrusted third parties, suppliers, users or websites, without risking harm to the host machine or operating system.

Static Analysis

- File Information
  - Size, Type, MD5, SHA1, SHA256, SHA512, CRC32
- Version Info
- Stings Data

cuckoo

Dynamic Analysis

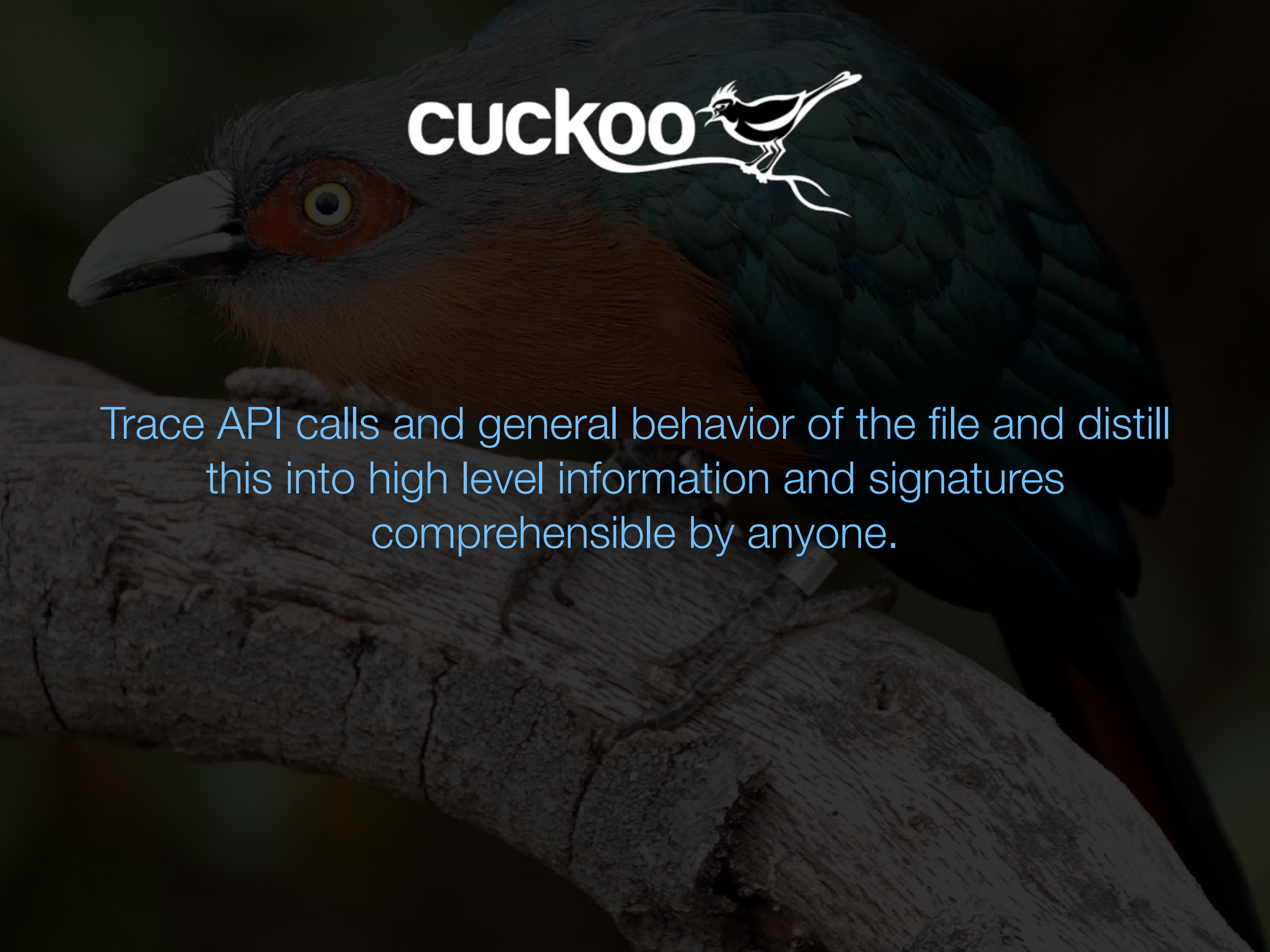
- Extracted Artifacts
- Behavioral Analysis
- Network Analysis
- Dropped Files
- Dropped Buffers
- Process Memory

You can throw any suspicious file at Cuckoo and in a matter of minutes Cuckoo will provide a detailed report outlining the behavior of the file when executed inside a realistic but isolated environment.

Cuckoo Sandbox is free software that automated the task of analyzing any malicious file under **Windows**, **OS X**, **Linux**, and **Android**.

Use Cases

- Generic Windows Executables
- DLL Files
- PDF Documents
- Microsoft Office Documents
- PHP Scripts
- Zip Files
- Java JAR
- Visual Basic (VB) Scripts
- Python Files
- CPL Files
- Websites



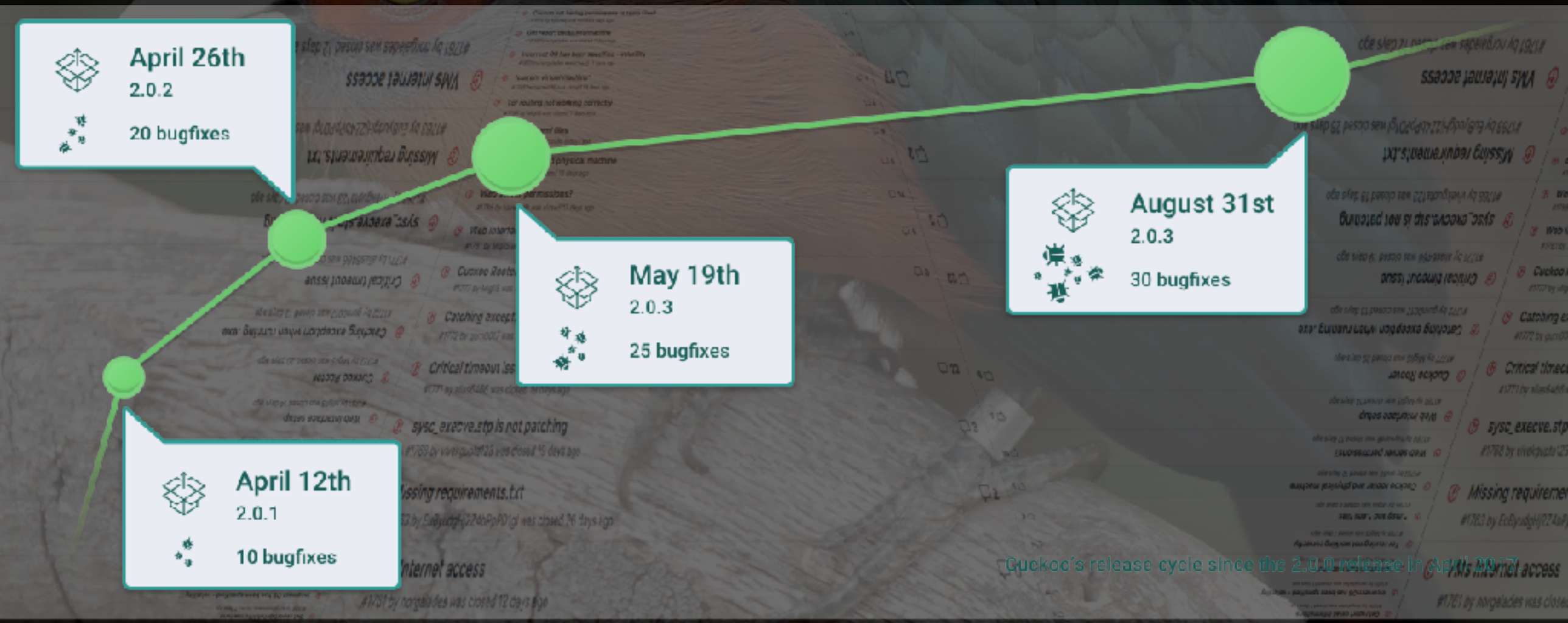
Trace API calls and general behavior of the file and distill this into high level information and signatures comprehensible by anyone.

Dump and analyze network traffic, even when encrypted with SSL/TLS.

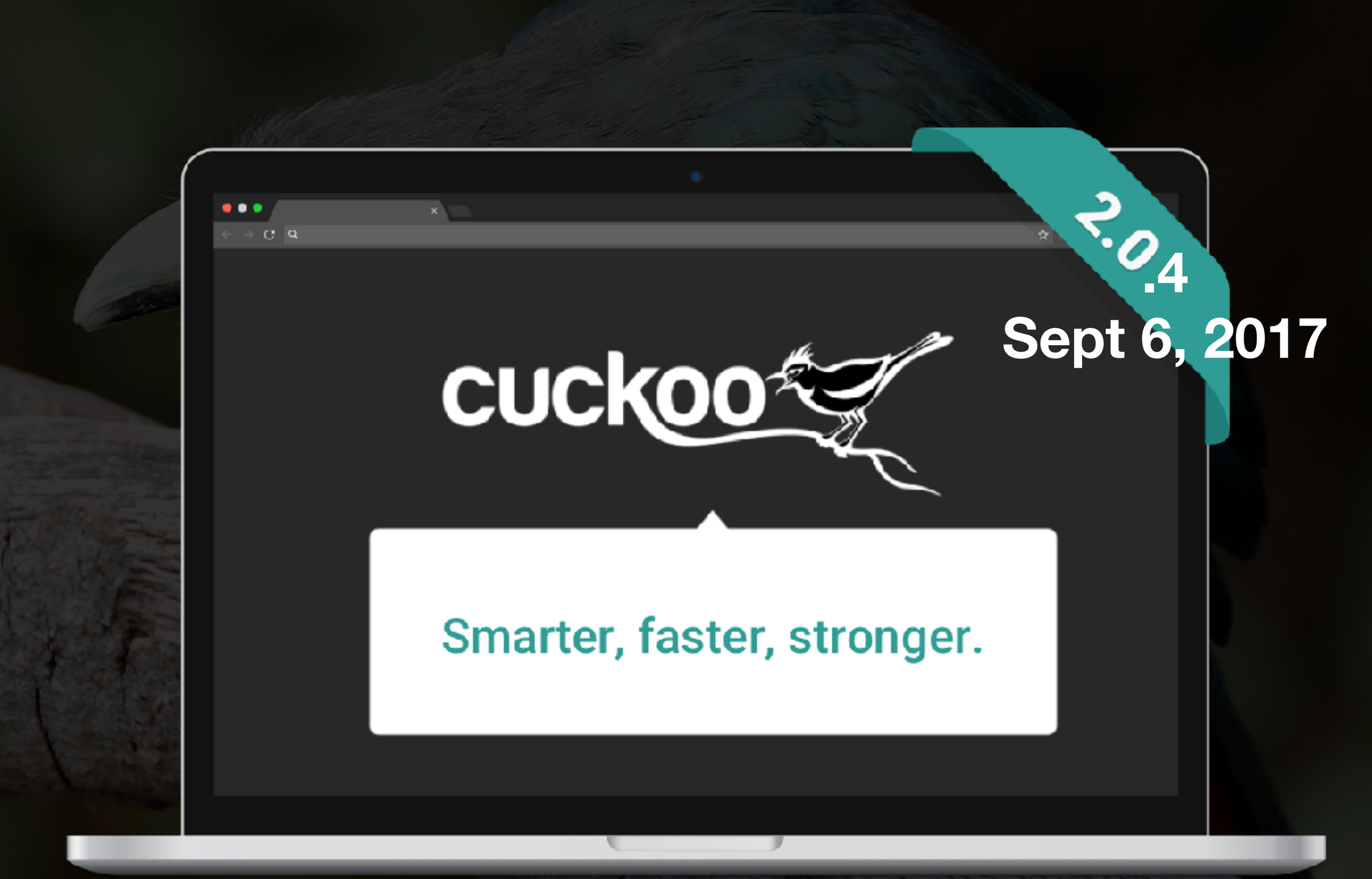
Perform advanced memory analysis of the infected virtualized system through Volatility as well as on a process memory granularity using YARA.

Version History

cuckoo



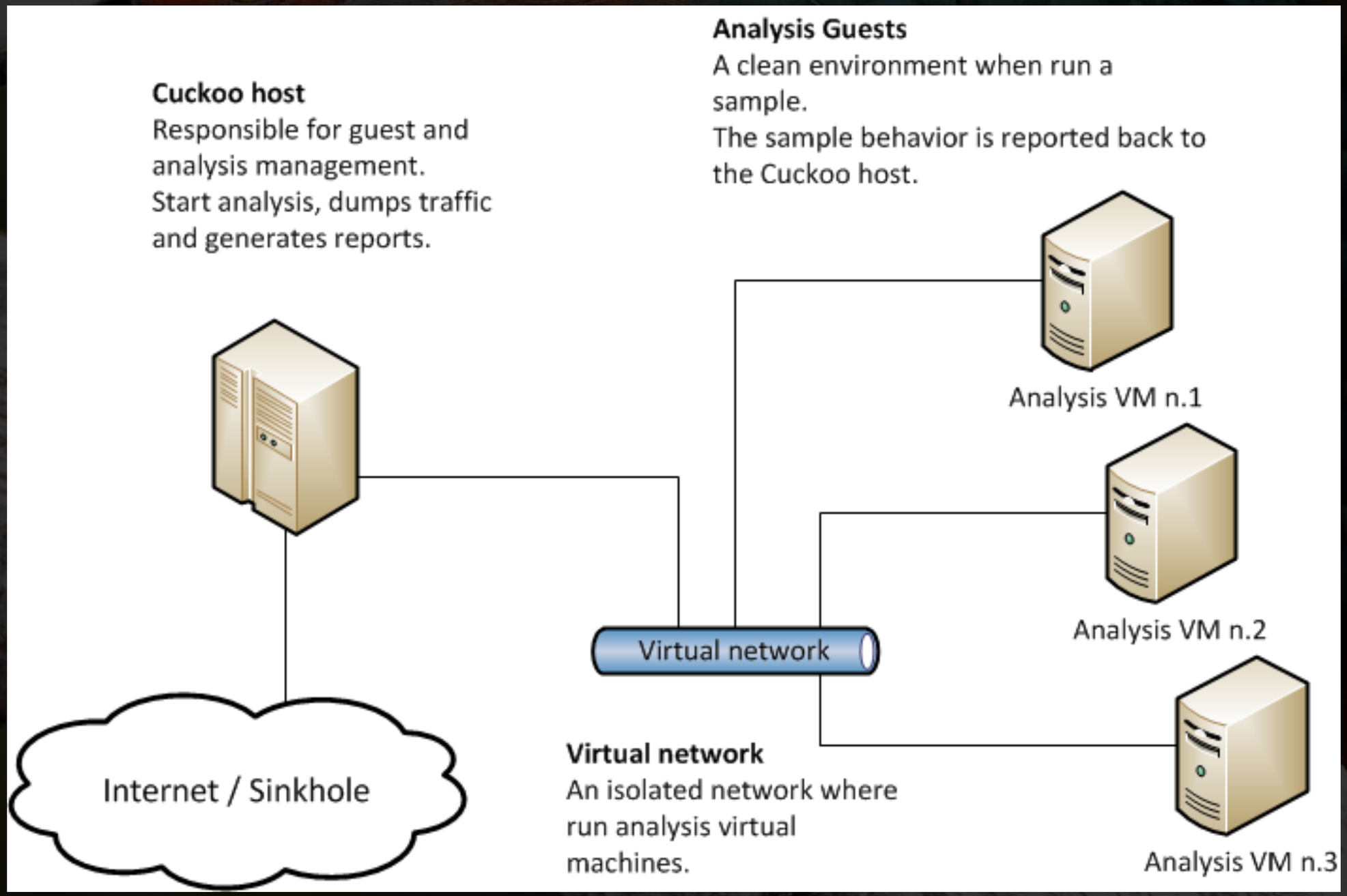
Cuckoo's release cycle since the 2.0.0 release in April 2017


cuckoo
2.0.4
Sept 6, 2017
Smarter, faster, stronger.

Technology Stack

- Operating Systems
  - Linux, MacOS, Windows
- Python
- Virtualization Software
  - Virtual Box, KVM, XenServer
- tcpdump
- Volatility
- Yara
- mitmproxy
- Django
- MongoDB
- Virus Total

Architecture



cuckoo

- Python
- tcpdump
- Volatility
- Yara
- Virtualization Software

Requirements

Before proceeding to installing and configuring Cuckoo, you'll need to install some required software packages and libraries.

Installing Python libraries (on Ubuntu/Debian-based distributions)

The Cuckoo host components is completely written in Python, therefore it is required to have an appropriate version of Python installed. At this point we only fully support Python 2.7. Older version of Python and Python 3 versions are not supported by us (although Python 3 support is on our TODO list with a low priority).

The following software packages from the apt repositories are required to get Cuckoo to install and run properly:

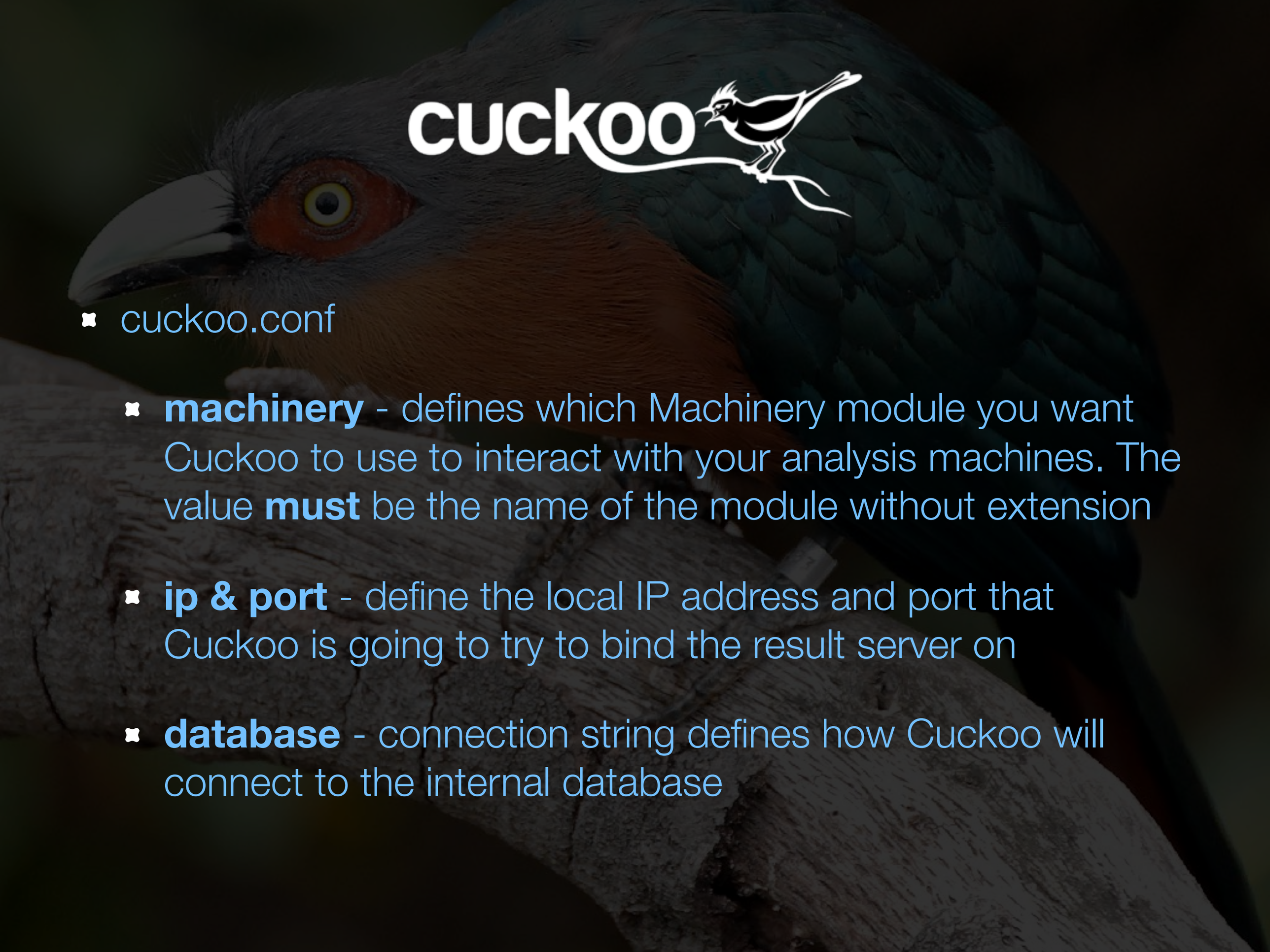
```
$ sudo apt-get install python python-pip python-dev libffi-dev libssl-dev
$ sudo apt-get install python-virtualenv python-setuptools
$ sudo apt-get install libjpeg-dev zlib1g-dev swig
```

In order to use the Django-based Web Interface, MongoDB is required:

```
$ sudo apt-get install mongodb
```

- cuckoo.conf * - for configuring general behavior and analysis options
- auxiliary.conf - for enabling and configuring auxiliary modules
- machinery.conf * - for defining the options for your virtualization software
- memory.conf - Volatility configuration
- processing.conf - for enabling and configuring processing modules
- reporting.conf - for enabling or disabling report formats

* required to get Cuckoo working



- cuckoo.conf
  - **machinery** - defines which Machinery module you want Cuckoo to use to interact with your analysis machines. The value **must** be the name of the module without extension
  - **ip & port** - define the local IP address and port that Cuckoo is going to try to bind the result server on
  - **database** - connection string defines how Cuckoo will connect to the internal database

- machinery.conf - Machinery modules are scripts that define how Cuckoo should interact with your virtualization software of choice.
  - Virtualbox - $CWD/conf/virtualbox.conf
  - KVM - $CWD/conf/kvm.conf
  - XenServer - operates through an API, so to access it a URL and credentials are required

Community

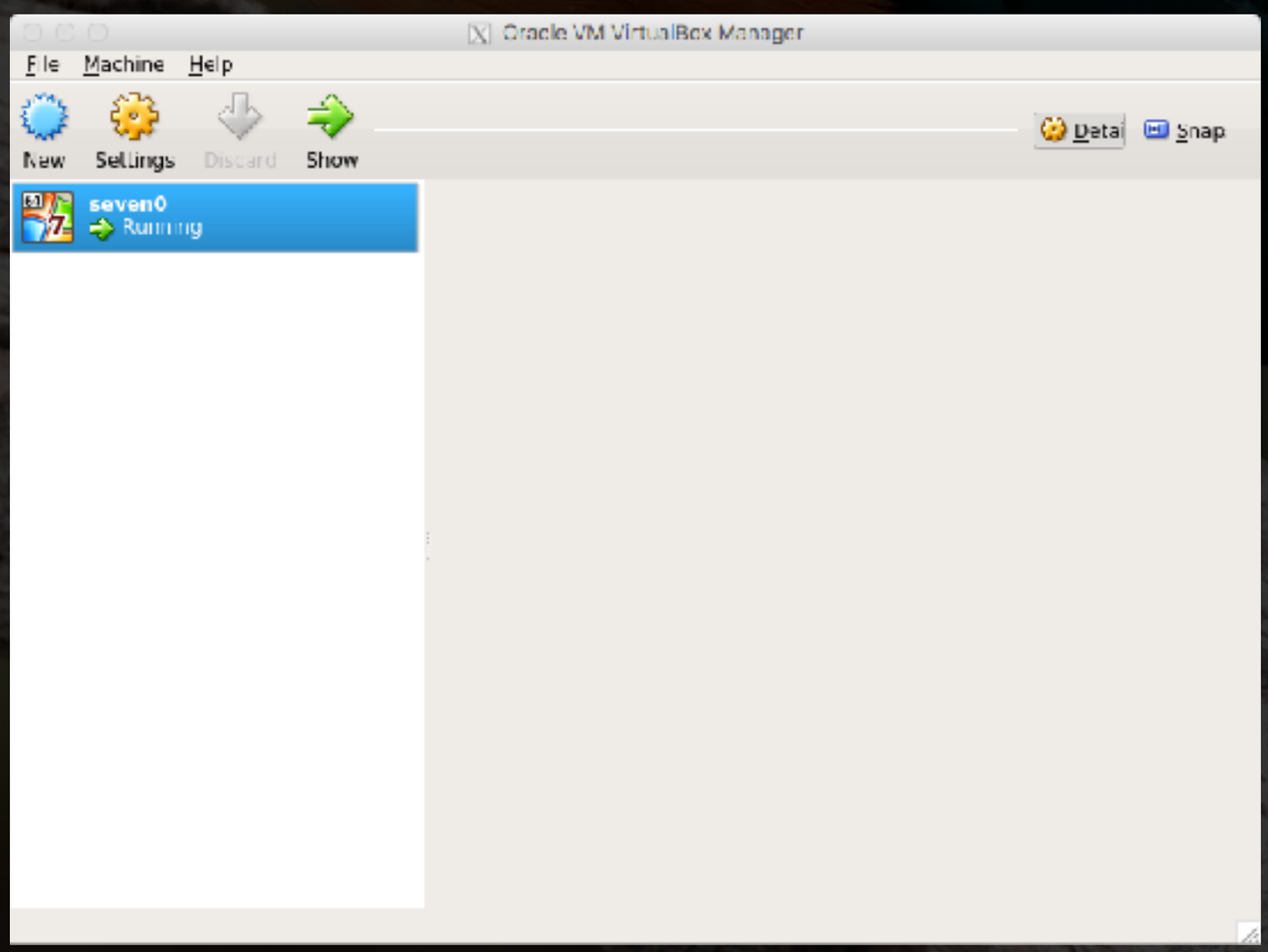
- downloads Cuckoo Signatures, the latest monitoring binaries, and other goodies from the Cuckoo Community Repository and installs them

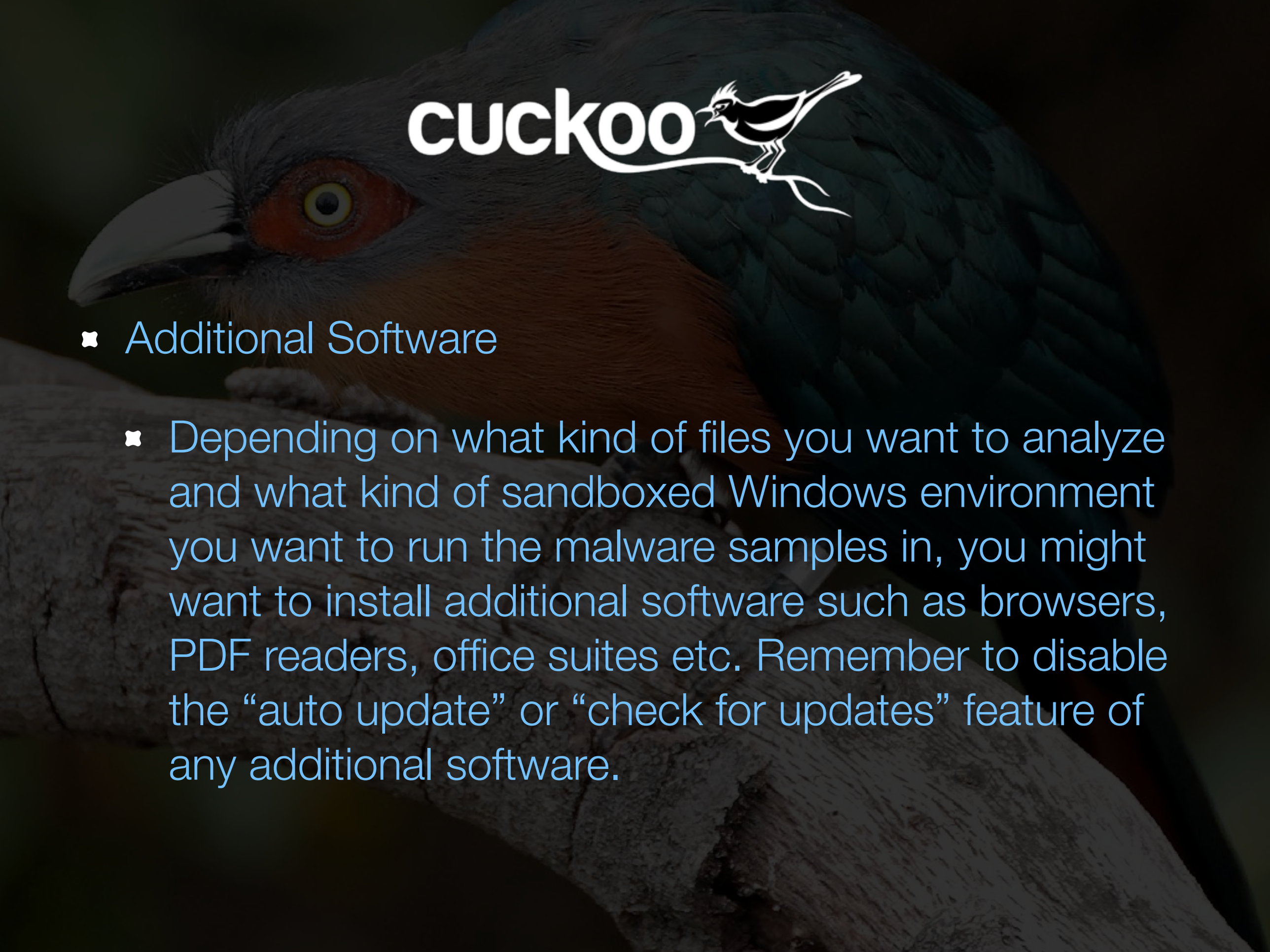
- cuckoo community

```
$ cuckoo community --help
Usage: cuckoo community [OPTIONS]

  Utility to fetch supplies from the Cuckoo Community.

Options:
  -f, --force               Overwrite existing files
  -b, --branch TEXT         Specify a different community branch rather than
                            master
  --file, --filepath PATH   Specify a local copy of a community .tar.gz file
  --help                    Show this message and exit.
```

- Guess OS Install (everything you need)
  - Windows 7 64bit
    - Yields much better results
    - Must disable User Access Control
  - Windows XP
  - Python
  - Python Pillow - Used for taking screenshots
  - Agent.py

- ssh -X ubuntu@192.168.0.10
- *run* virtualbox





- Additional Software
  - Depending on what kind of files you want to analyze and what kind of sandboxed Windows environment you want to run the malware samples in, you might want to install additional software such as browsers, PDF readers, office suites etc. Remember to disable the “auto update” or “check for updates” feature of any additional software.

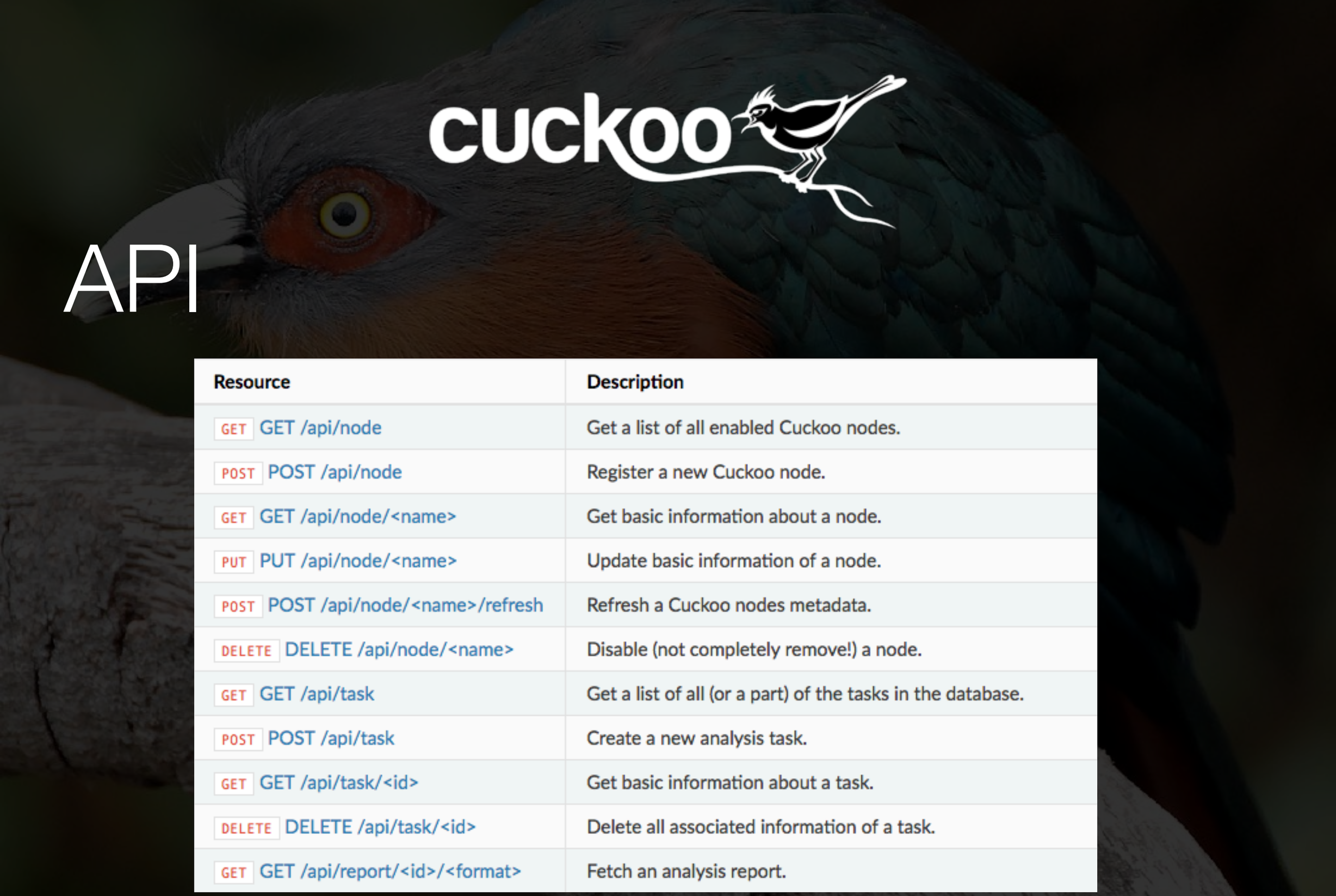
VMCloak

- http://vmcloak.org/
- https://github.com/jbremer/vmcloak
- VMCloak is a tool for automatically creating, cloning, and cloaking Virtual Machines to be used for Cuckoo Sandbox
  - Microsoft Office Documents
- Utilizes the Cuckoo Agent


```
# Install the latest vmcloak.
sudo pip install vmcloak --upgrade

# Mount the Windows 7 Installer ISO.
sudo mkdir -p /mnt/win7
sudo mount -o loop,ro win7.iso /mnt/win7

# Ensure the hostonly adapter is up.
vmcloak-vboxnet0

# Actually initialize the 64-bit Windows 7 VM.
vmcloak init --win7x64 seven0
```

```
vmcloak install seven0 office2007 \
    office2007.isopath=/path/to/a.iso \
    office2007.serialkey=ABC-DEF
```

```
vmcloak install seven0 adobe9 wic pillow dotnet40 java7
```



API

Resource	Description
GET GET /api/node	Get a list of all enabled Cuckoo nodes.
POST POST /api/node	Register a new Cuckoo node.
GET GET /api/node/<name>	Get basic information about a node.
PUT PUT /api/node/<name>	Update basic information of a node.
POST POST /api/node/<name>/refresh	Refresh a Cuckoo nodes metadata.
DELETE DELETE /api/node/<name>	Disable (not completely remove!) a node.
GET GET /api/task	Get a list of all (or a part) of the tasks in the database.
POST POST /api/task	Create a new analysis task.
GET GET /api/task/<id>	Get basic information about a task.
DELETE DELETE /api/task/<id>	Delete all associated information of a task.
GET GET /api/report/<id>/<format>	Fetch an analysis report.

CLI

```
$ cuckoo submit --help
Usage: cuckoo submit [OPTIONS] [TARGET]...

  Submit one or more files or URLs to Cuckoo.

Options:
  -u, --url            Submitting URLs instead of samples
  -o, --options TEXT   Options for these tasks
  --package TEXT       Analysis package to use
  --custom TEXT        Custom information to pass along this task
  --owner TEXT         Owner of this task
  --timeout INTEGER    Analysis time in seconds
  --priority INTEGER   Priority of this task
  --machine TEXT       Machine to analyze these tasks on
  --platform TEXT      Analysis platform
  --memory             Enable memory dumping
  --enforce-timeout    Don't terminate the analysis early
  --clock TEXT         Set the system clock
  --tags TEXT          Analysis tags
  --baseline           Create baseline task
  --remote TEXT        Submit to a remote Cuckoo instance
  --shuffle            Shuffle the submitted tasks
  --pattern TEXT       Provide a glob-pattern when submitting a
                       directory
  --max INTEGER        Submit up to X tasks at once
  --unique             Only submit samples that have not been
                       analyzed before
  -d, --debug          Enable verbose logging
  -q, --quiet          Only log warnings and critical messages
  --help               Show this message and exit.
```

Free Malware Analysis Tools

- https://malwr.com/
- https://www.virustotal.com/
- https://www.hybrid-analysis.com/

Things to Consider

- Tipping Your Hat
  - Monitored by Malware Authors
- Data Leakage
  - https://thehackernews.com/2017/08/fortune-1000-data-leak.html
- Availability
- File Size
- Typically Not Up-to-date


WARNING
ASSUMPTIONS
AHEAD

Tools

- SANS 572 - Advanced Network Forensics and Analysis
- Phil Hagen - @PhilHagen
- https://github.com/philhagen/sof-elk
- Mantella (utahsaint.org)
  - Unsure if its an active project?

kibana

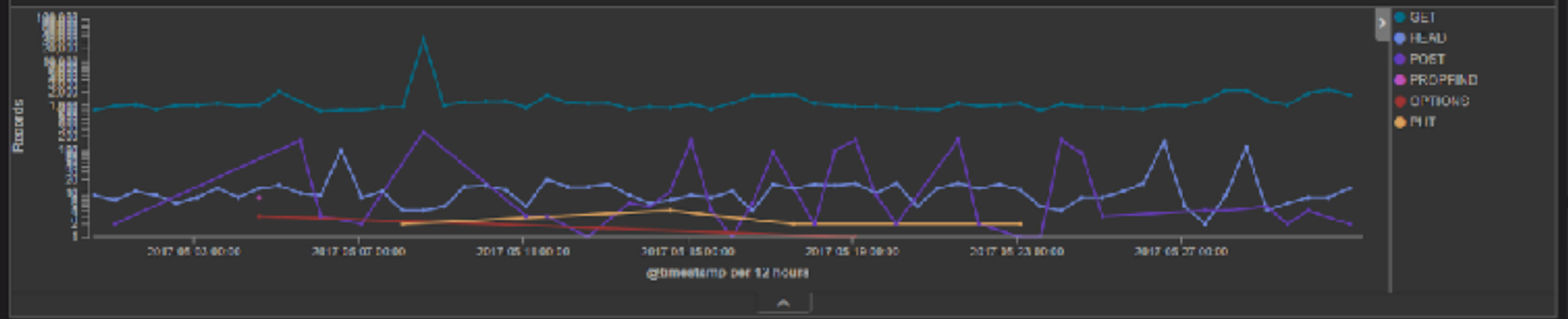
Discover | Visualize | Dashboard | Settings

~ 2 months ago to ~ a month ago

HTTPD Log Dashboard

Capture

HTTPD Timeline



HTTPD Log Count

108,331

HTTPD Records

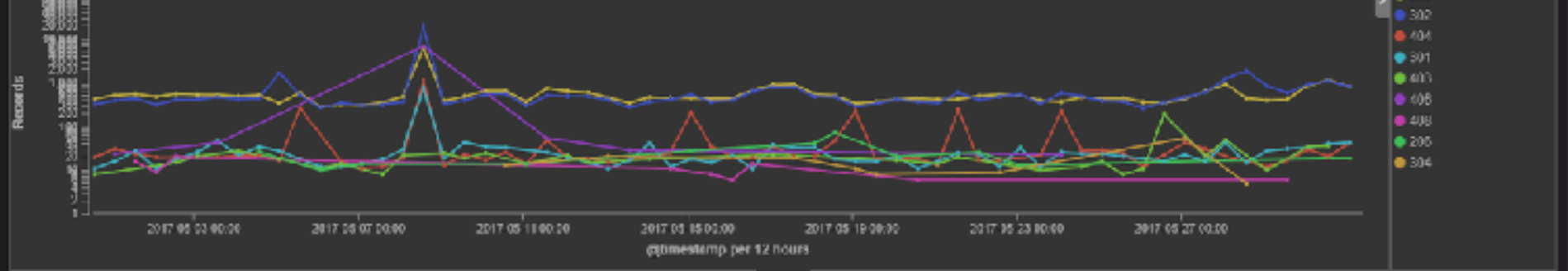
HTTPD Source ASNs

Source ASN	Records
AS3595: Micronet Corporation	33,826
AS14061: Digital Ocean, Inc.	7,052
AS8972: Host Europe GmbH	7,691
AS25151: Cyso Management B.V.	5,517
AS8075: Microsoft Corporation	5,160
AS15169: Google Inc	3,720
AS56957: Beijing Baidu Netcom Science and Technology Co., Ltd	2,715

Export: raw | formatted

1 2 3 »

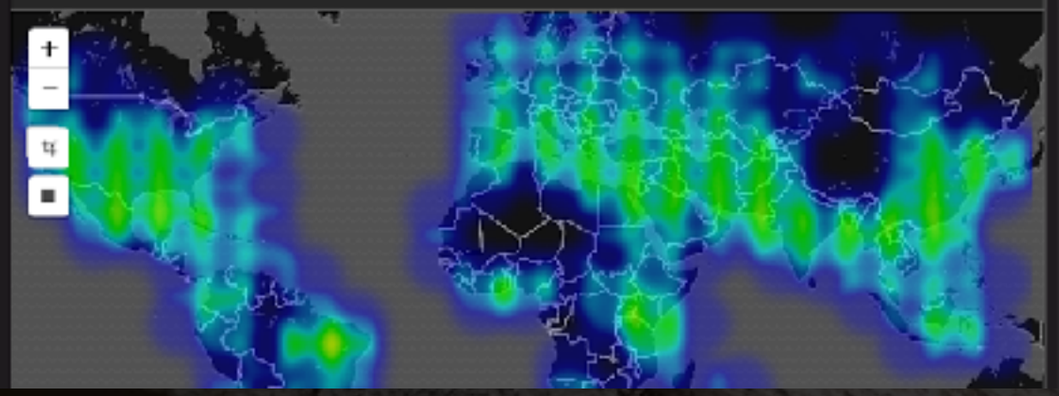
HTTPD Response Code Timeline



Visual Pie Graph

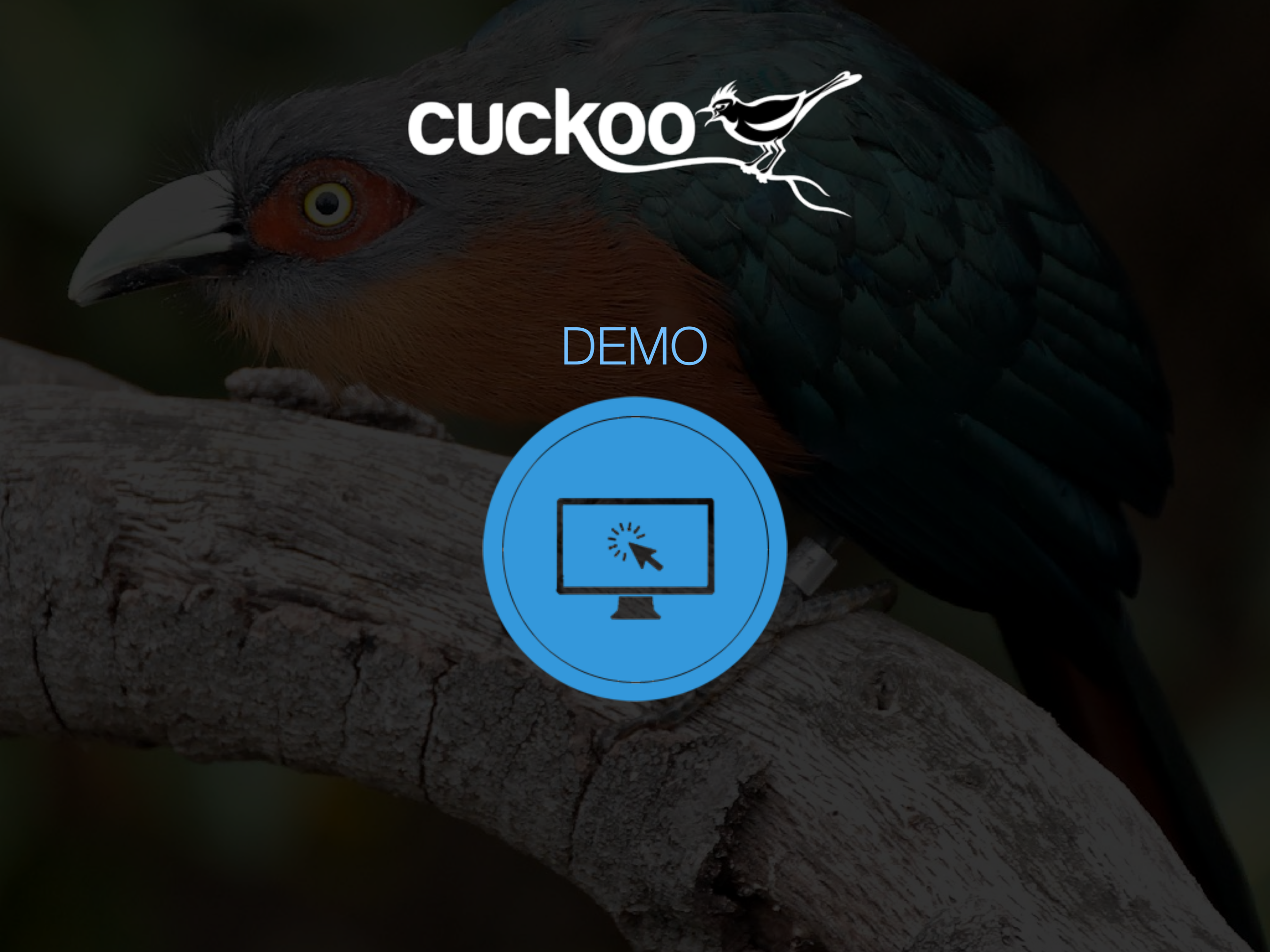
No results displayed because all values equal 0

HTTPD Access Source



HTTP User Agents

HTTP User Agent	Records
Mozilla/5.0 (Windows NT 6.3; WOW64; rv:39.0) Gecko/20100101 Firefox/39.0	32,812
Linguee Bot (http://www.linguee.com/bot; bot@linguee.com)	7,551
Tiny Tiny RSS/1.13 (http://tt-rss.org/)	6,617
Mozilla/5.0 (Windows NT 6.1; WOW64; rv:40.0) Gecko/20100101 Firefox/40.1	5,999
Go 1.1 package http	3,452
Mozilla/5.0 (Windows NT 6.3; Win64; x64)	3,452


cuckoo
DEMO

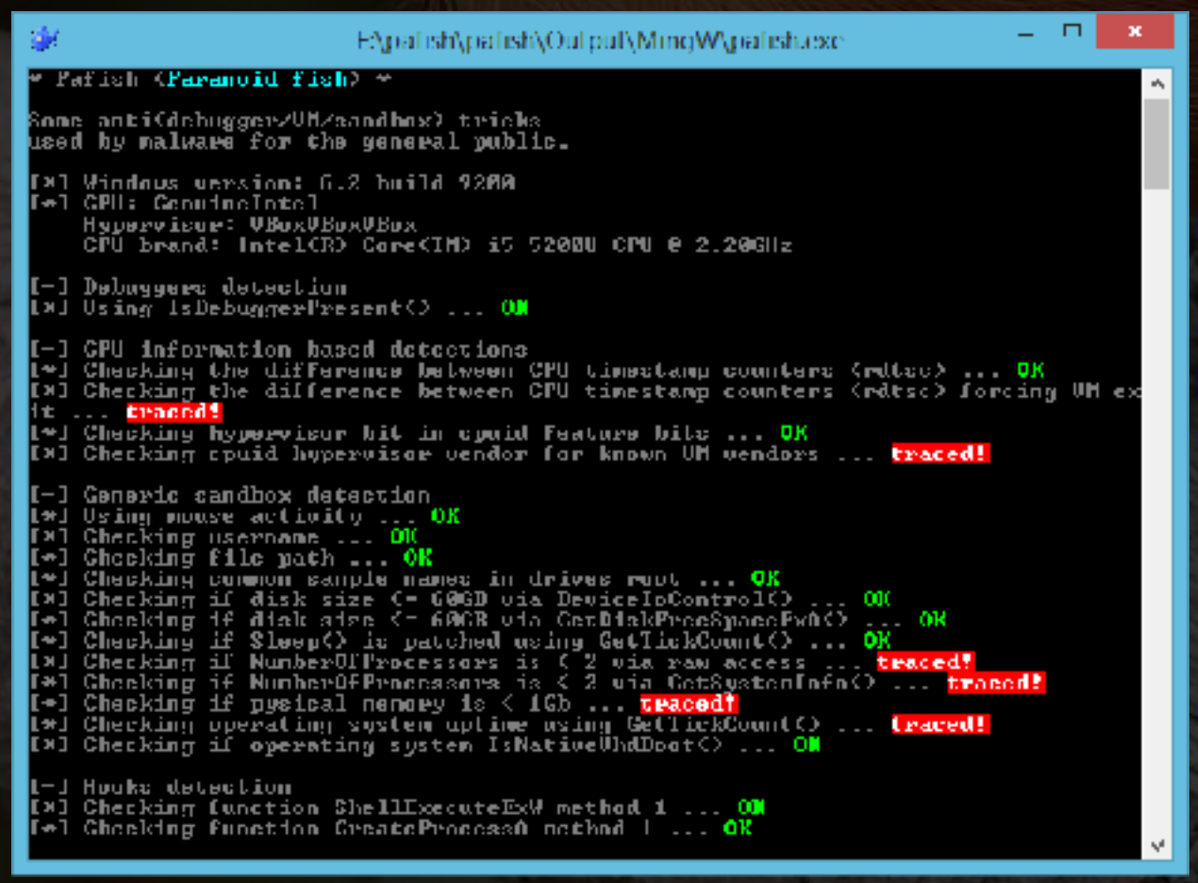
Malware Samples

- theZoo - https://github.com/ytisf/theZoo/tree/master/malwares/Binaries
- ObjectiveSee - https://objective-see.com/malware.html
- http://dasmalwerk.eu/
- http://www.virusign.com/

Warning

- Virtualization Detection
  - Changing MAC Address
- Sandbox Bypassing
  - 2017 - BSidesSF - Bypassing Malware Analysis Sandboxes is Easy by Michael Gough @HackerHurricane

Pafish (Paranoid Fish)



Pafish is a demonstration tool that employs several techniques to detect sandboxes and analysis environments in the same way as malware families do.

https://github.com/a0rtega/pafish

@enruhe_

Slides - https://github.com/enruhe/SAINTCON/