TLP: WHITE
RandoriSec Webinar

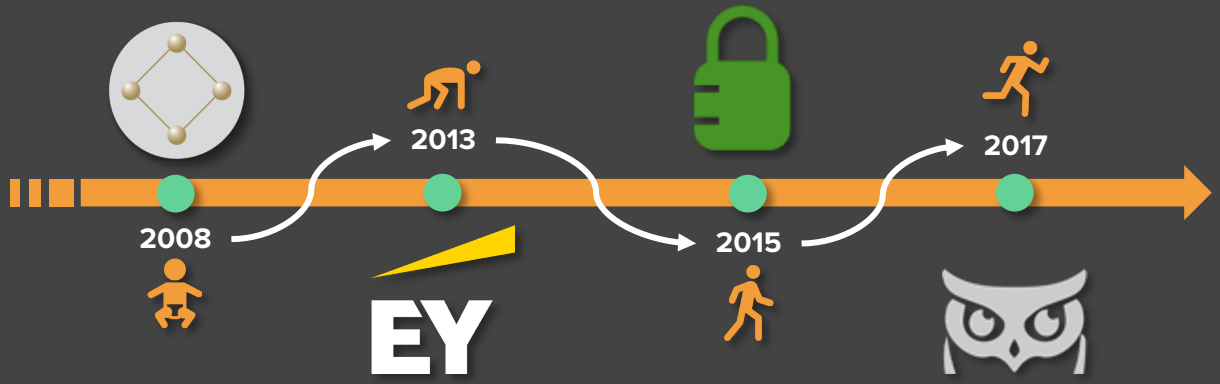
PatrOwl

The Red flavour of SOC automation

SecOps orchestration with an open-source SOA(R) platform
#SOAR #SecOps #OpenSource #PreventiveSecurity

Let me introduce myself

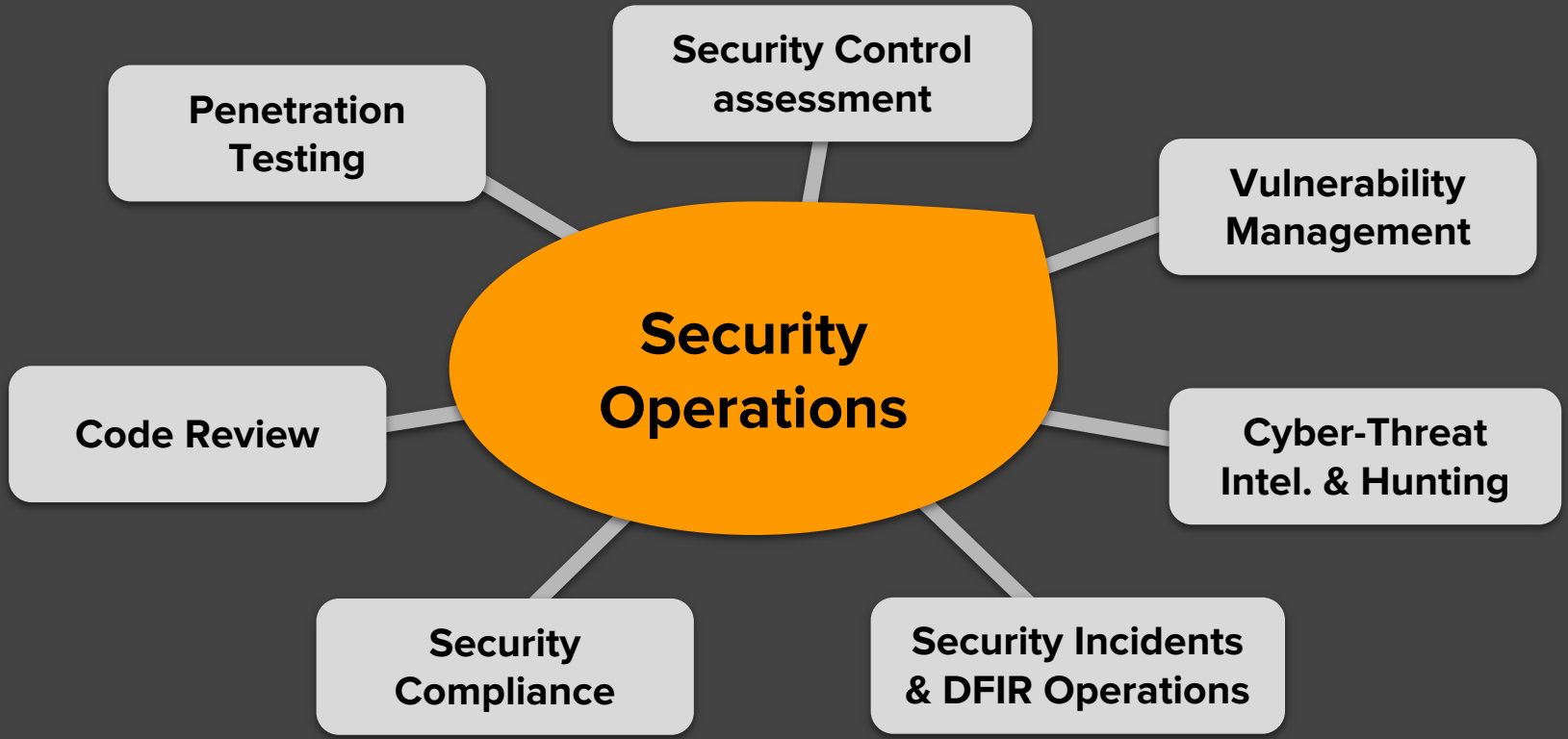
Nicolas MATTIOCCO
@MaKyOtOx
35 y/o 🇫🇷



- Security auditor
- Currently onboarded in the **Red Team** of an internal CERT/CSIRT for a financial institution in France
- First-timer on an OSS project
- Proud dad (first-timer too)

You don't even ~~care~~ need to know more about me...

My own definition of *SecOps* ©



What is **PatrOwl** ?

Open source, unified, integrated and scalable platform for SecOps automation and orchestration:

- **Continuous** and **full-stack** security overview
- Define threat intelligence & vulnerability assessment scans policies
- Orchestrate scans using tailor-made engines
- Collect & aggregate findings
- Contextualize, track and prioritize findings
- Check fixes and remediation effectiveness

End-Users:

- CERT/CSIRT, SOC, CTI, DFIR, Penetration testers, Risk Manager, Internal Audit, CISO, Fusion Center
- CTO, Dev[Sec]Ops, Network and system engineers, QA Team, Developers
- M&A, Compliance teams
- InsurTech

The end. Thank you for the attention !

Questions ?

A new deadly tool ! But we missed some details...

Story **horse** ?

Facing current and future cyber-security challenges

Trends

Facts & Challenges

1. **Poor visibility** on Cyber-exposure risks: Need to monitor a large, diversified, unmanaged and complex scope, even others assets ;
2. **Scarcity** of skilled and efficient **resources** in cyber-security ;
3. **Windows of exposure problem:** Cyber-security mediatisation causes high visibility for vulnerabilities and easiness of attacks ;
4. **Tool capacity-based approach** rather a business threats-based approach. Our great security tools are ineffective without proper strategy, expertise and processes.

Cyber-Exposure and risks are continuously growing and quickly changing

Facing current and future cyber-security challenges

Detecting security incidents

Precursores (may occur)

Indicators (have occurred or is happening)

Events monitoring reveals vulnerabilities and suspicious changes

Asset updates

- Application, system or network updates
- Infrastructure changes: open/closed ports, new subdomain, IP or domain assignment
- **Shadow IT ?**

Infosec KB updates

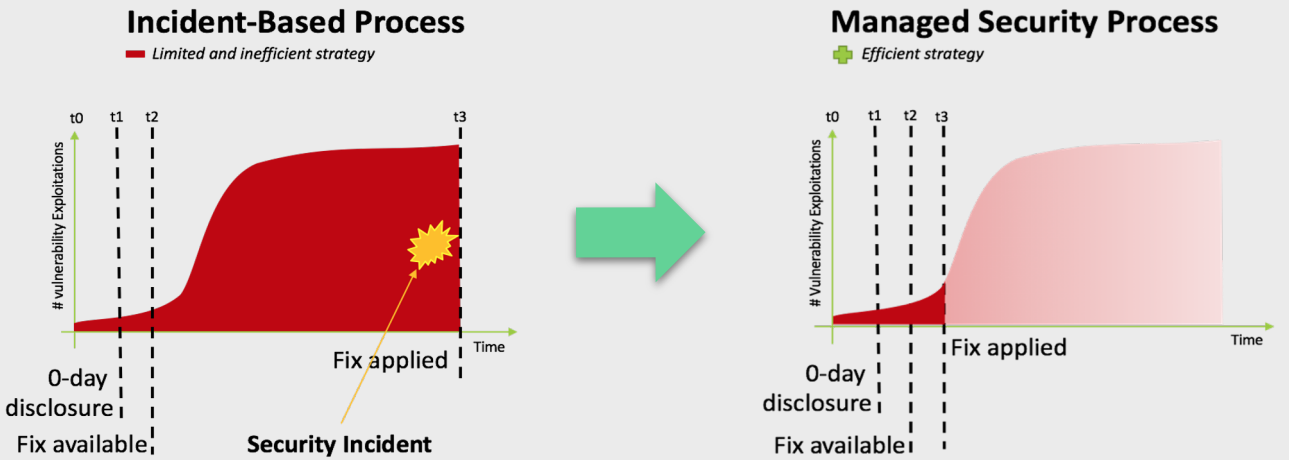
- CVE, CVSS, CPE updates
- 0-days & misconfigs
- Exploit releasing
- New detection method: scanner update, new tool released, policy updates, infosec researches
- Publication of IOCs

Ext. resource updates

- Data leaks
- Fraud: IP or DNS blacklists, Malware analysis, Typosquatting, ...
- Phishing campaign
- Changes on potential attackers' assets
- Attacks announcements
- Suspicious activities (SIEM)

Facing future cyber-security challenges

The “Window of Exposure” problem



Proactive detection
+ Alert notification
= Early fixing
= Safe earlier

QED

Attackers <u>will</u> attack your assets.
Tackling the window of exposure is now a top priority.

How to face these bigger, better, badder threats ?

What about **Automation** and **Orchestration** ?

How to face these bigger, better, badder threats ?

Me too !

Why automating SecOps ?

Do more checks

- Cover a larger and diversified scope
- Empower new capacities and improve cyber-security maturity level
- Get a better overview of cyber-exposure (full-stack)

Do it more often

- Continuously checking for vulnerabilities and suspicious changes
- Reduce delays in discovering and fixing a security incident (vulnerability or pwnage)
- Keep updated of your cyber-exposition risks

Do it more efficiently

- Reduce time to low value-adding tasks to focus on more complex security cases
- Reduce and manage costs
- Assess effectiveness of your SecOps activities through measurable KPIs

Do compliance and benchmarks

- Define and expedite controls
- Assess compliance level regarding corporate, regulatory and statutory standards
- Benchmark security level of assets using same control policies


AUTOMATION
PLEASE TAKE MY JOB

Of course, there are several known limits…

It does not cover 100% of risks in itself (do not be so naïve… Black magic does not exist)

- **Number of alerts ?**
- **False-Positives ?**
- **Functional vulnerabilities ?**
- **Qualification & Contextualisation ?**
- **Total Costs of Ownership ?**
- **Cyber-Defence Strategy ?**

… and probably all others generic downsides of automated systems …

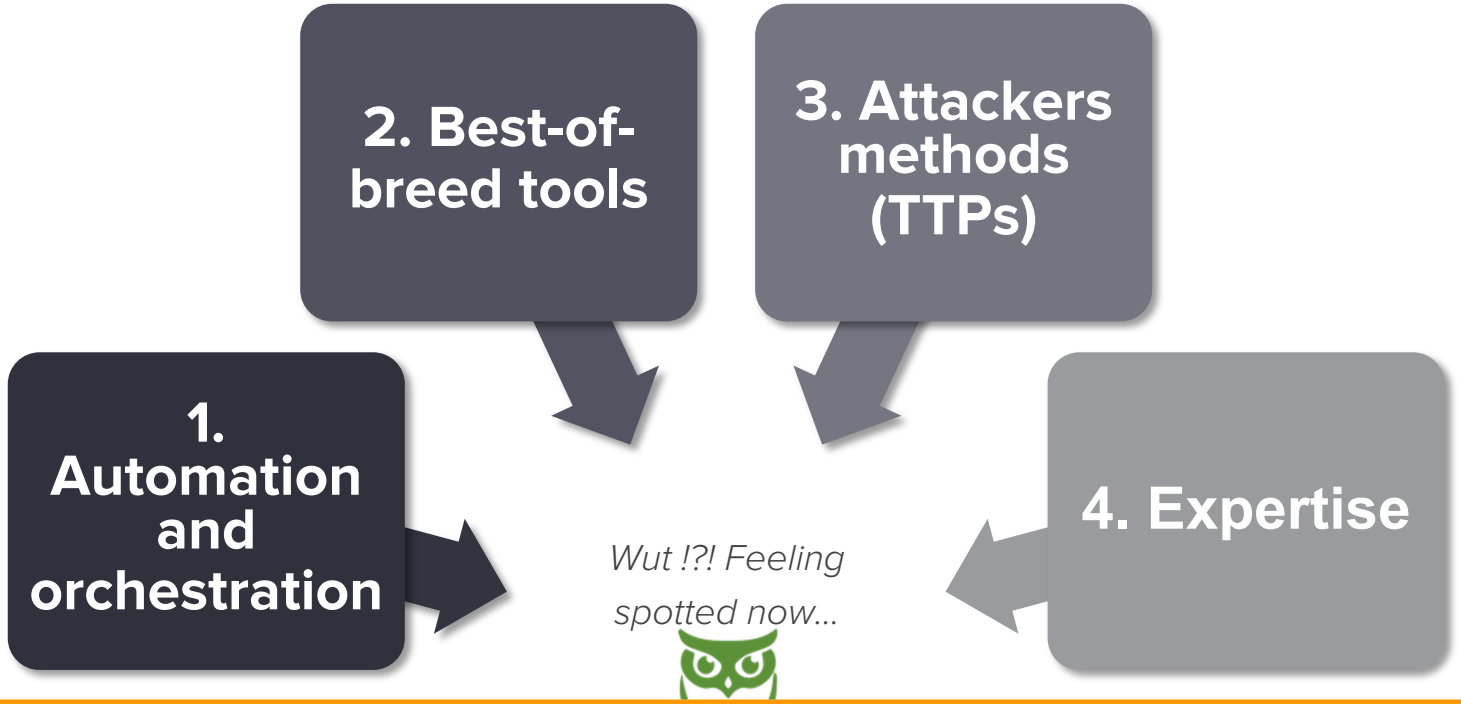
SecOps automation as a new standard ?

BTW, we built **PatrOwl** for automating and orchestrating **SecOps**

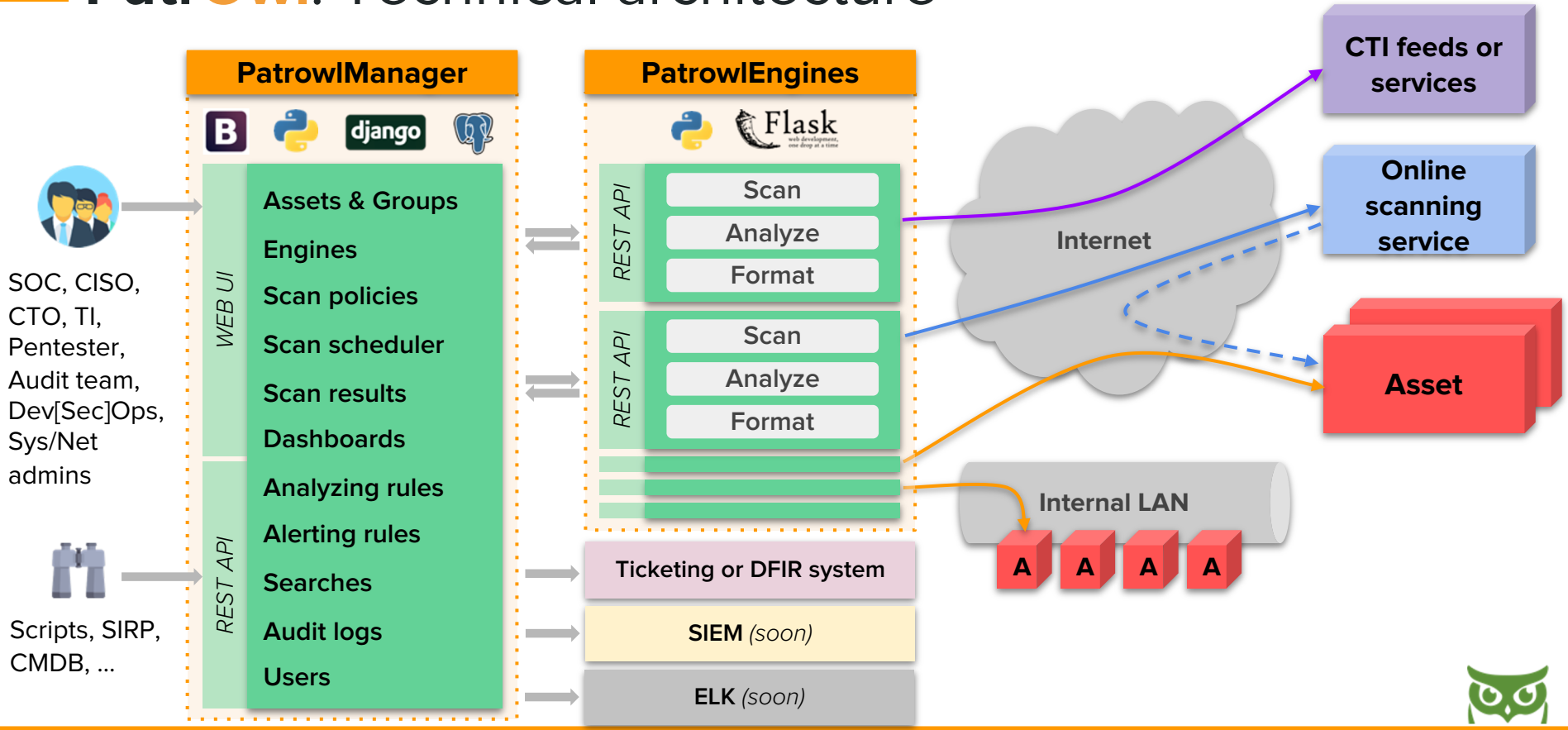

gifbin.com

PatrOwl's incentives

Efficiently moving from a reactive to a more *predictive* security posture with:

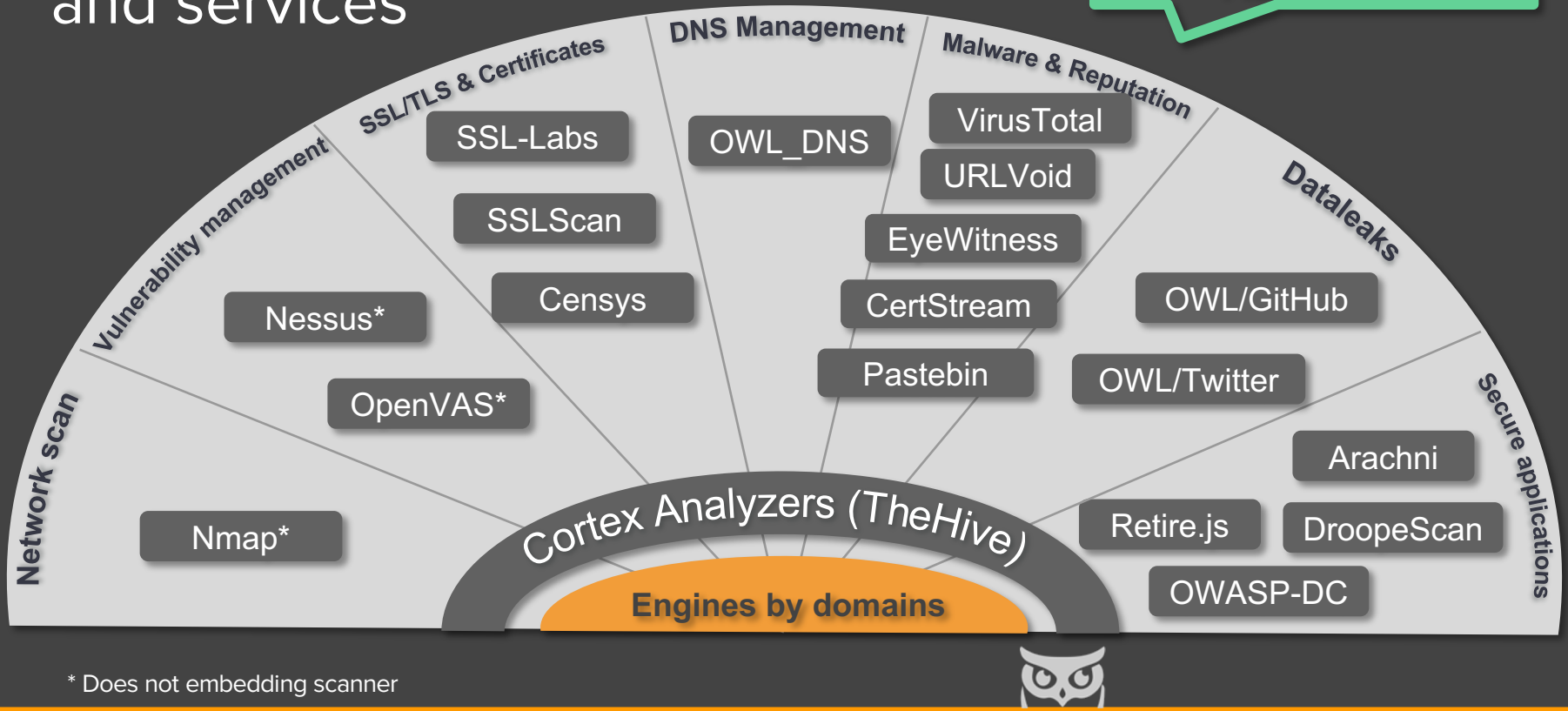


PatrOwl: Technical architecture



PatrowlEngines: Supported tools and services

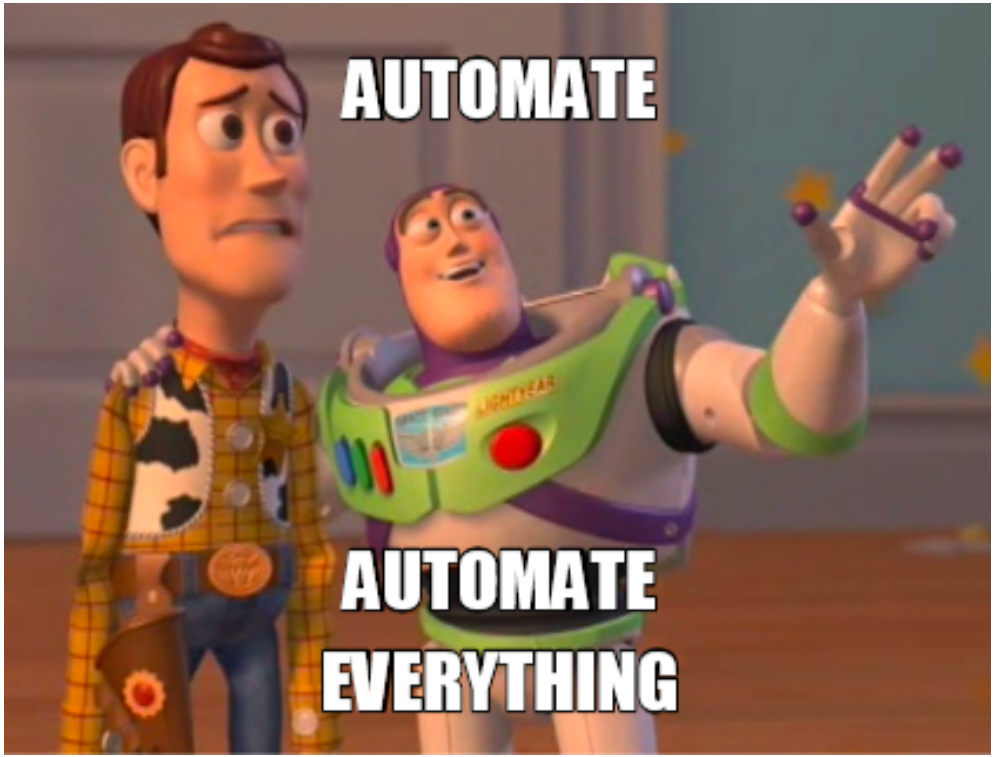
Turnkey micro-apps:
Docker images +
REST-API



* Does not embedding scanner

Next engines in the pipeline (to be confirmed)

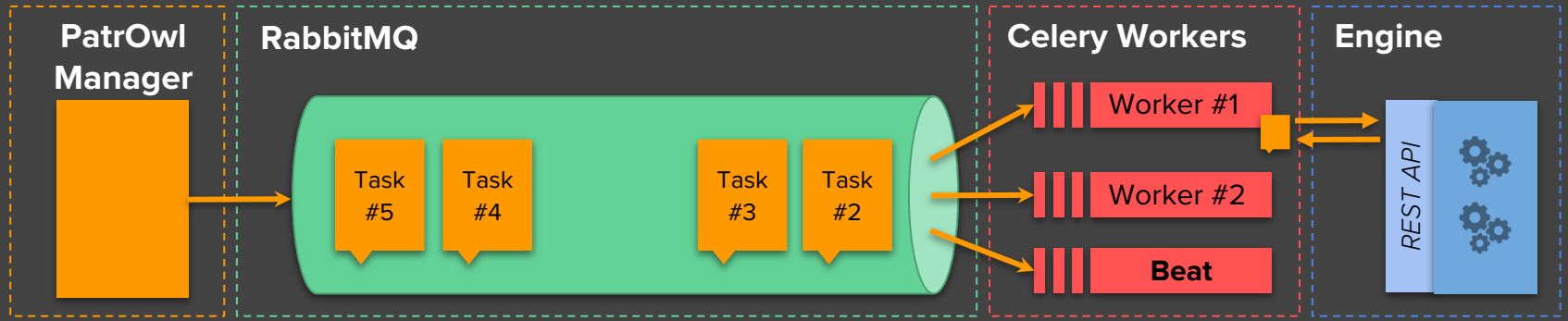
- **Vulnerability management**: Qualys, Rapid7 IVM/Nexpose
- **Pasties**: AIL-Framework (CIRCL)
- **CTI**: MISP, Shodan, Onyphe
- **WEB**: Acunetix, Burp, WPScan
- **Containers**: AquaSec, CLAIR, Jfrog Xray, TwistLock
- **Dataleaks**: Git/truffleHog, gitGraber, Clouseau
- **Cloud**: ScoutSuite, CloudSploit
- **... Any other idea ?**



Looking for scalability

Asynchronous scans:

- **RabbitMQ** is used as a message broker and **Celery** as the task queue processor. Messages are sent for monitoring engines or managing scans
- **Celery Beat** is the worker in charge of scheduled tasks



Current challenge: how to manage large amount of assets ? Findings ?

PatrOwl is a SOA(R) framework

Basic **use cases**

Use case #1: Recon steps for external pentests

Objectives

- First steps of every penetration tests: identify vulnerable targets and explore the best ways to exploit them

Basic strategy

1. Search subdomains (SE, brute-force)
2. Resolve IP addresses
3. List open ports
4. Fingerprint listening services
5. Search for vulnerabilities
6. Search for SSL/TLS misconfigurations
7. Sitemap and autonomous scans

Added values

- Free/Open-source tools:
  - Nmap (+scripts), OpenVAS, SSLScan, Sublist3r
  - Tenable.io || Qualys alternative for online monitoring ?
- Continuous tracking of exposed infrastructure assets and suspicious changes:
  - Open/closed ports
  - Service versions
  - Vulnerabilities & available exploits (i.e. Vulners script)
  - Public subdomains tracking
  - Known resolved IPs
  - Allowed SSL/TLS cipher-suites
  - Certificate expiry dates

Use case #2: SAST/DAST in a DevSecOps pipeline

Objectives

- Examining source code and running WEB applications for security defects

Basic strategy

1. On each commit || tag || merge detected on the code repository: clone the project and start a static code analysis of external libraries (SAST)
2. Once the WEB application is deployed on a staging environment, start an autonomous scan (DAST)

Added values

- Free/Open-source tools:
  - OWASP-DC → .Net, Java external libs (at least)
  - Retire.js → JS dependencies
  - Arachni → Web application scanner
- Easy integration of other security tools (REST API + **Patrowl4py** client)
- Early detection of (basic) vulnerabilities
  - But potentially critical !
- Areas of improvement:
  - Docker images checks
  - More integrations are coming: Checkmarx, Acunetix, Burp ...

Use case #3: Phishing preparation scenario

Objectives

- Search for early signs of malicious domains/websites presence

Basic strategy

1. Search for suspicious domains
   - randorizSec.fr, randourisec.fr, ...
2. Monitor them, looking for changes
   - Still parked domains ?
   - Issued certificates ?
   - New exposed services ?

Added values

- Free/Open-source tools:
  - CertStream : Search for potential fraudulent domains/certificates
  - EyeWitness: Take screenshots
  - OWL_DNS & VirusTotal: Gather data on (sub-)domains from CTI feeds
- Continuous discovery and monitoring of suspicious impersonating domains
- Areas of improvement:
  - Typosquating vectors
  - Image recognition

Use case #4: Code leaks on GitHub

Objectives

- Search for leaked internal source code, API Keys, passwords, scripts, …

Basic strategy

1. List the text pattern your want to monitor (beware of false-positives !). Ex:
   - Internal server and application names
   - Internet domain names
   - Cloud API Keys
   - Sensitive email addresses
2. Search these patterns on public GitHub repositories

Added values

- Free/Open-source tools:
  - OWL/GitHub: Search text patterns on GitHub
- Continuous monitoring of public GitHub repositories, including history and development branches!
- Areas of improvement:
  - Search secrets on public and internal Git/SVN repositories (~truffleHog, gitGrabber, …)

Various use cases

Monitoring Internet-facing systems
Scan continuously websites, public IP, domains and subdomains for vulnerabilities, misconfigurations, ...

Data leaks
Monitor code leaks on GitHub, sharing platforms (Pasties), emails in dump leaks, open AWS buckets, ...

Phishing / APT scenario preparation
Monitor early signs of targeted attacks: new domain registration, suspicious Tweets, suspicious pasties, VirusTotal submissions, phishing reports, ...

Vulnerability and remediation tracking
Identify vulnerabilities, send a full report to ticketing system (TheHive, JIRA, ...) and rescan to check for remediation

Regulation and Compliance
Evaluate compliance gaps using tailor-made scan templates

Vulnerability assessment
Orchestrate regular scans on a fixed perimeter, check changes (asset, vulnerability, CVSS, available exploits)

Penetration tests
Perform the reconnaissance steps, the full-stack vulnerability assessment and the remediation checks

Monitoring attacker or suspicious assets
Ensure readiness of teams by identifying attackers' assets and tracking changes of their IP, domains, WEB applications

Securing the CI / CD pipeline
Automation of static code analysis, external resources assessment and web application vulnerability scans

PatrOwl produces findings. A lots of findings...

How to about **prioritization** ?

Once upon a time in a CERT/CSIRT

Morning routine

Prioritize findings

- **Our morning routine when a new vulnerability is discovered:**

  Sources: Vulnerability Feeds, CTI, Bluez, Redz, 'Private channels' …

  - We need answers about our **exposure** and **compromising** statuses:
    - ~~✓ Is it a named vulnerability, with a logo and and dedicated website? @All: We're screwed !~~
    - ✓ What is the CVSS Base Score ? @SOC: Tell us ! Classical communication only to known product owners if it is upper than 7.0 and continue if it's upper than 9.0.
    - ✓ Are we vulnerable ? @SOC+Redz: Confirm the versions, the running configurations and counter-measures in place on our assets, contact product owners !
    - ✓ Are we exposed from the Internet ? @SOC+CTI: Tell us !
    - ✓ Is the vulnerability identified on a critical asset ? @SOC: Tell us !
    - ✓ Are we aware of any functional exploit ? @Redz+CTI: Go find them and test it !
    - ✓ Is there any patch or compensation measure available ? @SOC+CTI: Tell us !
    - ✓ Are there any likelihood catalysts : exploited in the wild? Media hype level ? Exploited by relevant threat actors ? @CTI: Tell us !
    - ✓ Are we already p0wned ? @DFIR: Investigate and reassure us !
    - ✓ Are we able to detect exploitation ? @DFIR: Tell us and/or try to setup alerts !
    - ✓ OK folks, do we have enough data to initiate a CSIRT alert ? @CERT manager: yes / no !

Prioritize findings

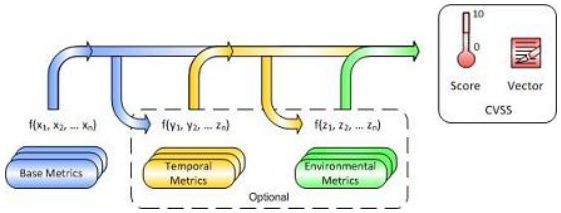
- **Wrap up**
  - It is definitely a teamwork, not just within the CERT/CSIRT team
  - CVSSv2 Base Score as a primary criteria
  - Vulnerability metadata are not static. They are continuously evolving over the time. Ex:
    - New patch available
    - New exploit released

Prioritize or die

Is the **CVSS Base Score** sufficiently **enough** to be a primary factor of discrimination in vulnerability management ?

Brief reminder of CVSS scoring

- Score ranging from **0.0** (low) to **10.0** (high/critical)
- Metrics:
  - **Base**: represents the intrinsic and fundamental characteristics of a vulnerability that are constant over time and user environments.
  - **Temporal**: represents the characteristics of a vulnerability that change over time but not among user environments.
  - **Environmental**: represents the characteristics of a vulnerability that are relevant and unique to a user's environment.
- Vector string: text representation of a set of CVSS metrics.



- Several versions: CVSSv1 (2005, NIAC/DHS), CVSSv2 (2007, NIST), CVSSv3.0 (2015, FIRST), CVSSv3.1 (2019, FIRST), *CVSSv4.0 (202x, FIRST)*

Pros	Cons
▪ THE standard ▪ Largely adopted ▪ Transparent ▪ Understandable from everyone	▪ Availability (v2 vs. v3 vs. nothing) ▪ Accuracy ▪ Completeness ▪ Updates ▪ Trust ▪ Equations ?!?

- Only the CVSS Base score is usually provided. Temporal and Environmental scores are on our behalf
- Other fun facts:
  - HeartBleed (CVE-2014-0160) was scored at 5.0
  - Spectre (CVE-2017-5753) was scored at 4.7

Prioritize or die

Again:
Is the **CVSS Base Score** sufficiently **enough** to be a primary factor of discrimination in vulnerability management ?

Criteria for prioritization

Threat

- **Exploit availability**
  - No known exploit available
  - A private exploit is available
  - A public exploit is available
- **Exploit maturity**
  - Trusting level: Tested, Validated, Shared by a trusted partner
- **Exploit ease**
  - Theoretical, difficult, easy, auto
- **Threat intensity**
  - Exploited in the wild (yes/no) ?
  - In the news (yes/no) ?
- **Threat relevancy**
  - Exploited by monitored threat actors (yes/no) ?

Vulnerability

- **CVSSv2 Impact & exposure**
  - Low (0.0 – 3.9)
  - Medium (4.0 – 6.9)
  - High (7.0 – 10.0)
- **Patch availability**
  - Official/Temporal fix /No/Unknown
- **Age of vulnerability**
  - Hot (0 – 14 days)
  - Recent (15 – 89 days)
  - Old (> 90 days)
- **Discovery ease**
  - ~impossible, difficult, easy
- **Detection ease**
  - ~impossible, difficult, easy

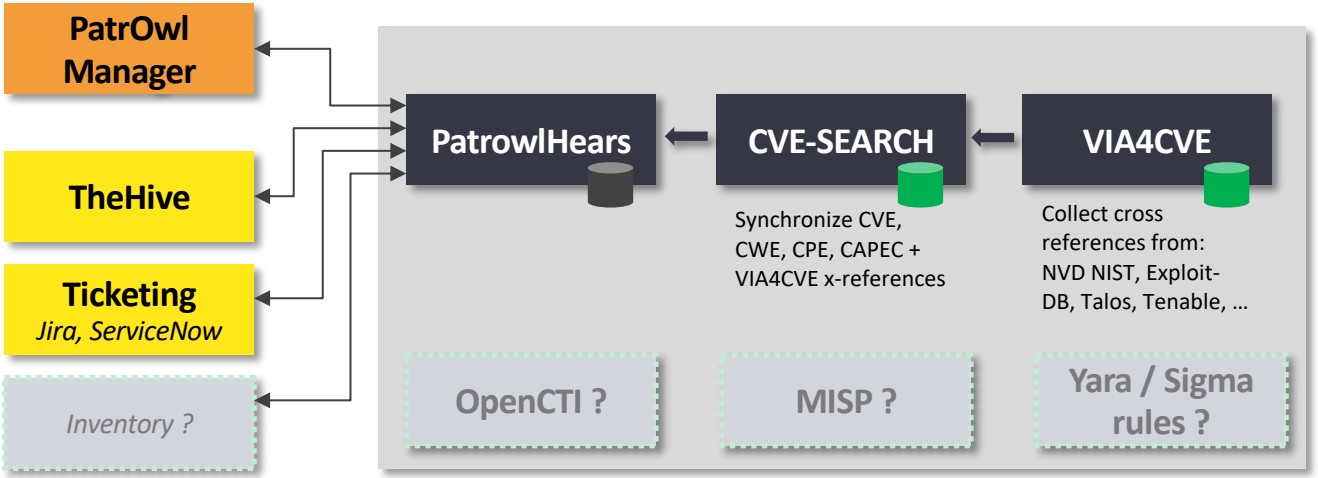
Asset

- **Criticality (ERM-based)**
  - Low
  - Medium
  - High
- **Vulnerable asset interface exposure**
  - Internet
  - Intranet
  - Restricted network
- **Distribution (number of occurrences)**
  - $0 < x \text{ assets} \leq 5$
  - $6 < x \text{ assets} \leq 100$
  - > 100 assets

4 suggested actions

- **1/ Now+**: Immediate correction + CSIRT crisis
- **2/ Now**: Immediate correction
- **3/ Next**: Apply fix in the next patching campaign
- **4/ Never**: Apply fix if possible (attention needed / possibly acceptable)

PatrowlHears architecture



- Collect and clean data: CVE, CPE, cross-references
- Create / Update vulnerability metadata from:
  - Collected data
  - User inputs
- Compute a vulnerability prioritization rating using:
  - Vulnerability metadata
  - Asset criticality and exposure
- Monitor vulnerabilities and Vendor/Products: track changes:
  - Track changes (CVSS, exploits, …)
  - Alert: TheHive, Email, Slack, Jira
- *Share feeds: public/private*

Take-away

Cost-Effective

Rationalize tools integration, product licenses and skills

Time-To-Value

Ease of use and deployment, templates for scan policies

Adaptability & Scalability

REST API, Open-Source connectors, adaptable to organisation's ecosystems

360° overview

Full-stack assessment of cyber-exposure, in real-time with relevant data

Always updated

Vulnerability KB, detection methods, threat scenarios

Made with ♥ by experts

Our team members are A+ security engineers

We currently work on:

- **More integration with:** 

  - Security Incident Response
  - IT Automation and Continuous Configuration
- **Patrowl4py:** Python API client for PatrowlManager and PatrowlEngines
- **Testing various use cases**
- **Debugging and improving quality (endlessly) and security**
- **Documenting (endlessly too !) + scan templates**
- **Supporting MITRE ATT&CK & scenario-based tests**
- **Building an Enterprise solution (SaaS and on-premise). Stay tuned !**
  - *Pro features: LDAP/AD/SAML/OAuth authentication, Cloud security assessment engines, assets auto-discovery and synchronisation, awesome custom dashboards, risk-based controls, Jira/ServiceNow integration, ELK ...*

It’s an open-source project: Contribution is needed !!

Who’s up for:

- **Testing it** and giving us lots of **feedbacks !**
- **Contributing:**
  - New engines
  - Debug
  - Features ??
- **Joining the core team ?**
- **Support us ?**

Dev[Sec]Ops, Security engineer, Cloud Architect, UX/UI Designer, QA Tester, Wonder-Woman (Batman is tolerated too) …

Q&A

1. **We have lots of questions !?!**
2. **We want a demo !?!**
   -- Meet us at the bar !
3. **Enough ! Please stop talking bro !?!**
   -- Thanks for the attention !

Contacts

More details ? Meet us ? Contributing ? Want a demo ? Want an awesome sticker ? Share a beer ? Requesting a Cloud/SaaS demo account (BETA test) ? Join us (**we are hiring**) ?

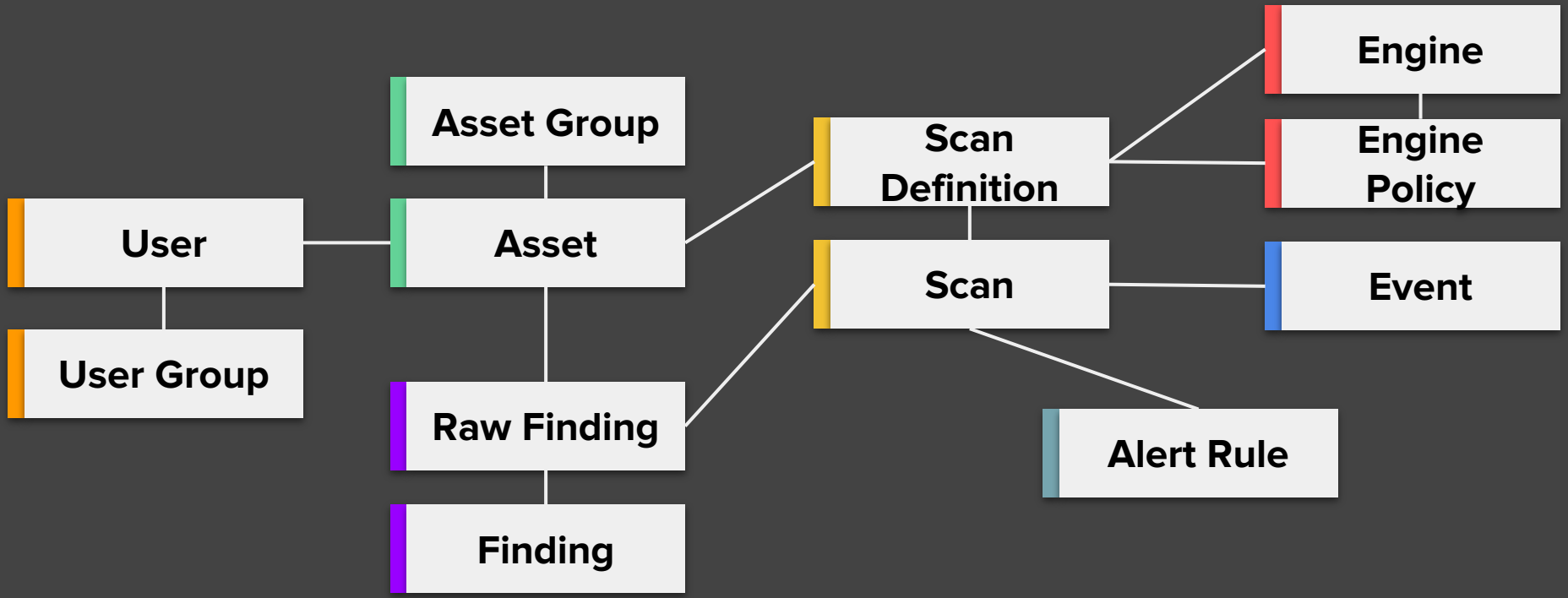
Find us everywhere on earth:

Now: Just in front of you
Mail: getsupport@patrowl.io
Web: https://patrowl.io
Twitter: @patrowl_io (Follow us !)
GitHub: @Patrowl (Star and fork us !)

Before you ask: Why PatrOwl is named “PatrOwl” ?

- The owl is able to see in the dark ~~deep web~~ with a large peripheral vision (almost 360°)
- The domain “patrowl.io” name was not already registered

Data Model (simplified)



PatrOwl Manager - Dashboard

Global indicators on assets, findings, scans, engines and rules

Asset and asset group grades

Most vulnerables assets and asset groups

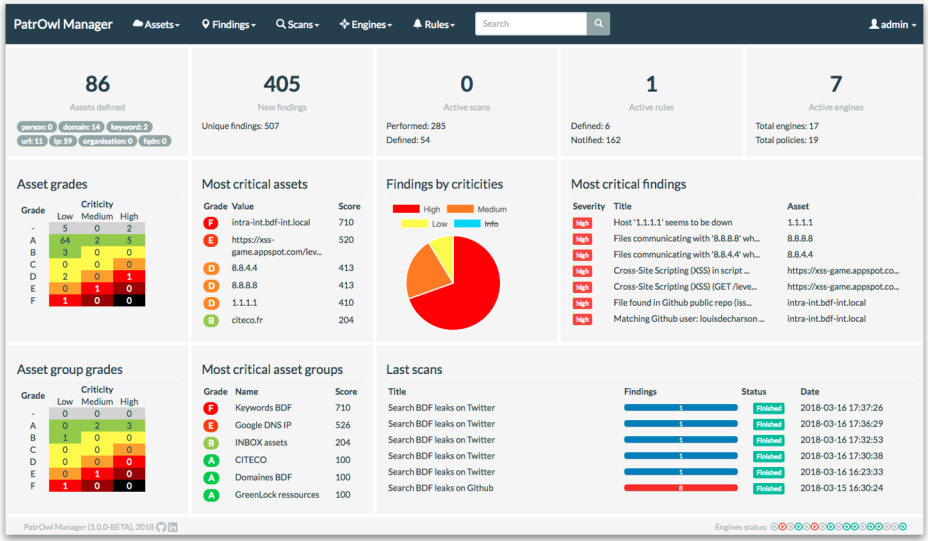
Most critical findings

Findings repartition by severity

Last scans status and results

Top CVSS Score / Findings

Top CVE, CWE, CPE, ...



PatrOwl Manager - Asset detailed view

Current finding counters, risk grade and trends (last week, months, ...)

Findings by threat domains:

- Domain, HTTPS & Certificate, Network infrastructure, System, Web App, Malware, E-Reputation, Data Leaks, Availability

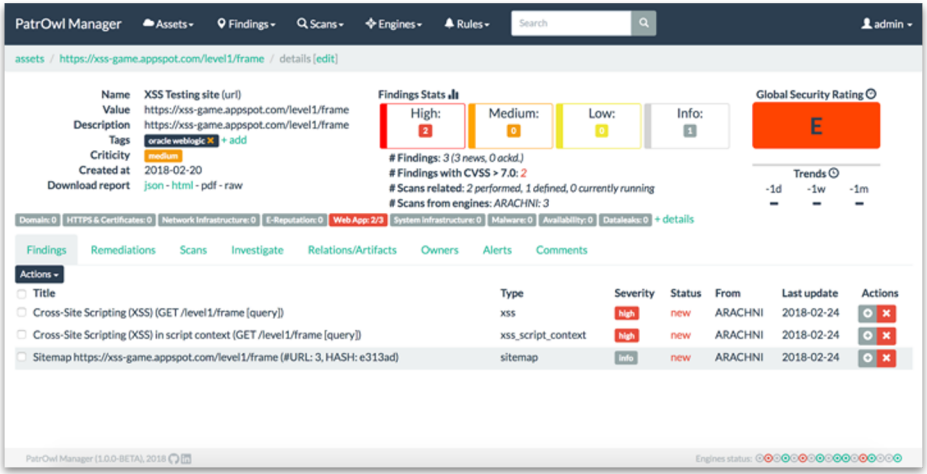
All findings and remediations tips

Related scans and assets

Investigation links

Export HTML, CSV or JSON reports

Custom tags



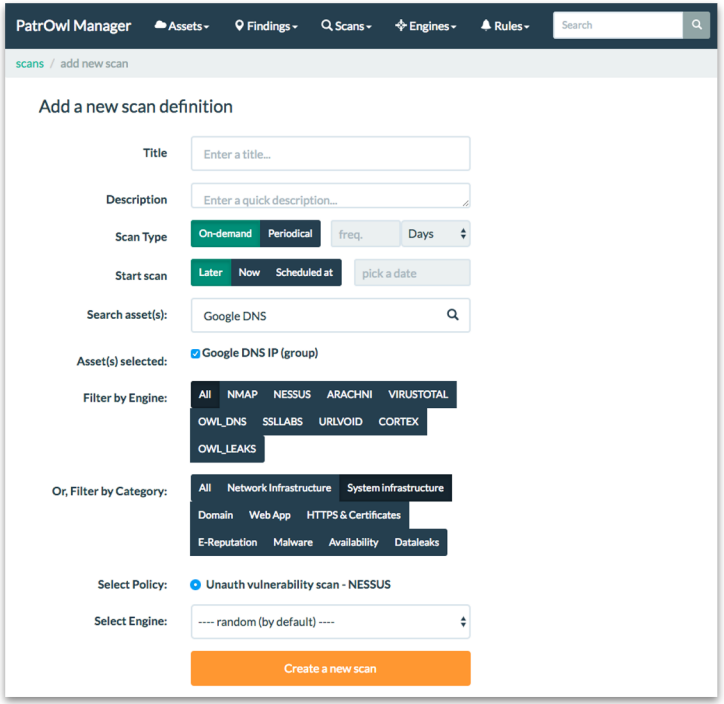
PatrOwl Manager - Scan definition creation view

Search and select assets and asset groups on their value or name

Filter policies by engine type or threat domain

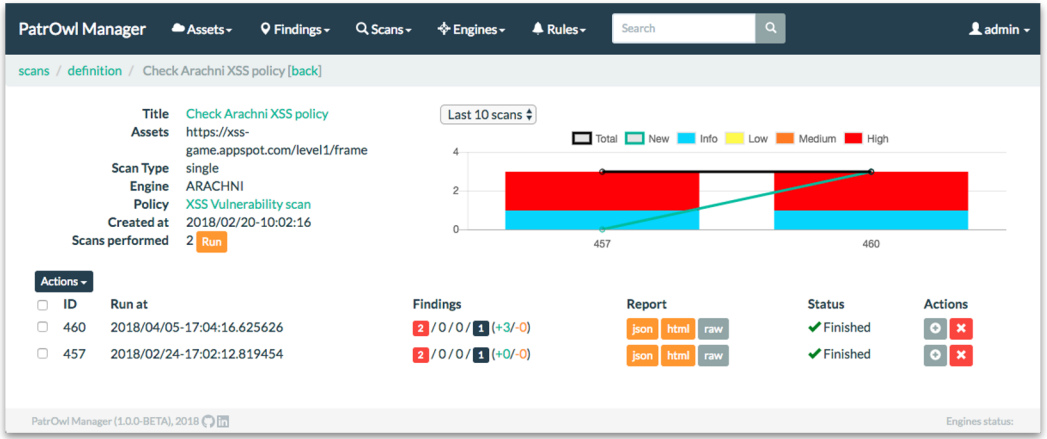
Select engine

- If no engine is selected, an engine is randomly chosen in available engines for each scan



PatrOwl Manager - Scan definition view

- Related scan results overview
  - ID, starting datetime, finding counters by severities, status
- Quick run button
- Quick scan report (HTML or JSON), delete or show details

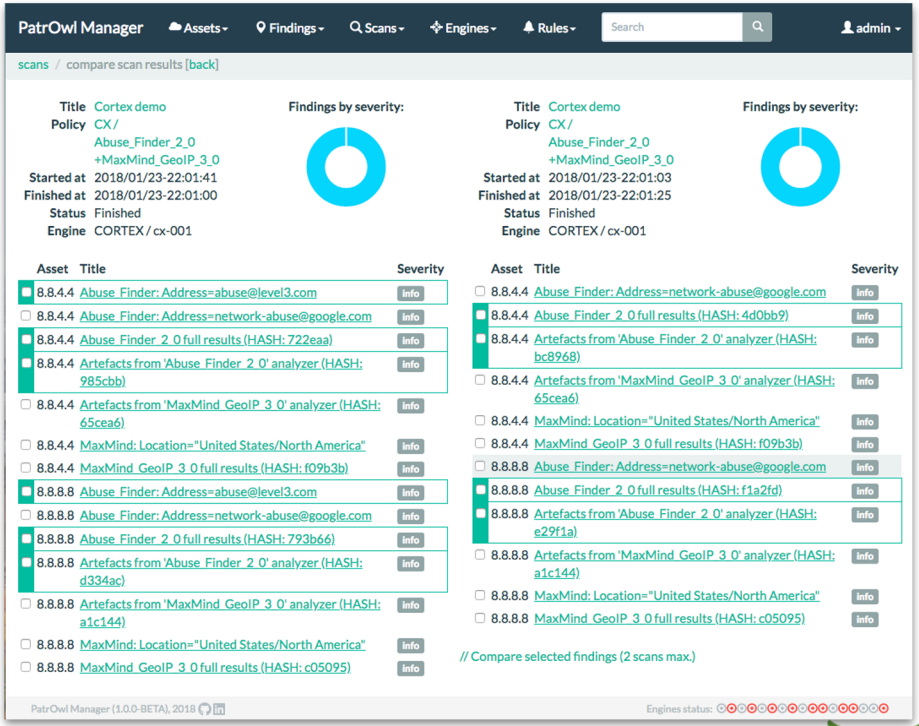


PatrOwl Manager - Scan compare view

Highlighting differences:

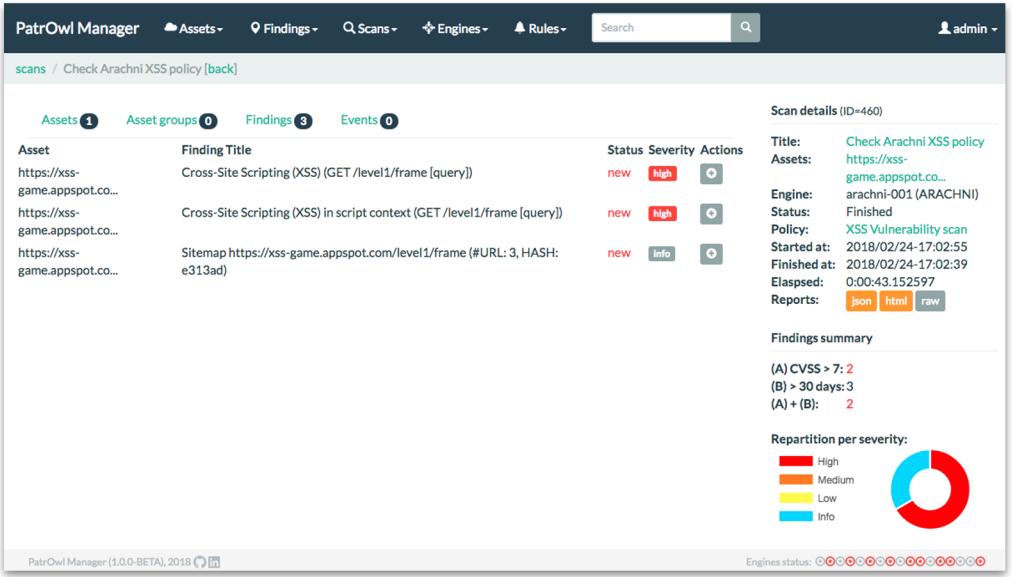
- new and missing findings
- same finding type but different details

Link to the findings comparison view



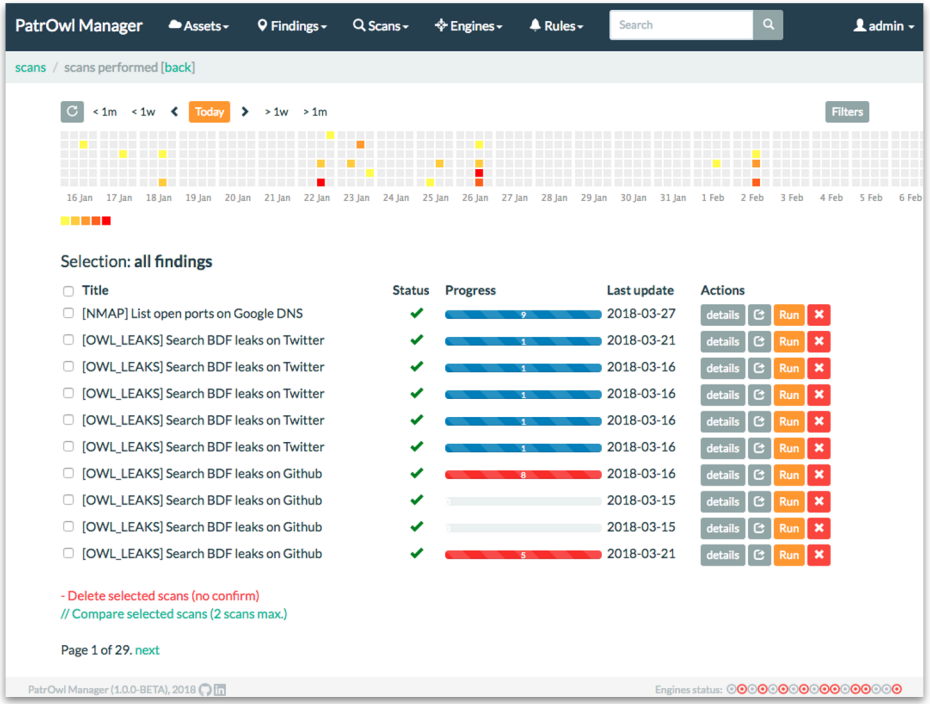
PatrOwl Manager - Scan results view

- Scans info: title, assets, status, policy, start/end dates
- Findings list + show details link
- Quick scan report (HTML or JSON)
- Findings summary on metrics
- Asset and asset group overview
- List of related events



PatrOwl Manager - Scan performed view

- Scans heatmap over days, weeks and months
- Advanced filters
- Run or delete scans
- Show scan details
- Compare selected scans



PatrOwl Manager - Finding view

Finding info

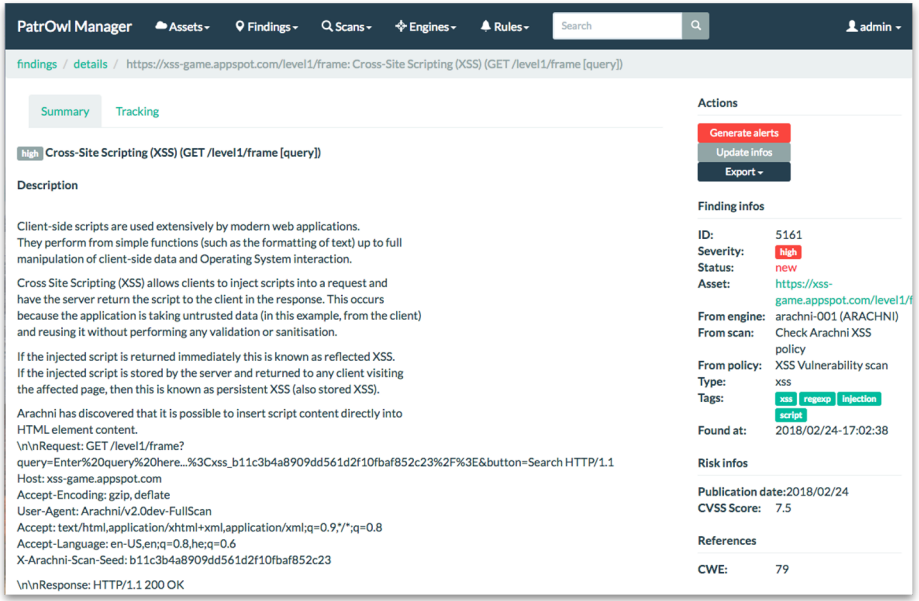
Description, solution, links and hash

Quick actions:

- Generate alerts
- Change metadata: severity, status, tags, CVSS
- Export to file (JSON or STIX2 format)

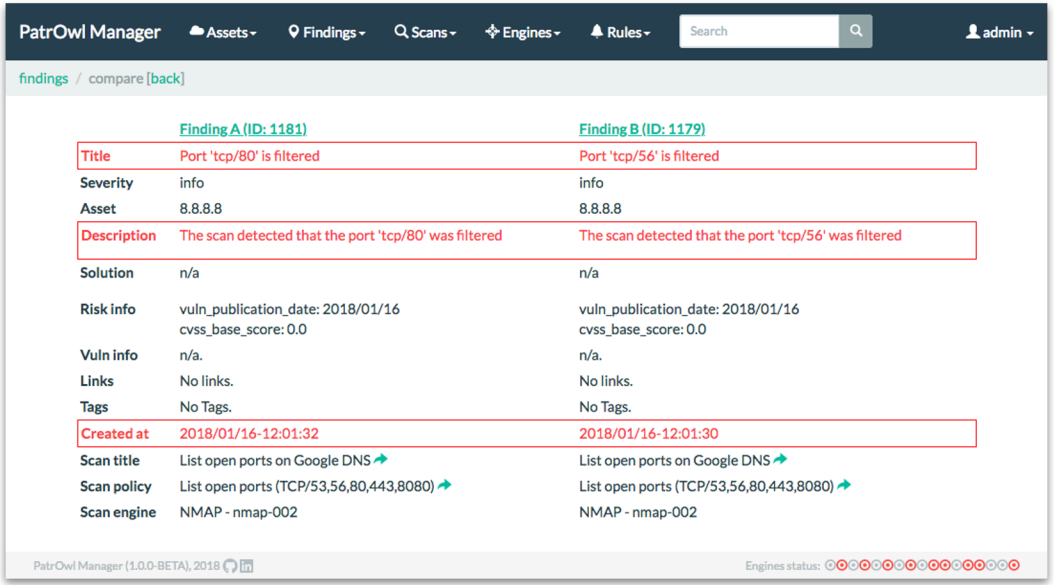
Show tracking info

- Changes history
- Matching scans



PatrOwl Manager - Finding compare view

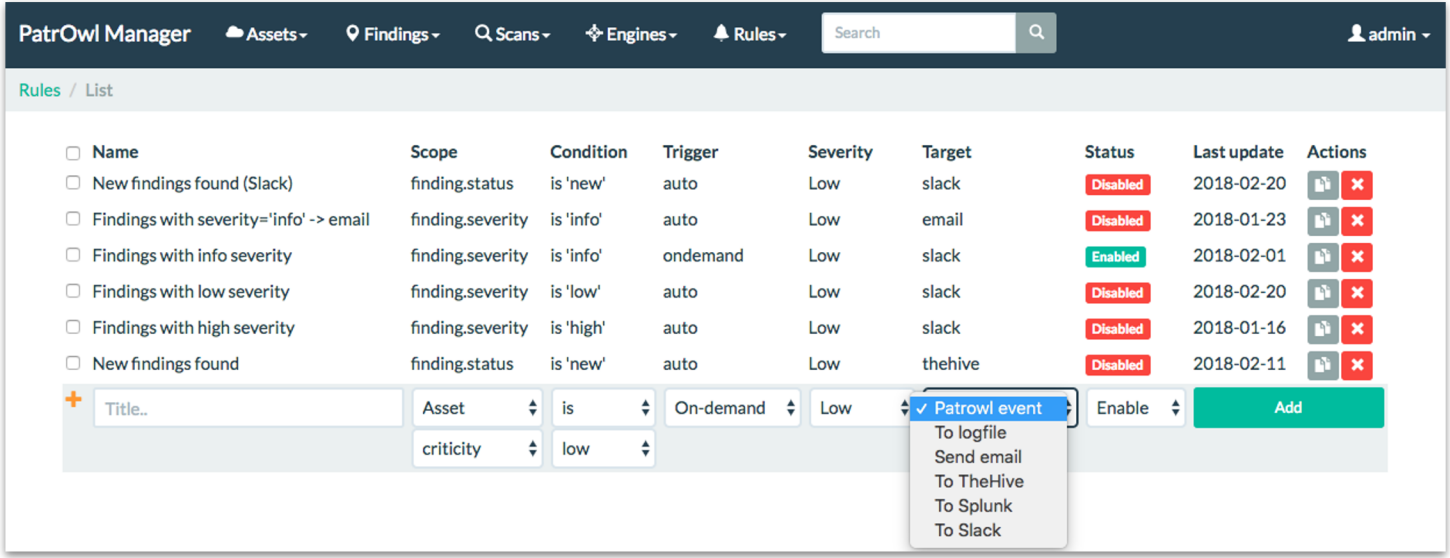
Highlighting differences between findings



PatrOwl Manager - Alerting rules management view

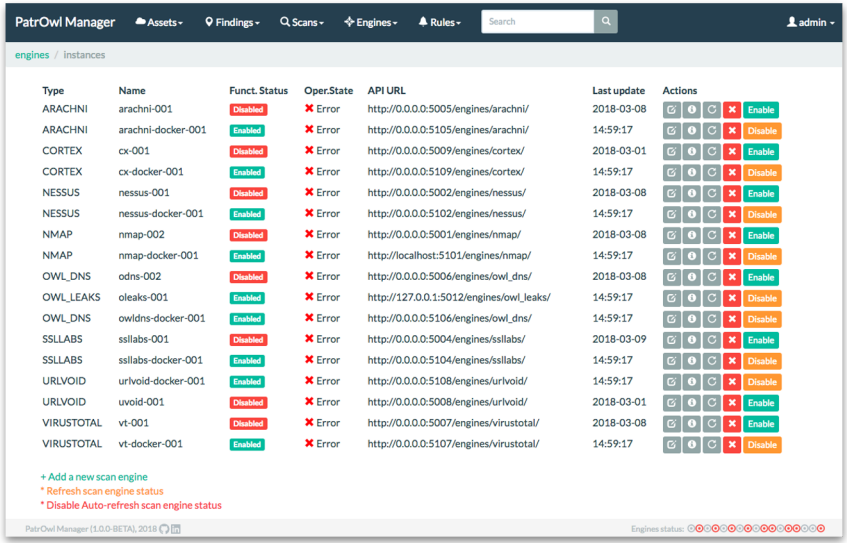
Create, copy, modify or delete alerting rules

Change functional status



PatrOwl Manager - Engine management view

Create, modify or delete engines
Change functional state
View engine info, including current scans performed
Refresh engines states
Enable/Disable the auto-refresh

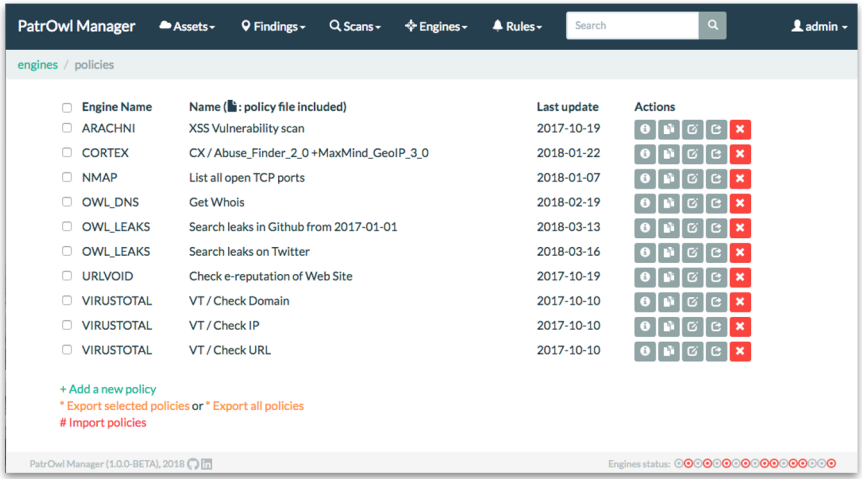


Engines states are regularly updated and always shown in the footer:

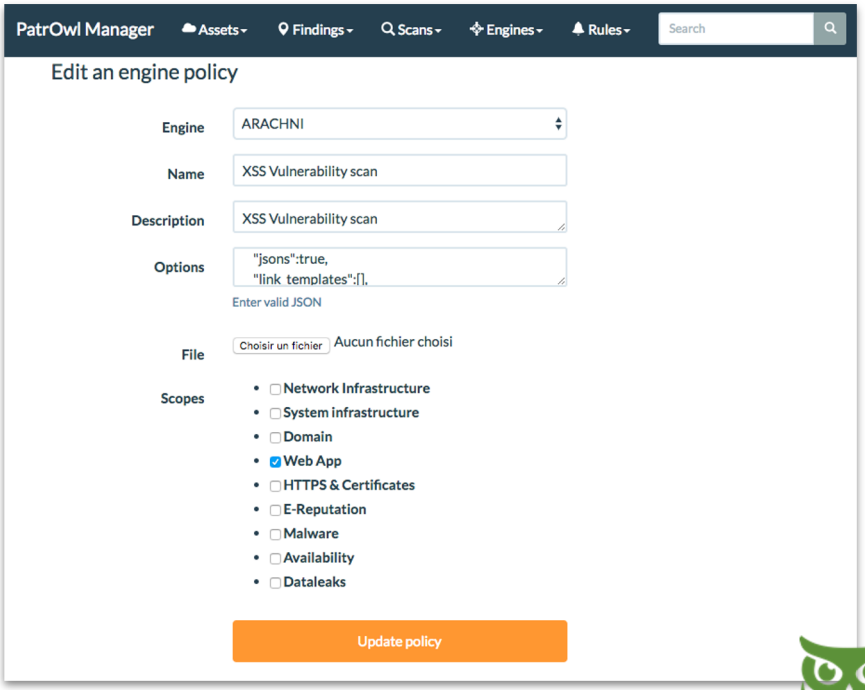
PatrOwl Manager - Engine policy views

Create, copy, modify or delete engine policies

Quick policy info retrieving



Engine policy details:



Contribution needed !!

Who's up for:

- **Test it** and give us **feedbacks !**
- **Contribute !**
  - New engines
  - Debug
  - Features ??

- **Joining the core team ?**
  - Dev[Sec]Ops, Security engineer, Cloud Architect, UX/UI Designer, QA Tester, Wonder-Woman (Batman is tolerated too) ...

Q&A

We have questions !?!

We want a demo !?!

Stop talking bro ! We want a break now !?!

Contacts

More details ? Meet us ? Contributing ? Want a demo ? Want an awesome sticker ? Share a beer ? Requesting an online demo account (BETA test) ?

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GitHub: @Patrowl (Star and fork us !)