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Data backup system with integrated active protection against ransomware

vSafe Agent development

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Malware Attack Loop

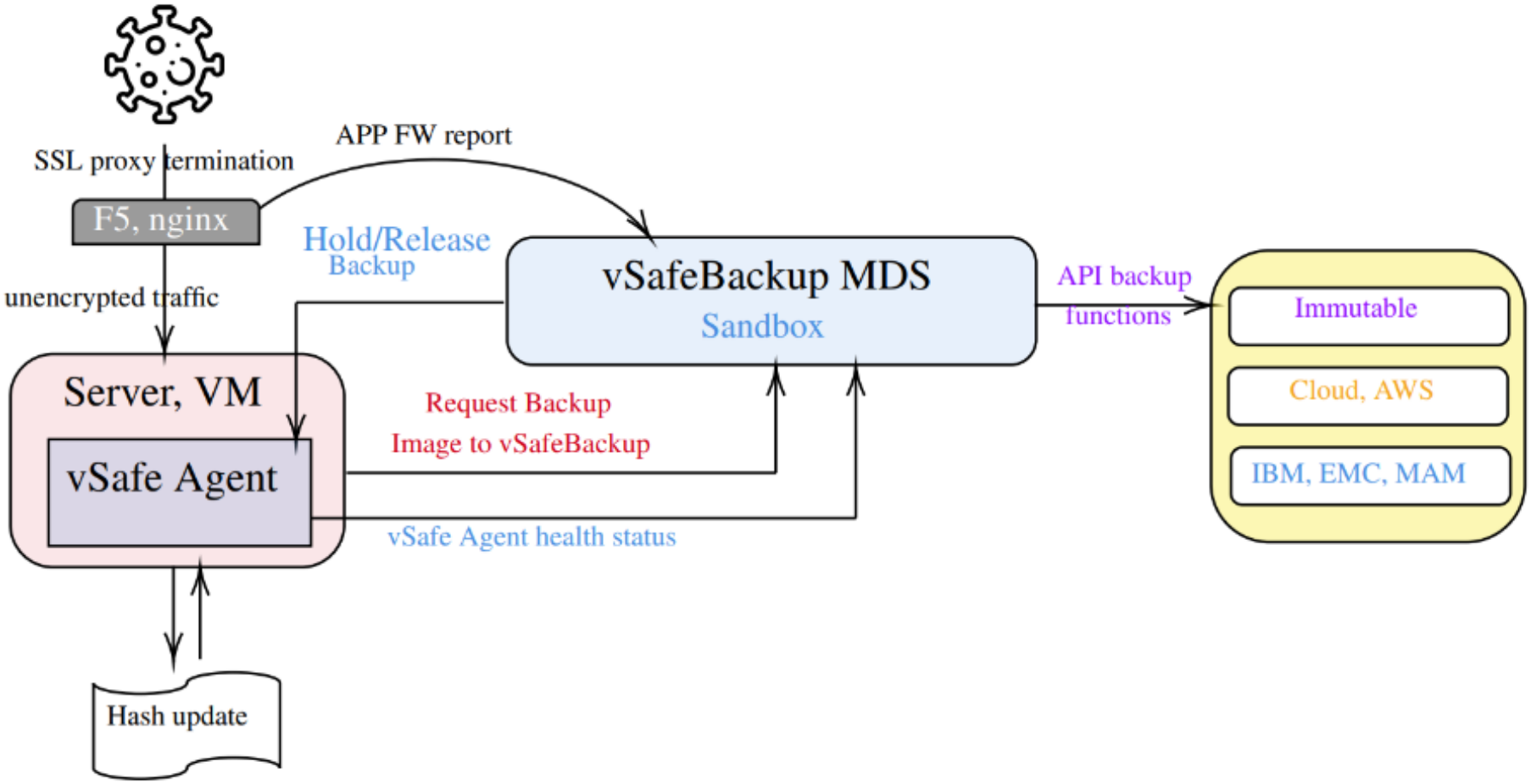
- Robust backup system → protection against ransomware attack
  - Backup diversification
  - Backup testing
- Robust backup system is not a bulletproof solution
- What if the backup is already infected with “sleeping malware”?
  - Malware can infect the system and then “sleep” for several weeks or months before detonating
  - Recovered copy is already infected and full recovery might not be possible at all
  - This technique is commonly used also to avoid dynamic inspection

vSafe Project

- Cooperation with Agora plus a.s. company
- Goal – create “intelligent” and complex system to detect ransomware in backups and avoid attack loops
- Leverages machine learning (Faiss) and hash analysis

- Similar projects:
  - Kaspersky Security for Virtualization

Solution Overview



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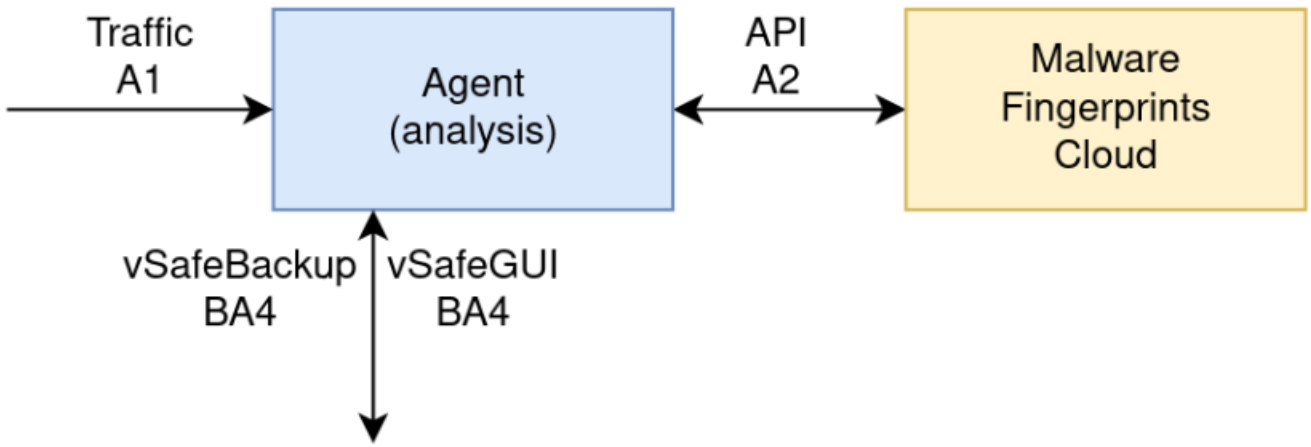
vSafe Agent High Level Solution

- The agent stands on the edge of the VM and monitors network traffic in real time
- Analysis of the traffic (meta)data
- The main responsibility of an agent is to extract interesting metadata in real time and look for suspicious patterns



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Agent vs. Agentless Solution

- Agentless solution
  - Original idea
  - Agent was supposed to be implemented as a VMware plugin
  - No need to install additional SW on the VM
  - Problems with network traffic monitoring in the VMware environment
  - Vendor specific solution

- Agent solution
  - Currently being implemented (C++ language)
  - An additional SW must be installed and run on the VM
  - Security concerns
  - Performance concerns

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Agent Components

JA3

- JA3 → lightweight method to quickly detect malicious communication based on TLS handshake
- JA3s → for the server-side communication
- vSafe Agent performs real-time JA3 computation and compares it against the DB of known JA3 signatures
- Faiss model is used to quickly determine exact match of the fingerprint

C2 Communication

- Monitoring of **outgoing** traffic
- Two phases
  - Learning phase – building local DB of whitelisted IPs and processes that initiates the communication
  - Monitoring phase
- Looking for suspicious communication with potential C2 servers
- Looking for unknown processes initiating the outgoing communication

Data Scanner

- Compare hashes of incoming data against known malicious samples
- Lightweight AV solution
- OPSWAT
- CIRCL.lu
- VirusTotal


```
{
 "md5": "6A5C19D9FFE8804586E8F4C0DFCC66DE",
 "sha1":
"016CD548A5BA78015F85E2591BF6189658ACA066",
 "sha256":
"BE41E36233DD8DB2B28A109E7FC7C409E1353BF2D1710
158BBE267280E163353",
 "scan_result_history": [
  {
   "total_detected_avs": 15,
   "total_avs": 37,
   "scan_all_result_i": 1,
   "start_time": "2019-02-26T21:53:32.770Z",
   "data_id":
"ZTE3MDgyMkh5UmZGTl94cV9aUzFsSWU3aGtVNA"
  },
  {
   "total_detected_avs": 15,
   "total_avs": 37,
   "scan_all_result_i": 1,
   "start_time": "2019-02-25T23:05:26.628Z",
   "data_id":
"ZTE3MDgyMkh5UmZGTl94cV9aQnlPR2RaUFJIRQ"
  },
  {
   "total_detected_avs": 15,
   "total_avs": 37,
   "scan_all_result_i": 1,
   "start_time": "2019-02-24T09:10:11.792Z",
   "data_id":
"ZTE3MDgyMkh5UmZGTl94cV9aSHlneFNneHphQlY"
  }
 ]
}
```

Suricata/Static Analyzer

- Add Suricata module and scan incoming traffic with static rules
- Freely available Suricata rulesets
- Possibility to detect
  - Known malware C2 communication patterns
  - CVE exploits
  - Exploit scans
  - etc.
- Potential performance issues

Next Steps

- Implementation of JA3 arbiter is already finished
- Implementation of the rest of vSafe Agent components
- Integration with the rest of the vSafe project
- Performance tests
- Quality tests on infected machines

Thank you for your attention

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