ORACLE

Remote Attestation Procedure Daemon(RATSd)

Evidence Collector

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Agenda

- Motivation
- System Design
- RATS conceptual message collection Daemon (RATSd)
- Type of evidence and leaf attesters
- Configfs-TSM
- Evidence Formats
- Current Status
- Challenges

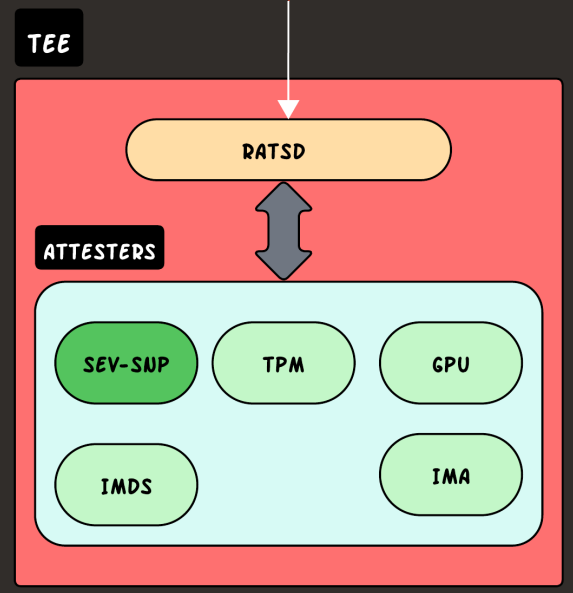
Motivation

- **System Composition:** Systems often include multiple attesters
- **Hardware Root of Trust (RoT):**
  - Remote Attestation requires it
  - Manufacturers provide HW modules acting as RoTs
- **Multiple manufacturers:**
  - Systems use compute hardware from various manufacturers, each with its own RoT
  - Each RoT addresses different parts of the Trusted Computing Base (TCB)
- **Evidence Collection:** Need a mechanism to collect evidence from all attesters
- **Compatibility:** Tool must adhere to data formats in the RATS architecture for integration with existing tools
- **Gap in existing tools:** No existing tools met these requirements, leading to the development of RATSd
- **Multi-Verifier:** https://datatracker.ietf.org/doc/draft-deshpande-rats-multi-verifier/

System Design

In: Nonce
Out: Attestation Token (EAT)

Relying Party



In: Attestation Token (EAT)
Out: Attestation Result (EAR)

Verifier (Veraison Services)

RATS conceptual message collection Daemon (RATSd)

- Provides the combination of evidence from each leaf attester for a system
- Implements leaf attesters as plugins
- Provides uniformed APIs to retrieve an attestation token
- Plugin Verification
  - For now, ratsd core (lead attester) and composite attester are assumed to be distributed by a trusted package registry
- Complex queries
  - Relying Party can pick what goes into the token
  - Plugin-specific query parameters

Leaf Attesters

- TSM (Trusted Secure Module) Report
  - Should work for both SEV-SNP and TDX
  - Attestation Report from the Secure Processor (OutBlob)
  - X509 Certificates (Auxblob)
- TPM
  - Requires SVSM
  - A TPM quote from TPM2 Tools returns PCR values with a signature
- GPU / TPU
- Integrity Measurement Architecture (IMA)

ConfigFS TSM

- Vendors have proprietary attestation report formats
  - SEV-SNP introduced the chardev, accessible via ioctl()
- Configfs is a filesystem-based manager of kernel objects, or config_items
  - Adopted as the cross-vendor mechanism to retrieve CoCo attestation report start v6.7
- Usage

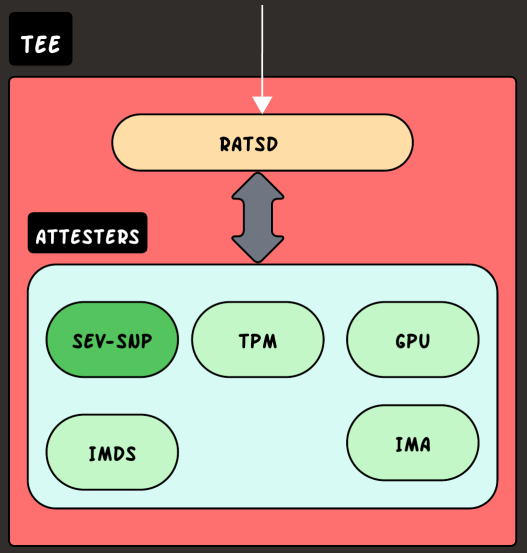
Tsm-report

- OutBlob
  - Binary Attestation report
  - Generated based on inblob
- Auxblob
  - Optional auxiliary data
  - Cert-table in SEV-SNP
- Service Report
  - Provider info (sev-guest, tdx-guest)
  - Manifest Blob

```
tsm-report = {
  ? auxblob: binary-string
  outblob: binary-string
  provider: tstr
  ? service-report
}

service-report = ((
  manifestblob: binary-string
  service_provider: tstr
) // service_provider: tstr)

binary-string = base64url-string .feature "json" /
bstr .feature "cbor"

base64url-string = tstr .b64u bstr
```

Evidence Formats

- Conceptual Message Wrapper (CMW) collection
- EAT envelope
- Registered TSM report media-type with IANA: "application/vnd.veraison.tsm-report+cbor"
- RATSd: https://github.com/veraison/ratsd



CMW collection

```
{
    "__cmwc_t": "application/
vnd.oracle.VMStandardE5Flex",
    "sevsnp": [
        {
            "type": "application/vnd.veraison.tsm-
report+cbor",
            "value": "<< tsm-report >>"
        }
    ],
    "tpm": [
        {
            "type": "application/vnd.tcg.tpm",
            "value": "<< TPMS_ATTEST >>"
        }
    ]
}
```

IANA recognizes "application/vnd.veraison.configfs-tsm+json".

Yet to register "application/vnd.oracle.VMStandardE5Flex" & "application/vnd.tcg.tpm

RATSD Response

```
[root@nsh-x10m-1 ~]# curl -X POST http://localhost:8895/ratsd/chares -H
"Content-type: application/vnd.veraison.chares+json" -d '{"nonce":
"TUlEQk5IMjhpaW9pc2pQeXh4eHh4eHh4eHh4eHhNSURCTkgyOGlpb2lzalB5eHh4eHh4eHh4
eHh4eHh4eA"}'
{"cmw":"eyJfX2Ntd2NfdCI6InRhZzpnaXRodWIuY29tLDIwMjU6dmVyYWlzb24vcmF0c2QvY213I
iwibW9jay10c20iOlsiYXBwbGljYXRpb24vdm5kLnZlcmFpc29uLmNvbmZpZ2ZzLXRzbStqc29uIi
wiZXlKaGRYaGliRzlpSWpvaVdWaFdORmx0ZUhaWlp5SXNJbTkxZEdKc2IySWlPaUpqU0Vwd1pHMTR
iR1J0Vm5OUGFVRjNRMjFzZFZsdGVIWlphbTluVGtkUk1FOVVVVEJPUkVrd1dsUlJORTE2U1hwUFJG
azFUbXByTWxwcVdUVk9lazB5V1ZSVmQwNTZhek5QUkdNMFRucG5NMDlFWXpST2VtY3pUMFJqTkU1N
lp6TlBSR00wVG5wbk0wOUVZelJPZW1jelQwUlNhMDVFYXpCT1JGRjVUa2RWTUU5RVRYbE5lbWN5VD
FSWk5VNXRXVEpQVkdONlRtMUZNVTFFWXpWT2VtY3pUMFJqTkU1Nlp6TlBSR00wVG5wbk0wOUVZelJ
PZW1jelQwUmpORTU2WnpOUFJHTTBUbnBuSWl3aWNISnZkbWxrWlhJaU9pSm1ZV3RsWEc0aWZRIl19
","eat_nonce":"TUlEQk5IMjhpaW9pc2pQeXh4eHh4eHh4eHh4eHhNSURCTkgyOGlpb2lzal
B5eHh4eHh4eHh4eHh4eA","eat_profile":"tag:github.com,2024:veraison/ratsd"}
```

Sample CMW Collection


```
{"__cmwc_t":"tag:github.com,2025:veraison/ratsd/cmw","tsm":
["application/vnd.veraison.configfs-
tsm+json","eyJhdXhibG9iIjoiWVhWNFlteHZZZyIsIm91dGJsb2IiOiJjSEpwZG14bGR
tVnNPaUF3Q21sdVlteHZZam9nTkdRME9UUTBOREkwWlRRNE16SXpPRFk1TmprMlpqWTVOe
k0yWVRVd056azNPRGM0TnpnM09EYzROemczT0RjNE56ZzNPRGM0TnpnM09EYzROemczT0R
Sa05EazBORFF5TkdVME9ETXlNemcyT1RZNU5tWTJPVGN6Tm1FMU1EYzVOemczT0RjNE56Z
zNPRGM0TnpnM09EYzROemczT0RjNE56ZzNPRGM0TnpnIiwicHJvdmlkZXIiOiJmYWtlXG4
ifQ"]}
```

Current upstream status of Ratsd

- ✓Lead attester / Ratsd Core
- ✓Configfs TSM leaf-attester
- ✓Leaf-attester query options
- ✓Leaf-attester selections
- ✓Cryptographically-verified leaf-attester
- ❑More leaf attesters (TPM quotes, IMA, etc.)
- ❑Signed CMW collection

Sample CMW Collection


```
{"__cmwc_t":"tag:github.com,2025:veraison/ratsd/cmw","tsm":
["application/vnd.veraison.configfs-
tsm+json","eyJhdXhibG9iIjoiWVhWNFlteHZZZyIsIm91dGJsb2IiOiJjSEpwZG14bGR
tVnNPaUF3Q21sdVlteHZZam9nTkdRME9UUTBOREkwWlRRNE16SXpPRFk1TmprMlpqWTVOe
k0yWVRVd056azNPRGM0TnpnM09EYzROemczT0RjNE56ZzNPRGM0TnpnM09EYzROemczT0R
Sa05EazBORFF5TkdVME9ETXlNemcyT1RZNU5tWTJPVGN6Tm1FMU1EYzVOemczT0RjNE56Z
zNPRGM0TnpnM09EYzROemczT0RjNE56ZzNPRGM0TnpnIiwicHJvdmlkZXIiOiJmYWtlXG4
ifQ"]}
```

Challenges

- Establishing trust in the lead attester
- Interaction between Veraison service and Veraison RATSd
  - The upstream Veraison service does not handle composite evidence
- Workload attestation
  - Current implementation of RATSd supports only single-VM
- CSR to obtain signing key

References

- Veraison main repo
  - https://github.com/veraison
- RATSd Repo
  - https://github.com/veraison/ratsd
- Veraison-service (Verifier)
  - https://github.com/veraison/services
  - SEV-SNP: https://github.com/veraison/corim/pull/167
- Driving upstream discussion
  - https://docs.google.com/document/d/1YfAatMWj6D1xxYncw4Kh64Mc3wbDNG5W0J8yjZ_QtjA/edit?tab=t.0

Thank you