Tools Security Roadmap

As of June 11, 2021

Revisions

- None

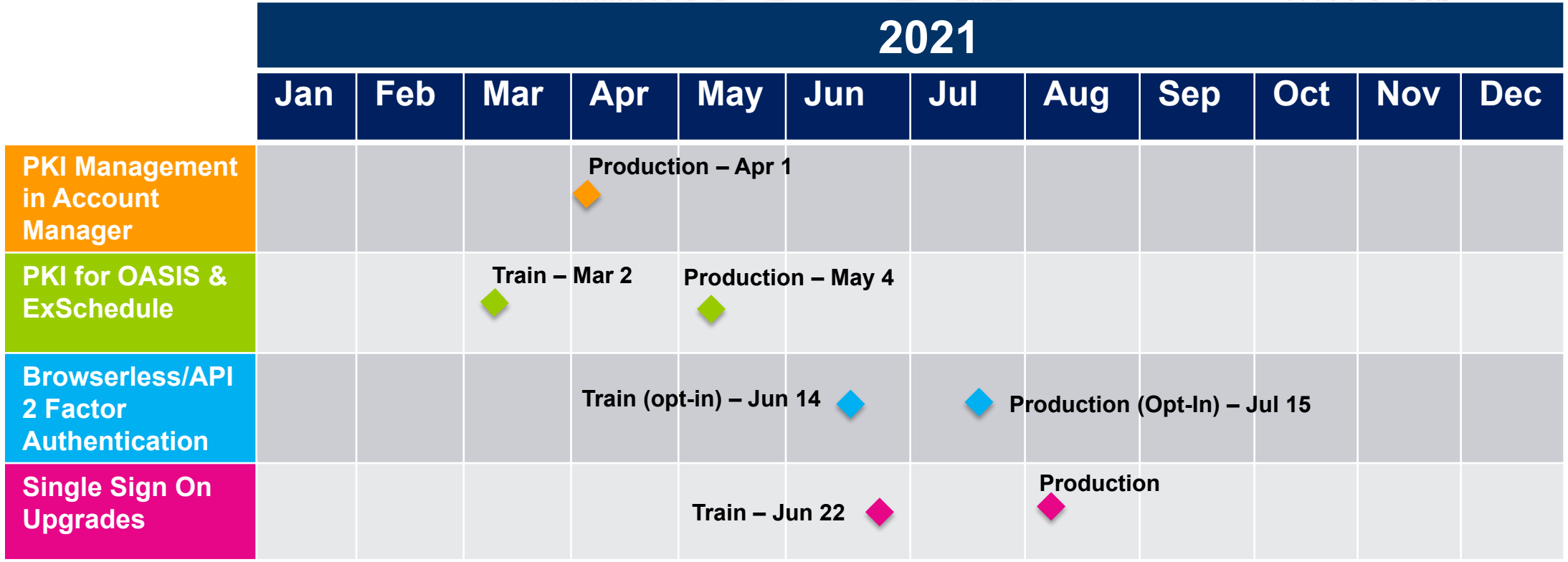
Impact Details

Product - Action Required	Dates	Who May Be Affected
Browser-less/API 2 Factor Authentication (opt-in) • Obtain valid PKI certificates from approved Certificate Authorities • Rewrite Browserless/API authentication code • Use PJM provided command line interface (CLI) • Make sure 2-Way SSL Connections, Client Certificates & Connection Renegotiation are enabled at Firewall & Security devices for outgoing PJM SSO traffic	**June 14** **4 p.m. to 7 p.m.** **(Train)** **July 15** **4 p.m. to 7 p.m.** **(Production)**	• Browser-less users of Markets Gateway, InSchedule, Power Meter, FTR Center, Capacity Exchange, DR Hub

Impact Details

Product - Action Required	Dates	Who May Be Affected
Single Sign on (SSO) System upgrade - Train • Any code parsing SSO Authentication response based on length will need to change. Use JSON parser or other methods	**June 22** **4 p.m. to 7 p.m.** **(Train)**	• Any browserless code that depends on knowing the length of the token will need to change

2021 Tools Security Roadmap



Legend

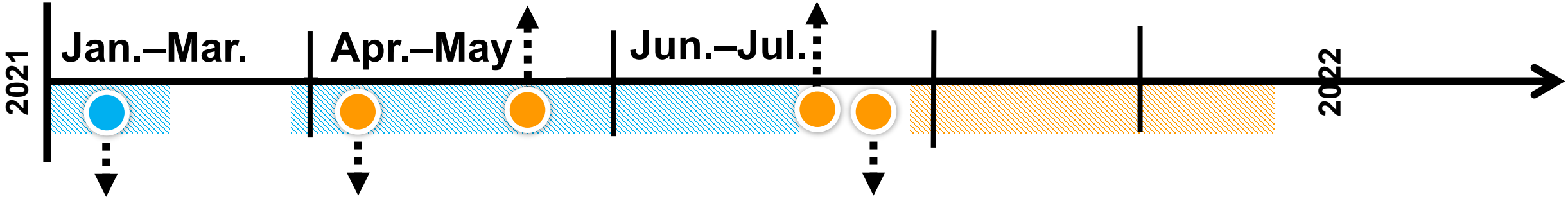
- Start Date
- End Date

* PKI Timeline

Jan. – Mar.
PKI Mandatory to Power Meter, Markets Gateway, InSchedule, FTR Center, DR Hub Capacity Exchange, MSRS

Jun. – Jul.
PKI opt-in to Power Meter, Markets Gateway, InSchedule, FTR Center, DR Hub Capacity Exchange

May 4
ExSchedule and OASIS Production Implementation



Mar. 2
ExSchedule and OASIS Train Implementation

Apr. 1
PKI Certificate link feature in Account Manager

Q3
PKI Opt-in to MSRS

FAQ Document

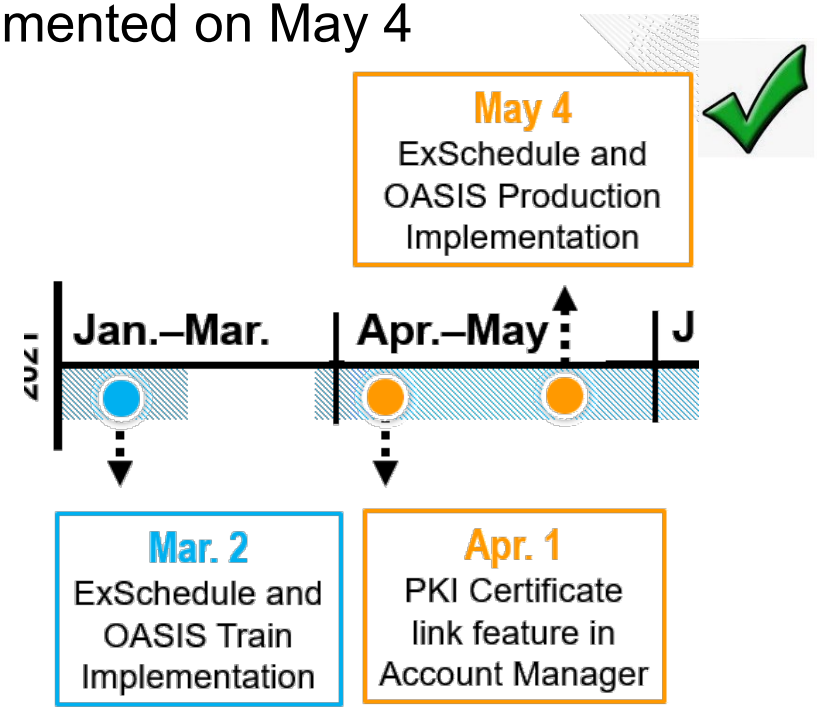
PKI Guide

* PJM accepting certificates only from NAESB Approved Authorities

Lessons Learned from May PKI Implementation

- Certificate(s) must be installed on all machines used to access the tools
- User must select the correct certificate from browser pop-up
  - Ensure a match with what is uploaded to Account Manager
  - If an incorrect certificate is selected, the user must close all browser windows before retrying
- Browserless code must be updated on all servers/machines used to access the tools
- Step-by-step review of PKI Guide will help in smoother implementation

ExSchedule and OASIS successfully implemented on May 4



Browserless API Two-Factor Authentication

SSO Upgrades

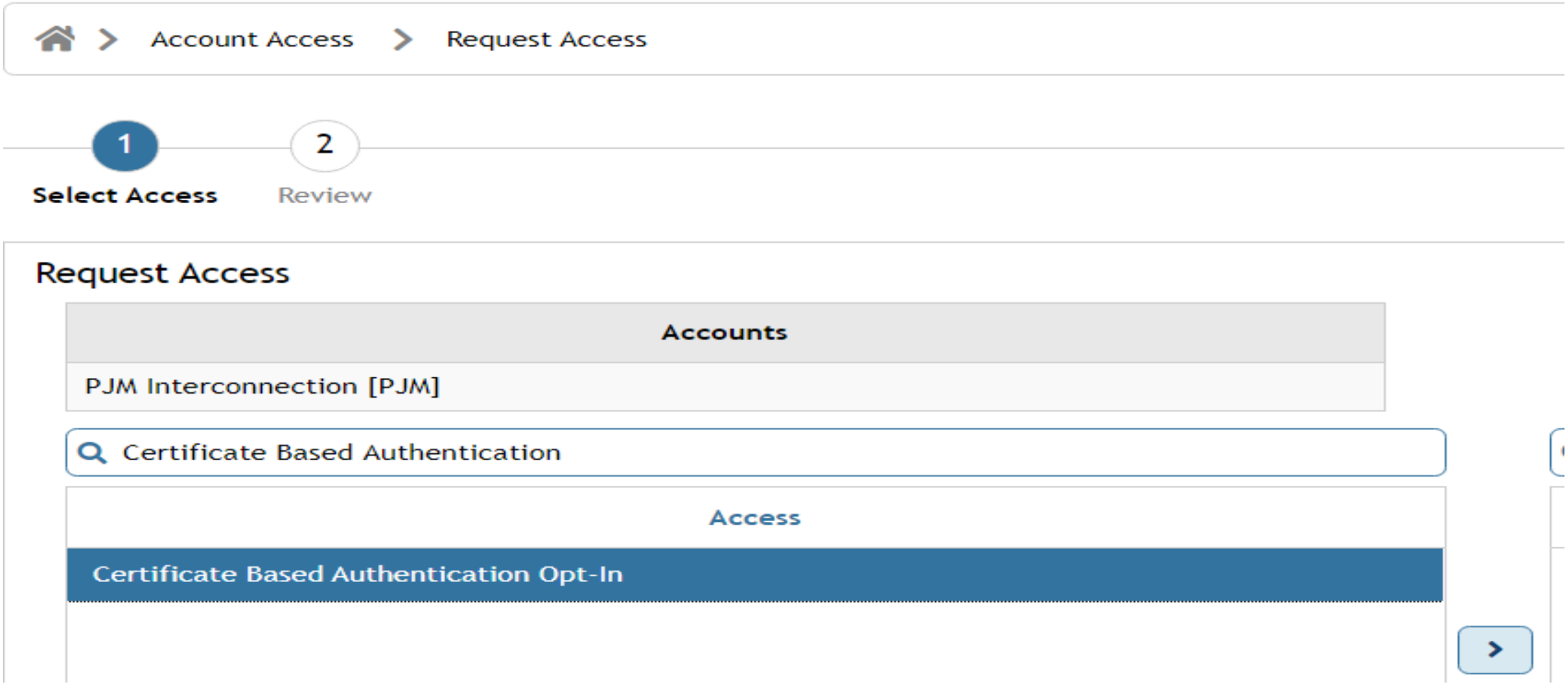
Background – Browserless API Two-Factor Authentication

- Leverage PKI solution
- Scope
  - Included: All PJM Tools that are part of Single Sign On and have Browserless APIs
  - Excluded: ExSchedule and OASIS
- Implemented In phases Optional then Mandatory
- Users can opt-in from Account Manager by requesting access to “Certificate Based Authentication Opt-In” role during the opt-in period
- For any reason users want to opt-out, they can work with their CAM to terminate access to the “Certificate Based Authentication Opt-In” role.

Browserless API Two-Factor Authentication Opt-in

- Once opted in, the user is required to provide a valid PKI certificate for
  - Markets Gateway
  - InSchedule
  - Power Meter
  - FTR Center
  - Capacity Exchange
  - DR Hub
- When:
  - Train – June 14
  - Production – July 15
- MSRS opt-in will be implemented in Q3 2021
- The mandatory cut-over will take place in Q1 2022

Opting in to PKI for Browserless



SSO Upgrades

- Single Sign On (SSO) System upgrades
  - When:
    - Train: June 22
    - Production: August TBD
- Impacts
  - SSO Token length is changing with upgrade and not going to be a fixed value
  - Any code parsing SSO Authentication response based on length will need to change. Use JSON parser or other methods

{"tokenId":"yRQ9EqYG_1XpUXYE2C3yFDPPE9A.*AAJTSQAtDIAlNLABw2Y0N0ZjerZUh3OGY4M2JjV29wc3BueWZweE09AAJTMQACMDc.*","successUrl":"/access/console","realm":"/"}

Contact

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Tool Security Changes

Member Hotline

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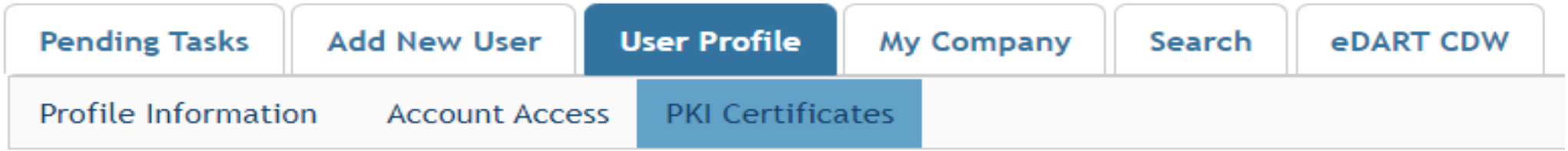
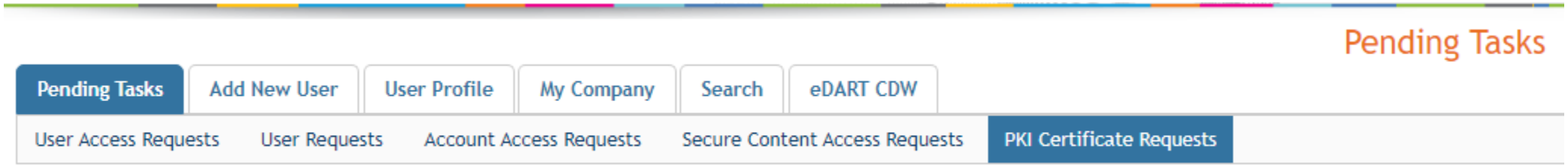
Appendix

- Uploading Certificate
  - The User can upload the certificate or the CAM can associate certificates with user account from Account Manager PKI Tab



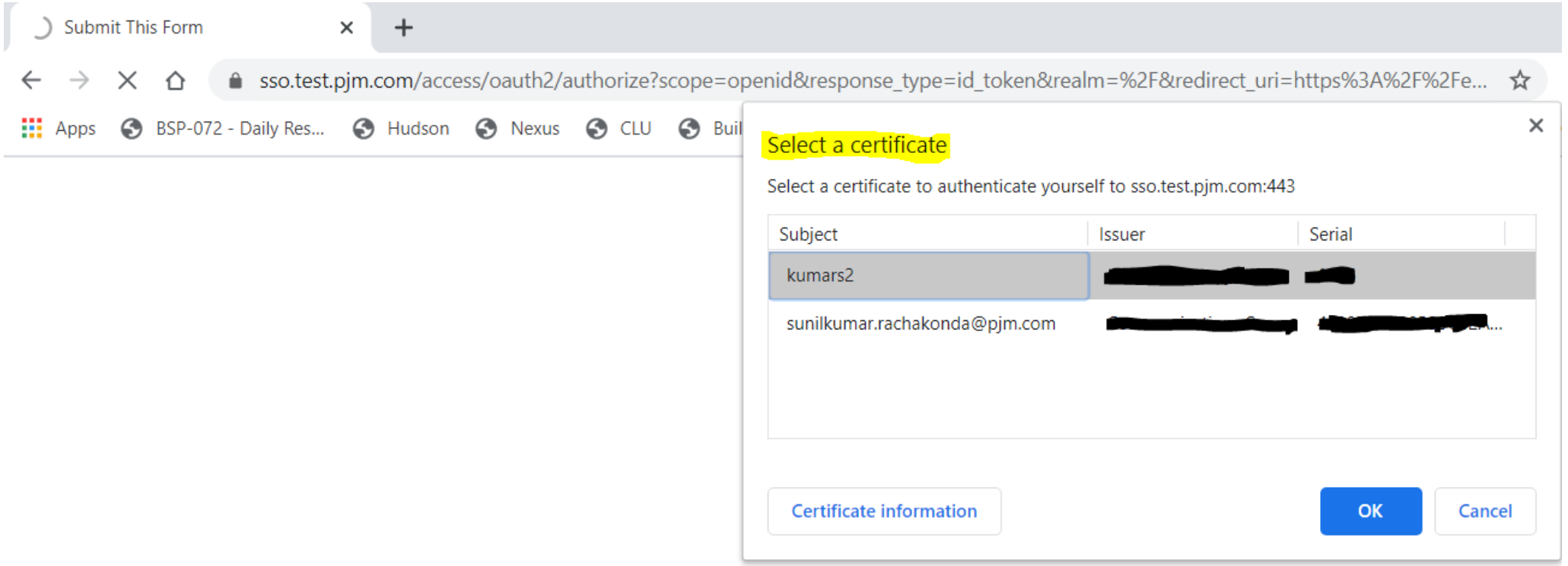
  - The CAM has to approve the certificate after the user upload



  - The user must Install the certificate in user's browser if logging into the UI

ExSchedule and OASIS

- Using certificate
  - On login to ExSchedule/OASIS the user will be prompted for a certificate



Browserless/API Changes

- Changes to Authentication process
- Associate certificates with user account from accountmanager PKI Tab
- Authenticate against ‘sso.pjm.com/access/authenticate/pjmauthcert’ with 2 way ssl connection (mutual authentication) to get a SSO token-id
- Call to Application REST API still same, pass token-id as header

Authentication:

```
curl --request POST --key testcert.key.pem --cert ‘testcert.crt:<privatekeypassword>' --header "X-
OpenAM-Username: <sso_username>" --header 'X-OpenAM-Password: <sso_password>'
'https://sso.pjm.com/access/authenticate/pjmauthcert‘
```

```
{"tokenId":“<tokenid>","successUrl":"/access/console","realm":"/"}
```

Application REST API

```
curl --request GET --header "Cookie: pjmauth=<tokenid>
‘https://exschedule.pjm.com/exschedule/rest/secure/download/xml/schedules’
```

PJM Command Line Interface (CLI)

- New version 1.5.0
- Java version 8 Patch 165 or higher is required
- Available at https://pjm.com/-/media/etools/pjm-command-line-interface-java-8.ashx?la=en
- No changes to usage of Application CLI commands
- A new property (below) was added to setenv.cmd file

```
set CERTIFICATE=-r ".pfx/.p12 file_location|privatekeypassword"
```

Browserless/API Changes

- Java Sample
  - https://www.pjm.com/-/media/etools/security/pki-certificate-authentication-java-code-sample.ashx?la=en
- .Net Sample
  - https://www.pjm.com/-/media/etools/security/pki-certificate-authentication-net-code-sample.ashx?la=en

Reference Documents

- FAQs for PKI Certificates and Two-Step Verification Browserless/API: https://www.pjm.com/-/media/etools/security/pki-faqs.ashx?la=en

- PKI-Based Authentication Guide: https://www.pjm.com/-/media/etools/security/pki-authentication-guide.ashx?la=en

- Exporting public keys from pfx/p12 : https://www.pjm.com/-/media/etools/security/pki-export-public-keys.ashx?la=en