Sustainable Self-Inspection Initiatives for improving Information Security at KEK

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Insight through Accelerators.
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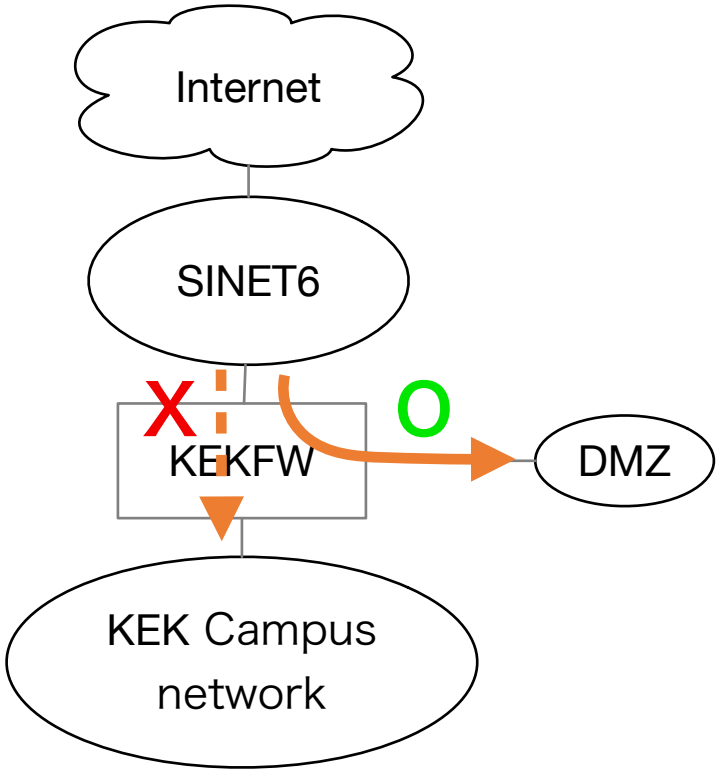
Public servers at KEK

- Public servers at KEK are deployed in DMZ

  (~300 servers, ~80 admins)
- Those server administrators are supposed to keep their server secure
- **Annual self-inspection campaign for DMZ servers** is one of organizational efforts to increase security
- Submitted reports are to be checked at a dedicated committee



DMZ User's Portal (Past system)

- A system to make a vulnerability scanner (nCircle IP360) easier to handle and submit reports
- Contributed to labor savings for server administrators and efficient compilation work
- The system had been operated and improved for 10 years
- Resulted in significant decrease in the number of vulnerabilities detected by the scanner

  ➡ **These efforts seem to be working!**

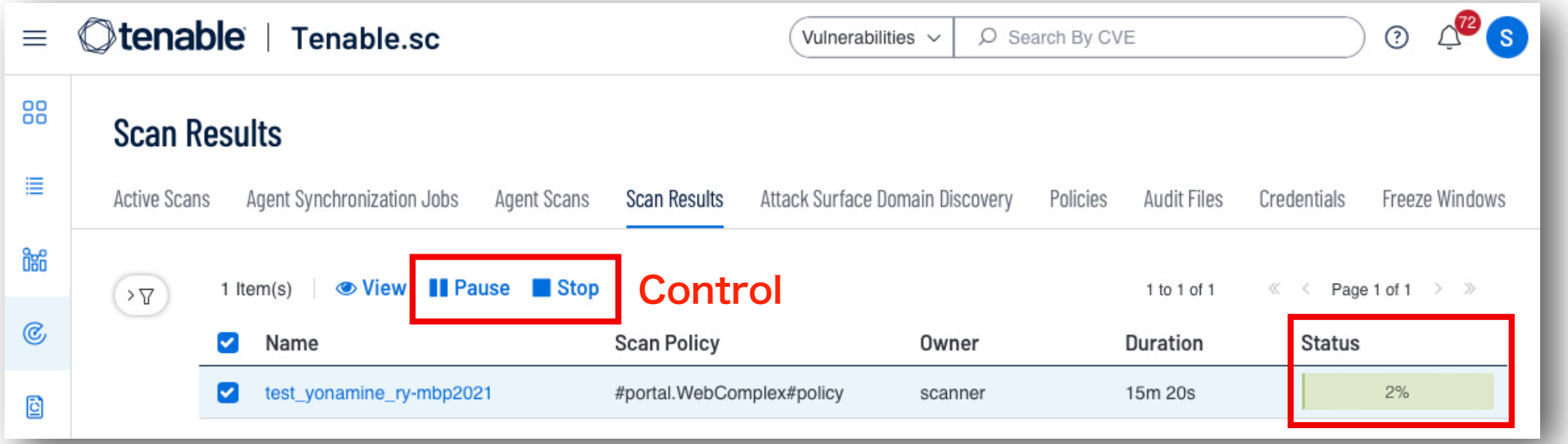
Revising system for self-inspection

- Changes from the time of development
  - Member turnover (The developer had left our team)
  - Vulnerability scanner appliance (nCircleIP360 -> Tenable.sc)
- The Portal became difficult to operate and maintain
- For a few years when the Portal was out of service, we had asked server administrators to fill out a self-inspection form in an Excel file and submit them

Key Roles of DMZ User's Portal

1) Vulnerability scanner Appliance User Interface

➡ Appliance UI itself became more user-friendly



➡ Wrapper is no longer required

Key Roles of DMZ User's Portal

2) Automatic email notification of detected vulnerabilities

➡ Already migrated to a new notification system

3) Self-inspection system

➡ Self-inspection using Excel files makes analysis and compilation very inefficient

➡All information to be filled in by server admins themselves

➡Unavoidable typos on host name or IP make matching against DB difficult

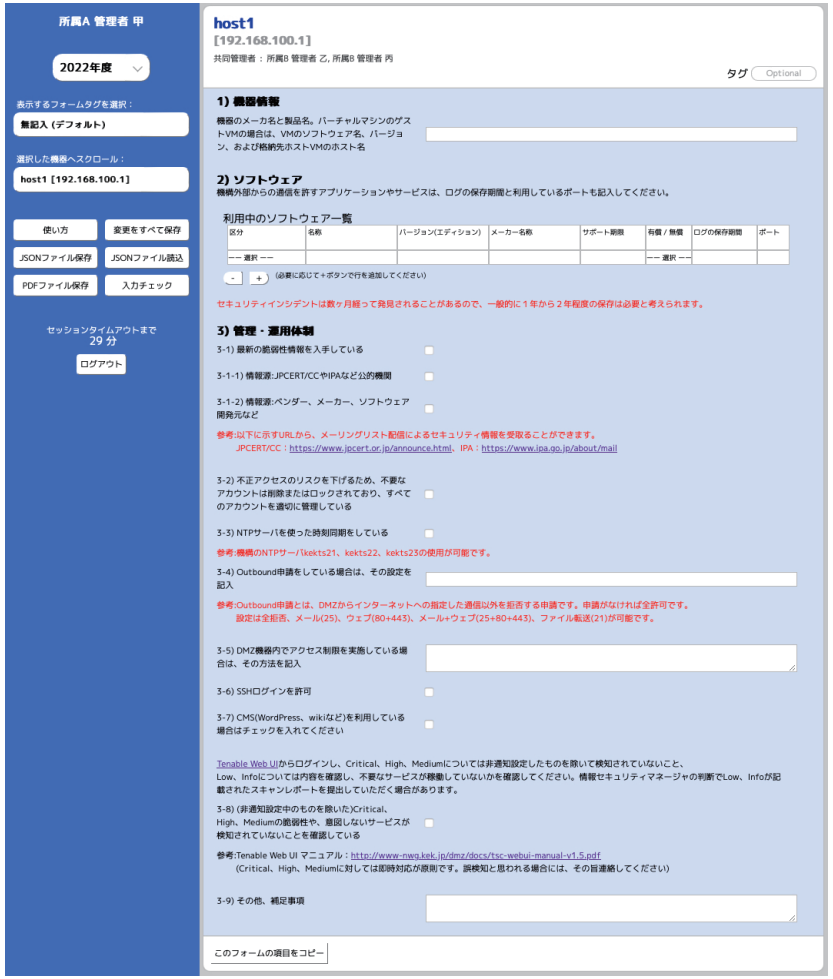
➡Need a sustainable way

Ideas for New System

- Maintainability is the key
  - Provide 3 functionalities of the Portal in separate systems that are loosely coupled with databases.
  - Web API and popular web frameworks make life easier
    - Node.js, Express as a backend of the web application
    - React as a frontend of the web application
  - Avoid depending on a specific member only

React

System Behaviors



- Forms related to login user appear
- A form per server
- Host name and IP are automatically set
- Co-admins automatically listed
- Filled data is visible to other co-admins
- Forms can be grouped by “tag” names
- Filled data is copiable to other forms
- Jump to a specific form
- Blank check for mandatory questions
- Compilation into PDF or JSON format

Control Panel

Form Display Area (Horizontally scrollable)

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Issue on Auto-Notification

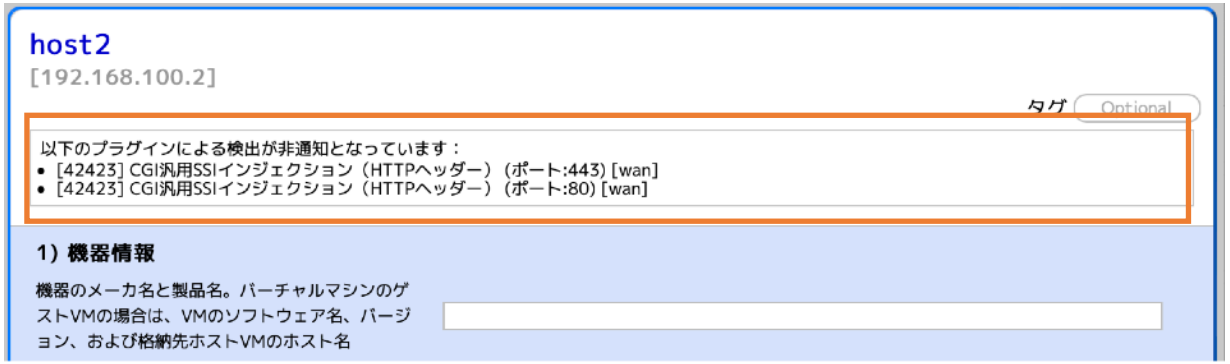
- When our security scanners find possible vulnerabilities in servers, the corresponding admins are notified by email, which is implemented in another system.
- Some alarms are false positive
- Some alarms are true positive but there is no way to take measures due to some operational reasons.
- We filter such auto-notification at the request of admins.

Drawback to Filtering Notification

- Once notifications get filtered, they become practically invisible
- Server admins easily forget they have asked to do so while the situation may change over time

➡

- List of filtering comes up in the self-inspection form if any
- Server admins are requested to explicitly their intent to keep the filtering if such a list appears.

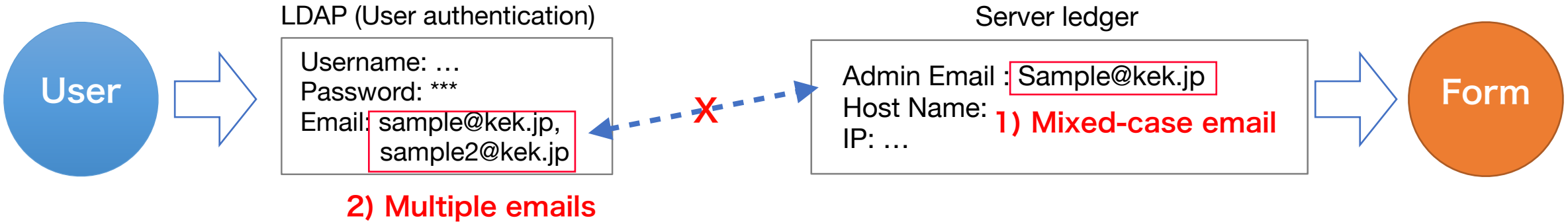


Problems discovered during campaign

- The system worked smoothly except for a few specific cases
- Forms not displayed to certain users, because of:

  1) Mixed-case registration of email addresses

  2) Multiple email addresses registered without priority



  3) A relatively new method in Javascript : “structuredClone”, which is incompatible with browsers older than ~ 2 years

Remaining issues

- The current situation is the same as that of the past system, which is highly dependent on a single developer.
- Now that we have completed the operational phase and have implemented the minimum necessary functions
- Maintenance and operation are ready to be outsourced

A Trial for Automatic Classification

- The self-inspection requires server admins to list up softwares installed, with classifying into several categories.
- “Others” category often used even when it is not optimal.
- Automatic classification can be easily implemented with Chat-GPT API, and it works nicely than I expected it would!

An example prompt to get GPT’s answers in a format:

```
① “Answer in one-word together with the reason.
② Add '@' between answer and reason.
③ Classify ${input} into the following software types: OS, SSH-server, mail-server, …
④ Answer as 'Others' only when none of the above options is appropriate.
⑤ Take earlier option if multiple options are possible.”
```

Summary

- An initiative to improve efficiency and operational stability of self-inspection system for KEK public servers is presented
- Past system for self-inspection campaign highly depend on
  - a specific scanner appliance
  - a single system developer
- New system successfully got through the campaign last year
  - Some improvements on UX
  - But, still highly dependent on a single system developer
- Plan: Outsource maintenance and management of the system