STAMP-based Approach to Codifying the Lessons-learned from a Massive Leak of Personal Information from Japan Pension Service

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Outline

- Introduction
- Incident
- Incident Reports
- Discussion
- Concluding remarks

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Introduction

Objective:

- Demonstrate the effectiveness of STAMP as a more powerful alternative to conventional approaches in
  - explaining a security breach case, and
  - codifying lessons-learned

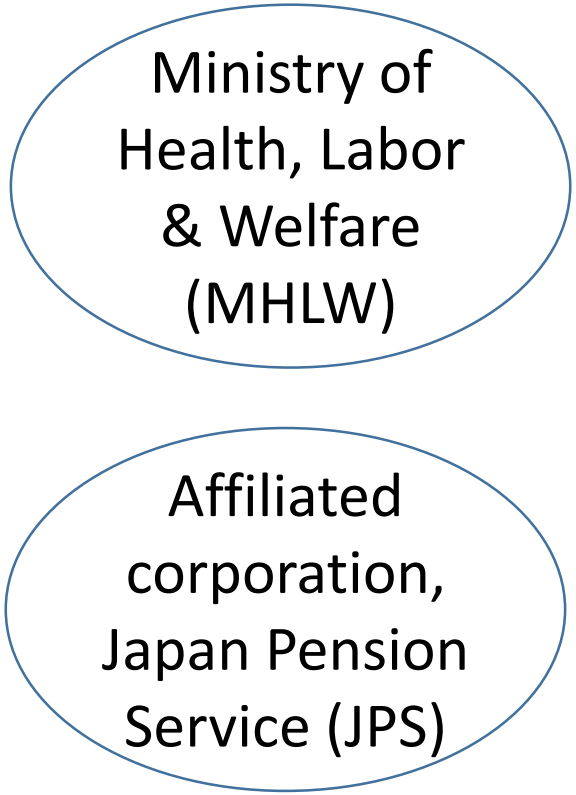
Method:

- Translate three different versions of incident report from different agents in a natural language into STAMP modeling notation.

(This Not CAST)

Incident overview

- In May 2015, the Japan Pension Service (JPS) was cracked.
- 124 malicious emails were sent since 8th May. Five staffs opened and 31 PCs were infected.
- It resulted in a massive leak of personal info. of 1.25 million enrollees, from 21th to 23th May.
- This prompted the revision of a new cyber-security strategy of the Japanese government.



Part of an extensive operation?

- Money was not the objective? The information stolen is not enough for financial attack.
  - 4-tuple: name, postal address, date of birth, and pension number. (52 thousands)
  - 3-tuple: name, date of birth, and pension number. (1.17 M)
  - 2-tuple: name and pension number. (31 thousands)
- Hackers seemed to shift their targets from the government to its peripherals
  - government-affiliated organizations, think tanks, private companies working with the government, and universities.
  - internal information hacked may be used as an inroad to other agencies and organizations.
- A far more serious incident at around the same time
  - The hack of the US Office of Personnel Management, resulted in the theft of data on 22.1 million employees, including millions with security clearance.

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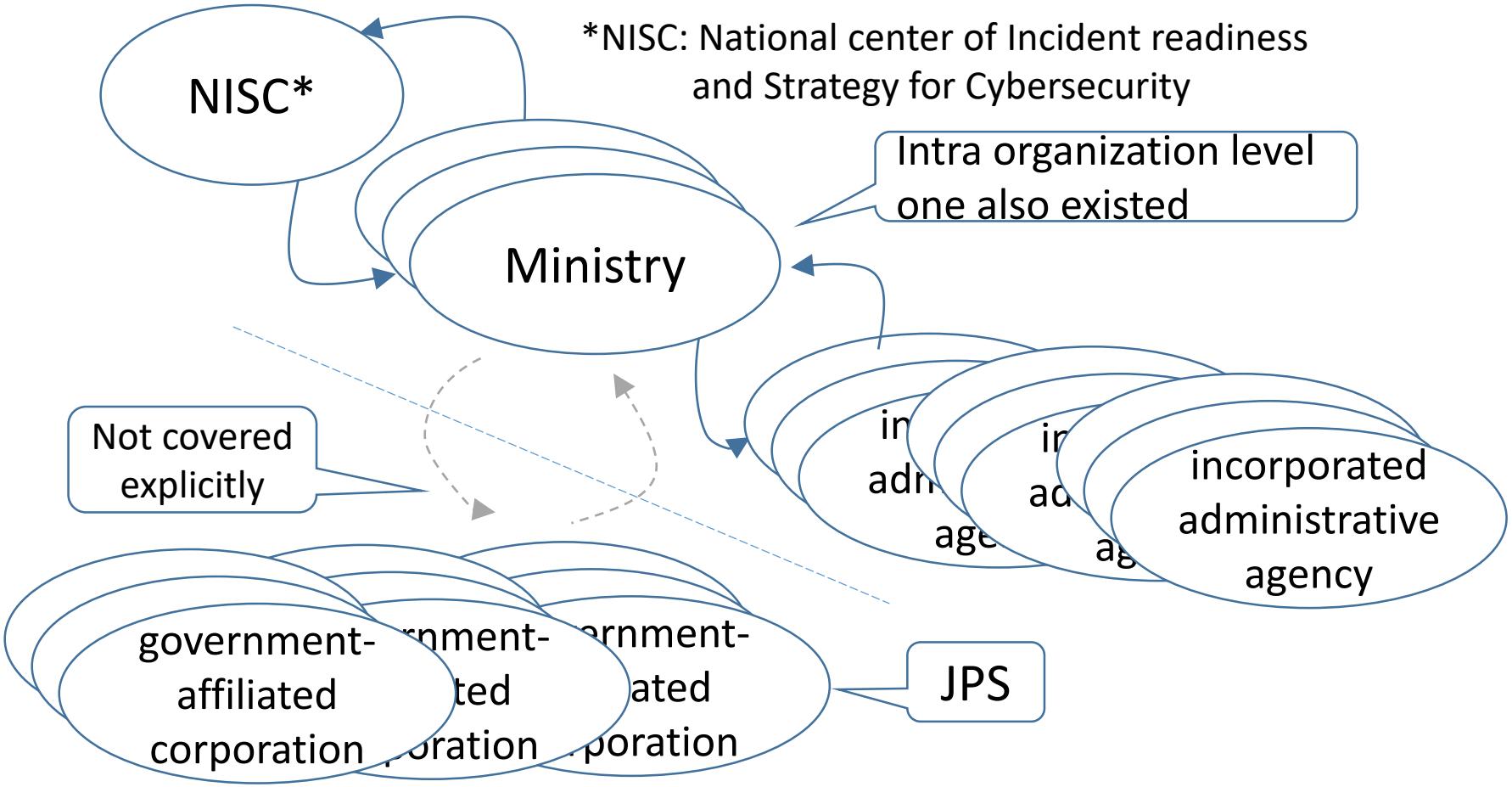
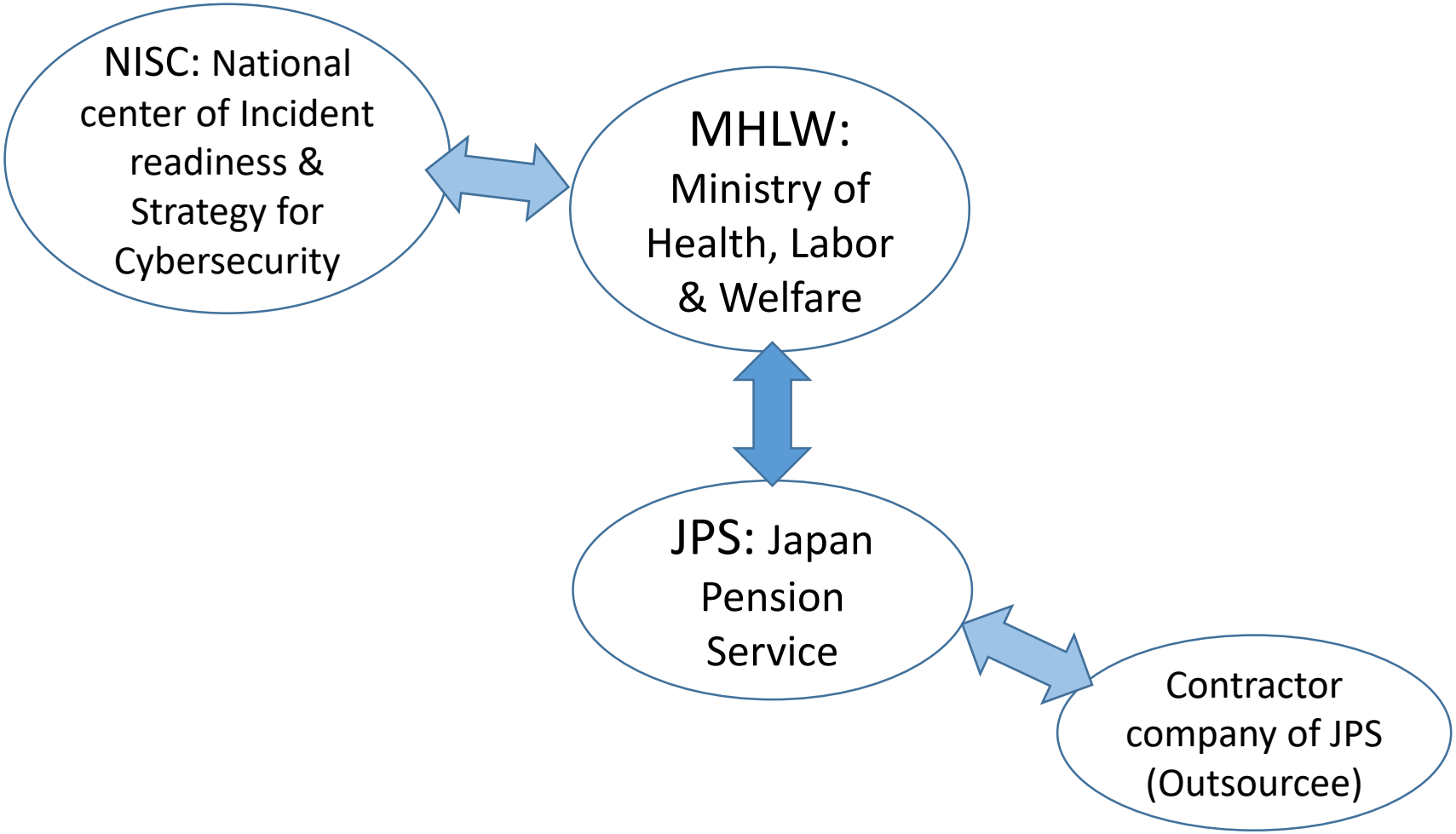
Government guideline existed

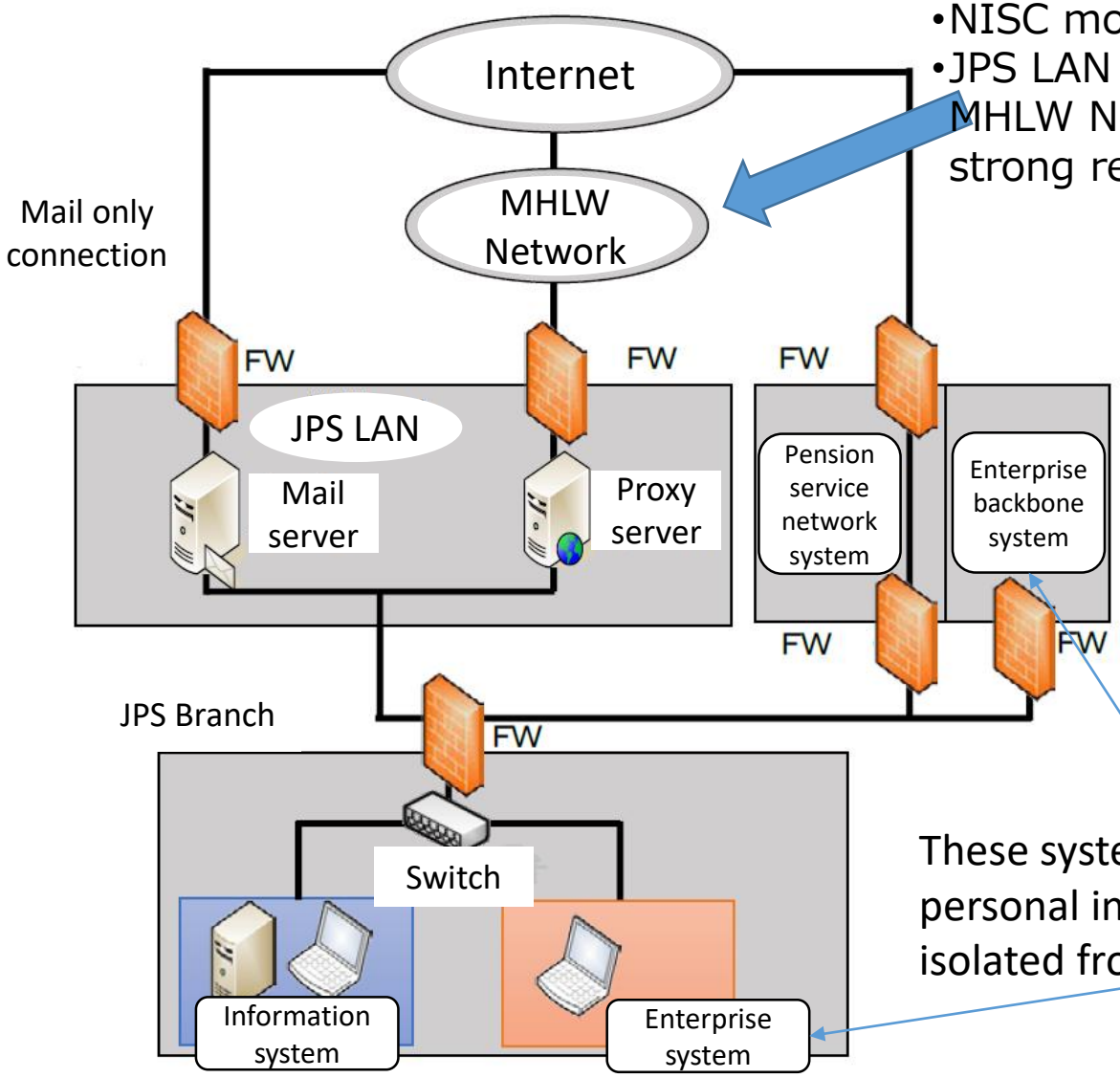
- The government guideline of security management assumed the following organizational interaction structure should work.



Main & Sub Agents(Components)



Network Configuration



- NISC monitors MHLW Net
- JPS LAN is connected to MHLW Network as it has strong relation to MHLW

These systems manage personal information and are isolated from Internet

Event sequence

Date	Attack	JPS	MHLW	NISC
05/08	*Malicious mail1 to public address *Malicious com. in 4 hours	*A staff clicked a link in malicious email. *Specified & disconnected PC *URL block and warn all staffs() *Internal information might be stolen	*Notified JPS only (failed to report to MHLW supervisor)	*Detected suspicious comm. & notified MHLW of it
/15		*Thought “terminated” according to analysis of outsourcee		*Analyzed given malware-1, and notified MHLW of result
/18	*Malicious mail2 /mail3 to private addresses	*3 staffs opened attached file of email and failed to detect infection *Reported to MHLW & filed claim to Police	*No sense of crisis almost no actions	
/19				*Analyzed given malware-2&3, and notified MHLW of result
/20	*Malicious mail4 to public address *C&C server	*A staff opened attached file, PC infected, administrative information started stolen *Not aware of the staff’s behavior.		
/21	*Leakage started	*26 PCs infected in total.	*Notified JPS only	*Analyzed given malware-4, and notified MHLW of result
/22		*Specified & disconnected PC, and closed the branch connection using MHLW net.	*Notified JPS only	*Detected suspicious comm. and notified MHLW of it
/23	*Leakage stopped	*Specified & disconnected PC according to warning of malicious communication from outsourcee. *Closed internet connection of the branch using MHLW network.		
/28		*police told “we find stolen data”		
/29		*Stopped the entire internet connection using MHLW network	*Notified NISC of circumstances	*Raised priority and sent CYMAT to JPS
06/01				*Held high-level meeting and warned to all ministries

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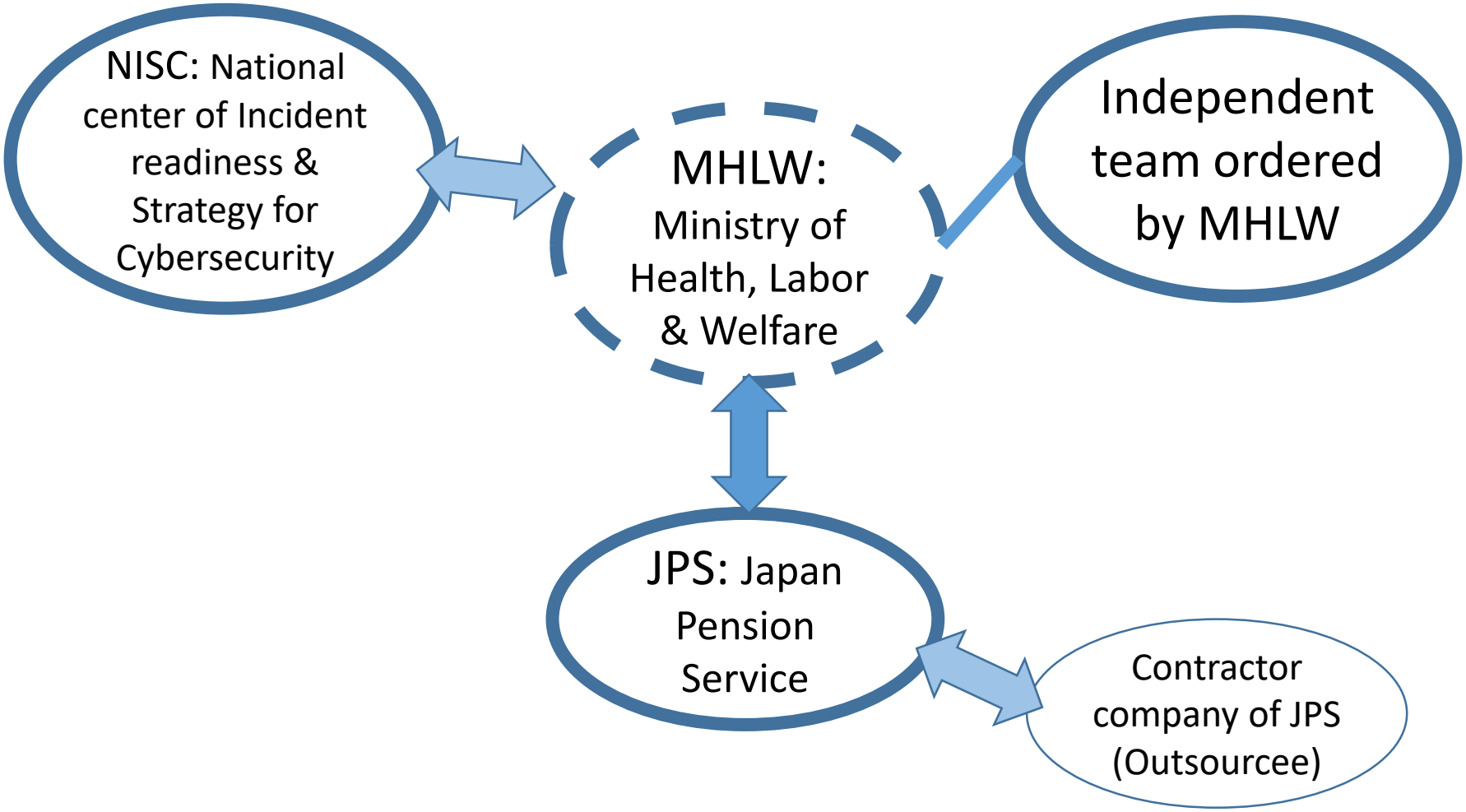
Different versions of report



NISC version

- Committee:
  - Unknown inside NISC.
- Volume:
  - 26-page natural language document including one table and three figures.
- Feature:
  - No specific conclusions.
  - Mainly explaining technical facts and corresponding actions of NISC.
  - Also explaining usage of the government guideline, including suggestions for MHLW and JPS. (implicitly also for all government and affiliated organizations)
  - Including recurrence prevention measures for themselves.

JPS version

- Committee:
  - Five JPS members and one external lawyer.
- Volume:
  - 35-page natural language document plus 9-page appendix including two tables and one figure.
- Feature:
  - Most detailed one regarding JPS actions
    - ✓ For example, actions in the following table.
    - ✓ A little defensive, seeming like an excuse.
  - Recurrence prevention measures include JPS culture
    - ✓Incident management organizational system
    - ✓File server system
    - ✓Security policy
    - ✓Staff education
    - ✓Governance, culture

Actions in JPS/targeted attack email

	Action || event	mail(1)	mail(2) 5/18	mail(3) 5/18_19	mail(4) 5/19	mail(5) 5/20
1	Monitor incoming email	△	○	△	○	○
2	Specify range of mail recipient	X	○	△	○	○
3	Disconnect PC if infected	△	X	X	○	X
4	Block the sender	X	○	△	○	○
5	Notify overall members	△	△	△	△	X
6	Collect infected PC & malware	○	○	△	X	○
7	Order virus analysis	○	△	△	NA	△
8	URL filtering	○	X	X	NA	X
9	Use vaccine	○	○	○	NA	○
10	Disconnect private line for email	X	X	X	X	X

○ - properly taken, △ - slightly late, or partial, X - too late, no action

Actions for suspicious communication

	Action || event	Suspicious communication (1) 5/18	Suspicious communication (2) 5/22	Suspicious communication (3)5/23
1	Monitor communication	○	○	○
2	Specify and disconnect infected PC	○	○	△
3	Analyze infection route	○	○	△
4	Analyze infected range using log	○	○	○
5	URL filtering	○	△	○
6	Enhance communication monitoring	○	○	○
7	Collect PC with malware	○	○	○
8	Order virus analysis	○	○	○
9	Use vaccine	○	○	○
10	Disconnect private line for email	X	○	○
11	Disconnect all lines for internet	X	X	X

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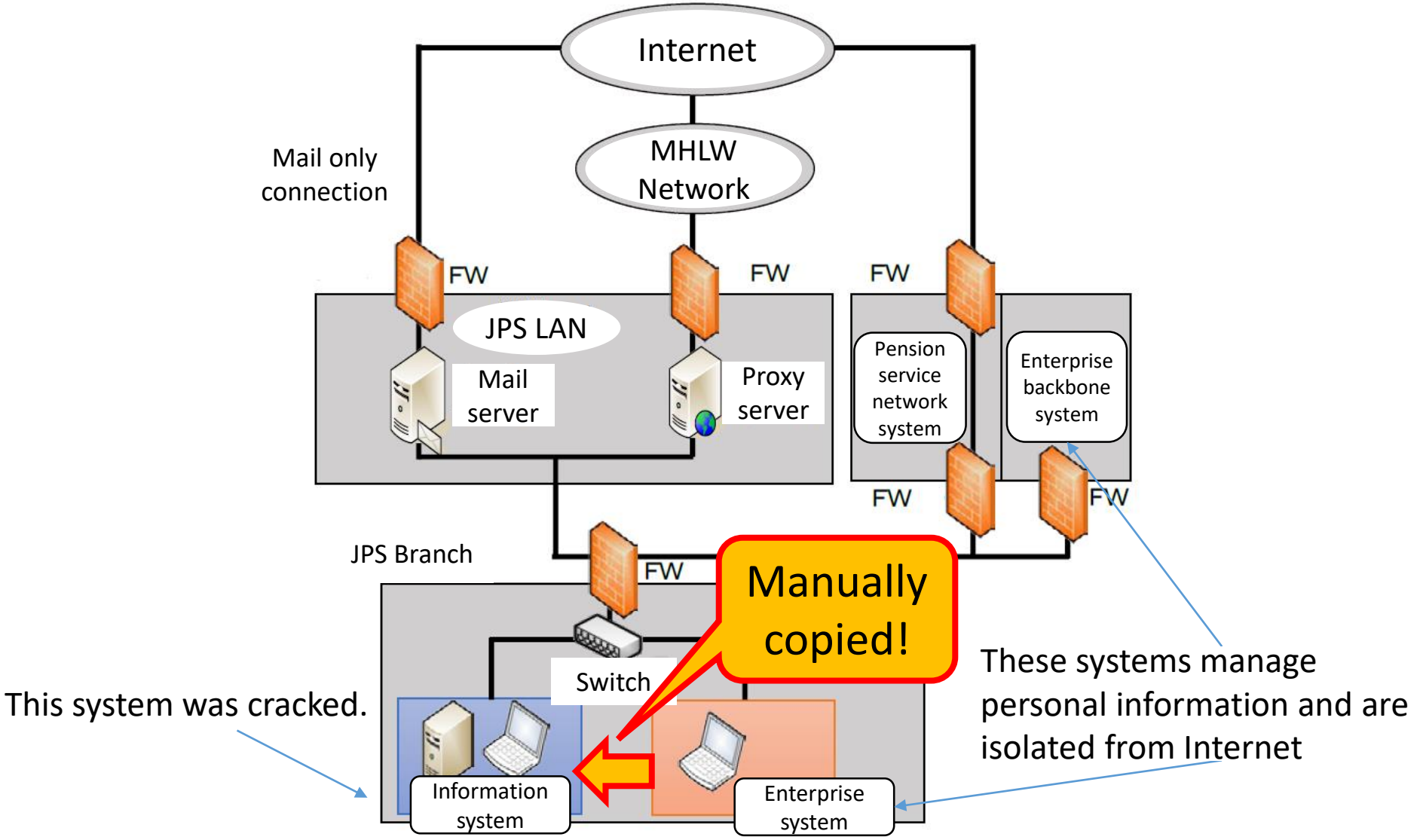
Violation of Operation Rule



Independent team version (MHLW)

- Committee:
  - 19 members (lawyers, security experts, auditors, …)
- Volume:
  - 37-page natural language document plus 3-page glossary.
- Feature:
  - Most comprehensive one
  - Interviewed 78 people and analyzed documents: MHLW, JPS, and its outsourcee and security soft company.
  - Tried to find “root cause”
    - ✓Lack of security risk awareness for their situation, security trend
    - ✓Inappropriate management system.
  - Recurrence prevention measures also include JPS culture
    - ✓Management system in JPS
    - ✓Management system in MHLW
    - ✓Technical measures
    - ✓Culture in JPS

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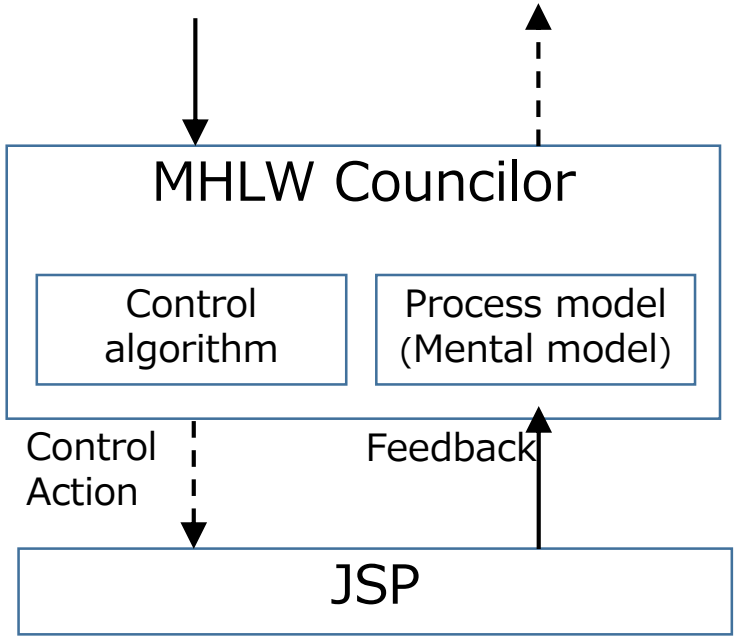
Discussion

- JPS and MHLW were so immature before and during the incident.
- We will find many missing control actions, actuators, sensors, feedbacks, process models in a visual manner if we use STAMP.



Why?

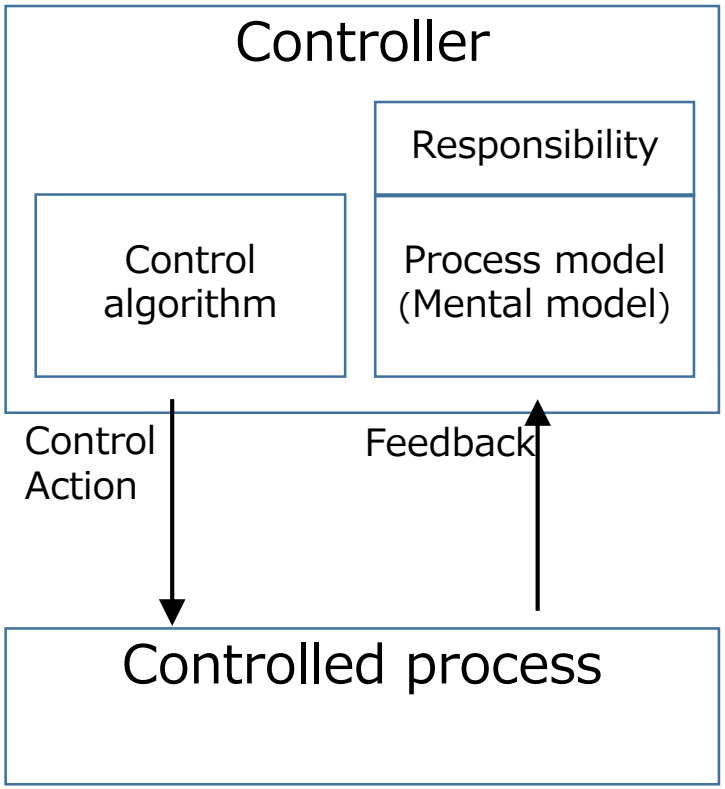
Using STAMP makes me consider why this could happen.

Most of the issues are related to inter/intra-organizational management system. Let's consider Japan specific issues

- We Japanese tend to communicate in high-context, with fewer words but a sort of telepathy.
  - Tend to avoid explicitly clarify responsibility and requirements.
  - Request for clarification may be regarded as arrogant/offensive.
  - Unrealistically optimistic expectation/assumption may survive.
- Seniority system still exists.
  - Our boss may have no knowledge nor mind set for emerging issues like security. This makes things like above much worse.
- "Amakudari" & "Sontaku" in organizations like JPS
  - Amakudari: Descent from heaven, revolving door, …
  - Sontaku: Required to behave by reading between lines.

STAMP for security management?

Is it a better language in describing & analyzing security management in a constructive way (especially for Japanese)?



Linguistic (model) relativity
“The principle of linguistic relativity holds that the structure of a language affects its speakers' world view or cognition.” (Wikipedia)

Proof of Concept needed (Plan)

Sample: Japan Information Security Audit Assoc.

- Audit method
  - Hearing
  - Review
  - Observation
  - Test
- Audit procedure guideline

Management details	Target	Method	Procedure
…	…	…	…
Responsibility of executives and organizational efforts for security management are written in the security policy documents	Security policy documents	Review	…
…			

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Summary

Trial Results:

- The insufficient inter/intra-organization controls can be represented in a structured & hierarchical way.
- It helps to explain the unsecure behaviors although additional context information will facilitate understanding of the reasons behind the behaviors.

Conclusions:

- STAMP seems more effective than conventional natural language based approach in representing & assessing the organizational control structure.
- We will continue this work by collaborating with practitioners such as auditors.