



Exastro

PSSO Method Guidebook

~Optimizing Exastro System Construction/Operation~

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Introduction



About this document

IT Engineers who are currently working in the field are struggling with inefficient system operation and construction. While the obvious solution is to make it more efficient, there are many who are wondering how to do it.

This document uses an on premise environment to show what obstacles to get rid off and what kind of preparation one must do in 3 simple steps **(AKA PSSO Method)**.

Step 1 : Central management of System info

Step 2 : Actualize Automatic Execution

Step 3 : Connect Design info and Automated Executions.

In order to estimate the automation/efficiency rate, the process changes and results will be divided into phases.

What is the PSSO Method?

The PSSO (Procedures for Streamlining System Operation) method is a process of changing conventional “Manual system construction/operation” to “Automated system construction/operation” and solves problems often found during the Design, Preparation and Execution phases.



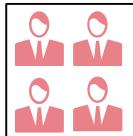
Roles used in this document.

For the sake of convenience, we will explain the roles used in this document below.



Development/Construction team

- In this document, the team responsible for system construction will be called “Construction team”. Normally in a real project, this would also include someone responsible for business/affairs and infrastructure.



Operation team

- The team responsible for operating running systems is called “Operation team”.



Team leader

- Representatives from each team who shares information and coordinates the team.

Overview image



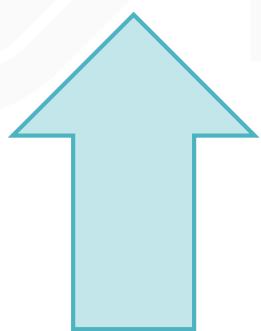
AS-IS and TO BE in Automation.

By following step 1-3, we can automate system operation/construction. Additionally, by changing the process, we can improve the efficiency of the automation.

TO-BE

**Automated system
construction/operation**

AS-IS



Preparing for Automation (Step 1,Step 2,Step 3)



Implementing Automated SI
(Changes to the process and results)

**Manual system
construction/operation**

The “pain” of IT Engineers that works with Constructing/Operating systems



Design

- Delays and errors occurs when communicating between teams.
- Double managing data and proprietary wording leads to errors in the design
- Multiple development leads to complications with managing design documents (forms)
- As a result, we don't know what information is the newest.



Preparation

- Work orders between teams are complex. Each time a time chart is created, it gets discarded.
- Every operation's Manual is discarded after its created/reviewed.
- Configurations are embedded in each procedure, and the number of patterns increases each time a new model/OS is added (barrier to multi-vendor support)



Execution

- Since the operations are done manually, the production time is inconsistent.
⇒People often have to wait before they can continue.
- Since most of the operations are done manually, human error is inevitable.

Said problems can be solved in 3 Steps



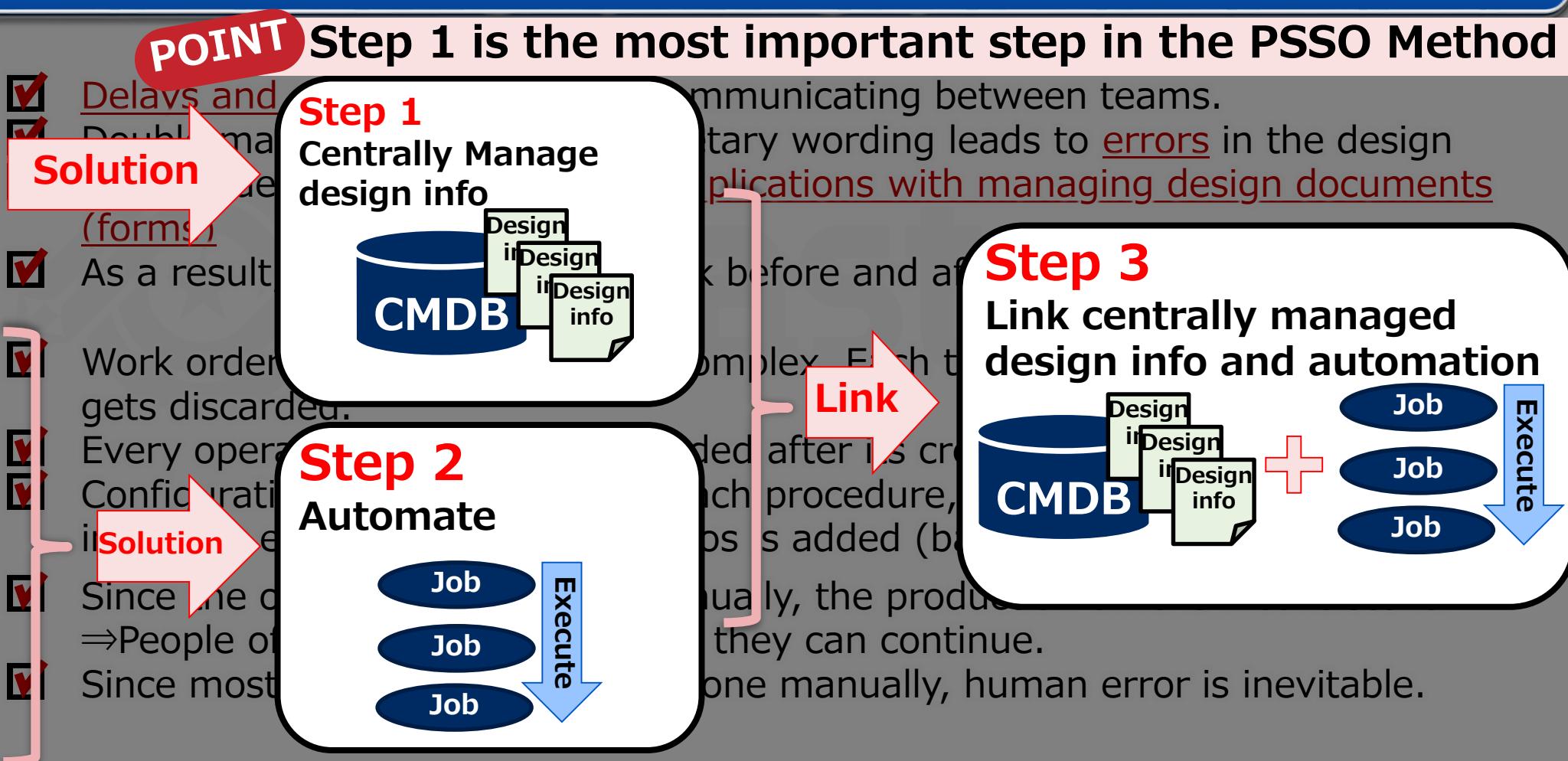
Design



Preparation

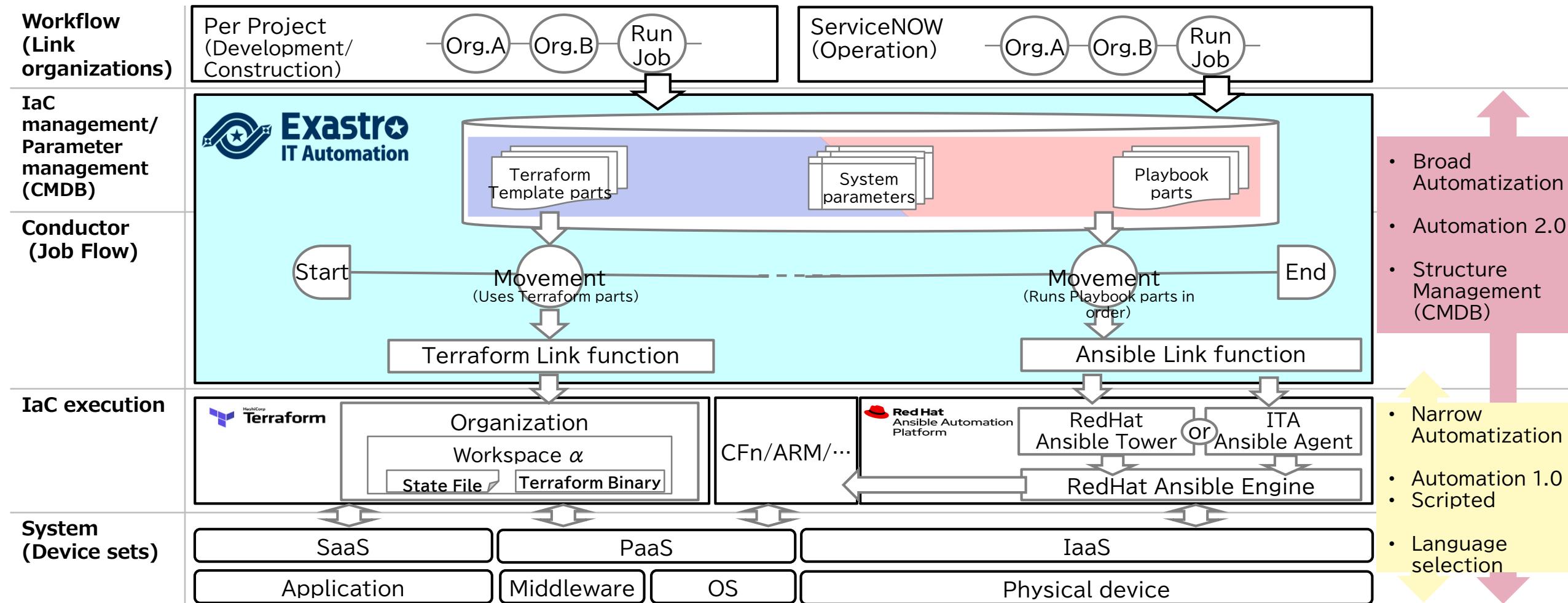


Execution

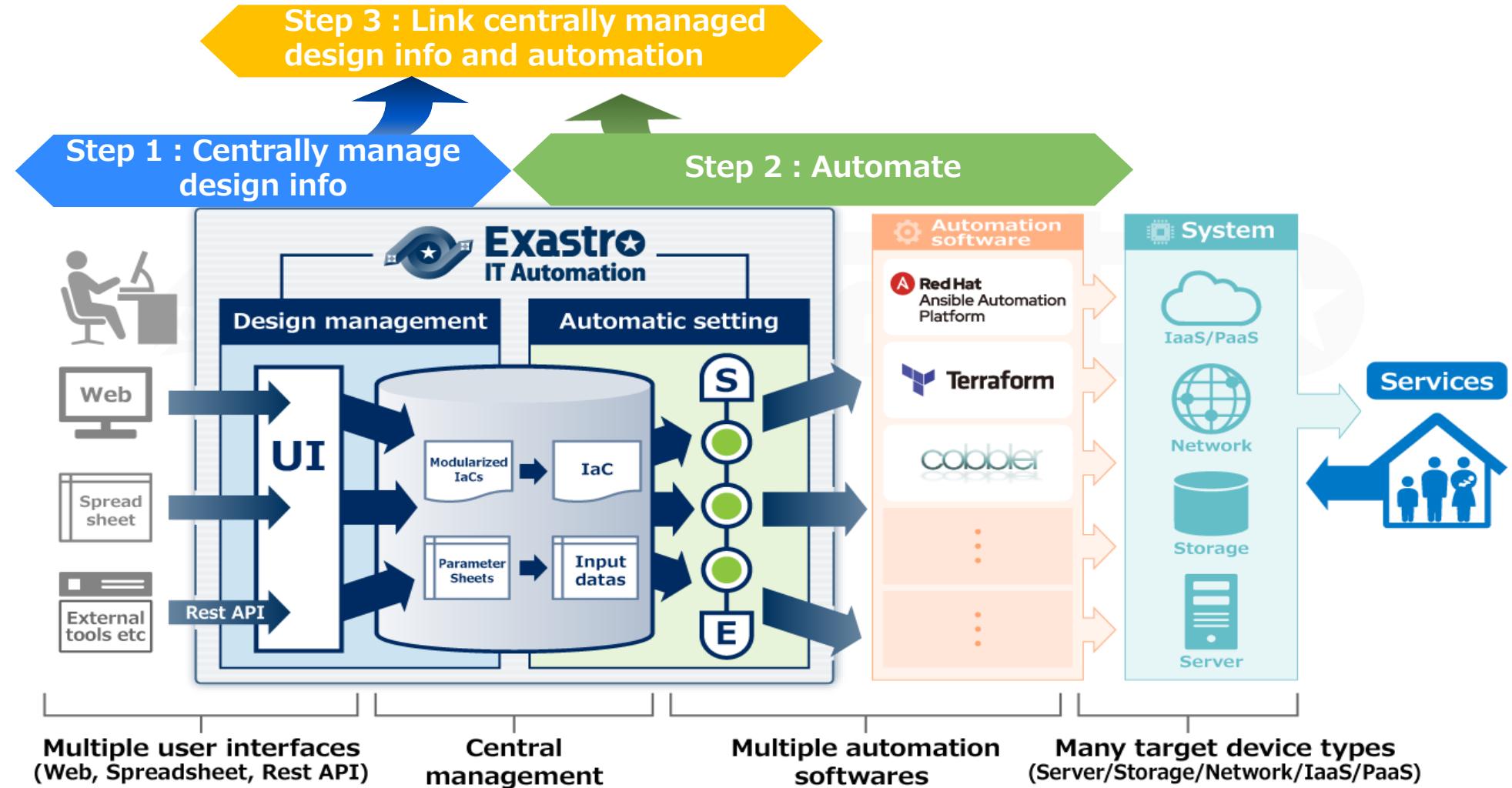


Relationship between the Automatization scope and the different steps

Step 2 only ⇒ “Narrow Automatization”
Step 1 ~ Step 3 ⇒ “Broad Automation”



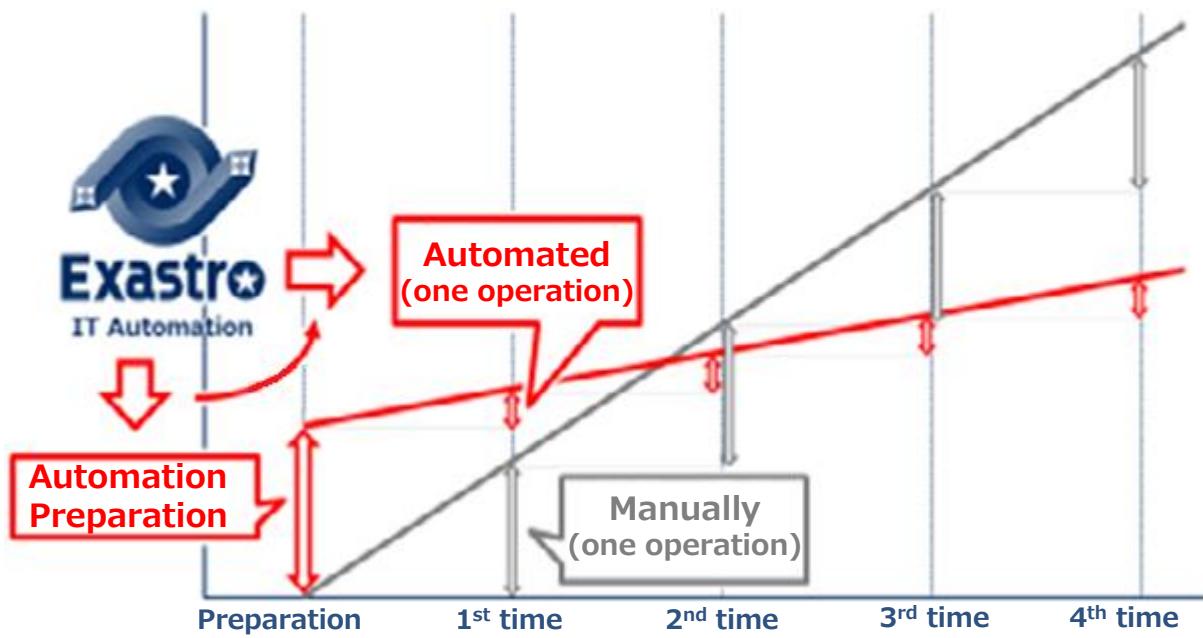
Exastro IT Automation supports the 3 step solution



Automation changes QCD and Tasks/results.

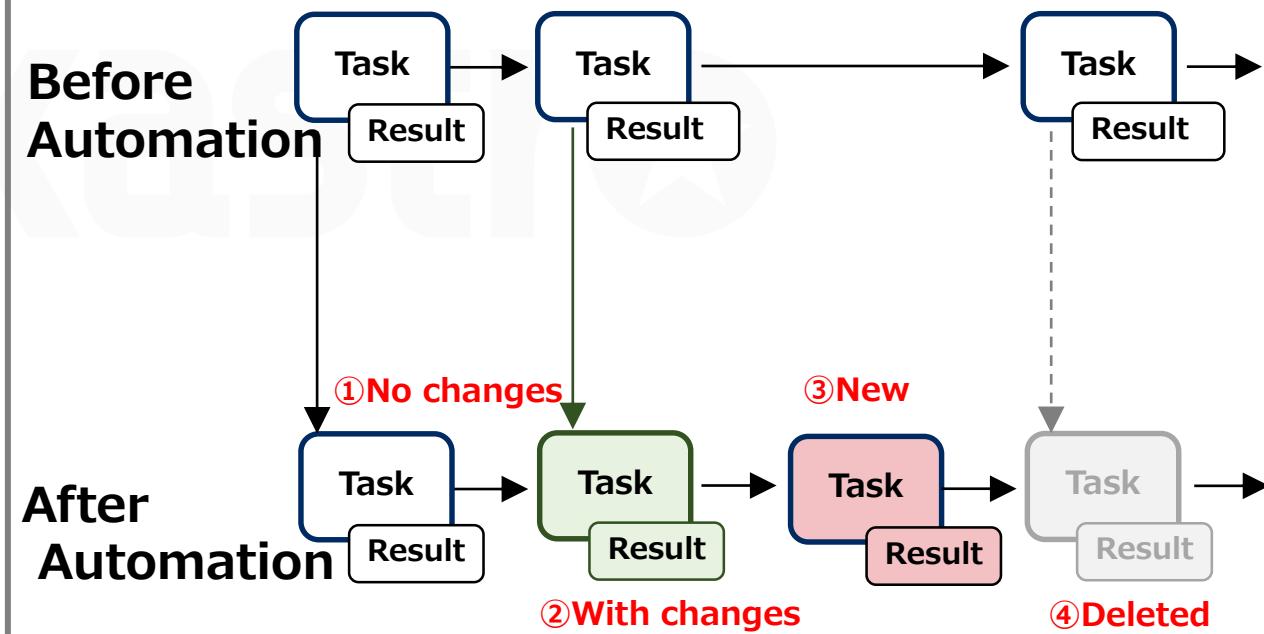
QCD (Quality • Cost • Delivery)

Manual labor → QCD Reform from Automation.



Tasks and Results

Tasks and Result changes can be divided in these 4 groups → 1.No changes 2.With changes 3.New 4,Deleted



Automation Preparation

Step 1 : Central management of the system info.

Step 2 : Actualize Automatic Execution.

Step 3 : Connect Design info and Automated Executions.

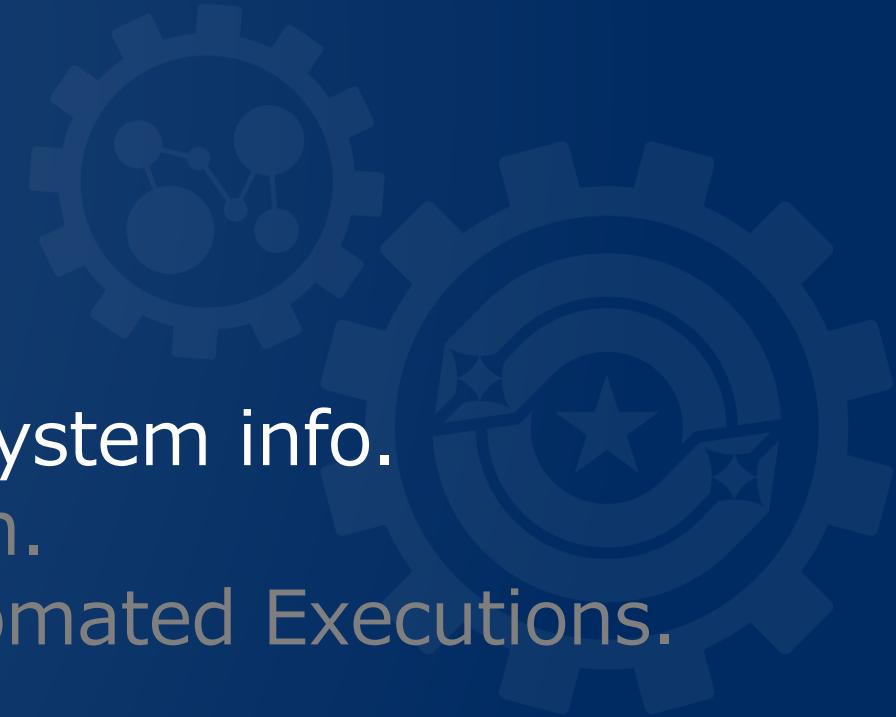


Automation Preparation

Step 1 : Central management of the system info.

Step 2 : Actualize Automatic Execution.

Step 3 : Connect Design info and Automated Executions.



Step 1 : Central management of System info

The next slides explains the **5 tasks in Step 1.**

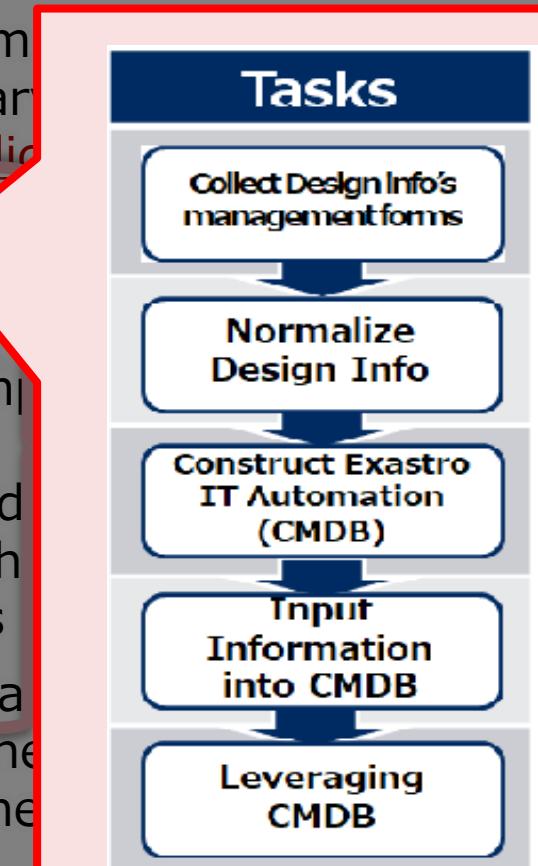
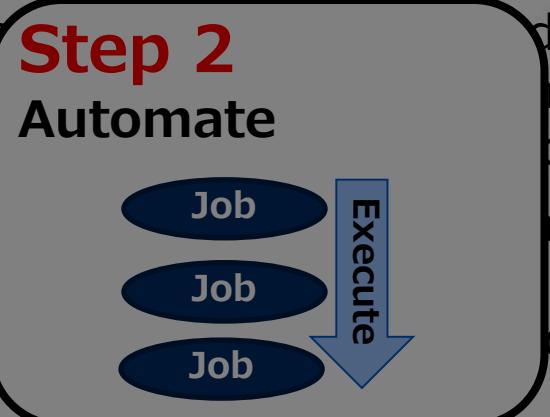
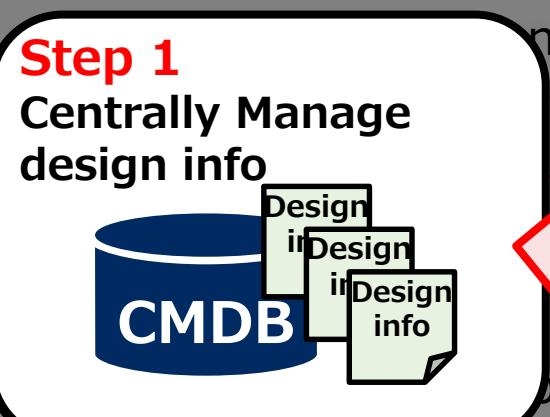


- Delays and
Double entry due
Solution
(forms)
- As a result

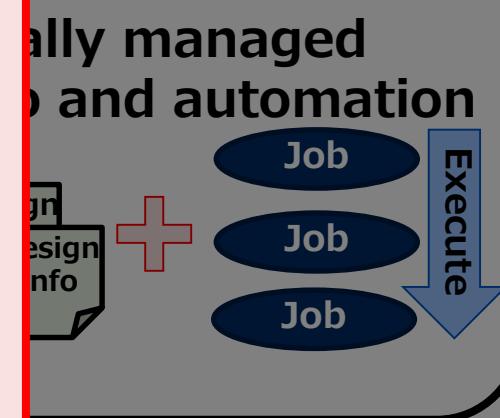
- Work order
gets discarded.

- Every operation
Configurations

- Since the data
→People often
Since most



5.
s in the design
design documents



is inevitable.

Step 1 : Central management of System info

Tasks

Collect Design info's management forms

Normalize Design Info

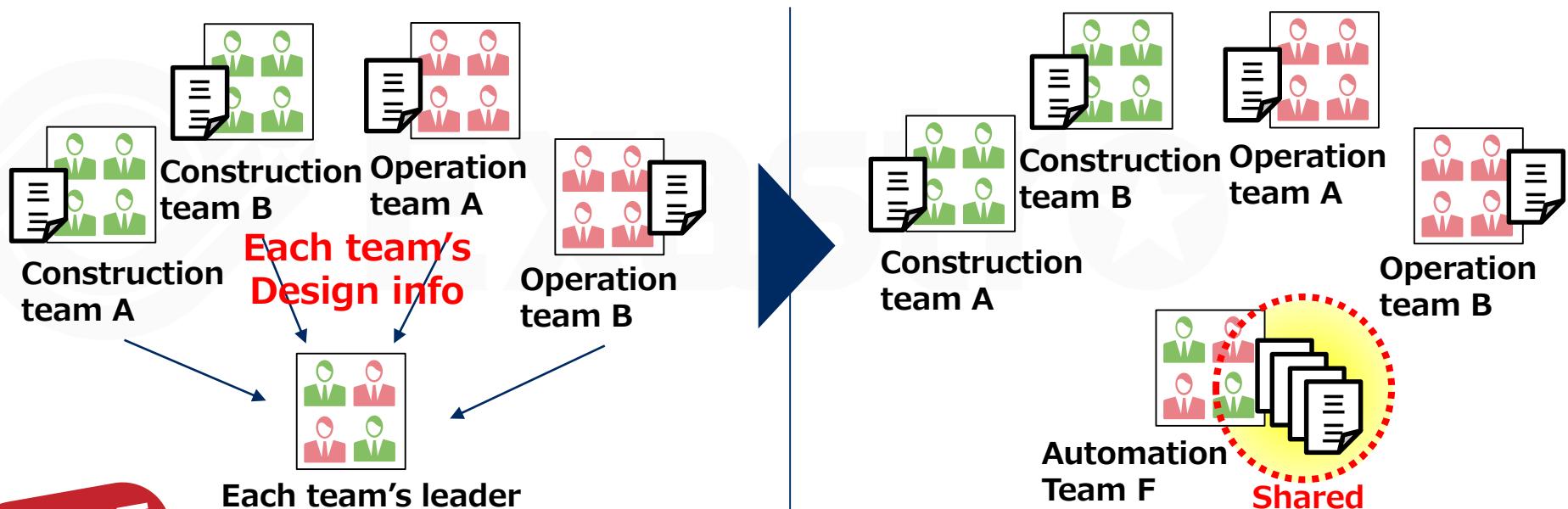
Construct Exastro IT Automation (CMDB)

Input Information into CMDB

Leveraging CMDB

Task Explanation

Each team leader collects the design info from their own teams and share it with each other.



POINT

- ① Clarify the purpose and decide the scope of the management
- ② There are several ways to manage existing design info
- ③ Example) Design info collected from an actual project.

Check next page

Step 1 : Central management of System info

Tasks

Collect Design info's management forms

Normalize Design Info

Construct Exastro IT Automation (CMDB)

Input Information into CMDB

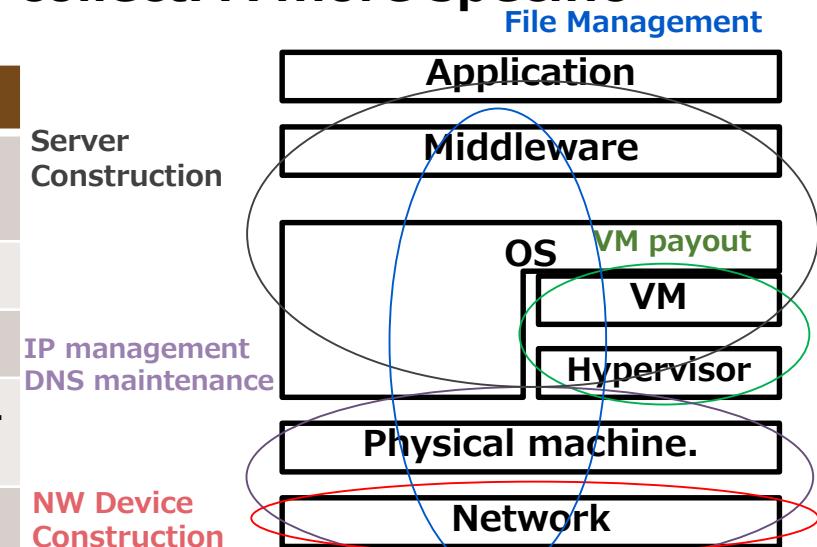
Leveraging CMDB

POINT

① Clarify the purpose and decide the scope of the management

First, one should clarify the goal. After that, we can decide the scope of the design information we want to collect. A more specific example can be found below .

Goals often used	Scope of information
1) IP Address Management	IP, Segments, Etc.
2) Assets Management	Serial Number, License, etc.
3) Server construction	IP, Host name, etc.
4) NW device construction	Interface Numbers, VLAN, etc.
5) VM Payout	Hypervisor, VM name, etc.
6) DNS maintaining	DNS server, domain name, etc.



Problems such as collecting too much or unnecessary information may occur if there are no clear goals. If there are multiple goals, we recommend to number them by priority and create the CMDBs in order.

Step 1 : Central management of System info

Tasks

Collect Design info's management forms

Normalize Design Info

Construct Exastro IT Automation (CMDB)

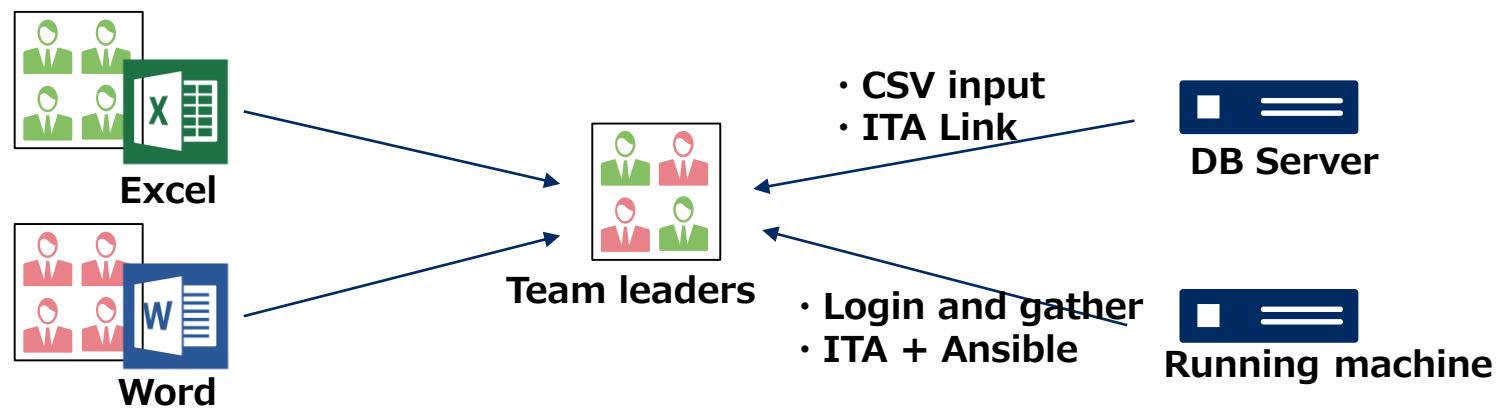
Input Information into CMDB

Leveraging CMDB

POINT

② There are several ways to manage existing design info

Many projects uses Excel or Word formats to manage Design info, so let's start with collecting those files. If you are storing design info in databases, you might consider dumping it in CSV Format or to link the database directly with Exastro IT Automation.



Depending on the project, users might have to gather information straight from a running machine (such as a VM) instead of the design info documents. In that case, we can use Exastro ITA and Ansible to easily collect data from the machines.

Step 1 : Central management of System info

Tasks

Collect Design info's management forms

Normalize Design Info

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Input Information into CMDB

Leveraging CMDB

POINT

③ Case ~ Collecting Design info from a real project.

Here is an example of how Construction management of servers and network devices can be achieved. In this case, the following design info was shared among the team leaders in order to easily identify the scope of the outage impact of the service.

Team	Collected Design info
Server G	<ul style="list-style-type: none">• Server list• Software installed on the server list
Network G	<ul style="list-style-type: none">• IP address list• Network device list• Network route list
Storage G	<ul style="list-style-type: none">• Path list• Storage disk list
Operation monitoring G	<ul style="list-style-type: none">• Message list
Business G	<ul style="list-style-type: none">• Components list• Server components list• Communication conditions list

For more details regarding this case, please refer to the URL below.
<https://exastro-suite.github.io/it-automation-docs/case.html>

Step 1 : Central management of System info

Tasks

Collect Design info's management forms

Normalize Design Info

Construct Exastro IT Automation (CMDB)

Input Information into CMDB

Leveraging CMDB

Task explanation

The team leaders normalizes the collected design info in a table format by eliminating duplicates, unifying names and breaking up redundant info.



Collected design info



Team leaders

Normalize

- Deleting Duplicates
- Unifying Item names
- Cleansing
- Etc.

Server type

Server
Web server
DB server
AP server

OS type

OS
RHEL7
RHEL8
WinServer2019

Server device list

Server	Model	Host name	OS
Web server	#1	web001	WinServer2019
Web server	#2	web002	RHEL8
AP server	#1	apsvr001	RHEL8

Communication list (allowed)

CommNo.	FROM	Protocol	TO
①	Web server#1	https	tcp
②	AP server#1	ODBC	tcp

POINT

- ① Sort the design info
- ② Organize the design info items (Columns)

Check next page

Step 1 : Central management of System info

Tasks

Collect Design info's management forms

Normalize Design Info

Construct Exastro IT Automation (CMDB)

Input Information into CMDB

Leveraging CMDB

POINT

① Sort the design info

Each team's collected design info is sorted according to the following

① If the info is enclosed to single teams or if it is shared with other teams.

If there is info linked with other teams, separate it from other info. By doing so, we can share the info with each others.

② If we're making the user select info from a pull-down menu in Exastro ITA.

We divide the info into two categories when registering design info. Info selectable from pull-down menus and info that can be entered manually. Info selected from pull-down menus will have their values registered as "Master".

③ The relationship of the design information.

We must decide the relationship (dependency) of the design info. This is important, as it directly affects the order in which we create and register design info. For example, in order to create a "server list", we first have to create and register "OS types".

Step 1 : Central management of System info

Tasks

Collect Design info's management forms

Normalize Design Info

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Leveraging CMDB

POINT

② Organize the design info items (Columns)

Eventually, the design info is collected in a table format. Therefore, it is necessary to organize what the “column” in the table should be according to the points below.

① Unification of the settings info item names (table column names).

Different teams often have different names for the same information. For example, the server team might call “IP Address” for just “IP”, while the network team might call it for “ip_addr”. In this case, we need to have the teams use the same name so the information can be counted as shared design info.

② Grouping the settings info.

In many cases, settings info becomes more readable if it is grouped up. To give an example, by grouping “IP Address”# and “Port Number” into “Connection Information”, we can improve both the readability and maintainability.

Step 1 : Central management of System info

Tasks

Collect Design info's management forms

Normalize Design Info

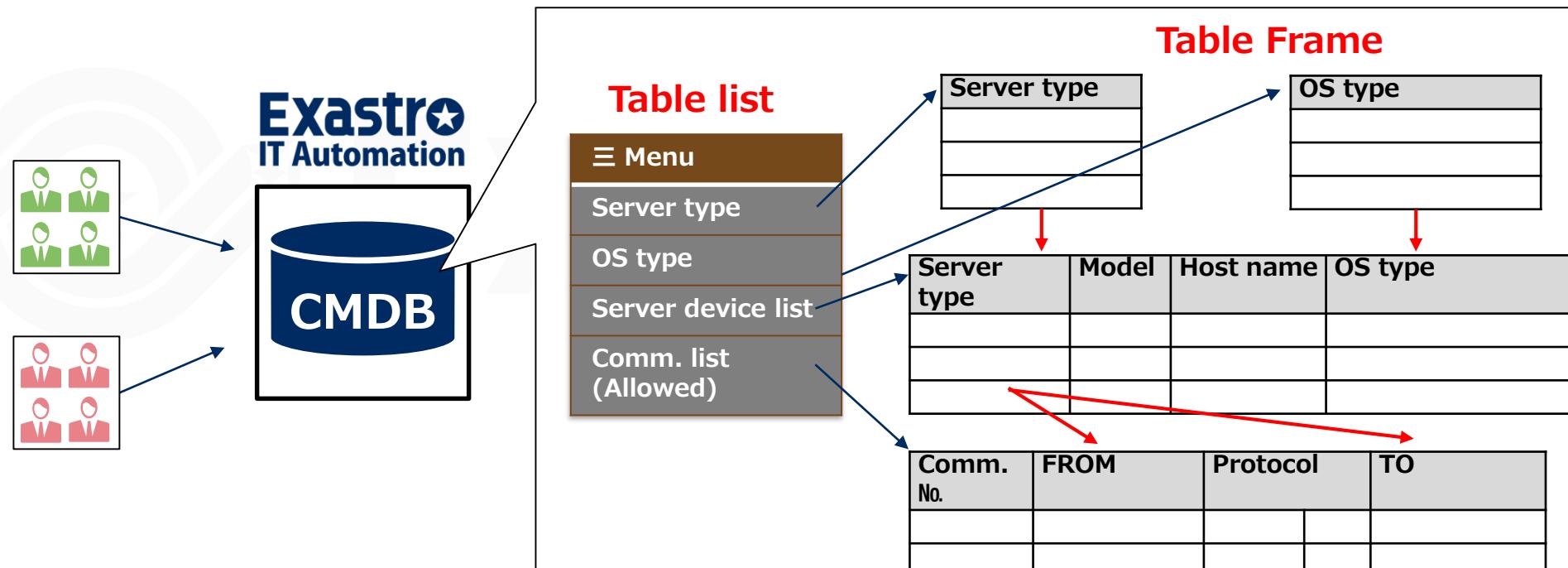
Construct Exastro IT Automation (CMDB)

Input Information into CMDB

Leveraging CMDB

Task explanation.

Based on the normalized design info, create a “table list” and a “table frame” to store the design info in the CMDB in Exastro IT Automation.

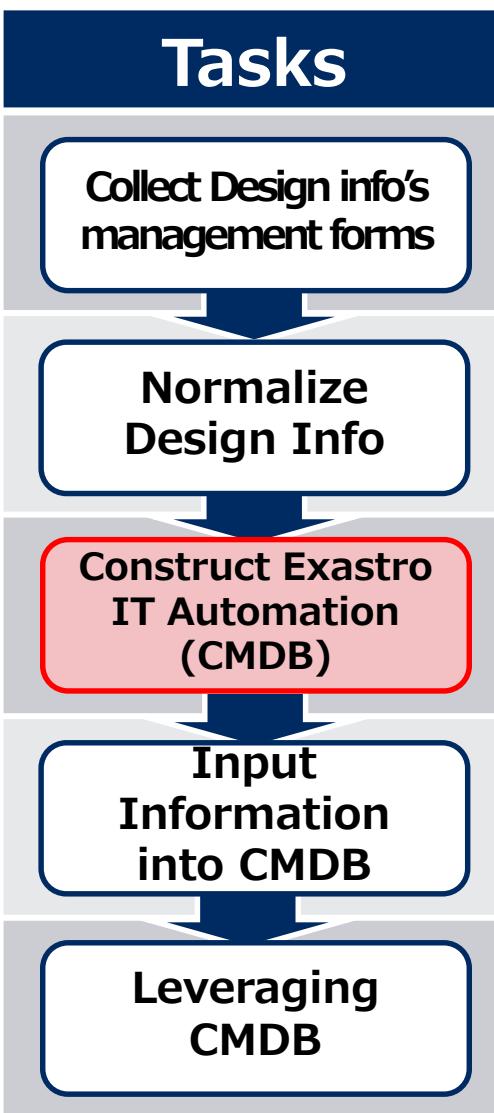


POINT

- ① Put restrictions on the columns to prevent input errors in the design values.

Check next page

Step 1 : Central management of System info



POINT ① Put restrictions on the columns to prevent input errors in the design values

Keeping the CMDB clean is impossible there are spelling/input errors when registering design values.

By setting restrictions to the table columns in Exastro IT Automation, it becomes easier if there are any spelling/input errors when inputting new design values. As a result, the CMDB can be kept clean.

Restriction	Restriction	Restriction	Pulldown = No errors
Letters, Hyphens , Periods	n.n.n.n format (n= number)	Pulldown selection	
Host name	IP address	OS type	
web-server	10.0.10.100	Windows Server 2019	
log-server	log-server	RHEL 8	...
DB_server	10.0.10.100	Error	Windows Server 2019
.....	Error	Windows Server 2016
		RHEL 8

Step 1 : Central management of System info

Tasks

Collect Design info's management forms

Normalize Design Info

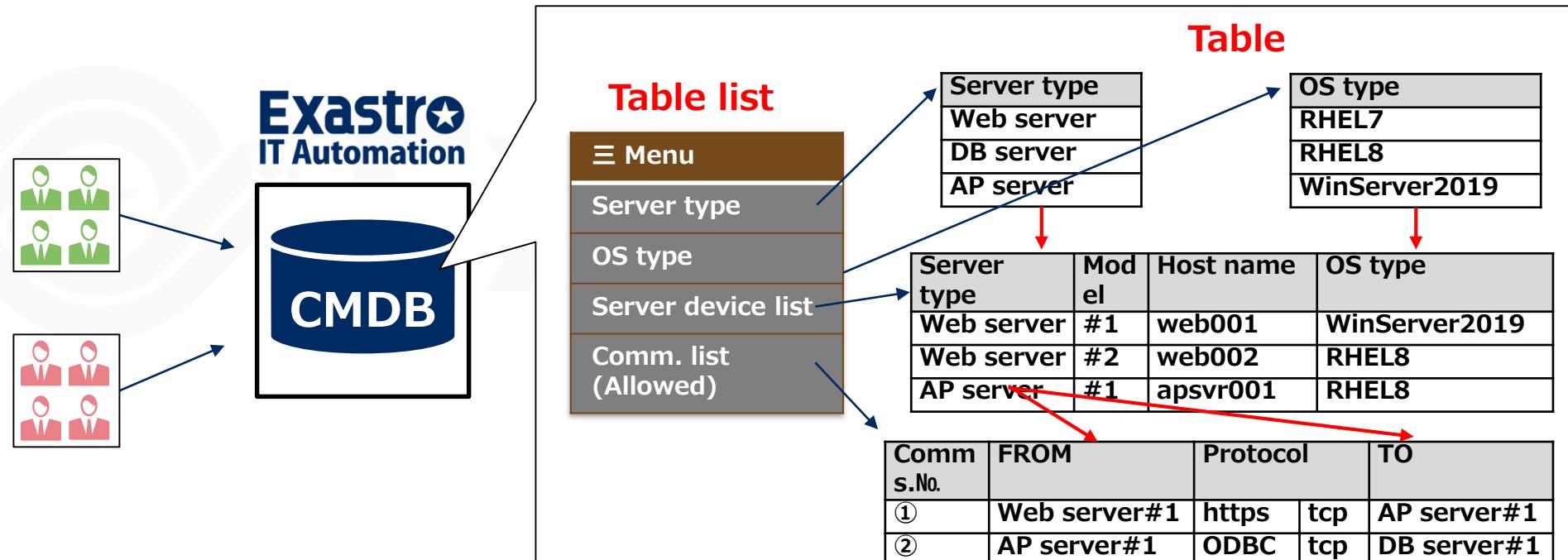
Construct Exastro IT Automation (CMDB)

Input Information into CMDB

Leveraging CMDB

Task explanation

Every team registers the design info to the CMDB



POINT

- ① Use Excel to register in batches.

Check next page

Step 1 : Central management of System info

Tasks

Collect Design info's management forms

Normalize Design Info

Construct Exastro IT Automation (CMDB)

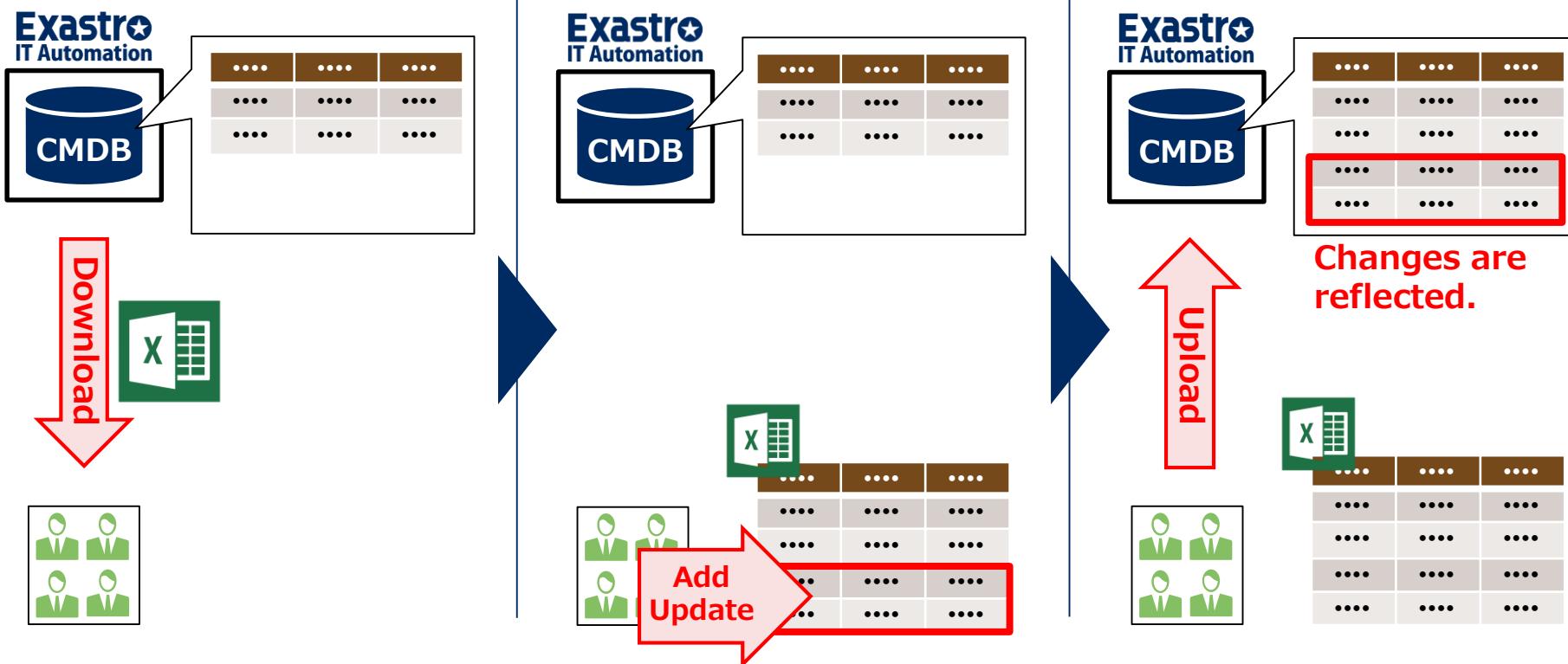
Input Information into CMDB

Leveraging CMDB

POINT

① Use Excel to register in batches.

The tables in Exastro IT Automation can be downloaded in Excel format. We can register design info more efficiently by adding/updating the information directly to the Excel file and then uploading it.



Step 1 : Central management of System info

Tasks

Collect Design info's management forms

Normalize Design Info

Construct Exastro IT Automation (CMDB)

Input Information into CMDB

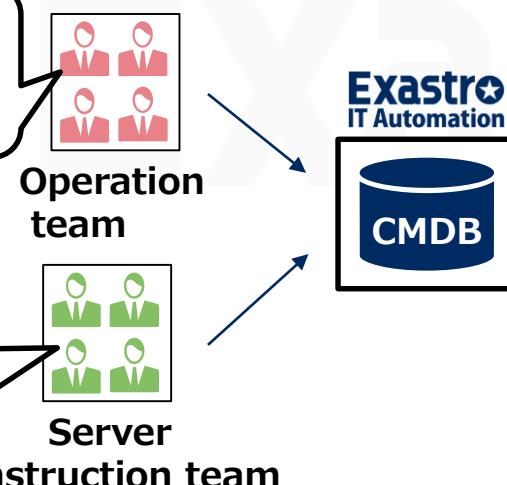
Leveraging CMDB

Task explanation

Refer and update the design info to suit the final goal. Additionally, it is possible to store the setting values by downloading it as an Excel file.

Referring and Updating CMDB

We want to see the version info for all the servers that are getting patched.



Let's update the server list now that there are additional web servers.

Submit the final product as an excel file

Exastro
IT Automation



Project

Attention

The client must have agreed to this in advance.

Deliver the final product



Client

POINT

① Case~ Investigating the scope of service outage impacts.

Check next page

Step 1 : Central management of System info

Tasks

Collect Design info's management forms

Normalize Design Info

Construct Exastro IT Automation (CMDB)

Input Information into CMDB

Leveraging CMDB

POINT

① Case~ Investigating the scope of service outage impacts.

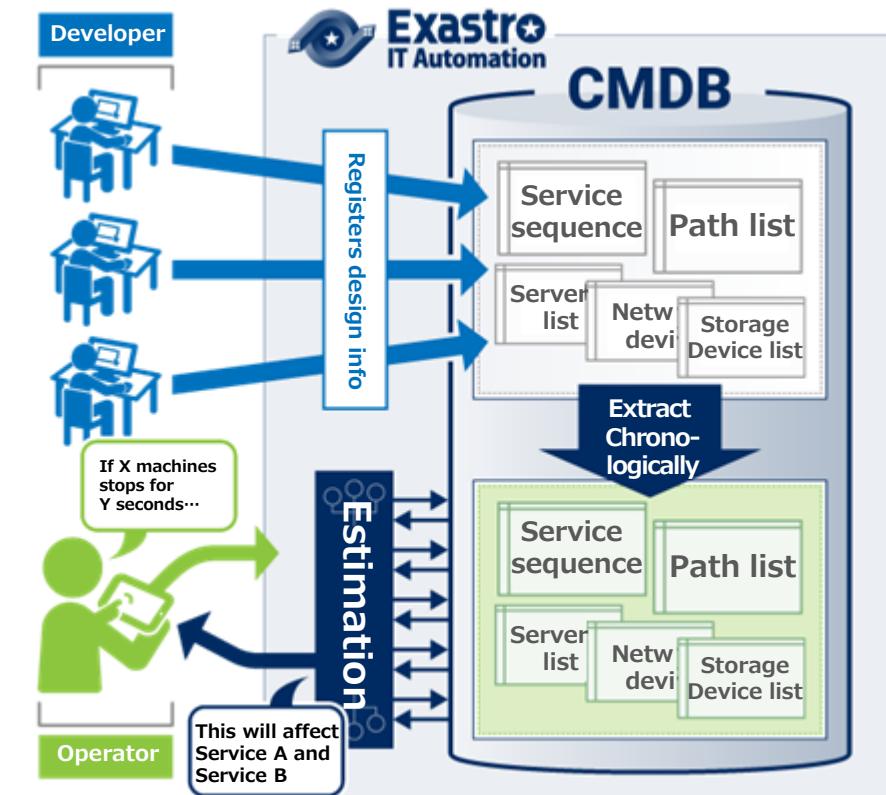
Here, we will show an example of using CMDB to investigate the impact of a service outage.

Problem Large-scale carrier systems require a lot of man-hours to investigate service impacts of both expected and unexpected equipment outages.

Solution By managing the configuration of the system, it is possible to automatically predict the impact of equipment outages.

Effect Don't have to pay 800 000 Yen per investigation. The annual cost was reduced by about 94 mil. Yen. (checked 120 times)

Construct CMDB



For more details regarding this case, please refer to the URL below.

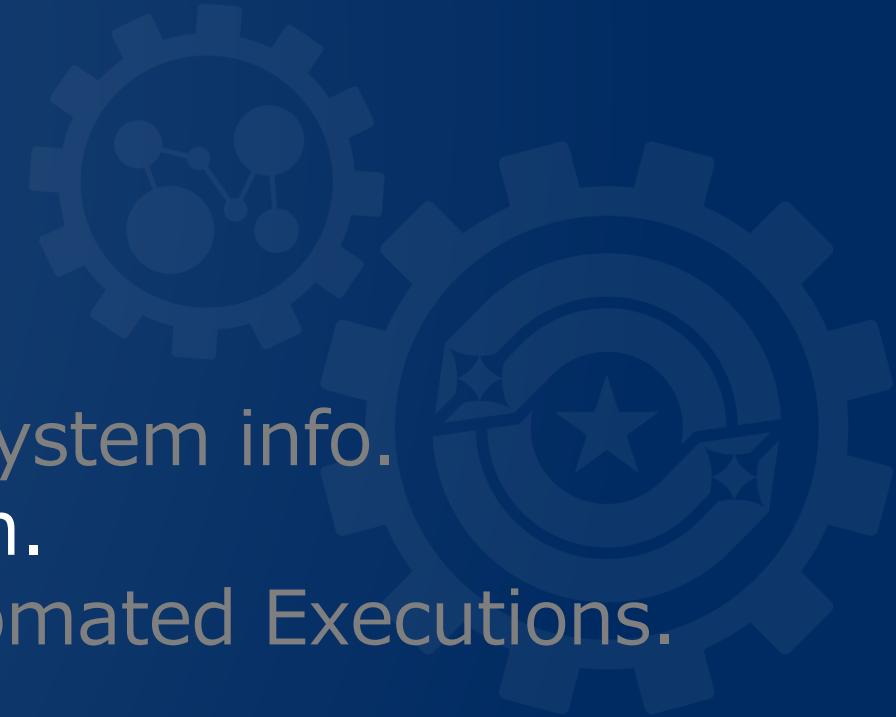
<https://exastro-suite.github.io/it-automation-docs/case.html#case003>

Automation Preparation

Step 1 : Central management of the system info.

Step 2 : Actualize Automatic Execution.

Step 3 : Connect Design info and Automated Executions.



Step 2 : Actualize Automatic Execution

The next slides explains the 5 tasks in Step 2.

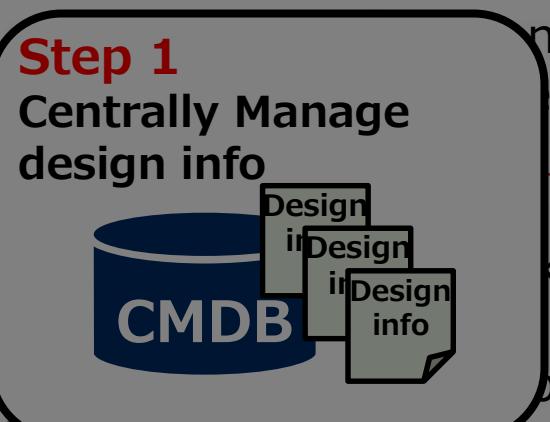


- Delays and double manual work
- Double manual work
- Solution** (forms)
- As a result

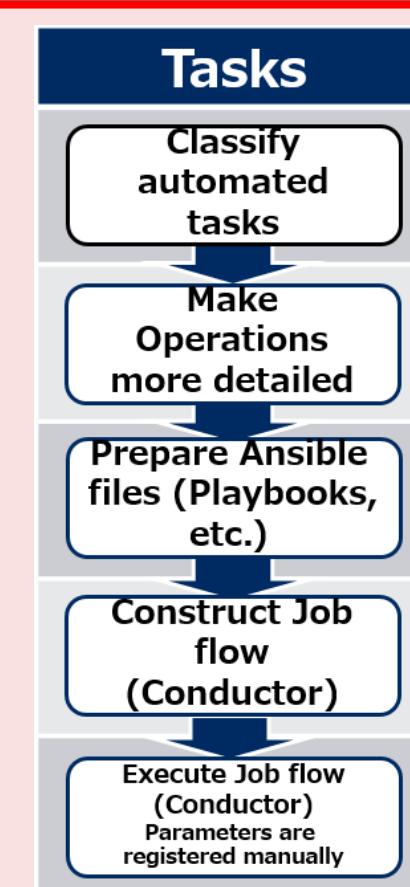
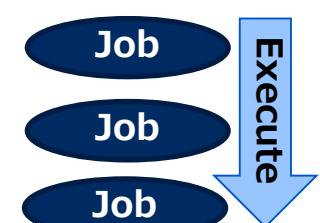
- Work order gets discarded.

- Every operation needs configuration
- Configuration is error-prone
- Solution** (Ansible Playbooks)

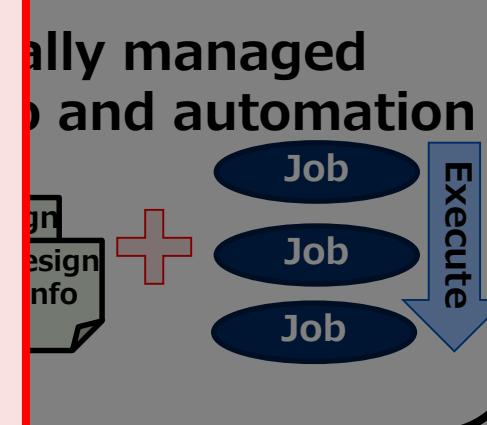
- Since one needs to do it manually
- ⇒ People often skip steps
- Since most of the time



Step 2 Automate



5. S. S. in the design
design documents



is inevitable.

Step 2 : Actualize Automatic Execution

Tasks

Classify automated tasks

Make Operations more detailed

Prepare Ansible files (Playbooks, etc.)

Construct Job flow (Conductor)

Execute Job flow (Conductor)
Parameters are registered manually

Task explanation

Organize the manually executed tasks and select which ones to automate.
If the organized tasks crosses more than one team, the team leaders will do the coordination.

Shared operations

- Implement Monitor agent
- Communication check(ping)
- Distribute hosts files
- etc

Server construction

- OS settings
- OS update
- SELinux settings
- firewalld settings
- etc

NW device construction

- IF settings
- VLAN construction
- Communication access settings
- etc



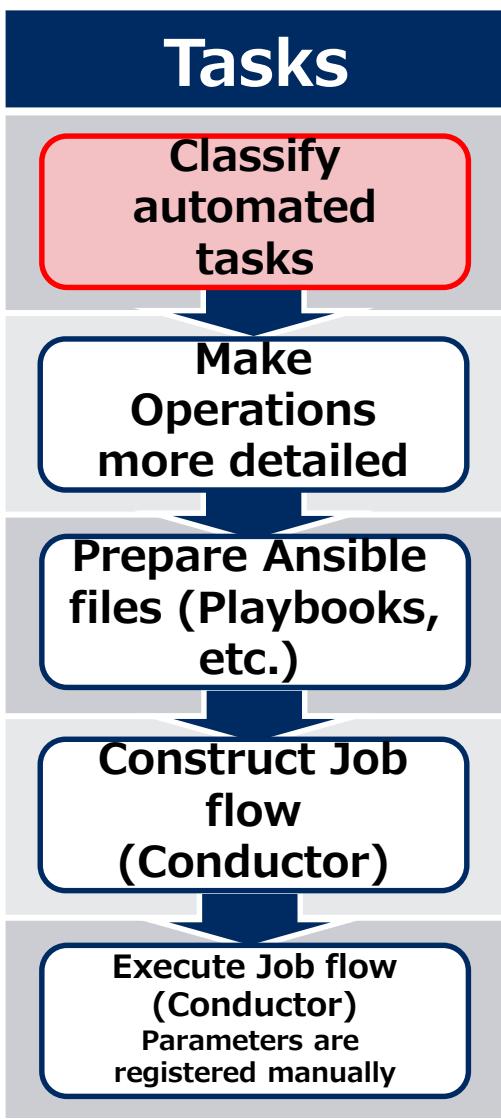
Team leaders

POINT

- ① Categorize tasks with “just right” granularity.
- ② Estimate the effects of the operation and arrange them by priority.

Check next page

Step 2 : Actualize Automatic Execution

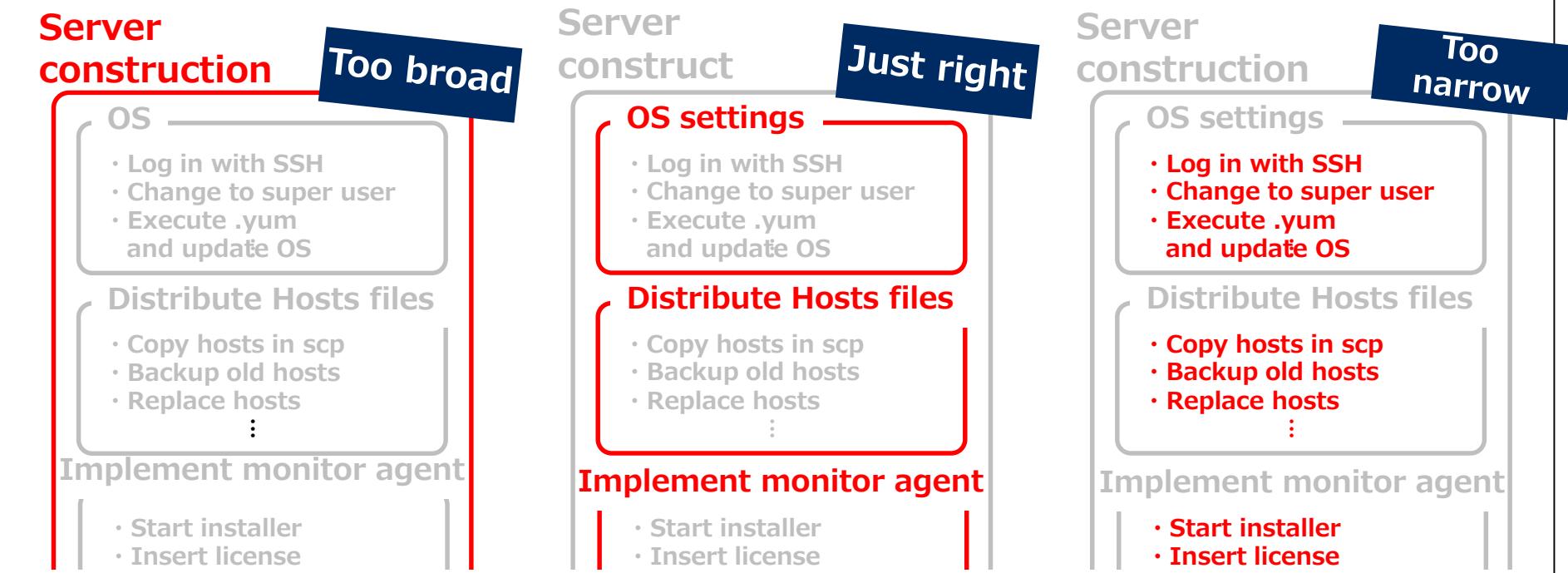


POINT

① Categorize tasks with “just right” granularity.

Categorize the tasks that are getting automated with “just right” granularity. For example, for server construction, the example in the bottom right has too much information. On the other hand, the one on the left is too broad.

As can be seen in the middle figure, the “OS Settings” illustrates the perfect amount of granularity.



Step 2 : Actualize Automatic Execution

Tasks

Classify automated tasks

Make Operations more detailed

Prepare Ansible files (Playbooks, etc.)

Construct Job flow (Conductor)

Execute Job flow (Conductor)
Parameters are registered manually

POINT

② Estimate the effects of the operation and arrange them by priority

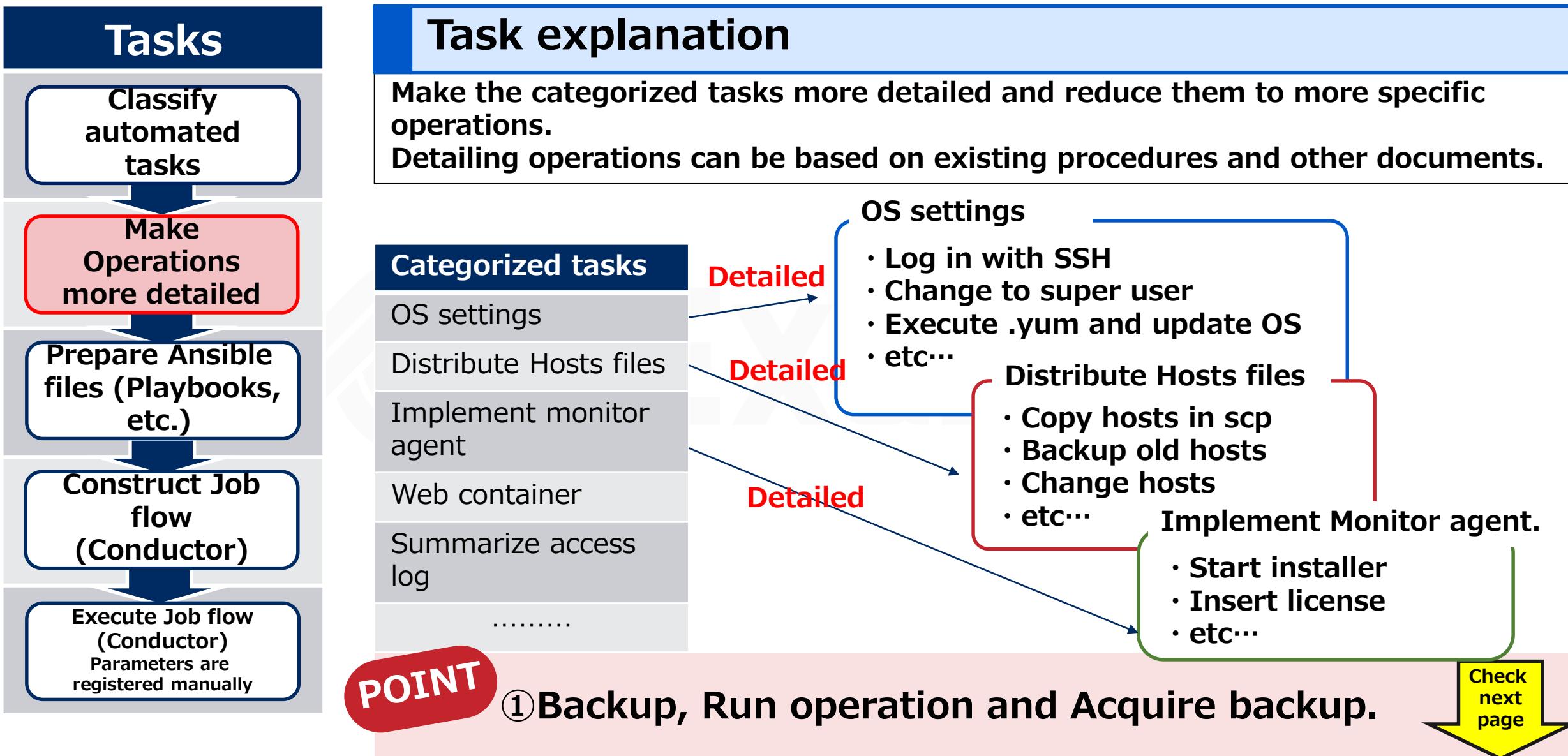
Estimate the effects of the operations and arrange them by priority. Once we know the effects, we can prioritize the tasks and decide whether to automate them or not.

Estimated effects includes the number of times the operation is used per year, the number of target devices and the number of man-hours per project. If the number isn't a quantitative number, it is possible to sort them by "Large", "Medium", or "Small". The following is an example of an organized list of operations with priority.

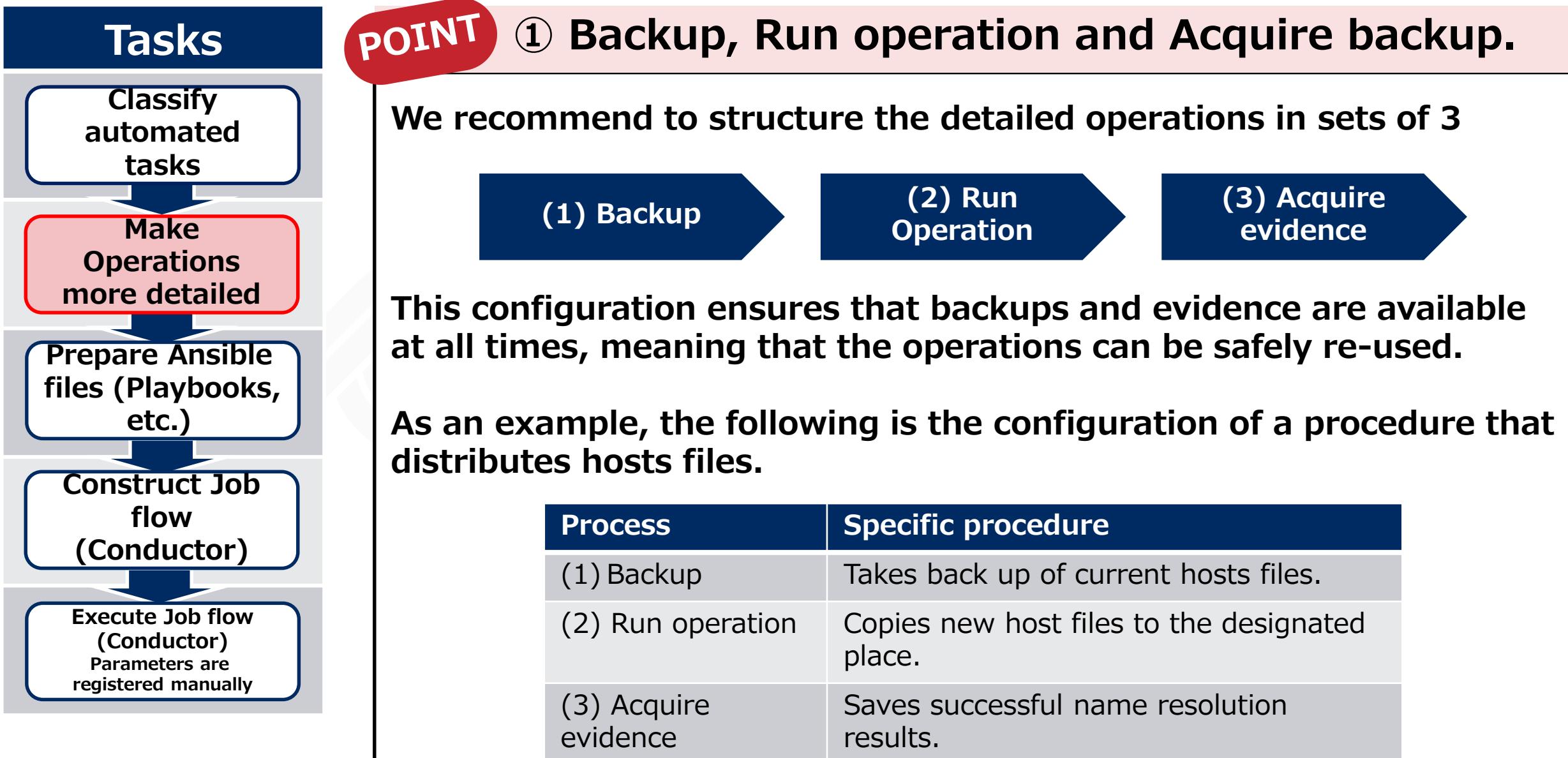
Operation	Times used	Number of devices	Man-hour per worker	Man-hour	Priority	Remarks
OS settings	50	50	10H	5H	High	Requires 2 persons
Distribute Hosts files	200	50	1H	0.5H	Middle	Updates 4 times a year
Implement monitor agent	30	30	5H	5H	Low	
Update Web contents	600	5	1H	1H	High	Updates 10 times a month
Summarize Access log	60	5	2H	2H	Low	Executed at the end of the month

As a general rule, automation tends to be more effective for common tasks, since they are used more often per year. Additionally, by reviewing the granularity of the tasks, we can find out which tasks are common.

Step 2 : Actualize Automatic Execution



Step 2 : Actualize Automatic Execution



Step 2 : Actualize Automatic Execution

Tasks

Classify automated tasks

Make Operations more detailed

Prepare Ansible files (Playbooks, etc.)

Construct Job flow (Conductor)

Execute Job flow (Conductor)
Parameters are registered manually

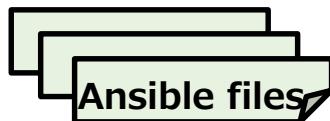
Task explanation

Prepare Ansible files (Playbook, Etc.) to execute the procedure. You can create new one or use existing ones.

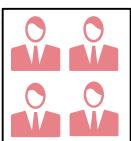
Ansible file preparation



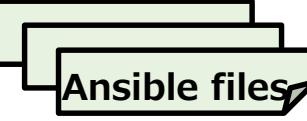
Create new from user manuals



Ansible files

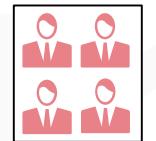


Reuse existing files

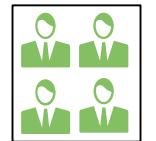


Ansible files

Ansible files registration



Register



Register

Ansible files is a set of files required for an operation to run.

- Playbook
- Role
- File
- Template

POINT

- ① Reuse any existing files available
- ② Variabilize any values that changes for each operation run.
- ③ Keep similar processes concise by repeating.
- ④ Create a standard configuration for templates.

Check next page

Step 2 : Actualize Automatic Execution

Tasks

Classify automated tasks

Make Operations more detailed

Prepare Ansible files (Playbooks, etc.)

Construct Job flow (Conductor)

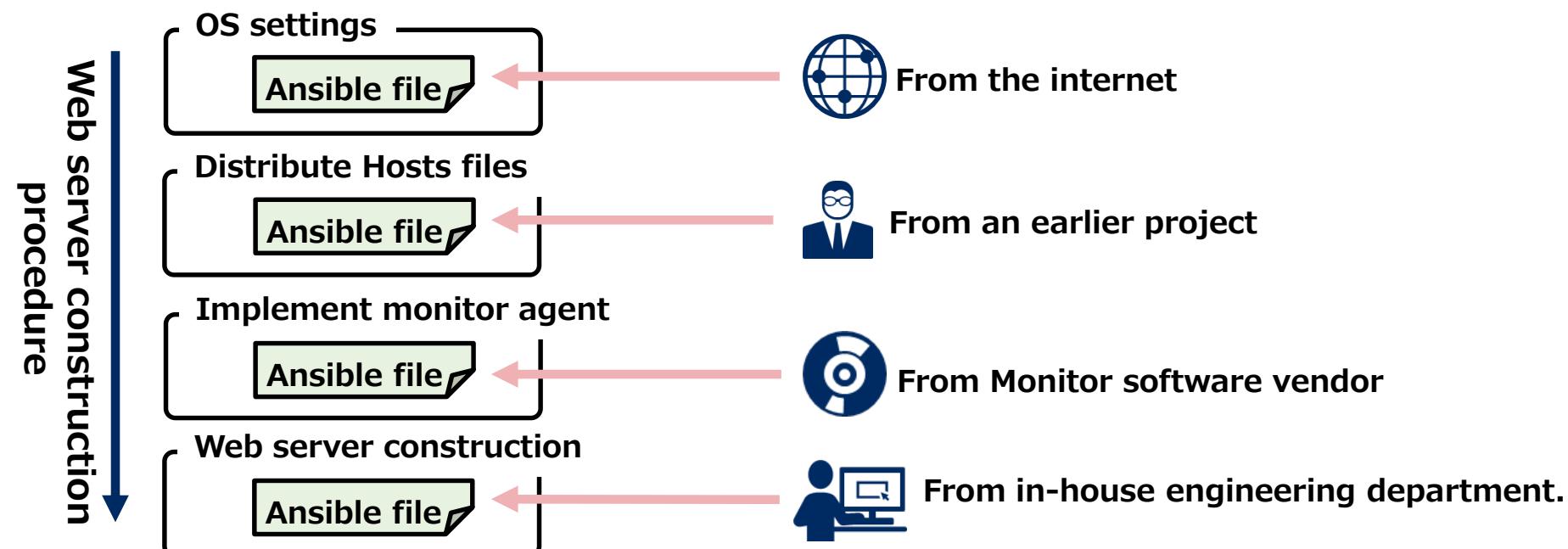
Execute Job flow (Conductor)
Parameters are registered manually

POINT

① Reuse any existing files available

You don't need to create every part manually in an Ansible file. If you have any existing files, it is possible to use parts of them to create other files more efficiently.

The following example illustrates how to build a web server by using Ansible files from various sources.



Step 2 : Actualize Automatic Execution

Tasks

Classify automated tasks

Make Operations more detailed

Prepare Ansible files (Playbooks, etc.)

Construct Job flow (Conductor)

Execute Job flow (Conductor)
Parameters are registered manually

POINT

② Variablize any values that changes for each operation run.

Some values, such as the host name for the machine, will change when the operations are executed. If you embed these values as fixed values in the Ansible files, you will need to modify the files every time you run an operation.

In order this, we use “variables” in Ansible files.

Playbook before variabilization

```
- hostname:  
  name: web01
```

Playbook after variabilization

```
- hostname:  
  name: {{ VAR_hostname }}
```

The playbook on the left has a fixed host name, “web01”. If we don’t change it, we will need to modify the playbook in order to set up “web02” on another machine.

On the other hand, the playbook on the right has the host name converted into a variable, {{ VAR_hostname }}. By setting specific values for the variables separately, the variablized parts can be replaced with any expected values when the operation is executed.

Step 2 : Actualize Automatic Execution

Tasks

Classify automated tasks

Make Operations more detailed

Prepare Ansible files (Playbooks, etc.)

Construct Job flow (Conductor)

Execute Job flow (Conductor)
Parameters are registered manually

POINT

③ Keep similar processes concise by repeating.

If the tasks are organized to be executed automatically, you might see that some similar tasks are used multiple times. In those cases, we can keep the process concise by using repetition. In the case of Ansible's Playbooks, we can use the "Loop" instruction.

The following is an example of a playbook that creates three directories: /dir1, /dir2 and /dir3. The playbook on the left runs 3 different processes. On the other hand, the one on the right uses "loop" to repeat the process, which makes it more concise and easier to maintain.

Not repeated playbook

```
- file:  
  path: /dir1  
  state: directory  
  
- file:  
  path: /dir2  
  state: directory  
  
- file:  
  path: /dir3  
  state: directory
```



Repeated playbook

```
- file:  
  path: "{{ item }}"  
  state: directory  
loop: {{ VAR_dirs }}
```

Step 2 : Actualize Automatic Execution

Tasks

Classify automated tasks

Make Operations more detailed

Prepare Ansible files (Playbooks, etc.)

Construct Job flow (Conductor)

Execute Job flow (Conductor)
Parameters are registered manually

POINT

④ Create a standard configuration for templates.

In situations where setting files are distributed to multiple servers, the contents of the files are in many cases almost the same, which only some of the values being different. In these cases, we can be more efficient by creating setting files using formats.

In Ansible, Files with .j2 extensions are “Format” files. Similarly to playbooks, formats can also use variables. The following is an example of an Apache settings file being created. The blue text are variables and the red text are values after it has been created.

httpd.conf.j2 (Format)

```
<VirtualHost *:80>
    ServerName {{ VAR_hostname }}
    DocumentRoot {{ VAR_docroot }}
</VirtualHost>
```

Create
Create

```
<VirtualHost *:80>
    ServerName www.test.com
    DocumentRoot /contents
</VirtualHost>
```

```
<VirtualHost *:80>
    ServerName www.dev.com
    DocumentRoot /public
</VirtualHost>
```

Step 2 : Actualize Automatic Execution

Tasks

Classify automated tasks

Make Operations more detailed

Prepare Ansible files (Playbooks, etc.)

Construct Job flow (Conductor)

Execute Job flow (Conductor)
Parameters are registered manually

Appendix : Managing Playbooks

This section describes how to manage Ansible materials (Playbooks,etc.), using problems and solutions that actually happened as examples.

PROBLEM

- ① The same playbook exists across multiple directories.
- ② Playbooks with different contents have the same name.
- ③ There are differences in playbook contents between the version management tool and ITA.

SOLUTION

- ① Create a directory for common processes.
- ② Decide on a naming convention in advance and don't allow files with same name
- ③ Manage using a version management tool and CICD tool.

Check next page

Step 2 : Actualize Automatic Execution

Tasks

Classify automated tasks

Make Operations more detailed

Prepare Ansible files (Playbooks, etc.)

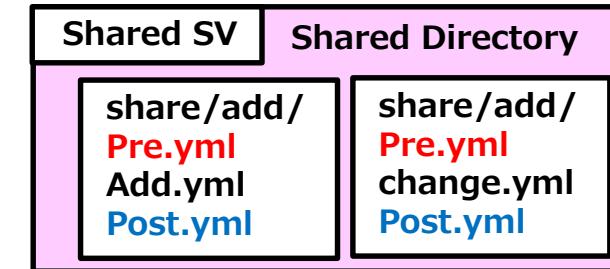
Construct Job flow (Conductor)

Execute Job flow (Conductor)
Parameters are registered manually

PROBLEM

① The same playbook exists across multiple directories.

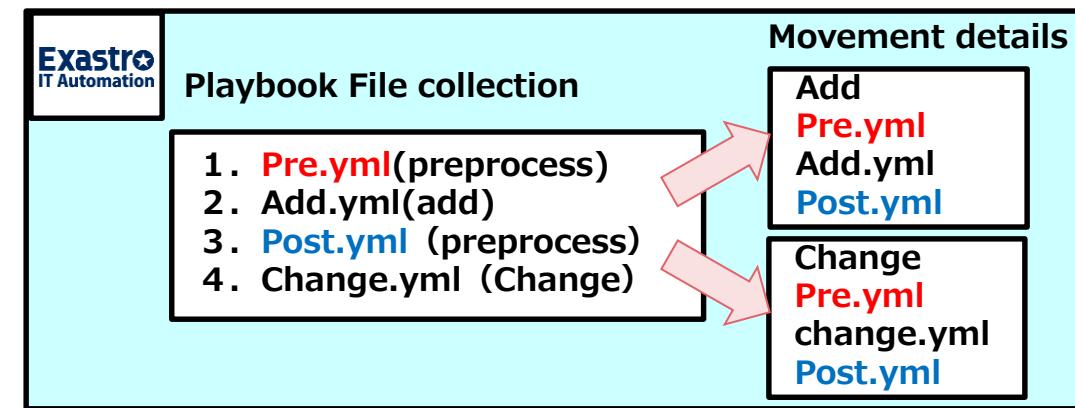
When we managed a shared directory, we created a new directory for each process, causing files to exist over multiple directories.



SOLUTION

① Use one Playbook for multiple processes.

ITA allows users to manage Playbooks in one central place, making it possible to use the same Playbook in different Movements.



Step 2 : Actualize Automatic Execution

Tasks

Classify automated tasks

Make Operations more detailed

Prepare Ansible files (Playbooks, etc.)

Construct Job flow (Conductor)

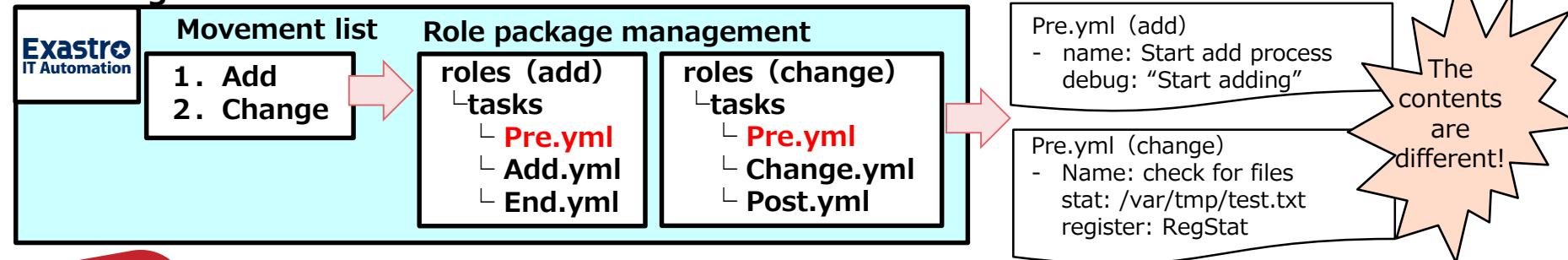
Execute Job flow (Conductor)
Parameters are registered manually

PROBLEM

② Playbooks with different contents have the same name.

Two files with the same name but different contents was accidentally created in Ansible Legacy Role.

Therefore, altering the “add” Pre.yml also changes the “change” Pre.yml, leading to a bug occurring.



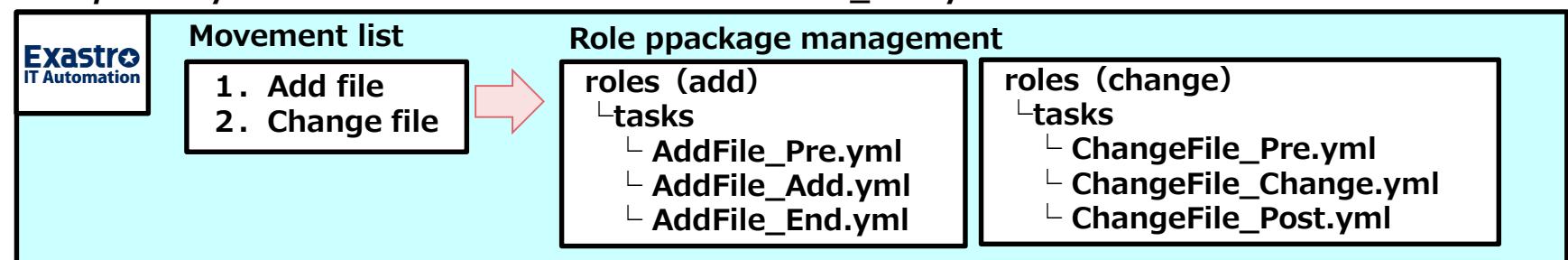
SOLUTION

② Decide on a naming convention in advance and don't allow files with same name

Ansible Role allows for files with same name but different packages.

However, as this often leads to bugs, we recommend deciding on a naming convention and forbidding files with same name.

Example: Playbooks are named in this format "Process_XXX.yml"



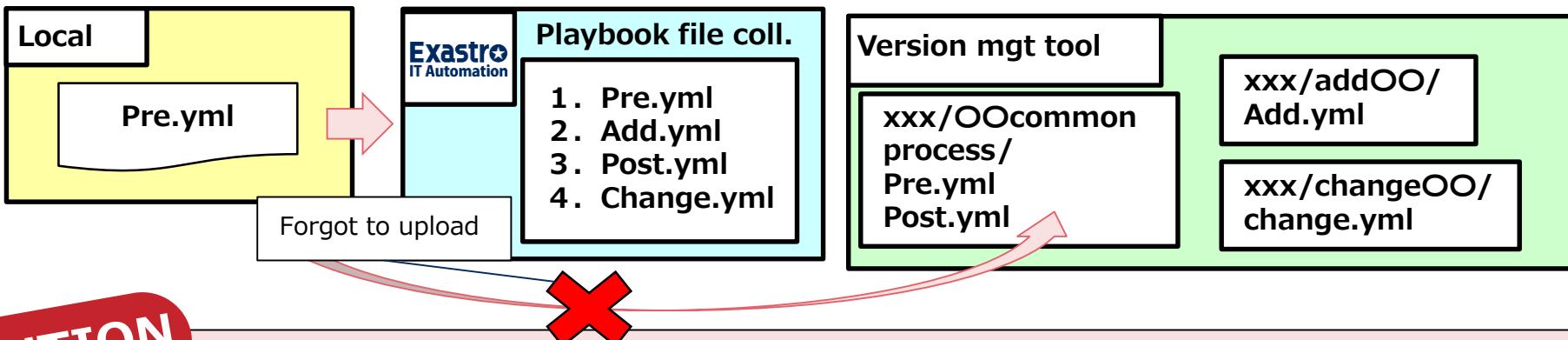
Step 2 : Actualize Automatic Execution

Tasks

PROBLEM

③ There are differences in playbook contents between the Version management tool and ITA.

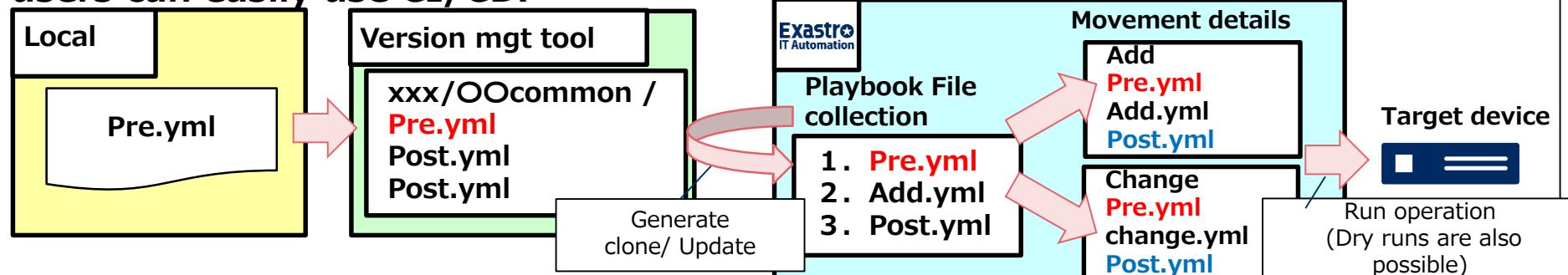
When adding and repairing Playbooks, we upload them both to ITA and a version management tool (Git, and such), but I forgot to upload it to ITA, meaning that the fix/new one wont get displayed.



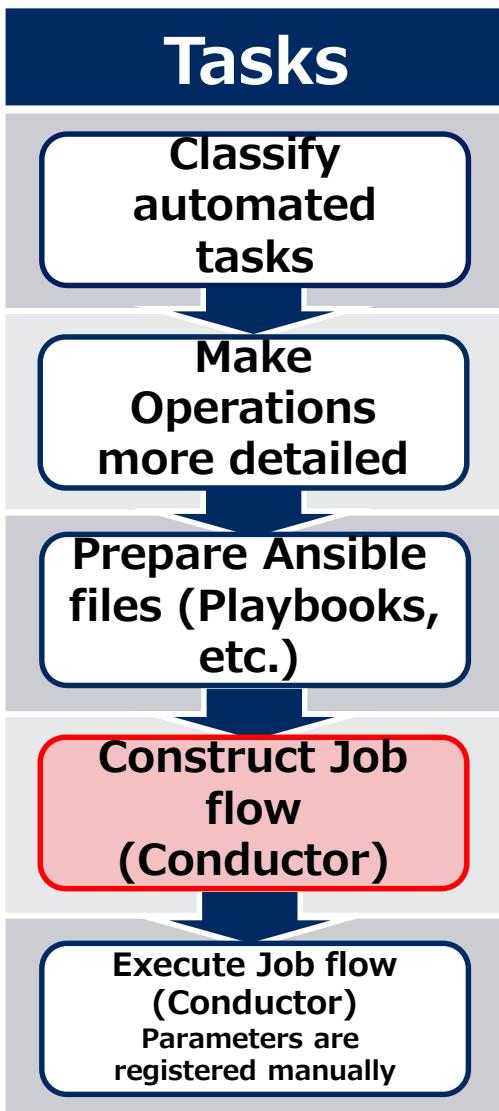
SOLUTION

③ Manage using ITA's CI/CD for IaC function.

For cases like these, we recommend that you use the ITA CI/CD for IaC function. This function automatically updates the files uploaded to ITA when the files in the version management tools are updated. If linked together with a Movement, users can easily use CI/CD.



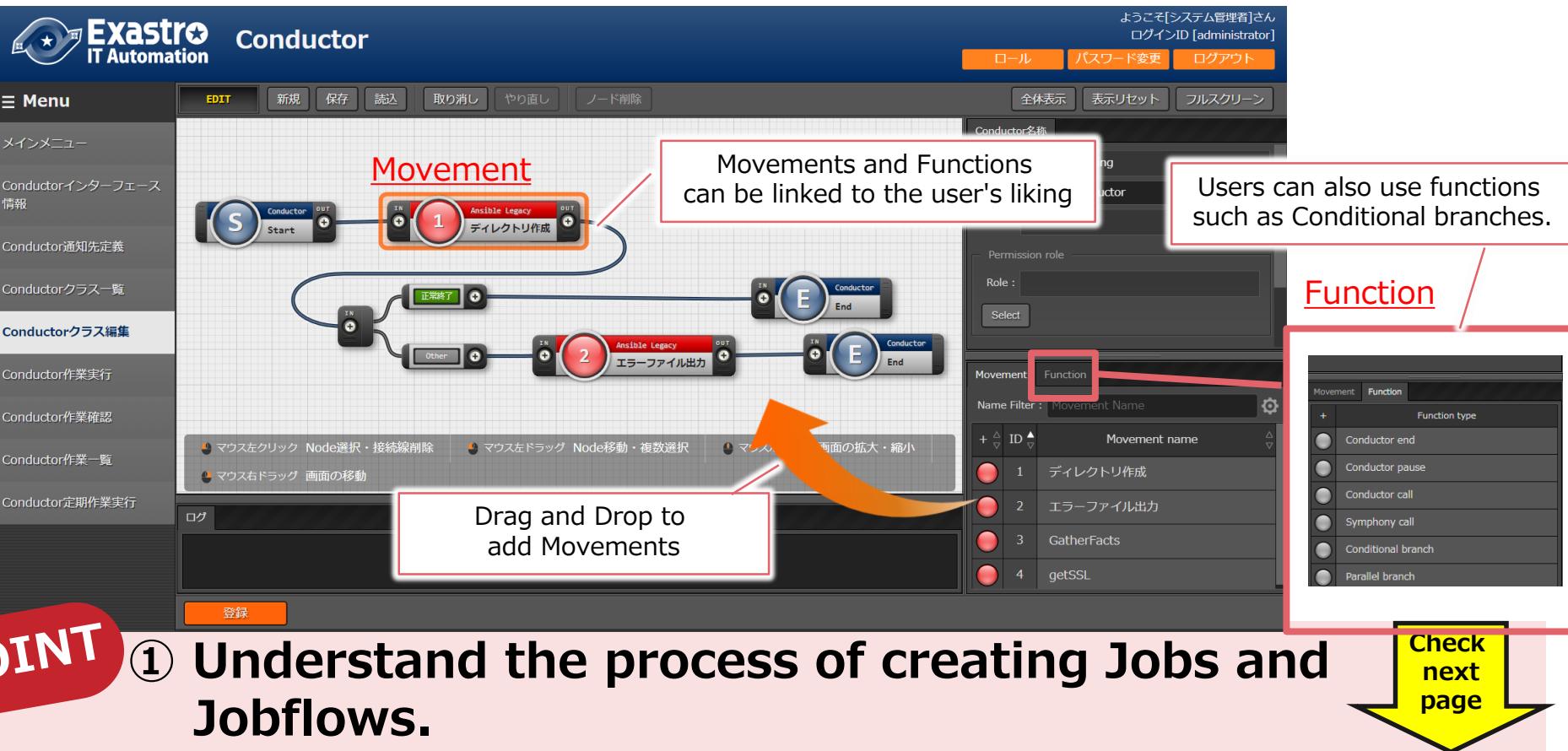
Step 2 : Actualize Automatic Execution



Task explanation

Create a Jobflow in IT Automation.

【Jobflow Creation screen】



Step 2 : Actualize Automatic Execution

Tasks

Classify automated tasks

Make Operations more detailed

Prepare Ansible files (Playbooks, etc.)

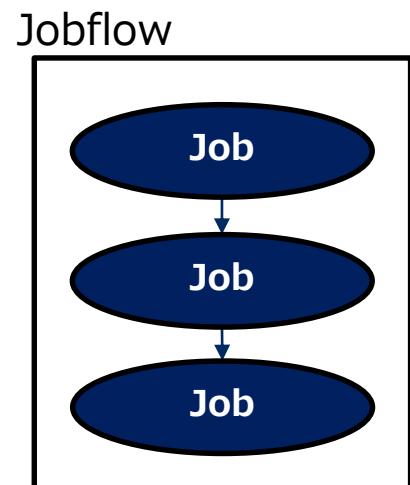
Construct Job flow (Conductor)

Execute Job flow (Conductor)
Parameters are registered manually

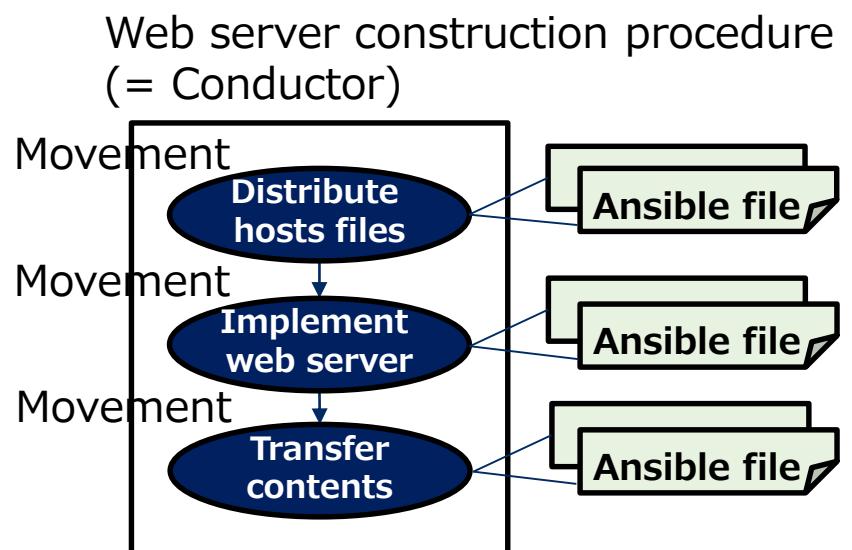
POINT

① Understand the process of creating Jobs and Jobflows.

The operations that we categorized in the first task of step 2, Classifying Automated Tasks, is called a “job”. A “Jobflow” is a string of several jobs that are executed in a specific order.



Realized with Exastro



In Exastro IT Automation, jobflows are made possible with the “Conductor” function, and “Jobs” by the “Movement” function. By linking an Ansible file (Playbook, etc.) to a movement, it becomes possible to run operations with real effects.

Step 2 : Actualize Automatic Execution

Tasks

Classify automated tasks

Make Operations more detailed

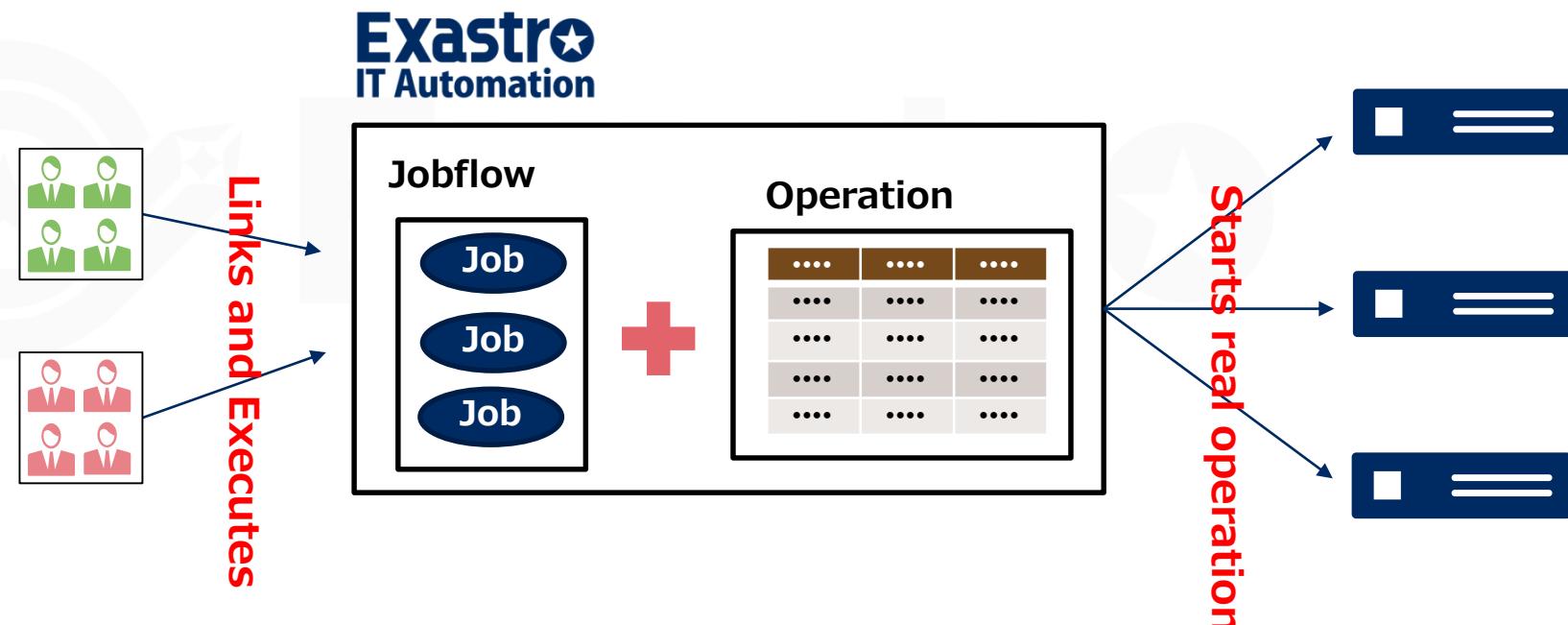
Prepare Ansible files (Playbooks, etc.)

Construct Job flow (Conductor)

Execute Job flow (Conductor)
Parameters are registered manually

Task explanation

Link Jobflow and Operation and Automatically execute the Operation.

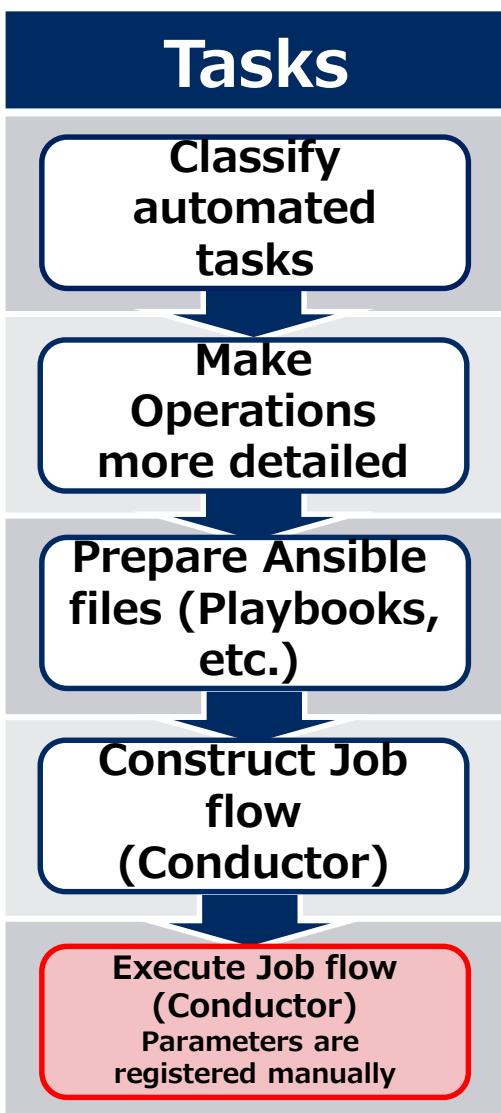


POINT

① Understand the relationship between Operations and Jobflows

Check next page

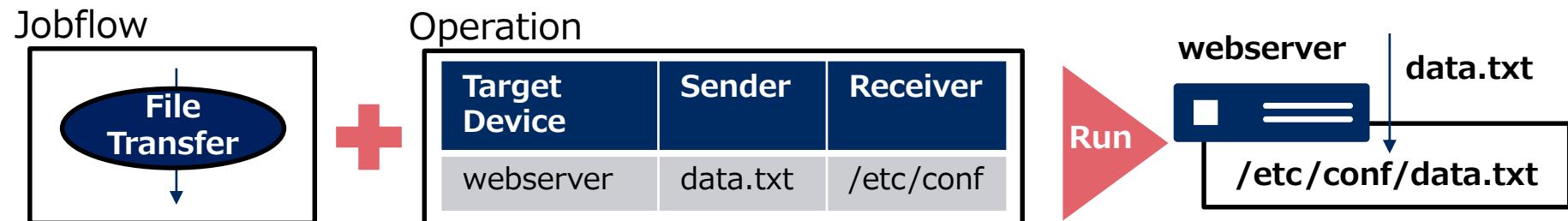
Step 2 : Actualize Automatic Execution



POINT

① Understand the relationship between Operations and Jobflows

An Operation links a target device and specific setting values to a Jobflow. The following illustrates a simple Jobflow that transfers files to a server.



With the help of the Operation, “Target Device” ,“Sender” and “Receiver” gets linked to the Jobflow. The combination above deploys Data.txt to the web server.

By changing the inside of the Operation, we can choose to send different files to different target devices.

Automation Preparation

Step 1 : Central management of the system info.

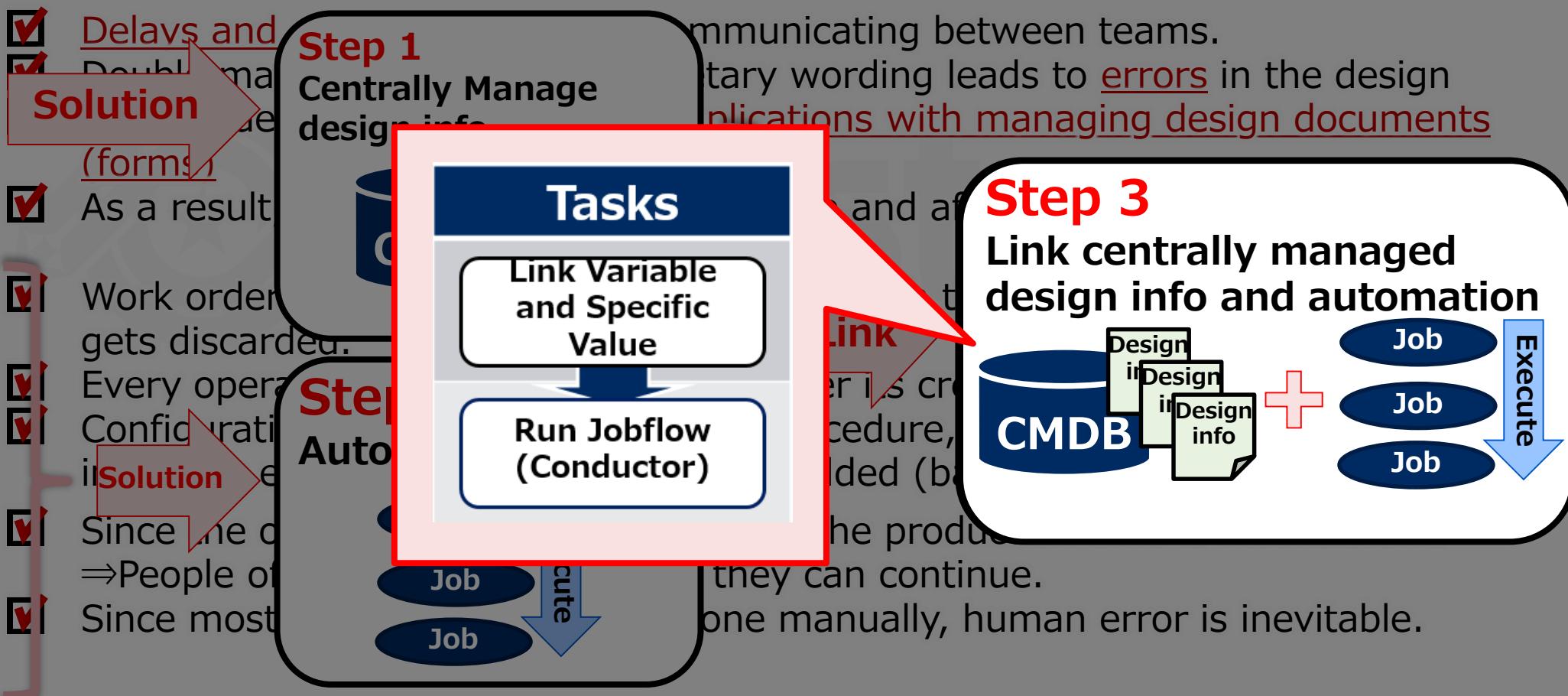
Step 2 : Actualize Automatic Execution.

Step 3 : Connect Design info and Automated Executions.



Step 3 : Connect Design info and Automated Executions

The following slides explains the **2 tasks** in step 3.



Step 3 : Connect Design info and Automated Executions

Tasks

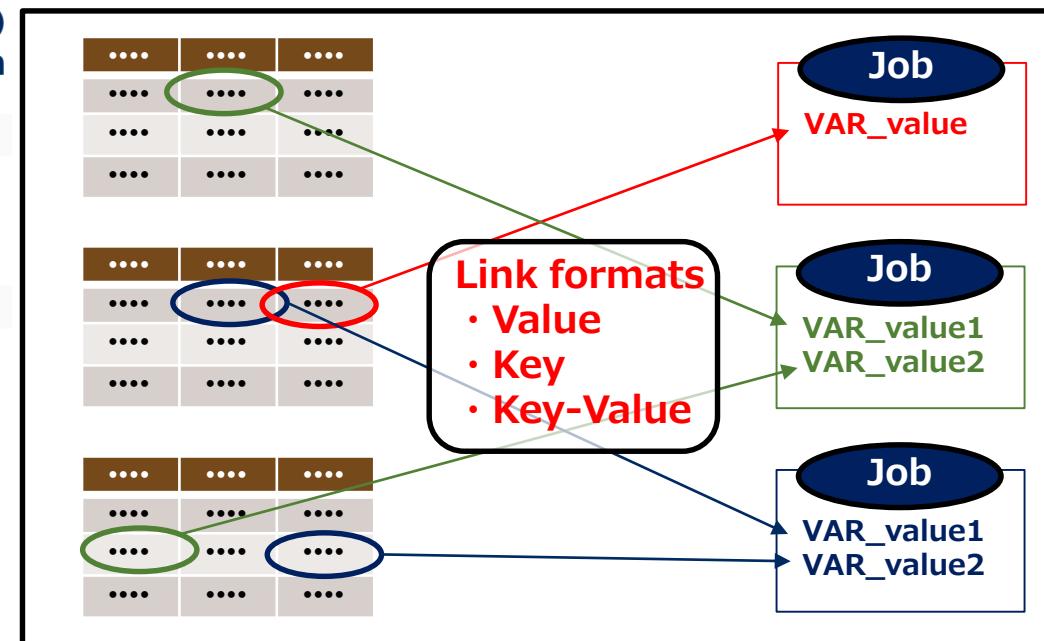
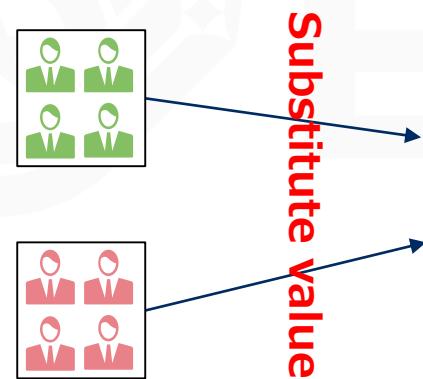
Link Variable
and Specific
Value

Run Jobflow
(Conductor)

Task explanation

Use the “Substitute automatic value registration list” function in IT Automation to link the parameter sheet values and the job variables.

Exastro
IT Automation



POINT

- ① How to use Value-types
- ② How to use Key-types
- ③ How to use Key-Value types

Check
next
page

Step 3 : Connect Design info and Automated Executions

Tasks

Link Variable
and Specific
Value

Run Jobflow
(Conductor)

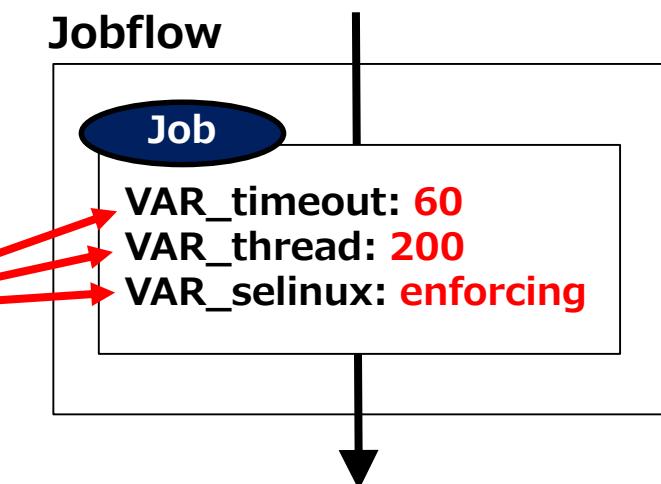
POINT

① How to use Value-types

Value type is a basic type and links the values inside the chart to the variables. It can be used for many things, such as for system settings and command line arguments.

The following illustrates how variables are linked to each of the server type settings.

Host name	Time out	Threads	SELinux
web1	60	200	enforcing
web2	60	200	enforcing
db-server	30	50	permissive



In the example above, each value in “web2” is linked with the job variables.

Step 3 : Connect Design info and Automated Executions

Tasks

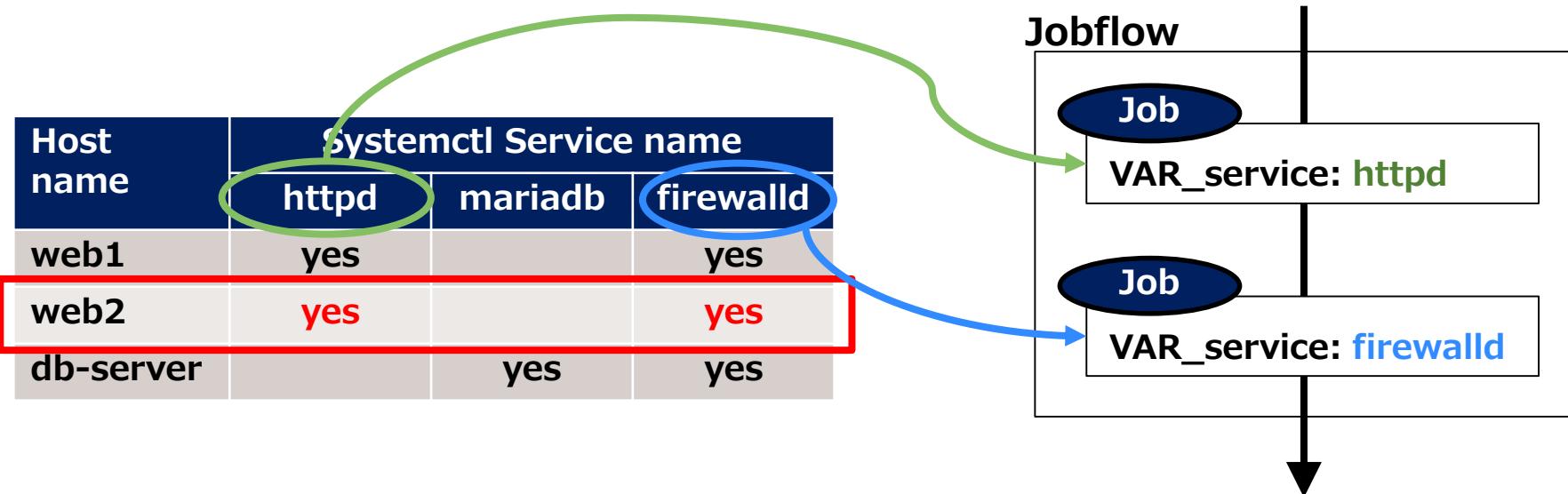
Link Variable
and Specific
Value

Run Jobflow
(Conductor)

POINT

② How to use Key-types

Key type is used to tie table column names to variables. It is mainly used as a flag. The following shows an example on how variables are linked to running services on a server.



In the example above, "Web2" has the columns, "httpd" and "firewalld" set to "yes", so the column names will be linked to the values of the variables and then execute the job.

Step 3 : Connect Design info and Automated Executions

Tasks

Link Variable
and Specific
Value

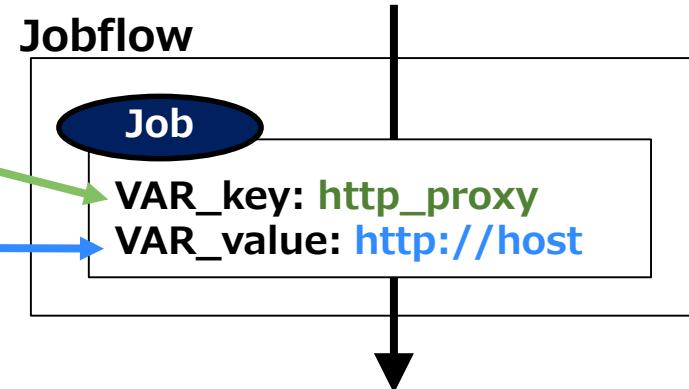
Run Jobflow
(Conductor)

POINT

③ How to use Key-Value types

Key-Value types can be used to tie both the key and value to a variable. The following example shows how to set environment variables on the server using the Environment variable definition table.

Host name	PATH	http_proxy
web1	/bin:/usr/bin	http://host
web2	/bin:/usr/bin	http://host
db-server	/bin:/sbin	http://proxy



In the example above, the column name is the environment name.

Both the environment variable name, “http_proxy”, and its value ,“http://host” are linked to the variable.

Step 3 : Connect Design info and Automated Executions

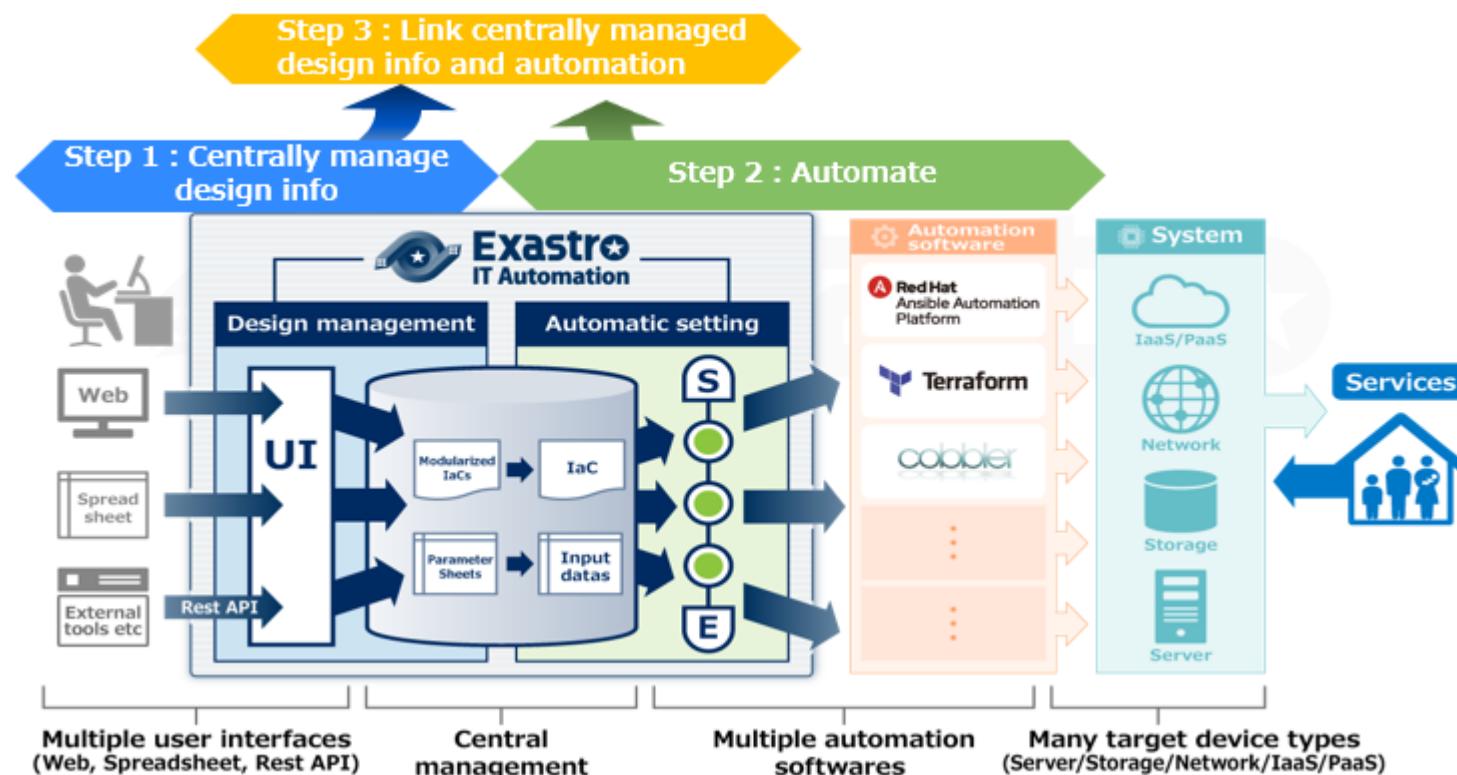
Tasks

Link Variable
and Specific
Value

Run Jobflow
(Conductor)

Task explanation

Link Jobflow and Operation and automatically execute the operation.
Users can create systems by using these two actions:
Edit parameters→ Execute.



- Implementing automated SI
Effects and Estimations
Post-Automation Process changes and results.



- Implementing automated SI
Effects and Estimations
Post-Automation Process changes and results.



Estimate the effects of the operation (repost)

Estimate the effects of the operations and arrange them by priority.

Once we know the effects, we can prioritize the tasks and decide whether to automate them or not. Estimated effects includes the number of times the operation is used per year, the number of target devices and the number of man-hours per project.

Operation	Times used	Number of devices	Man-hour per worker	Man-hour	Priority	Remarks
OS settings	50	50	10H	5H	High	Requires 2 persons
Distribute Hosts files	200	50	1H	0.5H	Middle	Updates 4 times a year
Implement monitor agent	30	30	5H	5H	Low	
Update Web contents	600	5	1H	1H	High	Updates 10 times a month
Summarize Access log	60	5	2H	2H	Low	Executed at the end of the month

If the number isn't a quantitative number, it is possible to sort them by "Large", "Medium", or "Small". The following is an example of an organized list of operations with priority.

Case: Constructing Network Device(1/2)

Overview

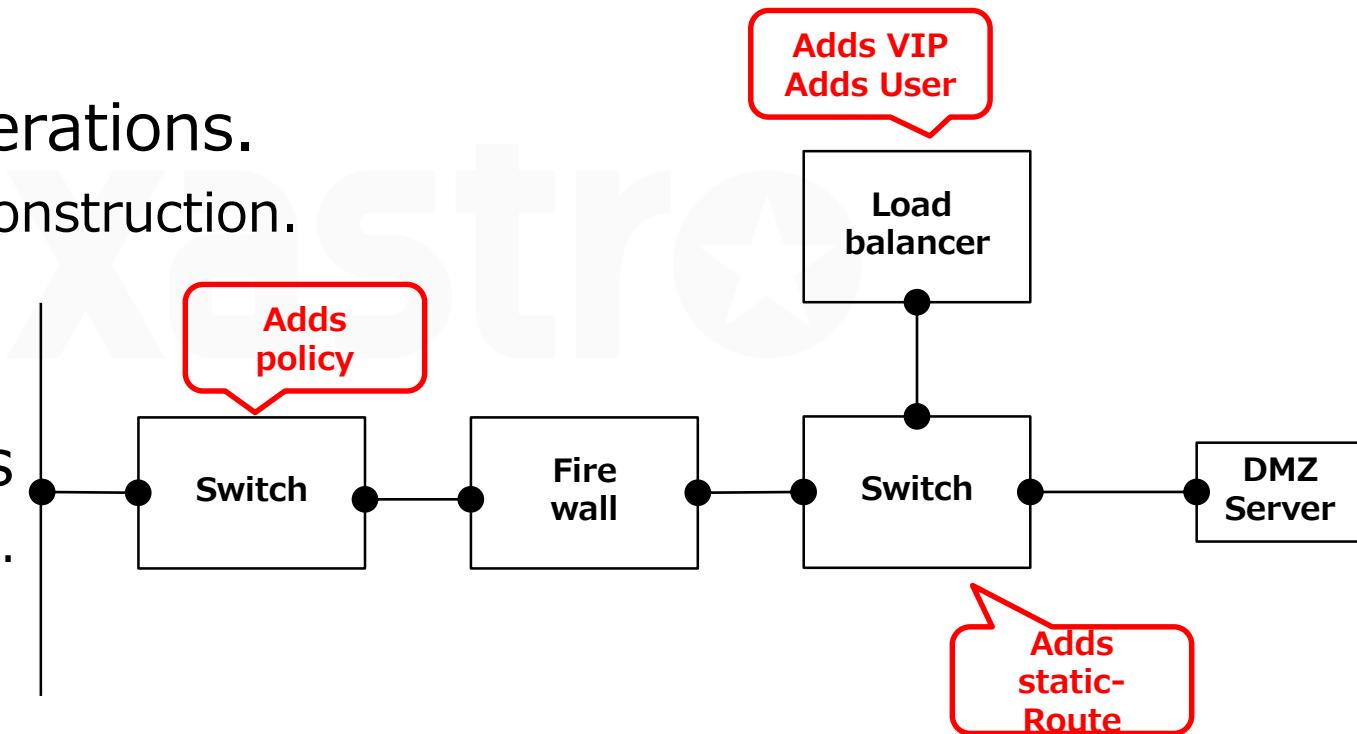
- Adding more network devices in a carrier type system
- Automate the operations of adding virtual IP and compare the operational costs of with and without automation.

Construction of the automated operations.

- Refer to the picture on the left for the construction.
- Total of 30 network devices

Automation construction and tasks

- Add Virtual IP and Member to Load balancer.
- Add policy to firewall
- Add static-route to switch.



Case: Constructing Network Device(2/2)

Increase/Decrease in man-hours before and after automation + added work.

		Defining	Basic Design	Detailed Design	Operation design	Production	Evaluation		Total
Before	Hours(Per worker)	20.1	22.4	11.2	0	19.7	12	58.4	143.8
After	Hours(Per worker)	28.7	20.6	20.3	0	12.1	4	9.5	95.2
	Increase/Decrease(%)	(↑ 43%)	(↓ 8%)	(↑ 81%)	-----	(↓ 39%)	(↓ 67%)	(↓ 84%)	(↓ 34%)
Added work	Consider Automation			Register CMDB		Run Jobflow			

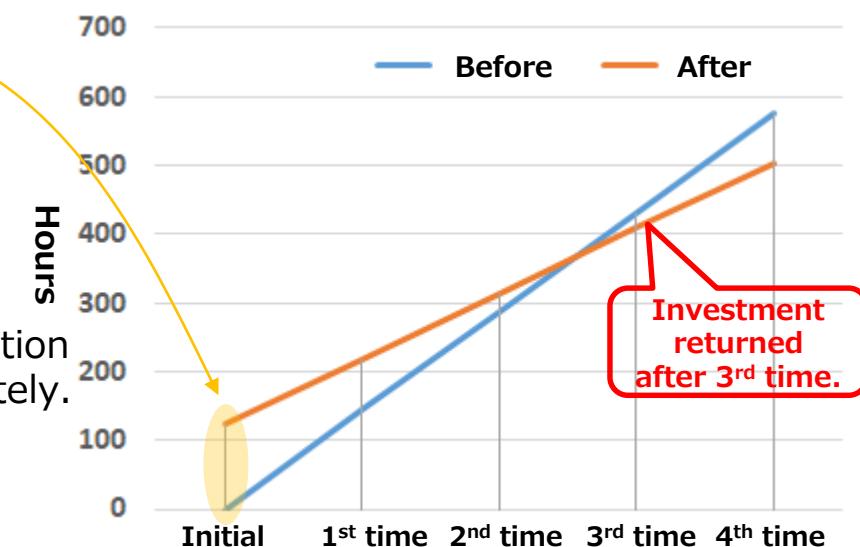
Return on Investment Concept.

- Man-hours used for Automation (Initial) : 123.4H
 - Step 1 : 44.7H Step 2 : 63.5H Step 3 : 15.2H
- Hours before Automation : 143.8H ⇒ After Automation : 95.2H
 - The number of man hours is reduced by 34%. Additionally, the investment returns profit after the **Third time** (including the Initial stage)
- Depending on the case, preparation for automation and implementing the automation may be done separately or at the same time. In this case, they were done separately.

Implemented at the same time



Individually implemented



Graph of Man-hours (costs)

- Implementing automated SI
Effects and Estimations
Post-Automation Process changes and results.



Defining Requirements

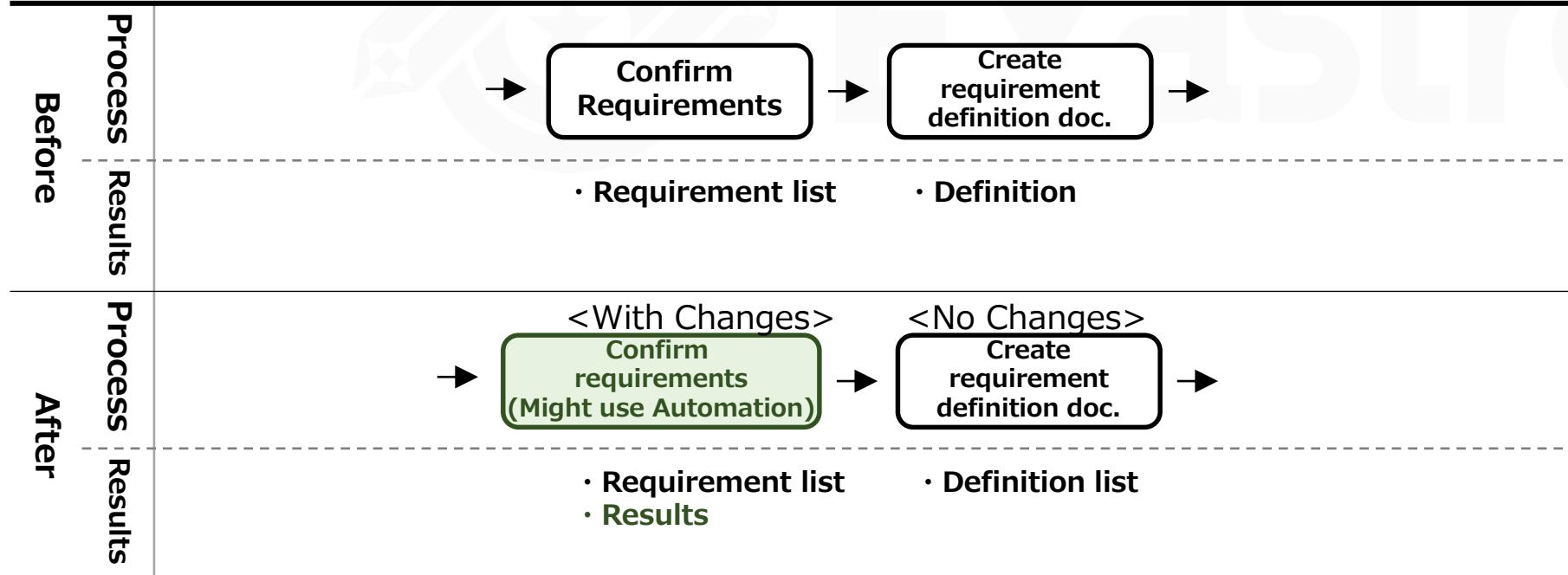
Changes in QCD per phase

Legend: 😊 No changes 😃 Better 🤖 Might have additional work

	Defining	Design	Det. Design	Op. Design	Production	Test	Release
	Q C D	Q C D	Q C D	Q C D	Q C D	Q C D	Q C D
Before	😊 😊 😊	😊 😊 😊	😊 😊 😊	😊 😊 😊	😊 😊 😊	😊 😊 😊	😊 😊 😊
After	😊 🤖 🤖	😊 😊 😊	😃 😃 😃	😊 😊 😊	😃 😃 😃	😊 😊 😊	😃 😃 😃

Product and Process changes

Legend : No changes Work With changes Work Add Work Delete Work



Explanation

At the defining stage, the scope of where Automation should be applied, etc. needs to be discussed and agreed upon. Therefore, C and D will increase.

Design

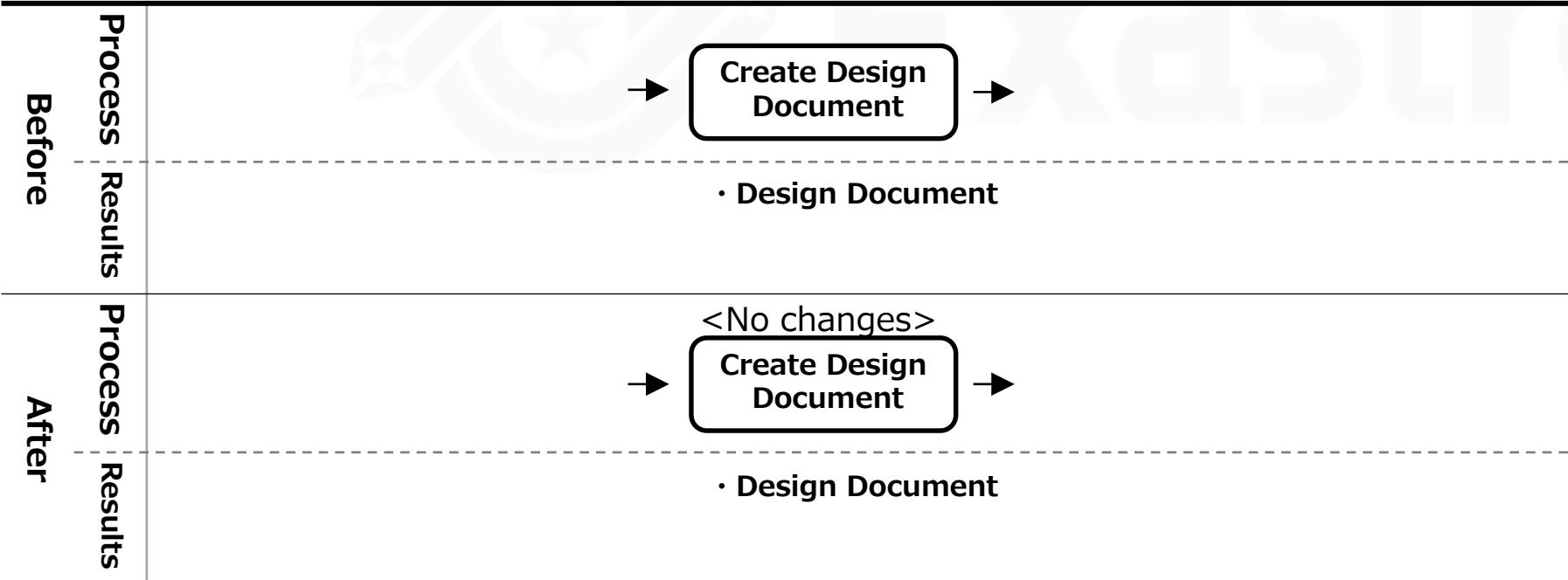
Changes in QCD per phase

Legend: No changes Better Might have additional work

	Defining			Design			Det.Design			Op. Design			Production			Test			Release		
	Q	C	D	Q	C	D	Q	C	D	Q	C	D	Q	C	D	Q	C	D	Q	C	D
Before																					
After																					

Product and Process changes

Legend : No changes Work With changes Add Delete



Explanation

Since the contents that are going to get incorporated into the Design phase already is decided in the preparation phase, there is no work to be added here.

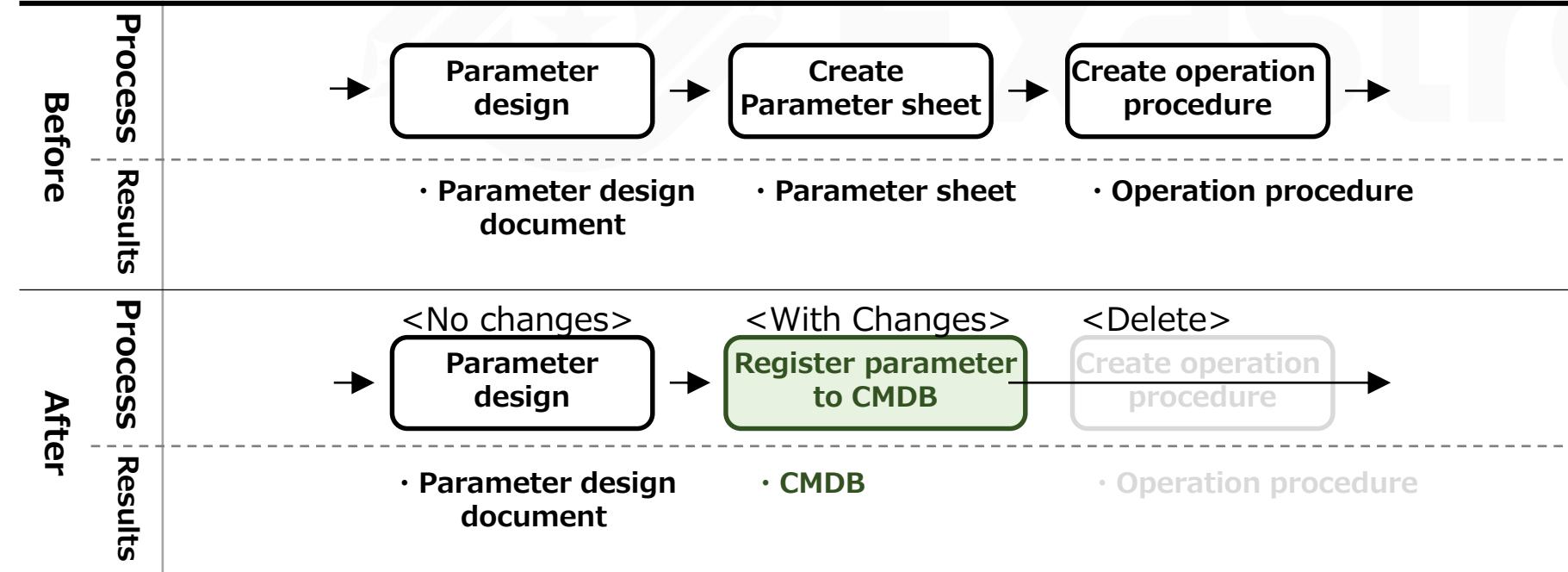
Changes in QCD per phase

Legend: 😊 No changes 😃 Better 🤖 Might have additional work

	Defining	Design	Det.Design	Op. Design	Production	Test	Release
	Q C D	Q C D	Q C D	Q C D	Q C D	Q C D	Q C D
Before	😊 😊 😊	😊 😊 😊	😊 😊 😊	😊 😊 😊	😊 😊 😊	😊 😊 😊	😊 😊 😊
After	😊 🤖 🤖	😊 😊 😊	😃 😃 😃	😊 😊 😊	😃 😃 😃	😊 😊 😊	😃 😃 😃

Product and Process changes

Legend : No changes Work With changes Work Add Work Delete Work



Explanation

Parameters created in the parameter design will be registered to the CMDB. This will formalize parameters and help eliminate ambiguity, improving Q.

Additionally, the operation procedures, such as the order of application of parameters, will be replaced by the job flow created in the early preparation stage. As a result, creating operation procedures will be deleted. This will improve both C and D.

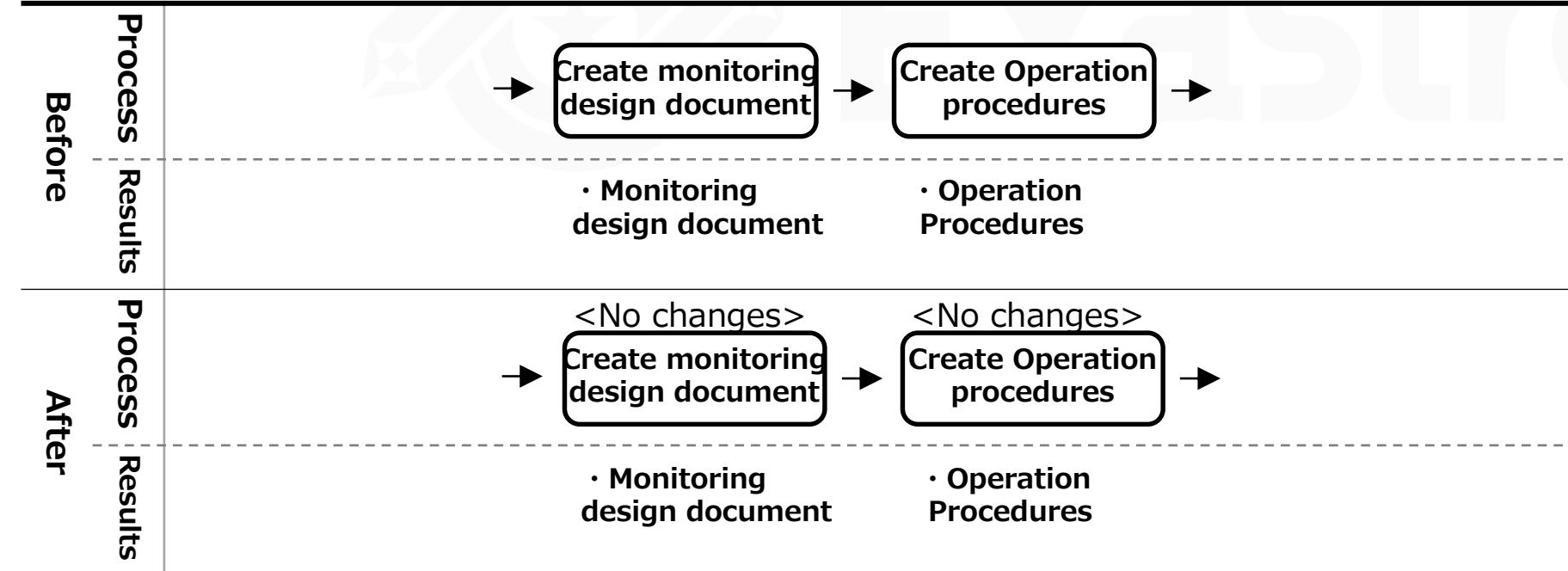
Changes in QCD per phase

Legend: ☺ No changes ☺ Better ☺ Might have additional work

	Defining	Design	Det.Design	Op. Design	Production	Test	Release
	Q C D	Q C D	Q C D	Q C D	Q C D	Q C D	Q C D
Before	☺ ☺ ☺	☺ ☺ ☺	☺ ☺ ☺	☺ ☺ ☺	☺ ☺ ☺	☺ ☺ ☺	☺ ☺ ☺
After	☺ ☺ ☺	☺ ☺ ☺	☺ ☺ ☺	☺ ☺ ☺	☺ ☺ ☺	☺ ☺ ☺	☺ ☺ ☺

Product and Process changes

Legend : No changes Work With changes Work Add Work Delete Work



Explanation

Since this section focuses on automating construction, automating the operations is not taken into consideration.

When operational automation is implemented, the process and QCD will most likely change.

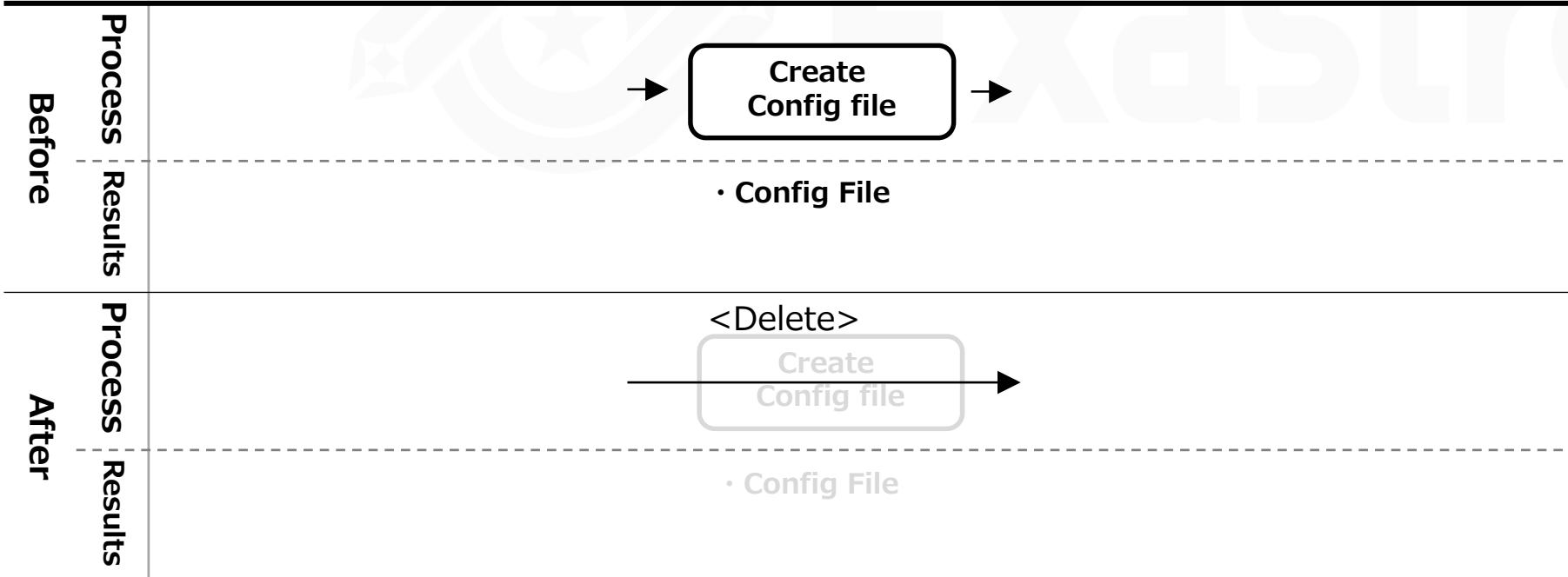
Production

Changes in QCD per phase

	Defining	Design	Det.Design	Op. Design	Production	Test	Release
	Q C D	Q C D	Q C D	Q C D	Q C D	Q C D	Q C D
Before	😊 😊 😊	😊 😊 😊	😊 😊 😊	😊 😊 😊	😊 😊 😊	😊 😊 😊	😊 😊 😊
After	😊 😊 😊	😊 😊 😊	😊 😊 😊	😊 😊 😊	😊 😊 😊	😊 😊 😊	😊 😊 😊

Product and Process changes

Legend : No changes Work With changes Work Add Work Delete Work



Explanation

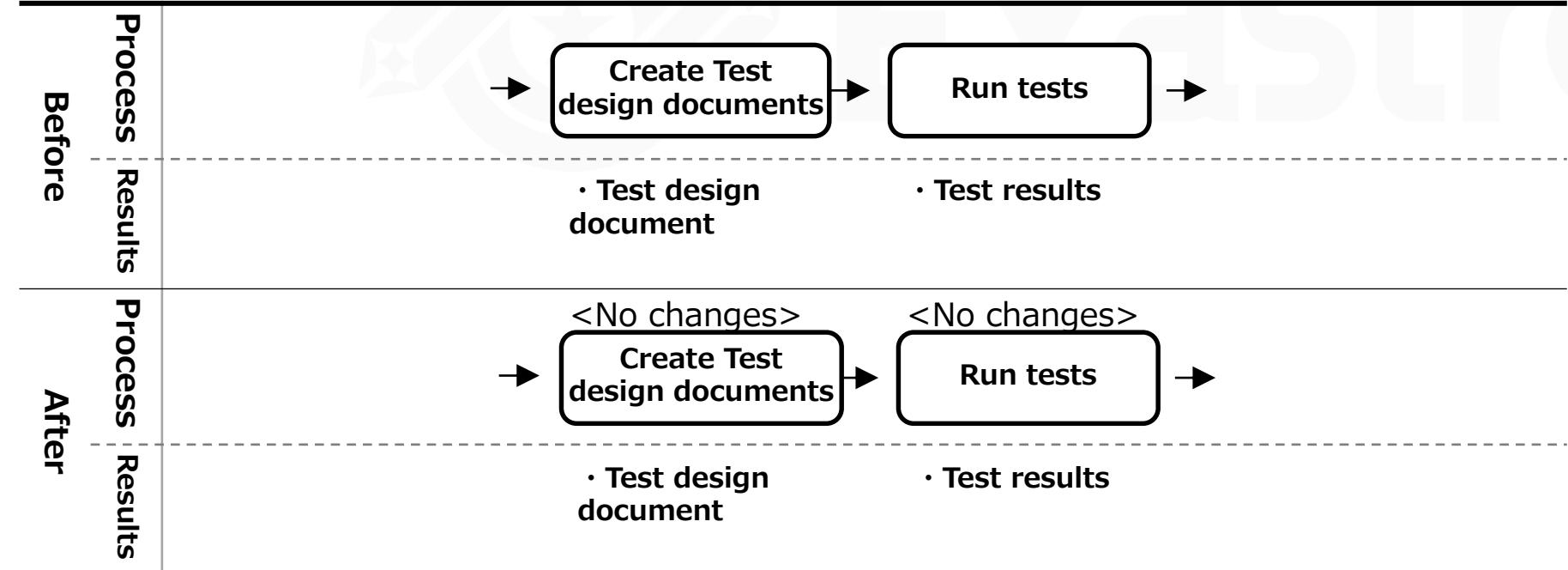
The configuration file is created based on the Detailed design. It is automatically generated from IaC and CMDB, so the tasks of creating config files is deleted.

Changes in QCD per phase

	Defining	Design	Det.Design	Op. Design	Production	Test	Release								
	Q	C	D	Q	C	D	Q	C	D	Q	C	D	Q	C	D
Before	😊	😊	😊	😊	😊	😊	😊	😊	😊	😊	😊	😊	😊	😊	😊
After	😊	😊	😊	😊	😊	😊	😊	😊	😊	😊	😊	😊	😊	😊	😊

Product and Process changes

Legend : No changes Work With changes Work Add Work Delete Work



Explanation

Again, this time, we're focusing on automating the construction of a system. Therefore, the test itself is not getting automated.

Similar to the production phase, the QCD/process will change if the test phase is automated.

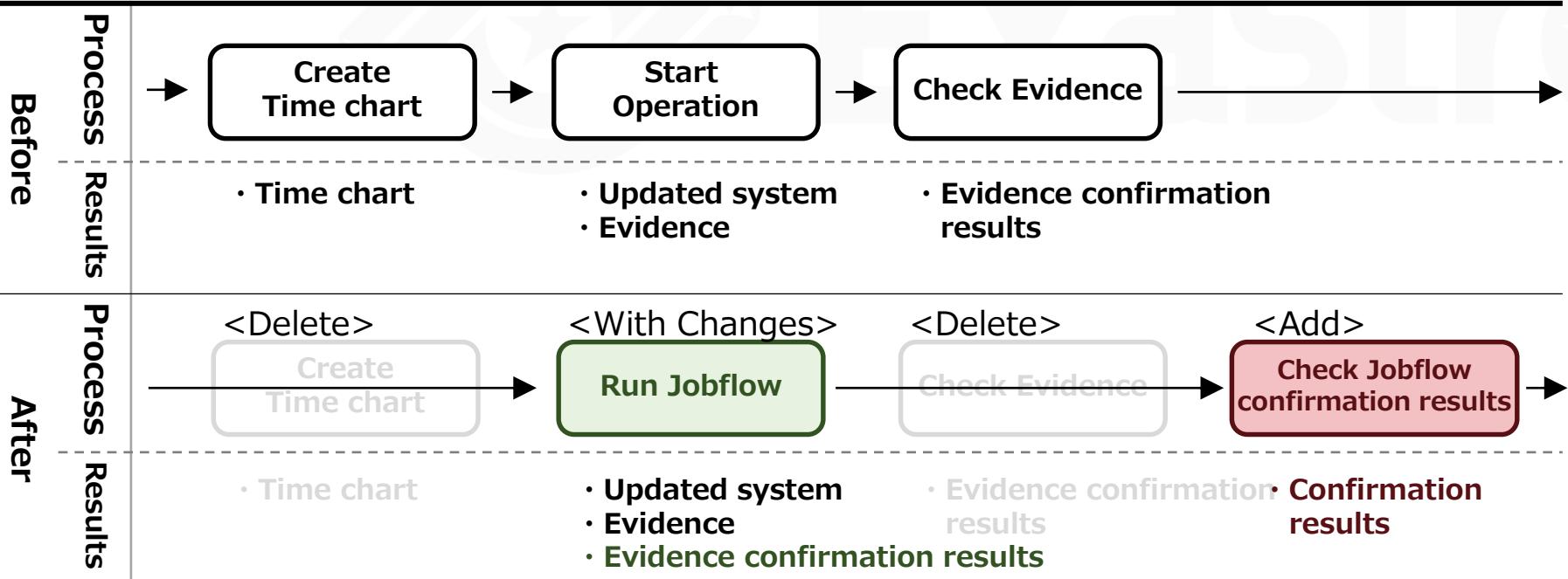
Release

Changes in QCD per phase

	Defining	Design	Detailed Design	Op. Design	Production	Test	Release								
	Q	C	D	Q	C	D	Q	C	D	Q	C	D	Q	C	D
Before	😊	😊	😊	😊	😊	😊	😊	😊	😊	😊	😊	😊	😊	😊	😊
After	😊	😢	😢	😊	😊	😊	😊	😊	😊	😊	😊	😊	😊	😊	😊

Product and Process changes

Legend : No changes Work With changes Work Add Work Delete Work



Explanation

The main task is to run the job flow created in the Detailed Design phase.

Since the time chart is replaced by the Jobflow, it will be deleted.

Since the evidence is checked in the Jobflow, the evidence check task will also be deleted.

Therefore, execution of the job

Summary



Summary

By following step 1-3, we can automate system operation/construction. Additionally, by changing the process, we can improve the efficiency of the automation.

TO-BE

**Automated system
construction/operation**

AS-IS

**Manual system
construction/operation**



Preparing for Automation (Step 1、Step 2、Step 3)



Implementing Automated SI(Changes to the
process and results)



Exastro 