

Strategic Innovation Promotion Program (SIP) Automated Driving for Universal Services
/ Large Scale Field Operational Test / Dynamic Maps
/ Consideration for Practical Use of the Dynamic Map Service Platform

Report (Summary)

February 2019
Dynamic Map Service Platform Consortium

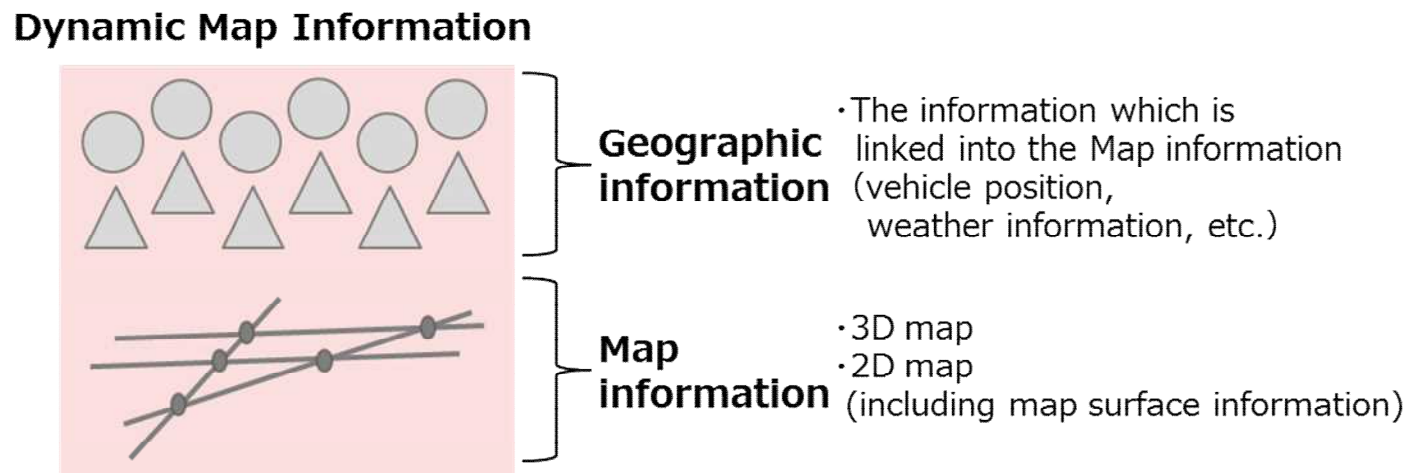
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1. Concept of the Dynamic Map Service Platform(SPF)

1.1 Definition of the Dynamic Map Information

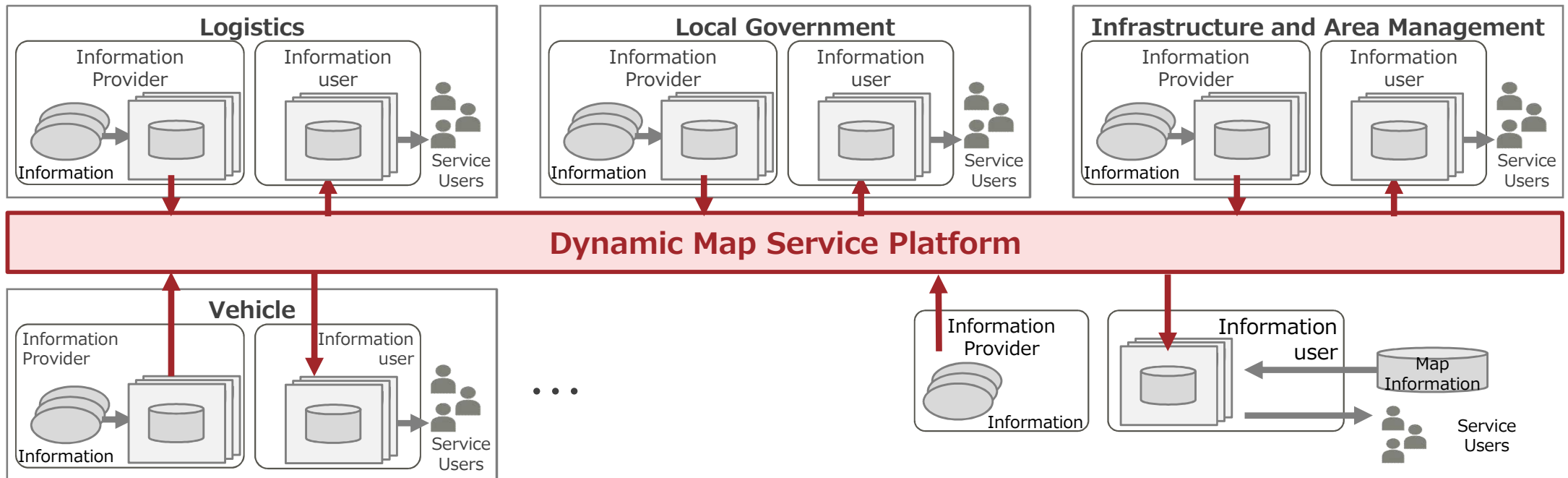
- In this project, we defined the components of the Dynamic Map information as shown below.



- The dynamic map consists of both map and geographic information. Map information includes the 3D maps made by SIP, and the 2D maps provided by map vendors. Geographic information is the generic name for information linked with map information, such as longitude, latitude, or load ID.

1.2 Outline of the Dynamic Map Service Platform

- The Dynamic Map Service Platform (SPF) has a mechanism which enables the geographic information, stored at various fields, to be utilized in various fields as shown below.



2. Organizing services provided by the SPF

2.1 Organizing services provided by the SPF

- We organized items concerning the SPF, described in the table below, based on the result of the project in 2017 fiscal year.

Items	Scope
The dynamic map information which should be handled by the SPF	We re-categorized the dynamic map information on each purpose to use it, and considered which information should be handled by the SPF.
Roles and functions of the SPF	We organized needs for the SPF, and revealed functions required for the SPF.
Benefits for the SPF users	We organized benefits for integrators who access to the SPF, and clarified the ideal image of the SPF.

- Based on the results of the above, we considered specifications of interfaces to acquire and provide various information, and action plans and system for practical use of the SPF.

2.2 The dynamic map information which should be handled by the SPF (1/5)

- In the project in 2017 fiscal year, we chose the dynamic map information that should be handled by the SPF, based on the results of considering the use cases of the SPF.
- In this project, we added information, which was requested in each field, to the above selected information through interviewing experts.
- The above information was classified into the categories listed in the table below.

No.	Categories	Explanations of the categories
1	Grasp of traffic situation	Information necessary for grasping traffic situation e.g. vehicle probe information, accident information
2	Grasp of people's movement	Information necessary for grasping people's movement e.g. people's position, SNS information related to movement of people
3	Grasp of disaster	Information which is needed for disaster prevention / disaster reduction e.g. hazard map, disaster information
4	Nature information	Information related to nature e.g. weather information, river water level
5	Maps	Map itself and information contained in maps e.g. road width information / pedestrians crossing information in maps

2.2 The dynamic map information which should be handled by the SPF (2/5)

- We chose the dynamic map information that should be handled by the SPF as listed in the table below.

※Each information was classified according to information user's needs.

Explanatory note: Level of needs ● high, ◎ middle, ○ low

No.	Information	Presence of information provider	Categories				
			Grasp of traffic situation	Grasp of people's movement	Grasp of disaster	Nature information	Map information
Information that was collected in the project in 2017 fiscal year							
1	Vehicle probe information (trucks)	exist	●				
2	Vehicle probe information (taxis)	exist	●				
3	Vehicle probe information (buses)	exist	●				
4	Vehicle probe information (construction vehicles)	exist	●				
5	Advanced traffic information (traffic information of each road lane)	exist	●				
6	Information on points where accidents occur frequently	exist	●				●
7	Weather information	exist		●	●	●	
8	Tweets	exist	○	●	●		
9	Information on spatial network model for pedestrians	exist		●			●
10	Mobile spatial statistics (population distribution)	exist		●			
11	Information on spots with frequent occurrences of rapid deceleration	exist			●		
12	Digital national land information	exist			●		
13	Road information where there is a risk of flooding	exist			●		
14	Road width information in 3D maps	exist					●

2.2 The dynamic map information which should be handled by the SPF (3/5)

No.	Information	Presence of information provider	Categories				
			Grasp of traffic situation	Grasp of people's movement	Grasp of disaster	Nature information	Map information
15	Pedestrians crossing information in 3D maps	exist					●
16	Road lane information in 3D maps	exist					●
17	2D maps (company A)	exist					◎
18	2D maps (company B)	exist					◎
19	3D maps	exist					○
Information that was chosen from viewpoint of the necessity to realize the service models which utilize the SPF							
20	Operation information of public transportation (e.g. trains, buses)	-	●	●			
21	Vehicle probe information (common vehicles)	exist	●				
22	Traffic jam information	exist	◎	●			
23	traffic restriction information (width, height, and weight restriction)	exist					●
24	In-vehicle camera information	-	◎		◎		
25	Information on point to avoid travelling	exist	◎				
26	VICS information	exist	◎				
27	Information on traffic jam prediction	-	◎				
28	Images on drive recorder of commercial vehicle	exist	◎				
29	Images on roadside camera	-	◎				
30	Information on road lane restrictions (static information)	-	◎				
31	Information on travel history	exist	◎				
32	Vehicle probe information (special vehicles)	exist	◎				
33	Predictions of human movement flow and traffic	exist		◎			
34	Signals for pedestrians	-		◎			○
35	Information on disasters that occurred in the past	-			◎		
36	Current disaster information	-			◎		
37	Information on street trees	-	○			◎	

2.2 The dynamic map information which should be handled by the SPF (4/5)

No.	Information	Presence of information provider	Categories				
			Grasp of traffic situation	Grasp of people's movement	Grasp of disaster	Nature information	Map information
38	Information on underground facilities (position, depth)	exist					◎
39	Route according to vehicle body size	-	○				○
40	Information on parked vehicles	-	○				
41	Information on driving action prediction of surrounding vehicles	-	○				
42	Information on behavior prediction of surrounding pedestrians	-	○				
43	Information on operation routes around construction sites	-	○				
44	Information on accident vehicle position	-	○				
45	Parking information	-	○				
46	Information on regional events	-		○			
47	Usage status of bicycle sharing	-		○			
48	Information on situation where emergency vehicles are heading	exist			○		
49	Information on neighborhood agreement	exist					○
50	Information on shipping destinations	-					○
51	Rest area for drivers	-					○
52	Information on restrooms	-					○
53	Pedestrians crossing information (information for drawing figures)	-					○
54	Rest area information (bench)	-					○
55	Barrier information	-					○

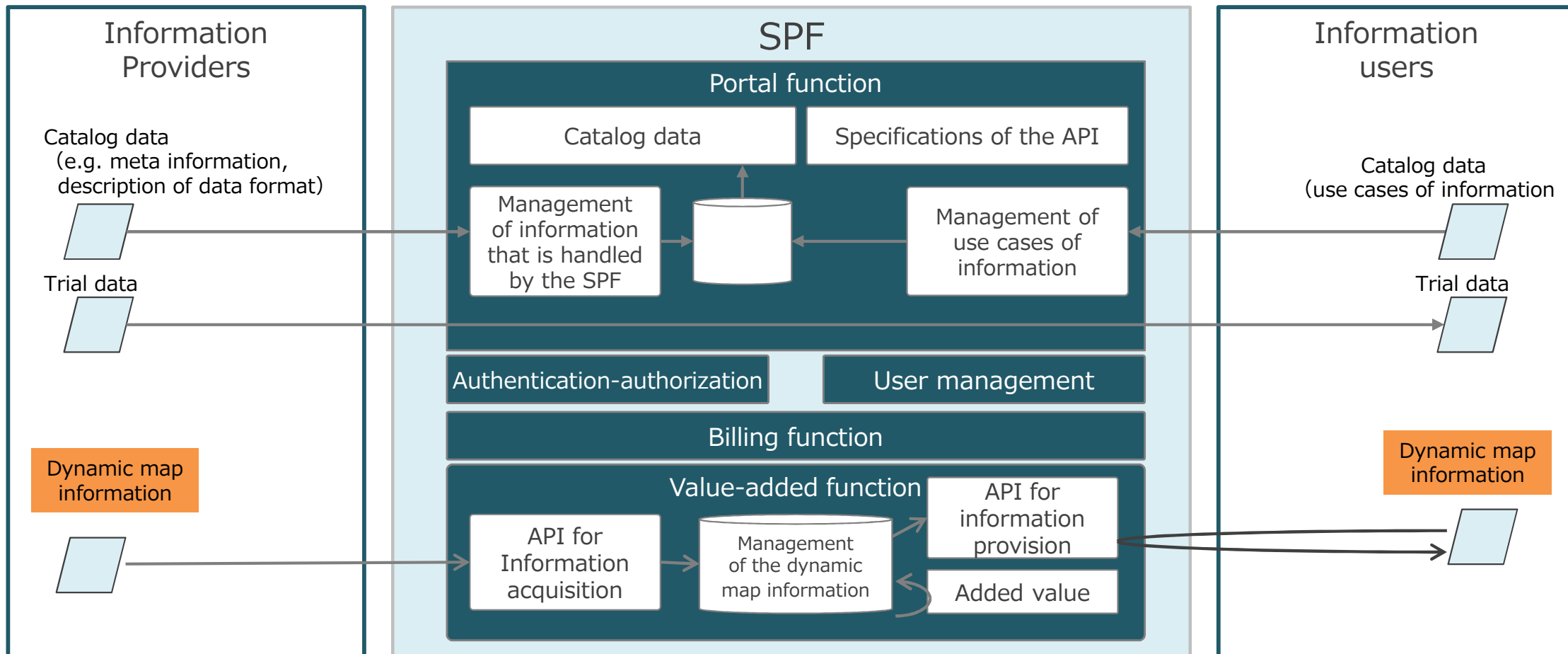
2.2 The dynamic map information which should be handled by the SPF (5/5)

No.	Information	Presence of information provider	Categories				
			Grasp of traffic situation	Grasp of people's movement	Grasp of disaster	Nature information	Map information
Information that was chosen from viewpoint of the sufficiency to achieve purpose of each category							
56	Vehicle probe information (common vehicles)	exist	●				
57	Information on signals (dynamic information)	-	◎	◎			
58	Railroad crossing information (dynamic information)	-	◎	◎			
59	Statics information of traffic jam	exist	◎				
60	Water level of river	exist				◎	
61	Information on road lane restrictions (semi-dynamic information)	-	○				
62	Height of electric wire	-					○

2.3 Roles and functions of the SPF

- Based on the needs of information providers and information users, system functions of the SPF that had been considered in the project in 2017 fiscal year were arranged as described below.

- ✓ Portal function : Providing contents of information that is handled by the SPF and specifications of API
- ✓ Authentication-authorization/user management: Managing the access authority to the SPF, and user information of the SPF
- ✓ Billing function : Managing information required for billing the SPF usage fee.
- ✓ Value-added function : Providing value-added information (e.g. format-optimized information)



2.4 Benefits for the SPF users

- Results of organizing benefits of utilizing the SPF from the SPF user's point of view are as described below.

No.	Categories	Benefits
1	Function	The SPF manages various information as to be overlapped easily to maps. (e.g. The SPF users can get various information by specifying the certain area and time zone)
2	Interface	Various information can be collected by one interface. As a result, the SPF users can reduce work hours of developing interfaces to get various information.
3	Business	It is easy for the SPF users to expand ideas for new business because the SPF provides various information to its users.
4	Data	The SPF users can get various information from reliable information providers.
5	Rule	The SPF unifies rules of handling various information, such as range of use of information, ownership of artifacts based on various information.

3. Interface Specifications of the SPF

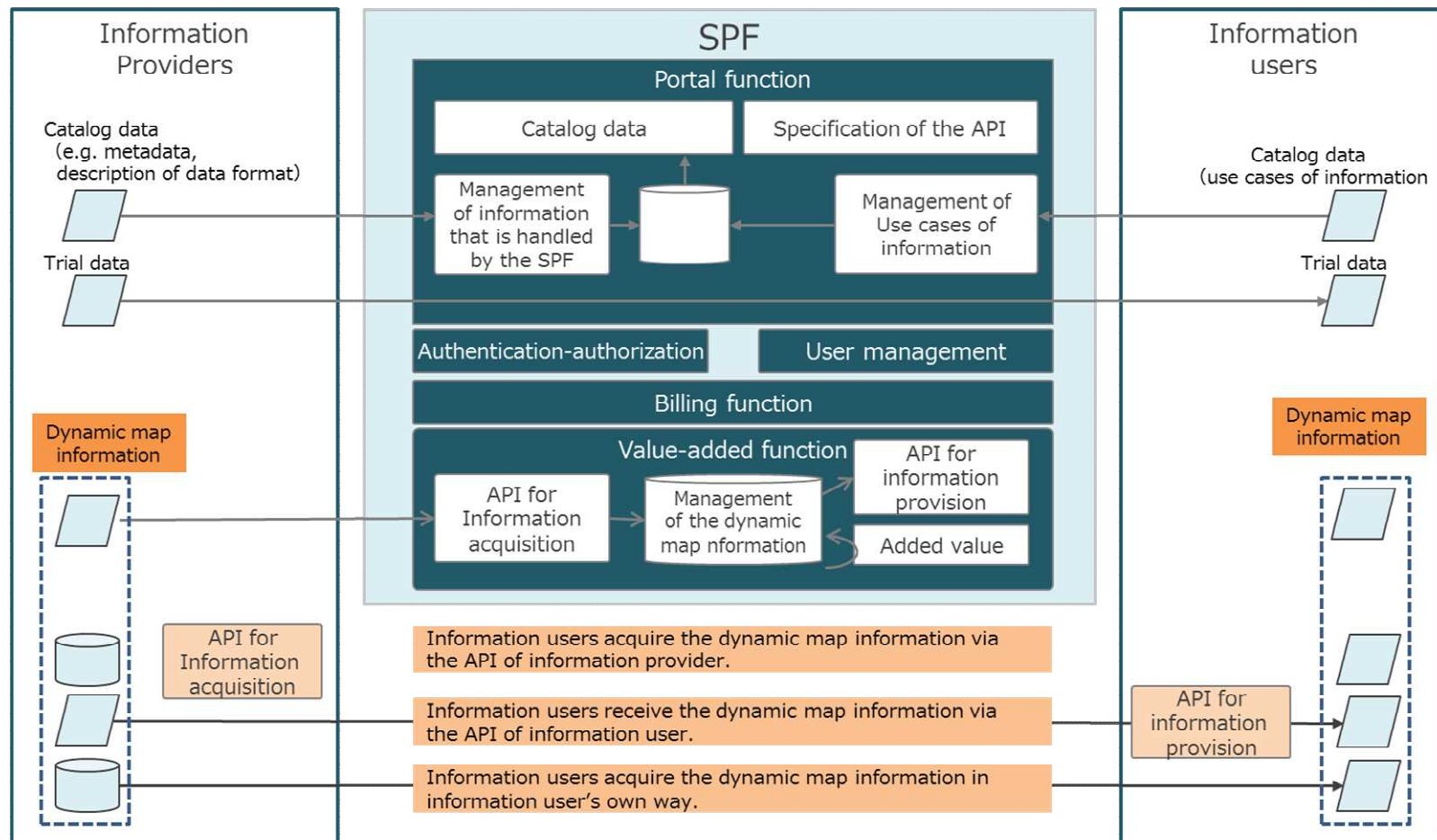
3.1 Specifications of interfaces to acquire/provide information

- We considered the necessary functions for the SPF.
(e.g. interfaces to get/provide information)
- We interviewed experts on the handling of public information, and considered cooperation with public information provider.

Items	Scope
Consideration of data processing method	We considered the data processing method to provide information to information users (e.g. to get/manage/provide information)
Consideration of specifications of the interfaces to get/provide information	We revised the specifications of the API which was created in the project in 2017 fiscal year.
Consideration of cooperation with public information provider	We considered cooperation with G-spatial information center that provides various public information.

3.2 Consideration of data processing method

- For the following reasons, we added an assumption that the dynamic map information is sent/received without going through the SPF, and organized the interface specifications.
 - There are companies that send and receive information in their own format.
 - There are information providers that don't want to store their information in the SPF.
- When we considered the interface specifications, we took into account that information providers and information users can select suitable data format to send and receive the dynamic map information.



3.3 Consideration of specifications of the interfaces to get/provide information

- We clarified the tasks related to the specifications of the API for information provision created in the project in 2017 fiscal year and revised the specifications to solve it.

No	Tasks	Contents added to the specifications
1	Checking the update of the dynamic map information with low update frequency.	- Definition of update date and time in HTTP header - Processing to check the above definition
2	Supporting binary data (e.g. images of in-vehicle camera, images/pictures of Twitter or other SNS)	- Supporting for binary data by BASE64 encoding or referring URI
3	Supporting large size data	- Method to divide data to send and receive large size data
4	Supporting data narrowing conditions other than time and space	- How to designate certain keywords as the narrowing conditions
5	Increasing conditions for specifying space	- Adding conditions to specify space (administrative code, space range, walking link ID)

- Based on the above activity, we considered the specifications of the API for information acquisition that is utilized by information providers to send the dynamic map information to information users.

3.4 Consideration of cooperation with public information provider

- We interviewed the G-spatial information center that provides various public information, and considered how to collaborate with them.

(1) Features of the G-spatial information center and the SPF

- The G-spatial information center mainly provides static public information. On the other hand, the dynamic private information is a candidate as information handled by the SPF.
- The G-spatial information center currently provides information in individual format.
On the other hand, the SPF will provide the dynamic map information to private IT vendor in common format.

(2) Cooperation plans

- Processing the dynamic information statistically in the SPF, and providing it to information users through the G-spatial information center.
 - > It will contribute to the expansion of information utilization.
- Providing public information handled by the G-spatial information center through the SPF in common format.
 - > It will promote the utilization of public information by private IT vendors.

4 . Consideration of Rules and System of the SPF

4.1 Consideration of Rules and System of the SPF

- Rules and system that should be decided for practical use of the SPF was considered with following steps.

Items	Scope
Consideration of activities for practical use of the SPF, and actualization method of the SPF system functions	Based on the result of "2. Organizing services provided by the SPF", we considered on activities for practical use of the SPF. After that, we also considered which SPF system functions should be actualized preferentially.
Rules and system for operating the actualized SPF functions	As described later, actualizing the portal function preferentially is effective. Therefore, we considered rules and system for operating the actualized portal function.

4.2 Activities for practical use of the SPF

- For practical use of the SPF, It is important to promote the concept of the SPF to acquire information providers and information users. The following three points are listed as the activities.

(1) Working on companies that hold the information which should be handled by the SPF

- Working on companies (e.g. automakers, 3D map vendors) that hold the information which should be handled by the SPF.

(2) Cooperation with industry groups

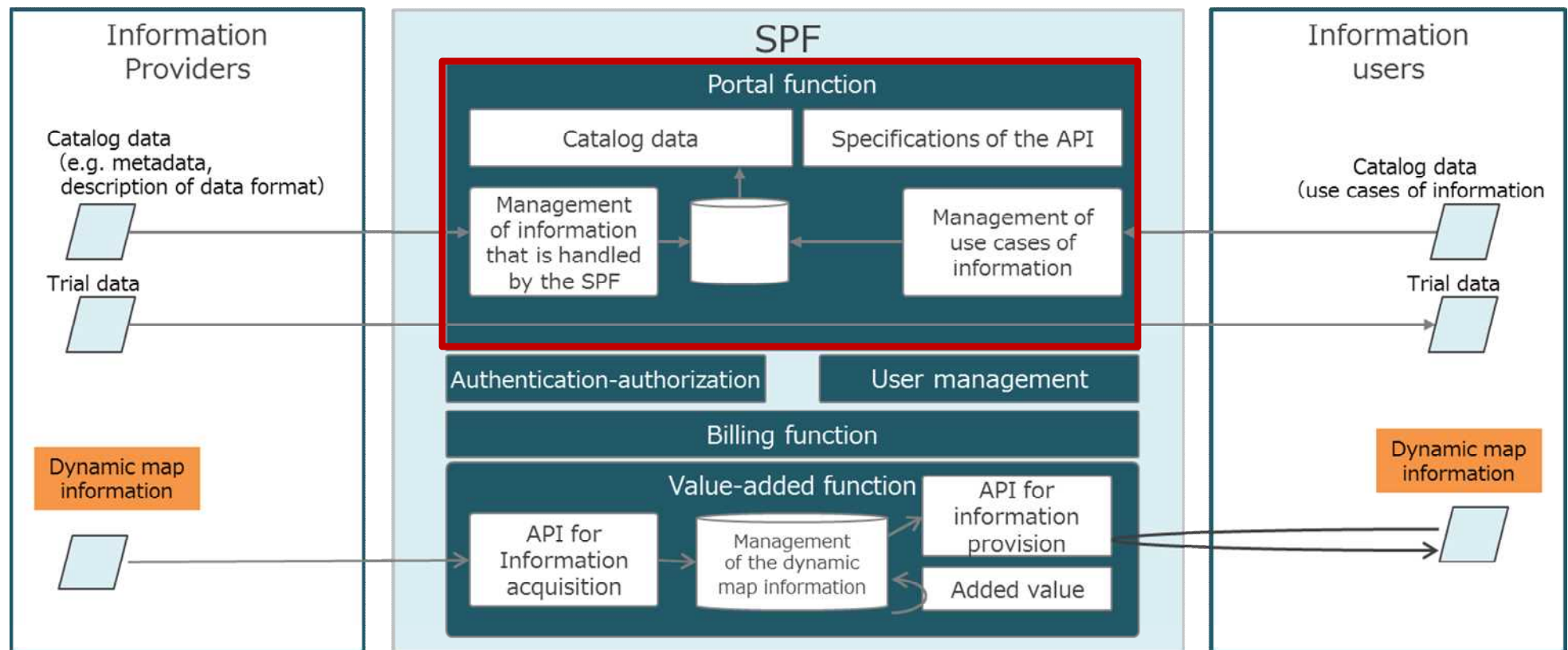
- Approaching industry groups (e.g. the G-spatial information center, Data Trading Alliance) that are considered to be effective for collaboration to promote the concept of the SPF.

(3) Activities to solve tasks of information providers and information users

- Working to lower barrier to utilize the SPF for information providers and information users. (e.g. providing uses and needs of information to information providers, providing use cases of information and trial data that can be tried in services to information users)

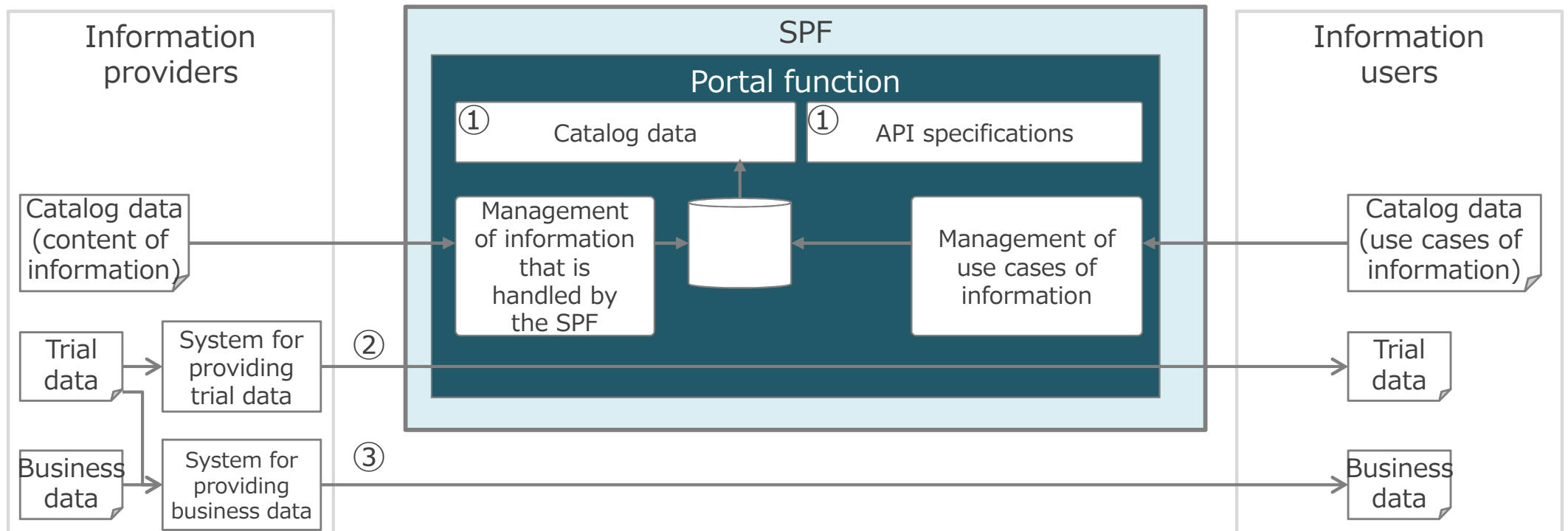
4.3 The SPF system function to be actualized preferentially

- Following structures should be actualized to promote the concept of the SPF.
 - Structures for various companies and industry groups to recognize the concept.
 - Structures to provide effective information to information providers and information users.
(e.g. uses/needs and use cases of information)
- For the above reasons, it is effective to actualize the portal function preferentially.



4.4 Outline of the SPF portal function

- Explanation about information which is handled by the SPF, use cases of the information, and the API specifications are posted on the web portal. Information that cannot be opened to the public is restricted so that only authorized companies can view it. (①)
- The SPF portal function can provide data for testing use in services (trial data) from information providers to information users. If information users want the trial data, they will request information providers that hold it. After information providers approved, the trial data is provided to information users through the SPF portal function. (②)
- When information users receive trial or business data from environments which are used for information providers' business, information users shall make a contract with information providers.(③)



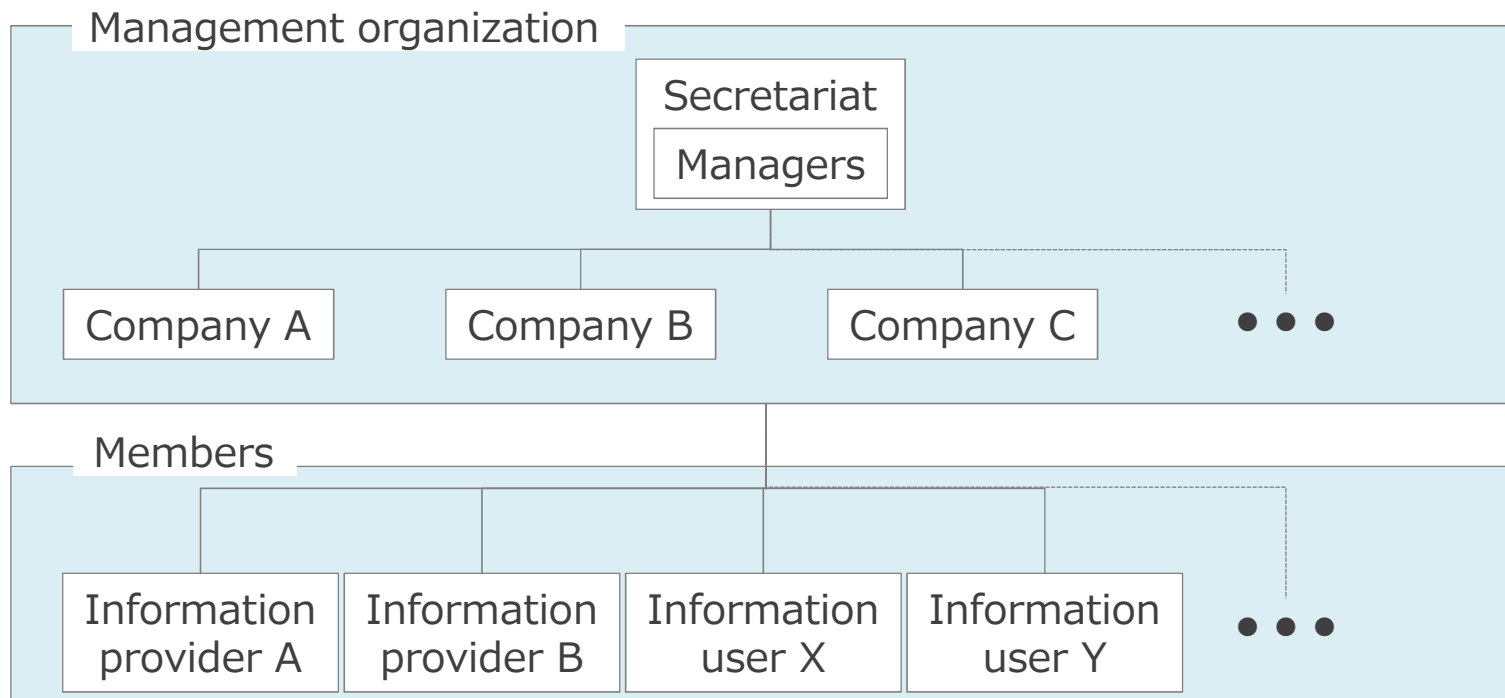
4.5 Rules and system for operating the actualized SPF functions

- Following table shows items to be defined before actualizing the SPF portal function.

#	Items	Content
1	Operation system	Secretariat to operate the SPF portal function, System to promote the concept of the SPF, etc.
2	Cost items	Items of costs required for actualizing the SPF portal function, etc.
3	Agreement	Contents of agreement for information providers and information users
4	Rules to use the SPF portal function	Requirements for information providers and information users to use the SPF portal function
5	Access restriction	Control of access to various information posted on the SPF portal function
6	Expanding information	Method to increase information posted on the SPF portal function
7	Providing use cases of information	Method to introduce use cases of information (e.g. what kind of information to be disclosed, how to disclose such information)

4.6 Operation system

Items	Definitions
Management organization	"Management organization" consists of "Secretariat" and "Members".
Secretariat	"Secretariat" operates the SPF portal function, and it consists of the person who selected from "Management organization".
Managers	"Managers" are in charge of managing the SPF portal function, and selected from representative company of "Management organization".
Members	"Members" are consists of information providers and information users registered as member of the SPF portal function.
Information providers	"Information providers" hold various information (e.g. vehicle probe information, tweet)
Information users	"Information users" utilize information that is provided from "Information providers", and offer services with the information.



4.7 Cost items

- Following table shows work items that are needed for actualizing and operating the SPF portal function, and the way of thinking about the cost burden of each item.

No.	Work items	Categories		Definitions	Cost burden
		Initial cost	Operational cost		
1	Actualizing the system to provide trial data	●		Actualizing the structures to provide trial data to information users.	Information providers
2	Operating the system to provide trial data		●	Operating the system to provide trial data. (e.g. maintenance of the system)	
3	Procurement of information	●		Procurement of information which is posted on the SPF portal function.	Information providers
4	Modify the data format	●		Modify the data format for the SPF portal function as needed	
5	Posting the catalog data	●		Creating the catalog data that explains contents of information , and posting it on the SPF portal function	Secretariat
6	Actualizing environment of the SPF portal function	●		Actualizing cloud environment of the SPF portal function	Secretariat
7	Operating the environment of the SPF portal function		●	Operating the cloud environment of the SPF portal function	Secretariat
8	Activities of "Secretariat"		●	Management of information of "Members", inquiry responding, etc.	Secretariat
9	Promotion of the SPF portal function		●	Activity to increase of information providers and information users.	Management organization

4.8 Agreement

- Components of the agreement of the SPF portal function is as following tables.

List of agreement

No.	Title of the agreement	Outlines	Purpose
1	Common agreement *	Regulations that "Management organization" presents to information providers and information users.	The basic items, that information providers and information users must comply in using the SPF portal function, are described in this agreement.
2	Agreement for information providers	Regulations that "Management organization" presents to information providers.	This agreement is made for information providers to provide their information to information users.
3	Agreement for information users	Regulations that information providers present to information users as needed.	This agreement is made for information users to use various information.

*Information providers and information users can use only some functions of the SPF portal function, unless they agree the common agreement.

Items which is described in the agreement

No.	Title of the agreement	Items described in the agreement
1	Common agreement	General rules, Definitions, Terms to use the SPF portal function, etc.
2	Agreement for information providers	General rules, Definitions, Restrictions, etc.
3	Agreement for information users	Depend on each information.

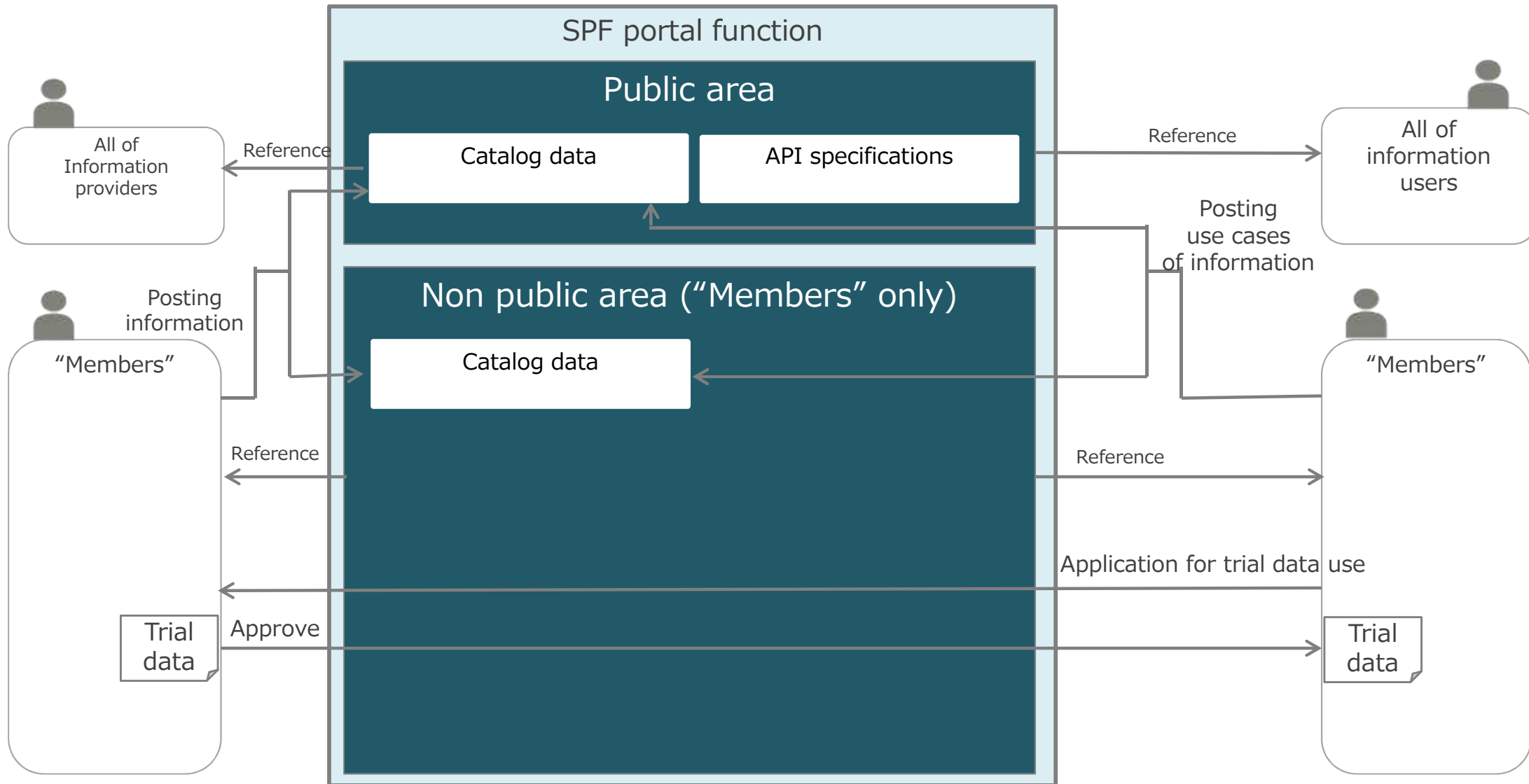
4.9 Rules to use the SPF portal function

- Rules to use the SPF portal function, described in the “common agreement” (see 4.8 Agreement), are as below.

No.	Items	Contents	Target
1	Certification	<ul style="list-style-type: none"> - “Members” must be a body corporate or an administrative body in Japan. - “Members” must agree to be made public as a member of the SPF portal function. 	Information providers/ Information users
2	Conditions to send/receive information	<ul style="list-style-type: none"> - When sending and receiving information through the SPF portal function, information providers/users must take security measures so as not to affect the SPF portal function. - “Members” must manage ID and password to login to the SPF portal with responsibility. - “Members” must prepare the environment to access the SPF portal function (e.g. the internet connection environment). 	Information providers/ Information users
3	Periodic audit/report	<ul style="list-style-type: none"> - “Members” must have an audit periodically to confirm that they meets conditions to use the SPF portal function. - “Members” must report on status of providing/utilizing information in response to a request from “Secretariat”. 	Information providers/ Information users
4	Conditions of information	<ul style="list-style-type: none"> - Information provider must have rights to provide information. - Such information must be utilize with map information. - Details of conditions to provide the information follow “Agreement for information providers”. 	Information providers
5	Conditions of using information	<ul style="list-style-type: none"> - Information users must present the purpose of using information. - Information users must not use information for commercial use or secondary use. - Information user can utilize the information only when information providers approve. - Information users must disclose the purpose of using the information to information providers. 	Information users

4.10 Access restriction

- There are two areas in the SPF portal function.
 - Public area: for spreading acknowledgement of information handled by the SPF portal function.
 - Non public area ("Members only") : for providing information only to "Members".



4.11 Expanding information

- Increasing information providers that hold the worth information will lead to the expansion of the distribution of information and the vitalization of the market utilizing various information.
- For the above reason, following activities to collect large number of information providers are important.

1. Appealing benefits of the SPF portal function to information providers

- It is effective to appeal to information providers that posting contents of various information on the SPF portal function leads to spreading acknowledgement of information and expanding the number of information users.

2. Activities that make it easier for information providers to use the SPF portal function

- It is effective to lower barrier to use the SPF portal function for information providers by permitting the information providers' own format.

3. Activities to increase the number of information providers

- It is effective to create proposal document to urge information providers to provide various information, and to use it as a tool for promotion of the SPF portal function.

(Items which should be listed in the proposal document: features of the SPF portal function, benefits for information providers, etc.)

4.12 Providing use cases of information

- Use cases of various information which should be posted on the SPF portal function are as follows.
- ✓ Use cases of the SPF portal function
- ✓ Use cases for matching information providers and information users.

Contents of use cases	
Use cases of the SPF portal function	<ol style="list-style-type: none">1. Introduce benefits to use the SPF portal function2. Introduce patterns of providing/utilizing information3. Use cases on utilizing information (e.g. service models examined in the project in 2017 fiscal year)
Use cases for information users	Examples of using information provided by information providers
Use cases for information providers	Use cases of various information in actual services

5. Results of this project / Future Tasks

5.1 Results of this project

- We considered for practical use of the SPF. Results of this project are as follows.

(1) Services provided by the SPF

It was clarified that contents of services which should be provided by the SPF with organizing information which should be handled by the SPF, system function of the SPF, and benefits of utilizing the SPF.

(2) Specifications of the interfaces to expand distribution of various information

We created specifications of the interfaces which enable to expand distribution of various information.

(3) Rules and system for practical use of the SPF

We organized activities for practical use of the SPF, system functions to be actualized preferentially (the SPF portal function), and clarified rules and system of it.

5.2 Future tasks

- It is important for practical use of the SPF to promote the concept of the SPF. Future tasks of the promotion activities are as follows.

(1) Clarification of the attractiveness of the SPF

It is important to clarify the attractiveness of the SPF and urge information providers and information users to utilize the SPF.

(2) Cooperation with information providers that hold information with high market needs

It is effective for increasing the SPF users to handle information with high market needs preferentially by the SPF. For that reason, it is important to work on companies that hold such information.

(3) Creating successful cases of utilizing the SPF

It is important to create successful cases of utilizing the SPF early to increase information providers and information users who use the SPF.