

Federation Architecture and Sequence

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1 Summary

1.1 Federation by SEP (Slice Exchange Point)

(1) Problem

- (a) Differences on Control-plane , Data-plane, Services, etc
- (b) Applying on federation-unconscious infrastructure (e.g. VNode)

(2) Advantages

- (a) Introduction of "common API"
- (b) GK manages everything: less impact on current infrastructure
 - API translation: between common APIs and testbed-original APIs
(commands, sequences, parameters, etc.)
 - Data-plane conversion

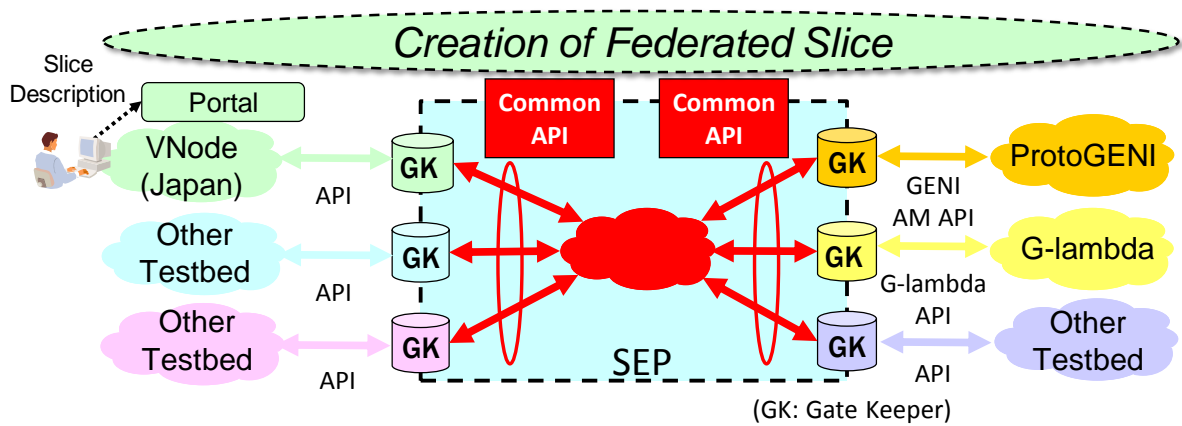


Fig. 1.1-1 Slice Exchange Point

1.2 Control-plane federation Architecture

- Cross-domain slice definition submitted to one domain
- Gate Keepers (GK) convert domain-specific commands, slice definitions to/from the common API
- Data Planes are connected by Gateway (GW)

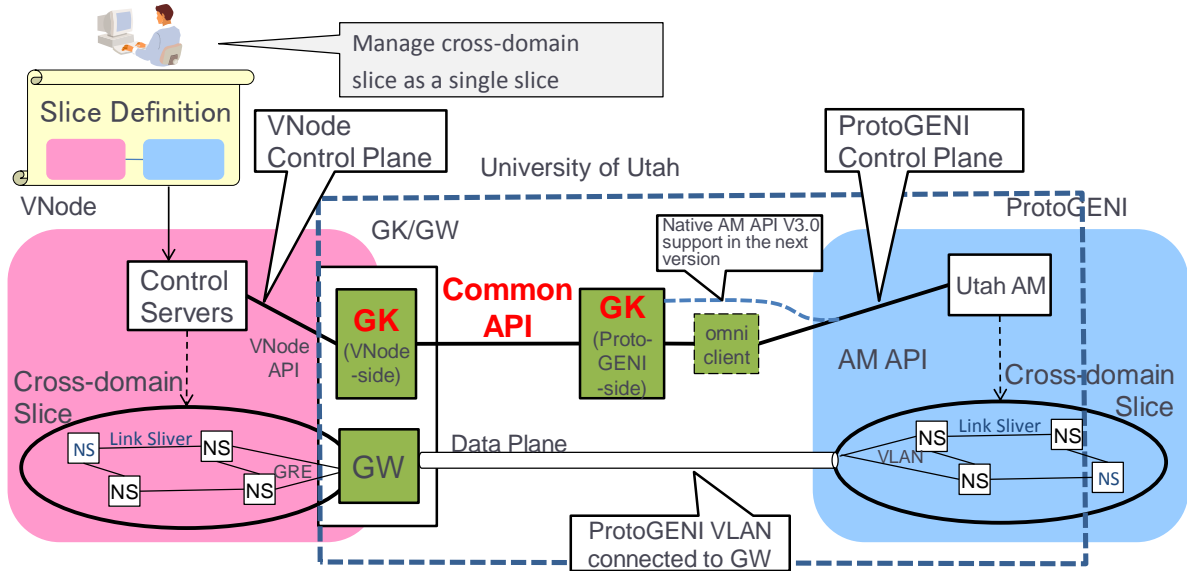


Fig. 1.2-1 Control-plane federation Architecture

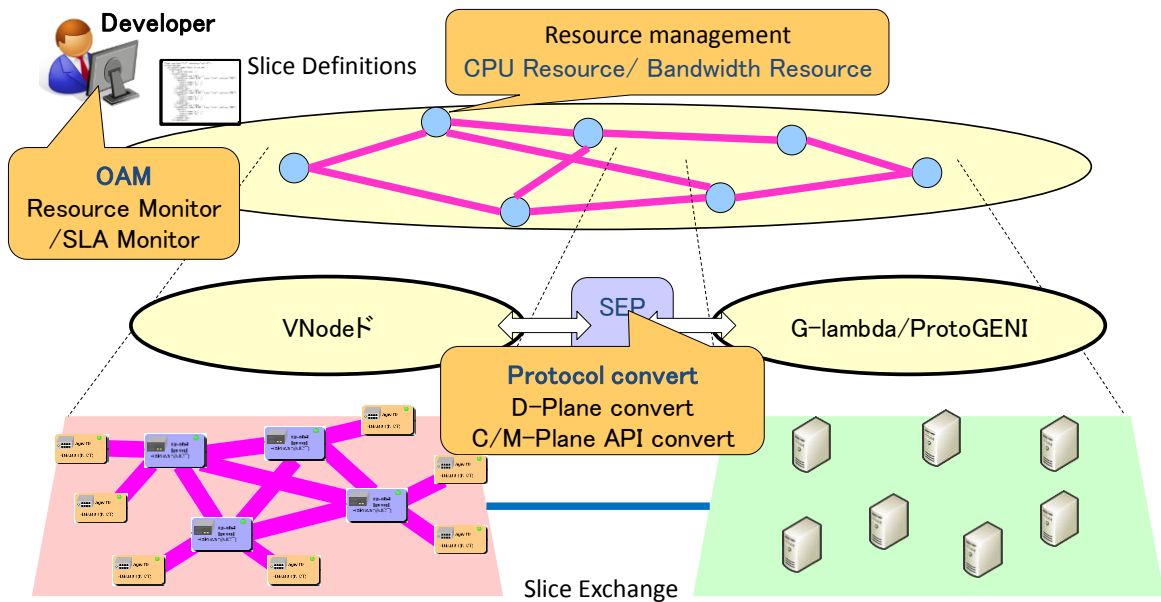


Fig. 1.2-2 Federation

1.3 Federation Execution Sequence

- ① Submit Slice Definition
- ② Convert VNode API (commands, slice definitions) to the common API
- ③ Convert the common API to ProtoGENI API and send it to the Utah AM
- ④ Create slice in each domain
- ⑤ Reply the information (VLAN ID) of cross-domain data plane
- ⑥ Connect data plane (by setting ProtoGENI's VLAN ID to GW)

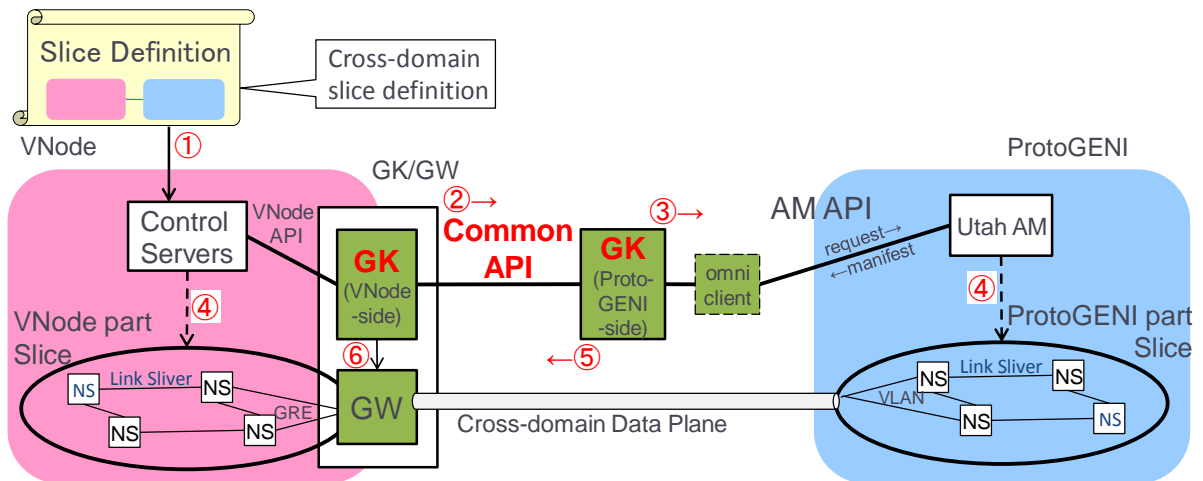


Fig. 1.3-1 Federation Execution Sequence

2 Gate Keepers (GK)

2.1 GK

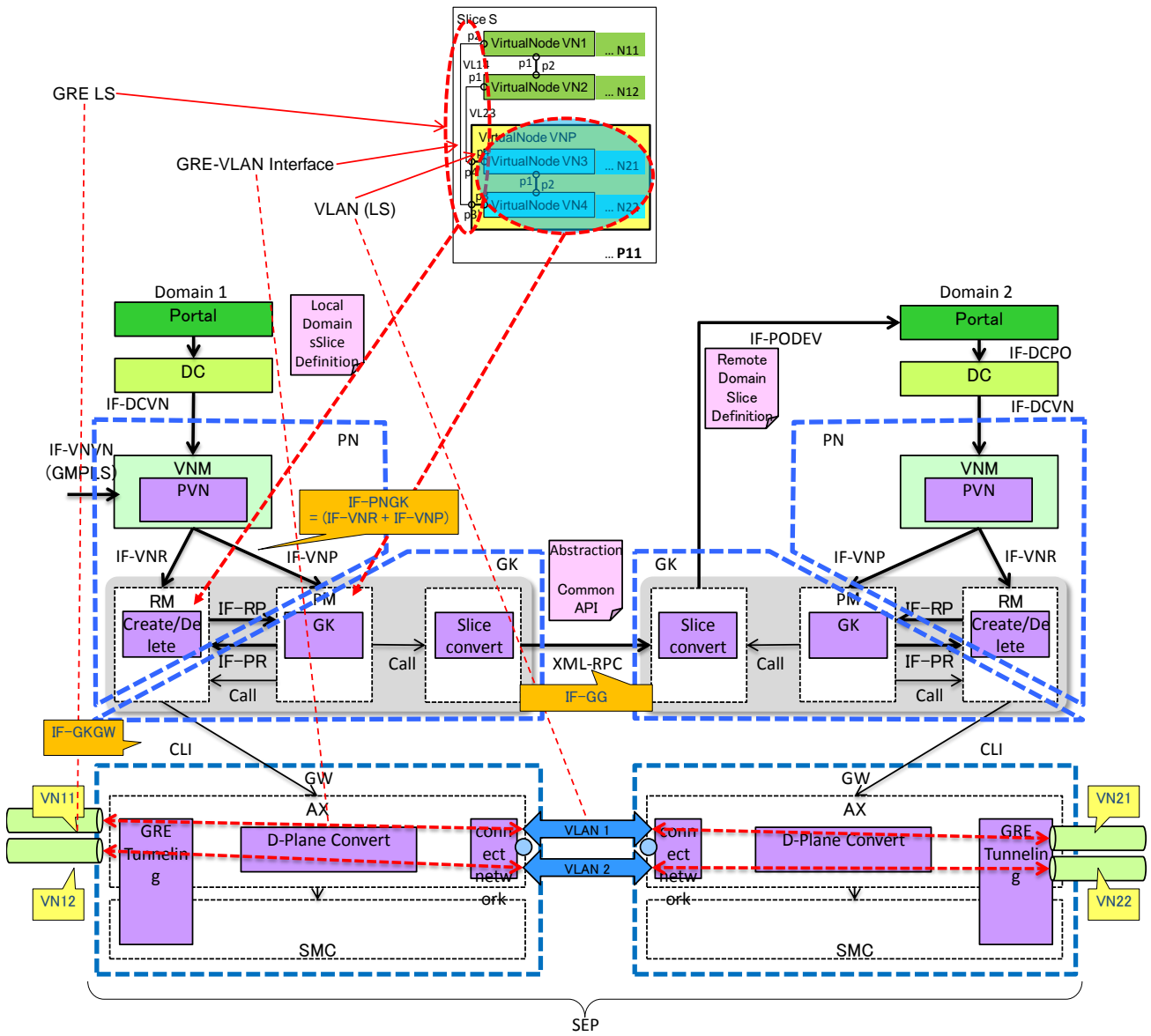


Fig. 2.1-1 Gate Keepers(VNode - VNode)

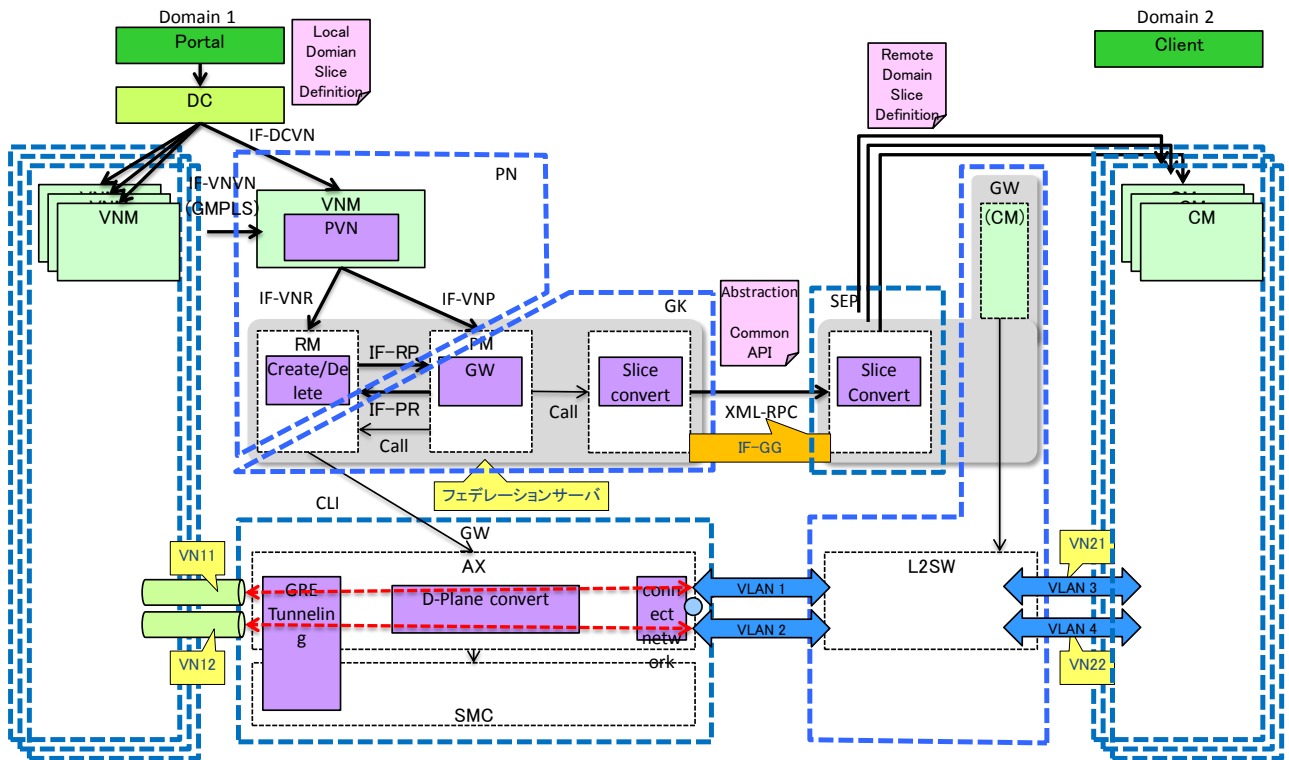


Fig. 2.1-2 Gate Keepers(VNode - ProtoGENI)

2.2 Multiple domains

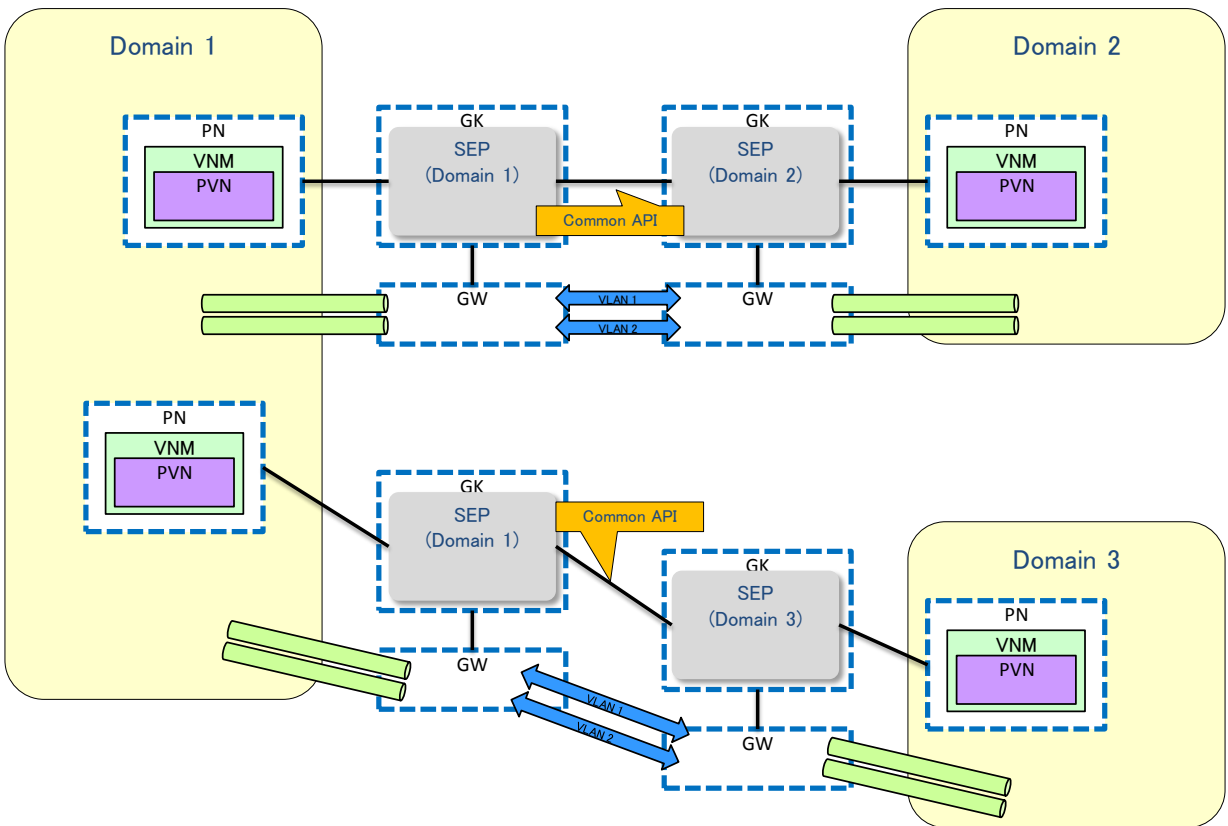


Fig. 2.2-1 Multiple domains

2.3 D-Plane

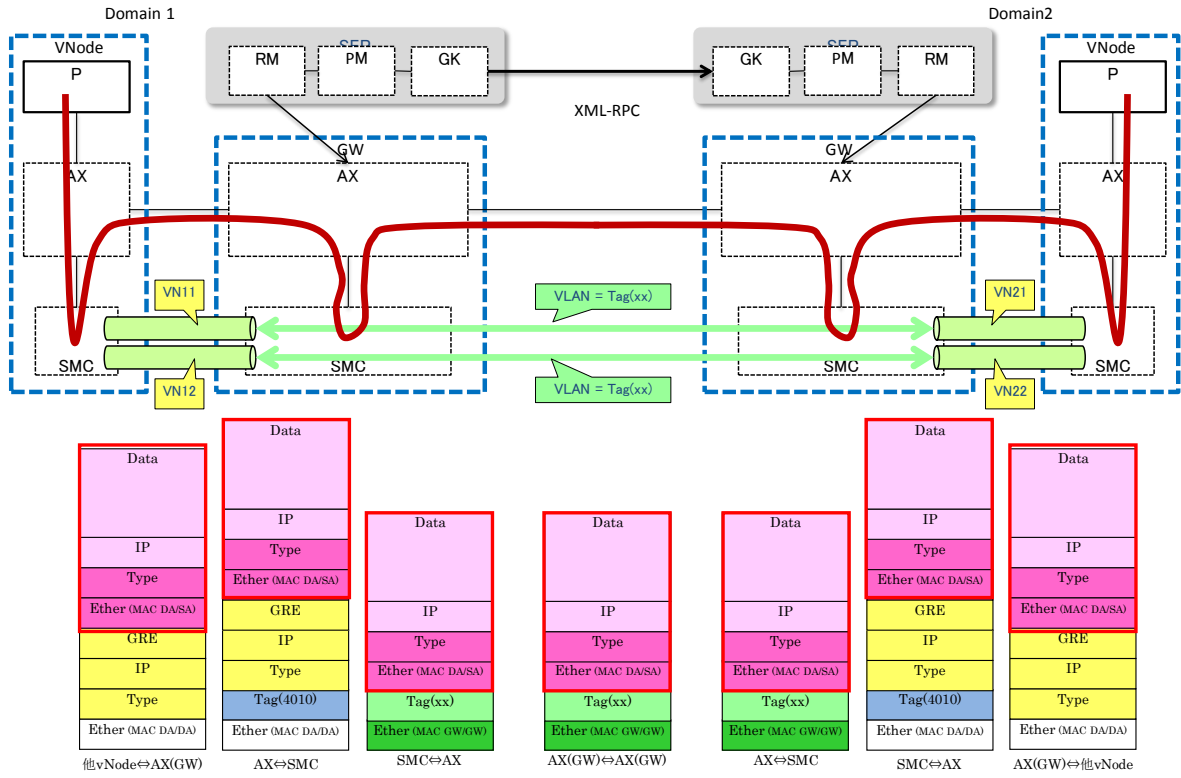


Fig. 2.3-1 D-Plane (VNode-VNode)

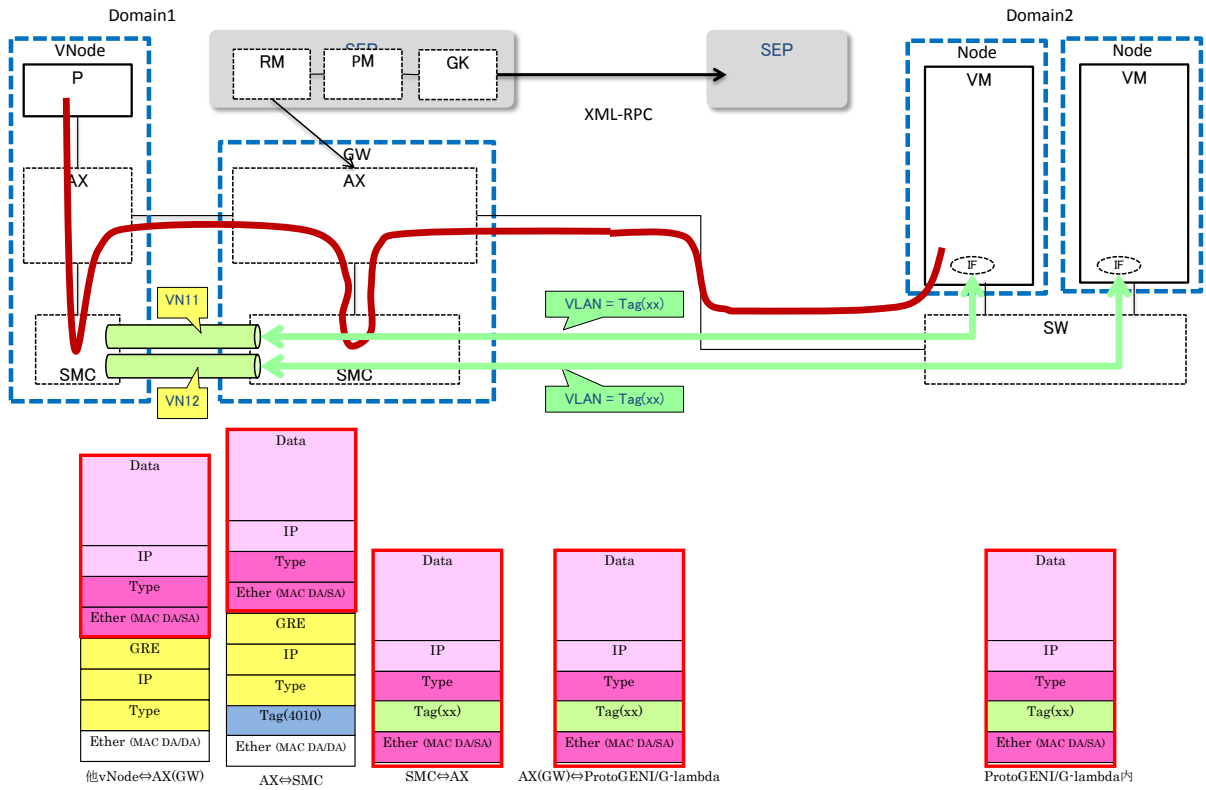


Fig. 2.3-2 D-Plane (VNode-ProtoGENI)

3 Common API

3.1 XML-RPC

Table. 3.1-1 Common API

#	コマンド	共通 API	VN⇒PG	PG⇒VN	備考
1	Create Slice	CreateSlivers()	○	○	
2	Start Slice	RunSlivers()	○	○	
3	Stop Slice	StopSlivers()	○	○	
4	Delete Slice	DeleteSlice()	○	○	
5	Add Slivers	AddSlivers()	×	○	
6	Delete Slivers	DeleteSlivers()	×	○	
7	Get Resource Information	ResourceInfo()	×	○	
8	Get Sliver Status	SliverStatus()	○	○	
9	Get Slice Status	SliceStatus()	×	×	
10	Notify Sliver Status	SliverStatusNotify()	×	×	
11	Get Node Sliver Statistics	NodeSliverStatistics()	△	×	
12	Get Link Sliver Statistics	LinkSliverStatistics()	×	×	

凡例) VN : VNode

PG : ProtoGENI

3.2 Sequence

3.2.1 Create Slice and Start Slice

(1) VN→PG

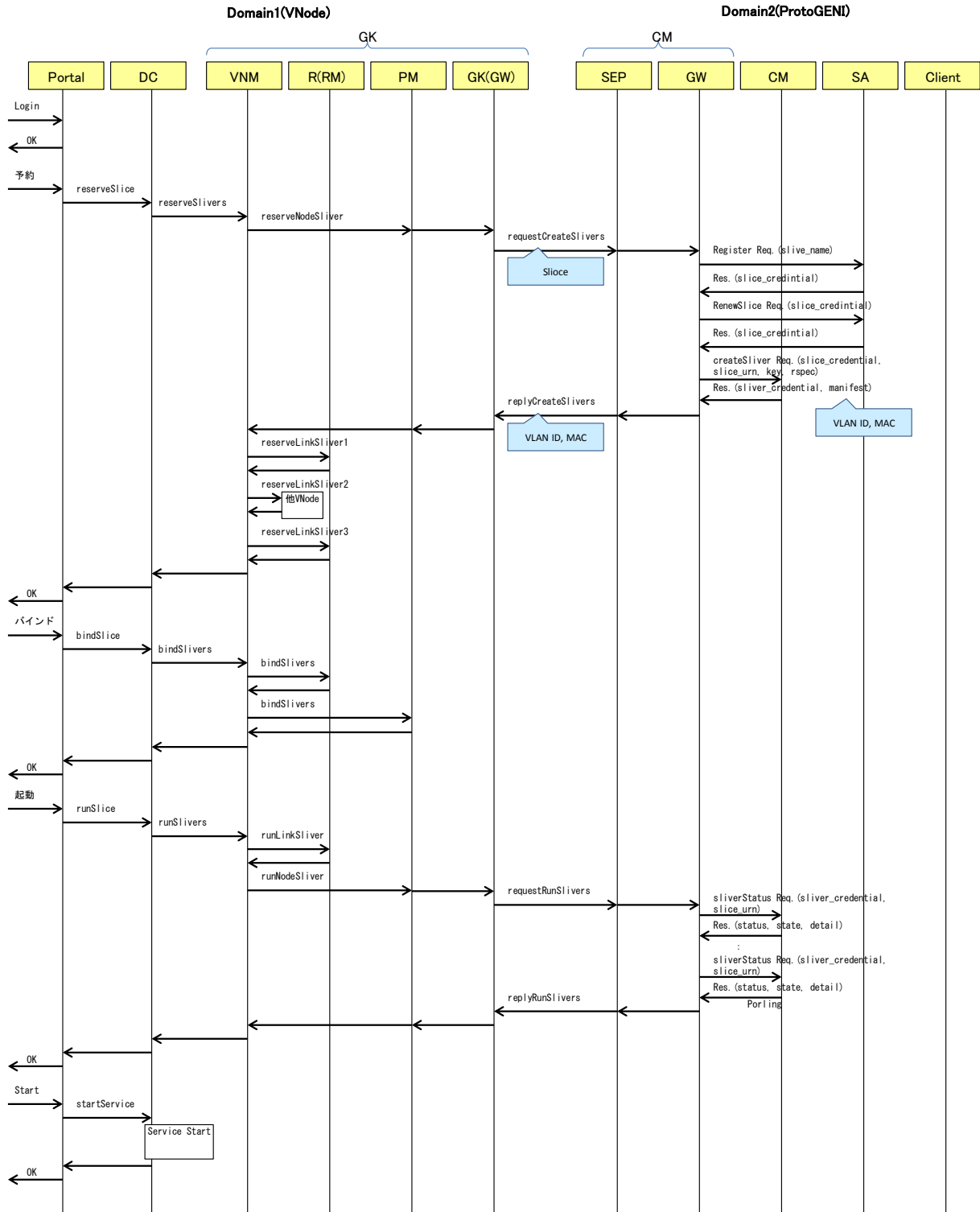


Fig. 3.2-1 Create Slice and Start Slice

(2)PG→VN

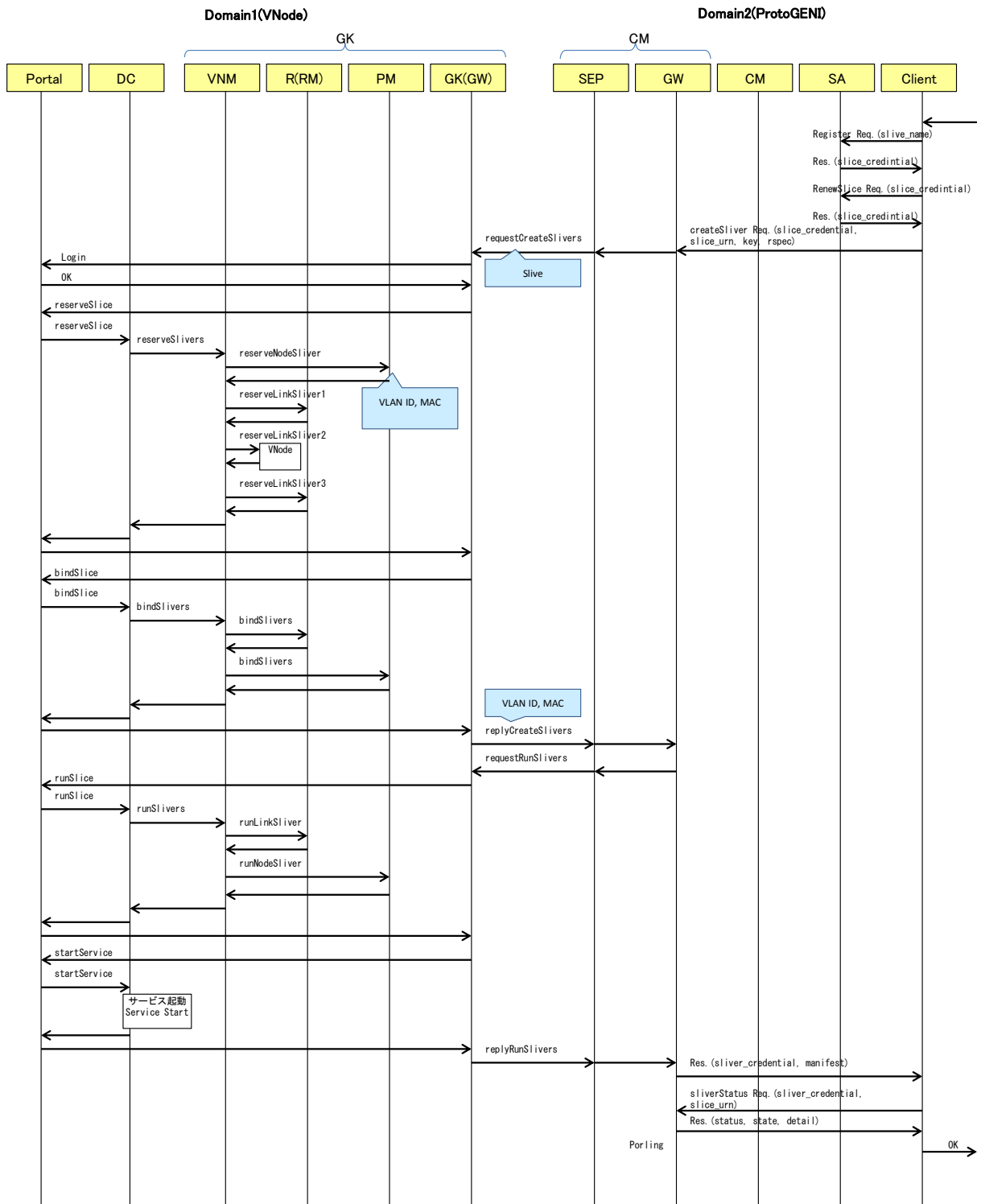


Fig. 3.2-2 Create Slice and Start Slice

3.2.2 Stop Slice and Delete Slice

(1) VN→PG

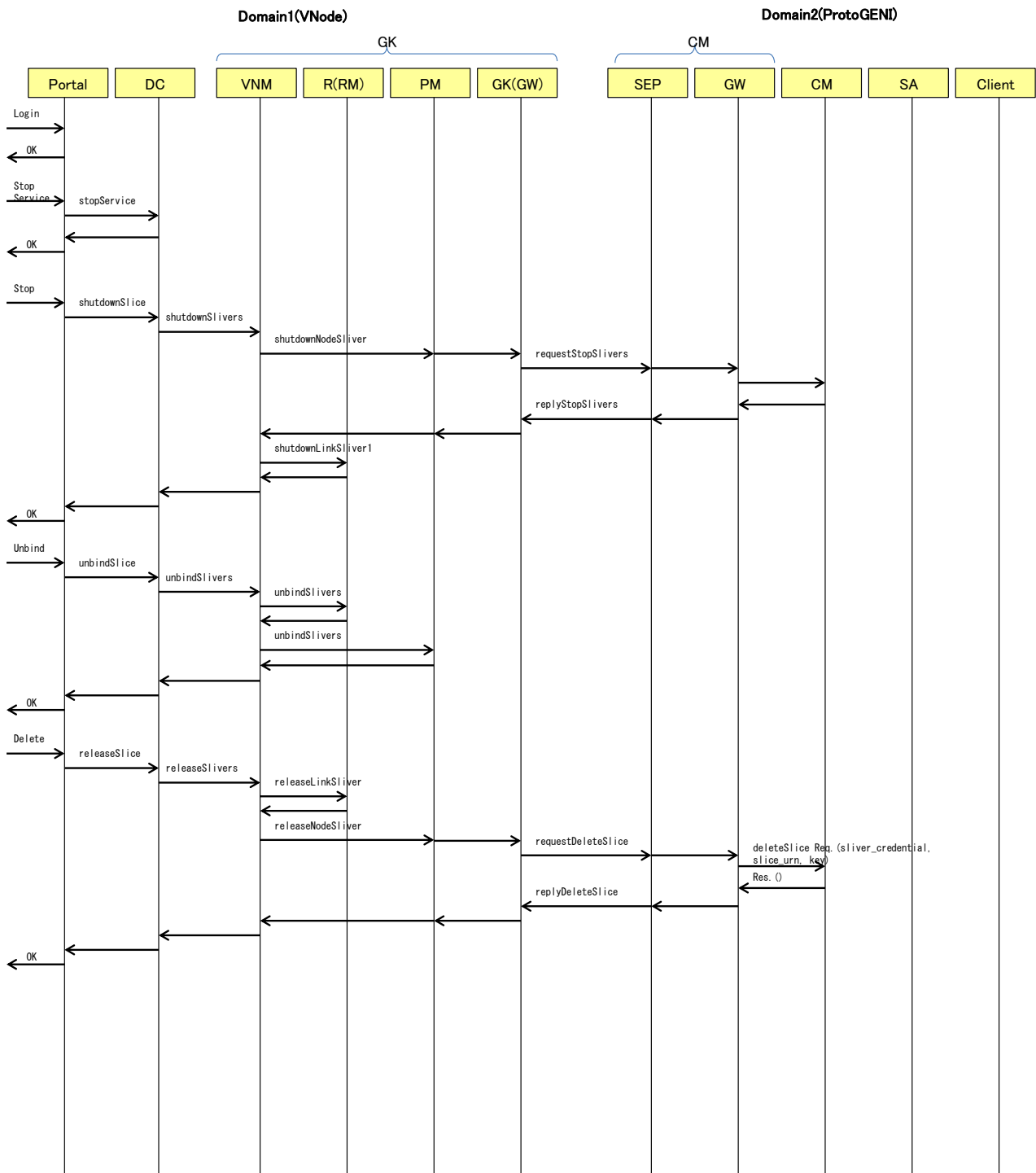


Fig. 3.2-3 Stop Slice and Delete Slice

(2)PG→VN

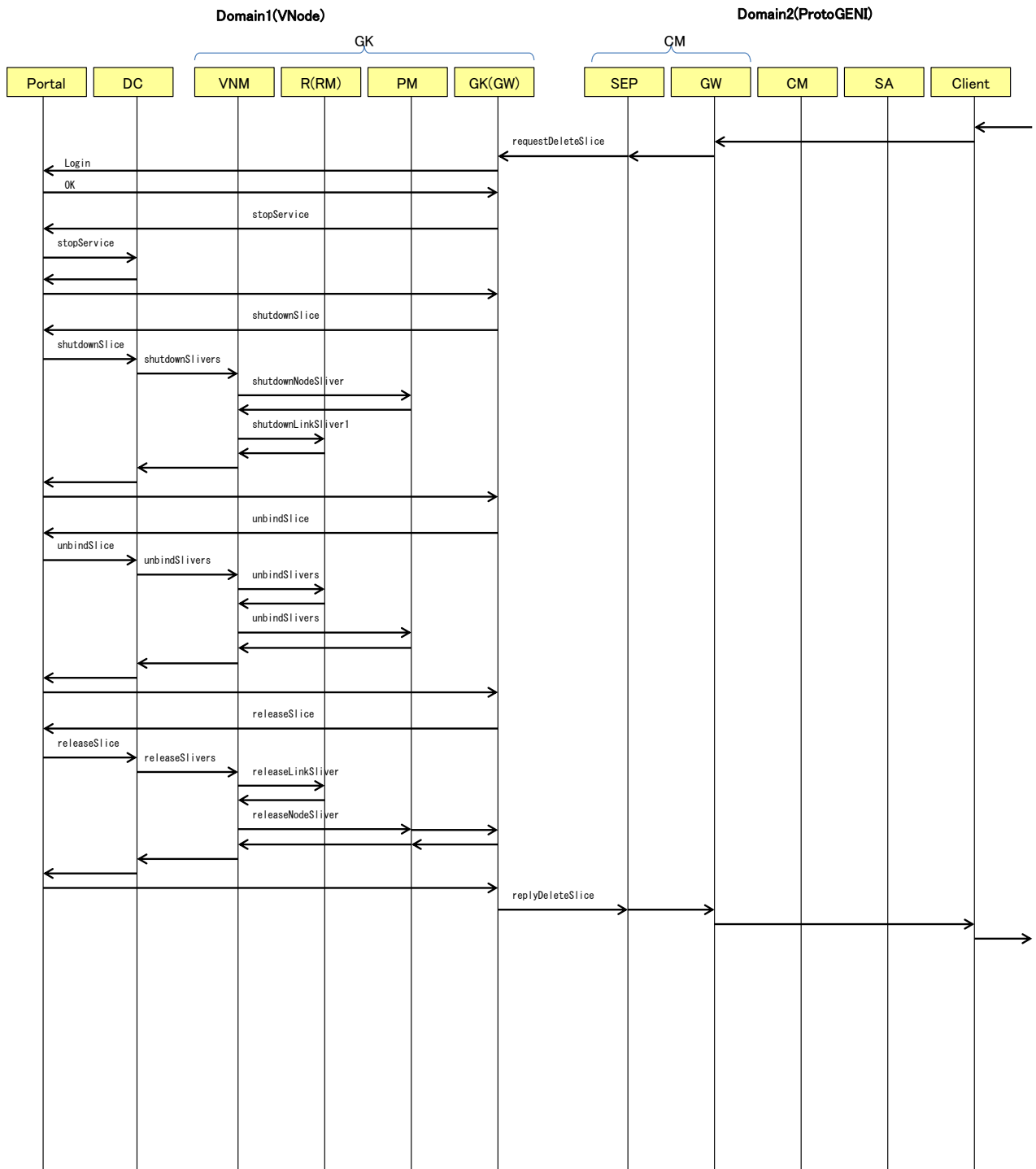


Fig. 3.2-4 Stop Slice and Delete Slice

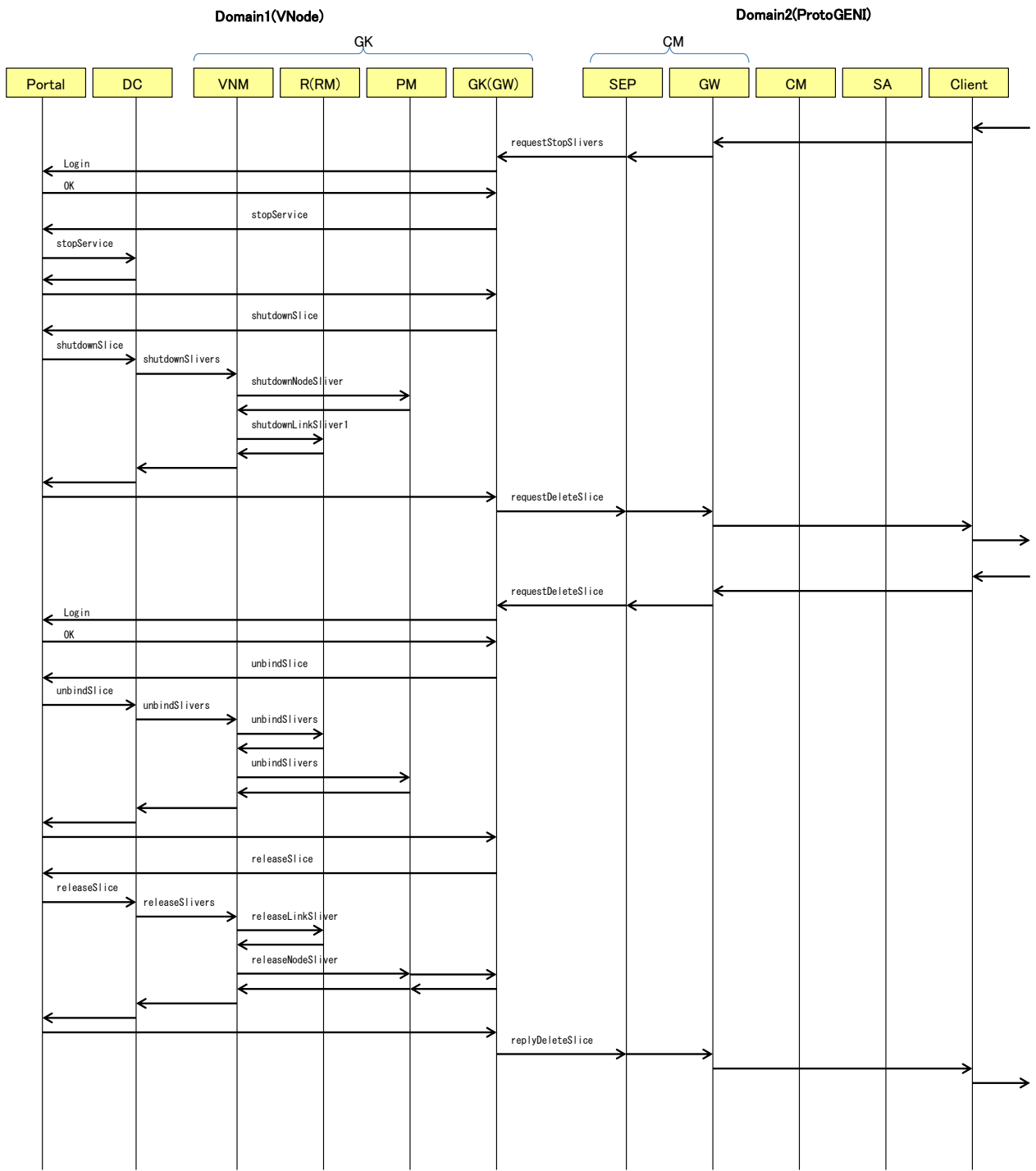


Fig. 3.2-5 Stop Slice and Delete Slice

3.2.3 Add Slivers

(1) VN→PG

[TBD]

(2) PG→VN

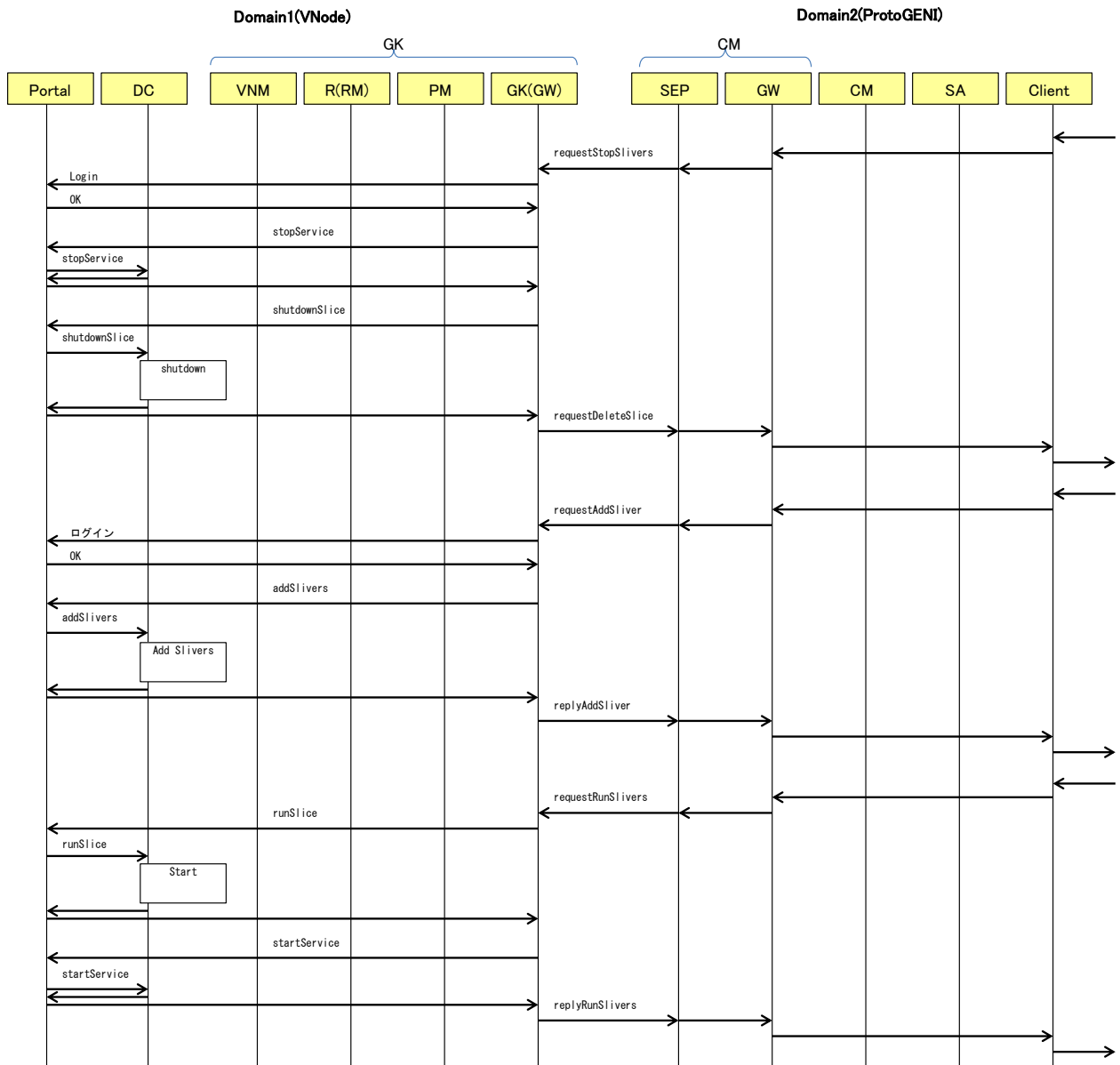


Fig. 3.2-6 Add Slivers

3.2.4 Delete Slivers

(1) VN→PG

[TBD]

(2) PG→VN

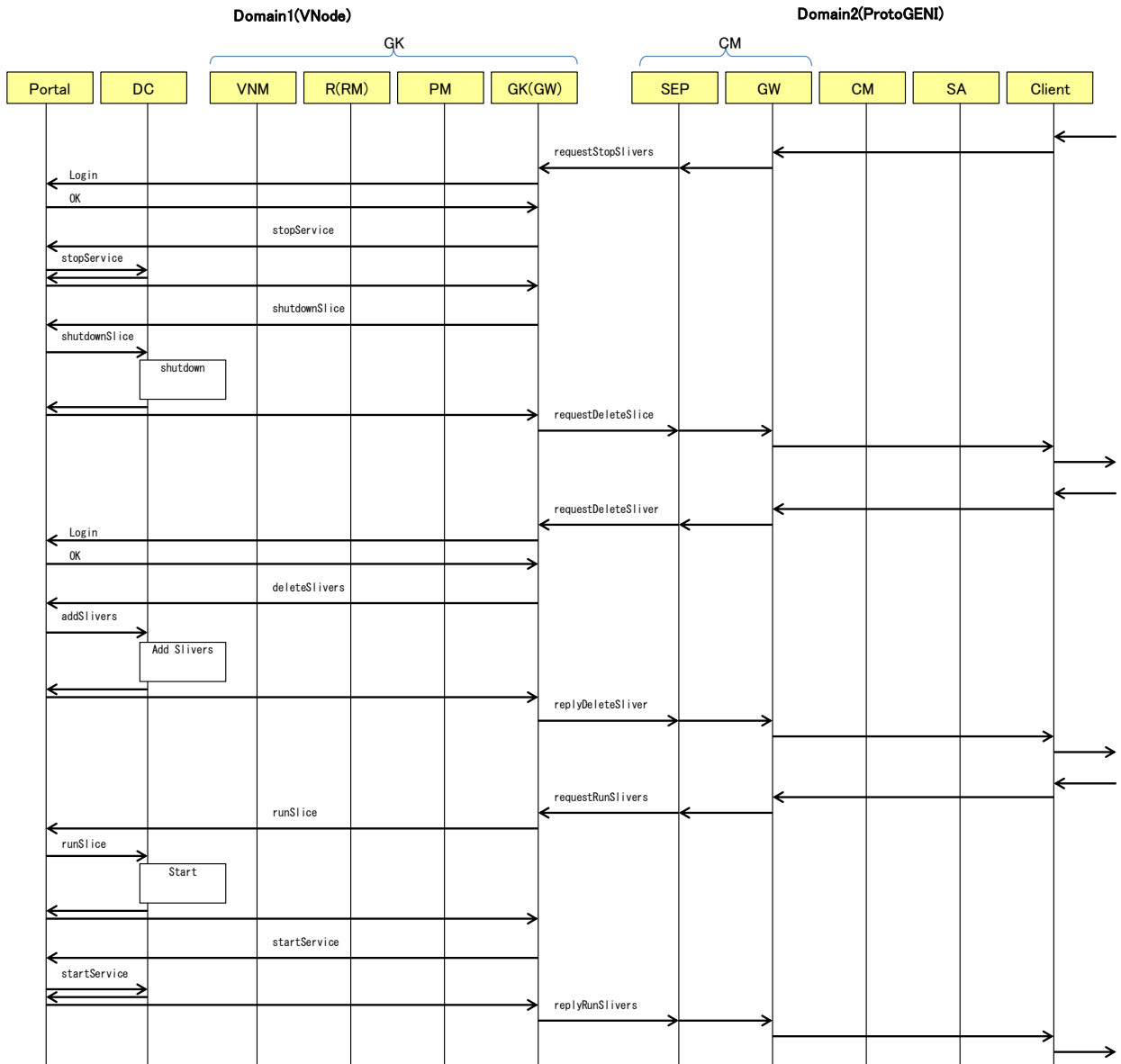


Fig. 3.2-7 Delete Slivers

3.2.5 Get Resource Information

(1) VN→PG

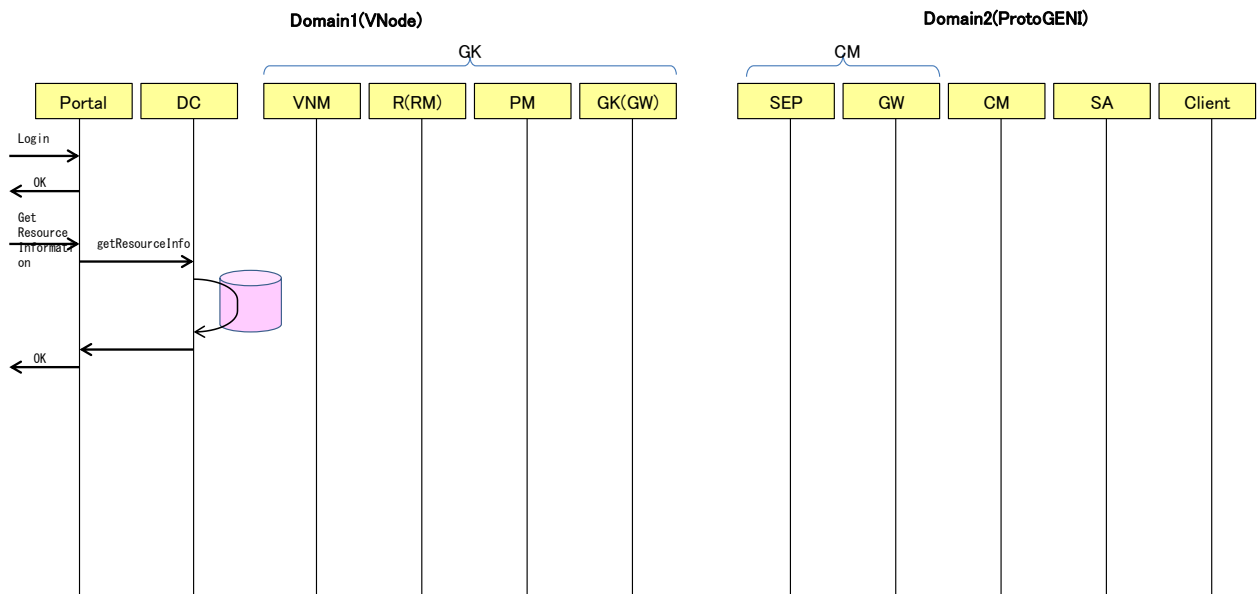


Fig. 3.2-8 Get Resource Information

(2) PG→VN

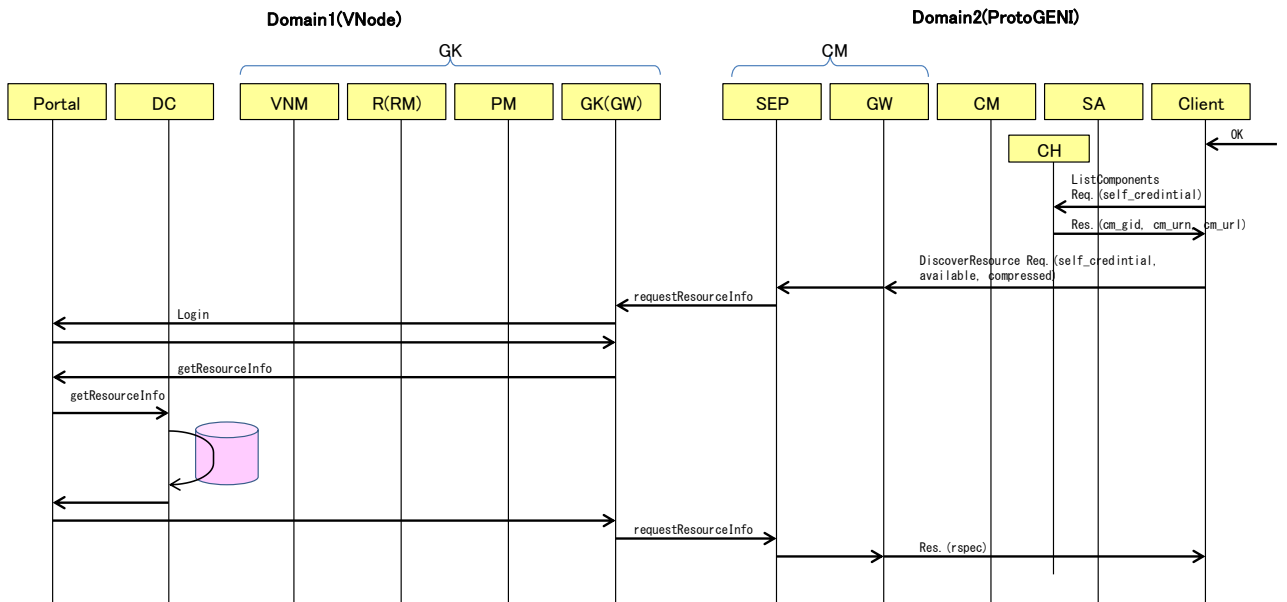


Fig. 3.2-9 Get Resource Information

3.2.6 Get Sliver Status

(1) VN→PG

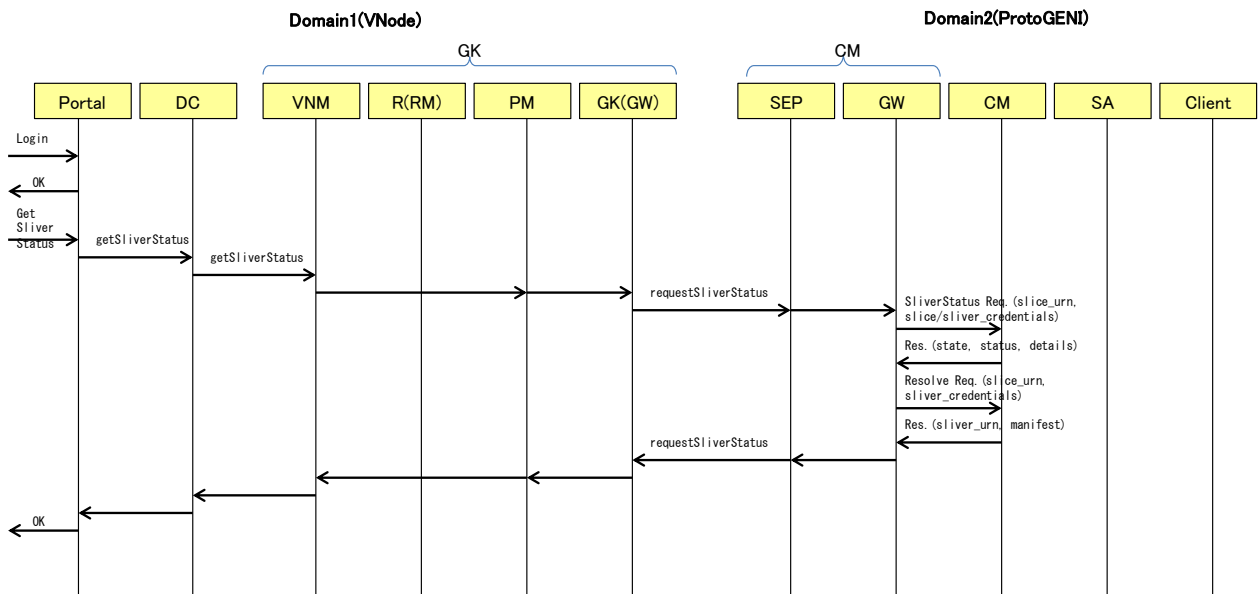


Fig. 3.2-10 Get Sliver Status

(2) PG→VN

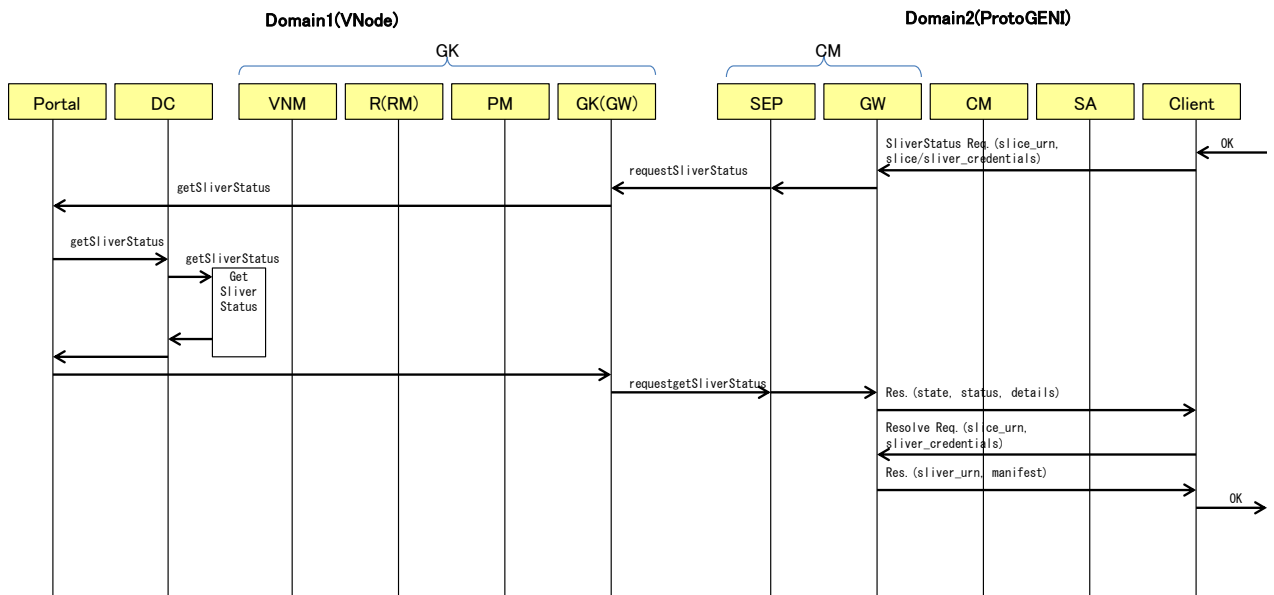


Fig. 3.2-11 Get Sliver Status

3.2.7 Get Slice Status

(1) VN→PG

[TBD]

(2) PG→VN

[TBD]

3.2.8 Notify Sliver Status

(1) VN→PG

[TBD]

(2) PG→VN

[TBD]

3.2.9 Get Node Sliver Statistics

(1) VN→PG

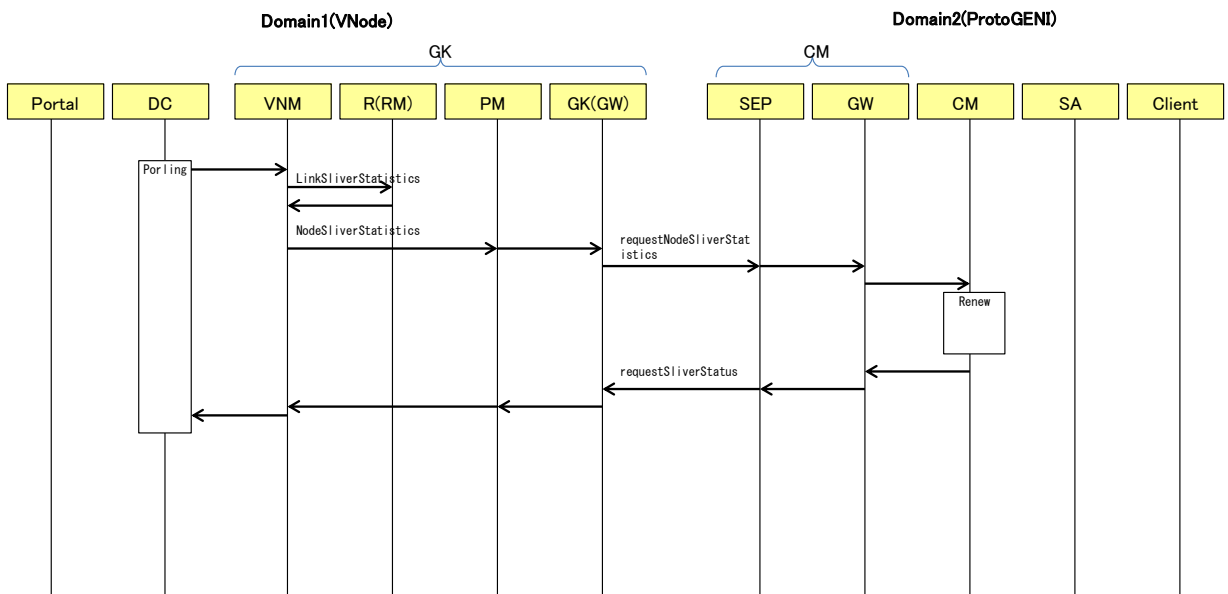


Fig. 3.2-12 Get Node Sliver Statistics

(2) PG→VN

[TBD]

3.2.10 Get Link Sliver Statistics

(1) VN→PG

[TBD]

(2) PG→VN

[TBD]

3.3 Common API Format

3.3.1 CreateSlivers

methodName	param	type		request			
				VN→PG	VN→VN	PG→VN	G-LAMB DA→VN
request.CreateSlivers	{	struct	must				
	command_version	string	must	○	○	○	○
	src_infra_name	string	must	○	○	○	○
	dst_infra_name	string	must	○	○	○	○
	src_slice_id	string	must	○	○	○	○
	nodeSlivers	array	must	○	○	○	○
	nodeSliver	struct	must	○	○	○	○
	sliver_id	string	must	○	○	○	○
	sliver_name	string		×	×		
	sliver_type	string	must	○	○	○	○
	parent_sliver_id	string	must	○	○	○	○
	node_type	string		○	○	○	?
	node_subtype	string		○	○	○	?
	location_name	string		×	×	○	?
	location_country	string		×	×	○	?
	location_longitude	string		×	×	○	?
	location_latitude	string		×	×	○	?
	start_time	dateTime		○	○	○	?
	end_time	dateTime		NULL	NULL	NULL	?
	os_name	string		○	○	○	?
	os_image_path	string	must	○	○	○	○
	software_install	struct		×	×	○	?
	install_urn	string		×	×	○	?
	install_path	string		×	×	○	?
	execute_path	string		×	×	○	?
	resource	struct		○	○	×	?
	cpumode	string		○	○	×	?
	cpu	string		○	○	×	?
	arch	string		○	○	×	?
	memory	string		○	○	×	?
	interfaces	array	must	○	○	○	?
	interface	struct	must	○	○	○	?
	interface_name	string	must	○	○	○	?
	src_vlan_id	int		○	○	○	?
	dst_vlan_id	int		○	○	×	?
	src_mac_address	string		○	○	×	?
	dst_mac_address	string		○	○	×	?
	ip_address	string		×	×	○	?
	ip_netmask	string		×	×	○	?
	ip_type	string		×	×	○	?
	vlan_id	int	—	⊖	=	—	—
	linkSlivers	array	must	○	○	○	?

linkSliver	struct	must	○	○	○	?	
sliver_id	string	must	○	○	○	?	
link_type	string		○	○	×	?	
link_subtype	string		○	○	×	?	
parent_sliver_id	string		○	○	×	?	
vlan_id	int		○	-			
resource	struct		○	○	×	?	
class	string		○	○	×	?	
bandwidth	string		○	○	×	?	
burstSize	string		○	○	×	?	
queuingDelay	string		○	○	×	?	
interfaces	array		○	○	×	?	
interface	struct		○	○	×	?	
interface_name	string		○	○	×	?	
binds	array		○	○	×	×	
bind	struct		○	○	×	×	
bind_name	string		○	○	×	×	
parent_sliver_id	string		○	○	×	×	
bind_infos	array		○	○	×	×	
bind_info	struct		○	○	×	×	
sliver_name	string		○	○	×	×	
interface_name	string		○	○	×	×	
vlan_id	int		-	○			
macaddress	string		-	○			
infraSpec	base64		○	○	×	×	
mapping	array		○	○	×	?	
amap	struct		○	○	×	?	
sliver_id	string		○	○	×	?	
location	string		○	○	×	?	
}							
methodName	param	type		reply			
				VN→PG →ID V	VN→VN →ID V	PG→VN →P	G-LAMB DA→VN →G
reply.CreateSlivers	{	struct	must				
command_version	string	must	○	○	○	○	○
src_infra_name	string	must	○	○	○	○	○
dst_infra_name	string	must	○	○	○	○	○
src_slice_id	string	must	○	○	○	○	○
return_code	int	must	○	○	○	○	○
nodeSlivers	array	must	○	○	○	○	?
nodeSliver	struct	must	○	○	○	○	?
sliver_id	string	must	○	○	○	○	?
sliver_name	string		-	-			
sliver_type	string	must	○	○	○	○	?
parent_sliver_id	string	must	○	○	○	○	?
node_type	string		○	○	○	○	?
node_subtype	string		○	○	○	○	?
location_name	string		×	×	○	○	?
location_country	string		×	×	○	○	?
location_longitude	string		×	×	○	○	?
location_latitude	string		×	×	○	○	?

start_time	dateTime		x	x	○	?
end_time	dateTime		x	x	○	?
os_name	string		○	○	○	?
os_image_path	string	must	○	○	○	?
software_install	struct		x	x	○	?
install_urn	string		x	x	○	?
install_path	string		x	x	○	?
execute_path	string		x	x	○	?
resource	struct		○	○	x	?
cpumode	string		○	○	x	?
cpu	string		○	○	x	?
arch	string		○	○	x	?
memory	string		○	○	x	?
interfaces	array	must	○	○	○	?
interface	struct	must	○	○	○	?
interface_name	string	must	○	○	○	?
src_vlan_id	int		○	○	○	?
dst_vlan_id	int		○	○	○	?
src_mac_address	string		○	○	x	?
dst_mac_address	string		○	○	x	?
ip_address	string		x	x	○	?
ip_netmask	string		x	x	○	?
ip_type	string		x	x	○	?
vlan_id	int		○	-		
linkSlivers	array	must	○	○	○	?
linkSliver	struct	must	○	○	○	?
sliver_id	string	must	○	○	○	?
link_type	string		○	○	x	?
link_subtype	string		○	○	x	?
parent_sliver_id	string		○	○	x	?
vlan_id	int		○	-		
resource	struct		○	○	x	?
class	string		○	○	x	?
bandwidth	string		○	○	x	?
burstSize	string		○	○	x	?
queuingDelay	string		○	○	x	?
interfaces	array		○	○	x	?
interface	struct		○	○	x	?
interface_name	string		○	○	x	?
binds	array		○	○	x	x
bind	struct		○	○	x	x
bind_name	string		○	○	x	x
parent_sliver_id	string				x	x
bind_infos	array		○	○	x	x
bind_info	struct		○	○	x	x
sliver_name	string		○	○	x	x
interface_name	string		○	○	x	x

vlan_id	int		-	○		
macaddress	string		-	○		
infraSpec	base64		○	○	×	×
mapping	array		○	○	×	?
amap	struct		○	○	×	?
sliver_id	string		○	○	×	?
location	string		○	○	×	?
}						

3.3.2 AddSlivers

methodName	param	type		request			
				VN→PG	VN→VN	PG→VN	G-LAMB DA→VN
request.AddSlivers	{						
	command_version	string	must	x	x	○	○
	src_infra_name	string	must	x	x	○	○
	dst_infra_name	string	must	x	x	○	○
	src_slice_id	string	must	x	x	○	○
	nodeSlivers	array	must	x	x	○	○
	nodeSliver	struct	must	x	x	○	○
	sliver_id	string	must	x	x	○	○
	sliver_type	string	must	x	x		
	parent_sliver_id	string	must	x	x	○	○
	node_type	string		x	x	○	?
	node_subtype	string		x	x	○	?
	location_name	string		x	x	○	?
	location_country	string		x	x	○	?
	location_longitude	string		x	x	○	?
	location_latitude	string		x	x	○	?
	start_time	dateTime		○	○	○	?
	end_time	dateTime		NULL	NULL	NULL	?
	os_name	string		x	x	○	?
	os_image_path	string	must	x	x	○	?
	software_install	struct		x	x	○	?
	install_urn	string		x	x	○	?
	install_path	string		x	x	○	?
	execute_path	string		x	x	○	?
	resource	struct		x	x	x	?
	cpumode	string		x	x	x	?
	cpu	string		x	x	x	?
	arch	string		x	x	x	?
	memory	string		x	x	x	?
	interfaces	array	must	x	x	○	?
	interface	struct	must	x	x	○	?
	interface_name	string	must	x	x	○	?
	src_vlan_id	string		x	x	○	?
	dst_vlan_id	string		x	x	x	?
	src_mac_address	string		x	x	x	?
	dst_mac_address	string		x	x	x	?
	ip_address	string		x	x	○	?
	ip_netmask	string		x	x	○	?
	ip_type	string		x	x	○	?
	vlan_id	int		x	x		?
	linkSlivers	array	must	x	x	○	?
	linkSliver	struct	must	x	x	○	?
	sliver_id	string	must	x	x	○	?

link_type	string			x	x	x	?
link_subtype	string			x	x	x	?
parent_sliver_id	string			x	x	x	?
vlan_id	int			x	x	x	?
resource	struct			x	x	x	?
class	string			x	x	x	?
bandwidth	string			x	x	x	?
burstSize	string			x	x	x	?
queuingDelay	string			x	x	x	?
interfaces	array	must		x	x	x	?
interface	struct	must		x	x	x	?
interface_name	string	must		x	x	x	?
binds	array			x	x	x	?
bind	struct			x	x	x	?
bind_name	string			x	x	x	?
parent_sliver_id	string			x	x	x	?
bind_infos	array			x	x	x	x
bind_info	struct			x	x	x	x
sliver_name	string			x	x	x	x
interface_name	string			x	x	x	x
vlan_id	int			x	x	x	x
macaddress	string			x	x	x	x
infraSpec	base64			x	x	x	x
mapping	array			x	x	x	?
amap	struct			x	x	x	?
sliver_id	string			x	x	x	?
location	string			x	x	x	?
}							
methodName	param	type		reply			
				VN→PG → B V	VN→VN → B V	PG→VN →P	G-LAMB DA→VN →G
reply.AddSlivers	{						
command_version	string	must		○	x	○	○
src_infra_name	string	must		○	x	○	○
dst_infra_name	string	must		○	x	○	○
src_slice_id	string	must		○	x	○	○
return_code	int	must		○	x	○	○
nodeSlivers	array	must		○	x	○	○
nodeSliver	struct	must		○	x	○	○
sliver_id	string	must		○	x	○	○
sliver_type	string			○	x		
parent_sliver_id	string	must		○	x	○	○
node_type	string			○	x	○	?
node_subtype	string			○	x	○	?
location_name	string			x	x	○	?
location_country	string			x	x	○	?
location_longitude	string			x	x	○	?
location_latitude	string			x	x	○	?
start_time	dateTime			x	x	○	?
end_time	dateTime			NULL	NULL	NULL	?
os_name	string			○	x	○	?

os_image_path	string		○	×	○	?
software_install	struct		×	×	○	?
install_urn	string		×	×	○	?
install_path	string		×	×	○	?
execute_path	string		×	×	○	?
resource	struct		○	×	×	?
cpumode	string		○	×	×	?
cpu	string		○	×	×	?
arch	string		○	×	×	?
memory	string		○	×	×	?
interfaces	array	must	○	×	○	?
interface	struct	must	○	×	○	?
interface_name	string	must	○	×	○	?
src_vlan_id	string		○	×	○	?
dst_vlan_id	string		○	×	×	?
src_mac_address	string		○	×	×	?
dst_mac_address	string		○	×	×	?
ip_address	string		×	×	○	?
ip_netmask	string		×	×	○	?
ip_type	string		×	×	○	?
vlan_id	int			×		?
linkSlivers	array	must	○	×	○	?
linkSliver	struct	must	○	×	○	?
sliver_id	string	must	○	×	○	?
link_type	string		○	×	×	?
link_subtype	string		○	×	×	?
parent_sliver_id	string		○	×	×	?
vlan_id	int			×	×	?
resource	struct		○	×	×	?
class	string		○	×	×	?
bandwidth	string		○	×	×	?
burstSize	string		○	×	×	?
queuingDelay	string		○	×	×	?
interfaces	struct		○	×	×	?
interface	must		○	×	×	?
interface_name	string		○	×	×	?
binds	array		×	×	×	?
bind	struct		×	×	×	?
bind_name	string		×	×	×	?
parent_sliver_id	string		×	×	×	?
bind_infos	array	must	×	×	×	×
bind_info	struct		×	×	×	×
sliver_name	string		×	×	×	×
interface_name	string		×	×	×	×
vlan_id	int		×	×	×	×
macaddress	string		×	×	×	×

infraSpec	base64		x	x	x	x
mapping	array		x	x	x	?
amap	struct		x	x	x	?
sliver_id	string		x	x	x	?
location	string		x	x	x	?
}						

3.3.3 RunSlivers

methodName	param	type		request			
				VN→PG	VN→VN	PG→VN	G-LAMB DA→VN
request.RunSlivers	{						
	command_version	string	must	○	○	○	○
	src_infra_name	string	must	○	○	○	○
	dst_infra_name	string	must	○	○	○	○
	src_slice_id	string	must	○	○	○	○
	nodeSlivers	array	must	○	○	○	?
	nodeSliver	struct	must	○	○	○	?
	sliver_id	string	must	○	○	○	?
	linkSlivers	array	must	○	○	○	?
	linkSliver	struct	must	○	○	○	?
	sliver_id	string	must	○	○	○	?
}							
methodName	param	type		reply			
				VN→PG →IB V	VN→VN →IB V	PG→VN →P	G-LAMB DA→VN →G
reply.RunSlivers	{						
	command_version	string	must	○	○	○	○
	src_infra_name	string	must	○	○	○	○
	dst_infra_name	string	must	○	○	○	○
	src_slice_id	string	must	○	○	○	○
	return_code	int	must	○	○	○	○
	nodeSlivers	array	must	○	○	○	○
	nodeSliver	struct	must	○	○	○	○
	sliver_id	string	must	○	○	○	○
	return_code	int	must	○	x	x	x
	linkSlivers	array	must	○	○	○	○
	linkSliver	struct	must	○	○	○	○
	sliver_id	string	must	○	○	○	○
	return_code	int	must	○	x	x	x
}							

3.3.4 StopSlivers

methodName	param	type		request			
				VN→PG	VN→VN	PG→VN	G-LAMB DA→VN
request.StopSlivers	{						
	command_version	string	must	○	○	○	○
	src_infra_name	string	must	○	○	○	○
	dst_infra_name	string	must	○	○	○	○
	src_slice_id	string	must	○	○	○	○
	nodeSlivers	array	must	○	○	○	?
	nodeSliver	struct	must	○	○	○	?
	sliver_id	string	must	○	○	○	?
	linkSlivers	array	must	○	○	○	?
	linkSliver	struct	must	○	○	○	?
	sliver_id	string	must	○	○	○	?
}							
methodName	param	type		reply			
				VN→PG →IB V	VN→VN →IB V	PG→VN →P	G-LAMB DA→VN →G
reply.StopSlivers	{						
	command_version	string	must	○	○	○	○
	src_infra_name	string	must	○	○	○	○
	dst_infra_name	string	must	○	○	○	○
	src_slice_id	string	must	○	○	○	○
	return_code	int	must	○	○	○	○
	nodeSlivers	array	must	○	○	○	○
	nodeSliver	struct	must	○	○	○	○
	sliver_id	string	must	○	○	○	○
	return_code	int	must	○	x	x	x
	linkSlivers	array	must	○	○	○	○
	linkSliver	struct	must	○	○	○	○
	sliver_id	string	must	○	○	○	○
	return_code	int	must	○	x	x	x
}							

3.3.5 DeleteSlice

methodName	param	type		request			
				VN→PG	VN→VN	PG→VN	G-LAMB DA→VN
request.DeleteSlice	{						
	command_version	string	must	○	○	○	○
	src_infra_name	string	must	○	○	○	○
	dst_infra_name	string	must	○	○	○	○
	src_slice_id	string	must	○	○	○	○
	}						
methodName	param	type		reply			
				VN→PG →IB V	VN→VN →IB V	PG→VN →P	G-LAMB DA→VN →G
reply.DeleteSlice	{						
	command_version	string	must	○	○	○	○
	src_infra_name	string	must	○	○	○	○
	dst_infra_name	string	must	○	○	○	○
	src_slice_id	string	must	○	○	○	○
	return_code	int	must	○	○	○	○
	}						

3.3.6 DeleteSlivers

methodName	param	type		request			
				VN→PG	VN→VN	PG→VN	G-LAMB DA→VN
request.DeleteSlivers	{						
	command_version	string	must	x	x	○	○
	src_infra_name	string	must	x	x	○	○
	dst_infra_name	string	must	x	x	○	○
	src_slice_id	string	must	x	x	○	○
	nodeSlivers	array	must	x	x	○	○
	nodeSliver	struct	must	x	x	○	○
	sliver_id	string	must	x	x	○	○
	linkSlivers	array	must	x	x	○	○
	linkSliver	struct	must	x	x	○	○
	sliver_id	string	must	x	x	○	○
}							
methodName	param	type		reply			
				VN→PG →IB V	VN→VN →IB V	PG→VN →P	G-LAMB DA→VN →G
reply.DeleteSlivers	{						
	command_version	string	must	x	x	○	○
	src_infra_name	string	must	x	x	○	○
	dst_infra_name	string	must	x	x	○	○
	src_slice_id	string	must	x	x	○	○
	return_code	int	must	x	x	○	○
	nodeSlivers	array	must	x	x	○	○
	nodeSliver	struct	must	x	x	○	○
	sliver_id	string	must	x	x	○	○
	return_code	int	must	x	x	-	-
	linkSlivers	array	must	x	c	○	○
	linkSliver	struct	must	x	x	○	○
	sliver_id	string	must	x	x	○	○
	return_code	int	must	x	x	-	-
}							

3.3.7 ResourcesInfo

methodName	param	type		request			
				VN→PG	VN→VN	PG→VN	G-LAMB DA→VN
request.ResourcesInfo	{						
	command_version	string	must	x	x	○	○
	src_infra_name	string	must	x	x	○	○
	dst_infra_name	string	must	x	x	○	○
	src_slice_id	string	must	x	x	○	○
	nodeSlivers	array		x	x	x	x
	nodeSliver	struct		x	x	x	x
	sliver_id	string		x	x	x	x
	linkSlivers	array		x	x	x	x
	linkSliver	struct		x	x	x	x
	sliver_id	string		x	x	x	x
}							
methodName	param	type		reply			
				VN→PG →IB V	VN→VN →IB V	PG→VN →P	G-LAMB DA→VN →G
reply.ResourcesInfo	{						
	command_version	string	must	x	x	○	○
	src_infra_name	string	must	x	x	○	○
	dst_infra_name	string	must	x	x	○	○
	src_slice_id	string	must	x	x	○	○
	return_code	int	must	x	x	○	○
	nodeSlivers	array	must	x ※1	x ※1	?	?
	nodeSliver	struct	must	x ※1	x ※1	?	?
	sliver_id	string	must	x ※1	x ※1	?	?
	sliver_name	string		x ※1	x ※1	?	?
	available	boolean	must	x ※1	x ※1	?	?
	node_type	string	must	x ※1	x ※1	?	?
	localtion_name	string		x ※1	x ※1	?	?
	localtion_country	string		x ※1	x ※1	?	?
	location_longitude	string		x ※1	x ※1	?	?
	location_latitude	string		x ※1	x ※1	?	?
	exclusive	bool		x ※1	x ※1	?	?
	start_time	dateTime		x ※1	x ※1	?	?
	end_time	dateTime		x ※1	x ※1	?	?
	os_name	string		x ※1	x ※1	?	?
	os_image_path	string		x ※1	x ※1	?	?
	interfaces	array	must	x ※1	x ※1	?	?
	interface	struct	must	x ※1	x ※1	?	?
	interface_name	string	must	x ※1	x ※1	?	?
	linkSlivers	array	must	x ※1	x ※1	?	?
	linkSliver	struct	must	x ※1	x ※1	?	?
	sliver_id	string	must	x ※1	x ※1	?	?
	sliver_name	string		x ※1	x ※1	?	?
	souce_id	string	must	x ※1	x ※1	?	?
	souce_interface	string	must	x ※1	x ※1	?	?
	dest_id	string	must	x ※1	x ※1	?	?

	dest_interface	string	must	x ※1	x ※1	?	?
	bandwidth	string		x ※1	x ※1	?	?
	packet_size	int		x ※1	x ※1	?	?
	latency	string		x ※1	x ※1	?	?
	packet_loss	string		x ※1	x ※1	?	?
	class	string		x ※1	x ※1	?	?
	}						

3.3.8 SliverStatus

methodName	param	type		request			
				VN→PG	VN→VN	PG→VN	G-LAMB DA→VN
request.SliverStatus	{						
	command_version	string	must	○	○	○	○
	src_infra_name	string	must	○	○	○	○
	dst_infra_name	string	must	○	○	○	○
	src_slice_id	string	must	○	○	○	○
	nodeSlivers	array	must	○	○	○	○
	nodeSliver	struct	must	○	○	○	○
	sliver_id	string	must	○	○	○	○
	linkSlivers	array	must	○	○	○	○
	linkSliver	struct	must	○	○	○	○
	sliver_id	string	must	○	○		
}							
methodName	param	type		reply			
				VN→PG →IB V	VN→VN →IB V	PG→VN →P	G-LAMB DA→VN →G
reply.SliverStatus	{						
	command_version	string	must	○	○	○	○
	src_infra_name	string	must	○	○	○	○
	dst_infra_name	string	must	○	○	○	○
	src_slice_id	string	must	○	○	○	○
	return_code	int	must	○	○	○	○
	nodeSlivers	array		○	○	○	○
	nodeSliver	struct	must	○	○	○	○
	sliver_id	string	must	○	○	○	○
	sliver_status	string		○	○	○	○
	interfaces	array	must	○	○	○	○
	interface	struct	must	○	○	○	○
	interface_name	string	must	○	○	○	○
	interface_status	string	must	○	○	○	○
	linkSlivers	array	must	○	○	○	○
	linkSliver	struct	must	○	○	○	○
	sliver_id	string	must	○	○		
	sliver_status	string	must		○		
}							

3.3.9 SliceStatus

methodName	param	type		request			
				VN→PG	VN→VN	PG→VN	G-LAMB DA→VN
request.SliceStatus	{						
	command_version	string	must	x	x	x	x
	src_infra_name	string	must	x	x	x	x
	dst_infra_name	string	must	x	x	x	x
	src_slice_id	string	must	x	x	x	x
	}						
methodName	param	type		reply			
				VN→PG →IB V	VN→VN →IB V	PG→VN →P	G-LAMB DA→VN →G
reply.SliceStatus	{						
	command_version	string	must	x	x	x	x
	src_infra_name	string	must	x	x	x	x
	dst_infra_name	string	must	x	x	x	x
	src_slice_id	string	must	x	x	x	x
	return_code	int	must	x	x	x	x
	nodeSlivers	array	must	x	x	x	x
	nodeSliver	struct	must	x	x	x	x
	sliver_id	string	must	x	x	x	x
	sliver_status	string		x	x	x	x
	interfaces	array	must	x	x	x	x
	interface	struct	must	x	x	x	x
	interface_name	string		x	x	x	x
	interface_status	string	must	x	x	x	x
	linkSlivers	array	must	x	x	x	x
	linkSliver	struct	must	x	x	x	x
	sliver_id	string	must	x	x	x	x
	sliver_status	string	must	x	x	x	x
	}						

3.3.10 NodeSliverStatistics

methodName	param	type		request			
				VN→PG	VN→VN	PG→VN	G-LAMB DA→VN
request.NodeSliverStatistics	{						
	command_version	string	must	○	○	○	○
	src_infra_name	string	must	○	○	○	○
	dst_infra_name	string	must	○	○	○	○
	src_slice_id	string	must	○	○	○	○
	nodeSlivers	array	must	○	○	○	○
	nodeSliver	struct	must	○	○	○	○
	sliver_id	string	must	○	○	○	○
}							
methodName	param	type		reply			
				VN→PG → B V	VN→VN → B V	PG→VN →P	G-LAMB DA→VN →G
reply.NodeSliverStatistics	{						
	command_version	string	must	○	○	○	○
	src_infra_name	string	must	○	○	○	○
	dst_infra_name	string	must	○	○	○	○
	src_slice_id	string	must	○	○	○	○
	return_code	int	must	○	○	○	○
	nodeSlivers	array	must	○	○	○	○
	nodeSliver	struct	must	○	○	○	○
	sliver_id	string	must	○	○	○	○
	timestamp	dateTime		x	x	x	x
	cpu	int		x	x	x	x
	memory	int		x	x	x	x
	storage	int		x	x	x	x
	interfaces	array		x	x	x	x
	interface	struct		x	x	x	x
	interface_name	string		x	x	x	x
	tx_packets	int		x	x	x	x
	rx_packets	int		x	x	x	x
	tx_bytes	int		x	x	x	x
	rx_bytes	int		x	x	x	x
}							

3.3.11 LinkSliverStatistics

methodName	param	type		request			
				VN→PG	VN→VN	PG→VN	G-LAMB DA→VN
request.LinkSliverStatistics	{						
	command_version	string	must	x	x	x	x
	src_infra_name	string	must	x	x	x	x
	dst_infra_name	string	must	x	x	x	x
	src_slice_id	string	must	x	x	x	x
	linkSlivers	array	must	x	x	x	x
	linkSliver	struct	must	x	x	x	x
	sliver_id	string	must	x	x	x	x
}							
methodName	param	type		reply			
				VN→PG →IB V	VN→VN →IB V	PG→VN →P	G-LAMB DA→VN →G
reply.LinkSliverStatistics	{						
	command_version	string	must	x	x	x	x
	src_infra_name	string	must	x	x	x	x
	dst_infra_name	string	must	x	x	x	x
	src_slice_id	string	must	x	x	x	x
	return_code	int	must	x	x	x	x
	linkSlivers	array	must	x	x	x	x
	linkSliver	struct	must	x	x	x	x
	sliver_id	string	must	x	x	x	x
	timestamp	dateTime		x	x	x	x
	tx_packets	int		x	x	x	x
	rx_packets	int		x	x	x	x
	tx_bytes	int		x	x	x	x
	rx_bytes	int		x	x	x	x
	latency	string		x	x	x	x
packet_loss	string		x	x	x	x	
}							

4 Sample

4.1 Create VNode-ProtoGENI federated slice

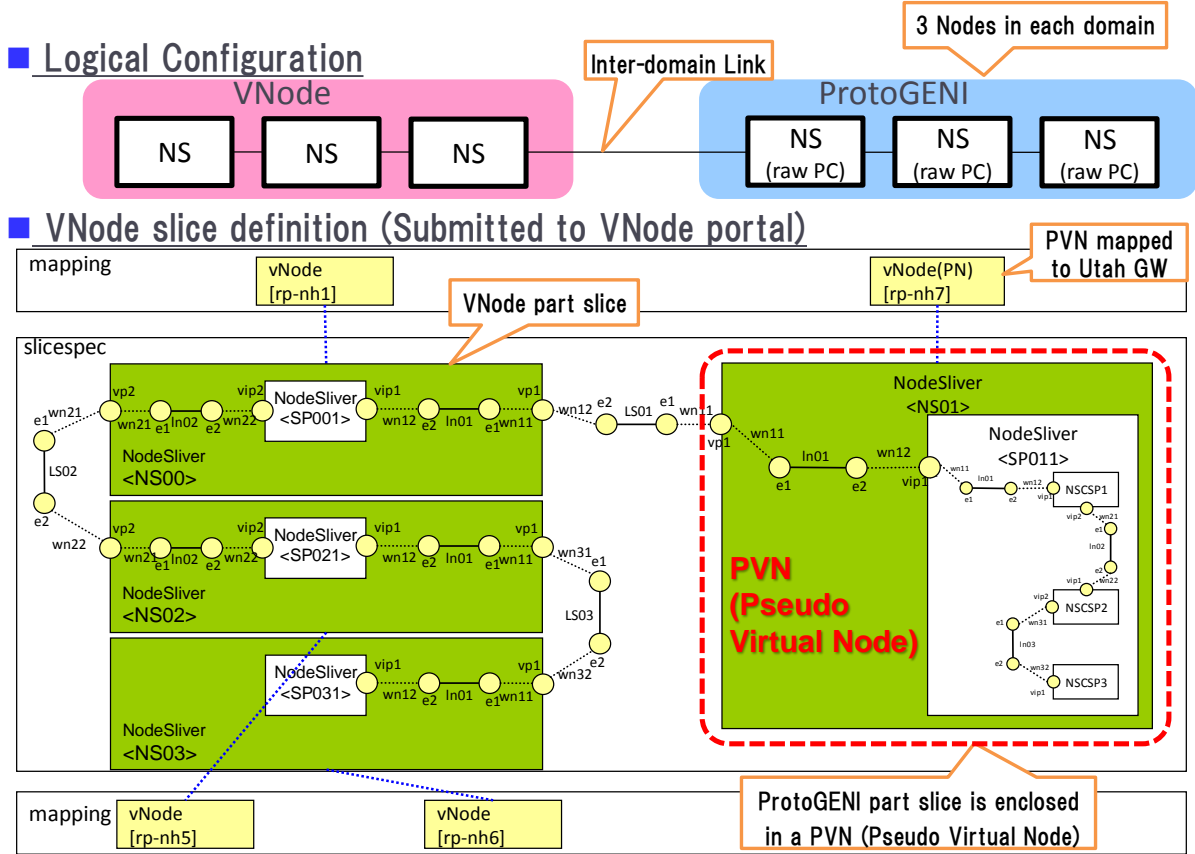
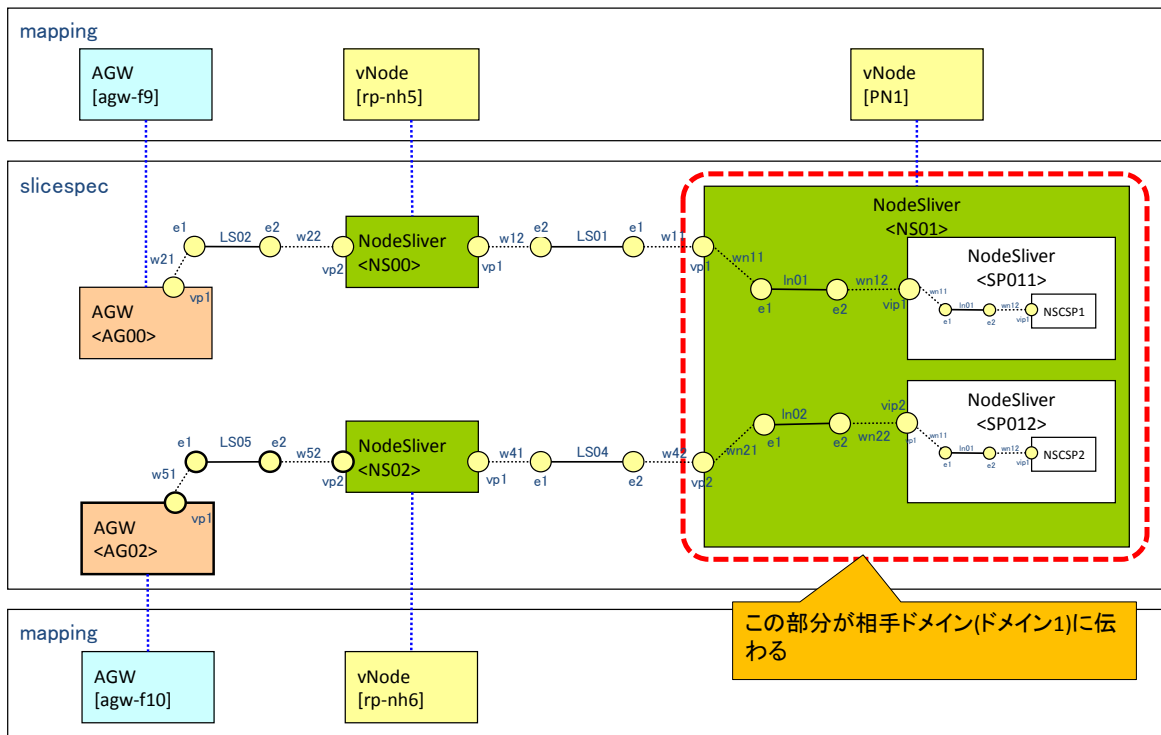


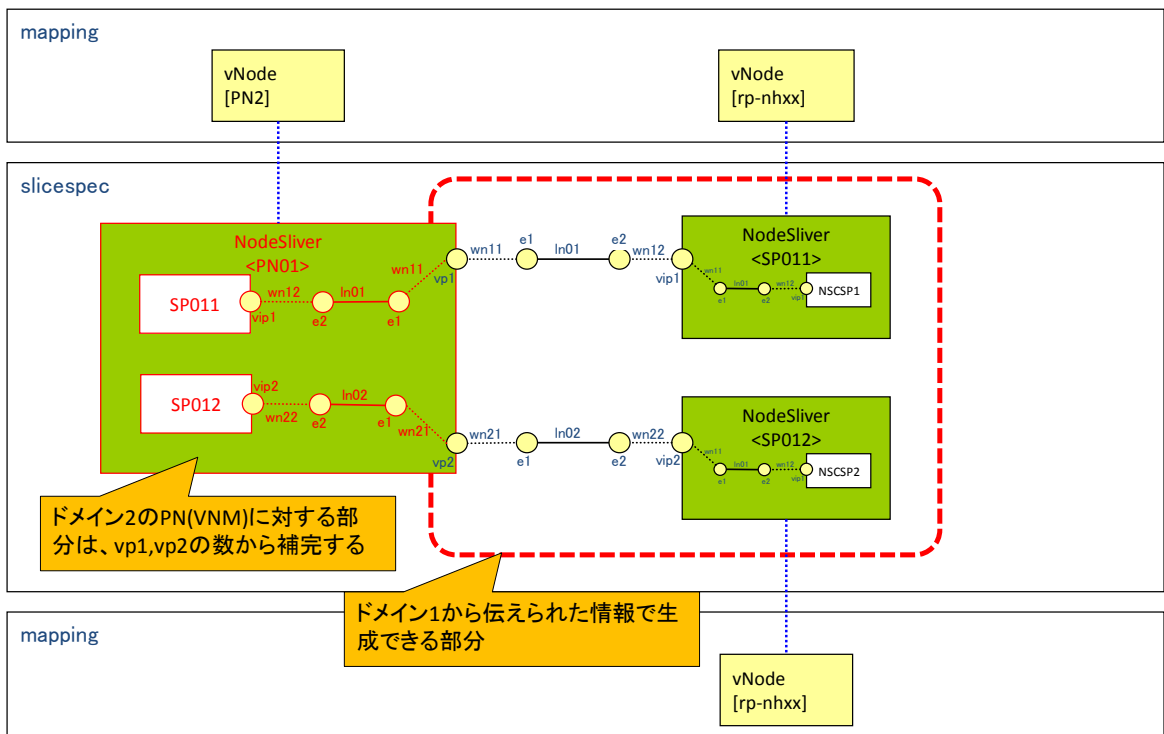
Fig. 4.1-1 Create VNode-ProtoGENI federated slice

4.2 Create VNode-ProtoGENI federated slice 2

(1)VNode side



(2)ProtoGENI side



4.3 Slice convert (VNode-VNode)

-	Domain 1 (VNode)	Domain 2 (VNode)
Link Sliver Domain 1 LS	<pre> <?xml version="1.0" encoding="UTF-8"?> <slice-design> <sllicespec name="NICT_Slice_ST002"> <sliverdef> <linkSlivers> <!-- LinkSliver LS01 --> <linkSliver name="LS01" type="link" subtype="GRE"> <resources> <resource key="bandwidth" value="100M" /> <resource key="burstSize" value="1024" /> <resource key="performanceIsolation" value="policing" /> </resources> <vports> <vport name="e1"/> <vport name="e2"/> </vports> </linkSliver> <!-- LinkSliver LS02 --> <linkSliver name="LS02" type="link" subtype="GRE"> <resources from="e1" to="e2"> <resource key="bandwidth" value="100M" /> <resource key="burstSize" value="1024" /> <resource key="performanceIsolation" value="policing" /> </resources> <resources from="e2" to="e1"> <resource key="bandwidth" value="100M" /> <resource key="burstSize" value="1024" /> <resource key="performanceIsolation" value="policing" /> </resources> <vports> <vport name="e1"/> <vport name="e2"/> </vports> </linkSliver> <!-- LinkSliver LS04 --> <linkSliver name="LS04" type="link" subtype="GRE"> <resources> <resource key="bandwidth" value="50M" /> <resource key="performanceIsolation" value="policing" /> </resources> <vports> <vport name="e1"/> <vport name="e2"/> </vports> </linkSliver> <!-- LinkSliver LS05 --> <linkSliver name="LS05" type="link" subtype="GRE"> <resources> <resource key="bandwidth" value="50M" /> <resource key="performanceIsolation" value="policing" /> </resources> <vports> <vport name="e1"/> <vport name="e2"/> </vports> </linkSliver> </linkSlivers> </pre>	<pre> <?xml version="1.0" encoding="UTF-8"?> <slice-design> <sllicespec name="Federation_Slice_NS01"> <sliverdef> <linkSlivers> <linkSliver name="ln01" type="link"> <vports> <vport name="e1" /> <vport name="e2" /> </vports> </linkSliver> </pre>
Domapn 1 LS	<pre> <!-- LinkSliver LS02 --> <linkSliver name="LS02" type="link" subtype="GRE"> <resources from="e1" to="e2"> <resource key="bandwidth" value="100M" /> <resource key="burstSize" value="1024" /> <resource key="performanceIsolation" value="policing" /> </resources> <resources from="e2" to="e1"> <resource key="bandwidth" value="100M" /> <resource key="burstSize" value="1024" /> <resource key="performanceIsolation" value="policing" /> </resources> <vports> <vport name="e1"/> <vport name="e2"/> </vports> </linkSliver> </pre>	<pre> <linkSliver name="ln02" type="link"> <vports> <vport name="e1" /> <vport name="e2" /> </vports> </linkSliver> </pre>
Domain 1 LS	<pre> <!-- LinkSliver LS04 --> <linkSliver name="LS04" type="link" subtype="GRE"> <resources> <resource key="bandwidth" value="50M" /> <resource key="performanceIsolation" value="policing" /> </resources> <vports> <vport name="e1"/> <vport name="e2"/> </vports> </linkSliver> </pre>	<pre> <linkSliver name="ln03" type="link"> <vports> <vport name="e1" /> <vport name="e2" /> </vports> </linkSliver> </linkSlivers> </pre>
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<p>Physics mapping</p>	<pre> <vport slivername="LS04" portname="e1"/> <vport slivername="NS02" portname="vp1"/> </bind> <bind name="w42"> <vport slivername="LS04" portname="e2"/> <vport slivername="NS01" portname="vp2"/> </bind> <bind name="w51"> <vport slivername="LS05" portname="e1"/> <vport slivername="AG02" portname="vp1"/> </bind> <bind name="w52"> <vport slivername="LS05" portname="e2"/> <vport slivername="NS02" portname="vp2"/> </bind> </structure> </slicespec> <mapping slice="NICT_Slice_ST002" vnetwork="HakusanST"> <amap node="NS00" vnode="rp-nh5" /> <amap node="NS01" vnode="PN1" /> <amap node="NS02" vnode="rp-nh6" /> <amap node="AG00" vnode="agw-f9" /> <amap node="AG02" vnode="agw-f10" /> </mapping> </slice-design> </pre>	<pre> </slicespec> <mapping slice="NICT_Slice_ST002" vnetwork="HakusanST"> <amap node="SP011" vnode="rp-nhxx" /> <amap node="SP012" vnode="rp-nhxx" /> <amap node="PN01" vnode="PN2" /> </mapping> </slice-design> </pre>
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