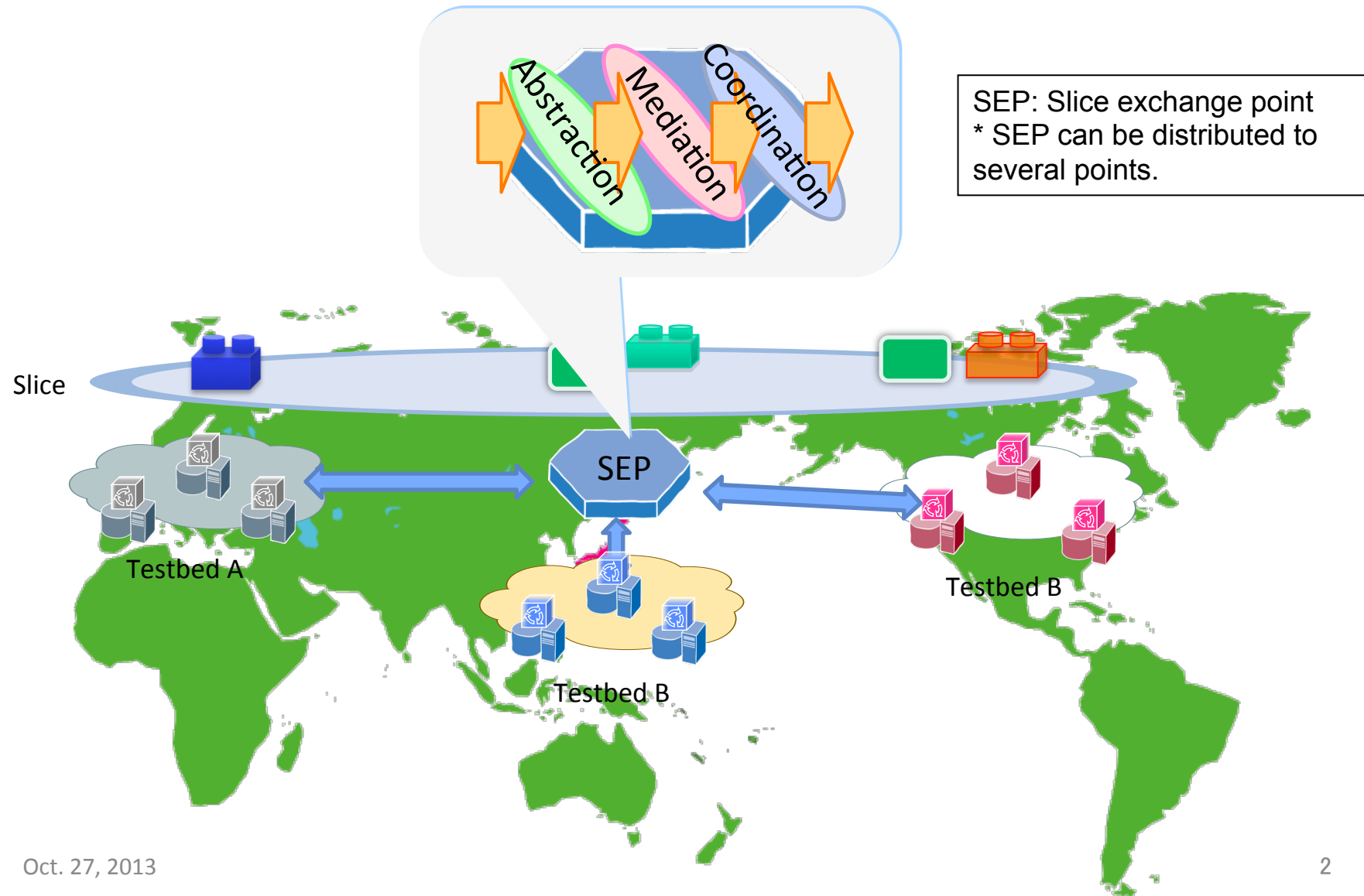# Slice Exchange Point
and
Federation between ProtoGENI and
VNode/FLARE @GEC18

Michiaki Hayashi (KDDI R&D Labs.)

Toshiaki Tarui, Yasushi Kanada (Hitachi)

Aki Nakao (Utokyo)

Slice Exchange Model (SEP)

SEP: Slice exchange point
* SEP can be distributed to several points.

Abstraction
Mediation
Coordination

Slice

SEP

Testbed A

Testbed B

Testbed B

Contributions of SEP to global experiments

- Testbed-neutrality
  - "Common" API
  - Resource description
  - New and remarkable capabilities of each testbeds

- Effective interconnection
  - Improve scalability in terms of # of physical connections in P2P model
  - Flexible Data-Plane protocol conversion at peering points.

    (e.g., Stitching, bridging/forking, L2(VLAN) and L3/4(NA(P)T) translation)

SEP
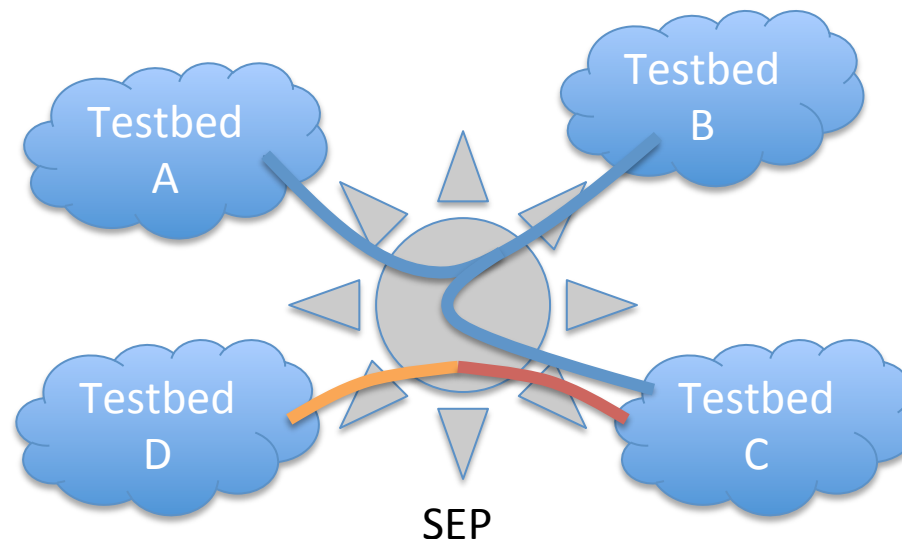
What we demonstrate @GEC18

Two-way federation between ProtoGENI and VNode, which use different resources, slice models, and management policies.

GEC18 DEMO
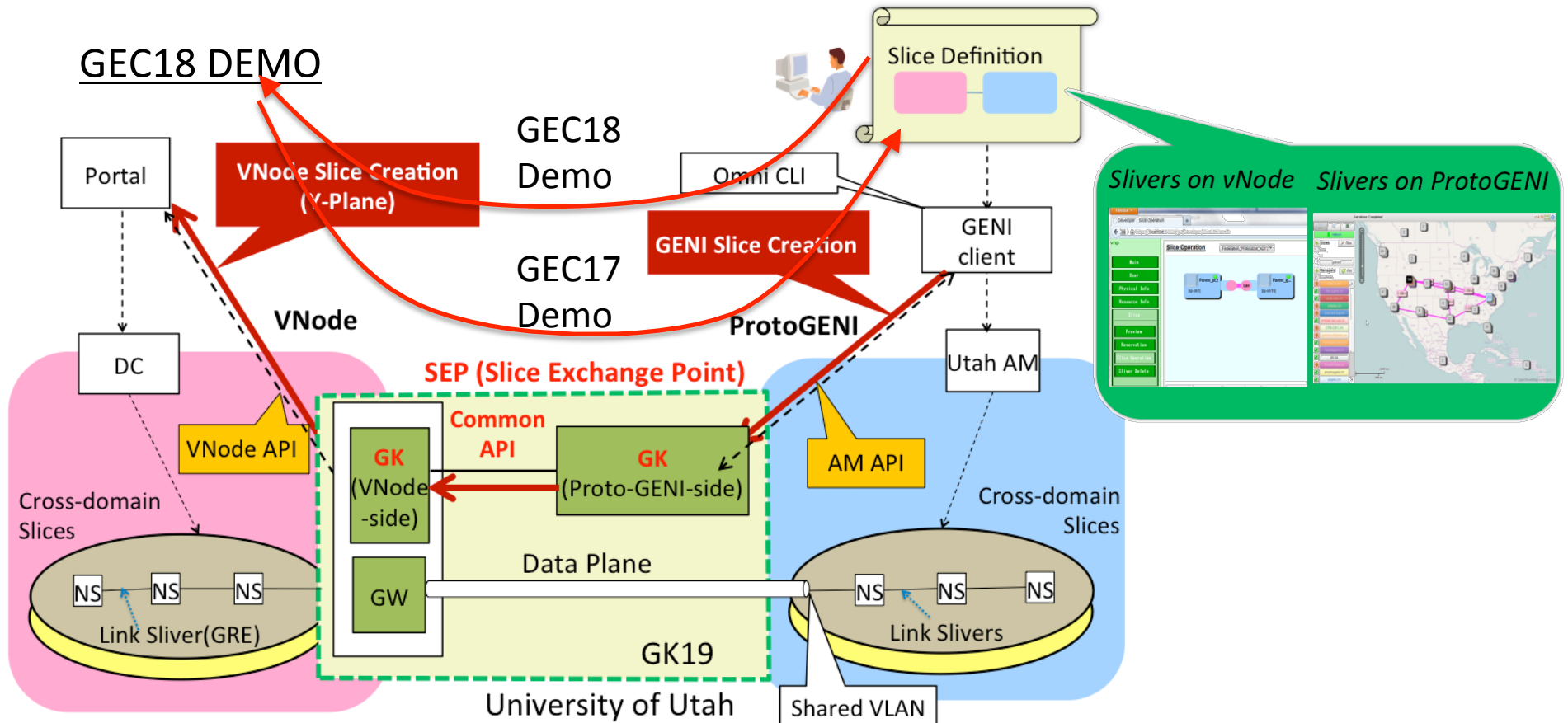
Oct. 27, 2013

GK: Gate Keeper, GW: Gateway, NS: Node Sliver, DC: Domain Controller

RSpec of AM-API for PG and VN

VNode

```
<rspec type="request"
    xsi:schemaLocation="http://www.geni.net/resources/rspec/3
                        http://www.geni.net/resources/rspec/3/request.xsd"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xmlns="http://www.geni.net/resources/rspec/3">
 <node client_id="pc4"
        exclusive="true">
  <sliver_type name="raw-pc" />
  <interface client_id="pc4:if0"></interface>
 </node>
 <link client_id="Lan4">
  <vlan:link_shared_vlan name="gk19-6" xmlns:vlan="http://www.geni.net/resources/rspec/ext/shared-vlan/1" />
  <interface_ref client_id="pc4:if0" />
 </link>
</rspec>
```

ProtoGENI

```
<rspec type="request"
    xsi:schemaLocation="http://www.geni.net/resources/rspec/3
                        http://www.geni.net/resources/rspec/3/request.xsd"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xmlns="http://www.geni.net/resources/rspec/3">
 <node client_id="pc1"
        exclusive="true">
  <sliver_type name="raw-pc" />
  <interface client_id="pc1:if0"></interface>
 </node>
 <link client_id="Lan">
  <vlan:link_shared_vlan name="gk19-6" xmlns:vlan="http://www.geni.net/resources/rspec/ext/shared-vlan/1" />
  <interface_ref client_id="pc1:if0" />
 </link>
</rspec>
```
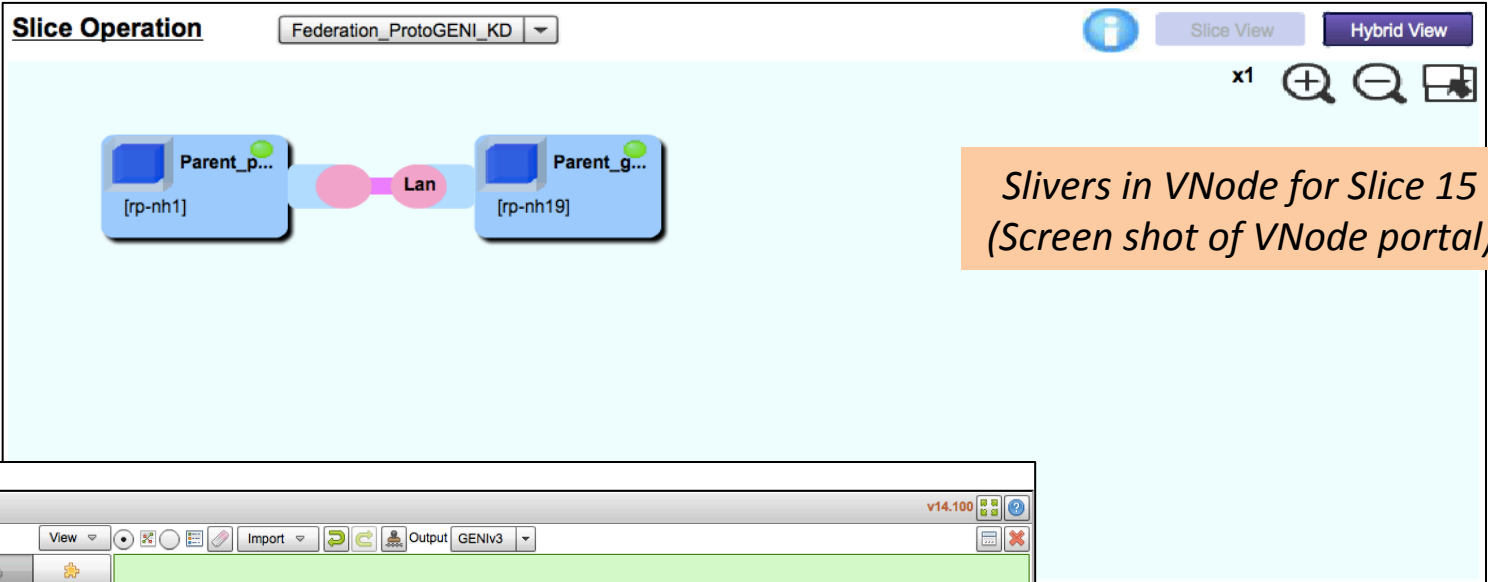
RSpec AM-API for PG and VN

VNode

ProtoGENI

Provisioned E2E slice (Slice ID=15)

Slivers in VNode for Slice 15
(Screen shot of VNode portal)

Slivers in ProtoGENI for Slice 15
(Screen shot of Flack)

Common CLI request from Omni

Step 1: Slice creation

```
[sep@sep gec18]$ omni.py createslice slice20 --debug
```

Step 2: Allocation

```
[sep@sep gec18]$ omni.py -a pg-utah3 allocate slice20 ~/gec18/ProtoGENIspecified.RS
pec.xml -V 3 -t GENI 3
15:47:19 INFO     omni: Loading agg_nick_cache file '/home/sep/.gcf/agg_nick_cache'
15:47:19 INFO     omni: Loading config file /home/sep/.gcf/omni_config
15:47:19 INFO     omni: Using control framework my_pg
15:47:19 INFO     omni.protogeni: Verbose logging is on
```

Step 3: Provision

```
[sep@sep gec18]$ omni.py -a pg-utah3 provision slice20 -V 3 -t GENI 3
15:47:56 INFO     omni: Loading agg_nick_cache file '/home/sep/.gcf/agg_nick_cache'
15:47:56 INFO     omni: Loading config file /home/sep/.gcf/omni_config
15:47:56 INFO     omni: Using control framework my_pg
15:47:56 INFO     omni.protogeni: Verbose logging is on
```

Step 4: PerformOperationalAction

```
[sep@sep gec18]$ omni.py -a pg-utah3 poa slice20 geni_start -V 3 -t GENI 3
15:48:35 INFO     omni: Loading agg_nick_cache file '/home/sep/.gcf/agg_nick_cache'
15:48:35 INFO     omni: Loading config file /home/sep/.gcf/omni_config
15:48:35 INFO     omni: Using control framework my_pg
15:48:35 INFO     omni.protogeni: Verbose logging is on
15:48:35 INFO     omni: Substituting AM nickname pg-utah3 with URL https://www.emul
ab.net:12369/protogeni/xmlrpc/am/3.0, URN urn:publicid:IDN+emulab.net+authority+cm
```

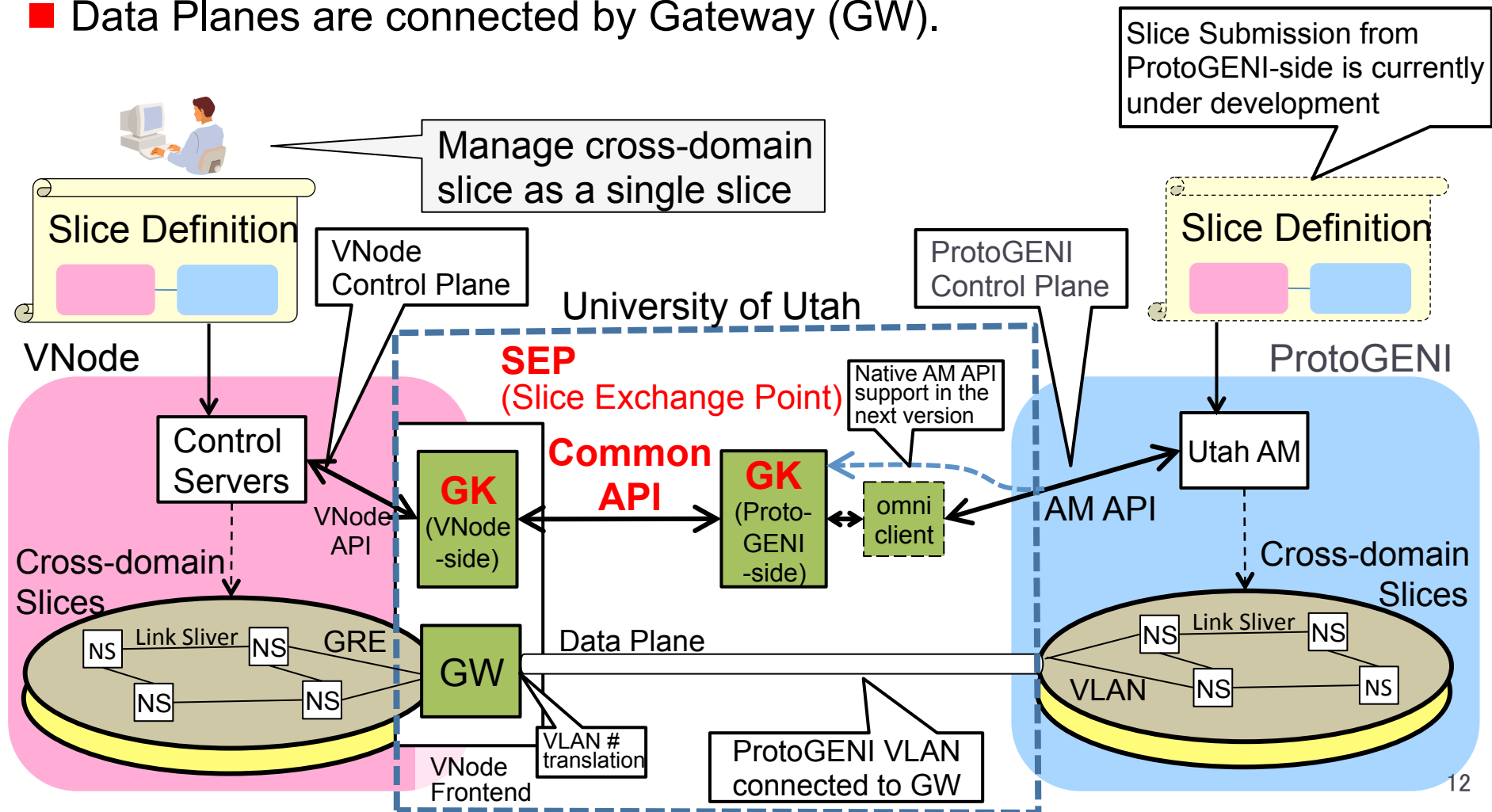Oct. 27, 2013

Successful demo in GEC18!
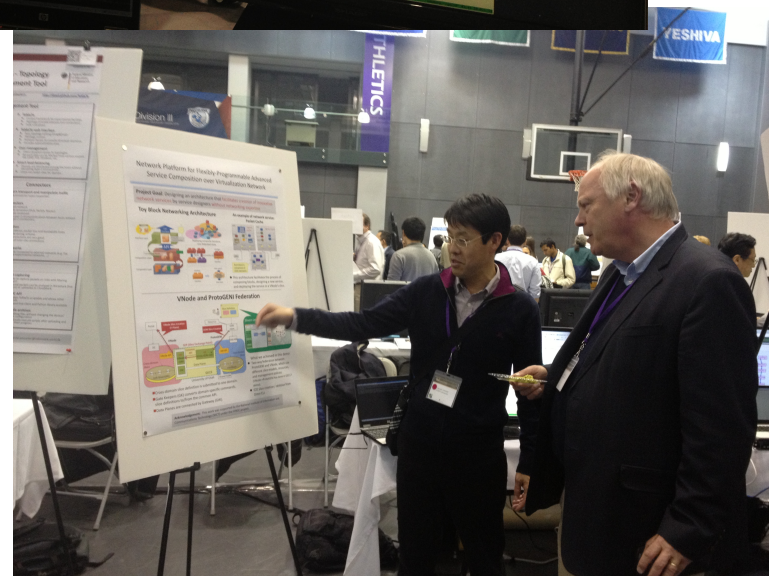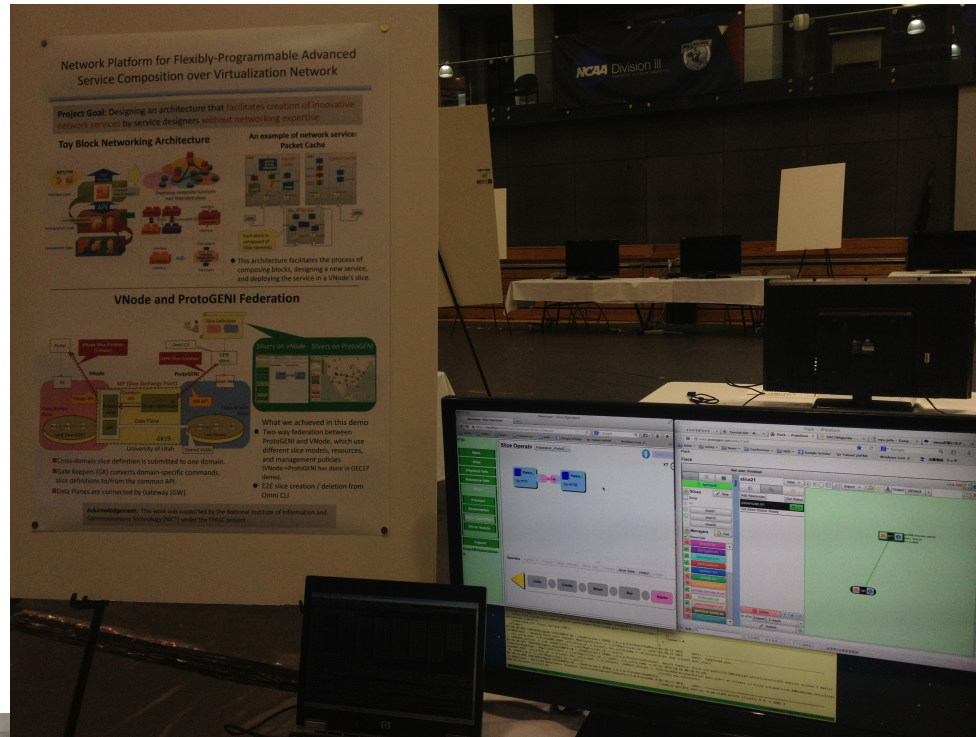
(Immediate)Future Work

- A slight modification to ProtoGENI

- 3-way Federation via common API

- Seamless specification across multiple testbeds (a single RSPEC)

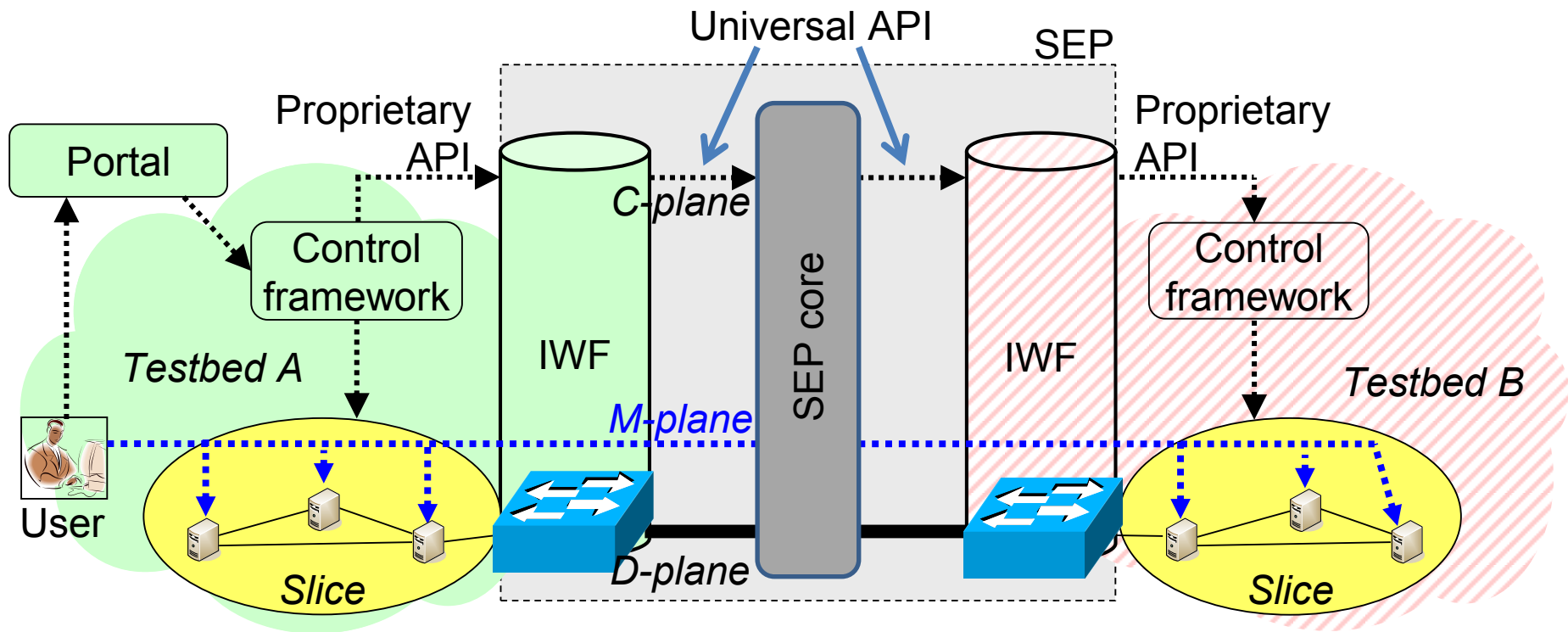- White paper and documentation

BACKUP

GEC17 demo

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

Slice Submission from ProtoGENI-side is currently under development

Manage cross-domain slice as a single slice

Slice Definition

VNode

VNode Control Plane

University of Utah

SEP
(Slice Exchange Point)

Common API

Native AM API support in the next version

ProtoGENI Control Plane

Slice Definition

ProtoGENI

Control Servers

GK
(VNode-side)

GK
(Proto-GENI-side)

omni client

Utah AM

AM API

VNode API

Cross-domain Slices

Link Sliver

NS NS GRE

NS NS

GW

Data Plane

Cross-domain Slices

Link Sliver

NS NS

VLAN

NS NS

VNode Frontend

VLAN # translation
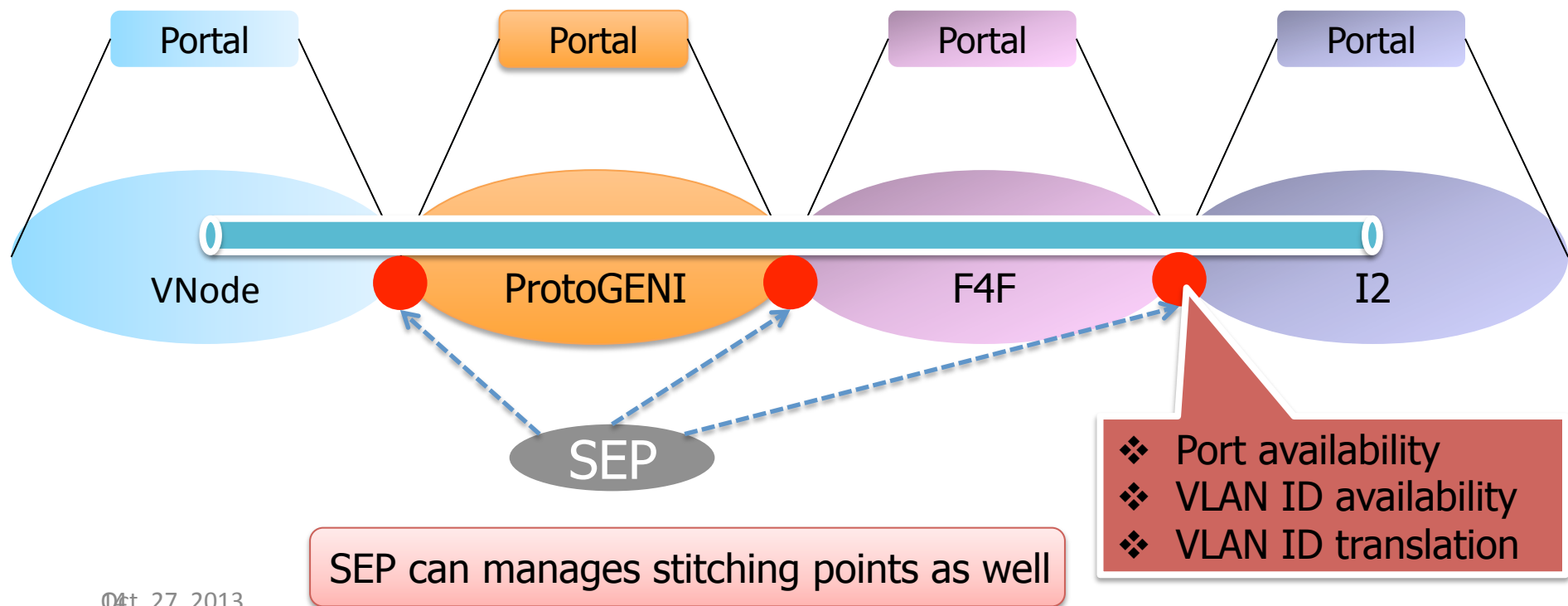
ProtoGENI VLAN connected to GW

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Architecture of SEP

Management of Configuration and Resource Data

- Helping E2E management
  - Dynamically-changing
  - Interconnecting (stitching) network (🔴)

Portal — VNode

Portal — ProtoGENI

Portal — F4F

Portal — I2

SEP

SEP can manages stitching points as well

- ❖ Port availability
- ❖ VLAN ID availability
- ❖ VLAN ID translation

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In-advance Reservation Service

- Helping E2E in-advance reservation
  - Even one domain ( ) can't schedule resources

In-advance reservation of slice

AM   AM   AM

Reserved slice

Time

Now

GEC18
9:00〜
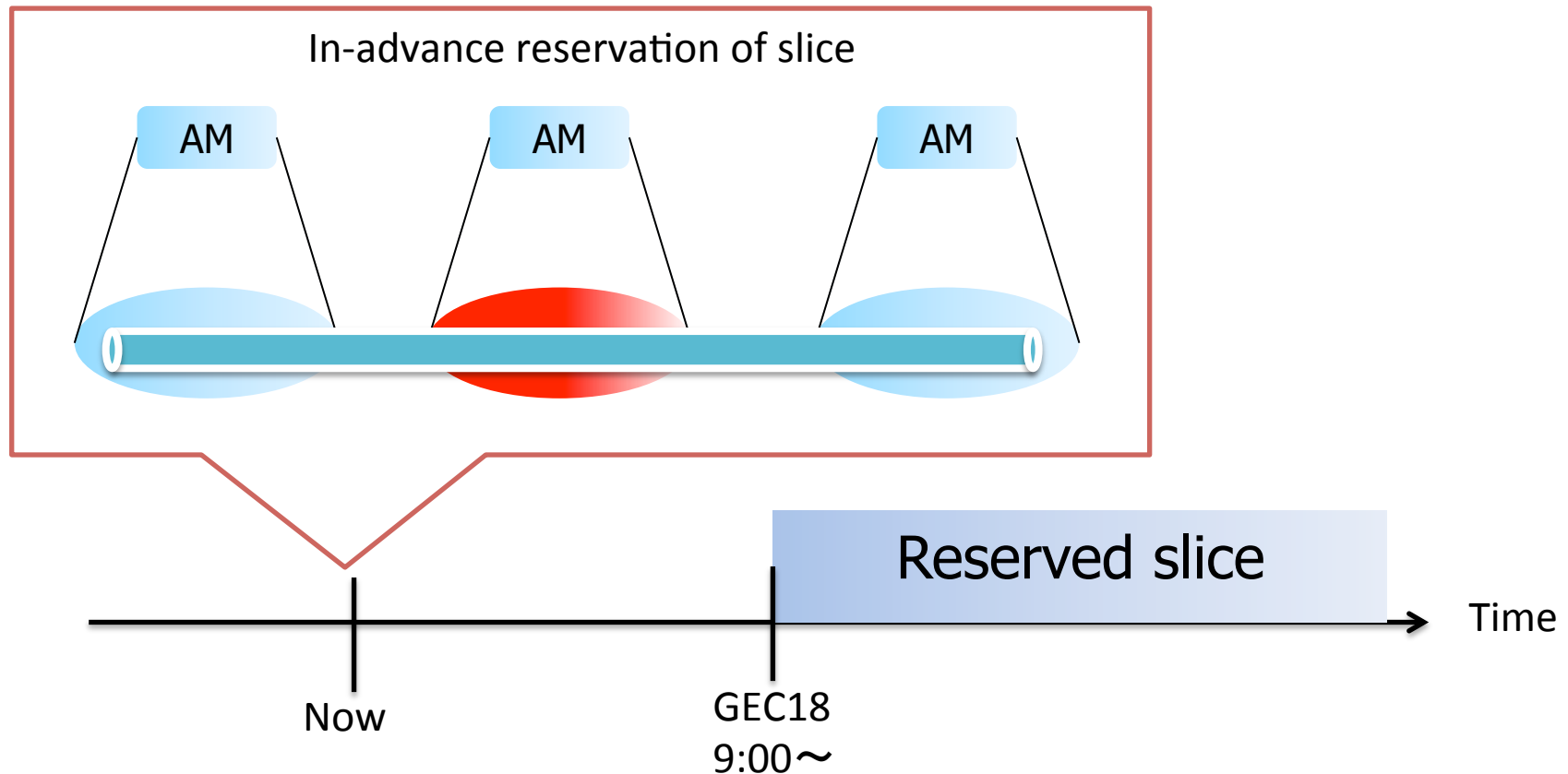
Managing different slice models

- Filling a gap between slice representations
  - Differences of resource granularity and configuration

High-level representation

Detailed representation