# An implementation of OpenFlow based virtual network for virtual clusters on the PRAGMA testbed

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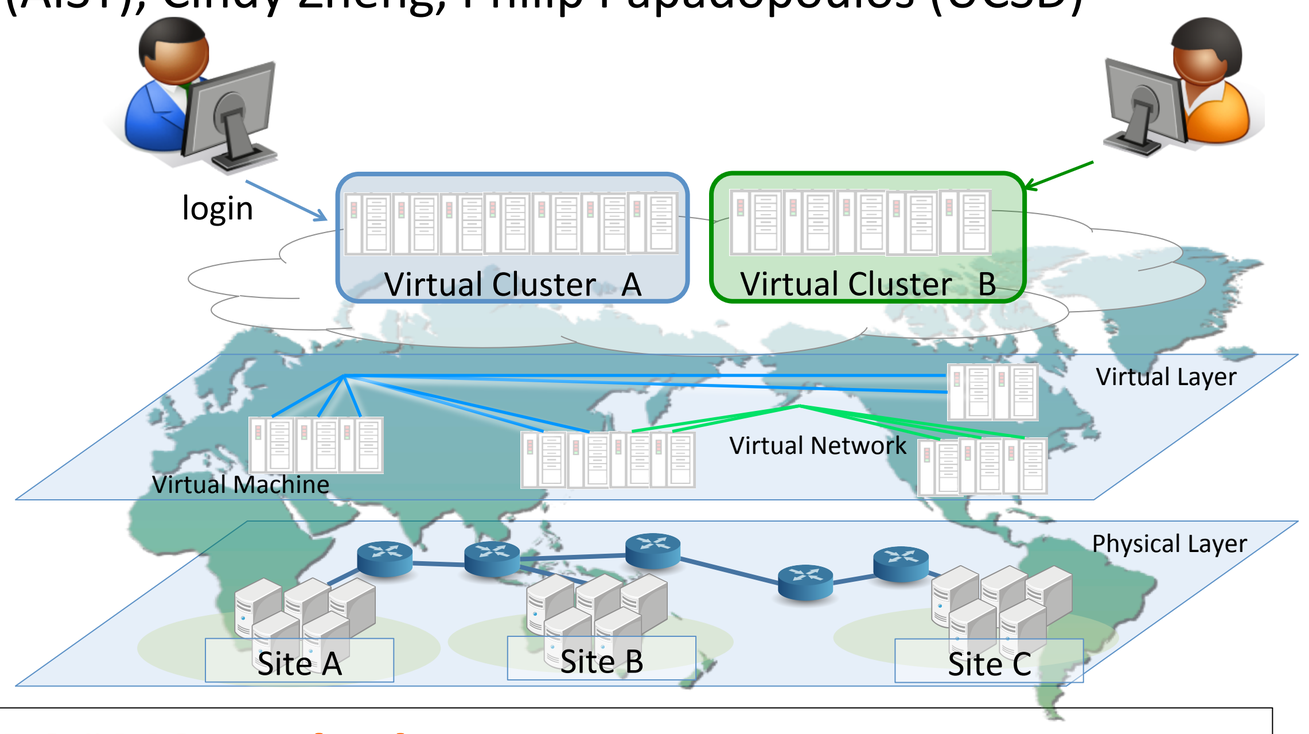
## Background

Grid and Cloud technology are supposed to allow us to easily aggregate and integrate computational resources into a large virtual computation environment on a wide-area network. However, it is still hard to deploy a single virtual computation environment like a local cluster among multiple organizations because of heterogeneities of resources and networks. In particular, how to set up isolated virtual network dedicated to each virtual cluster deployed on multiple sites is an issue.




## Proposal to PRAGMA testbed

The PRAGMA testbed is basically a cluster of cluster systems. To deploy a virtual cluster system, where each user group can use for their own purpose, on the PRAGMA testbed, an easy way to organize a virtual network spread over multiple partner sites is essentially required. From this consideration, we propose a OpenFlow-based administration method of the PRAGMA testbed, with which PRAGMA site administrators can easily deploy virtual networks.

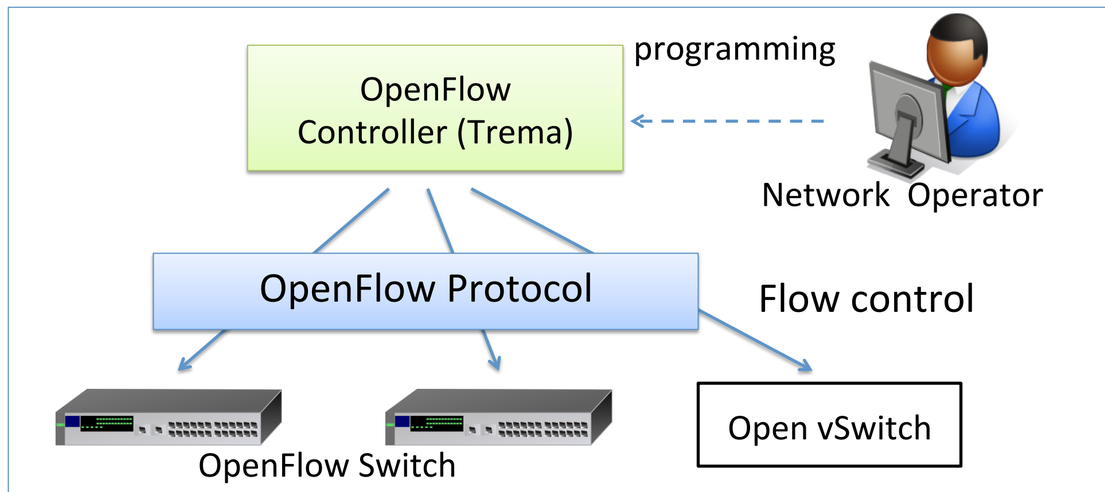
### <Setup environment>

For the proposal, the PRAGMA testbed should be configured and set up as follows.

1) *Open vSwitch* is installed into each machine of the PRAGMA testbed.
2) *Open vSwitches* are connected with GRE tunneling.
3) OpenFlow Controller (*Sliceable routing switch* based on *Trema*) is set up and configured to administer all *Open vSwitches* deployed onto machines on the PRAGMA testbed.

### <Benefit>

On the PRAGMA testbed set up with the procedure above, site administrators can easily organize a virtual network on arbitrary physical and virtual machines composing the PRAGMA testbed, simply by defining "Slice" as a list of MAC addresses of machines onto *Trema* with *Sliceable routing switch.*




- ***OpenFlow***

  A centralized programmable remote controller dictates the forwarding behavior to multiple OpenFlow switches. This architecture separating forwarding plane from control plane allows flexible management to network operator.

  - *Trema (http://trema.github.com/trema/)*

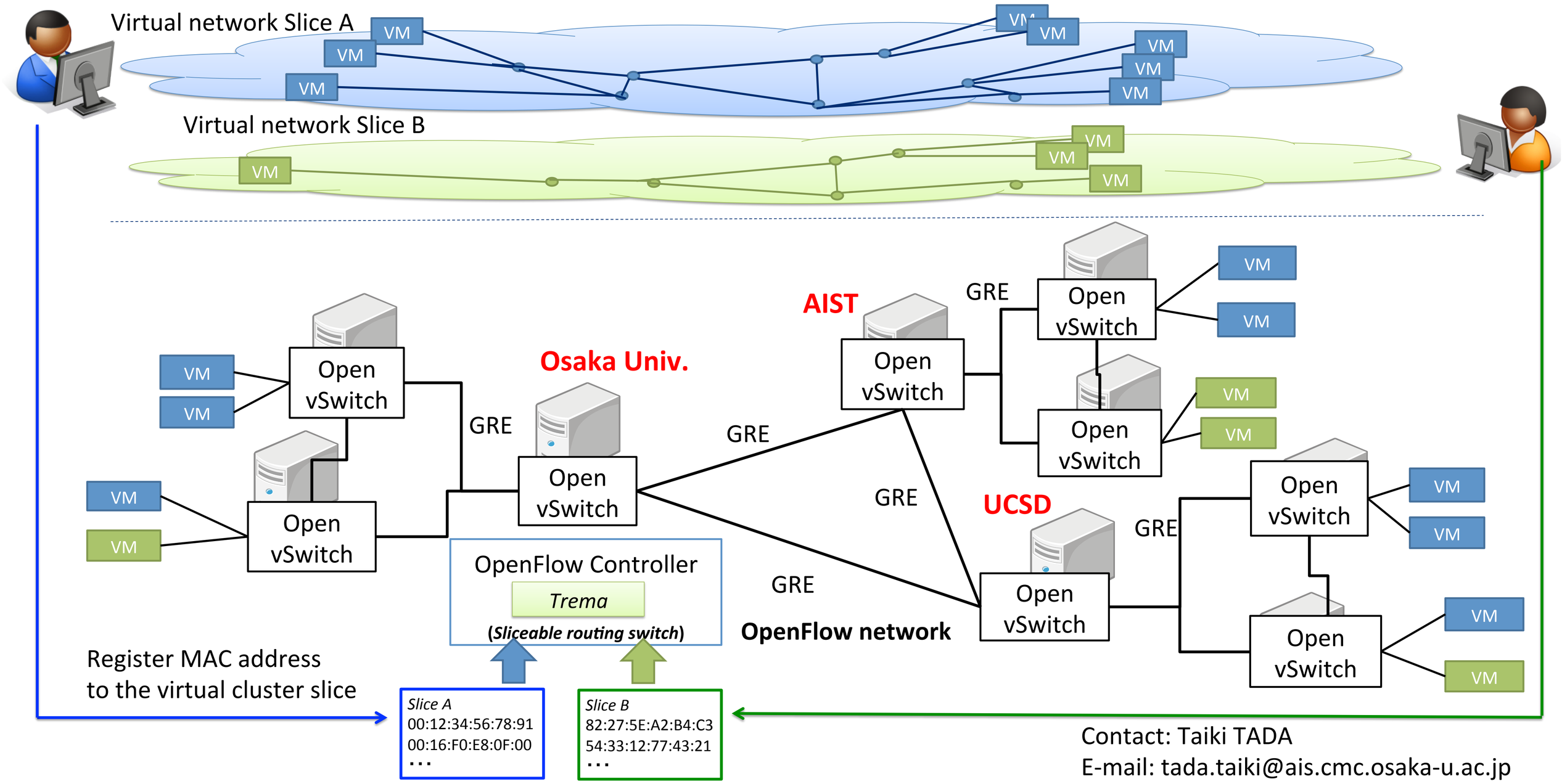
    A framework for developing OpenFlow controllers

  - *Open vSwitch (http://openvswitch.org/)*

    A software based implementation of OpenFlow switch

  - *Sliceable routing switch (http://trema.github.com/trema/app/)*

    An OpenFlow controller which provides isolated virtual network slices based on MAC addresses

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