Architecture of OpenFlow-based failure avoidance for SAGE

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Scientific data has been increasingly growing in size and complexity and therefore visualization technology has started to take a role of more importance. Tiled Display Wall (TDW, Fig.1), which is a single large display device composed of multiple sets of computers and displays, is such visualization technology. In particular, SAGE (Scalable Adaptive Graphics Environment) -based TDW allows scientists to display multiple series of scientific data, each of which might be located on a different site.

Fig.1 Tiled Display Wall

Problem

SAGE has a vulnerability to network failures. Specifically, if a network failure occurs on a network link between visualization application and display nodes, visualization on TDW partly stops (Fig.2).
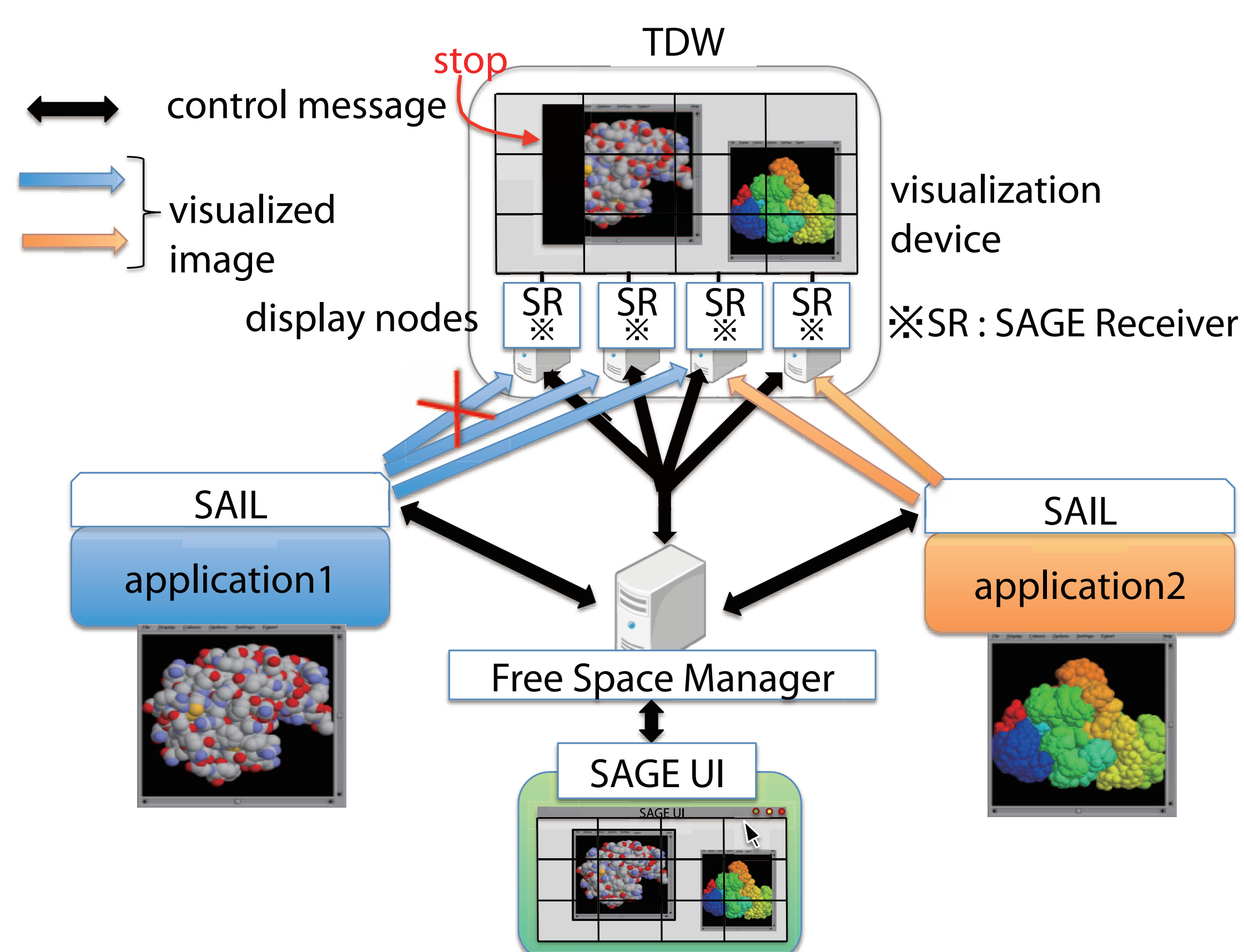

Fig.2 Network vulnerability in SAGE

Proposal

We propose a SAGE functionality that dynamically detects and avoids a network failure on a network link using OpenFlow, which allows to control network dynamically. The OpenFlow-based network failure avoidance functionality is composed of three functions.

- **Network failure detection function** detects the network failure between a visualization application and a display node.
- **Topology understanding function** grasps the network topology which OpenFlow Switches form.
- **Packet forwarding configuration function** discovers an alternate route and configures rules to OpenFlow Switches so that packets pass along the route.
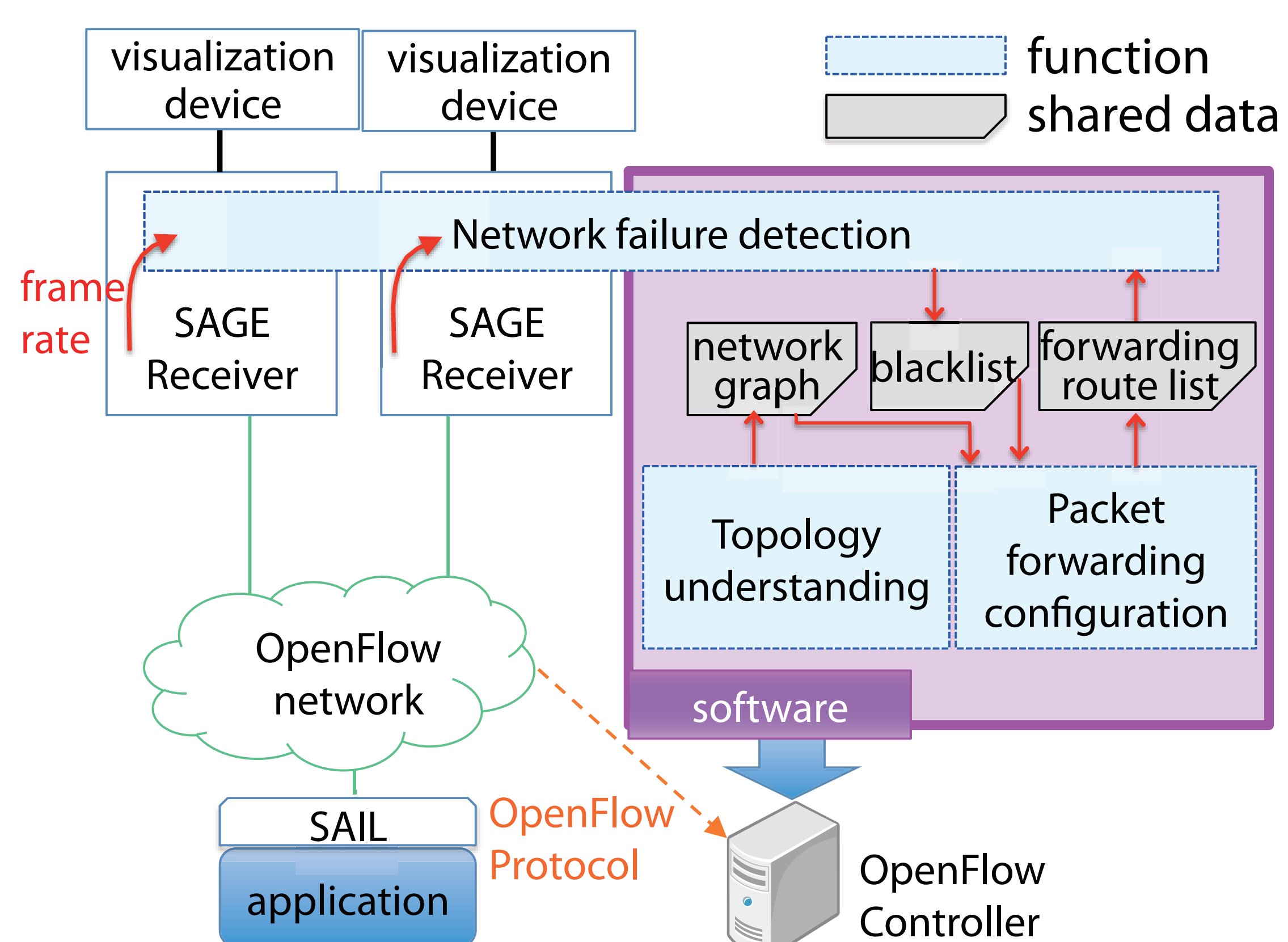

Fig.3 Proposed functionality
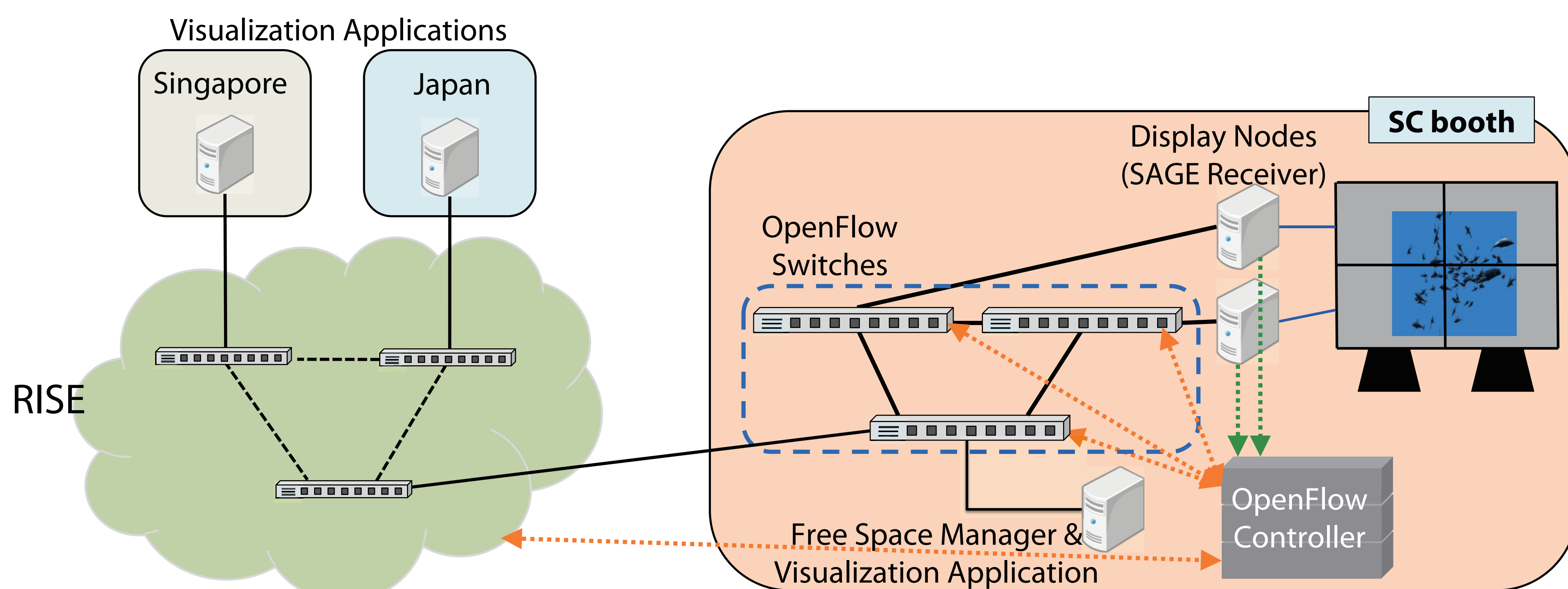
Demonstration Environment (at NICT booth)

Fig.4 Demonstration Environment

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