



NTT

NTT Information Sharing Platform Laboratories

Flows as a topology chart

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NTT Information Sharing Platform Labs.

■ Target

- IaaS platform (cloud computing environment)
- ISP backbone

■ Our Goals

- Referring to our tool for provisioning / capacity planning
- Reducing the cost for troubleshooting

■ Traffic Monitoring System “SASUKE”

- “SASUKE” is a hero of Ninja, covert agent
 - fictitious character, a story of 16th century.
- Collects Flow information from Exporters like a covert agent and report traffic information to a manager



“SASUKE”

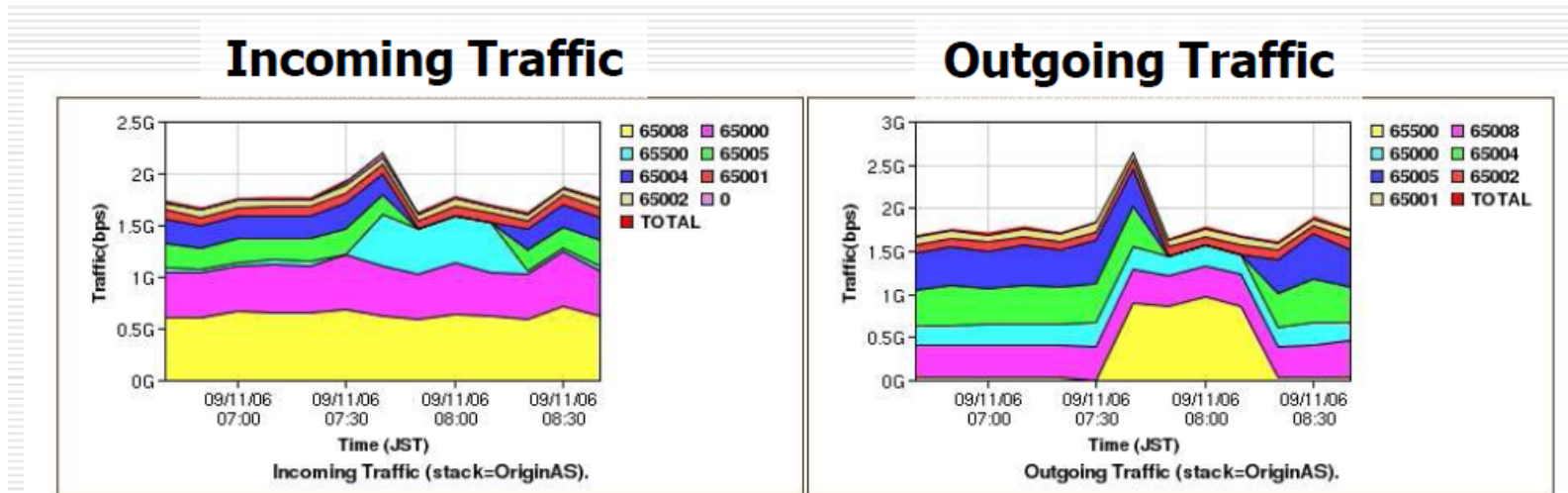
■ In FLOCON 2010, last year

➤ Atsushi Kobayashi

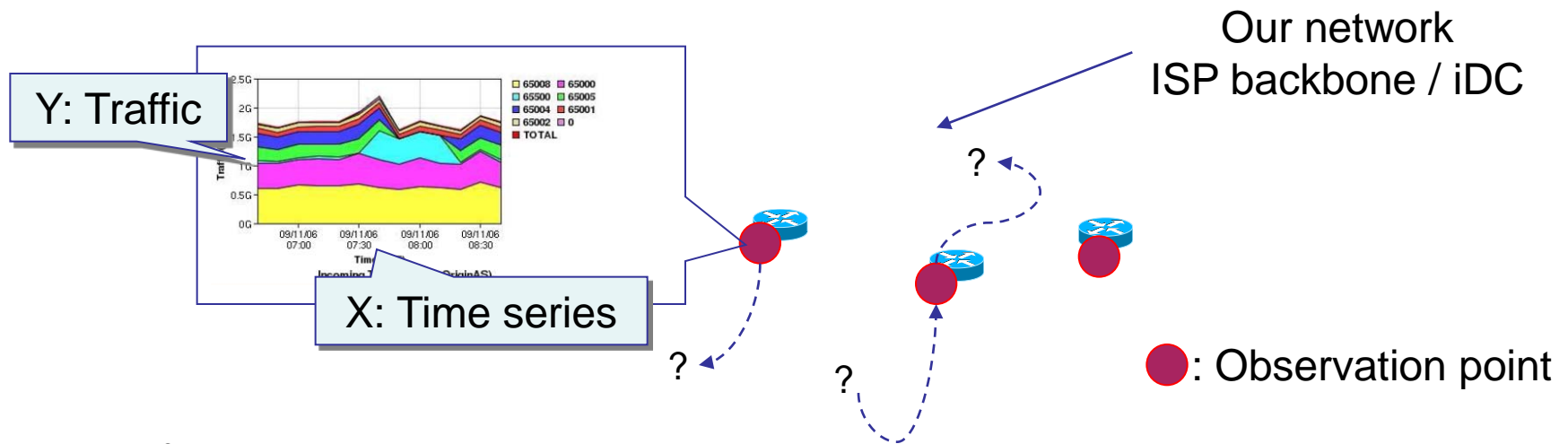
“SASUKE” Traffic Monitoring Tool: Traffic Shift Monitoring Based on Correlation between BGP Messages and Flow Data

• Features of this system:

- Visualizing traffic data using BGP routing information and Flow data.
- Showing these data as a stacked line chart



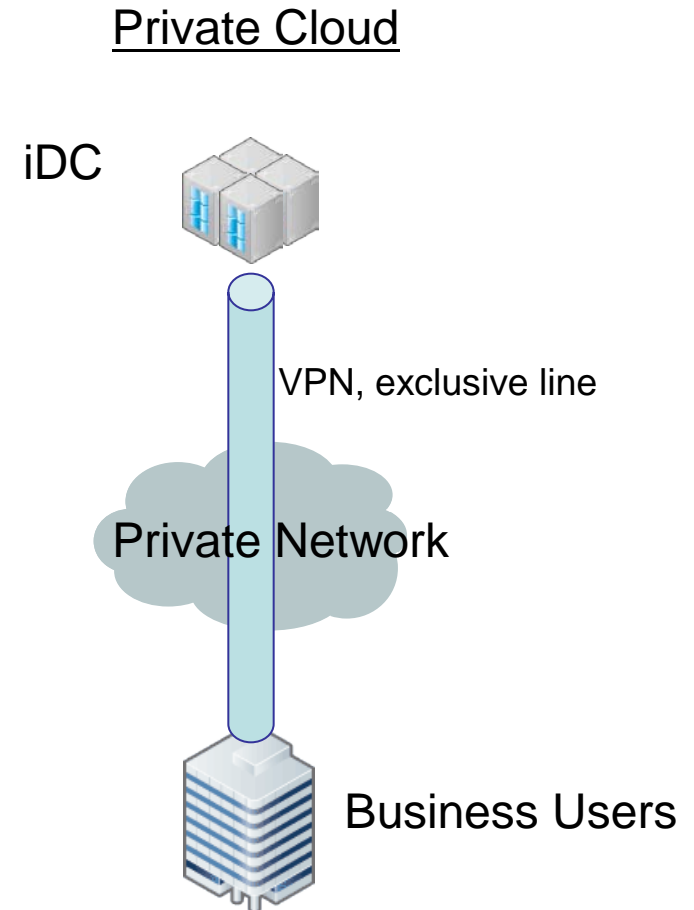
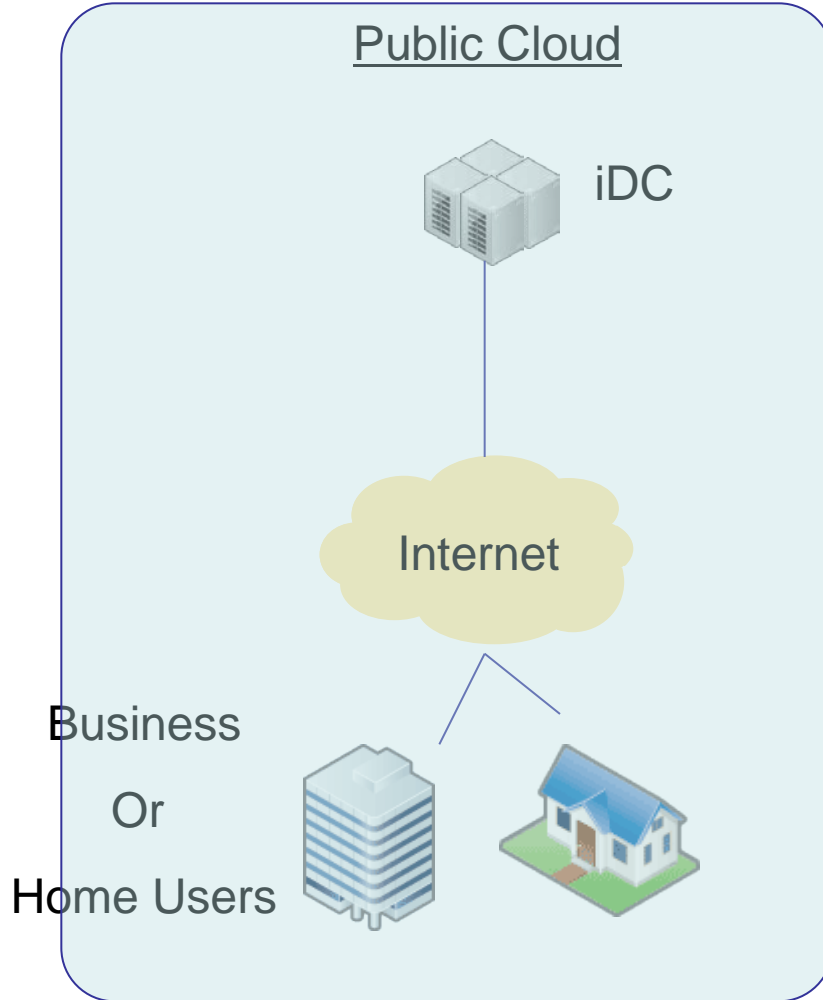
- A part of this system has been tested in commercial service, but there is an issue.
 - Only traffic change of observation point is visualized over the time by stacked line charts.
 - The chart doesn't show where flows go or come from.
 - We have to trace flows manually on inside / outside our network



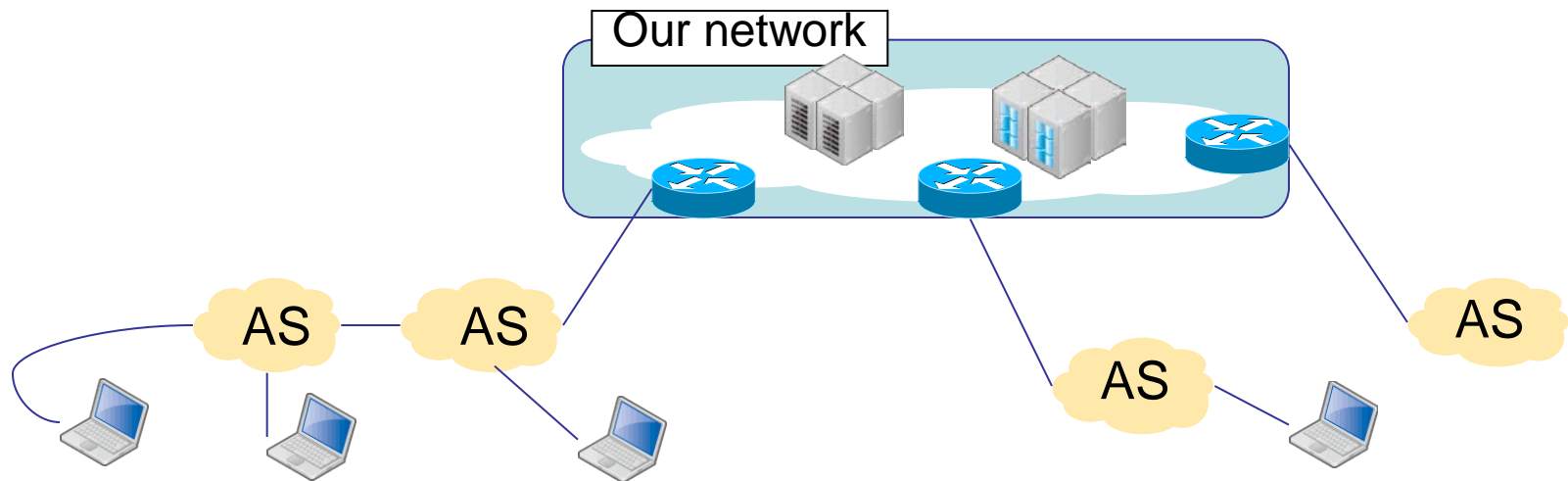
- New functions to solve above issue.
 - AS Network Topology Chart (for outside of our NW, iDC)
 - VM Network Topology Chart (for inside of our NW, iDC)

Outside of Data Center

■ Two types of cloud

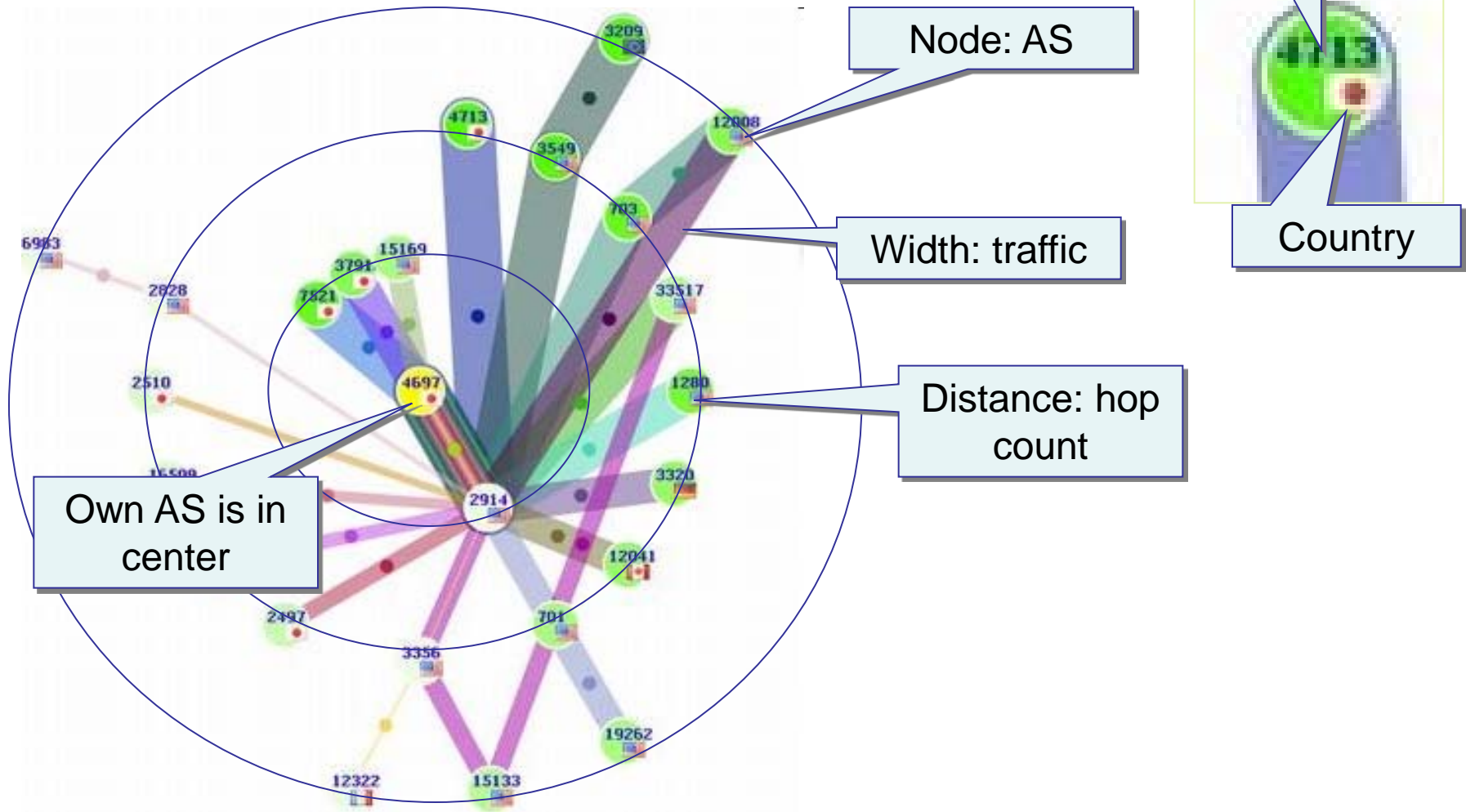


- AS's connect clients with servers of the data center.
- Complicated network.
 - The routes have been always changing.



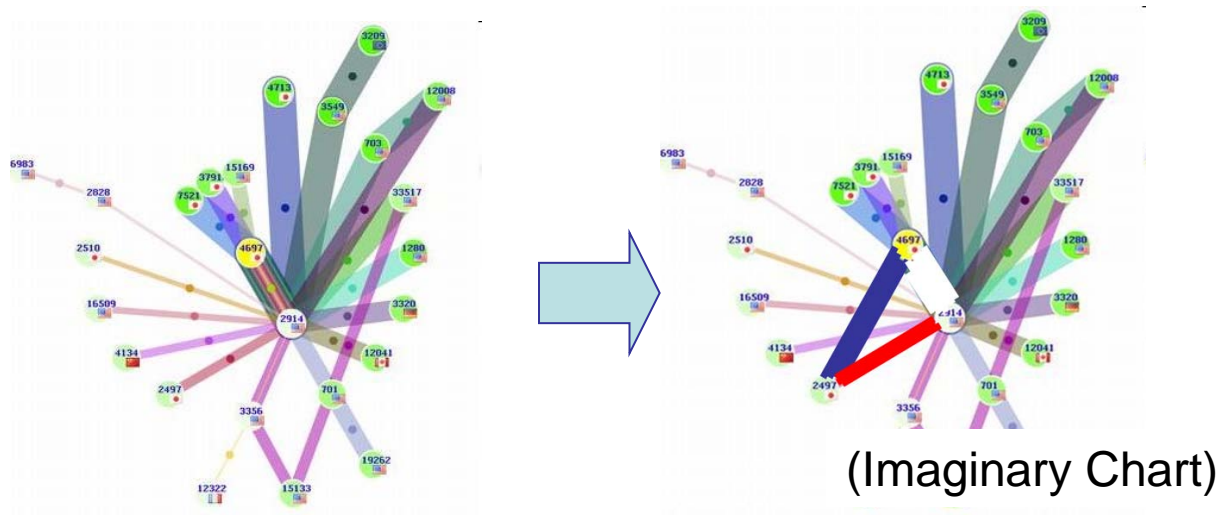
- Knowing of end-to-end flow is very important
 - To reduce the cost of trouble shooting for IaaS operators.
 - To choose a location of data center for IaaS users.

- Represents relationships between own AS and others
 - top-k traffic and BGP routing information of any 5 min.

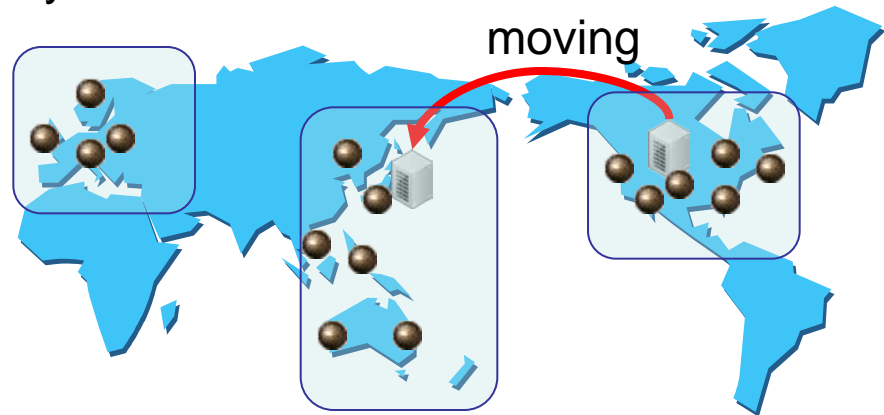


■ Link Down between AS's

- If a connecting link between AS's has gone down, the route may have changed and traffic which related with own AS may change extremely.
- IaaS operators have to know what happened and whether roundabout route was created or not.



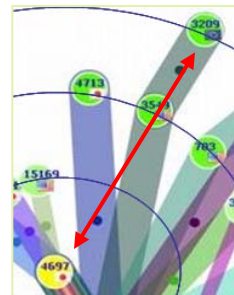
- Recently, IaaS users can choose a server location, typically, from Europe, North America or Asia Pacific.
 - In the near the future, choices may be increased.



- To choose a location of iDC, IaaS users can get some information from the chart.
 - Check large traffic nodes

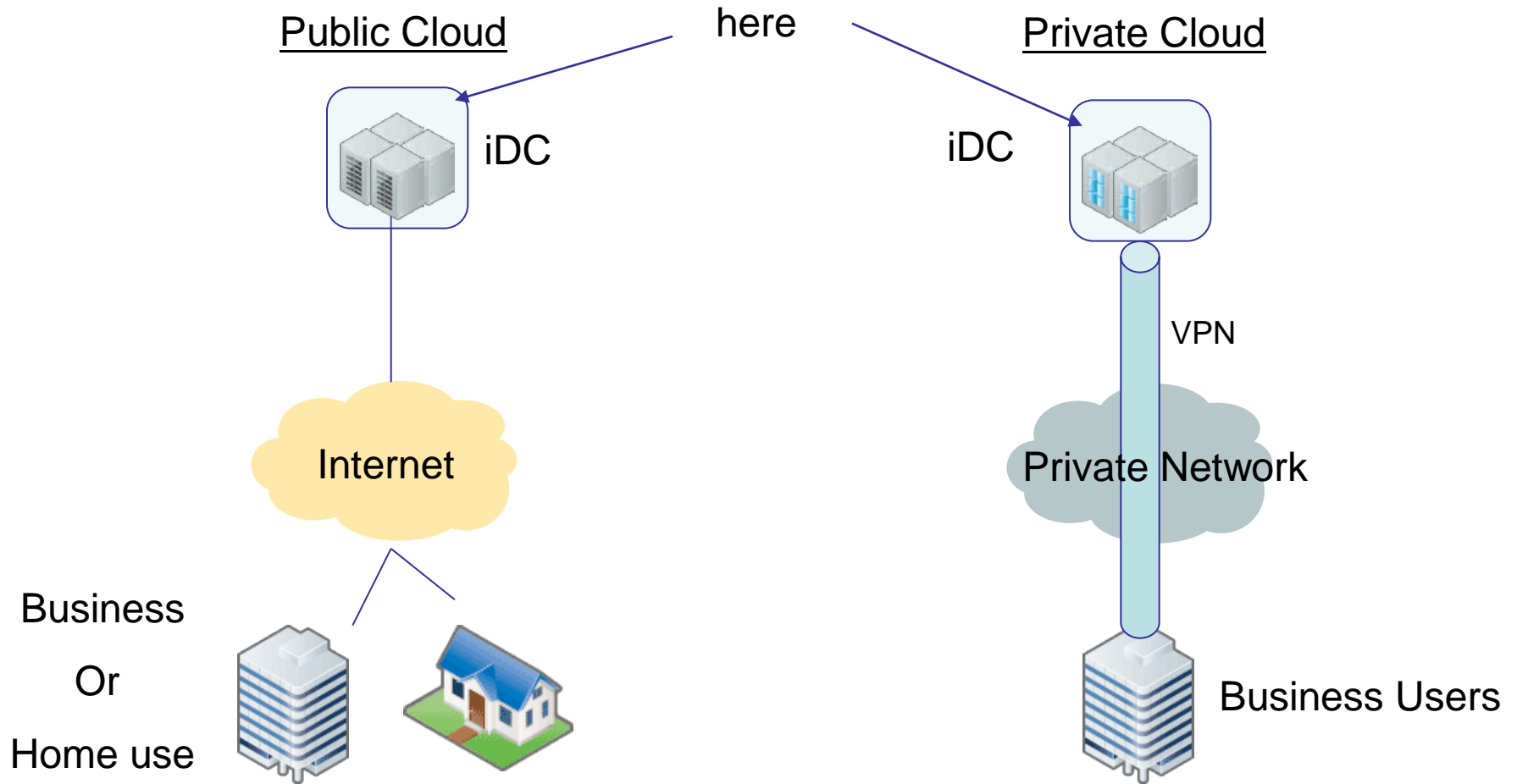


foreign country?



large # of hop count?

Inside of Data Center

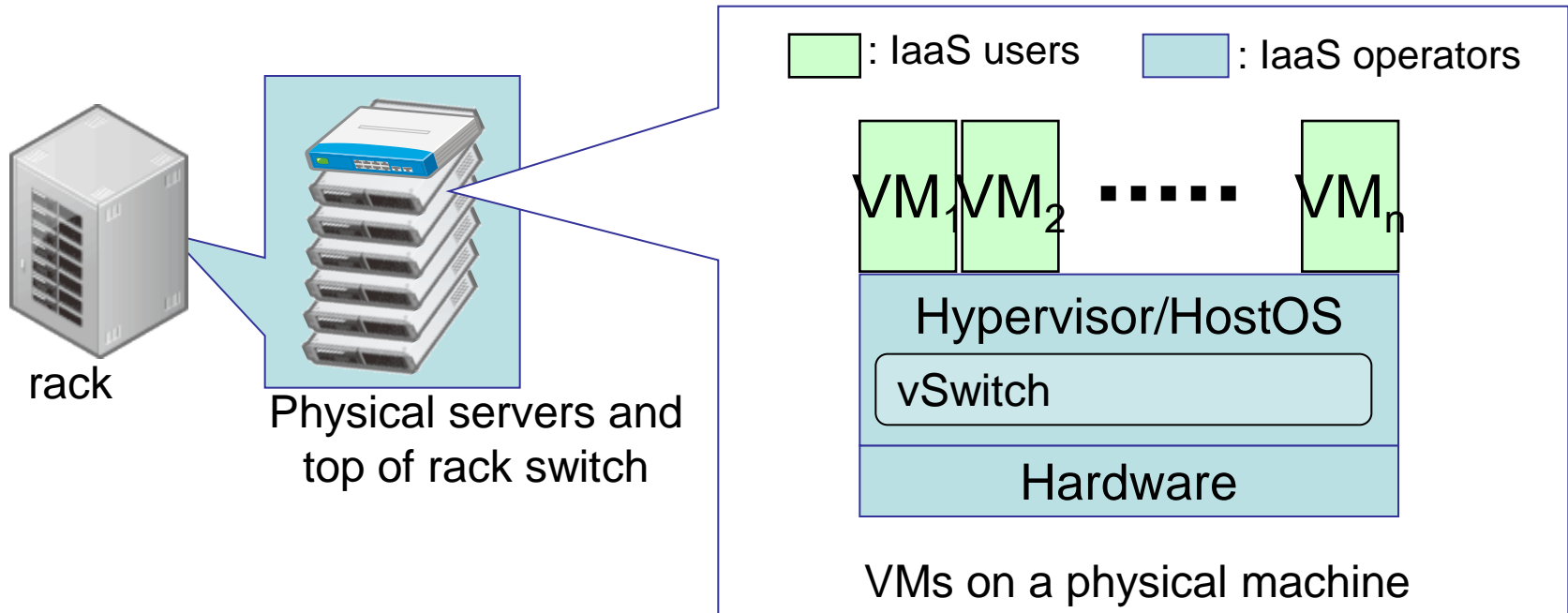


- More complicated structure than traditional one

- New technologies:
 - Virtualization technology
 - Physical machine includes virtual machines and switch(es)
 - Virtual LAN is also used

 - Live migration technology
 - Moving of a running VM to another physical machine without suspension
 - Any VMs may be moved to another physical machines, network structure may be changed.

- Approaches to visualization
 - Create a model of virtualized servers and network in a physical server.
 - Extend the visualizing scope to all physical servers in the data center.
 - Supporting the live migration is future work.



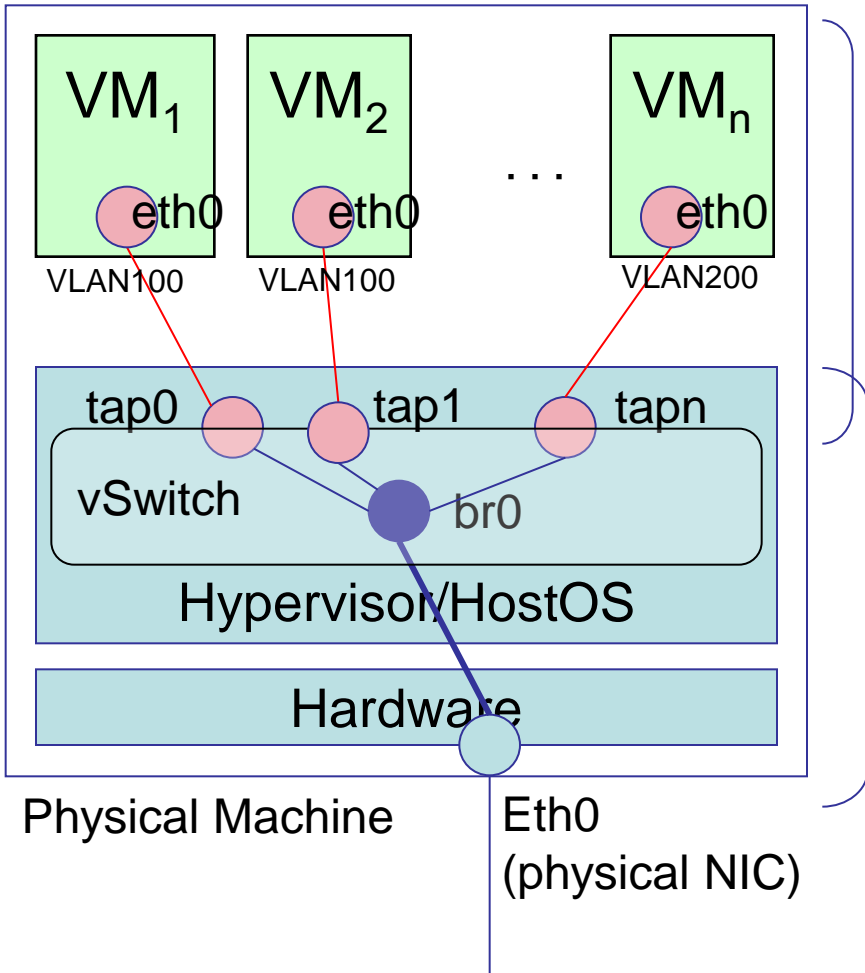
■ VM (Virtual Machine) / Guest OS

- A software implementation of machine
- Logical instance, same as physical one

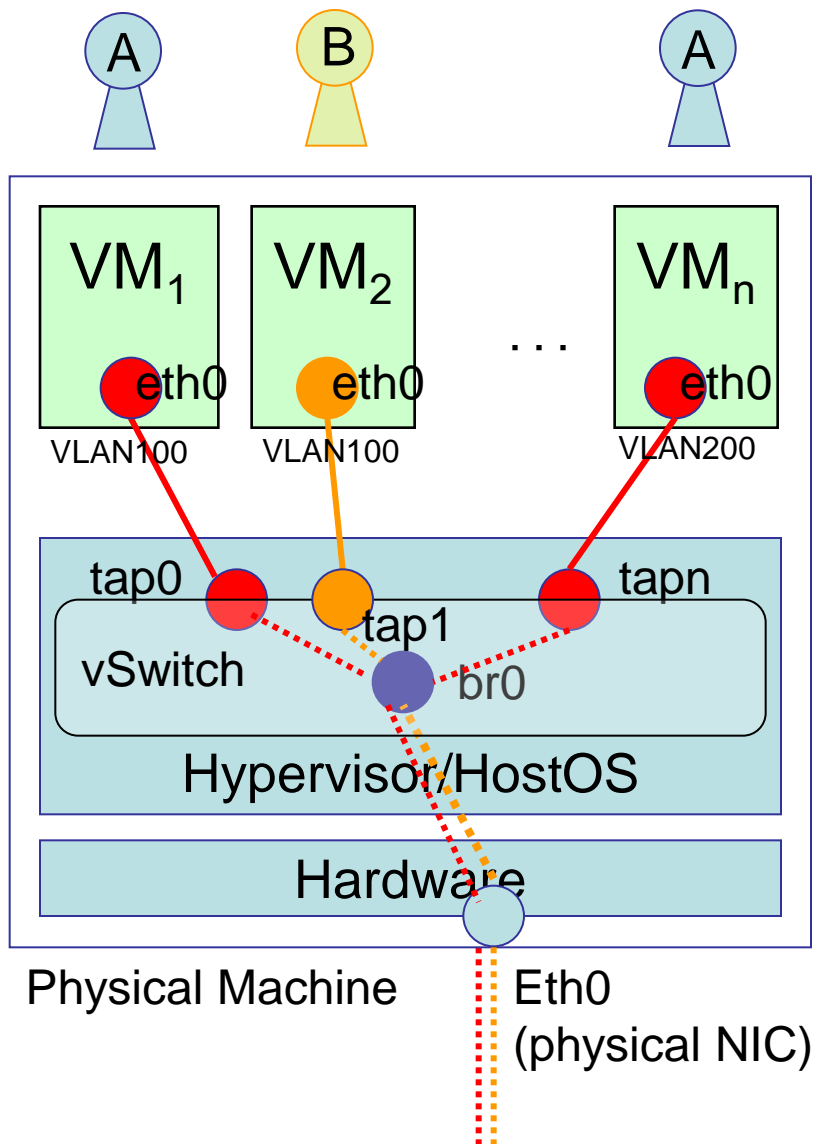
■ Hypervisor / Host OS

- Monitor and manage VMs
- IaaS operator can control this component.

VMs and vSwitch on a physical machine



- VM – vSwitch
 - each VM has I/F (like eth0)
 - It is connected with tap device of Host OS
- vSwitch – physical NIC
 - Tap and bridge devices in vSwitch
 - The bridge device is connected with NIC

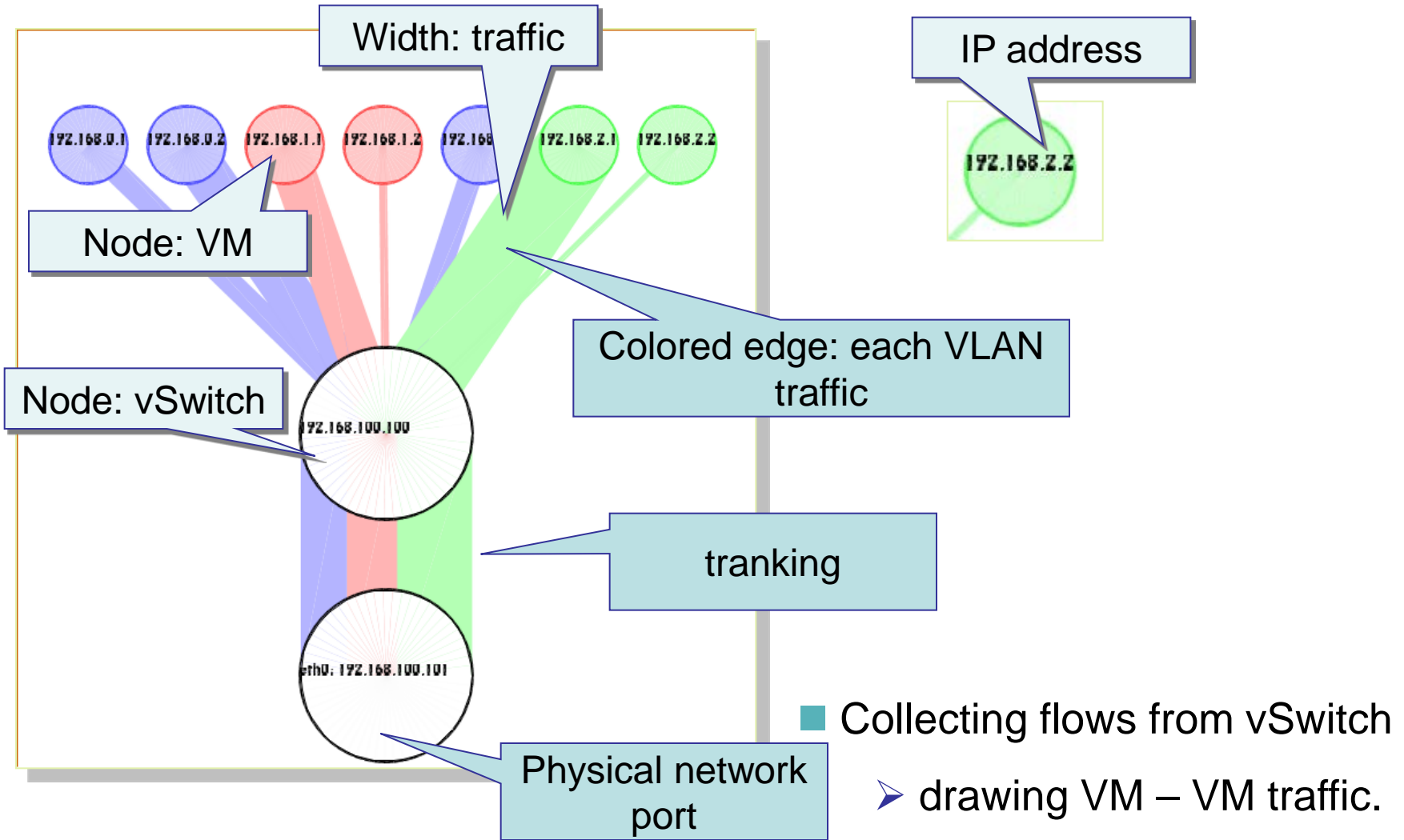


■ Tagged VLAN

- Some users share a physical machine
- Each user has to be separated from other users
 - Each user's VM has to be in same L2 segment

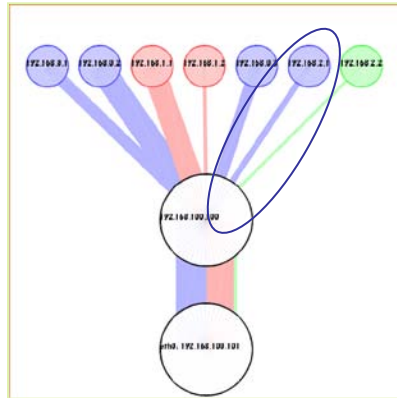
To meet above condition, tagged VLAN and vSwitch are needed.

- Shows a traffic topology in the physical server



- Collecting flows from vSwitch
- drawing VM – VM traffic.

■ Finding a misconfiguration of VM and vSwitch

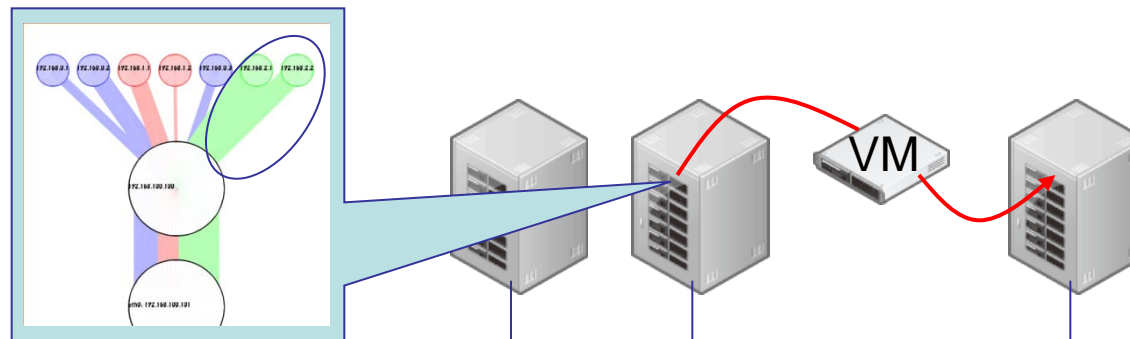


Abnormal case



Normal case

➤ Finding VMs which should be moved in capacity planning and migration



(extending the scope of visualization may be needed)

- Extending visualization scope to all of the server and network in our iDC.
 - The scope of the chart is only one physical machine now
 - Processing very large flow data

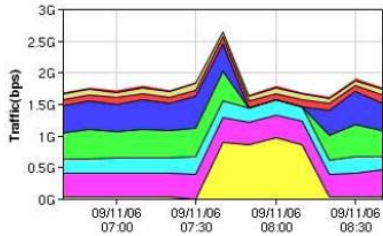
- Supporting next generation data center technologies
 - Not only basic VLAN (802.1Q) but also MAC-in-MAC (802.1aq/802.1ah) and VN-TAG (802.1Qbh)
 - using draft-kashima-ipfix-data-link-layer-monitoring-04
 - which is flexible IPFIX extension for all kinds of L2 components.

- Supporting changes of VLAN and VM location automatically
 - Live Migration, increase/decrease in the number of VMs
 - Linking resource DB

- We challenged to visualize inside and outside of our network by network topology charts using Flows.

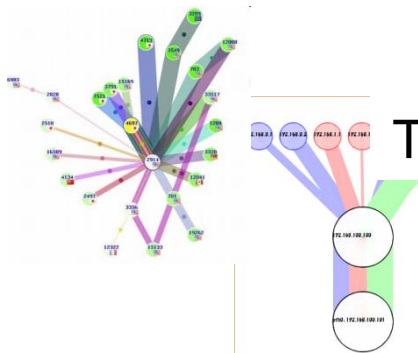
Type of chart

We can know...



Line chart

A traffic change over the time
(a part of a complicated network)



Topology chart

Relationships of each node
and
an overview of a complicated network.

The more complicate network we observe,
the more important these topology charts.