Computing resource notification domain in network

draft-fu-idr-computing-info-notification-domain-01

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Introduction

- With the new services arising, the computing and network convergence has become a new trend. The network could schedule the service traffic considering the computing metric.

  The basis are the computing measurement and computing identification, with the computing measurement (evaluate the amount and performance of computing resources) and computing identification(identify each computing resource) ,the computing resources can be represented for each computing resource provider.

- There are several ways for network to get the computing information of computing resource providers. By the **computing information notification schemes**, the routers in the network can synchronize their connected local computing information among themselves, eventually forming a global complete computing information.
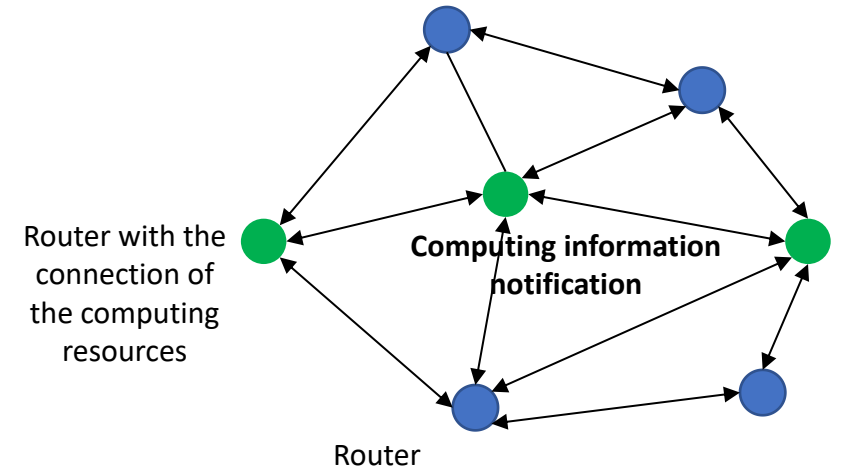
Computing information notification schemes

- The routes need to be aware of the computing information of data centers. For the router which connects the computing resources, after obtaining the information of the connected computing resources, it needs to **send the computing information to the neighbour routers**, which is the process of computing information notification.
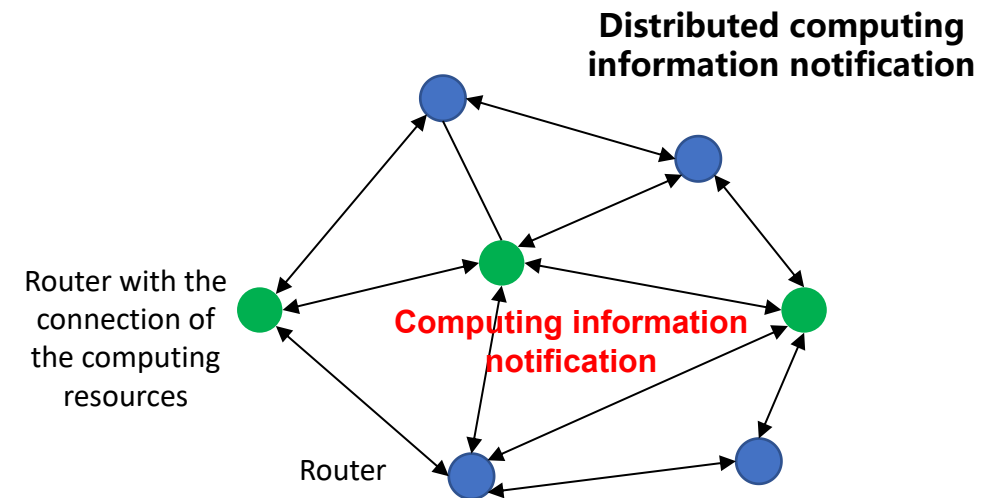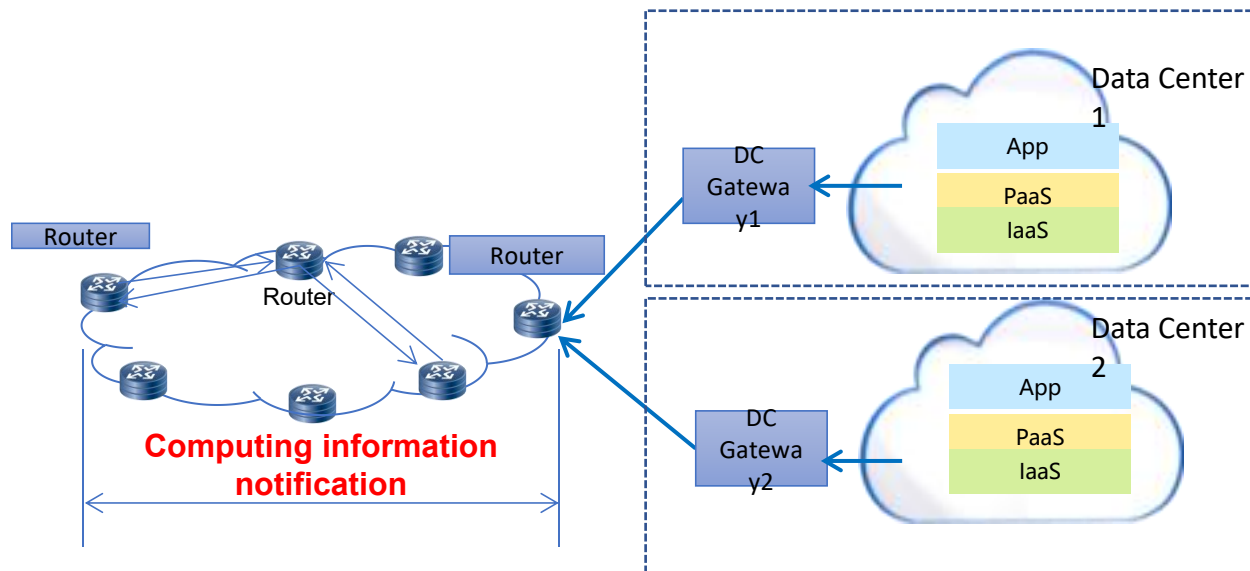
What are the problems with the computing information notification schemes?

- There may be multiple computing information notification schemes, one is that computing information status notification could made by **extending BGP (Border Gateway Protocol)** to the whole network, without defining the scope of the notification, so that **all the routers** on the whole network need to **maintain the computing information of the whole network,** and the routing table is large, which causes the burden to the network and routers.

- Exending BGP without limiting the scope of computing information notification **increases the amount of computing information notification in the network,** while the service traffic steering is always **among near area.**

- So to reduce the useless computing information notification in the network, and to improve the effciency of the computing information notification scheme is important.

Router with the connection of the computing resources

Computing information notification

Router

Definition of the notification domain

- The routing system contains the control plane and the forwarding plane. To achieve the computing and network coordination, the control plane needs to obtain the computing information of the servers for a service, and monitor the tunnel/policy status to the potential Egresses for the service. As described in [I-D.yao-cats-ps-usecases], the representation and encoding of computing metric is crucial, which is conveyed to routing system to support the components to act upon.

- **The routers only send the computing information to the routers located in the given notification domain.** If router 1 is outside of the notification domain of router 2, then router 2 will not send computing information to router 1.

- The notification domain needs to be defined accurately, the requirements contains several aspects as described below.
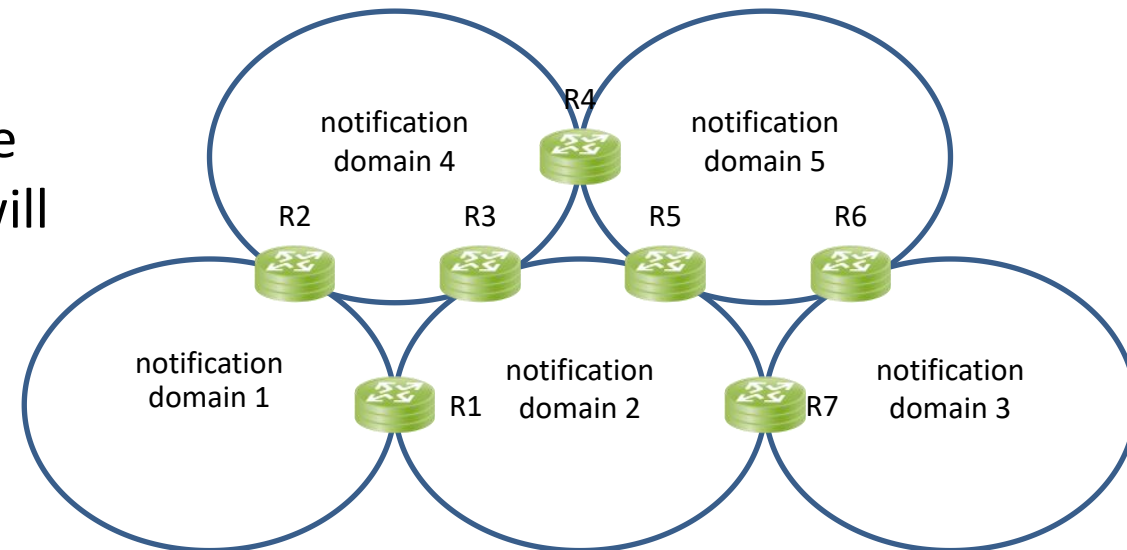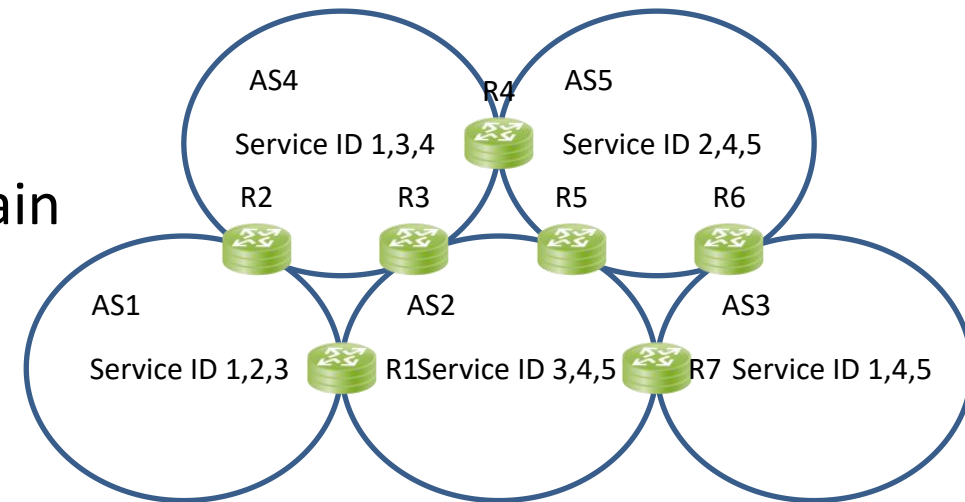
Requirements of the notification domain(1/2)

o Should support to determine the notification domain based on the ***computing service topology***. The computing service topology contains information about the identity of the computing service, as well as information about the location where the computing service is deployed .

o Should support to determine the notification domain based on ***geographical location***, and/or **the division of areas with the same service deployment** into a notification domain based on service dimension.

o Should support to determine the notification domain according to the **geographical location** and then the notification relationship between each autonomous domain is determined according to the **existing AS domain** in the IP protocol.

AS4
Service ID 1,3,4
R2   R3
AS1
Service ID 1,2,3   R1

R4   AS5
Service ID 2,4,5
R5   R6
AS2
Service ID 3,4,5   AS3
R7 Service ID 1,4,5

Requirements of the notification domain (2/2)

o Should support that when the size of the notification domain is determined, according to the network status information, the notification domain is *expanded* when the network status is good, and the notification domain is *reduced* when the network status is bad.

o Should support that when the notification domain is divided according to services, the size of the notification domain is determined according to *the number of nodes deployed* in the notification domain.

Example process of service scheduling based on the notification domain (1/4)

The computing information notification method is proposed to reduce the amount of computing notification information.

Step 1: The central controller determines the notification domain

Option 1: The central controller could determine the notification domain based on the ***computing service topology***.

- The generation of computing service topology includes the identification information of computing service and the location information of computing service deployment,
- Advertises the service topology information; and then advertises service status information on the established service topology.
- The notification domain could be defined based on the division of areas with the same service deployment into a notification domain based on service dimension.
    - During implementation, the computing service topology is generated based on the network topology and computing node topology generated by BGP-LS; and the service topology information is advertised through BGP-LS and DHCP by adding computing service information to the node attribute field.

Example process of service scheduling based on the notification domain (2/4)

Option 2: The notification domain could be defined based on the division of adjacent domains into a notification domain **based on geographical location**, and the central controller obtains the **AS domain** division strategy of the whole network and determines the size of the notification domain by **combining the network status information of different regions.** The network status information is reported by nodes to the central controller.

Option 3: The notification domain partitioning policy is generated after the central controller receives the inter-domain router **network state information, service deployment information,** and subscribes to the network status information or services deployment information of nodes according to the different domain partition strategies, and then distributes the policy to the inter-domain router for its configuration.

Example process of service scheduling based on the notification domain (3/4)

Step 2: The central controller advertises the notification domain partitioning policy.
The notification domain partitioning policy carried through Netconf and Yang management protocol is delivered. In practice, the notification domain is identified as follows:
- The number of AS through which the computing update information passes is set, and the hop limit is set to identify it. Or,
- Routers in the same notification domain are divided into the same community by using the BGP community attribute to identify the advertisement domain

Step 3: Advertises computing information to nodes in the notification domain.
Step 4: When the central controller schedules service requests, it selects the computing nodes that need to obtain real-time service status information through the generated computing service topology, and then sends the detection packet of service status information.

Example process of service scheduling based on the notification domain (4/4)

Step 5: The notification domain adjustment policy generation
When adjusting the size of the notification field, it further includes:
- The notification domain adjustment policy carried through Netconf and Yang management protocol is delivered based on one or a combination of the network status information, service scheduling result feedback information, and service deployment.
- When the size of the notification domain is determined, according to the **network status information**, the notification domain is expanded when the network status is good, and the notification domain is reduced when the network status is bad.
- When the notification domain is divided according to **services deployment**, the size of the notification domain is determined according to the number of nodes deployed in the notification domain.

Next step

- Further discussion on the requirements
- Any comments are welcome

Thank you!