Computing and Network Information Awareness system architecture for CATS

draft-yao-cats-awareness-architecture-02

Presenter: Daniel Huang, ZTE Corporation
Co-authors: Huijuan Yao, China Mobile
Xuewei Wang, Ruijie Networks
Zhiqiang Li, China mobile
Daniel Huang, ZTE Corporation
Changwang Lin, New H3C Technologies

Changes of the draft

- Update to 02 version after IETF-117
- The Controller component is updated and divided into two parts: the control plane and the management plane.
- The work flow of distributed mode has been updated
- The work flow of hybrid mode has been updated

Goals

- [I-D.ldbc-cats-framework] aims to solve the problem of how the network edge can steer traffic between clients of a service and sites offering the service.
- To enable the computing- and network-aware traffic steering decisions,awareness of computing service information and network information is the foundation.
- **A comprehensive awareness architecture:** introduce new comomponents and the corresponding interfaces and work flows are included,**to facilitate the deployment of CATS.**

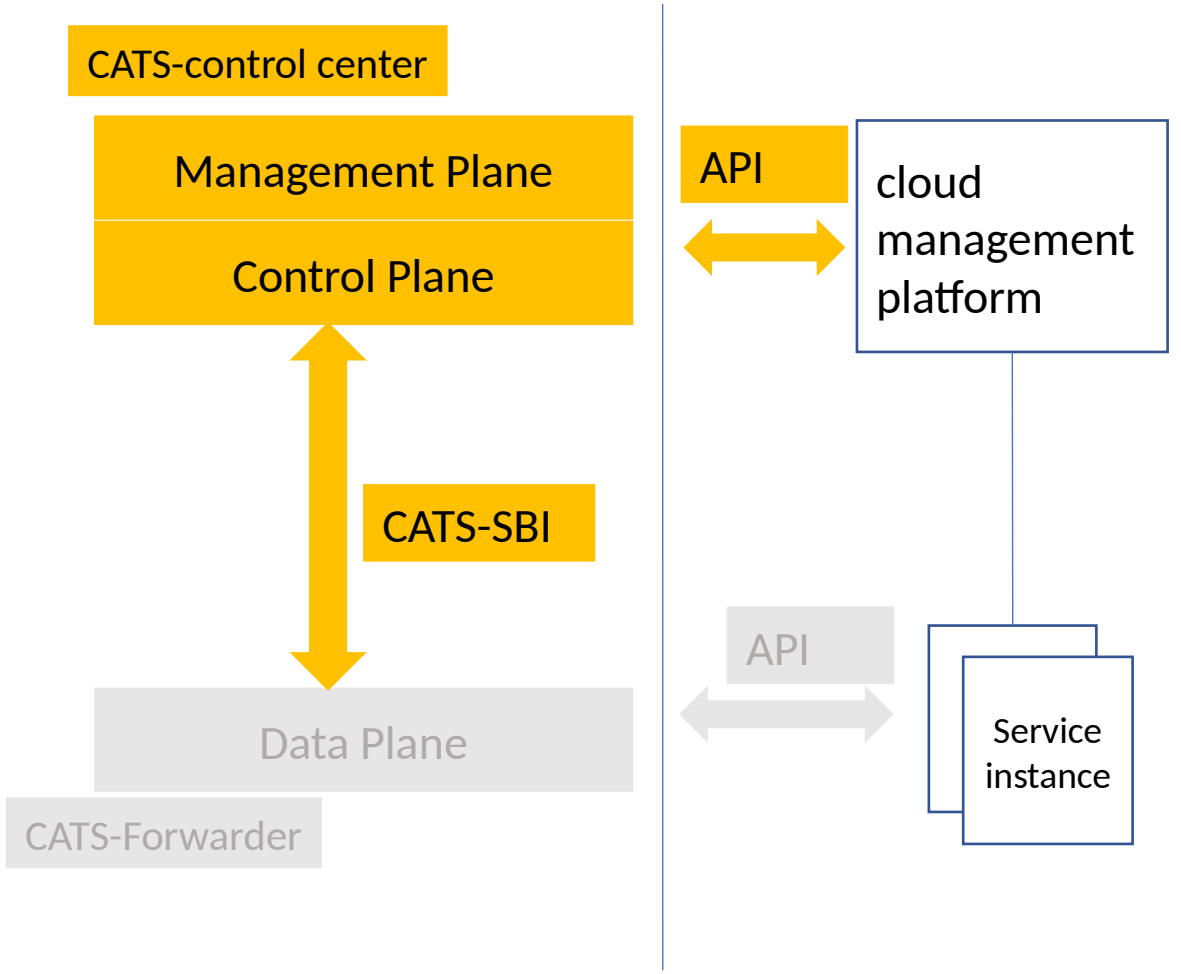
CNIA(Computing and Network Information Awareness) system architecture

- **A CATS-control center component** is additionally introduced to support fine-grained dynamic information awareness. And the control center is divided into the management and control plane.

- **CATS-Forwarder**, as the data plane,

  - It could also obtain networking and service information from the control center via CATS-SBI.

  - It can directly retrieve service information from the service instance through APIs and propagate it to other CATS-Forwarders



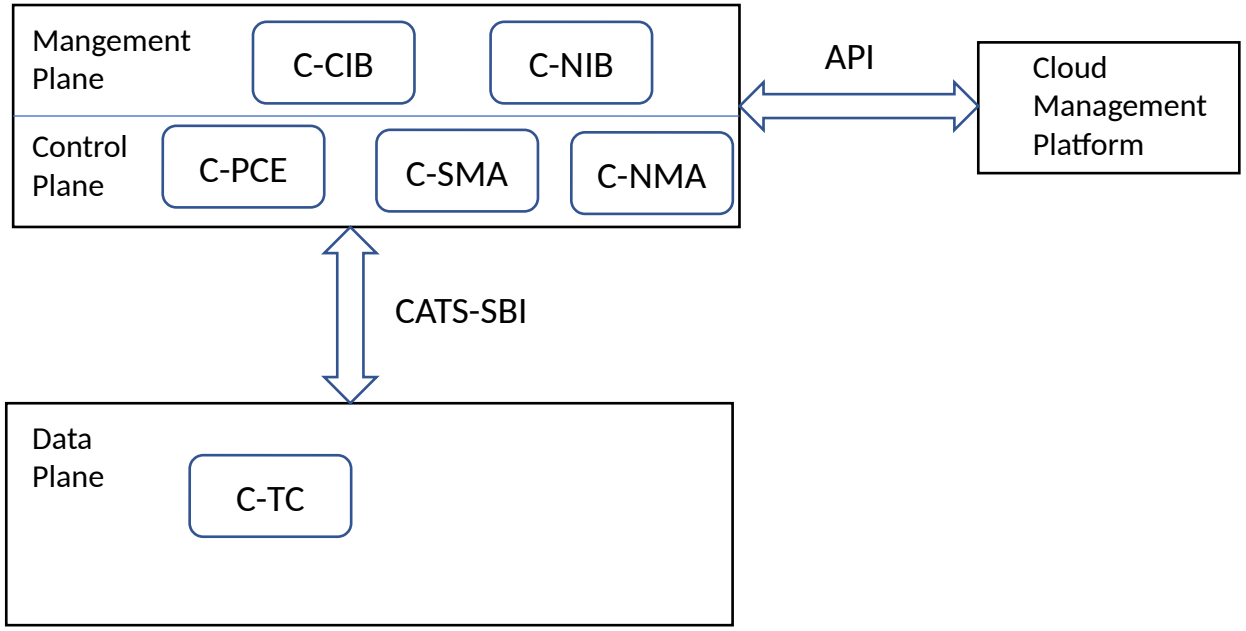
CNIA System Arhicteture

Working modes

- Centralized model : For some services that are sensitive to computing and network status, especially latency, such as AV/VR services, the network needs to be able to perceive detailed computing information and network information by centralized model.
- Distributed Model: For some services that are not sensitive to computing and network status.
- Hybrid Mode: For scenarios where some devices do not have independent path selection capability, a hybrid mode can be adopted, where devices that support independent path selection can perform path selection on their own, while others are centrally controlled by the Controller for path selection.

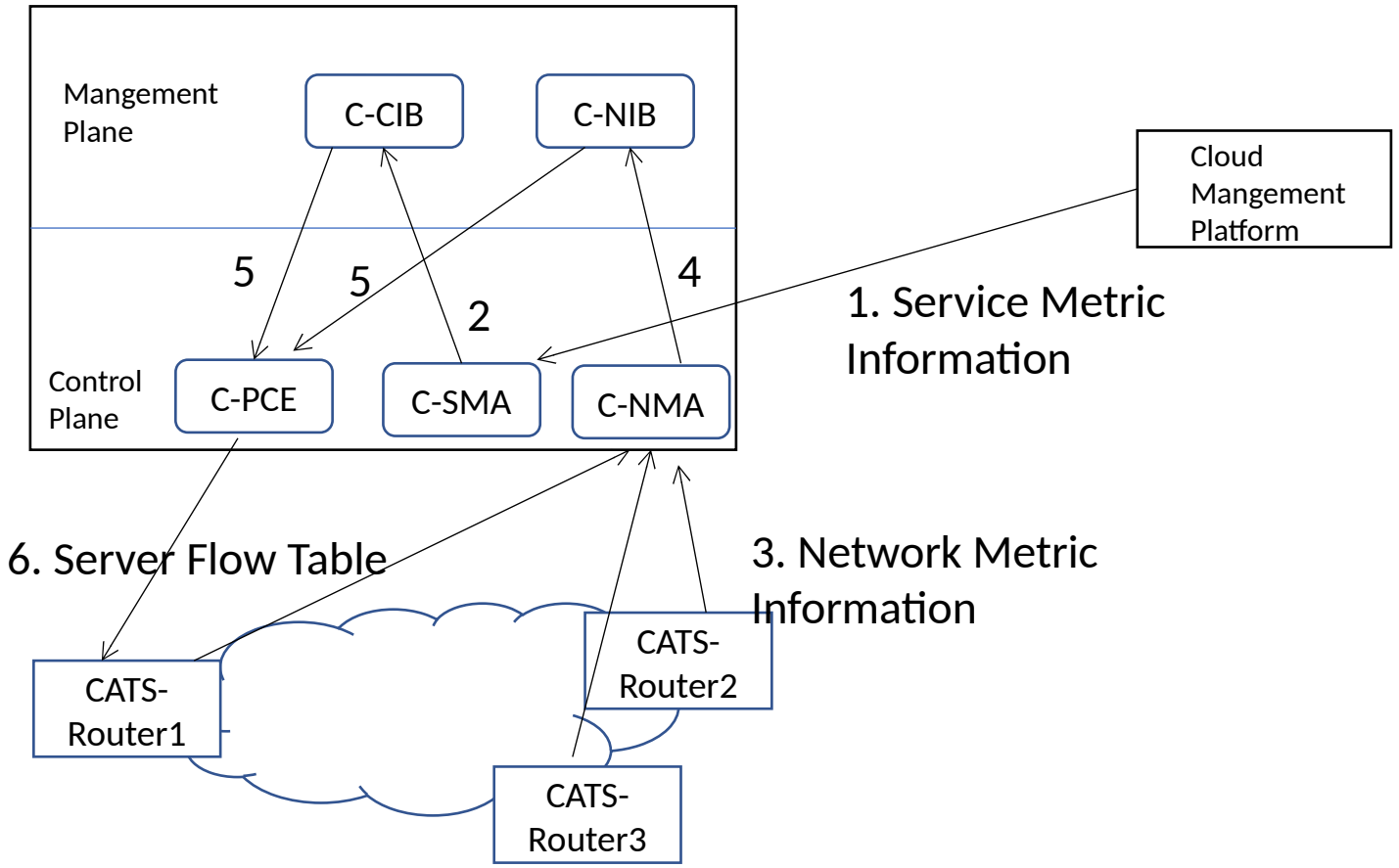
Centralized model

- CATS Computing information Base(C-CIB): Maintain fine-grained computing information.
- CATS Network Metric information Base(C-NIB): Maintain fine-grained network information.
- CATS Path Calculation Unit(C-PCE): Calculate optimal computing resource and network path based on C-CIB and C-NIB, and generate path policy and deliver to the CATS-routers.
- The control plane consists of C-SMA, C-NMA, and C-PCE functionalities. The management plane, maintains the C-CIB and C-NIB data.
- Service metric information are directly sent to the Controller through the API of the Cloud Management Platform.
- The data plane only contains the C-TC module. The flow tables for traffic forwarding are issued by the controller through the SBI interface.



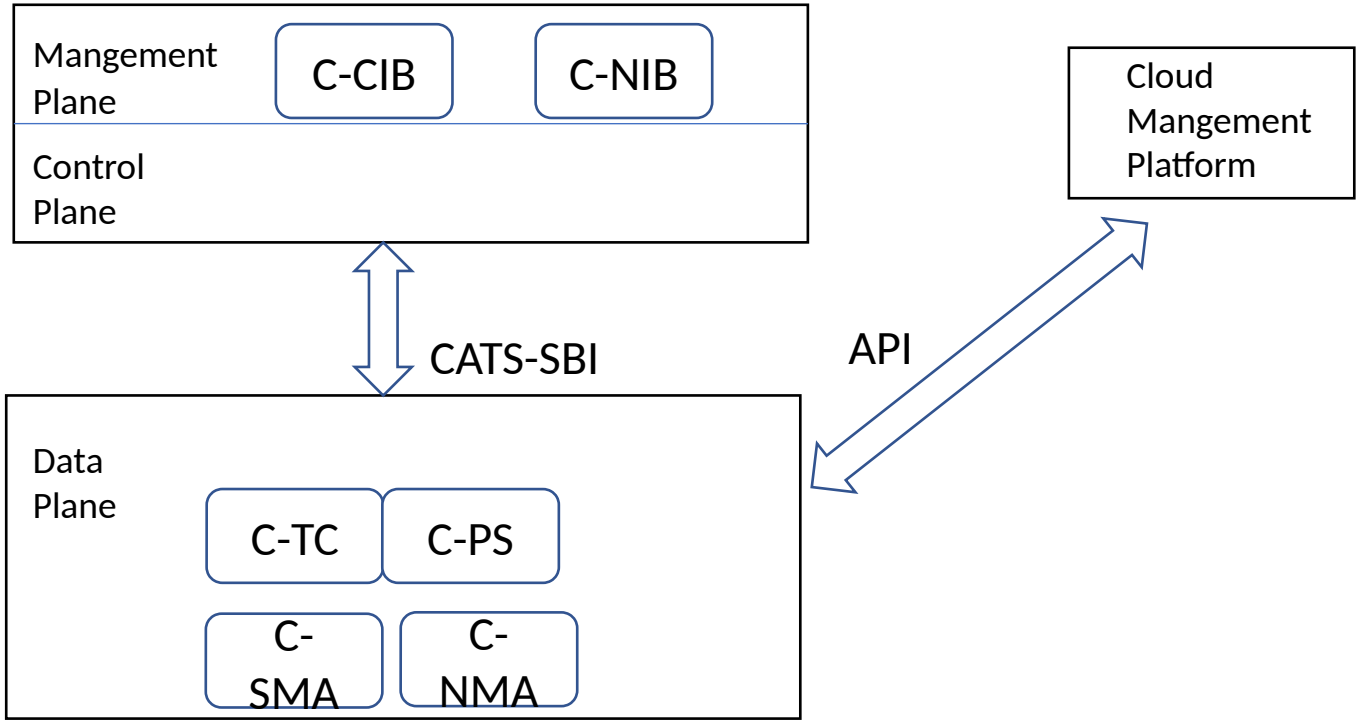
Workflow of Centralized model

1. The control plane collects service metric information through APIs.
2. The management plane maintains the C-CIB information through C-SMA.
3. The control plane collects network metric information through routing protocols.
4. The management plane maintains the C-NIB information through C-NMA.
5. C-CIB and C-NIB data changes will be communicated to C-PCE through the internal interface for reselection of paths, if there are any updates.
6. The Controller calculates the service path based on C-CIB and C-NIB information, and issues flow tables to CATS-Routers through the SBI interface for forwarding service traffic



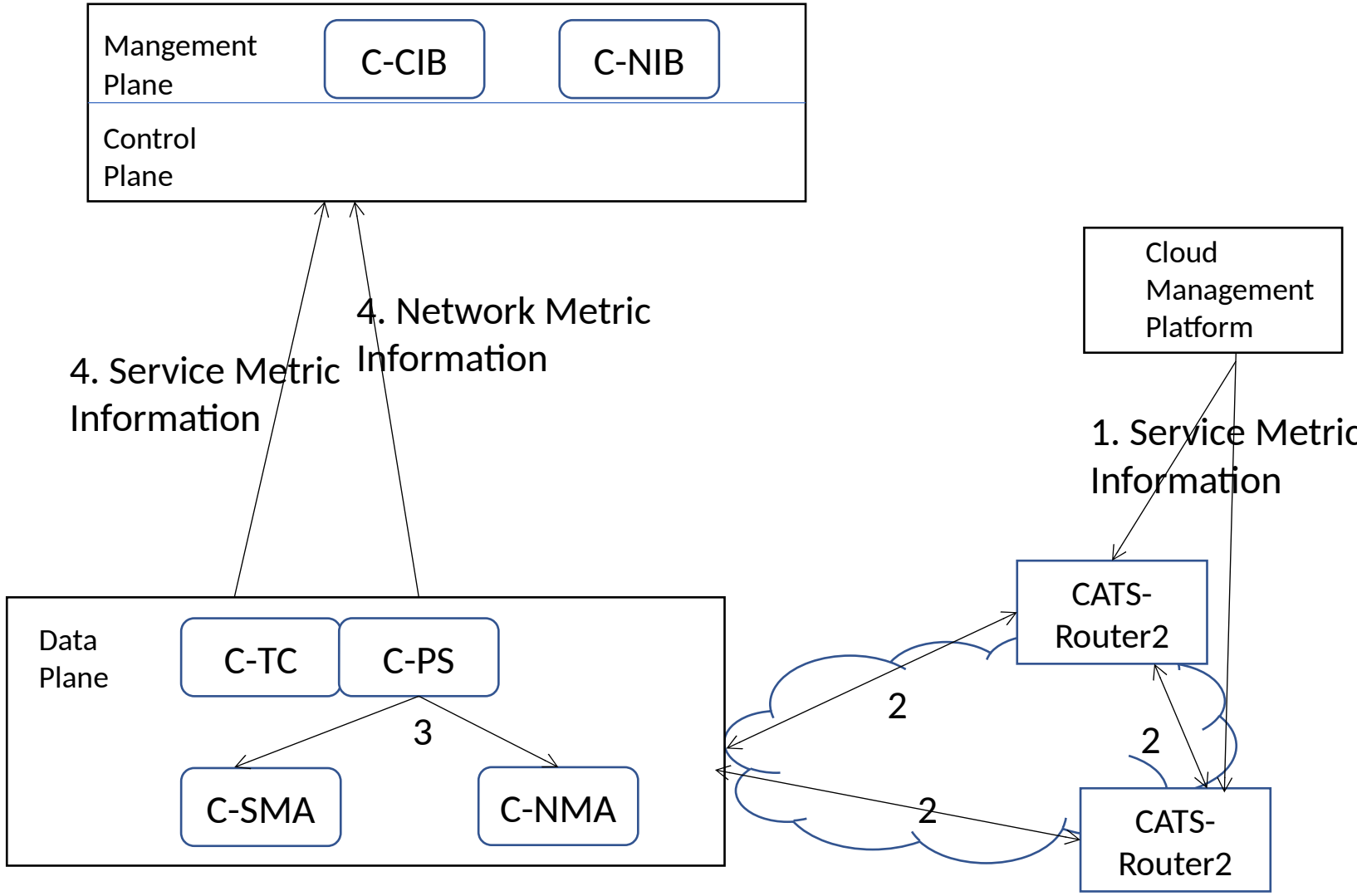
Distributed model

- The Controller does not have a control plane and only maintains C-CIB and C-NIB information in the management plane for network management purposes.
- The data plane consists of C-SMA, C-NMA, C-TC, and C-PS modules, which are capable of independently collecting network and service metrics and performing routing operations. It reports network and service metrics to the controller through the SBI interface.



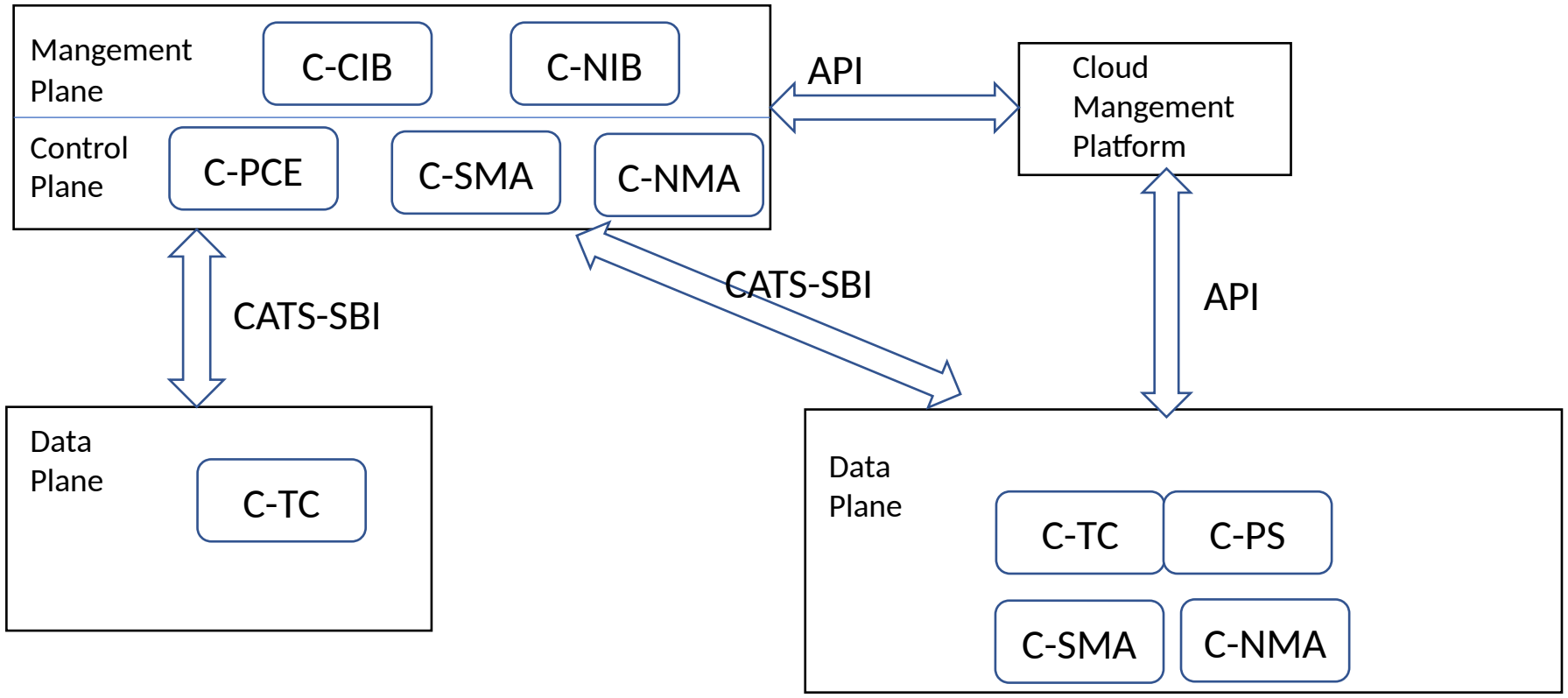
Workflow of distributed model

1. The data plane is responsible for collecting service metric information and is managed by the CATS-Router located close to the Cloud Management Platform.
2. The data plane disseminates service metric information throughout the domain through the propagation of routing protocols.
3. The data plane independently performs the routing of service traffic.
4. The data plane reports service metric information and network metric information to the controller through the SBI.



Hybrid model

- both the controller and the CATS-Forwarder with routing capabilities can perform the collection of computing information and the selection of paths. The CATS-Forwarder with routing capabilities can perform more precise path selection operations based on instructions from the controller. CATS- Forwarders without routing capabilities, on the other hand, directly forward data based on the results provided by the controller.



Next Steps

1, Coordination with the existing architecture draft:

- CATS center controller as well as its management (C-CIB/C-NIB)and control planes(C-NMA/C-SMA/C-PCE)
- interfaces incurred from the center controller with CATS routers.

2, The authors are open to combine the above differentiated components with another existing framework upon consensus.

3, Any comments, suggestions and contributions would be appreciated.

Thanks for your time !