

# **A Framework for Computing-Aware Traffic Steering (CATS)**

**draft-ldbc-cats-framework-01**

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IETF#116, Yokohama, March 2023

# Why this I-D Is Needed?

*“ Overall CATS framework & architecture: [1]*

*\* This work encompasses the various building blocks and their interactions, realizing a CATS control and data plane that addresses the identified problems and requirements in the groundwork, including methods for distributing necessary information to utilize the identified metrics in CATS use cases. This will also cover OAM, scalability, and security aspects. ”*

[1] <https://datatracker.ietf.org/doc/charter-ietf-cats/>

# (Current) CATS Functional Components

- **Boundary nodes**

- **CATS-Routers** make forwarding decisions based on CATS information to steer traffic belonging to the same service demand to the same selected service instance.
- **Ingress CATS-Routers** steer the service packets onto an overlay path to an Egress CATS-Router linked to the most suitable edge site to access a service instance.
- **Egress CATS-Routers** are egress endpoints of overlay paths and which connect a CATS-serviced site.

- **Agents to collect service and network metrics**

- **CATS Service Metric Agent (C-SMA):** Collects service capabilities and status, and reporting them to a CATS Path Selector (C-PS).
- **CATS Network Metric Agent (C-NMA):** Collects network capabilities and status, and reporting them to a C-PS.

- **A Path Intelligence to infer how to steer traffic**

- **CATS Path Selector (C-PS):** Determines the path toward the appropriate service location and service instances to meet a service demand given the service status and network status information.

- **Binding flows to paths**

- **CATS Traffic Classifier (C-TC):** Determines which packets belong to a traffic flow for a particular service demand, and for steering them on the path to the service instance as determined by a C-PS.

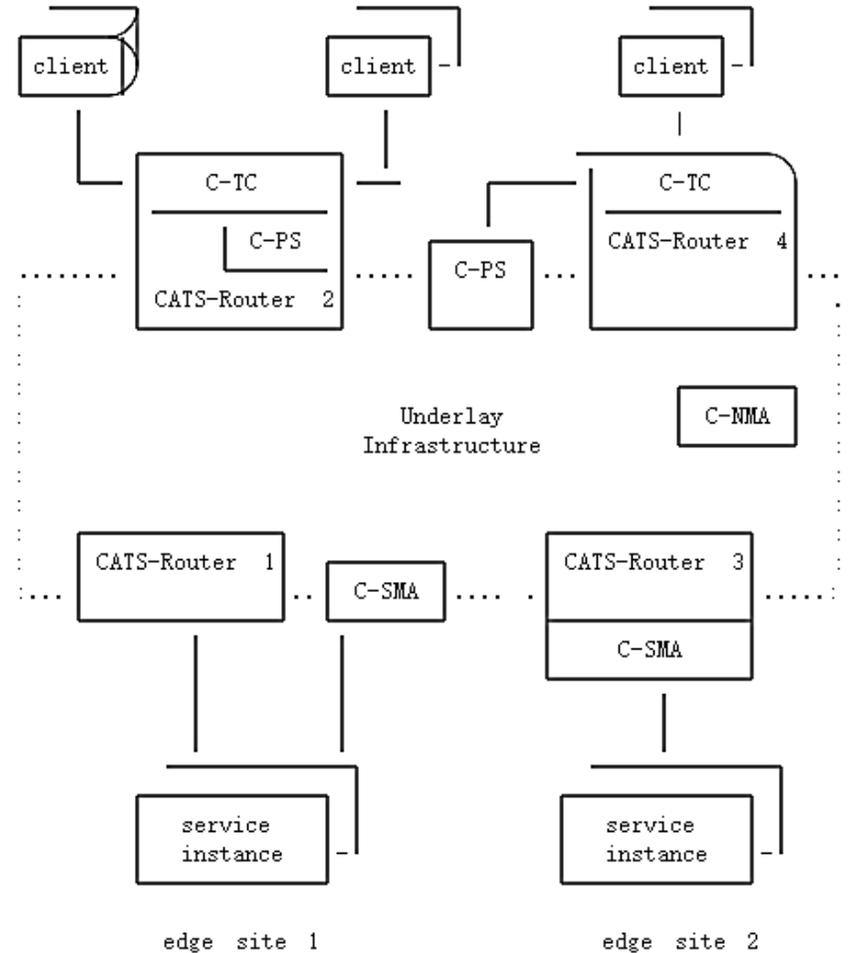
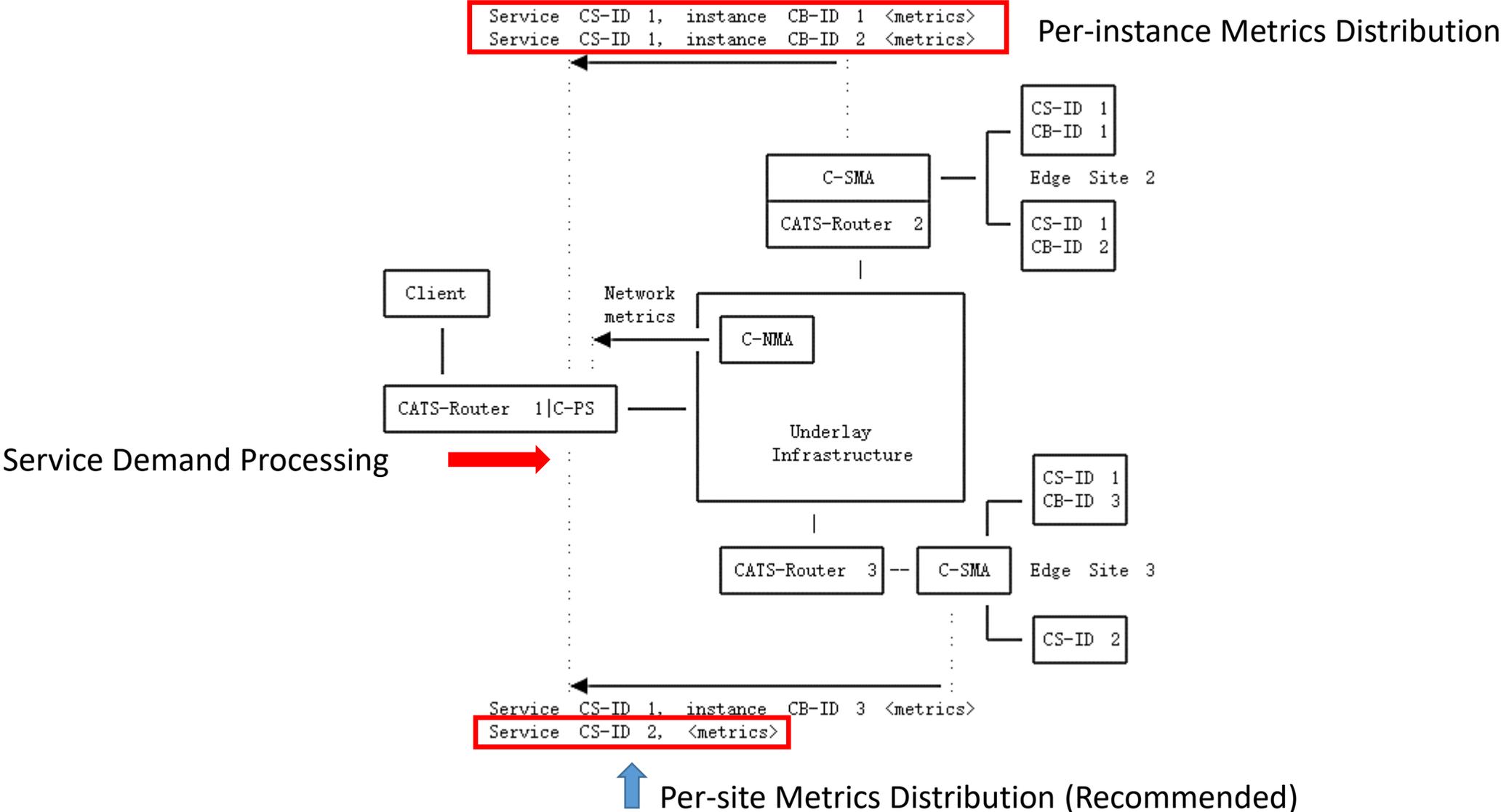


Figure 1: CATS Functional Components

# Key CATS Identifiers

- **CATS Service ID (CS-ID):** An identifier representing a service, which the clients use to access said service.
  - Such an ID identifies all of the instances of the same service, no matter on where they are actually running.
  - The CS-ID is independent of which service instance serves the service demand.
  - Usually multiple instances provide a (logically) single service, and service demands are dispatched to the different instance by choosing one instance among all available instances.
- **CATS Binding ID (CB-ID):** An identifier of a single service instance or site of a given service instance (CS-ID).
  - Optional. CB-ID may not be needed in a site-based selection when only one site is connected to an egress CATS router.

# A Sample Example



# -01: Editorial Modifications and Reorganization

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- Editorial modifications of the whole draft
- Reorganize the content of Section 3.3 CATS Components.
  - Add Overlay CATS-Routers and Underlay Infrastructure sub-section
- We met an issue of draft submission due to over 8 authors in the first page, so move Changwang Lin, Xueshun Wang, Xuewei Wang into content to address this issue. Many thanks for your supports and contributions.
- Add Luigi Iannone and Christian Jacquenet as contributors. Many thanks for your supports and contributions.

# -01: Add Provisioning subsection

## 4.1. Provisioning of CATS Components

```
TBC: --detail required provisioning at CAST elements (booptsrapping,  
credentials of peer CAST nodes, services, optimization metrics per  
service, etc.)--
```

- More text should be added for the Provisioning part
- Contributions are welcome

# -01: Security Considerations

- Too frequent update of metrics.
  - Aggregation
  - Dampening
  - threshold-triggered...
- Sensitive info leaking
  - Authentication
  - Integrity-protection
- This section will be enriched as the core document is being updated

## 5. Security Considerations

The computing resource information changes over time very frequently, especially with the creation and termination of service instances. When such an information is carried in a routing protocol, too many updates may affect network stability. This issue could be exploited by an attacker (e.g., by spawning and deleting service instances very rapidly). CATS solutions must support guards against such misbehaviors. For example, these solutions should support aggregation techniques, dampening mechanisms, and threshold-triggered distribution updates.

The information distributed by the C-SMA and C-NMA agents may be sensitive. Such information could indeed disclose intel about the network and the location of compute resources hosted in edge sites. This information may be used by an attacker to identify weak spots in an operator's network. Furthermore, such information may be modified by an attacker resulting in disrupted service delivery for the clients, up to and including misdirection of traffic to an attacker's service implementation. CATS solutions must support authentication and integrity-protection mechanisms between C-SMAs/C-NMAs and C-PSes, and between C-PSes and Ingress CATS-Routers. Also, C-SMA agents need to support a mechanism to authenticate the services for which they provide information to C-PS computation logics, among other CATS functions.

# -01: Add Privacy Considerations

- MUST prevent on-path underlay infrastructure from reading the CATS information.
  - Encryption
  - Authentication
- Personal data MUST NOT be exposed to external parties by CATS.
  - Encryption
  - Authentication

## 6. Privacy Considerations

Means to prevent that on-path nodes in the underlay infrastructure to fingerprint and track clients (e.g., determine which client accesses which service) must be supported by CATS solutions. More generally, personal data must not be exposed to external parties by CATS beyond what is carried in the packet that was originally issued by the client.

Since the service will, in some cases, need to know about applications, clients, and even user identity, it is likely that the C-PS computed path information will need to be encrypted if the client/service communication is not already encrypted.

For more discussion about privacy, refer to [RFC6462] and [RFC6973].

# Pending Issues

<input type="checkbox"/>	<input type="radio"/>	13 Open	✓ 3 Closed	Author ▾	Label ▾	Projects ▾	Milestones ▾	Assignee ▾	Sort ▾
<input type="checkbox"/>	<input checked="" type="radio"/>	Is C-NMA expected to use existing solutions?	question						
		#28 opened 2 weeks ago by boucadair							
<input type="checkbox"/>	<input checked="" type="radio"/>	Uniqueness scope of the CS-ID							
		#27 opened 2 weeks ago by boucadair							
<input type="checkbox"/>	<input checked="" type="radio"/>	On the definition of service transaction	revive-stable-version terminology						 1
		#24 opened 2 weeks ago by Deguello1							
<input type="checkbox"/>	<input checked="" type="radio"/>	On advertising CB-ID	editorial						
		#23 opened 2 weeks ago by Deguello1							
<input type="checkbox"/>	<input checked="" type="radio"/>	About several C-PS computation logics in the network							
		#22 opened 2 weeks ago by Deguello1							
<input type="checkbox"/>	<input checked="" type="radio"/>	About CATS (C-PS) implementation							
		#21 opened 2 weeks ago by Deguello1							
<input type="checkbox"/>	<input checked="" type="radio"/>	About the underlay/overlay taxonomy							 1
		#20 opened 2 weeks ago by Deguello1							
<input type="checkbox"/>	<input checked="" type="radio"/>	About egress/ingress taxonomy	revive-stable-version terminology						 1
		#19 opened 2 weeks ago by Deguello1							
<input type="checkbox"/>	<input checked="" type="radio"/>	About the forwarding role of CATS classifiers							
		#18 opened 2 weeks ago by Deguello1							
<input type="checkbox"/>	<input checked="" type="radio"/>	About the role of C-PS							
		#17 opened 2 weeks ago by Deguello1							
<input type="checkbox"/>	<input checked="" type="radio"/>	About "ingress-based overlay"	editorial						 1
		#13 opened 2 weeks ago by Deguello1							

# Cooperation: Use Github

- Github: <https://github.com/boucadair/can-framework>
- Fork it, make your Pull Requests, create issues, share comments on the open issues, etc.

# Next Steps

- Discuss and fix the pending issues
- Update the draft according to the discussion in WG
- Comments and suggestions are welcome

# Thank you



For your long-term support

The authors would like to thank Joel Halpern, John Scudder, Dino Farinacci, Adrian Farrel, Cullen Jennings, Linda Dunbar, Jeffrey Zhang, Peng Liu, Fang Gao, Aijun Wang, Cong Li, Xinxin Yi, Jari Arkko, Mingyu Wu, Haibo Wang, Xia Chen, Jianwei Mao, Guofeng Qian, Zhenbin Li, and Xinyue Zhang for their comments and suggestions.