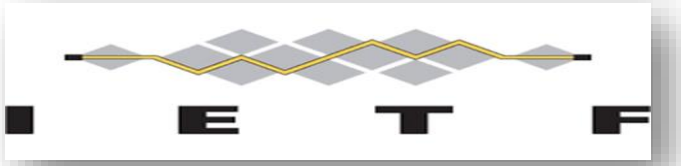
Zero Trust Network Access (ZTNA) for Network Cloud Interface



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Problem Statement

- Dynamic Nature of Cloud Services : requirement of dynamic policies ➔ Neotec (Network Operations for Telecom Clouds)
- Network cloud coordination lacks security mechanisms.
  - Cloud and Network telemetry data may be exposed to unauthorized entities.
  - Lack of Standardized Security Policies framework for enforcing ZTNA principles in network-Cloud coordination.
  - No standardized model to secure exposure of Cloud and Network resources dynamically.

Gap Analysis

- Previous IETF initiatives primarily focus on policy-based network orchestration, telemetry, and capability-aware routing.
- Previous initiatives do not adequately address real-time ZTNA policy enforcement for network- cloud interfaces.
- Lack of identity-based access control mechanisms between Cloud Service Orchestrators and Network Controllers.
- Absence of least privilege enforcement to restrict access to network and Cloud telemetry.

Proposed Solution

- YANG data model implementing ZTNA principles at the network-cloud interface and integrating ZTNA policies into the Neotec (NM4EC) framework.
- High Level Objective of the ZTNA YANG DM for Neotec:
  - **Establish identity-based access control** to secure network-cloud interactions.
  - **Enable least privilege principles**, ensuring entities only access necessary resources.
  - **Secure network and cloud telemetry exposure,** preventing unauthorized access.
  - **Enable continuous monitoring** to detect unauthorized access attempts and security anomalies.
  - **Ensure real-time, policy-driven security coordination** between cloud-aware orchestrators and network controllers.
  - **Provide a scalable and extensible structure** for future security enhancements.

ZTNA YANG Model major components

```
module: ietf-ztna-netcloud
  +--rw ztna-policy
     +--rw enable-ztna                          boolean
     +--rw identity-based-access
     |  +--rw access-rule* [id]
     |     +--rw id                              string
     |     +--rw identity                        string
     |     +--rw role                            string
     |     +--rw access-level                    enumeration
     +--rw least-privilege-enforcement
     |  +--rw enforce                            boolean
     |  +--rw restricted-metric* [metric-name]
     |     +--rw metric-name                     string
     |     +--rw access-level                    enumeration
     +--rw secure-exposure
     |  +--rw encrypt-metrics                    boolean
     |  +--rw exposed-metric* [metric-name]
     |     +--rw metric-name                     string
     |     +--rw exposure-level                  enumeration
     +--rw continuous-monitoring
        +--rw enable-monitoring                  boolean
        +--rw log-events                         boolean
        +--rw alert-threshold                    uint32
        +--rw threat-detection                   boolean
        +--rw monitoring-interval                uint32
        +--rw audit-logs* [log-id]
           +--rw log-id                          string
           +--rw timestamp                       string
           +--rw source                           string
           +--rw severity                         enumeration
           +--rw description                      string
```

Utilizing ZTNA YANG Module

Utilizing Least Privilege Enforcement:

```
{
  "ztna-policy": {
    "enable-ztna": true,
    "least-privilege-enforcement": {
      "enforce": true,
      "restricted-metric": [
        {
          "metric-name": "network-latency",
          "access-level": "summary-only"
        },
        {
          "metric-name": "bandwidth-usage",

          "access-level": "none"
        },
        {
          "metric-name": "cpu-load",
          "access-level": "detailed"
        }
      ]
    }
  }
}
```

Using Secure Exposure:

```
{
  "ztna-policy": {
    "enable-ztna": true,
    "secure-exposure": {
      "encrypt-metrics": true,
      "exposed-metric": [
        {
          "metric-name": "latency",
          "exposure-level": "public"
        },
        {
          "metric-name": "cpu-usage",
          "exposure-level": "restricted"
        },
        {
          "metric-name": "network-topology",
          "exposure-level": "private"
        }
      ]
    }
  }
}
```

Need you feedback for Neotec@ietf.org

- draft-dunchihi-neotec-zerotrust-access-dm-00
- Neotec Side Meeting: Wed 8am-9:30am

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The Neotec (NetOps4Clouds) is to define standardized interfaces, such as YANG models, to enable dynamic network policy adjustments—such as time-sensitive UCMP policies for routers—that accommodate the scaling of cloud-hosted services and ensure that adequate network resources are adjusted for the services in the clouds.

Thank you ! Stay Connected !

For additional information, please contact:

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