An Architecture of Network Artificial Intelligence (NAI)
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Abstract

Artificial intelligence is an important technical trend in the industry. With the development of network, it is necessary to introduce artificial intelligence technology to achieve self-adjustment, self-optimization, self-recovery of the network through collection of huge data of network state and machine learning. This draft defines the architecture of Network Artificial Intelligence (NAI), including the key components and the key protocol extension requirements.

Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119 [RFC2119]

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1. Introduction

Artificial Intelligence is an important technical trend in the industry. The two key aspects of Artificial Intelligence are perception and cognition. Artificial Intelligence has evolved from an early non-learning expert system to a learning-capable machine learning era. In recent years, the rapid development of the deep learning branch based on the neural network and the maturity of the big data technology and software distributed architecture make the Artificial Intelligence in many fields (such as transportation, medical treatment, education, etc.) have been applied. With the development of network, it is necessary to introduce artificial intelligence technology to achieve self-adjustment, self-optimization, self-recovery of the network through collection of huge data of network state and machine learning. The areas of machine learning which are easier to be used in the network field may include: troubleshooting of network problems, network traffic prediction, traffic optimization adjustment, security defense, security auditing, etc., to implement network perception and cognition.

This draft defines the architecture of Network Artificial Intelligence (NAI), including the key components and the key protocol extension requirements.
2. Terminology

AI: Artificial Intelligence

NAI: Network Artificial Intelligence

3. Architecture

3.1. Reference Model

![Diagram of Network Artificial Intelligence Architecture]

Figure 1: An Architecture of Network Artificial Intelligence (NAI)

The architecture of Network artificial intelligence includes following key component:

1. Central Controller: Centralized controller is the core component of Network Artificial Intelligence which can be called as 'Network Brain'. It can collect huge data of network states, store the data based on the big data platform, and carry on the machine learning, to achieve network perception and cognition, including network self-optimization, self-adjustment, self-recovery, intelligent fault location and a series of network artificial intelligence goals.

2. Network Device: IP network operation and maintenance are always a big challenge since the network can only provide limited state information. The network states include but are not limited to topology, traffic engineering, operation and maintenance information, network failure information and related information to locate the
network failure. In order to provide these information, the network
must be able to support more OAM mechanisms to acquire more state
information and report to the controller. Then the controller can
get the complete state information of the network which is the base
of Network Artificial Intelligence (NAI).

3. Southbound Protocol and Models of Controller: As network devices
provide huge network state information, it proposes a number of new
requirements for protocols and models between controllers and network
devices. The traditional southbound protocol such as Netconf and
SNMP can not meet the performance requirements. It is necessary to
introduce some new high-performance protocols to collect network
state data. At the same time, the models of network data should be
completed. Moreover with the introduction of new OAM mechanisms of
network devices, new models of network data should be introduced.

4. Northbound Model of Controller: The goal of the Network
Artificial Intelligence is to reduce the technical requirements on
the network administrators and release them from the heavy network
management, control, maintenance work. The abstract northbound model
of the controller for different network services should be simple and
easy to be understood.

3.2. Requirement of Protocol Extensions

REQ 01: The new southbound protocol of the controller should be
introduced to meet the performance requirements of collecting huge
data of network states.

REQ 02: The models of network elements should be completed to collect
the network states based on the new southbound protocol of the
controller.

REQ 03: New OAM mechanisms should be introduced for the network
devices in order to acquire more types of network state data.

REQ 04: New models of network elements should be introduced as the
new OAM mechanisms are introduced.

REQ 05: The operation models of network elements should be completed
based on the new southbound protocol to carry on the corresponding
network operation as the result of Network Artificial Intelligence.

REQ 06: The abstract network-based service models should be provided
by the controller as the northbound models to satisfy the
requirements of different services.
4. IANA Considerations

This document makes no request of IANA.

5. Security Considerations

TBD.

6. Normative References


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