

Network Working Group  
Internet-Draft  
Intended status: Informational  
Expires: May 4, 2017

Z. Li  
J. Zhang  
Huawei Technologies  
October 31, 2016

An Architecture of Network Artificial Intelligence (NAI)  
draft-li-rtgwg-network-ai-arch-00

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]

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF). Note that other groups may also distribute working documents as Internet-Drafts. The list of current Internet-Drafts is at <http://datatracker.ietf.org/drafts/current/>.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

This Internet-Draft will expire on May 4, 2017.

Copyright Notice

Copyright (c) 2016 IETF Trust and the persons identified as the document authors. All rights reserved.

This document is subject to BCP 78 and the IETF Trust's Legal Provisions Relating to IETF Documents (<http://trustee.ietf.org/license-info>) in effect on the date of publication of this document. Please review these documents carefully, as they describe your rights and restrictions with respect to this document. Code Components extracted from this document must include Simplified BSD License text as described in Section 4.e of the Trust Legal Provisions and are provided without warranty as described in the Simplified BSD License.

## Table of Contents

1. Introduction . . . . .	2
2. Terminology . . . . .	3
3. Architecture . . . . .	3
3.1. Reference Model . . . . .	3
3.2. Requirement of Protocol Extensions . . . . .	4
4. IANA Considerations . . . . .	5
5. Security Considerations . . . . .	5
6. Normative References . . . . .	5
Authors' Addresses . . . . .	5

## 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

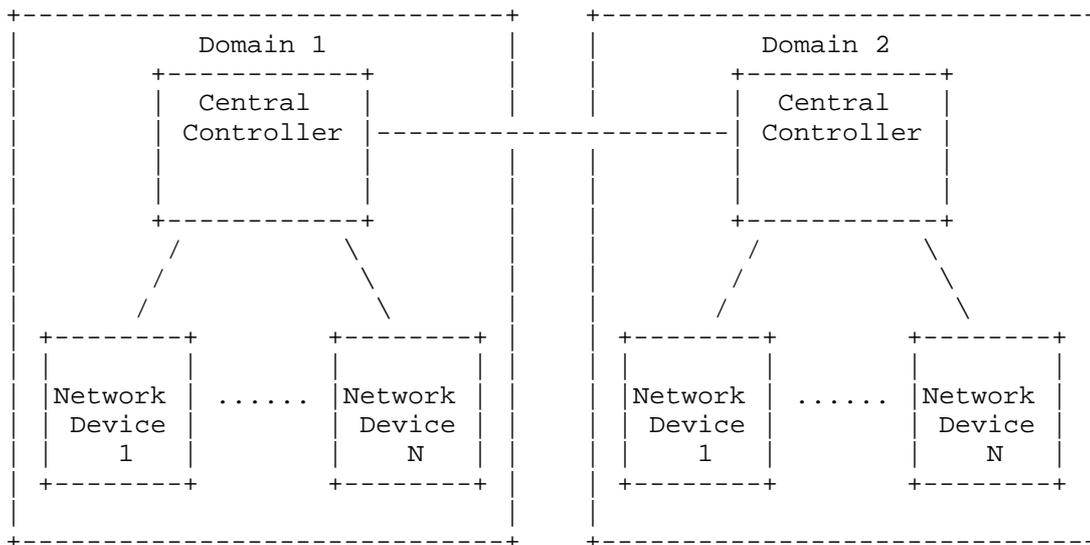


Figure 1: An Architecture of Network Artificial Intelligence(NAI)

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 includes 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

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, DOI 10.17487/RFC2119, March 1997, <<http://www.rfc-editor.org/info/rfc2119>>.

Authors' Addresses

Zhenbin Li  
Huawei Technologies  
Huawei Bld., No.156 Beiqing Rd.  
Beijing 100095  
China

Email: [lizhenbin@huawei.com](mailto:lizhenbin@huawei.com)

Jinhui Zhang  
Huawei Technologies  
Huawei Bld., No.156 Beiqing Rd.  
Beijing 100095  
China

Email: [jason.zhangjinhui@huawei.com](mailto:jason.zhangjinhui@huawei.com)