Unified Network Information Services (UNIS) allow users to discover network services and capabilities

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ABSTRACT

Dynamic circuit allocation using the Internet2 DCN (Dynamic Circuit Network) and network performance tools like perfSONAR use an "Information Services plane" that allows users to discover network topology and the location and capabilities of network services within that topology. As global federation of network services occurs, the standardization and flexibility of the network-centric Information Services becomes even more critical. Information Services Working Group (ISWG) comes forward to catalyze and focus development of these common information services by constructing UNIS - Unified Network Information Services plane. This plane will provide services such as edge mapping, measurement archives, distributed directory services, circuit monitoring, closest measurement point finding, interdomain pathfinder, topology abstraction. The poster will display an overview, work done and work in progress regarding this initiative.

Categories and Subject Descriptors
H.4.0 [**Information Systems Applications**]: General.

General Terms
Management, measurement, performance, standardization.

Keywords
Information services, network, measurement, performance, distributed computing, schema.

1. INTRODUCTION

The Internet2 community and its counterparts around the world have been actively engaged in developing new network services, including dynamic circuit networking capabilities and performance tools. Both dynamic circuit allocation using the Internet2 DCN (Dynamic Circuit Network) and network performance tools like perfSONAR use an "Information Services plane" that allows users to discover network topology and the location and capabilities of network services within that topology. As global federation of network services occurs, the standardization and flexibility of the network-centric Information Services becomes even more critical.

In order to help catalyze and focus the development of these common information services, the Internet2 Network Advisory Committee (NTAC) has commissioned the creation of a new Information Services Working Group (IS-WG). The group, in which our laboratory is a key participant, will work to further define the role and functionality of Information Services as well as drive design and development. Since these services will require specialized communications protocols, the group will work with and contribute to standardization bodies such as the OGF, GLIF, and the IETF. Discussions regarding the operation and exchange of information in organization federations will also be an important consideration.

To address the needs and use cases studied in the IS-WG, our laboratory puts forward UNIS – Unified Networks Information Services. UNIS is an information services plane: distributed software architectures use the information services plane to discover "meta" information within the network. This plane facilitates discovery of network topology, location, and capabilities of network services.

The UNIS umbrella of projects proposes solutions for information services necessities. Some of these projects are depicted in the following paragraphs.

1.1 UNIS topology schema

This schema allows a uniform expression of network topology elements. Forms of this schema are used currently in performance measurement infrastructures (such as perfSONAR), dynamic circuit networks (e.g., ESnet SDN, Internet2 DCN, ION, GÉANT AutoBAHN, Phoebus), experimental infrastructures (such as the Global Environment for Network Innovations – GENI, which studies evolving from its current RSpec schema to UNIS).

1.2 Periscope

Periscope is a flagship graphical control panel and visualization tool, a caching service, and normalizes domain-specific topology schemas.

1.3 New heuristic and algorithm for summarizing IP addresses in perfSONAR Lookup Service

The Lookup Service (LS) is a distributed directory, composed of levels, resembling the DNS system but used for measurement services. The LS is composed of the following components.

- Local directories (hLS): point to local services (measurement tools, archives) that ideally live in a domain. It accepts registrations directly from measurement services, and automatically finds the upper directory layer.

- Global directories (gLS) of local directories. The gLS is a global cloud of informations services, forming an upper layer similar to the DNS root system. Different instances of gLSs peer with each other to exchange and synchronize information.

The gLS accepts registrations from hLS instances only, which summarize their registrations and transmit this summarized information to the gLS. The summarized information includes a summary of IP addresses, hence the need for a new heuristic and algorithm to perform efficient summarization of IP addresses.

2. OUR WORK

We demonstrate, in the research, our efforts within the UNIS umbrella project to address information services plane needs. In particular, we propose the UNIS topology schema, to allow uniform representation of network topology components and that provides enough flexibility to fulfill the requirements of different domains, such as perfSONAR performance measurement infrastructure, and GENI's RSpec schema.

Taking advantage of UNIS schema capabilities, we have Periscope, a visualization and graphical control panel tool. In Periscope, topology data is stored and processed based on UNIS topology schema. Domain-specific network topologies are represented in UNIS and visualized in an interactive web-interface. Measurement data, collected from performance measurement infrastructures, such as perfSONAR (which Periscope is capable of interfacing with) is standardized and cached for analysis and display.

Finally, we outline our new heuristic and algorithm to summarize IP addresses, a key operation of the Lookup Service within perfSONAR performance monitoring architecture. The Lookup Service is a distributed directory service, where other services register to and clients perform queries to find other services and performance data. This directory service resembles a DNS system. To operate adequately, the service relies on lower level instances, which publish a summary of their controlled information to the upper level instance layer. By employing summarization, the service administers the volume of information that is published into the network. Moreover, resources, such as memory and storage, can be constrained.

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