Resource Discovery based on a Novel Distributed DNS Framework

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Abstract

A resource discovery framework based on VIRGO P2P distributed DNS is described here. With the convention of resource name as the format--functionscheme "::"global-hier-part"/"local-name, this framework supports flexible wildcards, and range queries by SQL-like query language.

In the large, decentralized, distributed resource sharing environments today or in the future, the efficient discovery of static and/or dynamic resources(The dynamic resources are meant both in dynamic change of attributes or dynamic exist in the network) is a big challenge.

The resource discovery based on Client/Server is not suitable for huge amount of resources. Here, a resource discovery framework based on VIRGO [3] P2P distributed DNS is described. The main advantages of this framework are the use of existing, widely accepted and consolidated DNS technologies and APIs to accomplish resource advertisement and dynamic discovery, and the use of VIRGO P2P technology to suit for the huge amount of resources' discovery effectively.

The convention for resource name is formatted as global unique hierarchical domains like domain names in DNS, and a local name to specify the local attributes of resource name [1]. The format of convention of resource names is as follows:

functionscheme" : "global – hier – part" / "local – name"

Here, the functionscheme is type or function or schema for the resource; the global-hier-part is the global hierarchical name similar as domain name, and the local-name is the local name for the resource.

We treat global-hier-part in the invention of resource name as domain name. We also use the similar concept of DNS zone for DNS server to manage the domain names. Resource names are published in their authoritative DNS server. The extension RRs in DNS server contains the parts of the functionscheme and local-part of conventions of resource name.

Every DNS Server maintains a route table and extension RRs related to its authoritative domain zone. Route table includes addresses of Foreign Name Servers which are prerequisite for Virtual Hierarchical Overlay Network and cached addresses of Foreign Name Servers which are refreshed by TTL rule. The DNS servers place themselves in virtual groups of VIRGO network according to their authoritative domain names. In query process, user program sends QUERY MESSAGE to Local Name Server, which routes to several intermediate Foreign Name Servers, and reaches the authoritative Domain Name Server. The authoritative Domain Name Server will response the query to the User Program [2].

QUERY MESSAGE contains SQL-like Query statement, which is formed as the following:

query::=SELECT{SCHEMA∥SUBDOMAIN∥ expr} AS c alias FROM(domainref[WHERE search condition]);

Here, SCHEMA is for querying functionschema for a Domain; SUBDOMAIN is for querying subdomain for a given super Domain; expr is for the property queried, which may be a set of properties; [AS] c_alias is the alias name for expr; domainref is for Domain Name, in which we can use * to indicate all sub domains; search_condition is similar to SQL statement in Database.

References

[1] Lican Huang Distributed Universal Resource Name Resolution based on Distributed DNS Internet Draft version 1 (work in progress), Feb,2008