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              Requirements for accessing data in network storage
                 draft-ohlman-decade-add-use-cases-reqs-00

Abstract

   So far, the intended scope of the DECoupled Application Data Enroute
   (DECADE) working group has mainly been focused on peer-to-peer (P2P)
   applications. There are however many non-P2P-based application that
   could also benefit from in-network storage. The target of DECADE
   should thus specify a protocol that is also suitable for generic
   applications with certain characteristics and not only P2P
   applications. This document enumerates a number of requirements that
   should be considered during the design and implementation of this
   protocol.

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 [RFC2119].

Status of this Memo

   material or to cite them other than as "work in progress."

   The list of current Internet-Drafts can be accessed at
   http://www.ietf.org/ietf/1id-abstracts.txt.

   The list of Internet-Draft Shadow Directories can be accessed at
   http://www.ietf.org/shadow.html.

   This Internet-Draft will expire on September 2, 2010.

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1. Introduction

   This draft suggests that DECADE should provide an application
   agnostic network storage mechanism, that is not only focused on P2P
   specific mechanisms. To ensure this we would like to make sure the
   scope of DECADE includes at least one use case besides the P2P use
   case. This second use case could for example be IPTV, but other
   alternative proposals that can represent the main characteristics of
   popular dissemination applications could also be used. This draft
   also want to make sure that requirements on the possibility of data
   reuse of cached copies in the network and of support for mobility are
   included in the WG charter. Thus the goal of this draft is to
   address some generic requirements that should be supported by in-
   network storage, both from an application and a use case situation
   point of view.

   This draft recogizes that DECADE have complementary requirements in
   the updated draft; I-D.draft-gu-decade-reqs-02 and aligns the layout
   accordingly.

   This document enumerates and explains the rationale behind additional
   requirements that should be considered in the specification of a
   protocol for DECADE.

2. General principles

   Other applications than P2P should be supported by DECADE, especially
   dissemination applications of streaming type (some with real-time or
   close to real-time requirements) as they can cause significant load
   on the network. The network load could be reduced significantly for
   these types of applications if copies stored locally in the network
   could be used instead of always fetching data from the source.

   A scenario that we are considering of a particular interest in this
   respect is represented by the IPTV use case. By IPTV we are
   referring here to the distribution of video content, mainly focusing
   on Video-on-Demand (VoD) services and user-generated contents. VoD
   services are commonly widespread in many Service Provider's networks.
   This scenario is characterized by the need to support an efficient
   large-scale distribution of video, possibly with a fairly high degree
   of replicated contents, to a multiplicity of fixed and mobile users.
   By supporting this application with the DECADE protocols, video
   content can be retrieved from the in-network storage, achieving a
   number of benefits. The originating servers can be relieved from
   most of the load, since popular content will be automatically
   available in the in-network storage, closer to the users. Improved
   network efficiency will be achieved, reducing the traffic load in the

upstream network segments. Moreover user experience, including
mobile ones, can also be improved.

2.1. Application-agnostic

2.1.1. Requirement

The specification of DECADE SHOULD strive to make the DECADE in-
network storage application-agnostic. As a verification of this
effort DECADE SHOULD be specified in such a way that it can address
at least one other application type, besides P2P applications.

2.1.2. Rationale

The currently proposed DECADE charter mainly addresses P2P
applications. However, there are other applications that also have
large footprint in the network load and could benefit from the work
done in DECADE. There is no need to address the requirements of all
types of applications but it should be ensured that DECADE implements
generic properties that are reasonably application agnostic. In
order to make sure that this is the case, it is proposed that at
least one more application type is taken into account. An example of
such an application could be large-scale video distribution such as
IPTV, YouTube, etc. A well-known issue with these applications is
the problem with flash crowds. That is also an example of a problem
which could be significantly eased if in-network storage is used to
provide users with locally available copies rather than all
requesting the data from the source (as outlined below in
Section 2.2). This can be extra beneficial for services with
realtime (or near realtime) components as traditional pre-caching
solutions can be difficult to use then.

2.2. Data reuse

2.2.1. Requirement

When certain content is popular and used by many users, the network
part of DECADE SHOULD be able to store only one (or any limited
number) copy of that data. The same data can then be used to serve
requests from multiple DECADE users.

2.2.2. Rationale

For an application like IPTV it is clear that multiple users will
request the same content, and thus wish to store multiple copies of
the same content in the in-network storage using DECADE. For these,
often very large, data objects it is clear that significant resources
can be saved in the network if a limited number of copies can be

stored in, for the network, strategic locations such that the usage
of storage and transmission resources are optimized. By only storing
a single copy of the data at each node, the storage requirements can
be greatly reduced. It has also been shown that there are strong
locality characteristics among requests for this type of content as
it's popularity often spreads through social networks or through a
geographic region [yoneki_09][gill_07]. This indicates that the
potential savings are very large. Well established use of web
proxies also indicates that data reuse can be a potential key
feature.

3. Data Access

3.1. Mobility

3.1.1. Requirement

DECADE SHOULD have the ability to support mobility of terminals/
users/applications by allowing the use of a data object that is
available near a new location when moving. DECADE COULD also provide
nomadic network storage.

3.1.2. Rationale

A lot of today's terminals are mobile, e.g. laptops and smartphones.
If locally found copies of data can be delivered to the DECADE user
the network can avoid a lot of cross network traffic that would be
needed to retrieve the data object from the home storage. If no
local copies can be found it can, under certain circumstances be
beneficial if the in-network storage of a DECADE user can move with
them (or become temporarily duplicated, depending on the expected
mobility characteristics) in order to avoid tunneling back to the
home storage. This can both improve performance for the mobile users
as data does not have to be fetched over a long-distance link, but
can also reduce costs for operators by reducing the traffic load in
their access networks.

4. IANA Considerations

This document has no requests to IANA.

5. Security Considerations

The re-use of copies in the network part of DECADE will require that
appropriate access control mechanisms are designed.

6. Acknowledgements

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   Information work package in the EU FP7 project 4WARD for
   contributions and feedback to this document.

7. Informative References

   [I-D.gu-decade-reqs]
             Yingjie, G., Yongchao, S., Yang, Y., and R. Alimi, "DECADE
             Requirements", draft-gu-decade-reqs-02 (work in progress),
             December 2009.

   [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate
             Requirement Levels", BCP 14, RFC 2119, March 1997.

   [gill_07] Gill, P., Arlitt, M., Li, Z., and A. Mahanti, "Youtube
             traffic characterization: a view from the edge",
             Proceedings of the 7th ACM SIGCOMM conference on Internet
             measurement , 2007.

   [yoneki_09]
             Yoneki, E., Sastry, N., and J. Crowcroft, "Buzztraq:
             predicting geographical access patterns of social cascades
             using social networks", Proceedings of the Second ACM
             EuroSys Workshop on Social Network Systems , 2009.

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