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Overlays on Data Centers

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Abstract--Online services and social network applications are hosted on large Data centres. To avoid the redesign of existing network and to update with latest services in developing trends we go for Overlay Networks on data centres.

Modern trends in hierarchical data centre design and global services running across different geographically disparate data centre pose unique Challenges and opportunity to introduce a new idea to improve the performance of Overlays on data centre. Here we present the design and architecture of DC2, in which nodes are aware of their location in data centre. In this paper, we present an idea of building the scribe overlay framework over DC2 which will increase the performance of overlays in hierarchical data centres for group communications

I. INTRODUCTION

Increasing popularity of large- scale online services that run in data centres. Latest data centres used to create cloud services are also growing now-a-days. Several next-generation P2P systems such as CAN [1], Chord [2], Pastry [3], and Tapestry [4] provide a self-organized overlay to enhance the search performance. In general, building an overlay should provide flexibility and enable rich services. However, one of the crucial issues in deploying an overlay network is the potential performance degradation. Scribe is a multicast system that relies on DHT routing to establish the multicast forwarding trees and can scale to large number of groups and membership dynamics.

In an overlay network, data transfer might not be as efficient as the one performed at the network layer. Routing in overlay networks focused primarily on optimizing the number of overlay links traversed for each lookup, because they were mainly designed for the wide area with no assumptions about the physical location of the nodes in the network. Routing overhead is also a key performance metric for overlay infrastructures. If the overlays are constructed randomly, nearby hosts in the overlay network may actually be far away in the underlying network. This may waste too much network resources and, therefore, degrade performance significantly

Thus, they do not pay close attention to several important requirements that are specific to data center environments. The physical topology of data center networks is multi-rooted tree topology with less overall bandwidth at higher levels of the tree than at the bottom which is referred to as the oversubscription factor (the ratio of up-links to the down-links).Implementations of existing system overlay frameworks are done assuming that all links are homogeneous

in their capacity, bandwidth and even costs. It does not pay attention to data Center awareness.

Services deployed on global basis involve geographically disparate data centres. It's quite expensive to move data across data centres in different availability zone.Simple hop count is considered as a metrics to optimize whereas latency is not a good determinant in data center environment. More fine grained knowledge of location of server is necessary to consider underlying topology. The links which crosses many hierarchies are more expensive than the ones present local within a rack.

In this paper, we demonstrate the effectiveness of DC2 using an overlay routing mechanism to improve efficiency based on location-awareness. The first is based on scribe framework while the second is on Hermes framework; we also provide an evaluation of performance comparing strengths and weaknesses.

The remainder of the paper is organized as follows. Section 2 describes background and DHT routing necessary to understanding the DC2 design presented in Section 3. Our implementation of scribe on DC2 is described in Section 4. We then detail closely related work in Section 5 before concluding in Section 6.

II. BACKGROUD

In this section some background information on DHT routing . The core functionality of DC2 is to build location aware overlay trees for group a member, which minimizes the number of links that cross from one hierarchical grouping to another.

A. DHT Routing

Implementation of a distributed hash table (DHT) is similar to Chord. Key-value pairs are stored in peer-to-peer network. Using the IP address of a peer in the network and dynamically built and repaired routing table routing is supported. Some of the algorithm are used to identify the nearest node and cheaper route. Consistent hashing by group identifiers is mapped to the key-space. This also provides load-balancing.

While routing we need to consider the defining of nearness and also the neighbour selection. Various efficient algorithms can be used for identifying the nearest path to destination. Similarly for selecting the neighbour in routing

IJERT

process we can use any of efficient mechanisms thereby improving the overall performance.

III. DC2 DESIGN

DC2 (Data center aware distributed Communication). The architecture of DC2 relies on the knowledge of the data center network topology. The three components of DC2 include *location identifiers, scalable overlay routing mechanism and coordinators*.

Location identifier is an identifier unique to the particular host. DC2 clusters the Data centers hierarchically for the routing. Here lowest level cluster is the leaf cluster. Clustering of leaf cluster to next high level hierarchy called interior cluster. Each leaf cluster belongs to one of the interior cluster. Location identifier can be identified as

DC id: Rack id : Host Id .

Since the Data center available is known and limited assigning identifier is not very tedious. Data center management is done by all the enterprise hence assigning identifier can be done easily. Identifiers for data center are taken from subnet address (\16) block allocated to the data center.

Overlay routing mechanism is not to be much concern in case of DC2. Hence it can work well with any popular routing mechanism. In this paper we describe the scribe and Hermes overlay routing mechanism on DC2 which improve the performance of overlay on data center.

Cluster coordinator present for each level of hierarchy. The queries are forwarded towards coordinator. The coordinators are identified based on key value. Randomly load can be balanced among the nodes.

IV. IMPLEMENTATION - DC2 SCRIBE

In DC2 SCRIBE we implement the scribe overlay routing in overlay routing mechanism of DC2. Scribe is a scalable infrastructure built on top of Pastry for application-level multicast. Scribe nodes create a *group* and other nodes join the group for multicasting messages to all members of the group. Scribe provides best-effort delivery of messages. Stronger reliability guarantees provided by Scribe.

Similarly as group management in Scribe we can manage the groups in DC2 Scribe also. Here the groupId is related to the location identifier. Each group has a unique groupId in scribe whereas in DC2 Scribe we generate Location based groupId (LocId-groupId). GenerateId() method invoked initially before create() when a node requests for create () operation.

DC2 Scribe provides the following simple API to its application similarly as scribe where instead of groupId we use LocId-groupId.(for example., Create (credentials,LocId-groupId) ,Join (credentials, LocId-groupId, messageHandler)etc) To create a group, a Scribe node asks Pastry to route a CREATE message using the LocId-groupId as the key (e.g. route (CREATE,LocId-groupId)).

In DC2 Scribe API for GenerateId() method is given here below. Here the DCId, RackId, HostId are considered, through which the request message is received. The location identifier of the nearer host is taken i.e the node near the member who request for join is identified.

GenerateId(DCId,RackId,HostId,groupID,credential) method produce LocId-groupId which is the generated groupId concatenated with hash value of LocId of creator's node. The remaining methods are invoked and take place same as scribe framework management. The routing here involves the process of generating the LocId-groupId for implementing Scribe DC2 Scribe.

V. CONCLUSION

The performance of overlays on data centers are improved by implementing the scribe infrastructure over the DC2 thereby considering data center awareness in routing mechanism. In this paper the implementation of Scribe on DC2 improve the performance thereby reducing the link stress and node stress. Data center awareness is the main concern in this paper which improves the performance of overlays on data centers.

REFERENCES

1. Sylvia Ratnasamy, Mark Handley , Richard Karp, and Scott Shenker "Application-Level Multicast using Content-Addressable Networks".
2. M.Castro, P. Druschel,A.M. Kermarrec and A.Rowstron,"Scribe: A Large-Scale and Decentralized Application-Level Multicast Infrastructure,"IEEE Journal on Selected Areas in Communications,vol.20,2002.
3. Stoica, R. Morris, D. Karger, M. F. Kaashoek, and H. Balakrishnan. Chord: A scalable peer-to-peer lookup service for Internet applications. In *Proc. ACM SIGCOMM'01*, San Diego, CA, Aug. 2001
4. Antony Rowstron and Peter Druschel, "Pastry: Scalable, distributed object location and routing for large-scale peer-to-peer systems," in *Proc. IFIP/ACM Middleware 2001*, Heidelberg, Germany, Nov. 2001.
5. B. Y. Zhao, J. D. Kubiatowicz, and A. D. Joseph. Tapestry: An infrastructure for fault resilient wide-area location and routing. Technical Report UCB//CSD-01-1141, U. C. Berkeley, April 2001.
6. Shelly Q. Zhuang, Ben Y. Zhao, Anthony D. Joseph, Randy H. Katz, and John Kubiatowicz, "Bayeux: An Architecture for Scalable and Fault tolerant Wide-Area Data Dissemination," Port Jefferson, NY, June 2001.
7. Kwon,Minseok,and Sonia Fahmy "Topology-Aware Overlay Networks for Group Communication"ACM NOSSDAV 2002.
8. P. Ganesan, K. Gummadi, and H. Garcia-Molina, "Canon in g major: Designing dhts with hierarchical structure," in *Proceedings of ICDCS*, 2004.
9. JANNOTTI, J., GIFFORD, D. K., JOHNSON, K. L., KAASHOEK,M. F., AND O'TOOLE, JR., J. W. Overcast: reliable multicasting with on overlay network. In OSDI'00: Proceedings of the 4th conference on Symposium on Operating System Design & Implementation (Berkeley, CA, USA, 2000), USENIX Association.
10. "A Construction of Locality-Aware Overlay Network: mOverlay and Its Performance" Xin Yan Zhang, *Student Member, IEEE*, Qian Zhang, *Member, IEEE*, Zhensheng Zhang, *Senior Member, IEEE*, Gang Song, and Wenwu Zhu, *Senior Member, IEEE,January 2004 IEEE Journal.*
11. "The Pastry Algorithm Based on DHT", Jihong Song , Shenyang University of Technology, China, Shaopeng Wang, Shenyang University of Technology,China, Computer and Information science journal November 2009.

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