Software Defined Storage Technology

Dr. S.C. Gupta  
Visiting Faculty,  
Department of Computer Science and Engineering,  
Indian Institute of Technology (IIT) Delhi  
Former Deputy Director General,  
National Informatics Centre, Delhi, India  
scgupta@cse.iitd.ac.in

Dr. Anita Goel  
Associate Professor, Department of Computer Science,  
Dyal Singh College,  
University of Delhi, India  
goel.anita@gmail.com

I. TUTORIAL OBJECTIVE

The objective of the tutorial is to discuss the emerging concept of Software Defined Storage (SDS) with practical example.

The overall objective of the tutorial: Participants can view a complete picture of storage—the traditional storage, storage in the cloud and the emerging Software Defined Storage.

• Providers of storage hardware and software solutions can understand the software defined storage architecture which will help in designing and providing SDS based more cost effective systems.

• Researchers can understand key concepts and challenges of software defined storage and contribute in evolving this technology further.

• Educators can understand the emerging view of storage in the cloud.

• Providers of cloud storage services will become aware of the emerging storage technology of the future for the data centres; which is more cost effective alternative to traditional storage systems.

II. TUTORIAL DESCRIPTION

Software defined storage (SDS) is the emerging storage technology. It is inspired by Software Defined Network (SDN), which divides the complexity of the router into two parts – Data Plane and Control Plane. The router retains the data plane which does the forwarding of packet based on the flow entries, which are given by the Control plane which now resides outside the router i.e. in a controller server. Similarly SDS divides the complexity of the storage device into two parts - the pure raw storage device and the controller software which now resides in a server and manages the set of raw storage device.

Reliability is managed by the controller by replicating multiple copies of each block on multiple devices. Also fragments of a file are stored on multiple devices. This increases the throughput as the file is read from multiple devices at the same time. The reliability and scalability thus achieved is same as being offered by expensive SAN and NAS storage systems, which are currently being used in large data centers.

SDS concept which germinated just a year back has taken off very quickly as the components/ concepts on which it is built were already available in Hadoop and Google File system. Within a short span of a year many vendors including many startups worldwide have started offering SDS based solution at 10 to 20% of the traditional SAN and NAS kind of storage devices. Today, several open source SDS solutions are available which can be used effectively in data centers and by users who have huge data storage requirements like broadcasting, mobile companies and many more. This new approach for storage management has huge scope for research and development as well. This tutorial aims to share the knowledge and experience, the speakers have gained in SDS over the last few years by way of several M.Tech and Ph.D. research oriented projects and its application in Cloud (Baadal Cloud designed and developed at IIT Delhi). The tutorial will cover the basics of various storage classes namely Block, File and Object storage and how these can be delivered by HDFS based SDS solutions which are reliable and scalable. It will cover Ceph, one of the prominent open source SDS solutions in detail as a case study and demonstrate its reliability, scalability and virtualization to meet the cloud storage requirement.

III. INTEREST TO THE SOFTWARE ENGINEERING COMMUNITY

Software Defined Storage is an outcome of the re-architecting the storage system. It is an excellent example of how a good architecture can lead to more powerful and cost effective solutions.

IV. SPEAKERS (SHORT BIOGRAPHY)

Dr SC Gupta is B.Tech (EE) and Rank holder from IIT Delhi’75 and has worked at Computer Group at Tata Institute of Fundamental Research and NCSDCT (now C-DAC Mumbai), Till recently, he worked as Deputy Director General, Scientist-G and Head of Training at National Informatics Centre, New Delhi and was responsible for keeping its 3000 scientists/ engineers uptodate in various technologies. He has extensive experience in design and development of large Complex Software Systems.

Currently he is a Visiting Faculty at Dept of Computer Science and Engineering, IIT Delhi. His research interests includes Software Engineering, Data Bases and Cloud Computing. He has been teaching Cloud Computing at IIT Delhi,
which includes emerging disruptive technologies like SDN and SDS. He has guided many M.Tech & PhD Research students in these technologies and has many publications in Software Engineering and Cloud Technology in National and International Conferences and Journals.

**Dr. Anita Goel** is an Associate Professor in Department of Computer Science, Dyal Singh College, University of Delhi, India. She has received her Ph.D. in Computer Science and Masters in Computer Applications from Jamia Millia Islamia and Department of Computer Science (University of Delhi), respectively. She has a work experience of more than 25 years. She is a visiting faculty to Delhi Technological University and NIIT University. From 2009-10, she was Fellow in Computer Science, at Institute of Life Long Learning (ILLL) in University of Delhi.

She has served as member of program committee of International conferences like IEEE BigData Congress 2015 and ICWI 2015. She has guided several students for their doctoral studies and has travelled internationally to present research papers. She has authored books in Computer Science and has several national and international research publications.