E534 - Big Data Applications
Lecture Notes

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E534 - BIG DATA APPLICATIONS

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1 PREFACE

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1.1 Disclaimer

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1.1.1 Acknowledgment

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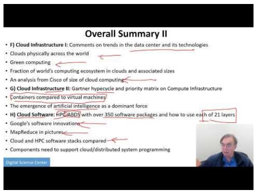
2 WEEK 1

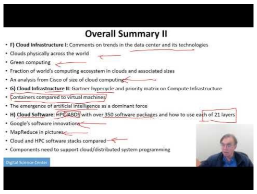
2.1 Week 1

2.1.1 A. Summary of Course



2.1.2 B. Defining Clouds I

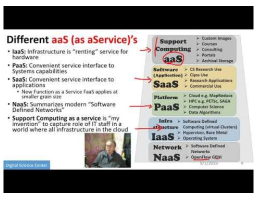
In this lecture we discuss the basic definition of cloud and two very simple examples of why virtualization is important.



How clouds are situated wrt HPC and supercomputers Why multicore chips are important Typical data center

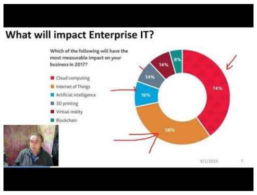
2.1.3 C. Defining Clouds II

Service-oriented architectures: Software services as Message-linked computing capabilities



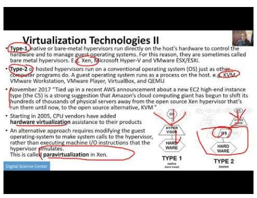
The different aaS's: Network, Infrastructure, Platform, Software The amazing services that Amazon AWS and Microsoft Azure have Initial Gartner comments on clouds (they are now the norm) and evolution of servers; serverless and microservices Gartner hypecycle and priority matrix on Infrastructure Strategies

2.1.4 D. Defining Clouds III: Cloud Market Share



How important are they? How much money do they make?

2.1.5 E. Virtualization: Virtualization Technologies,



Hypervisors and the different approaches KVM, Xen, Docker and Openstack

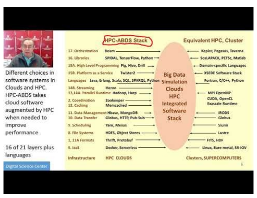
2.1.6 F. Cloud Infrastructure I

Comments on trends in the data center and its technologies Clouds physically across the world Green computing Fraction of world’s computing ecosystem in clouds and associated sizes An analysis from Cisco of size of cloud computing

2.1.7 G. Cloud Infrastructure II

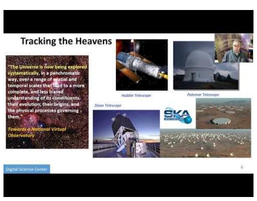
Gartner hypecycle and priority matrix on Compute Infrastructure Containers compared to virtual machines The emergence of artificial intelligence as a dominant force

2.1.8 H. Cloud Software:



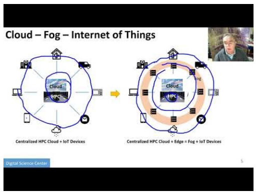
HPC-ABDS with over 350 software packages and how to use each of 21 layers Google's software innovations MapReduce in pictures Cloud and HPC software stacks compared Components need to support cloud/distributed system programming

2.1.9 I. Cloud Applications I: Clouds in science where area called



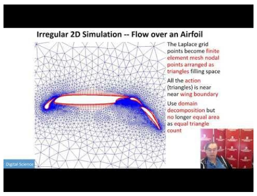
cyberinfrastructure; the science usage pattern from NIST Artificial Intelligence from Gartner

2.1.10 J. Cloud Applications II: Characterize Applications using NIST



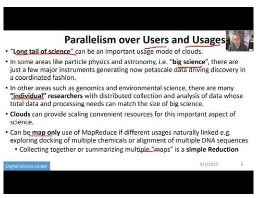
approach Internet of Things Different types of MapReduce

2.1.11 K. Parallel Computing



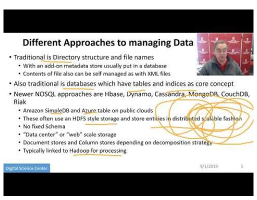
Analogies: Parallel Computing in pictures Some useful analogies and principles

2.1.12 L. Real Parallel Computing: Single Program/Instruction Multiple Data SIMD SPMD



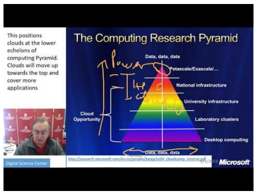
Big Data and Simulations Compared What is hard to do?

2.1.13 M. Storage: Cloud data



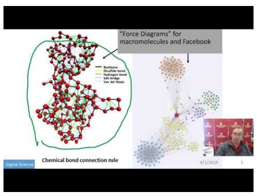
approaches Repositories, File Systems, Data lakes

2.1.14 N. HPC and Clouds



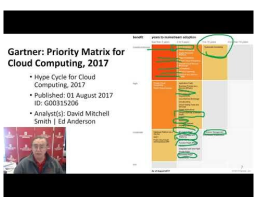
The Branscomb Pyramid Supercomputers versus clouds Science Computing Environments

2.1.15 O. Comparison of Data Analytics with Simulation:



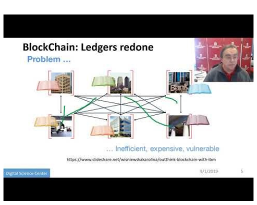
Structure of different applications for simulations and Big Data Software implications Languages

2.1.16 P. The Future I



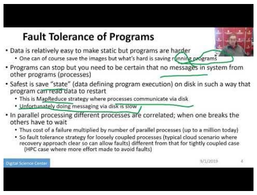
Gartner cloud computing hypecycle and priority matrix 2017 and 2019 Hyperscale computing Serverless and FaaS Cloud Native Microservices Update to 2019 Hypecycle

2.1.17 Q. other Issues II



Security Blockchain

2.1.18 R. The Future and other Issues III



Fault Tolerance

3 REFERENCES