大数据处理

课程回顾

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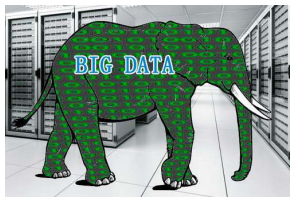
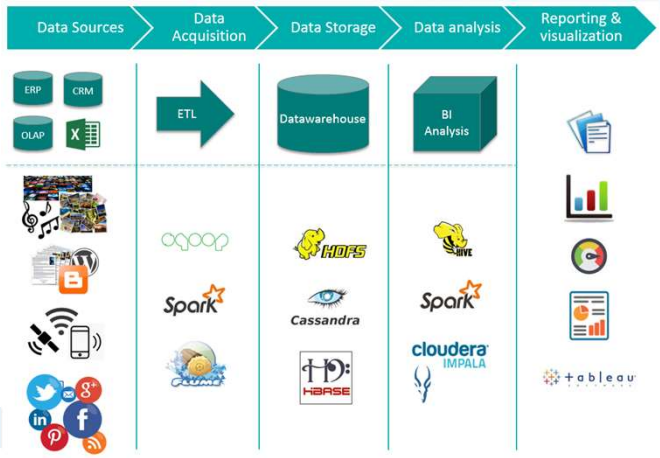
大数据（Big Data）

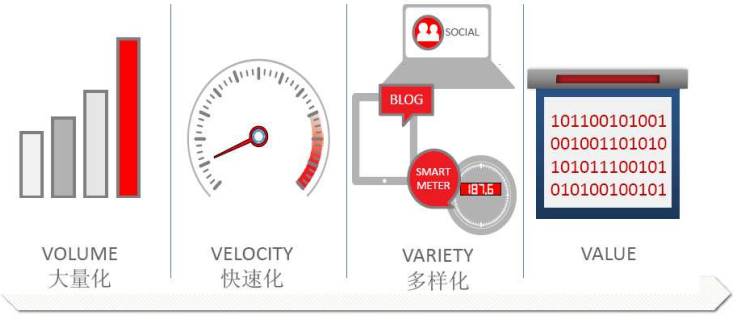
大数据是需要新处理模式才能具有更强的决策力、洞察发现力和流程优化能力的海量、高增长率和多样化的信息资产。（出自研究机构Gartner）



大数据（Big Data）生态

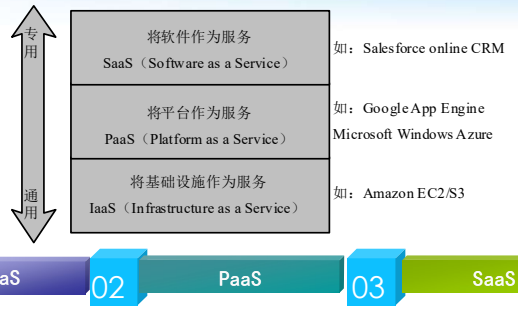


大数据特点（4“V”s）



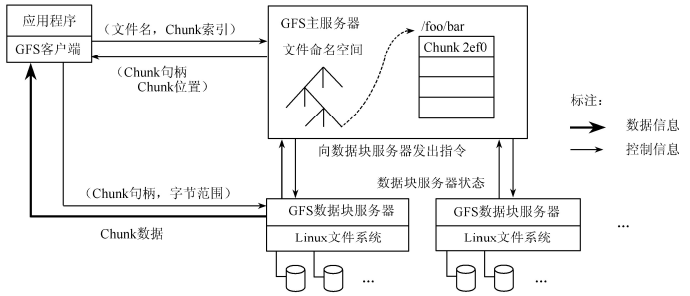
大数据不仅仅是数据的“大量化”，而是包含“快速化”、“多样化”和“价值化”等多重属性。

云计算的服务模型



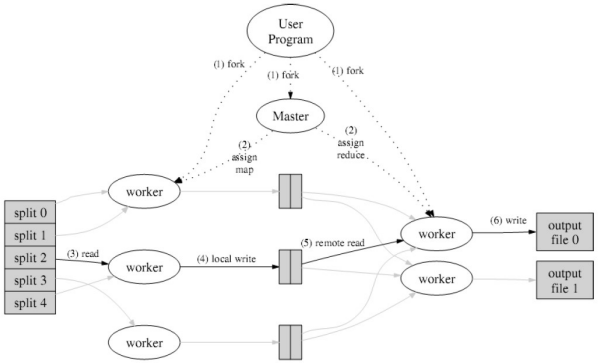
- 将硬件设备等基础资源封装成服务供用户使用
- 对资源的抽象层次更进一步，提供用户应用程序运行环境
- 针对性更强，它将某些特定应用软件功能封装成服务

Google GFS系统架构

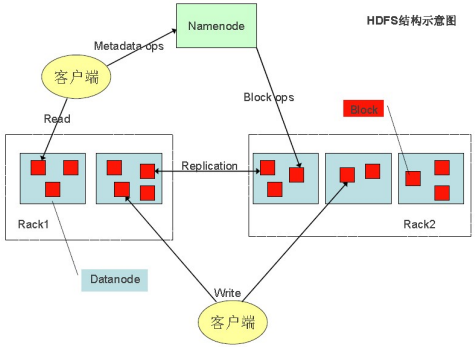


Client（客户端）：应用程序的**访问接口**
Master（主服务器）：**管理节点**，在逻辑上只有一个，保存系统的元数据，负责整个文件系统的管理
Chunk Server（数据块服务器）：负责具体的**存储**工作。数据以文件的形式存储在Chunk Server上

MapReduce架构

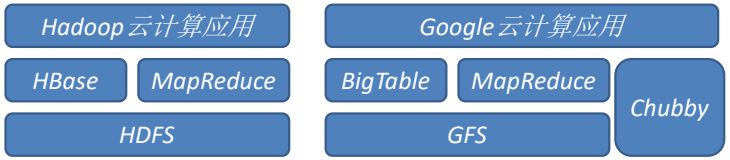


Hadoop体系结构



Hadoop VS. Google

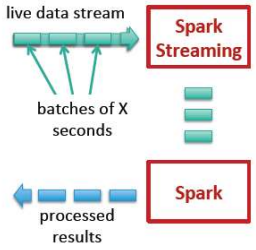
- 技术架构的比较
  - 数据结构化管理组件：Hbase→BigTable
  - 并行计算模型：MapReduce→MapReduce
  - 分布式文件系统：HDFS→GFS



Spark实时处理技术

Run a streaming computation as a series of very small, deterministic batch jobs

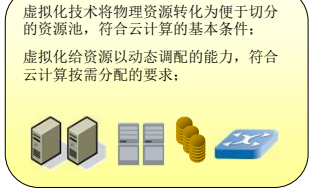
- Chop up the live stream into batches of X seconds
- Spark treats each batch of data as RDDs and processes them using RDD operations
- Finally, the processed results of the RDD operations are returned in batches

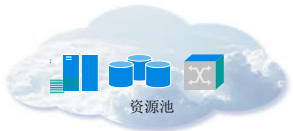


虚拟化技术的出现

虚拟化技术将物理资源转化为便于切分的资源池，符合云计算的基本条件；

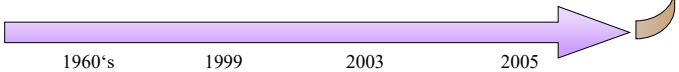
虚拟化给资源以动态调配的能力，符合云计算按需分配的要求；





Amazon采用虚拟化技术提供云计算平台，取得了商业上的成功，虚拟化技术成为云计算的基石；

2006

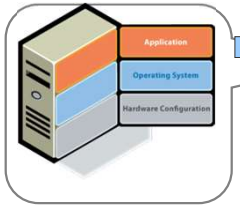


1960‘s	1999	2003	2005
IBM推出虚拟化技术，提高了昂贵的大型机的利用率；	VMware公司解决了X86虚拟化问题，推出了X86平台的虚拟机软件，使虚拟化技术开始走向普通用户。	开源虚拟化技术Xen推出，使虚拟化技术的研究和应用更加普及；	Intel和AMD推出支持虚拟化技术的处理器和芯片组，实现了硬件辅助虚拟化技术；

虚拟化技术

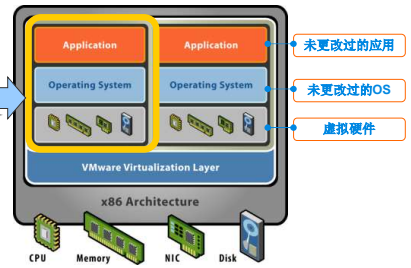
*虚拟化将硬件、操作系统和应用程序一同**封装**一个可迁移的虚拟机档案文件中*

虚拟化前



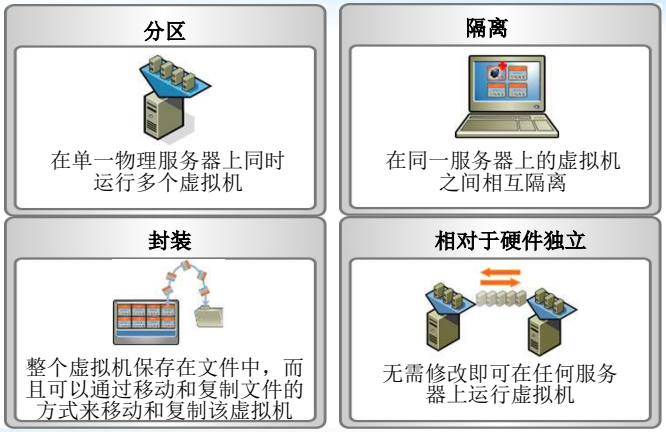
- 软件必须与硬件相结合
- 每台机器只能 运行单一的操作系统
- 每个操作系统有一个或多个应用程序负载（通常只有一个）

虚拟化后

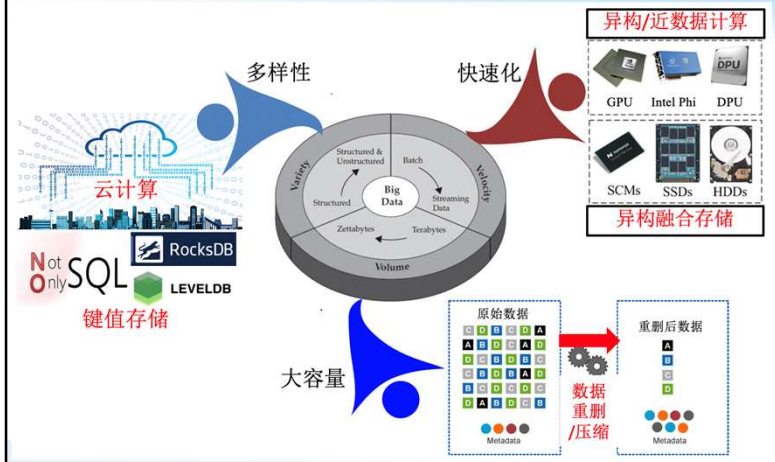


- 增加虚拟化层
- 裸金属架构
- 每台机器上有多个操作系统和多个应用负载

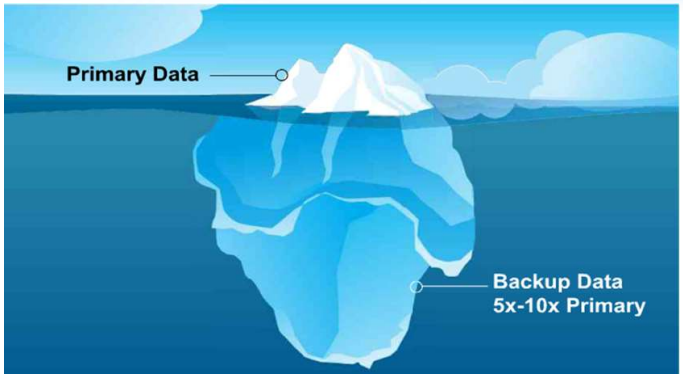
虚拟技术的四大特性



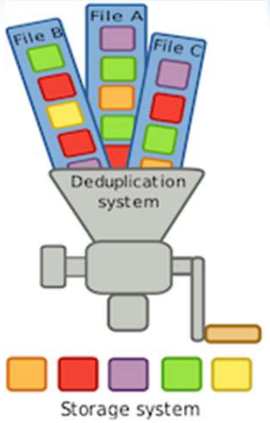
专题：应对大数据3V挑战的技术方案



重复数据删除技术的出现



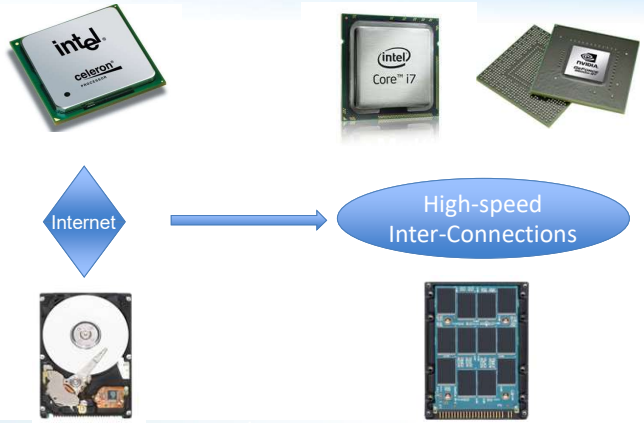
重复数据删除技术



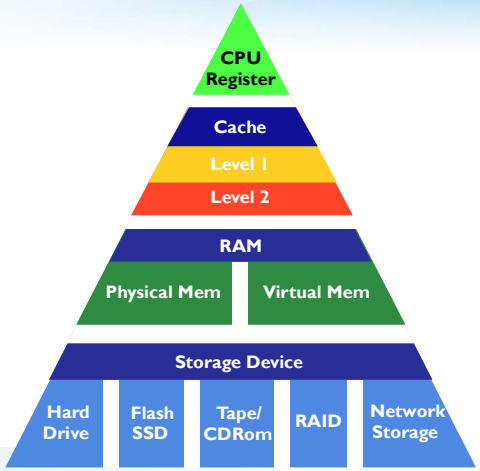
重复数据删除技术的优缺点

- 优势：
  - 控制数据增长，提出存储利用率
  - 提高网络带宽利用率，减少备份时间
  - 降低成本和能耗
- 劣势：
  - 需要额外内存和处理资源
  - 降低数据的可靠性
  - 增加了数据恢复的开销

固态盘等新型存储技术



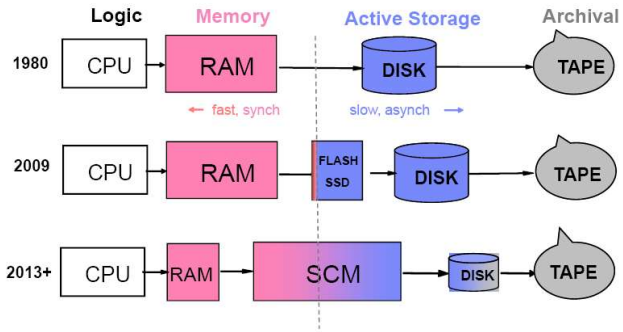
固态盘等新型存储技术



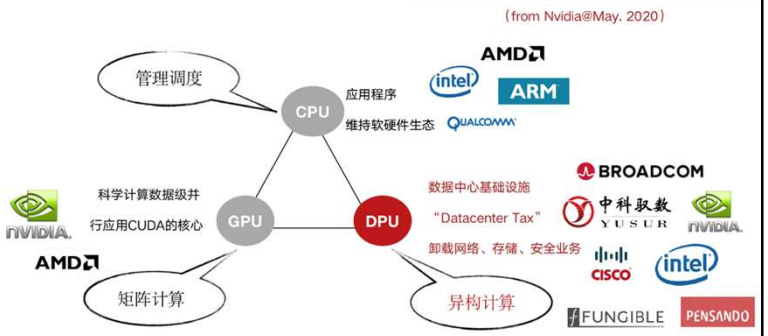
RAID比较

RAID	Min Disks	Storage Efficiency %	Cost	Read Performance	Write Performance
0	2	100	Low	Very good	Very good
1	2	50	High	Better than a single disk	Slower than a single disk
4	3	(n-1)*100/n	Moderate	Good for reads	Poor for small random writes
5	3	(n-1)*100/n	Moderate	Good for reads	Poor for small random writes
6	4	(n-2)*100/n	Moderate	Good for reads	Poor for small random writes

固态盘等新型存储技术



X PU 的异构计算



GPU

- CPU：更多资源用于缓存和逻辑控制
- GPU：更多资源用于计算，适用于高并行性、大规模数据密集型、可预测的计算模式。

SQL vs NoSQL

SQL：
结构化存储，固定Schema
索引
标准化查询语言
ACID
扩展性弱

NoSQL：
Schema不固定，可以动态改变
没有固定查询语言
BASE （Basically Available， Soft State， Eventually Consistency）
最终一致性
可以扩展到很大规模
高容错性