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Application and practice of parallel cloud computing in ISP

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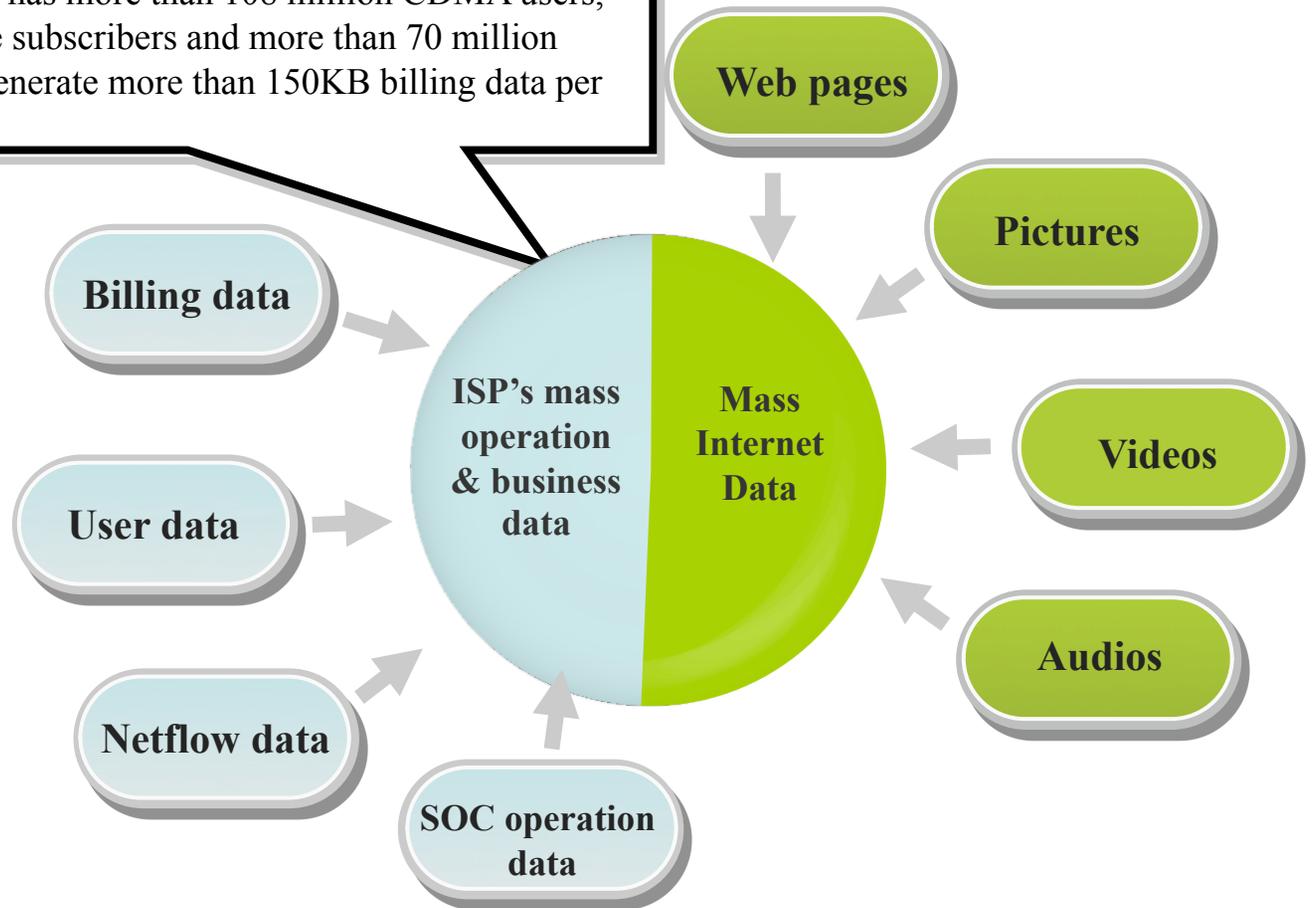
2011-10

- ❖ **Mass data management problem**
- ❖ **Applications of parallel cloud computing in ISPs**
- ❖ **Practice of parallel cloud computing in China telecom**
- ❖ **Conclusions**

Mass data management problem

By July 2011, China Telecom has more than 108 million CDMA users, 172 million fix-line telephone subscribers and more than 70 million broadband users. Each user generate more than 150KB billing data per year.

- **Facebook** is reportedly hosting 40 billion photos for over 600 million users.
- **Wal-Mart** handles more than 1m customer transactions every hour, feeding database estimated at more than 2.5 petabytes.
- The backbone network of **China Telecom** generates at least 10TB netflow data per day with the sampling rate of 1:5000.
- **SOC** generates massive warning info & device log data, TB size



- How to store massive data economically and reliably?
- How to analyze massive data efficiently and effectively?

Existing solutions

❖ **Ways to store massive data:**

- provide as much storage as needed, not economic.
- abandon historical data to reduce data size, will lose information.
- compress data before storing, not effective for future data processing.

❖ **Ways to analyze massive data:**

- Statistical analysis, data mining and business intelligent.
- Traditional data analysis tools such as SPSS, Clementine and SAS can only run on one host or on a small cluster, not feasible for petabytes massive data.

❖ **More powerful processing ability and more efficient analyzing methods are needed for massive data.**

Parallel cloud computing

- ❖ Introduced by Google, has been proved to be a powerful technology for massive data with extremely scalability and simplicity.
- ❖ Built on large cluster of commodity x86 pc servers.
- ❖ With an open source implementation named Hadoop, which provides a reliable shared storage and analysis system in a nutshell.
- ❖ Use MapReduce as paralleling programming model, suitable for data intensive application.
- ❖ Other features: Simple, flexible, fault-tolerant, scalable, economic...
- ❖ Currently, it is widely used by internet companies like Yahoo!, Last.fm, Facebook, and the New York Times.
- ❖ Also suitable for ISPs who have lots of IT supporting systems that gather massive network operation data and business data.

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Mass data management problem in ISPs

- ❖ **ISPs have many IT supporting systems such as OSS/BSS, which collect rich operation data & business data after years of running.**
- ❖ **Typical IT supporting systems are built on unix server & SAN storage network which are very expensive & hard to extend.**
 - Data is well-structured & managed by relational database.
 - Massive data is analyzed by traditional methods.
 - System capacity need to be carefully planned in advance.
- ❖ **Problems that ISPs are facing:**
 - Unix Servers are too expensive to maintain and upgrade. In 2009, China Telecom has spent more than 3 billion in IT supporting system.
 - Traditional data analysis methods couldn't process mass data efficiently.
- ❖ **More economic & more flexible architectures are needed by ISPs to solve mass data management problem.**

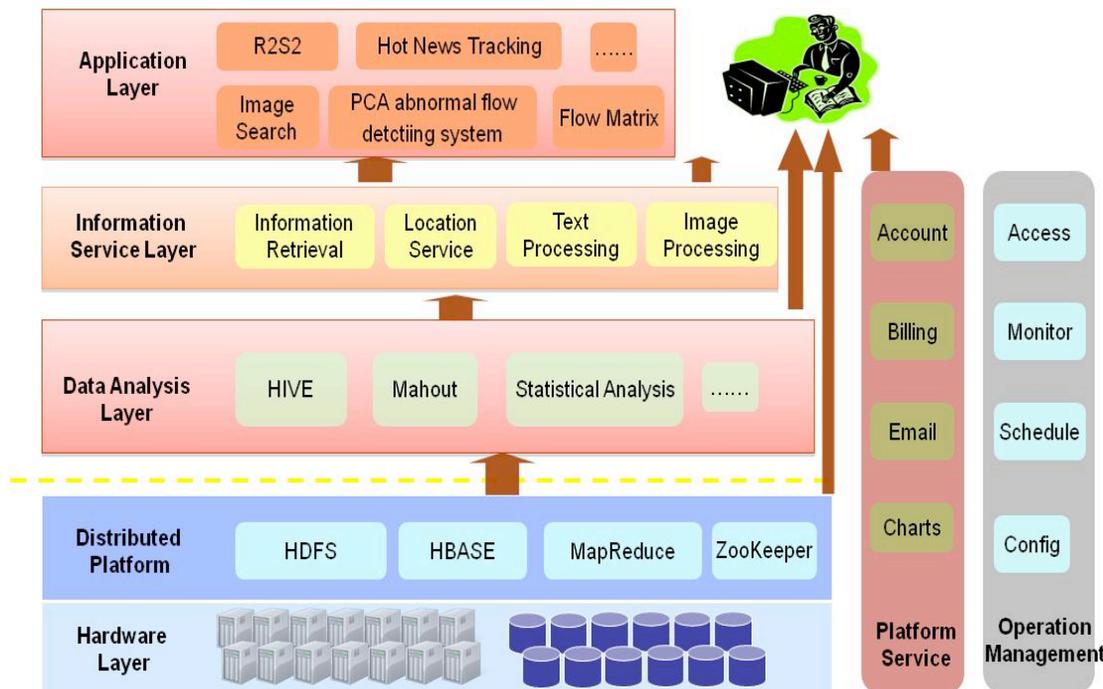
Applications of parallel cloud computing in ISPs

- ❖ **Utilize the large scale storage and processing ability of parallel cloud computing to do network operation data and user behavior analysis to optimize network and service quality, as well as to develop the customer consumption model.**
- ❖ **Run internal supporting system (OSS/BSS) on parallel cloud computing.**
- ❖ **Deploying Hadoop on virtual hosts in internet data centers (IDC) to provide parallel computing service for small enterprises.**

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Distributed Service Engine (DSE)

- ❖ China telecom has constructed a large scale data processing platform named distributed service engine (DSE).
- ❖ This platform is based on Hadoop and can provide large scale data processing ability for users and is supposed to support petabytes massive data.



Functional abilities of DSE

- ✓ Distributed storage and computing ability
- ✓ Data integration ability
- ✓ Basic data analysis ability
- ✓ Basic information processing ability
- ✓ Information service ability
- ✓ Basic platform service ability
- ✓ Platform operation management system

DSE Implementation

Hardware Resource

- 52 commodity pc servers with 396 cpu cores and 18T storage capacity
- High speed internet, with 512M bandwidth

Platform Deployment

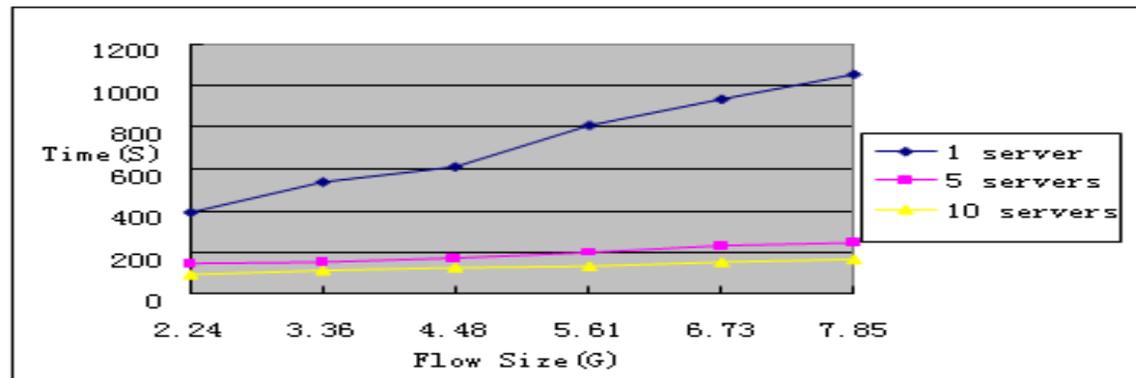
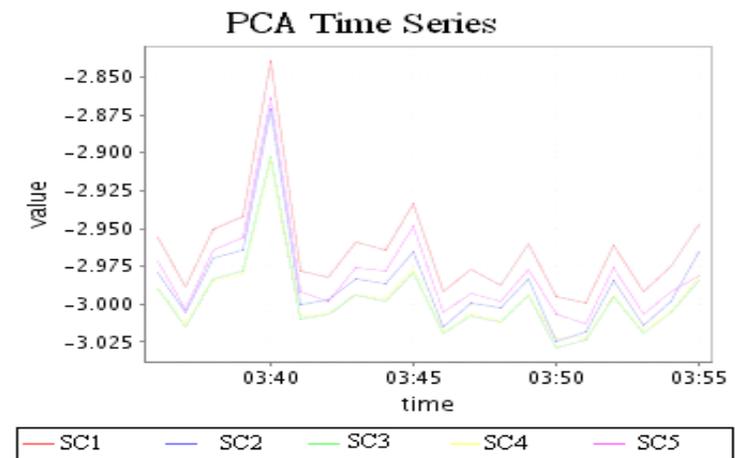
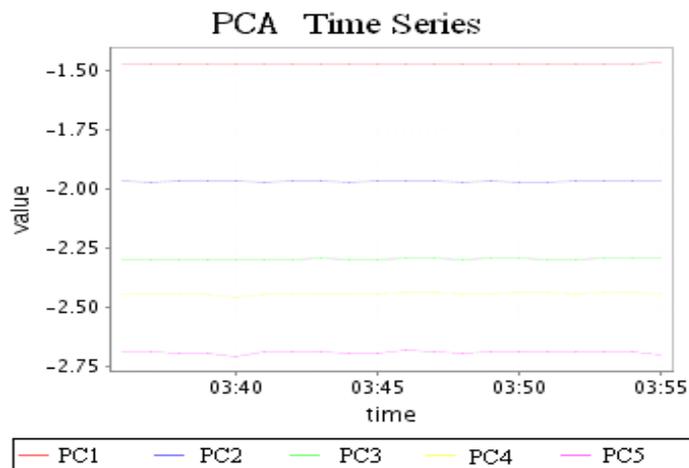
- Deploy Xen at hypervisor layer, and ECP as management platform
- Deploy Hadoop, Hbase, Zookeeper at distributed layer
- Use Mahout, HIVE as distributed data mining and data warehouse tools.
- Some basic text and image processing modules, such as information retrieval module are developed and deployed.
- Some basic information services like location service are also provided.

Applications

- Telecom systems: network traffic matrix analysis , PCA network traffic anomaly detection
- Internet applications: R2S2, RAFE and visual search

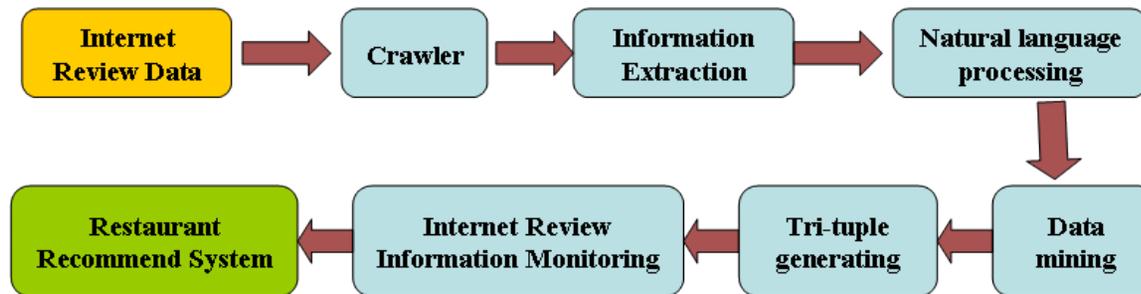
PCA network traffic anomaly detection on DSE

- ❖ PCA can effectively detect network anomaly traffic and the parallel cloud computing technology can greatly improve the system efficiency and scalability. This makes PCA based approaches can handle telecoms' large scale network data.



Restaurant Review Search System

- ❖ R2S2 is a restaurant recommending system which is based on analyzing and summarizing user comments over the internet.



- ❖ R2S2 is provided to public users as an open web service. It crawls more than 1,300,000 user comment records for over 120,000 restaurants from eight famous restaurant reputation websites. Using Hadoop Mapreduce, the system succeeds in processing 1,353,844 records in 10 hours in this cluster.

Restaurant Review Search System

详细信息

琶洲食府 总得分: 120 分 网友点评总数: 65 条 人均消费: ¥35

电话: 020-89898989
商圈: 天河区 体育中心
地址: 天河北天寿路31号江河水厦2楼
官方网址: http://www.food.com
菜系: 潮汕菜 北京菜 天津菜

口味: ★★★★★☆ 好评数: 25 条
服务: ★★★★★☆ 中评数: 30 条
环境: ★★★★★☆ 差评数: 10 条
性价比: ★★★★★☆

其它信息
可刷卡, 不收信用卡, 免费停车可刷卡

推荐菜系
葱烧海参 (18) 黄扒大排翅 (15) 黑胡椒牛柳 (14) 卤味拼盘 (10)

大众点评

评论摘要

综合 口味 环境 服务 价格比

1. Comment Summary

2. Comment categories

3. Positive Comments

物美价廉, 品种繁多。进入很多, 听说是家老店。地道的粤菜。东江的位置特别好, 很大的招牌。环境不错, 想吃到的粤菜种类好, 很大的招牌。环境不错, 想吃到的粤菜种类基本上都有。

4. Negative Comments

物美价廉, 品种繁多。进入很多, 听说是家老店。地道的粤菜。东江的位置特别好, 很大的招牌。环境不错, 想吃到的粤菜种类好, 很大的招牌。环境不错, 想吃到的粤菜种类基本上都有。

5. Neutral comments

物美价廉, 品种繁多。进入很多, 听说是家老店。地道的粤菜。东江的位置特别好, 很大的招牌。环境不错, 想吃到的粤菜种类基本上都有。

[查看所有评论](#)

高级搜索

6. Popularity trend diagram

7. Emotion trend diagram

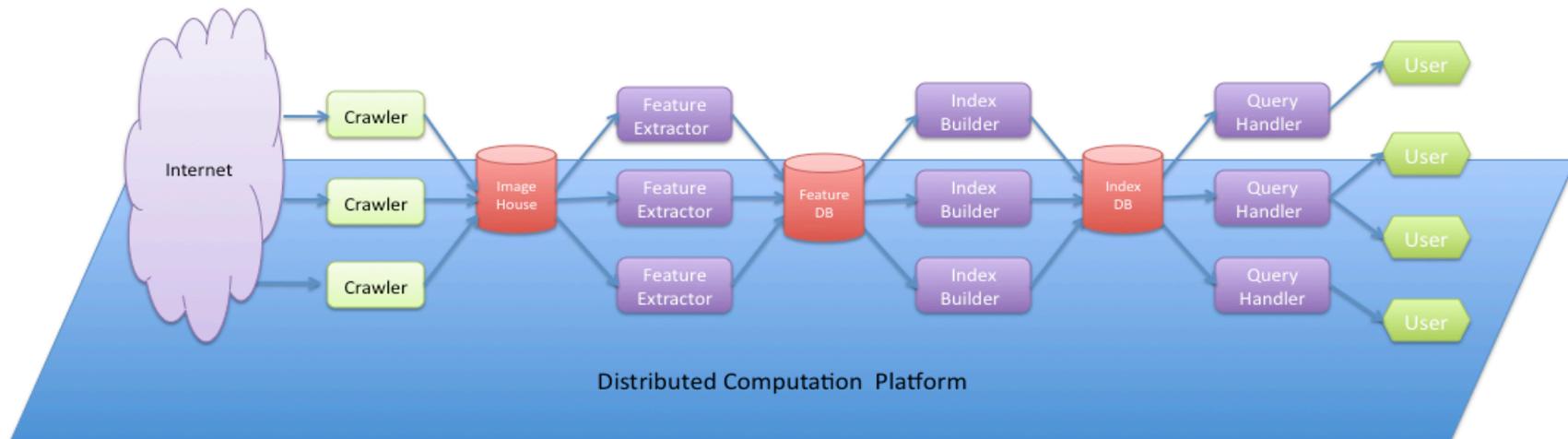
类似餐馆推荐

同商圈	同菜系	评分
上雅意大利休闲餐厅吉北店		150 分
人豪海鲜酒楼		145 分
玫瑰夫人(长宁路店)		140 分
人豪海鲜酒楼		135 分
玫瑰夫人(长宁路店)		130 分
肯德基虹口餐厅		128 分
上雅意大利休闲餐厅吉北店		124 分
人豪海鲜酒楼		119 分
玫瑰夫人(长宁路店)		118 分
肯德基虹口餐厅		110 分

餐馆新闻报道

- 国际宠物水族用品展览会
- 广州三胞胎同庆80岁生日
- 宿松开了家湘菜馆--喜相逢酒楼
- 【小吃做法】五香脆藕、乌龙茶叶蛋、南瓜饼
- 周末DIY香辣火锅
- 最牛的麻辣烫
- 广州三胞胎同庆80岁生日
- 广州三胞胎同庆80岁生日

Image Processing System



- ❖ The system is deployed in a twenty hosts cluster, with twelve physical machines and seven virtual machines
- ❖ A distributed crawler developed from Nutch grabs over 1 million pictures in about 24 hours, and generates 50G data. All images data are store in HDFS.
- ❖ SIFT algorithm is applied to detect and describe local features in images. The algorithm is implemented with MapReduce. It generates a 1000*128 high dimensional data matrix for each picture and store the matrix in Hbase.
- ❖ The system is able to process 1 million pictures in 5 hours.

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Conclusion

- ❖ **Parallel cloud computing technology is effective for large scale data processing, including telecom data processing and internet data processing.**
- ❖ **The maintenance cost of hadoop platform is relatively high due to the frequent hardware failures.**
- ❖ **Cannot reach carrier-grade level, which requires 99.999% availability.**
- ❖ **Need effective tools for tracking task statuses and failure reasons.**
- ❖ **Does not support real-time applications.**

Thank you !

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