# BOTSv3 Security Report: Frothly Brewing Company Attack Investigation

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**GitHub Link:** https://github.com/Patrick-cybersec/COMP3010HK-Security-Operations-Incident-Management/edit/main/comp3010/README.md

**Video Presentation:** [put YouTube link here] – short video (5 – 10 minutes) showing Splunk searches, screenshots, and main lessons

## 1. Introduction

BOTSv3 is a free training dataset created by Splunk. It simulates a real cyber attack on a fake company called **Frothly**, which makes beer. The company has offices, computers, servers, email, and uses Amazon AWS cloud services.

The dataset contains many different kinds of logs:

- Windows computer logs
- Linux server logs
- Network traffic
- Email messages
- AWS CloudTrail (who did what in the cloud)
- AWS S3 access logs (who read or uploaded files to storage)

In this assignment, I worked on the **200-level questions**. These questions focus mostly on problems in the AWS cloud and one question about Windows computers. My main goals were:

- Find out which people (IAM users) were using AWS
- Check if they used extra security (MFA) when logging in
- Discover when someone accidentally made a storage bucket public

- See what secret text file got uploaded after that mistake
- Find which computer was running a different version of Windows compared to others

**What I included in this report:** Only data from the BOTSv3 dataset. I used Splunk on my own computer. All events are from August 2018 (the time range in the dataset).

This exercise is very useful because it shows exactly how real Security Operations Center (SOC) analysts work every day: reading logs, asking questions, and finding problems before attackers cause big damage.

## 2. SOC Teams and How to Handle Security Incidents

A Security Operations Center (SOC) is like a control room that watches for cyber attacks 24/7. It has three main levels of people:

- **Tier 1 analysts**: They look at many alerts every day. They decide if something is real or just noise. They do the first quick check.
- **Tier 2 analysts**: They do deeper work. They search logs, connect different clues, and find out what really happened.
- **Tier 3 analysts**: They are experts. They hunt for hidden threats, write new detection rules, and help fix very difficult problems.

In the BOTSv3 scenario:

- Tier 1 might see alerts about strange AWS changes or many failed logins.
- Tier 2 would use Splunk to search for the exact event (like PutBucketAcl) and find user “bstoll” did it.
- Tier 3 would look at the whole picture and suggest long-term fixes like better AWS settings or new alerts.

Most SOCs follow the **NIST incident response steps**:

1. **Preparation** — Buy good tools, train people, make playbooks
2. **Detection and Analysis** — Find bad activity fast using logs and alerts
3. **Containment** — Stop the attack from spreading (example: make bucket private again)
4. **Eradication** — Remove the problem completely

5. **Recovery** — Bring systems back to normal
6. **Post-Incident** — Write a report and improve everything

From BOTSv3 I learned important lessons:

- Many security problems start because normal employees make mistakes (like forgetting to secure a bucket).
- If logs are missing or hard to search, it takes much longer to find the fact.
- Companies should use automatic tools (such as SOAR) to react faster and reduce human work.
- Prevention is better than reaction — strong rules like force MFA and never allow public buckets can stop most accidents.

## 3. How I Installed Splunk and Added the Data

I installed Splunk directly on my Windows computer (no virtual machine needed). This made setup faster and simpler for me.

**Step-by-step what I did:**

1. Downloaded the free Splunk Enterprise installer from the official Splunk website.
2. Ran the installer and followed the wizard (chose default options).
3. Started Splunk and changed the default password for safety.
4. Opened the Splunk web page in my browser.
5. Downloaded the BOTSv3 dataset zip file from GitHub.
6. Unzipped the file.
7. Used Splunk's "Add Data" feature or copied the extracted files into the correct Splunk apps folder (following the GitHub instructions).
8. Restarted Splunk if needed.
9. Tested with a simple search: `index=botsv3 | stats count by sourcetype` — it showed many sourcetypes like aws:cloudtrail, winhostmon, etc.

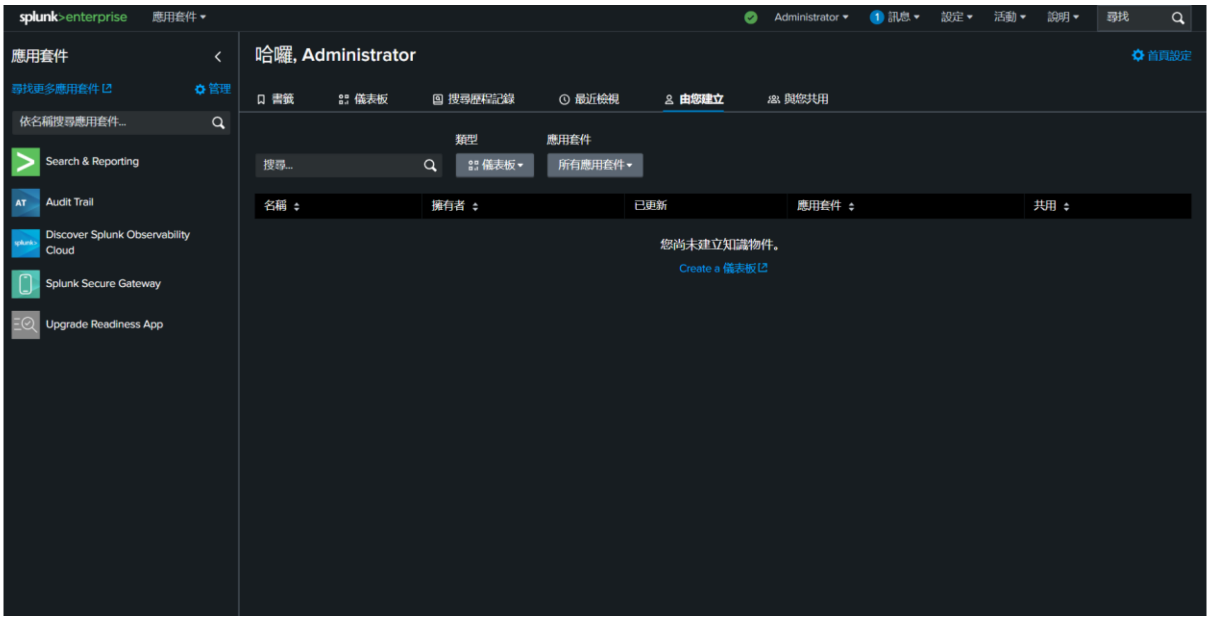
**Why I chose this setup:**

- It is quick and easy — no need to set up a separate virtual machine.

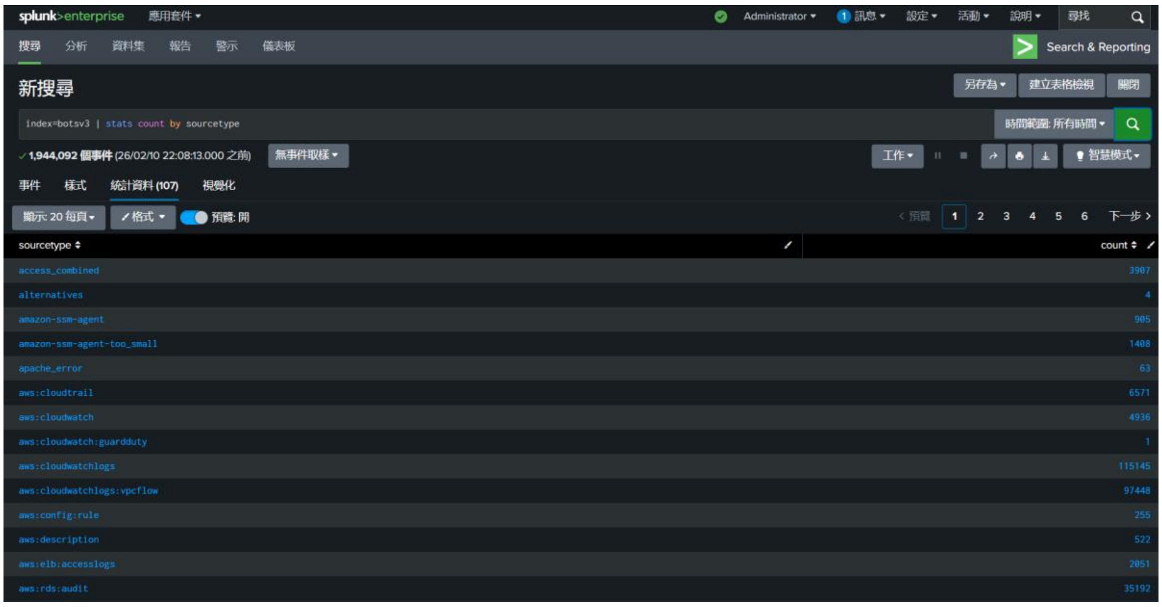
- Works well on my personal computer without extra RAM or disk space.
- Still gives full access to all BOTSv3 data and Splunk features.
- In a real small team or student lab, many people use Windows for simplicity.

Screenshots:

- Splunk welcome screen after login



- List of all sourcetypes found

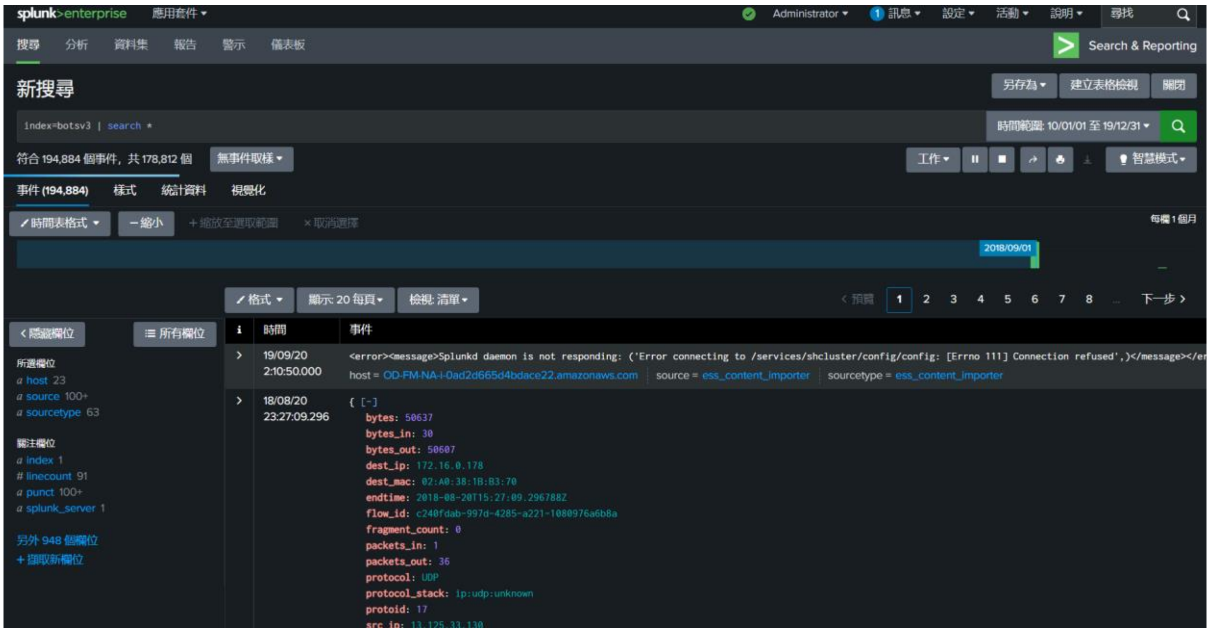


```
index=botsv3 | stats count by sourcetype
```

✓1,944,092 個事件 (26/02/10 22:08:13.000 之前)

| sourcetype | count |
|---|---|
| access_combined | 3907 |
| alternatives | 4 |
| amazon-ssm-agent | 905 |
| amazon-ssm-agent-too_small | 1408 |
| apache_error | 63 |
| aws:cloudtrail | 6571 |
| aws:cloudwatch | 4936 |
| aws:cloudwatch:guardduty | 1 |
| aws:cloudwatchlogs | 115145 |
| aws:cloudwatchlogs:vpcflow | 97448 |
| aws:config:rule | 255 |
| aws:description | 522 |
| aws:elb:accesslogs | 2051 |
| aws:rds:audit | 35192 |

- Simple search result showing data is working



```
index=botsv3 | search *
```

符合 194,884 個事件, 共 178,812 個

| i | 時間 | 事件 |
|---|---|---|
| > | 19/09/20 2:10:50.000 | `<error><message>Splunkd daemon is not responding: ('Error connecting to /services/shcluster/config/config: [Errno 111] Connection refused',)</message></er` host = OD-FM-NA-i-0ad2d665d4bdace22.amazonaws.com source = ess_content_importer sourcetype = ess_content_importer |
| > | 18/08/20 23:27:09.296 |  |

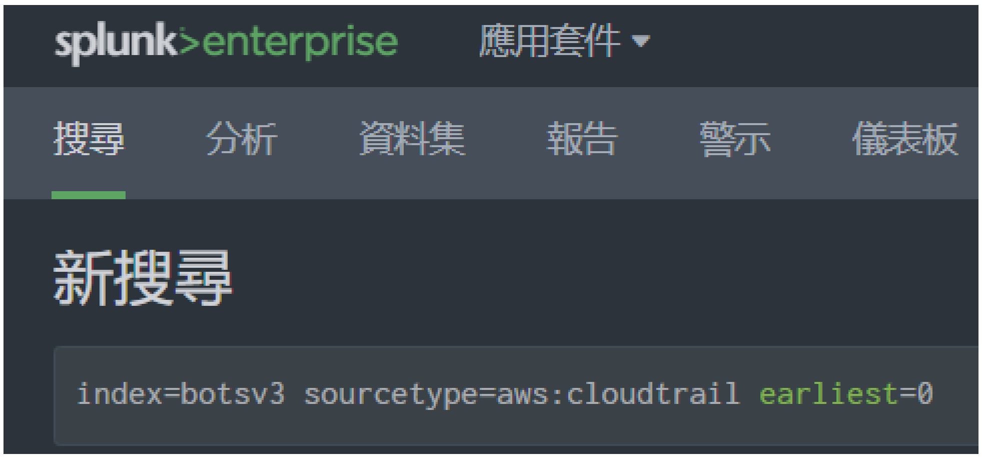
```
{ [-]
   bytes: 50637
   bytes_in: 30
   bytes_out: 50607
   dest_ip: 172.16.0.178
   dest_mac: 02:A0:38:1B:B3:70
   endtime: 2018-08-20T15:27:09.296788Z
   flow_id: c240fdab-997d-4285-a221-1080976a6b8a
   fragment_count: 0
   packets_in: 1
   packets_out: 36
   protocol: UDP
   protocol_stack: ip:udp:unknown
   protoid: 17
   src_ip: 13.125.33.130
```

## 4. Answers to the 200-level Questions

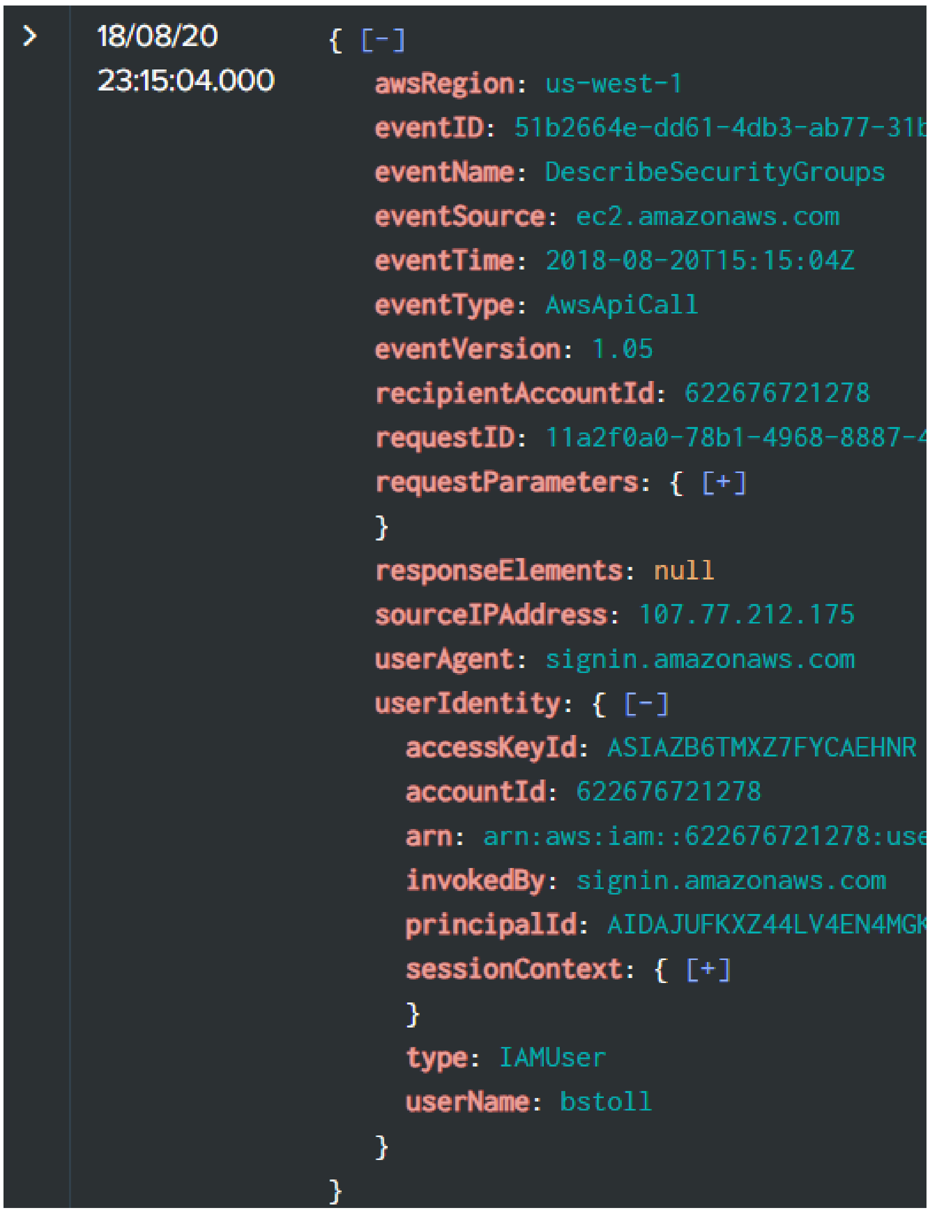
Question 1: Which IAM users used AWS services?

Answer: bstoll,btun,splunk_access,web_admin

Search used: `index=botsv3 sourcetype=aws:cloudtrail | stats count by userIdentity.userName | sort userIdentity.userName`

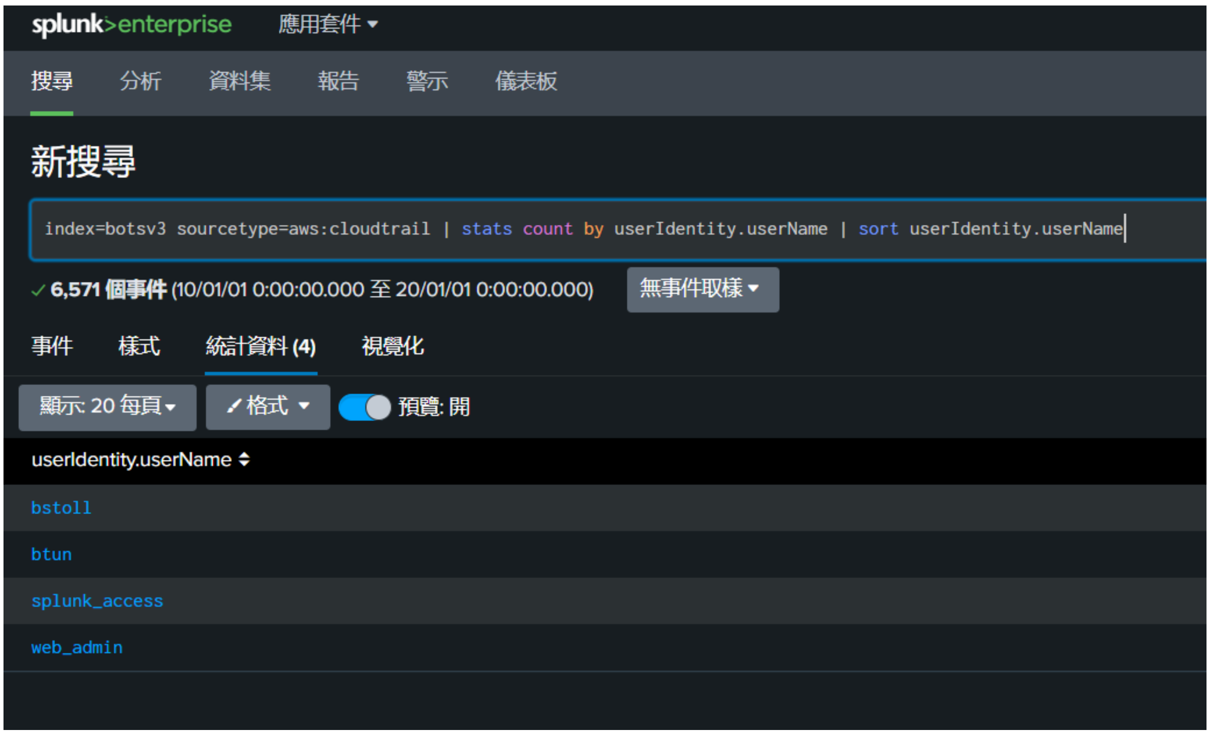


```
index=botsv3 sourcetype=aws:cloudtrail earliest=0
```



```
>   18/08/20        { [-]
    23:15:04.000       awsRegion: us-west-1
                       eventID: 51b2664e-dd61-4db3-ab77-31b
                       eventName: DescribeSecurityGroups
                       eventSource: ec2.amazonaws.com
                       eventTime: 2018-08-20T15:15:04Z
                       eventType: AwsApiCall
                       eventVersion: 1.05
                       recipientAccountId: 622676721278
                       requestID: 11a2f0a0-78b1-4968-8887-4
                       requestParameters: { [+]
                       }
                       responseElements: null
                       sourceIPAddress: 107.77.212.175
                       userAgent: signin.amazonaws.com
                       userIdentity: { [-]
                         accessKeyId: ASIAZB6TMXZ7FYCAEHNR
                         accountId: 622676721278
                         arn: arn:aws:iam::622676721278:use
                         invokedBy: signin.amazonaws.com
                         principalId: AIDAJUFKXZ44LV4EN4MGK
                         sessionContext: { [+]
                         }
                         type: IAMUser
                         userName: bstoll
                       }
                    }
```

Pay attention to userName



```
index=botsv3 sourcetype=aws:cloudtrail | stats count by userIdentity.userName | sort userIdentity.userName
```

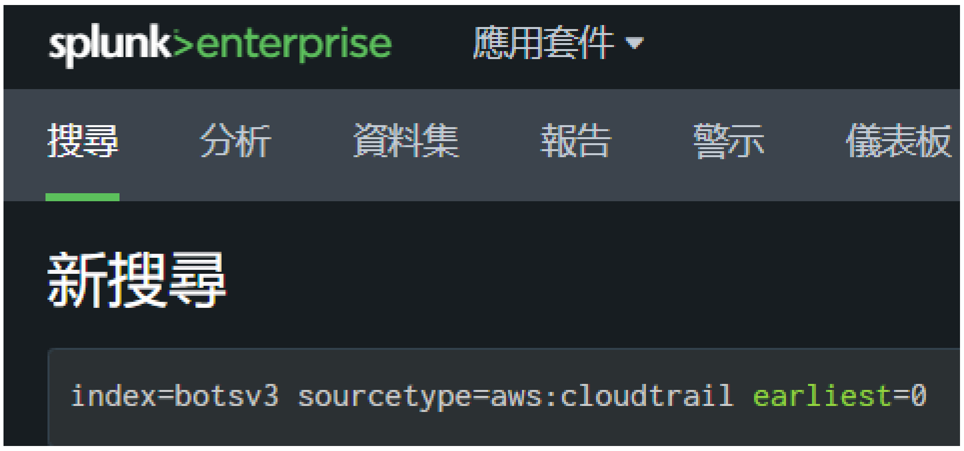
✓ 6,571 個事件 (10/01/01 0:00:00.000 至 20/01/01 0:00:00.000)

```
userIdentity.userName
bstoll
btun
splunk_access
web_admin
```

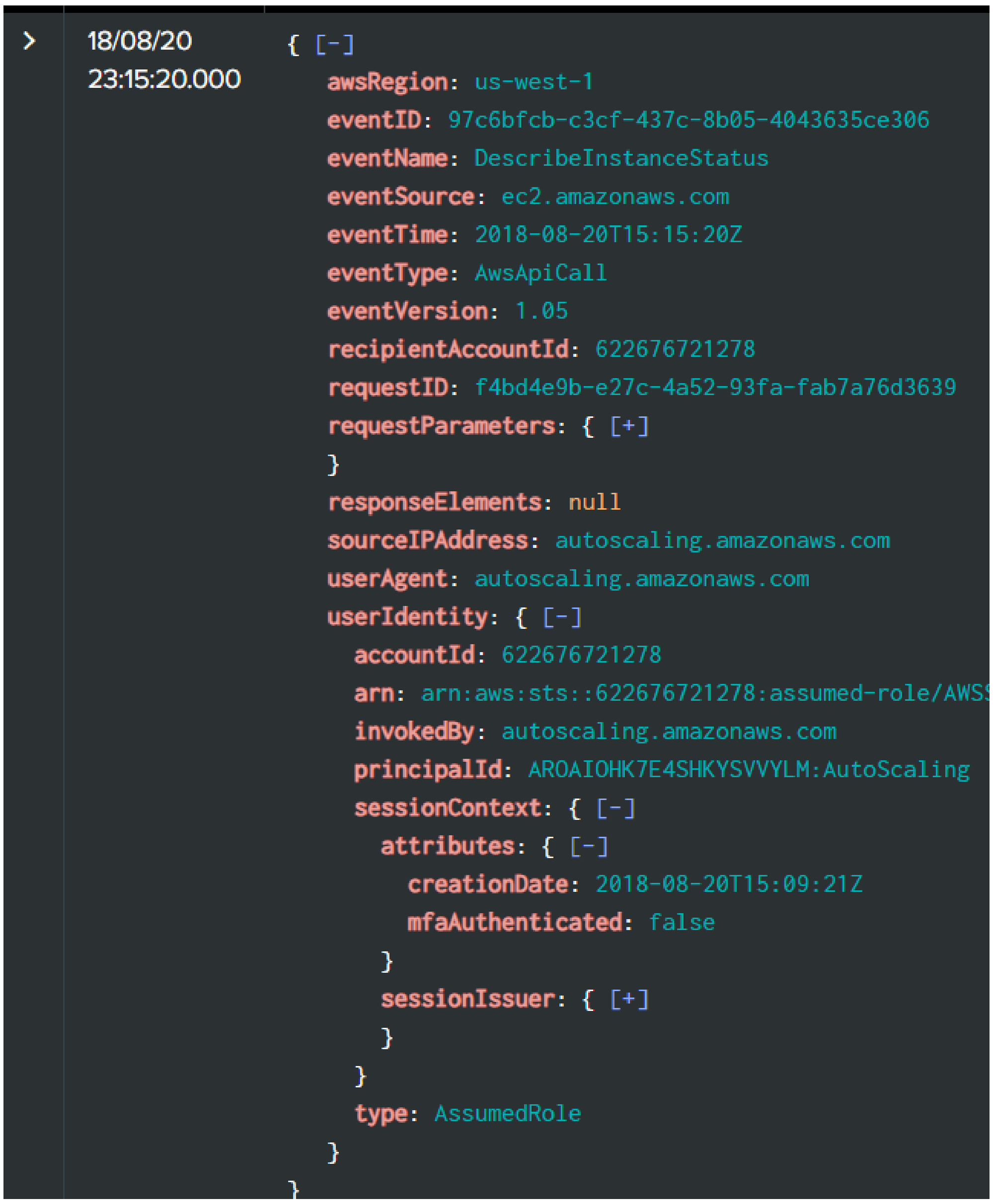
**Why it matters:** In a real company, SOC must watch who is using cloud accounts. Strange users or too many actions can be signs of hacking.

**Question 2:** Which field shows if someone did NOT use MFA?

**Answer:** userIdentity.sessionContext.attributes.mfaAuthenticated

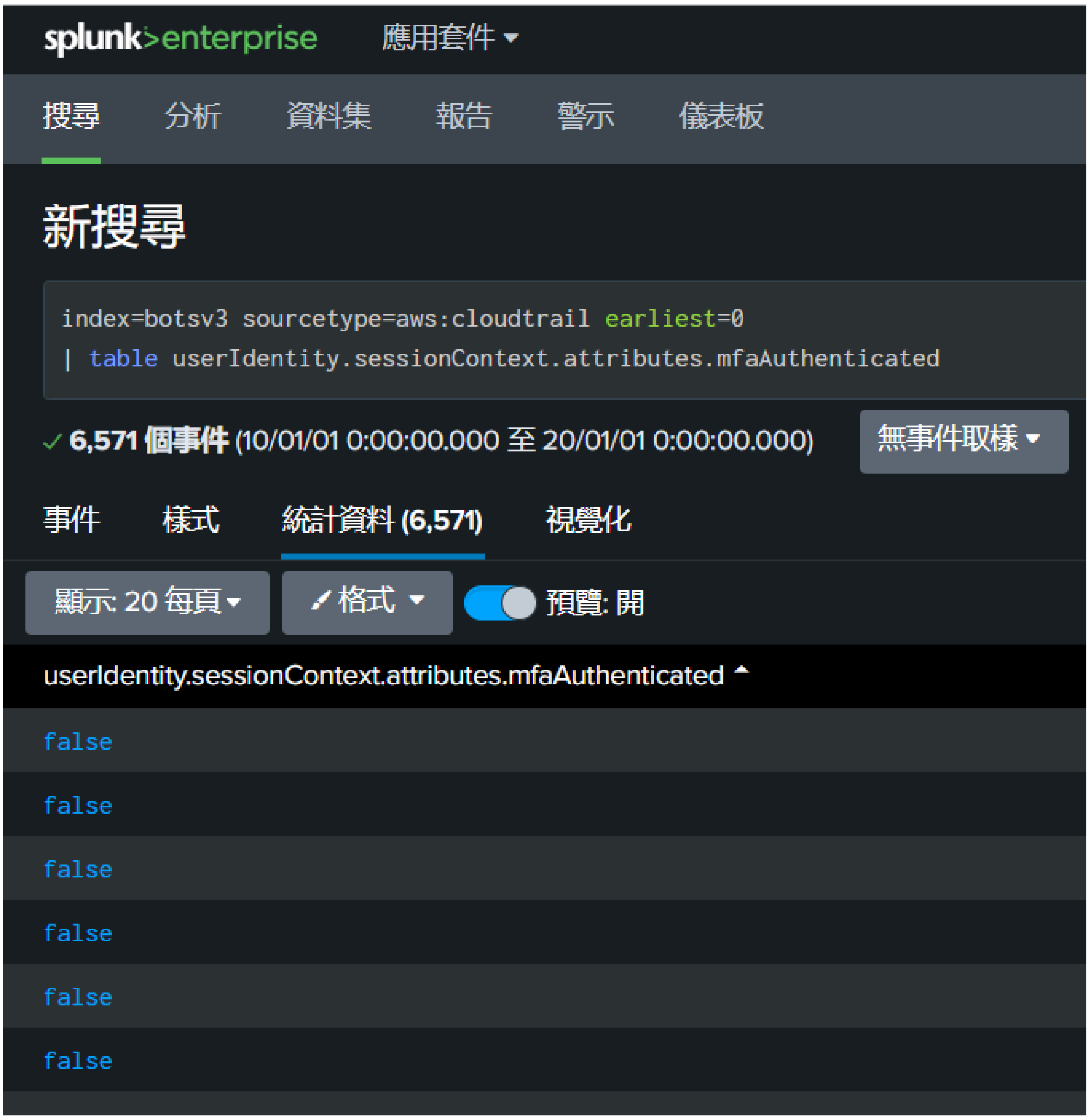


```
index=botsv3 sourcetype=aws:cloudtrail earliest=0
```



```
>  18/08/20        { [-]
   23:15:20.000      awsRegion: us-west-1
                     eventID: 97c6bfcb-c3cf-437c-8b05-4043635ce306
                     eventName: DescribeInstanceStatus
                     eventSource: ec2.amazonaws.com
                     eventTime: 2018-08-20T15:15:20Z
                     eventType: AwsApiCall
                     eventVersion: 1.05
                     recipientAccountId: 622676721278
                     requestID: f4bd4e9b-e27c-4a52-93fa-fab7a76d3639
                     requestParameters: { [+]
                     }
                     responseElements: null
                     sourceIPAddress: autoscaling.amazonaws.com
                     userAgent: autoscaling.amazonaws.com
                     userIdentity: { [-]
                       accountId: 622676721278
                       arn: arn:aws:sts::622676721278:assumed-role/AWS
                       invokedBy: autoscaling.amazonaws.com
                       principalId: AROAIOHK7E4SHKYSVVYLM:AutoScaling
                       sessionContext: { [-]
                         attributes: { [-]
                           creationDate: 2018-08-20T15:09:21Z
                           mfaAuthenticated: false
                         }
                         sessionIssuer: { [+]
                         }
                       }
                       type: AssumedRole
                     }
                   }
```

Pay attention at mfaAuthenticated



```
index=botsv3 sourcetype=aws:cloudtrail earliest=0
| table userIdentity.sessionContext.attributes.mfaAuthenticated
```

✓ 6,571 個事件 (10/01/01 0:00:00.000 至 20/01/01 0:00:00.000)

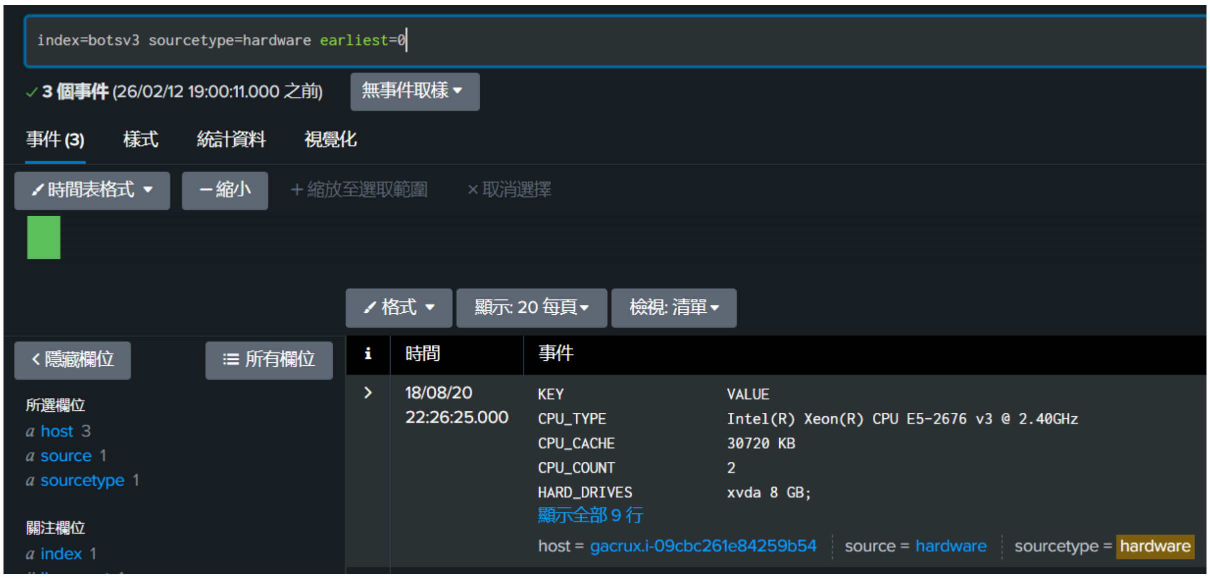
```
userIdentity.sessionContext.attributes.mfaAuthenticated
false
false
false
false
false
false
```

MfaAuthentication: false

**Why it matters:** Without MFA, stolen passwords are very dangerous. SOC should make an alert for any important action done without MFA.

**Question 3:** What CPU model is on the web servers?

**Answer:** E5-2676

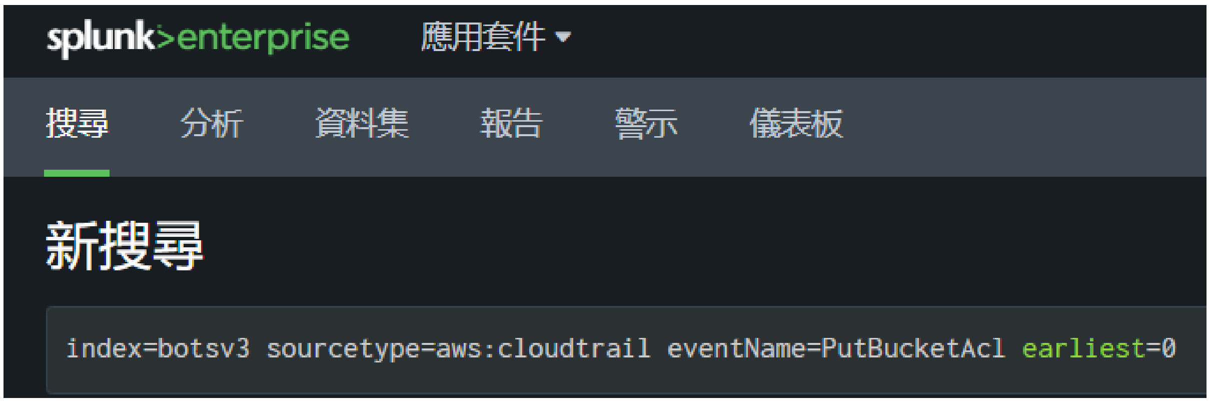

```
index=botsv3 sourcetype=hardware earliest=0
```

```
i  時間           事件
>  18/08/20       KEY            VALUE
   22:26:25.000   CPU_TYPE       Intel(R) Xeon(R) CPU E5-2676 v3 @ 2.40GHz
                  CPU_CACHE      30720 KB
                  CPU_COUNT      2
                  HARD_DRIVES    xvda 8 GB;
                  顯示全部 9 行
                  host = gacrux.i-09cbc261e84259b54   source = hardware   sourcetype = hardware
```

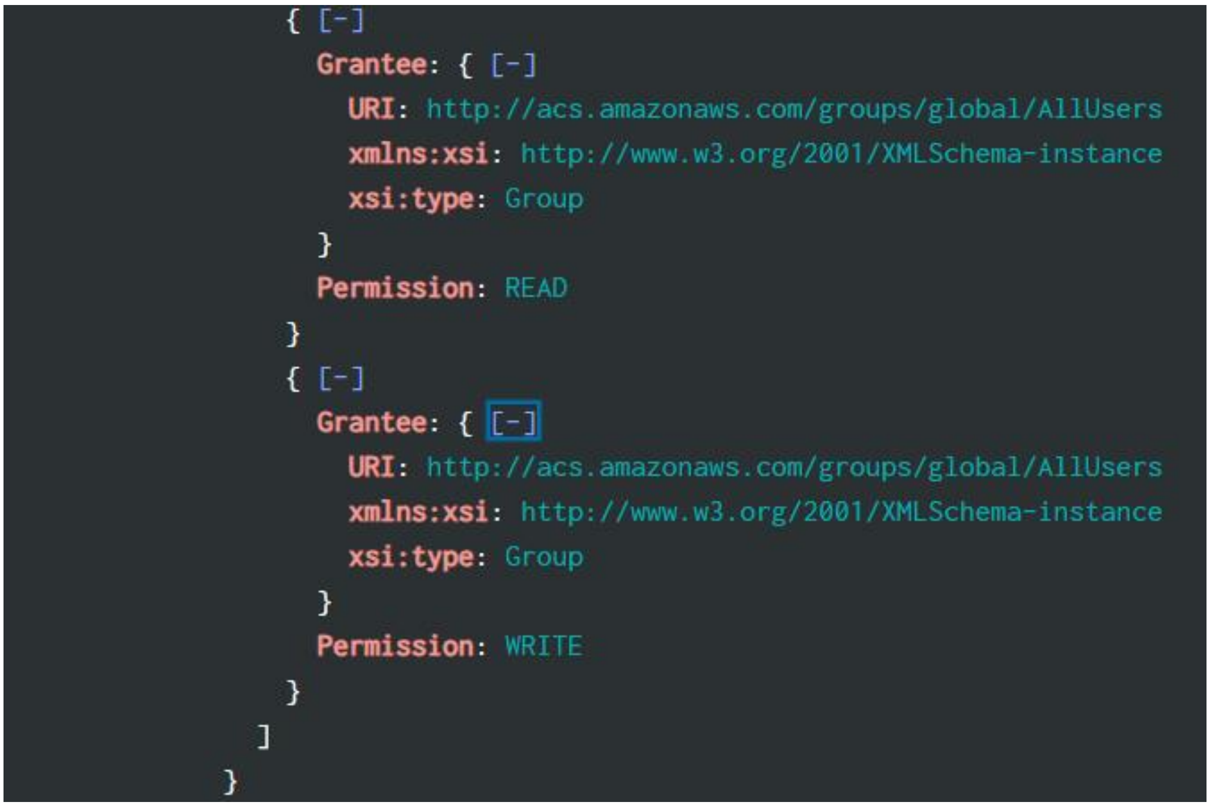
**Why it matters:** Knowing normal hardware helps SOC notice strange things, for example if CPU usage suddenly goes very high because of malware.

**Question 4:** What is the Event ID that made the S3 bucket public?

**Answer:** ab45689d-69cd-41e7-8705-5350402cf7ac



```
index=botsv3 sourcetype=aws:cloudtrail eventName=PutBucketAcl earliest=0
```



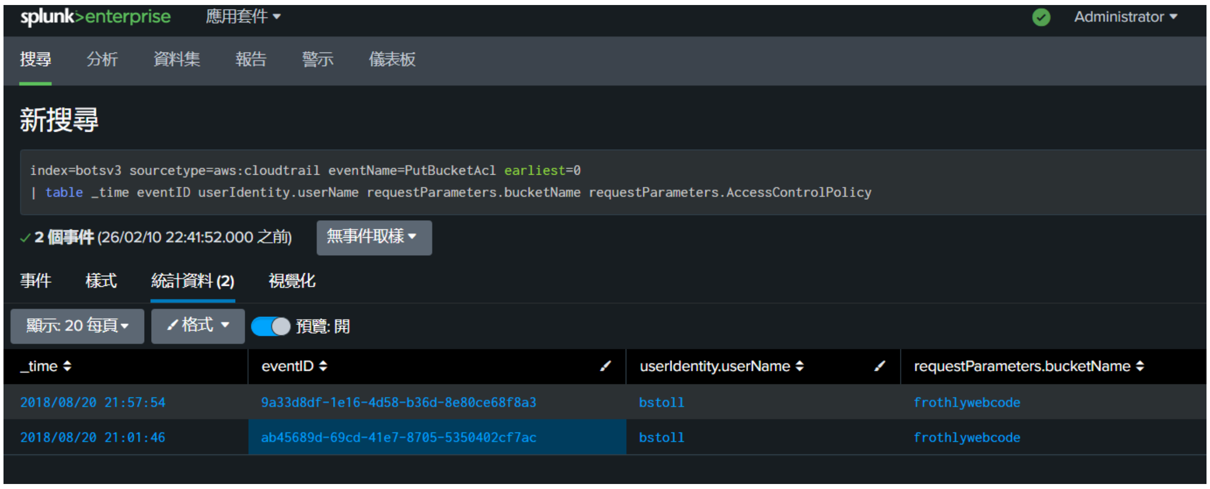
```
        { [-]
          Grantee: { [-]
            URI: http://acs.amazonaws.com/groups/global/AllUsers
            xmlns:xsi: http://www.w3.org/2001/XMLSchema-instance
            xsi:type: Group
          }
          Permission: READ
        }
        { [-]
          Grantee: { [-]
            URI: http://acs.amazonaws.com/groups/global/AllUsers
            xmlns:xsi: http://www.w3.org/2001/XMLSchema-instance
            xsi:type: Group
          }
          Permission: WRITE
        }
      ]
    }
```

Pay attention at /AllUsers

**Why it matters:** This ID proves exactly when and how the security mistake happened.

**Question 5:** What is Bud’ s username?

**Answer:** bstoll



```
index=botsv3 sourcetype=aws:cloudtrail eventName=PutBucketAcl earliest=0
| table _time eventID userIdentity.userName requestParameters.bucketName requestParameters.AccessControlPolicy
```

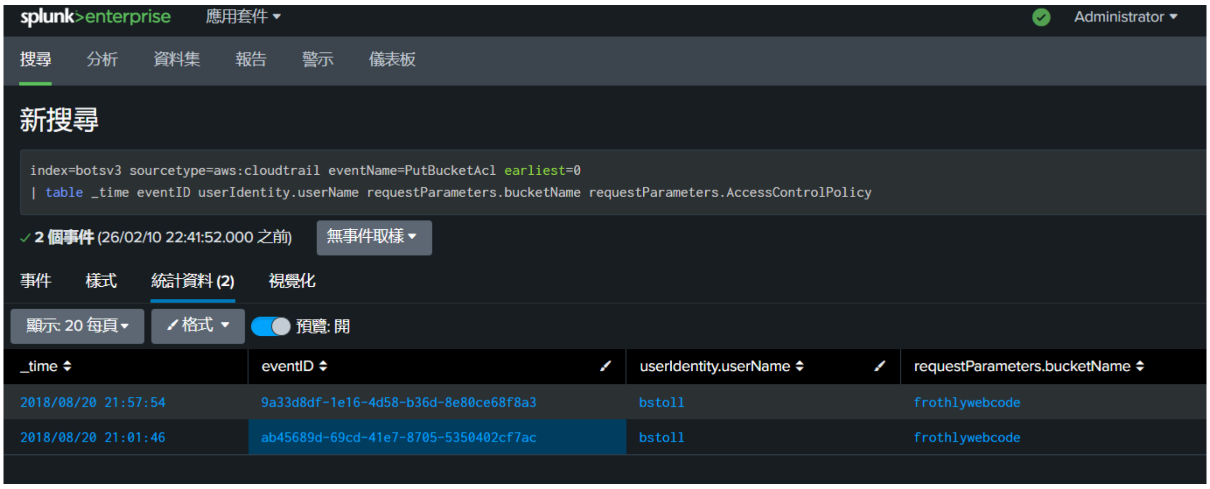
✓ 2 個事件 (26/02/10 22:41:52.000 之前)

| _time | eventID | userIdentity.userName | requestParameters.bucketName |
|---|---|---|---|
| 2018/08/20 21:57:54 | 9a33d8df-1e16-4d58-b36d-8e80ce68f8a3 | bstoll | frothlywebcode |
| 2018/08/20 21:01:46 | ab45689d-69cd-41e7-8705-5350402cf7ac | bstoll | frothlywebcode |

**Why it matters:** We can see it was probably an accident by an employee, not an outside hacker.

**Question 6:** What is the name of the public S3 bucket?

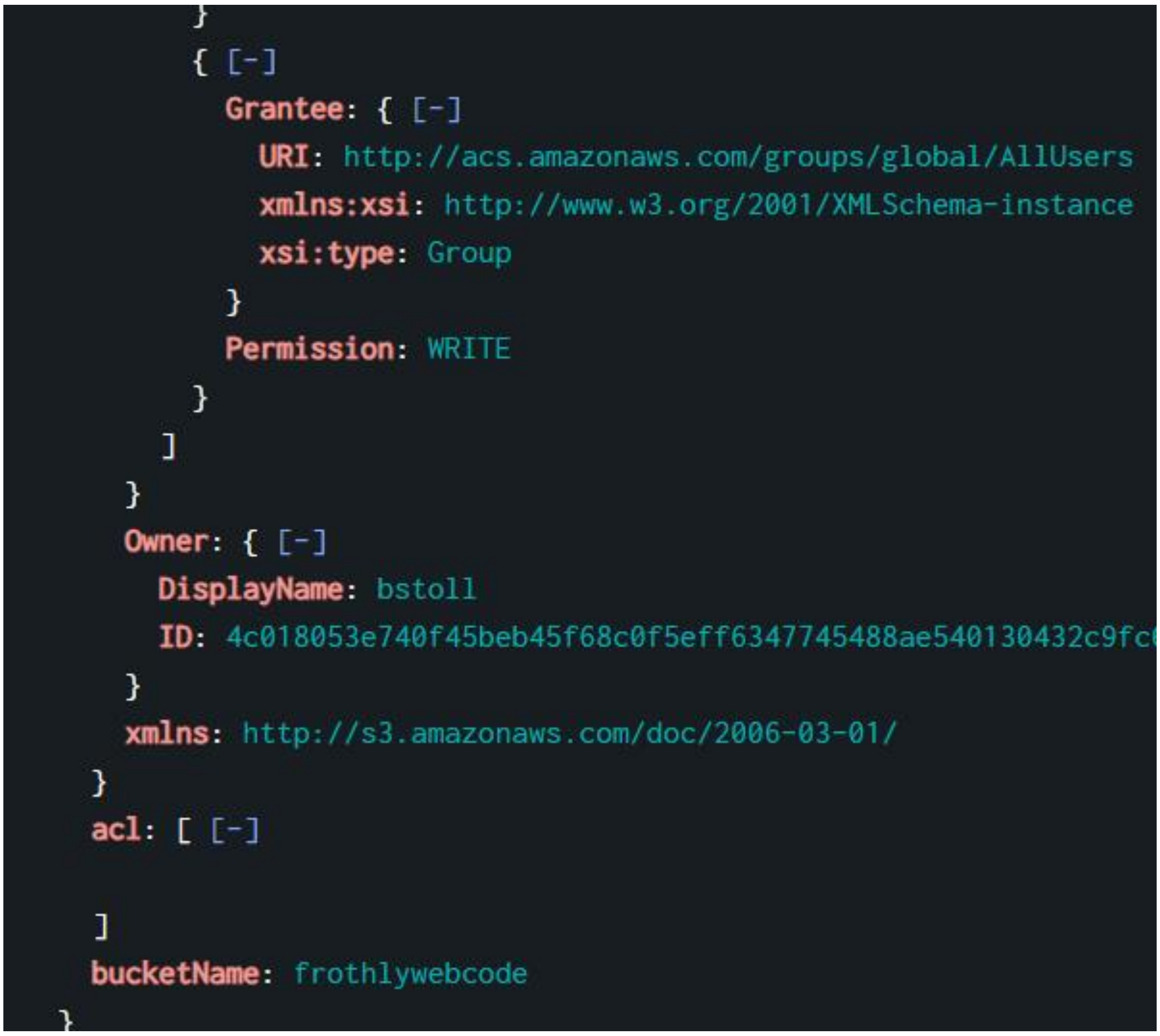
Answer: frothlywebcode



```
index=botsv3 sourcetype=aws:cloudtrail eventName=PutBucketAcl earliest=0
| table _time eventID userIdentity.userName requestParameters.bucketName requestParameters.AccessControlPolicy
```

✓ 2 個事件 (26/02/10 22:41:52.000 之前)

| _time | eventID | userIdentity.userName | requestParameters.bucketName |
|---|---|---|---|
| 2018/08/20 21:57:54 | 9a33d8df-1e16-4d58-b36d-8e80ce68f8a3 | bstoll | frothlywebcode |
| 2018/08/20 21:01:46 | ab45689d-69cd-41e7-8705-5350402cf7ac | bstoll | frothlywebcode |



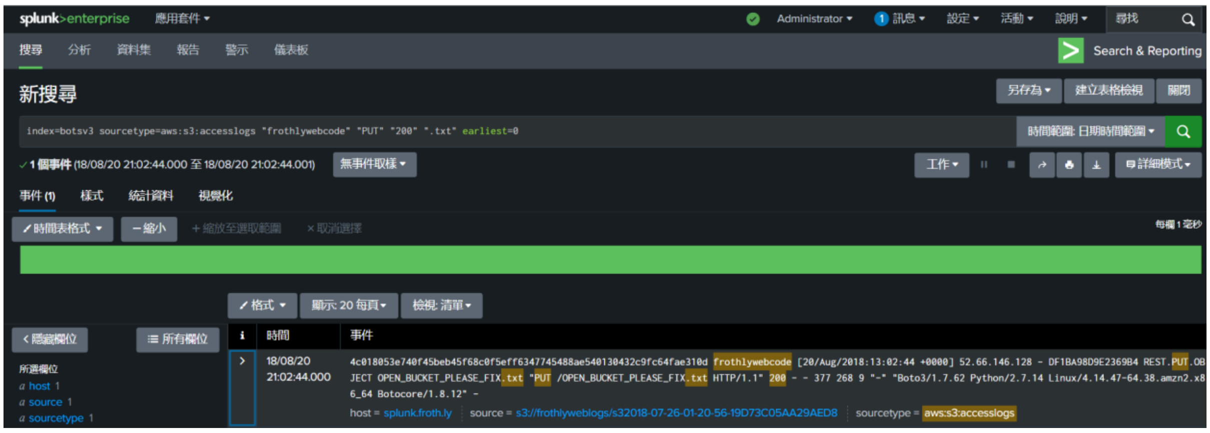
```
          }
          { [-]
            Grantee: { [-]
              URI: http://acs.amazonaws.com/groups/global/AllUsers
              xmlns:xsi: http://www.w3.org/2001/XMLSchema-instance
              xsi:type: Group
            }
            Permission: WRITE
          }
        ]
      }
      Owner: { [-]
        DisplayName: bstoll
        ID: 4c018053e740f45beb45f68c0f5eff6347745488ae540130432c9fc
      }
      xmlns: http://s3.amazonaws.com/doc/2006-03-01/
    }
    acl: [ [-]

    ]
    bucketName: frothlywebcode
  }
```

Pay attention at bucketName

**Why it matters:** Knowing the exact bucket name helps understand how much data was at risk.

**Question 7:** What text file was uploaded when the bucket was public?

**Answer:** OPEN_BUCKET_PLEASE_FIX.txt



```
index=botsv3 sourcetype=aws:s3:accesslogs "frothlywebcode" "PUT" "200" ".txt" earliest=0
```

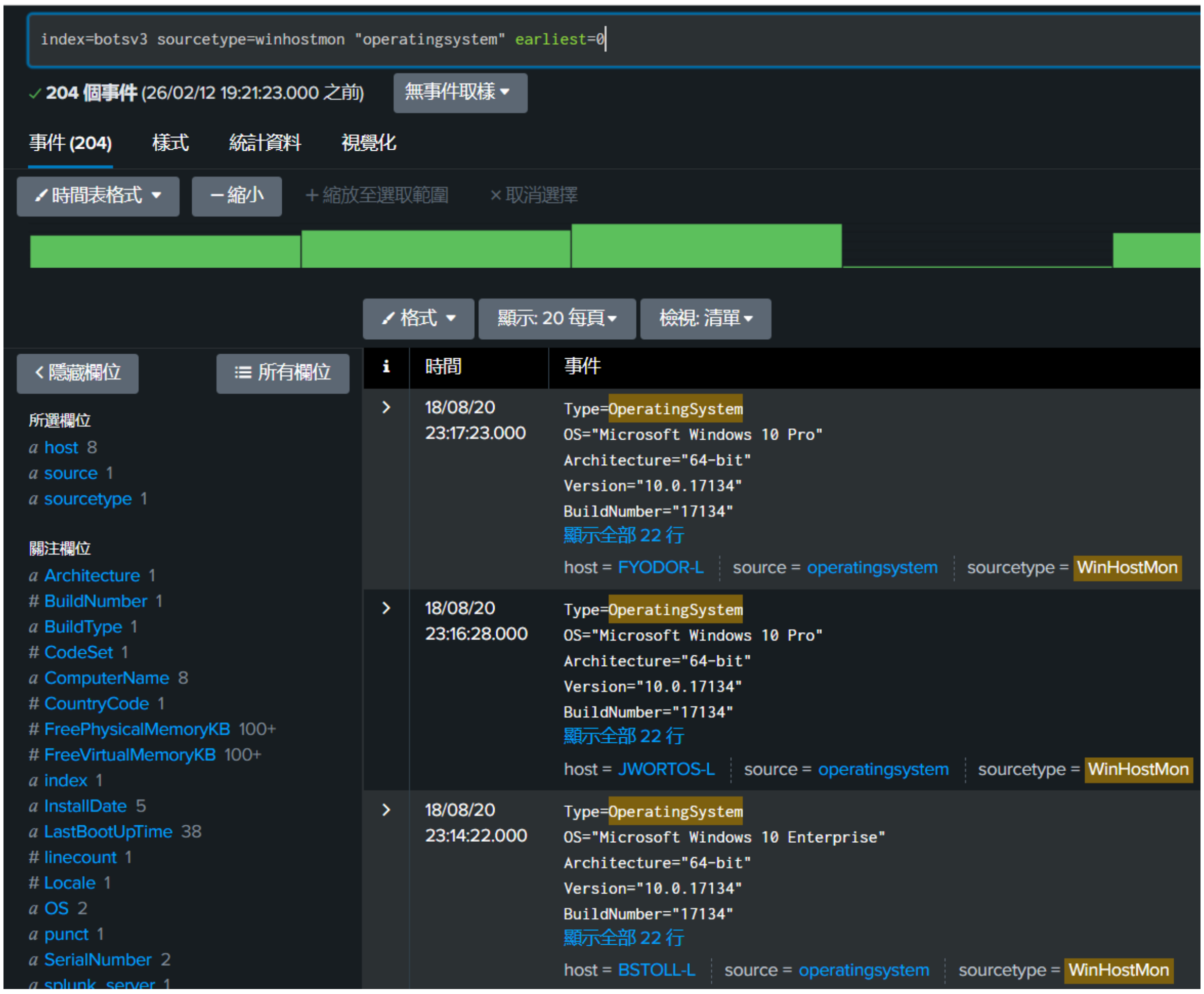
✓ 1 個事件 (18/08/20 21:02:44.000 至 18/08/20 21:02:44.001)

| i | 時間 | 事件 |
|---|---|---|
| > | 18/08/20 21:02:44.000 | 4c018053e740f45beb45f68c0f5eff6347745488ae540130432c9fc64fae310d frothlywebcode [20/Aug/2018:13:02:44 +0000] 52.66.146.128 - DF1BA98D9E2369B4 REST.PUT.OBJECT OPEN_BUCKET_PLEASE_FIX.txt "PUT /OPEN_BUCKET_PLEASE_FIX.txt HTTP/1.1" 200 - - 377 268 9 "-" "Boto3/1.7.62 Python/2.7.14 Linux/4.14.47-64.38.amzn2.x86_64 Botocore/1.8.12" - <br> host = splunk.froth.ly source = s3://frothlyweblogs/s32018-07-26-01-20-56-19D73C05AA29AED8 sourcetype = aws:s3:accesslogs |

**Why it matters:** This shows attackers (or curious people) could download secret files very easily after the mistake.

**Question 8:** Which computer has a different Windows version?

**Answer:** bstoll-l.froth.ly



```
index=botsv3 sourcetype=winhostmon "operatingsystem" earliest=0
```

✓ 204 個事件 (26/02/12 19:21:23.000 之前)　無事件取樣

事件 (204)　樣式　統計資料　視覺化

時間表格式　一縮小　＋縮放至選取範圍　× 取消選擇

格式　顯示: 20 每頁　檢視: 清單

隱藏欄位　所有欄位

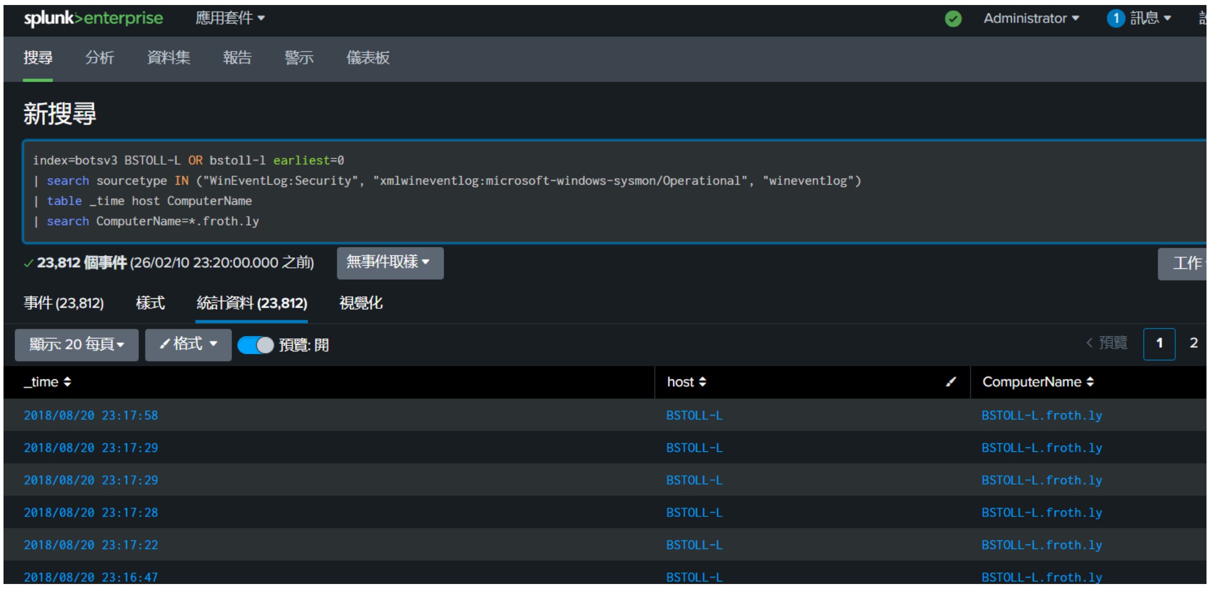
所選欄位
- a host 8
- a source 1
- a sourcetype 1

關注欄位
- a Architecture 1
- # BuildNumber 1
- a BuildType 1
- # CodeSet 1
- a ComputerName 8
- # CountryCode 1
- # FreePhysicalMemoryKB 100+
- # FreeVirtualMemoryKB 100+
- a index 1
- a InstallDate 5
- a LastBootUpTime 38
- # linecount 1
- # Locale 1
- a OS 2
- a punct 1
- a SerialNumber 2
- a splunk_server 1

| i | 時間 | 事件 |
|---|---|---|
| > | 18/08/20 23:17:23.000 | Type=OperatingSystem<br>OS="Microsoft Windows 10 Pro"<br>Architecture="64-bit"<br>Version="10.0.17134"<br>BuildNumber="17134"<br>顯示全部 22 行<br>host = FYODOR-L　source = operatingsystem　sourcetype = WinHostMon |
| > | 18/08/20 23:16:28.000 | Type=OperatingSystem<br>OS="Microsoft Windows 10 Pro"<br>Architecture="64-bit"<br>Version="10.0.17134"<br>BuildNumber="17134"<br>顯示全部 22 行<br>host = JWORTOS-L　source = operatingsystem　sourcetype = WinHostMon |
| > | 18/08/20 23:14:22.000 | Type=OperatingSystem<br>OS="Microsoft Windows 10 Enterprise"<br>Architecture="64-bit"<br>Version="10.0.17134"<br>BuildNumber="17134"<br>顯示全部 22 行<br>host = BSTOLL-L　source = operatingsystem　sourcetype = WinHostMon |

Pay attention at OS=” Microsoft Windows 10 Enterprise”

Other hosts using Microsoft Windows 10 Pro, but host: BSTOLL-L is uniquely using Microsoft Windows 10　Enterprise version.



```
index=botsv3 BSTOLL-L OR bstoll-l earliest=0
| search sourcetype IN ("WinEventLog:Security", "xmlwineventlog:microsoft-windows-sysmon/Operational", "wineventlog")
| table _time host ComputerName
| search ComputerName=*.froth.ly
```

✓ 23,812 個事件 (26/02/10 23:20:00.000 之前)

| _time | host | ComputerName |
|---|---|---|
| 2018/08/20 23:17:58 | BSTOLL-L | BSTOLL-L.froth.ly |
| 2018/08/20 23:17:29 | BSTOLL-L | BSTOLL-L.froth.ly |
| 2018/08/20 23:17:29 | BSTOLL-L | BSTOLL-L.froth.ly |
| 2018/08/20 23:17:28 | BSTOLL-L | BSTOLL-L.froth.ly |
| 2018/08/20 23:17:22 | BSTOLL-L | BSTOLL-L.froth.ly |
| 2018/08/20 23:16:47 | BSTOLL-L | BSTOLL-L.froth.ly |

**Why it matters:** Different versions can be a sign of compromise, or just bad management — SOC should check both.

**Overall lesson:** One small human mistake can cause big data leaks. Good tools like Splunk + strong rules can catch and stop it early.

## 5. Conclusion and References

### Summary of what I found:

- User bstoll made a storage bucket public by accident.
- After that, a sensitive text file was uploaded.
- Some AWS actions happened without MFA protection.
- One computer (bstoll-l.froth.ly) had a different Windows edition.

### What companies should improve:

- Force MFA on all accounts
- Use AWS setting to block public buckets automatically
- Create alerts for dangerous events like PutBucketAcl with public access
- Keep a list of normal computer setups so strange ones are easy to notice

### Simple references:

1. NIST. Computer Security Incident Handling Guide. 2012. https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.800-61r2.pdf
2. Splunk. BOTSv3 Dataset on GitHub. https://github.com/splunk/botsv3
3. AWS. Explanation of PutBucketAcl. https://docs.aws.amazon.com/AmazonS3/latest/API/API_PutBucketAcl.html

Extra files:

- Screenshots folder with pictures from Splunk
- Video showing live searches and explanations