We stare at data all day.
WTH is Big Data?!
larger than small data?
smaller than giant data?
some cool sauce for DBAs?
Aaaaahhh, no.
a simple way to describe a massive problem

*or opportunity depending on your p.o.v.
Big data comes out of machines

Machine-generated data is one of the fastest growing, most complex and most valuable segments of big data.
building a service?

you are a producer and consumer of data using an app?
All this data can be pretty cool and empowering.
except one little
A lot of it looks like this
13/Apr/2011 08:52:53, Info, Teardown, ASA-session-6-302014, TCP, 192.168.2.16, 192.168.1.6, (empty), (empty), 1100, 43025, 43025_tcp, (empty), 0, 1
13/Apr/2011 08:52:55, Info, Teardown, ASA-session-6-302014, TCP, 192.168.2.75, 192.168.1.6, (empty), (empty), 1048, 135, epmap, (empty), 0, 1
13/Apr/2011 08:52:55, Info, Teardown, ASA-session-6-302014, TCP, 192.168.2.75, 192.168.1.6, (empty), (empty), 1049, 43025, 43025_tcp, (empty), 0, 1
13/Apr/2011 08:52:55, Info, Teardown, ASA-session-6-302014, TCP, 192.168.2.75, 192.168.1.6, (empty), (empty), 1051, 135, epmap, (empty), 0, 1
13/Apr/2011 08:52:55, Info, Teardown, ASA-session-6-302014, TCP, 192.168.2.75, 192.168.1.6, (empty), (empty), 1052, 43025, 43025_tcp, (empty), 0, 1
and we’re expected to talk to it like this
SELECT MAX(answer.answer) FROM answer WHERE answer.member_id IN (SELECT member_i FROM team_member WHERE Business_stream = 'Upstream' AND stage = 'Appraise')

SELECT page.page_id AS mmax, (SELECT MAX(avg_score) FROM task_project WHERE task_project.project_id IN (SELECT project_id FROM project WHERE Business_stream = 'Upstream')) AS data_max, (SELECT AVG(avg_score) FROM task_project WHERE project_id NOT IN (SELECT project_id FROM project WHERE subteam<>1)) AS projavg, (SELECT AVG(avg_score) FROM task_project WHERE project_id IN (SELECT project_id FROM project WHERE Business_stream = 'Upstream')) AS companyavg, (SELECT AVG(avg_score) FROM task_project WHERE project_id NOT IN (SELECT project_id FROM project WHERE subteam<>1) AND project_id IN (SELECT project_id FROM project WHERE Business_stream = 'Upstream')) AS page,

WHERE page.category_name = 'Business'

FROM Boundaries

WHERE stage_name = 'Appraise'

AND riverorder.category_name = page.category_name

ORDER BY riverorder.page.order_
It could be better. yes? Better is good!
• Splunk brings color and life to your data!

• Powerful platform for analyzing machine data.

• World of technology & World of business.

• Power and Versatility
Google for log files
Splunk to the rescue in the data center
Use Cases

Splunk to the rescue in the Marketing department
Phases

PHASE I
Gather data from as many sources as necessary

Social Media Data

Credit Card Data

PHASE II
Transform the data into answers

PHASE III
Visualize or review the data to gain insight

source type | raw | IP address | fields...
---|---|---|---
syslog | ERROR | 12.1.1.002 | ...
other-source | ERROR | 12.1.1.40 | ...
syslog | WARNING | 12.1.1.40 | ...
syslog | WARNING | 12.1.1.002 | ...
other-source | ERROR | 12.1.1.002 | ...
other-source | ERROR | 12.1.1.002 | ...
events | ERROR | 12.1.1.002 | ...

>
The (Brief) Story of Splunk

- Erik Swan and Rob Das in 2002
- “How do you solve problems in your infrastructure?”
- Troubleshoot IT problems and retrieve data by traditional means.
- Spelunking -> Splunk
Products

- Splunk Enterprise
- Splunk Storm
- Hunk
- Splunk Light
- Google with Splunk
- Splunkbase
Applications

Splunk Big Data Strategy
Deliver ease of use, real-time analytics and enterprise capabilities

Data collection and indexing

Splunk storage
Hadoop
Other Stores

Ad hoc search
Monitor and alert
Report and analyze
Custom dashboards
Developer Platform
Solving Problems with Splunk

**Problem**
- User reports an error on a given webpage
- Complex firewall policies often block communication
- Developers not permitted to log on to production systems
- Too many consoles with different alerts

**Splunk to the Rescue!**
- Splunk pinpoints the individual server where the error is occurring
- Admins find answers, additional context, and save back-and-forth
- See debug traces in near real-time while leaving security barriers intact
- Specific system-level errors feed from Splunk to single monitoring system
Solutions with Splunk

- Converts logs to visual graphs and reports
- Identify and resolve issues faster.
- No separate database requirements.
- Supports any format and any amount of data.
- Simple to implement and scale.
- Continually index all of your IT data in real time.
- Automatically discover useful information embedded in your data.
- Set up alerts.
- Proactively review your IT systems.
Innovation with Splunk

- Splunk has a mission of making machine data accessible across an organization by identifying data patterns, providing metrics, diagnosing problems and providing intelligence for business operations.

- Splunk is a horizontal technology used for application management, security and compliance, as well as business and web analytics.

- As of early 2016, Splunk has over 10,000 customers worldwide.
Operational Intelligence

- Gain deeper understanding of customers
- Reveal important patterns and analytics
- Event & Detection
- Leverage live feeds & historical data
- Deploy solution quickly and provide flexibility
Features

- Collect and Index Data
- Search and Investigate
- Correlate and Analyze
- Visualize and Report
- Monitor and Alert
Collect and Index Data

- Index Anything, In Real Time
- Getting Data In
- Schema-on-the-Fly
- Time-Based Event Chronology

What Splunk Can Index

- Click-stream data
- Shopping cart data
- Online transaction data
- Logfiles
- Configs
- Messages
- Alerts
- Metrics
- Scripts
- Changes
- Tickets
- Windows
- Linux/Unix
- Virtualization And Cloud
- Applications
- Databases
- Networking

- Registry
- Event logs
- File system
- sysinternals
- Configurations
- syslog
- File system
- ps, iostat, top
- Hypervisor
- Guest OS, Apps
- Cloud
- Web logs
- Log4j, JMS, JMX
- .NET events
- Code and scripts
- Configurations
- Audit/query logs
- Tables
- Schemas
- syslog
- SNMP
- Netflow
- IDS
Search and Investigate

- Powerful search, analysis and visualization.
- Splunk Search Processing Language (SPL™)
- Transaction Search
- Interactive Results
- Data Sampling
• Machine Learning
• Correlate Complex Events
• Event Pattern Detection
• Datasets
Visualize and Report

- Visualizations
- Dashboards
- Automate and Share Reports
Monitor and Alert

- Monitor Events and KPIs
- Proactive Alerting
- Access from Anywhere
Most Enterprise Data is Machine-generated

Industrial Data + Additional Sources
- Shipping
- RFID
- GPS/Cellular
- Energy
- Manufacturing

Core IT
- Web Services
- Databases
- Security
- Developers
- Telecoms
- Messaging
- Networking
- Storage
- Applications

Customer-facing IT
- Online Shopping Carts
- Social Media
- Clickstream

Cloud

Virtual

Physical
What Does Machine Data Look Like?

**Sources**

- **Order Processing**
- **Middleware Error**
- **Care IVR**
- **Twitter**

**Machine Data Example**

```
ORDER, 2012-05-21T14:04:12.484, 10098213, 569281734, 67.17.10.12, 43CD1A7B8322, SA-2100
```


```
05/21 16:33:11.238 [CONNEVENT] Ext 1207130 (0192033): Event 20111, CTI Num: ServID: Type 0:19:9, App 0, ANI T7998#1, DNIS 5555685981, SerID 40489a07-7f6e-4251-801a-13ae51a6d092, Trunk T451.16
05/21 16:33:11.242 [SCREENPOEVENT] SerID 40489a07-7f6e-4251-801a-13ae51a6d092 CUSTID 10098213
05/21 16:37:49.732 [DISCEVENT] SerID 40489a07-7f6e-4251-801a-13ae51a6d092
```

```
{actor: {displayName: "Go Boys!!", followersCount: 1366, friendsCount: 789, link: "http://dallascowboys.com/", location: {displayName: "Dallas, TX", objectType: "place"}, objectType: "person", preferredUsername: "B0ysF@n80", statusesCount: 6072}, body: "Just bought this POS device from @ACME. Doesn't work! Called, gave up on waiting for them to answer! RT if you hate @ACME!!", objectType: "activity", postedTime: "2012-05-21T16:39:40.647-0600"}
```
Machine Data Contains Critical Insights

Sources
- Order Processing
- Middleware Error
- Care IVR
- Twitter

Order Data:
- Customer ID: 10098213
- Order ID: 569281734
- Product ID: 43CD1A7B8322, SA-2100

Exception follows: weblogic.jdbc.extensions.ConnectionDeadSQLException: Could not create new connection. The DBMS driver exception was: [BEA][Oracle JDBC Driver]Error establishing socket to host and port: ACME_DB-01:1521.

Order Data:
- Order ID: 43CD1A7B8322
- Customer ID: 10098213

05/21 16:33:11.238 [CONNEVENT] Ext 1207130 (0192033): Event 20111, CTI Num: ServID: Type 98#1, DNIS 5555685981, SerID 40489a07-7f6e-4251-801a-13ae51a6d092
- Time Waiting On Hold: 451.16

CUSTID 10098213
05/21 16:37:49.732 [DISCEVENT] SerID 40489a07-7f6e-4251-801a-13ae51a6d092

Twitter Data:
- Actor: Go Boys!!
- Followers Count: 1366
- Friends Count: 789
- Link: http://dallascowboys.com/
- Location: Dallas, TX
- Customer's Tweet:
  - Object Type: person
  - Preferred Username: BoysF@n80
  - Statuses Count: 6072
  - Body: Just bought this POS device from @ACME. Doesn't work! Called, gave up on waiting for them to answer! RT if you hate @ACME!!
  - Object Type: activity

Company's Twitter ID
• What is Indexing
• Indexes Supported
• Indexing Data

Scales to Hundreds of TBs/Day

Enterprise-class Scale, Resilience and Interoperability

Initiate searches and visualize results via Search Heads

Compress and store data on Splunk Indexers

Collect machine data from thousands sources via Splunk forwarders
Event processing and the data pipeline

- Configures character set encoding.
- Configures line breaking for multi-line events.
- Identifies event timestamps.
- Extracts a set of useful standard fields.
- Segments events.
- Dynamically assigns metadata to events, if specified.
The Search & Reporting application

It is the primary interface for using the Splunk software.

It can be used to:
- Run searches
- Save reports
- Create dashboards.
Uploading Data

• Adding the Data
  – The data is processed and transformed into a series of individual events that you can view, search, and analyze.

• Types of data
  – The Splunk platform accepts any type of data.
    – event logs
    – web logs
    – live application logs
    – network feeds
Where is the data stored?

- Indexing
- Events
- Events are stored in the index as a group of files that fall into two categories:
  - Raw data, which is the data that you add to the Splunk deployment. The raw data is stored in a compressed format.
  - Index files, which include some metadata files that point to the raw data.
- These files reside in sets of directories, called buckets, that are organized by age.
Searching the data

- host=vendor_sales
- source="tutorialdata.zip:\www1/access.log"
- source="tutorialdata.zip:\vendor_sales/vendor_sales.log"
- sourcetype="www1/secure"
## Searching the Data-Data Summary Dialog Box

The Data Summary dialog box contains a table with the following columns:

- **Host**
- **Count**
- **Last Update**

### Table Data

<table>
<thead>
<tr>
<th>Host</th>
<th>Count</th>
<th>Last Update</th>
</tr>
</thead>
<tbody>
<tr>
<td>mailsv</td>
<td>9,829</td>
<td>11/6/16 2:48:58.000 AM</td>
</tr>
<tr>
<td>vendor_sales</td>
<td>30,244</td>
<td>11/6/16 2:48:57.000 AM</td>
</tr>
<tr>
<td>www1</td>
<td>24,221</td>
<td>11/6/16 2:48:55.000 AM</td>
</tr>
<tr>
<td>www2</td>
<td>22,595</td>
<td>11/6/16 2:48:58.000 AM</td>
</tr>
<tr>
<td>www3</td>
<td>22,975</td>
<td>11/6/16 2:48:56.000 AM</td>
</tr>
</tbody>
</table>
Specifying time ranges

- Optimize Searches
- Troubleshoot an issue
Below the Search bar are four tabs:

- Events
- Patterns
- Statistics
- Visualizations
<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>11/4/16 06:59:00 PM</td>
<td>GET /category.screen?productID=CU-PG-G06 HTTP 1.1 200 1155 &quot;<a href="http://www.buttercupgame.com/product.screen?productID=CU-PG-G06">http://www.buttercupgame.com/product.screen?productID=CU-PG-G06</a>&quot; &quot;Mozilla/5.0 (iPad; U; CPU OS 4_3_3 like Mac OS X; en-us) AppleWebKit/533.17.9 (KHTML, like Gecko) Version/5.0.2 Mobile/8L1 Safari/6533.18.5&quot; 421 host = www2 source = tutorialdata.zip:www2/access.log sourcetype = access_combined_wcookie</td>
</tr>
<tr>
<td>11/4/16 5:12:00 PM</td>
<td>POST /cart.do?action=purchase&amp;productId=EST-218&amp;SESSIONID=SD00SL5F7AFDDF52798 HTTP 1.1 200 2383 &quot;<a href="http://www.buttercupgames.com/cart.do?action=adto&amp;productId=EST-218&amp;SESSIONID=SD00SL5F7AFDDF52798">http://www.buttercupgames.com/cart.do?action=adto&amp;productId=EST-218&amp;SESSIONID=SD00SL5F7AFDDF52798</a>&quot; &quot;Mozilla/5.0 (Macintosh; Intel Mac OS X 10_7_4) AppleWebKit/536.5 (KHTML, like Gecko) Chrome/19.0.1084.46 Safari/536.5&quot; 527 host = www2 source = tutorialdata.zip:www2/access.log sourcetype = access_combined_wcookie</td>
</tr>
<tr>
<td>11/4/16 5:08:54 PM</td>
<td>POST /category.screen?categoryID=SPORTS&amp;SESSIONID=SD00SL5F5AFDDF52775 HTTP 1.1 200 3057 &quot;<a href="http://www.buttercupgames.com/category.screen?categoryID=SPORTS">http://www.buttercupgames.com/category.screen?categoryID=SPORTS</a>&quot; &quot;Mozilla/5.0 (Windows; U; Windows NT 5.1; en-us; rv:1.9.2.8) Gecko/20100306 Firefox/3.6.28 .NET CLR 3.5.30729; .NET CLR 4.0c)&quot; 513 host = www3 source = tutorialdata.zip:www3/access.log sourcetype = access_combined_wcookie</td>
</tr>
<tr>
<td>11/4/16 5:06:10 PM</td>
<td>POST /category.screen?categoryID=SPORTS&amp;SESSIONID=SD04SL1F1ADDFF52763 HTTP 1.1 200 1129 &quot;<a href="http://www.buttercupgames.com/oldlink?itemID=EST-16">http://www.buttercupgames.com/oldlink?itemID=EST-16</a>&quot; &quot;Mozilla/4.0 (compatible; MSIE 7.0; Windows NT 5.1; .NET CLR 2.0.50727; .NET CLR 3.0.4506.2152; .NET CLR 3.5.30729; InfoPath)&quot; host = www4 source = tutorialdata.zip:www4/access.log sourcetype = access_combined_wcookie</td>
</tr>
</tbody>
</table>
Use fields to search

When searching for fields, we use the syntax `fieldname=fieldvalue`.

Search for successful purchases
- `sourcetype=access_* status=200 action=purchase`

Search for unsuccessful purchases
- `sourcetype=access_* status!=200 action=purchase`

Search for errors
- `(error OR fail* OR severe) OR (status=404 OR status=500 OR status=503)`

Search for sales of a specific product
- `sourcetype=access_* status=200 action=purchase categoryld=simulation`
Pipe and Commands

- The pipe character (|) indicates that you are about to use a command.
- The results of the search to the left of the pipe are used as the input to the command to the right of the pipe.

`sourcetype=access_* status=200 action=purchase`  
`sourcetype=access_* status=200 action=purchase | top`  
`sourcetype=access_* status=200 action=purchase | top categoryId`
• The **top** command is a transforming command.
Visualization

• Gives a graphical representation to the data.
Reports and Dashboards

- Reports are created whenever we save a search. We provide time ranges.
- Dashboards are views that are made up of panels.
- The panels can contain modules such as search boxes, fields, charts, tables, and lists.
• Extend the Power of Splunk with Apps and Add-ons
• Splunkbase has 1000+ apps and add-ons from Splunk and it’s partners and it’s community.
• An app or add-on for almost any data source and user need.
• Apps or add-on belonging to below categories:
  DevOps (Example: Splunk App for Jenkins)
  IT Operations (Example: Alert Manager)
  Security, Fraud & Compliance (Example: Splunk Add-on for Oracle Database)
  Business Analytics (Example: Splunk Datasets Add-on)
  IoT & Industrial Data (Example: Machine Learning Toolkit)
  Utilities (Example: Splunk Add-on for Microsoft Windows)
The Splunk REST API

- Exposes an API method for every feature in the product
- Whatever you can do in the UI – you can do through the API
- Index, Search, Visualize, Manage
- API is RESTful
- Endpoints are served by splunkd
- Requests are GET, POST, and DELETE HTTP methods
- Responses are Atom XML & JSON
- Versioning as of Splunk 5.0
- Search results can be output in CSV/JSON/XML
SDKs Overview

• Stay true to the semantics of the particular language
• Provide implementation that feels natural to the developer
  E.g. Project, build, IDE (where applicable) support
  Cover REST API endpoints based on use cases of language

• Namespaces
  owner: splunk username (defaults to current user)
  app: app context (defaults to default app)
  sharing: user | app | global | system
Splunk has SDKs available for

• Python
• Java
• Javascript
• PHP
• Ruby
• C#
What can we do using the SDK

• Integrate with third party tools
• Log directly to Splunk
• Integrate search results into your application
• Extract data for archiving
• Build a UI on the web stack of your own choice.
What the Splunk SDKs do for you

• Handling HTTP access
• Authentication
• Managing namespaces
• Simplifying access to REST endpoint
• Building the correct URL for an endpoint
• Displaying simplified output for searches
• Over 160 endpoints that provide access to almost every feature of Splunk
How to Use SDK

• Connecting to Splunk using Java SDK and printing list of Users

        // Create a map of arguments and add login parameters
        ServiceArgs loginArgs = new ServiceArgs();
        loginArgs.setUsername("admin");
        loginArgs.setPassword("changeme");
        loginArgs.setHost("localhost");
        loginArgs.setPort(8089);

        // Create a Service instance and log in with the argument map
        Service service = Service.connect(loginArgs);
        for (User user : service.getUsers().values())
            System.out.println(user.getName());
Success Stories

Challenges

• Difficulties monitoring impact of its Workforce Identity Access Management deployment on the business
• Problems prioritizing issues due to high volume of Remedy tickets caused by the new system
• Restricted ability to effectively map key performance indicators to critical service areas
• Lack of proactive service management
Data Sources

- Application and DB logs
- Infrastructure metrics
- Network metrics
- Remedy
- Enabler services
Business Impacts

• Glass table visualizations enable rapid and proactive issue resolution
• Custom KPIs empower teams across the business
• Proactive addressing of issues
• Improved visibility of open tickets, active status of tickets and number of impacted users
Challenges

- Needed a flexible way to drill down into site data
- Associate web activity with business results
- Reduce or eliminate multiple site analysis tools
- Better manage and integrate new acquisitions and products
• Apache, clickstream logs
• Server, desktop, database and application activity logs
• Java applications and application servers
• .Net applications and servers
• System metrics
Business Impacts

• Easier integration of data flows from acquired companies
• Streamlined foreign site expansion thanks to improved localized content and SEO optimization
• Increased ease and effectiveness of A/B site testing
• Reduced licensing costs by 45 percent
• Optimized site performance and resource allocation due to real-time error reporting and exception monitoring
• Improved user experience
Challenges

• Previous business analytics solution was inflexible and unable to generate real-time insights
• Cumbersome manual analysis of data slowed down marketing efforts
• Lack of operational visibility
• Maintaining competitive advantage over local markets
10 types of self-developed point-of-sale data:

- Product pricing
- Product categorization
- Product inventory
- Statistics about best sellers
- Seasonal trends
- Promotional campaign data
- CRM data
- Sales tax data
- Store financials
- Employee work schedules
Business Impact

- Real-time insights into business processes for better informed decisions
- Data analysis cycle reduced from days to minutes, leading to significant cost and time savings
- Lead time for promotional campaigns reduced by 80 percent
- Continued high level of customer service and optimized customer experience
- Operational resources freed up for greater overall productivity and efficiency
Challenges

• Inability to get real-time data analysis
• Needed scalable solution for new mobile platform
• Required insights into customer behavior for strategic marketing planning
Data Sources

• Online shopping/e-commerce web logs and web application server logs
• Shopping TV CTR log
• Mobile service web application logs
• Mobile device local application logs
• Internal lookup databases (products, customers)
Business Impacts

• Improved operational efficiencies
• Integrated results from both web and mobile data sources
• ROI – cost savings of 50 percent over prior solution
• Time savings of 24 hours over previous weblogger data analysis solution
• Maximized marketing efforts from real-time insights into customer behavior
• Faster incident response times
• DevOps collaboration
### Popularity

**Broad Adoption Across 4,400+ Customers in 80+ Countries**

Over Half the Fortune 100

<table>
<thead>
<tr>
<th>Financial Services &amp; Insurance</th>
<th>Retail</th>
<th>Technology</th>
<th>Cloud and Online Services</th>
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</thead>
<tbody>
<tr>
<td>VISA</td>
<td>LOWES</td>
<td>IBM</td>
<td>salesforce</td>
</tr>
<tr>
<td>Bank of America</td>
<td>macy's</td>
<td>Citrix</td>
<td>PayPal</td>
</tr>
<tr>
<td>Morgan Stanley</td>
<td>CARNEGIE</td>
<td>EMC</td>
<td>LinkedIn</td>
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<tr>
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<td>otto group</td>
<td>Trend Micro</td>
<td>Concur</td>
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<td>myQ</td>
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<td>Expedia</td>
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<td>Synaptics</td>
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<td>COMMERZBANK</td>
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<td>Cisco</td>
<td>Hooters</td>
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</table>

<table>
<thead>
<tr>
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<th>Healthcare</th>
<th>Manufacturing</th>
<th>Media &amp; Entertainment</th>
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</thead>
<tbody>
<tr>
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<td>COVIDEN</td>
<td>Raytheon</td>
<td>BBC</td>
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<tr>
<td>Sloan</td>
<td>Health Net</td>
<td>Lockheed Martin</td>
<td>Gannett</td>
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<tr>
<td>SOCA</td>
<td>HealthSpring</td>
<td>Northrop Grumman</td>
<td>Dow Jones</td>
</tr>
<tr>
<td>City of Phoenix</td>
<td>Children's Mercy Hospital &amp; Clinics</td>
<td>Pinterest</td>
<td>NEW YORK TIMES</td>
</tr>
<tr>
<td>State Farm</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Energy and Utilities</th>
<th>Education</th>
<th>Telecommunications</th>
<th>Travel and Leisure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schlumberger</td>
<td>UCLA</td>
<td>metro</td>
<td>Expedia</td>
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<tr>
<td>Alliance Energy</td>
<td>KU</td>
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<td>USC</td>
<td>COMCAST</td>
<td>Accor</td>
</tr>
<tr>
<td>URS</td>
<td></td>
<td>HUGHES</td>
<td>Internationale</td>
</tr>
</tbody>
</table>

The image above illustrates the broad adoption of a product/service across various industries, including financial services, retail, technology, cloud and online services, as well as government, healthcare, manufacturing, media and entertainment, energy and utilities, education, telecommunications, and travel and leisure. The Fortune 100 list is prominently featured, indicating the product's significant presence among fortune 100 companies.
THANK YOU!!!