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Multi-Tenancy: Achieving Security, Collaboration, And Operational Efficiency

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About The Presenters

- Ben August
- Sr. Solutions Engineer, ITS Middleware Services
- Higher Ed 10 years, UNC for 4 years
- Splunk Certified Administrator

- Dave Safian
- Sr. Solutions Engineer, ITS Middleware Services
- Higher Ed 20 years, at UNC for 5 years
- Splunk Certified Architect II

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The University Of North Carolina At Chapel Hill

- Nation’s first public university
- 19k Undergraduate students
- 11k Grad/professional students
- 11k Faculty/staff
- $2.4B Annual budget

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Carolina ITS By The Numbers

- 28,000+ Visits to walk-in Help Desk each year
- 68,000+ Operator assisted calls annually
- 22,000+ Software titles distributed annually
- 11+ Million inbound/outbound email messages per day
- 87,600 Active user accounts
- 50,000+ Computers provisioned and supported
- 50k Wired devices connect to network daily
- 60k Wireless devices connect to network daily
- 3923 Courses in LMS taught by 2,276 instructors

Campus Technology Challenges

- Open nature of higher education
  - Students using multiple personal devices on-campus
  - Interact with multiple systems throughout the day (web, LMS, student systems, email)
  - Students expect 24x7 access
  - Students active in social media when services are less than stellar

- Centralized and decentralized IT
  - 90 + departments who manage their own services
  - Some run their own servers, some run services hosted in ITS
  - All have similar reporting needs

Operational Challenges Within ITS

Supporting Mission-Critical Services

- Reactive to Issues (Not Proactive)
- Ad-Hoc Search Methods
- Hard to determine what data is relevant
- Lack of Holistic View of systems
- Finger Pointing / Lack of Factual Data
- Slow to resolve problems
- Complex Architecture

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IT Complexity In Core Business Services

Firewall

Routers, Switches, and Load Balancers

Web and Application Servers

Servers and OS

Authentication / Directory Servers

Storage

Databases

Virtualization

- Data in many different systems managed as silos by different teams
- Problems often present themselves across multiple tiers / nodes
- All of these systems produce data widely varying different formats

Reporting Objectives

Achieving Operational Efficiency, Security, and Collaboration

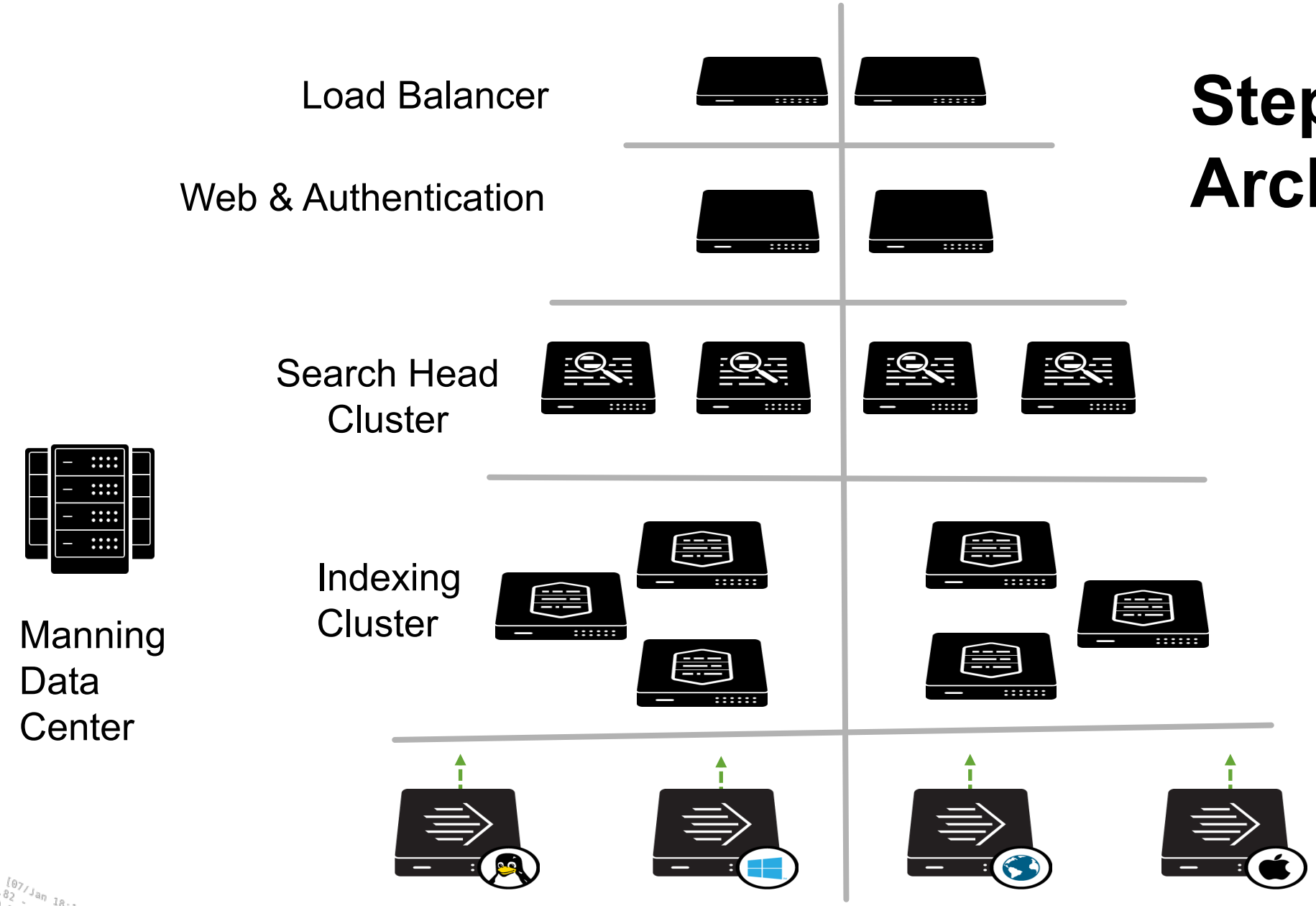
We need to build a reporting platform where we can collect and analyze all of our data all in one place.

- Get data out of silos and into a space where multiple teams can access it
- Enable team to work through problems using a common “language”
- Trace transactions through the entire system stack
- Restrict data to prevent authorized access / snooping
- Follow a user as they move through multiple systems and across campus
- Detect malicious activity and compromised accounts
- Make machine data about services available to less technical folks
- Provide tools to front-line support staff to offload work from tier 3
- Provide campus IT departments the same reporting capability

The Solution: Splunk

1. Build a Robust Architecture (High Availability / Disaster Recovery
2. Get Data out of Silos
3. Support Multi-tenancy for IT operations many departments and colleges
4. Grow Splunk Expertise across organization through collaboration
5. Publish dashboards tools that benefit the entire organization

Step 1: Robust Architecture



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Step 2: Get The Data In

From all mission critical systems and infrastructure

- Firewall Logs (130GB/day)
- Active Directory, Exchange (180+GB/day)
- PeopleSoft (10k+ unique log files/week)
- WordPress, Sakai LMS, campus web servers
- LDAP, Kerberos, Single Sign-On
- Switches, DHCP, F5

*nix

DB

WIN

VM

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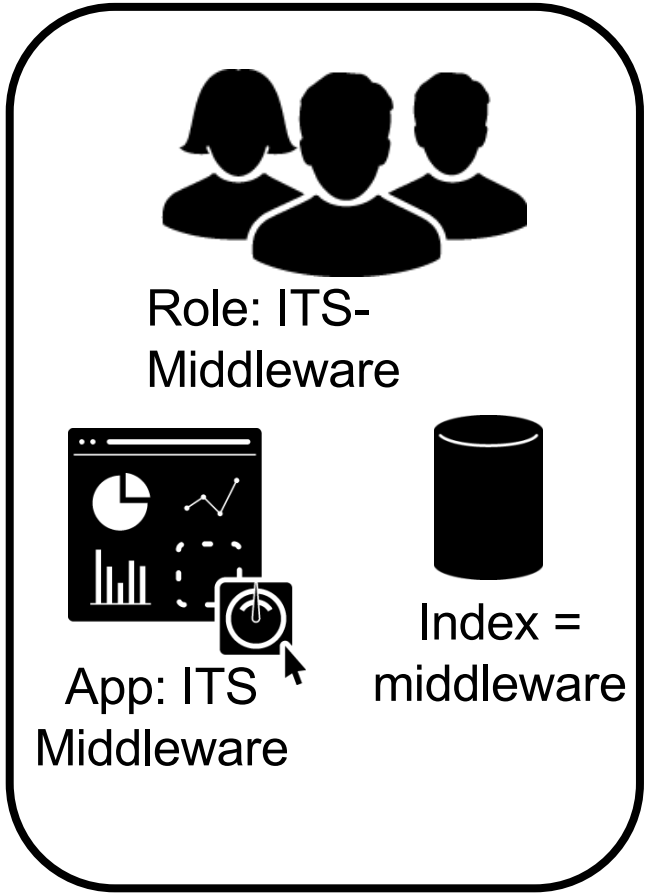
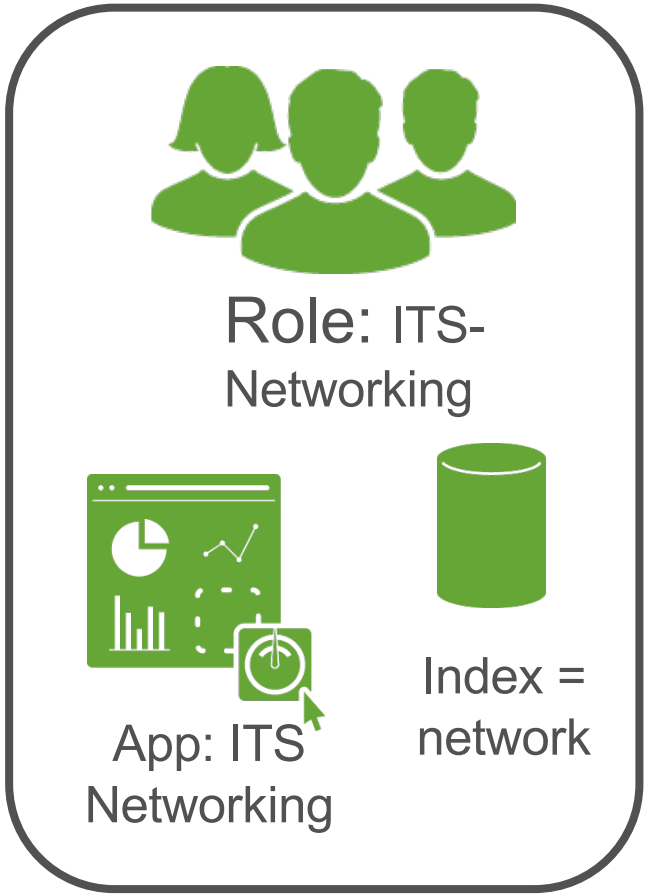
Step 3: Tackling Multi-Tenancy

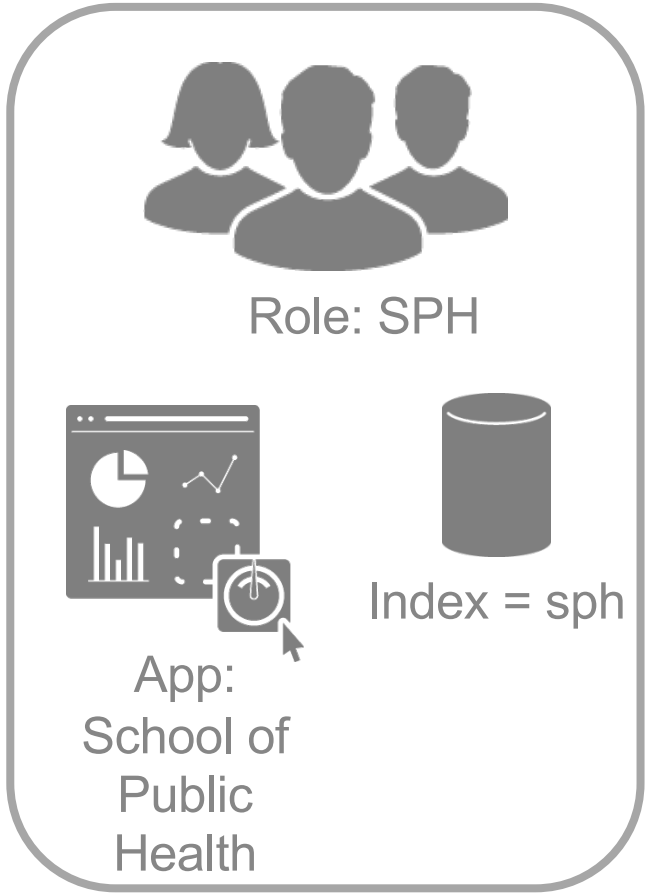
- How to organize data and access in Splunk?
  - Provide means to restrict access to specific data sources
  - Permit multiple teams access to specific data sets
  - Use established infrastructure to mange roles and memberships

Supporting Data isolation

The role, index, and app connection







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Supporting Data Sharing

Delegated Ownership Model

- We own the service, not the data
- Departments own:
  - The data in their index
  - The objects in their application
  - The membership of their roles
- We just proxy sharing requests and manage access
- Disclaimer: ISO gets access to all your data!

Access Control Delegation

Existing Infrastructure Saves Time

- Splunk Roles tied to LDAP groups
  - Authorization and Role membership
- LDAP groups tied to Group Management System
  - Grouper used for managing group membership
  - Groups fed from HR departmental data where possible
  - AD Admin Groups
  - Otherwise delegated to a manager
- Single Sign-On (Shibboleth) for password management
- Ansible Tower/ Git for automation, configuration management, versioning
- We have 660+ users and 100+ roles!

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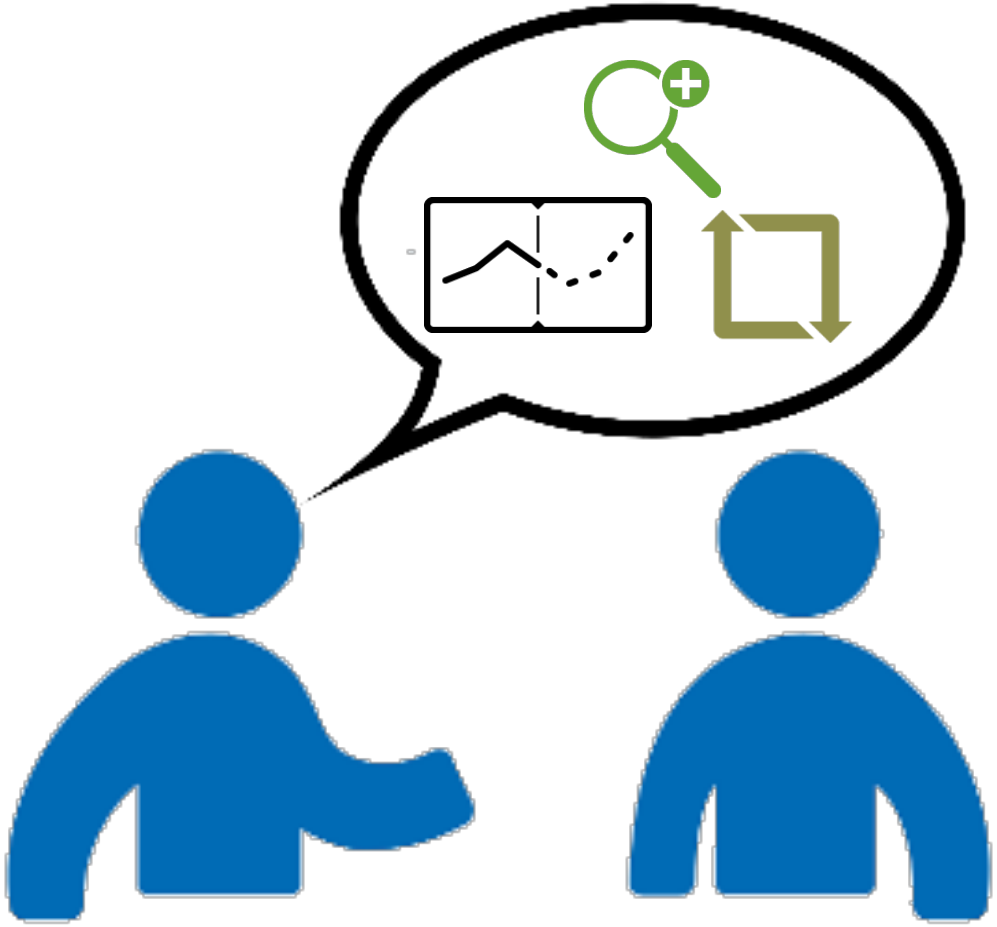
Step 4: Building Expertise Through Collaboration

Splunk Ninjas in Every Cubicle

- Splunk Community
  - How-to's on configuring forwarders
  - Best Practices
  - Users' Contributions
- On-site Splunk Training
- Informal Training Sessions
- Splunk User Mailing list
- Twitter: @UNCSplunk
- Internet 2/ Splunk Free Training



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Step 5: Building Enteprise-Class Reports

The Move to Institutional Reporting

- Start treating dashboards like enterprise tools
- One central location
- Controlled rollout of changes
- Validation of permissions
- Version Control

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The Splunk Shared Tools App

- Houses all dashboards used by multiple teams
- The app is globally accessible, dashboards are not
- Dynamic menus
- Super-users Group manages change process

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What UNC Does With Splunk

Achieving security, operational efficiency, and reporting

- Troubleshooting Tools for Support Staff
  - Account lockouts, Peoplesoft Troubleshooting
- Cross-department reporting and alerting on core University Systems
  - Campus Web (Wordpress), Financials/Student (Peoplesoft), LMS (Sakai)
- Self-Service reporting to Campus IT Departments for central services
  - Patch Management, Firewall Troubleshooting, Vulnerability Scanning
- Compromised account detection and alerting
- Malicious activity detection and alerting

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Live Demo

Peoplesoft Troubleshooting

Splunk Infrastructure | Active Directory and Messaging | Security and Firewall | Enterprise Applications | Networking | ITSApps | Middleware | Splunk Shared Tools

ConnectCarolina Troubleshooting

Edit | Export | ...

Onyen: dsafian
IP Address: 172.17.35.196
PID: 7 7
Last 24 hours | Submit | Hide Filters

Landing Page (connectcarolina.unc.edu) Access Data

Date/Time	IP Address	Domain	Path	HTTP Status	HTTP Referer	User Agent
08/16/2017 09:56:11.536	172.17.35.196	connectcarolina.unc.edu	/	200		Mozilla/5.0 (Windows NT 6.1; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/60.0.3112.90 Safari/537.36

Shibboleth Audit Data

Date/Time	Onyen	Client IP	Service Provider	Identity Provider (IdP)	IdP Host.
08/16/2017 09:56:21	dsafian	172.17.35.196	https://hcrpt.cc.unc.edu/shibboleth	https://sso.unc.edu/idp	ssoapp0p
08/16/2017 09:56:20	dsafian	172.17.35.196	https://fsrpt.cc.unc.edu/shibboleth	https://sso.unc.edu/idp	ssoapp0p
08/16/2017 09:56:20	dsafian	172.17.35.196	https://csrpt.cc.unc.edu/shibboleth	https://sso.unc.edu/idp	ssoapp0p
08/16/2017 09:56:20	dsafian	172.17.35.196	https://hc.cc.unc.edu/shibboleth	https://sso.unc.edu/idp	ssoapp0p

ConnectCarolina Grey Heller Access Data

Date/Time	Content Provider	Onyen	IP	menu ^	component	page	keys	
2017-08-16 09:56:41	hcprd	dsafian	172.17.35.196	ROLE_EMPLOYEE	PY_IC_PAY_INQ			
2017-08-16 09:56:43	paprd	dsafian	172.17.35.196	ROLE_EMPLOYEE	PY_IC_PAY_INQ			
2017-08-16 09:56:44	hcprd	dsafian	172.17.35.196	ROLE_EMPLOYEE	PY_IC_PAY_INQ	PY_IC_PI_LIST		
2017-08-16 09:56:59	hcprd	dsafian	172.17.35.196	ROLE_EMPLOYEE	PY_IC_W4			
2017-08-16 09:57:00	paprd	dsafian	172.17.35.196	ROLE_EMPLOYEE	PY_IC_W4			
2017-08-16 09:57:01	hcprd	dsafian	172.17.35.196	ROLE_EMPLOYEE	PY_IC_W4	PY_IC_W4_DATA	EMPLID=7	7

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Active Directory Lockouts

Active Directory Lockout Troubleshooting

Edit | More Info

Onyen

d*

Today

Submit

Active Directory Login Failures

Account_Name	AD Server	Server on Which Failed Authentication Occurred	Time
skjeff	addc4	webdot0p	12/01/2016 04:10:43 PM

Exchange Login Failures

Time	Account_Name	Server on Which Failed Authentication Occurred	Server Type
12/01/2016 12:56:35 PM	arbones	ITS-MSXHT6F	Exchange SMTP
12/01/2016 12:56:12 AM	kimmiche	ITS-MSXCA1	Exchange Client Access

Direct Computer Login Failures

Time	Account_Name	Server on Which Failed Authentication Occurred
12/01/2016 04:12:20 PM	jvmarcus	dhcp191069

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Key Performance Indicators

Splunk Infrastructure | Active Directory and Messaging | Security and Firewall | Enterprise Applications | Networking | ITSApps | Middleware | Splu

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Sakai traffic indicators

Edit

Last 45 minutes

Hide Filters

Average Response time (by time picker)

0.134 s

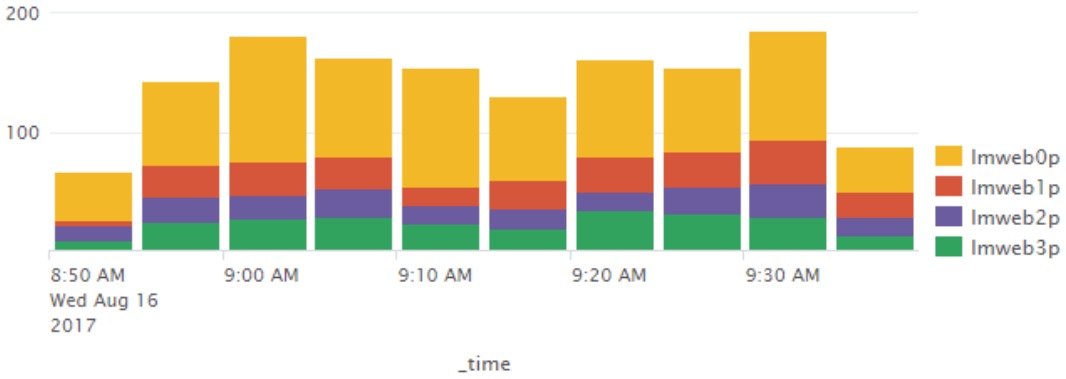
Successful Requests (by time range)

100 %

Requests per minute (last minute)

711

Logins per 5 minutes (by host over time range)



Concurrent Users

Request Distribution (web servers)

Avg Response Time per App Server

Request Distribution (application servers)

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Patching Compliance

Department: ITS

Deployment: UNC_Microsoft Updates-2...

Name: *

Submit

Compliant Clients

629 clients 4

In Progress Clients

14 clients 2

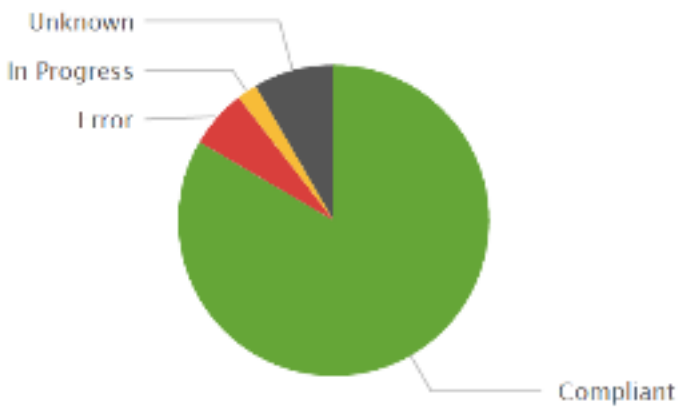
Error Clients

46 clients -5

Unknown Clients

63 clients -2

Compliance Overview



Departmental Compliance

Department	Compliant	Error	In Progress	Unknown	Total
ITS	629	46	16	63	754
Total	629	46	16	63	754

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Firewall Troubleshooting

Firewall Troubleshooting

Edit | Export | ...

Source IP Address: 172.17.35.196

Destination IP Address:

Destination Port:

Firewall Action: all

Perform DNS Lookup: No

Time Range: Last 60 minutes

Submit | Hide Filters

Source IP Address and Destination IP Address
Enter an IP address to search on. Leave empty to perform a wildcard (*) search of all IP addresses. Other wildcard values work as such such as 152.19.250.* OR 152.19.250/24.

Destination Port
Enter a destination port to search on. Leave empty to perform a wildcard (*) search on all ports.

Firewall Action
Filter results by firewall action. Show ALL traffic, Allowed, Blocked, or Unknown traffic actions.

Perform DNS Lookup
Attempt to translate IP addresses to hostnames. Doing so can substantially slow down search results.

Time Range
Select time range to search over.

Firewall search results:

Timestamp	Action	Firewall Address	vsys	Firewall Policy	Src Address	Src Zone	dest_ip_c	dest_zone	Protocol	dest_port	Pkts In	Pkts Out	Session End
2017/08/16 10:13:57	allowed	172.22.134.42	vsys6	ITSOSDMZP-0041	172.17.35.196	untrust	172.27.47.52	ITS-OS-DMZ-prod	tcp	8000	5	6	tcp-rst-from-client
2017/08/16 10:09:24	allowed	172.22.134.42	vsys6	MIDDLEWARE-0034	172.17.35.196	untrust	172.27.206.3	F5-DC-NoSNAT	tcp	443	10	9	tcp-fin
2017/08/16 10:09:24	allowed	172.22.134.42	vsys6	MIDDLEWARE-0034	172.17.35.196	untrust	172.27.206.3	F5-DC-NoSNAT	tcp	443	9	9	tcp-fin
2017/08/16 10:07:24	allowed	172.22.134.42	vsys6	MIDDLEWARE-0034	172.17.35.196	untrust	172.27.206.3	F5-DC-NoSNAT	tcp	443	10	9	tcp-fin
2017/08/16 10:07:24	allowed	172.22.134.42	vsys6	MIDDLEWARE-0034	172.17.35.196	untrust	172.27.206.3	F5-DC-NoSNAT	tcp	443	10	9	tcp-fin
2017/08/16 10:06:58	allowed	172.22.134.42	vsys6	MIDDLEWARE-0034	172.17.35.196	untrust	172.27.206.3	F5-DC-NoSNAT	tcp	443	10	9	tcp-fin
2017/08/16 10:01:58	allowed	172.22.134.42	vsys6	MIDDLEWARE-0034	172.17.35.196	untrust	172.27.206.3	F5-DC-NoSNAT	tcp	443	10	9	tcp-fin
2017/08/16 09:57:59	allowed	172.22.134.42	vsys6	MIDDLEWARE-0034	172.17.35.196	untrust	172.27.206.3	F5-DC-NoSNAT	tcp	443	10	9	tcp-fin
2017/08/16 09:57:14	allowed	172.22.134.42	vsys6	ERPD-1449	172.17.35.196	untrust	152.19.220.16	ERP-DMZ	tcp	443	9	10	tcp-rst-from-client
2017/08/16 09:57:14	allowed	172.22.134.42	vsys6	ERPD-1449	172.17.35.196	untrust	152.19.220.16	ERP-DMZ	tcp	443	11	12	tcp-fin

« prev 1 2 3 4 5 6 7 8 9 10 next »

Vulnerability Detection

Search Datasets Reports Alerts Dashboards ITS Security

Firewall: Dashboard

Edit Export ...

IP: 152.19.250.98

Time Range: Last 30 days

Submit Hide Filters

Firewall: Routing

Firewall search results:

IP	Firewall Address	Virtual Firewall	Destination Zone
152.19.250.98	serverpan0	vsys8	EntSys

Firewall: Host Vulnerabilities

Search results:

IP	DNS	assetgroup_sai	QID	SEVERITY	TITLE	STATUS	Published_On	First_Found_On	Last_Found_On	Last_Scan	age
152.19.250.98	itsdsafian1		370472	3	Linux Kernel Double Fetch Denial of Service Vulnerability	ACTIVE	07/19/2017	07/19/2017	08/03/2017	08/03/2017	28
152.19.250.98	itsdsafian1		82061	2	TCP/IP SYN Cookie Protection Not Enabled	ACTIVE	01/18/2005	06/14/2017	08/03/2017	08/03/2017	63

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Benefits To UNC

- All logs, for all systems across campus
- Visibility across the entire enterprise
- Data becomes accessible and relevant to non-technical
- Better security
- Increased efficiency
- Proactive Monitoring and Alerting
- Common tool/language used by the organization

Q&A

Dave Safian | Sr. Solutions Engineer
Ben August | Sr. Solutions Engineer

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Thank You

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