Leveraging graphs to understand our AD security

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Schedule

9 to 10:15

Setup and Intro to Graph Security

10:15 to 10:45 Break!

10:45 to 12:00

Let's find what's wrong in our domains!

Part 1

#psumac2023-graph

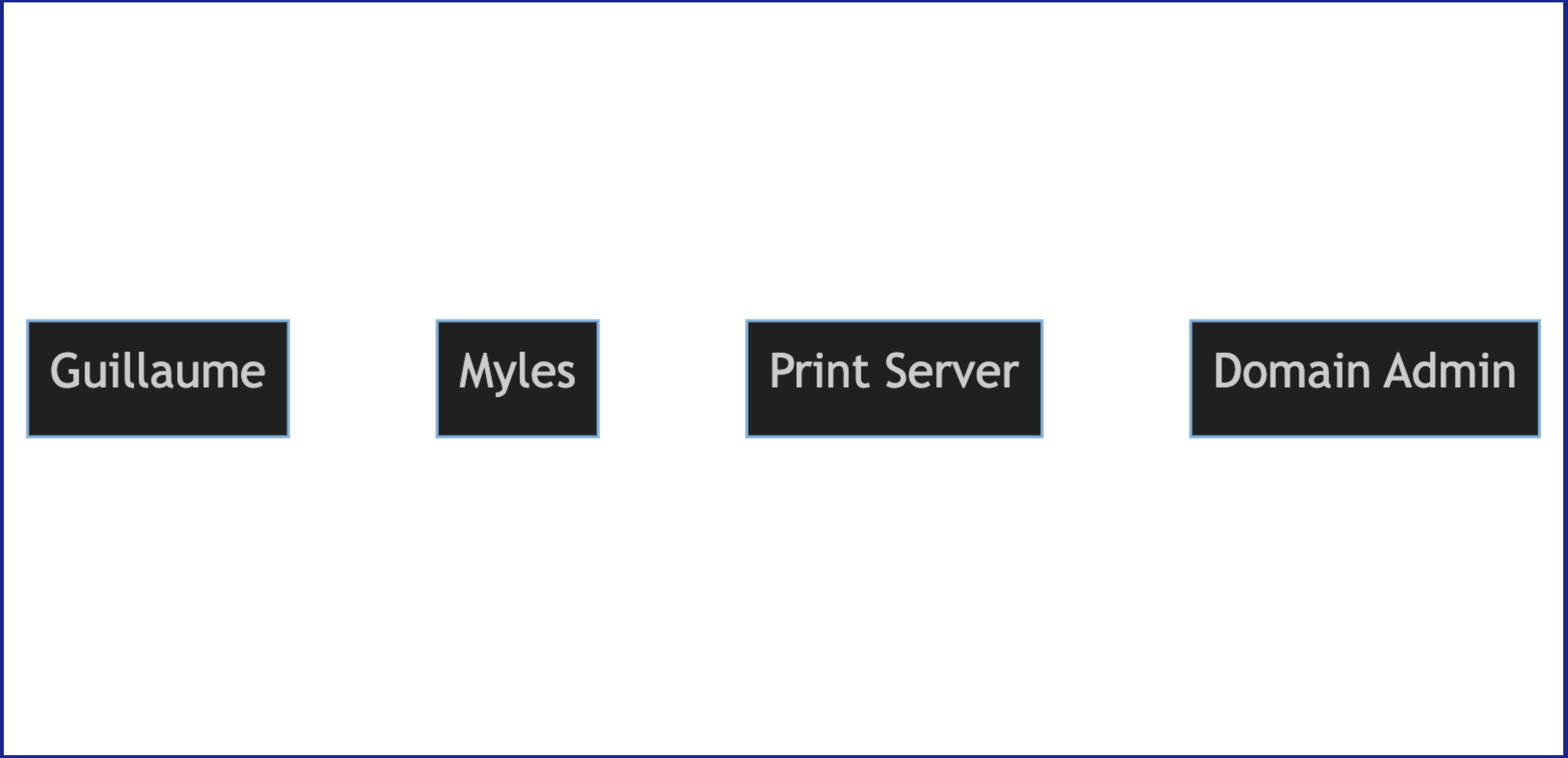
We will use this if copy-pasta is needed, support requests etc.

It will be archived at the end of the week.

Before we get started...

1. Make sure you have Docker installed - download it NOW if you need to.
2. Then fetch this neo4j image (more instructions later) `docker pull neo4j`
3. Download BloodHound 4.3.1 from `https://github.com/BloodHoundAD/BloodHound/releases` - GET THE INTEL VERSION (Apple Silicon build currently broken)
4. Join #psumac2023-graph on Slack

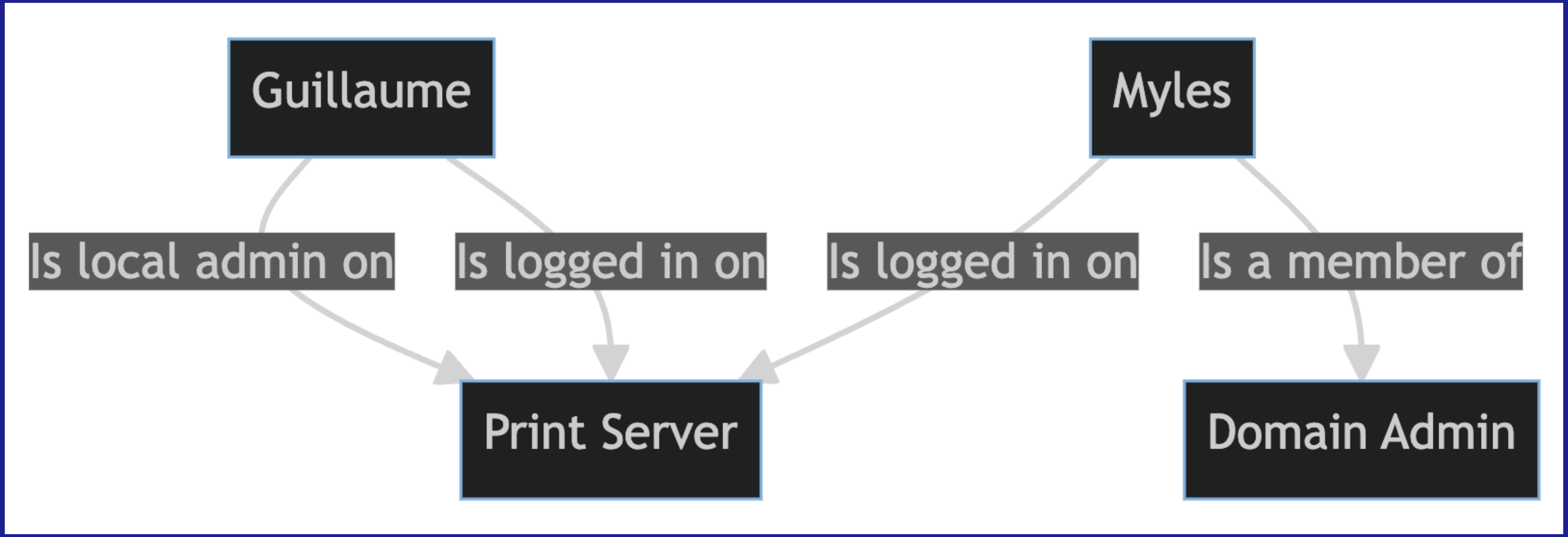
Why graph?



Objects exist in AD, but they're related to each other. A list is useful...

But a graph is way more useful.

Nested groups multiply benefits 10x too!



Typical BloodHound Setup

1. Neo4j Community v4
2. BloodHound
3. SharpHound

This is the graph database "back end" that BloodHound uses.

Installing on Mac

The official instructions will require that some form of Java is installed... so maybe we should just use Docker.

1. Install/Start Docker
2. `docker pull neo4j`
3. `docker run -p 7474:7474 -p 7687:7687 neo4j`
4. Browse to `http://localhost:7474/browser/`
5. Default username/pwd: `neo4j` – I'm changing mine to `psumac23`
6. 👍 up react on my Slack post "Done installing?"

Installing on Windows

You brought a Windows machine to this conference??

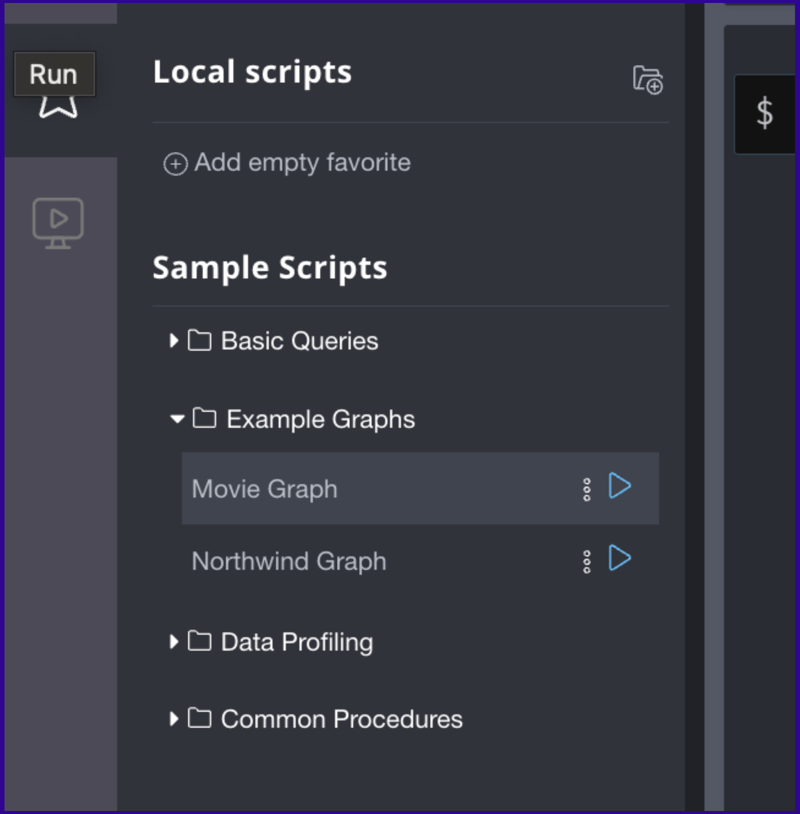
Instructions should actually be the same 😂

BUT I DID NOT TEST! GOOD LUCK!

1. Install/Start Docker
2. `docker pull neo4j`
3. `docker run -p 7474:7474 -p 7687:7687 neo4j`
4. Browse to `http://localhost:7474/browser/`
5. Default username/pwd: `neo4j` – I'm changing mine to `psumac23`
6. 👍 up react on my Slack post "Done installing?"

Movie Graph

To try neo4j – let's make it generate its "movie" database.



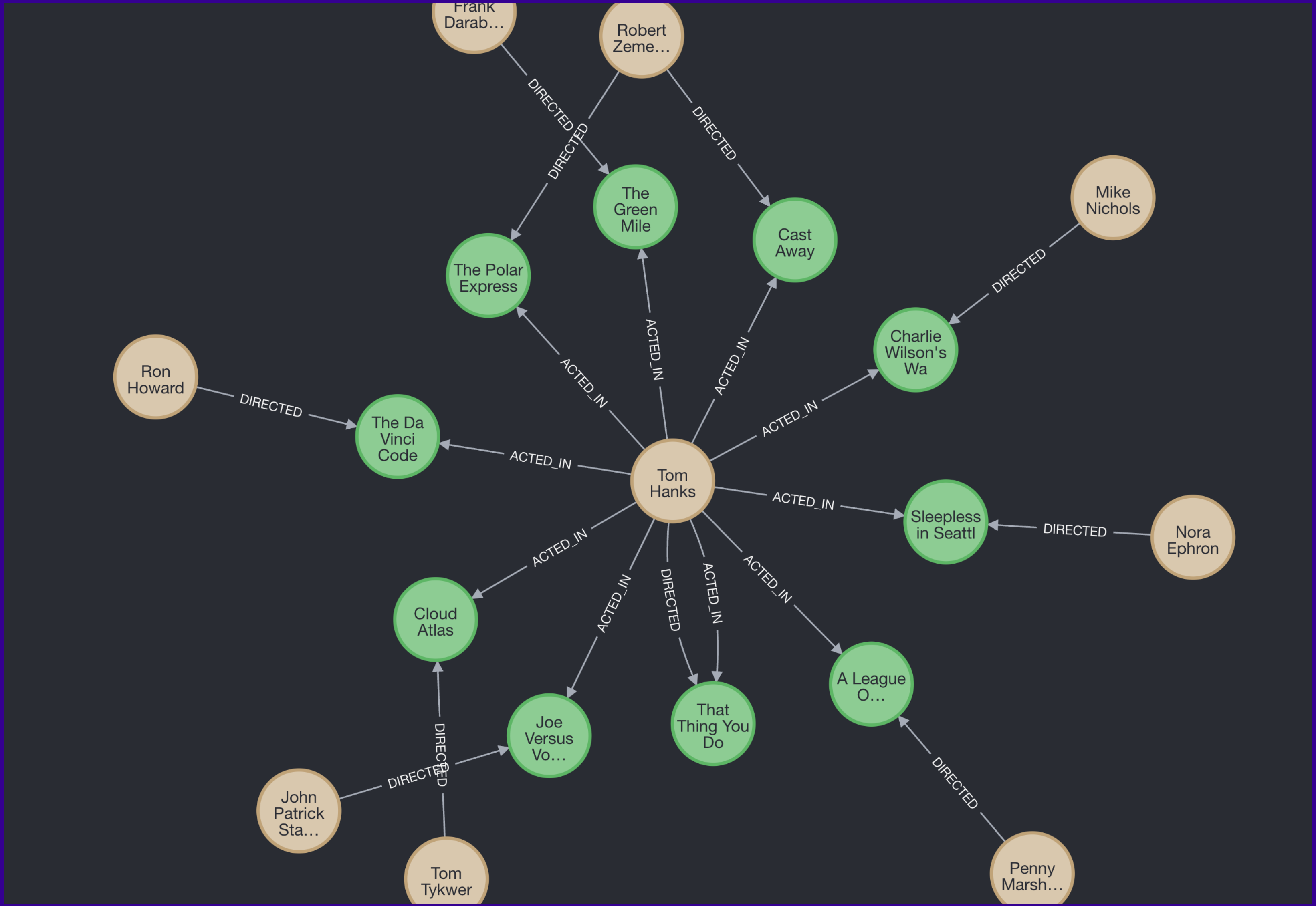
Run

Local scripts

Add empty favorite

Sample Scripts

- Basic Queries
- Example Graphs
  - Movie Graph
  - Northwind Graph
- Data Profiling
- Common Procedures


Frank Darab…
Robert Zeme…
DIRECTED
DIRECTED
DIRECTED
The Green Mile
Cast Away
The Polar Express
Mike Nichols
DIRECTED
Charlie Wilson's Wa
ACTED_IN
ACTED_IN
ACTED_IN
ACTED_IN
Ron Howard
DIRECTED
The Da Vinci Code
ACTED_IN
Tom Hanks
ACTED_IN
Sleepless in Seattl
DIRECTED
Nora Ephron
ACTED_IN
ACTED_IN
DIRECTED
ACTED_IN
ACTED_IN
Cloud Atlas
A League O…
Joe Versus Vo…
That Thing You Do
DIRECTED
DIRECTED
DIRECTED
John Patrick Sta…
Tom Tykwer
Penny Marsh…

> Your slide does not contain any visual elements. You can display text by adding a tabulator ⇥ in front of a paragraph. We discourage using a lot of text that is read from the slide. Use simple headlines, images or videos instead.

You can turn off this message in Preferences → Presentation .

Bacon Path

```
MATCH p=shortestPath(
(bacon:Person {name:"Kevin
Bacon"})-[*]-(meg:Person
{name:"Meg Ryan"}) ) RETURN p
```

What does the Bacon Path make you think of in Active Directory terms?

Someone who can introduce Toms

```
MATCH (tom:Person {name:"Tom Hanks"})-
[:ACTED_IN]->(m)<-[:ACTED_IN]-
(coActors), (coActors)-[:ACTED_IN]->
(m2)<-[:ACTED_IN]-(cruise:Person
{name:"Tom Cruise"}) RETURN tom, m,
coActors, m2, cruise
```

This is why we need graphs to understand AD: COMPLEXITY!

1. Download BloodHound from `https://github.com/BloodHoundAD/BloodHound/releases` – X64 version is more reliable and works fine in Rosetta. You might need to `wget` as Chrome considers `sharphound` to be malware and will block the zip. (Warning: Your EDR/AV might also trigger)
2. Unzip it (This is when a lot of EDRs will trigger. If only `sharphound` gets deleted, no worries, you won't need it today).
3. Right click to run it and bypass GateKeeper
4. Log in with previously configured credentials
5. Don't forget to 👍 message asking if you installed BloodHound properly. Or other reaction if you're having issues.

SharpHound: Warnings

SharpHound can be noisy and generate quite a bit of load. If you run it "by default", you will likely trigger at least some EDRs, IPS, etc.
Don't go and run this against domains you don't own, please, and if you do, read the full instructions!

Using SharpHound

We won't in this lab but you will need it in real life.

```
sharphound -d psumac.local
```

Collect sessions?

```
sharphound --CollectionMethods Session
```

Stealth?

```
sharphound --CollectionMethods Session --Stealth
```

ALL! (NOISY!)

```
sharphound --CollectionMethods all
```

Other Options

1. Target only specific DCs (useful to not load important DCs)
2. Various throttling options (useful to prevent detection but also to reduce performance impact on huge domains)
3. EncryptZip (useful so if someone finds your zip laying around, they can't open it easily).
4. Much more!

Importing demo data

https://evil.plumbing

2023 Archive – MacAdmins 2023 Lab Files

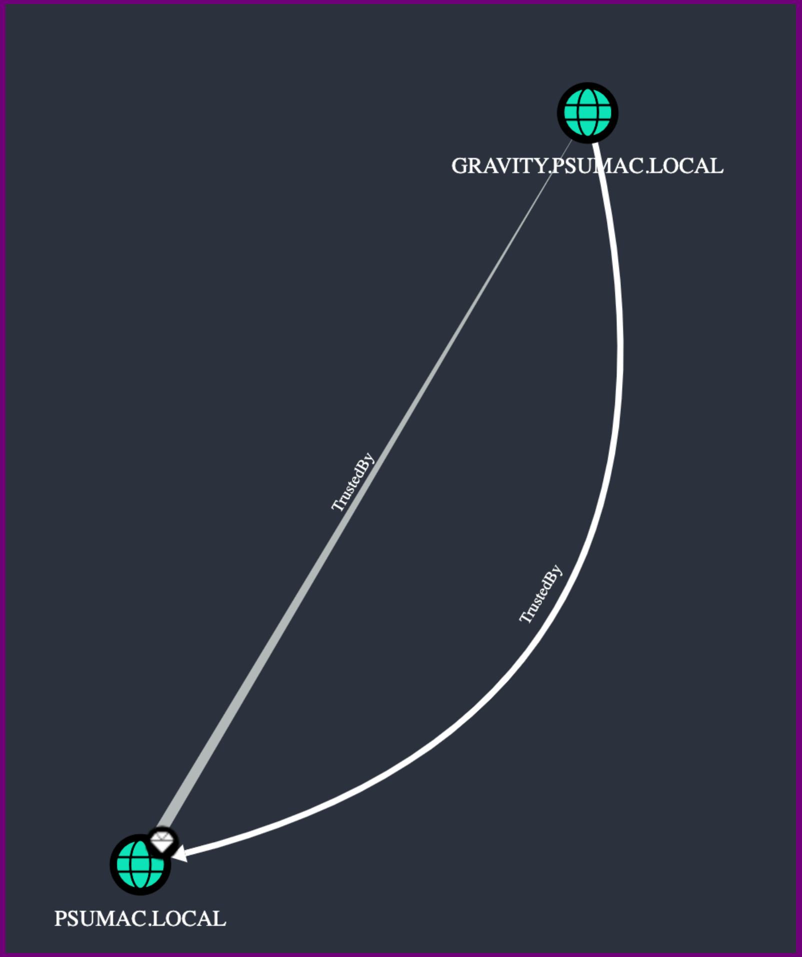
```
curl https://evil.plumbing/macadmins2023/lab-file1.zip --output lab-file1.zip
```

Why did I make a QR code for this?

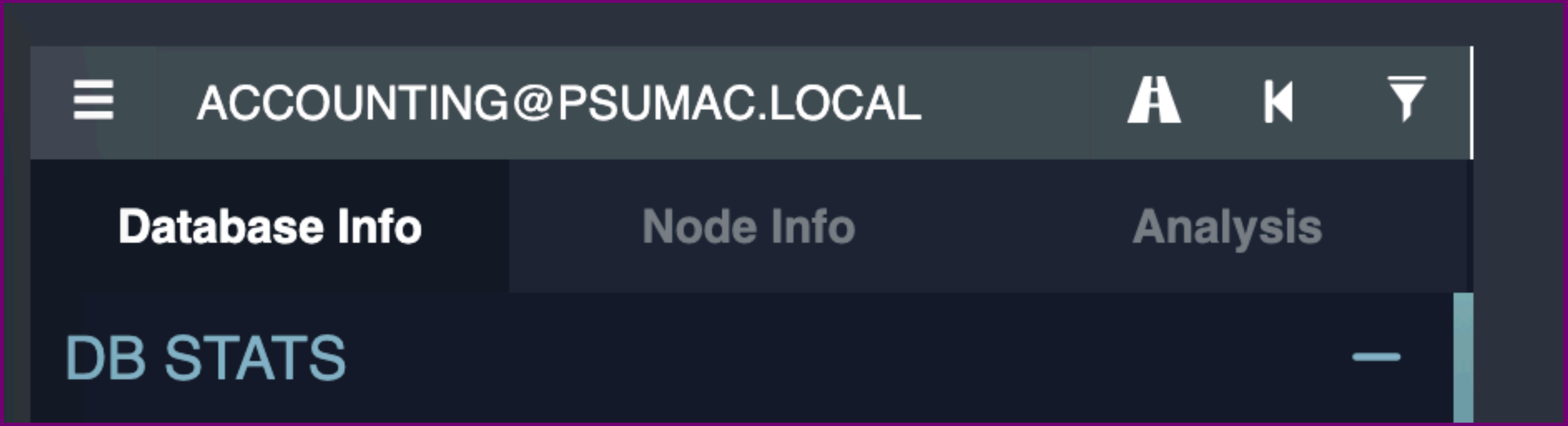
Importing

Navigating BloodHound

Draw domain trusts



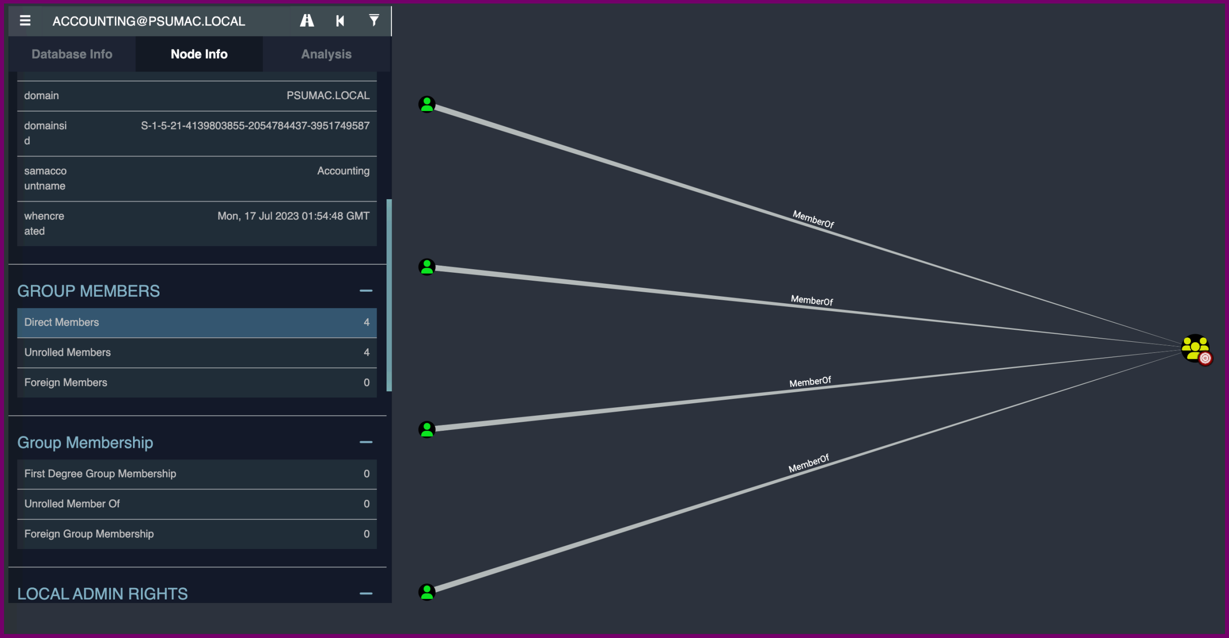
Searching for something



ACCOUNTING@PSUMAC.LOCAL

Digging into a user

Viewing details



ACCOUNTING@PSUMAC.LOCAL

domainsid	S-1-5-21-4139803855-2054784437-3951749587
domain	PSUMAC.LOCAL
samaccountname	Accounting
whencreated	Mon, 17 Jul 2023 01:54:48 GMT

GROUP MEMBERS

Direct Members	4
Unrolled Members	4
Foreign Members	0

Group Membership

First Degree Group Membership	0
Unrolled Member Of	0
Foreign Group Membership	0

LOCAL ADMIN RIGHTS

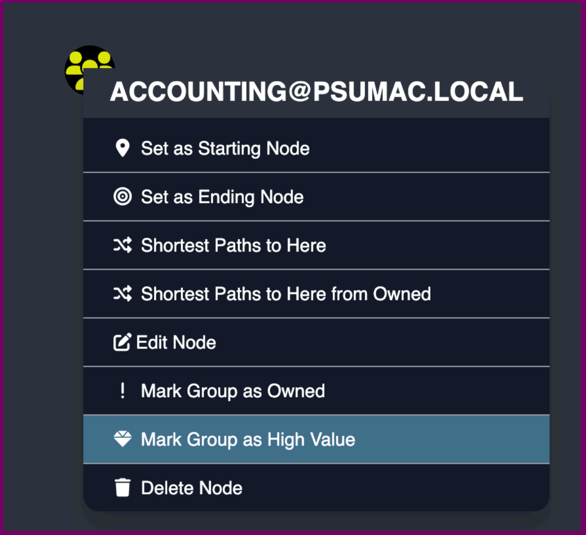
Let's set some targets!

accounting@

hr@

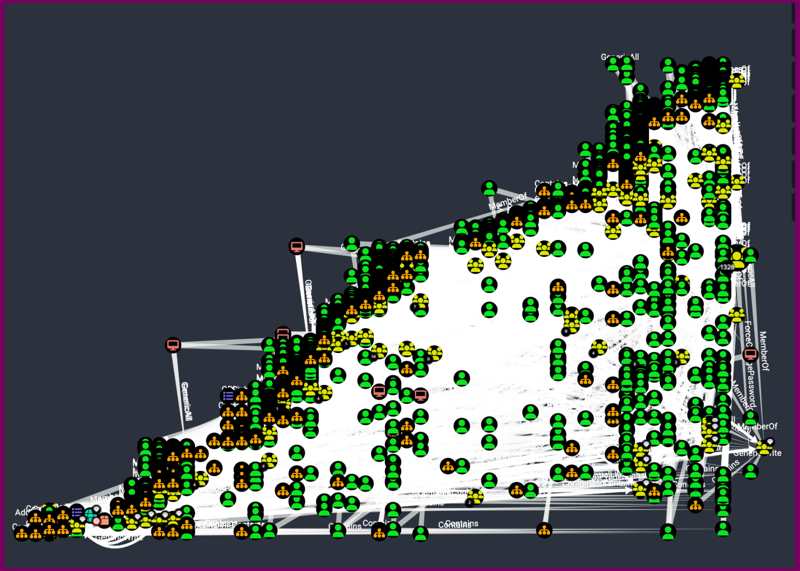
engineering@

legal@



ACCOUNTING@PSUMAC.LOCAL

Path to high value targets



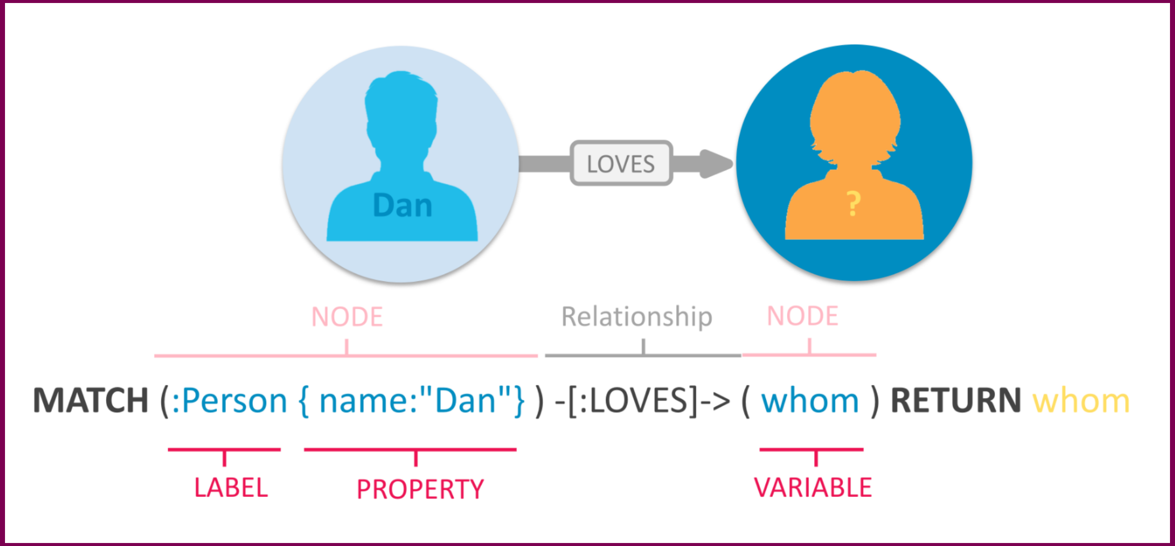
Too many options.. we'll come back later.

30M Break

Part 2

Cipher/Custom queries

```
MATCH p=(m:Group)-[r:AdminTo]->(n:Computer)
RETURN p
```



MATCH (:Person { name:"Dan"}) -[:LOVES]-> (whom) RETURN whom

Find users created in last 30 days

```
MATCH (u:User) where
u.enabled=TRUE and u.whencreated
> (datetime().epochseconds - (30
* 86400)) RETURN u
```

```
ord|GenericAll|GenericWrite|Owns|WriteDacl|WriteOwner|CanRDP|ExecuteDCOM|AllowedToDelegate|ReadLAPSPassword|Contains|GpLink|AddAllowedToA
```

Kerberoasting

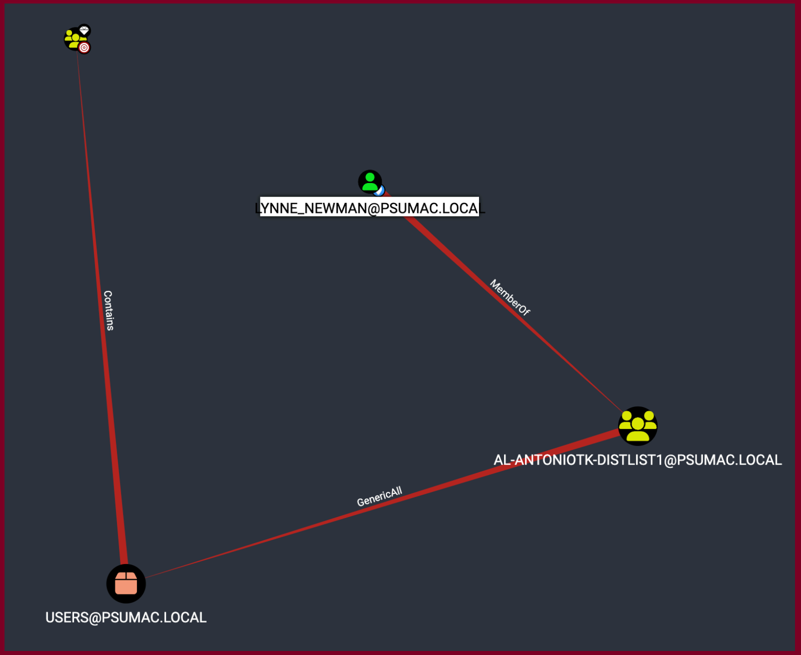
Kerberoasting is a post-exploitation attack technique that attempts to obtain a password hash of an Active Directory account that has a Service Principal Name (“SPN”). In such an attack, an authenticated domain user requests a Kerberos ticket for an SPN.
TL;DR -> You get a SPN - encrypted with the password of the service account, allowing you to brute-force the password. Service accounts with weak passwords are especially at risk.

Which Kerberoastable account is the most interesting?

5m

My answer

Other answers can be good too, so much of the domain is MESSY and RANDOMLY GENERATED: Lynne Newman ..or PRINT_AUTOMATOR.


LYNNE_NEWMAN@PSUMAC.LOCAL
MemberOf
AL-ANTONIOTK-DISTLIST1@PSUMAC.LOCAL
GenericAll
Contains
USERS@PSUMAC.LOCAL

Can you explain why?

Why might they actually not be interesting at all?

Who would be users that are similarly interesting?

Why do you want to have multiple targets for Kerberoasting?

Assume we owned Lynne_Newman

Let's mark her as owned

Lynne_Newman to high value targets

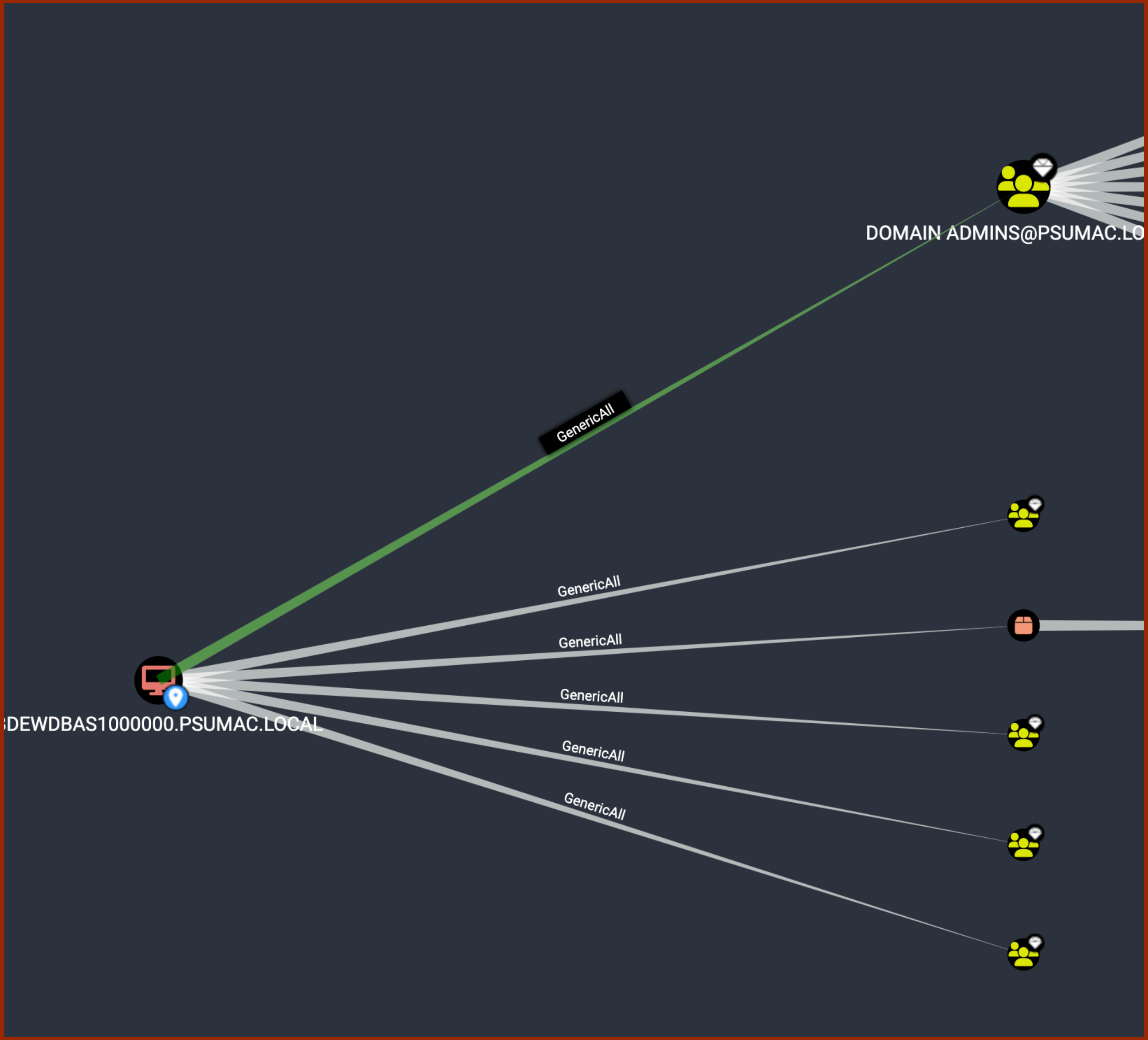
List her reachable high value targets

Is there something that could be filtered out?

Can you tell me about two paths to domain admin she has?

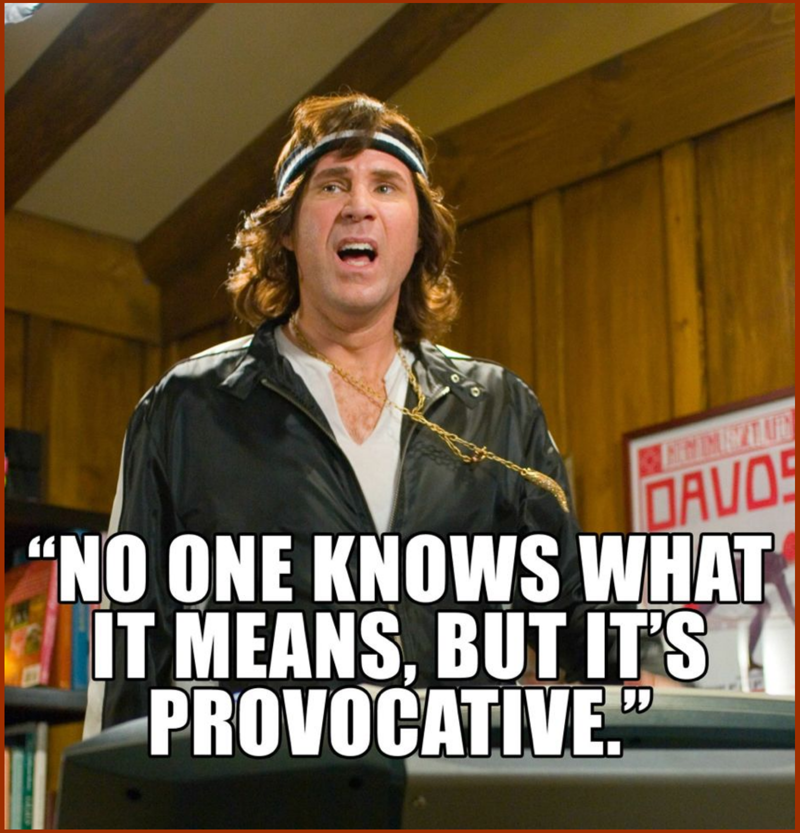
Why is this system interesting?

BDEWDBAS1000000



DOMAIN ADMINS@PSUMAC.LO
GenericAll
GenericAll
GenericAll
GenericAll
GenericAll
GenericAll
DEWDBAS1000000.PSUMAC.LOCAL

What does GenericAll even MEAN?



Mark it as high value

BDEWDBAS1000000

Let's add some other owned accounts

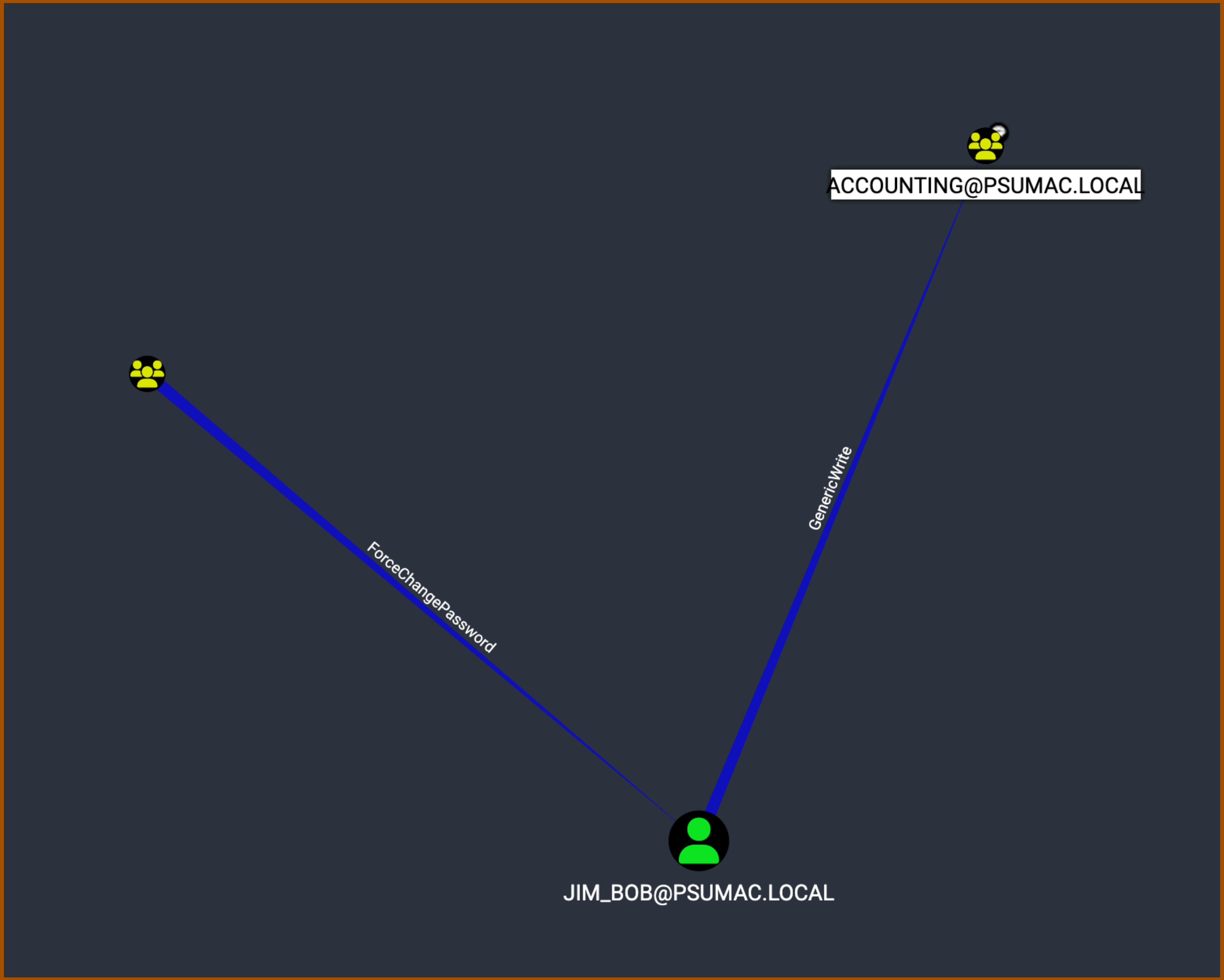
1. George_Bartlett
2. Mike_Talley
3. Veronica_Lancaster

What are some fun paths we now have from owned assets?

I don't have a single solution, let's just talk about fun paths!

Domain users to high value targets

Sometimes domain users have surprising permissions. At least one is at play... where?



ACCOUNTING@PSUMAC.LOCAL
GenericWrite
ForceChangePassword
JIM_BOB@PSUMAC.LOCAL

This means anyone can own JIM_BOB and then add users to accounting. Let's mark JIM_BOB as owned!

BloodHound and AD Security Links

1. https://github.com/ZephrFish/Bloodhound-CustomQueries
2. AdSecurity.org

Remember

BloodHound also works for Azure thingies!

Addicted to graphs yet?

https://github.com/JupiterOne/starbase

TONS of integrations! AD, MDMs, EDRs, GitHub, much more!

DEF CON workshop in a few weeks!

Thank you all!

Thanks for your time this early into the conference week!

Stay tuned for **Manage macOS Risk with Adv. Auditing Capabilities**

FEEDBACK

https://bit.ly/psumac2023-104A