Gaining Access:
More Cracking Methods

Dale Meredith
MCT | CEI | CEH | MCSA | MCSE
Cyber Security Expert

dalemeredith.com | Twitter: @dalemeredith | Linkedin: dalemeredith|

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NTLM Authentication

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How It Works

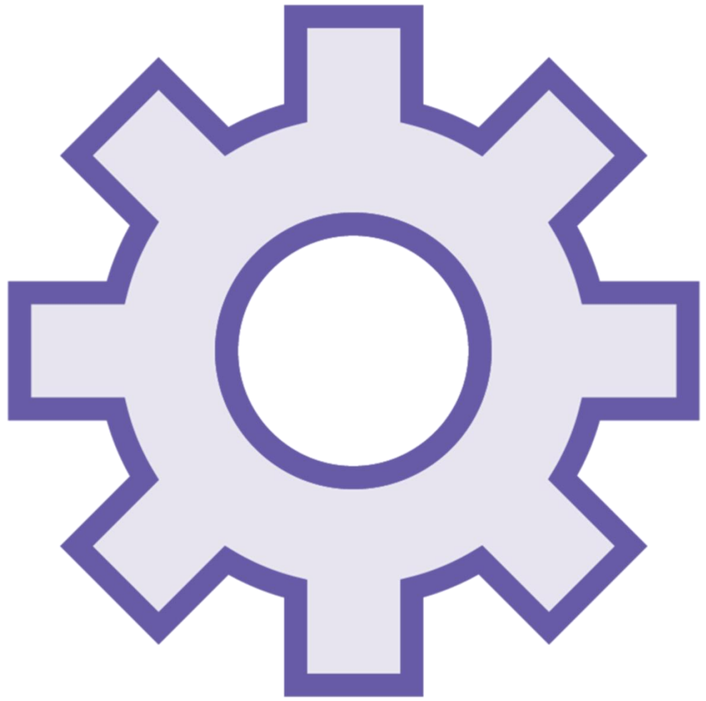
NTLM is used when:

There is no Kerberos trust between two different forests

Authentication is attempted by IP

If one or both systems are not in the same domain

If your firewall is blocking Kerberos ports



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How It Works

How it's used

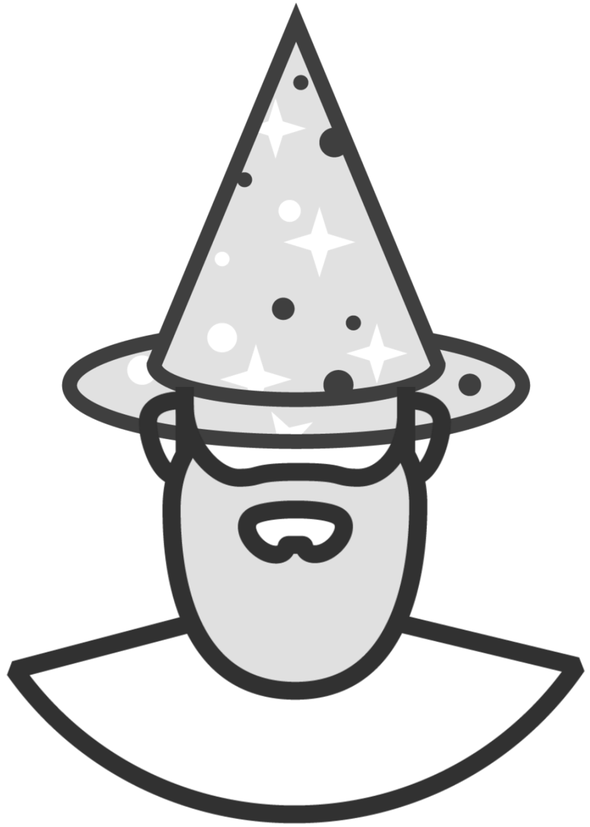
Challenge response algorithm

Passwords are not transmitted

V1 came with NT

- Just say NO!

V2 came with NT SP4



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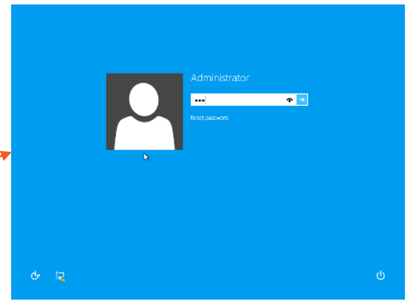
The Process



Admin:500:5837
39372495373948
573739282749

Domain Controller

Bb e8 pdq rsvp8
abc

Bb e8 pdq rsvp8
abc

Admin:500:5837
39372495373948
573739282749

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Kerberos Authentication

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The 3-headed Dog (Fluffy)

Better, stronger, faster

Ticket based

Fast

Avoids transmitting passwords

Time based (Remember the PDC?)

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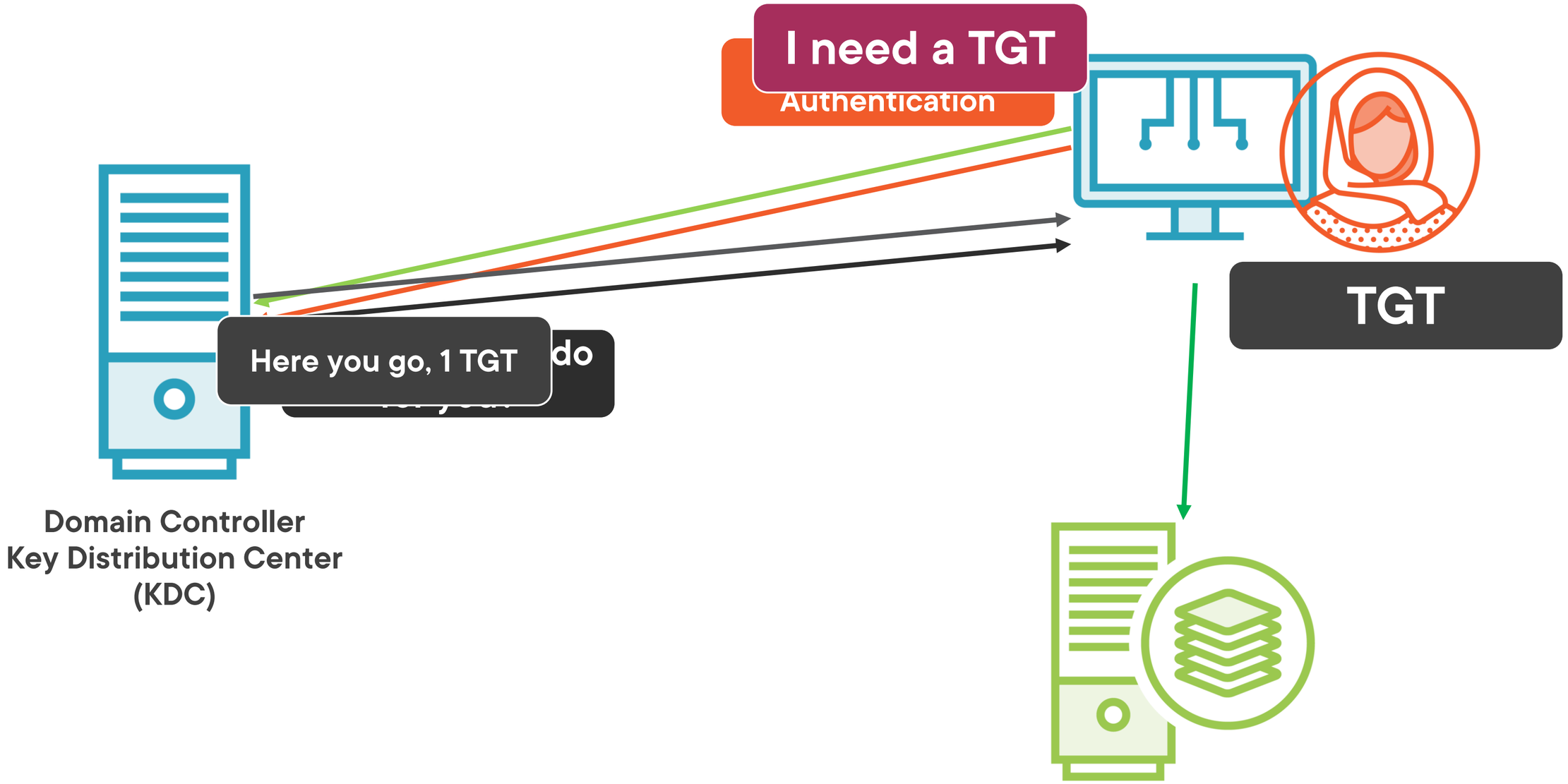
Fluffy in Use



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Salting

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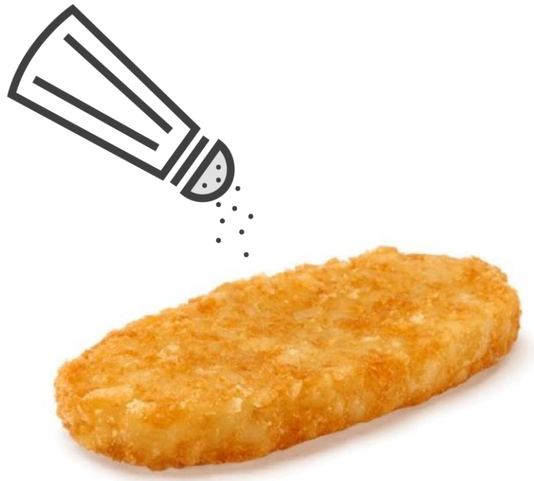
My Hash Needs Salt



Append or prepending random strings

Done before hashing

Prevents duplicate hashes

Unique to each password

```
hash(“BatmanRules”) =2cf24dba5fb0a30e26e83b2ac5b9e29e1b161e5c1fa7425e73043362938b9824
hash(“BatmanRules”) =2cf24dba5fb0a30e26e83b2ac5b9e29e1b161e5c1fa7425e73043362938b9824

hash(“BatmanRules” + “Qiduemx313) =9e209040c863f84a31e719795b2577523954739fe5ed3b58a75cff2127075ed1
hash(“BatmanRules” + “38dkeWqod2)=d1d3ec2e6f20fd420d50e2642992841d8338a314b8ea157c9e18477aaef226ab
```

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Hash + Username

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[1,2,3]

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Rainbow Tables and Other Options

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Somewhere Over the Rainbow...

Precomputed hash tables

Huge files

SSD & cloud computing

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Lookup Tables

Does any hash equal:
5f4dcc3b5aa765d61d8327deb882cf99:
FOUND: password5

What about:
6cbe615c106f422d23669b610b564800: not in database

Can I get a:
630bf032efe4507f2c57b280995925a9:
FOUND: letMEin12

Here's another one:
386f43fab5d096a7a66d67c8f213e5ec:
FOUND: mcd0nalds

Last one, I swear:
d5ec75d5fe70d428685510fae36492d9:
FOUND:p@ssw0rd!

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Reverse Lookup Tables

Searching for hash (apple) in users' hash list...
: Matches [alice3, 0bob0, charles8]

Searching for hash(blueberry) in users' hash list...
: Matches [usr10101, timmy, john91]

Searching for hash (letmein) in users' hash list...
: Matches [wilson10, dragonslayerX, joe1984]

Searching for hash (s3cr3t) in users' hash list...
: Matches [bruce19, knuth1337, john87]

Searching for hash (z@29hjja) in users' hash list...
: No users used this password

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You Gotta Love Technology

GPUs LOVE cracking passwords

Setup: 5 systems/25 AMD GPU/10Gbp

- 348 Billion NTLM passwords per second!
  - 14 character: hacked in 6 mins
- 180 Billion MD5 password per second!
  - 63 Billion per second is using SHA1

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Demo

Creating a Rainbow Table

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Password Recovery Tools

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Top Tools to Know

John the Ripper

hashcat

THC-Hydra

Medusa

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Countermeasures

- **Use GPO to turn off LLMNR and NetBIOS over TCP/IP**
- **Vindicate / got-responded**
- **Passwords**

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Demo

Cain & Abel

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Demo

L0phtCrack

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Demo

John the Ripper

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Learning Check

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Learning Check

- Authentication by IP
- Kerberos
- Salting
- Isolated system
- Rainbow tables

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Learning Check

- Reverse lookup table
- GPO settings
- NTLM Authenication
- Passwords
- John-the-Ripper

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Next Up:

Phase 2: Gaining Access - Escalating Privileges

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