Client Authentication Recommendations for Encrypted DNS (CARED)

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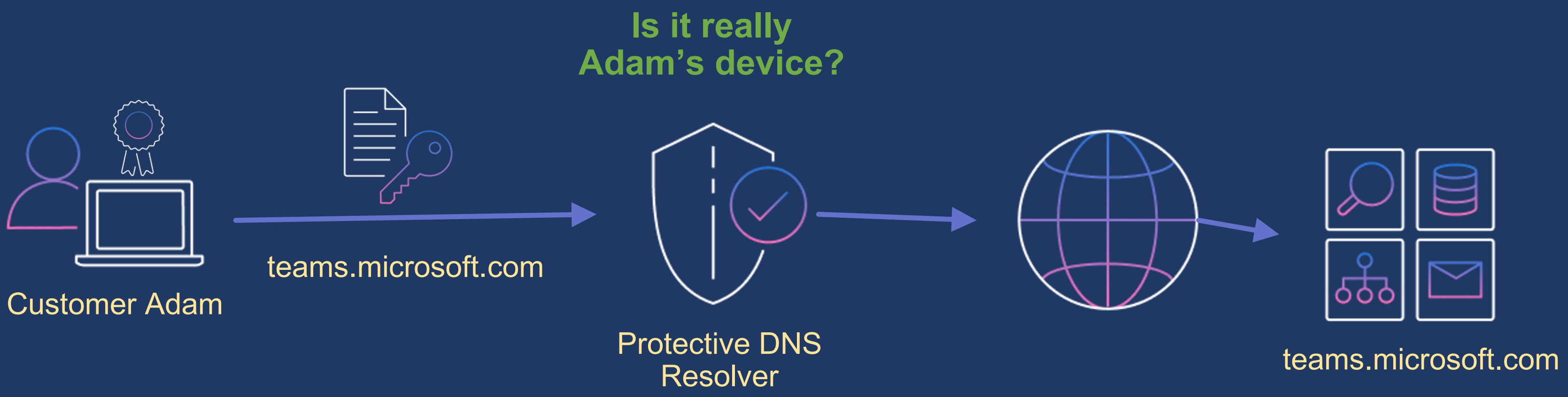
Client Authentication Recommendations

How can DNS clients provide verifiable proof of identity?

How can this identity be tied to machines so recursive resolvers can make resolution decisions based on human-affiliated identities?

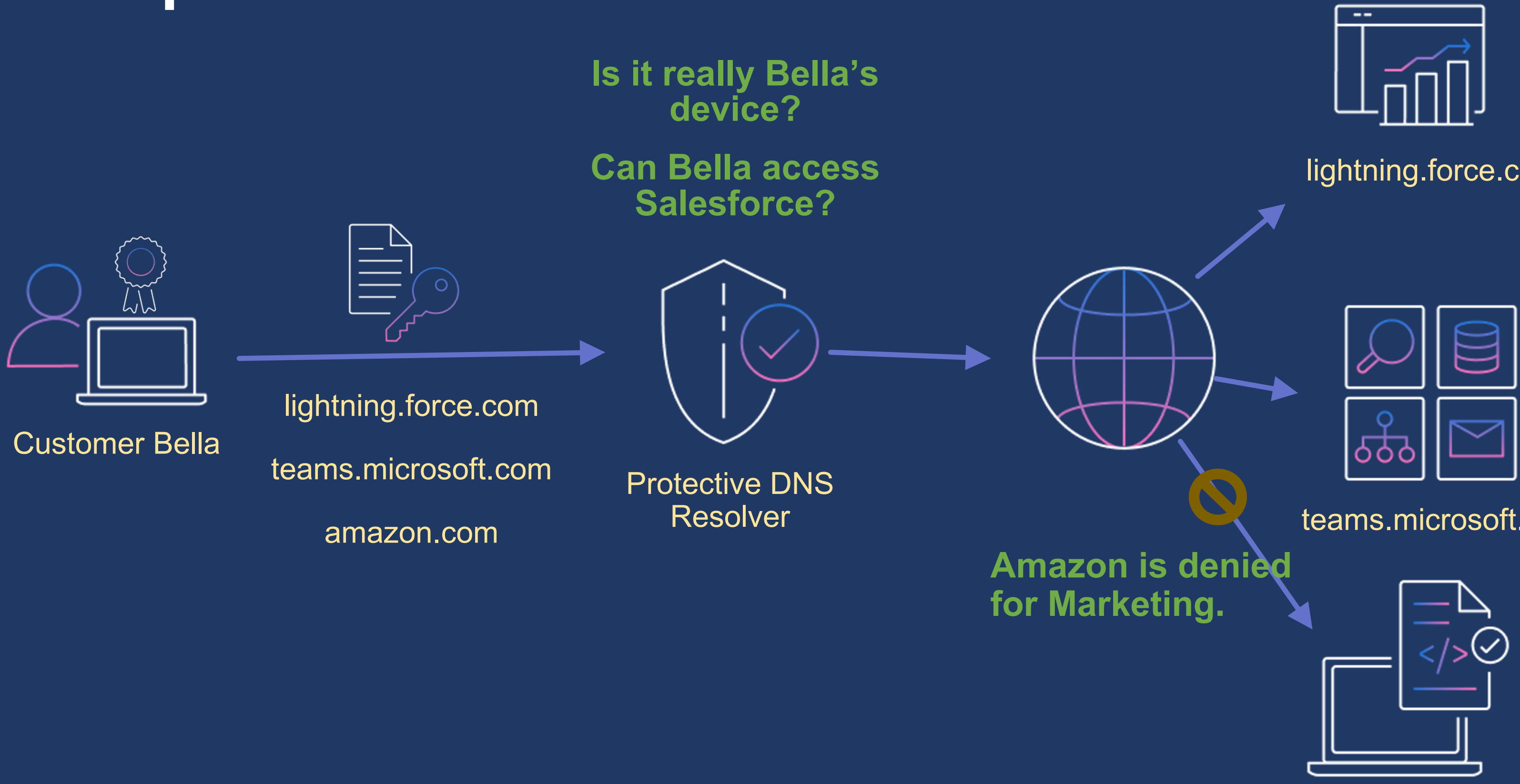
Use Case 1: Managed Access

- Adam has a machine with a certificate associated with him.
- Adam needs to access teams.microsoft.com.
- Protective DNS Resolver will verify the machine's identity and authorize it to receive the Teams DNS records because the machine belongs to Adam.



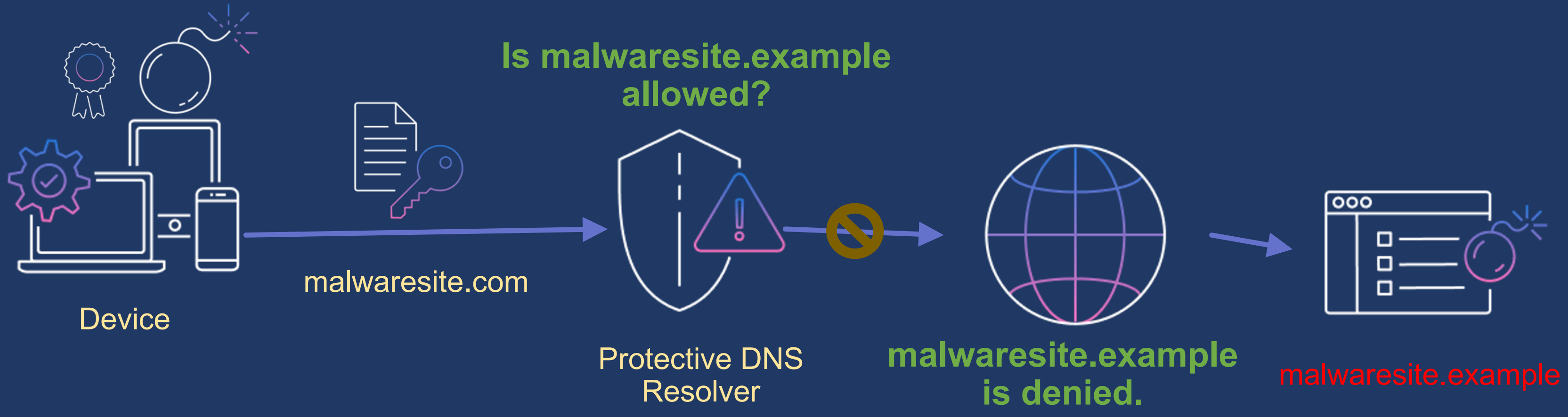
Use Case 2: Group Access Levels

- Bella has a machine with a certificate associated with her.
- Bella is in Marketing and needs to access salesforce.com
- Bella also needs to access teams.microsoft.com.
- Bella attempts to access amazon.com but this is against company policy.
- Protective DNS Resolver will verify the identity and authorize Bella to receive the teams & salesforce DNS records but deny Amazon.



Use Case 3: Device Access

- Device has an issued certificate on the machine.
- Malware on the Device attempts to connect to its Command and Control server at malwaresite.example.
- Protective DNS Resolver will verify the identity and determine malwaresite.example is bad and deny DNS records.



Requirements for Identity Proof

- DNS clients provide securely verifiable identity
- DNS servers & recursive resolvers must be able to provide device specific logs
- Authentication must be applied at the connection-level (avoid per query impact)
- Authentication must support DoH, DoT, and DoQ minimally
- Identity proof must be renewable and revocable
- Authentication must be compatible with the existing DNS protocol

Solution Options

- HTTP Authentication
  - Lacks support for DoT or DoQ
- JSON Web Tokens (JWT)
  - Similar to HTTP Authentication it lacks support for DoT or DoQ
- Microsoft Entra Verified ID and Azure Active Directory
  - Similar to JWT and lacks support for DoT or DoQ
- Create a new solution
  - Significant invest and adoption would be required – worth investigating long-term
- Mutual TLS (mTLS)
  - Meets goals and works across platforms
  - Requires a mechanism to distribute certificates and manage devices

Why create a draft?

Maximize interop between DNS implementations by recommending best practices for authentication.

Codify appropriate use of client auth with encrypted DNS to satisfy user privacy concerns.

https://datatracker.ietf.org/doc/draft-jaked-cared/