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Continuous Authentication and Distributed Session Management

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We need a session ‘kill switch’

…that works for all protocols and client types

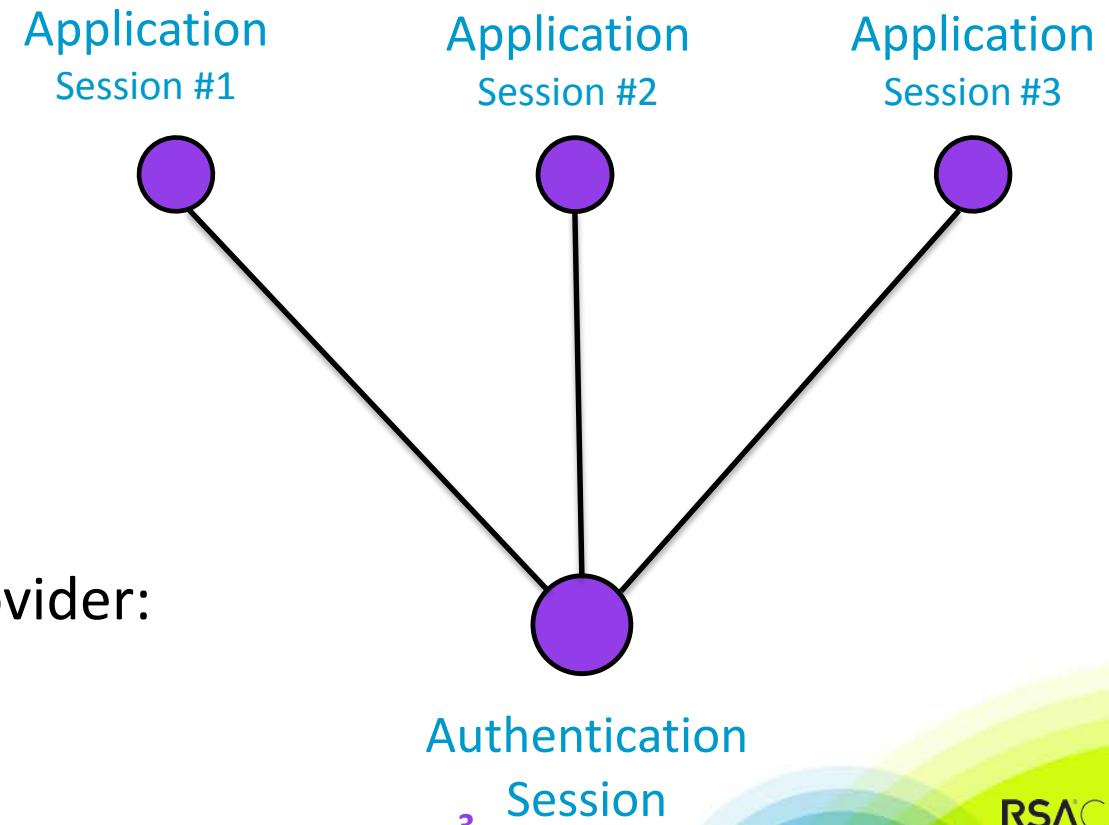
WHEN…

- Employment Termination
- Lost or Stolen Devices
- Elevated Risk

…AND for Continuous Authentication

Session Types

Relying Parties:
(Applications / APIs)



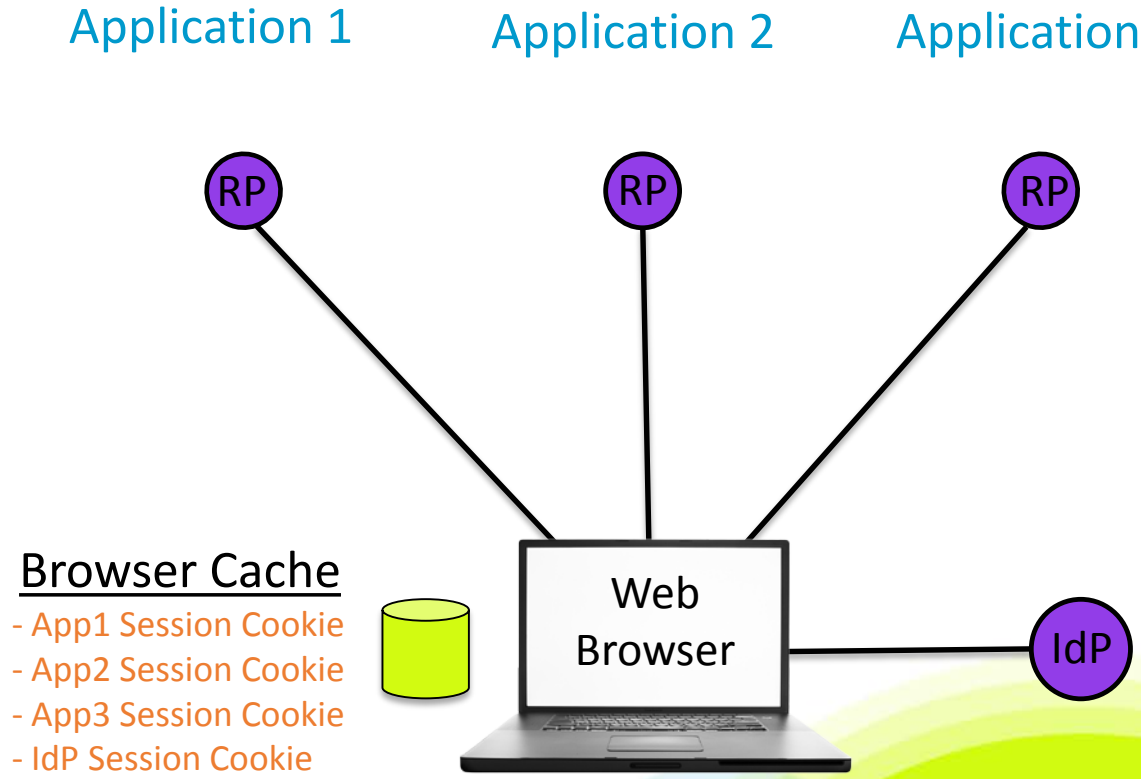
Front Channel Solutions

Browser-based communication

- iFrame
- Form Post / Redirection
- Logout Images

Problems

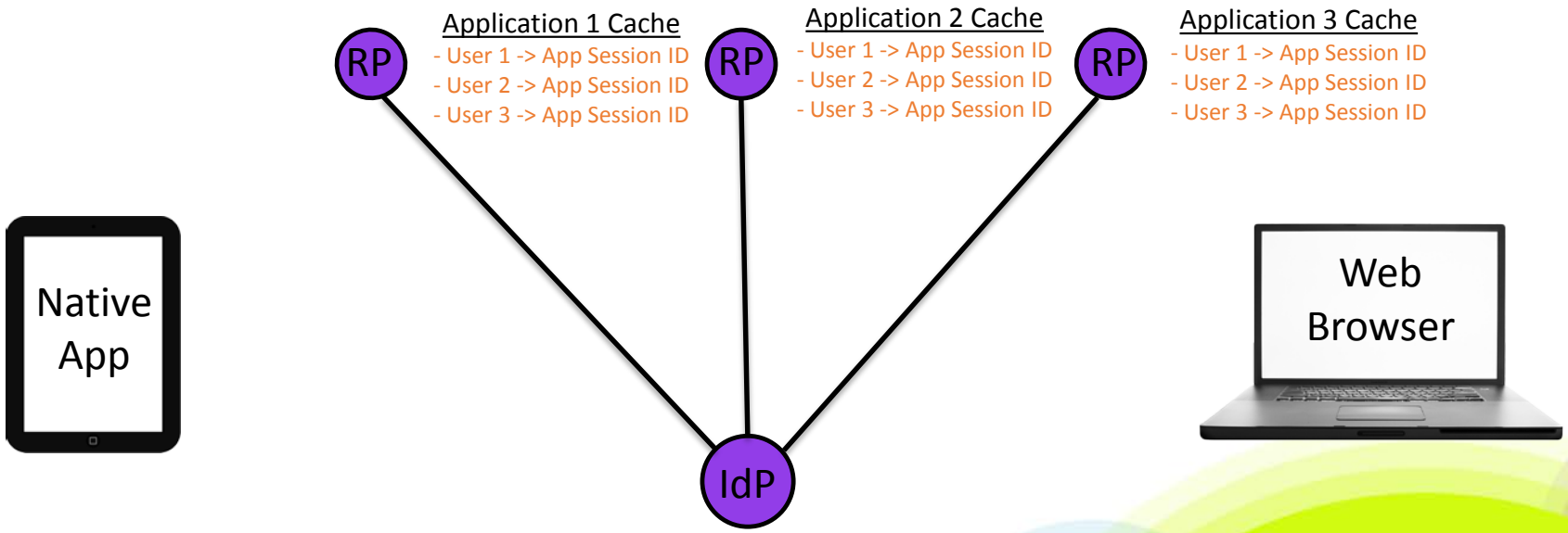
- No guarantees
- Unknown state



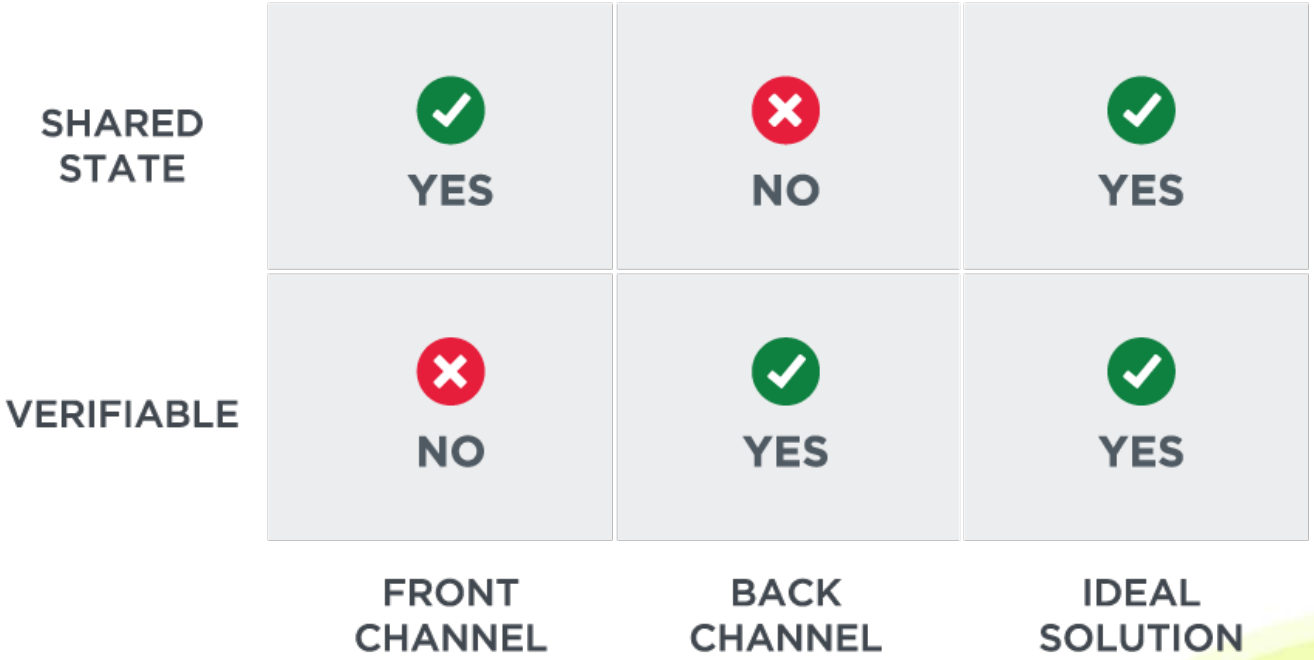
Back Channel Solutions

Direct API: IdP → RP

Problem: Correlating users with application sessions

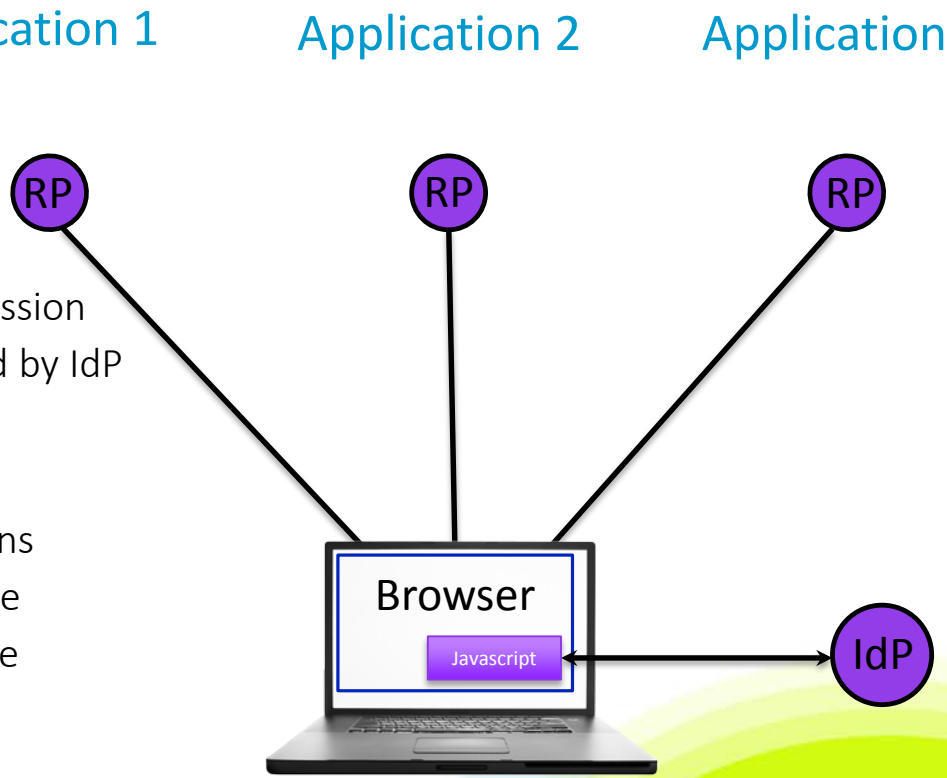


The Ideal Solution



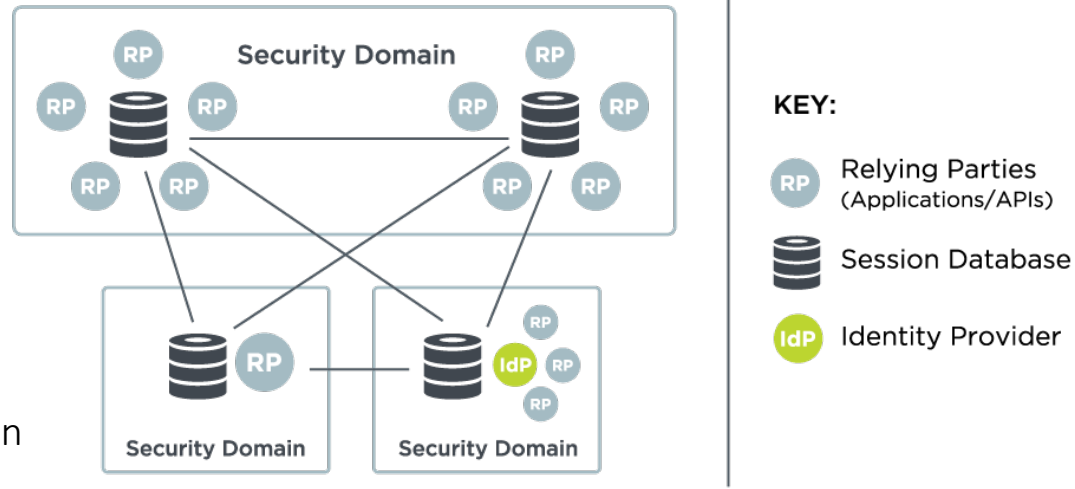
IDP Polling (One proposal for OIDC)

- JS Session Management Client
  - IdP loads JS for each application
  - JS polls IdP to check status of authN session
  - Access Token only available if approved by IdP
- Problems
  - Only works with single-page applications
  - IdP must be able to scale polling service
  - IdP must ensure polling service is active
    - When not active, allow / deny access?



Distributed Session Management

- Advantages
  - Independent of identity protocol
  - Independent of client type
  - Status lookups are local
    - No additional load on IdP
- Disadvantages
  - Additional bandwidth needed to replicate session transactions
  - RPs must add check of local session database to workflow



Advanced Features

- Session Extension
- Session Suspension
- Fine-grained, Dynamic Attributes
  - Level of Assurance
- Continuous Authentication
  - Clients and Applications can pass signals to risk engine
  - “Kill Switch” needed for infinite sessions

Continuous Authentication = Logout By Exception

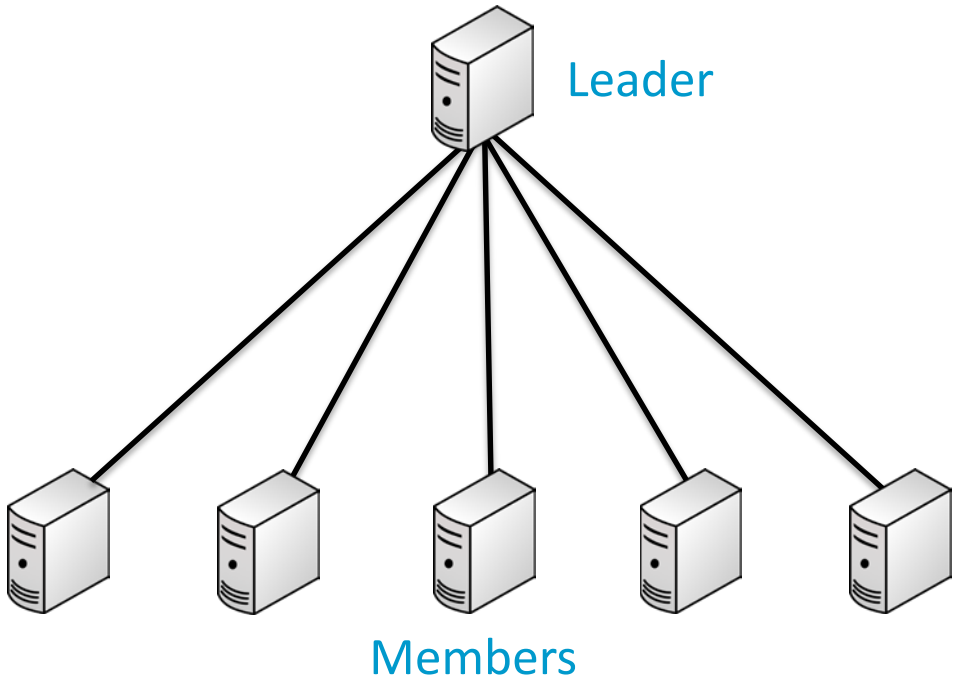
Use Case Requirements

- Fine-grained, trusted consensus timestamps
  - Cryptographic Proof of Receipt
  - Cryptographic Proof of Transmission
- Resilience to DoS attacks
- Immutable record for audit
- High throughput (transactions per second)
- High availability (no single point of failure)
- Low computation cost
- Scalable to large numbers of network members

Choosing a Consensus Algorithm

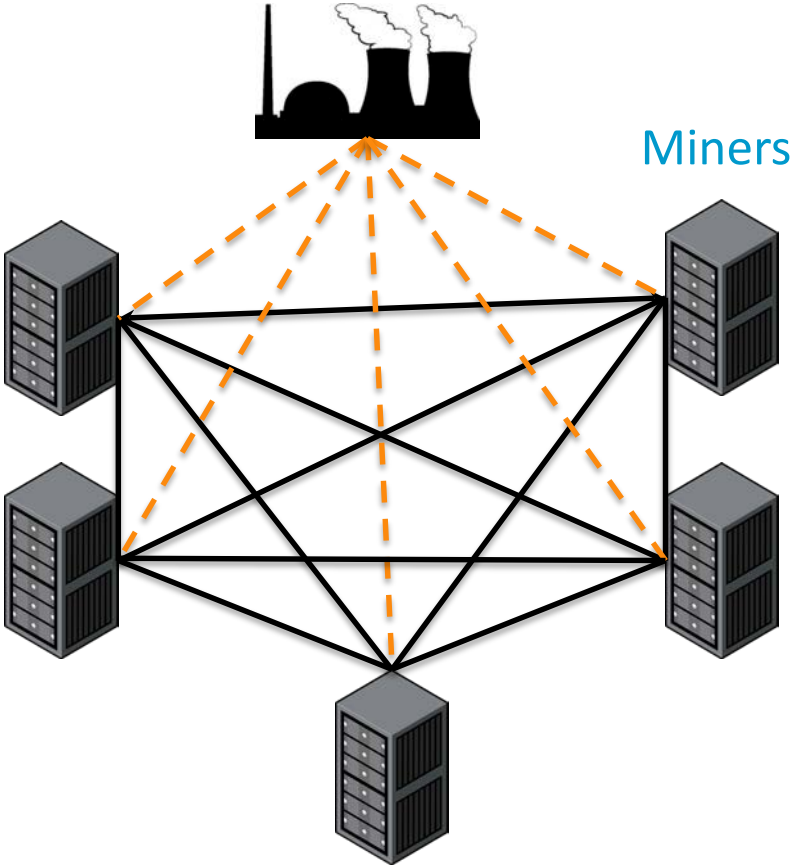
- Categories of distributed consensus algorithms:
  - Leader-based Systems
    - PBFT, Paxos, RAFT, TenderMint
    - Non-Proof of Work Blockchain
  - Proof of Work Blockchain
    - Bitcoin, Ethereum
  - Hashgraph

Leader-based Consensus



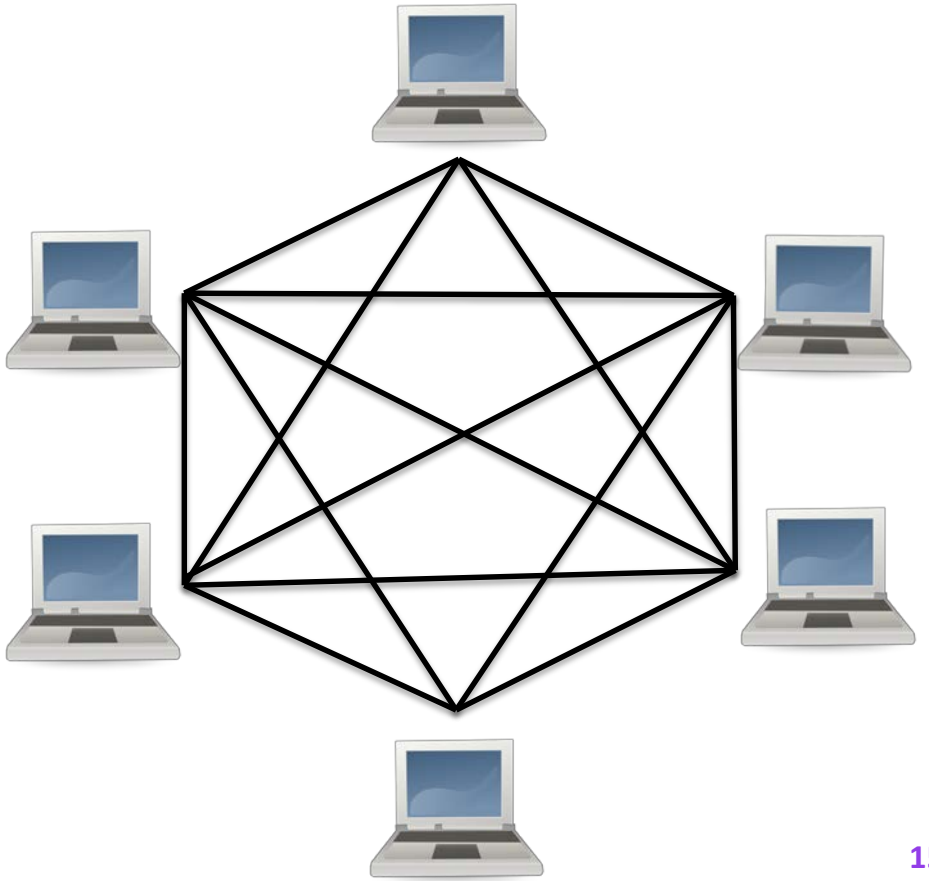
- Many variations
  - Includes Non-PoW Blockchain
- Advantages
  - Low computation requirements
  - Proof of Transmission
  - Immutable Audit
  - High Throughput
    - 1000s of tps, seconds latency
  - High Availability
- Disadvantages
  - Designed for ‘fault’ tolerance, not ‘attack’ tolerance
  - Susceptible to DoS attacks
  - No proof of receipt
  - No consensus timestamps
  - Moderate Scalability
    - Max Nodes: ~100

Proof of Work Blockchain



- Advantages
  - Proof of Transmission
  - DoS Resistance
  - Immutable audit trail
  - High throughput possible
  - High availability
  - Scalability
- Disadvantages
  - High computation requirements
  - Coarse-grained timestamps
  - No proof of receipt

Hashgraph Consensus



- Satisfies all requirements
  - Consensus Timestamps
  - Proof of Receipt
  - Proof of Transmission
  - DoS Resistance (Gossip Protocol)
  - Immutable Audit
  - High Throughput (>400,000 tps)
  - High Availability
  - Low computation (No PoW)
  - Scalable (1000 nodes)

Summary: Analysis of Requirements

	Server	Leader	PoW Blockchain	Hashgraph
Consensus Timestamps	✗	✗	✗	✓
Proof of Receipt	✗	✗	✗	✓
Proof of Transmission	✓	✓	✓	✓
DoS Resistant	✗	✗	✓	✓
Immutable Audit	✗	✓	✓	✓
Throughput	✓	✓	✓	✓
Fault Resistant	✗	✓	✓	✓
Computation Cost	✓	✓	✗	✓
Scalable	✓	✗ ✓	✓	✓

Summary

- A distributed session database moves complexity to a layer below identity protocols
- A mechanism for shared state opens opportunities beyond session logout
- Ping Identity proposed DSM to OIDF last year
- Open Source implementation of DSM to be released soon; DSM protocol continues to evolve
- When choosing consensus algorithm, start with application requirements, and plan for feature creep

Resources

- Contact Info: Mance@Swirlds.com
- DSM Software Download: dwaite@pingidentity.com
- Blog: Choosing a consensus algorithm
  - www.linkedin.com/in/manceharmon
- www.PingIdentity.com
- www.Swirlds.com