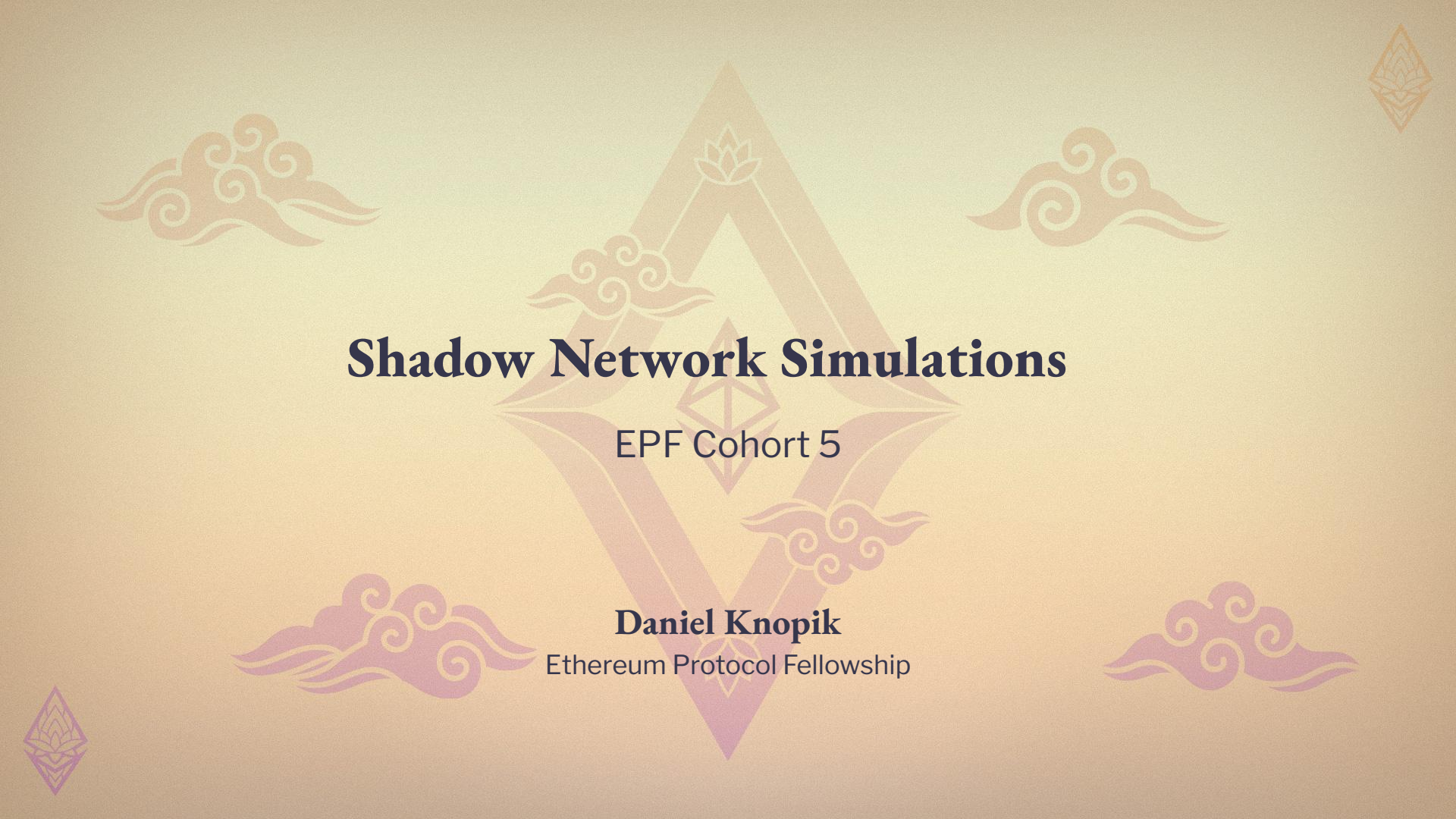


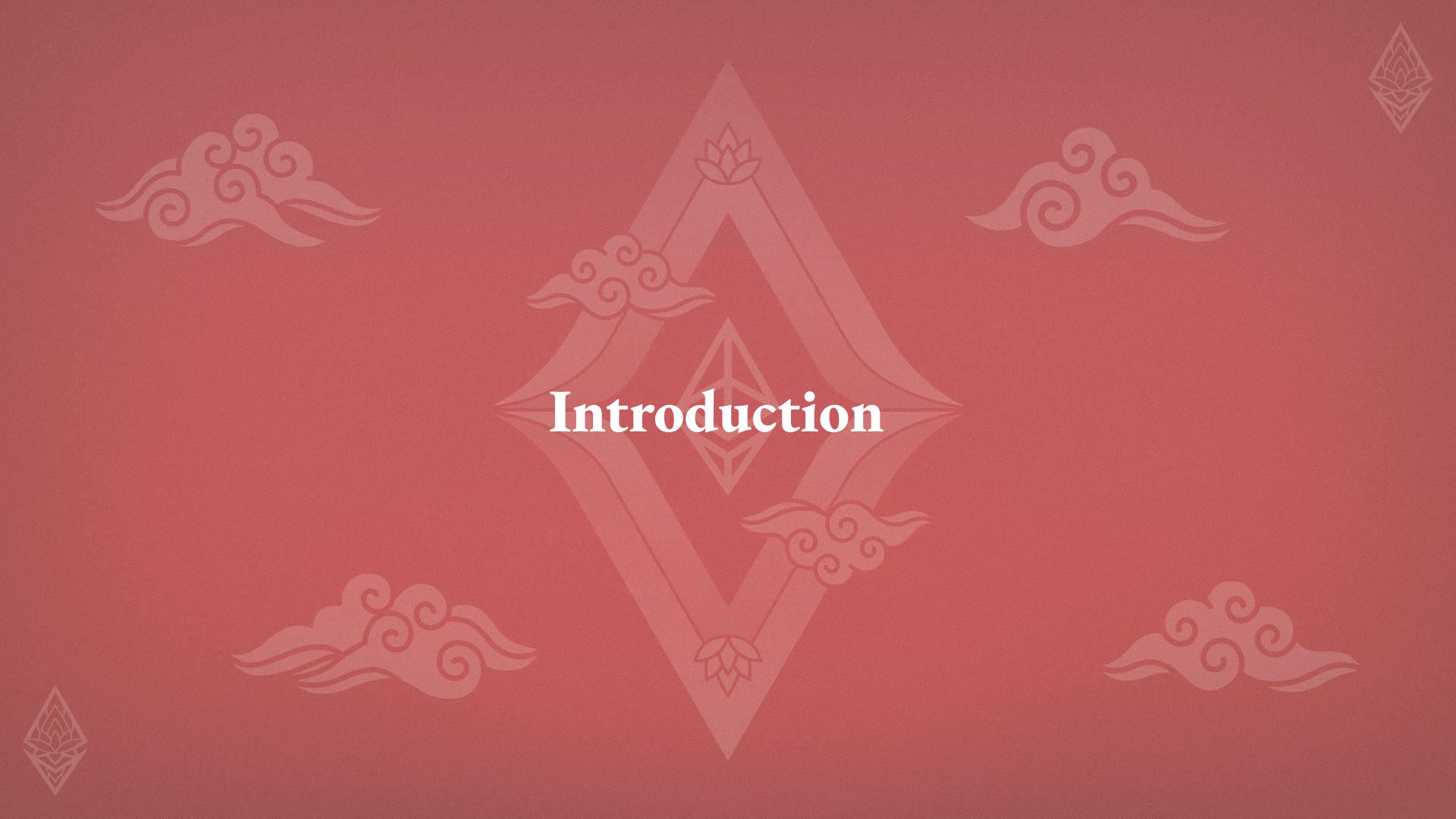


Shadow Network Simulations

EPF Cohort 5

Daniel Knopik

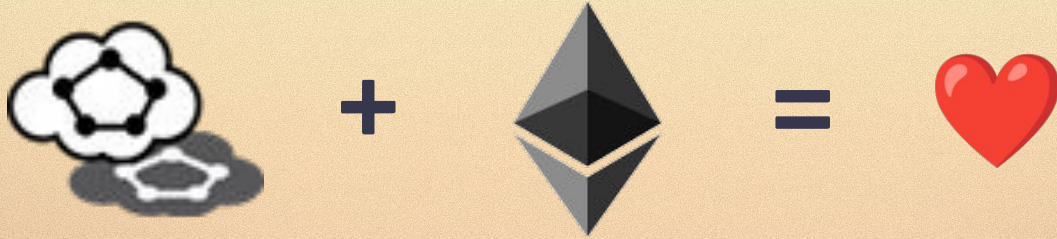
Ethereum Protocol Fellowship



Introduction

Network Simulations are awesome!

- We can test changes quickly without rolling out devnets
- With Shadow, we can run huge simulations - **with actual clients**



Project phases



Phase 1



Prepare a tool to easily
setup Shadow
simulations with
Ethereum clients

Phase 2



Run experiments on
PeerDAS and
IDONTWANT

Phase 3



Polish the tool for public
use - **Ethshadow** is born!





PeerDAS



PeerDAS

- Upcoming update to scale blobs .oO
 - Split blobs into parts called columns, with every node taking custody for some column
 - Heavy network changes required!
 - Currently, 128 additional subnets in Gossipsub
-
- Run simulations to help the R&D effort!
 - All results represent the state of PeerDAS 2-3 months ago





Simulation setup

- 1000 nodes
 - Reth, Lighthouse, and Lighthouse VC on each
 - 4000 validators
 - 45 minutes simulated time
-
- For fast simulations, we run on large servers
 - 1TB memory **minimum**
 - Experimented with different AWS and Azure instance types to keep costs low
 - Settled on r6i.32xlarge instances: 128 cores, 1TB memory
 - With Spot instance pricing and ~4h of simulation time, cost per simulation run is ~\$10





PeerDAS problems

- Simulated networks quickly fall apart as nodes lose sync, and can't sync again
- Similar to what was seen on the devnets at the time
- Score: how long can >66% of the network stay in sync
- The unmodified client with default configuration scored **0**
- A simulation where all nodes were supernodes stayed stable until the end 🤔
- Problem is that nodes could not send all data columns, causing some columns to get lost forever, causing nodes custodying those columns to lose sync





Attempted solutions

- We need our peers to cover all subnets so that we can get all columns out
- Increase number of peers
- Base Spec: 100
- 150 scored **10**
- 200 scored **56**
- 300 survived the whole simulation





Attempted solutions

- We need our peers to cover all subnets so that we can get all columns out

- | | |
|---|--|
| <ul style="list-style-type: none">• Increase number of peers• Base Spec: 100• 150 scored 10• 200 scored 56• 300 survived the whole simulation | <ul style="list-style-type: none">• Increase number of columns covered per peer• Base Spec: 4• 8 scored 10• 16 survived the whole simulation |
|---|--|





Attempted solutions

- We need our peers to cover all subnets so that we can get all columns out

- Increase number of peers
- Base Spec: 100
- 150 scored **10**
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- 300 survived the whole simulation



- Increase number of columns covered per peer
- Base Spec: 4
- 8 scored **10**
- 16 survived the whole simulation



- Increase number of supernodes (covering all columns)
- Increase to 10: scored **0**
- Increase to 25: scored **2**
- Increase to 75: scored **2**





State of Ethshadow

State of Ethshadow

- Source available on Github: <https://github.com/ethereum/ethshadow> ->
- Supports Geth and Lighthouse
- Experimental support for Reth and Teku
- Some documentation left to be written
- Usability improvements
- Shadow needs a lot of work for all clients to work





Thank you!



My mentors:

Adrian Manning, Sigma Prime
Pop, Ethereum Foundation

Support from:

João Oliveira, Sigma Prime
Jimmy Chen, Sigma Prime
Anton Nashatyrev, Consensys

EPF Organization:

Mario Havel
Josh Davis

The Ethereum Foundation

and all fellows!

Thank you!

Tomorrow's talk, an introduction to Ethshadow itself:



“Simulating an Ethereum network at scale” - on Stage 1 at 1:10 PM - together with Pop

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Ethereum Protocol Fellowship

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