zk-SNARK

Distributed Lab

Sep 5, 2024

Plan

1. What the zk-SNARK is?

What the zk-SNARK is?

What the zk-SNARK is?

Definition

zk-SNARK – Zero-Knowledge Succinct Non-interactive ARgument of Knowledge.

What the zk-SNARK is?

Definition

zk-SNARK – Zero-Knowledge Succinct Non-interactive ARgument of Knowledge.

- **Argument of Knowledge** - a proof that the prover know data that resolves a certain problem, and this knowledge can be verified.

What the zk-SNARK is?

Definition

zk-SNARK – Zero-Knowledge Succinct Non-interactive ARgument of Knowledge.

- **Argument of Knowledge** - a proof that the prover know data that resolves a certain problem, and this knowledge can be verified.
- **Succinct** - the proof size is relatively small and does not depend on the size of the data or statement.

What the zk-SNARK is?

Definition

zk-SNARK – Zero-Knowledge Succinct Non-interactive ARgument of Knowledge.

- **Argument of Knowledge** - a proof that the prover know data that resolves a certain problem, and this knowledge can be verified.
- **Succinct** - the proof size is relatively small and does not depend on the size of the data or statement.
- **Non-interactive** - to produce the proof, the prover does not need any interaction with the verifier.

What the zk-SNARK is?

Definition

zk-SNARK – Zero-Knowledge Succinct Non-interactive ARgument of Knowledge.

- **Argument of Knowledge** - a proof that the prover know data that resolves a certain problem, and this knowledge can be verified.
- **Succinct** - the proof size is relatively small and does not depend on the size of the data or statement.
- **Non-interactive** - to produce the proof, the prover does not need any interaction with the verifier.
- **Zero-Knowledge** - the verifier learns nothing about the data used to produce the proof, despite knowing that this data resolves the given problem and that the prover possesses it.

Still didn't get who is Snark...

Well... Let's take a look at some example.

Still didn't get who is Snark...

Well... Let's take a look at some example.

Imagine you're part of a treasure hunt...

Still didn't get who is Snark...

Well... Let's take a look at some example.

Imagine you're part of a treasure hunt...

...and you've found a hidden treasure chest...

Still didn't get who is Snark...

Well... Let's take a look at some example.

Imagine you're part of a treasure hunt...

...and you've found a hidden treasure chest...

...but how to prove that without revealing the chest location?

Still didn't get who is Snark...

The Problem: you have found a hidden treasure chest, and you want to prove to the organizer that you know its location without actually revealing that.

Still didn't get who is Snark...

The Problem: you have found a hidden treasure chest, and you want to prove to the organizer that you know its location without actually revealing that.

We can retrieve some information from that:

Question #95643

What is a secret data? Who is a prover and who is a verifier?

Still didn't get who is Snark...

The Problem: you have found a hidden treasure chest, and you want to prove to the organizer that you know its location without actually revealing that.

We can retrieve some information from that:

Question #95643

What is a secret data? Who is a prover and who is a verifier?

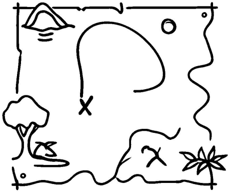
The Secret Data: the exact treasure location.

The Prover: you.

The Verifier: the treasure hunt organizer.

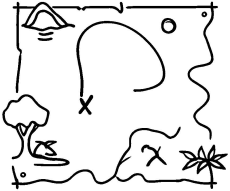
Still didn't get who is Snark...

The Problem: you have found a hidden treasure chest, and you want to prove to the organizer that you know its location without actually revealing that.



Still didn’t get who is Snark...

The Problem: you have found a hidden treasure chest, and you want to prove to the organizer that you know its location without actually revealing that.



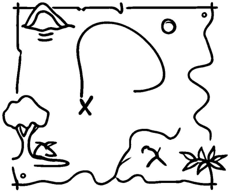
We can retrieve some information from that:

Question #81673

What is a secret data? Who is a prover and who is a verifier?

Still didn't get who is Snark...

The Problem: you have found a hidden treasure chest, and you want to prove to the organizer that you know its location without actually revealing that.



We can retrieve some information from that:

Question #81673

What is a secret data? Who is a prover and who is a verifier?

The Secret Data: the exact treasure location.

The Prover: you.

The Verifier: the treasure hunt organizer.

Ohh... Got it!

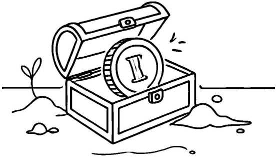
Here is how we can apply the zk-SNARK to our problem:

- Argument of Knowledge: You need to create a proof that demonstrates you know the chest is.
- Succinct: The proof you provide is very small and concise. It doesn't matter how large the treasure map is or how many steps it took you to find the chest.
- Non-interactive: You don't need to have a back-and-forth conversation with the organizer to create this proof.
- Zero-Knowledge: The proof doesn't reveal any information about the actual location of the treasure chest.

Ohh... Got it!

Here is how we can apply the zk-SNARK to our problem:

- Argument of Knowledge: You need to create a proof that demonstrates you know the chest is.
- Succinct: The proof you provide is very small and concise. It doesn't matter how large the treasure map is or how many steps it took you to find the chest.
- Non-interactive: You don't need to have a back-and-forth conversation with the organizer to create this proof.
- Zero-Knowledge: The proof doesn't reveal any information about the actual location of the treasure chest.



Well... The golden coin where the pirates' sign is engraved is our zk-SNARK proof!