

# ***Safe in the Beehive***



Local-First Access Control with E2EE & Capabilities



Safe in the Beehive 

***Brooklyn Zelenka @expede***

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[github.com/expede](https://github.com/expede)  
Vancouver 🇨🇦

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# *Brooklyn Zelenka @expede*

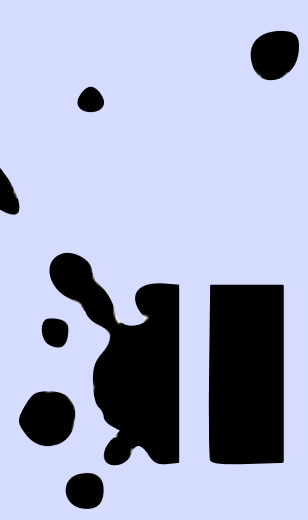
- ◆ Auth team lead at Ink & Switch
- ◆ Work(ed) on related projects:
  - ◆ UCAN (LoFi & P2P access control & RPC)
  - ◆ Webnative File System (E2EE state-based CRDT)
  - ◆ Rhizome DB (E2EE op-based CRDT)
  - ◆ ERC-902 (on-chain access control)



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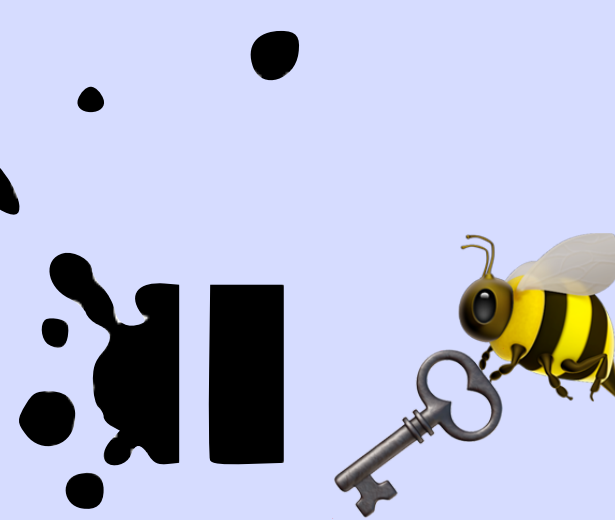
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# ***The Highest of Levels***

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# *The Highest of Levels*

- ◆ Comparable experience to cloud auth, minus the servers
- ◆ "Wikipedia-scale" (100k+ docs, 10k+ E2EE readers, 1k+ writers, 100s admins)
- ◆ Control who can read and write to documents
- ◆ Secure "at level of the FBI, but not necessarily NSA or Mossad"
- ◆ Compatible with swappable/interoperable sync servers
  - ◆ Servers can't read your document (encryption at rest)
  - ◆ ...but still be efficient: support Automerge compaction, fast key agreement, etc

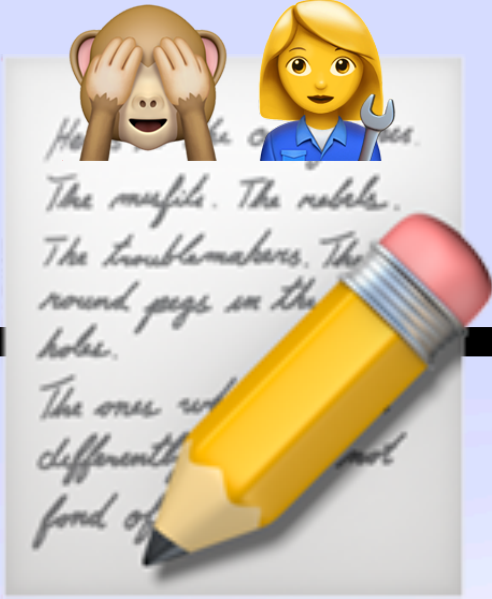


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# ***Cloud Auth Flow***

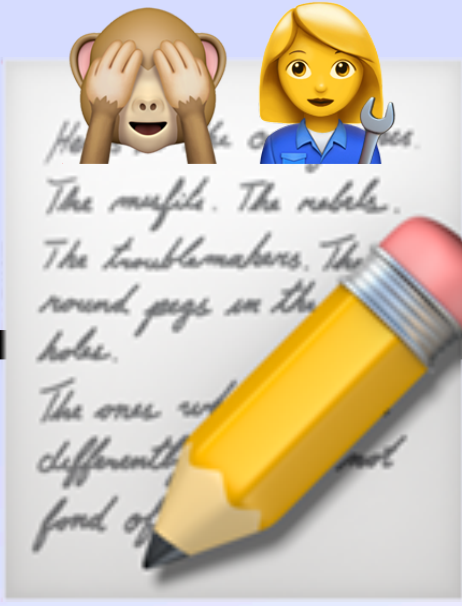
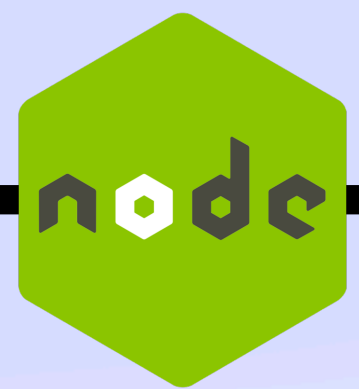
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# Cloud Auth Flow



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# Cloud Auth Flow



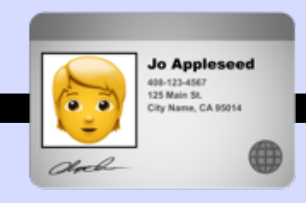
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# *Cloud Auth Flow*



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# Cloud Auth Flow

A purple rounded rectangle containing:

- Top left: A circular logo with 'OAUTH' and a large 'A'.
- Top right: A white button with the Apple logo and the text 'Sign In with Apple'.
- Center: A hand emoji and a soldier emoji.
- Bottom: A blue button with the Google logo and the text 'Sign in with Google'.



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# Cloud Auth Flow



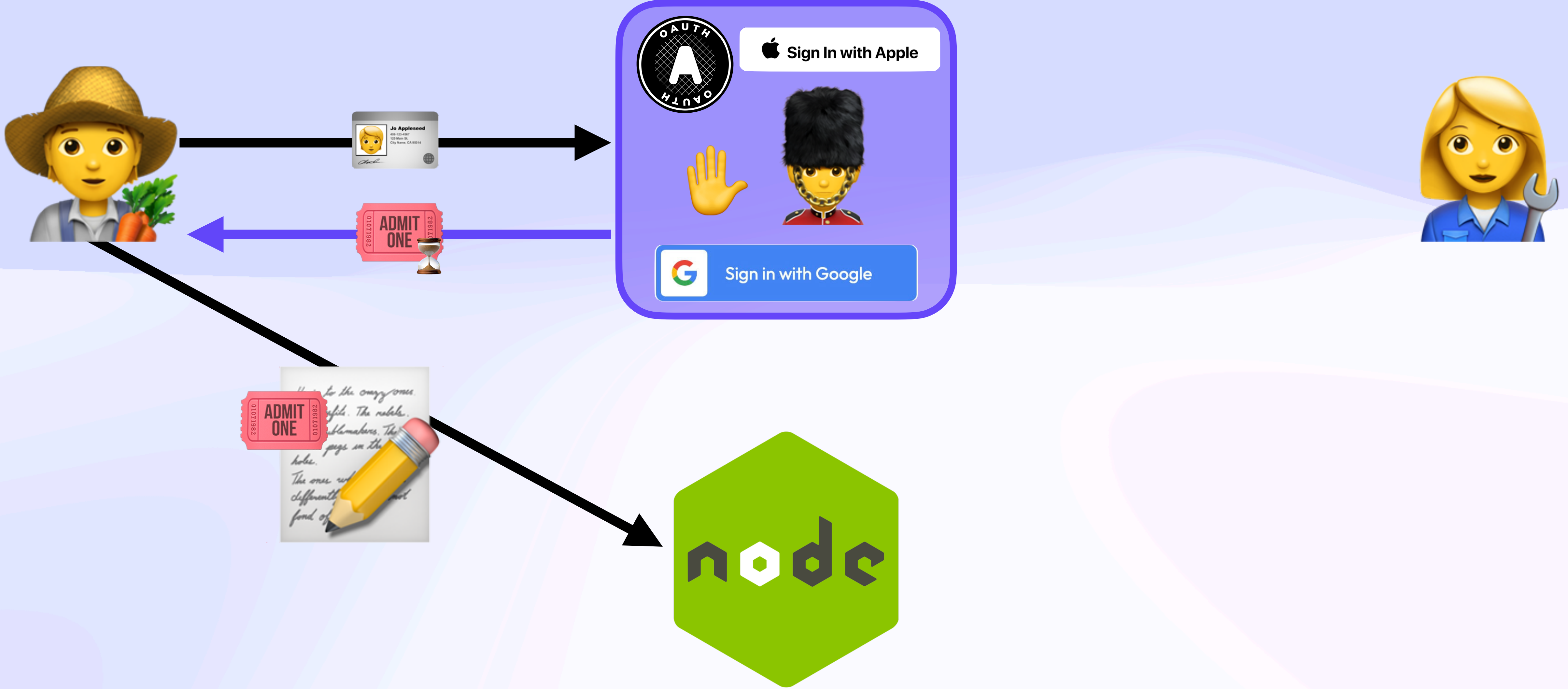
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# Cloud Auth Flow



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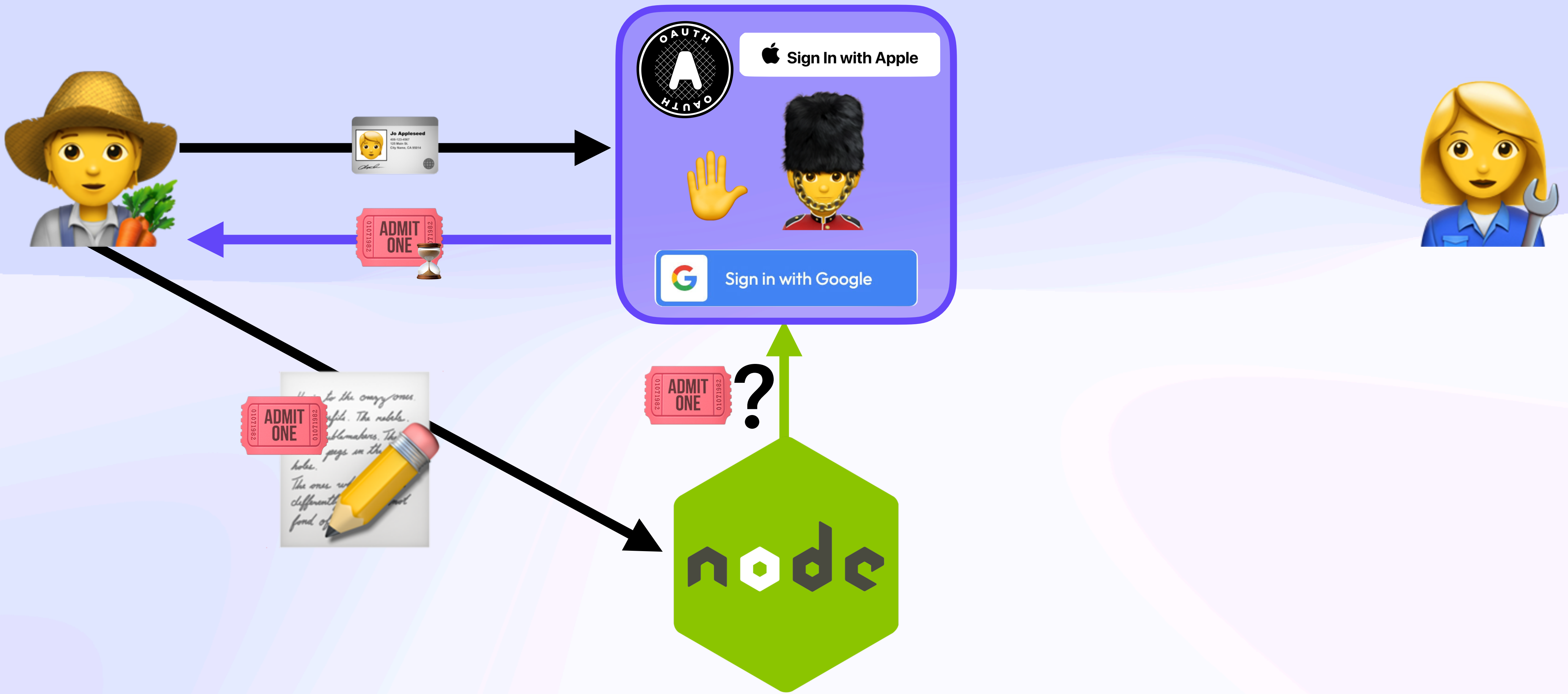
# Cloud Auth Flow





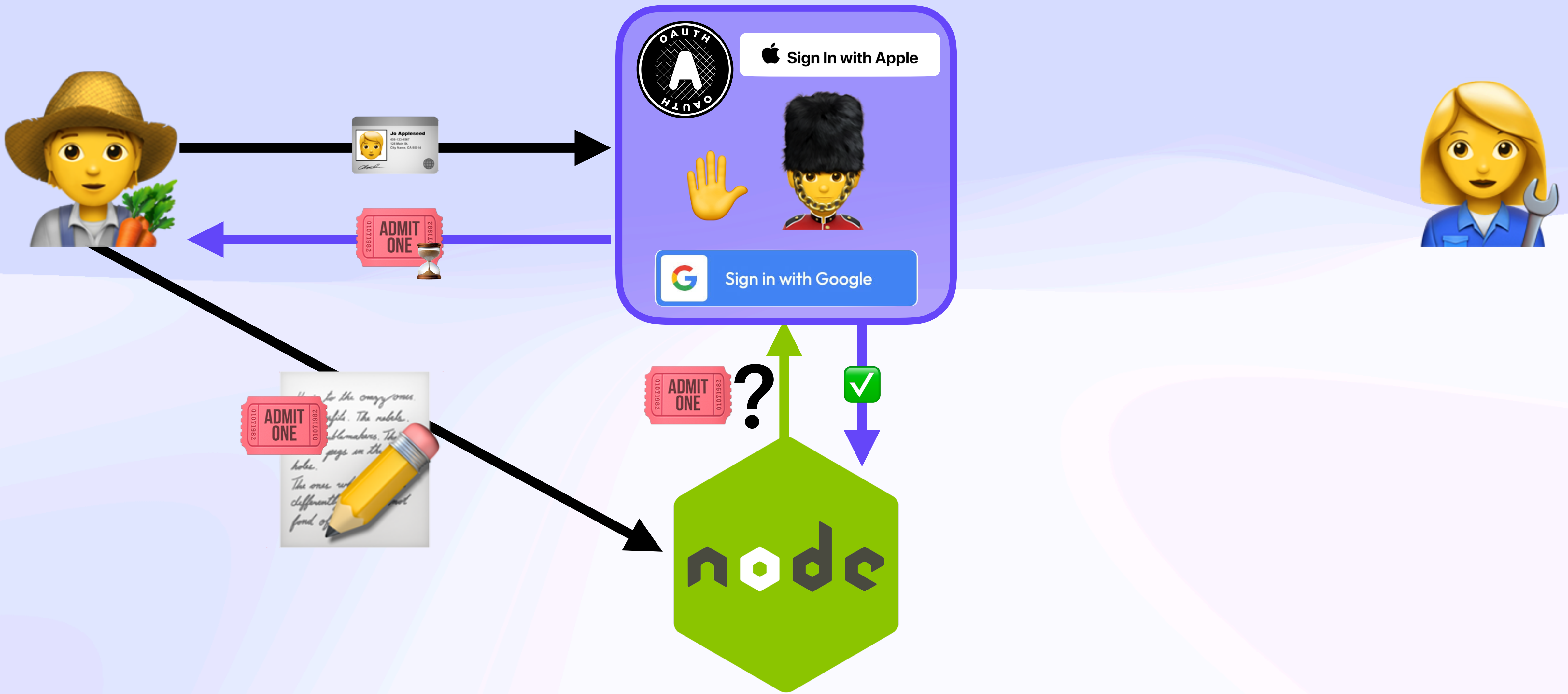
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# Cloud Auth Flow



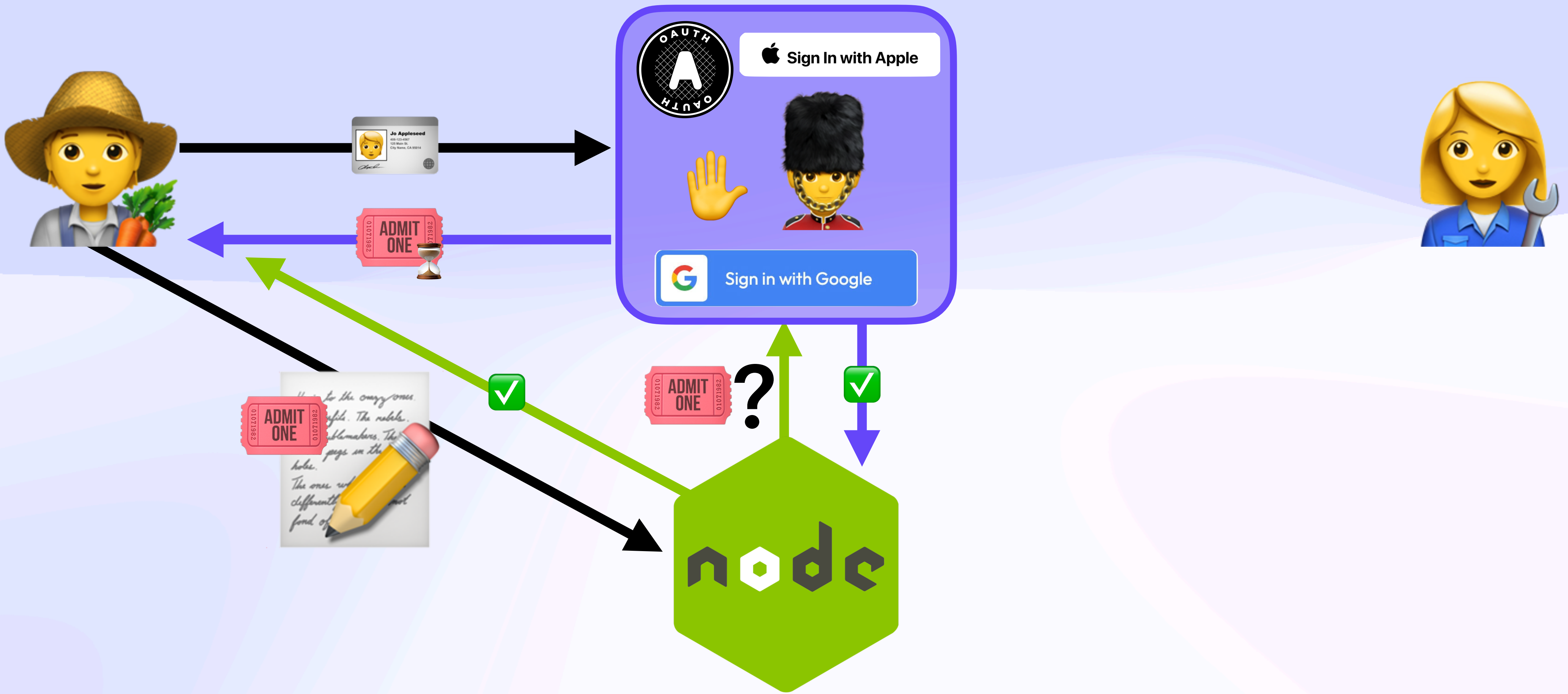
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# Cloud Auth Flow



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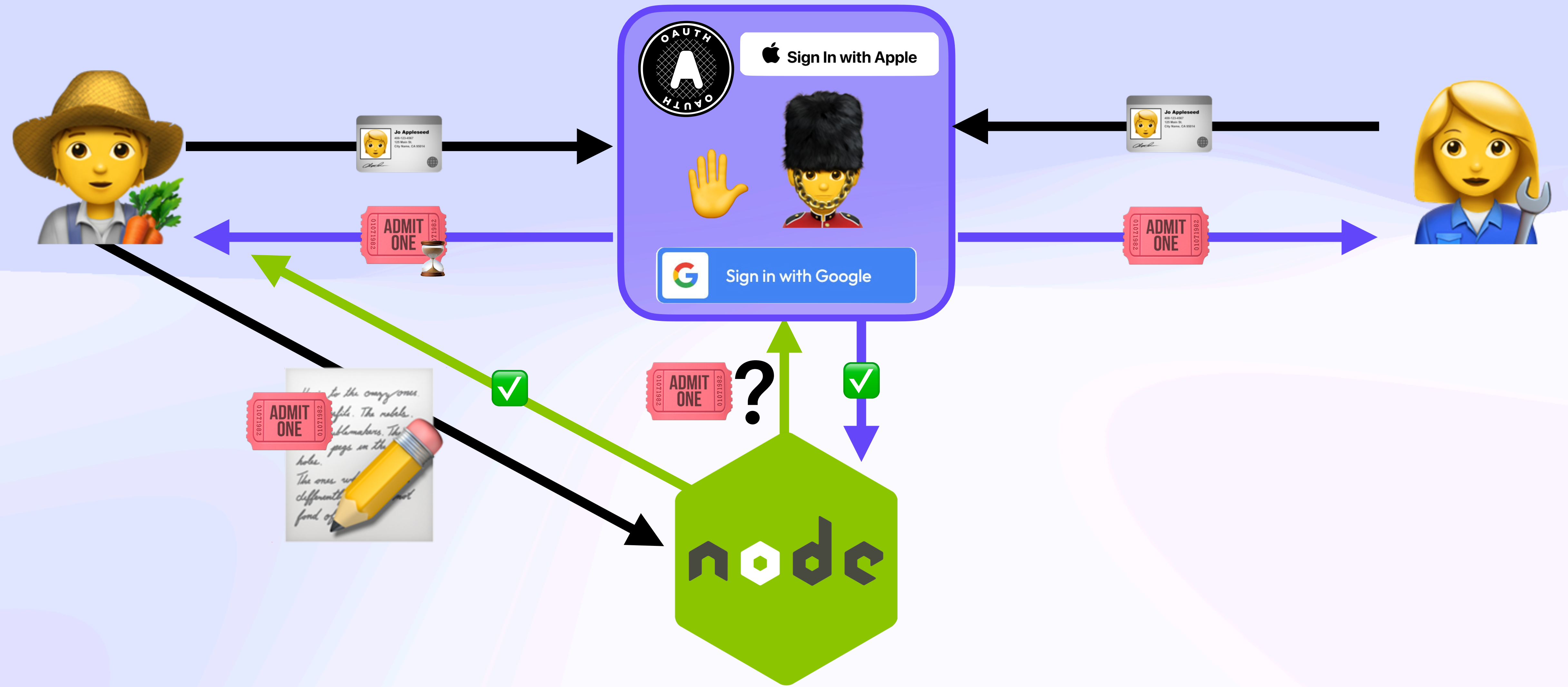
# Cloud Auth Flow





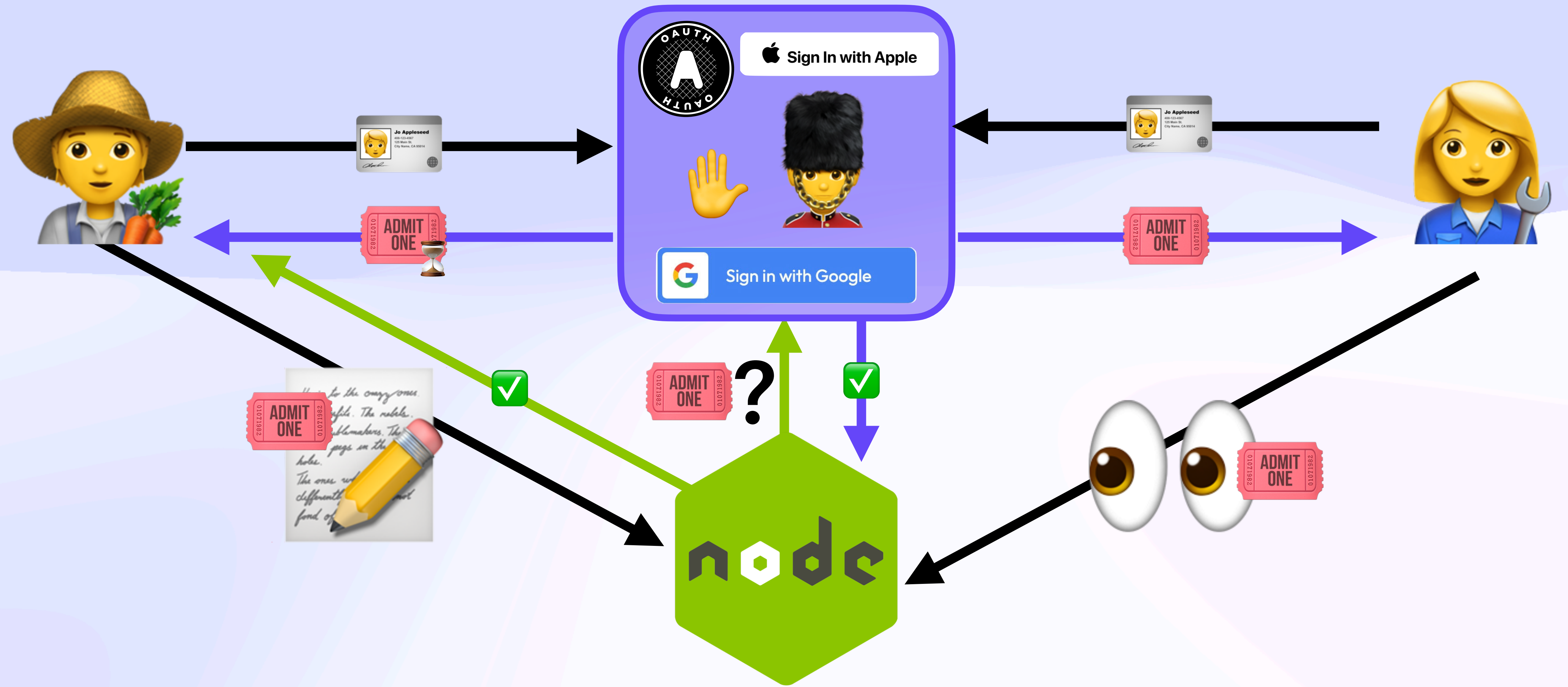
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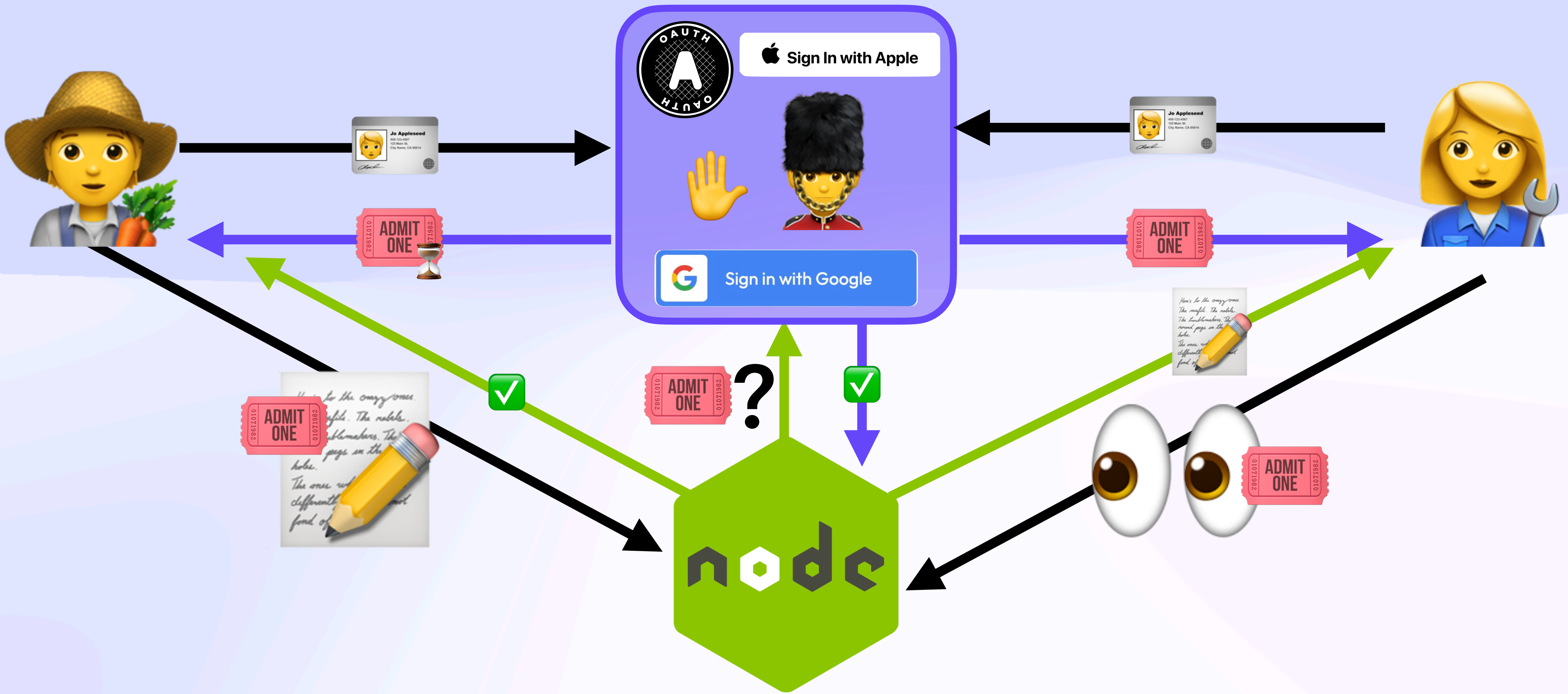
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# Cloud Auth Flow



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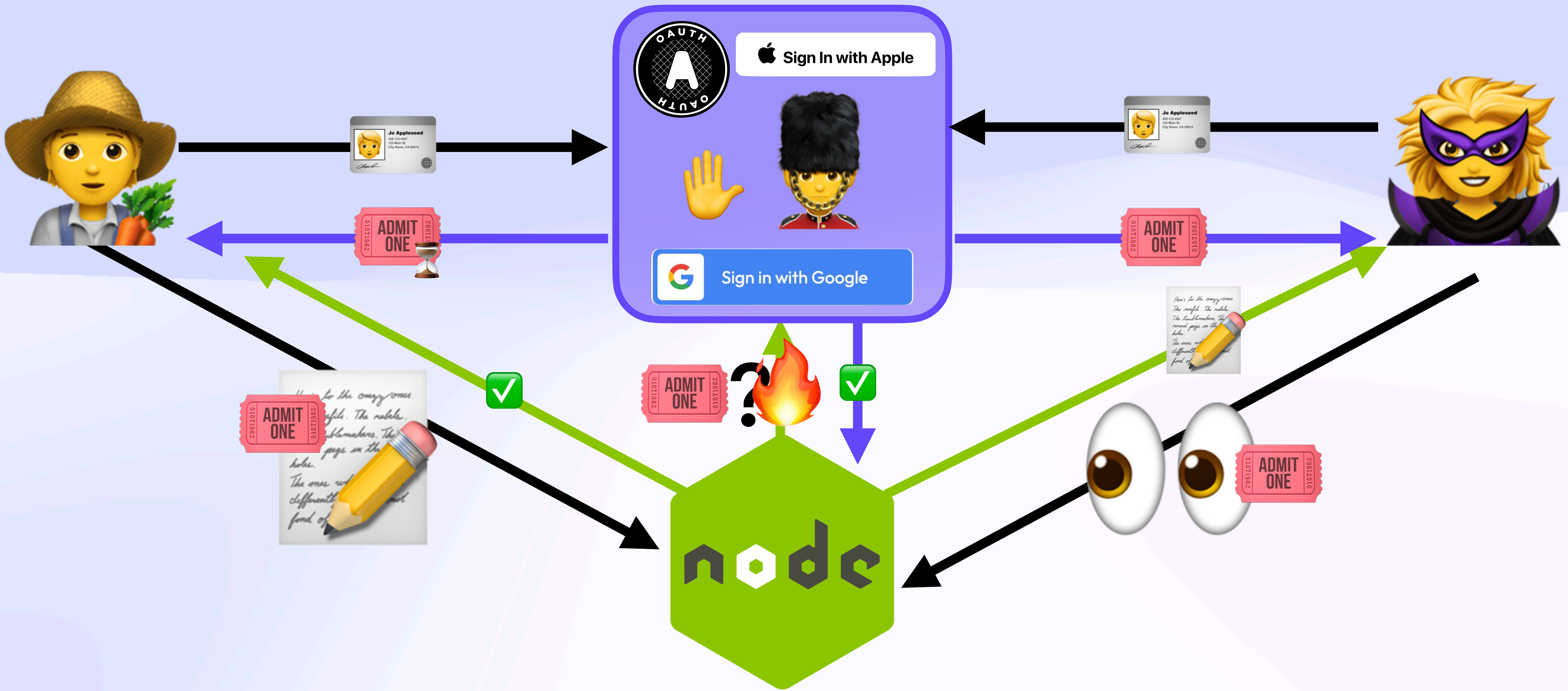






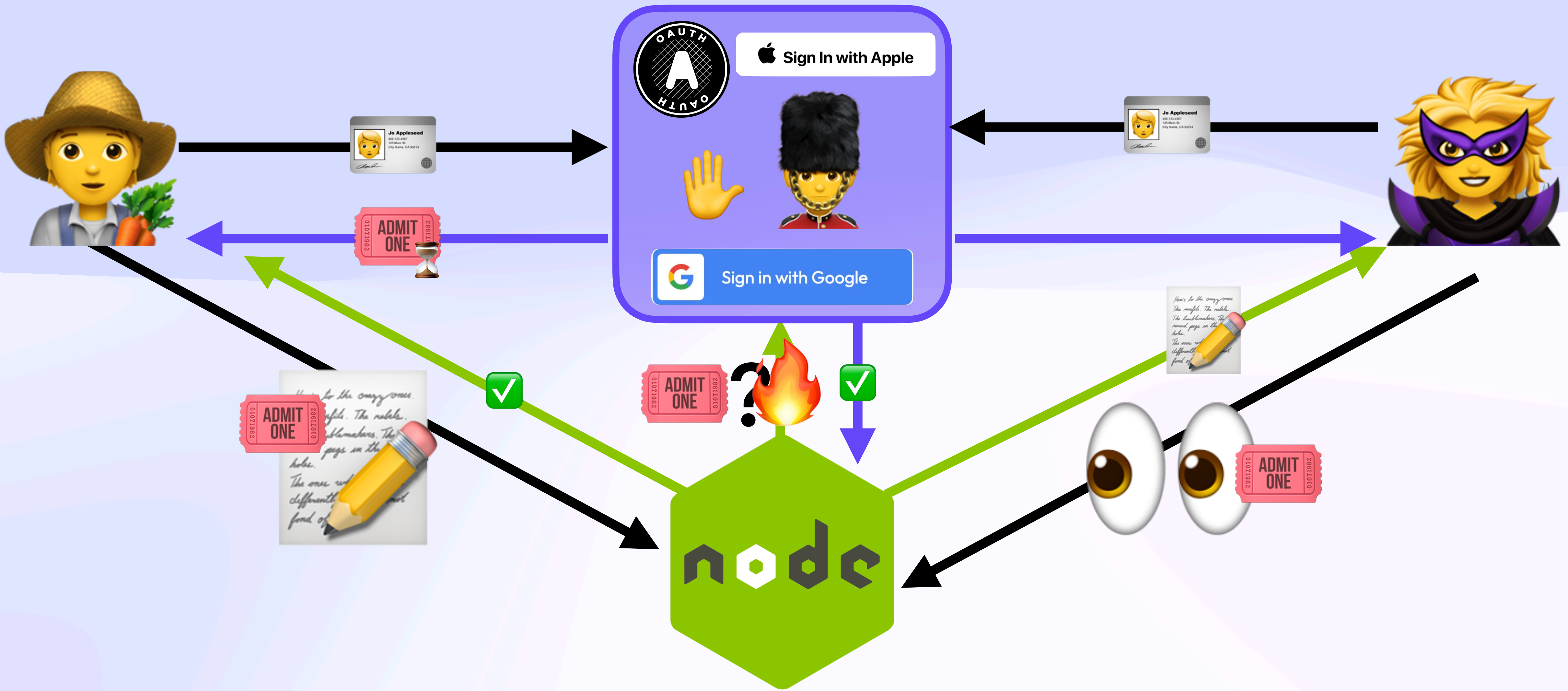
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# Cloud Auth Flow



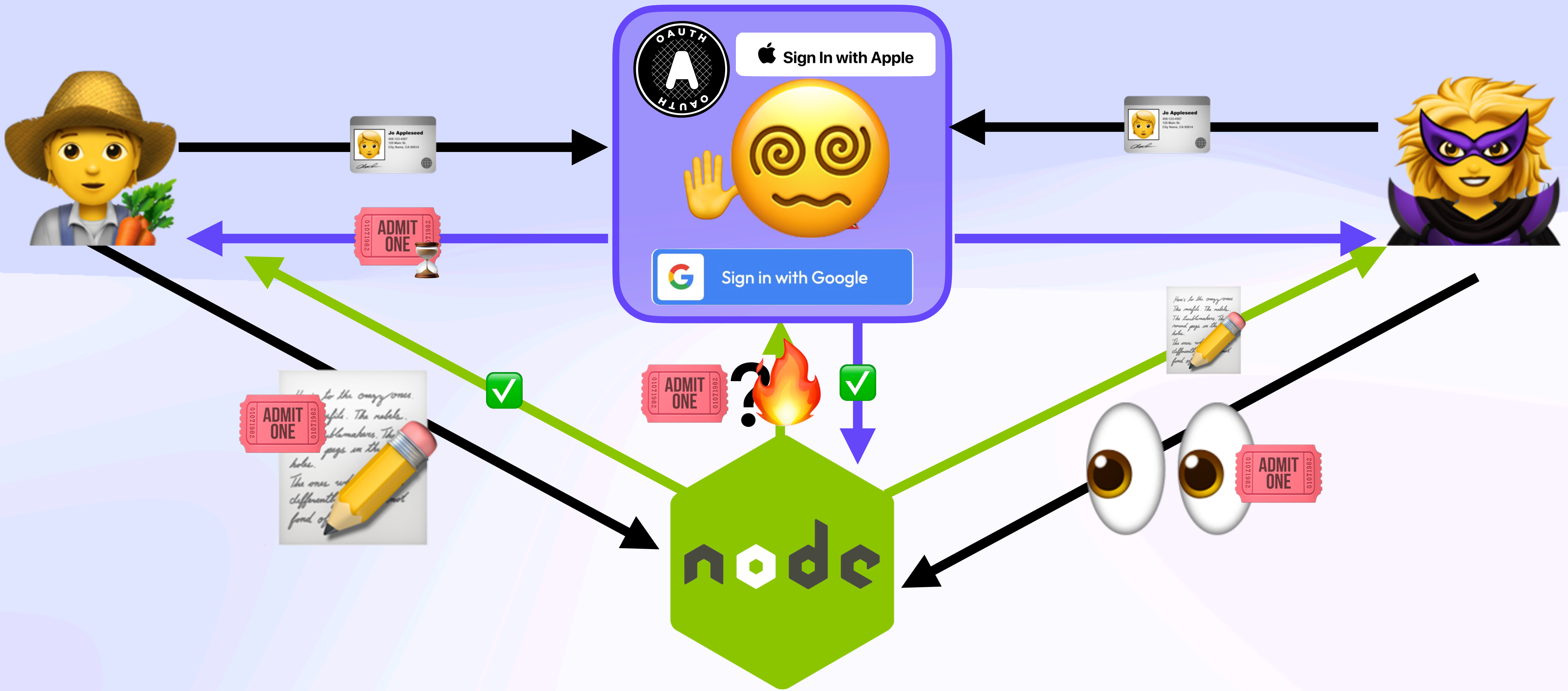
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# Cloud Auth Flow



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# Cloud Auth Flow



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# ***Cloud: Auth-as-Place***

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# Cloud: Auth-as-Place



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# Cloud: Auth-as-Place

"Over Here"



"Over There"



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# Cloud: Auth-as-Place

"Over Here"



"Over There"

A purple rounded rectangle representing the cloud authentication interface. It contains:

- A circular logo with 'A' and 'AUTH'.
- A button: "Sign In with Apple" with the Apple logo.
- A hand emoji and a soldier emoji.
- A button: "Sign in with Google" with the Google logo.

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# ***LoFi in Pictures***



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# LoFi in Pictures



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# LoFi in Pictures



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***Auth as Data: "Auth Must Travel with Data"***



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# **Auth as Data: "Auth Must Travel with Data"**



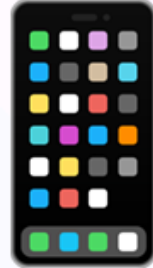
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# **Auth as Data: "Auth Must Travel with Data"**



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# ***Auth as Data: "Auth Must Travel with Data"***



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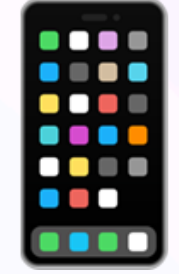
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# **Auth as Data: "Auth Must Travel with Data"**

"Auth Here"  
"Data Here"



"Auth There"  
"Data There"





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# Auth as Data: "Auth Must Travel with Data"

"Auth Here"  
"Data Here"



"Auth There"  
"Data There"



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# Auth as Data: "Auth Must Travel with Data"

"Auth Here"  
"Data Here"



"Auth There"  
"Data There"



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***Cloud***

***Local-First***



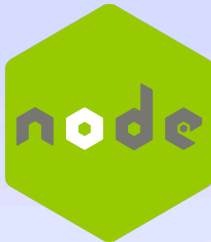
Safe in the Beehive 


# Cloud

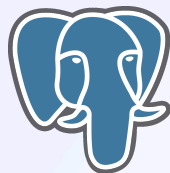
Auth 



Compute 



Data 



# Local-First



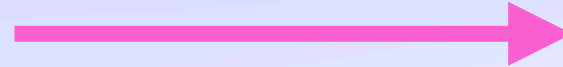
Safe in the Beehive 


# Cloud

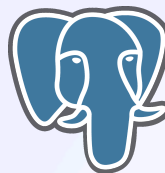
Auth 



Compute 




Data 



# Local-First

Compute 

Data 




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# Cloud


Auth 


Compute 

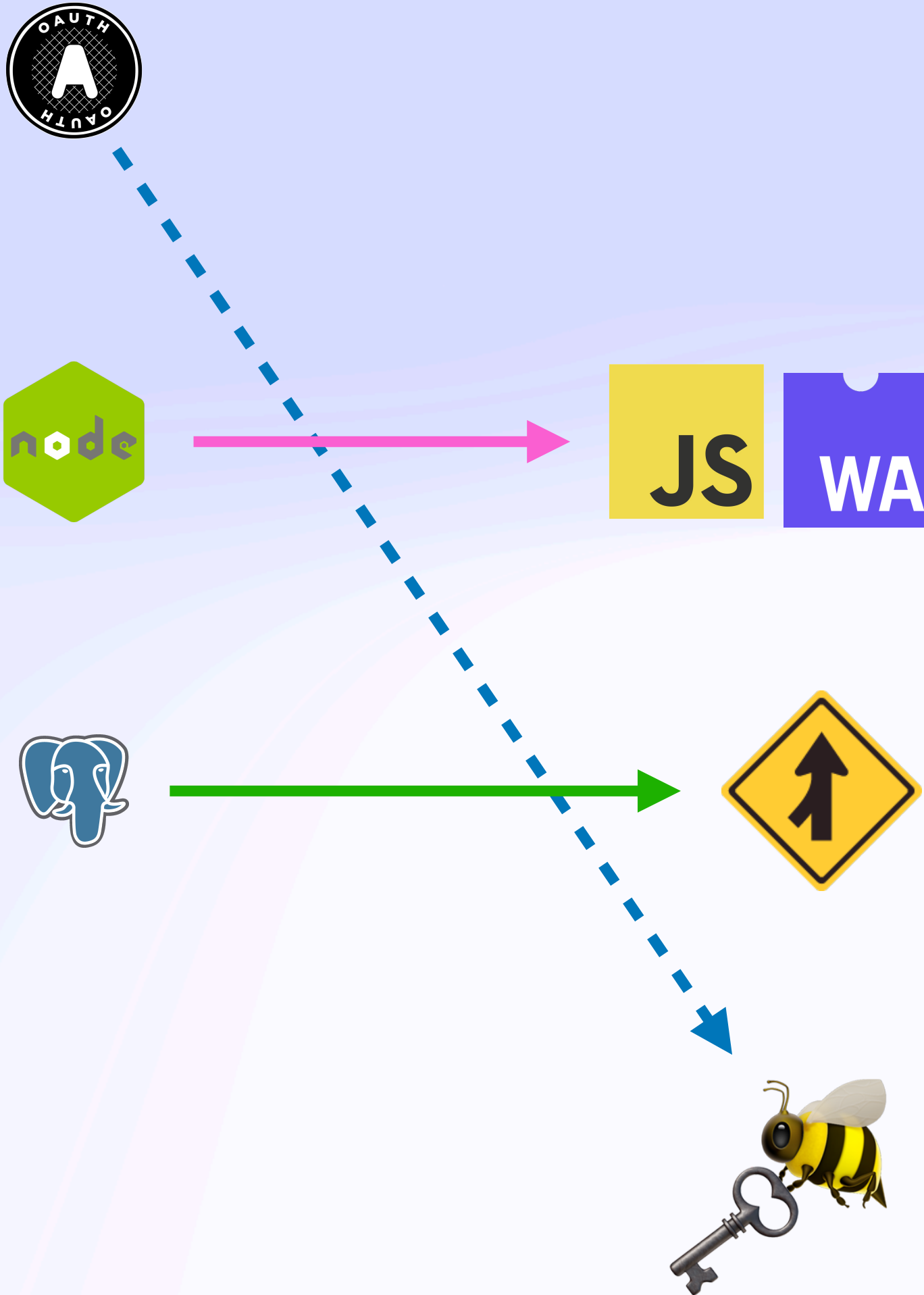
Data 

# Local-First

Compute 

Data 

Auth 



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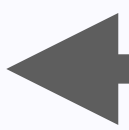
# *Levels*



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# Levels

Copy  
(Request)



# Safe in the Beehive

# Levels

Read  
(Decrypt)



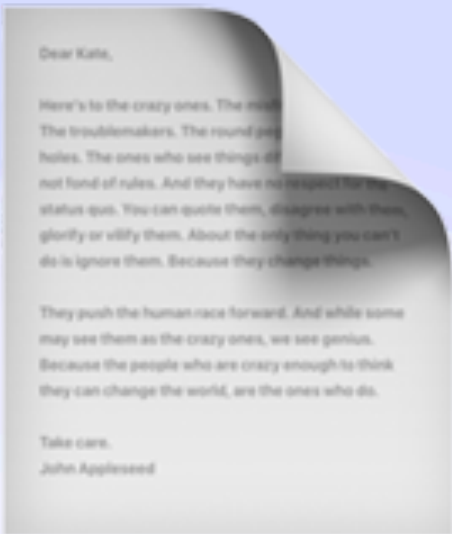
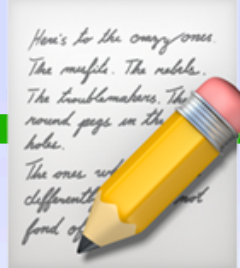
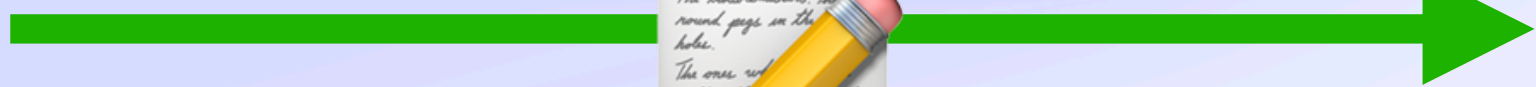
Copy  
(Request)



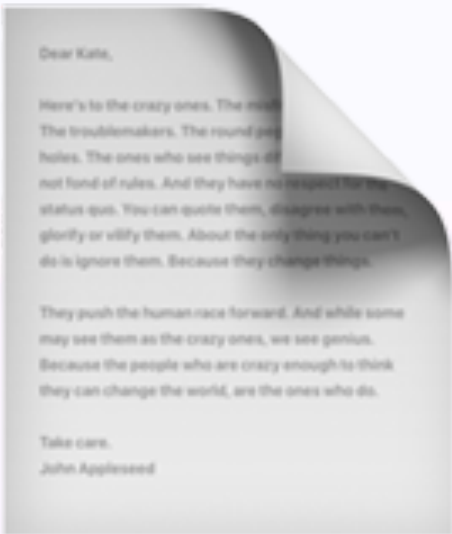
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# Levels

Write  
(Update)



Read  
(Decrypt)



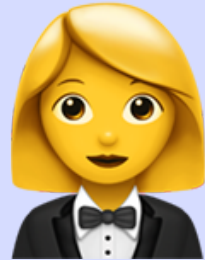
Copy  
(Request)



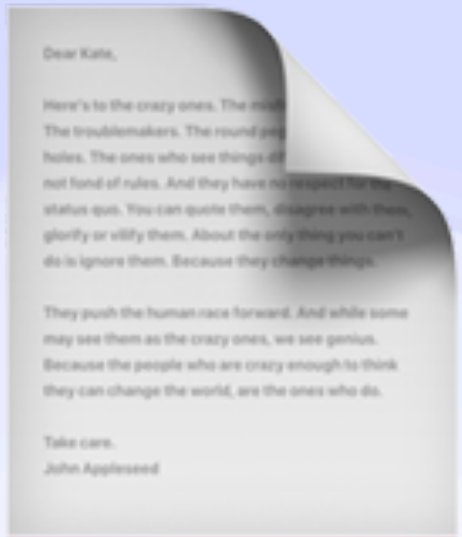
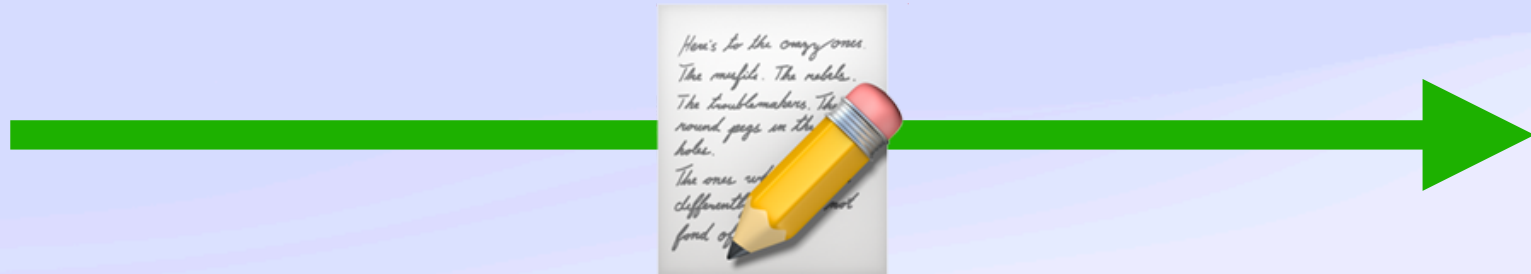
# Safe in the Beehive 🐝

## Levels

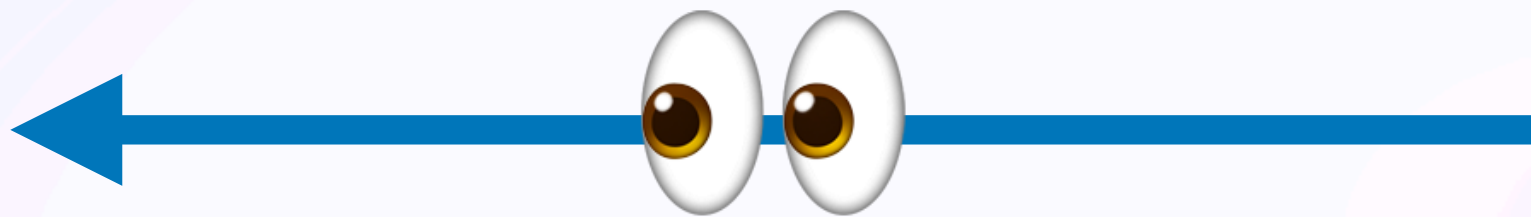
Admin  
(Revoke)



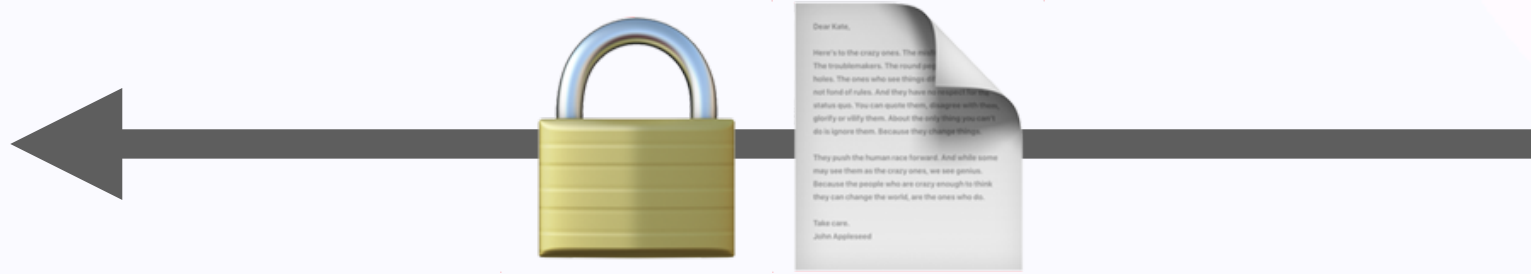
Write  
(Update)



Read  
(Decrypt)



Copy  
(Request)

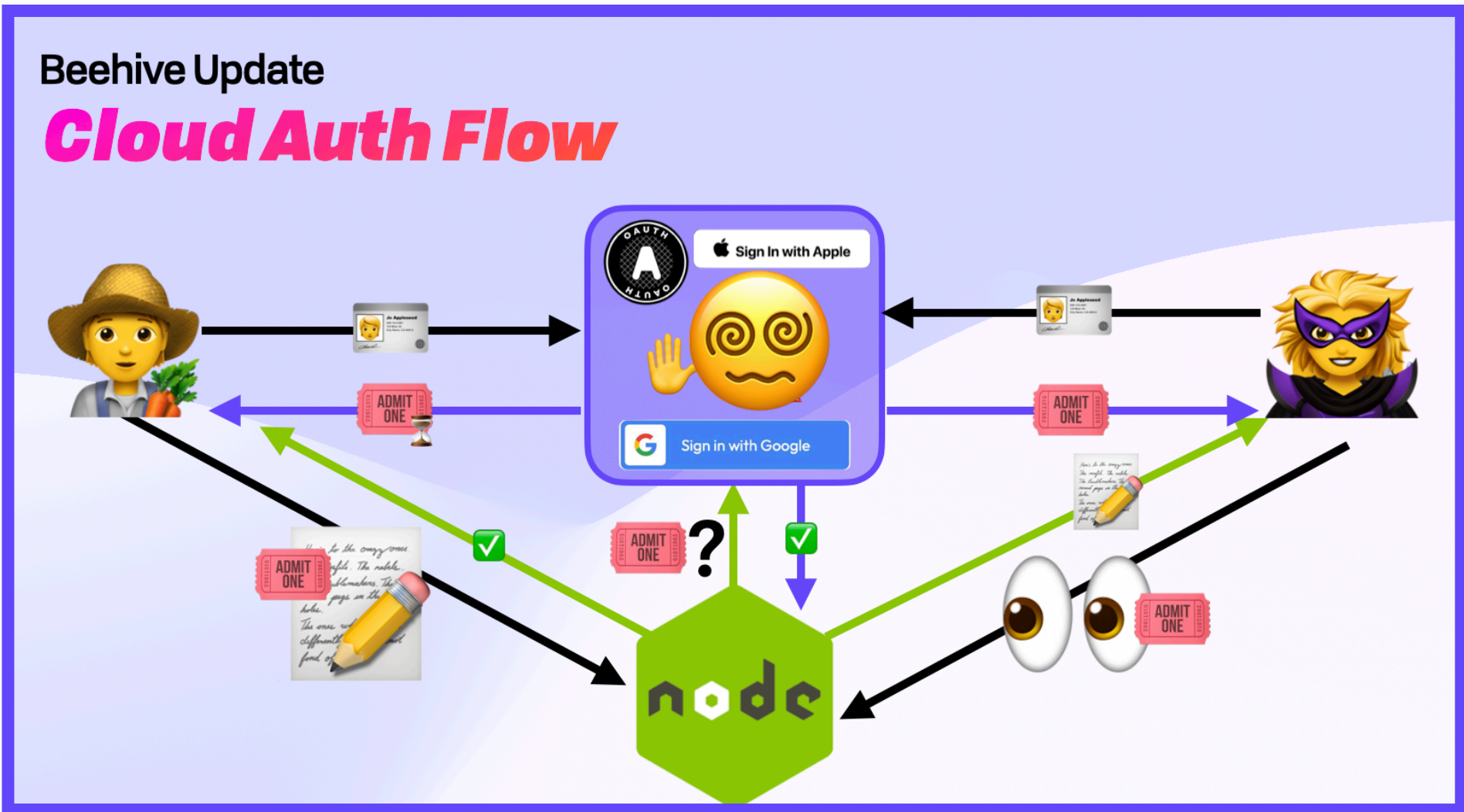


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# ***Self-Authenticating Changes***

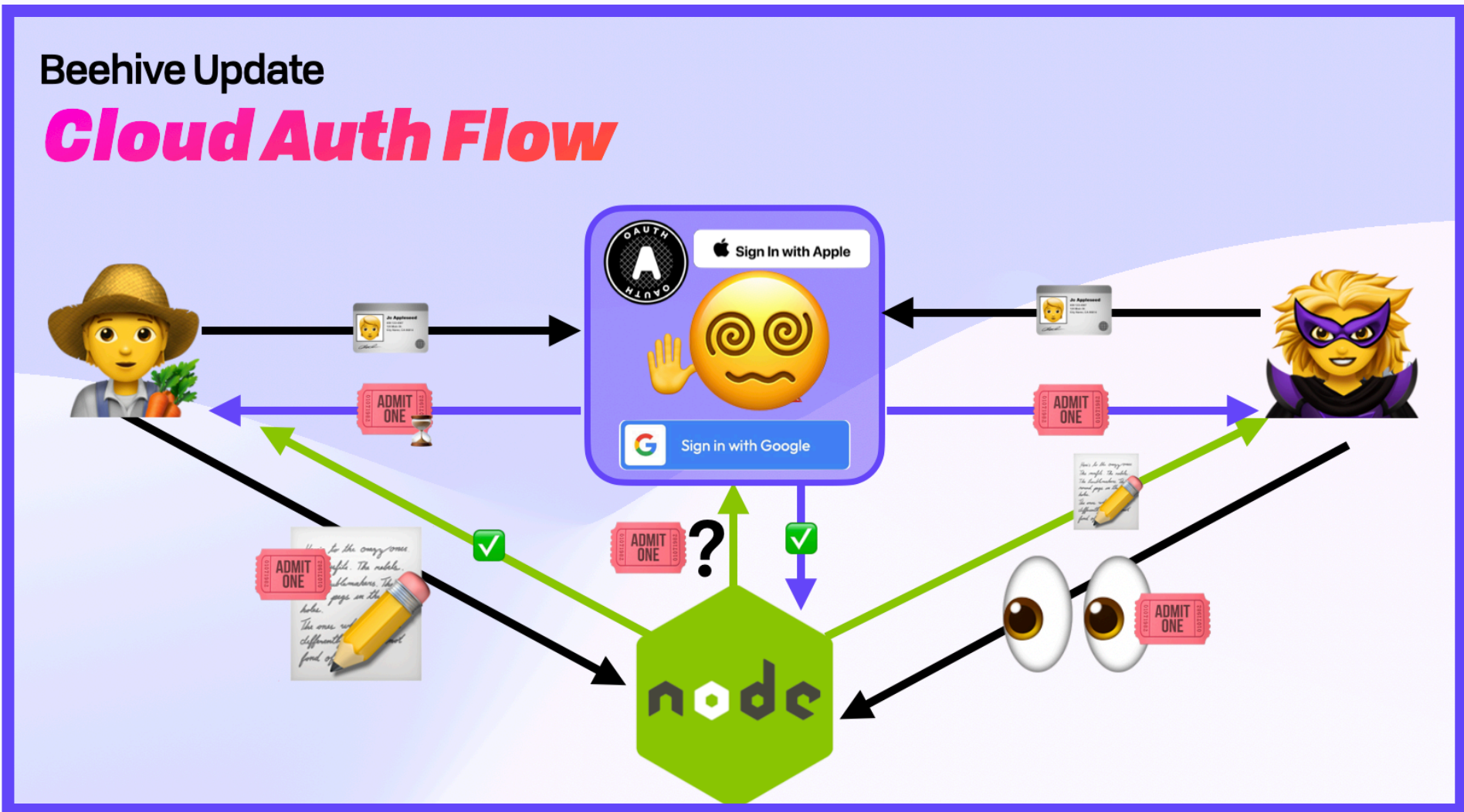
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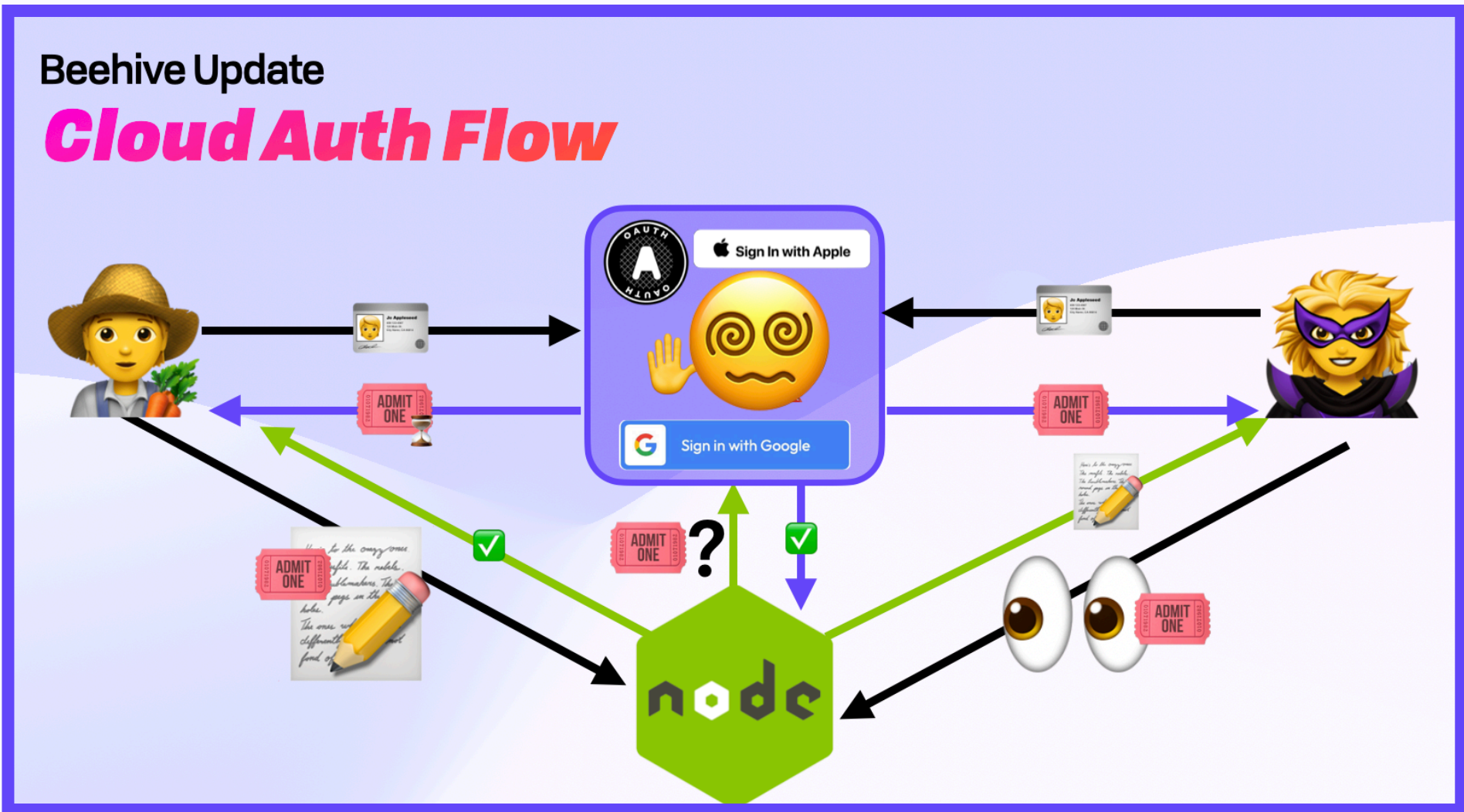
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# Self-Authenticating Changes



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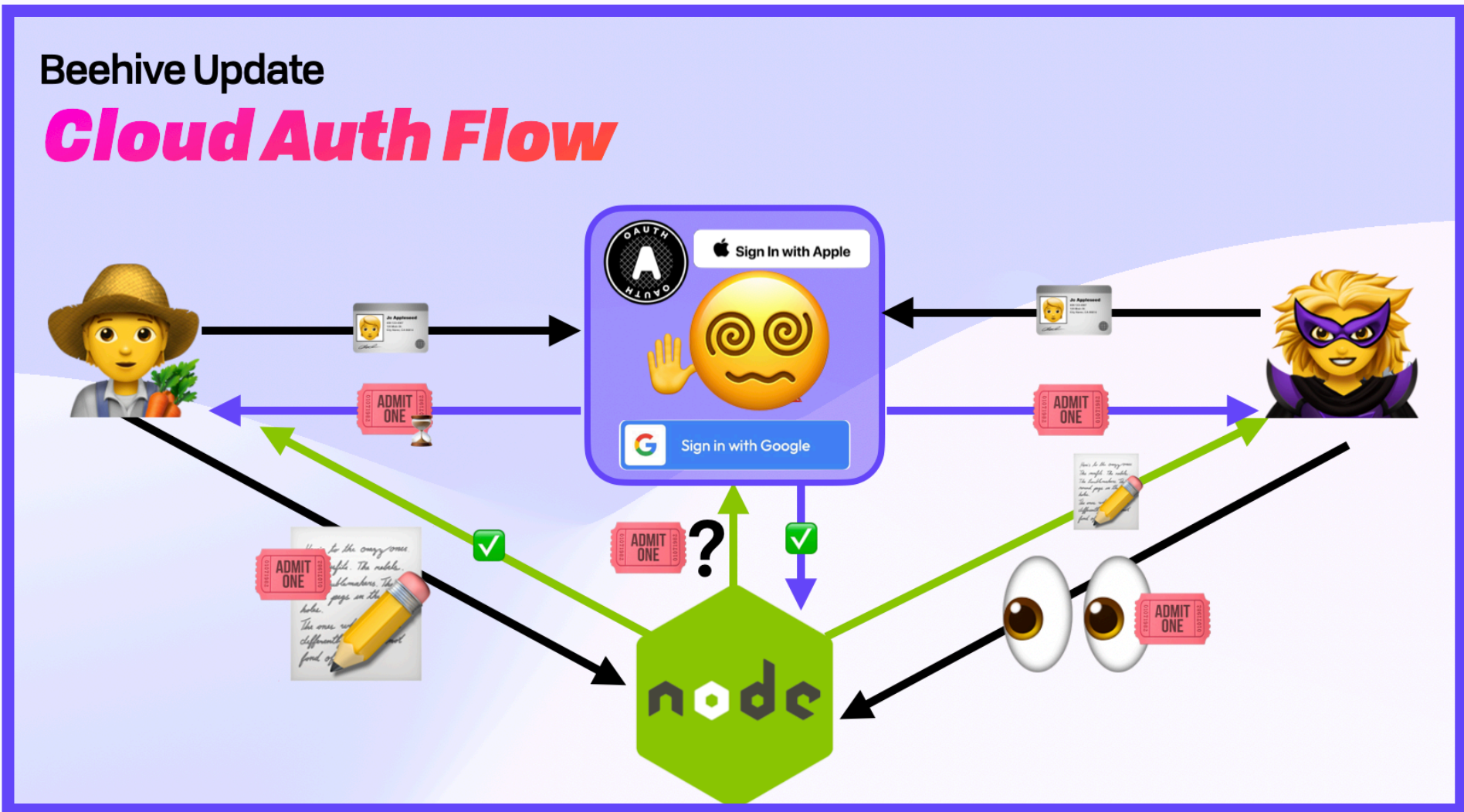


Safe in the Beehive 🐝

# Self-Authenticating Changes



Dear Kate,  
Here's to the crazy ones. The misfits. The troublemakers. The round pegs in a square hole. The ones who see things that not fond of rules. And they have no sense of status quo. You can quote them, disagree with them, glorify or vilify them. About the only thing you can't do is ignore them. Because they change things.  
They push the human race forward. And while some may see them as the crazy ones, we see genius. Because the people who are crazy enough to think they can change the world, are the ones who do.  
Take care,  
John Appleseed

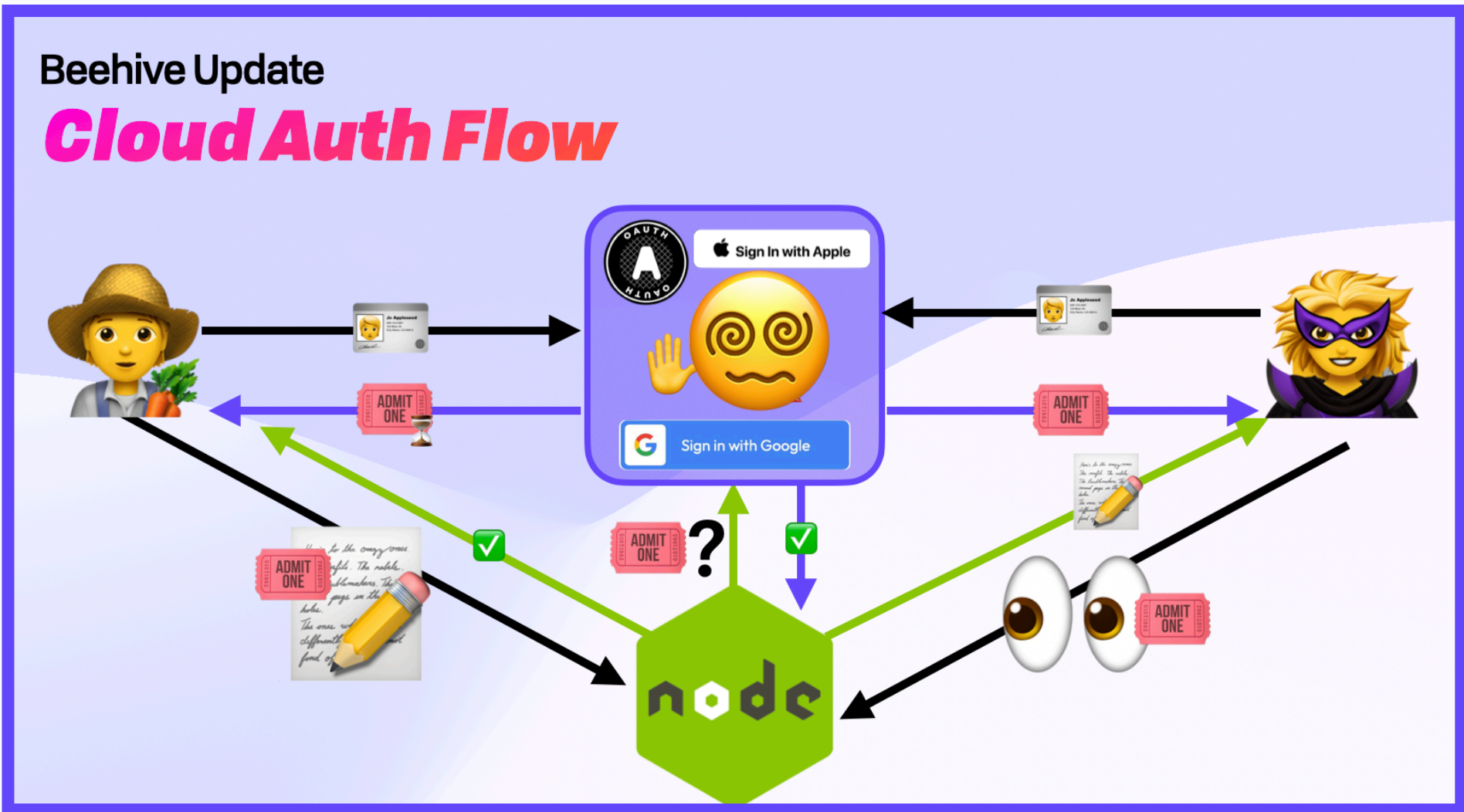


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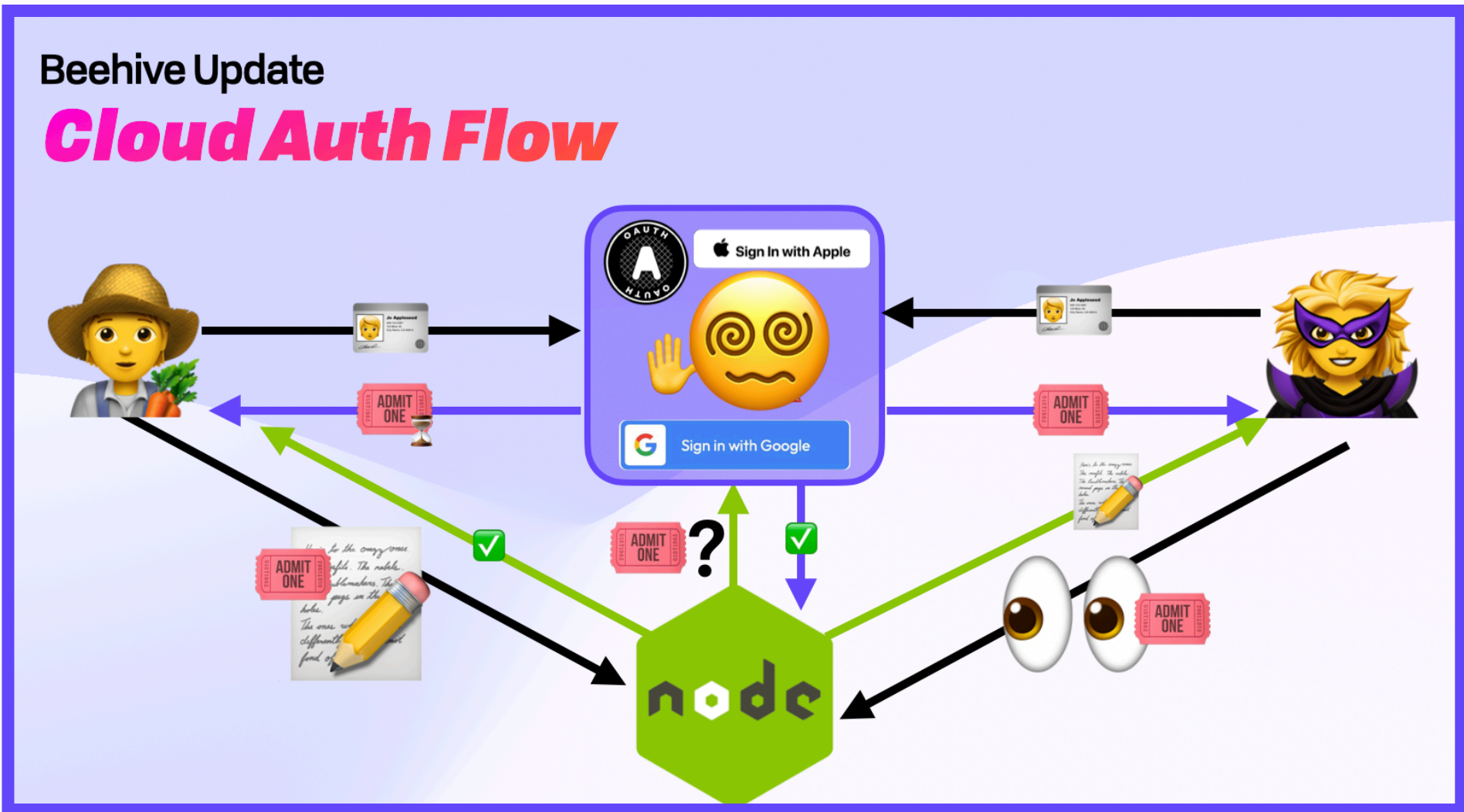


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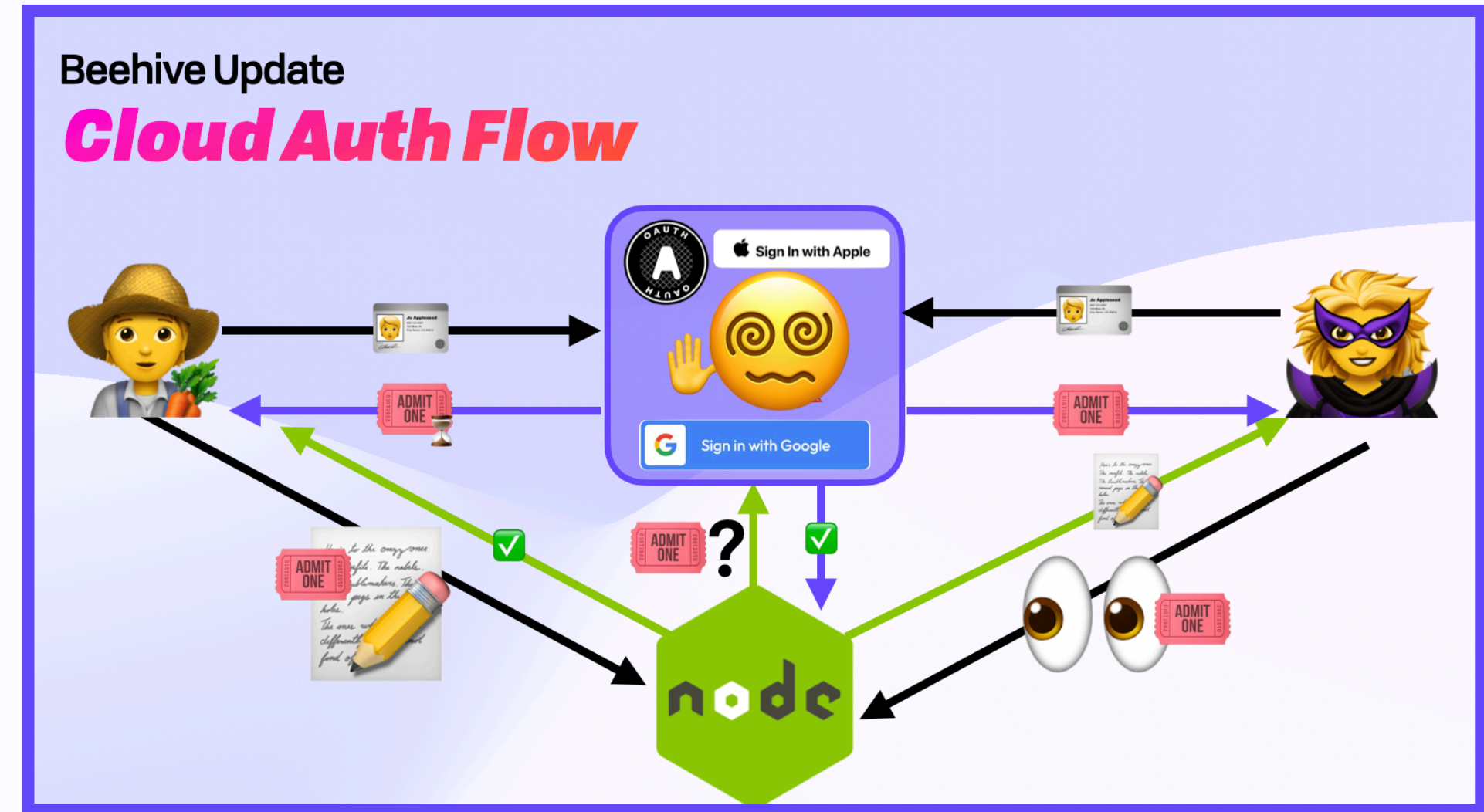
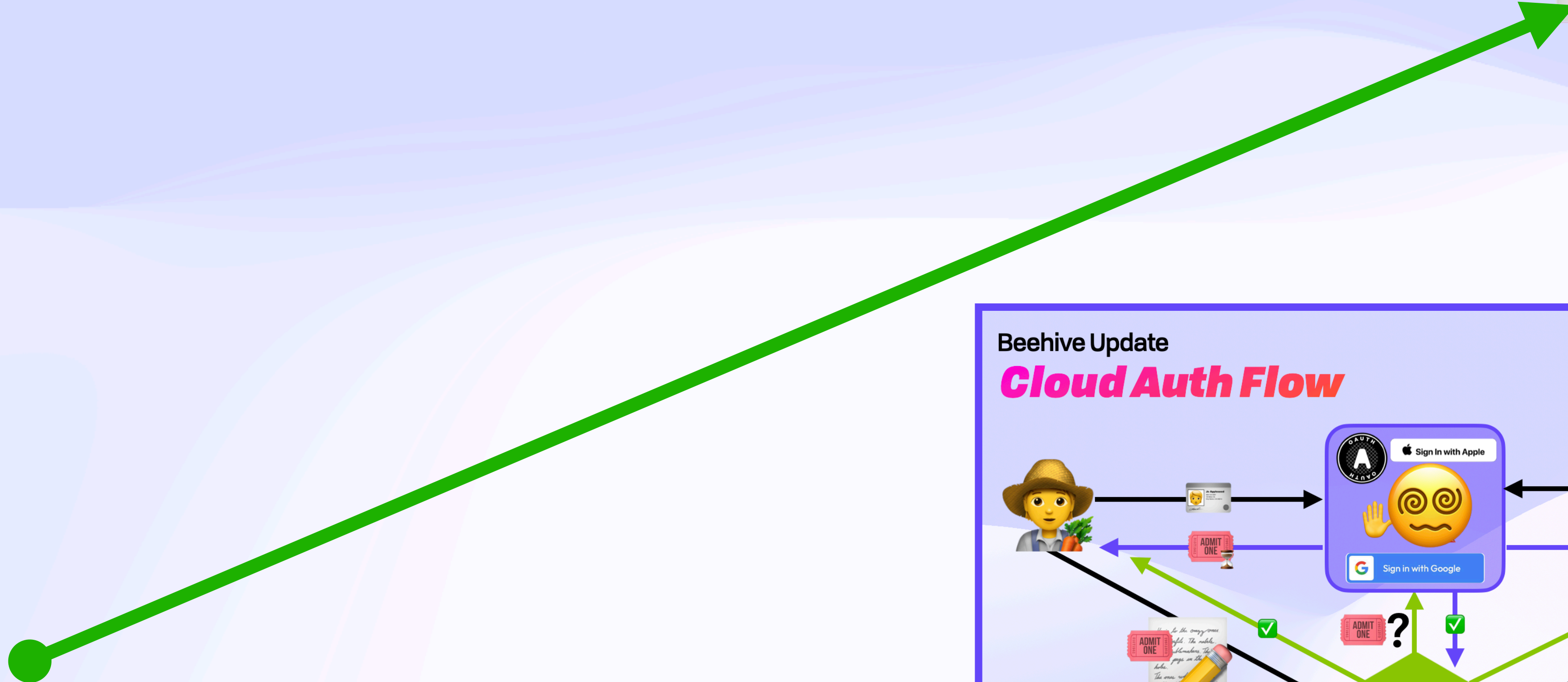
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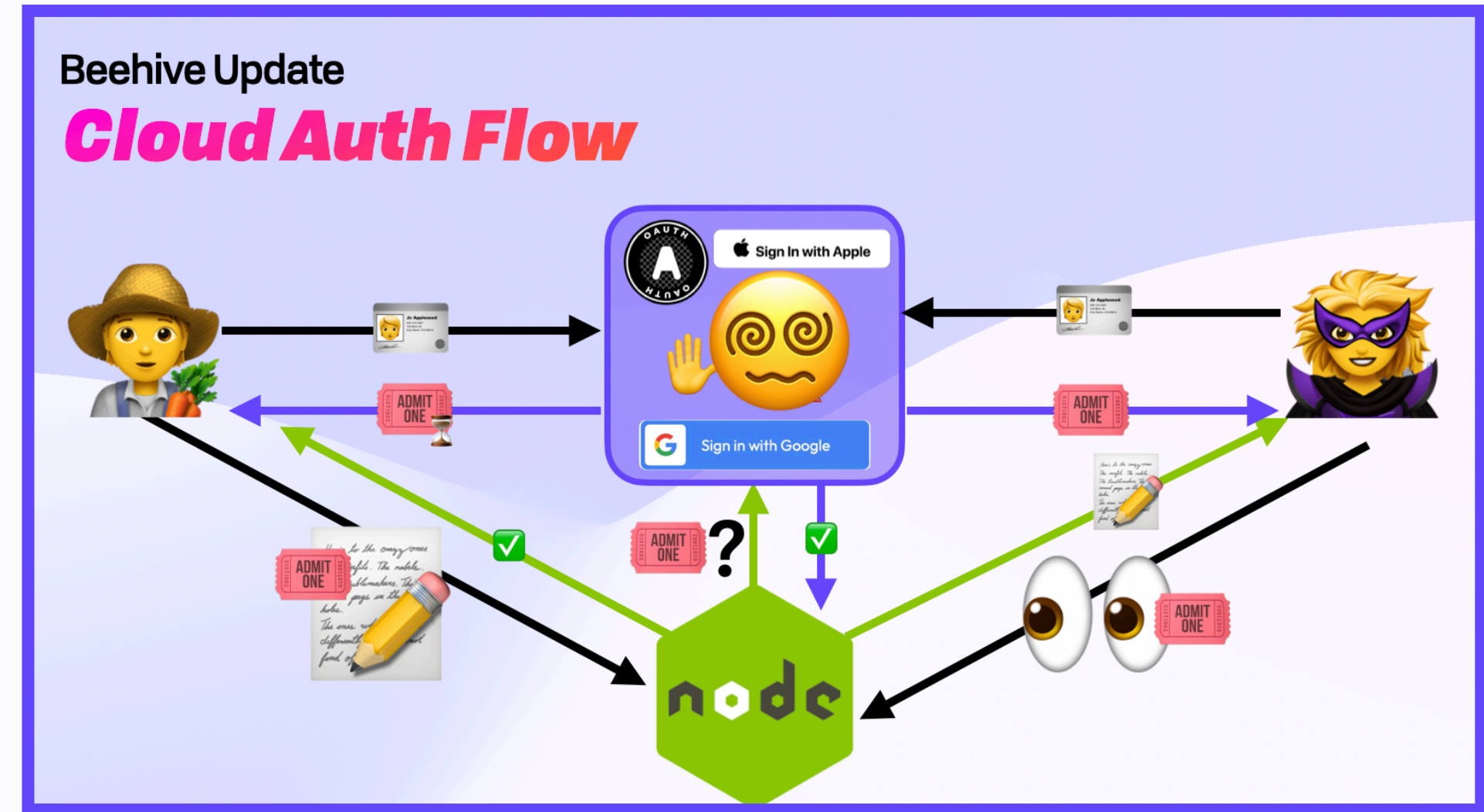
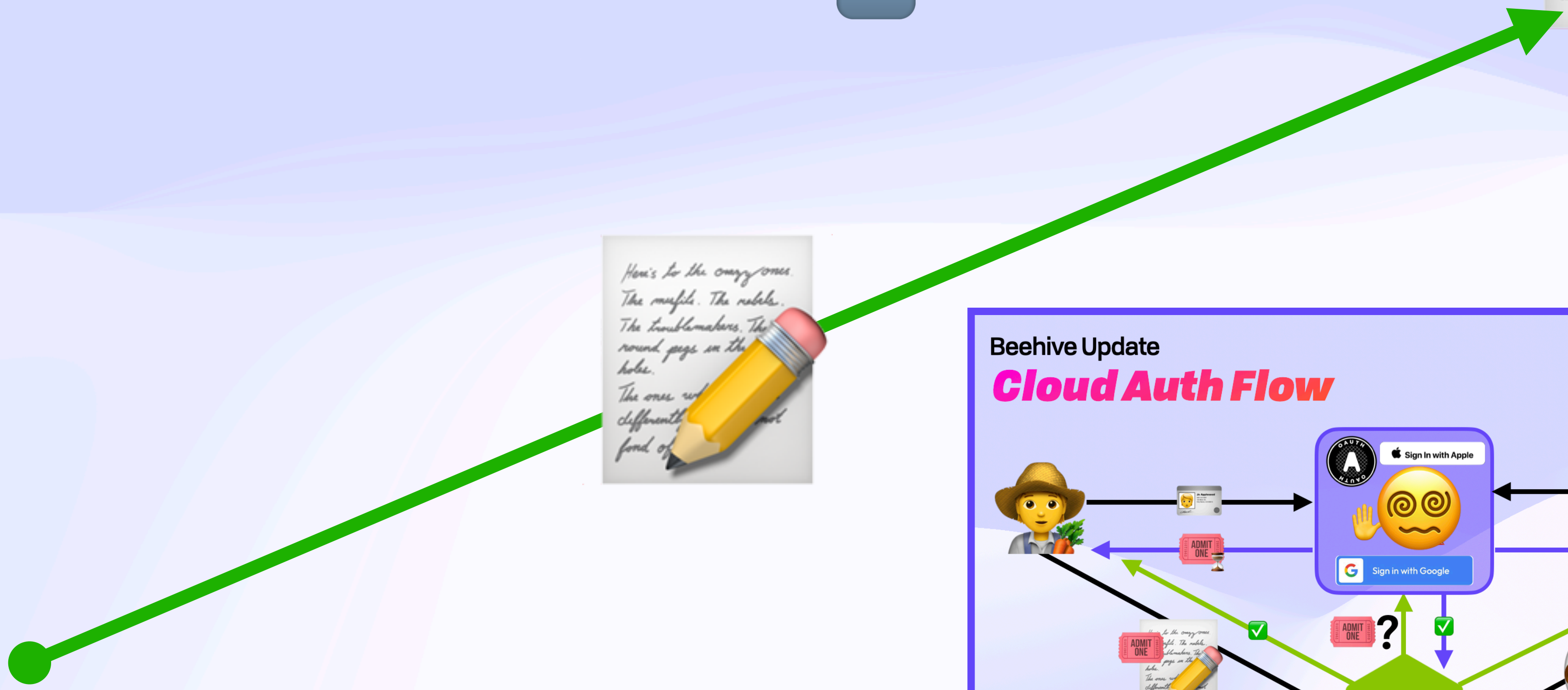
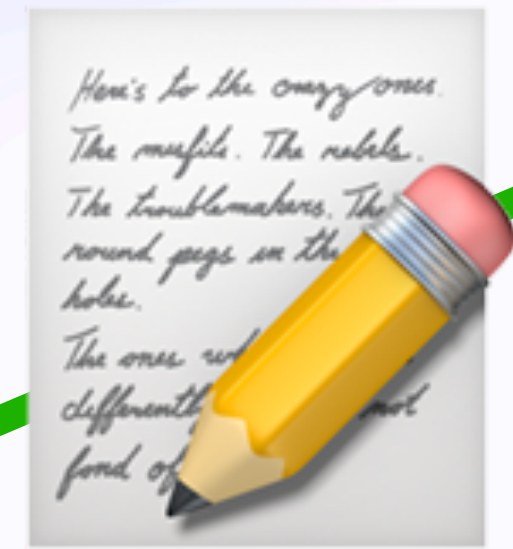
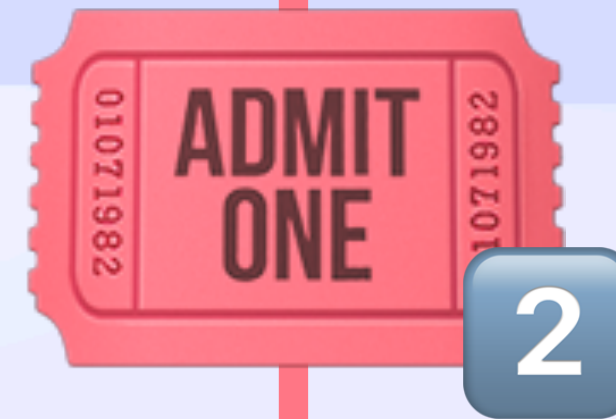
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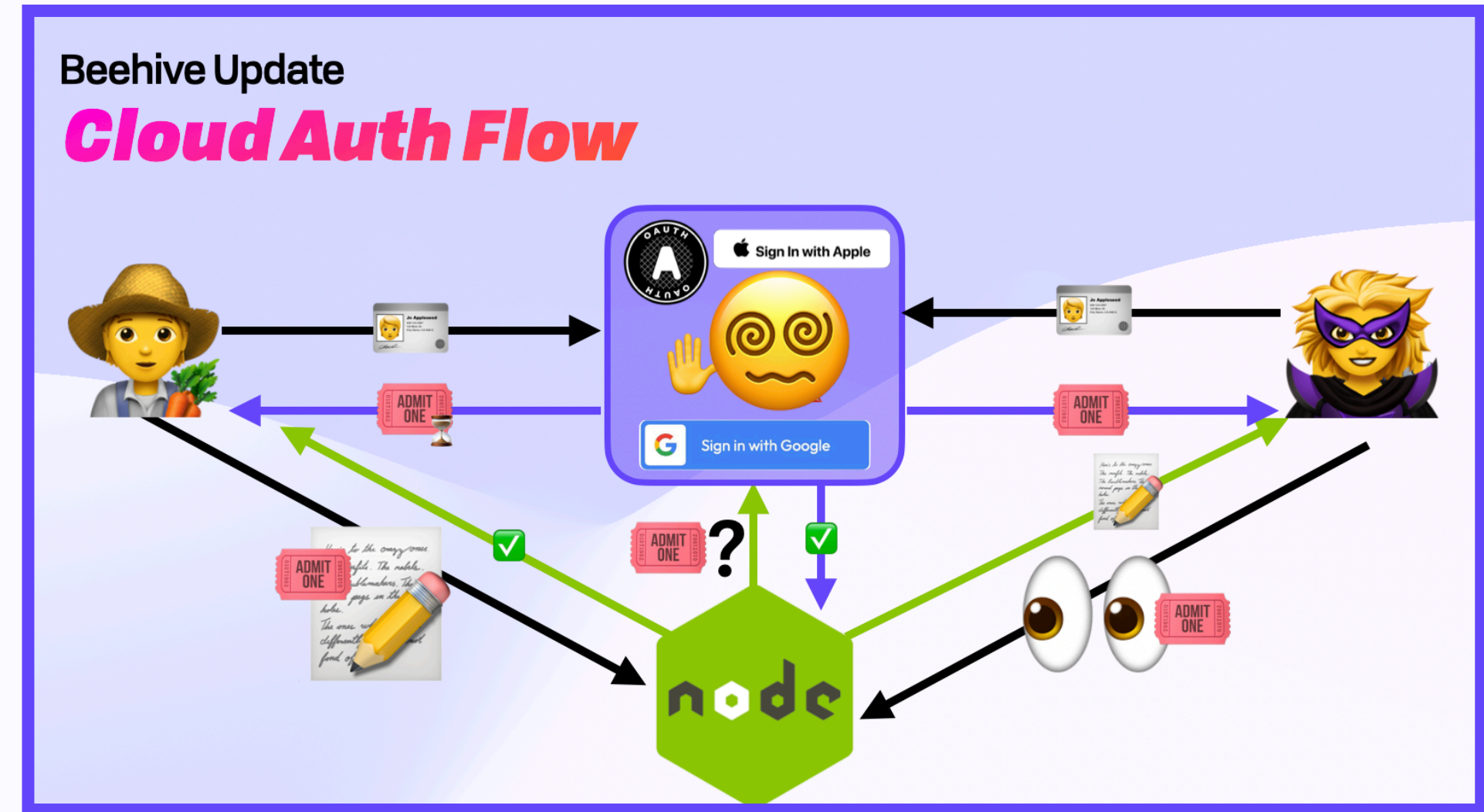
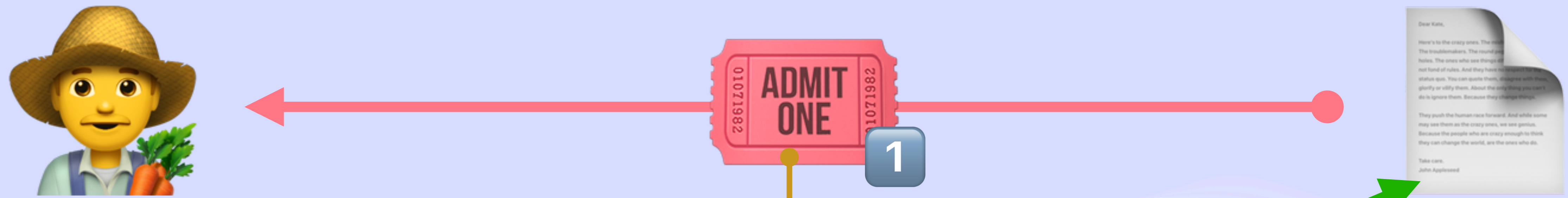
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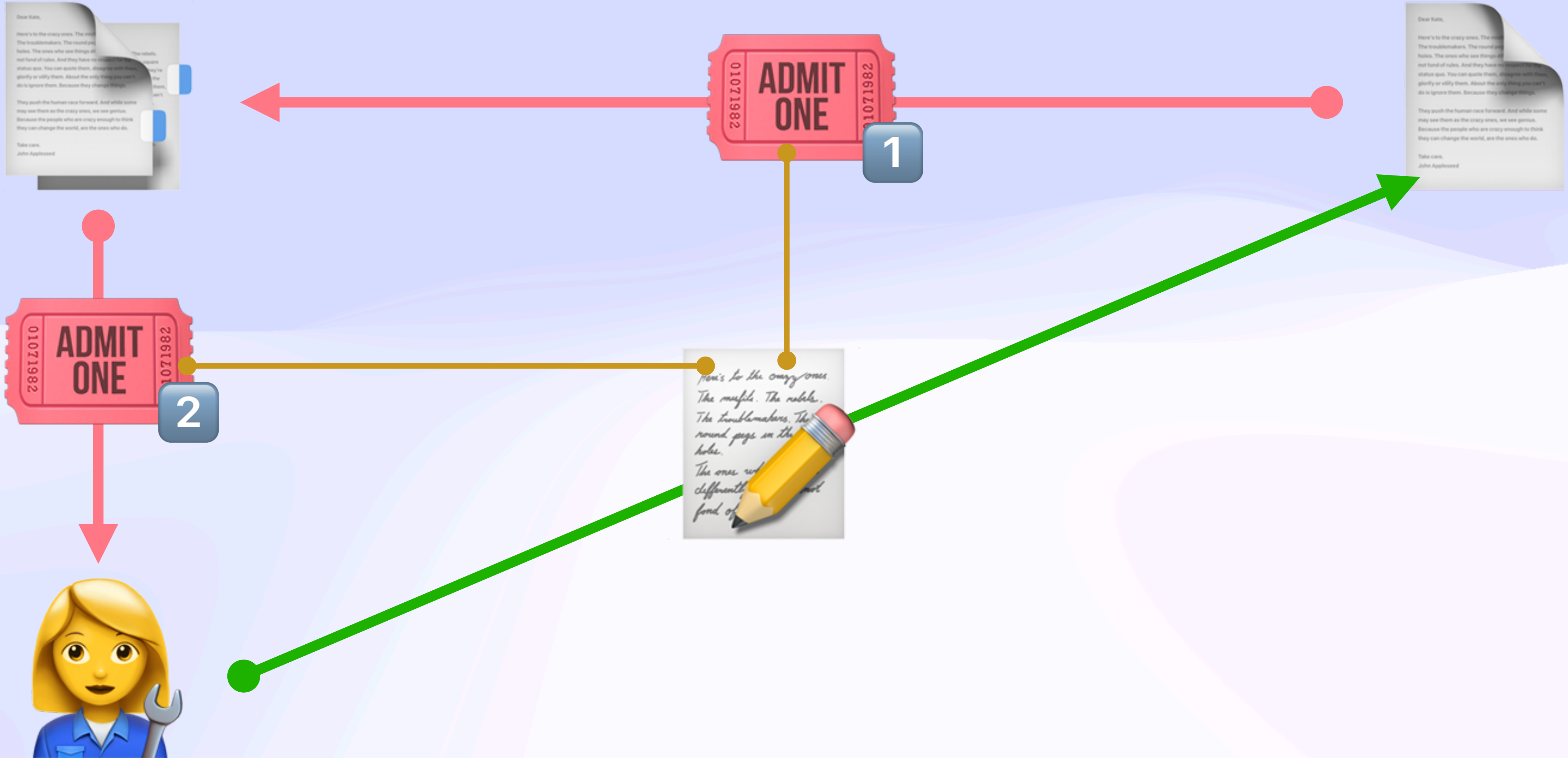
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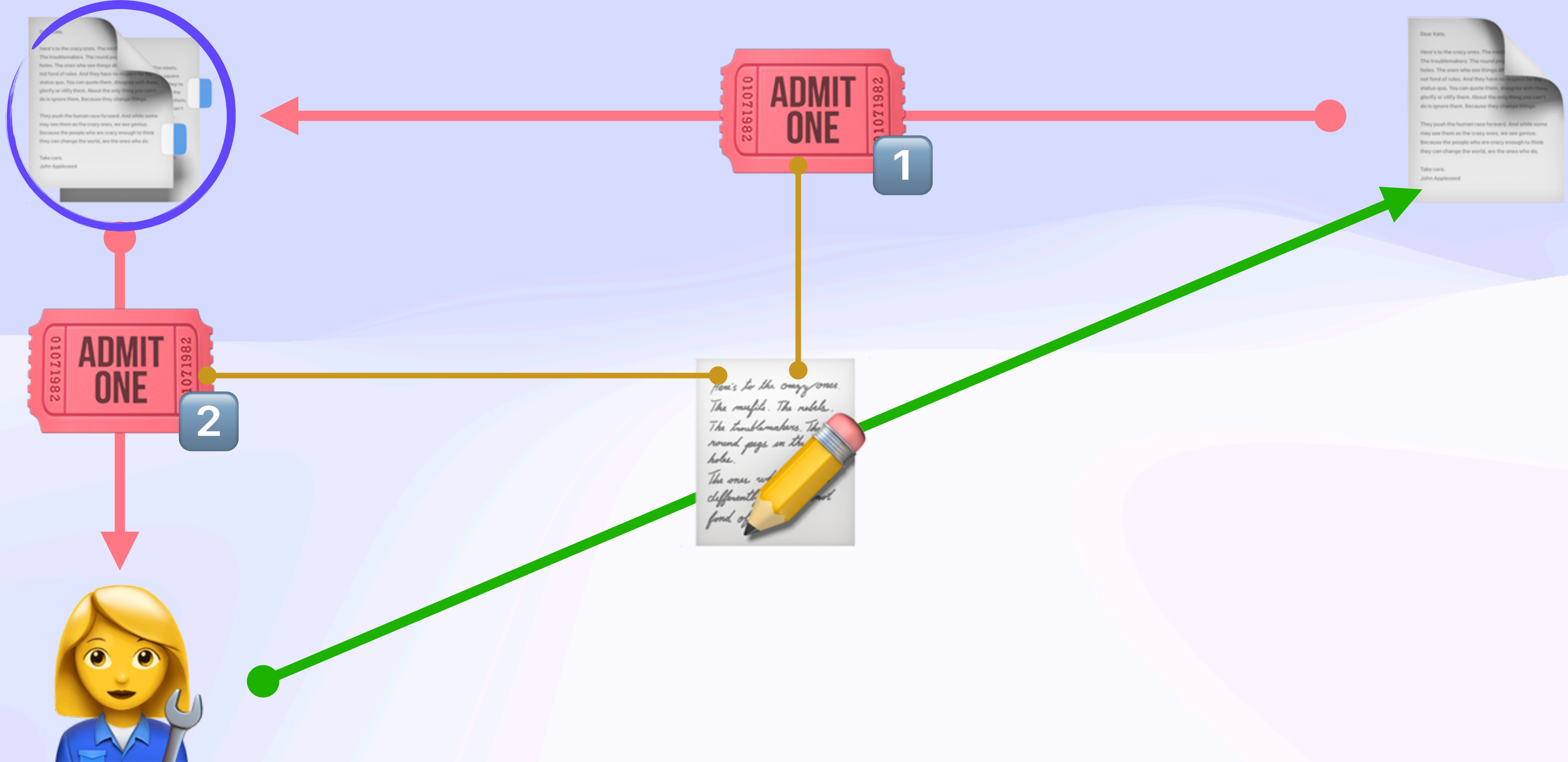
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# Self-Authenticating Changes



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# Self-Authenticating Changes





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# ***Causal Encryption***

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# *Causal Encryption*



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# Causal Encryption



Here's to the crazy ones.  
The mavericks. The rebels.  
The troublemakers. The  
round pegs in the  
holes.  
The ones who  
do things differently.  
The ones who  
are not  
fond of  
following  
the rules.



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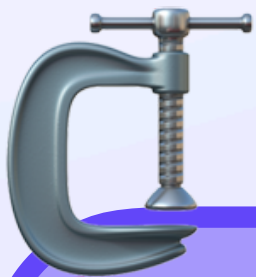


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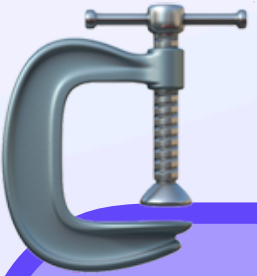


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# Causal Encryption



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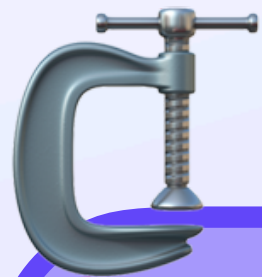


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# Causal Encryption



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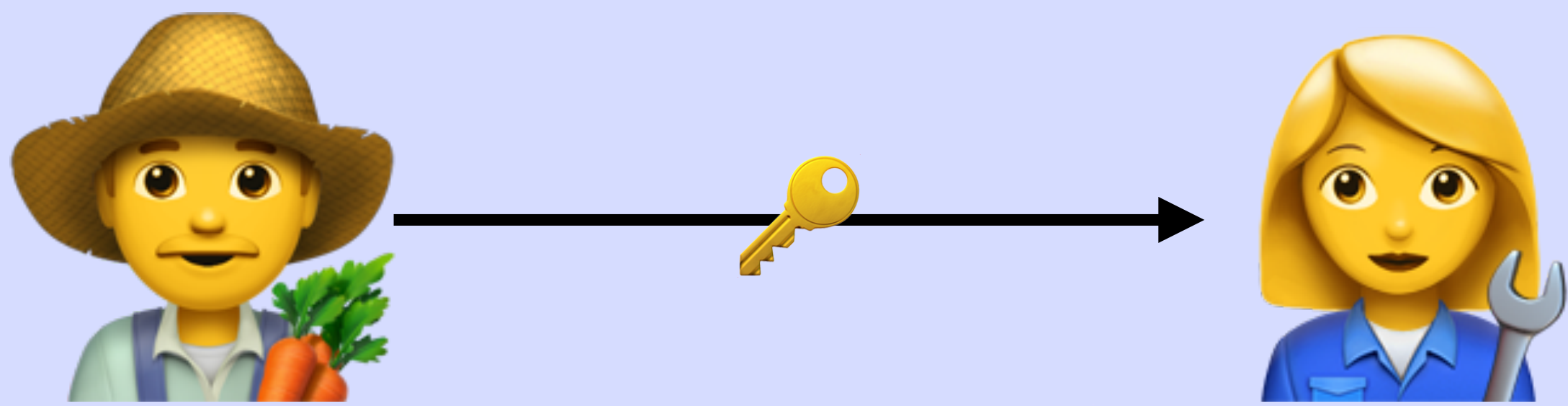


Here's to the crazy ones.  
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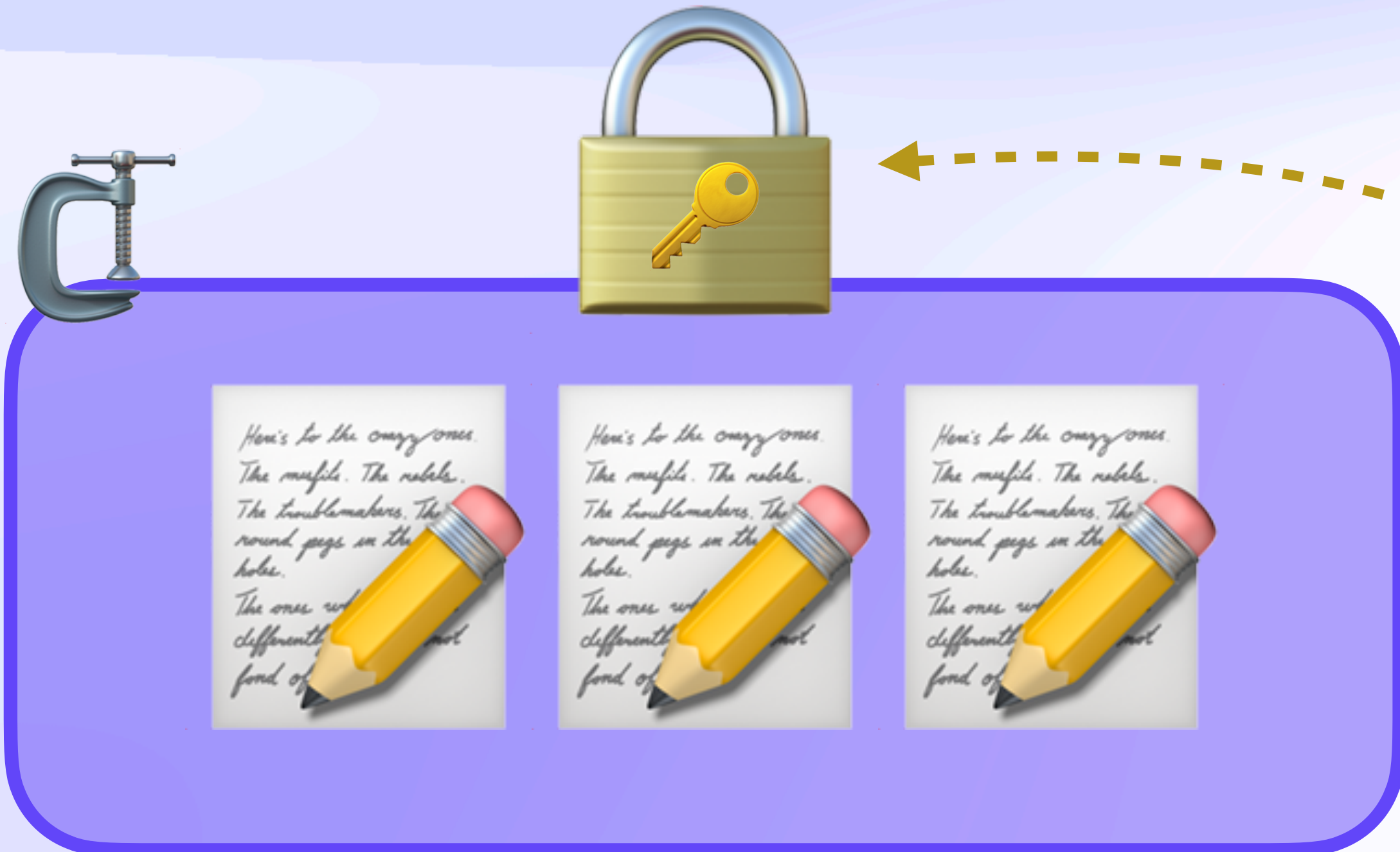
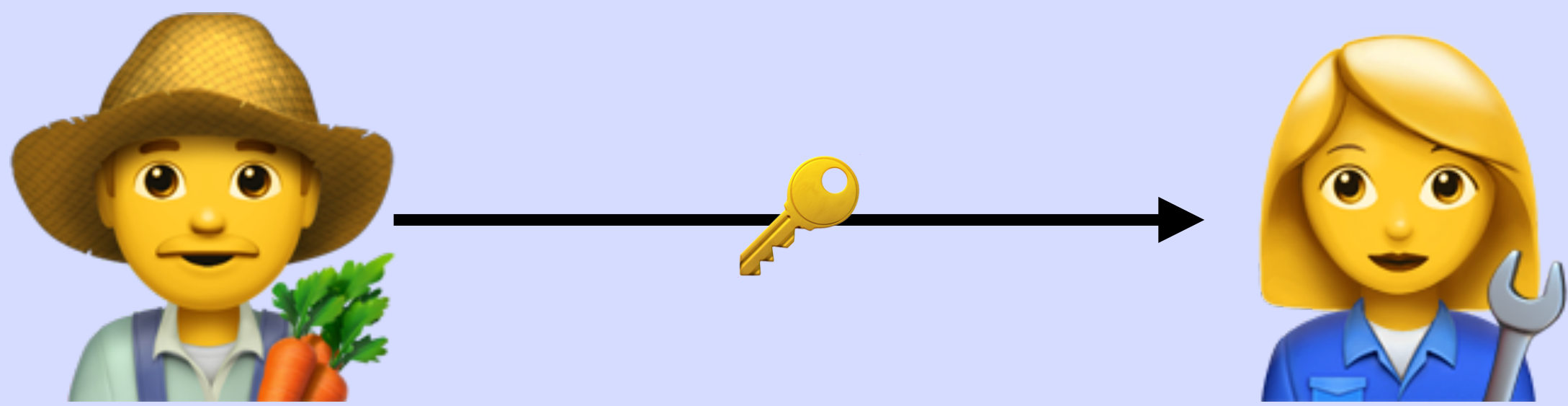
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# Causal Encryption



Safe in the Beehive 

# Causal Encryption



A purple rounded rectangle representing a locked state. At the top center is a padlock with a key icon inside it. To the left of the padlock is a key icon. Below the padlock are three notepad icons, each with a pencil icon. A dashed yellow arrow points from the right side of the rectangle towards the padlock.

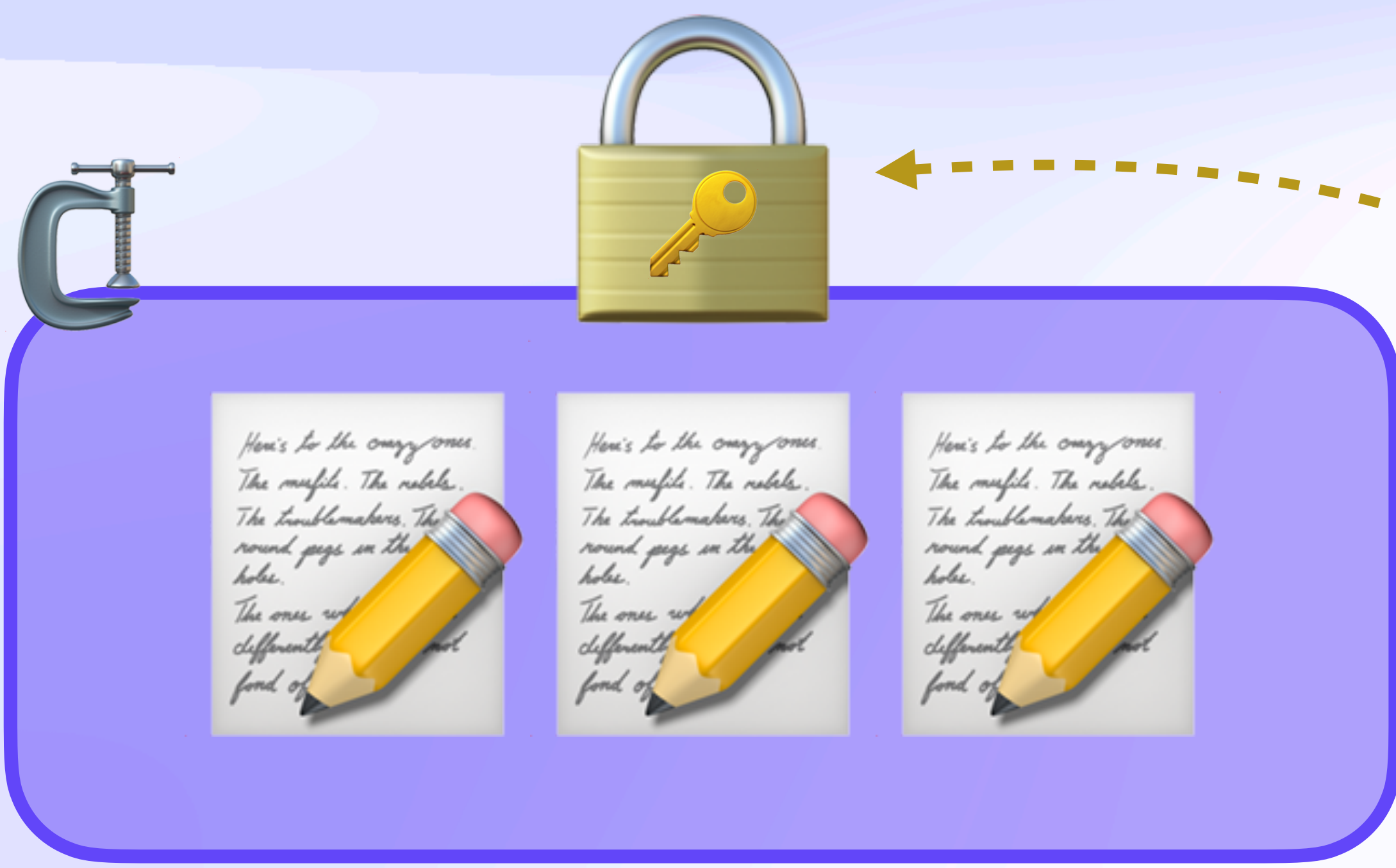
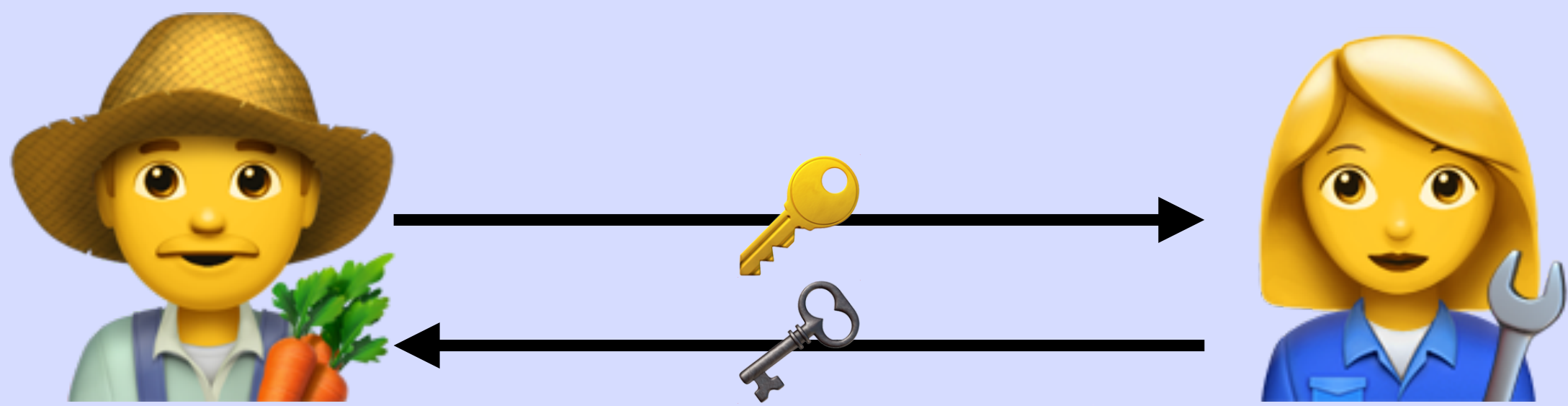


A pink rounded rectangle representing an unlocked state. At the top center is a padlock with a key icon inside it. To the left of the padlock is a key icon. Below the padlock are three notepad icons, each with a pencil icon. A dashed yellow arrow points from the left side of the rectangle towards the padlock.



Safe in the Beehive 

# Causal Encryption



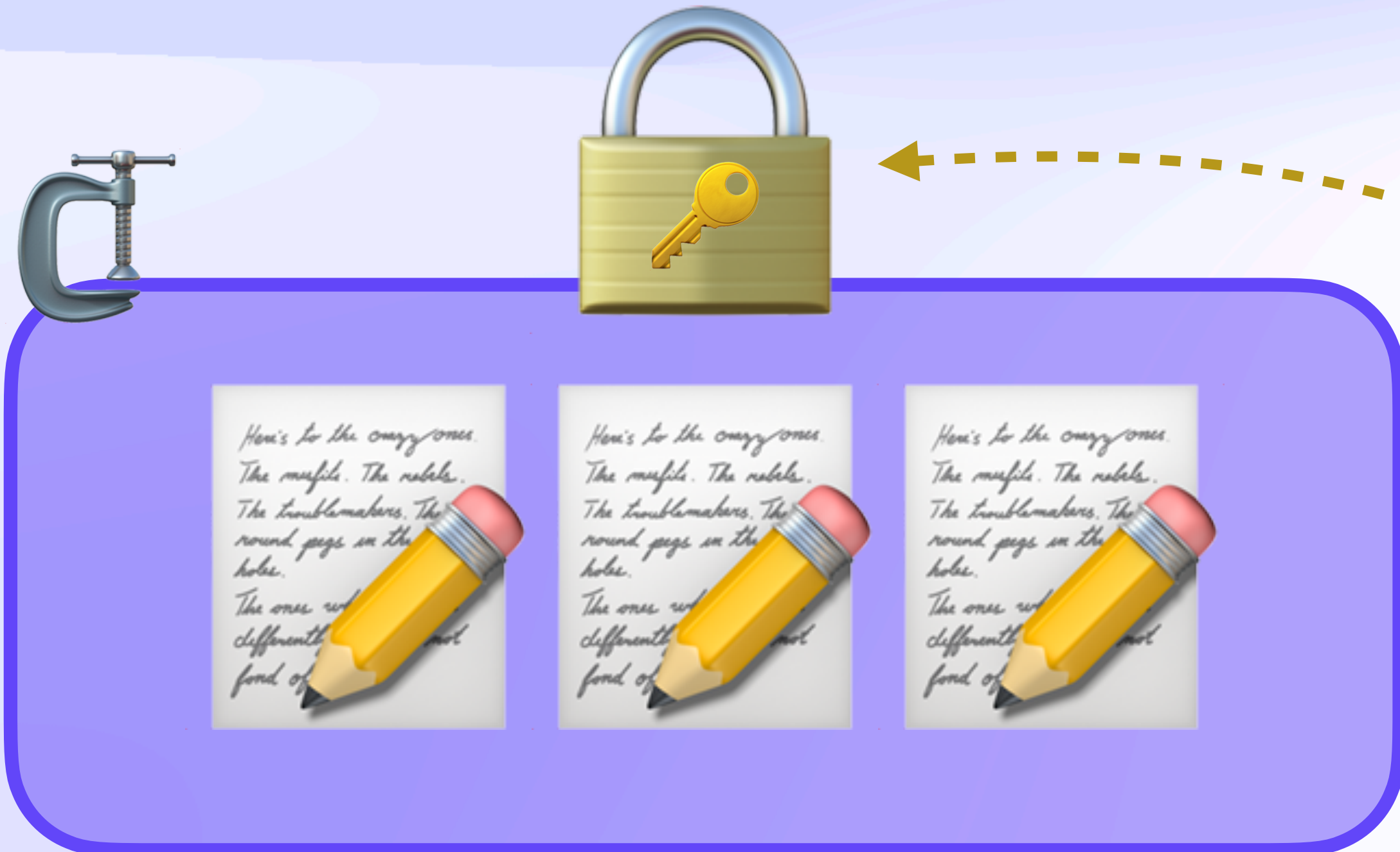
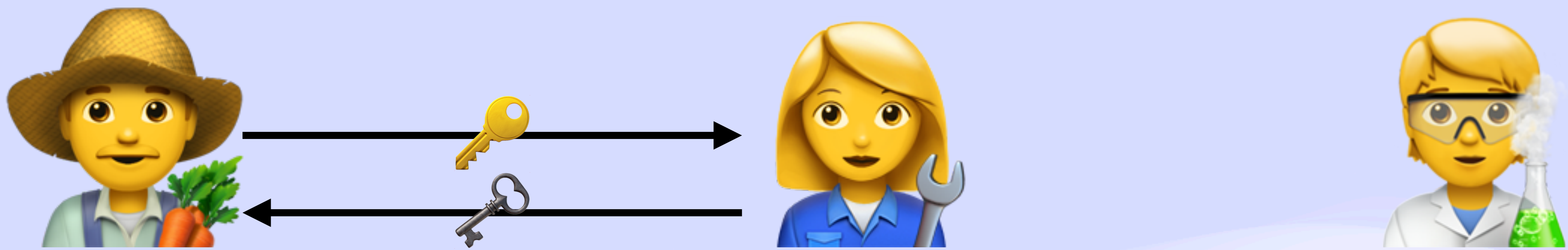
A purple rounded rectangular box containing three notepaper items. Each notepaper has a yellow pencil and contains the text: "Here's to the crazy ones. The mavericks. The rebels. The troublemakers. The round pegs in the holes. The ones who see differently. Not fond of rules." A gold key is placed on top of the first notepaper. A silver padlock is on top of the box, and a silver C-clamp is on the left side. A dashed yellow arrow points from the pink box on the right towards this purple box.



A pink rounded rectangular box containing three notepaper items, identical to the ones in the purple box. A silver key is placed on top of the first notepaper. A silver padlock is on top of the box, and a silver C-clamp is on the left side. A dashed yellow arrow points from this pink box towards the purple box on the left.

Safe in the Beehive 

# Causal Encryption



A purple rounded rectangular box containing a silver padlock with a gold key inserted. To the left of the padlock is a blue C-clamp. Below the padlock are three white notecards, each with a yellow pencil icon. The text on each notecard is: "Here's to the crazy ones. The mavericks. The rebels. The troublemakers. The round pegs in the holes. The ones who see differently. Not fond of rules."

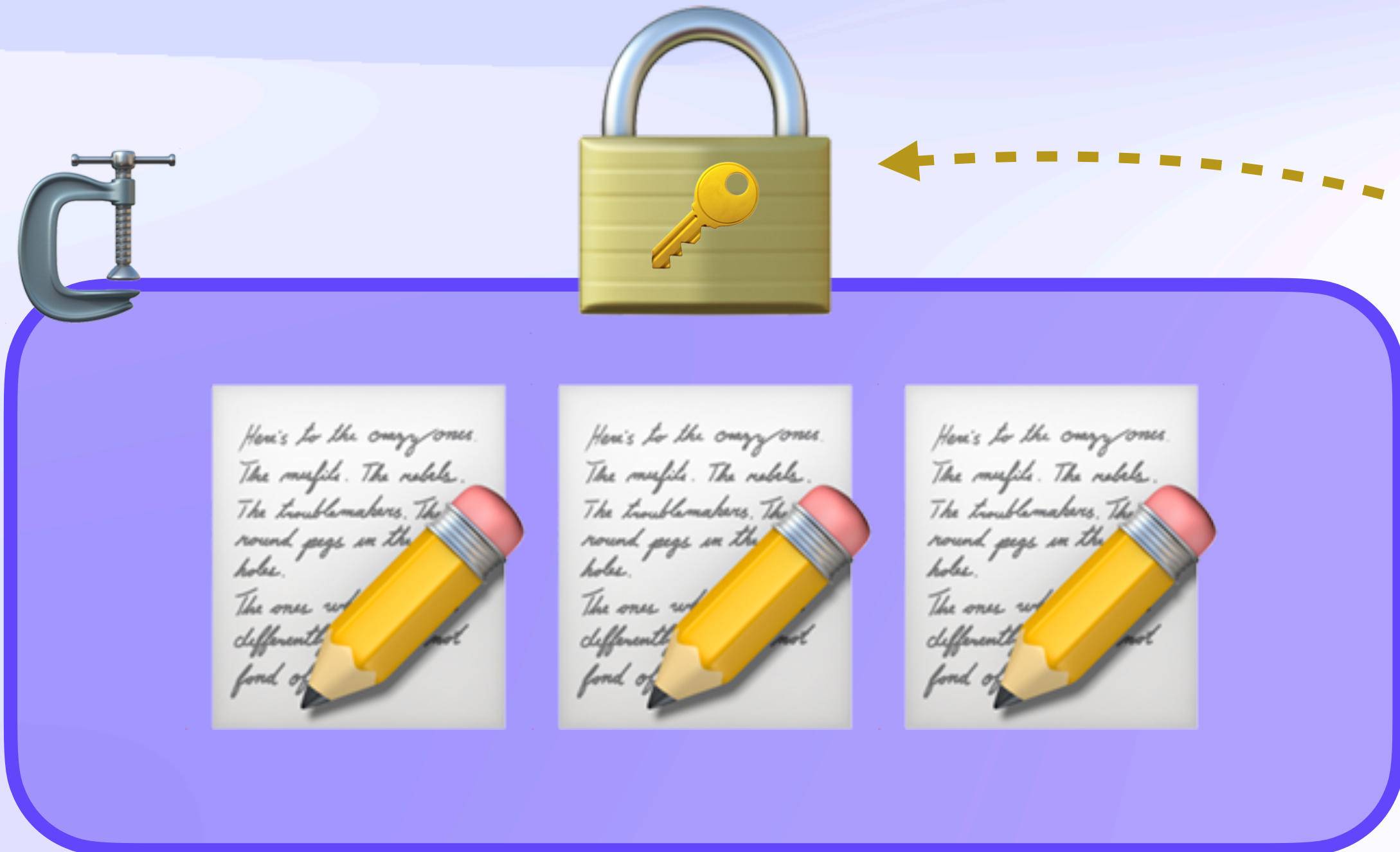
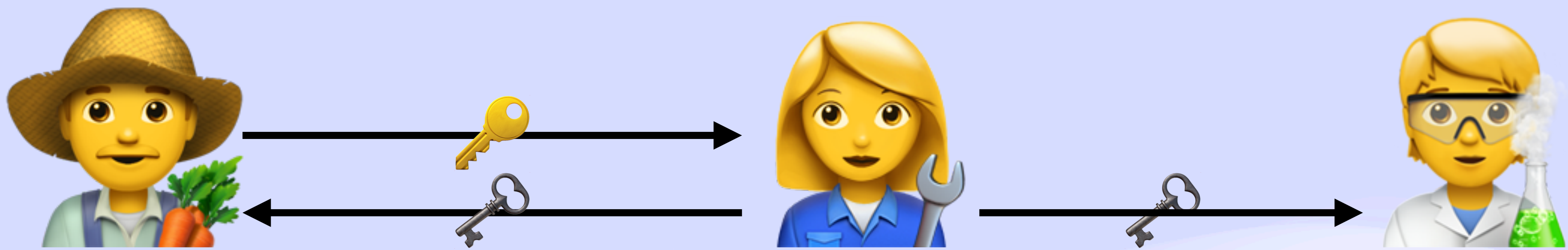


A pink rounded rectangular box containing a silver padlock with a silver key inserted. To the left of the padlock is a blue C-clamp. Below the padlock are three white notecards, each with a yellow pencil icon. The text on each notecard is: "Here's to the crazy ones. The mavericks. The rebels. The troublemakers. The round pegs in the holes. The ones who see differently. Not fond of rules."



Safe in the Beehive 

# Causal Encryption



A purple rounded rectangle containing a yellow padlock with a yellow key inserted. To the left is a blue C-clamp. Below the padlock are three notepaper icons, each with a yellow pencil. The text on the notepaper is: "Here's to the crazy ones. The mavericks. The rebels. The troublemakers. The round pegs in the holes. The ones who see differently. Not fond of rules."



A pink rounded rectangle containing a yellow padlock with a grey key inserted. To the left is a blue C-clamp. Below the padlock are three notepaper icons, each with a yellow pencil. The text on the notepaper is: "Here's to the crazy ones. The mavericks. The rebels. The troublemakers. The round pegs in the holes. The ones who see differently. Not fond of rules."

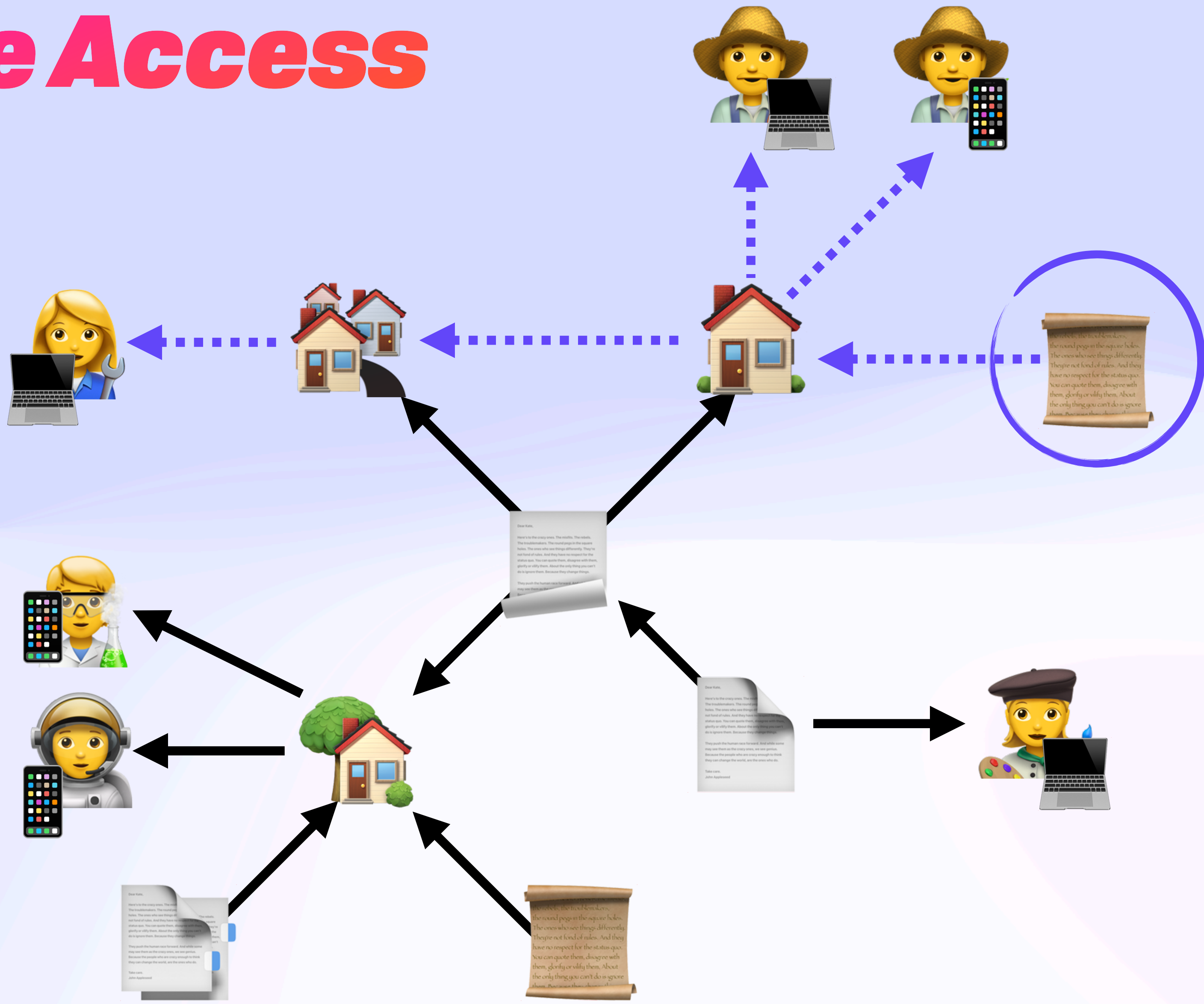






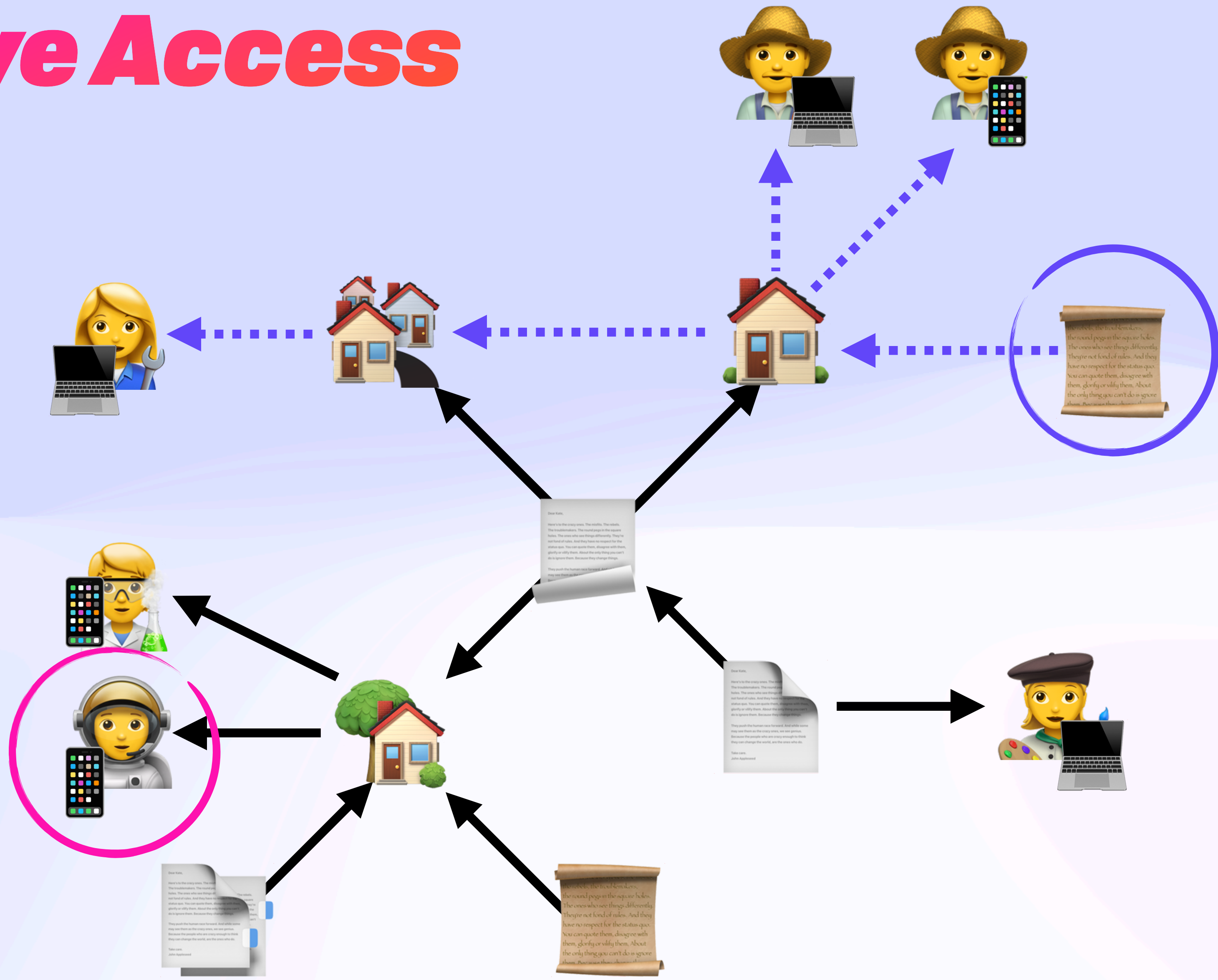
# Safe in the Beehive

# Transitive Access



Safe in the Beehive 

# Transitive Access







Safe in the Beehive 

***Plays Nice With Others***

Safe in the Beehive 

# ***Plays Nice With Others***

- User "identity"
- Key recovery

[automergerg.org](https://automergerg.org)



[inkandswitch.com/bee-hive](https://inkandswitch.com/bee-hive)

[github.com/ucan-wg](https://github.com/ucan-wg)



**Thank You, LoFi.so**



 [@expede@types.pl](mailto:@expede@types.pl)

 [bsky.app/profile/expede.wtf](https://bsky.app/profile/expede.wtf)

 [hello@brooklynzelenka.com](mailto:hello@brooklynzelenka.com)