

And now
for something
completely different...



UCAN Control Your Stuff

Local-First Authority Without Boundaries



**LOCAL
-FIRST
CONF**

Brooklyn Zelenka

@expede



Brooklyn Zelenka

@expede

- Open source, standards, PLT, DSys
- Knows a few things about UCAN
- Began UCAN for "the Rails of LoFi"
 - Now many use cases: CRDTs, storage, compute
- Runs an online distributed systems reading group
 - <https://lu.ma/distributed-systems>

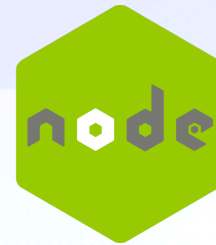


Client/Server

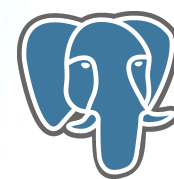
Auth 



Compute 



Data 

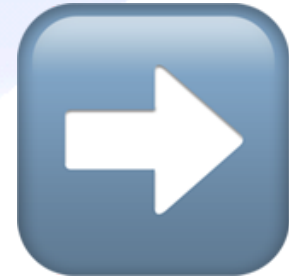
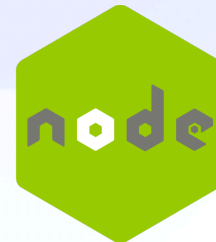


Client/Server

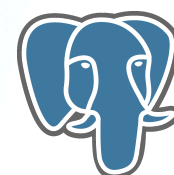
Auth 



Compute 



Data 




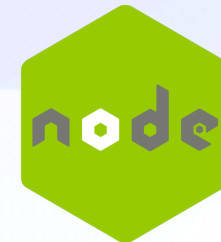
Client/Server


LoFi

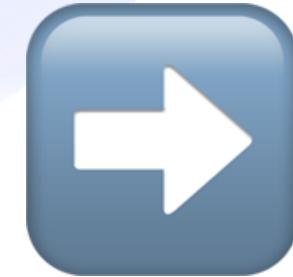
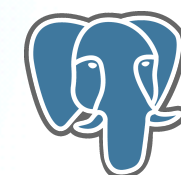
Auth 




Compute 



Data 



Compute 

Data 

Auth 

Schools of Thought



Schools of Thought

ACL Model

Schools of Thought

ACL Model



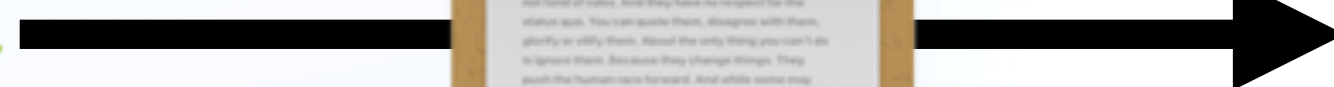
Schools of Thought

ACL Model



Schools of Thought

ACL Model



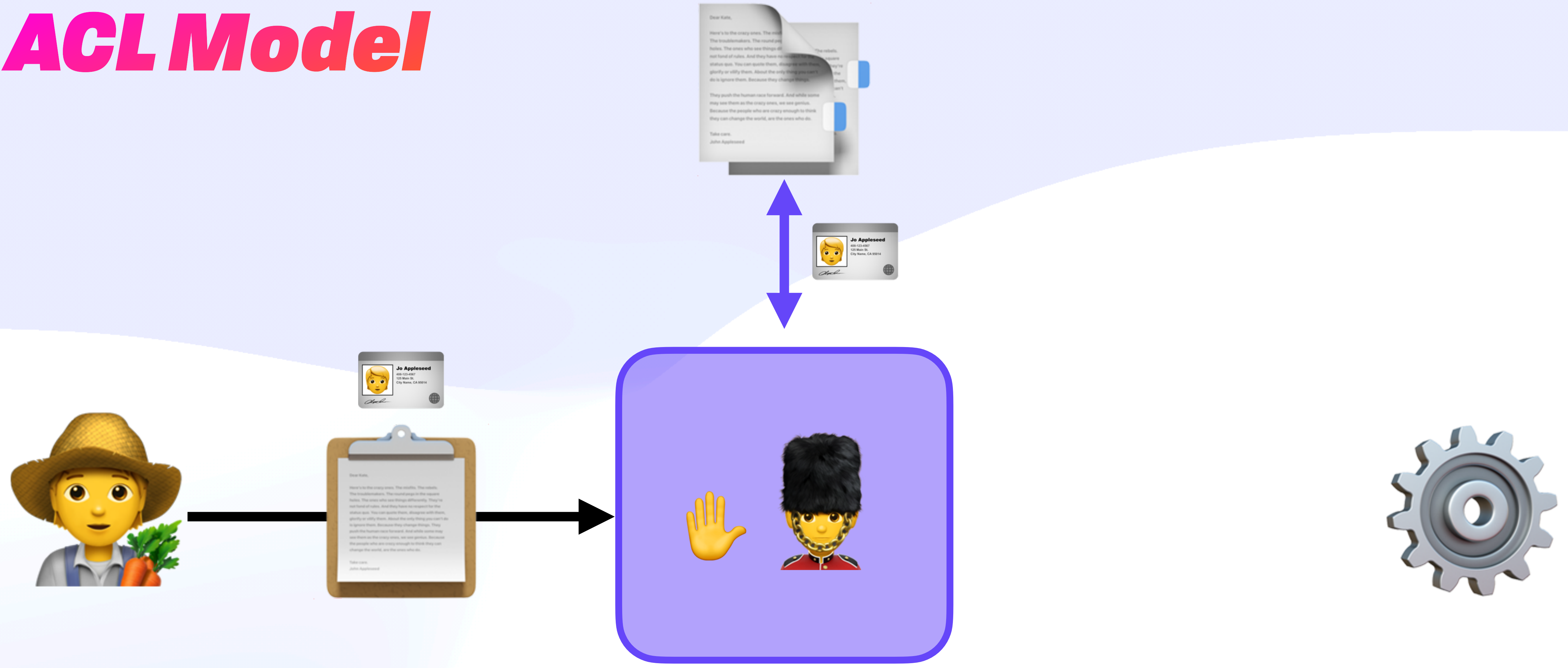
Schools of Thought

ACL Model



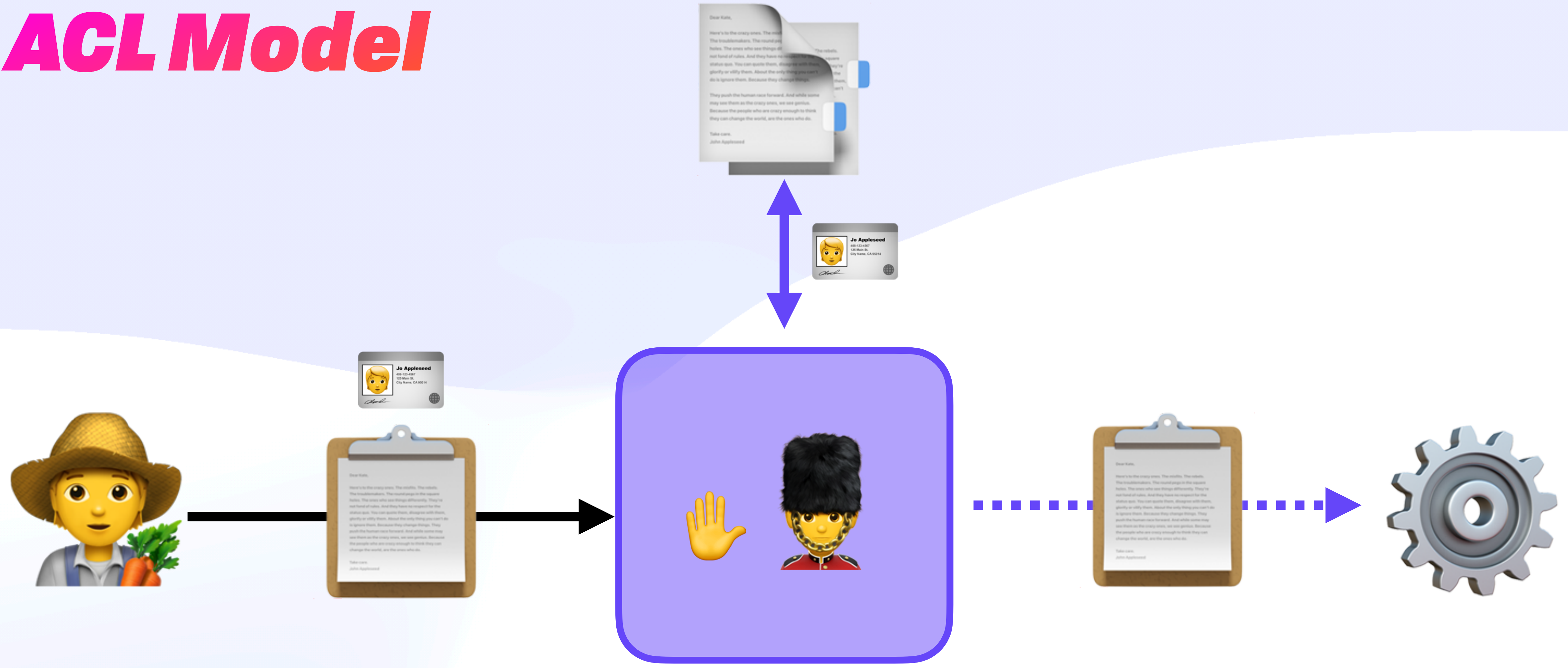
Schools of Thought

ACL Model



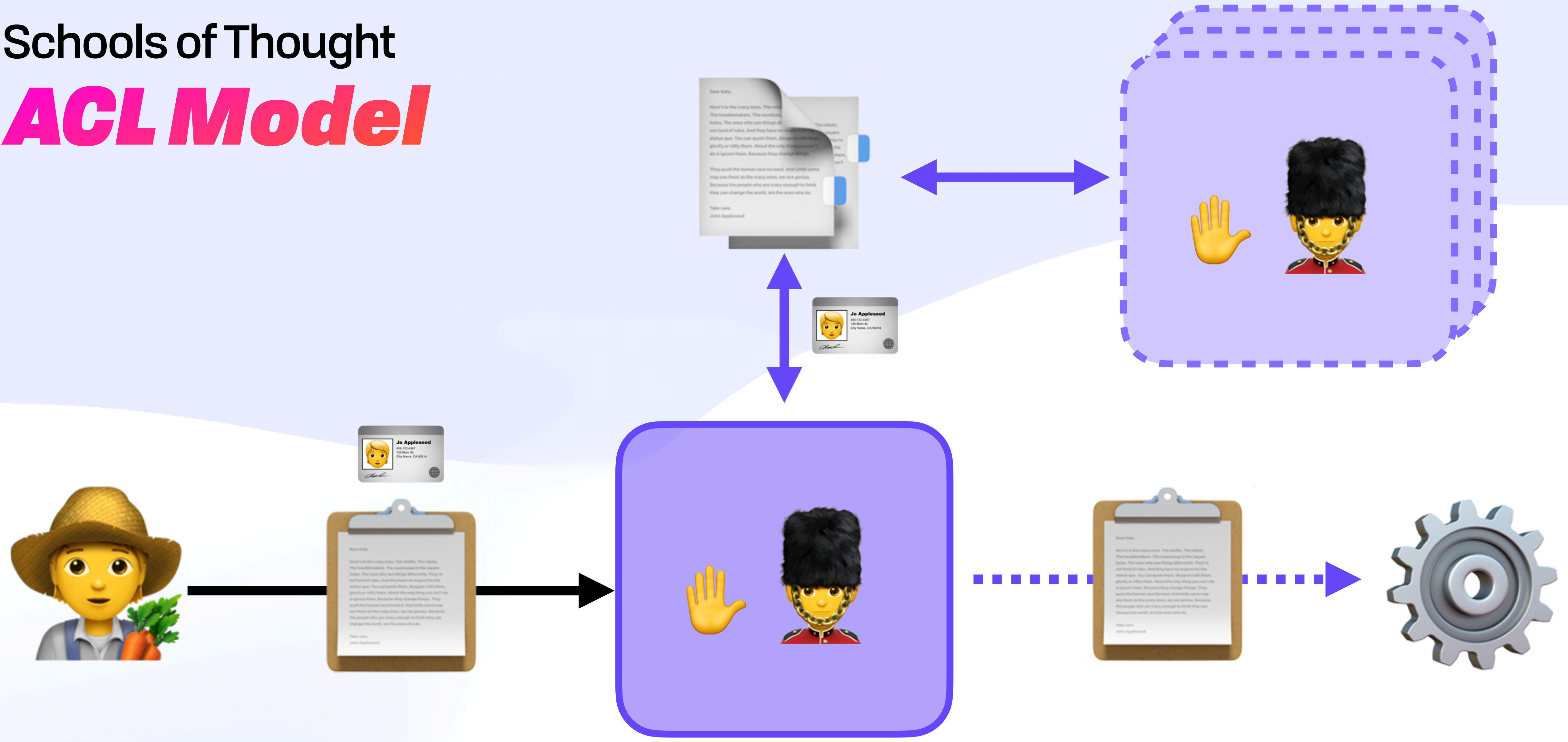
Schools of Thought

ACL Model



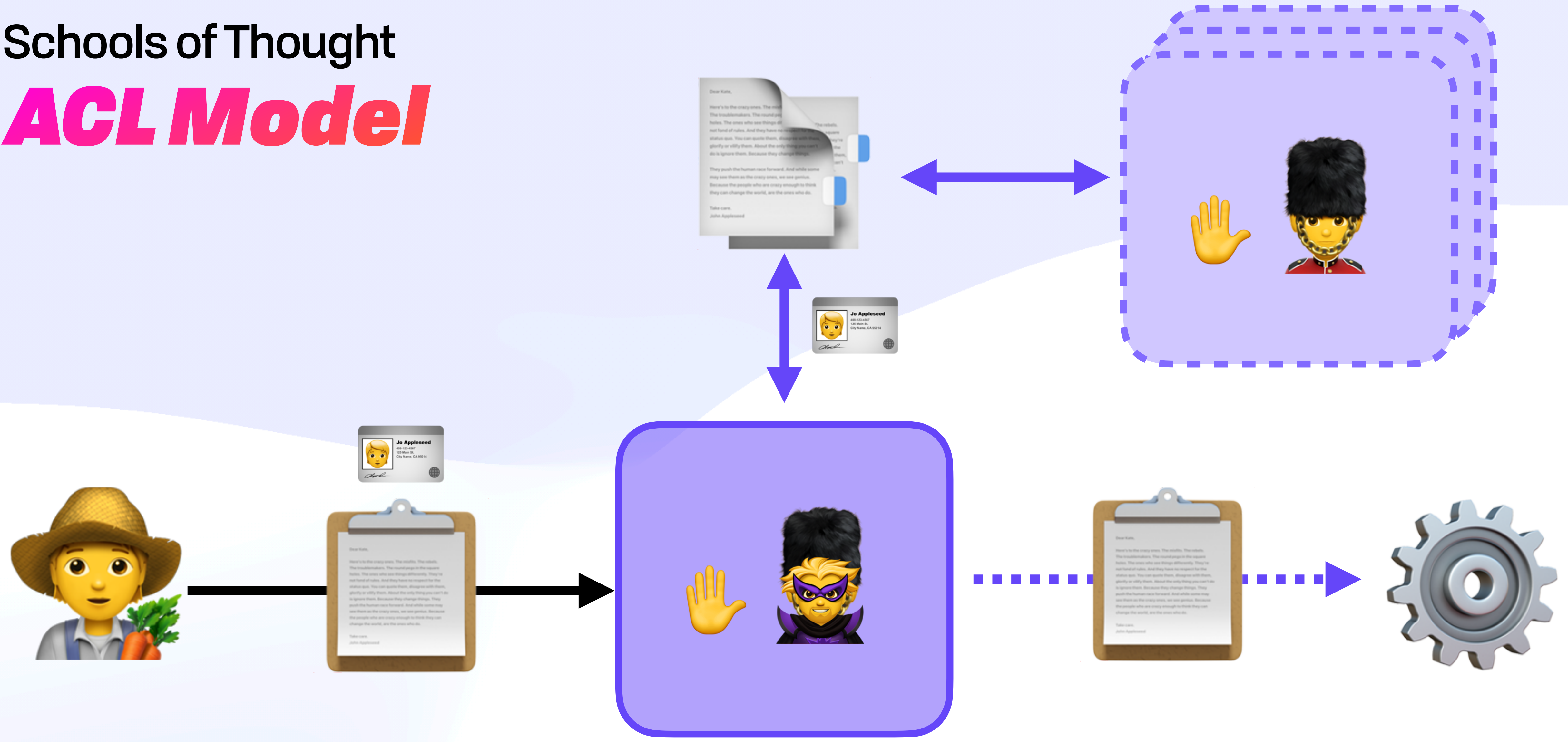
Schools of Thought

ACL Model



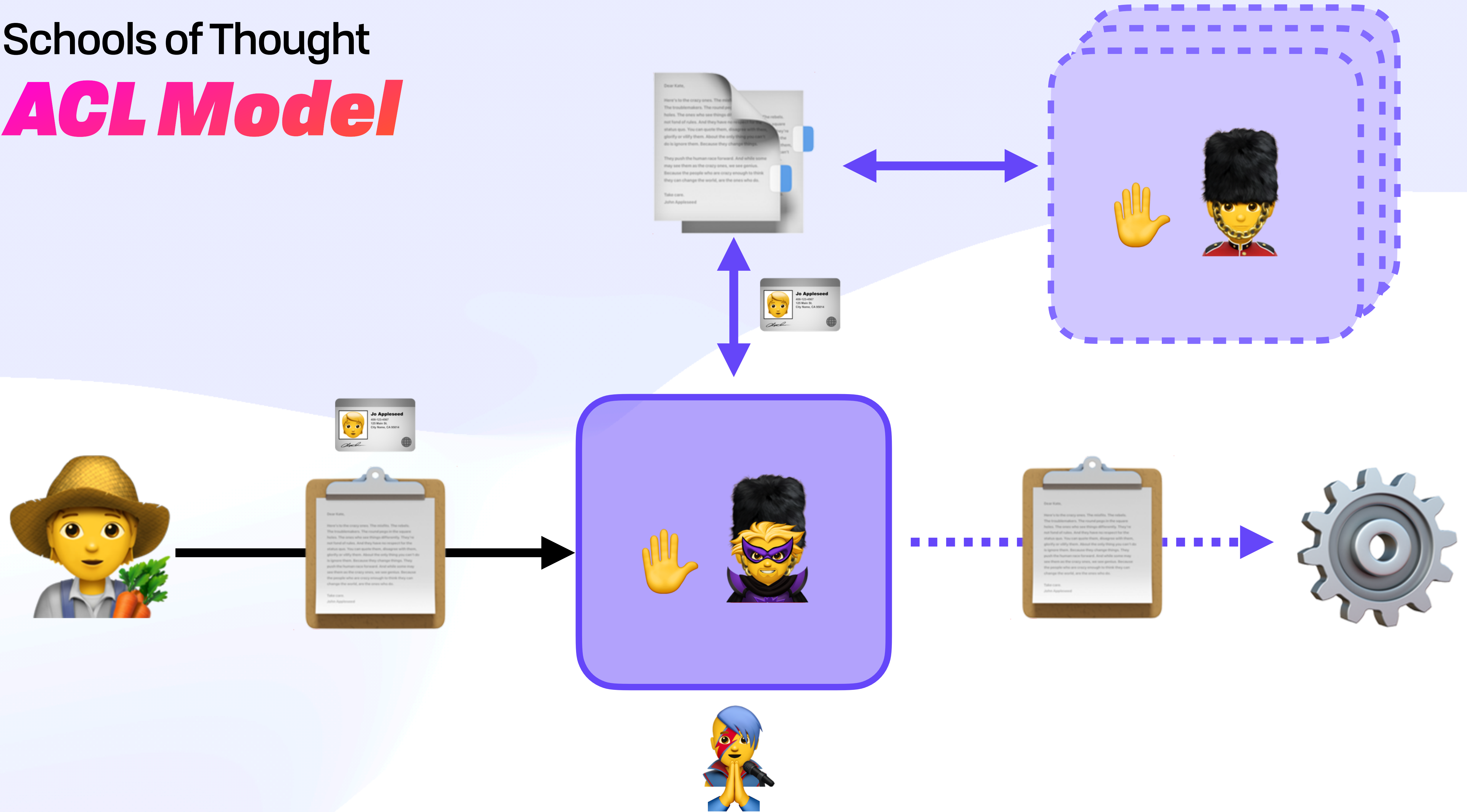
Schools of Thought

ACL Model



Schools of Thought

ACL Model



Schools of Thought

Certificate Capability Model

Schools of Thought

Certificate Capability Model



Schools of Thought

Certificate Capability Model



Schools of Thought

Certificate Capability Model



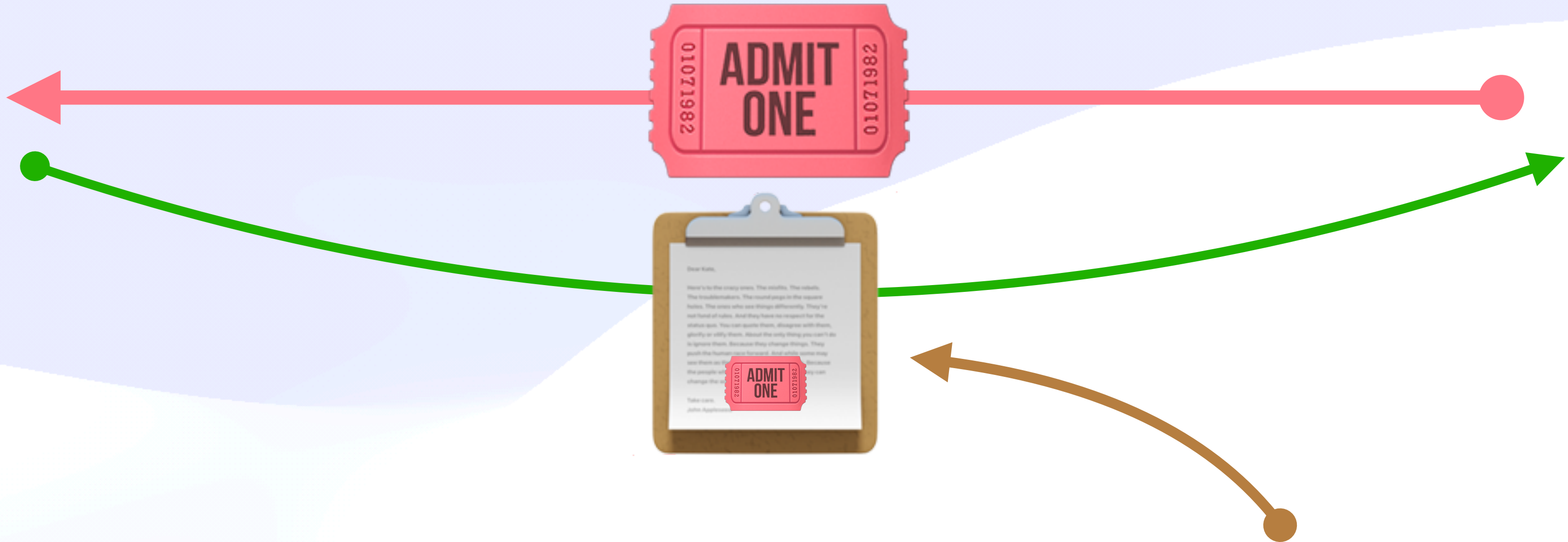
Schools of Thought

Certificate Capability Model



Schools of Thought

Certificate Capability Model



**Self-contained:
has all required info**

Schools of Thought

Certificate Capability Model



Schools of Thought

Certificate Capability Model



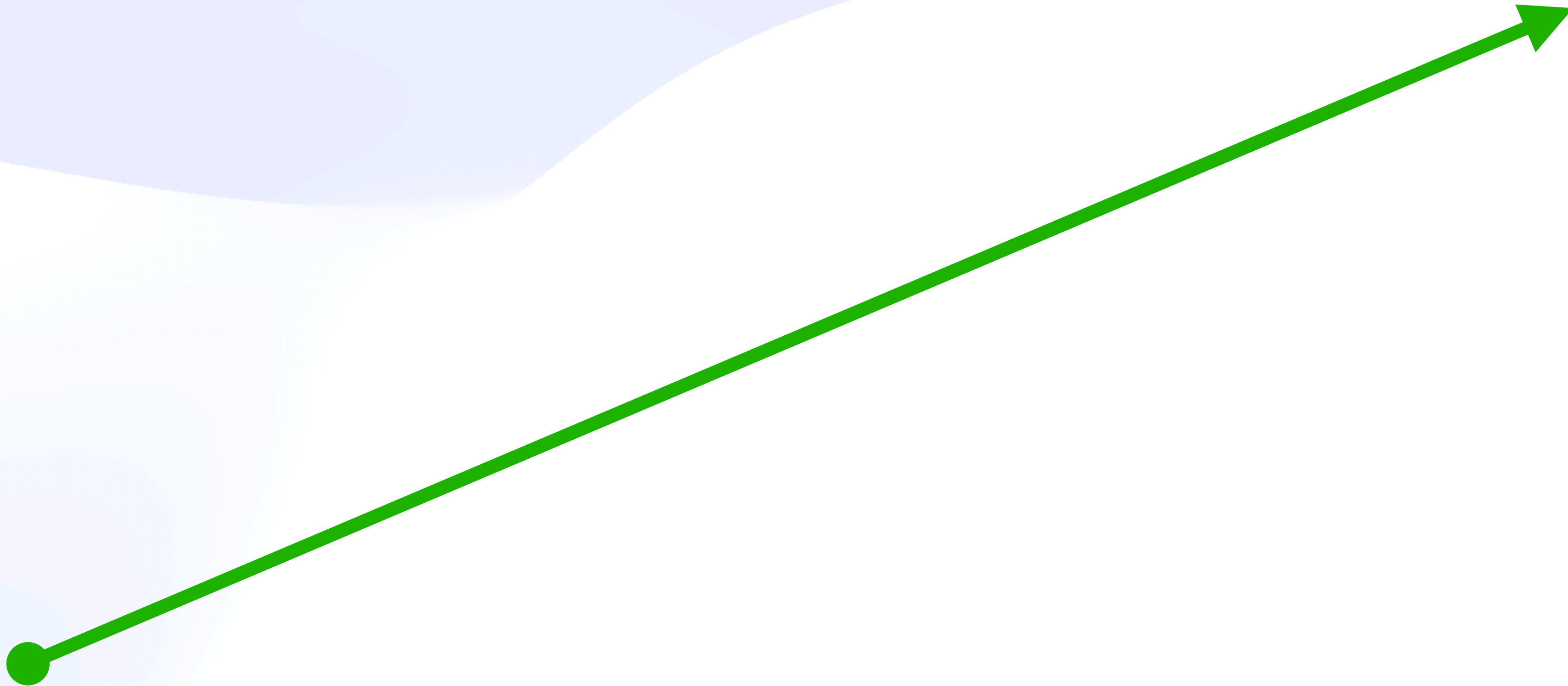
Schools of Thought

Certificate Capability Model



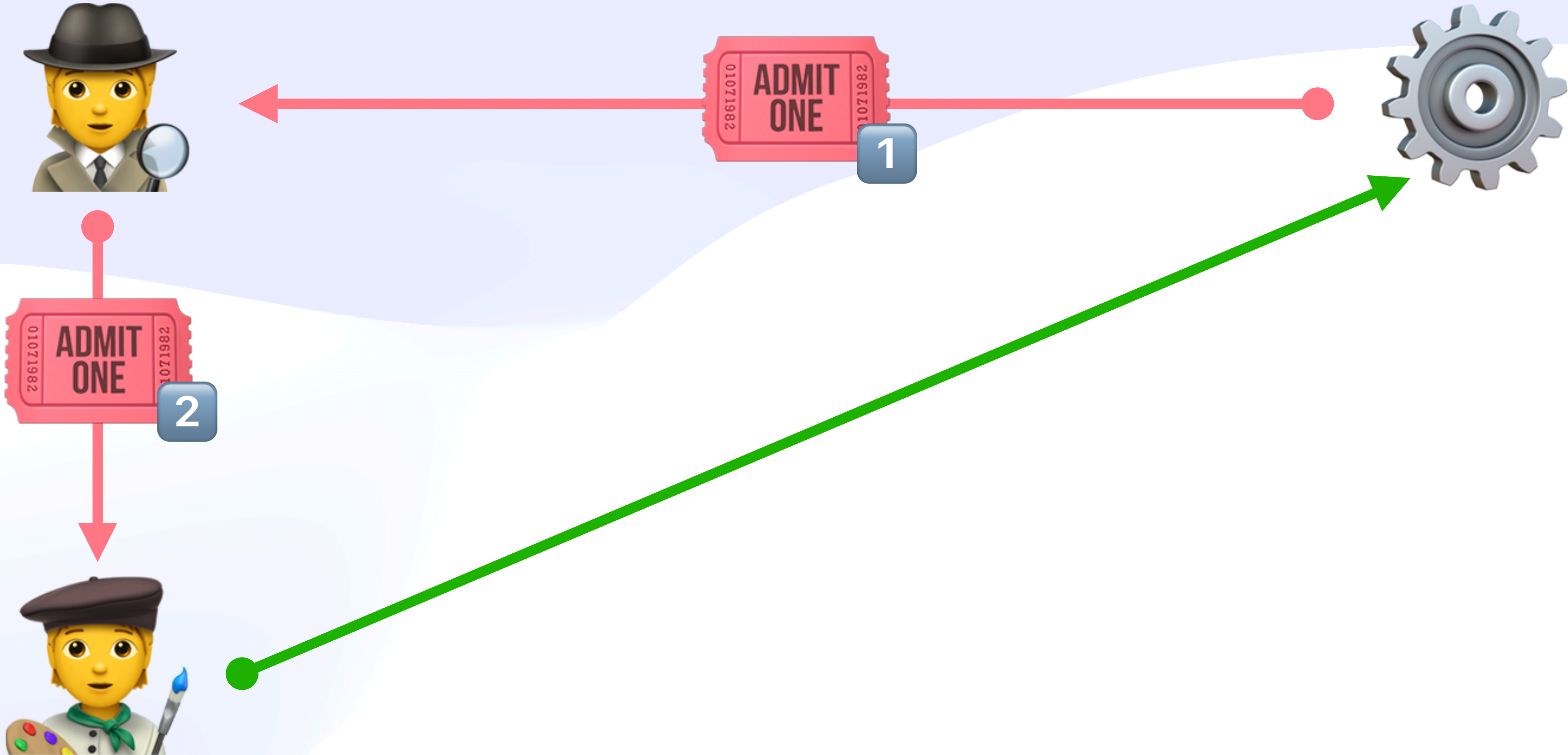
Schools of Thought

Certificate Capability Model



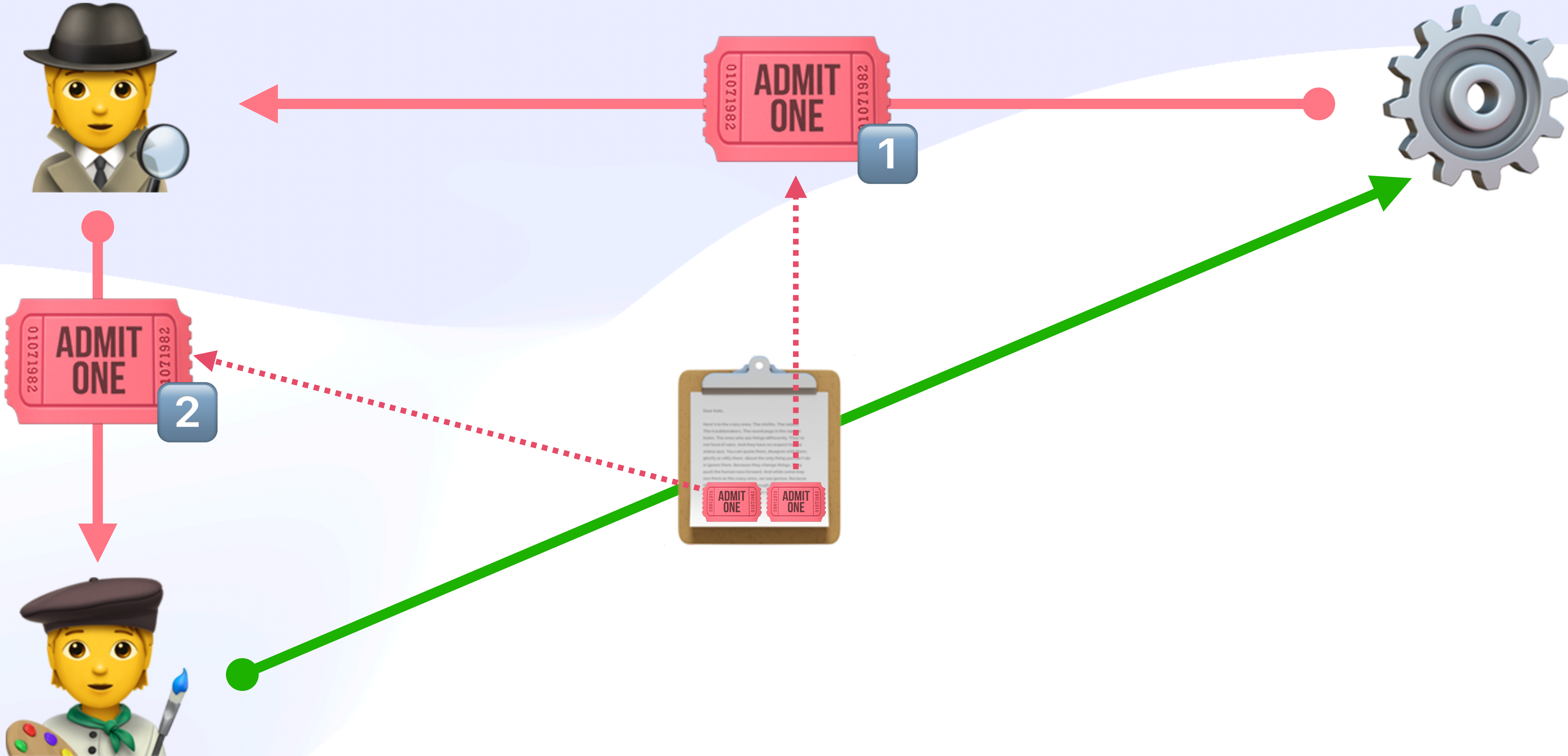
Schools of Thought

Certificate Capability Model



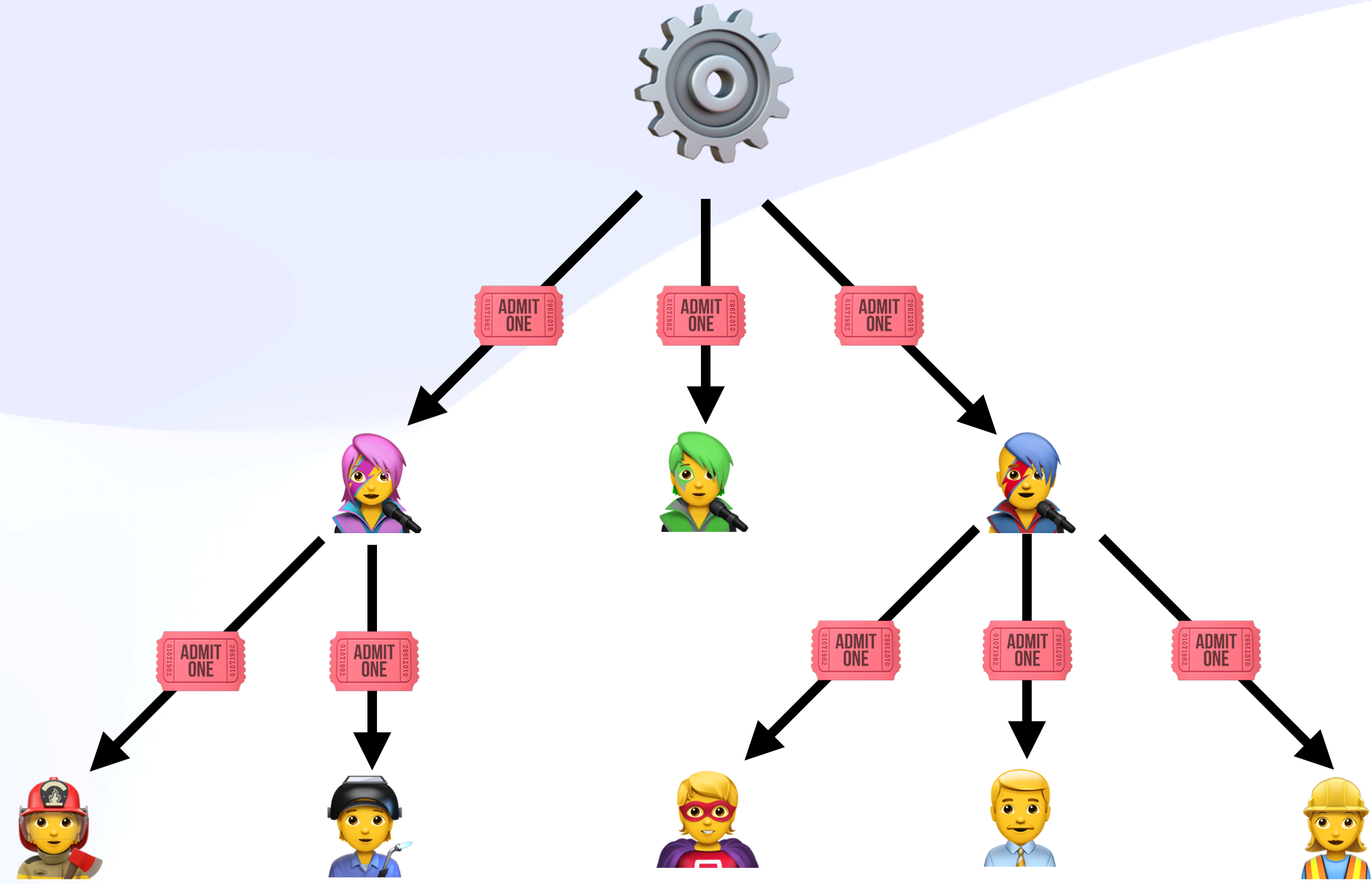
Schools of Thought

Certificate Capability Model



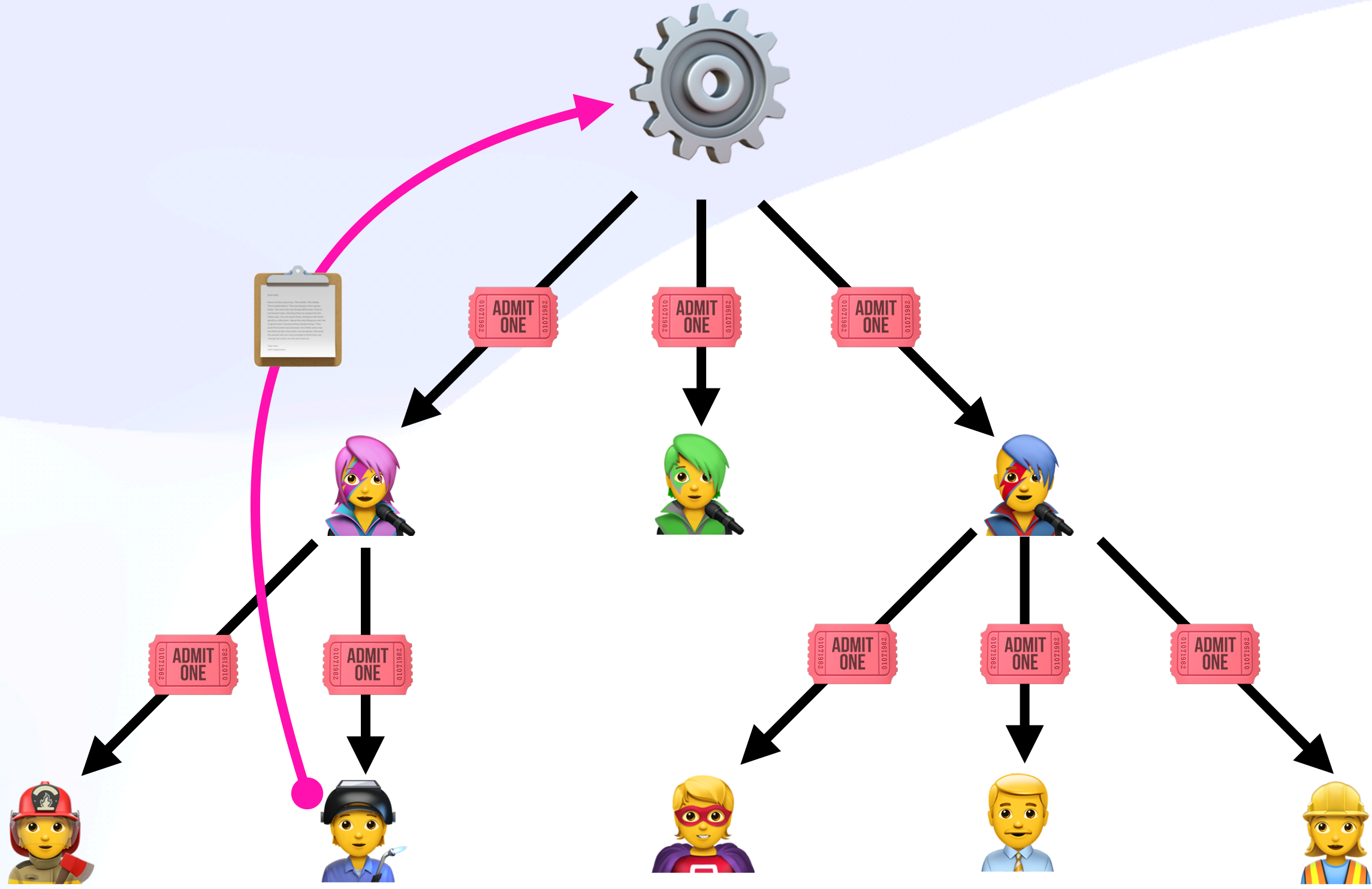
Schools of Thought

On a Need to Know Basis



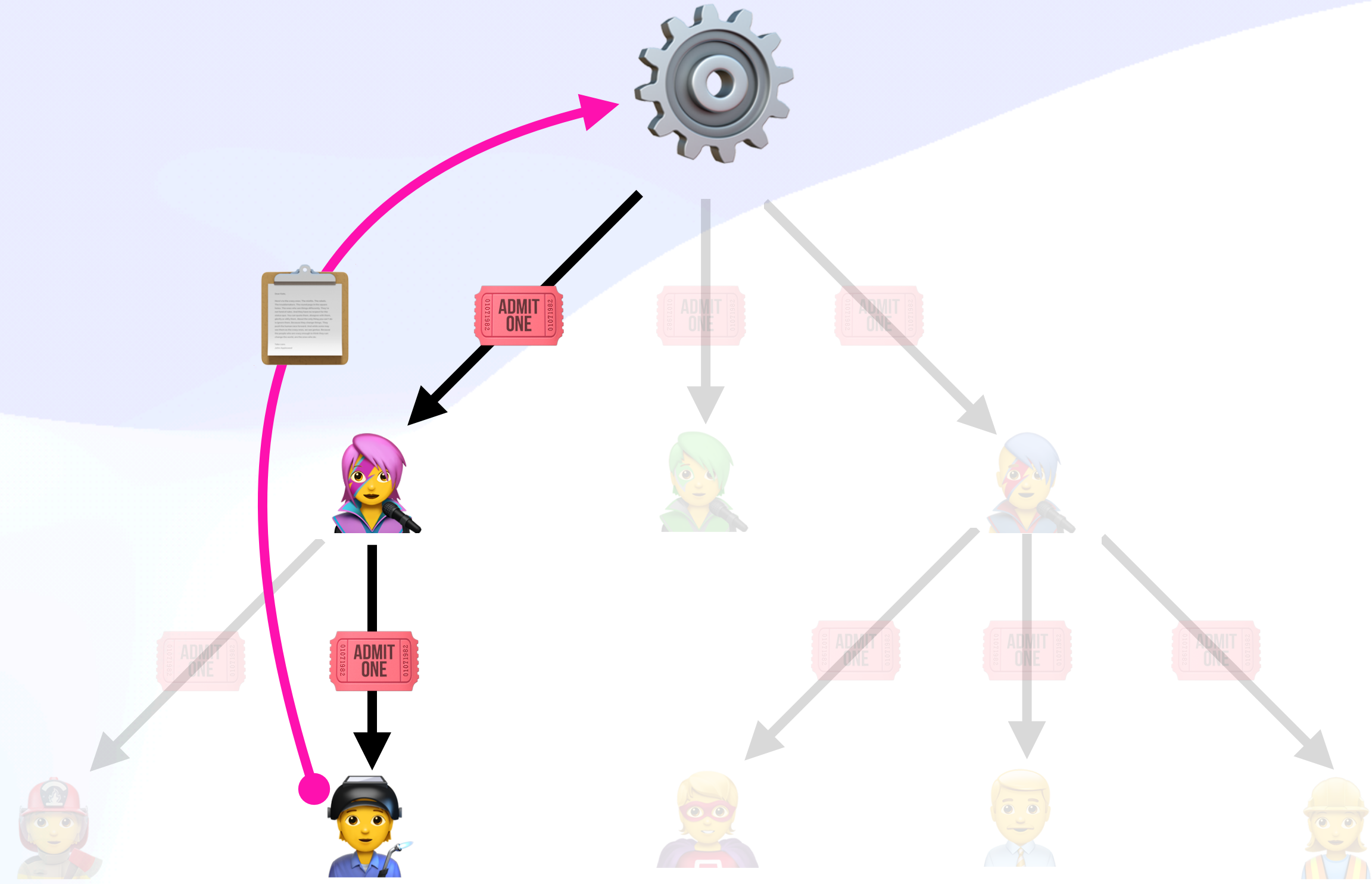
Schools of Thought

On a Need to Know Basis



Schools of Thought

On a Need to Know Basis



Schools of Thought

Auth Flow

Schools of Thought

Auth Flow



Schools of Thought

Auth Flow



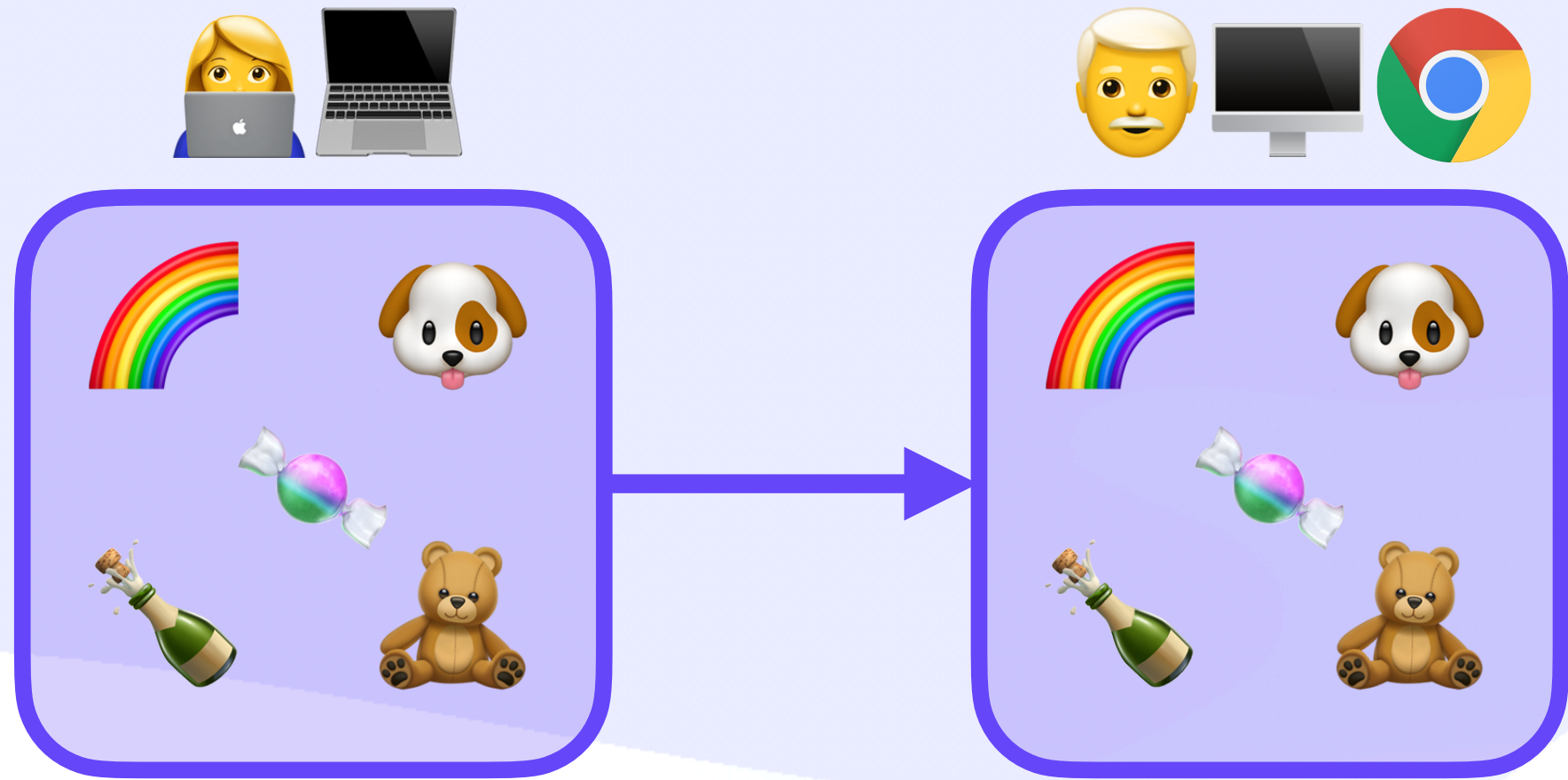
Schools of Thought

Auth Flow



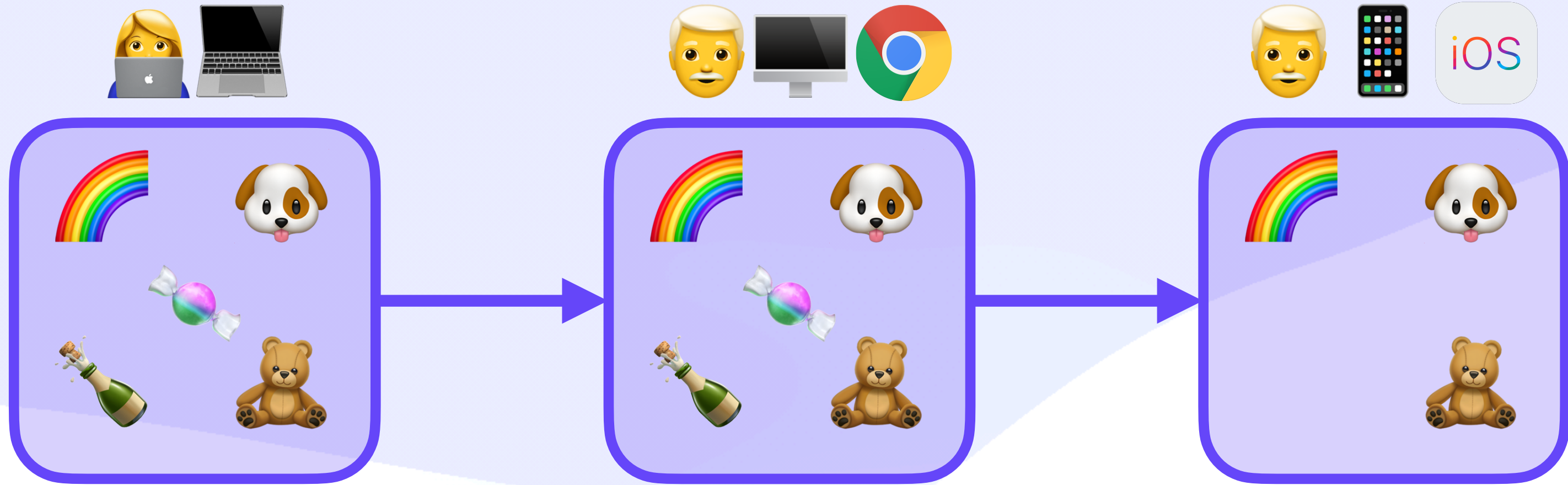
Schools of Thought

Auth Flow



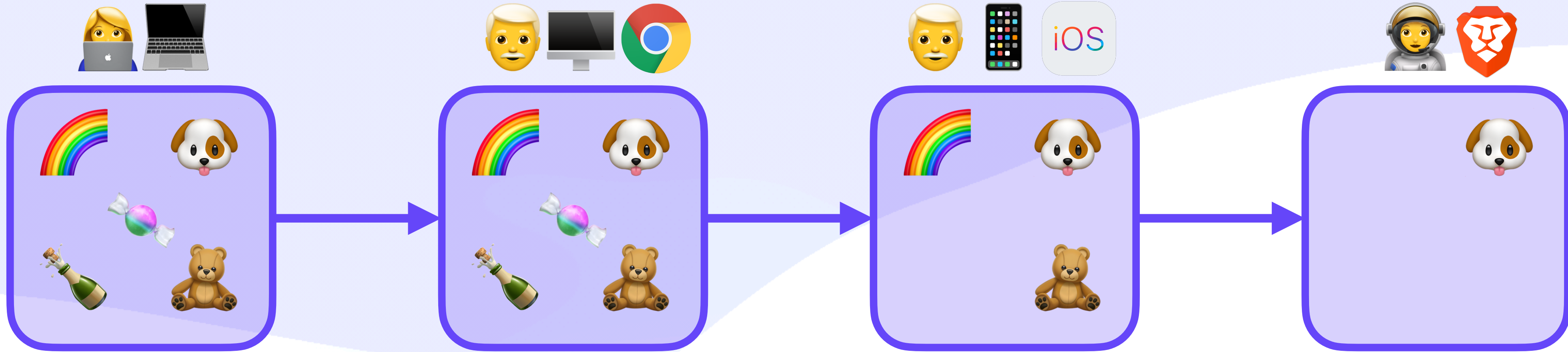
Schools of Thought

Auth Flow



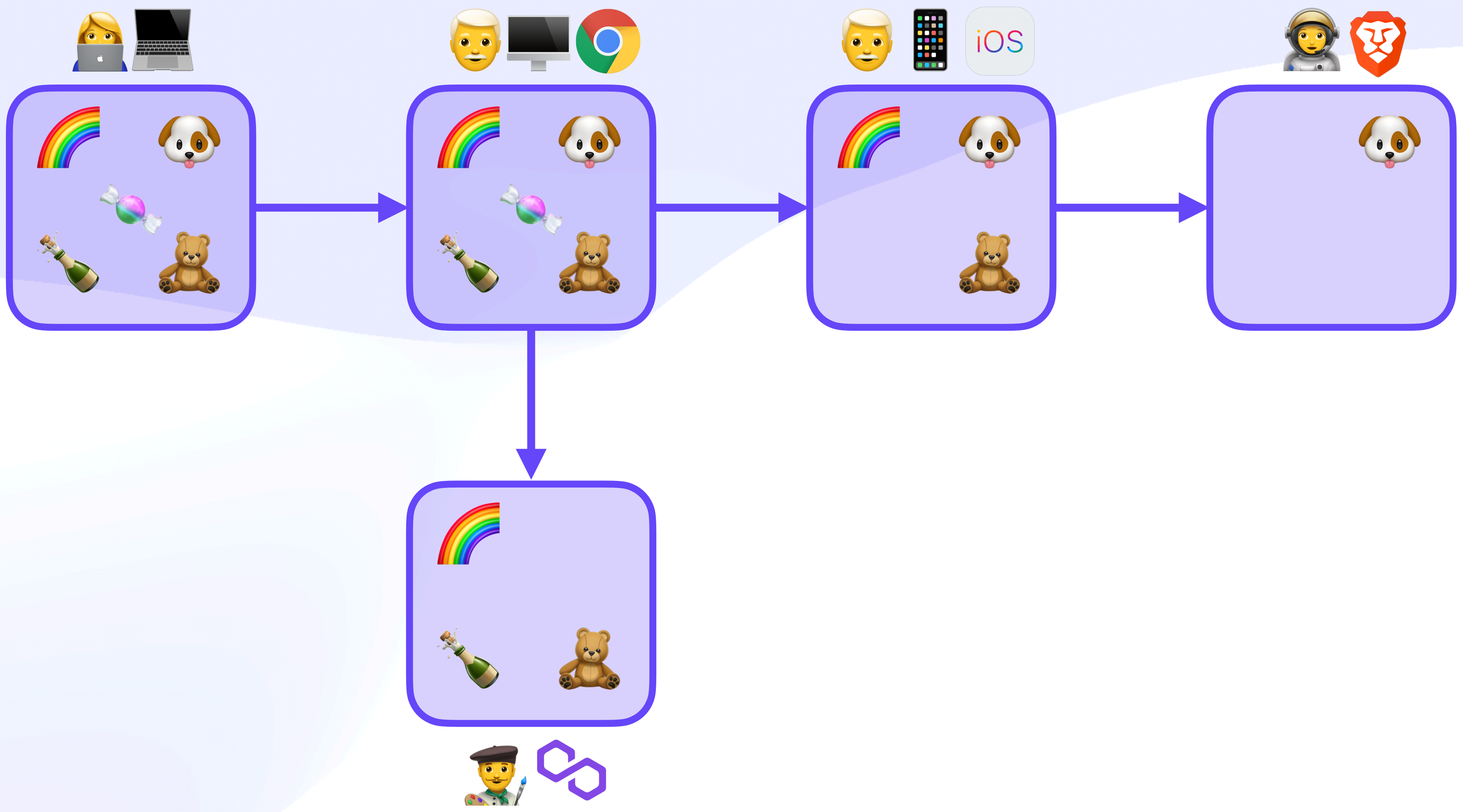
Schools of Thought

Auth Flow



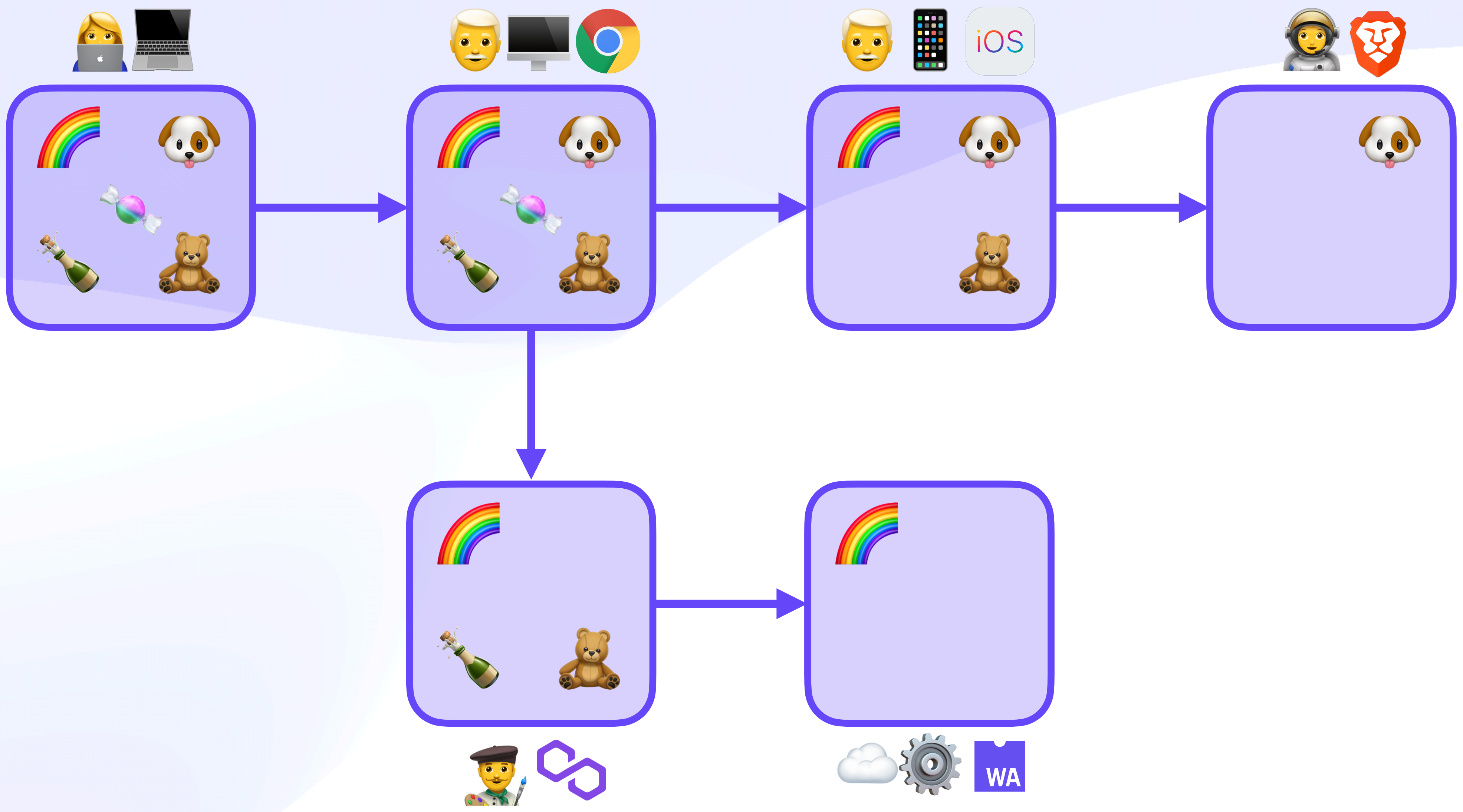
Schools of Thought

Auth Flow



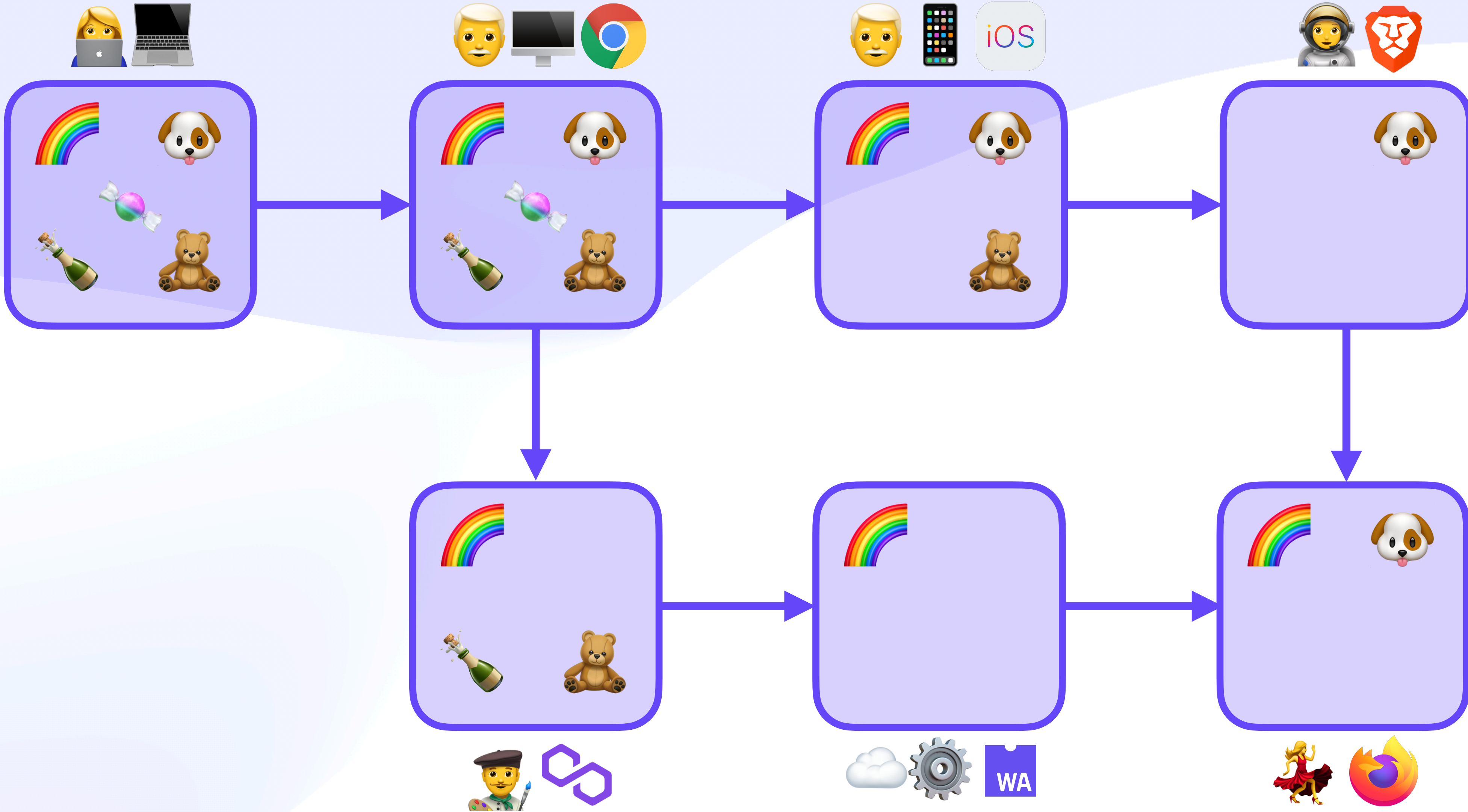
Schools of Thought

Auth Flow



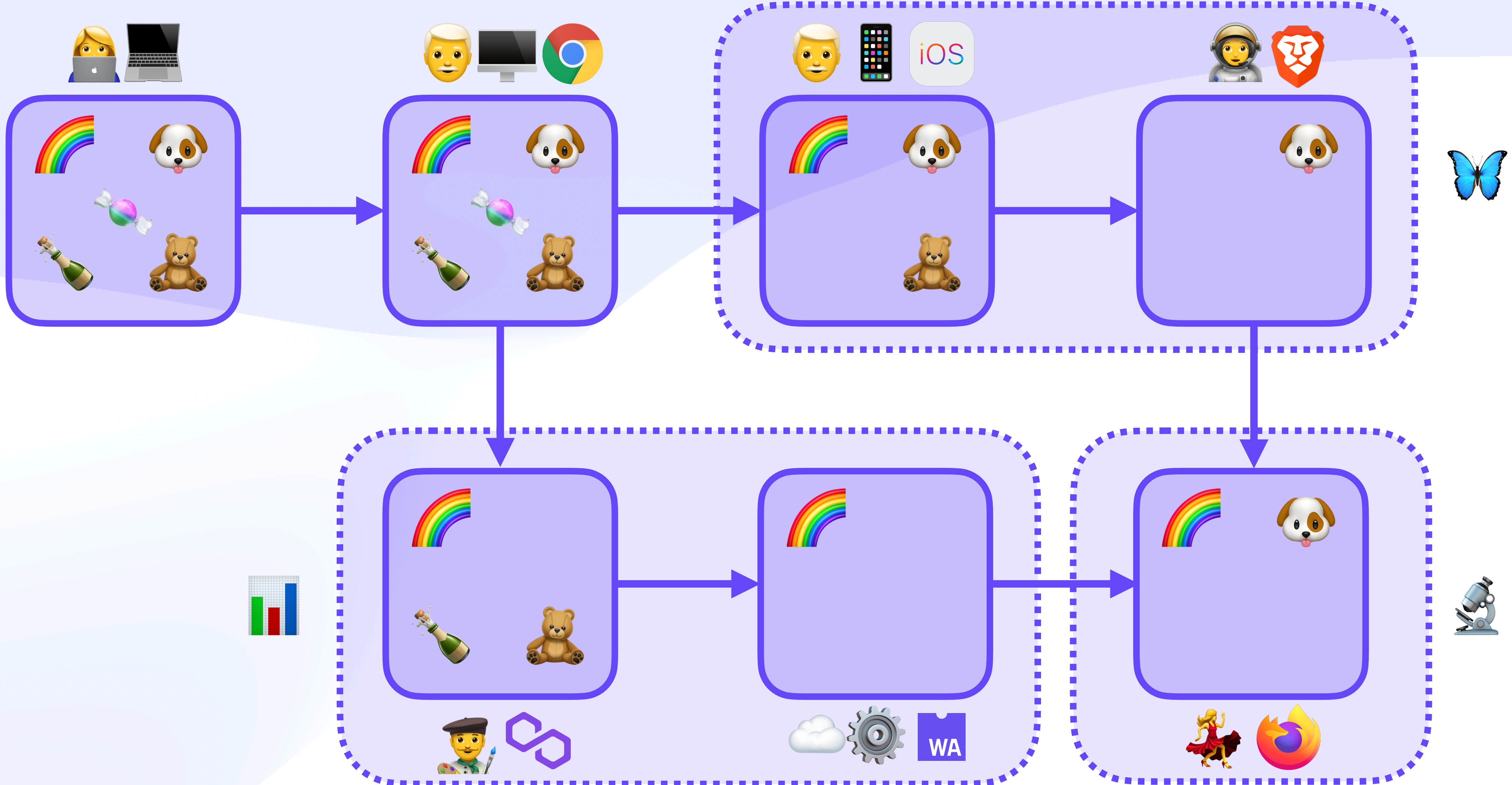
Schools of Thought

Auth Flow



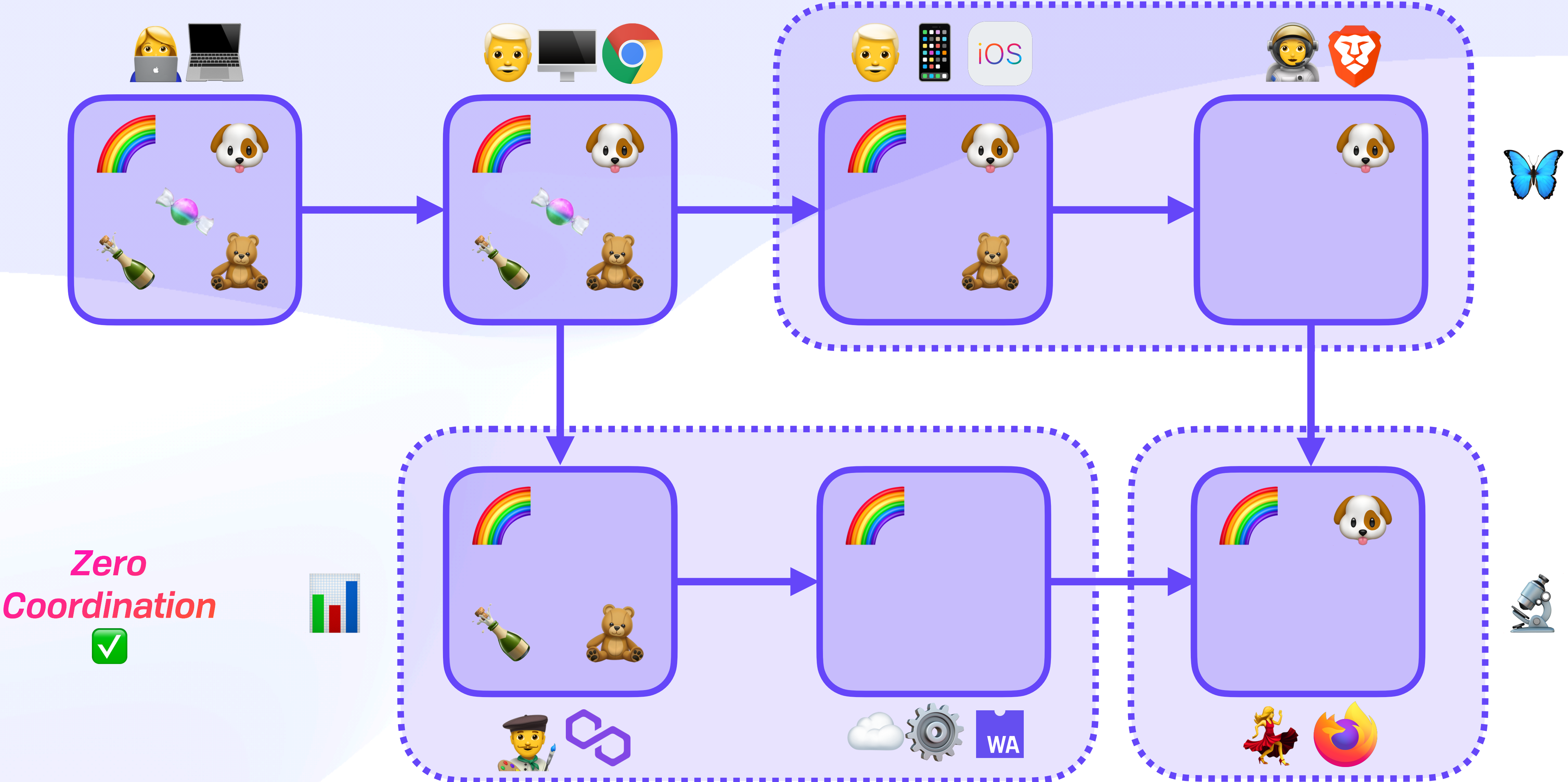
Schools of Thought

Auth Flow



Schools of Thought

Auth Flow



Raw Mechanics





Raw Mechanics

Checking Chains

About: 

From: 

To: 

Can: [, ]

About: 

From: 

To: 

Can: [, ]

About: 

From: 

To: 

Can: []






 [*]



 [, ]



 [, ]



 []



Raw Mechanics

Checking Chains

About:  

From: 

To: 

Can: [, ]

About: 

From: 

To: 

Can: [, ]

About: 

From: 

To: 

Can: []



 [*]



 [, ]



 [, ]



 []



Raw Mechanics

Checking Chains

About:  

From: 


To: 

Can: [, ]

About: 

From: 

To: 

Can: [, ]


About: 

From: 

To: 

Can: []



 [*]



 [, ]



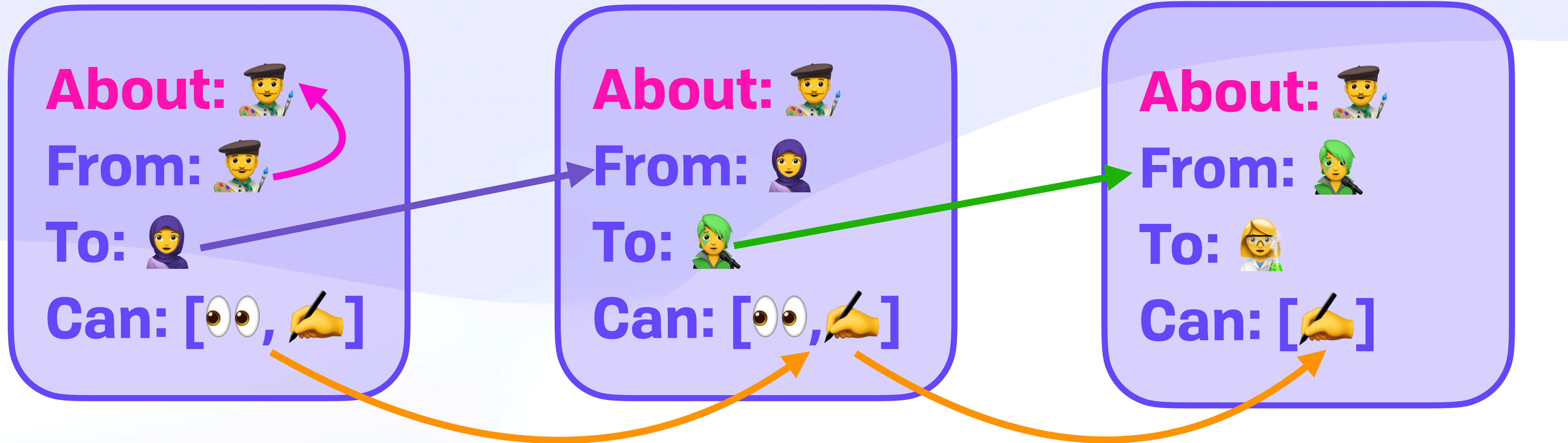
 [, ]



 []

Raw Mechanics

Checking Chains



[Artist emoji] [*]

[Woman in hijab emoji] [Eyes emoji, Hand holding pen emoji]

[Woman with green hair emoji] [Eyes emoji, Hand holding pen emoji]

[Woman with glasses emoji] [Hand holding pen emoji]

Raw Mechanics

Syntactically Driven

```
{
  iss: "did:key:alice",
  aud: "did:key:bob",
  sub: "did:key:doc"
  cmd: "/automerge/update",
  pol: [
    ["gt", ".foo[1].bar", "42"],
    ["eq", ".prev", 0x98ea6e4f216f2fb4b69fff9b3a44842c38686ca685f3f55dc48c5d3fb1107be4]
  ]
}
```

```
{
  iss: "did:key:bob",
  aud: "did:key:doc",
  sub: "did:key:doc"
  prf: [hash(delegation), hash(more_chain)]
  cmd: "/automerge/update",
  args: {
    foo: [
      {bar: 100}, // > 42
      {quux: "unconstrained"}
    ],
    prev: 0x98ea6e4f216f2fb4b69fff9b3a44842c38686ca685f3f55dc48c5d3fb1107be4
  }
}
```

Raw Mechanics

Syntactically Driven

```
{
  iss: "did:key:alice",
  aud: "did:key:bob",
  sub: "did:key:doc",
  cmd: "/automerge/update",
  pol: [
    ["gt", ".foo[1].bar", "42"],
    ["eq", ".prev", 0x98ea6e4f216f2fb4b69fff9b3a44842c38686ca685f3f55dc48c5d3fb1107be4]
  ]
}
```

```
{
  iss: "did:key:bob",
  aud: "did:key:doc",
  sub: "did:key:doc",
  prf: [hash(delegation), hash(more_chain)]
  cmd: "/automerge/update",
  args: {
    foo: [
      {bar: 100}, // > 42
      {quux: "unconstrained"}
    ],
    prev: 0x98ea6e4f216f2fb4b69fff9b3a44842c38686ca685f3f55dc48c5d3fb1107be4
  }
}
```

Raw Mechanics

Syntactically Driven

```
{
  iss: "did:key:alice",
  aud: "did:key:bob",
  sub: "did:key:doc",
  cmd: "/automerge/update",
  pol: [
    ["gt", ".foo[1].bar", "42"],
    ["eq", ".prev", 0x98ea6e4f216f2fb4b69fff9b3a44842c38686ca685f3f55dc48c5d3fb1107be4]
  ]
}
```

```
{
  iss: "did:key:bob",
  aud: "did:key:doc",
  sub: "did:key:doc",
  prf: [hash(delegation), hash(more_chain)]
  cmd: "/automerge/update",
  args: {
    foo: [
      {bar: 100}, // > 42
      {quux: "unconstrained"}
    ],
    prev: 0x98ea6e4f216f2fb4b69fff9b3a44842c38686ca685f3f55dc48c5d3fb1107be4
  }
}
```

Raw Mechanics

Syntactically Driven

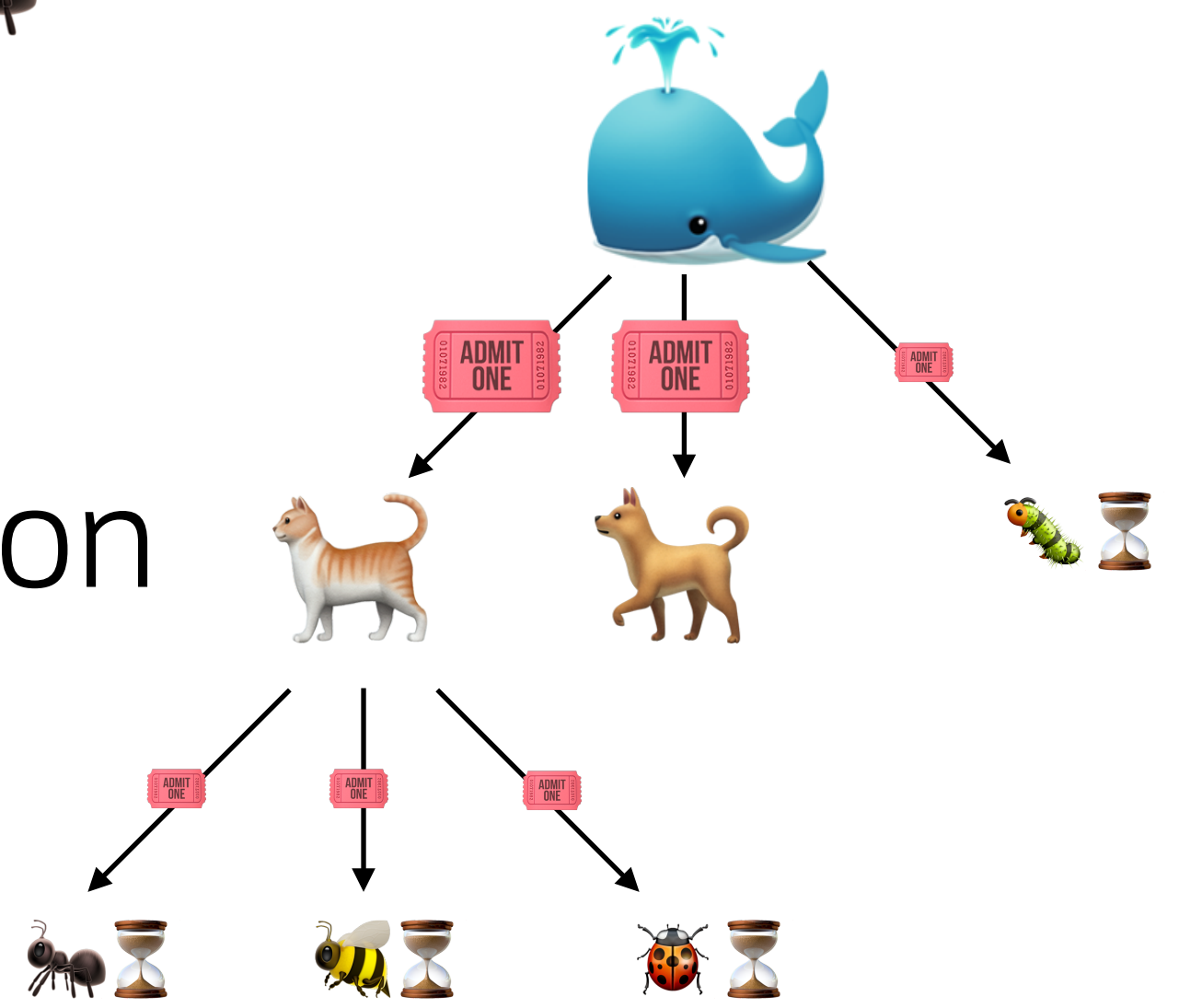
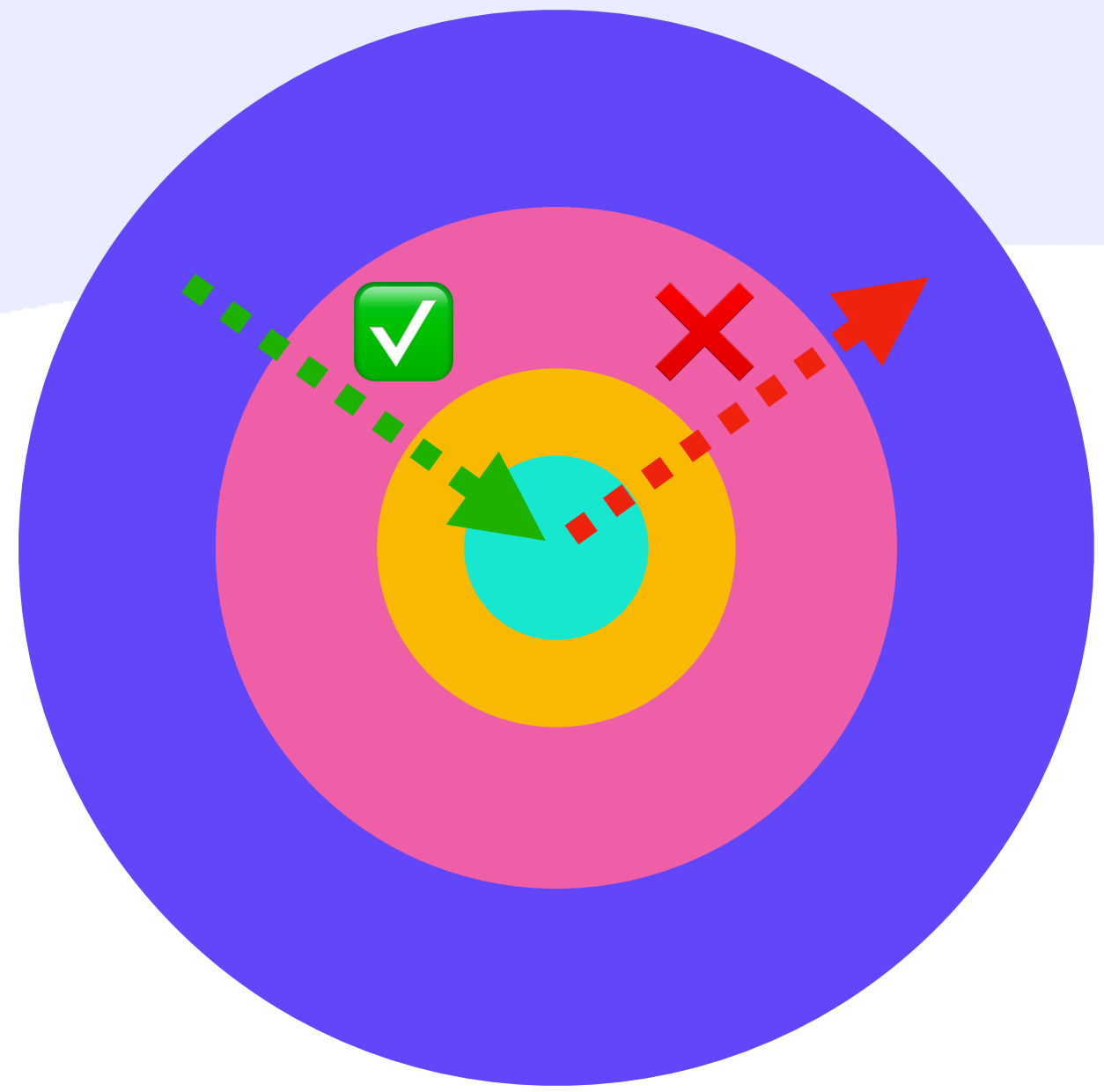
```
{  
  iss: "did:key:alice",  
  aud: "did:key:bob",  
  sub: "did:key:doc",  
  cmd: "/automerge/update",  
  pol: [  
    ["gt", ".foo[1].bar", "42"],  
    ["eq", ".prev", 0x98ea6e4f216f2fb4b69fff9b3a44842c38686ca685f3f55dc48c5d3fb1107be4]  
  ]  
}
```

```
{  
  iss: "did:key:bob",  
  aud: "did:key:doc",  
  sub: "did:key:doc",  
  prf: [hash(delegation), hash(more_chain)]  
  cmd: "/automerge/update",  
  args: {  
    foo: [  
      {bar: 100}, // > 42  
      {quux: "unconstrained"}  
    ],  
    prev: 0x98ea6e4f216f2fb4b69fff9b3a44842c38686ca685f3f55dc48c5d3fb1107be4  
  }  
}
```

The Freedom of Least Authority

Ad Hoc Caveats

- Agents are **abundant**
 - Few human system administrators 🐳
 - Billions of throwaway single-purpose workers 🐜
- Arbitrarily restrict authority
 - i.e. don't even allow an LLM to hallucinate intention



The Freedom of Least Authority

Minimal Surface Area

- Avoid the **confused deputy problem**
 - (Happens when an agent uses their authority to fulfil a request)
- UCAN
 - Executor never runs under their own "ambient authority"
 - All info in request: run with exactly that level of auth
 - "Just run with the handle you were handed"

Yes... UCAN!

Wrap Up



Capabilities Worldview

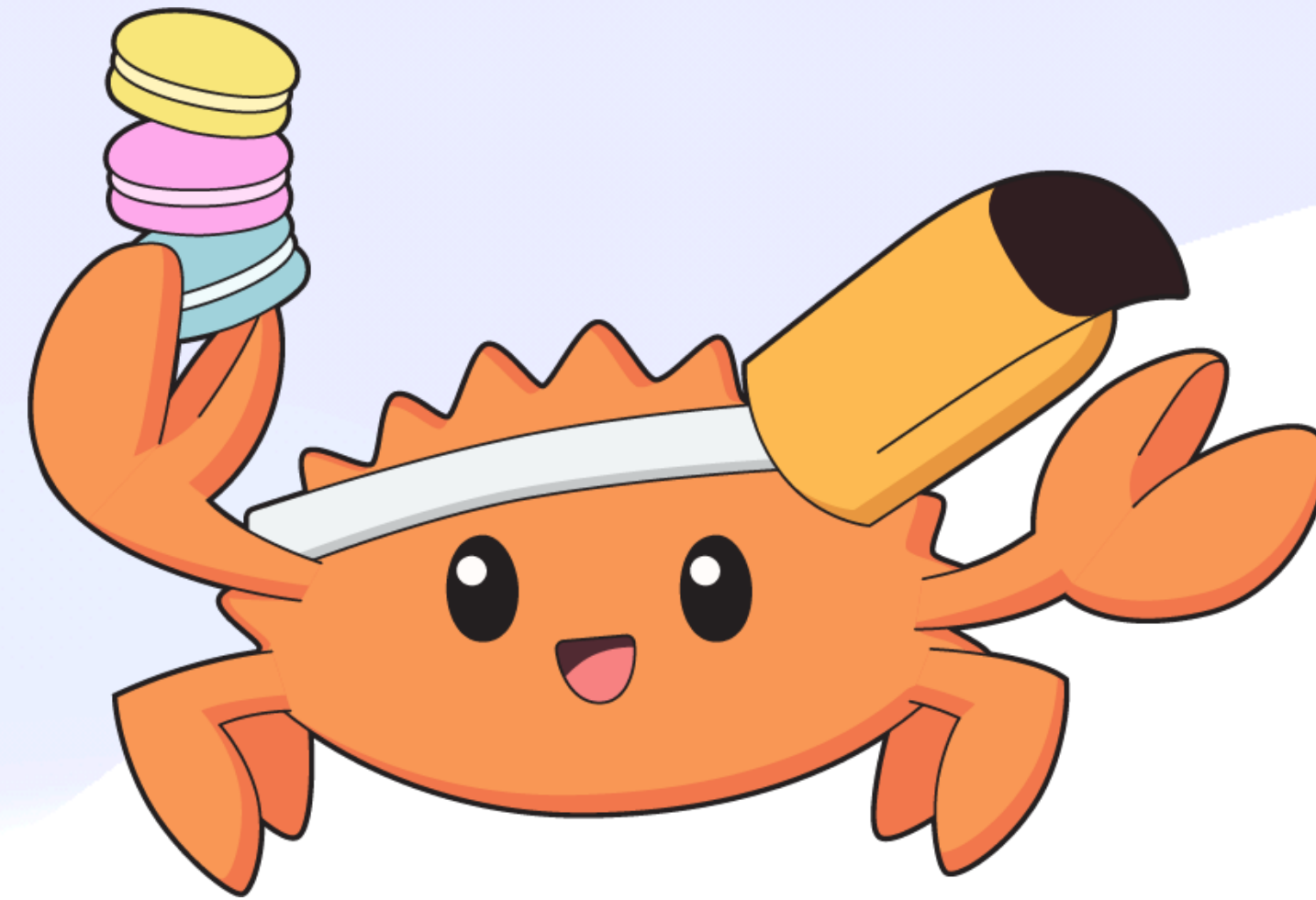
Honest Model, Simple to Use

- "If you have it, you can use it & share it"
- Closely models auth **ground truth**
- Natural **programming** model "like passing handles"

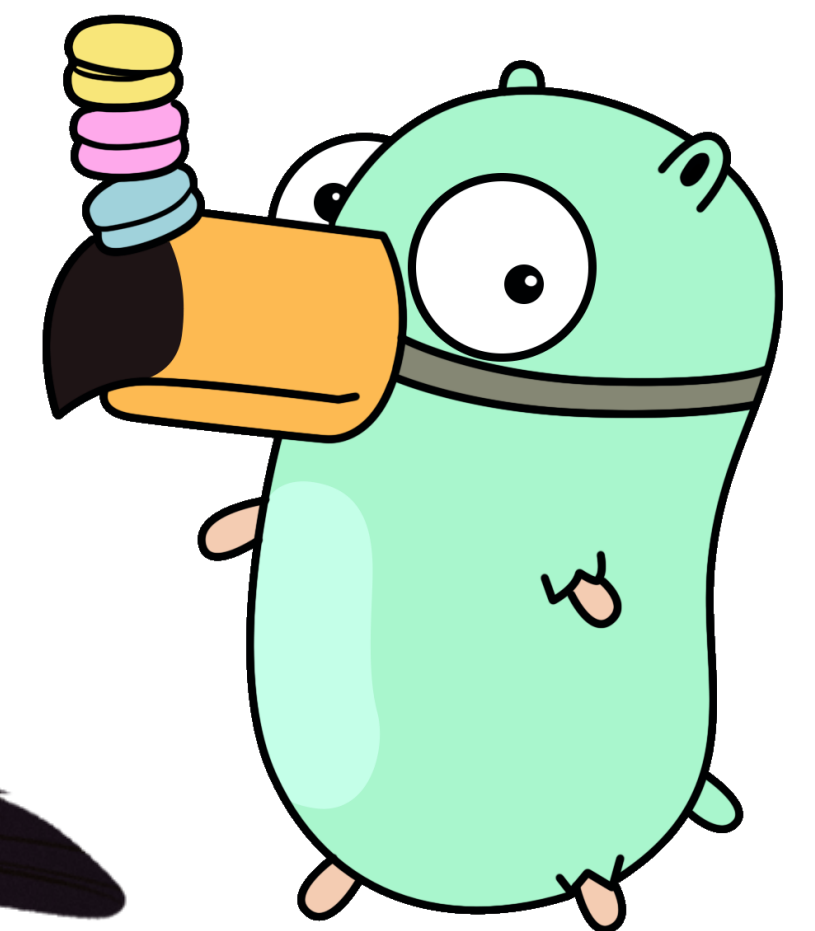
Resources

(Some) Existing Subprojects

- ◆ <https://github.com/ucan-wg/>
 - ◆ Specs & Improvement Proposals
 - ◆ v1.0 "any moment now"
- ◆ ts-ucan
- ◆ rs-ucan
- ◆ go-ucan
- ◆ hs-ucan
- ◆ AWAKE secure channels & login



AWAKE



<https://ucan.xyz>

<https://github.com/ucan-wg>

 ***Thank You, Berlin*** 

github.com/expede

@expede