How AI is changing Database Architecture

It's Not What You Think

Robert Hodges - Altinity CEO
OSA Con 2026



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Run Open Source ClickHouse® Better

Altinity.Cloud Enterprise Support

Antalya Builds – Altinity Operator for ClickHouse – Altinity MCP

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AI and the age of uncertainty

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Is AI a good or bad thing?

Geoffrey Hinton says there is 10% to 20% chance AI will lead to human extinction in three decades, as change moves fast

'We need dramatic changes': is societal collapse inevitable?

The Guardian US

AI 'godfather' Yann LeCun has 'zero concerns' about human extinction, says Anthropic CEO Dario Amodei is 'deluded'



By Emily Forlini
Senior AI Reporter

Follow

October 1, 2026, 3:00 AM ET

FORTUNE

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How capable is AI? Benchmarks miss 90% of O*NET tasks



https://www.mercor.com/research/labor-index/benchmark-map/

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The Humanities want to have a word...

The future is already here – it's just not very evenly distributed.

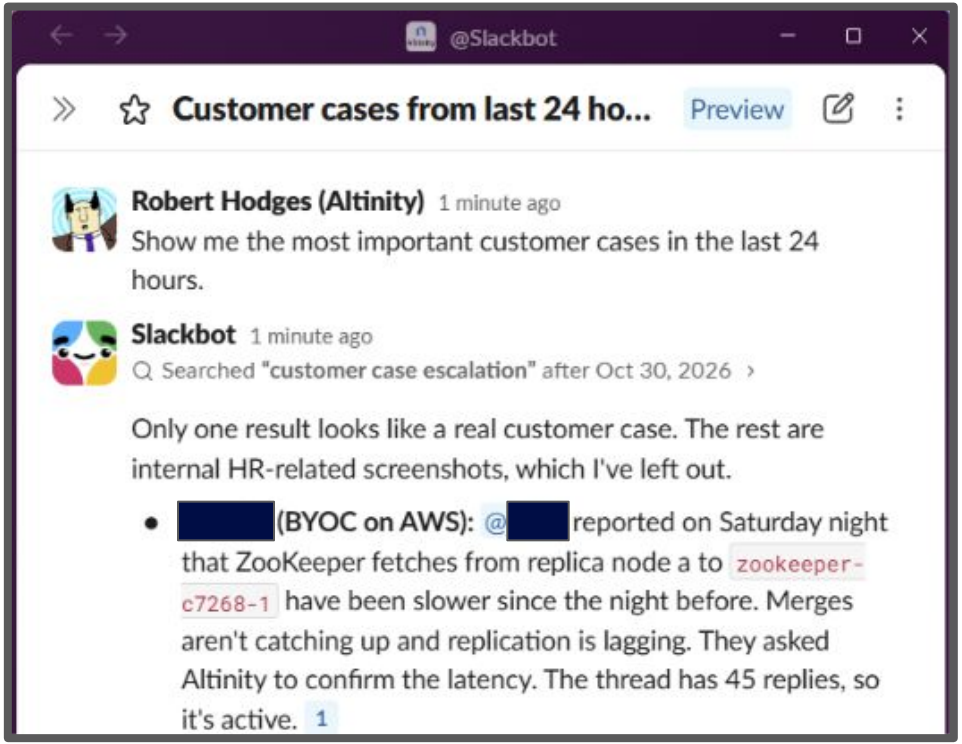
William Gibson

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Agents as normal workloads

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Does this agent look like a database problem?



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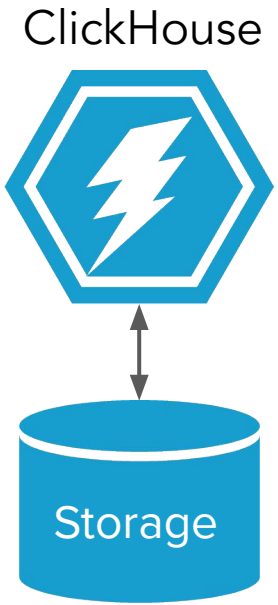
What analytic databases do when you aren't watching

Ingestion

Inserting new data

Compaction

Merging small parts into big ones



Query

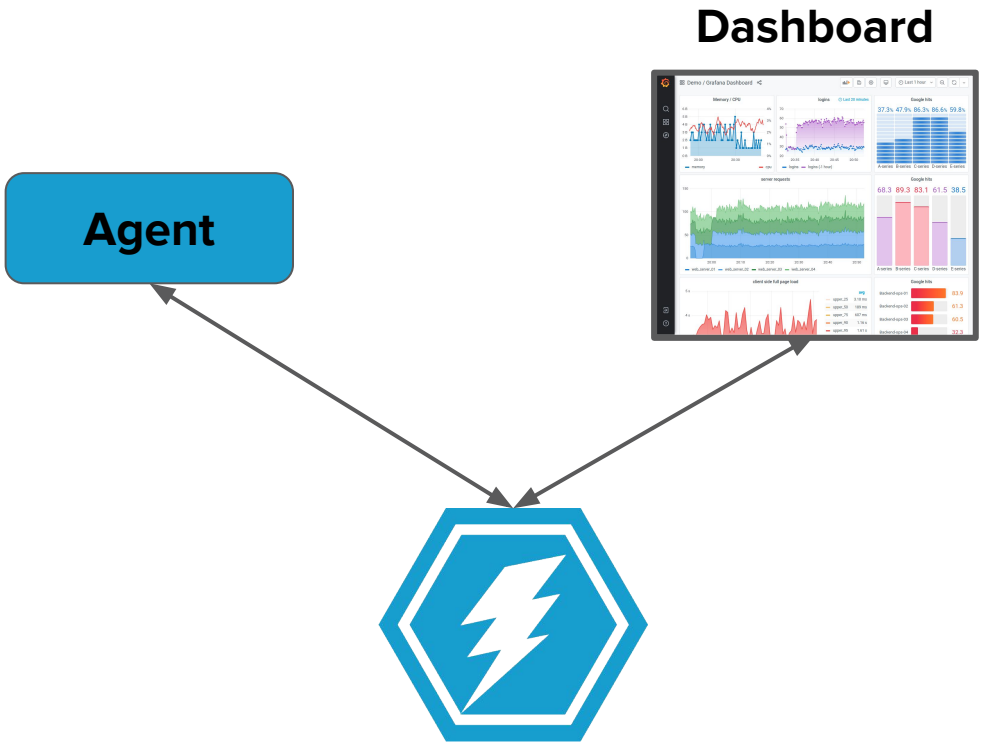
Selecting from tables

Mutation

Updating or deleting data

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Is there really a difference between agents and applications?

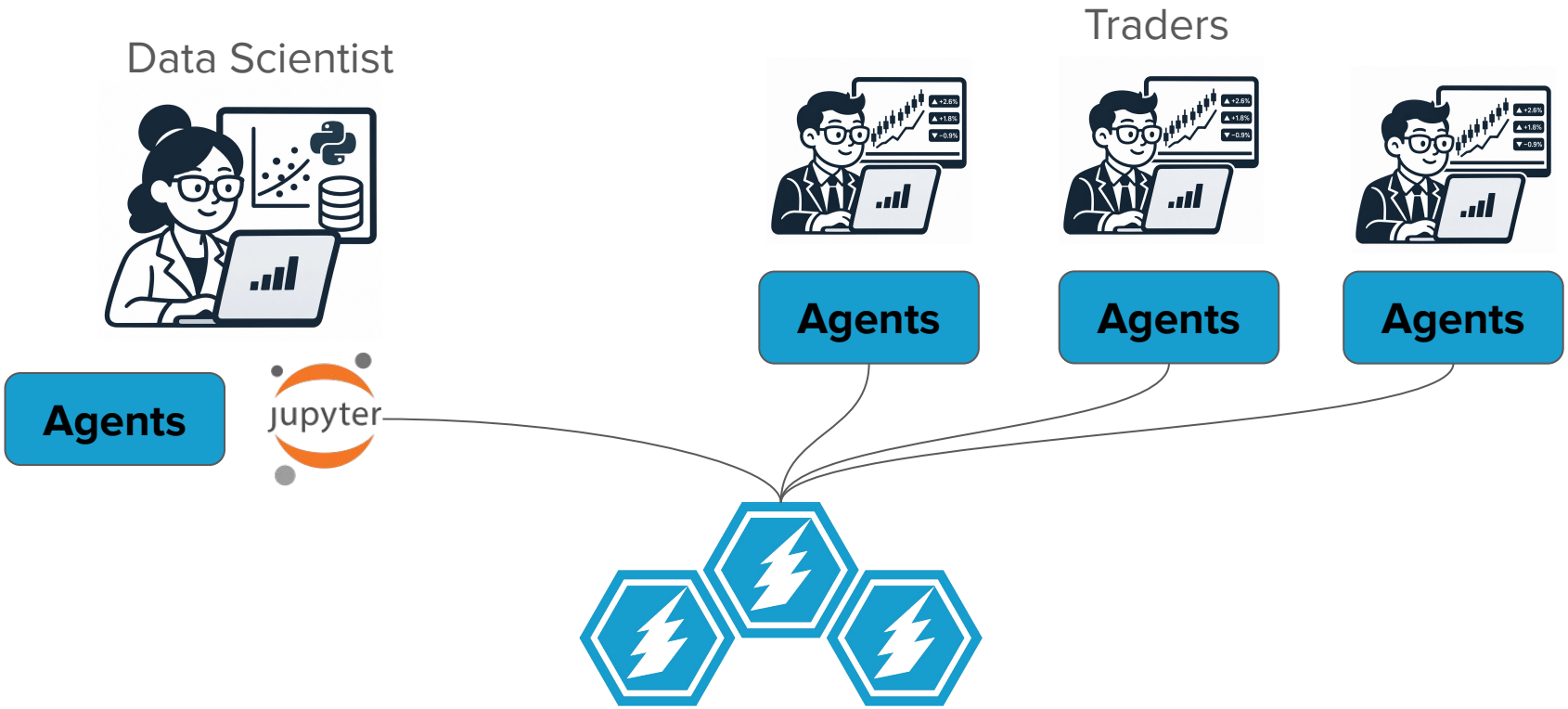


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Everyone's a data scientist

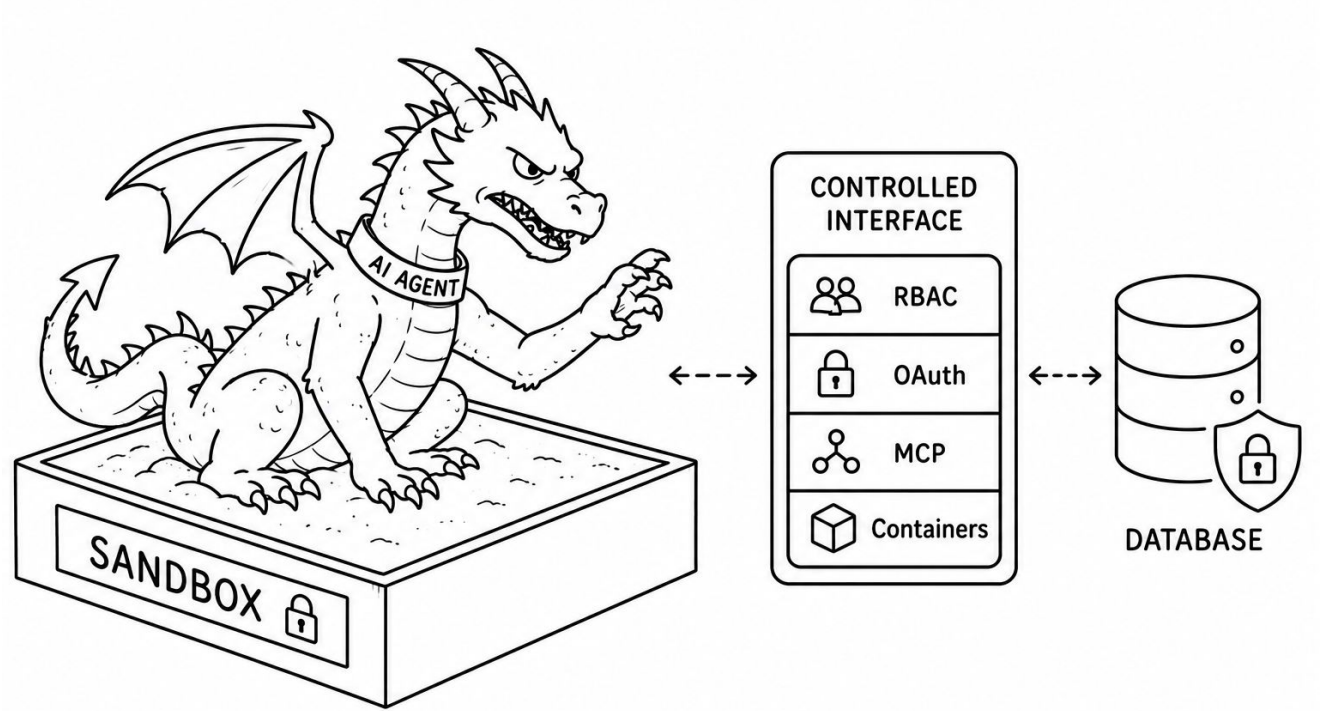
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Access to data is expanding



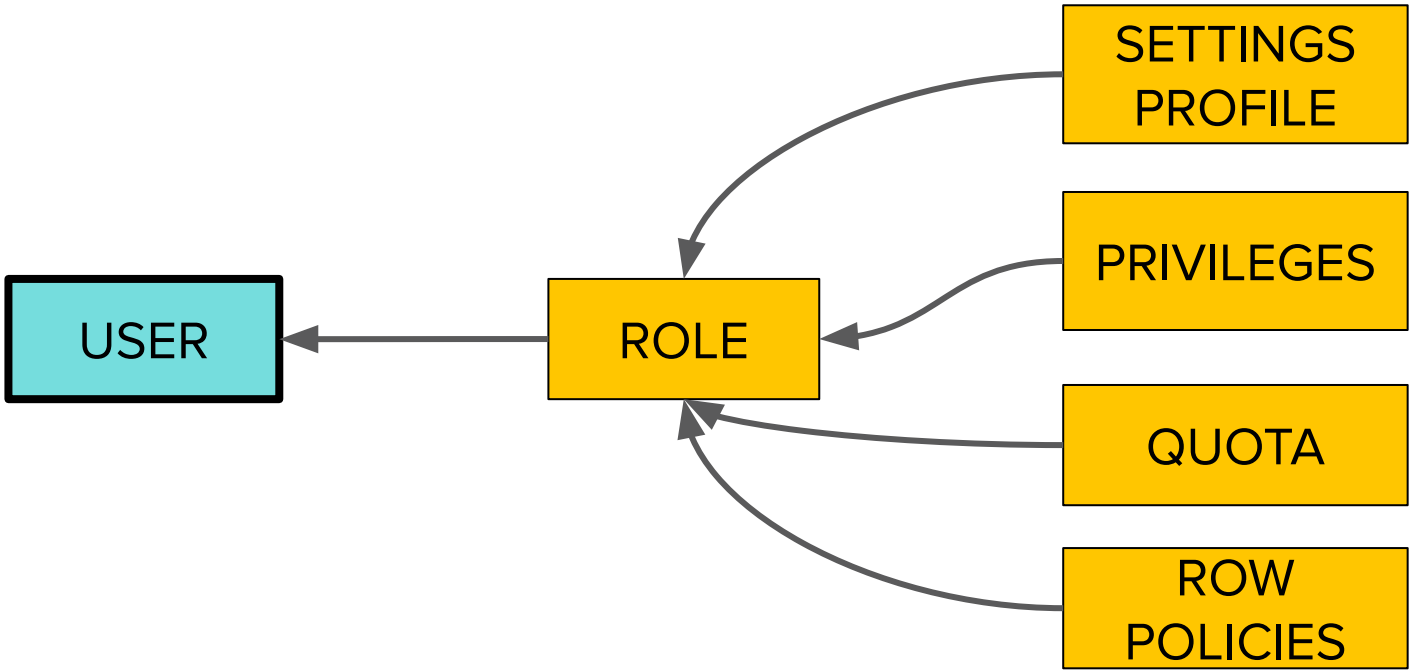
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Sandboxing protects data from agents (and careless users)



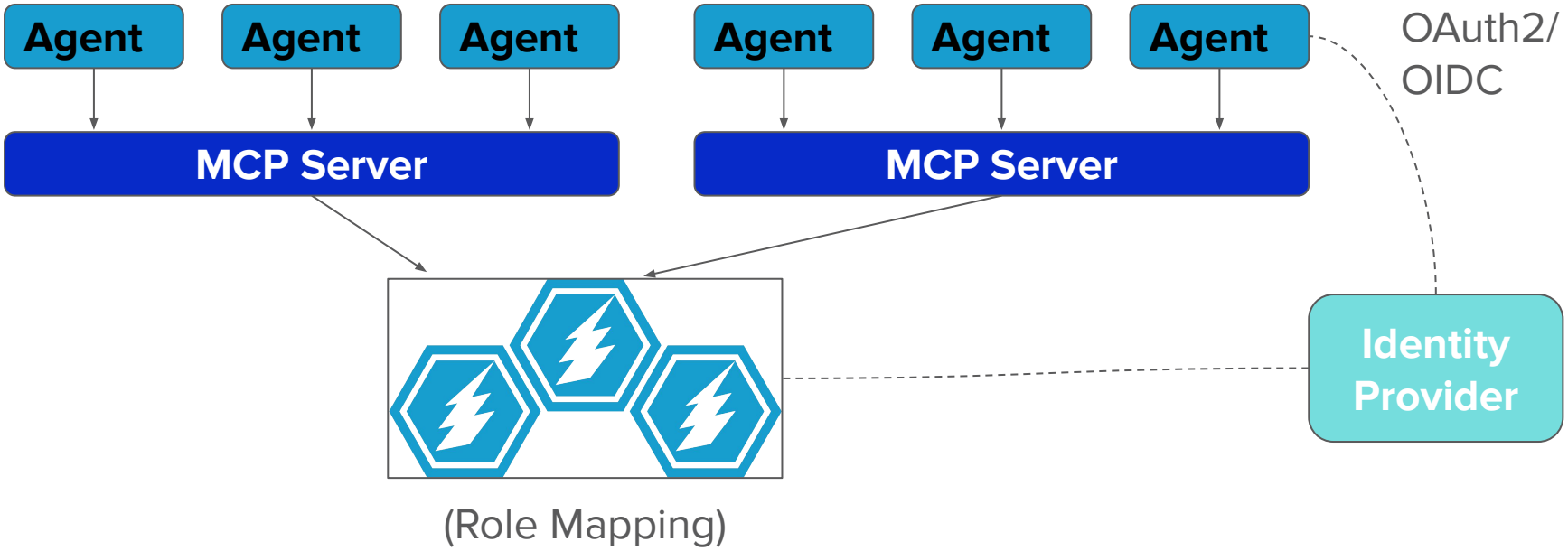
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We sandbox SQL data with Role-based Access Control (RBAC)



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Agent-ready architectures need uniform auth mechanisms

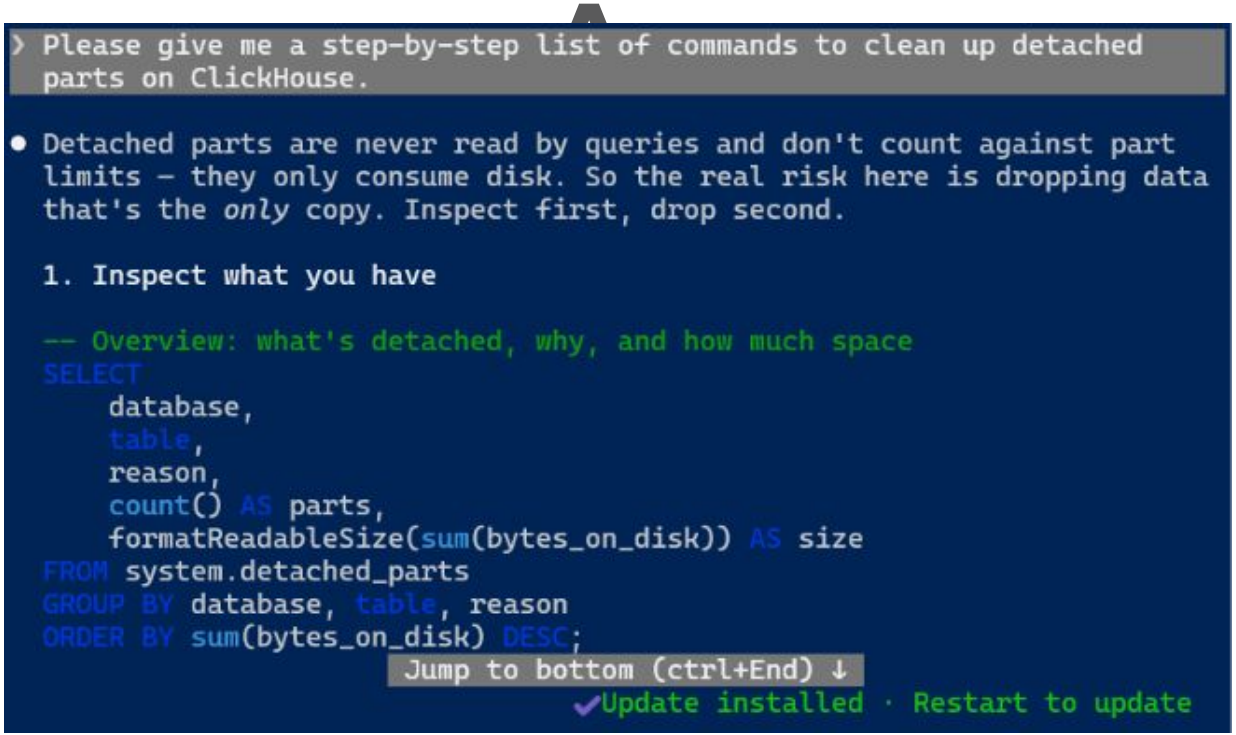


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An unexpected vulnerability

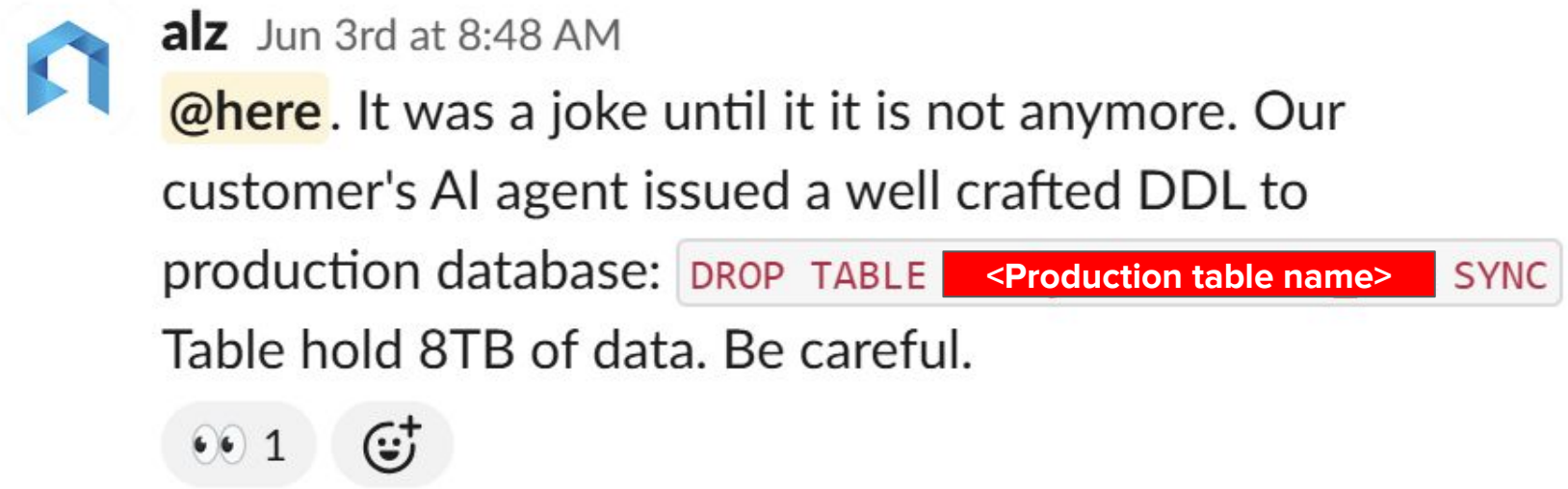
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AI is great! I don’t need database administrators any more



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This might not end well



(A real support case from June 3rd)

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How do you sandbox administrative tasks?

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How do you sandbox administrative tasks?

You don’t*

* Check back next year

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Let a hundred flowers bloom

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AI agents have fundamentally changed innovation

AI × DISTRIBUTED STORAGE

I only wanted a POC.

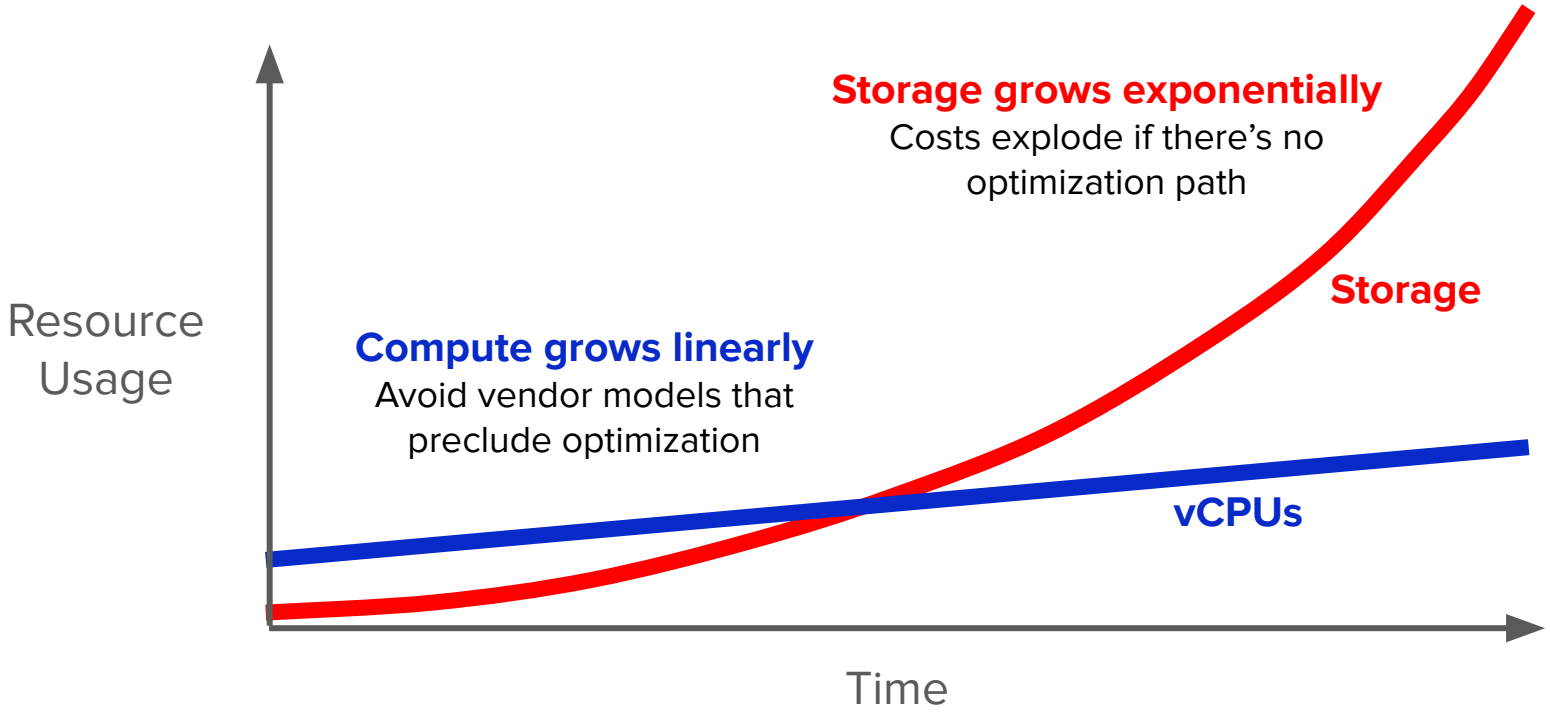
Building a distributed filesystem
for ClickHouse with AI agents.

Mikhail Filimonov
Principal Engineer · Altinity



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The problem: building scalable analytic applications



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The solution: table data on shared object storage

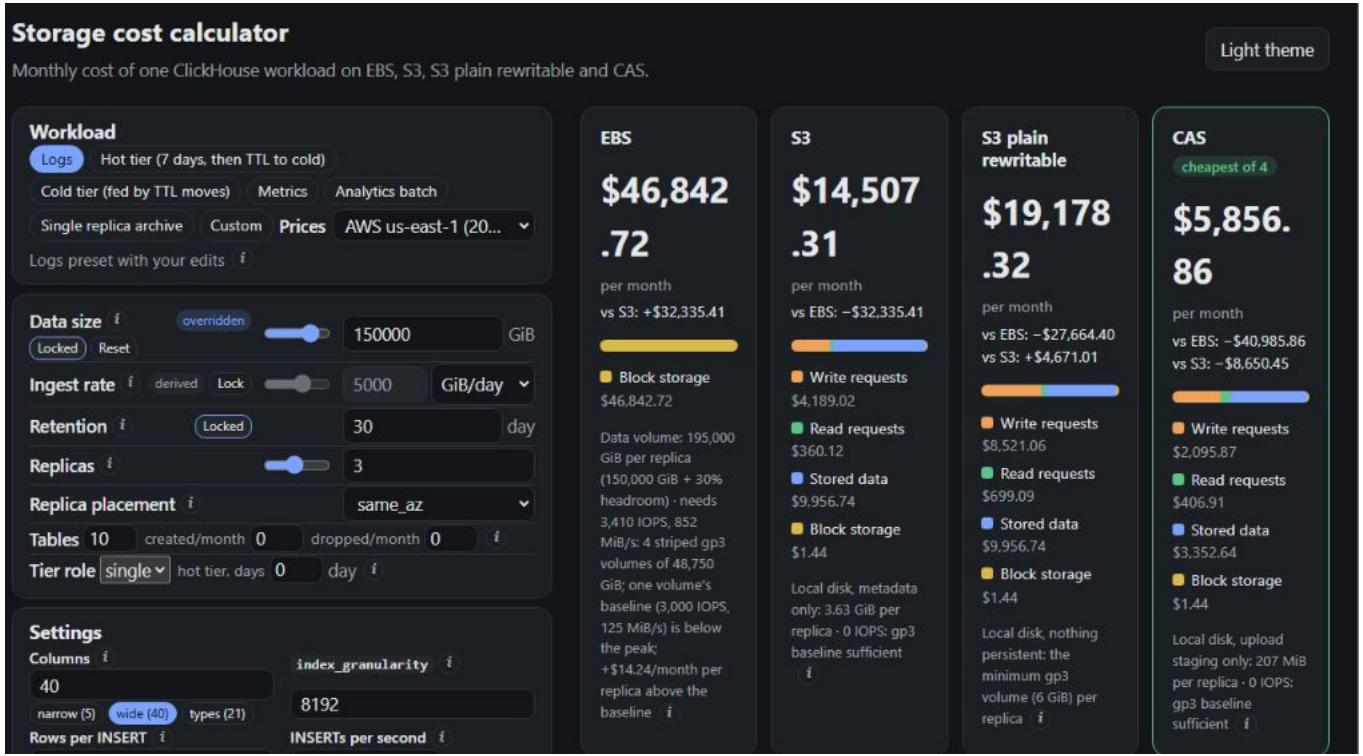
Same bytes. One blob.

- Bucket = source of truth for storage data and metadata
- Identical physical bytes → one shared blob
- Track owners; reclaim objects nobody needs
- Concurrent writers and GC, at terabyte-to-petabyte scale
- No global lock or stop-the-world collection



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Agent-based dev accelerates database innovation



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Practical effects of agent development on open source

Slop!

Weakened Open Core?

Network Effects?

Fast Innovation!

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Lots of CVEs are blooming, too

CVE-2026-109618 - PHP memory bug grants attacker control. (Discovered by frontier model)

CVE-2026-109619 - Another PHP memory bug grants attacker control. (Discovered by frontier model)

CVE-2026-111497 - Brotli buffer overflow enables remote code execution. (Discovered and reproduced using Codex.)

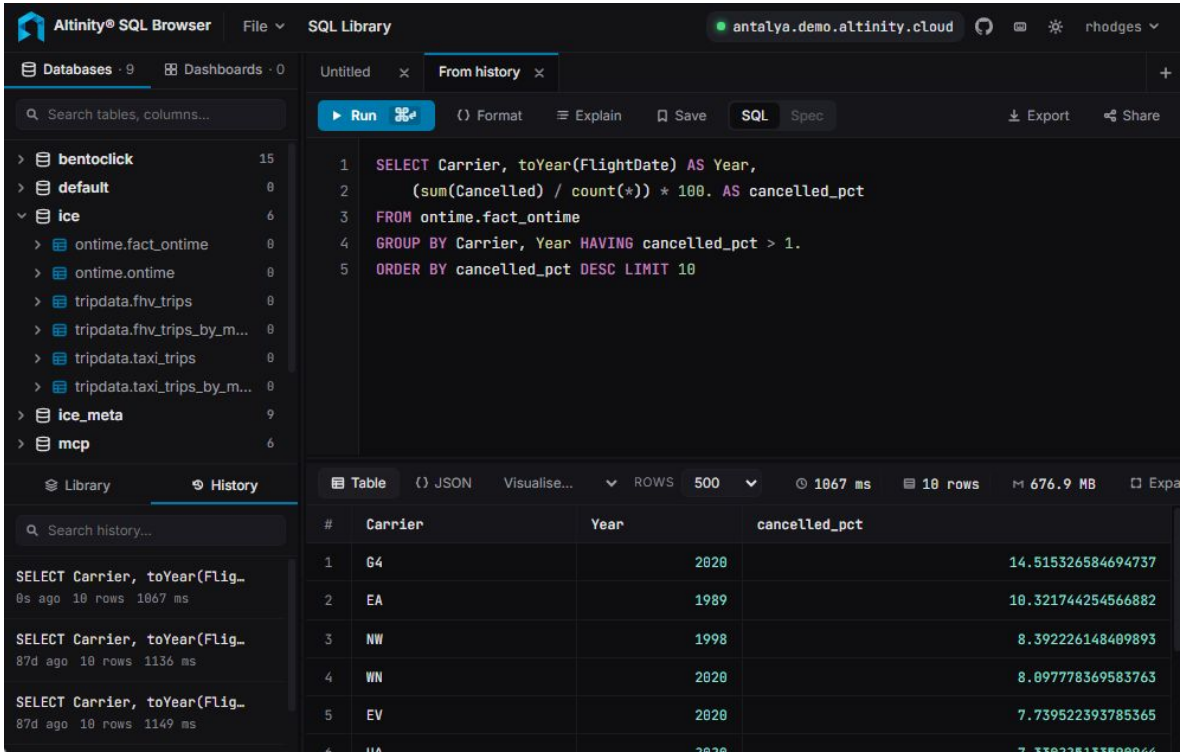
CVE-2026-111943 - Recoverable eMudra private keys (Exploitable by AI.)

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Big data goes indoors

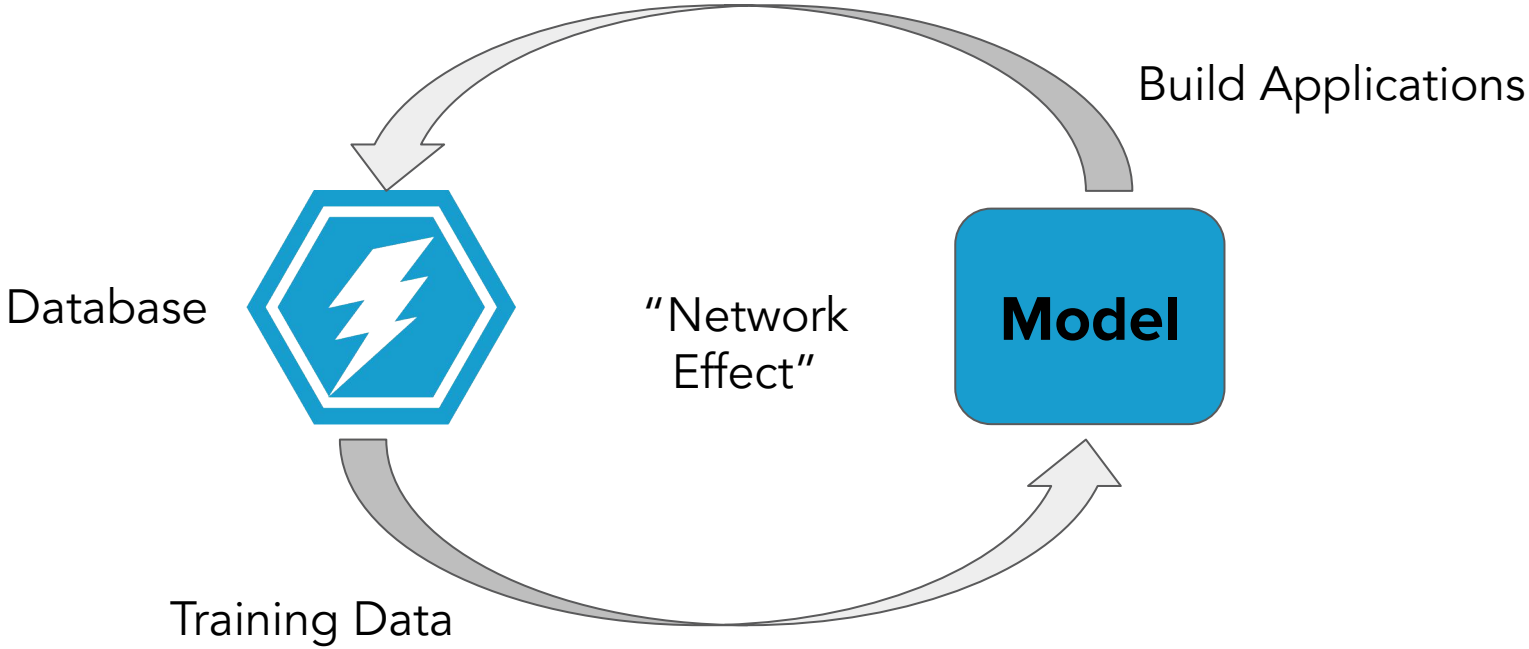
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In the future AI agents will dominate app development



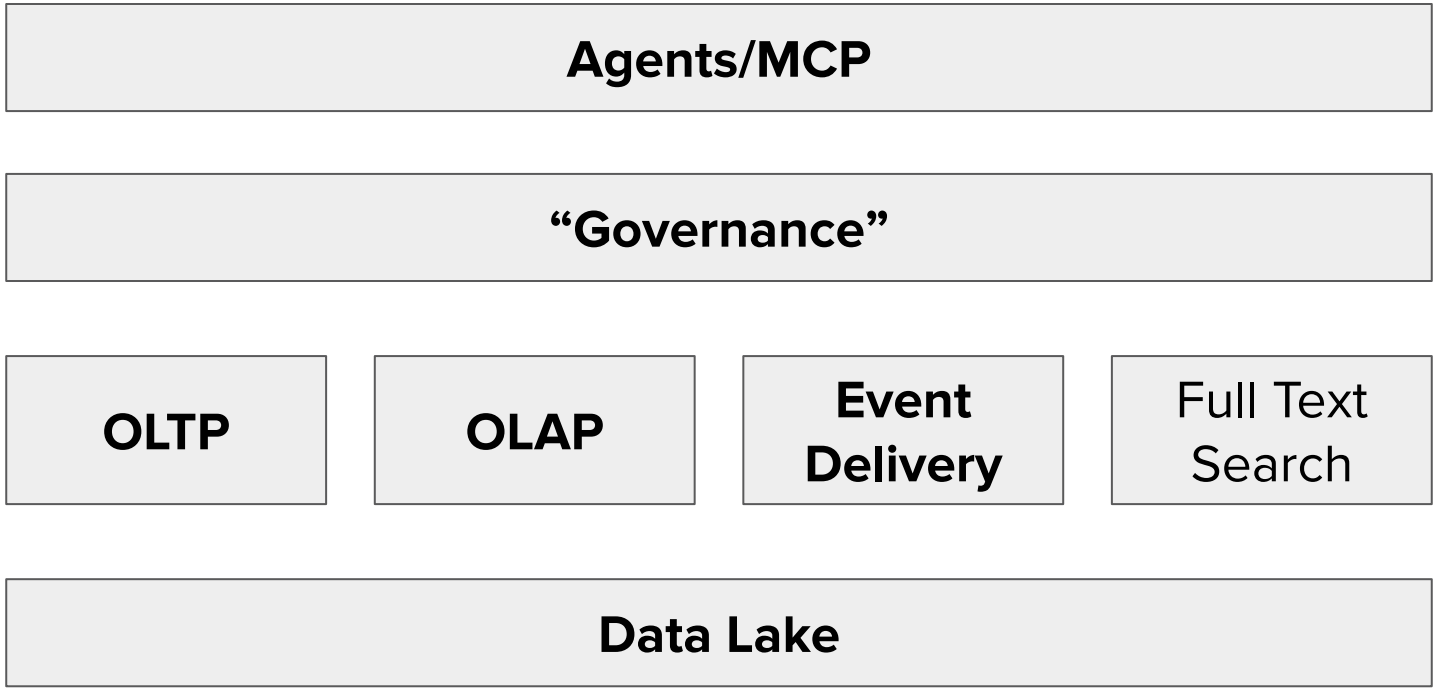
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AI training creates feedback loops on popular projects



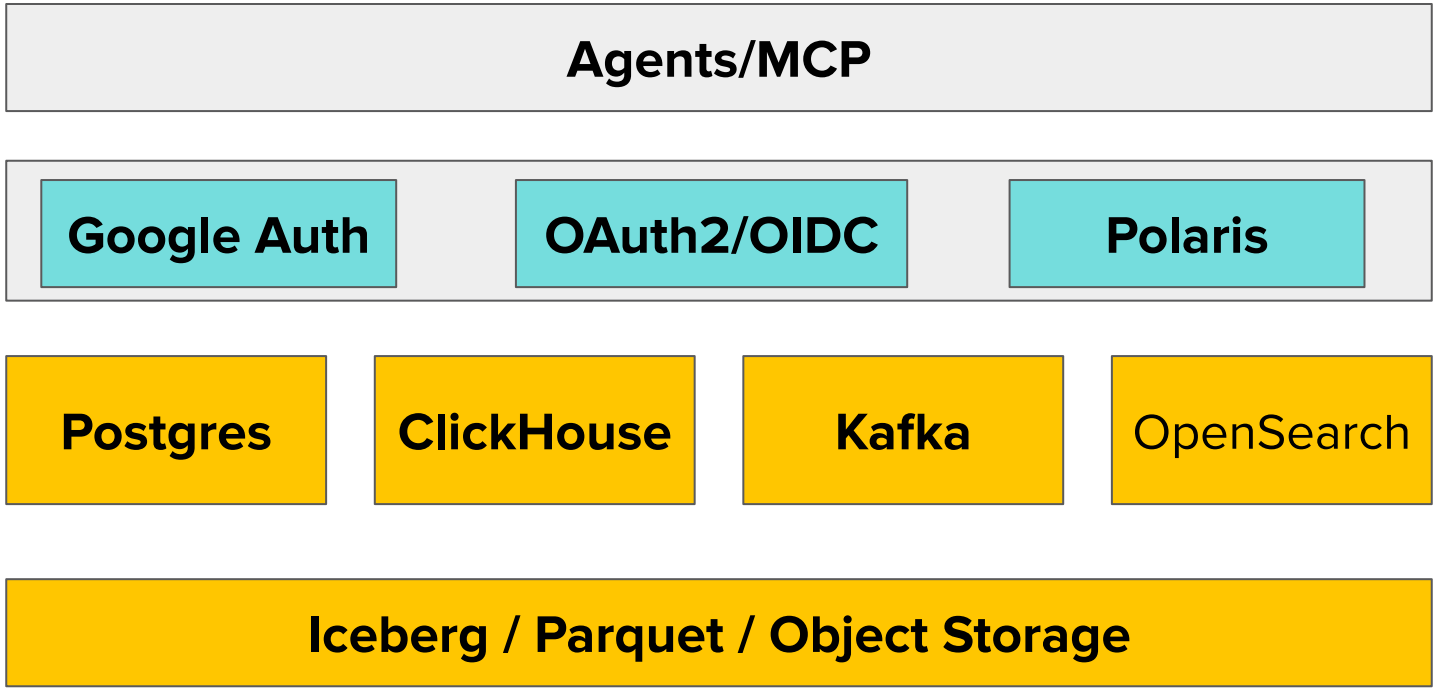
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Architectures are consolidating on popular OSS foundations



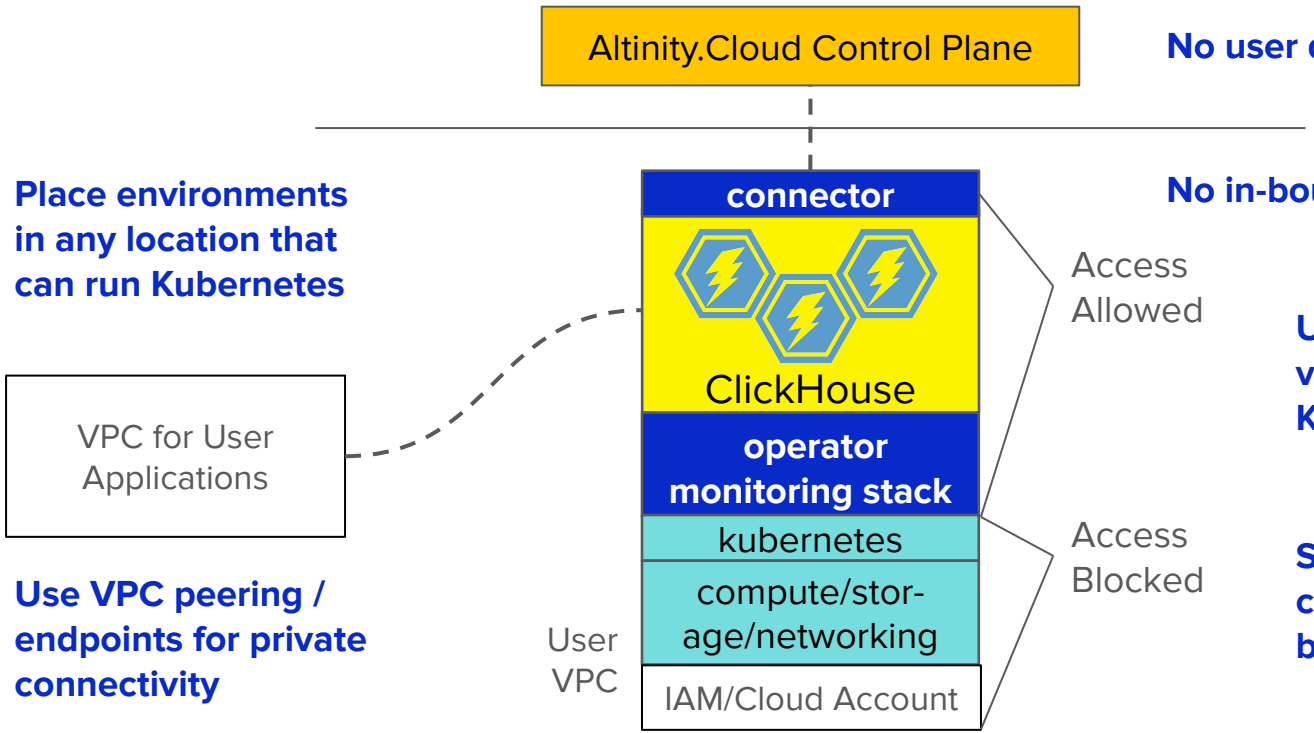
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What it looks like in real life...



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BYOC moves cloud platforms move in-house: sovereign data



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Even the wise cannot see all ends

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Thank you!
Questions?



Contact info:

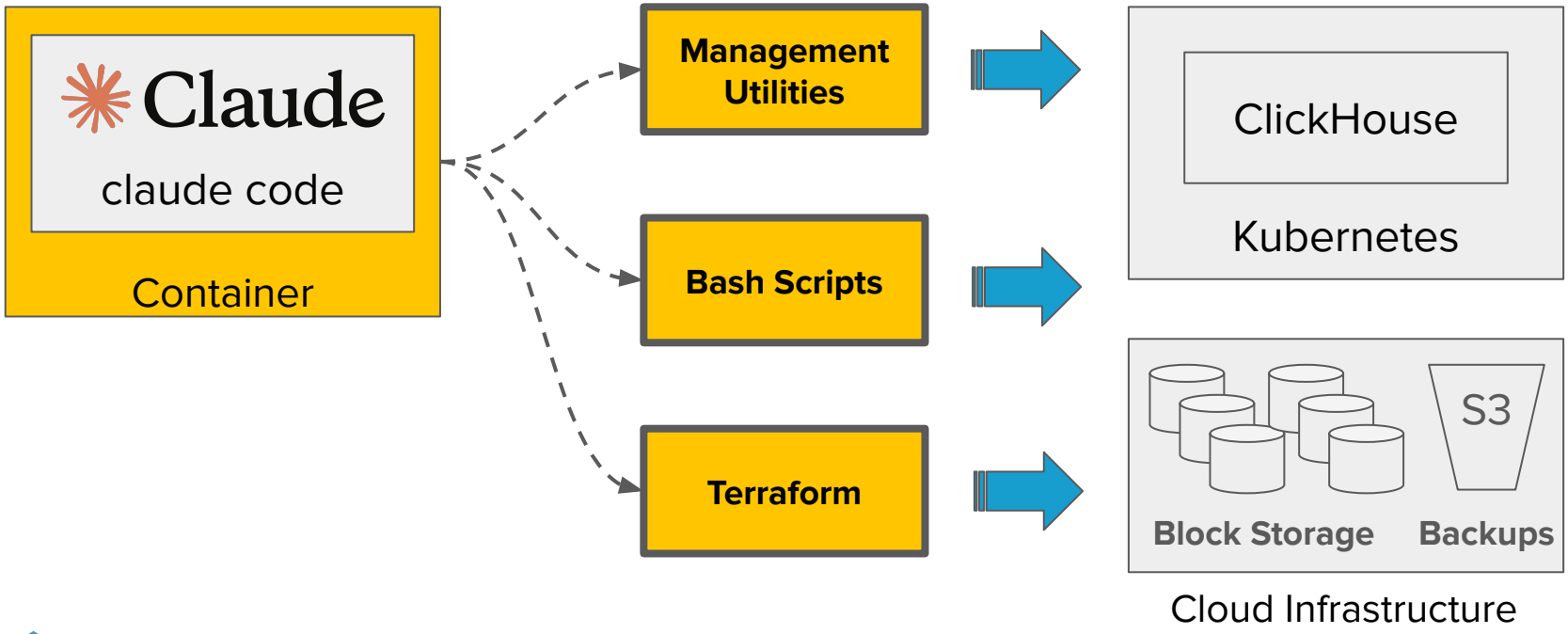
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Using agents to write tools is the best sandbox of all



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Consolidation of databases

- Training on OSS databases – PostgreSQL, MySQL, ClickHouse baked into LLMs
- Consolidation?
  - Vector storage
  - Key value storage
  - Document storage
-

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Do we need special DBMS features for AI?

Pinecone

Weaviate

Milvus

Qdrant

Chroma

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Building a role with read only access

```
-- Create a role.
CREATE ROLE OR REPLACE oauth_demo_role;

-- Grant limited privileges on it.
GRANT SELECT ON *.* TO oauth_demo_role;
GRANT SELECT ON system.* TO oauth_demo_role;
GRANT READ ON S3 TO oauth_demo_role;
GRANT READ ON REMOTE TO oauth_demo_role;
```


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Locking down resources

```
-- Set settings profile on role.
CREATE SETTINGS PROFILE OR REPLACE reader_profile
SETTINGS
  max_threads = 4, max_execution_time = 60,
  readonly = 1
TO oauth_demo_role

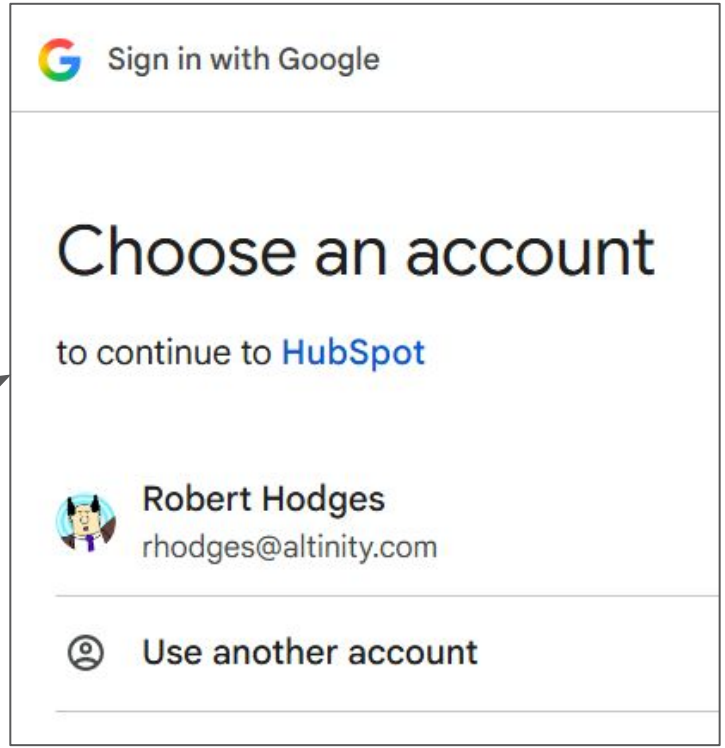
-- Set quotas on role.
CREATE QUOTA OR REPLACE reader_quota
  FOR INTERVAL 60 SECOND
    queries MAX 100
TO oauth_demo_role
```


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Let’s ensure every login account gets the sandbox role

Use OAuth!

Yeah, this thing



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How can OAuth2 + OIDC help?

ID Token

(Aka JWT, JSON Web Token, or Identity Token; Defined by OIDC)

"Token-based auth"

Identifies the user

Access Token

(Aka Bearer Token, used by OAuth2)

Grants access to a service for a limited duration

(Defined by OAuth2)

Refresh Token

Enables refresh of expired access tokens

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New Antalya Settings: Configure OAuth token processor

```
/etc/clickhouse-server/config.d/google-oauth-antalya.xml
<clickhouse>
  <token_processors>
    <google_oauth>
      <type>openid</type>
      <userinfo_endpoint>https://openidconnect.googleapis.com/v1/userinfo
</userinfo_endpoint>

<token_introspection_endpoint>https://openidconnect.googleapis.com/v1/userinfo
</token_introspection_endpoint>
      <jwks_uri>https://www.googleapis.com/oauth2/v3/certs</jwks_uri>
      <token_cache_lifetime>60</token_cache_lifetime>
      <username_claim>email</username_claim>
    </google_oauth>
  </token_processors>
</clickhouse>
```


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New Antalya Settings: Configure OAuth user role mappings

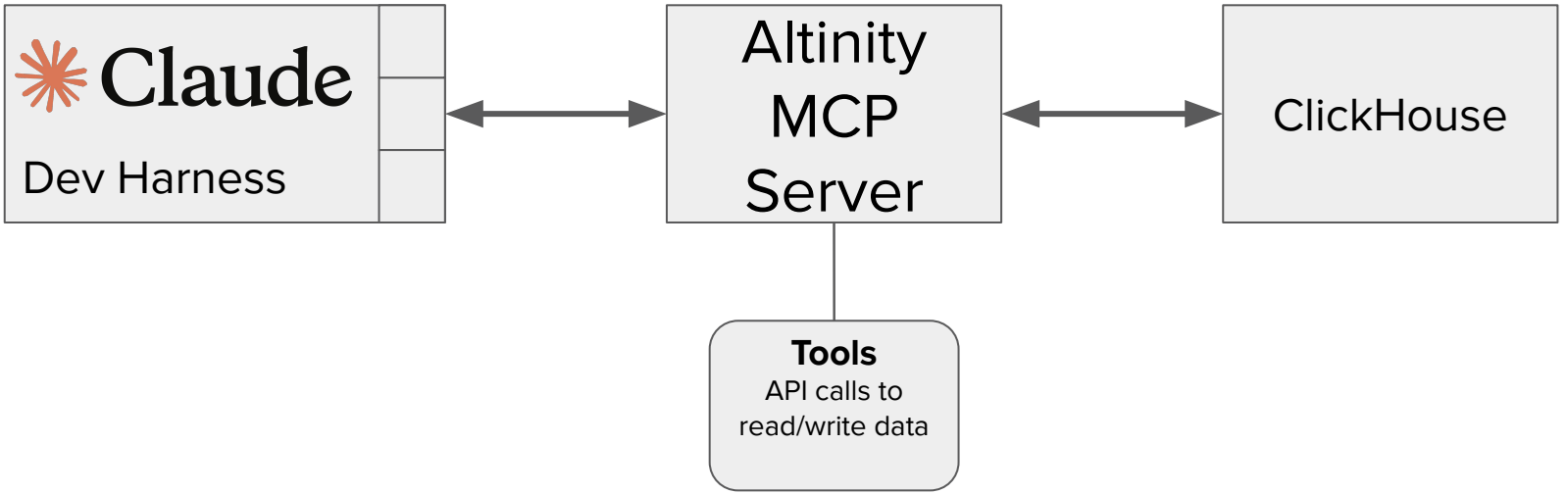
/etc/clickhouse-server/config.d/user_directories.xml:

```
<clickhouse>
  <user_directories>
      <token>
          <processor>google_oauth</processor>
          <common_roles>
              <oauth_demo_role />
          </common_roles>
      </token>
  </user_directories>
</clickhouse>
```

Restrict clients to read-only SQL

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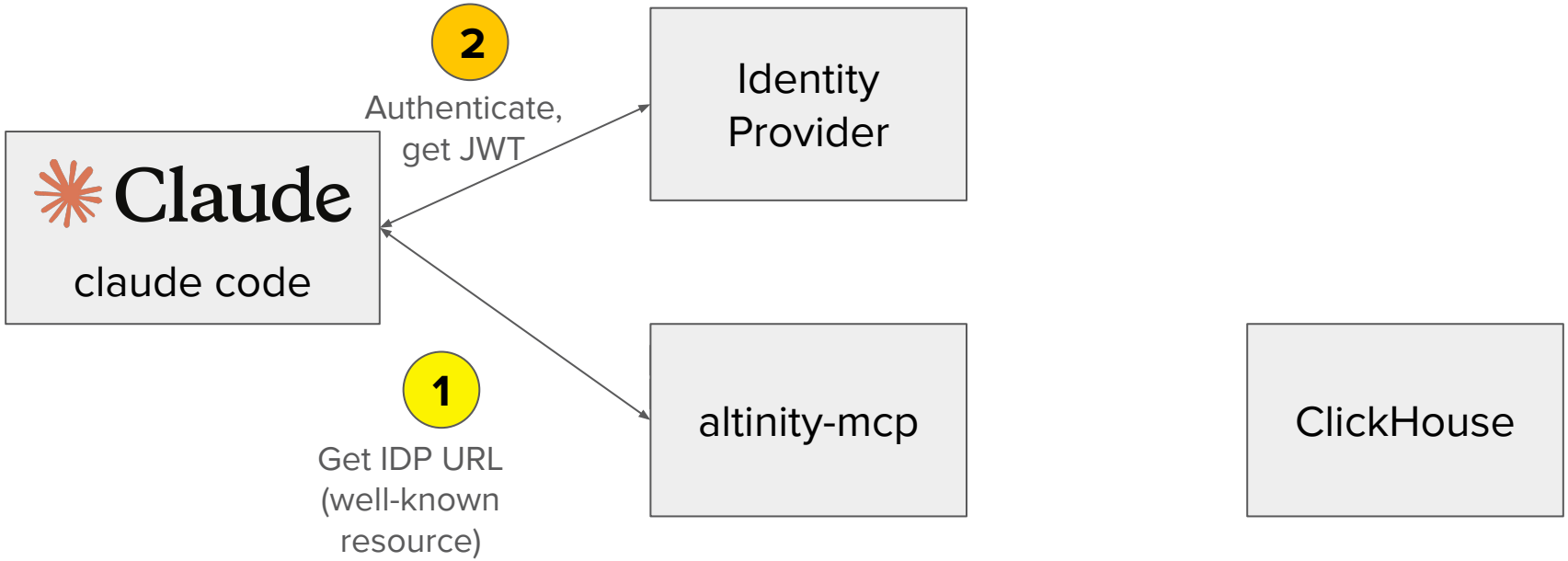
Altinity MCP* manages the database connection and OAuth



* Model Context Protocol

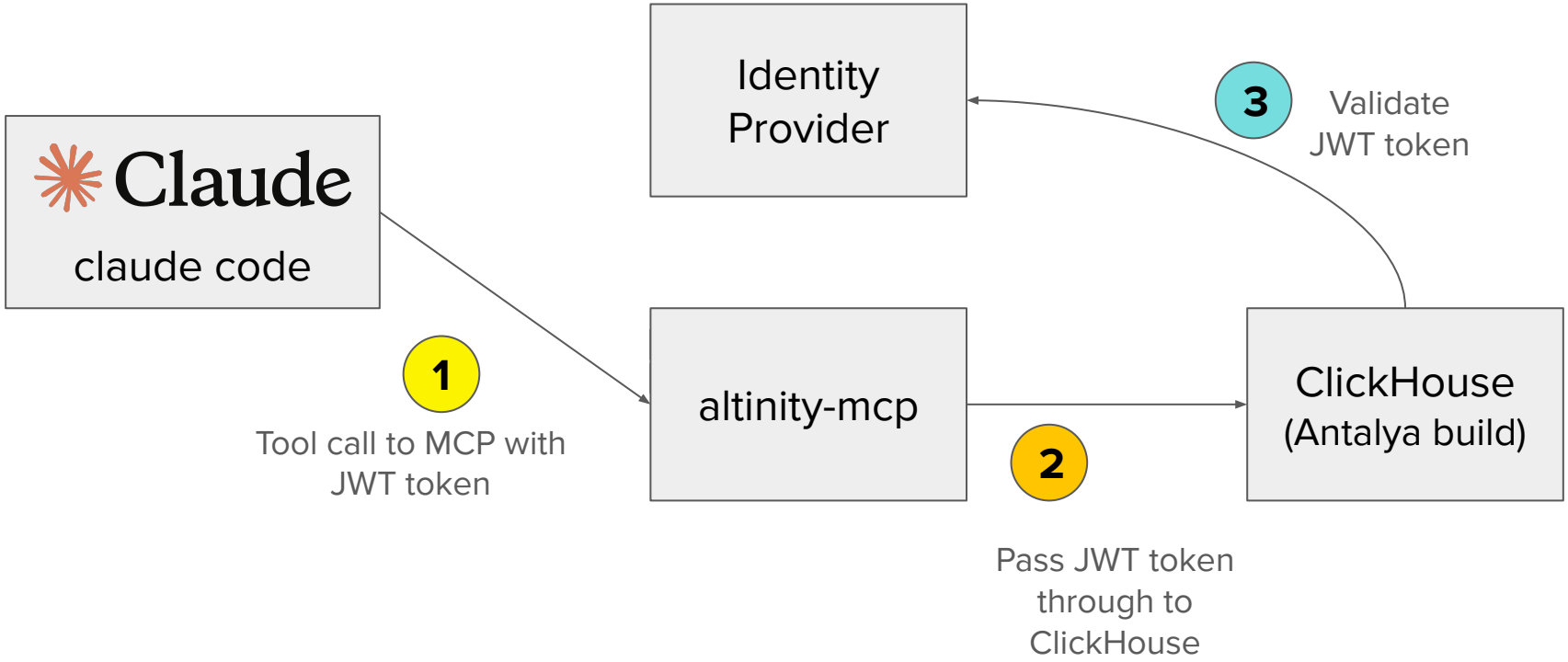
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Login: Claude authenticates directly to Identity Provider



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What happens when Claude accesses ClickHouse



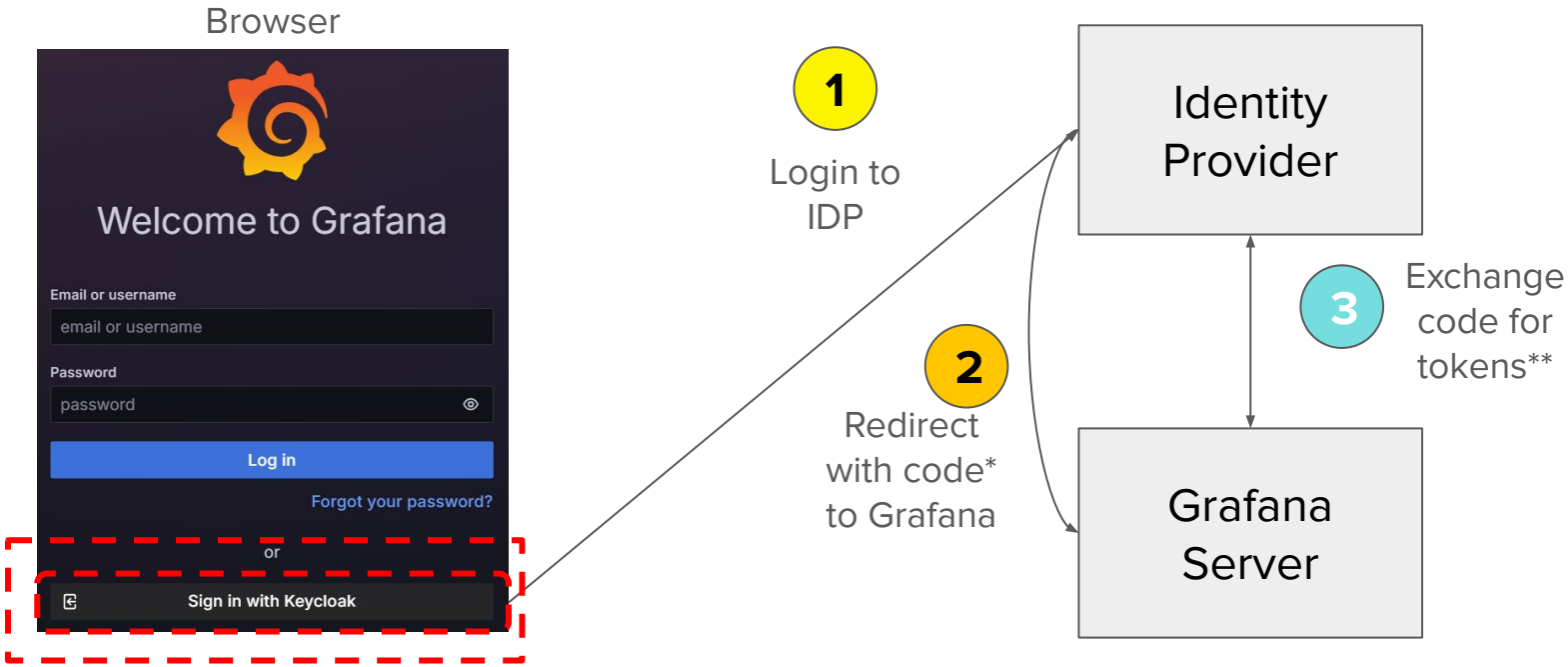
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Combining Grafana, ClickHouse, and OAuth

Featuring Antalya builds

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How OAuth works with Grafana

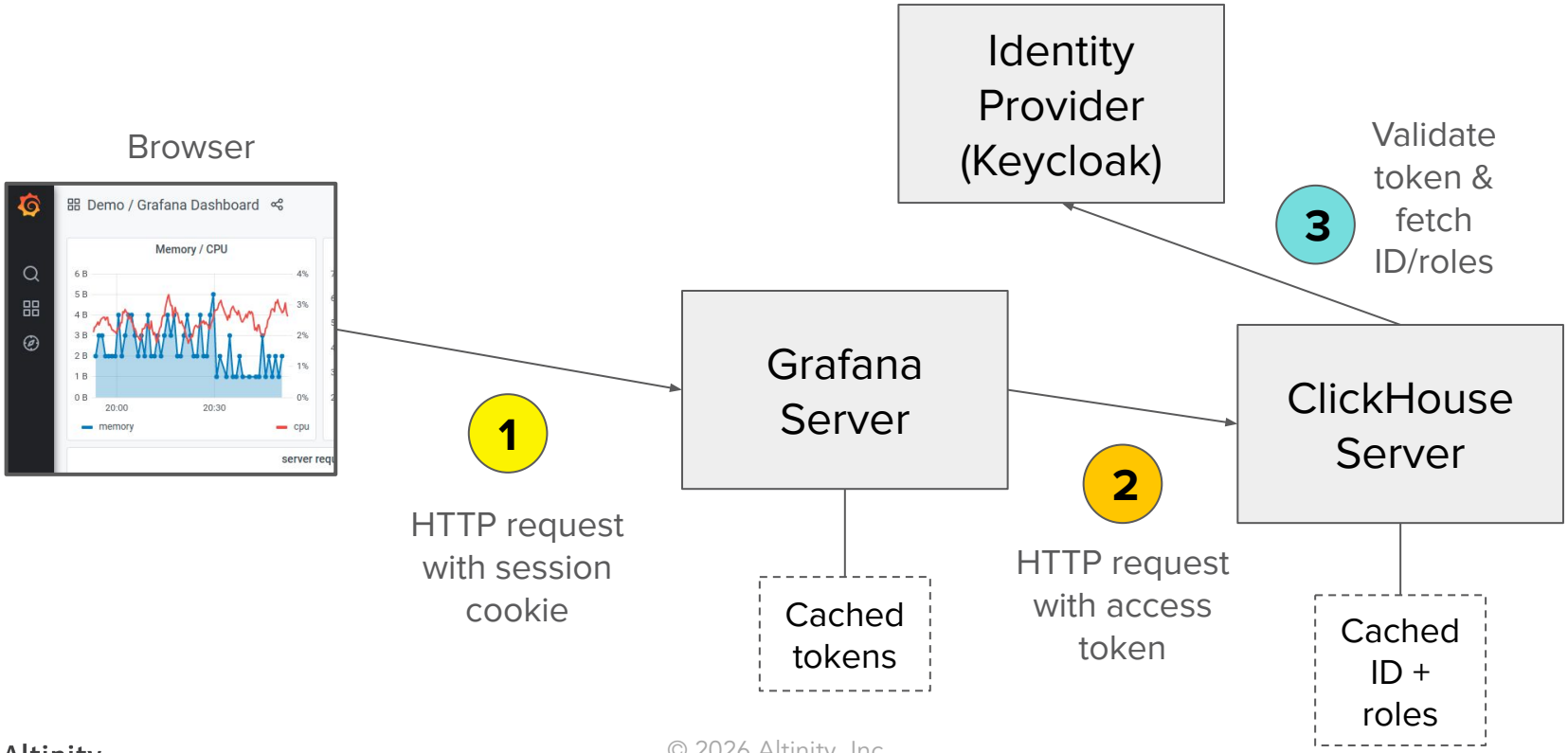


* Plus a nonce and other info for security

** Identity Token, Access Token, Refresh Token

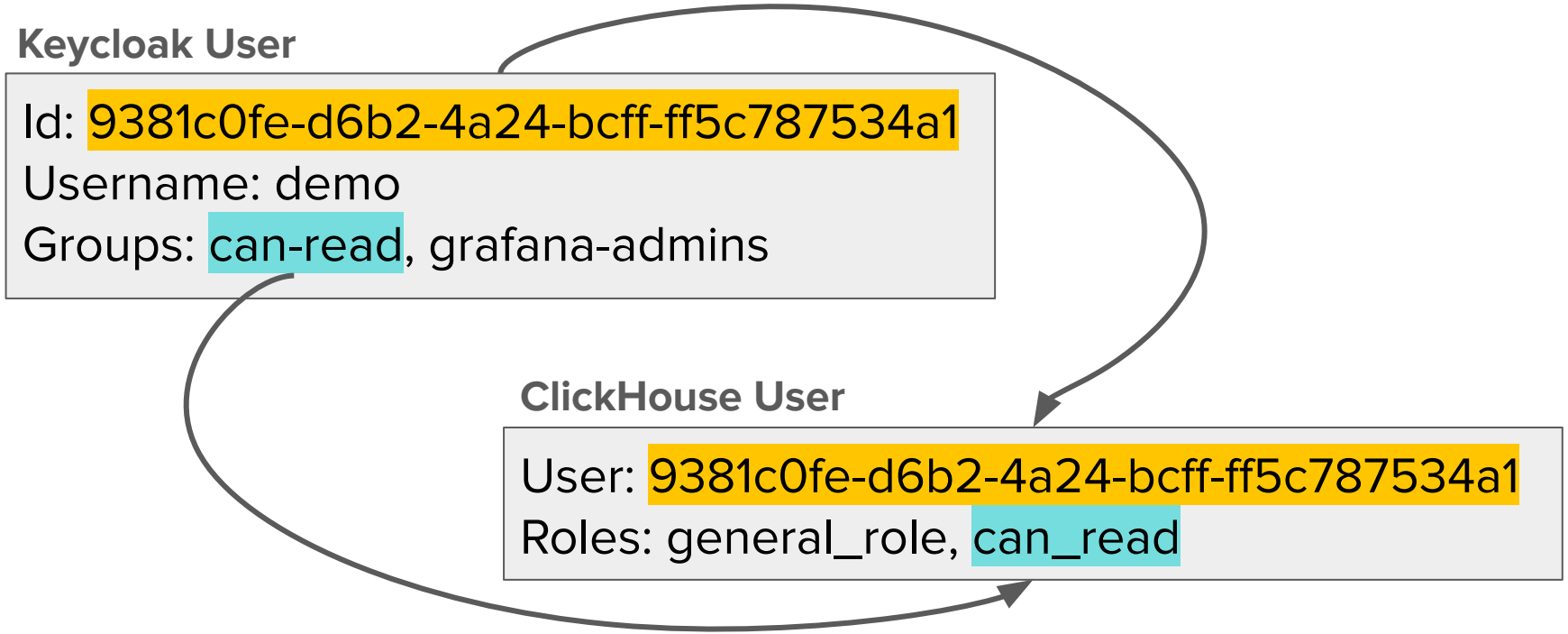
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What happens when Grafana accesses ClickHouse?



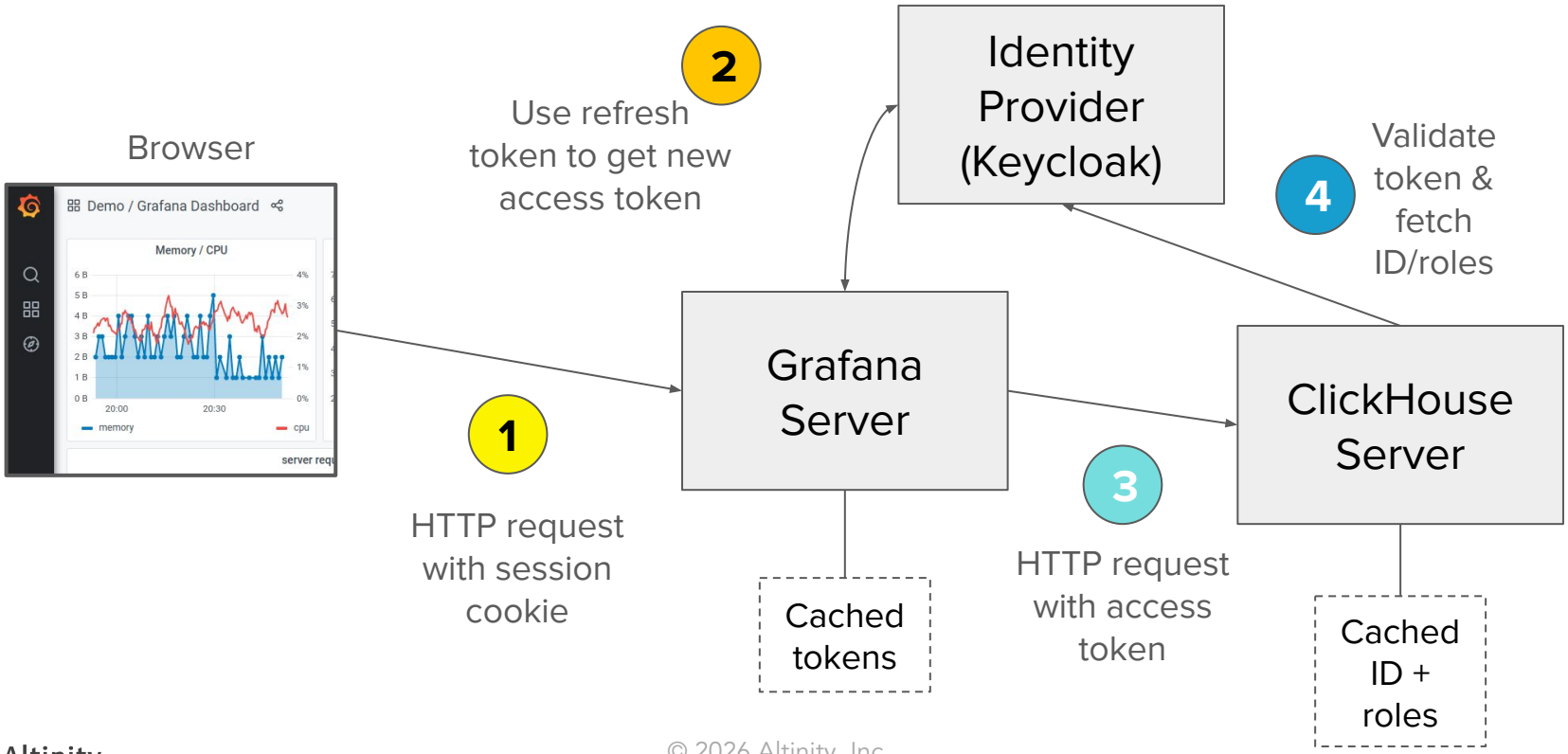
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How users are mapped when you connect to ClickHouse



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What happens when the access token expires?

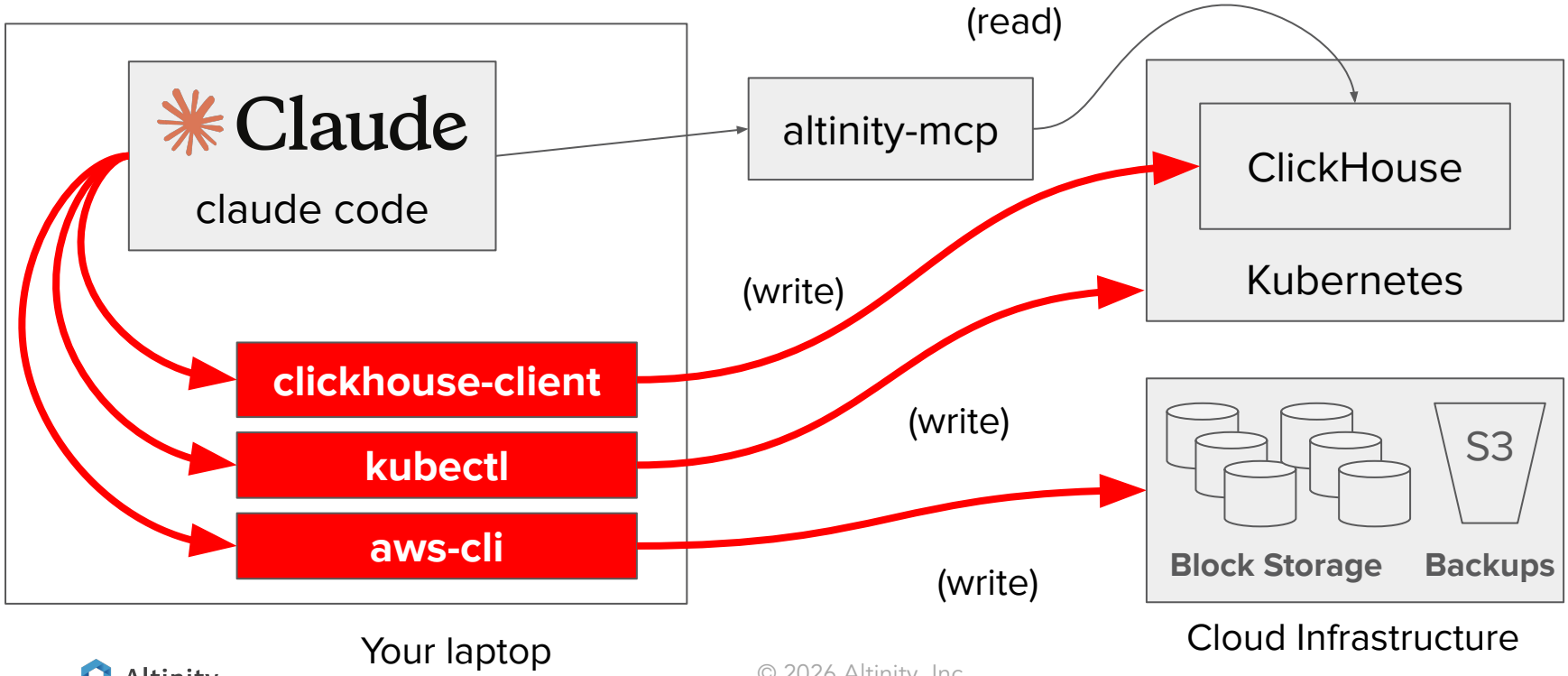


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A final thought about sandboxes

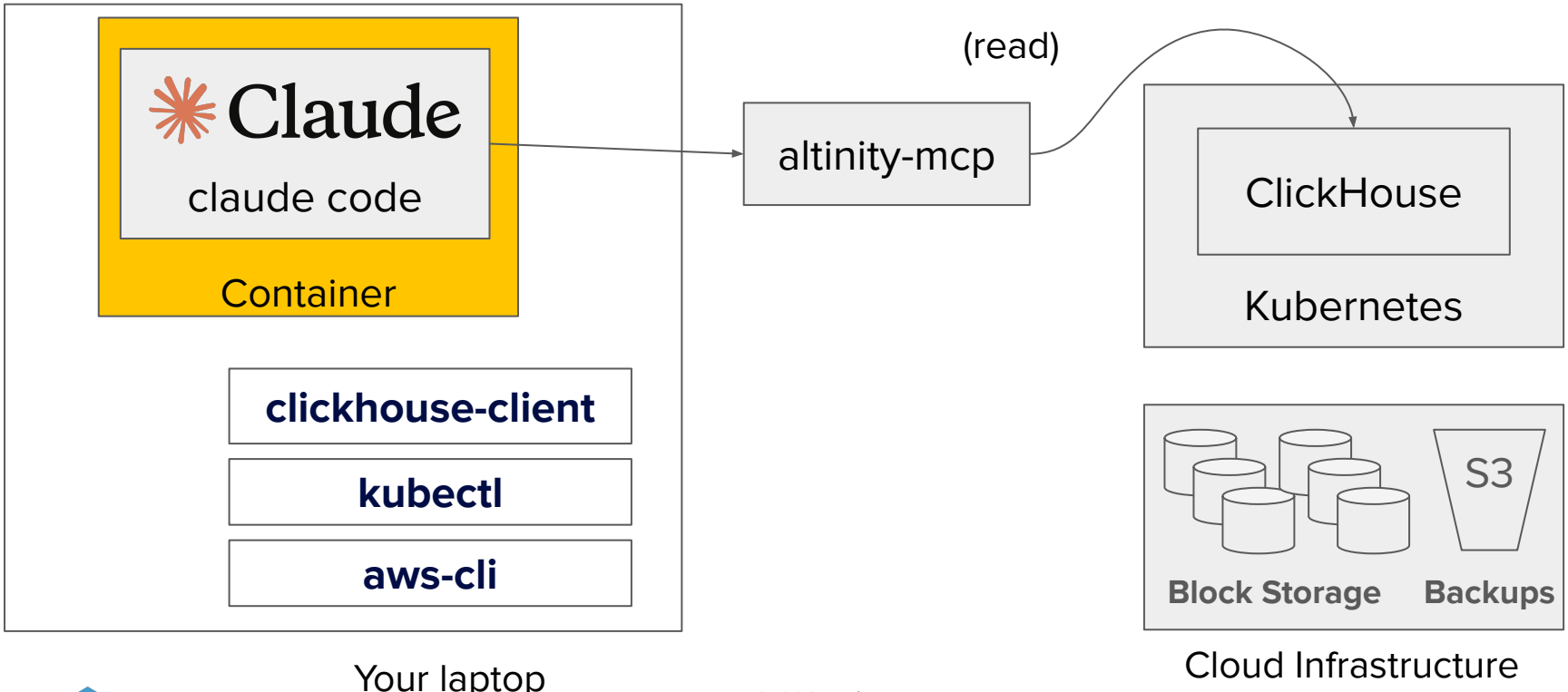
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Linux offers rich backdoor possibilities



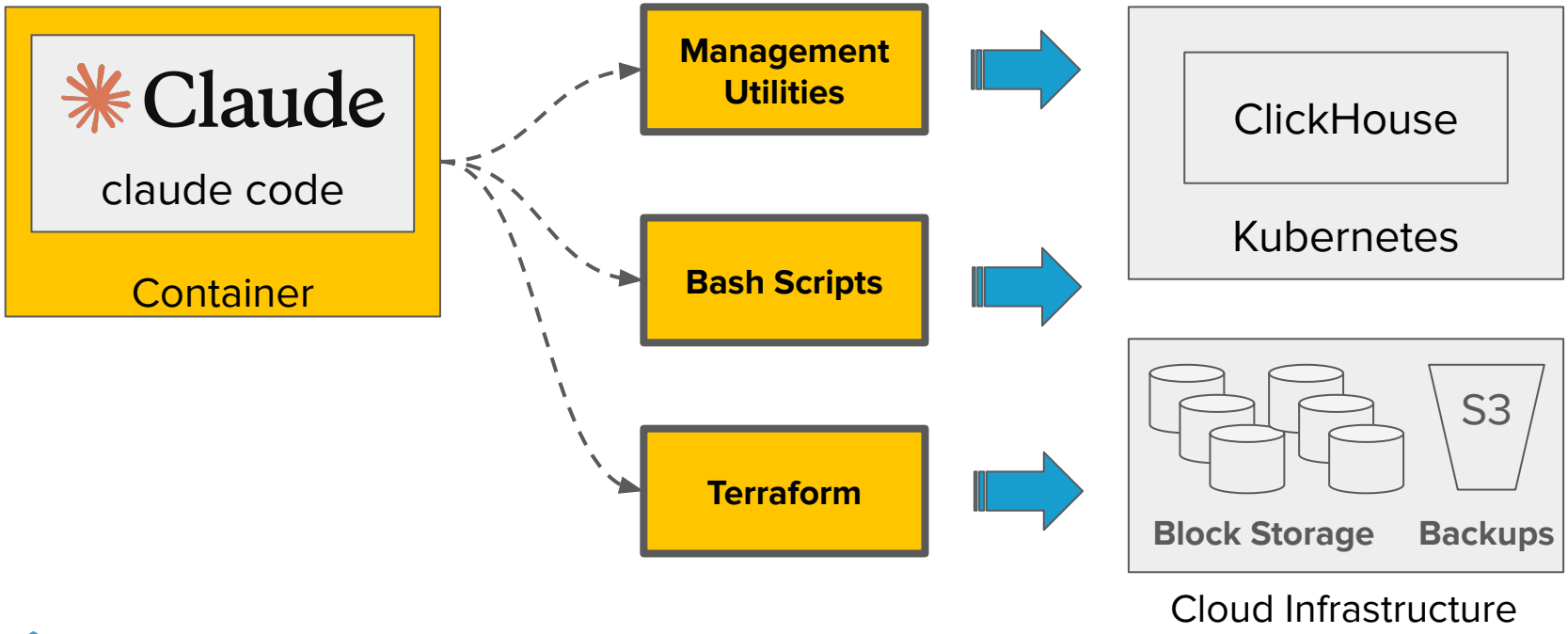
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Remove backdoors by sandboxing agents in containers



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Using agents to write tools is the best sandbox of all



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Demo Time!!

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Learn more!

- Altinity Website:
  - https://altinity.com
- Altinity Antalya Overview:
  - https://altinity.com/project-antalya-real-time-data-lakes/
- Altinity MCP Server
  - https://github.com/Altinity/altinity-mcp

Watch out for our new guide: ClickHouse® Cost Efficiency Best Practices

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Thank you!
Questions?



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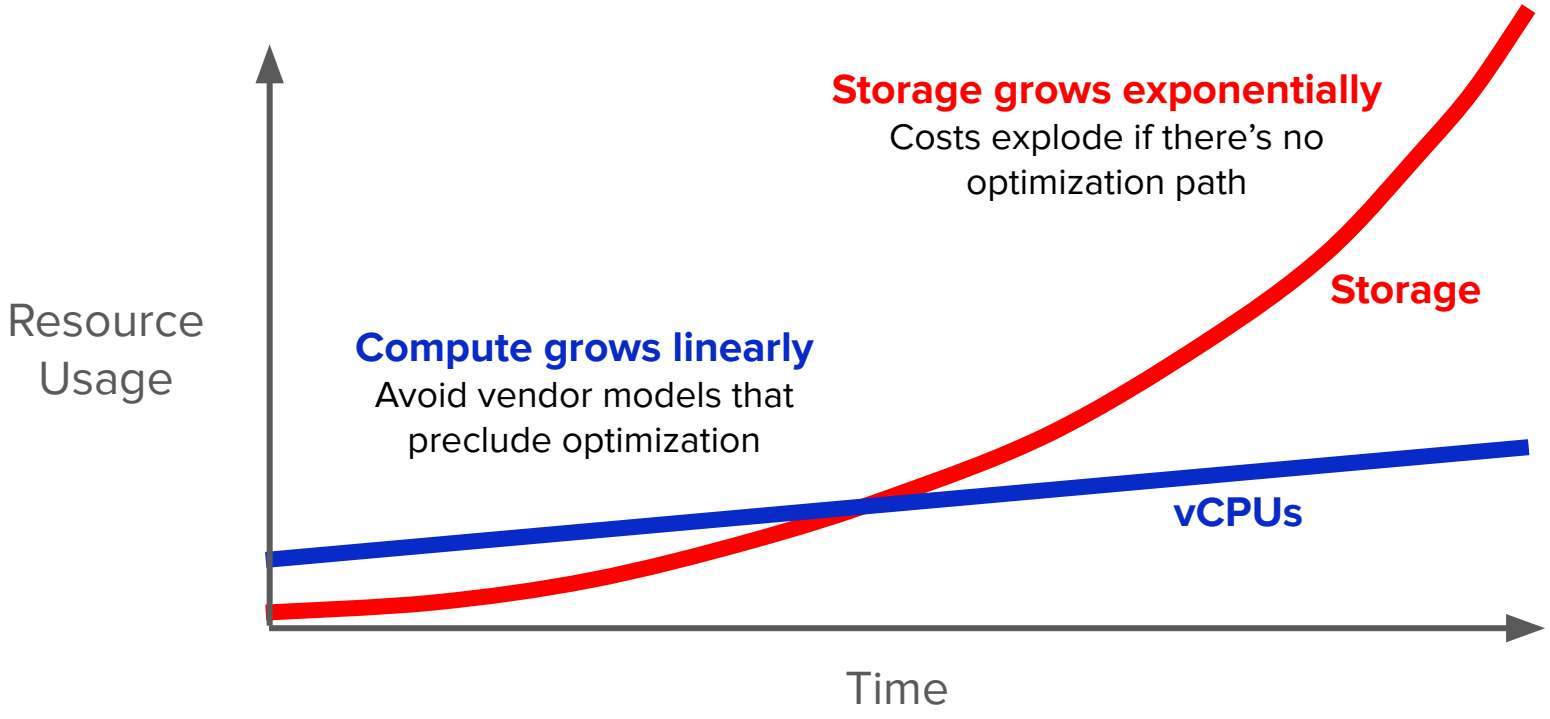
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Make ClickHouse more cost-efficient

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Big ClickHouse systems are ~~resource intensive~~ expensive



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Trick #1: Save big on storage by using it carefully

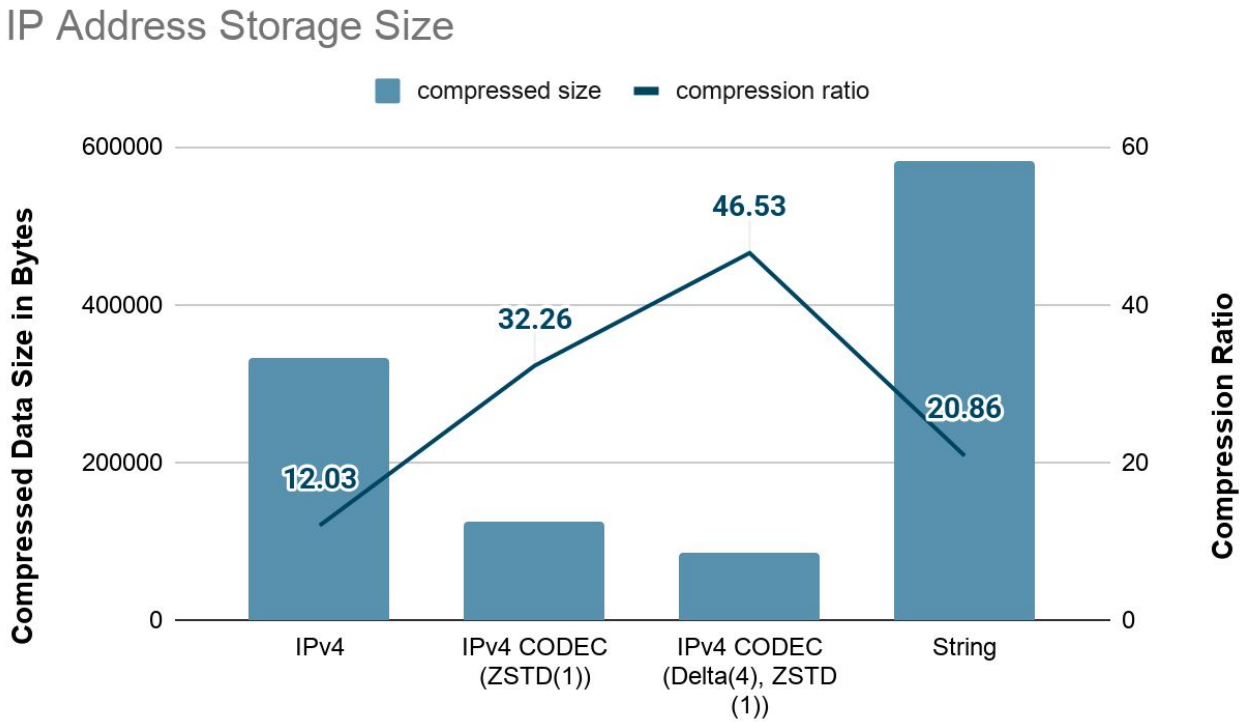
```
CREATE TABLE ipdemo.real_string
(
    `ip` String
)
ENGINE = MergeTree
ORDER BY ip
```

Better alternatives for IP addresses

```
IPv4
IPv4 CODEC(ZSTD(1))
IPv4 CODEC(Delta(4), ZSTD(1))
```

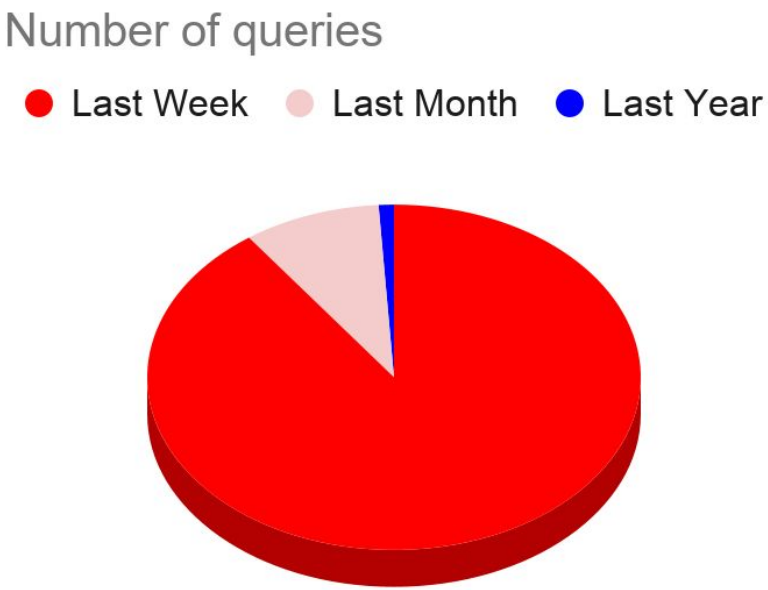

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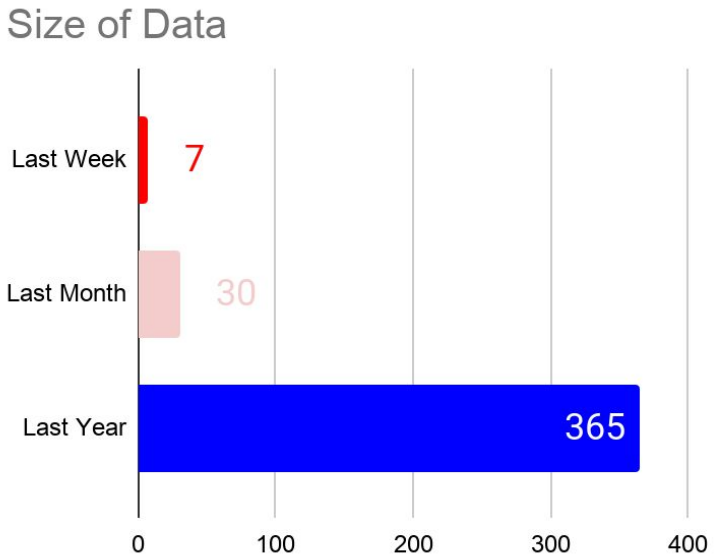
Sample table size for different IP address types



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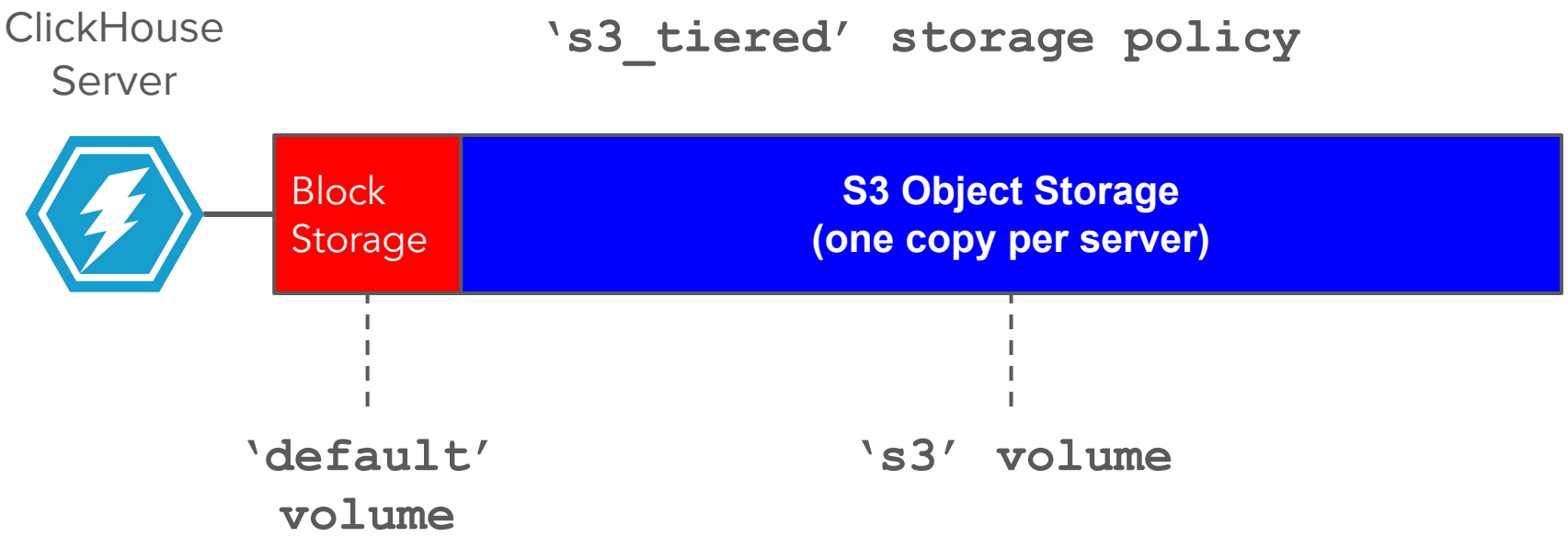
Trick 2: Put old data on cheaper storage





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Tiered Storage puts older data on cheaper storage



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Configuration for tiered storage

```
<clickhouse> <storage_configuration>
  <disks>
    <s3_disk> . . . </s3_disk>
  </disks>
  <policies>
    <s3_tiered>
      <volumes>
          <default> <disk>default</disk>
                <move_factor>0.1</move_factor></default>
          <s3> <disk>s3_disk</disk> </s3>
      </volumes>
    </s3_tiered>
  </policies>
</storage_configuration> </clickhouse>
```

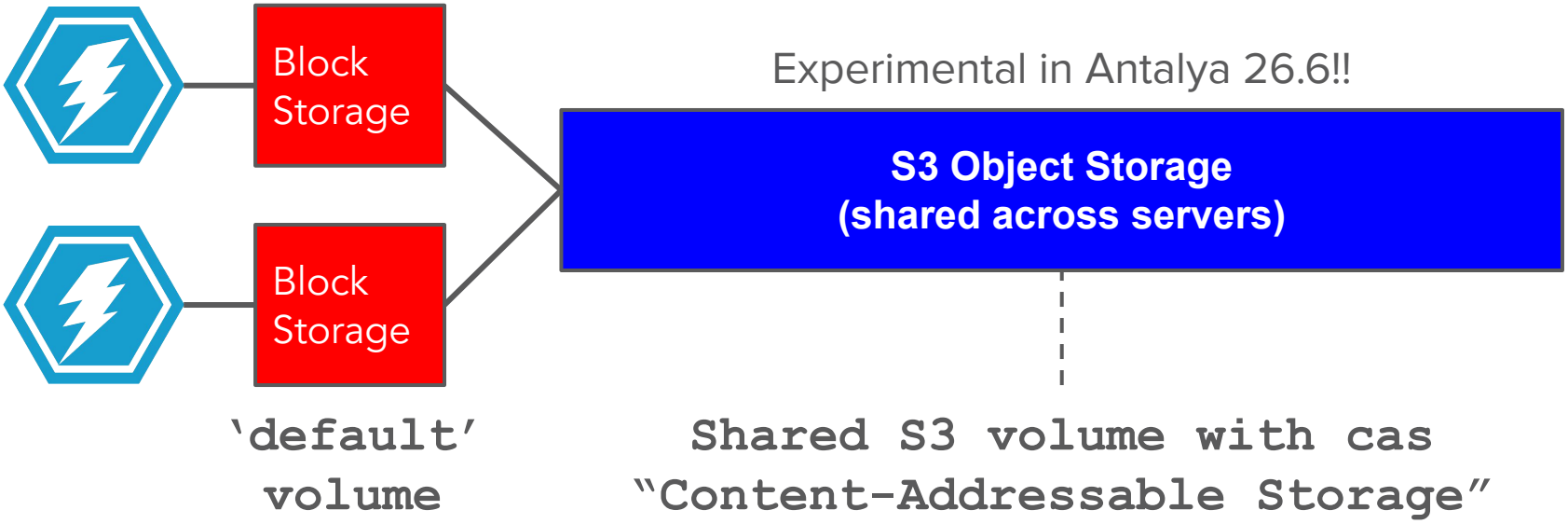

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Moving from block storage to S3 using a TTL

```
CREATE TABLE test_s3_tiered(
    `A` Int64,
    `S` String,
    `D` Date
)
ENGINE = MergeTree
PARTITION BY D
ORDER BY A
TTL D + INTERVAL 30 DAY TO VOLUME 's3'
  D + INTERVAL 365 DAY DELETE
SETTINGS storage_policy = 's3_tiered';
```


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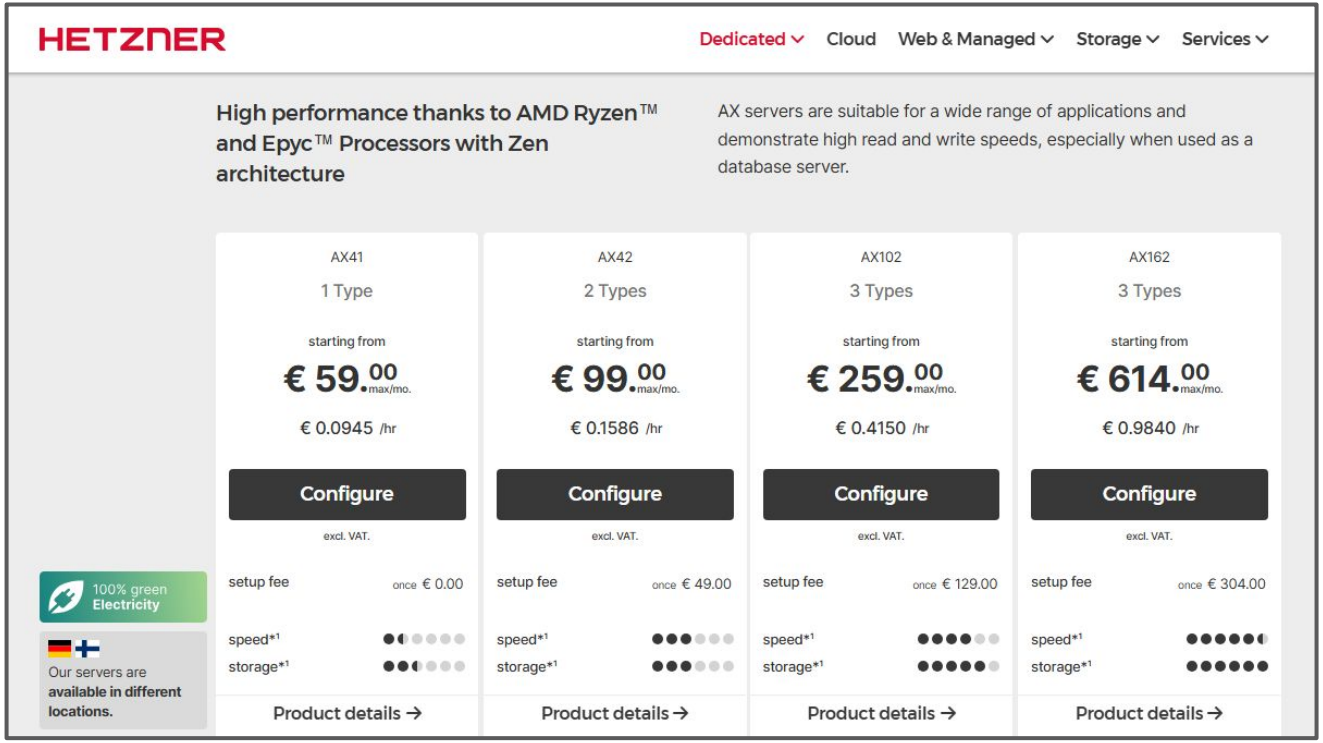
Better storage: Antalya CAS disks share S3 data



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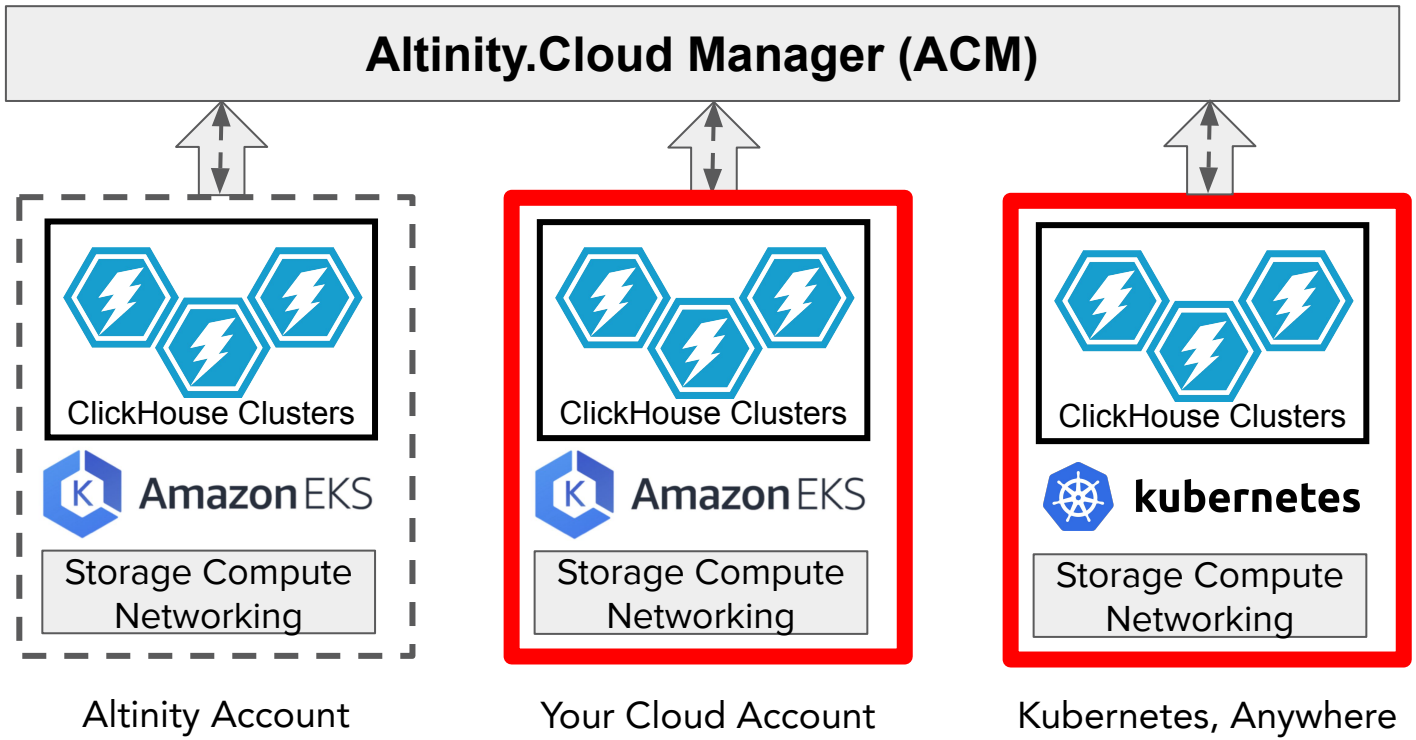
Trick #3: Use low-cost infrastructure providers

Up to 65% cheaper than AWS EC2 on-demand prices



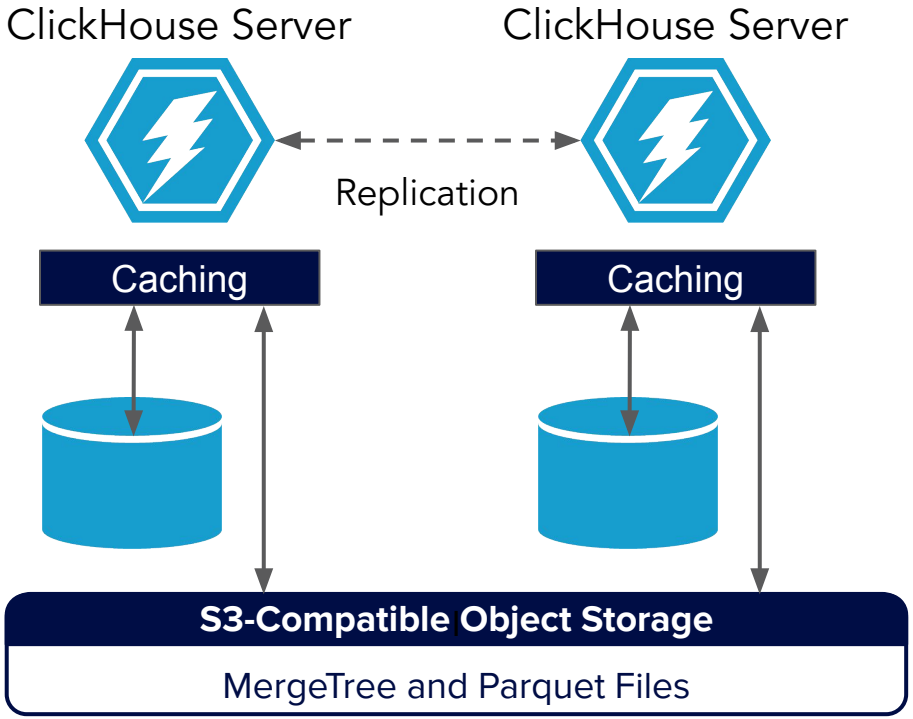
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BYOC == Bring Your Own Cloud



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How to optimize operation with BYOC model



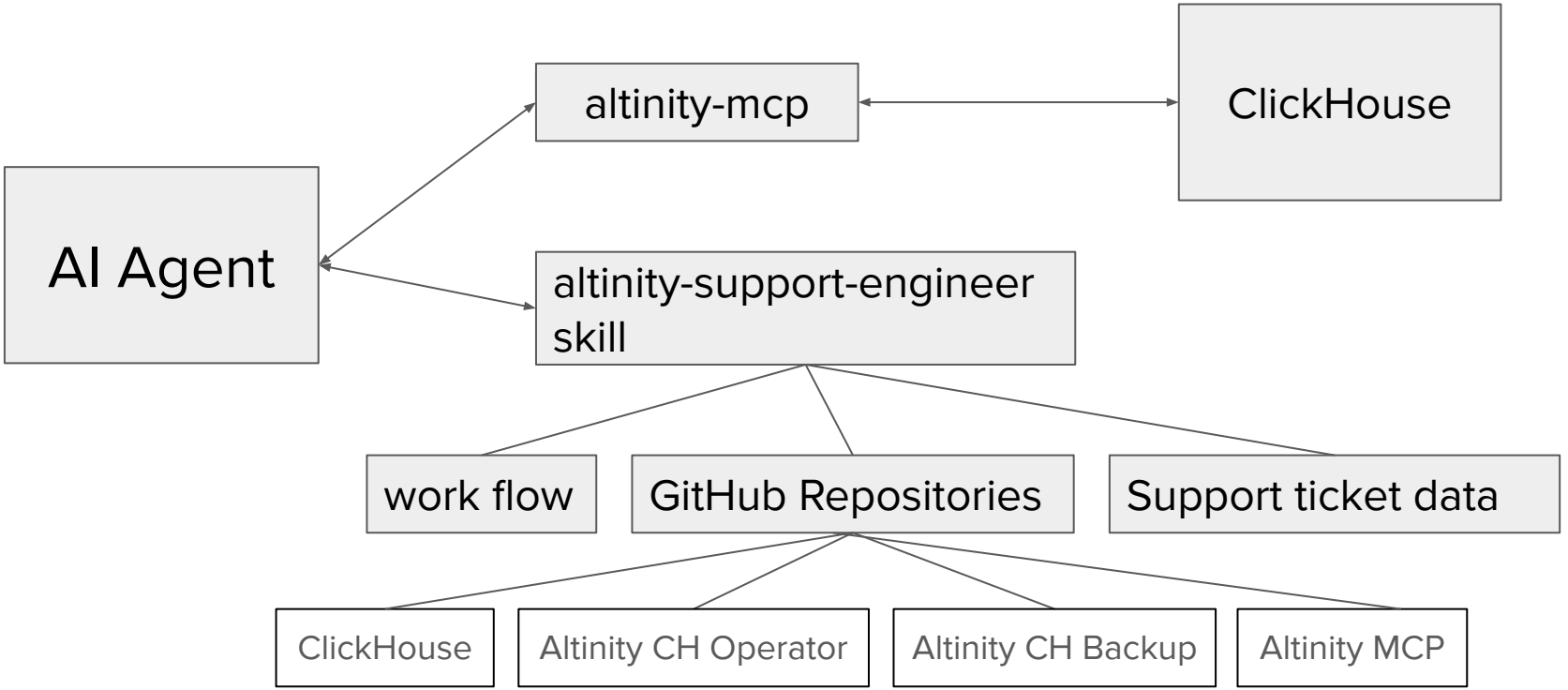
Cost Saving Recipes
- Apply PPAs to cut bill
- Set up savings plans
- Use cheap VMs
- Use spot instances
- Use cheap storage
- Co-locate with apps & storage (no transfer cost)
- Use low-cost providers
- Use specialized clouds

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Building agentic applications

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