Building Authorization with Node.js

Gabriel L. Manor @ Conf42: JavaScript 2023

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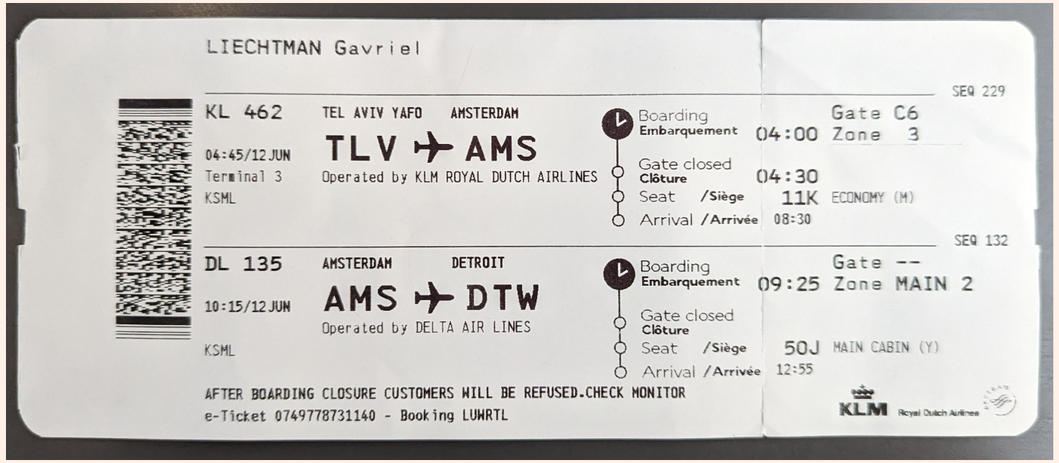
Find the Difference



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	Passport	Flight Ticket
Form of	Identity	Authority
Purpose	Verifies identity	Grants access to a flight
Scope	Global	Flight-specific
Issued by	Government	Airline desk, app, website, etc.
Information	Name, photo, birthdate, etc.	Name, flight number, seat, gate, etc.
Validity	Multiple years	One flight
Used	Once per flight	Multiple times per flight
Uniqueness	Unique to an individual	Unique to a flight and passenger
Changeable	No	Yes
Permissions	One (to travel)	Multiple (to board, to check bags, etc.)
Revocation granularity	All at once	One permission at a time
Transferable	No	Yes

	Authentication	Authorization
Purpose	Verifies user identity	Determines user permissions
Scope	Applies to all users	Specific to each user's role or status
Issued by	Identity provider	Any kind of data
Information	Username, social identity, biometrics, etc.	User roles, permissions, policy, external data, etc.
Validity	Until credentials change or are revoked	Per permissions check
Used	Once per session (typically)	Multiple times per session
Uniqueness	Unique to an individual user	Unique to a principal, action and resource
Changeable	Require session revocation	Yes (permissions can be updated, etc.)
Permissions	One (to access the system)	Multiple (to read, write, update, delete, etc.)
Revocation granularity	All at once (user is denied access)	One permission at a time
Transferable	No (credentials should not be shared)	Yes (policy can be applied to other users)

Authentication Advanced Features

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- Multi-factor authentication

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- Single sign-on / Social login / Passwordless

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- Multi-factor authentication
- Single sign-on / Social login / Passwordless
- User / account management
- Session management
- User registration / UI flows / customizations
- Account verification / recovery
- Audit / reporting / analytics / compliance
- Third party integrations


Auth0
clerk
STYTCH
frontegg
SuperTokens

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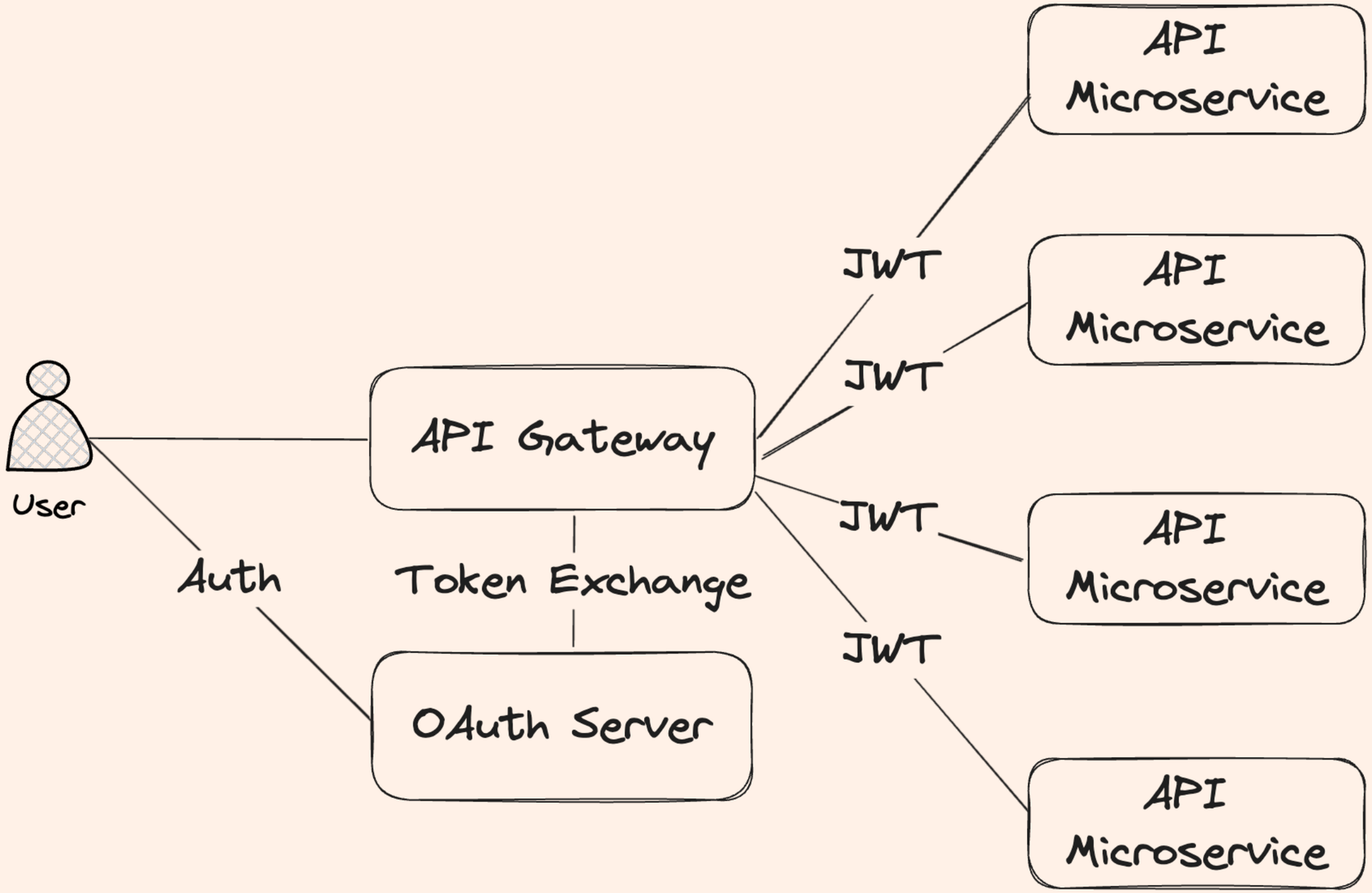
Gabriel L. Manor

Director of DevRel @ Permit.io

Not an ethical hacker, zero awards winner, dark mode hater.



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```
function deleteUser(user_id) {
  let user = User.get(user_id);
  if (user.role === "admin") {
    user.delete();
  }
}
```

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```
// Middleware
function rolesRequired(role) {
  return function (req, res, next) {
    if (req.user.role === role) {
      next();
    } else {
      res.status(403).send("Forbidden");
    }
  };
}

app.delete("/users/:id", rolesRequired("admin"), function (req, res) {
  let user = User.get(req.params.id);
  user.delete();
  res.send("User deleted successfully");
});
```

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```
// Middleware
function rolesRequired(role) {
  return function (req, res, next) {
    if (req.user.role === role) {
      next();
    } else {
      res.status(403).send("Forbidden");
    }
  };
}

function permissionsRequired(permission) {
  return function (req, res, next) {
    if (req.user.permissions.includes(permission)) {
      next();
    } else {
      res.status(403).send("Forbidden");
    }
  };
}
```

```
// Business logic
app.delete(
  "/users/:id",
  rolesRequired("admin"),
  permissionsRequired("delete_user"),
  function (req, res) {
    let user = User.get(req.params.id);
    user.delete();
    res.send("User deleted successfully");
  }
);
```

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```
// Middleware
function rolesRequired(role) {
  return function (req, res, next) {
    if (req.user.role === role) {
      next();
    } else {
      res.status(403).send("Forbidden");
    }
  };
}
```

```
// Business logic
app.get(
  "/enable_workflow/:user_id",
  rolesRequired("admin"),
  function (req, res) {
    const { userId } = req.params;
    let user = User.get(userId);
    let tier = bs.getTier(userId);
    if (tier !== "paid") {
      res.status(403).send("User is not paid user");
    } else if (user.sms_enabled) {
      sms(user.phone_number, "Workflow is enabled");
      res.send("Workflow enabled successfully");
    }
  }
);
```

```
// Business logic
app.get(
  "/enable_workflow/:user_id",
  rolesRequired("admin"),
  permissionsRequired("enable_workflow"),
  function (req, res) {
    const { user_id } = req.params;
    let user = User.get(user_id);
    let step1 = workflow.run();
    let step2 = workflow.run();
    if (user.sms_enabled) {
      send_sms_to_list(user.phone_number, "Workflow is enabled");
    }
    res.send("Workflow enabled successfully");
  }
);
```

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Staging

```
// Business logic
app.get(
    "/enable_workflow/:user_id",
    rolesRequired("admin"),
    permissionsRequired("enable_workflow"),
    function (req, res) {
        const { user_id } = req.params;
        let user = User.get(user_id);
        let step1 = workflow.run();
        ...
);
```

Production

```
// Business logic
app.get(
    "/enable_workflow/:user_id",
    rolesRequired("superadmin"),
    permissionsRequired("enable_workflow"),
    function (req, res) {
        const { user_id } = req.params;
        let user = User.get(user_id);
        let step1 = workflow.run();
        ...
);
```

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Express

```
app.get('/my_view', [
    rolesRequired('admin'),
    permissionsRequired('app_name.can_edit')
], function (req, res) {
    // Your view logic here
    ...
});
```

Flask

```
app = Flask(__name__)
login_manager = LoginManager(app)

class User(UserMixin):
    def __init__(self, id, role):
        self.id = id
        self.role = role

@login_manager.user_loader
def load_user(user_id):
    return User(user_id, 'admin')

@app.route('/admin')
@login_required
def admin():
    if current_user.role != 'admin':
        abort(403)
    ...
```

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```
if (
  user.role === "admin" &&
  user.tier === "paid" &&
  user.sms_enabled &&
  user.phone_number
) {
  send_sms_to_list(user.phone_number, "Workflow is enabled");
}
```

Authorization Best Practices

Declarative

Generic

Unified

Agnostic

Decoupled

Easy to audit

#1 Model

User | Action | Resource

Does *[Principal]* Allowed to Perform *[Action]* on *[Resource]*

Is a Monkey Allowed to Eat a Banana

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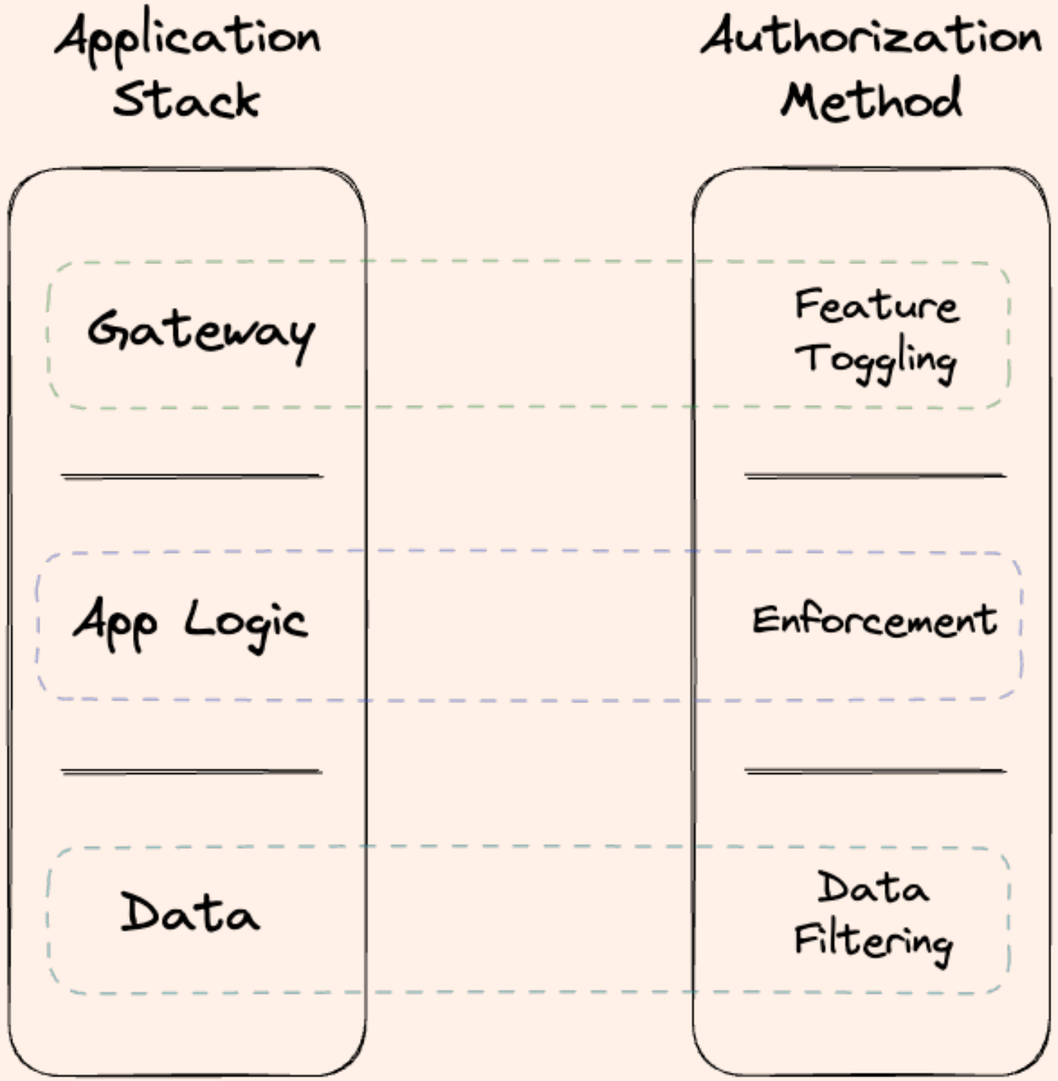

Application Stack
Authorization Method
Gateway
App Logic
Data
Feature Toggling
Enforcement
Data Filtering

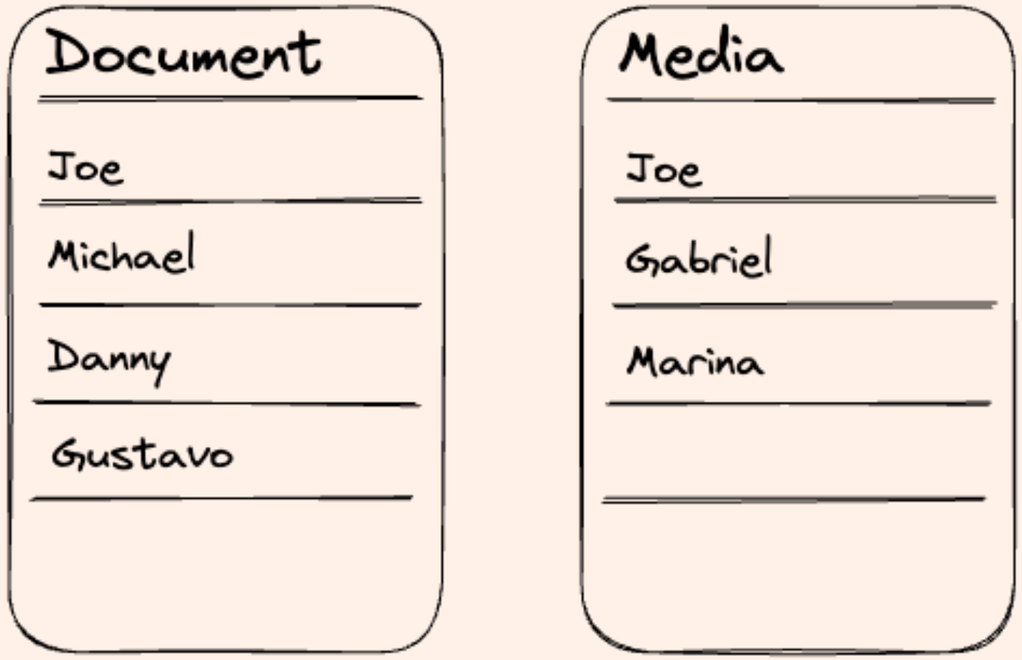
ACL - Access Control List

RBAC - Role-Based Access Control

ABAC - Attribute-Based Access Control

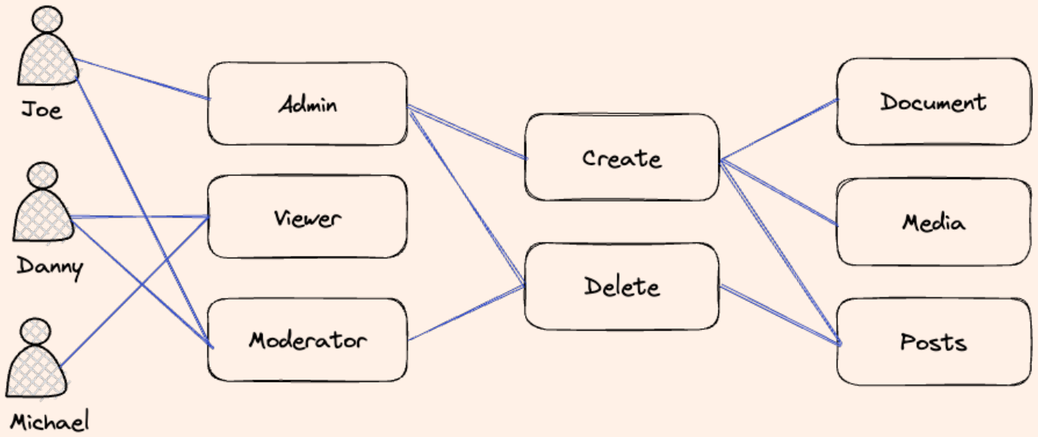
ReBAC - Relationship-Based Access Control

ACL - Access Control List



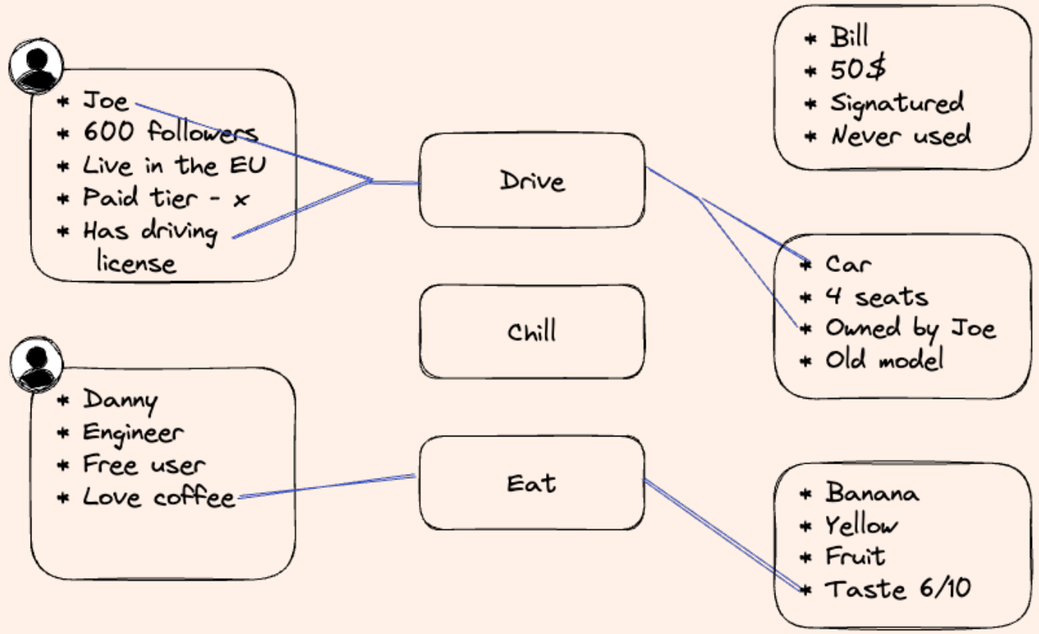
- EOL model
- Widely used in IT systems/networks
- No segmentation/ attribution support
- Hard to scale

RBAC - Role Based Access Control



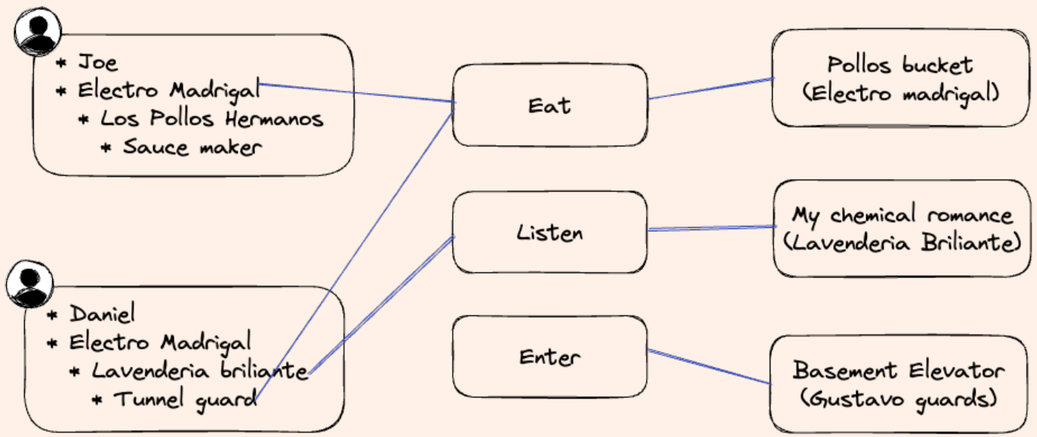
- The widely-used model for app authorization
- 🤓 Easy to define, use and audit
- No resource inspection
- Limited scalablity

ABAC - Attribute Based Access Control



- The most robust model for inspection and desicion making
- Configuration could be hard
- Easy to handle multiple

ReBAC - Relationship Based Access Control



- Best fit for consumer-style applications
- Support in reverse indices and search for allowed data
- Easy to scale for users (>1b) hard in desicion's

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#2 Author

Contracts Creates Better Relationships

👩🏽‍💻 *Especially in Human <> Machine Relationships* 🤖

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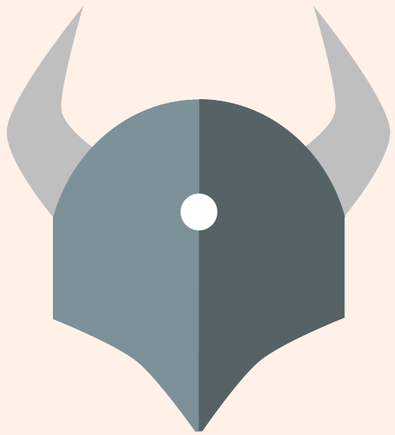
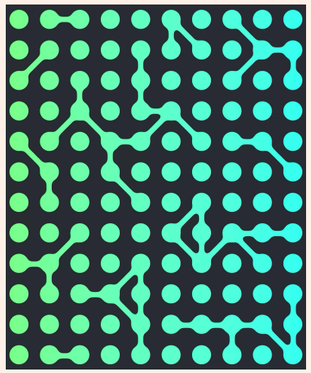
Open Policy Agent



AWS Cedar

Google Zanzibar - Open FGA




```
permit(
  principal in Role::"admin",
  action in
    [Action::"task:update", Action::"task:retrieve", Action::"task:list"],
  resource in ResourceType::"task"
);
```

```
permit (
    principal,
    action in
        [Action::"UpdateList",
         Action::"CreateTask",
         Action::"UpdateTask",
         Action::"DeleteTask"],
    resource
)
when { principal in resource.editors };
```

```
permit (
    principal,
    action,
    resource
)
when {
    resource has owner &&
    resource.owner == principal
};
```

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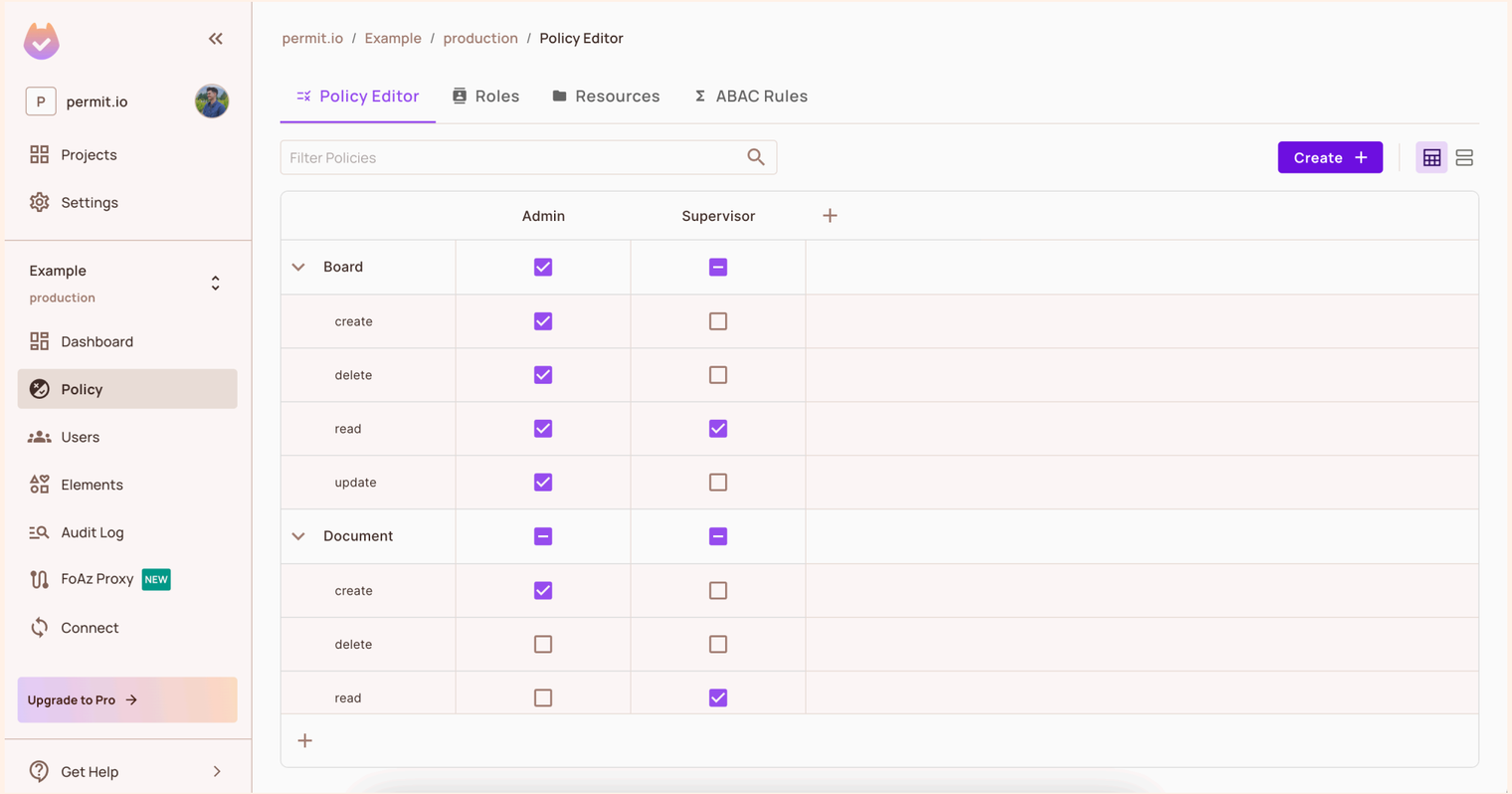
Generate Code from UI



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#3 Analyze

Cedar Agent

- Policy decision maker
- Decentralized continer, run as a sidecar to applications
- Monitored and audited
- Focused in getting very

#4 Enforce

Enforcing Authorization Policies

```
# Call authorization service
# In the request body, we pass the relevant request information
allowed = requests.post('http://host.docker.internal:8180/v1/is_authorized', json={
    "principal": f"User::\"{user}\"",
    "action": f"Action::\"{method.lower()}\"",
    "resource": f"ResourceType::\"{original_url.split('/')[1]}\"",
    "context": request.json
}, headers={
    'Content-Type': 'application/json',
    'Accept': 'application/json'
})
```

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CASL - Frontend Feature Toggling SDK

```
import { createMongoAbility, AbilityBuilder } from '@casl/ability';

// define abilities
const { can, cannot, build } = new AbilityBuilder(createMongoAbility);

can('read', ['Post', 'Comment']);
can('manage', 'Post', { author: 'me' });
can('create', 'Comment');

// check abilities
const ability = build();

ability.can('read', 'Post') // true
```

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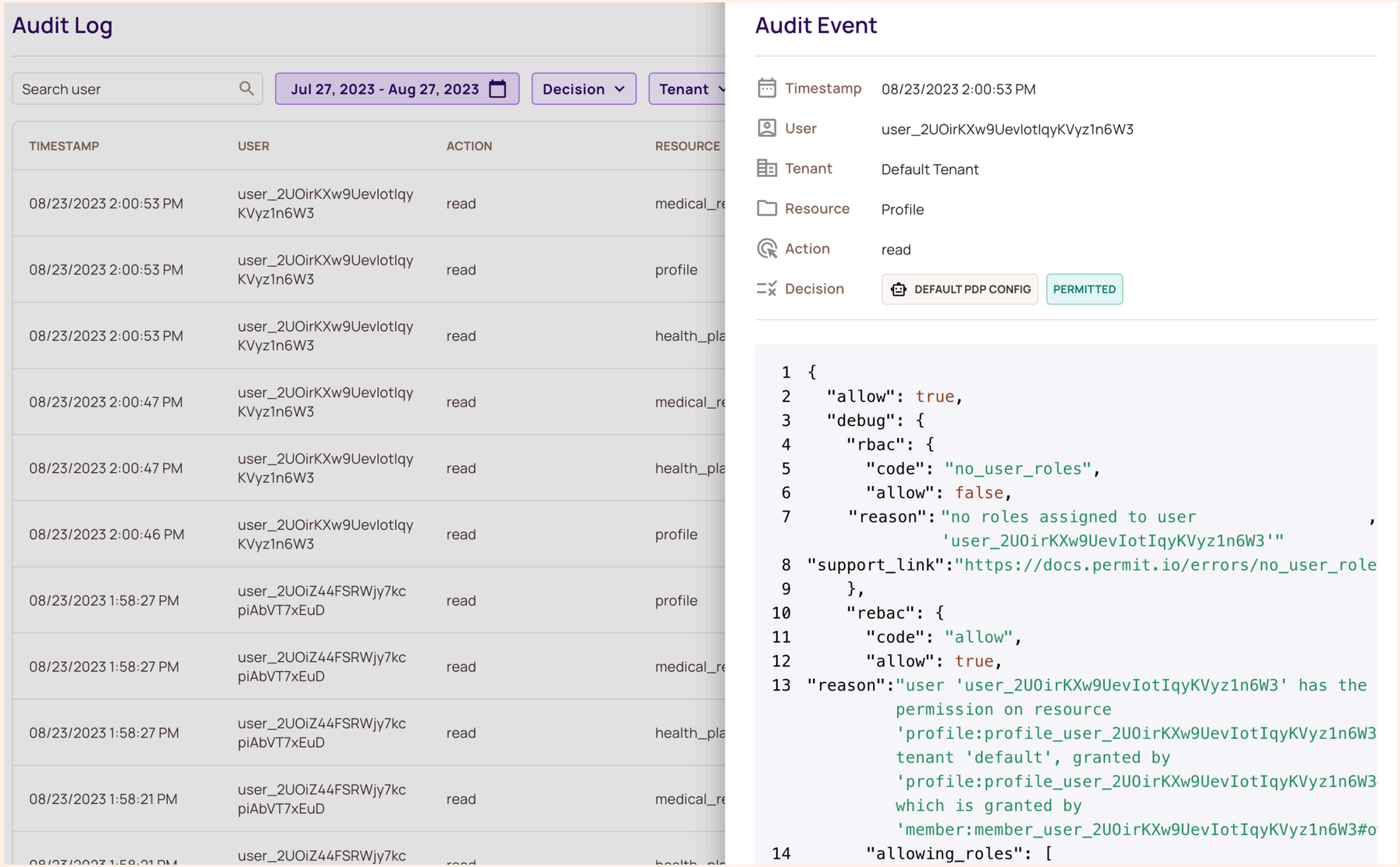
#5 Audit



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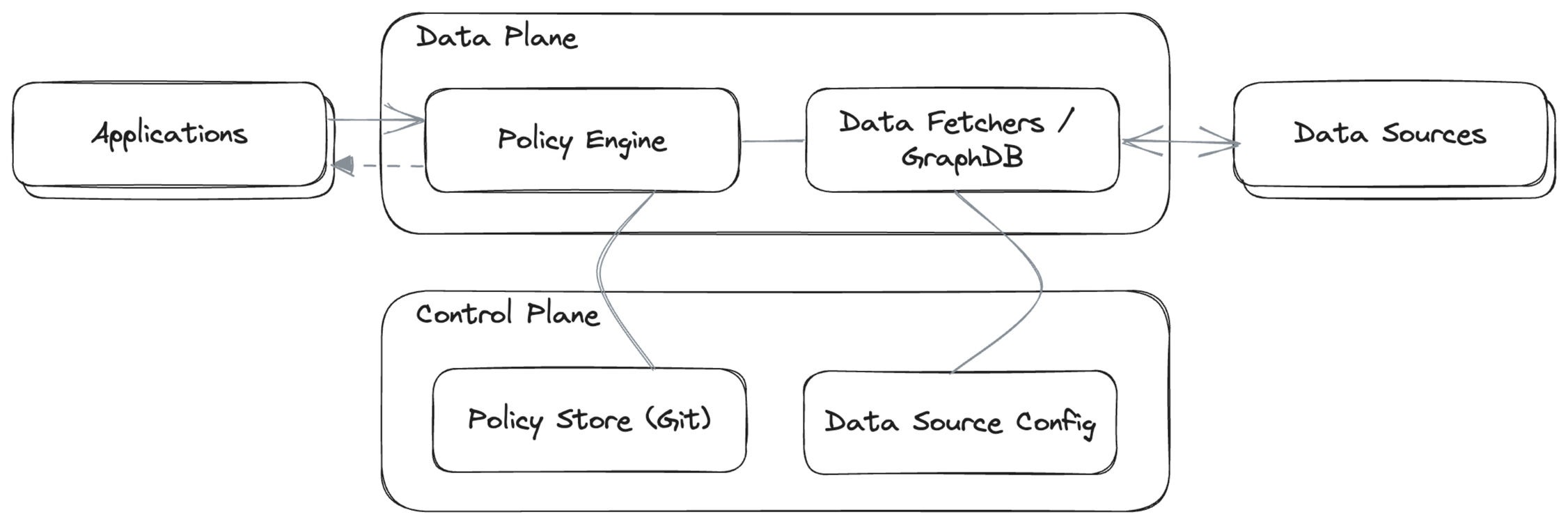
Authorization System Building Blocks



OPAL - Open Policy Administration Layer

- Open Source, Written in Python
- Sync decision points with data and policy stores
- Auto-scale for engines
- Centralized services such as Audit
- Unified APIs for the enforcement point
- Extensible for any kind of data source
- Supports OPA, Cedar (and soon to be announced more)
- Used by Tesla, Zapier, Cisco, Accenture, Walmart, NBA and thousands more

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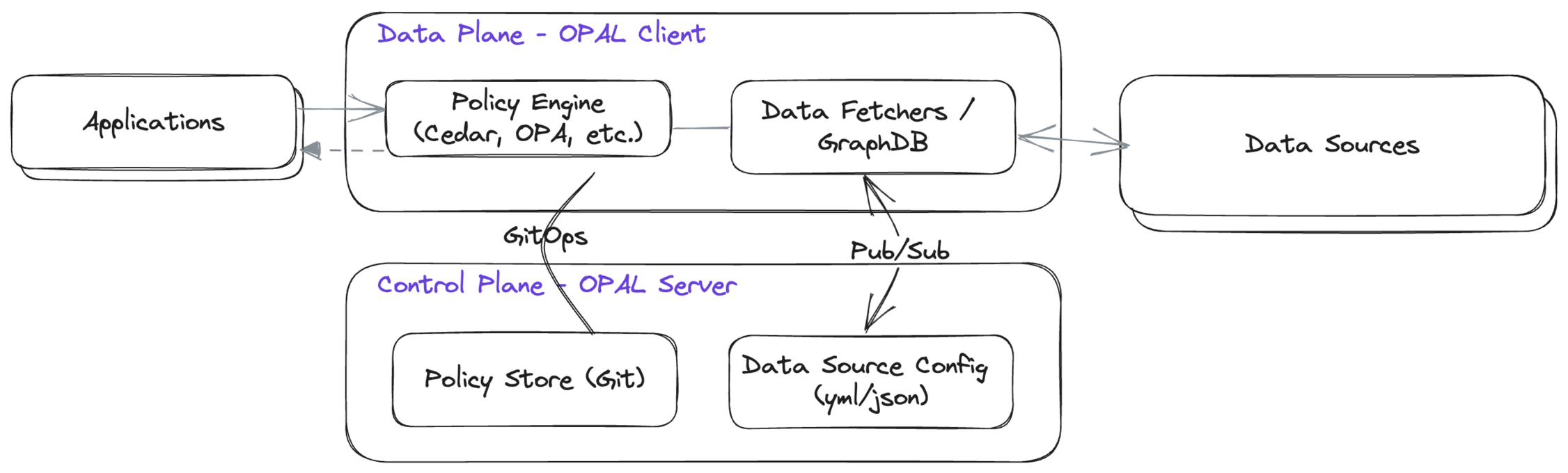
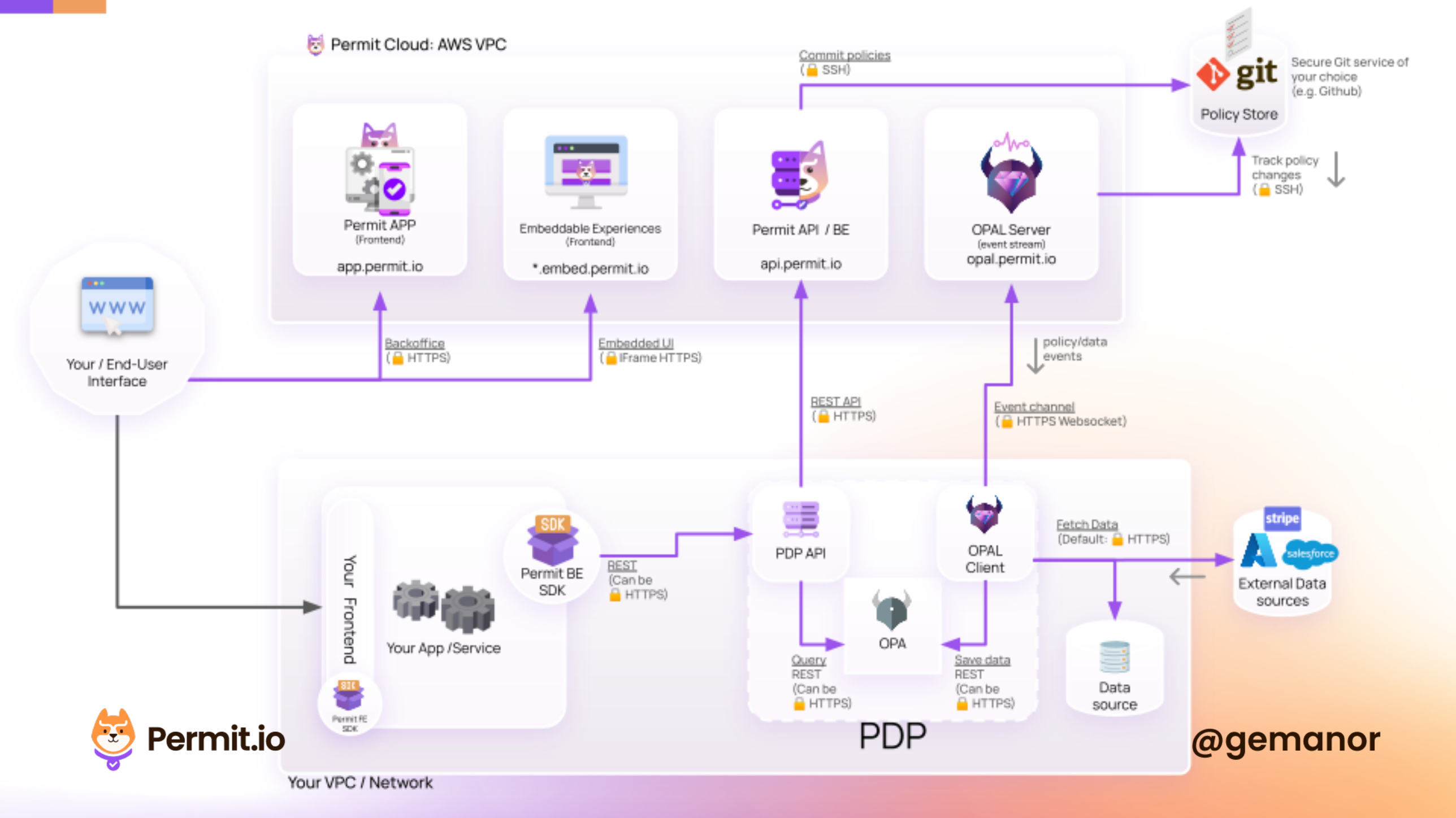
OPAL Based Authorization Architecture



🍿 Demo Time 🍿


Permit Cloud: AWS VPC
Commit policies
(SSH)
git
Policy Store
Secure Git service of your choice (e.g. Github)
Track policy changes
(SSH)
Permit APP
(Frontend)
app.permit.io
Embeddable Experiences
(Frontend)
*.embed.permit.io
Permit API / BE
api.permit.io
OPAL Server
(event stream)
opal.permit.io
Your / End-User Interface
Backoffice
(HTTPS)
Embedded UI
(IFrame HTTPS)
policy/data events
REST API
(HTTPS)
Event channel
(HTTPS Websocket)
Your Frontend
Permit FE SDK
Your App /Service
SDK
Permit BE SDK
REST
(Can be HTTPS)
PDP API
OPAL Client
Fetch Data
(Default: HTTPS)
stripe
salesforce
External Data sources
OPA
Query
REST
(Can be HTTPS)
Save data
REST
(Can be HTTPS)
Data source
PDP
Your VPC / Network
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