air.cab use-case guide

This guide uses an imaginative airline air.cab to demonstrate how smart tokens are created.

Introduction:

We assume a token issuer, air.cab, a regional airline issuing tickets as smart tokens. The process involves several parties:

air.cab

The token issuer that issues smart token airline tickets, typically on identifiers like the user's email address.

attestation.id

The identifier attestation issuer that also operates a PWA for authenticating and authorising using the attested web2 ID.

Smart Layer Gateway Node

The node responsible for assigning a service node. This is a work in progress and the role might merge with the archive node in the future.

Smart Layer Service Node

The service node assigned to handle the specific token instance.

Let's quickly recall that Smart Layer and Smart Tokens. Smart Tokens are programmable objects that encapsulate business logic, enabling limitless integrations with various systems and other tokens in a self-contained, interoperable format. Much of Smart Token deployment happens inside Smart Layer network. For this example, we assume that the token, including its controlling smart contracts and needed TokenScripts are already deployed to the Smart Layer so we can study the process how an individual smart token instance is created.

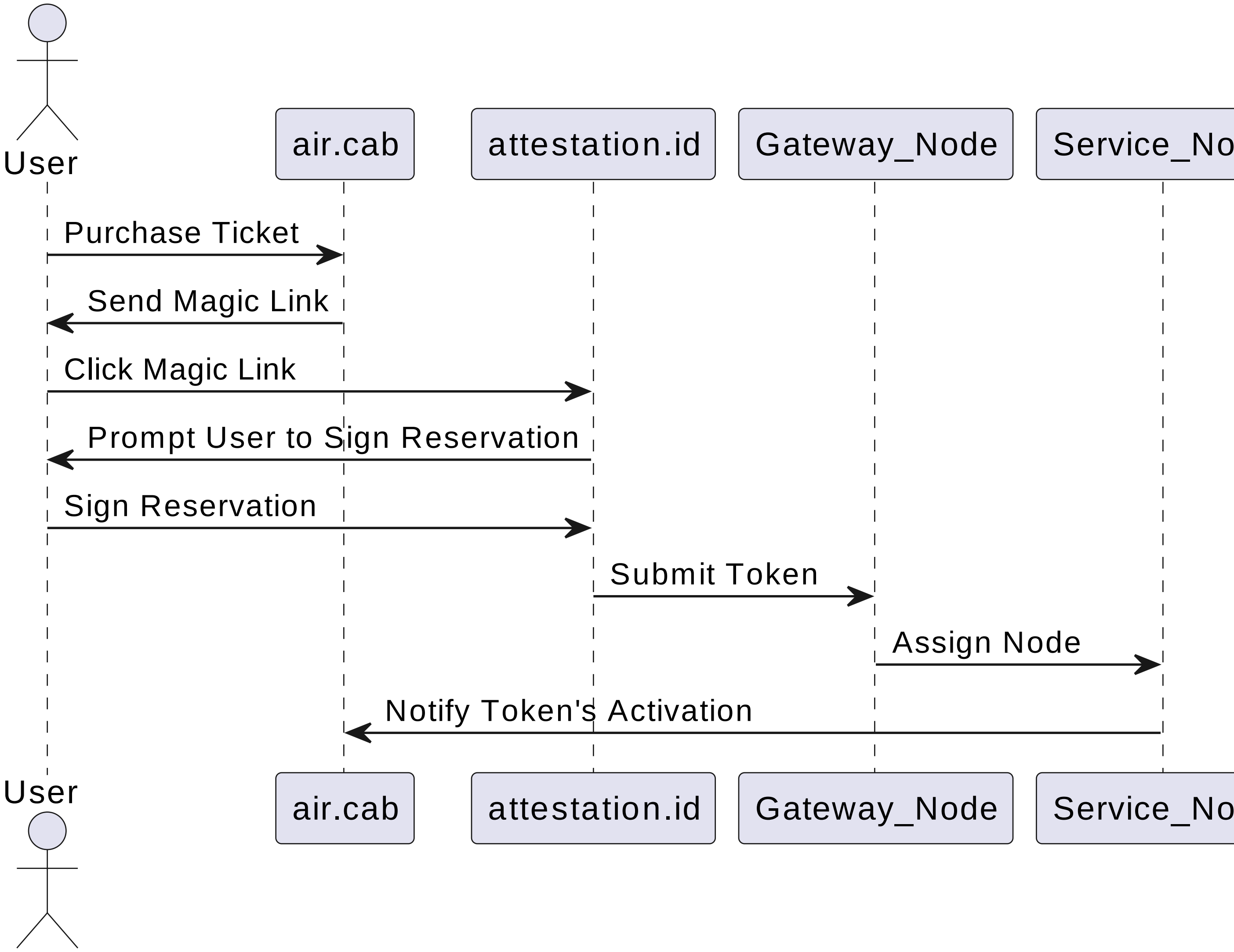
Key Knowledge Points

1. **User Acceptance**: The token has to be accepted by the user. Since issuers have to sign for a token to be issued, it means the token has to be signed at least twice, by the token issuer as well as by the user. This is distinctly different from Ethereum tokens, where tokens can be issued to any Ethereum address without their collaboration. In the Smart Layer Network, the user/token relationship is acknowledged and used to provide service.
2. **User's Public Key**: The token issuer doesn't have to learn the user's public key in order to send the token to the users. This design allows the users to get cryptographic keys at a later stage, preventing smart token from becoming a dependency for a business process of a web2 website.
3. **Token Creation**: The creation of the smart token, which is the creation of the token object in the smart layer network, doesn't depend on the token issuer being online, although its online presence expedites the process.

Instantiation Process

In this process, Air.Cab provides a magic link which leads to the creation of a token object in the smart layer, and it gets notified when it is created. Shortly after that, when Air.Cab issues the ticket, it updates the smart layer network with the ticket information, such as PNR (the 6-digit identifier of a ticket). This changes the smart token from reservation to a ticket. In a reservation state, it can provide some functionalities, such as used to apply for a VISA or used in the process of hotel booking. But once it is a ticket, it enables more use-cases that depends on actual tickets, such as lounge access or duty free shop dropping.

Now that we have a basic understanding of the Smart Layer and key knowledge points, let's look at the process of creating a smart token airline ticket.



1. *User Purchases a Ticket*: The user initiates the process by purchasing an airline ticket from air.cab.
2. *air.cab Sends Magic Link*: Upon transaction completion, air.cab sends the user an email with a "magic link" to claim a smart token. This magic link is also displayed on the reservation confirmation page. Most users are expected to click on the link in the web page.
3. *User Clicks Magic Link*: The user clicks the magic link, which leads to attestation.id with a ticket reservation signed by air.cab.
4. *User Signs Reservation*: attestation.id prompts the user to sign the reservation. This action initiates the verification of the key and the construction of a Pedersen commitment to the user's identifier. This process validates the user's acceptance of the smart token and provides proof of the user's key ownership to the Web 2.0 identifier.
5. *attestation.id Passes User-signed Token*: The attestation.id website passes the user-signed token to the Smart Layer network by submitting it to a gateway node.
6. *Gateway Node Assigns Service Node*: The gateway node assigns Service Node A for the token's runtime and forwards the token to Service Node A.
7. *Service Node A Fetches Tokenscript*: Service Node A fetches the tokenscript from Service Node B.
8. *Service Node A Executes Tokenscript*: Service Node A executes the fetched tokenscript. This triggers an on-creation event in tokenscript.
9. *Service Node A Notifies air.cab*: Prompted by the on-creation event, Service Node A notifies the airline about the token's activation in the network.

The process involves several steps, from the user purchasing a ticket to the Smart Layer Service Node notifying air.cab about the token's activation in the network. For convenience we left out a few small steps such as the retrieval of TokenScripts, which lets service node know how to callback air.cab and how to integrate wth other services and tokens.

Following the token cration diagram, here we can dive deeper to look at how it works on code level.

Step 1: Issuance of the token through a magic link

When a user makes a reservation on air.cab, the airline issues a smart token to represent the reservation. This token is delivered to the user through a magic link. The following code, which runs on the air.cab website, illustrates this process:

```
// Import the Smart Token Issuer library
const SmartTokenIssuer = require('smart-token-issuer');

// Initialize the Smart Token Issuer library with the token issuer's key
const tokenIssuer = new SmartTokenIssuer(tokenIssuerKey);

// Prepare the token
const token = {
    status: "reservation",
  // other token details
};

// Issue the token
const issuedToken = tokenIssuer.issueToken(token);

// Generate a magic link that includes the issued token
const magicLink = tokenIssuer.generateMagicLink(issuedToken);

// Display the magic link to the user on the UI
displayMagicLink(magicLink);
```

The magic link, which is displayed and emailed to the user, looks like this:

```
https://attestation.id/activate?token=cDlpINXzX6V883NH407gJlm
+8Vy1NKS8d94XBGwbzRjFm4IqlZkf2P2GVAxm...
```

Step 2: User accepting the token and submitting it to the Smart Layer network

When the user clicks the magic link, one of two things happens:

1. If the user has a cryptocurrency wallet, the wallet intercepts the link and helps the user sign the acceptance.
2. If the user does not have a cryptocurrency wallet, the link leads the user to a website (by default, attestation.id) where the user's private key is created if necessary. This key is used to sign the acceptance. Note that this is not exactly a cryptocurrency wallet, because the private key used here is incompatible with public blockchains such as Ethereum.

The user's signing of the acceptance is a crucial step for the token to be submitted to the Smart Layer network, i.e., to activate the token. Think of the smart token like a cookie that the user needs to accept. Once accepted and the accepted version is submitted, it's activated.

The following code, which runs on attestation.id, demonstrates the second case. As a developer who uses the Smart Layer, you do not need to write this code; it's provided here for demonstration purposes.

```
// User visits the attestation.id website via the magic link
```

```
app.get('/activate', async (req, res) => {
    // The issuedToken is extracted from the URL
    const issuedToken = req.query.token;

    // Display a message to the user
    res.send(`You are about to activate your reservation token:
 ${issuedToken}`);
});

// User signs the token using Passkeys key and submits it to the Smart Layer
// This step is handled by the user's device and the Passkeys API

// Hypothetical function provided by Passkeys API
async function signAndSubmitToken(token, passkeysKey) {
    // The token is signed using the Passkeys key
    const signedToken = await passkeysAPI.signToken(token, passkeysKey);

    // The signed token is submitted to the Smart Layer
    const response = await smartLayerAPI.submitToken(signedToken);

    // The response from the Smart Layer is returned
    return response;
}

// This function would be called when the user decides to activate their
 token
signAndSubmitToken(issuedToken, passkeysKey)
    .then(response => {
        // Handle the response from the Smart Layer
        console.log(`Token submitted to the Smart Layer: ${response}`);
    })
    .catch(error => {
        // Handle any errors that occurred during the signing and submission
 process
        console.error(`Error submitting token to the Smart Layer:
 ${error}`);
    });
```

Step 3: Processing the token in the Smart Layer network

Once the user's signed token is submitted to the Smart Layer network, the network processes the token. This is done by first obtaining the TokenScript associated with the token, then executing the `onActivation` trigger.

The `onActivation` trigger is defined in the TokenScript file associated with the token. Token-issuer puts JavaScript code here that sends a callback to the airline's website.

Here's how this might look in the JavaScript (to be packaged to TokenScript and executed in Smart Layer):

```
function onActivation(token) {
    // Callback to the airline's website to inform them of the activation
    try {
        const response = await axios.post('https://air.cab/callback', {
            token: token
        });

        if (response.status !== 200) {
            console.warn('Callback to air.cab failed, but token is still
 activated.');
        } else {
            console.log('Callback to air.cab successful.');
        }
    } catch (error) {
        console.warn('Callback to air.cab encountered an error, but token is
 still activated.');
    }
    // Update the status soft-state variable
    // soft-state are not written to smart contracts.
    updateSoftState('status', 'activated');

    // Regardless of the callback's success, the token is considered
 activated
    return { status: 'success', message: 'Token activated successfully.' };
}
```

This approach allows the status to be updated quickly and cheaply within the Smart Layer network, without needing to interact with the blockchain. The status update is then communicated to the airline's website via the callback.

Note: The token's activation is independent of the callback's success. While we attempt to notify the airline about the activation through a callback, the token is deemed activated even if this callback fails. This design choice prioritizes the token's activation over the callback's success for simplicity and ensures a seamless user experience.

Q&As

** Can't airline issue tickets without smart layer? **

The Smart Layer is not a dependency for issuing passenger a ticket; it is used to create a smart token out of that ticket. A smart token allows functionalities that can be expected if the airlines are an integration centre like Google, but can't happen due to the limited possible integration centres that can exist in a web ecosystem. Such features include upgrading the ticket through 3rd party or bidding market, using the ticket to enable more use-cases such as VISA application or insurance, integrating user's mobile app and web app etc. It might be smart enough to update your hotel booking if the plane is late. These will depend on smart layer function as the execution environment of the now smart-token airline ticket, but also that the parties who wants to integrate with such a ticket being connected to smart layer as well.