Digital Asset

CBDC Demo User Guide

Contents

Introduction

The CBDC Demo was created by Digital Asset using Daml®, the smart contract language that simplifies multi-party workflows across infrastructures, the cloud, and multiple persistence layers. It was originally created for a forum of the Organisation for Economic Co-operation and Development (OECD) on central bank digital currency (CBDC) in the fall of 2020.

The demo shows how Daml supports core features of CBDC, addressing these key requirements.

- **Tracking:** Daml supports auditing and tracking transactions and storing contracts along with the history of each transaction. Observers of a Daml contract can be customized to allow for more transparency and visibility.
- **Controls:** An authority controls who can own money at a programmatic level, for example, to comply with restricted lists (e.g., OFAC).
- **Safety:** For simple or complicated transactions, Daml can establish specific rules for money transfers that must be met atomically (e.g., all steps must be successful) for the transaction to occur.
- **Interoperability:** Daml would permit a CBDC system to bridge different ledgers and technologies.

Demo Scenarios

The demo simulates three different scenarios involving CBDC.

- Cross-Currency Exchange
- Government Stimulus Payments
- Interoperability between Different DLT CBDC Platforms

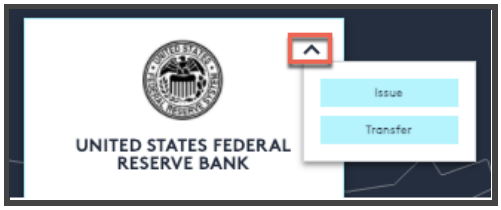
Participants

The following participants interact in the demo scenarios.

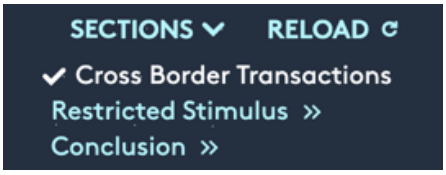
Participant	Role in Demo
European Central Bank	Issues digital currency equivalent to Euros to banks with which it has a relationship
United States Federal Reserve Bank	Issues digital currency equivalent to USD to banks with which it has a relationship
Commercial Bank A	A U.S. bank with relationship with Federal Reserve Bank
Commercial Bank B	A European bank with relationship with the European Central Bank
Alice	A U.S. consumer who receives stimulus payments in digital currency
Alpha Properties	“Alice’s” landlord

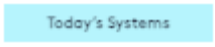
Using the Demo Screens

Click a chevron to open a window and make choices. Choose the chevron again to close.



Switch between scenarios by choosing **SECTIONS** at the upper right.



The  icon opens a description of the steps you can take to run the demo of that scenario. In addition. At the end of the steps, 

opens a series of screens showing what would happen in today’s world without the Daml solution.

Installing and Running the Demo

The CBDC Demo code is open source and available at: https://github.com/digital-asset/ex-cbdc/

Installing and Starting

Follow the instructions in the ReadMe file to install and start the demo. You have the option to install and run this on:

- Daml Sandbox — a simple ledger implementation that simulates a Daml Ledger
- Daml Hub — Digital Asset's fully managed and scalable cloud platform for Daml applications
- Canton — Digital Asset's the next generation of Daml ledger infrastructure that will enable seamless interoperability

Whichever option you choose, the demo will open in a browser window.

Restarting the Demo

The cleanest way to reset the demo is to stop and start again as described in the ReadMe file "Resetting the Prototype."

Use of the **Reload** button shown on the screen is also described in the ReadMe in "Resetting the Prototype with the Experimental Reset Service."

Step-by-Step Instructions

Cross-Currency Exchange

In today's financial ecosystem, each central bank would issue and track CBDC on its own platform, and settlement errors could occur when interacting with a different central bank and its digital currency. In the CBDC Demo, settlement fails if either leg fails, but privacy is preserved, with no details of the failure visible to the other parties.

Follow the example described below to see how this works. You can also follow the steps with whatever values you choose to work through your own examples.

Issue Digital Currency

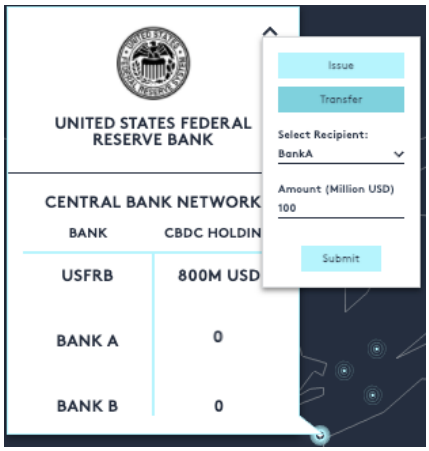
The two central banks issue CBDC to the commercial banks. To issue currency:

1. Begin on the first screen, **Cross-Border Transactions**.

2. Click the chevron in the United States Federal Reserve Bank window:
    a. Choose the **Transfer** button.
    b. Select the Recipient commercial bank: Bank A
    c. Enter an amount in millions of USD.

        In this example, 100 million.

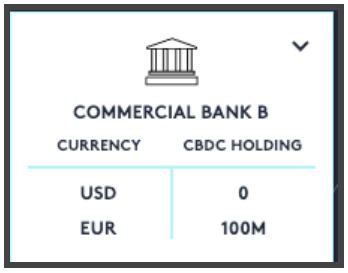
d. Choose the **Submit** button.



The amount will show in Bank A's USD holdings.

3. Repeat these steps in the European Central Bank window to transfer digital currency equivalent to Euros to Bank B.

   In this example, 100 million EUR.



4. Observe that the two central banks see only their own digital currency in each bank's holdings, not holdings of the other central bank's digital currency. Daml ensures strict data privacy.

Propose and Respond to PVP

Either commercial bank can propose a currency transaction. The other commercial bank can respond. If each bank's holdings are sufficient, the transaction will be completed. However, if either bank does not have sufficient funds, the transaction will fail.

To propose a PVP:

1. Select the chevron for Commercial Bank A and choose the **Propose PVP** button.
   The Propose PVP window will open.
2. In the proposal:
   a. The Counterparty Bank B will be selected in the **Counterparty** field.
   b. Enter the Buy amount.

      In the example, 100 million EUR.

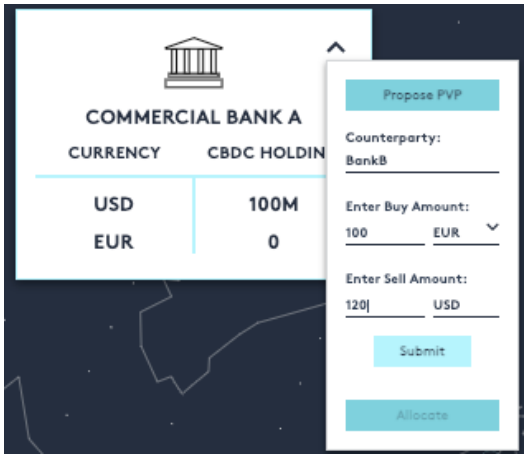
      Tip: *Be sure to change from USD to EUR.*

   c. Enter the sell amount.

      In the example, 120 million USD.

      Note: *Bank A has only 100 million USD in its holdings and will not be able to fulfill this order at settlement.*

   d. Choose the **Submit** button.



To respond to the proposal:

1. Go to the window for Commercial Bank B and click the chevron to see the proposal.

2. Bank B can either Accept or Decline the proposal. (See below for steps when a proposal is declined.)

   In this example, choose the **Accept** button.

   Note: *Bank B does not know how much USD Bank A actually has in its holdings, and neither does the European Central Bank.*

Now that Bank B has accepted the proposal, Bank A and B must allocate funds:

To allocate:

1. For Bank B, choose the **Allocate** button.
2. For Bank A, choose the **Allocate** button.

   The screen shows the results of each leg of the transaction. A **Failed** icon appears for Bank A as it did not have 120 USD to sell. Because this is an atomic transaction, both legs must pass, or both will fail. Bank B still has the same 100 EUR; nothing was transferred. And Bank A still has the same 100 USD.

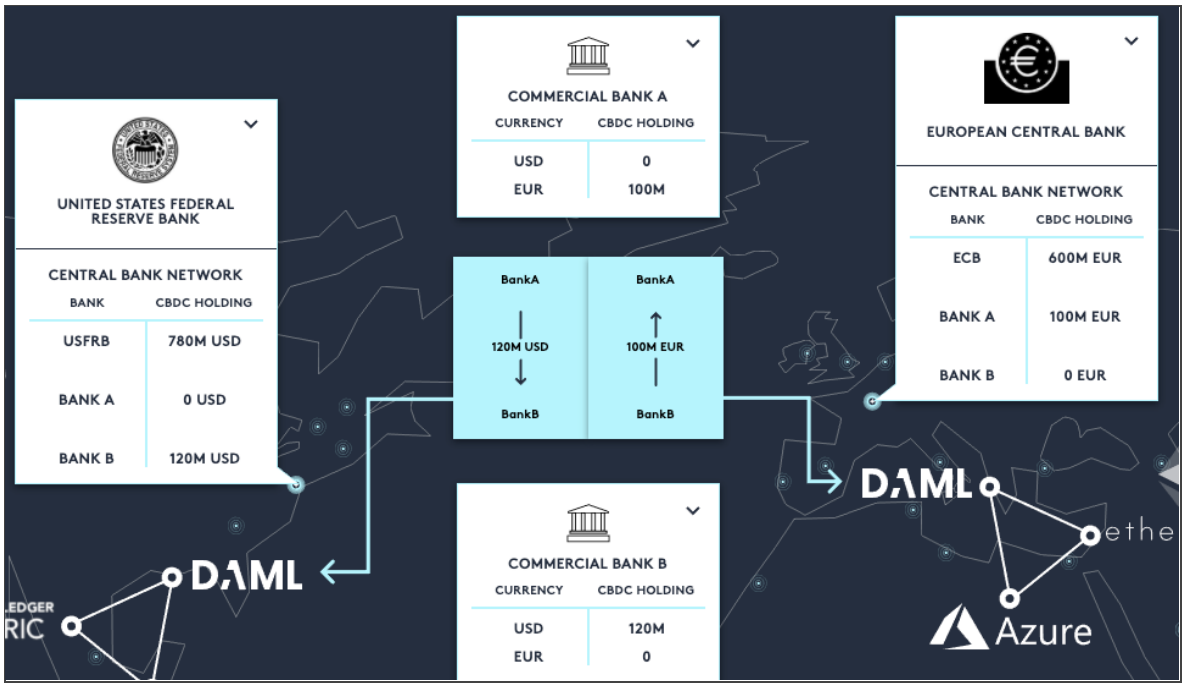
To have this failed transaction settle:

1. For the U.S. Federal Reserve, transfer 20 million USD to Bank A.

   Bank A will now have 120 million USD.

2. For Bank A, choose the **Allocate** button again.

   This time, the trade settles, both transactions succeed, and the holdings amounts change.



What Would Happen Today

Click the  to see a summary of the steps.

Then click the **Today's Systems** button and step through a series of x screens showing how this would work without Daml, where only some funds would be transferred, leaving a broken trade.

Other Examples

Counterparty Declines

To decline a proposal and then adjust it:

1. For Bank B, choose the **Propose PVP** button. In the proposal:
    a. The Counterparty Bank A will be selected in the **Counterparty** field.
    b. Enter the Buy amount: 60 million EUR.
    c. Enter the sell amount: 65 million USD.
    d. Choose the **Submit** button.
2. For Bank A, choose the **Decline** button.

    The trade will not go through, and the PVP window amounts will clear.

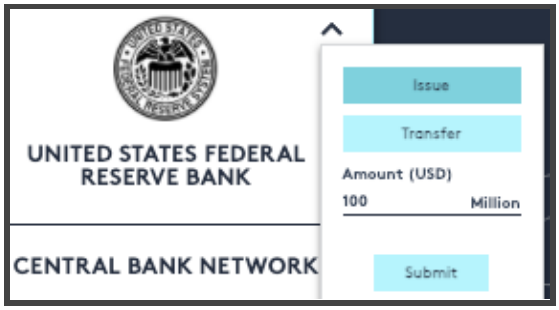
3. For Bank B, you can change the proposal amounts and this time have Bank A accept.
4. Once you allocate for both banks, the transaction will settle.

Central Bank Issues Additional CBDC

Either of the central banks can add to its own holdings of digital currency.

To issue additional currency:

1. Click the chevron for the central bank:
    a. Choose the **Issue** button.
    b. Enter an amount to issue.
    c. Choose the **Submit** button.



2. Note that the new amount is shown in the central bank's holdings.

Tip: You can run the demo with your own numbers as well. Consult the ReadMe instructions on restarting.

Government Stimulus Payments

CBDC can be used to distribute stimulus payments by governments to individuals. These can be either restricted funds, to be used only for specific purposes, or unrestricted funds. The rules can also allow the combination of restricted and unrestricted stimulus amounts to be used for the same payment.

Issue Stimulus Payments

To issue a restricted payment (to be used only for housing):

1. Choose **Restricted Stimulus** in the **SECTIONS** drop-down.

2. As the United States Federal Reserve Bank, choose **Restricted Stimulus**.
3. Enter 1000 USD for Alice.

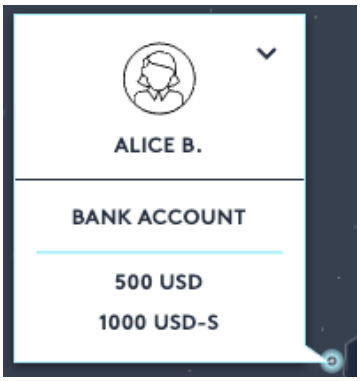
4. Choose the **Submit** button.

   Alice's bank account will be updated to show the restricted balance.

To issue an unrestricted stimulus:

1. As the United States Federal Reserve Bank, choose **Stimulus**.
2. Enter 500 USD for Alice and choose the **Submit** button.

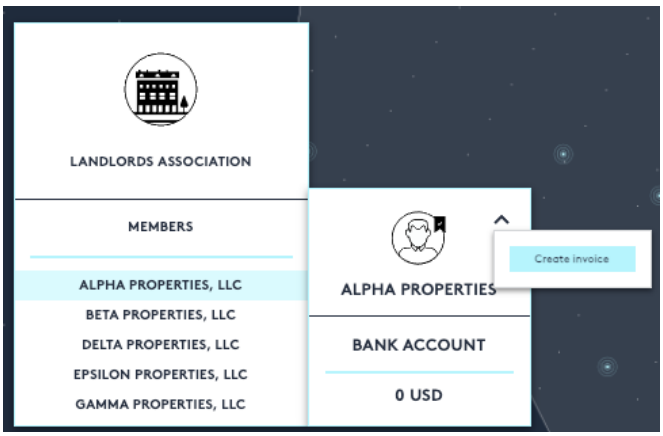
   Alice's bank account will show both amounts.



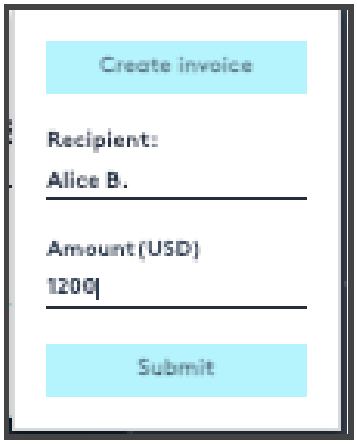
Issue and Pay an Invoice

To issue an invoice:

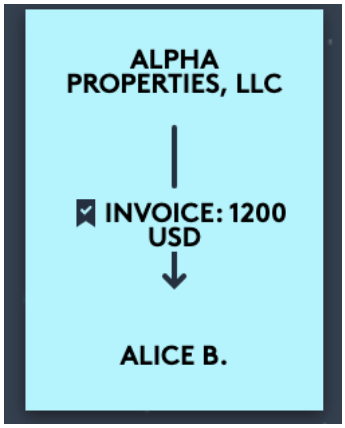
1. In the Landlords Association window, for Alpha Properties (Alice's landlord), choose **Create Invoice**.



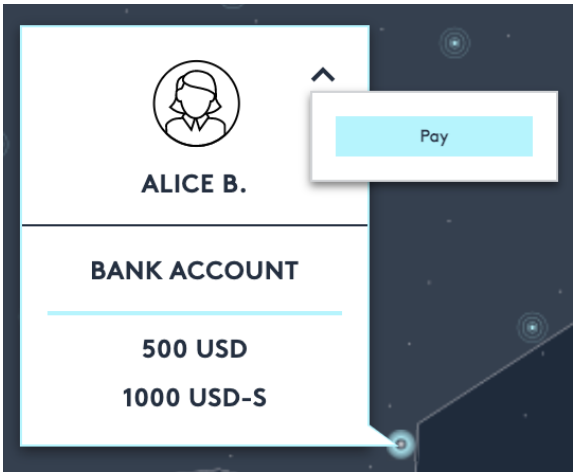
2. For the invoice:
   a. Enter the amount due as $1200.
   b. Choose the **Submit** button.



The invoice will be displayed.

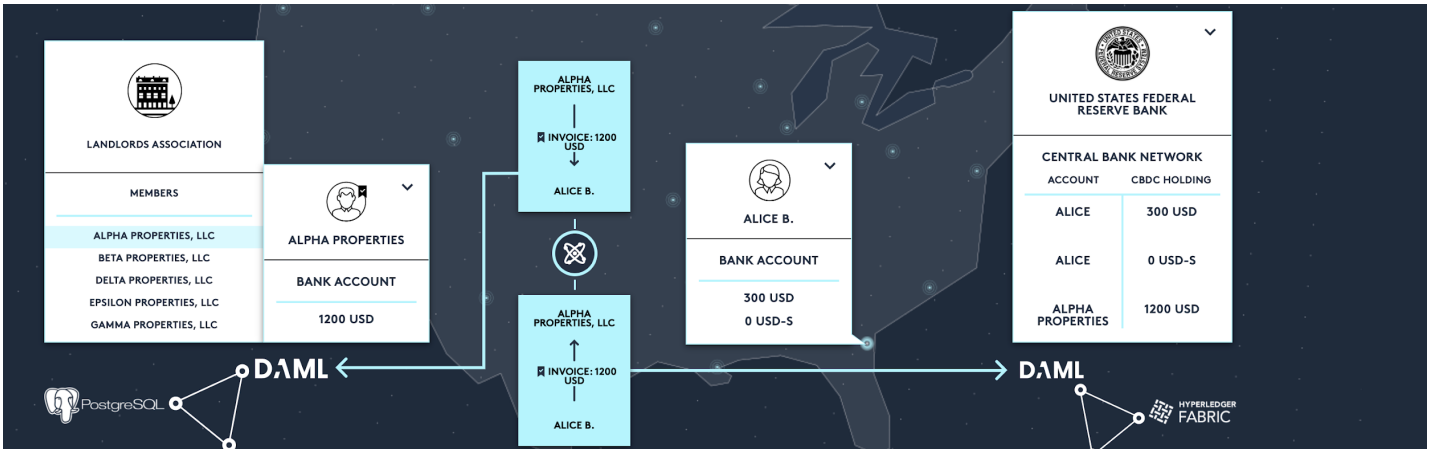


3. As Alice, choose the **Pay** button to pay the invoice.



The 1200 USD will be transferred from Alice to Alpha Properties, as shown in Alpha Properties bank account, the Federal Reserve records, and Alice's bank account.

A combination of both types of stimulus are used to pay, with the first amounts being taken from the restricted funds, and the balance, from the unrestricted funds. This leaves Alice with a 300 USD balance to use in an unrestricted manner.



Interoperability Simulation

Choose **Conclusion** in the **SECTIONS** drop-down to view the interoperability simulation.

This is not an interactive part of the demo. Instead, it shows a global economic network, where a variety of types of CBDC are issued, transferred, and used for payments. And all of this can happen on a variety of different ledger platforms using a variety of languages. Digital Asset's Daml is the smart contract language that unifies this variety of infrastructures, allowing for the features of true interoperability.