



PROJECT: EXPERIMENTAL TEST OF CBDC

CENTRAL BANK DIGITAL CURRENCY
2023

- ➡ Retail CBDC
- ➡ Domestic payment

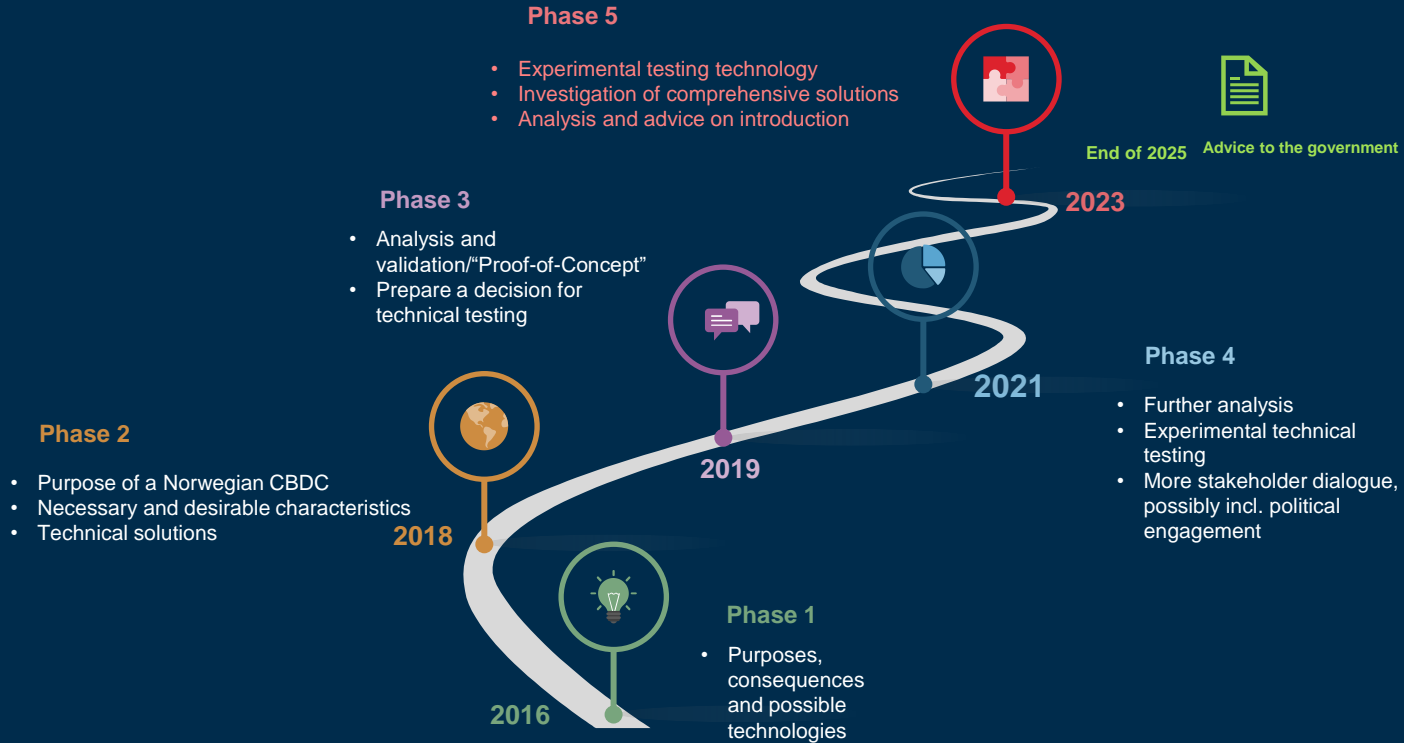
NORWAY



- 99,7 % internet penetration
- Approx. 50 % 5G mobile
- Close to completely cash less
- Digitally matured
- “All” people have a smartphone
- Public services are digitized
- High Trust in banks/government
- Secure digital identity. BankID a separate company own by all banks. One single login to all banks, tax filing, company registry, health record, public services.
- Norway have Instant payment.



Earlier phases





OUR CHOICE OF TECHNOLOGY

GOOD FOR EXPERIMENTAL TEST

MOST LIKELY NOT FOR THE DEPLOYMENT OF CBDC IN PRODUCTION

Our aim is to learn

TECHNOLOGY – SANDBOX

Hyperledger Besu

The basic technology is based on Hyperledger Besu, which is also called **Enterprise Ethereum**.

Consensus: Proof of Authority

Block every 5 sec

Wallet

We have a separate soft-wallet.

Banks are free to develop their own wallets, services and user-interface

ERC-20

Only Norges Bank can issue and burn

- Norwegian kroner
- **NOK**
- **4 decimal places**

Free transactions (no gas fee)

The screenshot displays the 'NORGES BANK' Connect wallet interface. At the top, there are navigation tabs for 'DASHBOARD', 'HISTORY', and 'ADMIN'. Below this, a 'Connect wallet' section shows a balance of '0.0000 NOK'. The main interface is divided into three primary sections: 'MINT TOKENS', 'BURN TOKENS', and 'TRANSFER TOKENS'. Each section includes a form with a 'Amount' field (set to '0.0000') and a 'NOK' label, followed by a corresponding action button. The 'TRANSFER TOKENS' section also includes a 'Recipient Address' field and a 'NOK' label. A red box highlights the 'Connect wallet' area at the top left.

RFP1 - Central bank issue and redeem

CEO
Jacobo Toll-Messia

FinTech company
based in Bergen,
Norway



MVP / simple Pilot

Spring 2022

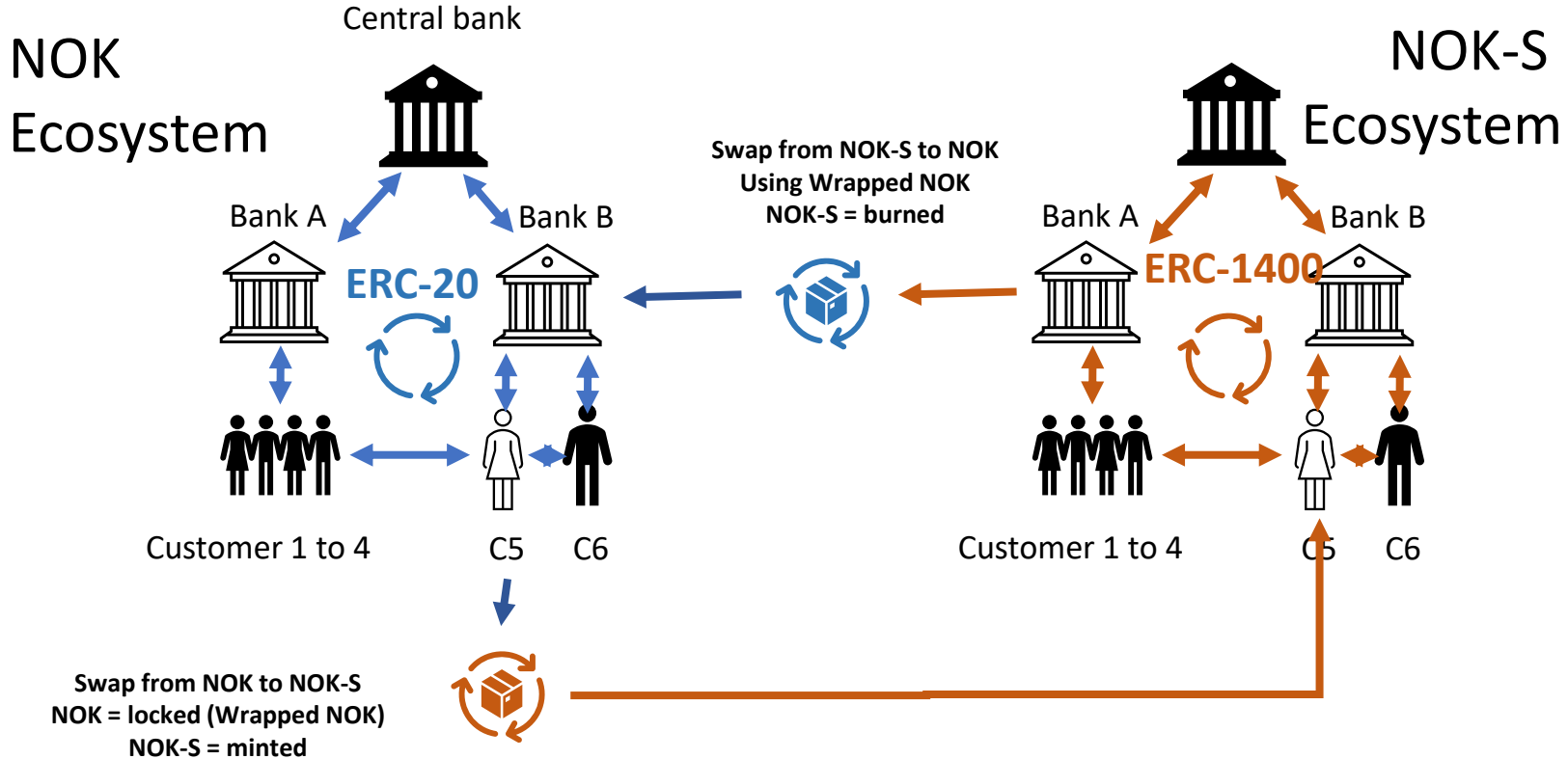
- ✓ Issue/mint new CBDC
- ✓ Send CBDC to private banks
- ✓ Receive CBDC from banks
- ✓ Redeem/burn CBDC

- ✓ Wallet for Central Bank
- ✓ Wallet for private banks

Autumn 2022

- ✓ Batch payment
- ✓ Swap to other eco-systems

BRIDGE / SWAP



CODEBASE GITHUB

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Sign up for a newsletter

The Sandbox Is Available On GitHub, The Norway Based On Ethereum Technology

News | 14.09.2022 11:52

COINTELEGRAPH The future of money

	BTC	ETH	BNB	SOL	XRP
	\$19,607	\$1,322	\$288	\$33	\$0.46
	+2.01%	+1.98%	+1.19%	+1.78%	-0.48%

News ▾ Markets ▾ Magazine People ▾ Cryptopedia ▾ Research Video

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HELEN PARTZ SEP 12, 2022

Norwegian central bank uses Ethereum to build national digital currency

The prototype infrastructure for Norway's central bank digital currency is based on Ethereum, the Norges Bank officially stated.

17328 Total views | 922 Total shares | Listen to article | 2:38

John Derbyshire
Sep 8 · 2 min read · Listen

Norges Bank CBDC Sandbox Code Now Public

Nahmii Update

ongoing work with Norges Bank, we are delighted to announce the code for their CBDC sandbox is now publicly available. You can find the code [here](#), which is licensed under an open-source Apache 2.0 license.



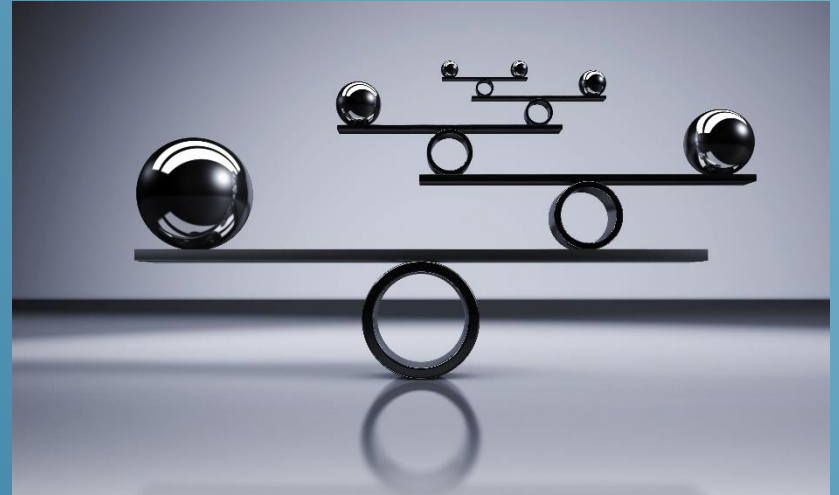
WHY HYPERLEDGER BESU?

Norges Bank tests many of the 17 Characteristics listed in the 1/2021 report

Third parties can relatively easily get into the sandbox (more than 200 000 EVM programmers)

Test CBDC money is token-based and programmable

A good choice for an effective experimental test




RFP2 - More user-cases

CEO
Jon Ramvi

FinTech company
based in Oslo,
Norway

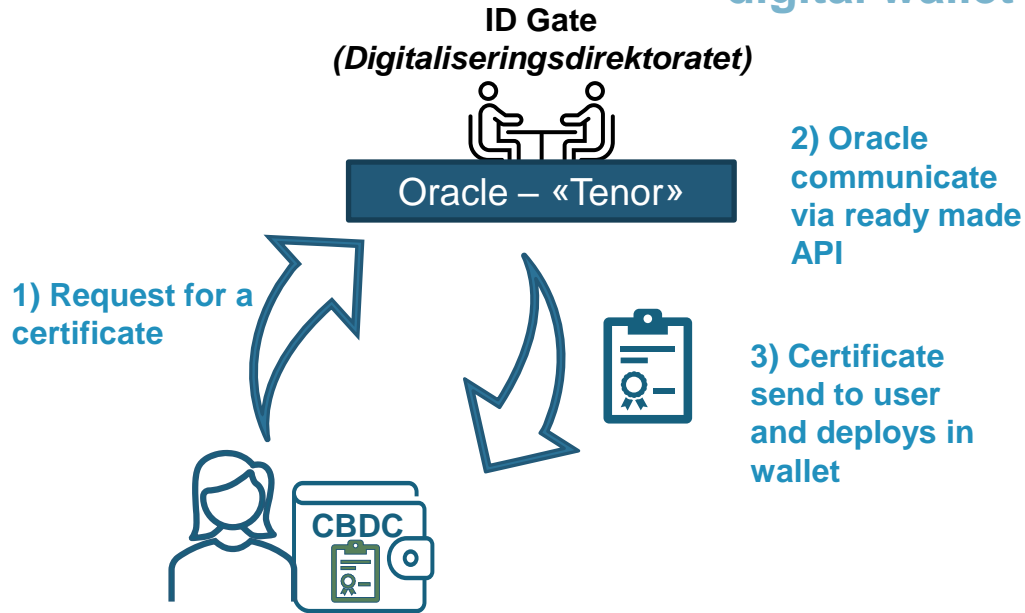


- 
- ✓ Verifiable Credential
(EU Digital Identity Wallet - eIDAS2)
 - ✓ Alias/Nickname database
 - ✓ Interest calculation -CBDC
 - ✓ Zero Knowledge Proof
 - ✓ Offline

 - ✓ GDPR/Privacy
 - ✓ Multi signature
 - ✓ Etc.

Verifiable Credentials (VC) – eIDAS2

digital wallet



Verifiable Credentials (VC) – eIDAS2

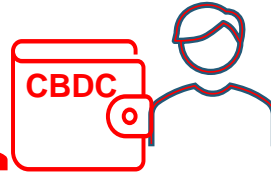
Verified certificate from centralised official databases

Company Registry

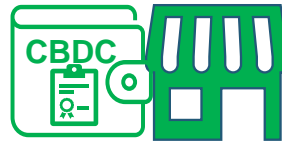
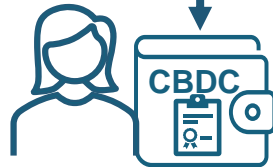
Social Security Registry



Verified digital identity



Programmable token



ERC-20 token

```
string public constant name;           Norske Kroner
string public constant symbol;        NOK
uint8 public constant decimals;      4
```

```
import "@chainlink/contracts/src/v0.8/interfaces/AggregatorV3Interface.sol";
AggregatorV3Interface internal priceFeed;
priceFeed = AggregatorV3Interface(0x9326BFA02ADD2366b30bacB125260A6f41031331);
function getLatestPrice() public view returns (int) {.....}
```

Event « if Norges bank then OK to mint and burn.....



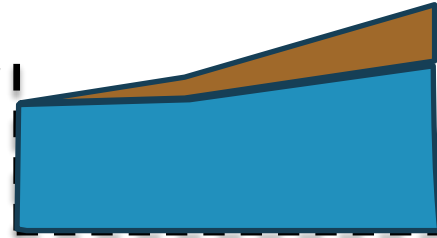
Interest on CBDC – positive & negative interest

Testing the aave calculation model

Norges Bank



Amount



Interest

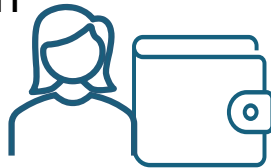
CBDC

Time

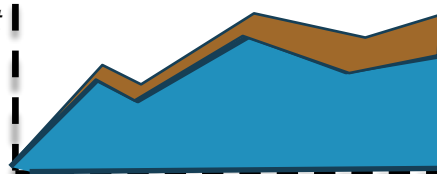
Programmable token

Aave model: based on every second, compounded interest, calculated on transaction, mint and burn

Private person
Company



Amount



Interest

CBDC

Time

```
string public constant name;           Norske Kroner
string public constant symbol;        NOK
uint8 public constant decimals;      4
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import "@chainlink/contracts/src/v0.8/interfaces/AggregatorV3Interface.sol";
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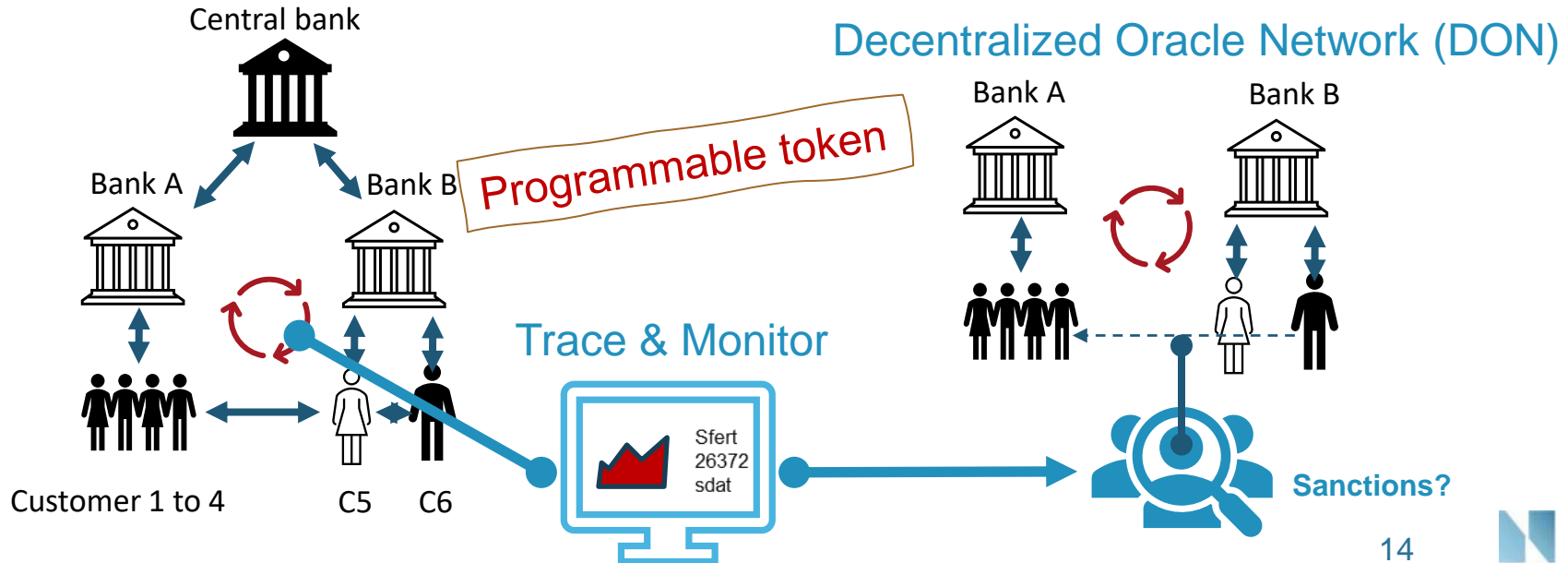
**ERC-20
token**



AML/CTF

Anti Money Laundering and Counter Terror Financing

EBA: 100 billion € in Compliance cost by banks – 1 000 billion illicit payment - approx. 1 % stopped
CBDC represent new technology either based on blockchain/DLT or account based in traditional technology.
How can new technology reduce cost of doing compliance for banks/PSP and at the same time increase the discovery rate and seizure for illicit payment.



Other use cases

Anonyme payment.

Symfoni started with a project for anonyme payment in parallel with the NBX AML/CTF project. The plan was to utilize **ZKP (Zero Knowledge Proof)**. But our programmers concluded that ZKP conflicts with business logic (smart contacts) inside our ERC-20 token. We ended up using something called “**Stealth Addresses**” strategy, that also can be quantum immune with a small change in the standard algorithm. This is not to say that Norges Bank plan to include anonyme payment in the future, but we needed to find out what the technology could allow. As anonymity and AML/CTF conflicts it was interesting to do them in parallel. As far as we know Norges Bank is the first central bank in the world to test anonyme payment this way.

Cap on CBDC.

This was the last service / user case Symfoni developed for us. If amount of CBDC exceeds a defined threshold, the amount over this threshold should automatically be transferred to the user’s bank account. As we did not have integration to banks in phase 4 CBDC was transferred to a special CBDC wallet. The payer did not get a notice, but the receiver got only the amount within the threshold and the transaction was automatically split between payee and the separate wallet. The cap was also on amount per day and week if exceeded defined threshold.

Project Hamilton – Boston FED / MIT

One student 40 %



Publications & Data News & Events

Office of the President Monetary Policy & Economic Research Supervision & Credit Payments Innovation Community Development In the Region

Project Hamilton Phase 1 Executive Summary



By Federal Reserve Bank of Boston and Massachusetts Institute of Technology Digital Currency Initiative



Off-the-shelf test

Workshops



IoT and M2M payment

ALPHA
VENTURI

Realizing these opportunities require underlying infrastructure with a unique set of features



Scalability

To cope with growing # of network participants and network traffic.

0% FEE

Feeless transactions

To allow economically viable operations at scale, and on small devices.

Decentralization

To eliminate single points of failure for near 100% uptime.

Security

To keep devices, people, and stored data and value protected.

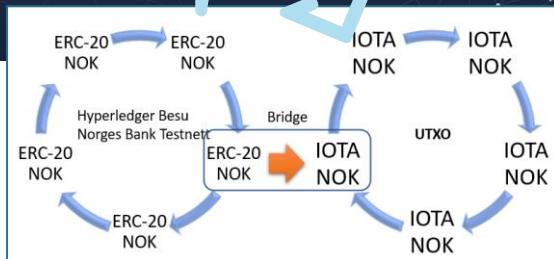


Energetic efficiency

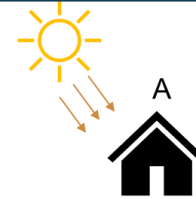
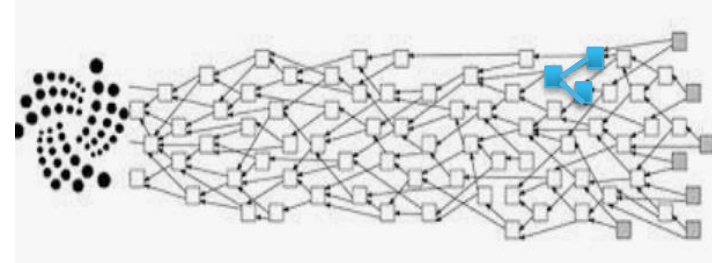
To minimize data footprint and energy consumption.

Standardization

To create compatibility for any participant and any type of interaction.



Directed Acyclic Graph or DAG



Selling electricity per second



Pay for electricity



Public engagement and Hackathons /Ideathons



University Bergen

The Norwegian
Digitalization Agency

University of Oslo

Fintech Norway

Etc.





Forside > Alle tema > Finansiell stabilitet > Digitale sentralbankpenger > Prosjekt Icebreaker

ALLE TEMA AKTUELT

Prosjekt Icebreaker

BIS og sentralbankene i Norge, Sverige og Danmark samarbeider om å teste kryssende betalinger med digitale sentralbankpenger for International Settlement (BIS) i et prosjekt for å



news.cision.com / Sveriges Riksbank / The Riksbank tests

The Riksbank tests cross-border payments with the e-

22:12:00 CET
The Riksbank and the central banks of Israel and Norway will test a joint exploration of how Central Bank Digital Currencies (CBDCs) can be used for international retail and

payments continue to be plagued by high costs, low speed, limited access and insufficient transparency. The Riksbank has launched an ambitious programme to improve cross-border payments, aiming to achieve faster and cheaper, as well as more transparent and inclusive cross-border payments. One of the workstreams explores how CBDCs could play a role in cross-border payments. The BIS Innovation Hub and other international institutions and standard-setting organizations have been working together to investigate the use of CBDCs for cross-border payments. The [most recent](#) work was published last July.

This project is a collaboration between Sveriges Riksbank, the Bank of Israel, Norges Bank, and BIS Innovation Hub. The project will develop a "hub" to which participating central banks will connect their domestic proof-of-concept CBDCs. The project is intended to test some specific key functions and the technological feasibility of interlinking different

GLOBAL government FINTECH

DIGITAL CURRENCIES

'Project Icebreaker' to test 'immediate' cross-border retail CBDC payments

By Ian Hall - September 30, 2022, 2:21 pm



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Project Icebreaker: Central banks of Israel, Norway and Sweden team up with the BIS to explore retail CBDC for international payments



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Norway, Sweden, and Israel central banks launch "Project Icebreaker" with BIS to explore central bank digital currencies

September 29, 2022 - by Kanlayakorn Pengrattana - 1 Comment



RFP3 – Cross border + more

Norwegian Block Exchange

CEO

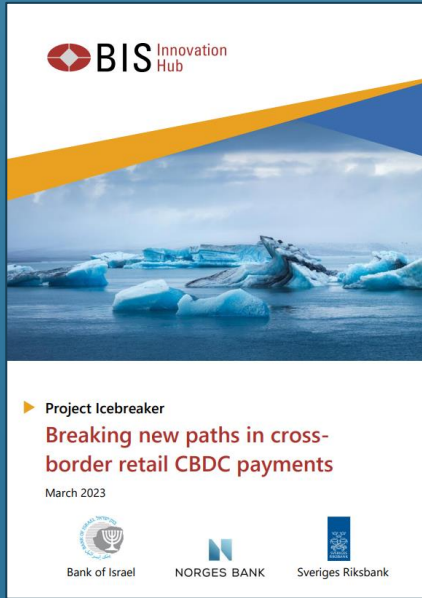
Stig Aleksander
Kjos-Mathisen

FinTech company
based in Oslo,
Norway



- ✓ Programmers for Project Icebreaker
- ✓ KYC/AML/CTF

Cross border - Icebreaker



An example of cross-border
payments with central
bank digital currency
(CBDC)

Experimental test of technology for CBDC phase 5

a part of the Norwegian CBDC project

Agenda

presentation October 2023



1) Strategy25

2) Earlier phases

3) Organizing

4) Sandboxes

5) Estimate project plan

6) Cooperation

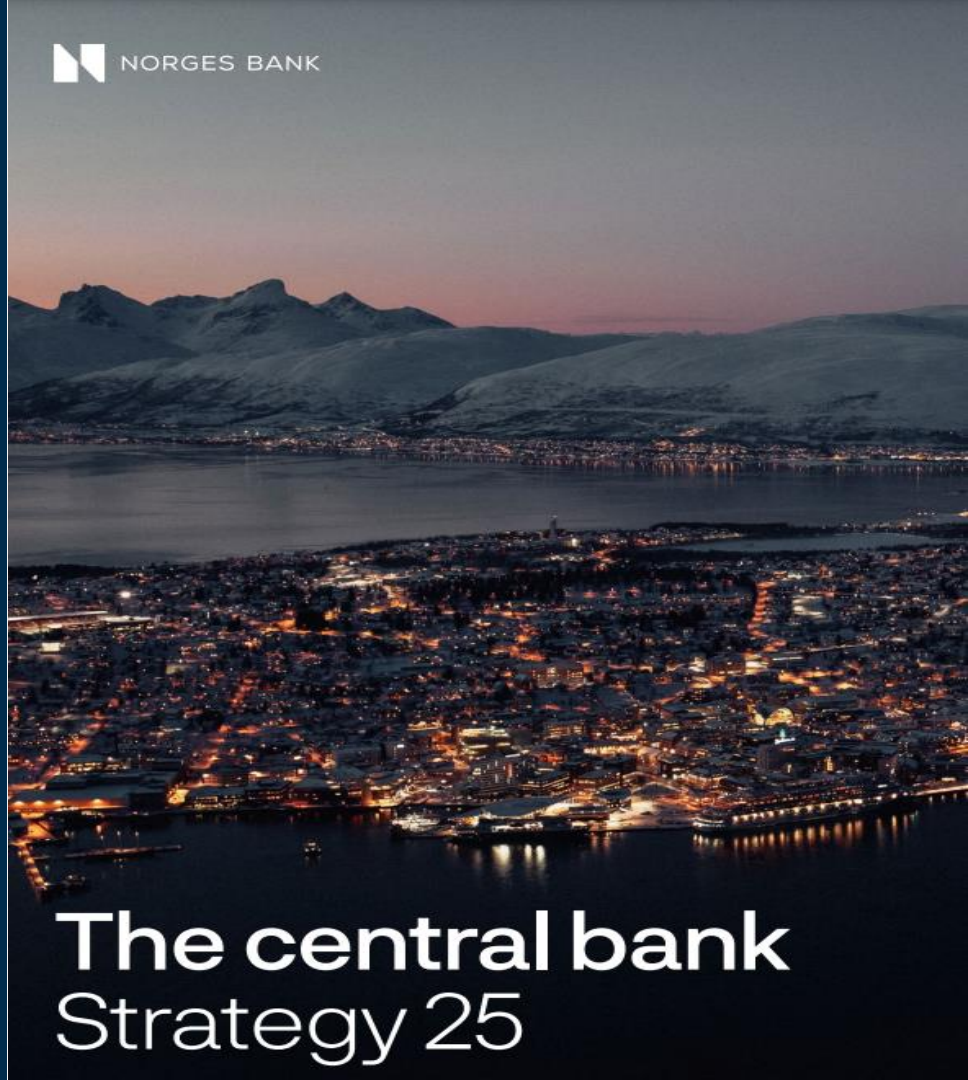
Strategy25

Norges Bank will prepare the ground for the issue, if appropriate, of a central bank digital currency (CBDC).

A CBDC may be necessary to ensure that NOK will continue to be a safe, efficient and attractive means of payment in the future too.

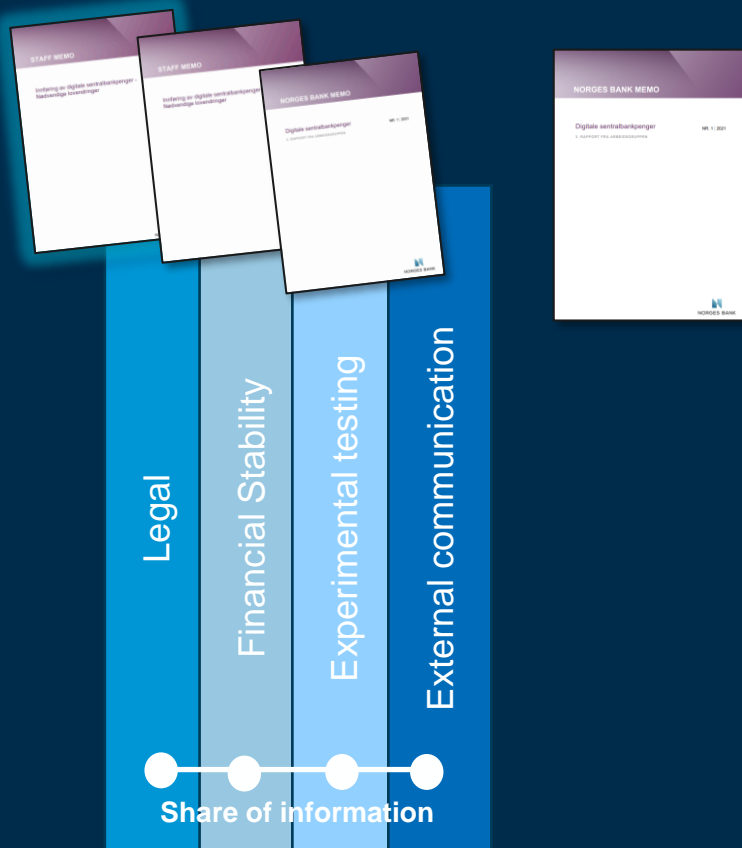
During the strategy period, we will analyze the possibilities afforded by, and the consequences of, introducing a CBDC and **test candidate solutions**.

To obtain knowledge and contribute to international standardization and cooperation, we will work with other central banks and international organizations.



Phase 4 -CBDC

How did we organize?



Phase 5 -CBDC

How do we organize?

Phase 4

Phase 5

Share of information and experience



Peder Østbye

Lasse Meholm

Morten Audsen

Analysis and advice on introduction

Technology Test

Investigation of comprehensive solutions

Law

Financial Stability

Analytical work

Experimental testing

External communication

Developer and architect

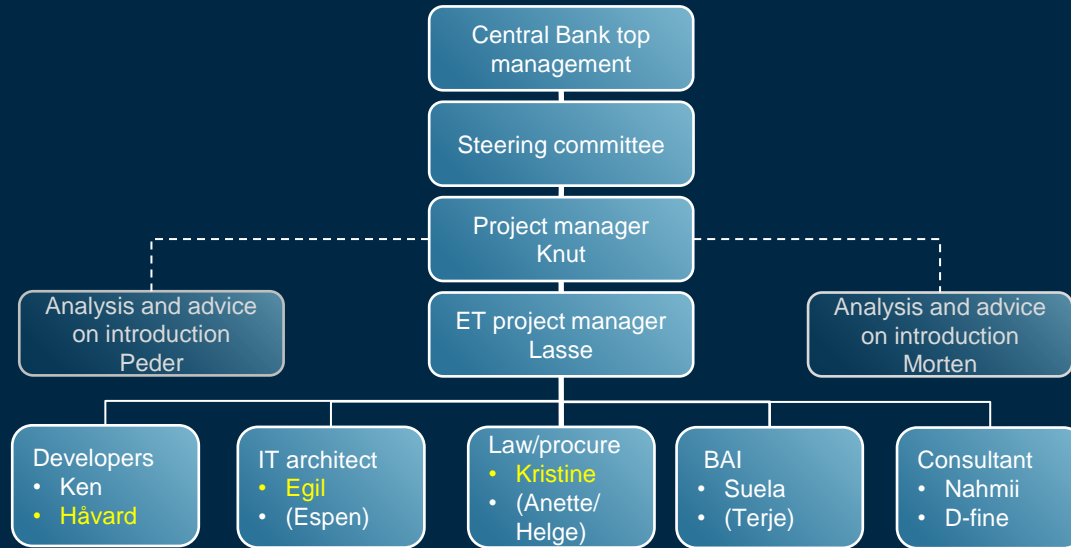
comprehensive solutions

Solution architect

External communication



Organizing Experimental Testing (ET)



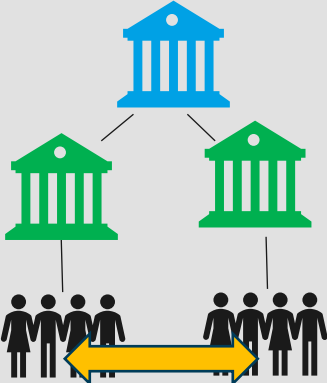


Retail
Hyperledger Besu

Hyperledger
Cacti ?



Wholesale
Hyperledger Fabric



Mint/burn

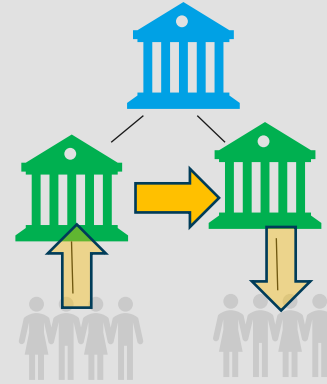
Private ledger

Self custodial

Other bridges

Stablecoin
Tokenized
Internet of Things
Banks Open Banking
M2M
RTGS
Offline payment
Digital inclusion

Central Bank
reserve to
private bank
w/wallet
bank deposit

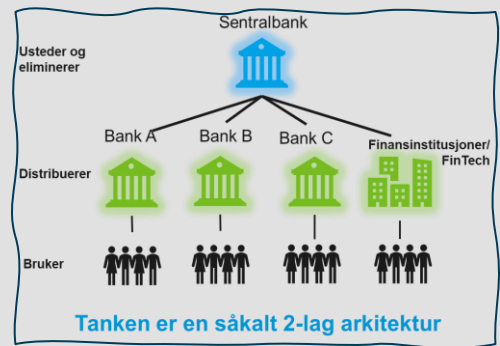


Mint/burn

Private ledger

Permissioned Custodial

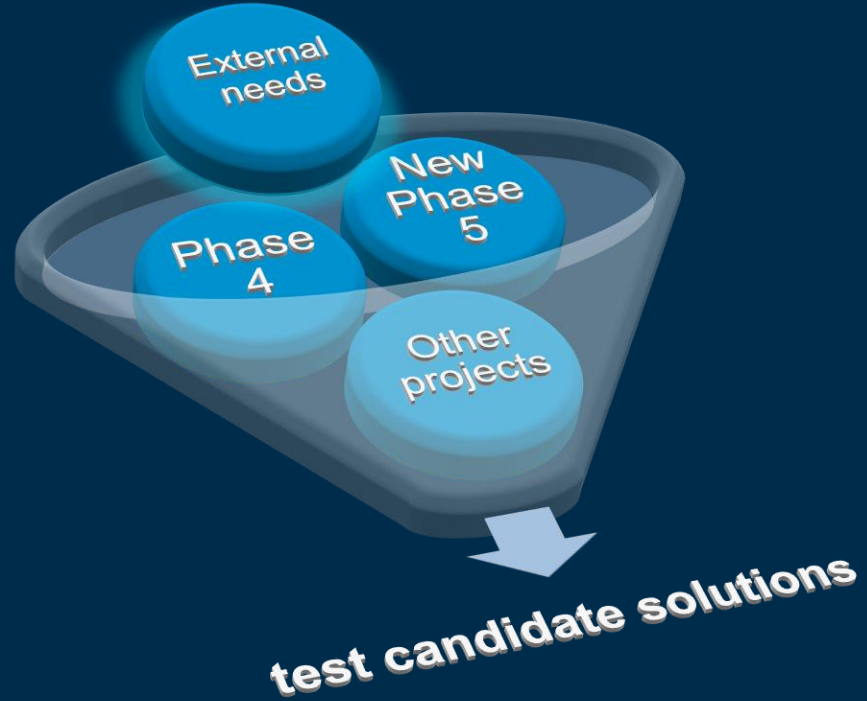
Sandboxes



Two tier architecture



Experimental test phase 5



Associated member of Hyperledger Foundation

The screenshot displays the Hyperledger Foundation website with a grid of member logos. The 'Blockchain Applications' category is highlighted with a blue border. The members listed are:

Logo	Member Name	Member Type	Funding
	Kerala Blockchain Academy	member	
	Kiva	member	\$11.5M
	MIT Connection Science	member	\$1.1B
	Mobility Open Blockchain Initiative (MOBI)	member	
	Monetary Authority of Singapore	member	
	Norges Bank	member	
	Open Earth Foundation	member	
	Peking University	member	
	Portland State University	member	\$7.2M
	Province of British Columbia - Ministry of Citizens Services	member	
	Saintgits College of Engineering	member	
	Smart Dubai	member	
	Sovrin Foundation	member	
	Stellar Development Foundation	member	\$3M
	Sun Yat-sen University	member	



RFP 2023

Frameagreement 2023 - 2025



d-fine





Next 2,5 years

- We look forward to a good collaboration with private and public organizations.
- The purpose is still to learn, experience and mature skills, thoughts and strategies.
- So that we prepare the ground for the issue, if appropriate, of a central bank digital currency (CBDC).

