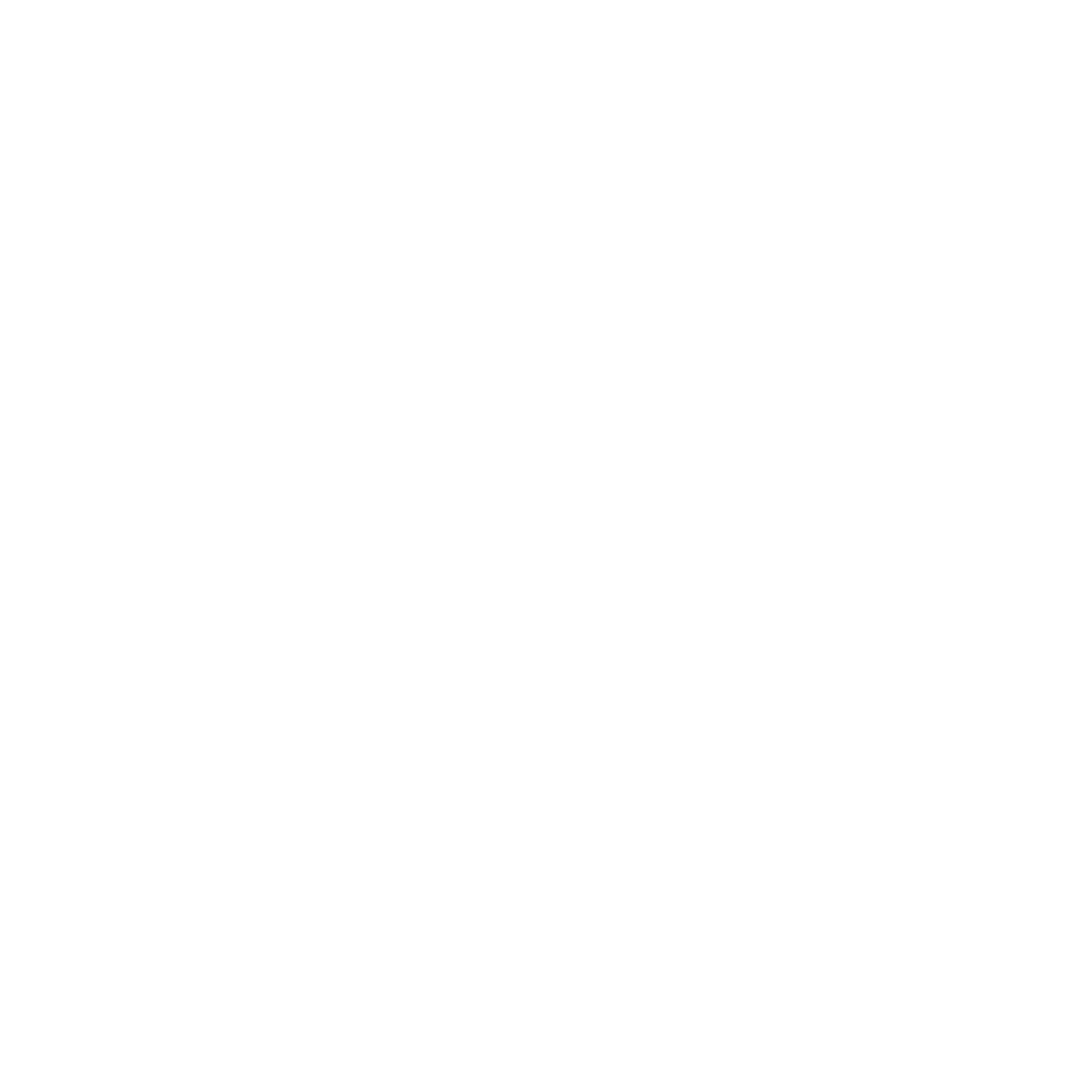
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*Version 1.16*

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FAC Pilot Fund Launch

An engagement paper for potential pilot participants

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# Executive Summary (this version for Fund Managers)

FAC is leading the digital transformation of the fund value chain across the financial markets, starting with a focus on the UK and Ireland, and later moving to global markets.

The Funds industry is rife with duplicated recordkeeping, as intermediaries and other institutional participants cannot take the risk that someone else’s record-keeping is inaccurate. FAC’s decentralised distributed ledger of all fund transactions enables a significant streamlining of the record-keeping function for the industry, including distributors, wealth managers and other intermediaries. The elimination of the need for reconciliation of records to a third party, combined with the immediacy of data availability, results in radically simplified and more standardised processes, and enables a more equitable fee model for those distributing fund products, benefiting fund managers, service providers and investors.

FAC leverages distributed ledger technology (DLT) to share data in a simpler and more timely fashion, eliminating complex processes, and ultimately driving change for the industry. FAC will enable Fund Managers to reduce their dependency on an overly complex web of intermediaries, significantly reduce settlement cycles and drive down the cost of investing in and managing funds. FAC delivers the accessibility and immediacy expected by the new waves of investors, and will also enable Fund Managers to launch new and innovative products and services.

The launch of lower cost of operation and distribution digital funds will also offer protection for the actively managed and open-ended Funds sector against the progressive rise of listed (and therefore easier to transact for investors) collective schemes: Exchange traded Funds and Investment Trusts.

Achieving the end state requires four components to participate in the journey toward maturity:

1. A software product and platform designed and built out to support an industry pilot, and then matured to launch into production.
2. Regulatory guidance to facilitate the pilot, and to support the production launch
3. A Fund Manager community to adopt the product, and to commit to launching tokenised Funds
4. Fund Servicing participants to deliver operational support to tokenised Funds

We have made strong progress to date building these components:

1. With two years of product design and build completed, and a successful proof-of-concept (‘POC’) with RBC, FAC have the base product at a level of maturity to undertake a successful pilot
2. With the support of the Investment Association, FAC are now advancing to a pilot within the FCA regulatory sandbox to launch a DLT fund
3. FAC has been shaped by a Strategic Advisory Group of Fund Managers (namely Alliance Bernstein, Aegon/Kames, Aberdeen Standard, Columbia Threadneedle, Franklin Templeton, Fidelity, GAM, HSBC AM, Insight Investment, Legg Mason, LGIM and M&G) who ensure that FAC is ‘by the Fund Managers for the Fund Managers’
4. FAC has lined up competing Fund Service organisations to pilot the suite of services required for this market transformation to be realised in production

As a Fund Manager, FAC will offer significant benefits including:

* First or early mover advantage, being associated with and able to promote the leverage of technology both to speed up transactions and lower the costs of owning Funds;
* The simplification of fund launch and distribution;
* Material cost reductions throughout the value chain;
* The elimination of transaction messaging through real-time data transparency;
* Immediacy of settlement upon NAV availability;
* The elimination of reconciliation of cash to transactions;
* Enhanced operational efficiency from simplified settlement, reduced reconciliation and improved oversight; and
* A reduction in the regulatory reporting burden through direct ledger access for the regulator.

Early active participation provides you as a Fund Manager with the opportunity to:

* Sit on FAC steerco and shape the business model, the commercial model and the fee structures;
* Either:
  + trial the launch of an innovative ‘digital’ Fund and pilot new internal control and operational processes internally
  + or ‘observe’ the operation of other FM digital funds and understand the implications of transacting them;
* Gain a market engagement edge by participating in the first and only FCA regulated DLT-fund launch in the UK and Ireland markets;
* Establish a strong position to move to a production fund launch in 2021; and
* Define the ownership of FAC, including the opportunity to co-invest, which is exclusive to all actively participating Fund Managers

There are limited number of pilot places. You should note that, unlike the Fund Service providers, as a Fund Manager you could play a passive role inside the pilot and experience the benefits of FAC through a dummy fund structure; however, this would not yield the full range of benefits outlined above. This document aims to provide as much information as possible to enable potential participants to make a decision as to whether they wish to play an active or a passive role within the pilot.

# Executive Summary (this version for Fund Service Providers)

FAC is leading the digital transformation of the fund value chain across the financial markets, starting with a focus on the UK and Ireland, and later moving to global markets.

The Funds industry is rife with duplicated recordkeeping, as intermediaries and other institutional participants cannot take the risk that someone else’s record-keeping is inaccurate. FAC’s decentralised distributed ledger of all fund transactions enables a significant streamlining of the record-keeping function for the industry, including distributors, wealth managers and other intermediaries. The elimination of the need for reconciliation of records to a third party, combined with the immediacy of data availability, results in radically simplified and more standardised processes, and enables a more equitable fee model for those distributing fund products.

FAC leverages distributed ledger technology (DLT) to share data in a simpler and more timely fashion, eliminating complex processes, and ultimately driving change for the industry. FAC will enable Fund Managers to reduce their dependency on an overly complex web of intermediaries, significantly reduce settlement cycles and drive down the cost of investing in and managing funds. FAC delivers the accessibility and immediacy expected by the new waves of investors, and will also enable Fund Managers to launch new and innovative products and services.

The launch of lower cost of operation and distribution digital funds will also offer protection for the actively managed and open-ended Funds sector against the progressive rise of listed (and therefore easier to transact for investors) collective schemes: Exchange traded Funds and Investment Trusts.

Achieving the end state requires four components to participate in the journey toward maturity:

1. A software product and platform designed and built out to support an industry pilot, and then matured to launch into production
2. Regulatory guidance to facilitate the pilot, and to support the production launch
3. A Fund Manager community to adopt the product, and to commit to launching tokenised Funds
4. Fund Servicing partners to deliver operational support to tokenised Funds

We have made strong progress to date building these components:

1. With two years of product design and build completed, and a successful proof-of-concept (‘POC’) with RBC, FAC have the base product at a level of maturity to undertake a successful pilot
2. With the support of the Investment Association, FAC are now advancing to a pilot within the FCA regulatory sandbox to launch a DLT fund
3. FAC has been shaped by a Strategic Advisory Group of Fund Managers (namely Alliance Bernstein, Aegon/Kames, Aberdeen Standard, Columbia Threadneedle, Franklin Templeton, Fidelity, GAM, HSBC AM, Insight Investment, Legg Mason, LGIM and M&G) who ensure that FAC is ‘by the Fund Managers for the Fund Managers’
4. FAC has lined up competing Fund Service organisations to pilot the suite of services required for this market transformation to be realised in production; the Fund Service providers are looking to capitalise on FAC network services, ranging from Business Network Operation, Business Service Operation and DLT-centric Fund Servicing

Fund services required for the FAC network include Transfer Agency 2.0, Custody 2.0 and Distribution 2.0, each of which is described in more detail within this document.

As a Fund Service Provider, FAC will offer you a significant range of benefits including:

* Being an early-mover in what is widely seen and an inevitable structural change in the way that Funds are operated and distributed – an opportunity to both shape and own the new environment and marketplace;
* FAC believe that business volume and revenues associated with existing and conventional fund operation and distribution will decline in the coming years. FAC offers participants the opportunity to compensate for this and be in a position to influence future commercial models and service provision;
* The demonstration of support to your clients in their ambitions to move towards digital fund issuance;
* Close interaction with the FAC’s SAG group of engaged and prominent fund managers;
* The protection of existing revenues and development of new revenue streams from digital Fund Servicing;
* The achievement of operational cost savings, driven from simplified transactional processes and the elimination of reconciliations;
* The delivery of enhanced client experience and service standards, through data immediacy and the compression of settlement and clearing time cycles;
* The improvement of management and regulatory reporting information;
* A meaningful reduction in risk, reduced error counts and improved regulatory oversight; and
* The establishment of credibility as an early mover and innovator in digital investment; to define and validate new digital fund services, leading to the development of a compelling and innovative digital fund servicing proposition.

Early active participation would provide you as a Fund Servicer with the opportunity to:

* Sit on FAC steerco and shape the business model, the commercial model and the fee structures;
* Gain a market engagement edge by participating in the first and only FCA regulated DLT-fund launch in the UK and Ireland markets;
* Establish a strong position to support production fund launches in 2021; and
* Define the ownership of FAC, including the opportunity to co-invest.

There are limited number of pilot places. This document aims to provide as much information as possible to enable potential participants to make a decision as to whether they wish to play an active role within the pilot.

# FAC Vision and Roadmap

## Motivation – The Future of the Funds Industry

The fund management industry is facing a medium-term existential crisis. Fund Managers are seeking ways to improve performance and to reduce costs: they need to justify fees and charges to a changing investor community looking for better value. Part of the problem is the high cost of servicing and administering Funds, compared to other investment vehicles: ETFs and directly-held investments are an increasing competitive threat.

The current state of the Funds industry encompasses numerous intermediaries, each adding cost, time and risk to the Funds value chain. The proliferation of intermediaries is compounded by duplicated record-keeping, and the resulting burden of reconciliation between separate data sets. This inefficiency impacts Fund Managers, Fund Service Providers and end Investors, whose returns are diluted by the resulting high cost of ownership.

**“**Fund Managers fees are being pushed down by investors, regulators and increased competition. As low-cost products gain share, there will be further pressure and consolidation. Technology will be vital across the business. And, the industry will have found some new opportunities to create alpha and restore margins. **It’s time to act.” – PWC Asset & Wealth Revolution, 2020.**

## DLT – The Opportunity for Change

Distributed Ledger Technology (DLT) allows identical data sets to be shared and guarantees the integrity of data across participants. This reduces the need for duplicative record-keeping and reconciliation across entities. Industry participants are increasingly aware that DLT can be a catalyst for simplified, more efficient workflows and help to improve data accuracy and timeliness and are factoring use of DLT into their strategic planning.

FAC have grasped this opportunity, focusing on the Funds value chain, to create a decentralised digital funds platform which dramatically reduces operational complexity. Within FAC, data is distributed across all parties on the network in a transparent, immutable and real-time basis. This significantly reduces the time, effort and risk involved in extracting, transforming, transferring and reconciling data through the value chain.

In FAC, cash and assets are tokenised on the network through exchanges specifically created to manage the transfer between real world and digital assets. Once converted into a digital form, transfer of ownership and settlement of value is possible to achieve in a reliable, accurate and immediate manner. This effectively isolates the process of record keeping on the register from the process of managing fiat cash settlement and bank account reconciliation: processes which are currently intertwined.

FAC provides the infrastructure for the complete lifecycle of funds to be represented, traded, distributed and reported-on as digital assets, enabling those on the FAC network to share the same information on ownership and transactions.

Through the practical deployment of DLT, FAC are challenging the way the funds industry operates by collapsing the supporting processes across the Funds value chain. Our mission is to reduce costs significantly, to support more profitable fund structures, and to streamline distribution channels.

FAC invites Fund industry participants to play a lead role and benefit from first mover advantage in creating a leaner and more cost-effective operating model that:

* Reduces friction, risk and cost for Fund Managers saving in internal operating costs;
* Significantly reduces the operating costs of Fund Service providers, allowing them to reduce fees;
* Reduces elongated settlement and fund clearing time-cycles;
* Facilitates the delivery of new and radical investment products / services;
* Improves investment propositions by providing a direct route to market for Investors;
* Gives Investors more control, providing them with direct access to their holdings and trades;
* Enables funds to be launched and distributed more easily and at lower cost; and
* Operates within existing and globally compliant regulation.



## A Phased Journey

The FAC vision extends beyond simply addressing the inefficiencies of the institutional Funds value-chain. Over time, we intend to expand FAC both globally and directly to investors, through becoming of a self-serve portal and a B2C portal in subsequent years. We aim to revolutionise access to investment, as well as the administration of investment.

While we are ambitious and optimistic about the target end state, we are also realistic, and recognise that we cannot jump directly to that end-state. We plan to move through a phased roadmap, with each phase maturing the network and layering on more added value.

The roadmap can be broken down into 5 phases:

1. Direct Issuance on-Ledger
2. Migration of Funds Issued Off-Ledger
3. Integration of Distribution
4. B2C Services on FAC
5. Underlying Assets and Fiat Currency On-Ledger

A more detailed overview of these phases can be found in Appendix 1 – FAC Roadmap.

Although we have designed and initiated the build for later phases of this roadmap, to begin we are focusing the industry pilot on phase 1.

## The Starting Point - Direct Issuance of a DLT Fund onto FAC

As outlined above, the core objective of the first phase in our journey is to issue a fund directly onto the FAC network. Transactions in the Fund can only operate on FAC. The approach to this phase is to hold a pilot inside the FCA sandbox with leading participants in the funds servicing industry to issue a DLT-fund onto FAC, to accelerate the evolution of the product and to act as a catalyst for market adoption.

The sandbox environment will enable our transformational journey to begin, and will enable the participation from forward thinking parties that are keen to benefit from first-mover advantage. To kickstart the journey, and to gain the initial success that will generate the required momentum, we need strong delivery from, and collaboration between four key contributors:

1. A product design and build team that can mature the FAC product and network over a series of phases, creating a platform that can be launched into production;
2. A regulator that can provide guidance during the development phases and support for the production launch;
3. A fund manager community that wants to adopt the product and is prepared to commit to launching tokenised Funds; and
4. Fund Service partners that want to develop and deliver support services for digital assets on a tokenised Funds network.

We believe that these four elements are coming together strongly, and that the time is right for us to press ahead to trial a live fund launch on FAC. We are focusing cross-market activity on a pilot to exercise FACs capability and to enable:

* Fund Managers to launch a DLT fund;
* Service Providers to support the fund, providing Fund Servicing / Transfer Agency and Custodial services;
* Service Providers to provide ‘digitalisation services’ that will be required in a DLT-centric world including Digital Custody and DLT-Network Operation; and
* The Regulator to ensure that the roles, responsibilities and functions meet the regulatory requirements.

Once the pilot has proven the soundness of the FAC platform and the robustness of the operational processes around it, then we will then move to production.

# Definition of the Pilot

## Summary of the Pilot

The pilot is sponsored by the FAC Strategic Advisory Group (SAG) of Fund Managers and will include participation from leading organisations in the funds servicing industry and the relevant regulators.

The aim of this pilot is to establish a ‘close to real’ sandbox operating environment, in which we will launch and operate a real tokenised fund on a distributed ledger. This will exercise the end-to-end funds process and will include all oversight and reporting functions necessary to reflect the normal operation of a mutual fund, properly and effectively. The pilot will run over an approximately 8-week period starting in Q3/4 2020.

The primary business objective is to confirm the feasibility of delivering a transformational platform for funds servicing, demonstrating significant operational and cost benefits to its participants, and achieving industry and regulatory support for a live implementation.

The pilot will be focused on the desired end state of FAC: a market platform for many participants to operate on, supporting the launch of a new kind of tokenised fund which is issued directly on the distributed ledger, with no support from conventional issuance structures. The experience and learning from the pilot will contribute to the planning for a live production implementation. This is a substantial piece of work in its own right and will follow on after the pilot.

## Components of the Pilot

The pilot exercise has three main components:

1. **Participant Involvement**

The pilot is intended to bring together key participants in the funds servicing value chain to collaborate together to deliver the test plan and achieve the desired outcomes. These participants are:

* **Investors** participating through one or more pooled nominee services operating their own nodes on the network.
* Multiple **Fund Service Providers** operating their own nodes. These nodes will cover transfer agency, fund issuance and on-ledger fund cash and asset management.
* Multiple **Fund Managers** with dedicated nodes for oversight and monitoring of shareholder dealing activity and associated fund cash flows.
* A **Regulator** (FCA), operating a dedicated regulatory oversight node with visibility of all activity on the network.
* A **Business Network Operator** providing infrastructure and technical support services and operating network shared services; these will include the Corda network directory, identity, notary and firewall services.
* **Business Services Operators** providing cash exchange and digital custody functions.
* NAV price feeds from **Fund Accounting** data providers, who are outside the scope of the network in this exercise.

1. **Operational Workflow**

Operations are focussed on the ‘day in the life of a fund’ (DITLOAF). DITLOAF encompasses all participants involved in order processing, cut-off management, fund cash flow management, pricing, settlement, and share issuance and cancellation on-ledger. The pilot will also incorporate all related reconciliation and oversight functions.

1. **Regulated Fund Vehicle**

In the pilot, FAC proposes to operate on a single currency basis (GBP), hosting single tier class level funds. The target fund(s) for the pilot will be an FCA-regulated OEIC (ICVC), offering daily dealing to UK-based institutional investors.

## Pilot Business Cycle

Once launched, the fund will be operated by the participants through a series of DITLOAF business cycles (see flow chart below). The workflow is very similar to a conventional fund flow, but there are significant differences in its execution that are achieved through the use of Distributed Ledger Technology. These are:

1. **Common messaging platform and data transparency** – The FAC network eliminates the multiverse of disparate and loosely coupled systems operated by individual companies. It supports the process on a single technology platform where data is seamlessly available to all participants on a real time basis.
2. **Reduction in reconciliation** – Participants share a common data set on a ‘I see what you see’ basis, so the need to reconcile data between systems and resolve errors is eliminated.
3. **Simplified settlement** **through tokenisation of cash and assets**– Tokenisation allows the funds settlement process, the exchange of cash and assets, to be decoupled from the banking settlement processes; this significantly reduces settlement time, delivers immediate finality and reduces risk.

The testing process will be designed to highlight and evaluate these differences.

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# Participant Roles in the Pilot

## Participant Roles in the FAC Network

In the DITLOAF daily cycle, five players on the FAC network are central to the daily operational process:

1. Investor
2. Fund Servicer
3. Fund Manager
4. Cash Exchange
5. Fund Accountant

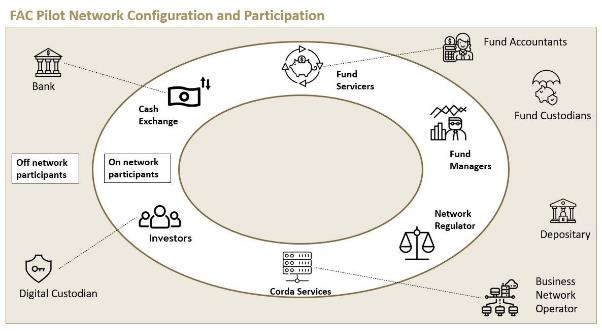
The pilot test cycles will focus primarily on the activities of these participants. However, other participants in the process have important roles too, and operate in a supporting fashion to this principal flow. The full set of participants required in the FAC future state Funds network are outlined below:

|  |  |
| --- | --- |
| FAC Network Participant | Role |
| **Oversight Roles:** |  |
| Regulators | Oversight of transactions |
| Fund Managers | Issuing a Fund and launching it on FAC. Oversight for cash flow reporting and receipt of fund fees |
| **Fund Servicing Roles:** | |
| Transfer Agency 2.0 | Order processing, including fund cash flow management, pricing, settlement, and unit issuance and cancellation and income payment and reporting |
| Custody 2.0 | Evolving the role of the fund custodian, with the custodian role largely staying outside the FAC network, however, may operate the notary node (which is a network service that provides uniqueness consensus) |
| Fund Accountant | Operates as normal providing NAV prices to TA2.0 and receiving subscription, redemption and outstanding share/unit data from TA2.0 |
| **Business Service Operators:** | |
| Cash Exchange Operator | Issuance and redemption of cash tokens |
| Asset Exchange Operator | Issuance and redemption of asset tokens to support the conventional issuance process |
| Digital Custodian | Management of the keys on the investor node and The Digital Custodian stands behind the assets issued on-ledger, giving Investors assurance on the existence of the assets and the accuracy of title. It facilitates the secure management and transfer of title to the assets on the FAC ledger |
| Liquidity Provider | Facilitator of investment and of settlement on the FAC ledger. Its role is to add liquidity in the form of cash or asset tokens, to ensure the most efficient operation of the network |
| **Business Network Operator** | Provides ‘infrastructure and node and network support services’ |

An overview of the roles and responsibilities of each FAC network participant is provided in Appendix 2 - Network Roles and Responsibilities.

## Network Participants in the Pilot

The FAC network is designed to provide a market platform, supporting an ecosystem of investors, funds, fund managers and supporting services. By necessity the pilot will operate on a simplified model with only a small number of participants, but still sufficient to exercise processes through the value chain and demonstrate benefits.



## Participation and Resource Commitments for the Pilot

The following table sets out the responsibilities of each participant in the pilot, and provides an estimate of their required resource commitment.

| **Participant** | **Role** | **Pre-Pilot** | **Pilot** | **Estimated Resource Commitment** |
| --- | --- | --- | --- | --- |
| **Investors** | Commit fiat cash to tokenise onto network and purchase shares in the launched fund/s | FAC to identify investors and agree participation. | For the pilot it will be Institutional Investors / Nominees.  Tokenise fiat cash onto FAC network through the investor node and participate in testing by subscribing to and redeeming fund tokens. | **Pre-pilot**: <0.5 person days per week  **Pilot**: <0.5 person days per week |
| **Fund Manager** | Sponsor and support the launch of a regulated fund onto the FAC network and play an active role as Fund Manager in the test cycles | Work with FAC to prepare fund launch and seek regulatory approval. Contribute to validation of operating model and test planning | Launch fund/s and supervise its operation adhering to normal regulatory requirements | **Pre-pilot**: 2 person days per week  **Pilot**: 1-2 person days per week |
| **Fund Servicers** | Undertake the operational roles associated with the fund (ACD) and transfer agent, including the daily pricing and settlement process and associated reporting activity. Fund Servicers will be the primary actors in the pilot, resourcing the majority of testing during. | Work with FAC to validate operating model and plan the test cycles and develop test scripts. | Support the fund launch and deliver the test plan operating the fund/s over multiple consecutive business cycles.  This is outlined in more detail in the Functional Testing section below | Fund Servicers will be the primary actors in the pilot and leading the majority of testing activities.  **Pre-pilot**: 2 person days per week  **Pilot**: 3 person days per week |
| **Business Network Operator (BNO)** | Provide and support infrastructure, node deployment and day to day operations ensuring participants can connect to and operate their nodes successfully. network directory, identity service, notary and firewall. | Work with the FAC build team to define infrastructure, deployment and support requirements and agree division of roles and responsibilities. | Work alongside the FAC build team to stand-up and operate the pilot environment incorporating all infrastructure, network services and support | **Pre-pilot**: 1 person days per week  **Pilot**: 2 person days per week |
| **Cash Exchange Operator & Bank** | Operate network nostro bank accounts for the deposit of fiat cash by investors and funds. Overseen the issuance of cash tokens and provide regular reconciliations. Cancel and redeem all cash tokens on request. | Work with FAC to define and validate the cash exchange service, integrating with the FAC cash exchange node. | Operate the cash exchange issuing and cancelling cash tokens as required and ensuring cash tokens are reconciled to immobilised fiat cash. Adhere to all operational and regulatory controls for handling client money. | Subject to further evaluation of technical and regulatory requirements but estimated at:  **Pre-pilot**: 3-4 person days per week  **Pilot**: 2 person days per week |
| **Digital Custodian** | Operate a digital custody service for investors on the FAC network | Work with FAC to define, deliver and validate the digital custody service integrating with the FAC investor node. | Operate the digital custody service as required selecting from roles and responsibilities outlined within the appendix 2 | Subject to further evaluation of technical and regulatory requirements but estimated at:  **Pre-pilot**: 2-3 person days per week  **Pilot**: 1 person days per week |
| **Fund Accountant** | External data provider of fund prices to Fund servicing participants. | Work with Fund Manager, ACD, and Custodian to plan, and detail the fund launch and operational test process.  Work with FAC to integrate an automated feed for NAV prices | Undertake conventional function for launched fund/s and cooperate with execution of test cycles. | **Pre-pilot**: <0.5 person days per week  **Pilot**: 1 person days per week |
| **Fund Custodian** | Custodian for fund | Work with Fund Manager, ACD, and Accountant to plan, and detail the fund launch and operational test process | Undertake conventional function for launched fund and cooperate with execution of test cycles. | **Pre-pilot**: 0.5 person days per week  **Pilot**: 1 person days per week |
| **Depositary** | Provides regulatory oversight of fund | Work with FAC and Fund Manager to define the requirements for oversight of fund launch and operation in the pilot | Undertake conventional function for launched fund/s and cooperate with execution of test cycles. | **Pre-pilot**: 0.5 person days per week  **Pilot**: 1 person days per week |
| **Regulator** | Has a privileged level of insight to transactions on the network for regulatory, AML and analytical purposes. | Non assigned passive role. Node will be operated by FAC on an evaluation basis | Non assigned passive role. Node will be operated by FAC on an evaluation basis | None |

# Preparation and Timeline for the Pilot

## Timeline

Subject to the successful completion of the pre-pilot preparatory work, we will launch the pilot in late Q3 / early Q4 2020; the pilot will operate for a period of approximately 8 weeks. The pilot will be a regulated sandbox activity overseen by the FCA. Participants will collaborate to achieve as close as possible to a real reflection of a regulated fund launch and operation on the FAC network.

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## Basic Pre-Requisites

Prior to the start of the pilot, a number of key activities need to be completed successfully to identify and onboard service providers and other participants, and to achieve the required connectivity. FAC and the pilot participants need to work together to build out an integrated operational capability, define detailed test plans and define the fund/s to be launched. Once we have those plans, definitions and capabilities, they will need to be approved by the regulator.

The pilot will commence once four ‘go’ conditions are met:

1. Participant engagement and readiness achieved;
2. Technical infrastructure in place and service integration completed; and
3. Fund product finalised; and
4. Regulatory approval received.

## Pre-Pilot - Preparation Workshops

All operational, technical and legal prerequisites will be progressed through workshops and working parties. FAC will lead these groups, which will also include resource and expertise from partners and service providers as appropriate. The workshops will be organised into three broad workstreams for operational, technical and legal/regulatory prerequisites.

1. **Operational**

This workstream will define a detailed test plan with clear understanding of roles and responsibilities, and will agree on the data sets to be used. Outcomes are:

* Proposed operating model defined, validated and agreed by all parties;
* All parties actively involved in testing are familiar with FAC functionality and workflows;
* All parties actively involved in testing understand their role;
* Resource requirements for all parties are validated and committed; and
* A set of test plans and related test data are produced and agreed.

1. **Technical**

This workstream will focus on delivering the technical environment for the pilot, including the required functional build. The Technical stream will engage with and onboard the Business Network Operator, the Cash Exchange, the Digital Custodian and the Fund Accountant / Administrator, including completion of the necessary technical integration on both sides. A set of commissioning tests will be required prior to starting the pilot. Outcomes are:

* Completion of baseline FAC functional development;
* Delivery of FAC infrastructure and network deployment, in partnership with Business Network Operator; and
* Integration and testing of Digital Custody and Cash Exchange business services.

1. **Legal, Regulatory and Fund Launch**

During the preparation for the pilot the Legal, Regulatory and Fund Launch workstream is expected to engage with the regulator directly. This engagement will address a series of issues and proposals concerning on-ledger issuance and DL-based fund operations. It will seek a position acceptable to the Regulator on fund constitutional and legal structures, participant roles and responsibilities and on reporting and regulatory oversight requirements. We will seek to ensure that the fund sandbox operation is as realistic as possible, in order to provide the maximum benefit for participants. Outcomes are:

* Fund definition, legal sign off and regulatory approval;
* Fund manager launch process defined and agreed;
* Reporting and oversight requirements defined and aligned with operational process;
* Seed funding and Investor participation in place.

## Individuals Assigned to the Pilot Working Group

This is a cross industry exercise requiring a high degree of collaboration and coordination to complete successfully in a timely and orderly fashion. To ensure that we can work together, we need the involvement of qualified individuals representing the participating businesses. Those individuals should:

* Be subject matter experts with the appropriate operational, product, legal or technical backgrounds, who can collaborate confidently in a cross-industry working group;
* Already possess relevant knowledge of distributed ledger technology, or be keen to work with FAC to understand distributed ledger concepts and apply them to the funds industry;
* Be willing to take part in preliminary workshops and planning sessions prior to the commencement of the first pilot phase; and
* Be available as committed throughout the pilot phases, in order to work with other members of the group to an agreed test plan.

# Test Plan for the Pilot

## Scope of Pilot Testing

It should be recognised that FAC is not a replacement for an existing TA system. FAC should be evaluated on a like-for-like basis, but instead considered on its own merits: they key is that FAC should demonstrate its ability to deliver a long-term transformative model of funds processing, in alignment with the participants’ business and regulatory requirements.

The scope of the test is limited to one or more funds launched for the purposes of the pilot. Some of the operational efficiency benefits are difficult to establish, however, without significant volumes replicating day to day business and it may be necessary to launch additional dummy funds (without fiat cash deposits) to support a higher level of operational volume.

## Constraints and Limitations

FAC will provide a pilot environment configured to support the pilot objectives. The system is developed to a proof of concept stage only, and will have a restricted set of functionalities. These will be focused on the specific requirements of the pilot fund/s, and will not seek to replicate the full diversity of multi-product and multi-jurisdictional functionality required for a commercial system.

Specifically, the following limitations should be considered when planning tests, in consideration of the current stage of FAC platform development:

1. Investor onboarding and associated KYC/AML processes are out of scope entirely;
2. Fund structures are limited to single tier class funds;
3. Swing pricing and anti-dilution levies are not supported;
4. Fees and commissions will only be supported where specifically agreed as part of the launched fund;
5. Client documentation will include contract notes and statement of holdings, but investor tax reporting is out of scope; and
6. Multi-user and configurable user access controls are not supported.

## Functional Testing

Building on the DITLOAF business cycle described above, and recognising the limitations and constraints of a pilot system, the testing will be focused very clearly on the validate of core FAC functionality. This core is the set of capabilities required to maintain an accurate register, and to undertake the normal daily business cycle for a fund. Our focus will be on proving these capabilities while identifying and demonstrating the main benefits of a DLT-based service.

The functional test plan will assess controls and benefits across the full value chain of participants in the daily cycle of a fund. This will encompass order placement, cut-off, the completion of the valuation and pricing cycle, and the finalisation of settlement.

* On the control side, tests will be designed to ensure the efficiency of operations, to check the integrity of the process and to monitor adherence to regulatory standards and controls.
* On the benefit side, testing will aim to identify and confirm key benefits associated with the implementation of DLT. Specifically, this will target increased data transparency, reduced reconciliation, faster settlement, reduced settlement risk and an overall lower cost / complexity of operation.

The following table lists the basic test scenarios which we expect to exercise in the course of the pilot.

| **Test scenario** | **Rationale / Benefit** |
| --- | --- |
| Setup and maintain a fund. | Demonstrates improvement in time to market for launching new funds. Customer experience and revenue opportunities. |
| Convert Investor and Fund fiat currency at the Cash Exchange and issue cash tokens onto the network. | Exercises the role of the Cash Exchange and its relationship to the bank. Revenue generation from operating digital exchange |
| Issue tokenised units for the fund onto the network. | Demonstrates the simplicity of fund issuance without the creation of a conventional asset |
| Setup and maintain investor records. | Provides investors and service providers with experience of fund holding on FAC |
| Place, track and complete investor buy, sell, transfer and switch operations with tokenised cash and assets on-ledger. Price a fund | Demonstrates operational efficiency, cost reduction, reduced settlement risk and elimination of reconciliation. |
| Produce daily cash flow information against a cut-off point, load NAV prices and prices orders. | Demonstrates operational efficiency and cost reduction. |
| Demonstrate required controls and reports for regulatory oversight | Evidences adherence to regulatory requirements |
| Validate the accuracy and integrity of investor and fund cash and asset balances across a multi-day business cycle. | Validates integrity of register. Demonstrates risk reduction and improved regulatory oversight, and builds confidence in product and vision. |

A detailed test plan across all functional elements of the system will be developed for the pilot, however, the below table highlights the high-level DITLOAF cycle:

| **Participant** | **Rationale / Benefit** |
| --- | --- |
| Investor | * Send offline request to the Distributor to set up their account on the Investor Node through the pooled nominee account. * Send fiat cash to Cash Exchange (bank account in the name of the Fund, segregated by Investor) |
| Distributor | * Open Investor’s account (KYC/AML pre-cleared but out of scope for the pilot) on the Investor Node as part of their pooled nominee account structure |
| Cash Exchange | * Convert fiat received from the Investor to Cash Tokens, and deliver to Investor account on the Investor Node |
| Investor | * Check their Cash Token balance, and instruct a subscription in a pilot fund through the Distributor’s pooled nominee account on the Investor Node |
| Fund Service Provider (TA2.0) | * Access the specific Fund Node for the pilot fund and review the subscription in accordance with fund rules, some of which will be automated via FAC but not all of them for the pilot. |
| Fund Manager | * As the Fund Manager can see the pending subscription in real-time, once the pilot fund’s daily cut-off passes, the Fund Manager can consider the pending subscription as approved, or (opt to reject it in accordance with the fund rules) * Incorporate the pending subscription amount in the cashflow projections for the purposes of managing the pilot fund’s investments. |
| NEXT DAY | |
| Fund Accountant | * Calculate the pilot fund’s NAV as normal on their system, using its read-only access on the Fund Node to retrieve outstanding shares/units and subscription/redemption detail. * Send NAV price for pilot fund to Fund Service Provider for upload |
| Fund Service Provider (TA2.0) | * Upload NAV price for pilot fund to the Fund Node, and review in accordance with its policies for NAV price movement tolerances. * Approve the pending subscription accepted on the prior day in accordance with fund rules * ‘Witness’ the issuance of Fund Tokens to the Investor’s account as part of the pooled nominee structure on the Investor Node. * ‘Witness’ the receipt of Cash Tokens on the Fund Node that originated from the Investor Node. |
| Distributor | * ‘Witness’ the receipt of the Fund Tokens in the Investor’s account as part of their pooled nominee structure on the Investor Node |
| Investor | * ‘Witness’ the receipt of their Fund Tokens in their account on the Investor Node. |
| Fund Manager | * Instruct the sending of Cash Tokens from the Fund Node to the Cash Exchange for conversion to fiat. |
| Cash Exchange | * Receive Cash Tokens from the Fund Node and convert to fiat into a ‘Fund Cash’ account (segregated from investor’s accounts at the Cash Exchange). |
| Fund Manager | * ‘Witness’ the conversion of Fund tokens to a fiat cash balance in the pilot fund’s ‘Fund Cash’ account at the Cash exchange * Instruct the sending of fiat cash to the Fund’s Custodian. |

## Non-Functional Testing

The pilot presents an opportunity to evaluate and understand the non-functional capabilities of the technology platform, and of the application architecture, against the following requirements:

* Performance: Connectivity and latency across nodes;
* Reliability: The accuracy, consistency and predictability of the system during normal use;
* Security: confidentiality, integrity and availability of data held on the network;
* Scalability: The capability of the network to absorb increased activity and volume.

## Expected Outcomes

At the end of the third phase of the pilot, the following deliverables should have been achieved:

* A verified set of end-to-end workflows, built to conduct the daily operations of a fund and to meet all necessary oversight and reporting requirements;
* An understanding of the key components of the fund prospectus and service provider agreement for an on-ledger fund;
* A proven process for launching an on-ledger, token-based fund;
* A set of prioritised activities necessary to bring the system to a production-ready state;
* A detailed definition of the future state operating model enabled by the proposed system; and
* A business plan for realising TA 2.0, along with an operational and commercial plan for bringing it to market.

## Success Criteria

The pilot is a key staging post in the transformation of the funds industry. It is critical that the completion of the pilot should trigger practical steps towards the adoption of the technology. The criteria which will determine if the pilot is successful in achieving this are:

* Confirmation of potential savings, benefits and risk reductions to participants;
* A broader understanding among the participants of how FAC enables transformative opportunities for funds servicing;
* Confidence across the respective teams, in the FAC platform and the collaborative nature of the potential partnership;
* An agreed view of how close FAC is to a solution for funds servicing and what would be required to bring it to production;
* A set of strategic objectives for FAC adoption, including the growth of income and market share, the enablement of long-term partnerships and the design and delivery of digitally enabled products; and
* Commitment for participant and SAG global fund managers to support the further development of FAC.

## Governance

The pilot will be run in a controlled project environment to ensure efficiency of execution and delivery of expected outcomes.

* FAC will provide a **project office** and coordinate planning, execution and review;
* A **working party** of participants actively engaged in the pilot will meet at least weekly, and more frequently during intense periods of activity, to checkpoint progress, to agree next steps and to review outstanding issues;
* A **steering group** of SAG members participating in the fund launches and senior representatives of participants will meet at least weekly during the course of the pilot exercise to review progress, to agree action on critical issues and to remove blockers to progress.

# Next Steps

FAC will hold workshops with Fund Managers and representatives of the participants to refine the shape of the pilot. The agenda will include (but not be limited to):

* April 2020
  + Circulate Engagement paper to FAC network participants for feedback
  + Workshop on commercial and business operating model
  + Legal, Regulatory and Fund Launch working group 1-on-1 discussions held
  + Early plans shared with FCA
* May 2020
  + Confirm which Fund Managers will launch sandbox pilot fund
  + Legal, Regulatory and Fund Launch kick-off meeting
  + Select and advance paperwork with pilot fund service providers
  + SAG meetings as required
* June 2020
  + Heads of agreement signed
  + Appropriate workshops

# Appendix 1: FAC Roadmap

## Vision Beyond Fund Value Chain Efficiency

The FAC vision extends well beyond the establishment of on-ledger registry and transaction management. We have set out a roadmap which sees the expansion of FAC geographically, into a global utility, and functionally, into higher value components of the value chain. The roadmap is broken down into 5 phases:

1. Direct Issuance on-Ledger
2. Migration of Funds Issued Off-Ledger
3. Integration of Distribution
4. B2C Services on FAC
5. Underlying Assets and Fiat Currency On-Ledger

## Direct Issuance on-Ledger

The first delivered capability of FAC was to accept issuance of funds directly onto the ledger. This applies to new funds or to new fund classes. The first tranches of funds supported by FAC will be on-ledger funds and the 2020 pilot will exercise live issuance, with a real fund in the FCA sandbox.

For directly issued funds, the ledger is the sole registry, and consequently there is no off-ledger register. There is no need for conversion or redemption between conventional shares / units and their tokenised representation on-ledger, as the assets only exist on-ledger: the ledger is proof of existence and proof of title.

All transactions in the fund shares / units are handled on FAC, and fund holders have no choice but to transact on-ledger. Buy and sell instructions are passed from the Investor nodes to the Fund node, and title is transferred between these nodes on settlement.

When buy orders predominate, the Fund Servicer at the Fund node will compute the new shares / units required to meet the net demand, and new assets will be issued on-ledger at the Fund node. Title to these will then transfer to the Investor nodes on settlement.

Cash, in the direct issuance model, is still converted between fiat currency off-ledger, and its tokenised representation on-ledger. The in-built FAC Cash Exchange manages this conversion and provides the facility for investors to tokenise cash for on-ledger settlement, and to redeem tokens into fiat currency.

To begin all Investors will be institutional: the number of participants and volumes will be limited, and KYC will be undertaken at the institutional level by the Fund Servicer at the Fund node. We will extend later to support designated nominee accounts. The KYC responsibility will remain with the operator of the Investor node, but individual approvals will be reflected onto FAC.

## Migration of Funds Issued Off-Ledger

On-ledger issuance reduces the cost and complexity of funds processing, and we expect that on-ledger issuance of funds will become the dominant model over time. However, there is a very large number of conventionally issued funds in the fund universe, and it will take a considerable time for direct on-ledger issuance to dominate the market.

We anticipate demand for conventional funds to be tokenised, in order to give their holders access to the flow benefits and reduced costs of DLT. Consequently, we have built a facility, the Asset Exchange, within FAC to provide a facility for migration of conventional funds onto the FAC distributed ledger. The Asset Exchange, like the Cash Exchange, converts and redeems between conventional assets and their tokenised representation on-ledger.

The Asset Exchange enables holders of conventional fund assets to tokenise them onto the ledger, and to transact on-ledger from that point on. However, the holder will still have the choice to transact off-ledger if they choose to do so. The register is essentially split, with the primary register being managed by the conventional Transfer Agent, and the on-ledger title representing a sub-register. All on-ledger assets will be represented as a single holding on behalf of the Asset Exchange.

As a special case of issuance and tokenisation, we are aware that some managers wish to issue assets on conventional form, but then to tokenise 100% of the fund shares / units. Under this scenario, the primary register still exists, but has only one entry: all conventional assets are held by the Asset Exchange. There is no facility for transaction off-ledger.

Also, in this phase, we will add one or more Liquidity Providers to the FAC network, to facilitate settlement completion and eliminate, as far as possible, settlement failures. The Liquidity Provider will contract with the Funds and the Investors to provide buffers of assets and cash on-ledger and will settle transactions on behalf of the participants.

## Integration of Distribution

For funds issued on-ledger, and for those conventionally issued funds which tokenise 100% of their issuance through the Asset Exchange, FAC is the only channel through which to access transactions in the fund. As a result, and Distributor or platform who wishes to gain access to the fund will need to be an FAC participant.

Through the first two phases of FAC’s development, it will be open to Distributors and funds platforms to participate in FAC and to operate nodes as concentrators. This will be through a nominee structure, where the concentrator runs a sub-register for their individual clients, and the FAC transaction is with the concentrator, rather than with the end client.

In the third phase on FAC development, we will integrate more closely to distributors and platforms. A standard Distribution API will be delivered, so that Distributors can integrate their own proprietary platforms with FAC.

For those seeking closer integration, we will enable the removal of the Distributor’s sub-register, and represent the end client holdings and transactions directly on FAC. FAC will provide a facility to net the buys and sells within each concentrator and instruct a single transfer on settlement.

## B2C Services on FAC

As more funds are issued or tokenised onto FAC, the range of funds supported will become an asset in itself. We also anticipate an increasing span of inter-operation between DL networks, broadening the range further. In our fourth phase, we will provide clients with direct access to that fund range.

For suitably qualified clients (including IFAs, professional investors and capable private clients), we intend to provide a self-service portal, enabling the client to access prices and performance history, see holdings and valuations, instruct transactions, monitor income and track asset and cash movements.

The direct access portal will enable funds to be invested through tax-efficient wrappers, including ISAs and pension structures in the UK. FAC will provide tax reports and analyses for investments outside a tax-wrap.

The portal will allow clients to specify the structure of their fund investments, for implementation through smart contracts. So, for example, the proportion of distributions paid in cash and in reinvestment will be definable by the client, eliminating the need for separate share classes for this purpose.

We will seek to give the client their own wallet on FAC and will integrate with a ledger-based KYC service to deliver an integrated KYC function.

## Underlying Assets and Fiat Currency On-Ledger

FAC’s approach to issuance and tokenisation of Funds has been designed to be as consistent as possible with best-practice approaches to the issuance and tokenisation of other asset classes. We anticipate that, increasingly, equities, bonds, commercial paper and government debt will be issued on-ledger or will be tokenised and able to benefit from on-ledger transaction.

The tokenisation of the underlying assets of a Fund on FAC will enable us to extend the self-service client portal to give FAC clients much wider control over the structure and content of their funds. They would, for example, be able to implement their own compliance rules, or skew the fund’s asset allocation, through smart contracts, while still taking advantage of the fund structure and its management as a collective vehicle.

Governments and central banks are increasingly engaged in debate about the issuance of cash in digital form. We anticipate that, over time, these debates will result in decisions to issue fiat currency on-ledger. FAC’s architecture will accommodate this development, and it will reduce, and ultimately eliminate, the need for the Cash Exchange to collateralise cash tokens with fiat cash deposited by Investors.

The combination of these two developments will result in the most efficient longer-term model for FAC clients: on-ledger issued funds, with tokenised underlying assets, settled in fiat currency issued on-ledger.

# Appendix 2: Network Roles and Responsibilities

This section provides detailed descriptions and responsibilities of each of the FAC network service providers.

## Fund Servicer

**Summary**

The Fund Servicer is the operator of the Fund node on FAC’s ledger. Investors will be taken on by the Fund Servicer: KYC and AML procedures are carried out in the onboarding process and checked for completeness on receipt of trade instructions from the Investor.

The Fund node is responsible for direct issuance (and cancellation) of fund assets (i.e. shares / units) in token form onto the FAC ledger. Tokenised assets from conventionally issued funds will be issued and cancelled by the Asset Exchange.

The Fund Servicer will issue tokens to satisfy net demand, where net buy orders from Investors predominate; where sell orders are in net excess over buys, then the Fund Servicer will cancel asset tokens. A buffer of asset tokens may be maintained at the Fund node to minimise issuance and cancellation of tokens. Alternatively, this liquidity service could be delivered by a separate Liquidity Provider on FAC.

The Fund Servicer will route cash through the Cash Exchange to the Fund Custodian from net purchases of fund assets by Investors, and request cash from the Fund Custodian to pay for sellbacks of fund assets from Investors. A pool of cash tokens may be maintained at the Fund node to minimise off-ledger transfers of cash to and from the Cash Exchange. Alternatively, this liquidity service could be delivered by a Liquidity Provider.

Following cut-off, the Fund Servicer will receive the NAV-based fund price from the Fund Accountant / Administrator. The Fund Servicer will then compute the values of the Investor orders and net these to establish the requirement for issuance / cancellation of tokens. For directly issued tokens, the Fund Servicer will implement this itself, or for off-ledger issued assets, it will request / deliver tokens through the Asset Exchange.

The Fund Servicer will instruct settlement to the Investor nodes (and to the Liquidity Providers(s)), to trigger simultaneous transfer of title to stock and cash. This will, in effect, update the register, whether this is the prime register for assets issued on-ledger, or the sub-register for off-ledger issued assets.

The Fund Servicer will receive a computation of total income from the underlying assets of the fund from the Fund Accountant / Administrator and will compute Investor entitlements to distributions. It will segregate Investors between cash distributions and accumulation / reinvestment distributions, creating tokens for reinvestments, and requesting cash from the Fund Custodian via the Cash Exchange for cash distributions. The Fund Servicer’s will segregate Group 1 and 2 investors for tax purposes, computing equalisation and dividend components of the distributions for the latter.

**Process Responsibilities**

Establishment

* Establish the FAC Fund node
* Establish links and instruction protocols with the Fund Custodian
* Establish links with the Fund Accountant / Administrator for NAV-based pricing and distributions
* Establish credit and asset buffer arrangements with Liquidity Provider *<not in pilot>*

Onboarding

* Take on FAC Investors
* Complete KYC / AML checks on FAC clients

Registry

* Oversee the maintenance of the register of title on FAC
* Make the title register accessible entitled parties on request

Transaction Management

* Receive buy / sell instructions on-ledger from FAC Investors
* Manage instruction cut-off times
* Check that KYC / AML checks are complete, or block / pend the orders
* Receive NAV-based Fund price from Fund Administrator / Accountant
* Compute values for buy / sell instructions
* Net buys / sells for issuance / cancellation and funding requirements
* Receive an manage hold instructions for unfunded buys / illiquid sells
* Instruct exchange of asset and cash tokens to Investor, Liquidity Provider and Digital Custodian nodes
* Manage transfer of title of asset tokens for buys and cash tokens for sells, on settlement
* Transmit cash to the fund for investment via the Cash Exchange and the Fund Custodian

Issuance / Cancellation

* Issue asset tokens to satisfy net buy instructions
* Cancel asset tokens to accommodate net sell instructions
* Allow for asset buffering facility agreed with Liquidity Provider *<not in pilot>*

Funding

* Deliver cash tokens to satisfy Investor sell instructions via the Cash Exchange
* Redeem cash tokens from Investor buy instructions via the Cash Exchange
* Allow for cash buffering / credit facility agreed with Liquidity Provider *<not in pilot>*
* Report to Fund Manager on cash flows from transactions

Charges

* Apply charges to the Investor *<not in pilot>???*
* Manage commission payments to agents / concentrators *<not in pilot>*

Distributions

* Receive accumulated income of underlying assets calculation from Fund Accountant / Administrator
* Compute distribution from accumulated income
* Compute on-ledger entitlements to distributions on record date
* Compute equalisation and dividend components of distributions by Investor *<not in pilot>*
* Split cash distributions from accumulation / reinvestment
* For cash distributions:
* Instruct Fund Custodian to deliver cash for cash distributions
* Receive cash tokens from Fund Custodian via Cash Exchange
* Deliver cash tokens to Investor nodes on pay date
* For reinvested distributions:
* Calculate reinvestment shares / units
* Instruct unfunded buy orders
* Transfer title on settlement to the Investor node

## Business Service Operator - Cash Exchange

**Summary**

The Cash Exchange is the provider of payment services and safekeeping of client and fund fiat cash held in deposit against the issuance of FAC cash tokens. The Cash Exchange operator will manage the issuance and redemption of cash tokens, reconcile fiat cash to tokens issued and conduct required KYC/AML checks on clients of the Cash Exchange. The Cash Exchange operator will be a regulated entity meeting the requirements for managing deposits of client money.

Cash is conventionally issued off-ledger in the form of fiat currencies. The primary role of the Cash Exchange is to convert fiat currency into currency tokens on the FAC Network, and to redeem these tokens back into fiat currency on-demand. The conversion is always at par for any currency, and tokens are currency specific. While the tokens are on-ledger, they move between participants (essentially between the Investor nodes and the Fund nodes), so the redeeming party for any token is unlikely to be the party to whom the token was first issued. The entitlement to redeem cash at the Cash Exchange is defined by the title to ownership on-ledger, not by any segregation records held by the Cash Exchange operator. The Cash Exchange will have transparency through to the on-ledger title and will operate a separate off-ledger ‘in-transit’ cash account for each client / currency pair.

The Cash Exchange (or Exchanges, as there may be more than one over time) are banking utilities for cash in transit to and from the ledger, enabling the digital and immobilised representation of cash on the FAC network. Essentially, the cash on deposit is collateral for the tokens in circulation on FAC’s ledger. Tokenised cash on the ledger facilitates title transfer and instantaneous settlement of transactions between participants.

Even where assets are issued directly on-ledger, the Cash Exchange will continue to operate, converting fiat currency at parity into a tokenised FAC form. However, at a later point in time, we anticipate that cash will be issued directly onto the ledger by central and commercial banks (and potentially others), and the role of the Cash Exchange will be eliminated for that component of digitised cash. However, we also anticipate that demand for settlement in fiat currency, and the extraction of value from the ledger, will persist, and the Cash Exchanges will continue to operate for these reasons.

Subject to regulatory approval and suitable risk mitigation, there is the potential for the Cash Exchanges to generate value for its operator and its clients by re-using the cash for short term investment, deposits or collateral. The Cash Exchange operator may also offer clients a foreign exchange service, enabling them to receive or redeem tokens in a different currency from their cash holdings. This offers a further source of revenue to the Cash Exchange operator.

In addition to tokenising cash, redeeming tokens into cash, exchanging currencies and generating yield, the Cash Exchange will also stand behind the integrity of tokens issued against fiat currency. Like the Asset Exchange, this is a continuing reconciliation function.

The Cash Exchange comprises three functional components:

1. The Proxy Owner, who is the trusted third party holding the deposits at the Cash Exchange on behalf of the FAC participants;
2. The Banking Facility, which safekeeps the deposited cash; and
3. The Token Manager, who issues and cancels tokens, and ensures alignment between the token population of the ledger and the cash held as collateral in deposit.

The Cash Exchange service will be integrated into the FAC Cash Exchange node. The organisation operating the Cash Exchange will be optimally positioned to maximise their roles within the globally expanding FAC network.

**Process Responsibilities**

Establishment

* Establish proxy owner / trusted third party as the holder of off-ledger cash deposited at the Cash Exchange
* Establish off-ledger multi-currency banking facility for deposits made to the proxy owner, including holding accounts for cash in transit *<single currency in pilot>*
* Optionally: Establish FX facility for conversion of deposits and redemptions between currencies *<not in pilot>*
* Establish Cash Exchange node on FAC
* Establish token issuance / redemption facility on FAC Cash Exchange node
* Set up client relationships with FAC participants as a deposit-taker / FX provider, with segregation defined by on-ledger title

Tokenisation

* Receive off-ledger transfer of cash from FAC participant to proxy owner into holding account
* Optionally: *<not in pilot>*
* Receive currency conversion request from FAC participant
* Compute cash tokens to issue in target currency on FAC
* Convert to target token currency in holding account in accordance with FX service rules
* Simultaneously:
* Issue cash tokens on FAC in the title of the FAC participant
* Move cash from the holding account into the off-ledger banking facility in the name of the proxy owner

Redemption

* Either:
* Receive cash redemption request from FAC participant off-ledger; or
* Receive cash redemption request from FAC participant on-ledger
* Optionally: Receive currency conversion request from FAC participant *<not in pilot>*
* Retrieve / request payment instructions from FAC participant
* Receive title transfer of cash tokens from the FAC participant to the Cash Exchange node
* Simultaneously:
* Cancel cash tokens on FAC in the title of the Cash Exchange
* Move cash from the off-ledger banking facility in the name of the proxy owner to the holding account
* Optionally: Convert from token currency to requested currency in accordance with FX service rules *<not in pilot>*
* Send off-ledger transfer of cash from holding account to FAC participant

Reconciliation

* Periodically: Reconcile the cash tokens in issue on FAC with the cash deposited in the proxy owner account

Yield Enhancement

* Optionally: Manage short term yield enhancement strategy with deposited cash *<not in pilot>*

## Business Service Operator - Digital Custodian

**Summary**

Once fund shares / units are issued directly on-ledger, the FAC Investor no longer needs a conventional Custodian / Nominee to hold the fund assets. This role is taken by the Digital Custodian, who is a provider of secure key management for Investors. We expect this service to be hosted by a party independent of FAC and integrated with the Investor node. The operator should be a regulated entity meeting the requirements for custody in fund servicing. We need to establish with FCA how well the Digital Custodian fits with existing custody regulations, and clearly identify where there are potential needs for new or revised rules.

The Digital Custodian stands behind the assets issued on-ledger, giving Investors assurance on the existence of the assets and the accuracy of title. It facilitates the secure management and transfer of title to the assets on the FAC ledger.

Each FAC participant will be issued an on-ledger hot wallet (‘hot’ meaning on-line and accessible in real time) to transact on the network, and each wallet is identified on the network via a ‘public key’. In addition, each wallet has a ‘private key’ that secures the wallet owner’s access to what are essentially bearer assets (cash tokens and asset tokens). The Digital Custodian manages the signature of transactions on behalf of FAC network participants, essentially by securing the Investors’ private keys, and managing a multi-party signature process to approve transactions.

Digital asset owners generally opt for solutions to safeguard their private keys offsite in secure, guarded and geographically distributed facilities, or offline ‘cold storage’ systems provided by the Digital Custodian. The Digital Custodian will facilitate the safe transfer of tokens out of cold storage and into FAC ‘hot’ storage for daily trading, and back into cold storage at the conclusion of the trading day. The Digital Custodians will either integrate with the operator of the Asset Exchange to enable intraday and/or end-of-day transfers of digital assets to and from the FAC hot wallets or will provide a native solution of their own.

The Digital Custodian role is best placed to record the history of token holdings on the ledger. This facilitates an asset servicing role, in addition to the key management services that Digital Custodians provide. The Digital Custodian will oversee the entitlements of their clients to fund distributions and ensure that the benefit of yield enhancement from their off-ledger assets accrues to the right Investors.

**Process Responsibilities**

Establishment

* Establish Digital Custodian Node on FAC
* Establish private key recovery procedures *<not in pilot>*
* Establish multi-signature schema for transactions
* Set up client relationships with FAC Investors as digital custodian
* Set up relationships with FAC Funds as digital custodian

Take-On

* Receive private keys from the Investor
* Manage encryption and safekeeping of private keys
* Agree multi-signature schema with Investor

Transaction Management

* Administer multi-signature schema
* Deliver access to tokens for title transfer

Implement Off-Line Storage *<not in pilot>*

* Operate cold storage facility
* Run cyclical transfers between cold and hot storage of keys

Issuance / Cancellation

* Monitor issuance and cancellation of all tokens for Fund clients
* Reconcile tokens held on-ledger to the records of issuance / cancellation

Asset Servicing *<not in pilot>*

* Calculate entitlements to distributions
* Ensure distributions are received by entitled token-holders on-ledger
* Allocate income from yield enhancement to entitled token-holders

Reporting / Access

* Enable regulators and other entitled third parties to access asset information in a secure environment
* Maintain records of Investor balances and transactions

## Business Service Operator - Asset Exchange *<not in phase 1 pilot>*

**Summary**

The Asset Exchange is the provider of safe custody of client and fund assets (i.e. shares / units) held in deposit against the issuance of FAC cash tokens. The Asset Exchange operator will manage the issuance and redemption of asset tokens, reconcile assets deposited at the Asset Exchange to tokens issued and conduct required KYC/AML checks on clients of the Asset Exchange. The Asset Exchange operator will be a regulated entity meeting the requirements for holding client assets in safe custody.

Until direct on-ledger issuance of funds becomes the dominant model, there will be a very large volume of funds issued in a conventional form, as units or shares. These are held in conventional custodian accounts, in nominee accounts or as entries in a register or sub-register. It is important that these conventionally issued funds have access to the FAC ledger and can be migrated over time to on-ledger representation. It is the role of the Asset Exchange to facilitate that migration.

The primary role of the Asset Exchange is to convert conventional fund assets into asset tokens on the FAC Network, and to redeem these tokens back into conventional assets on-demand. While the tokens are on-ledger, they move between participants (essentially between the Investor nodes and the Fund nodes), so the redeeming party for any token is unlikely to be the party to whom the token was first issued. The entitlement to redeem assets at the Asset Exchange is defined by the title to ownership on-ledger, not by any segregation records held by the Asset Exchange operator. The Asset Exchange will have transparency through to the on-ledger title and will operate a separate off-ledger ‘in-transit’ custody account for each client.

The Asset Exchange (or Exchanges, as there may be more than one over time) are essentially custodian utilities for assets in transit to and from the ledger, enabling the digital and immobilised representation of fund assets on the FAC network. Essentially, the assets in custody at the Asset Exchange are collateral for the tokens in circulation on FAC’s ledger. Tokenised assets on the ledger facilitate title transfer and instantaneous settlement of transactions between participants.

Where less than 100% of a fund’s shares / units are tokenised, then the Transfer Agent’s register will maintain the off-ledger holdings, and the Asset Exchange will be the holder on the register for all tokenised assets. The FAC ledger essentially operates as a sub-ledger, segregating ownership below the Asset Exchange. Where 100% of a fund’s shares / units are tokenised through the Asset Exchange, then the TA register will have only one entry, namely the Asset Exchange.

We anticipate that the market will move strongly over time towards fund issuance directly on-ledger. This will be maximally efficient, and for those funds issued in this way, the need for the Asset Exchange will be eliminated. However, we also anticipate that conventionally issued funds will continue to be part of the picture for a very long time to come, and that the role of the Asset Exchange will persist for many years.

Subject to regulatory approval and suitable risk mitigation, there is the potential for the Asset Exchange to generate value for its operator and its clients by re-using assets as collateral.

In addition to tokenising shares / units, redeeming asset tokens into shares / units, and generating yield, the Asset Exchange will also stand behind the integrity of tokens issued against fund shares / units. Like the Cash Exchange, this is a continuing reconciliation function.

The Asset Exchange is structured similarly to the Cash Exchange, and comprises three functional components:

1. The Proxy Owner, who is the trusted third party holding the shares / units at the Asset Exchange on behalf of the FAC participants;
2. The Custody Facility, which safekeeps the deposited shares / units; and
3. The Token Manager, who issues and cancels tokens, and ensures alignment between the token population of the ledger and the assets held as collateral in deposit.

The Asset Exchange service will be integrated into the FAC Asset Exchange node. FAC has already designed and built an internal Asset Exchange, and this will be used after the live pilot when we move from direct issuance to migration of off-ledger funds.

The organisation operating the Asset Exchange will be optimally positioned to maximise their roles within the globally expanding FAC network.

**Process Responsibilities**

Establishment

* Establish proxy owner / trusted third party as the holder of off-ledger fund units / shares deposited at the Asset Exchange
* Establish off-ledger safe-keeping facility for units / shares transferred to the proxy owner, including holding accounts for assets in transit
* Establish Asset Exchange node on FAC
* Establish token issuance / redemption facility on FAC Asset Exchange node
* Set up client relationships with FAC participants as a safe-keeper of assets, with segregation defined by on-ledger title

Tokenisation

* Receive off-ledger transfer of shares /units from FAC participant to proxy owner into holding account

Simultaneously:

* Issue asset tokens on FAC in the title of the FAC participant
* Move shares / units from the holding account into the off-ledger safe-keeping account in the name of the proxy owner

Redemption

* Either:
* Receive asset redemption request from FAC participant off-ledger; or
* Receive asset redemption request from FAC participant on-ledger
* Retrieve / request delivery instructions from FAC participant
* Receive title transfer of asset tokens from the FAC participant to the Asset Exchange node
* Simultaneously:
* Cancel asset tokens on FAC in the title of the Asset Exchange
* Move shares / units from the off-ledger safe-keeping facility in the name of the proxy owner to the holding account
* Deliver shares / units from holding account to FAC participant

Reconciliation

* Periodically: Reconcile the asset tokens in issue on FAC with the assets in the proxy owner safe-keeping account

Yield Enhancement

* Optionally: Manage short term yield enhancement strategy with deposited assets

## Business Service Operator - Liquidity Provider *<not in pilot>*

**Summary**

The Liquidity Provider is a facilitator of investment and of settlement on the FAC ledger. Its role is to add liquidity in the form of cash or asset tokens, to ensure the most efficient operation of the network. This encompasses the prevention of settlement failures, the elimination of unnecessary issuance / cancellation of tokens, and the reduction of off-ledger transfers generated by on-ledger activity. The Liquidity Provider may contract with the Investors and the Funds on FAC.

Without a Liquidity Provider, each client will need to have sufficient cash tokens on FAC to fund each buy order in full; any shortfall will result in the failure of the order, before or at settlement. The Liquidity Provider mitigates this, by providing credit headroom to each client, and settling in cash tokens with the Fund for buys, divorcing the need to move fiat currency into tokens through the Cash Exchange for settlement.

FAC will provide the infrastructure for the Liquidity Provider to manage its overall cash exposure and will facilitate the maintenance of the target level of liquidity through the Cash Exchange. The Investors will settle periodically with the Liquidity Provider to remain within their credit limits. In return for performing their role and taking risk, the Liquidity Provider will charge for this service through whatever means it agrees with the clients and the Funds.

In assets, the Liquidity Provider will maintain a buffer of asset tokens for settlement on behalf of the Fund, or if contracted to do so, for the Investors. For participants who act as concentrators, it is of value to be able to maintain a buffer of assets for delivery as well as cash, to avoid the knock-on effects of failed delivery from their own clients. An asset token buffer maintained by the Liquidity Provider for the Fund is the equivalent of a ‘Manager’s Box’ in a conventional unit trust model. The buffering of asset tokens is particularly useful where the Asset Exchange intermediates the issuance process but is still valuable in direct issuance to limit token issuance and cancellation: it is more efficient to reuse tokens within Corda’s DL implementation.

Subject to regulatory approval and appropriate risk mitigations, the Liquidity Provider may extend from settlement-based credit into investment credit and enable Investors to borrow to increase their capacity for fund investments. This would provide an additional source of revenue for the Liquidity provider.

The Liquidity Provider will operate a specific node on the FAC network. FAC will implement smart contracts to give effect to the rules and credit / buffer agreements that the Liquidity Provider enters with their clients.

**Process Responsibilities**

Establishment

* Establish Liquidity Provider node on FAC
* Define on-ledger credit terms / terms of service for assets and cash
* Set up client relationships with FAC participants as an asset / cash liquidity provider
* Set up client relationships with FAC Funds as an asset / cash liquidity provider

Cash Buffer Set-Up

* Compute required buffers of cash across clients and Funds, based on contracted credit commitments and expected client and Fund transaction levels
* Transfer cash to Cash Exchange off-ledger for issuance of cash tokens
* Optional: Transfer cash in multiple currencies to Cash Exchange for issuance of cash tokens
* Receive issued cash tokens from Cash Exchange and check against cash transferred

Asset Buffer Set-Up

* Compute required buffers of assets across clients and Funds, based on contracted buffer commitments and expected client and Fund transaction levels
* Issue on-ledger buy instructions to Funds for issuance of asset tokens
* Receive on-ledger settlement instruction from Fund node
* Receive issued asset tokens from Fund node
* Transfer title to cash tokens to Fund Node

Account Settlement with Investors / Fund

Periodically:

* Review credit headroom for Investor / Fund against agreed credit level
* Request on-ledger settlement of delta
* Investor / Fund transfers title to cash tokens to Liquidity Provider

Periodically:

* Review asset buffer for Investor / Fund against agreed credit level
* Issue buy / sell instruction to Fund node to maintain agreed buffer

Client-Side Settlement of Investor Buy Trades

* Receive copy of on-ledger buy instruction from client
* Notify relevant Fund node of settlement via Liquidity Provider
* Check client cash headroom against buy instruction

If headroom inadequate:

* Notify client and Fund node of held buy instruction
* Request on-ledger account settlement from client
* Hold buy instruction until cash account settled
* Receive on-ledger settlement instruction from Fund node
* Transfer title to cash tokens to Fund Node
* Update credit headroom for client

Fund-Side Settlement of Investor Buy Trades

* Receive copy of on-ledger buy instruction from Investor
* Notify relevant Fund node of settlement via Liquidity Provider
* Check Fund asset buffer against buy instruction
* If buffer inadequate, issue on-ledger buy instruction to Fund for issuance of asset tokens
* Receive on-ledger settlement instruction from Fund node
* Transfer title to asset tokens to Investor node
* Update asset buffer for Fund

Client-Side Settlement of Investor Sell Trades

Receive copy of on-ledger sell instruction from Investor

* Notify relevant Fund node of settlement via Liquidity Provider
* Check Investor asset buffer against sell instruction
* If buffer inadequate, issue on-ledger buy instruction to Fund for issuance of asset tokens
* Receive on-ledger settlement instruction from Fund node
* Transfer title to asset tokens to Fund node
* Update asset buffer for Investor

Fund-Side Settlement of Investor Sell Trades

* Receive copy of on-ledger sell instruction from Investor
* Notify relevant Fund node of settlement via Liquidity Provider
* Check Fund credit headroom against sell instruction

If credit headroom is inadequate:

* Notify client and Fund node of held sell instruction
* Request cash tokens from Fund via the Cash Exchange
* Hold sell instruction until cash tokens received from Fund via the Cash Exchange
* Receive on-ledger settlement instruction from Fund node
* Transfer title to cash tokens to the Investor Node
* Update cash buffer for Fund

## Business Network Operator (BNO)

**Summary**

A BNO can be seen as providing two focal areas of service, namely, ‘infrastructure and node support services’ and then ‘network and business services ‘. The BNO may be a stand-alone FAC network service provider or may also offer BSO and/or additional Fund Services.

**Process Responsibilities**

BNO: Infrastructure and Node Support Services

* Secure, high availability, financial services grade network, compute and storage infrastructure to node operators as a service.
* Upgrade coordination and maintenance activity across all nodes.
* Deployment and technology support for infrastructure and on node technology stack (SQL DB, JVM, Web server and integration layers).
* Work with development team to optimise container build and deployment mechanism
* ‘Health’ monitoring (network, security, availability, capacity and cost) and incident management.
* Auditable activity monitoring and potentially provide usage-based billing services.

BNO: Network Operator and Business Services

* Host and manage network services including notary, identity, network directory and application firewall.
* Validate participant identity and control issuance of root certificates to node operators and manage participant onboarding.
* Connect to, host or provide digital services such as KYC/AML, Custody and secure key management, exchange operation and CSD services and bank payment and FX services.
* Host and/or operate enhanced data services including network activity analytics, suspicious transaction monitoring, regulatory reporting