IBOR Standards Working Group

IBOR Requirements Definition

9th May 2014

Status of the paper:

This paper has been submitted to the IMA by the IBOR Standards Working Group. The IMA is circulating it to members for consultation and will consider endorsing it post-consultation, provided the feedback from members does not indicate any substantive opposition.

Contents

About the IBOR Standards Working Group

IBOR Standards Working Group is international collective of practitioners working in information technology and investment data management-related functions in a number of investment management organisations.

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About the Document

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Glossary

In this document, the following terms have these meanings:

Alignment	The selection and use by IBOR of reference data to enrich an IBOR extract. Common alignments will be with pricing data (i.e. valuations), analytics, fund constituents (i.e. look-throughs), and exposure groups. Without alignment, IBOR extracts will deliver only quanta of stock and cash.
Data Warehouse	A persistent store into which snapshots of positions are populated, and a history is accumulated, based on defined extracts from IBOR.
Event	Any market or internal occurrences (including transactions) that will (or might) lead to one or more changes in position data. So, for example, a stock purchase is an event, as is a corporate action, a fee, a dividend and a derivative contract.
Event Extract	A set of event data returned from a request defined in an IBOR event extract definition.
Exposure Group	IBOR reference data which defines the way in which the data in an IBOR extract will be aggregated and presented for exposure purposes.
Extract Definition	A definition of an IBOR position or event data extract. In the case of a position extract, this will specify its scope, timing, perspective, enrichment, form of delivery etc.
IBOR Console	A facility in IBOR through which the user can maintain reference data, monitor IBOR position-driver life-cycles, and request and view position and / or event extracts.
IBOR Dashboard	A facility in IBOR through which the user can review anomalies and breaks, access position data quality reports and analyse data quality trends over time.
Issue	A problem facing management, caused by shortcomings in current approaches to position management, and which IBOR is expected to address.
Liability	Committed or projected outflows from a fund / scheme, such as pension payments, insurance liabilities or scheduled fund payments.
Life-Cycle	The states through which a position-driver progresses as its position impact becomes more certain. An event may have one or more driver life-cycles.
Ownership Group	IBOR reference data which defines the scope of a position extract. Ownership groups will cover funds, groups of funds, strategies, desks, assets classes etc., as required by the IBOR client.
Position-Driver	An atomic position impact, i.e. a single factor which drives a single position change, for example, like a delivery of stock, or a cash movement. For each event captured into IBOR there will be one or more position-drivers, which will give effect to the position impacts of the event.

Position Extract	A set of position data returned from a request defined in an IBOR position extract definition.
Real Time Mart	A platform supporting a constantly-refreshed position extract which reflects the impact of IBOR position-drivers in close to real-time.
Requirement	A business need, driven from an issue and to be satisfied by one or more IBOR services.
Service	A collection of logically-related IBOR functions.
State	A stage in the life-cycle of an IBOR position-driver, reflecting the increasing certainty of its impact on a position over time. For example, one of 'estimated', 'committed', 'contractual' and 'physical'.
State Transition	The promotion of an IBOR position-driver from one state to the next, as a result of an update on its progress received from transaction processing or market data.
Transaction	An IBOR position-driver which has progressed to the point where the relevant parties have agreed to a movement of assets and / or cash. This may be a different IBOR state, depending on the event type: a trade will become a transaction when it is committed, while income becomes a transaction only when it is contractual.

1 Introduction

1.1 Background to IBOR

Over the last 2 years there has been increasing project activity among asset managers to address issues with position data: many firms now have initiatives planned or underway. This activity has focused on the requirement for an Investment Book of Record (IBOR), to provide position data for investment purposes, but also to ensure that consistency is maintained with position data for trading, accounting, custody, performance and reporting.

IBOR has become a high profile topic across the buy-side. This document has been drafted for the IBOR Standards Group, and is intended to provide a consensus definition of IBOR, to be published as an initial standard. Its target readership includes:

- Asset managers;
- Asset owners;
- Solution vendors / service providers;
- Consultants / system integrators; and
- Other standards bodies.

1.2 Establishing a Consensus on IBOR

Many industry solution vendors and service providers have become aware of IBOR's high profile, and there is now a diverse range of approaches and products which claim to deliver an IBOR. As a result, there is confusion in the market, and definitions of IBOR have differed widely. There is a risk that diverse and divergent products will be developed, without consideration to standards and inter-operability. To address this, the IBOR Standards Group has been established, and aims to reach consensus on:

1. The boundary around an IBOR;
2. The requirements and semantics of an IBOR; and
3. The inputs and outputs of an IBOR.

This document addresses the first two of these: a future paper from the Standards Group will address the third.

Despite the range and diversity of potential IBOR users, the Standards Group believes that there is a strong commonality in core position management functions, and in the business issues which IBOR sets out to address. It would be highly supportive to the industry to have a well-understood, consensus definition of IBOR, so that the expectations of managers, vendors and service providers can be aligned. We aspire to a state similar to compliance technology, where solution providers have developed genuinely comparable and competitive products.

1.3 Diversity in IBOR Implementations

All parties with an interest in IBOR are concerned to maintain a high level of quality in their position data, and to implement active quality management in a position data context. All parties wish to see complete and consistent position data, and to have confidence in its timeliness. However, the Standards Group expects that each IBOR implementation will have differences which reflect the business priorities and technology of the client. There are different classes of asset manager, asset owner and scheme: each will experience the issues documented here to differing extents, and each will focus on different subsets of the documented requirements.

Generally schemes and asset owners with multiple underlying asset managers are likely to focus on the effective aggregation of positions sourced from their managers. They will want high quality position data on a timely, but periodic basis, and may focus on a single cut per day, or per day per time-zone. By contrast, asset managers with rapidly-traded funds, or with index funds with the need for accurate intra-day cash, are more likely to demand real-time or near real-time positions.

Within each IBOR client, there will be a diversity of requirements for position views. The needs of portfolio management, trading, post-trade / middle office, investment operations and accounting are diverse, and each will require position data with a status and a timing which suits their varied perspectives. Different users will have different appetites for uncertainty. It is a key challenge for IBOR to deliver to this diverse requirement while maintaining strict consistency.

The Standards Group does not seek to define a single technical approach to the delivery of IBOR services, and recognises that there will be diversity in the approaches and technologies deployed by different vendors. Clients too will have diverse technical architectures and development strategies, which will influence both their choice of solution and the services which they need the IBOR application to deliver.

Certain technical approaches may be capable of delivering to a subset of the requirements, but would fall short of a full solution. It is the responsibility of the client and the vendor in each context to ensure that the proposed technical approach can satisfactorily deliver to the client's specific requirements.

1.4 Scope of IBOR Business Issues, Services and Requirements

The services set out in Section 3 describe the key functions of an IBOR platform, and are categorised into 'core' and 'frontier' services. The core services reflect the functions which the IBOR Standards Group expects any IBOR solution to offer. The frontier services may be delivered by the IBOR platform if that platform is broadly defined, but in some contexts may be delivered through common services within the client architecture, rather than from the IBOR product itself.

IBOR requirements are set out in outline in Section 4, together with the business issues which drive those requirements. The requirements are articulated in more detail (but still at a summary level) in Section 5. These describe generic industry needs for position data management. The requirements follow the categorisation of services in Section 3 into 'core' and 'frontier'.

The scope of positions envisaged for an IBOR implementation is comprehensive, and includes physical stock, fixed income, derivative contracts, structures, property, deposits cash and foreign

exchange positions. We expect that individual implementations of IBOR will address subsets of asset coverage, and that this will be dictated by the needs of individual managers.

IBOR's focus is on position management, rather than transaction processing or accounting. While the term 'IBOR' is now accepted in the industry as a label for initiatives of this kind, the industry issues and requirements described in this document cover position views generally. They include:

- Forecasts and estimated views;
- Traded / committed views;
- Contractual / accounting views;
- Physical / custodial / settled views; and
- Historical views.

IBOR's focus is therefore not only on position records for investment decision purposes, although the support of investment decision-making is a primary target.

2 Context of IBOR

2.1 The Buy-Side Position Management Process

While IBOR is a new component in most asset management architectures, its primary function is not new. The central role of IBOR is to deliver position data to users and to consuming applications: all managers have existing mechanisms in place to achieve this. IBOR's role is to do an existing job better, not to fulfil a completely new role.

In conventional buy-side architectures, front office systems are populated with position data on a periodic (usually daily) basis. When the new position data is loaded, it overwrites the previous version of the position data: the over-written data is acknowledged to be incomplete, and is rarely used in any control or reconciliation process. This flush / refresh process is assumed as the position management approach by most of the specialist software products in the front office space. It is materially different only where the asset manager implements a common platform for front, middle and back office support.

The range of events which drive position change is wide: events which may have an intra-day impact, but are unlikely to be reflected in a conventional Order Management System include:

- Collateral movements;
- Injections / withdrawals;
- Exercising of options;
- Some corporate actions;
- Third party hedging transactions;
- Class action / litigation proceeds;
- Underwriting commitments;
- Etc.

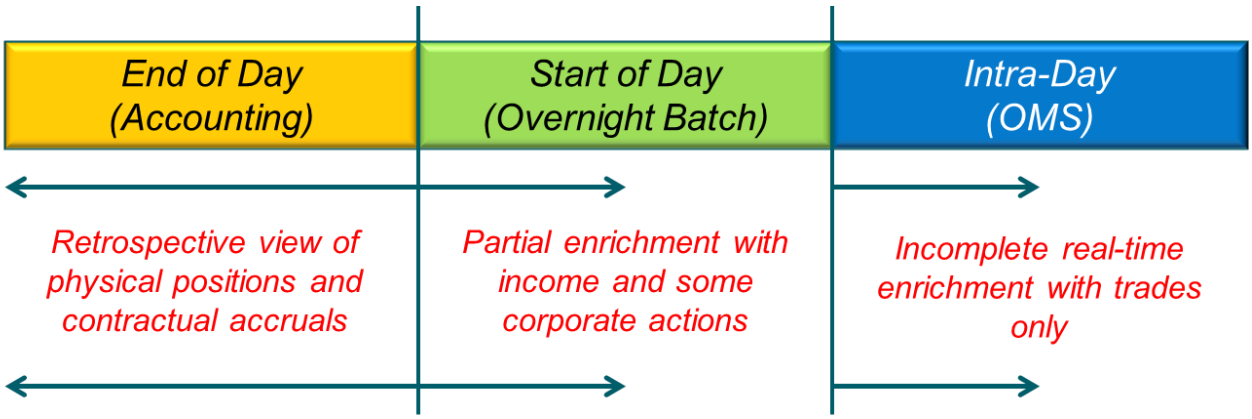
The intra-day adjustment of positions to take account only of trades is therefore materially deficient.

The position construction and maintenance process has three key components:

- An accounting end of day process;
- A batch overnight process which adds in some position drivers missing from the accounting view; and
- An intra-day real-time process (usually driven from the Order Management System) which adjusts the start of day positions with the impact of trades.

There is a clear limitation with each of these three steps:

- The accounting end-of-day is an accruals view, and by definition only includes movements which have been posted up to that point. It is therefore a single-status, retrospective view.
- The overnight enrichment process is generally partial in its effect: it adds in known income and corporate actions, but is unlikely to include other expected movements which may have a material impact on positions.
- The real-time intra-day updates managed by the OMS generally only take account of the impact of orders and trades. Other drivers are ignored, with the assumption that they will be picked up through a future flush / refresh of the start-of-day position data.



Conventional position data available to front office users is therefore an incompletely updated, partially enriched version of as-posted accounting data. This makes it problematic as a basis for investment decision-making, trading and compliance, and many investment managers are now questioning its fitness for purpose in the front office.

For managers or asset owners who appoint multiple external managers and / or multiple administrators, there are additional issues of aggregation of position data from their multiple sources. Different sub-managers and service providers deliver position data in different formats, with different statuses and semantics, and at different times. Constructing a coherent, semantically consistent start-of-day can be a very challenging task. This complexity adds to the demand for the strengthening of the position management process, and therefore augments the demand for IBOR.

2.2 IBOR Objectives

The point of an IBOR is to deliver higher quality position data than existing mechanisms can provide, where 'higher quality' means more complete and accurate data, provided in a more timely fashion, and delivered in forms which better satisfy the needs of the consuming users and applications. The concentration of position data into a quality-managed service can deliver architectural benefits too: existing position management mechanisms may be very diverse and are often very constrained.

For managers with the need for very timely, complete position views, IBOR offers a position management service which addresses the shortfalls of conventional batch-based, accounting-centric processes, while delivering independence from service provider data. For managers / asset owners whose primary issue with position data is aggregation, the delivery of a dependable, complete start-of-day is likely to be the major driver for their IBOR programme.

IBOR does not need to be treated as a 'slash and burn' data source, and its integrity can be drawn from its own maintenance and data quality management process, rather than inherited from the integrity of an external source. Taken to its logical conclusion, where coverage is as complete as it is in an accounting solution, this allows IBOR data to be treated as a prime record for investment purposes.

If the position data maintained by IBOR is timely and complete, then it can be used in meaningful reconciliations with accounting / custody positions delivered by internal and external service providers. IBOR can therefore facilitate more independence for the asset manager from its service providers, and provides the means by which the asset manager can monitor the quality of the data maintained by those service providers.

IBOR seeks to shorten the path from the drivers of position change to the construction of position data, and to achieve a high level of completeness in its coverage of those drivers. Thus IBOR will be capable of presenting more up-to-date positions which exhibit more completeness and integrity.

Because IBOR can have access to drivers of position change from an early stage in their life-cycles, it is not tied to a single status like an accounting-based solution: different levels of certainty can be accommodated in the positions delivered. IBOR can therefore more readily meet the varied needs of front office users, who demand position views ranging from long-term forecasts to as-of reconstructions, and flexibility over the statuses of the transactions included in their position data.

2.3 IBOR's Architectural Context

In most implementations, IBOR will occupy the space currently taken by the batch overnight processes which construct start-of-day positions. The intra-day position adjustments generated by the OMS will normally be unaffected, although IBOR may sit alongside the OMS and provide a more complete check on the OMS-derived positions in installations configured to deliver near-real time positions. There are developments also, among the major OMS providers, to enhance the position-keeping functions of the OMS, and to add more drivers of position change: this is welcome and, when combined with an IBOR start-of-day, can improve the integrity of intra-day position data.

For all implementations, it will be key that IBOR should deliver complete and timely start-of-day position data for those consuming systems which operate on this basis. To deliver a dependable timing for start-of-day, that delivery should be as free as possible from the timing constraints of a conventional overnight batch. In all contexts, however, there will be a process for maintaining alignment with other prime records, including accounting and custody views.

Prime record alignment may be through a reconciliation of accounting / custodian positions with IBOR positions, or may be through an adjustment / upload process. The delivery of complete position data presents the opportunity to use reconciliations to improve the control framework around position data, and to monitor the quality of external position data. Breaks in the reconciliation process will be resolved through investigation externally to IBOR, or, if unresolved, flagged by IBOR as weaknesses in position data quality. Some clients will treat IBOR as prime, some will prioritise accounting, and others will operate a process whereby the IBOR consumer accepts or rejects certain updates to the IBOR.

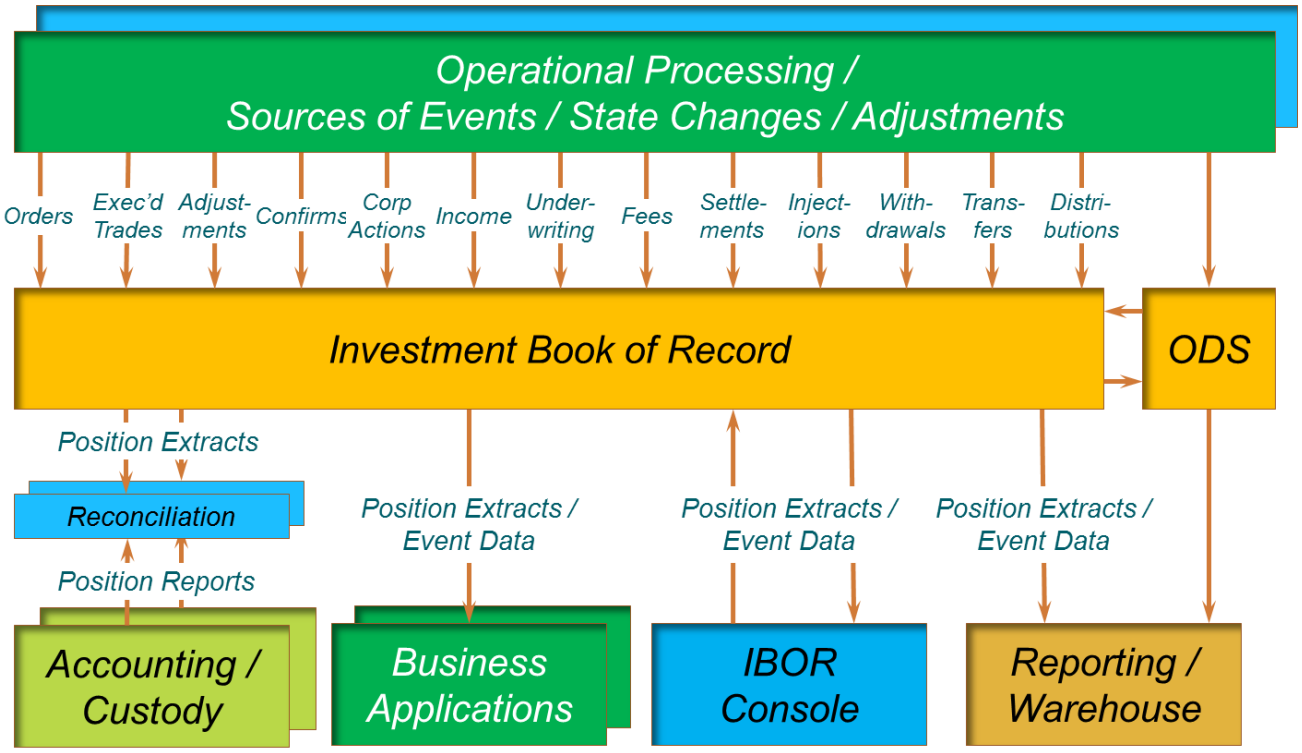
IBOR may or may not be the source of position data for applications which demand historic data, like performance and client reporting systems. It is clear that some IBOR users will continue to use the accounting end-of-day valuation as the source for historic applications, and use IBOR for live demands, and for applications which demand current and forecast views. Others will seek to source all position data for downstream systems from IBOR, relying on the reconciliation process to maintain alignment with accounting.

As it will hold a comprehensive, central view of the drivers of position change, IBOR has potential value as a source of event data. We expect that some IBOR users will seek to use IBOR as their primary source for event / transaction data, while others will not. Those who do not deploy IBOR in this way will leave individual transaction processing systems as the master source for transaction data, and create an architecture separate from IBOR to manage and deliver this data. In either case, a central Operational Data Store (ODS) may be a key component of the architecture.

2.4 Schematics of IBOR Context

2.4.1 Contextual View of IBOR

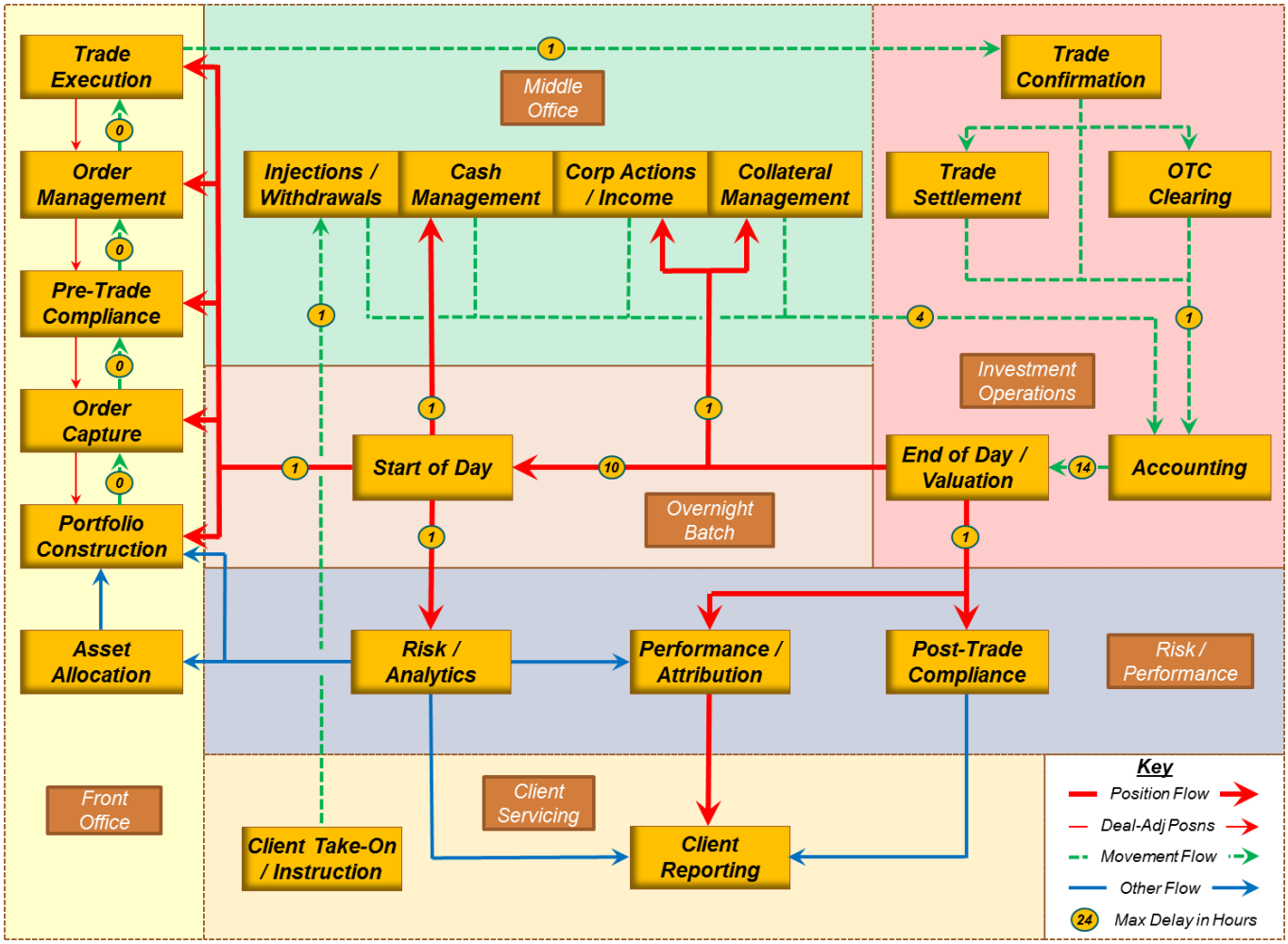
The schematic below shows a simplified view of the IBOR context, with source operational systems at the top, delivering position driver data. IBOR computes the consequences of the driver data and generates position / event views. The target systems / users at the bottom consume those extracts. which may exist in some IBOR client architectures. To the right is the ODS, which (where implemented) holds live transactional data, and event messaging to IBOR may route via the ODS. In addition to the population of position / event data into a warehouse, the ODS may also be a source of warehouse population, and IBOR may be a source of live data for the ODS.



2.4.2 Exemplar Functional Flow Pre-IBOR

The following schematics show a typical buy-side functional architecture before and after an IBOR implementation. The main flows of transaction data are left unchanged, but IBOR taps into event data at an early stage through messaging, and shortens the pathways from event to position impact.

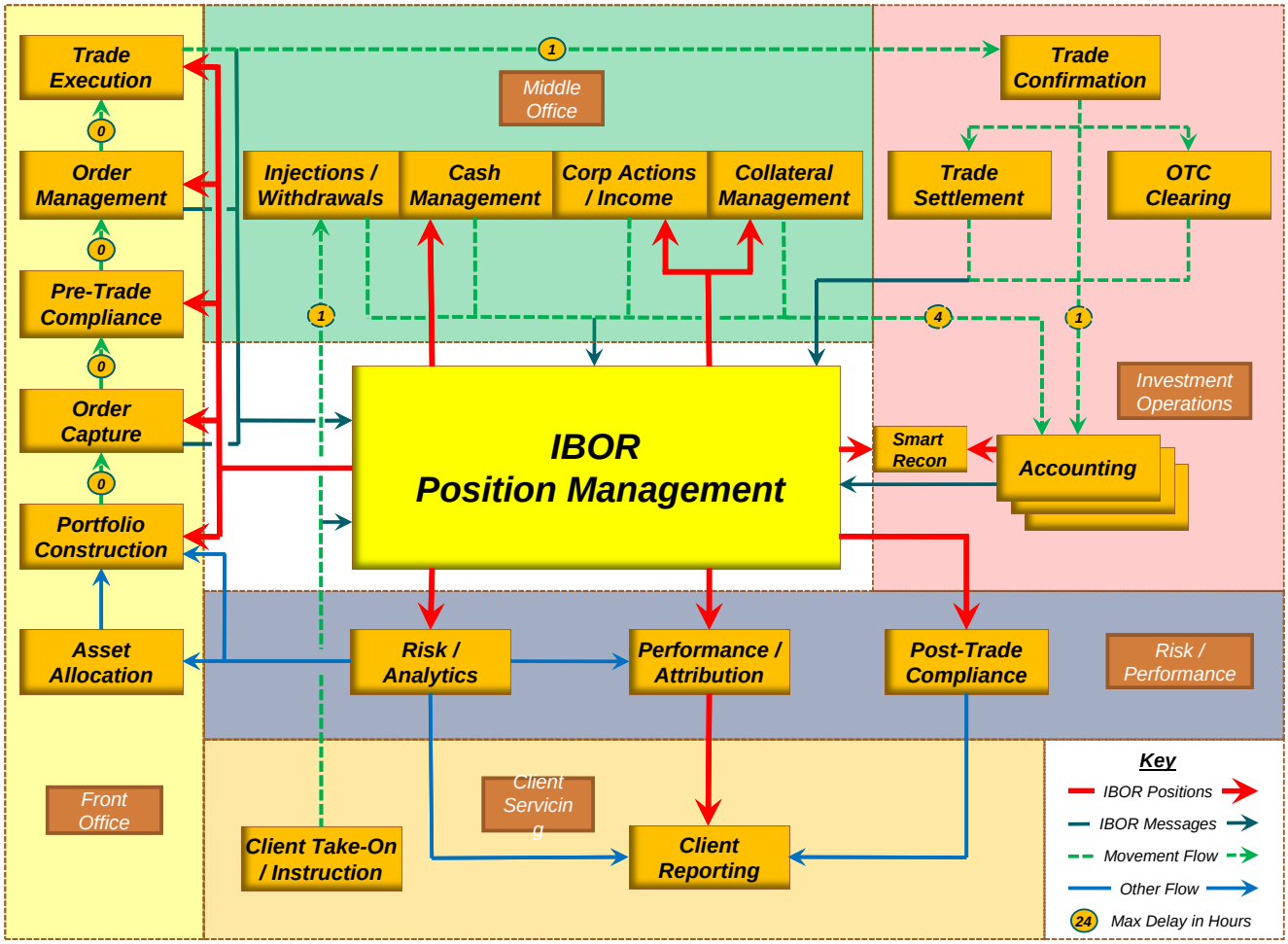
This schematic is of a typical and representative buy-side architecture, rather than a representation of a specific manager's structure. It shows the cyclical production of front office positions, based on the posting of transactions to accounting, and the overnight construction of a start-of-day position. The delays in the processing flows are indicative, and show typical timings, like a 10 hour overnight window and a 4 hour batching of inputs from middle office systems to accounting, and an hourly batch of trade data to accounting.



Please note that allocation of business capabilities to specific business areas such as front office or middle office are shown for illustrative purposes. Real allocation may vary between different firms. This standards is not endorsing any particular organisational design.

2.4.3 Exemplar Functional Flow Post-IBOR

In a typical implementation, IBOR is positioned as a replacement for the conventional overnight process, delivering more complete and timely position data. The implementation of IBOR, and the message flows which drive it, very materially shorten the pathways from position-drivers to their impacts in publishable position data. The delays in the processing flows are avoided by early capture of event data.



Ownership of the IBOR capability is deliberately not shown, as the decision is dependent on exact specifics of the firm. This standard is not endorsing any particular organisational decisions. Typical candidate business areas to own IBOR are middle office, investment operations or data management office.

3 IBOR Capabilities

This section sets out a consensus view of the capabilities expected of an IBOR / central position platform, and categorises these into 'core' and 'frontier' ones. Inputs to the definitions and to the core / frontier categorisation have been provided by multiple asset managers, schemes, consultants, service providers and vendors.

The IBOR Standards Group expects that this high level capabilities view will be a resource to assist potential clients to map IBOR onto their existing architectures, and to product vendors in defining the boundary around their IBOR offerings.

3.1 Core Capabilities

IBOR's primary function is to deliver high quality position data in a timely fashion. At its core, that position data is an inventory of assets, contracts and cash. Alongside this primary function, IBOR as the central position manager must provide the tools to manage position data quality, and to highlight when quality or timeliness is questionable. The core IBOR capabilities are defined to be those required to meet these needs:

1. Flexible definition of position views and the extraction of position data;
2. Project and capture events which impact positions;
3. Measure and manage the quality of event and position data;
4. Maintain and adjust event data as required, e.g. manual input or back-dated correction; and
5. Source and/or maintain reference data that is exclusive to IBOR.

3.2 Frontier Capabilities

Beyond the core capabilities, there are diverse needs for additional capabilities on the frontier of IBOR for the enrichment of core position data, to make it more usable or more valuable to the users and consuming applications. These enrichments will include:

1. Aggregation and grouping for positions;
2. Pricing / valuation for asset positions;
3. Model-based valuation for contract positions;
4. Rate conversion for cash positions;
5. Constituent look-through for fund, index and basket positions;
6. Analytics, especially for fixed income and derivative positions; and
7. Exposure grouping for all position types.

In addition to enrichments, there are middleware capabilities on the frontier of IBOR, which are required to manage the flows of data in and out of the application. Primary among these are:

8. Messaging, to manage the flow of event messages inbound to IBOR;
9. Reference data integration, to deliver external reference data to IBOR;
10. Downstream integration, to deliver the IBOR position data to consuming applications;
11. Data access mechanisms, e.g. a position data warehouse to persist IBOR position data extracts, or continuously updated operational data store for real-time positions;
12. Notification, to deliver IBOR-generated alerts to their target recipients; and

13. Reconciliations matching, to maintain alignment between IBOR position data and position data maintained by other systems and services.

Many applications will consume IBOR data, but certain applications will be very closely aligned with IBOR: these will directly exploit IBOR's event data history to deliver value-add services. They are required as part of a complete position management solution, but may or may not be delivered by an IBOR vendor solution. Such capabilities are consequently categorised as 'frontier', and include:

14. Book cost computation;
15. Positional P&L computation;
16. Commissions and charges computation; and
17. Transactional tax computation.

Finally, there are logical extensions to IBOR, which extend the scope of capabilities beyond the delivery of core asset position data. These will be critical to some IBOR clients, but will be irrelevant to others. They are therefore categorised as 'frontier'. Key among these are:

18. Support for liability events / positions alongside assets; and
19. The provision of event data to consuming systems alongside position data.

3.3 External Capabilities

The IBOR Standards Group sees the following capabilities, inter alia, as outside the scope of IBOR:

- Primary transaction processing of any form;
- Accounting;
- Economic modelling;
- Portfolio modelling;
- Market and reference data sourcing and maintenance, including pricing, benchmarks and constituents.
- Analytics computation and maintenance;
- Workflow handling for the resolution of anomalies / breaks; and
- Messaging infrastructure, to deliver source event messages from client systems.

3.4 Solution Architectures

Frontier capabilities may be delivered by components of an IBOR product, but in some architectures will be delivered by services outside the core IBOR application. We expect that the solution defined for any particular IBOR product or client will be a combination of all the core capabilities and some or all of the frontier capabilities. Where clients have more mature service architectures, we would expect more of the frontier capabilities to be delivered by components of that architecture, e.g. by enterprise application integration platform. For smaller clients, and those with less mature service architectures, we would expect that the IBOR application will be called on to deliver more frontier services.

3.5 Summary of Core, Frontier and External Capabilities

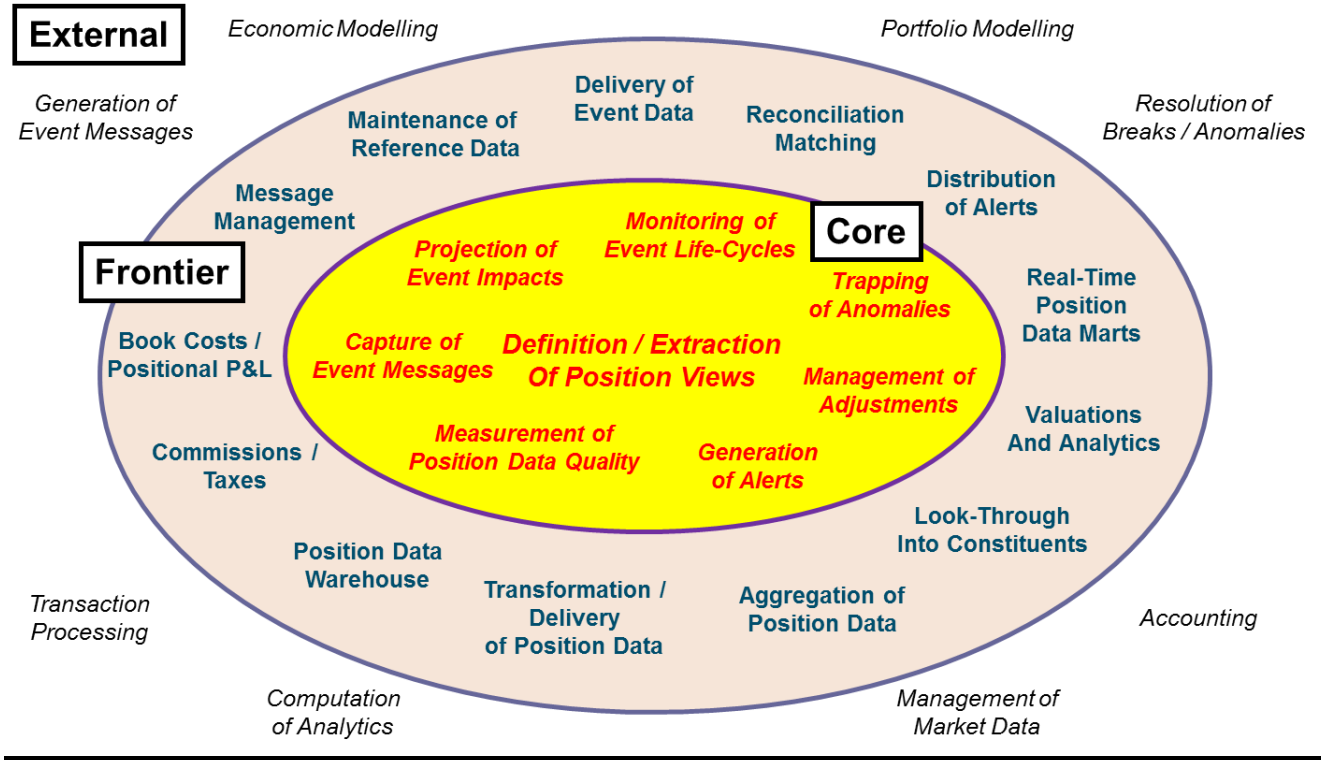
In summary, a core capability is identified where it is required as a component of every genuine IBOR solution.

A frontier capability is identified where it is:

- Required to deliver enriched position data;
- Required to manage the flows of data into and out of IBOR;
- Required to exploit position data as part of an overall position management service; or
- Required to extend the scope of IBOR beyond position data.

Capabilities outside the above categories lie wholly external to IBOR.

The schematic below summarises the core, frontier and external capabilities.



4 IBOR Requirements – Outline Level

This section sets out a consensus view of the requirements of an IBOR / central position platform. The requirements are categorised into core and frontier requirements, based on the categorisation of IBOR services in Section 3 above. Section 5 provides a fuller view of each requirement. The requirements are expressed in this section at an outline level under the following headings:

- Scope and Coverage of IBOR;
- Position Data Quality Objectives;
- Position Data Quality Management;
- Definition and Delivery of Position Data Extracts;
- Value-Add Services; and
- Administration, Performance and Scalability.

Inputs to the requirements have been provided by multiple parties and do not reflect the needs of any specific business. Individual clients of an IBOR product may have their own unique needs to add to this list, and many will need only a subset of the documented requirements (and particularly of the frontier requirements) to be delivered by their IBOR solution.

The IBOR Standards Group expects that the requirements list at this outline level will be a resource to product vendors, service providers and others organising product definitions under comparable headings. It should also be of use to clients in structuring their evaluations of competing products.

Buy-side businesses face a range of position data-related issues, which together define the shape of the IBOR platform, and drive the requirements. While the primary purpose of IBOR is to deliver position data for investment purposes, demands from other business areas are significant too, and the need for consistency is paramount. The requirements documented reflect the combination of these demands.

The core requirement of IBOR is to deliver high quality position data with the content and timeliness required by its users. It must ensure that the users understand the data that they are presented with, know how far they can rely on it, and understand the time that it is aligned / accurate to. To do this, as well as delivering position data, IBOR needs to be aware of the events which affect positions. It needs to work out their impacts, to monitor and track their progress (and their changing level of certainty), and to alert users as position data quality issues arise through the event life-cycles. Therefore, at a basic level, the IBOR requirement is for a data environment and workflow platform for the drivers of position change, and for the positions that result from them.

In this section, the requirements are mapped to their driving issues. The IBOR Standards Group has documented business issues in the expectation that this will provide a resource for asset managers in drawing up a problem statement for position data, and in constructing a business case for investment in IBOR.

The business issues documented are inclusive, and drawn from inputs from multiple investment businesses. The list of issues therefore does not reflect the problems faced by any specific business, but rather is an aggregation of issues reported across the industry. While many of the issues will be recognised by most managers, we expect that that each business will focus particularly on a subset that is most significant to them.

4.1 Scope and Coverage of IBOR

Requirement	Driving Business Issues
4.1.1 Coverage of Position Types and Asset Classes **Core** **IBOR should cover and deliver position data for all material asset classes and position-types, and represent positions, assets and transactions in an authentic fashion, without over-simplification, workarounds or distortion.** Frontier IBOR may support liabilities in addition to assets.	a) The inadequate representation in current systems of more complex instruments and of positions and transactions in those instruments. b) The inadequate representation in current systems of more complex events, and in particular of complex corporate actions, and inadequate representation of the position impact of those events. c) The difficulty of constructing a firm-wide view of risk and counterparty exposure on a timely basis. d) The inability to take a firm-wide view across assets and liabilities, resulting in constraints on the engineering of liability-driven products and inefficiencies in asset / liability hedging.
4.1.2 Ownership / Scope of Positions **Core** **IBOR should fully support conventional fund structures, but also fully represent alternative ownership structures like strategies, desks etc., and allow users to define new ownership structures as required.**	a) The inadequate representation in current systems of strategies, desks and other owners and groupings of positions that are not part of a portfolio hierarchy. b) The difficulty of supporting more complex investment strategies and products because of the poor representation of strategies in current systems, including lack of strategy P&L and performance.

4.2 Position Data Quality Objectives

Requirement	Driving Business Issues
4.2.1 Precision / Timeliness / Consistency of Position Data **Core** **IBOR should deliver complete, timely and consistent position data to investment decision makers and other position data users, such that the data can be treated as the prime record for investment purposes, irrespective of any service provider relationships.**	a) The absence of some key events from position data at start-of-day and intra-day, including some corporate actions, income, injections / withdrawals, in-specie transfers, maturities etc. b) The risk that investment, trading and compliance views may be based on partial or untimely position data, and the resulting dependence on vigilance and local record-keeping to compensate for weaknesses in core data. c) The complexity of outsource projects and transitions between service providers, driven materially from the complex position data and trade data dependencies between the parties.
4.2.2 Certainty of Position Data **Core** **IBOR should deliver position data which fully and accurately reflects what is known at the relevant time, but should give early visibility of drivers whatever their level of certainty, and explicitly identify position data which includes materially uncertain components.**	a) The late visibility of some future position changes, in some cases until they are posted to accounting, leading to uncertainly among users of position data that they are seeing the full picture. b) Uncertainty in cash positions and forecasts, risking under- or over-investment in active funds and risking increased tracking error for passive funds. c) The difficulty of optimising yield enhancement, cash management, collateral management and currency hedging when position data is uncertain or untimely.

4.3 Position Data Quality Management

Requirement	Driving Business Issues
4.3.1 Position Data Quality Workflow **Core** **IBOR should project the position impact and life-cycles of events, and support a strong exception management workflow process, through which the quality of position data can be actively managed and improved.**	a) The absence of any pro-active data quality management / exception management for position data, leading to position data which may be unscreened and of questionable or unknown quality. b) The difficulty of demonstrating robust processes for maintaining position data quality, to the increasingly demanding standards expected by regulators.
4.3.2 Support for Reconciliations **Core** **IBOR should deliver genuinely independent position data extracts suitable for reconciliation with internal and external service provider position reports, and capture unresolved reconciliation breaks.** Frontier IBOR may provide a reconciliations service to match IBOR extracts to position reports from internal and external service providers. Alternatively the client may use its own reconciliations function, in which case integration to IBOR will be required for alerting and data quality measurement purposes.	a) The absence of any effective reconciliation of front office position data with service provider positions, and the inability to monitor the quality of service provider position data without costly shadow record-keeping. b) The unwillingness of service providers to take responsibility for provision of data ahead of trade-processing, and in particular for provision of data to be used in investment decision-making. c) The possible absence of a central reconciliations service in the architectures of potential IBOR clients.
4.3.3 Management of Adjustments **Core** **IBOR should handle adjustments at any point in an event life-cycle promptly, ensuring that consistency is maintained in current and historic position data.**	a) The inability to reflect position adjustments and corrections in front office systems until after the next accounting close and completion of the overnight batch. b) The inconsistencies downstream in marketing, client reporting and performance data caused by adjustments.

Requirement	Driving Business Issues
4.3.4 Management of Alerts **Core** **IBOR should generate alerts for communication to data owners and other stakeholders to ensure that they are aware of data quality issues and unexpected changes / adjustments as they arise.** Frontier IBOR may provide a distribution and management capability for IBOR-generated alerts, and maintain address lists to support this. Alternatively the client may use its own alerting platform to distribute alerts sourced from IBOR.	a) The users being unaware of the quality of position data they are using, and in particular being unaware when that data becomes questionable for any reason. b) The dependence on informal message flows from reconciliations to the front office to alert them to breaks which impact their position data quality. c) The possible absence of a central alerting platform from the architectures of potential IBOR clients.
4.3.5 Measurement of Position Data Quality **Core** **IBOR should provide comprehensive support to the governance of position data and the measurement, monitoring and reporting position data quality.**	a) The absence of clear ownership of, and governance over position data. b) The lack of management information and metrics on position data, such that management has no full or objective view of its quality.

4.4 Definition and Delivery of Position Data Extracts

Requirement	Driving Business Issues
4.4.1 Definability of Position Views **Core** **IBOR should allow the user (or consuming application) to specify the timing, perspective, scope / ownership, status, assumptions and exclusions in the position data that they request, and to define the way in which the data is to be presented and enriched.**	a) The rigidity of position views presented to users which are pre-defined and do not reflect their preferences, reinvestment assumptions, views of near-cash etc. b) The lack of understanding among users of position data of what the positions presented to them do and do not include, of their timing, and of the assumptions on which they are based.
4.4.2 **Extraction of Position Data** **Core** **IBOR should construct position data promptly on request in whatever form the user has specified. This data may be presented as raw quantities, or for enrichment with reference data, calibration and aggregation as required.**	a) The limitations on the form of presentation and enrichment of position data in existing systems. b) The requirement for development to deliver position data in the form required by the users.
4.4.3 **Position Data Delivery to Consuming Applications** **Core** **IBOR should provide a single source of quality-assured position data to consuming systems, on a scheduled, on-demand or constantly refreshed basis. It should support the delivery of position and event data, without dependence on a batch process or on accounting positions.** Frontier IBOR may provide an on-board platform for position views defined as near real-time. Alternatively the client may provide its own platform(s) which will be refreshed from IBOR.	a) The proliferation of position data stores, with multiple versions of the truth, parallel maintenance, sub-optimal use of resources, and the need for complex impact analysis when any component changes. b) The dependence of position records on completion of a complex and fragile batch process, and the consequent difficulty of delivering a reliable front office start of day. c) The inability of some current data architectures to support intra-day, on-demand and constant refresh applications.

Requirement	Driving Business Issues
4.4.4 Enrichment – Valuation / Analytics / Look-Through Frontier IBOR may provide alignment services and source external reference data to enrich IBOR position extracts with pricing, analytics and constituents. Alternatively the client may run enrichment services externally to IBOR.	a) The possible absence of common service platforms from the architectures of potential IBOR clients.
4.4.5 **Aggregation** Frontier IBOR may provide an aggregation service to summarise position data into fund hierarchies, exposure groups etc. Alternatively the client may provide aggregation services through a Data Warehouse, or otherwise externally to IBOR.	a) The possible absence of an aggregation platform / data warehouse in the architectures of potential IBOR clients.
4.4.6 **Delivery of Historic Position Data** **Core** **IBOR should allow users to reconstruct positions for any scenario at any point in time, and should deliver timed snapshots of position data for conventional business intelligence and reporting.** Frontier IBOR may deliver a data warehouse for persistence of historic positions. Alternatively the client may implement an external data warehouse, and use IBOR to generate the position snapshots that are persisted in the warehouse.	a) The limitations on the ability to recall historic positions and transactions for the purposes of management information, business intelligence, compliance / regulatory investigations and litigation. b) The inability to deliver position data to the granularity increasingly demanded by regulators, without complex development and / or manual intervention. c) The possible absence of a data warehouse for the persistence of historic position data in the architectures of potential IBOR clients.
4.4.7 **Delivery of Event Data** Frontier IBOR may offer a service to deliver event data alongside position data to consuming applications and requesting users. Alternatively the client may deliver event data, where required, from its primary transaction processing systems.	a) The absence of any central source of event data for downstream systems across all transaction types, leading to complex system dependencies and conflicting views of the truth. b) The absence of any core system source of event data for some low frequency events, like underwritings and class action proceeds.

Requirement	Driving Business Issues
4.4.8 **Integration** Frontier IBOR may deliver an integration and distribution service to manage messages inbound to IBOR and to deliver position / event extracts outbound from IBOR. Alternatively this service may be provided by the client's own integration architecture.	a) The possible absence of a transformation / distribution platform from the architectures of potential IBOR clients.

4.5 Value-Add Services

Requirement	Driving Business Issues
4.5.1 Maintenance / Reconstruction of Book Costs / Lots / Positional P&L Frontier IBOR may support the maintenance or reconstruction of book costs, and deliver positional P&L from IBOR event data. Alternatively the client may rely on its own accounting services for book costs positional P&L.	a) The exposure of front office data, and in particular of position data and positional P&L, to data issues or downtime at the service provider. b) The lack of protection for front office investment operations from service provider failure, because of the absence of in-house prime position records (per 'Dear CEO' letter).
4.5.2 Aggregation of Commissions and Taxes Frontier IBOR may support the aggregation of historic commissions and taxes data from IBOR driver history.	a) The difficulty of extracting complete commissions and taxes history from trading systems, trade processing systems and accounting systems

4.6 Administration, Performance and Scalability

Requirement	Driving Business Issues
4.6.1 **Initial Take-On of Positions / In-Specie Transfers / Restructurings** **Core** **IBOR should provide strong automated support to the initial take-on of positions, to in-specie transfers and to fund restructures, and present their position impacts promptly.**	a) The need for provable integrity in the starting position for any transition or take-on. b) The late visibility of position changes resulting from injections, withdrawals, in-specie transfers and fund restructures. c) The inaccuracies in performance measurement and reporting over the time that it takes to process transfers and restructures through into position records.
4.6.2 **Provision for Manual Interaction** **Core** **IBOR should allow users to enter event data manually, deliver a console for visibility into the IBOR workflow, and provide a dashboard for the visualisation of data quality.**	a) The lack of core system support to some drivers of position change, leading to off-line record keeping for certain transaction types. b) The absence of any central location where all transaction types can be tracked, leading to the need to access multiple separate systems to monitor life-cycle status.
4.6.3 **Maintenance of Reference Data** **Core** **IBOR should provide facilities through the console for the maintenance of internal IBOR reference data.** Frontier IBOR may provide facilities through the console for maintenance of a fund hierarchy, exposure groups and other external reference data required by IBOR. Alternatively the client may maintain these externally and import the data required into IBOR. IBOR may maintain time-series of reference data to support the reconstruction of as-of positions. Alternatively the client may manage and deliver historic reference data externally to IBOR.	a) Internal application requirement.

Requirement	Driving Business Issues
4.6.4 **Security and Audit** **Core** **IBOR should provide robust facilities for application management, audit / control, recovery, and permissioning / entitlement to data.**	a) Internal application requirement.
4.6.5 **Support for Business Scalability / Complexity** **Core** **IBOR should support complex, global business models with multiple time zones and multiple service providers, and facilitate the growth and development of the client's assets and products.**	a) The difficulty of supporting multiple starts of day in global operations with multiple time-zones. b) The difficulty of maintaining multiple relationships with service providers with different operating models and service levels, and aggregating position data with different formats, timings and semantics. c) The need to actively reduce the risk of position error as instrument complexity, position size, trading volume and fund values grow, and the consequences of error therefore grow too.

5 IBOR Requirements – Summary Level

This section sets out a fuller consensus view of the requirements of an IBOR / central position platform. The section headings reflect the outline requirements and headings from Section 4 above, and the categorisation into core and frontier requirements is again based on the categorisation of IBOR services in Section 3 above.

The IBOR Standards Group expects that the requirements list at this summary level will be a resource to potential IBOR clients, by providing a starting point and checklist for their own requirements analyses. It will also be of value to product vendors and service providers, by articulating market expectations of an IBOR product at a more granular level.

5.1 Scope and Coverage of IBOR

Requirement
5.1.1 Coverage of Position Types and Asset Classes **Core** • Position data should be maintained and delivered by IBOR, covering all asset classes including cash, physical stock, fixed income instruments, property, derivative contracts and structures. • IBOR should capture terms and conditions data from external sources to support the assets covered. • Events and event life-cycles should be represented fully and without distortion, even where the underlying instrument is complex. • IBOR should represent assets and position types in an authentic fashion, including long / short positions, baskets, fund holdings, indices and encumbrances. • The impacts of each event and position-driver should be computed in a complete and timely fashion, even where the event is complex (e.g. corporate actions, maturities, in-specie transfers, underwritings). Frontier • IBOR could be extended from asset positions and asset classes into the representation of liability positions and liability classes. • IBOR templates could be extended to cover liability events and life-cycles.
5.1.2 Ownership / Scope of Positions **Core** • IBOR should represent the ownership of assets by funds within a fund hierarchy, and ensure that the integrity of the ownership is maintained. • IBOR should represent further structures of ownership of assets, covering at least strategies across funds, desks, business units and asset classes. • IBOR should allow new ownership structures to be defined by the user, based on existing reference data or manual maintenance.

5.2 Position Data Quality Objectives

Requirement
5.2.1 Precision / Timeliness / Consistency of Position Data **Core** • The positions delivered by IBOR should be of sufficient quality and completeness that they can be depended on by, and treated as prime records for the front office. • There should be no need to patch gaps in position data, through workarounds and position spreadsheets maintained by data owners and users. • All relevant, material events which will have an impact on asset and cash positions should be captured in a timely fashion and taken account of in IBOR, including any transaction-related charges and taxes. • The positions extracted from IBOR should reflect the impact of all known material drivers of position change, up to a selected date / time, and all position views should reflect the same underlying data on the drivers of position change. • Position data delivery should not be dependent on the completion of a batch process, or suffer any other systemic delay, excepting any requirement for pre-delivery reconciliations. • The view of events in IBOR should be consistent with the views of events managed in business processing systems, so that IBOR does not become just another competing view of the truth.
5.2.2 Certainty of Position Data **Core** • Each position-driver should be tracked through its life-cycle by IBOR, as its impact becomes more certain. • IBOR should distinguish at least between transactions in a physical / settled state, those in an unsettled state, but which are contractual obligations, those which are non-contractual commitments and those which are uncommitted estimates or intentions, like forecast dividends or unfilled orders. • IBOR should be able to include the impact of transactions at any stage of processing, including estimated or anticipated events, which may never crystallise into real transactions. • IBOR should support multiple versions and sources of estimates (including manually-entered estimates), should allow users to choose the estimates they use, and should make estimates private or public at the option of the owner. • When IBOR extracts position data, it should include drivers status(es) specified by the user, and allow the user to understand very clearly the level of certainty of the transactions / drivers included in the position data.

5.3 Position Data Quality Management

Requirement
5.3.1 Position Data Quality Workflow **Core** • For each event / instrument type combination in each status, IBOR should have a defined source, which may be business transaction processing systems, market data, or manual. • IBOR should be capable of capturing event data from the relevant sources when that data first becomes available, so that the impact of the events can be reflected promptly in IBOR. • For each event, the appropriate IBOR position-drivers should be generated and their life-cycles projected, taking account of instrument terms and conditions. • IBOR should maintain and validate tolerances, defining acceptable deltas between expectations of transaction data and the position-driver data actually captured. • Updates should be captured from the relevant business transaction processing systems, market data systems and manual sources to trigger state transitions within IBOR; • State transition triggers should be defined for each event type / instrument type combination, and should be selectable based on reference data. • Triggers should be matched to the driver in its previous state, and their relationships should be maintained, even where this is many-to-one, one-to-many or many-to-many. • IBOR should validate that each state transition is within tolerance, and where anomalies are identified, then IBOR should suspend the driver life-cycle and hold the state transition. • IBOR should enforce that the resolution of anomalies, and any amendments of data which result from that resolution, should adhere to pre-defined workflow controls, such as 4-eyes validation and recorded sign-offs. • Once anomalies are resolved then IBOR should capture the correct driver data and permit the transition of status to continue.

Requirement
5.3.2 Support for Reconciliations **Core** • IBOR should provide position data to support regular reconciliation of IBOR positions with position reports from custodians, accounting service providers, clearing brokers, market clearing utilities etc. • The targets for and frequency of reconciliations should be dictated by the IBOR client's reconciliation / control framework. • Reconciliations should be genuinely independent, so position data from IBOR should be constructed without a dependency on broker, accounting or custodian position data. • Position data extracts for reconciliation should be aligned with the timings and statuses of the target reports, and aligned to reference data appropriate to the target reports. • IBOR should deliver position data at a level of quality suitable for reconciliation such that it does not generate any material level of systemic breaks. Frontier • IBOR could match IBOR position extracts with external position reports. • Where reconciliation breaks occur, IBOR could provide facilities to track their resolution. • IBOR could maintain tolerances for reconciliation matching purposes. • IBOR could maintain consistency between the tolerances used for IBOR exception-management and those used for reconciliation matching.
5.3.3 Management of Adjustments **Core** • IBOR should apply adjustments and corrections to position-driver data as soon as IBOR anomalies or reconciliation breaks are resolved. • IBOR should maintain the consistency of historic driver data, by including late adjustments in its own driver history. • IBOR should maintain the consistency of historic position data, by generating an updated extract to a data warehouse when a late adjustment is applied.

Requirement
5.3.4 Management of Alerts **Core** • Where an anomaly or unresolved reconciliation break is identified, IBOR should generate alerts to data owners / stakeholders to make them aware that position data quality is questionable, and to Data Management to trigger investigations. • IBOR should generate clearing alerts to relevant data owners and other stakeholders when the quality of their position data is no longer in question. • IBOR should generate position change alerts to relevant data owners when unexpected adjustments are made to position-driver data which will impact their positions. • IBOR-generated alerts should be capable of routing to the client's issue-management or distribution systems. Frontier • IBOR could distribute alerts to relevant data owners and other stakeholders, including by email, text, and interaction with live applications. • IBOR could maintain contact lists to facilitate alert distribution. • IBOR could provide facilities to screen and filter alert traffic, to avoid over-provision of unwanted information and to allow users to specify alert preferences.
5.3.5 Measurement of Position Data Quality **Core** • IBOR should record trends over time in position and event data quality, and present these to Data Management, data owners and stakeholders. • Metrics should be computed for the levels of reconciliation breaks, IBOR-trapped anomalies, adjustments and times to resolution. • The level of breaks and anomalies attributable to internal and external service providers should be analysable.

5.4 Definition and Delivery of Position Data Extracts

Requirement
5.4.1 Definability of Position Views **Core** • When a user defines an IBOR extract scenario it should be persisted and made available for future reuse. • IBOR should allow the user to specify the date / time up to which transaction data is included in an extract. • IBOR should allow the user to select the perspective of a position extract, which may be a snapshot as at the selected driver date / time, an as-of reconstruction to an earlier point in time or a forecast over some future time. • IBOR should allow the user to specify the group(s) of assets for which they wish to extract positions, including funds, fund groups, strategies, desks, business units, instrument types etc. • The user should be able to select the status or statuses of the position drivers used to construct a position extract. • For certain consuming applications, the positions presented may be a combination of statuses, depending on the directionality of transactions: for example, to create a worst case for compliance, it should be possible to combine estimated / ordered buys with committed / traded sells. • It should be possible to include or exclude drivers from an IBOR position extract, at the option of the user. • Reconstructions based on data up to a specified point in history should also be available as snapshots, forecasts or as-of positions, based on the known data at the specified time. • IBOR forecasts should be definable for cash and / or non-cash assets, and for any time period or frequency within an overall time period (e.g. a six month forecast including each intervening month end). • Definitions of future event assumptions to be used in IBOR forecasts should be individualised, including assumptions on reinvestments, rollovers, corporate actions elections, projected trades or moves in pricing or other reference data. • Definitions of cash and currency for position extracts should be individualised, and may include single cash accounts, multiple accounts associated with a fund or fund group, user-defined cash-equivalents, and user-defined currencies.

Requirement
5.4.2 **Extraction of Position Data** **Core** • Positions should be extractable by IBOR in close to real-time and should be capable of including the impact of position driver data up to the most recently captured or projected. • Extracts should be constructed in accordance with the scenario defined by the user, and that scenario should be clearly identified to the user. • Position extracts should be accompanied by a clear definition of the timing, perspective, scope, status, assumptions and exclusions in the data presented. • IBOR should deliver position data to users in the medium that they require, including through the IBOR console, mobile media, physical reports, automated delivery and through routing of positions and / or position deltas to a real-time position data mart. • Extracts should be schedulable automatically to support routine reporting.
5.4.3 **Position Data Delivery to Consuming Applications** **Core** • IBOR should deliver position data at intervals defined by the needs of the consuming applications, including end-of-day position loads, start-of-day position loads, multiple intra-day position updates and near real-time positions for systems requiring constant-refresh. • Extracts from IBOR should be schedulable automatically to support routine delivery to consuming applications. • IBOR should integrate position delivery with the client's integration architecture, delivering position data to known locations for onward delivery to consuming applications, as specified by the client. • IBOR should deliver position data to a data warehouse in whatever form and at whatever frequency is demanded by users of the warehouse. Frontier • IBOR could provide real-time marts / data platforms to allow user / application access to position data views maintained in near real-time. • Real-time marts should be available maintained both from updates of IBOR position data extracts and through deltas sourced from IBOR. • Every IBOR extract definition should be capable of delivery through a real-time mart. • The triggers available for update should include specified time-interval, on-change and on-request.

Requirement
5.4.4 Enrichment – Valuation / Analytics / Look-Through Frontier • IBOR could deliver position data enriched with reference data and calibrated in accordance with the specification of the user. • IBOR could provide an alignment / computation service to enrich IBOR position extracts with pricing / price-model data to produce valuations. • IBOR could provide an alignment service to enrich IBOR position extracts with analytic data. • IBOR could provide an alignment service for fund constituent and benchmark data, to deliver position extracts including look-throughs. • Where IBOR provides look-throughs, IBOR itself should be the source of internal fund constituents.
5.4.5 **Aggregation** Frontier • IBOR could provide an aggregation service to summarise and group IBOR position data extracts. • IBOR could deliver position extracts expressed as percentages / contributions to exposure or as groupings of exposures. • IBOR could provide a capability to aggregate up a defined fund structure or other structured ownership grouping.

Requirement
5.4.6 **Delivery of Historic Position Data** **Core** • IBOR should deliver scheduled position data extracts for use in business intelligence applications and downstream applications. • IBOR should provide for more granular reconstructions that cannot be accomplished with position data persisted externally to IBOR, including snapshots, as-of positions or forecasts based on data up to any specified point in time. • To facilitate reconstruction, each IBOR event, driver version and status change should be retained, even if drivers are rolled-up or otherwise optimised for performance purposes. • IBOR should provide users with access to transaction history, reflecting the stages in the IBOR life-cycle (for native life-cycle history, users will be dependent on the history stored in the native business transaction systems). Frontier • A data warehouse for the persistence of historic position data could be provided as part of the IBOR platform. • IBOR could allow the user to specify both the extract scenarios to persist and the frequency with which they are delivered to the warehouse. • IBOR could maintain the consistency of the warehouse history when adjustments are received by IBOR.
5.4.7 **Delivery of Event Data** Frontier • IBOR could provide a request service for event data and deliver event data extracts. • Event data could be requested by users through the console, or by consuming applications. • Filtering of IBOR event extracts could include status, date range, ownership, message type (i.e. ab-initio / status change / adjustment) and quality (i.e. alert-generating / not alert-generating). • Event extracts could be defined relative to extracted positions – i.e. event data could be requested that is relevant to a position or set of positions, or to the delta between two positions. • Event extracts could be defined as generated on change – i.e. as soon as a change takes place which impacts a specified position, then the defined event data should be delivered.

Requirement
5.4.8 **Integration** Frontier • IBOR could retrieve event messages from source systems, transform these into IBOR-standard message formats, and deliver them. • IBOR could transform IBOR position / event data extracts into formats required by consuming applications. • IBOR could store IBOR extracts, route them to multiple defined locations and schedule their delivery to consuming applications. • IBOR could maintain an audit trail of the sources of event messages and the usage of position / event data extracts.

5.5 Value-Add Services

Requirement
5.5.1 Maintenance / Reconstruction of Book Costs / Lots / Positional P&L Frontier • IBOR position extracts could be deliverable enriched with book-costs based on IBOR event data. • In deriving book-costs from driver data, IBOR could allow the user to specify the accounting method, including Average Cost / Pooling, FIFO, LIFO, Highest Cost First, Lowest Cost First and Specific Lot Selection. • Positional P&L could be deliverable on a realised and unrealised basis, but not including any allocations of central costs, depreciation etc.
5.5.2 Aggregation of Commissions and Taxes Frontier • IBOR could deliver a capability to aggregate commissions and taxes from IBOR driver history. • Commissions and taxes aggregation could be filtered by attribute, including date / time range, ownership group and counterparty.

5.6 Administration, Performance and Scalability

Requirement
5.6.1 **Initial Take-On of Positions / In-Specie Transfers / Restructurings** **Core** • IBOR should deliver automated support to the initial take-on and integrity checking of IBOR positions, including both the generation of an IBOR starting point, and reconciliation. • IBOR should provide the same facilities to support in-specie transfers. • Where funds are restructured, IBOR should provide automation to streamline the transfer of asset ownership from one fund / fund group to another.
5.6.2 **Provision for Manual Interaction** **Core** • IBOR should provide facilities for the manual capture and / or amendment of events and event life-cycle data. • Where events are set up manually, then state changes and adjustments should be capable of manual capture. • Users should be able to access IBOR position extracts, events and life-cycle data via printed reports and through a console, which will support drill-down into event data. • An IBOR dashboard should provide visibility of exceptions and alerts, provide metrics on position data quality, display trends of data quality over time and deliver analyses of exception rates, error patterns and hotspots. • IBOR should maintain user-specified data quality targets, and where data quality falls below these, exception reports should be produced and delivered to the relevant data owners and to management. • IBOR data quality monitoring should include the attribution of data issues to external parties (including data- and service-providers), and the measurement of the data quality delivered and maintained by such parties. • IBOR should provide facilities to compare actual to projected state changes for any two points in time, and to back-test forecasts to identify the factors that led to inaccuracy.

Requirement
5.6.3 **Maintenance of Reference Data** **Core** • IBOR should provide facilities for the manual maintenance of IBOR reference data, including position extract scenarios, life-cycle projection templates and ownership relationships. Frontier • IBOR could provide a maintenance facility for fund and fund hierarchy data. • IBOR could verify that all assets are owned by a single fund at the bottom level of the fund structure. • IBOR could provide a maintenance facility for ownership groups outside the fund hierarchy. • IBOR could provide a maintenance facility for exposure groups. • To facilitate historic reconstructions of positions, a time-series of reference data could be retained alongside the IBOR driver history. • IBOR could provide users with visibility of historic reference data and an ability to select specific data to align to their extracts. • IBOR could select appropriate versions of reference data to enrich position extracts, using user-specified data, or data which best matches the selected date and time of the extract.
5.6.4 **Security and Audit** **Core** • IBOR should have robust application management facilities and controls, including a security, permissioning and access control layer to industry standards. • IBOR should maintain audit trails of access and extract requests and amendments to reference data, event data and subscriptions. • IBOR should persist restore points of known quality, and provide the facility to recover to a specified restore point.
5.6.5 **Support for Business Scalability / Complexity** **Core** • New event types and instruments should be capable of being accommodated in IBOR without material development. • IBOR should support global operations, including multiple management locations, multiple operational hubs and multiple time-zones. • IBOR should support complex business models, including multiple operating models, multiple Service Providers / Third Party Administrators and multiple Custodians. • IBOR should adhere to emerging IBOR standards, in order to accelerate and de-risk transitions between service providers and facilitate switching between different IBOR products.