



ASSET SERVICING

Asset Servicing Digital Update

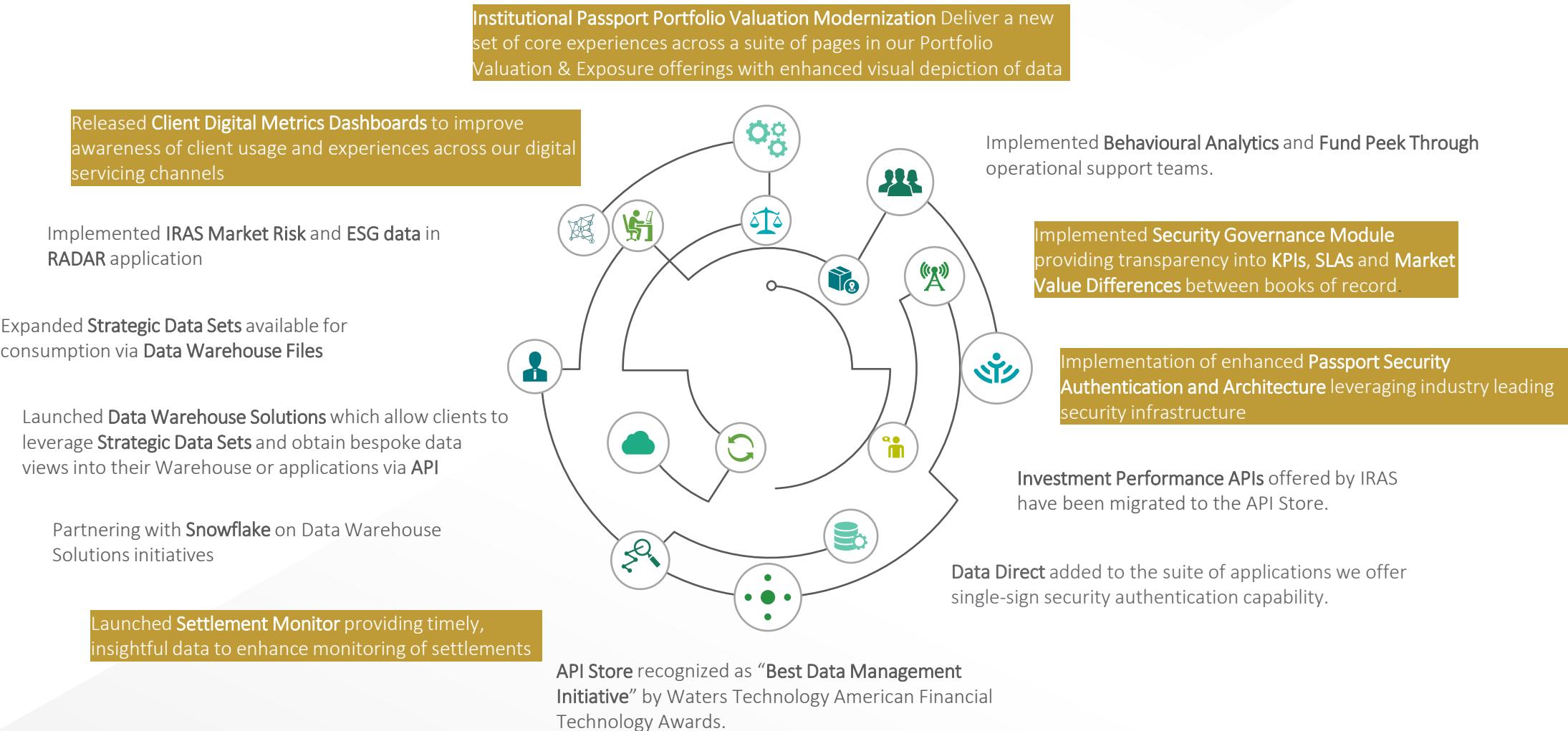
Q1 2023

APRIL 2023



Execution in Action for 2023 – Data and Digital Execution Focus

Enhancing the overall client experience with the evolution of our digital ecosystem



Our Digital Tenets

Enhanced Efficiency - Shortening the time from need to fulfillment. Designing a simple and intuitive user interface.

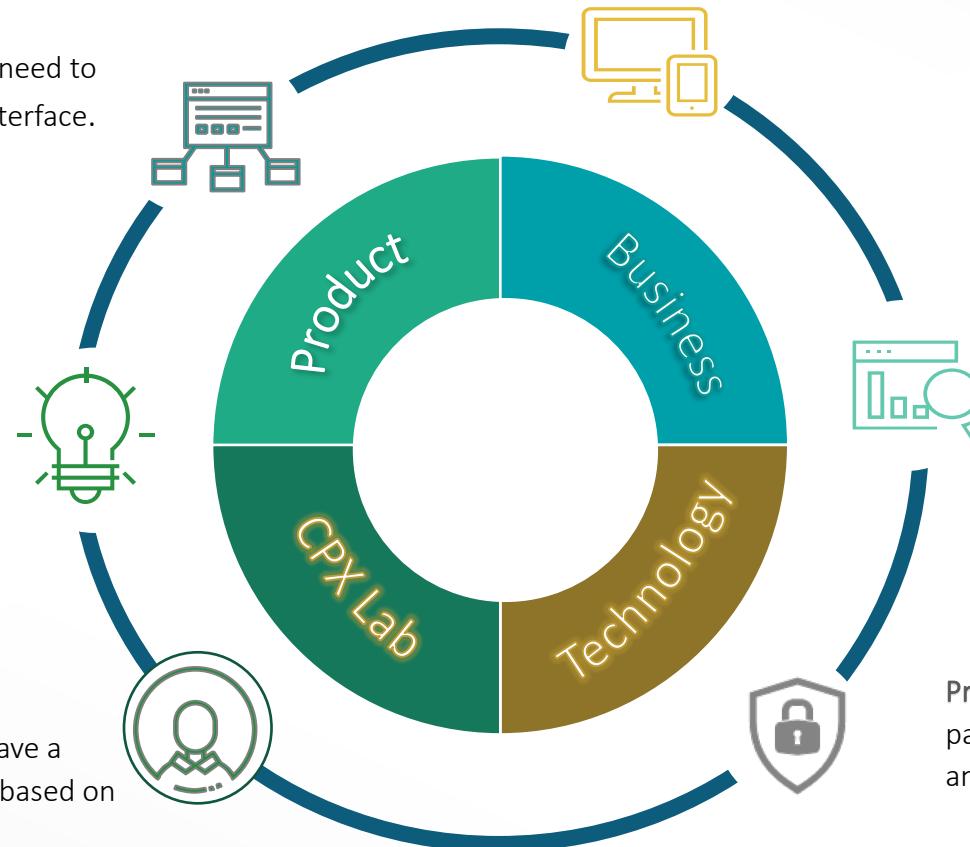
Knowledge from Numbers - Using technology to tailor the data tsunami, making it relevant, and providing depth on demand only when needed

Client Centric Solutions - Ensuring solutions have a view from the outside in, providing solutions based on client business needs and objectives

Access Anywhere - Providing multi channel data solutions across web applications, mobile and APIs to deliver a flexible and consistent client experience.

Analytical Awareness - A new generation of customizable digital tools that personalize experiences, optimizes data and allows the freedom to focus on what really matters.

Privacy & Security - Data privacy concerns are paramount. We continue to strengthen our privacy and security.



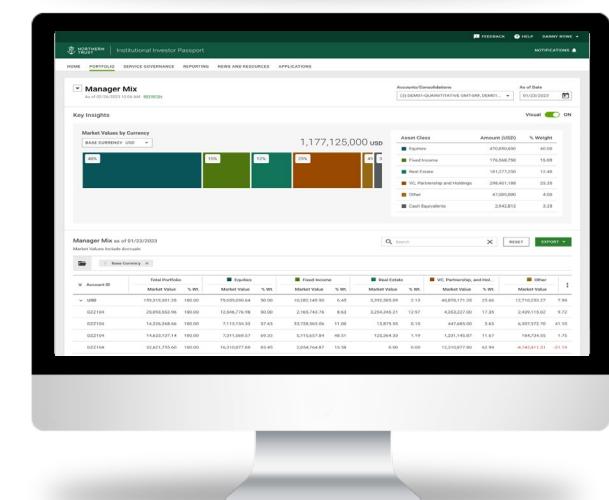
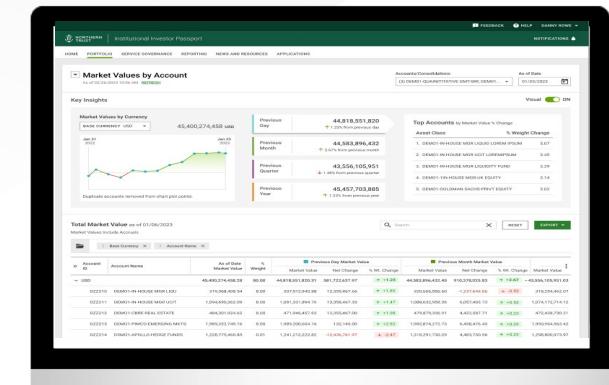
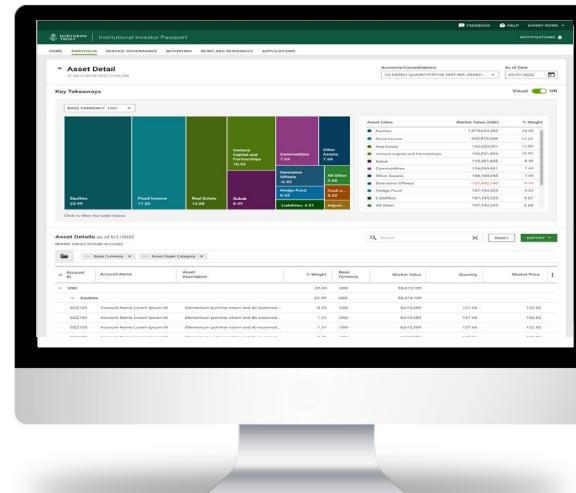
Institutional Investor Passport

New Portfolio Valuation Pages

Delivering digital solutions to support core client decisions

Key Features

- New digital interface designed to promote portfolio insights through improved visualization of data
- Leverages NT Human Centered Design approach to provide a modernized, interactive client experience
- Flexibility to customize data layout and group content according to user preference
- Filters and sorting simplify interaction with account data
- Supports both single account and consolidated views
- New responsive design provides flexibility to view in desktop, tablet and mobile experiences
- Accessibility compliant user interface

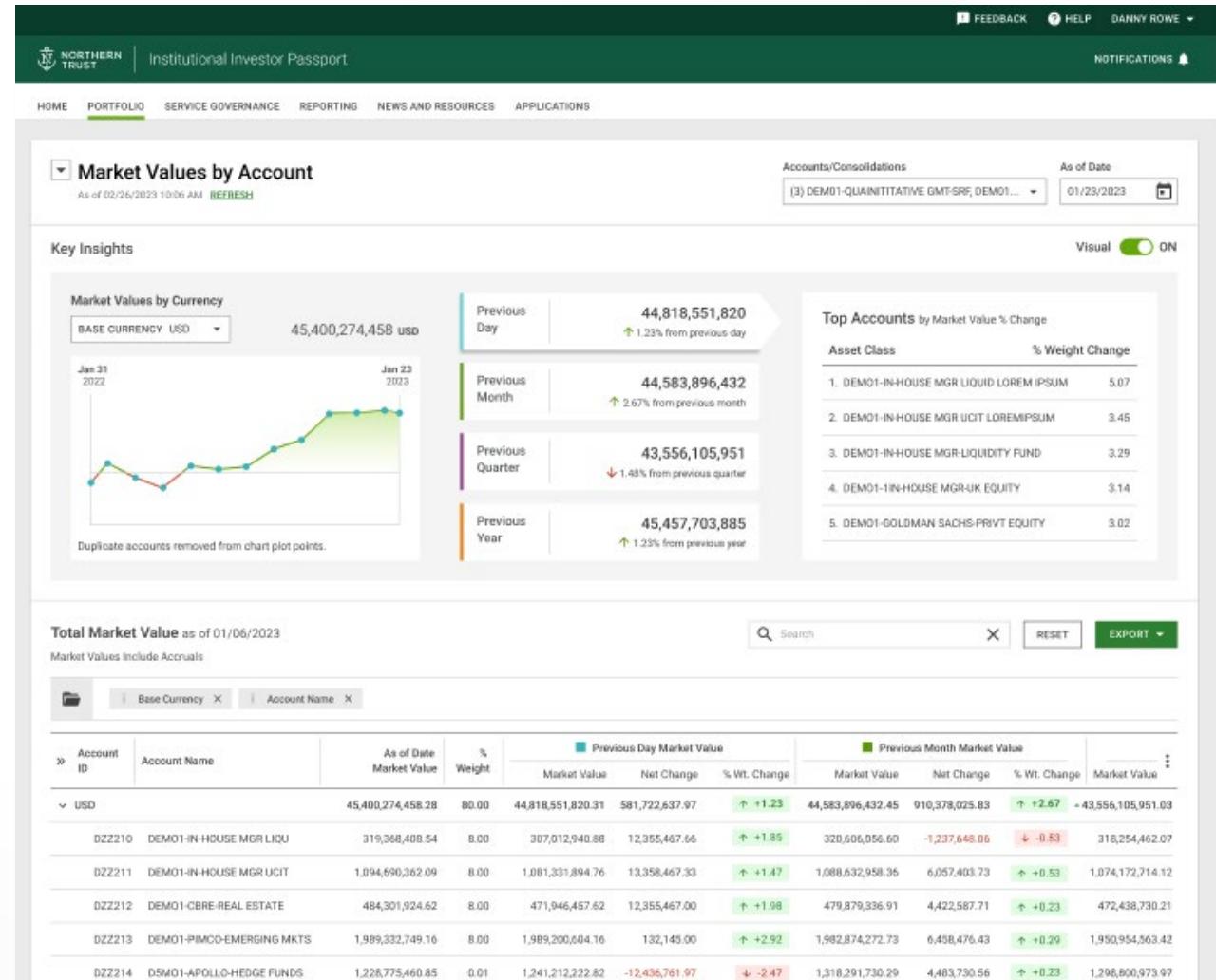


Portfolio Valuation – Market Values by Account

Delivering digital solutions to support core client decisions

Key Features

- Depicts breakdown of accounting-based valuations
- Charting represents breakdown of market value comparisons to previous time periods by selected base currency
- Table data includes
 - As of Date Market Value
 - Weight
 - Net Change
 - Percent Change
- View across various base currencies when multiple accounts are selected

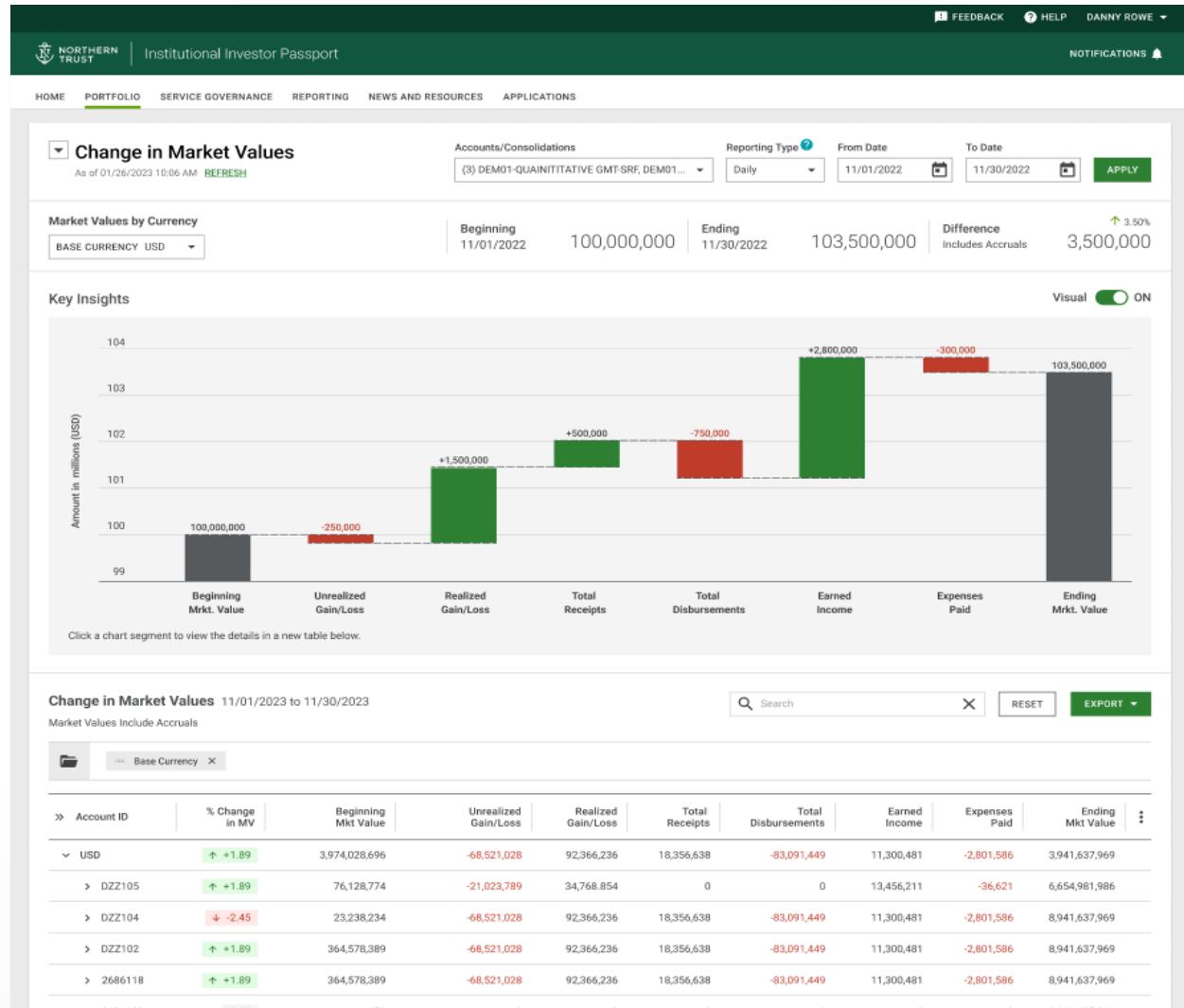


Portfolio Valuation – Change in Market Values

Delivering digital solutions to support core client decisions

Key Features

- Depicts breakdown of accounting-based investment valuations
 - Component data includes
 - ✓ Beginning/Ending Market Values
 - ✓ Unrealized Gains/Losses
 - ✓ Realized Gains/Losses
 - ✓ Total Receipts
 - ✓ Total Disbursements
 - ✓ Earned Income
 - ✓ Expenses Paid
 - ✓ User defined period of concentration provides flexibility to analyze across custom dates
- User defined period of concentration provides flexibility to analyze across custom dates
- View across various base currencies when multiple accounts are selected
- Future phase would introduce new APIs that provide enhanced drill down

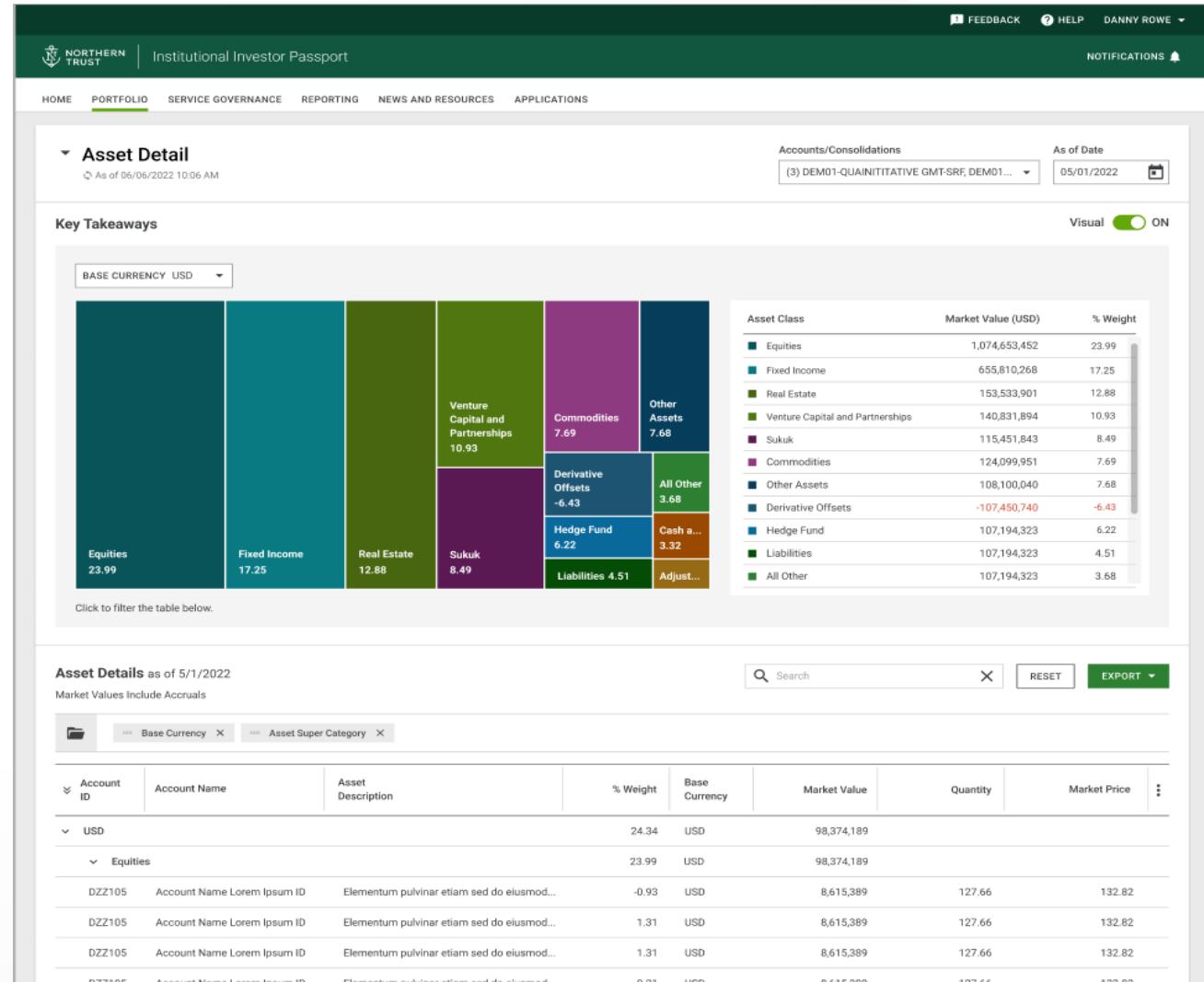


Portfolio Valuation – Asset Detail

Delivering digital solutions to support core client decisions

Key Features

- Tree map view of exposure across asset classes
- Component data includes
 - ✓ Asset Description
 - ✓ Quantity
 - ✓ Ending Market Values
 - ✓ Percent Weight
 - ✓ Unrealized Gains/Losses
 - ✓ Cost
 - ✓ Asset Super Category
 - ✓ Asset Sub-Category
- View across various base currencies when multiple accounts are selected.

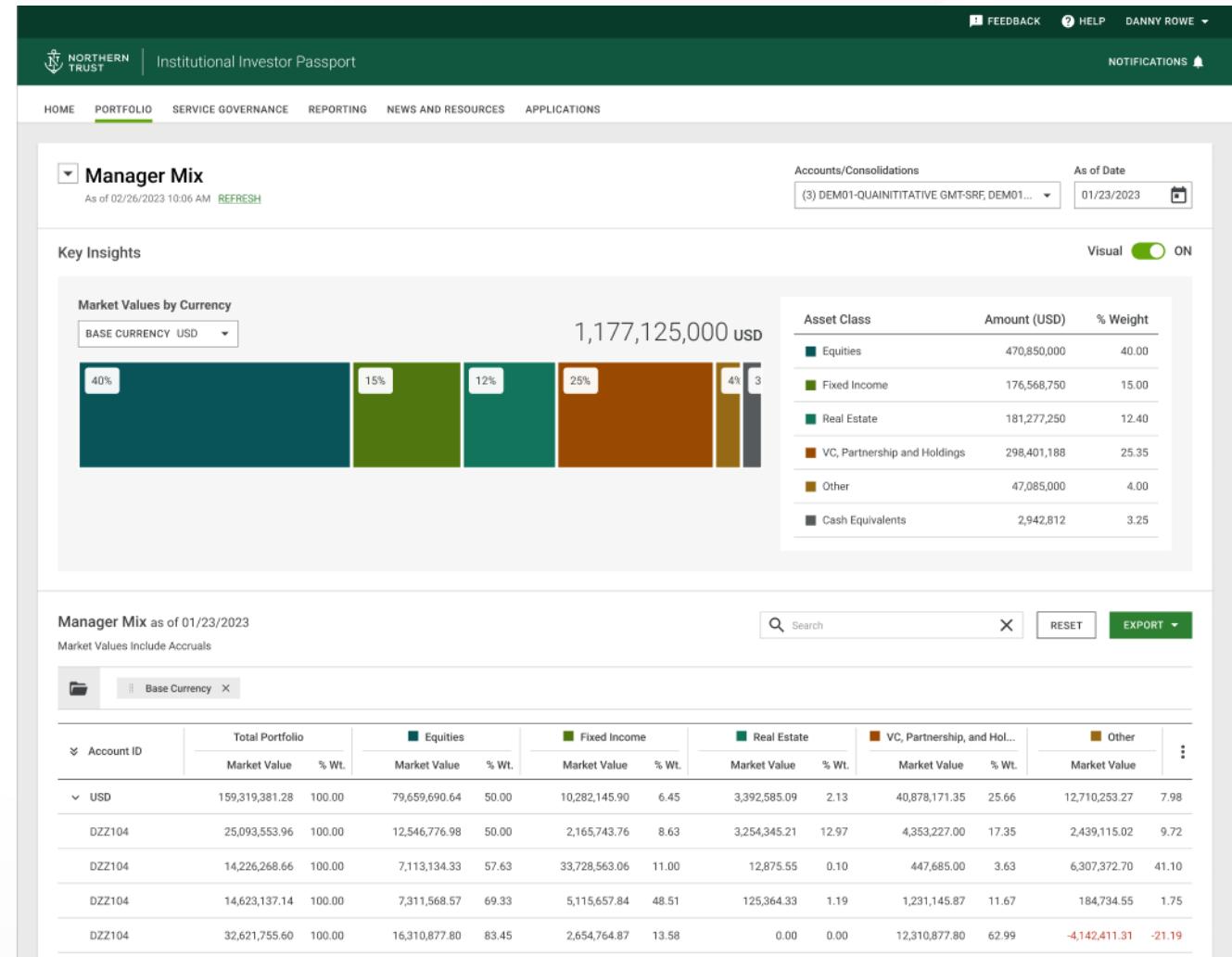


Portfolio Valuation – Manager Mix

Delivering digital solutions to support core client decisions

Key Features

- Horizontal Bar Chart view of exposure across asset classes
- Component data includes:
 - Ending Market Values
 - % Weight
 - ✓ Total Portfolio
 - ✓ Equities
 - ✓ Fixed Income
 - ✓ Real Estate
 - ✓ VC, Partnerships & Hedge Funds
 - ✓ Cash Equivalents
 - ✓ Other
- View across various base currencies when multiple accounts are selected various base currencies when multiple accounts are selected

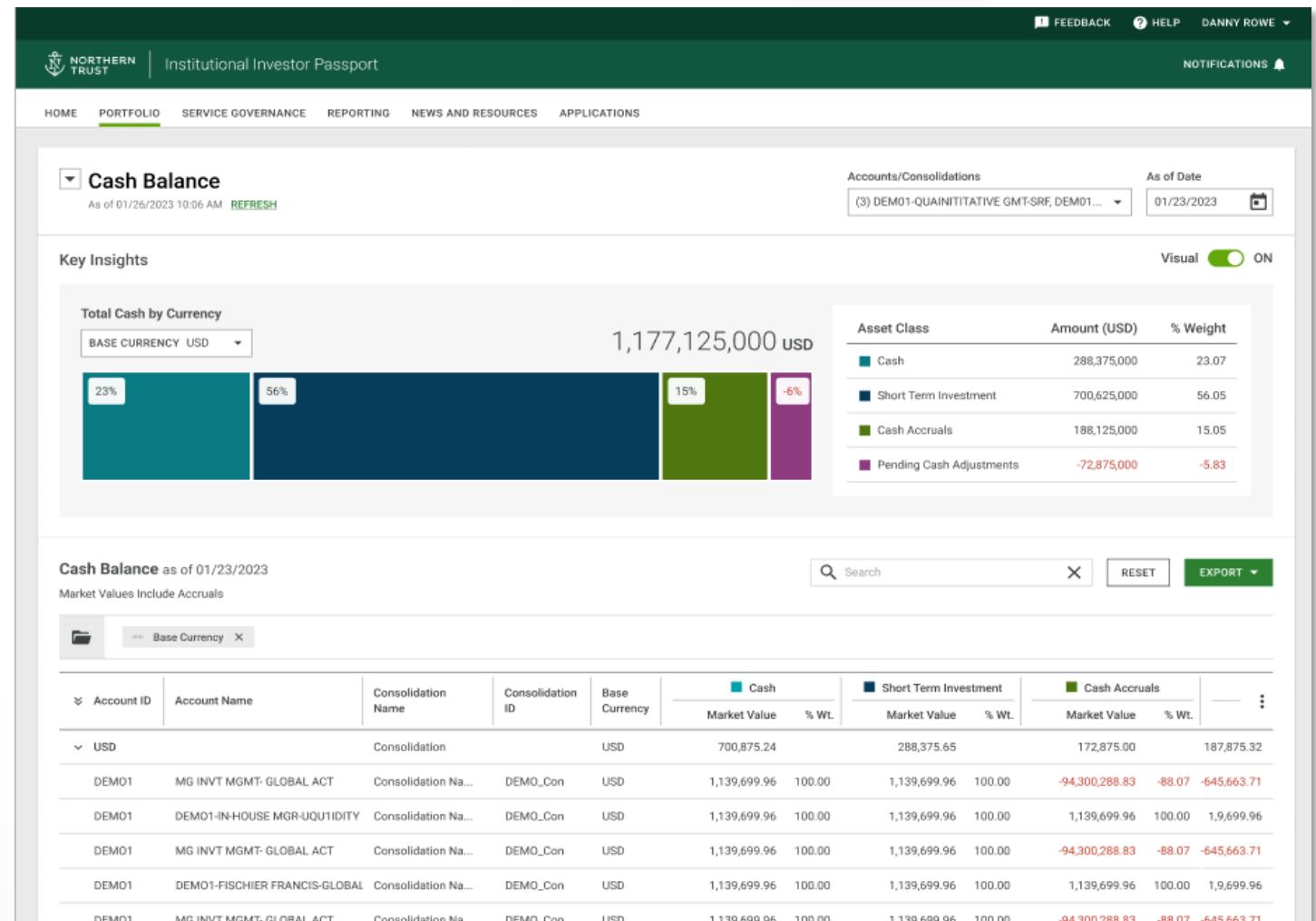


Portfolio Valuation – Cash Balance

Delivering digital solutions to support core client decisions

Key Features

- Horizontal Bar Chart view of exposure across cash categories
- Component data includes
 - Ending Market Values
 - % Weight
 - ✓ Total Cash
 - ✓ Cash
 - ✓ Short Term Investments
 - ✓ Pending Cash Adjustments
 - ✓ Cash Accruals
- View across various base currencies when multiple accounts are selected

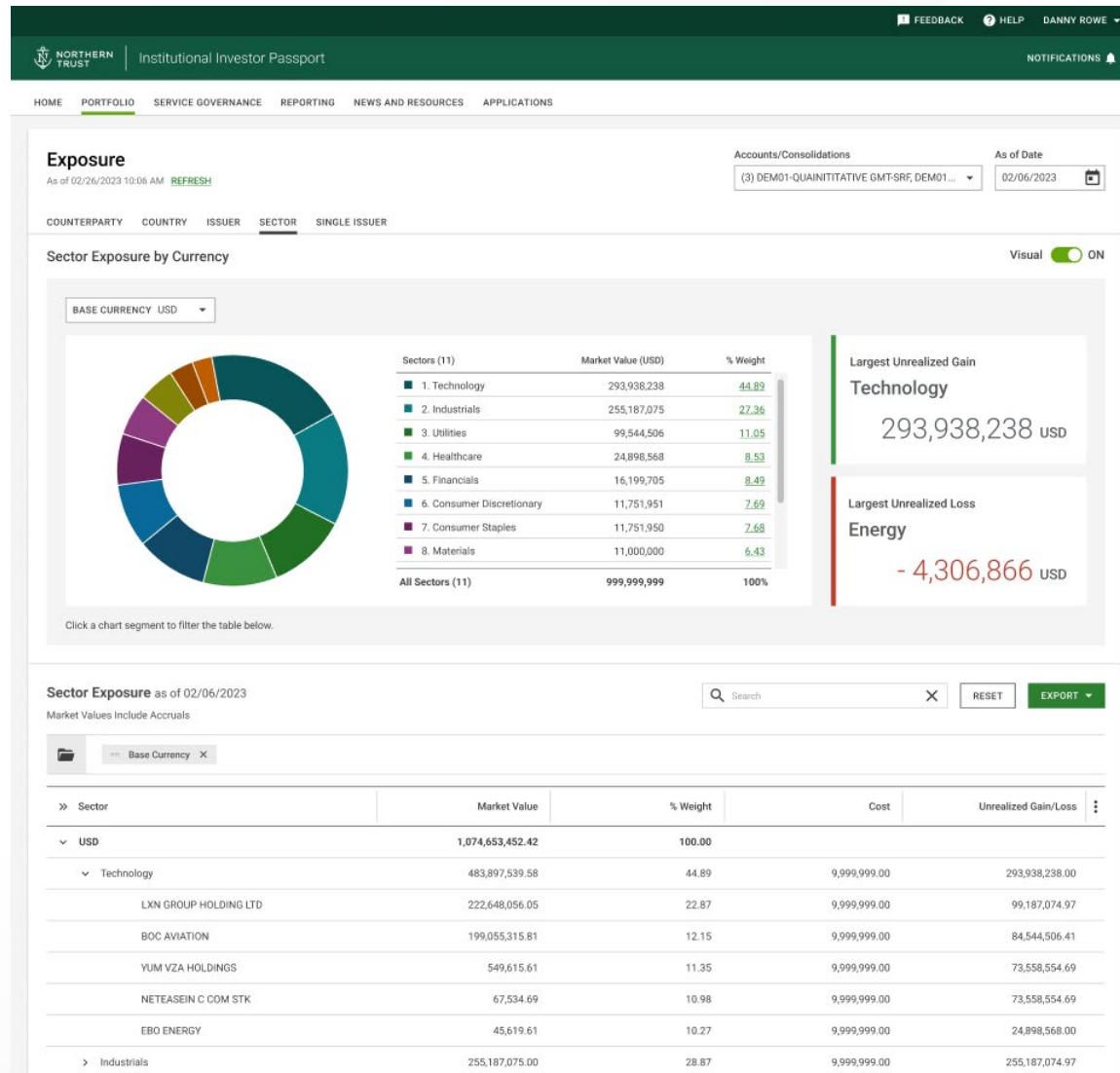


Portfolio Valuation – Sector Exposure

Delivering digital solutions to support core client decisions

Key Features

- Exposure views across Sector, Countries, Issuers and Counterparties
- Can be viewed across a single account or multiple accounts/consolidations
- Visual Cards easily identify asset class with Largest Unrealized Gain / Loss
- Content is exportable to Excel

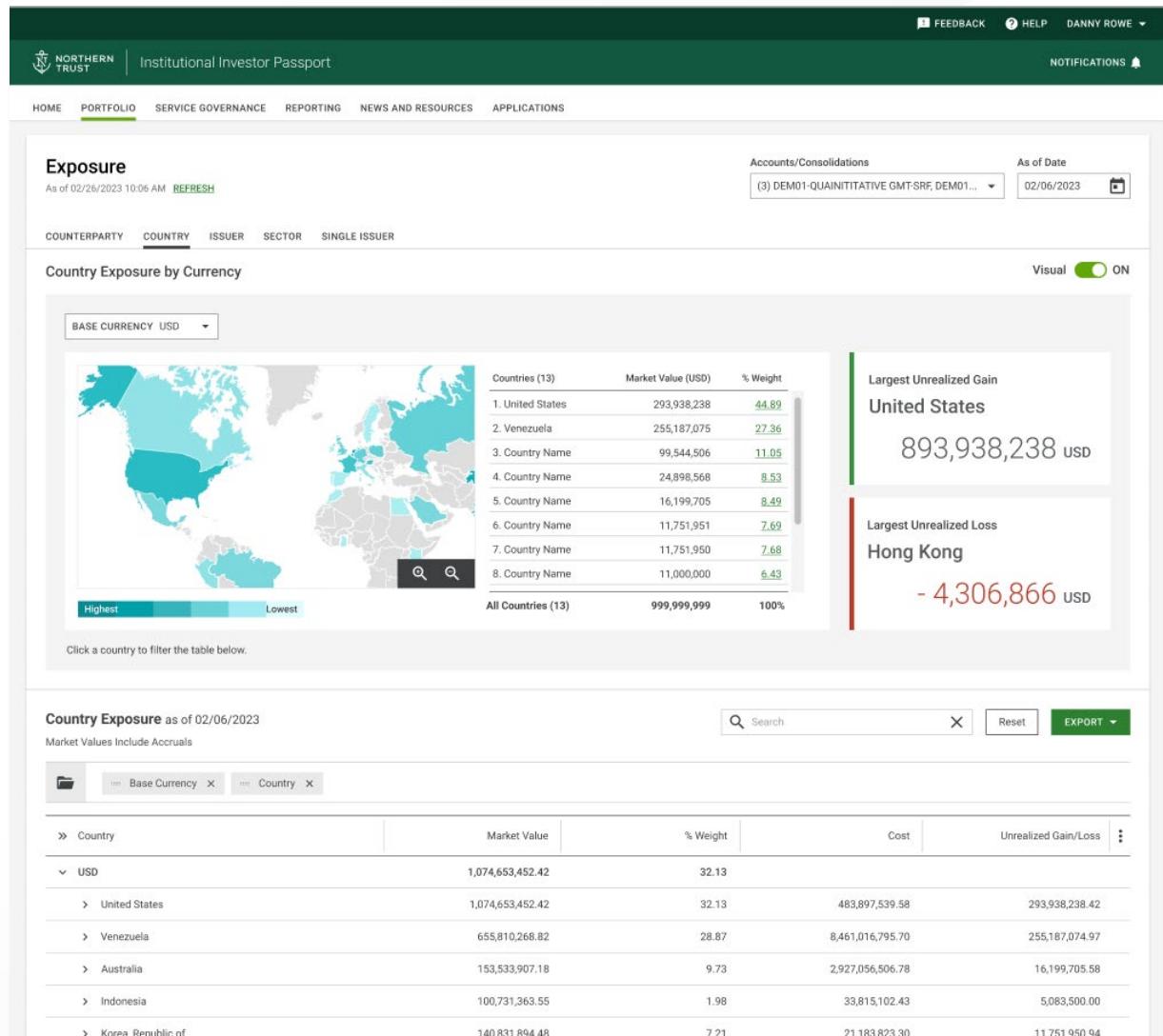


Portfolio Valuation – Country Exposure

Delivering digital solutions to support core client decisions

Key Features

- Exposure views across Sector, Countries, Issuers and Counterparties
- Can be viewed across a single account or multiple accounts/consolidations
- Visual Cards easily identify asset class with Largest Unrealized Gain / Loss
- Content is exportable to Excel

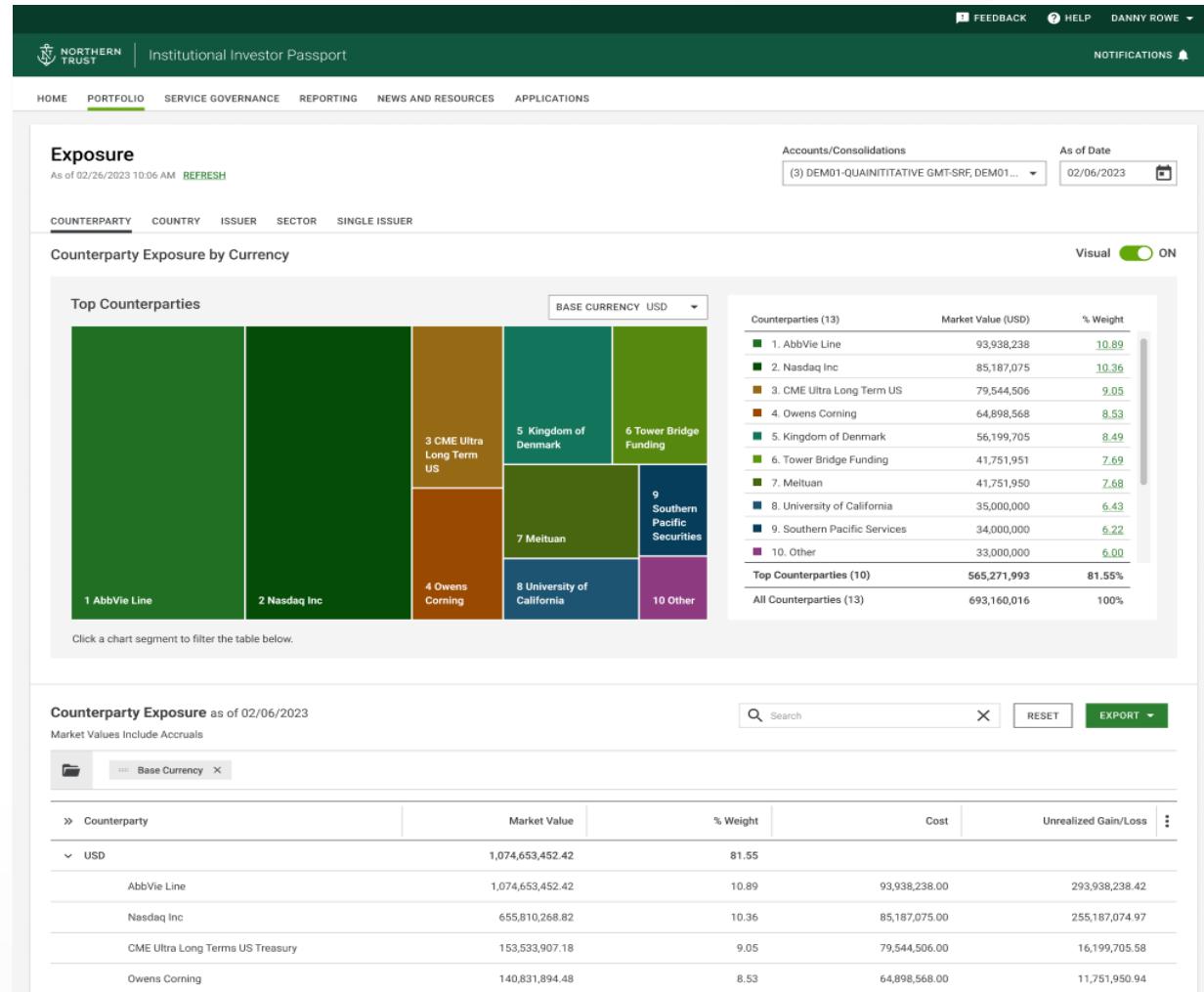


Portfolio Valuation – Issuer and Counterparty Exposure

Delivering digital solutions to support core client decisions

Key Features

- Release May '23
- Exposure views across Sector, Countries, Issuers and Counterparties
- Can be viewed across a single account or multiple accounts/consolidations
- Visual Cards easily identify asset class with Largest Unrealized Gain / Loss
- Content is exportable to Excel



Portfolio Valuation – New features coming in 2023

Delivering digital solutions to support core client decisions

Targeted Features

- Introduce click on visual charting to filter table data
- Change in Market Value page will include drill down feature allowing users to interrogate chart to view transactional data
- Mobile / responsive view will improve usability on phones and tablets
- Additional cosmetic / usability improvements

The image shows a screenshot of the Northern Trust Institutional Investor Passport interface. The top navigation bar includes links for HOME, PORTFOLIO (which is highlighted in green), SERVICE GOVERNANCE, REPORTING, NEWS AND RESOURCES, and APPLICATIONS. The top right corner shows 'DANNY ROWE' and a 'NOTIFICATIONS' bell icon.

The main content area is divided into two main sections:

- Exposure:** This section displays a 'Counterparty Exposure by Currency' chart. The chart is a treemap showing the distribution of exposure across various counterparties. A legend indicates the base currency is USD. A table to the right lists the top counterparties with their market value in USD and percentage weight. A note at the bottom says "Click a chart segment to filter the table below." The table data is as follows:

Counterparty	Market Value (USD)	% Weight
1 AbbVie Line	93,938,238	10.89
2 Nasdaq Inc	85,187,075	10.36
3 CME Ultra Long Term US	79,544,506	9.05
4 Owens Corning	64,898,568	8.53
5 Kingdom of Denmark	56,199,705	8.49
6 Tower Bridge Funding	41,751,951	7.69
7 Meituan	41,751,950	7.68
8 University of California	35,000,000	6.43
9 Southern Pacific Securities	34,000,000	6.22
10 Other	33,000,000	6.00
Top Counterparties (10)	565,271,993	81.55%
All Counterparties (13)	693,160,016	100%

The bottom section of the screenshot shows a 'Market Values by Account' page with a line chart titled "45,400,274,458 usd" comparing Jan 31 2022 and Jan 23 2023. The chart shows a general upward trend with some fluctuations. A note at the bottom says "Duplicate accounts removed from chart plot points."

Securities Services

Securities Services

Enhancing our online digital experience to provide clients additional tools to monitor their custody portfolios

Strategic Vision

Enhance the Digital Client Securities Services experience to provide consistency and transparency into client data and analytics while increasing productivity for clients and Northern Trust partners alike.

Key Features

- Reduced fragmentation across a user's experience
- Enhanced visualizations designed for interactive experience
- Reduced manual reporting complexities
- Improved analytics & data automation
- Improved self-service

Securities Services

Settlement Monitor
Dashboard

Custody KPI Tracker
Dashboard

Manager Reconciliation
Dashboard

Corporate Actions Delivery &
Response (CDR)

Digital Concierge Integration

Future deliverables include Securities Services Home Page, Tax Monitor, Digital Assets

Settlement Monitor

Delivering timely, insightful data to enhance client monitoring of settlements activity

Key Features

- Wealth Passport Integration April '23
- New Settlements ORC reports April '23
- Enhanced Narratives & Country of Settlement are expected 2Q '23
- Partial Status' delivered 4Q '22
- Improved navigation and workflow for more intuitive access to information
- Improved data coverage, quality & timeliness
- Multi-channel and responsive design allows via desktop, tablet, or mobile device

 [Product Video available](#)

Settlement Monitor
As of 08/21/2020 10:06 AM

Total Activity
10,098

Total Amount (Base)
1,950,000 USD

Click a card at left to filter the table below by a particular trade status.

Viewing Partially Failed Settlements

Group	Transaction Category	Asset Description	Trade Status	Trade Date	Actual Security Settlement Date	Quantity	Settlement Amount (Base)	Settlement Amount (Local)
Partially Failed (1)			Partially Failed			100	-10,000	-10,000
Trade ID 1	Buy	Asset Description Lorem Ipsum	Partially Failed	MM/DD/YYYY		100	-10,000	-10,000
			Settled	MM/DD/YYYY		80	-8,000	-8,000
			Failed			20	-2,000	-2,000

Securities Services Capabilities Catalogue

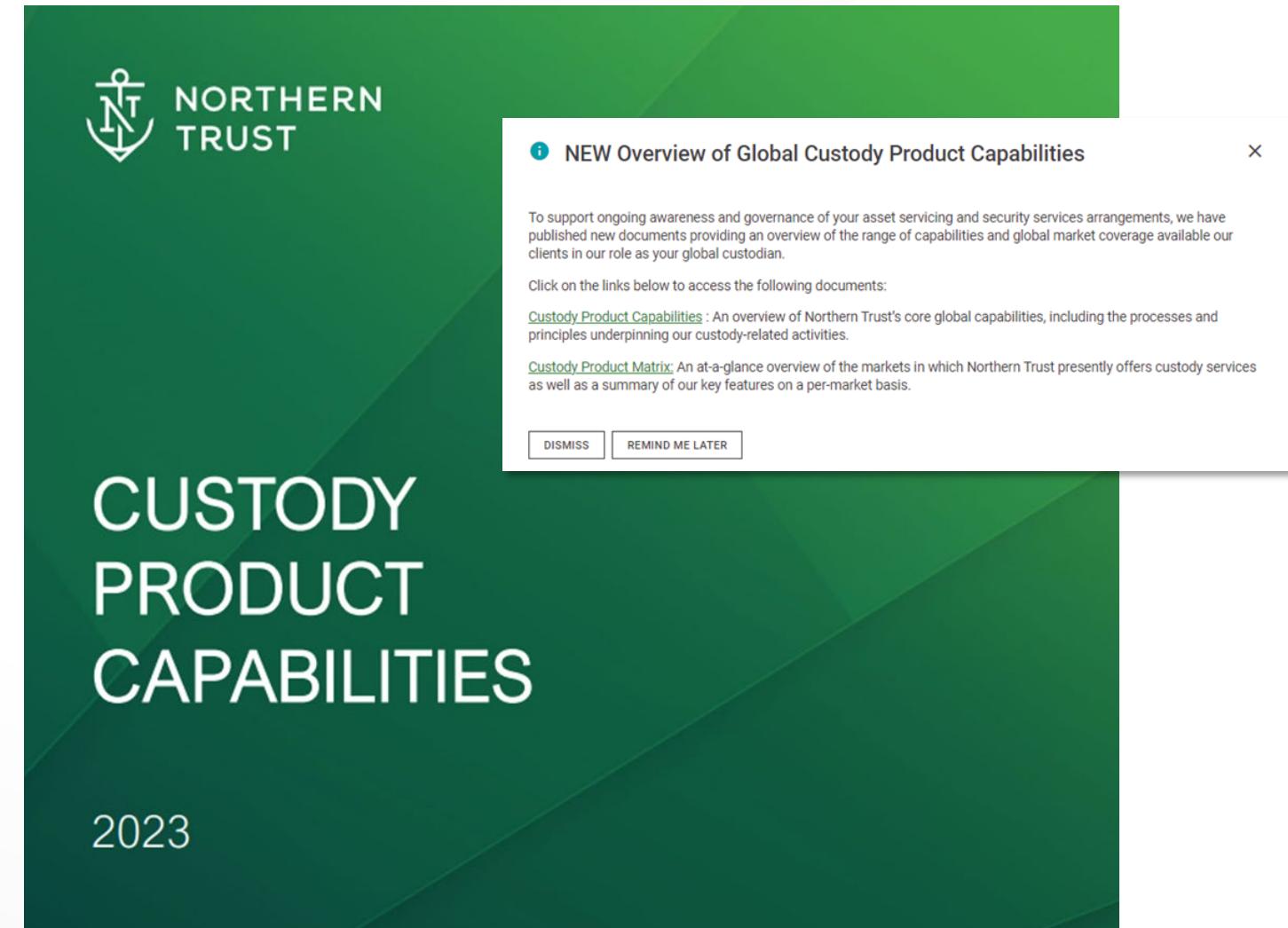
Provides a detailed review of Northern Trust's core capabilities as custodian with input of subject matter expertise from around the organization.

Key Features

The Securities Services Product Capabilities Catalogue provides a detailed review of Northern Trust's core capabilities as custodian with input of subject matter expertise from around the organization and a key focus on the client experience and what to expect from Northern Trust.

This catalogue focuses on these capabilities:

- Market Access and Account Structure
- Trade Communication and Settlement
- Transactions Linked to Foreign Exchange
- Tax Services
- Corporate Actions
- Income-related Services
- Proxy Voting
- Class Actions
- Manager Reconciliations



NORTHERN TRUST

CUSTODY PRODUCT CAPABILITIES

2023

NEW Overview of Global Custody Product Capabilities

To support ongoing awareness and governance of your asset servicing and security services arrangements, we have published new documents providing an overview of the range of capabilities and global market coverage available to our clients in our role as your global custodian.

Click on the links below to access the following documents:

[Custody Product Capabilities](#) : An overview of Northern Trust's core global capabilities, including the processes and principles underpinning our custody-related activities.

[Custody Product Matrix](#) : An at-a-glance overview of the markets in which Northern Trust presently offers custody services as well as a summary of our key features on a per-market basis.

[DISMISS](#) [REMIND ME LATER](#)

Service Governance Dashboards

Service Governance Overview

Enhanced monitoring and reporting solutions designed to deliver greater transparency

Key Drivers

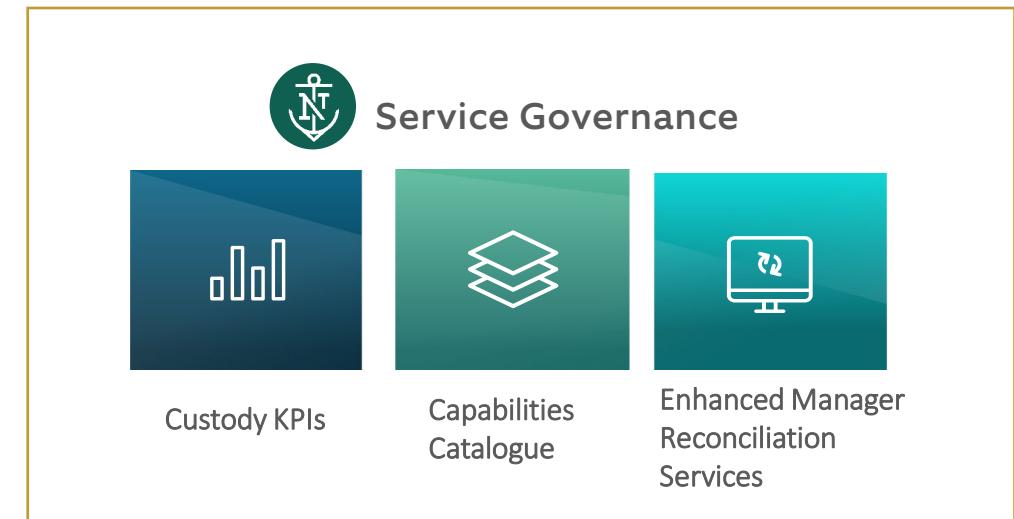
- In an outsourcing business Northern Trust recognizes that transparent KPIs are required to ensure understanding of service quality and value
- Service Governance dashboards enable that transparent record which is part of communication in our service relationship

Capabilities

- Custody Key Performance Indicators
Interactive custody data points across settlement instructions, settlements, corporate actions, income, and tax reclams
- Enhanced Manager Reconciliation Services
Interactive dashboard of Investment Manager vs. Northern Trust's discrepancies
- Capabilities Catalogue
Detailed profile of all custody capabilities provided. Found in IIP under News & Resources

Key Features

- Enriched data for more transparency
Contextual information to understand the 'Why'
- Smarter self-service for increased productivity
Intuitive design to surface the data you need to review
- Ease of customization to meet your specific needs
Flexible, intuitive interface



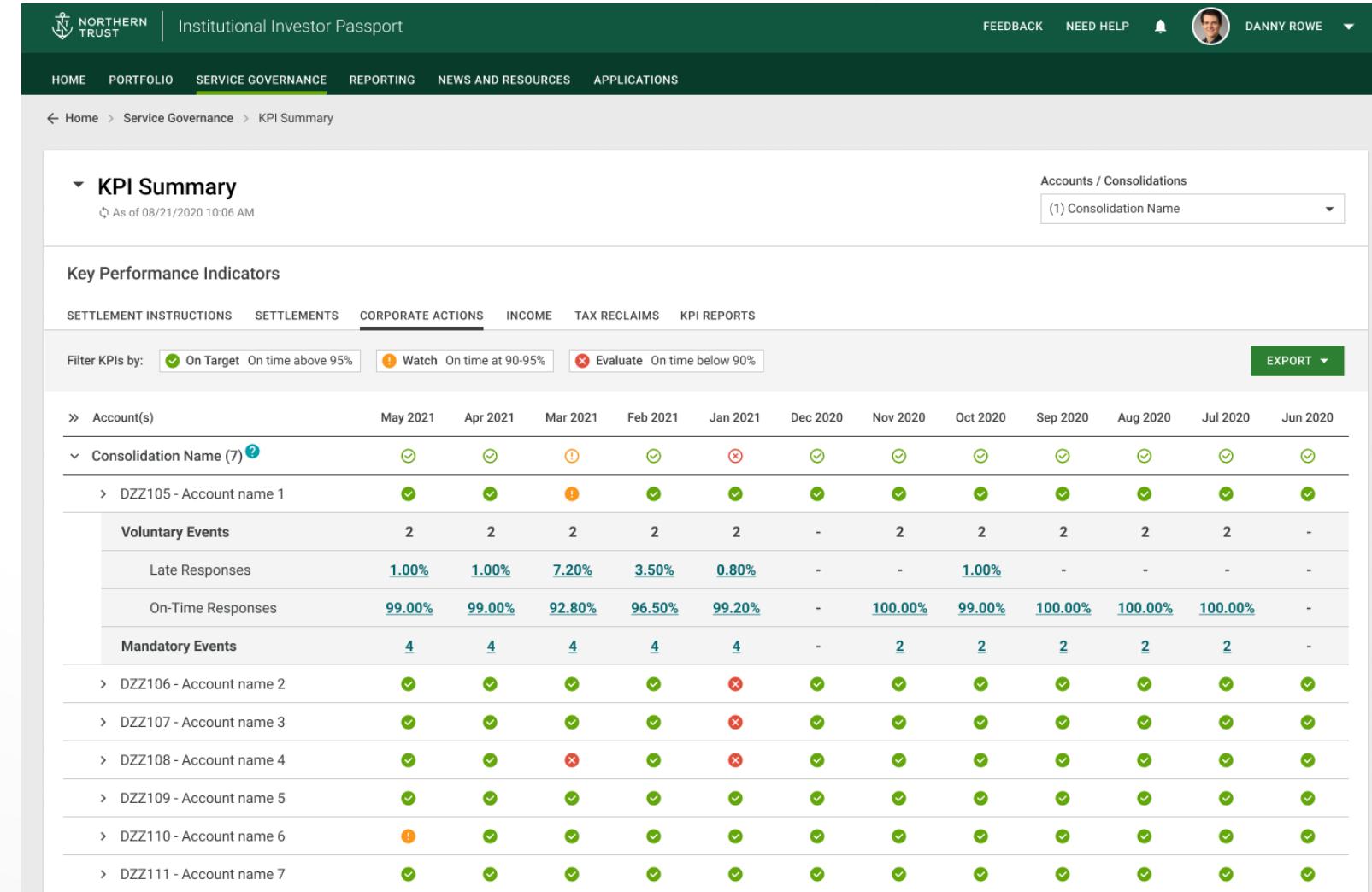
Custody Key Performance Indicators

Provides transparency into your custody key performance indicators through a modern online experience

Key Features

- Ability to measure KPIs across 5 key domains
 - ✓ Settlement Instructions
 - ✓ Settlements
 - ✓ Corporate Actions (2Q '23)
 - ✓ Income
 - ✓ Tax Reclaims (2Q '23)
- Provides a stop light approach to easily surface areas of focus – evaluate, watch, and on target
- Review summary, detail, and time series data points based on your specific needs
- Interactive experience to easily drill down to investigate areas of interest
- Details are exportable to Excel

 [Product Video available](#)



The screenshot displays the KPI Summary page of the Northern Trust Institutional Investor Passport. The page features a header with the Northern Trust logo and the title 'Institutional Investor Passport'. The top navigation bar includes links for HOME, PORTFOLIO, SERVICE GOVERNANCE, REPORTING, NEWS AND RESOURCES, and APPLICATIONS. On the right side of the header, there are links for FEEDBACK, NEED HELP, and a user profile for DANNY ROWE. The main content area is titled 'KPI Summary' and shows data as of 08/21/2020 10:06 AM. It includes a section for 'Key Performance Indicators' with tabs for SETTLEMENT INSTRUCTIONS, SETTLEMENTS, CORPORATE ACTIONS (which is selected), INCOME, TAX RECLAIMS, and KPI REPORTS. A filter bar allows users to 'Filter KPIs by' status: On Target (green), Watch (orange), Evaluate (red), and On time above 95% (green), On time at 90-95% (orange), and On time below 90% (red). The main table displays data for 'Account(s)' across months from May 2021 to Jun 2020. The table includes sections for 'Consolidation Name (7)', 'Voluntary Events', 'Late Responses', 'On-Time Responses', and 'Mandatory Events'. Each row represents an account, and each column represents a month. The status of each KPI is indicated by a colored circle (green, orange, red) in the corresponding cell.

Key Performance Indicators – Detailed Views

Provides transparency into your custody key performance indicators through a modern online experience

Key Features

Provides easy access to meaningful insights:

Settlements

- On-Time Settlements
- Failed Settlements (Reasons & Age)
- Canceled
- Interconnected with Settlements Monitor
- What happened vs. What is happening

Settlements Instructions

- Clean (Straight through Processing)
- Manual
- Repaired (Reasons)

Corporate Actions (2Q '23)

- On-Time/Late Elections for Voluntary Events
- Reporting for Mandatory Events

Income

- On-Time/Late Income Events

Tax Reclaims (2Q '23)

- On-Time/Late Tax Reclaim Events

KPI Report: Corporate Actions

As of 08/21/2021 10:06 AM

Key Indicators - Voluntary Events

Category	Value	Change
10 Late Responses	10.00%	↓ 65% from last month
90 On-Time Responses	90.00%	↑ 30% from last month

[OR, VIEW ALL EVENTS](#)

Top Event Types

Displaying 5 of # types

Type	Events
1. Optional Currency Dividend	5
2. Tender Offer	4
3. Share Premium Distribution	3
4. Dividend Reinvestment Plan	2
5. Optional Stock Dividend	1

Top Countries

Charting 5 of 14 countries by number of late responses

Country	Percentage
SGP	26%
GBR	25%
POL	24%
USA	17%
IND	8%

May 2021 Late Responses ↓ 65% from last month

Drag columns to create table row groups.

Account ID	Event Type	Asset Description	Asset Super Category	Country of Risk	CDR Event Ref	Asset SEDOL	Response Timeliness	⋮
2686111	Tender Offer	Description lorem ipsum sit dolor	Fixed Income	United States	LOREM 1234	798059	LATE	⋮

Key Performance Indicators – Time Series Views

Provides transparency into your custody key performance indicators through a modern online experience

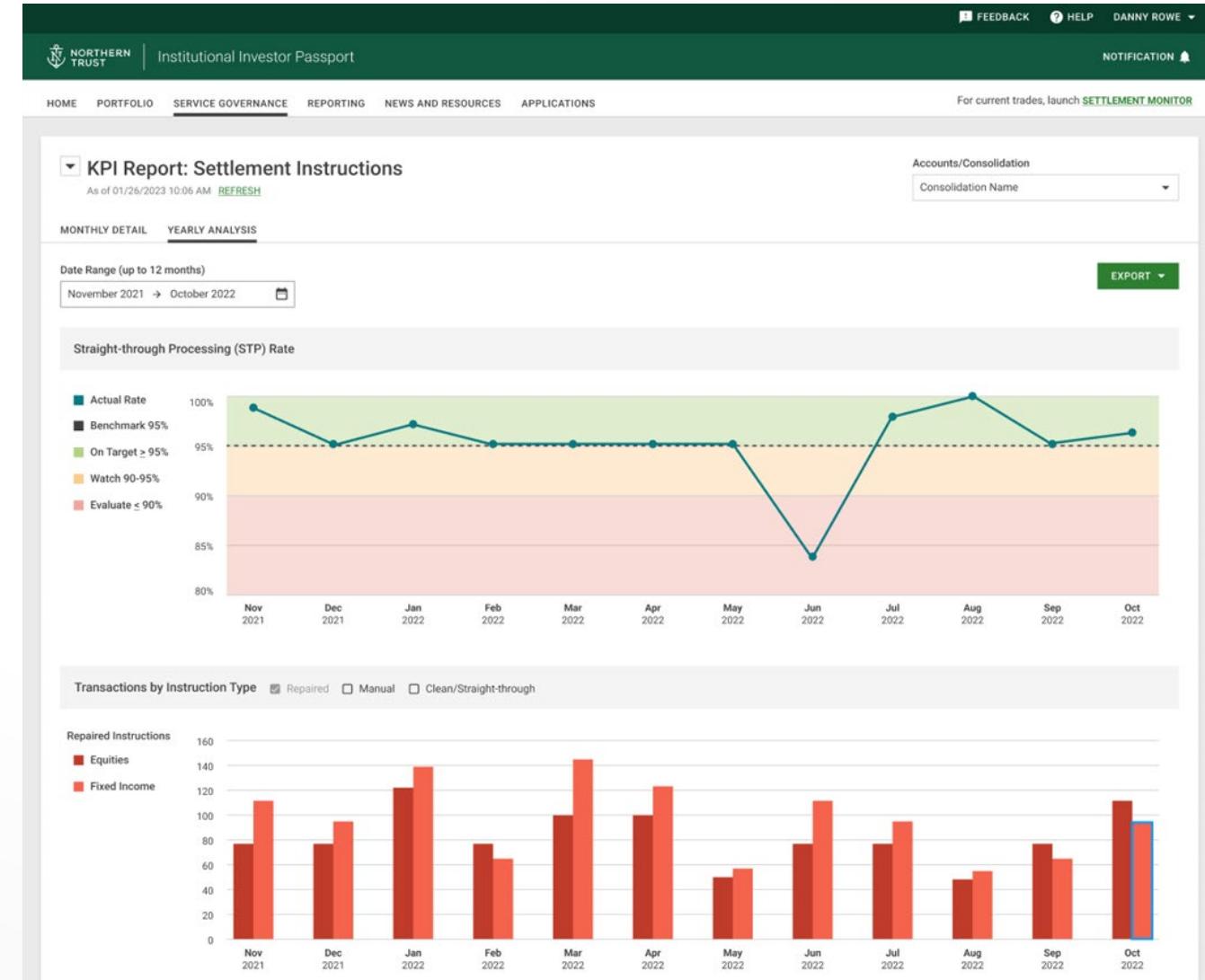
Key Features

Provides easy access to meaningful insights

Expected delivery is 2Q '23

Time Series visualizations for:

- ✓ Settlements
- ✓ Settlements Instructions
- Helps detect trends and anomalous information.
- Supports client Board reporting



Custody Key Performance Indicators | Admin Module

Provides transparency into your custody key performance indicators through a modern online experience

Key Features

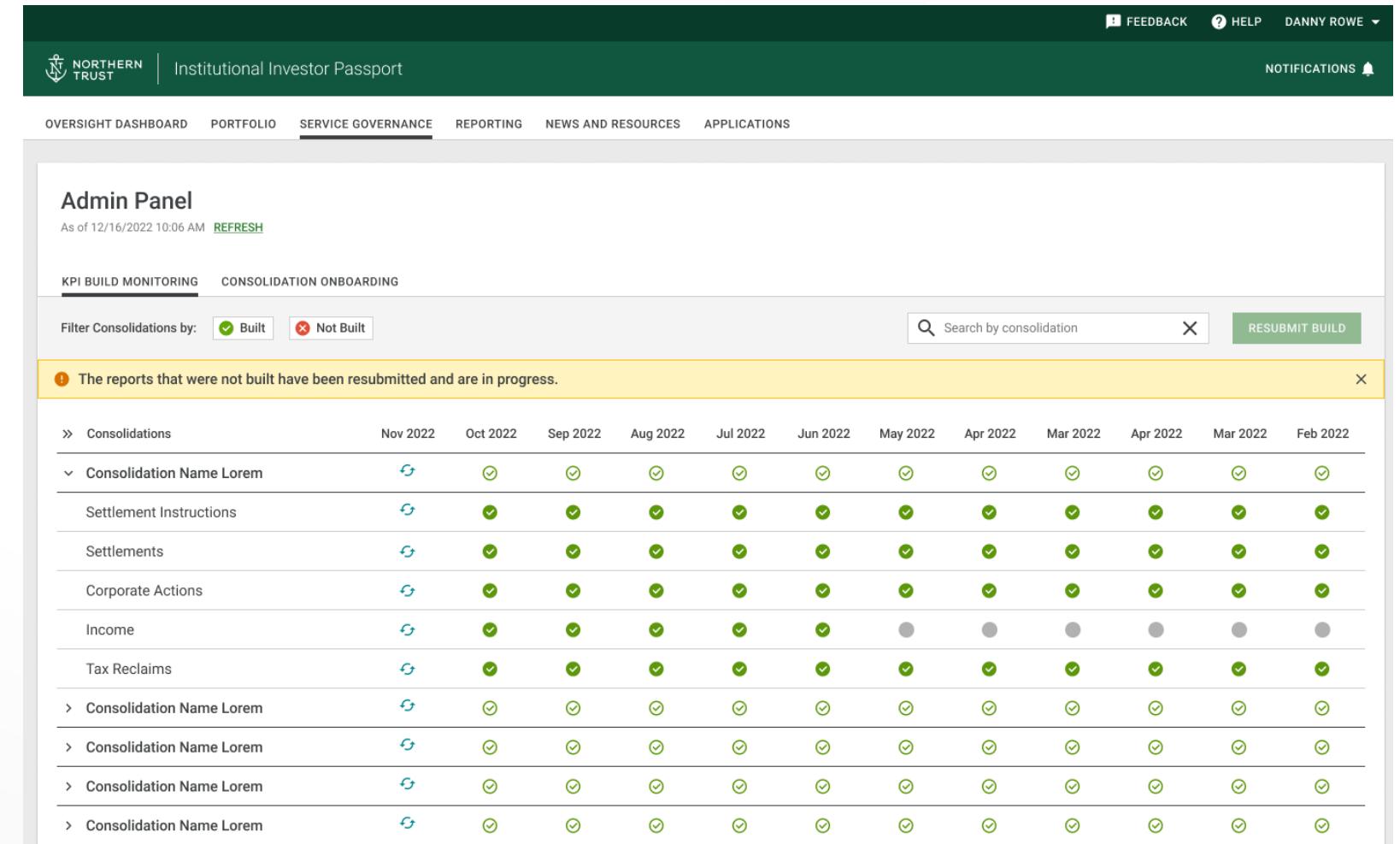
Internal facing only user experience

Delivery is expected May '23

Facilitates the On-Time delivery of information

Provides a view across clients and consolidations.

- Consolidation KPI Build Monitoring
- Enables KPI Consolidation Onboarding



The screenshot shows the Northern Trust Institutional Investor Passport Admin Panel. The top navigation bar includes links for FEEDBACK, HELP, DANNY ROWE, and NOTIFICATIONS. The main menu has tabs for OVERSIGHT DASHBOARD, PORTFOLIO, SERVICE GOVERNANCE (which is selected), REPORTING, NEWS AND RESOURCES, and APPLICATIONS. The central content area is titled 'Admin Panel' and shows a grid of data for 'KPI BUILD MONITORING'. The grid has columns for 'Consolidations' (with a dropdown arrow) and months from Nov 2022 to Feb 2022. Each cell contains a green checkmark, indicating successful builds. A yellow banner at the top of the grid area states: 'The reports that were not built have been resubmitted and are in progress.' There are also buttons for 'RESUBMIT BUILD' and a search bar labeled 'Search by consolidation'.

Enhanced Manager Reconciliation Services

Summary View

At-a-glance views of reconciliations across accounts and trailing 6 or 12 months

- Provides a stop light approach to easily surface areas of focus – evaluate, watch, and on target

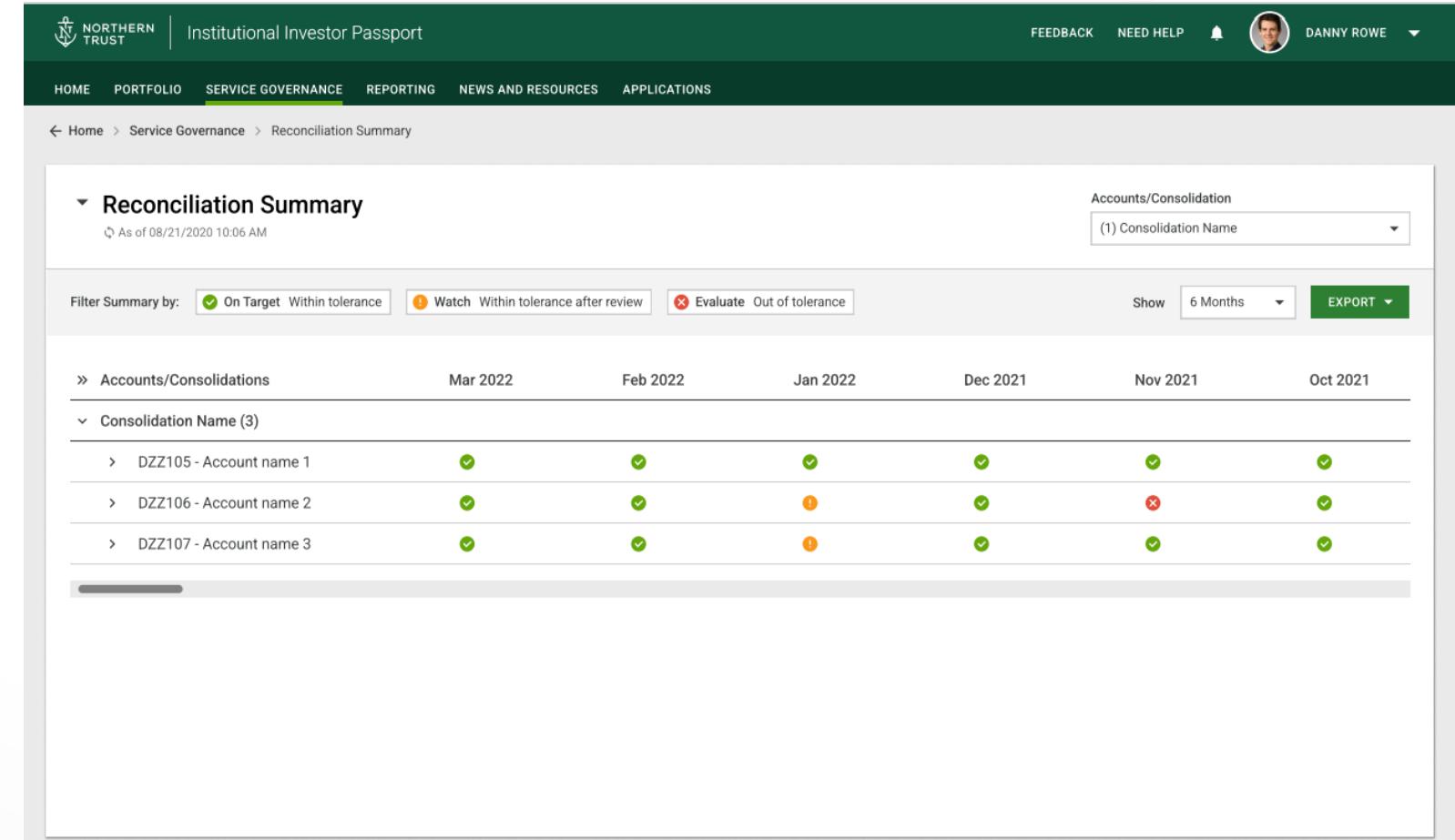
Account View

- Offers category overview with intuitive drill-down into details
- Ability to view aggregate levels side by side for both Investment Managers and Northern Trust

Holdings Level View

- Detailed individual holding level reconciliation views highlight holdings, pricing, market value and accruals

 [Product Video available](#)



Accounts/Consolidation	Oct 2021	Nov 2021	Dec 2021	Jan 2022	Feb 2022	Mar 2022
(1) Consolidation Name						
DZZ105 - Account name 1	✓	✓	✓	✓	✓	✓
DZZ106 - Account name 2	✓	✓	✓	!	✓	✓
DZZ107 - Account name 3	✓	✓	✓	!	✓	✓

Enhanced Manager Reconciliation Services – Detailed View

Provides transparency into the Enhanced Manager Reconciliation process

Key Features

- Detailed Account Reconciliation views highlight holdings, pricing, market value, and accruals discrepancies
- Offers category overview with intuitive drill-down into details
- Ability to view holdings for both Investment Managers and Northern Trust
- Measure differences against a defined tolerance
- Details are exportable to Excel

The screenshot shows the Northern Trust Global Funds Passport Service Governance Account Reconciliation page. At the top, there are navigation links: HOME, PORTFOLIO, SERVICE GOVERNANCE (which is highlighted in blue), REPORTING, NEWS AND RESOURCES, GLOBAL FUNDS PASSPORT, and APPLICATIONS. On the right, there are links for NEED HELP?, SHARE FEEDBACK, ANDREW ROSENSTEIN, and NOTIFICATIONS (11).

The main content area is titled 'Account Reconciliation' and shows a summary for December 2022. It indicates 'Reconciliation of Market Values' and 'On Target Within tolerance'. On the right, there are two summary boxes: 'Securities Difference 6.94 Bps 415,124.77 Base Currency (EUR)' and 'Total Difference 5.98 Bps 357,522.77 Base Currency (EUR)'. Below this, there is a 'Comments' section with a 'Commentary' toggle switch set to 'OFF'.

At the bottom, there is a table titled 'Reconciliation tolerance is 30.00 Bps'. The table has columns: Group, Asset Super Category, Asset Sub Category, Asset Description, ISIN, NT Market Value, IM Market Value, Market Value Difference, Share Difference, Price Variance (%), and Market Value Variance (Bps). The table shows data for various equities, including LINDSELL TRAIN GBL, ARTISAN PTNRS GBL, GQG GLOBAL UCITS, SKYLINE UM FD ICAV EAGLE, IMPAX FDS (IRL) PLC ENVIRO, POLUNIN DISCOVERY FUNDS, VULCAN GLOBAL VALUE FUN, and ORCHARD LANDMARK LTD. C. The table also includes a 'Search...' field and an 'EXPORT' button.



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