

Information Quality at the Transportation Security Administration

July, 2010

Operational Process & Performance Metrics



Introduction



- **Why information quality is so important from the perspective of the Performance Management Information System (PMIS) program.**
- **What is being done to ensure info quality.**
- **What is working well.**



“Scientific management means a constant search for the facts, the true actualities, and their intelligent, unprejudiced analysis.”

**- Alfred P. Sloan
MIT Class of 1895**

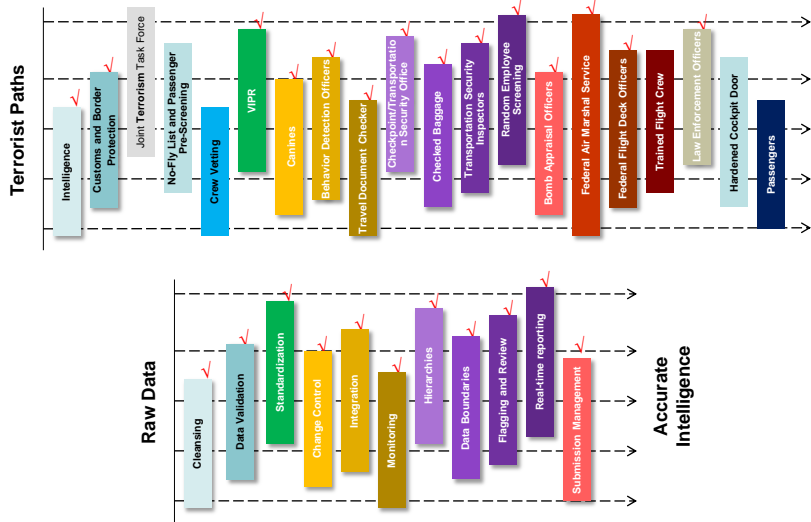


- **Performance Measurement Information System (PMIS):** The Performance Measurement Information System is a web-based application used to collect TSA metrics and measures. Data entry is accomplished by web browser or hand-held device. PMIS directly supports TSA's goal of becoming a performance-based organization.
- **Business Intelligence (BI) Tool:** The Performance Information Management System (PIMS) is a state-of-the-art tool which supports analysis, dashboarding, graphing, and reporting from a consolidated data warehouse. PIMS today reports on data from 18 TSA data sources.
- **Airport Information Management (AIM):** Next-generation data entry system to assist airports in managing their day-to-day business. Provides airports a consistent national interface with headquarters' support and ports existing field applications to this national enterprise application. Supports real-time business intelligence reporting.

Security and data quality layers



Transportation Security Administration

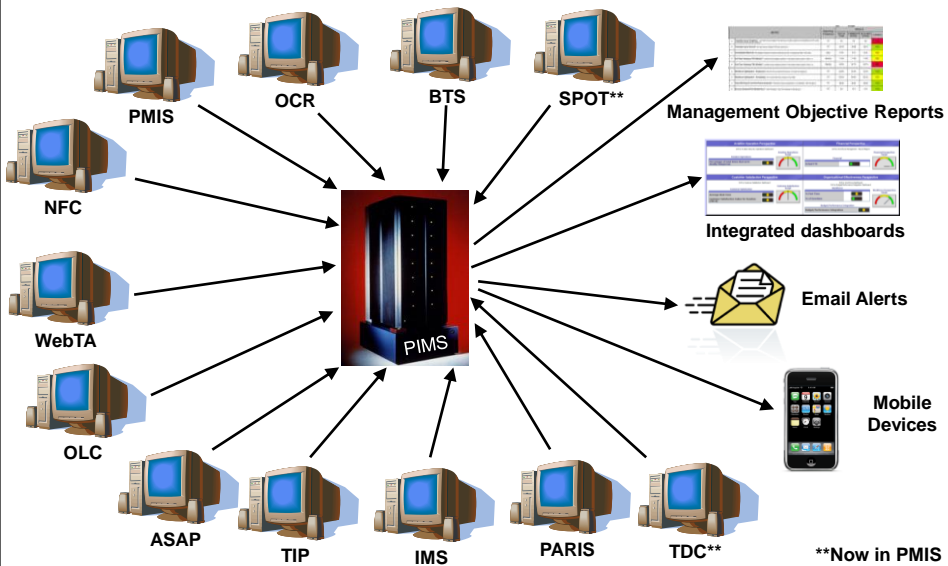


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Integrated Data Sources - PMIS



Transportation Security Administration

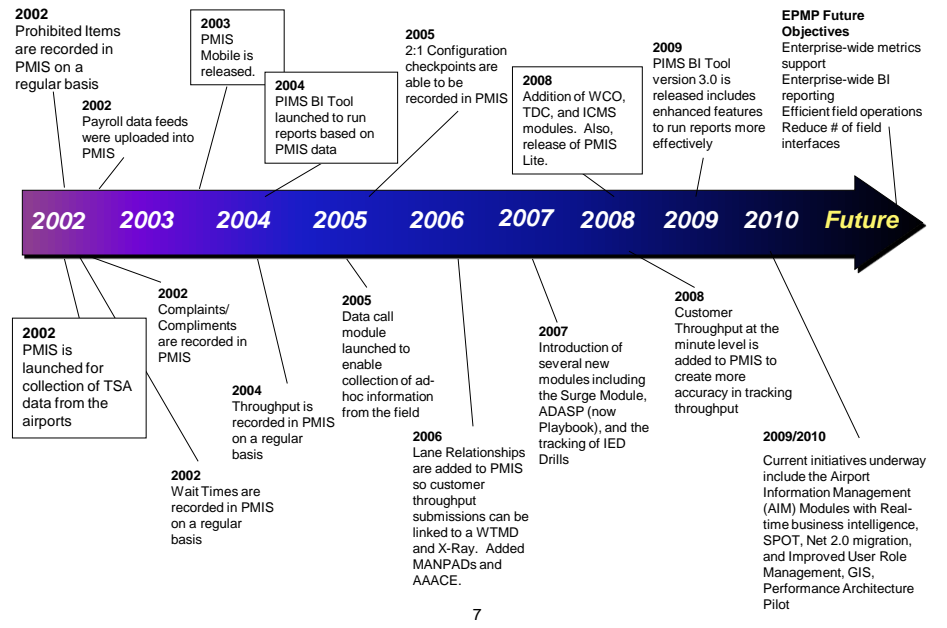


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Program History – Results



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Data design and collection considerations



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Custom hierarchies with integrated data collection and reporting.

Data collection methodology:

- Mapped to business process
- Requirements include data values consistent within multiple systems
- Working with master data

One “safe source” of operational data shared across multiple applications and program offices

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Testing (Quality Control)



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Work Product Category	Tool(s)	Verification Method(s)	Validation Method(s)
Requirements	Rational RequisitePro, BugZilla	Peer Reviews	Formal Reviews, QA Audits, Prototypes, Customer Acceptance of Requirements Specification.
Designs	Rational RequisitePro, AllFusion ErWin	Peer Reviews	Formal Reviews, Customer Acceptance of Design Specification.
Software	Subversion, Visual Studio, Rational ClearQuest	Peer Reviews, Unit Testing, Integration Testing, System Testing, Quality Audits	User Acceptance Test (UAT), Customer Acceptance of Software.
Documentation	Rational ClearQuest	Peer Reviews	Formal Reviews, QA Audits, Customer Acceptance of documents.
Test Procedures	Rational TestManager, Rational ClearQuest	Integration Testing, System Testing	Customer Acceptance of Test Specification.

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Challenge – inconsistent geographic data



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Many TSA systems allow user-entered checkpoint names, machine information, and airport location data. These text-based entries may differ depending on the individual(s) performing data input.

Furthermore, changes to geographic information must be propagated in a timely manner to both data entry and reporting systems.

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Solution - Custom hierarchies



Consistent hierarchies for data collection and reporting across PMIS/PIMS/AIM. All geographic values tagged with unique identifier and synchronized via ETL.

New Passenger Checkpoint Submission

Note: All fields below are required (excluding Random Gate Screening Performed and gray-shade cells).

Date: 2/16/2010 Checkpoint: Dulles Diamond Shift: Shift 2

Weapons/Other Prohibited Items Intercepted			
	Checkpoint General	Selectee Checkpoint	Random Gate Screening Performed?
	mandatory	mandatory	<input type="radio"/> No <input type="radio"/> Yes
Sharp objects			
Knives and blades (less than 3 inches)			
Tools			
Fireworks	0	0	0
Ammunition and gunpowder			
Flammables/Irritants	0	0	0
Knives and blades (3 inches or more)			
Replica Weapons			
Dangerous objects			
Clubs, bats, and bludgeons			
Box cutters			
Explosives	0	0	0
Lighters			
Firearms	0	0	0

1. Choose Geography

Search for: Match case

Available:

- ✖ X
- ✖ Airport Category
 - ✖ Airport
 - ✖ ATL:Hartsfield Atlanta International
 - ✖ BOS:Logan International
 - ✖ BWI:Baltimore-Washington International
 - ✖ CLT:Charlotte/Douglas International

2. Choose a Shift

Leave unchecked to include all shifts

- Shift 1
- Shift 2
- Shift 3
- Shift 4

3. Choose a Day of the Week

- Sunday
- Monday
- Tuesday
- Wednesday
- Thursday
- Friday
- Saturday

Solution - Custom hierarchies



The BI Reporting system is also designed to accommodate languages and airports from across the world

PREFERENCES

- General
- Folder browsing
- Grid display
- Graph display
- Export Reports
- Print Reports (PDF)
- Drill mode
- Prompts
- Report Services
- Security
- E-mail Addresses
- File Locations

Update Confirmation

Your personal preferences have been saved. Changes will take effect the next time you log in.

General

Default start page: Shared Reports Last folder: Shared Reports

Color Theme: blue

Language: English (United States)

Dynamic HTML: Internet Explorer 6 SP1, Safari 3.1.1 or later

Accessibility mode: Compatibility

Drop down menus: Open menus

- Area and Airport
- Geography
 - ✖ Airport
 - ✖ Airport Category
 - ✖ Area
 - ✖ Hub
 - ✖ Nation
 - ✖ USA
 - ✖ AFG
 - ✖ ALA
 - ✖ ALB
 - ✖ DZA
 - ✖ ASM
 - ✖ AND
 - ✖ AGO
 - ✖ AIA
 - ✖ ATA
 - ✖ ATG
 - ✖ ARG
 - ✖ ARM
 - ✖ ABW
 - ✖ AUS
 - ✖ AUT
 - ✖ AZE
 - ✖ BHS
 - ✖ BHR
 - ✖ BGD
 - ✖ BRB
 - ✖ BLR
 - ✖ BEL
 - ✖ BLZ
 - ✖ BEN
 - ✖ BIU
 - ✖ BTN
 - ✖ BOL

TSA systems do not employ a standard unique identifier for each user. As such, each application may utilize a different solution for user authentication.

Examples of system identifiers:

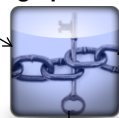
- Arbitrary auto-generated integer value
- Social Security Number
- email address
- Network login ID
- Last four digits of social + first two letters of last name
- First letter of first name + last name

Master reference table containing system identifiers from multiple applications. PII is encrypted using industry-standard algorithm

SSN	Name	Hours	Dollars
123456789	John Doe	40	\$1000
987654321	Jane Smith	80	\$2000

SSN	Name	Courses taken	Average Score
345345078	Bob Smith	6	90.5
873462961	Robert Doe	15	88.1

Cryptographic Function



User ID	Encrypted SSN	Network ID	External ID #1	External ID #2	Name
10001	1SDF334SFIF34	John.doe	JHDFG123	134523	John Doe
10002	435KLH234J34J	Jane.smith	KJJKH448	435345	Jane Smith
10003	53424234HJ3HL	Bob.smith	98343400	336644	Bob Smith

Challenge – Data entry mistakes



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Users may accidentally enter data values that are higher or lower than intended. These values should be flagged for review prior to being reported nation-wide.

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Solution - Boundary definition



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Insert New Boundary

Airport Category: X

Metric	Boundary	Value	Active	Activate
Baggage - Baggage Data - Number of Locks Cut or Broken for Screening - Baggage	High Limit	100	Active	De-Activate
Baggage - LEO Intervention - Cash > \$10,000 on International Flights - Baggage	High Limit	2	Active	De-Activate
Baggage - LEO Intervention - Contraband - Baggage	High Limit	2	Active	De-Activate
Baggage - LEO Intervention - Drug Paraphernalia - Baggage	High Limit	2	Active	De-Activate
Baggage - LEO Intervention - Drugs - Baggage	High Limit	2	Active	De-Activate
Baggage - LEO Intervention - Other LEO Interventions for Unresolved Alarms - Baggage	High Limit	2	Active	De-Activate
Baggage - LEO Intervention - Undeclared and/or Loaded Firearms - Baggage	High Limit	2	Active	De-Activate
Baggage - Prohibited Items Identified - Disabling Chemicals and Other Dangerous Items - Baggage	High Limit	25	Active	De-Activate
Baggage - Prohibited Items Identified - Explosive Materials - Baggage	High Limit	5	Active	De-Activate
Baggage - Prohibited Items Identified - Flammable Items - Baggage	High Limit	25	Active	De-Activate
Baggage - Prohibited Items Identified - Loose Ammunition - Baggage	High Limit	100	Active	De-Activate
Baggage - Screener Data - Number of baggage screeners on duty - Baggage	High Limit	100	Active	De-Activate
Baggage - Screener Data - Number of baggage screeners scheduled for work - Baggage	High Limit	100	Active	De-Activate
Baggage - Screener Data - Number of baggage screeners tardy - Baggage	High Limit	10	Active	De-Activate
Baggage - Screener Data - Number of baggage screeners with unscheduled absences - Baggage	High Limit	30	Active	De-Activate
Complaint Counts - Baggage Handling Process	High Limit	5	Active	De-Activate
Complaint Counts - Civil rights/discrimination	High Limit	2	Active	De-Activate
Complaint Counts - Discourteous treatment	High Limit	3	Active	De-Activate
Complaint Counts - Improper handling of property	High Limit	3	Active	De-Activate
Complaint Counts - Inappropriate contact	High Limit	2	Active	De-Activate
Complaint Counts - Lack of privacy	High Limit	2	Active	De-Activate
Complaint Counts - Lax screening	High Limit	2	Active	De-Activate

High and low boundary limits can be set on a per-metric, per-category basis for PMIS submissions. Submissions with values outside of boundaries are automatically flagged.

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Solution - Flagged submission review



Transportation Security Administration

Each submission can be individually reviewed for accuracy prior to being “promoted” for reporting in the Business Intelligence tool.

Date: 2/3/2010

Submission Status				
Date	Flagged Submissions	NonFlagged Submissions	Live	Total
2/3/2010	0	1	0	1
Other**	0	0	-	-



Passenger Checkpoint Submissions Review					
Date	Airport	Airport Code	Checkpoint	Shift	Action
2/3/2010	Baltimore-Washington Int'l Airport	BWI	Pier A	1	[View] [Perform Review] [Promote for Reporting]



Date: 2/3/2010 Checkpoint: Pier A Shift: 1

Weapons Intercepted at Checkpoint General		
Name	Value	Comments
Sharp objects	Old: 0 New: <input type="text"/>	<input type="text"/>
Knives and blades (less than 3 inches)	Old: 0 New: <input type="text"/>	<input type="text"/>
Tools	Old: 0 New: <input type="text"/>	<input type="text"/>
Fireworks	Old: 0 New: <input type="text"/>	<input type="text"/>
Ammunition and gunpowder	Old: 0 New: <input type="text"/>	<input type="text"/>
Flammables/Irritants	Old: 0 New: <input type="text"/>	<input type="text"/>

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Challenge – inconsistent item category data

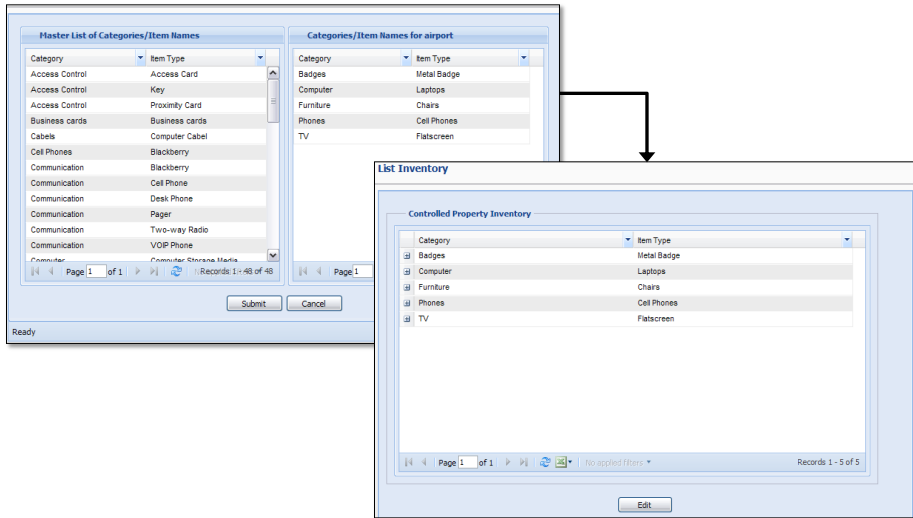


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Many TSA systems allow user-entered item names, item groups, and item category data. These text-based entries may differ depending on the individual(s) performing data input.

Furthermore, changes to item information must be propagated in a timely manner to both data entry and reporting systems.

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Drop-down lists and data entry screens can be customized according to individual airports' needs while maintaining standard category definitions.

The TSA business intelligence tool receives daily data feeds from a number of source systems. Each system may experience outages, maintenance, or service interruption during its scheduled data load.

Users at headquarters and in the field must be aware of any data load failures prior to running operational reports the following morning.

Solution – data load and interconnection status



Start Time	Finish Time	Project	
11/10/2009 1:00:36 PM	11/11/2009 2:53:12 PM	9A87A1E847385EA28D762084941373F4	PIMS BI Tool
12/9/2009 6:26:17 PM	12/9/2009 6:32:12 PM	9A87A1E847385EA28D762084941373F4	PIMS BI Tool
12/9/2009 6:48:01 PM	12/9/2009 6:54:48 PM	9A87A1E847385EA28D762084941373F4	PIMS BI Tool
12/9/2009 7:18:53 PM	12/9/2009 7:25:22 PM	9A87A1E847385EA28D762084941373F4	PIMS BI Tool
12/11/2009 1:24:53 PM	12/11/2009 1:25:42 PM	9A87A1E847385EA28D762084941373F4	PIMS BI Tool
12/11/2009 1:31:28 PM	12/11/2009 1:32:04 PM	9A87A1E847385EA28D762084941373F4	PIMS BI Tool
12/12/2009 8:29:40 PM	12/14/2009 2:06:56 AM	9A87A1E847385EA28D762084941373F4	PIMS BI Tool
12/14/2009 2:58:32 AM	12/14/2009 3:40:51 AM	9A87A1E847385EA28D762084941373F4	PIMS BI Tool
12/14/2009 4:33:56 AM	12/15/2009 2:14:51 AM	9A87A1E847385EA28D762084941373F4	PIMS BI Tool
12/15/2009 3:14:24 AM	12/15/2009 3:58:45 AM	9A87A1E847385EA28D762084941373F4	PIMS BI Tool
12/15/2009 4:50:44 AM	12/15/2009 5:19:01 AM	9A87A1E847385EA28D762084941373F4	PIMS BI Tool
12/16/2009 2:58:24 AM	12/16/2009 4:00:15 AM	9A87A1E847385EA28D762084941373F4	PIMS BI Tool

REPORT DETAILS

Report Filter:
(Date (ID) Between 2/9/2010 and 2/15/2010)

Data rows: 7 | Data columns: 6

Date	Metrics	PMIS Captured Metric Count	PMIS Throughput Metric Count	Number of IMS Inquiries	Number of PARIS Inspections	Number of PARIS Incidents	Number of PARIS Investigations
2/15/2010		99,311	33,894	7	23	84	16
2/14/2010		77,876	39,133	3	18	69	10
2/13/2010		78,037	39,078	1	18	72	12
2/12/2010		79,360	40,358	74	176	86	24
2/11/2010		79,754	39,501	52	232	84	57
2/10/2010		77,778	36,979	85	335	70	34
2/9/2010		78,862	38,418	52	398	109	64

Daily email distributions indicating success or failure of various data interconnections.

Solution – data submission management



Submission status for Logan International - 6/24/2010

Your airport has a status of **100%** for the last 7 days as of 6/24/2010 4:40:07 AM

[Click the percentage status for more information](#)

Report Date	PAX CKPT	PAX TPUI	BAG TPUI	BAG
6/22/2010	11/11	11/11	21/21	21/21
6/21/2010	11/11	11/11	21/21	21/21
6/20/2010	11/11	11/11	21/21	21/21
6/19/2010	11/11	11/11	21/21	21/21
6/18/2010	11/11	11/11	21/21	21/21
6/17/2010	11/11	11/11	21/21	21/21
6/16/2010	11/11	11/11	21/21	21/21

6/22/2010

Checkpoint	Shift	User	Submitted Date & Time
A1	1	Richard Williams Jr	Jun 22 2010 11:12PM
A1	2	Richard Williams Jr	Jun 22 2010 11:13PM
A1	3	Richard Williams Jr	Jun 22 2010 11:13PM
B1	1	Richard Williams Jr	Jun 22 2010 11:14PM
B1	2	Richard Williams Jr	Jun 22 2010 11:15PM
B1	3	Richard Williams Jr	Jun 22 2010 11:15PM
B2	1	Richard Williams Jr	Jun 22 2010 11:17PM

Submission summary allows airports to “drill down” for details about each day’s data.

Solution – asynchronous data entry



AM > Airport Maintenance > Manage Airport Lists > Manage Airline List

Home
Help
My Preferences
TS Support
Administration
Employees
Employee Records
Operations
Supplemental
Airport Maintenance
Launchpad
Manage Airport Lists
Manage Airline List
Manage Controlled Property Type List
Manage Key Type List
Manage Airport Settings
Manage Locations
Manage Bins
Physical Property Tracking
Resources
Logout

Manage Airline List

Reports Print

All airlines		Airlines listed for this airport	
Airline Name	Airline Code	Airline Name	Airline Code
40-Mile Air	Q5	American Airlines Inc.	AA
A/S Conair	CIQ	United Air Lines Inc.	UA
AAA Airlines	AAE	ABSA-Aerolinhas Brasileiras	M3
AAA-Action Air Carrier Inc.	ACI	ACM AIR CHARTER GmbH	0CQ
AAR Western Skyways	WSK	ANA & JP Express Co. Ltd.	9N
Accessair Holdings	ZA	ATA Airlines d/b/a ATA	TZ
Aces Airlines	VX (1)	Abaco Air, Ltd.	BZQ
Action Airlines	AON	Academy Airlines	ACD
Adirondack Airlines	ADR		
Advance Air Charters	AAQ		
Advantage Airlines	ADV		
Aer Lingus Plc	EI		
Aer Turca Toronto	OTO		

Page 1 of 31 Records 1 - 50 of 1909

Page 1 of 1 No Records 1 - 2 of 2

Submit Cancel

Ready

Application utilizes asynchronous JavaScript and XML (AJAX) to conduct data manipulation without repeated database calls. This reduces server traffic and database load.

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Challenge – data reporting delays



The TSA business intelligence tool receives daily data feeds from a number of source systems. Data from these systems may be up to 24 hours old in the data warehouse.

Users at headquarters and in the field have a need for more timely reporting and alerts.

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Solution - Real-time data integration



Transportation Security Administration

The screenshot shows the 'List Lost and Found' application interface. On the left is a data table with columns: Tracking ID, Item Category, Item Description, Location Found, Storage Location, Sensitive Item, Cash, High Value, and Item Status. The table lists various items such as Airline tickets, Alcohol products, Baby items, Bags, Birth certificates, Books, Cameras, Laptops, Umbrellas, and Wallets. On the right, a pivot table is displayed with the following data:

Location	LF Category Metrics	# of Lost and Found Items
Airport	Airline ticket	2
Airport	Alcohol Product	1
Airport	Baby Item	2
Airport	Bag	1
Airport	Birth Certificate	2
Airport	Book	1
Airport	Camera	1
Airport	Clothing item	2
Airport	Laptop	1
Airport	Photo ID	1
Airport	Umbrella	1
Airport	Wallet	1

Real-time data entry and reporting integration exists between AIM and PIMS utilizing a shared warehouse for “one safe source” of operational data. Referential data is synchronized in real time.

Solution - Real-time data integration



Transportation Security Administration

The screenshot shows the 'List Lost and Found' application interface. On the left is a data table with columns: Tracking ID, Item Category, Item Description, Location Found, Storage Location, Sensitive Item, Cash, High Value, and Item Status. The table lists various items such as Airline tickets, Alcohol products, Baby items, Bags, Birth certificates, Books, Cameras, Laptops, Umbrellas, and Wallets. On the right, an alert is displayed:

Alert: New item added to lost & found 2/3/2010 3:38PM
 PIMS BI Tool Staging [pmishelpdesk@tsa.dhs.gov]
 Sent: Wed 2/3/2010 3:39 PM
 To: Smereka, Michael <CTR>

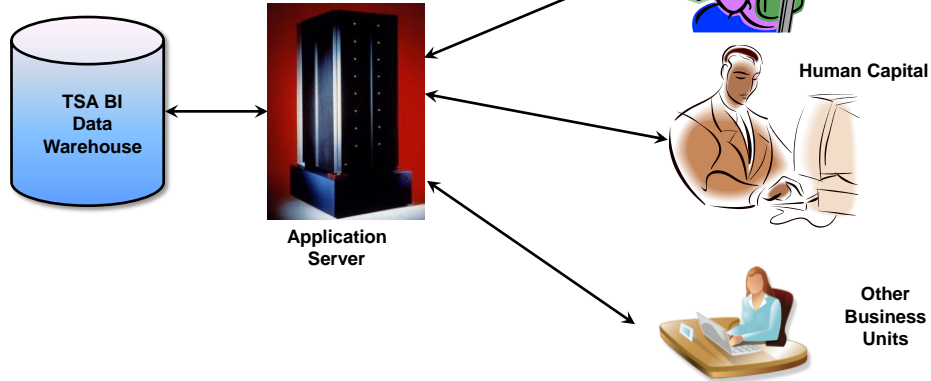
Below the alert is a report titled 'Create Report - Lost and Found Item' with the following data:

Checkpoint	LF Category Metrics	# of Lost and Found Items
Zone 11A	Alcohol Product	1
1	Laptop	1
1	Wallet	1
10	Clothing item	1
2	Camera	1
4A	Birth Certificate	1
5	Birth Certificate	1
7	Book	1
7A	Bag	1
7A	Umbrella	1
TOCC Office	Airline ticket	1
TOCC Office	Clothing item	1
TOCC Office	Photo ID	1
Zone 13B bag claim	Airline ticket	1
Zone 15A	Baby Item	1
Zone 17 (BTP)	Baby Item	1

Event- or time-based alert capability from integrated data warehouse

Integration options

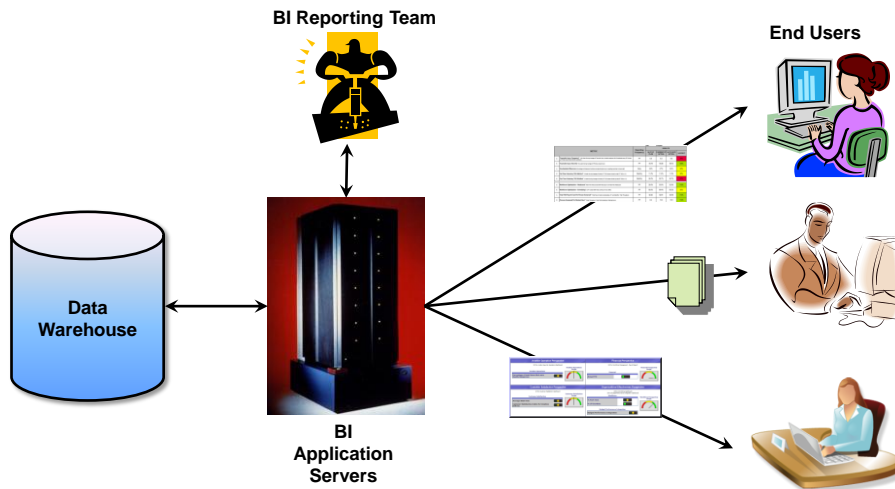
Each program office can be granted access to different areas of the TSA BI data warehouse
 This flexibility enables each business unit the ability to control its own data while pushing select elements agency-wide



Integration options

Option 1 – Standard Development Process

BI analytical team creates and maintains all publicly-available reports for a program office; users are allowed to create private “ad-hoc” reports within the application.



Integration options

Transportation Security Administration PIMS Business Intelligence Tool 3.0.2

Shared Reports My Reports History List My Subscriptions Create Document Preferences Search Help Logout

Home Tools Data Grid Format Last update: 6/24/10 1:29:59 PM

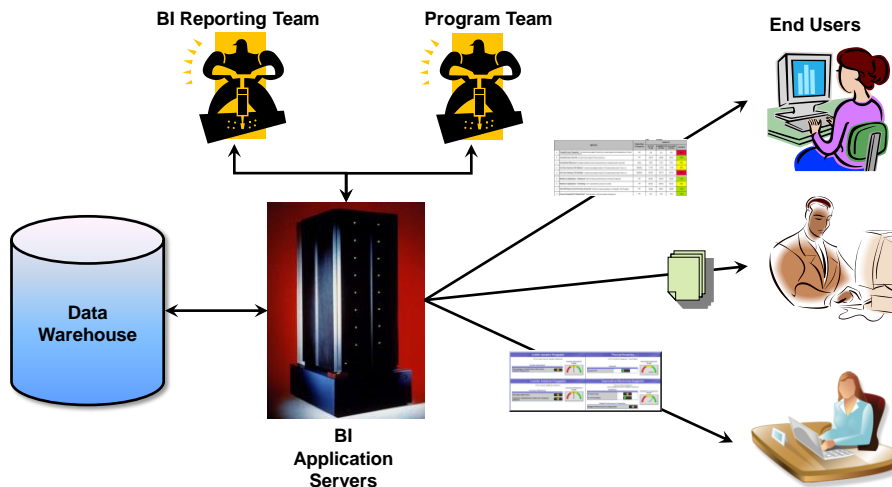
Airport	State	Category	Metrics	Amount
ABR Aberdeen Regional	SD	IV		\$0.02
ABI Abilene Regional Airport	TX	III		\$0.01
SPT Abraham Lincoln Capital Airport	IL	III		\$0.00
ADK Adak Naval Air Station	AK	III		\$0.00
SLK Adirondack Regional	NY	IV		\$0.00
CAK Akron-Canton Regional	OH	II		\$22.04
ALS Alamosa-San Luis Valley/Bergman Field	CO	IV		\$0.00
ALB Albany County	NY	I		\$5.89
OAJ Albert J. Ellis	NC	III		\$0.00
ABQ Albuquerque International Sunport	NM	I		\$17.53
AEX Alexandria International	LA	IV		\$0.00
ATA Alliance Municipal	NE	IV		\$0.00
APN Alpena County Regional	MI	IV		\$0.00
ACO Altoona-Blair County	PA	IV		\$0.00
AMA Amarillo International	TX	II		\$3.25
ANC Anchorage International	AK	I		\$15.36
GUM Antonio B. Won Pat International	GU	I		\$1.59
ACV Arcata-Eureka	CA	III		\$0.00
AVL Asheville Regional	NC	II		\$2.23
ASE Aspen Pitkin County Sardy Field	CO	III		\$0.63
AHN Athens/Ben Epps	GA	IV		\$0.00
ACY Atlantic City International	NJ	II		\$1.56
AUG Augusta State	ME	IV		\$0.00
AUS Austin Bergstrom International	TX	I		\$99.27
GRB Austin Strouhal Field	WI	III		\$1.73
BWI Baltimore-Washington International	MD	X		\$84.17
BGR Bangor International	ME	II		\$0.10
PAH Barkley Regional	KY	IV		\$0.00
HYA Barnstable Municipal	MA	III		\$0.00
MOB Bates Field Airport	AL	II		\$12.27

Example developer-created “Amount of Money Left at Checkpoint” analysis report showing values for a specific date range and subset of airports.

Integration options

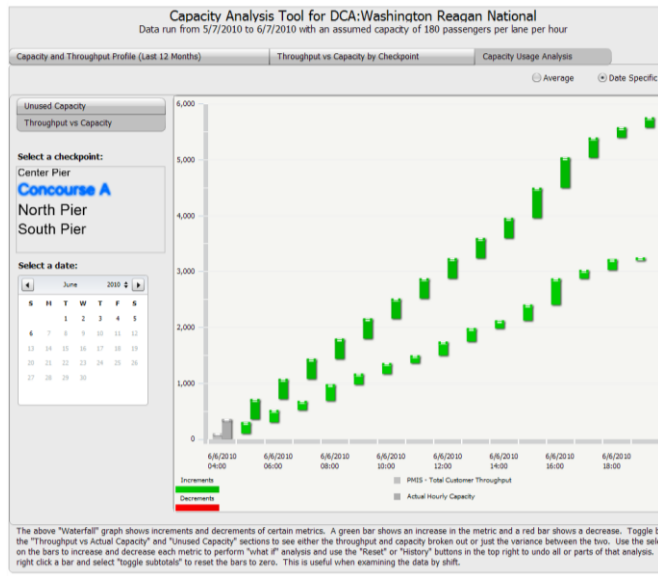
Option 2 (currently in use) – Collaborative Development Process

BI analytical team and program office developers create and maintain all publicly-available reports for a program office; users are allowed to create private “ad-hoc” reports within the application.



Integration options

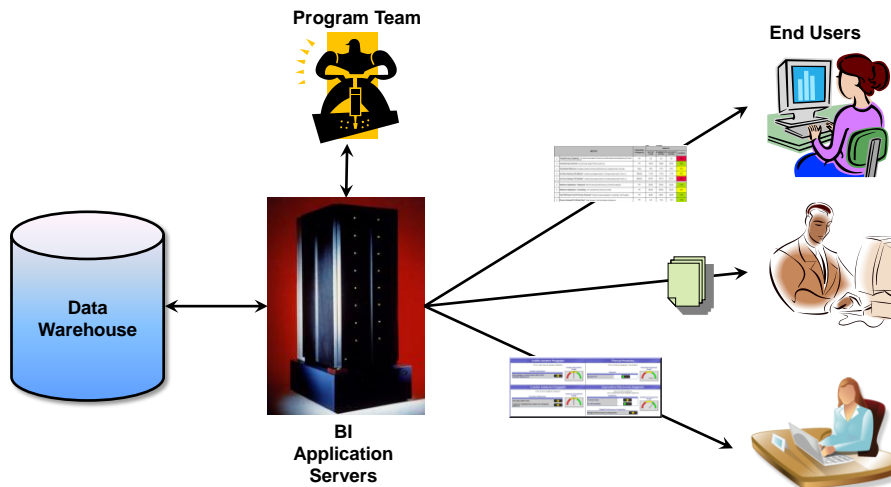
Example user-created “what-if” analysis report showing DCA throughput vs. capacity values for specific dates.



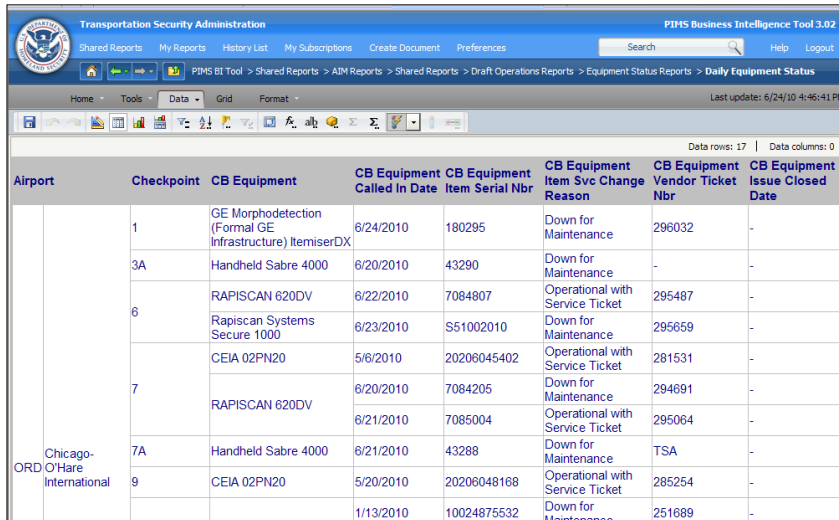
Integration options

Option 3 – Program Office Development Process

Program office team creates and maintains all publicly-available reports for a program office; users are allowed to create private “ad-hoc” reports within the application.



Integration options



Airport	Checkpoint	CB Equipment	CB Equipment Called In Date	CB Equipment Item Serial Nbr	CB Equipment Item Svc Change Reason	CB Equipment Vendor Ticket Nbr	CB Equipment Issue Closed Date
Chicago-ORD O'Hare International	1	GE Morphodetection (Formal GE Infrastructure) ItemiserDX	8/24/2010	180295	Down for Maintenance	296032	-
	3A	Handheld Sabre 4000	6/20/2010	43290	Down for Maintenance	-	-
	6	RAPISCAN 620DV	6/22/2010	7084807	Operational with Service Ticket	295487	-
		Rapiscan Systems Secure 1000	6/23/2010	S51002010	Down for Maintenance	295659	-
	7	CEIA 02PN20	5/6/2010	20206045402	Operational with Service Ticket	281531	-
		RAPISCAN 620DV	6/20/2010	7084205	Down for Maintenance	294691	-
			6/21/2010	7085004	Operational with Service Ticket	295084	-
	7A	Handheld Sabre 4000	6/21/2010	43288	Down for Maintenance	TSA	-
	9	CEIA 02PN20	5/20/2010	20206048168	Operational with Service Ticket	285254	-
			1/13/2010	10024875532	Down for Maintenance	251689	-

Example user-created report showing machine maintenance status and outages.

Media Comments

"The focus on metrics allows the TSA to avoid getting 'hamstrung' because it doesn't rely on intuition to make decisions or have information stored in disparate spreadsheets, data marts and reports."

- Wayne Eckerson
 Director of research and services
 The Data Warehousing Institute

"PIMS tracks more than 1,000 metrics in total, but TSA has customized dashboards and reports for approximately 30 roles within the agency, including top executives, optimization teams (they're the BI power users), and front-line security personnel."

- Special Report: Business Intelligence Gets Smart
Intelligence Enterprise
 September 2008

"If your most recent trek through airport security was less painful than even a year or so ago, thank the Transportation Security Administration's overarching business intelligence project, dubbed the Performance Information Management System, or PIMS."

- BI Efforts Take Flight
InformationWeek
 10/13/2008