The Human Reliability Company

Project Integrity

Project Database Reconciliation

SPI to Control System Databases

Houston SPI LTUF Meeting

May 13, 2014

About PAS

Founded in 1993

- Provider of *Human Reliability Software™* for *safe production*
  - *Human reliability is* a metric that relates to human factors that help minimize human error and lead to optimum human performance.
- Serving Power, Oil & Gas, and Processing industries globally
- Sustainable and profitable growth

Business Strategy

- Innovative technologies inspired by domain expertise
- Strategic customer relationships
- Mission critical software solutions
- 20% annual R&D Reinvestment

Thought Leadership & Strategic Partnerships

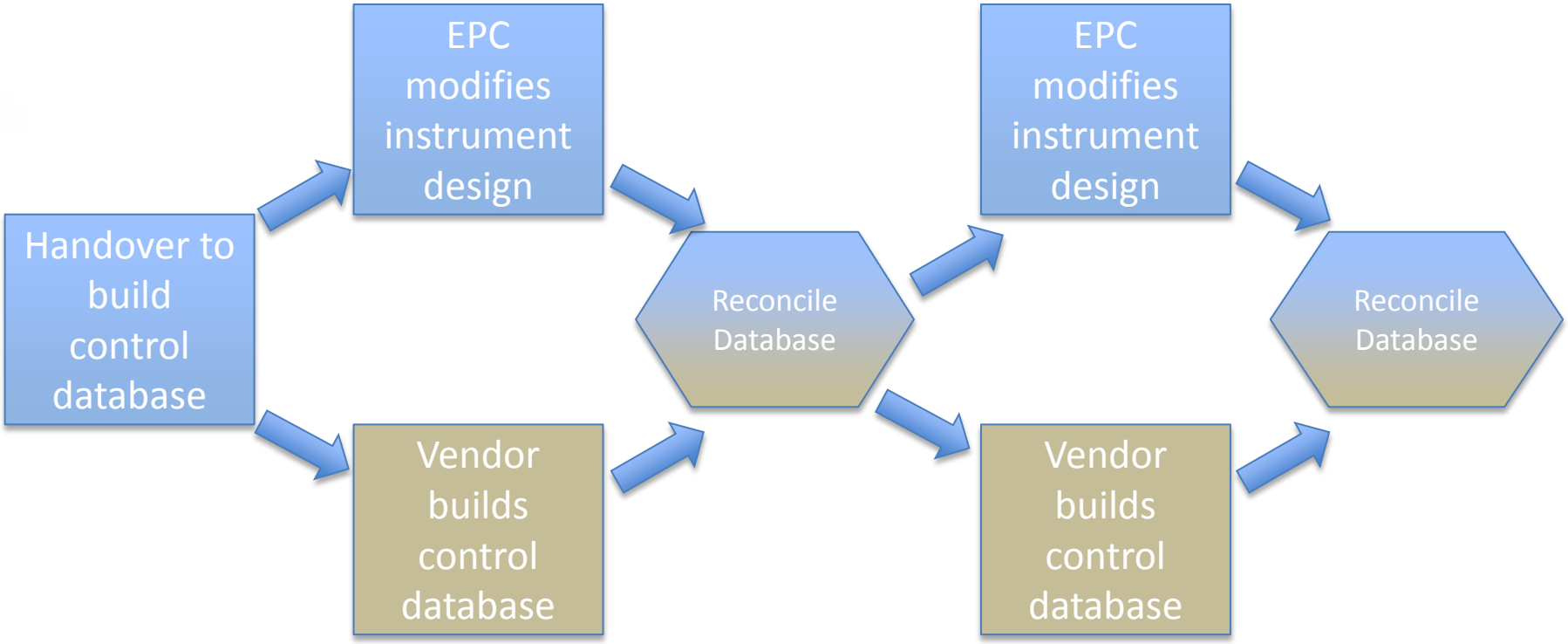
- Alarm Management and HP HMI Handbooks
- AICHE, NPRA, EPRI, ISA, EMMUA 191, OSHA
- Honeywell, Invensys, Intergraph, NovaTech and regional partners

SPI-DCS/SIS Database Reconciliation

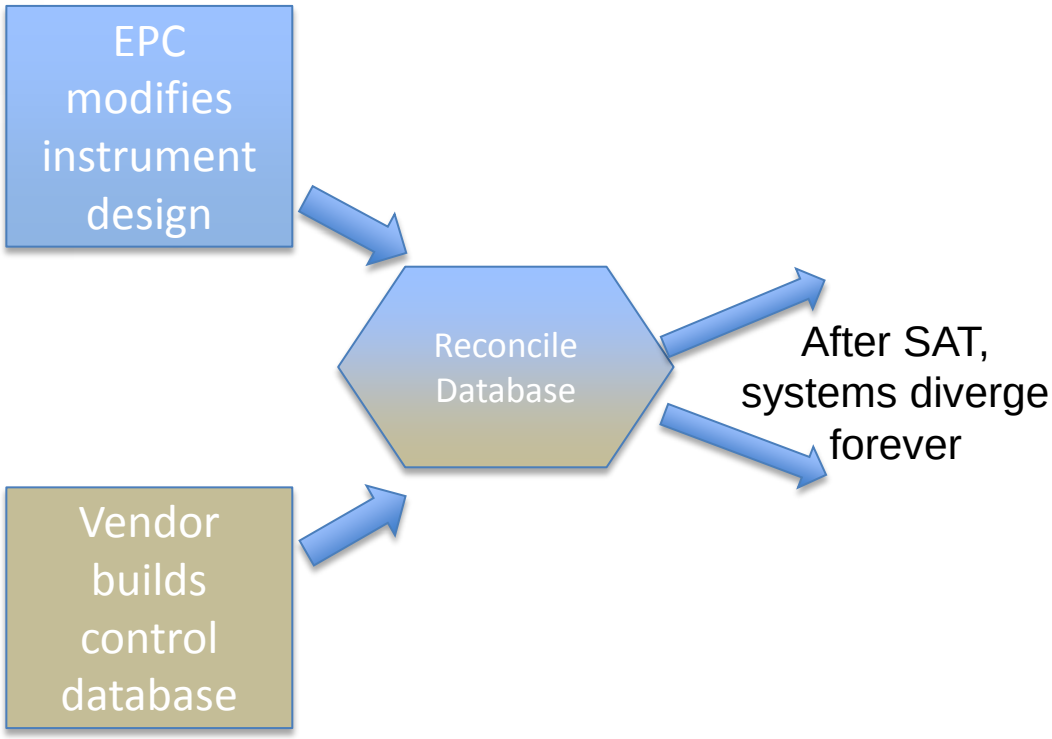
- Intergraph Smart Plant Instrumentation (SPI) Used by EPC for designing Instrumentation
- DCS/SIS Vendors use SPI database to build control database
  - SPI and DCS database begin to diverge
  - Revisions continue in SPI-DCS/SIS databases, creating discrepancies
- During several stages in the project, manual work process used to reconcile divergent databases
  - I/O Slot locations
  - Tag names
  - Engineering units
  - Descriptions
  - Device manufacturer for smart devices
  - Ranges
  - Etc.

Typical Project Process

During Project Execution, SPI is the "master" database – control databases are designed from the master



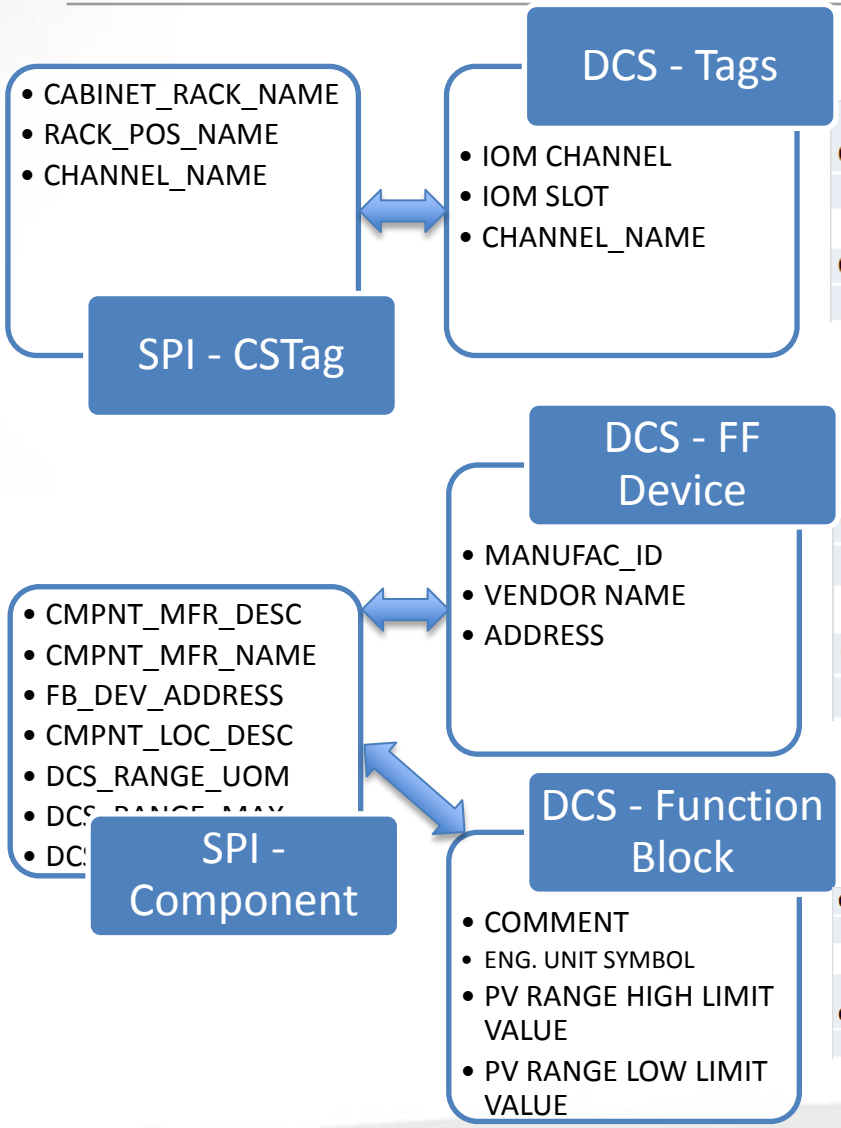
Typical Project Process



Typical Effort for Reconciliation

- 1 DCS with 10,000 I/O, 4 SIS with 1000 I/O each
  - 7 man weeks
  - 3 weeks calendar time
- Reconciliation typically done 3 to 4 times during the project
  - Detailed Design
  - Pre FAT
  - Post FAT
  - Post SAT
- Total Effort
  - 28 Man Weeks
  - 12 weeks calendar time

Typical Project Reconciliation Process today



At each phase of the project this task is executed 7,765

Object Name	CABINET_RACK_NAME	RACK_POS_NAME	CHANNEL_NAME
XI -6001	NODE-1	SLOT-1	10
↕	↕	↕	↕
Object Name	**IOM CHANNEL**	**IOM SLOT**	**IOM NODE**
XI_6001	10	1	1

At each phase of the project this task is executed 566

Object Name	CMPNT_MFR_DESC	CMPNT_MFR_NAME	FB_DEV_ADDRESS
LY -120B1	0x01151	Emerson	0xF2
↕	↕	↕	↕
Object Name	**MANUFAC_ID**	**VENDOR NAME**	**ADDRESS**
LY-120B1	0x00005100	Fisher Controls	0xF2

At each phase of the project this task is executed 9,951

Object Name	CMPNT_LOC_DESC	DCS_RANGE_UOM	DCS_RANGE_MAX	DCS_RANGE_MIN
LY -120B1	PROCESS MODULE	%	100	0
↕	↕	↕	↕	↕
Object Name	**COMMENT**	**ENG. UNIT SYMBOL**	**PV RANGE HIGH LIMIT VALUE**	**PV RANGE LOW LIMIT VALUE**
LY_120B1	TEST SEP WTROUT	%	100	0

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Typical Project Reconciliation Phases today

Design

7 Man Weeks of Effort

18,200 Items Reviewed

73,500 Attributes Processed

Pre FAT

7 Man Weeks of Effort

18,200 Items Reviewed

73,500 Attributes Processed

Post FAT

7 Man Weeks of Effort

18,200 Items Reviewed

73,500 Attributes Processed

Post SAT

7 Man Weeks of Effort

18,200 Items Reviewed

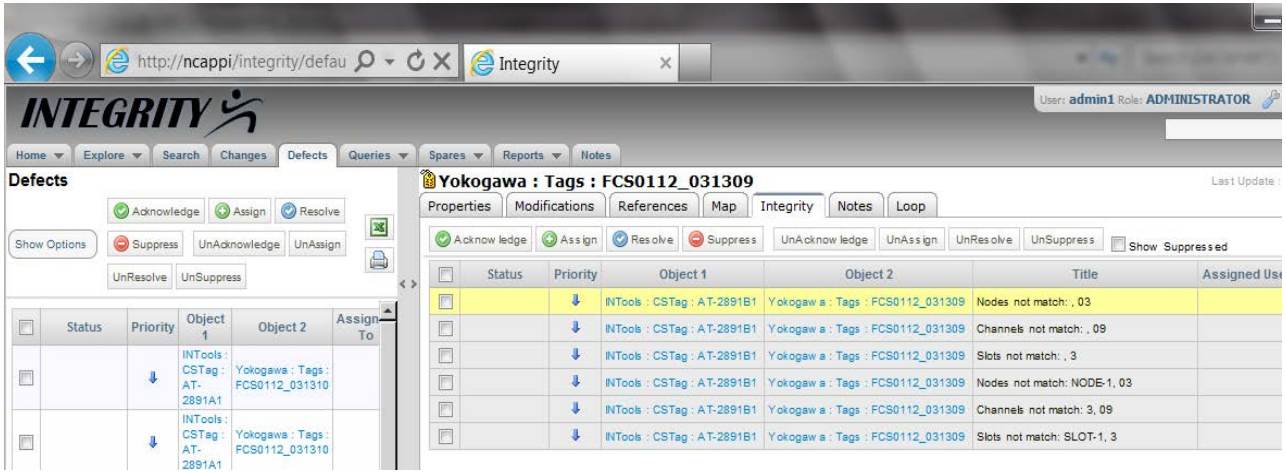
73,500 Attributes Processed

28 Man Weeks of Effort for Reconciliation

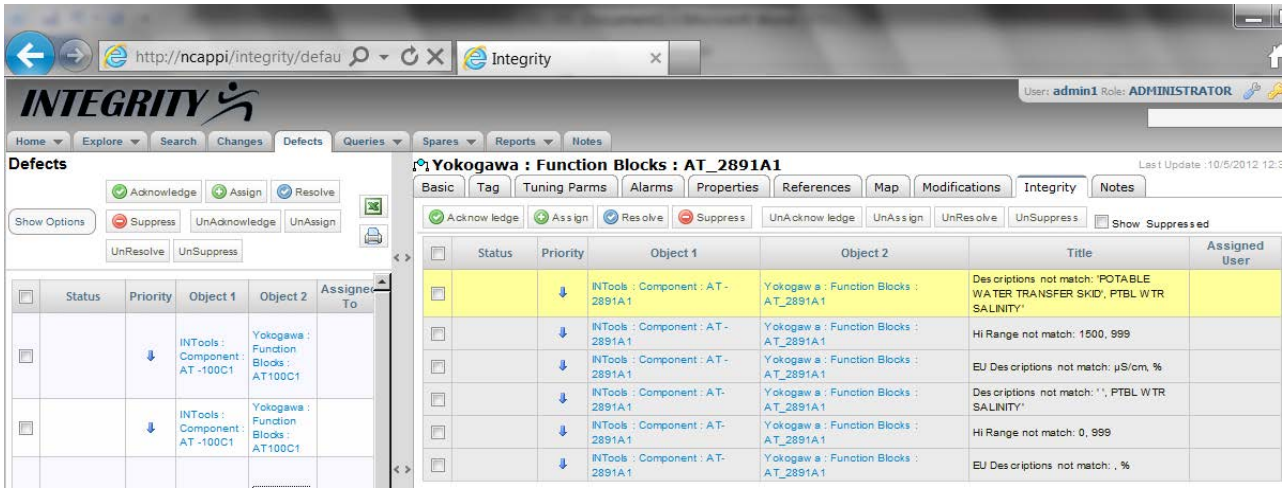
Integrity System Validation

- Integrity Automatically identifies mismatches between the databases
  - I/O Slot locations
  - Tag names
  - Engineering units
  - Descriptions
  - Device manufacturer for smart devices
  - Ranges
  - Etc.
- Saves engineering effort, improves quality
- Can be extended to validate other connected systems
  - DCS to SIS, APC, Historian, PLC's etc
  - SPI upgrades, SPI to SPI database versions
- Ensures accurate interfaces between disparate control systems throughout the life cycle of plant from design through operations

Example Discrepancies



I/O Locations



Entity Name & Ranges

Integrity Project Reconciliation Process

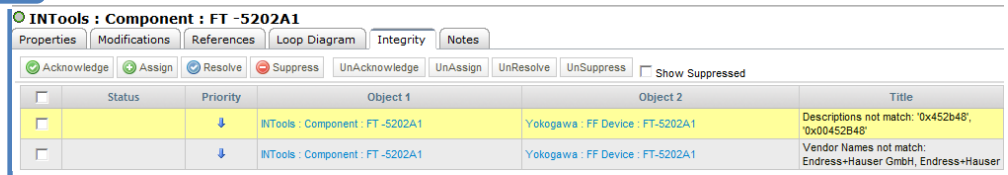
- CABINET_RACK_NAME
- RACK_POS_NAME
- CHANNEL_NAME

SPI - CSTag

DCS - Tags

- IOM CHANNEL
- IOM SLOT
- CHANNEL_NAME

At each phase of the project this task is executed automatically



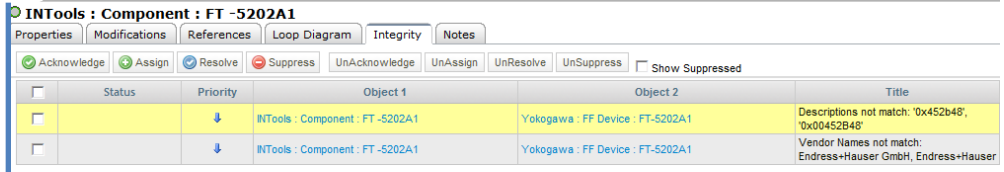
- CMPNT_MFR_DESC
- CMPNT_MFR_NAME
- FB_DEV_ADDRESS
- CMPNT_LOC_DESC
- DCS_RANGE_UOM
- DCS_RANGE_MAX
- DCS

SPI - Component

DCS - FF Device

- MANUFAC_ID
- VENDOR NAME
- ADDRESS

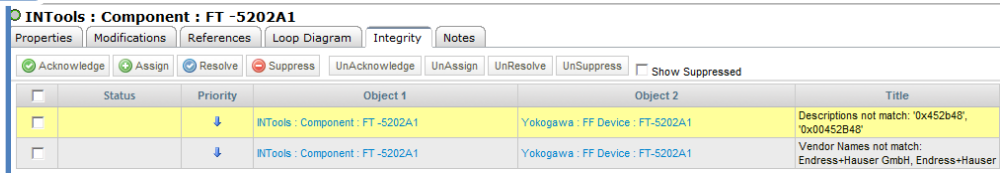
At each phase of the project this task is executed automatically



DCS - Function Block

- COMMENT
- ENG. UNIT SYMBOL
- PV RANGE HIGH LIMIT VALUE
- PV RANGE LOW LIMIT VALUE

At each phase of the project this task is executed automatically



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Integrity Project Reconciliation Phases

Design

1 Man Weeks of Effort

18,200 Items Reviewed

73,500 Attributes Processed

Pre FAT

1 Man Weeks of Effort

18,200 Items Reviewed

73,500 Attributes Processed

Post FAT

1 Man Weeks of Effort

18,200 Items Reviewed

73,500 Attributes Processed

Post SAT

1 Man Weeks of Effort

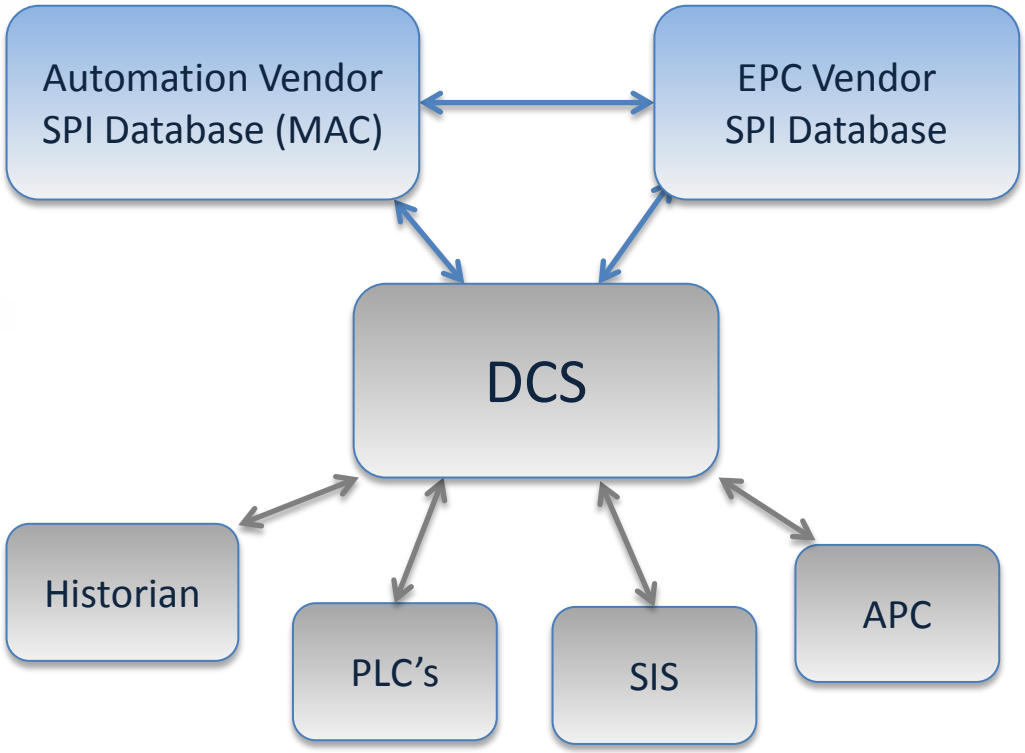
18,200 Items Reviewed

73,500 Attributes Processed

4 Man Weeks of Effort for Reconciliation

Higher Quality, Less Cost

One System to Ensure all databases are synched



Project Integrity

- Cross-Database Validation
- Defect Detection & Management
- Database Synchronization for Complex Automation Projects

Benefits & Savings – 14,000 I/O Project

- Shorten FAT and SAT
  - Less time spent identifying discrepancies, determining “who is right”
  - Faster startup (less time tracking down errors)
  - Errors found and remediated in the engineering offices, not at FAT or onsite
  - ***Savings in the millions of dollars*** by shortening FAT and SAT by several weeks
- Reduction in costs - Manpower
  - 28 Weeks Without Integrity, 4 Weeks With Integrity
  - ***24 Weeks (86% Savings) Reduction in I&E engineering effort ($170,000)***
- Database validation continually occurs, finding errors quickly and improving project quality
- Automatic validation of SPI database post startup
  - I&E techs use SPI database to drive instrument reliability program
- Validation can be extended to other integrated databases
  - DCS to SIS, PLC’s, APC, Historian, etc.
  - Similar savings as documented with SPI

Integrity saves millions of dollars by decreasing cost and risk associated with systems integration