Future of Data Management Summit

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SOLIDWORKS

Querying the PDM database

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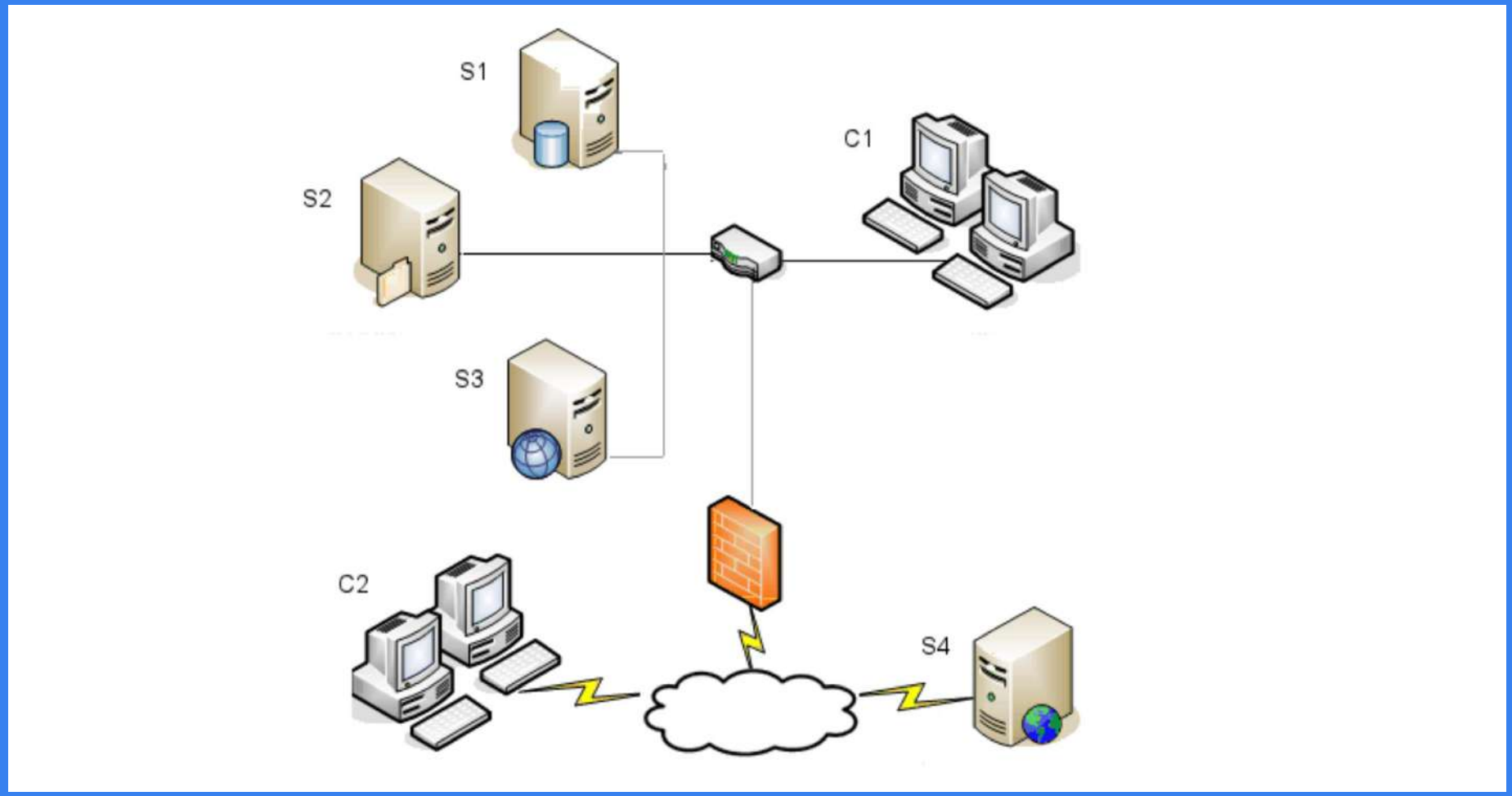
PDM Architecture



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Why ??

- Search and SQL Reports
- PDM Reports
- Troubleshooting
- Dashboards
- Custom apps

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WARNING!!!

- Backup, Backup, Backup
- Use Sandbox environment
- Read-Only
- Do not make changes to database structure
- Test Queries against large database and Major version releases
- For Web applications use SOLIDWORKS PDM Professional Web API

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Report Generator general considerations

- Data that a query accesses does not follow the permissions of the logged in user
- Not possible to use temp tables
  - No Drop and update commands
- Try using report query arguments
  - FileId, UserID, ProjectID, GroupID, StatusID and String

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PDM database structure

```
select type_desc, count(*) as 'No'
from sys.objects
group by type_desc
order by 2 desc
```

	type_desc	No
1	SQL_STORED_PROCEDURE	942
2	FOREIGN_KEY_CONSTRAINT	355
3	USER_TABLE	249
4	DEFAULT_CONSTRAINT	246
5	PRIMARY_KEY_CONSTRAINT	191
6	SQL_SCALAR_FUNCTION	176
7	SYSTEM_TABLE	72
8	SQL_TRIGGER	49
9	SQL_INLINE_TABLE_VALUED_FUNCTION	34
10	INTERNAL_TABLE	22
11	SQL_TABLE_VALUED_FUNCTION	13
12	UNIQUE_CONSTRAINT	5
13	SERVICE_QUEUE	3
14	VIEW	2
15	CHECK_CONSTRAINT	1

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Table Types

- Document details (such as Documents, DocumentConfiguration)
- Projects to store information about folders (Projects, DocumentsInProjects)
- File versioning (Revisions, DocumentRevisionConfiguration)
- Document references (Xrefs, XrefConfiguration)
- Metadata (VariableValue)
- Replication (ArchiveServerStored, ArchiveServers, ArchiveServerNeighbour)
- Bill of Materials (BomSheetValue, BomSheets, etc.)
- Document change history (HistoryRename, HistoryDelete, etc.)
- Workflows (Workflows, State, Transtions, etc.)
- Notifications for changes to documents or projects (Notifications, Messages)

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Table Types (2)

- Cards for files, folders, search, or templates (Cards, CardLists, CardControls)
- Custom columns for the search tool or SOLIDWORKS PDM File Explorer (CustomColumn)
- Search (SearchFavorites)
- Cold storage (ColdStorage, ColdStoreSchemas, etc.)
- User and group rights (GroupRights, UserRights, etc.)
- Tasks (Tasks, TasksInstances)
- Reports to store report queries and settings (ReportQueries)
- Serial numbers (SerialNumbers, SerialNumberPushBackCounters)
- Variables (Variable, VariableAliases)

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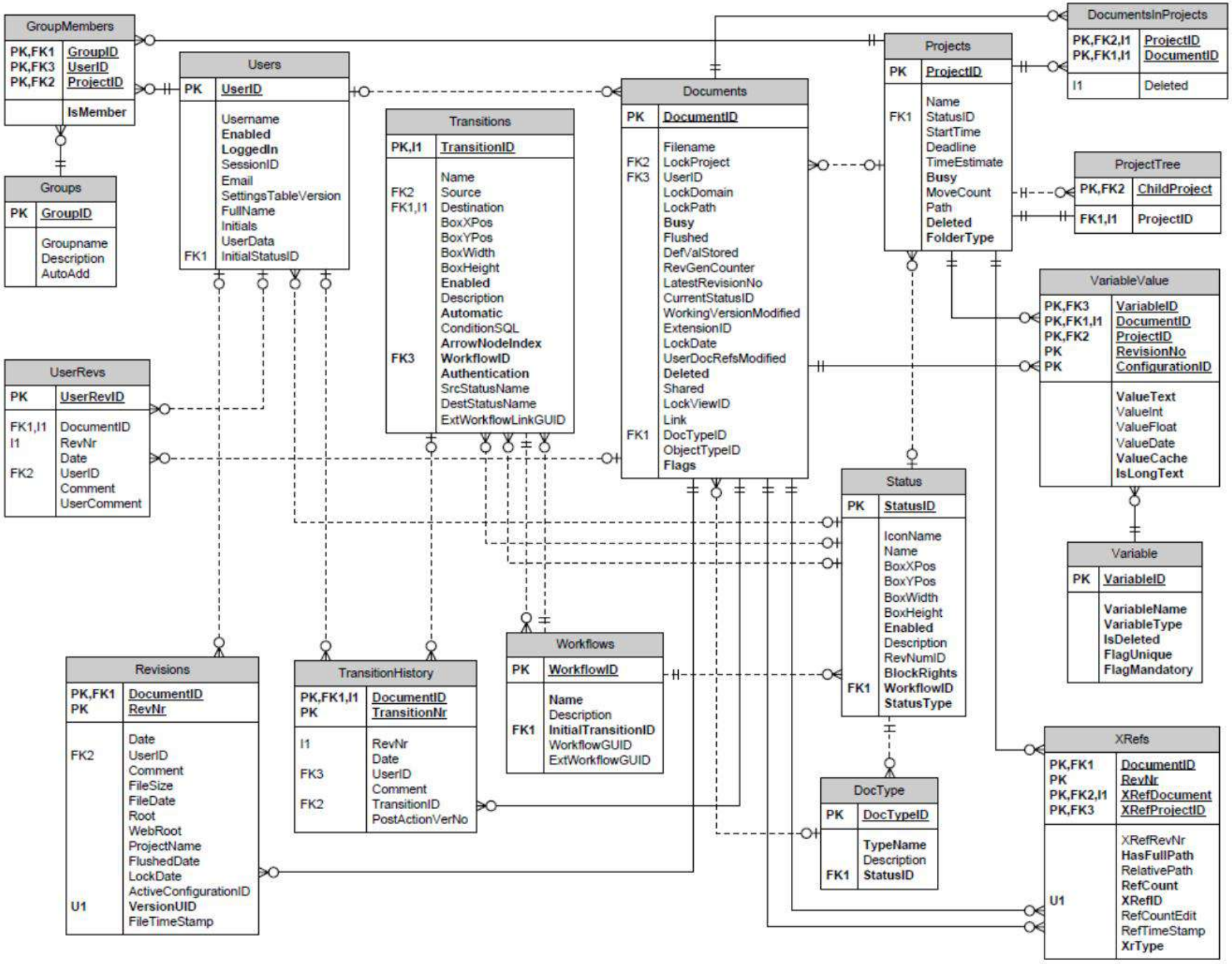
GroupMembers
PK,FK1 GroupID
PK,FK3 UserID
PK,FK2 ProjectID
IsMember
Groups
PK GroupID
Groupname
Description
AutoAdd
Users
PK UserID
Username
Enabled
LoggedIn
SessionID
Email
SettingsTableVersion
FullName
Initials
UserData
FK1 InitialStatusID
UserRevs
PK UserRevID
FK1,I1 DocumentID
I1 RevNr
Date
FK2 UserID
Comment
UserComment
Revisions
PK,FK1 DocumentID
PK RevNr
Date
FK2 UserID
Comment
FileSize
FileDate
Root
WebRoot
ProjectName
FlushedDate
LockDate
ActiveConfigurationID
U1 VersionUID
FileTimeStamp
Transitions
PK,I1 TransitionID
Name
FK2 Source
FK1,I1 Destination
BoxXPos
BoxYPos
BoxWidth
BoxHeight
Enabled
Description
Automatic
ConditionSQL
ArrowNodeIndex
FK3 WorkflowID
Authentication
SrcStatusName
DestStatusName
ExtWorkflowLinkGUID
TransitionHistory
PK,FK1,I1 DocumentID
PK TransitionNr
I1 RevNr
Date
FK3 UserID
Comment
FK2 TransitionID
PostActionVerNo
Documents
PK DocumentID
Filename
FK2 LockProject
FK3 UserID
LockDomain
LockPath
Busy
Flushed
DefValStored
RevGenCounter
LatestRevisionNo
CurrentStatusID
WorkingVersionModified
ExtensionID
LockDate
UserDocRefsModified
Deleted
Shared
LockViewID
Link
FK1 DocTypeID
ObjectTypeID
Flags
Workflows
PK WorkflowID
Name
Description
FK1 InitialTransitionID
WorkflowGUID
ExtWorkflowGUID
Projects
PK ProjectID
Name
FK1 StatusID
StartTime
Deadline
TimeEstimate
Busy
MoveCount
Path
Deleted
FolderType
Status
PK StatusID
IconName
Name
BoxXPos
BoxYPos
BoxWidth
BoxHeight
Enabled
Description
RevNumID
BlockRights
FK1 WorkflowID
StatusType
DocType
PK DocTypeID
TypeName
Description
FK1 StatusID
DocumentsInProjects
PK,FK2,I1 ProjectID
PK,FK1,I1 DocumentID
I1 Deleted
ProjectTree
PK,FK2 ChildProject
FK1,I1 ProjectID
VariableValue
PK,FK3 VariableID
PK,FK1,I1 DocumentID
PK,FK2 ProjectID
PK RevisionNo
PK ConfigurationID
ValueText
ValueInt
ValueFloat
ValueDate
ValueCache
IsLongText
Variable
PK VariableID
VariableName
VariableType
IsDeleted
FlagUnique
FlagMandatory
XRefs
PK,FK1 DocumentID
PK RevNr
PK,FK2,I1 XRefDocument
PK,FK3 XRefProjectID
XRefRevNr
HasFullPath
RelativePath
RefCount
U1 XRefID
RefCountEdit
RefTimeStamp
XrType
One
Many
One (and only one)
Zero or one
One or many
Zero or many

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Main Tables

- Documents
- Projects
- Revisions
- Xrefs
- VariableValue

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Documents table

- The DocumentID represents the unique ID for any file in the vault.
- The Filename is the name of the document. However, depending on the ObjectTypeID, the Filename can also be the name of a virtual document, a saved BOM, a cut-list, or an item
- The LockProject, UserID, LockDomain, LockPath, LockDate, and LockViewIDdata stores information about what folder, user, computer, path, date and local ViewID a checked out (locked) file has.
- LockProject=2 (which represents “no project”) or UserID=1 (which represents “no user”).

Column Name	*Data Type*	*Allow Nulls*
DocumentID	int	NOT NULL
Filename	nvarchar(255)	NULL
LockProject	int	NULL
UserID	int	NULL
LockDomain	nvarchar(255)	NULL
LockPath	nvarchar(255)	NULL
Busy	bit	NOT NULL
Flushed	int	NULL
DefValStored	int	NULL
RevGenCounter	int	NULL
LatestRevisionNo	int	NULL
CurrentStatusID	int	NULL
WorkingVersionModified	int	NULL
ExtensionID	int	NULL
LockDate	datetime	NULL
UserDocRefsModified	bit	NULL
Deleted	bit	NOT NULL
Shared	int	NULL
LockViewID	uniqueidentifier	NULL
Link	bit	NULL
DocTypeID	int	NULL
ObjectTypeID	int	NULL
Flags	int	NOT NULL

Documents table (2)

- The LatestRevisionNo column shows the latest version.
- The CurrentStatusID column can be joined with the Status table to obtain, for example, the workflow state name.
- The ExtensionID column can be joined with the FileExtension table to retrieve file extensions (such as sldprt).
- Shared

Column Name	*Data Type*	*Allow Nulls*
DocumentID	int	NOT NULL
Filename	nvarchar(255)	NULL
LockProject	int	NULL
UserID	int	NULL
LockDomain	nvarchar(255)	NULL
LockPath	nvarchar(255)	NULL
Busy	bit	NOT NULL
Flushed	int	NULL
DefValStored	int	NULL
RevGenCounter	int	NULL
LatestRevisionNo	int	NULL
CurrentStatusID	int	NULL
WorkingVersionModified	int	NULL
ExtensionID	int	NULL
LockDate	datetime	NULL
UserDocRefsModified	bit	NULL
Deleted	bit	NOT NULL
Shared	int	NULL
LockViewID	uniqueidentifier	NULL
Link	bit	NULL
DocTypeID	int	NULL
ObjectTypeID	int	NULL
Flags	int	NOT NULL

Revisions table

- The DocumentID is the unique ID for the file from Documents table and the RevNr column indicates document version
- Date display the time of check in for the document
- The UserID, Comment, and FileSize data stores user, comment, and file size information at the time of document check in.

Column Name	*Data Type*	*Allow Nulls*
DocumentID	int	NOT NULL
RevNr	int	NOT NULL
Date	datetime	NULL
UserID	int	NULL
Comment	ntext	NULL
FileSize	int	NULL
FileDate	datetime	NULL
Root	nvarchar(255)	NULL
WebRoot	nvarchar(255)	NULL
ProjectName	nvarchar(255)	NULL
FlushedDate	datetime	NULL
LockDate	datetime	NULL
ActiveConfigurationID	int	NULL
VersionUID	bigint	NOT NULL
FileTimeStamp	datetime	NULL

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Revisions table (2)

- The Root column shows the root of the local file vault view during check in. This information is used to build the correct reference paths when files with references are cached in vault views in different locations.
- The VersionUID is a unique ID given to each file version at check in. This information is used in replicate vaults to identify which server contains which version.

Column Name	*Data Type*	*Allow Nulls*
DocumentID	int	NOT NULL
RevNr	int	NOT NULL
Date	datetime	NULL
UserID	int	NULL
Comment	ntext	NULL
FileSize	int	NULL
FileDate	datetime	NULL
Root	nvarchar(255)	NULL
WebRoot	nvarchar(255)	NULL
ProjectName	nvarchar(255)	NULL
FlushedDate	datetime	NULL
LockDate	datetime	NULL
ActiveConfigurationID	int	NULL
VersionUID	bigint	NOT NULL
FileTimeStamp	datetime	NULL

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Xrefs

- The DocumentID and RevNr columns show the unique document ID and version of the “parent” file that contains a reference
- The XRefDocument and XRefRevNr columns show which “child” document ID and version that the parent is referencing.
- The XRefID is a unique ID for this parent-child reference relationship. This ID is used to join the XRefConfiguration table to retrieve additional reference information about what configuration relationship the reference contains
- The XrType data represents the reference type. For example, 1 for normal references and 6 for contextual references

Column Name	Data Type	Allow Nulls
DocumentID	int	NOT NULL
RevNr	int	NOT NULL
XRefDocument	int	NOT NULL
XRefProjectID	int	NOT NULL
XRefRevNr	int	NULL
HasFullPath	bit	NOT NULL
RelativePath	nvarchar(300)	NULL
RefCount	int	NOT NULL
XRefID	int	NOT NULL
RefCountEdit	float	NULL
RefTimeStamp	datetime	NULL
XrType	int	NOT NULL

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Variable Table

- The VariableID identifies the variable holding the value, which can be joined with the Variable table to retrieve the variable name or other variable properties such as unique, mandatory, etc
- The DocumentID and RevisionNo columns display the document ID and versionfor which the value applies
- The ProjectID column shows the project ID for which the value applies. When the variable value is for a file, the ProjectID has a value 2 (to indicate “no folder”).When the variable value is for a folder, the DocumentID, RevisionNo, and ConfigurationID columns all display a value of 1 (to indicate “no file”);

Column Name	Data Type	Allow Nulls
VariableID	int	NOTNULL
DocumentID	int	NOTNULL
ProjectID	int	NOTNULL
RevisionNo	int	NOTNULL
ConfigurationID	int	NOTNULL
ValueText	nvarchar(max)	NOTNULL
ValueInt	int	NULL
ValueFloat	float	NULL
ValueDate	datetime	NULL
ValueCache	nvarchar(64)	NOTNULL
IsLongText	bit	NOTNULL

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Variable Table (2)

- The ConfigurationID identifies the configuration that contains the value. ConfigurationID can be joined with the DocumentConfiguration table to get the actual configuration name.
- The ValueText and ValueCache columns display the actual variable value (metadata). Both types of data serve the same role, however the ValueCache data is limited to the first 64 characters of the variable value.

Column Name	Data Type	Allow Nulls
VariableID	int	NOTNULL
DocumentID	int	NOTNULL
ProjectID	int	NOTNULL
RevisionNo	int	NOTNULL
ConfigurationID	int	NOTNULL
ValueText	nvarchar(max)	NOTNULL
ValueInt	int	NULL
ValueFloat	float	NULL
ValueDate	datetime	NULL
ValueCache	nvarchar(64)	NOTNULL
IsLongText	bit	NOTNULL

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Report Types

- Reports for documents
- Reports for variable values
- Reports for database settings
- Statistics
- Reports for vault administration

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Report for documents

- General Documents detail
  - Documents details – Common tables for this type of report include Documents, DocumentsInProjects, Projects, Revisions, Status, and Users.

Example of Query 4-2 results:

	Filename	Status name	LatestRevisionNo	Category	Modified by	Checked In	ConfigurationName	File path
1	DOC-000000448.SLDDRW	Approved	4	-	Matt	2013-11-21 13:25:00	Sheet1	C:_Vault Views\TSQLDemo\Projects\PRJ-0
2	DOC-000000538.SLDDRW	Approved	4	-	Matt	2013-11-21 13:25:00	Sheet1	C:_Vault Views\TSQLDemo\Projects\PRJ-0
3	DOC-000000353.SLDDRW	Approved	3	-	Mark	2013-11-19 12:23:00	Sheet1	C:_Vault Views\TSQLDemo\Projects\PRJ-0

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Report for documents (2)

- Document versions 4-3
  - Document versions – Common tables for this report are Documents and Revisions. For checked in versions, you can use additional tables such as Users, FileExtension or DocumentConfiguration to get user details, file extensions, or configuration names.

Example of Query 4-3 results:

Results | Messages

	Filename	Version	Modifed by	Checked In	ConfigurationName	File path
1	DOC-000000448.SLDDRW	1/4	David	2013-10-27 16:57:00	Sheet1	C:_Vault Views\TSQLDemo\Projects\PRJ-000002\CAD ...
2	DOC-000000448.SLDDRW	2/4	Matt	2013-10-29 17:03:00	Sheet1	C:_Vault Views\TSQLDemo\Projects\PRJ-000002\CAD ...
3	DOC-000000448.SLDDRW	3/4	David	2013-11-11 10:17:00	Sheet1	C:_Vault Views\TSQLDemo\Projects\PRJ-000002\CAD ...
4	DOC-000000448.SLDDRW	4/4	Matt	2013-11-21 13:25:00	Sheet1	C:_Vault Views\TSQLDemo\Projects\PRJ-000002\CAD ...
5	DOC-000000538.SLDDRW	1/4	David	2013-10-27 16:59:00	Sheet1	C:_Vault Views\TSQLDemo\Projects\PRJ-000002\CAD ...
6	DOC-000000538.SLDDRW	2/4	Matt	2013-10-29 17:03:00	Sheet1	C:_Vault Views\TSQLDemo\Projects\PRJ-000002\CAD ...

Report for documents (3)

- Document and replication details 4-4
  - Document and replication details – You can use ArchiveServers to get the replication server details and ArchiveServerStored for information about replicated files.

Example of Query 4-4 results:

	Filename	Version	Modified by	Check In date	Check In comment	Replicated on servers
1	SHAFT - PULLEY.SLDPRT	1/2	David	2013-10-27 10:29:00		TS-APW8X64-SWK
2	SHAFT - PULLEY.SLDPRT	2/2	David	2013-10-27 10:35:00		TS-APW8X64-SWK, W7X64C1
3	SHAFT - LINEAR BEARING.SLDPRT	1/2	David	2013-10-27 10:29:00		TS-APW8X64-SWK
4	SHAFT - LINEAR BEARING.SLDPRT	2/2	David	2013-10-27 10:35:00		TS-APW8X64-SWK, W7X64C1
5	SHAFT - HEAD ASSY.SLDPRT	1/2	David	2013-10-27 10:29:00		TS-APW8X64-SWK

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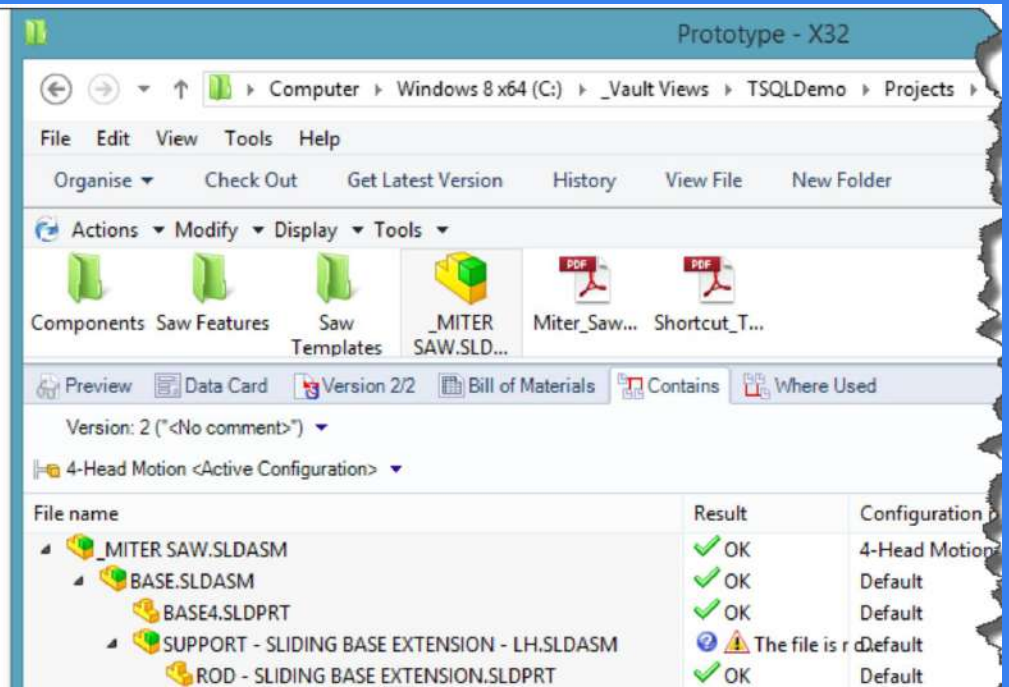
Report for documents (4)

- Document references 4-5
  - This report requires using the Xrefs table to retrieve references. The report uses a recursive method to loop through all document references. This example retrieves only the file structure and reference type. However, it is possible to extract addition information by combining with Queries 4-2 or 4-3

	File set references	Reference type
1	|_MITER SAW.SLDASM	Normal
2	|__BASE.SLDASM	Normal
3	|____BASE4.SLDPRT	Normal
4	|_____graduations.SLDPRT	Contextual
5	|____SUPPORT - SLIDING BASE EXTENSION - LH.SLDASM	Normal
6	|_____ROD - SLIDING BASE EXTENSION.SLDPRT	Normal
7	|_____SUPPORT - SLIDING BASE EXTENSION.SLDPRT	Normal
8	|____SUPPORT - SLIDING BASE EXTENSION-RH.SLDASM	Normal
9	|_____ROD - SLIDING BASE EXTENSION.SLDPRT	Normal
10	|_____SUPPORT - SLIDING BASE EXTENSIONRH.SLDPRT	Normal
11	|_____SUPPORT - SLIDING BASE EXTENSION.SLDPRT	Contextual
12	|__BLADE.SLDPRT	Normal
13	|__FENCE ASSEMBLY.SLDASM	Normal
14	|____KNOB-FENCE.SLDPRT	Normal
15	|____Lower Fence.SLDPRT	Normal
16	|____Upper Fence - LH.SLDPRT	Normal
17	|_____Upper Fence - RH.SLDPRT	Contextual
18	|____Upper Fence - RH.SLDPRT	Normal
19	|__HEAD ASSEMBLY.SLDASM	Normal
20	|____ASSY - DEPTH STOP.SLDASM	Normal
21	|____BLOCK - DEPTH STOP.SLDPRT	Normal



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Report for variable values

- Specific document 4-6
  - Specific document – The main table for retrieving variable values is the VariableValue table, can be joined with tables such as Variable to get variable names or Revisions to get version details

Example of Query 46 results:

	Filename	Version	ConfigurationName	VariableName	Value	File path
1	DOC-000000538.SLDDRW	1/4	Sheet1	Project number	PRJ-000002	\Projects\PRJ-000002\CAD Documents\DOC-000000538...
2	DOC-000000538.SLDDRW	1/4	Sheet1	Project Name	Model X32-02	\Projects\PRJ-000002\CAD Documents\DOC-000000538...
3	DOC-000000538.SLDDRW	1/4	Sheet1	Number	DOC-000000578	\Projects\PRJ-000002\CAD Documents\DOC-000000538...
4	DOC-000000538.SLDDRW	1/4	Sheet1	Date	2013-10-27	\Projects\PRJ-000002\CAD Documents\DOC-000000538...

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Report for variable values (2)

- Specific folder 4-7
  - Specific folder – The VariableValue table also contains the variable values for folders.

	Name	Folderpath	Variable name	Variable Value
1	PRJ-000001	\Projects\PRJ-000001\	Project Name	Model X32-001
2	PRJ-000001	\Projects\PRJ-000001\	Author	Mark
3	PRJ-000001	\Projects\PRJ-000001\	Project number	PRJ-000001
4	PRJ-000001	\Projects\PRJ-000001\	Date	2013-10-27
5	PRJ-000001	\Projects\PRJ-000001\	Project Location	Americas
6	PRJ-000001	\Projects\PRJ-000001\	Manager	Mark

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Report for database settings

- General Settings 4-9
  - General Settings – The Settings table stores the main user settings that are available in SOLIDWORKS PDM Administration Tool. The next example retrieves only settings from the Reference Dialog page of the Settings dialog box

	UserName	Setting	Status
1	Admin	Always work with latest &version of files.	OFF
2	Admin	Check out files silently without showing the check out dialog box.	OFF
3	Admin	Try to check out all referenced files when the referencing file is checked out.	ON
4	Admin	Do not mark &referenced files when changing state.	OFF
5	Admin	Show "not rebuilt" warnings on drawings and assemblies in need of rebuilding.	ON
6	Admin	Auto select reference files to get latest when checking out.	ON
7	Admin	Enable the get version command in SolidWorks Add-in.	OFF

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Statistics

- Statistics 4-12
  - Statistics data is useful for vault maintenance or project management. You can also generate statistics to show an audit trail for various data

	Day	NewFiles	NewFileVersions	NewFileRreference	TransitionOperations	DeleteOperations
1	27/10/2013	410	688	8	681	0
2	28/10/2013	2	3	0	2	0
3	29/10/2013	0	133	0	266	0
4	05/11/2013	1	8	3	263	0
5	08/11/2013	1	1	0	2	0
6	09/11/2013	1	2	0	1	0
7	11/11/2013	0	19	0	133	0
8	12/11/2013	1	1	0	1	0
9	19/11/2013	1	132	0	132	0
10	21/11/2013	0	133	0	133	0

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Troubleshooting

- Main commands
- Archive Server Service
- Database Server Service
- Performance

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Dashboards??

- PDM Report
- MS Excel
- PowerBI

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Query Best Practices

- Adopt good coding practices
- Write code for readability and maintainability
  - ii. Avoid using legacy join syntax
  - iii. Terminate statements with a semicolon
  - iv. Avoid using *
  - v. Use correct casing
- Write Standard code when possible

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Questions?

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