

DCA DiscTag™ Enabled Workflow

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Introduction

Since 1988, DCA has a continuous history of innovation in the optical disc industry, including the development of the world's first loading, mastering and verification products. DCA continues that history of innovation today with its products for XBOX 360, HD-DVD and Blu-ray.

For the XBOX 360 project, DCA decided to introduce a completely new workflow process, one that would not only allow job automation, but also allow complete information automation. Thus was born the idea of the *DiscTag Enabled* workflow.

The DiscTag Enabled workflow allows plants to solve the issues of budget/cost pressures, job tracking and problem analysis by linking metadata, such as customer/catalog IDs, HCRCs for verification, and testing profiles to a unique DiscTag embedded on each layer of the replica.

Components of the DiscTag Enabled Workflow

There are three separate components of the workflow:

1. **DiscTag Layer Marker** – a unique tag for each layer that is bound together with a Title GUID. This marker resides on each optical disc layer. The DiscTag layer marker is the key for retrieving XML and HCRC information from the metadata store (a separate partition on your server).
2. **HCRC** – the “Gold Reference” value for logical verification. This value resides on the metadata store.
3. **XML Metadata** – title history reports containing customer, catalog, job report information for the title, and a link to each layer's HCRC value. This XML resides on the metadata store.

There are several possible applications for the DiscTag Enabled Workflow in the replication chain, including:

- **Automatic Testing and Verification** – testers and verifiers can retrieve the DiscTag marker from a replica to automatically populate the user interface and start testing/verification with no operator intervention
- **Automatic Layer Matching** – testers and verifiers can retrieve the DiscTag marker on each layer to ensure that both layers belong together
- **Job Histories/Audit Trails** – plant personnel can use the web-based Title Manager software to lookup job history reports using either the DiscTag from a replica or a host of other parameters, including Customer Name, Catalog ID, Cut Number and Date Range.

DiscTag Layer Marker

The Disc Tag Layer Marker is a unique identification mark for each layer within a title. Its' contents include:

- Unique Title GUID (for each title and each version of a title)
- Unique Layer GUID
- Encoder ID
- Cut/Sequence # (updated each time an encoder remasters the title)
- Date/Time Stamp

The layer marker can exist in two states: either a pre-tag or a complete DiscTag. Pre-tagging is done prior to mastering, and allows the content to be uniquely tracked and tied to the HCRC/XML metadata throughout the content creation/loading process. A DiscTag enabled encoder will then complete the DiscTag by inserting the encoder ID, cut/sequence # and date/time stamp.

HCRC

Hierarchical CRC values (HCRC) provides a CRC for each sector of a disc image.

Advantages the HCRC include:

- Verification is completed without the need for source media to be present,
- Mis-compare are reported by sector and/or radius location,
- Multiple errors are located and reported individually,
- A substantial reduction in network bandwidth over bit-to-bit compares (<1% of the bandwidth is necessary for HCRC verification),
- Operators can verify portions of a replica, including single layers of a dual-layer disc, or a specific sector range, and
- Ready for all formats, including all forms of Audio CD, all modes of CD-ROM, all DVD formats, HD DVD and Blu-ray.
- Can cover all copy protections, including Macrovision Safedisc and Ripguard, CSS, CPPM and AACs.

XML Metadata

Metadata is stored on a server partition, known as the metadata store, as XML files.

There are two XML files created during the DiscTag Enabled workflow process:

- Title XML History File contains the Customer Name, Catalog ID (and version, if applicable), job reports, format type, and an optional tester profile. This file also contains links to the Layer HCRC values and the Layer XML files.
- Layer XML File contains the matching Title GUID for that specific layer, plus layer specific information (particularly for Twin Format).

All metadata is stored and looked up by the DiscTag layer marker value.

Industry Examples:

Automated Testing

1. Starts with an operator inserting a replica into a tester
2. The tester retrieves the DiscTag marker from each layer and sends the marker to the metadata store, which returns:
 - a. Customer and Catalog ID from the XML metadata
 - b. Format type/tester profile from the XML metadata
 - c. Optionally, HCRC values from the XML metadata link
3. The tester software then populates its' user interface and auto-starts.
4. Tester software then performs testing and optional verification from the HCRC values.
5. When testing/verification are complete, the tester job report is sent back to the metadata store, where it is inserted into the Title XML History file.

Layer Matching

1. Starts with an operator inserting a replica into a standard optical disc drive on a DCA Viper system
2. The drive retrieves the DiscTag marker from each layer, and using the marker value, Viper retrieves:
 - a. Customer and Catalog ID from the XML metadata
 - b. HCRC values from the metadata store
3. Viper populates its' user interface and auto-starts.
4. The first step in the Viper verify job is to confirm that the two layer markers are indeed the correct ones associated with the Title GUID on the metadata store. Second step is HCRC verification of the content.
5. When Viper is complete, it sends its' job report back to the server, where it is inserted into the Title XML History file.

Retrieving Job Reports for a Specific Replica

1. Using DCA's web-based Title Manager, plant personnel insert a replica into the local computer's optical drive
2. The drive retrieves the DiscTag marker from each layer, and using the marker, Title Manager returns the Job History Report from the Metadata Store
3. The Job History Report contains every job report from every tool that has created or processed this title from the title it was pre-tagged, including authoring, loading, encryption, mastering, verification, testing and archiving.
4. Title Manager can also tell you the location of the source fileset for that replica (Mastering Server, SAN or physical media archive).

Retrieving Job Reports from a Search

1. Plant personnel use DCA's web-based Title Manager to search for all titles from a user-specified date range.
2. Title Manager returns a list of all jobs that meet these criteria, along with links to all of their Job History reports.
3. Can also display the total number of errors from each test/verification, so that yields can be quickly computed.

Archive Management

1. Plant personnel use DCA's web-based Title Manager to search for all titles on their mastering server
 2. Users can manually select the titles to be archived to SAN or to physical media (via robotics)
- or-
3. Users can setup a rule to automatically SAN-archive titles with a Status of Complete and Verified after x # of days.
- or-
4. If users need to re-master a title, Title Manager can locate specific titles (either by search or by retrieving the DiscTag from a replica) and then re-load them from SAN or physical media to the mastering server.

Summary of DiscTag Advantages

On the content creation and authoring side of the business, advantages include:

1. A unique identifier available for each title and each version of the title. Check discs and retail discs can be matched with the Title metadata to ensure the correct version was replicated.
2. HCRC validation of the replica against the original "Gold Reference" created during authoring. Provides the ability for check discs to be easily and automatically verified.
3. Layer matching ensures that both layers from check discs and retail discs belong together using the Title GUID value from the metadata.
4. Job history reports are available to show the exact path your content took throughout the content creation/replication chain.

Summary of DiscTag Advantages, Continued

For replicators, the advantages include:

1. Automated testing and verification
2. HCRC error reporting by sector and radius points
3. Job history reports available throughout the replication chain
4. Ability to use DiscTag from a replica to:
 - a. Retrieve title history,
 - b. Archive the title to SAN or physical media
 - c. Reload/remaster the archive of the title from the network, and
 - d. Build custom reports from the XML metadata.
5. Layer matching ensures that both layers belong together
6. HCRC verification uses far less bandwidth for logical verification (than bit-to-bit), without the need to have the customer's media available during the test.

Conclusion

The DiscTag Enabled workflow provides advantages to companies in all phases of the content authoring and replication chain. In addition to providing automated testing and verification, DiscTag users can experience a host of easily retrievable information from the Job History reports, layer-matching, version tracking and identification, and many more information automation tasks.

DCA and its' partners throughout the industry are ready today to help you implement the DiscTag Enabled workflow for your business.

For more information contact your Regional Sales Manager

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