The Naim Hard Disk Player and Music Server Database

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Abstract
Music Servers have traditionally stored music in association with a database to allow retrieval of music at an Album level. While this is in accordance with the great majority of commercially available databases it is certainly not the manner in which a normal user selects music from conventional storage.

Music Servers, therefore, generally fall far short of the requirements of serious listeners of Classical Music, Jazz, and Compilation albums.

A better solution had to be developed before Music Servers and Hard Disk players attain ubiquity in the market alongside conventional sources such as CD players.

This paper demonstrates how information at Track level with Naim Extended Metadata can give a user experience beyond the convenience of conventionally selecting a CD from the shelf. Powerful database processing and search mechanisms deliver an intuitive user interface for both the casual user as well as the dedicated musicologist, whether playing music from the Hard Disk or simply playing a CD album in real-time.

1. Background

Traditionally, physical vinyl record and CD collections have been stored on shelves with spines visible. The content of the spines reflects the marketing endeavours of the record company on the one hand and also serves to indicate contents of the single disks or album for selection by the user. Selection of an album quickly offers additional information as soon as the album is removed from the shelf, as track information is readily visible along with other information relating to artists and the specific recording.

In order for a Music Server or Hard Disk Player to match or surpass the convenience of selecting disks from a collection on a shelf, a database internal to the Server has to be constructed to match the ripped disk.

The only unique identification for the disk relates to the properties of the data on the disc: number of tracks, track lengths, total play time etc. Information contained on the CD sleeve is not known to the Server.

The combination of tracks, track times etc. is possibly unique, but not always guaranteed to be so. At the time of ripping the Server will interrogate one or several on-line databases in order to match the disk being ripped with a managed and maintained database. The relevant database entry is downloaded, and together with Cover Art is used to give the user a local database within which music can be selected for play.

2. Current Situation

The shortcomings of the current state of the art of cataloguing ripped CDs fall into several categories.

Virtual music collections where the data representing the music is stored, but where there is no physical carrier create a new problem for cataloguing. Initially the industry responded with several commercial databases offering cataloguing at an ALBUM level:

ARTIST (SINGLE ARTIST FOR THE ALBUM)
ALBUM
GENRE

And within the selected album simply:

SONG

will identify any individual track.

This is the situation, supported additionally with Cover Art that has been used by the various free or subscribed databases for a number of years.

ALBUM LEVEL		TRACK LEVEL	
	Searchable		Searchable
Artist	Y	Song	Y
Album	Y		
Genre	Y		
Cover Art			

While this situation will work for simple Albums where the Album title is unambiguous and the Artist is the same for all tracks, the system immediately fails for compilations, where there are many possible artists individual to each track in the album.

2.1 International releases may be different

Albums may well exist in several versions in different territories. These may have a different track makeup or different Cover Art, even the same tracks but in different order, or differing track lengths due to editing refinements in later releases.

2.2 Gapless playback

Albums may be designed for continuous play. The concept of 'tracks' being merely to identify location on the physical disk. E.g. Opera, or Pink Floyd: The Wall.

2.3 Multi Disks
Albums may be part of a multiple disc set

2.4 Data Tracks
Albums may contain material additional to playable music – data tracks etc.

2.5 Metadata isn't always correct
Integrity of data is paramount. Mistakes in data entry mean that user-submitted databases are not generally reliable.

3. Requirements
The requirements for a reliable database from which to identify ripped CDs are summarised below:

3.1 Correctly identifying and allowing free searching within ARTIST, ALBUM, GENRE, SONG CDs.

3.2 This is adequately covered by the available commercial databases with one important shortcoming. Unless the data is edited or subject to some verification process the incorrect metadata could be displayed, resulting in end-user frustration.

3.3 Correctly identifying and allowing free searching within Compilation CDs.

3.4 There are several types of compilation disk to be found in a typical CD collection, including:

Classical	Same composer, various works, various artists
Classical	Same orchestra or artists, various composers, various types of music
Classical	Same type of music, various composers, various artists.
Sampler	Various unrelated tracks, various unrelated artists.
Sampler	Same artists, re-allocation of tracks from other releases
Sampler	Same record label but various artists and tracks

3.5 Correctly identifying and allowing free searching within multiple disk sets. Providing that there is sufficient cross checking and binding of disks in a multi-disc set then the situation is as above. Multiple disks can be combined into a single playing experience using the server Create Playlist function.

4. The Naim Solution
The solution devised by Naim is creating a database internal to the server populated by data from AMG among other databases, with sophisticated internal processing of the downloaded database entries.

AMG provide data at both Album and Track level. Importantly the database is manually edited: from both submissions from Record Companies and from User Submissions, manual database editing creates a master database, which initially promises to meet the specific requirements of Naim as below.

Additionally the database is configured by Naim to be self-optimising and various user tools as detailed in section 4 ensure a comfortable user experience. The full amount of AMG metadata is actually downloaded: nothing is discarded. This gives scope for additional functionality in response to market sentiment.

The basic engine for the Naim Hard Disk Player and Music Servers is provided by Digital Fidelity and is based around a powerful XML database application. Further specialised functions ensure that the sound quality achieved is well in advance of industry standards.

5. The Naim Extended Music Database
Correctly creating a database that will be effective for Compilation CDs requires that the search fields operate at both ALBUM level and at TRACK level.

The search fields proposed in the Naim Music Server and Hard Disk Player are: -

ALBUM LEVEL
Album Title
Album Artist 1
Album Artist 2
Album Genre

TRACK LEVEL
Track Title
Work
Track Artist 1
Track Artist 2
Track Artist 3
Track Artist 4

The concept of Artist includes:

Artist or Group or Soloist or Conductor
Composer
Orchestra or Group

Naim introduces the concept of PEOPLE for all Artists, Composers etc, to avoid users having to manage failed searches due to incorrect recollection of the precise Artist attribute.

There is therefore within The Naim servers and Naim Hard Disk Players the concept of PEOPLE SEARCH.

ALBUM LEVEL

	DISPLAY	SEARCH	
TITLE	Y	Y	
ARTIST NAME	Y	Y	PEOPLE SEARCH
PERFORMER / ORCHESTRA	Y	Y	
GENRE	Y	Y	
COVER ART	Y		

TRACK LEVEL

TRACK COUNT	DISPLAY	SEARCH	
TRACK TITLE	Y	Y	
WORK / PIECE / MOVEMENT	Y	Y	
COMPOSER	Y	Y	PEOPLE SEARCH
PERFORMER / SOLOIST	Y	Y	
CONDUCTOR	Y	Y	

6. Search

The Search path for the user makes no distinction between search at Album or Track level other than when searching for an ALBUM title.

The distinction is at the point of returning the results to the user. The rationale is that the end user will not be constrained by the physical CD boundaries of the original disc, which are purely an artifice introduced by the Record Company. The Naim user is therefore free of the constraints of the physical CD when searching.

The user searches allow both BROWSing and SEARCHing.

Browsing allows survey and selection from lists, in the manner of browsing a selection of CDs on a shelf, however they may be organised. Additionally there is the capability to Browse the metadata associated with Playlists.

At any stage of the Browse process the Album or Track selected can be simply added to a new playlist with a single click. All Browsing and Searching leads to track information: at that stage the corresponding full album information is available including Cover Art.

At any stage the View can be toggled from being list based to having a highly visible image of the highlighted album Cover Art as well as a scrollable list.

BROWSE PATHS				
Browse Music	Albums	Show Tracks	Play Album or Track	
Browse Artists	Artists	Show Albums	Show Tracks or Album Info	Play Album or Track
Browse Tracks	Show Track and Album Info		Play Track	
Browse Genre	Show Albums	Show Tracks or Album Info	Play Album or Track	
Browse Composer	Show Albums	Show Tracks or Album Info	Play Album or Track	
Browse Conductor	Show Albums	Show Tracks or Album Info	Play Album or Track	
Browse Performer	Show Albums	Show Tracks or Album Info	Play Album or Track	

7. Browsing

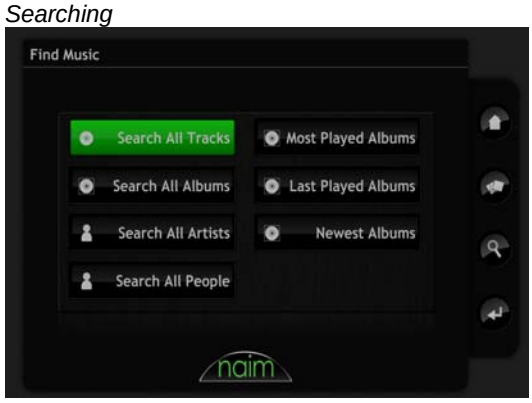
Within any of the menu categories sub-lists of album Titles, Track names, Composers names etc. allow the user to quickly drill down to the required selection.

8. Searching

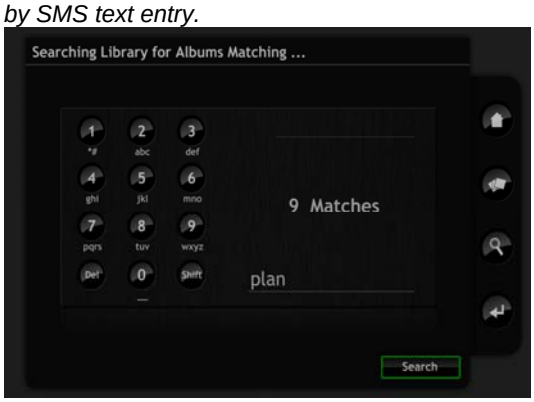
Searching is text entry based. Permits searching for specific text in album titles, track titles, performers, or people.

SEARCH PATHS			
Search All Tracks	SMS Text entry	Show tracks or Album Info	Play track or Album
Search All Albums	SMS Text Entry	Show Tracks or Album Info	Play track or Album
Search All Artists	SMS Text Entry	Show Albums	Play track or Album
Search All People	SMS Text Entry	Show Tracks or Album Info	Play track or Album

Searching

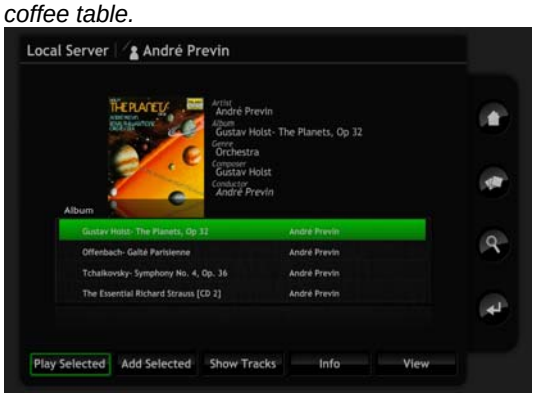


Search within Track Titles, Albums, and People is by SMS text entry.



Returned search results are displayed as list; directly analogous to selecting a CD from a shelf.

Alternatively the VIEW can be toggled at will to show Cover art to replicate the experience of rummaging for a disc among many others on a coffee table.



9. Playing the selected music.

Having made the selection, then using the extended metadata in the database the appropriate fields are populated for the user to view and further control playback using the transport controls.

10. Shortcomings of the AMG Database and the Naim solutions

10.1 Regional variations in albums

Disks may be issued with regional differences in tracks, track lengths, or other anomalies. The AMG database is currently USA centric. However, there is in place a mechanism to optimise the database for regional variations.

Should a Naim Server receive a less than perfect match from AMG, the secondary lookup of an alternative database is used. This will certainly not have the depth of track level metadata, but will at least provide basic disc identification. This information is automatically submitted to AMG. At this point both the Server and AMG record the situation.

Repeat occurrences, to a level of three similar incidents from different servers, prompts AMG to physically locate a copy of the errant disc for subsequent manual editing of the database to take account of the regional variations.

The Naim Hard Disk Player or NaimNet Server, at 03.00 hrs (default but can be changed) will automatically check with AMG for any subsequently amended AMG lookups, and in due course will correct all incomplete local database records.

10.2 Album not known

If the album is recognised on other databases then the process as in 5.1 ensures AMG optimisation and correction of the local server database. Should there be no match at all then there are a number of tools which allow the server user to create a manual database entry.

This is fed into AMG for use when a similar situation arises elsewhere, and is subject to the same edit rules for 3 occurrences. As of the end of January, 2008, the AMG solution's data coverage was approximately 11M pop music albums.

10.3 Multiple AMG returns

In many cases there are a range of possibilities for AMG matches. Logic internal to the Naim Server, subject in itself to ongoing optimisation, makes intelligent selection. In the event of equal weight of selection, a user selection is offered.

By using the available sleeve notes the user can refine the selection. Feedback to AMG refines the central database for future enhanced accuracy of lookup.

11. Conclusion

Naim have addressed the major shortcomings of Music Servers so far offered to the market, and in so doing have created a totally new concept in convenient playback of archived digital music.

Searching for material is often quicker than finding the Album in a well organised music library, while the profound level of information displayed by the Hard Disk Player while playing music rivals the CD sleeve notes for convenience and sheer user delight.

Multiple control interfaces make the most of the metadata available according to the type of user and application.

The benefits of the extended metadata and convenient operation even extend to CD Albums which have not been archived to Hard Disc: simply loading a CD in Player mode brings up the extended metadata and cover art on a variety of interfaces direct from the online database.

Naim's HDX is powered by the DigiFi™ platform; leading edge software technology licensed from DigiFi Ltd of London