MELOS: a musical ontology framework for diverse cultural repositories

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Project's Aims & Goals

Music Libraries and Archives are dealing with multiple formats of music, including multimedia, scores, and other related materials that need to be classified and stored in knowledge databases and knowledge repositories in a form that can be easily retrieved.

MELOS (from the ancient Greek word **μέλος**, which stands for song and melody) aims to:

- Create and interconnect Greek digital music libraries and knowledge repositories
- Develop a "world of music ontologies"
- Provide musicians and musicologists with a growing body of open access materials related to Greek music
- Equip the MIR community with new datasets (of folk as well as contemporary music) curated by musicologists and librarians
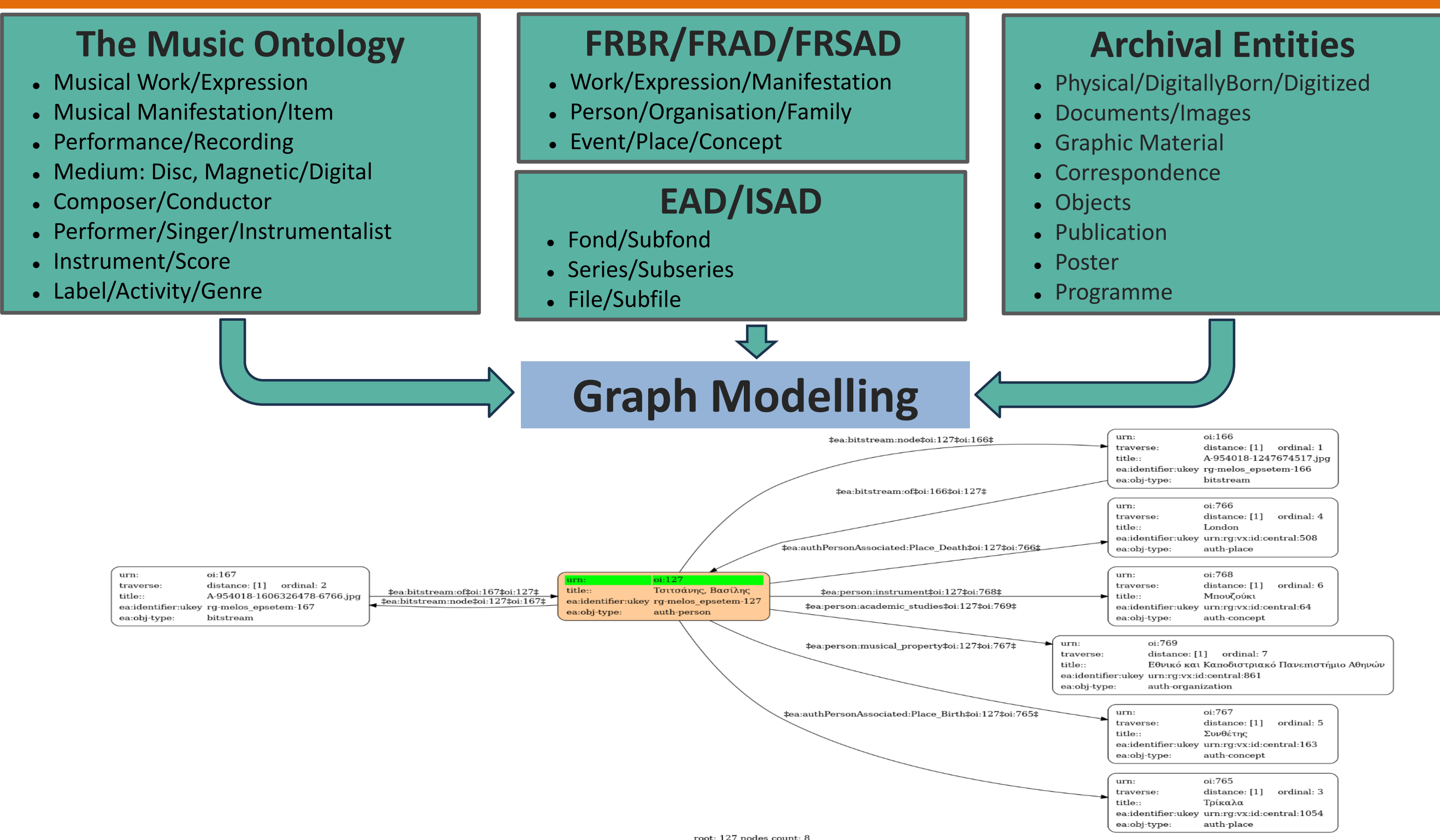
Music Collections
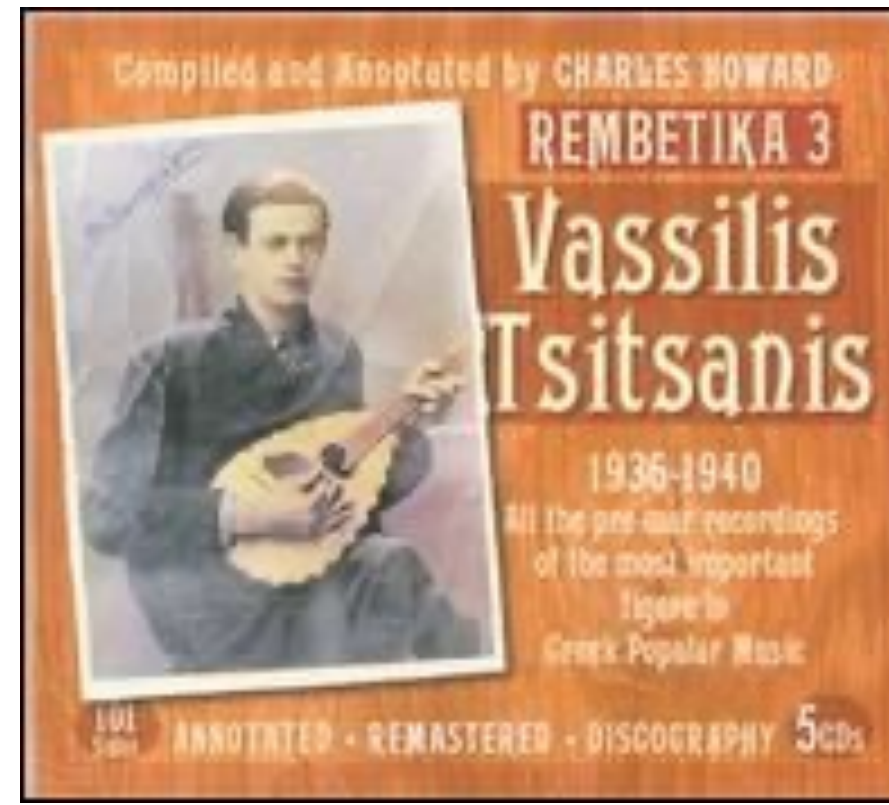
- the **Mikis Theodorakis Archive**: the composer's complete works (330 titles)
- the **Greek Archive of Contrabass**: compositions for double bass by Greek artists (22 solos, 15 concertos, 75 chamber music pieces)
- the **Vasilis Tsitsanis Collection of Recordings**: 1,267 tracks composed/performed by Vasilis Tsitsanis
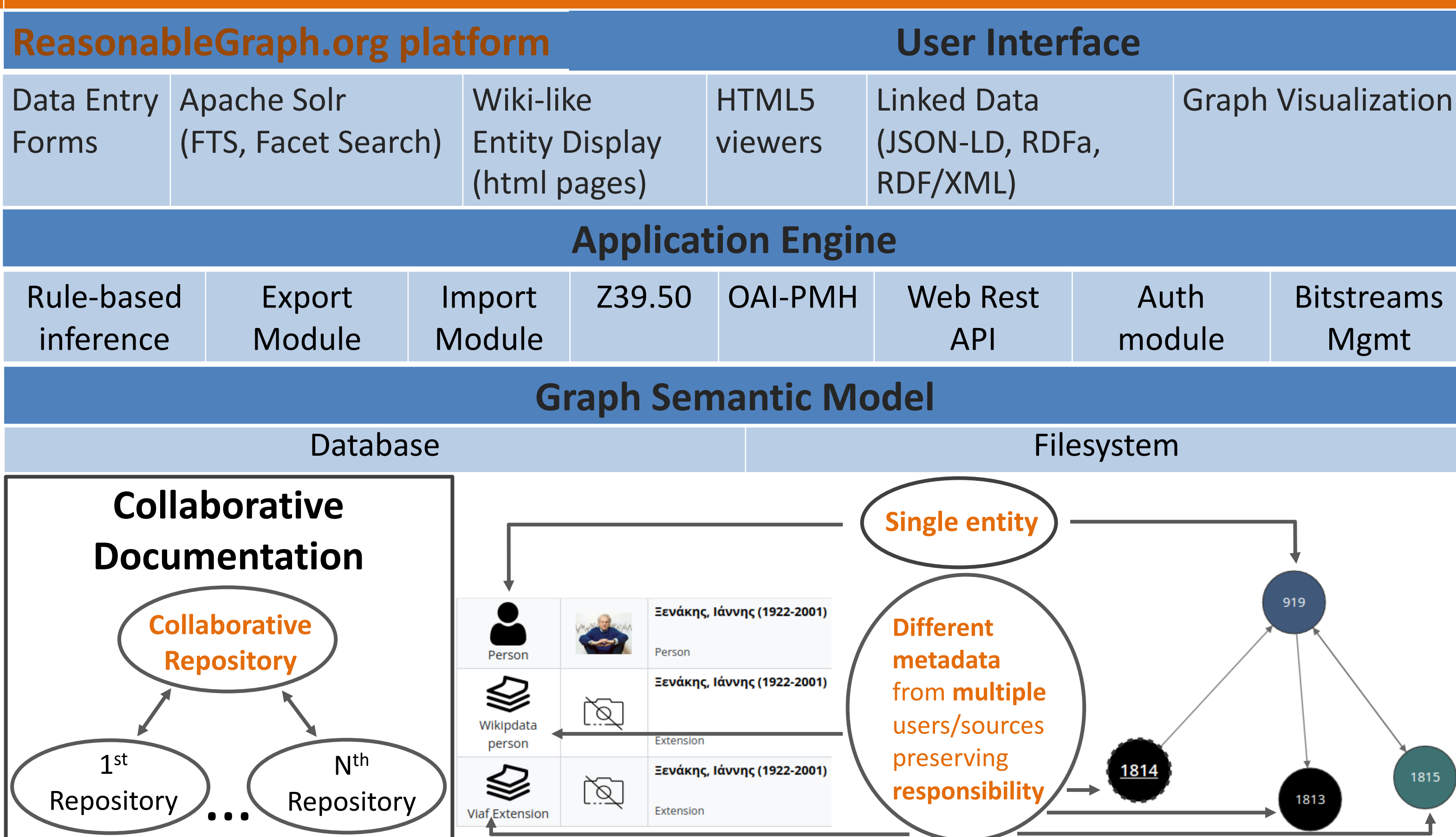
Data, Metadata & Artifacts

- Title, date, instrumentation, performers, album covers, program notes, and more
- **Audio & Scores** (some handwritten)
- **Musicological Analysis** (e.g., tonality, harmony, mode or makam, time signature, tempo, and genre)
- **Automatically extracted Musical Features & Audio Descriptors** (e.g., tempo-curves, rhythm, chroma, timbre, and dominant melody)

Ontologies

The Music Ontology
- Musical Work/Expression
- Musical Manifestation/Item
- Performance/Recording
- Medium: Disc, Magnetic/Digital
- Composer/Conductor
- Performer/Singer/Instrumentalist
- Instrument/Score
- Label/Activity/Genre

FRBR/FRAD/FRSAD
- Work/Expression/Manifestation
- Person/Organisation/Family
- Event/Place/Concept

EAD/ISAD
- Fond/Subfond
- Series/Subseries
- File/Subfile

Archival Entities
- Physical/DigitallyBorn/Digitized
- Documents/Images
- Graphic Material
- Correspondence
- Objects
- Publication
- Poster
- Programme

Graph Modelling

Platform Architecture

ReasonableGraph.org platform

User Interface					
Data Entry Forms	Apache Solr (FTS, Facet Search)	Wiki-like Entity Display (html pages)	HTML5 viewers	Linked Data (JSON-LD, RDFa, RDF/XML)	Graph Visualization

Application Engine							
Rule-based inference	Export Module	Import Module	Z39.50	OAI-PMH	Web Rest API	Auth module	Bitstreams Mgmt

Graph Semantic Model

Database	Filesystem

Collaborative Documentation

Collaborative Repository

1st Repository ... Nth Repository

Single entity

Different metadata from multiple users/sources preserving responsibility

Navigation & Music Metadata

Musicological Analysis
- Harmony & Melody
- Form & Segmentation
- Rhythm
- Genre (dance style)
- Lyrics transcription
… and more

Computational Features

The music metadata are enhanced with automatically extracted features that pertain to:

- Rhythm (e.g., BPM detection, Tempo-curves)
- Melody (e.g., Pitch-chroma, Dominant melody)
- Timbre (e.g., spectral centroid, MFCCs)
- Vocal timbre (e.g., formants, vibrato, inharmonicity)

The users can access these data through:

- Text fields
- Figures (plots)
- .csv files for time–series data (e.g., Chroma, Tempo)

Vibrato rate: 5.6 Hz   Vibrato extent: 35.9 cents

Beats per Minute (BPM):
BPM median: 138
BPM range: 135 - 141