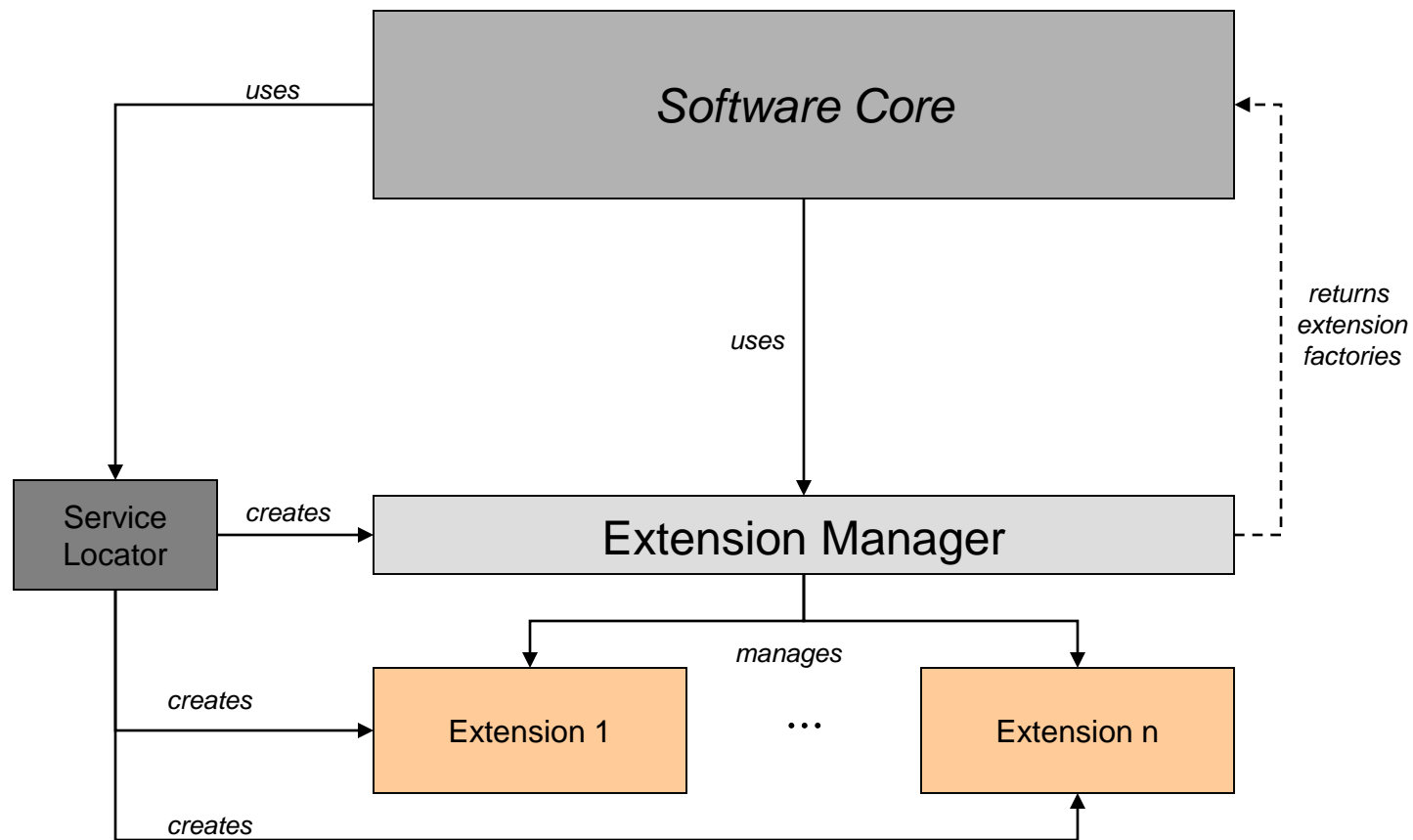
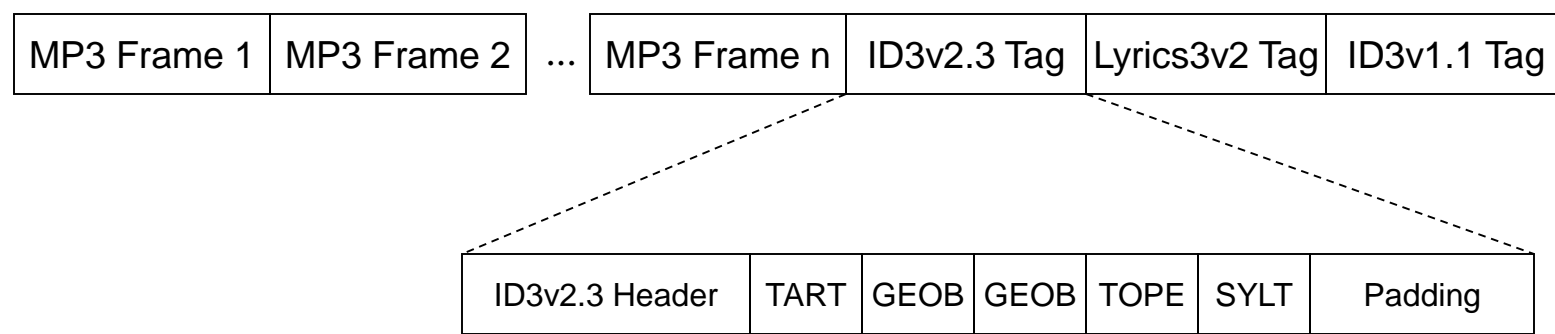


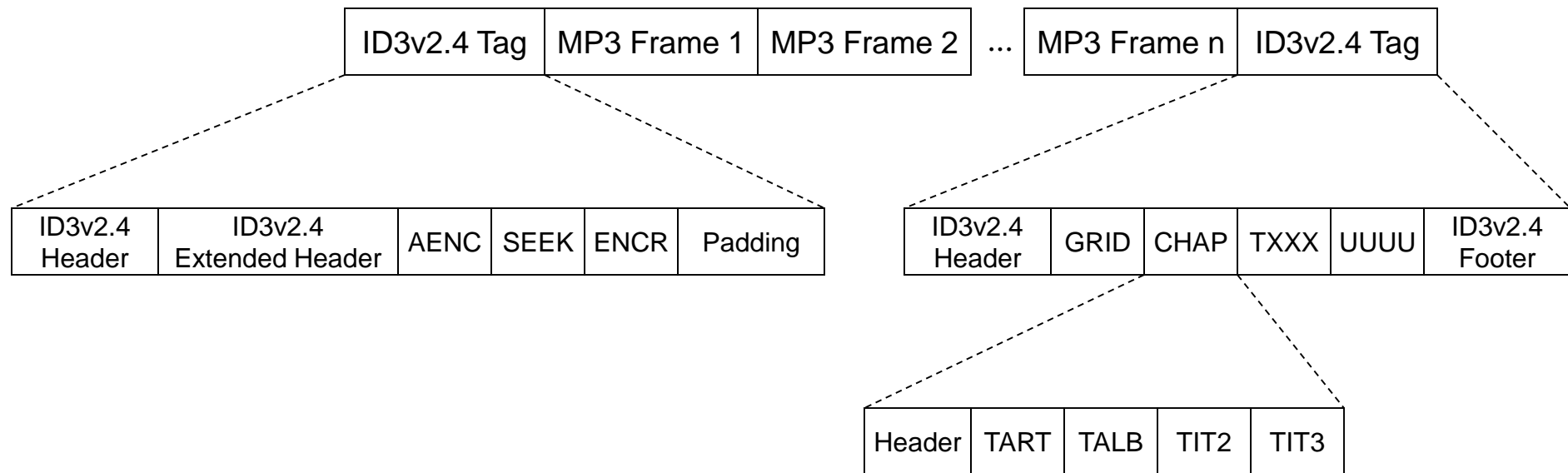
*Tag*

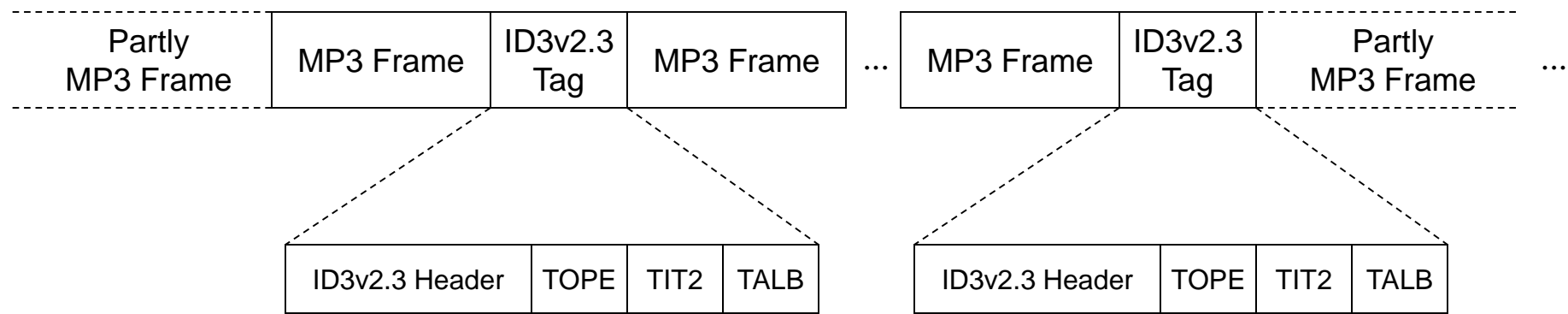
Payload Data

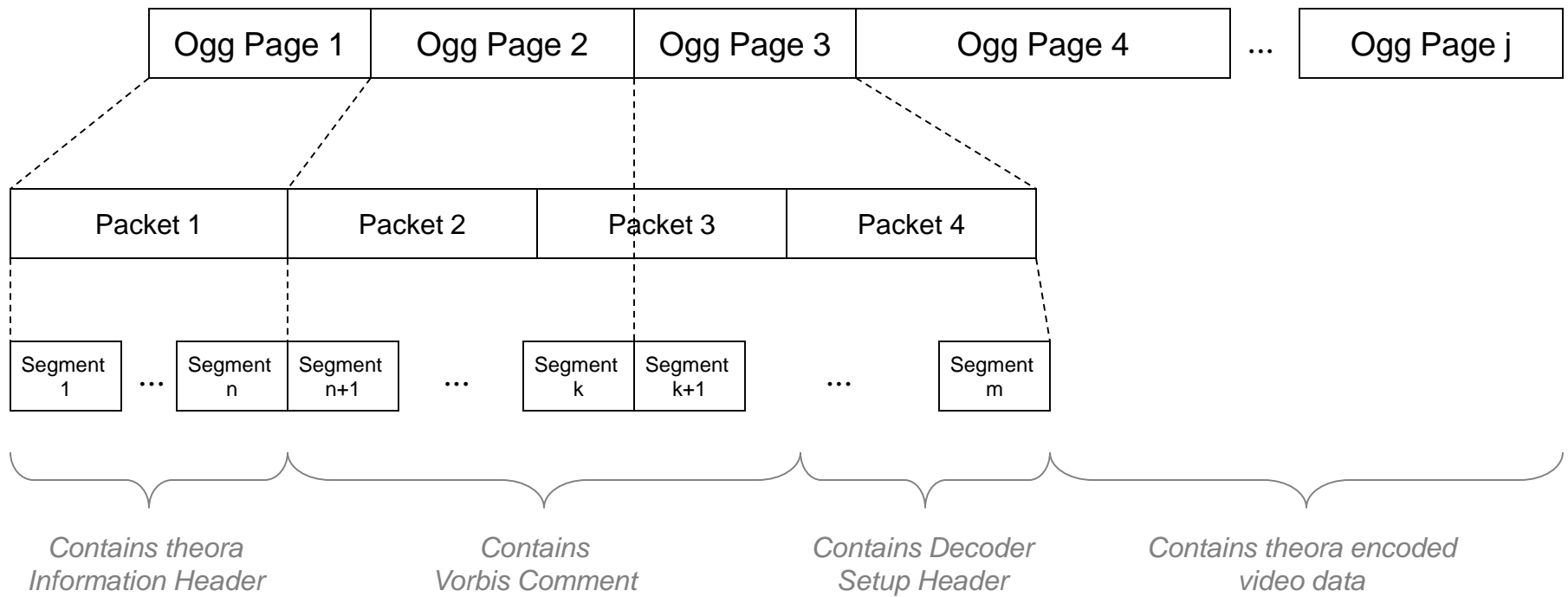


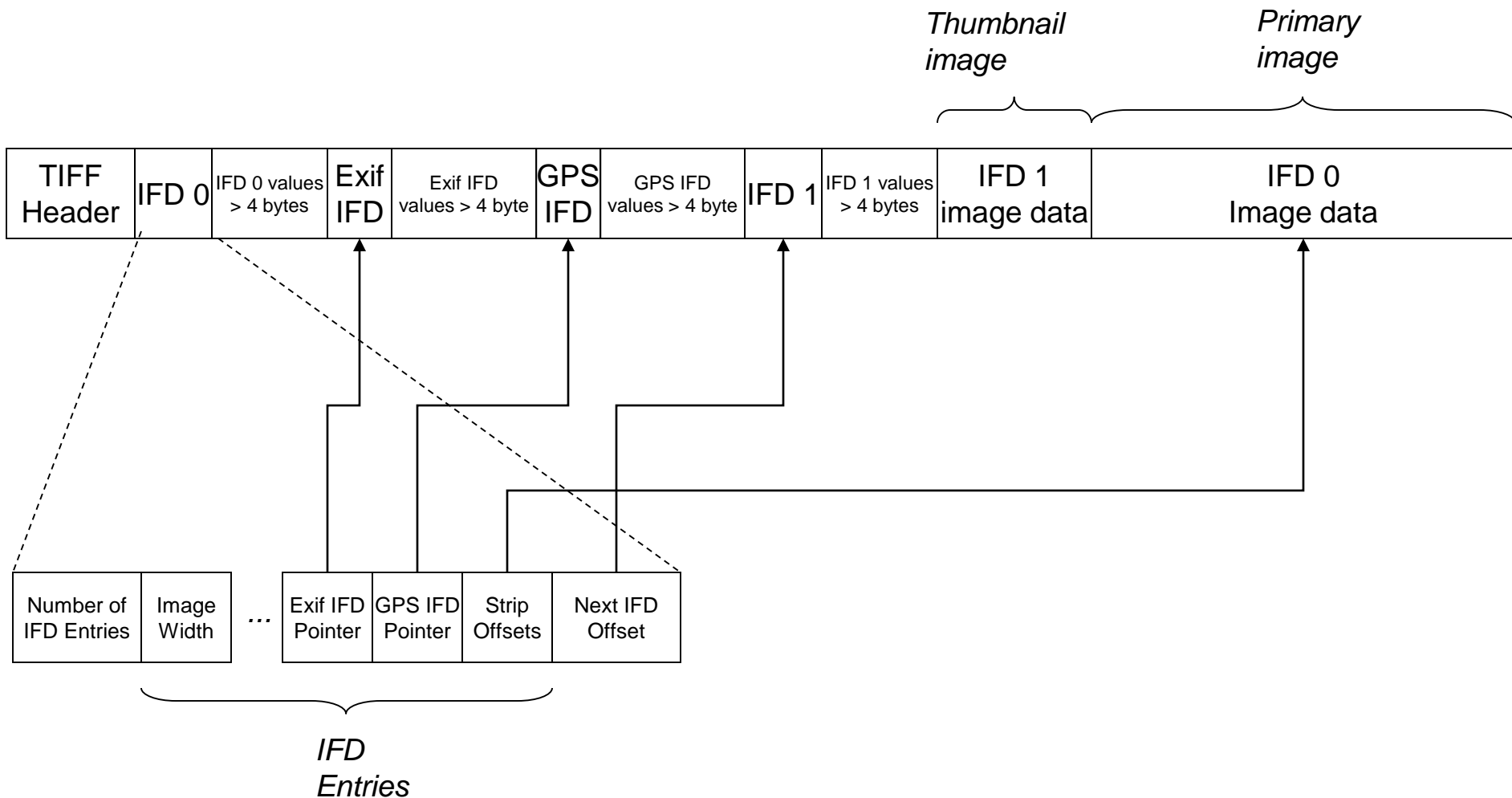


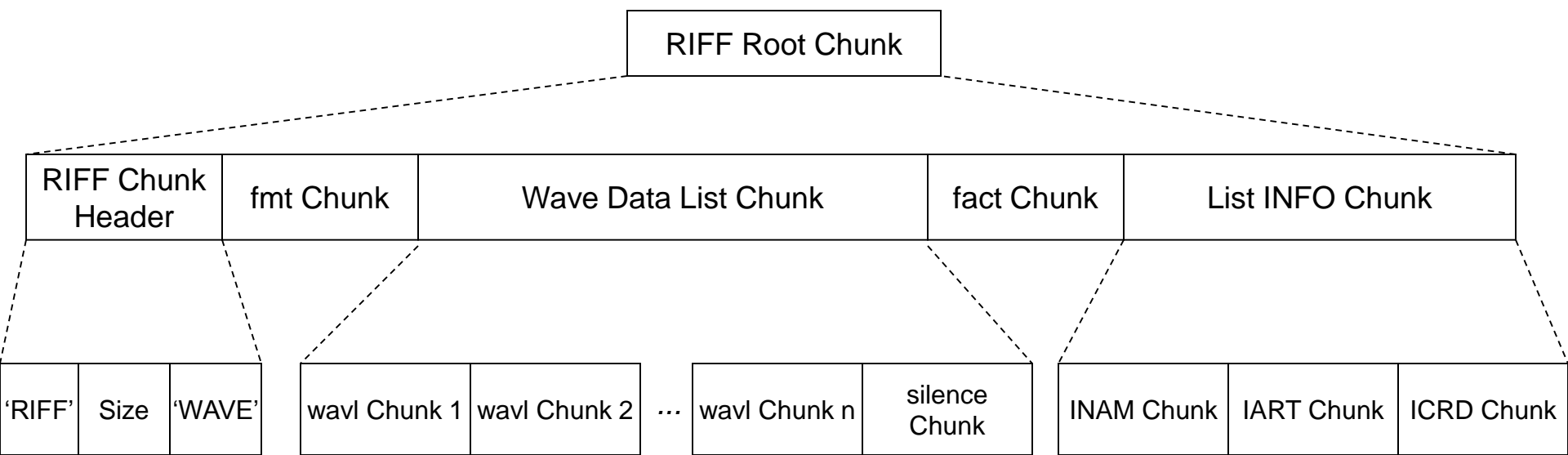














ftyp Atom	moov Atom	wide Atom	mdat Atom	free Atom
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profile Atom	movie header Atom	track Atom 1	track Atom 2	meta Atom	user data Atom
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track header Atom	media Atom	user data Atom (track 1)
----------------------	---------------	-----------------------------

track header Atom	media Atom	meta Atom
----------------------	---------------	--------------

Header	@nam	@arg	@com
--------	------	------	------

Header	@nam	@arg	@com
--------	------	------	------

Header	Metadata Handler Atom	Country List Atom	Item Keys Atom	Metadata Item List Atom
--------	--------------------------	----------------------	-------------------	----------------------------

EBML Header	Segment							
	Meta Seek Information	Segment Information	Track	Chapters	Cluster 1	Tags 1	Cluster 2	Tags 2

Tag 1				Tag 2
Targets	Simple Tag 1.1	Simple Tag 1.2	Simple Tag 1.3	

Track 1 UID	Track 2 UID	30	TRACK / SONG
-------------	-------------	----	--------------

TITLE	GE-GE	Alle meine Entchen
-------	-------	--------------------

Tag 3		
Simple Tag 2.1	Simple Tag 2.2	Simple Tag 2.3

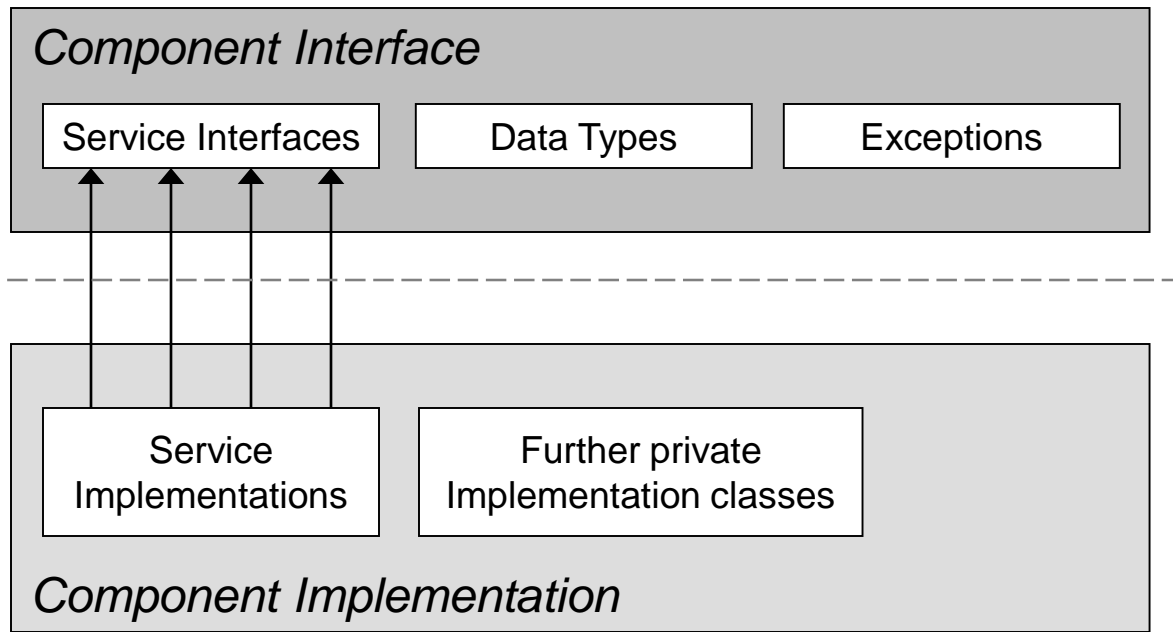
ARTIST	Simple Tag 2.1.1
--------	------------------

TITLE	GE-GE	Volkslieder
-------	-------	-------------

Simple Tag 2.1.1.1	Simple Tag 2.1.1.2
--------------------	--------------------

NAME	GE-GE	Herbert
------	-------	---------

ADDRESS	EN-US	Munich
---------	-------	--------



Application Layer

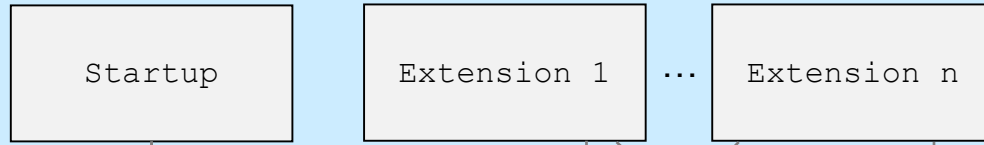
jMeta

Java 9 Virtual Machine (JVM)

Operating System

Physical Storage Medium

## High-Level API



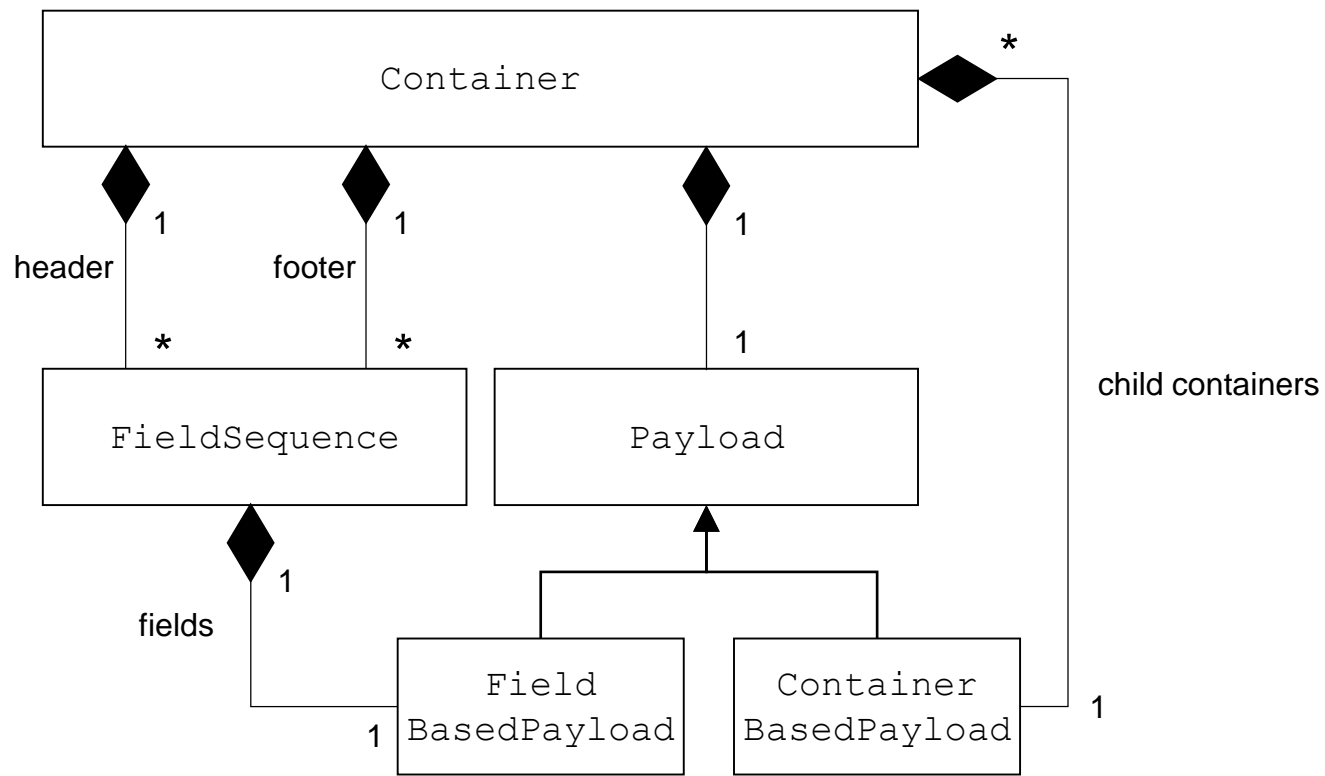
## Low-Level API



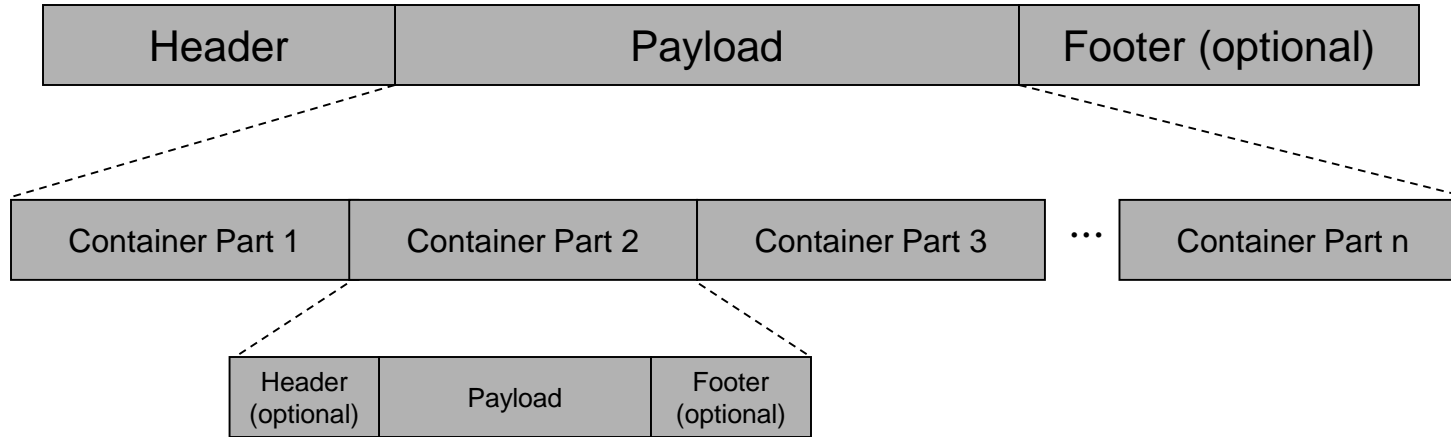
## Technical Base



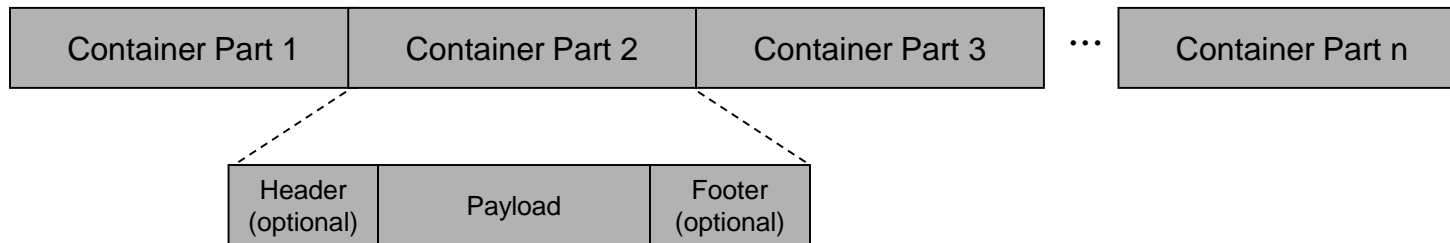




## *Parent Container*



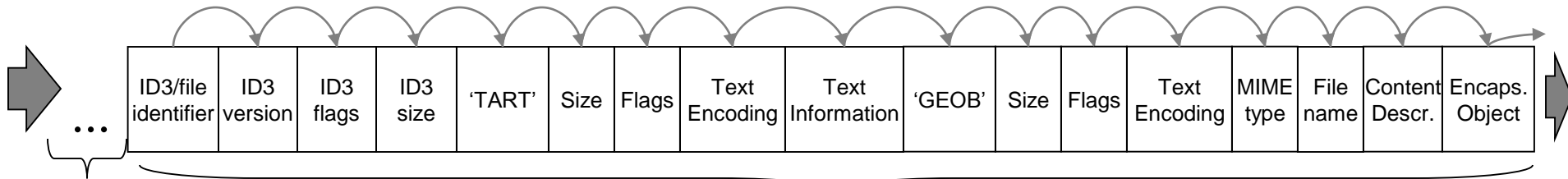
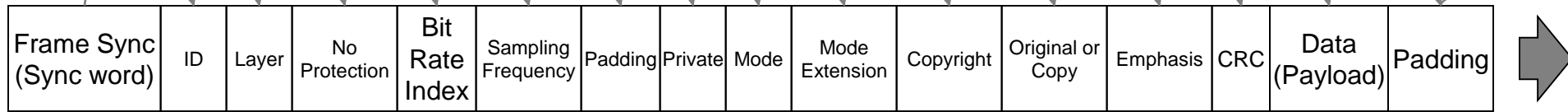
## *Top-Level Container Parts*





# MP3 Frame 1

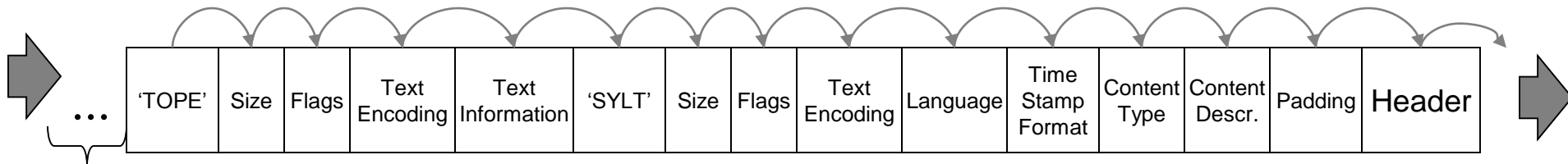
*hasNext() + next()*



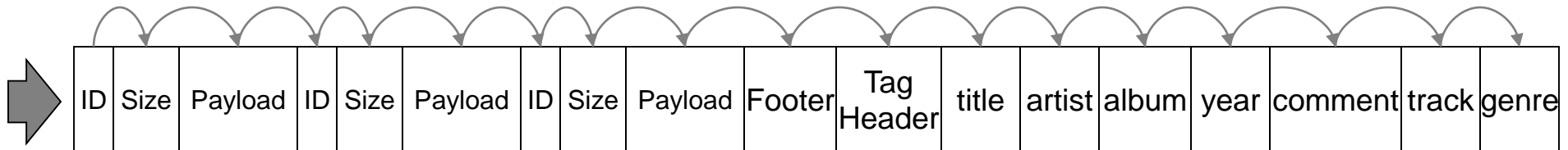
Other MP3 frames  
(same block sequence)

ID3v2.3 Tag

Lyrics3v2 Tag  
(first part)

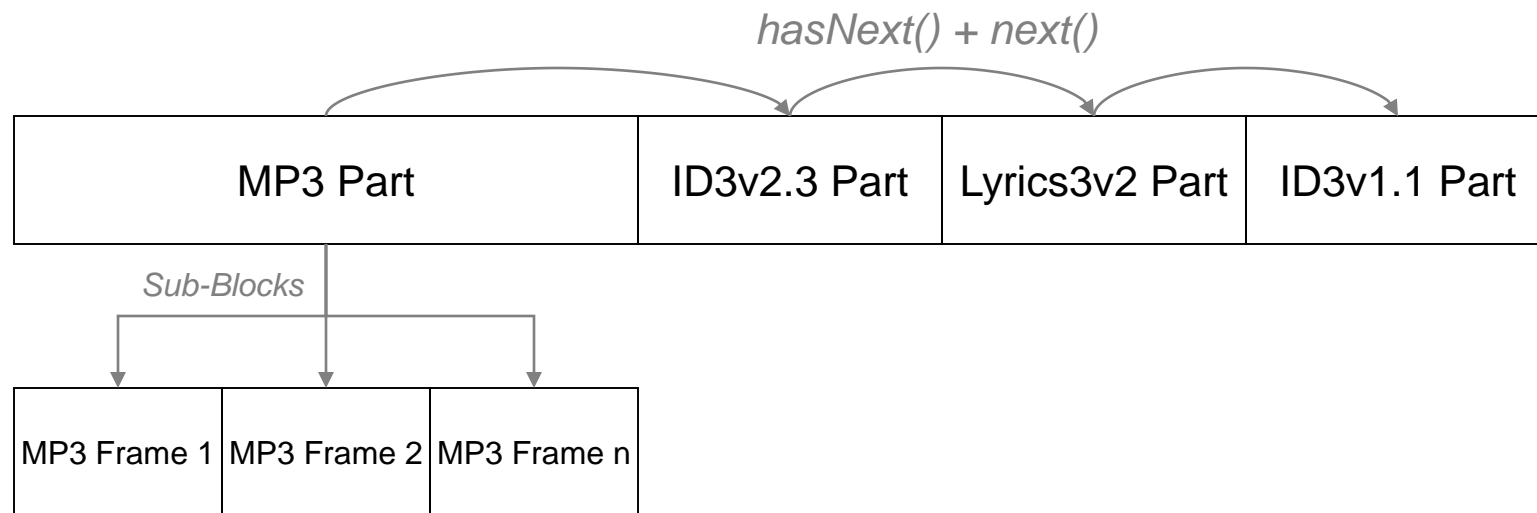


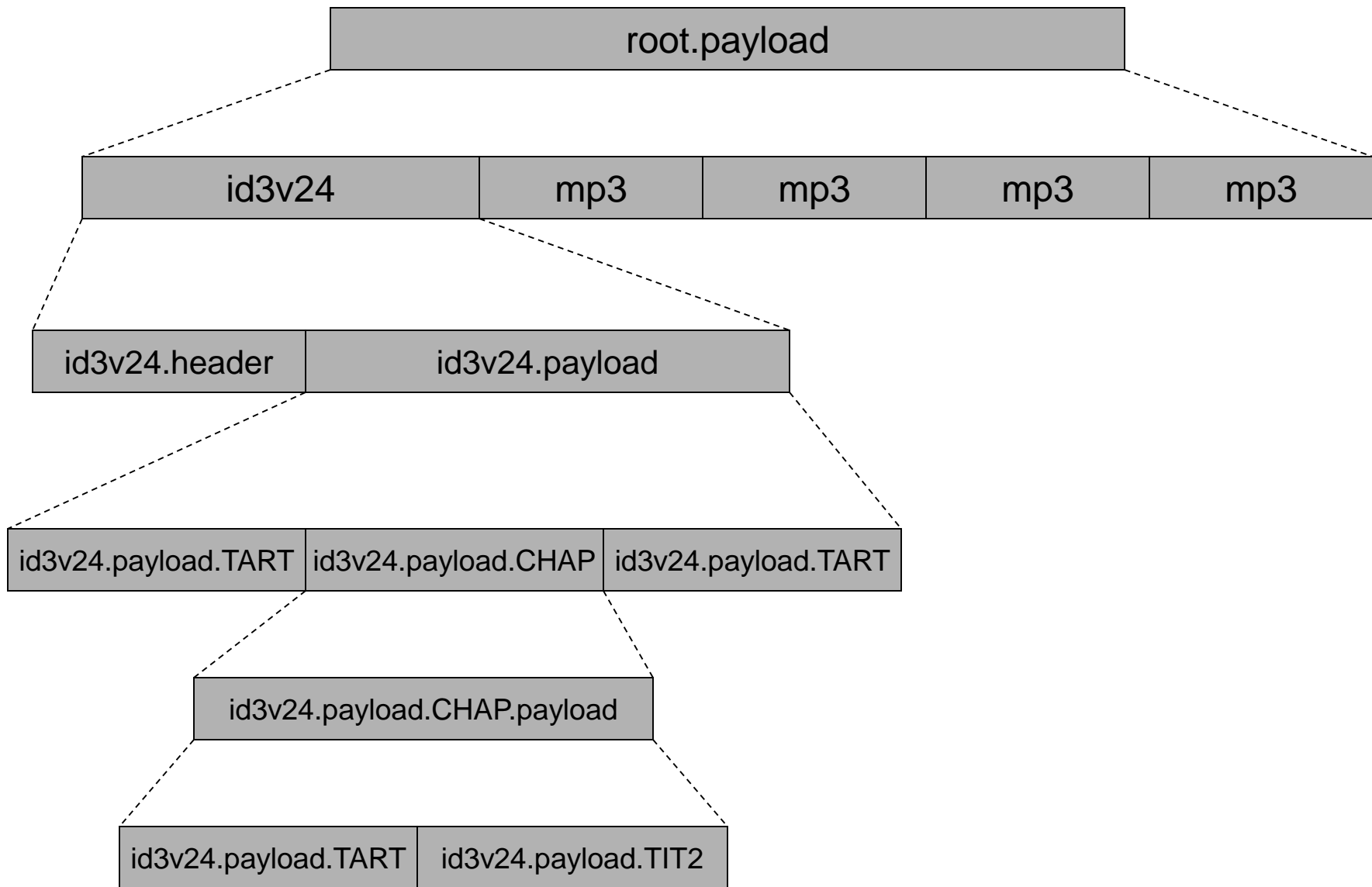
Second GEOB  
frame identical

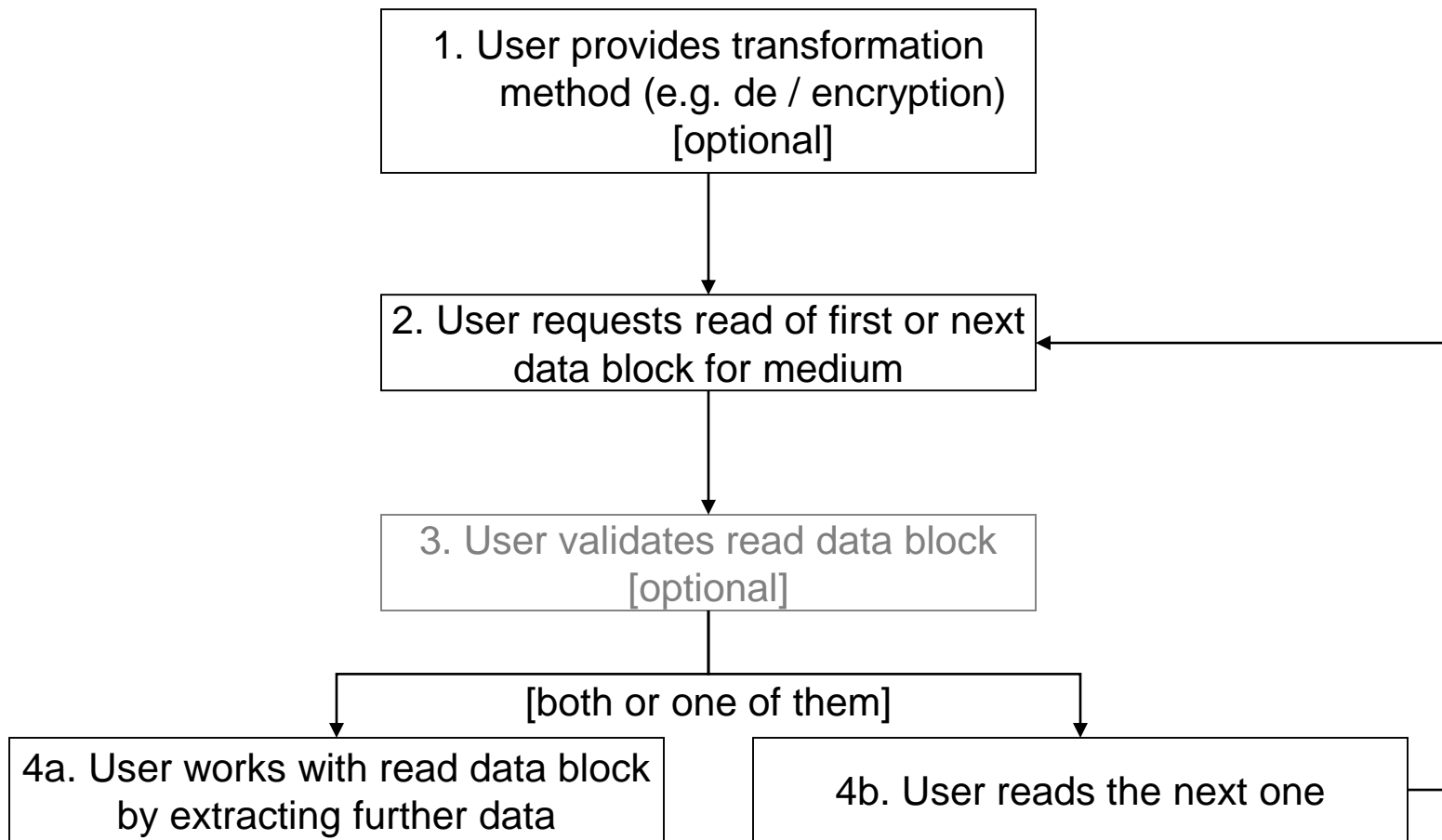


Lyrics3v2 Tag  
(second part)

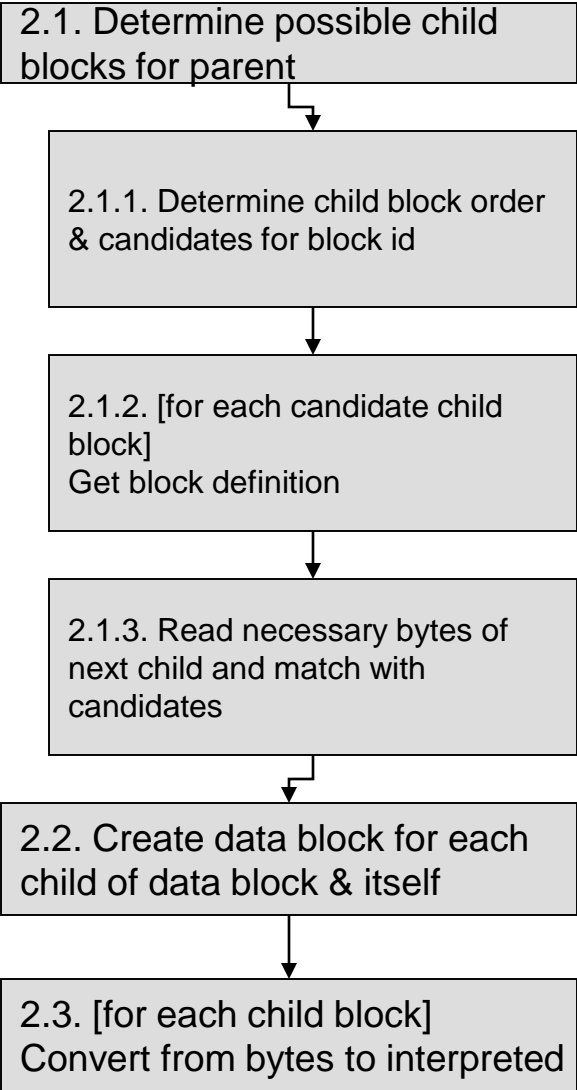
ID3v1.1 Tag





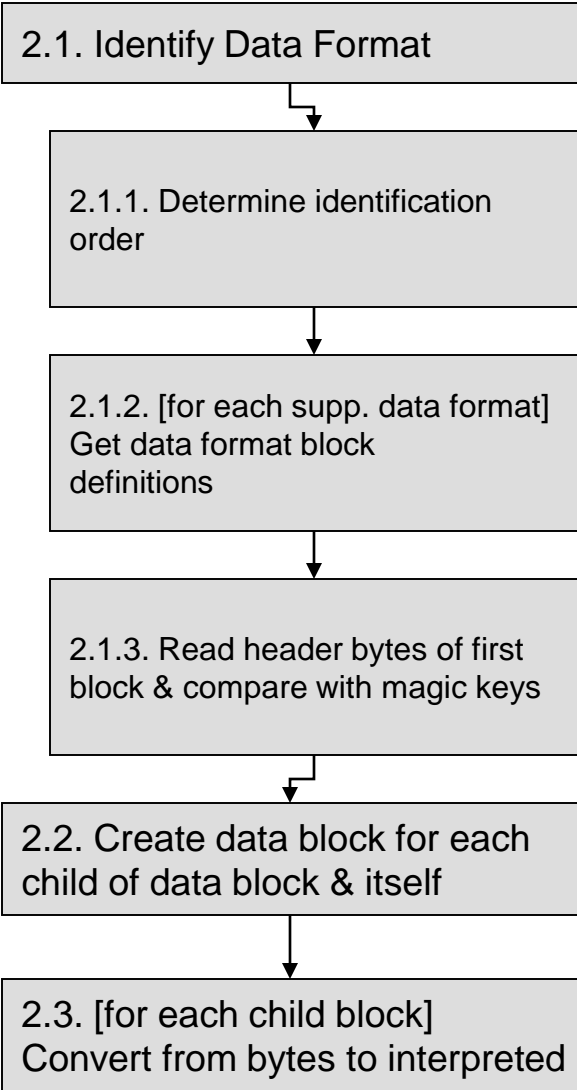


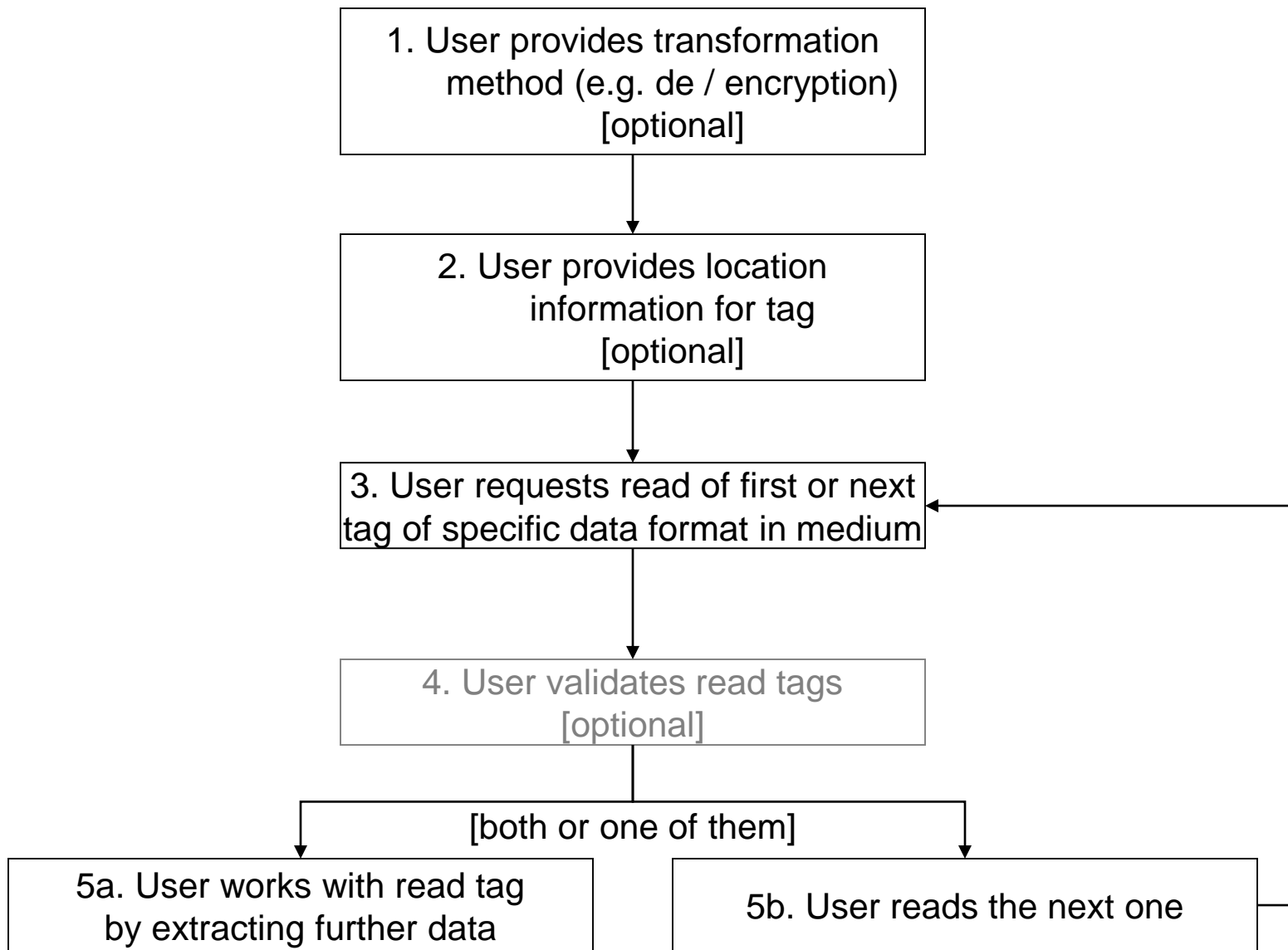
**Known parent block / data format**



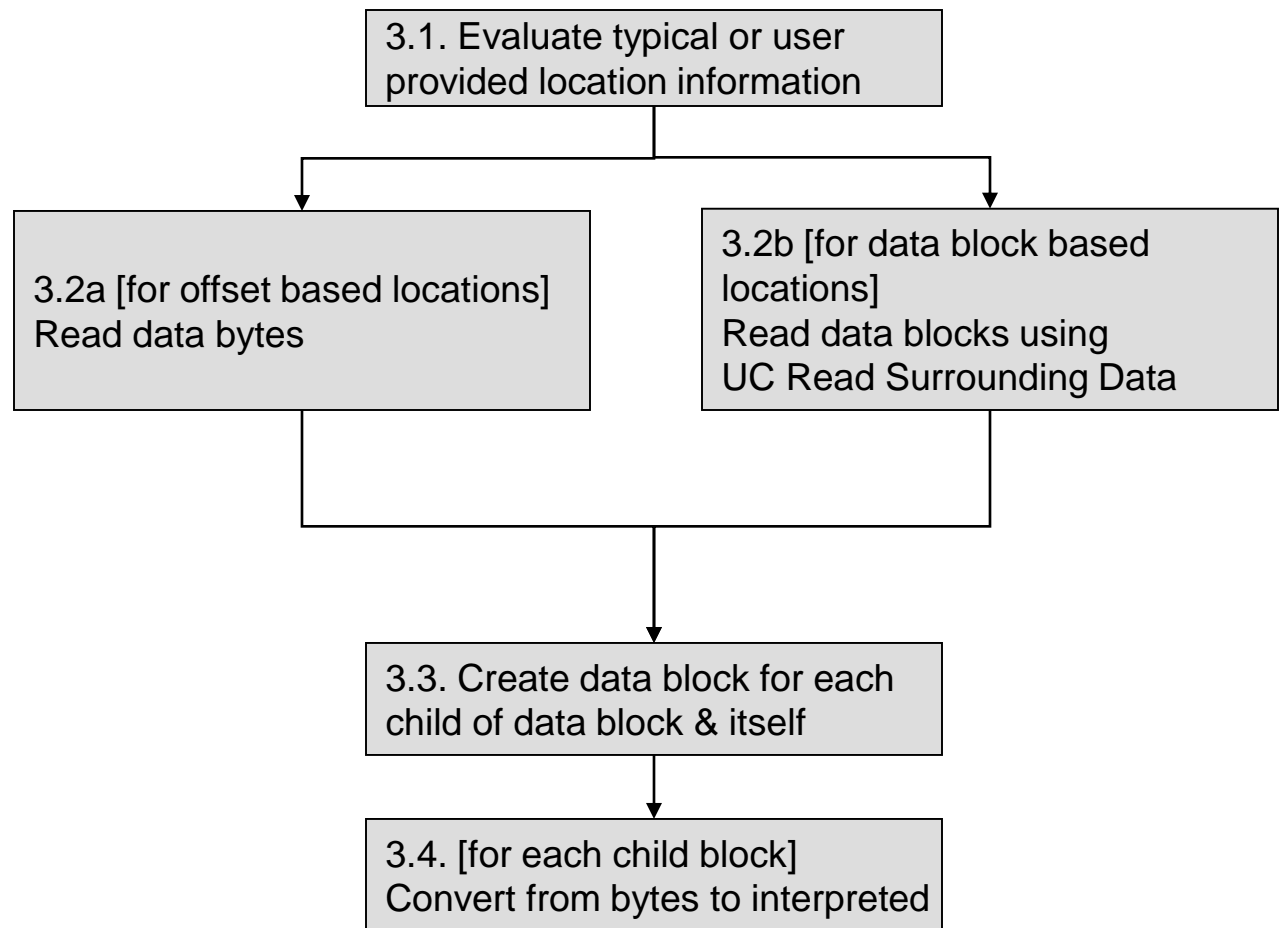
2. User requests read of first or next data block for medium

**No parent block / data format**

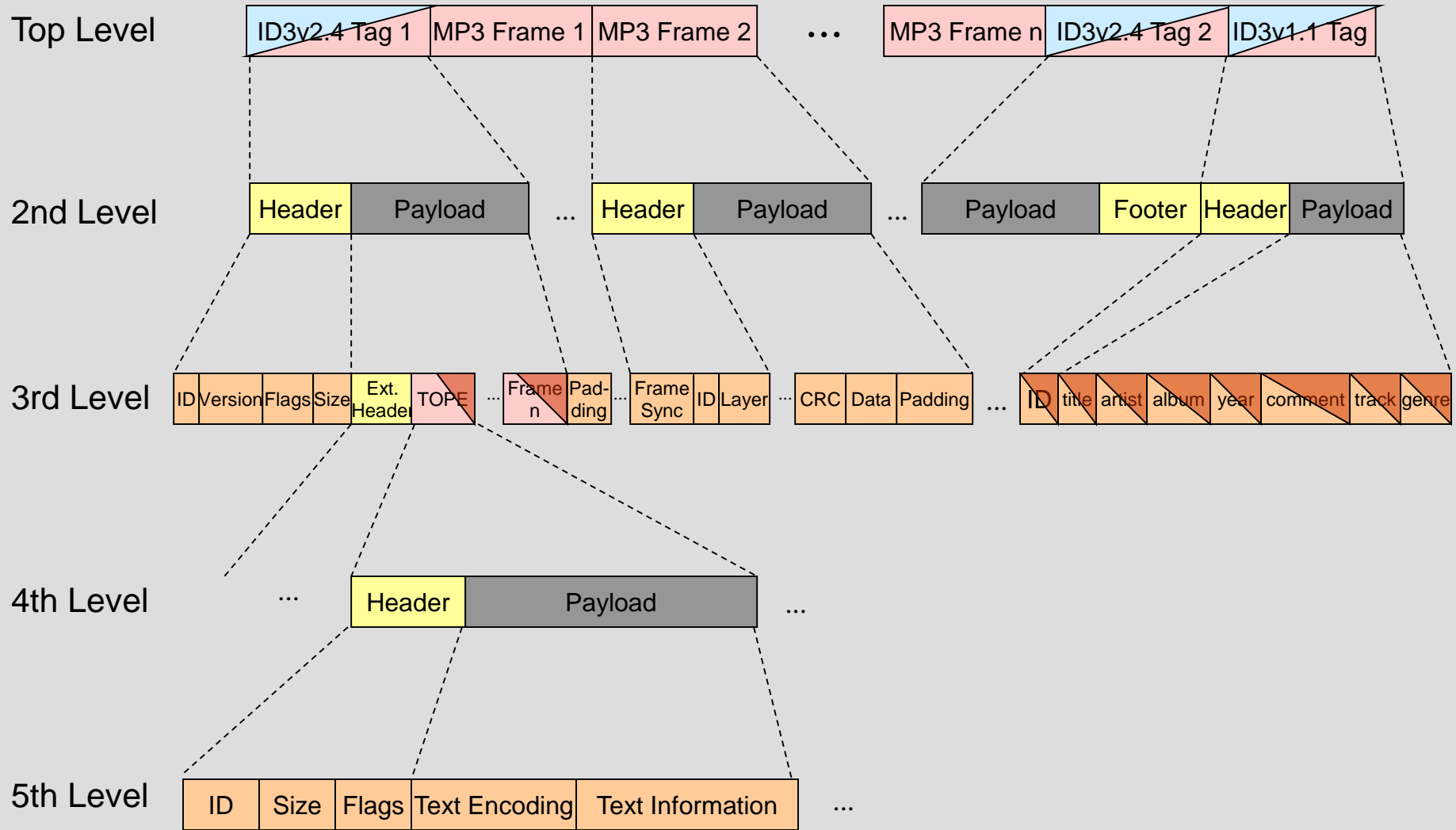




3. User requests read  
of first or next tag of  
specific data format  
in medium



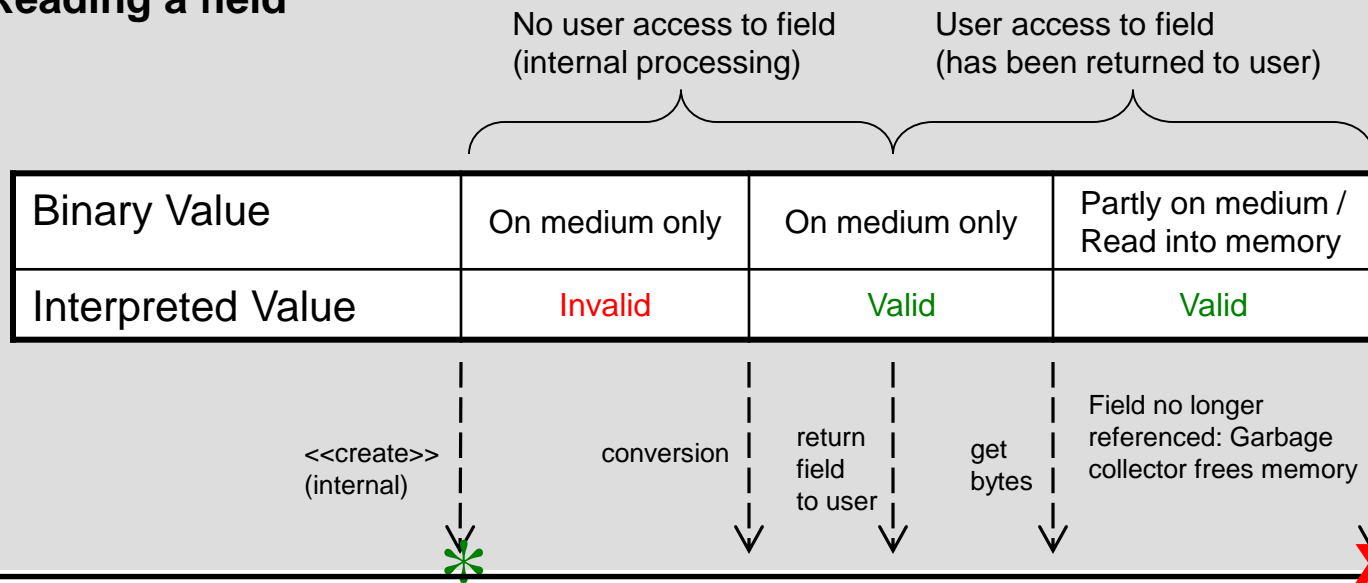
# Medium



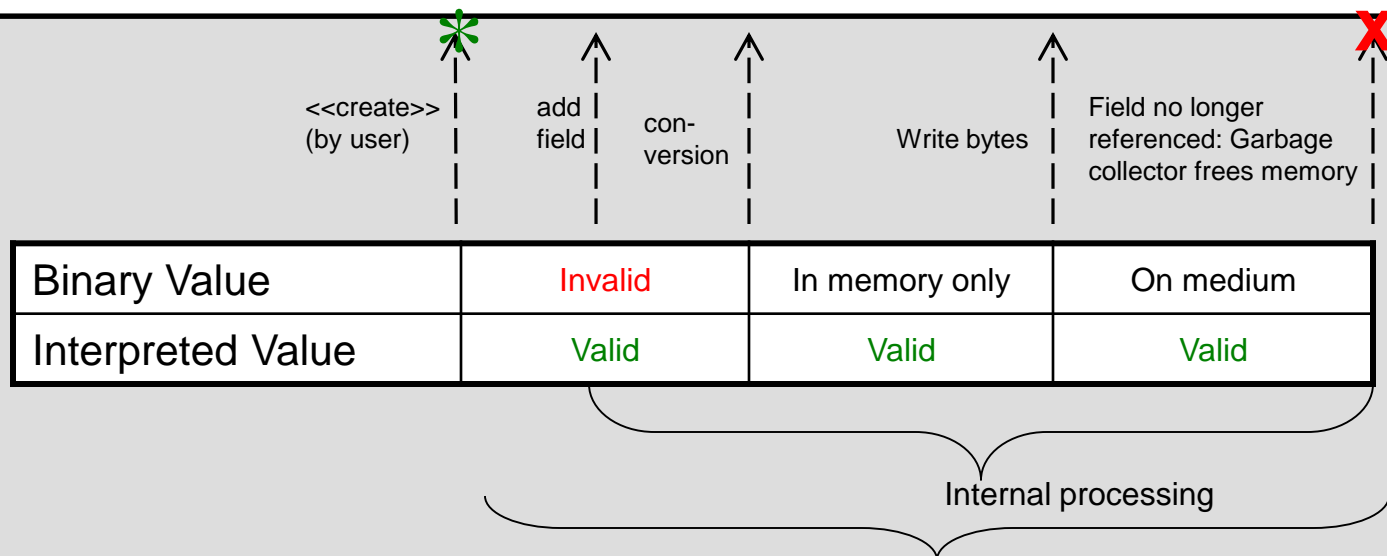
- Container
- Tag (special Container)
- Attribute (special Container)
- Header/Footer
- Payload
- Field



## Reading a field



Time



## Writing a field

User access to field (user has created it)

## Reading a large field

No user access to field  
(internal processing)

User access to field  
(has been returned to user)

Binary Value	On medium only	Partly on medium / Read into memory
Interpreted Value	Invalid	Valid

<<create>>  
(internal)

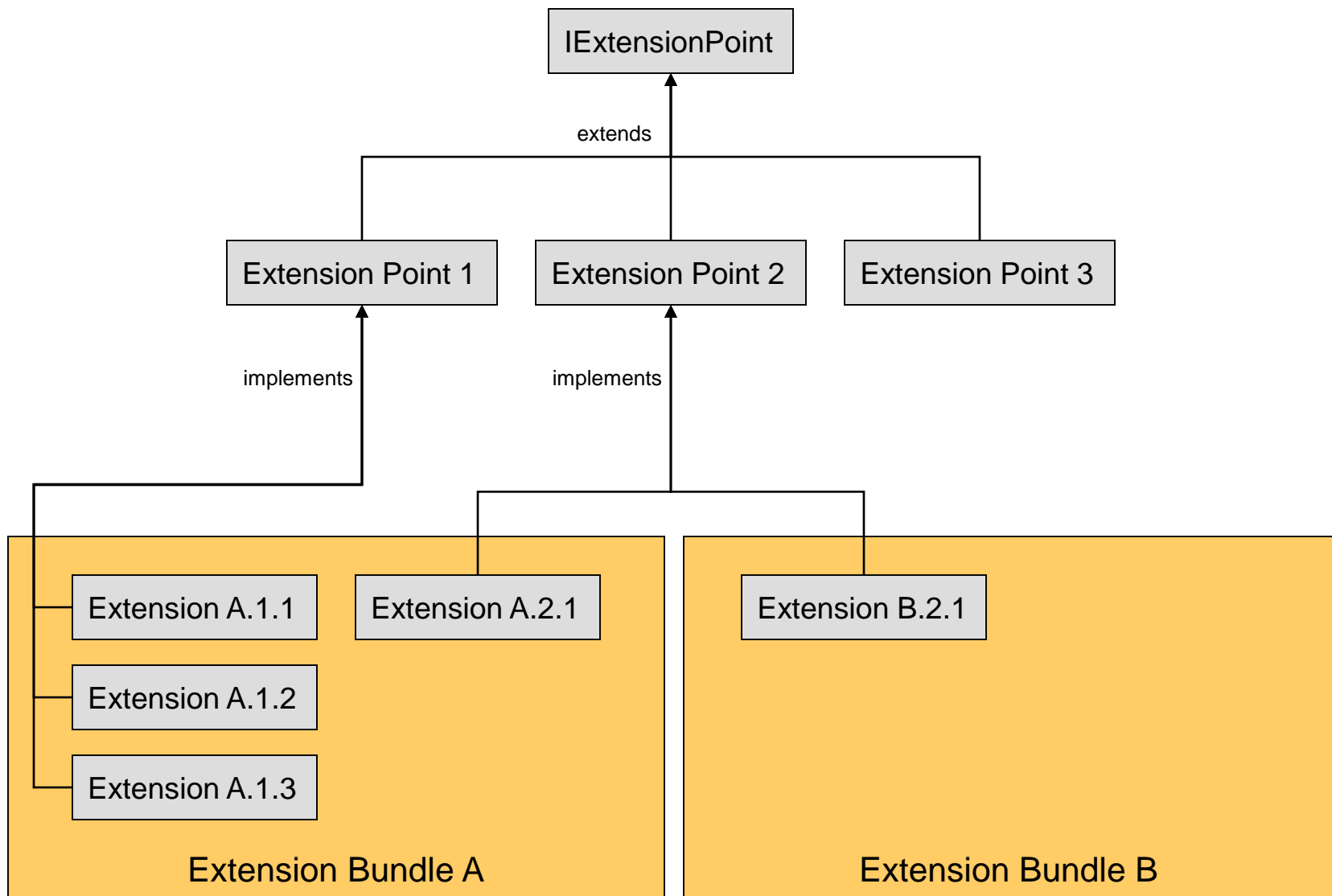
return  
field  
to user

get  
bytes

conversion

Field no longer  
referenced: Garbage  
collector frees memory

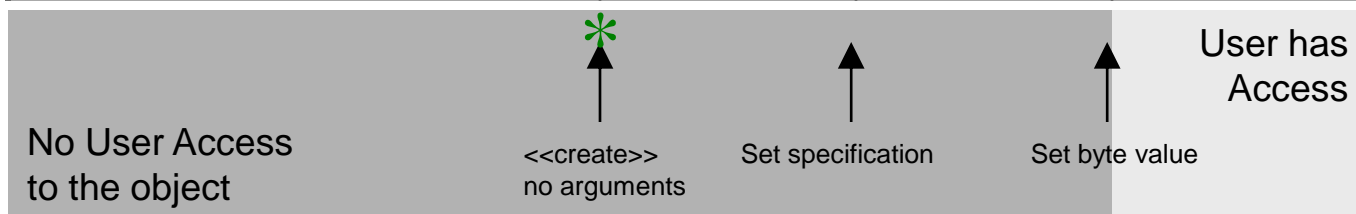
Time



# Value States

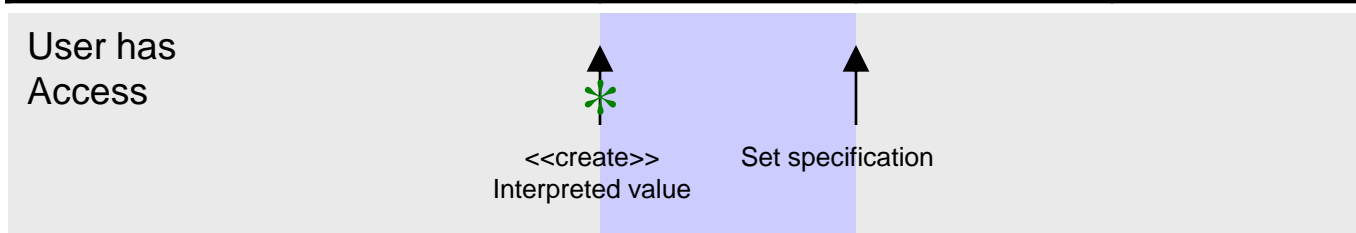
## Read

Byte Representation	Invalid	Invalid	Valid
Interpreted Representation	Invalid	Invalid	Valid
Converter	Invalid	Valid	Valid

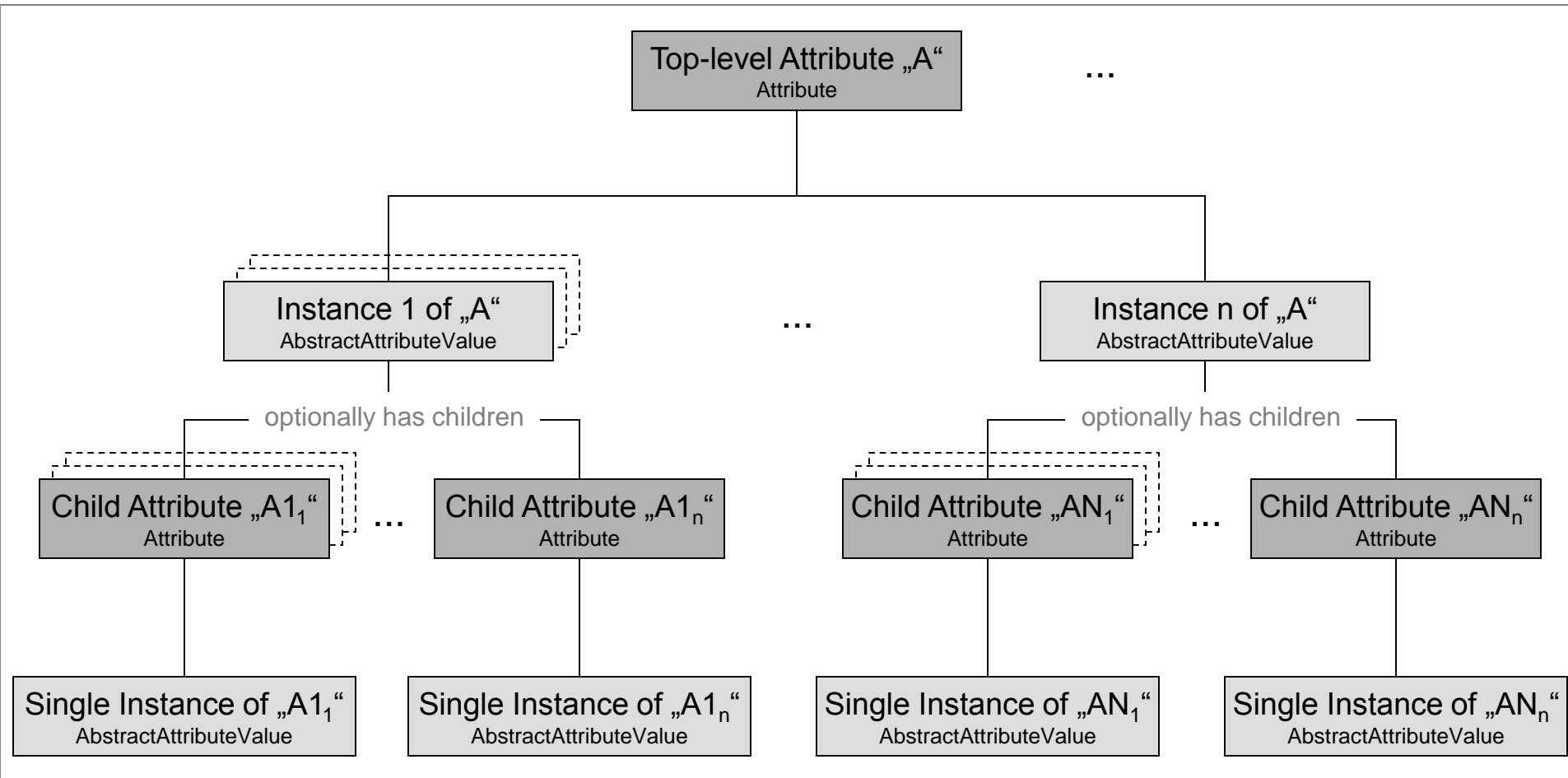


## Write

Byte Representation	Invalid	Valid	Valid
Interpreted Representation	Valid	Valid	Valid
Converter	Invalid	Valid	Valid

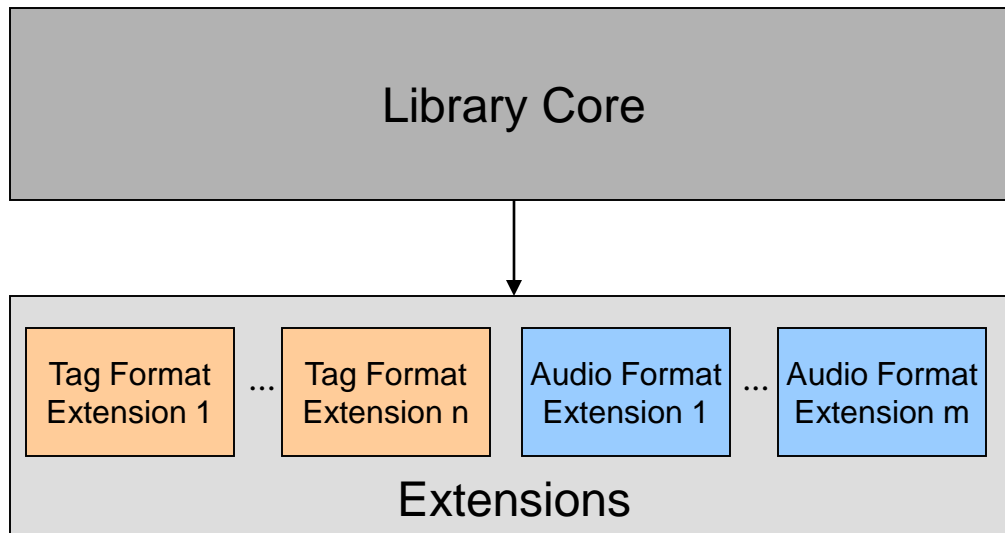


# Attribute Hierarchy

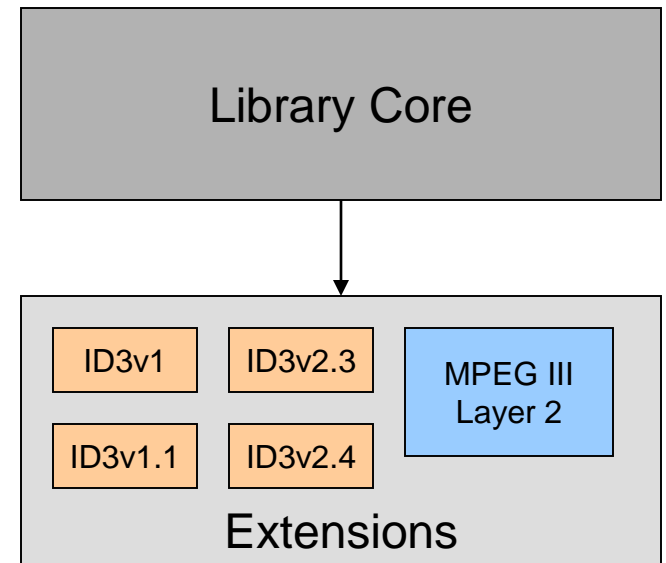


# Library Structure

Basic concept



Extensions contained in v0.5 bundle



# Audio Composition Structure

## Audio Composition (physical medium)

### Meta Data (optional)

Tag 1

Attribute A (Instance 1)

...

Attribute B

Child B1

Child B2

...

Attribute A (Instance 2)

...

Tag n

Attribute C

Attribute D

Attribute E

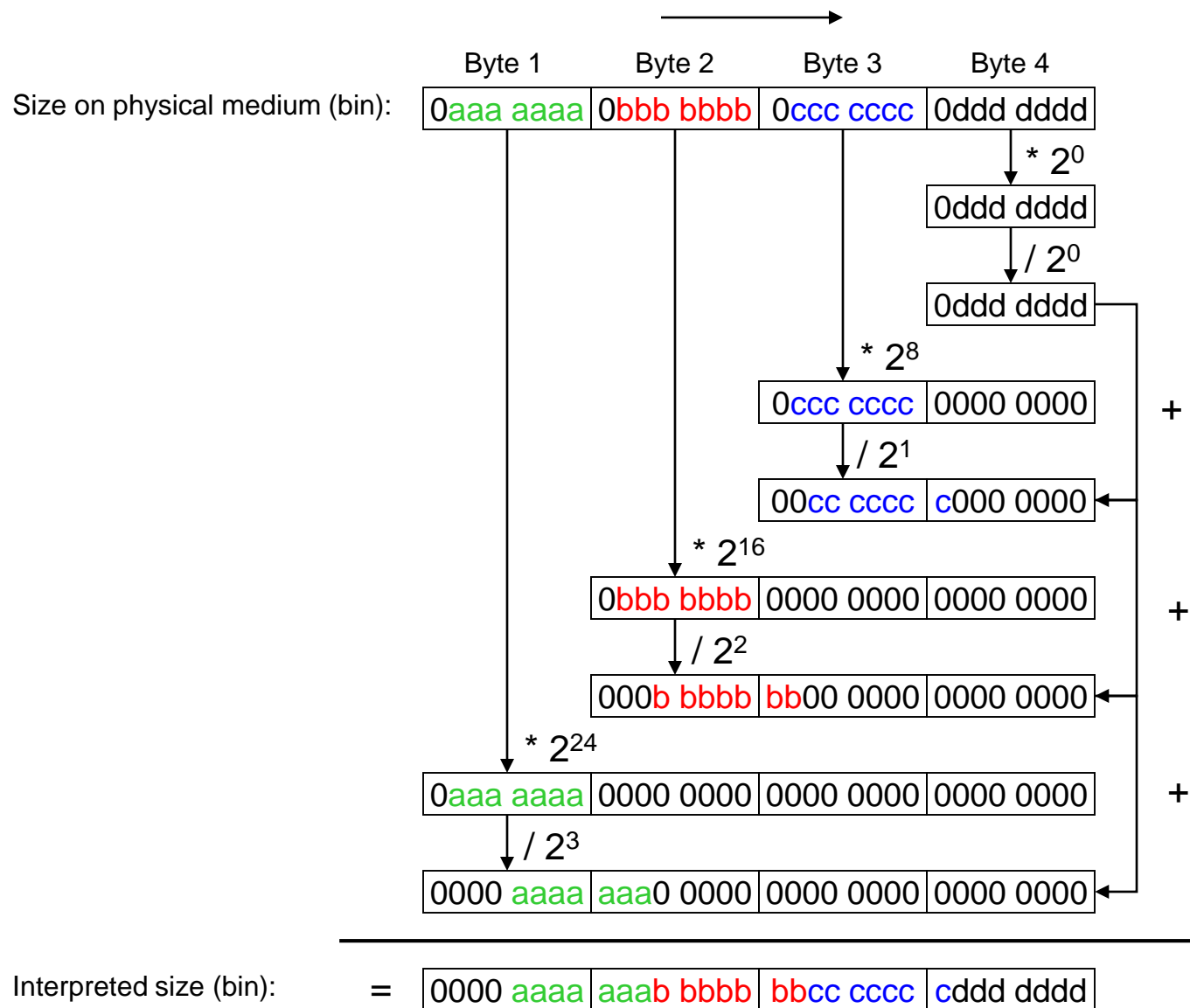
Attribute F

...

Attribute X

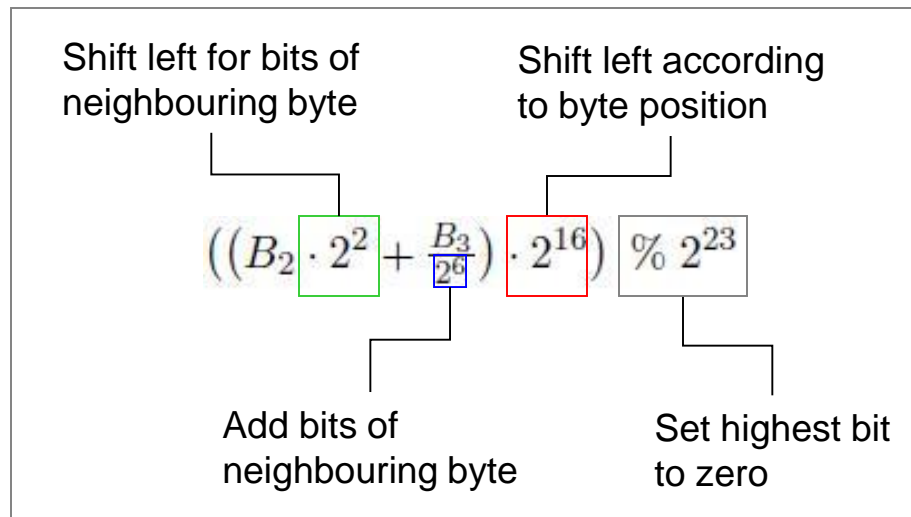
### Audio Data

# ID3v2 Size Interpretation After Reading





# Formula for retrieving ID3v2 size to write



## Writing –

processBytesBeforeWrite()

Attribute payload bytes

GroupingProcessing  
(v2.3, v2.4)

Group  
ID

Attribute payload bytes

CompressionProcessing  
(v2.3, v2.4)

Decompressed  
size

Group  
ID

Attribute payload bytes

C

EncryptionProcessing  
(v2.3, v2.4)

Decompressed  
size

Encryption  
method

Group  
ID

Attribute payload bytes

E C

MergeByteProcessing  
(v2.3, v2.4)

UnsynchronisationProcessing  
(all versions)

Decompressed  
size

Encryption  
method

Group  
ID

Attribute payload bytes

U

U

U

U

U E C

## Reading –

processBytesAfterRead()

Attribute payload bytes

GroupingProcessing  
(v2.3, v2.4)

Group  
ID

Attribute payload bytes

CompressionProcessing  
(v2.3, v2.4)

Decompressed  
size

Group  
ID

Attribute payload bytes

C

EncryptionProcessing  
(v2.3, v2.4)

Decompressed  
size

Encryption  
method

Group  
ID

Attribute payload bytes

E C

MergeByteProcessing  
(v2.3, v2.4)

UnsynchronisationProcessing  
(all versions)

Decompressed  
size

Encryption  
method

Group  
ID

Attribute payload bytes

U

U

U

U

U E C

# Example Flag Spec

Flag Bytes

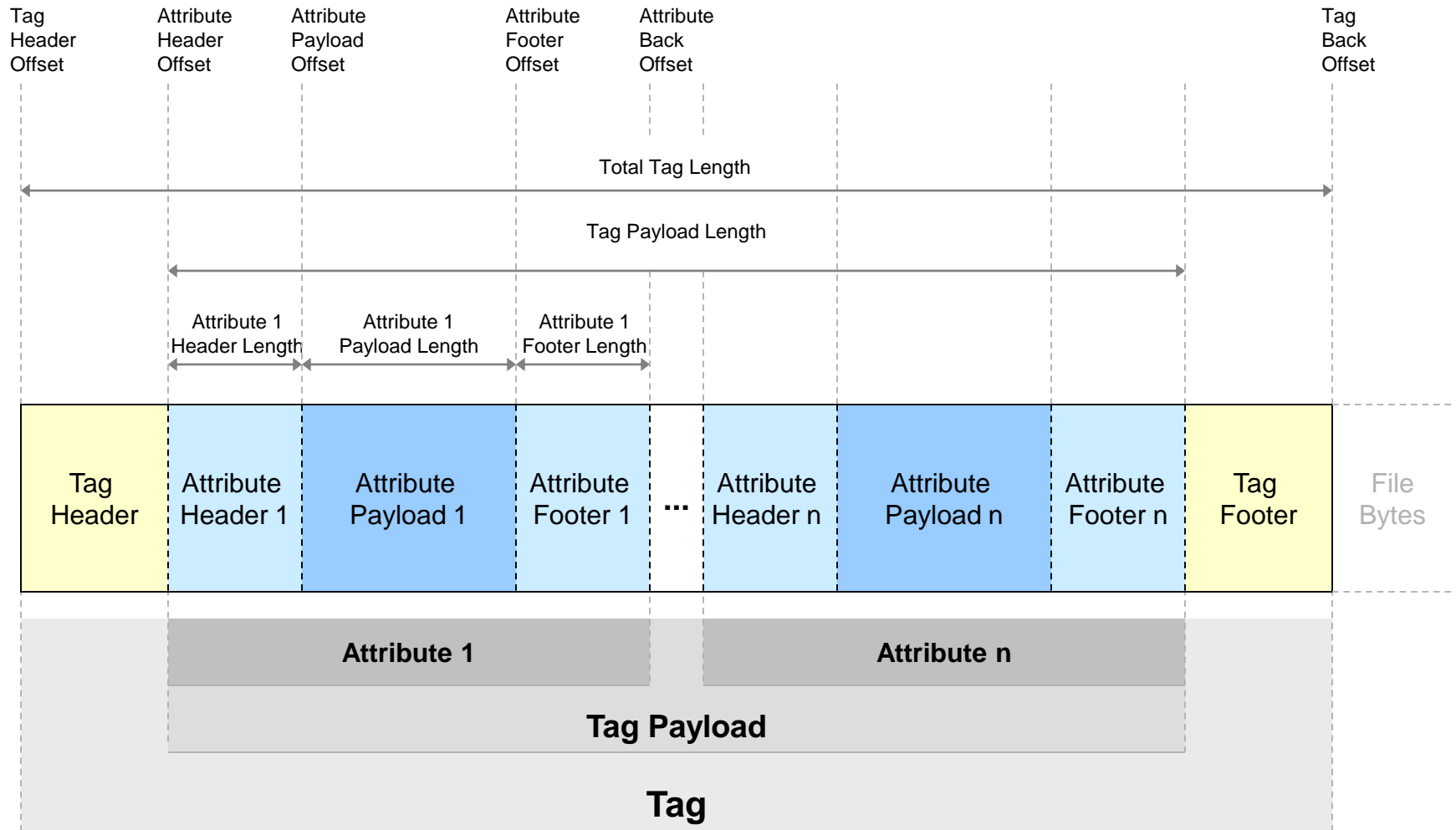
abc0 0000

Byte length = 1

Byte order = Big Endian

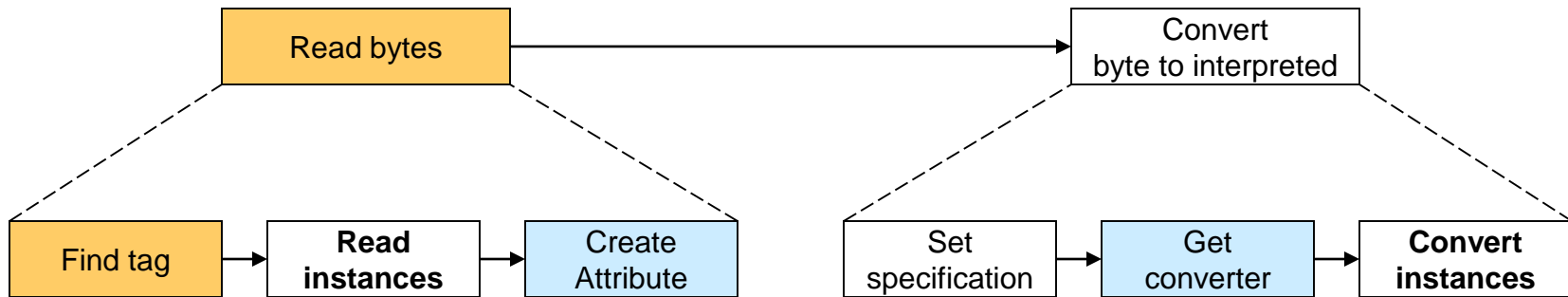
Flag	Bit Address
a = Compression	(1, 1)
b = Footer available	(1, 2)
c = Experimental	(1, 3)

# Tag Structure



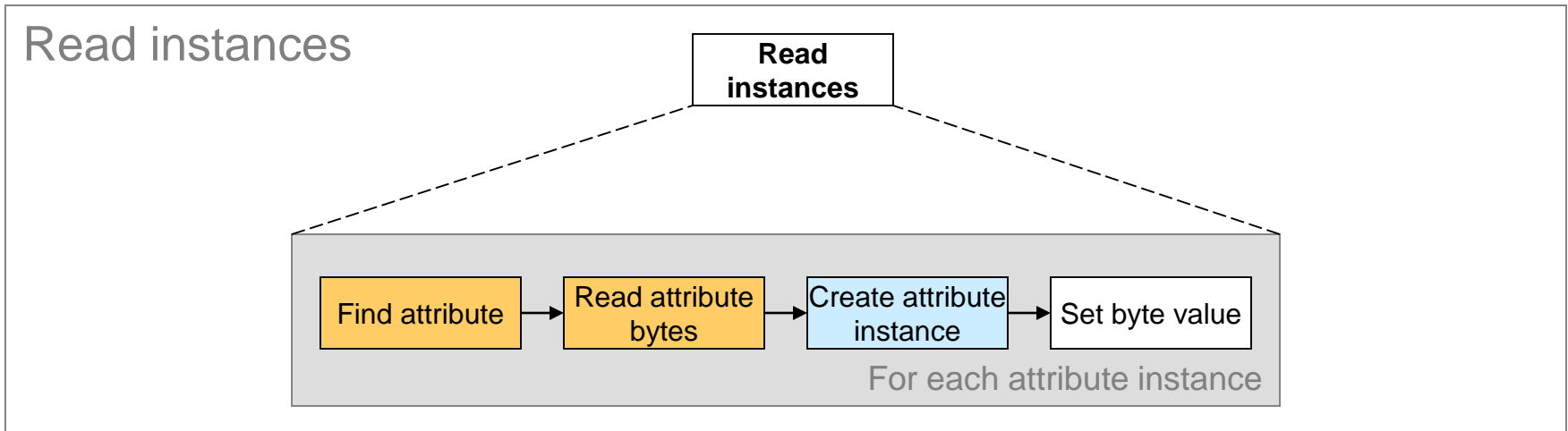
# Read attribute





## Read attribute



- : Object creation / retrieval
- : Access to physical medium
- : Other action
- : Action with sub-steps detailed on further figure

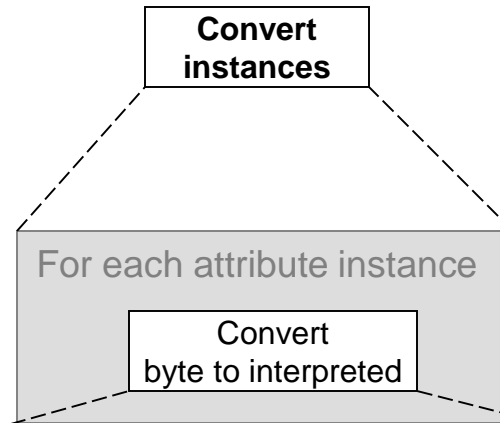
# Read instances



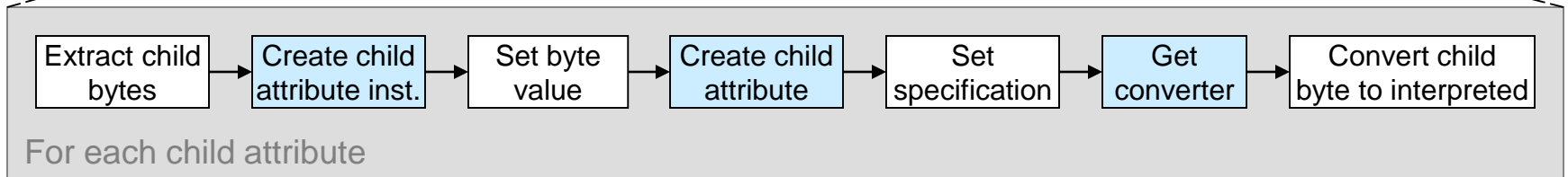
-  : Object creation / retrieval
-  : Access to physical medium
-  : Other action
-  : **Action with sub-steps detailed on further figure**

# Convert instances (Reading)

## Convert instances



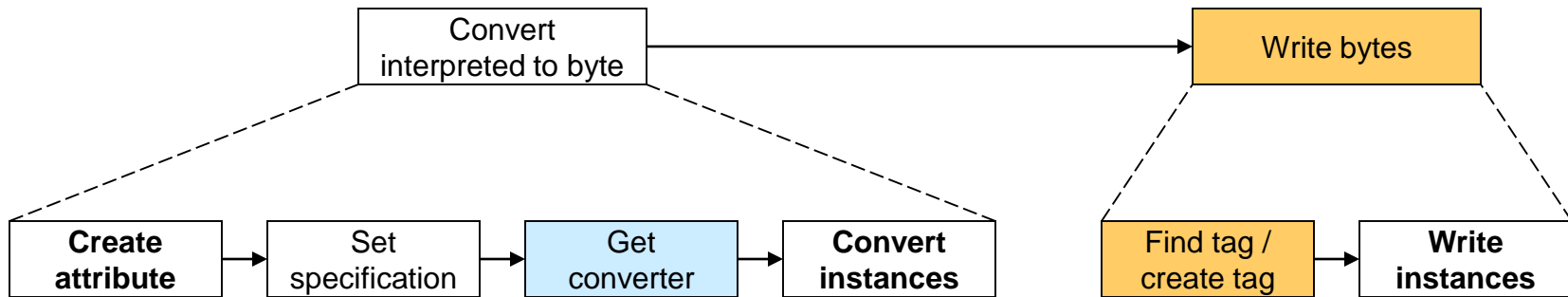
<For attributes with children only>



- : Object creation / retrieval
- : Access to physical medium
- : Other action
- : Action with sub-steps detailed on further figure

# Write attribute

## Write attribute

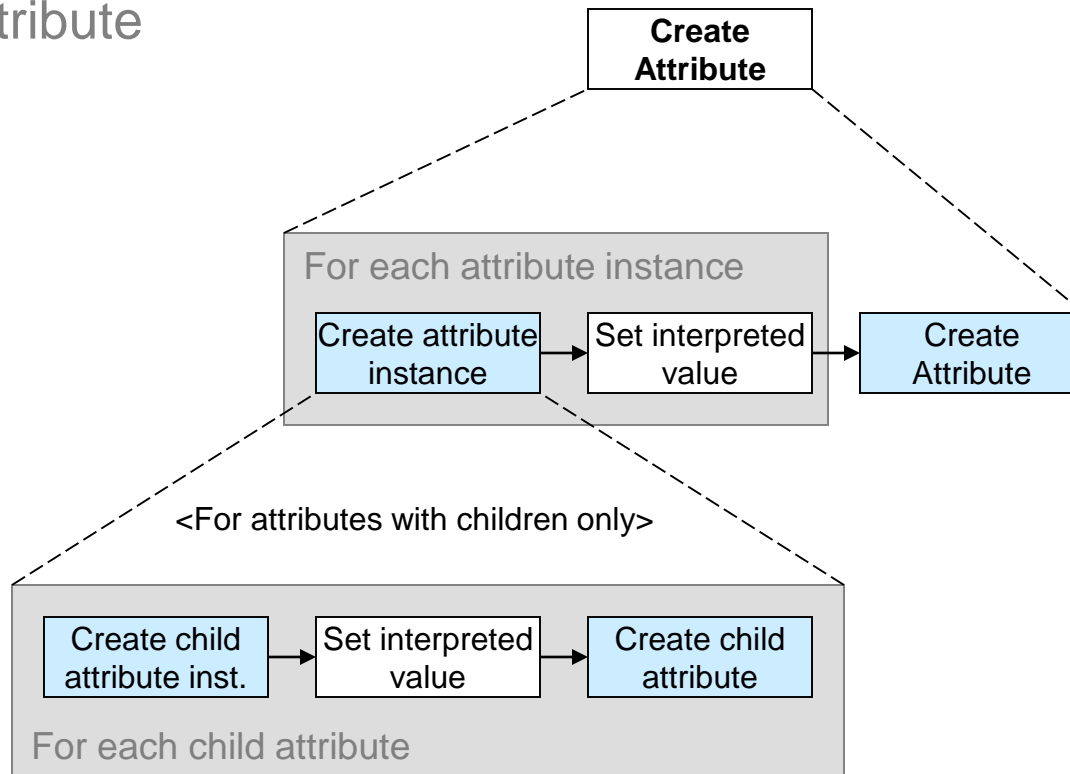


- : Object creation / retrieval
- : Access to physical medium
- : Other action
- : Action with sub-steps detailed on further figure



# Create attribute (Writing)

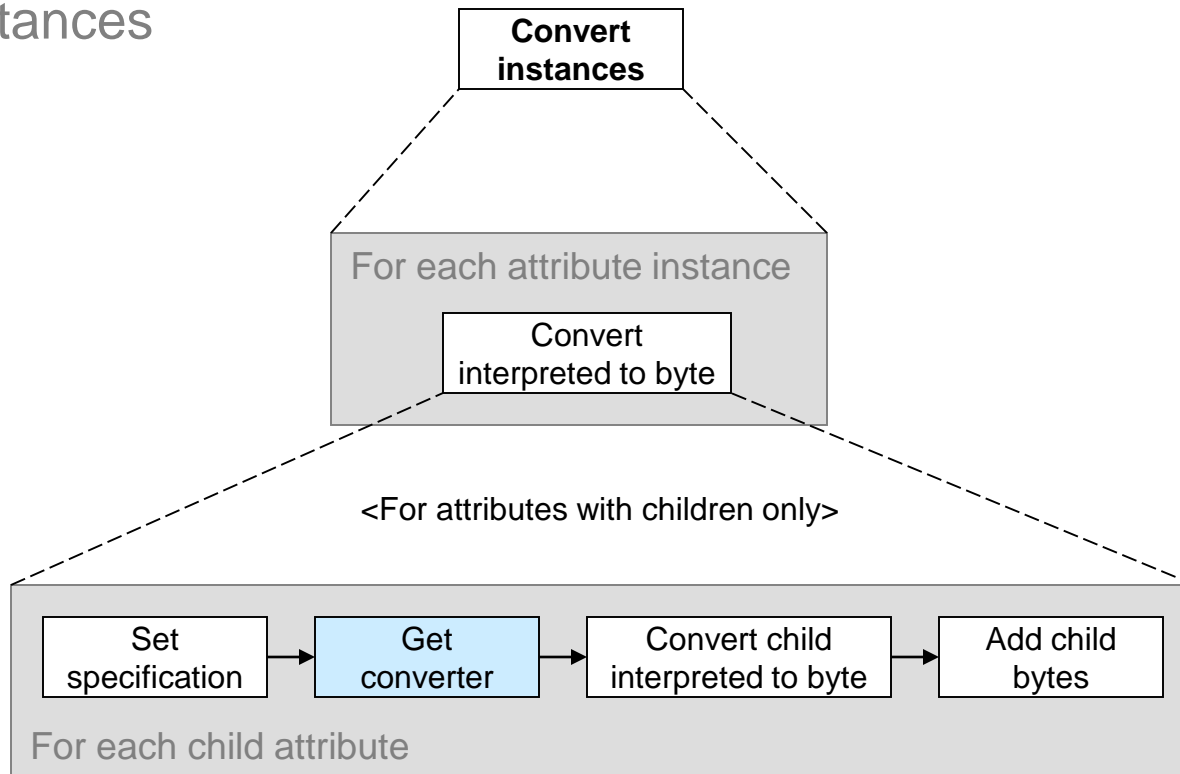
Create attribute







- : Object creation / retrieval
- : Access to physical medium
- : Other action
- : Action with sub-steps detailed on further figure

# Convert instances (Writing)

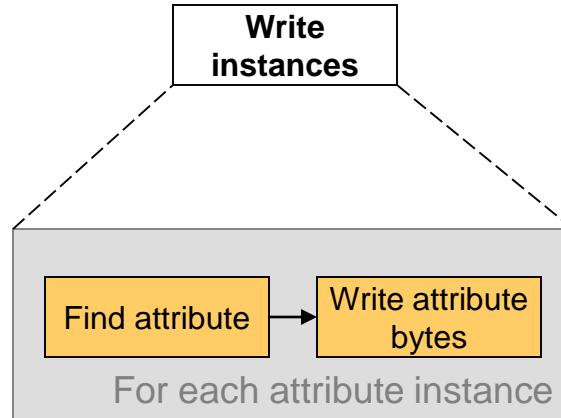
## Convert instances







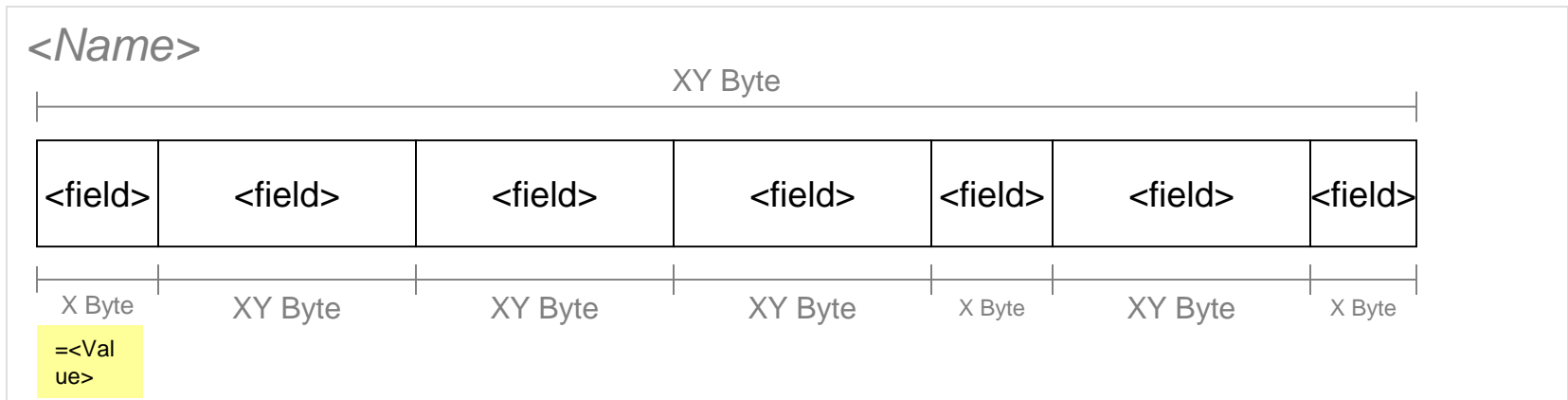
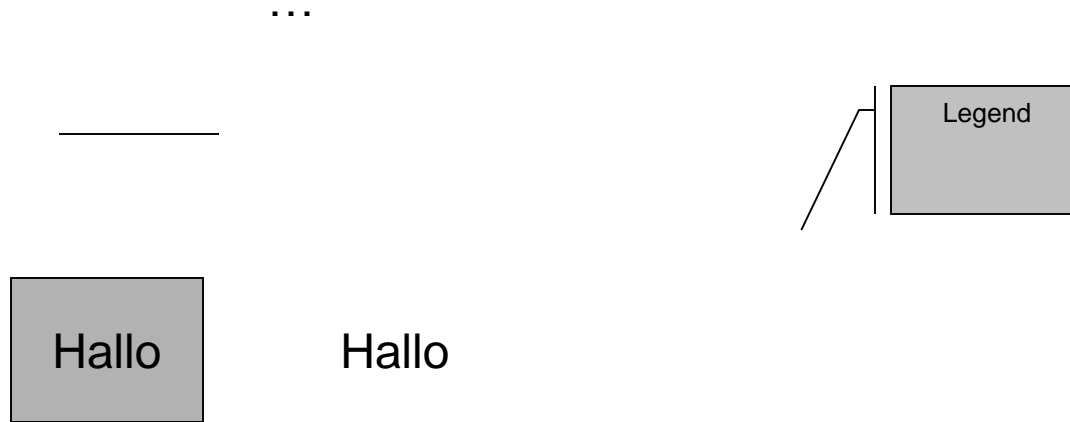
-  : Object creation / retrieval
-  : Access to physical medium
-  : Other action
-  : Action with sub-steps detailed on further figure

# Write instances

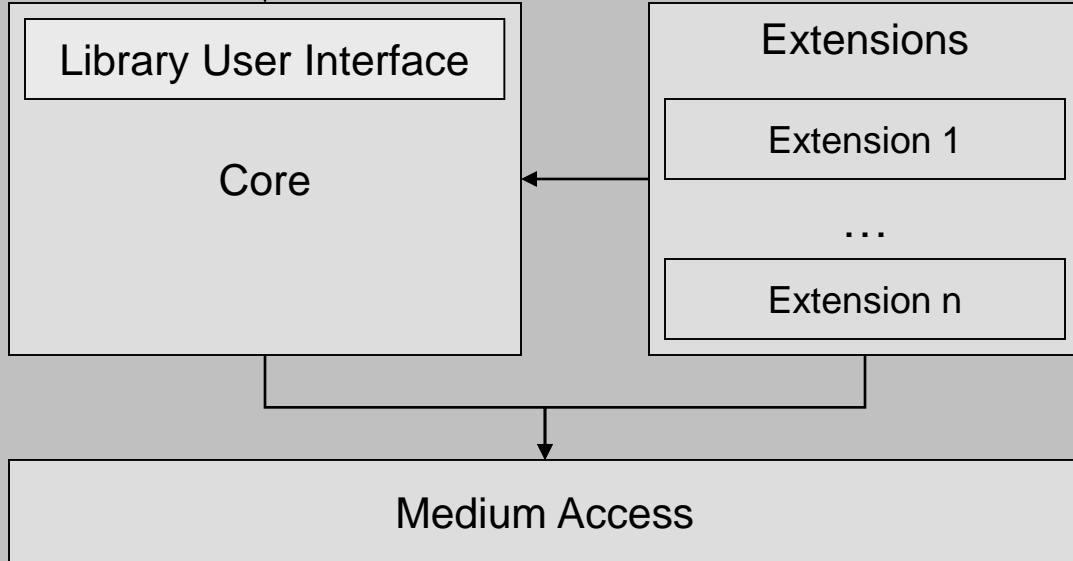
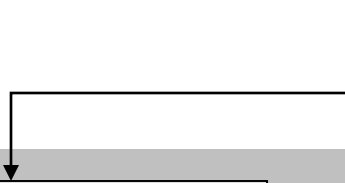
Write instances



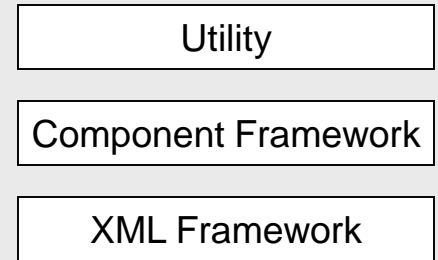
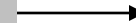
-  : Object creation / retrieval
-  : Access to physical medium
-  : Other action
-  : **Action with sub-steps detailed on further figure**



*Application Layer (User)*



*jMeta*



*Cross-functional*

ALT

# Template



Hallo