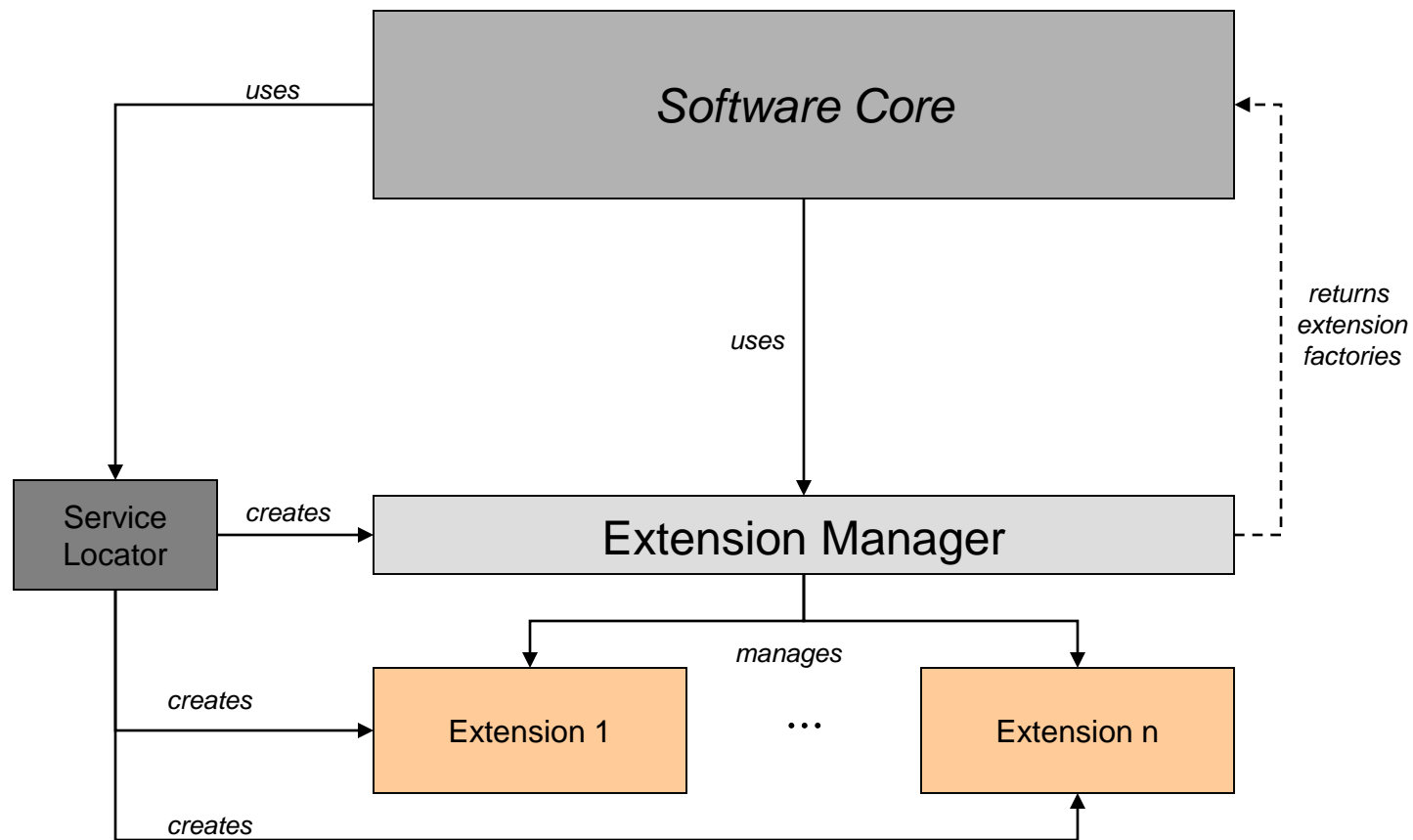
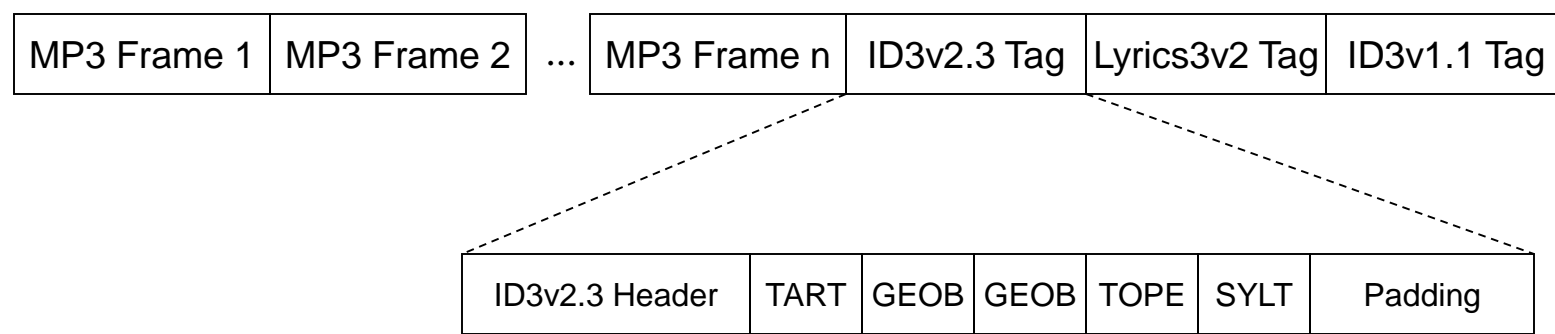


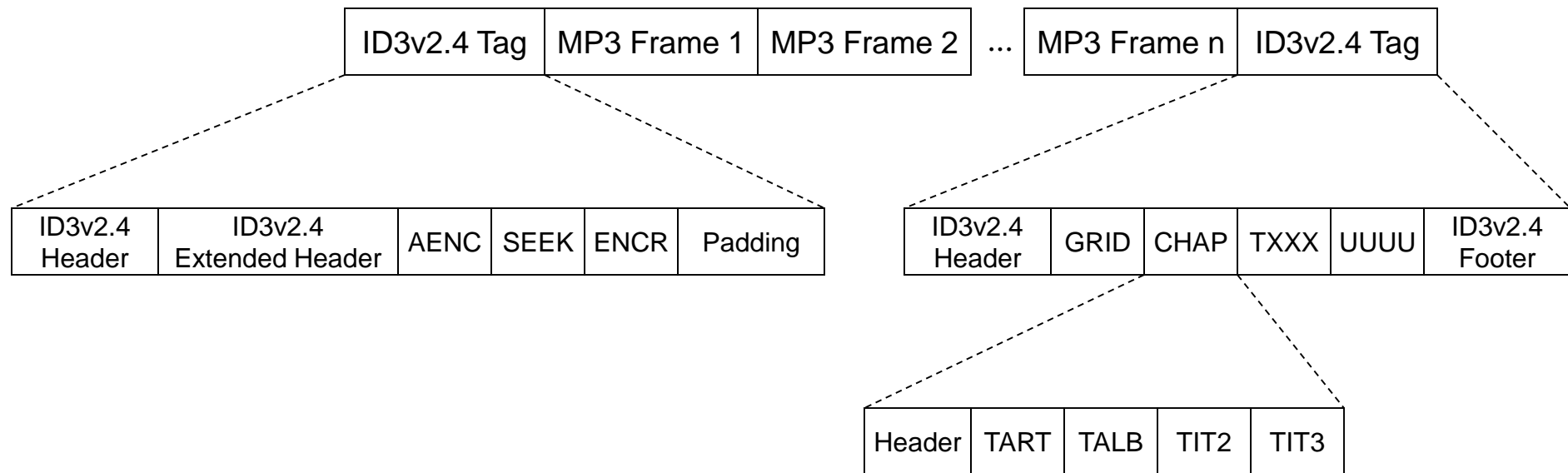
Tag

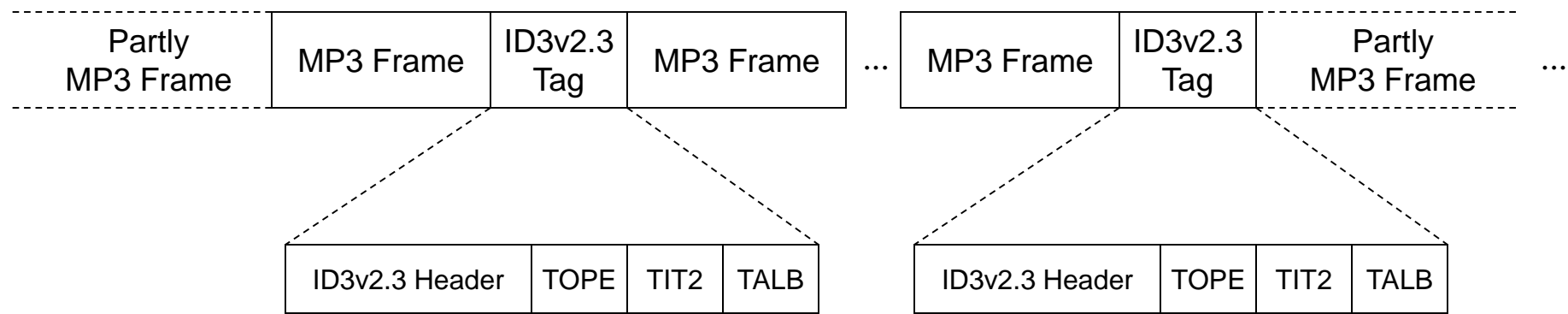
Payload Data

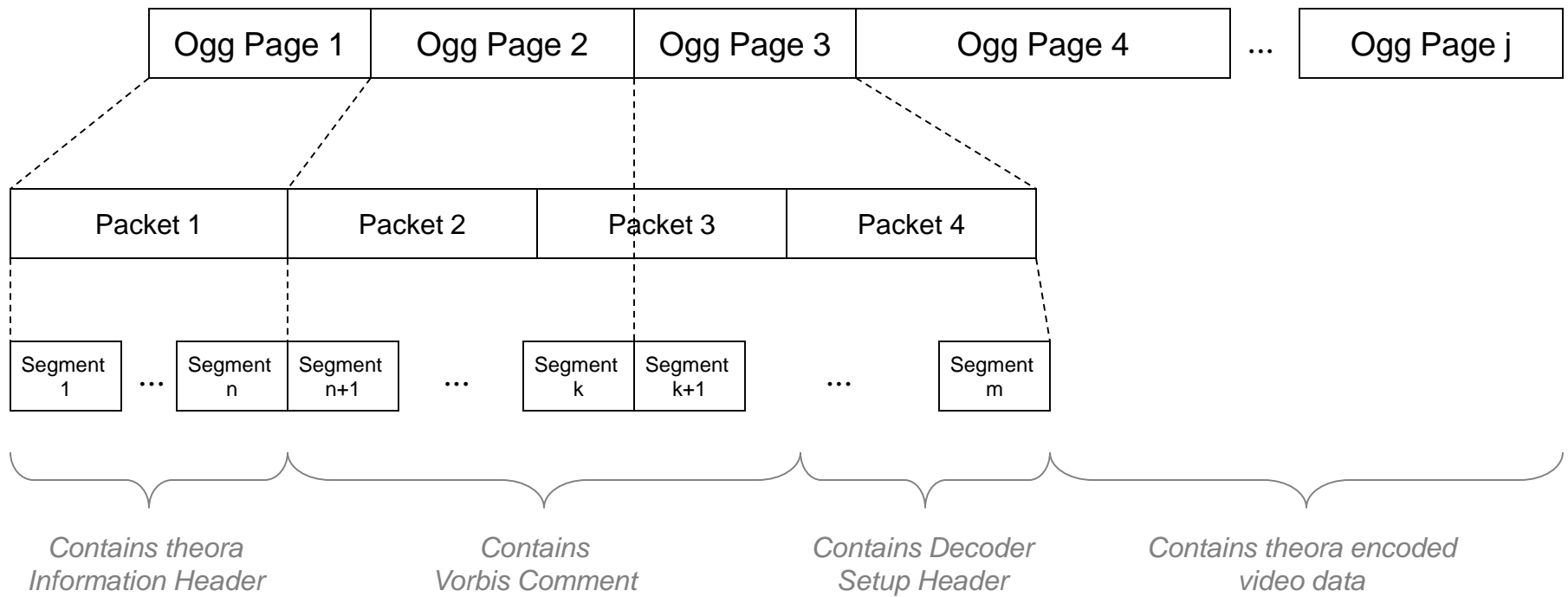


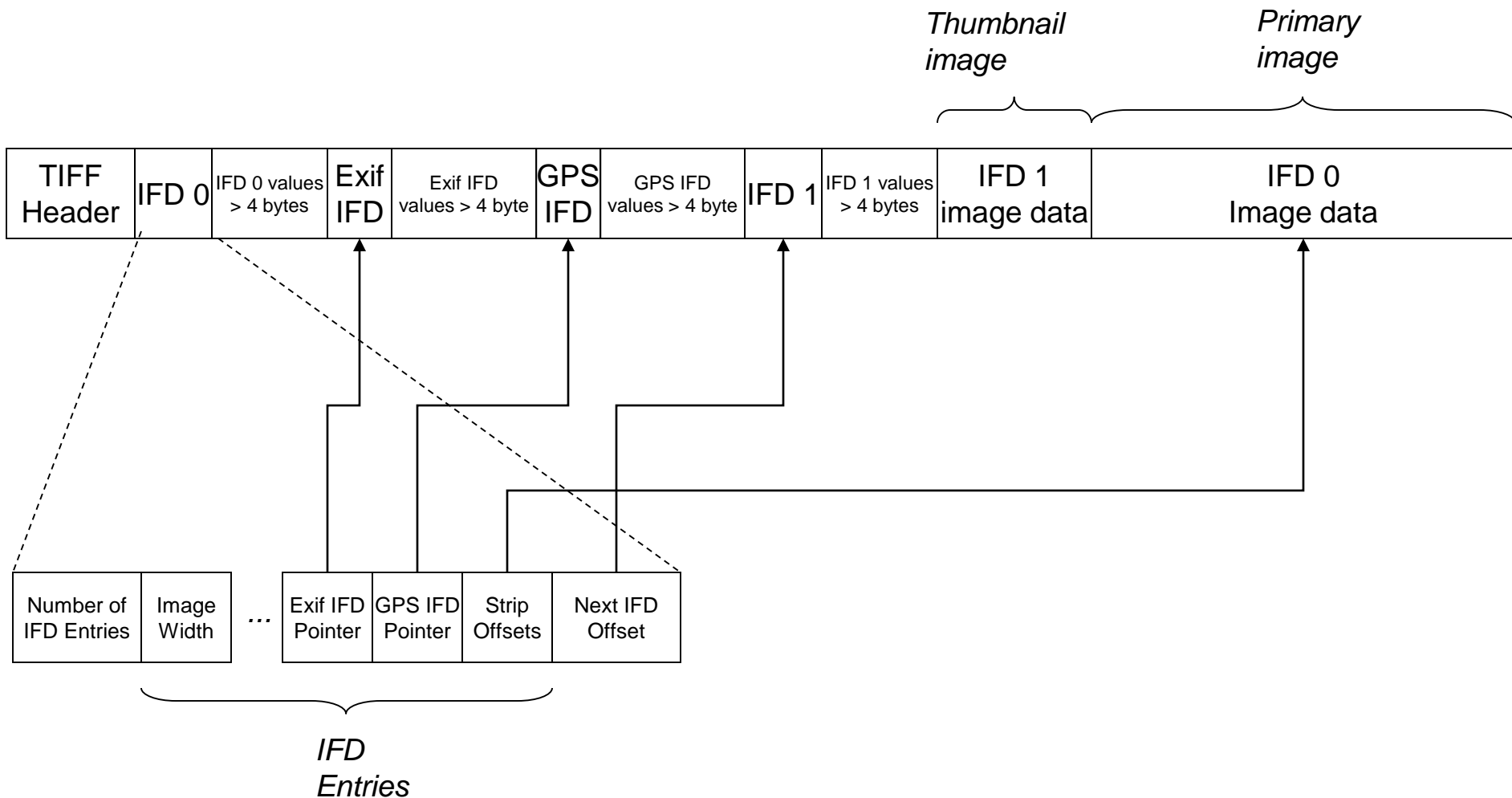


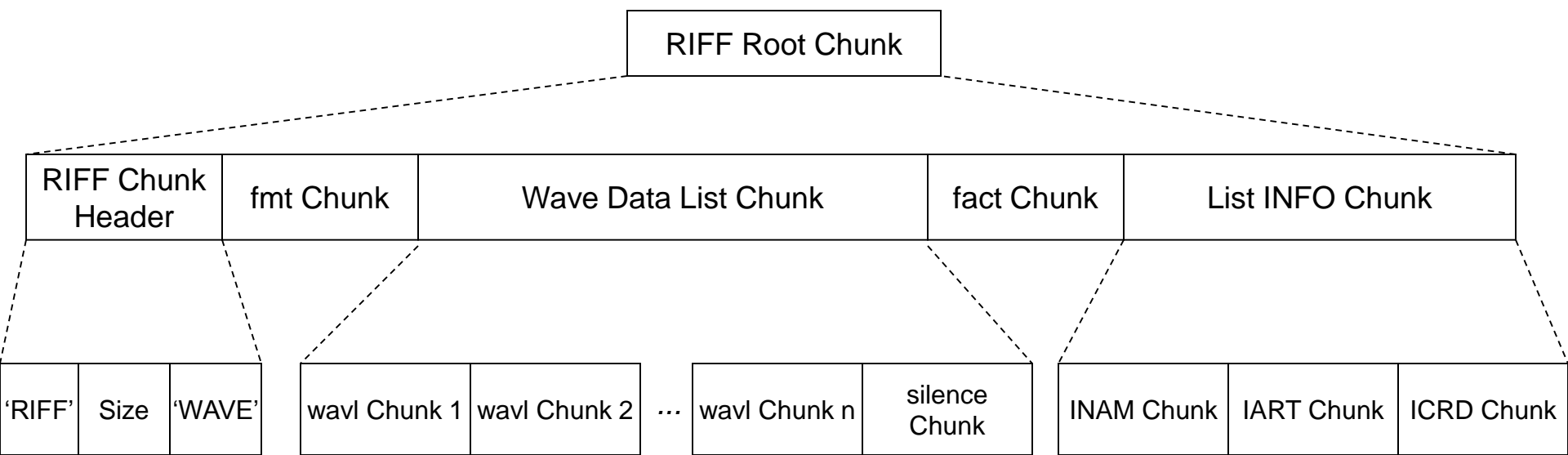












ftyp Atom	moov Atom	wide Atom	mdat Atom	free Atom
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profile Atom	movie header Atom	track Atom 1	track Atom 2	meta Atom	user data Atom
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track header Atom	media Atom	user data Atom (track 1)
----------------------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

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

Header	@nam	@arg	@com
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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

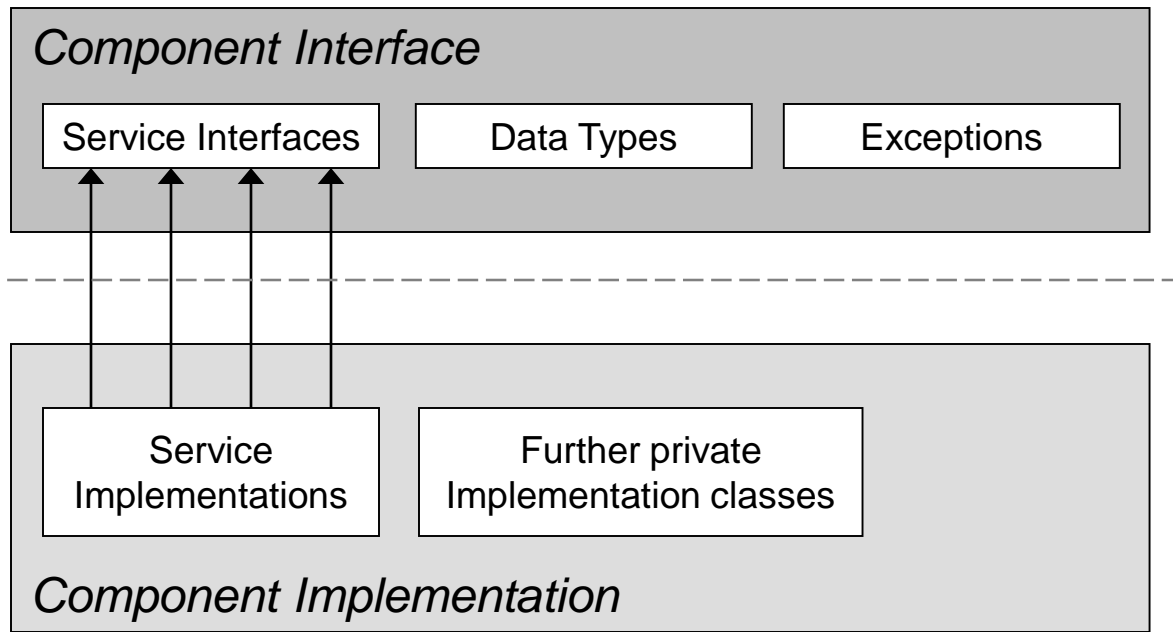
ARTIST	Simple Tag 2.1.1
--------	------------------

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

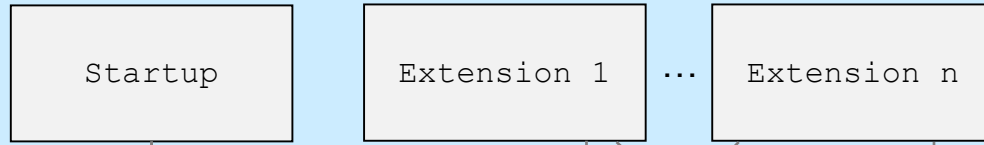
jMeta

Java 9 Virtual Machine (JVM)

Operating System

Physical Storage Medium

High-Level API



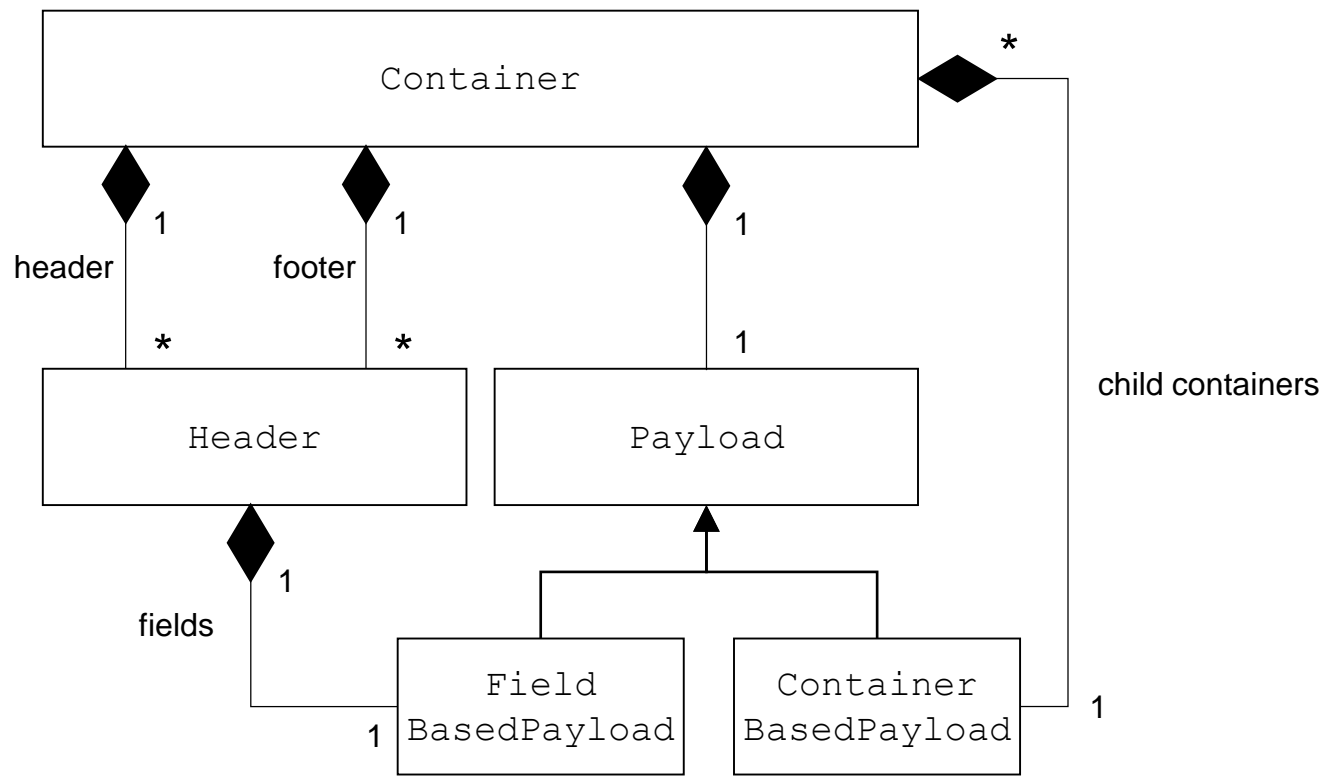
Low-Level API

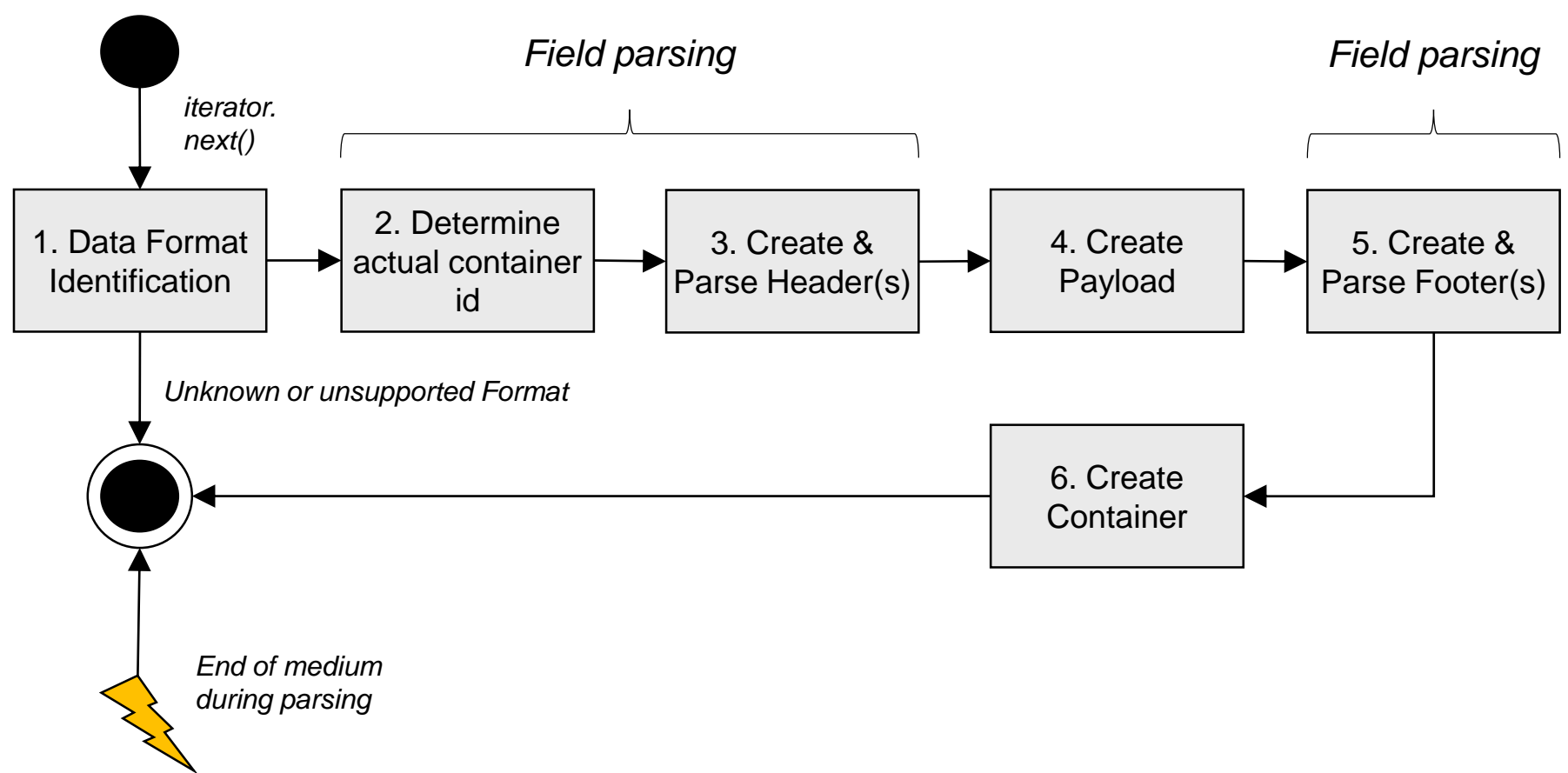


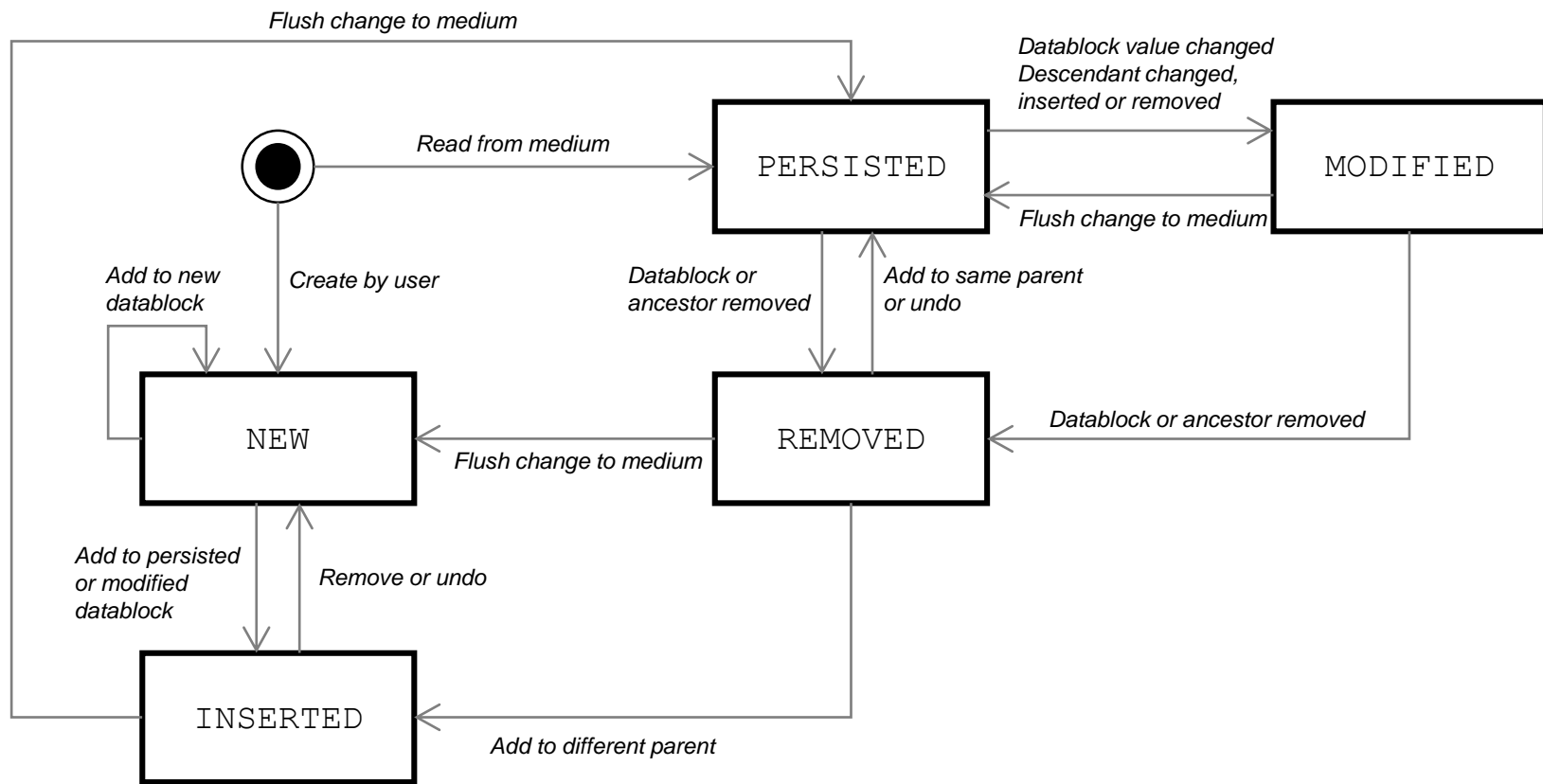
Technical Base



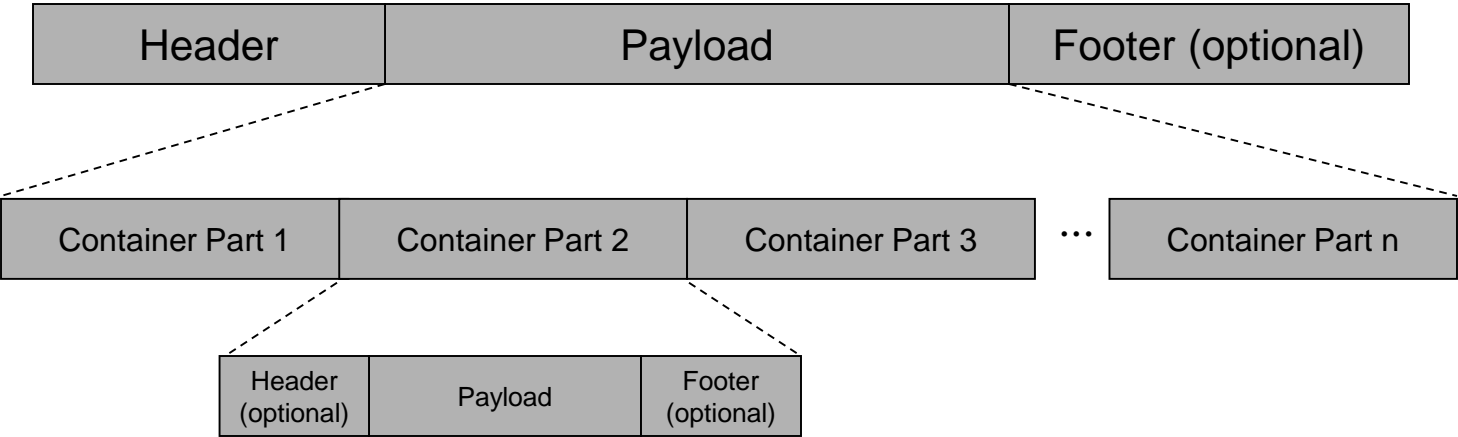




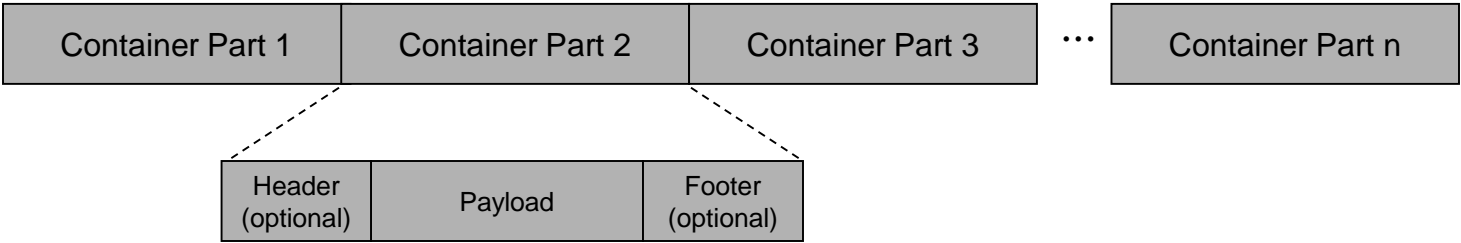




Parent Container

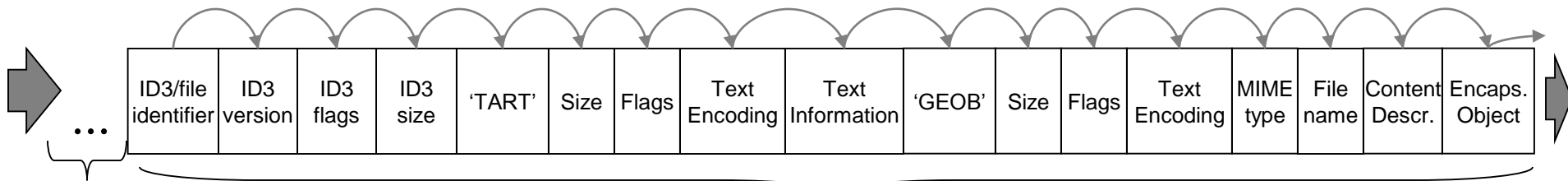
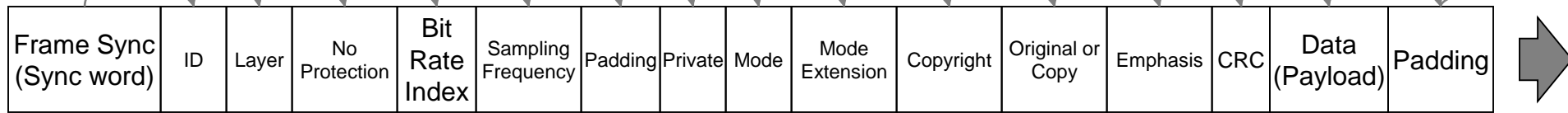


Top-Level Container Parts



MP3 Frame 1

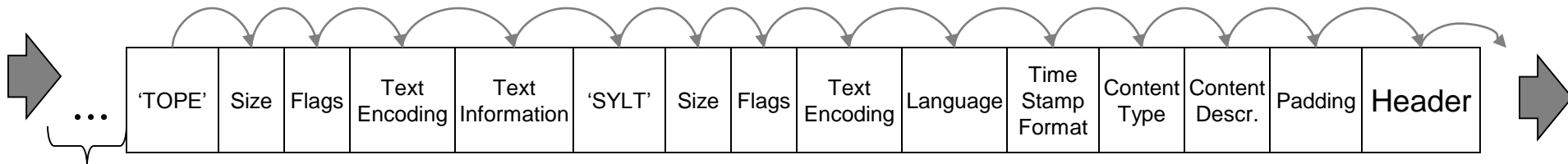
hasNext() + next()



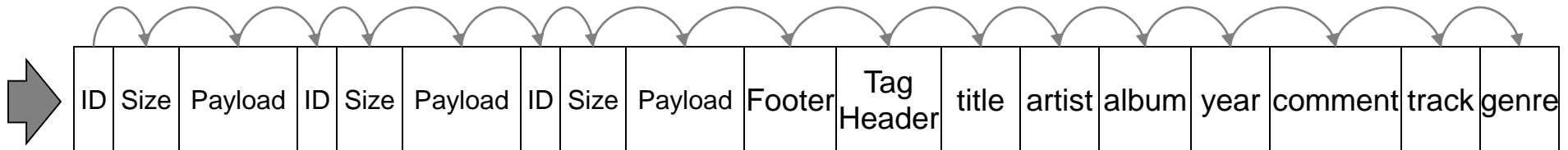
Other MP3 frames
(same block sequence)

ID3v2.3 Tag

Lyrics3v2 Tag
(first part)

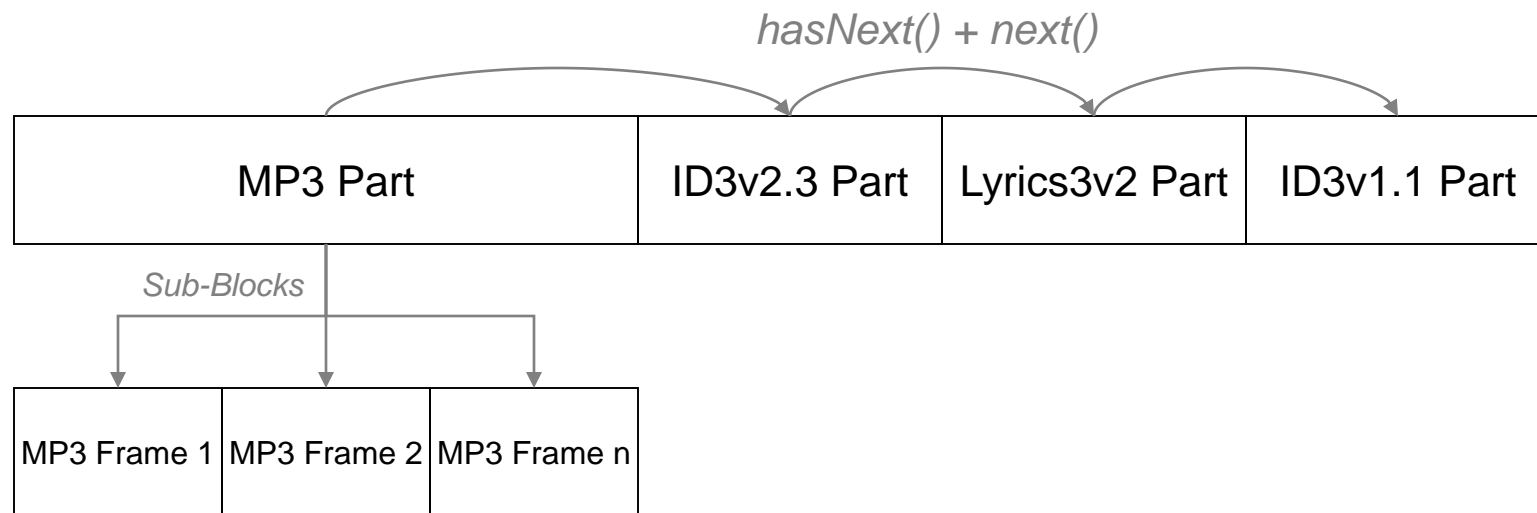


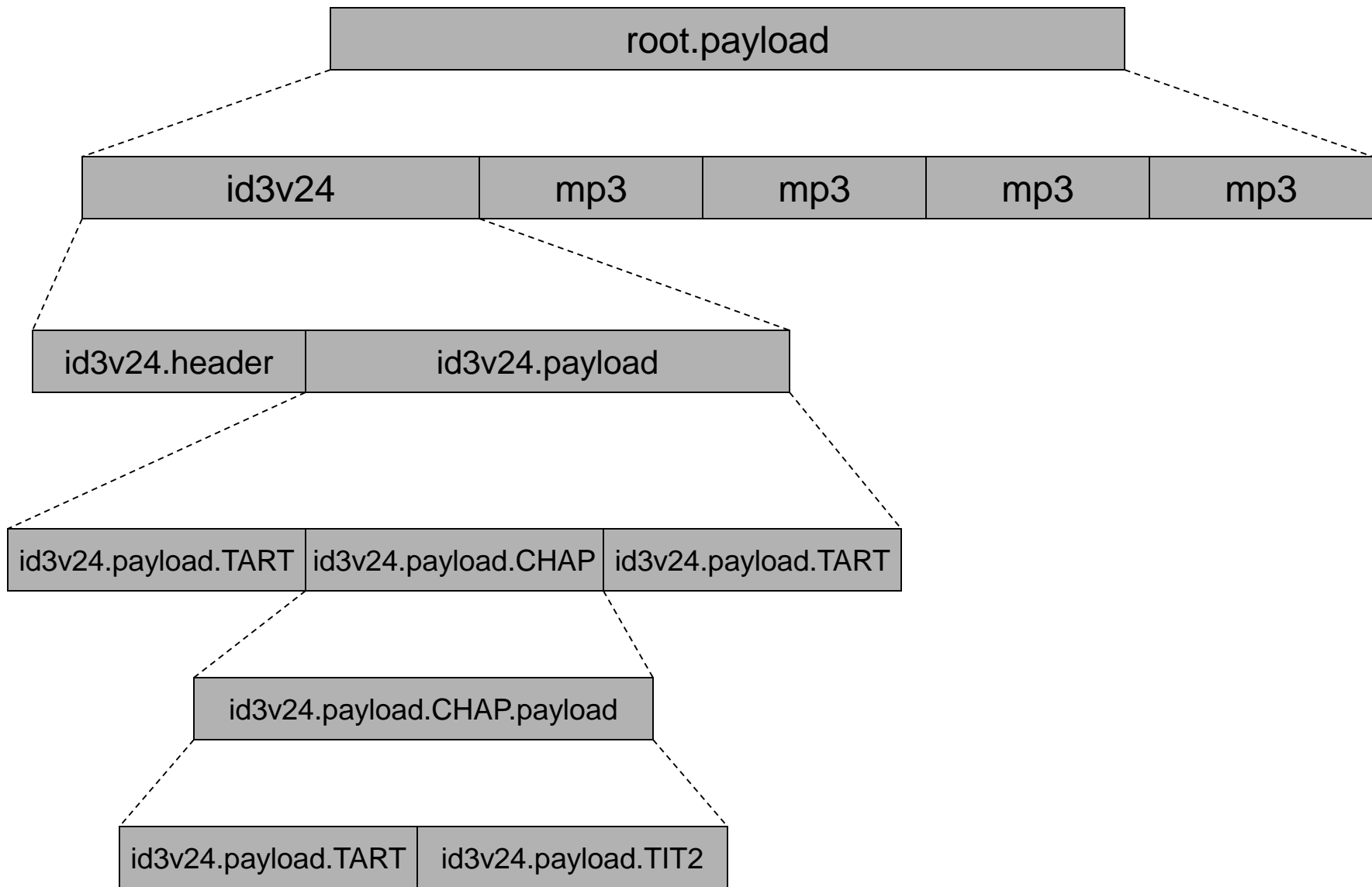
Second GEOB
frame identical

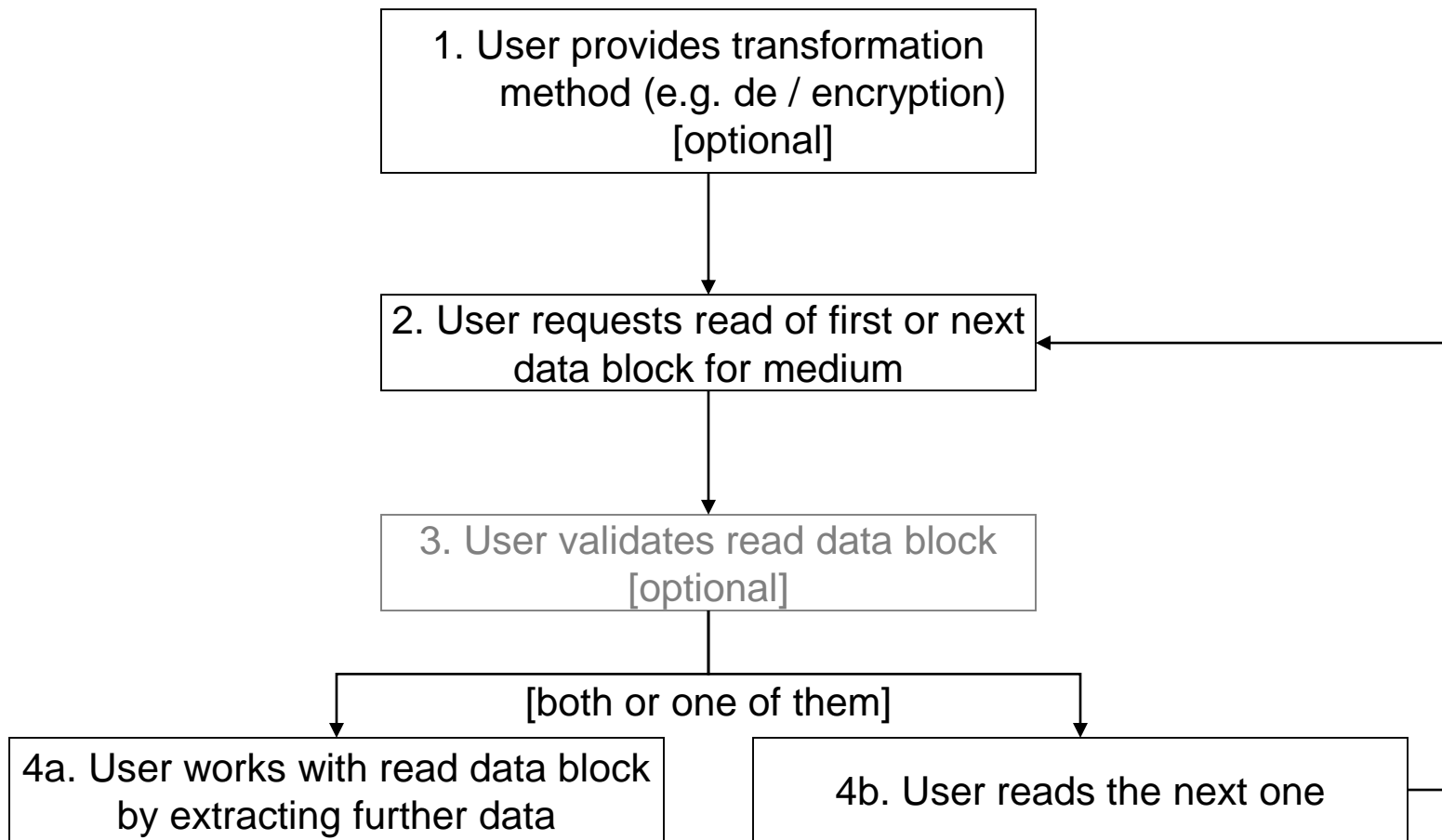


Lyrics3v2 Tag
(second part)

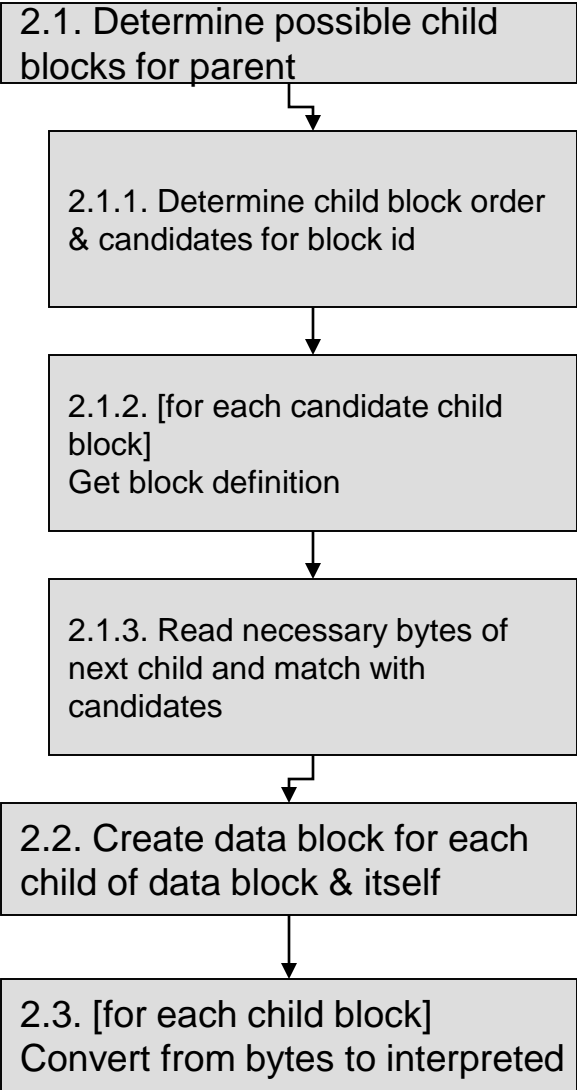
ID3v1.1 Tag





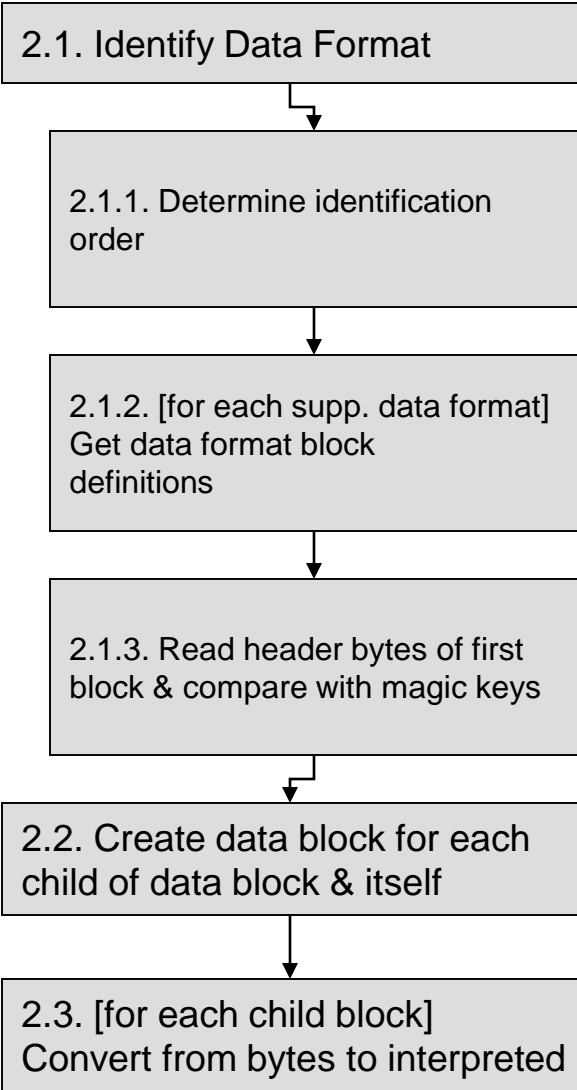


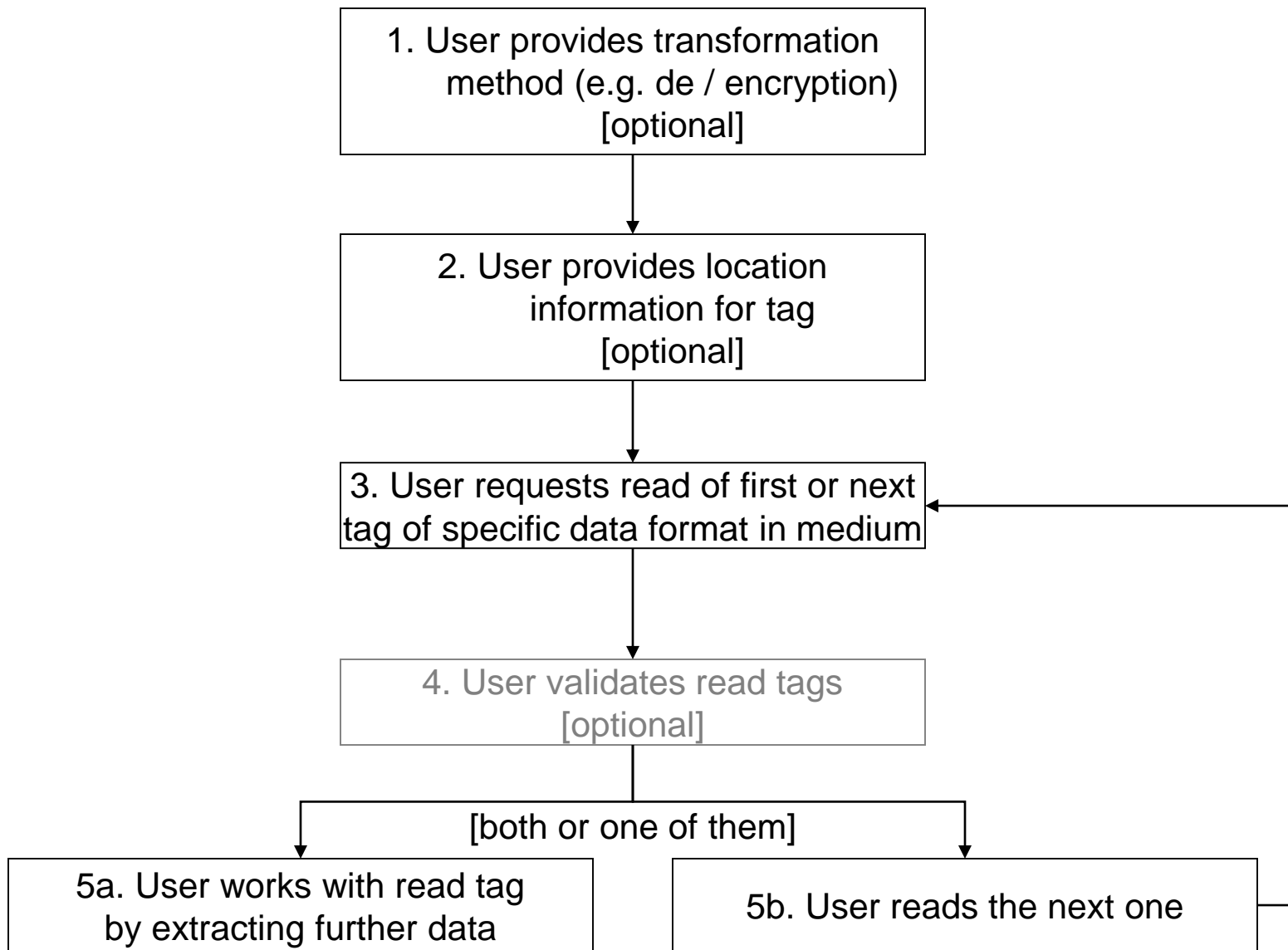
Known parent block / data format



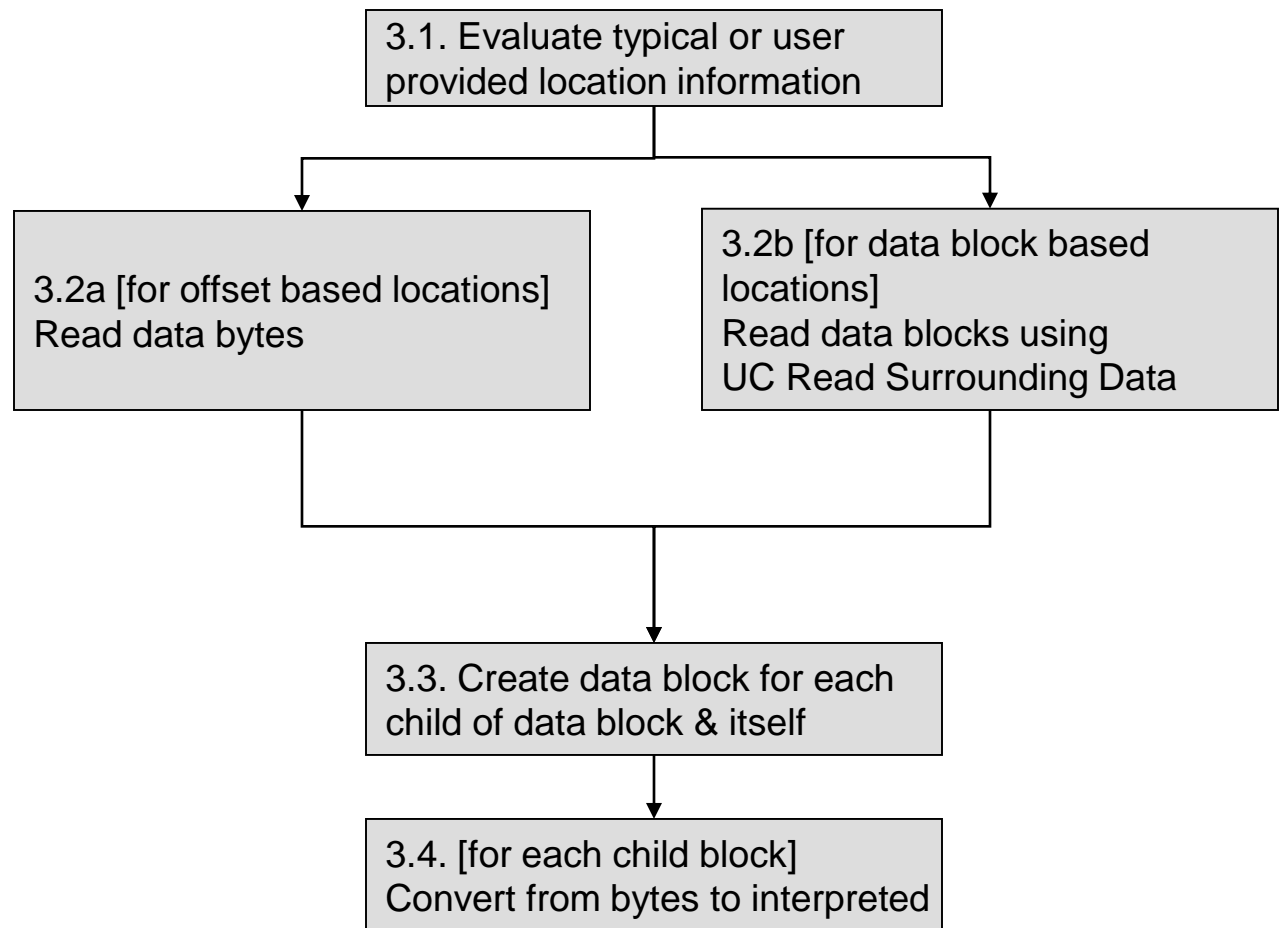
2. User requests read of first or next data block for medium

No parent block / data format

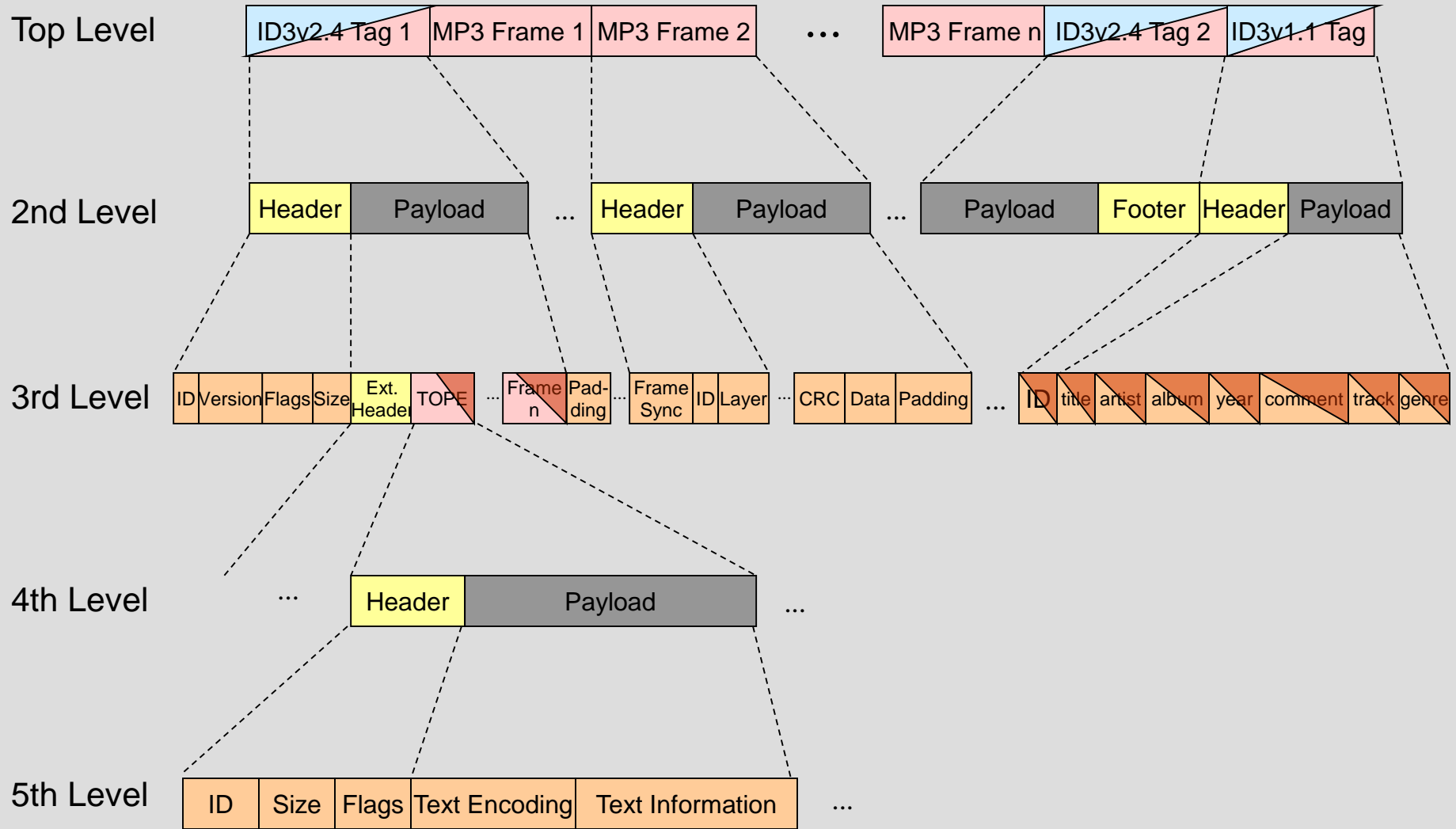




3. User requests read
of first or next tag of
specific data format
in medium

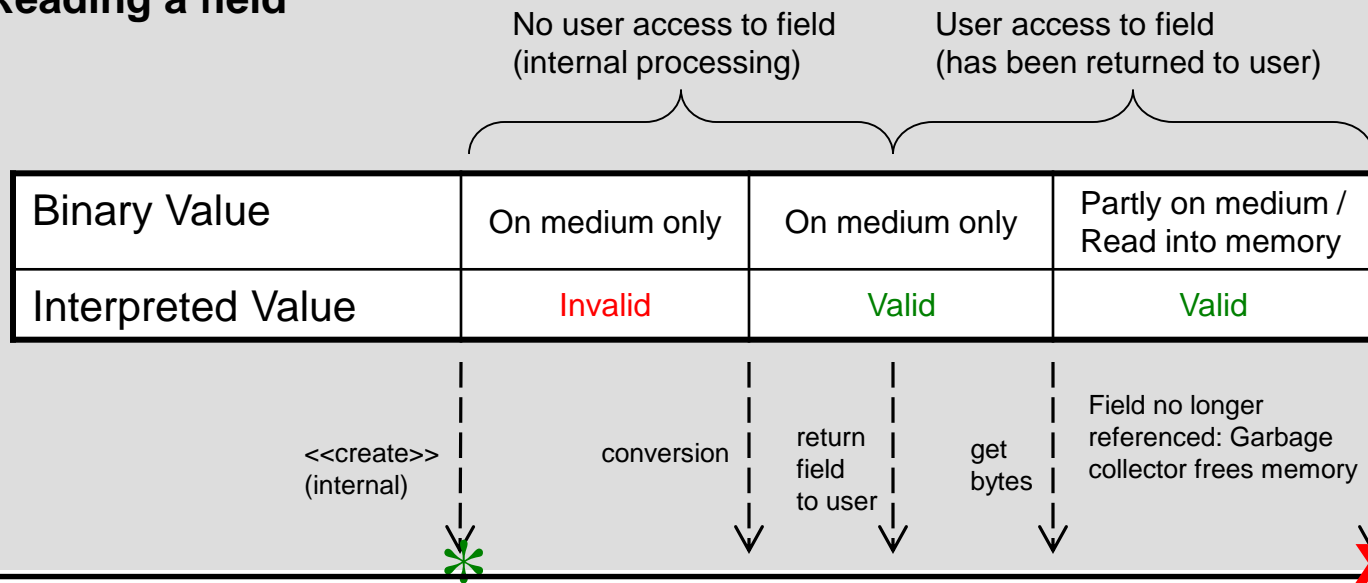


Medium

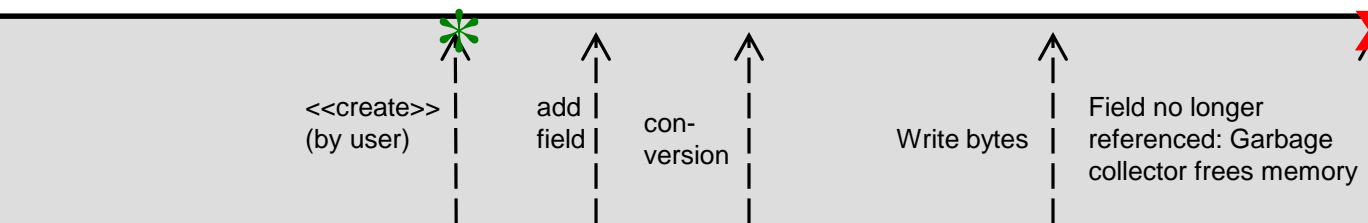


- Container
- Tag (special Container)
- Attribute (special Container)
- Header/Footer
- Payload
- Field

Reading a field



Time



Binary Value	Invalid	In memory only	On medium
Interpreted Value	Valid	Valid	Valid

Internal processing

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)

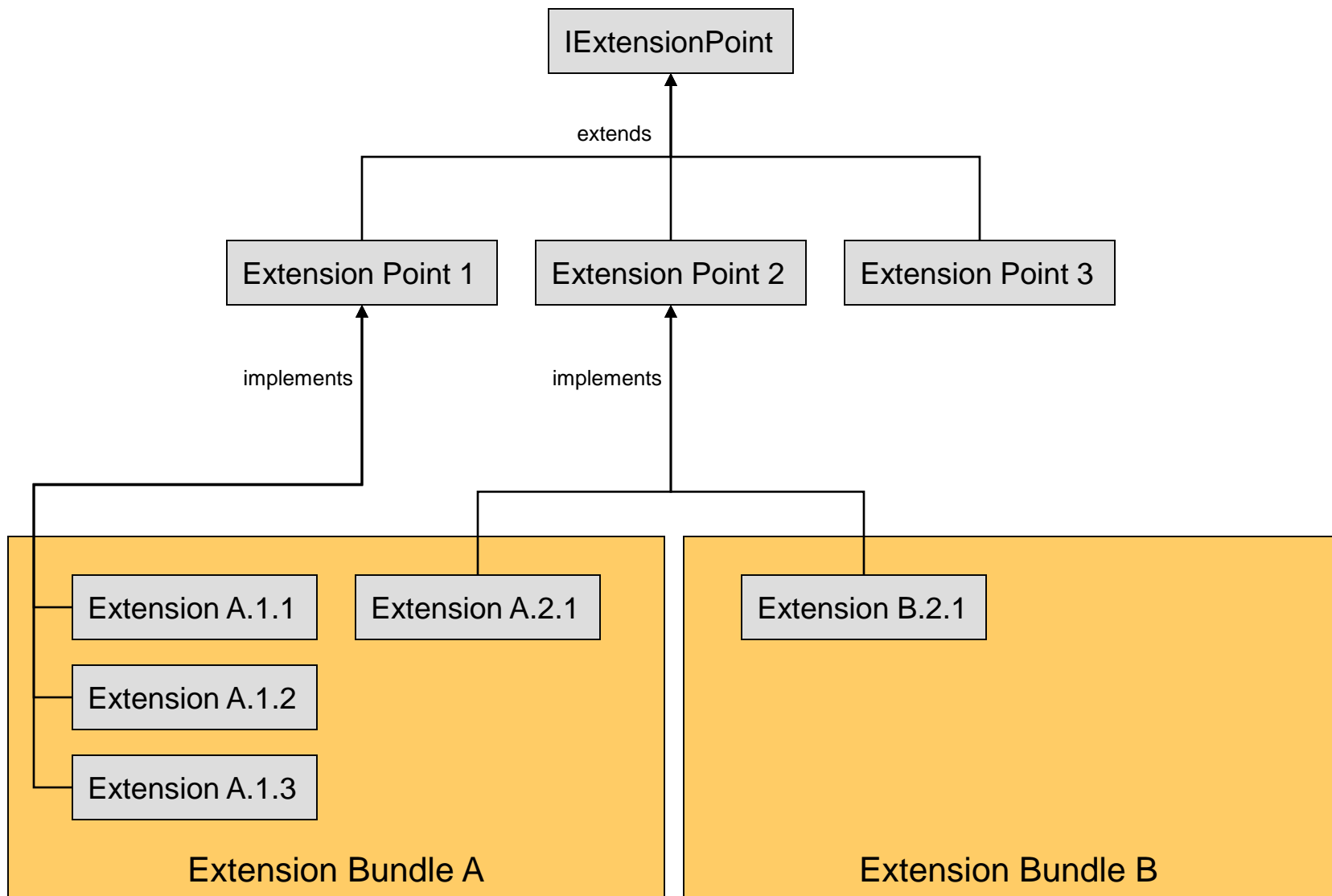
return
field
to user

get
bytes

conversion

Field no longer
referenced: Garbage
collector frees memory

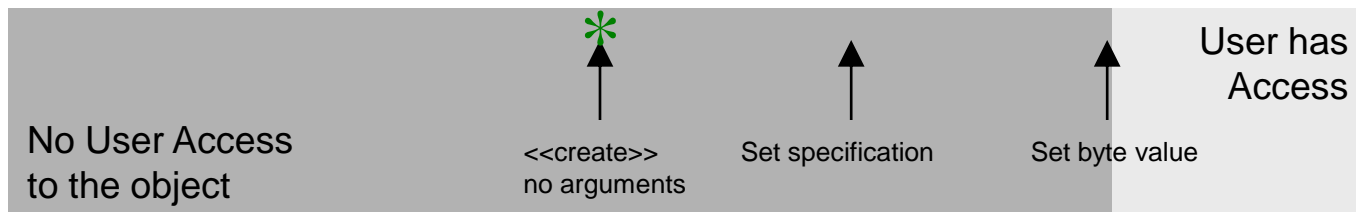
Time



Value States

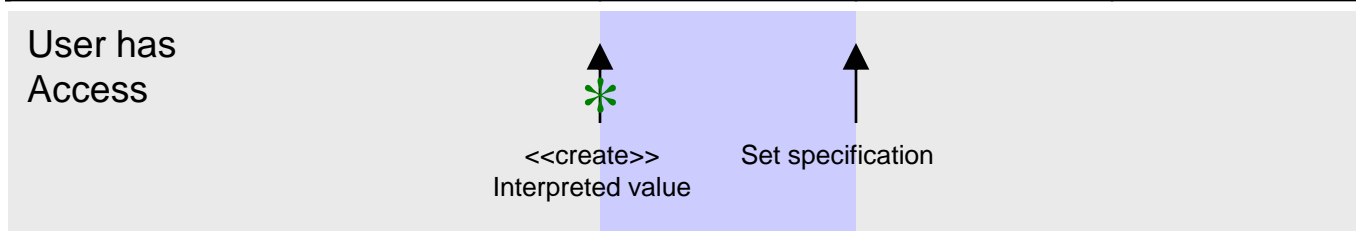
Read

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

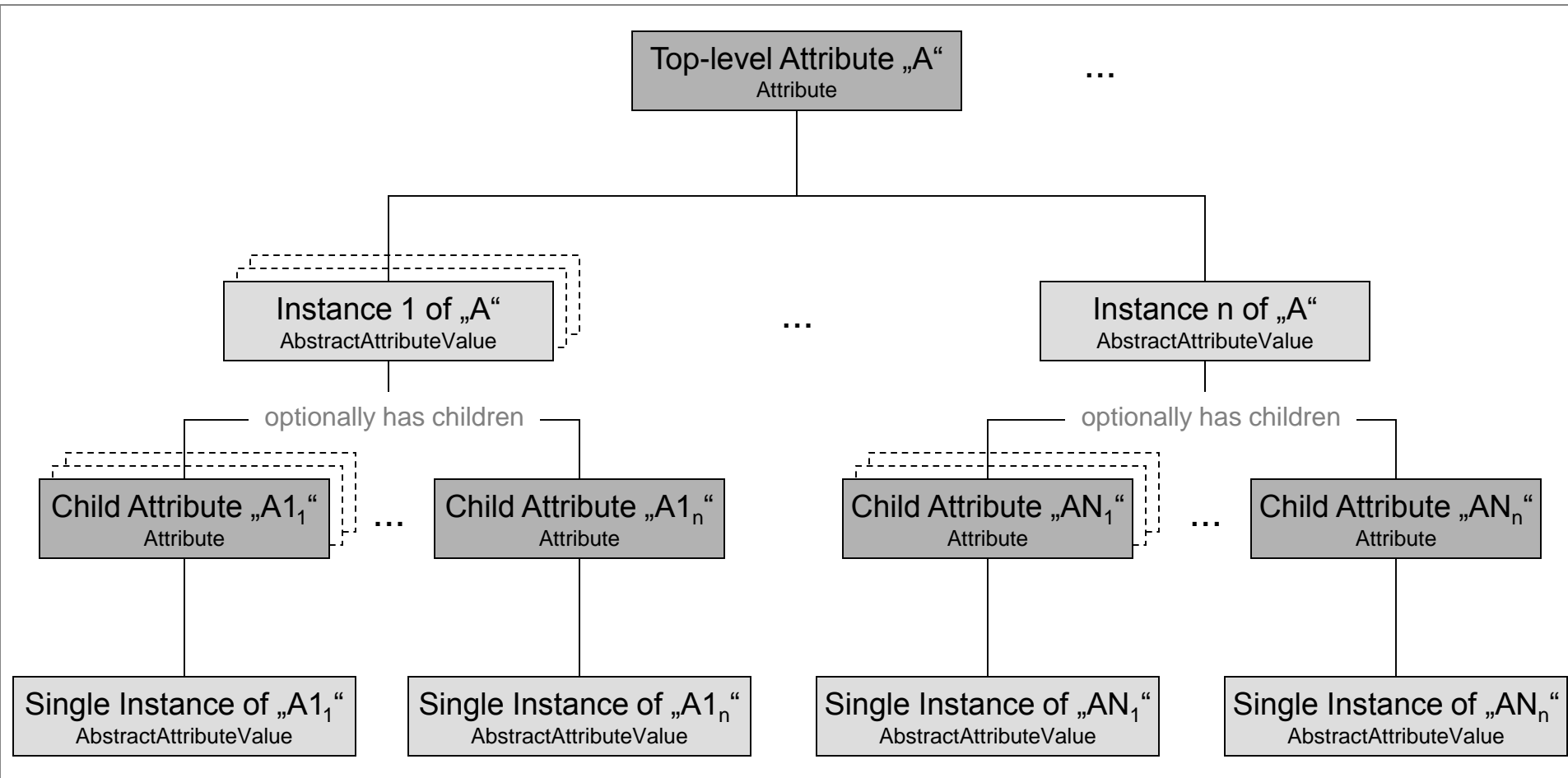


Write

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

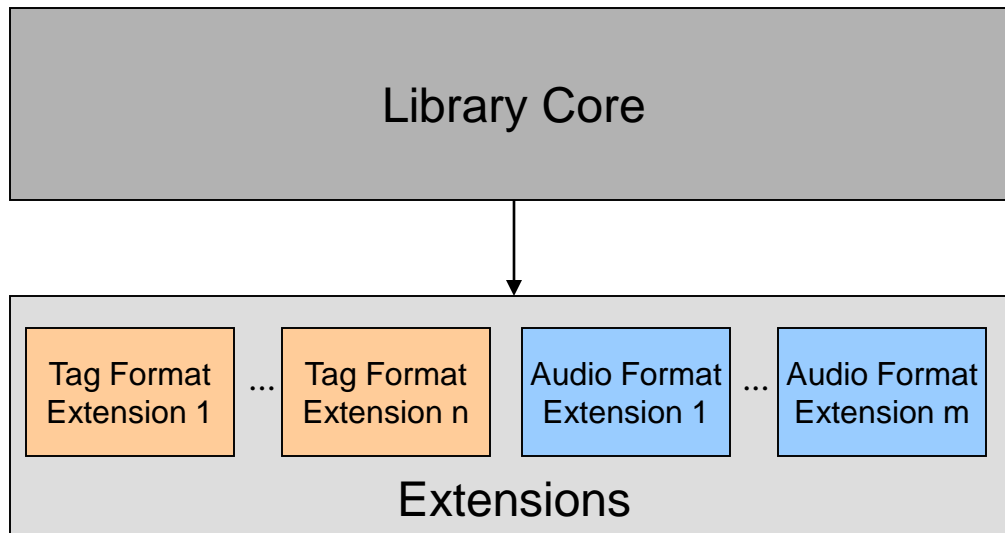


Attribute Hierarchy

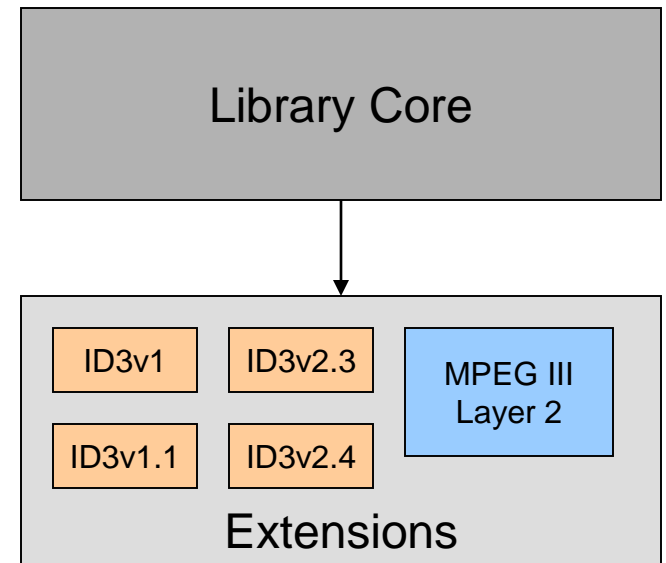


Library Structure

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

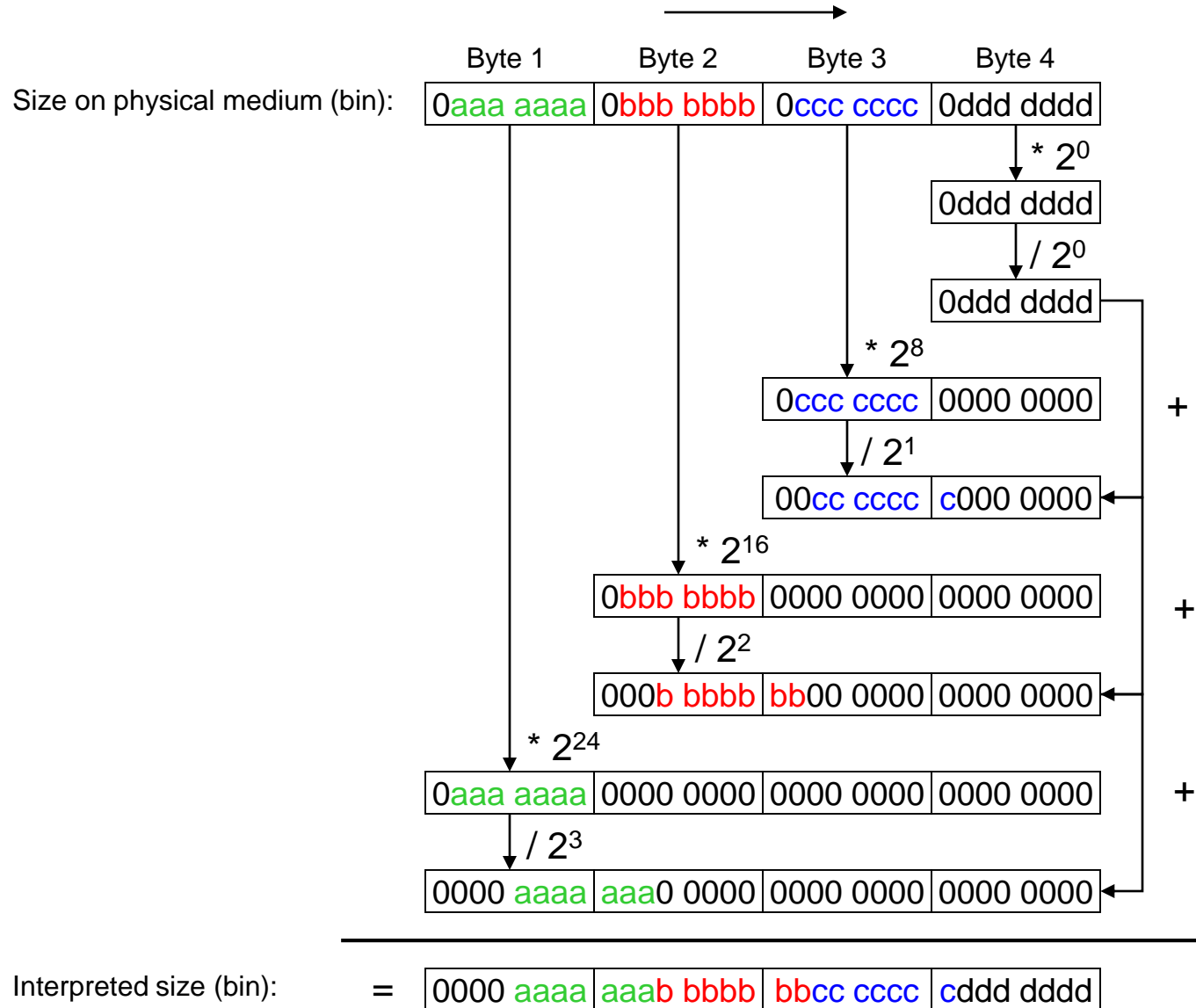
Attribute F

...

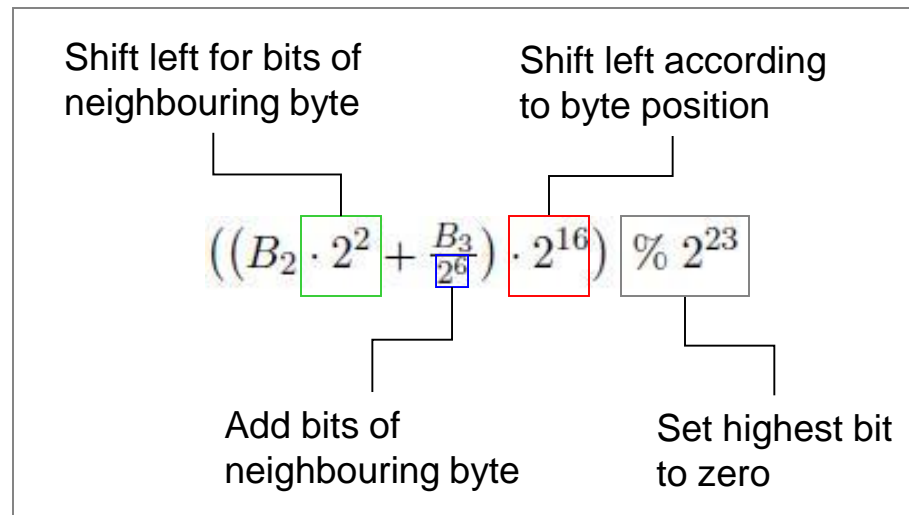
Attribute X

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

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

E

C

Example Flag Spec

Flag Bytes

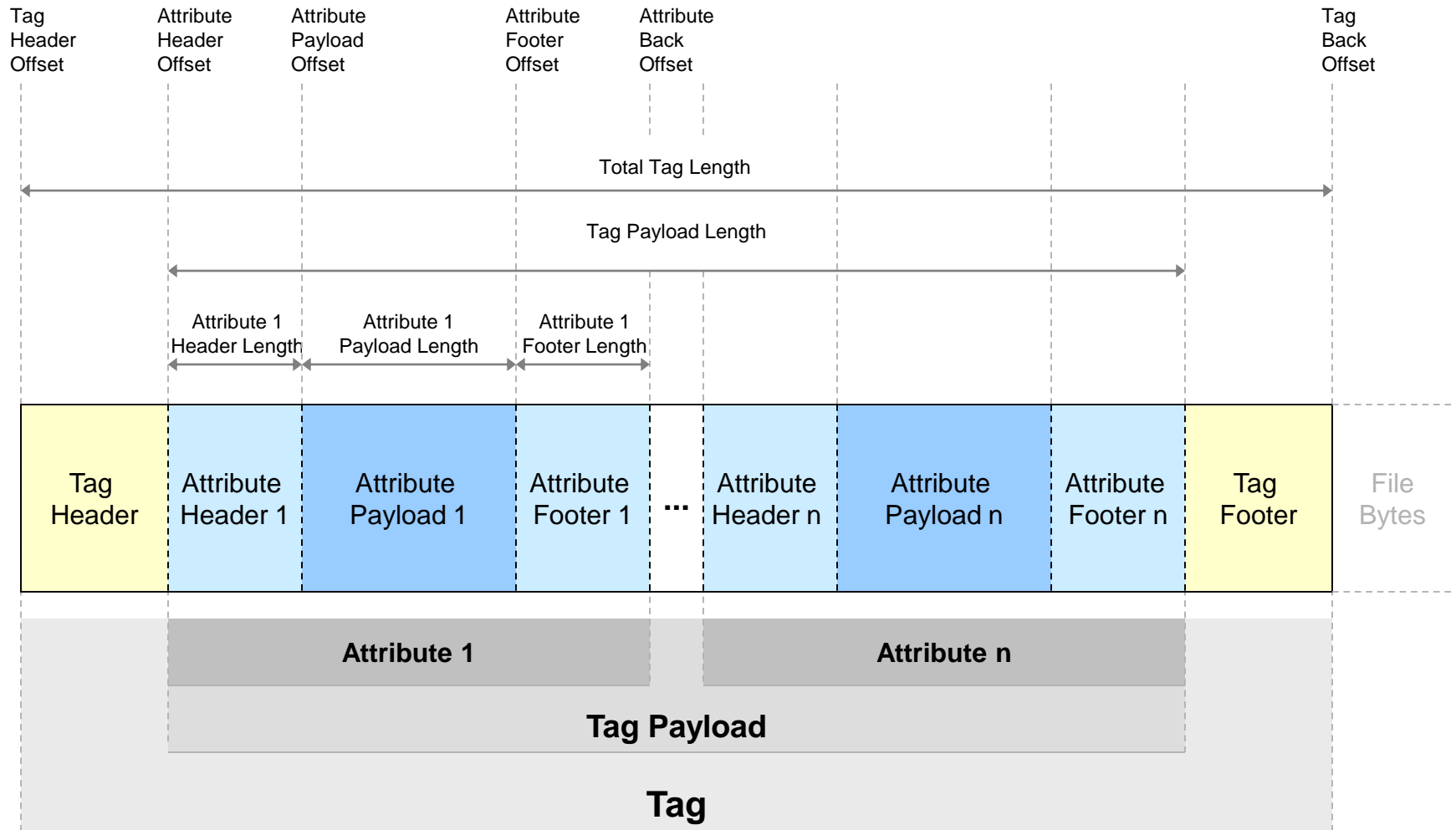
abc0 0000

Byte length = 1

Byte order = Big Endian

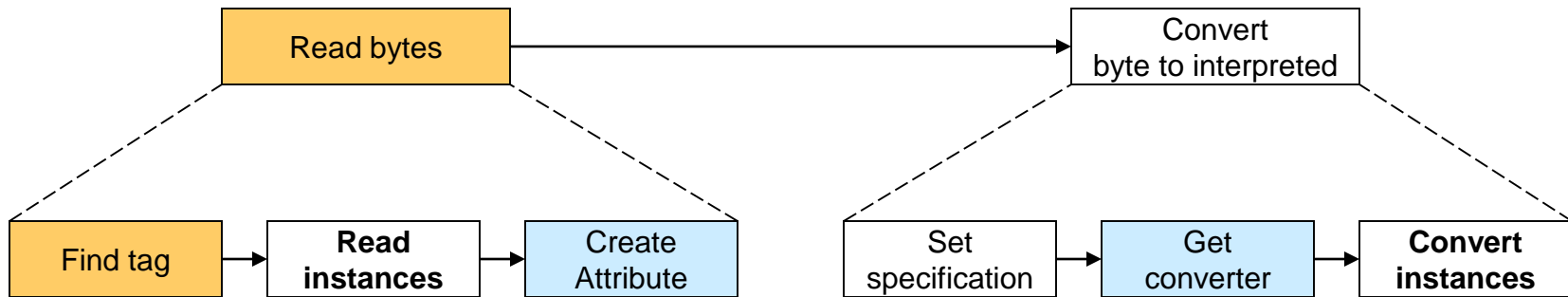
Flag	Bit Address
a = Compression	(1, 1)
b = Footer available	(1, 2)
c = Experimental	(1, 3)

Tag Structure



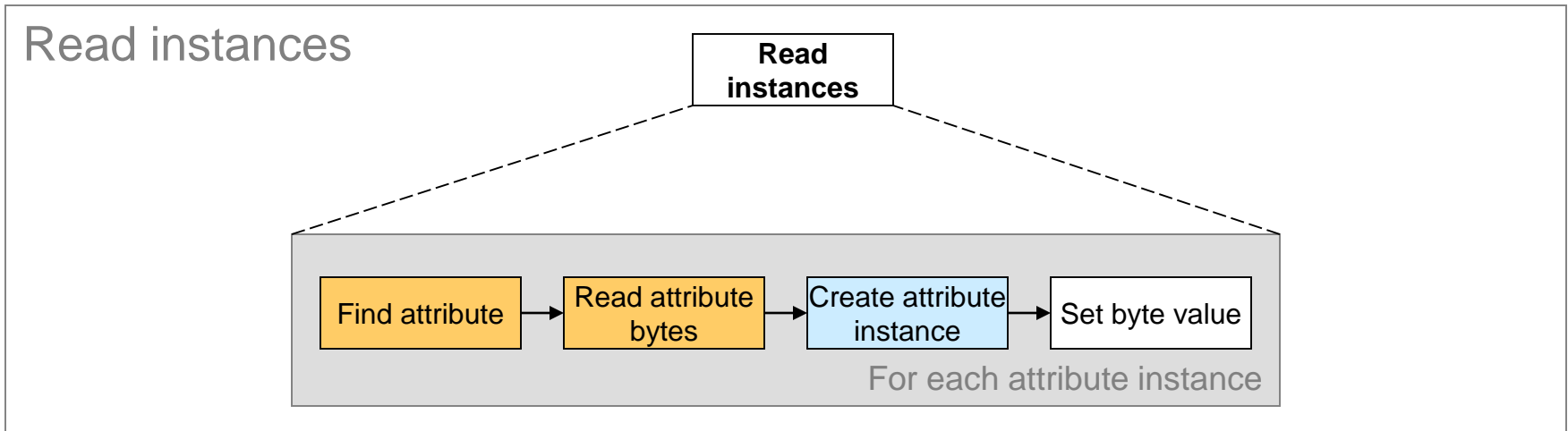
Read attribute





Read attribute



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

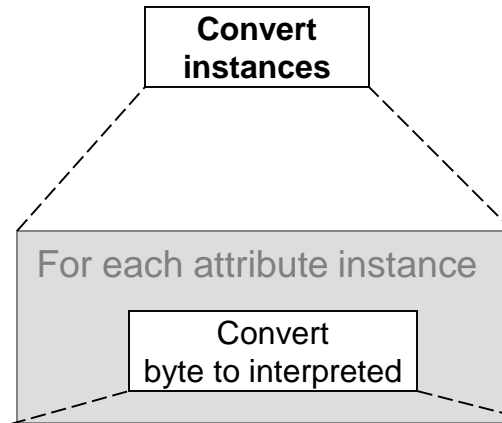
Read instances



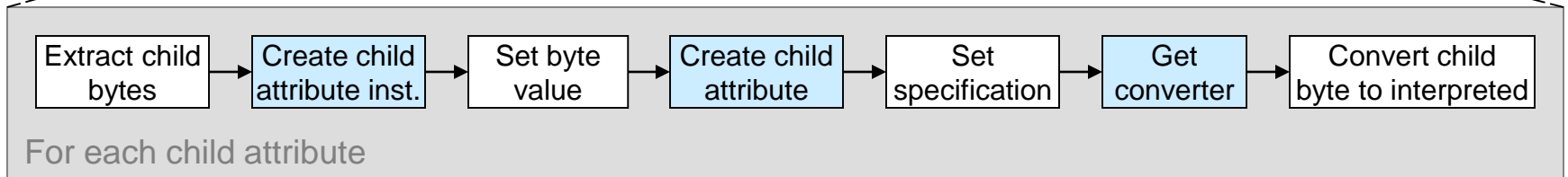
-  : Object creation / retrieval
-  : Access to physical medium
-  : Other action
-  : **Action with sub-steps detailed on further figure**

Convert instances (Reading)

Convert instances



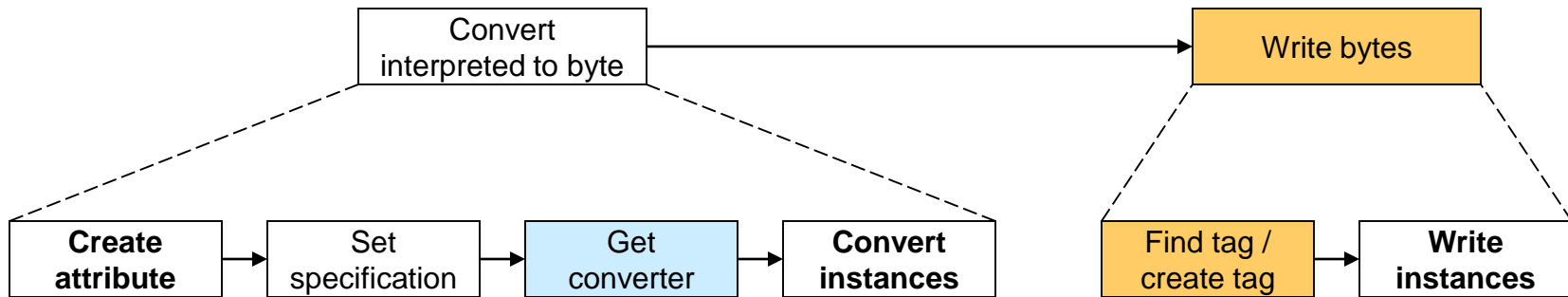
<For attributes with children only>







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

Write attribute

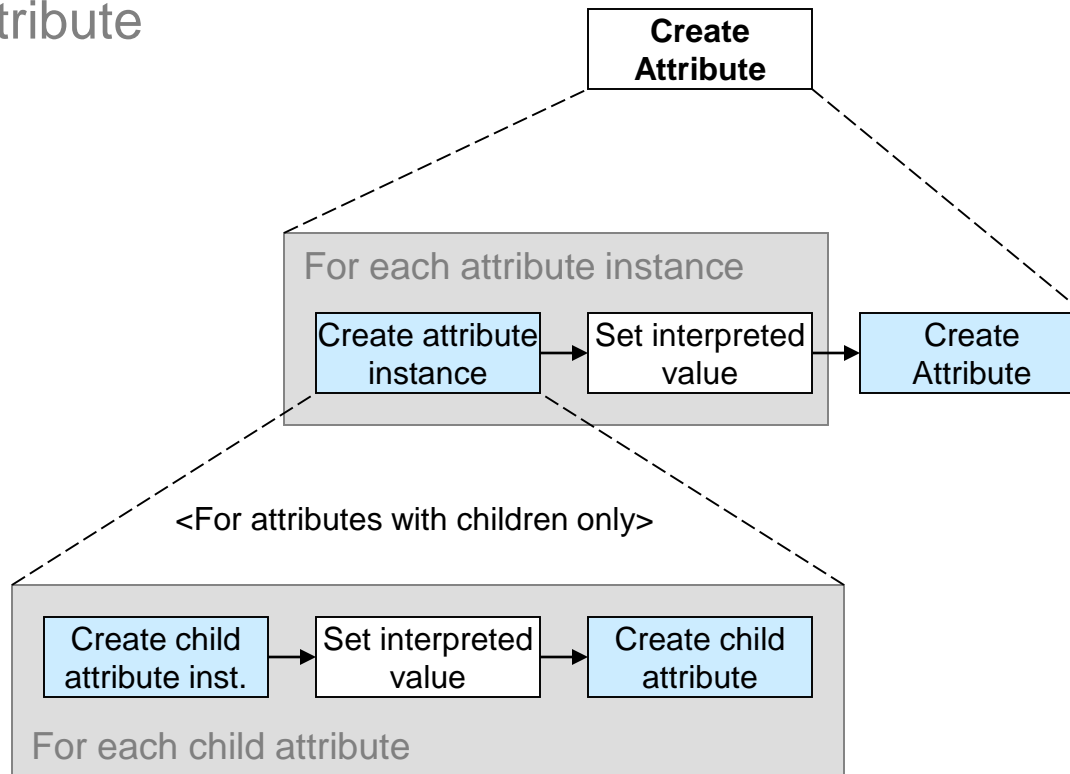
Write attribute



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

Create attribute (Writing)

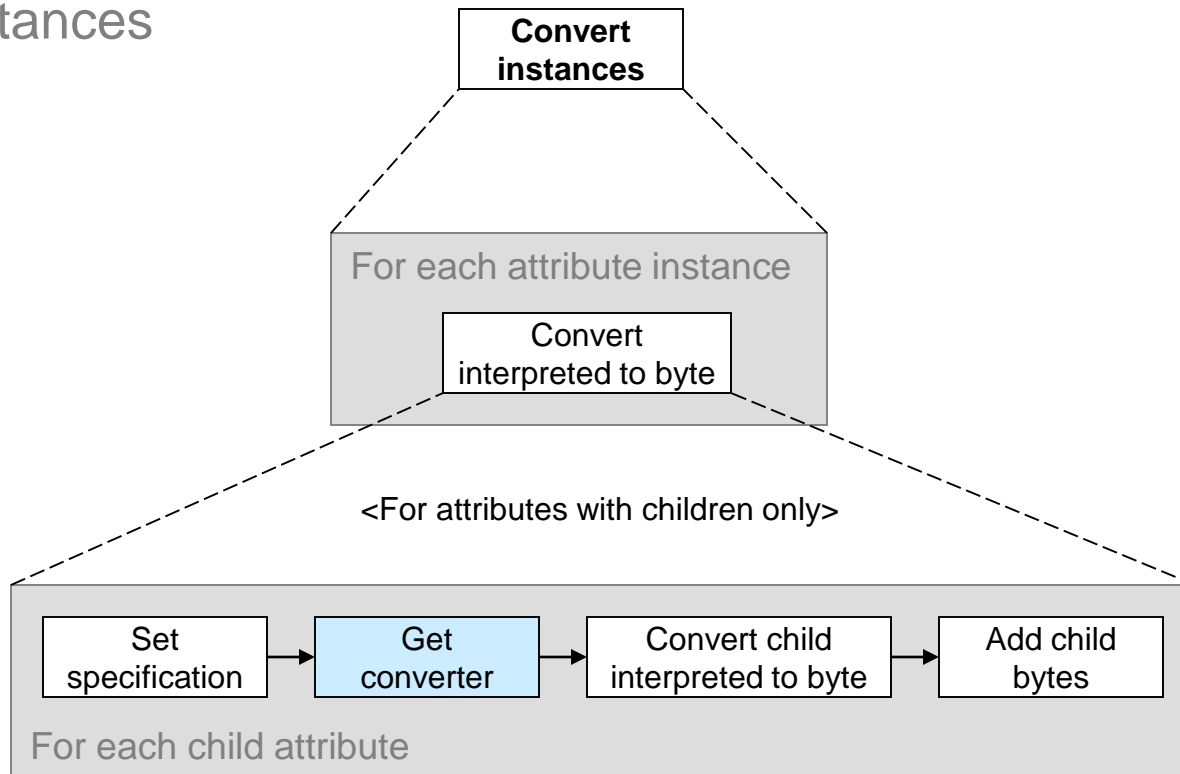
Create attribute







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

Convert instances (Writing)

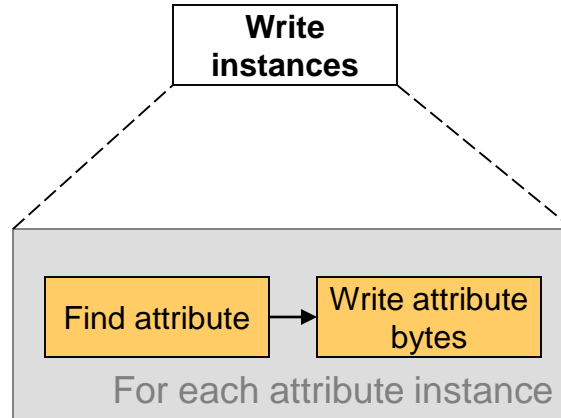
Convert instances







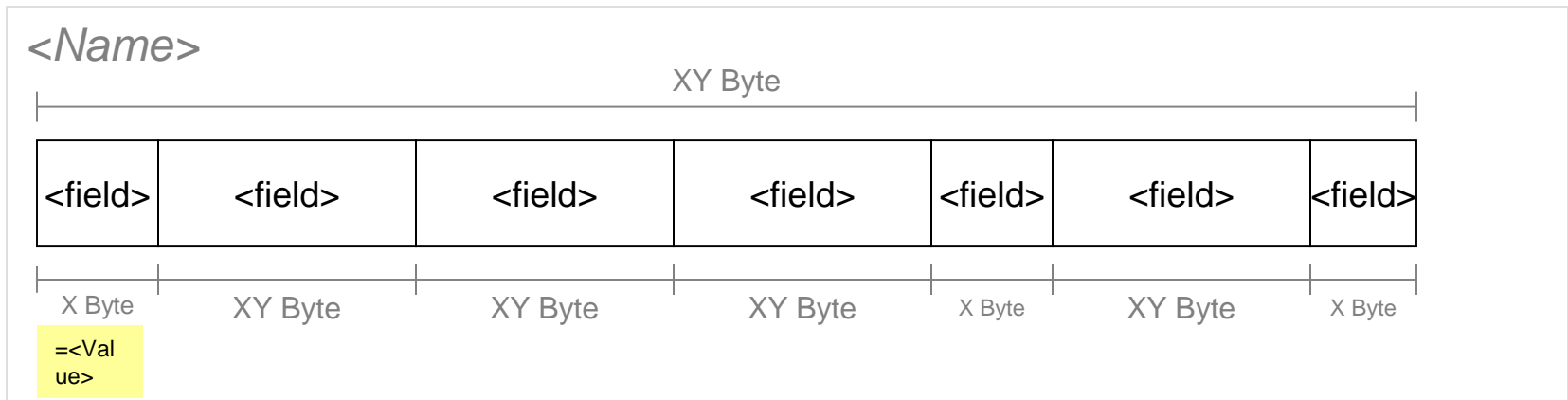
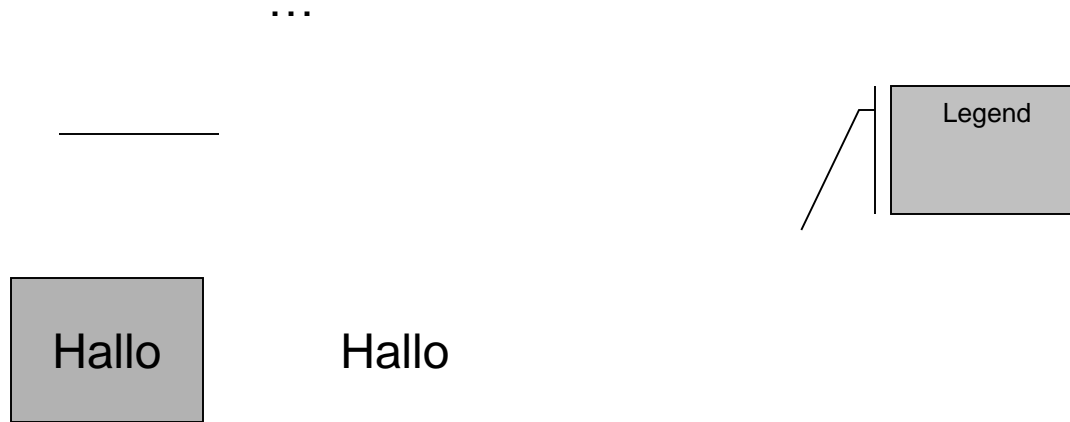
-  : Object creation / retrieval
-  : Access to physical medium
-  : Other action
-  : Action with sub-steps detailed on further figure

Write instances

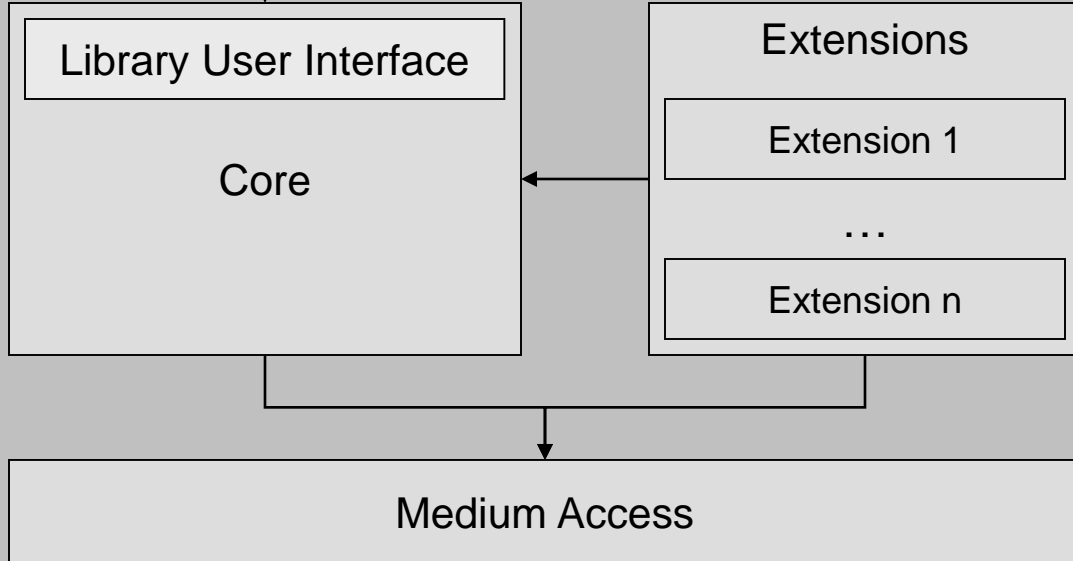
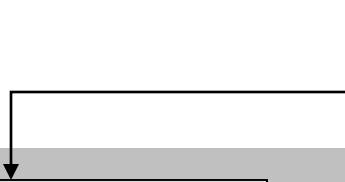
Write instances



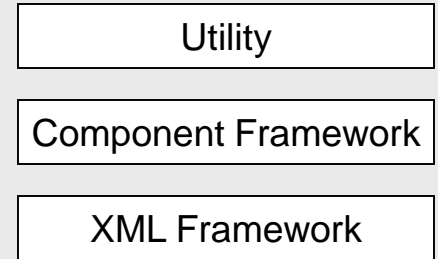
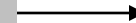
-  : Object creation / retrieval
-  : Access to physical medium
-  : Other action
-  : **Action with sub-steps detailed on further figure**



Application Layer (User)



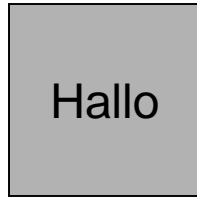
jMeta



Cross-functional

ALT

Template



Hallo