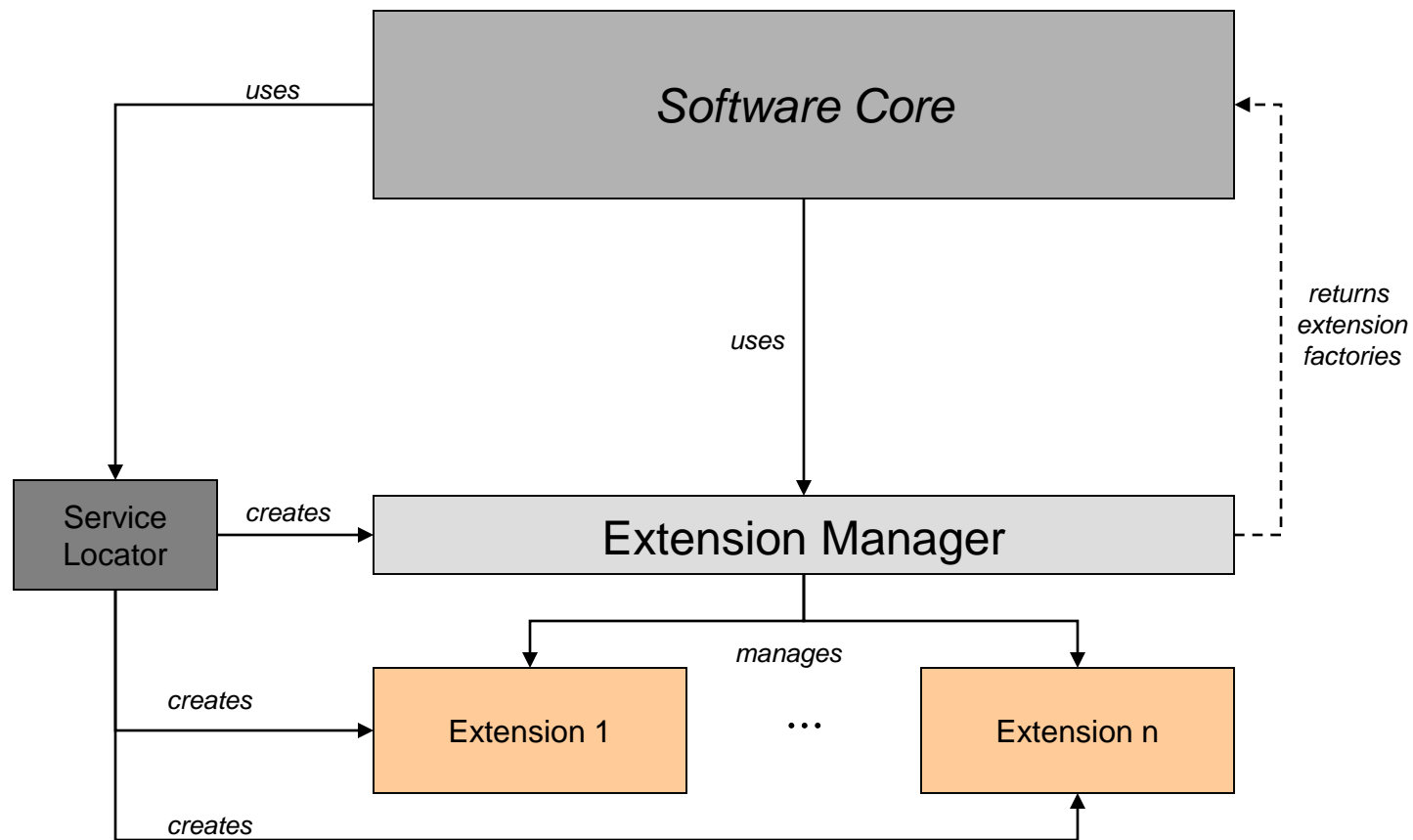
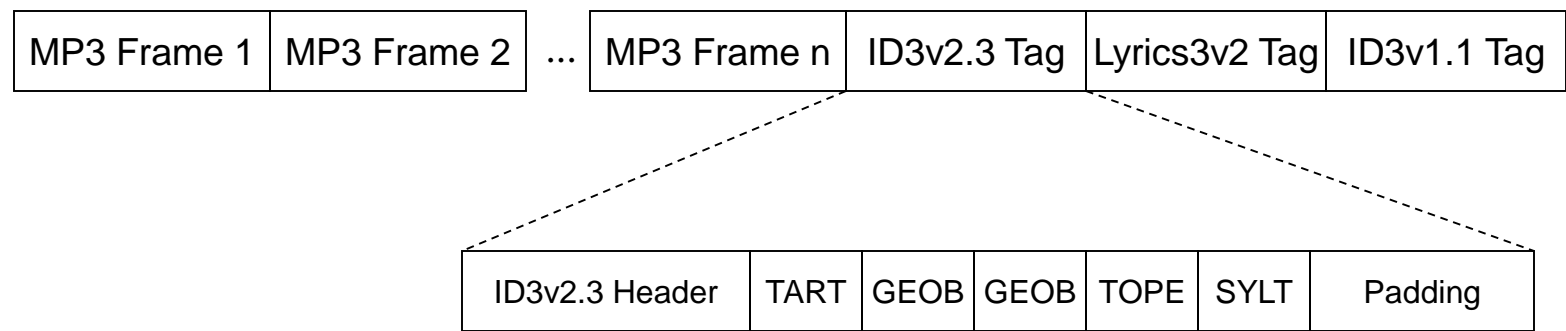


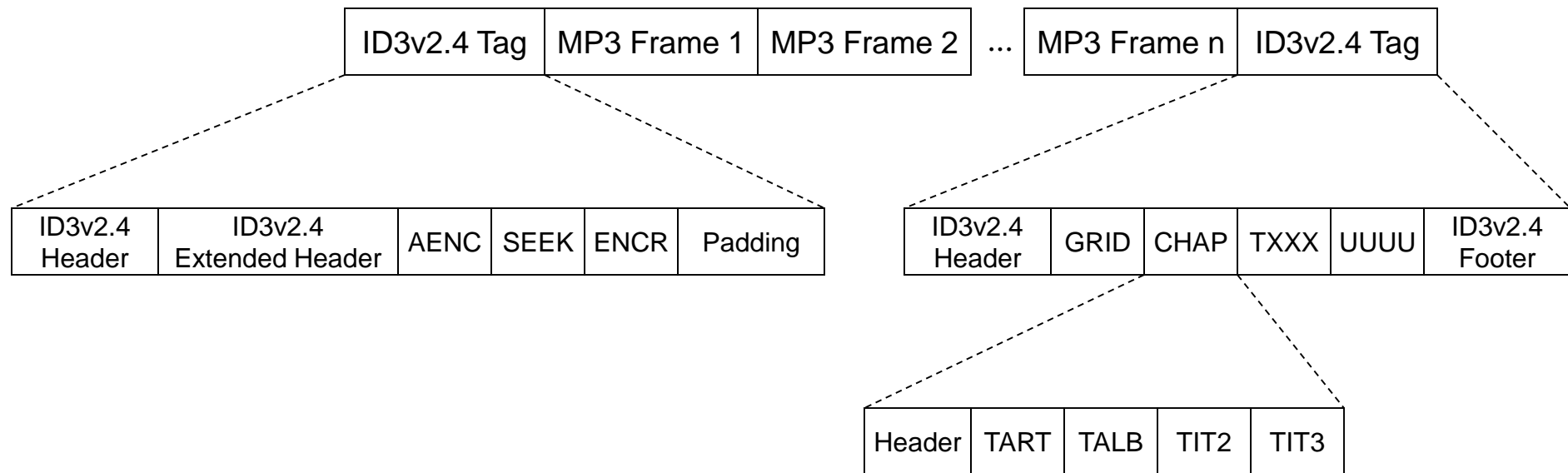
Tag

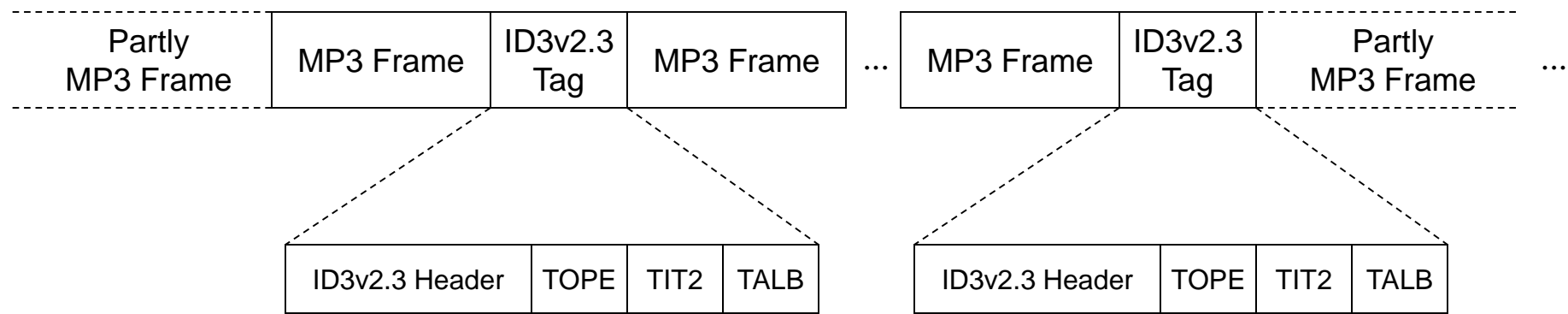
Payload Data

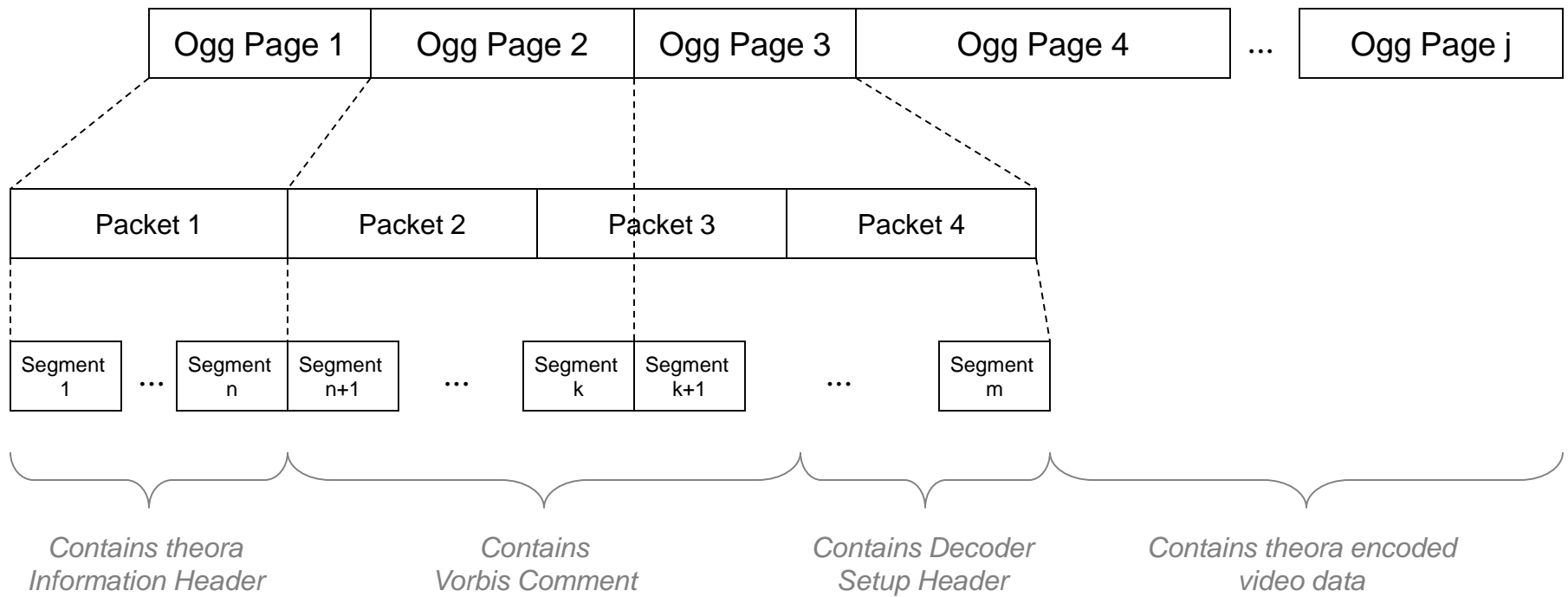


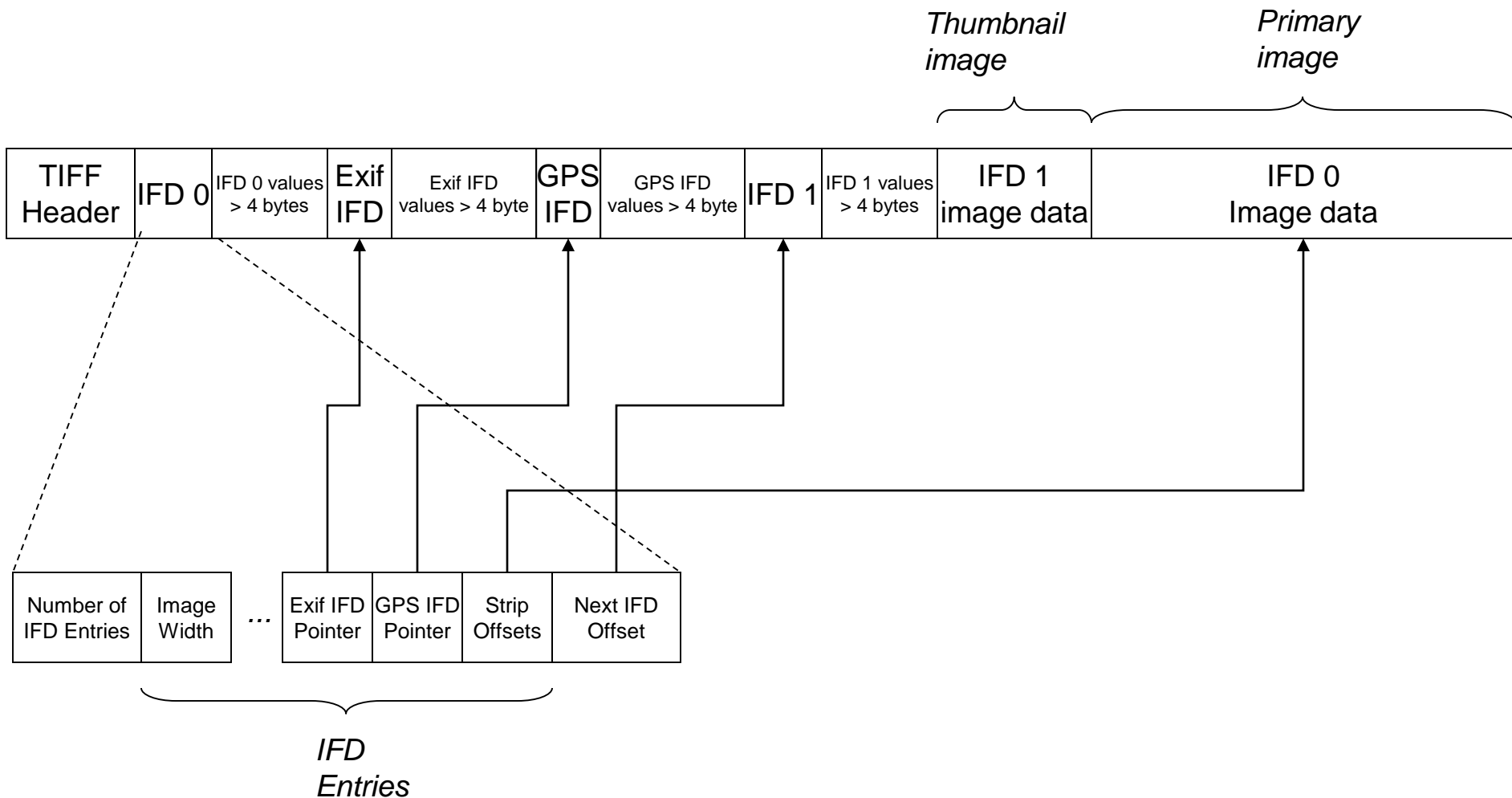


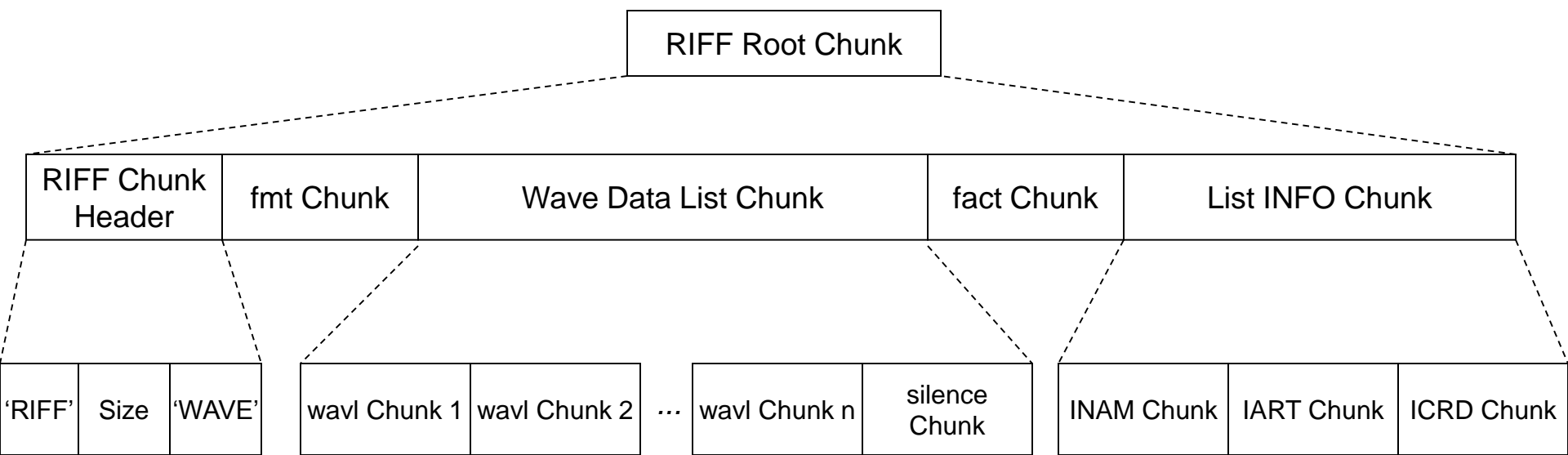












| | | | | |
|--------------|--------------|--------------|--------------|--------------|
| ftyp Atom | moov Atom | wide Atom | mdat Atom | free Atom |
|--------------|--------------|--------------|--------------|--------------|

| | | | | | |
|-----------------|----------------------|-----------------|-----------------|--------------|-------------------|
| profile Atom | movie header Atom | track Atom 1 | track Atom 2 | meta Atom | user data Atom |
|-----------------|----------------------|-----------------|-----------------|--------------|-------------------|

| | | |
|----------------------|---------------|-----------------------------|
| 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 |

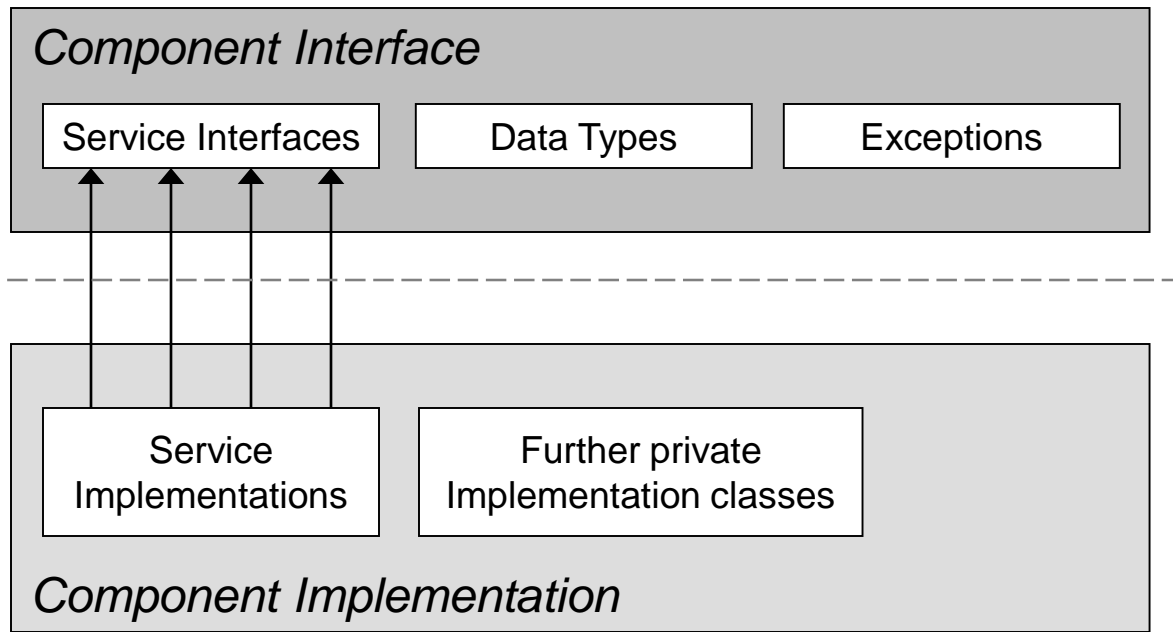
| | |
|--------|------------------|
| ARTIST | Simple Tag 2.1.1 |
|--------|------------------|

| | | |
|-------|-------|-------------|
| 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

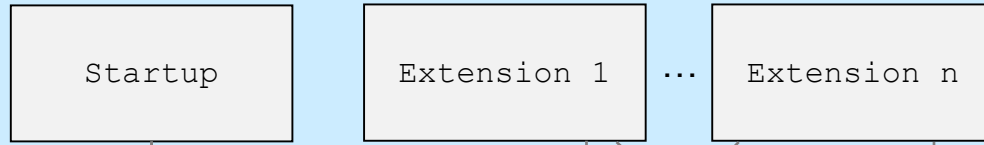
jMeta

Java 9 Virtual Machine (JVM)

Operating System

Physical Storage Medium

High-Level API



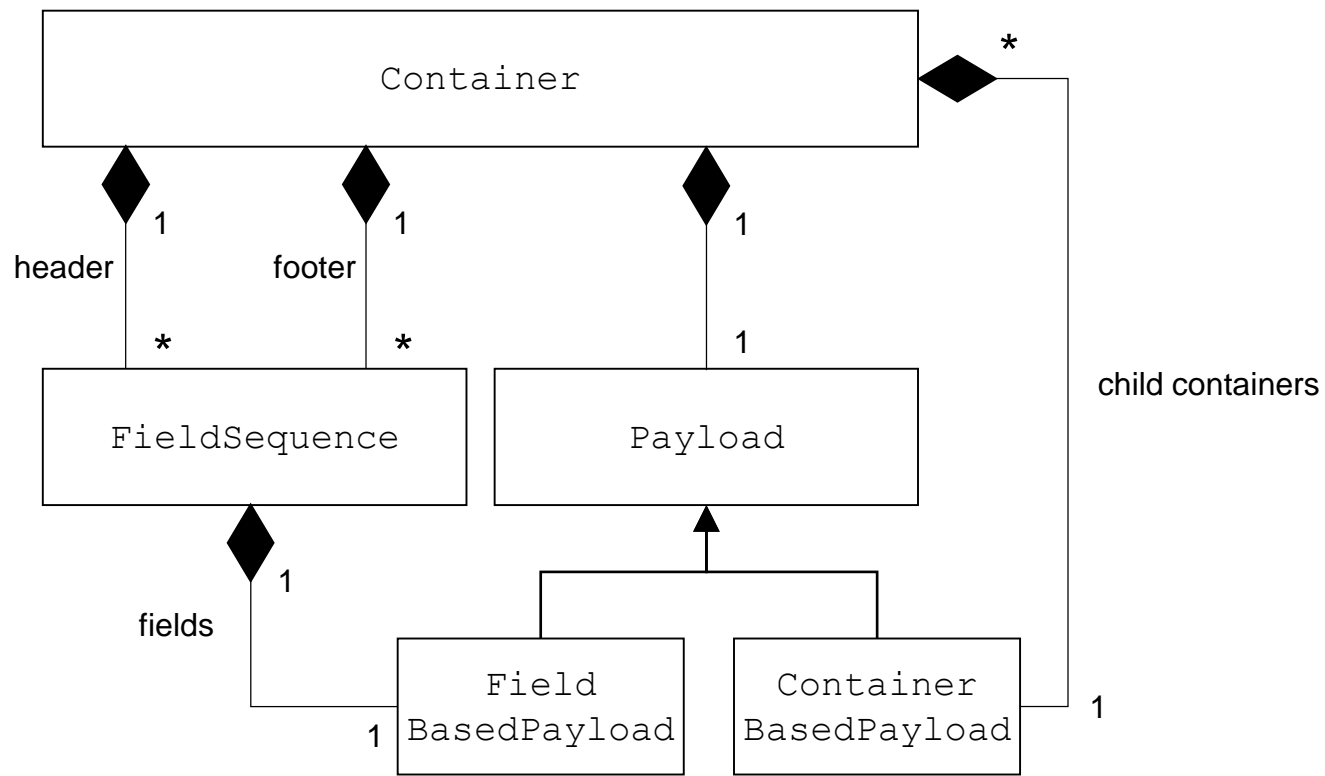
Low-Level API



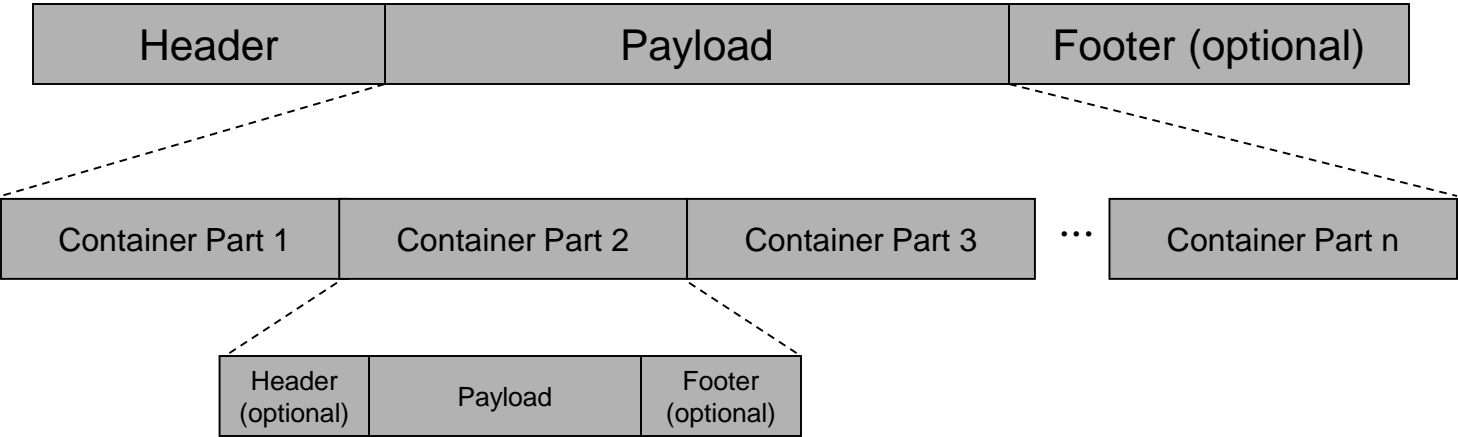
Technical Base



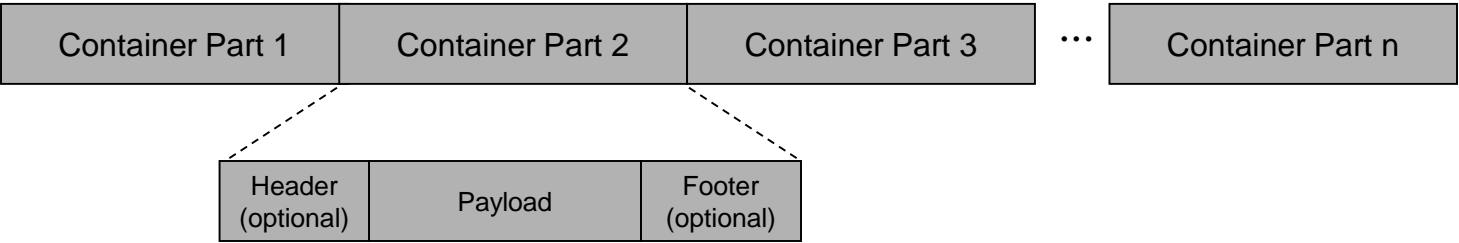




Parent Container

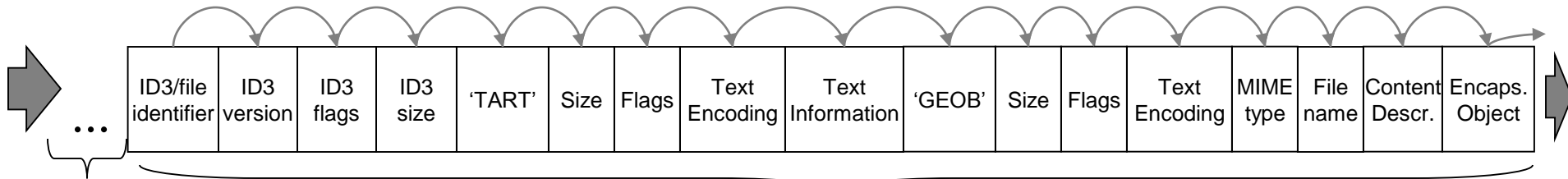
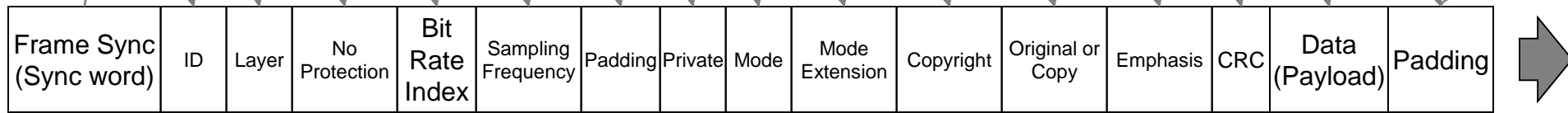


Top-Level Container Parts



MP3 Frame 1

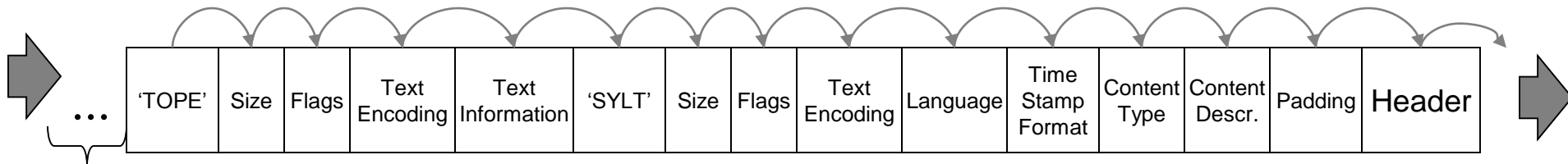
hasNext() + next()



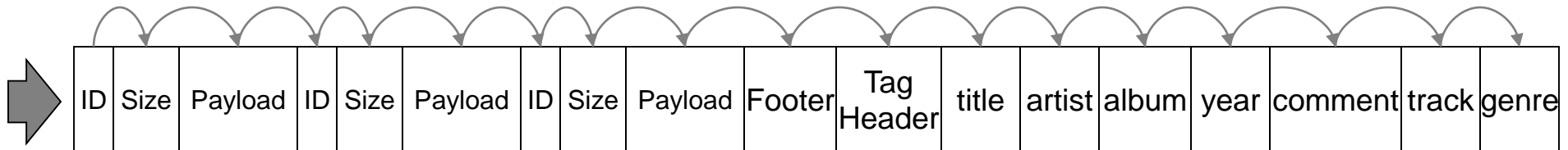
Other MP3 frames
(same block sequence)

ID3v2.3 Tag

Lyrics3v2 Tag
(first part)

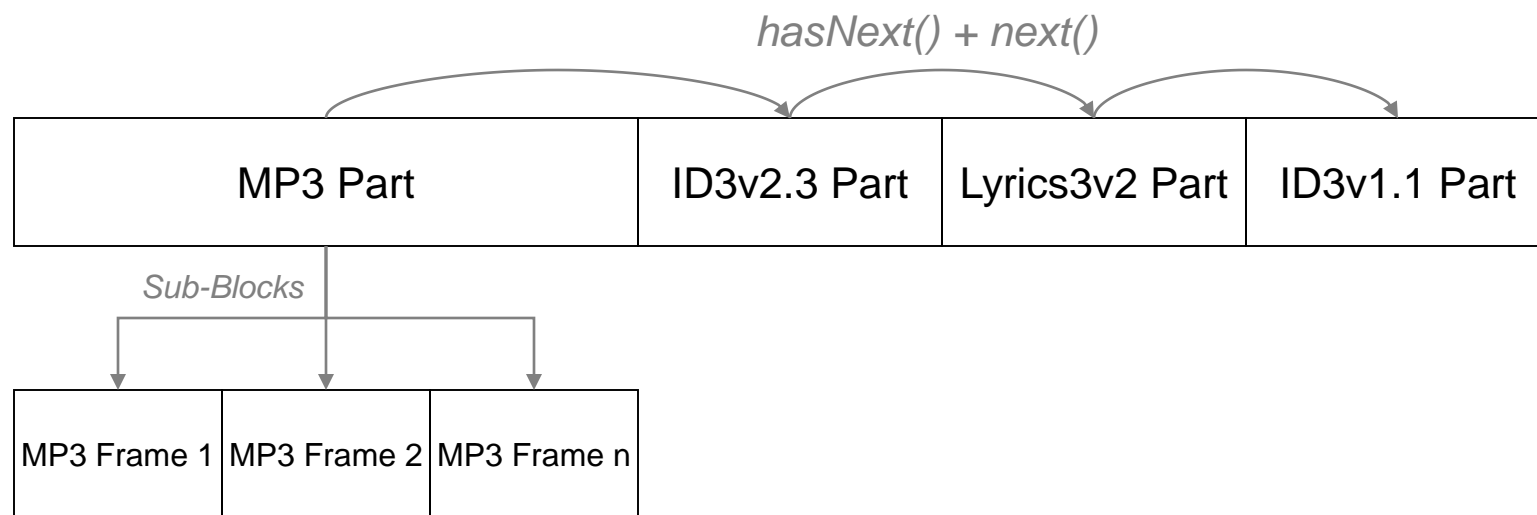


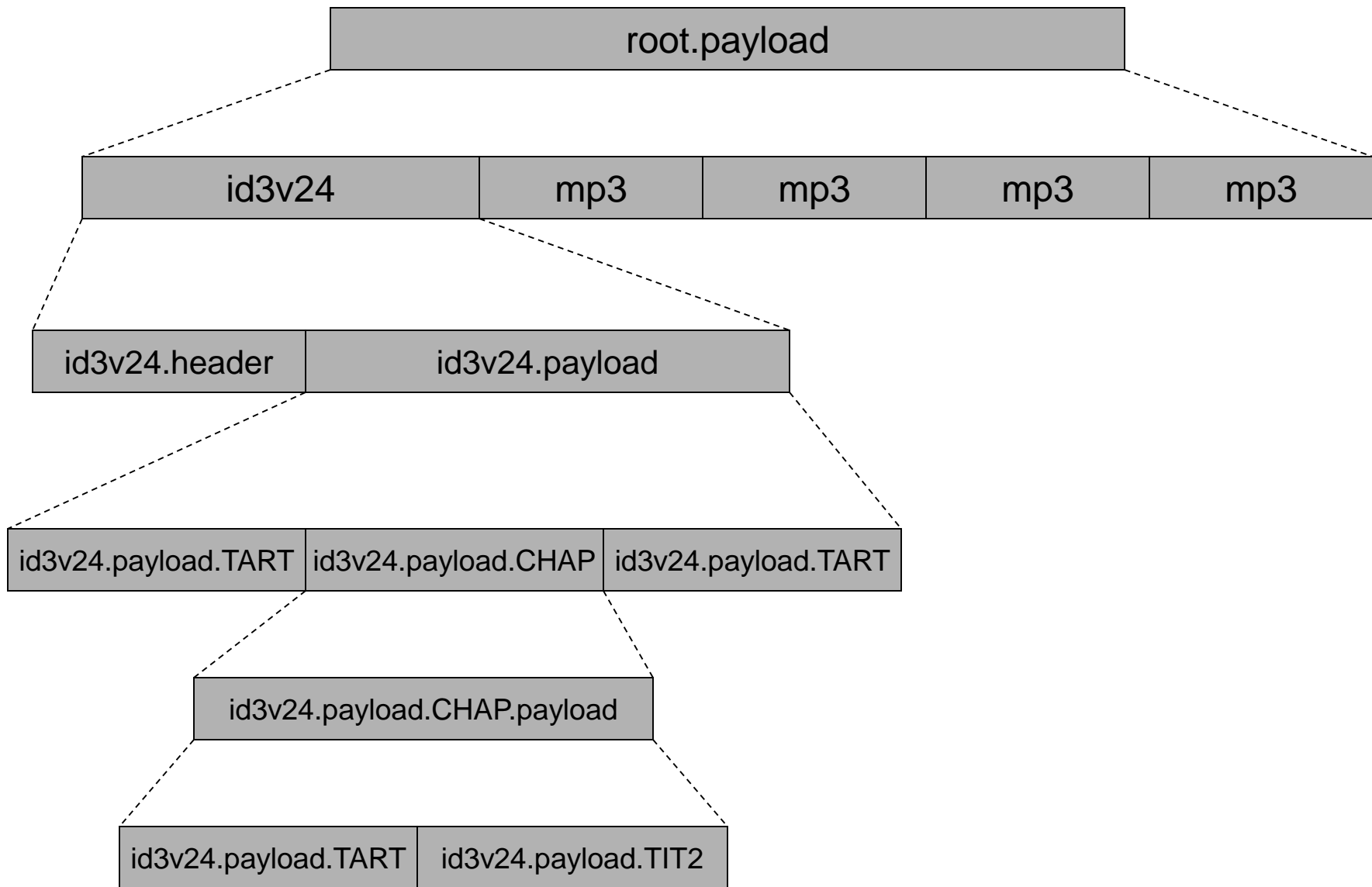
Second GEOB
frame identical

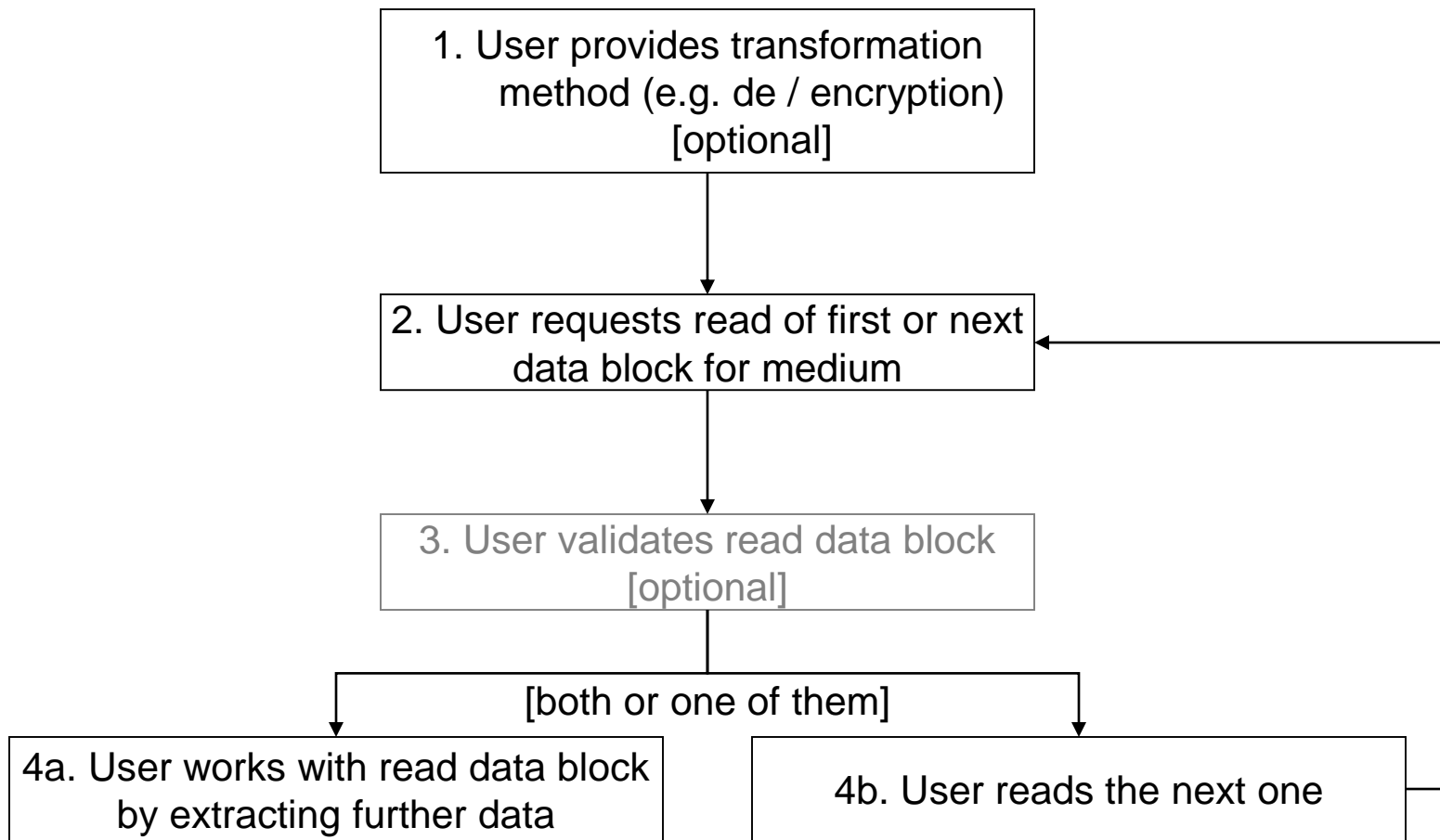


Lyrics3v2 Tag
(second part)

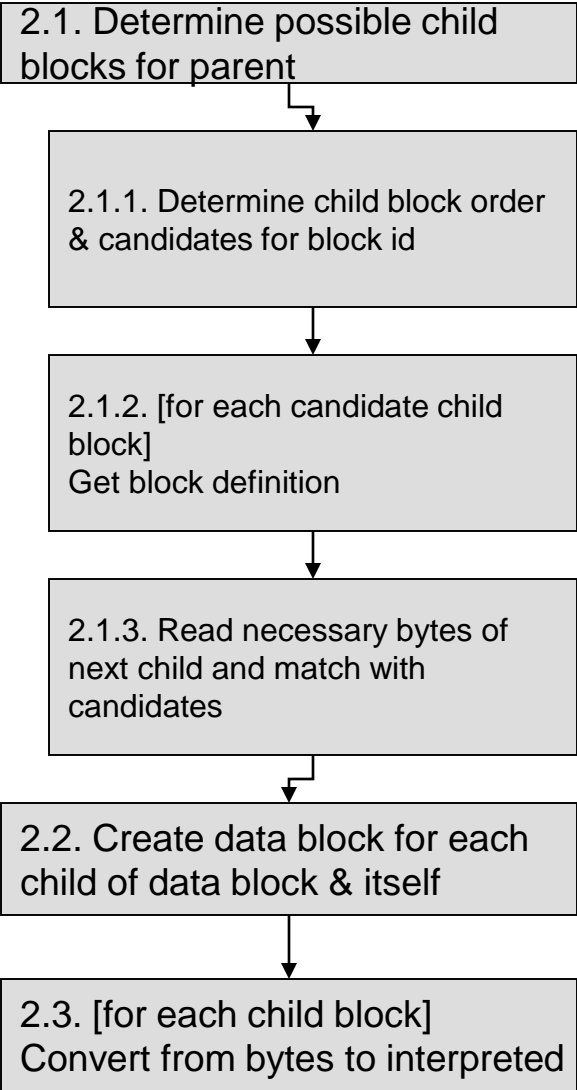
ID3v1.1 Tag





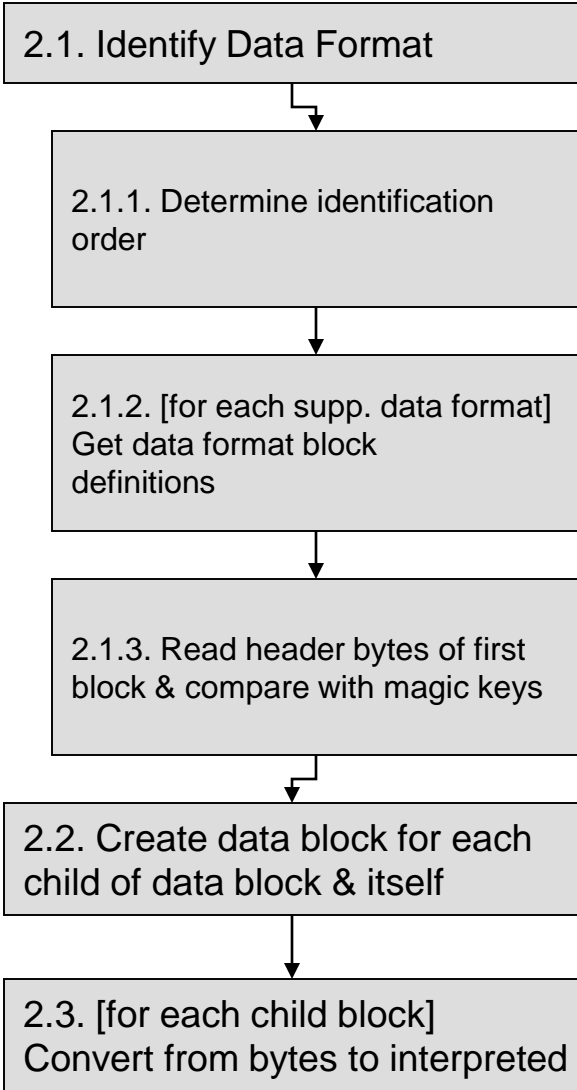


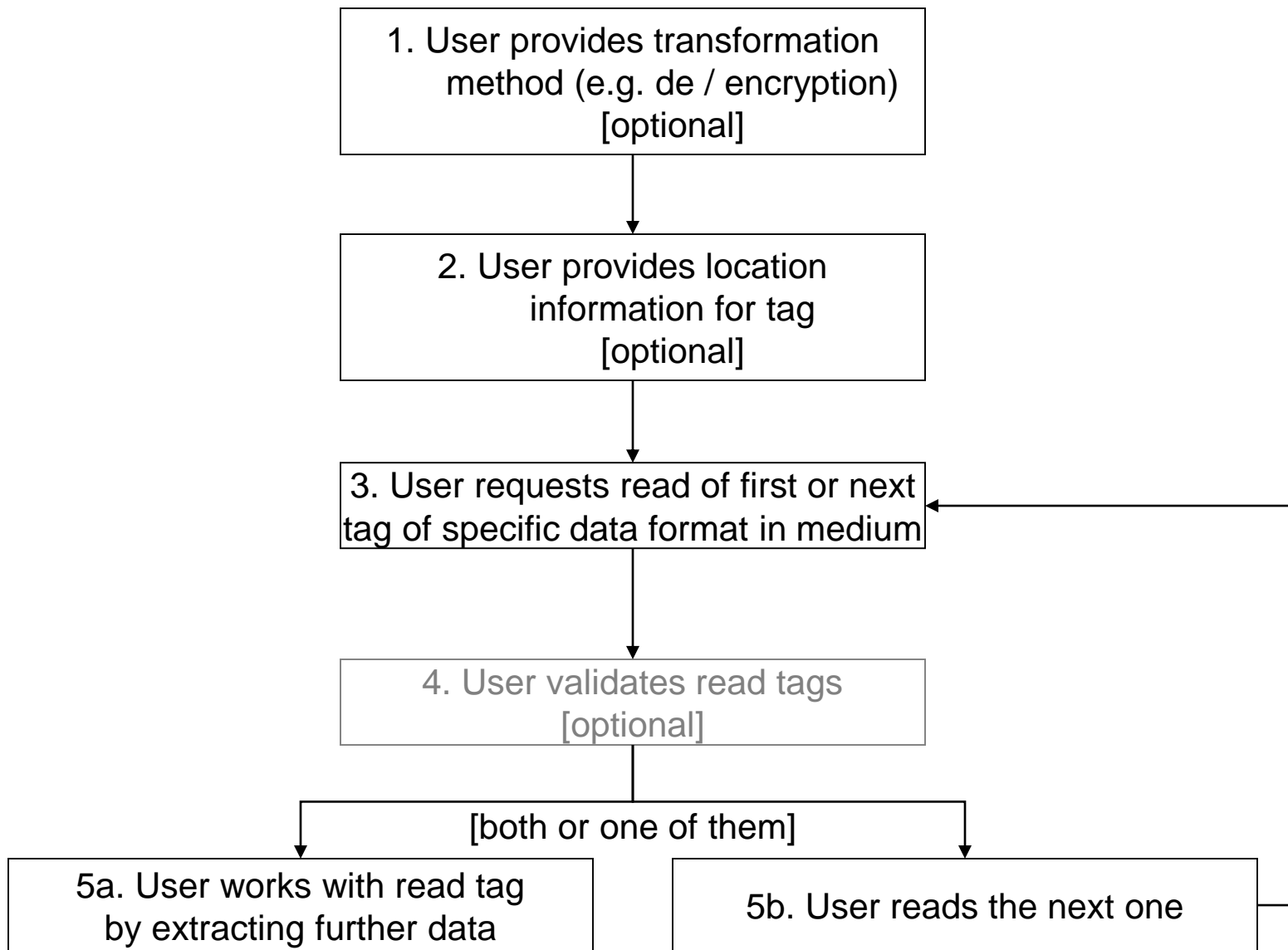
Known parent block / data format



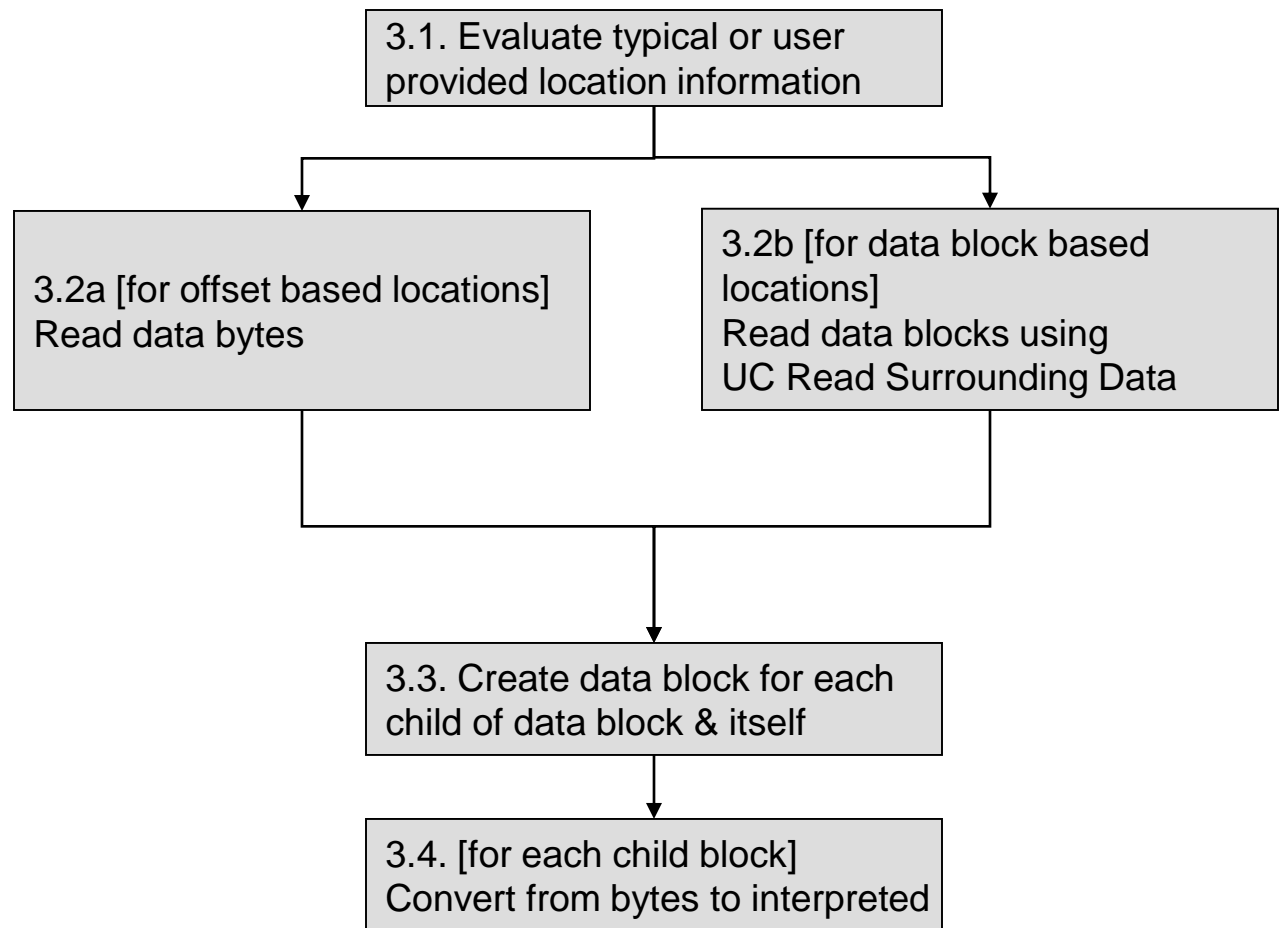
2. User requests
read of first or next
data block for medium

No parent block / data format

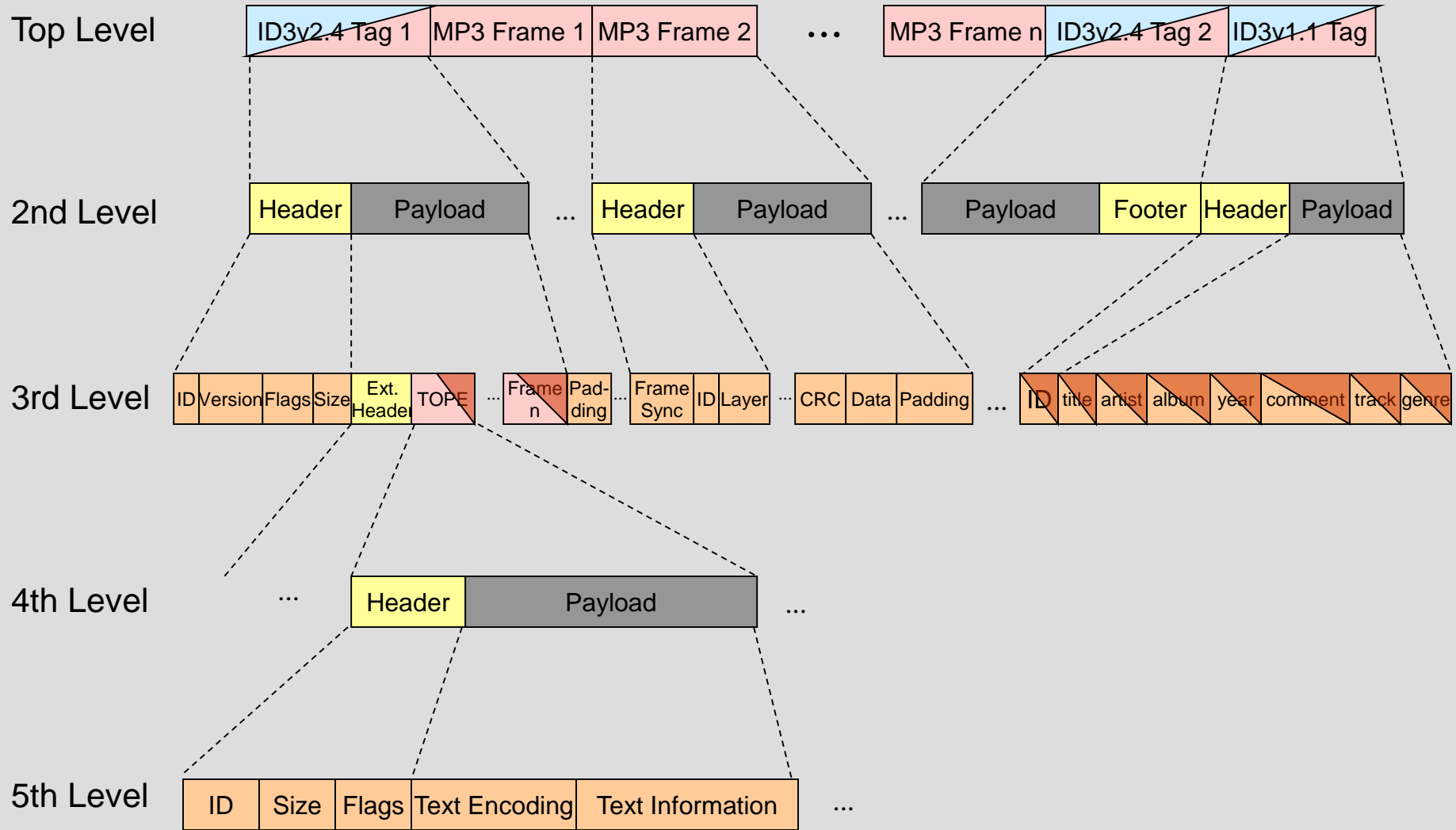




3. User requests read
of first or next tag of
specific data format
in medium

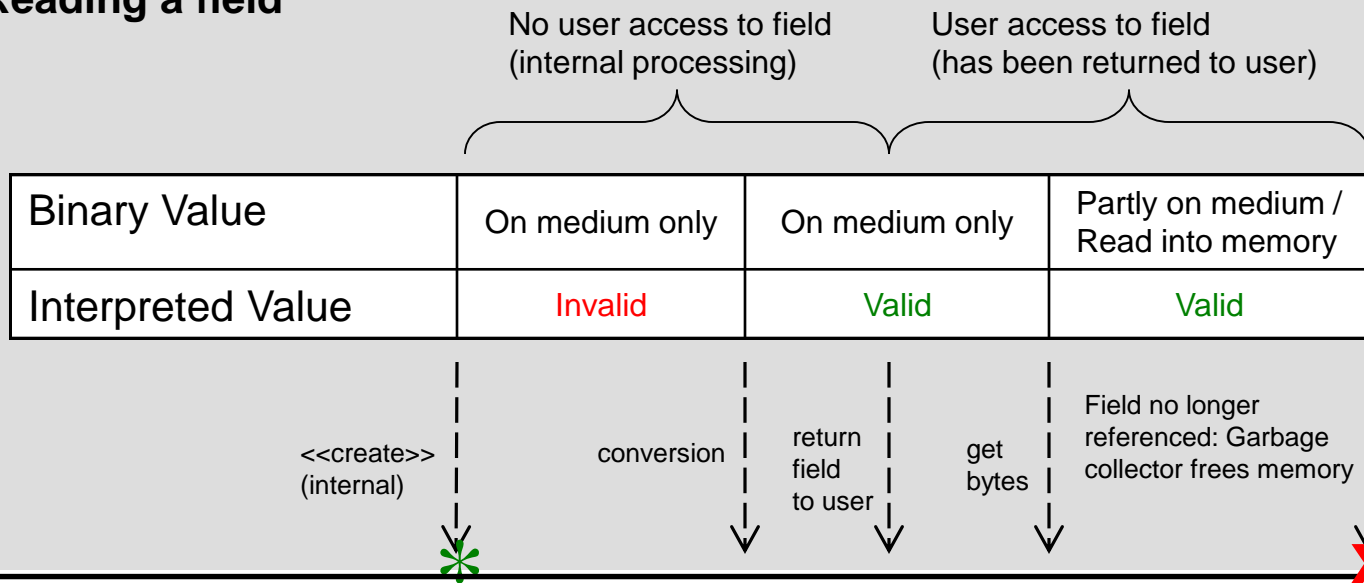


Medium

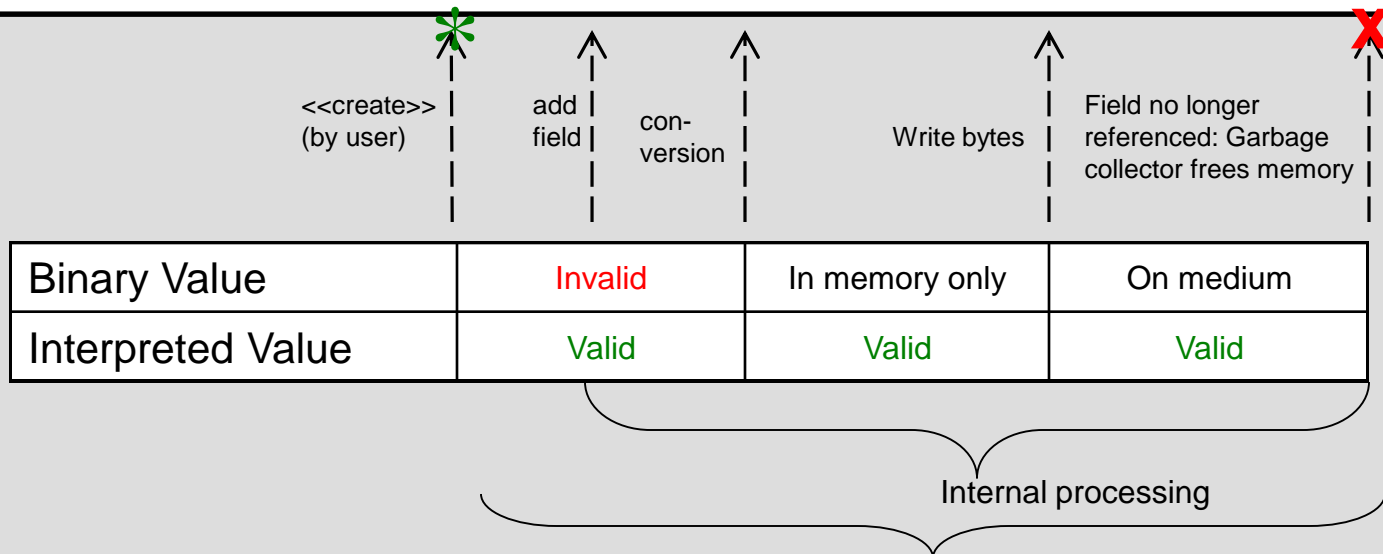


- Container
- Tag (special Container)
- Attribute (special Container)
- Header/Footer
- Payload
- Field

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

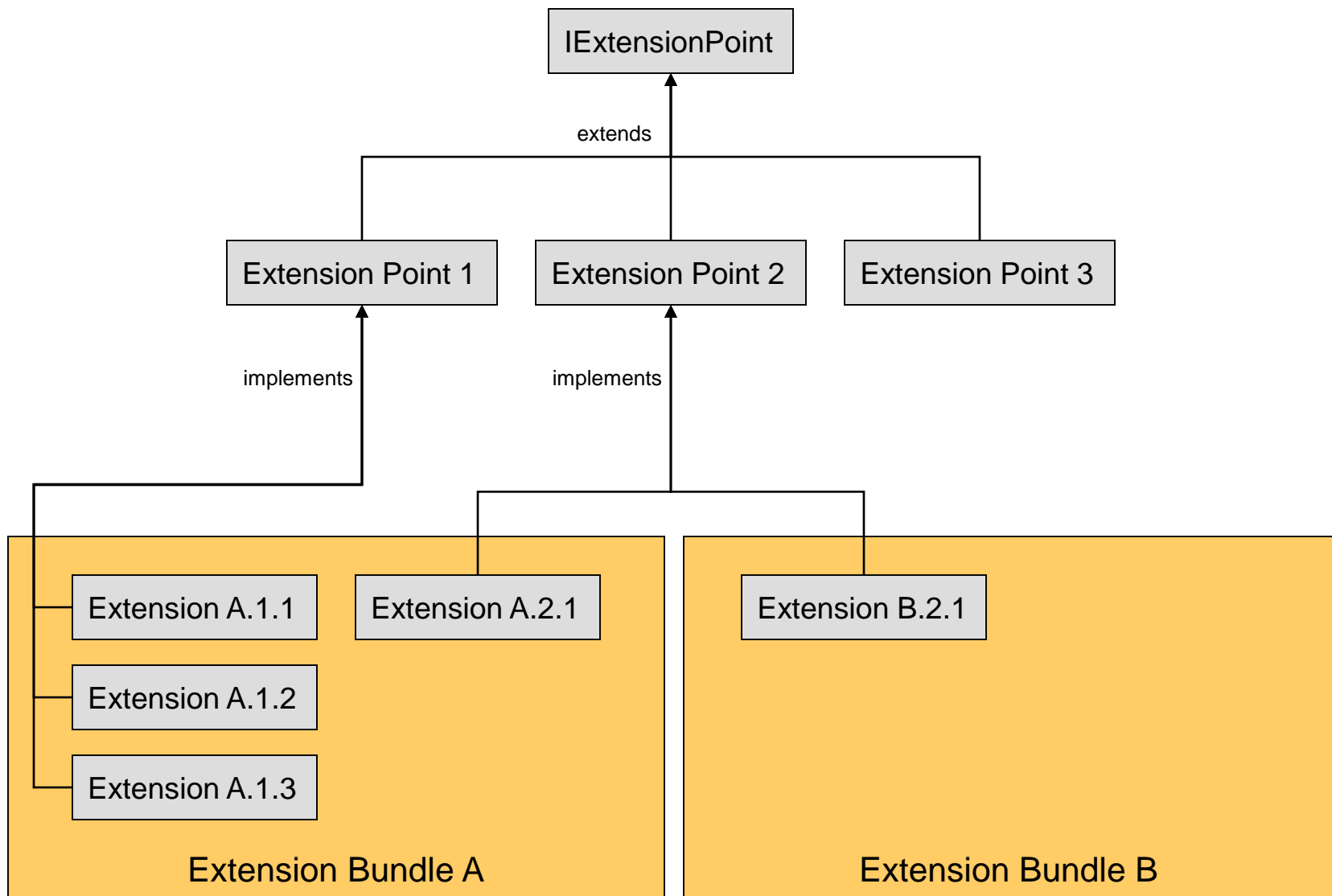
get
bytes

conversion

Field no longer
referenced: Garbage
collector frees memory

Time

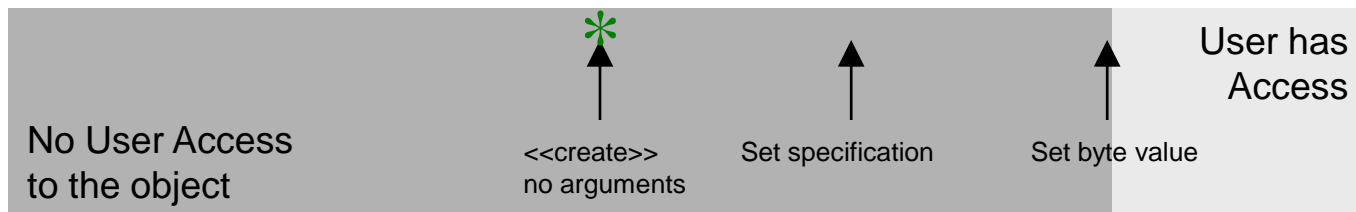




Value States

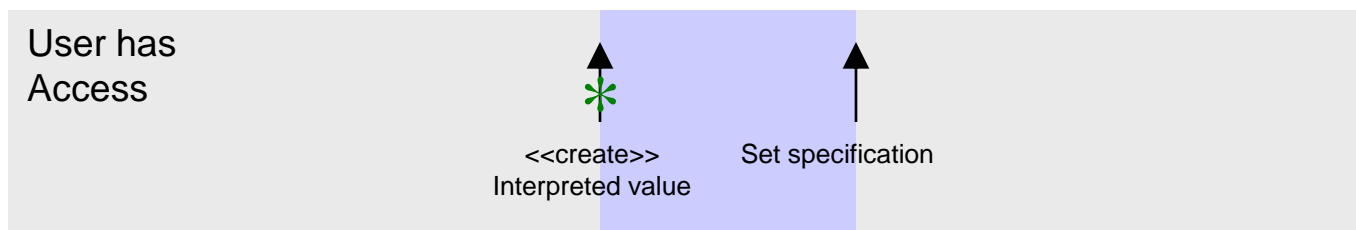
Read

| | | | |
|----------------------------|---------|---------|-------|
| Byte Representation | Invalid | Invalid | Valid |
| Interpreted Representation | Invalid | Invalid | Valid |
| Converter | Invalid | Valid | Valid |

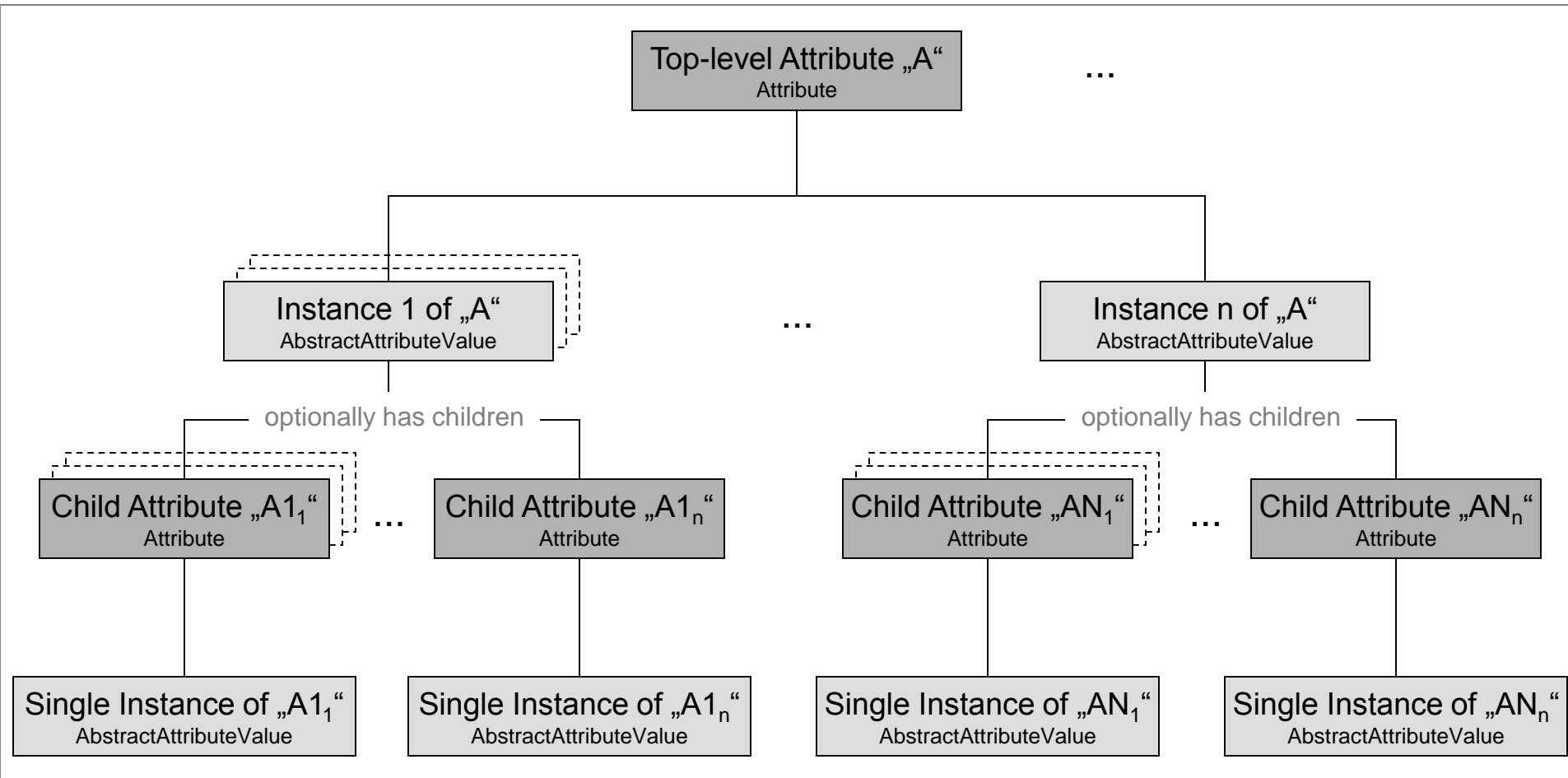


Write

| | | | |
|----------------------------|---------|-------|-------|
| Byte Representation | Invalid | Valid | Valid |
| Interpreted Representation | Valid | Valid | Valid |
| Converter | Invalid | Valid | Valid |

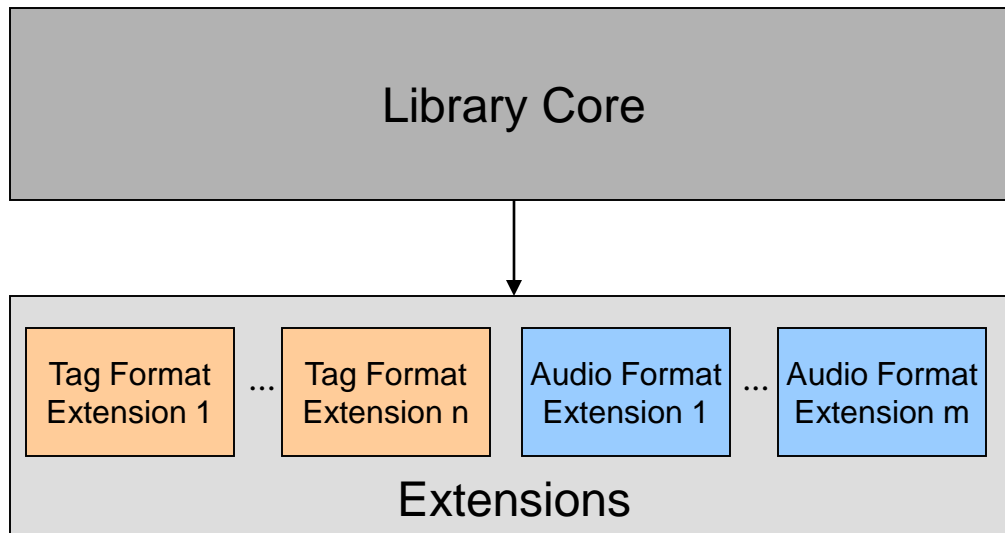


Attribute Hierarchy

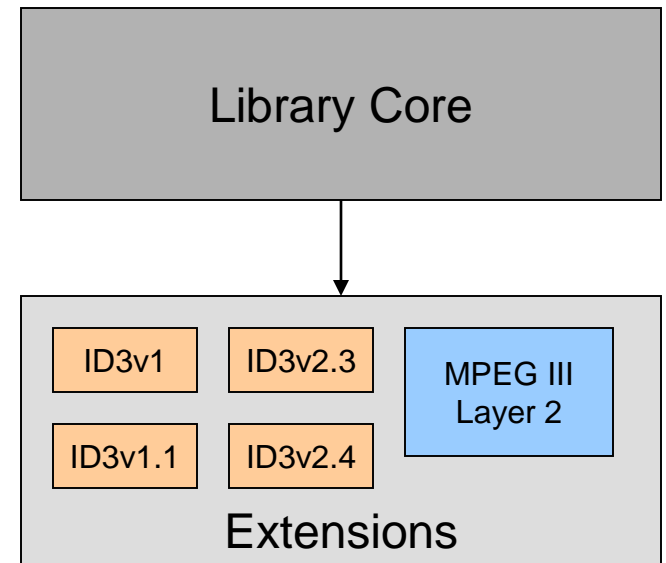


Library Structure

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

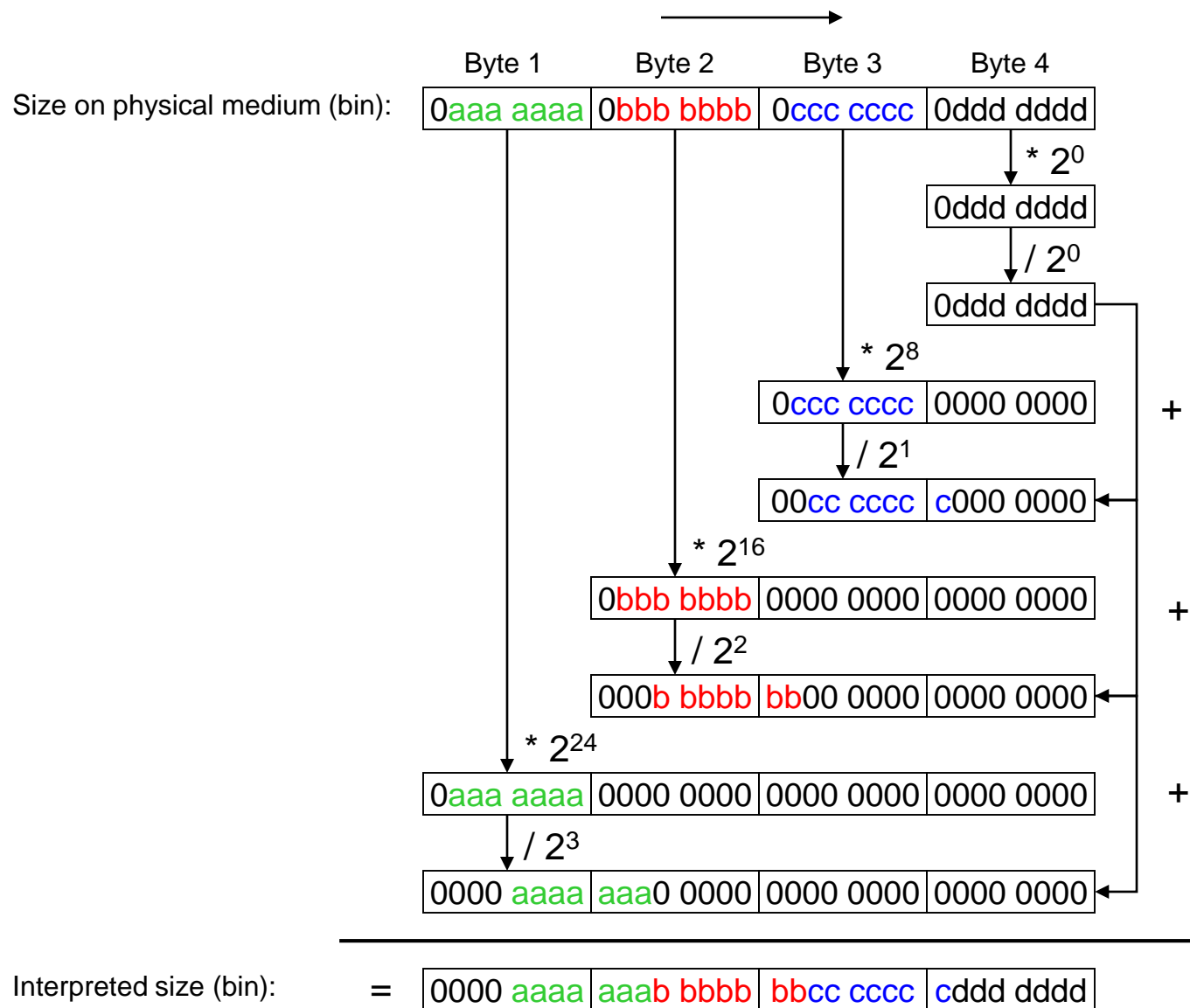
Attribute F

...

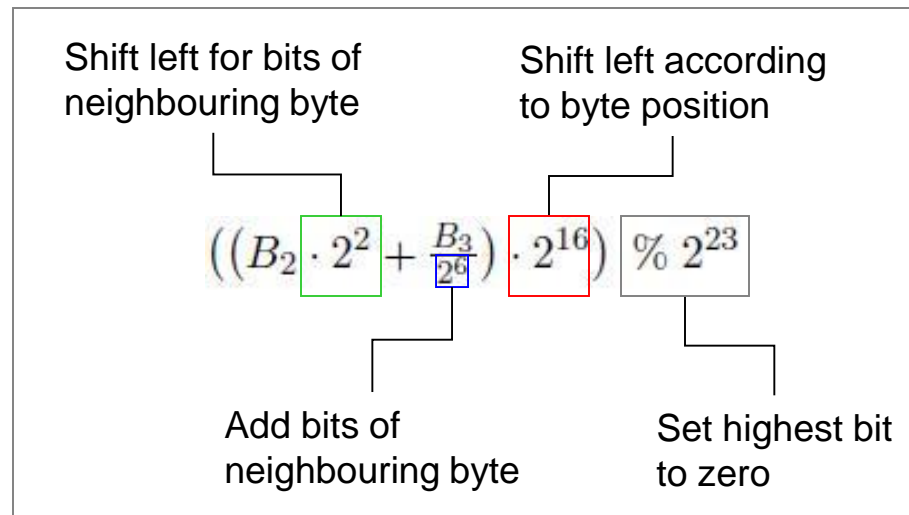
Attribute X

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

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

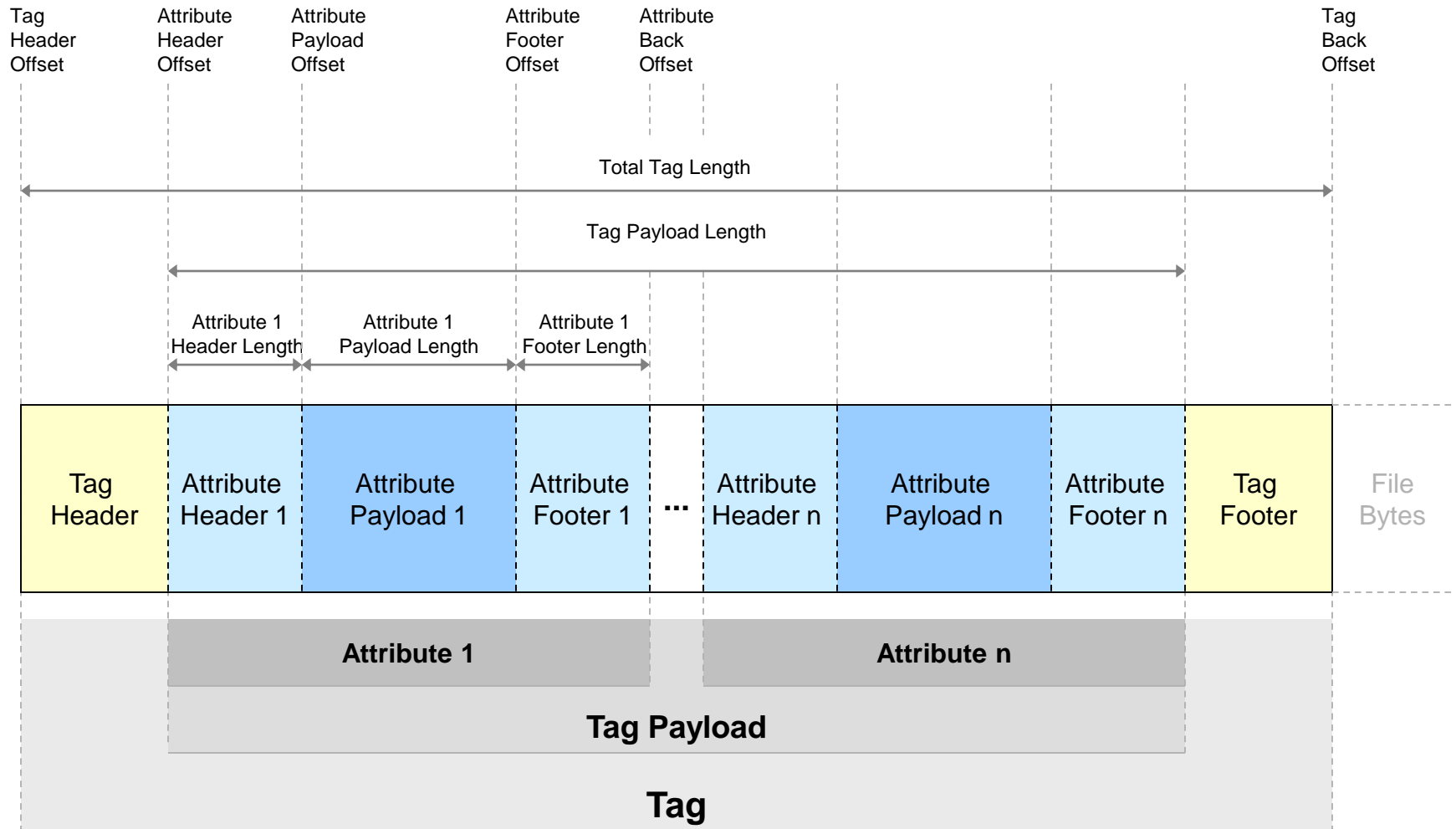
abc0 0000

Byte length = 1

Byte order = Big Endian

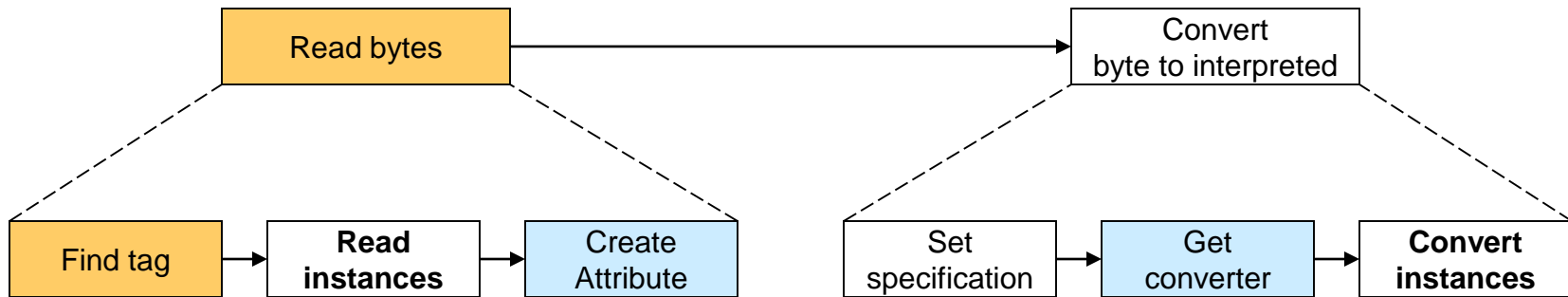
| Flag | Bit Address |
|----------------------|-------------|
| a = Compression | (1, 1) |
| b = Footer available | (1, 2) |
| c = Experimental | (1, 3) |

Tag Structure



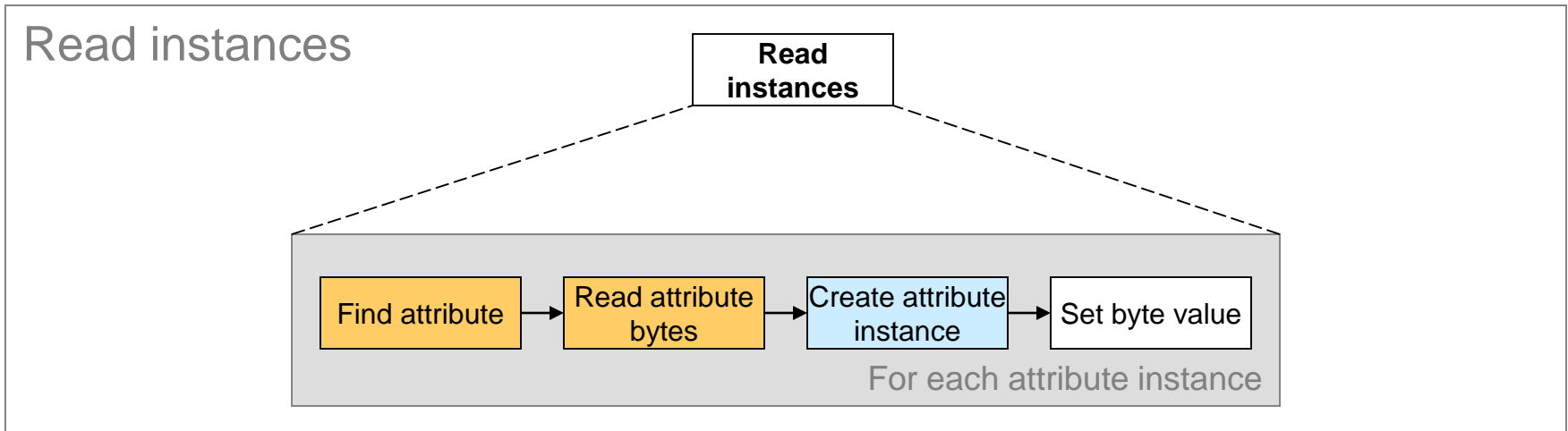
Read attribute





Read attribute



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

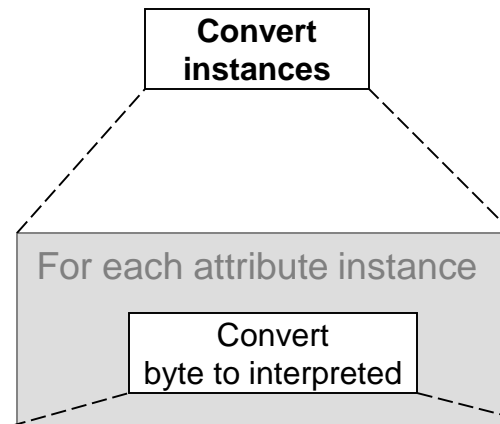
Read instances



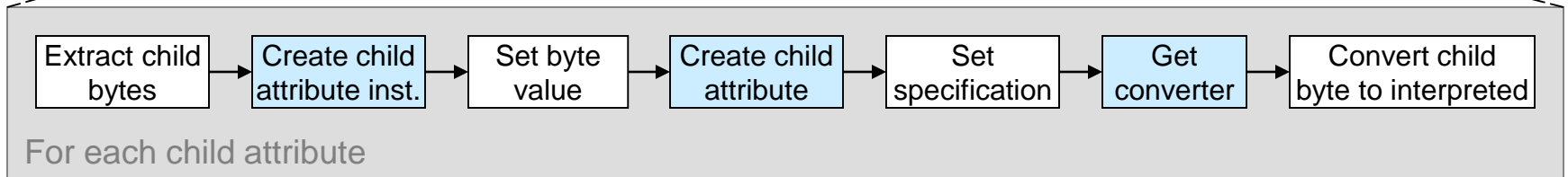
-  : Object creation / retrieval
-  : Access to physical medium
-  : Other action
-  : **Action with sub-steps detailed on further figure**





Convert instances (Reading)

Convert instances



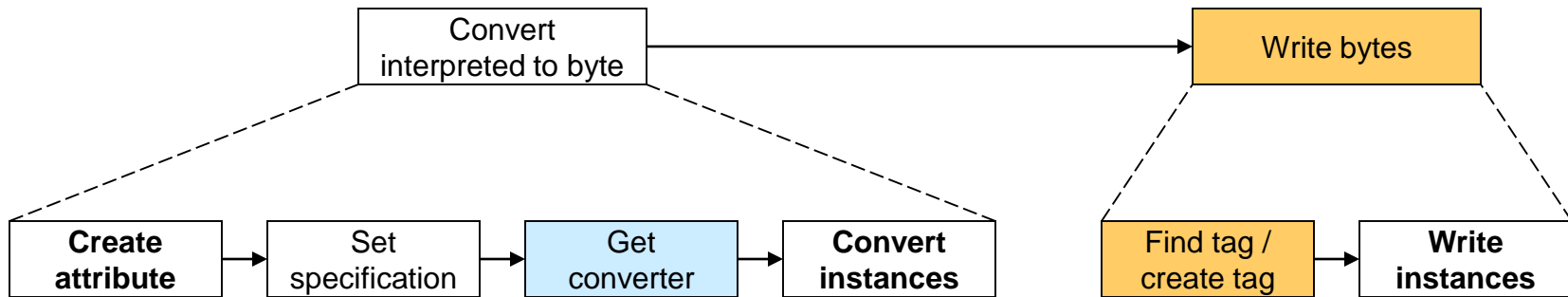
<For attributes with children only>







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

Write attribute

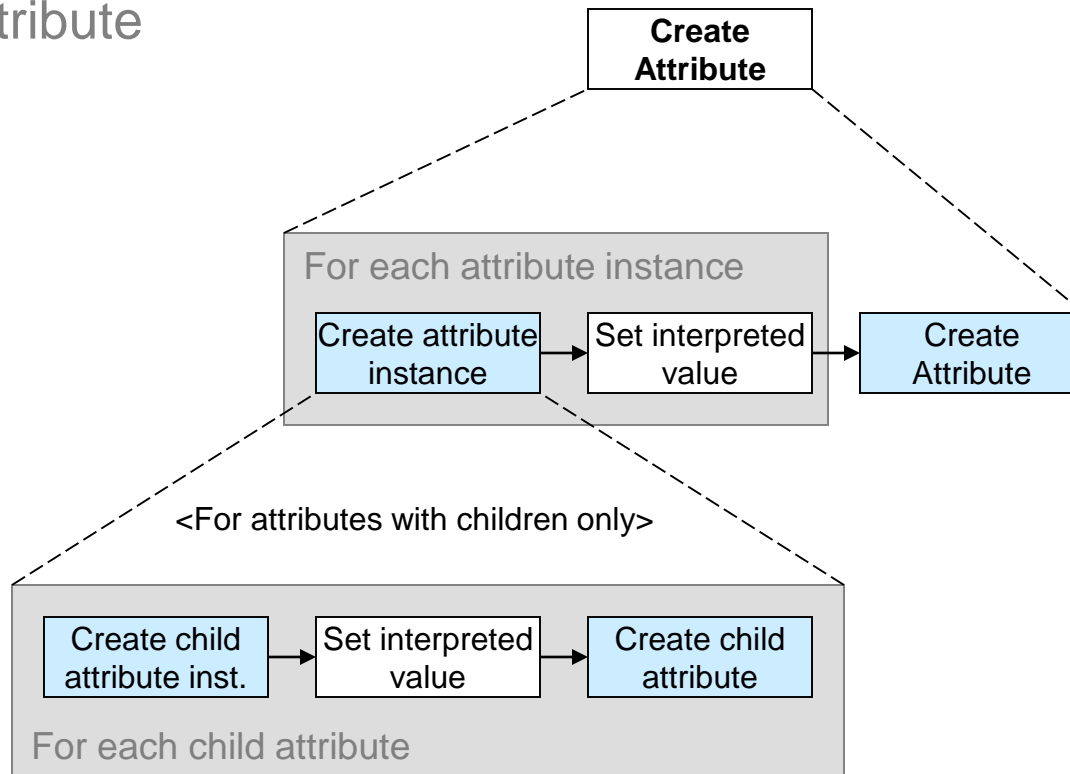
Write attribute



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

Create attribute (Writing)

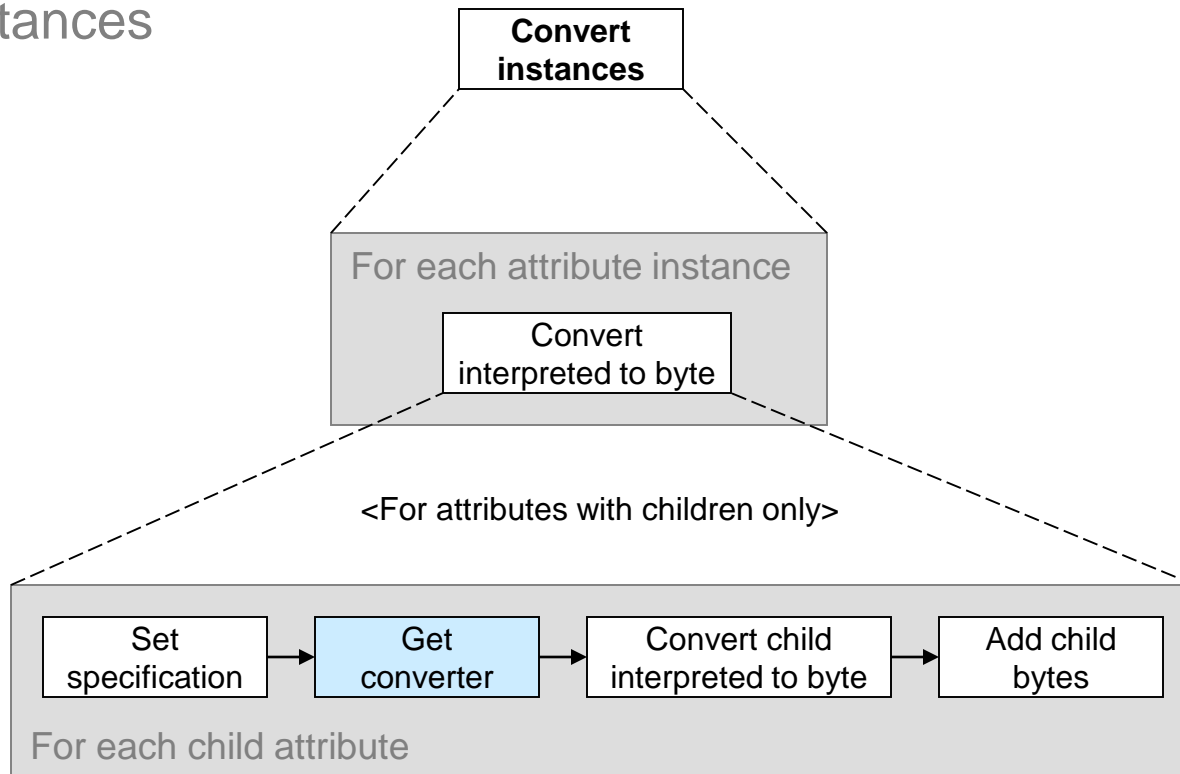
Create attribute







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

Convert instances (Writing)

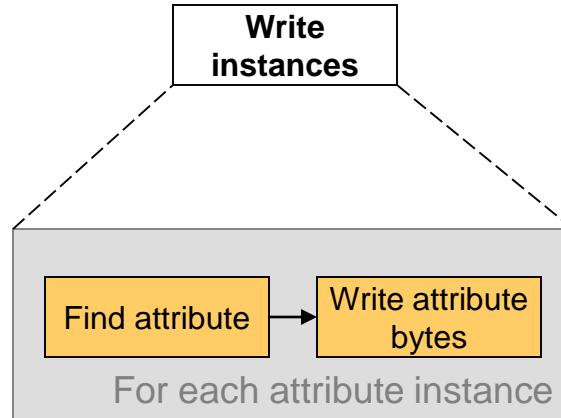
Convert instances







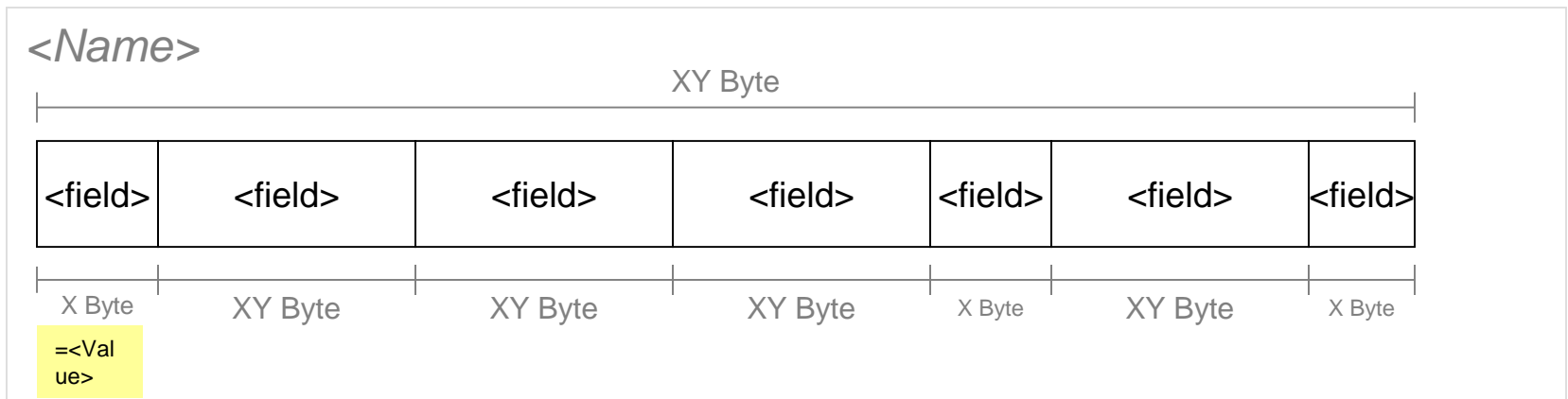
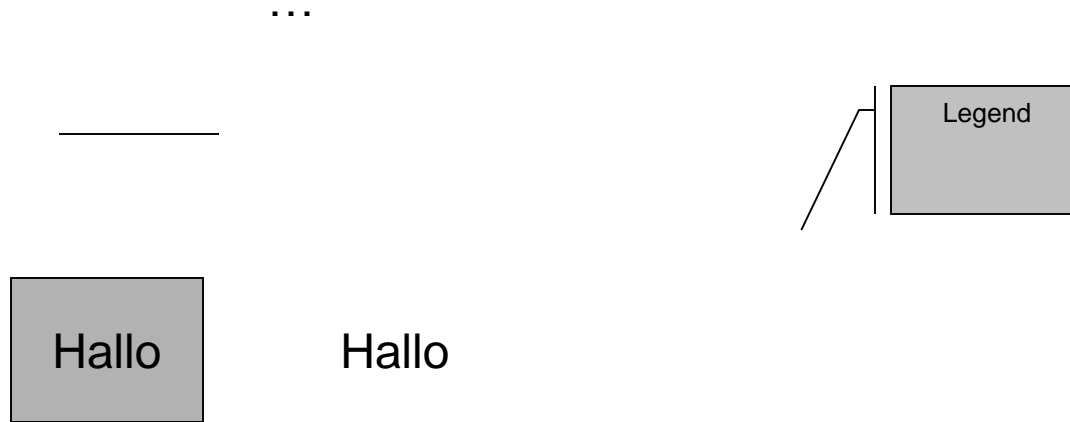
-  : Object creation / retrieval
-  : Access to physical medium
-  : Other action
-  : Action with sub-steps detailed on further figure

Write instances

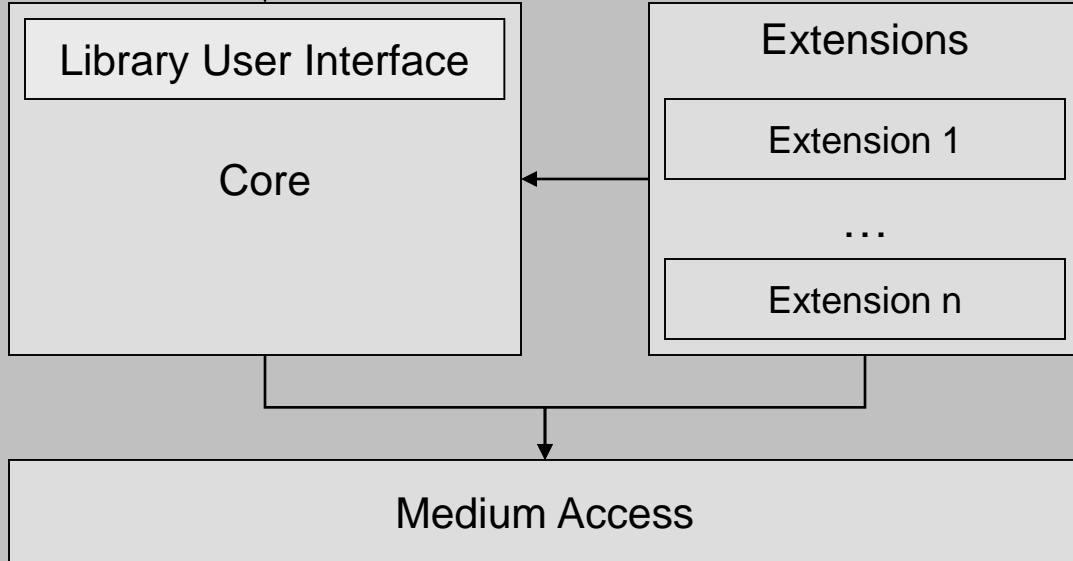
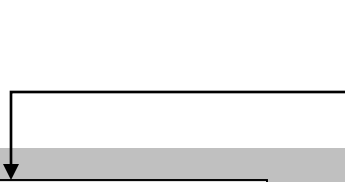
Write instances



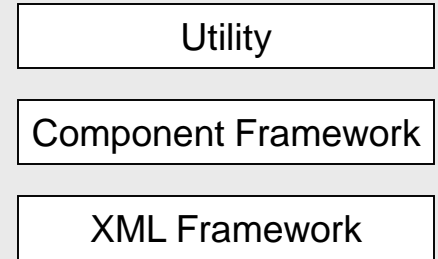
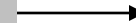
-  : Object creation / retrieval
-  : Access to physical medium
-  : Other action
-  : **Action with sub-steps detailed on further figure**



Application Layer (User)



jMeta



Cross-functional

ALT

Template



Hallo