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Gst-Analytics

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Collabora

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Presentation Outline

Analytics pipeline

Why would we use GStreamer for analytics pipeline

New and improved tools for analytics pipeline

Tensor Negotiation and Auto-plugging analytics elements

What is an analytics pipeline

An analytics pipeline is process that transform data into insights.

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Analytics pipeline examples

- Identifying unhealthy crops in a vertical farm.

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Analytics pipeline examples

- Locating a person in an open area.

What is an analytics pipeline

An analytics pipeline is process that transform data into insights.
Analytics pipeline examples

- Identifying unhealthy strawberry in a vertical farm.
- Locating a person in a large area.
- ML-based video compression.
- ML-based Dubbing
- Virtual privacy wall.
- ...

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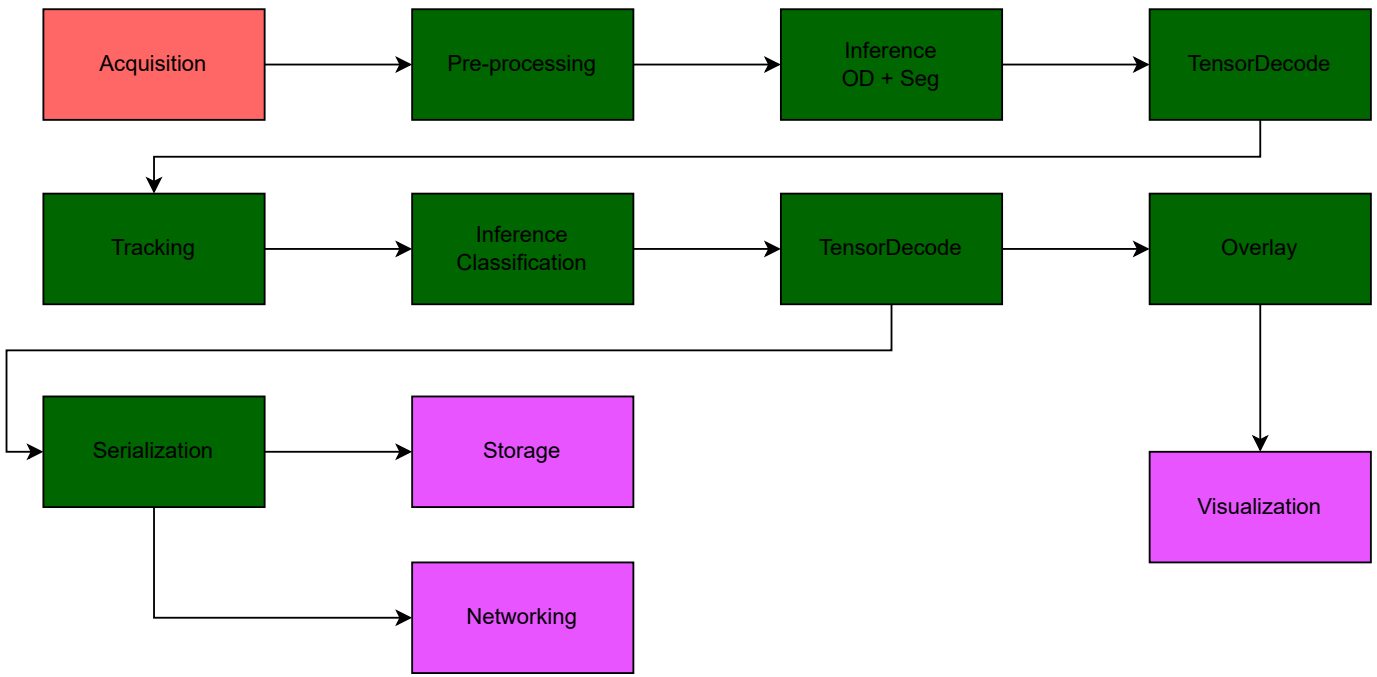
What is an analytics pipeline

Complex pipelines with multiple components interacting to archive the end goal.



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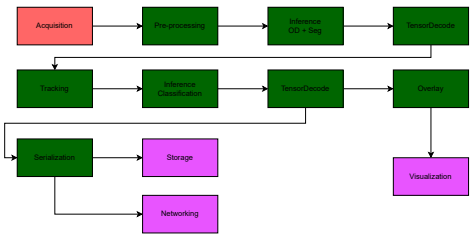
What is an analytics pipeline



Other analytics pipeline components

- Synthesize media from analysis results (Inference)

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Why would we use GStreamer for analytics pipeline

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- A growing analytics support

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- It has over 800 elements ready to use.
- Very efficient
- It has plenty of accelerated elements
- It excel at networking
- A growing analytics support
- It's been around for a long time and still thriving

Why would we use GStreamer for analytics pipeline

But most importantly is not just a bag of tools you get to bring home.

Why would we use GStreamer for analytics pipeline

It is the entire wheelhouse, tool included.

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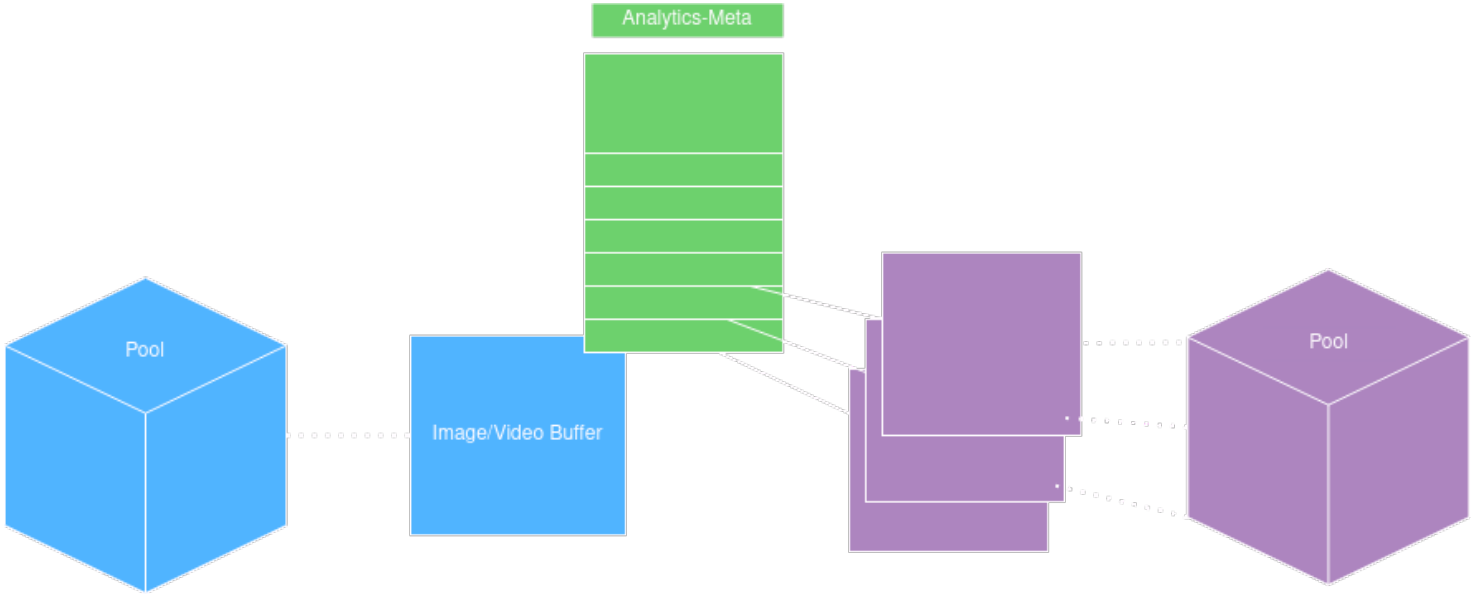
Analytics-meta



What's new in analytics-meta

- Analytics-Meta Manage Lifeline of other gobject

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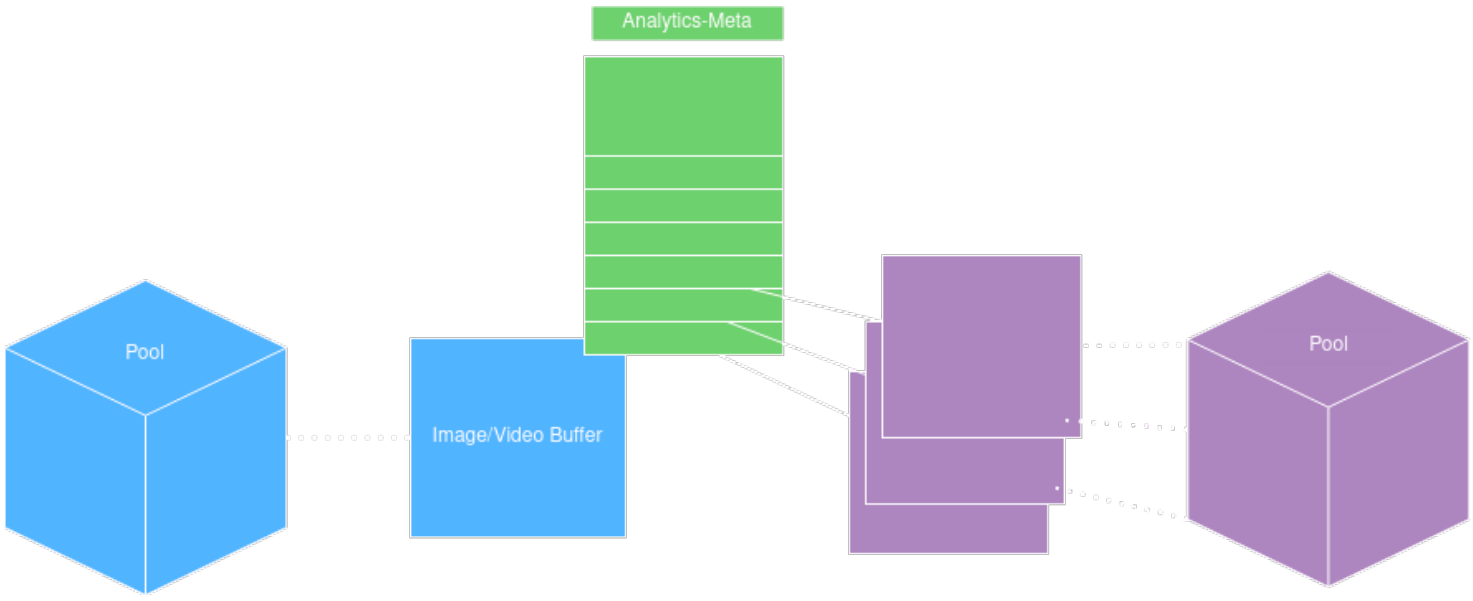
Analytics-meta



What's new in analytics-meta

- Analytics-Meta Manage Lifeline of other gobject
- Segmentation Analytics-Meta

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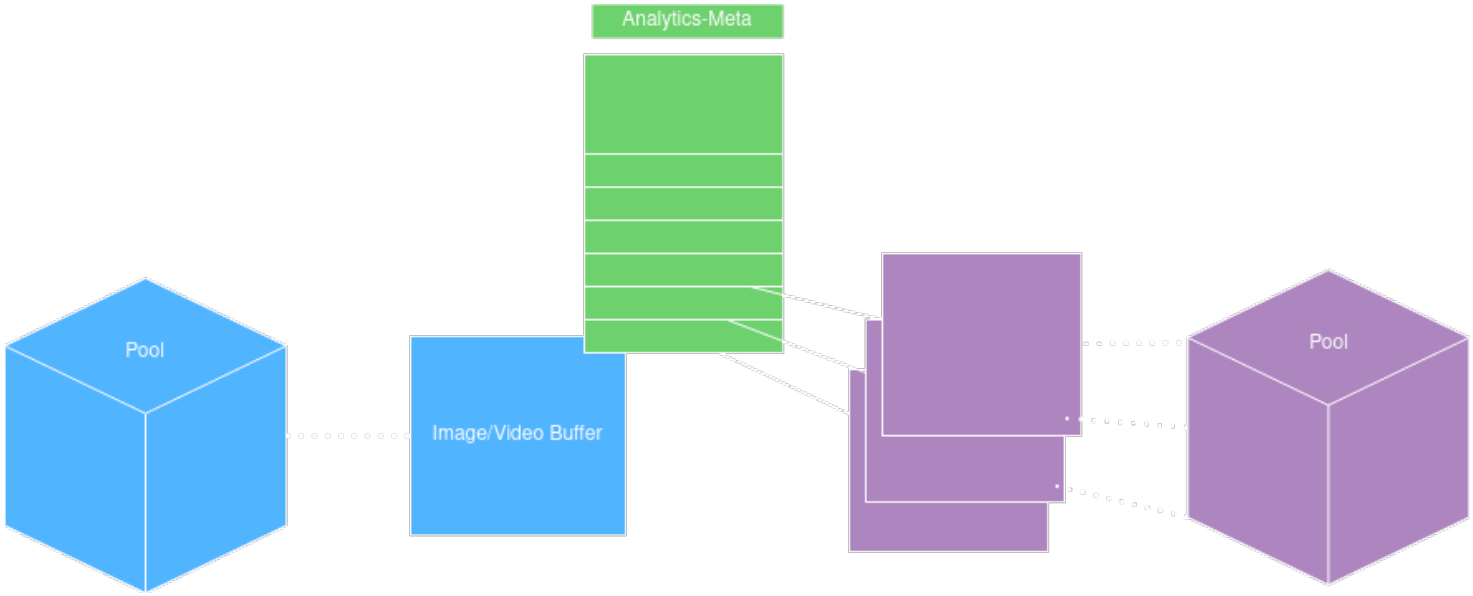
Analytics-meta



What's new in analytics-meta

- Analytics-Meta Manage Lifeline of other gobject
- Segmentation Analytics-Meta
- Tensor Analytics-Meta

New analytics elements

- ObjectDetectionOverlay

New analytics elements

- ObjectDetectionOverlay
- Fast-SAM/YoloV8-Seg tensor decoder

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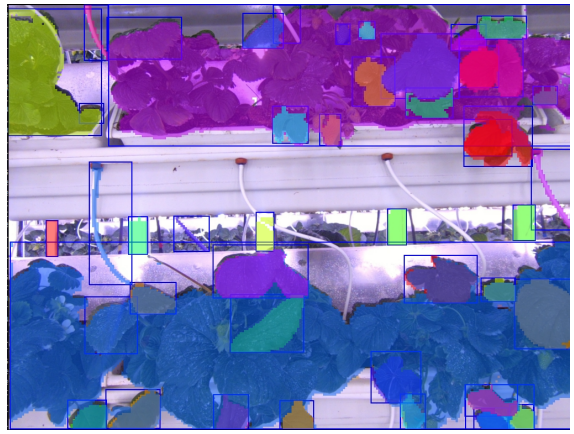
New analytics elements



- ObjectDetectionOverlay
- Fast-SAM/YoloV8-Seg tensor decoder
- Segmentation Overlay

New analytics elements

- ObjectDetectionOverlay
- Fast-SAM/YoloV8-Seg tensor decoder
- Segmentation-Overlay
- ClassificationTensorDecoder

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New analytics elements

- ObjectDetectionOverlay
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- PyTorchInference
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- TensorDecodeBin (Prototype)

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Improved analytics element

OnnxInference

- Sinkpad capabilities based on model

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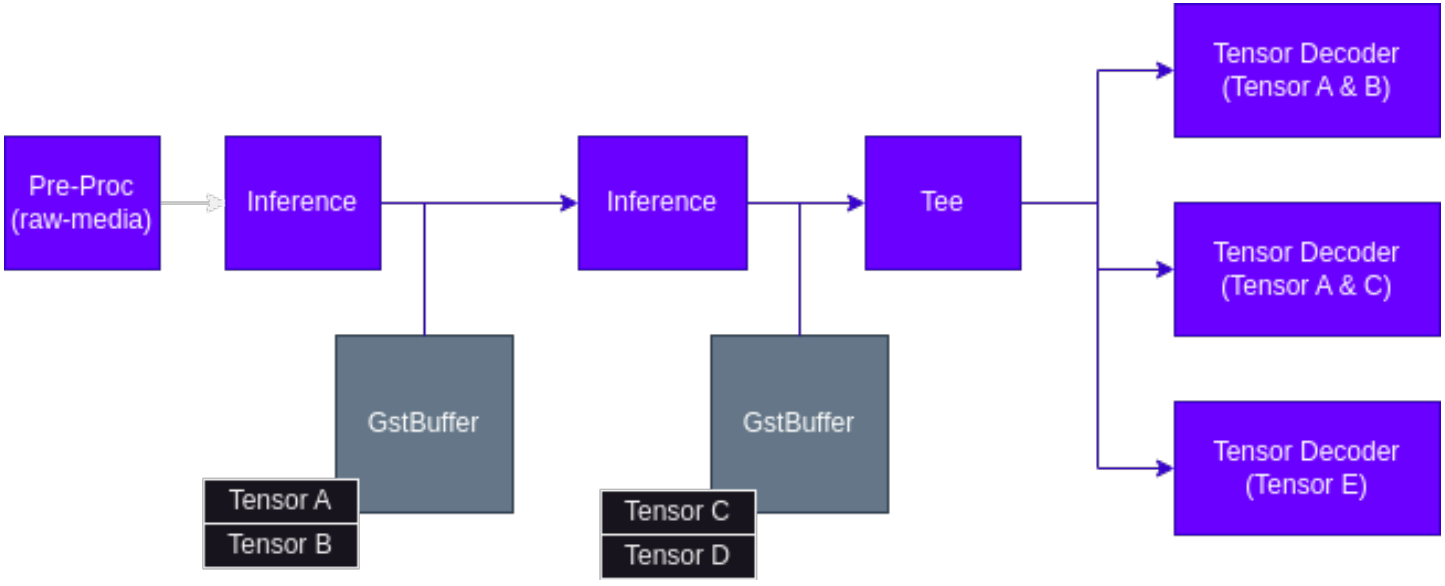
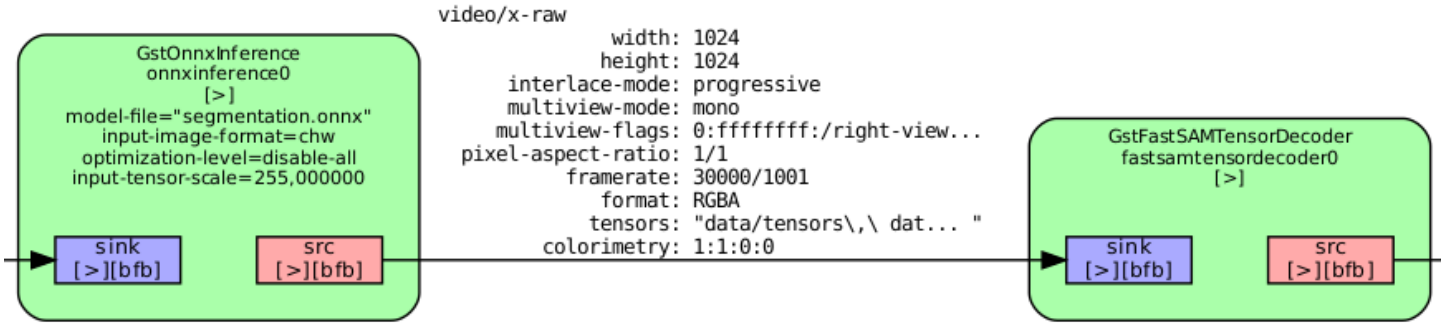
Tensors Constrain During Capabilities Negotiation





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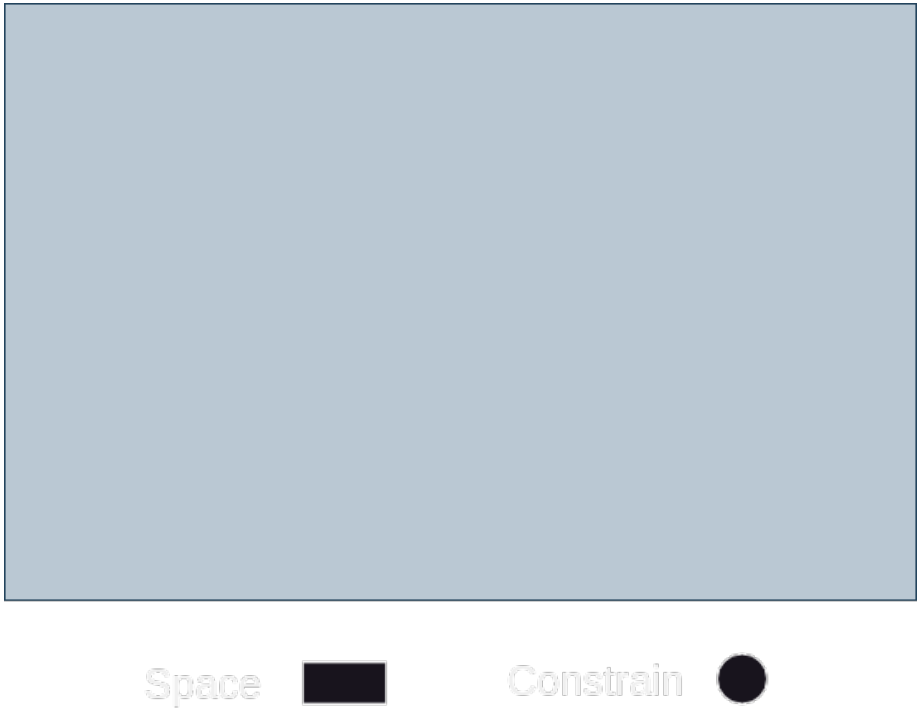
Quick Caps Review

With this capability which media can be accepted?

1 ” ”



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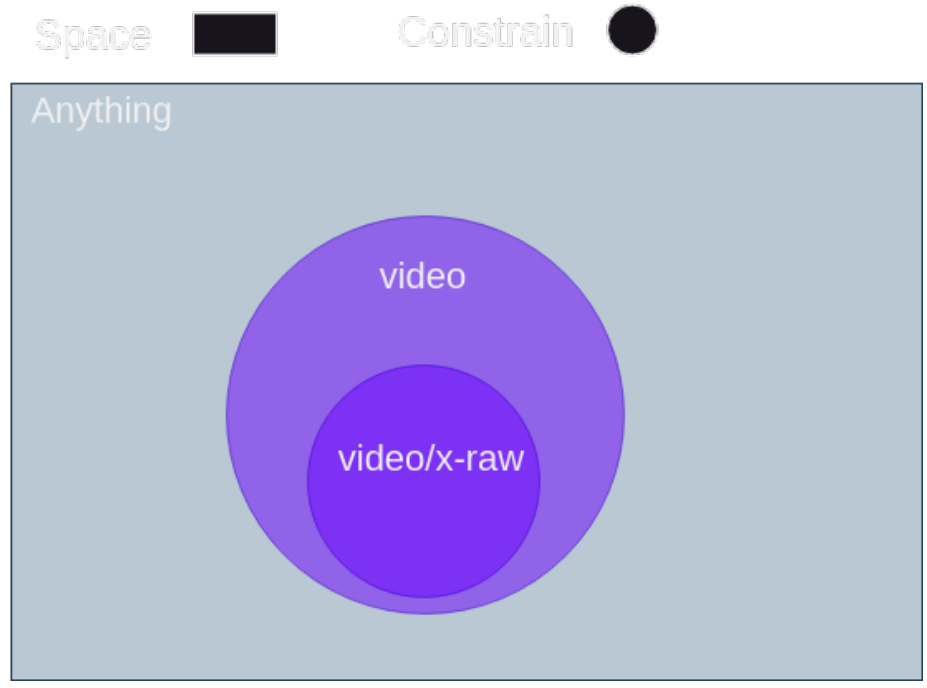
Quick Caps Review

```
1   "video/x-raw"
```



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Quick Caps Review

```
1  A = "video/x-raw"
2          width=[16, 1920]
3
4  B = "video/x-raw"
5          height=[16, 1080]
6
7  C = A (intersect) B
8
9  C = "video/x-raw"
10         height=[16, 1080]
11         width=[16, 1920]
```

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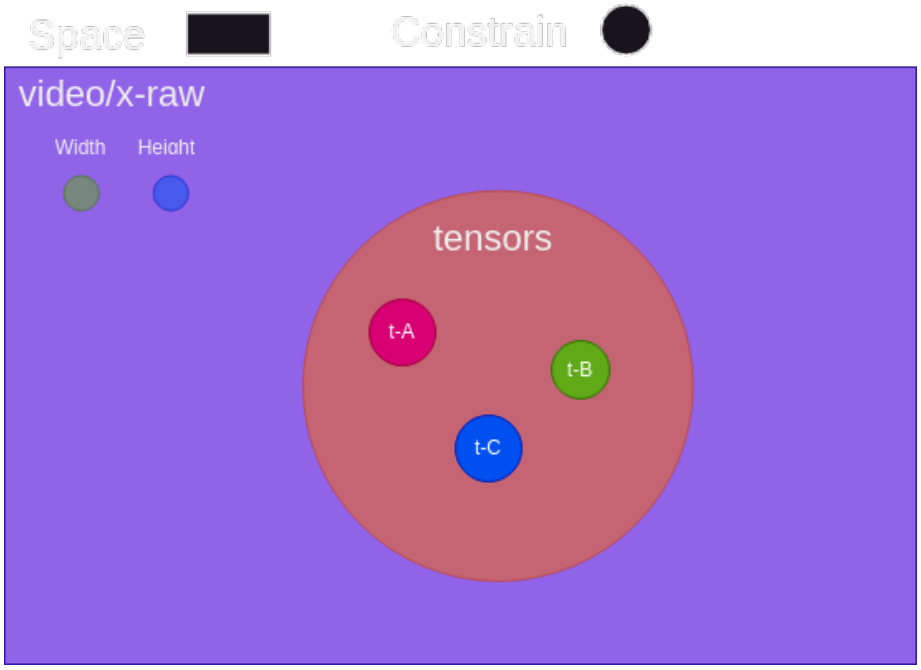
Quick Caps Review

```
1  video/x-raw
2     width=1920
3     height=1080
4     tensor=(GstCaps)[...]
```



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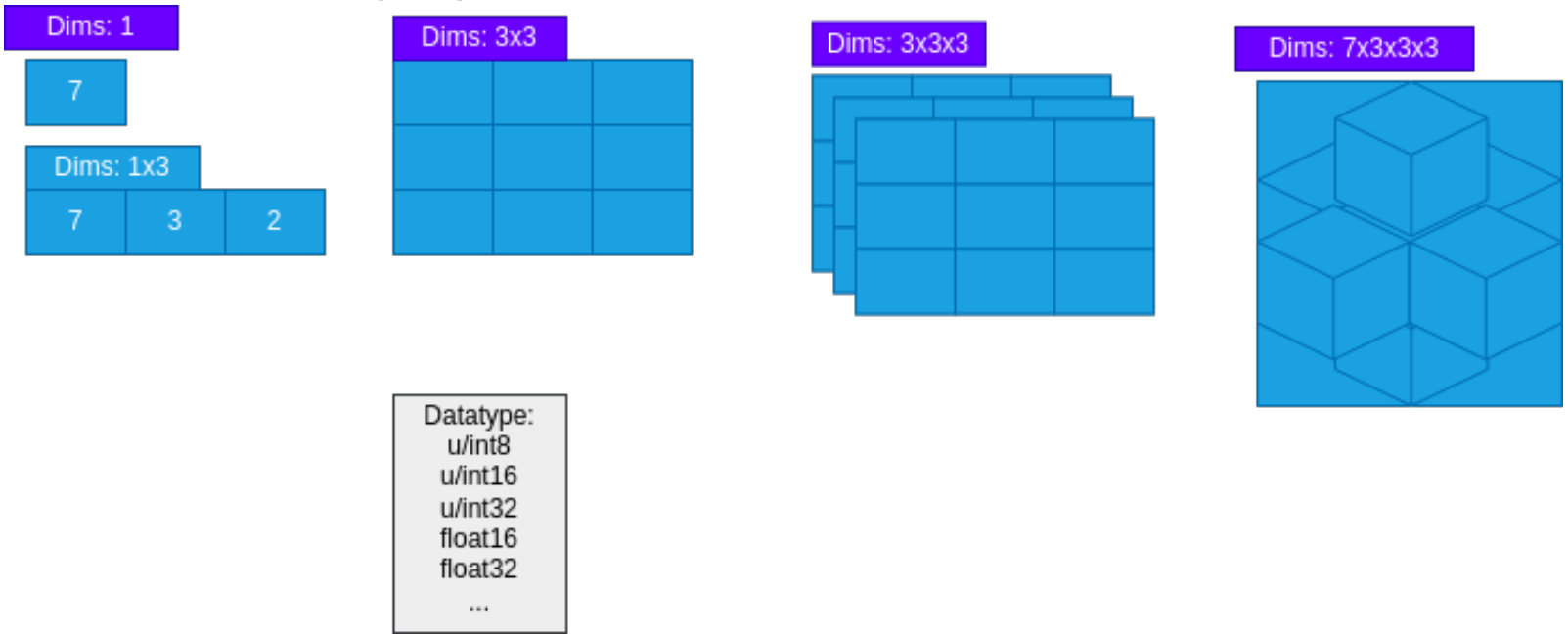
Quick Tensor Review

Generic tensor properties



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Quick Tensor Review

Model specific tensor property

Dims: 3x4

Datatype=float32

Obj-1	x1	y1	w1	h1
Obj-2	x2	y2	w2	h2
Obj-3	x3	y3	w3	h3

Dims: 3x4

Datatype=float32

Obj-1	x1	y1	x2	y2
Obj-2	x2	y2	x2	y2
Obj-3	x3	y3	x3	y3

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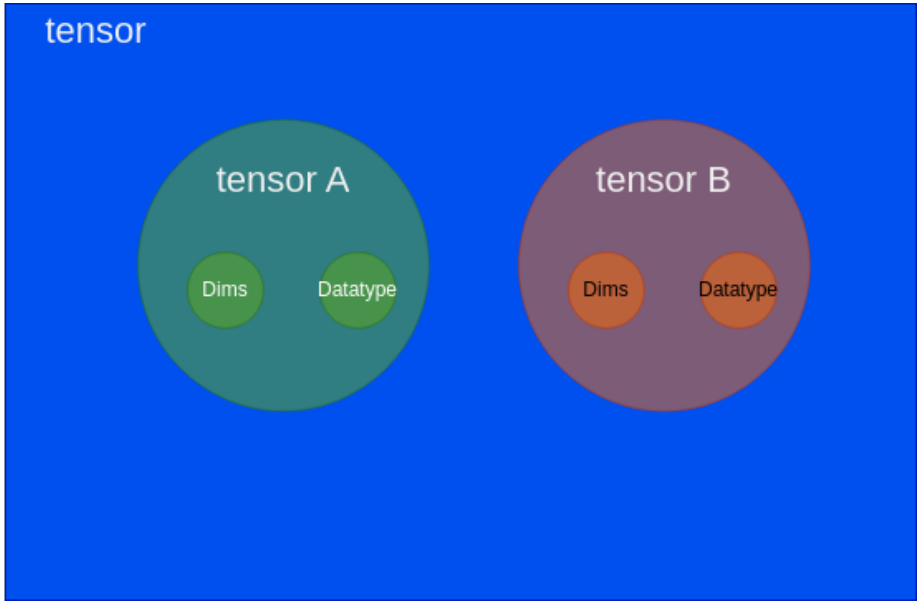
Tensors Constrains In Capabilities




```
1  tensor/strided,
2     dims=(uint)<37,21504>,
3     type=(string)float32,
```

Tensors Constrains In Capabilities

```
data=(structure)
   tensors,
      Gst.Model.FastSAM.Segmentation.Masks=(structure)
         tensor/strided,
            dims=(uint)<37,21504>,
            type=(string)float32,
      Gst.Model.FastSAM.Segmentation.Logits=(structure)
         tensor/strided,
            dims=(uint)<32,256,256>,
            type=(string)float32,
```

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Tensors Constrains In Capabilities

```
1   tensors=(GstCaps)
2     data/tensors,
3       model-name=(string)fastsam,
4       batch-size=(uint)1,
5       data=(structure)
6         tensors,
7           Gst.Model.FastSAM.Segmentation.Masks=(structure)
8             tensor/strided,
9               dims=(uint)<37,21504>,
10              type=(string)float32,
11              dims-order=(string)col;,
12          Gst.Model.FastSAM.Segmentation.Logits=(structure)
13            tensor/strided,
14              dims=(uint)<32,256,256>,
15              type=(string)float32,
16              dims-order=(string)col;;,
```

Tensors Constrain In Capabilities

Inference element extract tensors information and expose it on capabilities.

```
caps = video/x-raw,
  width=(int)1024,
  height=(int)1024,
  format=(string)RGBA,
  tensors=(GstCaps)[
    data/tensors,
      model-name=(string)fastsam,
      batch-size=(uint)1,
      data=(structure)
        tensors,
          Gst.Model.FastSAM.Segmentation.Masks=(structure)
            tensor/strided,
              dims=(uint)<1,37,21504>,
              type=(string)float32,
              dims-order=(string)col;,
          Gst.Model.FastSAM.Segmentation.Logits=(structure)
            tensor/strided,
              dims=(uint)<1,32,256,256>,
              type=(string)float32,
              dims-order=(string)col;;,
```

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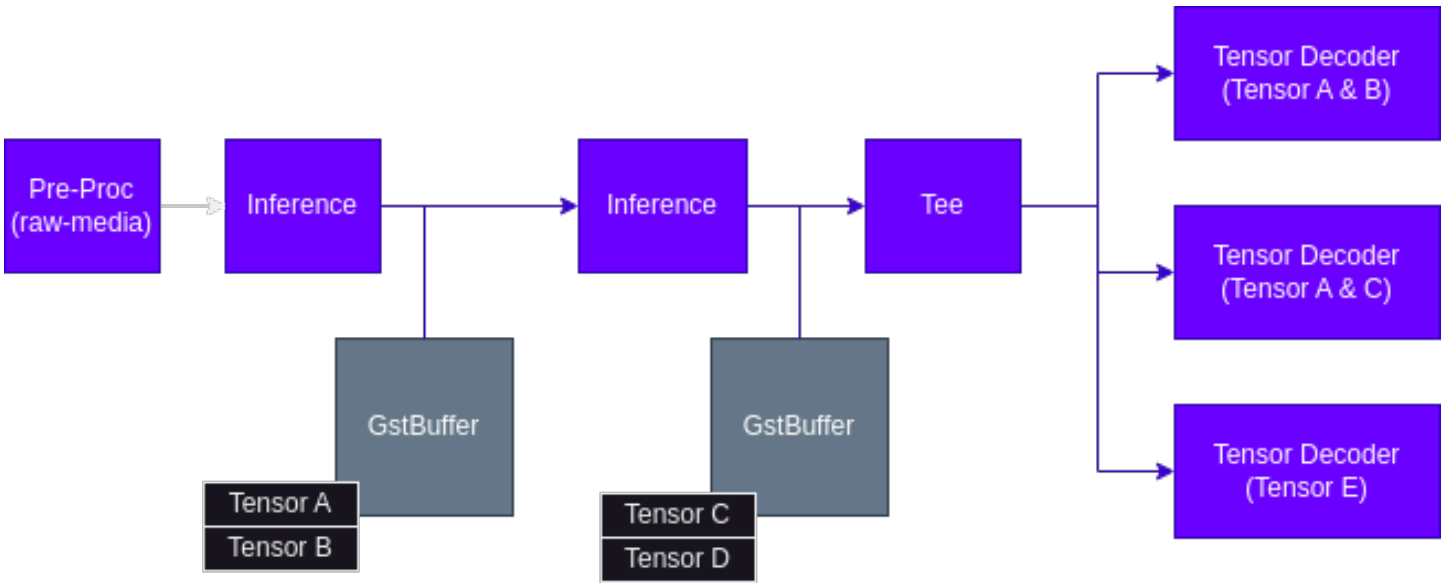
Tensors Constrains On Analytics Pipeline



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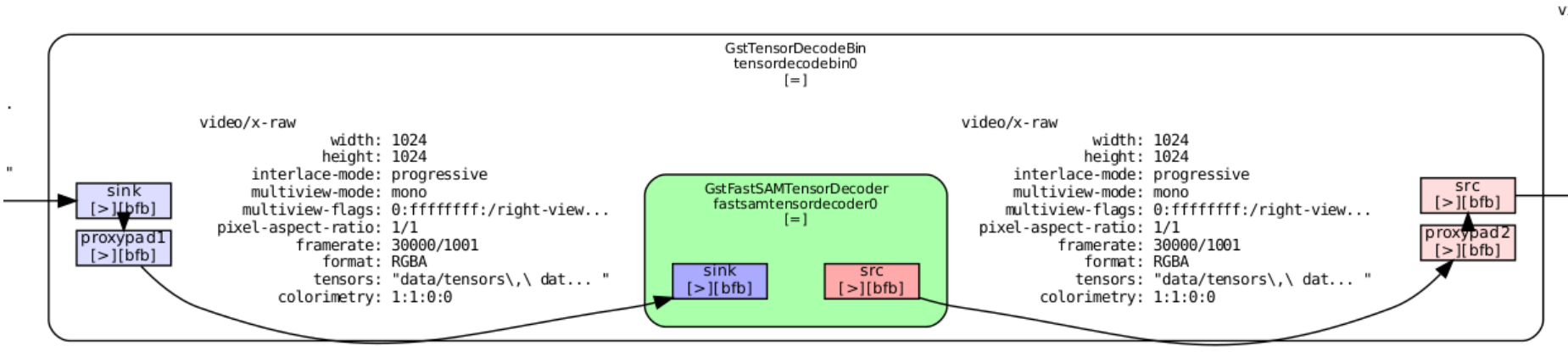
Auto-plugging Tensor Decoder Prototype



TensorDecodeBin

- Lookup element registry for "Klass == TensorDecoder"
- Query accept-caps and select if accepted
- Sort selected tensor decoders based on their rank
- Choose highest rank compatible tensor-decoder

Thanks!

Q & A

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