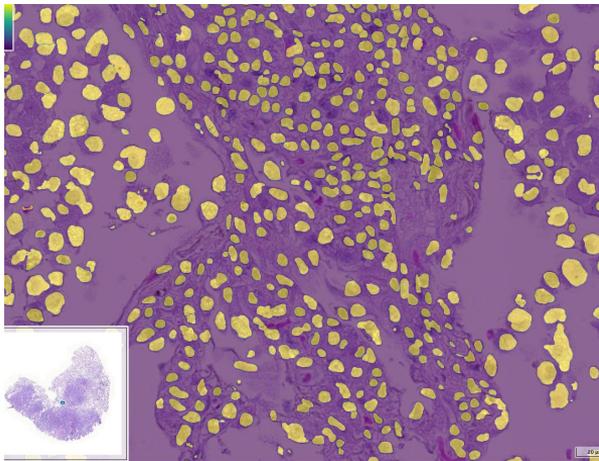


**Supporting Slides for
Supplement 255: Microscopy Bulk Enhanced Annotation
Background and Proposal**

Slides shown: WG-6 Meeting; March 19th 2026

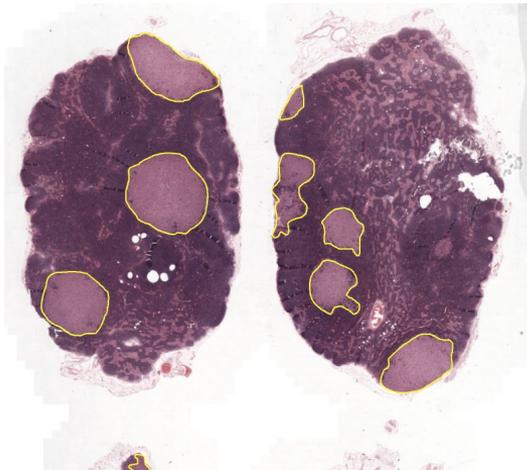
DICOM Defines Multiple IODs for Annotation

DICOM Segmentations



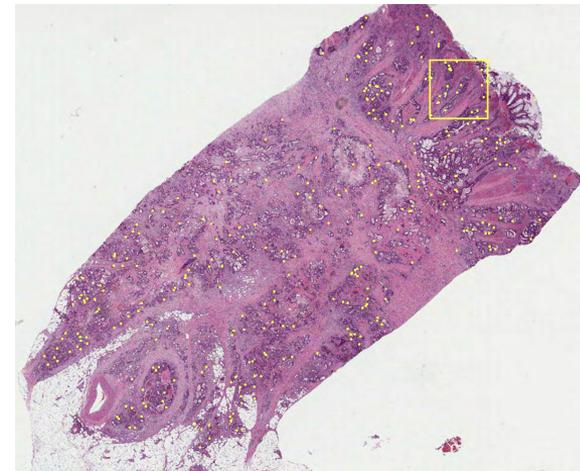
- Raster
- Optionally
 - Represent as pyramid
 - Multi-frame

Structured Reports



- Highly flexible combine text, vector graphics, and references to raster images.

Bulk Microscopy Simple (2021)



- Resolution independent (vector graphics)
- Points, lines, polygons, rectangles, ellipse
- Designed for ML use cases.

Bulk Microscopy Simple Annotations

What's good:

- Resolution independence
- Space efficient (Small storage size)

What is not possible polygons with holes:

- Annotations with holes
- Segmentations, Heat maps, Voids, Tears.

What are DICOM annotations

Define:

- Meaning of spatial region within DICOM image.

What is out of scope:

- Description of presentation (Colors, styles, etc).
- These defined with presentation states.

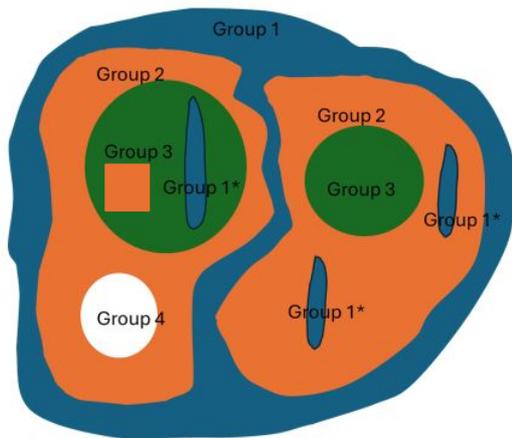
Proposal: Bulk Microscopy Enhanced Annotations

(006A, 0002) Annotation Group Sequence

Tag	Keyword	Type	VR	VM	
> (006A, XXXX)	MutuallyExclusiveReferenceUID	3	UI	1	Identifies annotation groups that are mutually exclusive to each other. May identify mutually exclusive relationships across multiple SOPInstances within the same series. If undefined the annotation group does not exhibit mutually exclusivity.
> (006A, XXXX)	MutuallyExclusiveOrder	3	UL	1	Defines the mutually exclusive ordering for all annotation elements within the annotation group. Mutually exclusivity applies only to annotation groups with equal MutuallyExclusiveReferenceUID.
> (006A, XXXX)	AnnotationMutuallyExclusiveOrder	3	OL	1	Interpreted as an array of Unsigned 32 bit integer values. Length = number of annotations * 4 bytes. The value defined at each 4 byte increment defines the order that the annotation group's corresponding annotation should be resolved.

Three Different Bulk Annotation Usages

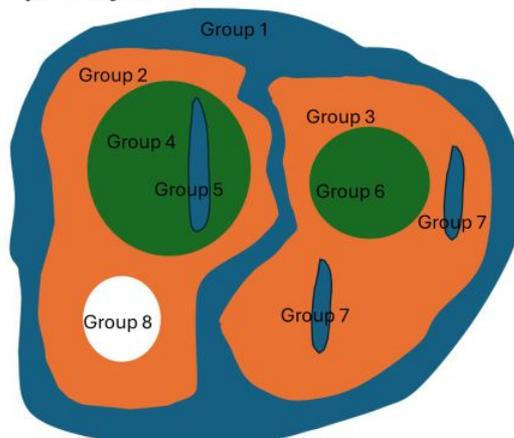
Sorted by kind: One annotation group per object kind



Has issues with rendering order, as the contained object might be hidden.

```
//Group 1
(0x0066, 0x0016):[points, ...
(0x0066, 0x0040):[Pointsindex,...
Visualization properties
}
//Group 2
(0x0066, 0x0016):[points, ...
(0x0066, 0x0040):[Pointsindex,...
Visualization properties
}
//Group 3...
```

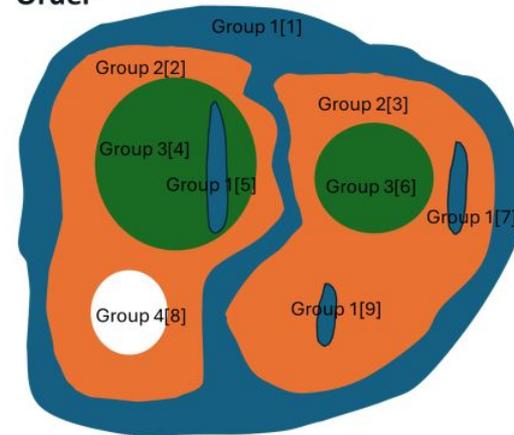
Implicitly preserving rendering order: Multiple annotation groups per object kind



Has issues with file size as there can be millions of groups.

```
//Group 1
(0x0066, 0x0016):[points, ...
(0x0066, 0x0040):[Pointsindex,...
Visualization properties
}
//Group 2
(0x0066, 0x0016):[points, ...
(0x0066, 0x0040):[Pointsindex,...
Visualization properties
}
//Group 3...
```

Proposed enhancement: Add Mutual Annotation Rendering Order



Extended the current standard

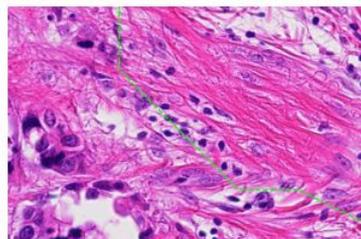
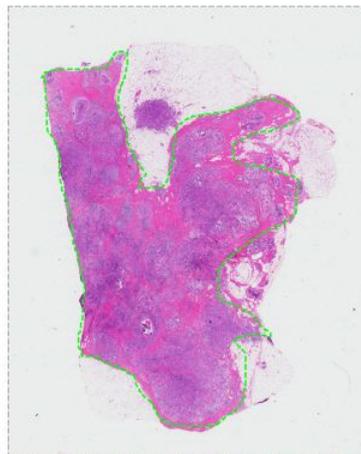
```
//Group 1
(0x0066, 0x0016):[points, ...
(0x0066, 0x0040):[Pointsindex,...
(0x00XX, 0x00XX):[MutuallyExclusiveRenderingOrder,...
{Visualization properties, ...}
}
//Group 2
(0x0066, 0x0016):[points, ...
(0x0066, 0x0040):[Pointsindex,...
(0x00XX, 0x00XX):[MutuallyExclusiveRenderingOrder,...
{Visualization properties, ...}
}
//Group 3...
```

Example 1

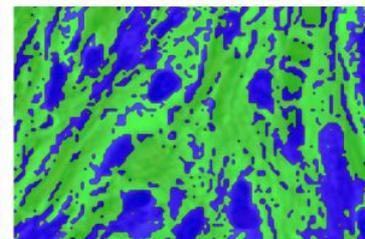
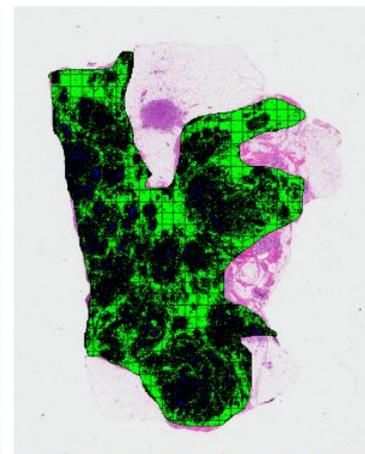
Approach	Groups	File size
Sorted by kind	4	783 MB
Preserved order	+2mio	1,43 GB
Enhanced	3	810 MB

For this extreme but not uncommon example, the enhancement significantly reduces the file size

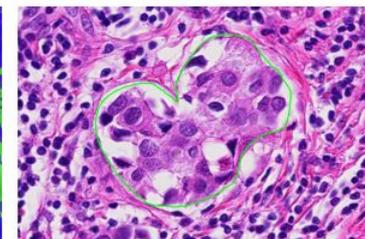
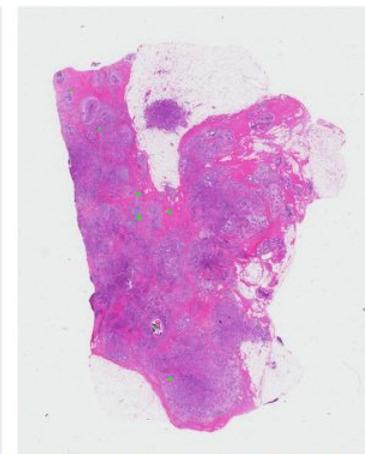
1 AI region
One object kind



~5mio AI labels
Two object kinds



~1k AI annotations
One object kind

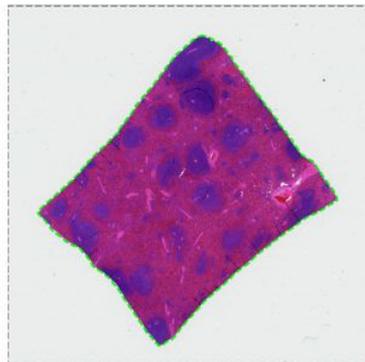


Example 2

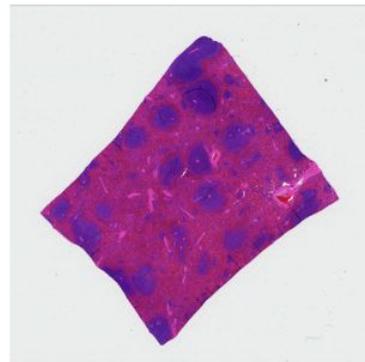
Approach	Groups	File size
Sorted by kind	6	389 MB
Preserved order	+2,4mio	1,31 GB
Enhanced	3	530 MB

For this extreme but not uncommon example, the enhancement significantly reduces the file size

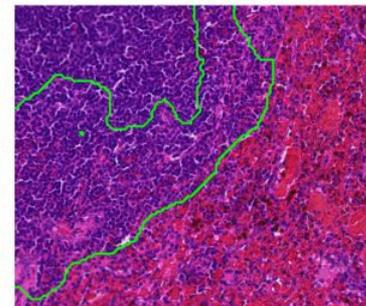
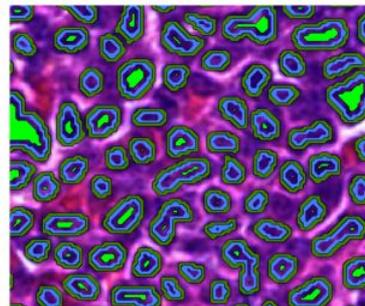
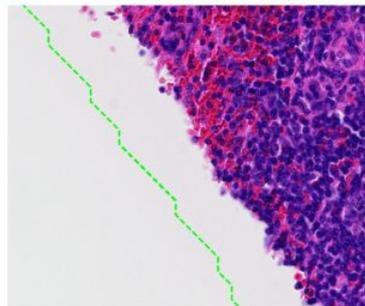
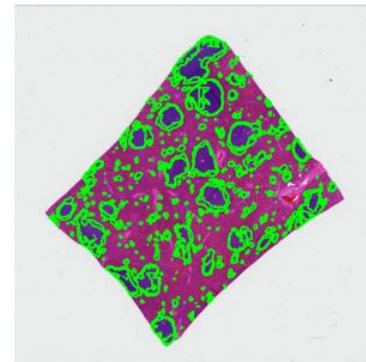
1 Manuel region
One object kind



~7mio AI labels
Four object kinds



16 AI annotations
One object kind



Heat Map Example (Grades/Probabilities)

