

## Image data and naming conventions

The objective of this document is to describe the format and naming conventions of individual frames of each video and the corresponding ground truths.

Each dataset has the following structure:

Dataset\_name ----- ON (original image data of the N-th sequence)  
----- ON\_GT (ground truth for the N-th sequence)  
----- SEG (ground truth for the SEG measure)  
----- TRA (ground truth for the DET and TRA measures)  
----- ON\_RES (results produced by a competing algorithm)

## Indexing

T - A zero-based temporal index composed of either three or four digits depending on the dataset

Z - A zero-based, three-digit slice index

## Original image data

**tT.tif** - Multi-page tiff file that contains the original image data (i.e., either 8-bit or 16-bit image data depending on the dataset) of a given frame.

## Manual tracking

**man\_trackT.tif** - 16-bit multi-page tiff file (markers have unique positive labels propagated over time, background has zero label). It contains markers for the corresponding original image tT.tif. The man\_trackT.tif file is provided for every challenge tT.tif file. However, note that the man\_trackT.tif file does not have to be provided for every training tT.tif file. Only the frames with non-empty manual tracking annotation are released.

**man\_track.txt** - A text file representing an acyclic graph for the whole video. Every line corresponds to a single track that is encoded by four numbers separated by a space:

L B E P where

L - a unique label of the track (label of markers, 16-bit positive value)

B - a zero-based temporal index of the frame in which the track begins

E - a zero-based temporal index of the frame in which the track ends

P - label of the parent track (0 is used when no parent is defined)

**Example:** Imagine a sequence of five frames. An object with label 1 exists in the first three frames. Then, a division event occurs in the fourth frame and daughter objects (with labels 2 and 3) exist until the end of the sequence. The corresponding track file contains the following three lines:

```
1 0 2 0
2 3 4 1
3 3 4 1
```

## Manual segmentation (2D real datasets)

**man\_segT.tif** - 16-bit multi-page tiff file (segmented objects have unique positive labels that are not necessarily propagated over time, background has zero label). It contains manual segmentation for the corresponding original image tT.tif. Not all objects have to be segmented. The man\_segT.tif file does not have to be provided for every tT.tif file. Only the frames with non-empty manual segmentation are released.

## Manual segmentation (3D real datasets)

**man\_seg\_T\_Z.tif** - 16-bit multi-page tiff file (segmented objects have unique positive labels that are not necessarily propagated over time, background has zero label). It contains manual segmentation for the Z-th slice from the corresponding original image tT.tif. Not all objects have to be segmented. The man\_seg\_T\_Z.tif file does not have to be provided for every slice of each tT.tif file. Only the slices with non-empty manual segmentation are released.

**man\_segT.tif** - 16-bit multi-page tiff file (segmented objects have unique positive labels that are not necessarily propagated over time, background has zero label). It contains manual segmentation for the corresponding original image tT.tif. All objects are segmented. The man\_segT.tif file does not have to be provided for every tT.tif file. Only the frames with non-empty manual segmentation are released.

## Generated tracking (simulated datasets)

**man\_trackT.tif** - 16-bit multi-page tiff file (markers have unique positive labels propagated over time, background has zero label). It contains markers for the corresponding original image tT.tif. The man\_trackT.tif file is provided for every tT.tif file.

**man\_track.txt** - A text file representing an acyclic graph for the whole video. Every line corresponds to a single track that is encoded by four numbers separated by a space (see Manual tracking for further details).

## Generated segmentation (simulated datasets)

**man\_segT.tif** - 16-bit multi-page tiff file (segmented objects have unique positive labels that are not necessarily propagated over time, background has zero label). It contains generated segmentation for the corresponding original image tT.tif. All objects are segmented. The man\_segT.tif file is provided for every tT.tif file.

## Participant's results for the Cell Tracking Benchmark

**maskT.tif** - 16-bit multi-page tiff file (segmented and tracked objects have unique positive labels propagated over time, background has zero label). It contains segmented and tracked objects for the corresponding original image tT.tif. The maskT.tif file is provided for every tT.tif file.

**res\_track.txt** - A text file representing an acyclic graph for the whole video. Every line corresponds to a single track that is encoded by four numbers separated by a space (see Manual tracking for further details).

It is the responsibility of each participant to provide results only for those objects that lie at least partly within the field of interest (FOI) for a particular dataset. The FOI specification is described in detail in [Annotation procedure.pdf](#).

In the case of Fluo-N3DL-DRO and Fluo-N3DL-TRIC, it is the responsibility of each participant to provide results only for those lineages of objects that are uniquely determined by tracking markers available in man\_track000.tif under Fluo-N3DL-DRO/ON\_GT/TRA and Fluo-N3DL-TRIC/ON\_GT/TRA, respectively.

### **Participant's results for the Cell Segmentation Benchmark**

**maskT.tif** - 16-bit multi-page tiff file (segmented objects have unique positive labels within individual frames, but the labels do not have to be propagated over time, background has zero label). It contains segmented objects for the corresponding original image tT.tif. The maskT.tif file is provided for every tT.tif file.

It is the responsibility of each participant to provide results only for those objects that lie at least partly within the field of interest (FOI) for a particular dataset. The FOI specification is described in detail in [Annotation procedure.pdf](#).

In the case of Fluo-N3DL-DRO and Fluo-N3DL-TRIC, all extra objects detected and segmented will automatically be filtered out based on the lineages of objects that are uniquely determined by tracking markers available in man\_track000.tif under Fluo-N3DL-DRO/ON\_GT/TRA and Fluo-N3DL-TRIC/ON\_GT/TRA, respectively. Therefore, all extra detected and segmented objects will not be penalized at all.