

## Visualizer framework for the ITK project

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# Motivation & Workplan

- Build a realistic interactive 3D model of the ITK project in a variety of formats (GDML, JSON, ROOT) for stand-alone and Web display
- Use the existing XML files for Step 2.X simulations (used for readout and services)
  - [InnerDetector/InDetTrackingGeometryXML/trunk/share](#) - readout
  - [InnerDetector/InDetDetDescr/PixelLayouts/BarrelInclinedRef/trunk](#) – support
  - 3<sup>rd</sup> party files (CAD, STP) from engineers
- Can be a critical link between simulations and engineering designs (CAD, STP)
- Web-based geometry view:
  - Does not require running VP1 on lxplus (how many people can use it?)
  - Can access each detector part, their sizes, dimensions etc.
- Workplan:
  - Make the code public (under github) and later move it to athena
  - Build PixelBarrel and PixelEndCap support structures and services
  - Implement visualization of services beyond simple services
  - Optimize the speed of viewing the models



# Initial version using TGeometry (ROOT)

- Build “assemblies”, rather than flat files with TGeometry objects
  - Each subdetector can be visualized separately
- Can be used with:
  - ROOT EVE display (local computer)
  - jsROOT: developers (S.Linev) will add tools to extract sizes, dynamic rulers etc
  - Fastest method: using OpenGL (runs a pyROOT script on GDML file)
- Project wiki:
  - <https://twiki.cern.ch/twiki/bin/view/Atlas/ITkVisualiser>
  - <http://atlaswww.hep.anl.gov/asc/itk/geom/viewdet.php> - first web-based version
- Several variations in order to boost performance
  - Whole detector
  - Half detector
  - Module-less detector

# Input files for inclined layouts: Quads, Duals, and Alternative

- High-priority: Inclined for Step.2.2. ATLAS-P2-ITK-19-00-00 (InclinedQuads):
- Used XML:
  - `Materials.xml`
  - `InclBrl4Ref_InclinedQuads_PixelBarrel.xml`
  - `ECRing4Ref_InclinedQuads_PixelEndcap.xml`
  - `ITK_PixelModules.xml`
  - `InclBrl4Ref_InclinedQuads_PixelStave.xml`
  - `InclBrl_PixelSimpleService.xml`
  - `InclBrl4_InclinedQuads_DiskSupport.xml`
- For Duals: replace “Quads” with “Duals”
- For Alternative: replace “Quads” with “Alternative”
- Web browser also has links to the above models for easy access
- Material (density) is not implemented (low priority for visualization)

# Coding

- Each ITK detector can be coded independently as separate source files:
- Currently implemented:
  - `ShowPixelBarrel.cxx`
  - `ShowPixelEndcap.cxx`
- Common interface:
  - `process(InDet::XMLReaderSvc& reader, TGeoVolume* top, TGeoManager* geom, int complexity)`
- One can add additional functionality by adding “SomeDetector.cxx” function
- The code is on GIT: C++/ROOT + xercesc library (no athena)

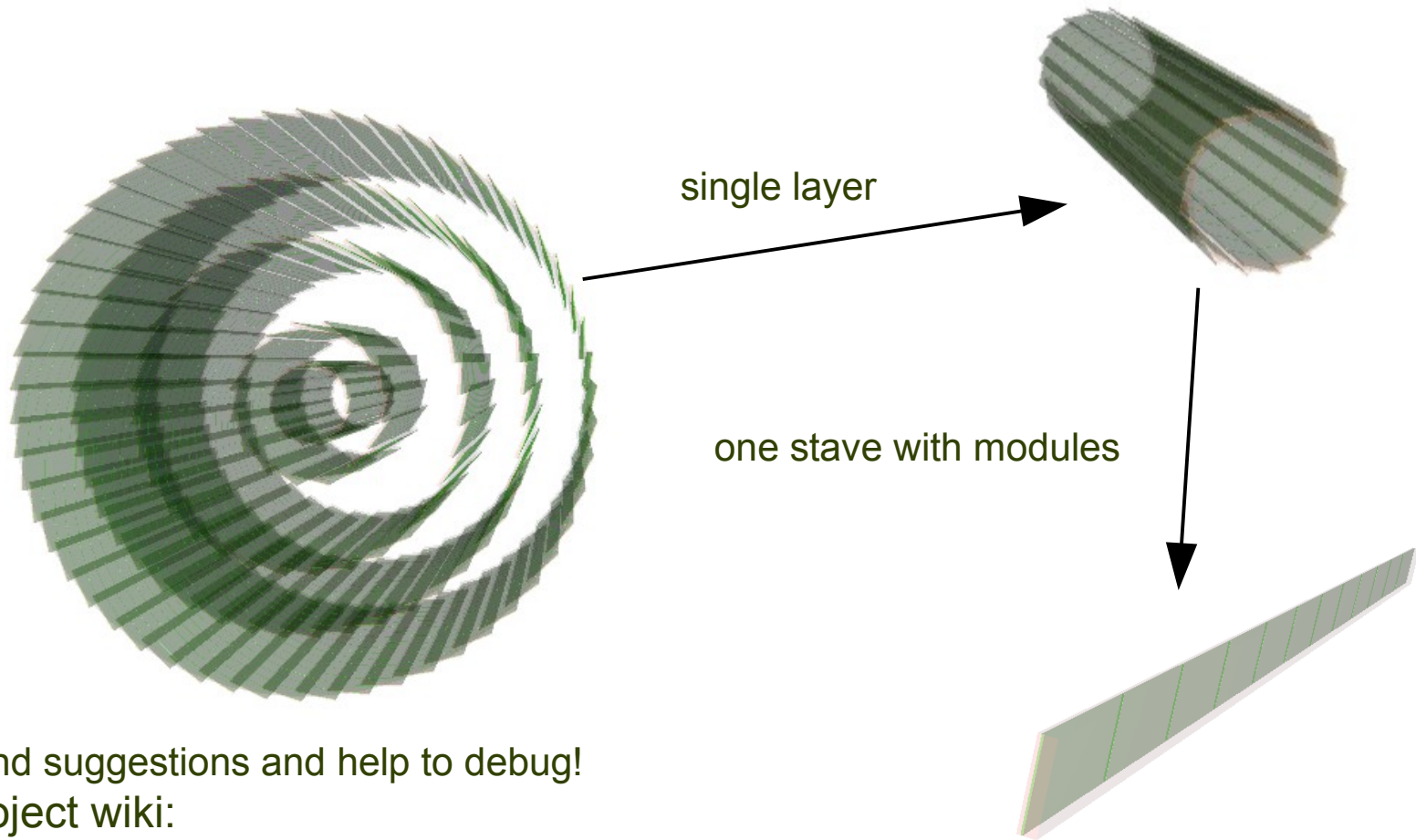
# Initial version:

<http://atlaswww.hep.anl.gov/asc/itk/geom/viewdet.php>

The screenshot displays the ITK Visualiser web interface. At the top, there is a navigation bar with a 'BACK' button, a 'Displayed:' dropdown menu currently set to 'Inclined\_Duals', and several links: 'Inclined\_Duals', 'Inclined\_Quads', 'Inclined\_Alternative', and 'HELP'. Below the navigation bar, there are 'Options:' and 'Full view' dropdown menus, and a 'Submit' button. The main content area shows a 3D visualization of a detector assembly, rendered in a semi-transparent yellow and green style. A red box labeled 'Change layouts' points to the 'Inclined\_Alternative' link. Another red box labeled 'View XML info' points to the '(INFO)' link. A third red box labeled 'Change view style for faster rendering' points to the 'Full view' dropdown menu. A fourth red box labeled 'Change presentation styles' points to the 'Appearance' section of the right-hand control panel. The control panel includes options for 'Clipping', 'Appearance', 'Smooth Lighting (SSAO)', 'Highlight Selection', 'transparency', 'Wireframe', 'Background' (set to '#ffffff'), and 'Reset camera position'. A 'Close Controls' button is at the bottom of the panel. On the left side, there is a tree view of the detector components, including 'PixelBarrel\_1', 'LayerAssembly\_1', 'Stave (Alpine)\_1' through 'Stave (Alpine)\_16', 'PixelBarrelLayer\_1', 'LayerAssembly\_2' through 'LayerAssembly\_5', 'PixelBarrelRings\_1', 'PixelEndcaps\_1', 'PixelSimpleServices\_1', and 'BeamPipe\_0'. A red box labeled 'Use right mouse to:' with a list of actions points to the tree view: '- expand the assemblies' and '- draw separate assembly'. The 3D model itself is a complex cylindrical structure with a central beam pipe, surrounded by multiple layers of staves and rings, rendered in a semi-transparent style.

# Visualizing separate assemblies

<http://atlaswww.hep.anl.gov/asc/itk/geom/viewdet.php>



Send suggestions and help to debug!

Project wiki:

<https://twiki.cern.ch/twiki/bin/view/Atlas/ITkVisualiser>