TTK’s Architecture and Core Data Structures

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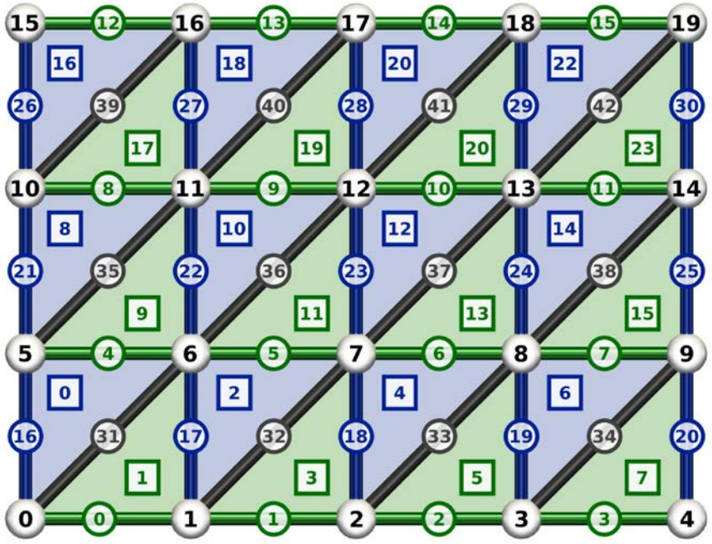
ttk::base – Base TDA Functors

- All TTK algorithms implemented as template functors
- Provides the ttk::Triangulation data-structure for TDA algorithms
  - Efficient mesh traversal routines for explicit or implicit meshes

Standalone C++
Access

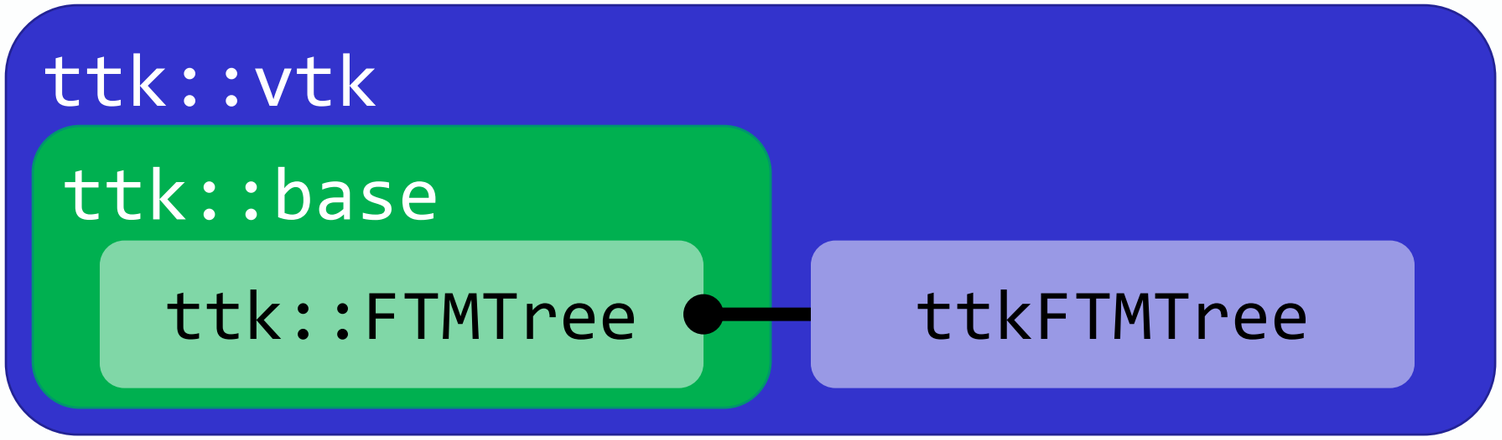
ttk::base – Cached Triangulation Data Structure

- ttk::Triangulation – optimized mesh traversal typically used in TDA
  - Fast boundary, skeleton, link and face/co-face traversals
  - Supports explicit meshes and implicit meshes (grid data)
- Run pre-processing once up front for traversal needs
  - E.g., preprocessVertexEdges(), preprocessCellEdges()



ttk::vtk – VTK Wrappers

- TTK base functors wrapped into vtkDataSetAlgorithm filters
- Take VTK inputs/outputs, grab raw pointers and pass to functors

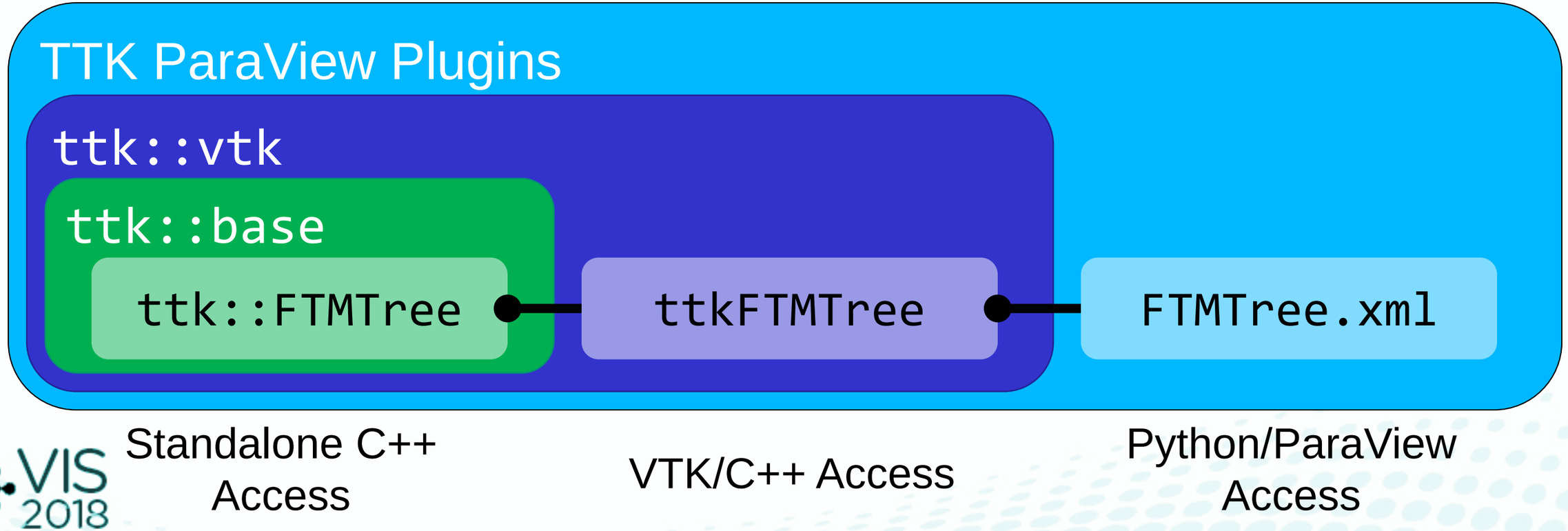


Standalone C++ Access

VTK/C++ Access

TTK ParaView Plugins

- Integrate VTK wrappers as filters available in ParaView & pvpython
- Requires plugin XML description and the VTK wrapper



Using TTK through the VTK Wrappers

- Recommended path for developers writing standalone applications
- CMake package files provided for TTK base and TTK VTK

```
find_package(VTK REQUIRED)
find_package(TTKBase REQUIRED)
find_package(TTKVTK REQUIRED)
```

Using TTK through the VTK Wrappers

- Recommended path for developers writing standalone applications
- Find VTK and TTK base and TTK VTK via CMake
- Link everything, or just what you need

```
target_link_libraries(app PUBLIC
                      ttk::vtk::ttkAll
                      ...)
target_link_libraries(app2 PUBLIC
                      ttk::vtk::ttkFTMTree
                      ttk::vtk::ttkPersistenceCurve
                      ...)
```

Extending TTK

- Implement your core algorithms as template functors in ttk::base
  - In CMake: `ttk_add_base_library`
- Provide a VTK wrapper to pass VTK data to/from your functor
  - In CMake: `ttk_add_vtk_library`
- Provide a ParaView plugin XML file for your VTK wrapper
  - In CMake: `ttk_add_paraview_plugin`

- See sample module “Blank”, or use the provided scripts

Thanks!