

Date: 7/9/2018
To: James Ahrens
cc: David Pugmire, David Rogers, Hank Childs
From: Kenneth Moreland, WBS 2.3.4.13 / ECP/VTK-m

Milestone Deliverable – STDA05-15

Milestone Due Date: June 30, 2018

Milestone Completion Date: June 30, 2018

Description of Milestone:

The STDA05-15 milestone comprises the following 4 distinct deliverables.

External Surface External facelist calculation produces the facets on the exterior of a 3D mesh. This algorithm is used ubiquitously within VisIt and ParaView. UO previously implemented a version of this algorithm for tetrahedral meshes, and, for this milestone, will extend this algorithm to work for all mesh types. Further, Sandia will integrate new VTK-m framework features with this algorithm.

Locate Point Point location makes use of a search data structure built from input data points to efficiently query for the points that are located within a specified region of interest.

Locate Cell Cell location, i.e., deciding which cell a point lies within, is a critical building block for many visualization algorithms, including picking and particle advection. For this milestone, UO will produce an efficient cell location module that can be used within other algorithms. This will be done in conjunction with ORNL, who will use the algorithm for particle advection.

The locate cell feature will allow us to expand the types of data that we can perform steady state advection, and as part of this milestone we will update that code to perform correctly on these data set types.

Point Movement 1 Point movement is the basis for deformations, transformations, and projections of geometric and image data inside VTK, ParaView, and VisIt. Further, the fundamental concept also can be used to apply transformations, and warps to arbitrary fields. This milestone will ensure that VTK-m will provide sufficient point movement algorithms for the needs of ParaView and VisIt.

Completion Proof of the Milestone:

The predefined objective completion criteria of this milestone for all the deliverables were the following items:



- The implementation is merged into the master branch of the central VTK-m repository.
- Documentation is added to the VTK-m User’s Guide working document.

The following table provides evidence for each implemented feature with links to the completed merge requests (evidence of the implementation merged into the master branch) and a link to the excerpt from the VTK-m User’s Guide documenting the filter.

Deliverable	Merge Requests	Documentation
External Surfaces	<ul style="list-style-type: none"> • Make external faces more generic !662 • Improve ExternalFaces filter !714 • Map point fields in ExternalFaces filter !716 • External Faces filter add CompactPoints option !720 • External faces production !860 	https://jira.exascaleproject.org/secure/attachment/13321/13321_VTKmUsersGuide+-+External+Faces.pdf
Locate Point	<ul style="list-style-type: none"> • PointLocatorUniformGrid !973 • PointLocator general interface !1292 	https://jira.exascaleproject.org/secure/attachment/13509/13509_VTKmUsersGuide-Locators.pdf
Locate Cell	<ul style="list-style-type: none"> • Add a CellLocator !957 • Some fixes for CellLocatorTwoLevelUniformGrid !979 • Add CellLocator !1054 • Spatial Search Interfaces and Bounding Interval Hierarchy Cell Locator !1282 	https://jira.exascaleproject.org/secure/attachment/13508/13508_VTKmUsersGuide-Locators.pdf
Affine Point Transform	<ul style="list-style-type: none"> • Point transformation worklet. !1177 • Create PointTransform filter !1265 	https://jira.exascaleproject.org/secure/attachment/13323/13323_VTKmUsersGuide-Point+Transform.pdf
Coordinate System Transform	<ul style="list-style-type: none"> • Add coordinate system transformation. !1275 	https://jira.exascaleproject.org/secure/attachment/13324/13324_VTKmUsersGuide-Coordinate+System+Transforms.pdf

Tasks to Complete the Milestone:

In the case for each of the deliverables, implementation started in a private topic branch. That branch was later submitted as a merge request where the code was run through regression tests across multiple test platforms. The merge requests were also subjected to human reviewers for approval. After necessary modifications were made, the code was merged to VTK-m’s master branch. Subsequently, documentation was written for the VTK-m User’s Guide.

Person(s) Responsible for Completing the Milestone:

Kenneth Moreland, David Pugmire, David Rogers, Hank Childs



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