**Western University, Department of Mechanical and Materials Engineering**

**MME 9710: Advanced CFD**

Assignment 2: Introduction to One Dimensional Transient Analysis

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# Fortran Solver

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Before completing the assignment problem, the Fortran code built for one dimensional diffusion analysis was updated to include routines for transient problems. The updated code includes a loop for a converged solution for each time step.

## Transient Discretization4

Transient discretization is an extension of the one-dimensional diffusion discretization. The transport equation over a set of control volumes (Figure 1) is expanded to integrate over the time domain in addition to volume:



Figure 1: Control Volume Set.

Where is the “new time”, , is the “old time”, , and is the weighting factor which controls the time discretization method. In general, the discretized transport equation takes the form:

The new transport equation caused the diffusion coefficient, source terms, and active coefficients to be updated to include a transient term:

# Code Verification