GPU Solutions for PSCAD: IT17112

Reporting Period	May 28, 2020 - June 11, 2020
Activities	• Received updated *Province* data that removed known issue of high level of difference between three lines of data. Data was processed and used to calculate new result vectors for the analysis below. • To establish the degree of accuracy in the GPU-based solving method, QRFactor can solve the system using either GPU-based methods or CPU-based methods. These results were compared to each other over all time steps and a histogram of the relative differences between the outputs was made. See figure 1. No relative differences greater than 10^{-5} were found. • The relative difference between the data sets $y(t)$ and $x(t)$ is defined as: $\Delta_{rel}(t) = \lvert y(t) - x(t)\rvert / \max(\lvert y(t)\rvert, \lvert x(t)\rvert)$. • Likewise, the new *Province* data from the two compilers, CompilerIF15 and CompilerGF462, was also compared. We see that there are some relative differences between the data that are larger than 10^{-1}. • Finally, two types of output from QRFactor were compared against the data from the two compilers. The data from CompilerGF462 most closely matches both QRFactor outputs: differences are typically less than 10^{-7}, with no values of Δ_{rel} greater than 10^{-5}. • **Conclusion**: the results from the GPU-based methods of QRFactor are consistent with the results of the GPU-based method, and with the provided output data to an acceptable degree. • Debugging QRFactor on U of W servers. Anticipate new timing data very soon.
Issues	• None
Milestones Accomplished	• New *Province* data processed and used with QRFactor. • GPU-based and CPU-based methods in QRFactor produce results consistent with known results.
Milestones Not Accomplished	• None
Next Week's Milestones	• Full run of new *Province* data on U of W servers.
Forwarded Issues	• None

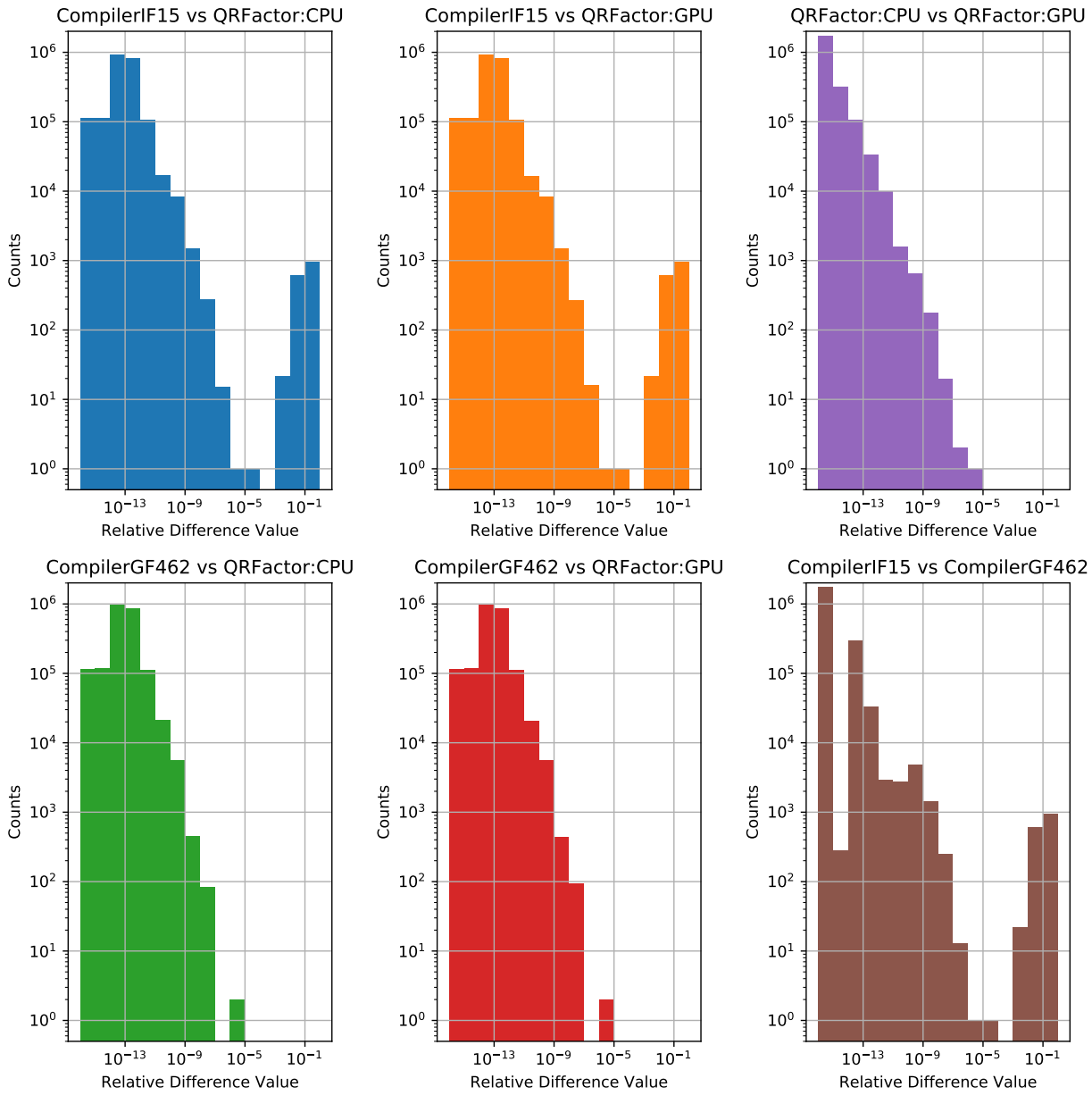

Figure 1: Cross-comparing the result vectors $\mathbf{X}(t)$ from: CompilerIF15, CompilerGF462, QRFactor CPU method, and QRFactor GPU method. In each case, the relative difference $\Delta_{rel}(t)$ between the data sets was calculated for all time steps in common – typically 298. A minimum threshold difference of 1.0 x 10^{-16} was used.