GUIDELINES FOR PERFORMANCE EVALUATION OF YOUR OPTIMIZED ARE ENGINE

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For project 2, you are required to evaluate the performance of the Reactivity Engine and report the evaluation result. Here are some instructions for you:


1. Engine setup.
Your engine should include an "on/off" switch to enable/disable the optimization mode. We expect you to evaluate the performance under both modes and compare the result in the report. You can add more switches, if multiple optimization techniques are employed in the engine and you wish to separate the effects of individual optimization techniques or capture the effect of any combination. But as a minimum, we expect the results of the "un-optimized vs. optimized" comparison.

2. Performance metrics.
The main performance metric is the total energy consumption of the engine over the Atlas network. The formula to estimate overall energy cost is given as Formula (15) in [P3]. The normalized energy coefficients (alpha & beta) for communication and sampling in the formula have different values depending on sensor platforms. You are required to report the energy performance for three sets of sensor platforms, known as S1, S2 and S3 in [P3]. The energy coefficients for these platforms are given in Table 1. Please read Section IV of the paper for more explanation.

In addition, you are encouraged to include other performance metrics relevant to the optimization technique used. For example, cache hit/miss ratio for a cache-based technique, data freshness or accuracy for a lossy optimization. You need to describe how these metrics are modeled and measured in your report.

You need to measure the number of pushes and pulls ($n_{push}$ and $n_{pull}$) to calculate the overall energy cost. This can be done by monitoring the number of method calls from the Atlas push and pull interface. Please review the “Push & Pull API" slide for the RE hands-on session, if you are not sure how to do it. Describe how...
\( n_{\text{push}} \) and \( n_{\text{pull}} \) are measured, and which methods in the API are being monitored in your report.

There is no requirement on running time for your measurement. But measurement time should be long enough so that RE’s energy performance stabilizes over time, and overcomes system warm up period.

4. **Test Cases**
   You may use the test case that we supplied you with (included in the RE Engine source code). Or, if you deem necessary, you may design your own test cases (the set of rules and sensors) for evaluation. In the latter case, describe the design considerations of your test case in the final report. For example, whether it is a generic case using random rules, or it is a specific case simulating certain user scenarios and applications. Is your optimization algorithm test-case dependent? How does scale (number of rules and sensors) affect your result?

5. **Report & Presentation.**
   We will shortly provide you with a word template for the project report. You should prepare a 10 minute presentation in powerpoint describing your optimization idea, showing its formalism, and reporting on the results. Do not include materials about the Engine itself, unless you added new features.