SI2-SSI: TESSE
Task Based Environment for Scientific Simulation at Extreme Scale

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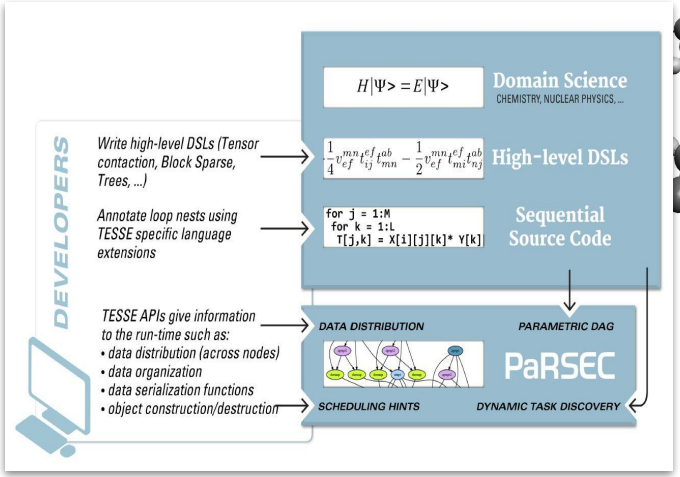
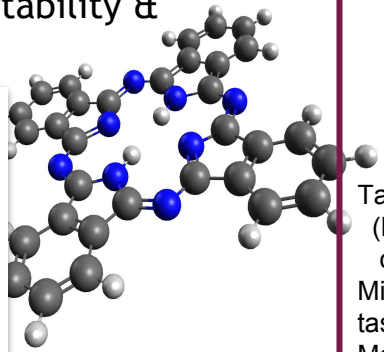
- **Challenge:**
  - Execute dynamic algorithms over irregular data on extreme scale hybrid machines using a task-based runtime
  - Guarantee performance portability & productivity





Recent Development

New Programming Model: Templated Task Graph (TTG)

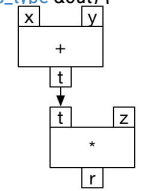
- General purpose programming model implemented in C++
- Applications composed as graphs of templated Ops encoding DAG of tasks instantiated at runtime
- Abstracts out the details of the execution runtime (PaRSEC and MADNESS already supported)

Tasks are parameterized (loop index, label of node, couple of indices)
Minimize the known task graph
Match tasks with keys
Explicit send / implicit receive

```
void Plus::op(const keyT &key,
              baseT::input_values_tuple_type &&t,
              baseT::output_terminals_type &out) {
  auto x = baseT::get<0>(t);
  auto y = baseT::get<1>(t);
  ::send<0>((int) (key), x+y, out);
}

Plus plus;
Times times;

connect<0, 0>(&plus, &times);
```



TensorFlow for general-purpose workloads