Regent Update

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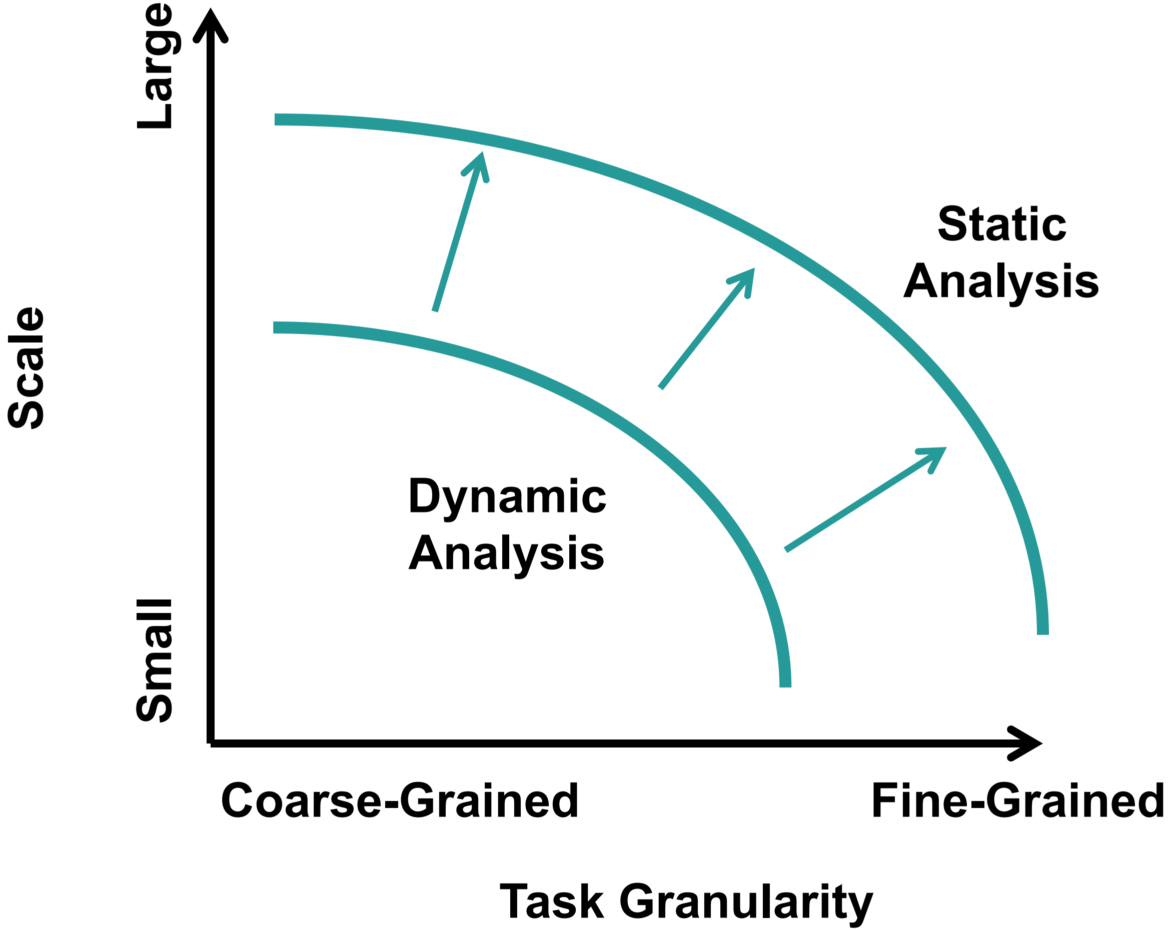
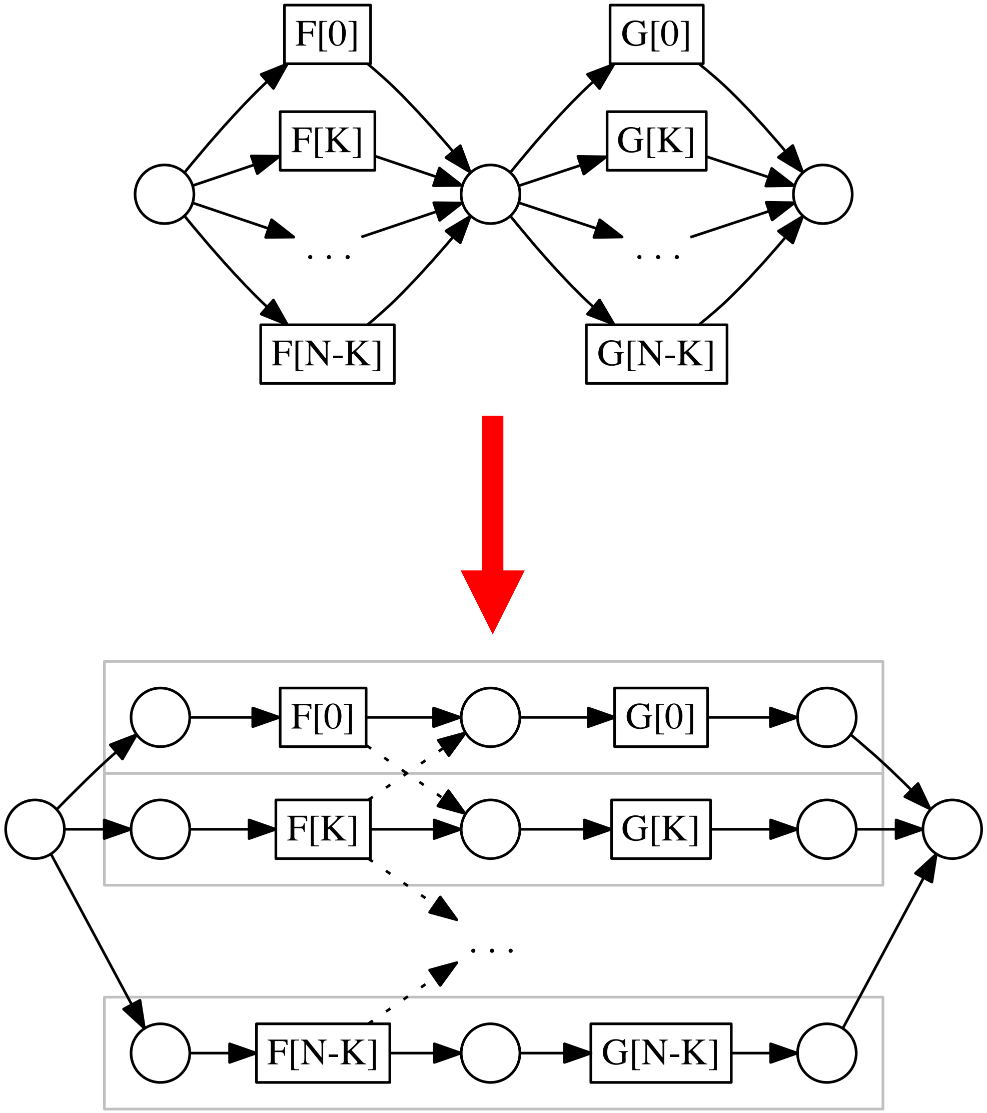
http://regent-lang.org

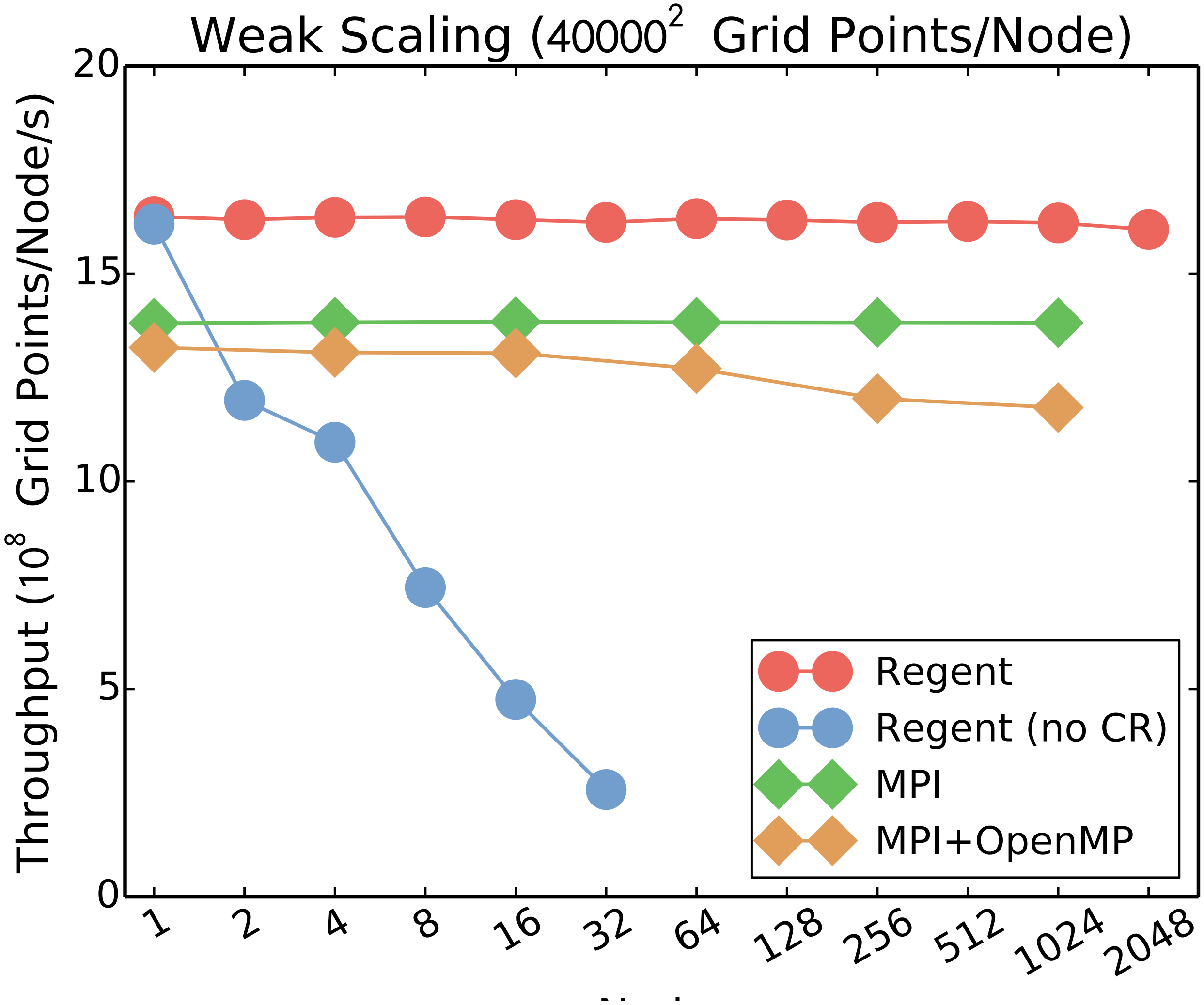
Goal: Pushing the Performance Envelope with Compilation



Static Control Replication

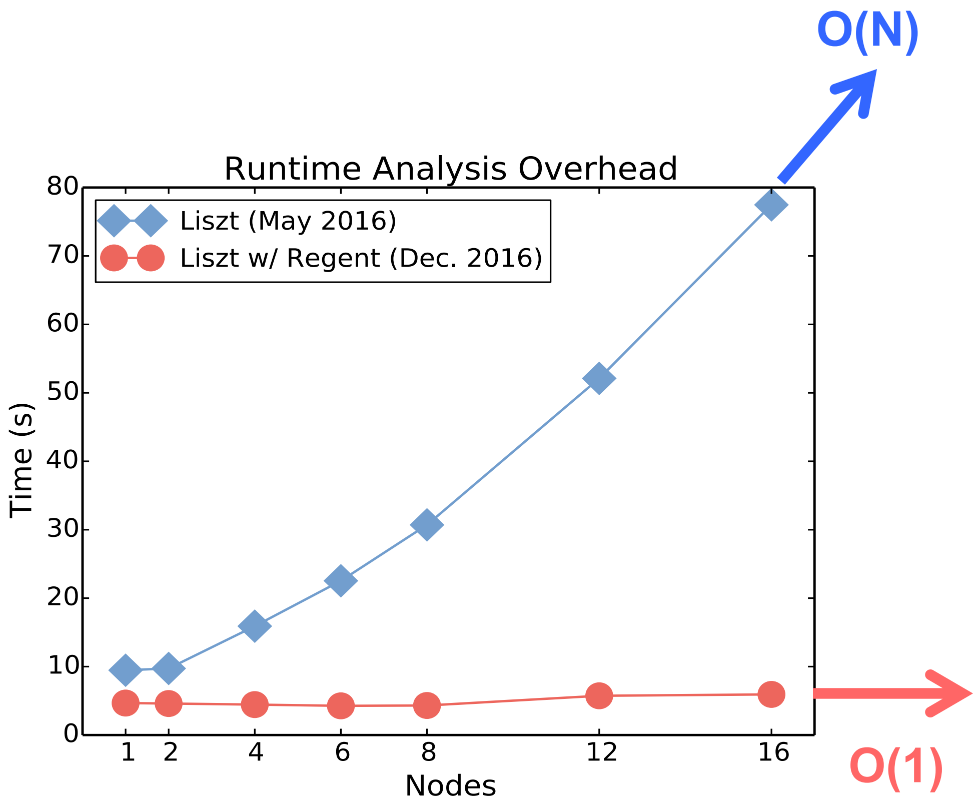


Weak Scaling with Control Replication



flat is better

Impact of Control Replication: O(N) Overhead => O(1)



O(N)

O(1)

lower is better

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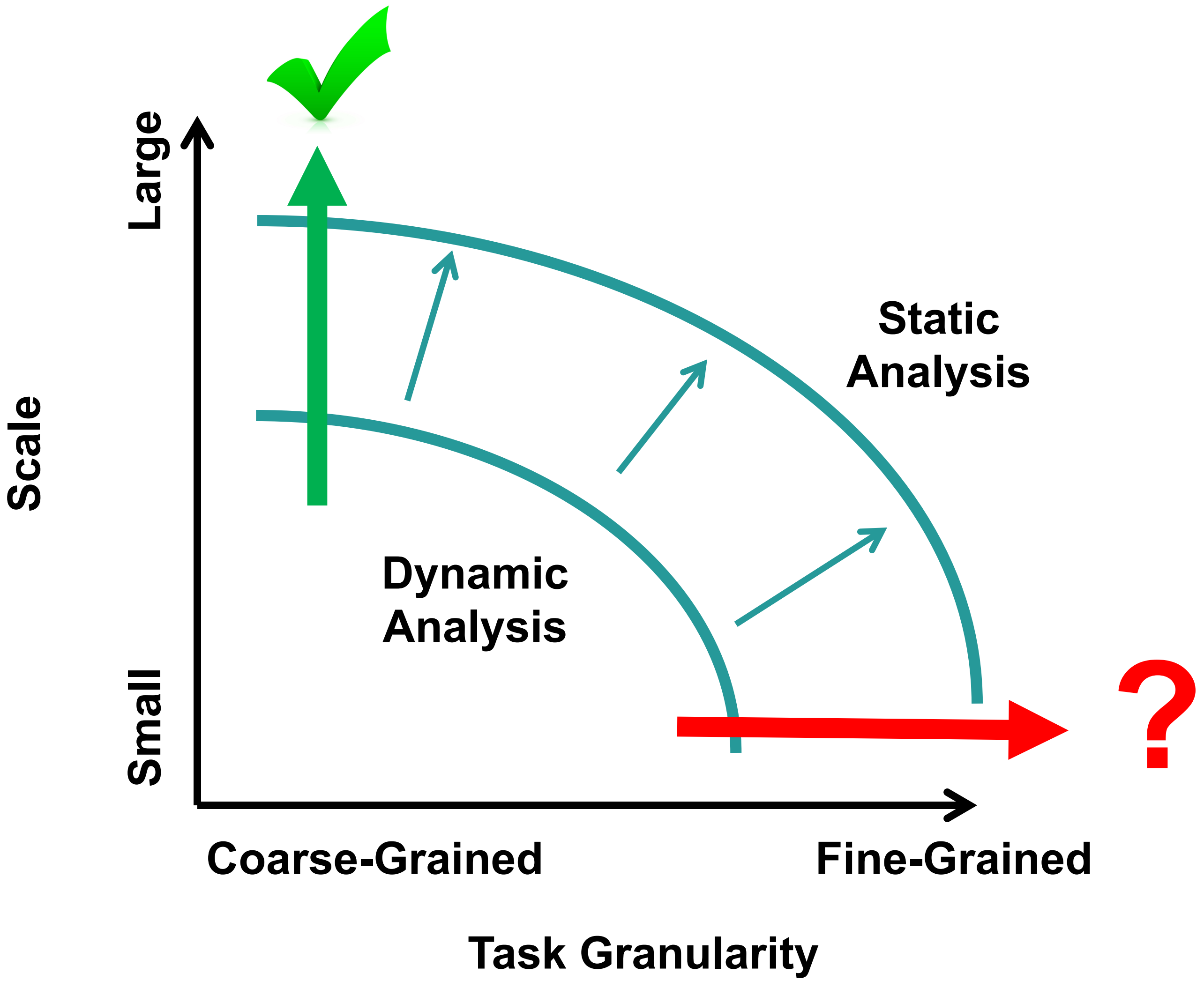
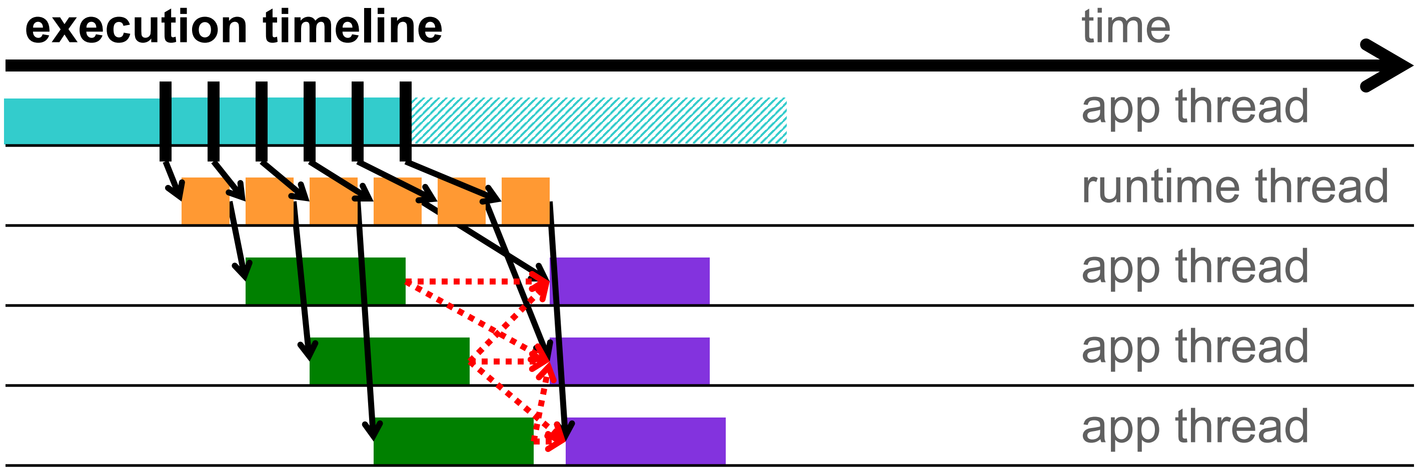


Why Static Analysis?

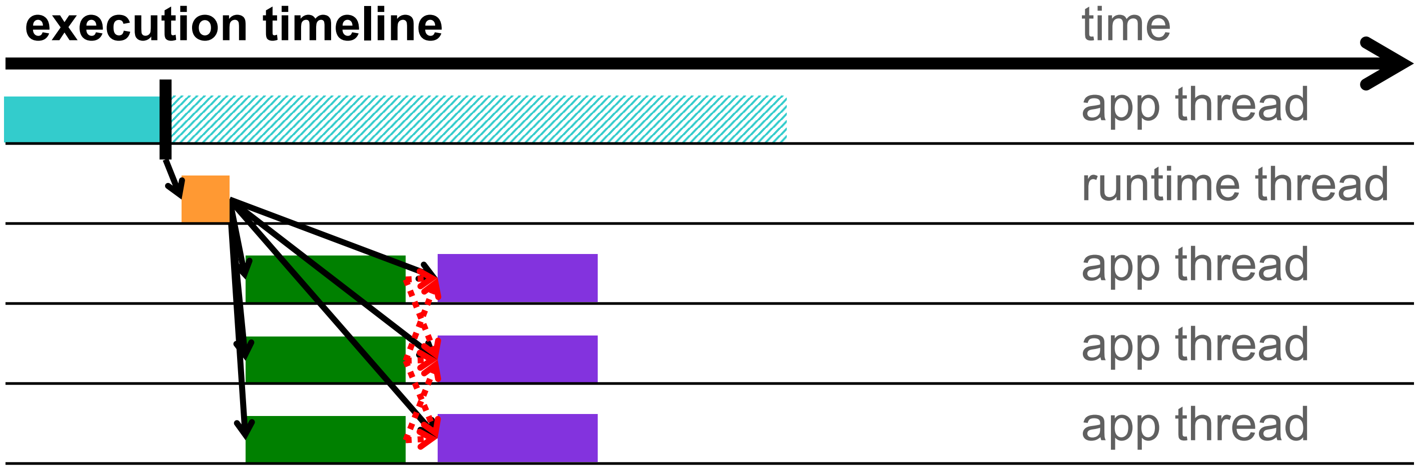
- Legion is a dynamic pipelined runtime
  - Logical dependence analysis
  - Mapping
  - Physical dependence analysis
  - Execution
- Cost is hidden as long as:
  - Throughput of runtime >= velocity of tasks
- Use static analysis to avoid work at runtime
  - Ideal case:
  - ~~Logical dependence analysis~~
  - ~~Mapping~~
  - ~~Physical dependence analysis~~
  - Execution

Today: Dynamic Dependence Analysis



```
for i = 0, 3 do
    calc_forces(…, points)
end
for i = 0, 3 do
    adv_pos_full(p_points[i])
end
```

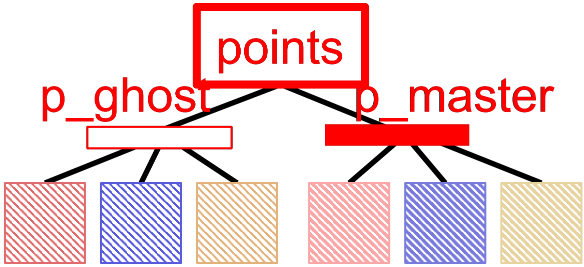
Future: Static Dependence Analysis

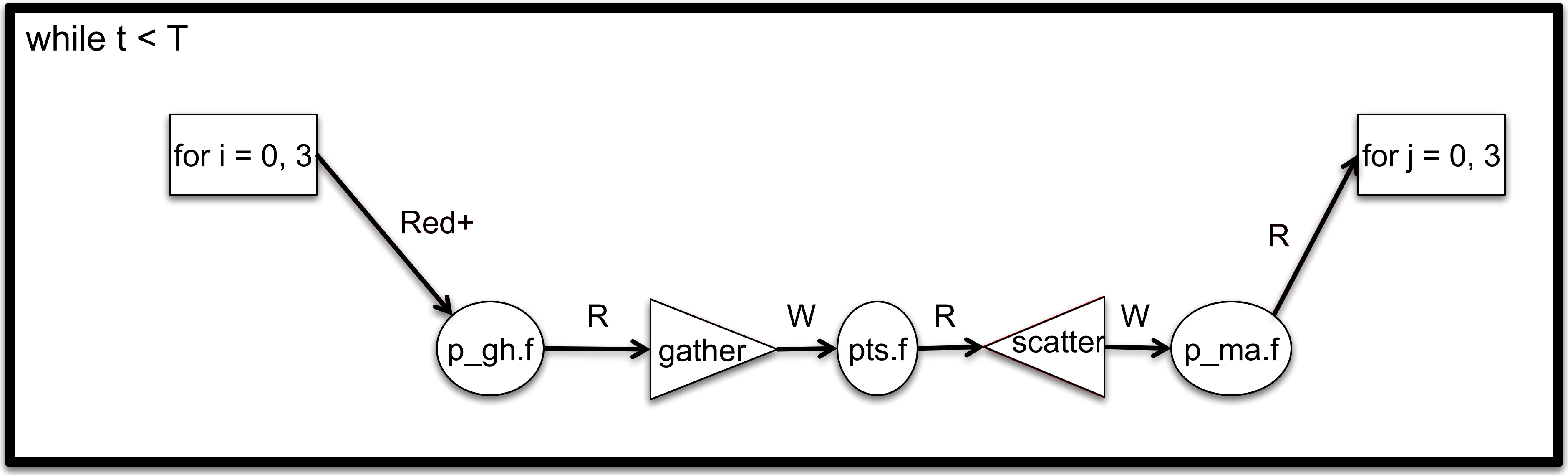


```
for i = 0, 3 do
   calc_forces(…, points)
end
for i = 0, 3 do
   adv_pos_full(p_points[i])
end
```

RDIR: Construction

```
while t < T do
    for i = 0, 3 do -- Red+(p_ghost)
        calc_forces(…, p_ghost[i]) -- Red+(p_ghost[i])
    end
    for j = 0, 3 do -- R(p_master)
        adv_pos_full(p_master[i]) -- R(p_master[i])
    end
    …
end
```





Plan for Static Analysis

- Static Dependence Analysis (RDIR)
- Static Mapping (Bishop)
- Generate Static Realm Dataflow Graph
- Runs as Operation in Legion Pipeline

Not Just Static: JIT

- Some applications don’t fit static analysis
- But some of these properties are JIT-static
- Start executing Regent compiler at runtime
    - Just another stage in the runtime