

# Unshackled Task

**Shilei Tian**<sup>1</sup>, Johannes Doerfert<sup>2</sup>, Barbara Chapman<sup>1</sup>

<sup>1</sup>Stony Brook University

<sup>2</sup>Argonne National Laboratory

# Motivation

- A `nowait` target is transformed into an OpenMP task.

```
#pragma omp target depend(D) nowait  
{ ... }
```

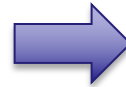


```
#pragma omp task depend(D)  
#pragma omp target  
{ ... }
```

# Motivation Cont.

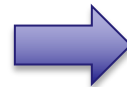
- A task region binds to the innermost enclosing parallel region.

```
#pragma omp task  
{ ... }
```



```
#pragma omp task  
{ ... }
```

```
#pragma omp task  
{ ... }  
#pragma omp task  
{ ... }
```



```
#pragma omp task  
{ ... }  
#pragma omp task  
{ ... }
```

```
#pragma omp target teams nowait  
{ ... }  
#pragma omp target teams nowait  
{ ... }
```



```
#pragma omp target teams nowait  
{ ... }  
#pragma omp target teams nowait  
{ ... }
```

# Motivation Cont.

- A task region binds to the innermost enclosing parallel region.

```
#pragma omp parallel master
{
  #pragma omp target depend(D1) nowait
    { /* kernel 1 */ }
  #pragma omp target depend(D2) nowait
    { /* kernel 2 */ }
}
```

# Motivation Cont.

- A task region binds to the innermost enclosing parallel region.

```
#pragma omp parallel master  
{  
#pragma omp target depend(D1) nowait  
    { /* kernel 1 */ }  
#pragma omp target depend(D2) nowait  
    { /* kernel 2 */ }  
}
```

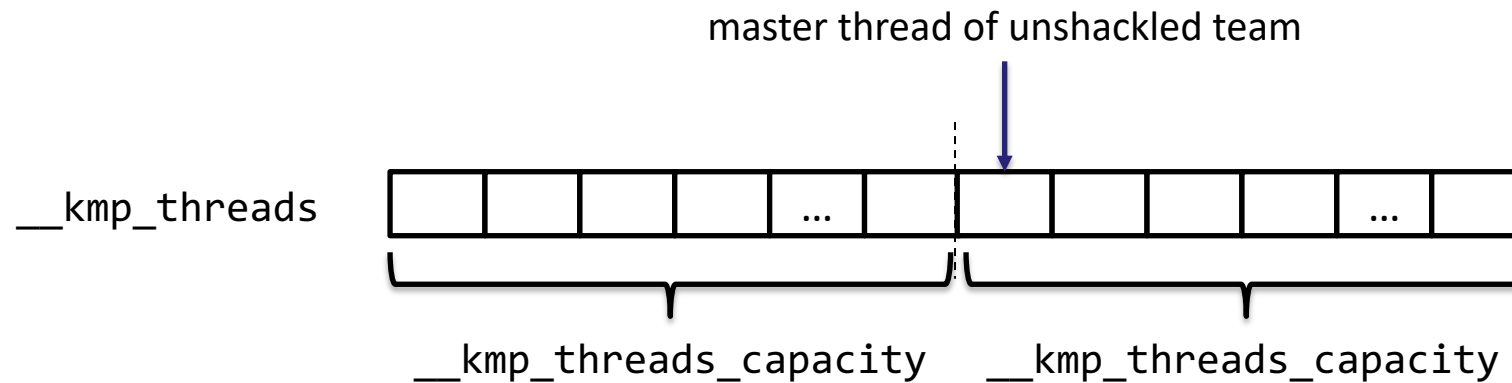
# Implementation - First Thought

- Create several threads. Let them execute a function that can fetch tasks and run tasks.
- Could work with existing dependency mechanism.
- It turns out I was almost writing a new `__kmpc_fork_call`!

# Implementation - Introduction

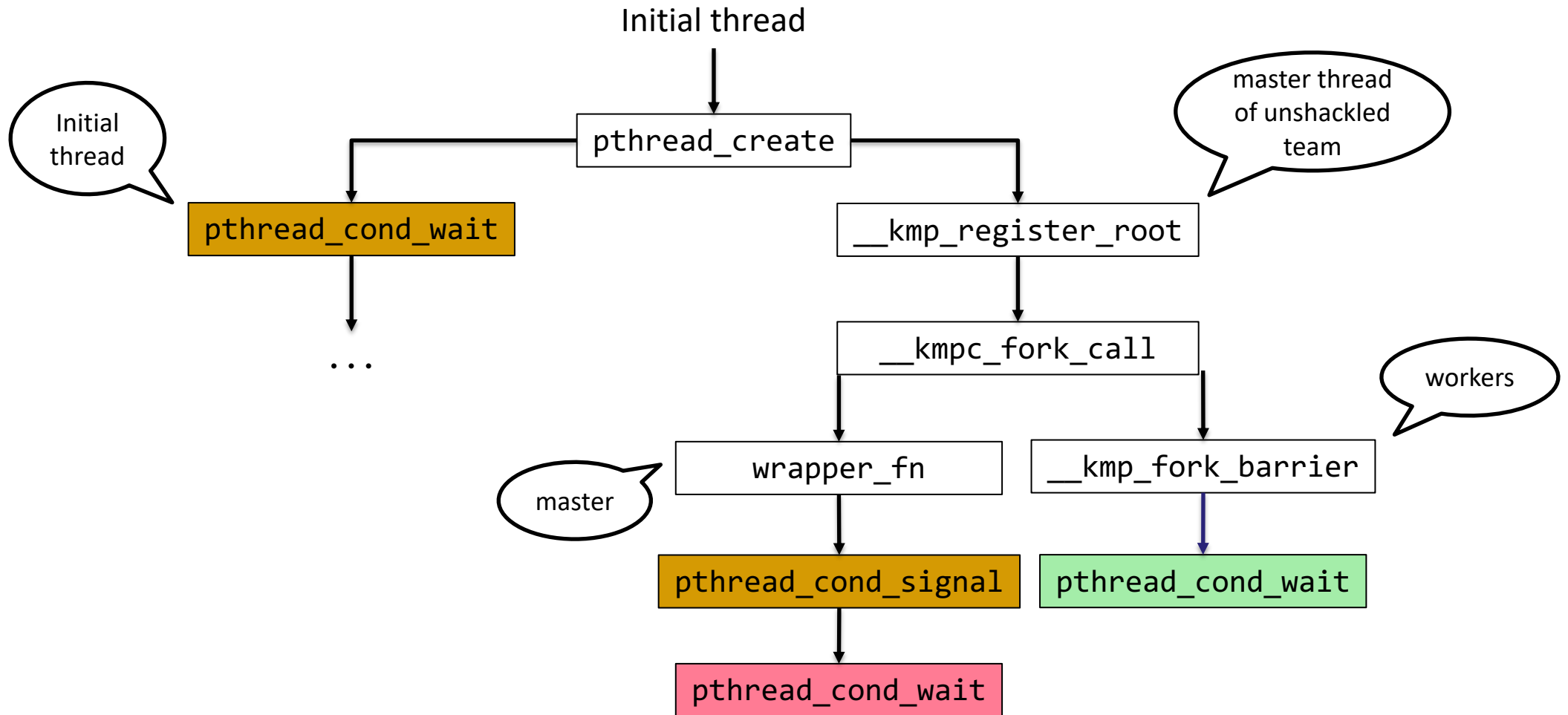
- Goal: Implement required features meanwhile reusing as much existing code as possible
- Create a solitary outer-most parallel region (unshackled team)
  - It should not impact and be impacted by regular parallel region
  - Any unshackled task will be pushed to the master thread of unshackled team

# Implementation - Initialization

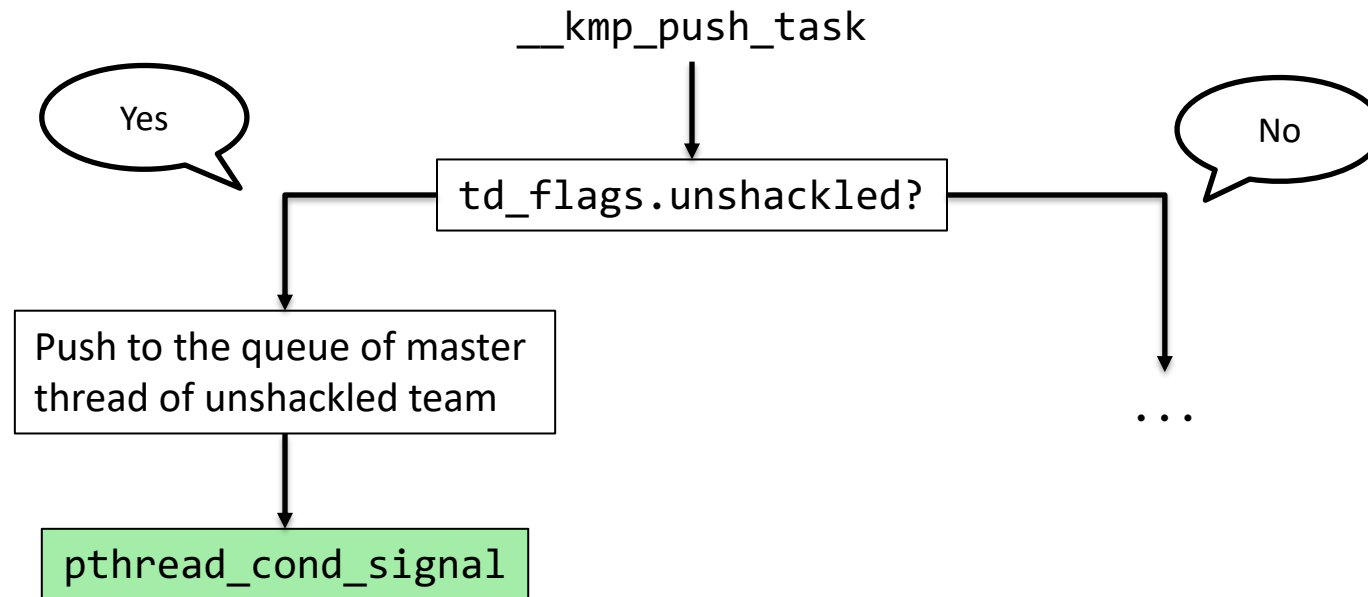




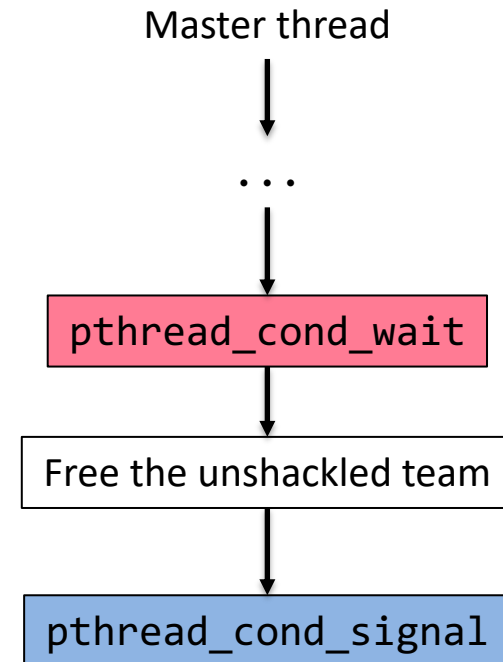
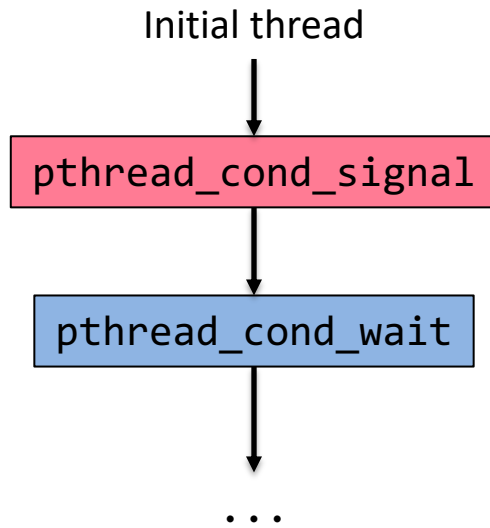
# Implementation - Initialization Cont.



# Implementation - Encountering A Task



# Implementation - Deinitialization



# Open Questions

- What features should unshackled task support?
  - Affinity, priority, etc.
- Synchronization?
- ...

# THANKS!