

# Improving STMs' performance via speculative execution

Hugo Rito and João Cachopo

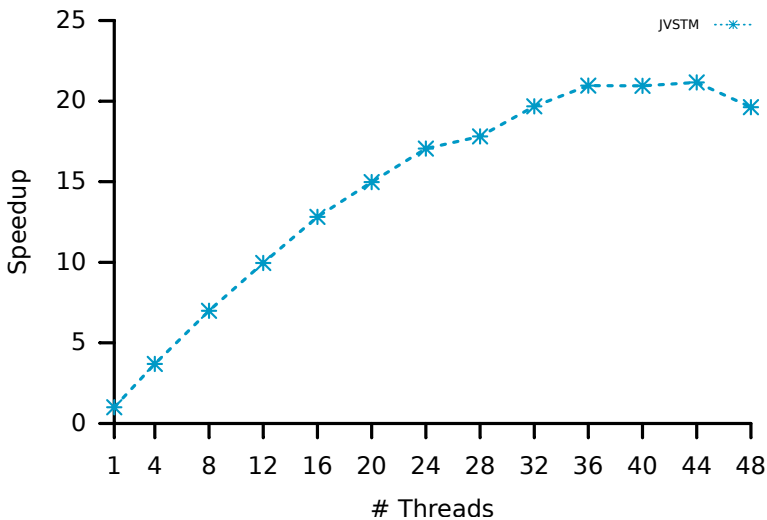
WTM 2014  
INESC-ID Lisboa

April 13th, 2014

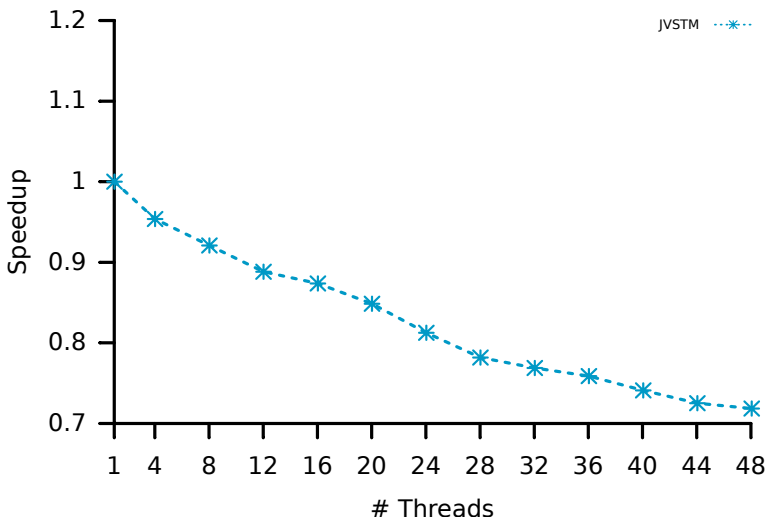
# Software Transactional Memory



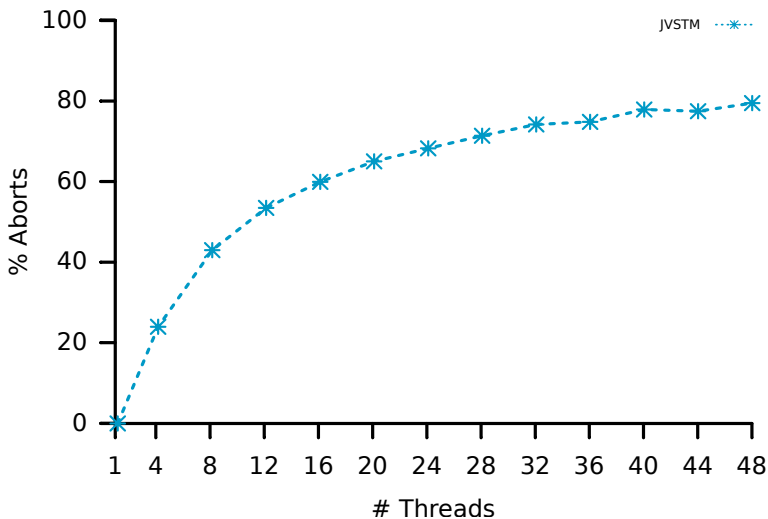
## STMBench7: Low-contention



## STMBench7: High-contention



## STM Bench7: High-contention

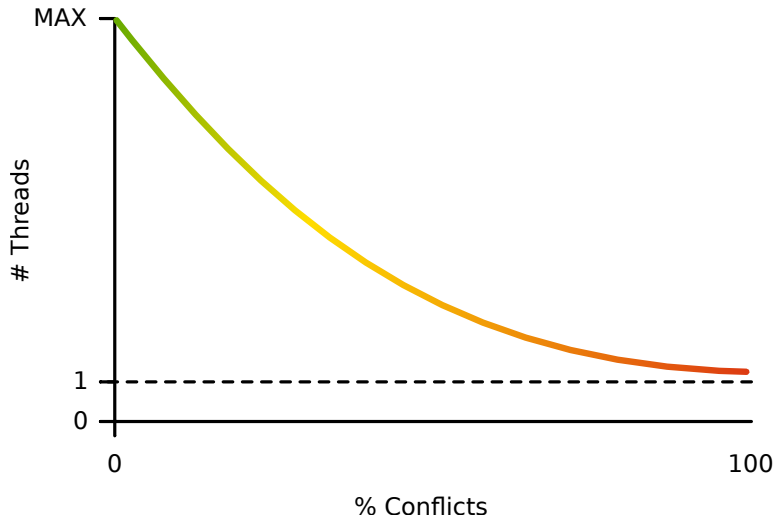


## Transaction scheduling

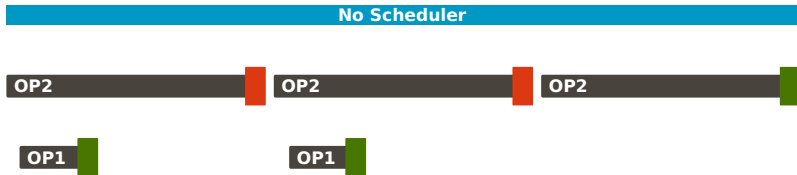
# Transaction Scheduler

- Reduce conflicts
- Monitor contention
- Serialize transactions

# Transaction scheduling

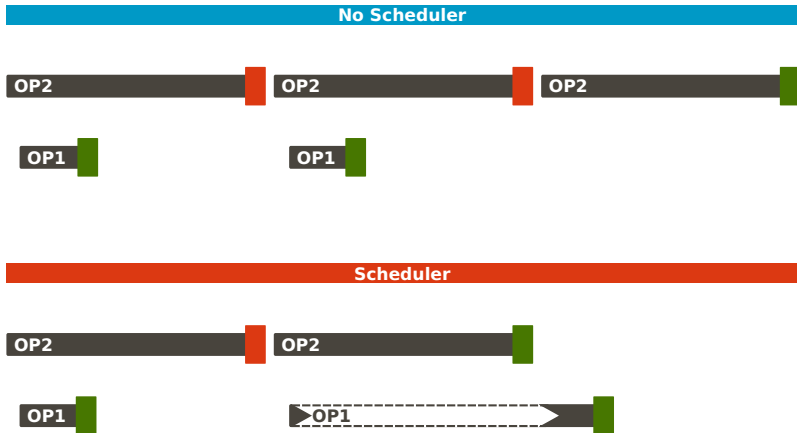


# Transaction scheduling

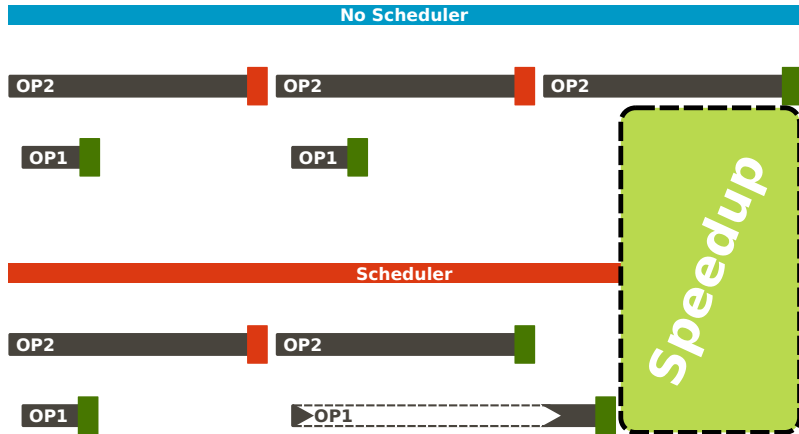




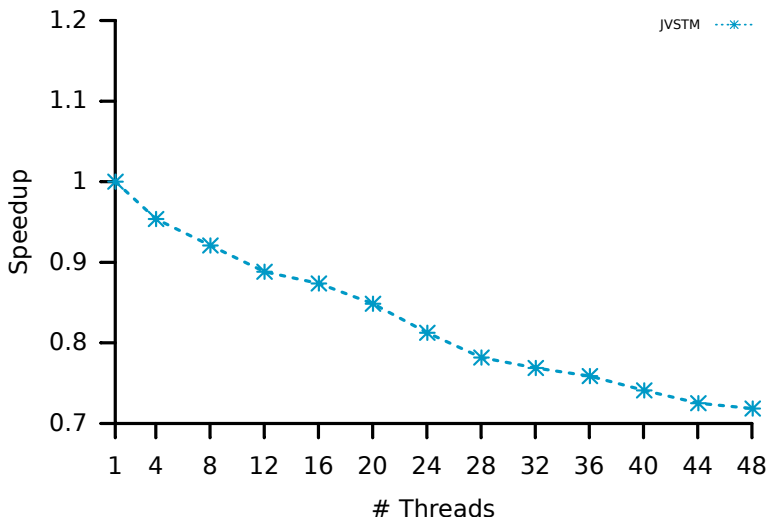
# Transaction scheduling



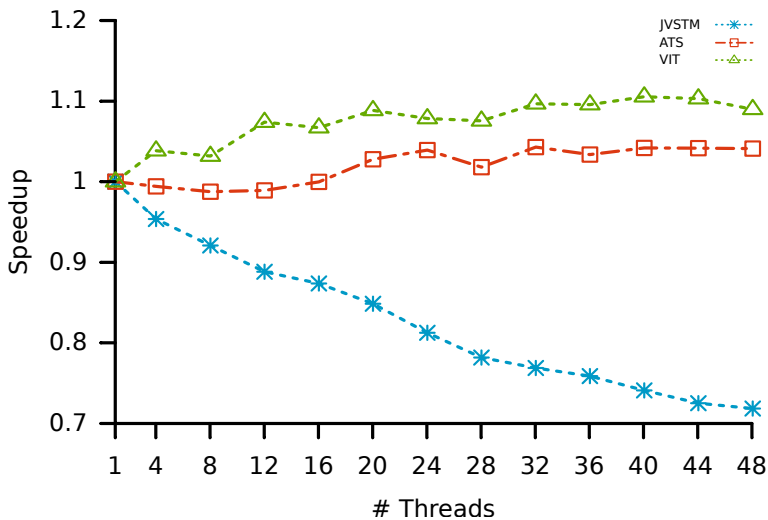
# Transaction scheduling



## STMBench7: High-contention



## STMBench7: High-contention

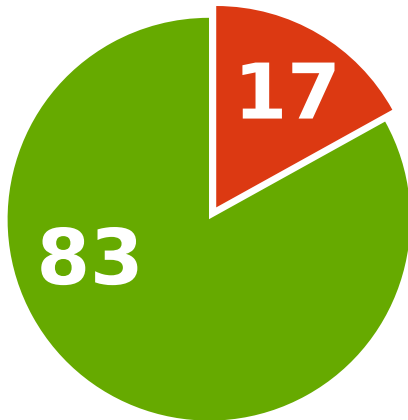


**Execution** vs **Wait** time: 1 thread

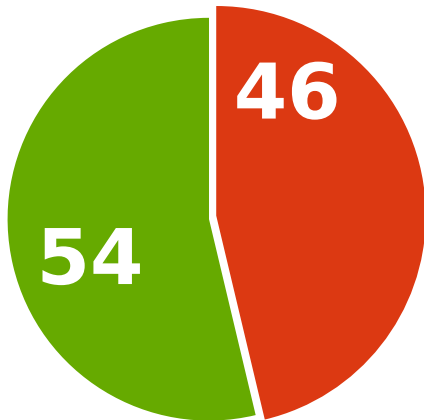


**100**

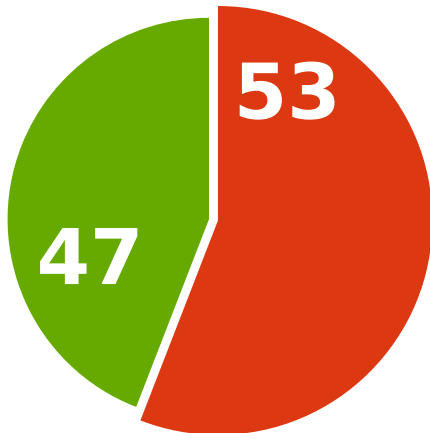
**Execution** vs **Wait** time: 16 threads



**Execution** vs **Wait** time: 36 threads



**Execution** vs **Wait** time: 48 threads



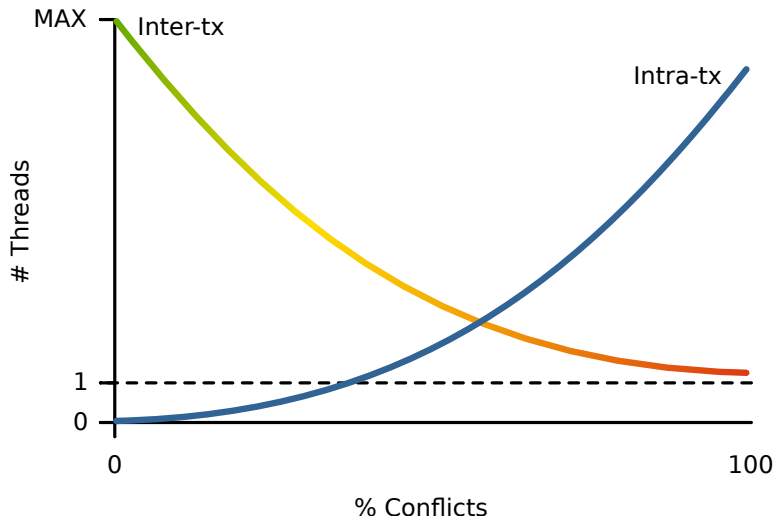


## Improved scheduling

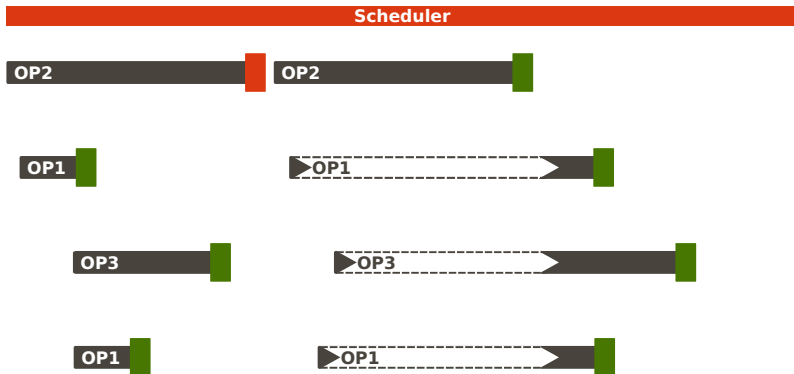
# Explore Intra-tx Parallelism

- Large transactions
- Collect execution info
- Help execute

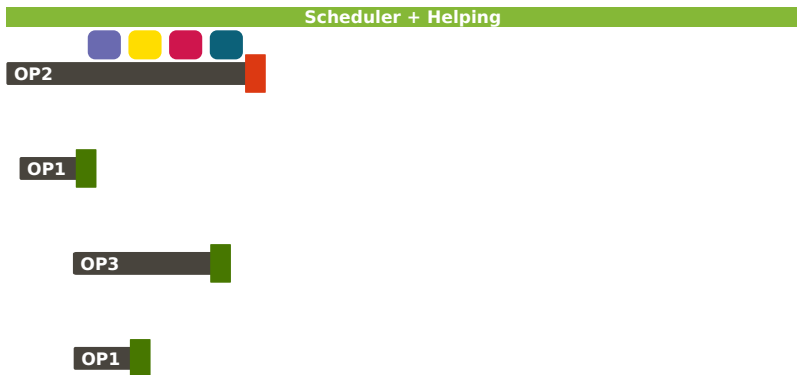
# Improved scheduling



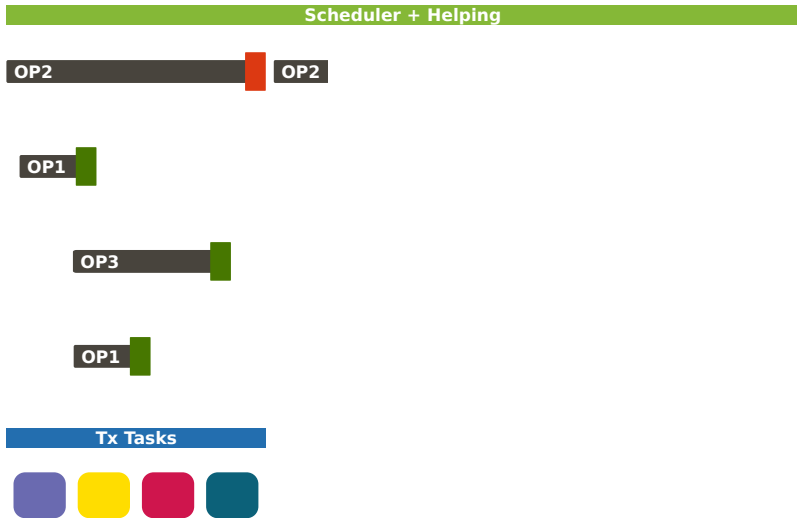
# New scheduling approach



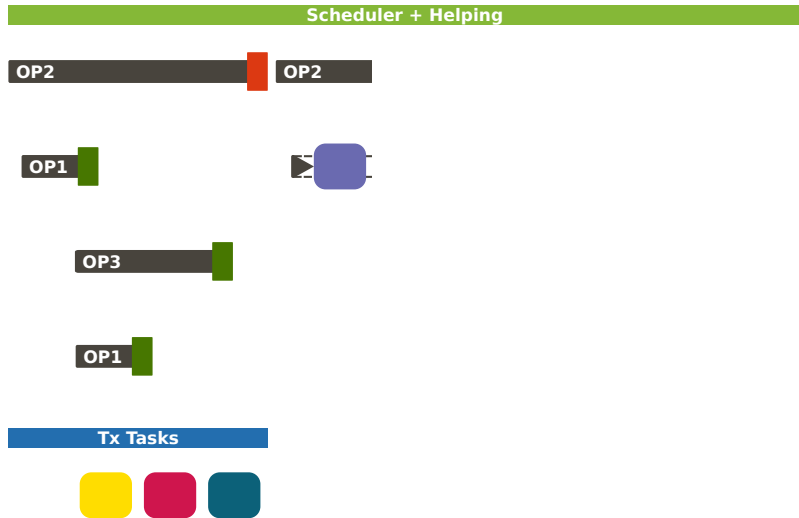
# New scheduling approach



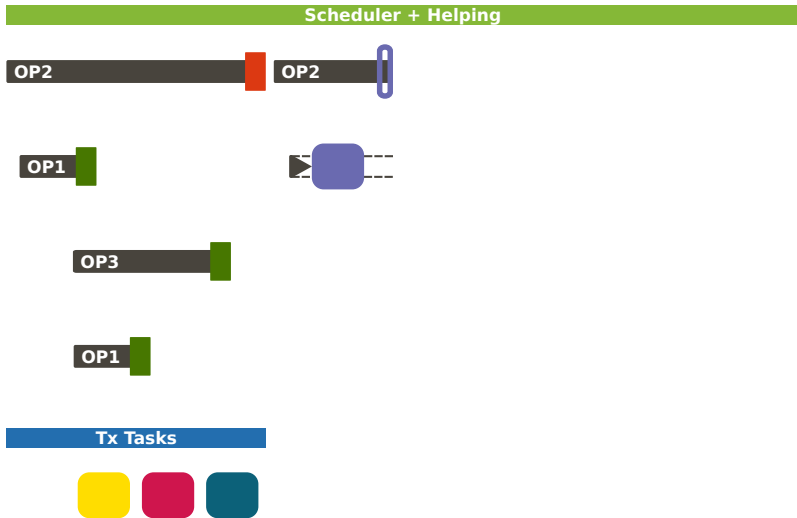
# New scheduling approach



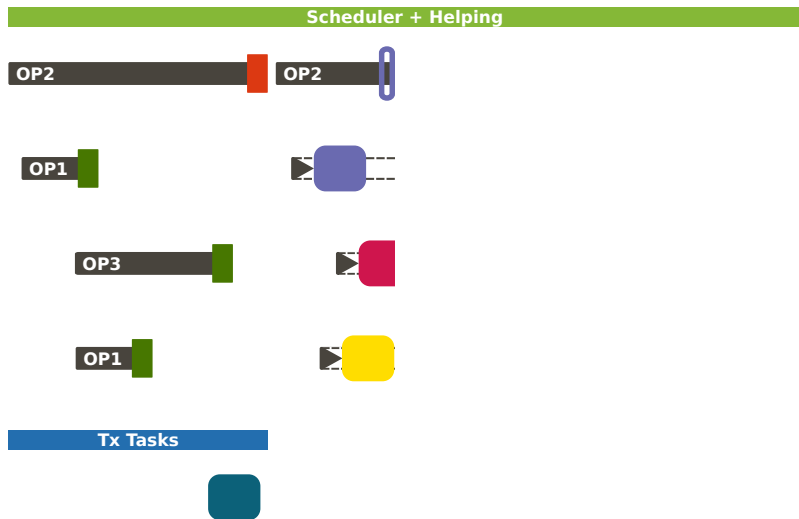
# New scheduling approach



# New scheduling approach

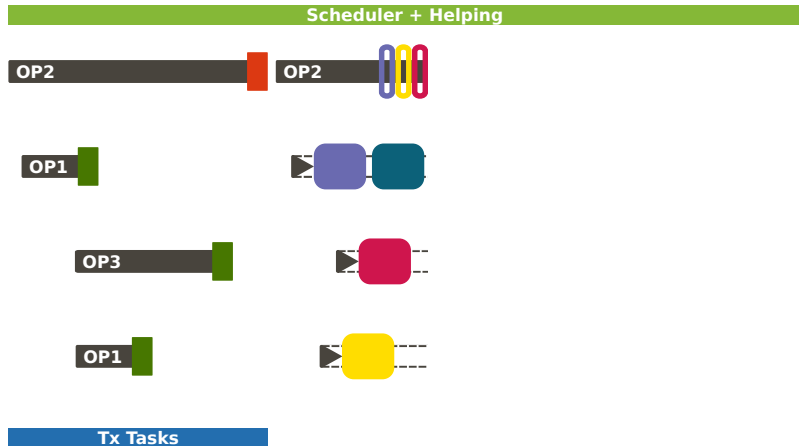


# New scheduling approach

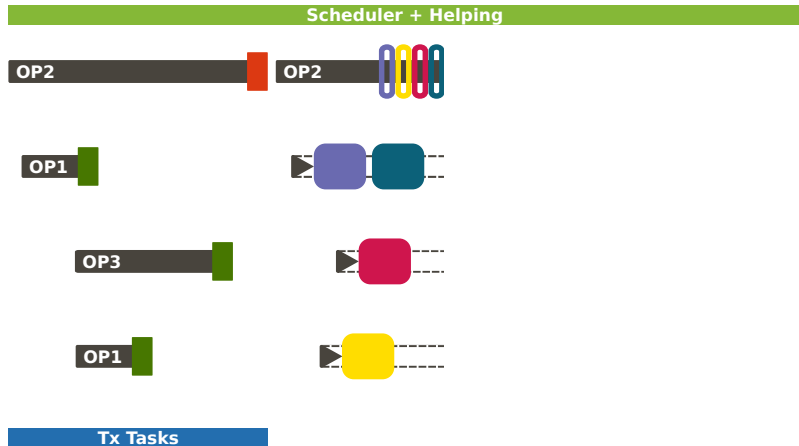




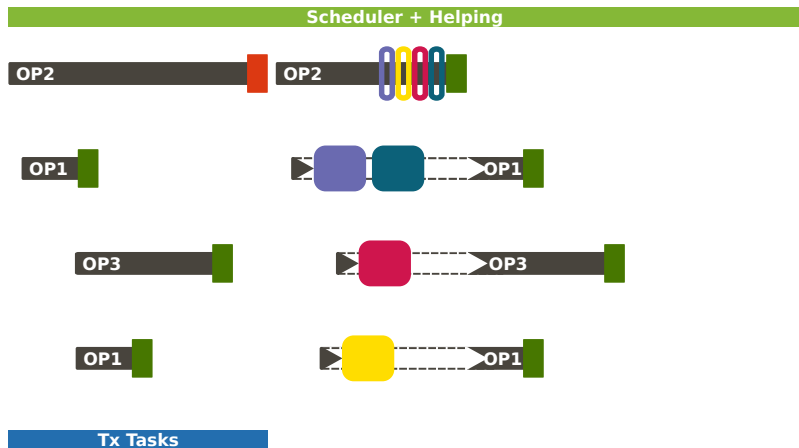
# New scheduling approach



# New scheduling approach



# New scheduling approach



# Tx tasks



■ The Good...

# Tx tasks



■ Read-only

# Tx tasks



■ Callable

# Tx tasks



- Result
- Read-set

# Tx tasks



■ The Bad...



# Tx tasks



- RW no dependencies

# Tx tasks



■ Callable

# Tx tasks



- Result
- Read-set
- Write-set

# Tx tasks



■ The Ugly...

# Tx tasks



- RW dependencies

## Tx tasks



- Callable
- Uncommitted reads

# Tx tasks



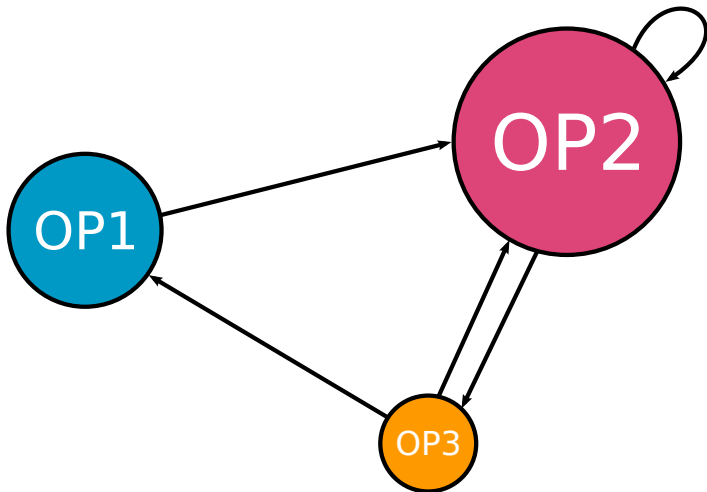
- Result
- Read-set
- Write-set

Evaluation

# MicroBench



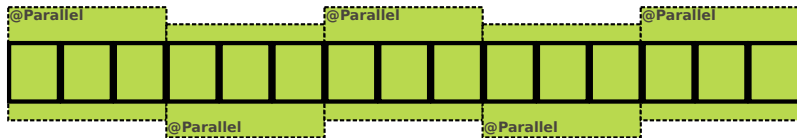
# Micro-benchmark: Operations



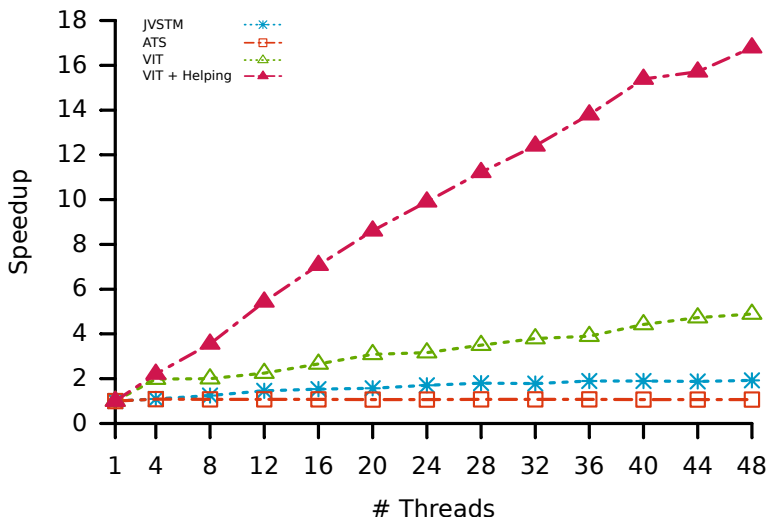
# Micro-benchmark: Data structure



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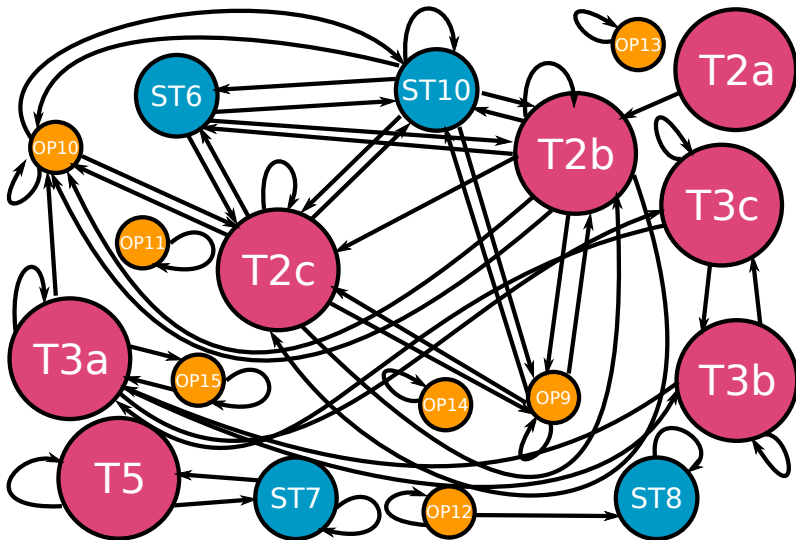
## Micro-benchmark



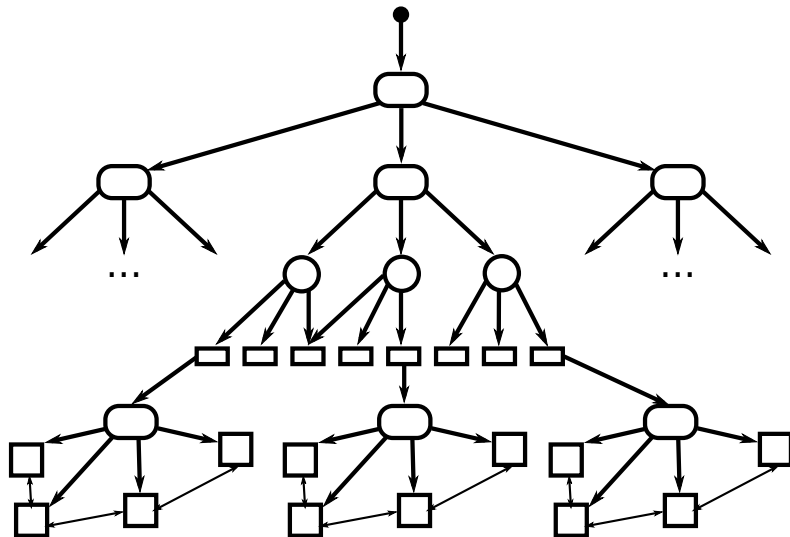
# Evaluation

## **STMBench7**

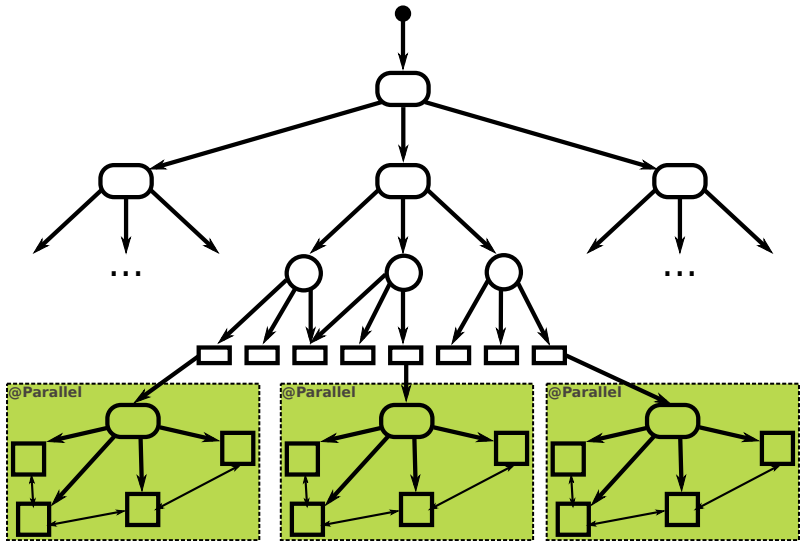
## STMBench7: Operations



## STMBench7: Data structure

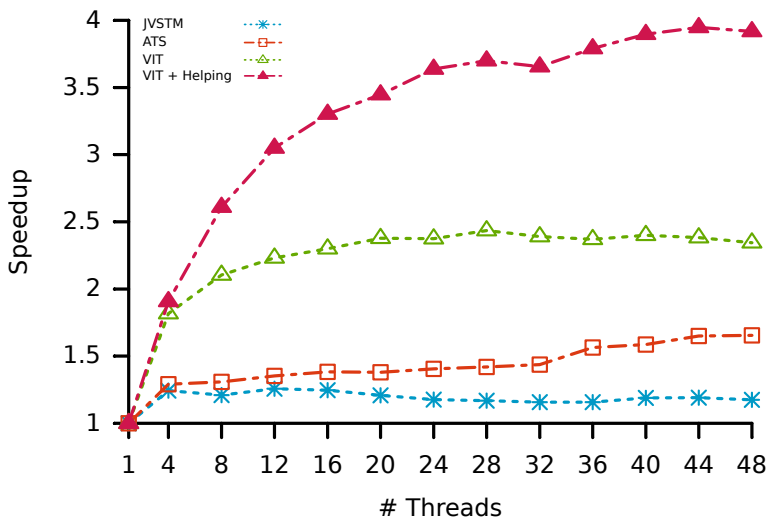


## STMBench7: Data structure

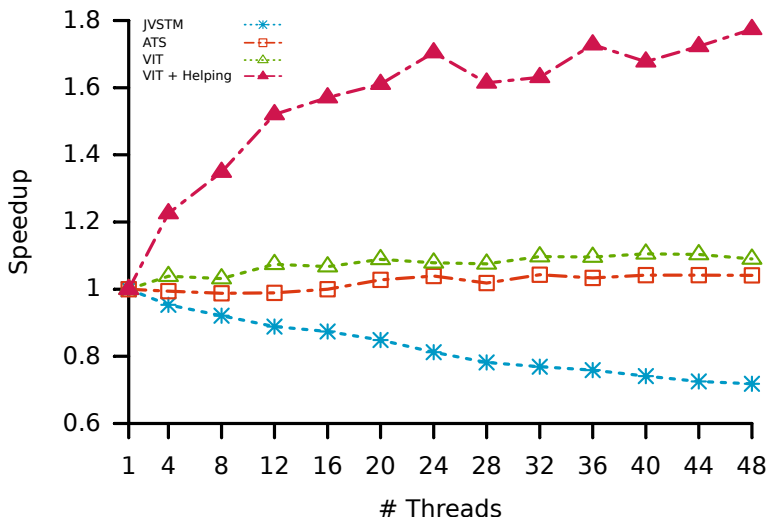




## STMBench7: 90% RO | 10% RW



## STMBench7: 10% RO | 90% RW



## Future work

# Future Challenges

- More schedulers
- Task identification
- Transactification

**Thank you,**

**Q U E S T I O N S**