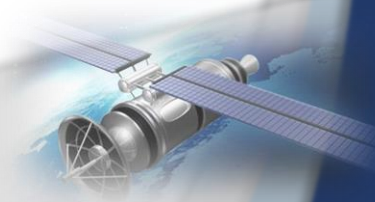


Reaching into space
TOGETHER

METHODOLOGY AND SEGMENTATION ANALYSIS FOR SIMULATOR PARALLELISATION

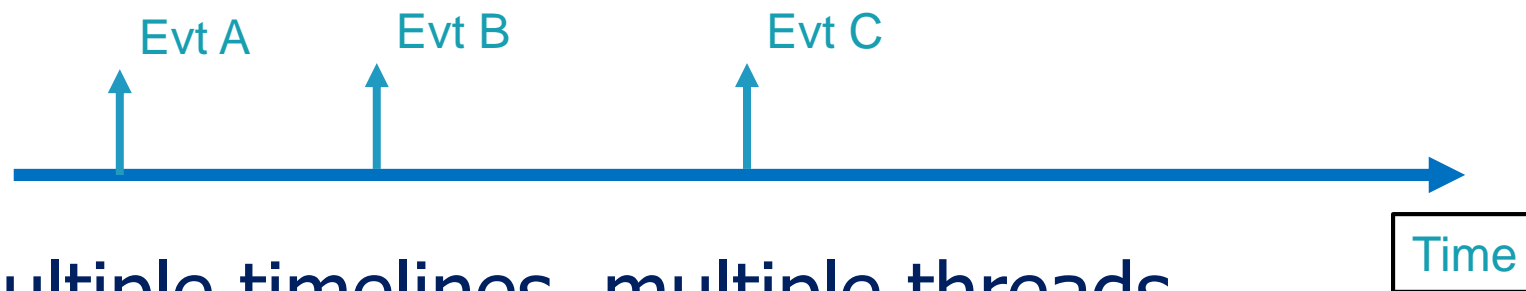
Current situation

- Multi-core processors are the norm
- Single threaded simulator
- Trade-offs on simulator representativity
 - Accuracy requires computational power

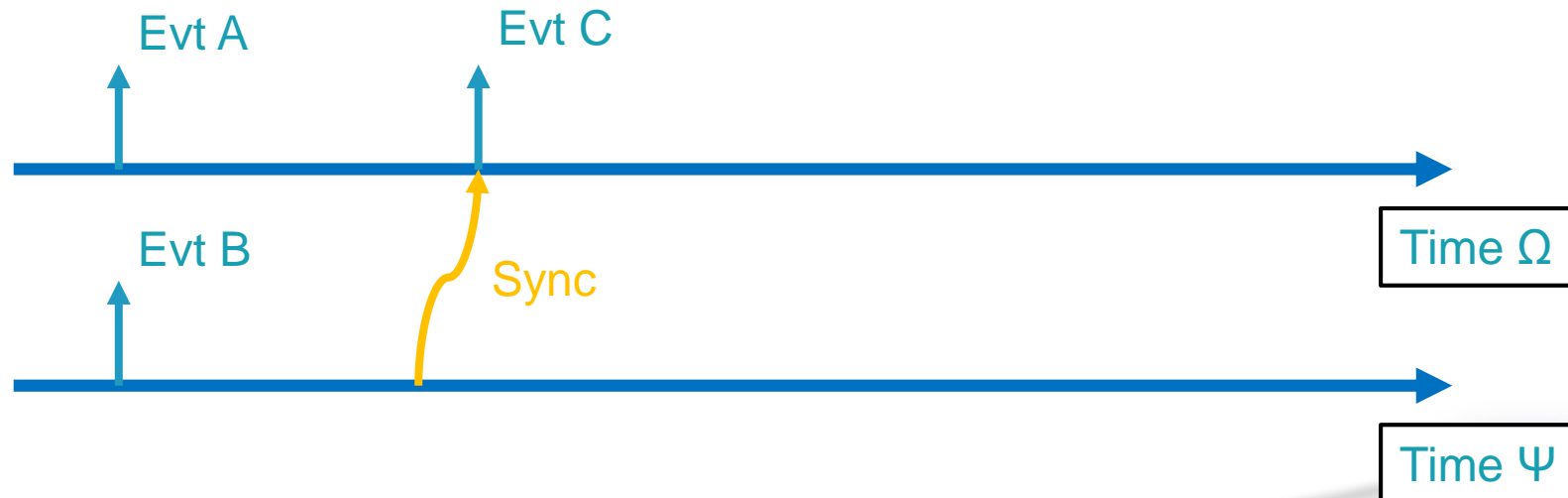


Discret event simulator

- Single timeline, single thread



- Multiple timelines, multiple threads



Problems

- Hundreds of event types
- Almost impossible to segmented by hand
- Conserve single thread behavior
 - Same date during multi-threads interactions
- No data races



Our goals

- Minimize user input for parallelisation
- Automatic segmentation of simulator
- Minimize number of synchronisations
- Enhance the documentation



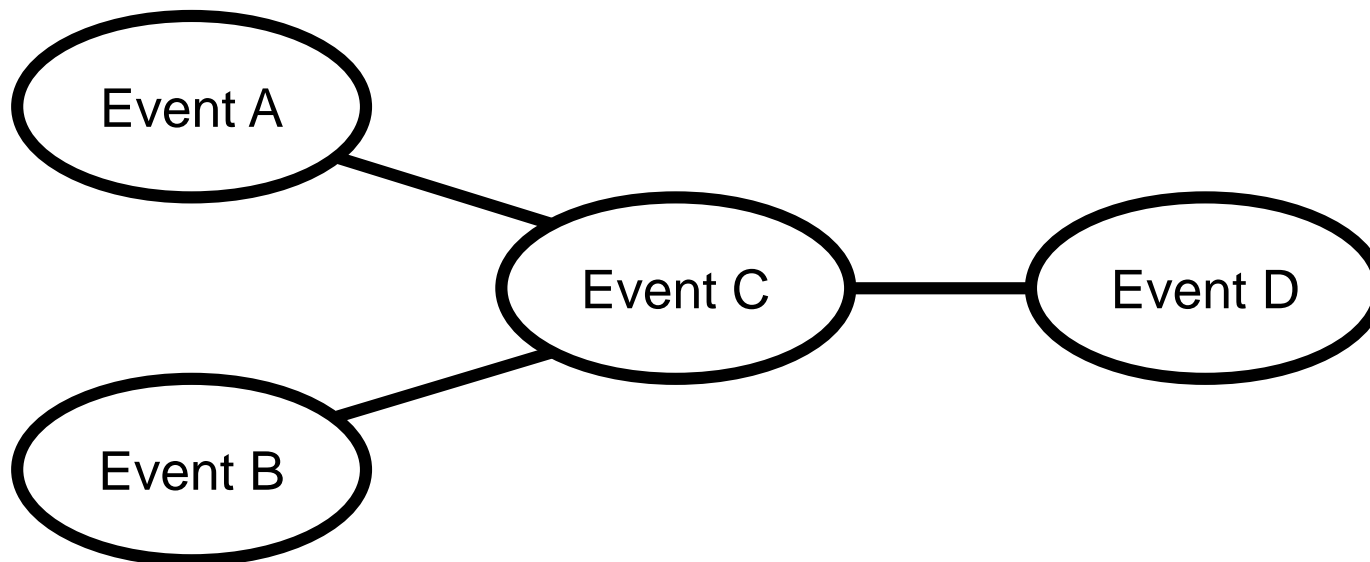
Relevant data

- SMP model definitions
 - Catalog and schedule files
- Event logger and statistics
 - Obtain by a nominal run



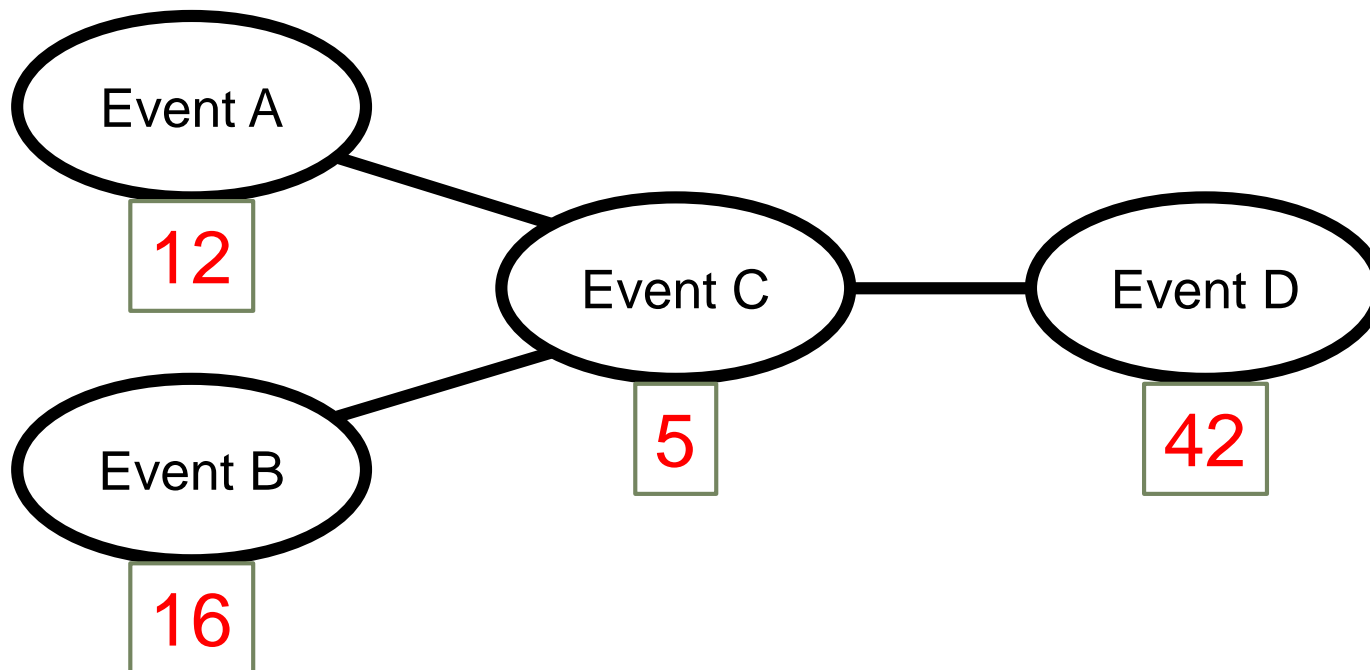
Graph representation

SMP model definitions for topology



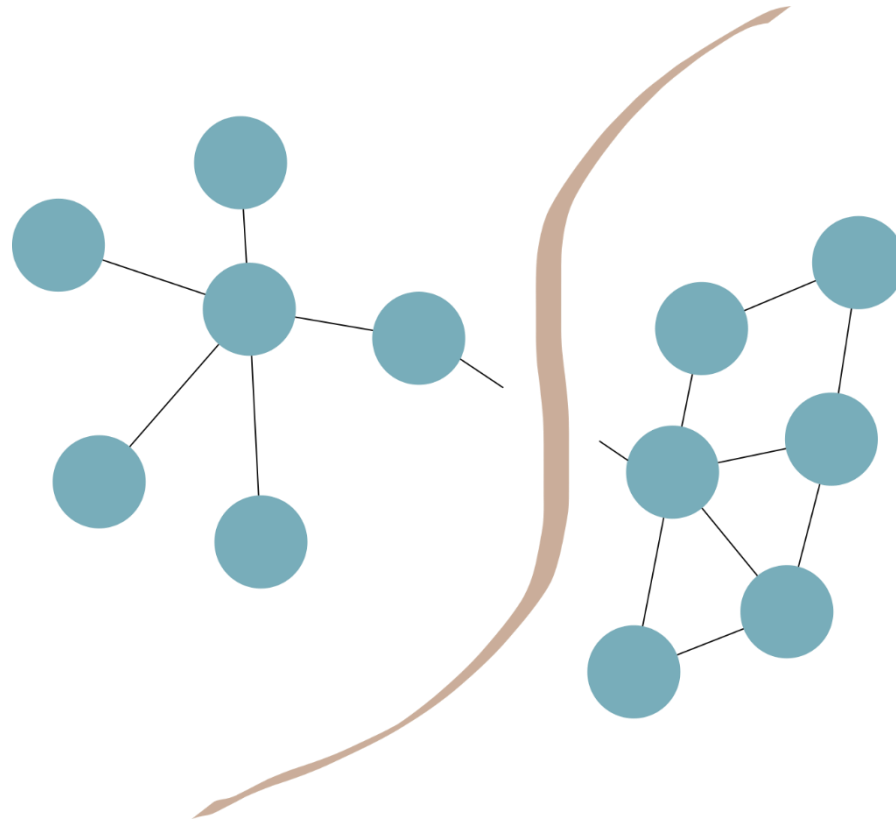
Graph representation

Event log and statistics for weights



Graph partitionning

Eg : METIS, Scotch

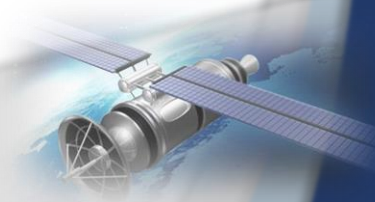


Already used in lot of physical simulations



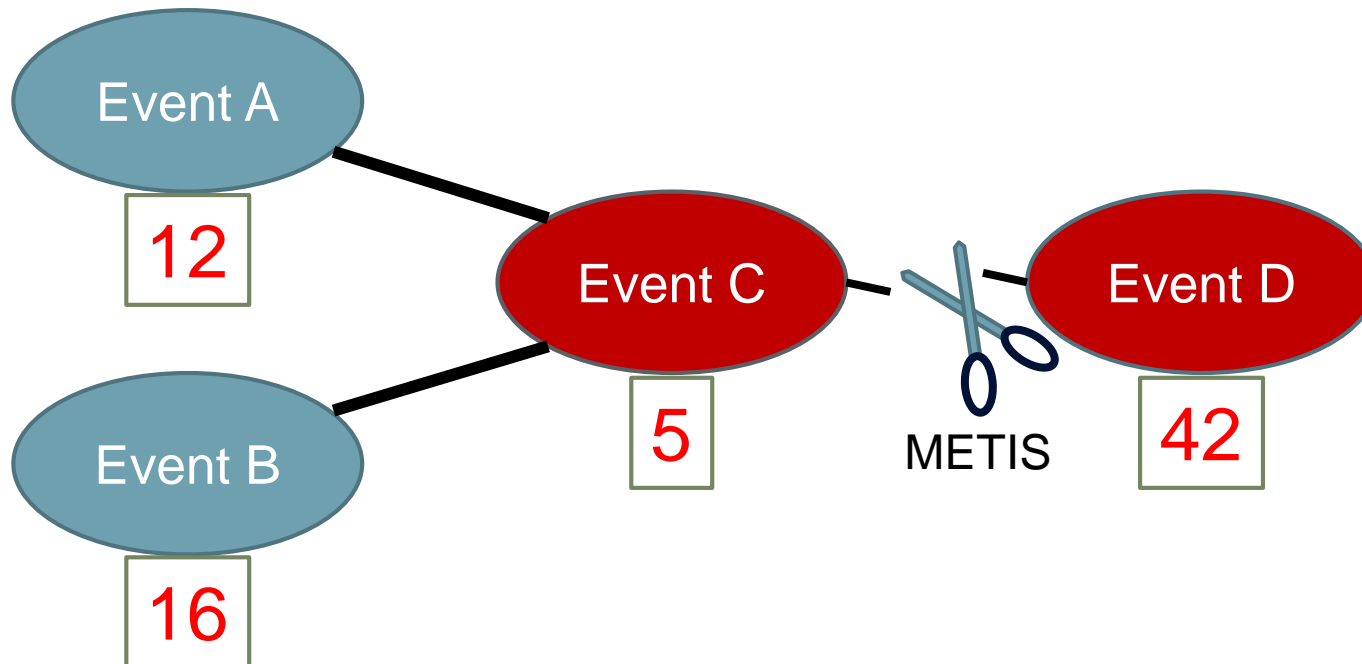
Synchronisation

- All links have different properties
 - Event/Interface link : hard to cut
 - Field link : ideal for synchronisation
- Only cut field links
 - Barrier for updating input values



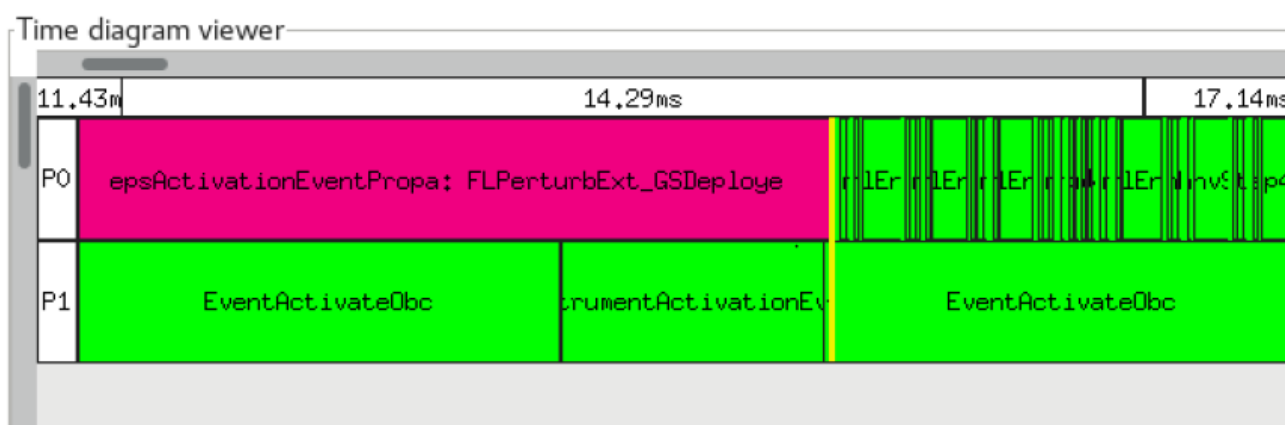
Synchronisation

Only Event C and Event D need sync



Speed-up estimation

- Replay events from logs and partitionned graph
- Simulate multithread execution

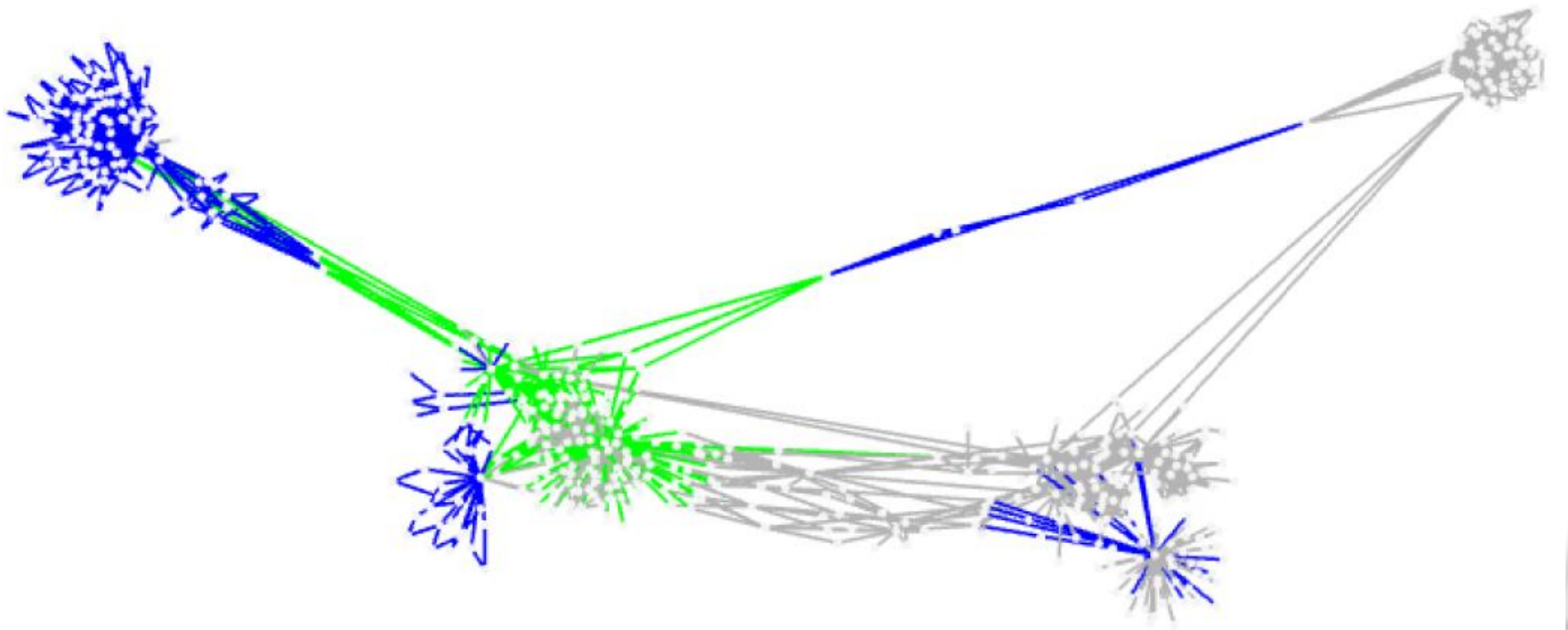


- Estimate saved time

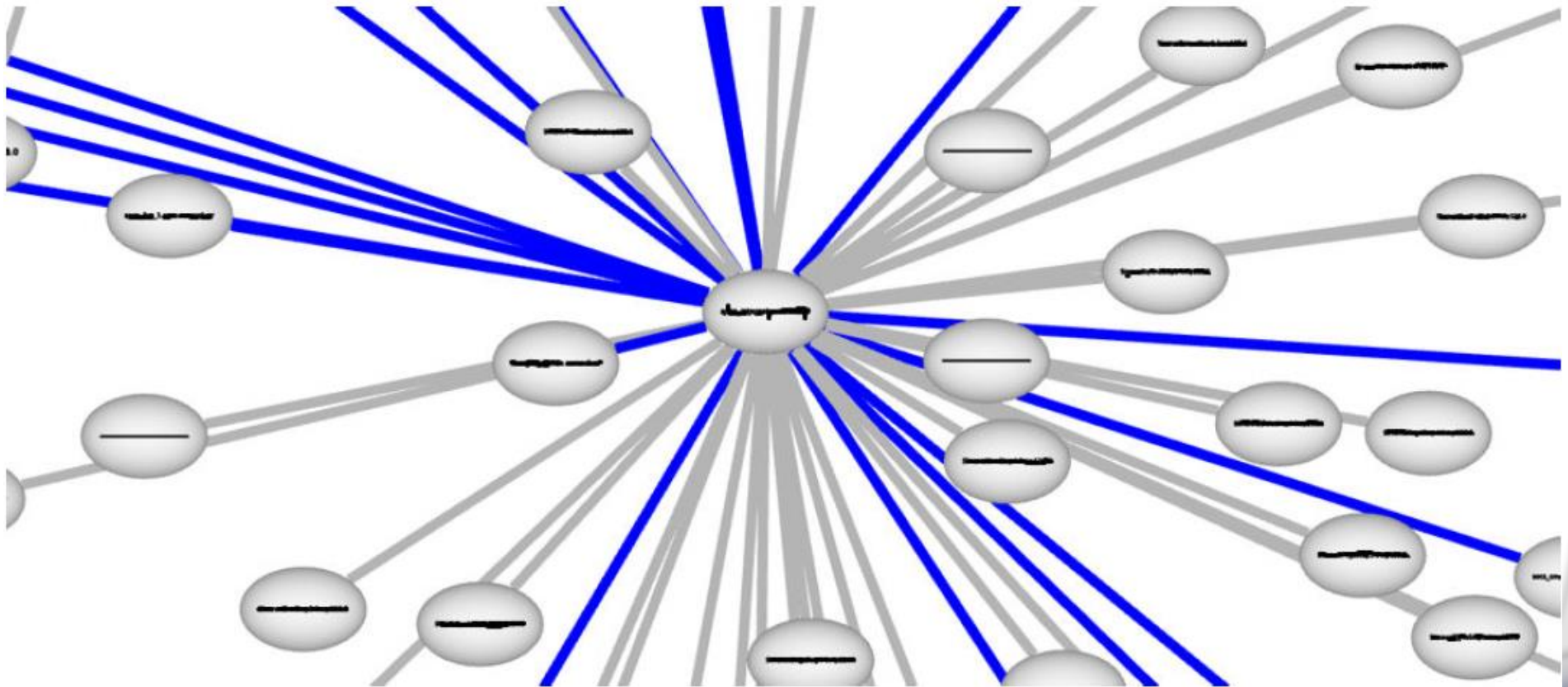


Documentation

Visualisation software : Graphviz, Tulip ...



Documentation



Limitations

- Don't consider frequency
- Implicit event order
- Possible global variable
 - File descriptors
 - I/O in general
- Non-SMP links



Conclusion

- Graph representation suitable for parallelism
- Easy to use with immediate feedback
- Global view of simulator



Perspective

- Try this method on real simulator environment
- Improve graph visualisation
- Find solutions for other SMP links



The end...

Thank you for your attention

Any questions ?

