



XXII
TwentySecond
Annual

engineering • design
expo 2015

University of Idaho
College of Engineering

Introduction:

Unicon is a very high level programming language and The Unicon Development Team is tasked with enhancing this signature language of the University of Idaho's Computer Science department.

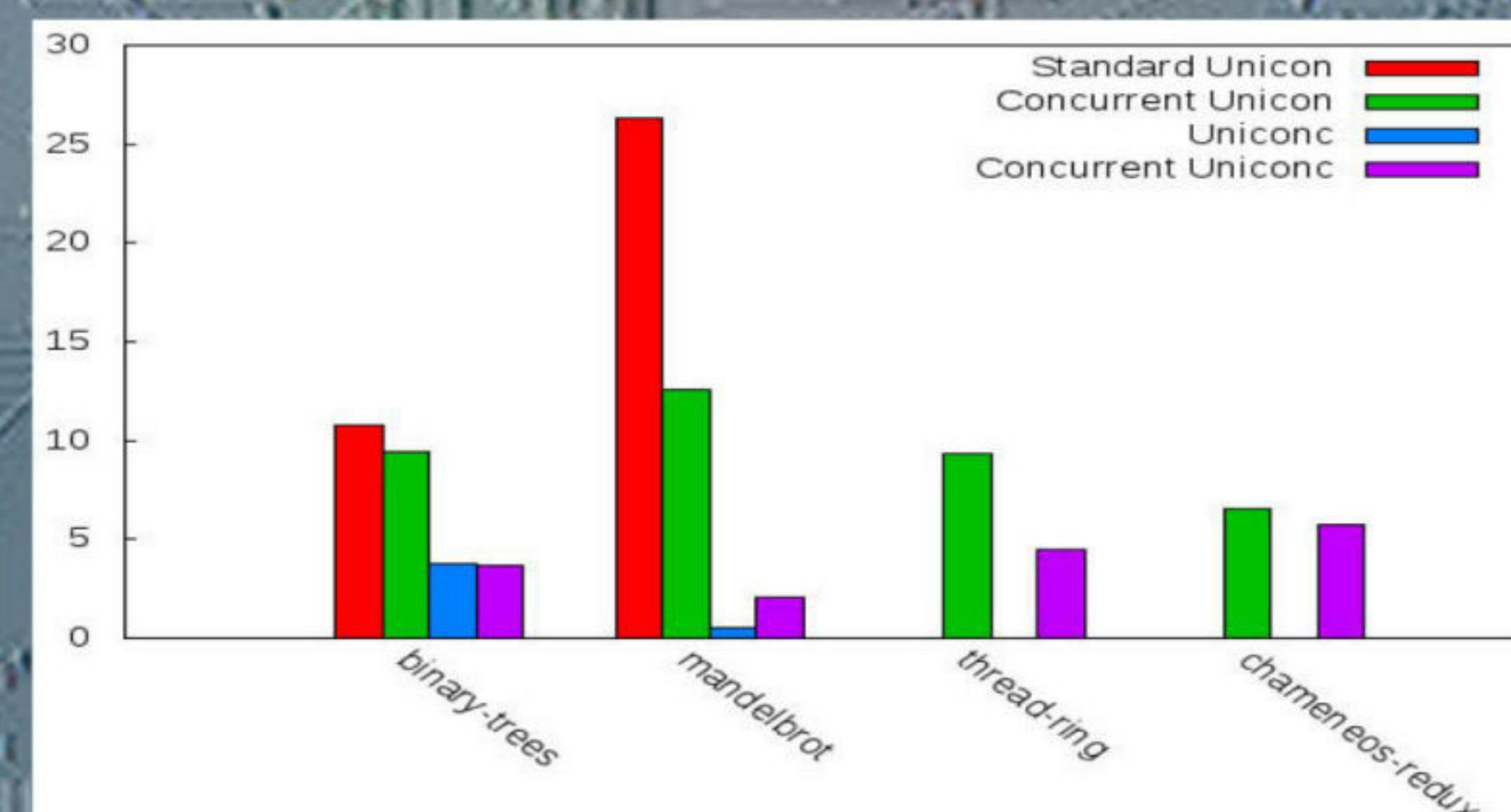
Objectives:

The Unicon Development Team's objectives are:

- Enhance the Unicon IDE to provide context-sensitive help in the form of hyperlinks from a procedure or method call to its code body or reference documentation.
- Extend Unicon's optimizing compiler to support concurrency features built using pthreads.

Unicon Development

unicon.org



Performance ratios reflect averages of three runs. Bars omitted where no timing data is applicable.

```

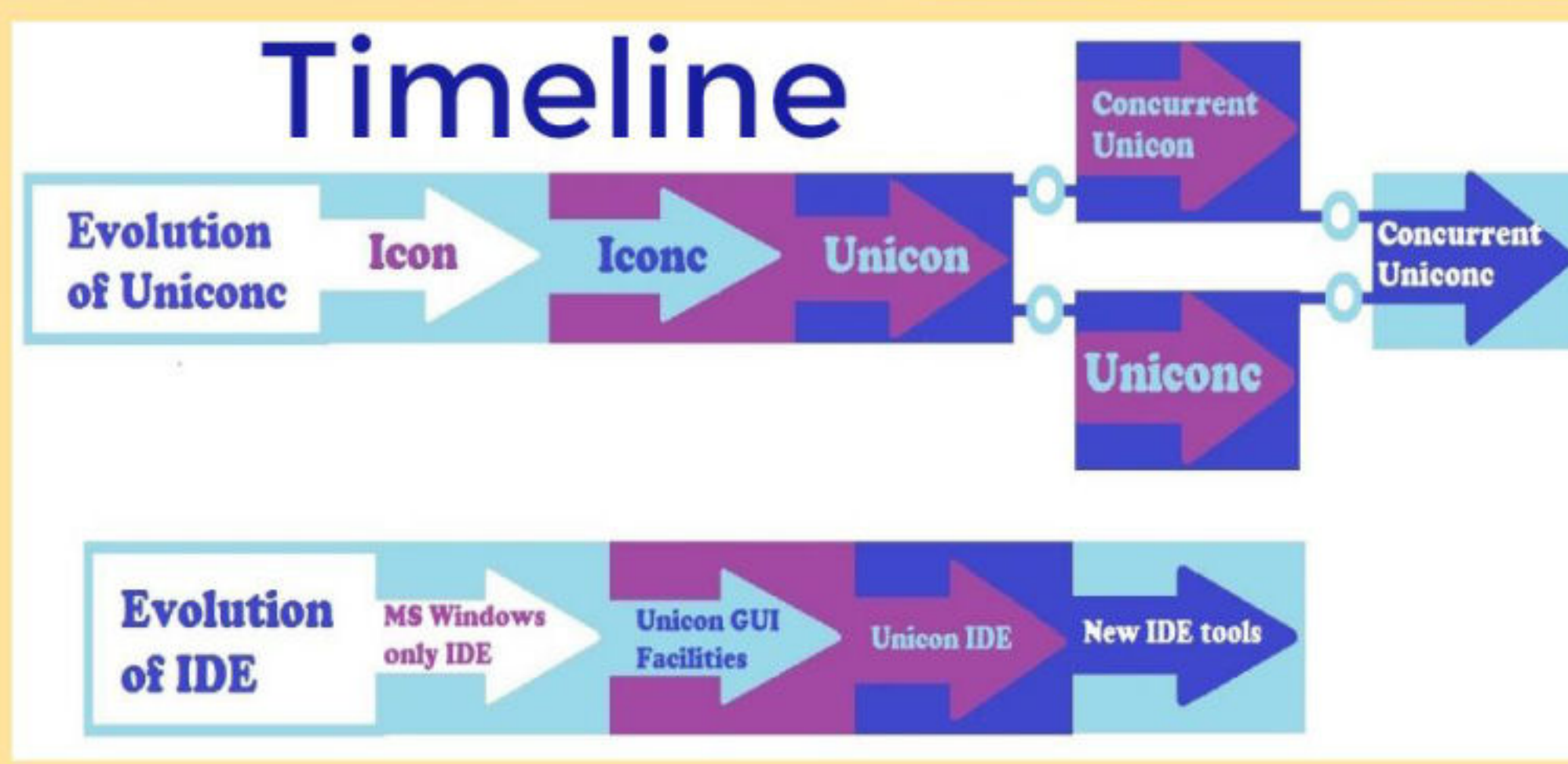
Unicon IDE
File View Config Edit Insert Compile Run Project Help
scratch thread-ring.im
50
51 procedure threadfun3(number)
52   next_thread := <<@ # wait for &
53   while ((0 < <<@) - 1) @>> next_thread
54   write(output, number)
55   @>> &main
56 end
57
58 procedure run_threadring(argv)
59   if argv[2] then
60     if numeric(argv[2]) = 2 then
61       run_threadring_new2(argv)
62     else
63       run_threadring_old(argv)
64   end
65 else
66   run_threadring_new(argv)
67 end

Unicon IDE
File View Config Edit Insert Compile Run Project Help
scratch thread-ring.im
82 procedure run_threadring_new2(argv)
83   n := argv[1]
84   first_thread := prev_thread := spawn(
85     every number = 2 to 503 do {
86       new_thread := spawn(create threadfun
87         new_thread @>> prev_thread
88         prev_thread := new_thread
89     }
90   first_thread @>> new_thread
91   n @>> first_thread
92   <<@
93 end
94
95 $ifdef MAIN
96 procedure main(argv)
97   output := &output
98   run_threadring(argv)
99 end
  
```

Results:

The faster Uniconc gets, the higher the proportional cost of concurrency mutexes and locking is. Longer running and significantly more parallel code may be required in order to see concurrent speedups that outweigh the costs of synchronizing threads.

Timeline



Unicon Development Team:

Serendel MacPherson
Ian Westrope
Shea Newton

Methods:

IDE

- Recognize name under cursor.
- Look up name in table.
- Move cursor to name definition, or for built-ins, to its reference documentation.

Uniconc

- Expose concurrent tools to Uniconc code generator.
- Modify compiler's lexical analyzer and compiler for new thread syntax.
- Make generated code thread-safe.
- Move runtime system globals into per-thread states.

Discussion:

Both objectives can report primary goals have been achieved.

IDE

Future work may include features such as code refactoring tools or "Find Usage" capabilities.

Uniconc

Future work may include porting graphics or event monitoring to Uniconc. Additionally concurrent implementation may be further optimized.