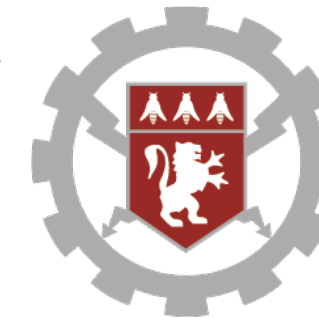
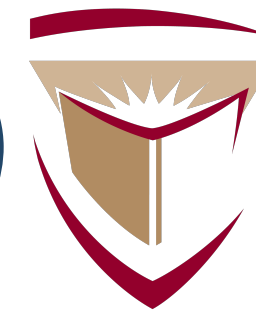


# SPECS: A new open-source photonic circuit simulator built for speed and reliability



try it out !

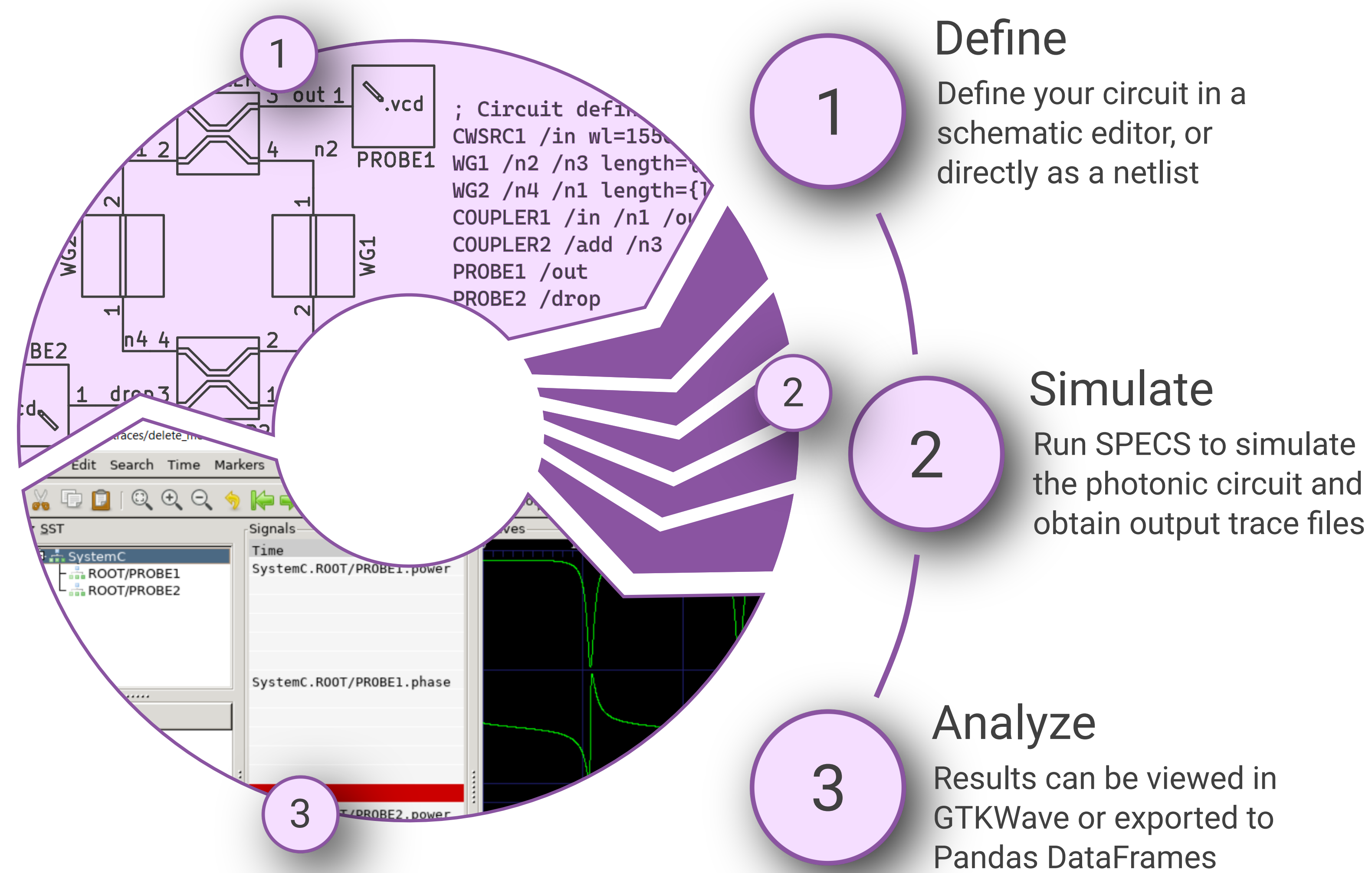
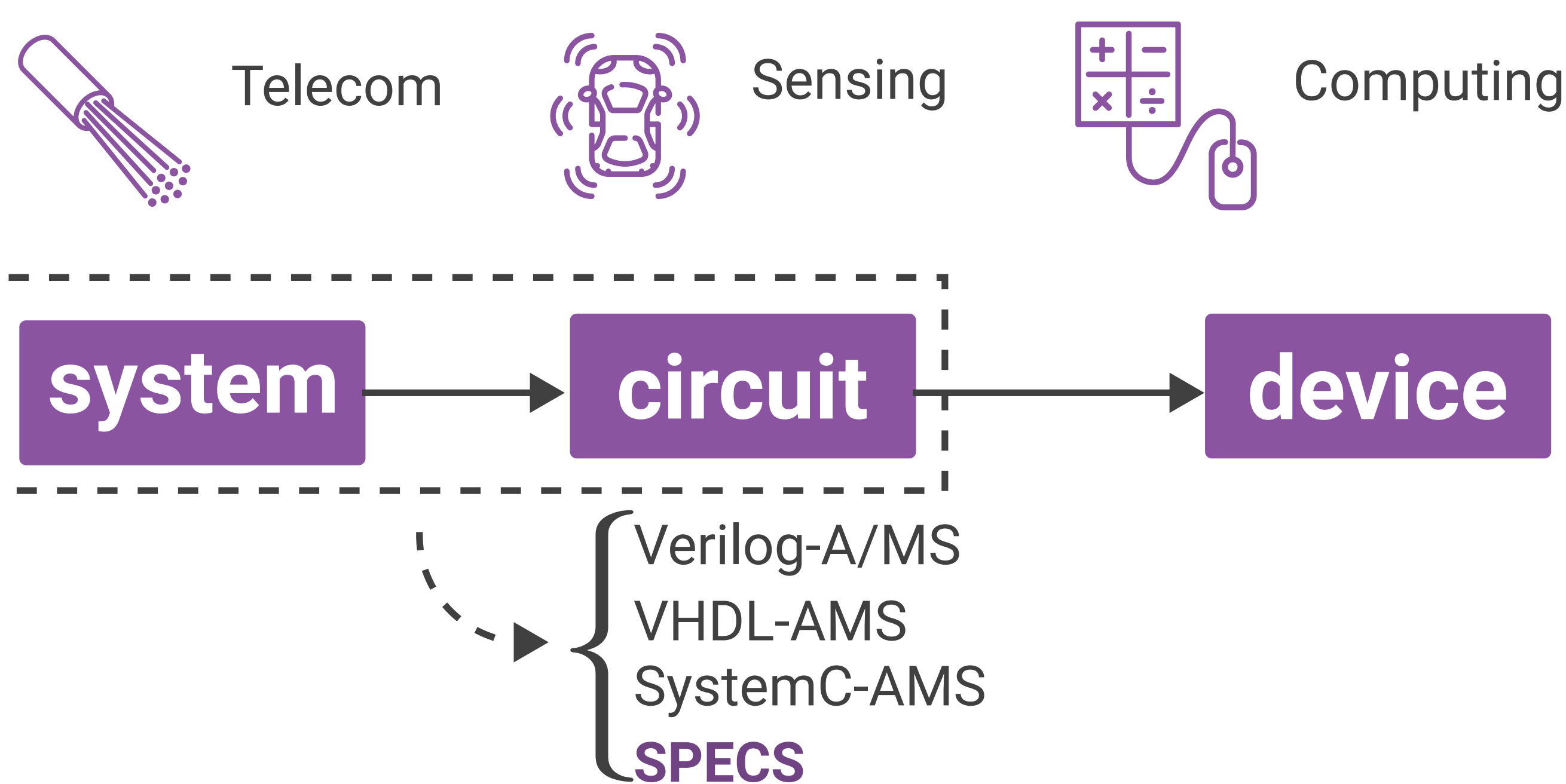
Clément Zrounba, **Raphael Cardoso**   
 M. G. de Queiroz, P. Jimenez, M. Abdalla  
 F. Pavanello, A. Bosio, S. Le Beux, I. O'Connor



Institut des Nanotechnologies de Lyon UMR 5270

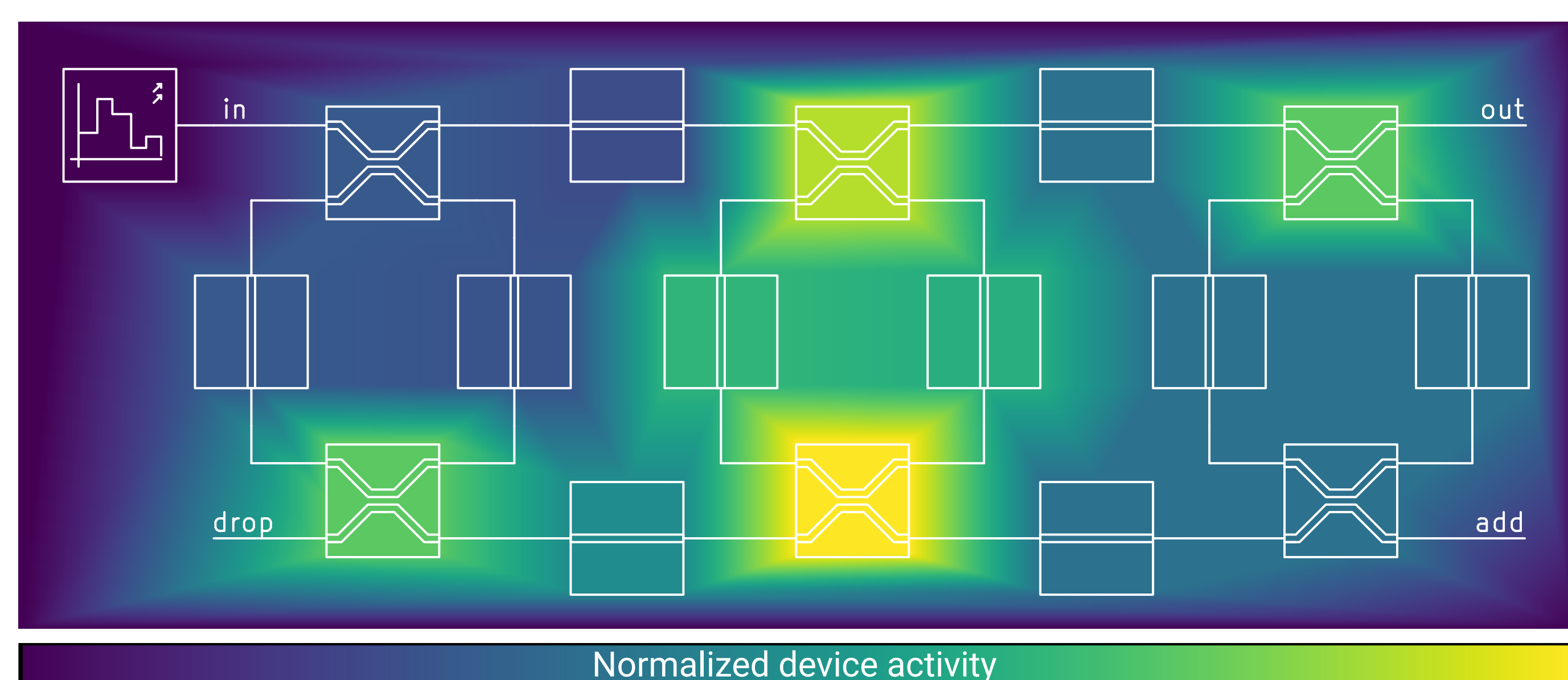
## Context

From communications to computing, building large-scale systems calls for efficient modeling tools beyond the device-level. We developed **SPECS** (Scalable Photonics Event-driven Circuit Simulator) as an effort to accelerate simulation of photonic circuits.

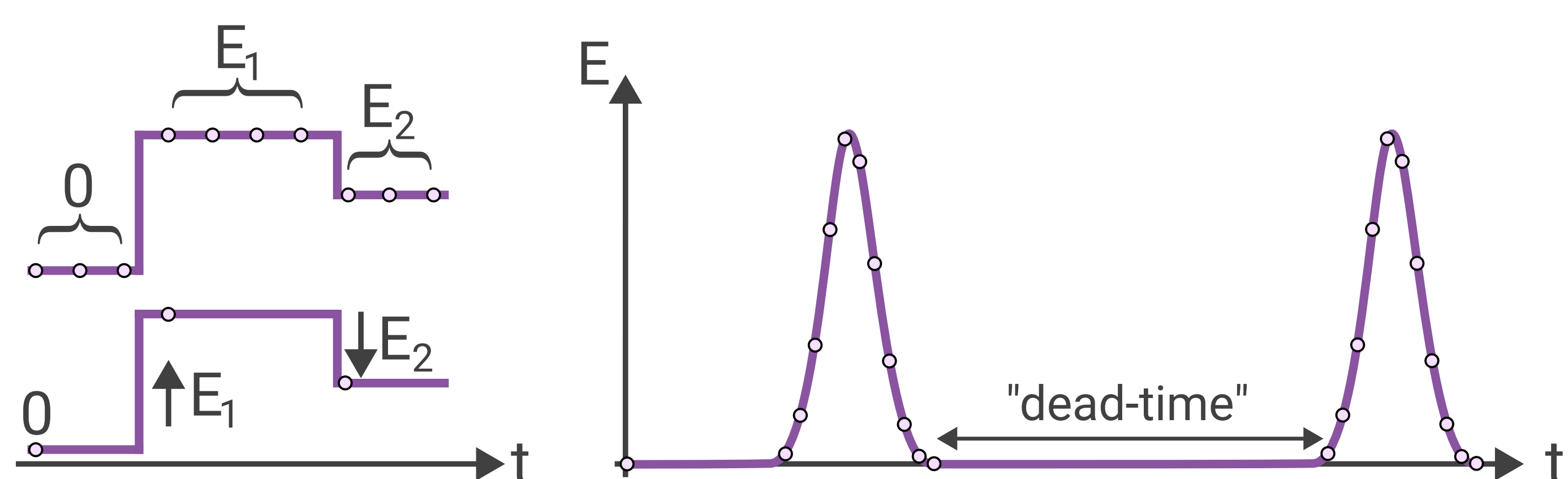


## Event-driven photonics

Usable as a SPICE-like standalone program or as a SystemC library, **SPECS** simulates devices only when needed, saving computer resources and designer time.

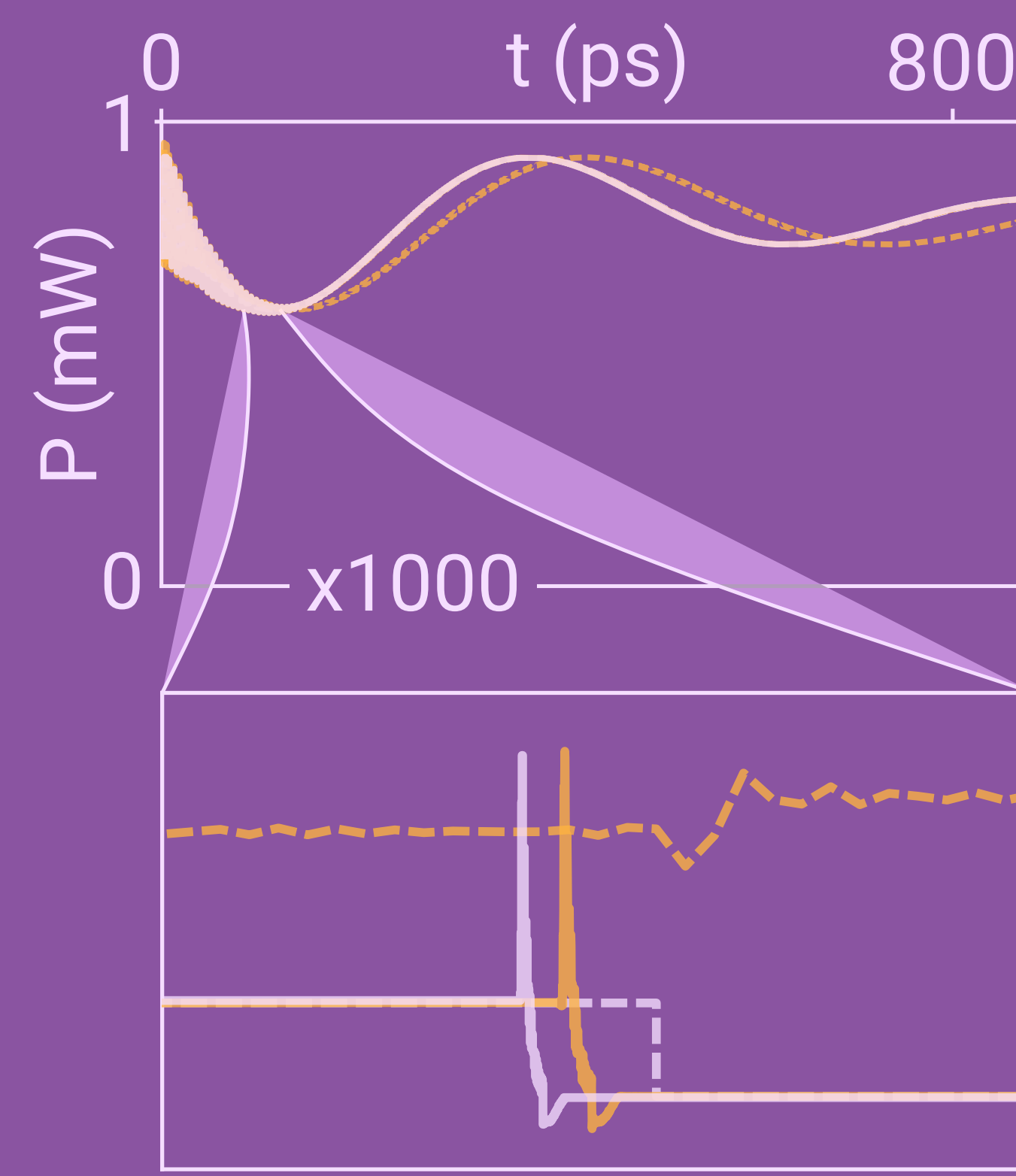


In event-driven simulation, signals are not sampled regularly: only variations of the electric field propagate. This scheme is particularly well suited to photonic circuits due to the timescale difference between signals ( $\sim$ ns) and propagation delays ( $\sim$ ps).



## Accurate...

**SPECS** can match the results of tried and tested circuit simulators, such as Lumerical™ Interconnect or Photontorch, while being better at handling sub-timestep delays, avoiding numerical errors that can corrupt Interconnect's results at low temporal resolutions.



## ... and yet, fast!

**SPECS** is generally orders of magnitude faster in time-domain simulations of digitally controlled circuits, unless the circuit has a high activity rate, a rare case in large photonic circuits. **SPECS** is up to 1000x faster running a 512-ring CROW circuit.

