

# LUSTRE, A SYNCHRONOUS DATAFLOW LANGUAGE

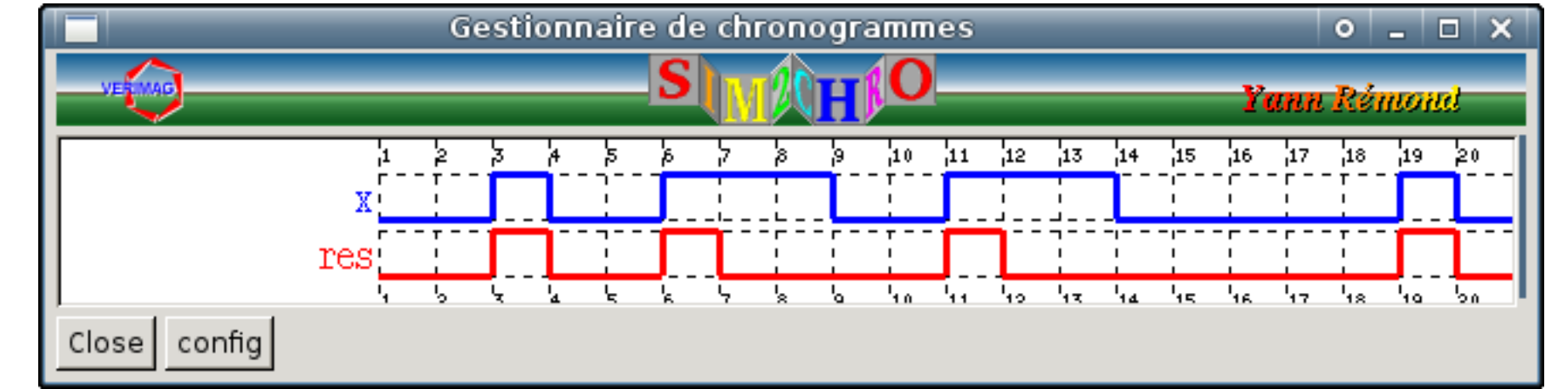
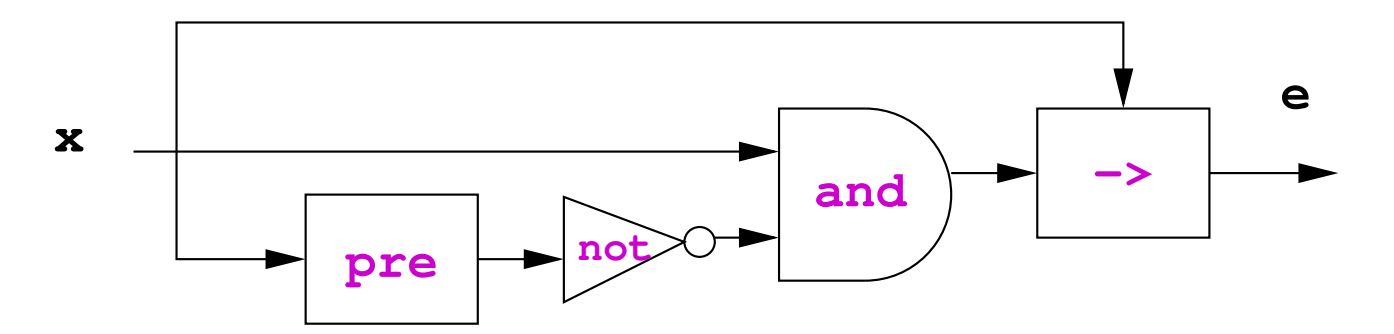
Verimag Laboratory

## Main Characteristics

- Generalization of Synchronous Circuits, where wires can hold any data types
- Logical discrete time
- High-level parallel specifications compiled into sequential code
- Correct-by-construction aspects:
  - No loop → compile-time bound on execution time
  - No recursive data structures (e.g., list) → compile-time bound on memory usage
  - Static Scheduling → no deadlock between tasks, no critical race
  - Deterministic behavior: What You Simulate Is What You Embed (WYSIWYE)

## An example: detecting rising edges

```
node edge (x:bool) returns (e:bool);
let
  e = x -> x and not pre x;
tel
```



## The Lustre Industrial History

- 1979-1984: first versions of Lustre
- 1986: the SAGA tool (based on Lustre) is created to develop the monitoring and emergency stop system of a nuclear plant
- 1986: a similar tool, SAO, was used to develop the fly-by-wire and flight control of the Airbus A320
- 1993: creation of *Verimag*, as an "unité mixte industrielle" with *Verilog*, which combined SAO and SAGA to create SCADE
- 2001: SCADE is acquired by *Esterel Technologies*
- 2012: SCADE is acquired by *Ansys*
- Nowadays, SCADE is one of the standard languages for safety-critical systems

## Lustre Spotlights

