



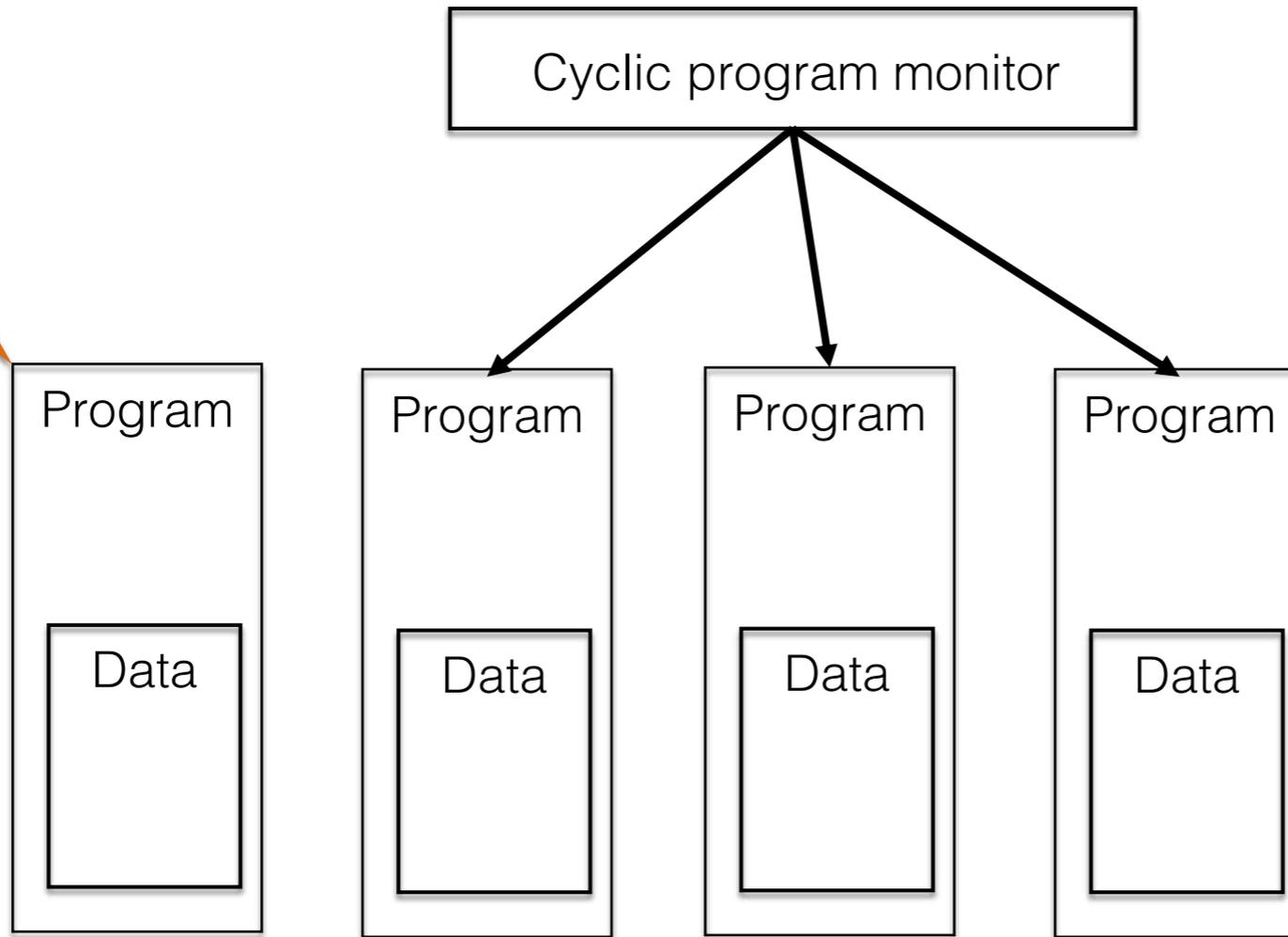
How Erlang got its name  
or  
Concurrency before Erlang

Bjarne Däcker  
former manager of CSLab

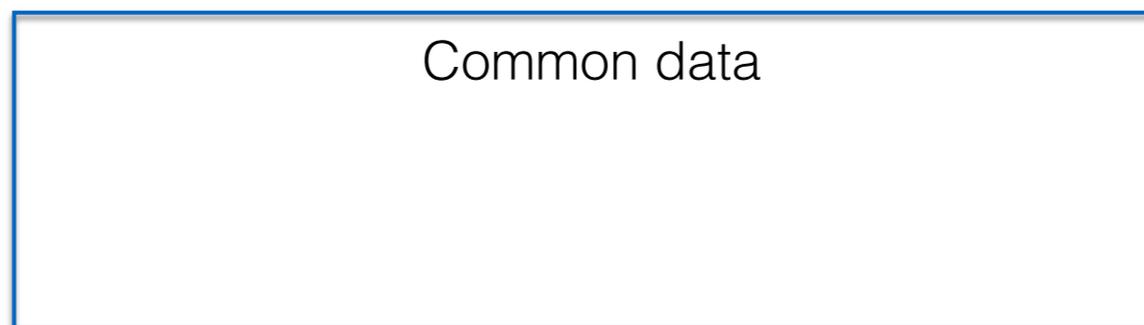
# Program structure of a simple control system

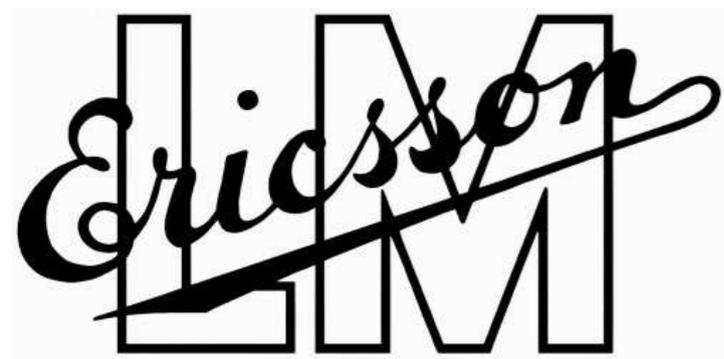


Interrupt



Each program has one entry point and has to keep its own state information



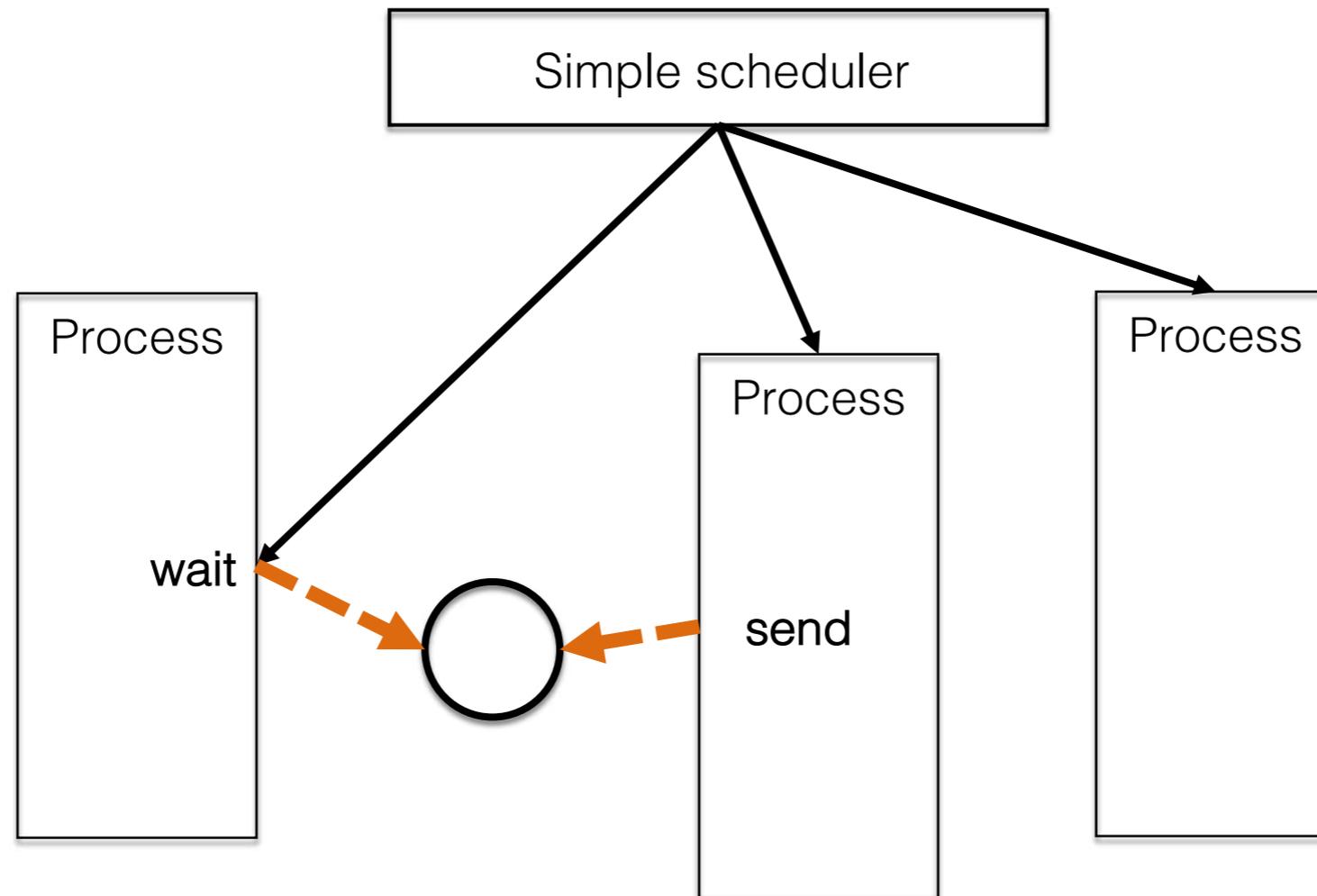


PL163

Released early 1970's

Processes

Buffers of signals



High-level assembler

A process can be suspended waiting for a signal. When that arrives the processing continues



Professor of  
Computer Science at  
ETH in Zürich.  
Inventor of Pascal  
and other languages.



# What we learnt from Niklaus Wirth and Modula

Modules

Processes

Process Communication

PL-type languages



# Modula

Invented by Niklaus Wirth  
Released early 1970's

Modules

Processes

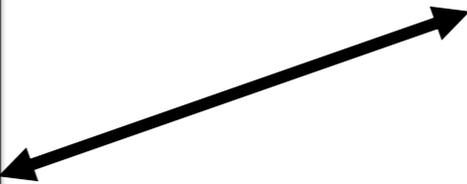
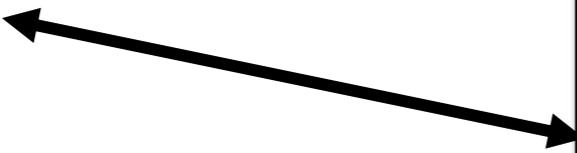
Process Communication  
through interface modules  
and signals



Interface module

procedure

procedure



Only one procedure can be executing. Others will be suspended



## CHILL

Developed for CCITT  
Released late 1970's



Modules

Processes

Process Communication

Three methods

- Regions
- Buffers
- Signals

There are several reasons why CHILL provides three different mechanisms for process communication:



- The ideas about what is the best method of communication between processes have not yet been stabilized in the world of programming language design. It would be too early to supply only one method of communication.
- Experience with communication between processes in a distributed system (without common memory between processors) is very limited. One communication mechanism may not be able to function optimally in both distributed and common memory architectures.



Ada

Developed for US DoD  
Released early 1980's

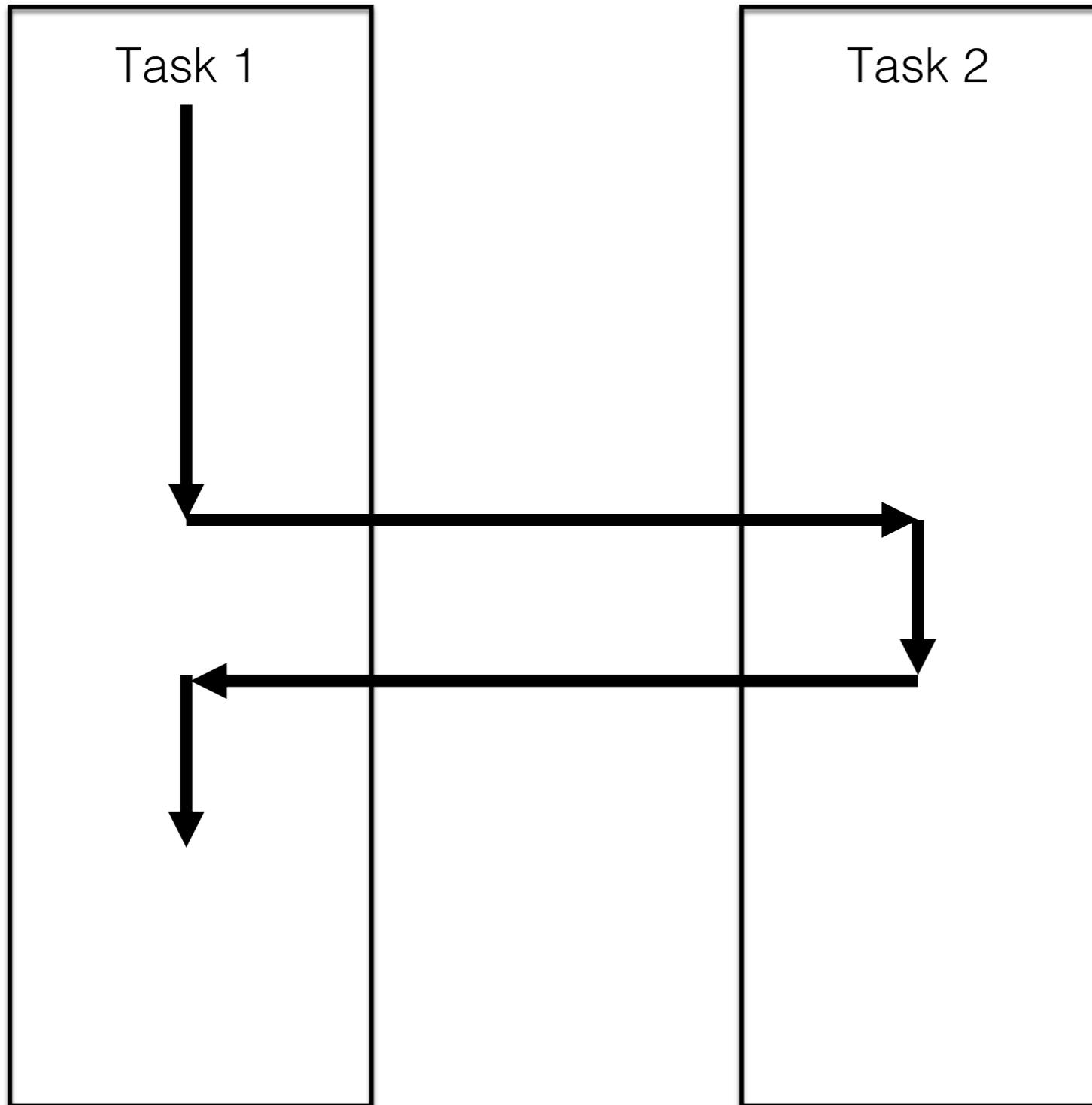
Packages

Tasks

Task communication  
through *rendez-vous*

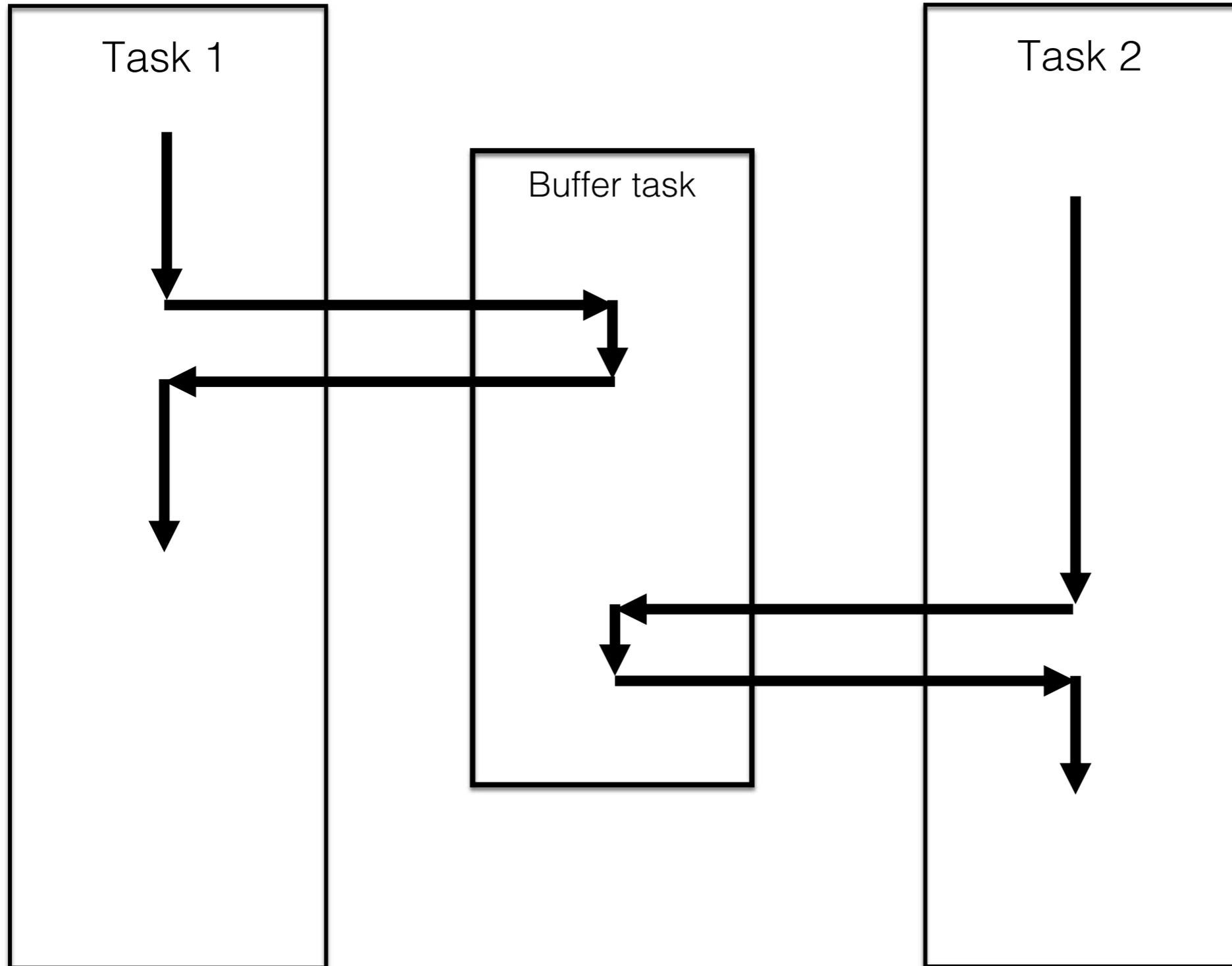


# *Rendez-vous* in action



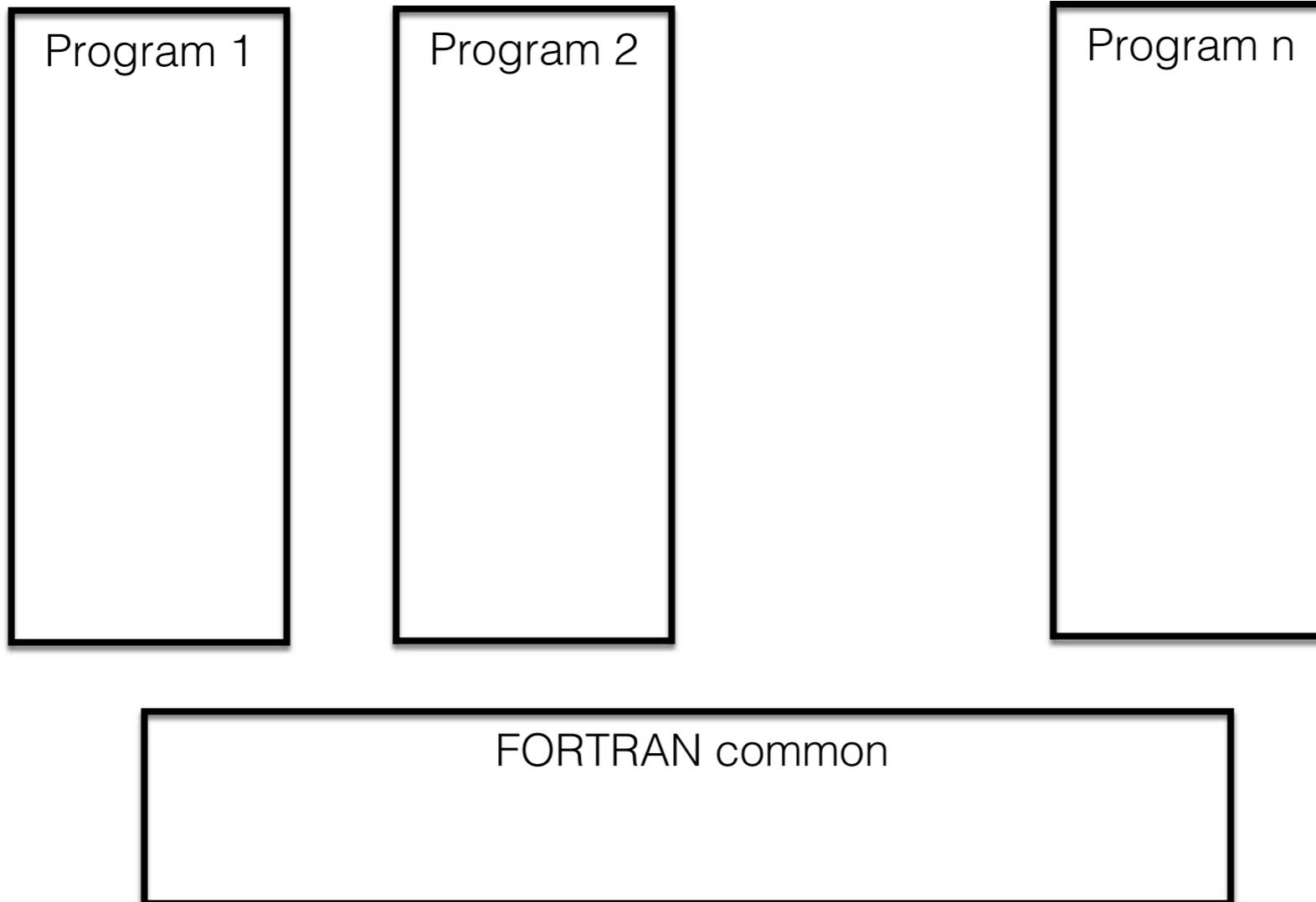
Task 1 makes a procedure call to Task 2. The two tasks synchronize at this point.

# Implementing message passing using *rendez-vous*

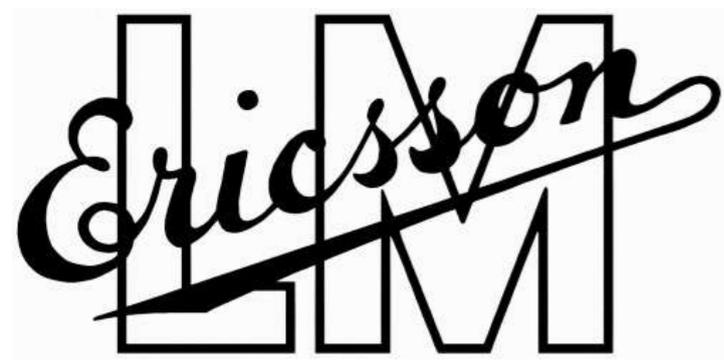


Message passing  
requires a buffer task

- Why was process communication so complicated?
- Because most Computer Scientists were thinking in terms of sequential programming.



- It is different if the application in itself is concurrent.



## EriPascal

Released late 1970's

Modules

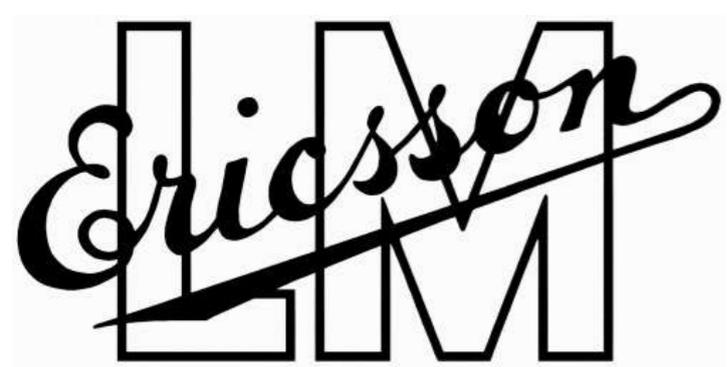
Processes

Process Communication  
using signals

Semantically equivalent to a subset of CHILL  
Implementation based on USD Pascal  
and a runtime system called EriOS



Presenting PASTEL (*Pascal for Telecom*) for Niklaus Wirth in May 1976



1980

Mike Williams, Göran Båge, Seved Torstendahl and Bjarne Däcker proposed to create a Computer Science Laboratory

And were allowed to start on a small scale ...

# CSLab

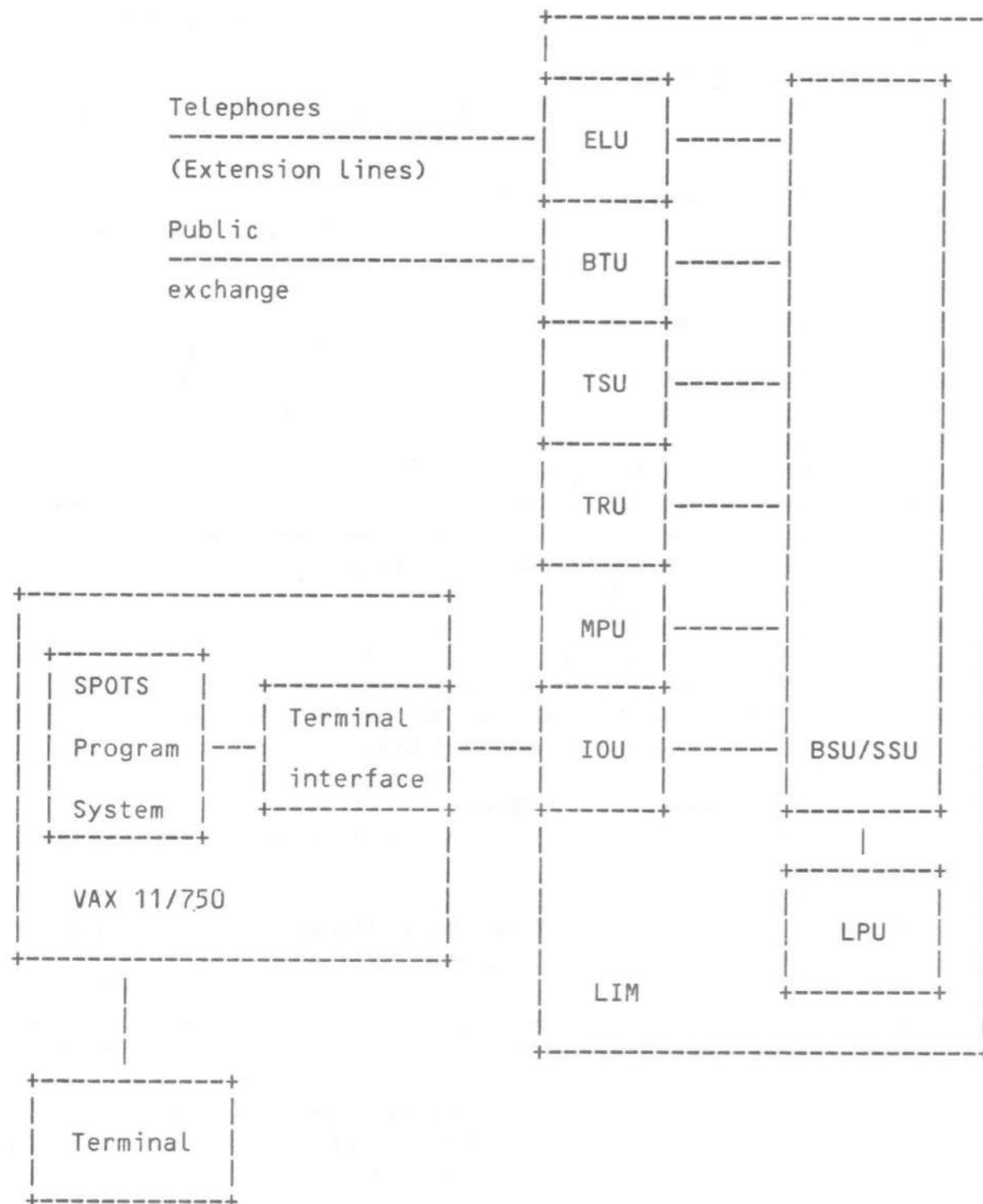


Started early 1980's with a mission to

1. Create a software technology for future telecom and support systems
2. Help introduce new technology in existing systems

## ANSVARsomRÅDE

XT/DU Datalogi har som ansvar på längre sikt att bygga upp en grundteknik inom programvaruområdet inför framtida telekom-system och stödsystem samt på kortare sikt att bidra till introduktion av ny programvaruteknik i existerande system.



## Laboratory setup

A telephone exchange, LIM  
(*Line Interface Module*),  
controlled by a VAX from  
DEC under Unix



Systematic experiments in programming telephony using different programming technologies

- Ada
- Concurrent Euclid (for CHILL)
- PFL (Parallel Functional Language)
- LPL (Logic Programming Language)
- OPS4 (Rule Based System)
- Frames (Object Oriented System)
- CLU (Abstract Objects)



The results were a bit inconclusive ....

It is becoming obvious that future telecommunication systems cannot be programmed with one language using one methodology. Future systems will probably be built up using many of the techniques used in these experiments. For example expert system technology might be used for the maintenance functions and the man machine interface, logic programming might be suitable for programming the signal system interfaces and parts of traffic handling and the underlying operating system might be programmed in an advanced imperative language.

This led to another round of experiments. Now also Joe and Robert joined. And a serious user group



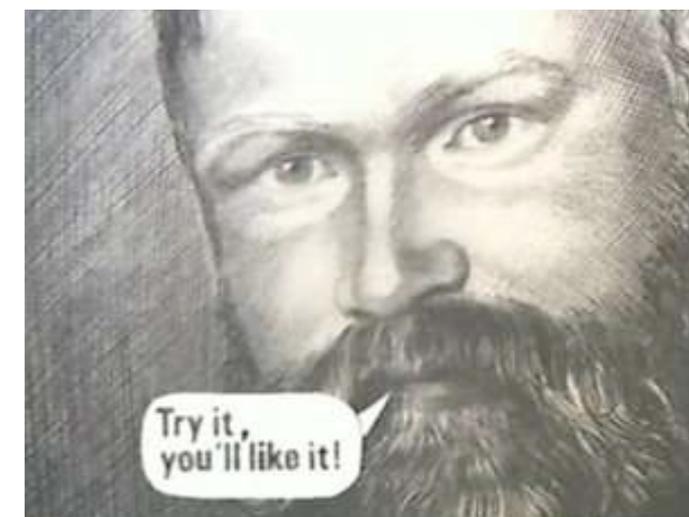
We did not intend to invent a new programming language. Perhaps those are created by international committees like CHILL and Ada?

But that is what happened. What about a suitable name like EriPascal? Perhaps EriLang?

[Wikipedia] **Erlang** is used in telephony as a measure of offered load or carried load on elements such as telephone circuits or telephone switching equipment.

A well-known term in telecoms. That settled it.

Pascal, Ada, Occam are also named after mathematicians.



The progress can be followed in the CSLab publications

Experiments with Programming Languages and Techniques for Telecommunications Applications. Eindhoven, April 14-18, 1986.

The Phoning Philosophers' Problem or Logic Programming for Telecommunications Applications. Salt Lake City, September 23-26, 1986.

Using Prolog for Rapid Prototyping of Telecommunication Systems. Bournemouth, July 3-6, 1989.

Erlang - An Experimental Telephony Programming Language. International Switching Symposium. Stockholm, May 27-June 1, 1990.

Implementing a Functional Language for Highly Parallel Real Time Applications. Florence, March 30-April 1, 1992.

Use of Prolog for Developing a new Programming Language. London, England, April 1-3, 1992.

Prototyping Cordless Using Declarative Programming. Yokohama, October 25-30, 1992.

Turbo Erlang: An Efficient Implementation of a Concurrent Programming Language. Madrid, May 24-25, 1993.

Concurrent Programming in Erlang. Prentice Hall, 1993.





Three wise guys. Joe, Robert, Mike at Bellcore December 1989



**Thank you**

<http://www.cs-lab.org/>