Plumbing the Arduino

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(and a cast of thousands, including Matt Jadud, Christian Jacobsen, Omer Kilic, Carl Ritson...)
A brief history lesson

- In the 1980s, INMOS created the Transputer
- ... and an unusual programming language, called occam
- Further developed at Kent in the 1990s and 2000s: occam-pi
- Here's what it looks like...
C++:

```cpp
doThing();
doOtherThing();
```

occam:

```occam
SEQ
doThing()
doOtherThing()
```
PROC main ()
    WHILE TRUE
    SEQ
        digitalWrite (13, HIGH)
        delay (200)
        digitalWrite (13, LOW)
        delay (200)
    
    :
PROC blink (VAL INT pin, period)
    WHILE TRUE
        SEQ
            digitalWrite (pin, HIGH)
            delay (period)
            digitalWrite (pin, LOW)
            delay (period)
    :
PROC main ()
    blink (13, 200)
    :

PROC main ()
   blink (13, 200)
:
occam:

PAR
x
y

C++:

??!??!!??
PROC main ()
PAR
  blink (13, 300)
  blink (14, 500)
: 
This is a channel.
Concurrency in action

- We call this “process-oriented programming”
- Build your program out of little, isolated components, and connect them together
- **Plumbing** is a library of ready-made components (like inputPin, invert and blink) for the Arduino
64 LEDs (well, 128, actually...)
How does that work?
How does that work?
How does that work?
Distributed embedded system
First node
Other nodes

serial.rx → buffer → buffer → buffer → ... → buffer → serial.tx

column → column → column → ... → column
The RepRap

- X, Y and Z axes with steppers and endstops
- Print head with heater, temperature sensor and extruder motor
- Serial interface to accept commands from a host computer
Plumbing the RepRap

- serial.port
- command.parser
- thermostat
- temp. sensor
- heater
- motor
- endstop
- axis. control
- x
- y
- z
- extruder
How do I learn more?

- Read the book!
- Available from our web site along with the software (all open source): http://concurrency.cc/
- For more about occam-pi: http://occam-pi.org/
- Thanks – any questions?