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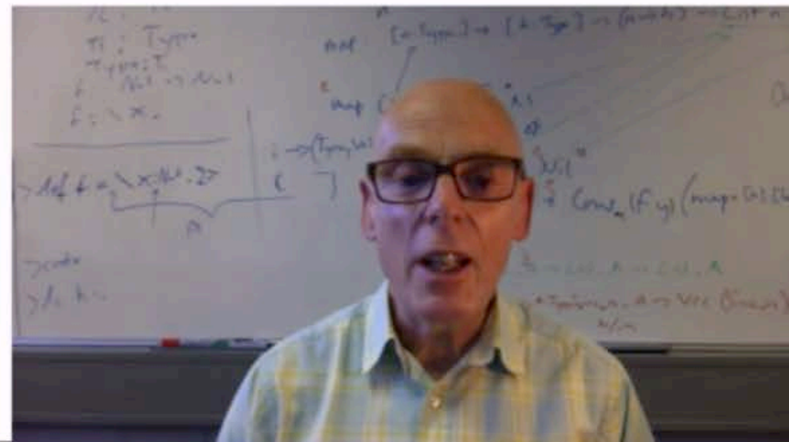
Links, signals and messages



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The Erlang approach

How to deal with an unexpected situation?

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Let it fail!

and have another part of the system solve the problem.

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Dealing with abnormal termination

When a process terminates abnormally,
it sends a *signal* to all the processes linked to it.

Why not just send a message to them?

The linked process might never deal with the message.

Even if it does, the process has to contain explicit code to deal with this …

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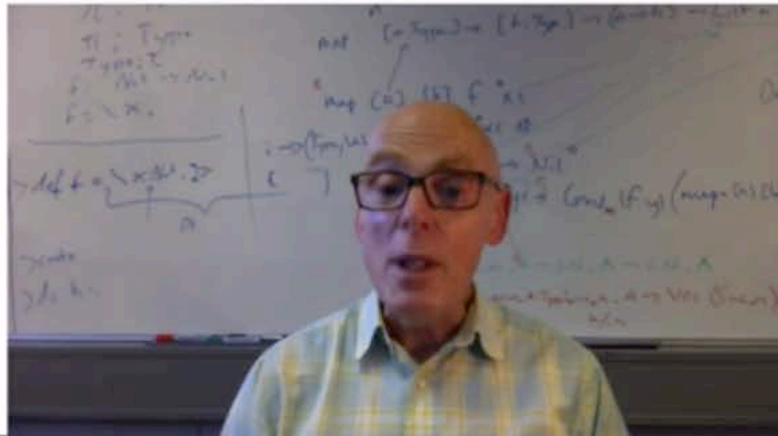
Signals ≠ Messages

When a process terminates abnormally, it sends a *signal* to all the processes linked to it, with the reason `killed`.

Signals propagate immediately … and the default behaviour on receiving a signal is to terminate (abnormally) yourself.



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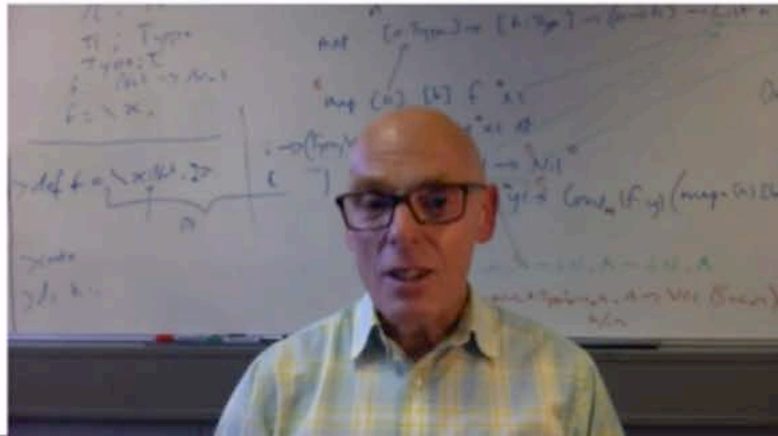
Signals and messages *are* connected

If we're to be able to deal with processes failing … we need to know when a process has failed, without being killed ourselves.



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Signals and messages *are* connected

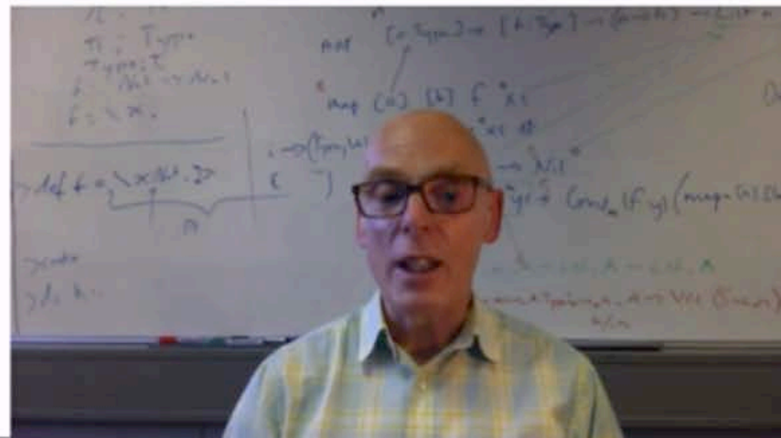
If we're to be able to deal with processes failing … we need to know when a process has failed, without being killed ourselves.

In a process, call

```
process_flag(trap_exit, true)
```

then *exit signals* to that process are converted to *messages:*

```
{'EXIT',FromPid,Reason}
```



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Fine-grained control

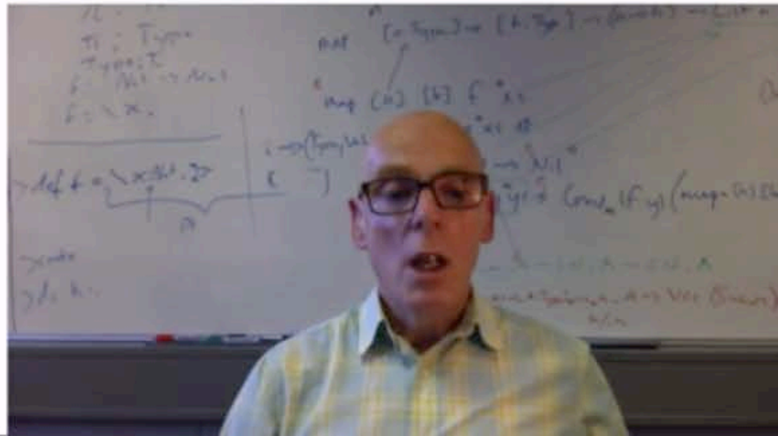
Trapping exits is controlled *per-process* and *dynamically*.

Switched on by calling

```
process_flag(trap_exit, true)
```

and off by

```
process_flag(trap_exit, false)
```



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Sending `exit` signals

Exits happen for all sorts of reasons: e.g. division by 0, …

Can be triggered in a process itself by calling `exit(Reason)`.

Can be caused in another process by calling `exit(Pid,Reason)`.

Normal termination has the reason `normal`, any other reason is abnormal.

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How a process reacts on receiving an exit

Exit type	Initiated by	Not trapping exits	Trapping exits
Normal	`exit(Pid,normal)`	Nothing	Receives `{'EXIT', Pid, normal}`
Abormal	`exit(Pid,Reason)`	Terminates abnormally	Receives `{'EXIT', Pid, Reason}`
Kill	`exit(Pid,kill)`	Terminates abnormally	Terminates abnormally

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What an elegant design!

Signals give a mechanism orthogonal to messages, guaranteed to be able to take down a system.

Trapping exits allow us to handle `exit` signals programatically, as messages, so that we can make more complex recovery code.

But, `exit(Pid,kill)` is guaranteed to override exit trapping, so we can still be sure of being able to kill a process.