TECHNISCHE UNIVERSITÄT DRESDEN

Faculty of Computer Science Institute for System Architecture, Operating Systems Group

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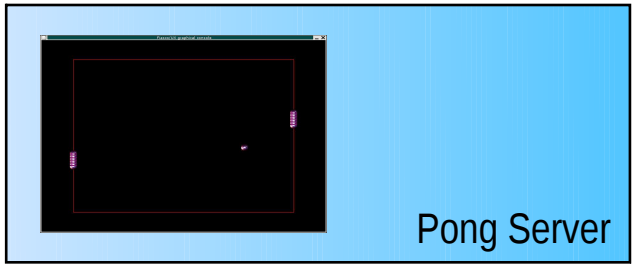
Complex Lab — Operating Systems 2012 Winter Term

Keyboard Device Driver & Integration

You are here



Paddle Client 1

Paddle Client 2

Console

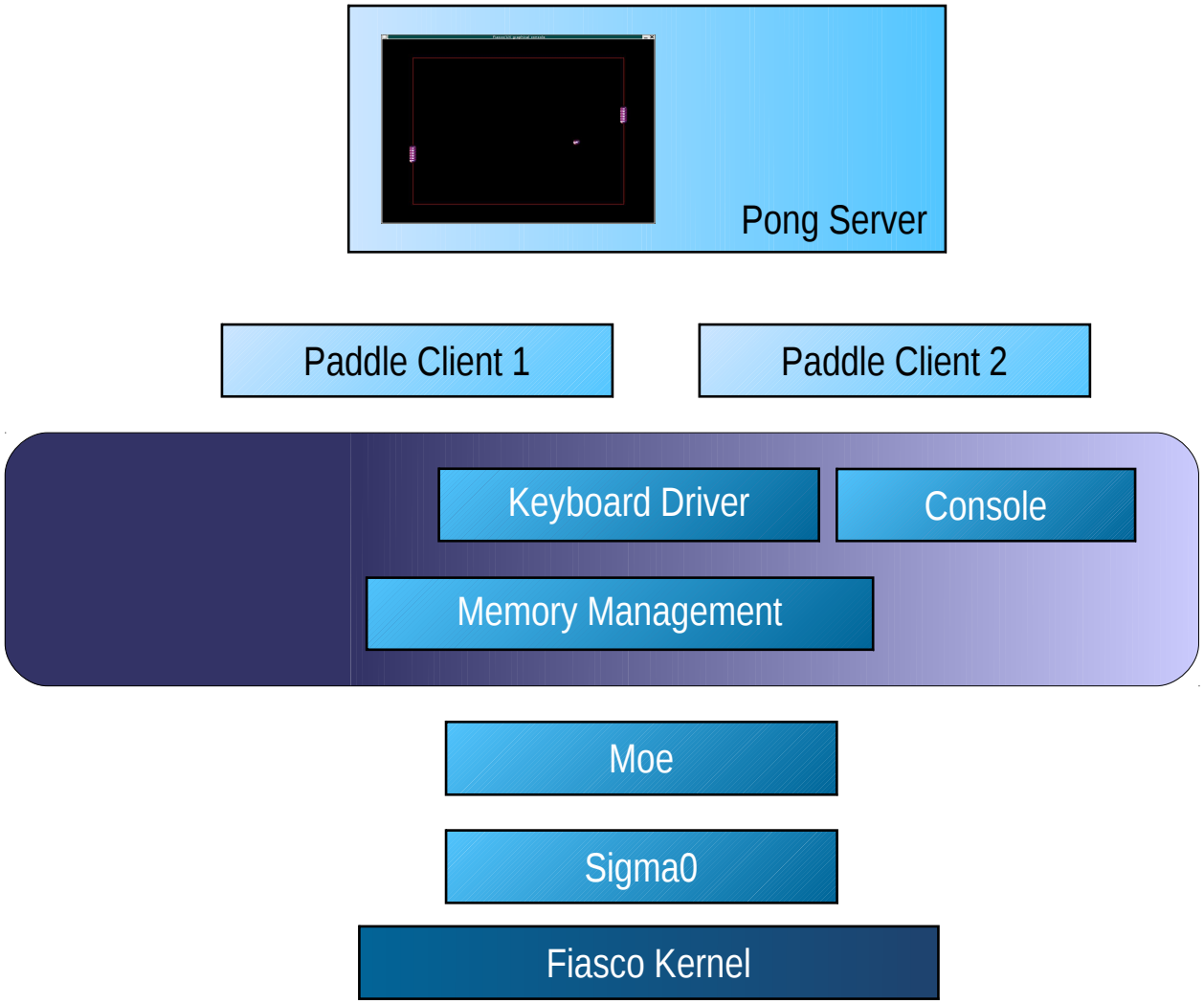
Memory Management

Moe

Sigma0

Fiasco Kernel

Today's Goal


Pong Server
Paddle Client 1
Paddle Client 2
Keyboard Driver
Console
Memory Management
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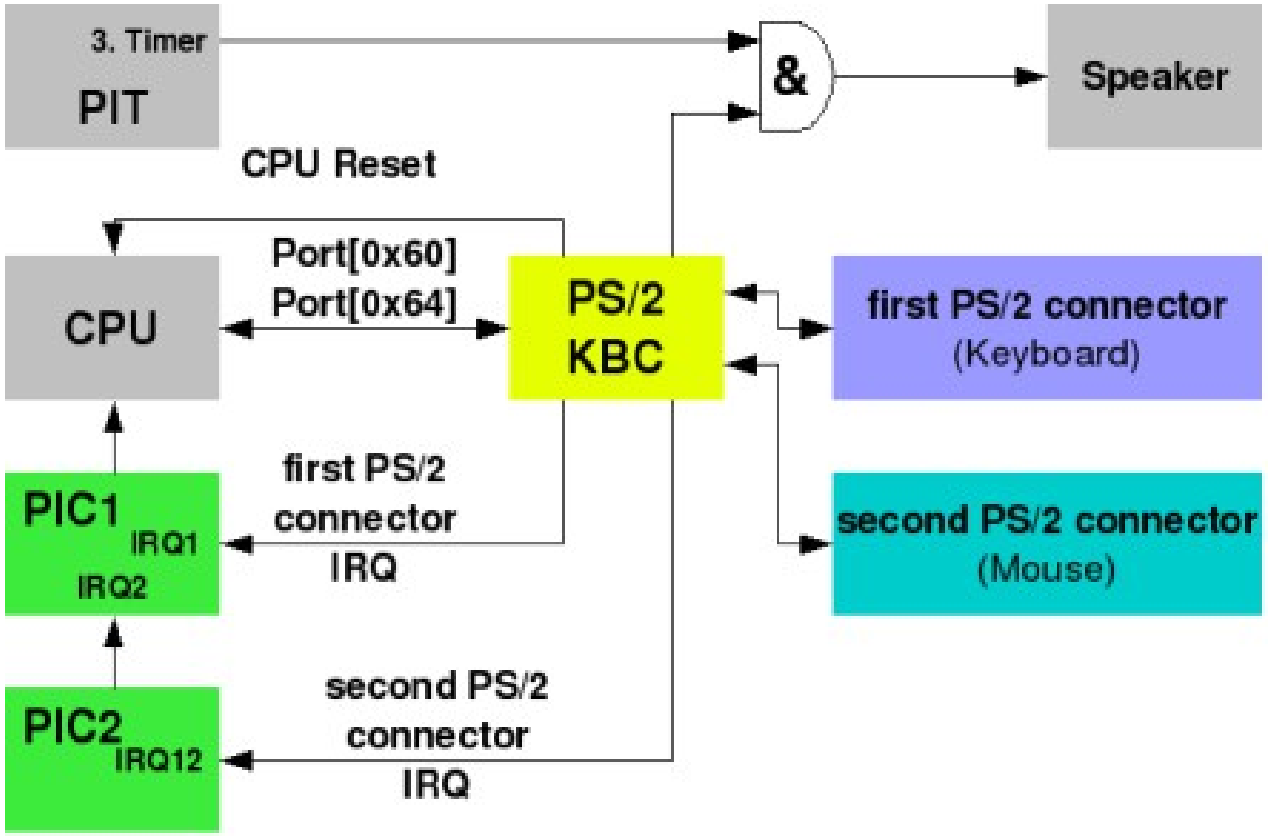
The PS/2 Keyboard



Source: http://wiki.osdev.org/PS2_Keyboard

Driving the keyboard

- Subscribe to interrupt 0x1
- On interrupt:
  - Read scan code from I/O port 0x60 (inb 0x60)
  - Translate scan code into key code and action
- That's it. Wrap a server interface around and you're done.

L4 and IRQs

- IRQs are bound to interrupt controllers (ICU)
  - HW ICU can be obtained using “icu=icu” in config file
- I/O library for managing I/O resources
  - Libio-direct – directly obtain resources from sigma0
  - No I/O manager involved – no security / management
  - Add “sigma0=sigma0” to config file
- l4/util/include/ARCH-x86/port_io.h
  - l4util_in<*>(), l4util_out<*>()
- l4/pkg/examples/interrupts → C version, C++ isn't hard either

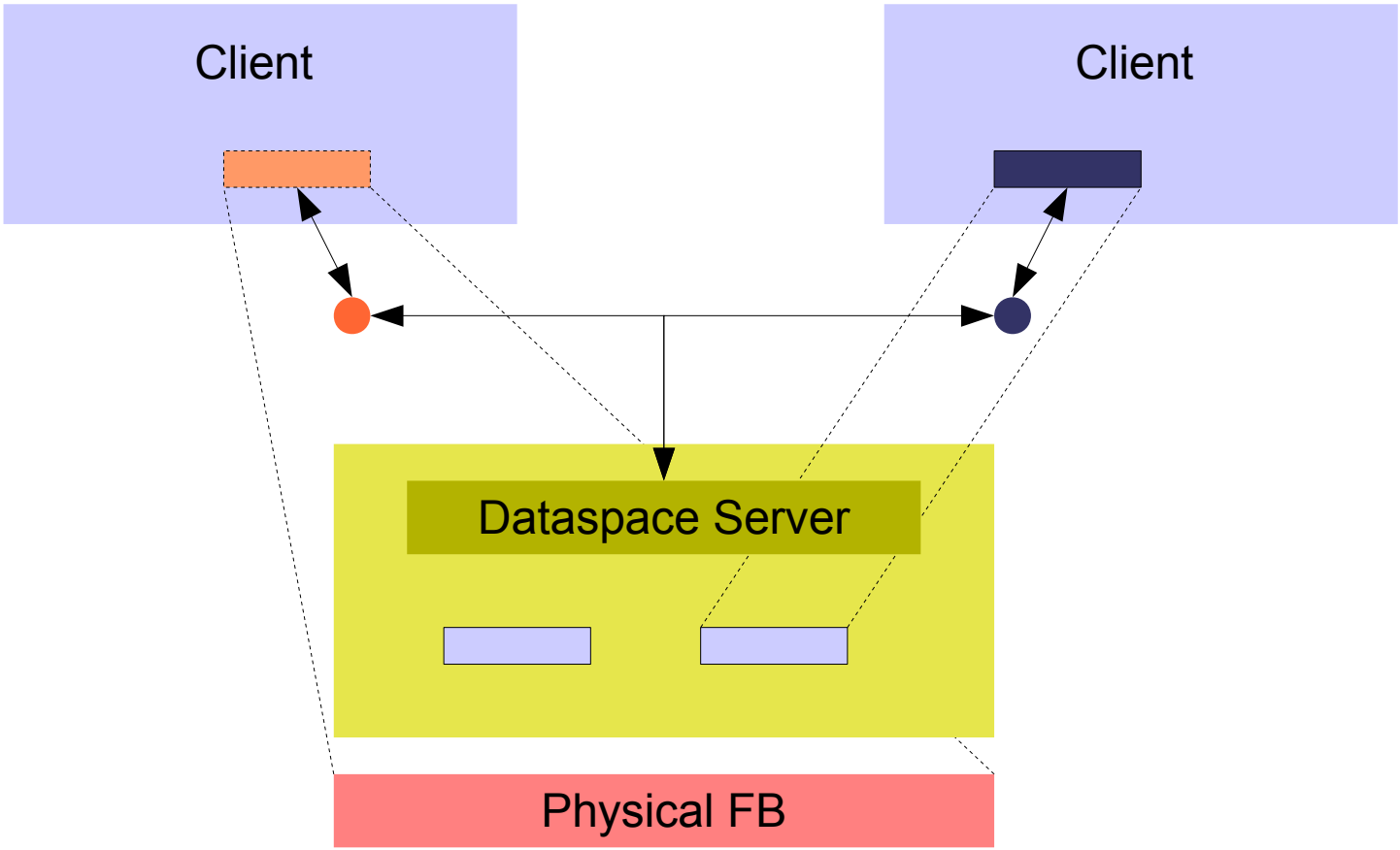
Combine paddle client and keyboard server

- You have:
  - A keyboard server (last assignment)
  - A paddle client (l4/pkg/pong/examples)
    - Currently moving up and down
- Now:
  - Modify client to use keyboard input from your keyboard server
  - Play pong with two clients and different key settings

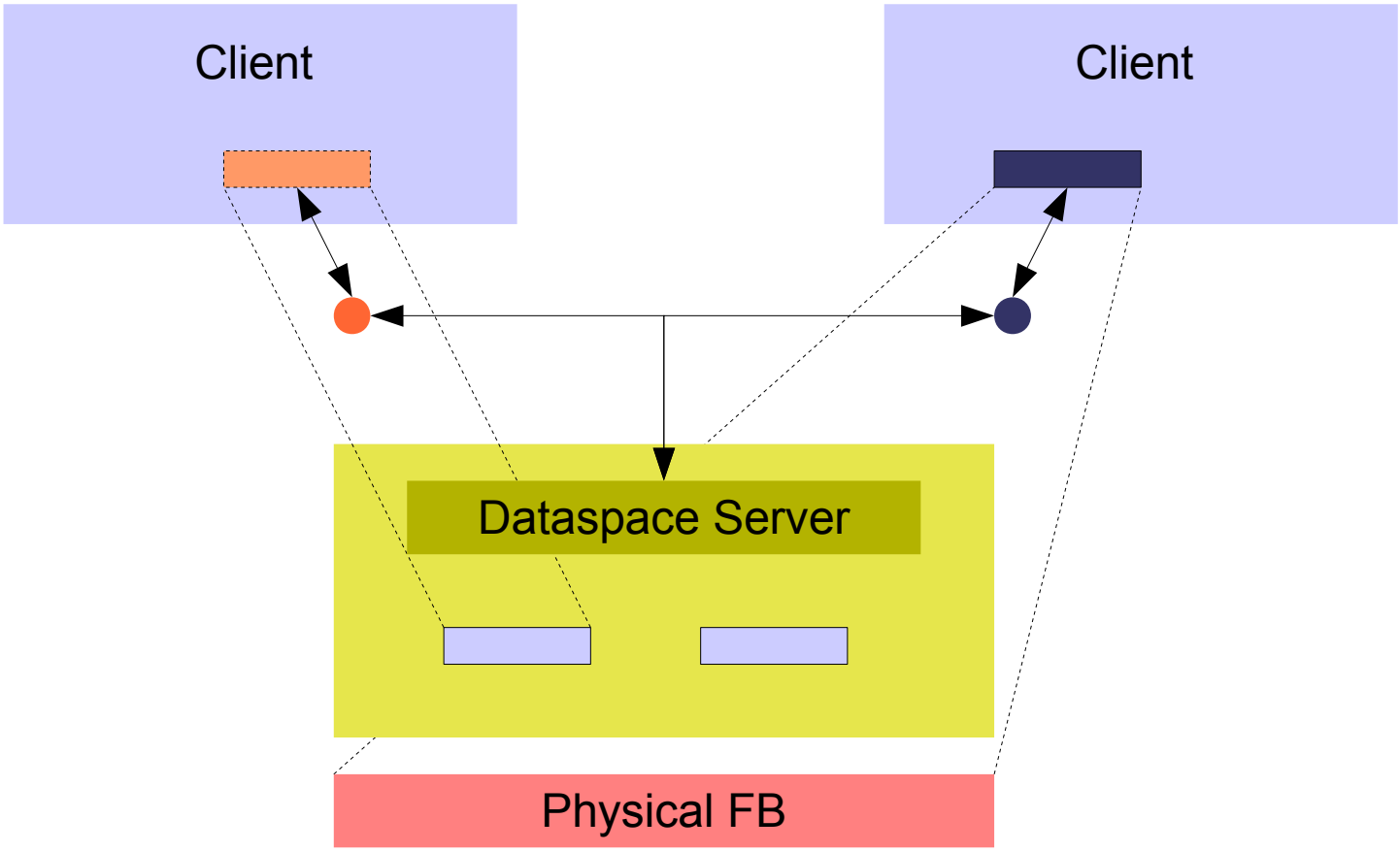
Graphical console multiplexing

- Enable your console server to switch between the pong console and your debug console
- ~~Alternatives 1~~
  - ~~Only console server has access to physical FB~~
  - ~~Clients get a virtual FB (== dataspace of the same size as the physical FB) and draw into it~~
  - ~~Console server periodically refreshes physical FB using memcpy from the currently active client FB~~
- Alternative 2 **Elite Edition!**
  - Active client directly renders into physical FB
  - Inactive client(s) render into a virtual data space
  - When switching active client, unmap all dataspaces and re-map physical/virtual FB data spaces

Console – Alternative 2



Console – Alternative 2



Relevant stuff

- Your server will need to implement a frame buffer interface as defined in l4re/include/fb
  - you'll need to hand out a capability to a fb data space
  - read: an IPC gate that you'll use to handle all requests going to this DS
- Your virtual dataspace should implement the functions as defined in l4re/include/dataspace .
- You may also have a look at l4re/util/include/dataspace_svr for a nearly-complete data space server implementation.

Switching Console Clients

1. User indicates client switch
2. Unmap physical framebuffer from client
3. Make client's FB point to a virtual copy
4. Unmap new client's virtual FB
5. Copy new client's virtual data into physical FB
6. Make new client's FB point to physical FB

- There is a race condition in there:
  - Between steps 2 + 3, the old client might draw, raise a page fault and get the physical pages mapped back
  - You'll need to handle this inside your implementation

That's it

Hand in everything until March 31st, 23:59:59 to your tutor.