



Introduction to HelenOS

Jakub Jermář

HelenOS?



Attempt to build a general-purpose OS

From a bunch of userspace components

Not necessarily compatible with existing APIs

Multiplatform

Technically advanced

Open source / Free

HelenOS?



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2001

2002

2003

2004

2005

2006

2007

2008

2009

2010

2011

2012

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`pthread`
`signal()`

`kill()`

`fork()`

`wait()`

`exec()`

`mmap()`

`wsempr()`

`strempr()`

HelenOS?



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AMD64

ARMv4

IA-32

IA-64

MIPS

PowerPC

SPARC V9

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Community structure

Developers

28 – 45 in total

15 active during last year

Core team and Contributors

Students

MFF UK (CZ, SK), UNIBA (SK), GSoC (CZ, RU, ...)

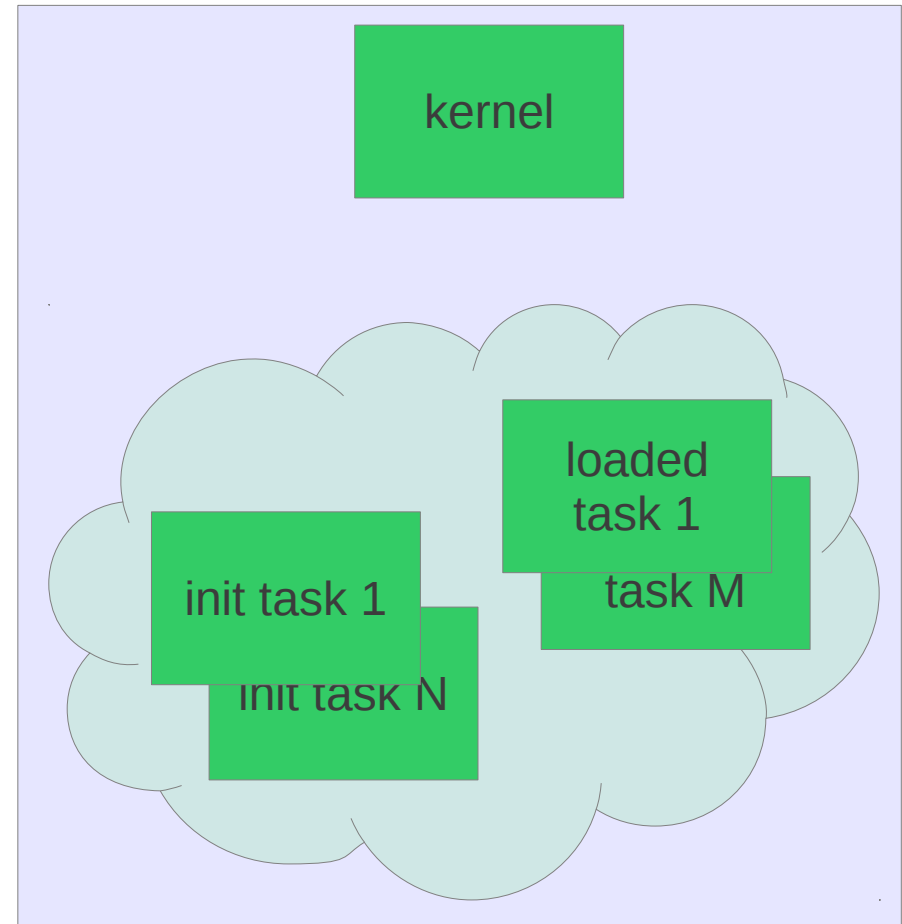
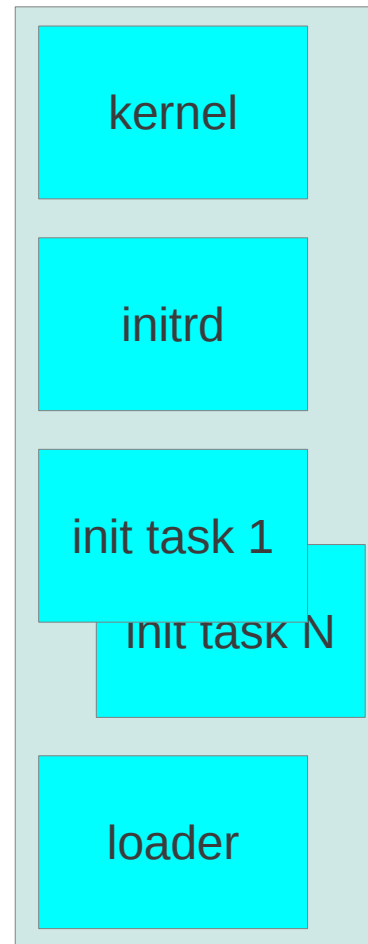
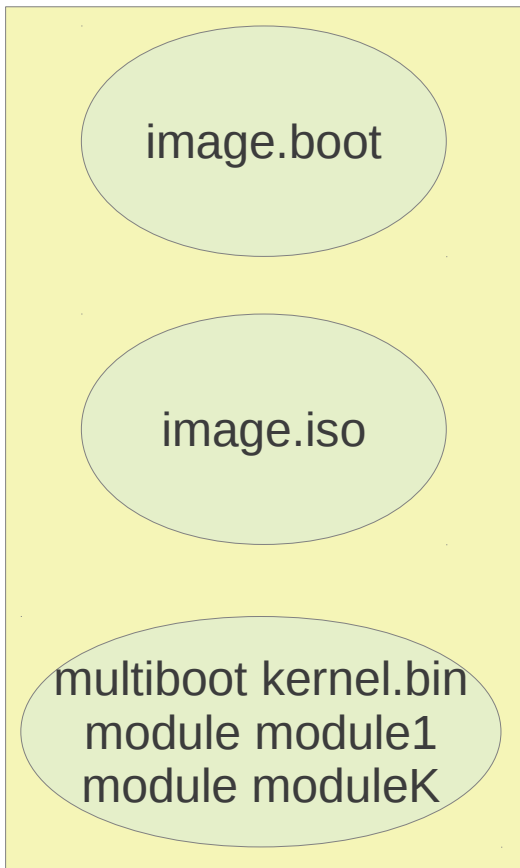
Researchers

MFF UK (CZ)

Independent hackers

(CZ, IT, US, IN)

Before and after system startup





Kernel briefing

Provides essential services to userspace

virtual memory

scheduling

IPC

- simple communication

- memory sharing

- inter-process data copy

Debugging features

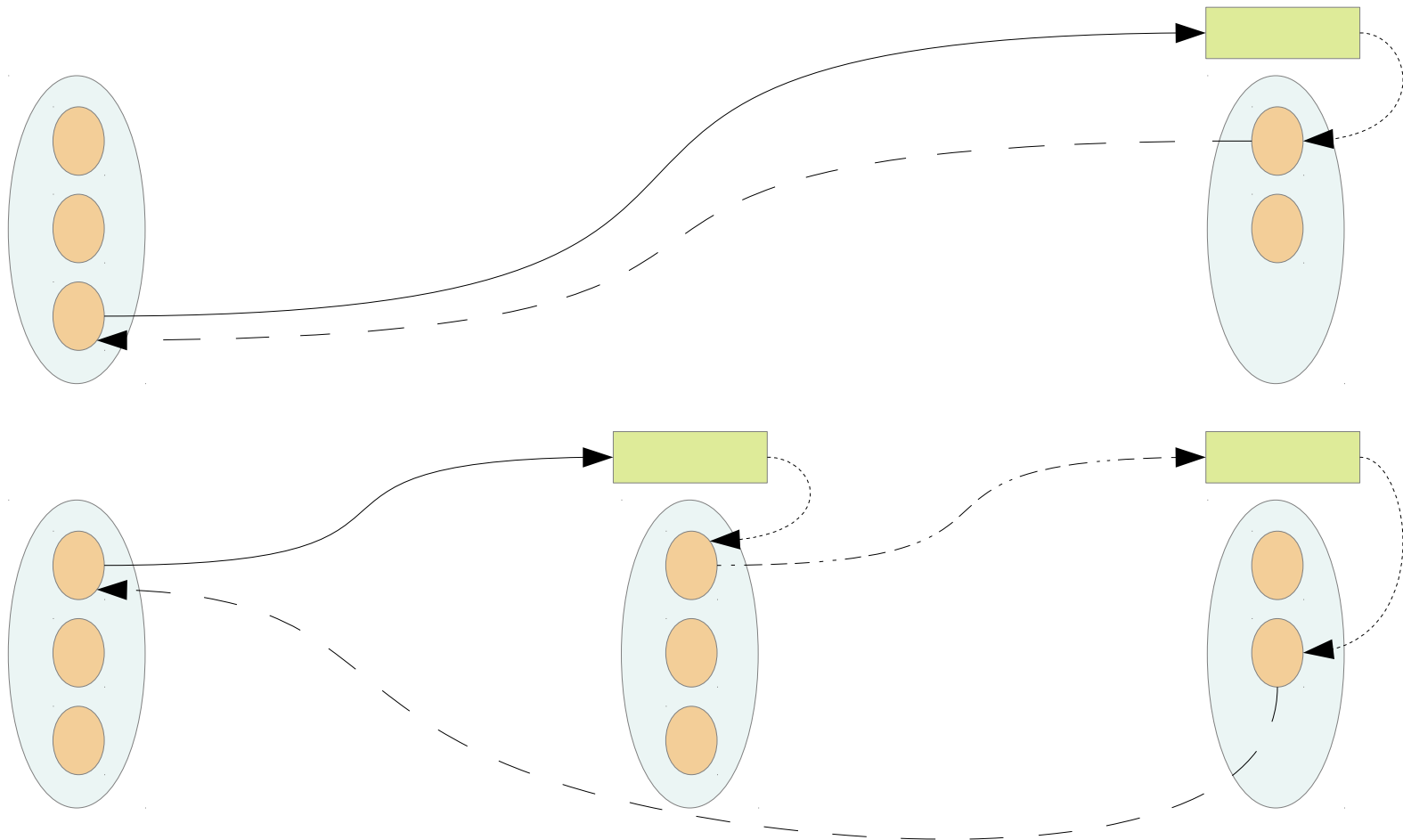
In-kernel drivers

kconsole

HelenOS IPC - kernel



Kernel provides (a)synchronous IPC primitives





HelenOS IPC - userspace

Libc

pairs requests with replies via callbacks

Async framework

simplifies asynchronous communication

eliminates callbacks

userspace threads

abstracts away from physical connections

sessions

concurrent requests sent over one logical datapath

higher level IPC expressions



Naming services

ns – naming service

first connection for each new process

connect me to a singleton service

VFS, devman, loc, ...

loc – location service

connect me to a named service

bd/initrd, bd/ata1disk0, devices/\virt\lo\port0

categories

locfs interface

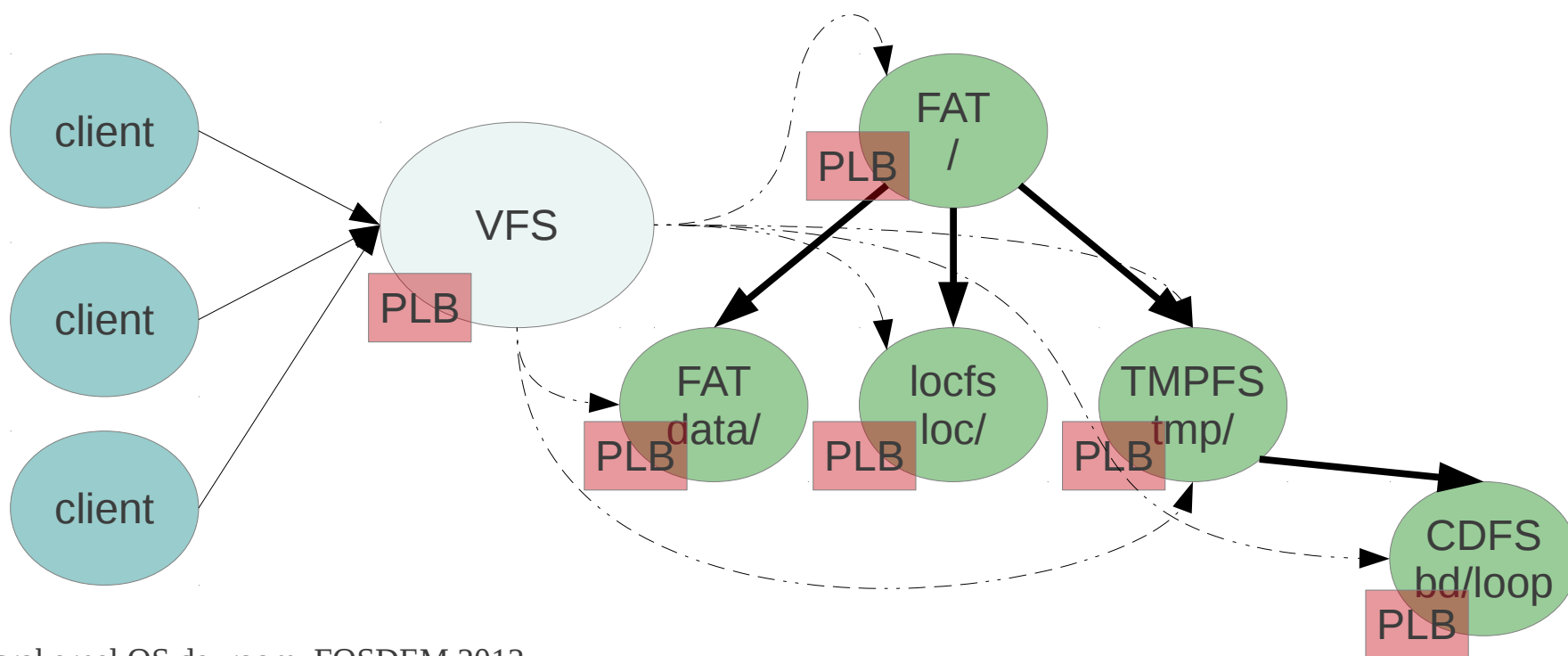


File systems

VFS

TMPFS, FAT, locfs, Ext2, MFS, exFAT, CDFS

libc, libfs, libblock





Device drivers

services as drivers

spawned by the user

file_bd, ata_bd, ...

DDF - Device Driver Framework

needed drivers are spawned automatically

hierarchy of devices

USB (UHCI, OHCI, usbhid, usbmst)

NIC (loopback, NE2000, E1000, RTL8139)

PCI, ISA, ...

Networking



fully decomposed TCP/IP stack

net

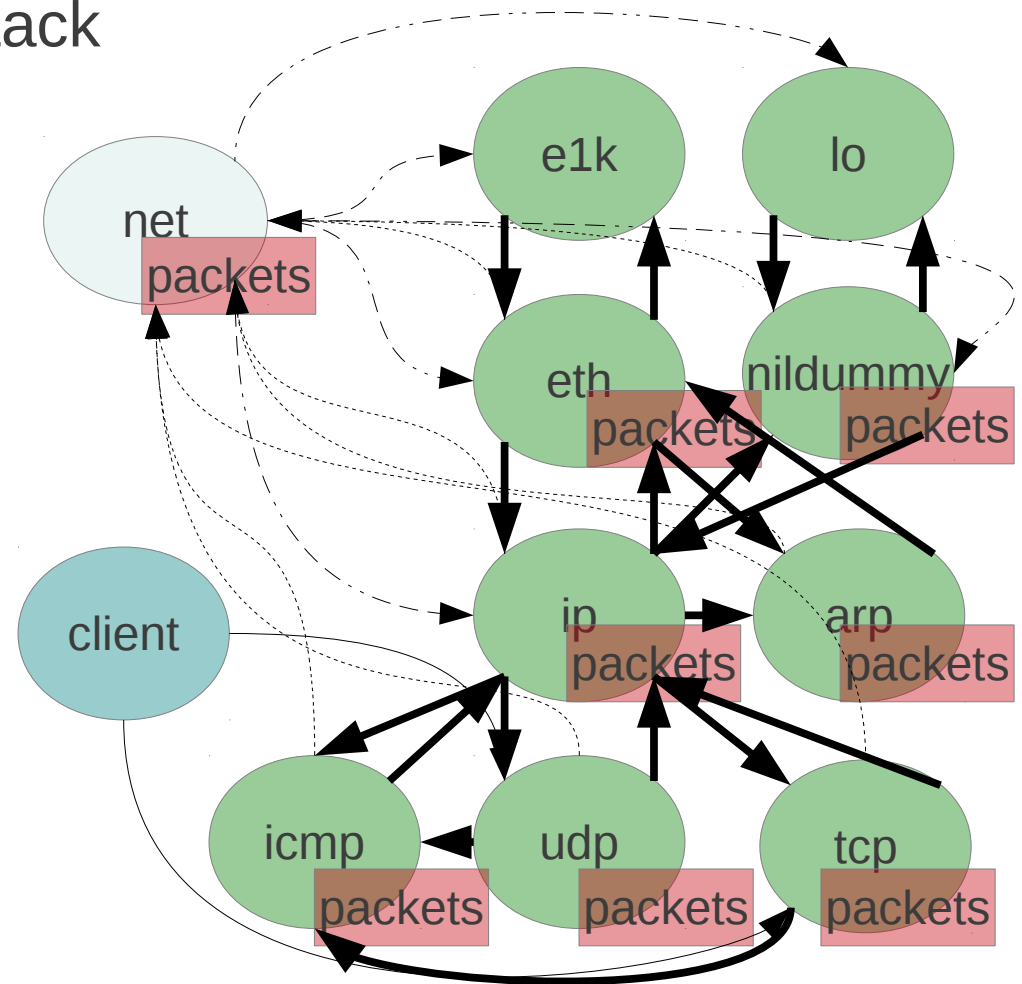
lo, ne2k, e1k, rtl8139

ip, arp

eth, nildummy

icmp, udp, tcp

libc, libnet, libnic



Networking



fully decomposed TCP/IP stack

~~net~~

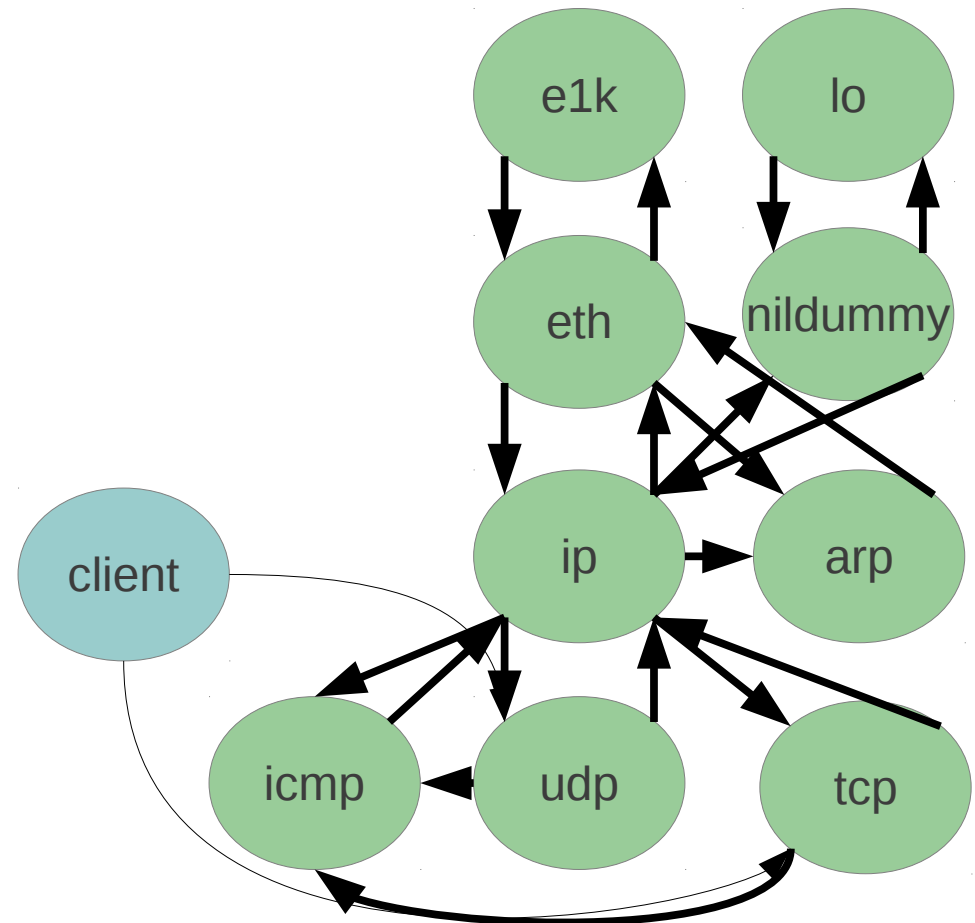
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Recent trends

Fixing past design mistakes

- little-brother kernel drivers

- memory management limitations

Following up with student contributions

- DDF, new TCP server, NICF, USB stack, filesystems

Additions and fixes enable more great new features

- websrv, remcons

Defying the 2nd Law of Thermodynamics

- entropy of HelenOS decreases



In the cooking

Graphics stack

Sound system

Ext4, VFS-FUSE connector

HelenOS DomU, HelenOS instead of Xen

Continuous integration

Installer



On the merge list

Task checkpointing

Statistical Profiler

MMU-less operation

NUMA support

RBAC security

Becoming self-hosting



Config

Python

Build

binutils
GCC
Make
Makedepend
In
find

pcc?
Clang?

Install

MBR
GUID

GRUB
U-Boot
ELILO
SILO
Yaboot

Use

edit
Bazaar
Qemu
msim
Ski

web browser
mail client
IRC client
SSH client



Becoming self-hosting

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Links

<http://www.helenos.org>

<http://trac.helenos.org>

<bzd://bzd.helenos.org/mainline>

<irc://irc.freenode.net/irc>

helenos-devel@lists.modry.cz

Q&A



Thank you!