Asuro Namespace Refactoring Plan

Overview

Refactor all source files under `src/` to use dotted namespace conventions (`asuro.*`). After refactoring, the only file at the `src/` root will be `asuro.pas` (the kernel entry point, currently `kernel.pas`). All other units move into namespaced subdirectories.

Goals

- Clear, hierarchical namespacing for every unit
- Separation of x86-specific code under `arch/x86/` to support future architectures
- Drivers remain under `driver/` with full namespacing
- Structure supports future additions (e.g. `src/wasm/asuro.wasm.*`)

Conventions

Rule	Example
All filenames are **lowercase**	`asuro.driver.bus.pci.pas`
Unit name matches filename (minus `.pas`)	`unit asuro.driver.bus.pci;`
Dots in the name reflect the folder hierarchy	`asuro.a.b.c.pas` lives in `src/a/b/`
If a unit has sub-units, it lives one level up	`asuro.driver.bus.usb.pas` in `driver/bus/` , sub-units in `driver/bus/usb/`
`system.pas` keeps its name (FPC compiler requirement)	`src/arch/x86/system.pas`

New Directory Structure

```
src/
├── asuro.pas                          # Kernel entry point (was kernel.pas)
├── arch/
│   └── x86/
│       ├── system.pas                 # FPC system unit (unchanged name, x86 asm)
│       ├── asuro.arch.x86.gdt.pas
│       ├── asuro.arch.x86.idt.pas
│       ├── asuro.arch.x86.irq.pas
│       ├── asuro.arch.x86.isr.pas
│       ├── asuro.arch.x86.tss.pas
│       ├── asuro.arch.x86.cpu.pas
│       ├── asuro.arch.x86.faults.pas
│       ├── asuro.arch.x86.util.pas    # x86 I/O: outb/inb, CLI/STI, TSC, BSOD
│       ├── asuro.arch.x86.multiboot.pas
│       ├── asuro.arch.x86.bda.pas     # BIOS Data Area
│       ├── asuro.arch.x86.contextswitcher.pas
│       ├── asuro.arch.x86.processloader.pas
│       ├── boot/
│       │   └── stub.asm               # Multiboot boot stub (NASM)
│       │
│       ├── fault/
│       │   ├── asuro.arch.x86.fault.ace.pas
│       │   ├── asuro.arch.x86.fault.bpe.pas
│       │   ├── asuro.arch.x86.fault.btsse.pas
│       │   ├── asuro.arch.x86.fault.cfe.pas
│       │   ├── asuro.arch.x86.fault.csoe.pas
│       │   ├── asuro.arch.x86.fault.dbge.pas
│       │   ├── asuro.arch.x86.fault.dbz.pas
│       │   ├── asuro.arch.x86.fault.dfe.pas
│       │   ├── asuro.arch.x86.fault.gpf.pas
│       │   ├── asuro.arch.x86.fault.idoe.pas
│       │   ├── asuro.arch.x86.fault.iope.pas
│       │   ├── asuro.arch.x86.fault.mce.pas
│       │   ├── asuro.arch.x86.fault.nce.pas
│       │   ├── asuro.arch.x86.fault.nmie.pas
│       │   ├── asuro.arch.x86.fault.oobe.pas
│       │   ├── asuro.arch.x86.fault.pf.pas
│       │   ├── asuro.arch.x86.fault.sfe.pas
│       │   ├── asuro.arch.x86.fault.snpe.pas
│       │   └── asuro.arch.x86.fault.uie.pas
```

```
│       │
│       ├── isr/
│       │   ├── asuro.arch.x86.isr.types.pas
│       │   ├── asuro.arch.x86.isr.manager.pas
│       │   ├── asuro.arch.x86.isr.tmr0.pas
│       │   ├── asuro.arch.x86.isr.tmr1.pas
│       │   ├── asuro.arch.x86.isr.ps2keyboard.pas
│       │   └── asuro.arch.x86.isr.ata.pas
│       │
│       └── memory/
│           ├── asuro.arch.x86.memory.physical.pas
│           └── asuro.arch.x86.memory.virtual.pas
│
├── core/
│   ├── asuro.core.version.pas            # Was include/asuro.pas (build metadata)
│   ├── asuro.core.util.pas               # Portable helpers (IntToStr, min/max, etc.)
│   ├── asuro.core.strings.pas
│   ├── asuro.core.lists.pas
│   ├── asuro.core.hashmap.pas
│   ├── asuro.core.md5.pas
│   ├── asuro.core.base64.pas
│   ├── asuro.core.color.pas
│   ├── asuro.core.fonts.pas
│   ├── asuro.core.rand.pas
│   ├── asuro.core.crc.pas
│   ├── asuro.core.types.pas
│   ├── asuro.core.texture.pas
│   └── asuro.core.targa.pas
│
├── io/
│   ├── asuro.io.stdio.pas
│   └── asuro.io.syslog.pas
│
├── debug/
│   └── asuro.debug.tracer.pas
│
├── memory/
│   └── asuro.memory.heap.pas             # Was lmemorymanager.pas
│
├── sched/
```

```
│   └── asuro.sched.scheduler.pas
│
├── driver/
│   ├── asuro.driver.management.pas        # Was drivermanagement.pas
│   ├── asuro.driver.types.pas             # Was driver/include/drivertypes.pas
│   ├── asuro.driver.net.pas               # Was driver/net/l1/net.pas
│   ├── asuro.driver.video.pas             # Was driver/video/video.pas
│   │
│   ├── bus/
│   │   ├── asuro.driver.bus.pci.pas
│   │   ├── asuro.driver.bus.usb.pas       # Was driver/bus/usb/USB.pas
│   │   └── usb/
│   │       ├── asuro.driver.bus.usb.types.pas
│   │       ├── asuro.driver.bus.usb.core.pas
│   │       ├── asuro.driver.bus.usb.hub.pas
│   │       ├── asuro.driver.bus.usb.uhci.pas
│   │       ├── asuro.driver.bus.usb.ohci.pas
│   │       ├── asuro.driver.bus.usb.ehci.pas
│   │       └── asuro.driver.bus.usb.xhci.pas
│   │
│   ├── hid/
│   │   ├── asuro.driver.hid.keyboard.pas
│   │   ├── asuro.driver.hid.mouse.pas
│   │   ├── ps2/
│   │   │   ├── asuro.driver.hid.ps2.keyboard.pas
│   │   │   └── asuro.driver.hid.ps2.mouse.pas
│   │   └── usb/
│   │       ├── asuro.driver.hid.usb.keyboard.pas
│   │       └── asuro.driver.hid.usb.mouse.pas
│   │
│   ├── interface/
│   │   └── asuro.driver.interface.serial.pas
│   │
│   ├── timer/
│   │   └── asuro.driver.timer.rtc.pas
│   │
│   ├── storage/
│   │   ├── asuro.driver.storage.management.pas
│   │   ├── asuro.driver.storage.ide.pas
│   │   ├── asuro.driver.storage.ahci.pas
```

```
│   │   ├── asuro.driver.storage.fat32.pas
│   │   ├── asuro.driver.storage.asfs.pas
│   │   ├── asuro.driver.storage.vfs.pas
│   │   └── asuro.driver.storage.partitiontable.pas
│   │
│   ├── net/
│   │   ├── asuro.driver.net.types.pas
│   │   ├── asuro.driver.net.utils.pas
│   │   ├── asuro.driver.net.eth2.pas
│   │   ├── asuro.driver.net.arp.pas
│   │   ├── asuro.driver.net.ipv4.pas
│   │   ├── asuro.driver.net.icmp.pas
│   │   ├── asuro.driver.net.tcp.pas
│   │   ├── asuro.driver.net.udp.pas
│   │   └── asuro.driver.net.dhcp.pas
│   │
│   ├── netdev/
│   │   └── asuro.driver.netdev.e1000.pas
│   │
│   ├── video/
│   │   ├── asuro.driver.video.types.pas
│   │   ├── asuro.driver.video.vesa.pas
│   │   ├── asuro.driver.video.vesa8.pas
│   │   ├── asuro.driver.video.vesa16.pas
│   │   ├── asuro.driver.video.vesa24.pas
│   │   ├── asuro.driver.video.vesa32.pas
│   │   ├── asuro.driver.video.doublebuffer.pas
│   │   ├── asuro.driver.video.lvgl.pas
│   │   ├── asuro.driver.video.windows.pas
│   │   ├── asuro.driver.video.desktop.pas
│   │   └── asuro.driver.video.uidebug.pas
│   │
│   └── exp/
│       └── asuro.driver.exp.testdriver.pas
│
└── app/
    ├── asuro.app.manager.pas              # Was progmanager.pas
    ├── asuro.app.vterminal.pas
    ├── asuro.app.base64.pas               # Was base64_prog.pas
    ├── asuro.app.md5sum.pas
```

```
├── asuro.app.dhclient.pas
└── asuro.app.vbeinfo.pas
```

Complete Rename Mapping

Root Entry Point

Old path	New path	Old unit	New unit
kernel.pas	asuro.pas	kernel	asuro

Architecture — x86 (arch/x86/)

Old path	New path	Old unit	New unit
include/system.pas	arch/x86/system.pas	system	system
gdt.pas	arch/x86/asuro.arch.x86.gdt.pas	gdt	asuro.arch.x86.gdt
idt.pas	arch/x86/asuro.arch.x86.idt.pas	idt	asuro.arch.x86.idt
irq.pas	arch/x86/asuro.arch.x86.irq.pas	irq	asuro.arch.x86.irq
isr.pas	arch/x86/asuro.arch.x86.isr.pas	isr	asuro.arch.x86.isr
tss.pas	arch/x86/asuro.arch.x86.tss.pas	tss	asuro.arch.x86.tss
cpu.pas	arch/x86/asuro.arch.x86.cpu.pas	cpu	asuro.arch.x86.cpu
faults.pas	arch/x86/asuro.arch.x86.faults.pas	faults	asuro.arch.x86.faults
contextswitcher.pas	arch/x86/asuro.arch.x86.contextswitcher.pas	contextswitcher	asuro.arch.x86.contextswitcher
processloader.pas	arch/x86/asuro.arch.x86.processloader.pas	processloader	asuro.arch.x86.processloader
include/multiboot.pas	arch/x86/asuro.arch.x86.multiboot.pas	multiboot	asuro.arch.x86.multiboot
include/bios_data_area.pas	arch/x86/asuro.arch.x86.bda.pas	bios_data_area	asuro.arch.x86.bda

Old path	New path	Old unit	New unit
`include/util.pas` *(x86 parts)*	`arch/x86/asuro.arch.x86.util.pas`	`util` *(partial)*	`asuro.arch.x86.util`
`stub/stub.asm`	`arch/x86/boot/stub.asm`	—	—

Architecture — x86 Faults (`arch/x86/fault/`)

Old path	New path	Old unit	New unit
`fault/ACE.pas`	`arch/x86/fault/asuro.arch.x86.fault.ace.pas`	`ACE`	`asuro.arch.x86.fault.ace`
`fault/BPE.pas`	`arch/x86/fault/asuro.arch.x86.fault.bpe.pas`	`BPE`	`asuro.arch.x86.fault.bpe`
`fault/BTSSE.pas`	`arch/x86/fault/asuro.arch.x86.fault.btsse.pas`	`BTSSE`	`asuro.arch.x86.fault.btsse`
`fault/CFE.pas`	`arch/x86/fault/asuro.arch.x86.fault.cfe.pas`	`CFE`	`asuro.arch.x86.fault.cfe`
`fault/CSOE.pas`	`arch/x86/fault/asuro.arch.x86.fault.csoe.pas`	`CSOE`	`asuro.arch.x86.fault.csoe`
`fault/DBGE.pas`	`arch/x86/fault/asuro.arch.x86.fault.dbge.pas`	`DBGE`	`asuro.arch.x86.fault.dbge`
`fault/DBZ.pas`	`arch/x86/fault/asuro.arch.x86.fault.dbz.pas`	`DBZ`	`asuro.arch.x86.fault.dbz`
`fault/DFE.pas`	`arch/x86/fault/asuro.arch.x86.fault.dfe.pas`	`DFE`	`asuro.arch.x86.fault.dfe`
`fault/GPF.pas`	`arch/x86/fault/asuro.arch.x86.fault.gpf.pas`	`GPF`	`asuro.arch.x86.fault.gpf`
`fault/IDOE.pas`	`arch/x86/fault/asuro.arch.x86.fault.idoe.pas`	`IDOE`	`asuro.arch.x86.fault.idoe`
`fault/IOPE.pas`	`arch/x86/fault/asuro.arch.x86.fault.iope.pas`	`IOPE`	`asuro.arch.x86.fault.iope`
`fault/MCE.pas`	`arch/x86/fault/asuro.arch.x86.fault.mce.pas`	`MCE`	`asuro.arch.x86.fault.mce`
`fault/NCE.pas`	`arch/x86/fault/asuro.arch.x86.fault.nce.pas`	`NCE`	`asuro.arch.x86.fault.nce`
`fault/NMIE.pas`	`arch/x86/fault/asuro.arch.x86.fault.nmie.pas`	`NMIE`	`asuro.arch.x86.fault.nmie`
`fault/OOBE.pas`	`arch/x86/fault/asuro.arch.x86.fault.oobe.pas`	`OOBE`	`asuro.arch.x86.fault.oobe`
`fault/PF.pas`	`arch/x86/fault/asuro.arch.x86.fault.pf.pas`	`PF`	`asuro.arch.x86.fault.pf`
`fault/SFE.pas`	`arch/x86/fault/asuro.arch.x86.fault.sfe.pas`	`SFE`	`asuro.arch.x86.fault.sfe`
`fault/SNPE.pas`	`arch/x86/fault/asuro.arch.x86.fault.snpe.pas`	`SNPE`	`asuro.arch.x86.fault.snpe`

Old path	New path	Old unit	New unit
fault/UIE.pas	arch/x86/fault/asuro.arch.x86.fault.uie.pas	UIE	asuro.arch.x86.fault.uie

Architecture — x86 ISR (`arch/x86/isr/`)

Old path	New path	Old unit	New unit
isr/isr_types.pas	arch/x86/isr/asuro.arch.x86.isr.types.pas	isr_types	asuro.arch.x86.isr.types
isr/isrmanager.pas	arch/x86/isr/asuro.arch.x86.isr.manager.pas	isrmanager	asuro.arch.x86.isr.manager
driver/timers/TMR_0_ISR.pas	arch/x86/isr/asuro.arch.x86.isr.tmr0.pas	TMR_0_ISR	asuro.arch.x86.isr.tmr0
driver/timers/TMR_1_ISR.pas	arch/x86/isr/asuro.arch.x86.isr.tmr1.pas	TMR_1_ISR	asuro.arch.x86.isr.tmr1
driver/hid/ps2/ps2_keyboard_isr.pas	arch/x86/isr/asuro.arch.x86.isr.ps2keyboard.pas	PS2_KEYBOARD_ISR	asuro.arch.x86.isr.ps2keyboard
driver/storage/ATA_ISR.pas	arch/x86/isr/asuro.arch.x86.isr.ata.pas	ATA_ISR	asuro.arch.x86.isr.ata

Architecture — x86 Memory (`arch/x86/memory/`)

Old path	New path	Old unit	New unit
pmemorymanager.pas	arch/x86/memory/asuro.arch.x86.memory.physical.pas	pmemorymanager	asuro.arch.x86.memory.physical
vmemorymanager.pas	arch/x86/memory/asuro.arch.x86.memory.virtual.pas	vmemorymanager	asuro.arch.x86.memory.virtual

Core Libraries (`core/`)

Old path	New path	Old unit	New unit
include/asuro.pas	core/asuro.core.version.pas	asuro	asuro.core.version
include/util.pas *(portable parts)*	core/asuro.core.util.pas	util *(partial)*	asuro.core.util
include/strings.pas	core/asuro.core.strings.pas	strings	asuro.core.strings
include/lists.pas	core/asuro.core.lists.pas	lists	asuro.core.lists
include/hashmap.pas	core/asuro.core.hashmap.pas	hashmap	asuro.core.hashmap

Old path	New path	Old unit	New unit
include/md5.pas	core/asuro.core.md5.pas	md5	asuro.core.md5
include/base64.pas	core/asuro.core.base64.pas	base64	asuro.core.base64
include/color.pas	core/asuro.core.color.pas	color	asuro.core.color
include/fonts.pas	core/asuro.core.fonts.pas	fonts	asuro.core.fonts
include/rand.pas	core/asuro.core.rand.pas	rand	asuro.core.rand
include/crc.pas	core/asuro.core.crc.pas	crc	asuro.core.crc
include/types.pas	core/asuro.core.types.pas	types	asuro.core.types
include/texture.pas	core/asuro.core.texture.pas	texture	asuro.core.texture
include/targa.pas	core/asuro.core.targa.pas	targa	asuro.core.targa

Kernel Services

Old path	New path	Old unit	New unit
stdio.pas	io/asuro.io.stdio.pas	stdio	asuro.io.stdio
syslog.pas	io/asuro.io.syslog.pas	syslog	asuro.io.syslog
tracer.pas	debug/asuro.debug.tracer.pas	tracer	asuro.debug.tracer
scheduler.pas	sched/asuro.sched.scheduler.pas	scheduler	asuro.sched.scheduler
lmemorymanager.pas	memory/asuro.memory.heap.pas	lmemorymanager	asuro.memory.heap

Driver Framework (`driver/`)

Old path	New path	Old unit	New unit
drivermanagement.pas	driver/asuro.driver.management.pas	drivermanagement	asuro.driver.management
driver/include/drivertypes.pas	driver/asuro.driver.types.pas	drivertypes	asuro.driver.types

Driver — Bus (`driver/bus/`)

Old path	New path	Old unit	New unit
driver/bus/PCI.pas	driver/bus/asuro.driver.bus.pci.pas	PCI	asuro.driver.bus.pci
driver/bus/usb/USB.pas	driver/bus/asuro.driver.bus.usb.pas	USB	asuro.driver.bus.usb
driver/bus/usb/usbtypes.pas	driver/bus/usb/asuro.driver.bus.usb.types.pas	usbtypes	asuro.driver.bus.usb.types
driver/bus/usb/usbcore.pas	driver/bus/usb/asuro.driver.bus.usb.core.pas	usbcore	asuro.driver.bus.usb.core
driver/bus/usb/usbhub.pas	driver/bus/usb/asuro.driver.bus.usb.hub.pas	usbhub	asuro.driver.bus.usb.hub
driver/bus/usb/UHCI.pas	driver/bus/usb/asuro.driver.bus.usb.uhci.pas	UHCI	asuro.driver.bus.usb.uhci
driver/bus/usb/OHCI.pas	driver/bus/usb/asuro.driver.bus.usb.ohci.pas	OHCI	asuro.driver.bus.usb.ohci
driver/bus/usb/EHCI.pas	driver/bus/usb/asuro.driver.bus.usb.ehci.pas	EHCI	asuro.driver.bus.usb.ehci
driver/bus/usb/XHCI.pas	driver/bus/usb/asuro.driver.bus.usb.xhci.pas	XHCI	asuro.driver.bus.usb.xhci

Driver — HID (`driver/hid/`)

Old path	New path	Old unit	New unit
driver/hid/keyboard.pas	driver/hid/asuro.driver.hid.keyboard.pas	keyboard	asuro.driver.hid.keyboard
driver/hid/mouse.pas	driver/hid/asuro.driver.hid.mouse.pas	mouse	asuro.driver.hid.mouse
driver/hid/ps2/ps2_keyboard.pas	driver/hid/ps2/asuro.driver.hid.ps2.keyboard.pas	ps2_keyboard	asuro.driver.hid.ps2.keyboard
driver/hid/ps2/ps2_mouse.pas	driver/hid/ps2/asuro.driver.hid.ps2.mouse.pas	ps2_mouse	asuro.driver.hid.ps2.mouse
driver/hid/usb/usb_keyboard.pas	driver/hid/usb/asuro.driver.hid.usb.keyboard.pas	usb_keyboard	asuro.driver.hid.usb.keyboard
driver/hid/usb/usb_mouse.pas	driver/hid/usb/asuro.driver.hid.usb.mouse.pas	usb_mouse	asuro.driver.hid.usb.mouse

Driver — Interface (`driver/interface/`)

Old path	New path	Old unit	New unit
driver/interface/serial.pas	driver/interface/asuro.driver.interface.serial.pas	serial	asuro.driver.interface.serial

Driver — Timer (`driver/timer/`)

Old path	New path	Old unit	New unit
driver/timers/RTC.pas	driver/timer/asuro.driver.timer.rtc.pas	RTC	asuro.driver.timer.rtc

Driver — Storage (`driver/storage/`)

Old path	New path	Old unit	New unit
driver/storage/storagemanagement.pas	driver/storage/asuro.driver.storage.management.pas	storagemanagement	asuro.driver.storage.management
driver/storage/IDE.pas	driver/storage/asuro.driver.storage.ide.pas	IDE	asuro.driver.storage.ide
driver/storage/AHCI.pas	driver/storage/asuro.driver.storage.ahci.pas	AHCI	asuro.driver.storage.ahci
driver/storage/fat32.pas	driver/storage/asuro.driver.storage.fat32.pas	fat32	asuro.driver.storage.fat32
driver/storage/asfs.pas	driver/storage/asuro.driver.storage.asfs.pas	asfs	asuro.driver.storage.asfs
driver/storage/vfs.pas	driver/storage/asuro.driver.storage.vfs.pas	vfs	asuro.driver.storage.vfs
driver/storage/partitiontable.pas	driver/storage/asuro.driver.storage.partitiontable.pas	partitontable	asuro.driver.storage.partitiontable

Driver — Network (`driver/net/`)

Old path	New path	Old unit	New unit
driver/net/l1/net.pas	driver/asuro.driver.net.pas	net	asuro.driver.net
driver/net/include/nettypes.pas	driver/net/asuro.driver.net.types.pas	nettypes	asuro.driver.net.types
driver/net/include/netutils.pas	driver/net/asuro.driver.net.utils.pas	netutils	asuro.driver.net.utils
driver/net/l2/eth2.pas	driver/net/asuro.driver.net.eth2.pas	eth2	asuro.driver.net.eth2
driver/net/l3/arp.pas	driver/net/asuro.driver.net.arp.pas	arp	asuro.driver.net.arp
driver/net/l3/ipv4.pas	driver/net/asuro.driver.net.ipv4.pas	ipv4	asuro.driver.net.ipv4
driver/net/l4/icmp.pas	driver/net/asuro.driver.net.icmp.pas	icmp	asuro.driver.net.icmp
driver/net/l4/tcp.pas	driver/net/asuro.driver.net.tcp.pas	tcp	asuro.driver.net.tcp

Old path	New path	Old unit	New unit
driver/net/l4/udp.pas	driver/net/asuro.driver.net.udp.pas	udp	asuro.driver.net.udp
driver/net/l5/dhcp.pas	driver/net/asuro.driver.net.dhcp.pas	dhcp	asuro.driver.net.dhcp

> **Note:** The old layer folders (`l1/` , `l2/` , `l3/` , `l4/` , `l5/` , `include/`) are flattened — protocol names are self-descriptive.

Driver — Network Device (`driver/netdev/`)

Old path	New path	Old unit	New unit
driver/netdev/E1000.pas	driver/netdev/asuro.driver.netdev.e1000.pas	E1000	asuro.driver.netdev.e1000

Driver — Video (`driver/video/`)

Old path	New path	Old unit	New unit
driver/video/video.pas	driver/asuro.driver.video.pas	video	asuro.driver.video
driver/video/videotypes.pas	driver/video/asuro.driver.video.types.pas	videotypes	asuro.driver.video.types
driver/video/vesa.pas	driver/video/asuro.driver.video.vesa.pas	vesa	asuro.driver.video.vesa
driver/video/vesa8.pas	driver/video/asuro.driver.video.vesa8.pas	vesa8	asuro.driver.video.vesa8
driver/video/vesa16.pas	driver/video/asuro.driver.video.vesa16.pas	vesa16	asuro.driver.video.vesa16
driver/video/vesa24.pas	driver/video/asuro.driver.video.vesa24.pas	vesa24	asuro.driver.video.vesa24
driver/video/vesa32.pas	driver/video/asuro.driver.video.vesa32.pas	vesa32	asuro.driver.video.vesa32
driver/video/doublebuffer.pas	driver/video/asuro.driver.video.doublebuffer.pas	doublebuffer	asuro.driver.video.doublebuffer
driver/video/lvgl.pas	driver/video/asuro.driver.video.lvgl.pas	lvgl	asuro.driver.video.lvgl
driver/video/windows.pas	driver/video/asuro.driver.video.windows.pas	windows	asuro.driver.video.windows
driver/video/desktop.pas	driver/video/asuro.driver.video.desktop.pas	desktop	asuro.driver.video.desktop
driver/video/uidebug.pas	driver/video/asuro.driver.video.uidebug.pas	uidebug	asuro.driver.video.uidebug

Driver — Experimental (`driver/exp/`)

Old path	New path	Old unit	New unit
`driver/exp/testdriver.pas`	`driver/exp/asuro.driver.exp.testdriver.pas`	`testdriver`	`asuro.driver.exp.testdriver`

Applications (`app/`)

Old path	New path	Old unit	New unit
`progmanager.pas`	`app/asuro.app.manager.pas`	`progmanager`	`asuro.app.manager`
`prog/vterminal.pas`	`app/asuro.app.vterminal.pas`	`vterminal`	`asuro.app.vterminal`
`prog/base64_prog.pas`	`app/asuro.app.base64.pas`	`base64_prog`	`asuro.app.base64`
`prog/md5sum.pas`	`app/asuro.app.md5sum.pas`	`md5sum`	`asuro.app.md5sum`
`prog/dhclient.pas`	`app/asuro.app.dhclient.pas`	`dhclient`	`asuro.app.dhclient`
`prog/vbeinfo.pas`	`app/asuro.app.vbeinfo.pas`	`vbeinfo`	`asuro.app.vbeinfo`

Special Cases

`system.pas`

FPC requires the `system` unit to be named exactly `system`. It cannot be renamed. It moves to `arch/x86/system.pas` and the build system must add `-Fuarch/x86` so FPC can find it.

`util.pas` Split

The current `include/util.pas` (~55 dependents) must be split into two units:

- **`asuro.core.util`** — portable helpers: `IntToStr`, `HexToStr`, `min` / `max`, `redraw`, string/array utilities, sleep logic (calling into a clock abstraction)
- **`asuro.arch.x86.util`** — x86 I/O: `outb` / `inb` / `outw` / `inw` / `outl` / `inl`, `CLI` / `STI`, TSC reads, `BSOD` (writes VGA text-mode memory at `$B8000`), anything with `{$ASMMODE intel}` inline assembly

Units that only use portable helpers: `uses asuro.core.util`
Units that also do port I/O: `uses asuro.core.util, asuro.arch.x86.util`

`include/asuro.pas` → `asuro.core.version`

The old `include/asuro.pas` (version/build metadata) is renamed to `asuro.core.version` to avoid collision with the main entry point `asuro.pas`. All `uses asuro` references for version info become `uses asuro.core.version`.

`stub.asm` Entry Point

The assembly boot stub calls `kmain` (the Pascal entry point exported by `kernel.pas`). After renaming the unit to `asuro`, verify the FPC-mangled symbol name. If it changes, update the `call` instruction in `stub.asm` accordingly.

Implementation Steps

Phase 1: Create Directory Skeleton

Create all new directories. No files move yet.

Phase 2: Split `util.pas`

Split `include/util.pas` into portable (`asuro.core.util`) and x86-specific (`asuro.arch.x86.util`) parts. This is done first because it affects nearly every other file.

Phase 3: Move & Rename Files

Move every `.pas` file to its new location with its new name. Update the `unit` declaration in each file. Do this in dependency order — leaf units first, then units that depend on them.

Phase 4: Update All `uses` Clauses

Rewrite every `uses` clause in every file to reference the new unit names. This is the largest mechanical change. Use the complete old→new mapping above as a find-and-replace dictionary.

High-traffic renames (most `uses` clause updates):

Old name	New name	~Dependents
`util`	`asuro.core.util` + `asuro.arch.x86.util`	~55
`syslog`	`asuro.io.syslog`	~40
`tracer`	`asuro.debug.tracer`	~35
`lmemorymanager`	`asuro.memory.heap`	~30
`strings`	`asuro.core.strings`	~20
`isr_types`	`asuro.arch.x86.isr.types`	~25
`isrmanager`	`asuro.arch.x86.isr.manager`	~10
`drivermanagement`	`asuro.driver.management`	~15
`drivertypes`	`asuro.driver.types`	~15

Phase 5: Update Build System

Update the Makefile (outside `src/`) with new `-Fu` unit search paths:

```
-Fuarch/x86 -Fuarch/x86/fault -Fuarch/x86/isr -Fuarch/x86/memory
-Fucore -Fuio -Fudebug -Fumemory -Fusched
-Fudriver -Fudriver/bus -Fudriver/bus/usb -Fudriver/hid -Fudriver/hid/ps2
-Fudriver/hid/usb -Fudriver/interface -Fudriver/timer -Fudriver/storage
-Fudriver/net -Fudriver/netdev -Fudriver/video -Fudriver/exp
-Fuapp
```

Update the NASM include path for `stub.asm` at its new location `arch/x86/boot/stub.asm`.

Phase 6: Clean Up

Delete empty old directories: `fault/`, `isr/`, `include/`, `prog/`, `stub/`, and emptied subfolders under `driver/` (`driver/include/`, `driver/timers/`, `driver/net/l1/` through `l5/`, `driver/net/include/`).

Phase 7: Verify

1. Full FPC build — zero unit-not-found errors

2. Grep for old unit names: `grep -rn "uses.*\bgdt\b" src/` (repeat for each old name)
3. Boot test in QEMU — verify `stub.asm` links correctly
4. Confirm no duplicate unit names: `find src -name "*.pas" | sort`

Future Namespace Reservations

Namespace	Purpose
`src/wasm/asuro.wasm.*`	WASM virtual machine
`src/arch/arm/asuro.arch.arm.*`	ARM architecture port
`src/arch/riscv/asuro.arch.riscv.*`	RISC-V architecture port
`src/driver/<category>/asuro.driver.<category>.<name>.pas`	New drivers

Key Decisions Recorded

Decision	Rationale
`system.pas` moves to `arch/x86/` but keeps its name	FPC compiler requires `unit system` to be named `system`
`util.pas` is split into portable + x86 parts	~55 dependents; clean arch separation needed
Mixed-hardware drivers (PCI, serial, RTC, PS/2) stay under `driver/`	They're drivers conceptually; x86 I/O port access is an implementation detail
ISR handlers (TMR_0_ISR, PS2_KEYBOARD_ISR, ATA_ISR) move to `arch/x86/isr/`	They register with x86 IDT gates and use inline assembly
Network layer folders (`l1/` – `l5/`) are flattened	Protocol names (eth2, arp, ipv4, tcp, etc.) are self-descriptive
`include/asuro.pas` becomes `asuro.core.version`	Avoids collision with main entry point `asuro.pas`
Kernel services use per-concern namespaces (io, debug, sched, memory)	Cleaner than a monolithic `kernel.*` namespace

Decision	Rationale
`lmemorymanager` (heap) is portable → `asuro.memory.heap`	The heap allocator logic is arch-independent; it depends on vmem/pmem via interface
`pmemorymanager` / `vmemorymanager` are x86-specific → `arch/x86/memory/`	Page directory/table entries are x86 i386 structures
`contextswitcher` / `processloader` go to `arch/x86/`	They will contain x86 register save/restore assembly when implemented