



PRINTING



WITHOUT LINUX

-Omkar Nanajkar

AGENDA

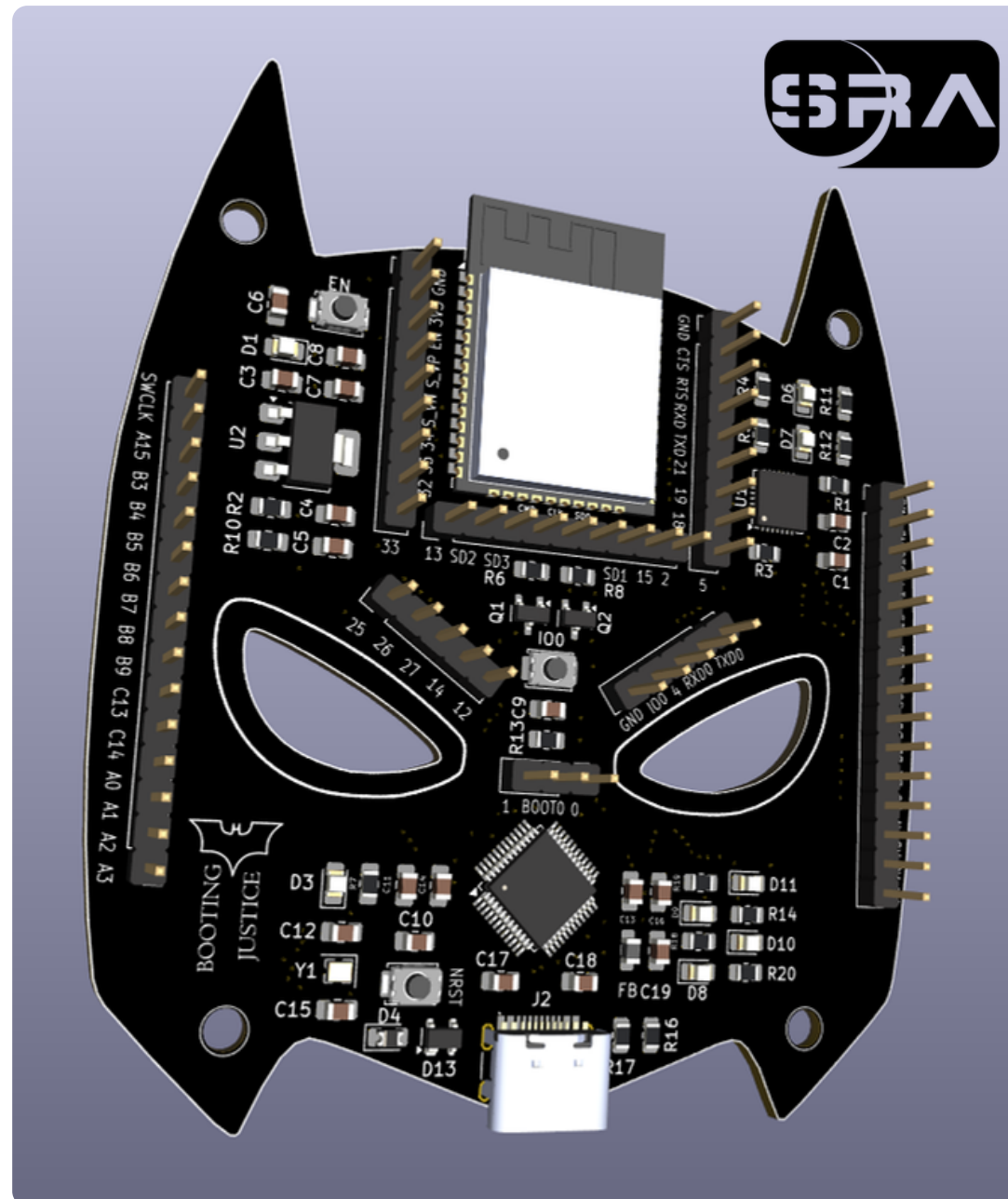


- Difference between Linux and Zephyr
- How do actually printers prints out ?
- CUPS
- DNS and mDNS
- IPP (Internet Printing Protocol)
- Printing without Linux

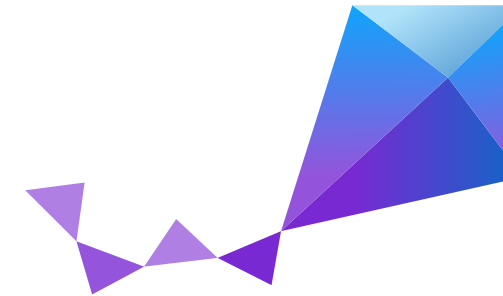


ABOUT ME

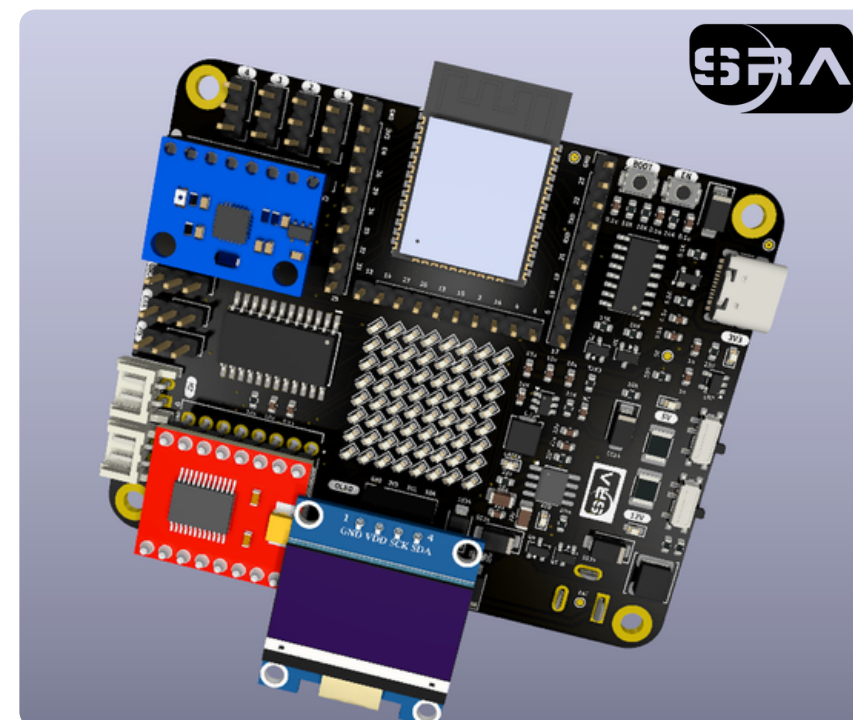
- Electronics Head SRA

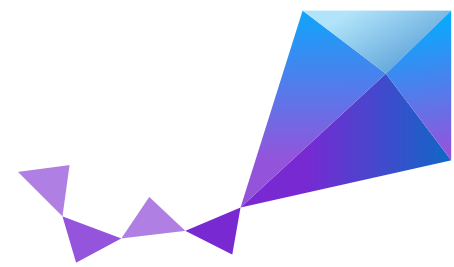


Google
Summer of Code

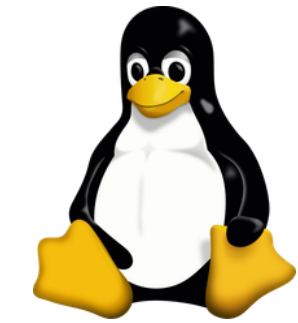


- Superr.ai : Product Design





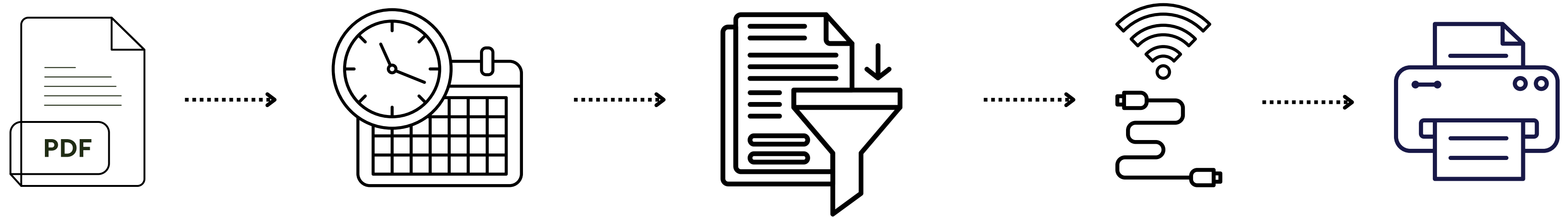
ZEPHYR VS LINUX



- Real-Time behaviour
- Flash and RAM in KB/MB
- Enables only features you need
- Optional file system (LittleFS)
- No User Interface, can use USB-CDC
- Less booting time
- Low power
- Not much complex
- nRF5320, ESP32-S3, RP2040

- Not real-time
- Flash and RAM in GB/TB
- Large feature rich kernel
- Extensive file system support (XFS)
- Support GUI, CLI
- More booting time
- High power
- Complex
- Raspberry pi/any working PC

●●● JOB'S LIFECYCLE



User Application

- Generating printing job
- pdf/img/jpeg

Scheduler and Queue

- managing print jobs
- managing print queues

Filter Pipeline

- pdftoraster
- CUPS Raster
- PWG Raster
- Apple Raster
- PCL

Transmission media

- WIFI
- USB

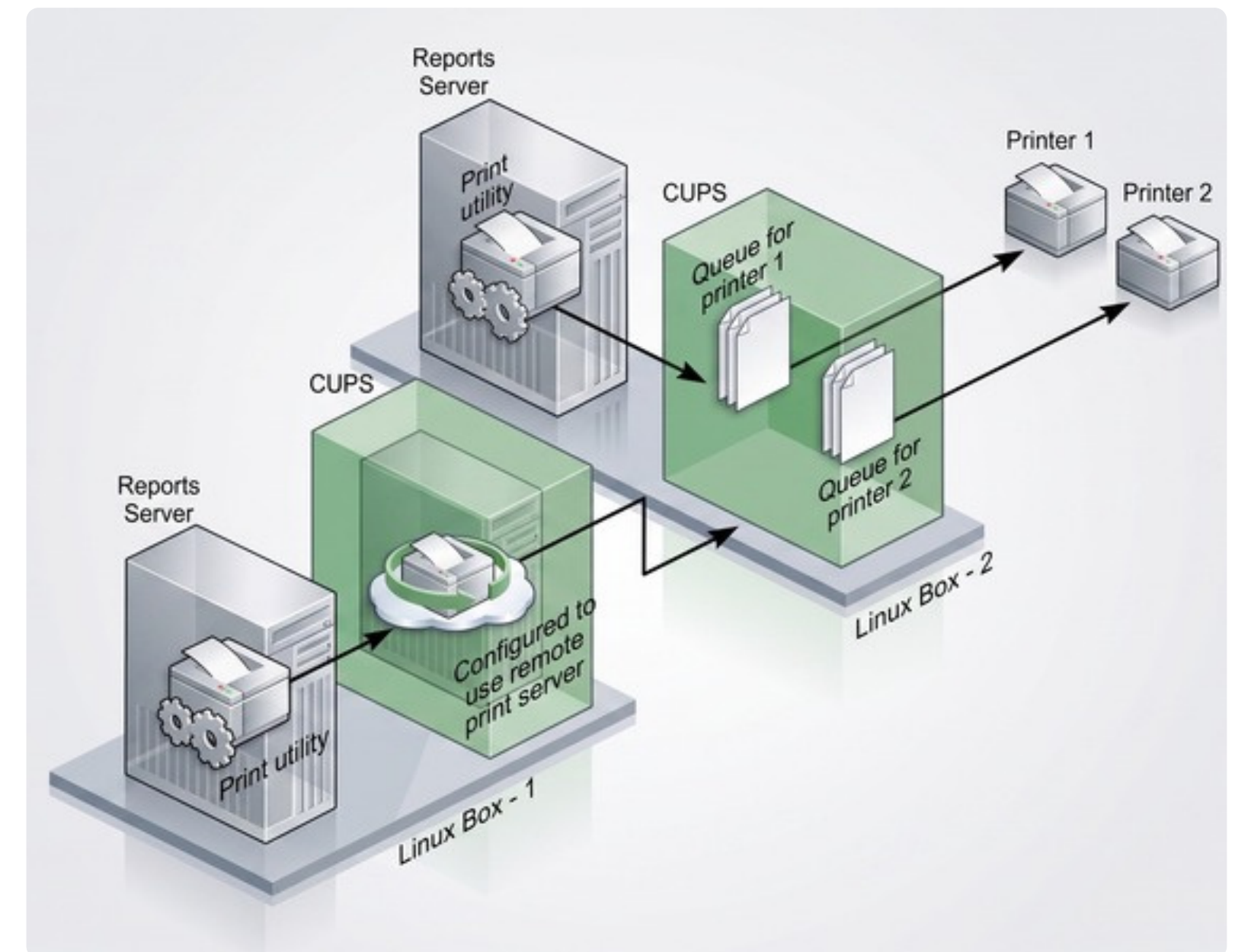
Printer

- Print out Job

CUPS



- Common UNIX PRINTING SYSTEM
- Designed for OS like linux, macOS.
- Printer discovery, job queuing, scheduling, status reporting.
- Sends jobs to CUPS instead of directly communicating with printers.
- Libcups/libcupsfilters, backend (USB, IPP, network), and libcupsfilters.
- Industry standard printing system.

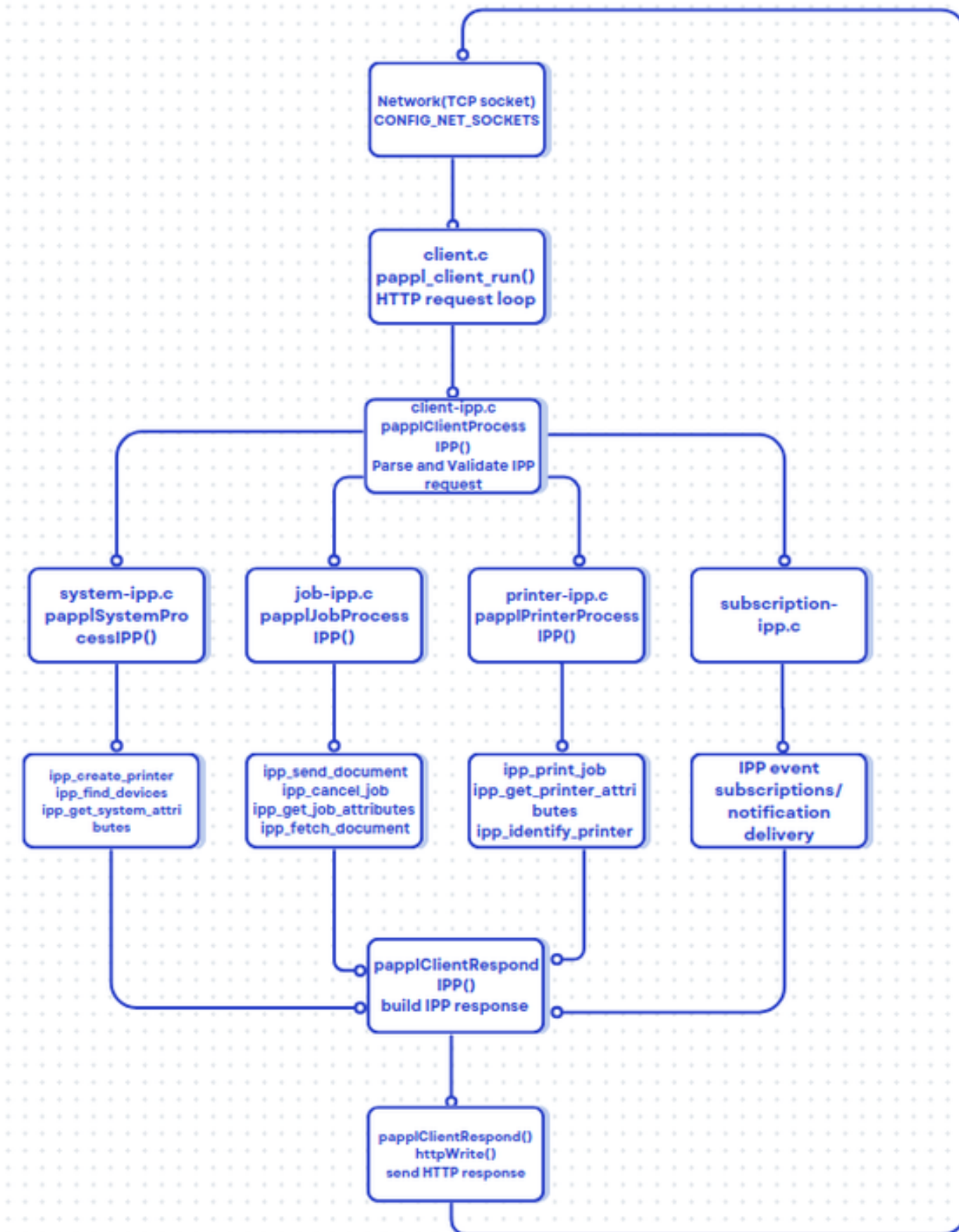


... IPP



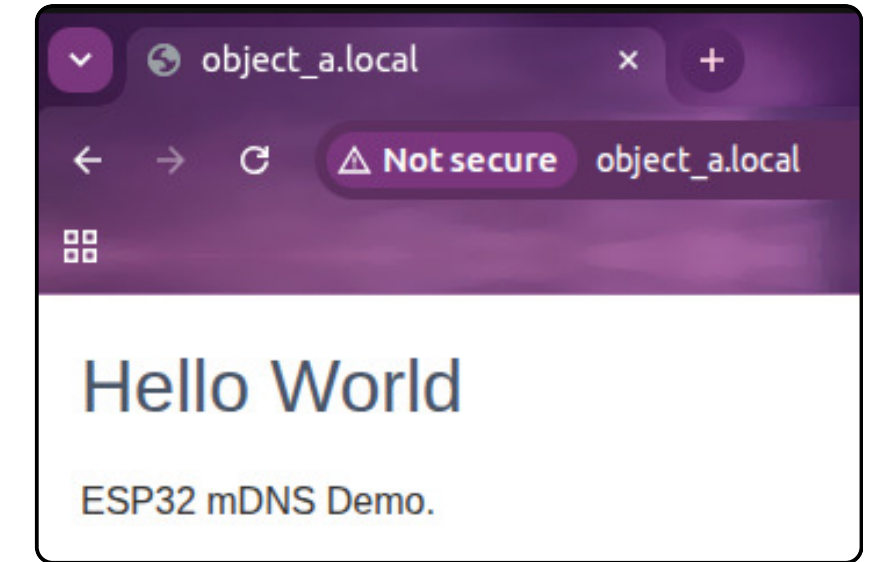
- Internet Printing Protocol
- IPP operations :
- Create-Job
- Send-Document
- Get-Printer-Attributes
- Get-Job-Attributes
- Get-Jobs
- Cancel-Job
- IPP-over-USB/WIFI

IPP REQUEST WORKFLOW :

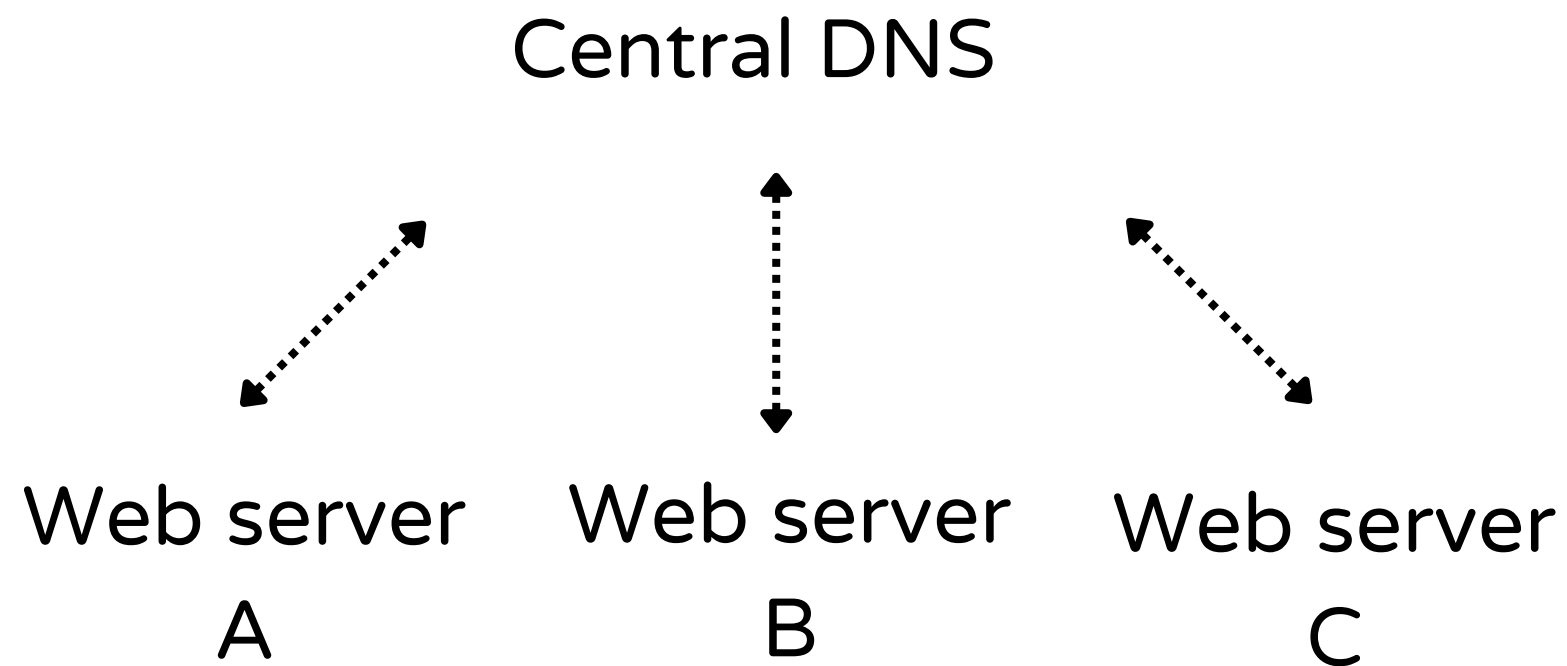




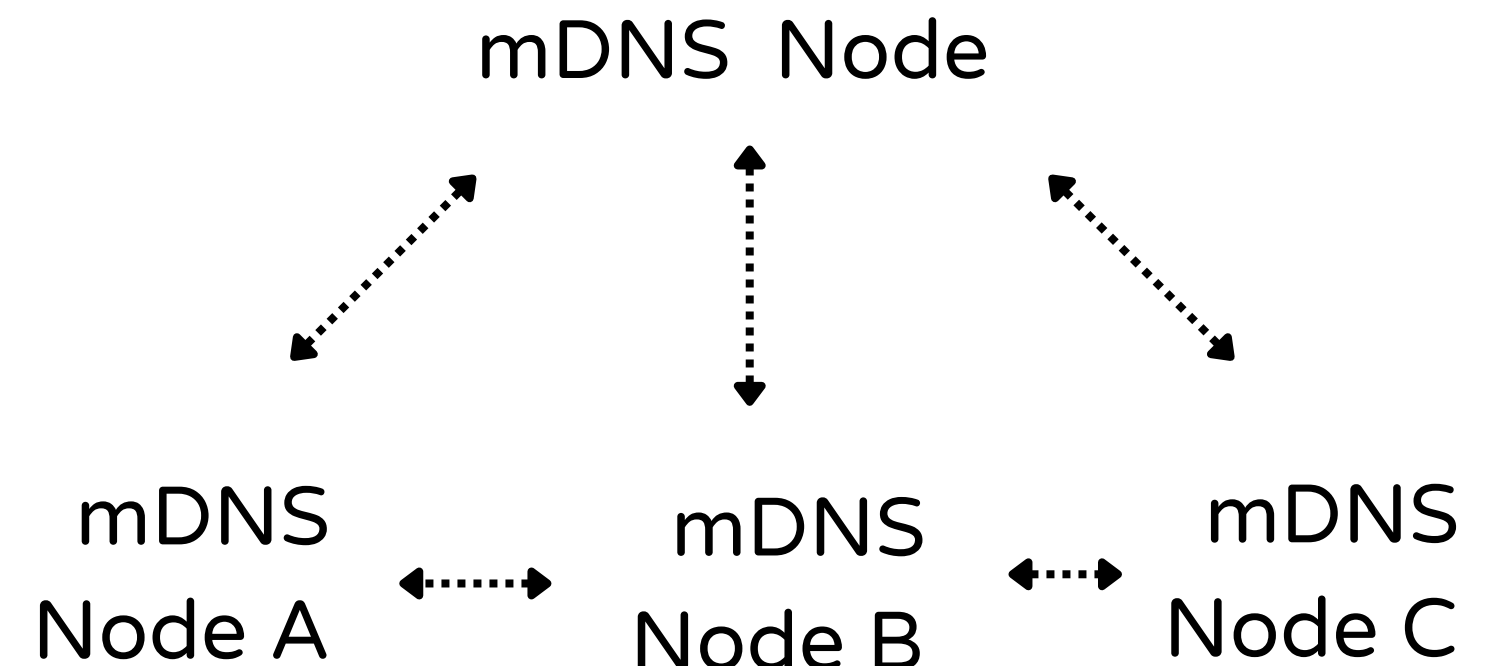
DNS and mDNS



- Domain Name system



- multicast Domain Name system



●●● PRINTING WITHOUT LINUX

- How to Port ?
- POSIX (Portable Operating System Interface)
- `pthread_create()` → `k_thread_create()`
- POSIX compatibility Layer
- Do I need to read to each and every function and file ?
- Stack overflows, memory leaks, larger footprints.
- Fatal error
- No definite values of buffer. Experimenting is the only way !
- Thread analyzer.



Thank you

