Configuring the OS for Tomorrow's Robots

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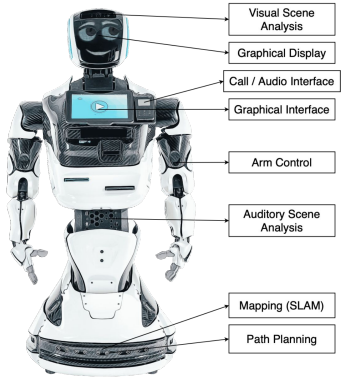
Tomorrow's Autonomous Mobile Service Robots

source: zdnet.com, robotics247.com

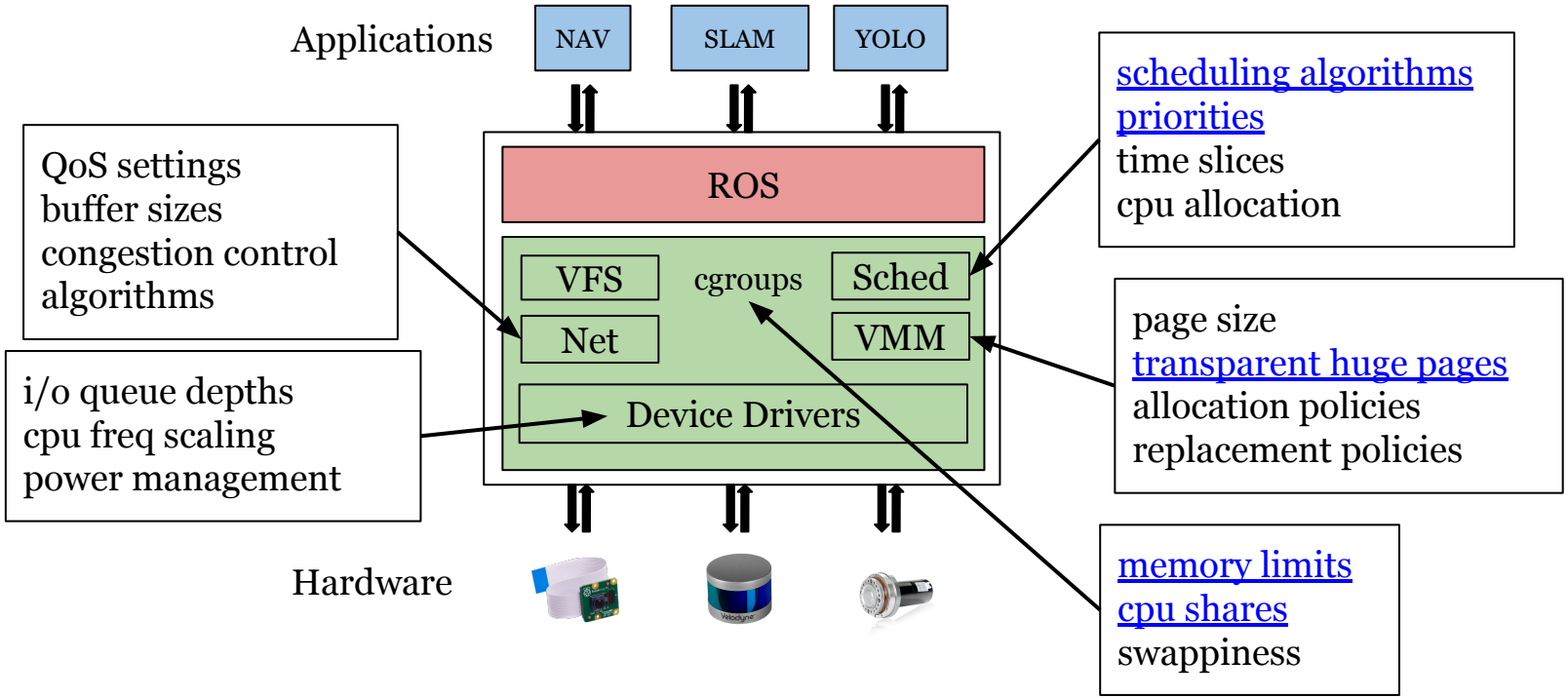


source: cleanpng.com

source: ieee.org, wikipedia.org

source: pngall.com

Configuring the Operating System

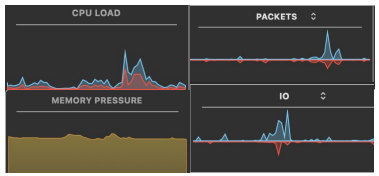


Why is configuration difficult?

1. Some knobs are per-process vs some are system-wide
2. Configuration for a application can have counterintuitive effects on performance of other applications
3. Optimal configuration depends on the environment
4. Global optimal configuration needs proper objective function defined over each application objective (slo)

Why should configuration change?

1. Environment (nature of input to the programs)
2. Contention (nature of load from each application)



contention, system configuration

Application

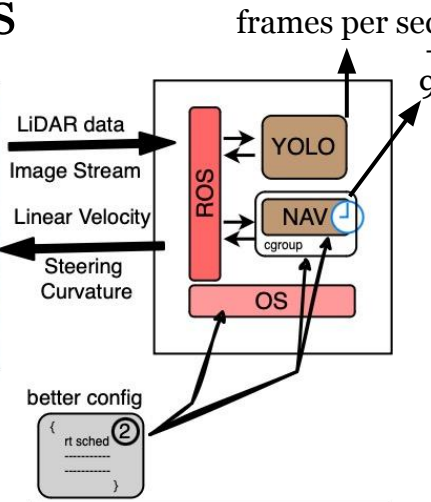
function (args) {
—————————
<instruction>
—————————
—————————
}

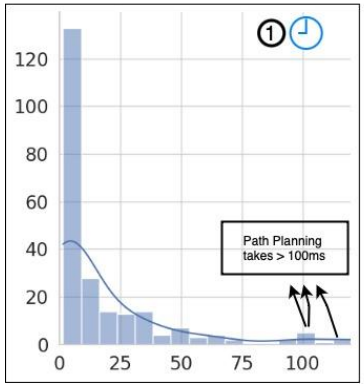
environment, context

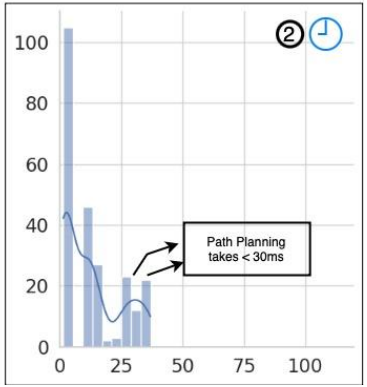
slo => function time (ms)

simple hallway
vs
circular maze!

Observations





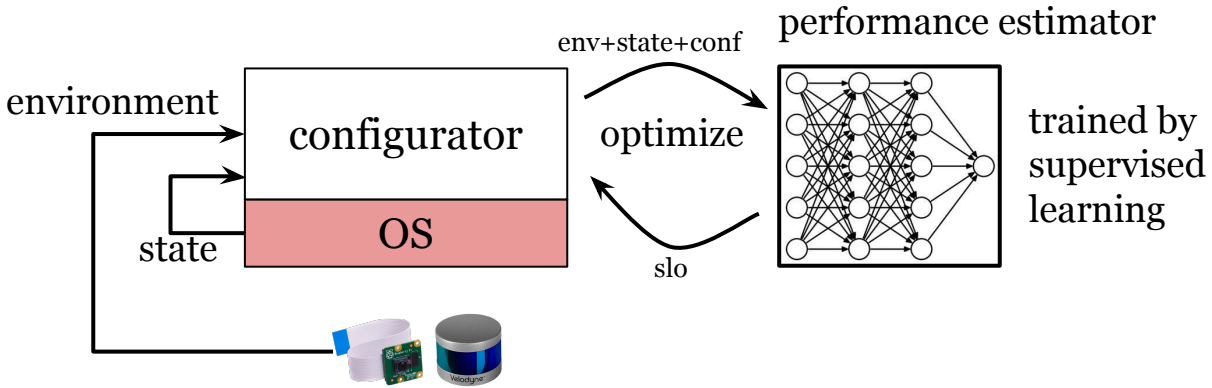


1. Scheduling algorithm for NAV to DEADLINE, with appropriate settings
   NAV ↑ YOLO ↓
2. Increasing CPU Shares for YOLO
   NAV ↓ YOLO ↑
3. Adding memory limits for YOLO
   NAV ↑ YOLO ↓
4. Transparent Huge Pages (system-wide)
   NAV ↓ YOLO ↑

Learning-based approach

Dynamic configuration updates through an ML model

- Prototype model that ignores environment



Thank You!

Experimental details, numbers, model performance,... etc!
Poster session later today (3:30 - 5:00 pm)

For other Learning in OS works - https://utns.cs.utexas.edu/
Robotics Lab - https://amrl.cs.utexas.edu/