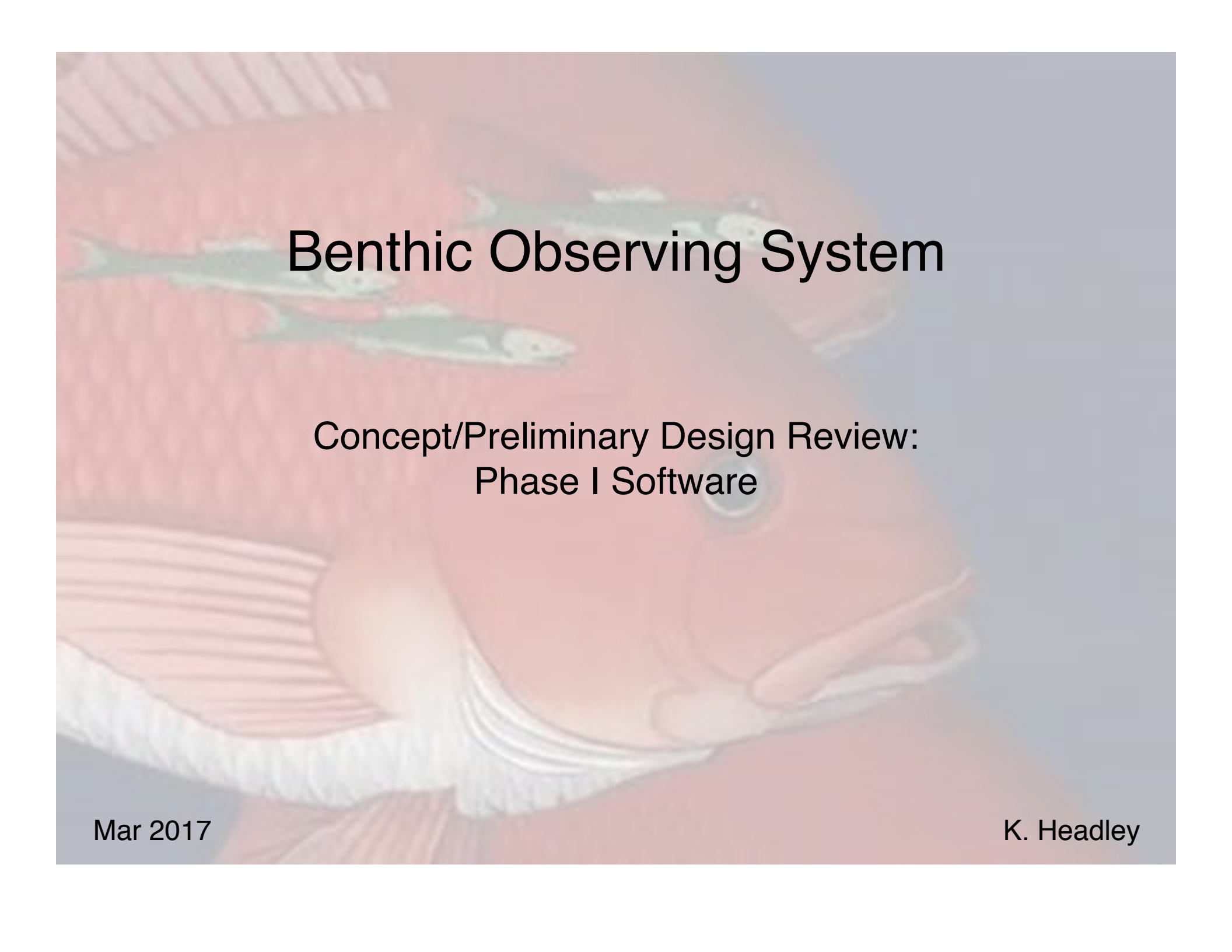




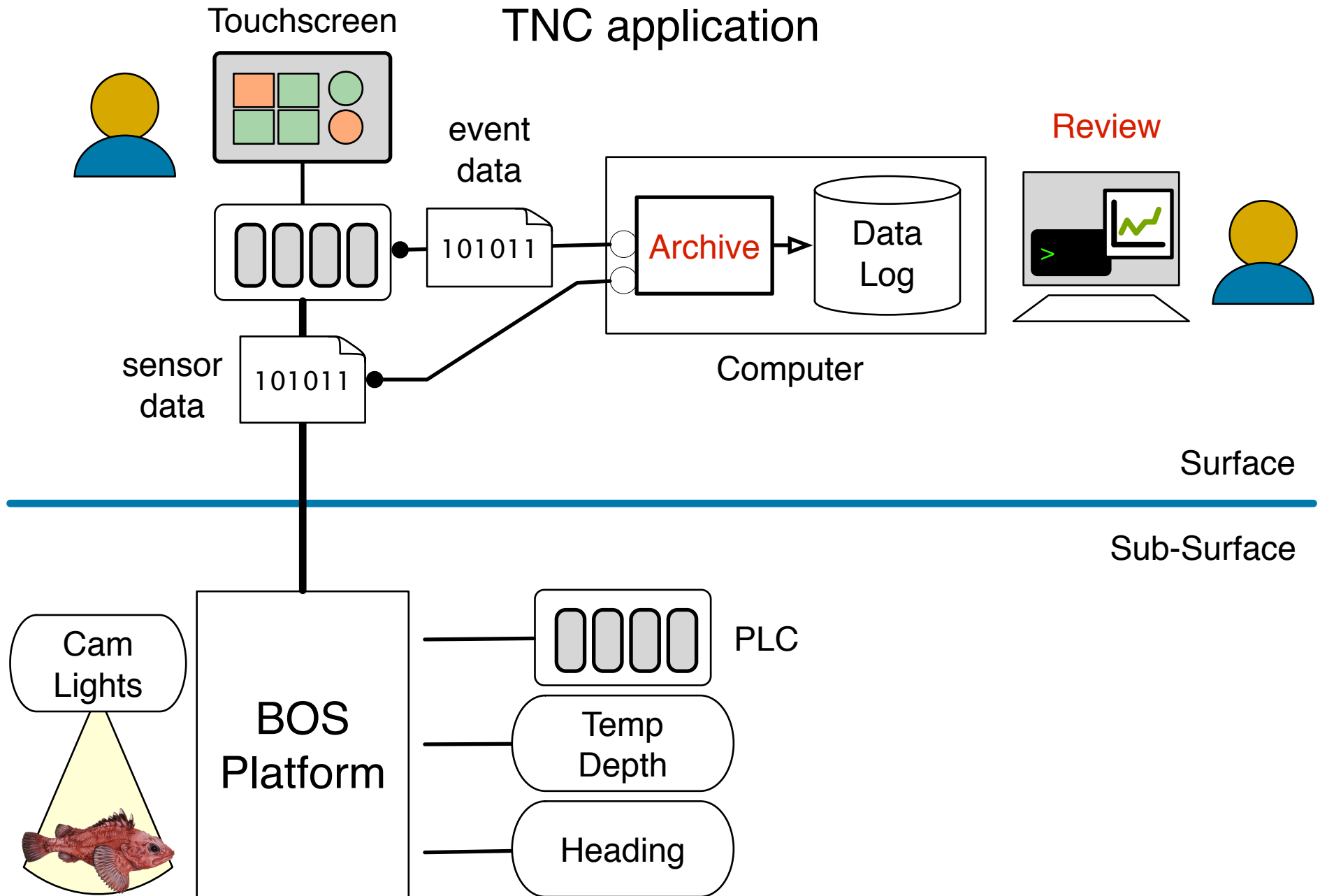
Benthic Observing System

Concept/Preliminary Design Review:
Phase I Software

Mar 2017

K. Headley

BOS Software TNC application



Key Software Requirements

Archived data streams

- Platform temperature, depth
- Platform heading, [pitch, roll?]
- Control events:
 - Camera/lights power
 - start/stop recording)
- Data time-stamps
- Data review (post-op)
- Data monitor (real-time)?
- Ease of use for science users
- Ease of development/extension

Required Software Features

- **Archive**
 - record timestamped data
- **Review**
 - data workflows, post-op

Possible Additional Features

- **Control**
 - system operation
- **Configuration**
- **Telemetry**
 - real-time distribution
- **Interpretation**
 - real-time parsing

Be careful what you wish for

Some features introduce requirements that impact approach, schedule and resources:

- Autonomous operation (e.g., battery powered)
- Remote/real time monitoring (especially via mobile devices)
- GUI

We can implement almost any feature, given enough time....

*Realistically, we evaluate **implementation options** for features in terms of **costs and benefits**:
Time, Resources, Risks, and Value*

Design Goals

- Minimize software development for first iteration
- Architect for future expansion
 - More contextual sensors
 - Real time, distributed/mobile displays
 - Control interface
 - Configuration
 - Autonomous operation?
- Keep code and development environment as simple as possible
- Minimize overall system complexity

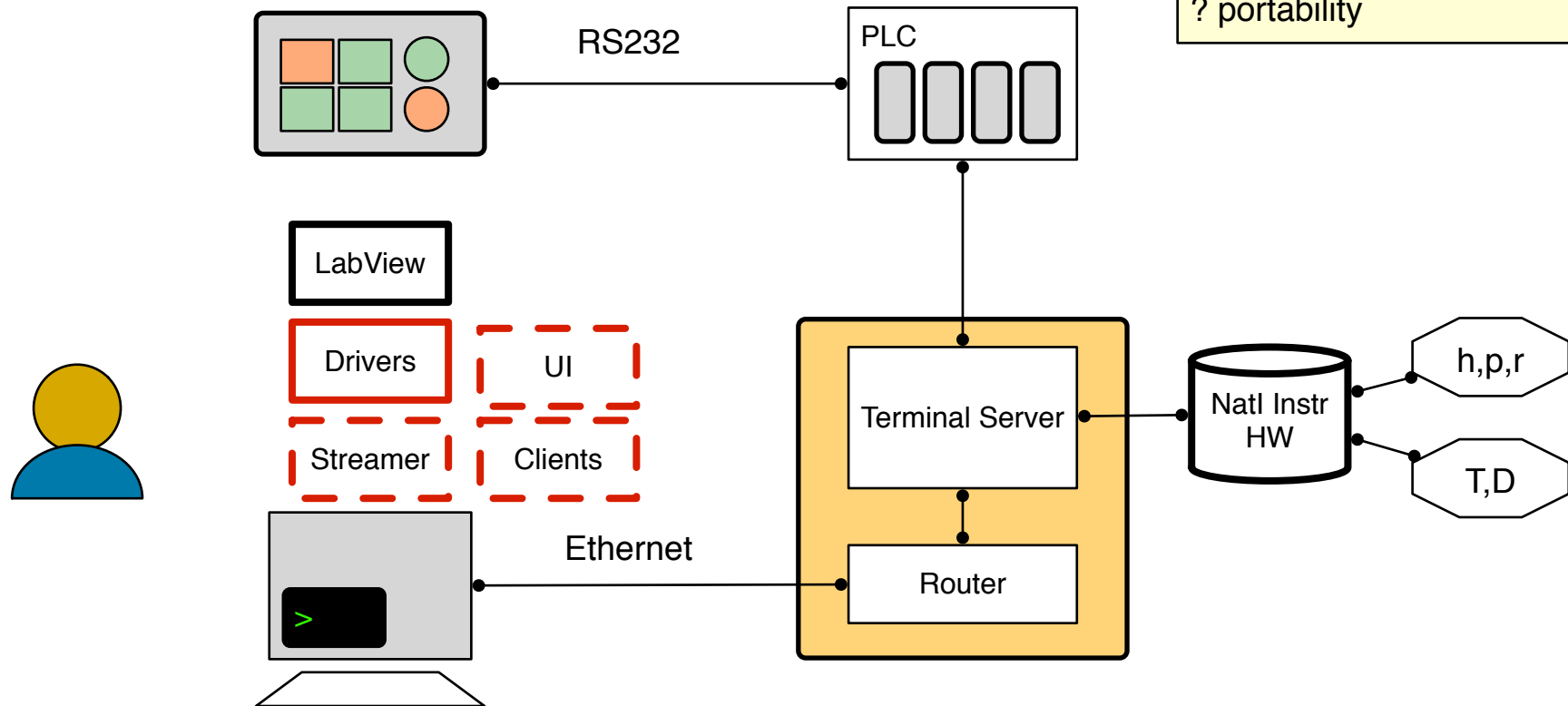
Implementation Approaches

Approaches	COTS	Custom
Data acquisition system SW + specialized HW	Labview/NI Acumen Campbell Scientific	OASIS
Software solutions SW + PC HW	Sensor mfg apps Comcap Aggsoft Magsys	Flux (FOCE) SIAM
Low/No tech a bit of a hack		Internal logging terminal capture
Custom solution SW [+ HW?...]	?	BOS app + ?

Use COTS software and hardware with quick start to (local only) graphical displays

Concept: LabView

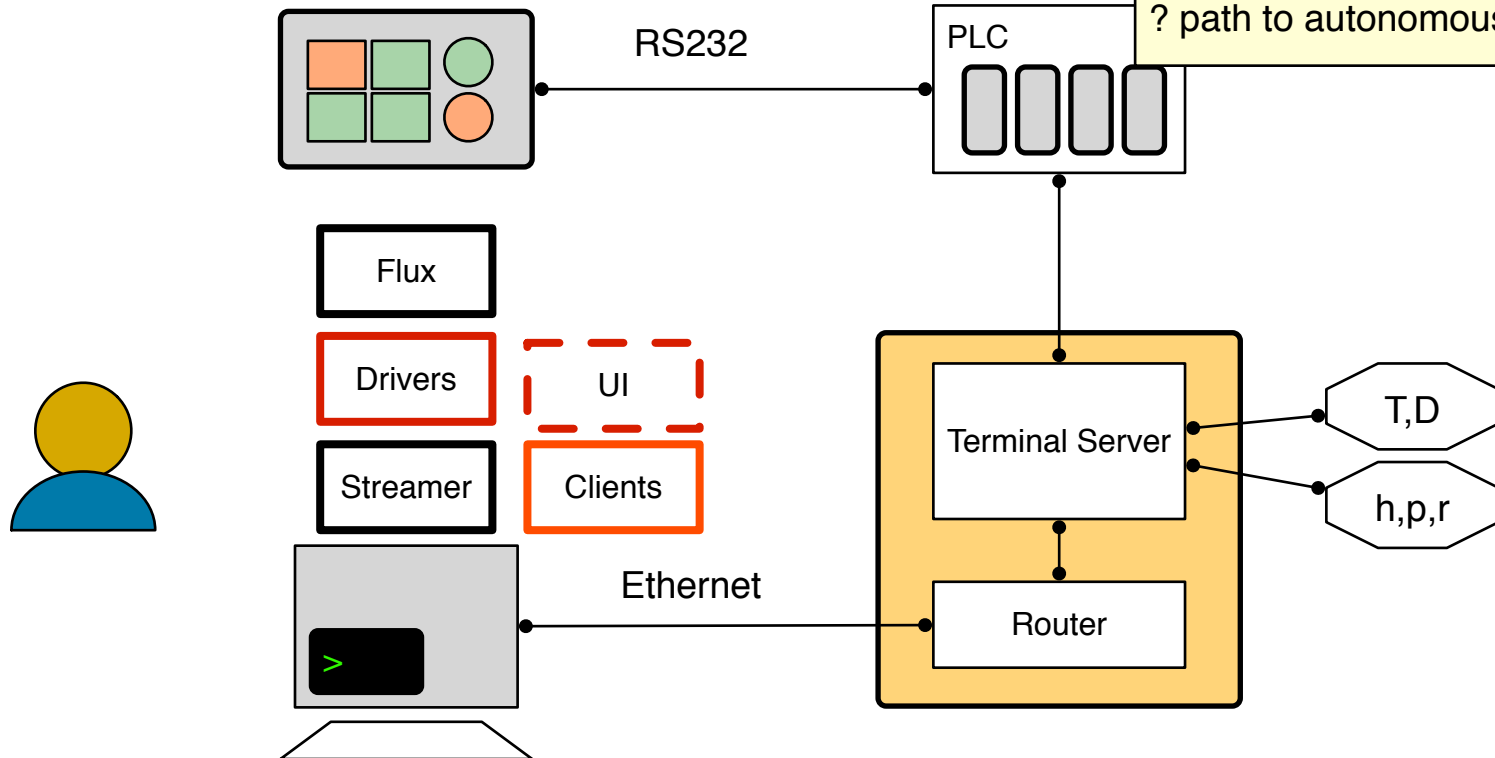
+ rapid development
+ GUI development tools
- HW/SW cost
- no path for autonomous use
? data distribution
? portability



Concept: Flux

Leverage existing Flux software, which includes advanced distributed architecture and other desirable features

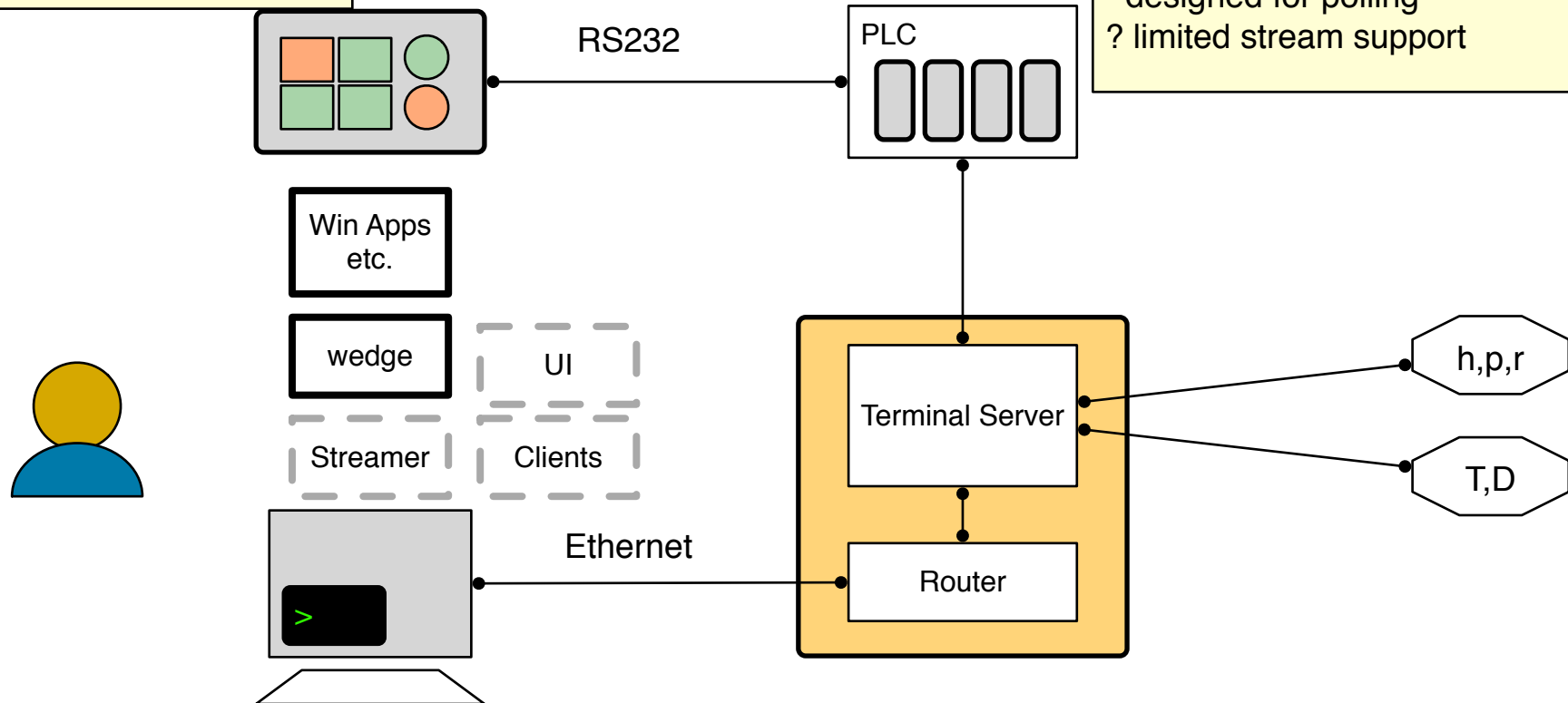
- + no hardware
- run in linux VM, bbone, rpi
- + support for virtual serial ports
- + has ZMQ data streaming
- ? RT performance > 1 Hz
- ? path to autonomous system



Use COTS wedge software to pipe data into files or directly into spreadsheets or other applications using DDE, etc.

Concept: COTS Software

+ low development cost
+ real-time data distribution via DDE
- designed for polling
? limited stream support



Software Concept Trades

Details

logging

RT performance	sample rates	polled	streaming
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distribution

RT telemetry	serial telemetry	Eth telemetry	RF telemetry
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autonomy

power	parsing
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implementation

HW cost	SW cost	SW development	platform support	scalability	reliability	integration
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COTS SW



Flux



OASIS



LabView



COTS HW



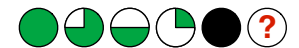
Custom



Software Concept Trades

short list

	cost	performance	risk	roadmap
COTS SW				
Flux				
OASIS				
LabView				
COTS HW				
Custom				



Software Use Cases

Pre-Deployment

Device
Console

Serial
Loopback

Launch/Recovery

Operation

Start Data Logging

Camera on/off

Lights on/off/flash

Recording Start/Stop

View latest logged
record from stream

View live
data stream

Upload
video

Post Deployment

Review data stream

To Do...

Scope
Schedule

Discussion



Constraints

- Schedule: August TNC deployment
- 2017 software development resources

Core Software Specifications

Sampling specs

TBD: format (ASCII, CSV)

TBD: rates per instrument? max?

TBD: synchronous, asynchronous

TBD: instrument configuration (pre-configured)

TBD: configurable per device?

Data access (post-op)

Ease of use

Ease of development/extension

Data timestamping

TBD: format (ISO1806, ASCII)

TBD: source (system clock)

TBD: time zone (UTC)

Data access (operation context)?

distributed/remote

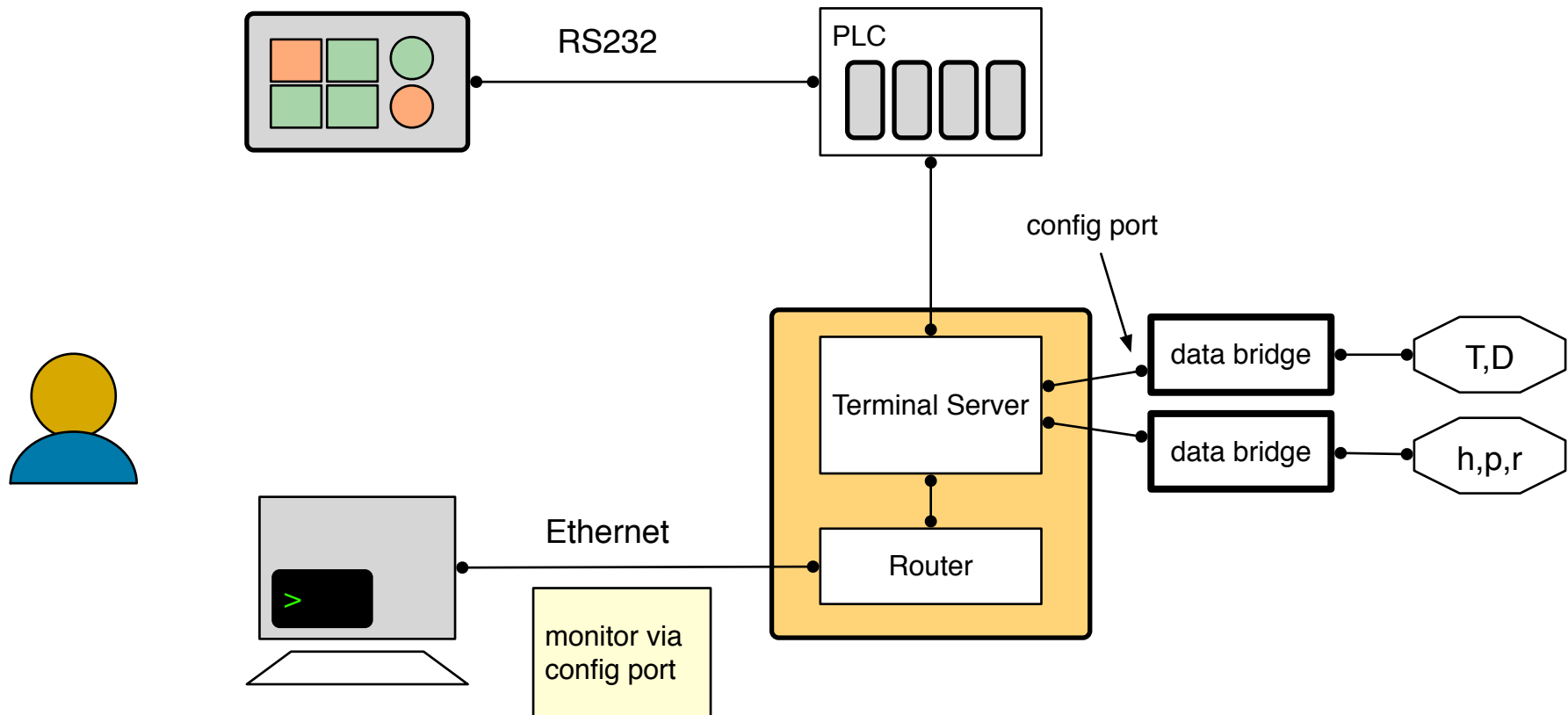
mobile

cross platform

COTS "data bridge" hardware solutions timestamp when delimiter received and log bytes to compact flash
similarly, one could use terminal capture (with no timestamping) or device vendor software (if it exists) to log data

Concept: COTS HW

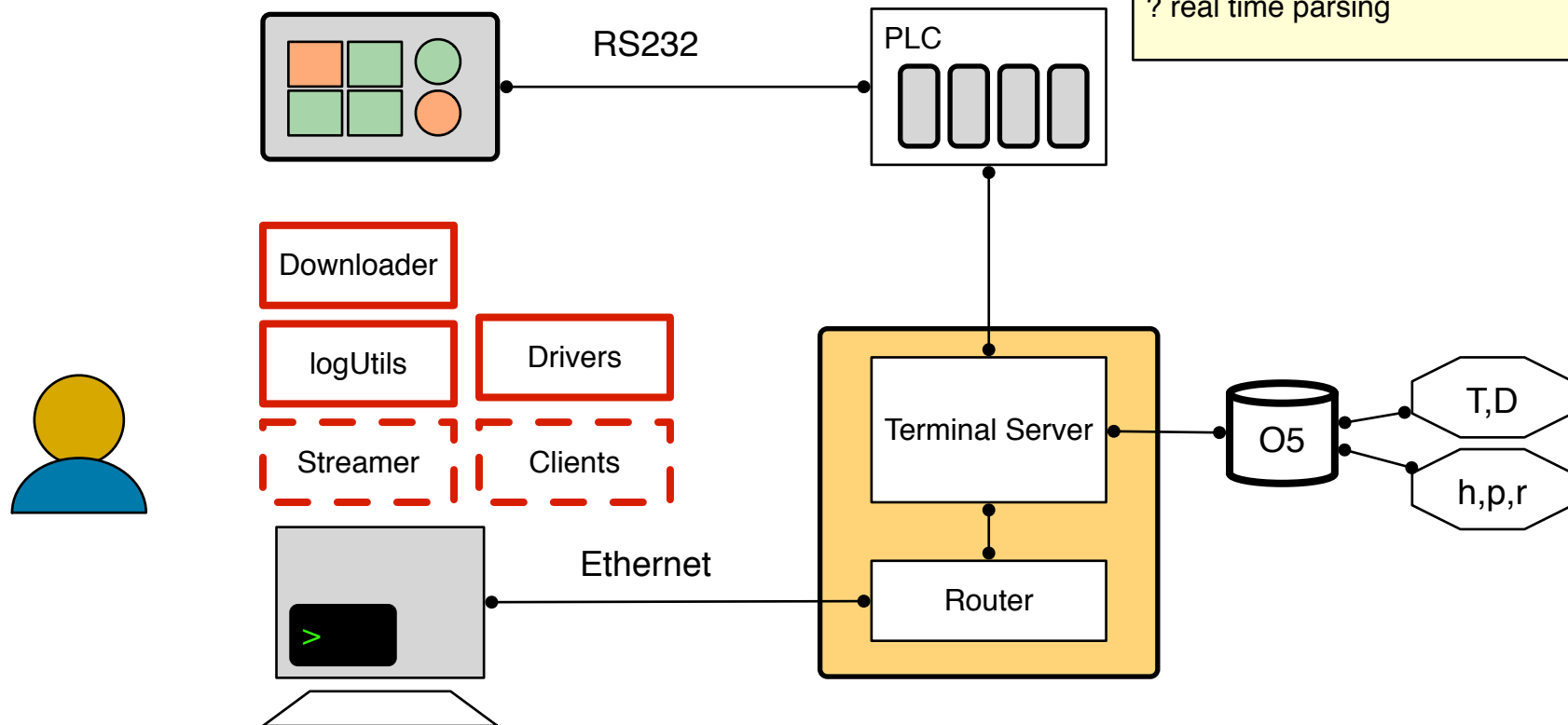
+ minimal development cost
- streams only (no polling)
? limited/no real time access



Leverage O5, looking ahead to autonomous concept

Concept: OASIS

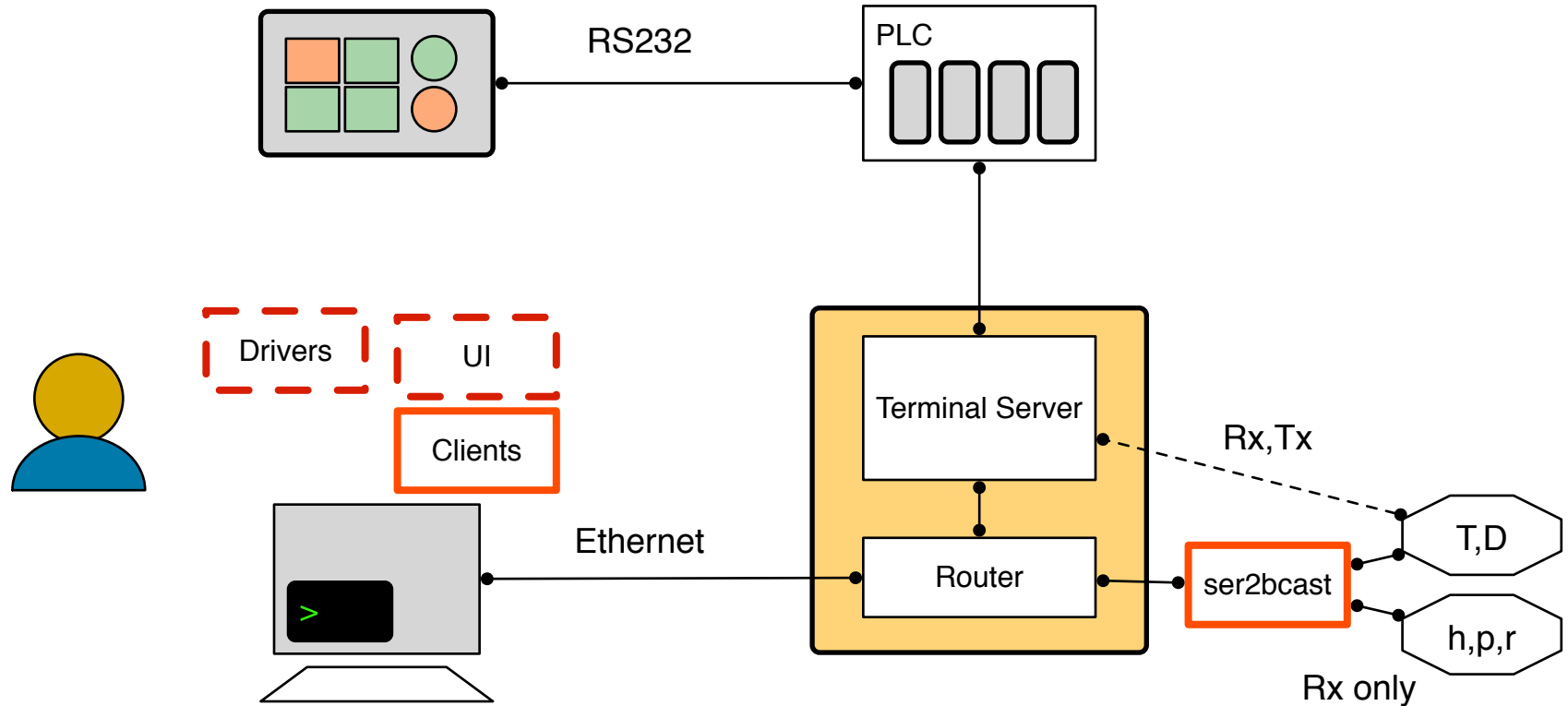
- + robust existing hardware
- + low power (for autonomous system)
- designed as stand-alone data logger
- ? max sample rate
- ? real time data distribution
- ? real time parsing



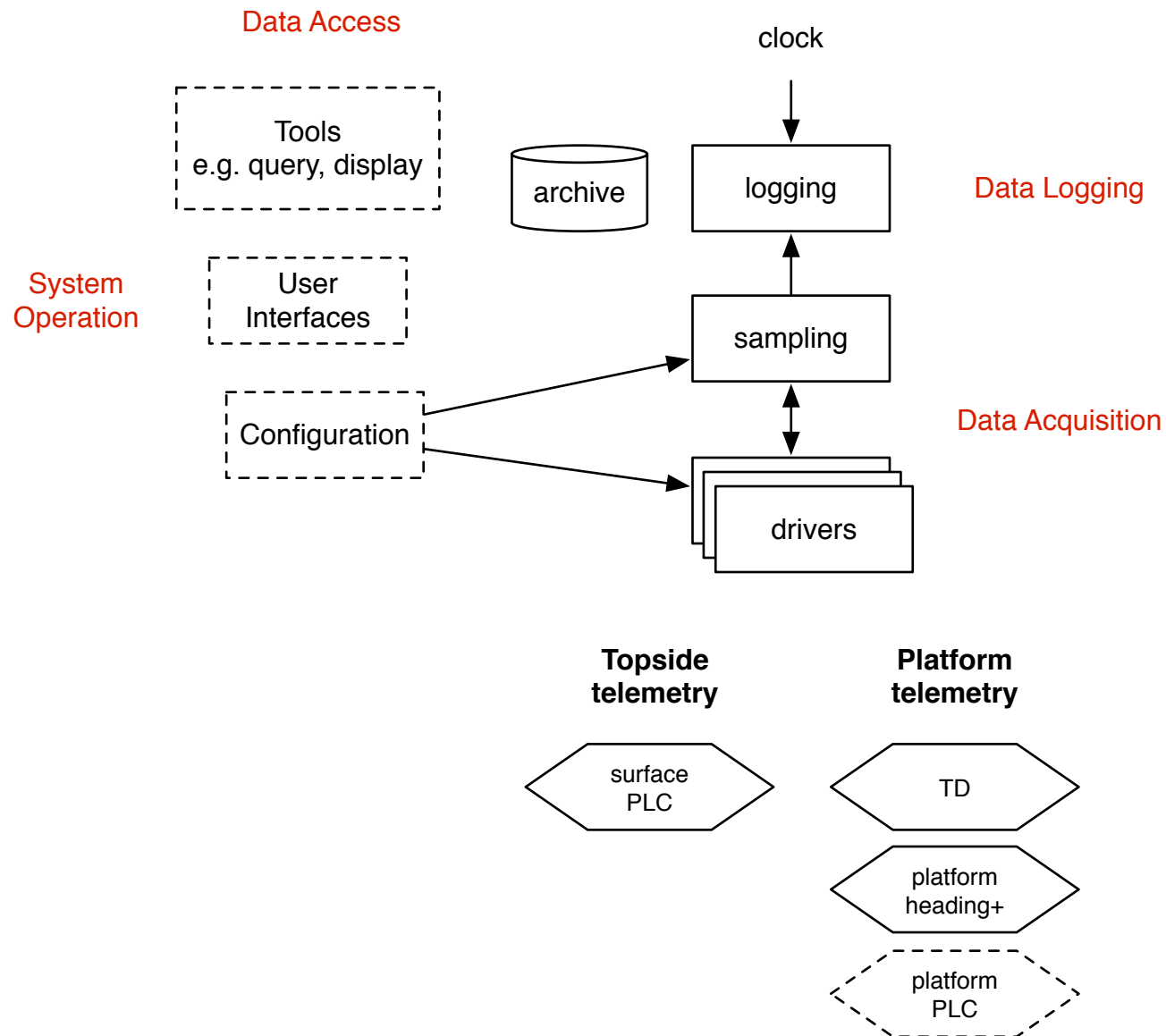
Concept: Serial to Ethernet Bcast

Broadcast timestamped serial streams to network, where clients

+
- streams only?



Core Software Features



Low/No Tech

Software

custom BOS app

Flux

SW Wedge

Ser2Eth

OASIS

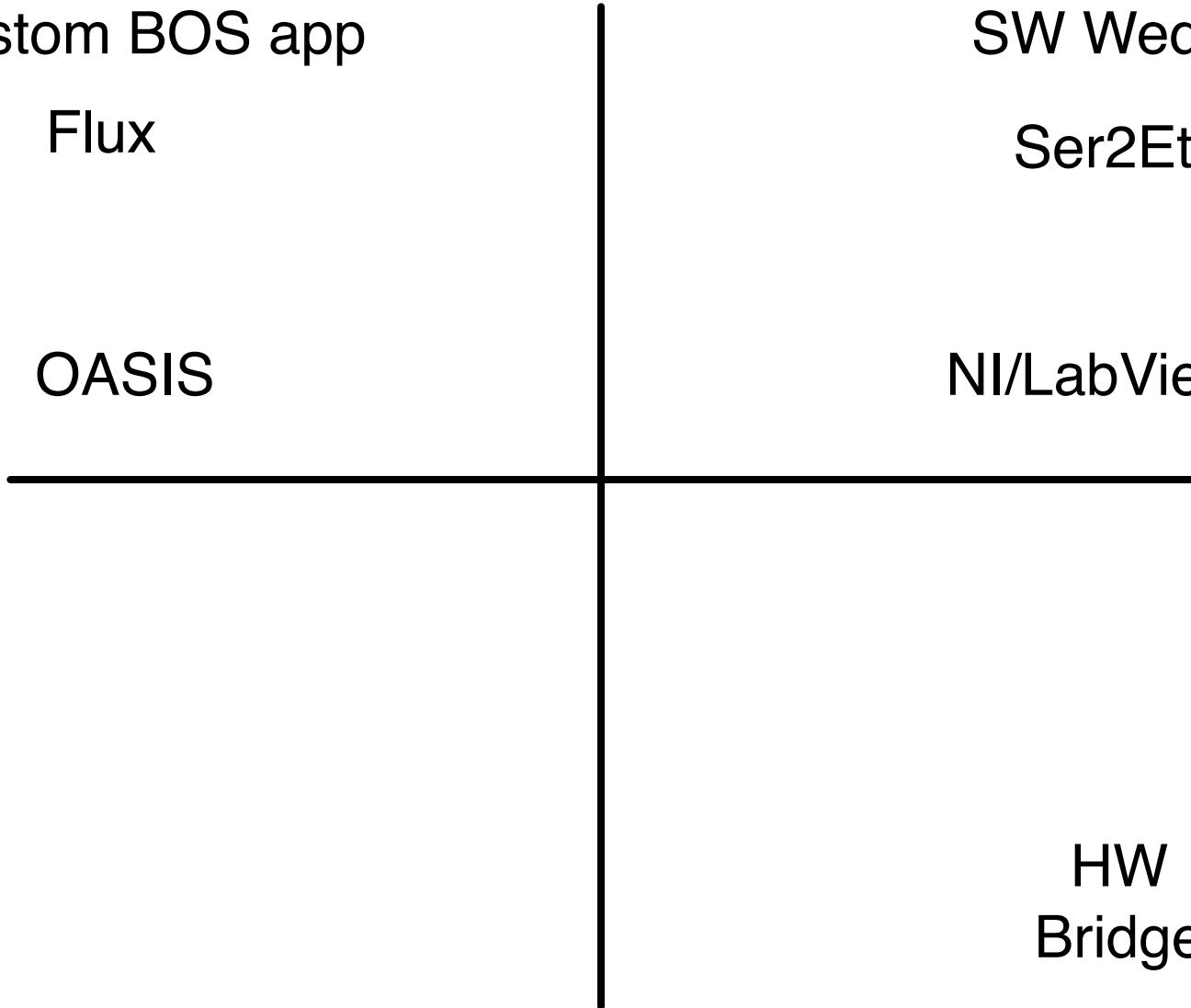
NI/LabView

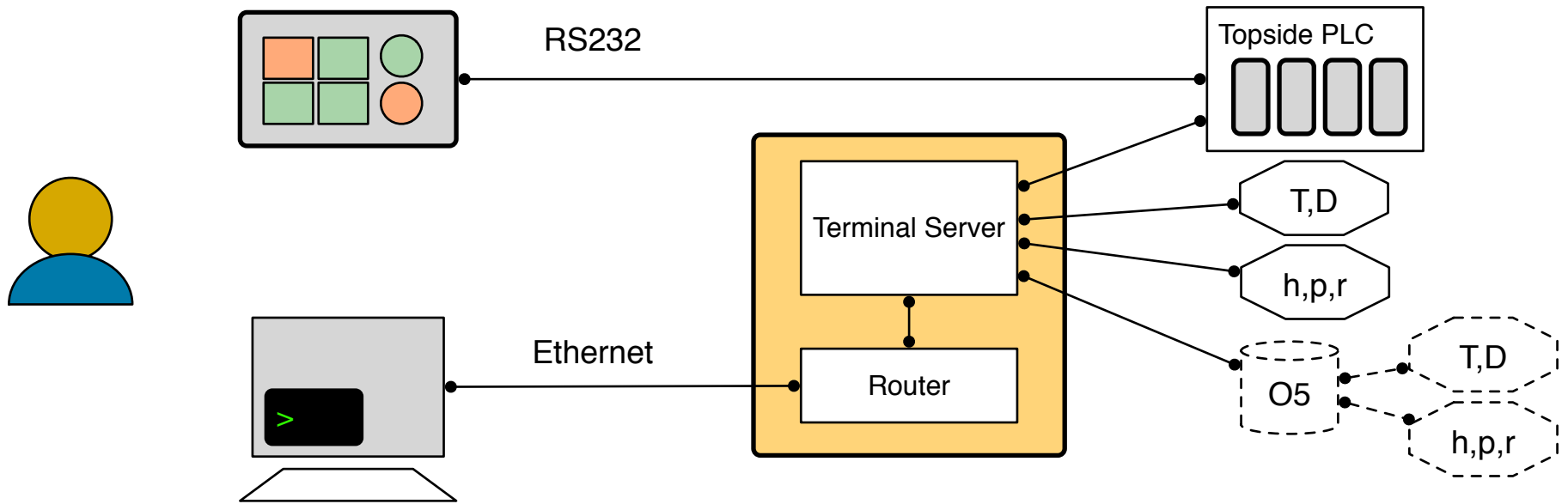
Custom

COTS

HW
Bridge

Hardware





Preferences

Windows and/or cross-platform development environment