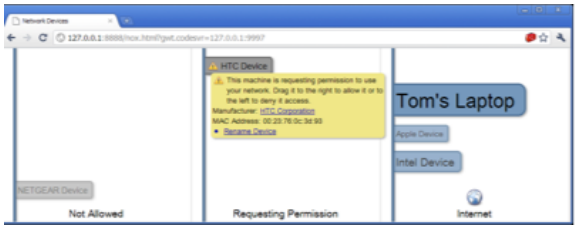

Figure 3: Simple control interface.

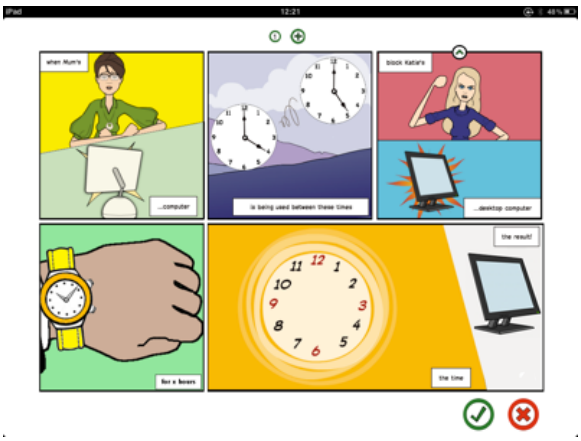

Figure 4: Novel interactive policy interface.

connect to the network as well as limiting access to specified web-hosted services, e.g., Facebook. By selecting appropriate options for each panel in the cartoon, non-expert users can implement simple policies such as "the kids can only use Facebook on weekdays after they've finished their homework." This is mapped to per-device network and DNS access restrictions which are only lifted once a suitably responsible adult inserts the appropriate USB storage key.

2. TECHNICAL DETAILS

Our platform takes the form of a small form-factor PC acting as the home router, exposing various APIs used by satellite interrogation and control devices. Providing those APIs, our software sits atop a standard Linux Ubuntu distribution running Open vSwitch[4] and NOX,[5] depicted in Figure 5 with our code shown as the shaded components.

The Homework Database, *hwdb*, provides measurement support as an active ephemeral stream database which stores ephemeral events into a fixed size memory buffer. It links events into tables and supports queries via a CQL [1] variant able to express temporal and relational operations on data. The database supports a simple UDP-based RPC interface enabling applications to subscribe to query results, persisting output as desired. Tables used are *Flows*, periodically observed active five-tuples; *Links*, link-layer information, e.g., MAC address and received signal strength (RSSI); and *Leases*, mapping Ethernet to IP address.

The *control API* NOX module provides a simple RESTful web interface to the router, invoked to exercise control over connected devices: by the Linux *udev* subsystem when a suitably formatted USB storage device is inserted; and directly by the various graphical control interfaces. The control API configures the behaviour of our DHCP server and DNS proxy NOX modules. The first manages DHCP allocations to ensure that *all* traffic flows are visible to software running on the router, avoiding direct Ethernet-layer communication between devices. The second intercepts outgoing DNS requests, performing reverse lookups on flows not matching previously requested names, to ensure that upstream communication is only allowed between permitted devices and sites.

[4] `http://openvswitch.org/`
[5] `http://noxrepo.org/`

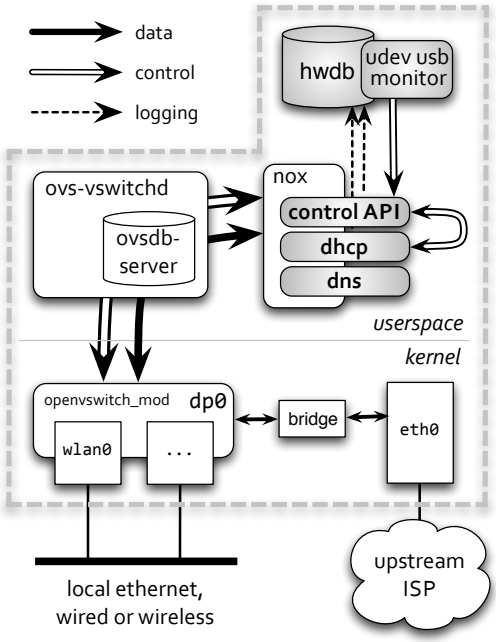

Figure 5: Software architecture of the Homework home router.

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