NFD on OpenWrt Home Router

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https://github.com/9th-ndn-hackathon/NFD-LuCI

Motivation

- OpenWrt: Linux for home routers
  - 50 platforms: ARM, MIPS, etc
  - 3500 packages via opkg package manager
  - Having NDN on OpenWrt can allow NDN to reach a large market.

- In the weeks leading to the hackathon:
  - @yoursunny ported NFD and other NDN programs to OpenWrt as opkg packages.

- However, they are command line only.
  - Is it nice to have a web-based user interface?

Software Architecture

NFD config
for LuCI

NFD status
for LuCI

UCI

nfdc

nfd-service

NFD
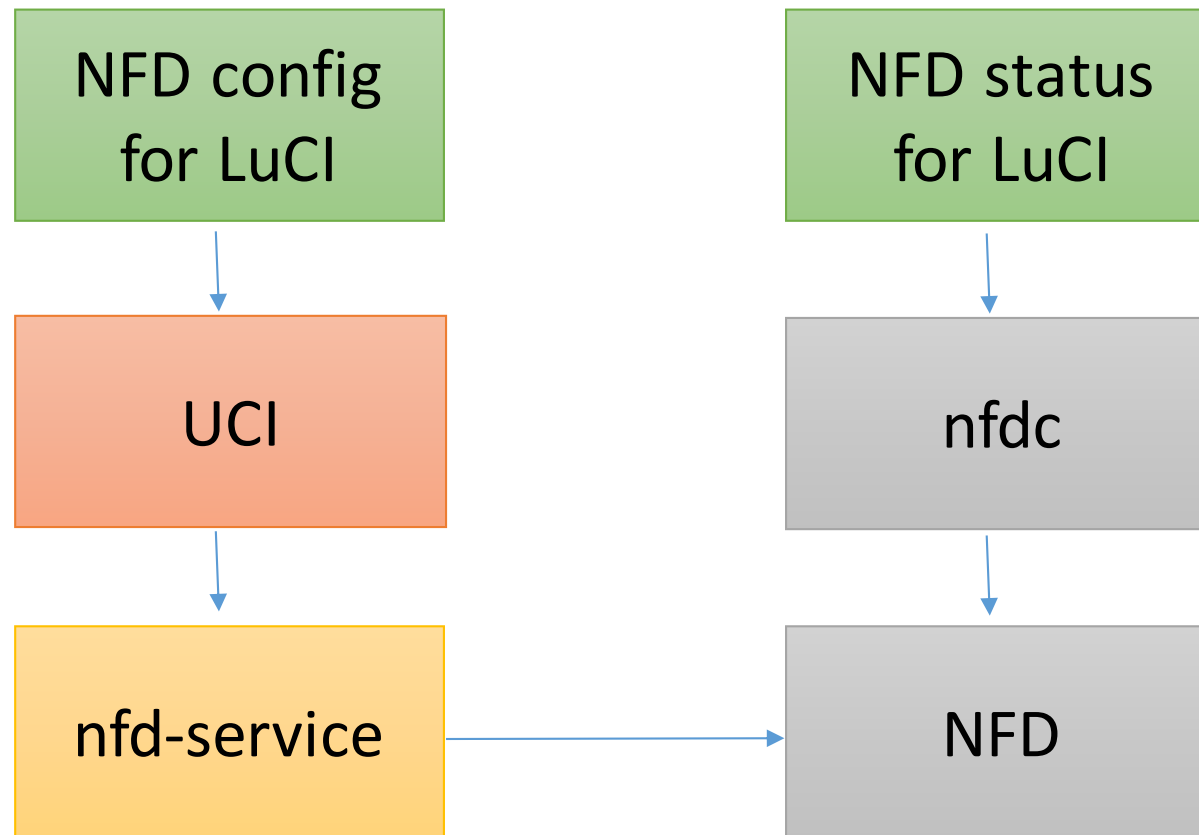
- from NDN platform
- from OpenWrt

- done last month
- accomplished this
weekend

UCI Config

```
config cs 'cs'
  option capacity '1024'
  option policy 'priority_fifo'

config face_system 'face_system'
  option udp_listen '1'
  option tcp_listen '1'
  option ether_mcast '1'

config strategy 'strategy_default'
  option prefix '/'
  option strategy 'self-learning'
```

UCI Config (continued)

```
config face
  option remote 'udp://spurs.cs.ucla.edu'
  list route '/ndn/edu/ucla'
  list route '/ndn/guest'

config face
  option remote 'udp://hobo.cs.arizona.edu'
  list route '/ndn/edu/arizona'
```

Design Highlights

- UCI config, not nfd.conf
  - UCI: Unified Configuration Interface of OpenWrt
  - GUI can be generated with very little code
  - nfd.conf is too verbose for home router use case
- Faces and routes go together
  - Are you typing `nfdc face create` followed by `nfdc route add` all the time?

NFD Config for LuCI (via UCI)

NFD - Strategy Choices

These forwarding strategy choices are applied when NFD service starts.

Strategy Choices

Prefix	Strategy	
/	self-learning	Delete
/localhost	multicast	Delete
/localhop	multicast	Delete

Add

Save & Apply   Save   Reset

NFD Config for LuCI (continued)

- Web UI is generated with very little code.
  1. Define the structure of UCI config.
  2. LuCI's CBI module does the rest.

- When you save the config:
  1. Config is saved into UCI.
  2. procd detects new config.
  3. procd restarts nfd-service (this step is not working).
  4. nfd-service script generates nfd.conf and restarts NFD.

NFD Status for LuCI (via nfdc)

Face List

Face ID	URI	RxInterest	RxData	RxNack	TxInterest	TxData	TxNack
1	internal://	0	129	0	196	0	0
254	contentstore://	0	0	0	0	0	0
255	null://	0	0	0	0	0	0
256	ether://[01:00:5e:00:17:aa]	0	0	0	1	0	0
257	ether://[01:00:5e:00:17:aa]	0	0	0	1	0	0
258	ether://[01:00:5e:00:17:aa]	0	0	0	0	0	0
259	ether://[01:00:5e:00:17:aa]	0	0	0	0	0	0
260	fd://26	173	16	0	16	97	0
263	udp4://198.111.224.197:6363	0	0	0	0	0	0
265	udp4://131.179.196.46:6363	0	0	0	0	0	0

NDN Network Diagnostics (ndnping)

Diagnostics

Network Utilities

/ndn/edu/arizona/cs/shijunxiao/beaglebone

[ndnping]

```
PING /ndn/edu/arizona/cs/shijunxiao/beaglebone
content from /ndn/edu/arizona/cs/shijunxiao/beaglebone: seq=6895091557948584418 time=188.04 ms
content from /ndn/edu/arizona/cs/shijunxiao/beaglebone: seq=6895091557948584419 time=145.026 ms
content from /ndn/edu/arizona/cs/shijunxiao/beaglebone: seq=6895091557948584420 time=146.583 ms
content from /ndn/edu/arizona/cs/shijunxiao/beaglebone: seq=6895091557948584421 time=141.273 ms

--- /ndn/edu/arizona/cs/shijunxiao/beaglebone ping statistics ---
4 packets transmitted, 4 received, 0 nacked, 0% lost, 0% nacked, time 620.921 ms
rtt min/avg/max/mdev = 141.273/155.23/188.04/19.0405 ms
```

Future Work

- Create config page for ndn-autoconfig section.

- Add dynamic updates for face status page.

- Integrate ndn6-file-server in UCI and LuCI.

- Integrate ndncert client in LuCI.

- Publish as opkg package(s).