What's new inside the Linux IEEE 802.15.4 subsystem?

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Introduction
Project Information

• Important new updates
  • Project name „linux-wpan“
  • Mailinglist: linux-wpan@vger.kernel.org
  • Website: http://wpan.cakelab.org

• Subsystem rework in progress
  • Netlink framework nl802154: DONE
  • Crypto-Layer over nl802154: WIP
  • Frame parsing/creation: WIP
New Frameworks
Basic Idea

Cherry-pick the good things from wireless stack!

<table>
<thead>
<tr>
<th>wireless</th>
<th>Description</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>wlan#</td>
<td>Default interface naming</td>
<td>wpan#</td>
</tr>
<tr>
<td>station</td>
<td>Default interface type registration</td>
<td>node</td>
</tr>
<tr>
<td>iw</td>
<td>Command framework</td>
<td>iwpan</td>
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<tr>
<td>nl80211</td>
<td>Netlink kernel framework</td>
<td>nl802154</td>
</tr>
<tr>
<td>cfg80211_ops</td>
<td>Soft- and Hard-MAC Interface</td>
<td>cfg802154_ops</td>
</tr>
</tbody>
</table>
New Frameworks

nl802154

- What is nl802154?
  - Kernelspace 802154 netlink framework
  - Netlink is socket communication
    - Userspace ↔ Kernelspace
    - Used mostly for configuration
  - Goal: Easy to add new 802.15.4 netlink cmds

- Why we add it?
  - Code looks almost the same like wireless
  - Wireless people get easier familiar
  - Already well-established frameworks
  - Getting wireless community for 802.15.4 IoT

Use-Cases
New Frameworks

nl802154 code example

Shell iwpan (wpan-tools) call
iwpan dev wpan0 set pan_id 0xabcd

Userspace iwpan command framework implementation
COMMAND(set, pan_id, "<panid_arg>",
NL802154_CMD_SET_PANID, 0, CIB_NETDEV,
handle_panid_set, NULL)

Kernelspace nl802154 framework
1. static const struct genl_ops nl802154_ops[] = {
2.     ...
3.     {
4.         .cmd = NL802154_CMD_SET_PANID,
5.         .doit = nl802154_set_panid,
6.         .flags = GENL_ADMIN_PERM,
7.         .internal_flags = NL802154_FLAG_NEED_NETDEV |
8.             NL802154_FLAG_NEED_RTNL,
9.     },
10.    ...
11. };
New Frameworks

6LoWPAN Next Header Compression (NHC)

- What is 6LoWPAN NHC?
  - 6LoWPAN describes compression formats
  - IPv6 compression and NH compressions
  - Like UDP, IPv6 Extension Headers, etc.

- NHC Framework
  - One compression format per module
  - Easy to handle: Simple callbacks
    - Compression
    - Uncompression
  - Only NHC UDP is currently available
Future Work
IEEE 802.15.4 and 6LoWPAN

• IEEE 802.15.4
  • Remove the old netlink interface
  • Implement the still WIP rework parts
  • More MAC-Functionality
    • Coordinator support
    • Management-Layer triggered by netlink
      • Like MLME-SCAN for identifying PANs

• 6LoWPAN
  • Configuration Interface for NHC
  • Implement more NHC modules :-)
Summary
What you know and can do now!

• Interested? What you could do now!
  • Visit: http://wpan.cakelab.org
  • Get the IEEE 802.15.4 Standard
  • Setup some test environment

• Possible hacking tasks
  • As a newbie
    • Start simple tasks like: number → “const char *”
    • Finally: become a wireless-guru!
  • As a wireless-guru
    • Look for similar paradigms in 802.15.4
    • Friendly-copy solutions from wireless subsystem
Questions?