NETCONF Light
(NETCONF on Constrained Devices)

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Motivation and Approach

Motivation

- Some applications (e.g., the Smart Grid) have a requirement to run a single management protocol on a set of devices with very different processing and storage capabilities.
- NETCONF (RFC 6241) provides a fairly feature complete solution for network devices such as routers and switches.
- Constrained devices may not be able to support NETCONF completely — so how "small" can NETCONF be?

Approach and Assumptions

- Define a proper subset of NETCONF that is appropriate for constrained devices.
- Assumption: On constrained devices, the amount of configuration data is small and the need to interact with multiple management systems concurrently is small.

NETCONF Light (NCL)

Reduced Protocol Operations

- NCL implementations are not required to support filtering on `<get-config>` and `<get>` operations.
- NCL implementations are not required to implement the `<edit-config>` operation (simply use `<copy-config>`).
- NCL implementations only support the `<running>` datastore.
- NCL implementations may choose to only support one concurrent session (makes `<lock>` and `<unlock>` trivial).
- NCL uses a different XML namespace to identify itself.

Things Kept Unchanged

- XML encoding of the configuration data (although XML format is less relevant since there is no `<edit-config>`).
- RFC 6241 framing (although this took effort to implement if memory is tight).

NETCONF Light Implementation Experience

Characteristics

- Contiki NETCONF Light implemented on AVR Raven motes (Class 1 devices, 16 KiB RAM, 128 KiB Flash)
- Uses NETCONF over plain TCP instead of SSH or TLS
- Uses Contiki's Coffee File System to store the configuration (and we had lots of "fun" with its implementation)
- Supports all the NETCONF operations as described before

Memory Consumption

- $\approx$ 13 KiB RAM (10 KiB Contiki, 0.5 KiB System Manager, 2.6 KiB NETCONF)
- $\approx$ 87 KiB Flash with $\approx$ 12 KiB reserved for the four files in the Coffee File System
- Further code optimizations are possible and file sizes in flash memory can be adapted

NETCONF Light Status

Mailing List Feedback

- Kent Watsen (Juniper) expressed interest in this work for a very different reason: gradually migrating devices supporting "legacy" configuration interfaces to support NETCONF. Such devices often do not yet use XML as the native config format. It would be nice if there were a mechanism for devices to announce which standard NETCONF operations they support.
- Andy Bierman supported the idea to streamline NETCONF for small devices.

Open Issues

- Security: Class 1 and Class 2 devices can't affort multiple security protocols and SSH is most likely not available.

References

V. Perelman, J. Schönwälder, and M. Ersue.

Network Configuration Protocol for Constrained Devices (NETCONF Light).
Internet-Draft (work in progress) <draft-schoenw-netconf-light-00>, Jacobs University, Nokia Siemens Networks, June 2011.