State of large NID support

Expand to new LNet protocols, May 2023

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Large NID support

• Long wanted feature
  ) Once work started people started requesting status of this work

• Main goal is to allow Lnet setup with IPv6
  - Other protocols are possible like IB hardware addressing

• This implementation is a collaboration between SUSE and ORNL
  - Additional testing is done by Yehuda Yitshak (amazon)

• The goal to complete the foundational LNet support for the 2.16 release

• Lustre 2.17 will complete the support of large NID for everything (nodemap, GSS)
Progress up to 2.15 LTS

• Ticket LU-10391 opened Feb 2016

• Discussion with Linux community about native client lead to IPv6 requirement.
  
  - SUSE involvement

• Late 2019 discussion of LNet IPv6 design.
  - Lustre 2.13.52 we see first landings.
  - Changes are far reaching

• Lustre 2.15 LTS changed most of LNet core supports large NID

• No actual transmission of large NIDs with wire protocol

• No user land tool changes to allow large NIDs
  - Will back port patches to ignore large NIDs
Small change, big impact

• `lnet_nid_t → struct lnet_nid`
  - `lnet_nid_t` (64 bit - net_type | address)
  - `struct lnet_nid {
      __u8   nid_size;       /* total bytes - 8 */
      __u8   nid_type;
      __be16 nid_num;
      __be32 nid_addr[4];
    } __attribute__((packed));`

• `nid_size == 0` then `struct lnet_nid == lnet_nid_t` (big endian)

• `nid_type == 0xff` means wild card (`LNET_ANY_NID`)

• Can be expanded up to 256 bits address.
Macro changes for user land

• Conversion functions:
  \[
  \begin{align*}
  \text{void } & \text{ lnet_nid4_to_nid(lnet_nid_t nid4, struct lnet_nid *nid)} \\
  \text{lnet_nid_t } & \text{ lnet_nid_to_nid4(const struct lnet_nid *nid)}
  \end{align*}
  \]

• \text{nid_is_same()} is needed for comparison

• \text{struct lnet_process_id → struct lnet_processid}

• \text{LNET_NID_ANY → LNET_ANY_NID}

• \text{LNET_NID_LO_0 → nid_is_lo0(nid)}

• Wire shark changes (lnt-idl.h)
  \[
  \begin{align*}
  \text{struct lnet_hdr_nid4 → struct lnet_hdr} \\
  \text{Struct lnet_acceptor_connreq → struct lnet_acceptor_connreq_v2} \\
  \text{Struct lnet_ni_status → struct lnet_ni_large_status}
  \end{align*}
  \]
LNet tool changes

• Only visible change to lnetctl / lctl is taking large NID strings
  • `lctl list_nids fe80:f68:45bd:7b60:e933@tcp`
  • `lnetctl ping fe80:f68:45bd:7b60:e933@tcp`

• Internal code changes
  - Migrate to Netlink / YAML API
    • Allows changing userland interface without API breakage
  - Merged pre multi-rail APIs with multi-rail APIs (LU-10003)
  - At this time several patches are done but not merged.
  - Pieces still in progress
    • Inetctl net [show | set], Inetctl discover
    • Inetctl import / export, Inetctl udsp
    • Ictl net fault
Other tool changes

• LNet selftest
  - Internal move to Netlink API (LU-8915)
    • WIP
  - Implement YAML configuration file support (LU-10975)

• Lustre changes
  - NRS debugfs / proc files take large NID string
  - NID export hash supports large NID string
    • lctl get_parm mdt.*.exports.$NID.hash
  - mount -t lustre [fe80:f68:45bd:7b60:e933]@tcp
    • https://review.whamcloud.com/#c/fs/lustre-release/+50362/
Lustre work left

- Enhance MGS NID table to handle large NIDS (LU-13306)
- Update Lustre UUIDs to handle large NIDs (LU-13340)
  - Found MGC UUID ("MGC" NID _0) string can overflow
- Handle large NIDs for change logs (LU-13308)
- Remaining LU-10391 work for Lustre
  - Update l_getidentity to handle large NIDs
  - Update sptlrpc to handle large NIDs (LU-10937)
    - Could be completed during 2.17 cycle
- Add Large NID support to nodemap (LU-14288 / LU-13307)
  - Also could be completed during 2.17 cycle
- Interop testing between LTS and latest master
  - We need testers
New future Lustre functionality coming

- Do LNet discovery in background (LU-14668) (Mostly done)
- Allow specification with an IP. Currently interface only supported (LU-13642)
- Use imperative recovery logs for client to server connections (LU-10360)
  - Use LNet discovery and IR logs to bring up LNet instead of YAML config files
  - Can add new network to file system without write conf (LU-14608)
- Use hostnames in config llogs (LU-10359)
Conclusion

• Core functionality should be completed for 2.16 release
• Completion by 2.17 release
• New functionality that is the result of this work.
• Once complete and ported to native client the native client will be pushed to Linus
Acknowledgments

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