Linux Kernel TIPC

Introduction

TIPC (Transparent Inter Process Communication) is a protocol that is specially designed for intra-cluster communication. It can be configured to transmit messages either on UDP or directly across Ethernet. Message delivery is sequence guaranteed, loss free and flow controlled. Latency times are shorter than with any other known protocol, while maximal throughput is comparable to that of TCP.

TIPC Features

- Cluster wide IPC service

  Have you ever wished you had the convenience of Unix Domain Sockets even when transmitting data between cluster nodes? Where you yourself determine the addresses you want to bind to and use? Where you don't have to perform DNS lookups and worry about IP addresses? Where you don't have to start timers to monitor the continuous existence of peer sockets? And yet without the downsides of that socket type, such as the risk of lingering inodes?

  Welcome to the Transparent Inter Process Communication service, TIPC in short, which gives you all of this, and a lot more.

- Service Addressing

  A fundamental concept in TIPC is that of Service Addressing which makes it possible for a programmer to chose his own address, bind it to a server socket and let client programs use only that address for sending messages.

- Service Tracking

  A client wanting to wait for the availability of a server, uses the Service Tracking mechanism to subscribe for binding and unbinding/close events for sockets with the associated service address.

  The service tracking mechanism can also be used for Cluster Topology Tracking, i.e., subscribing for availability/non-availability of cluster nodes.

  Likewise, the service tracking mechanism can be used for Cluster Connectivity Tracking, i.e., subscribing for up/down events for individual links between cluster nodes.

- Transmission Modes

  Using a service address, a client can send datagram messages to a server socket.

  Using the same address type, it can establish a connection towards an accepting server socket.

  It can also use a service address to create and join a Communication Group, which is the TIPC manifestation of a brokerless message bus.

  Multicast with very good performance and scalability is available both in datagram mode and in communication group mode.

- Inter Node Links

  Communication between any two nodes in a cluster is maintained by one or two Inter Node Links, which both guarantee data traffic integrity and monitor the peer node's availability.

- Cluster Scalability

  By applying the Overlapping Ring Monitoring algorithm on the inter node links it is possible to scale TIPC clusters up to 1000 nodes with a maintained neighbor failure discovery time of 1-2 seconds. For smaller clusters this time can be made much shorter.

- Neighbor Discovery

  Neighbor Node Discovery in the cluster is done by Ethernet broadcast or UDP multicast, when any of those services are available. If not, configured peer IP addresses can be used.

- Configuration

  When running TIPC in single node mode no configuration whatsoever is needed. When running in cluster mode TIPC must as a minimum be given a node address (before Linux 4.17) and told which interface to attach to. The "tipc" configuration tool makes is possible to add and maintain many more configuration parameters.

- Performance

  TIPC message transfer latency times are better than in any other known protocol. Maximal byte throughput for inter-node connections is still somewhat lower than for TCP, while they are superior for intra-node and inter-container throughput on the same host.

- Language Support

  The TIPC user API has support for C, Python, Perl, Ruby, D and Go.

More Information

- How to set up TIPC:

  http://tipc.io/getting_started.html
- How to program with TIPC:

  http://tipc.io/programming.html
- How to contribute to TIPC:
- http://tipc.io/contacts.html
- More details about TIPC specification:

  http://tipc.io/protocol.html

Implementation

TIPC is implemented as a kernel module in net/tipc/ directory.

TIPC Base Types

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\networking\[linux-master][Documentation][networking]tipc.rst, line 130)

Unknown directive type "kernel-doc".

```
.. kernel-doc:: net/tipc/subscr.h
   :internal:
```

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\networking\[linux-master][Documentation][networking]tipc.rst, line 133)

Unknown directive type "kernel-doc".

```
.. kernel-doc:: net/tipc/bearer.h
   :internal:
```

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\networking\[linux-master][Documentation][networking]tipc.rst, line 136)

Unknown directive type "kernel-doc".

```
.. kernel-doc:: net/tipc/name_table.h
   :internal:
```

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\networking\[linux-master][Documentation][networking]tipc.rst, line 139)

Unknown directive type "kernel-doc".

```
.. kernel-doc:: net/tipc/name_distr.h
   :internal:
```

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\networking\[linux-master][Documentation][networking]tipc.rst, line 142)

Unknown directive type "kernel-doc".

```
.. kernel-doc:: net/tipc/bcast.c
   :internal:
```

TIPC Bearer Interfaces

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\networking\[linux-master][Documentation][networking]tipc.rst, line 148)

Unknown directive type "kernel-doc".

```
.. kernel-doc:: net/tipc/bearer.c
   :internal:
```

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\networking\[linux-master][Documentation][networking]tipc.rst, line 151)

Unknown directive type "kernel-doc".

```
.. kernel-doc:: net/tipc/udp_media.c
   :internal:
```

TIPC Crypto Interfaces

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\networking\[linux-master][Documentation][networking]tipc.rst, line 157)

Unknown directive type "kernel-doc".

```
.. kernel-doc:: net/tipc/crypto.c
   :internal:
```

TIPC Discoverer Interfaces

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\networking\[linux-master][Documentation][networking]tipc.rst, line 163)

Unknown directive type "kernel-doc".

```
.. kernel-doc:: net/tipc/discover.c
   :internal:
```

TIPC Link Interfaces

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\networking\[linux-master][Documentation][networking]tipc.rst, line 169)

Unknown directive type "kernel-doc".

```
.. kernel-doc:: net/tipc/link.c
   :internal:
```

TIPC msg Interfaces

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\networking\[linux-master][Documentation][networking]tipc.rst, line 175)

Unknown directive type "kernel-doc".

```
.. kernel-doc:: net/tipc/msg.c
   :internal:
```

TIPC Name Interfaces

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\networking\[linux-master][Documentation][networking]tipc.rst, line 181)

Unknown directive type "kernel-doc".

```
.. kernel-doc:: net/tipc/name_table.c
   :internal:
```

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\networking\[linux-master][Documentation][networking]tipc.rst, line 184)

Unknown directive type "kernel-doc".

```
.. kernel-doc:: net/tipc/name_distr.c
   :internal:
```

TIPC Node Management Interfaces

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\networking\[linux-master][Documentation][networking]tipc.rst, line 190)

Unknown directive type "kernel-doc".

```
.. kernel-doc:: net/tipc/node.c
   :internal:
```

TIPC Socket Interfaces

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\networking\[linux-master][Documentation][networking]tipc.rst, line 196)

Unknown directive type "kernel-doc".

```
.. kernel-doc:: net/tipc/socket.c
   :internal:
```

TIPC Network Topology Interfaces

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\networking\[linux-master][Documentation][networking]tipc.rst, line 202)

Unknown directive type "kernel-doc".

```
.. kernel-doc:: net/tipc/subscr.c
   :internal:
```

TIPC Server Interfaces

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\networking\[linux-master][Documentation][networking]tipc.rst, line 208)

Unknown directive type "kernel-doc".

```
.. kernel-doc:: net/tipc/topsrv.c
   :internal:
```

TIPC Trace Interfaces

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\networking\[linux-master][Documentation][networking]tipc.rst, line 214)

Unknown directive type "kernel-doc".

```
.. kernel-doc:: net/tipc/trace.c
   :internal:
```