MTP: Mesh Transport Protocol

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Ertan Onur

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CONTENTS:

CHAPTER

ONE

MTP

1.1 Overview

This readme provides background on the Mesh Transport Protocol (MTP).

1.2 Features

MTP provides the following **features**:

- MTP separates policy from mechanism. The user space application is able to configure supported features of MTP
- MTP

1.3 Headers

1.4 Authors

Authors
Ertan Onur

int **MTP_load**(void)
invoked when this module is loaded into the Linux kernel

Parameters

void
no arguments

Return

0 on success, otherwise a negative errno.

void __exit MTP_unload (void)
invoked when this module is unloaded from the Linux kernel.

Parameters

void
no arguments

int **MTP_bind**(struct socket *sock, struct sockaddr *addr, int addr_len)

Implements the bind system call for MTP sockets: associates a well-known service port with a socket. Unlike other AF_INET6 protocols, there is no need to invoke this system call for sockets that are only used as clients.

Parameters

struct socket *sock
Socket on which the system call was invoked.

struct sockaddr *addr
Contains the desired port number.

int addr_len
Number of bytes in uaddr.

Return

0 on success, otherwise a negative errno.

void **MTP_close**(struct sock *sk, long timeout)

Invoked when close system call is invoked on a MTP socket.

Parameters

struct sock *sk
Socket being closed

long timeout
??

int **MTP_shutdown**(struct socket *sock, int how)

Implements the shutdown system call for MTP sockets.

Parameters

struct socket *sock
Socket to shut down.

int how
Ignored: for other sockets, can independently shut down sending and receiving, but for MTP any shutdown will shut down everything.

Return

0 on success, otherwise a negative errno.

int **MTP_disconnect**(struct sock *sk, int flags)

Invoked when disconnect system call is invoked on a MTP socket.

Parameters

struct sock *sk
Socket to disconnect

int flags
??

Return

0 on success, otherwise a negative errno.

int **MTP_ioc_abort**(struct sock *sk, unsigned long arg)

The top-level function for the ioctl that implements the MTP_abort user-level API.

Parameters

struct sock *sk
Socket for this request.

unsigned long arg
Used to pass information from user space.

Return

0 on success, otherwise a negative errno.

int **MTP_ioctl**(struct sock *sk, int cmd, int *arg)
Implements the ioctl system call for MTP sockets.

Parameters

struct sock *sk
Socket on which the system call was invoked.

int cmd
Identifier for a particular ioctl operation.

int *arg
Operation-specific argument; typically the address of a block of data in user address space.

Return

0 on success, otherwise a negative errno.

int **MTP_socket**(struct sock *sk)
Implements the socket(2) system call for sockets.

Parameters

struct sock *sk
Socket on which the system call was invoked. The non-MTP parts have already been initialized.

Return

always 0 (success).

int **MTP_setsockopt**(struct sock *sk, int level, int optname, sockptr_t optval, unsigned int optlen)
Implements the getsockopt system call for MTP sockets.

Parameters

struct sock *sk
Socket on which the system call was invoked.

int level
Level at which the operation should be handled; will always be IPPROTO_MTP.

int optname
Identifies a particular setsockopt operation.

sockptr_t optval
Address in user space of information about the option.

unsigned int optlen
Number of bytes of data at **optval**.

Return

0 on success, otherwise a negative errno.

int MTP_getsockopt (struct sock *sk, int level, int optname, char __user *optval, int __user *option)

Implements the getsockopt system call for MTP sockets.

Parameters

struct sock *sk
Socket on which the system call was invoked.

int level
??

int optname
Identifies a particular setsockopt operation.

char __user *optval
Address in user space where the option's value should be stored.

int __user *option
??.

Return

0 on success, otherwise a negative errno.

int **MTP_sendmsg**(struct sock *sk, struct msghdr *msg, size_t length)

Send a request or response message on a MTP socket.

Parameters

struct sock *sk
Socket on which the system call was invoked.

struct msghdr *msg
Structure describing the message to send; the msg_control field points to additional information.

size_t length
Number of bytes of the message.

Return

0 on success, otherwise a negative errno.

int **MTP_recvmsg**(struct sock *sk, struct msghdr *msg, size_t len, int flags, int *addr_len)

Receive a message from a MTP socket.

Parameters

struct sock *sk
Socket on which the system call was invoked.

struct msghdr *msg
Controlling information for the receive.

size_t len
Total bytes of space available in msg->msg_iov; not used.

int flags
Flags from system call, not including MSG_DONTWAIT; ignored.

int *addr_len
Store the length of the sender address here

Return

The length of the message on success, otherwise a negative
errno.

int **MTP_sendpage**(struct sock *sk, struct *page* *page, int offset, size_t size, int flags)

??.

Parameters

struct sock *sk
Socket for the operation

struct page *page
??

int offset
??

size_t size
??

int flags
??

Return

0 on success, otherwise a negative errno.

int **MTP_hash**(struct sock *sk)

??.

Parameters

struct sock *sk
Socket for the operation

Return

??

void **MTP_unhash**(struct sock *sk)

??.

Parameters

struct sock *sk
Socket for the operation

void **MTP_rehash**(struct sock *sk)

??.

Parameters

struct sock *sk
Socket for the operation

int **MTP_get_port**(struct sock *sk, unsigned short snum)

It appears that this function is called to assign a default port for a socket.

Parameters

struct sock *sk
Socket for the operation

unsigned short snum
Unclear what this is.

Return

Zero for success, or a negative errno for an error.

int **MTP_diag_destroy**(struct sock *sk, int err)

??.

Parameters

struct sock *sk
Socket for the operation

int err
??

Return

??

int **MTP_v4_early_demux**(struct sk_buff *skb)

Invoked by IP for ??.

Parameters

struct sk_buff *skb
Socket buffer.

Return

Always 0?

int **MTP_v4_early_demux_handler**(struct sk_buff *skb)

invoked by IP for ??.

Parameters

struct sk_buff *skb
Socket buffer.

Return

Always 0?

int **MTP_softirq**(struct sk_buff *skb)

This function is invoked at SoftIRQ level to handle incoming packets.

Parameters

struct sk_buff *skb
The incoming packet.

Return

Always 0

int **MTP_backlog_rcv**(struct sock *sk, struct sk_buff *skb)

Invoked to handle packets saved on a socket's backlog because it was locked when the packets first arrived.

Parameters

struct sock *sk
MTP socket that owns the packet's destination port.

struct sk_buff *skb
The incoming packet. This function takes ownership of the packet (we'll delete it).

Return

Always returns 0.

int **MTP_err_handler_v4**(struct sk_buff *skb, u32 info)

Invoked by IP to handle an incoming error packet, such as ICMP UNREACHABLE.

Parameters

struct sk_buff *skb
The incoming packet.

u32 info
Information about the error that occurred?

Return

zero, or a negative errno if the error couldn't be handled here.

int **MTP_err_handler_v6**(struct sk_buff *skb, struct inet6_skb_parm *opt, u8 type, u8 code, int offset, __be32 info)

Invoked by IP to handle an incoming error packet, such as ICMP UNREACHABLE.

Parameters

struct sk_buff *skb
The incoming packet.

struct inet6_skb_parm *opt
options

u8 type
type

u8 code
code

int offset
offset

__be32 info
Information about the error that occurred?

Return

zero, or a negative errno if the error couldn't be handled here.

__poll_t **MTP_poll**(struct *file* *file, struct socket *sock, struct poll_table_struct *wait)

Invoked by Linux as part of implementing select, poll, epoll, etc.

Parameters

struct file *file
Open file that is participating in a poll, select, etc.

struct socket *sock
A MTP socket, associated with **file**.

struct poll_table_struct *wait
This table will be registered with the socket, so that it is notified when the socket's ready state changes.

Return

A mask of bits such as EPOLLIN, which indicate the current
state of the socket.

int **MTP_metrics_open**(struct *inode* *inode, struct *file* *file)

This function is invoked when /proc/net/MTP_metrics is opened.

Parameters

struct inode *inode
The inode corresponding to the file.

struct file *file
Information about the open file.

Return

always 0.

ssize_t MTP_metrics_read (struct file *file, char __user *buffer, size_t length, loff_t *offset)

This function is invoked to handle read kernel calls on /proc/net/MTP_metrics.

Parameters

struct file *file
Information about the file being read.

char __user *buffer
Address in user space of the buffer in which data from the file should be returned.

size_t length
Number of bytes available at **buffer**.

loff_t *offset
Current read offset within the file.

Return

the number of bytes returned at **buffer**. 0 means the end of the file was reached, and a negative number indicates an error (-errno).

loff_t **MTP_metrics_lseek**(struct *file* *file, loff_t offset, int whence)

This function is invoked to handle seeks on /proc/net/MTP_metrics. Right now seeks are ignored: the file must be read sequentially.

Parameters

struct file *file
Information about the file being read.

loff_t offset
Distance to seek, in bytes

int whence
Starting point from which to measure the distance to seek.

int **MTP_metrics_release**(struct *inode* *inode, struct *file* *file)

This function is invoked when the last reference to an open /proc/net/MTP_metrics is closed. It performs cleanup.

Parameters

struct inode *inode
The inode corresponding to the file.

struct file *file
Information about the open file.

Return

always 0.

int MTP_dointvec (struct ctl_table *table, int write, void __user *buffer, size_t *lenp, loff_t *ppos)

This function is a wrapper around proc_dointvec. It is invoked to read and write sysctl values and also update other values that depend on the modified value.

Parameters

struct ctl_table *table
sysctl table describing value to be read or written.

int write
Nonzero means value is being written, 0 means read.

void __user *buffer
Address in user space of the input/output data.

size_t *lenp
Not exactly sure.

loff_t *ppos
Not exactly sure.

Return

0 for success, nonzero for error.

int MTP_sysctl_softirq_cores (struct ctl_table *table, int write, void __user *buffer, size_t *lenp, loff_t *ppos)

This function is invoked to handle sysctl requests for the "gen3_softirq_cores" target, which requires special processing.

Parameters

struct ctl_table *table
sysctl table describing value to be read or written.

int write
Nonzero means value is being written, 0 means read.

void __user *buffer
Address in user space of the input/output data.

size_t *lenp
Not exactly sure.

loff_t *ppos
Not exactly sure.

Return

0 for success, nonzero for error.

enum hrtimer_restart **MTP_hrtimer**(struct hrtimer *timer)

This function is invoked by the hrtimer mechanism to wake up the timer thread. Runs at IRQ level.

Parameters

struct hrtimer *timer
The timer that triggered; not used.

Return

Always HRTIMER_RESTART.

int **MTP_timer_main**(void *transportInfo)

Top-level function for the timer thread.

Parameters

void *transportInfo
Pointer to struct MTP.

Return

Always 0.

void **MTP_sock_init**(struct MTP_sock *mtpsk, struct MTP *mtpinst)

Constructor for MTP_sock objects. This function initializes only the parts of the socket that are owned by MTP.

Parameters

struct MTP_sock *mtpsk
Object to initialize.

struct MTP *mtpinst
MTP implementation that will manage the socket.

Return

always 0 (success).

struct MTP ***MTP_init**(void)

Constructor for MTP object. This function initializes MTP data structure.

Parameters

void
no arguments

Return

pointer to the MTP object.

CHAPTER

TWO

INDICES AND TABLES

- genindex
- modindex
- search

INDEX

M