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Multipath TCP MIB  
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Abstract

This memo proposes a simple Management Information Base (MIB) that gathers statistics and counters about the operation of a Multipath TCP implementation.

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## 1. Introduction

Multipath TCP is an extension to TCP [RFC0793] that was specified in [RFC6824]. Multipath TCP allows hosts to use multiple paths to send and receive the data belonging to one connection. For this, a Multipath TCP is composed of several TCP connections that are called subflows.

This memo proposes a simple Management Information Base (MIB) that gathers statistics and counters about the operation of a Multipath TCP implementation. They are designed to give a better understanding of Multipath TCP operations. In particular, the MIB covers the different failure conditions that might occur and would trigger a fallback to regular TCP of the MPTCP connection or the failure of a subflow. These failures have important operational implications. Further, several counters are defined to track the transmission and reception of data at the MPTCP-layer. These counters might help to understand the performance of MPTCP.

## 2. The MPTCP Group

mptcp OBJECT IDENTIFIER ::= { mib-2 TBD } - TBD

mptcpPassiveConn OBJECT-TYPE

SYNTAX        Counter  
UNITS         "connections"  
MAX-ACCESS   read-only  
STATUS        current  
DESCRIPTION  
              "The number of MPTCP connections that made a direct  
              transition to the ESTABLISHED state from the  
              SYN-RECEIVED + MP\_CAPABLE state. In this MIB,  
              an MPTCP connection  
              is defined as a TCP connection where both the  
              SYN and the SYN + ACK segments  
              contained the MP\_CAPABLE options."  
::= { mptcp 1 }

mptcpActiveConn OBJECT-TYPE

SYNTAX        Counter  
UNITS         "connections"  
MAX-ACCESS   read-only  
STATUS        current  
DESCRIPTION  
              "The number of MPTCP connections that made a direct  
              transition to the ESTABLISHED state from the  
              SYN-SENT + MP\_CAPABLE state."  
::= { mptcp 2 }

mptcpPassiveCsumEnabled OBJECT-TYPE

SYNTAX        Counter  
UNITS         "connections"  
MAX-ACCESS   read-only  
STATUS        current  
DESCRIPTION  
              "The number of MPTCP connections that made a direct  
              transition to the ESTABLISHED state from the  
              SYN-RECEIVED + MP\_CAPABLE state with the DSS CHECKSUM  
              enabled."  
::= { mptcp 3 }

mptcpActiveCsumEnabled OBJECT-TYPE

SYNTAX Counter  
UNITS "connections"  
MAX-ACCESS read-only  
STATUS current  
DESCRIPTION  
    "The number of MPTCP connections that made a direct  
    transition to the ESTABLISHED state from the  
    SYN-SENT + MP\_CAPABLE state with the DSS CHECKSUM  
    enabled."  
 ::= { mptcp 4 }

mptcpPassiveRemovedSubflows OBJECT-TYPE

SYNTAX Counter  
UNITS "connections"  
MAX-ACCESS read-only  
STATUS current  
DESCRIPTION  
    "The number of MPTCP subflows that made a transition to the  
    CLOSED state from the ESTABLISHED state upon reception of  
    a segment containing REM\_ADDR or RST."  
 ::= { mptcp 5 }

mptcpActiveRemovedSubflows OBJECT-TYPE

SYNTAX Counter  
UNITS "connections"  
MAX-ACCESS read-only  
STATUS current  
DESCRIPTION  
    "The number of MPTCP subflows that made a transition to the  
    CLOSED state from the ESTABLISHED state upon emission of  
    a segment containing REM\_ADDR or RST."  
 ::= { mptcp 6 }

mptcpPassiveAddedSubflows OBJECT-TYPE

SYNTAX Counter  
UNITS "connections"  
MAX-ACCESS read-only  
STATUS current  
DESCRIPTION  
    "The number of MPTCP subflows that made a direct  
    transition to the ESTABLISHED state from the  
    SYN-RECEIVED + MP\_JOIN state."  
 ::= { mptcp 7 }

mptcpActiveAddedSubflows OBJECT-TYPE

SYNTAX        Counter  
UNITS         "connections"  
MAX-ACCESS   read-only  
STATUS        current  
DESCRIPTION  
      "The number of MPTCP subflows that made a  
      transition to the ESTABLISHED state from the  
      SYN-SENT + MP\_JOIN state through the  
      PRE\_ESTABLISHED state."  
 ::= { mptcp 8 }

mptcpFailedToEstablishInitialSubflows OBJECT-TYPE

SYNTAX        Counter  
UNITS         "connections"  
MAX-ACCESS   read-only  
STATUS        current  
DESCRIPTION  
      "The number of initial MPTCP subflows (i.e. the initial SYN  
      segment contained the MP\_CAPABLE option) that could not  
      transition to the ESTABLISHED state from the SYN-RECEIVED  
      or SYN-SENT states. The reason being one of:  
      - the SYN+ACK didn't contain a MP\_CAPABLE  
      - the first ACK didn't contain a DATA\_ACK or the first  
      data-segment did not contain a DSS mapping  
      - 4-way handshake didn't complete (SYN+ACK or ACK not received)  
      Given these reasons, a connection could not get established or fell  
      back to regular TCP. They are most likely due to middleboxes  
      interfering with the connection."  
 ::= { mptcp 9 }

mptcpFailedToEstablishSubflows OBJECT-TYPE

SYNTAX Counter  
UNITS "connections"  
MAX-ACCESS read-only  
STATUS current  
DESCRIPTION  
    "The number of non-initial MPTCP subflows (i.e. subflows started with a SYN containing the MP\_JOIN option) that could not transition to the ESTABLISHED state from the SYN-RECEIVED or SYN-SENT states. The reason being:  
        - the SYN+ACK didn't contain a MP\_JOIN  
        - the first ACK didn't contain a DATA\_ACK or the first data-segment did not contain a DSS mapping  
        - The connection had already failed back to TCP  
        - the 4-way handshake didn't complete (SYN+ACK or ACK not received)  
    Given, these reasons a subflow could not get established. They are most likely due to middleboxes interference."  
 ::= { mptcp 10 }

mptcpFallbackEstablishedConnections OBJECT-TYPE

SYNTAX Counter  
UNITS "connections"  
MAX-ACCESS read-only  
STATUS current  
DESCRIPTION  
    "The number of MPTCP connections that fell back to regular TCP while being already ESTABLISHED. The reason being one of:  
        - Reception of more than a window worth of data without DSS  
        - Reception of a segment with an incorrect DSS checksum  
    This happens when a middlebox is interfering with the data flow after the connection has been successfully established."  
 ::= { mptcp 11 }

mptcpOtherFailures OBJECT-TYPE

SYNTAX Counter  
UNITS "connections"  
MAX-ACCESS read-only  
STATUS current  
DESCRIPTION  
    "The number of MPTCP connections where an invalid segment was received  
        - Bad DSS-mapping (aka, the specified DSS-mapping does not map the TCP sequence numbers)  
        - All other possible failures"  
 ::= { mptcp 12 }

## mptcpInvalidJoinReceived OBJECT-TYPE

SYNTAX Counter  
UNITS "segments"  
MAX-ACCESS read-only  
STATUS current  
DESCRIPTION  
    "The number of SYN+MP\_JOIN segments that were received but  
    discarded due to :  
        - Error in the HMAC  
        - Token not found"  
 ::= { mptcp 13 }

## mptcpFailRX OBJECT-TYPE

SYNTAX Counter  
UNITS "connections"  
MAX-ACCESS read-only  
STATUS current  
DESCRIPTION  
    "The number of MPTCP connections where the remote host  
    initiated a fallback. This counter is triggered by the  
    reception of a MP\_FAIL."  
 ::= { mptcp 14 }

## mptcpRetrans OBJECT-TYPE

SYNTAX Counter  
UNITS "segments"  
MAX-ACCESS read-only  
STATUS current  
DESCRIPTION  
    "The number of segments that where retransmitted  
    at the MPTCP (meta) level, including all the types  
    of reinjections."  
 ::= { mptcp 15 }

## mptcpFastCloseRX OBJECT-TYPE

SYNTAX Counter  
UNITS "segments"  
MAX-ACCESS read-only  
STATUS current  
DESCRIPTION  
    "The number of MP\_FASTCLOSE received."  
 ::= { mptcp 16 }

## mptcpFastCloseTX OBJECT-TYPE

SYNTAX Counter  
UNITS "segments"  
MAX-ACCESS read-only  
STATUS current  
DESCRIPTION  
    "The number of MP\_FASTCLOSE emitted."  
 ::= { mptcp 17 }

mptcpReceivedInOrder OBJECT-TYPE

SYNTAX Counter  
UNITS "segments"  
MAX-ACCESS read-only  
STATUS current  
DESCRIPTION  
    "The number of segments that were received in order at the  
        MPTCP (meta) level."  
 ::= { mptcp 18 }

mptcpReceivedOutOfOrder OBJECT-TYPE

SYNTAX Counter  
UNITS "segments"  
MAX-ACCESS read-only  
STATUS current  
DESCRIPTION  
    "The number of segments that were received out of order at the  
        MPTCP (meta) level."  
 ::= { mptcp 19 }

mptcpSentSegments OBJECT-TYPE

SYNTAX Counter  
UNITS "segments"  
MAX-ACCESS read-only  
STATUS current  
DESCRIPTION  
    "The number of segments that were emitted at the  
        MPTCP (meta) level."  
 ::= { mptcp 20 }

END

### 3. IANA considerations

The MIB module in this document uses the following IANA-assigned  
OBJECT IDENTIFIER values recorded in the SMI Numbers registry:



Descriptor -----	OBJECT IDENTIFIER value -----
mptcp	{ mib-2 TBD }

RFC Editor: The IANA is requested to assign a value for "TBD" under the 'mib-2' subtree and to record the assignment in the SMI Numbers registry. When the assignment has been made, the RFC Editor is asked to replace "TBD" (here and in the MIB module) with the assigned value and to remove this note.

#### 4. Conclusion

This document has proposed a simple Management Information Base (MIB) to manage Multipath TCP.

#### 5. Acknowledgements

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#### 6. Normative References

- [RFC0793] Postel, J., "Transmission Control Protocol", STD 7, RFC 793, DOI 10.17487/RFC0793, September 1981, <<http://www.rfc-editor.org/info/rfc793>>.
- [RFC6824] Ford, A., Raiciu, C., Handley, M., and O. Bonaventure, "TCP Extensions for Multipath Operation with Multiple Addresses", RFC 6824, DOI 10.17487/RFC6824, January 2013, <<http://www.rfc-editor.org/info/rfc6824>>.

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