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SCTP Socket API Extensions for Concurrent Multipath Transfer  
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## Abstract

This document describes extensions to the SCTP sockets API for configuring the CMT-SCTP and CMT/RP-SCTP extensions.

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SCTP Socket API Extensions

September 2021

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[1.](#) Introduction

This draft describes extensions to the SCTP sockets API (see [\[RFC6458\]](#), [\[RFC4960\]](#)) which allow an application to configure the behaviour of the Concurrent Multipath Transfer (CMT) extensions CMT-SCTP, CMT/RPv1-SCTP, CMT/RPv2-SCTP and MPTCP-like (see [\[I-D.tuexen-tsvwg-sctp-multipath\]](#), [\[Globecom2010\]](#), [\[PAMS2012\]](#), [\[Dre2012\]](#), [\[PAMS2011\]](#), [\[SoftCOM2011\]](#), [\[ConTEL2011\]](#), [\[AINA2010\]](#), [\[IAS2006\]](#)).

[2.](#) Concurrent Multipath Transfer and Resource Pooling Activation/Deactivation (SCTP\_CMT\_ON\_OFF)

This socket option activates or deactivates CMT and sets the corresponding Resource Pooling variant to be applied. The `sctp_assoc_value` structure is used to specify the association for which the CMT state should be changed and the new CMT state.

Definition of the `sctp_assoc_value` structure:

```
struct sctp_assoc_value {
    sctp_assoc_t  assoc_id;
    uint32_t      assoc_value;
};
```

`assoc_id`: Holds the identifier for the association of which the CMT state should be changed. Ignored for one-to-one style sockets.

`assoc_value`:

0 Turns CMT off.

1 Turns plain CMT-SCTP on. No Resource Pooling is applied.

2 Turns CMT-SCTP on. CMT/RPv1 Resource Pooling as defined in [[AINA2010](#)] is applied.

3 Turns CMT-SCTP on. CMT/RPv2 Resource Pooling as defined in [[ConTEL2011](#)] is applied.

4 Turns CMT-SCTP on. MPTCP-like Resource Pooling as defined in [[SoftCOM2011](#)], [[ConTEL2011](#)], [[PAMS2012](#)] is applied.

### [3.](#) Testbed Platform

A large-scale and realistic Internet testbed platform with support for the multi-homing feature of the underlying SCTP protocol is NorNet. A description of NorNet is provided in [[PAMS2013-NorNet](#)], [[ComNets2013-Core](#)], some further information can be found on the project website [[NorNet-Website](#)].

### [4.](#) Security Considerations

Security considerations for the SCTP sockets API are described by [[RFC6458](#)].

### [5.](#) IANA Considerations

This document does not require IANA actions.

### [6.](#) Acknowledgments

The authors would like to thank Michael Tuexen for his support.

### [7.](#) References

#### [7.1.](#) Normative References

[I-D.tuexen-tsvwg-sctp-multipath]

Amer, P. D., Becke, M., Dreibholz, T., Ekiz, N., Iyengar,

J., Natarajan, P., Stewart, R. R., and M. Tuexen, "Load Sharing for the Stream Control Transmission Protocol (SCTP)", [draft-tuexen-tsvwg-sctp-multipath-22](#) (work in progress), August 2021.

[RFC4960] Stewart, R., Ed., "Stream Control Transmission Protocol", [RFC 4960](#), DOI 10.17487/RFC4960, September 2007, <<https://www.rfc-editor.org/info/rfc4960>>.

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[RFC6458] Stewart, R., Tuexen, M., Poon, K., Lei, P., and V. Yasevich, "Sockets API Extensions for the Stream Control Transmission Protocol (SCTP)", [RFC 6458](#), DOI 10.17487/RFC6458, December 2011, <<https://www.rfc-editor.org/info/rfc6458>>.

## [7.2.](#) Informative References

[AINA2010]

Dreibholz, T., Becke, M., Pulinthanath, J., and E. Rathgeb, "Applying TCP-Friendly Congestion Control to Concurrent Multipath Transfer", Proceedings of the 24th IEEE International Conference on Advanced Information Networking and Applications (AINA) Pages 312-319, ISBN 978-0-7695-4018-4, DOI 10.1109/AINA.2010.117, April 2010, <<https://www.wiwi.uni-due.de/fileadmin/fileupload/I-TDR/SCTP/Paper/AINA2010.pdf>>.

[ComNets2013-Core]

Gran, E., Dreibholz, T., and A. Kvalbein, "NorNet Core - A Multi-Homed Research Testbed", Computer Networks, Special Issue on Future Internet Testbeds Volume 61, Pages 75-87, ISSN 1389-1286, DOI 10.1016/j.bjp.2013.12.035, March 2014, <<https://www.simula.no/file/simulasimula2236pdf/download>>.

[ConTEL2011]

Dreibholz, T., Becke, M., Adhari, H., and E. Rathgeb, "On the Impact of Congestion Control for Concurrent Multipath Transfer on the Transport Layer", Proceedings of the 11th

IEEE International Conference on  
Telecommunications (ConTEL) Pages 397-404,  
ISBN 978-953-184-152-8, June 2011, <[https://www.wiwi.uni-  
due.de/fileadmin/fileupload/I-TDR/SCTP/Paper/  
ConTEL2011.pdf](https://www.wiwi.uni-due.de/fileadmin/fileupload/I-TDR/SCTP/Paper/ConTEL2011.pdf)>.

- [Dre2012] Dreibholz, T., "Evaluation and Optimisation of Multi-Path Transport using the Stream Control Transmission Protocol", Habilitation Treatise, March 2012, <[https://duepublico.uni-duisburg-  
essen.de/servlets/DerivateServlet/Derivate-29737/  
Dre2012\\_final.pdf](https://duepublico.uni-duisburg-essen.de/servlets/DerivateServlet/Derivate-29737/Dre2012_final.pdf)>.

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[Globecom2010]

Dreibholz, T., Becke, M., Rathgeb, E., and M. Tuexen, "On the Use of Concurrent Multipath Transfer over Asymmetric Paths", Proceedings of the IEEE Global Communications Conference (GLOBECOM) ISBN 978-1-4244-5637-6, DOI 10.1109/GLOCOM.2010.5683579, December 2010, <[https://www.wiwi.uni-due.de/fileadmin/fileupload/I-  
TDR/SCTP/Paper/Globecom2010.pdf](https://www.wiwi.uni-due.de/fileadmin/fileupload/I-TDR/SCTP/Paper/Globecom2010.pdf)>.

- [IAS2006] Iyengar, J., Amer, P., and R. Stewart, "Concurrent Multipath Transfer Using SCTP Multihoming Over Independent End-to-End Paths", IEEE/ACM Transactions on Networking, Volume 14, Number 5, Pages 951-964, ISSN 1063-6692, DOI 10.1109/TNET.2006.882843, October 2006, <<http://www.fandm.edu/jiyengar/papers/cmt-ton2006.pdf>>.

[NorNet-Website]

Dreibholz, T., "NorNet - A Real-World, Large-Scale Multi-Homing Testbed", Online: <https://www.nntb.no/>, 2019, <<https://www.nntb.no/>>.

[PAMS2011]

Adhari, H., Dreibholz, T., Becke, M., Rathgeb, E., and M. Tuexen, "Evaluation of Concurrent Multipath Transfer over Dissimilar Paths", Proceedings of the 1st International Workshop on Protocols and Applications with Multi-Homing Support (PAMS) Pages 708-714, ISBN 978-0-7695-4338-3, DOI 10.1109/WAINA.2011.92, March 2011, <<https://www.wiwi.uni-due.de/fileadmin/fileupload/I-TDR/SCTP/Paper/PAMS2011.pdf>>.

[PAMS2012]

Dreibholz, T., Adhari, H., Becke, M., and E. Rathgeb, "Simulation and Experimental Evaluation of Multipath Congestion Control Strategies", Proceedings of the 2nd International Workshop on Protocols and Applications with Multi-Homing Support (PAMS) ISBN 978-0-7695-4652-0, DOI 10.1109/WAINA.2012.186, March 2012, <<https://www.wiwi.uni-due.de/fileadmin/fileupload/I-TDR/SCTP/Paper/PAMS2012.pdf>>.

[PAMS2013-NorNet]

Dreibholz, T. and E. Gran, "Design and Implementation of the NorNet Core Research Testbed for Multi-Homed Systems", Proceedings of the 3rd International Workshop on Protocols and Applications with Multi-Homing Support (PAMS) Pages 1094-1100, ISBN 978-0-7695-4952-1, DOI 10.1109/WAINA.2013.71, March 2013, <<https://www.simula.no/file/threfereedinproceedingsreference2012-12-207643198512pdf/download>>.

[SoftCOM2011]

Dreibholz, T., Becke, M., Adhari, H., and E. Rathgeb, "Evaluation of A New Multipath Congestion Control Scheme using the NetPerfMeter Tool-Chain", Proceedings of the

19th IEEE International Conference on Software,  
Telecommunications and Computer Networks (SoftCOM) Pages  
1-6, ISBN 978-953-290-027-9, September 2011,  
<<https://www.wiwi.uni-due.de/fileadmin/fileupload/I-TDR/SCTP/Paper/SoftCOM2011.pdf>>.

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