V2: 15th April 2021	Added Apple's feedback		
All agreed			
Requirements for Scalable Transport	**Normative text**	**Consolidated summary**	**Proposed updates to L4S-ID draft**
1. Use of L4S Packet Identifier (A1.1)	Section 4.1: A sender that wishes a packet to receive L4S treatment as it is forwarded, MUST set the ECN field in the IP header (v4 or v6) to the ECT(1) codepoint.	- Compliant or planned - OS APIs and Kernels need to support it (can RFC8311 be used to justify API updates)	None, OK as is
(Scalable CC requirement)	Section 4.3: As a condition for a host to send packets with the L4S identifier (ECT(1)), it SHOULD implement a congestion control behaviour that ensures that, in steady state, the average time from one ECN congestion signal to the next (the 'recovery time') does not increase as flow rate scales, all other factors being equal.	- Compliant or planned - More clarification needed to align marking rate to throughput	Improve informative text for rate convergence of long flows
5. Reduce RTT dependence (A1.5)	Section 4.3: A scalable congestion control MUST eliminate RTT bias as much as possible in the range between the minimum likely RTT and typical RTTs expected in the intended deployment scenario.	- Compliant or planned - Also for longer RTTs more throughput is planned	None, OK as is
(ECT(1) use needs Prague compliance)	Section 4.3: In order to coexist safely with other Internet traffic, a scalable congestion control MUST NOT tag its packets with the ECT(1) codepoint unless it complies with the following bulleted requirements.	- Compliant to this requirement - Comments were on refered requirements	None, OK as is
Scalable Transport Protocol Optimizations	**Appendix text (non-normative text)**		
1. Setting ECT in TCP Control Packets and Retransmissions (A2.1)	This item only concerns TCP and its derivatives (e.g. SCTP), because the original specification of ECN for TCP precluded the use of ECN on control packets and retransmissions. To improve performance, scalable transport protocols ought to enable ECN at the IP layer in TCP control packets (SYN, SYN-ACK, pure ACKs, etc.) and in retransmitted packets. The same is true for derivatives of TCP, e.g. SCTP.	- Supported or planned	RTP/RTCP clarifications will be added
2. Faster than Additive Increase (A2.2)	It would improve performance if scalable congestion controls did not limit their congestion window increase to the standard additive increase of 1 SMSS per round trip [RFC5681] during congestion avoidance. The same is true for derivatives of TCP congestion control, including similar approaches used for real-time media.	- Supported or planned	None, OK as is
3. Faster Convergence at Flow Start (A2.3)	Particularly when a flow starts, scalable congestion controls need to converge (reach their steady-state share of the capacity) at least as fast as Classic congestion controls and preferably faster. This affects the flow start behaviour of any L4S congestion control derived from a Classic transport that uses TCP slow start, including those for real-time media.	- Research code exists and planned	None, OK as is
Questioned and strong objections			
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(Prague compliance description)	Section 4.3: The specification of a particular scalable congestion control MUST describe in detail how it satisfies each requirement, and for any non-mandatory requirements, it MUST justify why it does not comply.	- Is this requirement really needed? - How can it be enforced? - May not be possible (propriatary).	This requirement is removed
6. Scaling down to fractional congestion windows (A1.6)	Section 4.3: A scalable congestion control SHOULD remain responsive to congestion when typical RTTs over the public Internet are significantly smaller because they are no longer inflated by queuing delay.	- Compliant code and research code exist - Not all convinced if this is needed, others support it and plan to implement - Develop during experiment as needed.	Keep SHOULD. The need for this requirement should be observed during the experiment
7. Measuring Reordering Tolerance in Time Units (A1.7)	Section 4.3: A scalable congestion control SHOULD detect loss by counting in time-based units, which is scalable, as opposed to counting in units of packets (as in the 3 DupACK rule of RFC 5681 TCP), which is not scalable. This requirement does not apply to congestion controls that are solely used in controlled environments where the network introduces hardly any reordering.	- Compliant or planned - One disagreement that using time only and not packet count is a foolproof solution	Consider expressing in terms of the reordering requirement instead of the method? Alternatively also allow a dual condition based on both time and packet counting?
(Burst limit)	Section 4.3: A scalable congestion control is expected to limit the queue caused by bursts of packets. It is only required that the specification of a particular scalable congestion control MUST define, quantify and justify its approach to limiting bursts.	- Normative requirement is mainly documentation related, see above - Can more clear guidelines be given?	The normative MUST is removed. Warning text still present.
Clarification needed			
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2. Accurate ECN Feedback (A1.2)	Section 4.2: For a transport protocol to provide scalable congestion control it MUST provide feedback of the extent of CE marking on the forward path.	- Compliant - Clarification needed for feedback timing and RTT requirements - Some remaining concerns with Accuate ECN	- Appropriate feedback timing depends on the proprietary protocol and needs to be tuned to it - Remaining concerns about Accurate ECN needs to be dealt with in tcpm.
3. Fall back to Reno-friendly congestion control on packet loss (A1.3)	Section 4.3: As well as responding to ECN markings, a scalable congestion control MUST react to packet loss in a way that will coexist safely with a TCP Reno congestion control [RFC5681].	- Compliant to the intent - Not clear what it means "coexist safely with a TCP Reno congestion control" - Don't want to be as degraded as Reno for long RTTs	- Seeking input from WG on clarification to this requirement e.g. RFC5033
4. Fall back to Reno-friendly congestion control on classic ECN bottlenecks (A1.4)	Section 4.3: A scalable congestion control MUST implement monitoring in order to detect a likely non-L4S but ECN-capable AQM at the bottleneck. On detection of a likely ECN-capable bottleneck it SHOULD be capable (dependent on configuration) of automatically adapting its congestion response to coexist with TCP Reno congestion controls [RFC5681]. To participate in the L4S experiment, a scalable congestion control MUST be capable of being replaced by a Classic congestion control (by application and by administrative control).	- Robust detection scheme needs real deployment experience. - Develop during experiment as needed. - Combination with delay based control could minimize potential issues - Clarification: is detection itself required?	- If L4S Operational guidelines draft is adopted, these requirements will need to be aligned with it