

Interplanetary Internet: an architectural framework for space internetworking

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Abstract

The Consultative Committee for Space Data Systems (CCSDS) has been working on extending the terrestrial Internet into space since the mid 1980s, when it helped establish the internetworking architecture for the Space Station program. This led to the initiation of the joint NASA/DOD "SCPS" program, which created full international standards enabling the use of the FTP-TCP/UDP-IP suite in space and in 1996 flew the first spacecraft with an IP address in Earth orbit.

More recently, CCSDS has been studying the extension of the Earth's Internet technology across the entire Solar System, including its use on missions near-Earth, in Deep Space and on and around other planets, as well as within the individual spacecraft themselves. The Interplanetary Internet architecture embraces:

- Relatively conventional Internet techniques deployed "in-situ" in regional environments where short-delay, conversational communications are possible
- Long-haul backbone protocols for interconnecting these far flung distributed internet fragments with their parent on Earth
- A new end-to-end application overlay protocol – "Bundling" – that provides the functional analog of TCP-IP by permitting reliable, secure routing of data across multiple disconnected and heterogeneous networks where delay is not negligible.

This paper will review the pioneering work of CCSDS in leading the development and standardization of "Space Internet" capabilities, and will suggest where that work will head in the coming decade as the "Interplanetary Internet" becomes a reality.