Future Capabilities for the Deep Space Network

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Recently, the Deep Space Network (DSN) of NASA underwent a major upgrade (called the Network Simplification Project, or NSP) of its Telemetry, Tracking, and Command (TT&C) capability. As part of this upgrade, the ranging and telemetry equipment were redesigned and implemented in an architecture that allows easy addition of new capabilities.

This paper will look at three new capabilities that are in different stages of development. First, turbo decoding, which provides improved telemetry performance for data rates on the order of 1 Mbps and below, will be discussed. The initial implementation of turbo decoding has just recently been completed and will be used for the Messenger spacecraft. Next, pseudo-noise (PN) ranging will be presented. PN ranging has several advantages over the current sequential ranging, namely easier operations, improved performance, and the capability to be used in a regenerative implementation on a spacecraft. The PN ranging implementation has just begun; its first user will be the New Horizons mission. Finally, Low Density Parity Check (LDPC) decoding will be discussed. LDPC codes can provide performance to the same level as turbo codes, but are designed for use in the 10 Mbps range. LDPC research is still underway and the implementation into the DSN has yet to be committed.