

NASA'S AES ARMED WITH FULL WIRESHARK CAPABILITY FOR CRITICAL NETWORK PROTOCOLS

NASA (National Aeronautics and Space Administration) utilized CrowdPlat's crowdsourcing platform to build open-source Wireshark plug-ins that are used to test DTN (Disruption Tolerant Network) code, completing the documentation to CCSDS international standards.

Executive Summary

NASA's Advanced Exploration Systems (AES) division is comprised of technical experts who develop technologies that will be used in the next generation of human space exploration missions. The AES DTN Project required updating and developing open-source Wireshark dissectors for several Delay/Disruption Tolerant Network (DTN) protocols such as Bundle Protocol (BP), Licklider Transmission Protocol (LTP), Streamlined Bundle Security Protocol (SBSP), CCSDS File Delivery Protocol (CFDP), and Asynchronous Management Protocol (AMP). NASA posted details of the DTN work on CrowdPlat's platform. After CrowdPlat assigned an expert project manager, he promptly engaged with NASA and assigned an expert Wireshark plug-in C/C++ developer who completed all tasks to NASA's satisfaction. CrowdPlat is pleased to have been able to deliver complex, quality solutions to NASA, and we are proud to share in NASA's interests and contribute to advancing the state of science and engineering and addressing tomorrow's problems today.

Client Overview

An independent agency of the executive branch of the US federal government, National Aeronautics and Space Administration (NASA) is responsible for civilian space programs and aeronautics and aerospace research across the US. NASA develops advanced, revolutionary technologies for spacecraft, aircraft, airspaces, and spaceways, including deep space. From space, for the benefit of humankind, NASA also has Earth missions that study changes in Earth's natural resources and climate.

Background

NASA's DTN protocol suite, built for space data communication, enables data communication across millions of miles – far beyond the capabilities of the terrestrial Internet. DTN protocols are used where conventional Internet protocols (IPs) do not work. The suite enables the internet to work in the presence of delays, disruptions, and losses in data transmission, all of which become significant over the vast distances across which space communication takes place.

DTN can be used in non-space data networks that experience extreme stress due to heavy high-speed traffic loading conditions, e.g., terrestrial applications that witness long delays, frequent disruptions, unidirectional transmission, and high error rates. In such networks, DTN is often overlaid on IPs.

Wireshark is the world's foremost network protocol analyzer – an essential tool for any network manager. Widely used across many commercial enterprises, government agencies, and educational institutions for network troubleshooting, analysis, software and communications protocol development, and education, Wireshark is open-source, cross-platform, and the de facto standard at many of these organizations. Numerous network developers around the world have been actively contributing to Wireshark development over the years.

Wireshark uses protocol dissectors for fine-grained capture and analysis of network traffic at the most fundamental level. NASA therefore decided to build Wireshark dissectors of DTN protocols and make the dissectors available for all Wireshark users.

Due to the lack of connectivity, DTN uses a store-and-forward approach for storing data throughout the network and incrementally moving the data forward so that it ultimately reaches its destination. Bundle Protocol (BP), which is part of the DTN suite, enables the standardized end-to-end reliable data transfer.

Challenge

Before this project, the BP dissector in Wireshark was at an experimental stage and had only been partially implemented. Hence, users were able to decode only partial information, which could potentially mislead them. One of the particular challenges was thus to understand the implementation of the existing BP dissector and to incorporate all the changes required to match the published CCSDS standard.

Additionally, NASA wanted a dissector for CFDP, which is a standardized file transfer protocol that can run over BP. Like BP, a CFDP dissector existed, but it had not been fully documented. In fact, it was less well-documented than many protocols Wireshark supported. Accordingly, the other challenge was to finalizing and achieving clarity on the protocol payload. This had to be accomplished through direct interactions with key developers, including the protocol developer himself, and by working from published and draft standard specifications.

In sum, the project required high proficiency in Wireshark, in-depth knowledge of DTN standards, and a thorough understanding of the Wireshark philosophy and documentation, and NASA's protocol standardization process – overall constituting a niche, specialist skill set. Furthermore, the existing code had to be checked for consistency with the Wireshark library and new code development had to rigorously follow suit. In addition, it was imperative that the code was tested, and QA carried out, with meticulous precision.

Solution

NASA posted details of the DTN challenges as multiple projects on CrowdPlat's platform. A project manager quickly engaged with NASA to clarify details, including scope, timelines, and budget commitments, and then submitted a proposal, which was approved. An expert Wireshark plug-in developer with the precise skill set was assigned and worked on the projects sequentially for eight months. To clarify requirements or provide updates on progress, the developer, project manager, and NASA personnel held several conference calls. The work was executed flawlessly, and the developer suggested improvements that helped the overall outcome.

The Crowdplat Advantage

Identification of expert freelance Wireshark developer. As a result of the crowdsourcing model, NASA was able to tap into high-caliber freelance Wireshark developer at a fraction of the cost compared to traditional consulting firms. The results were satisfactory to NASA and analysis and observation of the protocol formats were completed with step-by-step verification.

Timely delivery through continuous engagement and interaction. Owing to the reputation and credibility of CrowdPlat's project manager, initiation of contact and follow-through with NASA's managers, developers, and testers were successful. The project manager continuously kept in touch with his NASA counterparts. This enabled timely clarification and resolution of technical aspects and ensured smooth project execution.

