Internet-Based System for Voice Communication With the ISS

This system offers advantages over a prior telephony-based system.

Marshall Space Flight Center, Alabama

The Internet Voice Distribution System (IVoDS) is a voice-communication system that comprises mainly computer hardware and software. The IVoDS was developed to supplement and eventually replace the Enhanced Voice Distribution System (EVoDS), which, heretofore, has constituted the terrestrial subsystem of a system for voice communications among crewmembers of the International Space Station (ISS), workers at the Payloads Operations Center at Marshall Space Flight Center, principal investigators at diverse locations who are responsible for specific payloads, and others. The IVoDS utilizes a communication infrastructure of NASA and NASA-related intranets in addition to, as its name suggests, the Internet. Whereas the EVoDS utilizes traditional circ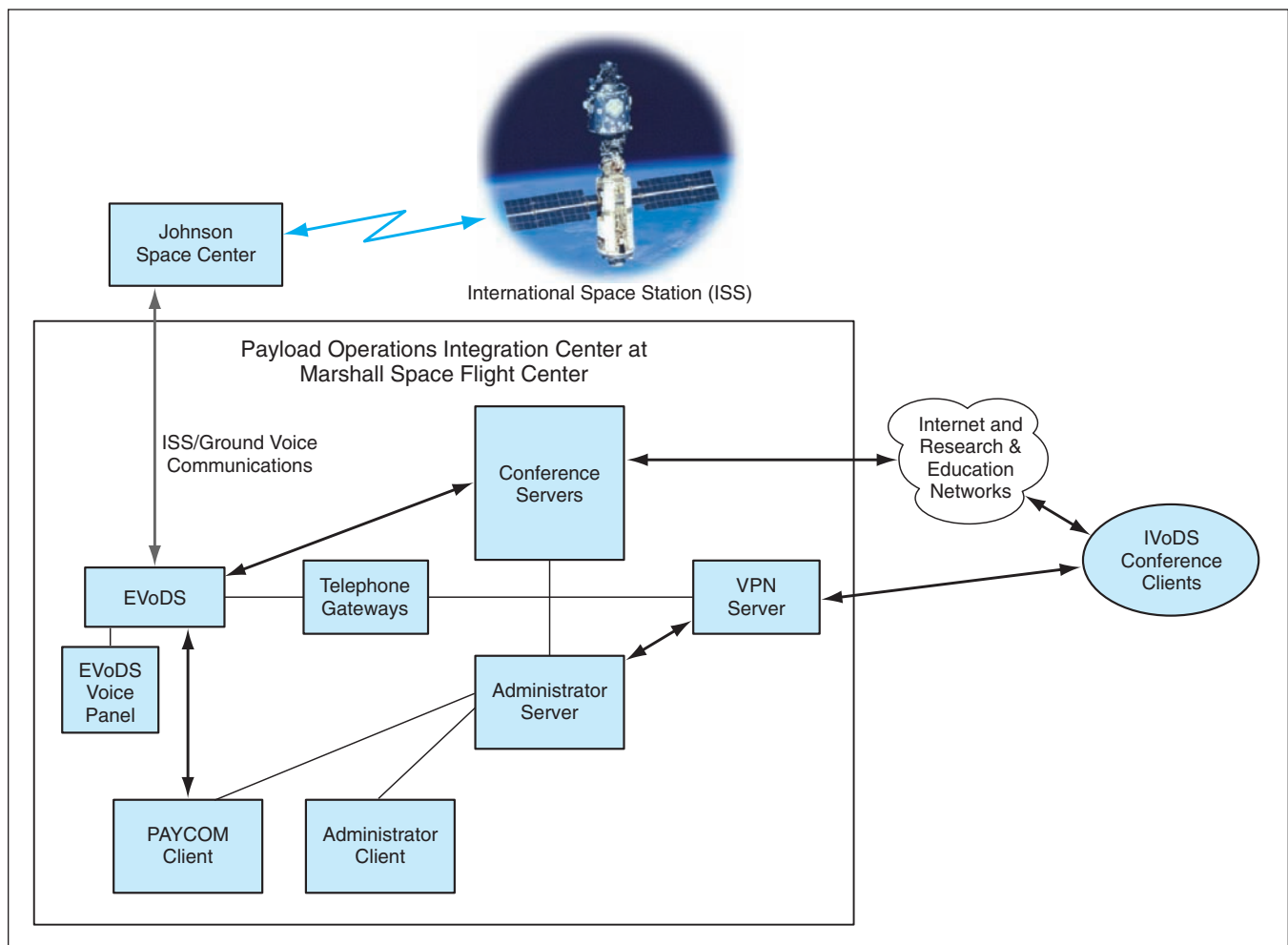uit-switched telephony, the IVoDS is a packet-data system that utilizes a voice over Internet protocol (VOIP). Relative to the EVoDS, the IVoDS offers advantages of greater flexibility and lower cost for expansion and reconfiguration.

The IVoDS is an extended version of a commercial Internet-based voice conferencing system that enables each user to participate in only one conference at a time. In the IVoDS, a user can receive audio from as many as eight conferences simultaneously while sending audio to one of them. The IVoDS also incorporates administrative controls, beyond those of the commercial system, that provide greater security and control of the capabilities and authorizations for talking and listening afforded to each user.

The IVoDS has a client/ server architecture. It utilizes the H.323 VOIP with custom extensions as required to support operations unique to the ISS mission. An authorized user can gain access to the IVoDS by means of a standard desktop personal computer and modem capable of intranet or Internet communication with the Payload Operations Center at a rate of at least 128 kb/s. The subsystems of the IVoDS (see figure) include the following:

- Conference or voice servers: These are computers that host conferences (voice loops) to which client computers connect.
- Conference or voice clients: These are the aforementioned client computers, which are located at the remote work sites of individual users.
- Administrator server: This is a computer that processes requests from the administrator client described below.

The **IVoDS** manages voice communications among users aboard the ISS and users at diverse terrestrial locations.

This computer maintains collections of network, user, and conference data, and controls the conference or voice servers.
- Administrator client: This computer manages users, conferences, and the database in the administrator server.
- Payload communications manager (PAYCOM) client: This is a computer that exerts control over who talks in such restricted conferences as those

that include direct communication with crewmembers of the ISS.
- Virtual public network (VPN) server: Like other VPN servers, this serves to authenticate, by use of identification numbers and encryption, the computers of remote users (in this case, conference clients) who seek access to the IVoDS.
- Telephony gateways: These are interfaces between (1) the EVoDS voice loops,

which are of public switched telephone network type, and (2) the IVoDS Internet-Protocol-based conferences.

Stripline/Microstrip Transition in Multilayer Circuit Board
Transitions like this one could be useful in microwave communication products.
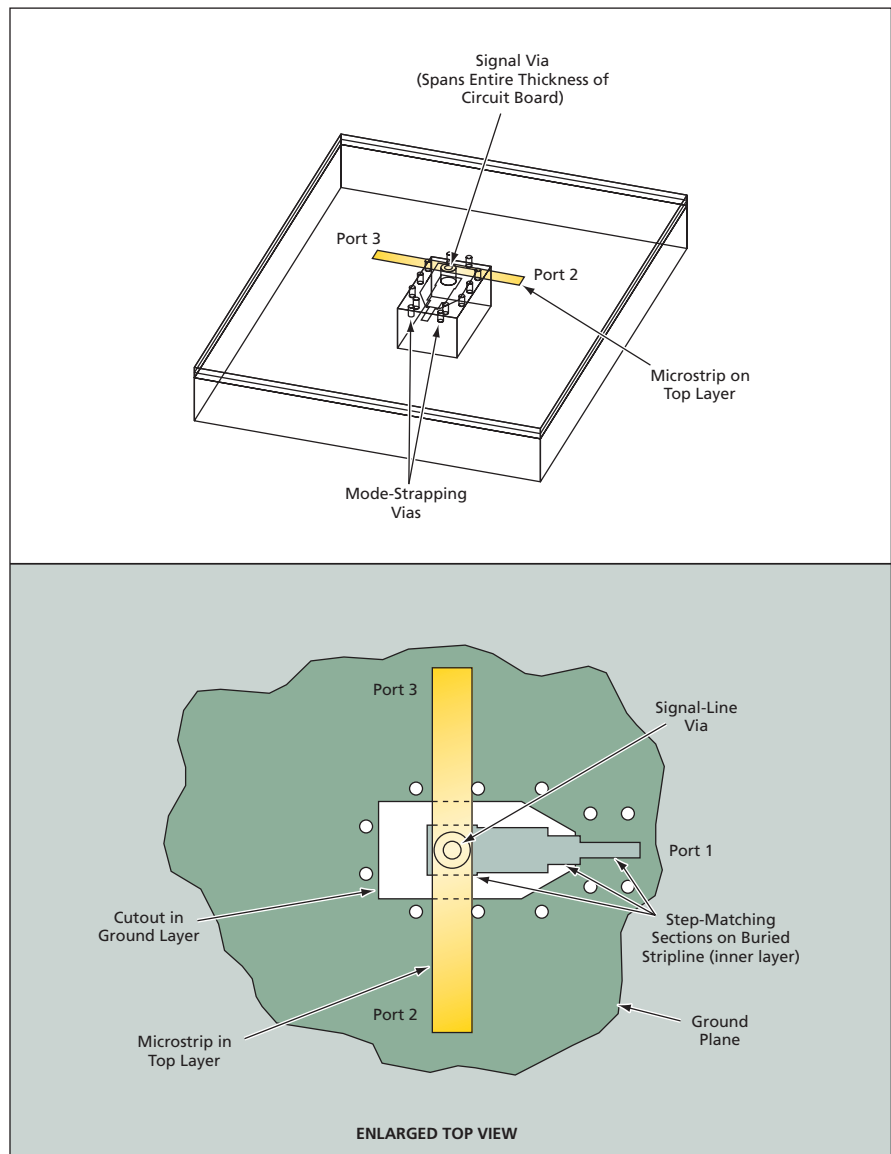
NASA's Jet Propulsion Laboratory, Pasadena, California

A stripline-to-microstrip transition has been incorporated into a multilayer circuit board that supports a distributed solid-state microwave power amplifier, for the purpose of coupling the microwave signal from a buried-layer stripline to a top-layer microstrip. The design of the transition could be adapted to multilayer circuit boards in such products as cellular telephones (for connecting between circuit-board signal lines and antennas), transmitters for Earth/satellite communication systems, and computer mother boards (if processor speeds increase into the range of tens of gigahertz).

The transition is designed to satisfy the following requirements in addition to the basic coupling requirement described above:
- The transition must traverse multiple layers, including intermediate layers that contain DC circuitry.
- The transition must work at a frequency of 32 GHz with low loss and low reflection.
- The power delivered by the transition to top-layer microstrip must be split equally in opposite directions along the microstrip. Referring to the figure, this amounts to a requirement that when power is supplied to input port 1, equal amounts of power flow through output ports 2 and 3.
- The signal-line via that is necessarily a part of such a transition must not be what is known in the art as a blind via; that is, it must span the entire thickness of the circuit board.

The lower end of the via is connected to a circular pad on the bottom (ground) layer. Electrically, this pad is a dead-end or no-connection point. The pad is surrounded by a cutout in the ground layer; the cutout includes a rec-

Built Into a Multilayer Circuit Board, the stripline-to-microstrip transition couples power from port 1 to ports 2 and 3.