

ARPA-Internet Protocol Policy

Status of this Memo

This memo is a policy statement on how protocols become official standards for the ARPA-Internet and the DARPA research community. This is an official policy statement of the ICCB and the DARPA. Distribution of this memo is unlimited.

Introduction

The purpose of this memo is to explain how protocol standards are adopted for the ARPA-Internet and the DARPA research community. There are three important aspects to be discussed: the process, the authority, and the complex relationship between the DARPA community and the DDN community. To do this some background must be given and some of the players described.

DARPA = Defense Advanced Research Projects Agency
DDN = Defense Data Network

The DARPA World

The DARPA world is headed up by the DARPA office. DARPA sponsors research on many subjects with a number of contractors. This set of contractors is called the "DARPA research community". DARPA typically casts its research efforts into "programs" that involve work by several contractors. One program is the "Internet Program", which is researching computer communications issues and constructing experimental communication systems. When the experiments are successful, the results are often put into use to support further work in the Internet Program and other DARPA research programs. In this way, DARPA developed the ARPANET, SATNET, Packet Radio Networks, and the Internet.

In 1981 DARPA established the Internet Configuration Control Board (ICCB) to help manage the DARPA Internet Program.

The ICCB

The concerns of the ICCB fall into two categories:

Short Term Issues:

Keeping the Internet operating as an on-going resource, i.e., dealing with problems that arise due to the growth in the size of the system and the level of use of the system. Sometimes this suggests research on new procedures and algorithms, or suggests changes to the existing protocols and procedures. Sometimes the results of long range research become available and their introduction into the current system becomes a short term concern.

Long Term Issues:

The ICCB also considers communication problems related to the Internet more abstractly. The ICCB suggests to DARPA possible research topics and experiments. The ICCB may act as a sounding board for ideas suggested by others.

DARPA has delegated some aspects of the management of the Internet Program and operation of the (experimental) ARPA-Internet for the DARPA research community to the ICCB.

The members of ICCB were chosen to represent a spectrum of interests and viewpoints. The ICCB members are from different organizations, their individual backgrounds specialize in different operating systems and their viewpoints on computer communication issues are diverse.

The chairman of the ICCB is also the "Internet Architect", and the assistant chairman is the "Deputy Internet Architect". The ICCB currently has 12 members. The Internet Architect is Dave Clark of MIT, and the Deputy Internet Architect is Jon Postel of ISI.

The DDN World

The DDN is a communication system for DoD operational use. It integrates many networks and communication systems now used and planned within the DoD. One part of the DDN system is networks that are also part of the Internet, specifically MILNET and the networks connected to it.

The DDN is managed by the DDN Program Management Office (DDN-PMO). The DDN-PMO sets policy for the use of DDN facilities and enforces protocol standards established for use in the DDN networks.

Within the DoD, there are three protocol committees: the Protocol Standard Steering Group (PSSG), the Protocol Standard Technical Panel (PSTP), and the Protocol Configuration Control Board (PCCB). These committees have members that represent most elements of the DoD. Generally, they develop and recommend guidelines for protocol standardization and usage to the DDN-PMO, and to all of the DoD. The PSSG is a policy setting committee for all of DoD on matters of protocols standards.

The Relationship between the DARPA World and the DDN World

There is cooperation between DDN-PMO and DARPA about the Internet. A few people serve on both the DoD committees (PSSG, PSTP, or PCCB) and the DARPA committee (ICCB). There are good working relationships between the key people in the DARPA office and the DDN-PMO, and between the technical people in both worlds at lower levels.

For example, the ICCB may decide that a certain protocol is to be used in the ARPA-Internet, and develop an implementation plan and schedule. The DDN-PMO would separately consider the issue. It may decide to require that protocol to be implemented in DDN on the same schedule, or it may decide to wait for some results from the DARPA experiment with that protocol before committing to a schedule, or it may decide that that protocol is not required in the DDN.

There are two documents that specify TCP. RFC-793 is the official specification of the DARPA research community. Military Standard 1778 is the official specification of the DDN community. The two documents specify the same protocol.

Organizations that are connected to the Internet through authority derived from DARPA follow the rules set by the ICCB and DARPA.

Organizations that are connected to the Internet through authority derived from DDN-PMO follow the rules set by the DDN-PMO.

DARPA Official Protocol Designation

Official protocols for the ARPA-Internet and DARPA research community are specified in RFCs and should have that designation indicated in the first few paragraphs of the defining RFC. That is, the RFC defining an official protocol should have a policy statement that says,

"This RFC specifies a standard for the DARPA community. Hosts on the ARPA-Internet are expected to adopt and implement this standard."

or something quite similar.

Also, there is a memo titled "Official Protocols". This document is issued occasionally as an RFC that describes all the official protocols of the ARPA-Internet. This document provides information on each protocol; its status (experimental, required, etc.), specification, additional comments, other references, dependencies, and the person to contact. The most recent issue is RFC-901.

RFCs are coordinated by the RFC Editor and distributed by the Network Information Center (NIC). The RFC documents are stored as online files in the NIC's computer. Announcements of new RFCs are sent to a mailing list of interested people. The RFC Editor is Jon Postel.

The Normal Development of an DARPA Protocol Standard

There probably never has been a "normal" case. In most instances some exception or another has been made to the following procedure.

The Typical Chain of Events

The development of a protocol starts with some discussion with random people in messages and meetings over an idea of a new protocol and the form it ought to take.

Someone writes a draft and proposes this draft to a group of people who are interested in the problem. They suggest revisions and iterate the discussion. Eventually, they may decide that they have a reasonable definition of the new protocol and then pass this definition on to the RFC Editor.

The next step is that the RFC Editor sends a draft to other people who might also be interested in the problem. These people can number just a few, or be part of a large mailing list. Depending upon the results from this selected informal group, the draft can be revised and rewritten several times.

When this process stabilizes, the protocol draft is sent out as an RFC, identified as a draft proposal of a protocol that may become an official protocol. The RFC is sent to the ARPA-Internet world at large.

After a certain amount of time, if only a few comments are sent back, some people may try to implement the draft protocol.

Test implementation of a protocol is a difficult management issue.

Experiments must be done with a small number of participants due to the difficulty in changing many implementations at the same time if changes in the protocol are necessary.

In cases where the ICCB deems it necessary, a set of test implementations will be done. A few participants are picked (typically 5 or fewer) for such experiments. This may lead to revision of the protocol before further implementations are encouraged or before the protocol is made official.

If no problems arise, a new RFC is issued containing the complete definition of the protocol, and that the protocol is an official protocol of the ARPA-Internet and DARPA research community.

In general, lower level protocols are more critically judged than higher level protocols (for example, a protocol like TCP would be subject to more careful study than an application like the DAYTIME protocol).

The Bottom Line

For the ARPA-Internet and the DARPA research community, DARPA is in charge. DARPA delegates the authority for protocol standards to the ICCB. The ICCB delegates the actual administration of the protocol standards to the Deputy Internet Architect.

For the DoD in general, the PSSG is in charge. The PSSG delegates the authority for the day to day management of protocol standards in the DDN to the DDN-PMO.