IEEE P802.11

Wireless Access Method and Physical Layer Specification

Intellectual Property Issue for Multiple–Rate PHYs

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Abstract

There is a significant risk that the approach being considered to permit MAC support of PHYs that can operate at multiple data rates could infringe a patent. The patent in question is held by a company that is neither involved in wireless communication nor represented at 802.11. This submission identifies the patent and assignee thereof, summarizes the technology claimed in the patent, and includes a copy of the U.S. Patent document. This submission does not express an opinion on the desirability of using this patented approach to multiple–rate PHY support, nor on the advisability of including multiple–rate PHY support in the draft standard.

Disclaimers

1) The author of this submission is the principal inventor of the cited patent. However, neither the author, nor Digital Ocean, Inc. (the author's current employer) have any rights to, nor any financial interest in, this patent.

2) The author of this submission is not an attorney, and this document is not a legal opinion concerning the scope of the patented subject matter nor the potential relevance of this patent to any proposal under consideration by 802.11. The statements about the contents of the patent are technical opinions from an individual who is familiar with the patented subject matter through participation in the invention thereof, and is familiar with the wireless LAN subject matter through subsequent, unrelated work in that field and participation in 802.11.

3) The sole purpose of this submission is to alert the members of the 802.11 working group to the existence of a potentially important intellectual property issue. Neither the contents of this document, nor the fact that this document has been generated and submitted, shall be interpreted as a recommendation by the author regarding the inclusion of multiple–rate PHY support in the draft standard. Furthermore, the author is neither advocating nor opposing the use of this patented approach to multiple–rate PHY support in the event that a decision is made to include multiple–rate PHY support in the draft standard.

Background

At the meetings during 1994 there has been considerable discussion of approaches that allow the MAC to effectively utilize the capabilities of PHYs that are able to transfer data at more than one data rate. Of particular interest have been approaches that permit concurrent support for operating at more than one of these data rates within a single BSS, dynamically selecting the data rate at which to transfer each MPDU. A detailed proposal of this type is document 94/157, written by Pablo Brenner and presented at the Orlando meeting (07/94) by Michael Rothenberg. The (extensive) discussion that followed this presentation is summarized in document 94/209.

While the details vary, all of the proposals for MAC support of multiple–rate PHYs include one of the following approaches:

a) A process in which the station initiating the data transfer indicates its data rate capabilities to the addressed recipient (generally as part of the RTS frame), the recipient uses this information (and its own data rate capability information) to select the highest (or otherwise "best) mutually available data rate for use during this transfer, and the recipient communicates the rate to be used for the transfer back to the initiator (generally as part of the CTS frame).

b) A process in which the station initiating the data transfer indicates its ability to transfer at more than one data rate to the addressed recipient (generally as part of the RTS frame), the recipient responds by indicating its own data rate capabilities to the initiator (generally as part of the CTS frame), and the initiator uses this information to select the highest (or otherwise "best") mutually available data rate for use during the transfer.

c) A process in which stations with multiple–rate capabilities monitor network traffic and/or exchange appropriate control or management frames in their BSS in order to obtain information needed to build a table that relates station addresses with the data rate capabilities of the stations. Prior to initiating each data transfer, the sender consults its capability table to determine the highest (or otherwise "best") mutually available data rate for use during the transfer.

The '732 Patent

U.S. Patent 5,077,732 is entitled "LAN With Dynamically Selectable Multiple Operational Capabilities." The original application for this patent was filed on November 14, 1988, and the patent was granted on December 31, 1991. This patent was assigned to, and is still owned by, Datapoint Corporation. This patent discloses the dynamic selection mechanisms for use on a LAN in which a subset of the stations have enhanced communication capabilities, with the exemplary capability being support for LAN transfers at a higher data rate. Among this patent's 66 claims are ones that cover each of the three approaches summarized above.

The work that yielded this invention was an early stage in the development of ARCNETplus®, which provided complete interoperability in a mixed network comprised of some ARCNET® nodes and some ARCNETplus nodes. All nodes could communicate at ARCNET's 2.5Mbps "common rate," while pairs of ARCNETplus nodes, connected by an appropriate cable, could communicate at 20Mbps. This development began, and the invention occured, in 1987. The initial reduction to practice took place during 1988, and the ARCNETplus patent applications were filed, and the product was announced to the public, in late 1989. Besides the U.S. Patent, there are several foreign patents (I'm not sure which countries) based on the U.S. application.

The claims of this patent are very broad, and are not specific to ARCNETplus. The breadth of these claims is due to a filing date that is earlier than the beginning of work on speed enhancements to other common LAN types, and a proof–of–concept implementation that supported CSMA operation as well as token passing.

- The fact that the principal example of "operational capabilities" are different data rates over a single medium is made clear at many points in the patent, starting with the first two lines of the abstract.

- The detailed description of the invention directly states that "The communication medium may take the form of a plurality of interconnected signal communication links, such as coaxial cables, twisted cable pairs, optical links, radio links, or combinations of these and others." [column 4, lines 33–37, emphasis added]

- The approach in which the inquiry (RTS) solicits rate capability information, the response (CTS) indicates available data rates, and the source node selects the data rate to use for the transfer is illustrated in Figures 13 and 14, and described in columns 15–17.

- The approach in which the inquiry (RTS) indicates available data rates, the destination node selects the data rate to use for the transfer, and the selected rate is communicated back to the source node in the response (CTS) is illustrated in Figures 15 and 16, and described in columns 17–18.

- Several approaches that build a capability table (associating addresses with data rate capabilities) at each multi–rate node, including ones that monitor network traffic and extract information therefrom, ones that exchange capability information at network initialization, and ones that convey capability information in specific frames, are illustrated in Figures 17–23 and described in columns 18–23. Some of these approaches are specific to token based channel access, but most are applicable to non–token networks (for example, see column 19, line 67 through column 20, line 29).

There are several branches of the claim tree that do not require the use of a token, and appear to be nearly identical to means or methods under consideration at 802.11. Some of these include:

- Claims 1, 2, 3, 4, 7, 8, 9, 10, and 11 — a general listing of the means for a network with multiple, dynamically selectable data rates.

- Claims 1, 2, 3, 4, and 5, (and 6) — where capability information is exchanged when the node becomes active on the network.

- Claims 1, 2, 3, 4, 18, 19, 20, 21, and 22 — where capability information is exchanged at the common rate to permit the source node to select the rate to use for the data transfer.

- Claims 1, 2, 3, 4, 18, 19, 20, 23, and 24 — where capability information is exchanged at the common rate to permit the destination node to select the rate to use for the data transfer.

- Claims 1, 2, 25, 26, 27, 28, 29, and 30 — which specifically identify data rate as an operational capability, provide for more than two such rates, etc.

- Claims 31–56, which are method claims covering most of the same functionality as the means claims 1–30.

- Claim 59, a means plus function claim that provides a different description of the fundamental dynamic, multi–rate mechanism.

The Patent Holder

The patent is owned by Datapoint Corporation, where the author of this submission was employed as Principal Architect from 1984 through 1989. Despite a long history of LAN development (and the introduction of the first LAN to reach the market — ARCNET in 1977), Datapoint has been minimally involved in the IEEE 802 LAN standards effort, and has had no involvement with 802.11. Other than their implementation of some point–to–point infrared links in the late 1970s and early 1980s, they have not been involved with wireless communication, and those products have been out of production for many years.

For most of its history, Datapoint was exceedingly reluctant to enforce its intellectual property, or even proprietary information, rights. However, during the last few years, Datapoint has been attempting aggressively to enforce several of its patents pertaining to video teleconferencing technology. Many of the alleged infringers implemented the functionality that is alleged to infringe in order to comply with an ITU H–series teleconferencing standard (with which Datapoint had no involvement nor participation, and with which the Datapoint teleconferencing products do not comply). Despite Datapoint's teleconferencing work having predated the teleconferencing standards, it is likely that nobody on the standards committee was aware of the Datapoint patents in this area. The potential exists for a similar situation with multiple–rate PHY support in 802.11.

In mid–August, 1994, the author made informal contact with the Datapoint corporate counsel to determine whether Datapoint might be willing to license this patent on the reasonable and non–discriminatory basis necessary for possible use in an open standard. The informal answer (from a lawyer unfamiliar with the rules under which the IEEE standards process works) was that Datapoint would be willing to engage in discussions with the standards committee for a license for limited, particular uses, if the standards committee was interested in using Datapoint patented technology in a standard — certainly not a refusal to license this patent, but far from a response that provides a clear or low–risk path toward a resolution of this matter.