County of San Mateo Information Technology Standard	
Technology:	IP Communication
Category:	Network Communications, Network Attachments
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Business Purpose:	Promote a single standard network protocol for workstations, printers, servers, applications and any other device utilizing the County of San Mateo Network.
Effective Date:	10/1/05
Introduction:	The County's data network is not only being used more intensively by traditional computer applications, but it is being (or will soon be) used by newer, more diverse, applications like IP Telephony (VOIP), and streaming audio/video. With the volume and diversity of traffic increasing, it is important that the core network protocol, which transports this traffic, exhibit the following characteristics: 1. Robust: Be used by a wide variety of applications 2. Extensible: Easily extended to be used in areas it was not originally designed for. 3. Routable: Easily traverse through various segments of a network. 4. Impose a low processing overhead on intermediate network nodes as the packet makes its way to its destination 5. Secure: Offer sophisticated mechanisms to encrypt the data carried in its packets. 6. Fast: Support high bandwidth traffic (exceeding 1Gbps). 7. Support sophisticated QoS mechanisms to provision higher bandwidth for those applications that need it. 8. Open standard: Developed and promoted by a standards body such as the IETF, as opposed to being a proprietary offering of a company. 9. Enjoy broad industry support: The more widely used, the bigger the choice of equipment that supports it, and the higher availability of labor with expertise in it. The one protocol that meets all these requirements is IPv4 (Internet Protocol, version 4), and it is by far the most widely used protocol in the County's networks.

	However, some parts of the County also run other protocols as well, for example IPX, which is not an open standard and is outdated. Network switches are moving away from hardware based switching of non-IP protocols to software based switching. This will mean additional processing overhead as well as degradation in performance if non-IP protocols are left on the network. And finally, some non-IP protocols are too talkative – consuming more bandwidth on the network than IP for the same amount of work done. Printers using non-IP protocols, may exhibit slowness in printing after the county implements QoS mechanisms in its networks. This is because many non-IP protocols do not support QoS, and all such traffic would therefore be put on the default (lowest) level of service by the QoS mechanism. The County has to implement QoS in order to implement IP Telephony (VOIP). While the County should work towards the elimination of non-IP protocols from the County's network, care should be taken to ensure no new network protocol enters the environment without due consideration. By adopting a single standard network protocol, the County will realize lower costs by: 1. Avoiding the need to buy appliances (routers, printers etc) that support multiple protocols. 2. Reducing complexity of the network. 3. Reducing the need to hire experts specializing in multiple (and unneeded) protocols.
Standard:	The County adopts IPv4 as its standard network protocol. All new network attachments and application communication should be IPv4 based. Non-IP traffic should be introduced only if IP has been proven to be inadequate, and with approval from the County's Information Services Department.
Product Recommendations:	Please refer to Product Recommendations page.
Terminology:	**Internet Protocol (IP)** The Internet Protocol (IP) is a data-oriented protocol used by source and destination hosts for communicating data across a packet-switched network. Data in an IP network are sent in blocks referred to as packets or datagrams (the terms are basically synonymous in IP). Packet switches,

	or network routers, forward IP datagrams across interconnected layer 2 networks. IP supports protocol layering as defined in the OSI reference model. Popular higher-level protocols like HTTP, TCP, and UDP are built directly on top of IP. Likewise, IP can travel over several different lower-level data link interfaces like Ethernet and ATM. IP originated with UNIX networking in the 1970s and is the common element found in today's public Internet. The current and most popular version of the protocol in use today is version 4 (IPv4). IPv6 is the proposed successor to IPv4; the Internet is slowly running out of addresses, and IPv6 has 128-bit source and destination addresses, providing more addresses than IPv4's 32 bits. Versions 0 through 3 were either reserved or unused. Version 5 was used for an experimental stream protocol. **Quality of Service (QoS)** The term Quality of Service (QoS) refers to the probability of the network meeting a given traffic contract. When the Internet was first being created, there was no perceived need for a QoS application. So in fact the entire internet ran on a "best effort" system. A traffic contract specifies guarantees for the ability of a network/protocol to give guaranteed performance/throughput/latency bounds based on mutually agreed measures, usually by prioritizing traffic. Elements of network performance within the scope of QoS include availability (uptime), bandwidth (throughput), latency (delay), and error rate. Certain types of applications, such as IP Telephony (VOIP), require a certain level of bandwidth to function - if they get more than that they can't use it, and if they get less, then they can't function at all.