CROSSROADS SYSTEMS INC (CRDS) IPO

Company Overview

Company Name	CROSSROADS SYSTEMS INC
Company Address	11000 NORTH MOPAC EXPRESSWAY AUSTIN, TX 78759
Company Phone	5123490300
Company Website	www.crossroads.com
CEO	Brian R. Smith
Employees (as of 7/31/1999)	114
State of Inc	DE
Fiscal Year End	10/31
Status	Priced (10/20/1999)
Proposed Symbol	CRDS
Exchange	NASDAQ
Share Price	$18.00
Shares Offered	3,750,000
Offer Amount	$67,500,000.00
Total Expenses	$1,004,713.00
Shares Over Alloted	0
Shareholder Shares Offered	–
Shares Outstanding	25,632,926
Lockup Period (days)	180
Lockup Expiration	4/17/2000
Quiet Period Expiration	11/15/1999
CIK	0001093207

Company Description

OVERVIEW

We are the leading provider of storage routers for storage area networks, based on our market share of storage routers shipped. Our storage routers serve the critical function of enabling Fibre Channel storage area networks to connect with many of an organization's other computer

Full Description

The IPO profiles may contain historical records.
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Exhibit 1102

CROSSROADS SYSTEMS INC (CRDS) IPO

The market for SAN products generally, and storage routers in particular, is increasingly competitive. We anticipate that the market for our products will continually evolve and will be subject to rapid technological change. We currently face competition from ATTO, Chaparral, Pathlight and, to some extent, Computer Network Technologies. In addition, our OEM customers could develop products or technologies internally that would replace their need for our products and would become a source of competition. We expect to face competition in the future from storage system industry suppliers, including manufacturers and vendors of other SAN products or entire SAN systems, as well as innovative start-up companies. For example, manufacturers of Fibre Channel hubs or switches could seek to include router functionality within their SAN products which would obviate the need for our storage routers. As the market for SAN products grows, we also may face competition from traditional networking companies and other manufacturers of networking products. These networking companies may enter the storage router market by introducing their own products or by entering into strategic relationships with or acquiring other existing SAN product providers. In addition, we expect to face competition in the future from one or more of the following sources:

- OEMs, including our customers and potential customers;

- LAN router manufacturers;

- storage system industry suppliers, including manufacturers and vendors of other SAN products or entire SAN systems; and

- innovative start-up companies.

As the market for SAN products grows, we also may face competition from traditional networking companies and other manufacturers of networking products. These networking companies may enter the storage router market by introducing their own products or by entering into strategic relationships with or acquiring other existing SAN product providers. It is also possible that OEM customers could develop and introduce products competitive with our product offerings. Furthermore, we have licensed our 4200 storage router technology to Hewlett-Packard, one of our OEM customers and a stockholder of our company. While to date this OEM has not introduced competitive products based on this technology, this OEM could potentially do so in the future.

We believe the competitive factors in the storage router market include the following:

- OEM endorsement;

- product reliability and verified interoperability;

- customer service and technical support;

- product performance and features;

- brand awareness and credibility;

- ability to meet delivery schedules;

- strength of distribution channel; and

- price.

Company Description

OVERVIEW

We are the leading provider of storage routers for storage area networks, based on our market share of storage routers shipped. Our storage routers serve the critical function of enabling Fibre Channel storage area networks to connect with many of an organization's other computer devices that use different computer protocols. Specifically, when used in storage area networks our storage routers decrease congestion in the transfer of data within a network, reduce the time required to back up data, improve utilization of storage resources, and preserve and enhance existing server and storage system investments.

To date, we have sold approximately 6,000 storage routers, primarily to major manufacturers of servers and storage systems. These computer equipment manufacturers sell our storage routers to end-user organizations for use in their storage area networks. We have also recently begun to sell our storage routers through companies that distribute, resell or integrate our storage routers as part of a complete SAN solution.

INDUSTRY BACKGROUND

Increasing Importance of Information Management

Information management has become a strategic imperative for many organizations today. The broad deployment of widely dispersed computer networks combined with the widespread use of the Internet, intranets and electronic commerce have enabled organizations to empower employees, customers and suppliers with access to vast amounts of data. However, the dramatic growth in

the amount of data generated, stored, protected and accessed has created increasingly serious information management challenges. Exacerbating these challenges is the greater number and types of users who access this data, as well as the proliferation of various types of software applications across many different computer devices that use different protocols for the input and output of data. Organizations therefore are seeking to implement processes and systems that effectively and efficiently store, manage and ensure the integrity and availability of data 24 hours-a-day, seven days-a-week, 365 days-a-year.

The Interconnect Bottleneck and Limitations of the Point-to-Point Storage System Architecture

While data storage capacity and microprocessor speeds have increased dramatically, the speed at which information is transmitted from storage systems to microprocessors has not increased nearly as rapidly. This imbalance has resulted in bottlenecks at the interconnection points where the input and output of data occurs. These interconnect points are commonly referred to as the I/O. These I/O bottlenecks cause large delays in the movement of data within a network, significantly slowing down the network's day-to-day operations and frustrating network users. The I/O bottleneck persists due, in large part, to the limitations of the computer protocols that traditionally have been used to transport data across the I/O.

One of the most commonly used I/O protocols is the small computer system interface, or SCSI. While widely used, SCSI has inherent performance limitations, including:

- the amount of data SCSI can transport at one time;
- the physical distances over which SCSI can operate;
- the limited number of storage devices SCSI can connect to a server;
- SCSI's inability to grow with and adapt to the requirements of growing and changing computer networks;
- SCSI's lack of management capabilities; and
- SCSI's inability to connect more than one server to a storage device, which restricts data accessibility.

For example, a SCSI connection enables data throughput of only 40 or 80 megabytes per second, can transmit data over no more than 25 meters, and can support a maximum of only 15 devices. In addition, SCSI does not have any inherent capability to manage storage systems or any devices attached to those systems. As a result, already busy network servers also must perform these tasks. Finally, a SCSI-connected device can only be accessed by a single server. If the server becomes unavailable for any reason, data on its connected device becomes inaccessible. Despite its limitations, SCSI currently is the most prevalent interconnect, or I/O, protocol and is expected to remain an important I/O protocol in the future.

Adding to the problems created by the I/O bottleneck is the so-called "point-to-point" architecture used in the vast majority of enterprise computing systems today. This architecture relies on a dedicated, point-to-point SCSI connection between each server and only one storage device. In effect, each server/storage pair becomes an island. To perform data backup -- making a copy of data to protect it from loss or corruption -- data must be moved from a storage system, through its attached server, over the primary computer network (referred to as the local area network, or LAN), then through another server to a backup storage system. The following graphic depicts, in simplified form, the point-to-point architecture:

[Description of Graphic:

The graphic depicts a standard local area network, or LAN. Across the top of the diagram are three "Storage Devices": a "Tape Storage" device and two "Disk Storage" devices. These storage devices are connected via SCSI connections to three "Servers": a "Unix" server, a "Window NT" server and a "Netware" server. These three servers are connected to a "Local Area Network" (depicted in the form of a cloud), to which various "Network End Users (Clients)" (represented by computer terminals) are attached.]

Because users can access information residing on a storage device only from the server connected to that storage device, and because a significant amount of data must be moved across the local area network, two bottlenecks occur. First, the amount of data which can traverse the SCSI interconnect between the server and the storage device at a given time is severely limited, the information going to and coming from the storage device is more difficult to access and manage, and the risk of data loss is increased. As the number of requests for stored data from the server grows, congestion within the server increases and server performance further decreases. Second, the LAN becomes congested, slowing an organization's day-to-day operations. As a result, many organizations are moving away from point-to-point storage system architectures to reduce I/O bottlenecks and improve their overall information management.

Addressing the I/O Bottleneck with Fibre Channel Storage Area Networks

The higher performance Fibre Channel protocol has received broad recognition as a means to address many of the current limitations and difficulties of information management. Fibre Channel is an industry standard interconnect protocol developed in the early 1990s and approved by the American National Standards Institute in 1994. Fibre Channel enables data throughput of more than 100 megabytes per second, can transmit data over distances of up to 10 kilometers and can enable the interconnection of hundreds of different servers and storage systems. As a result of these capabilities, Fibre Channel has enabled the evolution of a new network storage architecture: the storage area network, or SAN.

A storage area network, or SAN, is a high-speed computer network dedicated to data storage that allows different types of storage devices, such as tape libraries and disk arrays, to be shared by all end users through network servers. Similar to the way in which traditional local and wide area computer networks permit any end user on the network to access any network server, a SAN creates a "pool" of data storage that can be shared by multiple servers. Through various configurations similar to those used in traditional computer networks, SANs can connect any server with any storage system, and storage systems with each other. This any-to-any connectivity enables large amounts of data to be shared and accessed among servers and storage systems running different computer operating systems or software applications.

Three key devices enable the interconnection of a SAN with other network

components, as well as the various components of the SAN with each other:

- The Storage Hub is a Fibre Channel-based device which connects Fibre Channel servers to Fibre Channel storage devices via a single shared data communication path. Leading suppliers of storage hubs include Gadzoox Networks and Vixel.
- The Storage Switch is a Fibre Channel-based device which connects Fibre Channel servers to Fibre Channel storage devices via multiple communication paths. Leading suppliers of storage switches include Ancor Communications, Brocade Communications and McDATA.
- The Storage Router is a device which, in effect, translates communications across different computer protocols, including both SCSI and Fibre Channel, in order to connect all of the various components of the SAN, including servers, storage systems, storage hubs and storage switches. By enabling data transport across multiple computer protocols, storage routers facilitate seamless communication between the SAN and attached SCSI-based servers and storage systems. As such, storage routers enable both server-to-storage and storage-to-storage communication. We are the leading supplier of storage routers based on the number of units shipped, and believe that we were the first company to ship a storage router.

The following graphic depicts a basic SAN in which storage devices and servers are connected in their own network, enabling multiple servers to access multiple storage devices. Storage routers are shown here enabling the connection of an organization's existing SCSI disk and SCSI tape storage devices, as well as an existing SCSI server, to the Fibre Channel SAN.

Graphic schematic diagram of a storage area network

[DESCRIPTION OF GRAPHIC: The graphic depicts a schematic diagram of a storage area network, or SAN. Across the top of the diagram, two "Storage Devices" are depicted: a "Tape Storage" and a "Disk Storage" device. Each of these storage devices are connected via the SCSI protocol to depictions of two "Storage Routers." These storage routers are in turn connected to a "Fibre Channel SAN with hubs/switches" (represented by a cloud) in the center of the diagram. The SAN is connected to (i) three different servers running Unix, Windows NT and Netware, respectively, (ii) "Fibre Channel Storage Devices," and (iii) via a "Storage Router" through a SCSI connection to a "SCSI Server." Finally, each of the servers is in turn connected to a "Local Area Network," to which various "Network End Users (Clients)" are attached (represented by computer terminals).]

New Applications Enabled by Fibre Channel SANs

Fibre Channel SANs have enabled a number of important applications, including:

- LAN-free Backup. Disruptions to a computer system can result in the loss or corruption of data. Therefore, most organizations regularly perform data backup by moving data from storage systems to separate or off-site storage systems or data centers where the data can be safely stored. Because data backup can account for a significant portion of the data traffic over local area networks, it is often a major contributor to bottlenecks at the input/output interconnect. As networks are increasingly required to be available to users on an around-the-clock basis, the available time during which data backup can be performed has decreased, while the time required to perform backup has increased due to the growth of the amount of data being backed up. Unlike traditional backup which entails the use of multiple servers to access each of their storage devices, LAN-free backup uses the SAN to move data from a storage system through one server then directly to a backup storage system. By moving the data backup function from the LAN to the SAN, LAN-free backup substantially reduces I/O bottlenecks.
- Server-free Backup. The development of server-free backup has the potential to further extend the benefits of LAN-free backup by virtually removing the server from the backup process. This application will enable automated data movement between storage systems directly across the SAN, allowing data backup while utilizing a very small percentage of the server's internal data processing capacity. As a result, organizations will no longer need to identify lengthy time periods, or "backup windows," for disconnecting servers from the network in order to perform backup.
- Shared Storage. In the traditional point-to-point storage architecture, a significant portion of storage resources are underutilized because they are accessible only by a single server which may not efficiently use the resource. With SANs, multiple servers can access the same storage devices, enabling more stored data to be available to more users, and reducing the need to add more servers or storage devices to support greater storage requirements.
- Data Mirroring and Disaster Tolerance. SANs improve an organization's ability to ensure the integrity of its data by facilitating data replication, or mirroring, and enhanced disaster tolerance and recovery. In mirroring, two copies of transaction data are created and maintained on separate storage systems. This redundancy reduces the chance of data loss or corruption. Because SANs enable very high data transmission rates and support transmission distances of up to 10 kilometers per Fibre Channel link, SANs enable mirroring across storage systems that may be many kilometers apart from each other. These capabilities also facilitate the creation and maintenance of offsite data centers that support business recovery in the event data is lost at a primary storage site.

The Need for Storage Routers to Facilitate the Adoption of SANs and Emerging I/O Protocols

As storage area networks are relatively new, most storage devices in the market continue to be sold with the small computer system interface. Additionally, most organizations have made significant investments in storage devices and servers that use the small computer system interface. Thus, in order to enable organizations to achieve the benefits of deploying a storage area network, the SAN must be able to operate in conjunction with the different I/O protocols employed by the devices which are connected to it or within it. Because many organizations have made significant investments in computer equipment which uses the small computer system interface protocol, organizations

are reluctant to replace these devices on a wholesale basis or to stop purchasing them. As a result, these organizations will require their Fibre Channel-based SANs to communicate with SCSI-based devices.

Several other current and emerging I/O protocols also are expected to be incorporated into commercial SAN products, servers and storage systems in the future. These protocols include asynchronous transfer mode, which would support the high-speed transmission of data between multiple SANs via networks operating over large distances, otherwise known as wide area networks. Other current and future I/O protocols under development are intended to reduce the incidence of I/O bottlenecks.

These include Next Generation I/O (NGIO) and Future I/O, as well as System I/O, the recently announced combination of these two competing protocols. As new protocols achieve commercial acceptance, storage routers will be increasingly essential to connect these devices to the SAN, enabling seamless communication among servers, storage devices and other SAN components that utilize different computer protocols.

THE CROSSROADS SOLUTION

We are the leading provider of storage routers for storage area networks, based on our market share of storage routers shipped. Our storage routers enable organizations to deploy SANs within their existing computing networks. Our storage routers presently connect Fibre Channel SANs with SCSI servers and SCSI storage systems and are fully interoperable with commercially available Fibre Channel storage devices and equipment. Using our storage routers, organizations can deploy and derive the benefits of SAN technology today, while preserving their existing investments in SCSI-based computer equipment.

Incorporated into our storage routers is our proprietary storage routing software that "intelligently" examines data traffic in the SAN to prioritize transmission and minimize congestion in the flow of data. This software also enables communication between different I/O protocols, supports rapid field deployment of new storage area network configurations, enables sharing of storage resources by multiple servers and can be adapted to new I/O protocols as they emerge. Our proprietary software is combined with software management tools and embedded in our storage routers. Our storage router hardware consists of industry-standard microprocessors and industry-standard application specific integrated circuits.

Our storage routers are purchased by end-user organizations of all sizes, primarily to improve backup systems in their SANs. Our storage routers are in use in the data centers of large, multi-national corporations, as well as in smaller companies such as Crossroads, where we use two of our storage routers in conjunction with our own storage area network for LAN-free backup and to connect SCSI-based disk storage devices.

We believe that deploying our storage routers helps organizations improve and reduce their total cost of information management by offering a number of important benefits, including:

Facilitating Efficient Backup and Recovery

Currently, our storage routers are used primarily to connect SCSI tape storage systems to Fibre Channel SANs for LAN-free backup. By allowing the backup process to be accomplished across the SAN, rather than across the local area network, our storage routers remove a common source of congestion within the LAN. As a result, the primary computer network has greater availability to perform day-to-day operations. LAN-free backup also provides flexibility to conduct backup at any time of day. This capability is increasingly important as users demand network availability around the clock and from geographically dispersed locations. In addition, we have software nearing completion which is designed to enable server-free backup. By removing the server almost entirely from the backup process, server-free backup will offer further significant reductions in network server utilization. Finally, our storage routers support the distance capabilities of Fibre Channel SANs, enabling long distance data mirroring and the creation of redundant data sites to restore data when a dedicated storage system fails or is damaged.

Providing Broad, Verified Interoperability

Our storage routers are designed to function together, or interoperate, with all commercially available Fibre Channel storage hubs and storage switches, as well as other SAN components, including storage devices, host bus adapters, operating systems and storage management software. Our storage routers function in over 2,500 different configurations of SANs, thus providing organizations with flexibility in designing and changing their SANs. Furthermore, our storage routers support concurrent transmissions of data utilizing multiple computer protocols, including SCSI and the Internet Protocol. Our storage routers can be deployed in SANs which connect servers running diverse operating systems, including NetWare, Unix and Windows NT. Our storage routers have been tested and verified through our Crossroads
Verified-Storage Area Network (CV-SAN) program, which is now available through our Web-based Configurator.

Increasing Scalability and Implementation Flexibility

Our storage routers are designed to operate in any SAN computing environment and are designed to be able to adapt as organizations grow and change their computer networks to address their increasing data storage and information management needs. Our storage routers also are designed to work in all Fibre Channel SAN configurations so that organizations can modify their storage architecture to address their changing needs without changing their storage routers. Organizations can incrementally add storage routers as backup demands grow or as new storage devices are added to their networks. Our newest line of storage routers can be configured to support data transmission over copper or fiber optic lines.

Enhancing Storage Area Network Manageability

Our storage routers are designed with features that support an organization's ability to conduct systems diagnostics and management, as well as real-time application monitoring, from remote locations. In addition, the proprietary software embedded in our storage routers enhances the ability of an organization to manage of storage systems that are attached to the storage router by translating network management protocols to storage management protocols. To this end, we work closely with leading independent software vendors, such as BMC Software, Computer Associates, Hewlett-Packard and Tivoli Systems, to ensure that our storage routers can be managed through their network

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