CROSSROADS SYSTEMS INC (CRDS) IPO

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Key Data   Use of Proceeds   Competitors

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

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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 those
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 "Unit" 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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