J SQUARED TECHNOLOGIES INC.

Reflective Memory & Fiber Optics

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J SQUARED Reflective **Memory**

What is REFLECTIVE MEMORY?

A Reflective Memory network is a special type of shared memory system designed to enable multiple, separate computers to share a common set of data.

Reflective memory networks place an independent copy of the entire shared memory set in each attached system. Each attached system has dull, unrestricted rights to access and change this set of local data at the full speed of writing to local memory.

When data is written to the local copy of Reflective Memory, high speed logic simultaneously sends it to the next node on the ring network. Each subsequent node simultaneously writes this new data to its local copy and sends it on to the next node on the ring. When the message arrives back at the originating node, it is removed from the network and, depending on the specific hardware and number or nodes, every computer on the network has the same data at the same address within a few microseconds.

Local processors can read this data at any time without a network access. In this scheme, each computer always has an up to date copy of the shared memory set. In the four-node example shown, it takes 2.1 µs for all computer to receive the data that was written to Reflective Memory.*

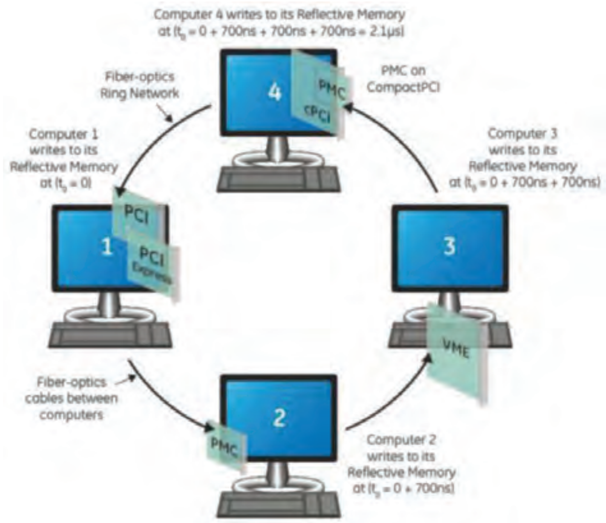

Figure 1 *Reflective Memory provides very low latency between nodes.*

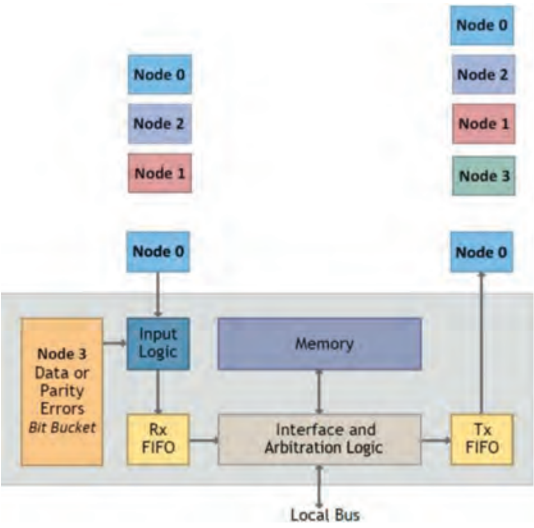

Figure 2 *Reflective Memory data insertion. Data from the network is automatically written to local memory and transmitted on to the next network node by embedded logic.*

A Reflective Memory board (node) consists of local memory, an embedded interface, and arbitration logic which provides access for both the host computer and the Reflective Memory.

The Reflective Memory boards may be physically installed or connected to a variety of computer buses, including VME, and PCI/PCI-X, Compact PCI, PCI Express or any standardized or proprietary system capable of hosting a PMC site. This allows most popular workstations and single board computers to be connected via Reflective Memory regardless of their interoperability.

** This latency is calculated assuming no network traffic, short cable lengths and the largest packet size is possible. Cable length and network traffic can cause the latency to increase, but as long as the bandwidth of the network is not exceeded, the latency should not increase significantly.*

Light travels down a fiber-optic cable by bouncing repeatedly off the walls. Each tiny photon (particle of light) bounces down the pipe like a bobsleigh going down an ice run. Now, you might expect a beam of light traveling in a clear glass pipe to simply leak out the edges. But if light hits glass at a really shallow angle (less than 42 degrees), it reflects back in again - as though the glass were really a mirror. This phenomenon is called total internal reflection. It's one of the things that keeps light inside the pipe.

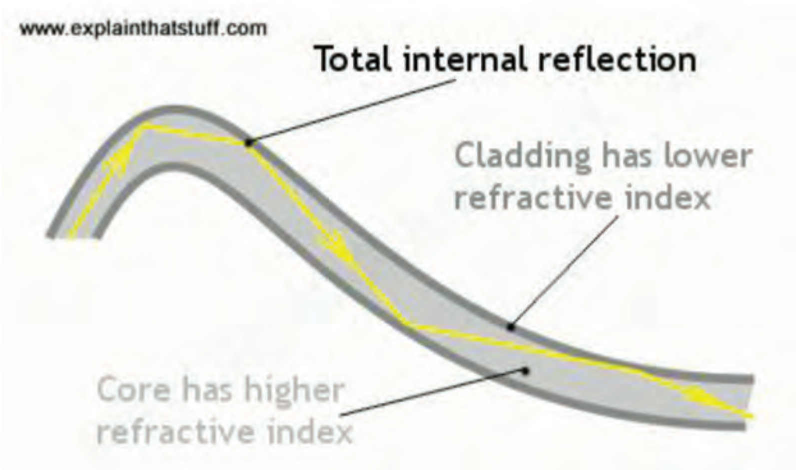

Figure 3 *Total internal reflection keeps light rays bouncing down the inside of a fiber-optic cable.*

The other thing that keeps light in the pipe is the structure of the cable, which is made up of two separate parts. The main part of the cable - right in the center - is called the core, and that's the part light travels through. Wrapped around the outside of the core is another layer of glass called the cladding. The cladding's job is to keep the light signals inside the core. It can do this because it is made of a different type of glass to the core. More technically, the cladding has a lower refractive index.

TYPES OF FIBER-OPTIC CABLES

Optical fibers carry light signals in what are called modes. That sounds technical but it just means different ways of traveling: a mode is simply the path that a light bean follows down the fiber. One mode is to go straight down the middle of the fiber. Another is to bounce down the fiber at a shallow angle. Other modes involve bouncing down the fiber at other angles, either more or less steep.

The simplest type of optical fiber is called single-mode. It has a very thin core about 5-10 microns (millionths of a meter) in diameter. In a single-mode fiber, all signals travel straight down the middle without bouncing off the edges (red line in Fig 4). Cable TV, Internet, and telephone signals are generally carried by single-mode fibers, wrapped together in a huge bundle. Cables like this can send information over 100 km (60 miles).

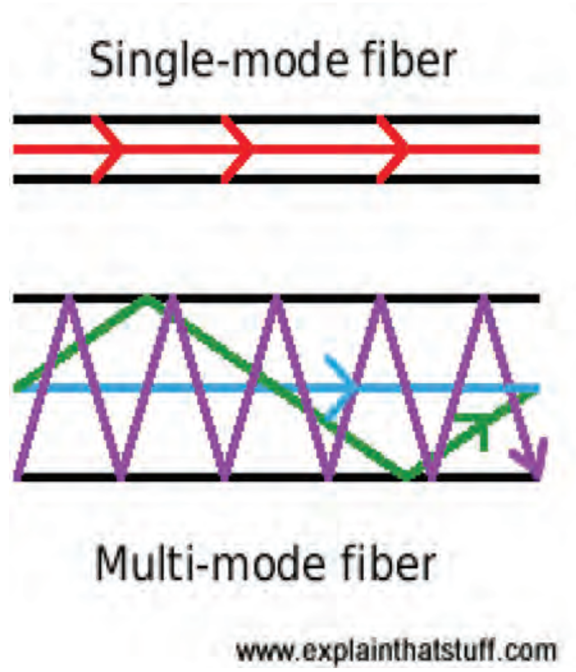

Figure 4 *Light travels in different ways in single-mode and multi-mode fibers.*

Another type of fiber optic cable is called multi-mode. Each optical fiber in a multi-mode cable is about 10 times bigger than one in a single-mode cable. This means light beams can travel through the core by following a variety of different paths, or in other words, multiple modes (purple, green, and blue lines in Fig 4). Multi-mode cables can send information only over relatively short distances and are used (among other things) to link computer networks together.

Even thicker fibers are used in a medical tool called a gastroscope (a type of endoscope), which doctors poke down a patient's throat to detect illnesses inside their stomach.

A gastroscope is a thick fiber-optic cable consisting of many optical fibers. At the top end of a gastroscope, there is an eyepiece and a lamp. The lamp shines its light down one part of the cable into the patient's stomach. When the light reaches the stomach, it reflects off the stomach walls into a lens at the bottom of the cable. Then it travels back up another part of the cable into the doctor's eyepiece.

Other types of endoscopes work the same way and can be used to inspect different parts of the body. There is also an industrial version of the tool, called a fiberscope, which can be used to examine things like inaccessible pieces of machinery in airplane engines.

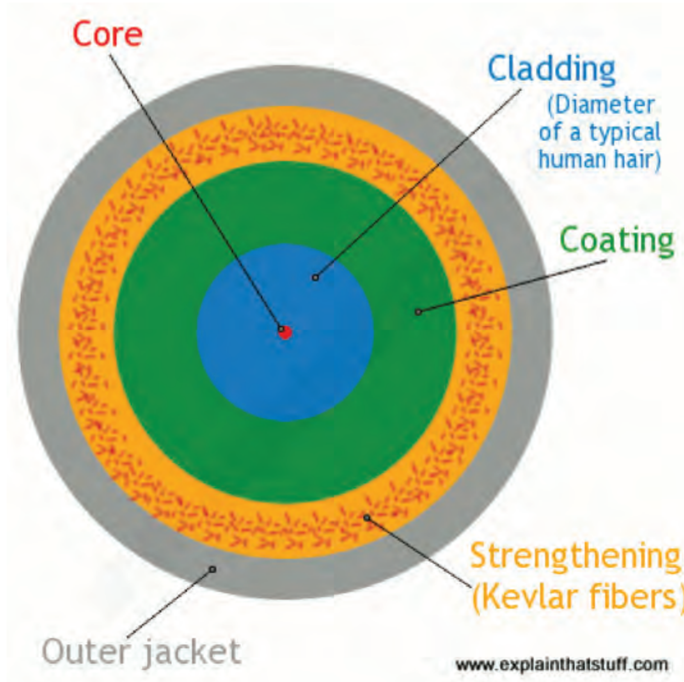

Figure 5 *Inside a typical single-mode fiber cable (not to scale). Thin core surrounded by cladding roughly ten times bigger in diameter, plastic outer coating (about twice the diameter of the cladding), some strengthening fibers made of a tough material such as Kevlar, protective outer jacket on the outside.*

SUMMARY

Reflective Memory is an optimal way to share data in time- critical applications ranging from data acquisition and process control to advanced simulation. Reflective Memory networks provide a real-time networking capability that surpasses most communications technologies for low latency and deterministic performance. Reflective Memory networks connect systems with minimal update delays and no access restrictions, to enable multiple, remotely located nodes to share a single data set in real time.

J-Squared RFM FIBER OPTIC CABLE

Simplex Cable (F5)

JST P/N	Multi-Mode Fiber Optic Cable, LC-LC Connectors, 62.5 micron core
CBL-000-F5-000	0.5 feet (0.15 m)
CBL-000-F5-001	1 foot (.31 m)
CBL-000-F5-002	5 feet (1.5 m)
CBL-000-F5-003	10 feet (3 m)
CBL-000-F5-004	25 feet (7.5 m)
CBL-000-F5-005	50 feet (15 m)
CBL-000-F5-006	80 feet (24 m)
CBL-000-F5-007	100 feet (30 m)
CBL-000-F5-008	150 feet (46 m)
CBL-000-F5-009	200 feet (61 m)
CBL-000-F5-010	250 feet (76 m)
CBL-000-F5-011	350 feet (107 m)
CBL-000-F5-012	500 feet (152 m)
CBL-000-F5-013	574 feet (175 m)
CBL-000-F5-014	656 feet (200 m)
CBL-000-F5-015	820 feet (250 m)
CBL-000-F5-016	1,000 feet (304.30 m)
CBL-000-F5-017	1,148 feet (350 m)
CBL-000-F5-018	1,312 feet (400 m)
CBL-000-F5-019	1,500 feet (456.45 m)
CBL-000-F5-020	1,640 feet (500m)

Duplex Cable (F6)

JST P/N	Multi-Mode Fiber Optic Cable, LC-LC Connectors, 62.5 micron core
CBL-000-F6-000	3 feet (1 m)
CBL-000-F6-001	6 feet (2 m)
CBL-000-F6-002	10 feet (3 m)
CBL-000-F6-003	16 feet (5 m)
CBL-000-F6-004	32 feet (10 m)
CBL-000-F6-005	66 feet (20 m)
CBL-000-F6-006	98 feet (30 m)
CBL-000-F6-007	164 feet (50 m)
CBL-000-F6-008	230 feet (70 m)
CBL-000-F6-009	328 feet (100 m)
CBL-000-F6-010	393 feet (120 m)
CBL-000-F6-011	426 feet (130 m)
CBL-000-F6-012	492 feet (150 m)
CBL-000-F6-013	557 feet (170 m)
CBL-000-F6-014	656 feet (200 m)
CBL-000-F6-015	721 feet (220 m)
CBL-000-F6-016	754 feet (230 m)
CBL-000-F6-017	820 feet (250 m)
CBL-000-F6-018	885 feet (270 m)
CBL-000-F6-019	984 feet (300 m)
CBL-000-F6-020	1 ft (0.3 m)

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