Lightfleet® Multiflo™ Data Distribution System

Switch to a switch-free data fabric for lowest latency and maximum throughput.

**Features/Benefits**
- Data-flow architecture radically improves network determinism
- Multicasting is inherent, reducing message overhead
- Self-directed packets eliminate supervisory delays
- Distributed flow control eliminates tree-spanning, head-of-line, and queuing delays
- Secure-by-design multiflo architecture
- Highly efficient switch-free technology reduces power and cooling requirements
- Scalability to 530 nodes using multiple DDMS

**Overview**
Lightfleet’s Multiflo Data Distribution System (DDS), introduces a new approach to interconnecting multicomputer systems that is based on the new concept of Self-Directed Data Flow. The DDS accomplishes the same basic functions as a switched fabric, but does so more efficiently and with lower latency.

Unlike switched fabrics, the native mode for data movement in the DDS is multicast, eliminating network congestion in high performance computing applications that must maintain coherent memory among multiple processors.

Lightfleet’s switch-free fabric does not need a separate data path controller to ensure efficient routing of information. Flow-control is in effect “woven” into the fabric, enabling the Lightfleet system to avoid the problems of high latency jitter and dropped packets that switched fabrics can suffer under extreme conditions.

**DDS Components**
Illustration of a DDS with the DDM (pink) in the center connected to multiple HBAs (green) which are connected to their Hosts (blue).

The dashed circle indicates a plurality of inputs, connections and hosts, while the red arrows illustrate a particular multicast transmission originating in the far-left host.
Lightfleet Multiflo™ Data Distribution System (DDS)

Lightfleet’s streamlined internal packet protocol provides an efficient means of data transfer, while also optionally supporting the messaging function of Ethernet systems. A DDS packet consists of payload in data frames with a digital wrapper on each end. All packet control is provided by the interaction of the wrapper with the elements of the DDS, so packets “find their own way” through the Lightfleet fabric to the desired destinations without any top-down supervision managing the data flow and delaying transport.

Secure by design

A major advantage to the Lightfleet fabric is its inherent ability to avoid cyber security threats that are directed at the network fabric itself. The Multiflo Data Distribution System has been designed in such a way that malicious packets cannot be built that will impact the operation of the DDM. Data flows from source to destination under hardware control based on information contained in the packet, but the packet contents themselves are not able to modify the data path as malicious packets might in a switched network. By avoiding the most-often exploited vulnerabilities of computer networks, Lightfleet’s “secure-by-design” Multiflo DDS forms the basis for financial and mission-critical computing systems of all types.

Data Distribution Module (DDM)

The destination field encoded in each packet is interpreted by the Multiflo DDM as an index into a “subscription” table located in the DDM and maintained by software residing in the source and destination computers/servers. Therefore each packet contains all the necessary information to guide the packet smoothly through the DDM’s internal flow control logic to multiple designated exit ports simultaneously.

Lightfleet Packet Protocol

A DDS packet consists of payload in data frames with a digital wrapper on each end. The first bytes, containing the destination, introduce each packet to components of the DDS. The last bytes contain a cyclic redundancy check (CRC) to verify payload integrity. 
**Multiflo™ DDM Back Panel**

The Lightfleet DDS switch-free fabric consists of the company’s innovative Multiflo™ data distribution module (DDM) serving multiple host-bus adapters (HBAs) in host computers or servers connected to the DDM by means of optical fibers.

The DDM is configured for top-of-rack applications, with high performance MTP multi-fiber transmit and receive ports and redundant power supplies.

**Lightfleet Host Bus Adapter**

The Lightfleet Multiflo architecture works with a host bus adapter (HBA), a highly optimized CPU/network interface card, in each server. The HBA uses the Lightfleet data format that enables data flow between servers without the overhead of running fully-loaded Ethernet transfers. The patented data engine on each card reduces latency and handles many simultaneous messages in flight with hardware data integrity checking.

**Scalability**

Multiple DDMs can be directly connected, enabling network expansion to serve up to 530 computing nodes while ensuring that deterministic latencies are maintained.

**Lightfleet API Software**

The Lightfleet DDS has multiple software options. The first is a device driver that emulates an Ethernet adapter that works at the bottom of the TCP/IP stack. With this driver, you can use standard Linux TCP networking tools and applications. However, to get the highest and best performance with the DDS, Lightfleet has implemented a native API in a loadable library. To convert an existing network application to the Lightfleet API, the network API calls in the existing application are converted to the Lightfleet API. In a well structured application, this should take minimal effort.
## Specifications

### Physical
- 24 fixed fiber channel ports (10 Gbps)
- Dual redundant, hot-swappable power supplies
- LED link indicator

### DDM Power
<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Supplies</td>
<td>2 (redundant)</td>
</tr>
<tr>
<td>Power Supply Airflow</td>
<td>Rear airflow exhaust</td>
</tr>
<tr>
<td>Input Voltage</td>
<td>100 to 240 VAC</td>
</tr>
<tr>
<td>Frequency</td>
<td>47 to 63 Hz</td>
</tr>
<tr>
<td>Typical Operating Power</td>
<td>82 W (24 ports at 100% load)</td>
</tr>
<tr>
<td>Maximum Power</td>
<td>110 W</td>
</tr>
</tbody>
</table>

### HBA Power
<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical Operating Power</td>
<td>15 W: 1 port active with SR optics at 100% load</td>
</tr>
<tr>
<td>Maximum power</td>
<td>25 W</td>
</tr>
<tr>
<td>Input Voltage</td>
<td>12 V from server</td>
</tr>
</tbody>
</table>

## Ordering Information

### Lightfleet Multiflo™ DDM
- **Description**: 24-port DDM
- **Part Number**: DDM-EVAL001-024

### Lightfleet Host Bus Adapter
- **Description**: Host Bus Adapter with SFP+ tranceiver
- **Part Number**: HBA-EVAL001-001

### Accessories and Spares
- **Description**: 1M Fiber cable
- **Part Number**: OFO00007-001-00
- **Description**: 2M Fiber cable
- **Part Number**: OFO00008-001-00

## Warranty and Service

The Lightfleet DDM and HBA system components are provided with a 1-year limited hardware warranty. The warranty includes hardware replacement with a 10-day turnaround from receipt of a return materials authorization (RMA). Lightfleet offers a wide range of services to help accelerate your success in deploying and optimizing the Lightfleet platform in your data center. The innovative Lightfleet Services are delivered through a unique combination of people, processes, tools, and partners and are focused on helping you increase operation efficiency and improve your data center network. Lightfleet Services offerings help increase investment protection, optimize network operations, support migration operations, and strengthen your IT expertise.

**Interested in evaluating Lightfleet technology?**

Lightfleet will provide all the details to qualified organizations. Please call Jay Brandon at 360.816.5700 or email jbrandon@lightfleet.com to order or discuss specific requirements.

For more information, visit [www.lightfleet.com](http://www.lightfleet.com)