APPLICATION NOTES:
Interconnecting ODIN frames

Figure 1. A typical SFP

The new OMNEO Digital Intercom – ODIN – has the ability to grow through software licensing, and by interlinking multiple frames to create a single intercom matrix. A single ODIN has up to 128 ports. One keypanel uses one port. ODIN is equipped with an Inter-Frame Link, or IFL for short. The IFL uses a bidirectional optical fiber link with a signaling rate of approximately 2 Gbit/s.

To connect the IFL, users will require at least one SFP per unit. SFP stands for Small Formfactor Pluggable and it is the physical interface between the electrical and optical signals. An SFP contains a laser that sends out light on one fiber, and a detector that receives light on the other. Thus, the cable has two strands of optical fiber. A typical SFP is shown in Figure 1. Fibers are available with different physical connectors. This one is called LC.

The IFL is located on the rear of the unit, as shown Figure 2. The IFL consists of four “cages”, where the SFPs are inserted. Note ODIN does not ship with SFPs. They must be ordered separately.

Figure 2. The rear of ODIN has the IFL connectors

In a multi-ODIN configuration, units are connected in a daisy-chain or in a ring. There are two connectors for Uplink and two for Downlink. Each link is duplicated to provide redundancy, but utilizing the redundancy feature is a user choice.

Figure 3 shows the simplest IFL configuration. IN the example, four ODINs are interconnected to create a four-frame intercom with up to 512 ports. The Downlink of Frame 1 is connected to the Uplink of Frame 2, the Downlink of Frame 2 to the Uplink of Frame 3, and, finally, the Downlink of 3 to the Uplink of 4. As previously stated, each link is bidirectional, so the Frames are fully interconnected. The IFL transmits audio and some additional information for required for system “housekeeping”. This system is sensitive to a single point failure. If a fiber breaks, the system is split at that point, and the four frames no longer have full interconnectivity.

There are two ways of adding additional redundancy to the system, as shown in Figure 4.

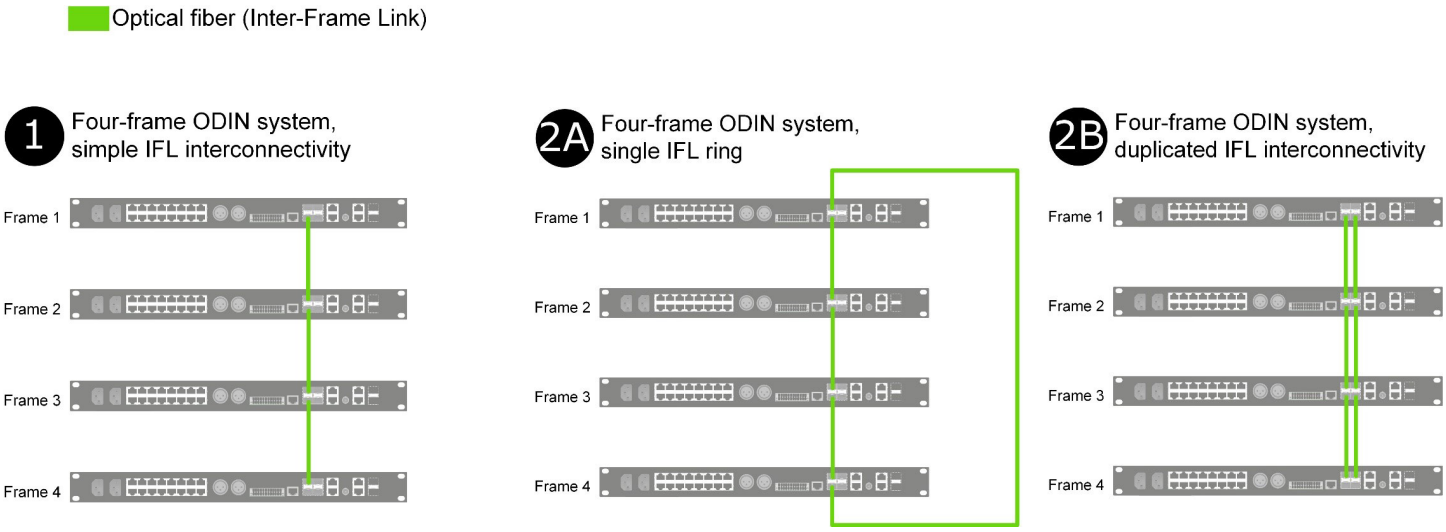

Figure 3. IFL configuration 1

Figure 4. IFL configurations 2A and 2B

In configuration 2A, Frame 1 and Frame 4 are interconnected. The Downlink of Frame 4 goes to the Uplink of Frame 1. This ring is resilient to a single fiber failure. Two additional SFPs are required.

In configuration 2B, each fiber link is duplicated using the Secondary. This requires six additional SFPs. This structure is resilient to multiple fiber failures, as long as two failures do not occur between the same two frames.

Configurations 2A and 2B are not equivalent from a system reliability perspective. Suppose Frame 2 goes off line. Maybe it was in a different rack, and the breaker in that rack tripped. In configuration 2A, you are left with three of the four frames fully interworking. In configuration 2B, you will be left with two islands: there is no audio between Frame 1 and Frames 3 & 4.

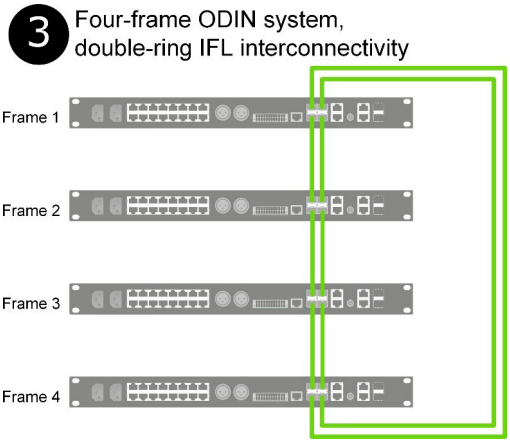

Figure 5. IFL configuration 3

Configurations 2A and 2B can be combined, as shown in Figure 5. This double-ring IFL requires a total of 16 SFPs but offers a very high level of resilience against fiber failure.

The level of redundancy should be determined based on the criticality of the application. With ODIN, you have a choice. ODIN also offers a unique degree of scalability, starting with a 16 port single ODIN while allowing growth up to eight ODIN frames with 128 ports each, for a total of 1024 ports.