[0017] Both unfolded configurations, where an array of emitters transmits light across a space to an array of receivers, and folded configurations, where the emitters and receivers lie in the same plane, have been attempted. Most FSOI methods lack direct broadcast capability due to the one-emitter, one-receiver assumption.

[0018] Point-to-point optical communications, wherein a narrowly focused laser beam communicates information to a single receiver, represents the extreme case of an optical fan-out of one. A variation is to split a narrowly focused laser beam using one or more beam splitters, each beam splitting producing two beams from the original. In this way, a single narrow beam can be split into 2^j beams by j beam splitters, achieving an optical fan-out of a single narrow beam into multiple narrow, but weaker, beams. However, since the receivers are typically small devices, perhaps a tenth of a millimeter in diameter, it is difficult to achieve and maintain optical alignment of the narrow laser beam onto one or more receivers across all but the smallest distances.

[0019] A similar method of fan-out has been achieved by use of a diffractive element such as a hologram that splits a single beam into a multiplicity of beams. U.S. Pat. No. 6,452,700 discloses an FSOI backplane based on holographic optical elements mounted on an expansion card. This approach also suffers from sensitivity to alignment which is augmented by temperature sensitivity of the hologram material that affects the size of the fan-out pattern. In a typical implementation of a four-node, point-to-point optical interconnect whose linear dimensions are approximately 100 mm, the constraint on angular alignment of the narrow beam is ½0th of a degree. Severity of this constraint increases linearly with the size of the interconnect.

[0020] What is needed is a cost effectively scalable approach to optical interconnection that is not sensitive to alignment issues.

SUMMARY OF THE INVENTION

[0021] There is a need for the following aspects of the invention. Of course, the invention is not limited to these aspects.

[0022] According to an aspect of the invention, a process comprises operating an optical fan-out and broadcast interconnect including: fanning-out an optical signal from an optical signal emitter, of one of a plurality of nodes, with a diverging element of one of a plurality of optics; and broadcasting the optical signal to one of a plurality of receivers of all of the plurality of nodes with a light collecting and focusing element of all of the plurality of optics, wherein the plurality of optics are positioned to define an optics array, the plurality of receivers are positioned to define a receiver array that corresponds to the optics array and the plurality of nodes are positioned to define a node array that substantially corresponds to the receiver array and the optics array. According to another aspect of the invention, a manufacture comprises an optical fan-out and broadcast interconnect including: a plurality of nodes positioned to define a node array, each of the plurality of nodes having an optical signal emitter and a plurality of optical signal receivers positioned to define a receiver array that substantially corresponds to the node array; and a plurality of optics optically coupled to the array of nodes, the plurality of optics positioned to define an optics array that substantially corresponds to the node array and the receiver array, each of the plurality of optics including a diverging element and a light collecting and focusing element, wherein an optical signal from the optical signal emitter is fanned-out by the diverging element of one of the optics and broadcast to one of the plurality of receivers of all of the plurality of nodes by the light collecting and focusing element of all of the plurality of optics. According to another aspect of the invention, a process comprises operating a lightnode including: fanning-out an optical signal through a diverging element; broadcasting the optical signal through a light collecting and focusing element; and receiving the optical signal with one of a plurality of receivers, wherein the plurality of receivers are positioned to define a receiver array. According to another aspect of the invention, a manufacture comprises a lightnode including: a diverging element; a light collecting and focusing element optically coupled to the diverging element; and a receiver array optically coupled to the light collecting and focusing element, the receiver array having a plurality of optical signal receivers positioned to define the receiver array. According to another aspect of the invention, a manufacture comprises a node array including a plurality of nodes positioned to define the node array, each of the plurality of nodes having an optical signal emitter and a plurality of optical signal receivers positioned to define a receiver array that substantially corresponds to the node array. According to another aspect of the invention, a manufacture comprises an optic array including a plurality of optics positioned to define the optics array, each of the plurality of optics including a diverging element and a light collecting and focusing element.

[0023] According to another aspect of the invention, an apparatus comprises a communications network interconnect including an input layer including a plurality of input channels; a multicast channel branching fabric coupled to the input layer; and a modular output layer coupled to the multicast channel branching fabric layer, the modular output layer including a plurality of individual serial data channels; and a plurality of sets of endpoints, each set of endpoints coupled to one of the plurality of individual serial data channels. According to another aspect of the invention, a method, comprises: inputting a signal into an input layer that includes a plurality of input channels; multicasting the signal through a multicast channel branching fabric that is coupled to the input layer; and outputting the signal through a modular output layer that is coupled to the multicast channel branching fabric layer, wherein outputting includes conveying the signal through a plurality of individual serial data channels; and sending the signal to a plurality of sets of endpoints, each set of endpoints coupled to one of the plurality of individual serial data channels.

[0024] According to another aspect of the invention, an apparatus comprises a broadcast interconnect including: a plurality of nodes positioned to define a node array, each of the plurality of nodes having at least one optical signal emitter and a plurality of optical signal receivers positioned to define a receiver array that substantially corresponds to the node array; and a plurality of optics optically coupled to the array of nodes, the plurality of optics positioned to define an optics array that substantially corresponds to the node array and the receiver array, each of the plurality of optics including at least one optical distributing element and an optical collecting element, wherein an optical signal from