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**Question**

•Explain the following Interconnection networks:

1.Torus

2.Hypercube Interconnection Network

Solution.

1. [Hypercube](https://en.wikipedia.org/wiki/Hypercube) Interconnection networks is a type of [network topology](https://en.wikipedia.org/wiki/Network_topology) used to connect multiple [processors](https://en.wikipedia.org/wiki/Processors) with memory modules and accurately route data. Hypercube networks consist of 2m nodes. These nodes form the vertices of squares to create an internetwork connection. A hypercube is basically a multidimensional [mesh network](https://en.wikipedia.org/wiki/Mesh_networking) with two nodes in each dimension. Due to similarity, such topologies are usually grouped into a k-ary d-dimensional mesh topology family where d represents the number of dimensions and k represents the number of nodes in each dimension
2. A [**torus**](https://en.wikipedia.org/wiki/Torus)**interconnect** is a switch-less [network topology](https://en.wikipedia.org/wiki/Network_topology) for connecting processing nodes in a [parallel computer](https://en.wikipedia.org/wiki/Parallel_computer) system. In [geometry](https://en.wikipedia.org/wiki/Geometry), a [torus](https://en.wikipedia.org/wiki/Torus) is created by revolving a circle about an axis [coplanar](https://en.wikipedia.org/wiki/Coplanarity) to the circle. While this is a general definition in geometry, the [topological](https://en.wikipedia.org/wiki/Topological) properties of this type of shape describes the network topology in its essence. The first 3 dimensions of torus topology network are easier to visualize. Below are the description respectively.

* 1D Torus it is one dimension, *n* nodes are connected in closed loop with each node connected to its 2 nearest neighbors communication can take place in 2 directions, 1D torus is same as [ring interconnection](https://en.wikipedia.org/wiki/Ring_network).
* 2D Torus it is two dimension with degree of 4, the nodes are imagined laid out in a two-dimensional rectangular lattice of n rows and n columns, with each node connected to its 4 nearest neighbors, and corresponding nodes on opposite edges connected.
* 3D Torus: it is three dimension, the nodes are imagined in a three-dimensional lattice in the shape of a rectangular prism, with each node connected with its 6 neighbors, with corresponding nodes on opposing faces of the array connected
* ND Torus: it can have *N* dimension, each node of *N* dimension torus has 2N neighbors, communication can take place in 2N directions. Each edge is consist of n nodes. Total nodes of this torus is *nN*.