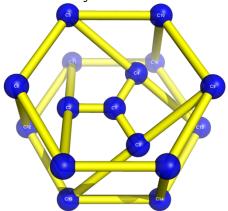
## Parallel Computing by Y. Deng

## Problem 1.2

In the following 3D graph, the 16 blue balls are considered as identical vertices and the lines are considered as bi-directional edges. Now, you need to broadcast N floating-point numbers from the central vertex (C1) to the entire system of 16 vertices including the source.



Please complete the following:

- (1) Design algorithm(s) to quickly complete the broadcast of  $N = 10^6$ ;
- (2) Implement your algorithm(s), collect timing results, on a supercomputer by imitating the above given network topology with the basic non-collective light-weight basic single-sided MPI functions: MPI\_Graph\_create(), MPI\_Isend(), MPI\_Irecv() and a few other supporting functions.
- (3) Call the MPI-provided MPI\_Bcast() to carry out the broadcast and collect timing results.
- (4) Repeat the above two steps for  $N = 10^7$  and  $N = 10^8$ ;
- (5) Construct a table as follows and make comments:

| N               | My_BCast() | MPI_Bcast() | T1/T2 |
|-----------------|------------|-------------|-------|
|                 | Time (T1)  | Time (T2)   |       |
| 10 <sup>6</sup> |            |             |       |
| 10 <sup>7</sup> |            |             |       |
| 10 <sup>8</sup> |            |             |       |