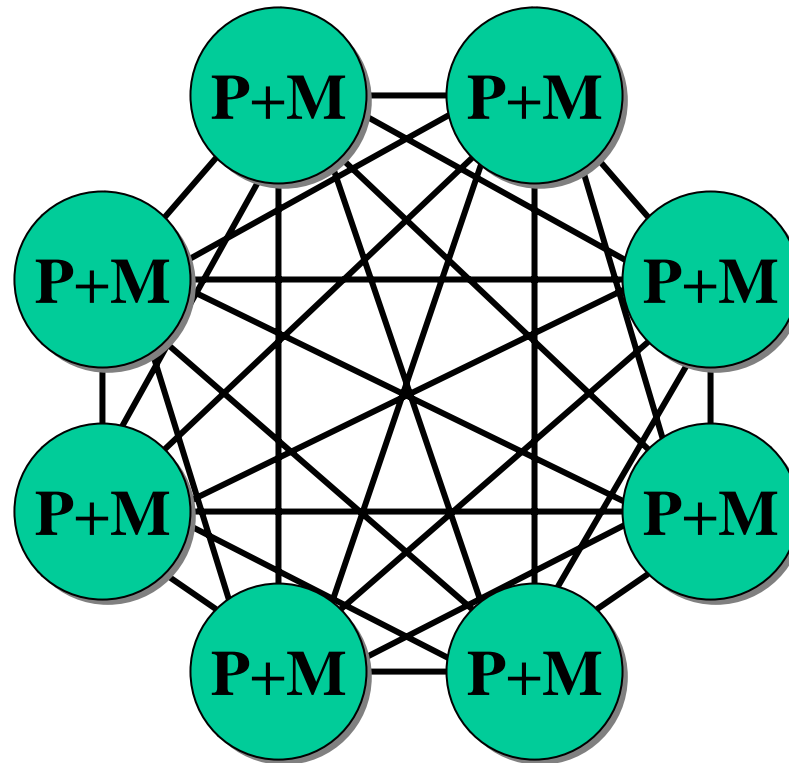# Interconnection Networks

Charles E. Leiserson
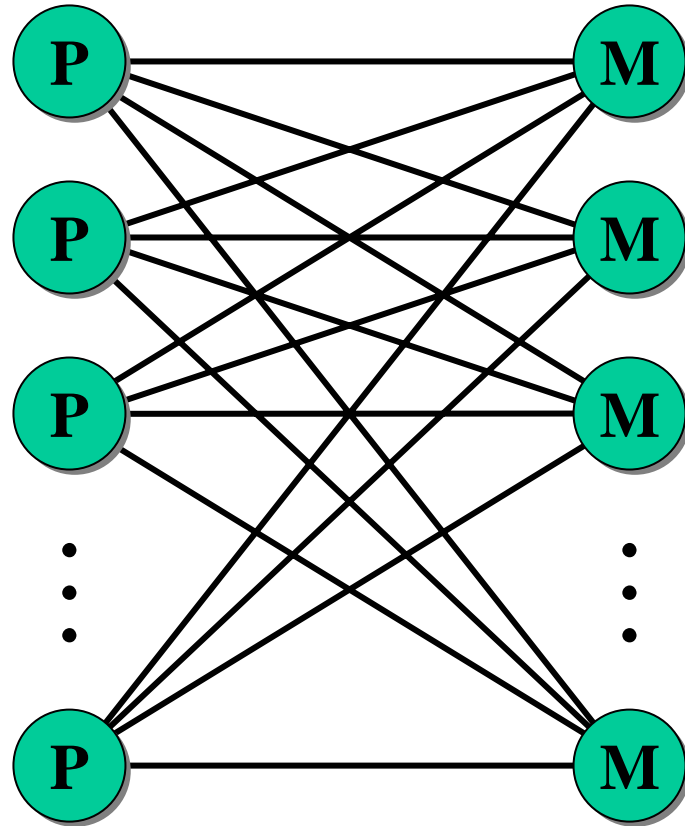
6.896 *Theory of Parallel Systems*

March 29, 2004
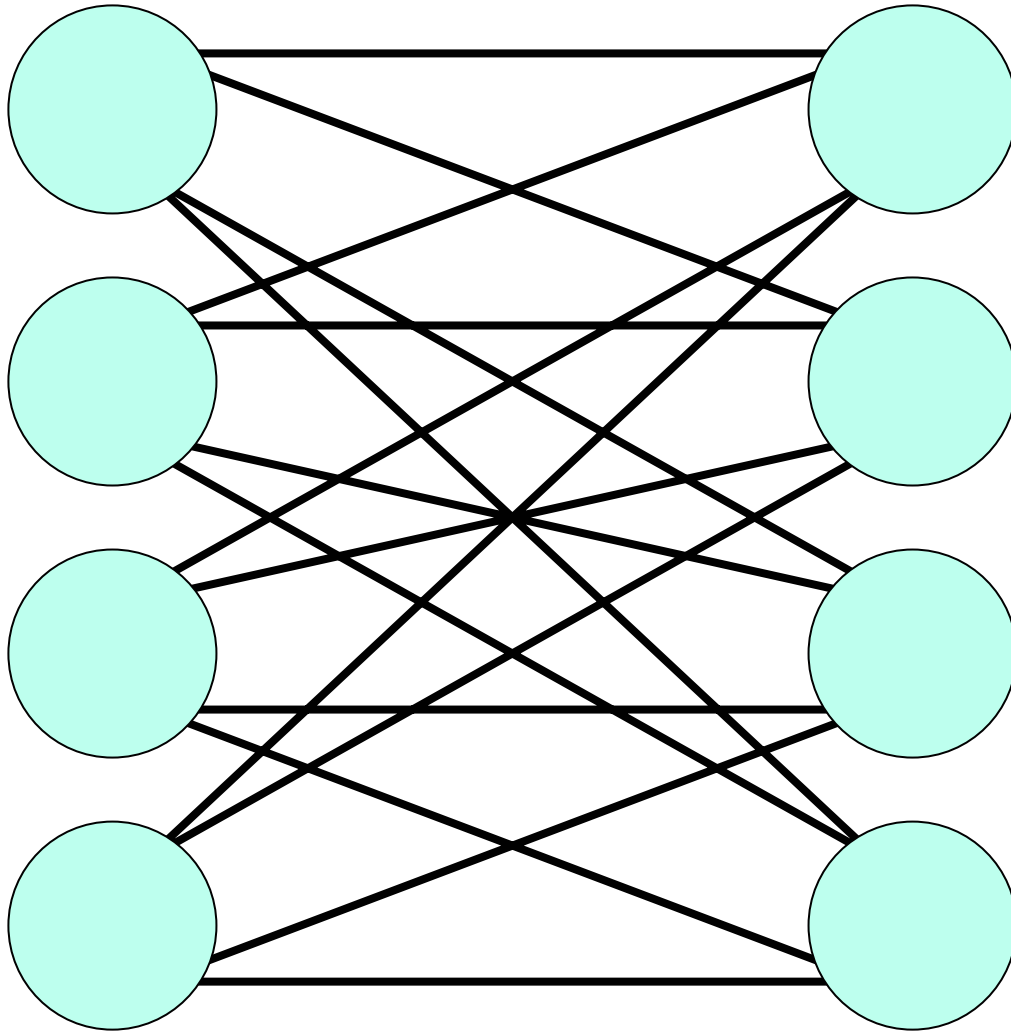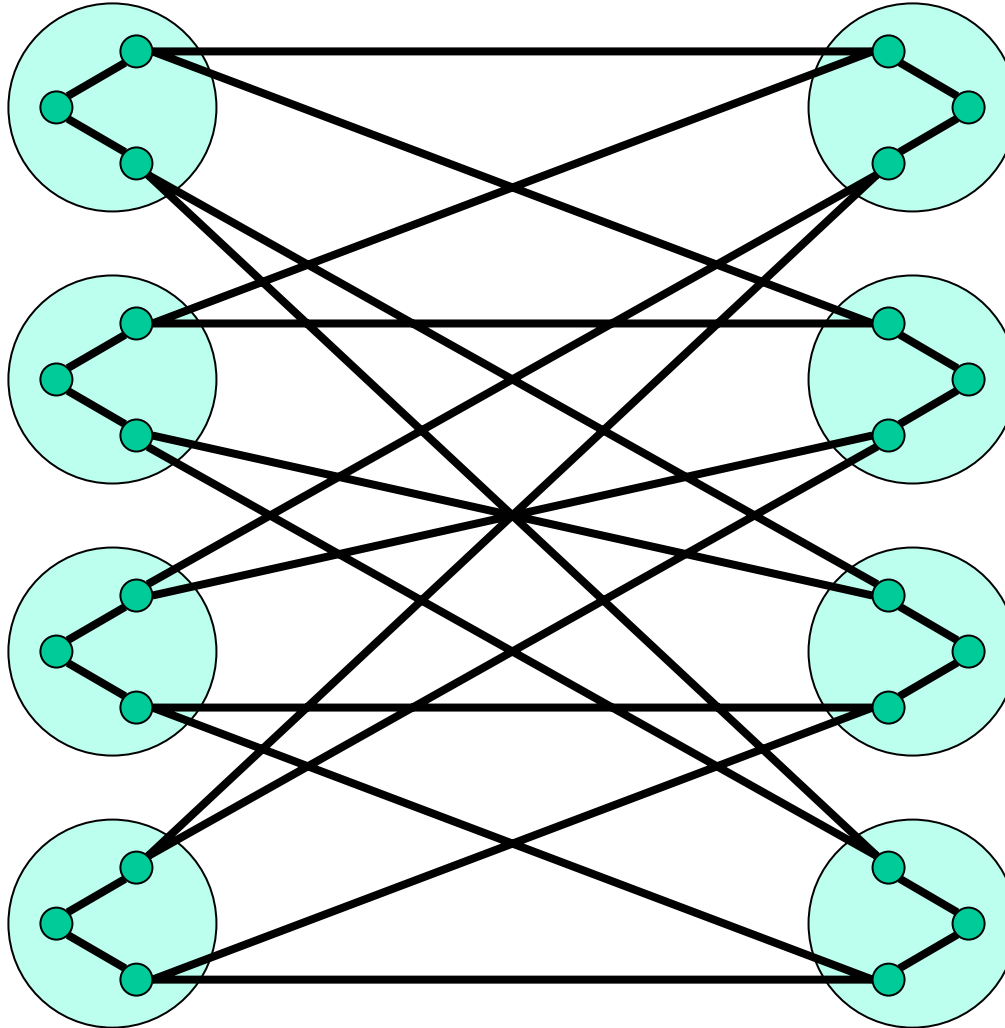
"Ideal" Parallel Computer
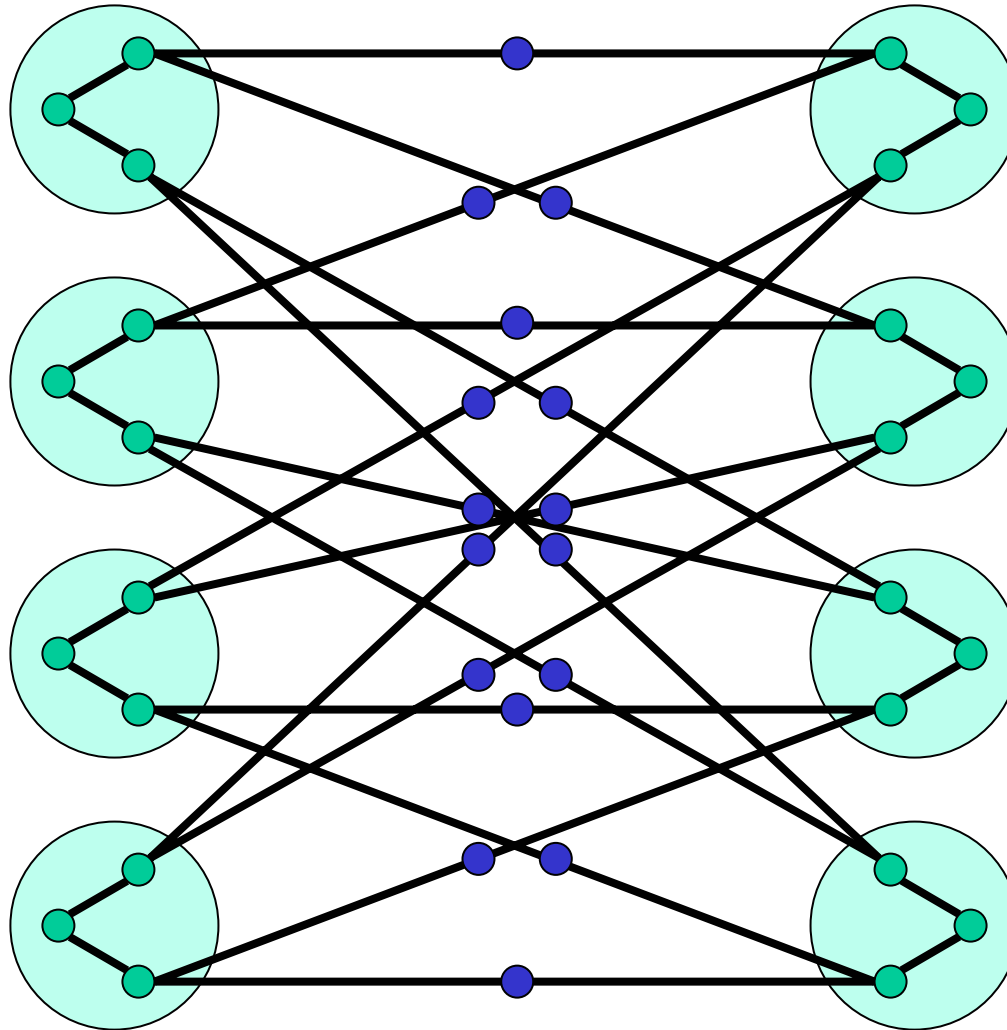
"Ideal" Parallel Computer
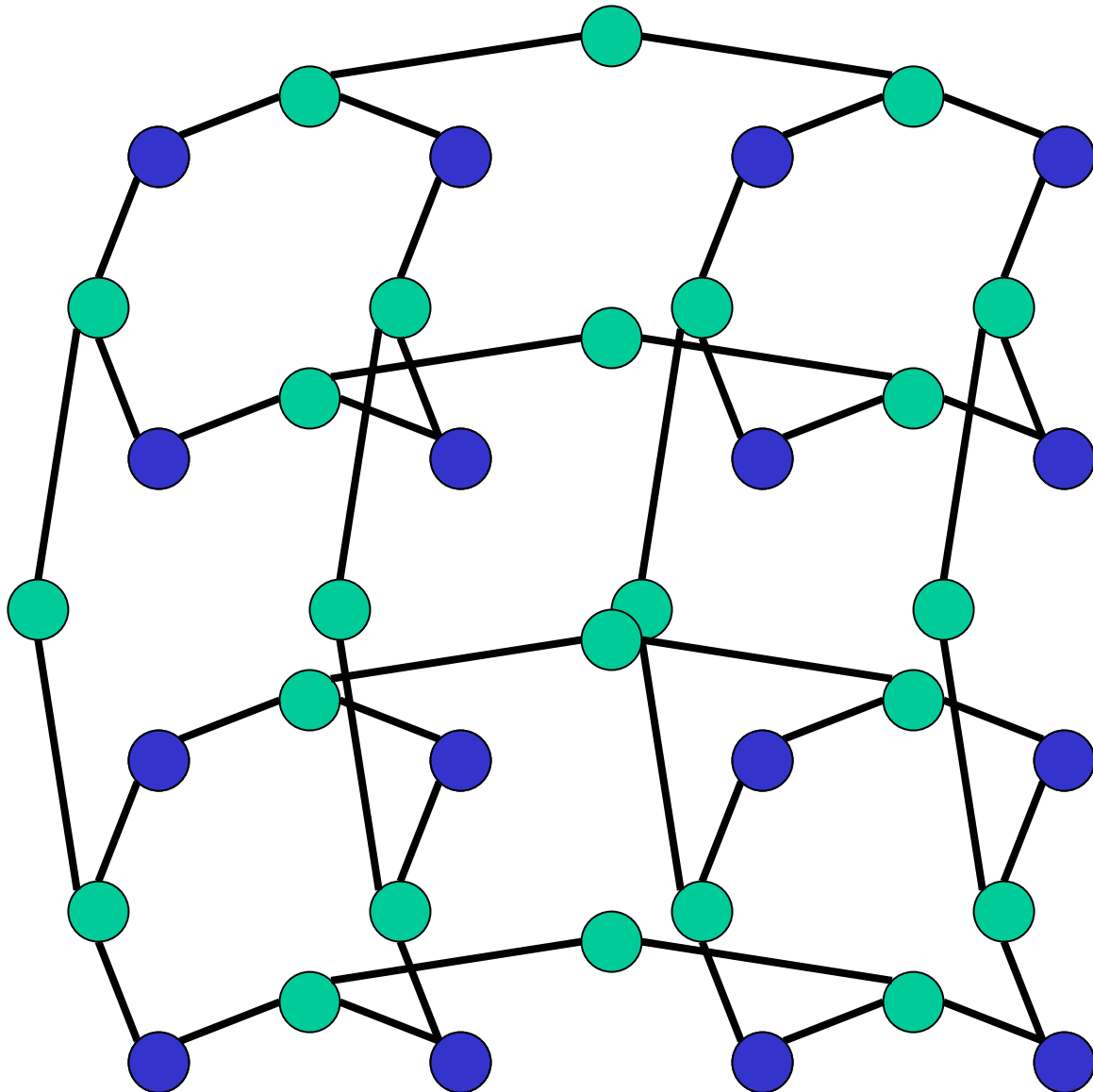
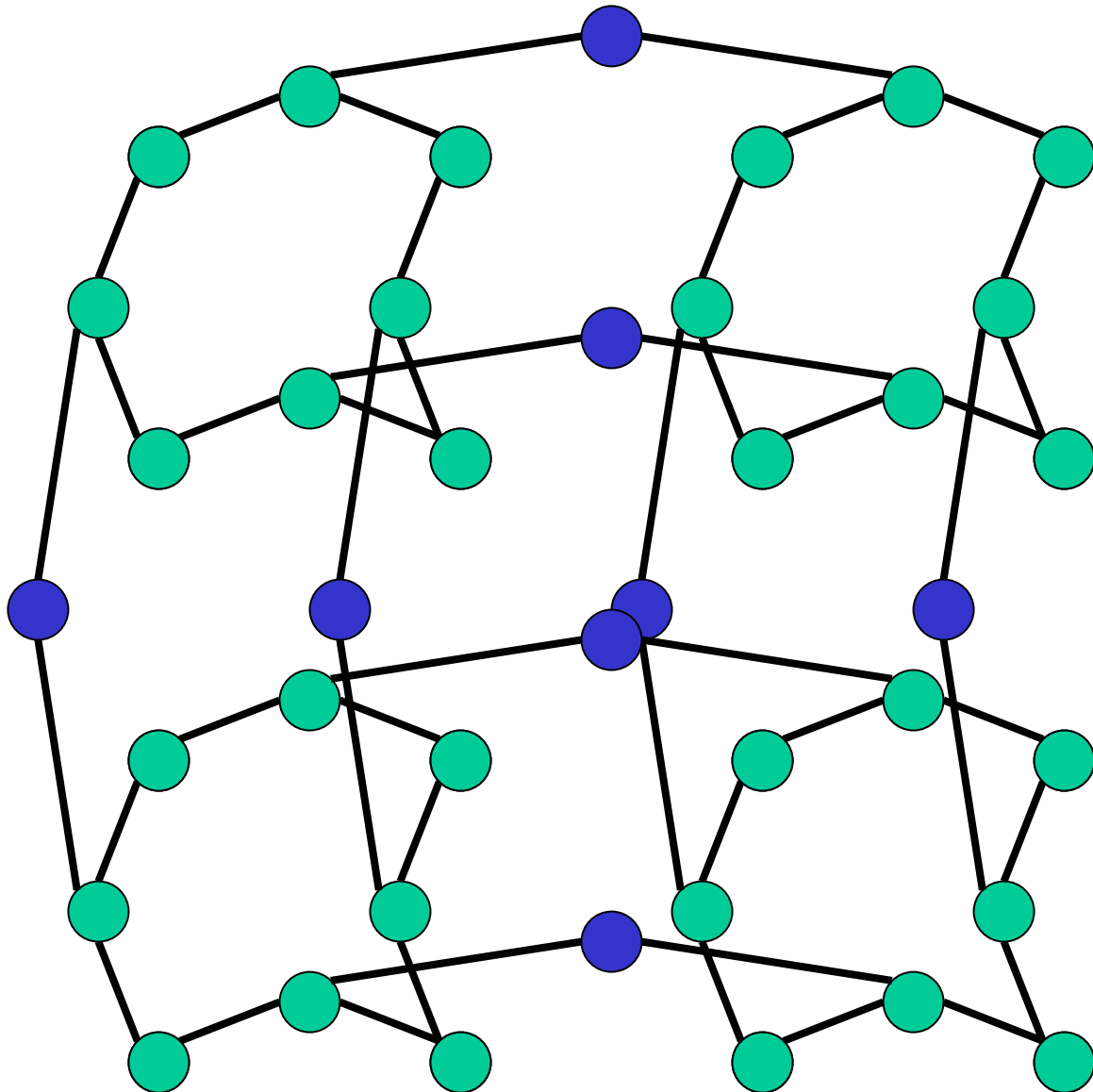# "Ideal" Parallel Computer

"Ideal" Parallel Computer
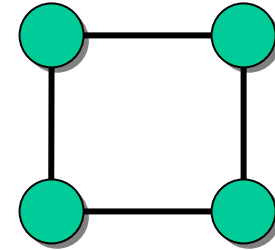
"Ideal" Parallel Computer

Mesh of Trees

Mesh of Trees

Hypercube
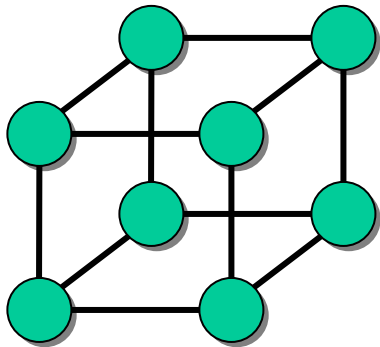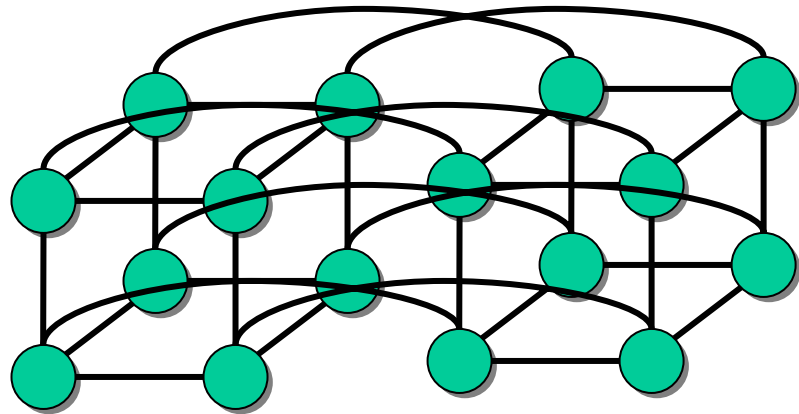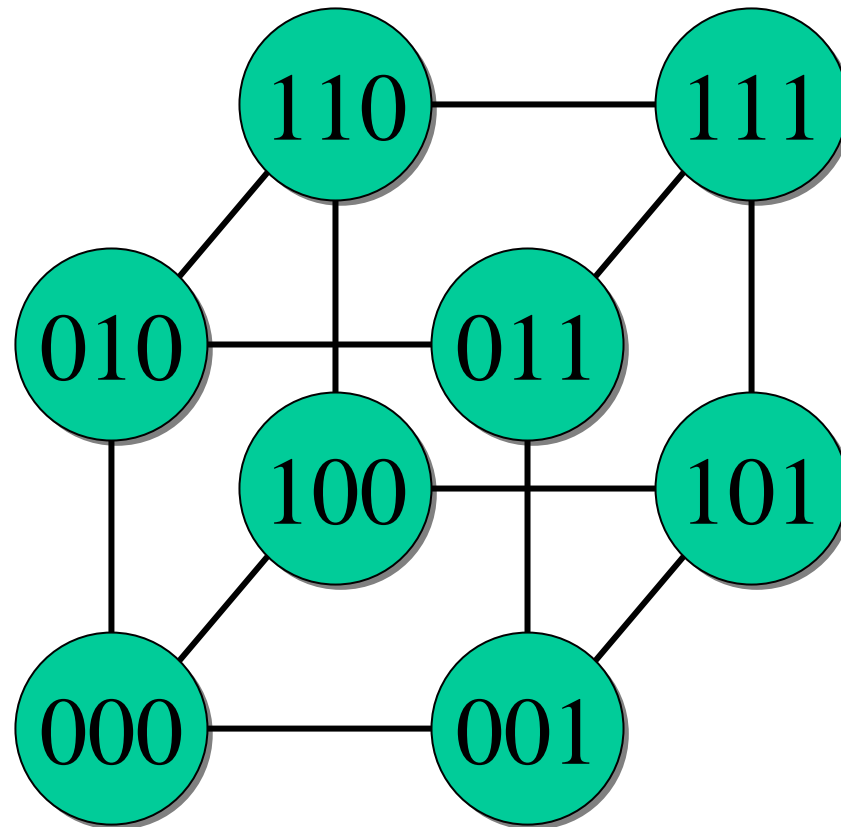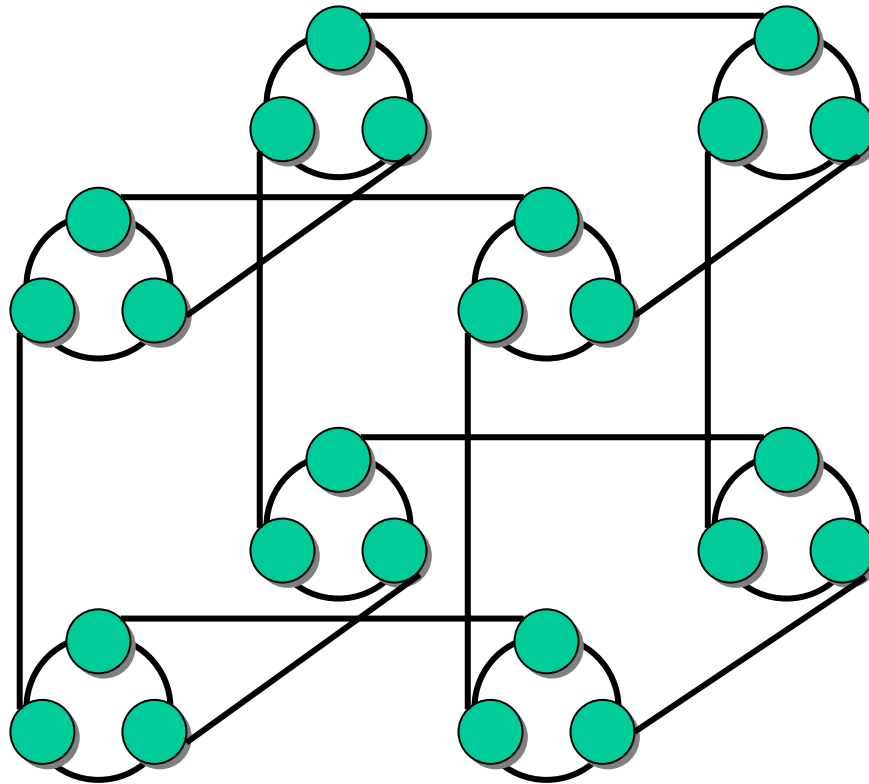
$d = 0$
$N = 1$

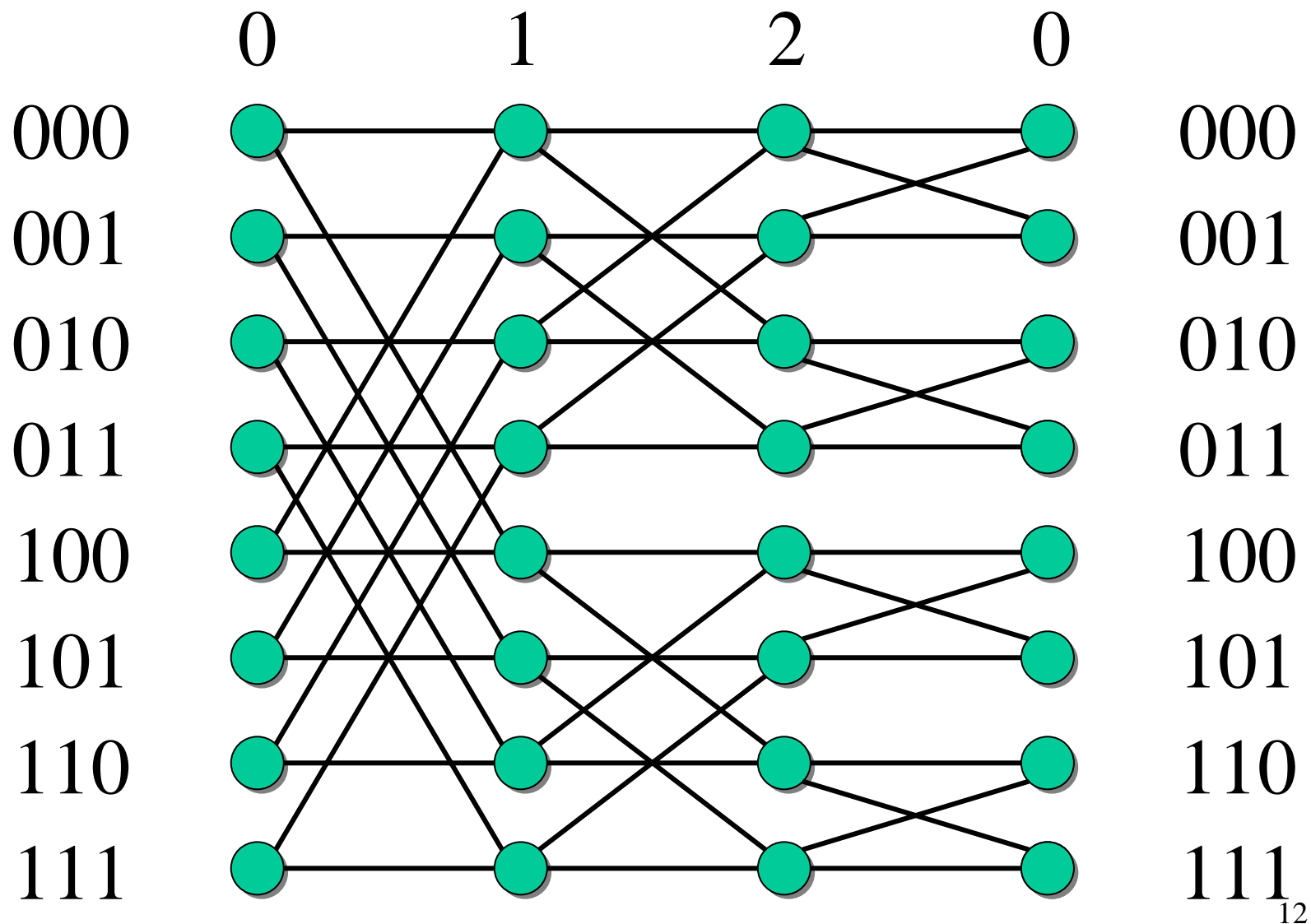$d = 1$
$N = 2$

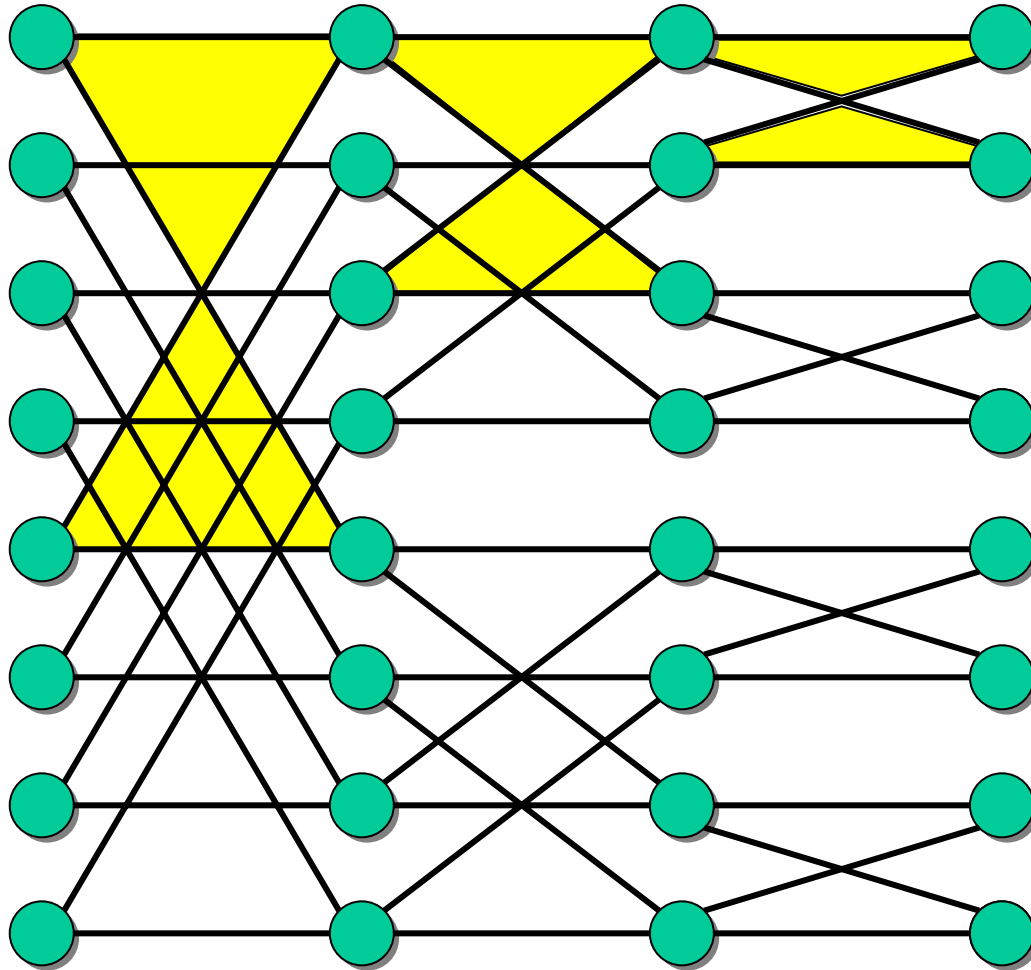$d = 2$
$N = 4$

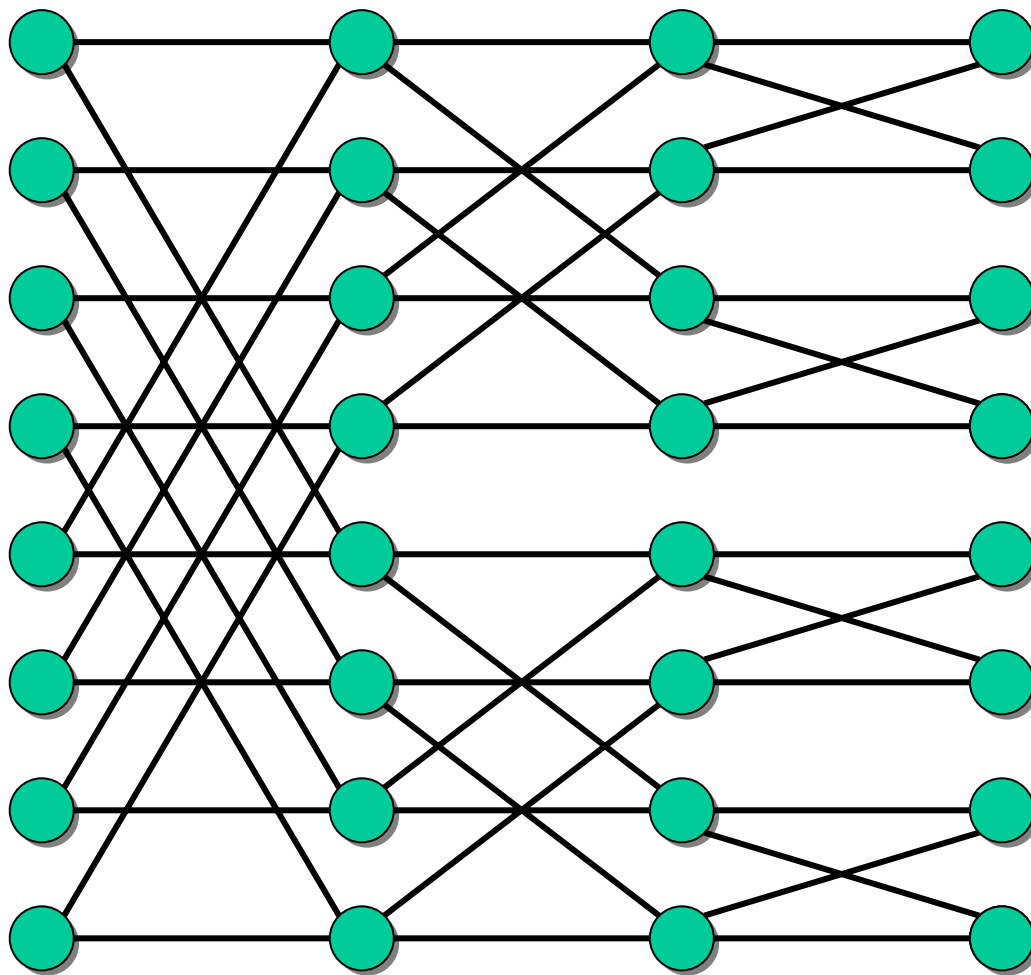$d = 3$
$N = 8$

$d = 4$
$N = 16$

Hypercube
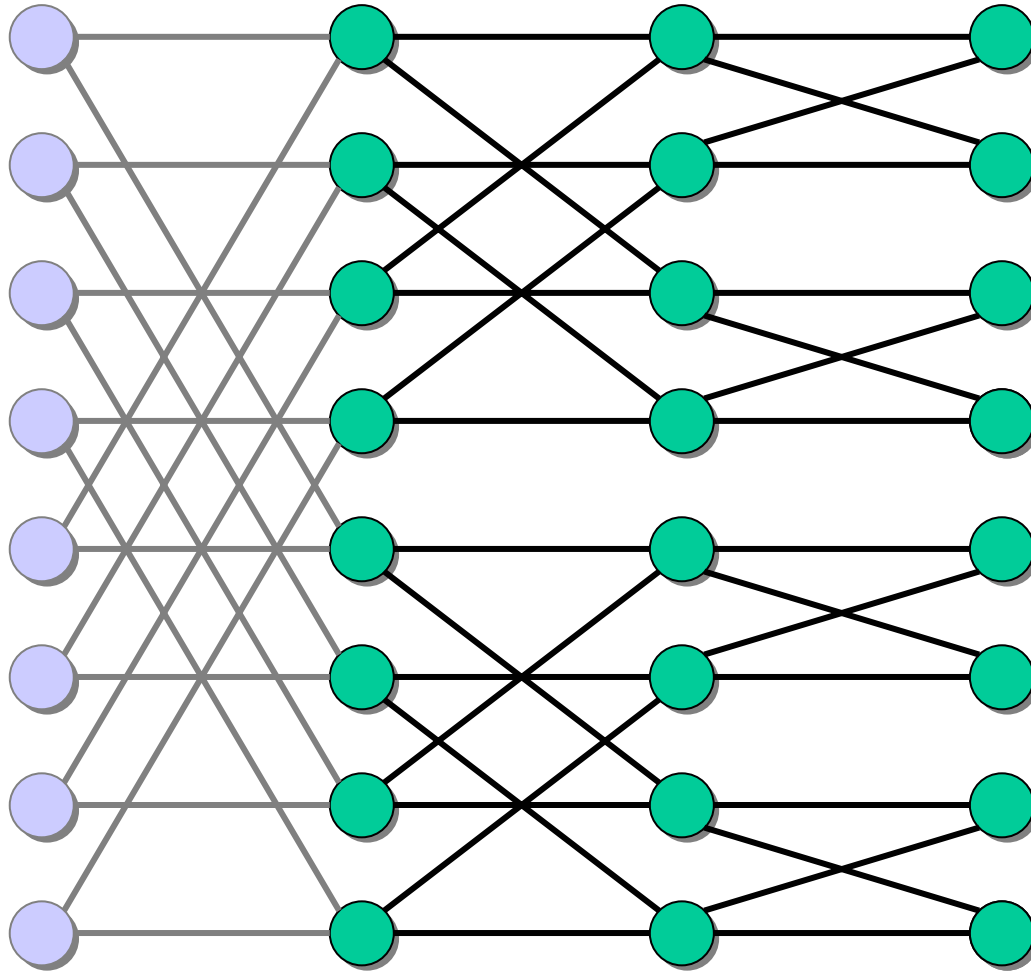
Cube-Connected Cycles

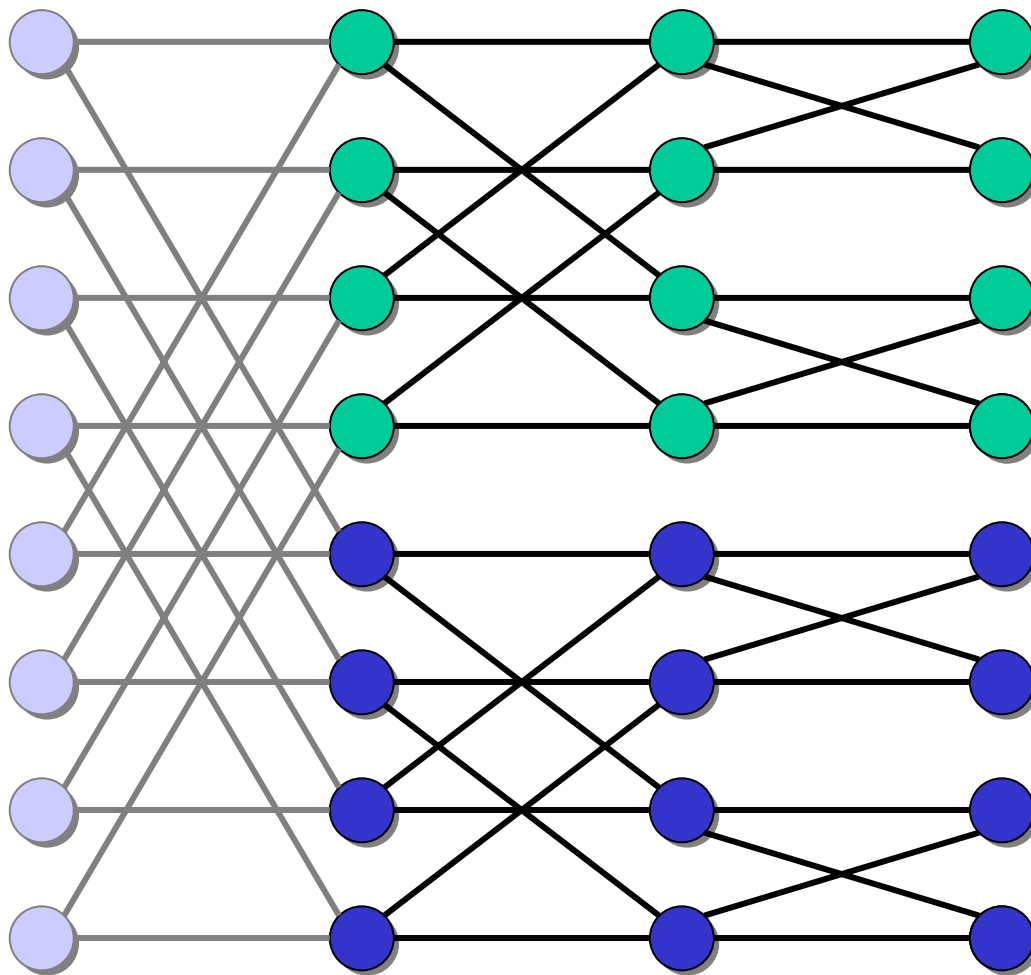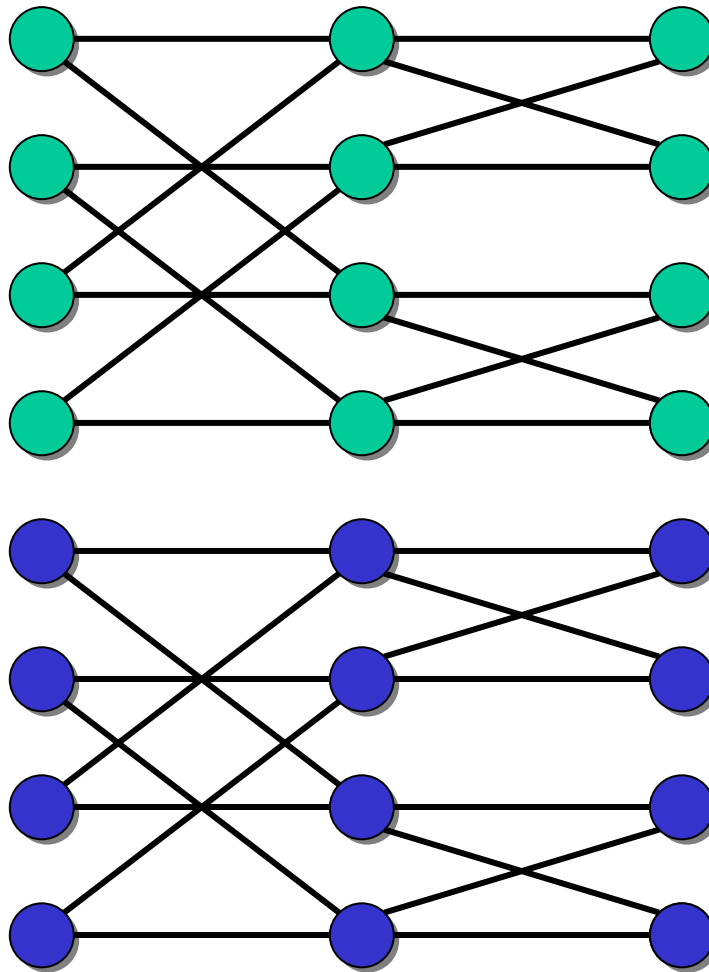# Butterfly (FFT) Network

Butterflies

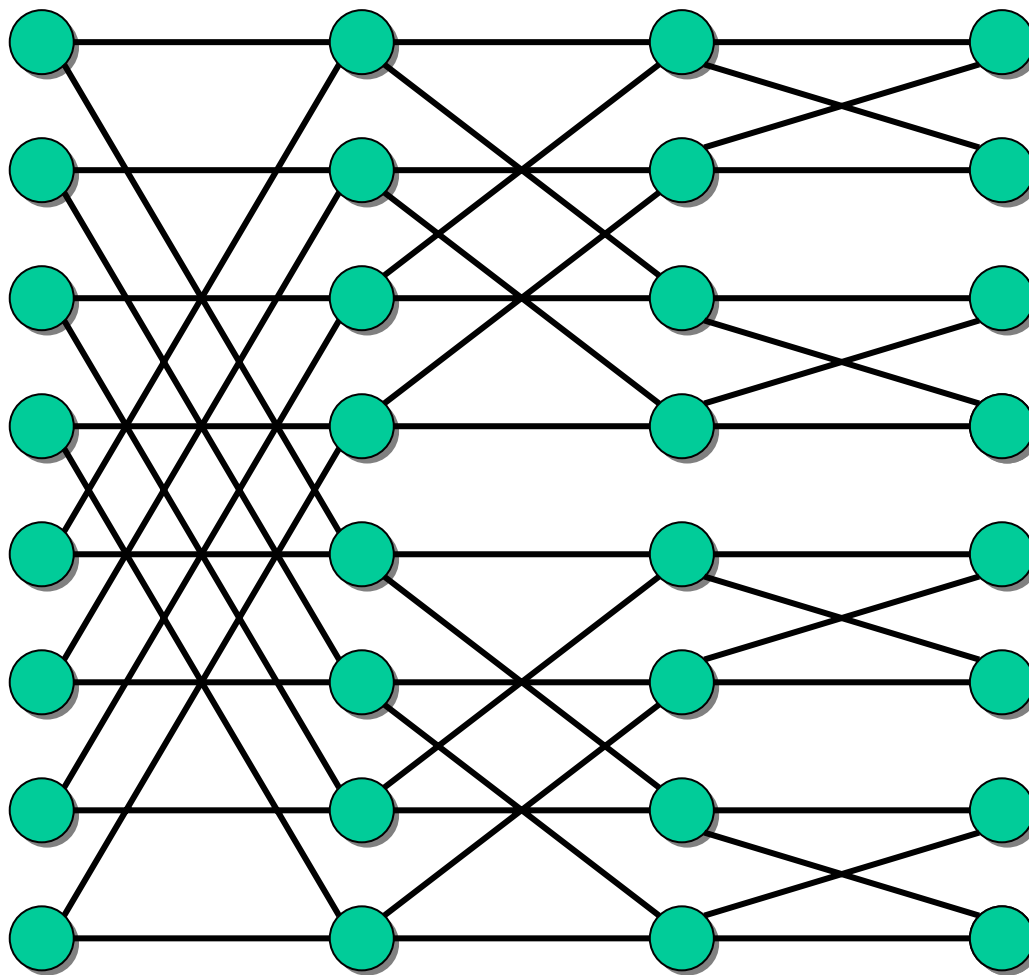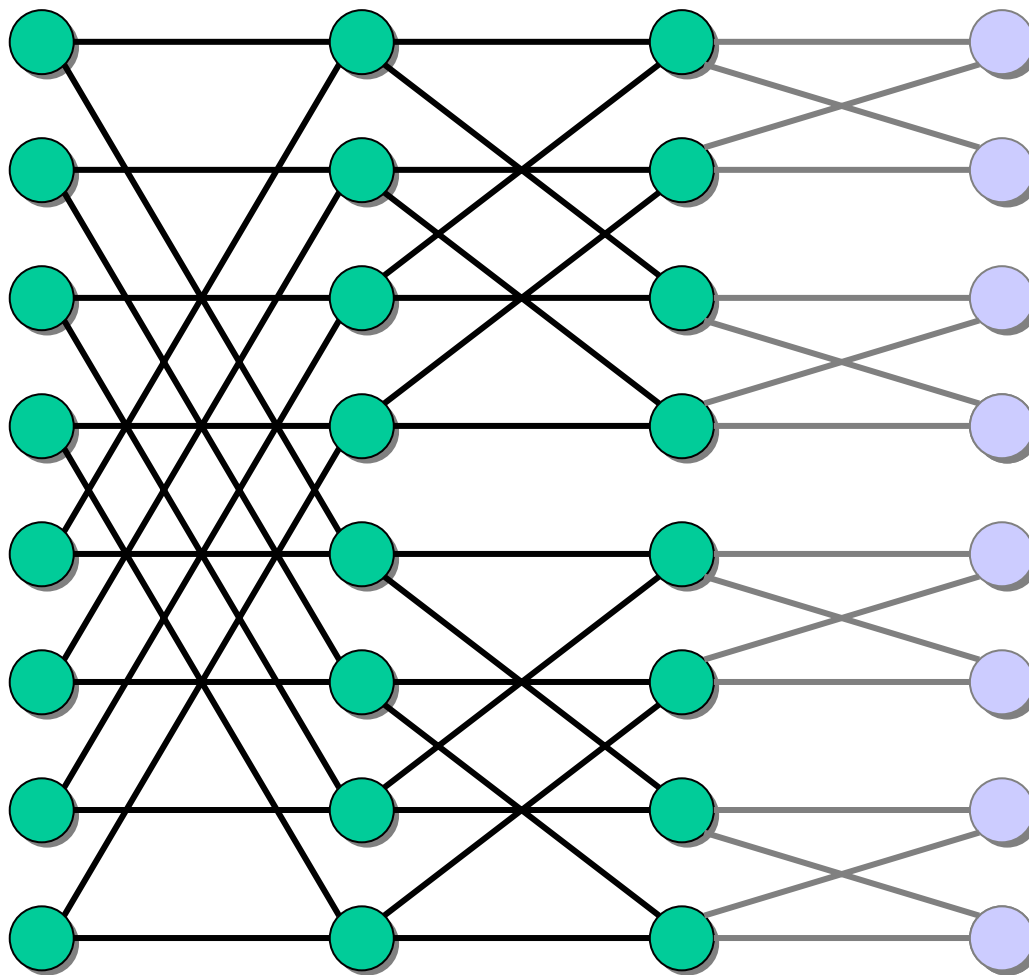# Decomposing a Butterfly

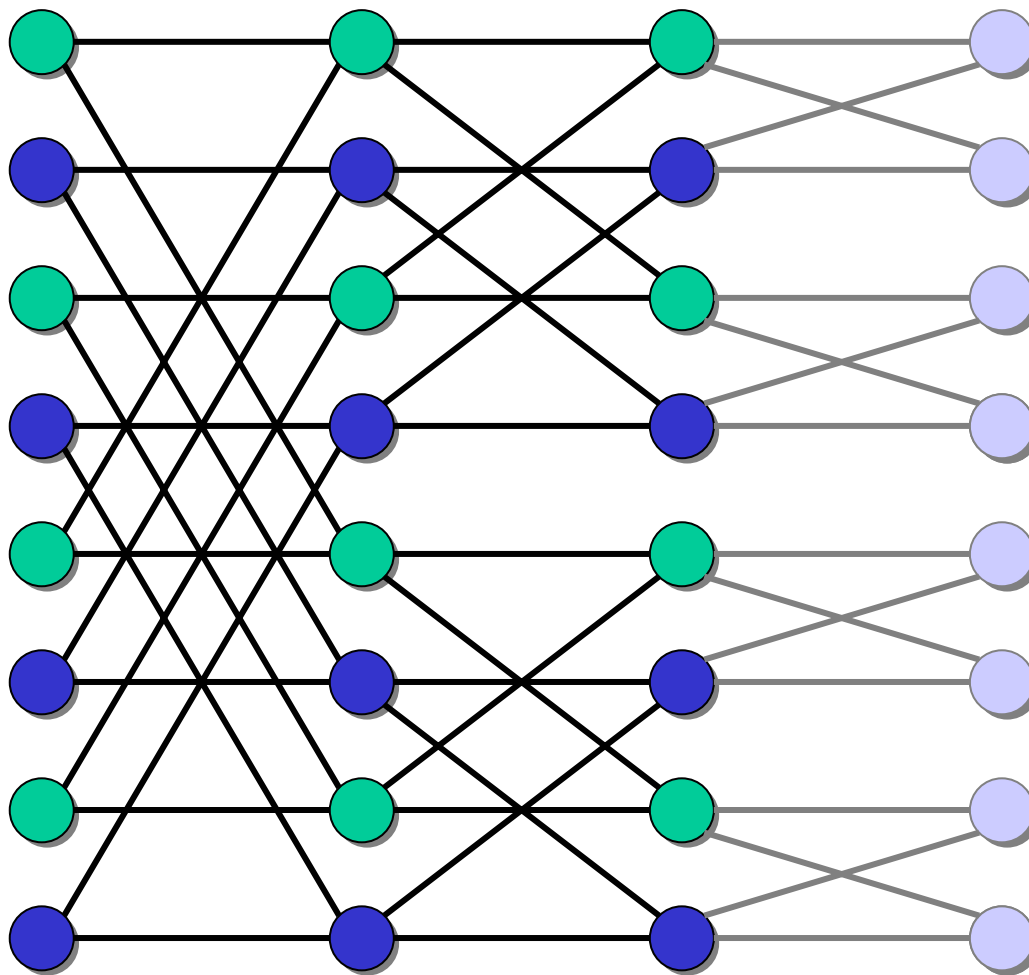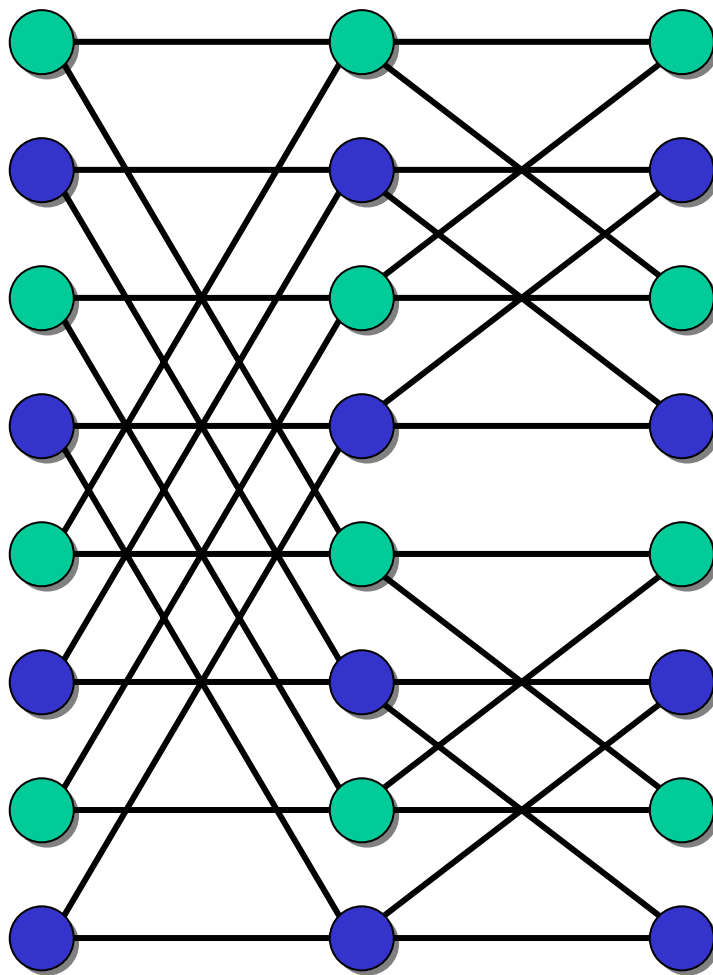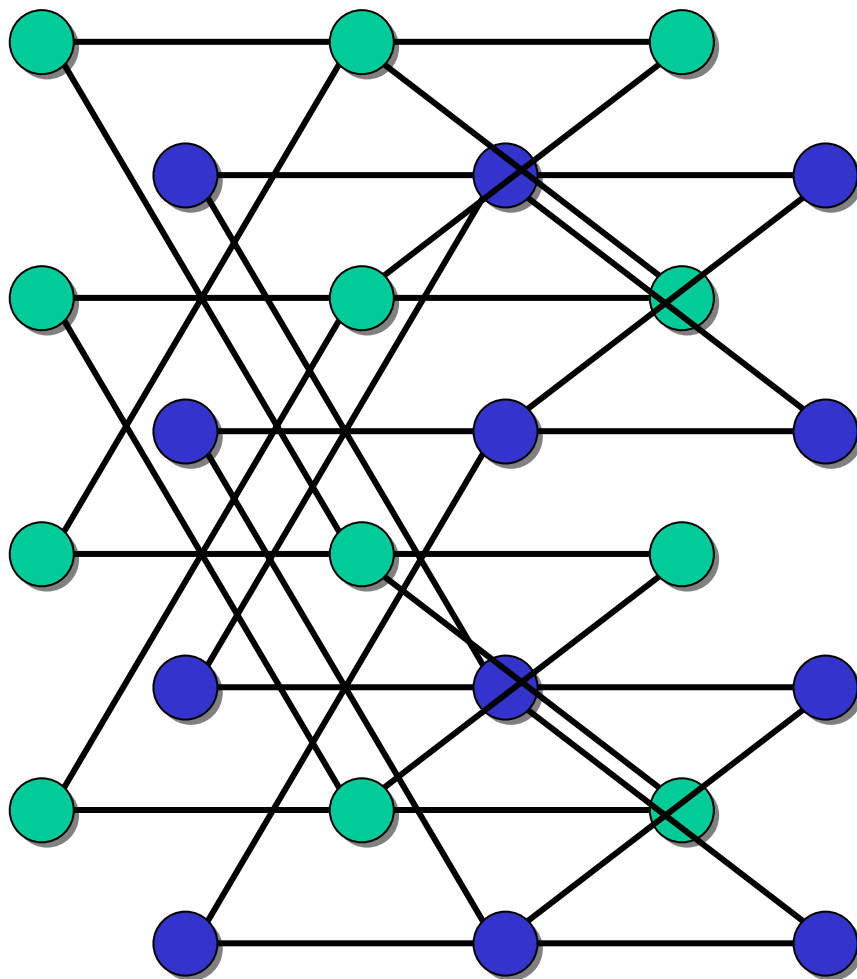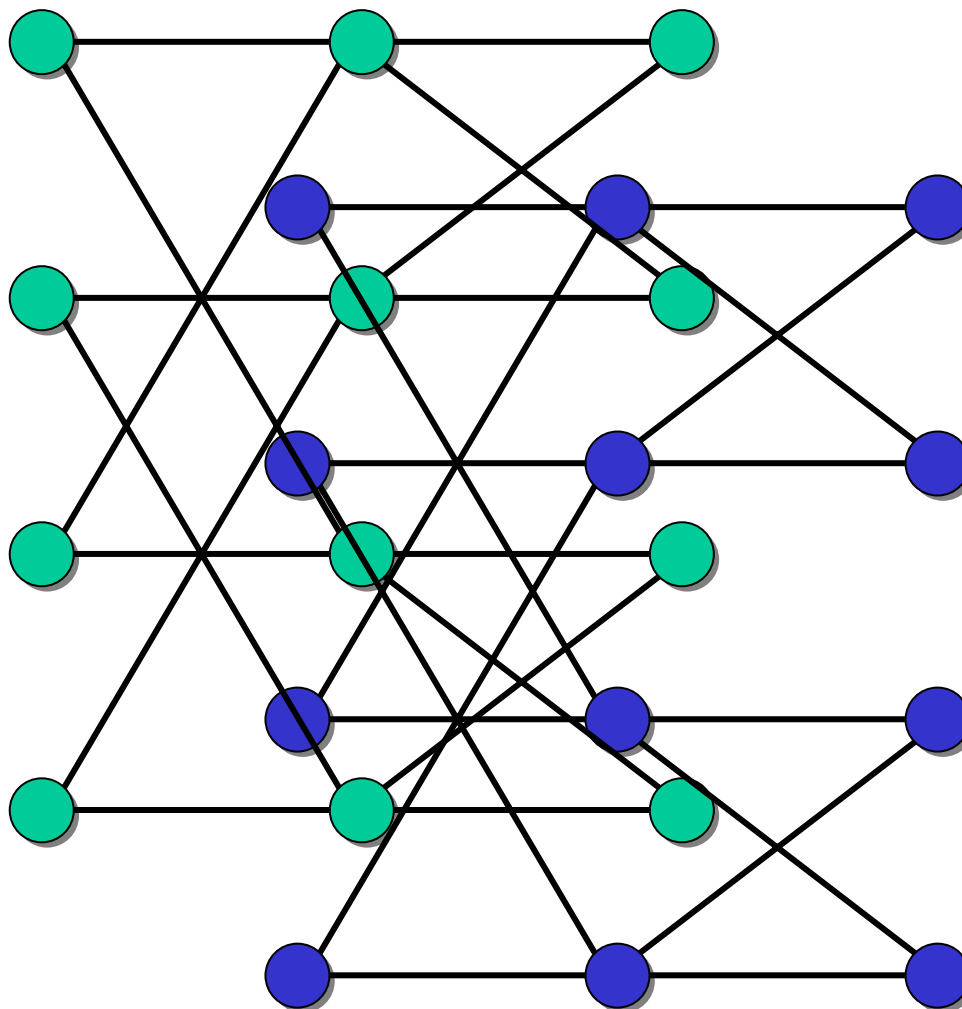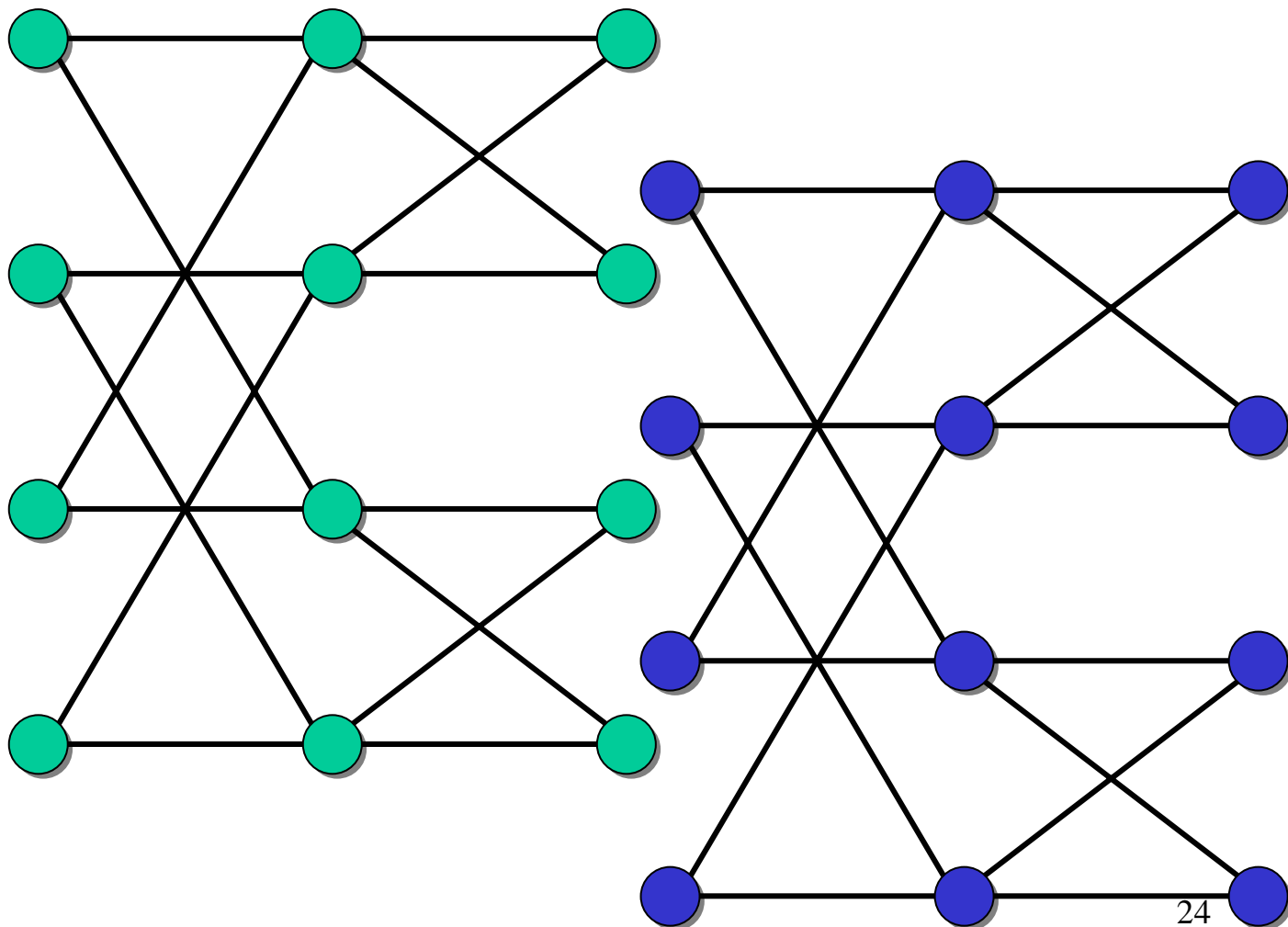# Decomposing a Butterfly

Decomposing a Butterfly

Decomposing a Butterfly

Decomposing a Butterfly II

Decomposing a Butterfly II

Decomposing a Butterfly II

Decomposing a Butterfly II
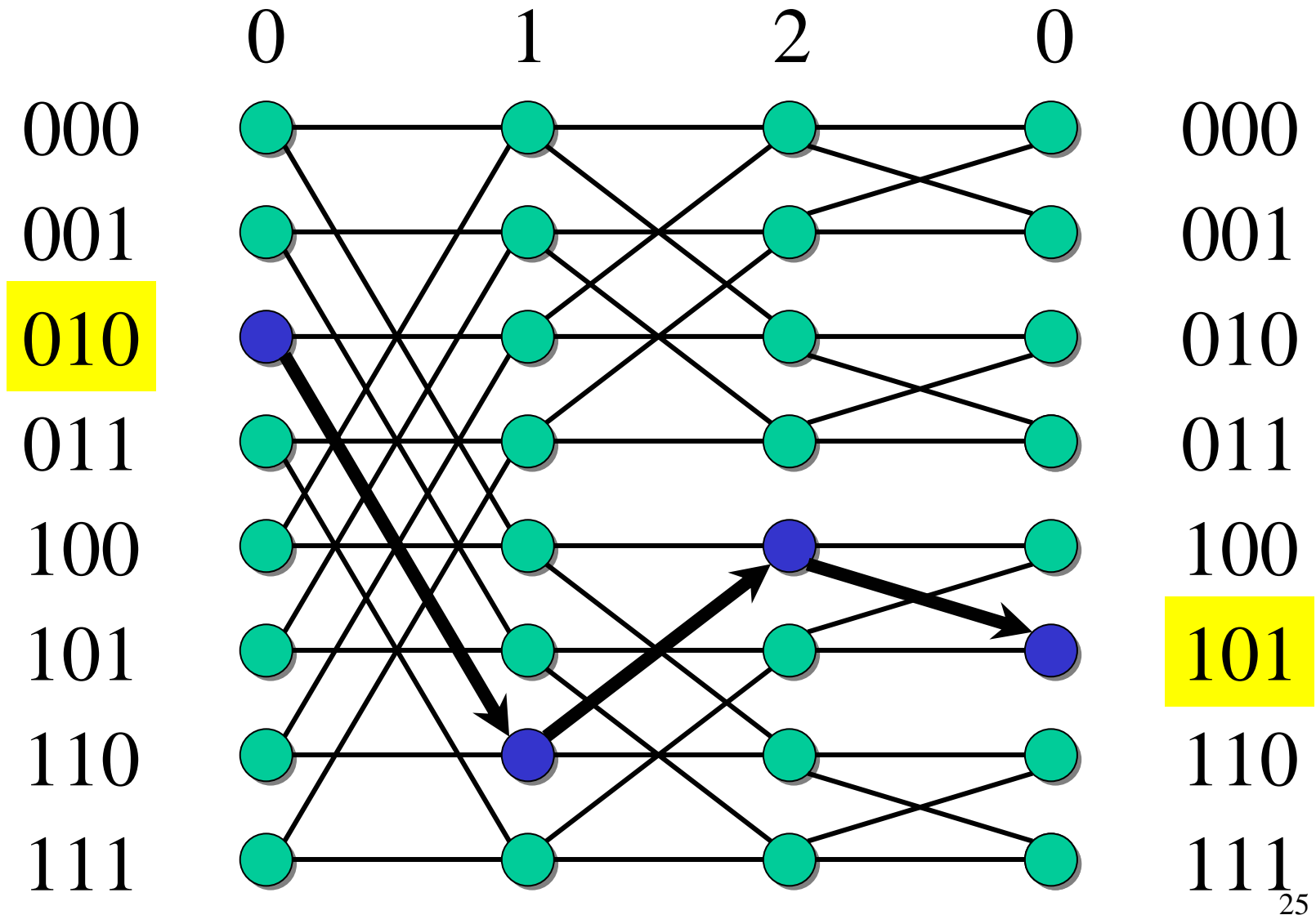
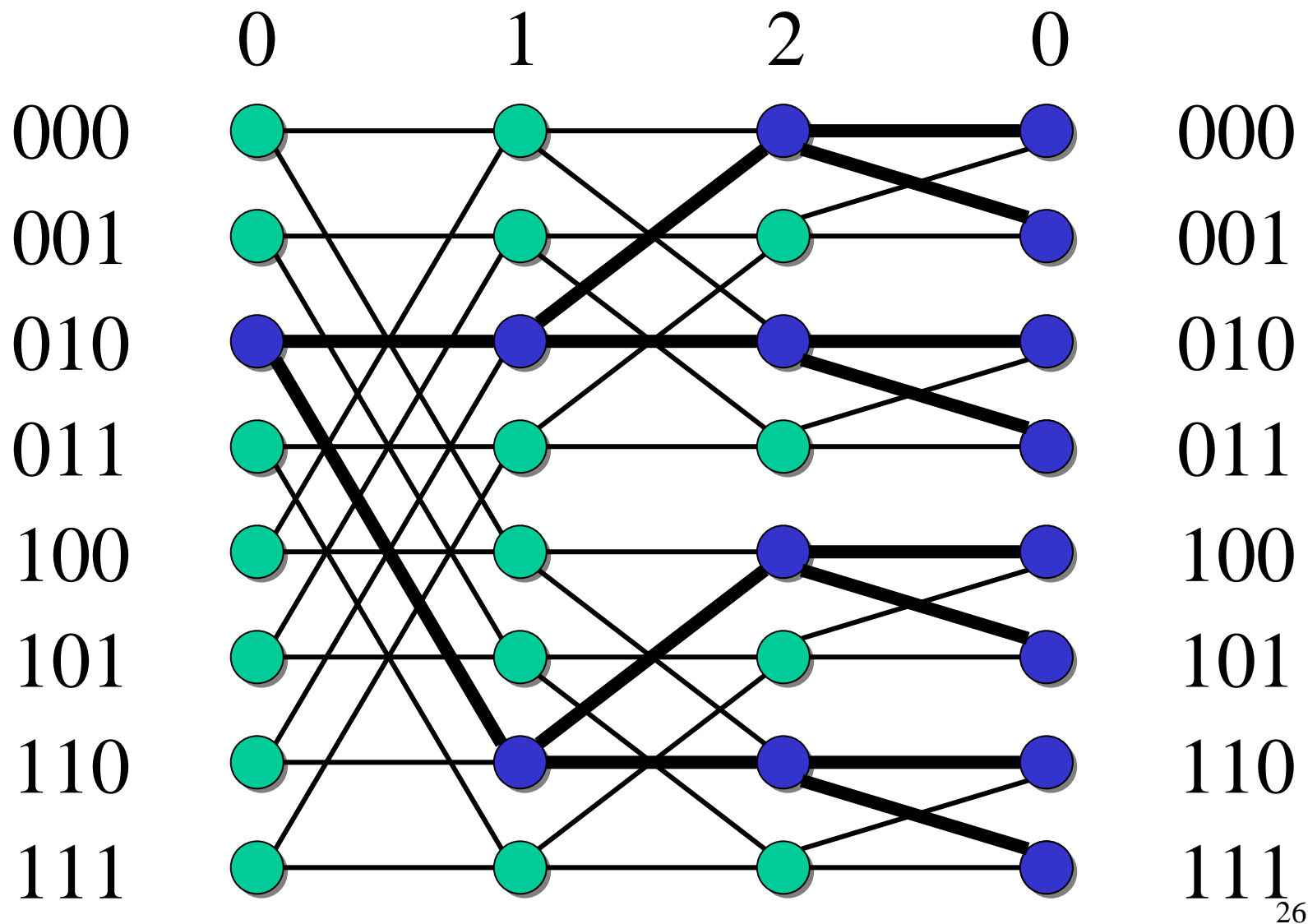# Decomposing a Butterfly II
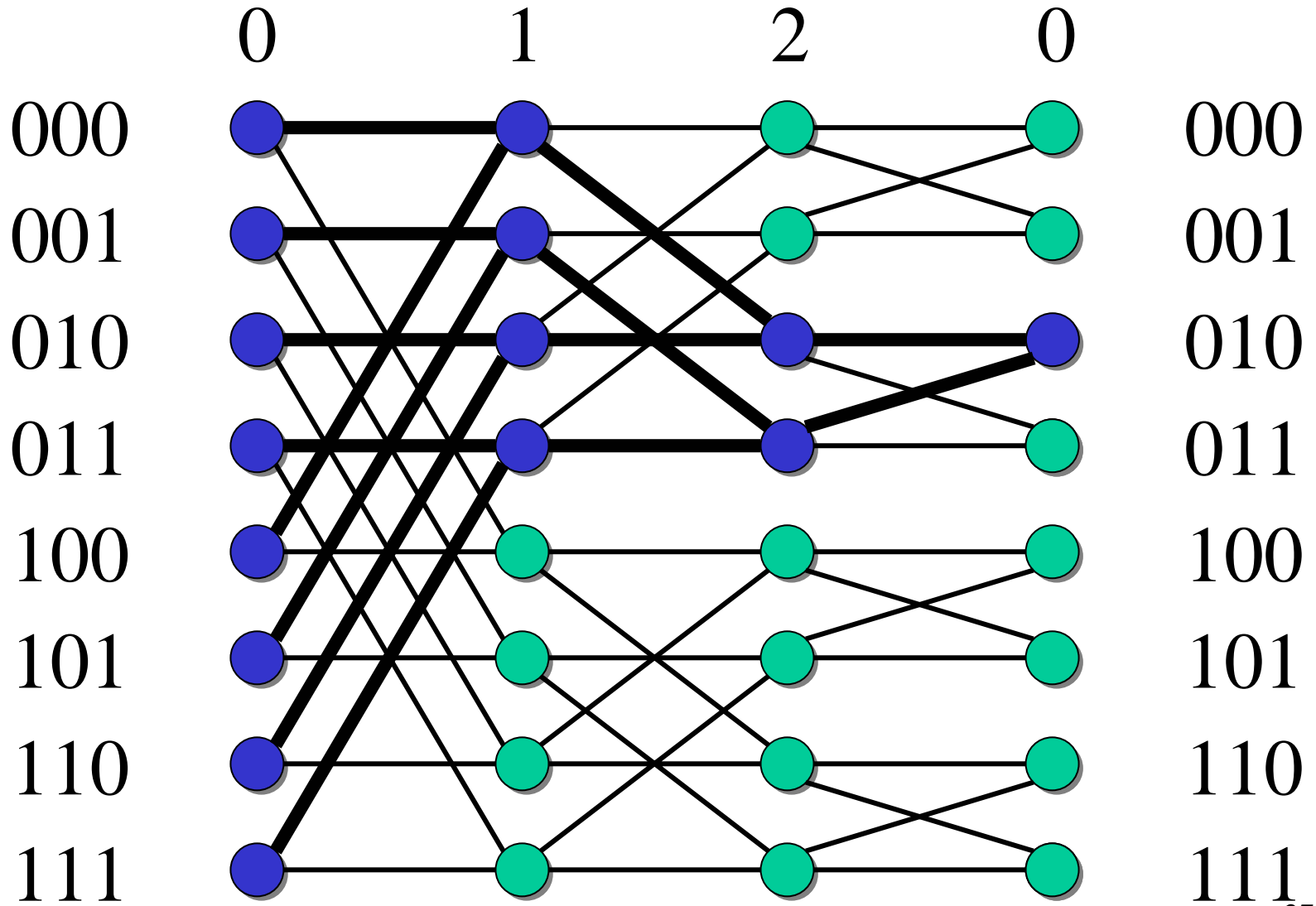
Decomposing a Butterfly II
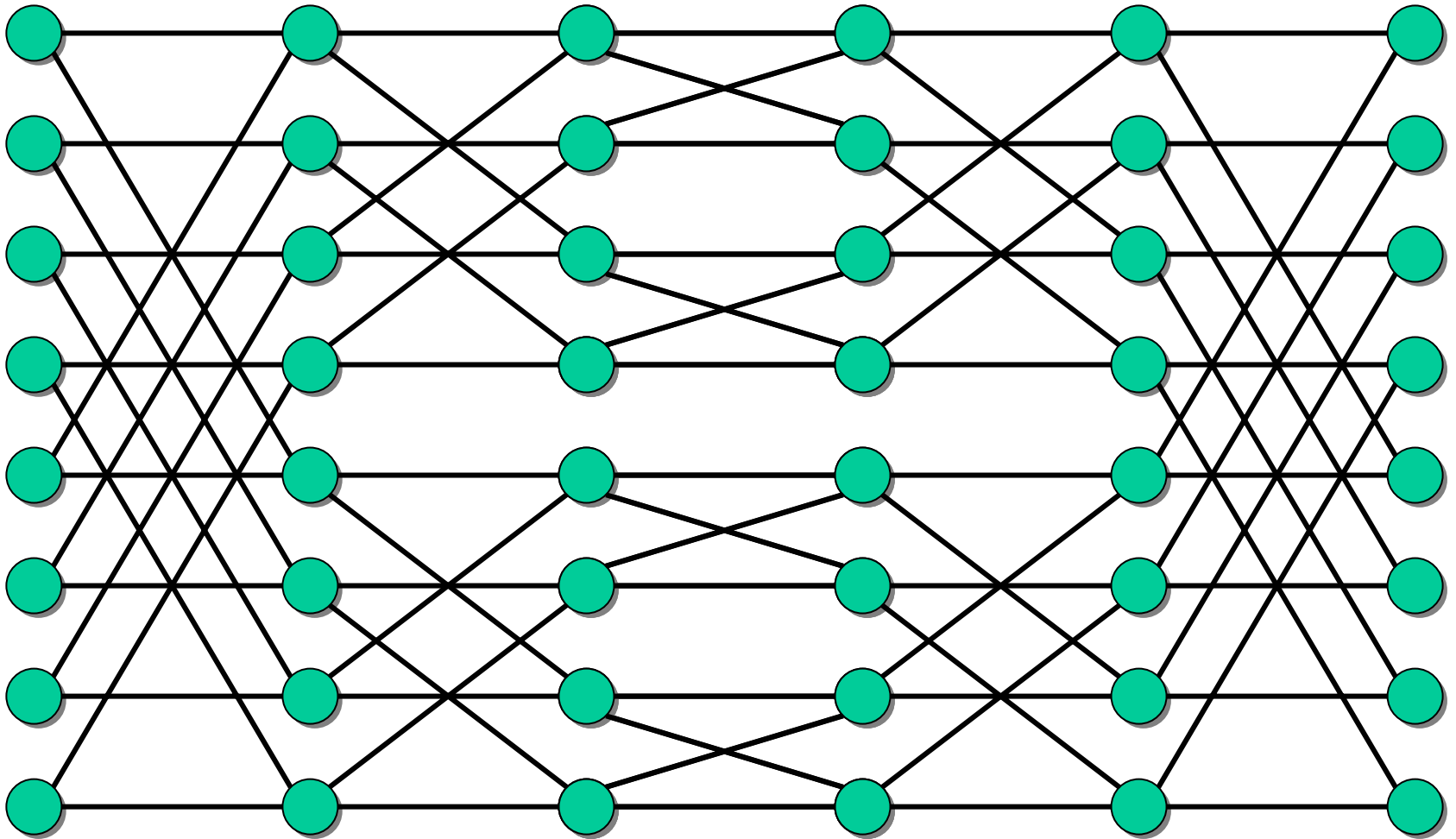
Decomposing a Butterfly II
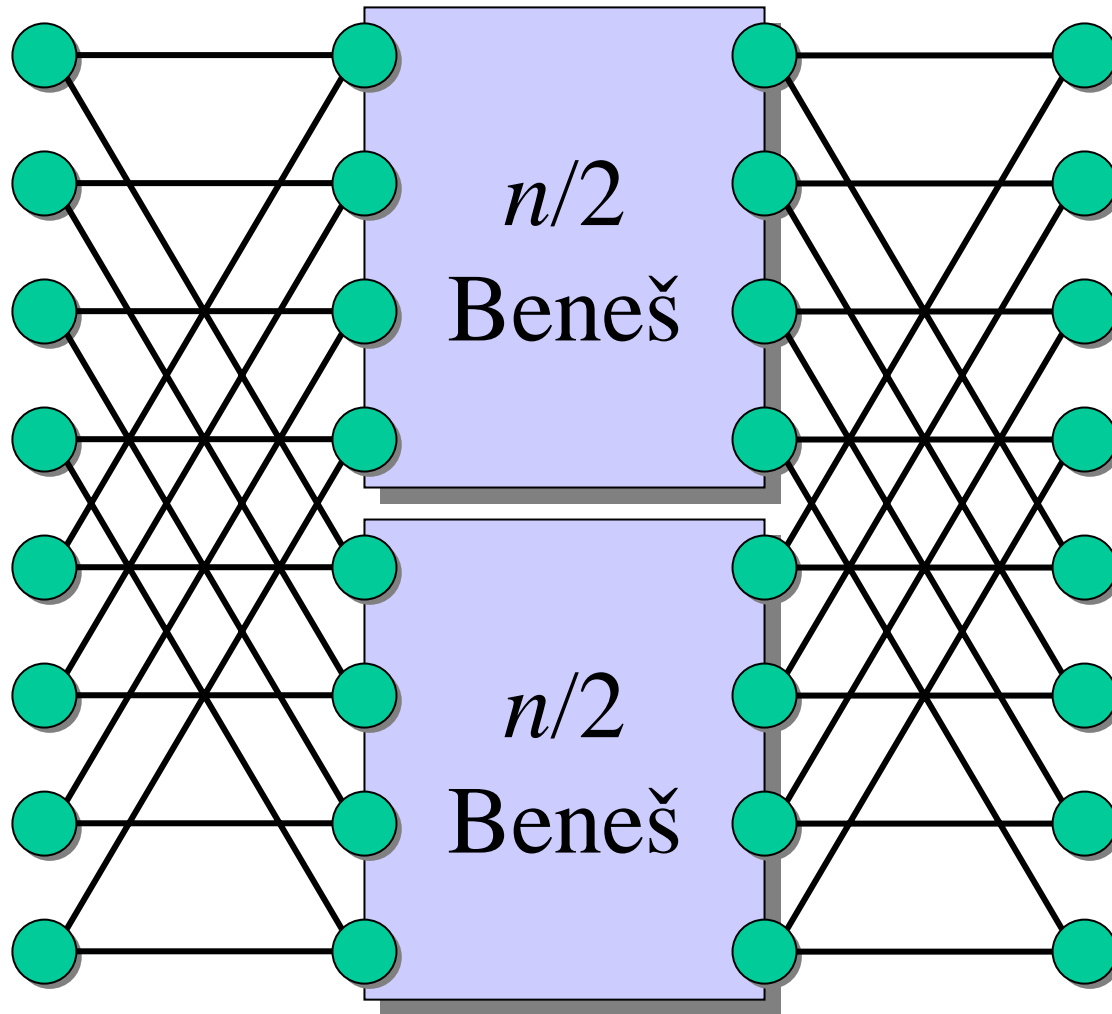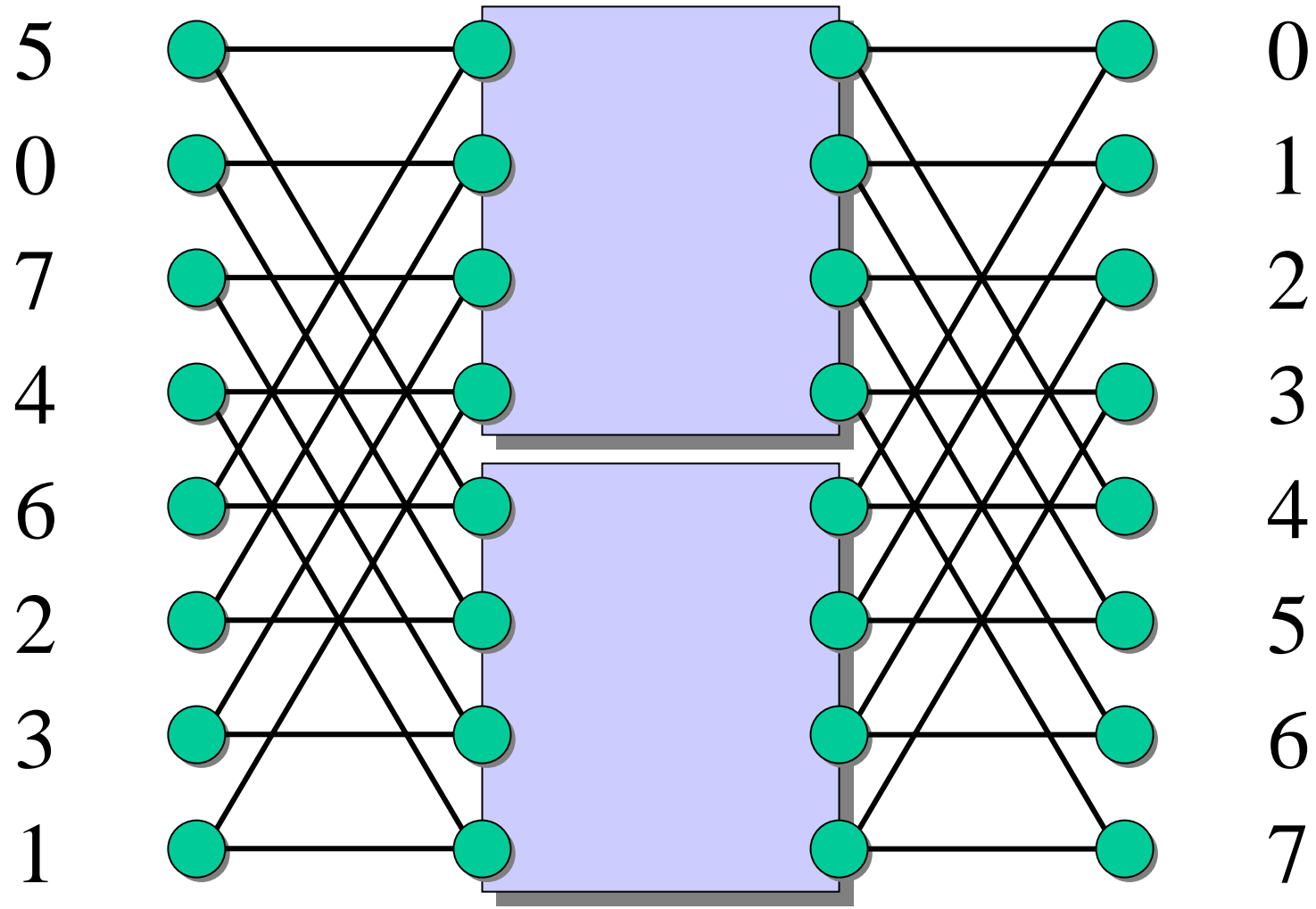
Routing on a Butterfly

Tree in Butterfly

Tree in Butterfly

Beneš Network

Decomposing a Beneš Network

Routing on a Beneš Network

5   0
0   1
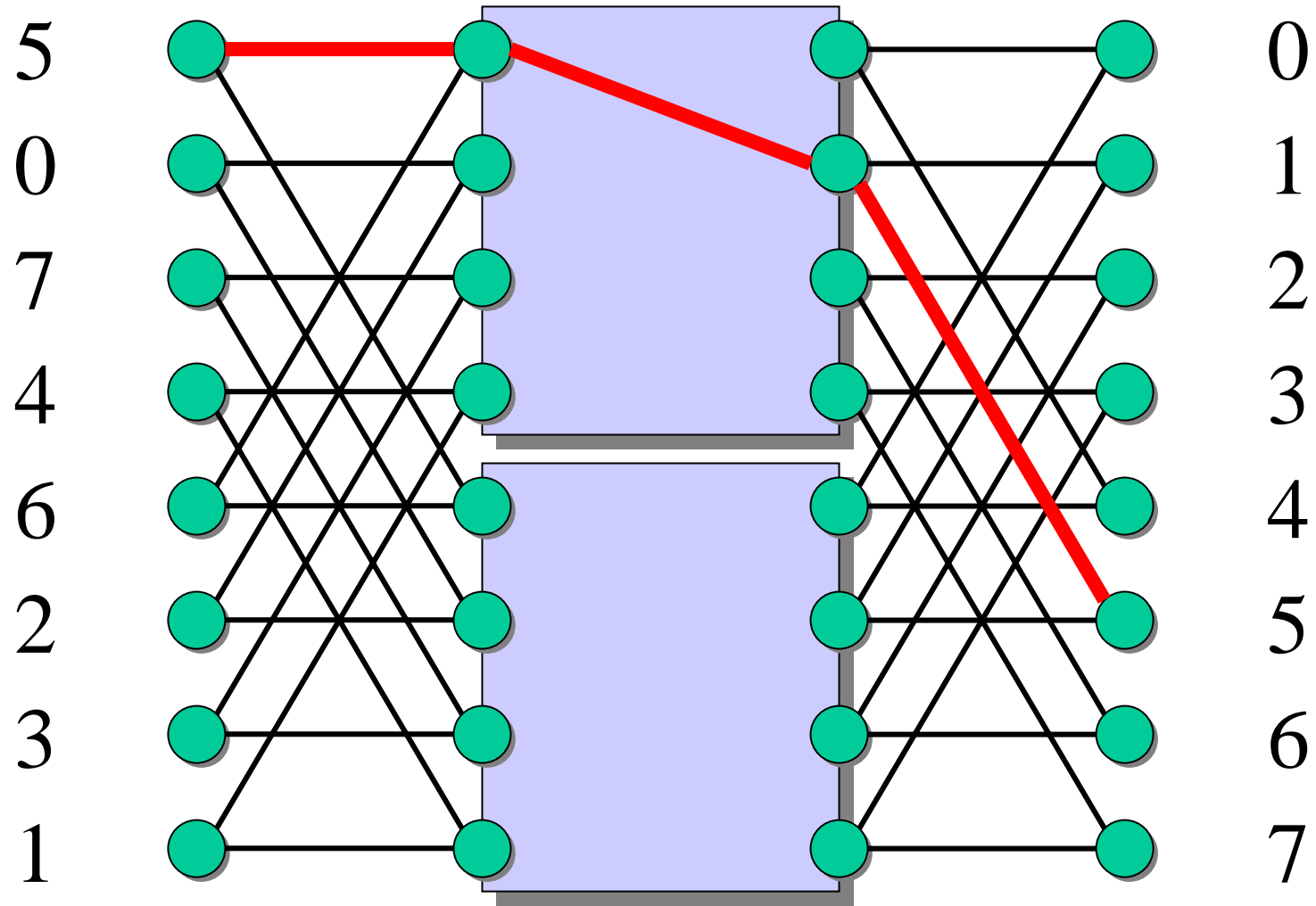7   2
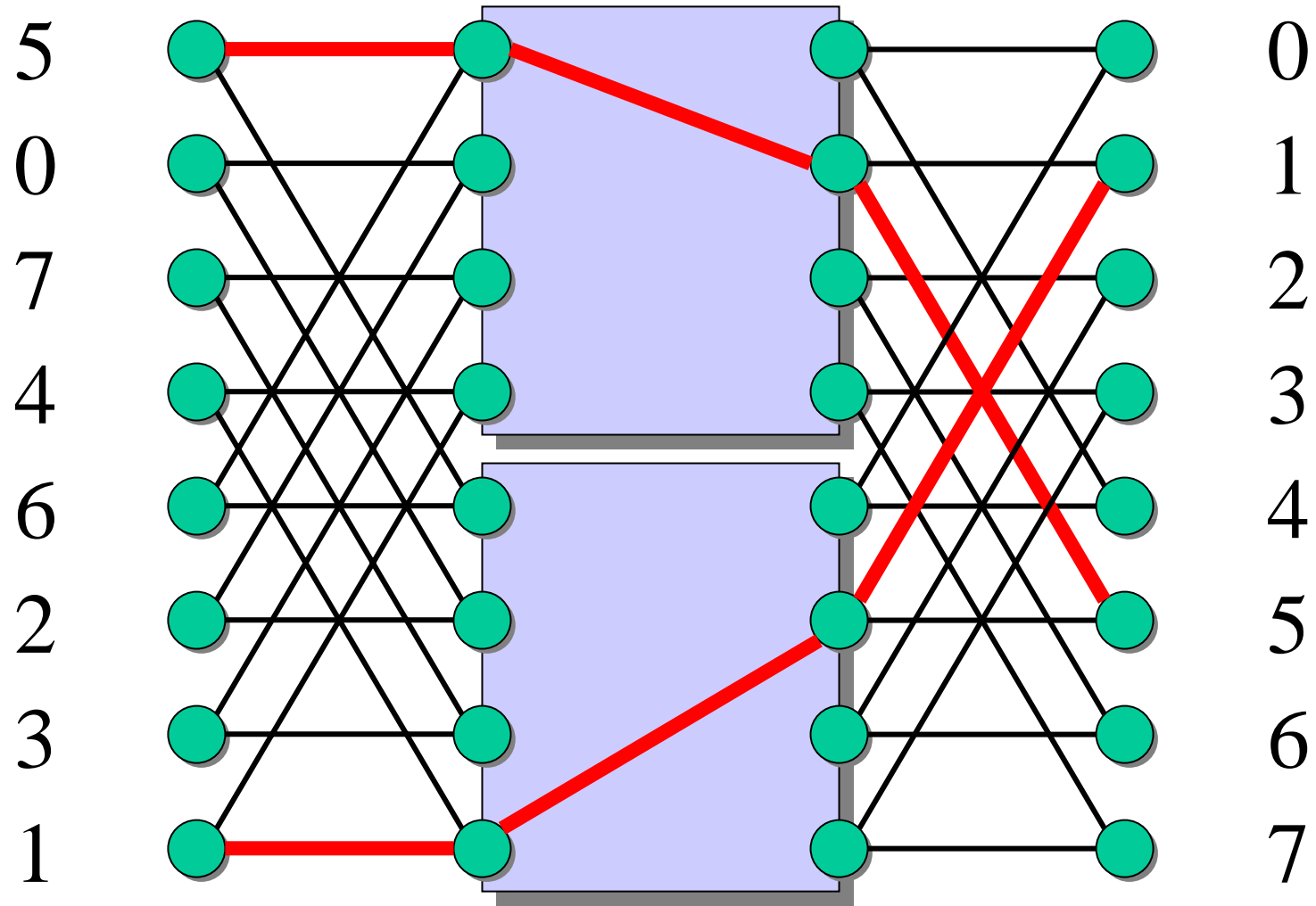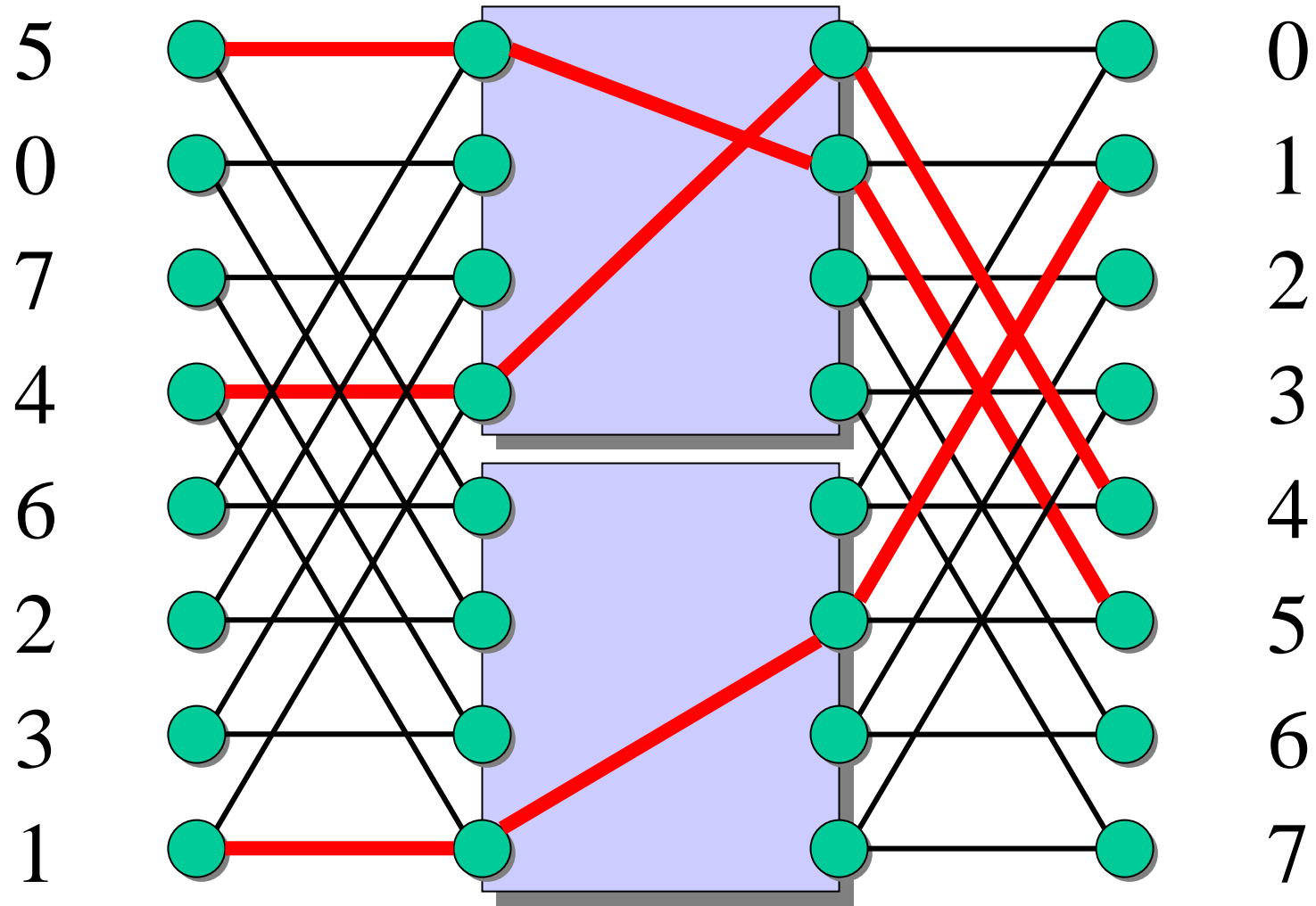4   3
6   4
2   5
3   6
1   7

Routing on a Beneš Network

Routing on a Beneš Network

Routing on a Beneš Network

Routing on a Beneš Network

Routing on a Beneš Network

Routing on a Beneš Network
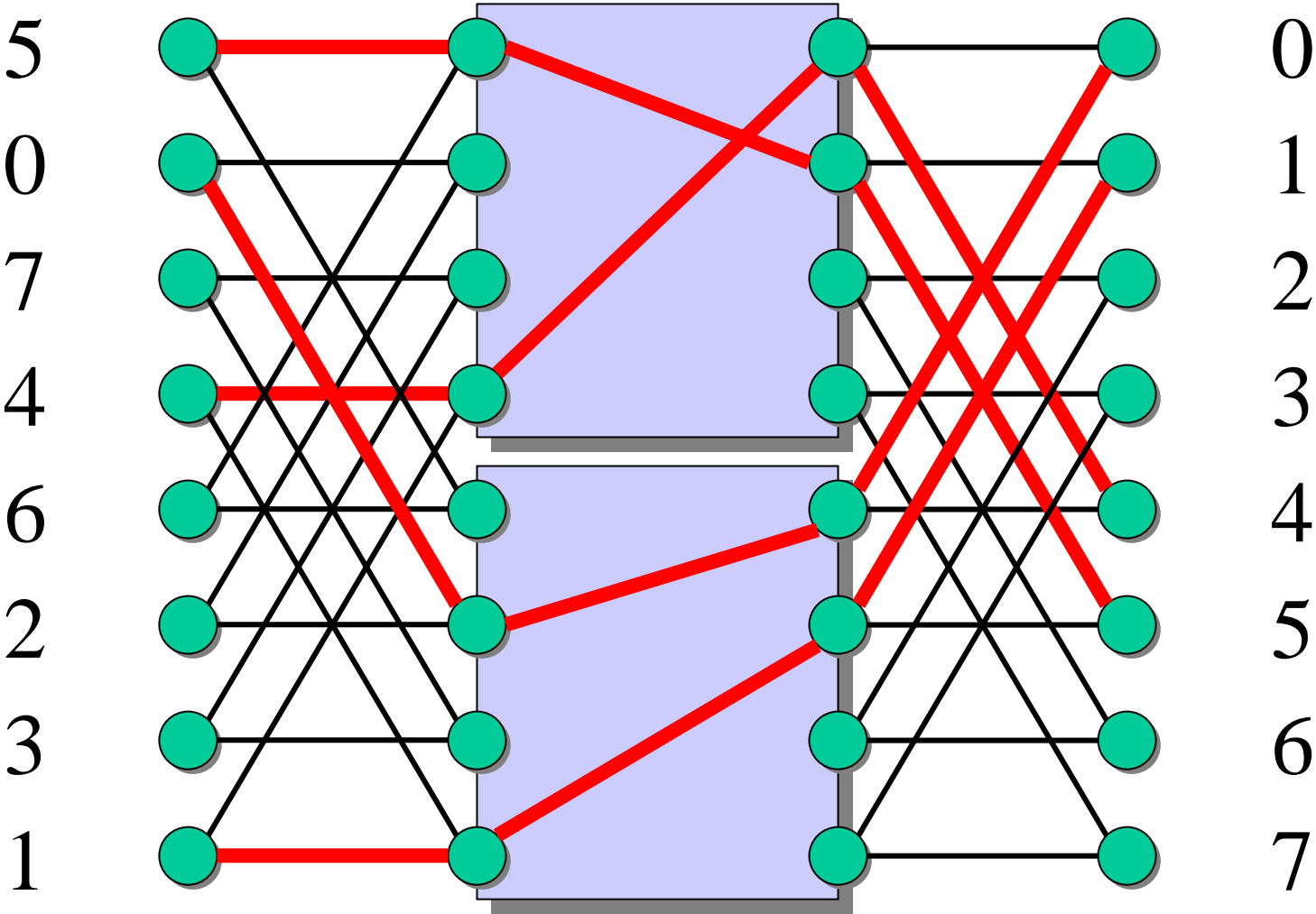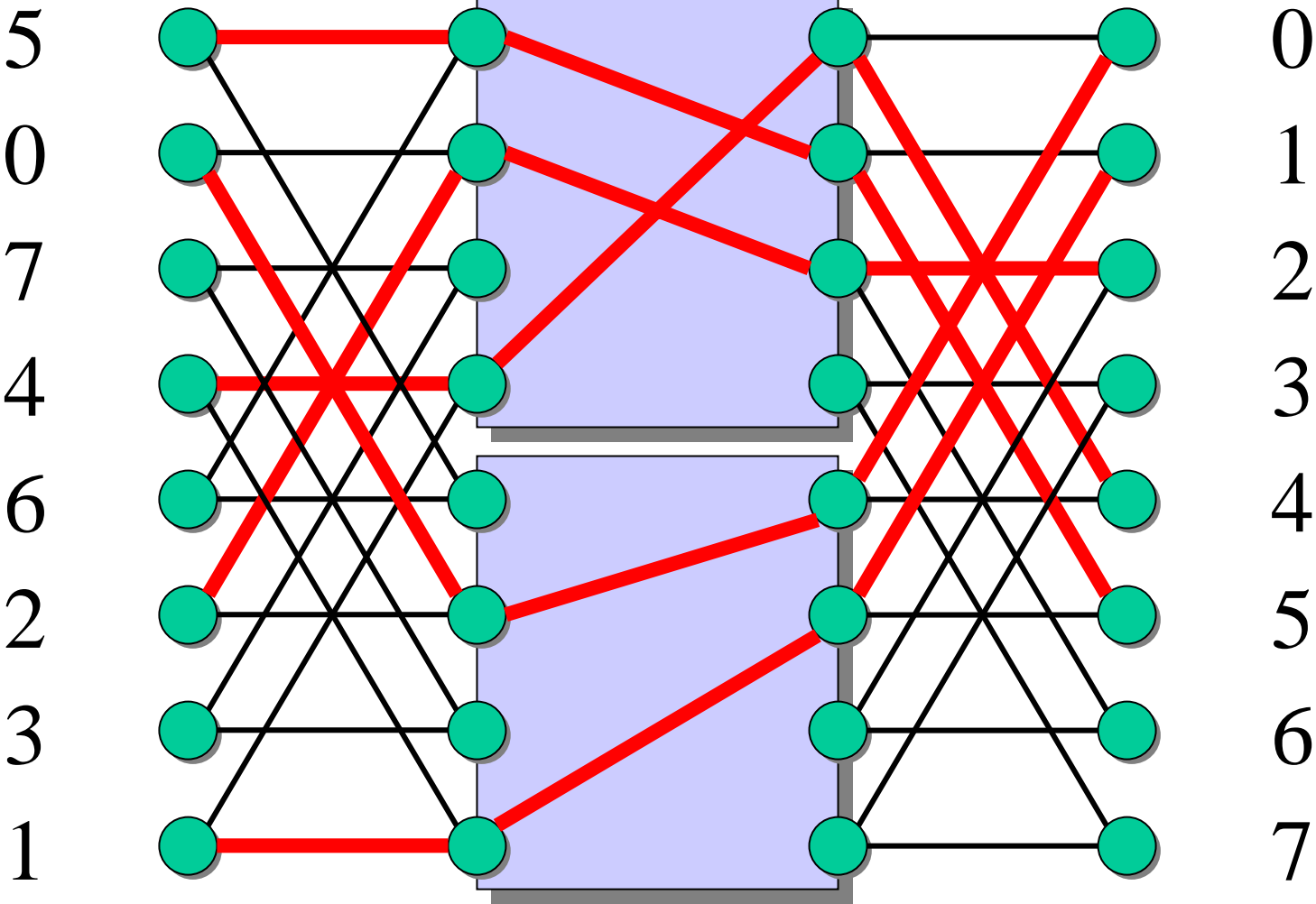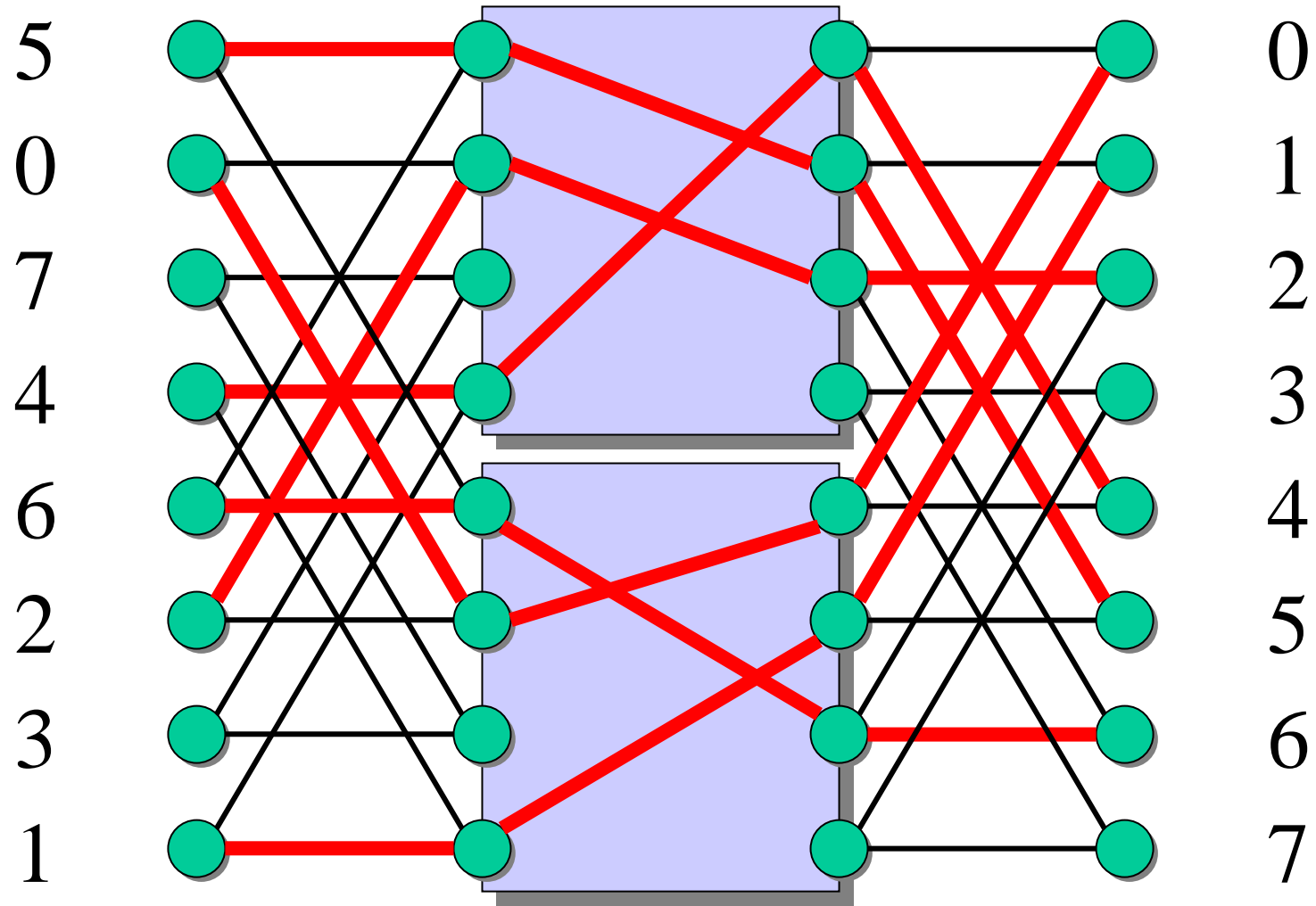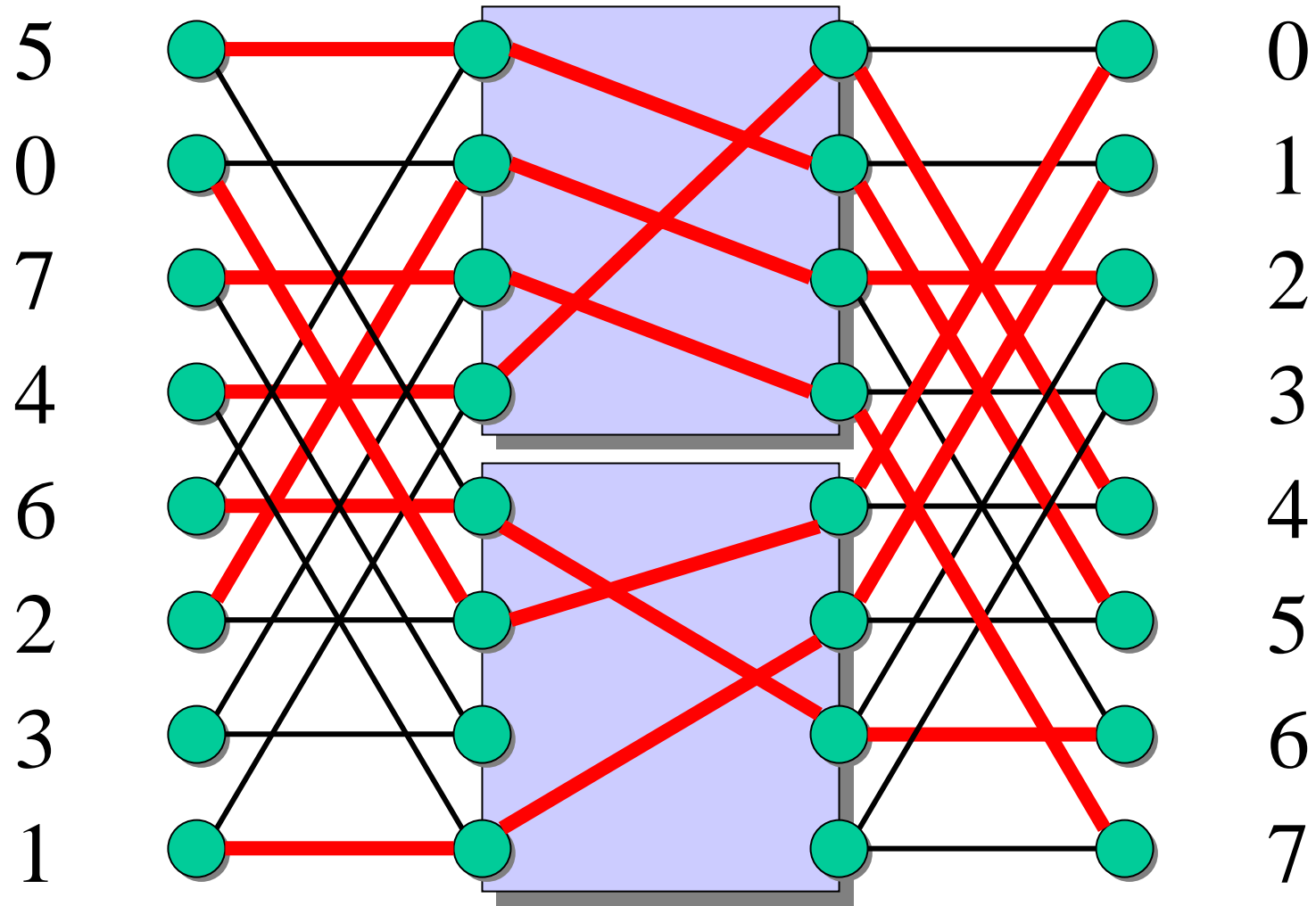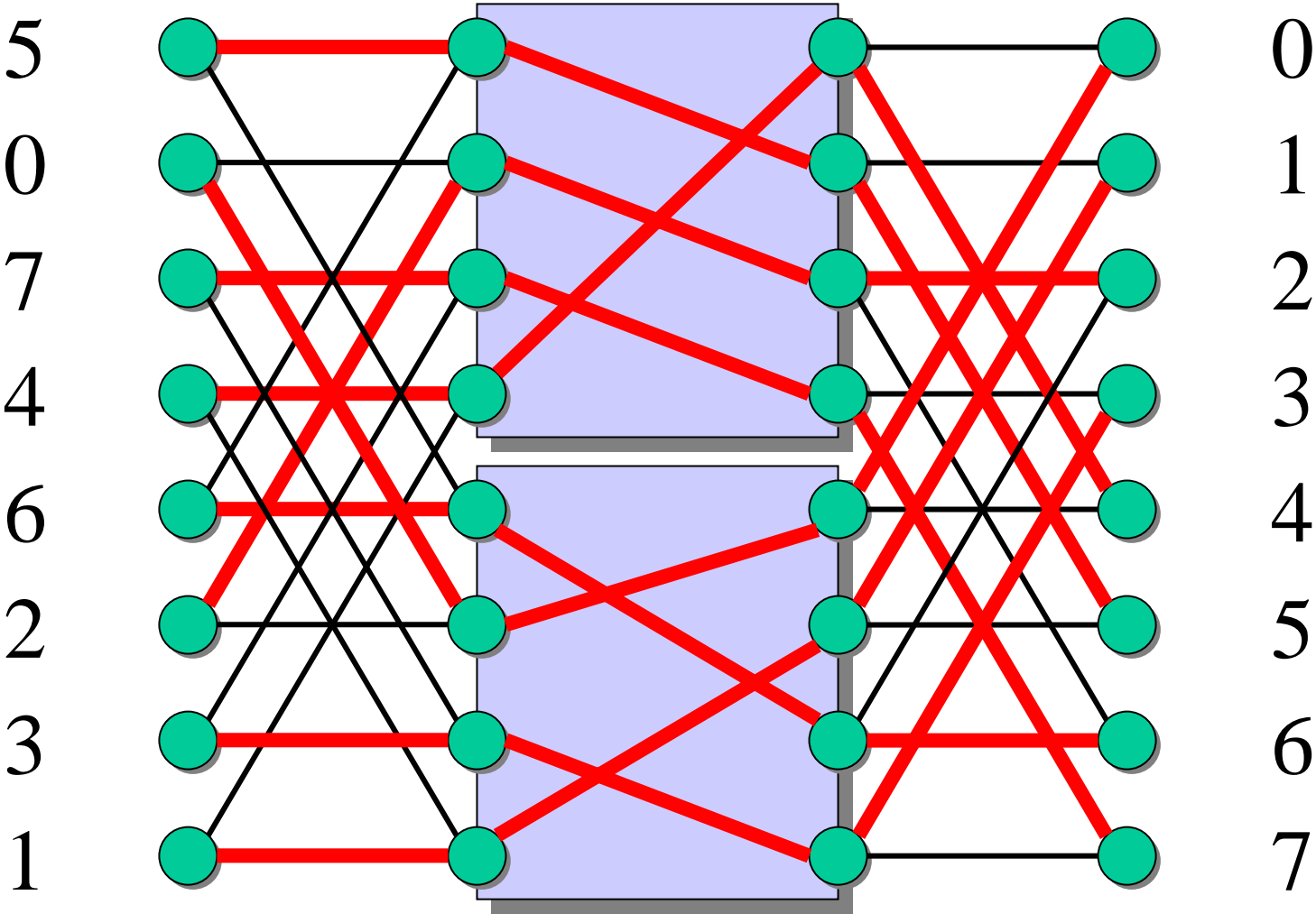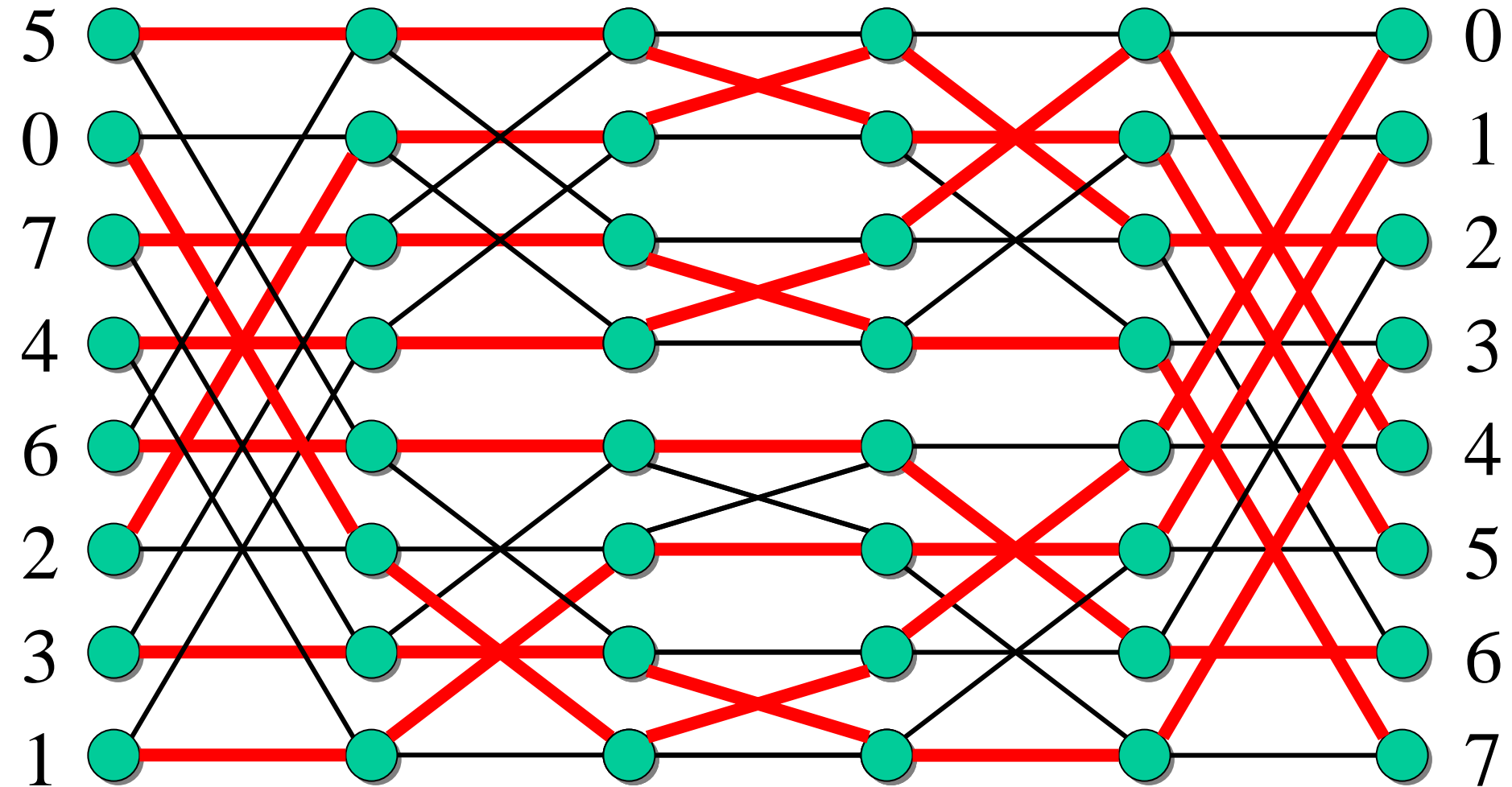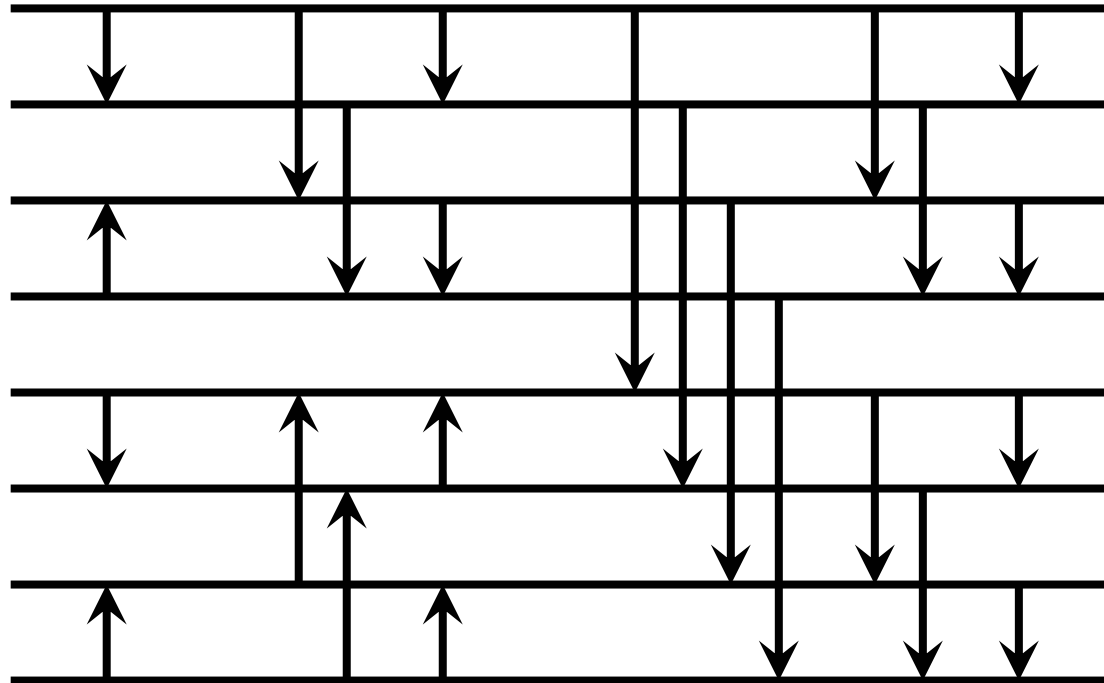
Routing on a Beneš Network

Routing on a Beneš Network
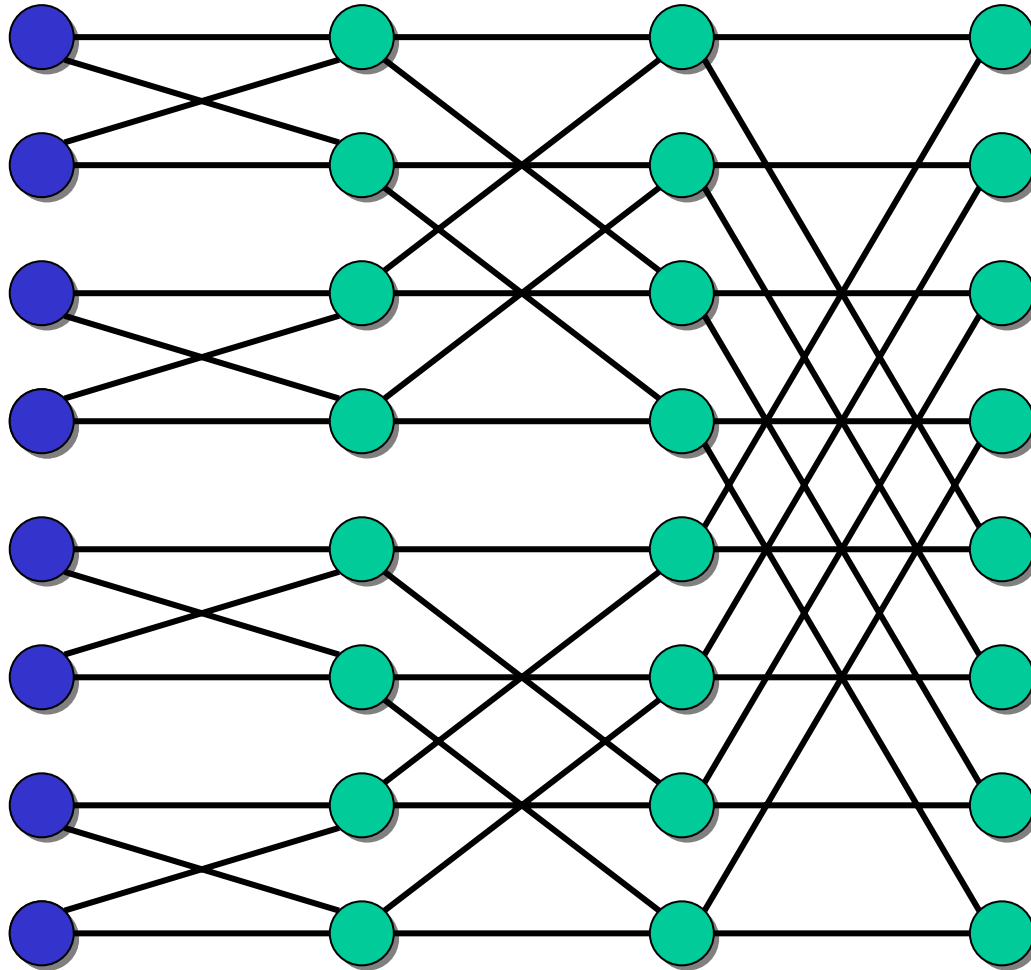
Routing on a Beneš Network
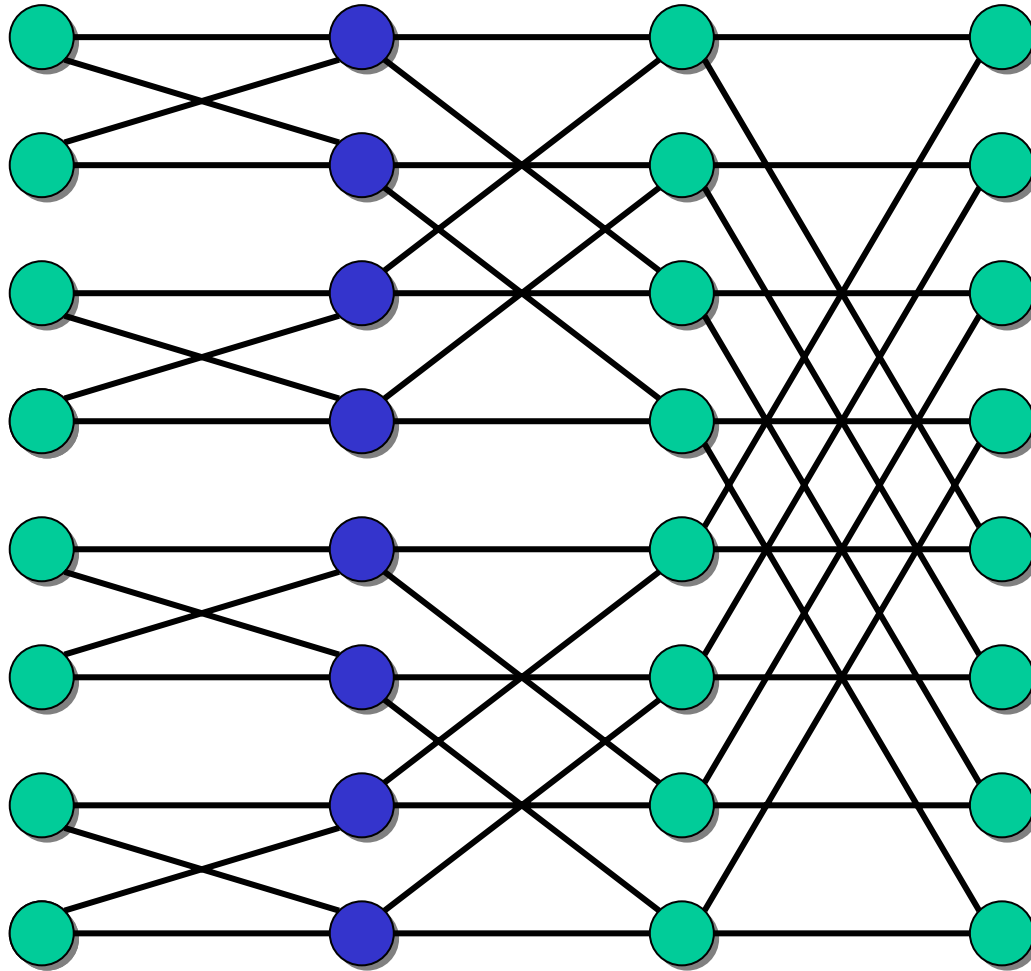
Bitonic Sorting Network
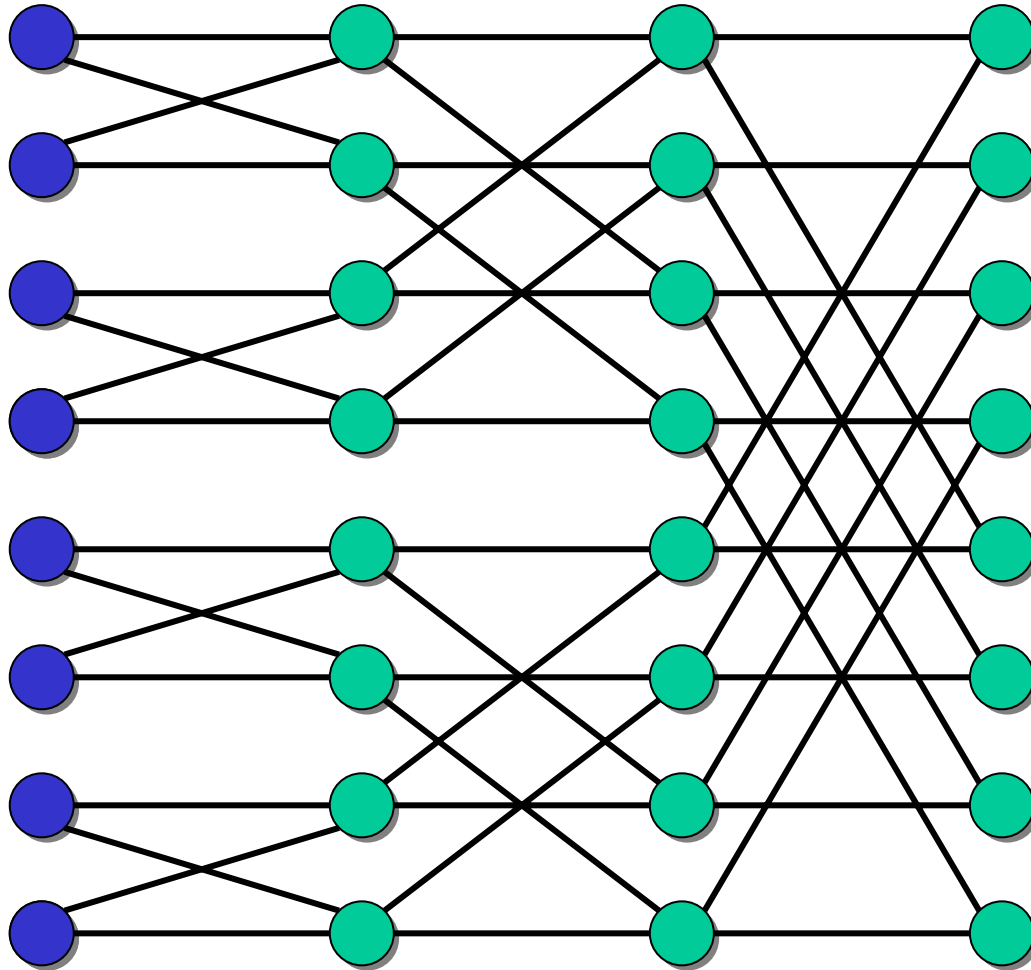

Hypercube connections!

Bitonic Sort on Butterfly

Bitonic Sort on Butterfly

Bitonic Sort on Butterfly

Bitonic Sort on Butterfly

Bitonic Sort on Butterfly

Bitonic Sort on Butterfly
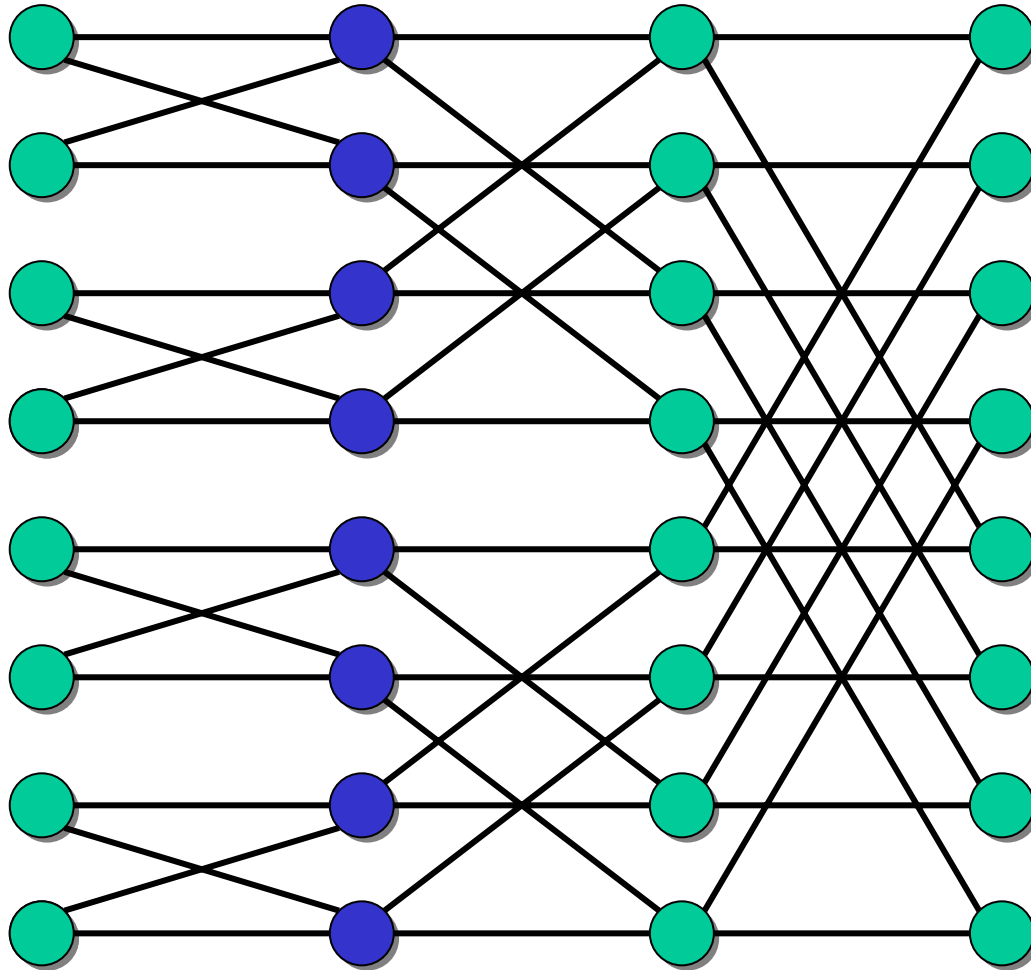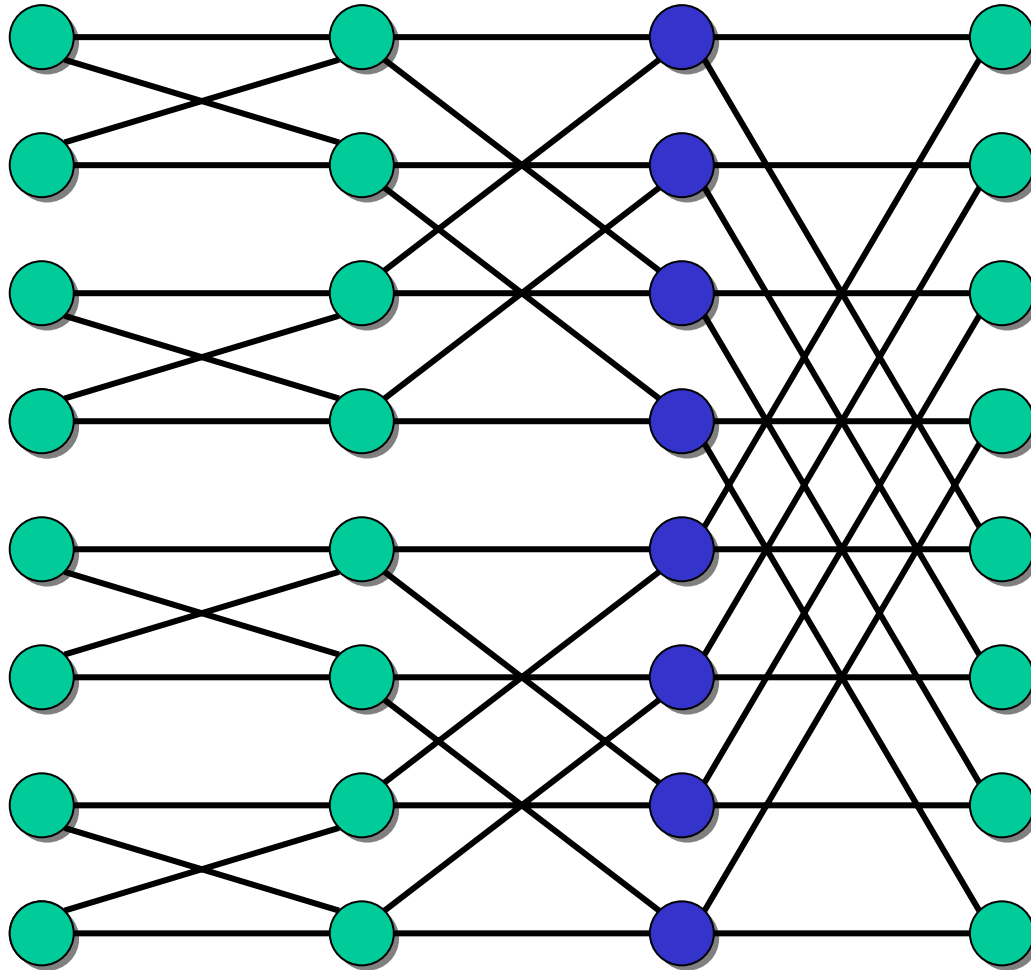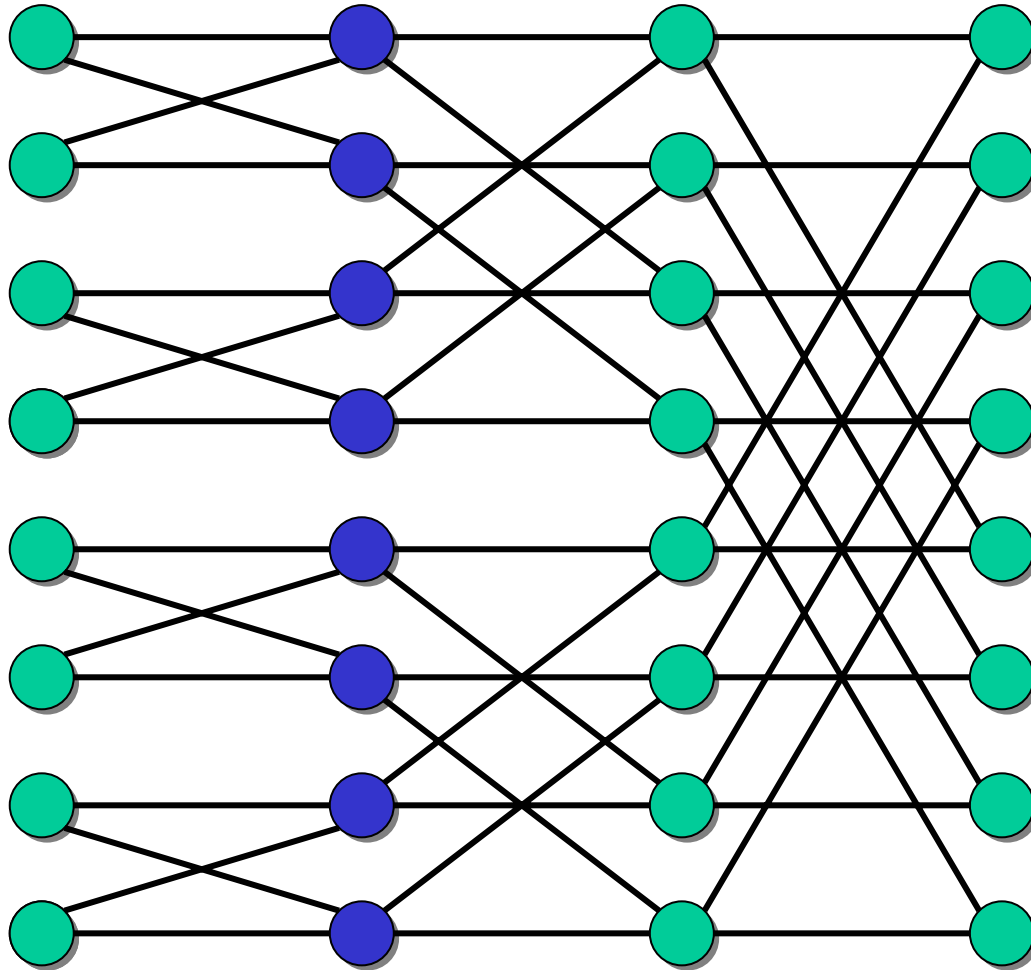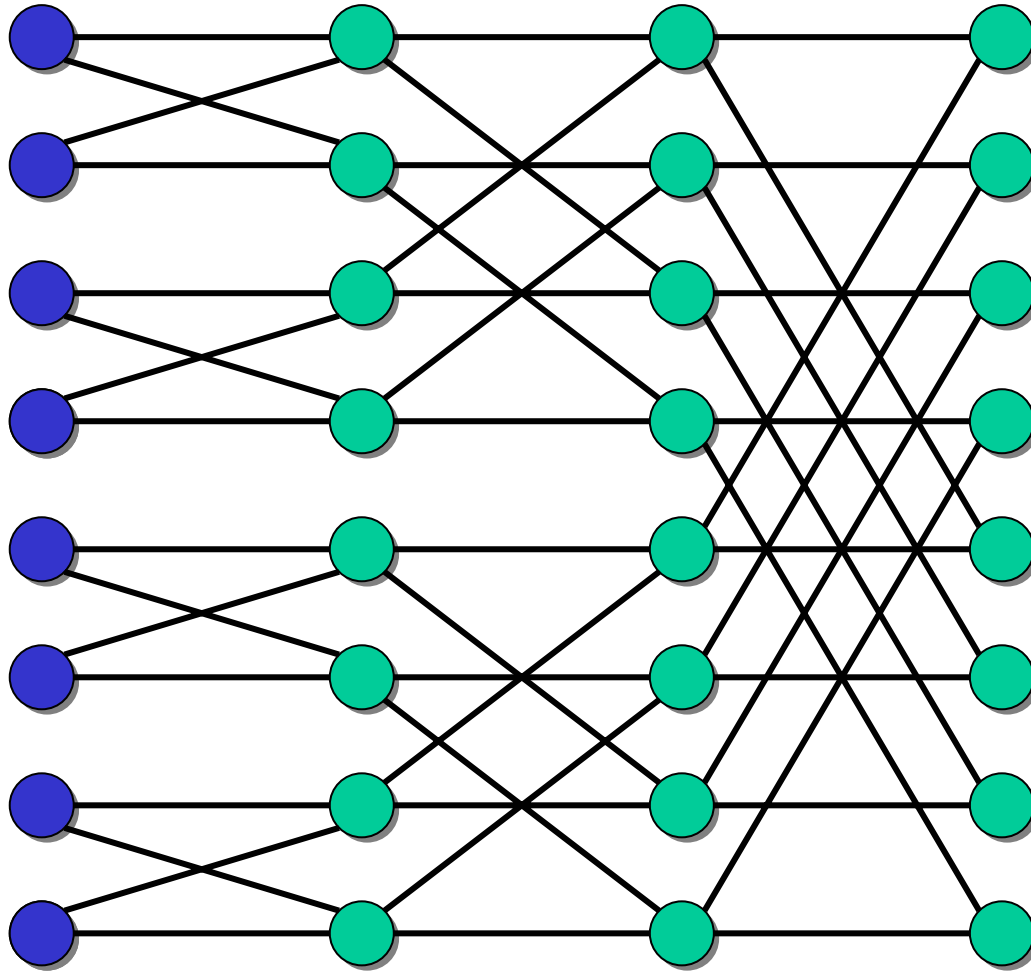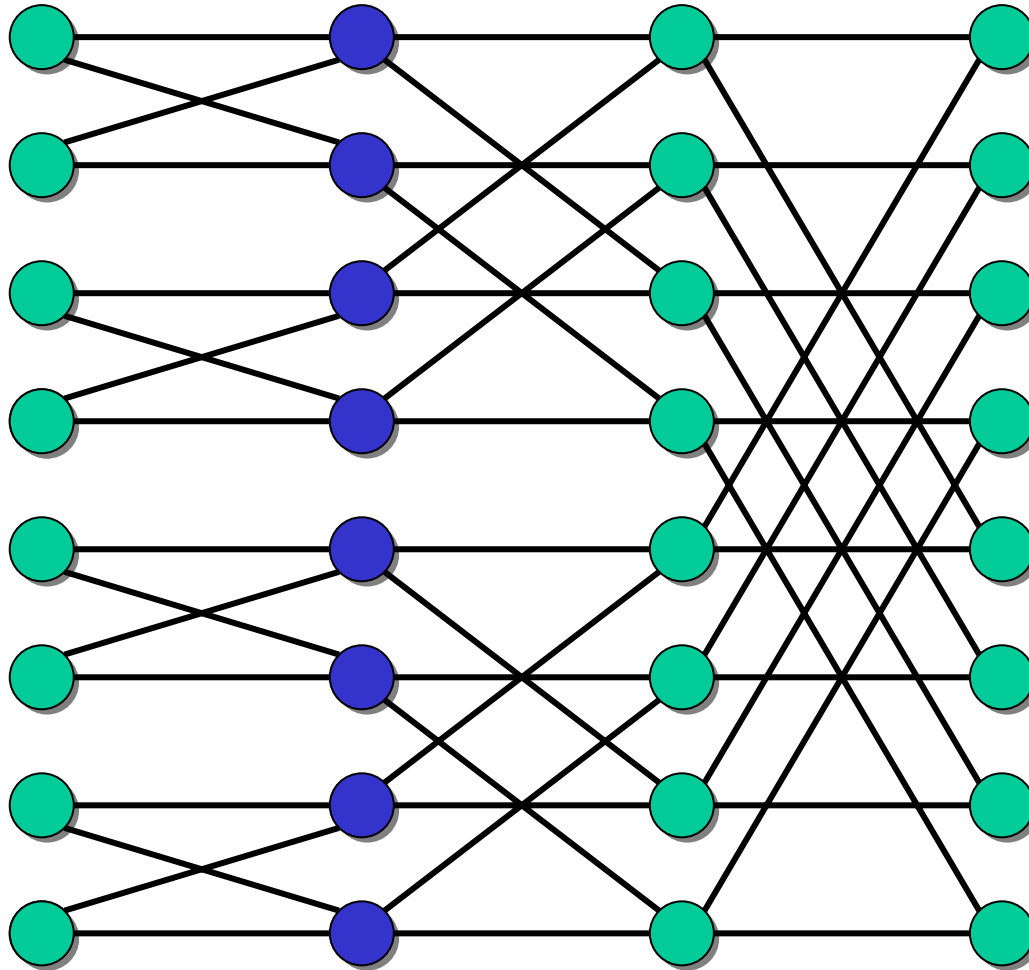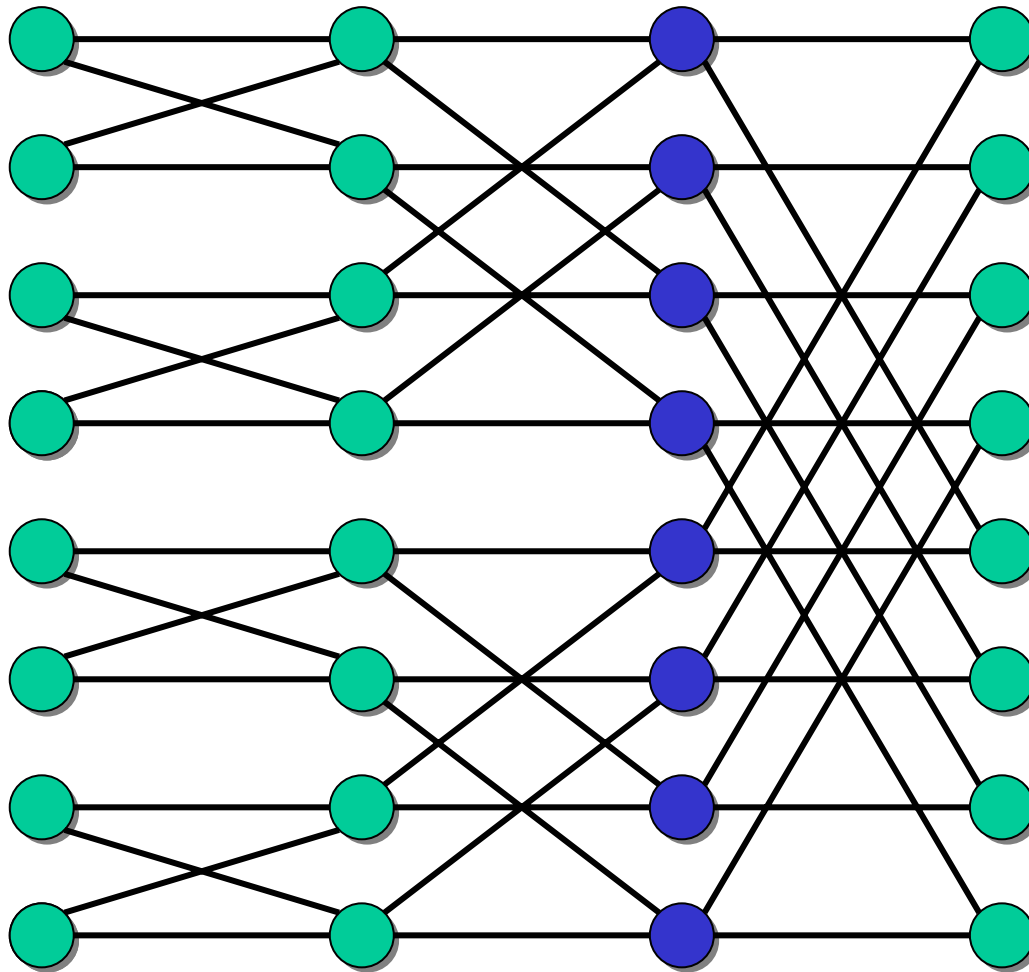
Bitonic Sort on Butterfly

Bitonic Sort on Butterfly

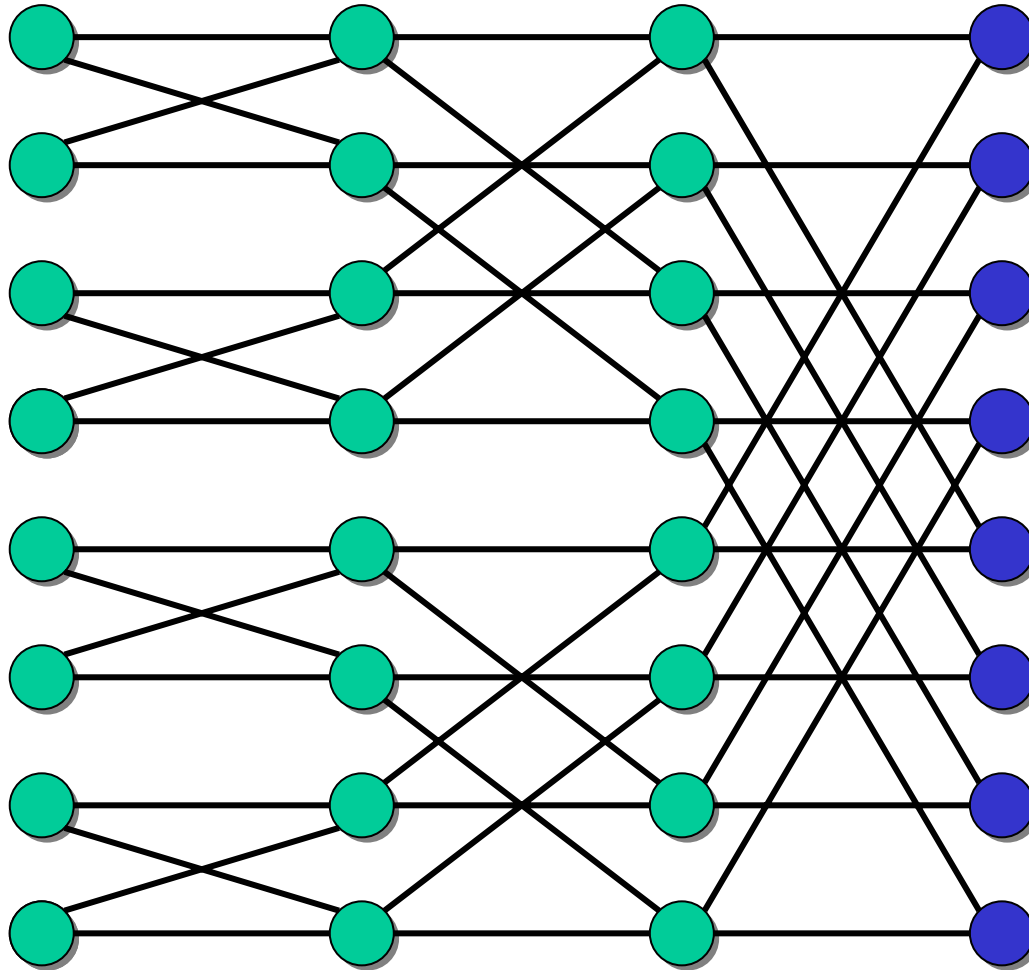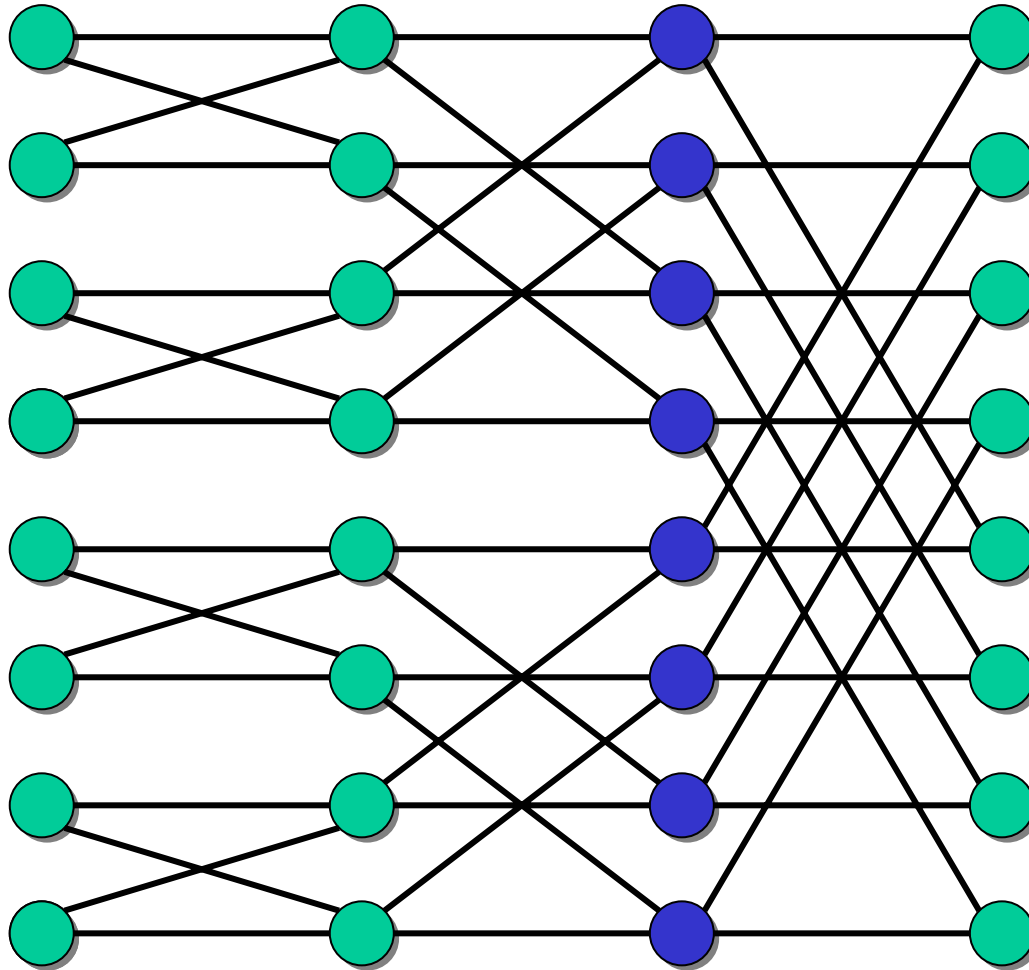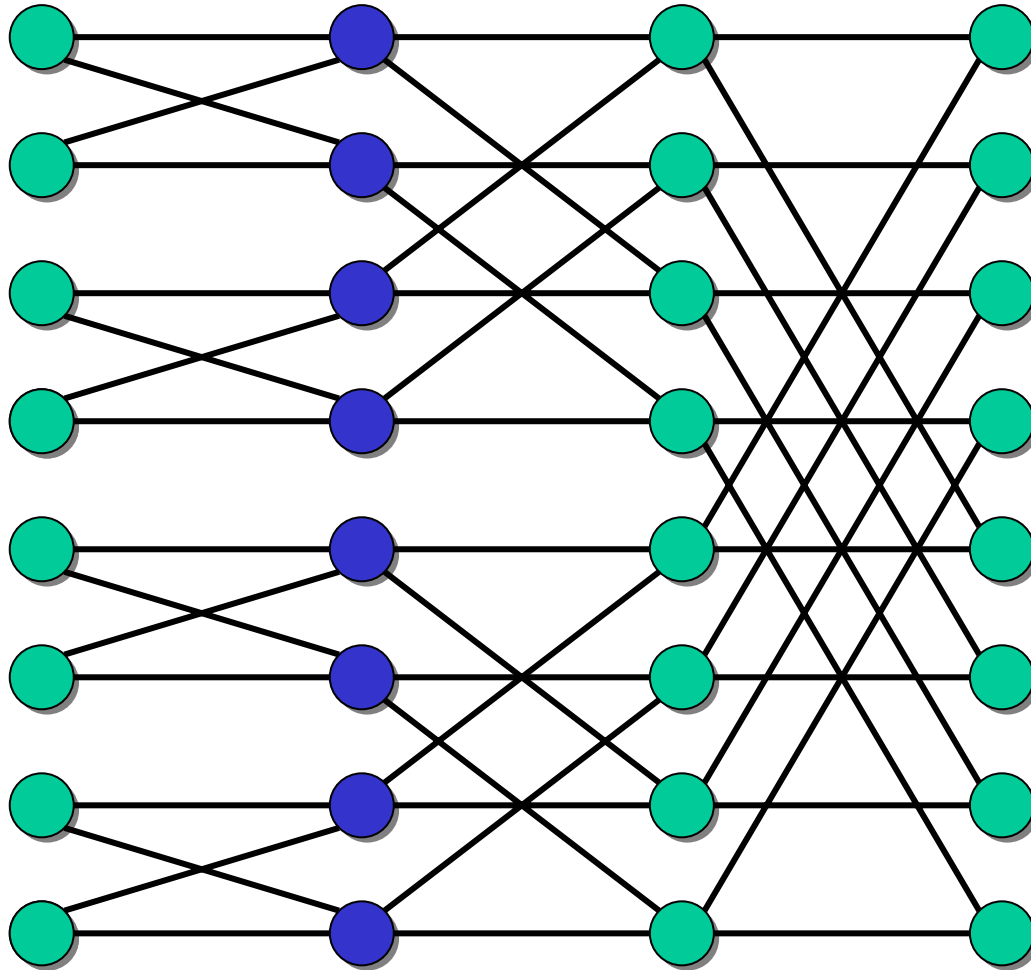# Bitonic Sort on Butterfly

Bitonic Sort on Butterfly

Bitonic Sort on Butterfly

Bitonic Sort on Butterfly

Bitonic Sort on Butterfly