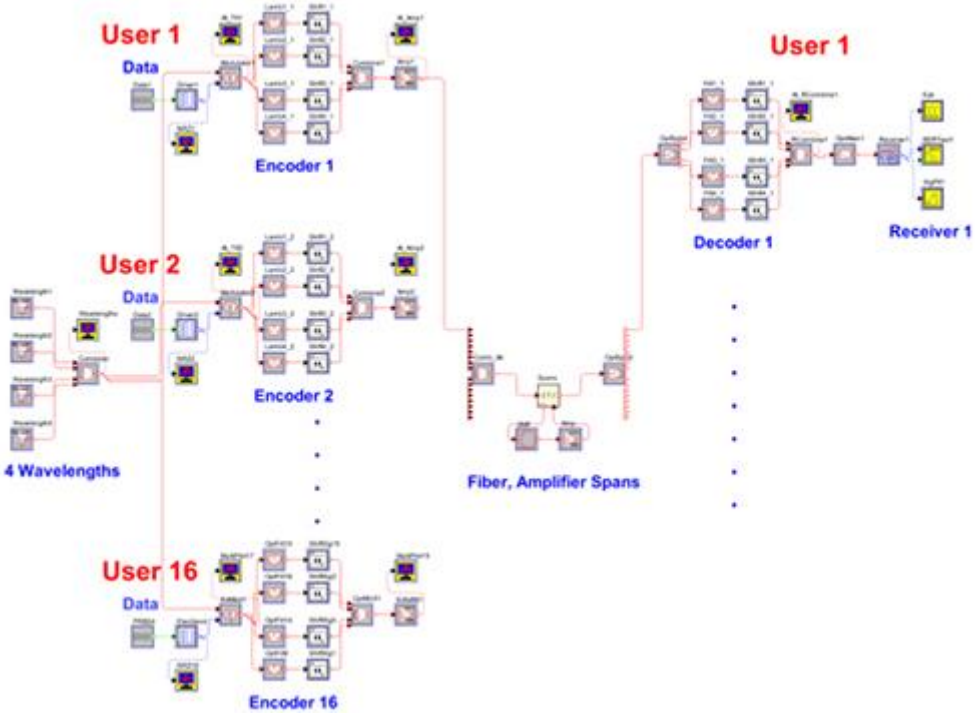
Optical Code Division Multiple Access (OCDMA) Link with Encoding/Decoding Based on Pseudo-Orthogonal Code

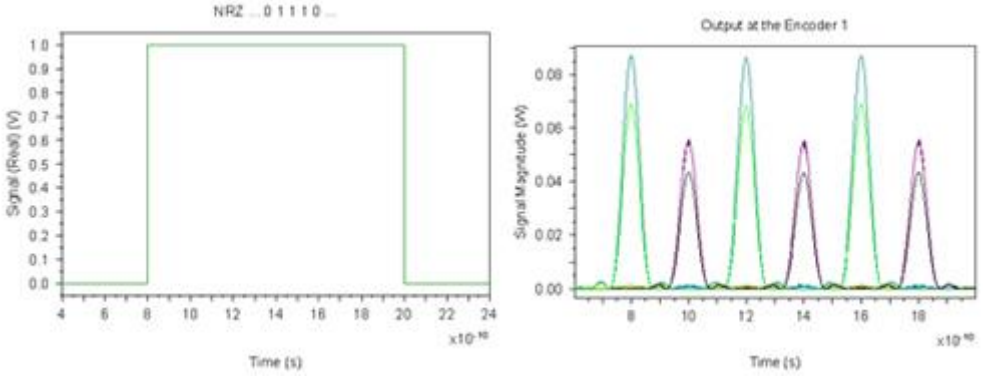
Tools Used: OptSim

Data access security and ability to support asynchronous, bursty data transmission are two of the main driving forces behind a lot of interest in the OCDMA techniques. On the other hand, the poor spectral efficiency of OCDMA systems demand appropriate choice of coding techniques and multi-access interference (MAI) is often a limiting factor.

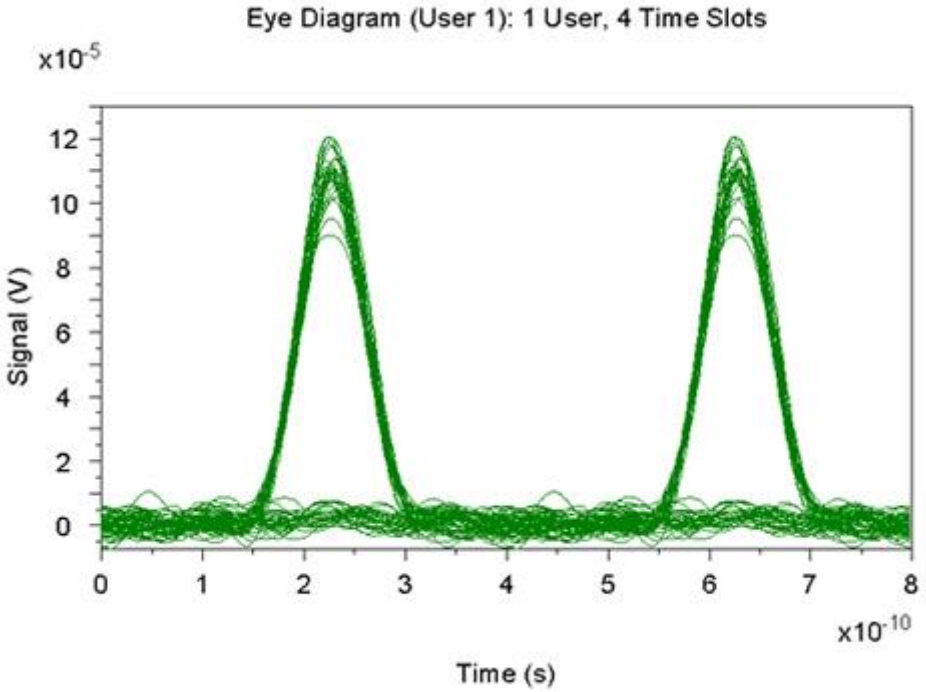
This example illustrates an OCDMA design with a commonly used tree network topology layout as shown below:

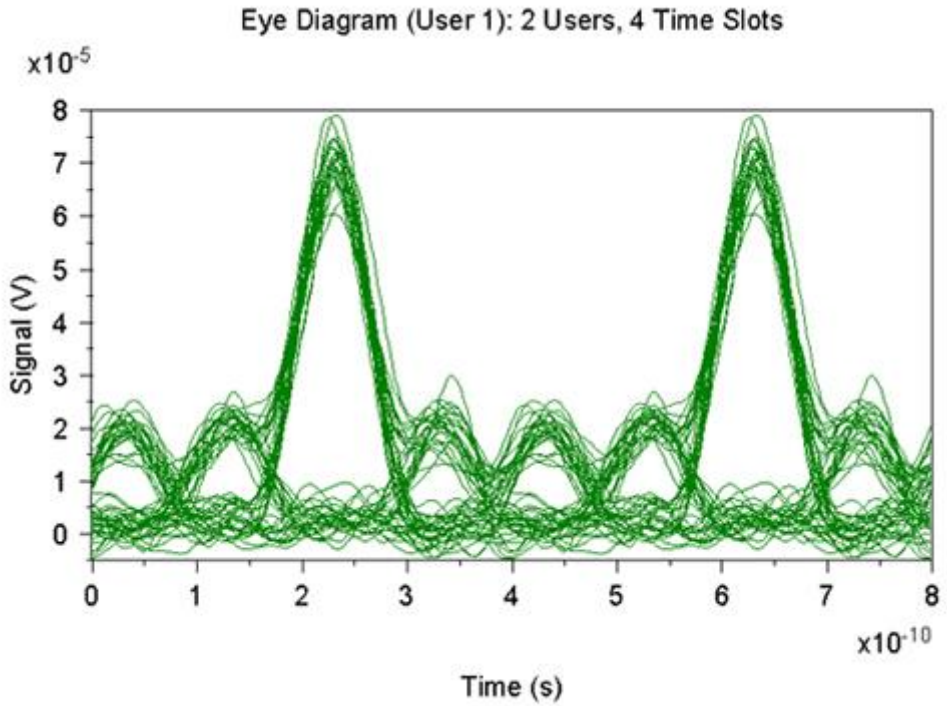


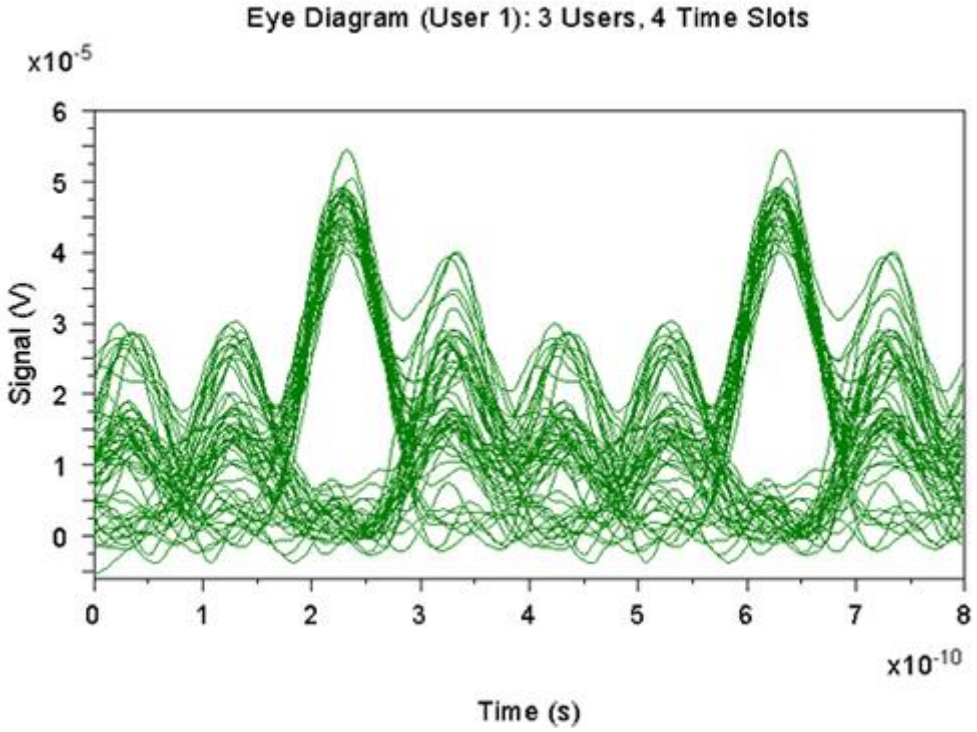
The figure below shows several of the NRZ data bits and corresponding encoder output bits with User 1 signature:



One can clearly see both visually and quantitatively the performance degradation in the presence of multiple users due to MAI. As a further exercise, the reader may add more Users at encoding/decoding sides and observe more eye diagrams and their degradation in presence of MAI.






Eye Diagram (User 1): 3 Users, 4 Time Slots
x10-5
6
5
4
3
2
1
0
Signal (V)
0
1
2
3
4
5
6
7
8
x10-10
Time (s)