

Designing Reliable FSO Networks – Summary

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(a) Metro hybrid mesh network for 5G backhaul: FSO is a great candidate for metro mesh networking, particularly for mobile backhaul, but its reliability is a major concern. The attenuation of FSO links increases drastically in adverse weather conditions and link distances are reduced to a few tens of meters. This makes the network connectivity vary with weather. There are several elements that can be utilized to handle this reduced network connectivity. First, weather can be accurately predicted for the relatively near future (30 minutes to an hour) over areas and distances that are of interest in FSO networks (up to a few km), making it easier to pre-plan for link outages. Second, FSO transceivers can be reconfigured in much shorter time scales (ms to seconds) compared to the prediction time windows (minutes to hours), thus making it possible to reconfigure the network topology to mitigate the effects of link outages due to weather. Relevant research questions are: (a) how can we integrate weather prediction in the network topology reconfiguration process? (b) what is the optimal topology for satisfying a given traffic demand? (c) If an RF/FSO hybrid is used, how do we manage the hybrid network?

(b) FSO for HAP: High-altitude platforms (HAPs) using balloons and UAVs are being experimented with for several applications including Internet access for remote areas. FSO is a potential candidate for connectivity between such nodes. Sustained FSO connectivity under mobility is a challenge. This requires improved PAT and multi-connectedness in order to maintain network connectivity in the face of uncertainty. Note that the uncertainty is due to movements of nodes rather than weather at such high altitudes.