In the talk I will discuss self-adjoint Laplace operators on partitions of Euclidean spaces into finite number of bounded and unbounded Lipschitz domains. The problem becomes interesting when we pose local boundary conditions which connect neighboring domains in the partition. Spectral properties of the corresponding self-adjoint Laplacians turn out to be related to different combinatorial properties of the partition such as the number of colors sufficient to color all the domains in a way that neighboring domains have distinct colors or some path lengths in the corresponding graph of neighborhoods. This talk is based on the joint work with Jussi Behrndt and Pavel Exner.