# Passive scattering systems

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There is an extensive literatur on a class of linear time-invariant dynamical systems called "well-posed scattering passive systems". Such a system is generated by an operator $S$ which is called a scattering passive system node. In the existing literature such a node is typically introduced by first giving a long list of assumptions which imply that $S$ is a system node, and then adding an inequality which forces this system node to be scattering passive. Here we proceed in the opposite direction: we start by requiring that $S$ satisfies the appropriate inequality, and then ask the question of what additional conditions are needed in order for $S$ to be a system node. The answer is surprisingly simple: A necessary and sufficient condition for an operator $S$ to be a scattering passive system node is that $S$ is closed and maximal within the class of operators that satisfy the appropriate passivity inequality. In the absense of external inputs and outputs this condition is identical to the standard condition which characterizes the class of operators which generate contraction semigroups on some Hilbert space.