Navigable overlay networks

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Overlay networks are (logical) networks built upon physical ones to support various kinds of applications (data retrieval, routing, etc.) and infrastructures (peer-to-peer, publish/subscribe, etc.). This lecture will focus on navigability in overlay networks, i.e., the ability to construct or discover short paths in overlay networks, in a distributed manner. We will consider both the construction of navigable structured overlay networks, and the way to slightly modifying pre-existing non-structured overlay networks to make them navigable. The lecture will borrow examples from sociology (small world phenomenon) and distributed databases (peer-to-peer file-sharing systems) to illustrate several fundamental metric-related concepts that naturally emerge when studying overlay networks. These concepts include doubling dimension metrics, and graph tree-decomposition, as two complementary approaches enabling a better understanding of navigable networks.