Peer-to-Peer Semantic Integration

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Abstract. Peer-to-Peer computing (P2P) is a model in which each system acts potentially as both client and server, and systems link the one another without resorting on centralized services. Thanks to its generality, flexibility, and scalability, P2P is one of the prominent models in the Web. Endpoint-based Web Services infrastructures, for instance, reflect a P2P nature. Popular P2P systems are generally limited to the management of simple objects whose description is based on few facets directly encoded in the objects' identifier. This inhibits the development of systems that require data to be described by complex semantic characterizations. Advanced data oriented P2P integration systems have been recently proposed to overcome these limitations, mostly based on Semantic Web standards and shared ontologies. As the complexity of the universe of discourse grows, however, P2P models raise a number of non trivial issues. The notion of? sharing an ontology? in 'loosely coupled' environments, for instance, should be carefully considered in the light of the basic observation that the actual interpretation of ontology predicates (i.e. the semantics) dwells in the shadow of providers? implementation. Moreover, there are contexts in which global conceptual models are not given at all, and the integration logics results in a Web of P2P conceptual mappings. Issues like these lead to the need of giving P2P information integration a suitable formal semantics. We will see how the classic data integration approach that consists in creating a unique database out of a set of information sources turns out to be quite inadequate. Then, we will present the general idea of an epistemic semantics that allows thinking at P2P integration in terms of knowledge and beliefs of a set of cooperative - and yet independent? agents who access a set of possible worlds. Finally, we will discuss some deep implication of this idea and outline research directions.