

Abstract Submitted  
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**Utilizing Maximal Independent Sets as Dominating Sets in Scale-Free Networks**<sup>1</sup> N. DERZSY, Rensselaer Polytechnic Institute, F. MOLNAR JR., Northwestern University, B. K. SZYMANSKI, G. KORNISS, Rensselaer Polytechnic Institute — Dominating sets provide key solution to various critical problems in networked systems, such as detecting, monitoring, or controlling the behavior of nodes. Motivated by graph theory literature [Erdos, *Israel J. Math.* **4**, 233 (1966)], we studied *maximal independent sets* (MIS) as dominating sets in scale-free networks. We investigated the scaling behavior of the size of MIS in artificial scale-free networks with respect to multiple topological properties (size, average degree, power-law exponent, assortativity), evaluated its resilience to network damage resulting from random failure or targeted attack [Molnar et al., *Sci. Rep.* **5**, 8321 (2015)], and compared its efficiency to previously proposed dominating set selection strategies. We showed that, despite its small set size, MIS provides very high resilience against network damage. Using extensive numerical analysis on both synthetic and real-world (social, biological, technological) network samples, we demonstrate that our method effectively satisfies four essential requirements of dominating sets for their practical applicability on large-scale real-world systems: 1.) small set size, 2.) minimal network information required for their construction scheme, 3.) fast and easy computational implementation, and 4.) resiliency to network damage.

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