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AN APPROACH TO MODEL COMPLEX INTERDEPENDENT INFRASTRUCTURES

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Abstract: Developed countries rely on many infrastructures as energy transportation, water supply, telecommunication, etc., which are more and more mutually dependent. This phenomenon represents a new and very dangerous vulnerability: an accidental or malicious (e.g., terroristic attack) fault could spread across, amplifying its negative consequences. This imposes to develop methodologies and tools to support decision makers and infrastructures' stakeholders in the analysis of these new scenarios, and in defining suitable protection strategies. To this end, in this paper, we propose an approach to model interdependent infrastructures which, on the bases of mostly qualitative information, is able to set up a (rather sophisticated) simulator. *Copyright ©2005 IFAC*

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1. INTRODUCTION

The welfare of large segments of population depends in developed countries on many technological infrastructures as energy distribution, telecommunications, water supply networks, transportation, etc. (Dunn, 2004; U.S., 2003*a*)

In the very last years, for a lot of economical, social, political and technological reasons, we observed a rapid change in their organizational, operational and technical structures. Among other reasons, this transformation is due to the wide spread of ICT technologies and brought to an increased level of interdependency.

Unfortunately this phenomenon represents a new and very dangerous vulnerability. Indeed, due to the presence of coupling among the different infrastructures, an accidental or malicious failure in one of them may easily spread across, amplifying its negative consequences, and affecting remote (from geographical and/or logical point of view) users. As an example, in 1998 the failure of the telecommunication satellite Galaxy IV produced, beyond several problems in telecommunication and air transportation (due to absence of high-altitude weather reports), also difficulties on the highway: drivers could not perform refuel because gas-stations lost the capability to process credit cards (Rosenbush, 1998).

Other examples about negative effects of interdependencies can be discovered analysing consequences of blackouts occurred in 2003. Specifically, in Italy on Sept. 27th there was a considerable delay in power recovery caused by the cascade failure of the telecommunication systems: SCADA

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