Virtual Infrastructure:

Putting Information Infrastructure on the Technology Curve

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Introduction

The present debate concerning the National Information Infrastructure (NII)[1] has focused primarily on the introduction of competitive markets for the supply and distribution of information. Although competition will be an important component of the NII, and one which we welcome, we argue that it is inappropriate to frame the debate entirely in terms of competition. Competition can be seen as a consequence of a fundamental development driving technical and economic innovation within the information industries; namely, the adoption of the digital paradigm.

The digital representation and transmission of information enables competition within the infrastructure. For example, competition within the US long distance telephone network is facilitated by software-controlled digital switches and cross-connect facilities. Competition has, in turn, accelerated the development of digital technology, thereby powering the present technology curve, the "perpetual engine" of the information age. However, digitization offers opportunities for innovation that go beyond competition. We hypothesize that the second, and more sweeping, wave of the digital revolution will emanate from the *virtualization* of the infrastructure. By a Virtual Infrastructure (VI), we mean the adoption of a software perspective that embraces a much more dynamic and heterogeneous approach to the representation of information, the configuration of hardware and software systems that process it, and the binding of resources to its processing and distribution.

In this paper, we offer a vision of what it would mean for the National Information Infrastructure to be a Virtual Infrastructure that takes full advantage of the digital paradigm. We begin by examining various distribution infrastructures – including traditional infrastructures for utilities and packaged goods as well as information. We point out differences among the commodities that these infrastructures are distributing, as well as differences among the infrastructures themselves.

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[1] The debate was *officially* launched with the publication of [1].

We present a taxonomy of distribution models that could emerge for the National Information Infrastructure and describe the model we believe is the natural outcome. This model is substantially different from the "convergence model" that has been popularized by many NII pundits. In our model, the infrastructure is not