Foreword

New telecommunications and information technologies are making it possible *for the first time* to create large-scale, distributed infrastructure that tightly and dynamically integrates multiple resources – *in real time*. Such distributed fabrics will be used to create multiple new types of communication services with enhanced capabilities that far exceed those commonly used in the world today and, perhaps more importantly, enable the creation of powerful new applications.

Already, early prototypes of these capabilities are transforming science and engineering, enabling studies across space and timescales far beyond what has been possible and what is still common today: These prototypes are enabling integration not only among observational, experimental, and computational methodologies in a given discipline, but also among different environments such as the seafloor, land mass, and the atmosphere. They are making possible sharply vivid collaborative environments that transcend traditional visual communication modes, allowing for realistic remote presence in which virtual collaborators appear almost as true to life, as if they were physically present in the room.

These powerful applications are destined to migrate quickly from the realms of early adopters to wider communities. Perhaps the ultimate "application" these technologies will support is "borderless collaboration" among multiple countries, ethnic cultures, languages, and disciplines to address increasingly complex problems facing the world, a scenario which, in turn, has the potential of leading to greater global understanding and harmony.

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