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Cyberinfrastructure for the US NSF Ocean Observatories Initiative

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The Internet today is vastly different than the Internet that we knew even five years ago and the changes that will be evident five years from now, when the NSF Ocean Observatories Initiative (OOI) prototype has been installed, are nearly unpredictable. Much of this progress is based on the exponential growth in capabilities of consumer electronics and information technology; the reality of this exponential behavior is rarely appreciated. For example, the number of transistors on a square cm of silicon will continue to double every 18 months, the density of disk storage will double every year, and network bandwidth will double every eight months. Today's desktop 2TB RAID will be 64TB and the 10Gbps Regional Scale Network fiber optical connection will be running at 1.8Tbps. The same exponential behavior characterizes the future of genome sequencing. The first two sequences of composites of individuals' genes cost tens of millions of dollars in 2001. Dr. Craig Venter last year published a more accurate complete human genome (his own) at a cost on the order of $100,000. The J. Craig Venter Institute has provided support for the X Prize for Genomics offering $10M to the first successful sequencing of a human genome for $1,000. Major advances in technology that are broadly viewed as disruptive or revolutionary rather than evolutionary will often depend upon the exploitation of exponential expansions in capability. Applications of these ideas to the OOI will be discussed. Specifically, the agile ability to scale cyberinfrastructure commensurate with the exponential growth of sensors, networks

and computational capability and demand will be described.