**Project Summary** for NSF Information Technology Research (ITR) Program
(Information Technology Education and Workforce, and Information Management areas)

# Computer Science Curriculum and the Next Generation of Education Technologies

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Rapid advances in computer technology require computer science curriculum changes that best prepare students for jobs in business, academia and government. These advances further allow new types of interactive courseware, new learning environments and new business models for educational infrastructure. This proposal weaves these themes together and will develop prototype undergraduate computer science curriculum combined with research and development in the distance and distributed learning environments that could be deployed within the next few years. Our focus is on the particular needs of Historically Black Colleges and Universities (HBCU). We will research architectures that allow modular courseware that integrates different authors and different authoring strategies. Further we assume that learning environments should allow integration of capabilities from multiple academic and commercial sources.

The major components of the project will be

- Development of interactive computer science courseware exploiting the best educational technologies and preparing tomorrow's undergraduates for careers involving computers. This courseware will be integrated into course sequences appropriate for outside use.
- Research in and prototype development of a next generation learning environment exploiting the best academic and commercial ideas in both the education specific and general information areas. This environment will support synchronous, asynchronous and interactive learning models.
- Delivery of the new courses with teachers from the participating universities and a broad-based student body.
- Assessment and evaluation of both the new curriculum material and the information technology used to prepare and deliver it.

A major result will be a networked Computer Science courseware delivery system. This courseware presented over the Internet will supplement on-campus CS curricula at HBCU's with both CS courses from other HBCU's and major CS departments around the country. It will also enable HBCU's to offer, via the Internet, courses in their own universities, which are developed at other universities. This infrastructure will build on experience gained over the last three years from teaching several regular semester Syracuse CS courses at Jackson State (an HBCU) over the Internet. Jackson State now is using this delivery technology to teach their own CS courses at Morgan State. This effort is having a significant effect on the pipeline of minority CS graduates, enhancing the quality of their education and also serving to increase the attraction of a computer science career. We have already shown the potential to be expected from enlarged effort across all the HBCUs, as well as the rewards from involving CS faculty at HBCUs both in the use and enhancement of the underlying information technology. We will enhance this activity by integrating the Florida State distance education CS curriculum into it and adding another HBCU, namely Florida A & M University.

The technology approach will be built around the concept of a collaborative portal with shared events supported in both synchronous and asynchronous mode. We will develop a new system using ideas and components from previous commercial and academic systems such as Syracuse's synchronous TangoInteractive system developed over the last two years. We will also exploit Florida State's experience using the commercial Blackboard technology and a recent evaluation of current practice from Mississippi State. We will use a distributed object framework such as Ninja from UCB or E-Speak from Hewlett-Packard and systematic use of XML metadata conforming to community standards as they are developed. A key requirement and major research issue will the ability to support course modules and tools from multiple sources interoperating with common services and interfaces.