

FORCORE: FORTIFYING CYBERINFRASTRUCTURE OPERATIONS FOR RESEARCH AND EDUCATION AT B-CU

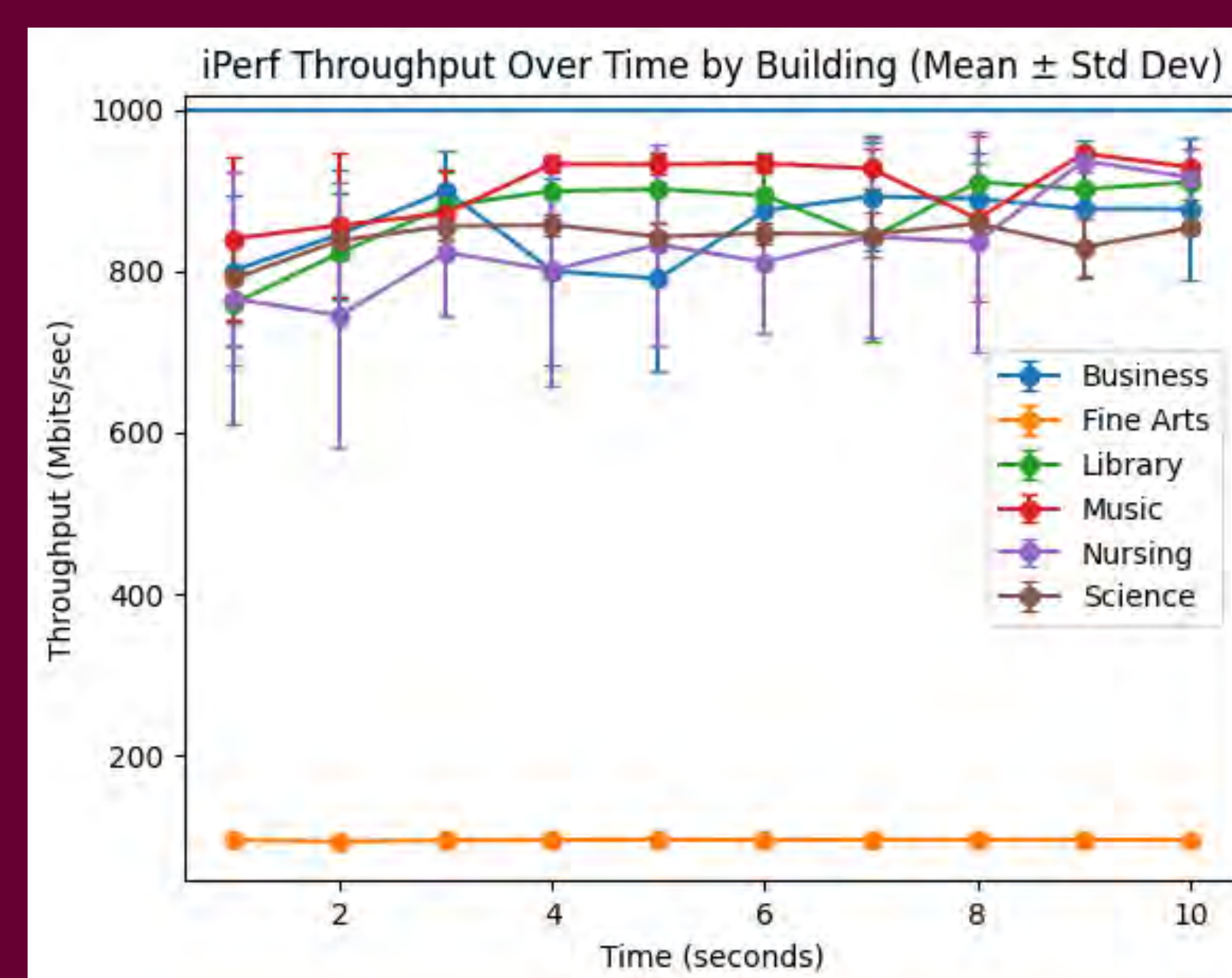
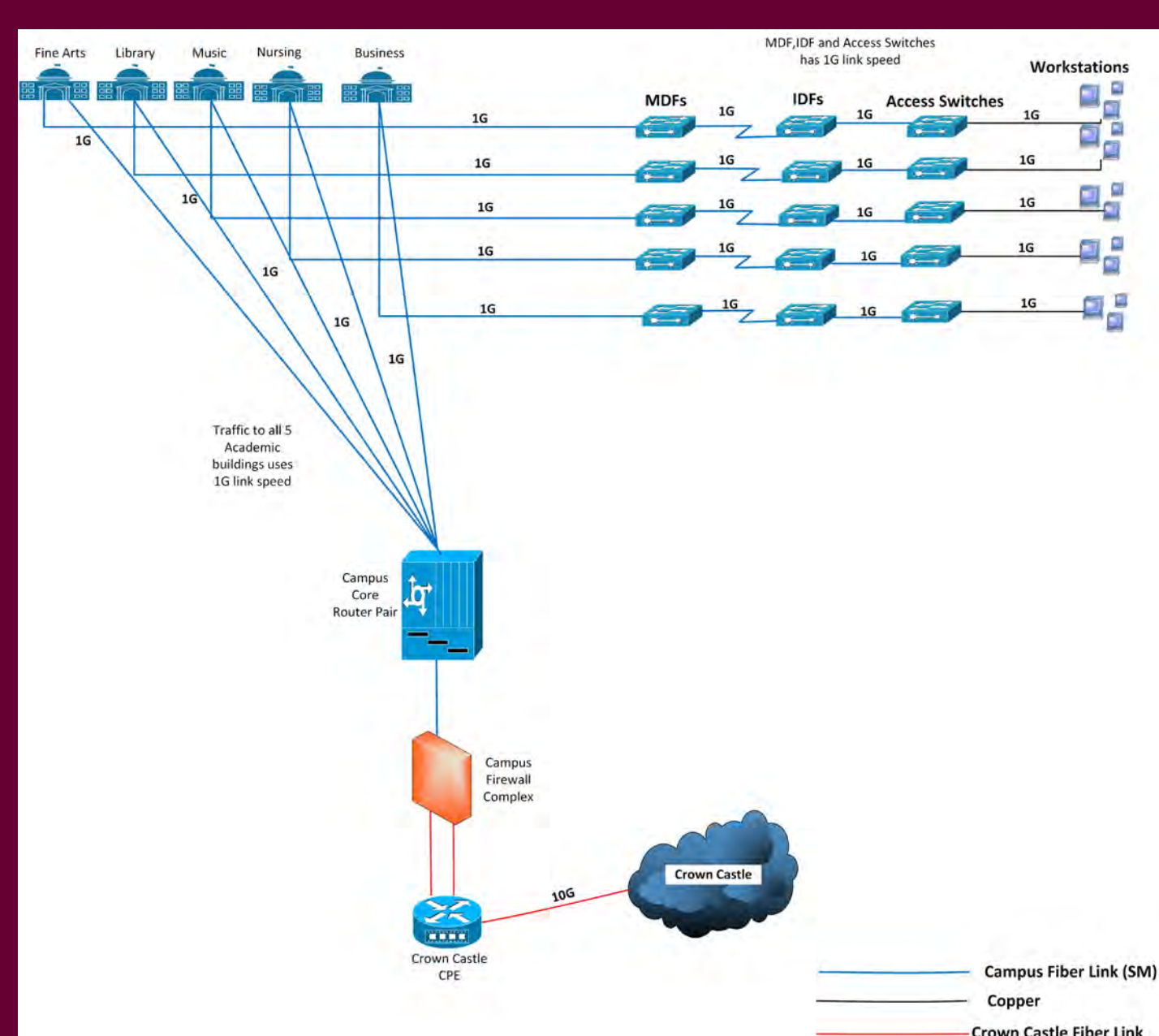


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INTRODUCTION: The FORCORE (FORTIFYING CYBERINFRASTRUCTURE OPERATIONS FOR RESEARCH AND EDUCATION) project aims to transform Bethune-Cookman University's cyberinfrastructure by addressing critical performance bottlenecks and establishing a secure, high-performance, and research-enabled network environment. Baseline iPerf testing reveals significant variability across campus, with throughput ranging from approximately 100 Mbps in legacy environments to near 1 Gbps in partially upgraded buildings, highlighting the need for a comprehensive modernization effort. To address these challenges, FORCORE will standardize network performance to ≥ 1 Gbps at the edge while deploying a 10 Gbps backbone by September 2026. This upgrade will be coupled with the implementation of AI-driven, behavior-based cybersecurity systems that enable real-time threat detection, adaptive response, and continuous monitoring.

Beyond infrastructure improvement, the project establishes a **cybersecurity research platform**, transforming the campus network into a live testbed for studying the interaction between high-speed data transfer and advanced security models. This environment will support research on detection accuracy, automated response, and the impact of adaptive security on performance in 1–10 Gbps environments. By integrating high-performance networking with advanced cybersecurity, ForCORE will enhance research capacity, enable data-intensive collaboration, improve student learning experiences, and position B-CU as a model for scalable, secure cyberinfrastructure at HBCUs and other under-resourced institutions.



DATA: Current network performance varies significantly across buildings, with measured throughput ranging from ~ 100 Mbps in legacy infrastructure to ~ 900 Mbps in partially upgraded environments. While the nominal network capacity is 1 Gbps, these results demonstrate inconsistent performance and clear bottlenecks.

The ForCORE project will standardize performance to meet or exceed the 1 Gbps baseline across all buildings and transition to a 10 Gbps backbone by September 2026, enabling high-speed, data-intensive research and collaboration.

EVALUATION AND DEMONSTRATION PLANS

- **STANDARDIZE NETWORK PERFORMANCE to ≥ 1 Gbps across five academic buildings**, eliminating current bottlenecks identified in baseline iPerf testing (e.g., ~ 100 Mbps performance in legacy infrastructure).
- **DEPLOY AND VALIDATE A 10 GBPS CAMPUS BACKBONE** by September 2026, enabling high-speed, data-intensive research and collaboration.
- **DEMONSTRATE MEASURABLE IMPROVEMENTS IN NETWORK PERFORMANCE RELATIVE TO BASELINE**, INCLUDING:
 - Increased throughput and reduced congestion
 - Reduced latency
 - Decreased variability in performance over time
- **QUANTIFY PERFORMANCE GAINS IN PREVIOUSLY CONSTRAINED ENVIRONMENTS**, INCLUDING order-of-magnitude improvements (e.g., $\geq 10\times$ increase in Fine Arts building throughput).
- **REDUCE MEAN TIME TO DETECT (MTTD) AND RESPOND (MTTR) to cybersecurity incidents** through AI-driven, behavior-based monitoring.
- **EVALUATE EFFECTIVENESS OF AI-DRIVEN CYBERSECURITY SYSTEMS**, INCLUDING:
 - Detection accuracy and response time
 - Number of automated threat responses (alerts triaged, quarantines applied, unauthorized devices contained)
 - Impact of adaptive security on network performance (ensuring minimal disruption to high-speed workflows)
- **IMPROVE USER EXPERIENCE**, as measured by faculty and student satisfaction with network reliability and security usability.
- **INCREASE RESEARCH CAPACITY AND COLLABORATION**, including growth in the number, scale, and data intensity of external research partnerships leveraging B-CU's upgraded infrastructure.

RISKS

- **INTEGRATION WITH LEGACY INFRASTRUCTURE:** Transitioning from mixed 100 Mbps / 1 Gbps environments to a standardized ≥ 1 Gbps edge with a 10 Gbps backbone may present compatibility challenges during phased upgrades.
- **TEMPORARY SERVICE DISRUPTIONS:** Network upgrades and equipment replacements may result in short-term interruptions to campus connectivity.
- **CYBERSECURITY SYSTEM COMPLEXITY:** Implementing AI-driven, behavior-based security systems requires continuous tuning to maintain detection accuracy while minimizing false positives.
- **Change management and adoption:** Effective use of new systems will require training and support for faculty, staff, and students.

POTENTIAL FOR ADVANCES

- **TRANSFORMATIONAL INFRASTRUCTURE:** Eliminates identified bottlenecks (e.g., ~ 100 Mbps constraints) and establishes consistent ≥ 1 Gbps performance at the edge with a 10 Gbps backbone, enabling high-speed, data-intensive research.
- **CYBERSECURITY RESEARCH PLATFORM:** Establishes a real-world, high-performance testbed for AI-driven, behavior-based cybersecurity, enabling research on threat detection, adaptive security models, and the interaction between security and network performance in 1–10 Gbps environments.
- **RESEARCH ENABLEMENT:** Supports advanced, data-intensive research across disciplines such as public health, climate science, and artificial intelligence through reliable, high-performance, and secure connectivity.
- **INSTITUTIONAL IMPACT:** Enhances competitiveness for external funding, strengthens faculty recruitment and retention, and prepares students for technology-driven careers.
- **RESILIENCE AND CONTINUITY:** Improves disaster recovery and network reliability, ensuring continuity of research and operations during hurricanes and other disruptions.
- **SCALABILITY AND BROADER IMPACT:** Provides a replicable model for cyberinfrastructure modernization at HBCUs and under-resourced institutions, expanding participation in national research ecosystems.

