

FutureFLEX Powered Touchdown

*Why did the Arizona Cardinals choose
Air-Blown Fiber as Their Fiber Optic Infrastructure &
Support System for Their Wireless Platform and
Cisco Unified Communications Network?*

University of Phoenix Stadium... Home of the Arizona Cardinals





University of Phoenix Stadium... Home of the Arizona Cardinals

FAST FACTS

- **Ranked Among World's 10 Most Impressive Sports Structures by Business Week**
— the ONLY Building in the U.S to Earn that Distinction
- **Host Stadium for the 2008 Super Bowl**
- **Six-levels, 1.7 Million Square Feet, with 160,000 Feet of Exhibit Space & 20,000 Feet of Meeting Room Space**
- **Includes Wireless Internet & Network Access at Every Seat for Fans... Enabling Fantasy Football, Food & Beverage Orders, Ticket Purchases, and more**



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University of Phoenix Stadium... Home of the Arizona Cardinals

FAST FACTS cont.

- **Seamless Voice, Data & Video for Cardinal Team Member Communications and Real-Time Simultaneous Training Sessions for Both the Stadium & Training Facility**
- **Renowned Retractable Roof**
- **North America's 1st and Only Removable Field, Placed on a 12 Million lb. Tray**
- **Prototype of a Ready-for-Anything, Next Generation Network — Utilizing Technologies Affordable and Easily Implemented into Any Enterprise Network**



The Hurry-Up Offense:



Setting the Network Goals

- **Expandability & Scalability**
- **Flexibility**
- **Security**
- **Revenue-Centric**

- **To Create an Open & Fluid Network That is Ready to Immediately Respond to the Needs of the Cardinals, Employees, Customers, and Fans**
- **The Development of a LAN That is Prepared to Immediately Adopt Emerging Higher-Bandwidth Technologies — IP Video, Cisco TelePresence**
- **Creation of a Network That Proactively Generates Positive ROI & Revenue VS a Reactive Cost Center**



The “Hurry-Up” Network Model

FutureFLEX Air-blown Fiber + Cisco Unified Communications =

- **Immediate Scalability**
- **Immediate Flexibility**
- **Reliable Security**
- **Continuous ROI**



The Scalable “Hurry-Up” Network

FutureFLEX Air-blown Fiber + Cisco Unified Communications

- When Choosing the Cisco Converged IP Network, consideration was given to the highly scalable Unified Cisco Call Manager software, which supports up to 30,000 lines per server and the expandability inherent in the Cisco unity server architecture
- The challenge was to develop a network backbone and structured cabling infrastructure that could quickly and easily accommodate the scalability and flexibility of the stadium’s Cisco software, Cisco IP architecture, the electronics, and wireless platform.



The Cisco Triple Play...

Cisco Unified IP Architecture:

Seamless Voice, Data, and Video Communications

- Enables Collaboration between the Cardinals Headquarters, Training Facility, and Stadium for Video Conferencing Data, Game Film, and Materials — integrating communications more closely with processes
- Engages Fans with Cisco IP Phones with Touch-screen LCDs for Fantasy Football and Internet Interaction for Purchasing Tickets and More for a Technology-enabled Fun Experience
- Unified Mobility for Viewing Calls, Data, and Email Anytime on Either a Wired or Wireless Platform — adding flexibility for the exchange of information
- Call-management and Call-center Software to Ensure Customer Satisfaction
- Totally Secure Converged IP Network



The Cisco Triple Play...

The IP Requirements for All the Stadium's Building Systems are Supported by the Converged FutureFLEX Air-blown Fiber Network Backbone...



Providing the Team with Backbone



Cisco CEO John Chambers is Betting There will be a 200% Increase in Network Load over the Next 2 Years” ... Real-Time Video

(Bandwidth for Video over IP May Skyrocket, Search Networking.com, June 27, 2006)

- **As New Bandwidth-rich Applications Get Deployed, They are Pushing the Limits of Data Transmission on the LAN, Making the Physical Layer an Increasingly Important Part of Network Integrity**
- **Since the Backbone & Structured Cabling are Often the Cause of Future Bottlenecks in the Implementation of New & Better Technologies and Swift Provisioning of IT Projects, Traditional Structured Cabling Can Hinder the Development of Next Generation Networks (NGNs)**



Providing the Team with Backbone cont.



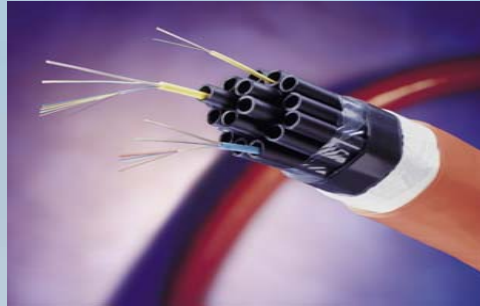
Upgrades, Network Reconfigurations, and Expansions by Conventional Means Just Weren't Fast Enough or Cost Effective Enough for the Most Efficient, Flexible, and Scalable Network Envisioned for the Stadium

- To Support the Scalability in the Transport, Presentation, and Application Layers, it is Crucial that the Physical Layer be Equally and Immediately Scalable to Support Quickly, Easily, and Cost Effectively the Implementation of these Bandwidth-Rich Technologies
- Conventional Backbone & Structured Cabling Costs (Dark Fiber and Labor-Intensive Installation) are High for Network Expansions, Adds, Moves, and Changes, thereby Inhibiting ROI and Promoting a Reactive Cost Center for IT Rather Than a Revenue-Generating Entity.



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The Flexibility & Scalability of Air-blown Fiber



Unlike Conventional Fiber Optic Infrastructures, Air-blown Fiber...

- Eliminates Investment in Dark Fiber & the Need to Forecast Future Network Requirements
- Allows Blowing of Any Type and Count of Fiber Bundles at Speeds of Up to 150 ft. per Minute ---Even in Secure & Hard-to-Reach Areas
- Provides Immediate Control of Network Capacity and Bandwidth Requirements in REAL-TIME for a Bandwidth-Ready, Technology-Ready LAN
 - The Stadium can Literally Install Multimode Fiber Today, Change its Mind, and in Minutes Blow Out the Old and Blow in New Single-mode or 10 Gig Fiber for IMMEDIATE Bandwidth Control



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The Flexibility & Scalability of Air-blown Fiber cont.

Unlike Conventional Fiber Optic Infrastructures, Air-blown Fiber...

- **Eliminates Construction Work and Associated Disruption to the Daily Operations of the Stadium for Network Upgrades, Expansions, and Reconfigurations**
- **Allows Fiber to be Blown Out Undamaged to be Reused in Other Parts of the Network, Saving the Fiber Investment**
- **Facilitates Significant Cost Savings in Time & Labor (Typically over 90%), Generating Incremental ROI with Each Network Upgrade, Expansion, or Reconfiguration Project**
- **Provides Quick & Easy Network Adds, Moves, and Changes in Minutes or Hours Versus Days, Weeks, or Months**
- **Yields Quick Project Turnaround, Maximizing IT Productivity, and Enabling Fast Implementation of the Latest Technologies on the Fly.**



FutureFLEX Air-blown Fiber...No Time Outs

Distributed Antenna System – Example

- **Immediate Need to Get Antenna System Installed**
- **Additional Single-mode Fiber Strands Would be Needed to Connect the Main Telephone Room to Each of the 25 Data Closets where Wireless Equipment would be Installed**
- **If Conventional Fiber Optic Infrastructure was in Place, the Project would Not have been Completed on Time for the August 2006 Kick-off**
- **With FutureFLEX, this took a few days with minimal impact on labor resources instead of the weeks it would have taken with conventional methods and intensive labor requirements**



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FutureFLEX Air-blown Fiber...No Time Outs



Rolling Stones Concert ---

- Last Minute Rolling Stones Requested in a Day's Notice to Have Their 9-Story, 200-foot Steel Stage — taking up 1/3 of the Arizona Cardinals' Home Field — Moved to a Different Location

FutureFLEX provides the speed and flexibility to respond “immediately” to the needs, wants, and demands of customers, vendors, fans, employees, and the Cardinals, which defines... The “Hurry-Up,” Revenue Generating, “Ready-For-Anything Network



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Air-blown Fiber ... *IT Deliverables*

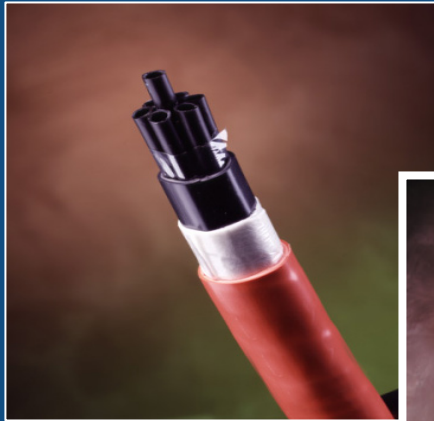
- **Immediate Control of Network Capacity and Bandwidth for True Scalability and Flexibility**
- **Immediate Control of Budget and Project Turnaround by Paying and Planning One Project at a Time — Providing Freedom from Long-term Budget and Future Project Planning**
- **Quick & Easy Network Project Turnaround, Saving Time to Devote to Other IT Network Needs**
- **Fast Restoration and Less Network Downtime**



Air-blown Fiber ... *IT Deliverables cont.*

- **No Disruption to the Facility or Daily Operations during Network Upgrades, Reconfigurations, or Expansions**
- **Significant Cost Savings and ROI— Dollars which Can be Re-channeled for Investment in New or Emerging Technologies**
- **A LAN that Keeps Up with the Exact Pace of Emerging Technologies (IP Video and TelePresence), Ensuring Against Quick Network Obsolescence**
- **A LAN that is Ready for Anything... Including the 2008 Super Bowl**

Air-Blown Fiber Components



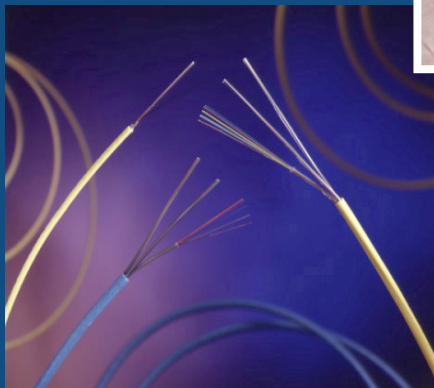
TUBE CABLES



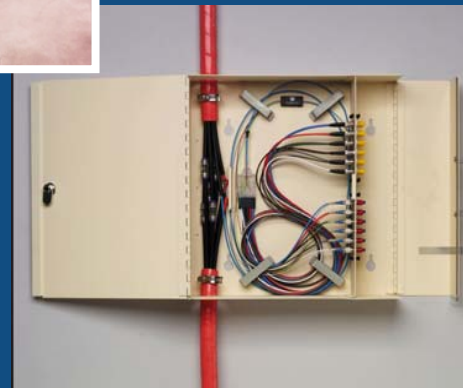
TDUs



**BLOWING
EQUIPMENT**



FIBER BUNDLES



FTUs

Air-Blown Fiber Components



TUBE CABLES

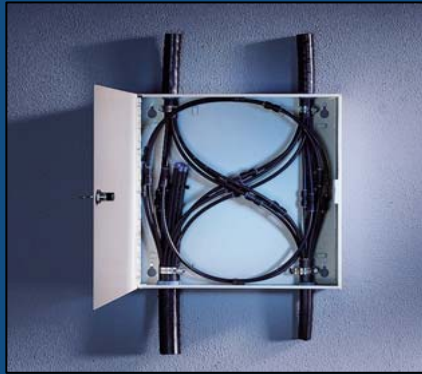
- Tube Cable holds up to 19 individual tubes within an outer jacket.
- Indoor – Plenum, riser and general purpose
- Outdoor – All dielectric and armored versions
- Tubes are 6mmID/8mm OD
- Tube cables range from 5/16” to 2” OD.
- Maximum capacity for a tube cables is 342 fibers.
- Available in various Outdoor, Indoor/Outdoor, Riser-Rated, Plenum-Rated, and Shipboard Low-Smoke Zero-Halogen options



FIBER BUNDLES

- Fiber bundles contain from 2 up to 24 fibers per bundle
- Available in single-mode, 50 μm multimode, 62.5 μm multimode...and laser optimized 10Gb 50/125 micron MMF or Hybrid bundles
- Fiber bundles can be easily blown in minutes anywhere in the network (even hard to reach and secure areas) giving you immediate scalability and bandwidth, while reducing project time and labor costs by 97% (typical)

Air-Blown Fiber Components



TUBE DISTRIBUTION EQUIPMENT

Tube Distribution Units are used to connect the tubes together to form a single path for the fiber bundles.

TDU's can be used to connect outside plant tube cables to indoor rated tube cables or to connect lower count tube cables to higher count tube cables

Indoor and outdoor rated TDU's are available.

Splice cases may also be used for TDU's

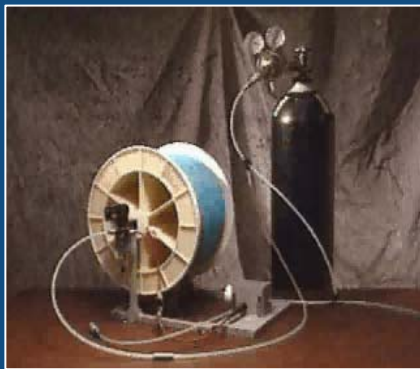
BLOWING EQUIPMENT

Blowing head installs fiber bundles at speeds up to 150 ft. per minute

Blowing head uses either nitrogen or compressed air

Completely air driven, no electricity required

Requires only one operator



Air-Blown Fiber Components

FIBER TERMINATION EQUIPMENT

Designed to Support:

- Single Mode and Multi-mode Fibers
- Field Termination Methods
- Pigtail Splicing Methods
- All Common Connector Types



Wall or rack mount

12 to 288 fiber capacity

Cost Comparison Between Conventional Cabling & Air-Blown Fiber

1. Hole drilling cost basis:
(\$100/floor)
(12 floors)

2. Unistrut®/messenger wire installation cost basis:
(1.5 hour/floor)
(12 floors)
(\$59/hour)

3. Cable pulling cost basis:
(5-person crew)
(6 hours)
(12 floors)
(\$59/hour)

Labor & Materials	Conventional (\$)	Air-blown Fiber (\$)
Drill holes through all floors	1200 ¹	—
Install Unistrut® or Messenger	1062 ²	—
Cable Pulling/Blowing	1770 ³	118 ⁴
Fire Stop	354 ⁵	—
Total	\$4386	\$118

1. Bundle blowing cost basis:
(2 hour)
(\$59/hour)

2. Fire stop cost basis:
(0.5 hour/floor)
(12 floors)
(\$59/hour)

- **Using an Air-blown Fiber System Saves 97% in installation costs over a conventional cable solution**

- Since conventional installation costs are so prohibitive, it is generally common to overbuild the conventional system by installing additional (dark) fiber, which adds cost *over and above* what has been illustrated, namely the cost for fiber that may never be used. The same process must also be repeated in the future if the current fiber becomes obsolete and 10- Gigabit Ethernet fibers, for example, are required.

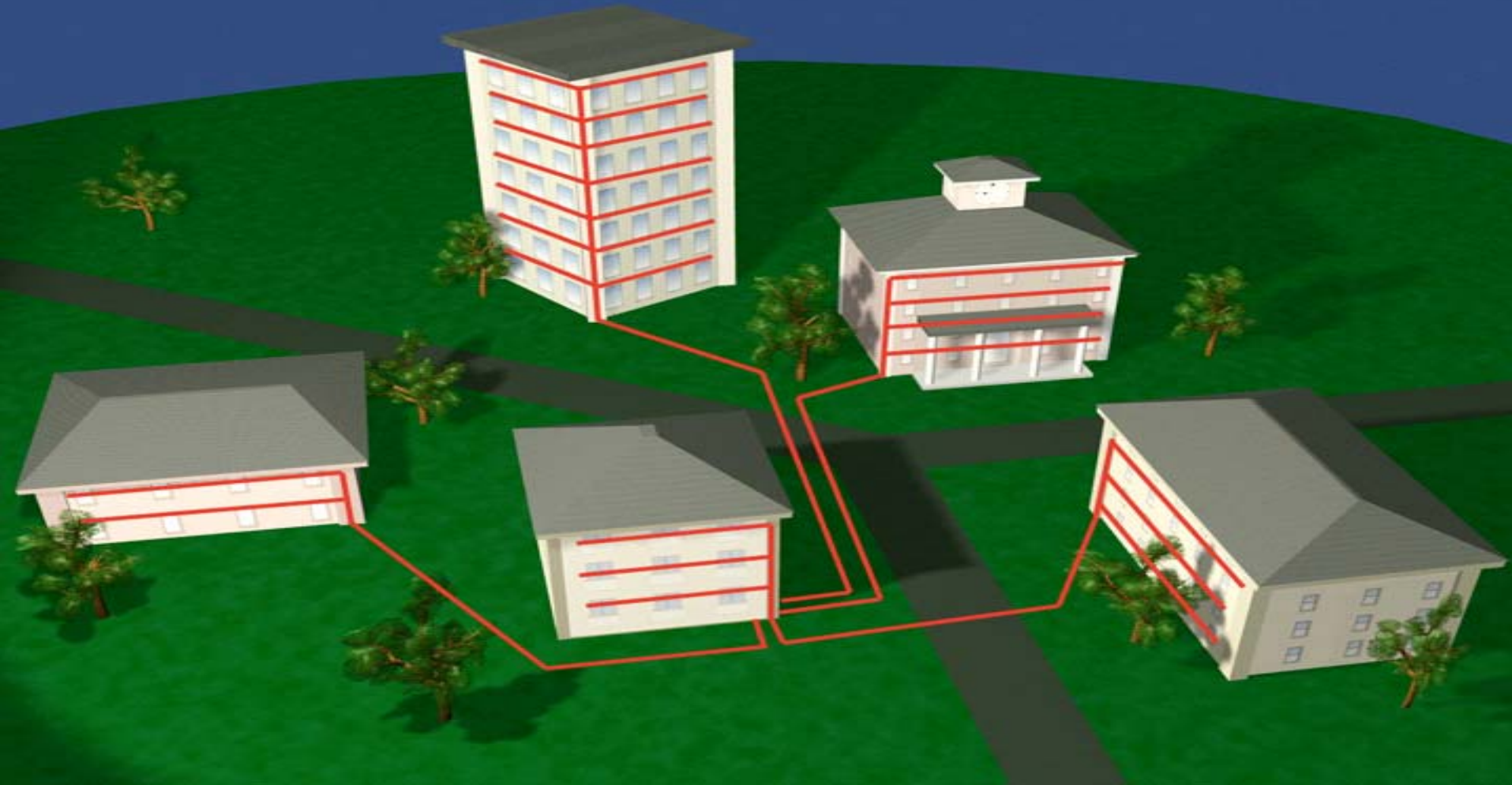


Cost Comparison Between Conventional Cabling & Air-blown Fiber

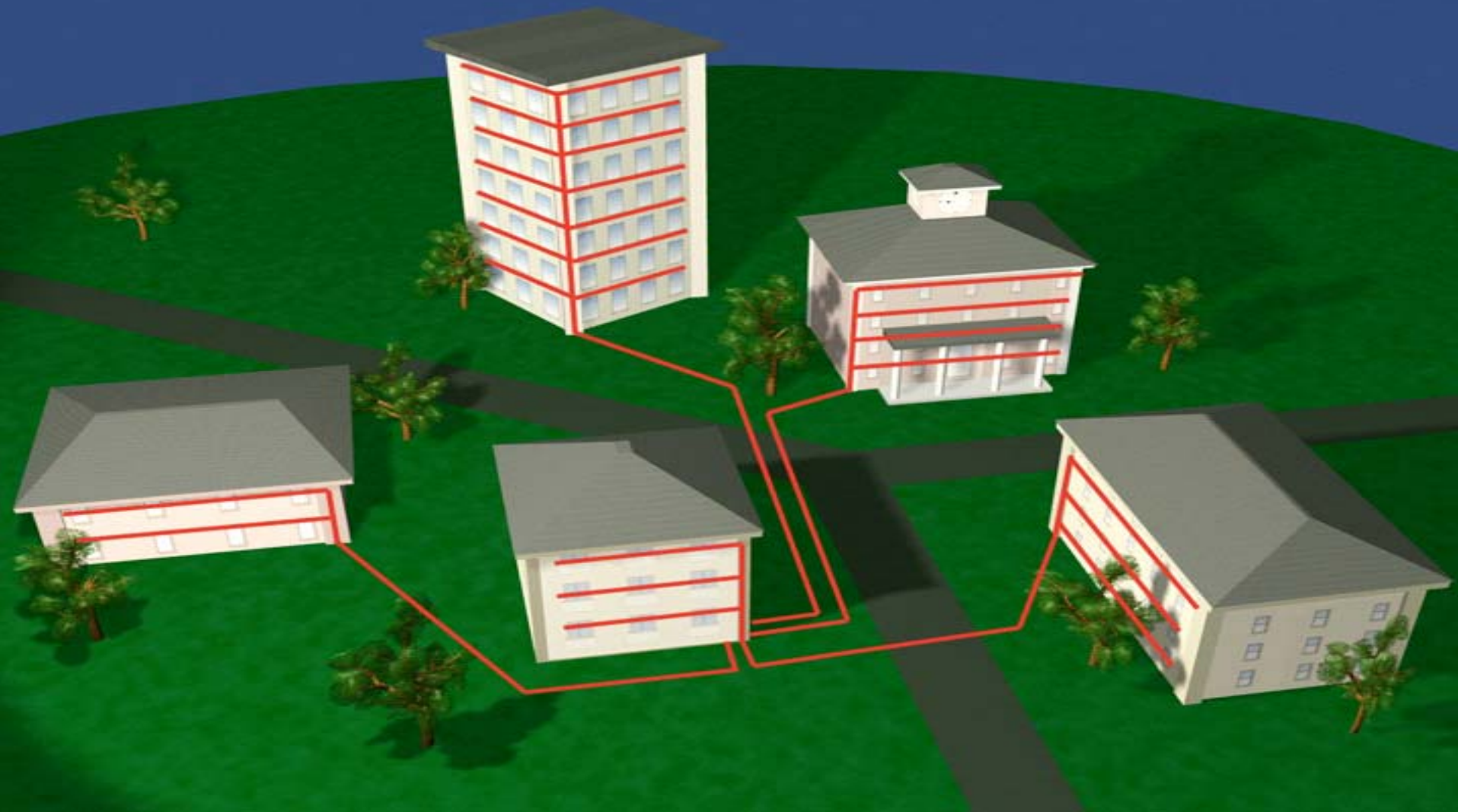
An Air-blown fiber infrastructure = continuous ROI + short payback periods

- Initial costs for installing the air-blown fiber tube infrastructure generally compare favorably against that of conventional cable.
- Cost benefits become far more apparent and greater with each and every future upgrade or network add, move or change... resulting in continuous and recurring ROI (return on investment)
- Short pay-back time for the Air-blown Fiber tube infrastructure investment; in most cases pay-back is realized with the very first upgrade project
- However, with the high cost of pulling cable for upgrades and network reconfigurations, a conventional cable backbone generates only high recurring costs, yielding most often a negative ROI
- In an existing Air-blown fiber infrastructure, the costs associated with upgrading, adding bandwidth, or making any moves, adds, and changes to the network are “negligible” compared to conventional fiber optic systems

ABF Deployment



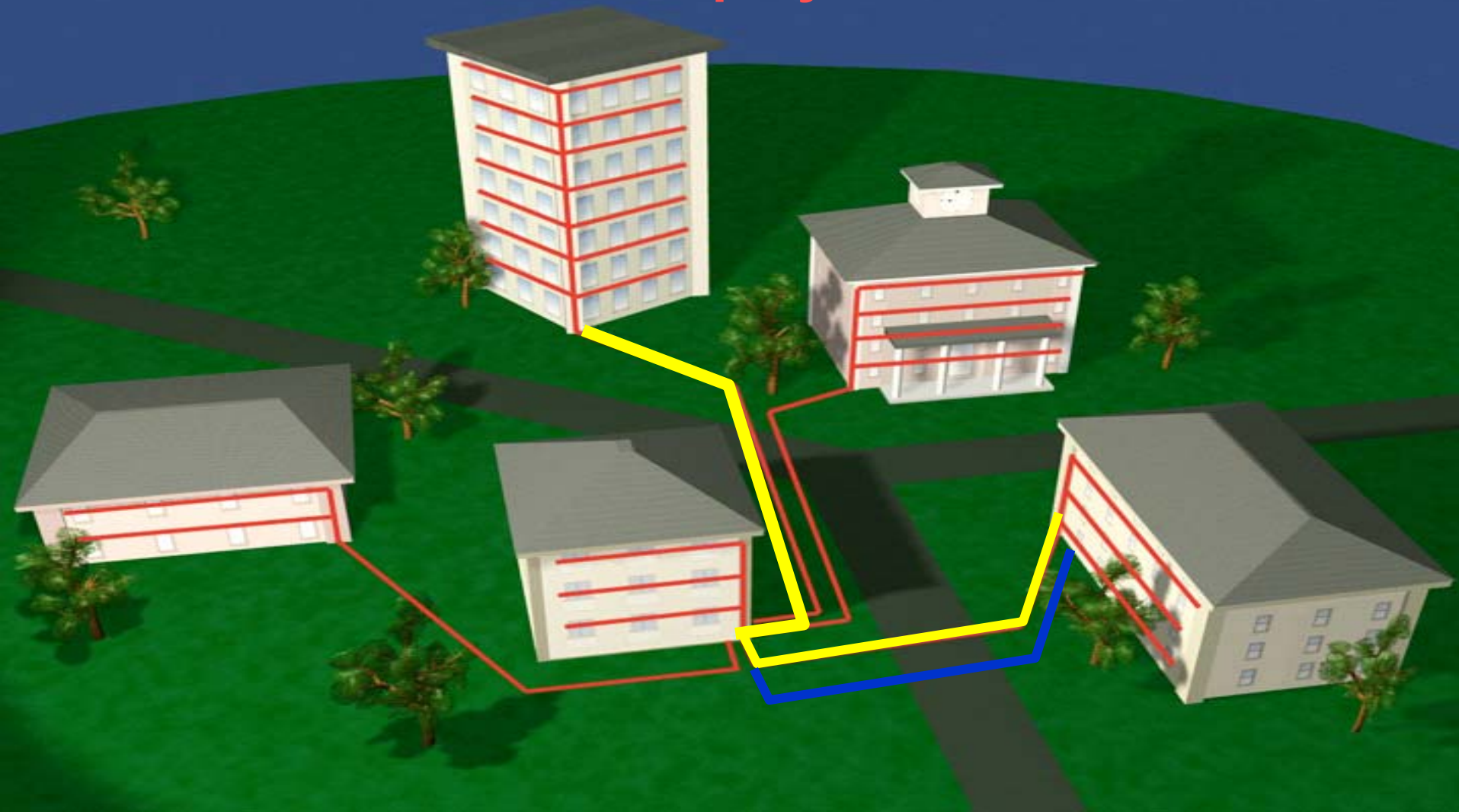
ABF Deployment



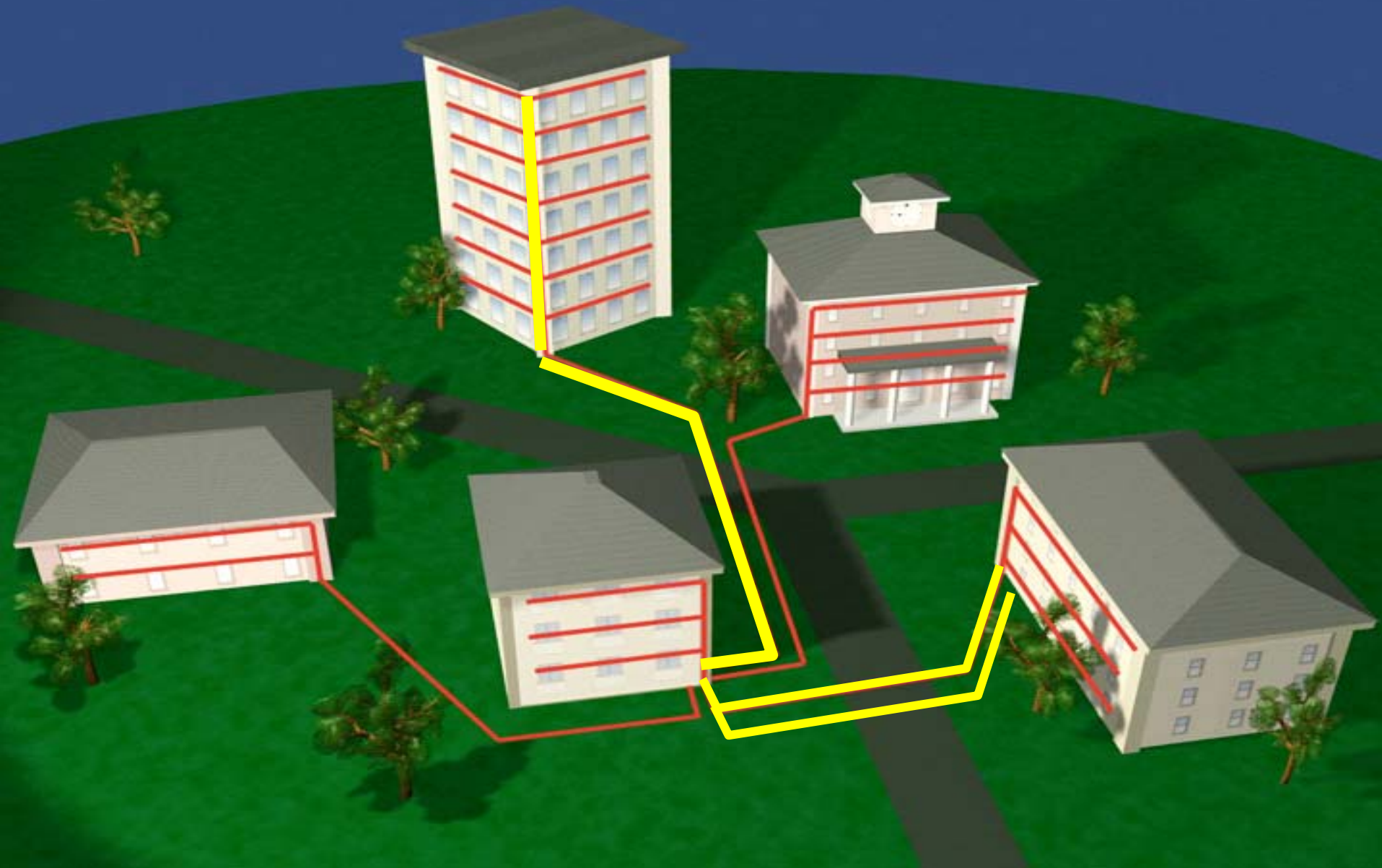
ABF Deployment



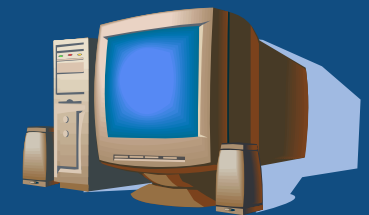
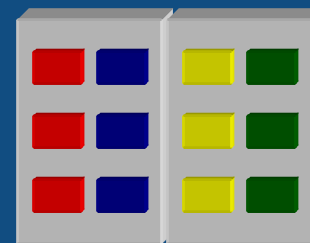
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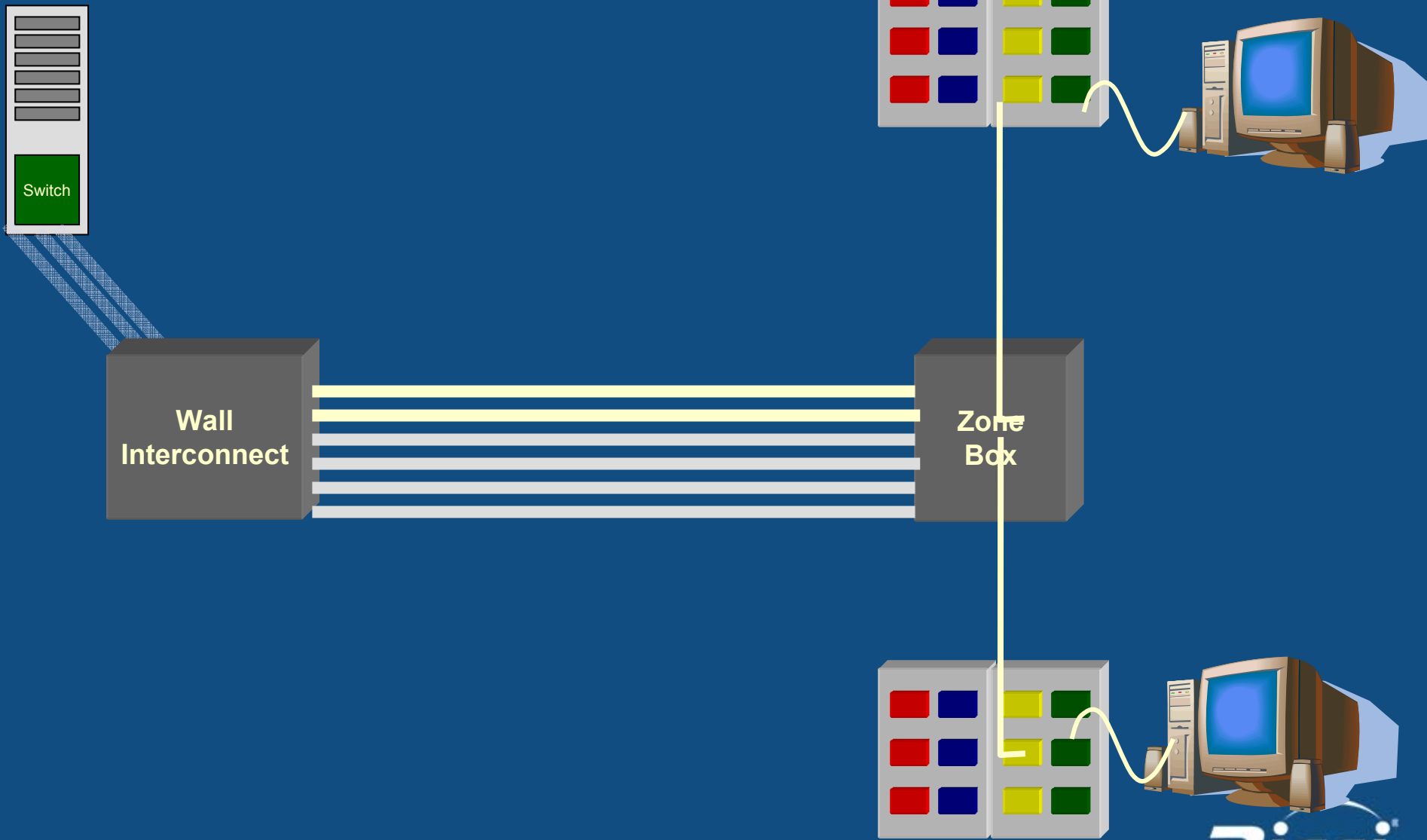
ABF Deployment



Fiber Deployment



Fiber Deployment



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Summary...

FutureFLEX Air-blown Fiber provides IT managers with the most advanced and cost-effective fiber optic infrastructure available...guaranteeing a network that is synchronized to keep up with the exact pace of emerging technology

- **Immediate scalability of the network, with immediate increases & control of bandwidth**
- **Rapid network upgrades, expansions, and reconfigurations for quick project turnaround and faster network restoration**
- **Quick & Easy implementation of new technology, such as IP Video & CiscoTelePresence**
- **Elimination of dark fiber & the guess-work in forecasting future network requirements for a Real-time, bandwidth-ready, technology-ready LAN**
- **Significant recurring cost savings that can be re-channeled to other IT investments**



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Summary...

FutureFLEX Air-blown Fiber provides IT managers with the most advanced and cost-effective fiber optic infrastructure available...guaranteeing a network that is synchronized to keep up with the exact pace of emerging technology

- **Control over network capacity, planning, and IT budgets; pay-as-you-go; one project at a time**
- **Almost limitless network capacity for expansions**
- **Ability to blow out fiber and reuse it**
- **No disruption to facility and operations; reduced down-time**
- **A flexible infrastructure that continuously yields positive ROI and significant reductions in time and labor costs (avg. 97%) in support of a revenue-generating network**



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FutureFLEX Air-blown Fiber + Cisco Unified Communications =



TOUCHDOWN !

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