05/03/2016

Ben Franklin Parkway Project

Crown Castle's Partnership Experience and Small Cell Network Deployment in Philadelphia

FCC Panel – May 3, 2016

The Foundation for a Wireless World.

Agenda

1. Introduction – the Pope is coming!
2. Small Cell Architecture Overview and Benefits
3. Ben Franklin Parkway Project Inception and Initial Planning Stage
4. Regulatory /Government Relations Considerations
5. Construction Commencement and Execution
6. Result/Recap of Experience and Customer Satisfaction

Introduction

The Pope's Visit

- In 2015, the city and the wireless carriers who serve the Parkway found themselves with just nine months to prepare for the arrival of a completely different kind of icon—the Pope.
- Nearly 900,000 people greeted the Pope when he arrived in Philadelphia for a public mass during the 2015 World Meeting of Families. To accommodate the anticipated wireless demand and to prepare for future events, Crown Castle was asked to expand its existing fiber and install additional nodes, leveraging its existing contract and good relations with the City.
- Each installation needed to be fully utilized as a shared solution across multiple carriers to preserve the beauty of the Parkway.

Introduction

The Pope's Visit

Small Cell Architecture Benefits

Why are Small Cells a Good Solution?

- Small Cell networks have proven to be an excellent solution to increase voice and data capacity in places where large groups of people congregate, like stadiums, theme parks, universities, or, as in this specific case, the Ben Franklin Parkway.
  - Smaller in size and lower in power, each node covers a smaller area than a traditional cell site.
    - Using multiple nodes, closer to the ground, results in more capacity to the same geographic area than one traditional tower would normally cover, translating to a better overall experience for wireless users in the area.
- **Visually appealing:** unobtrusive type of infrastructure solution for areas such as historical districts where a tower isn't a feasible solution.
- **Flexible**: Node facilities are connected to a central hub by fiber optic cables. As technology changes, electronics can easily be upgraded to the latest technology by reusing the fiber that is already in place.
- **Shared:** Supports multiple carriers—eliminating redundant infrastructure.

The Ben Franklin Parkway Experience

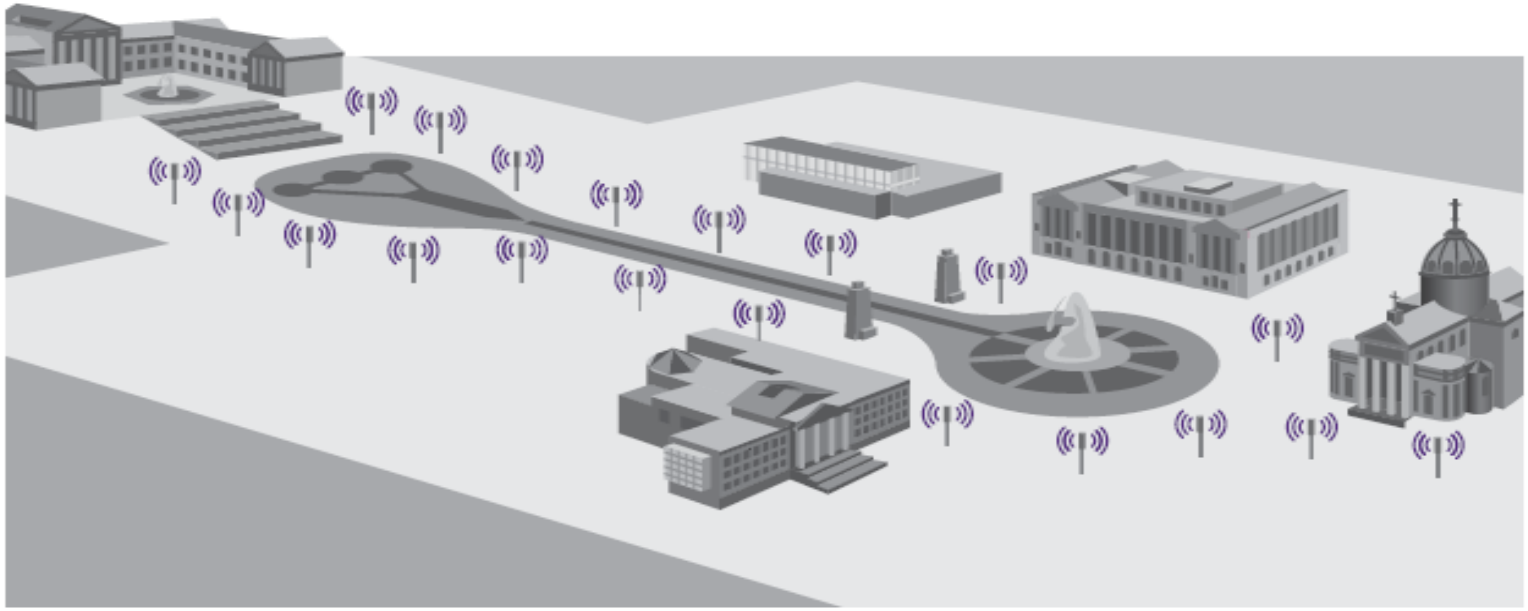
Small Cell Architecture on the Parkway

Modernizing wireless service in historic Philadelphia.

CROWN CASTLE

Philadelphia's tree-lined Benjamin Franklin Parkway is one of the most iconic and historic streets in America. To accommodate the anticipated crowds for the Pope's 2015 public mass, as well as events that include the 2016 Democratic National Convention, the Parkway needed a wireless infrastructure upgrade.

To preserve the aesthetics of the Parkway, we installed 37 nodes on existing streetlights and inconspicuous poles. The new small cell solutions (SCS) network will enable carriers to provide the coverage and capacity to meet their subscribers' current and future wireless demands ensuring access to essential emergency services.



The Ben Franklin Parkway Experience

Project Inception and Initial Planning Considerations

- Summer 2014, Crown Castle engaged contractually with two wireless service providers to provide Small Cell network design coverage in anticipation of the Pope's visit in September 2015.
- July 2014 – Initial work by Crown Castle's Product Management team to select appropriate equipment for the planned nodes. Crown Castle's Radio Frequency Engineering team engaged to begin planning for carrier's event coverage requirements.
- Sep 3, 2014 – First meeting with City of Philadelphia Parks and Recreation Department Staff - explained the project and provided photo simulations showing equipment options designed to blend in with the existing streetlights.
- Nov 18, 2014 – Revised photo simulations provided to the City showing alternate equipment configurations based upon September meeting.
- Dec 10, 2014 – A proposed network plan was provided to the City depicting 38 proposed node facilities (ultimately 37 were constructed due to design iteration). Thirteen were planned to be new poles and 24 were existing pole replacements to accommodate the equipment.

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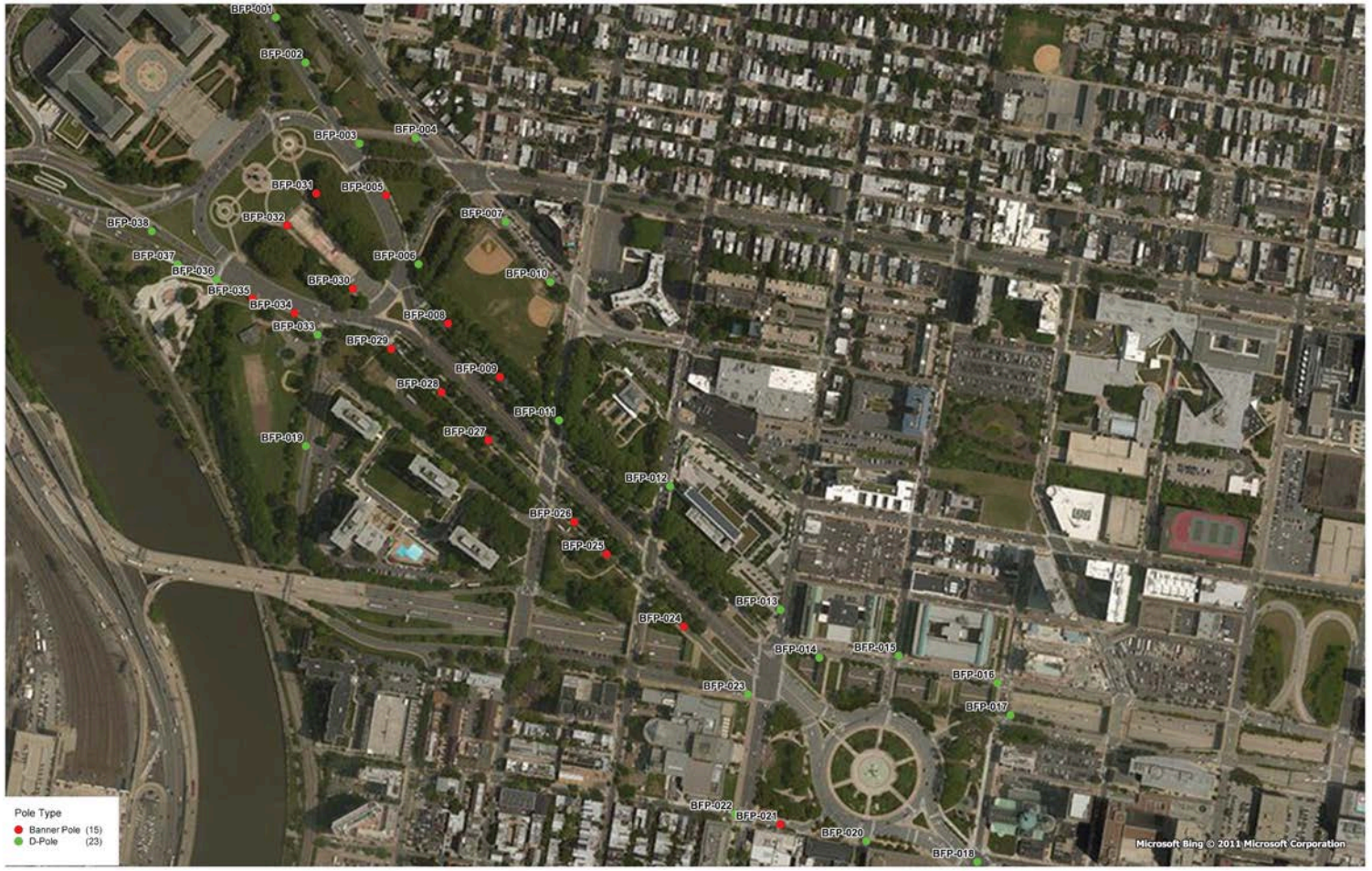
Regulatory/Government Relations Aspect

- Crown Castle coordinated with the planner of the event and obtained approvals from six separate departments: the Philadelphia Streets Department, the Parks Department, the Permitting Department, the Office of Emergency Management, Philadelphia Electric (PECO), and Philadelphia Gas Works (PGW), in addition to obtaining approvals from the Pennsylvania State Historic Preservation Office and interested tribes.
    - The foundation which facilitated the coordination was the pre-existing license agreement by and between the City and Crown Castle that governs the terms of access to the City's public rights-of-way for the provision of Crown Castle's services.
- In addition, Crown Castle and its customers coordinated with various federal agencies charged with event security.

The Ben Franklin Parkway Experience

The Approved Design -37 Nodes



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Regulatory/Government Relations Aspect Cont'd

- Dec 19, 2014 –formal submission made to the Pennsylvania SHPO for approval of the 38 facilities.
- Jan 5, 2015 – formal approval from the PA SHPO Office was received.
- Jan 30, 2015 –proposed neutral host HUB facility location within private property identified, NDA executed to allow Crown Castle to commence lease negotiations to place carrier electronics (approximately 1 block away from the Parkway).
- Feb 3, 2015 – Revised photo sims were again submitted to the City showing two node configurations (one ultimately selected and constructed).
- Mar 3, 2015 – HUB lease fully executed and construction began on the 1,924 square foot HUB facility.
- Mar 13, 2015 – Final approval for the design (locations and equipment type) granted by the City from Mr. Palmer of the Parks Department and from Mr. Montanez of the Streets Department.
- March 13, 2015 – Construction begins for the 37 node facilities. This included extensive underground trenching for fiber and electrical service.

The Ben Franklin Parkway Experience

Underground Conduit Construction

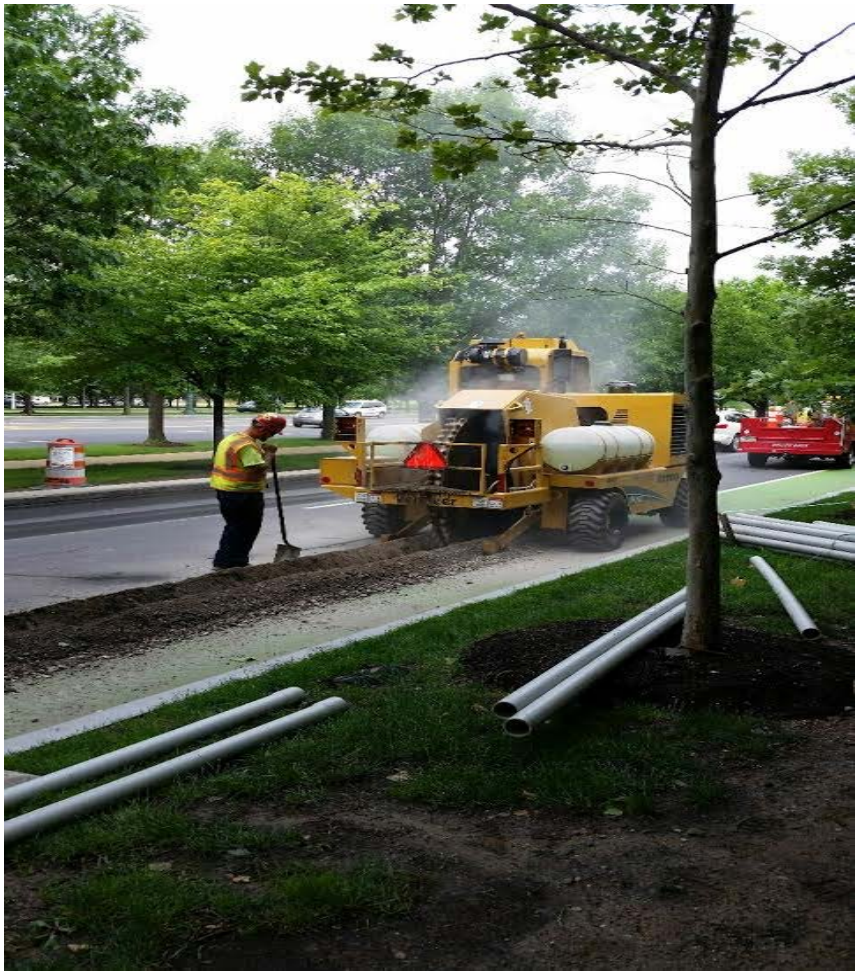
- 2.5 Miles of New Underground Infrastructure to include Fiber Optic Cable and New Electrical Power Service
  - 3 – 2” Conduits
  - 60 – Flush Mount Splicing Vaults

Partnered with Local Authorized Contractors and Utilities

- Hired local authorized City of Philadelphia contractors
- Excavating Contractors performed open trench underground construction method and restored the roadway, crosswalks and bike path

The Ben Franklin Parkway Experience

Underground Conduit Construction



The Ben Franklin Parkway Experience

Pole Construction

- 37 – New DAS Site were Constructed in the Parkway Area
  - 13 – Net New Poles were added
  - 24 – Existing Poles were Replaced
- Of the 37 Sites:
  - 24 Poles had 3 Carriers, 4 Poles had 2 Carriers and 9 Poles had 1 Carrier

Partnered with Local Authorized Contractors and Utilities

-Electrical Contractor performed, new UG foundations and pole installation, along with the installation of the DAS Antenna and Radio units

- Worked with the local utilities to identify their underground facilities

The Ben Franklin Parkway Experience

Pole Construction

The Ben Franklin Parkway Experience

Partnership

The success of the Benjamin Franklin Parkway DAS Project was due to the Partnerships created and Collaboration with all the City of Philadelphia Departments for one common goal.

- Met with the various organization i.e. Highway, Survey and Design, Traffic and Street Lighting Units along with the Parks Commission
- Field surveyed the proposed area to be constructed with ALL Departments
- Reviewed Construction Method for approval by ALL Departments
- Worked with the Right of Way (ROW) Unit to ensure documented plan for permitting
- Through the Parks Commission, we worked with Production Company who staged the Papal Event
- Worked with the Philadelphia Police to ensure Road Closure

The Ben Franklin Parkway Experience

Crown Castle Network Performance Results and Customer Satisfaction

- When the crowds gathered and the pope arrived, the network withstood the surge in demand.
  - One carrier reported over 12.6 terabytes of data usage on their network—almost 7.5 times as much as they reported for 2015's biggest NFL game.
  - Wireless customers were able to share their experiences with friends and family around the world, and access to essential emergency services remained available.
  - The upgrade will serve the city and carriers well into the future.

- Customer commentary on Crown Castle's services and network performance for the pope's visit

  "Crown Castle has really come through and made sure that this [installation was] completed and up on time." - Kurt Woehr, *Director of RAN Engineering, AT&T*

Thank You

FOR FURTHER INFORMATION
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