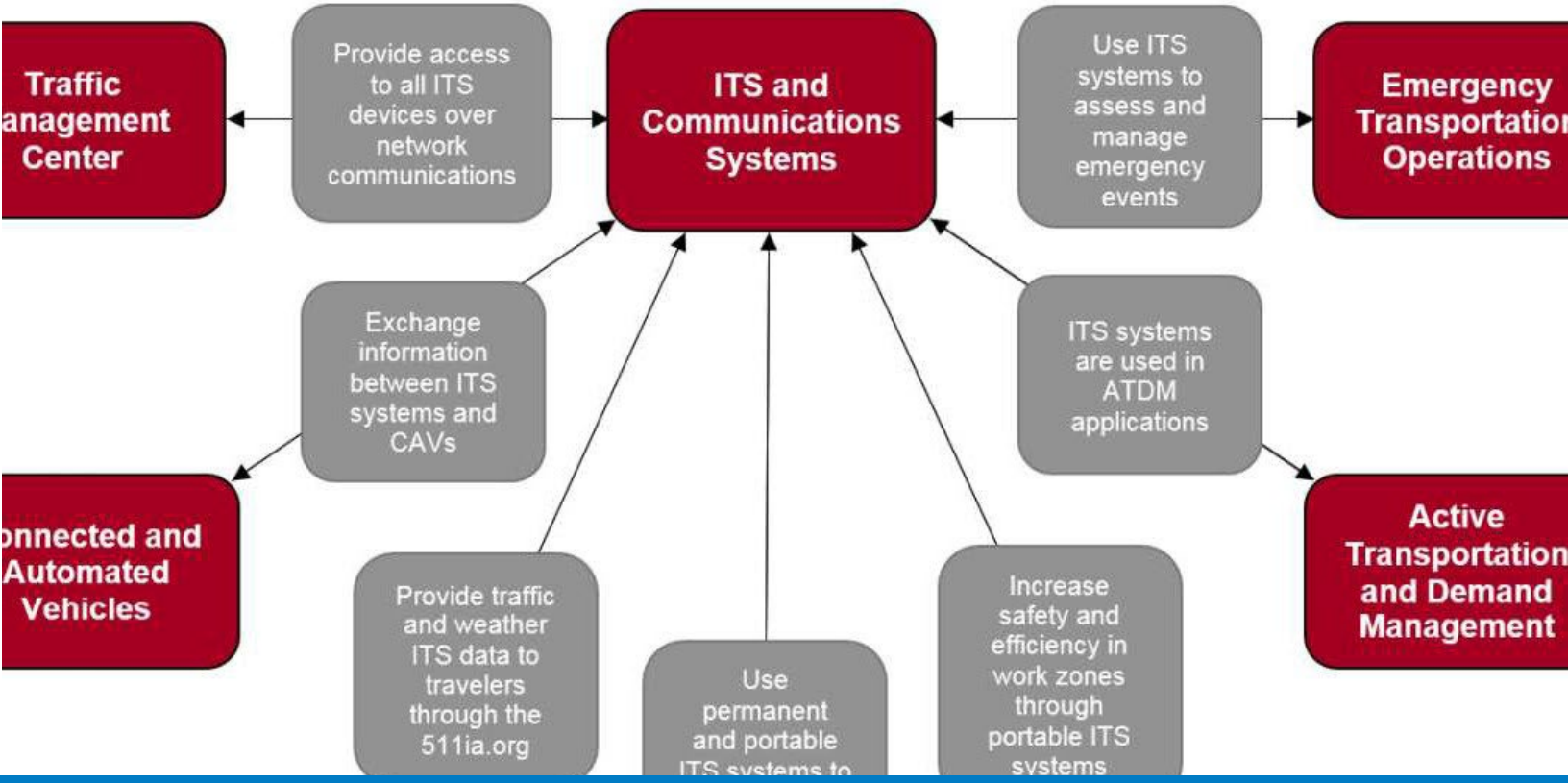
Omaha City-wide Traffic Signal Communication Network

Network Architecture and Design

Technical White Paper



System & Master Planning | **Network Design & Architecture** | Infrastructure Design | Network Operations & Maintenance (NOM) | Integration & Troubleshooting | Training

Public Works and Traffic Department leadership at the City of Omaha, NE had the vision to identify the need to upgrade and improve their 40 year old traffic signal system with modern technology. To accomplish this, all 1000 of their existing signal controllers, their legacy operations and management software's and procedures, and the entire city-wide traffic signal communication system had to be replaced. This is the story.

Situation



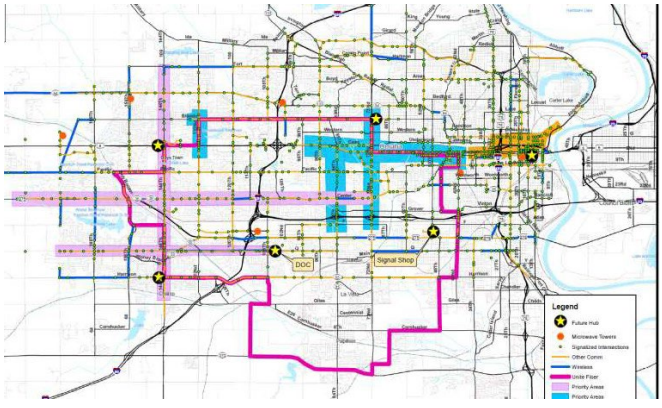
With more than 1000, Type 170 signal controllers, each running software last upgraded in the late 1990's, the City of Omaha had limited ability to improve existing traffic operations, let alone look to incorporate needed Smart City or Intelligent Transportation System (ITS) components. To address these needs, Omaha first completed a detailed Systems Engineering Master Plan that quantified the Needs, developed detailed Concepts of Operation, created Alternatives Analyses on how best to implement the vision, and a Requirements and Verification Plan to ensure all parts of the project worked as designed.

Our team assisted with the overall Master Planning process and managed the city- wide Communication Component of the Plan, working closely with the City to prepare the guidelines and overall system architecture that would not only provide for high-speed broadband communications to all 1000+ traffic signals, but also provide a backbone fiber network for other City government uses.

Solution

Using the information and design processes developed in the Master Plan process, our team worked with City Staff to create an overall plan for the utilization of dark fibers made available for use by the City thru an agreement with a private fiber provider. This agreement basically allows the City to use a portion of any fiber cable installed by this provider for traffic and general city uses. This shared private fiber cable runs along many of the major arterial roadways within the City and provided an economical method to create a high-speed, high-bandwidth fiber backbone throughout the entire metro area.

Sharing the cable with a private internet provider also poses challenges: how do you schedule (and reschedule) repair work? Who does the repairs? How can we ensure a quality product when we are done with the initial build? Each of these questions, plus 100 more, needed to be discussed and decided before the actual design process commenced.

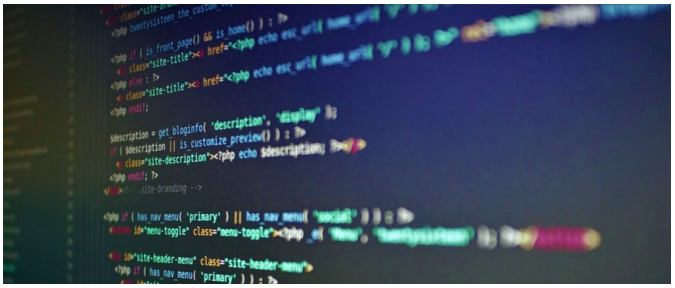


Results

PROGRESS!!!!

Over the past 4 years, Omaha has been diligently implementing the Master Plan and the project is currently on Phase 3 of 10 to complete the entire signal system replacement. To date, our team has assisted with the design, integration, programming and implementation of the city-wide 10-GB fiber backbone installed and lit to over 15 Layer III routers located across the City. These router hubs provide connection and management of the new traffic signals and have the capacity to manage future ITS and SMART Community infrastructure that may be deployed by the City. 300+ signal replacements have been designed and installed with new 2070 ATC controllers operating and connected to the new Traffic Operations Center (TOC). The new regional Advanced Traffic Management Software (ATMS) is up and running and citizens are starting to see the impacts of improved traffic operations.

Conclusion



The City of Omaha had the leadership and vision to identify a problem, define a workable solution, promote the program to civic leaders to obtain critical funding, and the willingness to invest in a long-term program critical to the future of the City. In the next 4-6 years, Omaha will have completed the program to replace all 1000+ of their legacy traffic signal controllers and will have completed the installation of a modern, high bandwidth fiber optic communication system that provides for signal communication as well as for other future infrastructure needs. Our team is proud to have played a part in making this happen.

> Technology's trust is a good thing...but control is a better one"
>
> Stephane Nappo

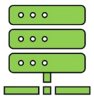
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System & Master Planning – This is the first step in understanding and developing a modern communications and system management network. Without a plan, it just a parade of projects that may or may not work together in harmony and provide the results intended.



Network Design & Architecture – "The Intelligent application of the newest technologies and procedures to make you system operate efficiently". If only it was that easy – continued operation and support of legacy systems and hardwares, while taking advantage of new technologies, make the design of the network architecture the most critical link in the development of your system.



Infrastructure Design – Creating design plans that meet the requirements of funding agencies and provide the needed information for the proper installation of physical assets is a fundamental component of all wide area management and communication networks. Our licensed professional engineers understand how to make this happen efficiently.



Network Operations & Maintenance (NOM) – "Technology installed but not maintained in misplaced technology." Just because you built a great communication and management system, doesn't mean it will always work as intended or when needed. The ongoing monitoring and review of any operational management system is critical if you intend to utilize said network when it's really needed.



Field Integration & Troubleshooting – The best installed and maintained system will eventually meet with unintended issues. Have a plan on how to mitigate and respond to periodic breakages and device failures – our trained and certified staff can help.



Training – Experience has taught that most technologies are not utilized to anywhere near their capabilities or capacities. This is often due to the fact that system operators don't know what the new systems are capable of doing. Trained staff can maximize the benefit of any technology or system.

Communications & Technology

by Design