

Paper Title

GIS Methodologies Applied in LYNX, Central Florida's Regional Transportation Authority,
by Stanimira Bourova

Paper Abstract

The Central Florida Regional Transportation Authority (LYNX) provides a transit service for Orange, Seminole, and Osceola counties and has employed GIS extensively for more than five years. Applications for display and analysis are in place and efforts to develop and improve our own data by integrating information available from regional agencies are ongoing. GIS tools generate values required for National Transit Database ridership reports utilizing a combination of geocoded bus stop locations and data collected by Automated Passenger Counter devices. As LYNX system updates occur, service and directional route miles are calculated for reporting purposes. The Authority is using both printed maps and internal ArcIMS services for evaluation of the transit levels of service by jurisdiction and political districts as well as providing a live access to LYNX data for the staff. Future service planning is also conducted using the demographic data from the Census, as well as local Traffic Analysis Zones and Development of Regional Impact data.

Paper

Central Florida's Regional Transportation Authority - LYNX, provides service for three counties with a total area of 2,538 sq miles and a population of more than 1.5 million. Local population has grown 13% in the last 4 years. The three county transit agency was created in 1931, but the current organizational structure was emplaced in 1992. LYNX has a bus fleet of 238 vehicles. Necessary funding is a complex combination of company revenue and funds provided by local, state and federal governments. Such funding schema requires a lot of flexibility and accurate reporting mechanisms, based on geography. For this purpose the agency installed ArcView 3.2 in 1999 for the Planning department. The software was primarily used to develop hard map copies and assist in various planning initiatives such as new route proposals and transit demand analyses.

Over the intervening several years LYNX has expanded the GIS functions and has developed a complete regional base map with data layers for local roads, municipal and political boundaries, major points of interest, and demographic data from the Census and local traffic analyses zone (TAZ) studies. Recently a Bus Stop database with geocoded location for more than 5,000 transit stops and related information for the associated amenities was added. The layer with the bus routes was linked to the local road data from the counties in our service area.

LYNX Planning employed GIS data in a report generation process for our local jurisdictions and for the National Transit database. The bus stop data is used together with Automated Passenger Counter (APC) technology for analyses of stop level ridership data. The Authority is still using paper maps for display and presentations, but our employees have access to several interactive maps published on the ArcIMS server. Our base map data is also used by paratransit and vanpool program applications. These layers are major component of our Windows based scheduling software that will be functioning in full by the end of 2005.

LYNX ADA Service Area

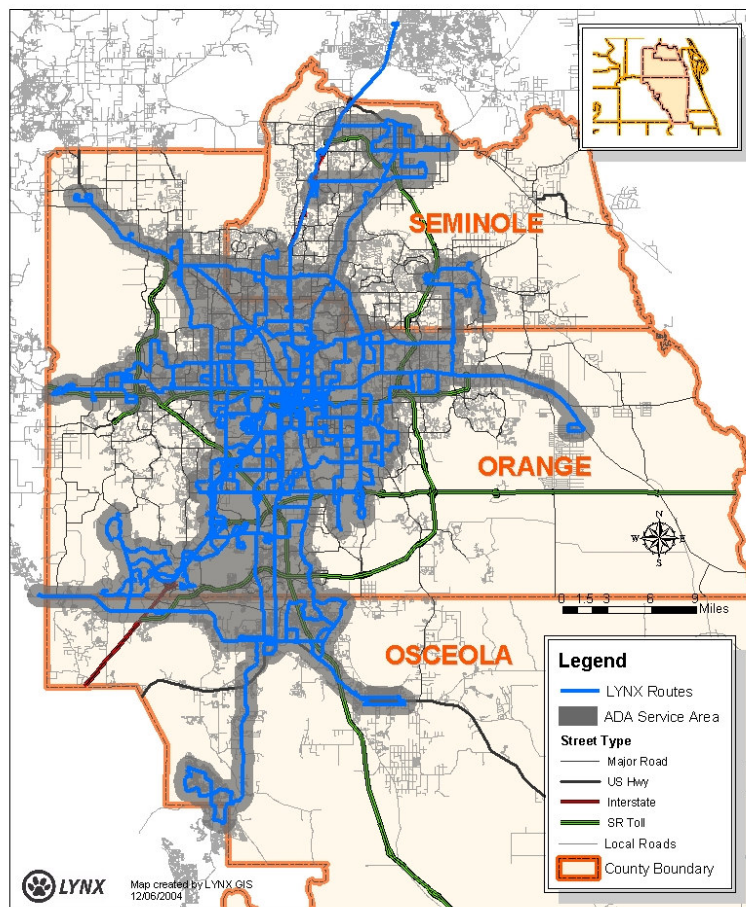


Figure 1. LYNX ADA Service Area

One of the biggest challenges from a GIS point of view is the span of LYNX area of service - it covers three counties. Therefore it requires combining the best data available for each one of them and creating a reliable base map dataset. For applications and analyses we prefer to use local geodatasets created by the counties. The LYNX GIS group is processing this data to create continuing datasets for our service area. In some cases

we need to match the attributes from each layer and create unique identifiers. When local data is not available we use data from regional data sources such as the Florida Geographic Data Library or the Census Tiger data. LYNX is an active member of the Central Florida GIS (CFGIS) initiative to increase the coordination between GIS users in 10 Central Florida Counties including Orange, Seminole and Osceola. This effort was initiated in 2001 and is led by the East Central Florida Regional Planning Council. The primary goal is cooperation and coordination in the development and distribution of data by bringing GIS professionals and agencies together.

Some of the major county data sets we use are local and major roads, municipal and political boundaries, school locations, points of interest, and aerial photography. The biggest challenge and the layer we use most extensively is the local roads in our service area. The processing of this file includes snapping of segments at the county boundaries, renaming, standardizing and converting the attributes. This process usually takes place yearly or after one or more of the counties have made major updates to their file. LYNX also modifies the file by adding parking lot entrances and private access streets where the buses make loops and turns.

In addition to compiling regional base map datasets for our service area LYNX also maintains its own geographic datasets. This data is made available to the public and also used internally for a variety of projects. Our current and future routes layers and Access LYNX service area are based on street centerline file and are updated every time the service is changed or streets are shifted. We used Census tract data to build a file with areas where the population falls under Title VI requirements for transit service. (Title VI is a federal program, based on the 1964 Civil Rights Act, that requires equal level of service for areas with a large percentage of minority population). This data is used for analyzing our current level of service and facility locations and to ensure that we do keep the balance as the service is expanded or new facilities are built.

The LYNX Bus Stop Inventory database keeps information about the geographic distribution of transit stops and amenities such as shelters, benches, and even trashcans. Each stop is also identified for accessibility – to ensure it follows the requirements of the Americans with Disabilities Act of 1990. In 2001 LYNX finished a project to geocode all the existing bus stops, over 5000, and created a SQL database to facilitate, maintain and make updates. The layer with bus stop attributes is a base for creating bus stop files for each route with sequence and time point information – APC calibration files. These files were initially created and are currently maintained with ArcView software. Combining this data with the data collected by APC equipment provides LYNX with bus stop ridership data that is easy to visualize and overlay with other GIS layers such as jurisdiction or Title VI boundaries. The uses of the Bus Stop Inventory outgrew very quickly the initial

idea of the project and now we are in a process of upgrading to a new database that will be integrated with our scheduling software and will streamline the creation of calibration files for our APC system.

Another very popular in house developed application with a geographic component is our Access based APC reporting system. This application uses collected ridership data and geographic location of each stop to generate summary reports by routes for each jurisdiction in our service area. It also provides a convenient way to map the ridership data as needed. Our goal is to combine the reporting functionality of this system with the strengths of ArcIMS mapping options.

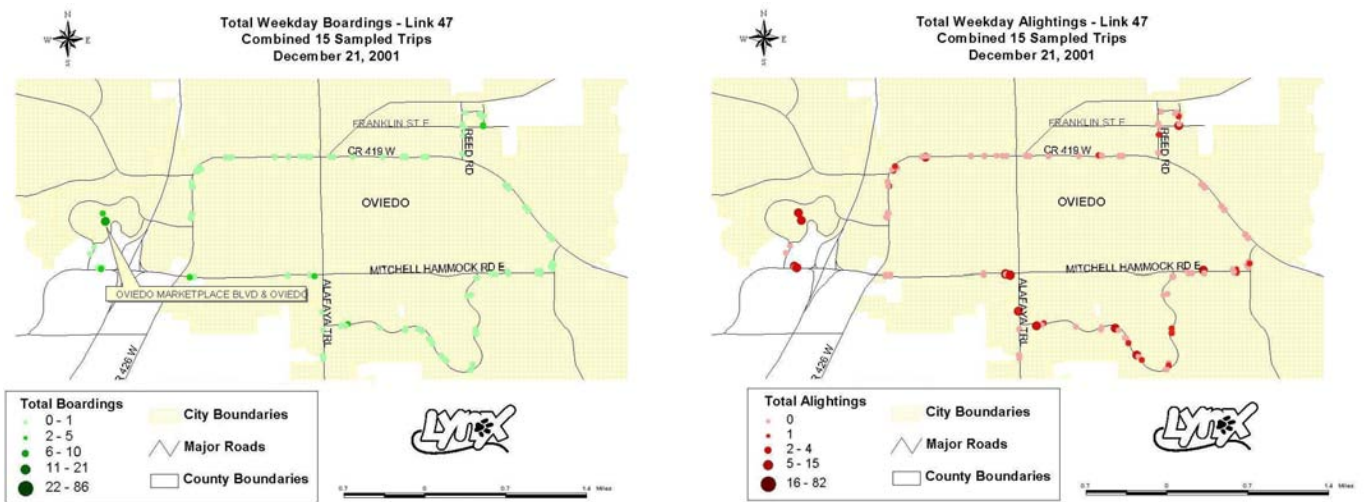


Figure 2. Collected ridership data with Automated Passenger Counter

As a transit authority LYNX is required to report information about revenue and ridership to the National Transit Database (NTD) every Fiscal year. Four years ago the numbers were generated by using a manual count of people getting on and off the buses, followed by manual entering of the collected data. Now the entire process is automated. The ridership data is collected by 20 APC units distributed throughout the system. The assignments of APC equipped busses are made to focus on required NTD data collection. Every day the collected data is downloaded to a base station and processed for evaluation and system check. At the end of each reporting period stop level ridership data is generated and processed to update the SQL database. The APC Reporting System application is linked to this database and provides convenient access to APC generated data.

ArcView functionality is used in another aspect for NTD reports. LYNX system files, based on street centerline segments, are used to calculate Directional Route Miles for our system. The process includes assigning a direction value and measure to each segment. Because of the large size of our service area the GIS based methodology saved hundreds of hours of manual survey. Segment based GIS route layers are also used to generate reports for our funding partners. ArcView is used for calculating the percent of each route that fall in a given jurisdiction. From there LYNX service hours by jurisdiction are calculated to generate reports and determine the required funding.

LYNX Fixed Route System Directional Miles FY 2004

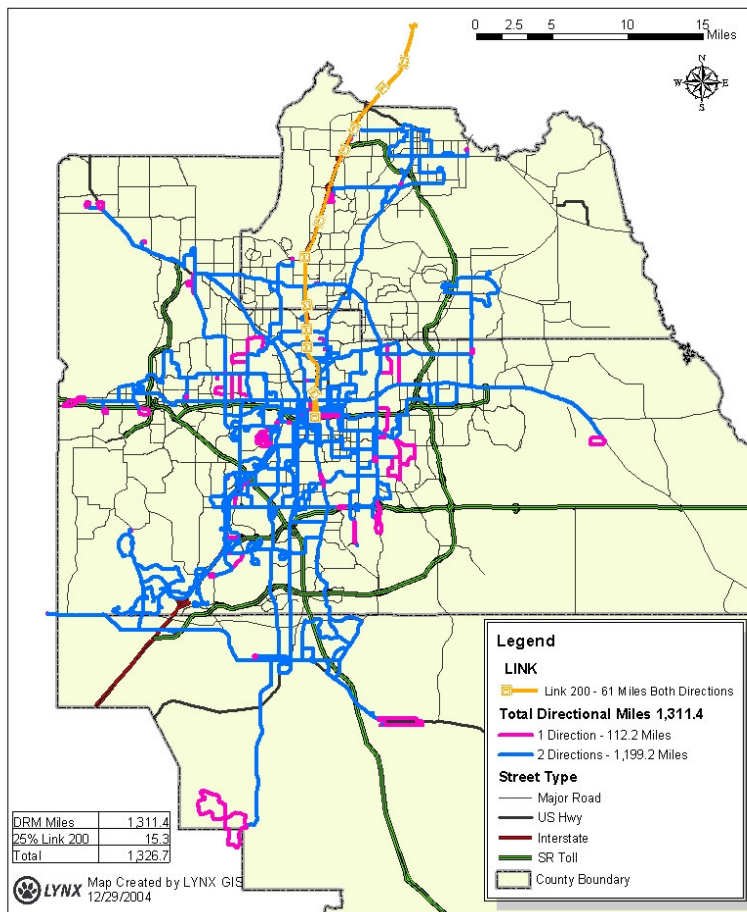


Figure 3. NTD report on Directional Route Miles

In 1992 LYNX was designated as the Community Transportation Coordinator (CTC) by the State of Florida Commission for the Transportation Disadvantaged for Orange, Osceola and Seminole Counties. As CTC LYNX has an important role for the efficient provision of special transportation service by eliminating duplication of effort by

multiple agencies. This paratransit service is known as Access LYNX. The demand for this special service has experienced dramatic growth since 1992, although the funding has remained almost constant. The situation requires more efficient methods for trip planning and the functionality of ArcGIS is applied for geographic and proximity analyses of our Access LYNX customers to regional medical facilities such as dialysis centers. Generated maps and tables are excellent tools for Access LYNX providers to optimize their trips and realize savings. GIS is integrated into a number of operations throughout the enterprise. Our regional base map layers and in house created layers are used in variety of GIS applications throughout the company. The base map layers are distributed to facilitate updates of different software modules used for scheduling trips or geocoding. We also have three different ArcIMS applications for internal use. The most popular of them is the Bus Stop Inventory service.

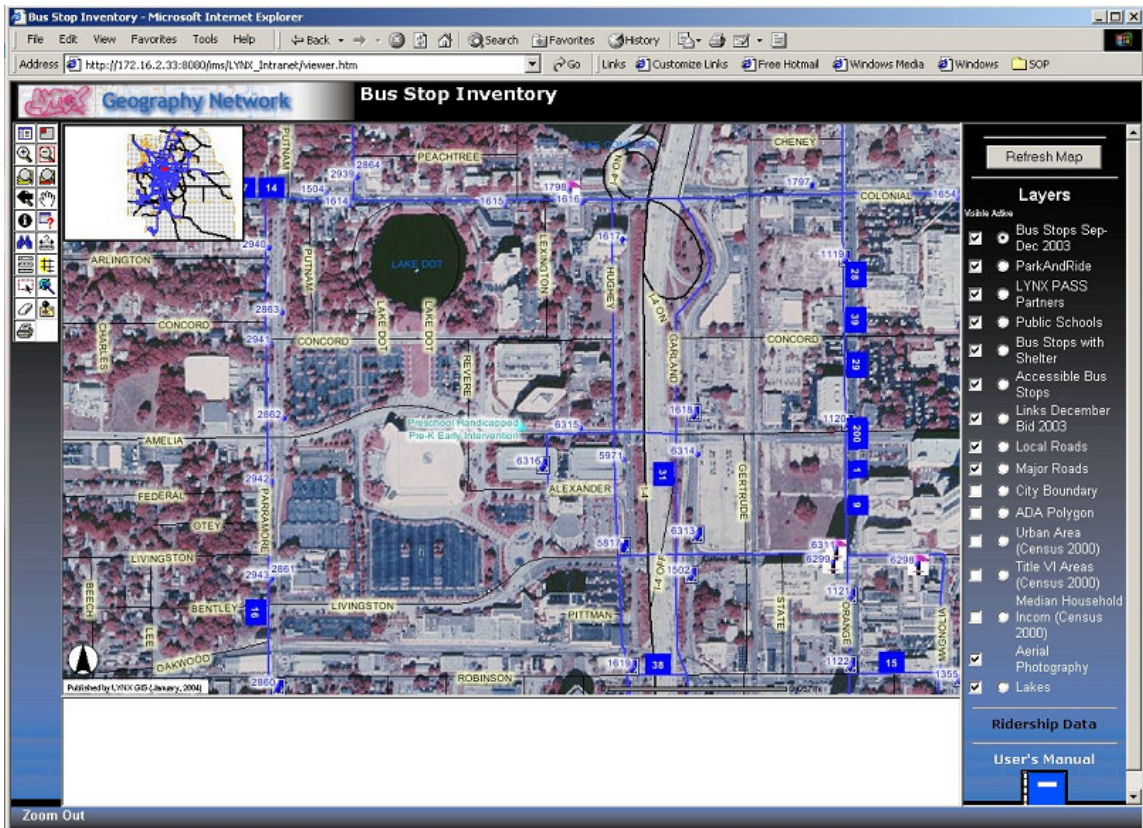


Figure 4. ArcIMS Service – Bus Stop Inventory

The Bus Stop Inventory service was developed to assist our customer service representatives with their day-to-day activities and to provide LYNX Planning staff with a tool that is easy to utilize for analyses of current level of service. LYNX Customer service representatives are using the address location tool to provide directions to customers to

the closest bus stop and route. They also are able to tell if the bus stop has a shelter and is ADA accessible. Information about Park and Ride facilities and places where bus passes are sold is also available.

The Bus Stop Inventory also has a link to an Excel table, generated by our APC reporting system, with ridership data by bus stop. The ridership and associated demographic data are employed by LYNX planners to decide on issues such as requested changes of bus stop locations, building shelters, or realigning services. This application was upgraded with an option to display MrSID aerial photography.

Recently the LYNX GIS group created a new ArcIMS service to assist our strategic planning and business relation staff in their effort to promote transit services. The application, called LYNX DRI Data, displays a Development of Regional Impact (DRI) layer with polygons of areas scheduled for development. This DRI layer is created, updated and published by Florida DOT. LYNX staff updates the layer attributes with comments and suggestions about transit planning, passed on each development. The application displays the future changes in bus routes, according to the LYNX Transit Development Plan as well as Traffic Analyze Zone data and current and projected demographic data by Census and Florida Bureau of Economic and Business Research (BEBER).

In the five years since ESRI software was installed the LYNX Planning department has employed its functionality to improve communication within the organization, with our funding partners and with local elected officials. In house developed ArcIMS applications allow for quick and cost effective access to the most current bus stop, amenities and route information as well as for making effective decisions for service changes. ArcGIS functionality facilitated various cost effective decisions such as implementing APC technology and increasing the efficiency of Access LYNX trips. GIS became integrated into the operations throughout the enterprise by providing staff with base map data and the many layers developed and maintained in house. The next logical step will be implementation of ArcSDE and geodatabase technology to create a centralized GIS data depository and to provide seamless integration with all enterprise applications that employ GIS data.

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