Local Government Data Model

Implementation Guide

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Local Government Data Model

This document provides information about the Local Government Data Model purpose and content. The intended audience includes local government GIS Managers and Implementation Teams.

The basis for this model is the work done by the USGS in their GIS for the Nation model, and as the model was being developed in collaboration with several organizations, it became apparent that more than just the feature classes, tables, and relationships were needed. This document provides a high-level set of guidelines for implementation that should help with your implementation project. The content is largely based on a presentation from the ESRI User Conference in June 2007.

A number of key people supported the development of the data model:

- Steve Holmes from Loveland, CO
  - Long-time GIS Shop moving to the Geodatabase

- Brett Lavender/Nancy Von Meyer working at Clayton County, GA
  - New GIS project with good success in the first 6 months

- Steve Gay from Boone County, KY
  - Move to Geodatabase completed with good results and documentation, and

- A bit later in the process Scott Oppmann and others from Oakland County, MI provided great feedback
  - Mature Geodatabase implementation.
1. Purpose

The purpose of this data model is to provide a practical starting point for organizations that are just getting started with ArcGIS, and also to provide a reasonable data model target for more mature organizations moving to the Geodatabase from shapefiles and other formats/data models. The goal is to make it easier to move to the Geodatabase.

Beyond these basic datasets, there are a number of applications/business functions in local government that are not completely addressed by this data model. Typical examples are Land Records solutions and Water Utilities solutions. Many of those examples already exist and are accessible from peer organizations, conferences and in online materials/data models. If you are looking for a more specific application or business function, start with data models in those areas. Proceedings from ESRI User Conferences are also useful sources, as are general Google searches for examples. Plain-old-networking still might be the best way to grow your program into new application areas.

This data model provides a Geodatabase structure for typical local government datasets. Most of the content has been derived from other data model templates and tailored to local government best practices. The goal is to have a solid foundation to support a number of business applications, and also to facilitate regional and national information sharing by building a level of consistency in the way these common datasets are managed.
2. Data Model Content

The general data themes or categories for Local Government data were established in the 1980’s. While technologies and formats have changed over the years, these data themes are still relevant.

In the template model, there is a lot of content included. At a summary level, the content includes:

- 2 Feature Datasets
- 48 Feature Classes
- 1 Topology
- 1 Raster
- 60 Domains
- 2 Tables
- 1 Relationship Class
If you are just getting started you will likely choose a subset of the content – some recommendations for priorities are provided later in this document.

The following picture shows the top-level view of the data model in ArcCatalog:

The model is organized into 2 feature datasets. Feature datasets are used to group feature classes with a common spatial reference and editing permissions. The ManagedData feature dataset includes feature classes that are typically managed by local government organizations.
The ReferenceData Feature Dataset contains datasets that are obtained from other sources and are used as a reference by local governments:
Of course there is a lot more detail in the model than what you see here. In the Design Template at [http://www.esri.com/datamodels/localgovernment](http://www.esri.com/datamodels/localgovernment) you will find detailed documentation in Visio and Html formats. One example of each of those documentation styles is included here.
A discussion about tools and documentation for your model is included in the Implementation Guide.

3. Implementation Guide

While a lot of thought and experience went into the content of the data model, user feedback indicated that people are more interested in practical implementation advice than discussing design patterns and technical details. This section provides a high-level discussion of the steps involved in implementing your Geodatabase project.
3.1 Inventory Current Data and Data Needs

Even if you are just getting started, there will be GIS data available in your community. This section provides some advice on how to discover what data is already available in your community.

What do you have?
Within your own organization you should talk to people in different departments about existing data and who has it. Some of the groups doing GIS work will likely be in:

- Planning
- Assessment/Land Records
- Emergency Management, and
- Water Utilities

What do others have for you?
If you are in a City, talk to the County/Region. If you are in a County/Region, talk to the Cities. You’ll probably be surprised by the gaps and overlaps in datasets.

You should also investigate the data available from Regional, State and Federal sources in your jurisdiction. Talk to people in multiple departments at multiple levels of government. Get out and network with your peers to see what they are doing and learn from their experience.

What do you need?
You can use the list of datasets in the data model as a shopping list. If you are just getting started, we recommend that you start with the following datasets:

- Parcels
  - Point or polygon representation based on data availability and long term plans. Points can be generated by geocoding the assessor database and moving the points to parcels/rooftops of buildings.
  - Assessor database. Develop a plan to link spatial and tabular records for applications.
  - Utility and telephone records. A Good source of address and land records information – usually these are reasonably accurate since billing/revenue depends on these records. The correlation between these records and parcel datasets can be complex, but they are one good source of information.
- Street Centerlines
– Existing dispatch datasets, existing centerline dataset, commercial sources, Census Bureau, Departments of Transportation

– You may have a challenge in sifting through geometry and attribute content in multiple datasets. An accurate, up-to-date centerline dataset has many benefits to a wide variety of applications.

– Address Points are also desirable, even in the early stages of a GIS Program. Many advanced GIS programs, however, do not have address points, and they accomplish a lot with a good street centerline dataset.

– Hydrography

  – National Hydrography Dataset (NHD) and/or local sources

  – Water resource data is in high demand – not just for mapping purposes but for everything from transportation to environmental to recreation.

– OrthoImagery


  – Develop a plan to have high-resolution imagery updated every few years. The costs can be shared with other organizations, and the value in terms of perception and visualization is significant.

  – Derived products such as Digital Elevation Models can be developed as part of the image capture program, and there are options for multi-band products as well as color orthophotography.

– Administrative Boundaries

  – Local, Census Bureau, or Commercial data

– Buildings/Structures/Facilities

  – Sources for Facilities are high on the priority list. You should consider the FacilitySitePoint and FacilitySite datasets early in the project. This is relatively new on the list of local government datasets, but a number of emergency and daily business functions can be supported with data that provides the location and name of key infrastructure along with point of contact information.

– Other datasets

  – As available from local, state, and federal government sources

  – ArcGIS Online
– ESRI Maps and Data
– StreetMap USA
– Other commercial data providers
– PLSS for PLSS States
– Address Points from Dispatch applications, licensing, etc.
– Existing Business applications

Beyond this basic set of priorities, you should consider the business drivers/business functions that your system will need to support to develop your own list of priorities for data collection.

Spatial Reference
As you inventory available datasets, collect information about the spatial reference for the datasets. One of the early decisions you need to make is which spatial reference to use. There is a lot of information about Spatial References in the ArcGIS Desktop Help system (http://webhelp.esri.com); you can use that as a guide along with advice from peer organizations if you are just getting started.
3.2 Hardware/Software Setup

If your GIS team is small, you can get started with some basic hardware and software. An outline is shown in the diagram below.

Your starting point could be as simple as a single Mapping and Data Management computer (a Desktop or high-end Laptop). Some people even use ArcView for this, but you won’t be able to edit Workgroup or Enterprise Geodatabases, or use more sophisticated data types in the Geodatabase such as Topologies if you use ArcView. ArcEditor or ArcInfo licenses are recommended for data management users. As the system grows you will want to have at least one ArcInfo license. In general, floating licenses are the best approach for multi-user environments. You should also consider which ArcGIS extensions will be required for different applications.

To distribute or publish the information, the starting point can be as simple as creating CDs or managing an FTP site for data exchange. Beyond the basic datasets, you can publish maps, layers, and finished products such as .pdf’s for casual users. One practical approach here is to distribute a Compressed File Geodatabase – this will really shrink the database size and you’ll be pleased with the performance.

The next step for publication will be to consider how to use ArcGIS Server to publish maps and related content. You can get started with a relatively inexpensive Server here and expand the system as user demand and budgets permit.

Overall, it is relatively easy to grow the hardware and software over time, but you should have a long-term plan in mind for how your data management processes and the use of ArcGIS technology will evolve. One of the important decisions is that once you move to a Workgroup/Enterprise Geodatabase that editors will require an ArcEditor or ArcInfo license to edit the database. It is possible to use ArcView to do editing with local data, but you should consider the how the whole system will evolve over time:

- Will you eventually use versioning and replication to automate the update of the Enterprise Geodatabase?

- Is it acceptable to have applications and local data in ArcView and have ETL tools to load the data to the Enterprise database?
- Is the cost difference in ArcEditor and ArcInfo licenses justified by productivity increases in editing and mapping work?

- Do you need some of the advanced datasets and capabilities provided in ArcEditor and ArcInfo? For example, a local file/personal Geodatabase with a topology will require an ArcEditor license.

Some organizations, especially those who currently edit with ArcView and may have limited budgets, will likely choose to continue to edit with ArcView.

The diagram below provides a list of hardware and software that is typical for larger GIS teams and more advanced implementations.
3.3 Create Geodatabase from Template Model

The template data model is provided in Geodatabase XML Workspace format. To use the XML Workspace document, create an empty Geodatabase, right-click on it, and select “Import->Xml Workspace Document”.

Follow the steps in the wizard and you should see the content of the Geodatabase after selecting “Refresh” or “F5” after the wizard finishes.

Tool Tips

- ArcCatalog is the best tool for modifying the design if you are just getting started, but there are tools such as GDB XRay, ArcGIS Diagrammer, GeoProcessing tools/scripts/models, and ArcObjects that can be used to manage your design content.

- You can use GDB XRay to examine the contents of the Geodatabase in detail and do some design (spreadsheets) and documentation (Html). These tools were developed as part of building the local government data model to meet needs for a simpler design and documentation process in ArcGIS.
3.4 Configure Data Model

The data model contains a number of feature classes, attributes, and domains. The steps involved in configuring the data model are described in this section.

Set Spatial Reference

Once you have selected a spatial reference(s), you will need to modify the spatial reference in the template Geodatabase. You can right-click and select “Properties…” on feature datasets and workspace-level feature classes to change the spatial reference.
Once the spatial reference is set and you load data, it is relatively difficult to change it, so you need to spend some time on this decision early in the process to avoid rework later.

At an elementary level, spatial references manage the complex math required to represent the surface of the earth. Many common spatial references for local government attempt to flatten the “orange peel” into smaller pieces – UTM coordinate systems are good examples of this. ArcGIS can do projection on the fly to display information stored using different spatial references, so it is acceptable to have data stored in more than one spatial reference. At the same time, you should consider managing data in one spatial reference so that you can take advantage of datasets such as topologies, networks, and also improve interoperability with other tools that may not handle multiple spatial references at an application level. If you do a lot of analysis it is generally better to store the data in the same projection instead of using projection on the fly.

While it would be easy to recommend that everyone should use UTM, some cities/counties are unfortunately located in awkward places along the dividing lines between pieces of the orange peel (New Orleans is one example of this).

Before ArcGIS 9.2 there was a need to be careful about the precision of the Geodatabase coordinate system, but that consideration was removed with High Precision geometry storage in 9.2.

**Tool Tips**
- Once you have data loaded, you can still use the GeoProcessing “Project Data” tool to re-project your data
Configure Domains

You will need to populate some domain values for your jurisdiction. The purpose of the domains is to ensure consistent data entry in the system.

The domains you will need to tailor include:

- CITYNAME Domain
- COMMUNITYTYPE Domain
- COUNTY Domain
- LASTEDITOR Domain
- ROADDR Domain
- ROADJURISDICTION Domain
- ROADNAME Domain
- ROADPOSTDIR Domain
- ROADTYPE Domain
- STATEDISTTYPE Domain
- STCOFIPS Domain
- STFIPS Domain
- ZIP Domain
- ZoningDistricts

You can also make changes to other domains as required.

Tool Tips

- You can import contents of database tables using the Geoprocessing Task TableToDomain.
- You can use GDB XRay tools to type/paste domain lists into Excel spreadsheets to import into your Geodatabase.
- You can also perform minor edits of the domains using ArcCatalog.
- Some organizations prefer not to use domains and they write simple applications that read this information from database tables.
• For countries outside of the US, you will need to make some changes - zip codes to postal codes, FIPS codes to some other national/regional identification scheme. Once you make those changes you should not have to make significant changes to the content unless you want the domain values to be presented/stored in a different language. If you need some help to create a model for a different language, please contact sgrise@esri.com since there are tools and methods that will help to make this easier. Also, your ESRI Distributor will likely be interested to support this effort.
Organize into Feature Datasets

If you have a single data management team that does all of the editing, you can use the ManagedData and ReferenceData structure from the template model. You will need to grant permissions on Workgroup/Enterprise Geodatabases to those users.

If you have editing performed by multiple workgroups, you should consider granting privileges to the groups according to the data they are responsible for managing. Separating those feature classes into workgroup-based feature datasets and granting common permissions to all feature classes within a feature dataset is recommended. For instance, if you have a group that will manage the Police and Fire Boundaries and Structure/Facility data, you should create a separate Feature Dataset as shown in the example below:
• You may need to drop the topology to move some feature classes to different Feature Datasets. You can recreate the topology using the topology .rul file included with the design template materials. The wizard will skip over rules that correspond to feature classes that are no longer in that Feature Dataset.

• You may need to do occasional rule validation to check topological relationships between datasets that are managed by different departments. You should develop a plan to monitor this aspect of data quality as part of data update procedures.

• While you are doing this housecleaning, you could also re-arrange, delete, or rename feature classes you have no plan to implement. One simple way to do this is just rename everything you are not using to start with “zzz” or to move the feature classes to a feature dataset called “zzz” or “unused”. There is a minor performance impact incurred by keeping the feature classes in the same feature dataset as features you are editing – they are opened/checked when users Start Editing, and also in some editing operations (i.e., the first time feature classes in a topology/feature dataset are edited). In practice it is probably best to create a separate “Future Feature Classes” FDS in your Geodatabase or a separate File-based GDB to hold unused feature classes to help alleviate performance issues and then import any feature classes needed at a later time).
Set up Topology

A basic topology is included with the data model. Experience with many local government datasets indicates that most datasets coming from multiple sources will have basic topological issues. For that reason, the rules are quite simple in the template.

There are a few key decisions:

- **Cluster Tolerance.** This is the distance between points that the topology engine will basically consider as coincident. By default the cluster tolerance will be very small, which means that vertices will have to be very close together to be snapped together (not likely the case if you are loading multiple shapefiles from different sources). You should consider how accurate the data is when choosing the cluster tolerance. For instance, if the data is accurate to 1ft, you wouldn’t want to have a cluster tolerance >= 1ft because the accuracy of the data would be impacted. It is generally wiser to have a cluster tolerance between 0.5 to 0.1 times the accuracy of the data. You should experiment with your own data to better understand the impact (just remember to keep original copies!).

- **Rules.** Simple rules work best – at least when you are getting started. Work with a few small areas and experiment with different rules to see if rules will work for your data. You will likely notice some surprising issues in current data when you run even the most basic rules on the data.

- **Generally speaking,** the relationships between administrative boundaries and the underlying features (roads, rivers, etc.) they are vertically integrated with will not have any consistent rules. That may be counter-intuitive but it’s usually the case.
• In Enterprise Geodatabases you should understand topology default parameters when setting up a topology.

Tool Tips

• You can use GeoProcessing tools/scripts to create a topology and rules if you want to automate this portion of the Geodatabase creation.

• Once you set the topology up and register the contents as Versioned (Enterprise/Workgroup/Personal Geodatabases), you will have to un-version the Geodatabase to change topology rules. Generally speaking you want to get this part right at the start of the project, but when you change rules later, make sure to post versions, analyze, compress and analyze again before unregistering as versioned.

• Users need to be aware that when they choose to validate their topology at the end of the setup process in ArcCatalog, that data will move based on the cluster tolerance and ranks and that there is not an option to “undo” this. If users want the ability to undo the changes caused in the validation process, then the validation needs to be performed in an edit session within ArcMap. Users who are using high-accuracy data such as points captured in a land surveying project need to keep this in mind as values can change as a result of topology validation even when using the highest rank of 1 (one).
Review Documentation and Descriptions

Basic documentation, especially for Descriptions of the datasets and attributes is provided with the data model. Again, the html data dictionary report included with the design template includes this information. You can also browse the information in ArcCatalog.

You should review the detailed properties of the datasets:

- Descriptions (stored in Metadata in the Geodatabase)
- Data Themes (stored in Metadata Keyword)
- Field Names, Types, Alias Names, Length, Precision, Scale, Domains, etc.

While these details are reasonable for most implementations, it is difficult to rename columns, change data types, or even change field lengths once the Geodatabase is created. It’s even more difficult to make changes once you load data. Spend some time before loading your data getting the details right.

<table>
<thead>
<tr>
<th>Fields</th>
<th>Alias Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOURCEDATASETDESC</td>
<td>Source Dataset Desc</td>
<td>Short Description of Source Dataset for this feature</td>
</tr>
<tr>
<td>SOURCEORIGINATOR</td>
<td>Source Organization Name</td>
<td>Name of Source provider for this feature</td>
</tr>
<tr>
<td>DATASECURITY</td>
<td>Data Security</td>
<td>Data security Classification according to common security classification levels</td>
</tr>
</tbody>
</table>
Tool Tips

- The GDB XRay tools were developed as part of this data model effort to simplify the process of examining Geodatabases and managing the properties and associated documentation.

- Most changes can be made using either ArcCatalog Geodatabase tools a variety of GeoProcessing, ArcObjects, ArcGIS Diagrammer, and GDB XRay tools.
3.5 Implementation

The next section provides information about implementing the data model – loading data, system administration, and strategies for growing the system over time.

Set up Enterprise/Workgroup Geodatabase Environment

At an early stage, even small workgroups should consider moving to a Workgroup Geodatabase. It is possible to implement a data management system without a single Geodatabase repository, but as your work progresses you will keep bumping into reasons to do it. There is a lot of information in the ArcGIS Help system related to setting up Geodatabase environments for both Workgroup and Enterprise implementations.

Small teams can get started with a Workgroup Geodatabase. If an Enterprise Geodatabase is in your future you should consider setting up the software and infrastructure to support your needs early in the project. This work can go on in parallel while you prepare and load data.

If you are not familiar with setting up Geodatabases, it will take a bit of time to install and configure the environment. Do spend some time understanding configuration settings such as dbtune, topology defaults, and other configuration options specific to your database platform:
http://support.esri.com/index.cfm?fa=knowledgebase.techarticles.articleShow&d=30673. In general, the larger the deployment environment, the more time you should spend on these details.

You should also develop procedures for backups & recovery before installing & deployment). For example, the City of Loveland spent several months prior to finalizing their implementation on understanding all components of the Geodatabase and how would or wouldn’t be used in the final design. For organizations just getting started, this time can be reduced by using this template. However, for existing systems, its crucial to understand all aspects of what users need even if those users work in departments outside of their own.

For more information on this topic refer to the ArcSDE Configuration and Tuning Guide for your database platform. There are also a number of useful Whitepapers and Technical Articles at http://support.esri.com.

Load Data

Before you load data, you will first need to develop a source-target matrix: this is typically a spreadsheet that describes the source dataset name and the target dataset name.

This data model does some aggressive consolidation of features such as golf courses, cemeteries, parks, etc. into a small number of feature classes. The reason for this is to reduce the number of feature classes/queries to the underlying database, which has a direct affect on overall performance.

A simple example is shown below. This example shows loading school district lines and polygons from multiple source datasets into 2 target feature classes. Consolidation of
multiple shapefiles into fewer feature classes is desirable from performance and design standpoints. The original “layers” can be recreated in ArcMap using definition queries and the layers can be stored on disk/in maps so users don’t have to re-configure this.

Next, you will need to develop routines to load the data. There are some simple tools to support this, and some more complex tools. In general, you should find a way to keep this as simple as possible, but you should consider automating the loading tasks since you will likely do this a number of times.

It is a good idea to do most of the initial data loading work on your development Desktop/Laptop system. File Geodatabases are fast for data loading and manipulation. To get the data to the production Workgroup or Enterprise Geodatabase, you can copy and paste from the File Geodatabase. Another approach is to set up the target Geodatabase and use the GeoProcessing “Append” Tool to append data to the target Geodatabase.
Tool Tips

- To load data into the target model, you can use GeoProcessing Tools, Scripts, and Models to store some of the parameters for data loading. A sample Javascript file is provided in the design template to demonstrate how to script the data loading task (LoadData.js).

- For more advanced data loading activities, the ArcGIS Data Interoperability Extension provides a number of additional capabilities to tailor and automate data loading processes. Data Interop is also a good tool for distributing data in different formats and data models from your data management system, so there are a number of reasons to consider using this extension beyond initial data loading.

- You will likely end up loading your data multiple times before you get it right. Spend some time automating the process at the beginning and you can concentrate on getting the data right rather than wrestling the tools.

- Setting up and loading raster data requires another level of planning and implementation. The ArcGIS Desktop Help system is a good reference for the steps involved in setting up raster data.

- Make sure to turn off Logging when you are loading to your ArcSDE database, especially for raster data.
Maps and Layers

Some sample maps are included in the design template, but you will need to connect the maps and layers to your own Geodatabase to use them. In ArcMap you will need to Repair the data source(s) for the Layers as shown below.

Also keep in mind that the sample layers will need some modification and tailoring. Like the database model, there are many detailed properties for the map layers that have to be reviewed and considered.

It is also likely that you will need to create several maps to support short and long term needs. In most cases the best way to develop a map design is to do some work in ArcMap and get feedback from end users/decision makers. You should be able to do a lot of mapping work with the basic data model, but you should also understand that your mapping work may have some impact on the data model. It’s a good idea to think about the types of maps and try to understand any data model/data impacts early in the process.

Tool Tips

- GDB XRay has some tools for documenting map layers like the documentation for Geodatabases – html and Visio/SVG graphics.
Data Management and Administration Plans

An important step is to define data maintenance processes and responsibilities. This should include detailed definitions of the processes for updating the data. In addition, it is useful to have some initial project work focused on data quality in the following areas:

- Basic data quality and integrity checking. It is likely that after setting up domains and topology for the database you will have a number of cleanup activities.

- Addresses, Parcels, and Street Centerlines are typically a challenge, especially if you are just getting started. Concentrate on these datasets in the initial stages of improving data quality.

Plan your workflow and data management tasks in sufficient detail that operators/users understand what to do when they sit down at the computer. You may find specific challenges related to multi-user editing and versioning that could be new to you and your organization – develop a plan and test the workflows before making final decisions. It is wise to evaluate several options – talk with others who already have ArcSDE & multi-user environments).

You should also consider activities related to system administration and management at this point. Develop a plan that includes day-to-day administrative tasks, assigning permissions, and backup/recovery strategies. Test your backups by doing a restore onto a different system. Prior, to going live with the system and once a good restore is established on the different system, it is suggested by the City of Loveland that a catastrophic failure is simulated on the main system and a recovery is subsequently made from the backup system.

Tool Tips

- Consider developing simple tools for data editing that streamline the data maintenance activities. Small investments in tools can lead to significant productivity and quality gains. Focus on practical needs like reducing the number of mouse clicks and putting commonly-used tasks into simple toolbars at first. Drive additional activities based on feedback from the users of the tools.

- To build additional rules for data integrity and quality into your Geodatabase, you should understand Class Extensions and Validation in ArcGIS. There is significant documentation on these topics at http://edn.esri.com.
Setting up the Publication System

In many cases a separate publication is required for use by external and/or internal users. Many organizations strive to have a single Geodatabase instance, but others prefer to separate the Publication system for various reasons:

- Architecture (performance, scalability, high availability),
- Security (filtered data content to remove sensitive data from public systems, different permissions on the publication database),
- Data Model (structure to support business applications vs. data maintenance, generally de-normalized/simplified).

The big design question for the publication system is whether to use the same data model as the maintenance system or not. For maintenance it is desirable to normalize data (split out into multiple tables and reduce redundancy in the database). At the same time, casual/web users will want to access all of the information with a single mouse click – typically these users will struggle with relationships and other complexities in the database.

For this data model template, a number of attributes and datasets have already been simplified or de-normalized. In the data maintenance environment you may need to normalize tables or drop attributes because the data is maintained in other Enterprise systems.

For the publication model, you may need or want to pull additional attribute information from other Enterprise systems, or you may want to simplify the publication data model in other ways.

One interesting opportunity starting at ArcGIS 9.2 is to use Geodatabase replication between the maintenance database and the publication database. The data model presented here is well-suited to using Geodatabase replication, but if you have additional needs then you will need to understand your options.

Tool Tips
- Geodatabase replication provides out of the box tools for distributing data to a publication system.
- The Data Interoperability Extension provides ETL tools that can be used to automate data distribution to the publication system in the case that the target data model is different from the source data model
- In some organizations, there is just one GIS Server and the distinction between maintenance and publication environments is just the applications that work from a single Geodatabase.
• Use python scripts to push maintenance data to the publication database (can be done using scheduled tasks)
Growing the System Time

Once you have the basic system in production, you are not done. One thing you’ll notice is that a lot of good things start to happen – requests from users and departments for additional support, and some funding and projects to help expand from the basic system outlined here.

There is no magic formula for prioritizing business applications, but revenue sources from Land Records and Municipal Utilities tend to drive funding for GIS in local governments. As the team working to grow the system, you should develop a strategy for growth based on best practices. Here are some basic activities you should consider as part of a strategy:

• Find peers and success stories for different application areas. For local governments, the Urban and Regional Information System Association (URISA) holds a meaningful conference for sharing ideas.

• Share solutions and data
  – Internal
  – Gov2Gov

• Talk to business managers in your organization
  – About how to leverage GIS data in government business functions
  – About Spatially enabling existing business applications/workflows

• Expand Data and Map Publishing
  – Build Web Services
  – Multiple hosting and access options

• Add new datasets as time allows and the need arises

• Find your consumers/customers and listen to them

Overall, you should develop a long-term strategy for growing the program, and look for opportunities to achieve your goals incrementally through funded projects and collaboration in your community.