MetroGIS: Moving Regional GIS Data Sharing from Concept to Reality

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Abstract: *In the fall of 1995, the Metropolitan Council of the Minneapolis and St. Paul Area began a regional GIS data sharing initiative called MetroGIS. The goal of this effort is to facilitate, through a collaborative stakeholder governed mechanism, wide-spread sharing of geospatial information among the organizations that serve this seven-county area and to improve decision making support for the participant organizations. This paper describes the circumstances, the approach and the preliminary results of the MetroGIS initiative*.

Introduction

MetroGIS is a region-wide geographic data and information sharing project with participation from both the private and the public sectors. This initiative began in fall 1995 and is still developing. MetroGIS emphasizes broad based participation in the policy and technical decision making needed to bring it to reality.

The participants include all forms of government with jurisdiction within the seven county Twin Cities Metropolitan Area of Minnesota, together with private sector, utility, and academic interests. The Twin Cities Metropolitan Area is 3,000 square miles in area and has a population of more than 2.4 million people. As of 1997, the metro region is made up of 7 counties, 189 municipalities, 66 school districts and 46 water management organizations.

The Metropolitan Council initiated and is facilitating this stakeholder-governed, multi-participant venture. The Metropolitan Council is a regional planning organization that coordinates the orderly development of the seven county metro area and also has operational responsibilities for transit services and wastewater treatment. The Council develops data to support all of these responsibilities. GIS has expanded to meet a growing demand to support activities in forecasting, land use, transit, transportation planning and wastewater.

All counties and many municipalities and other organizations within the seven county area have GIS capabilities. Sharing of GIS data is taking place in some parts of the region, especially between counties and the municipalities within those counties. State level efforts to facilitate sharing are also occurring.

Development of standards and data clearinghouse efforts is being coordinated through the Minnesota Governor's Council on Geographic Information and Minnesota Land Management Information Center. All of these activities are advancing GIS data sharing. MetroGIS is taking the next step by establishing policies, procedures, standards and a mechanism which supports region wide, multi-jurisdictional GIS data sharing.

Circumstances Leading to GIS Data Sharing

Regional Circumstances

As in other regions, a variety of circumstances are advancing the arguments in favor of GIS data sharing. The Internet is affecting both the demand for information and the ease with which it can be made available to others. At the same time, pressure is increasing on government agencies to become more efficient, reduce costs, and still maintain traditional levels of service. Advances in GIS and computer technology have also brought GIS technology within the reach of most local government agencies.

Many organizations in the Twin Cities Metropolitan Area have developed GIS capability in response to their internal needs. The cost of acquiring data remains one of the greatest barriers to the use of GIS and has created an environment ripe for sharing GIS data development costs. Yet traditional agency boundaries impede this demand because there are no coordinated policies in place which encourage cooperative efforts.

The number of GIS users with overlapping jurisdictions is increasing as more local governments in the seven county area acquire GIS capabilities. School districts and watershed management organizations often have boundaries which cross into more than one county. The counties are the source for much of the basic GIS data needed to support local government activities, yet there is no data standardization between counties.

Data standards and policies which encourage cooperation will benefit all levels of government. Yet who should take the lead? How can an individual county justify initiating regional data sharing?

Metropolitan Council's Circumstances

The Metropolitan Council is a regional planning and operating agency. Operating the public transit system, wastewater treatment and overseeing land use policy for the seven county area is a regional leadership role which fits well with an effort to share GIS data across the Twin Cities Metropolitan Area. While these circumstances make the Council a logical choice to lead such an initiative,

there must be a substantial internal business reason for such an ambitious effort. The need to improve the accuracy of land use data is just that reason.

The Metropolitan Council's traditional way of collecting land use information has been to interpret it from aerial photography. In addition to its use by the Council as a general land use planning tool, land use information is also used as a key piece of information for controlling urban development. It is used to determine land allocations for development within each community in the region. For many communities the accuracy of this interpretation is critical, especially for those communities experiencing rapid growth.

Generalized land use interpreted from aerial imagery no longer has the accuracy demanded by communities in this land planning process. Many of the communities have access to land use information for individual land parcels either based on county data or coded by the community. No mechanism exists to allow the information to be shared easily by local and regional users and no standard exists which can be applied fairly across the whole region. Acquiring an accurate source for existing land use data with standard classifications is a need the Council believes can be resolved through the sharing of GIS data.

Develop a Strategic Plan

Metropolitan Council Support

What began in the Summer of 1994 as a need by the Metropolitan Council to develop better data for a specific task -- determining land availability for development -- soon turned into a regional initiative with two major goals: (1) acquire GIS data to support internal activities such as land use planning, urban services planning, and forecasting, and (2) Facilitate the availability of GIS data and resources of the region for the common benefit of the region.

A proposal was developed in October of 1994 which required hiring staff to support the goals of this initiative. A plan also was developed to produce ortho photography at a much lower altitude than available from USGS Digital Ortho Quarter Quads. Ortho photography at a 5,000 foot elevation along with a 2 foot contour interval digital terrain model was selected to serve many needs of local, regional, state and federal agencies. The estimated cost for this 3,000 ortho image project was more than $6 Million. The Council allocated $1.2 million for 1996 and 1997 to support this project. The remaining funds were expected to come from state, federal and local organizations with an interest in the data.

Support of the GIS Community

In October of 1995, the Council and the Minnesota Land Management Information Center (LMIC) (now known as the Minnesota Geospatial Information Office: MnGeo) co-sponsored two GIS Information Forums. The forums were attended by more than 150 people from 88 different organizations. Officials from all levels of government and many private corporations attended. The concept of a regional GIS and the Council's offer to facilitate the initiative were presented. Skepticism mixed with genuine support for the concept of sharing GIS data characterized these early forums. Two messages came out of these sessions with state, federal and utility company officials to discuss ortho imagery: (1) People strongly supported developing a means to share GIS data and felt the Council should take a leadership role in this effort; and (2) while the value of 5,000 foot ortho imagery was acknowledged, the same resources could more effectively be used to enhance existing GIS efforts and facilitate regional GIS data sharing.

Based on this early feedback, the Council revised its plan. In November 1995, the Council agreed to replace its ortho imagery incentive program with a data and cost-sharing incentive program designed to be responsive to the individual needs of each county and to support projects that promote cross-jurisdictional GIS data sharing.

Create a Common Vision

Twenty one people, selected from organizations with GIS expertise and attendees of the GIS Information Forums, were asked to participate in a day-long strategic planning retreat on December 14, 1995. John Bryson of the Humphrey Center at the University of Minnesota was retained to facilitate the retreat. During the retreat, a series of large and small group exercises were used to generate issues, ideas and strategies and then organize the steps needed to develop a cross-jurisdictional GIS data sharing effort. Over 250 tasks were identified along with their relationships to each other. With support from Metropolitan Council staff, additional meetings were held through April of 1996 to create a common vision of cross-jurisdictional GIS data sharing for the Twin Cities Area. In these meetings, 15 strategic issues were refined and ranked, and consensus was reached on the scope of what was to become known as MetroGIS.

These facilitated meetings led to two results. First, the strategic planning group developed an understanding of other member perspectives and gradually forged a statement of intent for MetroGIS. The MetroGIS statement of intent is as follows:

Provide an ongoing, stakeholder governed, metro-wide mechanism through which participants easily and equitably share geographically-referenced graphic and associated attribute data that are accurate, current, of common benefit and readily usable.

The second outcome of the strategic planning meetings was an interim decision making structure. By April of 1996, the strategic planning group had taken on a new name, the MetroGIS Coordinating Committee, along with interim operating rules and four advisory teams to address the 15 strategic issues. The four teams and their purposes were identified as follows:

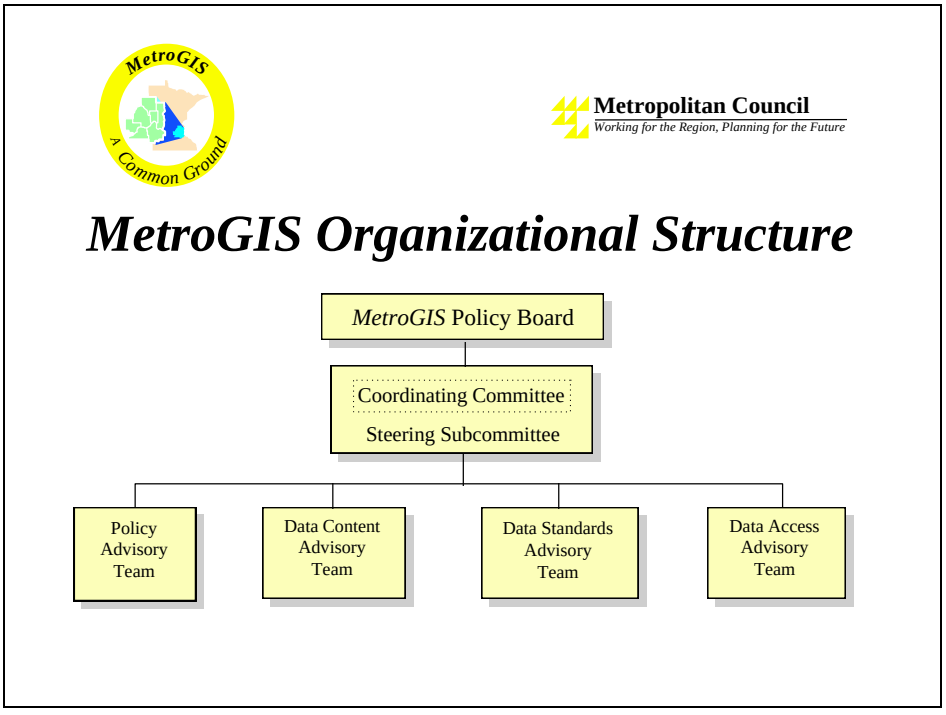
Data Access: Identify the mechanisms for indexing, describing, and accessing current, accurate, secure and usable geographic referenced graphic and associated attribute data.

Data Content: Identify the data sets and their characteristics which provide the greatest utility for the Metro Area GIS data user community.

Data Standards: Identify or develop standards that allow data sharing among the participants of the MetroGIS.

Policy: Identify a strategy to obtain participant commitment and long-term financial support for a stakeholder governed, metro-wide mechanism to equitably share geographically-referenced data.

FIGURE 1:



Sixty-four additional people were recruited to participate on these teams. A forum was held on May 16, 1996 to explain the strategic planning process and the purpose and responsibilities of each of the four teams. The first team meetings were held simultaneously to help people understand the breadth and depth of the MetroGIS initiative. The structured agenda established a coordinated purpose and consistent format among the teams.

By the end of May 1996, an overall plan and the core of the MetroGIS decision making structure were in place (Figure 1). Strategic issue advisory teams were populated and ready to take actions to implement MetroGIS. The one remaining decision making component was a board to set policy.

Implement the Strategic Plan

Endorsement Process

A policy making body was needed to have the organizational and political support necessary to bring MetroGIS to reality. The roles of various participants helped define their representation in the decision making body for MetroGIS. Three levels of stakeholder interests were identified:

Essential Participants: Organizations whose participation is vital to the existence of the MetroGIS.

System Enhancers: Organizations which produce data or possess resources (equipment, staff or funds) that, although not essential to the existence of the MetroGIS, would enhance the functionality or benefits received from it.

Secondary Beneficiaries: Organizations or individuals which are solely users of MetroGIS data or services.

Support of the objectives of MetroGIS by key stakeholder interests early in the project was critical to the success of MetroGIS. As a result, formal endorsement and the selection of a Policy Board representative from each of the seven counties and the Metropolitan Council were sought in the fall of 1996. Endorsement of MetroGIS objectives and Policy Board representatives from associations which represent metro area municipalities, school districts and watershed districts was also secured. The MetroGIS Policy Board convened for the first time on January 15, 1997.

Identification of Common Business Information Needs

Simultaneous with the endorsement project, work began on another strategic issue necessary for sharing data -- identify data to be shared. It was clear from the strategic planning process that each participant had both their own special area of interest for data sharing and their own idea of what was meant by a particular GIS data set. The Data Content Advisory Team was charged with defining the core data that would be shared by MetroGIS participants. A process called business object modeling was selected for this task and Advanced Strategies Incorporated (ASI), a consulting firm based in Atlanta, was hired to guide the process.

Most business object models assume a single organization with some sort of central authority to require participation, enforce compliance or limit scope. MetroGIS is a consortium of numerous interests. It has no centralized authority to require participation and must rely upon a distributed system with many processing nodes and voluntary participation. The value of a business object model to MetroGIS is not as a means to enforce implementation, but rather as a process in which each participant identify its own information needs and the group as a whole reaches consensus on a model which benefits all participants.

Once again, a key component of the MetroGIS initiative was to include participants representing many perspectives. More than 100 subject matter experts from local, county, regional, state and federal levels of government and the private sector were invited to participate in one of six focus groups. Over 750 business information needs in the form of questions were identified. These 750 questions were consolidated into a list of 87 discrete information needs. Representatives from each of the focus groups were then asked to participate in three days of meetings to develop a business object model showing the entities, relationships and attributes needed to answer those business information needs. A survey was conducted to rank the importance of each consolidated information need from a cross-jurisdictional perspective. The results of this survey are not yet analyzed.

Two products will result from this process: 1) a list of core interdependent data needs common to most organizations serving the seven county area; and 2) a model of the entities, attributes, and relationships which make up MetroGIS business information needs. The next step, anticipated to begin in June 1997, will identify the real world sources of the best data to satisfy the core data needs.

Define the Metropolitan Council's Role

Because of its dual roles as both facilitator and stakeholder, the Metropolitan Council defined its role as facilitator early in the process. By defining its facilitation role, the Council has made room for others share the responsibility for the development of MetroGIS and freed itself to participate as a stakeholder with its own internal business needs. The Metropolitan Council formally adopted a leadership role, on February 8, 1996, which is defined by the following activities:

- Support the MetroGIS Policy Board, the Coordinating Committee, and each of committee's affiliate advisory teams;
- Support the initiative's mass media communication needs;
- Develop and maintain data bases with regional significance;
- Finance pilot projects;
- Facilitate the execution of data sharing agreement among stakeholders.

Data and Cost Sharing Agreements

Using the plan developed in early public meetings and acting in its facilitator role, Council staff approached each county to negotiations a data and cost sharing agreement. The first step defined the status and needs of each organization's GIS and the benefits they would receive from GIS data sharing. Each organization brings its own mix of assets to the negotiations. The mix includes data (geographic, related attributes and imagery), resources (staff, experience and equipment), and funds (from existing programs, matching funds and new initiatives). To define the status, needs and benefits for a county, a series of meetings were held with county and staff of other jurisdictions within the county. These meetings clarified county and Council interests and documented assets and needs forming the foundation for negotiations with each organization.

This documentation provides the basis on which an individual data and cost sharing agreement can be developed. Each agreement is between the Metropolitan Council and the county and has provisions with three major purposes: 1) to level the playing field with other MetroGIS participants; 2) to share a part of the maintenance costs incurred by the county; and 3) to fund projects of value to the county, its communities and the development of MetroGIS. In exchange for the benefits of these provisions, counties agree to share their GIS data with other participants for approximately three years. The

agreements do not give users the right to redistribute data. It only gives them the right to use the data. Many counties require a license agreement be signed before the data are made available.

Four of the seven counties had signed agreements by the end of 1996. The remaining county agreements are expected to be completed by mid 1997. These agreements are between the Metropolitan Council and each county and are part of the Council's role to facilitate the development of MetroGIS. The purpose of these agreements is not to establish MetroGIS, but to create an environment in which agencies can explore long-term GIS data sharing solutions. By signing an agreement a county establishes a policy which allows data exchange. The mechanism for exchange, data standards and the data content has yet to be established.

Beginnings of Data Sharing

Before MetroGIS fully develops as an organization, practical tests of data sharing must occur. The data and cost sharing agreements and other MetroGIS initiatives have created an environment open to GIS data sharing. The following examples illustrate early tests and successes in sharing.

In counties where data and cost sharing agreements have been executed data is already being shared across jurisdictional boundaries. TIES, an information systems service consortium serving most Twin Cities Area school districts, has begun a GIS pilot project in Dakota and Scott Counties using data available through these agreements. School districts are a good example of how organizations will both benefit and contribute to the success of MetroGIS through data sharing. School districts need parcel information for a wide range of business needs from routing school buses to long-range projection of school enrollments and the need for facilities. As part of their regular business activities school districts conduct annual censuses of school aged children. Parcel boundaries associated with school census data have value not only for the immediate needs of the school districts but also for county and regional planning and forecasting.

Although digital ortho imagery was not pursued as part of the MetroGIS initiative, a cooperative aerial photography flight was flown. The Council, in collaboration with three counties, developed specifications for a 5,000 foot flight and contracted for aerial photography for parts of three counties. A fourth county used the specifications for a separately contracted flight. Two benefits were derived from this project: 1) Overall costs were reduced by aggregating the demand for aerial photography by the individual counties; and 2) A common standard for 5,000 foot aerial photography was implemented increasing the value of the product especially along the borders between counties.

An agreement for the use of a regional street centerline database is being negotiated between the Council, the state transportation agency (MnDOT) and a private data supplier, The Lawrence Group (TLG). The data set contains street centerline and address range data for the region and portions of the rest of Minnesota and parts of Wisconsin. The agreement licenses all state and local government agencies in the state of Minnesota to use the street centerline data.

In addition to the importance of the information content of the street centerline data set, it is also important for testing procedures and policies for sharing GIS data. While each county has its own local coordinate system for GIS data, MetroGIS must develop a standard which allows an easy and reproducible means of transferring data from those local coordinate systems to a regional standard for use by other participants of MetroGIS. The street centerline data is an excellent data set for working out the process for the actual sharing of data. Wherever possible, the street centerlines are based on county parcel data and the road right-of-ways they show. This information is in county coordinates and must be converted to the MetroGIS standard of UTM, NAD83 Meters. By developing the conversion process with this data set, procedures for other data sets can be established using this process as a model.

While these early sharing tests and successes only hint at the value of MetroGIS to participants, they are important in demonstrating that MetroGIS can succeed and its principles are sound. Both data sharing experiences and MetroGIS projects are being documented to help others learn from those experiences and to evaluate the benefits of MetroGIS to participants and the region.

Points of Interest along the Way

This section contains a series of personal observations that have been shaped by my experience with the MetroGIS initiative.

My Data, My Revenue

One of the greatest hurtles to be overcome before GIS data can be successfully shared on a regular basis is the issue of preserving or replacing revenues generated by GIS products. How can data be shared without destroying revenue streams that many MetroGIS participants use to support their GIS functions? It is difficult to encourage sharing based on a promise of future benefits when current revenues could be lost.

Data and cost sharing agreements are meant to alleviate some of these concerns in two ways: (1) data are to be freely shared with participants only, leaving most revenue streams in place; and (2) the agreements provide funds which in part

compensate essential data providers for maintenance, past development and help support GIS initiatives of interest to the participant.

Pace of Development

It was clear early in the process of developing MetroGIS that a wide range of philosophies were represented in the groups. The philosophies range from *"let's just do it and see what needs to be changed as we go along"* to *"everything must be carefully planned before action is taken"*. This has created a healthy tension in meetings. The value comes from the balance that is achieved between taking action too soon—resulting in potentially bad decisions which cannot be easily changed; and taking action too late—risking the possibility of losing support or momentum.

Include Stakeholders with a Variety of Perspectives

In the MetroGIS project, a conscious effort has been made to include a broad representation of the region's GIS community. Consideration of geographic distribution, level of government, private and non profit participation has been a central concern when developing invitation, newsletter and mailing lists. Articles have regularly appeared in Minnesota's GIS/LIS News and Council publications. A website has been established with information on team activities, MetroGIS mission, projects, updates and results. Efforts are being made to keep the GIS data as vendor neutral as possible so organizations using various software products can participate.

Early in the process, participants were skeptical about whether decisions would be dominated by the Council or if all participants would have a voice in the development of MetroGIS. As the decision making structure for MetroGIS has developed into a user governed organization, participants have become increasingly confident that their concerns will be addressed. Participation in MetroGIS is voluntary, making it necessary for all participants to see benefits for their organization. Otherwise they have no reason to continue participation.

When Opportunity Knocks...

Two benefits of combining development and acquisition efforts when sharing GIS data are: reduced costs and improved efficiencies. These benefits are often possible not just because people are willing to work together but also because opportunities arise which allow the completion of tasks using resources that may not otherwise be available. Watching for opportunities which allow for the leveraging of funds to accomplish the goals of MetroGIS is important. Without clearly defined goals it is easy to lose sight of the focus of MetroGIS and divert resources and energy to side issues. At the same time, flexibility in selecting

among goals is necessary for successfully taking advantage of opportunities. Council funds have been used as seed money to leverage resources from other organizations, both internal and external to the region.

Bring Cookies

While this seems trivial, it is really quite important. The early stages of the development of MetroGIS depends heavily on not only the participating organizations but even more so on the individuals in each of the organizations who must take the concept of GIS data sharing back to their organizations and promote it from within. These people are extending themselves and a simple "thank you" goes a long way. Many of the brainstorming sessions require participants to concentrate on complex conceptual ideas. Comfortable settings, snacks and well organized meetings allow people to perform at their best.

Conclusion

MetroGIS has had a successful beginning. More than 300 people from 100 organizations have participated in various phases of this initiative. Careful planning and involvement of participants with diverse interests has helped it grow. The time and effort invested to build a strong foundation for regional GIS data sharing in the Twin Cities Metro Region has been well spent. MetroGIS has well defined goals and mission, a clearly articulated decision making process, broad based participation, and leadership and end user support.

MetroGIS is a work in progress. One and a half years into the initiative, many tasks remain to be completed before MetroGIS is truly established as a cross-jurisdictional GIS data sharing organization. A mechanism to select and access shared data must be developed and implemented, agreements must be reached on the range and characteristics of data to be shared, data and procedural standards must be established and an appropriate legal structure must be defined to legitimize MetroGIS as a free standing entity. Data and cost sharing agreements have opened a 3 year window of time for MetroGIS participants to explore ways to best share GIS data before a long-term solution is achieved.

Finally, MetroGIS promises benefits for the whole region. Implementation of MetroGIS is expected to reduce duplication of effort, cut government costs at all levels, vastly expand access to geographically referenced information and allow organizations to concentrate on the issues rather than argue over the credibility of the data. These benefits are being realized through a stakeholder governed metro-wide organization which responds to the common concerns of participants.

References

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Acknowledgements

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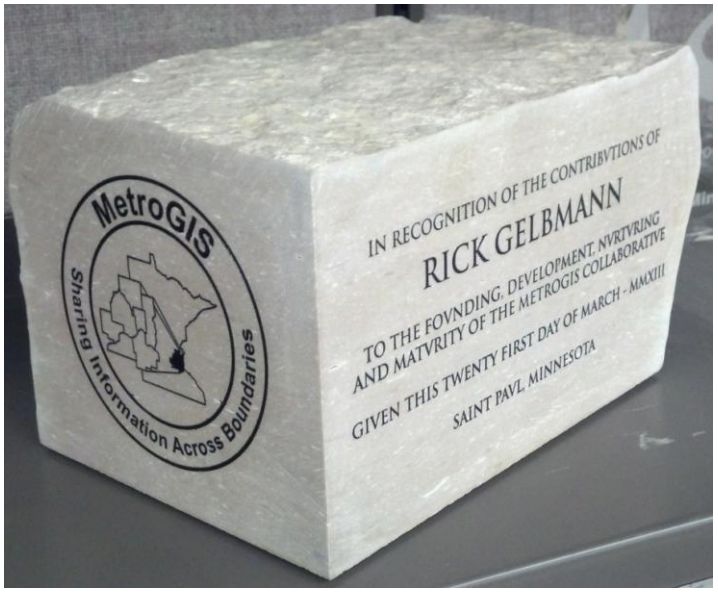

This ‘cornerstone’ was awarded to Rick Gelbmann in April 2012 from the MetroGIS Coordinating Committee upon his retirement from the Metropolitan Council after twenty years of dedicated service.

Rick was one of the “founding fathers” of MetroGIS and a key architect in ensuring the collaborative was able to develop and flourish.