



Imagining Possibilities: The Next Frontier for Geographic Information Technology

June 1, 2006 Forum

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Respectfully,

Randall Johnson, Forum Project Manager
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EXECUTIVE SUMMARY

On June 1, 2006, nearly 250 individuals gathered at the University of Minnesota's Hubert H. Humphrey Institute to attend an event, entitled "Imagining Possibilities: The Next Frontier for Geographic Information Technology". The forum was designed around four keynote speakers, respected nationally and internationally within the geospatial community, who were invited to share their visions of capabilities that geospatial technology will enable within the next five years. The speakers were: Michael Liebhold, Senior Researcher for the Institute for the Future (ITF), Clint Brown, Director of New Product Release for ESRI (Environmental Systems Research Institute), Mark Reichardt, President of the Open Geographic Consortium, and Professor Ian Masser, spatial data infrastructure expert and former President of the Global Spatial Data Infrastructure (GSDI). The composite effective evaluation ratings for the keynote speakers and panel sessions were 3.38 and 3.13, among the best, if not the best, ever received in MetroGIS's ten-year existence.

This event was hosted by MetroGIS in conjunction with Mn GIS/LIS Consortium, University of Minnesota, MN Office of Geographic and Demographic Analysis, Governor's Council on Geographic Information, Metropolitan Council, and the Mn Chapter of GITA. MetroGIS served as the lead sponsor because its leadership recognized the need for a glimpse into next-generation capabilities of geospatial technology before launching, later in the year, an initiative to update the Business Plan that guides MetroGIS's efforts¹.

The forum attendees represented a wide variety of professions and job responsibilities, including technologists, managers and policy makers, affiliated with all types of government interests that serve the seven-county Metropolitan Area, Greater Minnesota and beyond, as well as a variety of academic, non-profit, and for-profit interests.

The four keynote speakers offered an amazing diversity of perspectives and "big ideas" regarding several aspects of the future of geographic information technology – the tools and applications themselves, standards needed, and organizational structures needed to fully capitalize on the technology. Following each of the keynote addresses, an hour-long panel session was held to explore in more depth the "big ideas" shared to ensure a clear understanding in preparation for discussion of preferences and options to guide MetroGIS into its second decade of fostering collaborative solutions to common geospatial needs. While MetroGIS has successfully implemented several regional solutions to common information needs, solutions for several others have yet to be identified. A leadership adequately informed about possibilities will be critical to effectively answering the question, should MetroGIS's focus be on maintaining what has been built or embrace new challenges?

An overview of "big ideas" shared, listed by keynote speaker, includes:

Michael Liebhold (Senior Research, Institute For the Future [ITF])

- Individuals will become a dominant segment of GIS user base.
- GeoWeb will work as increasingly more web objects will have spatial coordinates and if everyone adopts a standard way of delivering data. Special emphasis on individuals and the realization of the Star Trek *Tricorder* vision of knowing everything about a place.
- Need to act now to prevent Balkanization of information: e.g., the Google way, the Yahoo way, the Microsoft way, etc. GeoRSS can bring resolution.
- Technology is becoming imbedded in many devices and applications.

Clint Brown (Director of Software Product Release, Environmental Systems Research Institute [ESRI])

- A Digital [Environmental] Nervous System for the Planet will exist when we link sensor networks from many sources [and vendors]. Need Data Fusion Centers.
- Emergency response to a crisis like Hurricane Katrina is showing us the value of data sharing, but it took extraordinary efforts to pull together data from various sources.

Mark Reichardt (President, Open Geospatial Consortium [OGC])

- Open standards facilitate entry of new firms with new products and solutions. They also facilitate data sharing among all users.
- New standards are coming that will
 - 1) Allow Computer Aided Design (CAD) users to share their as-built information.
 - 2) Provide a registry of map symbology and style
 - 3) Facilitate service chaining
 - 4) Enable sensor locations
 - 5) Start work on semantic interoperability

Professor Ian Masser (Spatial Data Infrastructures and Former President of the Global Spatial Data Infrastructure [GSDI])

- Five principles from Infrastructure for Spatial Information in Europe (INSPIRE)
 - Data should be collected once and maintained at the level where this can be done most effectively
 - It should be possible to combine seamlessly spatial data from different sources and share between [sic] many users and applications.
 - Spatial data should be collected at one level of government and shared between [sic] all levels
 - Spatial data needed for good governance should be available on conditions that not restricting to its extensive use
 - It should be easy to discover which spatial data is available, to evaluate its fitness for purpose and to know which conditions apply for its use
- GIS user base is changing, with technology-aware professionals becoming an ever-smaller fraction of this base.
- For the benefit of both government and society, we need to design governance structures that facilitate networking, data sharing, and the maximum use of data assets. MetroGIS is one of many good models.
- To be successful, GIS organizations need to be seen as necessary and valuable to those who control their budget. They need to actively market themselves.

WELCOME

At 8:15 a.m. Victoria Reinhardt, Ramsey County Commissioner and MetroGIS Policy Board Chairperson, introduced herself, welcomed the participants, and thanked the sponsoring organizations for making this event possible.

The vast expertise of the four keynote speakers was recognized and they were thanked for agreeing to spend the day sharing their understanding of capabilities they believe will be possible within the five years due, in large part, to advances in geospatial technology. The participants were encouraged to take advantage of the panel sessions following each of the keynote talks to explore nuances of the possibilities shared by the speakers. She emphasized that the learning that occurs at this event is intended to play a significant role in upcoming strategic planning programmed by MetroGIS and the other sponsoring organizations.

Chairperson Reinhardt closed her welcoming remarks by acknowledging that, as a community, we need to better understand technology possibilities before we can decide on priorities and appropriate partnering opportunities necessary to set a compelling course for the remainder of the decade. This forum is an initial step in that process. She wished everyone an enjoyable and enlightening day.

OVERVIEW OF THE DAY

Note to the reader: The presentation slides used to transition from one segment of the program to the next are presented in Appendix B.

Will Craig, Associate Director for the Center of Urban and Regional Affairs (CURA), University of Minnesota, served as the Emcee for the event. He opened his comments with an overview of the purpose of the forum:

....identify a range of technology possibilities related to enhancing the sharing of and effectively using geospatial data and information important to the day-to-day operations of the organizations that comprise our community.

Craig then provided a brief overview of the day's program, encouraged the participants to jot down questions as they came to mind to ask of the panelists following each keynote speaker, and invited everyone to take advantage of this opportunity to learn from the four widely respected keynote speakers. He then introduced the first speaker.

IMAGINING POSSIBILITIES (Part A): WHAT DOES THE CUSTOMER WANT (THOUGH THEY MAY NOT KNOW IT YET) AND WHAT ARE WE PREPARING TO DELIVER?

Keynote Speaker: Michael Liebhold: Institute for the Future.



Biographical material included in the program packet: Michael Liebhold is a Senior Researcher for the IFTF focusing on pro-active, context-aware and ubiquitous computing, as well as social implications and technical evolution of a geospatial web. He is active in projects aimed at helping technologists and strategic planners from top tier companies and the public to better understand the emerging geospatial information infrastructure.

Summary of Michael Liebhold's Presentation (See Appendix C for some slides from this presentation.)

Liebhold provided the audience with an amazing look into the future of geographic technology through the lens of a technology futurist. He clearly has respect and high expectations for the geographic information system (GIS) community and the role GIS technology is posed to play in evolving the Internet to a new dimension – the **GeoWeb**: where information and documents are found not just by content (URL), but by location. He believes that adding a geospatial dimension will encourage mapping/documentation of valuable trends associated with place.

His concept of realizing the Tricorder device associated with the Star Trek television series was particularly insightful. This device would be similar in size to a cell phone and it would provide the user with the ability to interact real time with the place they are located; gathering, querying, analyzing, and displaying a host of information. He called this capability **first person or real time cartography**. To make this concept a reality, **metadata will need to evolve** to incorporate formal and plain language data descriptions. Standards will also need to be established soon so that stovepipes between ESRI/Microsoft/Google/and Yahoo do not restrict interoperability important to fully realizing the technology's potentials. He used the term "**balkanization of information**" to describe the current situation where by large Geo-Internet commercial interests are independently exploring ways to capture market share. Liebhold offered the concept of **GeoRSS** as potentially the missing link to address the interoperability challenge. Another challenge to realizing the Tricorder concept is that critical data often involve a fee and licensure for access. If government policies do not evolve to more **open access of data** needed for first person cartography, Liebhold suggested that the Open Street Map Movement that began in the United Kingdom might well establish itself in the United States to overcome this challenge. He also cited a newcomer to the GeoWeb environment, www.Platial.com, whose leadership has created a platform that works with all the current leading commercial Geo-Internet interests, giving further creditability to the open map movement.

Liebhold then shared some of the benefits to society of the practice of "**path making**" that is beginning to take hold and which is fueled by users adding their stories (photos, maps, text) to the world wide database supported by the Internet. Path making involves creating a spatial memory or capturing stories about place. GIS and the GeoWeb are at heart of this emerging practice.

He also talked about the **concept of pixel views**. The idea is that spatial data about a place can be drilled down from the global view, to the nation, to the state, to the sub-state, to the structural unit, and ultimately to building interiors, coupled with attributes that define **non-visible characteristics** attached to each view in the progression. He talked about this capability as fundamental to achieving a better understanding all aspects of our world community (e.g., built environment, at risk ecologies, health needs and opportunities, security risks and opportunities, geo-demographics.). He ended with a caution that **GeoSPAM** is an up and coming issue as the concept of first person cartography evolves.

Questions/Answers (No Panel Session) – Michael Liebhold

A short question and answer opportunity was provided to the audience following Michael Liebhold's presentation. The Forum Planning Workgroup thought it best to provide a brief opportunity for questions immediately following Liebhold's presentation rather than make everyone wait for the formal panel session after the next speaker.

What is the new role for GIS Professionals? Reply: the new rock stars. Share your data. Get citizens involved.

What about the government's use? Location privacy? Reply: A problem potentially. The phone companies know where we are, the agencies do, but we don't. Tradeoff of security versus privacy. We take for granted the society of trust.

What is the geospatial community's role in educating the public on preventing them from using geospatial data inappropriately? What about the subtleties, nuances, technical issues? Reply: One step at a time. Make a list of the most important technical limitations, show people how easy it is to use. Get them using it as a hook. DLESE (Digital Libraries in Earth Science Education).

What role does government have to play in providing geospatial information in the future? Is it just overhead, or is it a core mission? Reply: for public health and safety, it's of utmost importance. Some places are perfectly safe, others are unsafe. Why don't the police publish incident maps? Why don't insurance companies make auto accident records visible? Katrina was a wakeup call. One storm or earthquake would be a disaster in California. The case of emergency response is the foothold to justify geospatial information. Public access to data is seen as a right by citizens. In Europe, they have more cost recovery, and so less grassroots mapping.

Will a user-encoded web be viable solely by being self-policed, like Wikipedia is relatively good data because the users police it? Reply: There will be abuses, spatial spam, we'll have to filter, it's going to be chaotic, but there WILL be more spatial data.

REFRESHMENT BREAK

Will Craig called for a break at 9:40 a.m. He reconvened the forum at 10:00 a.m. and introduced the next keynote speaker.

IMAGINING POSSIBILITIES (Part B): WHAT DOES THE CUSTOMER WANT (THOUGH THEY MAY NOT KNOW IT YET) AND WHAT ARE WE PREPARING TO DELIVER?

Keynote Speaker: Clint Brown: Environmental Research Systems Institute, Inc. (ESRI)



Biographical material included in the program packet: Clint Brown is Director, Software Products for ESRI. Responsible for managing all ESRI product releases in use today in thousands of organizations worldwide. Responsible for product design, development and release of quality products. Works closely with Software Development teams managed by Scott Morehouse, ESRI's Chief Software Architect and Visionary.

Summary of Clint Brown's Presentation (A copy of the slide presentation is provided in Appendix D).

Clint Brown began his comments by acknowledging the rich history of GIS in Minnesota, noting that successful GIS goes hand-in-hand with strong communities. He then provided a brief explanation about the unique capability of GIS to integrate data from applications (views), geospatial databases, and geoprocessing models which are all based on geography. A locally-acceptable location (geography) is the key to sustaining trust for use as an effective business tool and the appropriate level of detail must be shown for the geography of concern: Are you at block level, county, state, nation, or world view?

He emphasized that GIS technology is an integrating tool capable of bringing together data from many sources and supporting visualization of the current situation as well as future possibilities for decision making of all kinds. He concluded his introductory remarks by noting that the future will favor organizations that use/integrate GIS technology, as GIS is used to do real work and is among the top ten fastest growing industries. Based upon estimates ESRI has made, organizations that comprise metropolitan areas the size of the Twin Cities invest \$50 to \$100 million annually to support decision making via GIS and related technologies, much of which is uncoordinated. Brown emphasized with an investment of this

magnitude, the information produced from these activities needs to be acknowledged as a **key asset**. He also emphasized that coordination of the related expenditures could add greatly to existing capabilities.

Brown then talked about the vision of an expanded NSDI (National Spatial Data Infrastructure) where 14 themes of framework data, important to everyday decision making, at all scales (global, national, state, sub state, community, individual property), can be readily accessed along with the ability to zoom seamlessly among them. He offered a concept of **Data Fusion Centers** as a means to realize this vision by integrating data developed at all levels by those who are most well qualified to do so.

An analogy of the federal highway system was offered as a possibility to achieve the vision of the NSDI, through which guidelines and funding for data development flow down from national and state authorities and the data flows up from the local government entity closest to the actual creation and day-to-day transactions that modify the source data. To accomplish this two-way flow, agreement on a **common operational picture** is critical. He congratulated MetroGIS for its accomplishments toward establishing a common operational picture of data standards and custodial roles and responsibilities. He commented that the **U.S. Geological Survey's "Blue Book"** provides valuable information on data models, collection guidelines and custodial responsibilities and encouraged the participants to review it if they had not already done so. He emphasized that responding to crisis situations requires interoperability of data and that implementation of standards is critical to achieving interoperability. The 2005 experience dealing with the aftermath of Hurricane Katrina reinforced the need for interoperability and wide-spread adherence to agreed upon standards, as an estimated 25-50 person years of redundant work resulted from the lack of interoperability.

Once a common operating picture is achieved, the full capability of the technology can then be achieved by connecting individual geospatial technology systems to a system of systems that supports viewing of data simultaneously from many sources in one place. Brown referred to the visualization mechanism as a **GIS Dashboard** powered by **XML web services** shared via the Internet (GeoWeb), a means through which to achieve the vertical flow of data critical to realizing the NSDI vision.

Faster processing and increased bandwidth have increased technology options: mobile GIS: tablet PCs, pocket PCs, etc. These advancements also mean that a host of new professions/businesses are taking advantage of the technology (e.g., utility workers, firefighters, emergency preparedness planners). Most also recognize that surveying will be just another layer in the GIS with updating a result of a transactions made via Smart Phones/Smart Clients.

In response to the question from the forum planners – what new capabilities related to geographic information technology he believes will be available in five years - Brown responded that “it’s all GIS” – imagery, weather, GPS, Google – then mentioned several specifics:

- The future will favor organizations that harness the power of GIS
- A Common Operation Picture will be achieved
- Google Earth like products will include all 14 themes of framework data
- Mobile workforce management via GIS will become mainstream
- The public will continue to demand higher quality data, applications, and visualizing tools.
- Sensor networks for the world - digital nervous system for the planet – will become integrated, the data will flow where needed and be transformed for the particular need at hand for decision support.
 - NetCDF – will become popular as a format for time series location information. (i.e., weather report). Stream gauges, traffic sensors, will become integral components of the GeoWeb.
 - GIS education will be more wide spread and people will think geographically
 - GIS software will be bug free and easy to use!
 - GIS organizations across local, state, and national governments will co-develop and collaborate.

Synthesized Big Ideas From Both Presentations - Prepared by Matt McGuire (Recorder)

Big Idea: Democratization of Spatial Information, “You don’t have to spell GIS to be able to use it”

Comments:

- Customers expect/demand more and more access to spatial information.
- We need to be good stewards of GIS as people access it from all backgrounds
- Stewards create Views. Data views are very important. Different users and uses need different views.
- Risks
 - Privacy
 - Misuse – unethical or ignorant - of data
 - Equity of Access; the Digital Divide
- “GIS” may never be a household name, yet spatial information will continue to be used in a wider variety of ways, by a wider variety of people.
- “Make the data as self-evident as possible”. In order, for people to use data they have to understand what it is.

Big Idea: How do we justify/achieve Customer Demands?

Comments:

- Must develop a Champion - a non-GIS professional at a higher level
 - Document your successes
 - Build a library of good case materials
 - "I'll know my song well before I sing it."
- Develop the expertise
 - Education
 - Look Vertical Local-->County--> Region-->State
 - Consultants
- Need to reevaluate business models
 - Business model is not cost recovery.
 - Need business cases for availability
 - Look at other existing funding models
- Top-Down and Bottom-Up issue
 - Top provides funding and guidelines
 - Bottom builds data

PANEL SESSION - IMAGINING POSSIBILITIES (PARTS A AND B)

Will Craig introduced Mark Kotz, GIS Database Administrator with the Metropolitan Council, who served as the moderator for this panel session. Kotz then introduced each of the four panelists, in addition to Michael Liebhold and Clint Brown, and the two session recorders. A listing of these individuals, including their titles and organizational affiliations, is provided in Appendix J.

Questions/Answers: Panel Session Following the Liebhold and Brown Presentations

Notes Prepared by Mike Dolbow (Recorder)

Brandt Q: Google mashups: services, apps, none are integrated. Is there a movement to integrate them?

Liebhold: A: Notion of encoding the points in mashups in GeoRSS will enable them to be discovered in traditional web discovery tools: www.Platial.com, but also Yahoo maps, who already offer RSS output. It’s possible, but clearly a challenge to blend the mashup data. Google didn’t really know about all the mashups, but the awareness is dawning – not just to combine mashups from several sources and render on top of ESRI databases, etc. Get everyone to encode the data with GeoRSS coordinates, but also expose them.

Knippel Q: “It’s all GIS”. Common understanding of a fascinating science with lots of potential. However, anxiety exists from lack of basic understanding about GIS and why it should be funded (from higher

officials). Can you offer some insights in how to help people understand these basic concepts, get a strategy to build on the groundswell of understanding in the public, provide aid in these arguments to fund GIS.

Brown A: Decision makers in organizations where GIS is successful, that person is a champion. Not so much because they knew GIS, but because you built something with GIS that helped them do their job better. Look for opportunities to make GIS real important in the decision making. It's been complicated for so long just to build basic information that we can lose sight of turning it around and serving the mission of the organization. Second, lots of efforts exist to compile information in books about the benefits, the business case for GIS. Not just cost, but real-world situations about what it's meant for savings, lives saved, etc. ESRI has contracted to write more. Jim Garinger, former governor of Wyoming, talks about legislature. Had a bill about horseshoes, debated for 2 hours because they were all experts. Then they cut Medicaid by 2 thirds to "See what happens".

GIS is outreach within organizations to meet missions and grow understanding, and broad understanding to work with customers and testimonials to do it well. Otherwise we're in for a fight. They could just say "I can use Google Earth". If you can do your job with just that, great, but if you can't...? We all have to address this question.

Liebhold A: Document your successes proactively, before asked. Closure of project: summarize. Build a library of case materials to share. Organizational vision sessions, describing real and hypothetical benefits. Don't necessarily publish & prettify, but use them for continuous improvement. "I'll know my song well before I start singing it" (Dylan). Do it internally and be your own harshest critic.

Loesch Q: Comment on concept of information and data knowledge, and ease of data understanding. Microsoft spends \$\$ on software usability. What about data usability and understanding? Raw data on web, misuse, etc. Metadata is important but scarce and difficult to find and use. How do we transform the raw data to easily used/understood info?

Brown A: Information, data: MAPS are the most effective way to build the information. Base layers PLUS. Part of being a GIS pro is offering the data, the maps, the 3D viz. Capture the analytical processes to serve them in a more information-dominant view instead of a data dominant view. Visualization is going to be really big in GIS. Not just the data, but the VIEWS of the data. Google Earth wakeup call – present the information so people can understand it. Critical info about the data is the level of accuracy. We need to be good stewards of the data so it works well for people. Different data products for different audiences. An emergency call operator needs a different view of the data than the public. Offer the dashboards with the appropriate view, appropriate tools, what they need to get their job done.

Liebhold: A: Make the data as self-evident and self-describing as possible. Get away from acronyms. Plain English. Institute professional practices to use common vocabulary to describe datasets. Second steps: how do you browse and find data? Google Earth is at a loss on how to manage hierarchy – how do you manage 800 layers? Are there new kinds of iconography we can take advantage of?

Rowekamp Q: Is there really a GIS for Dummies?

Brown A: Don't know!

Rowekamp Q: Working with small counties and cities. 1-2 person shops. Hard to comprehend some of this technology being implemented there. What's the practical advice you give to a small organization with a small component that still wants to be positioned to take advantage of these advances in the future? What to tell them to be ready?

Brown A: The GIS Community. One, not just co-developing the content, but co-developing the expertise. As a community, think about how to develop the expertise. If the small community can't do it, can a regional entity take it on? A regional body like MetroGIS might be able to do it. Texas & Minnesota are both very social community based societies. Building bridges. Except Texans are a bunch of...

But THEY have \$6 million in funding to develop nodes of GIS expertise at El Paso, SFA U, Austin, etc. Copies of all the data held there, if the local community can't do it, they'll do it, develop the content and provide the infrastructure. (University Cooperative Extension GIS? – MD) Small consultants are a big piece of the puzzle.

Liebhold: A: Search the web to see if someone's thought of it – any bright idea. Skills building in small communities, someone's done it somewhere. Mapping Hacks is a great introduction to homegrown mapping techniques that anyone with tech skills can do. A lot of free software is available. Open source software will increase.

Audience Q: Numbers. When do you think the term "GIS" will become a household industry name? How many years?

Brandt: is IT a household name? I don't think it'll ever be a household name, but then I thought the same about GPS 7 years ago.

Knippel: People are becoming more geographically aware. Maybe they don't call it GIS, but that's what it is. It may be called something else, but 5 years.

Loesch: Never. Products will be the household terms. Google, Yahoo, etc.

Rowekamp: Agree.

Liebhold: Packet networks – what are they? Millions using. People will become comfortable with it and not know what it is.

Brown: How to measure? Date? GPS in Google gets 100 million hits. GIS gets 120 million. Household term with educated people, but not with everyone. People won't have to know how to spell it to use it.

Audience Q: What are the biggest risks posed by these technologies?

Brown: Privacy rights, ethics of GIS, the biggest concern is privacy. It's easy for a utility company to share their data in the case of an emergency. But they won't do it, for very good reasons. Fear of misuse.

Appropriate use of data is important. We're losing our ability to be a democracy. They can predict how we'll vote so they align districts so our vote doesn't matter anymore. Government at a local level has to remain powerful.

Liebhold: Equity of access. US is blessed with access to tools and data. Others in the world do not. There will be an increasing digital divide. Risk of losing wonderful things because of 9/11, when utilities clamp down and won't make data available, which is an overreaction I hope we can overcome as a community. A detailed public utility map was created from public sources, then shut down by the CIA.

Knippel: Technology is a fast moving bus. Custodians of public \$\$ try to figure out where to get on it, what the benefits are. It's easy to make \$million mistakes – investing in the wrong time, etc.

Brandt: How accurate is the data? People create data that's wrong, publish it, it then takes on a life of it's own, then big problems.

Rowekamp: You can buy readily available data on internet, with easier to use tools, can do analysis, and you have no idea if it's right. Anyone can use it now, doesn't understand it, and can be a problem.

Audience Q: Parcel information provided, most counties have nice internet sites, some are using applications on laptops, using parcel information. Applications are different, projections are different, nice to have a standardization of projections and fields.

Kotz A: Through MetroGIS, a dataset that is standardized across counties for seven metros.

Brandt: Hashed out, stored. For the 7 counties. Published, available. Could be used across the state.

Brown: Collaborating across the state?

Brandt: So far limited to 7.

Brown: Concept of community-based GIS should be to do MetroGIS-style standardization. People want to be able to look across the country to see consistent information.

Brandt: Not everyone stores data the same way = difficult to agree.

Audience Q: Value of building vs. size for redevelopment.

Knippel: Parcel data comments common. Take heat for it. Trying – get us at the table to develop a common standard, that's difficult. Justifying it is difficult. From the counties perspective, the parcel db's were developed and justified for internal biz purposes. It's a stretch to look beyond that and understand the common benefit to the public to make it available even if we don't get a direct return on investment. Should we be able to sell it to recover our costs? We need help to build a stronger case for building data, help people understand the indirect return on investment. Help politicians understand that.

Brandt: Things like Google and Mapquest are making people expect data to be free, even though it costs money to develop it.

Brown: Cost recovery is not the biz model. We need the case studies of the benefits. Open County Michigan – strong progressive thinking. MetroGIS reminds me of Calgary, with an executive committee to manage across community. Honolulu, also. Miami. People are investing because of the biz case. Reuse of information. URISA is great to provide creative funding models. Pima County in AZ build a parking lot to pay for GIS. Assessment on parcels just as people pay tax on utility. Benefits are big. Reach out into professional community to find examples.

Liebhold:: Top-down issue. Top-down funding would help. Top-down education.

Brown: Top-down combined with bottom-up. Top-down is funding and guidelines. Like we built interstates. Supported by states along guidelines. Build at the local level. Like Imagery for the Nation. NSGIC and NACO will lobby hard for it. Not really big amounts of money. These days it's Homeland Security money that can be tapped. Get GIS community to adopt a common vision and create a big lobby for this.

Notes Prepared by Matt McGuire (Recorder)

The Champion is a non-GIS professional at a higher level

There is difficulty in cost-benefit analysis/justifying your costs:

- Document your successes
- Build a library of good case materials
- "I'll know my song well before I sing it."

Issue of literacy - misuse of data/information

- Data usability vs. software usability
- Views are very important
- Views not the data
- We need to be good stewards with Access Different views
- Make the data as self-evident as possible
- New kinds of Iconography
- Thoughtful descriptions

How to translate this into a small community?

1. Develop the expertise -
 - o Education\
 - o Look Vertical Local-->County--> Region-->State
 - o Consultants
2. Look for centers of excellence in small communities
3. Open Source Mapping Hacks?

When will GIS become a household word?

Never? Don't need to spell GIS to use it. Reframe the term.

What are the risks?

- Privacy
- Voting analysis - redistricted into meaningless votes
 - o Gov't at local level is the protector here
- Equity of access - Digital Divide
- Custodians of Public Money - when do we get on the bus
- Danger of decisions made off of inadequate or wrong data

Working together across borders

Community GIS for the nation

Lots of reasons to synthesize

It's a stretch for policy makers to understand

External needs

Business model is not cost recovery.

1. Need business cases for availability
2. Funding models

Reuse of information - reduce redundancy

It's a Top down issue, top down funding would help, also need top down education

Top Down and Bottom up

- Top Down provides funding and guidelines
- Bottom up - Build it

LUNCH RECESS AND TECHNOLOGY DEMONSTRATIONS

Will Craig recessed the forum for the lunch break at 11:45 a.m. The participants were informed that box lunches were available in the Atrium adjacent to the auditorium. He also explained that a recess of one and half hours had been provided to encourage the participants to attend one or two of the eleven technology demonstrations, in addition to eating lunch. A listing of the demonstrations given is provided in Appendix L. Links to several of the presentations are provided in this Appendix.

Craig reconvened the forum at 1:00 p.m. and introduced the next keynote speaker.

WHAT'S NEEDED TO ACHIEVE THE POSSIBILITIES: DESIGNING NEW STANDARDS AND CAPACITIES

Keynote Speaker: **Mark Reichardt**: President, Open Geospatial Consortium (OGC)



Biographical information provided in the program packet. President of OGC, a not-for-profit international consortium of more than 310 companies, government agencies and universities participating in a consensus process to develop publicly available geoprocessing interface specifications.

Summary of Mark Reichardt's Presentation *(A copy of the slide presentation is provided in Appendix E).*

Mark Reichardt introduced himself and summarized the three programs of the Open Geospatial Consortium (OGC) –Interoperability, Specification Development, and Outreach and Community Adoption. He talked briefly about the membership in the OGC and reasons why they join – align themselves with others to influence industry direction (litmus test for maturing ideas), improve choice and competition in the marketplace, and reduce their respective risk regarding product development.

Reichardt then summarized several topics currently under development by OGC, noting that a use-case format is how they go about their business of testing and reaching agreement on standards:

- cascading web services,
- catalogue services,
- location based services (OpenLS),
- intelligent web mapping queries (save profile),
- and common interoperable framework user definitions –

He then summarized several topics areas that OGC will address shortly:

- **Geospatial Digital Rights Management (GeoDRM)**
- **RSS (encoding geography to enable live-feed images) and GeoRSS**
- symbology management,
- as-built integration,
- web-based modeling,
- Building Information Models (BINs)
- City GML Multi-Scale Modeling (interior views scalable to regional views)

In summary, Reichardt commented that a solid base open standards is in place but that attention to standards has to continue be the norm into the future, in particular, in conjunction with the IT community. The implications of rapid increase in technological capabilities, from Reichardt's perspective, are that a "fire house" of information is available and will continue to increase in volume. This plethora of information can not be effectively managed without use of geospatial technology. "Fitness for use" decisions will increasingly demand more attention and, as such, a better system of encapsulating this information into the system must be created. Human factors will increasingly drive decisions related to standards.

Reichardt closed his remarks by complimenting MetroGIS on its achievements as a regional geospatial collaborative and invited MetroGIS to consider joining the OGC to participate in its processes and knowledge sharing,

"Big Ideas" offered by Mark Reichardt - Summary prepared by David Vessel (recorder)

1. Standards are a way to share data among users and optimize the application environment for each user
2. Standards allow a variety of clients to use the appropriate data for a task with minimal waste
3. Standards allow data producers to specify access by a client and/or a purpose. This allows users to segment data by intended use as well as identification and more efficiently delivers appropriate amounts of data.
4. GIS community is addressing ever increasing sources of data (sensors- traffic cameras, ground sensors, etc)
5. Needs for situational awareness are fueling demand for more sensitive and timely data. These volatile datasets are expensive and necessitate broad application of open standards to justify their expense.
6. Increasing application specifications in RFPs for open data and systems standards increases the access and choices of these systems.
7. Standards allow broadest amortization of investments in data and increase the opportunity for software innovation. Proprietary formats can no longer be used to hold data investments hostage by a vendor.

**PANEL SESSION - WHAT'S NEEDED TO ACHIEVE THE POSSIBILITIES:
DESIGNING NEW STANDARDS AND CAPACITIES**

Will Craig introduced Chris Cialek, GIS Clearinghouse Supervisor, who served as the moderator for this panel session. Cialek then introduced each of the four panelists, in addition to Mark Reichardt, and the two session recorders. A listing of these individuals, including their titles and organizational affiliations, is provided in Appendix J.

Questions/Answers: Panel Session Following the Reichardt Presentation

Notes prepared by Nancy Radar (Recorder)

Q (Bittner): What advice do you have for starting places to pull this type of approach together?

A (Reichardt): OGC can provide a forum for communities to compare notes on their experiences and business cases. Members have an explicit voice in the OGC process.

Q (Lime): It seems that the open source community and niche vendors have been much more likely to adopt WFS and WCS standards, whereas there's been slow or uneven acceptance among large vendors. Do you agree with that assessment, and if so, is it changing and what is driving this?

A (Reichardt): Every organization has a different reason for participating in OGC. Many large organizations ARE implementing OGC standards. What's most important is the Big Picture: OGC creates market pressures for standards and participants don't want to be left out. Technology users need to be consistent in asking industry to implement these standards; this will reinforce the money that has already been invested to make standards real.

Q (Slaats): More and more good data is being provided via WMS and WFS – how do we organize these data sets in a way that users can choose the best data that’s most appropriate for their needs? *[and something about what organization the provider should do versus what the user’s client application should do – I’m not quite clear on that]*

A (Reichardt): Can create profiles for communities of interest. Need to work on semantic issues that prevent discovery.

Q (Swing): A lot of standards come from the top and many people are at the bottom, wondering what is the next incremental step to apply them? GIS should be integrated into business and IT classes – where are the universities?

A (Reichardt): There’s still a disparity between GIS and IT, although some standards are integrated. Geospatial profile is written for non-GIS people. OGC has about 100 academic partners. A working group is focused on this issue.

Q (audience index card): What standards are there for security and privacy?

A (Reichardt): This is not OGC’s specialty. Instead, OGC takes security and privacy standards developed in the broader community, tests them with their members’ business cases, and gives feedback to the developers of those standards on issues or limitations.

Lime: DNR avoids authentication by providing only data with no restrictions and with a disclaimer.

Reichardt: That approach will not likely work in the long-term since there will be more and more derivative products that rely upon a restricted source or that provide information that in combination will pose a security or privacy problem (example of robbers putting together two different information sources, one on location of alarms (not sure what the other one was) in order to plan a break-in)..

Swing: Providers need to abide by legal restrictions and also unofficial guidelines such as not allowing parcel searches by name.

Bittner: Firewalls can act to keep information provided on intranets secure; unrestricted data can go outside the firewall on the internet.

Slaats: Currently, MetroGIS distributes parcel data and TLG (street centerline) data that have restrictive licenses, so MetroGIS has a need for security standards now. IT may be the place to look for help.

Reichardt: OGC needs a voice from regional interests since this provides a powerful voice to industry.

Q (audience index card): How do you feel about KML?

A (Reichardt): It’s very instructive, especially to kids. The problem is that you can’t integrate the individual systems (Google’s overhead view; A9’s street-level view; and Windows Local’s bird’s eye-view). Google has just joined the OGC, so this should get a good conversation going about interoperability.

Q (Robert Maki): In the process of doing work for an FGDC grant on WFS and GML, DNR has found that GML is very broad, not at all a narrow thing to implement. Is that the case?

A (Reichardt): Yes, GML is intended to be versatile and all-encompassing. What’s needed are profiles for commonly needed functions such as point pairs. OGC needs to manage these profiles but not necessarily write all of them – their members write them.

Q (Chris Cialek): What does it mean to register a product with OGC?

A (Reichardt): One meaning is that a vendor claims that their product implements OGC standards. The other is that OGC subjects the product to compliance tests and certifies that the product meets OGC standards.

Swing: We need to require compliance in our RFPs.

Reichardt: Yes, that will help industry recover their costs and will validate participation in standards development.

Q (not sure from who): What role is there for reference implementations of their standards?

A (Reichardt): They are encouraged. They are typically from open-source. “Plugfests” are a stress test of the standard on a product. The OGC network is a resource for the community to use to test your software.

Q (Will Craig): Metadata is our job but it’s not fun and often not done. Does RAMONA have legs or do we need to write full metadata?

A (Reichardt): How long are we around? Data becomes questionable once its creator leaves. If data is to be used independently, be reused, and be used appropriately, it needs to be documented to the best fidelity possible.

Bittner: This idea is parallel with documentation during application development. Metadata matters when you try to share applications. How many people document their code?

Last unrelated comment (Reichardt): Standards are member-driven; working groups decide whether a proposed standard is worth pursuing.

REFRESHMENT BREAK

Will Craig called for a break at 2:30 p.m. He reconvened the forum at 2:50 p.m. and introduced the next keynote speaker.

WHAT’S NEEDED TO ACHIEVE THE POSSIBILITIES: DESIGNING NEW ORGANIZATIONAL CAPACITIES

Keynote Speaker: **Professor Ian Masser**: Successful Spatial Data Infrastructures



Biographical information provided in the program packet. Founder Chairman of the Associations of Geographic Information Laboratories in Europe 1998-99, President of the European Umbrella Organisation for Geographic Information 1999-03, and President of the Global Spatial Data Infrastructure (GSDI) Association 2002-04. Author of numerous publications, most recently GIS Worlds – Creating Spatial Data Infrastructures, which recognizes MetroGIS’s efforts. (See book review at <http://www.urisa.org/Journal/Vol17No2/BudicReview.pdf>.)

Summary of Professor Masser’s Presentation (A copy of the slide presentation is provided in Appendix F).

Professor Ian Masser thanked those responsible for inviting him to participate in today’s forum. He began his comments by recognizing the work that has been in the Twin Cities by way of MetroGIS to establish a successful Spatial Data Infrastructure (SDI). He commented that his role today was to talk about the organizational side of Spatial Data Infrastructures (SDIs), as opposed to the technical aspects. He then shared the following **principles that he believes underlie successful SDIs**:

- Data should be collected once and maintained at the level where it is most effective
- Spatial data should combine seamlessly from various sources
- Data collected at one level should be shared at other levels (i.e. local, state, federal, etc).
- Extensive use of data should not be restricted.
- It should be easy to discover what data is available, and to evaluate it’s fitness for a particular use.

Masser then shared several emerging **trends related to successful SDIs** around the world:

- **Moving from product to process**
 - Producers to users
 - Database creation to data sharing
 - Centralized to decentralized structure
- **Moving from formulation to implementation**
 - Single to multilevel participation
 - Coordination to governance (more open/ participatory)
 - Existing to new organizational structures

Masser used several international examples to illustrate various collaborative models from less complex to more robust. He also shared a technology innovation that involves the use of **geo-smart tags** developed for an Australian application. The database that supports the smart tags is a **point dataset of unit addresses**, a solution that conceptually appears to be similar to the vision adopted by the MetroGIS Policy Board for the Twin Cities for which no operational model had previously been located.

Masser concluded his comments noting that a major challenge to establishing and maintaining a successful SDI is to **ensure standards and harmony, yet respect diversity**. To address this challenge, he noted there has been a shift to more **inclusive models of stakeholder governance**, in many cases resulting in new governance structures, as is the case in the Twin Cities with MetroGIS’s efforts. He also noted that public/private partnerships are also becoming more common to achieve what neither sector can do on its own, again a recognition that has surfaced in the Twin Cities.

Big Ideas offered by Ian Masser – Joella Givens (Recorder)

- **Don’t believe too strongly in technology.**
- **We must be willing to share power in order to move forward with SDI.**
- **SDI by nature is a patchwork quilt or collage.**
- **Public/Private partnerships are working well in various parts of the world.**
- **Moving toward a Spatially Enabled Society requires an important shift in emphasis. The goal is for about 1% of the end ‘GIS users’ being actual GIS professionals, less than 5% being general IT users, and 95% being users who are unaware that they are using a GIS.**
- **This also means a large shift toward producing products and services for these non-specialist users.**
- **Networking is the key to successful SDI implementation.**

**PANEL SESSION - WHAT’S NEEDED TO ACHIEVE THE POSSIBILITIES:
DESIGNING NEW ORGANIZATIONAL STRUCTURES**

Will Craig introduced Nancy Read, Technical Services Coordinator with the Metropolitan Mosquito Control District, who served as the moderator for this panel session. Read then introduced each of the five

panelists, in addition to Professor Masser, and the two session recorders. A listing of these individuals, including their titles and organizational affiliations, is provided in Appendix J.

Questions/Answers: Panel Session Following Professor Masser's Presentation

Notes prepared by Joella Givens (Recorder)

Arbeit – LMIC has experienced repeated challenges to stay alive as an organization, and always has to justify its value. Do others experience the same challenge, and how successful are they?

Masser – There are two basic strategies. The first is to make yourself useful, and the second is to get participation of various stakeholders (including government, utilities, etc.). People need to feel they are getting value, and you need to demonstrate your value. You can also evaluate the potential for outsourcing. Outsourcing may be good or bad, depending on the circumstance. You don't want to lose in-house expertise, but should look at what activities/tasks could be done outside.

Maki – There is a tendency in the US to consolidate IT services, and in some states GIS is being swept along. What elements of and SDI should be centralized?

Masser – First look at the data that is common, that should be centralized. Also look at shared services. People involved in developing e-government services may do well to provide GIS services on the web. However GIS folks are often the most knowledgeable about web-based services.

Harper – How well are educational institutions prepared to teach GIS concepts and how to use GIS tools in their various disciplines?

Masser – Many universities have not included GIS in traditional geography programs (just GIS bits). However other disciplines are seeing a surge of GIS knowledge. Academies around the world have been slow to come up to speed on the area of GIS, and GIS degree programs are just getting started. This educational challenge is very worrying.

Pollock – How do we help policy-makers understand the issues relating to GIS when we have a limited amount of their time (about 1 ½ hours per month)?

Masser – The only real answer is to get more time, to help them to understand that it is worth their time to understand GIS issues. You also have to work on making your presentation as efficient as possible, driving the important points during the time you have.

Gelbmann – MetroGIS is evolving as an organization. Discussions toward application sharing have implications of organizational issues. Sharing data is different, as that is a commodity that can be packaged. Application sharing can have various levels, from passing along the entire application (more like data sharing), to shared services. What are the implications of this change?

Masser – You will really need to look closely at the resources at your disposal. Can you take advantage of students completing a masters' thesis? What are the opportunities for collaboration with the private sector? Find partners, and then look at presenting this in the most opportune way.

Notes prepared by Tanya Mayer (recorder)

Arbeit:

Our agency has had a hard time surviving as a coordinating entity in times of fiscal difficulties and we have a difficult time educating the ever-changing electorate. Do you know if these are difficulties experienced in other parts of the world and how successful have others been in situations like this?

Masser:

1. Make it sound useful – something they can't do without
2. form a very active coalition with local government, academia, and private sector
3. Have a willingness to outsource the main day to day work

Maki

There is a tendency in the U.S. at the state level to consolidate the I.T. departments, in some cases, GIS is swept along. Can you comment on centralization vs. decentralization and what elements are suited for each?

Masser:

1. This is difficult – these are very new situations
2. The best providers tend to be those used to operating in a distributed organization
3. Acknowledged that there is a realignment taking place within government

Harper

As a non-traditional user, from a local government perspective, we have a difficult time with current administration and decision makers with their limited understanding of GIS, and getting them to understand that GIS is so much more than developing the parcel data set. From an educational perspective, how is education being structured to educate students in 1) geographic visualization and 2) GIS?

Masser:

1. Generally, geography departments and course have not benefited or added to traditional geography courses. They have missed GIS educational opportunities.
2. Surveyors are another major player and are not getting students in surveying programs
3. Crises is coming that people are not trained in GIS
4. Academics are very slow to keep up

Nancy Pollock

How do we keep policy board members sufficiently educated about GIS and make an impact with such a short amount of meeting time?

Masser

1. Difficult – more time is the key but not always possible
2. Issue of presentation – get the point out “before the 10th floor”

Gelbmann

An evolution is occurring in MetroGIS. Data sharing efforts have been the focus the past 10-12 years, with significant success. Recently (the past 2-3 years) discussion at a policy level has started to change to application sharing and how it fits into the organization. This has implications as how we work together. Applications can be shared 1) as-is; 2) deciding on an environment together and working on applications independently; 3) collaboratively working on applications or 4) shared services that represents a collaborative plan.

Masser

- 1) Look at resources available at your disposal
 - a. U of MN masters students
 - b. Private sector sources that benefit as well

CLOSING

Will Craig led the closing by stating that he was very pleased with what he had heard during the day and acknowledged that he now has a new found appreciation for the benefits that can result from compliance with standards. Craig then affirmed that several “big ideas” were shared during the course of day and that they will provide substantive food for thought as MetroGIS and the other sponsoring organizations go about their business of planning ’s next steps for leveraging the possibilities associated with the use of geographic technology to better serve the institutions and citizens of Minnesota.

He thanked the participants for their participation, encouraged everyone to submit an evaluation, and adjourned the forum at 4:30 p.m.

Appendix A



Imagining Possibilities:

The Next Frontier For Geographic Information Technology

Hubert H. Humphrey Center, University of Minnesota
June 1, 2006

Forum Purpose: *identify a range of technology possibilities related to enhancing the sharing of and effectively using geospatial data and information important to the day-to-day operations of the organizations that comprise our community.*

Final Program

- 7:30 a.m. Continental Breakfast and Pick up Program Materials
- 8:15 **Welcome**
Victoria Reinhardt, MetroGIS Policy Board Chairperson and Ramsey County Commissioner
- 8:20 **Overview of the Day**
Will Craig, Associate Director, Center of Urban and Regional Affairs, University of Minnesota
- 8:25 **Imagining Possibilities: What Does the Customer Want (Though They May Not Know It Yet) and What are We Preparing to Deliver?**
Michael Liebhold: Senior Researcher, Institute for the Future
- 9:40 Refreshment Break
- 10:00 *Clint Brown, Director of Software Products, Environmental Systems Research Institute (ESRI)*
- 10:45 **Panel Session A: Moderator: Mark Kotz, GIS Database Administrator, Metropolitan Council**
- 11:45 Box Lunch (*Pick up lunches and eat in technology demonstration classrooms*)
Technology Demonstrations (*see separate document in packet for listing*)
- 1:00 p.m. **What's Needed to Achieve the Possibilities: Designing New Standards and Capacities**
Mark Reichardt, President, Open Geospatial Consortium (OGC)
Panel Session B: Moderator: Chris Cialek, GIS Clearinghouse Supervisor, Mn Land Management Information Center
- 2:30 Refreshment Break
- 2:50 **What's Needed to Achieve the Possibilities: Designing New Organizational Structures**
Professor Ian Masser, Spatial Data Infrastructures
Panel Session C: Moderator: Nancy Read, Technical Services Coordinator, Metropolitan Mosquito Control District and Chairperson, MetroGIS Coordinating Committee
- 4:20 **Closing**
Will Craig, Associate Director, Center of Urban and Regional Affairs, University of Minnesota

Appendix B

Program Transition Slides

Go to:

<http://www.metrogis.org/specialevents/techpossibilities/ImaginingPossibilitiestransitionsides.pdf>

Appendix C
Keynote Presentation
- Michael Liebhold-

Michael Liebhold's presentation included 36 slides, of which we were authorized to publish seven. The seven slides may be viewed at:
http://www.metrogis.org/specialevents/techpossibilities/Liebhold_selected_slides.pdf

Those interested in reviewing current material on his topic are directed to http://del.icio.us/inbox/starhill_blend, a community bookmarking service that is updated several hundred times a day with directly relevant resources, blended from dozens of related topics. Any of the topics on the right of the website are links to aggregated specific topics. Additionally, a search can be made using keywords "GeoWeb" or "Liebhold" for further resources.

Appendix D
Keynote Presentation
- Clint Brown -

Go to:

<http://www.metrogis.org/specialevents/techpossibilities/MNFutureClintBJun2006.pdf>

Appendix E
Keynote Presentation
- Mark Reichardt –

Go to:

<http://www.metrogis.org/specialevents/techpossibilities/ReichardtMetroGIS010606.pdf>

Appendix F
Keynote Presentation
- Professor Ian Masser –

Go to:

<http://www.metrogis.org/specialevents/techpossibilities/MasserMetroGIS010606.pdf>

Appendix G

Forum Evaluation Results

Outstanding ...4
Good3
Average2
Poor.....1

Was this Forum...

- | | |
|--|------|
| 1. An effective means to learn about new ideas?..... | 3.60 |
| 2. Useful in providing valuable information?..... | 3.48 |
| 3. Relevant to job responsibilities?..... | 3.15 |

The Program

- | | |
|---|--|
| 1. Effectiveness of the keynote speakers | |
| A) Michael Liebhold | 3.88 |
| B) Clint Brown | 3.26 |
| C) Mark Reichardt | 3.16 |
| D) Ian Masser | <u>3.20</u> |
| | Effectiveness Composite Score: 3.38 |
| 2. Effectiveness of the Panel Sessions | |
| A (AM): What does the customer want? | 3.24 |
| B (PM1): Designing New Standards and Capabilities | 3.01 |
| C (PM2): Designing New Organizational Structures | <u>3.13</u> |
| | Effectiveness Composite Score: 3.13 |
| 3. Usefulness of the Question and Answer Sessions | 3.13 |
| 4. Usefulness of the Technology Demonstrations | 3.40 |

Adequacy of Facilities

- | | |
|------------------------|------|
| 1. Meeting Spaces..... | 3.53 |
| 2. Food | 3.47 |

General Comments

1. Congratulations on today's forum. You hit one out of the park!!
2. Congratulations and thanks to all involved with the "Imagining Possibilities" forum yesterday. I was impressed with the quality of the presentations and discussion, and also with how well organized this complex event was. This event will serve as a valuable kickoff to the MetroGIS strategic planning process, and will surely inform the Council's strategic planning as well.
3.I know it was a lot of work on your part. It was an excellent and very insightful event. Congratulations are definitely in order. Your efforts are very much appreciated!
4. meeting was a logistical success. By mid-morning I knew we had the successful content we wanted. It was very satisfying to be part of an event that delivered on both counts. (Will Craig)
5. Technology demonstrations were excellent!
6. I thought that the picture taking during the sessions was very distracting, disruptive and really unnecessary.
7. Technology presenters didn't have time to eat.
8. Clint Brown needed better prep on nature of his audience.
9. I find 20-minute demo's without hands-on to be not as helpful – spent time networking with people which was useful.
10. Overall well done – thought provoking discussions
11. The air in the main auditorium got painfully stale after first 1.5 hour session.
12. Sound was good – the right level of volume and clear.

13. The questions the panel asked Ian were not addressed and answers would be nice to get.
14. I would suggest more time be devoted to technology demos if future forums are done.
15. Photo taking was distracting. I don't think it was crucial to the event to take 10-15 shots of each presentation. It also seemed to interrupt the presenters' thought process. You could see them flinch and anticipate the next click of the camera. The first couple of pictures were not a problem, but after that I started to follow the photographer rather than the speaker. I almost got up a couple of times to ask her to stop.
16. More technology demonstrations and more time spent on them.
17. Too many pictures taken during talks! The flash was very distracting!
18. Usefulness of the Question & Answer sessions starred, with comment, Great!
19. Usefulness of Technology Demonstrations was scored beyond Outstanding – actual category was “Holy Shit!”
20. Food: Brie & pork sandwich? Damn!
21. I loved the panel sessions.
22. Technology Demonstrations could have used more time

Most Inspiring Ideas.

1. Using Geo PDF (saw at technology demo)
2. GeoWeb
3. Advancing information flow from my office through GeoRSS feeds.
4. To think outside the box; to stay up with technology as it affects our business.
5. Counties – States – Feds & Standards based data sharing
6. Ian Masser – moving away from using the (pejorative) word “coordination” towards the word “governance”
7. The work we all need to do in making society aware of the benefits and uses of integrated spatial data.
8. Possibilities for real-time sensors integrated with base reference data.
9. Governance is complicated, requires dedication & work. Common theme: importance of selling to policymakers the value of (a) GIS & (b) coordination.
10. What will be the hot topics in the next 5 years?
11. Use of LBS on a micro basis (bldgs, etc.) rather than global
12. “Policy, not technology” – dissolve the line holding back data & services & value will be rapid in large ways.
13. Possibilities of organizing own SDI & clearinghouse
14. The content of Michael Liebhold's presentation
15. Potential for GIS in the future
16. Michael's description of future visions
17. Mass geo-informational tools allowing collaboration at all levels, allowing 2-way information sharing
18. GIS is moving into the mainstream
19. Michael Liebhold's vision of the future
20. STDS & product vendor sessions
21. The diversification of GIS and spread to non-traditional users (e.g. GoogleEarth)
22. Difficulty of connecting with lay GIS use in language that makes sense to them
23. Recording “folklore” as a spatial feature
24. The direction of GIS is broadening and the complexity is increasing.
25. First person geography
26. Can I use my cell phone to geo-locate myself and get real-time arrival info for nearby Metro Transit user? (And will the bus wait for me when I'm 1 minute late?)
27. Geospatial Data/Skills/Applications as basic literacy – can't withhold data for fear of misuse any more than literature
28. The desire to investigate open source GIS topics
29. Data Interoperability & Sharing, community resources available, strength of a user community
30. Google Mashups are some function I need to start using
31. Hearing the speakers who use or promote GIS on a level other than what I'm used to working with (i.e., local, state, etc.) speak on GIS value & usefulness
32. Geographers/GIS professionals tend to think comprehensively & ideally. Yet, the real revolution in the spread & adaptation of GIS continually is actually going to require us to figure out how to implement out complex understanding of GIS into applications that are simple to comprehend & are user friendly.

We want geographic awareness & competency? Well, I believe this is one way to achieve it to some degree.

33. I believe it is essential to work across jurisdictions to set standards.
34. My company would like a Map Server that would serve employees without Arc View. A web Map Server would assist employees.
35. WM3, WES, ease of use
36. All data is spatial.
37. New governance structures for multi-level stakeholder & participation.
38. GIS could (should) become easier for the novice user.
39. GeoPDF was good for near future – best new future idea is geospatial hypermedia.
40. Geo based web instead of URL based
41. Looking at a whole new area for a job!
42. MAP to PDF
43. Telling about what's coming up and how people are using ANSI Standards was the most helpful. I also think discussing how we can all come together is very important. It's great to have a place for all types of professionals to come together.
44. The idea of the Geospatial Web is very exciting and unique to think about. Very inspiring!
45. Using Google Earth & Weather info in current mapping program
46. Reminder of need to keep up to speed.
47. It was great to hear about emerging trends and the advances in technology – the direction the world is moving in.

Questions For Panelists (From Note Cards Submitted During Forum)

For Clint Brown:

1. Clint talked about the “GIS for the Nation”, USGS leadership in the Blue Book, unified strategies for themes, standards, data fusion and a common operating picture. USGS has been instrumental in these activities. How can we accomplish some of these things when USGS – National Mapping Division is being threatened? M
2. When will we be able to edit 3D data (grid surfaces) in ESRI 3D software (like Arc Scene)? M
3. Along the lines of 3D visualization, is ESRI developing more advanced 3D modeling tools? More specifically, has there been development in incorporating 3D laser scanning/terrestrial or ground based LIDAR outputs (point clouds) into an ESRI environment for the purposes of modeling and visualization? M

For Michael Liebhold

1. While we need to shift toward serving non-GIS specialists, do you see a trend toward increased spatial knowledge in the upcoming generation? A2
2. How is Open Source (data/software) impacting your operations now and in the future? (cost, public access, etc.?) M
3. What do we need to do to prepare our children to be effective in the future of spatial awareness? Particularly, how can we impact K-12 education to develop programs to address this? M
4. How real is the danger and what are the implications of the Balkanization of geospatial environments of the large web companies? M

For Ian Masser

1. For Ian Masser: Please comment briefly on the strengths and weakness of the models you presented. (not asked) A2
2. While we need to shift toward serving non-GIS specialists, do you see a trend toward increased spatial knowledge in the upcoming generation? A2 *[asked to both Messrs. Liebhold and Masser]*

For Mark Reichardt

1. How is OGC going to develop standards for the new airborne digital mapping cameras? A1
2. How is the OGC approaching standards for building security & privacy protections into the technology (software, data ...)? A1

3. Is OGC also looking at Geo PDF? A1
4. To what extent do public agencies participate in OGC? What do you consider to be the most effective strategy for promoting OGC standards within the State? A1
5. For Mark R: What, if anything, is the relationship between OGC and Multi-Speak? A1

For David Brandt and Randy Knippel

1. How do “customers” fit into funding GIS in your counties? M

General Questions

1. What are the biggest risks posed by these new technologies? M
2. When do you think the term “GIS” will become a household/industry name when we won’t have to explain what it is to anyone who is not familiar with it? (10-20 yr?) M
3. Dashboards are popular in the non-GIS world as well – I’m seeing general website redesigns that segment content for distinctive audiences. What do our experts recommend as strategies to integrate GIS & non-GIS dashboards? (including organizational issues). M
4. Could panel members comment on the pros/cons of licensing and restricting access to geospatial data? M
5. I am teaching a GIS course this year at North High School about 25 blocks from here. Do you have suggestions for encouraging “people of color” & women to consider GIS as a career? Do you see any national trends related to this issue? M
6. Where do you see the best commercial opportunities for small business GIS firms (next 2-3 years)? M
7. The Minnesota Historical Society, in conjunction with LMIC, is developing an online Geography/History GIS for 5th through 12th grade classrooms, incorporating over 300 georeferenced maps, with live links to historic photographs, etc. As experts, what would you envision for ideal, simplistic GIS tools that could be understandable to non-technical, non-GIS users (aka 6th grade teachers) but will be beneficial for students who will be entering a far more GIS savvy world – the next generation of GIS users? M
8. If GIS is going to be embedded in society, it means that we need students in all disciplines being trained in GIS. Is the education community offering training in all disciplines or is it still very centralized in just or a few departments? M
9. Dave, Washington County took the photos off the web portal. What was the issue? M
10. In the “Flat World” can you describe how we can improve our competitive position or a better vision on integrating our business processes? M
11. How do you feel about KML? A1

Questions Submitted via Evaluation Forum

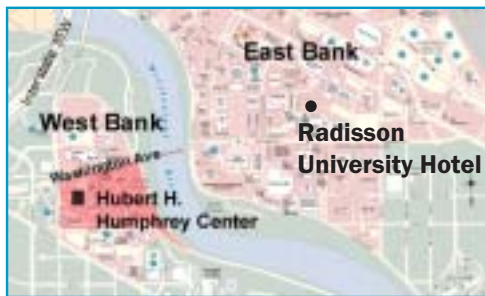
1. What is status of GIS standards? Besides Marketing and Government planning, are there activities in GIS directed at historical data to locate public heritage and genealogy interests? Also anthropology based studies. NMDA has genetic profiles of over 4Million marrow donor volunteers.
2. What were strengths & weaknesses of models presented? Are there some that are better suited to statewide collaboration?
3. What can IT management do to support/expand and make the value of GIS more visible?
4. There was a CD mentioned by Mark during PM1. Where is CD available?
5. How do I get a job at IFTF?

Appendix H
Pre-forum Promotional Brochure

See following pages

Program

- 7:30 a.m. Continental Breakfast and Pick up Registration Materials**
- 8:15 Welcome**
- 8:20 Imagining Possibilities:** What Does the Customer Want (Though They May Not Know it Yet) and What are We Preparing to Deliver?
- Michael Liebhold: IFTF
- Clint Brown: ESRI
- 9:40 Refreshment Break**
- 10:45 - Panel Session**
- 11:45 Lunch and Technology Demonstrations**
- 1:00 p.m. What's Needed to Achieve the Possibilities:** Designing New Standards and Capacities
Mark Reichardt, *Open Geospatial Consortium (OGC)*
- Panel Session
- 2:30 Refreshment Break**
- 2:50 What's Needed to Achieve the Possibilities:** Designing Management Structures
- Professor Ian Masser: *Spatial Data Infrastructures*
- Panel Session
- 4:30 Adjourn**



Location: Hubert H. Humphrey Center, West Bank, University of Minnesota
For directions, parking information, and an expanded view of the map go to www.cura.umn.edu/HHH-directions.php.

Registration and Fee

	Price
Before May 17, 2006	
All day	\$65
Morning Session Only (no lunch)	\$40
On or after May 18, 2006	
All day	\$70
Morning Session Only (no lunch)	\$45

Attendance is limited to 250 people
Registration begins on Thursday, April 20, 2006

To Register: Visit www.regonline.com/94145

Lunch Preference: Box lunches will be provided for those who register for the all-day option. An assortment of meats and vegetarian meals will be available. If you want a vegetarian meal, please note this preference when registering.

Notice of Confirmation – An email confirmation will be sent upon receipt of payment. An invoice may also be generated for those who cannot pay by credit card. **NOTE:** Payment must be received by May 22, to guarantee your reservation.

Cancellation Policy: Confirmed registrants who do not participate or who cancel after May 25, 2006 will forfeit their entire fee. Refunds will not be given for no-shows.

Hotel: The Radisson University Hotel (on the University of Minnesota campus) is offering a special rate of \$109/night. Call 612-379-8888 to register.

More Information: If you would like further information about this forum, please contact Randall Johnson at randy.johnson@metc.state.mn.us or call 651-602-1638.

Presented by:

MetroGIS, Metropolitan Council,
MN GIS/LIS Consortium,
MN Governor's Council on Geographic Information,
MN Chapter of GITA,
MN Office of Geographic and Demographic Analysis,
University of Minnesota



Metropolitan Council



Imagining Possibilities:

*The Next Frontier For
Geographic Information Technology*

Thursday, June 1, 2006
7:30 a.m. to 5 p.m.

Hubert H. Humphrey Center
West Bank
University of Minnesota
Minneapolis, MN

Why Attend *Imagining Possibilities*

Geographic information technologies are evolving rapidly. Innovations will create exciting new opportunities for GIS users across sectors. Five years from now, the way we deliver information and services to our customers may look quite different than today.

This one-day forum will bring together several widely respected experts and visionaries representing multiple facets of the geographic information field. They will help our community address questions such as:

- What will we be able to do with this technology five years from now?
- How will these innovations affect service delivery capabilities and customer appreciation?
- How might these innovations help us address data sharing and access needs and preferences?
- How can we use these innovations to improve the cost effectiveness of decision support and service delivery?
- What, if any, organizational and/or policy changes might be needed to take full advantage of these innovations?

Who Should Attend *Imagining Possibilities*

Morning session: The focus of the morning session will be on possibilities for innovations in geographic information technologies within the next five years. You should attend if you are a:

- **Manager or technologist** who works with geographic information systems to support decisions and service delivery.
- **Policy maker or senior management** in an organization that is using or is considering using geographic information technologies.

A reduced fee is offered to attend only the morning session to encourage attendance by policy makers and senior management.

Afternoon session: In the afternoon session, the guest experts will field questions in order to delve into the specifics of how to achieve the possibilities shared during the morning session. You should attend if you are **responsible for managing and supporting geographic information technologies** for decision-making and service delivery, in particular within the government community.

Keynote Speakers:

The keynote speakers confirmed as of this writing are among the most respected visionaries and content experts of our time within the geographic information technology community:



Clint Brown: Environmental Systems Research Institute, Inc. (ESRI) Director, Software Products for ESRI. Responsible for managing all ESRI product releases in use today in over thousands of organizations worldwide. Responsible for product design, development, and release of quality products. Works closely with Software Development teams managed by Scott Morehouse, ESRI's Chief Software Architect and Visionary.



Professor Ian Masser: Founder Chairman of the Associations of Geographic Information Laboratories in Europe 1998-99, President of the European Umbrella Organization for Geographic Information 1999-03, and President of the Global Spatial Data Infrastructure Association 2002-04. Author of numerous publications, most recently GIS Worlds – Creating Spatial Data Infrastructures



Mark Reichardt: Open Geospatial Consortium (OGC). President of OGC, a not-for-profit international consortium of more than 310 companies, government agencies and universities participating in a consensus process to develop publicly available geoprocessing interface specifications.



Michael Liebhold: Institute For The Future (ITF). Mike Liebhold is a Senior Researcher for the ITF focusing on pro-active, context-aware and ubiquitous computing, as well as social implications and technical evolution of a geospatial web. He is active in projects aimed at helping technologists and strategic planners from top tier companies and the public to better understand the emerging geospatial information infrastructure

Appendix I
Forum Participants

See following pages

Report Name: MetroGIS Forum: Attendee Directory

Event# : 94145 (01-Jun-06) - Status: Active

Report Date: 30-May-2006

Event Title : MetroGIS: Imagining Possibilities Forum

Record Count: 228

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 Report Date: 30-May-2006
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Event# : 94145 (01-Jun-06) - Status: Active
 Event Title : MetroGIS: Imagining Possibilities Forum

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Report Name: MetroGIS Forum: Attendee Directory

Event# : 94145 (01-Jun-06) - Status: Active

Report Date: 30-May-2006

Event Title : MetroGIS: Imagining Possibilities Forum

Record Count: 228

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Report Name: MetroGIS Forum: Attendee Directory

Event# : 94145 (01-Jun-06) - Status: Active

Report Date: 30-May-2006

Event Title : MetroGIS: Imagining Possibilities Forum

Record Count: 228

First Name	Last Name	Company	Address Line 1	Address Line 2	City	US State/ Canadian	Zip	Email
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Event# : 94145 (01-Jun-06) - Status: Active

Report Date: 30-May-2006

Event Title : MetroGIS: Imagining Possibilities Forum

Record Count: 228

First Name	Last Name	Company	Address Line 1	Address Line 2	City	US State/ Canadian	Zip	Email
Mark	MacLennan	National Marrow Donor Program	3001 Broadway Ridge, Suite 500		Minneapolis	MN	55413	mmaclenn@nmdp.org
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Susanne	Maeder	Land Management Information Center	658 Cedar Street		St. Paul	MN	55155	susanne.maeder@state.mn.us
Mary	Mahoney	Ramsey County Department of	50 West Kellogg Blvd.	Suite 550	St. Paul	MN	55102	mary.mahoney@co.ramsey.mn.us
Robert	Maki	Minnesota Dept. of Natural Resources	500 Lafayette Road		St. Paul	MN	55155	robert.maki@dnr.state.mn.us
Clarence	Manz	St. Louis County MIS Dept.	320 West Second St.		Duluth	MN	55802	manzc@co.st-louis.mn.us
Dan	Marckel	CURA - University of Minnesota	1425 University Ave	Suite 230	Minneapolis	MN	55455	marckel@umn.edu
John	Margraf	National Weather Service	1733 Lake Drive West		Chanhassen	MN	55317	john.margraf@noaa.gov
Ian	Masser	UCL	Town End House	Taddington	Buxton	MH	SK17 9UF	masser@onetel.com
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Bob	Mazanec	Metropolitan Council	390 North Robert St.		St. Paul	MN	55101	bob.mazanec@metc.state.mn.us
Charlie	McCarty	Mn/DOT	Waters Edge	1500 West County Road B2	Roseville	MN	55113	charlie.mccarty@dot.state.mn.us
Matt	McGuire	Dakota County	14955 Galaxie Ave		Apple Valley	MN	55124	matt.mcguire@co.dakota.mn.us
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Steve	Melberg	Melberg Marketing	1290 Lyman Avenue		Wayzata	MN	55391	steve@melberg.com
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First Name	Last Name	Company	Address Line 1	Address Line 2	City	US State/ Canadian	Zip	Email
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First Name	Last Name	Company	Address Line 1	Address Line 2	City	US State/ Canadian	Zip	Email
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Charles	Skelton	Facet Technology Corporation	6517 City West Parkway		Eden Prairie	MN	55344	skelton@facet-tech.com
Alison	Slaats	Metropolitan Council	230 E. 5th St.		St. Paul	MN	55101	alison.slaats@metc.state.mn.us
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Blair	Tremere	Metropolitan Council	390 North Robert Street		St. Paul	MN	55101	blair.tremere@metc.state.mn.us
Jerry	Vandelac	City of Minneapolis	350 5th St S Room 210	Planning Department	Minneapolis	MN	55415	jerry.vandelac@ci.minneapolis.mn.us
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David	Vessel	Metropolitan Council	230 East 5th St.		St. Paul	MN	55101	david.vessel@metc.state.mn.us
Rebecca	Vick	Land Management Information Center	658 Cedar St., Suite 300		St. Paul, MN	MN	55155	becky.vick@admin.state.mn.us
David	Wagner	St Paul Regional Water Services	1900 Rice St		St Paul	MN	55117	dave.wagner@ci.stpaul.mn.us
Sally	Wakefield	1000 Friends of Minnesota	26 Exchange St. E		St. Paul	MN	55101	swakefield@1000fom.org

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First Name	Last Name	Company	Address Line 1	Address Line 2	City	US State/ Canadian	Zip	Email
Mark	Wald	ObjectFX Corporation	10 Second Street NE	Suite 400	minneapolis	MN	55413	mark.wald@objectfx.com
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Paul	Wickman	Emmons & Olivier Resources	651 Hale Avenue North		Oakdale	MN	55128	pwickman@eorinc.com
Beth	Widstrom-Anderson	Metropolitan Council	230 East Fifth Street		St. Paul	MN	55101	beth.widstrom@metc.state.mn.us
George	Wilkinson	WpgLtd	11661 Vista Drive		Minnetonka	MN	55343	wpg@mm.com
Walter	Woodson	Mccaa, Webster & Associates	1422 W. Lake Street	Suite, 212	Minneapolis	MN	55408	walter.woodson@mccaawebster.com
AJ	Wortley	WI State Cartographer's	550 N. Park St., UW-Madison	384 Science Hall	Madison	WI	53706	lwortley@wisc.edu
Bob	Wright	Minnesota Dept. of Natural Resources	5463-C West Broadway		Forest Lake	MN	55025	robert.wright@dnr.state.mn.us
Xiao-Hong	Zhang	East View Cartographic	3020 Harbor Lane, North		Plymouth	MN	55447	xzhang48@yahoo.com
Tim	Zimmerman	Hennepin County Public Health	525 Portland Avenue	HSB - 3rd Floor, mc 963	Minneapolis	MN	55415	tim.zimmerman@co.hennepin.mn.us

Appendix J

Panel Session Participants

Panel A – 10:45 AM

Moderator: Mark Kotz, GIS Database Administrator
Metropolitan Council

Speakers: Michael Liebhold, Senior Researcher
Institute for the Future

Panelists: David Brandt,
Senior Information Technology Analyst
Washington County

Randy Knippel, GIS Manager
Dakota County

Recorders: Mike Dolbow, GIS Coordinator
MN Dept. of Agriculture

Clint Brown, Director of Software Products
Environmental Systems Research Institute (ESRI)

Tim Loesch, GIS Operations Supervisor
MN Dept. of Natural Resources

Terese Rowekamp, President
Rowekamp Associates

Matt McGuire, GIS Specialist
Dakota County

Panel B – 1:00 PM

Moderator: Chris Cialek, GIS Clearinghouse Supervisor
MN Land Management Information Center

Speakers: Mark Reichardt, President
Open Geospatial Consortium (OGC)

Panelists: David Bitner, GIS Specialist
Metropolitan Airports Commission

Steve Lime, Data and Applications Manager
MN Dept. of Natural Resources

Recorders: Nancy Rader, GIS Data Coordination Specialist
MN Land Management Information Center

Alison Slaats, GIS Specialist
Metropolitan Council

Bill Swing, IT Director
Wright County

David Vessel, Transportation Planner
Metropolitan Council

Panel C – 2:50 PM

Moderator: Nancy Read, Technical Services Coordinator
Metropolitan Mosquito Control District

Speaker: Professor Ian Masser, Spatial Data Infrastructures
Spatial Data Infrastructures

Panelists: David Arbeit, Director
MN Dept. of Geographic & Demographic Analysis

Rick Gelbmann, GIS Manager
Metropolitan Council

Jane Harper, Principal Planner
Washington County

Recorders: Joella Givens, GIS Manager
MN Dept. of Transportation

Robert Maki, GIS Manager
MN Dept. of Natural Resources

Nancy Pollock, Executive Director
Metropolitan Emergency Services Board

Tanya Mayer, GIS Coordinator
Metropolitan Council

Appendix K

Sponsoring Organizations

1. MetroGIS

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2. MN GIS/LIS Consortium

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Website: <http://www.mngislis.org>

3. University of Minnesota - CURA

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4. MN Governor's Council on Geographic Information

Contact:

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5. Metropolitan Council

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6. MN Chapter of GITA

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alan.laumeyer@centerpointenergy.com

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7. MN Office of Geographic and Demographic Analysis

Contact:

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St. Paul, MN 55155
651-201-2460

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Website: <http://www.lmic.state.mn.us>

8. U.S. Geological Survey

Contact:

Ron Wencil, USGS Geospatial Liaison
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Mounds View, MN 55112
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rwencil@usgs.gov

Website: <http://www.usgs.gov>

Appendix L
Technology Demonstrations

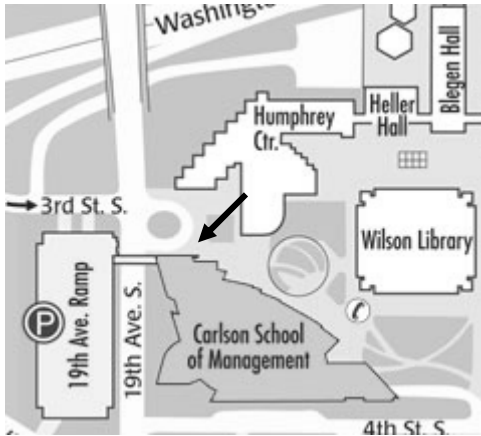
(During Lunch Recess)

See following pages

Imagining Possibilities:

The Next Frontier For Geographic Information Technology

Technology Demonstrations: 12:00 noon and 12:30 p.m. (repeated)

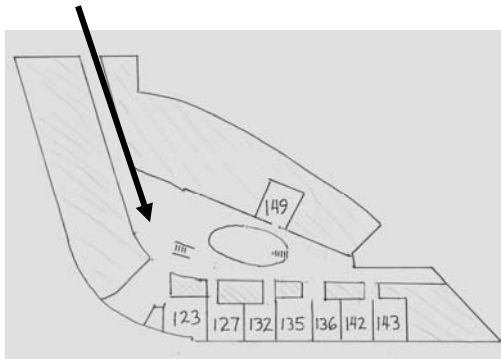


To get to Tech. Demos:

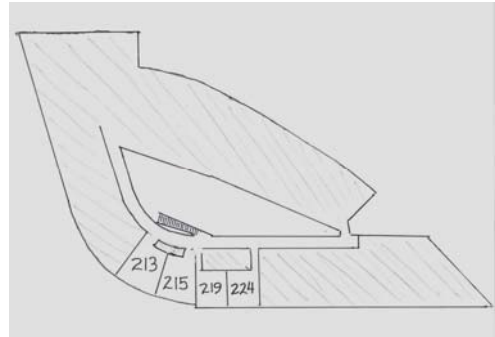
- Pick up lunch at Humphrey Atrium
- Go out through Humphrey main entry (west)
- Cross sculpture garden (or take sidewalk – no steps)
- Enter Carlson, north door
- Follow hall to Atrium, look for Tech. Demo signs (some are upstairs)

Alternate route from Humphrey basement to Carlson basement in case of rain.

Carlson
Interior View:



1st Floor (ground level)



2nd Floor

Room – in Carlson	Title	Presenter(s)
215 (upstairs)	Google Earth 101	Paul Wickman, Emmons & Olivier Res. Inc.
219 (upstairs)	Using GIS Data And Images In Google Earth	Sally Wakefield, 1000 Friends of Minnesota & Dan Marckel, Center for Urban and Regional Affairs, U of M
123	Google Mashups With Mapbuilder.Net	David Erickson, e-strategy.com
127	Real-Time, Fast, Local - Under The Hood At National Weather Service Site	John Margraf, IT Specialist, National Weather Service, Chanhassen, MN
132	Spatial Rules And Events	Kevin Crothers, ObjectFX
135	Map2pdf – Getting Maps Mobile	Lon Cornell from TerraGo Technologies & Teri Alberico, Army Corps of Engineers
136	New Arcgis Explorer	Chris Liske, ESRI
142	Mapserver – Open-Source Software For Mapping On The Web	Brian Huberty, U.S. Fish and Wildlife Service & Perry Nacionales, University of Minnesota
143	Giving Map Publication Control Back To The Data Owners	Bob Basques, City of St. Paul
149 (12:00)	Centralized Data Serving: Web Mapping Services	Tim Loesch, Minnesota Dept. of Natural Resources
149 (12:30)	Web Feature Services	Ken Boss, Minnesota Dept. of Natural Resources

215 - [Google Earth 101](#) Paul Wickman, Emmons & Olivier Res. Inc. (pwickman@eorinc.com)

This demo provides a "global" overview of Google Earth and available extensions. A local application developed for the Rice Creek Watershed District connecting to EOR's MapServer will also be shown. For more information contact GeoServices@eorinc.com.

219 - [Using GIS Data And Images In Google Earth](#) Sally Wakefield, 1000 Friends of Minnesota (swakefield@1000fom.org) & Dan Marckel, Center for Urban and Regional Affairs, U of M

Google Earth is an enticing tool for viewing places, but it can also show a surprising array of data. Learn how to add shapefiles, raster images, photographs, and citizen comments into Google Earth and share the products. This session will use examples developed in real-world community situations.

123 - [Google Mashups With MapBuilder.net](#) David Erickson, e-strategy.com (info@e-strategy.com)

MapBuilder.net is a tool to build custom Google and Yahoo maps without learning the Maps API and JavaScript. It provides a visual interface with geocoding and import features, and lets users tag locations and publish on their own website. *e-strategy.com*, a locally-based Internet marketing firm, used MapBuilder to help local businesses such as Martinizing add locations to their web presence.

127 - [Real-Time, Fast, Local - Under The Hood At National Weather Service Site](#) John Margraf, IT Specialist, National Weather Service, Chanhassen, MN (john.margraf@noaa.gov)

The National Weather Service has introduced new features on their web site, based on GIS applications, that provide users with a more detailed display of weather information for their location. This presentation will demonstrate some of the applications on the NWS web sites, in addition to describing some of the raw GIS weather data sets that are available for specialized use.

132 - [Spatial Rules And Events](#) Kevin Crothers, ObjectFX (kevin.crothers@objectfx.com)

ObjectFX provides SpatialFX, an innovative Java-based software platform that enables the integration of dynamic location-based services such as mapping, vehicle routing, address geocoding and other spatial operations into enterprise applications. Users of applications built on the SpatialFX™ Platform can view and interact with real-time, integrated views of information in a location-based context, thereby enabling faster, more effective decisions. The technology serves as a foundation for a wide range of software applications that include Dynamic Operations Management, Mobile Asset Management, Location Analysis, and Network Visualization & Management, installed at organizations such as Boeing, FedEx, United Airlines, Qwest, U.S. Army and the U.S. Postal Service.

135 - [Map2PDF – Getting Maps Mobile](#) Lon Cornell, TerraGo Technologies (lcornell@terragotech.com) & Teri Alberico, Army Corps of Engineers (teri.alberico@mvp02.usace.army.mil)

The Army Corps of Engineers needed tools to pull large files from GIS applications into a format that is manageable, highly portable and easy for non-GIS professionals to use. MAP2PDF lets Corps GIS engineers create maps with complex attributes and distribute them via a GeoPDF. Field personnel use Adobe Reader to view maps, turn layers off and on, query attributes, display coordinates or create redlines and notes. Acrobat round-tripping capabilities allow for integration of data gathered in the field with enterprise GIS systems.

136 - [New ArcGIS Explorer](#) Chris Liske, ESRI (nparipovich@esri.com)

ArcGIS Explorer is a new lightweight GIS data viewer available as a free download from ESRI. ArcGIS Explorer provides a quick and easy way for anyone to access GIS data in both 2D and 3D environments. The viewer comes standard with several free web services hosted by ESRI. Data from multiple sources can also be added to the viewer such as publicly available web services or data from your organization's own secure servers allowing you to browse and query data and create your own maps.

142 - [MapServer – Open-Source Software For Mapping On The Web](#) Brian Huberty, U.S. Fish and Wildlife Service (Brian_Huberty@fws.gov) & Perry Nacionales, University of Minnesota (pnaciona@gis.umn.edu)

MapServer excels at rendering spatial data (maps, images, and vector data) for the web. <http://mapserver.gis.umn.edu/> The Open Source Geospatial Foundation has been created to support and build the highest-quality open source geospatial software. The foundation's goal is to encourage the use and collaborative development of community-led projects. <https://www.osgeo.org/>

143 - [Giving Map Publication Control Back To The Data Owners](#) Bob Basques, City of St. Paul (bob.basques@ci.stpaul.mn.us)

Why restrict data owners to publishing in a system they don't control? Gismo is the City's newest data discovery tool, built with JavaScript, MapServer, and the "Map book" concept. Now data owners don't have to hand off data updates to the Web Administrator – they control all aspects of publishing their spatial and tabular datasets, including when, how often, how much, and what it looks like.

149 (12:00) - [Centralized Data Serving: Web Mapping Services](#) Tim Loesch, Minn. Dept. of Nat. Res. (tim.loesch@dnr.state.mn.us)

Managing and serving GIS data from a centralized data store is a reality at the Minnesota DNR. With more than 600 users in 72 offices spread over a large geographic area, the DNR is efficiently serving more than 150GB of imagery using a standardized web protocol called Web Mapping Services or WMS. This same protocol is also being used to serve data to the public via a variety of web mapping portals including the popular DNR Data Deli.

149 (12:30) - [Centralized Data Serving: Web Feature Services](#) Ken Boss, Minn. Dept. of Nat. Res. (ken.boss@dnr.state.mn.us)

Web Feature Services (WFS) aim to pick up where Web Mapping Services (WMS) leave off. Where WMS provides a convenient map-image representation of geospatial data over the web, WFS delivers actual vector and attribute data in a standardized XML format. Server and client software collaborate to provide browse, query, filter, and even transactional (create/update/delete) functionality over the internet. A publicly-accessible experimental WFS from the DNR will be demonstrated.

Appendix M

(AM Session Notes –Source of Summary)

Michael Liebhold Presentation:

Notes drafted and submitted by Michael Dolbow (Recorder) (“big ideas in bold)

- IFTF: Gather experts from particular fields to form an opinion on what the future looks like
- A Geospatial Web: where info and documents are found not just by content, but by location
 - Layered geospatial data
 - Web, sound, objects that are geocoded
 - Augmented perception: new ways of seeing info in front of us
 - Invisible attributes -> visible
 - Sentient landscapes – processing & presenting information
 - Context-aware computing: your mobile device knows who you are and where you’re going, it can do things on your behalf to help conduct your tasks
- Large hacking movement in geospatial information now – inventing new open source software, etc
- “First person geography” – seeing it from a street level view, not bird’s eye
- “Tricorder” everything about a place should be available as information
- GPS resolution will improve over the next 5 years. There will be dual receivers to use both US and European satellite systems
 - Triangulation from WIFI base stations – if they’re geocoded in a database, your device can figure out where it is. Intel has an open source device at www.placelab.org
 - Loki.net or loki.com – toolbar with an open interface – has databases for over 100 US cities so a laptop can know where it is, even without a GPS
- Need to think about cartography in new ways. First person graphic views (Sony XYZ).
Augmented video: hold up your viewfinder on your phone and see links attached to real things in the world.
 - Google is enabling consumers to create 3D models easily with SketchUp tools, that they can then overlay on top of Google earth
 - WorldWind Markup from NASA – open source, GoogleEarth style
 - UW AR Toolkit – Augmented Reality – allows cartoons or graphics to hover in the air above objects
 - Stanford: GEOvrml – markup language for Virtual Reality
- The Tricorder is a very simple idea, but it’s complex to integrate all the data beneath it. Discovery of geospatial data is a difficult problem. Across the world, the provision of geospatial data is a mess. No standard way to find things, etc. Global problem: no way for a “spider” to find and index geospatial data
- Challenge: integrate formal and informal geospatial media. Taxonomies are different between disciplines
 - “Flicker” – can post photographs on web, provide a keyword. Ordinary people are going to label their data with plain language tags. “Wild Web Geotagged Metadata”. “Tag cloud”: not a formal schema or hierarchy – how to merge with formal tags
- Open Software Ecology: moving from legacy data to open source mapping tools. XML is the key to hold it all together: creates a mechanism for data to be self-identifying. The web will get integrated with geospatial data – user geocoded web.
- If we don’t move NOW, the stovepipes of information systems and storage mechanisms will prevent the “tricorder” vision from ever happening
- GeoRSS: the missing link? EASY to embed a geocoded RSS value in the RSS feed. You can create a map to subscribe to information: anytime someone posted geocoded info, it automatically

pops up. Great for Emergency Response, collaborative mapping, etc. Designed in concert with OGC folks – so very simple GML semantics are included.

- The rise of Personal Cartography: hacking Google Maps. Can paste Google Maps into a web page, overnight sensation.
 - “Mapping Hacks”: book by Erie, Gibson, & Walsh
 - Platial.com – premier mapping mashup website. All points are encoded in GeoRSS. Can be put on top of all other mapping systems. Flickr-style plain language tags.
- Empowering people in place with “ground truth”. Ordinary people can construct a new digital version of reality. People are taking civic action with free mapping. Open Street Map Movement (OSMM). Started in UK in response to the restriction of geospatial data in UK.
- Pathmaking: creating spatial memory. Important to native histories. Urban geographers collecting city stories/histories: stories about a place. Aggregation of feelings/impressions about a place
- Ecotourism, Precision Ag, Public Health, GeoDemographics (could lead to GeoSPAM)
- 3D facilities maps, making the invisible visible. Flashlight that has an RFID reader that can then shine the info back on the package
- PacManhattan – game board in downtown. Locative media experiments
- GeoWeb index: how many nations in the world are prepared to harness the benefits? Very few.
- Challenge: education, geospatial literacy. Ordinary people are going to start to appreciate and use this data.

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Michael Liebhold Presentation:

Notes drafted and submitted by Matt McGuire (Recorder)

- Search the internet spatially - Map of Trends
- Imagine the data you can't see - augmented perception
- Context-aware commuting
- placelab.org
- Loki Toolbar - open API
- Yahoo has coarse Tag(?)
- We are used to the omniscient view (orthoview), Other:
- Augmented video Aspen Movie Map from 1978 - crazy talk back then, now Microsoft is using it in their beta of www.local.live.com
- Augmented Reality Toolkit ARToolkit
- GeoVRML
- All this requires the support of Geospatial data - Provision of Geospatial is a big mess
- Geospatial Tagging
- User Geocoded web
- Balkanization of Geospatial Information - Google|Microsoft|Yahoo
- www.Platial.com
- Open Map movement
- PacManhattan

Clint Brown Presentation

Notes drafted and submitted by Michael Dolbow (Recorder) (“big ideas in bold)”

- Rich history of GIS in MN: successful GIS goes hand in hand with strong communities
- ESRI's goal is to advance GIS: open source is exciting – GIS for the world

- Education, tech support, etc. Grants, press.
- How do we meet our needs as a society as this technology develops?
- *The purpose of an information system is to support real “line of business” activities.*
- People are demanding higher and higher levels of detail from geospatial information
- Three sources: Applications(Views), Geospatial databases, & Geoprocessing models. All based on geography – “the science of our world”
- Encapsulating geographic knowledge and making it directly usable and accessible
 - Favor better decisions, efficiency, solve problems, communicate, visualize: idea, plan, conflict, proposal, situation status, etc
 - **Create a common view of the earth**
- Bureau of Labor Statistics predicts GIS to be a top 3 tech employment job. Top 10 growth in employment overall.
- Need to show the appropriate level of detail for the geography of concern. Are you at block level, county, state, nation, or the world view?
- Technology improvements have enabled us to grow. Faster processing, increased bandwidth. GIS: Always been a system to HOOK participants together. GIS logic moving back into servers, but those servers can distribute the information better now than they could in the past.
- Mobile GIS: tablet PCs, pocket PCs, etc. Utility workers, firefighters. Professional GPS, surveying. Surveying will be just another layer in the GIS. Updates will just be a transaction. Smart Phones/Smart Clients.
- Sensor network for the world: digital nervous system for the planet. Another information set. NetCDF: format for time series location information. (i.e. weather report). Stream gauges, traffic sensors, all part of the GeoWeb.
- “GIS Dashboard” – a set of dashboards – online maps – for the users:
 - Define audience
 - Define content to be served
 - Build simple web application
 - Publish and serve
- **Fuse services from many nodes** and databases through XML web services in open source combination dashboards. I.e., CUAHSI – common information access for hydrological scientists.
- GIS should mean more:
 - Examples
 - A community of 1 million people is probably spending between 50 and 100 million a year on geospatial efforts
 - 25-50 people years of redundant work done in response to Katrina – no planning
- ***Data sharing needs to be part of future emergency response planning***
- GIS for the Nation: data models. ISO themes. USGS Leadership “Blue Book”. Recognize the common set of practices for industries that cut across political divisions.
 - Minimum set of collection guidelines
 - Identify the stewards
 - Created a successful data model to respond to Katrina within 2 weeks.
 - A model for a national GIS system. Multi-participant: local-state-federal system.
 - Plan: provide for immediate preparedness
 - Facilitate multi-agency collaboration
 - Improved response
 - Data Fusion Centers: a mirror – at least there’s a copy somewhere. Collaborative data building provides for a Common Operational Picture. Gets you a common understanding of the content, which is critical to a coordinate response.
 - Servers need to publish information in an open way.
 - Imagery for the Nation: contributing to the USGS Blue Book. The cities should get some help from the feds to do the high res photography

- Could be used as a GIS for MN? For the Twin Cities?
- Geospatial One Stop, similar.
- Next five years: publish own map services. Publish own Google Earths. It's all GIS: Imagery, Surveying, Weather, Design & construction, GPS, RFID, web content. That's the spatial data infrastructure.
- Digital Nervous System: trees in the west are dying. Integrate the sensor networks, flow data to where it's needed.
- GIS Education ubiquitous. Students apply GIS. Accomplished GIS users with insight. Starts in K-12, continues beyond college. Finally a "GIS for Dummies" book! **Thinking geographically.**
- Crucial for managing: cities, agriculture, response to disease, environment, transportation, infrastructure, inspection, workforce management and maintenance.
- The public will continue to demand high quality data
- GIS users will freely share data and host GIS web services. Complete data coverage with multiple levels of detail. Need a Google Earth with all 14 layers of basic info.
- GIS software will be bug free and easy to use!
- Savings of 15% in workforce management. Embedding in utilities and other parts of society.
- Used as a tool for science.
- Feet on the street, directed crime mapping
- GIS organizations across local, state, and national governments will co-develop and collaborate.

Clint Brown Presentation

Notes drafted and submitted by Matt McGuire (Recorder)

GIS is used to communicate, visualize, and understand. Create a common view of the world.

Trends:

- Server Based
- Real Time Sensor Information
- Mobile GIS
 - Fill Clients
 - Smartphones

GIS is becoming a sensor network - a Digital nervous system for the planet

The GIS Community is developing dashboards

1. Define Audience
2. Define Content to be served
3. Build simple web applications

GIS should mean more for example The Twin Cities are spending \$50 -100 million annually in managing GIS - **what are we getting for that?**

GIS was used extensively in Hurricane Katrina Response. 25 -50 man years of *redundant work!*

Event was full of lessons

- Planning
- Data
- Organization
- Methodology

Data fusion center - a redundant copy

GIS services - service level agreement allow a common operating picture

Five Years:

- Server GIS
- It's all GIS
 - Imager
 - Surveying
 - Active Tags
 - etc...

Appendix N

(PM2 Session Notes –Source of Summary)

Notes prepared by Joella Givens (Recorder)

Don't believe too strongly in technology.

Basic principles underlying SDI (spatial data infrastructure)

- Data should be collected once and maintained at the level where it is most effective.
- Spatial data should combine seamlessly from various sources
- Data collected at one level should be shared at other levels (i.e. local, state, federal, etc).
- Extensive use of data should not be restricted.
- It should be easy to discover what data is available, and to evaluate it's fitness for a particular use.

Emerging Trends

- Moving from product to process
 - Producers to users
 - Database creation to data sharing
 - Centralized to decentralized structure
- Moving from formulation to implementation
 - Single to multilevel participation
 - Coordination to governance (more open/ participatory)
 - Existing to new organizational structures

We must be willing to share power in order to move forward with SDI.

Victoria Australia (example discussed)

- They started with individual states, and then added a federal government later (as opposed to the US model of having the federal government first then creating the states). Therefore the money and impetus was at the local level. Money sources included land titling revenue.
- They laid the foundation for management and custody of the states, therefore funding the data sets.
- They moved through the above trends over time.

Two approaches for working with multi-level organization structures are

- Top-down
 - Advantage is in creating standards and harmonization
- Bottom-up
 - Advantage is in diversity, different aspirations and resources of stakeholders

The Challenge is to ensure standards and harmony, yet respect diversity.

SDI by nature is a patchwork quilt or collage.

There was a shift to more inclusive models of stakeholder governance. The problem is in the number of stakeholders and their diversity.

New governance structures have facilitated the development of SDI and data management.

SLIP Collaboration Portal (Shared Land Information Portal) was an effort to minimize duplication. This application was released May 1, 2006, and builds on staff expertise. Focus areas included emerging management, land development, national resource management, and register of interests.

This portal is a public-private partnership (PSMA being the private entity), whose purpose is to provide seamless data to stakeholders. This is a private corporation, owned by the government. So SLIP is owned by the government, but not in the government.

The Netherlands also has an example of a working public/private partnership, whose focus is on mutual benefits.

Germany set up a Center for Geoinformation, a company set up to stimulate the geoinformation community. Cross-border projects introduce complications.

Public/Private partnerships are working well in various parts of the world.

Moving toward a Spatially Enabled Society requires an important shift in emphasis. The goal is for about 1% of the end 'GIS users' being actual GIS professionals, less than 5% being general IT users, and 95% being users who are unaware that they are using a GIS.

This also means a large shift toward producing products and services for these non-specialist users.

One example of the shift toward e-government is the use of spatial smart tags.

Networking is the key to successful SDI implementation.

Notes prepared by Tanya Mayer (recorder)

Slide 1-2

Warning in believing too strongly in technology

Slide 3-4: SDI Principals: 5 commandments

1. Data collected once and maintained
2. Combined seamlessly across border

Slide 5: SDI elements

1. Institution
2. Create and Maintain Data
3. Make Data Accessible / Usable
 - a. Metadata
 - b. Pricing
 - c. Licensing
 - d. Access Awareness
4. Facilitating and Developing Technical tools and Applications

Slide 6: Emerging Trends

1. Product to Process
 - a. Producers to Users
 - b. Data creation to Data Sharing
 - c. Centralized to Decentralized
2. Formulation to Implementation
 - a. Single to Multi-level
 - b. Coordination to Governance
 - c. Existing to New Organizational Structures
3. Victoria Government Example
 - a. 1997-03 – Foundation for management and custodianship of 8 fundamental datasets
 - b. 2004-07 – shift in emphasis to whole of industry approach, focus on spatially enabled government and introduction of new governance structure

Slide 9: Multi-Level Structure of SDI

1. Top Down vision
 - a. Emphasized need for standardization and harmonization
2. Bottom Up vision
 - a. Emphasizes importance of diversity given very different aspirations of various stakeholders
3. Challenge
 - a. Ensure part of both, requires sustained mutual learning process

Slide 10: Likely Outcomes
Patchwork or Collage

Slide 13: Governance of SDI's

1. Shift to more inclusive models of stakeholders
2. Problem of inclusiveness – potential of hierarchical model: National, State, Local...

Slide 15-35: SDI Management Options

1. Restructuring within existing state and local government (Australia example)
 - a. SLIP Collaboration Portal – shared land information platform is an enabling framework to promote information sharing with a focus on
 - i) Emergency
 - ii) Land development
 - iii) Natural resources
 - iv) Register of (property) interests
2. Restructuring external to existing (Nova Scotia example)
 - a. Seamless access to government services from the desktop
 - b. Maintains and distributes data
 - i) Topographic
 - ii) Property records
 - iii) Gateway to all geographic holdings
 - c. Developed by a coalition of public-private interests
3. Consortium – joint ventures by data producers (Australia example)
 - a. Seamlessly stitch existing data together in to 1 data layer
 - i) Administrative boundaries
 - ii) Address file
 - iii) Parcel polygons
4. Joint Ventures by Data Users (Dutch example) – create & maintain more/less consistent data
 - a. Utilities (60%)
 - b. Municipalities (20%)
 - c. Cadastral, State and Regional (20%)
5. Collaborative (MetroGIS, Germany examples)
 - a. Cross-Border (XBorder) project example

Slide 36: Toward a Spatially Enabled Society

Shift in emphasis: GIS Professionals (1%) → general I.T. (<5%) → to General Population (95%)
Challenge to implement

Slide 38: Spatial Information Market

Example: Victoria Spatial Smart Tag use for spatial search engines

Slide 40: The Message: Networking is the key to a successful SDI Development

Slide 41: Preferred Option: Collaborative Focus

Blend across organizations without acquiring new technologies
(Least preferred: internal focus)

Slide 42: Our Task:

1. Design Management Structures that Facilitates Networking
2. Create SDI's to spatially enable both Government and Society

Endnotes:

ⁱ The subject June 1 forum is the second event hosted by MetroGIS in preparation for MetroGIS's pending Business Plan Update initiative. The first event (Beyond Government Users: Future Directions for MetroGIS) was held in November 2005 and focused on possible partnerships with non-government interests to address common geospatial needs yet to be addressed. More information about the November 2005 event can be viewed at http://www.metrogis.org/teams/pb/meetings/06_0118/forum_summary.pdf. The reader is also invited to review the information at http://www.metrogis.org/about/business_planning/index.shtml#parta1 for general background about the pending MetroGIS Business Plan Update initiative.