The idea of distance learning is, historically speaking, relatively new. In the late 1720s, a teacher, Caleb Phillips, advertised lessons on shorthand note taking offered by mail; this correspondence course was completed through the exchange of letters, or correspondence, between the student and teacher. This form of education was popularized through the expansion of the increasingly ubiquitous and effective US Postal Service. By the mid-1800s, this style of learning had spread throughout Europe and the UK’s University of London boasted the first courses at the university level. Technological advances in the early 1900s saw the creation of e-learning, with courses being disseminated using radio and television broadcasts, and in the late 1900s broadband enabled internet-based platforms. Coined in 2008 by Dave Cormier, University of Prince Edward Island, the newest iteration of distance learning is the idea of the massive open online course (MOOC); the trend is towards a free, non-credit course, available to anyone with an internet connection.

Esri’s MOOC program sprang from their Education Outreach team; pitched in early 2014 as a way to enable users to “test-drive” the spatial analytics tools in ArcGIS Online (AGOL). The first course Going Places with Spatial Analysis launched in September 2014 and aimed to complement offerings by colleges and universities. In the second half of 2018, Esri now offers 5 MOOCs:

- Going Places with Spatial Analysis (Season 2)
- The Location Advantage
- Go-It-Yourself Geo Apps
- Earth Imagery at Work
- Cartography.

The following article provides an end user’s perspective on the two MOOCs recently offered by Esri, The Location Advantage, and Cartography. (read ‘Cartography full stop’) which ran from the end of April to June.

Cheval Blanc 1947

As part of the cohort from the analog generation, I was thrilled to experience the rapid uptick of technology in the late 20th century and the excitement that each year would bring massive improvements over the last. Looking back, perhaps I was too optimistic on how quickly or efficiently we would use the seemingly un-ending bounty of tech. The first blu-ray movie that I ever saw was Pixar’s Ratatouille. The perceived villain of the story, Anton Ego, is a feared critic whose harsh review caused a reversal in fortunes for Chef Gusteau and his self-titled restaurant, which neatly sets up story line and plot that again culminates with the expectation of another scathing review. In this story, we’re neither the anthropomorphic hero nor his human compatriots; just prospective diners, deciding where to spend the currency that is our time and attention.

As a pairing, initially, I thought Cartography. and The Location Advantage complemented each other well. Map making and actionable analysis. Data presentation in
two forms, the artistic and the practical. Declarative and persuasive. Coming off the heels of the SCAUG annual conference, I felt energized enough to attempt these two courses in tandem. As defined by Esri, these courses:

- Cover a single theme
- Involve four to six weeks of instruction, with two-three hours per week of study
- Require registration but are free to take
- Run once or twice a year with firm start and end dates
- Provide certificates to students who complete the course material
- Introduce students to subject matter experts from across Esri and its community

The Evolution of Esri’s MOOC Program, Part IV
Signing up is probably the easiest part of the process, the interface is handled through the My Dashboard section of esri.com/training; depending on your organization’s internal policies, your named user may not be “enabled for Esri access.” If so, treat yourself to a free (Essentials Plan) ArcGIS Developer account (developers.arcgis.com); it is similar to the ArcGIS Public Account but has access to premium content, premium apps, training labs, and 50 free credits a month. After signing up, the MOOCs will appear as training items in your dashboard, clicking on one will bring you to that course’s home page, and from there you “enter” the course, another dashboard-type situation.

Chew it Slowly
Like any pairing, comparisons between two items experienced concurrently are inevitable. As much as I tried to avoid it, I had a definite preference going into the MOOCs. My favorite course in school was Applied Retail GIS; case studies, ArcGIS Business Analyst Online (BAO), and applied location analytics. I was dreading a course on cartography, probably one of the weakest aspects of my professional work. As part of our organizational ethos, we strive for self-improvement--I was determined to improve myself in this aspect. Esri has opted for a more traditional experience with the majority of their MOOCs, content is incrementally unlocked on a weekly schedule and a syllabus has been prepared ahead of time. This meant that each week I experienced the pairing anew. A tot of Cartography, followed by a chaser of The Location Advantage.

Only Think About the Taste
The newest of Esri’s five MOOCs, the premise behind Cartography, is two-fold; one, an introduction to modern cartographic technique, and two, an introduction to map-making within the less-than-appreciated ArcGIS Pro (Pro). I had only recently devoted myself to the Dao of Pro, after completing a time-cube project for a poster presentation at the 28th Annual SCAUG Conference in San Antonio. I was curious to see how this course would reinforce what I had learned independently. I was instantly captivated. The very first video is set up as a panel-format and casual discussion between 3 of the course authors and professional cartographers at Esri. “What is Cartography?” (hosted on YouTube) was 17½ minutes of a conversation that was an incredibly effective way to build excitement for what could otherwise be a course titled The Worst Part of Your Job.

Like any course, the first session has some housekeeping tasks that you’ll need to complete. Opening exercises get you to download and install Pro, and provide you with a named user account for AGOL (and Pro) specifically for this course. After these have been squared away, the last task is to make our first map. After downloading a pre-prepared dataset, the exercise has you move through the major steps of map-making: metadata, setting a coordinate system, importing data, definition queries, symbolization, labeling, layout creation, and exporting. All of these steps are documented well and allows anyone that has never used Pro the ability to take it out for a long test drive.

This first exercise took a lot longer than I had originally budgeted my time for. When I thought I had reached the end of the exercise, I was greeted with a series of three stretch goals. Tasks to make the map more unique; suggestions with no steps or walkthrough. Afterward, you’re encouraged to post an introduction to a forum that is specific to the first week. Week 1 really gave me something of a reality check about the time requirements for this course. On the course homepage it says, 2-3 hours of study a week is required. I’d say that 3+ hours is a more reasonable estimate. For a subject like cartography, this is a good thing.

Now, Try them Together
The Location Advantage is the second MOOC that Esri launched in 2015, and geared specifically for recent graduates and current students of business schools at the bachelor and graduate level. Similar to Going Places with Spatial Analysis, the course allows students to “try on” BAO. This is accomplished, again, with a named user given for the duration of the course. The flavor of this course is decidedly different. The opening video (hosted directly through Esri’s site) feels more like a prolonged voicemail rather than an invitation to explore; it is thankfully short.

Outside of the housekeeping tasks, on the list of exercises for the week, we had several items that caught my eye: additional videos with Esri staff, a case overview, and a weekly guest lecture from an industry expert. A software developer at Esri gives a much-needed extended introduction to the concepts of how geography and location information can benefit businesses, this feels like the warm welcome that Cartography nailed on the first swing. The lecturer for Week 1, is none other than University of North Texas professor, Dr. Murray Rice, the same instructor that taught the
unforgettable course Applied Retail GIS. I felt right at home and excitedly began to devour the content. Unfortunately, it felt like as soon as the “lecture” started it was over. The interview was done over the phone, so a single slide is presented during the entirety of the conversation. The host asks four complete rounds of questions and then calls it a day.

The case overview video briefly introduces the actual exercise, giving it more of a narrative feel: you work for a fictitious Canadian Bank that wants to increase the services offered. In this exercise there is not an actual BAO component, everything is done within AGOL. Your task is to locate company buildings from a .csv, load them into a web map, alter pop-up settings, alter symbology, add demographic data from AGOL layers, and author a swipe/spyglass story map to consume your work. Documentation is great, and those unfamiliar with AGOL should fly along without a problem.

**You Must Try Things that may not Work**

Over the next 6 weeks, the time-demands were pretty significant. If you have the ability, I would whole-heartedly recommend carving out research & development time during your working day. Doing more than treading water in the ever-expanding ocean that is spatial technology requires us to deliberately increase our skill set by trying out processes and discovering new ways to do things better. My R&D time was largely spoken for, which is why I opted to spend my lunch hour completing the MOOCs, even still, I ended up doing some of this work at home as well. In the end, what was left?

Understanding the Esri MOOCs requires understanding MOOCs in general. The biggest deficiency of these programs happens to be their best selling points, low barriers to entry and accessibility from anywhere form a disconnect between the student and the material. Unlike compulsory education, there is no school building that you go to daily, no teacher to reprimand you for failure to meet expectations, and no peer pressure to complete the learning journey together. While MOOCs enjoy high rates of registration, completion rates lag far behind. The Esri MOOCs are not exempt from this trend, using viewing rates from the Cartography videos hosted on YouTube as a proxy, the approximate attendance rates for Week 1 started at 20,332 and finished Week 6 at 3,440. While the 83% decrease overall seems shocking, the largest numerical drop is between Week 1 and Week 2 (6,088); if viewed from Week 2 to Week 6 the attrition rate is a more realistic 44%

Esri has opted for a more traditional experience with the majority of their MOOCs, content is incrementally unlocked on a weekly schedule and a syllabus has been prepared ahead of time. Dialogue is mostly uni-directional; although, there are some open forums during some weeks of the MOOCs (course instructors participated), most of the time a student is offered a one-and-done response to finish the section each week. Each course did include an ask-me-anything session hosted on Esri’s GeoNet, the participation in each course varied dramatically with 18 comments in The Location Advantage and 165 comments for Cartography.

**Lightning-y**

Cartography, full stop. It would be easy enough to end it here. As the fifth iteration of Esri’s MOOC program, Cartography, enjoys the benefits of high production values. Apart from the magnetic on-screen talent, video is captured using multiple shots, audio is professionally recorded, and pains are taken to reduce the apparent use of scripts and talking points. The syllabus and materials are well-thought out, there are multiple links to additional examples and further reading, and two exercises a week. The weekly video discussion is the show that I wish I could watch on Netflix (and maybe Netflix agrees?). It has a simple introduction and theme with background music, appropriate B-roll throughout, the cartographers are informative, enthusiastic, and easily connect with the audience while discussing their passion. Finally, recurring segments give the series continuity from week to week: word of the week, carto-fails, famous cartographer, analog tools of the cartographic trade, and a weekly tea with biscuits. And lastly, the stretch goals felt appropriate; less intimidating than a blank canvas, but enough to feel like you’re building ownership for the project.

The ability to use BAO in an unlimited way is hands down the best perk of The Location Advantage. Other notable benefits included the lecture videos with Esri employees, and the phone interviews with academic leaders in business, both of which were nice ways that the course delved into areas beyond how to simply use particular tools within the BAO environment. These conversations helped to show the necessity of approaching business objectives with a geographic lens in your toolkit. Further, each of the exercises has a scenario in which you are asked to imagine that you are part of a company or have some sort of economic interest in a specific topic; for me, these helped to spur my imagination into industries and use-cases with which I am unfamiliar. The greatest benefit shared between both courses is that all materials are downloadable in PDF format including exercises and video transcripts.

**Anchovy Licorice Sauce**

Anton Ego speculates that, negative criticism is fun to write and to read; my personal interest is in identifying ingredients that do not work in the overall MOOC dish. While Esri is offering a meaningful piece of itself, in terms of both time and resources required to produce these courses, their end goal is to increase the use of their platform and services. Although these courses are technically free, there is a significant commitment in terms of time and mental energies expended to follow through to completion; ultimately, it is the end-user that must be satisfied and fulfilled by the exchange.

While The Location Advantage was only produced in 2015, it has an incredibly dated look and feel. Video segments of the host and guest lecturers from within the Esri organization are shot from tripod mounts and possess no differentiation in terms of angle, zoom, or other fundamental spices from the videographer’s kitchen. Scripts were un-memorized, read verbatim, and clearly visible from the reflection of eye glasses of some lecturers. These videos were not hosted through YouTube and were affected by a technical outage during the course, making them inaccessible for a time. These are all hurdles that Esri has easily cleared in the Cartography course and there seems to be little reason to not revisit the video production pieces in this instance. I had that feeling of regretting
the meal I had ordered, and lusting after the plate at the table next to mine.

What should have been the best part of The Location Advantage ends up being its most lackluster, the so-called “guest lectures” with academic business leaders. These guest lectures are actually phone interviews, in each segment, the host asks 3-4 rounds of questions, and concludes the interview. Production-wise, there is nothing else to stimulate the viewer except a power point card showing the interviewee’s name, institution, and photo. While an in-person taped interview would be easy for a global company to manage, at a minimum, the effective use of B-roll would go a long way to making these conversations seem like more than an afterthought. Those that are taking this course are interested in the subject material, and the target audience is paying or has paid tens of thousands of dollars to learn more about the subject matter in business schools across the continent; the brevity of each interview is akin to baking a delicious meal, only to serve your patron a tablespoon’s worth, and expecting them to be satisfied.

The hosting of forums per week within the in-house educational platform feels very limited. An inability to search forum posts and limited screen real estate are obvious barriers to fulfilling participation. GeoNet is a great platform and could be used more effectively for course communication; although it would cause some of the content to bleed out beyond registrants, an unexpected benefit is to whet the appetite for the next course offering. Esri’s method of rewarding the most active users of the forum (with a free personal license or Esri published title) feels a bit forced, and seems to encourage over-commenting in lieu of substance—perhaps guided discussions from the course teachers could compensate, or grouping participants into clusters to break down the overwhelming feeling of anonymity. Spending your temporal currency dining out should have similarities to the physical experience: charming service, stimulating conversation, and an intimate atmosphere.

**Hungry for More**

I will admit that taking two courses concurrently was a bit challenging, and perhaps not something that I will repeat; but it’s hard to say no to a great pairing. In terms of time spent, I learned things that I did not know, that I had forgotten, and had never considered. The technical aspects were great in terms of learning more about functionality that I had not yet explored in ArcGIS Pro and Business Analyst Online, and from that view, these courses were a wild success. The ability to learn about a technical subject and to have fun while doing it is the sort of privilege that is rare amongst most professionals, and meeting face-to-screen with some of the giants in the industry is even better. I am looking forward to seeing Esri continue to dedicate resources to producing original content, keeping existing courses current, and hopefully extending some screen time to individuals outside of their immediate organization.

The climax of Ratatouille sees the food critic Anton Ego discover the true identity of the famous new Chef at Gusteau’s, and despite this, write a surprisingly unabashed endorsement of the restaurant. In our conclusion, the reviews are mixed. Many aspects were well-thought out, creative, and contribute to the continuing evolution of MOOC best practices. Other features seemed ill-prepared, unimaginative, and posed a general disregard for the appetite of the intended audience. I will return again, and my expectations will be high.

The people at Esri are enthusiastic about their work and that enthusiasm deserves to be shared as widely as possible; I’d like to thank them for stepping out and taking risks with distributing their work in this fashion. The next round of MOOCs will launch September 5 and run through October 16, on the menu is Cartography, and Do-It-Yourself Geo Apps. Another two courses will be available starting October 31 and ending December 11, Going Places with Spatial Analysis (Season 2) and Earth Imagery at Work.

![Image](https://www.flickr.com/photos/mathplourde/)

*By Mathieu Plourde ([Mathplourde on Flickr](https://www.flickr.com/photos/mathplourde/)) - 4*
Just finished up another energizing URISA GIS Leadership Academy. Nearly 60 attendees (including 3 from Nigeria, 2 from Australia and 2 from Hawaii) joined us in Salt Lake City.

The interactions, discussions and sharing among the participants was fantastic. Thanks to our instructors – Ashley Hitt, Melisa Caric-Lee, Allen Ibaugh, Dianne Haley and Keri Brennan — for your dedication and knowledge!

Ashley leading sessions 1 & 2.

SWOT exercise.

The GLA is in demand.

Don’t miss the opportunity to attend (for the first time in one year) a third offering of the program this December 3-7, 2018 in Austin, Texas. Our URISA Texas Chapter has been asking for the program and we’re so happy to be heading to Austin!

Register by September 4 for early bird discounts for Austin!

We’ve already booked one GLA in 2019! Our Carolina URISA Chapter is very enthusiastic about hosting the Academy in Raleigh, North Carolina during the week of May 20-24, 2019.

Like Austin, Raleigh is a technology-focused state capital with a young and vibrant energy. Registration for Raleigh is already open. This one will be popular too, so make your plans early!

A second GLA in 2019 was just announced in Toronto, Ontario! Join your GIS colleagues in that fantastic city during the week of August 19-23, 2019.

Group photo in front of the I ♥ SLC sign downtown.
GIS Architecture and GIS Management
By Ed Wells

GIS architecture, more than any other single factor, defines and limits the potential capabilities of a GIS. GIS architecture, in turn, is a crucial determinant of GIS staff roles and staff specialization. GIS architecture and staff specialization determine the recommended GIS management and technical practices for a given system. Architecture provides the framework for strategic GIS planning and efficient GIS implementation.

This article defines GIS architecture and its components, and describes the four basic GIS architectural structures. It then defines the basic GIS staff roles, and the GIS practice areas within which the staff accomplishes work. That framework is then used to develop some concepts and principles for GIS management, implementation, and planning.

GIS ARCHITECTURE, STAFF ROLES, AND PRACTICE AREAS

GIS ARCHITECTURE COMPONENTS AND TYPES
GIS architecture is the structural framework of the GIS. A GIS architecture is composed of five integrated component architectures:

1. GIS strategy, standards, and governance architecture
2. GIS infrastructure architecture
3. GIS process architecture
4. GIS data architecture
5. GIS application architecture.

The five component architectures can be integrated into any of four basic GIS architectural structures. The architectures differ in their cost, power, complexity, staffing requirements, and capacity to span a large organization. Each has its strengths and limitations. From simplest to most complex, the four types are:

1. Decentralized or desktop GIS,
2. Federated GIS,
3. Stand-alone enterprise GIS, and
4. Integrated enterprise GIS.

Each GIS architecture offers a different trade-off between costs (of development, lead time, staffing, and funding), and the resulting benefits from information availability, information integrity, informed decision-making, and operational efficiencies. Each organization should identify its optimum GIS architecture, given the needs and resources at hand, and work toward implementing the GIS that best suits its needs.

It should not be assumed that every organization will begin with a decentralized GIS and evolve to an integrated enterprise GIS. Many organizations are too small to need or support an integrated enterprise GIS. Large organizations can and have implemented an integrated enterprise GIS from the outset.

The purpose, features, GIS staffing, limitations, and value of each of the four types are described here, along with the triggers that typically require evolution from a simpler to a more complex architecture.

Decentralized or Desktop GIS
Purpose: Individual use of GIS as a tool.
Features: Individuals and departments work independently, typically with desktop GIS software. Data exchange with other systems is file-based and ad-hoc.
GIS Staffing: Typically, few if any full-time GIS staff. GIS users typically work in GIS analyst roles in the business departments, and use GIS in support of their business tasks.
Limitations: No central IT support. No central means of enforcing data definitions, QC rules or data integrity. Data standards, application development standards, business rules, and QC rules, if maintained, are maintained by common understanding and agreement among the individuals doing the work. This architecture can be sustained in small organizations but it does not scale up to support large organizations.
Value: Least cost. Easiest to get started. Individuals and workgroups can proceed independently without the overhead and constraints of interdepartmental coordination.
Evolution trigger: The need for data sharing or user coordination grows to the point that the needs are not met by individuals working on standalone machines.

Federated GIS
Purpose: Provide a central GIS repository.
Features: Basically a sharedrive with a central GIS software license. Individual users or departments create data and applications as needed under different schemas and store them in a common server. IT/GIS team supports only the server and the basic GIS server license and desktop client licenses. IT/GIS team might also maintain a few core datasets. Business departments handle all other data modeling, collection, and maintenance. Departments post datasets at will for mapping and geographic analysis. GIS use is restricted to client software users only. Application development is focused on desktop applications at the department level. Data exchange with other systems is file-based and ad-hoc.
GIS Staffing: At least one full-time GIS person, working as the GIS manager/GIS architect/GIS System administrator/GIS analyst or GS application developer. If two or more persons, the roles may be...
split among the people depending on their skills.

Limitations: No centrally-enforced security policy on who can create or edit data. No central means for implementing standards across users and departments. No central data management or data integrity checks. No enterprise level of system integration. Limited ability to create web services and mobile GIS services. This architecture can be sustained in small organizations but it does not scale up to support large organizations that require consistent spatial information across the enterprise.

Value: Departments can share data at minimal cost and with minimal coordination constraints.

Evolution trigger: Interdepartmental data usage requires centralized data management or integrity checks; or workflow coordination requires versioned editing.

Stand-alone Enterprise GIS

Purpose: Migrate from decentralized desktop GIS to server-based GIS.

Features: Supports server-based GIS with RDBMS (e.g., PostgreSQL, Oracle, SQL Server) and client user licenses. Centralized data model with integrity checks, but no services for integrating GIS with other IT systems. GIS use is restricted to client software users only. Security policies control user privileges (create/edit/view). Versioned editing can allow multiple persons to edit the same dataset simultaneously with conflict protections and without suspending user access. Application development is server-based, focused on GIS function delivery, perhaps with some GIS-only web pages. Mobile services for GIS software applications only. Data integration is based on file exchange between systems.

GIS Staffing: Full time GIS manager/analyst, GIS architect/system administrator, with additional GIS analysts and/or GIS application developers as needed for data and application development/maintenance.

Limitations: Web services, and web service architecture, for GIS client users only. No system integration services. GIS data can be viewed only via GIS software.

Value: Supports common data models and data integrity across departments.

Evolution trigger: GIS use and importance grows to the point that persons who browse by web viewer as well as those with client software. Centralized data model with integrity checks. Department datasets must conform to enterprise standards. Versioned editing can allow multiple persons to edit the same dataset simultaneously with conflict protections and without suspending user access. System integration is delivered through web services and APIs incorporating GIS functions. Web services support data exchange and data integration with other systems. GIS provides authoritative source of both spatial (map geometry) and attribute information (e.g., street names, facility addresses, etc.). Security protected by web service security as well as user roles and permissions. Supports mobile standards and platforms.

GIS Staffing: GIS Manager; GIS Architect; GI System Administrator; Additional GIS analysts and/or GIS application developers as needed for data and application development/maintenance.

Limitations: High capital and operating costs; large and specialized GIS staff.

Value: Data integrity checks support consistent data across the enterprise. Web services support loosely-coupled interfaces to other systems. GIS web services provide GIS data views enterprise-wide to users without GIS licenses or training. Shared enterprise GIS processes/workflows; managed system and data.

GIS STAFF ROLES

Roles denote the work done by persons with distinct skill sets. Roles should not be confused with individual persons, nor with organizational employees or job titles. A person can take on multiple roles (quite common in smaller organizations), and, in larger organizations, multiple people may have the same role. An organization may contract out certain roles and have other roles done by in-house staff. There are six basic GIS staff roles, with the following responsibilities:

GIS Manager

Organization, coordination, and direction of GIS program activities and resources, including strategic planning, stakeholder coordination, governance, budgeting, contracting/procurement, personnel management, legal policies, and management reporting.

GIS Architect

Establishment and implementation of architectural strategy, system architecture (including security strategy), data architecture and modeling (spatial and attribute), internal technical coordination. Enterprise integration with other systems.

GI System Administrator

System administration and upgrades, continuity of operations, disaster recovery, GIS security policy administration. GIS license management and license server administration. Software maintenance, patches and upgrades. Client and server software deployment. Software, database, and web service troubleshooting. GI and relational database management system administration, model updates, and tuning. Implementing schema changes in staging and production environments. Pushing reconciled data updates from editing to publishing environments (and rollback). Web application and service administration. System documentation.

GIS Application Developer (desktop, client-server, web, mobile)

Creation and maintenance of GIS applications. (requirements analysis; planning and task estimation; high-level and detailed design; programming; component and integration testing; documentation; and training).
GIS Analyst
Use of spatial analysis tools and data to answer specific business questions; creation, conversion, and maintenance of spatial data sets; legacy data cleanup; metadata; user support and training; support for application testing (requirements analysis, preparation of test data sets, analysis of data test results).

GIS Technician
Performance of GIS production tasks according to prescribed procedures.

GIS architecture is a crucial determinant of the size, balance, specialization, and likely growth of GIS staffing. As the number of GIS users increases in an organization, coordination and management become more complex, which in time requires a more complex GIS architecture to maintain data integrity, data consistency, and system and data availability across the larger range of users. A more complex architecture will require more specialized GIS staff to manage and operate the system, which in turn will change the size and balance of the staff.

GIS PRACTICE AREAS
Practices, in the context of this article, are rules or procedures followed to accomplish work. GIS work falls into six practice areas. Five are technical, and they are defined by the five components of GIS architecture. The sixth, GIS administration, is non-technical.

Each of the six practice areas is briefly described below.

GIS strategy, standards, and governance
The organizational assessments, requirements analyses, strategic and implementation plans, standards, GIS governance, and stakeholder relations that underpin GIS planning and implementation.

GIS system infrastructure
The hardware, software, and network components of the system, and the roles, policies and procedures for managing and securing them.

GIS business processes and workflows
The authorities, roles, and task sequences (workflows) that define the business processes that the system is intended to support, especially data collection, maintenance, and QC workflows.

GIS data, data analysis, and data modeling
The data used in the GIS (spatial and tabular); methods for analyzing GIS data; and the data models, policies, rules, and operations that govern 1. the data included in the GIS, and 2. how that data is integrated, organized, stored, maintained, and used by the organization, including by other information systems in the organization.

GIS applications and services
The GIS applications, services, and interfaces created to support business tasks, operations, and analyses, and GIS interaction with other systems.

GIS administration
The non-technical aspects of GIS management: leadership, budget/accounting, personnel, procurement, legal matters, and project management (non-technical aspects).

Each staff role spans all six practice areas, but the knowledge required of each area varies with the role. The GIS manager, for example, must span all six practice areas, but only to the extent needed to organize, direct, and coordinate GIS program activities. The GIS manager’s role is not to know how to do every other role personally, but to organize, coordinate, direct, and evaluate the work and resources of the GIS team. The GIS manager has primarily responsibility for GIS administration, and must take a leadership role in articulating GIS strategy, standards, and governance, and must have enough knowledge of the other practice areas to ensure that other members of the GIS team have the direction, time, and tools needed to fulfill their roles.

Within any particular GIS program, recommended practices in any of the five technical practice areas depend most heavily on the architectural complexity and staff specialization of the program. Within GIS applications and services, for example, recommended application development practices in a desktop system would be quite different from those in an integrated enterprise system.

GIS MANAGEMENT, GIS IMPLEMENTATION, AND GIS PLANNING

GIS PROGRAM, OPERATIONS, AND PROJECT MANAGEMENT
GIS management involves program management, operations management, and project management. Programs, operations, and projects differ in fundamental ways that require different technical skills and management strategies.

A GIS program comprises the plans, resources, projects, and operations needed to support the ongoing development and use of the GIS. Unlike a project, a program has no completion date—programs are expected to continue indefinitely. The GIS program manager’s responsibility is to set and revise strategic GIS program goals so as to maintain ongoing GIS alignment with organizational goals and resources, and to manage the GIS team so that team accomplishments justify ongoing support and expanded business use of the GIS within the organization.

An operation is a sequence of defined tasks performed repeatedly to provide a standard product or service. Unlike projects, which occur once and have an end date, operations are repeated as often as needed, indefinitely. The GIS operation manager’s responsibility is to ensure that operational products and services meet the output standard, each and every time.

A project, as defined by the Project Management Institute, “is a temporary endeavor undertaken to create a unique product, service, or result” (A Guide to the Project Management Body of Knowledge, 6th edition, 2017, Sec. 1.2). Projects have start and end dates, and projects are not repeated. The GIS project manager’s responsibility is to manage the project team so as to bring the GIS project to completion within the constraints of scope, schedule, and cost.
GIS IMPLEMENTATION: DEVELOPMENT, OPERATIONS, AND EVOLUTION

GIS program, operations, and project management provides the organization, direction, and coordination for ongoing GIS use and improvement. GIS use and improvement includes three kinds of work: GIS development, GIS operations, and GIS evolution. Development creates GIS capabilities within an architecture. Operations develop capabilities into repeatable, defined, managed, optimized GIS processes. Evolution is the migration from one architecture to another. Often all three types of work are occurring simultaneously in a GIS program.

GIS development entails the creation of a balanced set of system and staff resources appropriate for a particular GIS architecture. A specific GIS architecture delimits the potential capabilities of a GIS; development determines the capabilities that are actually achieved within that architecture. Development maturity grows as the potential capabilities of an architecture are actually developed and put into production.

GIS operations develop capabilities into repeatable, defined, managed, optimized GIS processes. GIS operations cover a broad range of tasks that are performed repeatedly, such as data maintenance, software patches, and continuity-of-operations drills. Operational maturity comes from development of operations within an architecture, from initial testing to managed, optimized procedures.

GIS evolution is the process of migration from one architecture to another (almost always from simpler to more complex). GIS evolution should be considered a discontinuous change, not a continuous process, and it requires significant changes in GIS system infrastructure, in GIS staffing roles and competencies, and in the business and IT practices and procedures for using the GIS and managing it—both during the transition (which can be lengthy) and afterwards. Evolutional maturity is shown by the extent to which components of the old architecture have been either upgraded to the new architecture, or decommissioned.

GIS PLANNING

GIS success depends on aligning GIS development and management with the organization’s strategic goals and available resources. GIS development and management must fit the type, scale, and resources of the organization, and fulfill the organization’s purpose for implementing the GIS.

GIS planning defines GIS program strategies and actions to implement the organizational vision for GIS. GIS planning requires an organizational assessment, which provides the context for the business, architectural, and financial requirements analyses. These analyses together provide the basis for the strategic plan and implementation plan. Together they align plan objectives with organizational and stakeholder interests, balance resources across competing stakeholder needs and system development priorities, and organize the work into an efficient series of projects and tasks for execution.

GIS Organizational Assessment and GIS Requirements Analyses

Strategic alignment requires an organizational assessment, which provides the context for the business, architectural, and financial requirements analyses.

- The GIS organizational assessment describes the purpose, structure, and scale of the organization and its IT environment, to provide a basis for assessing the resources and constraints that will shape the GIS business requirements. The organizational factors are independent of the GIS and can be used to assess whether the existing/planned GIS is of appropriate scale and complexity for the organization.

- The GIS business requirements analysis states the strategic reasons for developing a GIS, and the sources of support for it. It describes the key business processes and data resources, expected benefits, champions and stakeholders, and funding sources.

- The GIS architectural requirements analysis sets forth the technical requirements and working assumptions for a GIS that meets the organization’s business needs. It is the basis for detailed architectural design. It is the basis for the GIS financial requirements analysis, and it is a crucial determinant of staffing requirements. The analysis may be descriptive (of an existing system), or prescriptive (for a planned system), or both (if the purpose is to change an existing system).

- The GIS financial requirements analysis determines the financial resources required to meet the business and architectural requirements. While the architectural analysis determines whether and how a GIS can support the organizational goals, the financial analysis shows whether and how the GIS is aligned with organizational resources.

These four analyses—the organizational assessment and the business, architectural, and financial requirements analyses—provide the basis for the GIS strategic program plan and implementation plan.

Strategic Plan and Implementation Plan

The strategic plan extends the organizational assessment and requirements analyses by:

1. Defining the projects and operations needed to meet each requirement, and the tasks needed to build and maintain them;
2. Balancing the allocation of GIS resources across a range of user needs to build and use a range of GIS capabilities; and,
3. Determining the task dependencies among related tasks that dictate the order in which they are executed most efficiently.

The strategic program plan must balance and sequence strategic projects, in the context of existing capabilities and ongoing operations, so that each project builds on prior accomplishments, and all build toward an integrated, managed architecture that supports the capabilities and data resources needed to meet the organization’s strategic GIS goals. Specific project plans must ensure that each of the architectural components is in place to support efficient project execution, or, alternatively, include in the plan sufficient time and resources.
resources to develop any architectural components that are not already in place.

The implementation plan extends the strategic plan or project plan by tying the tasks to a schedule; confirming that the required funds, staff, tools, and procurements can be in place when they are needed; and detailing how the work will be accomplished.

**Strategic Balance: User Portfolio and Capability Portfolio**

GIS development and operations must balance the interests of multiple stakeholders, who have a mix of common and differing GIS goals and resources. The GIS strategic plan can frame the tradeoffs in terms of a user portfolio and a capability portfolio:

1. The user portfolio describes the stakeholders’ goals and groups them by common process and data needs.
2. The capability portfolio describes the GIS functionalities and data models required to meet the stakeholders’ goals, and groups the capabilities by common resource (staff, tools) needs.

The portfolio approach offers a comprehensive framework for evaluating the many tradeoffs (funding, staff, tools) necessary to plan and execute GIS program strategies and projects. In general, the portfolio approach favors projects and activities that serve multiple stakeholders and goals over those that serve just one.

**Strategic Sequence of Architectural Implementation**

A GIS is not fully implemented until all five architectural components are tested and in production. Similarly, implementation of new system capability—a new application, a new software module, a new process or dataset—also requires that all five architectural components for that capability are in place before that capability is in full production.

A GIS plan, whether it be for a program or a project, should cover all five architectural components, and order the tasks so that each of the necessary architectural components is put in place in the following sequence:

1. **GIS strategy, standards, and governance** take first precedence, as they provide the organizing principles for the other four components.
2. **GIS system infrastructure** is second; it provides the development platform for the remaining components.
3. The **GIS process architecture** and the **GIS data architecture** should then be developed in tandem; they have to complement each other. Applications cannot be put in production without data, and the data is not ready for production use until the business processes and responsibilities are established to maintain the data in the course of normal operations.
4. The **GIS application architecture** provides the framework within which specific applications can be developed coherently and efficiently. If the system infrastructure, processes, and data are in place, applications can be developed rapidly and efficiently.

A complete plan, by covering all five architectural components, organizes tasks so that each task builds on a solid foundation of prior work, and all build toward strategic goals. It avoids common short-term traps, such as compiling a dataset with no business commitment or process to maintain the data.

**CONCLUSION: USE IS THE MEASURE OF SUCCESS**

An organizational GIS is in constant development and change. GIS technology is dynamic; stakeholder interests and support are dynamic; organizational goals and resources are dynamic; the GIS itself is always in development, operation, and evolution; and the organization must constantly adapt to changes in external mandates and conditions. At any given time, a GIS program encompasses multiple projects and operations, in varying stages of implementation.

The concepts and principles described in this paper apply to GIS of any scale and architecture, so they can guide the planning and management of a GIS as it develops and evolves in scale, span, and architecture. And because the concepts and principles underpin the plans, they also guide the day-to-day management of plan execution.

In most organizations, GIS is a support program. A GIS is developed to support the achievement of organizational goals and the improvement of business operations. The strategic purpose is not to develop a GIS for its own sake, but to develop a system that is useful, used, and therefore valued within the organization. Use is the measure of success.

**Author’s Note and Acknowledgements**

This paper was written after I retired from nine years of service as GIS Manager for the Washington Metropolitan Area Transit Authority (WMATA). I am indebted to many colleagues at WMATA and within URISA for insights included in this paper. In particular, credit and thanks are due to two WMATA colleagues. Minhua Wang, formerly GIS Architect and currently GIS Manager at WMATA, defined the four GIS architecture types and their staffing requirements. Anurag Mehta, formerly Consulting GIS Architect at WMATA, described to me the five components of GIS architecture (adapted from the Zachman framework of the 1980’s and 1990’s), and their sequence of implementation.
GIS-Pro & CalGIS 2018
October 9-12, 2018
Palm Springs, California

Featured keynote speaker – Jack Dangermond

GISP Certification: As always, this event earns ample Education points toward GISP initial certification and renewal.

AICP-CM Approved Credits: The Palm Springs program was approved for 90.5 AICP-CM credits! For the breakdown, click here or download the PDF summary.

Be sure to check the box on the registration form or email URISA if you are interested in taking advantage of onsite childcare services during the event. #GISBabies #FamilyFriendly

We are hosting a silent auction to support fundraising for URISA’s GISCorps! Get ready to bid! If you have an item(s) to contribute to the auction, please email URISA.

In addition to valuable meet-ups and networking events, URISA’s Vanguard Cabinet of Young Professionals is sponsoring K-12 and University student competitions and a Young Professional competition! More here.

Check out this Story Map of Palm Springs attractions. You might want to plan an extended visit in October!
Modernizing the modern... URISA's steps forward to adapt to new and expanded ways of geospatial thinking

Over 50 years ago, the founders of URISA had the insight to think about technology and information systems in ways that hadn’t been thought of before. Their vision laid the foundation for and seeded the philosophy that URISA should always be on the edge of innovation and technologies, modern in approach, and an association of collaborative networks and learning opportunities. This way of thinking has led to the long-term sustainability, viability and growth of the organization and has steadily evolved as technologies have become mainstream.

In previous columns I described URISA as a family, a personal and professional network, and we are not only those things but also an organization packed with programs, initiatives and a talent pool of modernized- forward thinking people.

Reflecting on our history and exciting new industry directions, this article will highlight some updates, key trends and opportunities, and URISA activities and programs that are moving the organization and the industry forward.

Industry Technology/Trends...UR-Information Systems-A

It should go without saying...we’re an association of technology people. We love technology! It’s even buried in our name- UR-Information Systems-A. We’ve stuck to it while evolving with the times - in our work and as an organization, and technology is helping us with that.

When URISA was founded there were no social networks, no Internet, no cell phones, no apps or any of the other amazing technologies we have today. URISA has worked hard to modernize as an organization and is proud to be leading the way on a vast array of technological fronts for these rapidly changing landscapes. For decades location data has been a critical part of our work for the public sector. However, in the past decade the rise of the role of location data at our fingertips in commercial products, smartphones and other mobile devices has revolutionized the ways in which GIS professionals work with and think about this data. This has further expanded our audience and understanding in the public realm. Readily available community focused information is expected across geospatial disciplines and has expanded the use of web-based geographic tools, performance, dashboards, open source data, using data to tell stories, collaborate and communicate in emergencies/disasters and with the communities we serve. Reflected in our educational offerings (trainings & workshops, conferences), URISA continues to play a leading role in framing the use of GIS with these technologies to meet evolving challenges, build foundations for a sustainable future, and support decision-making in urban and regional settings and beyond.

Reaching in to to grab the readily available operational and collaboration tools

What’s in URISA’s “bag of holding”?? Packed with all the latest artisan tools, URISA is readily equipped with modern technologies and platforms to best manage the organization and provide benefits to its members. Podio is a workspace platform which is broadly utilized organizationally across URISA committees and teams including some URISA chapters. The use of Podio has expanded organizational team capabilities by improving collaboration, creating and managing meetings, developing group tasks, and enhancing overall communications. Attending one of URISA’s many events...you are sure to use the Sched app to explore who’s attending the event and identify which sessions you plan to attend. Sched allows for quick updates, on-the-fly mobile networking experience for event attendees.

URISA continuously works to create a dynamic and informative website, urisa.org, experience with recent and frequent updates. A new website with a more modern platform was launched this year. Upgrades to the URISA website in recent years expanded meeting registration, increased online learning opportunities and incorporated other integrated features. Hosting of local chapter websites have also been available. The website is integrated with a robust member management system, Abila. Through the implementation of OneURISA, Abila is a readily available comprehensive membership management system capable of centralizing all URISA membership registration, reducing redundancy and connecting resources, enhancing URISA and local operations, reducing administrative burdens for our local chapters, and increasing collaboration and engagement for all of URISA’s members.

*for our D&D enthusiasts :)

President’s Corner
Teresa Townsend, AICP
Supporting our members and the industry

URISA supports members throughout the phases of their careers, in fact it’s one of our 3 key strategic goals:

1. Protect, promote and grow the GIS profession
2. Support GIS professionals at all stages of their careers with essential training and resources
3. Sustain and strengthen the organization and resources

Supporting this principle as a key foundational goal has expanded and evolved URISA’s dedication in meeting the needs of our members today including young professionals and women in GIS.

URISA’s Young Professionals

URISA continues to expand opportunities for young professionals. Members of the Vanguard Cabinet regularly collaborate with URISA leaders and committees to create programs geared toward other young professionals. Just this week, URISA has launched a new scholarship for select young professional URISA members to broaden their horizons through attendance at the GIS-Pro conference. Apply now!

http://www.urisa.org/gispro-studentsyps#scholarship

URISA’s Women in GIS

Know what else makes a science/technology focused organization more modern...URISA supports women in leadership! URISA has emerged as a leader among technical, professional organizations in supporting women in the industry and through leadership roles.

The organization is also charting the way in supporting families, such as providing childcare at this year’s GIS-Pro conference.

Creating leaders and making an impact across the globe

Leadership and demonstrated commitment to and beyond an industry have become a requirement for excellence in modern, technical professionals and URISA has responded to these needs for all members. Members can serve on a variety of URISA committees and run for office to become involved as leaders within the organization. Nearly 800 GIS professionals have participated in the URISA GIS Leadership Academy which has offered 5 day sessions of targeted leadership training since 2007 and is currently offered in multiple locations and sessions throughout the year. Due to the high volume of participation and interest, the GIS Leadership Academy was expanded this year and continues to gain momentum.

URISA also affords the opportunity for professionals to make an impact and broader contribution through the abundant, diverse and rewarding volunteer projects and experiences available through GIS Corps.

Being an industry advocate and expanding our reach

Having a voice at the local, national and international levels is powerful and with the expanding world of geospatial information and audiences, a voice versed in geospatial language is essential. Many local members have sought advocacy assistance in working on critical issues in data and in the geospatial professionals practice. Whether advocating for professional integrity of the practice and role of GIS professionals at the state level or promoting GIS data availability and use at the national level or contributing internationally through the United Nations, or in partnerships with other like-minded organizations, URISA speaks out on behalf of the industry and individual members to address issues facing the profession from every level. URISA advocates directly on a variety of GIS issues and works with partners/affiliations and is represented with groups such as the Coalition of Geospatial Organizations (COGO) to leverage this impact on policy makers in moving the industry forward. OneURISA is further multiplying and expanding the reach of URISA members and chapters from the local to the global level, building on these partnerships to keep the organization at the forefront of today’s GIS important industry concerns, opportunities and conversations.

URISA has also been working to put volunteers, technologies and services in place to track emerging issues of importance that affect the industry. Keeping an advocacy lens and building strong networks, we have been able to respond to member requests for more involvement and information, particularly on policy, legislative tracking, GISP defense, and event support.

Whole system thinking...

Modernizing is more than thinking about technical systems – it’s about the whole system.

While technology and the role of geospatial information have evolved rapidly in recent years, the speed of these changes will continue to accelerate, and professionals are just beginning to conceive of and envision the future possibilities and geospatial applications. A fundamental shift has begun, not only in the technologies of GIS, but in the way that we think about the...
applications of geospatial information. The idea of taking a systems approach is built into the name, but there has been a shift towards taking the power of geospatial tools and the encompassing perspective that they provide to expand the boundaries of what GIS means and what it can do across limitless “systems”. The reach of GIS across industries, sectors, and disciplines continues to grow, with ever expanding approaches to how geospatial information can play a role in tackling broad issues today and solving problems and challenges into the future.

Consistent with the vision when the organization was formed, URISA has been and continues to take steps to respond to and anticipate these innovations and technological changes. The organization is working to provide a unified approach towards leadership and advocacy in moving forward and for fostering the professional development and collaborative connections of our members. URISA and our partners are embracing a more modern geospatial way of thinking and leading the way in bringing together people, resources, ideas and new ways of thinking. It is an exciting time to get involved! I look forward to seeing what the next waves of engagement and leadership within the organization will bring in evolving us even further along the path.

URISA’s Professional Education Committee is pleased to present our Open Source GIS FAQ. This is the fourth in a series of Geospatial Fact Sheets intended to highlight relevant issues and policies to the profession. These documents provide guidance and links to further information about various topics. Previous fact sheets cover topics such as the Geospatial Data Act, Addressing and the 2020 Census. All the documents can be found on the URISA website (http://www.urisa.org/resources/geospatial-fact-sheets/).

If you would like to see a particular topic covered or would like to contribute to one, please contact the Professional Education Committee Chair, Kevin Mickey, GISP.

Are you coming to GIS-Pro & CalGIS 2018?

Take the opportunity to attend the URISA Coordination Meeting & Strategic Planning. URISA Committees meet in small groups on Monday afternoon and report their activities and needs to their colleagues and leadership, so everyone hears the same thing. Organizational strategic planning updates and future workplans will be discussed. Interested members who wish to find out more about committee activities are also encouraged to attend to discover opportunities within the organization.

There will be ample opportunity to connect with URISA’s Committee Chairs throughout the conference and we’ll announce workplans and volunteer opportunities to the entire membership by the end of the year.
I Want YOU for the URISA Mentoring Network

By Tory Elmore, URISA Vanguard Cabinet Chair

The URISA “family”

I recently had the good fortune of speaking with URISA’s President-Elect, Kim McDonough. Kim had reached out to find out what was going on with the Vanguard Cabinet. What were we working on, and what were our plans for the future? At my invitation, Kim joined us for a Leadership Committee call, and then the Cabinet’s monthly call. He even volunteered himself for our first-ever podcast with Directions Magazine. As I listened to Kim talk about his thirty years with URISA (longer than I’ve been alive, mind you), I couldn’t help but think This is what commitment looks like.

In my own year and a half with URISA, I’ve found no shortage of people who, like Kim, have dedicated themselves wholly to this organization. People who fly cross-country not to attend a conference, but to plan one. People who thank you for asking them to deliver a presentation on a few days’ notice. People who never stop asking What can I do to help?

Perhaps it’s something in the Kool-Aid, but ask Kim and he’ll launch into a laundry list of reasons that joining URISA was the best choice he’s ever made. Key among those reasons are the connections he’s forged with other members. And he’s not alone: “URISA is more than a professional organization, it is a family you get to choose to be a part of,” Teresa Townsend, URISA’s current President, once told me.

All of this got me thinking: How do I build a URISA family?

There are a lot of good answers to this question. Attend your local chapter meetings. Join a committee. Present at GIS-Pro. But I’m a Vanguard Cabinet member, and I wanted to approach it from that perspective. How do we, the Vanguard Cabinet (VC), connect Young Professionals (YPs) with the treasure trove of experience that is URISA’s membership? How do we create opportunities for meaningful relationships to grow?

An imperfect approach

The VC Mentoring Program has, for several years, been a key resource provided by the Cabinet to YPs. Potential mentors and mentees complete an online application describing their academic and professional experience and interests, and applicants are matched based on shared values (and, ideally, time zones). When I joined the Cabinet in 2017, I was immediately drawn to the mentoring program, perhaps because of my own invaluable experience with a mentor that set me down the path I’m on today. Yet I quickly found that the program lacked, or perhaps had lost, enthusiasm, both on the part of those running it and those participating in it. When asked about their experience with the program, the most common response I received from organizers was that it was “difficult to make matches from such a small pool”; from participants, that the match “wasn’t a good fit.”

At first I wondered if it was just a problem with the application. Maybe we aren’t asking the right questions? But the more I thought about it, the more I realized that the program we had created provided little opportunity for organic relationship building. That mentor I mentioned earlier? The day I met Dr. Hawthorne we spent nearly 30 minutes rattling off Chuck Norris jokes at one another. (Chuck Norris doesn’t sleep… he waits.) Who knows how we would’ve compared on paper. “These things outside GIS are just as important, if not more, when people reflect on their own self-image,” said Kara Utter, URISA’s 2017 Young Professional of the Year. “Finding common ground on a personal level is beneficial, even in a professional environment.”

Short of adding Do you like pizza? and Dogs or cats? to the program application, however, I was lost with regard to the how. How do we provide YPs with a platform to forge real, meaningful mentor/mentee relationships?

It actually took someone recommending we scrap the program altogether to find an answer. “Not everyone is looking for a one-on-one relationship. Other than that, what are we really even offering?” asked Rachel Rodriguez, a fellow VC member. “The real value of URISA is the network of members. When I started this job, I wanted to talk to someone with experience in a specific technical area. So I asked [Wendy Nelson, Executive Director] if she knew someone at URISA to connect me with. I only spoke with that person a few times, but the experience was invaluable.”

A new program is born

The URISA Mentoring Network, the newest iteration of the VC Mentoring Program, calls upon URISA members to serve as potential mentors to one or more young professionals. URISA members will have the opportunity to “opt in” to the Network when they renew their membership each year. When a member opts in, he or she agrees to being contacted by a YP looking for mentorship of some kind. The mentor will be asked to share some personal and professional interests in a short bio, as well as indicate which kinds of mentorship (short term/long term) he/she is willing and able to provide.

Mentees will apply for the program via a revamped application, indicating their own personal and professional interests as well as...
what type of mentoring they’re interested in. The VC will be working behind the scenes to make “matches,” but instead of one-on-one matching, we’ll provide applicants with several recommended contacts and work with them to reach out to one or more Network members.

Our new program is built upon a few key premises. First, that YPs are looking for a variety of different mentoring opportunities, ranging from brief interactions to long-term one-on-one relationships. Second, that a single person can have several mentors and vice versa, that a single mentor can have several mentees. Third, that the most meaningful relationships are formed organically, are not necessarily predictable on paper, and are often built on shared personal (as well as professional) interests.

We believe that the strength of the program will come from the breadth and diversity of its participants. That’s why we’re asking all URISA members to consider participating in the Network.

Take a moment and think about the benefits URISA has provided you during the time you’ve been a member. Take a moment and think about the people who have helped you get to where you are today. Take a moment and think about whether you could do that for someone else.

And if the answer is yes, then we want YOU for the URISA Mentoring Network.

Please send questions and comments about the URISA Mentoring Network to mentoring@urisa.org.
Get your copy of the URISA GIS Salary Survey

How do you stack up?
Is your organization offering a competitive salary package for potential hires and for staff retention?

URISA’s GIS Salary Survey is an ideal resource for both job seekers and for those who hire GIS staff. As in the past, an Executive Summary is available for FREE and a comprehensive analysis of the results is available for purchase.

URISA GIS Salary Survey Executive Summary: This document is a preview of the URISA GIS Salary Survey, and includes valuable summary data from the survey results.

Quick Hits:
• The survey is based on 3,060 respondents who are employed full-time.
• The average salary of survey respondents was $70,857 - an increase of 15% over the 2010 average of $61,540.
• GISPs, on average, earned $10,000 more than non-GISPs.
• A majority (57.7%) of respondents are employed within some level of government, from local to federal agencies.
• Most receive additional forms of compensation including health insurance, paid conference attendance, life insurance, paid training, pension/retirement plans and 401(k) plans.
• They spend an average of 70.8% of their time performing geospatial tasks and work an average of 41.6 hours per week.
• The minimum level of education required for their position is a Bachelor’s degree.
• They have an average of 13.5 years of professional experience and have been in their current position for an average of 6.8 years.
• Less than half (42.5%) were GISPs.
• Two-thirds were male and the average age of respondents was 40.5 years.
• Most (90.4%) respondents were from the U.S. with the greatest concentration from the South Atlantic, Pacific, Mountain and West South Central regions.

View the Table of Contents

Purchase the URISA GIS Salary Survey publication (nearly 600 pages) as a downloadable PDF: $199 for members and $350 for nonmembers
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Mapping for recovery, rescue operations and development in underprivileged countries; analysis, cartography, app development, needs assessments, and technical workshops

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Des Plaines, IL 60016, USA

For any questions concerning contributions/donations, please contact GISCorps committee members at: info@giscorps.org.

www.giscorps.org/contribute
Welcome New URISA Members

Jai Anasazi—Denver, CO
Jacob Anderson—Hawkinsville, GA
Sharon Anderson—Ada County Highway District—Garden City, ID
Tyler Arnold—Ada County Highway District—Garden City, ID
David Bamford—Planning Department, Town of Garner—GARNER, NC
Michael Bleddynn—Houghton, MI
Rene’ Brill—Los Angeles County—Glendale, CA
Todd Burciaga—Peoples Gas—Chicago, IL
Austin Chow—University of Southern California—Cerritos, CA
Kathleen Clancy San Marcos, CA
Michael Couch, GISP—Meshek & Associates—Tulsa, OK
Christy Cox —Sacramento, CA
Jeffrey Cox —Scottsdale, AZ
Bryn Dunbar—Fairbanks North Star Borough—Fairbanks, AK
Katherine Elrod—US Navy—FPO, AE
Richard Foster—Durham, NC
Karlie Freeman—The Kelley Group—Tusculumia, AL
Michelle Gallagher—Chandler, AZ
Heidemarie Gauss—Federal Aviation Administration - Aeronautical Information Services—Columbia, MD
Annette Ginocchetti, GISP—NEPA Alliance MPO—Pittston, PA
Mallory Graves—Alta Environmental—Long Beach, CA
Eliza Gutierrez-Dewar—University of Southern California—Santa Cruz, CA
Katherine Hamilton—Cardno, Solana Beach, CA
Robert Hauck, GISP—City of Charleston—Goose Creek, SC
Claudia Henriquez—Akimeka, LLC—Mattland, FL
Charles Houston—Woolpert—Newport News, VA
Kelsey Jindra—DATAMARK Michael Baker International—Oceanside, CA
Gail Jorgenson—Ada County Highway District—Garden City, ID
Kory Kennedy—Lansing, MI
Harrison Knapp—University of Southern California—Westport, CT
Michael Krause—Oak Park, IL
Martin Kurtovich—California Public Utilities Commission—, CA
Beau MacDonald—University of Southern California Spatial Sciences Institute—Los Angeles, CA
Sean McDonald—University of California—Valencia, CA
Jyoti Mistry—Solv3D Inc—Calgary, AB Canada
Chad Morris—Percheron, LLC—Spring, TX
Andrew Parrish—Ada County Highway District—Garden City, ID
Sean Perigord—Boynton Beach, FL
John Poleon, GISP—Highlands County—Sebring, FL
Jose Rico—University of Southern California—Harbor City, CA
Matthew Rosete, GISP—Environet, Inc.—Kaneohe, HI
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Cassandra Seabourn—Freese & Nichols—Fort Worth, TX
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Eric Smith—Raleigh, NC
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Monika Thorpe—Environmental Resources Management (ERM)—Hoffman Estates, IL
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Jacqueline Waite—US EPA—Washington, DC
John Wall—North Carolina State University—Raleigh, NC
John Wilson—University of Southern California—Los Angeles, CA
Fikriyah Winata, CTT+, EADA—University of Illinois at Urbana-Champaign—Urbana, IL
Usman Yahaya—Geo-Fractal Axis Nig Ltd—Kaduna, KD Nigeria
Sam Young, GISP—Blaine County—Ketchum, ID

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- Michael Baker International’s DataMark suite of software solutions and services support public safety answering points (PSAPs) and their GIS stakeholders in this mission critical transition. DataMark solves upgrade challenges, helps improve public-safety communications and ensures the data meets the precise NG9-1-1 requirements. The software considers all aspects of the data that is provisioned to a NG9-1-1 system (data creation, clean up, quality and maintenance workflows). With extensive expertise in GIS and public safety, Michael Baker can help GIS departments determine what they need to do in order to support NG9-1-1.
- GIS-based mobile app for managing infrastructure assets
- Michael Baker International engineers created a mobile phone-based computer software platform, MICAP (Mobile Infraction Capture) to collect and analyze data and images over broad geographic areas to help monitor utility equipment for changes and compliance problems. The GIS-based MICAP platform provides access to licensed data, as well as the collection and analysis of new data and images, delivering an improved workflow interface for managing assessments, repairs, and geographic changes to infrastructure assets. It is designed for state agencies, municipalities, utility companies, land developers and other engineering firms that need to effectively monitor and manage utility poles, underground cables, utility pipelines, bridges, roadway infrastructure and other assets. MICAP is free and available via the App Store and Google Play.
- Local watershed assessment at the push of a button
- iWATR (Integrated Watershed Assessment Tool for Restoration) is a mobile app-based innovation developed by Michael Baker International’s water services team to add speed, capability – and value

For information about URISA Partnership, please visit:
Cyclomedia offers the following licensed products:

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- Cycloramas — Seamless, accurate 360° panoramas taken at street-level with our patented recording technology.

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- GlobeSpotter — Our feature-rich web app for viewing Cycloramas that runs on any browser supporting Flash.
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To provide an easy-to-use assessment tool for any city, county or state planner across the U.S. to develop or better manage local land. The app combines GPS features and data from the U.S. Environmental Protection Agency and other government sources, to compile local data at the push of a few buttons. It tabulates a comprehensive assessment, and provides several solution options with cost estimates to solve specific water quality-impairment problems in watersheds.

- Analyzing bridge data with ease
  iUSBridges, is a geographic information system (GIS)-based app that allows users to locate nearby bridges, explore details of those bridges, save image information on favorite bridges, and share feedback. iUSBridges uses data retrieved from the Federal Highway Administration’s (FHWA) National Bridge Inventory. State departments of transportation provide updated bridge information on a cyclical basis to the FHWA.

For more information, click here.

Silver Corporate Partners

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Cyclomedia is the market leader in systematic imaging of large-scale environments from cities to complete countries. Cyclomedia’s smart imagery solution creates Cycloramas — 360-degree panoramic images — with high accuracy, providing current and clear views of street-level environments.

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We provide ready-made solutions throughout Europe, North America, and Asia. Our technology is widely used in government GIS, public safety, and security markets, as well as in construction, infrastructure management, and insurance.

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Learn more: Featured Projects

**GeoDecisions**

Since 1986, GeoDecisions has partnered with clients throughout the U.S. and abroad to design, develop, and deploy leading edge, disruptive GIS tools and applications that improve decision-making. Backed by Gannett Fleming, our rock-solid engineering parent company established in 1915, we combine the best talent and resources from across our firm to deliver the best business solutions.

Planning, budgeting, managing assets and data, and optimizing resources are critically important in today’s global economy. At GeoDecisions, we provide the data management and mapping technology tools and products that help clients successfully navigate change. Our geospatial information technology (IT) offerings empower organizations to make more informed business decisions and improve their bottom line. Partnering with industry leaders such as Esri, our turnkey approach encompasses strategic planning and implementation design all the way through system integration and testing. Our foundation for success is based on the belief that the true power of GIS lies in the integration of diverse information technologies, data formats, and systems. From cloud computing and mobile technologies to Software-as-a-Service (SaaS) offerings built on the Esri® platform, our location-based IT solutions provide next-generation reporting, visibility, and analytics.

GeoDecisions believes that all IT projects require vision and considerable leadership to be completed successfully, on time, and on budget. By championing a philosophy vested in partnering, collaboration, and shared goals, GeoDecisions’ staff makes every effort to work with all parties who will use a system. We strive to recommend the best-fit solutions for our clients, based on the balance of available funding and personnel versus desired functionality.

GeoDecisions is ISO 9001:2008-certified and employs more than 80 IT and geographic information system (GIS) professionals operating out of 9 offices. Our staff is engaged in IT consulting and in the design, development, and deployment of data repositories and geospatial and Web-enabled information management systems. GeoDecisions IT solutions are flexible, scalable, and reusable.

Our business specialties benefit the logistics and fleet management, insurance and financial, municipal and facility asset management, transportation, and utility markets.

Our team includes subject matter experts with advanced certifications who keep their fingers on the pulse of geospatial technology. Through industry leadership, ongoing training, and a unique blend of talent, GeoDecisions professionals work to exceed client expectations every day. Our vision identifies and mitigates risk, resulting in more effective project collaboration, on-time delivery, and success.

**Evari GIS Consulting**

Evari GIS Consulting, Inc. (Evari) was founded in 2009 with the mission of providing high quality, custom GIS solutions for municipal projects. Evari has a wide array of project experience supporting municipalities, utilities, and energy service companies, providing As-Needed GIS support for Transportation, Civil Engineering, Storm Water, Undergrounding Master Planning, Street Lighting and Planning projects. Evari is driven to innovate, employing GIS to streamline data management, empower field crews with mobile GIS technology, and facilitate Smart City, IoT solutions. With a focus on producing clear, accurate and valuable data, maps and figures, Evari’s provides its clients with effective decision-making and project communication tools. Evari leverages the Esri Technology Stack (ArcGIS) and the Amazon Web Services Cloud Computing platform for a broad range of municipal GIS applications.

**VESTRA**

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As a leader in GIS/IT, Environmental Solutions, Engineering, and Surveying, VESTRA has the depth of know-how and experience to help clients achieve success. VESTRA, an employee-owned corporation dating back to 1988, prides itself on our local presence and commitment to the community. Our mission is to be our clients’ most-valued consultant by providing cost-effective, innovative, and technically superior project solutions. Whatever your current or future needs, VESTRA’s full-service resources are available to support you on your next critical project.

**Business Partners**

**Applied Ecology, Inc.**

Located in Brevard County, Applied Ecology is knowledgeable and experienced in working with clients in the central and south Florida area. Our location has allowed us to be highly involved in the Indian River Lagoon TDML process, and preserving some of the most precious natural resources of the Tampa Bay and Indian River Lagoon estuaries. We serve municipalities and other businesses that cater to public clients and are experts in their fields.

Applied Ecology, Inc. is a small, woman-owned business with 40 years of combined specialized experience in:

- GIS
- Remote sensing
- Project management
- Complex data and database management
- Statistical analyses
- Software tool development

We focus on serving public clients in:

- Environmental resource management
- Ecological studies
- Water resources
- Stormwater management
- Utilities
AEI has the experience and skills to plan studies that cross multiple disciplines. Please see the key staff qualifications and project examples to see the level of expertise a small team

- Data management
- Custom programming
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- High-level spatial and statistical analyses
- Report writing

We take pride in being a highly responsive business that delivers quality products on-time!

**Bad Elf**

**AFFORDABLE GPS SOLUTIONS. COMPREHENSIVE INDUSTRY SUPPORT.**

Bad Elf specializes in the design and manufacture of affordable and reliable high-performance GNSS receivers for GIS mapping and field data collection. All of our products are lightweight, portable, and provide a battery life of twenty-four hours for a full day of data collection activities. Our complete product line offers a range of capabilities and accuracy (from 2.5 meters to 1 meter) to match your requirements.

Bad Elf products work seamlessly with most GIS and mapping apps in the iTunes App Store or the Google Play Store. Bad Elf also supports Android and Windows devices, providing streaming location data in standard NMEA sentences.

Our Bluetooth GNSS Surveyor provides high-accuracy (~1 meter), multi-constellation support (GPS, GLONASS, QZSS), SBAS (WAAS/EGNOS/MSAS), and universal Bluetooth connectivity (iOS, Android, Windows). The free Bad Elf Utility app for iOS includes DGPS and post-processing workflows.

We are forging strong relationships with GIS app developers taking advantage of our products’ advanced hardware features thru our Bad Elf Developer program. There are no restrictions on how you use your data. We believe in open standards. Any device that can connect to a Bad Elf GNSS receiver via Bluetooth will be able to consume data directly from our GNSS accessories. Your data. Your way.

**Geocove**

Geocove helps agencies solve the problem of where. Geocove provides spatial technology solutions to government agencies and utilities to help them collect, manage, visualize and share information. We provide insight into problems and solutions for decision makers, users and the public. We also make seriously cool map apps. So how does your GIS program work for you? info@geocove.com

**GeoTechVision**

With offices in Kingston, Jamaica (876-970-5686) and Georgetown, Guyana (592-227-0433) www.geotechvision.com

GeoTechVision focuses on “Delivering Value through Innovative Solutions!” We have been assisting Caribbean Businesses, Agencies and Government Ministries to develop and effectively use spatial intelligence in critical decision making! We are very involved with establishing Geographic Information Systems, GPS and Mobility products and solutions, as well as marketing our own “GeO” brand tablet. We consider Human Capacity Building as very critical - right from the classroom to the work environment. Hence our Classroom Management Solution and our strong focus on Training and Development in all our engagements. Our other consulting services include Project Management, Information Security Advisory, Process Audit and Assurance, Business Analysis and Enterprise GIS solution planning and implementation.

**Infrastructure Mapping and Autonomy**

We leverage technology developed by our autonomous vehicle mapping partner for rapid LiDAR processing and map production.

Infrastructure Mapping and Autonomy was created out of the Heavy Industry of Civil Maps an industry-leading artificial intelligence company, providing LiDAR processing and feature extraction services. Our technology was first developed to meet the high accuracy. 3D mapping needs of the autonomous vehicle industry. IMA is now bringing this technology to the engineering and infrastructure industries.

Our technology allows us to scan, map and report on assets or asset areas at a rapid pace and affordable cost not possible before. Leveraging our proprietary artificial intelligence, patented cloud based processing technology, and global relationships for LiDAR collection and processing and quality control, we can generate data sets, models and change detection reports 10x faster than with traditional methods.

By creating HD 3D maps in the earliest stages of projects, our clients are able to increase the NVP of projects by lowering the time to completion and reducing and deferring survey programs until the later stages of a project. Additionally, clients with existing assets to manage benefit from our centralized on-line business-to-business services to manage their rapid feature extraction and mapping programs. Eliminating the inefficient traditional person to person sales and manual data handling processes. Our al-a-carte on-line tools allow asset owners to individually direct and manage their mapping projects, resulting in quicker turnaround times and lower costs overall.

**RFP Distribution**

URISA members, remember that URISA will distribute your RFP/RFQ announcements to our corporate and business members at no charge. Simply email your announcement to info@urisa.org (Subject: RFP Service) and we’ll send it right out for you!
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MGP is an information systems services company that specializes in geo-spatial solutions. Our comprehensive range of geographic, data modeling, and business process solutions provide you new opportunities to find a better way. We believe that innovation creates opportunity and collaboration breeds success. MGP was formed as a shared business model in which clients are partners. This philosophy enables significant cost savings and makes it possible for any client, regardless of size, to get where they need to go. MGP is the managing partner of the GIS Consortium.

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Planning Communities, LLC provides a wide range of multi-disciplinary planning services for local, state and federal agencies, tribal nations and community organizations. Community, transportation, environmental and GIS services include local/regional planning, visioning/ scenario planning, land use, socioeconomic, market and cost-benefit analysis, community asset mapping, tool/ application support and development, process improvement/ integration, consensus-building and facilitation.

Headquartered in Raleigh, North Carolina, Planning Communities has additional offices in Charlotte (NC) and Seattle (WA). Planning Communities is a North Carolina certified Small Professional Service Firm (SPSF) and is certified as a DBE in North Carolina, Tennessee, Florida and Delaware.

Solv3D, Inc.
Solv3D creates tools that enable people to effectively use large 3D point clouds and immersive imagery within their existing workflows. Using the 3DPointLogic™ toolkit, individuals can easily turn massive point clouds into manageable data sets. With the SiteVisit360™ collaborative platform, companies can merge 3D point cloud data, panoramic imagery and other photography, resulting in a virtual project environment, allowing them to more effectively leverage the value of their datasets for estimation, planning, design, and decision-making.

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Contact:
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Spatial Relationships, LLC is a consulting firm that provides on-demand teams of expert Geospatial Professionals to ensure organizations have the capability to deliver on existing and future goals, manage business risk, and increase profitability.

Think of us as your geospatial concierge. Our “concierge services” provide resources and solutions for planned or abrupt disruptions as well as future projects. These can include:
- Being a key person down – planned leave or unexpected departure
- Technical requirements — fill skills, knowledge and training gaps
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Spatial Relationships, LLC was born out of the necessity to increase profitability. Our “concierge services” provide resources and solutions for planned or abrupt disruptions as well as future projects. These can include:

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August 19-23, 2019
URISA GIS Leadership Academy
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