Strategic Geospatial

Observations for Technology and GIS Leaders

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Strategy is a word often used to reflect a military operation or campaign. However, it can just as easily be applied to commerce or even personal conduct. When I talk about strategy I am thinking about identifying a North Star from which to navigate. A strategy is framework with which to make decisions. Now, when navigating towards your North Star, it is possible to deviate reasonably to avoid pitfalls. No journey is utterly straight, we all have obstacles to avoid, but it is good to have a sense of direction, of intent. That is your strategy.

Strategic thinking means we are trying to step beyond the immediate problems or tasks at hand to consider broader meaning. Why does one company do this, while another does that? What might a press release imply about the status of the parties in question? There are many instances where thinking beyond the immediate horizon is informative.

In thinking about strategic geospatial we are focusing our strategic efforts on the geospatial sector. What our sector does, what the trends might be and how we should address the nature of disruption are all themes which influence us. A strategy can help sculpt our response to market forces.

This document is a collection of essays which help describe how we at Sparkgeo think about geospatial technology. Stories are often a good way to demonstrate. This is not a description of *our* strategy, but it will help indicate our purview.

Finally, strategies can be good or bad. Indeed, they can be good and bad at the same time! In many ways a strategy sits on a multifaceted spectra. This document is not intended to criticize other strategies, it is more designed to act as a seed for your thought.

I do not know anything about you as a reader, except that you have shown an interest in thinking strategically about our geospatial community. Therefore, I cannot possibly observe or judge your opinions or decision

making; only you walk in your shoes. However, I can provide some observations about our sector from the perch I have found myself on.

Some of those observations are packaged here. Most of these essays come from work published as blog posts or articles elsewhere, and they have all been attributed as such. But they have not been bundled in this way before. Where the opportunity has presented itself, some space has been provided for notes with some thought provoking questions.

Hopefully you find this useful.

Geospatial Analytics Will Eat the World

Notes

Sometimes a strategy might be using an enabling technology. Recognizing the differences and similarities between map making, geospatial analysis and data science might enable you to deliver solutions in new markets. Not every geospatial question needs a map, yet they could still require geospatial expertise.

This means you could use the skills you already have to deliver products or services you already possess in different ways. But to do this you might need to talk the language of the new market. You might also need to deliver the product in a manner familiar to the new market. Many business people find charts, graph and report easier to digest than maps. Don't be afraid of packaging up your skills in the form which your clients understand most effectively. Often appropriate packaging of technology can make all the difference.

Geospatial technology isn't just about maps. If that is the case how do we differentiate the value of geography from that of pure data science? Is geospatial just a data science derivative?

In 2011 Marc Andreessen famously wrote that software was eating the world. Unsurprisingly, he was right. Software continues to provide enormous business value with a previously unheard of ability to scale quickly. The software revolution has created a virtuous cycle that supports the creation of more technology companies and companies that effectively leverage technology. Within this context, we have seen the rise of big data, cloud computing and pervasive connectivity as easier to access technologies.

In the geospatial business, we have been working with big data for some time. Commercially, those technologies have traditionally sat in truly enormous companies, but for the most part, massive data acquisition, analysis and management have been a government concern. A significant barrier to broader commercial adoption of geospatial technology has always been the movement of data around old infrastructures to make it available to new services. Without data transportability or accessibility, the opportunity to leverage data products in multiple ways was severely diminished. Thus, data was typically under-utilized. It is hard to become a modern data-oriented company when you can't use your data.

The rise of cloud-first technology provides an opportunity to address the old question of data access. Perhaps the opportunity for the geospatial sector is greater than most. The reason for this lays in the geospatial sector's key problem: Though maps and images are fun, they make difficult products to sell.

Indeed, the debate still rages on as to what the geospatial/geographic information system (GIS)/mapping business even is. In essence, this underlines the fact that geo-products are at best awkward to manage.

Why Will Geospatial Analytics Eat The World?

It is simple, really. The cadence of data capture has increased markedly in concert with the cloud's ability to store and distribute data. This means quite suddenly it has become possible to create products which describe our changing world in close to real-time. We can move data around, we can access it from multiple places, we can push it into manipulation pipelines and we can visualize it all on the cloud at scale.

But there is a caveat: We need to think deeply about creating products that actually support real business processes. As geospatial people, we have been obsessing over maps and images. It turns out that, though maps and images are valuable visualization products, in the end, business people need actual numbers to support their decision making processes. This is why geospatial technology has not moved wholesale into commercial-land. Thankfully, we are about to witness a drastic change.

When your Uber driver is directed around construction that was identified by another driver five minutes before, geospatial analytics are getting you to work faster.

When your bank can quickly identify credit risk by looking at transaction histories of all other customers in demographically similar zip codes, geospatial analytics are getting you the credit you need.

When your insurance company can determine that your house is a low-risk flood zone because of the surrounding topography and a recently planted forest, geospatial analytics are saving you money and helping the insurance company reduce their risk.

These example use cases do not result in a map or an image. They do, however, illustrate the opportunity that geospatial data provides to deliver amazing value. Interestingly, this revolution will likely happen quietly. You might not even notice that search results are more local, or that your Uber arrives faster or that parcels will get delivered to wherever you happen to be. All you will see is better service and better products.

The future of geospatial technology probably isn't a map. The future of geospatial tech might be an email alert, a report, a graph or an ordered list. In fact, it will be all those things and likely more.

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Scale in a Time of Web Maps

Notes

Scale is a complicated word. It can be a description of data size, or web traffic or 'availability'. In terms of geospatial data, scale obviously has a geographic component too.

This article is more than just an amusing play on words, though. Managing for scale is absolutely critical, the cloud can provide a framework for it. In many ways applying scale is just like applying force to a bridge. It is a test of structural integrity.

In terms of distribution, is scale just about the cloud?

Scale has taken on a completely new meaning for me. In my training and early career, scale referred to a conversion measurement indicating a comparison between a measurement on a paper map and a measurement in the real world. The big 'thing' about GIS was that it was scale-less; you could zoom in as much as you wanted and the map changes accordingly, amazing!

The word scale for me is now a combination of a number of concepts, some old and some new. The idea of the conversion between a screen measure and a real world measurement is still pertinent. Though in web mapping parlance this term has some-what devolved to the term "zoom" or "zoom-level" which on reflection is a horrible degradation, though usefully user-centric.

In general, the term scale for me is now more about data than it is about display. In web terms when we talk about scale, and we refer to the size of data the enormity of a repository, database or storage engine. If one 'gets to scale' then you receive your badge of honour and its implied you have figured out how to manage ever larger amounts of data and can do something useful with it. Of course the 'doing something useful with it' means you typically have competence around display or management.

In web mapping terms scale here can be about how to draw gazillions of features on a map, however, not necessarily how to usefully draw gazillions of points on a map.

Oh, great lots of data, thanks...

At Sparkgeo we have worked with numerous companies who deal with scale regularly. What I have discovered is one of the great conceits of our modern web mapping life:

Just because you can draw a gazillion points on a map, does not at all mean that you should.

In fact, the decision to draw anything on a map needs to take into consideration both the traditional understanding of scale. At what geographic density does it make sense to draw the features on the map? But also balance that with the scale at which the data is relevant. This characterization of data scale having an effect on an analytical outcome has always been a central feature of traditional GIS analysis. In our modern life of geospatial applications, it is very easy to forget we are still applying traditional GIS concepts albeit within a different purview and with new technologies.

As such, it's easy to forget that data scale and indeed data quality have a direct impact on the algorithmic quality of whatever we are doing. It took till version 5.6 for MySQL to consider that geographic analysis should be considered beyond the Minimum Bounding Rectangle, we're only on 5.7 now.

So wait, our technology does matter to scale then? Yes it does, especially when it constrains your data's ability to be functional at a certain scale, even if it is to meet the demands of scale. If your technology constrains your data's ability to perform, then your data if defined by your technology. So your scale is limited by your scale.

Yup, it's getting pretty murky, I agree.

But instead of clarifying, because frankly there is no clarity here, consider this: what scale is your crowdsourced geospatial data? This question is beautifully complex. Your scale will be determined by a mix of context, application, device, and storage technology variables. Most interestingly, it is this mix within a single data source.

An example of this complexity is the ease with which one can programatically to switch from device GPS to GeoIP depending on GPS signal availability. This means within a single table the variation of

geographic accuracy is between 5 meters and city / regional. Again, just because you can collect data in this manner, this does not mean you should; there is a significant risk of breaking algorithmic expectations. Your local search is useless if you are basing user location on GeoIP, its not very local.

This variety of seemingly structured but hugely variable data is a new feature of our industry getting to scale. Tread carefully, however. We have enormous opportunity to build geospatial applications which can change lives. It is very easy to get tied up in the joy of solving our scale problem, whilst forgetting that we are trying to capture, manipulate and display that data at entirely the wrong scale.

Old problems are new again.

This article first appeared on the Sparkgeo blog.

Geospatial Is Not GIS

Notes

Thinking about the Venn of geographic technology is useful. Where do geospatial, GIS, geomatics or whatever overlap? More interestingly kit is worth thinking of cases where one activity can be classified easily into one category. This allows the thinker to identify the differentiable traits of one category.

Understanding the nature of a category allows one to ask questions critiquing those edges.

How else has our industry been commoditized? Can we avoid it, or is this just business evolution?

I've been GIS. Now I'm geospatial.

GIS has always suffered from a crisis of identity. Indeed, some still argue over the acronym itself. Perhaps it is our need to distinguish ourselves from other technologists. After all, our knowledge of geography is the central differentiator between us and those who "just know computers." For some time this has been the status quo. We, as GIS people, have become familiar with being the difficult child, 'screaming for the attention of the masses but never quite getting what we think we are due. Well, we didn't get it until Google Earth and Maps came along. Now we are in the unsatisfactory position of having to say that we do things like Google Maps, when of course our jobs are much more nuanced.

Here is the rub: As GIS people, we secretly know that we don't actually "do things like Google Maps." We do GIS, and that is different from what has emerged as geospatial.

In GIS-land, we typically use a desktop, or more recently hybrid technology, to create custom cartographic or analytic products. In geospatial land, we use code to create streams of cartographic or analytic products. These two determinations are subject to a typical Venn-esque overlapping. To some extent, you might consider that one would use GIS to create a workflow. GIS is great for this; it's a very flexible, experimental environment. Then, if you want to turn that workflow, once refined into a highly repeatable, even scalable process, the geospatial person would do that.

Yes, I know, we have had people writing code in GIS for years and years. But only recently has the consumer sector been interacting with that code. Case in point: I don't buy road maps for a vacation destination anymore. That entire workflow has been subject to geospatial refinement. I'm a "xennial", the last generation to remember a time before the internet. I have bought a road map within the last 15 years, but it wouldn't cross my mind to do so anymore (except as some hipster art project).

The GIS person in the road map workflow has been turned into code. Indeed, those people have become Google Maps. Wait — there are still cartographers and data people involved. They might even use GIS technology. But now, software delivers the product to the consumers. Therefore, scalable, automated delivery of a geographic product is necessary. That's a geospatial workflow, not a GIS workflow.

There, I just said it. Geospatial turns GIS into code. That only happens if the process is necessary to repeat many, many times, as is the case for consumer web applications. But in the end, geospatial people take a GIS workflow and scale it.

For some, this may sound like a fearsome prospect. It seems like I'm saying that technology will consume GIS people, and only those with an Amazon Web Services certification and an opinion on the latest JavaScript framework will survive. I don't think that's true. I think we'll see something entirely different.

The thing is: data is universally terrible

Geographic data, the mud-hole I have spent my career swimming in, is beset with consistently awful data products. It doesn't even seem to matter how much you pay — data is never good. Another feature of geography is that the population is universally opinionated about published data quality. If your map is 80% good, then the other 20% will mislead. Or worse, if everyone manages to complete 80% of each of their journeys, you will have a generally unhappy user base. In geospatial and GIS we have the dichotomy of terrible data, with little margin for error. For this reason alone, GIS people will always be necessary. As we see the rise of consumer-facing geospatial applications, it is likely we will also see a resurgence of GIS jobs on the market.

I don't think we'll continue to see the crazy GIS job descriptions that we see now. Those descriptions that require numerous programming languages with knowledge of GIS and serving technologies, all for a significantly lower

salary than that of any computer scientist. I believe we will see higher value in an ability to find and fix data problems.

As our community continues to build more geospatial web applications and more analytic products from geospatial data, the need for increased data quality will be critical. Trust in an application comes from delivering good and believable experiences. We create those experiences through the application of good data to good workflows.

Consequently, geospatial is not GIS. As our market evolves, I expect that GIS people will be the "data people", and geospatial people will be the "distribution people".

This article first appeared on Forbes' website.

Pack a Snack: Geospatial Disruption in Government Is Slow

Notes

Governments are large organisations. Start any discussions early and listen for opportunities to reduce risk. Expect any government business to evolve slowly. Much of the geospatial sector depends on government work. Do you need to complete like this, or can you find and open a new market for the same time investment?

I've noticed that there's a tendency to think of disruptive technology as being short-term in some way — that a disruptive force suddenly emerges on the market and sweeps away the competition in short order.

In geospatial, my technology niche, things seem to happen both slowly and very quickly. There are numerous tiny companies with hot new technologies and some enormous companies with seemingly more traditional tools. One distinct pattern I've noticed is that disruption happens at the pace of enterprise technology. Indeed, one might even say that disruption happens at the speed of government.

Like it or not, the government sector is a critical driver in the geospatial community. Whether it's garbage-route maps or strategic military deployments, geospatial plays a pivotal role in numerous governmental processes. Given that most government units are slow to adopt any technology — something I've noticed in my company's work in this sector — change is notoriously slow. If change is slow, disruption must be similarly gradual. However, incremental change does happen, and much like a sandcastle being worn down, continual erosion will topple anything, eventually.

Startups are often happy to hire other startups or buy their bleeding-edge technology. They're often delighted to disrupt themselves in this way, being comfortable with change. But in the government and enterprise sectors, especially when an organization has any hierarchy of management, the willingness to risk a new technology seems to diminish significantly. I've noticed that this often comes down to middle management. Many executives and leaders are comfortable taking risks; they often want to be seen as innovative.

They'll pontificate about how they're willing to try and fail. In my experience, front-line staff, engineers and technologists can often comment

on or test new technology relatively easily. But when it comes to signing a check or taking a sizeable technology risk, it's usually the middle management who bear the brunt of the responsibility. Their leadership might be comfortable with failure, but leaders often see a portfolio of projects, some of which will fail and, hopefully, more of which will win. With a collection of innovative projects, it's possible to play the odds. In fact, that's often an effective strategy. But when it's your project that's the risk, far fewer people are truly willing to gamble with failure.

Sometimes called the "clay layer", middle management can be where disruptive technology hits an adoption wall. Built from the future aspirations and career security of the middle manager, the wall is real and understandable. Being squeezed between those who direct and those who execute, middle managers often feel responsible for a project without the ability to do much more than monitor it. It can be a tough gig. Navigating this barrier as a disruptive startup takes a lot of time and a lot of empathy.

Perhaps time is the primary constituent here. I've noticed that the longer a business exists, the more likely it is to be taken seriously by a government customer. But counter to the nature of modern venture capital-fuelled startups, disruption in government technology is slow. The infamous VC burn rate often encourages a quick sales cycle, making the government a potentially painful place for startups to do business.

How then can geospatial technologists do a better job of providing services to government sectors? Here are three ideas to help:

1. Lower the risks for middle management. This might mean lowering costs, increasing interoperability or providing more deployment support. Consider the career risk your customer is taking on you, and how easy it would be for them not to.

2. Don't highlight the new and shiny nature of technology; that's likely off-putting. Instead, consider the experience of your engineering and management team, and focus any discussion on that. Your company might

not have been around long, but your team's depth of expertise might easily provide the necessary confidence.

3. Stay in the private sector. Don't rely on the government sector as a first market. Though seemingly a healthy market, the government sector sales cycle can kill a startup. Instead, make sure that innovative government leaders are paying attention to you through bountiful use of blog posts and articles, while your team is creating value in a more agile sector.

Geospatial in government is evolving. The increased confidence in open-source technologies is undeniable. Additionally, we're seeing a differentiation between traditional geographic information system (GIS) people and geospatial professionals with a greater focus on process automation and scalability. But geospatial technologists always need to sell their wares to people, and it turns out that empathizing with those people can help. By understanding the middle management layer, selling geospatial technology to the government sector could be much easier.

This article first appeared on Forbes' website.

GIS: Vertically Challenged

Notes

Sometimes names or titles matter, sometimes they can be ignored. GIS has seemingly always had an identity crisis. Thinking strategically, this confusion over names could be an opportunity to deliver an old business to a new vertical.

Consider if you have a 'traditional' GIS workflow that could be relabelled and delivered to traditionally non-geospatial markets via a new delivery method.

Considering if your organization is vertically or horizontally focused is also useful. The idea of a horizontal being hidden inside a vertical allows us to start exploring how some companies are delivering technology.

Some companies focus on building a technology ecosystem which could contain numerous tools, with the intention to lock a user in to their offering. Some focus on building basic blocks of technology which can be pulled into a custom code base or workflow. Both of these approaches are perfectly reasonable, but have different market effects.

During my presentation at the recent GeoIgnite event in Ottawa, I suggested that geospatial is a horizontal market hidden inside a vertical. I want to take the opportunity to unpack that assertion and see if we can glean some insight by doing so.

Geospatial is a horizontal market hidden inside a vertical

GIS, geomatics, neo-geography, technical geography, geospatial, data science, geoint. GIS and its namesakes have always struggled with an identity crisis. Some readers may be critical of me for separating geospatial workflows from those which I have described as geographic information systems — GIS. It is, however, safe to say that the activity of leveraging data that holds a geographic reference has always been challenging to compartmentalize. The reasons for this state of confusion are numerous, but one is that geography is quite finicky and that the details matter.

This need to know specifics has led us to differentiate ourselves from those who are uninitiated. Hence, the "is spatial special" debate. But this differentiation and the subsequent evolution of tools to support the specific needs of the practice of geographic analysis has evolved our professional activity (whatever you want to call it) into being a siloed tower of granola-powered, Birkenstockian pseudo-nerds.

How many GIS practitioners are still making the "what is GIS?" presentation? Sure, I agree that GIS and geospatial encompass a series of particular skills, experiences and technologies that other professionals might lack. But those shouldn't separate us; they should add value.

Geospatial could be a pervasive layer supporting virtually every business vertical. But we continually think of ourselves as a vertical. We think of the GIS industry. This thinking silos and separates us. There is no "database department," so why would there need to be a "GIS department"?

Running a consulting company, we get to see many examples of business workflows. Much of our work is in the technology sector. Though San Francisco has woken up to geography, I think GIS has somewhat missed the opportunity to realize this market. Put another way, GIS as an industry has presented itself so poorly that those not-indoctrinated into the cult of technical geography have just sat down and figured it out themselves. They have done this in a manner that has circumvented all the traditional tools and practices of our guild.

This pattern is alarming, disarming and slightly embarrassing. But it is also the nature of disruption, and we must pay attention.

Beyond Silicon Valley, there are occasional good examples of GIS in the insurance and banking sectors, but again, they are typically siloed efforts.

To some extent, we can blame the cloud because the cloud has very effectively demonstrated a gap. GIS is an excellent tool for exploratory analysis of data for distribution to a small number of professionals.

But GIS has typically done a poor job of building robust, highly repeatable geospatial workflows. Software developers write that code backed by large sums of venture capital or a significant defence contract, outside the typical "industrial GIS complex."

Frankly, it is hard to programmatically scale niche, unstructured data exploration. GIS is an excellent solution for algorithmic development: It is iterative, creative and detailed. Yes, it can be automated, but rarely can it be so wholly automated that a human is out of the loop. Typically, someone needs to press "go" on some workflow and refine some parameters. Yes, we can do GIS on the internet, but that would be the same thing that we already have on a different medium.

This dependency on human input is one reason why GIS is not baked into as many business workflows as the business community and the geospatial community would like. It is a headache to take a GIS workflow and roll it into a data pipeline. Most GIS processes get tuned for data which was

manually cleaned up by a professional. Without that optimized data, things get much harder. Yet geography, the question of where, is pivotal to so many business processes.

The cloud has neatly demonstrated the opportunity that scalability provides to businesses. GIS could generally manage to automate a process to some extent within an organization. But beyond that, things would be complicated by licensing, data access and purview.

We need to start building tools for the robust distribution of geographic workflows to a cloud-based environment. Again, this points to a missing geospatial cloud, which is more about willingness and pricing than a technology. I still contend that without true usage-based pricing, we do not have a geospatial cloud.

GIS people are excellent at creating products for GIS people. To de-silo GIS or geospatial (or whatever it is that we are), we should be thinking about how to communicate with those outside our Venn blob. In doing this, we might break the unwritten rules of our guild. But we might also open markets that are both desperate for better data products and willing to pay for them.

This article first appeared on Forbes' website.

Data is Opinionated

Notes

Accepting our bias, and that we are always under the influence of bias helps us better understand context. Which in turns informs any kind of business process optimization. This could be a cultural bias (what our societies currently value), a scientific bias (our current understanding of reality), or just a personal bias based on experiences. To accept that we have blindspots better prepares us for them.

Do you see areas where human behaviour inadvertently influences something that might typically be seen as programmatic?

Geospatial data in particular is opinionated. Now, opinion isn't always a great thing. Opinion doesn't mean you know better, it just means you have a particular view of the world and feel comfortable in maintaining that perspective.

We live in an age where strong opinion seems to be celebrated; whether that opinion is founded in fact or fiction is largely irrelevant. Perhaps, this context has led us to a place where we are comfortable just seeking single opinions on a subject. Obviously as geospatial professionals this habit is dangerous.

My initial assertion that data has opinion is an extension of the idea that data comes from somewhere. Whether that is an imagery source or the crowd or a survey. Typically there is a single source and we stick to it. We loosely consider 'error', but do we consider opinion?

Opinion needn't be erroneous, but instead it indicates a perspective from which a particular data point is created. The danger of perspective is that not every viewpoint will capture the entire reality.

Image Opinion

In terms of imagery, we could consider that the spectral, spatial and temporal resolutions of a particular sensor as facets of its opinion. That sensor will be limited in its perspective of the Earth by those features of its design. In reality should we, as pursuers of the Earth's representation, only consider one opinion of our Earth? Is the opinion we choose to listen to always correct? is it the best opinion? Are we reaffirming our own confirmation bias by not looking beyond the specifications of our chosen image source?

In practical terms, I am talking about our ability to leverage multi-sensor remote sensing. Multi-sensor anything is hard, really hard. We have to

consider different orbits & altitudes, different times of the day, different atmospheric correction, different resolutions. But, in those problems are the opportunity. More opinions lead to a better understanding of an issue. Additionally, we have constellations and constellations of interesting Earth observation satellites being launched. We now have the ability to draw real imagery conclusions about things happening today from the clouds of opinion in our orbit. We just need to start doing it.

Vector Opinion

Imagery is largely a matter of the interpretation of differing perspectives. With vector data, opinion is even more pertinent. The interesting thing about vector data is its far greater ability to be just plain wrong. Consider the humble road network. Is one source of this data ever truly correct? Are we willing to bet our autonomous vehicle future on a single source of road data? No, that would be crazy talk.

Sure, who wants lots of different lines telling us the same thing? Our software friends will throw up theirs arms and say “redundancy!” But, what if we don’t find that the data agrees? Who is right? What is rightness? This speaks to the Tower of Open Babel we data people have created. I warn our clients that when we are considering vector sources we should think about those sources as extensions of the characters who created them. The cast of characters and their view of the world invariably has a huge impact on what that data source is capable of telling us.

Indeed, opinion in vector data is so marked we should always be wary of any analysis comprising single sources of data on a particular subject.

I implore you, observe how opinionated your data is, and consider seeking a second opinion.

This article first appeared on the Sparkgeo blog.

Scaling Up: Why Cloud-Native Geospatial Matters Now

Notes

Consider the difference between "strategy" and "tactics". A strategy is your North Star, tactics are how you navigate every day towards your strategy. In this essay, the cloud enables massively scalable geospatial technology; the cloud is a key feature of a cloud-native strategy. However, in other circumstances the cloud might be a tool employed to achieve a strategy, in other words: a tactic.

Many confuse these terms. They might use "strategy" to actually describe a "tactic". Try and catch it in conversation.

But, also notice that strategy has an organizational scale to it. Your company could have a strategy, then your department might have its own strategy to execute on part of your organization's strategy, and so forth. Ideally, these things will be reflective of each other, but this is not always the case.

Think about your organization's tactics and strategies. Does your team have a strategy, or are you purely tactical?

The practice of geospatial is well-suited to a cloud-native architecture. With training, machines can be considerably better than humans at parsing vast amounts of geospatial data. As such, cloud-native applications will power the automated future of geospatial. You should get on-board.

Scale

Before we dive into cloud-native applications, it's important to define scale. It's a wonderful subject to consider within the context of modern geospatial technologies. It has clear geographic connotations in cartography. Every map should indicate the ratio between the depicted features and that of the landscape itself: the map's geographic scale. Our community has been building scale-independent geographic information systems (GIS) for some time, allowing users to zoom in almost infinitely on a map.

It turns out that geographic scale is more dependent on the data itself than the technology used to display it. Technology can make data do anything, but data is limited in its ability to inform. Those limitations are really about scale. No matter how far I zoom in on a medium resolution satellite image like those captured by Landsat, I still won't see details like my car, for instance. The contents of a pixel will always be limited by the sensor used to capture the image. It is that simple. As much as we might like otherwise, data is as subject to the Peter Principle as any person is.

The word scale has more recently been hijacked by the technology and business communities to describe an ability to quickly cater to a large number of consumers, usually via the internet. Interestingly, scale can reference data size as well as consumer interest. Startups could talk about scale as their ability to attract a gazillion users, but scale can also mean the management of large amounts of data. Often these definitions are two perspectives on the same phenomena: a gazillion users will usually necessitate a lot of data.

Born With Our Heads In The Cloud

The cloud-native approach to software architecture has evolved to describe a technology which can respond to scale by actively exploiting the advantages afforded by cloud technologies. Practically, this involves the development of systems with containerized micro-services tied together with continuous delivery mechanisms under the watchful eye of a DevOps team.

Yes, that was a mouthful of tech jargon. The net effect is the development of technologies that can scale up or down services automatically based on user demand.

Cloud-native geospatial is a convenient collision of our definitions of scale.

Chris Holmes wrote the seminal work on cloud-native geospatial. In doing so, he has outlined a couple key features, including:

The avoidance of data duplication through smart serving; why download data when you can connect to it?

The movement of software to the data; when data becomes too cumbersome or “big”, we should move our analysis to the data rather than extracting data to analyze.

These two features are somewhat symbiotic enablers of cloud-native applications. To them, I would also add a layer of data science. Analytics about analytics seems somewhat “meta”, but listening to the workings of a machine provides a fundamental understanding of what that machine does. Too often, our community builds cloud machinery before understanding what the end users are interested in consuming. An analytics layer turns a science project into a business.

As we choose our own adventures through geospatial web services and products, we should consider why geospatial is a particularly suitable practice for a cloud-native architecture.

The first argument for geospatial companies to consider is that of technology scale. As discussed above, geospatial is unusually data-dependent. Applications usually need to parse large amounts of imagery or vectors into small amounts of information. Humans have a hard time comprehending large amounts of data; machines are great at it. Humans are better at contextualizing digested data. To divide this labor effectively, we need systems that can scale up to process a question and provide the digested data product for human consumption — a cloud-native workflow.

Secondly, more geospatial companies are identifying as content companies. For them, building an environment where data is accessible via API rather than as a download will result in an enormous cost saving and increased accessibility.

Accessibility has always been a concern. Recently, we have seen an increase in examples of programmatic access to data instead of human-initiated access. Indeed, as geospatial analytics start to eat the world, we will see a great deal more of this. This kind of machine-centric access to updated imagery, base maps or sensor networks is beginning to feed our machine learning (ML) and artificial intelligence (AI) futures. Accessibility evolves from being a headache to being an opportunity.

Presently, there is a great deal of research activity around the creation of training data for AI from geospatial data. We will, of course, have to continue to train algorithms, but soon we will have adequate base training sets, and we will start to rely, then subsequently depend, on automated systems to monitor for change across our landscapes.

Cloud-native geospatial enables this automated future, by opening the door to automated data capture, automated analysis, automatic parsing of vast amounts of new data, automatic delivery of monitoring alerts, reporting and mapping.

Welcome to the future of geospatial — it will live on the cloud.

This article first appeared on Forbes' website.

The Mysterious Case of the Missing Geospatial Cloud

Notes

This article is dated. Being linked to specific technologies makes it so. By the time you read this my supposition might be woefully out of date; the internet moves fast.

However, the concepts behind this article remain relevant. Proprietary infrastructure is seen as a reasonable risk or investment, but proprietary application-level technology impacts an organization's investment in intellectual property. When then does a technology move from application to infrastructure?

Can we convince the technology market that geospatial is an infrastructural utility on which custom, IP-able code can be written?

Agility in itself can be a strategic tool. No matter the size of an organization, being adaptable to a changing environment can open vital new markets. The cloud has evolved to enable deep organizational flexibility.

Finally, this article argues that a "cloud" business is defined more by its pricing than anything. Is that fair?

It's a mystery; it really is.

Let me set the scene. I've been running Sparkgeo for almost a decade. When I started the company, our central intent was to put maps on the internet, instead of paper. Our client base almost immediately switched from the resources sector, which had made sense for a company with roots in Northern British Columbia, to the U.S. technology sector. From forestry, we moved into social networks.

We partner with venture-funded startups and large technology companies in pursuit of geospatial goals. Of course, I cannot and will not say anything about what we have done for these companies, in particular. What I can tell you about are some mysterious patterns.

Where Is The Geospatial Cloud?

When I started traveling to meet with clients in San Francisco I would be asked about building geospatial platforms of one nature or another. Usually, these would involve a mix of data stores, programmatic data access points (APIs), data pipelines, manipulation engines and visualizations (web maps). I would suggest various industry incumbents as options, but it was clear that my clients had little interest in purchasing large amounts of software to satisfy what was only part of their value proposition.

Indeed, they were much happier investing in developer time and building on an open stack. They felt this strategy would allow them to own any created intellectual property (IP). They would be happy to plug in visualization services (Google Maps, Mapbox, etc.), but when it came to actual data flow they wanted to own the pipeline, as it were.

We are surrounded by clouds of one sort or another. Consumer clouds, government clouds, internet of things clouds, financial clouds, industrial

clouds — these clouds are just computing environments tuned for particular use cases. In the face of a significant industrial investment, getting a tuned system can make great sense. Indeed, the low cost of entry to any kind of cloud makes them relatively low risk to evaluate and develop on. Beyond that, the generic cloud ability to scale elastically when necessary is very attractive to organizations with large amounts of data. Both consumer and enterprise geospatial technologies are no different from other technology sectors in their ability to benefit from adopting a cloud infrastructure.

The Twist

The twist in this tale is that these start-ups and technology companies were not investing in a stack of geographic information system (GIS) technology because of IP ownership concerns, but they were investing in proprietary cloud technologies on which to put their newly developed code.

These companies were simply making excuses not to buy into a geospatial cloud. Why would this be?

The Opportunity

As I mentioned, there are actually incumbents in the market providing some options for geospatial clouds. There are solutions from Sparkgeo partners like Esri's ArcGIS Online (AGOL) and Boundless' Managed Server Enterprise and others like GISCloud. Additionally, there are other more industry-specific options such as Pitney Bowes' Spectrum Products. However, none of these products have taken a pure cloud approach.

Instead, there is too much focus on selling a full stack of technology for a significant investment and too little opportunity for the customer to pick and choose elements that conveniently fit together.

Mapbox's Eric Gundersen has approached part of this problem by likening their stack to building with Lego bricks, but still, their technology has never supported massive customer data storage or flow and is progressively

becoming more focused on vehicles and urban mobility over general geospatial use cases. In reality, you could argue that Mapbox is morphing into “mobility cloud.”

The geospatial community is lacking a cloud toolkit tuned for geospatial use cases. That toolkit might include an entire stack of technology from desktop GIS editing to geocoding, but could also just allow for a billion geocodes. This environment is similar to what one might find in the Amazon Web Services or Google Cloud console.

As a keen spectator of this industry, I can suggest two potential solutions that could emerge from the geospatial sector. Conceivably, Esri could revisit their “full stack or no stack” strategy.

As suggested above, this appears to be more of a change in business model than any significant engineering effort. Another obvious solution would be a tight partnership between Boundless and Mapbox which would result in a similar feature set to that offered by ArcGIS Online. This, combined with an ability to pick and choose geospatial technologies from some kind of common administrative console, would also provide the kind of geospatial cloud experience our community is presently missing.

The final plot twist in this tale is that some of the incumbents already have all the pieces available and this could just as easily be a pricing and marketing discussion. Meanwhile, the major cloud providers are building more spatial features into their platforms (Google, Amazon Web Services, Azure).

The question is, will the traditional GIS providers remain in the lead as general computing takes the shift to cloud-based environments? Will spatial continue to be special? Or will the massive cloud providers release enough geospatial tools to subsume the traditional geospatial market along with the geospatial technology market.

This article first appeared on Forbes’ website.

Finding Scarcity In An Abundance of Analytics

Notes

Data is a commodity. The risk with a commodity is that the market decides its value independent of what the cost might be to create that commodity. It's the same with timber or minerals.

If we are to create data services then, how can we either create a product so useful that everyone wants it, or one that morphs to be of scarce value to as many users as possible?

The law of scarcity is a building block of commerce. It suggests that a desirable item in short supply is more valuable than one that is more readily available.

How does this apply to our digital economy? Indeed, how should we think about scarcity when software-as-a-service companies are obsessing over scale and growth?

The dichotomy I want to illustrate here is that of scale vs value. There is an idea with technology companies that we should create something once and then sell it many times. That is true with platform software (e.g., iTunes), but it is not valid with providers of data. With data or the insight derived from it, the value of that insight diminishes with the number of people who have access to it. This is the law of scarcity as it pertains to information.

The maturity of cloud technology has boosted the opportunity that geospatial technology affords the business community. We can build pipelines of data in the sky. We can control the flows of that data with manipulation engines, transformations and fusion techniques. We can identify features from imagery, then use those features to feed machine learning algorithms. We can use those algorithms to filter and interpret torrents of data flowing at a rate orders-of-magnitude higher than a team of humans could consume.

Geospatial can now deliver what we have always promised: the near real-time, remote monitoring and analysis of assets. But how should we be providing this capability? An obvious place for us to look has been the financial markets. Providing traders and analysts with new insight with which to develop "signal". The commercial geospatial and remote sensing industry, which has been chasing access to the elusive "Bloomberg Terminal", should, however, consider the pricing effect of abundance.

Of course, there are base data acquisition companies which must exist to support the creation of geospatial analytics. Those are the companies that are creating streams of base data from which the analytics companies are drawing their insight. Products of this nature will always be necessary, indeed foundational for discerning any geospatial insight. Including the satellite, LiDAR, RADAR, metrological and mapping companies, these are the companies that know how to create building blocks from which to derive vertically-focused insight. These companies will remain mostly unchallenged by scarcity, but they will be subject to the increased dilution of their industries as more competing vendors emerge. Additionally, in a rapidly moving commercial environment, their products' shelf lives will shorten. However, their challenges are another story.

Scarcity tells us that if everyone has access to a particular insight, then that insight doesn't differentiate its owners anymore. Indeed, that insight has become commoditized. In other words, if the whole market can use the same data products, then no discernible signal will be created. Whatever value that insight had has taken a hit with the increase in the addressable market size.

Business value comes from having an edge — knowing the things that others do not. But for the insight provider, by selling the same product to more customers, the value of the product itself decreases. With the achievement of "Silicon Valley" scale, would come the virtual nullification of any business benefit.

For geospatial companies who have expertise in analytic creation, this becomes an exciting challenge. It might mean the production of customized analytics combining commercially available sources as well as proprietary sources. It might mean the creation of customizable analytics, selling geographic exclusivity or even identifying novel data acquisition methods. For those suitably equipped, engaging a commoditized-analytic street-fight might be the attractive path!

In the broader business community, it might involve building geospatial research and development teams with the capabilities to craft bespoke business intelligence solutions from geospatial sources with direct access to vertical domain expertise.

Counter to the recent internet software vendors (ISV) and software-as-a-service (SAAS) cultures, after the creation of enabling geospatial software, the central geospatial analytics play might be the production of highly customized analytics providing the business edge.

The commoditization risk of "insight as a service" may be too high.

This article first appeared on Forbes' website.

Closing Notes

Strategic Geospatial Recommendations

- Think critically about technical geography
- Question the ways in which geospatial technology can be delivered
- Consider where geospatial is being used; consider why geospatial is not being used
- Try to quantify, but don't be afraid to fill gaps with instincts
- Embrace being proven wrong
- Commit to execution
- Demonstrate leadership in geospatial technology

At Sparkgeo we have challenged ourselves to think strategically about geospatial technology. The intent of this document is twofold:

1. To provide some food for thought on a series of specific subjects.
2. To encourage discussion about strategy within the geospatial community.

You can probably tell that the subject of strategy is messy. But ultimately having a guiding principal is helpful. What we have seen is that there is no right answer and evolution of thinking is absolutely necessary. More so, a strategy will not in itself solve anything. The adoption of a strategy is only valuable when it is followed through with execution. Execution takes leadership and organizational willingness.

Depending on where you are in your career and on your org chart you may have different levels of influence. But, I would suggest that whatever your job title you can show leadership.

Critical thinking and open discussions are a good place to start. If you stay quiet You might be wrong; but it would be much worse if you found that you were right, but too late.

I urge you to look at the complicated spectra of geospatial through a strategic lens and see what insights you can discern.

About the Author

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I am the founder and CEO of Sparkgeo, a geospatial partner for some of the biggest brands in technology. With an academic background in Engineering and Remote Sensing, I have worked in government science, municipal engineering, resource and technology sectors turning data into value.

Since starting Sparkgeo, we've been helping startups, large enterprises, and non-profits across North America make the most of location through the strategic application of geospatial technology.

We provide geospatial advice, then back that advice up with an ability to write and deploy custom geospatial code at scale.

Our obsessive focus on geospatial technology makes us a somewhat unique company. In fact, most of our work is with other technology companies. They look to us as expert partners who can lend them expertise that's not easily found in-house. We listen carefully, are platform-agnostic, and look to afford the most value we can to our clients. To make this possible, each of our staff members has a high degree of autonomy. This allows them to do what they must—instead of being bound to tradition or bureaucracy.

I have had a great deal of fun scratching the itch which has become Strategic Geospatial. Hopefully, you have also found some benefit.