

In spring 2008, South Carolina GIS consulting firm and ESRI business partner ROK Technologies (Roktech) saw great potential in Web services for assisting clients that needed to deliver cartographic imagery quickly.

One of its clients, FltPlan.com, serves flight-tracking maps to the general aviation industry. FltPlan.com needed to accommodate sudden influxes of visitors to its site. Instead of making costly investments in hardware to expand the company's capacity, Roktech used a unique combination of ArcGIS Server tile processing and a relatively new type of cloud computing called Hardware as a Service (HaaS).

Because company budgets aren't always in step with the cost of advancing computer technology, the IT industry often creates

workaround services that close the gap between what a user needs and what that user can afford. Software as a Service (SaaS) cloud computing is a more well-known example of this strategy. Software licenses are deployed to customers for on-demand use rather than deploying (and paying for) a multitude of individual installations on every device in an organization. In the same way, HaaS is cloud computing that allows organizations to purchase external computer processing power, storage, and data transfer services for a fraction of what it would cost to purchase new computers, servers, and T1 lines to furnish that same capacity. Typically, HaaS vendors charge clients for the services they use rather than a monthly fee.

Tiles on a Cloud

Cloud computing and ArcGIS Server deliver a thrifty solution

By Matthew DeMeritt, ESRI Writer

Significance of the Map Cache

The introduction of the map cache in the latest version of ArcGIS Server greatly enhances the delivery of cartographic imagery. Maps are initially processed and cut into smaller tiles. Map caching increases the speed of GIS applications because it eliminates the need to request data from the database, process it, then send it to the browser on demand. In response to a request, preprocessed tiles fall seamlessly into place and users enjoy a pleasant Internet mapping experience. The strategy of using cached map layers that aren't frequently updated as base layers and dynamic map services for operational layers provides users with a much more responsive Web map.

Since the emergence of map-cached ArcGIS Server sites, user demand has noticeably increased. As a result, many smaller organizations that serve high-quality cartographic imagery are hitting a bandwidth limit fairly quickly as traffic to these sites grows. Since the cost of adding more T1 lines isn't realistic given limited budgets of many businesses and small governments, the result can be imagery that takes eons to render.

Cumulus Business

Roktech noticed many of its clients experiencing this bandwidth problem. "We asked ourselves—why not host our clients' map caches

on our own servers and purchase data delivery services through Amazon S3 when we hit our own bandwidth ceiling?" explained Jason Harris, a GIS developer at Roktech. "Bandwidth logjams understandably make clients nervous, and this was a way to relieve their anxiety." Roktech called its new service tile cache hosting.

Tile cache hosting was successfully implemented for FltPlan.com, Roktech's client with the most pressing bandwidth issue. The flight-tracking Web site served a nationwide raster dataset via its new application created using the ArcGIS Server API for JavaScript. In addition to its main flight planning site, FltPlan.com ran sites that served ArcIMS maps and other ArcGIS-based dynamic layers. Even with its multiple T1 capacity, bandwidth for all FltPlan.com's sites became saturated within days of the new sites going live. Roktech moved FltPlan.com's map cache to its own facilities, offloaded the bandwidth draw to its own connection, and solved the problem.

"The issue arises when the ArcGIS Server host machine doesn't have the bandwidth to serve the tiles quickly enough," said Harris. "The site became so popular, and so quickly, that their available bandwidth bottlenecked practically overnight. With ArcGIS Server, we can now create these maps beforehand. When an Internet user requests a map, ArcGIS

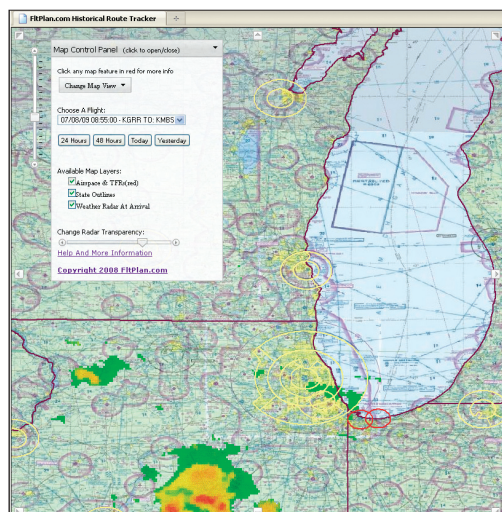
Server finds the correct tile and sends it. This was a time-saver compared to all the work that ArcIMS had to do before it could send the user a map."

The transfer of the map cache immediately made a huge difference in site performance. As FltPlan.com's site continues to become more popular with the general aviation industry, it scales nicely. As the user base grows, Roktech simply increases the amount of data delivery services it requests from Amazon S3 and charges FltPlan.com accordingly. This is a much cheaper alternative to adding more T1 lines and is just as useful for solving bandwidth problems experienced by other clients.

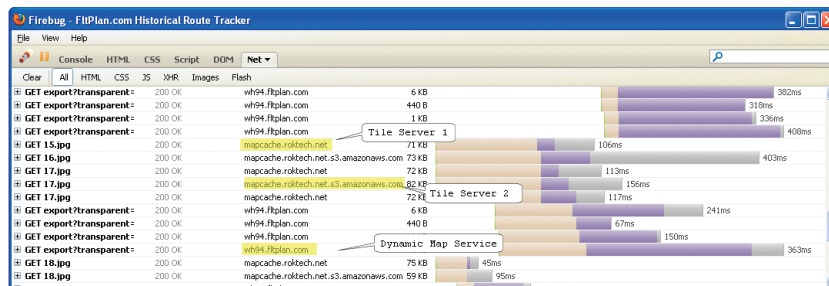
Configuring the Tiles

Both ArcGIS Server JavaScript and Flex APIs allow developers to tell applications to point to different tile servers. Essentially, tile servers are just places where map caches are stored. These tile servers (called "buckets" in Amazon S3 parlance) do not necessarily need to be on the same physical network as ArcGIS Server. Roktech specially processes the tiles and transfers the map cache tiles for storage on both its own fiber network and the Amazon S3 cloud service.

"That's the central concept," said Harris. "As developers, we have the ability to pull data in from multiple servers and locations and use



FltPlan.com serves flight-tracking maps to the general aviation industry.



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For more information, take the ESRI free Web training seminar, "Implementing and Optimizing ArcGIS Server Map Caches."

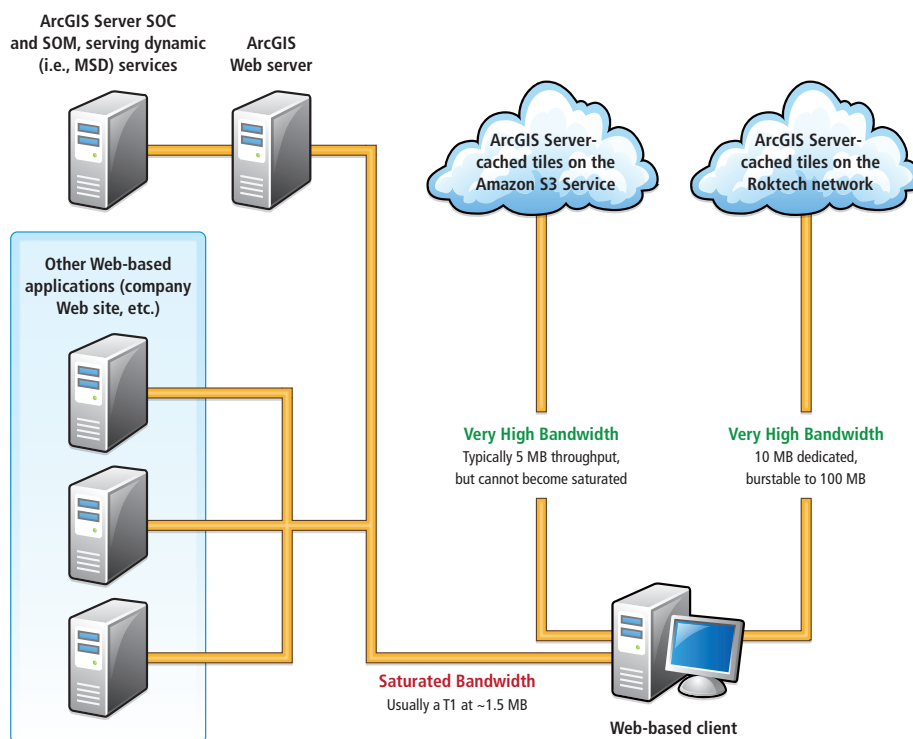
it in the same map. ESRI obviously gave these new APIs some serious thought. The [ArcGIS] Server team made it incredibly simple to make engaging, dynamic mapping applications that attract so many users."

Roktech decided to use Adobe ColdFusion to process the tiles and prepare them for the upload to the Amazon S3 service. Harris said ColdFusion was chosen because it's tightly integrated with Adobe Flex and makes Internet application development and deployment quick and easy. It is also a natural fit for creating Web applications with ArcGIS Server.

Once the cache is converted, it is simply uploaded to the Amazon S3 service. Roktech uses Bucket Explorer (www.bucketexplorer.com), an interface for Amazon S3, for uploading the cache because it is extremely easy to use and does the job quickly. According to Harris, uploading the cache takes time and requires patience but is well worth the effort because the payoff is huge.

Sustainable Growth

"Because of the time-sensitive nature of flight planning, we wanted to provide the smooth-scrolling map service for users—like the kind you'd see on the big sites like Google Maps," said Ken Wilson, president of FltPlan.com. "ESRI and Roktech found a way to do that for us, giving our sites the speed of the larger



Comparing the old and new architectures

sites. We could not have sustained the popularity of our sites with slow-rendering maps."

Until the price of adding multiple T1s becomes ridiculously cheap, HaaS cloud computing is an inexpensive solution for the bandwidth bottleneck experienced by smaller

organizations. "I don't know the nuts and bolts of it," Wilson confessed. "I do know that ESRI and Roktech helped us meet our goals of immediate mapping at a fraction of the price of expanding our fiber network. In the end, that's all that matters."