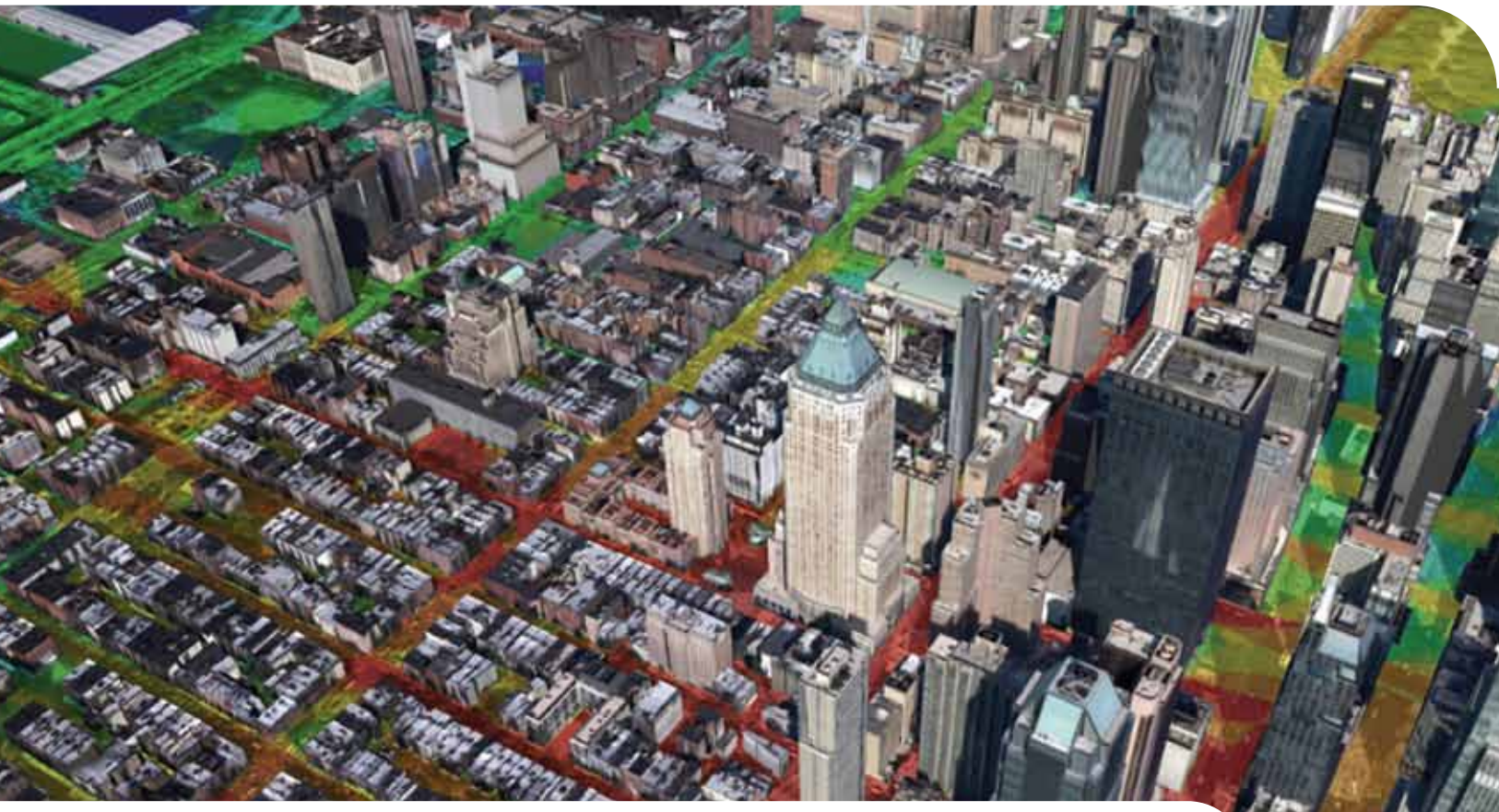
computa maps

Mapping your world in 3D



Geodata For RF Planning and Optimization

Preferred global supplier of geodata to:

- Wireless operators
- Network equipment vendors
- RF consultancies and service firms

ComputaMaps specialized in the production and delivery of geodata to wireless operators and their suppliers over ten years ago. We've lived through the network upgrades from 2 to 3G and are eagerly participating in the current evolution to 4G. Customers use our data, in conjunction with their RF planning tools and advanced urban propagation models, through each stage of the network lifecycle.

Resolution, Scale & Accuracy

Geodata is based on information digitized from maps and photos. The resolution of a data set is the pixel size of its raster elements. Geodata can be output at virtually any resolution, but unless the source imagery and related mapping data is at equal or higher resolution their accuracy is limited.

Challenges Faced by Today's Wireless Operators

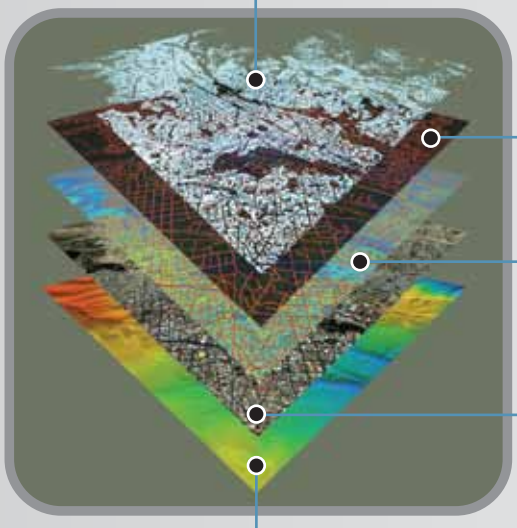
In the past, operators have used 2D medium resolution data (20-50m) to plan 2G and 3G networks. We've witnessed a dramatic increase in demand for our 3D City Planner products as operators have deployed HSPA and LTE networks and subscriber expectations for network quality have risen. Built-up urban areas provide the greatest RF challenges, and with the highest population concentration the largest payoff, to wireless operators.

With the proliferation of smartphones, social networking and location-based services, operators are seeing wireless data usage expand rapidly to augment commoditized voice service revenues. With the increased data traffic delivered through smartphones and subscribers growing dependence on more bandwidth-intensive applications, operators are experiencing capacity issues on their networks. Unfortunately adding more spectrum is not always an option. Even when it is, it is a costly solution.

While 4G networks promise to be more spectrally efficient, many operators are planning to target a series of non-traditional vertical markets and M2M (machine-to-machine) communications meaning any additional capacity will be quickly used up. The need for proactive simulation-based RF planning and optimization, based on geodata designed for this purpose to provide an accurate "real world" model has never been greater.

Typical Geodata Layers

ComputaMaps products typically contain the following layers:



3D Building Models – Derived from stereo satellite and aerial imagery, these models provide orthorectified high-resolution accuracy and are the cornerstone of successful urban model development and related RF planning

Vectors – These can represent a number of different elements including roads, rivers, coastlines, etc. and are fully geo-referenced

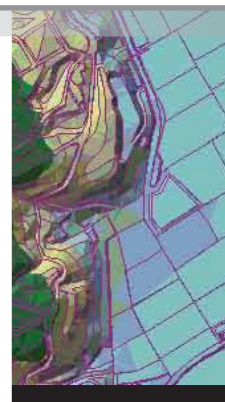
Clutter – Often referred to as land use, ComputaMaps offers a range of statistically categorized classes (e.g., forest, urban, etc.) that are useful for traffic planning and prediction model creation in RF planning tools

Orthoimage – A high-resolution image tied to the data set to simplify the use of the geodata compared to the real world

DTM – Better known by the acronym, digital terrain models (DTM) provide a 3D model of the surface of the earth and are a core layer in all ComputaMaps data sets

Minimum Mapping Unit

The minimum mapping unit is the smallest area for which an individual clutter class will be represented in the clutter layer. For example, if the minimum mapping unit is 20m x 20m (400 square meters) a stand of trees measuring 100 square meters in area will not be represented in the clutter layer.



Why 3D Geodata?

These high-resolution products provide a very accurate model on which to perform RF planning and optimization, particularly in dense urban environments. Why is the market so interested in 3D data? There are a number of reasons:

Increasing amounts of high-resolution imagery (e.g., sub 0.5m) – a key input to the development of 3D models – are available today

RF planning tools are now able to process higher-resolution data given hardware and software improvements

Propagation models have become increasingly sophisticated to accurately model urban propagation phenomena

Increasing network densification: inter-site distances that were once 500m to 1 km are now as close as 200-300m

Higher expectations for subscriber experience mean operators can no longer simply plan for street level outside of buildings

ComputaMaps Product Portfolio

Product	Description	Application	Resolution	Data Layers	Typical Data Set Size
Region Planner					
Region Planner	Large area or whole country	Bid planning, rural planning	30-200m (2D)	DTM, clutter and linear vectors Optional: orthoimagery & raster maps	200,000 sq. km² +
Urban Planner					
Urban Planner	Urban and metropolitan areas	RF design in built-up suburban and urban areas	Medium resolution 5-30m (2D)	DTM, clutter and linear vectors Optional: orthoimagery & raster maps, NAVTEQ information	200-10,000 sq. km²
City Planner					
City Planner	3D data focused on urban centers, including building polygons.	Microcell planning in horizontal and vertical planes using urban prediction models	1-5m	DTM, digital height model (raster), building models, clutter, linear vectors & orthoimagery Optional: NAVTEQ information	20-2000 sq. km²
LandScan™					
Population Maps LandScan™	Population density per sq. km estimates	Bid preparation and traffic planning	N/A	Mapinfo-raster data	Per country

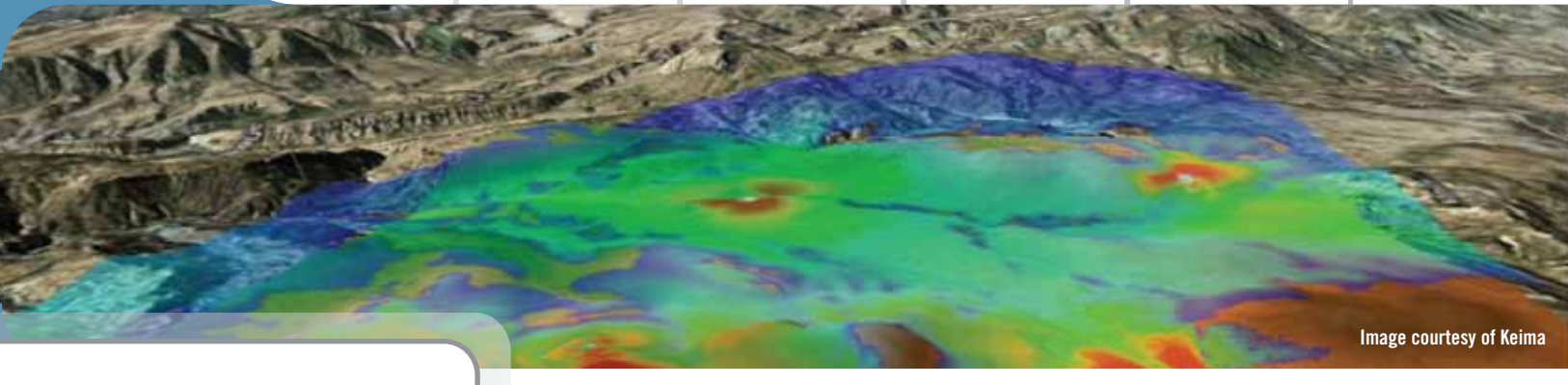


Image courtesy of Keima

Building a City: Manila

We recently built a 1500 km2 high-resolution data set for Greater Manila that included 3 million buildings. The data set was based on 16 different 50-cm satellite images and took 42 days from order.

Creating a 3D building model begins with sourcing the latest imagery. Image processing includes block adjustment and setting up stereo models. The next step involves terrain extraction including mass points, breaklines, bridges and overpasses. The ComputaMaps production team then concentrates on feature extraction of buildings and other man-made features, followed by roads and other linear items. The imagery is ortho-corrected and mosaicked and clutter classes are extracted. Finally, post-processing, data conversion and quality assurance is completed and the product is ready for delivery.

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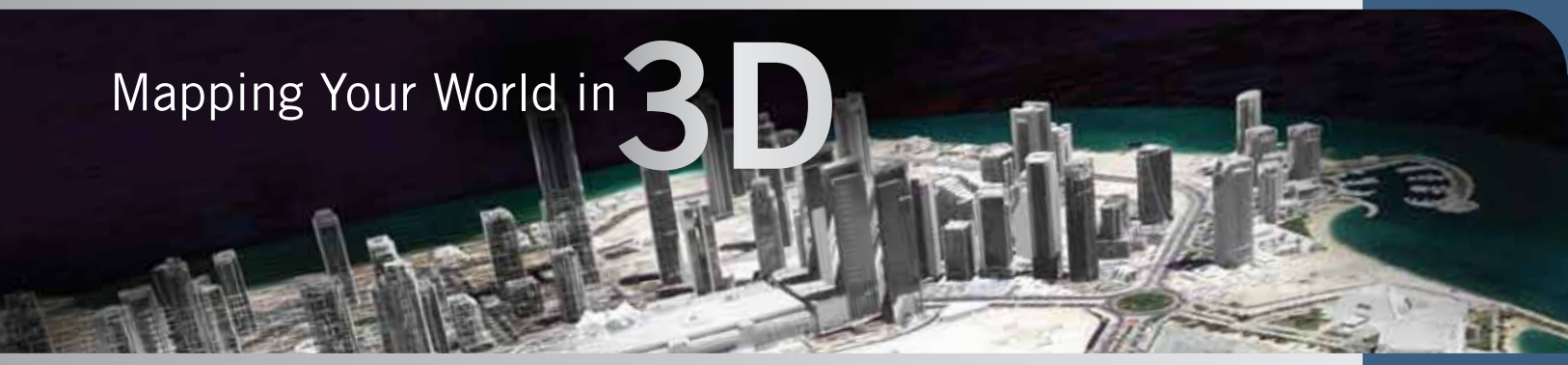

ComputaMaps understands the unique challenges that RF and performance engineers are facing as they plan and optimize their networks. Fundamentally, you require the most accurate representation of your network so that improvements achieved in simulation will be realized once implemented. Our 3D City Planner models provide the accuracy that engineers demand. We currently have over 200 cities in 3D suitable for wireless planning – and we're working on more every day.

4D City Models

Many of our customers have made large prior investments in 3D city models, which can become out-of-date within months or years, especially in rapidly developing cities. We have developed a methodology to provide an update service whereby we identify all demolished, modified and newly-built structures and incorporate these changes into a fresh delivery. We have named this product 4D City Models, typically supplied with an annually recurring subscription, to ensure that radio engineers always have access to a consistent and constantly updated model of their planning environment.

Understanding the 3D Production Process

The most precise geodata available is 3D city models, or City Planner data sets, available at 1-5m resolution. This data will be accurate to the resolution specified in the x and y axis, as well as for height (the z axis). More advanced urban propagation models can generate predictions in the horizontal and vertical planes, allowing for tremendous accuracy in modeling canyoning effects, diffraction, reflection, etc. Given the complexity in creating these models, and the level of detail provided, they are typically only used in urban areas.


ComputaMaps at Mobile World Congress

Key Purchase Considerations

- Compatibility with RF/microwave planning tool and GIS applications
- Works with specialized models (e.g., ray-tracing model for urban modeling)
- Quality and accuracy of product
- Track record of geodata vendor (e.g., how many years in business?)
- Vintage of source data
- Product availability

Integration with RF Planning Tools

ComputaMaps can deliver data in the correct format for use with leading planning tools:
Aircom Asset
ATDI ICS telecom
Forsk Atoll
Mentum Planet®
TEMS Cellplanner
And more...

Support for Specialized RF Models

- Orange Labs Model
- Wavecall WaveSight
- CRC-Predict
- Pace 4G
- AWE WinProp
- And more...

Focused on Telecom

With our focus on the telecom market, ComputaMaps attends the large regional trade shows as an exhibitor. Even if we aren't exhibiting, our people will attend shows in their territory making these events a great place for us to catch up on industry trends and meet with our valued customers.

Innovating in Telecom Geodata

At ComputaMaps we are constantly striving to do things faster, better and inject technology into processes to make them repeatable and scalable. Our business has grown through the years and we've scaled our operations accordingly, while retaining all key production steps in-house. Our speed of development means a constantly growing catalogue of data.

Our extensive production allows us to innovate in our business processes as well, such as through the development of the Change Detection and Update Service. Through this service we can advise a customer on what exact parts of their data set are stale and require an update. Of course, our constantly growing global catalogue also allows us to deliver innovative products such as 4D City Models.

Your Global Supplier for Telecom Geodata

ComputaMaps is a privately-held business dedicated to the creation and delivery of geodata to the telecom industry for customers around the world. We ensure quality throughout our production cycle by controlling all development. With innovative processes, we can scale our production rapidly and deliver high-resolution products quickly. This speed of production and the ability to generate data for any region of the world are key differentiators in our product offering. Our 3D catalogue of recent vintage data represents over 30000 km^2 and is growing daily.

ComputaMaps delivers its geodata products for use in all commercially available RF planning and optimization tools in a range of formats and for use with specialized propagation models. We also offer pre- and post-sales support in your time zone through our global offices.

To learn more about the ComputaMaps product portfolio, visit our website at www.computamaps.com

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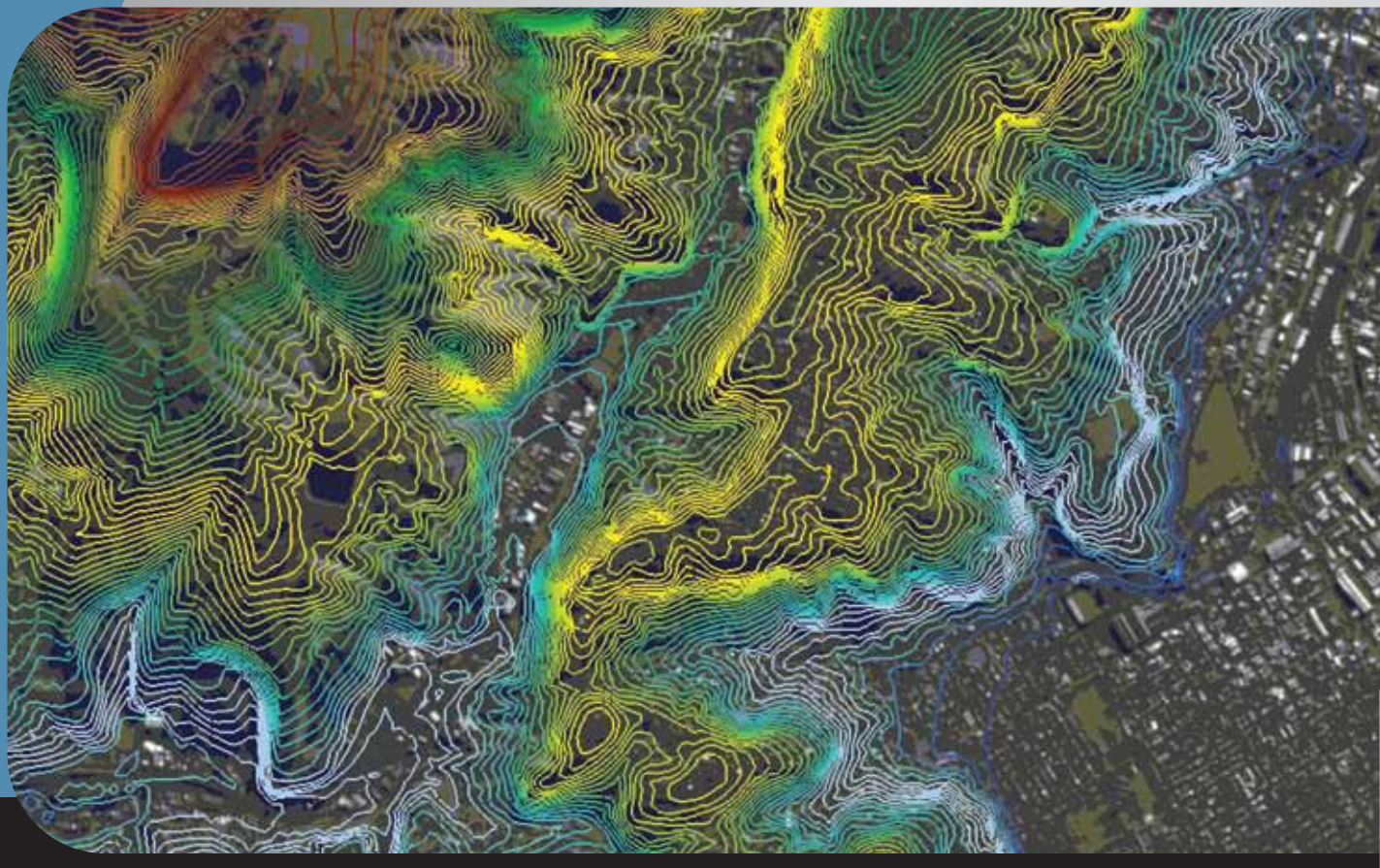

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