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**Introduction**

During 2014 the number of mobile devices will surpass the world’s population. Smart phone and tablet acceptance is fast accelerating and in common use.

Tablets in particular are becoming popular in Utilities, Telcos and Emergency Services for field use operation. Ruggedized covers conforming to MIL-STD-810 are available turning a standard tablet into military specification at 10% of legacy ruggedized laptop cost.

The LatLonGO® solution has been designed from the ground up to address today’s opportunities for mobile geospatial information systems (GIS). LatLonGO® provides the end-user with a system for distributing GIS information seamlessly to any touch client mobile device (iPad, Android and Windows 8 tablets) and web client.

LatLonGO® provides an up-to-date copy of corporate data and handles Smallworld GIS, ESRI ArcGIS and spatialNET natively (WYSIWYG) and any other GIS format via OpenGeo or FME. It can process data from any GIS format and serve it from any server, in-house or in the cloud.

LatLonGO® compresses, encrypts and distributes data for any client (touch or web), allowing users to work on-line or off-line any time without network access.

It is ideal for mobile workers who require access to their corporate GIS data "sometimes connected", even in remote or security sensitive locations where no web access is allowed.

**Product Positioning**

![Functionality Cost](image)

LatLonGO® is positioned at the “low-cost, high-user-count” spectrum of the GIS market providing simple review functionality and sophisticated business system integration capability for the majority of the Utility/Telco/Emergency Services user base.

LatLonGO® is both a mobile app and a web client. It is designed to enable field operator and Control Centre to communicate directly with each other in real time. Instructions and work orders can be sent to field crews and job completion reports returned directly to the Enterprise Resource Planning (ERP) system, Customer Information System (CIS), Outage Management System (OMS) or Distribution Management System (DMS).
The LatLonGO® mobility solution is a powerful geo-centric mobile integration platform to any other enterprise information system – enabling the Spatial Enterprise:

The biggest challenge for Mobility acceptance by the field work force is the management of complex business process flows by simple and intuitive software running on ruggedized tablets.

The ‘simplicity by design’ philosophy extends into sophisticated business processes by providing a Certified SAP Mobility interface to NetWeaver Gateway and SAP Plant Maintenance and Planned Outage use cases, as well as supporting dynamic GeoRSS layers for Unplanned Outage scenarios.
LatLonGO® Architecture - any2any™

- any data    - Smallworld GIS, ESRI, spatialNET, Oracle Spatial, OpenGeo, FME
- any server  - in-house, Amazon AWS, other
- any client  - iOS, Android, Windows 8
- any time    - on-line or off-line

any data
Special extractors have been developed for Smallworld and ESRI to preserve the source GIS symbology without loss of cartographic quality. The extractor performs in multi-node parallel processing mode to minimise tiling of very large geographic areas down to very low zoom levels.

1 New iOS versions always released first, followed by Android and then Windows 8 by demand.
While all major GIS now support the OpenGIS® Web Map Service Interface Standard (WMS), these and other defined standards rely on on-line connectivity to function. There is no single common mobile off-line data format supported by all GIS vendors to allow seamless data sharing between source data agencies.

The ESRI shape file (SHP) comes closest to this ideal and is a popular geospatial vector data format for geographic information systems software. It is developed and regulated by ESRI as a (mostly) open specification for data interoperability between ESRI and other software products – unfortunately feature symbology is not preserved requiring tedious re-assignment of symbology on target clients.

any server
Recent times have seen a noticeable shift towards cloud computing emerging in Government agencies around the World and the US Government has defined the top 10 priorities to further USG Cloud Computing Technology Adoption.

There are now many cloud service providers, none larger or more sophisticated than Amazon Web Services (AWS). A large offering of specialised services is available on the AWS platform to allow for seemingly limitless processing and storage scalability – or ‘elasticity’ in AWS terms.

Many utility companies still have security concerns about off-site hosting so we have designed the LatLonGO® mobile/web server to be universal. The pros and cons of cloud computing are still fiercely debated and ultimately come down to trust vs significant operational savings.

Advantages
- Access to a wide range of applications without download or installation
- Application access from any computer, anywhere
- No hardware or software expenditure
- Consumption is billed as required with no or minimal upfront costs
- Scalability of on-demand resources

Disadvantages
- Users do not store of their own data
- Provider dependence
- Business continuity and disaster recovery ‘out of control’
- Data migration issues during provider change-over
- Risk of provider going out of business

any client
Traditional web client applications provide a “single near identical” look-and-feel, while the “browser wars” typically result in the lowest common denominator (typically Internet Explorer) functionality web client:

A mobile application (or mobile app) is a software application designed to run on smart phones, tablet computers and other mobile devices. They are available through application distribution platforms such as the Apple App and Google Play stores. One of the major issues for mobile GIS software vendors is the requirement for simultaneous native app Apple iOS, Google Android, Windows 8 and web client support.
Without getting into the relative benefits of each OS, it is highly unlikely that a Utility would lock into one particular platform as the cost/benefits for either are a constantly shifting, leap-frogging target. Even if lock-in would occur on some customer sites, in order to gain maximum market reach cross-platform OS support remains a key requirement.

any time
The client/server architecture allows for sometimes connected mobile app state and incremental updates from office data stores and servers through mobile server connectors.

LatLonGO® Data Layering

We believe in giving our customers more choice than just Google maps.

LatLonGO® supports

- Bing Roads & Aerial
- MapQuest
- HERE
- OpenStreetMap, and
- Customer’s own base maps (ie State cadastre).

‘Internal’ overlays can be extracted by spatial, theme or project-based criteria. The transparent tile layering approach allows for easy interoperability between proprietary data formats using ‘external’ layers. The tile format is industry standard.
Parallel Processor Tiling Engine

While the Smallworld GIS extractor tiles 30 times faster and storing 40 times less data than the 2\textsuperscript{nd} best commercial offering we are aware of, we realise that major extract coverage or deep tiling zoom level (1:100) output requires significant computing resources.

For this reason we developed a parallel processor only limited by the number of computing nodes or licences available.

**Incremental Updates**

Any changes made to the original extract are supplied to the LatLonGO\textsuperscript{®} server and available to web and touch clients as incremental updates.

**Data Compression and Encryption**

The LatLonGO\textsuperscript{®} extractor stores data in highly compressed and AES-256 encrypted format.

**Highly scalable HTTPS Web/Mobile Server**

LatLonGO\textsuperscript{®} supports 250 concurrent users on a low spec 4-core VM with 4GB of memory.

Data volumes and display performance are optimised – in a recent benchmark the LatLonGO web server served over WiFi outperformed the source GIS connected over a LAN when displaying identical data sets to the web client. The administrator part of the server allows for the creation of user specific configuration files defining available base layers, user layers and other administrative detail.

Furthermore a quick layer preview is available for the administrator in order to compose specific configuration files.
Redlining allows for the creation of free-hand or structured drawings that can be associated with:

- notes
- photos
- voice recordings or
- GPS

It also allows for the selection/display/deletion of existing date-stamped redlines. Red lines can be named and grouped into logical place marks and are synchronised with the Mobile Server and subsequently the office GIS during the next client/server connect.

**Measurements**
Coordinates, length and area measurements can be made.

**Roving Map**
The tablet can be put into GPS lock to get a roving map display.
Internals

Any schematic representation is supported
LatLonGO® supports Network Tracing logic, depending on source data integrity (ie flow logic).

Network layer connectivity permitting, LatLonGO® is able to trace network segments between start and end points and collect attribute data (impedance) along the trace or identify shut-off blocks, for example.
Client App Integration

One of the advantages of the LatLonGO® native client is the easy integration of all pre-existing tablet OS functionality such as sharing via Mail, Twitter, screen capture, print or copy.

The example above captures the current map screen and emails it to a colleague, this may include redlining or additional text in the body of the email.

LatLonGO® uses URL scheme traversal to invoke other apps on the tablet, for example TomTom for off-line street navigation.

This process works in reverse, for example the SAP/Syclo Work Manager or any other app can be configured to request the display of a LatLonGO® object on a map.
SAP Integration

SAP integration with LatLonGO® is achieved in a number of different ways:

- direct through NetWeaver Gateway (SAP Certified July 2013)
- via SAP/Syclo Work Manager client app, one-way now, two-way awaiting SAP SMP3.0
- as embedded SAP-GUI LatLonGO® web client
Field Notifications from LatLonGO® to SAP are supported, extending the certified interface from a read/online to write/online with read/write offline in the road map.
Google Integration

- StreetView
- Google on-line Street Navigation
- Free text search across entire data base extract or Google address
- Permalinks (simply rendered so as to be human-readable)

GeoRSS Support

In GeoRSS, location content consists of geographical points, lines, and polygons of interest and related feature descriptions.

GeoRSS feeds are designed to be consumed by LatLonGO®.

By building these encodings on a common information model, the GeoRSS collaboration is promoting interoperability and "upwards-compatibility" across encodings.²

The web client runs on all modern versions of standard web browsers.

The client interface is identical to the mobile app version, except for tablet specific functions (camera, GPS, voice).

Free text search for asset attributes is instantaneous.
Client Help System

While the product philosophy remains “Simplicity by Design” a comprehensive client help system is included.

The Help System can easily be customised to include more specific instructions at deeper help nesting levels.
**App Store Distribution**

For ease of distribution the free LatLonGO® client app is available in the Apple App and Google Play Store as well as the SAP Mobility App Store.

**Product Support**

Extensive Server Administrator documentation is available. In addition we-do-IT has 30+ fully qualified Smallworld resources (highest number in Australia, more than GE) for support.

Our SAP & GISconnect Smallworld GIS interface resources have unique skill-sets while a dedicated full-time team of global resources is in place for on-going product development.

Product installation/training effort is minimal (Smallworld <1 day, Server ½ day, client 1 hour).

**Product Customisations**

we-do-IT can customise LatLonGO® to fit with specific client requirements.

A fully documented API is on the development road map to allow partners and customers to add their own customisations.

**Conclusion**

LatLonGO® is a Mobile GIS for distributing office GIS information to web browsers and to mobile devices (iPad, Android and Windows 8 tablets). It can load data from a variety of GIS formats into cloud- or local-host based storage and compresses and packages the data for mobile tablet devices, allowing them to work offline (without network access).

For utility office workers and field crews who require access to their organization’s GIS data, even in the field where no communications network exists, LatLonGO is a connected or disconnected GIS.

It is focussed on review and simple redlining on web browsers, iPad, Android and Windows 8 tablets, and unlike other solutions the product shows the utilities' GIS data over any number of base maps, providing a simple user interface aimed at the majority of GIS users and provides the useability typically found on consumer mapping sites and mobile apps.

The goal of the architecture is to provide a framework for optimal "sometimes connected" use of GIS data by field personnel. For the foreseeable future, useful outdoor wireless network coverage (WiFi, 3G, 4G, etc) will be incomplete compared to the service area of utilities. This means utility field crews are unable to rely on wireless networks during day-to-day tasks.

However, a large amount of useful information is available online, so a completely disconnected solution loses out on all this.

The optimal solution is software based on a "sometimes connected" assumption. This brings the benefits of both modes - functional reliability, plus access to online services and information. Where possible, enough data should be cached locally on the device for functionality to exist whether connected or not.

The architecture easily fits specific business requirements, for example an integrated SAP-GIS-DOMS environment for both planned and unplanned outages.
About we-do-IT

we-do-IT is a global provider of quality geospatial IT solutions offering full life-cycle support to clients in telecommunication, electricity, gas, and water utility industries. We specialise in FTTx Physical Network Inventory (PNI) development, training and support using Synchronoss SPATIALInfo, GE Smallworld GIS and other geospatial IT in a customer-focussed, vendor-agnostic approach.

Since 1995, we have created an international reputation and maintained a successful track record of delivering innovative spatial IT business solutions. We have offices in nine locations across Australia, New Zealand, North America, India and Europe. We are able to offer 24h global support.

Over the last 17 years we have worked on every GIS Business System Integration aspect imaginable and have accumulated a vast specialised domain knowledge base in the Telco and Utilities industry.

We source best-of-breed technology, staff and like-minded International partners to fulfil our customer’s needs. We listen carefully and work smart to turn our customer’s business needs into cost effective solutions. We offer right-shoring and highly competitive blended day rates.

Our we-do-IT (India) Pvt Ltd operation in Hyderabad is a wholly Australian owned subsidiary.

About the author

The author had his first ‘mobile GIS’ experience in 1984 writing a least-squares adjustment program in Z80-Assembler for a ruggedized Mettenmeier EF80 ‘Electronic Field Book’ with a two line 40 character LCD display.

During 1997 - we-do-IT’s second year of existence - two of the company’s most gifted programmers wrote “ITworx” designed to run on Win3.1 and 8Mb of memory. It was pen aware, had a seamless map base and scale dependant display, a Street Gazetteer, it would read and write Intergraph design files, had an MS-Access data store, interfaces to Smallworld GIS, Intergraph, MapInfo and SAP R/3 Batch Input (equipment, functional location, notification, work order).

It also did not sell a single copy as it had a highly specialised feature set with limited mass market appeal – a lesson in simplicity for LatLonGO®.