PT FREEPORT INDONESIA WEB GIS AND DATA INTEGRATION SYSTEM IMPLEMENTATION

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ABSTRACT

PT Freeport Indonesia is the largest Cu-Au mine deposite in Indonesia which is operated in the remote area of Papua in the eastern part of Indonesia.

Geographic Information Systems (GIS) had been implemented by PT Freeport Indonesia, especially for Exploration and Environmental monitoring since 2000. The GIS was managed by using mostly desktop GIS software. The centralized maps and other geo-science information were used the dedicated server folders; however the information integrity, process accountability is not optimal. Potential data duplication and versioning is occurs between different users.

Starting in 2009, PT Freeport Indonesia Management reviewing to initiate the integrated data and GIS system to deploy the related geo-science information through out the organisation. The vision is to have a single source of truth regarding Geographic Information System (GIS) that is supported by clear governance and accountability matrix to ensure the sustainability of the benefits.

The first phase of the GIS system integration had completed which is covered firstly the establishing prototype of the centralized database as an input to the GIS system and secondly is the prototype of the GIS basemap of mine infrastructure and geo-science basemap information. The mine information have published thought out the Web GIS are the Civil Geotechnical Hazard monitoring, Mine Surface Grasberg Prism monitoring and soon the DOZ Underground Hazard map will be released. Continue development and improvement is on going to enhance the performance, services and content of PT Freeport Indonesia Web GIS system which is proved to accelerate the information distribution.

Key words: Freeport Indonesia, GIS, Grasberg, Hazard Map
INTRODUCTION

PT Freeport Indonesia is one of the world's largest Au-Cu mine located in the central range of Papua, in the most eastern part of Indonesia. The total ore reserve reported in 2007 is 2.81 billion metric ton with average 1.04% Cu, 0.90ppm Au and 4.16 ppm Ag. PT Freeport Indonesia started its operation in 1972 after being granted the first generation Contract of work signed in 1967. Ertzberg (Gunung Bijih) ore body was the first ore mined, and in parallel during the mining operation, PT Freport Indonesia Geologists conducted mineral exploration activities to discover another ore body around the outcropped Ertzberg.

After the giant Grasberg Au-Cu Porphyry system discovered in 1988, Freeport Indonesia decided to expand the exploration area, not only to cover areas surrounding the Ertzberg complex but also to cover the main Papua island. The second contract of work call as the Contract of Work Block B (CoW-B) was granted in 1992 to conduct the green field exploration over the main mobile belt of Papua central range. During this period, the manual drafting and light table was used to review the exploration work progress. Light tables were commonly used by geologists to overlap several types of map to created the geological compilation for target review and target generation.

GIS system was introduced to all PT Freeport Indonesia geologists in 2000, the main work of this phase was to transfer the manual map to the digital mapping system, reprocessing the geophysical and geochemical information to the digital image and the last but not the least is transfer skills to all geologist on using computers for GIS and other digital data.

DESKTOP GIS

PT Freeport Indonesia uses Desktop GIS for 2D and 3D geological mapping and data evaluation. Several GIS software packages were implemented for different purposes and reasons. The different software applications created a new problem when users try to transfer and/or share maps and GIS products to other software packages requiring many hours of conversions and re-work.

Desktop GIS curently is still in use by Geologists who are required to generate their own interpretations and ideas when compiling maps, allowing different geological interpretations within the same area using the same dataset. However the approved final versions should be published and/or shared to the other persons.

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1 PT Freeport Indonesia, 2007 tour Companion, pp.6
The key of success for the geological data compilation and interpretation is the readiness and the standardization of the base map such as: topography, drainage, infrastructures, satellite and airborne photo images. Several standard derivative images may be generated from the geochemical and geophysical data. Special image from the geophysical and/or geophysical using specific data evaluation technique may be requested to highlight the potential of interest area.

Since 2000, PT Freeport Indonesia exploration geologists have been introduced to GIS systems to review their geo database including topography, geological, geochemical and geochemical maps and images. Digital spatial database gathering for geochemical data had commenced to support the digital GIS evaluation method. The data transfer method used was the direct digitation and data conversion from ACAD map to the database system which will then be combined with the laboratory database. The high effort of the validation was required in this stage, several data quality issues were discovered such as the duplicated samples, swapped sample and samples with no coordinate locations. The transformation from the paper based maps to the digital maps was initiate around 1996 by digitizing the paper product map.

By the expansion of roles and responsibilities, Geo Data management is not only managing Exploration dat but also the mine geology, geotechnical and other geo science relationships. Within PT Freeport Indonesia, desktop GIS specialists were hired for several departments such us Environmental, Tailing River Management Project (TRMP), and Social Outreach Local Development (SLD) department.

The lack of data coordination and no common framework, agreed process, and accountability matrix; which end up in a very silo oriented process in the geosciences data management resulting in redundant efforts and duplicate information. One of the primary intents of developing an enterprise GIS is to reduce the duplicative efforts and the limitations and deficiencies that result from inconsistent and disparate sources. GIS provides the tools and a systematic approach to geospatial data management that staff may use to reduce or eliminate redundancies and data inconsistency.

WEB GIS AND DATA INTEGRATION OBJECTIVES

The main objective of enterprise web GIS firstly is to publish and share the information within organization in the standardized format. Secondly by the the integration system data redundancy as well as file versioning issues will be reduced by the centralising and standardizing data. Ability to provide standards and update maps throughout PTFI, as well as integration with FCX global GIS architecture strategy, which over time, organizations and individuals will develop a well rounded experience and

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2 Tomy Indarto
education regarding GIS enabling them to take the fullest advantage of the technological and organizational setting available to them.

Data integration was designed using independent commercial database system (SQL base) which is will feed to the GIS system. This method selection rather than to use the existing geo-database attached in the web GIS system is proposed to improve governance, auditable database and information system, and transparency of geosciences information management, process, and system for area Geosciences. The advance of this choice is to reduce the data processing in the web GIS server and to enhance the data publishing to the web.

Using the separate database instead of using geo-database attached in web GIS package is to simplyfy the data entry and validation process as well as to standardize the standard database software used within PT Freeport Indonesia. Of course this strategy also proposed to reduce the confusion of user (data entry) as well as to reduce the potential redundently database. The separated database development was proposed to improve geosciences information integrity, consistency, transparency, reliability, scalability as well as clearer process accountability

The integration between the current and/or the near future geo-science related database with web GIS implementation is to streamline the data transfering and reduce the manual work. Improve the performance data presentation and reporting on the map, for an example is the rain gouge monitoring should be deploy and plotted in the real time base.

SYSTEM DEVELOPMENT ISSUES AND CONSTRAINT

Not all GIS users are preferred the web integrated system. Especially, field geologist are demanding the quick access and rought data and map interpretation. They only want a rought map to guide the field geological mapping. In the nature, in the initial stage of exploration, they have no sufficient data for interpretation and reporting. The initial geological interpretation map may not published. During the exploration campaing, geological information will collected and build a solid geological interpretation map which is able to share and publish to the other parties.

During the initial stage of GIS development, some raw/ transactional data are not standarized and the worse is the data is not stored centrally. In some case the data is not store in the digital format properly. Creating a standard data format and gathering the scattered data trough out the organization is take some effort, but should be done. Data validation also requested before the data and/or information will store and published to the web GIS.

3 ibid
In the nature, the field data or information may contain the error. For example the sampling procedure done by the new employee with out following proper SOP may create the discrepency analytical assay of sample. Laboratory its self potentially also create an error for analytical assay report, the most problem is for typo error and/or sample swap. So some departments are worrying regarding the real time data publishing to the web GIS. The dicrepancy data may create the mis-interpretation of report. The automatic filtering by validation system may helpfull, however this system may required a complex argument. Some data generally only can validate by the expert people based on his/her experience to suspect the data issues.

Different version of basemap and different format of the map also generate the GIS integration. To validate the most updated map from different version of map is take time. Better knowledge of the interest area should be help to justified and which the most updated map. The map selection from different scale also required for publishing to web GIS.

INTEGRATED DATABASE RELATED TO THE WEB GIS

Data Integrated is involved three databases catagory which are Exploration database, Mine and the vicinity Geo-hazard monitoring and Environmental monitoring. All three database catogories are recognized as the critical data for baseline and monitoring (Figure 1). The data should be maintainance and to be kept as long as possible during the mine live time plus the mine closure period.
Figure 1: The Schematic proposed of PT Freeport Indonesia Integrated Data Related to Enterprise Web GIS (revised on Aug 2011). The different type data transactional are grouped by the database system, aggregation and/or pre processing data may required before feeding to the Enterprise Web GIS system.
FUTURE WORK

The direction of future work using the enterprise geosciences web is to further refine the usability and user friendliness of the map services offered, to further integrate GIS data products to other mining systems within PT Freeport Indonesia as well as providing additional data entry and delivery channel using mobile devices. There are opportunities for in-the-field geological mapping data entry and GIS map assisted sample collection using GIS map capable mobile devices. The data may then be aggregated in a centralized repository and be available to the GIS users in near real time as publish-ready data provided QC checks and data validations are rigorously applied during data entry.
CONCLUSION AND RECOMENDATION

1. The GIS and data integration system developed within PT Freeport Indonesia is in the innitiation stages. The common problem is the standarized data and format as well as the centralized of the data.
2. Using the integration system should reduce the current issue and improve the information dissemination and sharing with in the organization.
3. The more importance is the success of the change management, change culture for data collection, data quality and information management awareness.
4. Dedicated person to manage the system and process may required to asure that the system are working properly and information updated in the timely manner.

Reference

1. PT Freeport Indonesia, 2007, 2007 Tour Companion, PT Freeport Indonesia