The GIS Project at Rio Tinto Exploration

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Marcelo Braghin
RTX Global GIS Manager

The vision...

Provide Exploration with comprehensive, coherent data and enhanced digital tools and systems, to enable Tier One discoveries and increase the effectiveness of the exploration process.
Agenda

Background

Business Problem and Solution

Benefits of the GIS Project

Selected Solution Components:

• Infrastructure

• Design

• Application

Sample 3D and 2D analysis

Questions
Background: Rio Tinto at a glance

– We are a leading global business delivering value at each stage of mineral and metal production
– We employ approximately 71,000 people in more than 40 countries
– We fulfil vital consumer needs and improve living standards
– Our commitment to safety is fundamental to the way we do business
– Sustainable development is at the heart of everything we do
– Underlying earnings in 2012 of US$9.3 billion
RTX approach

- Clear strategy
- Rigorous global prioritisation
- The right people in right places
- A range of tools and innovative techniques
- Delivery of Tier 1 discoveries
Traditional approaches and exploration innovation
Where we operate

We currently explore for 7 different commodities over 20 countries

Aluminium
Copper
Diamonds & Minerals
Energy
Iron Ore

- Greenfield projects
- Brownfield projects

GIS Project
RTX has a 65 year tradition of discovery

<table>
<thead>
<tr>
<th>Year</th>
<th>Project</th>
<th>Commodity</th>
<th>Country</th>
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<tbody>
<tr>
<td>1947</td>
<td>Lac Allard</td>
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<td>1962</td>
<td>Tom Price</td>
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<td>Borates</td>
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<td>1968</td>
<td>Rossing</td>
<td>Uranium</td>
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<td>Paragominas</td>
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<td>Diavik</td>
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<td>Potash</td>
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<td>Resolution</td>
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<td>2012</td>
<td>Saskatchewan</td>
<td>Potash</td>
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- 16 of the 25 discoveries were in developing countries with 5 impacted by sovereign risk
- 3 of the 25 came from junior company alliances (Argyle, Lihir, Diavik)
- 7 discoveries were sold in FS or after commencement of production
- Typically > 10 years from discovery to production
65 year track record of discovery success

GIS Project
Problem definition

• Current GIS approach within Exploration:
  – Disconnected infrastructure
  – Multiple GIS applications
  – Decentralized and unstructured data

• Challenges
  – Exploration data is a local rather than corporate asset
  – Geo professionals use different GIS applications which can hinder communication
  – Data sharing between GIS applications is difficult
Solution: Unified GIS platform based on ESRI applications

- ArcGIS desktop / server and mobile
  - Modified to include selected plug-ins, tools and extensions
- Unified infrastructure
  - Hub and spoke design
- Common business processes
  - Workflow based on ESRI Geodatabase
- Common training and support
  - Application and process training
- Common central database
  - One “source of the truth”
  - Supported with spokes to for faster, local access
Solution requires change

Current

Mapinfo or ArcGIS
Identify & download GIS data from local server
Analyze / edit data using local standards
Maintain data on local servers and desktops

Future

ArcGIS
Identify & download GIS data from Hub and Spoke as a cache
Analyze / edit data using global standards
Maintain data using global protocols on central Hub
## Benefits of the GIS project

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Details</th>
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<tbody>
<tr>
<td>Improved data quality and consistency</td>
<td>- Enable more confident and informed decision-making</td>
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<tr>
<td>Improved data management</td>
<td>- Ensure that our data is treated as the valuable asset that it is</td>
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<td>Increased consistency and reduced duplication</td>
<td>- Optimise staff time on value adding activities</td>
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<td>- Minimise ramp up time for staff moving from project to project</td>
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<td>Increased opportunities to leverage synergies</td>
<td>- Provide for integration with new, improved applications (3D, mobile apps/field data capture, visualisation and solution discoveries)</td>
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<tr>
<td>Improved data discoverability and analysis</td>
<td>- Maximise geoscientists’ time on data analysis</td>
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<td>- Facilitate data sharing, collaboration, and innovation</td>
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Infrastructure: Hub and spoke architecture puts data close to the user
Design: Conceptual architecture for GIS platform

- Sharepoint
- Metacarta
- External Map services
- ArcGIS Server
- SDE Geodatabases
- ESRI Data Appliance
- ESRI replication
- File Geodatabases
- Imagery
- Imagery
- SQL Server ETL
- RTX SQL Databases
- Flexi Cadastre
- DAP
- ArcPAD
- 3D packages

GIS Project
Application: ArcGIS 10.1 desktop

• Benefits of new ArcGIS Package:
  – Puts everyone on the same system, facilitating future upgrades
  – Gives users enhanced functionality (plug-ins)
  – Performance enhancements (Rio Tinto specifics)
  – Provide RTX standards (style sheets and templates)

• Components:
  – ArcGIS 10.1
  – Plugins:
    • Geosoft plug-in / Target for ArcGIS
    • xTools Pro
    • Metacarta plug-in
    • ET Geowizards
    • Customized Geodatabase plug-ins
  – ESRI Extensions:
    • Spatial Analyst
    • 3D Analyst
    • Geostatistical Analyst
Mag grid: captured from Geosoft DAP

Drilling: ETL from acQuire to SDE Geodatabase

Grade shells: Leapfrog imported as multi patch in a file Geodatabase
ArcGIS 3D Capabilities and Integration
ArcScene 10.1

- LiDAR topo in a file Geodatabase
- Drilling: ETL from acQuire to SDE Geodatabase
- Grade shells: Leapfrog imported as multi-patch in a file Geodatabase
ArcPAD
Data is easily brought into the field using a combination of ArcPAD and Trimble Juno

Mag data from geophysical survey
• Anomalies identified by geophysicists
• Roads for navigation
• Claim boundaries
• Viewed in ArcPAD and used for Anomaly checking while in the field
Surface Samples
ETL from acQuire to SDE Geodatabase

Standard symbology applied
Daily updates in a versioned SDE Geodatabase
QUESTIONS?