Vision to Reality: How Reliance Jio used GIS to build India's largest 4G Network

Reliance Jio promises to shape the future of India by providing end-to-end digital solutions for businesses, institutions and households; seamlessly bridging the rural-urban divide. Jio aims to enable this transformation by creating cutting-edge voice and broadband network and a powerful ecosystem on which a range of rich digital services will be enabled.

Jio envisions an India where broadband networks, affordable smartphones, availability of rich content and applications are basic necessities consumed in abundance, equally by individuals and businesses, in far-flung villages and large cities, in line with the Government of India's 'Digital India' vision. To realize this vision, Reliance Jio embarked on creating a complete ecosystem comprising of future proof infrastructure, services, service delivery platform and service access mechanisms.

To begin with, Jio created an extensive, future-proof, end-to-end, all-IP network across India to provide next generation digital services. Jio acquired pan India spectrum in 2300 MHz, 1800 MHz and 800 MHz bands in all Telecom circles of India investing over US $ 5 Billion. Jio has planned over 100,000 4G LTE cellular sites. Jio has also laid more than 250,000 kM of fibre-optic cables, covering 18,000 cities and over 100,000 villages, with the aim of covering 100% of the nation's 1.25 Billion population by 2018. FTTx Network will have 250,000 kM of additional optical fibre over next 2 years. This network has an initial capacity to serve in excess of 100 million wireless broadband and 20 million Fibre-to-Home customers.

Challenges

Building a green-field all-IP telecommunications network is a highly capital intensive process involving multitude of stakeholders like Network Planners, RF Engineers, Real Estate, Construction, O&M, Business, Projects and Finance personnel. Typical challenges faced by RJIL were:

- How to plan, build and manage this extensive network by project teams spread all over India?
- How to plan optimal RF Coverage using multiple frequency bands to ensure consistent and seamless service quality? How and where can technologies like Small cells and WiFi networks be used for traffic and cost of access optimization?
- How to specify, identify and manage network assets throughout their life-cycle?
- How to optimize both wireless and fibre networks during planning stage?
- How to acquire sites and RoW? How to manage paperwork, funds and title during / after acquisition?
- How to track project progress from scope release to Construction to Testing and Commissioning?
- How can multiple stakeholders across the organization participate in the extensive, end-to-end workflow in a collaborative but hierarchical manner for approvals of various types? How can everyone view and share the progress at each level?
- How to efficiently gather the field data and convert it to telecom inventory?
- How to create physical and logical inventory in a smart, automated manner ensuring maximum data flow-through and minimal manpower for end-to-end OSS operations?
- How to improve outage management efficiency to minimize network down-time, MTTR and manpower requirement?

Solution

Realizing the potential of geospatial technology, Reliance Group has been an early adopter of ArcGIS in several of their businesses. As such, use of ArcGIS Platform was preordained in Jio project. An enterprise level GIS was implemented at Reliance Jio, spanning multiple departments, thousands of users including planners, engineers, field workers and decision makers.

Highly experienced Jio GIS Team designed system architecture, geospatial data structure and application framework especially suited to Telecom industry so that ArcGIS became one of the foundation layer application platforms for Jio business. The solution also ensured implementation of telco-specific, end-to-end workflows to ensure systematic build-up of data ensuring only incremental efforts at each stage.

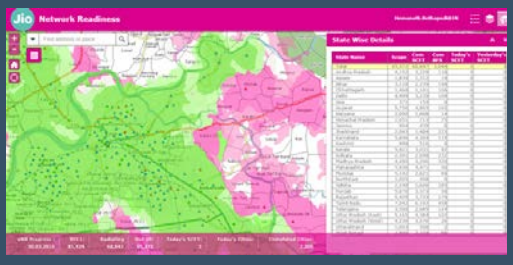
GIS was integrated with IT systems such as SAP ERP, CRM, BSS and Document Management System, Telecom specific applications like Atoll RF planning, Ericsson's NetworkEngineer & Granite Inventory, HP's Service Manager etc. ensuring end-to-end process management. Majority of the solutions are ArcGIS Server based web applications or mobile apps using Esri SDK. In recent times, most of these solutions are being migrated to Portal for ArcGIS ensuring that Jio's Enterprise GIS is in step with latest Esri geospatial technology.

Enterprise Services – Building a common foundation for all

To ensure consistent referencing across all teams, a common base map service "RMaps" along with routable road network service was developed. RJIL developed custom geo-locators to find landmarks, PoIs and their telecom facilities which is used extensively in all applications. In addition, services like Monsoon Progress helped ensure consistent planning and risk analysis across impacted areas.

Optimal RF Network Planning

Coverage created by Atoll RF planning tool is smoothened and projected using complex geoprocessing tools to visualize coverage in the spatial context and arrive at the right number of sites and their location. Based on the requirement and availability of sites with existing infrastructure providers, Jio professionals take decisions to own, build or lease facilities from other tower companies at required location. This has resulted in substantial reduction in CAPEX for the project.



Wireless Planning

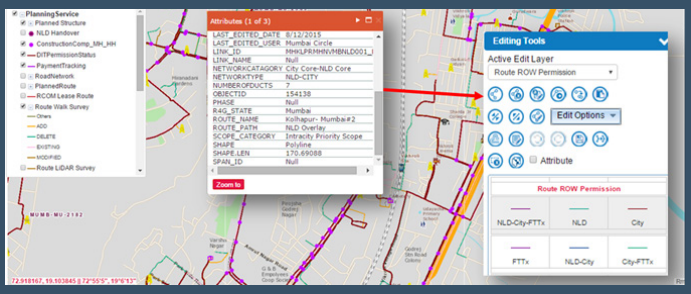
ArcGIS Workflow Manager was used to define an end-to-end, LTE Network Plan to Build project workflow. The extensive workflow comprises of 108 steps such as candidate identification, surveying, negotiations and acquisition, various stages of construction, testing, commissioning and optimisation. RJIL's LTE Workflow handles **more than 100,000 Cell Sites each with more than 250 different set of activities.** The workflow is integrated with SAP ERP for FiCo functions, Documentum system for all lease / purchase documentation, Ericsson's NetworkEngineer for inventory and other enterprise GIS systems.

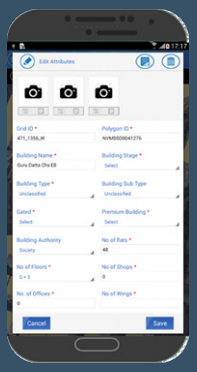
Use of this application during the project phase has not only resulted is saving of huge costs due to efficient workflow and avoidance of redundant site acquisition but, in fact, it would have been impossible to execute project of this magnitude across the whole country in the given timeframe without such an application .

Optimal Wireline Network Planning and Inventory Management

ArcGIS Desktop and web applications with RMaps, routing and geo-locator services are used for OFC route and network planning. NetworkEngineer is used to model telco equipment, create physical and logical inventory for both ISP and OSP areas using connectivity to trace the network.

Fibre to the home allows provisioning much higher bandwidth, rich content and applications to consumers.





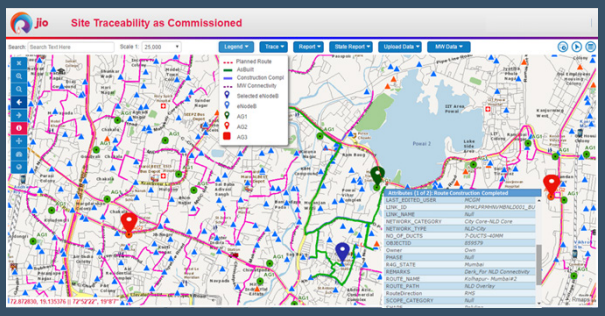
FTTx network planning requires accurate land base with demand estimation (home-passes and purchasing power) through field survey. In Jio, FTTx survey is carried out using Esri Mobile SDK based mSurvey application and captured field data is directly updated in GDB. Other wireline applications are also used in FTTx

Network Construction

No network design changes are allowed without update in GIS system with appropriate approvals. Link drawings and Construction Work Orders are issued using GIS application and ERP integration. As-Built network quantities are tallied with planned GIS route to ensure compliance, tracking and cost control. Esri Mobile SDK based Android apps were developed for As-Built data collection by field personnel. Paper-based As-Built mark-up and web based As-Built update in conventional manner is also available where mobile survey is not possible.

Project Progress and Spatial Inventory Management

Web based tools for Spatial inventory management are developed to manage the inventory data and perform detailed analysis which helps in decision making. Site traceability is one the most useful functionality to trace the planned and commissioned network. It allows network planners and operations staff to visualize Jio's all-IP network on map through 3 logical telecom layers – access, aggregate and core – during planning and operations

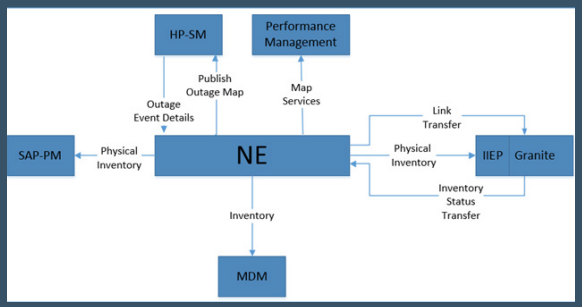


Mobile based progress monitoring dashboard for senior management to quickly review all important project KPIs in various geographic areas covering all modules – wireless, wireline and FTTx was developed.

Service Provisioning and Assurance

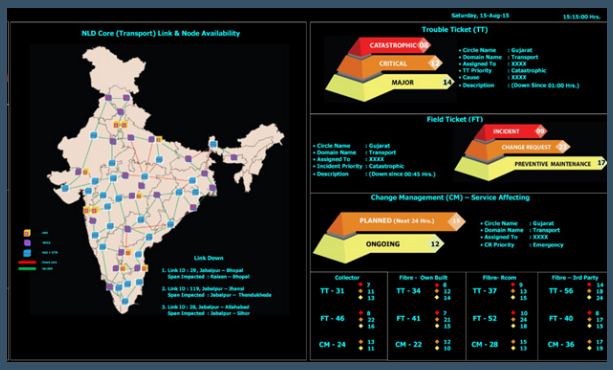
GIS is not only being used for efficient Network planning but also is a mandatory input for Service Provisioning performed on Ericsson's Granite platform which is tightly integrated with NetworkEngineer, a dedicated Telco solution on Esri platform.

Similarly, Service Assurance functions on HP platform extensively use various map and data services published from GIS platform for performance management and outage management.

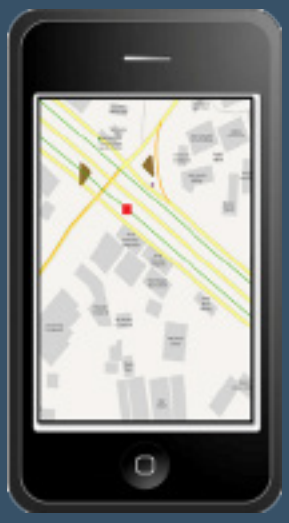


Network Operations

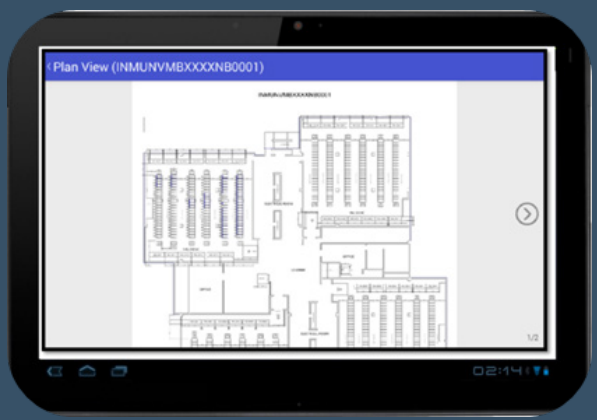
Network Operations Centre at Reliance Jio is laid out with several rows of desks, facing a video wall depicting geographic and schematic status of network and KPIs to monitor performance and availability of pan-India network. GIS and NetworkEngineer based analytical reports and maps facilitate this critical function at Jio.



Field Operations



To operate and maintain the inside plant (ISP) and outside plant (OSP) network in field, mobile and web based applications tightly integrating Network Engineer, Granite, HP-SM and fiber fault management systems are deployed for use by NOC and field users. These applications have resulted very quick restoration time and update of the As-Built network data after such repairs.



Benefits

Geospatial technology and ArcGIS platform have helped Reliance Jio to efficiently build an modern and extensive 4 G telecom network comprising of more than 250,000 kilometres of fibre-optic cables, covering 29 states, 18,000 cities and over 100,000 villages with an initial capacity to serve in excess of 100 million wireless broadband and 20 million FTTx customers through more than 100,000 facilities.

Jio estimates direct savings and productivity improvement of over Rs. 300 million during network build phase itself due to use of GIS for network planning, analysis and optimisation. Jio has also observed 2-3 times improvement in MTTR in field operations. This would result in payback of investment during project stage while continuing benefits during steady state operations will more than justify investment in GIS.

Jio services will be launched in the second quarter of 2016 when additional public-facing GIS applications will help improve customer satisfaction.

Customer Speak

> “Our successful GIS implementation has holistically addressed challenges of telecom network management through end-to-end, process based, integrated geospatial solutions, allowing collaborative work resulting in huge CAPEX savings and very high ROI.”

Milind Deshpande, Sr. Vice President,
GIS & NE Reliance Jio