GIS Asbuilt Data Capture for Network Inventory

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Abstract:

Reliance Jio business teams like Network Planning and Engineering, Construction and Operations and Maintenance rely heavily on GIS based Asbuilt application to capture telecom network inventory details for the assigned planned routes and integrate them with billing information. The application has been successfully used by 1700 engineers for both Intercity and Intracity telecom routes to capture data of around 2,50,000 kilometers (National long distance), 80,000 kms of Intracity and about 1,00,000 mobile towers.

Jio Asbuilt mobile app permits field engineers to create and modify network inventory details and replaces the slow-paced and clunky paper-and-pencil approach. This application is an excellent amalgamation of ArcGIS web and mobile technologies where assignment of planned routes and work-area details along with GIS quality checks is done using sophisticated ArcGIS web tools. The application is also used to create and update transmedia, splice and equipment information that has removed painful ways of manual work.

The mobile app has also allowed the field engineers to capture real-time images of the network inventory and update it back to the server which is a novel way of corroborating field work. The quality assurance team can review the same and accept or reject the findings which not

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only increases the efficiency but also the quality of Asbuilt results.	

Introduction

Reliance Jio Infocomm Ltd. (RJIL) possesses the largest high-speed wireless broadband spectrum across India. It offers various services on fixed (FTTx) and wireless (LTE) networks to 330+ million customers as of July 2019. RJIL has integrated GIS system with other systems and made it the backbone for entire network planning and engineering. Jio Asbuilt application allows the company to generate all details of the network inventory and assimilate it with the billing system. The application consists of three different modules and eight user groups with dedicated tasks.

High-Level Process Work-Flow (Asbuilt Module):

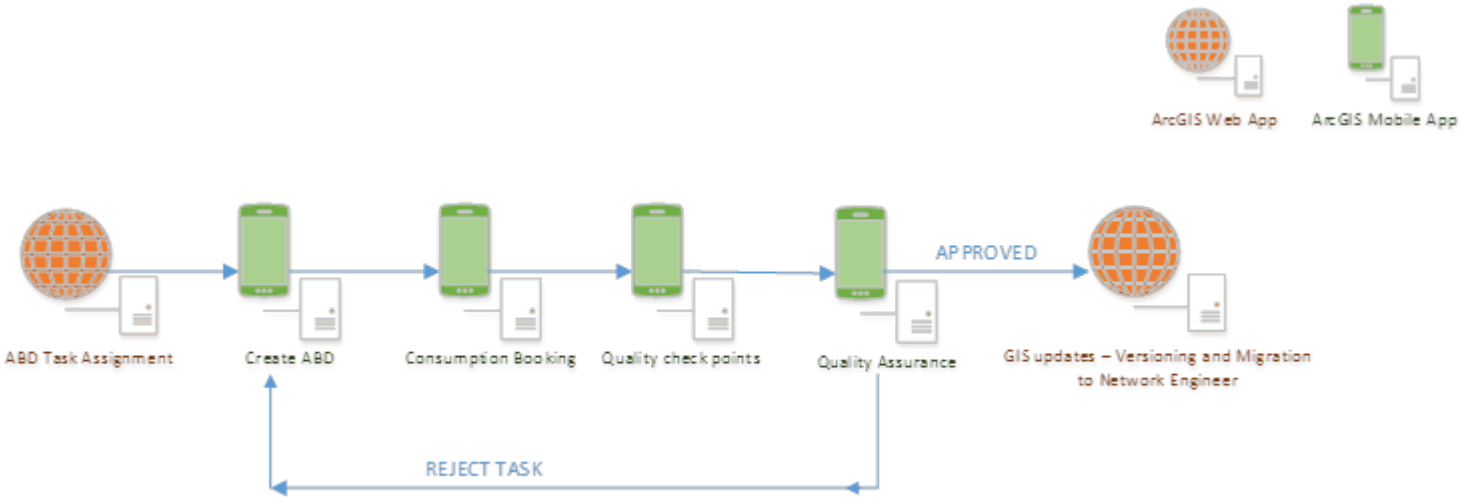

Fig: 1 - Asbuilt Workflow

The Asbuilt workflow begins with the assignment of a planned route (Fig 2) called as a cluster to the Fiber Engineer (FE) by the Maintenance Point Construction Manager (MPCM). These two users belong to the Construction Team. The planned route is depicted as a polyline in the ArcGIS web app and the MPCM user can select the link to be assigned via a combination of filtering options. The MPCM user can also use the ArcGIS

web app option of splitting the cluster polyline and assign it to multiple FE users. In Fig 2, we can see that the polyline

has been split into three different clusters (using three different colors in the ArcGIS Polyline API) and assigned to three different FE users. The FE user can instantly use his mobile app to login and click on the link assigned. As soon as the FE clicks on the link, the map zooms in on the assigned planned route (Fig 3).

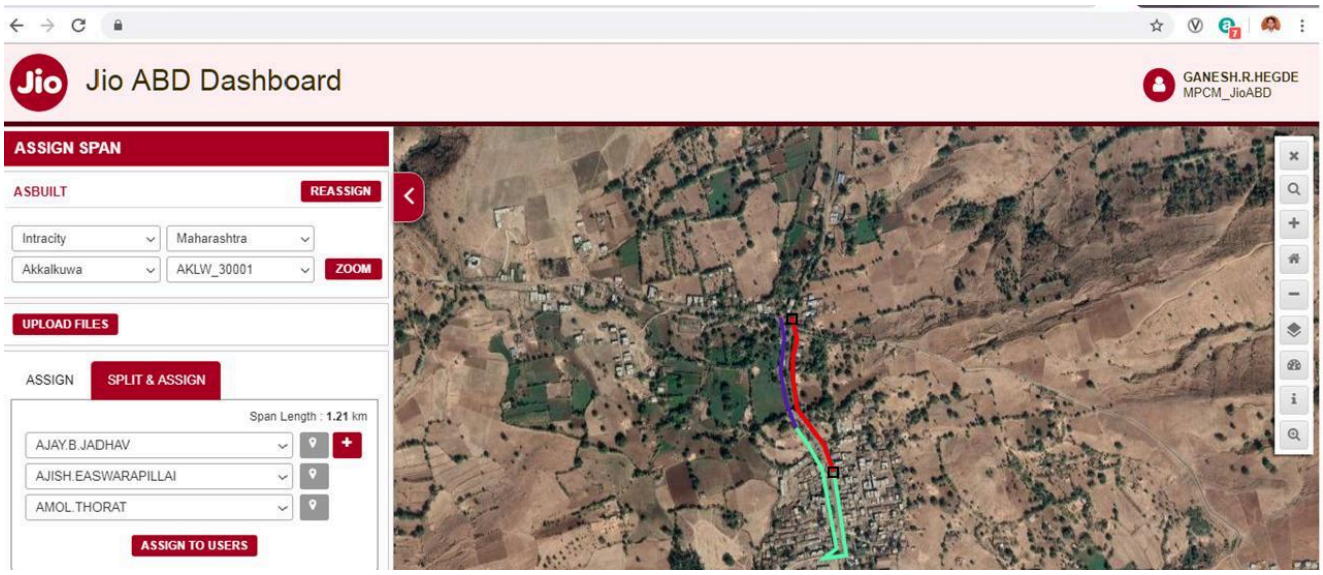

Fig: 2 - MPCM User Dashboard

Assignment of planned Route (Cluster) to three FE Users using a filtering mechanism

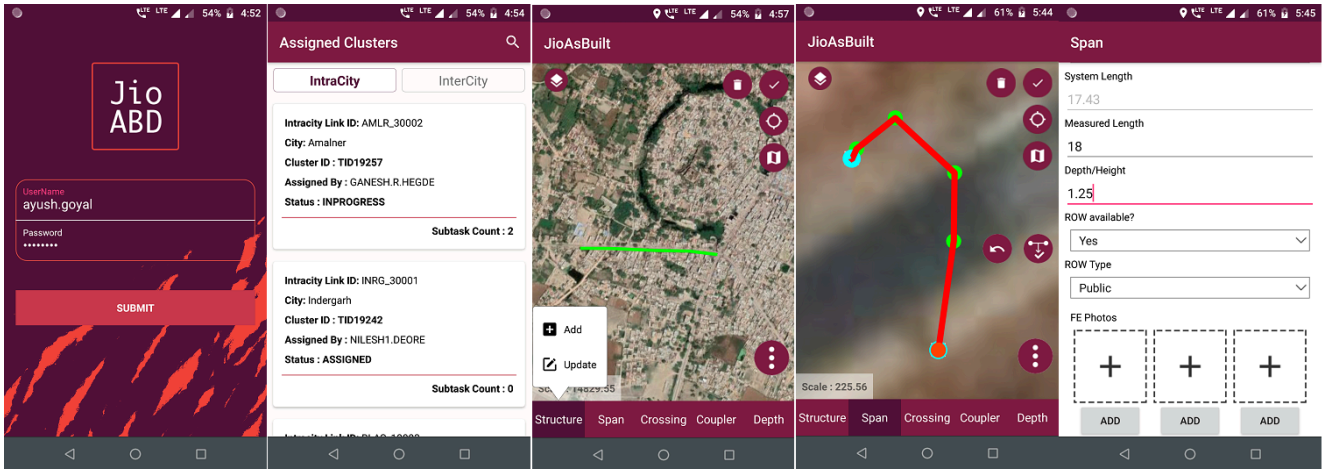

Fig: 3 - FE User mobile workflow

The FE user can select any of the network inventory options visible on the screen and add or update the geometry (polyline or point) depicting that inventory infrastructure. The FE also captures three images of the inventory from various angles that substantiates the presence of the inventory at that location. A new TaskID is generated in the backend database as soon as a new record is added, and a cluster will have multiple task IDs created. This TaskID coupled with the geometry attribute like system length in meters will then be used to associate with the consumption booking details of that inventory in question. Consumption booking means the actual Bill-Of-Quantity (BOQ) and Service-Of-Quantity (SOQ) used to install that inventory. This includes the billing of manpower resources, drilling, ducting, trenching and the installation costs for every route meter covered. The FE user also punches in several quality checks that give a clear picture of the condition of the inventory at the time of recording detail (Fig 4).

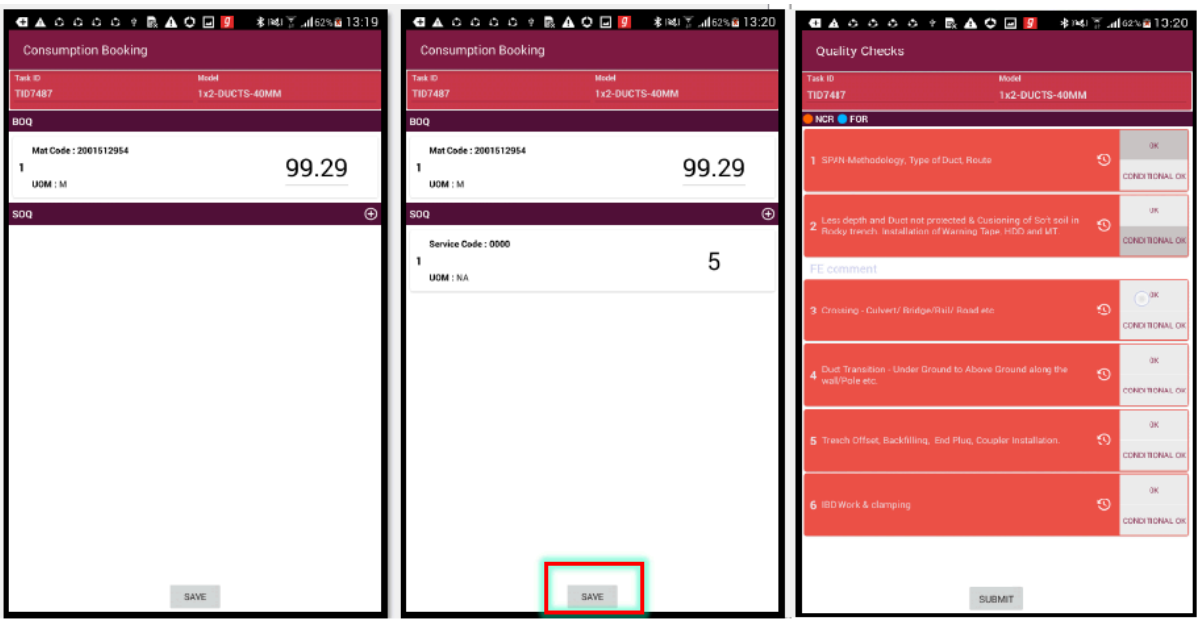

Fig: 4 - FE User mobile – Consumption Booking and Quality Check Points

After the FE user submits the entire updated cluster, the QA user springs into action and logs in the mobile app. Using a similar interface, he (she) clicks on a cluster-of-interest from a list of clusters. The QA user validates the details as provided the FE user and either accepts or rejects the cluster task(s). On rejection, the cluster task(s) is re-assigned to the FE user and he (she) is supposed to update the inventory details again. On approval, the action switches to the ArcGIS web app where the GIS QC user approves the cluster task(s). As soon as the

approval is confirmed, the versioning tool aligned with the backend ArcSDE geodatabase converts the unversioned data to versioned database. This task thus gets migrated to the Network Engineer and the Asbuilt task is complete.

High-Level Process Work-Flow (Cable Blowing Module):

The cable-blowing module is like the Asbuilt module, albeit with the following changes (Fig 5). The MPCM user in this case, assigns the span completed in the Asbuilt module to the FE user. The FE user logs into the mobile app and from the list of assigned spans, he (she) updates the cable blowing details. This includes addition and edits of the inventory items like transmedia (cables), equipments, splices and attachments. The consumption

booking module is also quite like the Asbuilt module and the billing system gets updated with these details. After the QA user approves these details, the GIS QC user uses the web app to migrate these details to the Network Engineer.

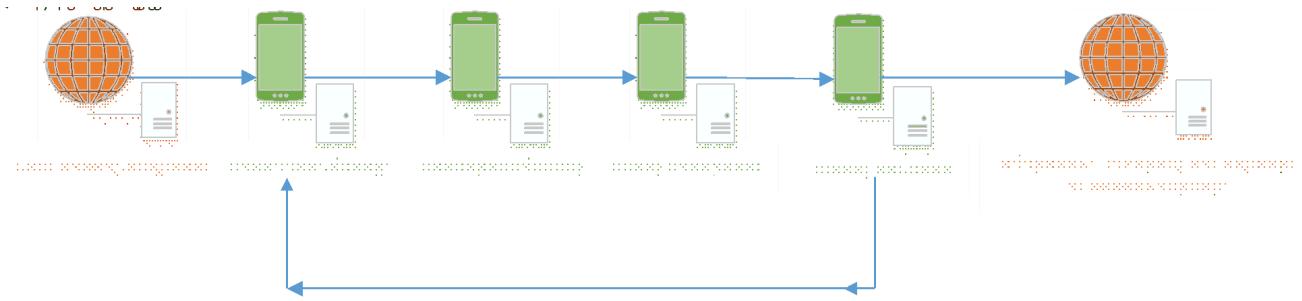

Fig: 5 - Cable Blowing Workflow

High-Level Process Work-Flow (ECN Module):

The ECN or Engineering Change Note is a vital part of the Asbuilt workflow involving users like MPCM and FE from the construction team and the NPE (Network Planning and Engineering) user from the Planning team (Fig 6). The first step in the workflow rests with the MPCM user who assigns the Planned Route to the FE user. The FE user logs into the mobile app. The interface for ECN is intertwined with the Asbuilt workflow screen as discussed in the previous pages. This allows the FE user to not only update the Asbuilt inventory features but also raise an ECN whenever he (she) feels the need to do so. ECN shows the change in the route taken to lay the

network inventory on the road as opposed to the route proposed by the planning team. The changes in the route were engineered keeping in mind the constraints on the field dictated by fluctuating natural or man-made phenomena that alters the road necessitating changes in the network flow. The ECN raised in the mobile app generates a unique Task ID and the MPCM user uses the ArcGIS web app to approve or reject the ECN geometry details.

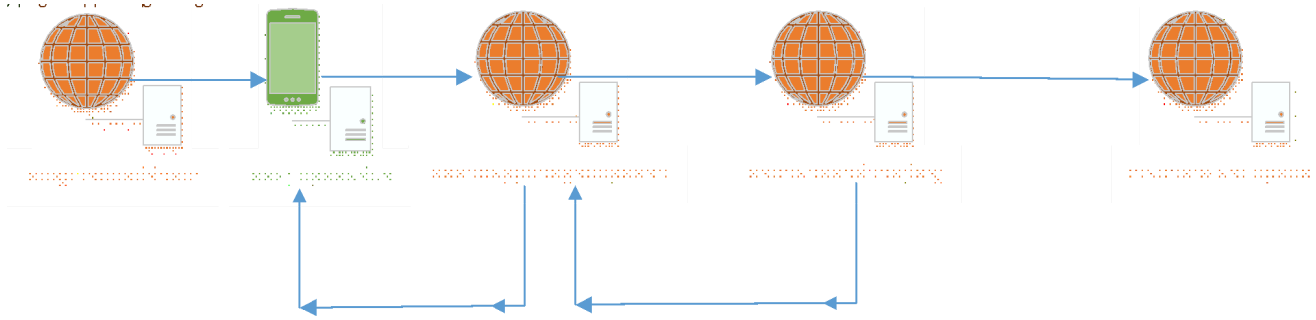

Fig: 6 - ECN Workflow

The MPCM user must also attach supporting documents using the web app detailing his (her)

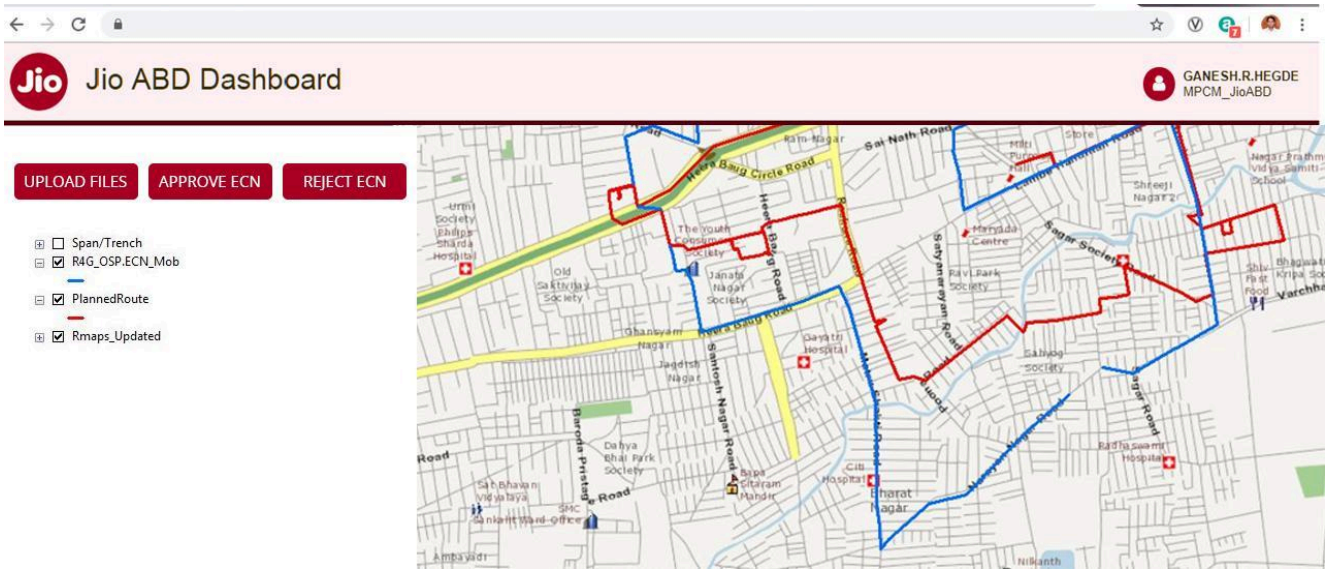

Fig: 7 - ECN versus planned Route as seen by the MPCM user

observations. Fig 7 shows the ECN details as seen by the MPCM user before approval or rejection. The red polyline geometry shows the planned route from a Tier 2 Indian city that was assigned to the FE user. The FE

user found changes in the Asbuilt route due to field constraints and raised the ECN accordingly. This ECN is shown as the blue-polyline and the MPCM user can see the changes before arriving at a conclusion.

The MPCM user's approval allows the ECN to move into the bucket-list of the Fibre Lead from the planning team for a second round of approval. If the Fibre lead rejects the ECN, then the task goes back to the MPCM. The Fibre lead must

provide suitable remarks for the rejection using the Web app. But if the Fibre Lead approves the ECN then it is considered final. The Deputy CTO can view the final ECN and the planning team needs to update and migrate the planned Route in the geodatabase.

Conclusion

1. Jio Asbuilt application helps Network Planning and Engineering team, Construction team and the Operations and Maintenance team in equal measure.
2. These ArcGIS based Web and mobile applications provide real-time data capture for network inventory. The instantaneous display of business information on feature layers has been a boon for multiple users across the company.
3. Jio Asbuilt network inventory apps have eliminated the painful efforts for generating Asbuilt document and creating inventory in Network Engineer which were earlier done using the traditional approach of paper and pen.
4. The Billing system gets an accurate value that reduces pilferage due to human oversight that happened in the older manual process.
5. An effective delegation of network inventory record management process is a direct outcome of this automation and integration with other systems.