

Migra- Next Generation Migration for Telecom Industry



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1.0 Introduction to Migration



Now, the communication service providers are faced with significant challenges as the traditional separated network become converged. The logical and physical network (OSP/ISP) information is of at most importance to any communication service provider. With rapid changes in technologies in OSS, Inventory systems there are an urgent need for the CSPs to move/adopt to new system/technologies. Since starting from scratch would lead to increased expenditures, Data migration serves as a one stop single solution for the CSP's to upgrade their systems in next generation model along with latest network data. Data Migration is the process of moving logical network and

physical network data (GIS) which speed's up communication service provider transformation and allow them to realize the benefits of their transformation investment much quicker. Data migration is all about transferring/re-defining data from a legacy platform to a target environment in the most economical way, with the least amount of business disruption and risk. The critical factor for data migration is to consolidate data and applications, to shift from one product vendor to another for the interest of service provider strategy or upgrade existing version of an application. Data migration is at the heart of the deployment process. In the telecom business, Inventory/OSS environments are being optimized to fit with Next Generation Migration strategies to reduce a greater extent of operating costs, rapid improvement of efficiencies and increased customer satisfaction.

In addition to this, present and future market trends, the mergers and acquisitions for the convergence of networks and services have become a factor for gaining a competitive edge, additionally the country's regulatory intermittent pressures have been greatly increased which has directed the focus on inventory application deployment or application upgrade to latest version, henceforth consequently required application data migration to run the business effectively in day to day operations

2.0 Business Challenges

Business challenges in Data migration can be broadly categorized into five types; which are Landbase challenges, Network Challenges, Application Challenges, System Challenges and Project Management Challenges, these challenges depend and vary based from project to project. The details are provided below.

2.1 Landbase Challenges

Telco companies are forced to acquire new landbase and few of them are purchasing latest center line due to demographic changes, rapid infrastructure development in the urban cities, government polices industrial growth, political decisions, etc. The data conflation methodology for landbase is changing and accuracy is increased in this recent past. Few of challenges listed below but not limited to:

- **Global Position System (GPS)** - Telecom projects require complete, concurrent and correct database. Team should hold an expertise and experience in issues related to street network, cadastral mapping, and parcel mapping. Data migration companies must have experience in complex activities such as updating land base by referring latest satellite high resolution images, civil survey, and GPS methods to get up-to-date land base data due to changes in demography, urban planning, government policies, industrial developments
- **Change in Coordinate system** - The coordinate system is a data frame property: Only one coordinate system is possible in each data frame in order to display all the layers in the same way. There could be a requirement of changing the co-ordinate system to the latest defined and sometimes as compliance to the Government ordnance.
- **Visualization Scale** -When the map contains quite a lot of information stored in different layers, some features should be shown only at a certain scale, if not they could be too difficult to distinguish (small scales) or the information provided can not suitable or not accurate enough (big scales). As an example, trench annotation each 500 scales, 200 scales are available, so depending on the map scale the most suitable data should be displayed accordingly
- **Symbology or Cartographic Representation** - Concerning symbols, a very important fact should be pointed out: need to be consider the user-defined rules, doesn't change the actual spatial geometry of the feature, feature symbols are stored within the geodatabase, stored as a property of a feature class, more complex map symbology or visualization, for better looking maps, store different types of symbols for different purposes, single interface to manage symbology instead of buried in the layer properties windows
- **Differences in Land base** - Many countries are undergoing projection refinements, improvements and datum changes that will result in positional accuracy differences in their published data. This is one of the big challenges, where the existing network has to be re-positioned to the newly procured land base without loosing its positional precision.
- **Positional Accuracy Improvement (PAI)** – PAI ensures positionally accurate and an updated network information for strategic decision making. What is PAI ? It is program that aims to re-survey the data to a greater level of absolute accuracy. The result being that features on the base map may “shift” by several meters. The effect of this becomes apparent when user data is overlain on the revised background mapping, thereby highlighting the discrepancies between the pre-PAI and post-PAI versions of the map data

2.2 Network Challenges;

Telco companies are expected intelligent Inventory management systems to allow users to define, configure, and place equipments in the Inside Plant and Outside Plant, later which will be integrated automatically with OSS systems. Most of the telco ISP data are maintained in XLS, Ms-Access and OSP is maintained in

legacy systems with out any process model. To get Intelligent Inventory system which has to face few of challenges listed below but not limited to:

- **Complexity of Network Models:** New Generation Inventory system has developed/customized tools which allow users to create specifications for complex outside plant objects such as structures (central office, cabinet, manhole), spans and span units (conduit, ducts, inner ducts); cables (fiber, copper, HFC, wireless), and equipment (MUX, FIC, DSLAM, NGDLC). Apart from this, each new component of equipment (chassis, slots, plug-ins, and ports) can be created; this was not with practice of old Generation Inventory management systems.
- **Engineering Business Rules:** Most of the telco legacy systems do not have business rules and use only simple queries. (Example: how many distribution points are available in an exchange area) There is a need to develop complex engineering business rules in enterprise system so that user can get an assortment of information (such as details of a particular cable which is running from one street to other street with their pair counts and relevant cables prime owners) which can be used to communicate and resolve network issues accurately.
- **Backlog Work and Updation:** Usually the mounting work orders are not updated in the network. These results in disparate and uncertainty of network information causing a mismatch with the actual assets installed in the field. There could be modifications /additions / deletions that could have happened for some time in the field due to the ever expanding business. These updates usually do not get reflected in the network inventory system. This also makes the network not synchronized with the OSS or logical database.
- **Poor Quality Network:** Some of telco's network quality is not up to the mark making it difficult to migrate the data to the new generation GIS systems. There could be various reasons behind this; a few to start with would be inaccurate network generation, primitive capturing standards, an outdated network etc.
- **Physical Inventory not synchronized with OSS:** As a general practice, telco's are updating the OSS first before they update the inventory network. Specifically on the Port management or LOC management, If physical inventory is not updated frequently (if not dynamically), the mis-match between both the network and the OSS system will increase. This would lead into serious quality issues in the end to end complete system

2.3 Application Challenges;

- **Data Model Analysis** - Mapping is the activity of identifying features or data elements that represent the target system. This includes analysis and consolidation of all source systems (with relevant issues to be considered) at the time of model mapping.
- **Application Re-Engineering** – Most of the legacy system are written/programmed in FORTRAN and C or C++ languages, so the present environment demands latest programming skills to modify or migrate the code from older system to newer system for end-to-end management of inventory systems.
- **Inventory System** – The system is considered a success only when the data model fully meets the needs and considerations of the various groups. In this regard, team should play a key role in collecting and analyzing data from various groups as part of business requirement methodology for current and future business requirements.
- **Custom Application development** – Custom application development to meet the required functionalities and performance parameters using COTS-based or bespoke solutions.
- **Integration with other system** - Conducting a study of their hardware, software, database, and EAI compatibility and evaluation & monitoring of the related risks to connect business critical information one system to other.

- **Data Migration Testing Issues**– There is a need to consider the technical challenges in source application and targeted applications along with subject matter expertise in telecom inventory for better testing of the migration application with their tools and data

2.3 System Challenges;

- **Short turnaround time** - Typically telco's freeze their data entry while performing data migration. During this period, data cannot be changed neither in the destination nor in the source system, so organizations must minimize/cut down the downtime for migration to a great extent. Very large data sets may even require benchmarking, established by measuring the amount of elapsed time for migration of similar smaller data sets, to ensure that required migration can be performed within an acceptable timeframe.
- **Unreasonable End-user expectations** - Setting customer expectations and helping them to understand the time and effort required to migrate data is critical to the success of the system.
- **Data Prioritization & Model complexity** - Depending on the complexity, the migration may need to be prioritized, moving some parts of the data before others and data from the source system may not map directly to telco COTs product because of its structure and multiple source databases that may have different data models. Decisions must be made as to how to best map the data to take advantage of features of the telco COTs product and need to understand COTs architecture and develop custom tools and data migration scripts to streamline processes to transfer the data from one system to other.
- **Inconsistent or corrupt source data** -Data in the source databases may not have consistent formatting, source raster data, vector data, digital data etc.
- **Limited options for accessing source data** -. There are application level restrictions on which objects or entities can be extended. The business must make a decision about which ones to extend. Some legacy systems may be limited in the formats provided for the export of data in this case, manual need to be analyzed the data
- **Hardware/Software Issues** -Need to be consolidation many operating platforms to one and evaluate current hardware capacity and also planned for large capacity hardware to run the consolidate data with effectively and need to be consider performance of the applications to run current/future business requirements. A separate plan need to maintained for software consolidation and issues need be track for centralized IT Management environment

2.5 Project Management Challenges;

- **Unrealistic deadlines** - Some would argue that the majority of data migration projects have "schedule slippage" as a standard feature rather than an anomaly. The challenge of many managers becomes to find alternate approaches to the tasks and schedules in order to complete a project "on time", or to get approval for slipping dates out. An "absolute" time-based deadline such as an externally-scheduled event or public holiday forces an on-time completion but, most project timelines do eventually slip due to faulty initial deadlines.
- **Communication Dearth** - Quite a few project managers and team members do not provide enough information to the stakeholders involved in a project, along with this is the lack of quality infrastructure and effective communication through proper channels.
- **Scope changes** - As most project managers know, an evil nemesis "The Scope Creep" is usually the PM's nightmare that continually tries to take control of the project.
- **Resource competition** - Projects usually compete for resources (people, money, time) against other projects and initiatives, therefore it's the job of the project manager to jump into the competition and compete for the best resources they are.

- **Uncertain dependencies** - The project manager and the team determine project dependencies, assessing the risk. Reliability behind these linkages usually involves trusting someone else's assessment.
- **Failure to manage risk** - A project plan has to include within it some risks, simply listed, but no further review happens unless instigated by an event later on...
- **Insufficient team skills & Lack of accountability** - The team members for many projects are assigned based on their availability, and some people assigned may be too proud or simply not knowledgeable enough to tell the manager that they are not trained for all of their assigned work. The project participants and related players are not held accountable for their results - or lack of achieving all of them.
- **Customers and end-users are not engaged during the project** - Project teams can get wound up in their own world of internal deliverables, deadlines, and process and the people on the outside do not get to give added input during the critical phases.
- **Vision and goals not well-defined** - The goals of the project (and the reasons for doing it), along with the sub-projects or major tasks involved, are not always clearly defined. Clearly communicating these vague goals to the project participants becomes an impossible task

3.0 Infotech Business Solution Strategy –Migra (A new concept)

Migra - a fool-proof data migration methodology takes into account not only the entire scope of a project but also other essential hidden requirements like Positional Accuracy Improvement, it delivers higher quality of data and improved applications, which typically translates into greater revenues and profits, thus nullifying the cost of investment. Migra gives an unprecedented level of confidence to the customer as it allows them to fully rely on the data and network for next generation network. The migration strategy determines the focus of the overall project as it involves analysis of source and target data models, planning of tools, exception and connectivity management as well as adherence to business rules and requirements. Migration plan developed in the strategy phase plans for data migration, building the intelligent data model and migrating applications along with data to a new NGOSS system. The new system is integrating or synchronizing with OSS systems as per business requirements, which results for all stakeholders to improve their process, turnaround time and ultimately is providing the best services to end-customers

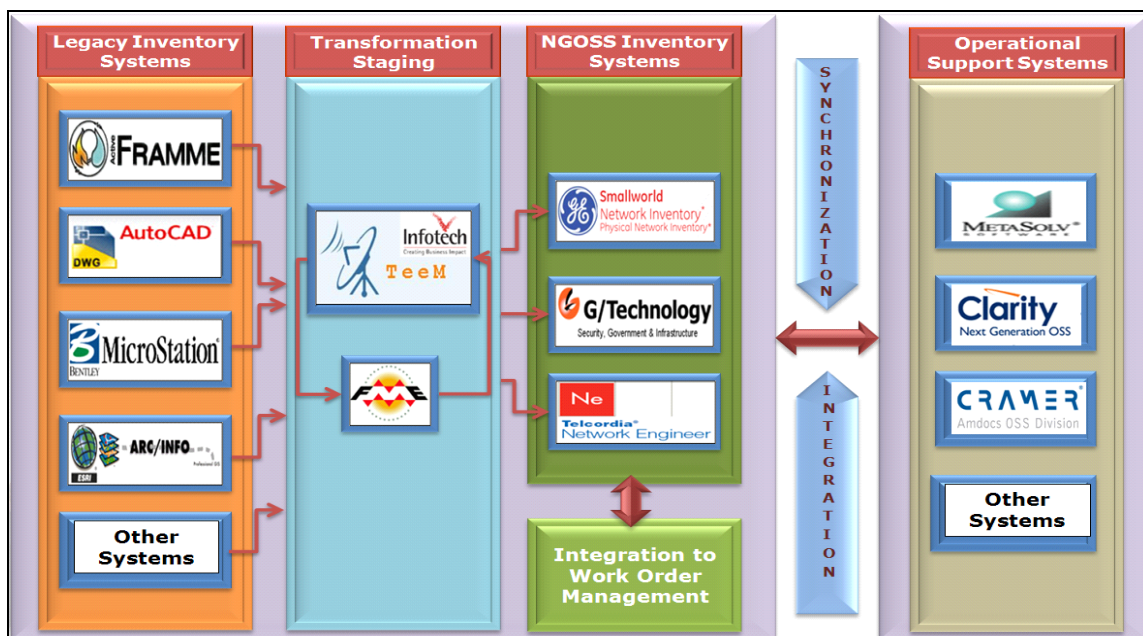


Figure-1; End to End (E2E) Data Migration with Integration Overview

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4.0 Infotech's Solution Approach

A service provider's inventory information needs to be complete, consistent, and concurrent. The systems must support a seamless operation, thus avoiding or reducing any costly intervention in the process, whether to perform a physical survey of the inventory or through multiple entries of data. Migration Company has a wide range of experience in integration and migration projects. Infotech technological skills allow us to define and understand the business process of both old, new and the upcoming technologies. The database design and administration experience allows us to understand the data structures and define crosswalks. The system development expertise empowers us to select the most efficient off-the-shelf data integration & migrations tools or write custom data integration & migration software when anomalies are too complex for simple solutions. The uniqueness of the Infotech solution Migra is: Provide a tailor-made solution; exclusively customized using proven process, end to end; after a through study of the existing network and requirement of the customer; by taking into account the commercial sensitivity of the migration.

The key point is Infotech solution success the experience with many Telco's from all over the globe and capability to understand the client needs, and Migra Methodology handles the whole migration program for telcos which including integration with OSS.

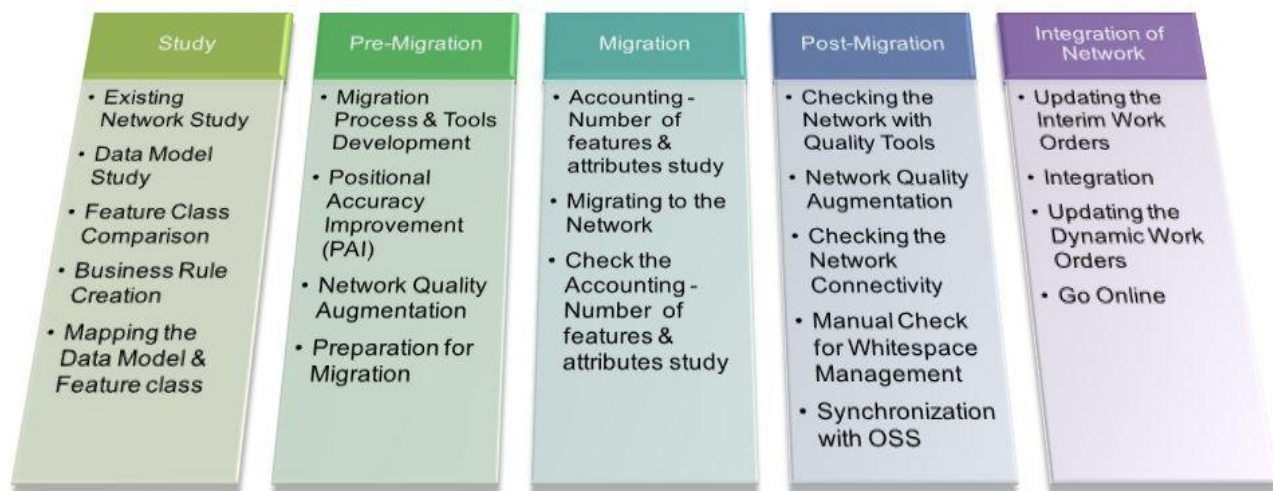


Figure-2; Infotech's Data Migration Approach (Five Phases)

4.1 Study

Infotech has large team of GIS professionals with expertise and significant experience on platforms such as ArcFM, ArcGIS, Smallworld, Intergraph, Bentley, Telcordia etc. They do have strong telecom domain knowledge, highly quality oriented, and an optimized technical approach built on years of production experience which allow serving better services to global telco operators across the globe. Team has including consultants, architects, developers, programmers, and implementation/integration specialists and system testers in various platforms with development languages experience (Microsoft/Java)

The legacy system and the target system requirement have to be studied in terms of data model, Feature class, Annotation, business rules etc. The data model and the feature class and annotation should be mapped with the target system. The following steps are followed during this phase

- Pilot & Production project plan preparation
- Business requirements or Requirement gathering
- Study and analyses existing GIS systems
- Gap analysis (Data model and Applications)

- Available Freeze Time & feature class comparison
- Data modeling mapping source to target
- Business rules creations & feature class & Annotation
- Data Modeling mapping with other systems (OSS/BSS)

4.2 Pre-Migration

Process and tools are the two important ingredients of the migration. The cost effective solution can be derived after defining the optimized process and the most automated / Semi automated tools possible. The existing network has to be re-positioned to the newly procured land base without losing its positional precision. Conflation or positional accuracy Improvement (PAI) is the solution for this. This can be optional according to the customer's requirement.

This step will be executed for whole data once. In this process data teams checks the data for connectivity etc. If any errors found, the corrections will be done on individual file and re run the Pre-translation until no errors found or will be informed to the customer based on the requirements. Pre-Trans is most important operation of the migration project where any of the errors that been unnoticed or looked over in the earlier operations are filtered and cleared. The network quality can be augmented to the acceptable level. The backlog work orders can be posted in this stage. The general quality issues like connectivity errors, attribute errors can be rectified. Various comparison and mapping tables will be created to enable the smooth migration. The following steps are considered during this phase:

- Migration process and tools configurations
- Positional accuracy improvement –For landbase and network
- Network quality augmentation - Bring to high quality
- Preparation for Migration by using internal process and pre-Migra tools

4.3 Migration

A cohesive end-to-end OSS solution will commonly involve multiple customization and integration activities, including integration with the network equipment and/or Element Management System (EMS), customization and integration of multiple existing or new OSS applications, customization of BSS applications and their integration with enterprise resource planning applications, as well as integration with partners' and suppliers' applications.

Data migration solution involves software assets, best practices “process templates” developed from repeated data migration projects both inside and outside of the telecom environment, and experienced resources. Due to the complexity of most data migration projects in Telecom, some vendors only focus on a part of the solution rather than an end-to-end process. For a project to be successful, however, the full data migration process must be addressed

The solution includes both software and professional services personnel with data migration experience associated with connecting to the data sources involved, understanding the data relationships, data cleansing, data transformation, and making the migrated data available to all concerned.

It is imperative to preserve the integrity all the features without any loss during the migration process. Hence, the number of features and attributes will be checked before and after migration. The following steps are followed during this phase.

- Accounting – Number of features and attributes
- Migrating to the network along with latest data
- Check the Accounting – Number of features and attributes

4.4 Post-Migration

The migrated network will be checked by various quality tools including connectivity, topology, association rules and various business rules for attributes. The network presentation and annotation placement will be checked manually for white space management. After the complete check, the OSS database can be synchronized and checked for its anomalies. This can be corrected to create a 100% synchronization between the network and the OSS data base. The following steps are followed during this phase.

- Checking the network with quality tools
- Network quality augmentation (optional)
- Checking the network connectivity
- Manual check for white space management
- Synchronized with OSS

4.5 Integration of Network

The migration of the network will be taken for execution as batch wise which comprising of a batch of Networks or individual network. The batch will be decided based on an analysis on the number of work orders expected to be processed with the Network

Production Integration: Integration architectures such as Service Oriented Architectures (SOA), Event Driven Architectures (EDA) and Enterprise Application Integration (EAI) - combined with Business Process Management (BPM) allow telco service providers to develop effective cross-application, cross-platform and cross-organizational business processes. Improving these business processes is the continuous aim for any CSPs. However deploying integration architecture is not only about implementing a technology, but also about adopting an approach and a set of principles to ensure the benefits of the integration architecture are reaped - not just short term but throughout its life-cycle.

Backlog Capture and Integration: While the migration process is designed to minimize impact on the production system, the migration process will require some time to perform. During the short time the telco operations will not stop, and to support this team has developed a robust methodology for the pre-recording of work in process, and the population of the migrated data with the correct Work Order data

Work Order Management and Integration: It is one of the best ways to maximize workflow efficiency. No longer will supervisors and workers be left waiting around for updation or verification that work is done. Sequential work can be started immediately upon completion, reducing downtime with each task. Planners/Field Engineer or GIS team simply look the status of work order to verify equipments and network cables which including civil structures to be inspected; view and mark tasks completed in the Inventory system. The below are the tasks for typical work order life cycle for telcos to follow the process and then integrate with NGOSS bases systems as part of work flow management

- Pre-post Network
- Posting Network
- Proposed Updating/Removal of Network
- White Space Management (WSM)
- Plot QC/Onscreen QC
- Editing/Fixing Errors
- Merge/Post Network
- Upload updated database into Centralized Database

Integration with OSS - The Next Generation OSS Integration is becoming more complex because of the shift to IP based service offerings and Fixed Mobile Convergence. The paradigm is shifting towards real-time managing of the network resources, and the demand of the business is for the OSS to be more agile, flexible, and less complex. If you are striving to take your OSS to the next level then becomes the obvious option. Our experts will undertake two classes of OSS project: OSS streamlining projects for existing OSS infrastructures, and OSS enhancement projects to support new service and technology introduction.

In view of the complex operational environment and time constraints, as well as the need to optimize capital expenditure and operating expenses, service providers face major integration challenges, first in terms of compliance with unique requirements, and second in terms of the integration of new applications with their legacy OSS applications and networks.

OSS solutions must be able to meet the service provider's business, technical and operational requirements both today and in the future. As a result, OSS solutions need to be designed with a complete understanding of these current and future requirements, both in terms of features and processes. The first phase of system integration encompasses an OSS solution architecture, customization and integration specifications, taking account of the service provider's existing OSS, network environment and business processes. The delivery of a complete OSS solution should include adaptation of the business processes, an impact study to identify potential organizational changes, and staff training to ensure that the service provider achieves the expected operational benefits for end to end solutions

5.0 Tools and Technology

Within the IT field, the need to migration data has been long understood, and there are a significant range of tools available on the market today. Each of these tools has its own unique capabilities, however the migration of Spatial Network Inventory data is a new and emerging subject matter of a majority of the current migration tools providers. In general terms we can define the existing tools as one of the following:

- Attribute centric tools
- GIS Migration Tools
- Network Migration Tool
- Enhanced Migration Tools
- Land base Migration
- Business Rules
- Work-flow Migration
- Exception Management
- Connectivity Management

5.1 Spatial Data Migration with Commercial ETL Tools –

Businesses need migrating data one (or many) systems to another from time to time. This is often a major headache for many large and small telco organizations to complete on time and on budget. Data migration can be even more complex when large amounts of data needed to be migrated from databases to databases from different vendors on different platforms. Migrating huge amount of data in heterogeneous environment is becoming a norm. The cost of failure is unacceptable because failed data migration project means a failed application project. In the market few spatial ETL tools are available which are not providing the solution as customer requirements where Infotech team play role to customize the tools and deliver the migration projects to telco operators. Here is Spatial ETL is comprised of three capabilities:

- Extract the data from its source
- Transform the data as required to make it usable

- Load the data into the destination view or dataset

Extracting Data from its Source - The first step in spatial ETL is extraction. In the extraction process, the spatial ETL tool gathers the source data for processing, copying it from its original location. This ensures that when transformation is performed in the next step, it can be done without impacting existing infrastructure

Transforming Data to make it Usable - Transformation is the core functionality of spatial ETL, as it is the process that converts the data into the format, structure and coordinate system that end users require. Transformation occurs in three forms, enabling users to:

- Translate spatial data into the format that the end consumer requires
- Restructure the data into the required data model and coordinate system
- Integrate disparate data into a single, central view or database

Loading Data into Destination Database- Once data has been extracted from its source, converted into the required format, data model, and coordinate system, and even integrated with data from other sources; it is time to load the data. The data can be loaded into either a destination dataset or a data view

The below are the few commercial Spatial ETL tools but not limited to,

Safe Software's - Feature Manipulation Engine (FME), is widely used spatial data translator that moves data quickly between a varieties of systems. During data translation, FME can perform a variety of geometric and attribute operations, since they were not previously associated with data translation.

New from PCI Geomatics – a GeoRaster Extract, Transform and Load tool for populating Oracle 10g Spatial GeoRaster enterprise databases. Take advantage of GeoRaster – a powerful feature of Oracle Spatial that lets you store, index, query, analyze, and deliver image and gridded raster data, and associated metadata.

5.2 Spatial Data Migration with Internal Migration Tools -

Infotech Customized Migration XMLs - XML (Extensible Mark-up Language) is most commonly used to migrate the data from one flat form to another flat form. XML is widely used to migrate the spatial data moves data quickly between variety systems by using migration tools. Data capturing flat form (TeeM) with Oracle9i is having capability to maintain the data in structured way the data will be translated through configuration file into XML format including attribute and spatial data. XML data will be validated to avoid migration issues in order to match the data model in target system.

Validated XML data will be migrated through XML translator into target system. XML translator will be having glue file (mapping file), which contains object level and attribute level mapping between XML and target system. Based glue file XML translator migrate the data from XML to target system.

Infotech's TeeM™ – Propriety Data Migration Tool

Infotech team has developed the TeeM `software is customized software, which can support the capturing the telecom network also in a most efficient way. The data captured in TeeM software is exported into XML format. The XML contains the spatial data including attribute data. The exported XML data is migrated into Target system (Smallworld PNI/G-Tech/NE) by using XML translator. The XML translator is

functioning based on the data-mapping file (glue file) between source and target systems.

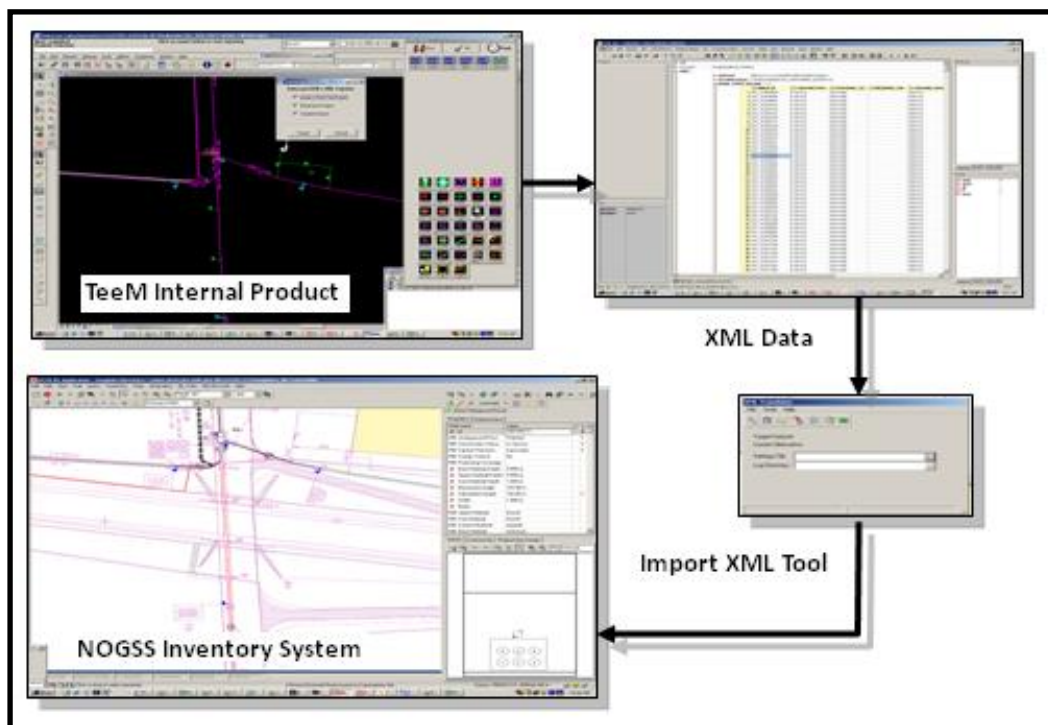


Figure-3; Migration Process Flow -TeeM to Next Generation Inventory System

6.0 Business Benefits

Infotech team will replace telco current fixed-line solution with a consolidated, convergent Inventory that places all network data in one repository, providing a single point of visibility across the network, and enabling telco efficiently track and account for all its network assets. As a result, it will be easier for telcos to plan and manage network resources and assure accurate service delivery across all its lines of business such as sales, marketing's, research, finances and other OSS backend teams and the below are few benefits not limited to.

- Faster, lower-cost data migration efforts
- Reduced risk of scope cutting, cost overrun, or project delay
- Improved data consistency across systems, processes, and organizations
- Increased responsiveness to the business
- Existing network will be used to the maximum extent.
- Positional accuracy improvement can be done along with the Migra program.
- By framing some business rules after discussing with customer, Migra can implement the business rules along with the migration.
- The network quality can be augmented
- Process will be developed to meet the requirement of target platform chosen by the customer.
- Migration can be made semi or automatic. This will be done after through study of the existing networks and the target network.
- Migra takes care of the large end to end program with very less impact on the current business; by reducing the freezing time
- Enabling telco inventory management end to end solutions to better tracking and monitoring the process

7.0 Conclusion

In our view, data migration has historically been under-valued, under-resourced and not treated with the attention it deserves. As a result, many major telco migration projects have failed either partially or completely. The remedy for these failures, we believe, is to accord data migration the respect it deserves: to coincide it in detail prior to the initiation of relevant projects and not as an afterthought. In turn, this will result in increased status for telco data migration as a discipline, which will, as a result, mean that more experienced and capable staff are attracted to this function. In a virtuous circle, this will then improve the practice of data migration, which will feedback into improved costing and delivery for broader projects that involve data migration. Infotech introduced full-blown tool for telco customers for simplifying and user-friendly automatic data migration from legacy system to NGOSS Inventory system. The behind successes formulae is simple that is **WYSISWYGIT** (*What You See In Source, What You Get In Target*) and also additional features will be available based on customer requirements. Infotech has invested lot of money towards in-house R&D activities for data migration for the below telco legacy systems

- Intergraph FRAMME to G-Comms, Smallworld PNI and Telecordia Network Engineer
- Autodesk or Bentley CAD to Smallworld PNI or NE or G-Comms
- Integration & Synchronization from NGOSS based Inventory Applications to OSS
- Data Migration/Cleansing for OSS/Inventory Applications

The below is proof of confirmation and long-term commitment from Infotech top management and also verify Migra investment in our last quarter results in the our website

“UTG has introduced an in-house developed tool named MIGRA, which helps us perform our tasks faster, thus improving utilization” - Source Infotech Q4 Fy09 and Year Ended March 31, 2009

8.0 Acknowledgement

The Author is grateful to,

Mr. Ravi Jesupaul, Sr.Principal Consultant –Telecom, is having more than two decade experience and helping world-wide Tier1& Tier2 telco’s data migration large projects. His continuous support in upgrading telecom domain expertise. And also he is encouraging innovative economic services for telcos to implementing one stop single solutions for all inventory business issues. He is also spear heading telecom business more than decade at Infotech.

About Author

Upendar Kasam, B.Tech, (MBA), Prince2, ITIL & IQA, is the author, having more than 12 years of experience in the Utilities/Telecom domain specializing in Geographic Information System (GIS), Inventory Management System (IMS) along with implementation experience and strong data migration project management experience. He is also having knowledge in eTOM business model from TM Forum. Prior to Infotech, Upendar brings a rich experience by associating with Tech Mahindra, Avineon companies. He is presently working as a Project Manager - Telecom Practice for Infotech Enterprise Ltd. He is also a professional member in the Project Management Institute (PMI), USA.