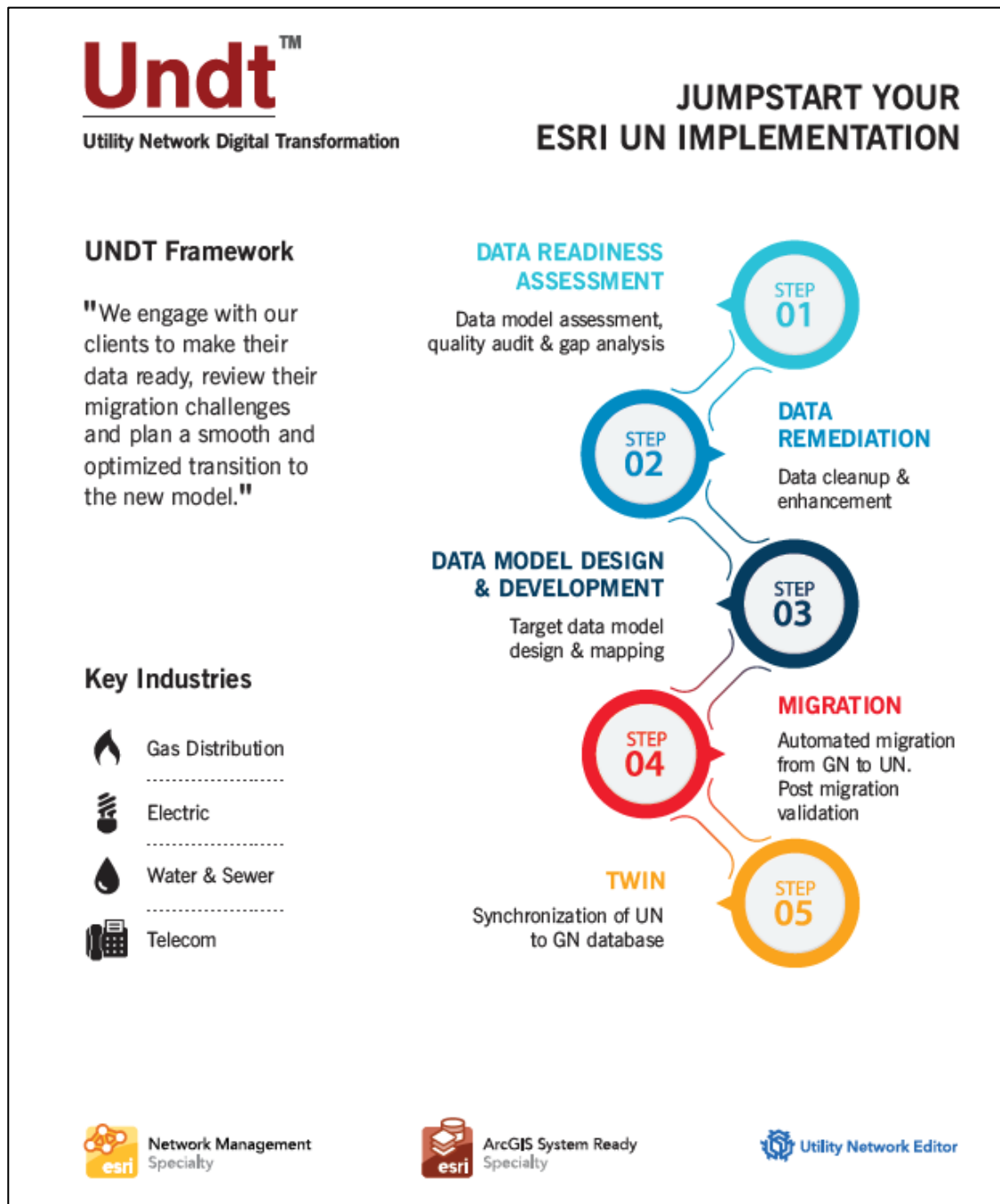


UN Data Migration Approach using Accelerator (UNDT™)

RMSI, a certified 'Esri Utility Network Specialty Partner, brings extensive experience in utilities data and migration. Our unique Utility Network Digital Transformation (UNDT™) framework significantly automates and simplifies the migration from the Geometric Network model to the Esri Utility Network Model. We propose a phased migration approach, encompassing data assessment, remediation, data model mapping, and the actual migration process to ensure a seamless transition to the Esri utility model.



1. Data Assessment and Remediation (DART)

The Data Readiness Assessment involves all planning and design activities required for migrating Geometric Network data to the Utility Network Data Model, collectively termed as Data Migration Requirements Specifications (DMRS). RMSI will identify gaps between the Geometric Network data and the Utility Network Data Model and perform necessary Data Readiness checks. This process aims to minimise errors in the geometric data before transitioning it to the Utility Network Data Model.

RMSI has implemented standard-based procedures that include multiple checks and validations to ensure the quality and integrity of the data, particularly for feature classes within the geometric network. Errors identified through these checks must be corrected before transitioning data from the Geometric Network (GN) to the Utility Network (UN). For this project, RMSI will address known data issues and non-standardised asset attribution fields using utility best practices. Leveraging its Data Quality Toolkit, which includes the Data Assessment and Remediation Tool (DART), RMSI will ensure that all data meets the required quality standards before migration

Product Features – Data Assessment and Remediation (DART)

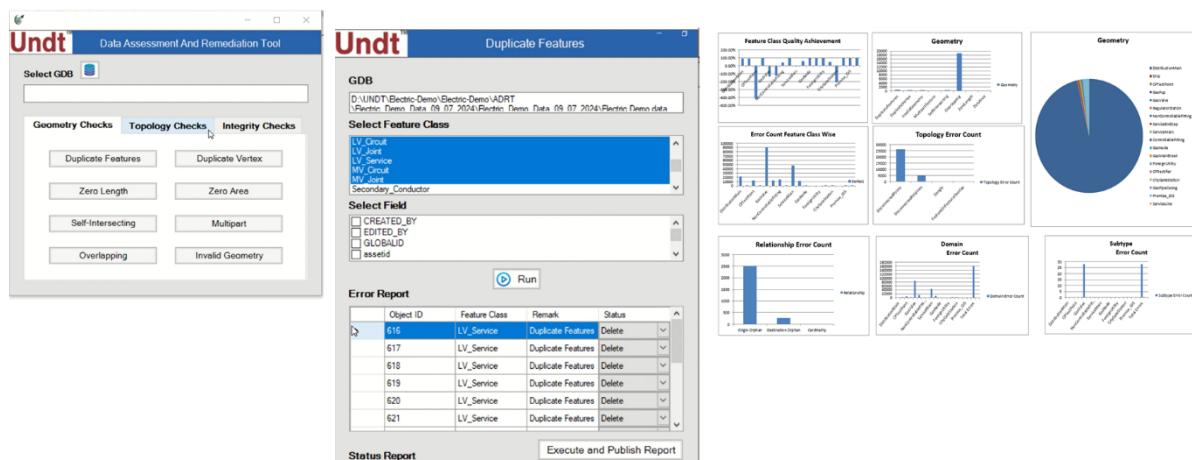


Figure: Data Assessment and Remediation tool

RMSI performs several detailed data quality checks to ensure the integrity of the network data, including Duplicate Geometry Checks, Geometry on Geometry Checks, Composite Checks, Valency Checks, Domain Checks, and Null Value Error Checks. These checks help identify and address issues such as co-located system features, connectivity errors, missing relationships, and incorrect attribute values. Any identified issues will be reviewed and discussed with the client team to ensure data accuracy before migration.

Errors Remediations: For performing Data Quality Remediation RMSI will use the Data Assessment and Remediation Tool (**DART**) with minimal manual intervention. The tool

resolves any geometric network issues identified by the DART tool. DART tool also helps to reduce the time and cost for data remediation

2. Data Model and Mapping Tool (MMT)

RMSI will conduct a Data Model assessment to compare the current Geometric Network schema with the Utility Network asset package. This involves creating a data mapping sheet and a summary with a comparison matrix. The assessment will cover Feature Class, Field, Domain, and Data Type comparisons between the source and target databases. A summary sheet will indicate the percentage match for each parameter, with higher matches reducing manual work needed for migration. The goal is to achieve a 100% successful migration, aided by a detailed comparison and remediation process.

Product Features – Model and Mapping Tool (MMT)

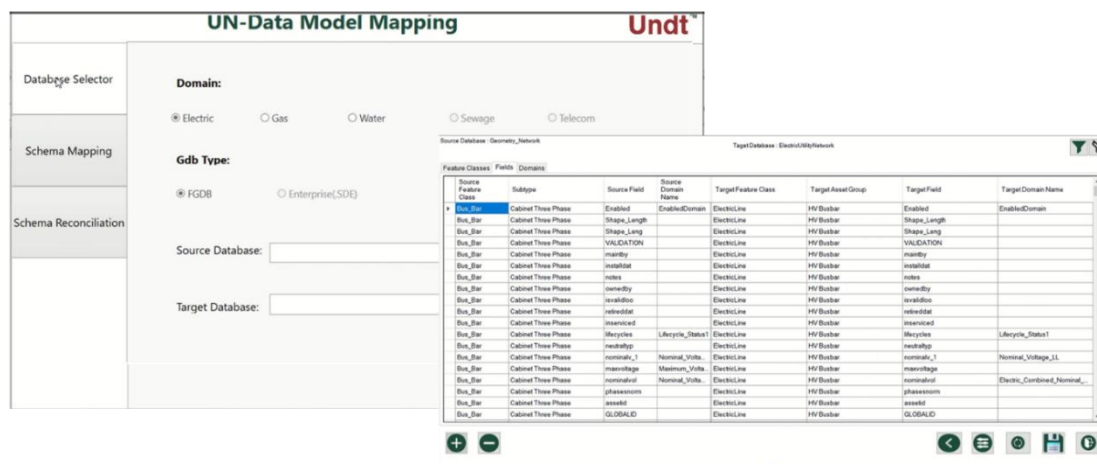
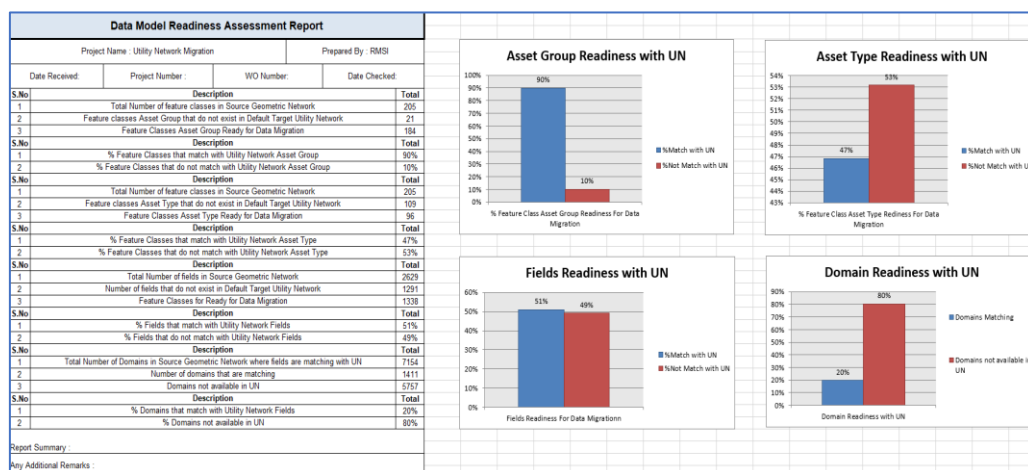



Figure: Data Model Assessment Summary

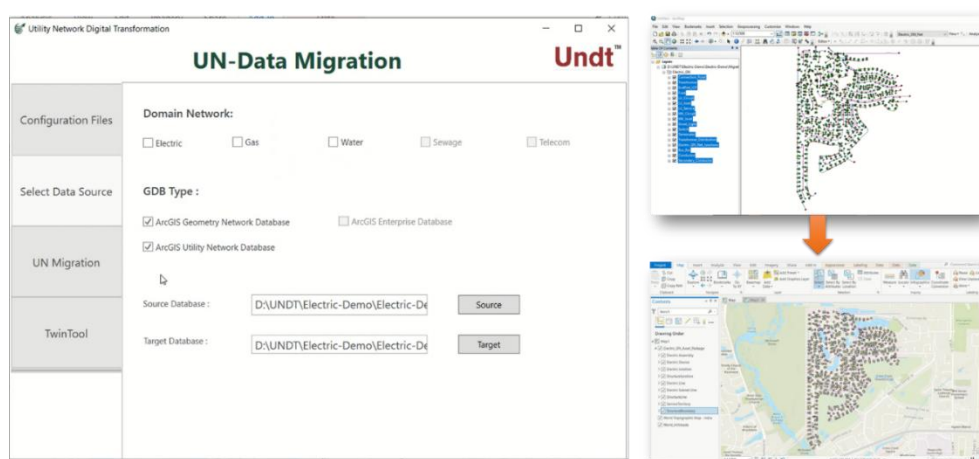
Data Model Remediation: After performing Data Readiness Assessment RMSI will perform the Data remediation. In Data model remediation RMSI will ensure that the number of errors in geometric network data identified by DART tool will be resolved before moving it to the Utility

Network Data Model. As well as in Data Model Assessment, RMSI will ensure and fill the gaps in Utility Network Data Model with respect to Geometric Network data model as identified by UNDT Schema Reconciliation tool.

UN Configuration: RMSI will perform several key tasks to prepare the Utility Network Data Model for migration. First, they will define feature classifications by creating any missing fields, domains, asset groups, and asset types in the Utility Network Asset Package. Terminal configurations will be assigned for complex features with multiple inputs and outputs, such as transformers in Electric Domain. RMSI will then create tiers and set subnetwork definitions for effective subnetwork management. Connectivity rules will be established based on the geometric network data connectivity workflow, ensuring proper network connections. Trace configurations will be used to analyse network paths and connectivity. Finally, network categories will be created and assigned to group features at the asset group and asset type levels, enhancing the network's functionality and management.

3. UN Data Migration Tool (DMT)

Once the data remediation process is completed, the Geometric Network (GN) data is migrated to Utility Network (UN) Data model. For migrating the data from GN to UN RMSI uses the UNDT tool. UNDT tool is developed by RMSI that ensures that all quality standards are met with the latest requirement. This tool performs the complete migration of Geometric Network to UN Asset Package with creating Utility Network and Migrating data form UN asset package to Utility Network. As well as the UNDT tool has Twin capability, which perform the data cutover task.



Once RMSI configures the Utility Network, they will perform essential post-processing tasks before publishing the feature service. First, the data will be registered as versioned with branch versioning, allowing multi-user editing and supporting the Utility Network. RMSI will then ensure the database is ready (by configuring the Oracle, SQL Server or PostgreSQL), creating

the Enterprise Geodatabase, adding users, and granting necessary privileges. After these steps, the electric utility network services will be published, enabling editing, analysis, and viewing capabilities across the organisation.

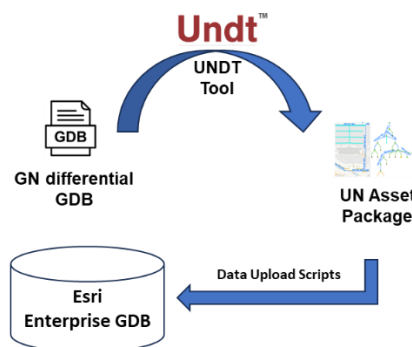
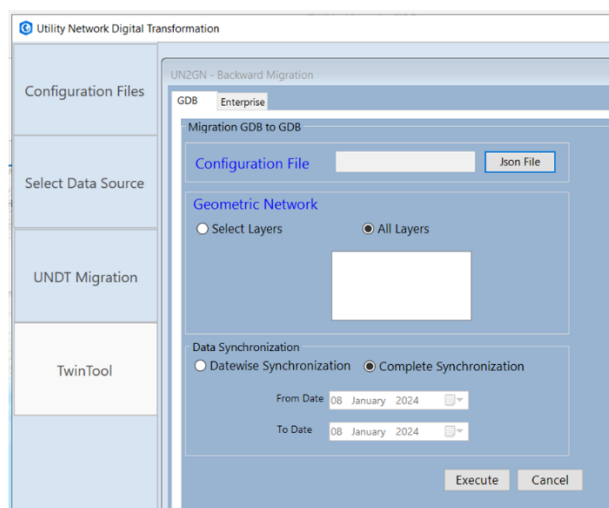


Figure1: Post Processing steps

4. Twin Tool – Data Cutover and Sync

RMSI envisions that even after completing migration to the utility network, utilities will still need to facilitate operations through the geometric network for seamless utilisation. To achieve these goals, RMSI has developed a process to synchronise data between utility networks and geometric networks. These processes are easily configurable, scalable and expandable. During the transition period, client can continue to use the existing environment, solutions and integrations to the geometric network where necessary. These processes are easily configurable, scalable and expandable. RMSI has named this tool “Twin”, as it replicates utility network edits in the geometric model and Vice-versa. “Twin” remains in place until all aspects of the migration are complete.

Product Features – GN & UN Data Sync for Cutover



5. Utility Network Data Preparation for integration with third party ADMS/OMS, eAM, AMR, SCADA and Other

Integrating a Utility Network with third-party applications like ADMS/OMS, eAM, AMR, SCADA, PowerFactory, or ETAP enhances utility management and operational efficiency. RMSI will start by clearly defining integration requirements and identifying the needed functionalities and

data exchanges. They will assess available APIs and integration options for both the Utility Network and third-party applications to determine the best approach. Data models will be mapped and transformed for seamless compatibility between systems. Comprehensive documentation will be provided, along with training for users on the integration process. RMSI will ensure ongoing maintenance and support to address any issues or enhancements post-deployment, ensuring a successful integration that enhances utility management capabilities



Figure: Architecture for UN Integration with Third Party

6. QA/QC Approach

RMSI QA/QC (testing) approach consists of multiple phases according to project life cycle. Testing life cycle is defined in following phases and each of them is summarised in the sections below.

❖ Test initiation

RMSI's QA/QC team will participate in each sprint to understand client's requirements and expectations, reviewing SRS, use cases, user stories, and other deliverables for compliance. Any noncompliance will be logged, tracked, and resolved before certification. Only when the QA/QC team certifies a document or product as "Ready to Deliver" will it be submitted to client for review, feedback, and approval. During this phase, the QA/QC team will:

- Prepare a Requirement Traceability Matrix according to sprint requirements (incremental).
- Create and establish a client repository.
- Implement version control for all documents received.
- Establish a feedback mechanism system

❖ Test Plan/ Strategy

RMSI's Testing team will align testing with the project plan following Scrum methodology. During the test planning phase, they will develop a test plan and strategy, documenting all related tasks. The test plan document will be shared with client for review and approval.

Test strategy followed by RMSI is given below:

Test Strategy identification	• Test methodology will be identified for the project/sprints which includes the different testing types to be performed in the project.
Resource planning:	• Resources will be identified for the project/sprints and the roles and responsibilities will be assigned to them for testing activities.
Tools Selection	• Tools for functional, performance, security testing and bug tracking will be identified as per requirements
Build Acceptance criteria	• QC team will accept a Build from development team if the build document (BD) is available with clear testing scope, list of changes/new implementation, list of bug fixes and Unit test report.
Test Pass/Fail Criteria	• A component/function/module/system will be considered as "Pass" if it meets all requirements without causing any direct or indirect failures during testing. However, any components/ function/module/system would be considered as "Fail" if actual results are not same as the expected results as mentioned in the test cases documents or its functioning affects any other functionality adversely.
Test Severity	• For each defects found in testing a severity will be assigned from below mention criteria:
Acceptance Criteria	• A release will be accepted by the CCWD if it has no critical or major defects. Average, Minor and Enhancements will not be considered for acceptance but will be fixed before Acceptance of project. Although, this criterion will be discussed with Al Ain Municipality and will be defined the baseline for this project
Test Suspension/Resumption criteria	• Testing of a build will be suspended by QC/QA team if main functionalities have critical/major issues or build is not working for properly/ major functions. Testing will only be resumed if the new build is provided with fixes for the defects. This will be followed for each and every sprint
Defect Tracking and Life Cycle	• The defects found in various phases of review, testing will be logged and tracked through the bug tracking tool. A defect may go to the different phases in its life cycle.
Test Exit Criteria	• Testing of a build will be considered complete if all modules/components have been tested, all user acceptance test cases are successfully executed and reported bugs are fixed and verified.

Figure: Test Strategy Plan

Pre- Migration Testing:

A detailed testing will be done to ensure that the qualified data is moving to the final database. The process will be done through Sample testing of 35% of data and based on the results; this iteration will continue until 100% results are achieved. User can follow the same process for testing of each utility system configuration and migration

Post-Migration Testing:

Execute a testing after data is migrated and post migration errors are fixed. The process will be done through Sample testing of 35% of data and based on the results; this iteration will continue until 100% results are achieved.

❖ Knowledge Transfer & Documentation

RMSI will leverage its extensive experience to design and deliver a comprehensive training program, starting early in the project lifecycle and continuing through the Software Development Lifecycle (SDLC) and maintenance phases. Using its Certified Training Process,

RMSI will ensure effective knowledge transfer by identifying and training key individuals—technical staff, administrators, and users—who will become future trainers. The training will cover technical, administrative, and functional aspects, including server administration, user management, security, and the integrated system's framework and database design. The goal is to ensure effective system maintenance, service improvement, and long-term sustainability. The client project manager will assist in identifying the relevant stakeholders for training.