STRATEGIC WHITE PAPER

Solving the NGN Data Migration Challenge

The costs associated with data inaccuracy have emerged as a fundamental issue for service providers planning to migrate subscribers from the PSTN to an IP network. This white paper outlines a new approach developed by Bell Labs to help operators optimize the total costs for subscriber data validation during IP Transformation.

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Introduction

Consider the following telecommunications market research:

- "Dirty" data migrated from legacy to next-generation networks will cost U.S. and European operators $6.3 billion per year by 2010.
- Up to 50% of existing legacy access network records have some level of inaccuracy.
- Up to 50% of access network faults are related to inaccurate data records.
- 88% of fieldwork takes longer than a month to be updated.
- Operators can save more than $0.30 per customer line per year for each one percent improvement in data quality[1].

While these claims might be disputed, there is no arguing with the need to understand the quality of legacy access data when undertaking a significant IP transformation program. Migrating dirty data can result in high after care costs for service provisioning, port configuration, billing errors, and even extended service outages. Validating the accuracy of all subscriber and network configuration data requires the physical testing of access equipment, which typically comes at a very high cost. So, the costs associated with data inaccuracy have emerged as a fundamental issue for service providers planning to migrate subscribers from legacy to next generation networks.

While this issue is clear, the trade-offs between validating data before migration versus addressing errors after migration are not well understood. Service providers tend to favor an all or nothing approach to data validation. These strategies, which essentially circumvent the need to understand the trade-offs and their significant economic implications, result in less than optimal cost management and migration schedules.

To begin to understand the trade-offs, service providers need answers to three basic questions:

- How polluted (dirty) are my network access records?
- How much would it cost to cleanse the data before migrating it to my target next-generation network?
- What are the post migration (aftercare) costs related to not cleansing the data?

Many operators have already answered the first question – they estimate that over 15% of their access network data records have errors.

Regarding the second question: Based on our experience working with several large incumbent service providers with at least five million subscribers, we determined that validating service and network configuration data relating to access equipment includes the following:

- **Data validation (pre-migration)**
  - **Manual method** – Two to four minutes of labor costs per subscriber, depending on the type and location of access equipment. For example, a service provider with five million subscribers could experience costs of up to 200 staff years in additional IP transformation program costs.
  - **Mechanized method** – 10 to 20 seconds of labor costs per subscriber plus cost of measurement equipment. This could cost a service provider with five million subscribers up to 17 staff years in additional IP transformation program expenses.[2]

1 Mellis, John, "'Dirty data' secrets exposed", *TotalTelecom*, July 13, 2006. (http://www.totaltele.com/View.aspx?t=4&ID=84117)

2 While mechanized verification systems that can reduce the validation timeframe to 10-20 seconds per subscriber exist for some technologies, these systems typically measure every port in the system. Therefore, the access network utilization percentage must be factored into the calculation, as well as the costs of the measurement equipment and the integration of the existing systems into the measurement process.

- **Aftercare (post-migration)**
  - **Error correction** – This is typically a manual effort and mostly done on an individual subscriber basis. It is estimated that each error requires 30 minutes to resolve. However, not every data error will cause a post-migration issue. Our experience shows that 10% of these errors affect a customer's service and require correction. Assuming the scenario described above, ignoring data validation and correcting errors after migration would result in 78 staff years in additional IP transformation program costs.
  - **Customer satisfaction** – This is an additional, less tangible cost, associated with post migration error correction and is based on the customer's perception of the impact of the data migration on their services. In the worse case, a negative customer experience can result in the complete loss of the subscriber.

There is another question that service providers need to ask to establish the most effective approach for validating legacy access data when migrating subscribers:

- How much data pollution is acceptable?

Restated in economic terms, the question becomes, "At what data pollution rate can I minimize my total costs for migrating subscribers?" This paper recommends how to answer that question by offering a new approach that optimizes the combined data validation and migration aftercare costs. This approach minimizes the total costs related to polluted data. It describes a process that determines an optimal data pollution rate when migrating subscribers as part of an IP transformation program. In one case, this new approach allowed a service provider to reduce its total costs by 25% by creating a streamlined data validation process based on an optimized target data pollution rate.

Network Data Validation

Figure 1 shows the various points in a network that typically involve some type of data validation activity. These activities include manual physical testing of access equipment in the field and operations support systems synchronization.

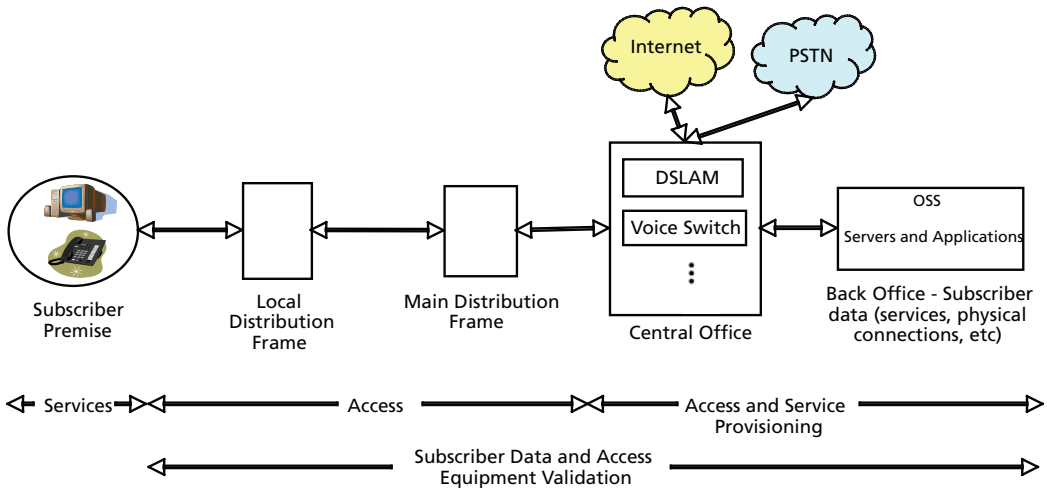

Figure 1: Network data validation points

When migrating subscribers, the most resource intensive activity is the validation of subscriber and network configuration data associated with access equipment. Determining the total costs for pre-migration data cleansing and the total cost of post-migration error correction for data pollution allows the service provider to fully understand how to minimize the data validation cost of migrating subscribers.

Network data validation points include:

Subscriber configuration data related to access equipment typically includes the following items:

- Line/phone number
- Line type
- Services

Network configuration data related to access equipment typically includes:

- Switch port location
- MDF (main distribution frame) port numbers
- Port numbers on wiring blocks (within access equipment)

The term "access equipment" as used in this paper, refers to the following:

- MDF
- Street cabinets (LDF)
- Distribution blocks

Other terms used throughout this paper include:

- Data validation, which refers to ensuring that operations support system records reflect the physical equipment configurations and the subscriber services.
- Aftercare, defined as the tasks associated with addressing customer affecting errors after migration. This can include the costs for both error correction and customer dissatisfaction.
- Data pollution is a mismatch between the operation support system data as compared to the actual subscriber and network configuration.
- Target data pollution rate is the network pollution rate that a service provider plans to attain through data cleansing.
- Optimal data pollution rate is the target data pollution rate that provides an optimal total cost for data validation and aftercare.

Pre- and Post-Migration Data Validation Trade-offs

As stated earlier, two basic questions that service providers need to ask about their data validation plans include: How polluted – or dirty – are my network access records; and how much would it cost to cleanse the data, before migrating it to a target next generation network? More specific questions include:

- How accurately does the subscriber and network configuration data in the support systems reflect the physical configuration of the access equipment?
- What is the current pollution rate?
- What is the current impact of the polluted data?
- Does the data need to be cleansed prior to migration?

The third basic question regarding the post migration (aftercare) costs related to not cleansing the data, requires a sound understanding of the back-end costs of migration and the extensive aftercare associated with data pollution. Data errors that are not corrected prior to this stage can lead to migration aftercare. Most often, subscribers report these errors to a service provider's helpdesk. When this occurs, the errors associated with data pollution must be segregated from business as usual errors and errors from other parts of the migration process. Once identified, these errors typically require individual correction.

Our experience shows that the cost to fix an error after migration is many time higher than the pre-migration cost. This cost does not include the impact of customer dissatisfaction associated with subscriber identified errors.

Considering the magnitude of aftercare migration costs, it is important to answer some fundamental questions including:

- What is the cost to address a customer call after migration?
- What is the relationship between the data pollution rate before migration and errors that impact the customer after the subscriber is migrated?
- What is the impact on migration in terms of potential lost revenue (customer dissatisfaction)?
- Based on the pollution rate, are additional resources, such as staff and equipment, required for migration aftercare? If so, what resources are required and at what cost?
- How long will the correction of inaccurately migrated subscribers take?
- Do any of the service provider's existing processes support migration aftercare? If not, can the processes be modified to support this effort? Also, what modifications or new processes are required and, if so, at what cost?

The less frequently asked key question, "At what data pollution rate can I minimize my total costs for migrating subscribers?" can also be decomposed into the following questions:

- What is the target pollution rate that yields the minimum total cost related to data pollution? (This includes data validation and after care related costs.)
- How can I determine this optimal rate?
- How do I determine which access equipment to validate, based on the optimal rate?

By answering all these questions, a service provider will fully understand the trade-off between pre- and post-migration data validation. However, by not answering them, the service provider's default position becomes an unsatisfactory "all or nothing" approach.

Understanding the Cost Impact of Current Strategies

Despite its disadvantages, service providers typically take the all or nothing approach to data validation, because they do not understand the relationships among data pollution rates, migration costs, customer dissatisfaction, and resource planning.

ALL OR NOTHING AT ALL

Validating all customer and service related data before equipment migration minimizes post migration errors and aftercare costs. However, this approach can be very costly and time consuming, and usually becomes the gating factor in deployment and migration schedules. Moreover, as shown in Figure 2, the cost of validating all data is fixed, regardless of the data pollution rate.

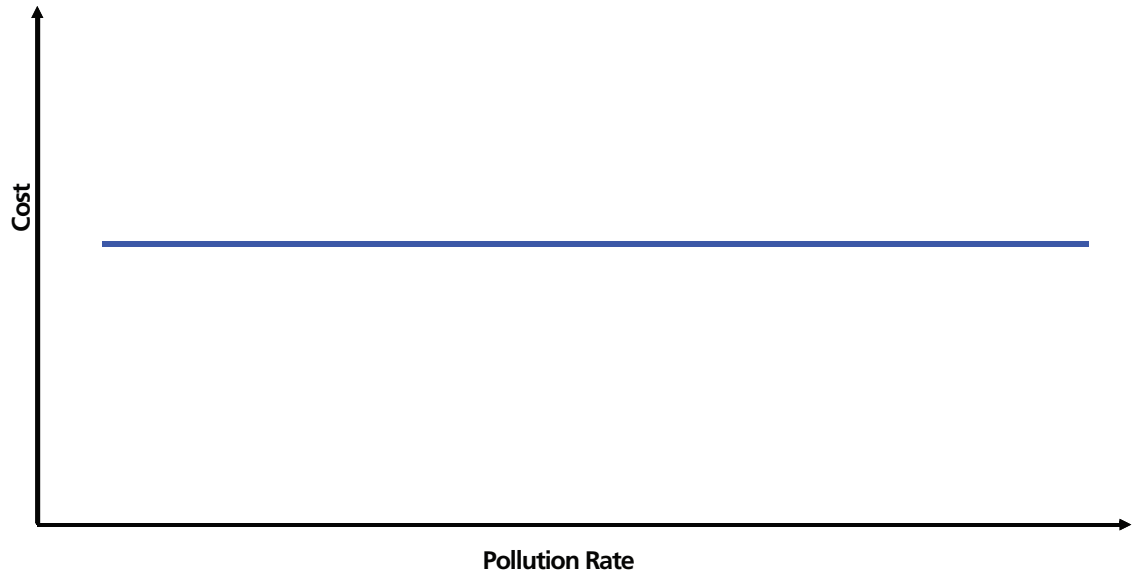

Figure 2: Validating all data

The "no" data validation approach does reduce upfront costs and delays in initiating equipment migration. However, this tactic results in a higher number of errors after the migration of equipment, which in turn causes higher aftercare costs and customer dissatisfaction. As shown in Figure 3, the overall cost of this approach is variable, based on the data pollution rate prior to migration. These costs can be significant, since each aftercare repair can be time consuming.

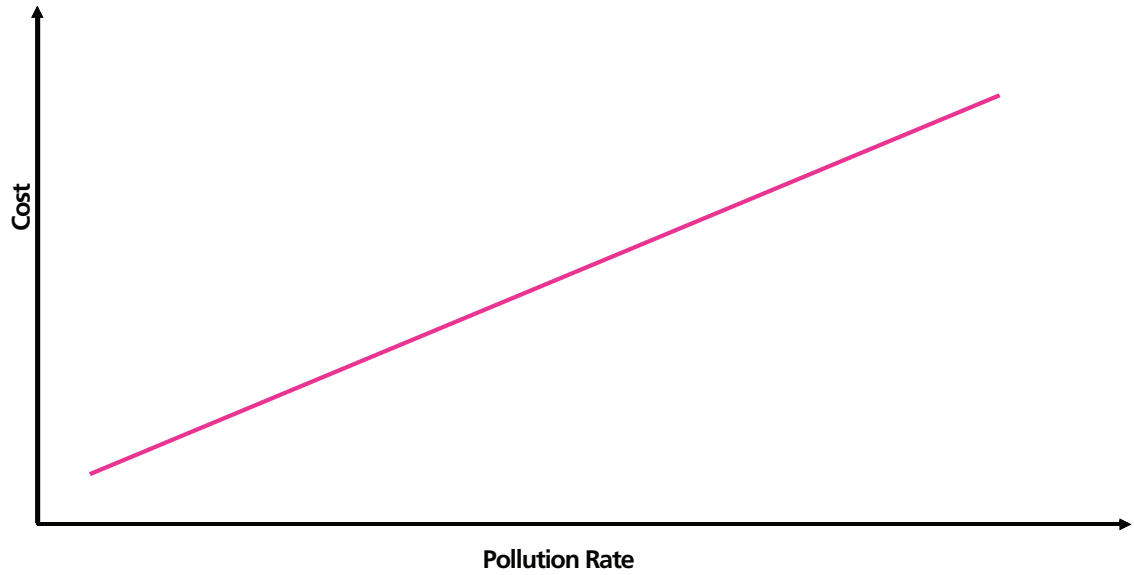

Figure 3: Using existing data (no validation)

A New Migration Planning Approach for Data Validation

Alcatel-Lucent provides a financially optimal alternative to the all or nothing approaches to data validation. The Alcatel-Lucent approach considers the total costs of migration related to data pollution. The total costs are actually the sum of pre-migration or "data validation cost" to a targeted pollution rate plus the post migration or error correction cost from the targeted pollution rate.

Establishing a Target Data Pollution Rate

A typical network contains access infrastructure (typically interconnection blocks of varying types) that provide connection and services to the subscriber premise. A typical measure of the data pollution rates across a large number of these components results in a pollution rate distribution illustrated in Figure 4. Often the individual component pollution rates vary considerably from the average pollution rate.

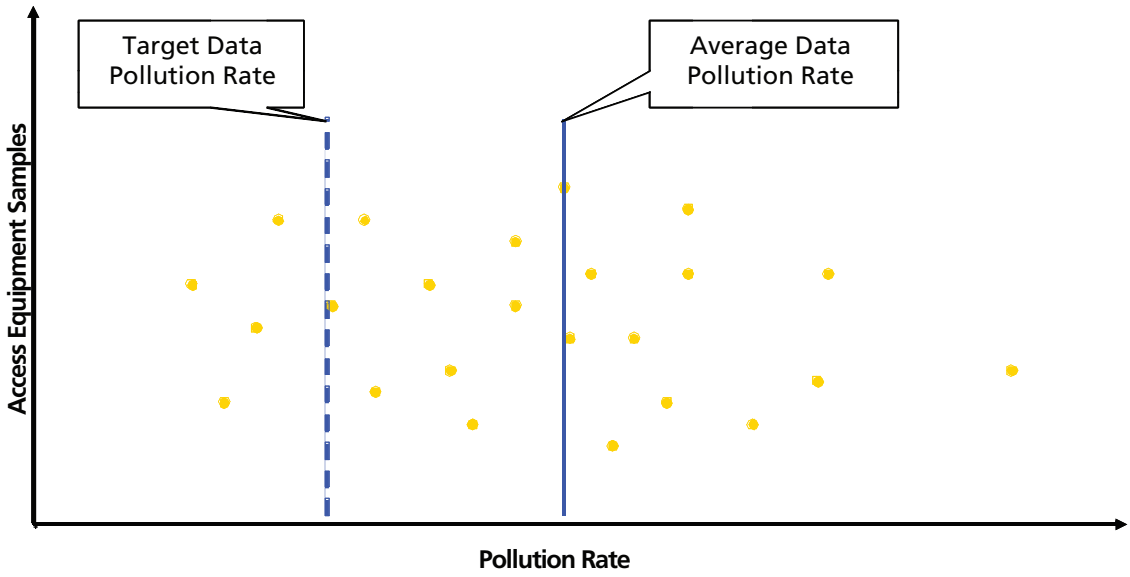

Figure 4: Cabinet pollution rate samples

The Alcatel-Lucent approach establishes a target data pollution rate. All access infrastructure to the right of the target data pollution rate are planned for data validation (pre-migration) and the infrastructure to the left of the target data pollution rate are not validated.

Note that the data points – each representing a pollution rate for an individual element – are not evenly distributed. However, the distribution of these data points can be statistically represented. This yields a new cost equation for data validation which varies based on the selected target data pollution rate. This new relationship is shown in Figure 5. It indicates that the lower the selected target data pollution rate, the higher the data validation costs.

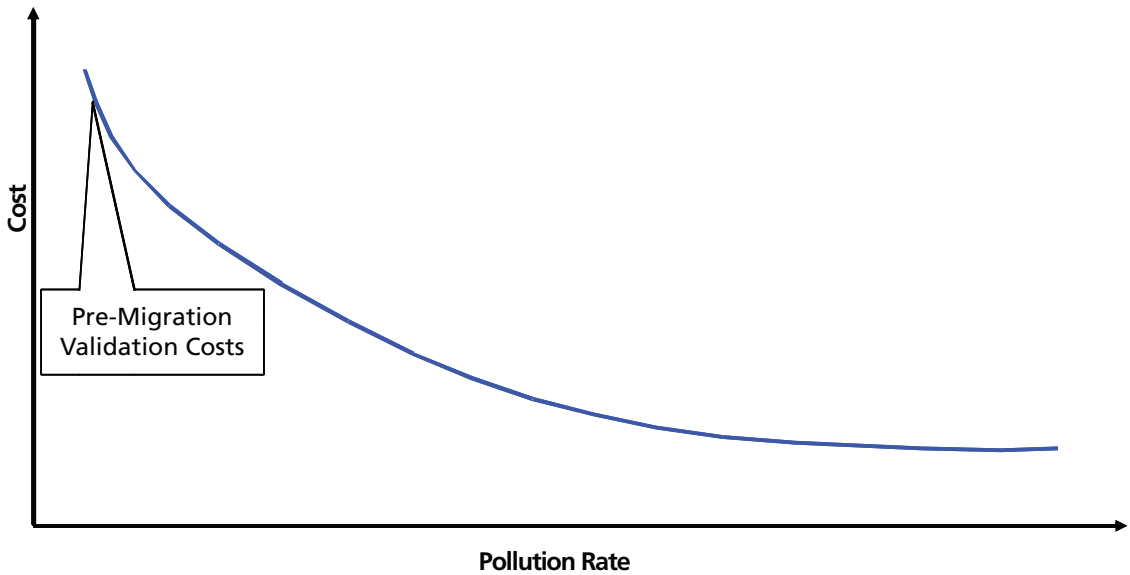

Figure 5: Costs for pre-migration

As mentioned above, when calculating the total cost of migration related to data pollution, it is important to consider both pre- and post-migration costs. These are shown in Figure 6.

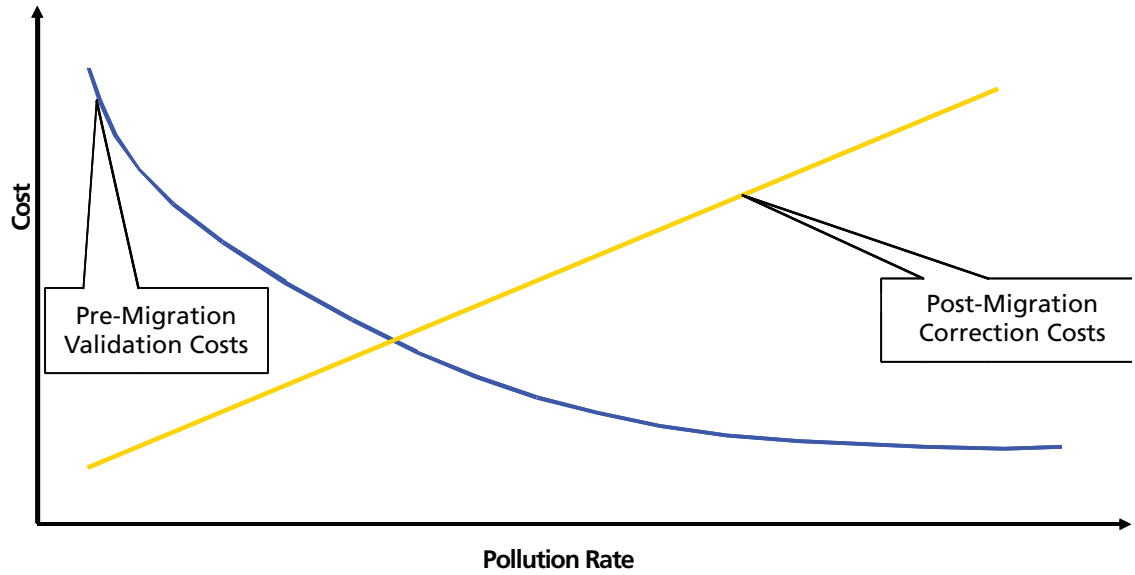

Figure 6: Costs for pre- and post-migration

Adding the pre- and post-migration costs together provides the total costs based upon pollution rate, as shown in Figure 7. This chart indicates that the service provider will experience minimal costs by validating the data to the "optimal target data pollution rate."

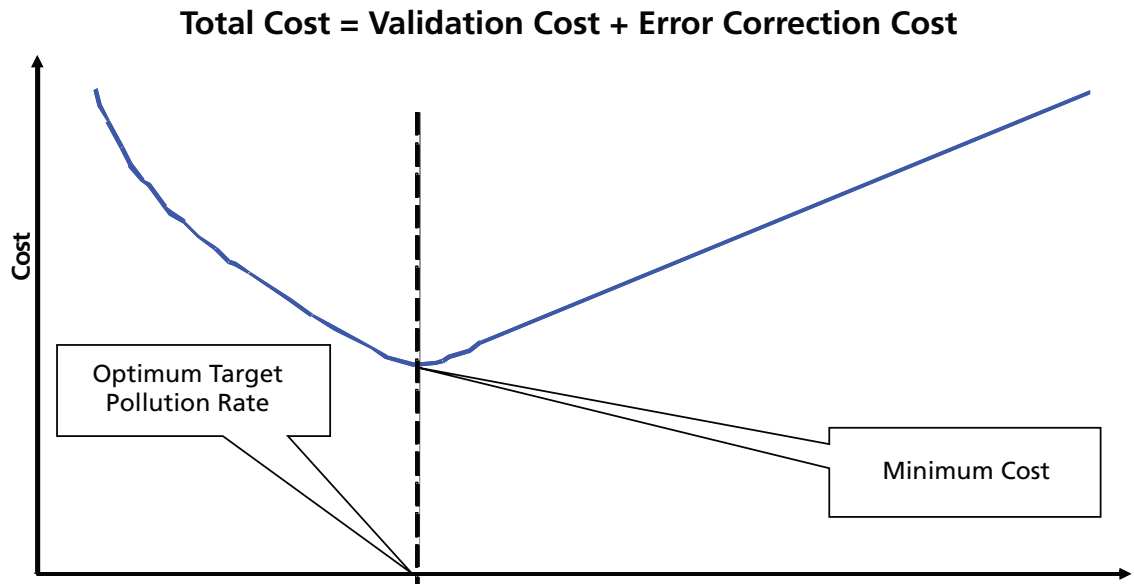

Figure 7: Minimum costs and optimal target pollution rate

Alcatel-Lucent Optimized Data Validation Methodology

Alcatel-Lucent has developed a three step methodology that provides decision support related to pre- and post-migration planning. The methodology consists of these activities:

- Benchmarking the data pollution rates
- Auditing existing processes
- Evaluating data pollution rates using the Data Evaluation Planning Model

Benchmark Data Pollution Rates

The pre-migration data validation costs and the post migration error correction costs are both related to data pollution rates. Therefore, benchmarking the data pollution rates serves to scope the effort needed in pre-and post-migration. This benchmarking is usually recommended as part of the process audit and derives its results from data validation of a statistically representative set of access equipment.

Existing Process Audit

Alcatel-Lucent works with the service provider to understand the existing processes that are used for data validation as well as for error correction (customer support). The purpose of this audit is to determine if existing processes and methods can be used to support the access equipment migration as far as validating the subscriber data on a large scale and supporting error correction after migration is concerned.

Often, processes and resources do exist. However, they may not be adequate to meet the effort and speed needed for a large scale migration of access equipment. Simply scaling existing resources to meet the required migration volumes can introduce unnecessary costs to the migration program. In order to accommodate these volumes, processes must be designed that typically use elements from the existing processes, but optimize tasks based on resource requirements, skills, and geographic limitations. The audit also serves to define the network and resource profiles that are required as input to the data evaluation planning model. Alcatel-Lucent provides a summary to the service provider that includes recommendations related to existing process and resources to meet the planned migration.

Data Evaluation Planning Model

The data evaluation planning model specifically provides decision support related to the data validation and error correction efforts associated with migration of access equipment (cabinets and MDFs).

One challenge in using this new approach is the specific identification of the access equipment that should be validated based upon a pre-determined target data pollution rate. The data evaluation planning methodology helps to identify this equipment through the benchmarking of data pollution rates and the process audit. Depending on the service provider and size of the network, the data pollution rates will often be determined by: region; equipment type; validation process type; test equipment; and the staff that perform the validation. Alcatel-Lucent's Bell Labs has created a series of algorithms that utilize complex grouping theory to evaluate these and other factors, and identify the most likely candidate components for data validation. This information is used as input to the data evaluation planning model.

The model is encapsulated in a proprietary tool developed by Bell Labs that defines the relationships between the network configuration, resources, pollution rates, and statistical distribution of errors. Results from the process audit and benchmarking of data pollution rates are used as input to the model as shown in Figure 8.

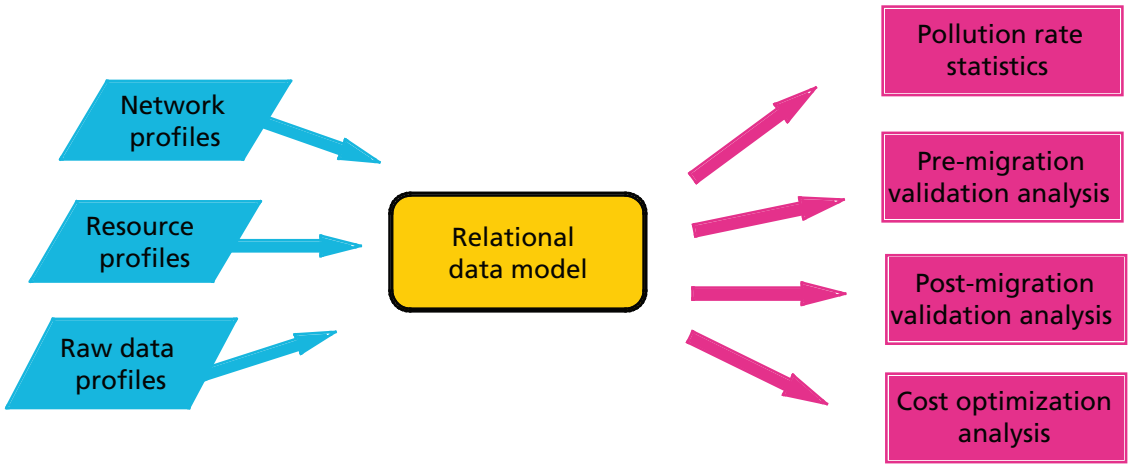

Figure 8: Data evaluation planning model

The data evaluation planning model is portable, and used in collaboration with the service provider to establish the target data pollution rates along with providing estimates for the needed resources in both pre- and post-migration planning phases.

Some of the data evaluation planning model capabilities are as follows:

- Characterization of network resources, including geographic and service dependencies.
- Pre-migration analysis - an estimation of resources (staff and equipment) required for cleansing the configuration database related to the equipment to be migrated.
- Post migration analysis - an estimation of resources (staff and equipment) required to correct customer reported problems related to the new equipment. This includes modeling and understanding the relationship of data cleansing and impact (lost revenue and repair costs) on the customer after migration.
- Graphical analysis - analysis of pre- and post-migration costs based upon data pollution rates.
- Data pollution rate analysis - a determination of the optimal target data pollution rate prior to equipment migration.
- Multiple profile support - the creation of multiple network and resource profiles for combinatorial analysis.

Conclusion

Service providers considering the migration of legacy to next generation network access equipment are faced with the challenge of understanding the cost impact of data pollution as it relates to subscriber configuration and services. This data pollution is costly to correct, but if not corrected, can be even more costly to address in terms of dealing with the resulting subscriber service outages and potential customer churn. Service providers need an experienced and knowledgeable services partner to help meet the challenges of minimizing the subscriber migration costs and intervals, as well as the impact to subscribers resulting from the migration.

Alcatel-Lucent is experienced in addressing the challenges of data pollution associated with access equipment migration. We partner with the service provider to understand the data pollution rates, audit existing validation process, and build a resource and network profile that enables informed decision support for planning migration resource needs and minimizing the overall costs.

For more information go to www.alcatel-lucent.com/iptransformation.

Authors

Timothy J. Connelly
Principal Consultant – Alcatel-Lucent, Services Division

Tim Connelly is a Principal Consultant within the Alcatel-Lucent Network Integration Services Practice. Connelly has spent 15 years working in large-scale network deployments and migrations, most recently in developing strategies for migration from legacy to IP networks. He is currently working with a European service provider developing subscriber migration strategies and processes for their IP network transformation. He has spoken at various conferences including IT-Expo, IMS-MMD, Capacity 2005, Informa FMC, and TelecomNext. Connelly has a B.S. in Mechanical Engineering from Georgia Institute of Technology.

Jack W. McKnight
Alcatel-Lucent – Bell Labs

Jack McKnight is Distinguished Member of Technical Staff within Bell Labs Network Planning, Performance and Economic Analysis Center. McKnight has spent 28 years working in development of network equipment, software development, software architecture, and system performance analysis. Most recently, he has been developing models and strategies for minimizing cost of subscriber migration from TDM to IP networks. McKnight has a B.S and M.S. in Electrical Engineering from the University of Kentucky.

David P. Mongeau
Alcatel-Lucent – Bell Labs

David Mongeau is a technical manager within the Network Planning, Performance and Economic Analysis Center of Bell Labs. He has over 20 years experience in the communications networking industry. His current work focuses on solving next-generation network transformation challenges that call for robust process engineering, modeling, and simulation. His most recent conference papers covered the topics of ensuring integrity of network inventory/configuration data and of discovering and extracting data from heterogeneous networks. Mongeau holds an MBA from Purdue University, an MS from Rensselaer Polytechnic Institute, and a BS from Carnegie Mellon University.

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