Revenue Assurance Guidebook

Revenue Leakage Framework and Examples

GB941 Addendum D

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Executive Summary

Revenue Assurance is a rapidly maturing discipline within the telecommunications industry; the last ten years has seen widespread industry acceptance of the issues and increasingly effective techniques and systems to detect, investigate, correct and prevent such revenue and cost leakage.

There is now a wealth of operational experience of revenue assurance and the aim of the addendum is to demonstrate the breadth of this area by documenting a wide range of real-life examples and classifying them within a revenue assurance framework.

This framework consists of eight areas:

- Product and offer management
- Order management and provisioning
- Network and usage management
- Rating and billing
- Receivables management
- Finance and accounting
- Customer management
- Partner management

It is expected that operators will be able to use this Addendum to review the scope of their revenue assurance operations to minimize the opportunity for issues to fall outside the scope of their current revenue assurance operations.

1 Revenue Assurance Framework

The revenue assurance framework presented here is based on the end-to-end order to cash life cycle within communications service providers.

It aims to provide a list of real-life examples of revenue assurance issues from a range of potential failure points at which revenue leakage can occur, demonstrating the breadth of the revenue assurance discipline.

The revenue assurance examples presented here are comprised of real-life examples witnessed by members of the Revenue Assurance working group of the TM Forum.

It should be pointed out that these examples have been drawn from many different projects, and consequently it is extremely unlikely that an operator is likely to suffer from all of these issues.

However, this document can be used by operators to review the scope of their revenue assurance initiatives to minimize the chance that issues may remain undetected.

For the purposes of this document revenue leakage includes traditional revenue leakage as well as inflated costs referred to here as cost leakage and the financial implications of lost revenue opportunity, where:

Revenue leakage	Relates to lost revenues where a chargeable event occurred which should have been billed to the customer or operator but was not, or was charged at a lower rate.
Cost leakage	relates to overpayment of costs for chargeable services to a third party
Revenue Opportunity	relates to the situation where a business policy is in place to set pricing levels, but these are either set at negative or unintentionally low margin levels or the situation where a revenue assurance artificially limits the revenues that can be generated from a subscriber.

It also includes losses causes by fraudulent activities, where synergies exist with revenue assurance activities.

These risks all specifically related to the direct point at which the leakage occurs.

Any revenue assurance risks which do not result directly in leakage are not included in this document.

The Revenue Assurance framework comprises of eight elements as described below. Please note that the element here are taken from those processes typically referred to in the RA community and deviate slightly from the Business Process

Framework (eTOM) processes. A mapping to Business Process Framework processes is provided in GB941-D

1.1 Product and Offer Management

The first leakage point relates to the product management and offer management functions within a Communications Service Provider.

It primarily relates to commercial issues associated with product conception that may result in the development of unprofitable products and services as well as the timing of product launches and special offers which may be made from time to time.

1.2 Order Management and Provisioning

The second leakage point relates to the process of capturing and fulfilling orders from both domestic subscribers and commercial organizations.

Issues range from errors in customer contracts, service activation faults or delays that impact revenues and/or costs as well as the coordination of suppliers and third parties costs.

1.3 Network and Usage Management

The third leakage point relates to the accurate accounting of service usage within the network and the management of that information from collection from the switching infrastructure to delivery to the rating and billing process.

Issues identified here include network security and integrity, management of network equipment, network routing, recording and management of usage information, data integrity and data transfer within an organization.

Some internal and external fraud issues are also identified here.

1.4 Rating and Billing

The fourth leakage point relates to the rating and billing process, from tariff identification, pricing and invoice production.

Rating and billing issues range from subscriber management, charging and invoicing errors including tax calculation and the handling of usage information within the rating and billing environment.

1.5 Receivables Management

The fifth leakage point relates to collections of monies after the invoice has been issued.

Issues here cover failures in the cash collection process, subscriber identity issues and the write-off of bad debt.

1.6 Finance and Accounting

The sixth leakage point relates to the finance arena and in particular the accurate reporting of the financial performance of an organization.

Finance and accounting issues are associated with general ledger mapping from the billing environment, tax payments with government agencies, incomplete processing of information from the billing environment and incorrect posting of entries in the chart of accounts.

1.7 Customer Management

The seventh leakage point relates to the area of customer management and customer care.

Issues found here include customer adjustments and rebates, subscriber identity issues, incorrect charging and discounting.

1.8 Partner Management

The eighth and final leakage point relates to management of third parties, primarily business-to-business interactions with organizations such as content providers, interconnect partners, dealers, roaming partners, wholesale partners and resellers.

Issues cover the following areas: under-billing of partners, over-billing by partners, mismanagement of interconnect agreements, route optimization, charging errors, data exchange with external organizations and it also includes some fraud issues.

2 Revenue Leakage Examples

For each of the revenue assurance leakage framework components outlined in section 1, this section describes real-life examples of revenue and cost assurance issues witnessed by members of the TM Forum's Revenue Assurance working group.

2.1 Product and Offer Management

2.1.1 New product launched with no process to bill

Ref	Title	Operator Category
A.1	New product launch with process to bill	Fixed line
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Sales & marketing
Description A commercial product was sold to a business customer even though the billing system was not capable of charging and invoicing for that product, resulting in six months corporate usage of that service being written off.		
Root Cause In a highly competitive market, priority was given to securing the business customer, a well known company, and the assumption made that the billing system would catch up with invoicing within two months. Only after seven months was billing initiated but due to the contract with the business customer the first six months charges were not accepted and had to be written off by the operator.		
Detection This issue was detected when the six month's revenues for this customer were written off.		
Correction Upgrade the billing system to charge for this product.		
Prevention Ensure products can be billed for when launching a new product. This should be part of every operator's new product development process.		

2.1.2 Unexpired product/service promotions

Ref	Title	Operator Category
A.2	Unexpired product/service promotion	Fixed line
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Sales & marketing
Description		
A discounted promotion was offered to certain customers, for a twelve month period, but at the end of the twelve months billing did not revert to standard tariff, the discounted rate continued, in some cases for a further 18 months.		
Root Cause		
It was found that in many cases the expiration date was not configured properly, and as a result the promotion/discount was not terminated when it should have been. This was due to the fact that this information was inserted manually into the system that controls the period of the promotion or service and that this information was inserted in the wrong format. This resulted in the end date being corrupt and consequently the special rate was not being terminating.		
Detection		
Manual queries were run on the expiration date tables to validate date formats and invalid dates were found. Furthermore, a comparison of services and promotion marketing catalogues was made with the CRM product tables to identify where initiation date and expiry do not match.		
Correction		
Service and promotion expiry dates were updated according to the marketing plans.		
Prevention		
Creating a validation and verification process to ensure correct date formats are entered and that they match with CRM product catalogues.		

2.1.3 Expired service or promotion no longer billable

Ref	Title	Operator Category
A.3	Expired service or promotion no longer billable	Fixed line
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Sales & marketing
Description		
Customers were allowed to sign-up to services or promotions that had been discontinued and no longer billable.		
Root Cause		
The product catalogue had not been updated to remove the discontinued services/promotions and was still being sold.		
Detection		
Analysis of rejected billing records indicated a rate plan that no longer existed in the billing system.		
Correction		
The old tariffs were reintroduced to the billing system, so that the operator could honor the products that had been sold.		
Prevention		
Periodically check the status of products, services and promotion with the product marketing department to ensure that the product catalogue is up to date.		

2.1.4 Unprofitable usage based services

Ref	Title	Operator Category
A.4	Unprofitable usage based services	Mobile

Description

A mobile operator launched without full national coverage and entered into a national roaming agreement with another operator to ensure that its subscribers were able to make and received calls within 96% of their territory.

However, this national roaming product lost money for the home operator and the CFO was not aware of this situation.

Root Cause

The charges for home subscribers for their national roaming calls were lower than the service charge levied by the home operator's national roaming partner.

As subscriber billing and national roaming out-payments were handled by different systems, billing accuracy of these two processes were checked independently and never compared with each other.

Detection

The negative margin was detected during a one-off tariff review of subscriber charges and associated out-payments.

Correction

Due to the fact that this is a commercial issue, correction is difficult, unless changes to published tariffs can be introduced without affecting the competitiveness of subscriber tariffs or more favorable terms negotiated with the national roaming partner.

Prevention

Formally review the commercial terms and tariffs for all elements of a service prior to launch as part of the new product development process.

2.1.5 Unprofitable equipment sales

Ref	Title	Operator Category
A.5	Unprofitable equipment sales	Fixed line
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Sales & marketing
Description		
Equipment is priced below cost, creating a negative margin, in addition to any subsidies for customer acquisition.		
Root Cause		
Incorrect pricing of customer premises equipment.		
Detection		
Financial analysis of the service showed that the one-off revenues associated with the provision of customer premises equipment was less than that charged by the supplier for that equipment.		
Correction		
The price plan was updated to include the correct retail charges for the equipment.		
Prevention		
Sanity check of rate plans versus costs prior to service launch and every time a change is made to the charging tables.		

2.1.6 By-pass numbers not charged

Ref	Title	Operator Category
A.6	By-pass numbers not charged	Mobile
Type of Leakage		**Area of Business Responsible**
Revenue opportunity		Sales & marketing
Description		
International calling cards allow customers to make international calls often at low or free rates.		
Root Cause		
An operator of low cost international calls, provided a freephone access number through which registered customers could dial their destination number and benefit from significantly lower rates than their own operator.		
Detection		
Analysis of zero-rated calls showed as peaks to these access numbers and upon investigation the service was discovered.		
Correction		
These access numbers were barred within the network.		
Prevention		
It is difficult to prevent such services, but continuous analysis of customer call behavior can identify such services.		

2.1.7 Low margin calls

Ref	Title	Operator Category
A.7	Low margin calls	Mobile
Type of Leakage		**Area of Business Responsible**
Cos leakage		Sales & marketing
Description		
An operator had negotiated preferential termination rates to four countries with an alternative carrier, where previously calls had to be terminated via their PTT at higher rates. However, it was found that calls were still being routed via their PTT resulting in lower margin for those calls.		
Root Cause		
Network routing had not been updated to reflect the new termination agreements.		
Detection		
This issue was detected through a one-off CDR analysis project relating to interconnect traffic. All agreements were reviewed and interconnect traffic analyzed independently of the settlement process. During this exercise it was found that no traffic to these four international destinations was being routed by this alternative carrier. On further analysis the traffic could be seen to be routed over trunk groups associated with the PTT.		
Correction		
The network routing tables were updated.		
Prevention		
Formalize the procedure for informing network operations of changes to the interconnect agreements and perform spot checks that these changes have been implemented.		

2.1.8 Ambiguous sales promotions

Ref	Title	Operator Category
A.8	Ambiguous Sales Promotions	Fixed line
Type of Leakage Revenue Leakage		**Area of Business Responsible** Marketing
Description Revenue leakage due to financial adjustments arising from billing complaints as a result of ambiguous free sales promotions.		
Root Cause Customers' liability for costs not made clear in all material featuring free offers.		
Detection High number of bill adjustments following free offer campaign.		
Correction N/A. Campaign cannot be corrected once it has ended.		
Prevention Ensure customers' liability for costs are made clear in all material featuring free offers.		

2.1.9 Poor QoS provided to high ARPU customers

Ref	Title	Operator Category
A.9	Poor QoS provided to high ARPU customers	WiMAX
Type of Leakage Revenue Opportunity		**Area of Business Responsible** Marketing, Technology
Description A WiMAX operator experienced substantial revenue dips as several of its high ARPU corporate customers churned to a competitor		
Root Cause Poor Quality of Service was provided to the corporate customers, resulting in customer dissatisfaction, and hence the churn.		
Detection Customer feedback during exit interviews.		
Correction No correction was performed.		
Prevention Offer of assured and premium QoS plans. Ensure processes & systems in place to provide assured and premium QoS.		

2.1.10 Campaign Management Discounts Subscriber Linguistics Behavior

Ref	Title	Operator Category
A.10	Campaign Management Discounts Subscriber Linguistics Behavior	Wireless
Type of Leakage		**Area of Business Responsible**
Revenue Opportunity		Marketing
Description An international mobile operator rolled out its services in rural markets in the Indian subcontinent and attracted several subscribers by offering low cost prepaid plans. The operator launched SMS campaigns for value added services, and experienced a transient increase in revenues. Gradually, the subscriber numbers and revenues declined, resulting in lost revenue opportunity to the operator.		
Root Cause The SMS campaigns were launched in 'English', which was not well interpreted by the rural population. Several subscribers unknowingly opted for the value added services without realizing the cost implications of the same. This lowered the attractiveness of the plans, and resulted in subscriber churn.		
Detection An analysis of traffic and churn reports revealed the root cause of the problem.		
Correction No correction could be done.		
Prevention Campaign management to consider the sociolinguistics for the given subscriber bases.		

2.2 Order Management & Provisioning

2.2.1 Contract Incorrect

Ref	Title	Operator Category
B.1	Contract incorrect	Fixed line data provider
Type of Leakage		**Area of Business Responsible**
Revenue opportunity		Sales & marketing
Description		
In some cases an operator was taking orders for a lower speed connection that had been requested by the customer, resulting in a loss of revenue opportunity.		
Root Cause		
The order capture process provided a default speed for new broadband circuits, that was the slowest speed offered, and in some cases this default value was accepted by the customer services representative rather than entering the customer's requested speed if higher.		
Detection		
Analysis of customer complaints showed a relatively high number of complaints for a new broadband service.		
Correction		
Correction was initiated by customer complaints, when the service they received did not agree with their original requirements. Please note in some cases customer did not complain, and a lower speed service was provided resulting in lost revenue opportunity.		
Prevention		
Customer services representatives attended additional training on the correct way to complete customer orders. The default speed of the service was removed from the system forcing the customer services representatives to enter a value.		

2.2.2 Insufficient customer information for billing purposes

Ref	Title	Operator Category
B.2	Insufficient customer information for billing purposes	Mobile
Type of Leakage Revenue leakage		**Area of Business Responsible** Sales & marketing
Description Incomplete customer information provided with a new order resulted in the service being provided but with the inability to bill the subscriber.		
Root Cause The order management validation process of customer information accepted invalid payment details.		
Detection A review of accounts with billing errors identified this problem, but the problem had been in existence for four months prior to detection.		
Correction The customer was contacted and corrected payment details were supplied, but only the last three billing periods could be billed, one month's worth of usage remained unbilled.		
Prevention The order management process should be amended so that payment details are validated before the provisioning of service commences.		

2.2.3 Invalid customer given account during identification validation

Ref	Title	Operator Category
B.3	Invalid customer given account during identification validation	Fixed line
Type of Leakage Fraud		**Area of Business Responsible** Sales & marketing
Description Failure to validate the identity of a customer at sign-on stage led to services being provided by no payment being received. This could include false identity being used, multiple application fraud or “long firm” fraud.		
Root Cause Insufficient identity checks for new subscribers.		
Detection Uncollected revenues against issued invoices.		
Correction No correction was possible as the customer could not be traced.		
Prevention Checking of identities with credit reference agencies, preferably on-line, together with compiling a database of known fraudulent identities and sharing this information between operators. Call profiling can be used to identify the same person even if they are using an alias.		

2.2.4 Delay in processing order

Ref	Title	Operator Category
B.4	Delay in processing order	Fixed line
Type of Leakage		**Area of Business Responsible**
Revenue opportunity loss and cost leakage		Sales & marketing
Description		
A delay in provisioning also delayed the subscriber's use of the service and consequently also delayed service and usage revenues from that subscriber as well as increased costs in manual corrections for the order that were required.		
Root Cause		
Discrepancies between the service configuration data in various network elements gave rise to provisioning failures that had to be resolved manually.		
Detection		
The introduction of KPIs measuring the number of orders that required manual intervention and the time from order to service exposed the nature of the problem.		
Correction		
As well as the manual intervention required for failed orders a multi-way data matching and correction exercise between network elements, order management and inventory management was used to clean up the systems involved in service activation.		
Prevention		
Identify and correct the process breaks that allowed the data in these various systems to go out of synchronization and run the service data matching exercise on a periodic basis.		

2.2.5 Third party costs of orders on hold

Ref	Title	Operator Category
B.5	Third party costs of orders on hold	Fixed line
Type of Leakage		**Area of Business Responsible**
Revenue opportunity loss and cost leakage		Sales & marketing
Description Internal delays with the provisioning of service for new orders gave rise to the situation where third parties facilities had been ordered and were being paid for even though the service had not yet been provided to the customer and consequently no revenues were being generated.		
Root Cause Facilities from third parties were ordered early in the provisioning process even though internal issues may delay the go live date for the service.		
Detection KPIs monitoring the profitability of orders showed initial negative margin.		
Correction No correction for existing order was possible.		
Prevention For new orders, delay the provision of third party facilities until internal dependencies have been met.		

2.2.6 Third party costs for cancelled circuits

Ref	Title	Operator Category
B.6	Third party costs for cancelled circuits	Fixed line
Type of Leakage		**Area of Business Responsible**
Revenue opportunity loss and cost leakage		Sales & marketing
Description		
A provider of leased line data services was in a position where it was leasing more lines from its network supplier than it was selling on to its customers.		
Root Cause		
The processes to supply and terminate leased lines were separate processes such that when customers terminated their contracts or reduced the number of circuits they required these circuits were not automatically flagged for resale or termination from its supplier.		
Detection		
The profitability of the lease lines service was declining and a review of circuit utilization was initiated. This compared customer contracts with supplier contracts and it was found that there were significantly more circuits being leased from its supplier than were being leased to its customers.		
Correction		
The number of circuits being leased from its supplier was reduced.		
Prevention		
Active management of lease line cancellations with a periodic review of contracts with suppliers to minimize over supply of leased lines.		

2.2.7 Third party costs for early provision of service

Ref	Title	Operator Category
B.7	Third party costs for early provision of service	Fixed line
Type of Leakage		**Area of Business Responsible**
Cost leakage		Technology
Description		
Provision of service before due date gave rise to cost from third party suppliers before the service was taken up and the customer was paying for the service.		
Root Cause		
The order management process assumed a “provision as quickly as possible” policy in order to minimize the possibility of missing a customer go live date.		
Detection		
An analysis of costs versus revenues showed a revenue lag for certain customers.		
Correction		
This issue could not be corrected for existing orders.		
Prevention		
More sophisticated provisioning and order management scheduling algorithms were required so that the service is ready for operation as close to the customer’s go-live date as possible whilst minimizing the risk of overrunning the contracted service date thus minimizing third party costs.		

2.2.8 Order cancellation due to delay in provisioning

Ref	Title	Operator Category
B.8	Order cancellation due to delay in provisioning	Fixed line
Type of Leakage		**Area of Business Responsible**
Revenue opportunity and cost leakage		Technology
Description A delay in provisioning caused customers to cancel their order before service was provided. Consequently no revenues were generated from the customer although costs were incurred in the order management process even though not fully provisioned, plus the loss of the ongoing revenue opportunity from the customer.		
Root Cause Discrepancies between the service configuration data in various network elements gave rise to provisioning failures that had to be resolved manually.		
Detection The introduction of KPIs measuring the number of orders that were cancelled before billing commenced exposed the nature of the problem.		
Correction No correction was possible, the customer was lost.		
Prevention Identify and correct the process breaks that allowed the data in these various systems to go out of synchronization. Run a service data matching exercise on a periodic basis to detect these anomalies and correct them before they affect the service action process.		

2.2.9 Provisioned service different to customer requirements

Ref	Title	Operator Category
B.9	Provisioned service different to customer requirements	Fixed line
Type of Leakage		**Area of Business Responsible**
Revenue leakage and cost leakage		Technology
Description		
Provisioning errors resulted in the subscriber benefiting from services and features which were not included in their monthly service fees, resulting in potential revenue loss. Sometimes this also resulted in additional third party costs being incurred, reducing the profitability of the subscriber.		
Root Cause		
Provisioning failures led to the overprovision of services and features for a subscriber.		
Detection		
A subscription audit that matched service configuration settings between network elements and billing accounts identifies these discrepancies.		
Correction		
The service and features discrepancies identified during the subscription audit were used as the basis of manual correction to the service and features settings the network element and/or billing systems. Note, that in some cases subscribers were being under-charged for the services provided, even though they had not originally been ordered, but after contacting them some customer subscribed to these services resulting in additional revenues for the operator.		
Prevention		
Identify the process gaps that gave rise to the service activation discrepancies and correct these faults. Run the subscription audit on a regular basis.		

2.2.10 Service activated but no billing account created

Ref	Title	Operator Category
B.10	Service activated but no billing account created	Fixed line
Type of Leakage Revenue leakage		**Area of Business Responsible** Sales & marketing
Description Provisioning of a data service sometimes resulted in service being provided but not recorded in the provisioning system.		
Root Cause The provisioning process involved interactions with many network and BSS systems. However, the provision system did not implement a transactional model when implementing service, such that if one step failed the previous steps would be rolled back. The result was that in some cases service was provided but the provisioning system regarded the service as unprovisioned. As billing was synchronized with the provisioning system in these cases no billing was performed.		
Detection A comparison of configuration information from network elements with the billing system showed these discrepancies.		
Correction The provisioning system was updated with the correct service information.		
Prevention The provisioning system was updated to include a roll-back feature for failed orders.		

2.2.11 Billing ceased but service still provided

Ref	Title	Operator Category
B.11	Billing ceased but service is still provided	Fixed line
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Technology

Description

When moving house, a tenant requested that their service be terminated, however the termination request resulted in the closure of the billing account but without ceasing the service.

After the premises had become vacant the service was detected and used for a call selling operation.

This resulted in no revenues to the operator, as billing had been correctly terminated, but the operator did receive and settle call termination charges received by other networks, as the call selling operation targeted international destinations.

Root Cause

When the request for the line cease returned failed, the error message returned to the provisioning process was ignored, resulting the service remaining active even though the process went on to close the billing account.

Detection

A spot check of unbilled lines with network usage identified the anomaly.

Correction

Once identified the line was ceased, but previous unbilled usage could not be recovered but all termination costs associated with this usage had to be honored.

Prevention

Error handling in the de-provisioning process was corrected.

2.2.12 Ported-out numbers not delisted from billing

Ref	Title	Operator Category
B.12	Ported-out number not delisted from billing	Fixed line
Type of Leakage		**Area of Business Responsible**
Cost leakage		Technology
Description		
When number portability was introduced the operator continued to bill the customer even though the number had been ported out.		
Root Cause		
The process for porting out numbers was not updated the internal ported numbers database resulting in billing continuing for these numbers.		
Detection		
Analysis of customer complaints identified issues with the porting-out process.		
Correction		
The ported-out database was updated.		
Prevention		
The porting-out procedure was modified to update the internal ported-out numbers database correctly. A comparison of the network routing database for ported numbers with the billing database should be run periodically to catch similar errors in the future.		

2.2.13 Ported-in numbers not billed

Ref	Title	Operator Category
B.13	Ported-in number not billed	Mobile
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Technology
Description		
Ported-in mobile numbers were not being billed because the billing system did not recognize the numbers as home subscribers.		
Root Cause		
An error with the network routing prefix for ported-in numbers results		
Detection		
A review of mobile portability procedures detected errors in the generation of usage data for some ported-in numbers.		
Correction		
The mediation system was modified to handle the incorrect number portability prefix in this case until the network elements were updated. It was possible to identify and recover previous call records from the data warehouse for the current billing period and reprocess them for billing.		
Prevention		
The network elements were modified to generate the correct routing prefix.		

2.2.14 Pre-paid handsets activated as post-paid

Ref	Title	Operator Category
B.14	Pre-paid handsets activated as post-paid	Mobile
Type of Leakage		**Area of Business Responsible**
Cost leakage		Technology

Description

In order to reduce queues in its retail outlets a mobile operator offered an "active at home" service where post-paid phones could be activated by faxing through a registration form to a customer services line.

The operator also offered a SIM-only prepaid service.

Some customers found that they could buy a post-paid handset and insert the pre-paid SIM without having to register the post-paid handset.

As post-paid handsets have a higher subsidy than pre-paid handsets, these customers were effectively getting subsidized pre-paid handset, increasing the costs and reducing the margin of the service to the operator.

Root Cause

Handsets were not locked to type of SIM.

Detection

IMEI analysis showed post-paid handsets with pre-paid SIMs.

Correction

No correction was possible.

Prevention

Restrict post-paid handsets to post-paid SIMs unless unrestricted by customer services.

2.2.15 Failure to meet contract volume commitment

Ref	Title	Operator Category
B.15	Failure to meet contract volume commitment	Fixed line
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Sales & marketing
Description		
Interconnect or wholesale customers who do not fulfill the contracted volume commitment were still charged the discount rate.		
Root Cause		
The analysis of usage for interconnect and wholesale customers with volume agreements was not being performed.		
Detection		
A manual audit of volume agreements identified the problem.		
Correction		
Adjustment invoices were raised for the last three months of traffic with these customers, but traffic before this period could not be corrected.		
Prevention		
Ensure monitoring of usage versus volume agreements is operational.		

2.2.16 Delay in number porting causes delay in billable service to customer

Ref	Title	Operator Category
B.16	Delay in number porting causes delay in billable service to customer	Mobile
Type of Leakage		**Area of Business Responsible**
Revenue opportunity		Customer service
Description		
A delay in ported mobile numbers between operators causes a period of time when the customer did not have service with either the original or new networks resulting in loss of revenue opportunity for the new operator.		
Root Cause		
The new operator suffered delays in porting-in new numbers such that service was terminated by the original network on the date previously agreed.		
Detection		
Analysis of customer complaints.		
Correction		
No correction was possible the revenue was lost. Please note that subscribers also suffered a loss of confidence in the new network operator, this being the first time that many of them had taken service from them.		
Prevention		
Ensure porting-in process operates to agreed deadlines.		

2.2.17 Overpayment for supporting services that have been cancelled

Ref	Title	Operator Category
B.17	Overpayment for supporting services that have been cancelled	Fixed line
Type of Leakage Cost leakage		**Area of Business Responsible** Technology
Description A fixed line operator also provided a hosting service and it was found that costs were being incurred from the hosting partner for services that had been cancelled.		
Root Cause The cancellation or downward adjustment of customer requirements for hosting services were not communicated to the hosting service provider resulting in charges for servers that were no longer being used.		
Detection A one-off review of customer orders versus supplier invoices showed a discrepancy.		
Correction No correction was possible, these costs could not be recovered.		
Prevention Coordination between cancellation of orders and active management to the level of corresponding services commissioned from suppliers.		

2.2.18 Failure to bill for services added and removed during billing cycle

Ref	Title	Operator Category
B.18	Failure to bill for services added and removed during billing cycle	Fixed line
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Technology
Description		
Adjustments certain services during a billing period were not reflected on the invoice until the next billing period.		
Root Cause		
For certain services the billing system did not pro-rate service adjustments made during a billing period. Billing was accurate from the beginning of the next billing period, but was missed from the time the adjustment was made until the end of that billing period. This could result in under or over-billing depending upon the nature of the adjustment.		
Detection		
A review of invoices showed no mid-period adjustments even though it was known that this was happening.		
Correction		
No correction was possible once the invoices had been issued.		
Prevention		
The billing system was upgraded to support pro-rata billing for mid-period service adjustments for the affected services.		

2.2.19 Costs incurred from delays in submission of cancellation

Ref	Title	Operator Category
B.19	Cost incurred from delays in submission of cancellation	Fixed line
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Customer service
Description		
Cancellation of customer orders did not result in the immediate cancellation of third party services resulting in charging of these services for an additional, and unnecessary, billing period.		
Root Cause		
The customer service was terminated as requested based on contractual terms, but because of the internal delay the notification of the termination of third party service to the purchasing team third party costs were incurred for an additional billing period.		
Detection		
Monthly margin analysis of these services showed an anomaly at the end of the service period.		
Correction		
No correction was possible as it was not possible to obtain a refund on from the third party supplier.		
Prevention		
The eradication of delays in the order cancellation procedure, such that notification of the release of third party costs is prioritized.		

2.2.20 Incorrect capture of equipment sales

Ref	Title	Operator Category
B.20	Incorrect capture of equipment sales	Mobile
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Sales & Marketing
Description		
Chargeable mobile handsets were being issued free of charge.		
Root Cause		
Incorrect equipment identification resulted in chargeable handset being sold as free of charge.		
Detection		
A stock reconciliation showed a difference between the expected and actual stock levels held. Further investigation uncovered the error.		
Correction		
The equipment identification was amended.		
Prevention		
In store cross-checking of equipment labeling.		

2.2.21 Stranded assets

Ref	Title	Operator Category
B.21	Stranded assets	Fixed line
Type of Leakage		**Area of Business Responsible**
Cost leakage		Technology
Description		
A DSL service provider was purchasing an excess amount of equipment for the number of subscribers using the service.		
Root Cause		
During the termination of service the network resources were deactivated in the physical network but were not marked as free in the inventory system.		
Detection		
A data integrity audit between network equipment, order management and the inventory system identified discrepancy in status of equipment.		
Correction		
The inventory system was updated with the correct equipment status so these stranded assets could be utilized.		
Prevention		
The service deactivation process was corrected to ensure the inventory management system was updated correctly. Periodic data integrity audits would ensure such anomalies were identified if the situation was to recur.		

2.2.22 Over provisioning of network components

Ref	Title	Operator Category
B.22	Over provisioning of network components	Fixed line
Type of Leakage		**Area of Business Responsible**
Cost leakage		Technology

Description

The provision of ports for line termination operated on the basis of activating multiple ports in one go when none we were available and subsequent activation requests using the already active but unused ports, until another batch were activated.

However, the process always opened another batch or ports without using up the over provisioned ports from the last activation request, resulting in significant overcapacity in network termination units.

Root Cause

Activation process failure to use activated but inactive ports.

Detection

Increasing lack of space in the line termination enclosures triggered an investigation and audit that identified a high number of unused line terminators.

Correction

No correction was possible for existing line termination units, although future requests were forced to use existing ports.

Prevention

Activation process was corrected to allocate ports correctly, with monitoring of active versus inactive ports.

2.2.23 Failure to implement service charges according to contract

Ref	Title	Operator Category
B.23	Failure to implement service charges according to contract	Fixed line
Type of Leakage Cost leakage		**Area of Business Responsible** Technology
Description A business account added a service which accounted for installation charges being charged to the customer. However, the contract required the installation charge should free of charge.		
Root Cause An installation charge waiver request form was not complete but the customer account team.		
Detection Analysis of one-time charges showed the increase for this customer.		
Correction A credit for the installation charges was given to the customer.		
Prevention The original customer contract should be referred to when generating subsequent service requests.		

2.3 Network and Usage Management

2.3.1 Invalid customer allowed to make call

Ref	Title	Operator Category
C.1	Invalid customer allowed to make call	Mobile
Type of Leakage Revenue leakage		**Area of Business Responsible** Technology
Description Loss caused by device connected to the network creating usage events with chargeable elements but no process to bill.		
Root Cause Postpaid users that requested to be disconnect from the service provider were marked as disconnected in the CRM/Billing systems, but the information was not updated in the HLR		
Detection Comparison of the lists of active users between the HLR and Billing and CRM systems identified these discrepancies.		
Correction Updating the HLR database in accordance with the data in the CRM system.		
Prevention Revision of the update processes between the CRM and the HLR, and weekly comparison between the active users information between the HLR and the CRM and billing systems.		

2.3.2 CDRs not produced

Ref	Title	Operator Category
C.2	CDR not produced	Fixed line
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Technology
Description		
CDRs for a small number of external routes were not generating usage records.		
Root Cause		
Some new routes had been introduced with interconnect partners, but the default setting for the trunks was not to generate usage data and this had not been altered. The trunks therefore were not generating usage.		
Detection		
At the end of the next accounting period invoices raised by another party disagreed with the expected traffic terminated with that partner due to those trunks not recording usage data. This also affected the accuracy of the invoices raised by the operator for traffic terminated on behalf of the other operator.		
Correction		
None, CDRs could not be generated after the event.		
Prevention		
Ensure all routing changes are communicated with the BSS community. Run periodic usage analysis and identify zero usage trunks.		

2.3.3 CDRs not produced correctly

Ref	Title	Operator Category
C.3	CDRs not produced correctly	Mobile
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Technology
Description		
CDRs for certain services were generated with an unexpected routing prefix which caused the records to be rejected by the mediation system.		
Root Cause		
Network engineering introduced a new routing mechanism without informing the mediation team of the new routing prefix.		
Detection		
Inspection of CDRs showed unusual routing prefixes.		
Correction		
The error/suspense files for the current billing period were reprocessed by the mediation system. Usage in files for previous billing periods was not recoverable.		
Prevention		
Planned changes to the network environment must be reviewed with the BSS community		

2.3.4 Incorrect recording of call duration

Ref	Title	Operator Category
C.4	Incorrect recording of call duration	Mobile
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Technology
Description		
An operator found that the duration in some usage events were under recorded.		
Root Cause		
A timing error on the switch resulted in the duration field recording a duration less than that indicated by the start time and end time fields.		
Detection		
A manual inspection of CDRs identified this problem.		
Correction		
No correction was attempted for existing CDRs.		
Prevention		
The mediation system was updated to recalculate the duration based on the difference between the start time and end time fields.		

2.3.5 Call rounding error

Ref	Title	Operator Category
C.5	Call rounding error	Fixed line
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Technology
Description An operator's billing system charged to the neatest second whilst the network records to the nearest hundredth of a second. The operator found that the fractional parts of call duration were truncated rather than rounded to the nearest second.		
Root Cause The mediation system's handling of fractional parts of seconds.		
Detection Independent CDR tracking between mediation input and mediation output showed the truncation of the duration.		
Correction No CDRs were corrected.		
Prevention The mediation system was updated to round call duration to the nearest second.		

2.3.6 Number ranges already in use assigned to new interconnect operator

Ref	Title	Operator Category
C.6	Number ranges already in use assigned to new interconnect operator	Fixed line
Type of Leakage Revenue leakage		**Area of Business Responsible** Technology
Description A national PTT re-allocated an existing number range to a new operator that had previously been allocated to another operator, with two consequences. Firstly, the traffic to that operator was routed incorrectly, resulting in termination charges rather than a service fee for the operator. Secondly, the settlement invoices were sent to the wrong operators, resulting in invoice disputes, costs incurred in investigating the issue and rebilling the operators and a delay to payment of the service fees impacting the operator's cash flow.		
Root Cause Ineffective number range management allowed a number range to be allocated without being recorded, enabling the range to be re-allocated.		
Detection This issue came to light due to the dispute raised by the other operator.		
Correction Reset routing and settlement rules for the original number range and allocate an additional number range to the new operator.		
Prevention Ensure the number range allocation process records allocated ranges correctly and as a fail-safe extend the network number allocation process not to allow a previously allocated number range to be reallocated without approval from the interconnect department.		

2.3.7 Failure to bar IMSI from roaming

Ref	Title	Operator Category
C.7	Failure to bar IMSI from roaming	Mobile
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Technology
Description A mobile network allowed foreign subscribers to make and receive calls even though the operator did not have a roaming agreement with the visiting network. This prevented subscriber charges being raised on the visiting network, but the visited network still had to pay the termination costs associated with the outgoing calls made by the unexpected visiting subscribers.		
Root Cause The network allowed these subscribers to attach to the network. In addition, the mediation system had a lookup table of the valid roaming agreements and dropped the unexpected roaming records without generating an alert or report.		
Detection An analysis of network usage from roaming subscribers summarized by visiting network was compared with the list of roaming agreements and the anomalies were identified.		
Correction The network was updated to prevent subscribers from the identified networks attaching to the network.		
Prevention Periodic review of network roaming configuration with list of valid roaming agreements.		

2.3.8 Third party costs incurred because network route unavailable

Ref	Title	Operator Category
C.8	Third party costs incurred because network route unavailable	Fixed line
Type of Leakage Cost leakage		**Area of Business Responsible** Technology
Description A fixed line operator suffered from increased traffic termination costs.		
Root Cause A technical fault with a trunk group caused traffic to use the overflow routes. These overflow routes were connected to another operator that charged higher termination rates.		
Detection Network operations team detected the problem as alarms were raised for the faulty route.		
Correction The route was fixed and placed back into service resulting in the normal routing of traffic. It was not possible to recover the increased termination costs during the trunk outage.		
Prevention This type of issue cannot be prevented.		

2.3.9 Countries closed off

Ref	Title	Operator Category
C.9	Countries closed off	Mobile
Type of Leakage		**Area of Business Responsible**
Revenue opportunity		Technology
Description		
Subscribers are not allowed to make international calls to certain countries.		
Root Cause		
Due to suspected fraudulent traffic to some countries, all the traffic to these countries was blocked.		
Detection		
Detecting zero traffic to destinations to which there was traffic in the past, and by analyzing complaints of customers that they cannot make calls to certain countries.		
Correction		
Removing the blocking of the calls to the closed off countries in parallel of taking actions to prevent the fraudulent traffic.		
Prevention		
Regular checking of availability of connections to all countries, and analysis of changes in traffic volume per destination.		

2.3.10 Failure to use least cost route for traffic delivery

Ref	Title	Operator Category
C.10	Failure to use least cost routing for traffic delivery	Fixed line
Type of Leakage Cost leakage		**Area of Business Responsible** Technology
Description An operator had agreements with a number of different interconnect partners, offering different termination charges to given destinations based on volume, time of day. It discovered that by routing its traffic to different operators it could reduce its termination costs.		
Root Cause The network implemented a static traffic routing plan that did not take termination costs into account.		
Detection Margin analysis of wholesale traffic indicated higher costs than necessary.		
Correction No correction possible.		
Prevention Continuous management of performance against interconnect agreements to ensure most cost-effective route is being used, at least on a daily basis. This must take into account volume agreements, discount and penalty rates. Please note that the least cost route is not necessarily the best route to use due to quality of service issues.		

2.3.11 Pre-paid platform downtime gives free usage

Ref	Title	Operator Category
C.11	Pre-paid platform downtime gives free usage	Mobile
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Technology

Description

An operator found that it was providing unexpectedly high volumes of free service during routine maintenance of its prepaid platform.

Root Cause

The prepaid platform's charging and balance management engine could not be updated without taking it out of service.

However, the operator did not want to interrupt service and so allowed pre-paid subscribers to continue to make calls even though these could not be accounted for.

To minimize revenue leakage issues this was performed in the early hours of the morning, but subscribers were using the internet to inform others that a maintenance period was in progress.

Detection

Analysis of traffic patterns during maintenance period showed unusually high traffic volumes for the time of day.

Correction

No correction possible.

Prevention

Enable system maintenance without the need to take the pre-paid platform of out service, perhaps by utilizing a shadow or fall-back system.

2.3.12 CDRs not written to network element data file

Ref	Title	Operator Category
C.12	CDRs not written to network element data file	Fixed line
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Technology
Description		
An operator found that calls from certain lines were not generating service usage information.		
Root Cause		
For many years employees of the operator were given free calls. This was implemented by switching itemized billing off for the home lines for employees. However, when an employee ceased service or moved home, itemized billing was reinstated for those lines.		
Detection		
A network audit of line attributes found many more lines were providing free calls than there were current employees.		
Correction		
No correction was possible.		
Prevention		
Ensure termination of employment results in modification of the line attributes. Consider implementing this employee benefit by administering a database of eligible personnel within the billing system.		

2.3.13 Data loss during file transfer between systems

Ref	Title	Operator Category
C.13	Data loss during file transfer between systems	Mobile
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Technology

Description

An interruption in network availability during a file transfer between the network elements and the mediation system resulted in data loss.

Note, that this can happen between any two internal or external systems, for example: network element to mediation, mediation to billing, mediation to interconnect settlement, mediation to roaming clearing house, etc.

Root Cause

An interruption to the network connectivity resulted in Lack of data integrity checks by sending and receiving system.

Detection

Trend analysis of traffic volumes billing indicated drop in traffic but this was not shown by network statistics.

Correction

Files were recollected from the switch and not data loss was experienced in this case.

It should be noted however that certain devices, especially network elements have a limited storage capacity and if data is not transferred within a given time period this data may be lost permanently.

Prevention

Implement in-line data integrity checks such as the following:

- File sequence number gap check
- Block sequence number gap check
- Record sequence number gap check
- Inter-CDR end-time gap check.

2.3.14 Billable CDRs incorrectly filtered by mediation system

Ref	Title	Operator Category
C.14	Billable CDRs incorrectly filtered by mediation system	Mobile
Type of Leakage Revenue leakage		**Area of Business Responsible** Technology
Description A mobile operator offered a voicemail service and provided a short code enabling subscribers to access their voicemail which was free of charge. The billing system was overloaded and the mediation vendor was instructed to remove calls to voicemail retrieval. Implementation of the new filtering rule caused billing to an international destination to cease.		
Root Cause The new filtering rule was implemented as a prefix match rather than an exact match, causing more records than expected to be removed from the billing chain.		
Detection Independent analysis of network usage records and billing summaries showed a discrepancy in international traffic.		
Correction For the current billing period records were recovered from the reject file and the filter was changed from a prefix match to an exact match.		
Prevention Improved testing and code inspection processes for new releases of mediation software.		

2.3.15 Incorrect transformation of file in mediation

Ref	Title	Operator Category
C.15	Incorrect transformation of file in mediation	Fixed line
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Technology

Description

It was found that mediation was adding an hour to the timestamps within a CDR, pushing calls an hour early into peak rate and was pushing calls an hour earlier into off-peak rates.

There was a net loss of revenue as a result of this issue.

Root Cause

A switch ended up being deployed in a time zone that was different to its original delivery destination. The switch clock was not altered for local time; instead the mediation system added an hour to the timestamp.

Initially, this was correct but when the country entered daylight saving the clock was correctly adjusted to local time, but the rule of adding an hour was not turned off in the mediation system.

Detection

Testing of the mediation system with hand generated CDRs of known origination, destination and timing highlighted the problem.

Correction

No correction of billed event was possible.

Prevention

Ensure changes to mediation rules are fully documented and actively managed.

Full test the mediation system, including with known CDRs, before deploying into the production environment.

2.3.16 Short duration calls rounded to zero duration

Ref	Title	Operator Category
C.16	Short duration calls rounded to zero duration	Mobile
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Technology
Description		
An operator found that it was not charging for calls of less than three seconds because it rounded such calls to zero.		
Root Cause		
When service was launched an operator suffered from a high proportion of dropped calls and decided not to charge calls of less than three seconds because this was likely to be due to network quality issues. This rule was never reviewed and was still in place two and a half years after launch.		
Detection		
CDR tracking from mediation input to mediation output found the discrepancy.		
Correction		
No correction to previous bills was possible.		
Prevention		
Ensure changes to mediation rules are fully documented and actively managed. Full test the mediation system, including with known CDRs, before deploying into the production environment.		

2.3.17 Incorrect set up of GSM gateways

Ref	Title	Operator Category
C.17	Incorrect set up of GSM gateways	Mobile
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Technology
Description		
GSM gateway MSC incorrectly recording off-net calls.		
Root Cause		
Incorrect switch configuration resulted in chargeable calls to certain destinations being recorded with a zero duration. This was limited to a small number of international destinations via one interconnect partners.		
Detection		
Zero duration call analysis showed an unusually high number of events for specific destinations via one interconnect partner.		
Correction		
The switch configuration was updated to record these calls correctly.		
Prevention		
Periodic use of call simulation, where a switch's configuration is tested for charging of all valid service combinations, would prevent such issues if used each time the configuration is updated.		

2.3.18 Trunk identify set up incorrectly

Ref	Title	Operator Category
C.18	Trunk identity set up incorrectly	Fixed line
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Technology

Description

It was found that traffic on certain routes was being charged at an incorrect rate to the wrong operator.

Trunks terminated not reused for certain period of time.

1 Restarted route to different operator, routed inappropriately.

2 Recharging the wrong operator.

Root Cause

Terminated trunks were being reused too soon.

Normally, before trunks could be reused they had to remain active for a given period of time. However, in this case the route was restarted to a different operator with the consequence that traffic was routed inappropriately and the wrong operator was charged for traffic received on that route.

Detection

An invoicing query raised by the original operator highlighted this problem, as they were not sending any traffic on this route.

On further investigation it was found that the traffic termination fees were higher than expected, because traffic was still being terminated to the original operator rather than the new operator.

Correction

No correction was possible. Traffic had to be accounted and settled based on the actual routing of the calls.

Prevention

Review of trunk allocation procedure to ensure correct procedures are followed.

Periodic analysis of the implementation of network routing with the agreements in place.

2.3.19 Internal abuse of network

Ref	Title	Operator Category
C.19	Internal abuse of network	Mobile
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Technology
Description		
An operator found that employees of another, related operator were benefitting from free calls on mobile phones provided by that company in another country.		
Root Cause		
An operator was acquired by another operator and became part of its group. Employees of the acquiring company were working on site and provided were with company mobile phones with free usage that was booked to internal departmental accounts. However, after the acquisition period, the employees return to their original company, that was based in another company, but many retained their phone and continued to make use of the free service once they returned home.		
Detection		
Analysis of call usage booked to internal departments was much higher than expected and consisted mainly of international roaming calls.		
Correction		
No correction was possible.		
Prevention		
Active management of equipment and service provided to internal staff members.		

2.3.20 Loss of CDRs caused by local storage failure on switch

Ref	Title	Operator Category
C.20	Loss of CDRs caused by local storage failure on switch	Fixed line
Type of Leakage Revenue leakage		**Area of Business Responsible** Technology
Description An operator lost revenue due to the loss of call detail records.		
Root Cause A fault with the call recording module of a switch caused data files to be lost before they had been collected by the mediation system.		
Detection A gap in file sequence number was detected by the mediation system.		
Correction No correction was possible.		
Prevention Ensure switch data storage is resilient to a single point of failure.		

2.3.21 Prepaid usage not triggering IN platform

Ref	Title	Operator Category
C.21	Prepaid usage not triggering IN platform	Mobile
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Technology
Description		
Subscribers that had migrated status from post-paid to pre-paid and had retained their numbers were given free usage.		
Root Cause		
The migration process had updated the subscriber status in the subscriber table so that the mediation system filtered calls records from the post-paid billing system, but the HLR had not been updated to trigger the IN platform.		
Detection		
An analysis of MSC records showed some pre-paid subscribers did not have the pre-paid extended data fields present in their CDRs.		
Correction		
No correction was performed.		
Prevention		
Correct the post-paid to pre-paid migration process to ensure the HLR is updated correctly. Run a check that all pre-paid subscriber trigger the IN platform.		

2.3.22 Delayed Network De-provisioning for 3rd Party Services

Ref	Title	Operator Category
C.22	Delayed network de-provisioning for 3rd party services	Wireless
Type of Leakage Revenue and Cost Leakage		**Area of Business Responsible** Technology
Description To attract subscribers to its newly launched mobile television services, a quad-play operator offered a sports channel promotion during the World Cup season. The promotion provided a free subscription to 'Star Sports' with a subscription to 'ESPN'. After the World Cup was over, several subscribers continued to receive the free subscription.		
Root Cause After the World Cup was over, the promotion had been deactivated on the billing system, but the network configuration was not updated given the lack of automated provisioning mechanisms. As a result, subscribers were not billed for viewing 'Star Sports', resulting in revenue leakage. Additionally, the channel partner continued to bill the operator for channel usage, resulting in cost leakage.		
Detection High invoice amounts from the channel partner triggered the alarm, and an analysis of network configuration revealed the root cause.		
Correction No correction could be done.		
Prevention Automated and synchronous provisioning of billing and network systems.		

** This controls combines the controls A.2 and B.17, and provides a scenario where both revenue and cost leakage can result in significant losses to an operator.*

2.3.23 Erroneous Recharge Card Voucher Activations

Ref	Title	Operator Category
C.23	Erroneous recharge card voucher activations	Wireless
Type of Leakage Cost Leakage		**Area of Business Responsible** Technology
Description An operator in West Africa incurred cost leakages resulting from a high number of unusable recharge vouchers, requiring the operator to provide manual adjustments to subscribers.		
Root Cause To minimize fraud and voucher theft during transit, the operator had implemented a process whereby the dealer stores are required to send a voucher batch activation request to the operator. The activation process was executed manually by low-skilled staff who made typographical errors while keying in the voucher batch numbers. As a result, there were instances where subscribers were unable to use voucher cards. Moreover, erroneous activations spawned two fraud vulnerabilities: voucher theft and duplicate voucher recharges.		
Detection An analysis of customer complaints revealed a high number of unusable voucher complaints. The voucher activation process was reviewed, and activation logs were analyzed to derive at the root cause.		
Correction Manual adjustments to subscribers.		
Prevention Hiring of high-skilled personnel for voucher activation. Reconciliation of activation requests with activation logs and reporting on discrepancies.		

2.3.24 Poor Service Quality

Ref	Title	Operator Category
C.24	Poor Service Quality	Fixed line
Type of Leakage Revenue leakage		**Area of Business Responsible** Marketing
Description Revenue leakage due to customers receiving financial compensation for service outages.		
Root Cause Poor quality management of service pre- and post-launch.		
Detection Low service availability ratio. High number of complaints regarding service. High customer churn ratio.		
Correction Address technical service issues responsible for most financial compensation requests.		
Prevention Alignment of service development and launch with established quality standards.		

2.4 Rating and Billing

2.4.1 Incorrect charges applied to events

Ref	Title	Operator Category
D.1	Incorrect charges applied to events	Fixed line
Type of Leakage Revenue and cost leakage		**Area of Business Responsible** Technology
Description A misidentification of traffic class by the billing system resulted in subscriber billing charging for premium rate calls at normal long distance rates. Rating for the out-payments to the owners the of premium rate services was conducted correctly by another system.		
Root Cause An error in the number plan table guided the rating engine to normal long distance tariffs.		
Detection Independent monitoring of premium rate traffic showed a discrepancy with the billing statistics.		
Correction No correction was possible once the calls appeared on a subscriber invoice.		
Prevention The number plan table was reviewed to ensure all entries were correct and checking procedure introduced after all subsequent changes.		

2.4.2 Events records written off because they are too old to bill

Ref	Title	Operator Category
D.2	Records sent to a third party which are lost or delayed	Mobile
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Technology
Description Inbound roaming records were sent to the visiting network operators over 30 days old and were rejected by the roaming clearing system. Please note that the operator incurred and settled the termination charges associated with off-termination of calls made by these subscribers.		
Root Cause Delays in the processing of inbound roaming records caused the CDRs to become unbillable.		
Detection The problem was identified when the files were rejected by the operator's roaming clearing house.		
Correction No correction was possible.		
Prevention Procedures were put in place to identify late process of CDRs and prioritize their processing to meeting the clearing deadline.		

2.4.3 CDRs in suspense written off without inspection

Ref	Title	Operator Category
D.3	CDRs in suspense not yet rated	Fixed line
Type of Leakage Revenue leakage		**Area of Business Responsible** Technology
Description Errors in billing of premium rate services resulted in chargeable subscriber records being deleted without inspection or correction.		
Root Cause Billing did not occur for premium rate numbers that were not linked to billing accounts. Instead the usage records were written to an error/suspense file that grew in size, to such a point that the file was periodically deleted in order to make space on the system.		
Detection A one-off analysis of the error/suspense file showed that it contained billable records.		
Correction None possible, the data files were deleted.		
Prevention Ensure all error/suspense file are actively managed.		

2.4.4 Manual billing inaccuracies

Ref	Title	Operator Category
D.4	Manual billing inaccuracies	Mobile
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Technology
Description A mobile operator introduced a corporate product before the billing system could generate invoices for the service. Instead, the operator used a spreadsheet to construct the bills by hand.		
Root Cause At the time the invoices were raised, not all of the billing information was available, but the invoices were generated anyway.		
Detection A manual inspection of the invoice process identified billing anomalies.		
Correction In some cases it was possible to raise adjustments to the original invoices, but in some cases the charges were written off.		
Prevention Ensure all manual invoices are doubled before being issued. Ensure the billing can charge for services before they are launched.		

2.4.5 Missing long duration call segments

Ref	Title	Operator Category
D.5	Missing long duration call segments	Fixed line
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Technology
Description		
The mediation system was responsible to assembling long duration call segments in to a single aggregated record for billing, but in some circumstances the call remained unbilled.		
Root Cause		
The network occasionally omitted to generate all segments of a long duration call.		
Detection		
Analysis of network usage information and billing summaries identified a shortfall in billed duration.		
Correction		
Switch updated to generate all long duration call segments.		
Prevention		
Ensure the switch generates all long duration call segments. To mitigate the risk the mediation system should be altered to at least charge up to the missing segment rather than reject the whole call. Further, consideration should be given to charge for the whole call if subsequent segments are generated after the missing segment.		

2.4.6 Incorrect routing of usage records to end systems

Ref	Title	Operator Category
D.6	Incorrect routing of usage records to end systems	Fixed line
Type of Leakage		**Area of Business Responsible**
Cost leakage		Technology
Description		
Subscriber records were incorrectly routed to the interconnect settlement system. Whilst the records were eventually billed correctly, cost were incurred in investigating the problems and reprocessing the records, plus cash flow was impacted because they missed the billing cut off and had to be billed in the next billing period.		
Root Cause		
Incorrect routing rules in the mediation system identified subscriber usage records are interconnect settlement records.		
Detection		
A high number of rejected records by the interconnect settlement system.		
Correction		
The records were extracted from the interconnect settlement system and recycled into the billing system.		
Prevention		
Review of mediation business rules. Testing of the mediation system with known test cases prior to releasing to the production environment.		

2.4.7 Bills produced do not cover the services provided

Ref	Title	Operator Category
D.7	Bills produced do not cover the services provided	Fixed line
Type of Leakage Revenue leakage		**Area of Business Responsible** Technology
Description For certain services an operator was not charging for the supply of customer premises equipment (CPE).		
Root Cause The feed from logistics system that recorded the dispatch of CPE for these services was failing and no check was made by the billing system.		
Detection A manual review of equipment supply and revenues identified a revenue shortfall.		
Correction For some customers it was possible to charge retrospectively for the supply of the equipment for other the charges had to written off as it was too late to charge.		
Prevention Effective error checking and notification to be applied to all data feeds.		

2.4.8 Calls incorrectly identified as duplicates

Ref	Title	Operator Category
D.8	Calls incorrectly identified as duplicates	Mobile
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Technology
Description		
An operator found that it was not charging for all calls.		
Root Cause		
The billing system implemented a check for duplicate calls which ran prior to any billing run to ensure that no duplicate records had reached the billing system. However, due to errors in this check it incorrectly identified some calls as duplicates and removed them from billing.		
Detection		
Analysis of network usage data and billing data showed a discrepancy in usage duration between the two data sources.		
Correction		
No correction was performed for previous issued bills.		
Prevention		
The duplicate detection rules were updated to prevent this issue. All new releases of the billing system should be tested for the correct operation the de-duplication process prior to going into production.		

2.4.9 CDR enrichment incorrect

Ref	Title	Operator Category
D.9	CDR enrichment incorrect	Fixed line
Type of Leakage		**Area of Business Responsible**
Cost leakage		Technology
Description		
The introduction of a 1xxx Indirect access service temporarily caused these calls to be charged as international calls to the USA.		
Root Cause		
The routing prefix was supposed to be recorded in a new field in the usage records, however the switch left the prefix on the front the B number, causing the misidentification of these calls. The problems was identified in the billing system prior to invoicing, but the operator incurred costs in correcting the problem and waiting for the switch manufacturer to deliver a new switch build to correct the problem as source.		
Detection		
Billing statistics showed a large increase in international traffic to the USA and this caused an investigation.		
Correction		
The mediation system was changed to remove the routing prefix from the B number and redirect the records to the IDA processing system that charged the long distance operator for delivering the calls to them rather than directly to the subscribers.		
Prevention		
Testing of new switch builds before they are introduced into the network.		

2.4.10 CDRs correlated incorrectly

Ref	Title	Operator Category
D.10	CDRs correlated incorrectly	Mobile
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Technology
Description		
Revenue loss was detected because long duration calls were not correlated correctly.		
Root Cause		
Long calls in the network caused multiple, intermediate call records to be produced in the network. The mediation system was tasked with identifying such sets of records and aggregating them into a single record for billing purposes. Instead, the mediation system just sent the last record in the set rather than accumulating the total duration from all records in the set.		
Detection		
The problem was detected by independent analysis of network usage records and billing records. The minutes of use from the network records were higher than that from the billing records.		
Correction		
Such calls within the current billing period were reprocessed and billed correctly.		
Prevention		
Adequate testing of mediation functionality prior to deployment of the system would have prevented the issue.		

2.4.11 Print vendor does not receive all complete bills

Ref	Title	Operator Category
D.11	Print vendor does not receive all complete bills	Mobile
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Technology
Description		
An operator found that not all invoices had been issued even though they had been generated by the billing system. These invoices appeared as bad debt in the financial systems as the revenue had been booked into the general ledger.		
Root Cause		
An intermittent failure in the transfer of data between the operator and the print shop resulted in a series of invoice not being issued.		
Detection		
A customer complained that they had not received a bill.		
Correction		
None, it was not possible to regenerate the invoices.		
Prevention		
A failsafe transfer mechanism is required between the operator and the print shop to detect missing invoice files, such as the inclusion of file sequence numbers and checks for detecting gaps in this sequence.		

2.4.12 Bundle allowance applied incorrectly

Ref	**Title**	**Operator Category**
D.12	Bundle allowance applied incorrectly	Mobile
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Technology
Description		
Calls to a specific national mobile operator were incorrectly identified as on-net calls and offset against bundled minutes rather than being charged.		
Root Cause		
The prepaid rating engine classified CDRs with a traffic class and the table used identified this specific mobile prefix as an on-net rather than as an off-net call.		
Detection		
A spot-check of zero rated calls in the pre-paid platform identified the problem.		
Correction		
No correction was possible as the pre-paid rating engine could not post-rate.		
Prevention		
Testing of the pre-paid rating engine prior to use in the production environment.		

2.4.13 Pre-paid tariffs set up incorrectly

Ref	Title	Operator Category
D.13	Pre-paid tariffs set up incorrectly	Mobile
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Technology

Description

Pre paid customers were charged using incorrect tariffs.

Root Cause

Common root causes for this problem are:

1. Incorrect data in billing reference tables
2. Manual contract/price plan was interpreted incorrectly, and as a result was entered incorrectly to the billing system.
3. Pre-paid users were associated with the incorrect price plans

In this case the problem was the association of the customer to the incorrect price plan.

Detection

By using a Rating and Billing Verification (RBV) engine. The contract was re-interpreted independently and entered to an RBV. The RBV obtained the information regarding the customer type from the CRM system, and about the correct pricing from the master product catalogue. The RBV showed that recurring charges for certain items were different in the Billing and the RBV system because the customer was associated to the incorrect plan in the billing system

Correction

Correcting the association of the customer to the correspondent plan in the billing system.

Prevention

By proactively using an RBV system to verify both existing and new price plans/contracts, using the original contract, master product catalogue, and data from the CRM system.

2.4.14 Retail call tariffs set up incorrectly

Ref	Title	Operator Category
D.14	Retail call tariffs set up incorrectly	Mobile
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Technology
Description		
Calls to an international destination were charged at a reduced rate.		
Root Cause		
The tariff table included an international destination as part of Europe rather than in a different international rate band, resulting in lower charges of calls to this country.		
Detection		
Margin analysis of international calls performed by combing subscriber billing and interconnect settlement data found one country to be operating at a significantly lower margin than expected.		
Correction		
No correction was possible once the calls had been billed.		
Prevention		
The tariff tables were updated and periodic checks put in place to ensure the tables remained accurate.		

2.4.15 Equipment tariff set up incorrectly

Ref	**Title**	**Operator Category**
D.15	Equipment tariff set up incorrectly	Fixed line
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Order management
Description		
For a broadband service, some customer premises equipment, in this case an ADSL router/modem, was provided free of charge.		
Root Cause		
Equipment charge incorrectly recorded as zero for some customers.		
Detection		
An ad hoc analysis of the revenues generated by the service included an analysis of one-off charges showed that this was less than the number of lines provisioned, indicating a		
Correction		
No correction was possible since the analysis was performed many months after the service had been provided.		
Prevention		
Periodic, routine analysis of one-off revenues as well as usage revenues.		

2.4.16 Non-usage pricing structure set up incorrectly

Ref	Title	Operator Category
D.16	Non-usage pricing structure set up incorrectly	Fixed line
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Technology

Description

Non-usage charges, i.e., recurring and one-time charges were entered incorrectly into the rating/billing system.

Root Cause

Common root causes for this problem are:

1. Incorrect data in billing reference tables
2. Manual contract/price plan was interpreted incorrectly, and as a result was entered incorrectly to the billing system.
3. Pre-paid users were associated with the incorrect price plans

In this case the problem was association Incorrect data in billing reference tables.

Detection

By using Rating and Billing Verification engine (RBV). The contract was re-interpreted independently and entered to an RBV. The RBV got the information about the customer type from the CRM system, and about the correct charging from the master product catalogue. The RBV showed that recurring charges for certain items were different in the Billing and the RBV system.

Correction

Re entering the relevant items prices to the billing system and reproducing the bill.

Prevention

Proactive use of a RBV system to verify existing and new price plans/contracts, using the original contract, master product catalogue, and CRM system could prevent such issues.

Also, by recurrent verification of reference data accuracy.

2.4.17 Rating logic applied incorrectly

Ref	Title	Operator Category
D.17	Rating logic applied incorrectly	Fixed line
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Technology
Description		
Customers saw an increase in the tax amount as FUSF was charged incorrectly by the rating engine.		
Root Cause		
There was an error in the billing system as the percentage of FUSF was incorrectly set at a high percentage.		
Detection		
Analysis of statistics produced by the billing process showed an unusual increase in the tax amount applied to customers over multiple billing cycles.		
Correction		
Adjustments were applied to the customer's accounts.		
Prevention		
When rate changes are performed the updated rates can be compared to the new rates and if there is any mismatch it can be highlighted and detected before they are applied.		

2.4.18 Incorrect rating identifier applied during rating

Ref	Title	Operator Category
D.18	Incorrect rating identifier applied during rating	Fixed line
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Technology
Description		
Long distance calls were undercharge due to an error in the distance calculation algorithm.		
Root Cause		
The distance band was calculated based on the geographic coordinates of the originating and destination zones and this information added to the usage record by the mediation system. However, the calculation was incorrect and this caused the rating engine to calculate the wrong charge.		
Detection		
The test call generation system identified the problem.		
Correction		
Non-invoiced calls were reprocessed by the mediation system and re-billed. No correction could be performed for previously billed calls.		
Prevention		
The mediation system was updated to calculate the distance band correctly.		

2.4.19 Calls not accurately rated due to inaccurate reference data

Ref	**Title**	**Operator Category**
D.19	Calls not accurately rated due to inaccurate reference data	Fixed line
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Technology
Description		
The income from a new service was much lower than expected.		
Root Cause		
A reference table used in the billing system was populated manually; it included prices for different services in cents units. However, a mistake was made when entering this information. The price was entered in Euros instead of cents, i.e. 0.005 instead of 0.5, which resulted in a much lower rate being applied to the service than expected.		
Detection		
By noticing the low income of the service and by using a Rating and Billing Verification engine (RBV). The RBV got its reference data from the source information on the prices from the product Catalogue (and not from the Billing system reference table).		
Correction		
Manual correction of the reference data in the billing system		
Prevention		
By creating an automatic process to update the data in the billing system reference tables from the product catalogue, and by recurrent verification of the reference data accuracy		

2.4.20 Concurrent charging loss

Ref	Title	Operator Category
D.20	Concurrent charging loss	Mobile
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Technology
Description		
If two charging events were generated for the same prepaid account at the same time one of the charges was not applied.		
Root Cause		
The pre-paid platform was not queuing its charging request properly and at times of high load some charges were dropped.		
Detection		
Comparison of network usage information and charging records showed the missing charges.		
Correction		
No correction was possible as the second charging event was lost.		
Prevention		
An updated prepaid charging engine was stress tested before replacing the existing system.		

2.4.21 Discounts calculated incorrectly

Ref	Title	Operator Category
D.21	Discounts calculated incorrectly	Fixed line
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Technology
Description		
Customers had a discount for off peak hours calls, and a second discount for calling certain countries. The plan definition was that in the case where both discounts were applicable, only the higher discount should be applied. However in practice the Operator applied both discounts for off peak hours calls to those countries.		
Root Cause		
Incorrect definition of the price plan in the billing system		
Detection		
By using Rating and Billing Verification engine (RBV). The contract was re-interpreted independently and entered to an RBV, the bill produced by the billing system was compared by the RBV with the bill it produced, and the discrepancies in the amounts of discounts for specific calls were detected.		
Correction		
Correcting the price plan in the billing system		
Prevention		
By proactively using an RBV system to verify existing and new price plans/contracts. Using the original contract as the source of information for the RBV		

2.4.22 Customer reference data missing from rating engine

Ref	Title	Operator Category
D.22	Customer reference data missing from rating engine	Mobile
Type of Leakage Revenue leakage		**Area of Business Responsible** Technology
Description Usage events for certain customers were rejected by the rating engine due to the subscriber's reference data being missing from the subscriber table or incomplete.		
Root Cause Occasionally, new subscriber records were not inserted correctly into the subscriber table as referenced by the rating engine, causing a lookup failure and rejection of the usage record.		
Detection Analysis of the error suspense file indicated many rejected records from the same subscribers.		
Correction The subscriber table was updated manually and the rejected usage records reprocessed.		
Prevention Identify the error that caused the updates to fail and compare the rating subscriber table with the master CRM table periodically to identify missing entries.		

2.4.23 Re-credit raised in pre-paid billing system for successfully sent SMS

Ref	Title	Operator Category
D.23	Re-credit raised in pre-paid billing system for successfully sent SMS	Mobile
Type of Leakage Revenue leakage		**Area of Business Responsible** Technology
Description Subscribers were being credited for failed SMSs even though the SMS was delivered successfully.		
Root Cause A mobile operator charge pre-paid subscribers for SMS on request, but did not want to charge pre-paid subscribers for SMS that were not delivered, so when an SMS failure message was detected a credit was issued to top-up the account for the cost of the failed SMS. However, the SMSC repeatedly marked successful SMS deliveries as failed, resulting in unnecessary recharges to the affected prepaid accounts.		
Detection Routine comparison of network usage records with prepaid charging platform identified the incorrect recharges.		
Correction No correction was possible.		
Prevention Full testing of the SMSC prior to live operation.		

2.4.24 Prepaid service allowed service with zero balance

Ref	Title	Operator Category
D.24	Re-credit raised in pre-paid billing system for successfully sent SMS	Wi-Fi
Type of Leakage Revenue leakage		**Area of Business Responsible** Technology
Description Business customers of a national voice and data provider were able to obtain Wi-Fi service even if their credit was zero.		
Root Cause Updating of the Radius server required syntax changes in the Radius policies. The versions of the Radius server in the development and production environments were different meaning that the revised policies were not implemented correctly in production, resulting in a Wi-Fi connection being provided even though the credit balance of the customer was zero.		
Detection Analysis of Wi-Fi connection showed some unusually long connection with abnormally high downloaded data volumes from a restricted user base.		
Correction No correction was possible for previous connections. The production server was updated to implement the new policies correctly.		
Prevention Testing environment updated to ensure tested systems reflect the production environment.		

2.4.25 Inappropriate Credit Limits

Ref	**Title**	**Operator Category**
D.25	Inappropriate Credit Limits	Fixed line
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Billing & Collections
Description		
Revenue leakage due to inappropriate credit limits assigned to customers.		
Root Cause		
Available credit limits not aligned with defined customer segments.		
Detection		
High number of customers being disconnected due to reaching assigned credit limit. High average percentage variance between average monthly bill and assigned credit limit.		
Correction		
Re-assigning more appropriate credit limit for customer.		
Prevention		
Constant review of alignment of credit limits with defined customer segments.		

2.4.26 Dual Charging for Roaming-out Subscribers

Ref	Title	Operator Category
D.26	Outbound MMS charged twice for roaming out postpaid subscribers	Wireless
Type of Leakage		**Area of Business Responsible**
Opportunity Loss		Technology
Description Roaming-out postpaid subscribers were charged twice for each outbound MMS by a tier 1 operator in India.		
Root Cause MMS charging node performed real time charging for all subscribers (including home & roaming-out subscribers). Inbound TAP files, containing the MMS xDRs, were processed in the operator's billing system, resulting in dual charging of MMS xDRs.		
Detection Reporting of errors by the Revenue Assurance solution, and an increasing number of customer service complaints related to overbilling		
Correction Customer bills were adjusted during the next billing cycle.		
Prevention Inbound TAP files were pre-processed to filter away the MMS xDRs for postpaid subscribers, before being processed by the billing system.		

2.4.27 Billing Errors Resulting From Billing Software Upgrade

Ref	Title	Operator Category
D.27	Billing errors resulting from billing software upgrade	Wireline
Type of Leakage Revenue Leakage		**Area of Business Responsible** Technology
Description A broadband service provider underwent a billing transformation to accommodate its increasing subscriber base. The operator experienced a dip in revenues for its corporate subscriber base.		
Root Cause A custom module had been deployed in the previous billing system to bill the services offered to corporate subscribers. The documentation and source code were poorly maintained for this module. This module could not be introduced in the new billing system due to technology constraints, and hence the revenue leakage.		
Detection An analysis of revenue trend for corporate subscribers revealed an increase in service usage, but a decline in revenues.		
Correction No correction could be performed for the lost revenues. The new billing vendor was issued a change request to include the functionalities of the custom module in the new billing system.		
Prevention Documentation and maintenance of changes to operational systems.		

2.4.28 Deactivated VAS not Re-activated

Ref	Title	Operator Category
D.28	Deactivated VAS not re-activated	Wireless
Type of Leakage		**Area of Business Responsible**
Opportunity Loss		Marketing, Technology

Description

A wireless operator provides ring back tones (RBT) as a VAS to its prepaid subscribers, and charges a subscription fee at monthly schedules. Despite a high number of subscriptions, the operator experiences frequent service deactivations, resulting in revenue losses from missed opportunity.

Root Cause

A root cause analysis that when a subscriber's prepaid balance falls below the subscription fee during the scheduled run, the RBT service is deactivated. Even if the account is recharged by an amount above the subscription fee, the VAS is not automatically activated. The service activation happens only during the next scheduled run, provided the required balance is available. Subscribers can call the CSRs to have the service activated between two consecutive scheduled runs. However, given the nature of the service, several subscribers fail to realize the RBT activation, and hence remain unsubscribed. This results in situations where the RBT service remains deactivated for long periods for several subscribers, resulting in missed revenue opportunities to the operator.

Detection

An analysis of RBT revenue trend, service activation process, and subscriber service status revealed the root cause of the problem.

Correction

No corrections can be done in such scenarios, as the service was not provided to the subscriber.

Prevention

Possible means of prevention: Frequent scheduled runs for deactivated subscribers.

Inform subscribers about deactivated services, and provide incentives for service activation.

2.5 Receivables Management

2.5.1 Bad debt write-off

Ref	Title	Operator Category
E.1	Bad debt write-off	Fixed line
Type of Leakage		**Area of Business Responsible**
Revenue leakage, potential fraud		Finance
Description		
Revenue loss due to uncollected billed revenue that is written off after the litigation process.		
Root Cause		
The new customer process does not always perform a credit check to identify potential defaulters.		
Detection		
An analysis of the reason for unpaid invoices revealed the issue. This could also be due to expatriate workers who return to their native countries without clearing their outstanding dues.		
Correction		
This cannot be corrected; this revenue cannot be recovered once it is written off.		
Prevention		
Improved credit checking procedures as part of the customer take-on process, to identify subscribers who have a poor credit rating and are likely to default on their payments. Monitoring of customer usage and payment patterns to identify potential defaulters before the event. Please note that this could be an indicator of fraudulent behavior especially if the same subscriber is responsible, perhaps with different identities on the same network, or with the same identity on different networks. Prompt payment discount scheme for early paying customers. Opening fast-track payment channels such as direct debit. Service restoration fee following disconnection due to non-payment. To curb revenue leakages caused by departing expatriate workers, create real-time links between immigration systems and credit companies. Tighter credit controls on worst offending nationals, e.g. request sponsor guarantees at time of service activation.		

2.5.2 Fraudulent credit card information supplied by customer

Ref	Title	Operator Category
E.2	Fraudulent credit card information supplied by customer	Fixed line
Type of Leakage Revenue leakage due to fraud		**Area of Business Responsible** Finance
Description Stolen credit card details are provided in order to gain service but after the bill is produced no payment is made.		
Root Cause New customer process does not detect that details of stolen cards are being provided.		
Detection Analysis of the reason code for unpaid invoices revealed the problem.		
Correction Instigate revenue recovery procedures by criminal investigation and prosecution.		
Prevention Tighter identity checking procedures and payment details checks during customer take-on process.		

2.5.3 Cash collection process failure

Ref	Title	Operator Category
E.3	Cash collection process failure	Fixed line
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Finance
Description		
An operator failed to issue the direct debit payments for a proportion of its customer base. Although ultimately the direct debits were issued it caused an impact to cash flow.		
Root Cause		
A file of direct debits payments was generated by the billing system but it was transmitted successfully to the payment services provider.		
Detection		
A trend analysis of payments showed a dip in the collected revenues for the accounting period.		
Correction		
The file was re-transmitted to the payment services provider.		
Prevention		
Correction to the file transmission protocol to prevent recording of a failed transfer as a successful event.		

2.5.4 Inflexible 'Payment by Installment' Schemes

Ref	Title	Operator Category
E.4	Inflexible 'Payment by Installment' Schemes	Fixed line
Type of Leakage Revenue leakage		**Area of Business Responsible** Billing & Collections
Description Revenue leakage due to customer's lack of adherence to payment installment schedule.		
Root Cause Payment installment schedule does not suit customers.		
Detection High number of missed payment installments.		
Correction Suggest alternative payment installment schedule for payment defaulters.		
Prevention Constant review of payment installment schemes in place to ensure they meet the needs and expectations of customers.		

2.5.5 Late Payments

Ref	Title	Operator Category
E.5	Late Payments	Fixed line
Type of Leakage Revenue leakage		**Area of Business Responsible** Billing & Collections
Description Revenue leakage due to late payments ultimately resulting in bill write-offs.		
Root Cause No encouragement for customers to pay on time.		
Detection Low percentage of bills paid on time by customer.		
Correction N/A. Once bill has passed due date, nothing can be done to restore its status to 'on time'.		
Prevention Prompt payment discount scheme for early paying customers. Opening fast-track payment channels such as direct debit. Service restoration fee following disconnection due to non-payment.		

2.6 Finance and Accounting

2.6.1 Revenue incorrectly posted to General Ledger

Ref	Title	Operator Category
F.1	Revenue incorrectly posted to General Ledger	Fixed line
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Finance
Description		
The financial reports of an operator showed high levels of revenue in an error/suspense account preventing the accurate reporting of its financial information.		
Root Cause		
An error in the mapping between the billing charts of accounts the general ledger.		
Detection		
The value of revenues that could not be allocated to general ledger accounts was much higher than expected.		
Correction		
A manual exercise was undertaken to trace the translation from the billing chart of accounts to the financial reporting system.		
Prevention		
The billing chart of accounts was revised to minimize the potential for this error to recur in future. The billing chart of accounts was periodically reviewed to ensure the general ledger stayed up to date with changes in the billing environment.		

2.6.2 Incomplete process of records from POS to the financial system

Ref	**Title**	**Operator Category**
F.2	Incomplete process or records from POS to the financial system	Fixed line
Type of Leakage Revenue leakage		**Area of Business Responsible** Finance
Description Certain point of sale (POS) transactions could not be posted to the chart of accounts.		
Root Cause The point of sale data had transaction codes that were not defined for the financial system.		
Detection A larger than expected number of unallocated POS transactions.		
Correction Mapping rules were defined for the new transaction codes.		
Prevention Finance team involved in all changes to transaction codes to ensure their correct mapping to the financial systems.		

2.6.3 Tax over payment

Ref	Title	Operator Category
F.3	Tax over payment	Fixed line
Type of Leakage		**Area of Business Responsible**
Cost leakage		Finance
Description		
An operator was overpaying sales tax for wholesale transactions were tax does not apply to other jurisdictions.		
Root Cause		
An error in the tax tables caused tax to be calculated and paid unnecessarily.		
Detection		
New member of staff in the finance team queried the payment of these taxes.		
Correction		
The tax was reclaimed from the government agency.		
Prevention		
Periodic review of tax tables to ensure current legislation correctly implemented. Review of tax tables on introduction of new tax rules.		

2.6.4 Pre-paid roaming VAT over payment to customs

Ref	Title	Operator Category
F.4	Pre-paid roaming VAT over payment to customs	Mobile
Type of Leakage Cost leakage		**Area of Business Responsible** Finance
Description Value added tax (VAT) paid on outbound roaming charges even though the subscriber was outside of a chargeable VAT zone.		
Root Cause Incorrect VAT calculation rules implemented within the accounting system.		
Detection An internal review of tax calculations identified too much tax was being paid.		
Correction VAT adjustment submitted to the government's tax agency.		
Prevention Periodic review of VAT calculation rules. Automatic review of VAT calculation rules when changes are implemented to VAT rules.		

2.7 Customer Management

2.7.1 Customer care rebates are given inappropriately

Ref	Title	Operator Category
G.1	Customer care rebates are given inappropriately	Fixed line
Type of Leakage Revenue leakage		**Area of Business Responsible** Customer service
Description For reasons of customer retention customer service representatives were instructed to give customer rebates for certain types of complaint without reference to a supervisor. However, some subscriber abused the system and made repeated complaints and received multiple rebates.		
Root Cause The rebate history was not shown on the customer services system.		
Detection An analysis of rebate transactions showed clusters of subscriber numbers and indicated abuse of the policy had taken place.		
Correction Not correct was possible, rebates could not be recovered.		
Prevention Education of the CSR representatives and inclusion of the rebate history shown in the customer care system.		

2.7.2 Pre-paid top-up payments are allocated to the incorrect account

Ref	**Title**	**Operator Category**
G.2	Pre-paid top-up payments are allocated to the incorrect account	Fixed line
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Technology
Description		
Credit top-ups for some pre-paid customers resulted in someone else's account being credited with the voucher.		
Root Cause		
A database migration error resulted in inaccurate customer information remaining on the voucher management system, resulting in incorrect allocation of credit in certain circumstances.		
Detection		
This problem was detected by customer complaints being escalated by call centre staff.		
Correction		
Database migration errors were fixed manually.		
Prevention		
Adequate testing of billing support systems prior to use in live network.		

2.7.3 Discounts incorrectly applied repeatedly to a single account

Ref	**Title**	**Operator Category**
G.3	Discounts incorrectly applied repeatedly to a single account	Fixed line
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Customer service
Description		
Some corporate customers with account hierarchies enjoy double discounting		
Root Cause		
The account hierarchy mechanism did not prevent the same discount being applied at the root account as well as a departmental account. For customers that were billed at the root account, the discount was applied twice.		
Detection		
Manual inspection of the billing account structure revealed the problem.		
Correction		
No correction would be made for previously issued invoices.		
Prevention		
The billing system was updated to prevent the same discount being applied at different levels in the account hierarchy.		

2.7.4 Incorrect manual intervention of the billing system

Ref	Title	Operator Category
G.4	Incorrect manual intervention of the billing system	Fixed line
Type of Leakage Revenue leakage		**Area of Business Responsible** Customer service
Description Bills were adjusted manually resulting in both under-billing and over-billing.		
Root Cause No authorization process for manual bill adjustments.		
Detection Customer complaint for over-billing of a manually adjusted bill caused other manually adjusted bills to be inspected and under-billing was also detected.		
Correction No correction is possible once the invoice was issued.		
Prevention Adopt a four-eyes policy for manual bill correct, i.e. allow changes a reviewed by a second qualified person before the bill is issued.		

2.7.5 Incorrect manual intervention of the billing system

Ref	**Title**	**Operator Category**
G.5	Misdirected Bills	Fixed line
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Billing & Collections
Description Revenue leakage due to customers not receiving bills.		
Root Cause Bills being sent to outdated/ incorrect customer postal address.		
Detection High percentage of bill write-offs originating from customers requesting hard copies of bills. High percentage of late payments originating from customers requesting hard copies of bills.		
Correction N/A. No action can be taken once bill written off or late payment received.		
Prevention Encourage e-billing. Confirm postal addresses for frequent late payers requesting hard copies of bills.		

2.7.6 Inappropriate Cross/ Up-Selling Activity

Ref	**Title**	**Operator Category**
G.6	Inappropriate Cross/ Up-Selling Activity	Fixed line
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Sales
Description Revenue leakage due to customer's inability to pay for additional/ upgraded service.		
Root Cause Cross/ up-selling activity targeting wrong set of customers.		
Detection High number of cancellations of additional/ upgraded services following cross/ up-selling activity. High number of customers being disconnected due to reaching assigned credit limit following cross/ up-selling activity. High percentage of late payments following cross/ up-selling activity.		
Correction Offering customer more suitable additional/ upgraded services in line with customer's usage pattern.		
Prevention Well defined customer target segment for any cross/ up-selling activity, based upon customers' usage patterns.		

2.7.7 Inability to Pay

Ref	Title	Operator Category
G.7	Inability to Pay	Fixed line
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Billing & Collections
Description Revenue leakage due to customers' inability to pay due to death, debilitating illness or imprisonment.		
Root Cause Death, debilitating illness, imprisonment.		
Detection Formal notification from customer.		
Correction N/A. Monies cannot be recovered.		
Prevention Upper age limit for new customer registration.		

2.8 Partner Management

2.8.1 Roaming partners billed incorrectly

Ref	Title	Operator Category
H.1	Roaming partners billed incorrectly	Fixed line
Type of Leakage Revenue leakage		**Area of Business Responsible** Finance
Description Roaming partners were not billed for short calls that could be billed according to the interconnect agreements.		
Root Cause A rule that dropped short calls CDRs at the mediation dropped the short calls of external calls.		
Detection Analysis of the dropped calls showed billable records in the error/suspense file.		
Correction Changing the drop rules in the mediation corrected the problem for subsequent calls.		
Prevention Regular dropped calls analysis and revision of the mediation rules		

2.8.2 Interconnect partners billed incorrectly

Ref	Title	Operator Category
H.2	Interconnect partners billed incorrectly	Mobile
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Finance
Description		
Invoices for interconnect partners were not complete, resulting in under-billing.		
Root Cause		
New routes had been introduced by network operations, but the mediation system had not been informed of these new routes and consequently was not forwarding this information to the interconnect settlement system.		
Detection		
Invoices were queried by an interconnect partner, giving rise to the suspicion that not all usage was included on the invoice. A subsequent end-to-end analysis of usage data from the switch usage data files found more traffic on external routes than an equivalent analysis of the information held by the interconnect settlement system.		
Correction		
The mediation system reference tables were updated to include the new external routes.		
Prevention		
Ensure adjustments to network routing are reviewed with the BSS community rather than being performed in isolation within the network. Periodic review of network routing tables with BSS systems.		

2.8.3 Overcharging by a third party

Ref	Title	Operator Category
H.3	Overcharging by a third party	Fixed line
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Finance
Description		
Charges received from an interconnect partner for terminating traffic on their network were higher than they should have been.		
Root Cause		
Charging errors by the interconnect partner resulted in overcharging for terminating traffic.		
Detection		
A comparison of network traffic with the received invoice showed less traffic leaving the network than was being billed for by the other party.		
Correction		
The invoice was disputed and the charges corrected in line with the evidence supplied by the originating network.		
Prevention		
Ensure invoices from third parties are cross-checked based on the record of traffic sent to a particular operator.		

2.8.4 Arbitrage

Ref	Title	Operator Category
H.4	Arbitrage	Fixed line
Type of Leakage		**Area of Business Responsible**
Cost leakage		Finance

Description

A fixed line operator did not differentiate between fixed line and mobile termination rates, using a blended rate assuming a certain mix of fixed and mobile traffic.

This fact was exploited by an international operator that did differentiate, charging more for termination of mobile calls than for fixed-line calls.

It chose to route all of this mobile traffic via this operator, making a higher margin for itself on mobile termination to that country than via other possible terminating carriers.

It also chose to terminate fixed-line traffic via another operator that had a lower fixed-line termination rate to that country.

This resulted in a different mix of traffic received from this international operator resulting in significantly reduced margins for this traffic.

Root Cause

Deliberate exploitation of pricing differences between operators to maximize revenues and the failure of the terminating network to analyze the mix of traffic from its partner to ensure it was in line with the agreement between them.

Detection

Margin analysis on the traffic received on these routes was lower than expected.

Correction

No correction was possible, as charging was in line with published tariffs.

Prevention

Do not offer blended rates; ensure tariffs defined at appropriate level.

2.8.5 Overpayment of commissions

Ref	Title	Operator Category
H.5	Overpayment of commissions	Mobile
Type of Leakage		**Area of Business Responsible**
Cost leakage		Sales & marketing

Description

Commission payments made to channel partners when not appropriate.

According to an agreement the operator should pay to its resellers of packages (phones and SIM) a commission only if the package generated a certain amount of traffic.

However, in practice the amount was paid regardless of the amount of traffic generated by the package.

Root Cause

The commissioning process was not fully automatic. The amount of traffic generated by the packages was not available in an appropriate form on due time, to the people calculating the commissions payments.

Detection

When the information regarding the amount of traffic generated by each of the packages was finally available it was identified that several packages did not generate the required volume of traffic for triggering the payment of the commission.

Correction

Creating an automatic process that pays commissions only after the volume of traffic that was generated is known.

Prevention

Creating a control that verifies its correctness of the commissioning process by comparing traffic information from primary systems, to the traffic information that arrives to the commissioning system.

2.8.6 Revenue is shared with partners incorrectly

Ref	Title	Operator Category
H.6	Revenue is shared with partners incorrectly	Fixed line and Mobile Service Providers
Type of Leakage Cost leakage		**Area of Business Responsible** Finance
Description Revenue share calculations are inaccurate when the content provision failed. This revenue leakage scenario is applicable for any service provider offering a mix of 3rd party services. This scenario can have several variations, and the responsible business areas would vary accordingly. As an example, for mobile commerce service provider, the partner management could refer to streamlining business relationships with financial institutions, with the end objective of offering lucrative services to subscribers. The concept can be extended to downstream channel management and maintaining a strong network of dealers, agents and merchants to promote service adoptions.		
Root Cause The charging rules for subscribers were different for out-payments to content providers. Subscribers were charged on completion of the content download, whereas content providers were charged based on request.		
Detection Margin analysis of the content service showed lower margins than expected. Further analysis highlighted the difference in commercial terms between subscriber billing and the triggering of out-payments to content providers.		
Correction No correction was possible and charging and settlements were in accordance with agree contractual terms.		
Prevention Review of contractual terms with content providers.		

2.8.7 Wholesale traffic is not recorded accurately and passed to others for billing

Ref	Title	Operator Category
H.7	Wholesale traffic is not recorded accurately and passed to others for billing	Fixed line
Type of Leakage Revenue leakage		**Area of Business Responsible** Finance
Description The identification of service usage records to be sent to an MVNO for billing to their customers was inaccurate, resulting in undercharging of the MVNO as well as the MVNO's customers.		
Root Cause The host network did not transfer all data files to the MVNO.		
Detection Trend analysis based on the MVNO's billing statistics indicated an unexpected drop in traffic.		
Correction The usage data files for the MVNO were regenerated by the host network.		
Prevention Perform routine trend analysis on billing statistics to identify potential data loss. Ensure a file tracking mechanism is in place with the host network, such that gaps in sequence of files received can be identified prior to the billing process. Generate test calls from MVNO handsets and check that they are received in the data feed from the host network.		

2.8.8 Leasing circuits from third party under retail rather than wholesale contract

Ref	**Title**	**Operator Category**
H.8	Leasing circuits from a third party under a retail rather than wholesale contract	Fixed line
Type of Leakage		**Area of Business Responsible**
Cost leakage		Technology
Description		
Overpayment of costs for leasing circuits due to being charged a retail rate rather than a discounted wholesale rate.		
Root Cause		
Procurement team failed to spot the incorrect tariff.		
Detection		
Margin analysis showed services were operating below expected margin.		
Correction		
The terms of the purchase were renegotiated and a rebate was made for the previous overcharging.		
Prevention		
Review of commercial terms prior to contract signature to ensure costs in line with product plan.		

2.8.9 Dealer fraud

Ref	Title	Operator Category
H.9	Dealer fraud	Mobile
Type of Leakage		**Area of Business Responsible**
Cost leakage due to fraud		Finance
Description Dealer inflated the number of handsets activated to claim higher commissions. A single identity was used multiple times to activate additional handsets which were never used.		
Root Cause The handset activation process allowed multiple handsets to be activated with the same identity.		
Detection Analysis of unused active handsets, i.e. those handsets that never made a call nor received one within three months of activation, revealed a cluster for a given dealer for a given time period.		
Correction A criminal investigation was initiated to recover overpaid commissions.		
Prevention Prevent multiple handsets being activated for a given identity without supervisor authorization.		

2.8.10 Operator fails to meet bilateral agreement

Ref	Title	Operator Category
H.10	Operator fails to meet bilateral agreement	Fixed line
Type of Leakage		**Area of Business Responsible**
Cost leakage		Finance
Description		
Traffic volumes sent to a third party operator do not meet the volume agreement. In this case the operator still has to pay for the full volume, effectively increasing the termination of the traffic sent to this operator, thus impacting margin on that traffic.		
Root Cause		
When a lower cost became available for a certain traffic class, traffic was re-routed using this lower cost operator without taking into account the volume agreement with the original operator.		
Detection		
Margin analysis revealed lower margin on this traffic than expected.		
Correction		
No correction was possible as the issue was only detected at the end of the accounting period.		
Prevention		
Improvements to the least cost routing algorithms to take into account volume agreements when termination rates change.		

2.8.11 Fines imposed for failure to meet traffic agreement

Ref	Title	Operator Category
H.11	Fines imposed for failure to meet traffic agreement	Fixed line
Type of Leakage Cost leakage		**Area of Business Responsible** Finance
Description Traffic volumes sent to a third party operator do not meet the bilateral agreement, and a higher, penalty rate is imposed by the third party, resulting in higher costs for termination of the traffic sent and impacting margin for that traffic.		
Root Cause Traffic is not being routed in the most optimal way when taking into account penalty and discounted rates associated with interconnect agreements.		
Detection Termination costs higher than expected.		
Correction Cannot be corrected retrospectively, this cost cannot be recovered once it has been routed.		
Prevention Ensure traffic routing is actively monitored throughout the accounting period to minimize the possibility of penalty rates being imposed thereby maximizing the opportunity of achieving discounted rates.		

2.8.12 Sub-optimal call duration rounding on self-invoiced statement

Ref	Title	Operator Category
H.12	Sub-optimal call duration rounding on self-invoiced statement.	Fixed line
Type of Leakage Cost leakage		**Area of Business Responsible** Finance
Description An operator's interconnect settlement process caused revenue loss due to truncating fractional parts of call duration rather than rounding up to the nearest second.		
Root Cause Call rounding rules implemented within the mediation system.		
Detection A one-off code review of mediation system revealed the incorrect call rounding rules.		
Correction Unbilled calls for the current accounting period were re-processed with the new rounding rules. No correction was possible for previously charge calls.		
Prevention End-to-end reconciliation of correctly rounded network duration with invoiced duration. Testing of interconnect billing chain with a range of call durations to ensure correct rounding.		

2.8.13 Wholesale recharges incorrectly calculated

Ref	Title	Operator Category
H.13	Wholesale recharges incorrectly calculated	Fixed line
Type of Leakage		**Area of Business Responsible**
Cost leakage		Finance
Description		
Recharges of third party costs inaccurately calculated and passed on.		
Root Cause		
Not all of the third party costs involved in providing a corporate data services were identified as being associated with the customer resulting in undercharging of the customer.		
Detection		
An audit of procured services versus sales invoices showed a discrepancy. Many of these assets were active and associated with the supply of live services.		
Correction		
The unbilled active assets were identified and recharged to the appropriate customer, some back billing was possible. Please note that some stranded assets were also identified during the course of this investigation and analysis.		
Prevention		
Effective coordination of the procurement of third party services and onward billing of customers.		

2.8.14 Inbound TAP files never received or delayed too long by clearing house

Ref	Title	Operator Category
H.14	Inbound TAP files never received or delayed too long by clearing house	Mobile
Type of Leakage Revenue leakage		**Area of Business Responsible** Technology
Description A sub-set of outbound roaming TAP files were never received from the clearing house.		
Root Cause The roaming clearing house's file server crashed and some of the data was lost.		
Detection A gap in the sequence of files received from the roaming clearing house for a particular set of international roaming partners was detected.		
Correction No correction was possible.		
Prevention Protect sensitive data feeds with file systems that are resilient to two points of failure.		

2.8.15 CDRs from inbound roaming files rejected by clearing house

Ref	Title	Operator Category
H.15	CDRs from inbound roaming files rejected by clearing house	Mobile
Type of Leakage Revenue leakage		**Area of Business Responsible** Technology
Description Inbound TAP records were written to the wrong files and were rejected by the roaming clearing house. By the time the issue was investigated the data was more than 30 days old and was not longer eligible for clearing.		
Root Cause TAP files have a particular naming convention that indicates the visited and visiting network operator. The visited network had placed calls from the wrong visiting network in some of these files.		
Detection Rejected file report from the roaming clearing house.		
Correction None was possible as the time for submitting inbound roaming record had expired.		
Prevention Testing of production of TAP-out files.		

2.8.16 Inbound TAP CDRs dropped between clearing house and TAP module

Ref	**Title**	**Operator Category**
H.16	Inbound TAP CDRs dropped between clearing house and TAP module	Mobile
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Technology
Description		
A temporary lack of file space on the operator's TAP file collection module caused TAP files to be lost during the transfer process from the roaming clearing house.		
Root Cause		
Acknowledgement of the collection of the TAP data file from the clearing house was made even though the file could not be written to the local system.		
Detection		
Monthly trend analysis of TAP data showed a dip in traffic.		
Correction		
No correction was possible, as the data loss was not detected in time for the data to be re-collected from the roaming clearing house and billed within cut-off period for the billing period.		
Prevention		
Daily reconciliation of the file transfer list provided by the roaming clearing house and the files list generated by the mediation system.		

2.8.17 SDR variance between clearing house and TAP module

Ref	Title	Operator Category
H.17	SDR variance between clearing house and TAP module	Mobile
Type of Leakage Cost leakage		**Area of Business Responsible** Finance
Description A roaming clearing house repeatedly rejected TAP files submitted causing the operator to correct the files by re-rating and re-submitting to the clearing house. Additional internal costs were incurred to perform this process and an additional re-processing fee was charged by the clearing house.		
Root Cause Incorrect SDR exchange rate was being applied to the TAP records.		
Detection Rejected files from roaming clearing house.		
Correction Update SDR rates, re-rate TAP file and re-submit to clearing house.		
Prevention Ensure SDR exchange rates are correctly updated on a daily basis.		

2.8.18 Inbound TAP files – incorrect deduction of tax where no reclaim possible

Ref	**Title**	**Operator Category**
H.18	Inbound TAP files – incorrect deduction of tax where no reclaim possible	Mobile
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Technology
Description		
Overpayment of taxes resulted in revenue loss.		
Root Cause		
Incorrect tax calculations in the billing system and once the payments had been made the overpaid tax could not be recovered.		
Detection		
Manual analysis of billing system discovered the problem.		
Correction		
The tax calculation was adjusted.		
Prevention		
Adequate testing of billing support system prior to live operation.		

2.8.19 Outbound TAP files or CDRs rejected or dropped by TAP module

Ref	Title	Operator Category
H.19	Outbound TAP files or CDRs rejected or dropped by TAP module	Mobile
Type of Leakage Revenue leakage		**Area of Business Responsible** Technology
Description A mobile operator experienced systematic loss of revenue due to a particular type of international roaming. Visiting subscribers originated calls that were incorrectly billed by the TAP module.		
Root Cause Calls that involved CAMEL service generated composite CDRs (mobile-land and land-land). In these composite CDRs the network nodes generated some unexpected fields causing the records to be rejected.		
Detection Large numbers of rejected CDRs in the TAP module caused alarms to be generated and the situation was investigated.		
Correction A custom module was written to correct the CDRs such that they could be reprocessed by the TAP module and the network vendor was contacted for a repair to the network elements.		
Prevention The operator introduced an automatic network testing tool that allows the real-time analysis of toll ticketing files where these CDRs were generated. The real-time analysis allowed checking of CDRs fields against expectation, with warning and alarms being generated as soon as an anomaly was identified, thus reducing the number of CDRs affected before post processing activities.		

2.8.20 Outbound TAP files or CDRs rejected by clearing house

Ref	Title	Operator Category
H.20	Outbound TAP files or CDRs rejected by clearing house	Mobile
Type of Leakage Revenue leakage		**Area of Business Responsible** Technology
Description TAP files were rejected by clearing house.		
Root Cause TAP files were sent to the clearing house with a higher delay than permitted by contract. Such files have to be generated within 30 days.		
Detection Rejection notices from clearing house.		
Correction Changing internal procedures to ensure timely production of the TAP files.		
Prevention A set of controls that monitors the production and emission of TAP files as well as inspects their format and volume, and checks for significant variances from previous periods.		

2.8.21 Interconnect rates set up incorrectly in interconnect billing system

Ref	Title	Operator Category
H.21	Interconnect rates set up incorrectly in interconnect billing system	Mobile
Type of Leakage Revenue leakage		**Area of Business Responsible** Technology
Description Interconnect settlement process was under-charging interconnect partners.		
Root Cause Lack of controls around modifying tariffs in the interconnect settlement system allowed termination of fixed calls at mobile rates termination of mobile calls at fixed rates. As the operator was a mobile operator there was net under-billing as they terminated a much higher proportion of mobile traffic than fixed traffic.		
Detection An independent analysis of the end-to-end accurate of the interconnect revenue stream detected the reversal of the traffic volumes and hence the charging.		
Correction Fortunately, this was detected prior to the invoice run so there was time to reverse the rates and the bills were successfully corrected.		
Prevention Adequate testing of billing support systems prior to go live.		

2.8.22 Fixed line operator unable to bill for SMS

Ref	Title	Operator Category
H.22	Fixed line operator unable to bill for SMS	Fixed line
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Technology
Description		
A fixed line operator offered an SMS service, routing SMS message to an SMS service provider for delivery. The operator was not billing its subscribers for sending SMS's whilst the service provider was charging for handling of the SMS messages.		
Root Cause		
The SMS service provider did not send the delivery acknowledge message to the operator.		
Detection		
A financial review of the SMS product showed no revenues.		
Correction		
The operator temporarily billed from the SMS request message rather than the delivery acknowledge message.		
Prevention		
Either reconcile the number of SMS request messages with the SMS acknowledgement message or charge from the SMS request message.		

2.8.23 Time of day blended rates

Ref	Title	Operator Category
H.23	Time of day blended rates	Fixed line
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Technology
Description The interconnect settlement process is unable to differentiate between different time bands for international traffic and consequently a blended rate is applied causing charging inaccuracies. Note, if identified by an interconnect operator, this charging anomaly could be exploited.		
Root Cause Operator billing reports, from which interconnect settlement takes place, does not show the time band.		
Detection Manual review of interconnect settlement process.		
Correction No correction possible; this revenue could not be recovered.		
Prevention Improve the interconnect settlement process so to report interconnect traffic based on time band.		

2.8.24 Traffic class blended rates

Ref	Title	Operator Category
H.24	Traffic class blended rates	Fixed line
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Technology

Description

A new local exchange carrier (LEC) negotiated a blended rate for termination of traffic to a particular long distance operator, assuming just 10% of international traffic.

However, as a result of this agreement the LEC advertised low international termination rates significantly increasing the proportion of international traffic over the assumptions in the blended rate resulting in higher margins for the LEC but reduced margins for the long distance operator.

Root Cause

Deliberate exploitation of a blended rate for financial gain by one operator and the other not monitoring the traffic mix being received from the other.

Detection

One of the international partners for the long distance operator queried an abnormally high increase in traffic it was terminating on their behalf originating from the same region, the region serviced by the LEC.

Correction

No correction was possible for the traffic already terminated as the agreement did not allow invoicing adjustments to be made to the blended rate.

The interconnect agreement was terminated for future traffic.

Prevention

Monitor the traffic mix received from an operator and ensure it is in line with the agreement with that operator. If not, either adjusts the agreement or bar traffic from that operator.

2.8.25 Fraudulent interconnect traffic

Ref	Title	Operator Category
H.25	Time of day blended rates	Fixed line
Type of Leakage		**Area of Business Responsible**
Revenue leakage		Technology

Description

A new operator terminating traffic to their PTT in a way that voided termination charges even though the PTT bore the international termination charges.

Root Cause

The new operator deliberately exploited a loophole in the PTT's tandem switch that resulted in these calls being recorded with zero duration.

The PTT's interconnect system filtered out zero duration calls prior to rating, even though the usage records had correct start time and end time stamps.

Detection

When analyzing usage patterns for the PTT an unexpectedly high number of zero duration calls were observed for international calls originating on a group of trunks associated with a particular operator.

Correction

The mediation system recalculated the duration of the calls from the start and end times.

Prevention

The interconnect agreement was terminated and the operator successfully prosecuted for fraudulent delivery of traffic.

Periodic network testing to ensure accurate recording of usage information.

3 Administrative Appendix

This Appendix provides additional background material about the TM Forum and this document.

3.1 About this document

This is a TM Forum Guidebook. The guidebook format is used when:

- The document lays out a 'core' part of TM Forum's approach to automating business processes. Such guidebooks would include the Telecom Operations Map and the Technology Integration Map, but not the detailed specifications that are developed in support of the approach.
- Information about TM Forum policy, or goals or programs is provided, such as the Strategic Plan or Operating Plan.
- Information about the marketplace is provided, as in the report on the size of the OSS market.

3.2 Document History

3.2.1 Version History

Version Number	Date Modified	Modified by:	Description of changes
1.0	12/OCT/08	Geoff Ibbett	First version for first formal review by the Revenue Assurance working group.
1.1	20/DEC/08	Geoff Ibbett	Additional scenarios: 2.3.1 2.3.9 2.4.10 2.4.13 2.4.15 2.4.16 2.4.19 2.4.21 2.8.1 2.8.5 2.8.20
1.2	04-March-09	Tony Poulos	Minor updates

1.3	04-Mar-09	Tina O'Sullivan	Minor corrections.
1.4	20-Apr-09	Alicja Kawecki	Minor updates for web posting.
1.5	21-Jul-09	Alicja Kawecki	Sections 3.2, 3.3 and 3.4 updated per Gadi Solotorevsky
1.6	02-Mar-2011	Amit Goenka	Updated based on recommendations from Abdullah H. Al Harthy and Connectiva Systems, Inc.
1.7	5-May-2011	Alicja Kawecki	Updated Notice, minor cosmetic corrections made prior to web posting and ME
1.8	16-Sep-11	Alicja Kawecki	Updated to reflect TM Forum Approved status
1.9	22-March-12	Gadi Solotorevsky	Updated to use Frameworx nomenclature
1.10	13-April-12	Alicja Kawecki	Notice, minor cosmetic corrections made prior to web posting and ME

3.2.2 Release History

Release Number	Date Modified	Modified by:	Description of changes
1	12/OCT/08	Geoff Ibbett	First version of Addendum D to GB941.
2	03/MAR/08	Geoff Ibbett	Updated company contact information
3	2 March 2011	Amit Goenka Anandan Jayaraman	Connectiva
3.6	22 March 2012	Gadi Solotorevsky	cVidya

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