CAPACITY BUILDING FOR COUNTERING MISAPPROPRIATION OF TELEPHONE NUMBERS IN PACIFIC ISLAND COUNTRIES

2018

POST IMPLEMENTATION ASSESSMENT REPORT

ITU-PITA Capacity Development Workshop on Number Misappropriation and Telecom Fraud held in Nadi, Fiji

Contents

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Date.....16/10/2018

Introduction

The overall objective of this project is to strengthen the capacity to combat misuse of national telephone numbering resources in the Pacific Island Countries by enhancing telephone numbering management practices and information sharing.

Specific objectives are to:

- review and validate the previous International Telecommunication Union (ITU) study such as the Capacity Building and ICT Policy, Regulatory and Legislative Frameworks Support for Pacific Island Countries (ICB4PAC) project report and recommendations, to determine whether the issues are still relevant and to understand current barriers to implementation of the recommendations;

- develop best practices and guidelines for Pacific Island Member States to counter Number Misappropriation; and

- assist in preparing papers/reports to be submitted to or presented at relevant Asia-Pacific Telecommunity (APT) and ITU meetings, ITU Study Group(s), and Pacific fora.

PARTNERS

Australian Government
Department of Communications and the Arts

The Government of Australia, represented by the Department of Communications and the Arts (DoCA)

International Telecommunication Union (ITU)

BRIEF DESCRIPTION

Based on the World Telecommunications Development Conference 2014 (WTDC-14) Resolution 78 on "Capacity building for countering misappropriation of Recommendation ITU-T E.164 telephone numbers", further re-enforced by the World Telecommunication Development Conference 2017 (WTDC-17) Resolution 78 (Rev. Buenos Aires, 2017) on "Capacity building for countering and combating misappropriation and misuse of ITU Telecommunication Standardization Sector numbering resources", the Telecommunication Development Bureau (BDT) of the International Telecommunication Union (ITU) has been called upon to support human capacity building and activities aimed at addressing number misappropriation. This project focuses on the number misappropriation issue as well as builds human capacity in the Pacific Island Countries to counter numbering misuse. It supports the provision of training and guidelines for best practices on managing telephone numbers based on ITU-T Recommendation E.164.

1 Background

The Department of Communications and the Arts (DoCA) of the Australian Government signed an agreement with the International Telecommunication Union (ITU) on 12 January 2017 to implement a project addressing the issue of Misappropriation of Telephone Numbers in Pacific Island Countries. DoCA had provided a contribution of USD 150,000 to this project (Project Number: 9RAS17056). ITU contributed USD 10,000 in addition to the project.

In collaboration with the Pacific Island Countries, DoCA and ITU aimed to raise awareness and strengthen capacities to combat the misuse of international telecommunication numbering resources due to fraudulent incidences. This misuse has deep economic, social and trade implications.

When a misuse is detected, the response from many of the world's mobile and fixed Operators is to block the Country Code of Island Operators. The consequence of blocking a Country Code impacts the lives of people, for example:

- Island residents travelling abroad are blocked from calling home;
- Calls from family and friends living outside the island are blocked;
- Telephone roaming is blocked, which may dissuade travellers from coming to the Islands for holidays or conferences;
- Some Operators are even reluctant to negotiate roaming agreements with Island Operators; and,
- Island economies which rely on tourism for employment and income are impacted.

In 2010, the ITU, through a project on "Capacity Building and ICT Policy, Regulatory and Legislative Frameworks Support for Pacific Island Countries" (ICB4PAC), undertook a study on numbering practices, which included a particular focus on telephone numbering misappropriation. This project was part of the @CP-ICT Programme funded by the 9th European Development Fund (EDF) and co-financed by the ITU. The study included 15 Countries: Cook Islands, Fiji, Kiribati, Republic of Marshall Islands, Federated States of Micronesia, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Timor Leste, Tonga, Tuvalu and Vanuatu. Details are available at: https://www.itu.int/en/ITU-D/Projects/ITU-EC-ACP/ICB4PAC/Pages/default.aspx.

The World Telecommunications Development Conference 2014 (WTDC-14) Resolution 78 on "Capacity building for countering misappropriation of Recommendation ITU-T E.164 telephone numbers" required actions by the BDT to address the issue of number misappropriation. As part of the implementation of Resolution 78, in 2016, a global survey on telephone number misuse and misappropriation was carried out. The purpose of this survey was to gather input on the results achieved and the implementation efforts undertaken. This would support the development of general guidelines as well as contribute to further implementation of Resolution 78. At the World Telecommunication Development Conference, 2017 (WTDC-17), Resolution 78 (Rev. Buenos Aires, 2017) on "Capacity building for countering and combating misappropriation and misuse of ITU Telecommunication Standardization Sector numbering resources" was further enforced and BDT was called upon to support human capacity building and activities to address number misappropriation.

It has therefore been one of the key projects for ITU in collaboration with the Pacific Island Countries, DoCA and other partners such as Pacific Islands Telecommunications Association (PITA) and the Asia-Pacific Telecommunity (APT) to address this issue. This project will lead to the enhancement of prudent telephone numbering management practices, increased sharing of information as well as the development of best practices and guidelines to counter number misappropriation.

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Scope of review

As part of the implementation assessment of project 9RAS17056 on Capacity Building for Countering Misappropriation of Telephone Numbers in Pacific Island Countries, a mission was undertaken from 11 to 13 April 2018 in Nadi, Fiji. The aim of the mission was to participate in an activity of the project, which is an International Telecommunication Union (ITU) - Pacific Islands Telecommunications Association (PITA) Capacity Development Workshop on Number Misappropriation which had been organized with the support of the Department of Communications and the Arts (DoCA), Australia.

ON-SITE VISIT from 11-13 April 2018

- Due to a cyclone, all flights to Nadi were cancelled on 10 April, and participants of the workshop had to stay in their respective hotel rooms, which led to a loss of 1 day of training. Arrival in Nadi was on 11 April. However, the experts were able to catch up and complete the workshop on time on 13 April. The mission agenda is attached as Annex A.

- Participated in the ITU-PITA Capacity Development Workshop on Number Misappropriation, which was supported by DoCA Australia. The Workshop was successfully organized and well-attended. It provided the opportunity to meet, present ITU's work and discuss this project with various stakeholders and partners. Project collaboration between the ITU, PITA and the participants of the Pacific Island Countries at the workshop with regard to the topic of number misappropriation was strengthened. List of participants is attached as Annex B.

- Participants of the Workshop, the PITA representative, as well as the three experts who carried out the training on number misappropriation were interviewed. A video footage was also taken to create a consolidated 2-3 minute video to showcase the project and the work of the ITU in close collaboration with PITA, DoCA, the regulators, operators as well as other partners in the Pacific Islands. In addition, the video would be a tool to share the experience of the Pacific Island Countries on this issue. A video message from DoCA has also been included. The completed video can be viewed at: https://youtu.be/aWN1Yh7xico

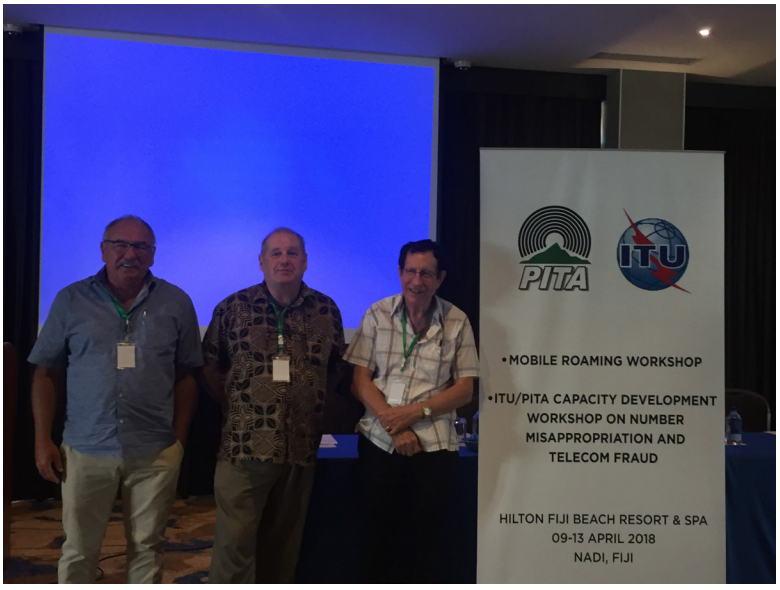
- Experts in this subject area were engaged to review the work carried out before by the ITU, particularly the relevant reports produced under the ICB4PAC (2010) and the global survey (2016) on telephone number misappropriation. A questionnaire was used to gather information on the extent to which the number administration of the Pacific Island Member States had evolved. The responses from the Member States together with the responses from the earlier studies were analyzed and the conclusions presented under the following three broad categories in a 1st report titled "An update of the numbering management practices in the Pacific Island Countries and its application to countering Numbering Misuse":

  a) State of National Regulation;
  b) Knowledge of Numbering Activities and Information; and
  c) Level of Number Misuse/Misappropriation.

- A 2nd report had been prepared on "Best practices to manage ITU-T Recommendation E.164 Telephone Numbers". These two reports were the basis of the presentations made at the Workshop held in Fiji where feedback from the participants were found to support the conclusions and the recommendations made therein. Specifically, the aim of the Workshop was to:

  a) Present findings and recommendations resulting from the ITU study on "An update of the numbering management practices in the Pacific Island Countries and its application to countering Numbering Misuse";
  b) Present the "Best practices to manage ITU-T Recommendation E.164 Telephone Numbers"
  c) Gather feedback from relevant stakeholders to finalize these two above-mentioned reports;
  d) Strengthen the capacity of national regulatory authorities and the industry to combat misuse of national telephone numbering resources in the Pacific Island Countries; and
  e) Raise awareness on telecom fraud and ways to tackle the issue.

The three experts at the Workshop were Mr. Philip Rushton (also ITU Study Group 2 Chairman), Mr. Colin Yates and Mr. Stuart Davies, who made presentations to build the capacity of the participants on number misappropriation, international traffic routing, number hijacking and fraud. The experts provided quality training which was well-appreciated. The participants engaged actively in the working group sessions. The outputs from the Number Misappropriation Survey were discussed and recommendations were provided on the actions to be pursued to raise the knowledge of number misuse within the Pacific region.



Workshop Experts

Working Group Sessions

The participants in turn presented the in-country situation. The participants from the Telecom Regulators shared their views on the impact of number misappropriation in their home Island and how they would like to see this issue managed. The representatives from private sector in the region attending the Workshop shared the impact number misappropriation had on their organizations and how they would like to see the issue managed. The two reports titled “An update of the numbering management practices in the Pacific Island Countries and its application to countering Numbering Misuse” and “Best practices to manage ITU-T Recommendation E.164 Telephone Numbers” are available in Annex C and D respectively.

Delegates representing Regulators in the Pacific Island Countries

Collaborative discusssions

Knowledge sharing

Panel discussions

Expert presentations

Training room

Engaged participation

3 Results achievement

3.1 Number misappropriation assessment for the Pacific.

Best practice and guidelines for tackling number misappropriation in the Pacific Island Countries.

Key performance indicator

Key reports

Initial target

1st Report: Assessment

2nd Report: Best practices and guidelines for the Pacific Island Countries

Achieved

Yes

Remarks

1st Report:

A review was undertaken on the ICB4PAC report and the ITU 2016 Global Survey. Feedback from the Workshop was also considered. This report is attached as Annex C: "An update of the numbering management practices in the Pacific Island Countries and its application to countering Numbering Misuse".

2nd Report:

The best practices and guidelines for the Pacific Island Countries report is attached as Annex D: "Best practices to manage ITU-T Recommendation E.164 Telephone Numbers".

3.2 Enhanced participation by Pacific Islands Countries in regional meetings and building awareness and human capacities on the best practice and guidelines for tackling number misappropriation in the Pacific Island Countries

Key performance indicator

Number of workshops/meetings to be organized and number of participants

Initial target (1)

Stakeholders are expected to participate / meet during the:

a) ASP RPM
b) PITA AGM
c) PRFP-10

Remarks

Several stakeholders from the Pacific Island Countries attended and met to discuss various issues related to the sub-region during the following events:

a) ITU Asia-Pacific Regional Preparatory Meeting (RPM) for World Telecommunication Development Conference (WTDC-17) was held in Bali, Indonesia from 21 to 23 March 2017, preceded by the Regional Development Forum for Asia and the Pacific (RDF-ASP) on 20 March 2017.
Further information is available at: https://www.itu.int/en/ITU-D/Conferences/WTDC/WTDC17/RPM-ASP/pages/default.aspx

Achieved

Yes

b) PITA 22nd AGM and tradeshow was held in Guam from 23 to 27 April 2018. This brought stakeholders from the Pacific Islands together to discuss various issues on the theme "Unlocking and Securing Digital Lifestyles in a Connected Pacific".

Further information is available at:
http://www.pita.org.fj/index.cfm?action=events&cmd=view&id=11EA9DAC-5254-005C-8E72A1EB2C43B353

c) The Asia-Pacific Telecommunity (APT) organized the 10th Policy and Regulation Forum for Pacific (PRFP-10) from 25 to 27 April 2017 in Nadi, Fiji. This brought together the telecommunications and ICT policy makers and regulators from the Pacific Islands for a dialogue on issues being faced in the sub-region.

Further information is available at:
https://www.apt.int/2017-PRFP-10

Initial target (2)

Training workshop to be organized and at least 80% of countries identified as being prone to the issue to participate

The ITU-PITA Capacity Development Workshop on Number Misappropriation, which was supported by DoCA Australia, was organized from 11 to 13 April 2018.

List of participants is attached as Annex B. There were 40 participants + 3 invited speakers + 2 from PITA and + 1 from ITU, bringing a total of 46 persons at the workshop.

Further information is available at:
https://www.itu.int/en/ITU-D/Regional-Presence/AsiaPacific/Pages/Events/2018/numbering2018/home.aspx.

The workshop was preceded by the PITA Mobile Roaming Workshop for Pacific on 9-10 April 2018 which helped optimize logistical costs and participation.

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Financial Status

Project cash contributions received as planned?		
Y/N/Not applicable	Percentage (%)	Explanations
Yes	100%	The project was jointly funded by DoCA (USD 150,000) and ITU (USD 10,000)

Is the level of expenditure at the expected level?		
Y/N/Not applicable	Percentage (%)	Explanations
Yes	94%	Total expenditure: USD 149,984

Any funds remaining unused?		
Y/N/Not applicable	Percentage (%)	Explanations
Yes	11%	USD 16,029 is the remaining balance from DoCA funds
Yes	100%	USD 10,000 is the remaining balance from ITU funds

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Findings

The misuse of telephone numbers has long been recognized as an issue in the Pacific Islands, and it continues to be one. The situation has increased in complexity as the global telecommunications market has advanced and continues to evolve. As it is also a global issue, the results of this project would be useful to other countries and stakeholders as well.

This project is a follow-up to work carried out by the ITU under the previous ICB4PAC project in 2010 and the BDT global survey on telephone number misuse and misappropriation in 2016. The ICB4PAC project detailed the telecommunication environment, number structure and national numbering plans of the countries in the Pacific Islands at that time. Member States have been assisted in developing the capability to counter ITU-T E.164 telephone number misappropriation. Based on the report prepared for this project, "An update of the numbering management practices in the Pacific Island Countries and its application to countering Numbering Misuse[1] ", the level of numbering misuse has fallen in the Pacific Islands as reflected in the responses to the questionnaire. Efforts undertaken so far should be continued to further reduce such incidences.

The documents and research produced through this project are expected to be used as templates for future activities and notifications to combat ITU-T E.164 telephone number misappropriation.

1 This report was the basis of a presentation to the PITA/ITU Conference on Numbering Misuse, held in Fiji, April 2018, that supported the conclusions and the recommendations made.

6 Lessons learned

Support from the local regulators and telecom sector in the Pacific Island Countries and partners such as DoCA, PITA and APT, in collaboration with the ITU, has been key for the success of this project.

Feedback from stakeholders was enabled through the Workshop organized in collaboration between ITU and PITA supported by DoCA Australia. It was important to have a venue where the results of the questionnaire, conclusions and recommendations could be shared to then get participant feedback for the final reports. The Workshop also helped build human capacity on this subject. In addition, it strengthened the conversations between the stakeholders to foster collaboration.

More extensive efforts should be made to increase awareness or reference to ITU-related information on the subject. Particularly with the increase of new persons participating in the telecommunications environment as the markets evolve.
The results of this project may also benefit other countries which may face the issue of number misappropriation by learning from the experiences shared in the Pacific Islands in the reports prepared as well as through a knowledge sharing platform.

7 Conclusions

The consequence of blocking a Country Code due to misuse of international telecommunication numbering resources impacts the lives of people relying on these communication lines. This misuse has deep economic, social and trade implications. The commitments of the Pacific Island Countries and support of DoCA as well as PITA in collaboration with the ITU have been strong in this area to raise awareness and propose solutions amongst the countries as well as in-country to address this issue.

This project has built capacities in the Pacific Island Countries on the enhancement of prudent telephone numbering management practices. It has also increased the sharing of information and developed a report on "Best Practice for the management of ITU-T Recommendation E.164 telephone numbers" (Annex D). This report is expected to be of use to other countries, beside the Pacific Island Countries, to counter and combat telephone numbering misuse.

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Recommendations

Building on the momentum of the project, as well as the strong commitment of the governments, particularly the regulators in the Pacific Island Countries in the area of Number Misappropriation, it is recommended that the issue be widely shared and further efforts be made to counter number misappropriation.

It is also suggested that the Member States undertake a self-assessment of their numbering regime against best practice as identified in the report "Best practices to manage ITU-T Recommendation E.164 telephone Numbers" (Annex D). The report recommends promoting the circulation of information and the role that the ITU could undertake in establishing the point of contacts within Member States. Further strengthening of communication between Member States' points of contact to facilitate direct communication between Member States to share information as well as to manage disputes is recommended. As well as a mechanism to effectively disseminate numbering misuse information to operators.

It is recommended that a Number Misappropriation portal for the Pacific Island Countries be established. However, as it is necessary to maintain the information on this portal to stay current, it would require a budget for a longer duration and should be hosted by an entity which could support the infrastructure and coordination with and amongst stakeholders in the Pacific Island Countries.

It is also recommended that a toolkit be developed to assist Member States in the necessary knowledge to counter numbering misuse as it evolves, based on good number management and principles to underpin the required processes.

Further assistance in strengthening national legal and regulatory frameworks in the Pacific Islands is recommended to ensure best practices in ITU-T E.164 telephone numbering management are incorporated to counter telephone number misappropriation.
As number misappropriation is driven by financial consideration, the subject of money flow could be reflected in a related ITU study group, as appropriate.

Project closure report will be prepared by the Project Manager.

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Attached documents

Number	Title
1.	Annex A: Mission Agenda
2.	Annex B: List of Participants at the ITU-PITA Capacity Development Workshop on Number Misappropriation, which was supported by DoCA Australia
3.	Annex C: 1st Report: An update of the numbering management practices in the Pacific Island Countries and its application to countering Numbering Misuse
4.	Annex D: 2nd Report: Best practices to manage ITU-T Recommendation E.164 Telephone Numbers

10 Annexes

Annex A
Mission Agenda

Wednesday 11 April 2018

- Arrival in Nadi on 11 April at 18:20

Thursday & Friday, 12 – 13 April 2018

- Participated in the ITU-PITA Capacity Development Workshop on Number Misappropriation, which was supported by DoCA Australia
- Opening of the Workshop on 12 April
- Closing of the Workshop on 13 April
- Meetings with PITA and Experts
- Interviews with the participants from the Pacific Island Countries
- Departure to Nadi Airport and Flight to Geneva on 13 April at 18:50

Workshop venue and participants

Annex B

List of Participants at the ITU-PITA Capacity Development Workshop on Number Misappropriation, which was supported by DoCA Australia

Organization	Country	Name
ATHKL	Kiribati	May David
Bluesky Communications	American Samoa	Rajamohan Rajathurai
Bluesky Cook Islands	Cook Islands	Tereapii Heather
Bluesky Cook Islands	Cook Islands	Mata N Eliaba
Comfone AG	Switzerland	David Roth
Communications Commission of Kiribati	Kiribati	Kaboterenga Romatoa
Communication Department - MEIDECC	Tonga	Mr. Lutoviko Lui Falemaka
Department of Telecommunications (Regulatory)	Nauru	Criden Appi
Ministry of Communications & Transport	Tuvalu	Tele Pelosa
Ministry of Transportation, Communications & IT	Marshall Islands	Damian Jetnil
NICTA	Papua New Guinea	Gava Lakau
NICTA	Papua New Guinea	Paulus Wiambi
Office of the Regulator	Samoa	Tuuaga Aviata
Office of the Vanuatu Telecommunications Regulator	Vanuatu	Brad Partridge
OPT-PF Vini SAS	Tahiti	Heia Teuapiko
OPT-PF Vini SAS	Tahiti	Jean-Christophe Bongi
Sigos	Germany	Florian Leeder
Sigos	Australia	George Geronikos
Solomon Telekom Company Limited	Solomon Islands	Luisa Marau
Telecom Vanuatu Ltd	Vanuatu	Krzysztof Malinowski
Telecom Vanuatu Ltd	Vanuatu	Christopher Jacquier
Telecom Vanuatu Ltd	Vanuatu	Cedric Kere
Telecom Vanuatu Ltd	Vanuatu	Laurence Mainguy
Teletok Tokelau	Tokelau	Koroi Cabogaunatalei Anise
Teletok Tokelau	Tokelau	Timote Sirila
Tonga Communication Corporation	Tonga	Ema Lautaimi
Tonga Communication Corporation	Tonga	Iki Lolohea Tuitavake
Vodafone Fiji Limited	Fiji	Shelvindra Prasad
Vodafone Fiji Limited	Fiji	Nilesh Chand

Vodafone Fiji Limited	Fiji	Isaac Albert
Vodafone Fiji Limited	Fiji	Shayal Prasad
Vodafone Fiji Limited	Fiji	Krishna Menon Sami
Vodafone Fiji Limited	Fiji	Karunesh Ratnam
Vodafone Fiji Limited	Fiji	Ashwin Lal
Vodafone Fiji Limited	Fiji	Sanjay Dutt Sharma
Vodafone Fiji Limited	Fiji	Sheenal Shivani Kumar
Vodafone Fiji Limited	Fiji	Rajneal Kumar
Vodafone Fiji Limited	Fiji	Buliruarua Lesuma
Vodafone Fiji Limited	Fiji	Ashil Kishore
WeDo Technologies Australia	Australia	Miguel Lopes
Invited Speakers		
Rushton Communications Consulting		Philip Rushton
Telecom Expert		Stuart Davies
Yates Fraud Consulting Ltd		Colin Yates
PITA		
Pacific Islands Telecommunications Association		Fred Christopher
Pacific Islands Telecommunications Association		Deborah Albert
ITU		
International Telecommunication Union		Ramita Sharma

This ITU project is contributing to the achievement of the Sustainable Development Goals

ITU Projects
ITU Headquarters, Geneva, Switzerland
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www.itu.int/en/ITU-D/Projects/

Annex C:

An update of the numbering management practices in the Pacific Island Countries and its application to countering Numbering Misuse[1]

Philip Rushton

[1] This report was the basis of a presentation to the PITA/ITU Conference on Numbering Misuse, held in Fiji (April 2018) that supported the conclusions and the recommendations made.

Contents

1 EXECUTIVE SUMMARY

The misuse of telephone numbers from the Pacific Island member States has long been recognised as an issue, and it continues to exist. The situation has increased in complexity as the global telecommunications market has developed.

The misuse of numbers exploits the difference that exists between the potential length of a telephone number, of up to 15 digits, and the analysis of that telephone number, of up to the first seven digits. In reality the numbers of digits that are analysed are as short as possible to facilitate call establishment, in terms of routing and charging. It is this difference that is exploited by those seeking to misuse telephone numbers.

The role of member States, with regard to the administration of the national significant numbers (NSN) that reflects the national regulatory, legal and social requirements, is to define the structure of the National Numbering Plan (NNP) including the rules and processes of the allocation of the resources.

The extent to which misuse of telephone numbers were being misused at the turn of the 21st Century led to an initial project commissioned by the ITU, jointly with the EC and a report "Capacity Building and ICT Policy, Regulatory and legislative Frameworks support for Pacific Island Countries". That report, which was comprehensive, reviewed the nature of the telecommunication environment in the Pacific Islands at that time, including the nature of the market, the number structure of the Member State concerned, and the details of the national numbering plans.

As the nature of telephone number misuse is continually evolving, it was thought useful to assess the extent to which the number administration of the Pacific Island Member States had evolved since the original report written in 2010.

The methodology for the assessment utilised a questionnaire that focussed on specific elements associated with telephone number administration. This was also part of the earlier report and allowed a comparison to be made.

The details of the responses from the Member States that responded were included as were the responses from the earlier report. It was from this detail that the analysis and recommendations were made.

The conclusions fell into three broad categories, namely

a) State of national regulation

b) Knowledge of Numbering Activities and Information

c) Level of Number Misuse/Misappropriation

It was found that liberalisation, and as a result competition had increased, and was focussed on the mobile telecommunications market. However there were some issues identified where further development with respect to regulatory issues was required. The telecommunications environment in the Pacific Islands Member States continues to evolve.

The extent to which knowledge, specifically concerning ITU related information was weak[2], as was the case in the original report. The continued occurrence of this situation is perhaps explained by the increase of new people participating in the telecommunications environment as the markets evolve.

In considering the lack of knowledge, and accepting that misuse whilst an issue in the Pacific Islands is prevalent elsewhere is driven by financial consideration, that ITU T SG2 give some

[2] Attendees at the PITA/ITU workshop on Number Misuse (Fiji, April 2018) had no knowledge of the existence ITU's Operational Bulletin.

consideration to reflecting proposals regarding disruption of the money flow in its work. In addition, and recognising the success of some direct action that has been taken to counter misuse, that ITU-T SG2 needs to reflect on the role that ITU-T E.156 can provide to the ITU noting that it cannot get involved in disputes between Member States. As part of this focus on dissemination of information consideration should be given by member States to have points of contact to facilitate direct communication between Member States. It is recommended that ITU T SG2 seeks to have a mechanism that would allow the dissemination of numbering misuse information to operators.

The level of numbering misuse has fallen in the Pacific Islands, driven in part by the activity that has occurred, and reflected in the responses to the questionnaire. Such activity should continue.

In addition to the recommendations with respect to ITU-T SG2, it is also suggested that the Member States undertake a self-assessment of their numbering regime against best practice that is identified in a related report[3]. As part of that report, and reflected in the Recommendations in this report is the role that the ITU could undertake in establishing the point of contacts within Member States, and promoting the circulation of information.

The final recommendation is the development of a toolkit to assist Member States to develop and evolve the necessary knowledge to counter numbering misuse and the issues that result. Whilst such a toolkit is problematic given the nature of national numbering it should be based on good number management and the principles that would underpin the processes required.

2 INTRODUCTION

Misuse of telephone Numbers from Pacific Island Member States has long been recognised as an issue and it is an issue that continues to exist. It is an issue that exists in a global telecommunications market that is no longer one of simplicity, but one of complexity

The complexity of the issue of misusing telephone numbers has to be viewed against a telecommunications market spectrum that on the one side has a market that can be characterised as being dominated by government owned service providers and that on the other side can be characterised as a market that has multiple service providers competing against each other. In between these two alternatives are markets that reflect elements of both sides of the spectrum, to varying degrees.

Misuse of telephone numbers exploits the complexity of to-day's communications market, with resellers offering access to telephone numbers over which they have no rights. In doing so the resellers are exploiting the basic structure of an international telephone number[4]. An international telephone number can be up to 15 digits long, comprising both the country code and the national significant number (NSN). Country Codes are between 1 and 3 digits, and thus the NSN can be between 14 and 12 digits long. Invariable the international number associated with a Member State is shorter than the 15 digits that are permitted.

However, in order to route a telephone call, the originating service provider only has to analyse up to 7 digits of the dialled telephone in order to determine the routeing of the call, and the costs associated with it. In many cases, and depending upon the structure of the telephone number the analysis of the dialled digits is shorter than the 7 digits permitted.

The misuse of telephone numbers exploits the difference between the analysis of the dialled digits and the potential NSN. An originating service provider will not know if the international number (Country code combined with National Significant Number) is legitimate or not. Resellers advertise access to numbers that are not in service but exist behind the initial part of the NSN, and take

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[3] Best practices to manage ITU-T Recommendation E.164 telephone Numbers, Phil Rushton October 2017

[4] Recommendation ITU-T E.164 "The International Telecommunication Numbering Plan"

revenue associated with the use of such numbers.

The role of Member States with respect to telephone numbers is the administration of the NSN part of the international number. The method by which the NSN is administered, and the way it is structured reflects the legal regulatory and social requirements of a given state. Over time the administration of the NSN may evolve to reflect new uses to which telephone numbers can be put, to meet increased demand for the resource, or to reflect the evolving telecommunications market with the arrival of new providers.

As part of the administration of the NSN, Member States need to define the structure of the NSN, the rules governing its use, and the process by which resources of the NSN are allocated. If one of these elements is missing then exploitation of an NSN by resellers in order to misuse the telephone numbers is made easier. The prevalence of the misuse of Pacific Island Member States numbering at the turn of the 21st century to led to a project commissioned by the ITU, jointly with the EC in 2010 entitled Capacity Building and ICT Policy, Regulatory and legislative Frameworks support for Pacific Island Countries (ICB4PAC)" (referred to as the 2010 report going forward).

The 2010 report that the project produced[5] was comprehensive and covered the telephone number administration of the Pacific Island Member States of

- Cook Islands,
- Fiji,
- Kiribati,
- Republic of the Marshall Islands,
- Federated States of Micronesia,
- Nauru,
- Niue,
- Palau,
- Papua New Guinea,
- Samoa,
- Solomon Islands,
- Timor Leste,
- Tonga,
- Tuvalu
- Vanuatu.

In addition to covering the detail of the environment e.g. whether the environment was monopolistic or liberalised, the number structure length etc., the 2010 report also addressed other aspects of the national telecommunication plans including the existence and use of short codes or national only numbers, and whether number portability existed. Furthermore the 2010 report also discussed the status of the Member State's name resource, i.e. the ccTLD top level

[5] A review of numbering management practices in the Pacific Island Countries – A study for the ITU and EC's ICB4PAC project; Incyte Consulting 2010

domain name.

This report focuses only on the administration of the NSN and does not discuss other aspects of national telecommunication numbering plans or name resources further.

3 BACKGROUND

The 2010 report identified the state of the market for each Pacific Island Member State, the extent to which the governance of the telecommunications environment was enshrined in a legal and regulatory framework. Variations in such frameworks, and therefore in the use of the telephone numbers of Member States, existed. To assist Member States to evolve in order to be able to be better placed to counter and combat the misuse of telephone numbers the report presented "Best Practice Guidance for number management"[6].

Misuse of telephone numbers is continually evolving. For example at the time of the 2010 report, access to the internet was via auto diallers and modems associated with personal computers. This was major area of numbering misuse. The move to broadband has removed that particular misuse, but others have emerged. For example using artificially inflated traffic to generate revenue of a number that terminates somewhere other than the country indicated by the country code.

This report seeks to assess the extent to which the number administration of the Pacific Island Member States has evolved since the original report written in 2010. The management and governance of NSN's is a significant building block in countering numbering misuse. It is not the only building block; others include direct communication between National Regulatory Authorities, fast response by operators to block unusual traffic flows to number ranges, speedy notification of unusual traffic flows between operators etc.

However knowledge of the assignment of NSN resources, the use to which such resources are to be put and what elements of the NSN are assigned are an important part of the activity. This report seeks to assess what has evolved since the 2010 report in order to assist Member States in deciding whether future action is required and if it is in what form.

4 METHODOLOGY

In order to assess the extent to which administration environment of national telephone numbering resources had evolved since the 2010 report, a questionnaire was developed and sent to the Pacific Island Member States. The questionnaire for this report, which is contained in Annex A, focussed on specific elements associated with telephone number administration as the basis of comparison with the 2010 report.

The comparison between the findings of the 2010 report, based on questionnaires, and this report, also based on questionnaires, is presented in the analysis section of this report. In the analysis section each Member State is presented with first the output from the 2010 report and then information taken from the questionnaire associated with this report.

In developing the structure of the analysis, and noting that not all Pacific Island Member States responded to the 2010 report[7], a similar situation in this report will be taken as there having been no change since the 2010 report and noted as such.

The 2010 report was structured to reflect monopolistic and liberal environments. This is not continued in this report. Instead this report will take the environment as presented in 2010[8] at the

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[6] Ibid, Section 4.7 (p42 - 46)

[7] The 2010 report has responses from 13 of the 15 Pacific Island Member States

[8] A review of numbering management practices in the Pacific Island Countries – A study for the ITU and EC's ICB4PAC project; Incyte Consulting 2010 pp 15-38

country level, as the initial regulatory position, and describe any changes since that time in the evolved regulatory position.

In addition to the questionnaire circulated to assess evolution and developments of the regulatory environment of the Member States, the ITU issued an additional questionnaire, which is in Annex B to this report. This additional questionnaire had a wider scope and those questions that overlapped with the questions in Annex A are identified in review of the individual Member State as Additional Information.

Both questionnaires were sent to the Member States, and the additional questionnaire was sent to operators as well. The questionnaire in Annex A was sent to 14 Pacific Island Member States. Timor Leste was not included in the list. 12 countries responded. The additional questionnaire had responses from 10 Member States and 4 operators.

The information from the questions in the additional questionnaire is used in the analysis section of the report from the 10 operators only. The responses from the operators are not considered further.

5 MEMBER STATE ANALYSIS

5.1 Cook Islands

5.1.1 Initial Regulatory Position

The Cook Islands telecommunications market was monopolistic in 2010, and the Telecommunications Act (1989) did not include a reference to managing numbering resources.

The management and evolution of the telephone numbering resources were with the operator.

The national numbering plan was in 2009, a last update was sent to the ITU in 2006, and there were plans for a future update to the National numbering plan.

There are no documented processes on numbering assignment, and this role is undertaken by engineers in the incumbent.

5.1.2 Evolved Regulatory Position

The country has not liberalised but work is in progress to amend that. The legislation is the Telecommunications Act 1989 and the Broadcasting Act 1989. No information is available on line.

5.1.3 Additional Information

The incumbent operator administers the telephone numbering resources.

5.2 Fiji

5.2.1 Initial Regulatory Position

The Fijian telecommunications market was liberalised in 2010, and the Telecommunications Promulgation 2008 provided the necessary power to the Telecommunications Authority of Fiji to manage numbers.

The management of the telephone numbering resources is with the Regulator, whilst it is thought that the Ministry has responsibility for the evolution of the governance.

No information is known on the last update the national numbering plan, but an update was sent to the ITU in 2008, had no information is known on planned updates to the national numbering plan.

There are no available documented processes on numbering assignment.

5.2.2 Evolved Regulatory Position

The market was liberalised with the formation of the Telecommunications Authority of Fiji under the Telecommunications Promulgation 2008. Information is available at the TAF website.

5.2.3 Additional information

The numbering plan and associated rules of governance are draft.

5.3 Kiribati

5.3.1 Initial Regulatory Position

The Kiribati telecommunications market was monopolistic in 2010 and the Telecommunications Act 2004 did not include a reference to managing numbering resources.

The management and evolution of the telephone numbering resources were with the Regulator.

There was no information as to the last update of the national numbering plan, although an update was sent to the ITU in 2004 and there were plans for a future update to the National numbering plan.

There are no documented processes on numbering assignment.

5.3.2 Evolved Regulatory position

The telecommunications market was liberalised with the Communications Act 2012, and the information is available.

5.4 Republic of the Marshall Islands

5.4.1 Initial Regulatory Position

The Marshall Islands telecommunications market was monopolistic in 2010 and had no legislation that addressed number management.

The management and evolution of the telephone numbering resources were with the operator.

The last review of the national numbering plan was unknown, although an update was sent in 2009, and there are plans to update the national numbering plan.

There are no documented processes on numbering assignment.

5.4.2 Evolved Regulatory Position

No information available, and therefore using the methodology outlined in section 4, the assumption is no change.

5.5 Federated States of Micronesia

5.5.1 Initial Regulatory Position

The Micronesian telecommunications market had no legislation in 2010 on telecommunications.

The management and evolution of the telephone numbering resources were with the operator.

No information was available as to when the last update to the national numbering plan occurred, but an update was sent to the ITU in2002, and no plans exist to update the National Numbering Plan.

There are no documented processes on numbering assignment.

5.5.2 Evolved Regulatory Position

The telecommunications market has been liberalised, under the Telecom Act 2014 (Public Law 18-52) but the telecommunications regulations and national numbering plans have not yet been developed.

5.5.3 Additional Information

Although telephone number administration is undertaken by the incumbent, recent legislation has established a regulator who will ultimately administer the numbers. This was legislated in public law 2018-54.

5.6 Nauru

5.6.1 Initial Regulatory Position

The Nauru telecommunications market was monopolistic in 2010. No other information was available.

The management and evolution of the telephone numbering resources were thought to be with the Ministry.

No information was available as to when the last update to the national numbering plan occurred, but an update was sent to the ITU in2002, and no information exists to update the National Numbering Plan.

There are no documented processes on numbering assignment.

5.6.2 Evolved Regulatory Position

The telecommunications market has been liberalised through the Telecommunication and Regulatory Affairs Act 2017, which is available online. Currently there is no further information on the numbering plan, nor are the multiple companies operating.

5.6.3 Additional Information

The office of the regulator is responsible for the management of the telephone numbering resources, under the remit provided by the Telecom Regulatory Affairs Act 2017.

5.7 Niue

5.7.1 Initial Regulatory Position

The Niue telecommunications market was monopolistic in 2010, and whilst the Communications Act 1989 and the Telecommunications Regulations 1968 refer to elements of numbering management, specific number management is not addressed.

The management of the telephone numbering resources is with the operator, who is also thought to be responsible for evolution of the administration.

No review has been done on the national numbering plan, and it is not applicable to send an update

to the ITU

In 2002, and no plans exist to update the National Numbering Plan.

There are no documented processes on numbering assignment.

5.7.2 Evolved Regulatory Position

A number of Acts exist the define the market including Niue Communication Act 1989

Radio Regulations 2009, Radio (Fees) Regulations 2009, Telephone (Fees) Regulations 2009 and Cybercrime Policy 2015, and there is work to update the legal framework. Whilst there are no competitors in the market, there are also no restrictions for competitors.

5.8 Palau

5.8.1 Initial Regulatory Position

The Palau telecommunications market was monopolistic in 2010, and had no telecommunications legislation.

The management and evolution of the telephone numbering resources is with the operator.

No information exists as when the last numbering plan review occurred, but an update was submitted to the ITU in 2006, and there are no plans to review the National numbering plan.

There are no documented processes on numbering assignment.

5.8.2 Evolved Regulatory Position

There is no legislation prohibiting Palauan business from becoming an operator, and there legislation pending in the National Congress but it has not yet been passed.

5.9 Papua New Guinea

5.9.1 Initial Regulatory Position

The Papuan New Guinea telecommunications market was liberalised in 2010, with the National Information and Communications Act 2009 establishing the National Information and Communications Technology Authority (NICTA) to have responsibility for the numbering plan.

The management of the telephone numbering resources is with the Regulator, who is also thought to have the responsibility for the evolution of the policy.

The National numbering plan was updated in 2008, and an update submitted to the ITU in 2010, and there are plans to update the national numbering plan in the future.

There are documented processes on numbering assignment.

5.9.2 Evolved Regulatory Position

No information available, and therefore using the methodology outlined in section 4, the assumption is no change.

5.9.3 Additional Information

NICTA administer the national numbering plan.

5.10 Samoa

5.10.1 Initial Regulatory Position

The Samoan telecommunications market was liberalised in 2010, with the Telecommunications Act making the regulator responsible for the administration of national telephone numbers.

The management of the telephone numbering resources is with the Regulator, whilst the Ministry has responsibility for the evolution of the policy.

The National Numbering plan was reviewed in 2016[9], and an update was sent to the ITU in 2009 and there are plans to update the national numbering plan in the future.

There are draft documented processes on numbering assignment.

5.10.2 Evolved Regulatory Position

The regulatory framework is the Telecommunications Act 2005. The national numbering plan is not available electronically, and there is currently competition on the mobile market.

5.10.3 Additional Information

The Regulator has a national number plan.

The process for obtaining additional numbering resources is to apply to the Office of the Regulator, who assigns according to the request made.

5.11 Solomon Islands

5.11.1 Initial Regulatory Position

The Solomon Islands telecommunications market was liberalised in 2010, and the Telecommunications Act 2009 mandated administration of telephone numbers to the telecommunications Commission.

The management of the telephone numbering resources is with the Regulator, whilst the Ministry has responsibility for the evolution of the policy.

The National Numbering plan was reviewed in 2008, and an update was sent to the ITU in 2010 and there are plans to update the national numbering plan in the future.

There are no documented processes on numbering assignment.

5.11.2 Evolved Regulatory Position

Liberalisation in 2009 was mandated by the Telecommunication Act 2009, which together with the National Numbering Plan is available electronically. Competition exists in the mobile market.

5.11.3 Additional Information

The current legislation remains the Telecommunication Act 2009.

The process for obtaining additional numbering resources is to apply to the Commission who then assign the numbers and who also notifies the ITU.

5.12 Timor Leste

5.12.1 Initial Regulatory Position

The Timor Leste telecommunications market was monopolistic in 2010, but had legislation (Decree Law no 12/2003) assigning responsibility of number management to the Regulatory Authority.

The management and evolution of the telephone numbering resources is with the

[9] The notification of the Samoan National Numbering Plan was made known as part of the review process undertaken at the PITA/ITU workshop on Numbering Misuse (Fiji, April 2018)

Regulator.

There is no information on the last review of the National Numbering Plan, but an update was submitted to the ITU in 2003, and no plans exist to update the national numbering plan.

There are no available documented processes on numbering assignment.

5.12.2 Evolved Regulatory Position

No information was requested from Timor Leste.

5.13 Tonga

5.13.1 Initial Regulatory Position

The Tongan telecommunications market was liberalised in 2010 with the Communications Act 2000 mandating the Department of Communications to administer the telephone numbering resources.

The management and evolution of the telephone numbering resources is with the Ministry.

The National Numbering plan was reviewed in 2010, and an update was sent to the ITU in 2008 and there are plans to update the national numbering plan in the future.

There are no documented processes on numbering assignment.

5.13.2 Evolved Regulatory Position

Whilst the market has been liberalised there is no information about the numbering plans online. Competition exists on both fixed and mobile services, for both domestic and international.

5.13.3 Additional Information

The Ministry of Information and Communication are responsible for managing telephone numbering resources, under the remit of the Communications Act 2015, Part VII Division 1 (Numbering and Electronic Addressing).

5.14 Tuvalu

5.14.1 Initial Regulatory Position

The Tuvalu telecommunications market was monopolistic in 2010 and neither the Telecommunications Corporation Act 1993 nor the Telecommunication Regulations referenced Number management.

The management and evolution of the telephone numbering resources is with the operator.

The national numbering plan was last amended in 2009, and an update was submitted to the ITU in 2009, and no plans to update the National number plan exist.

There are no documented processes on numbering assignment.

5.14.2 Evolved Regulatory Position

The Telecom Act 2012 began liberalisation of the market by removing the exclusive rights of the incumbent and permitting licences to be granted to other operators. No additional licences have been awarded as yet. Whilst the legislation is available electronically, no numbering plan exists.

5.14.3 Additional Information

The Ministry of Communications and Transport administer the numbering plan, although there is no specific regulation in place. The incumbent telephone operator administers the numbers but

without, it is thought, a documented process.

5.15 Vanuatu

5.15.1 Initial Regulatory Position

The Vanuatu telecommunications market was liberalised in 2010, and the administration of numbering resources is referenced in the licences to the service providers rather than in the Telecommunications and Radio communications Act 2009.

The management of the telephone numbering resources is with the regulator, who is also thought to be responsible for the policy.

The National Numbering plan was reviewed in 2010, and an update was sent to the ITU in 2010 and there are plans to update the national numbering plan in the future.

There documented processes on numbering assignment are not public but are referenced within the licences of the operators.

5.15.2 Evolved Regulatory Position

The legislation is available on the Regulator's website, and competition exists on the fixed, mobile and ISP markets.

5.15.3 Additional Information

The Telecommunications and Radiocommunications Regulator administers the national numbering resources.

6 CONCLUSIONS

Consideration of the responses to the questionnaires and the comparison of the evolution that has occurred in national telecommunication markets has identified a number of useful and interesting issues that are worthy of further consideration. These issues, that are dealt with in turn, include

a) State of national regulation

b) Knowledge of Numbering Activities and Information

c) Level of Number Misuse/Misappropriation

6.1 State of National Regulation

The comparison between the 2010 report and the questionnaire for this report indicates that there has been an increase in liberalisation of the telecommunications markets, although with varying degrees of competing operator in existence. Of the 12 countries that now have a liberalised market, only 2 had competing operators in the fixed market.

Competition in the mobile market existed in 6 countries, and for other technologies the majority of the competition was for Internet Service Providers or ISP's.

This move to liberalisation whilst befitting consumers has not necessarily been accompanied with all the regulatory requirements that best practice of number management. For example availability of the national numbering plan electronically is not universal. The lack of easy access to a national numbering plan makes it easier for telephone numbers to be misappropriated. There is no public knowledge to counter otherwise.

The evolution that has occurred in many of the Pacific Island states continues, and support to the on-going development and presentation of information, especially national numbering plans that

are up to date is to be encouraged. As part of the presentation of the national numbering plans Member States should be encouraged to follow the proposed structure in Recommendation ITU T E.129.

The evolution of number management that has occurred since the initial research undertaken in 2011 reflects a general evolution away from state run telecommunications to a liberalised market, and the move to number management in a liberalised market. This approach has happened in many of the Pacific Islands, and therefore there has been a significant change since 2011. It should be noted that with any government endeavour change is considered and assessed before occurring, and so it is with number management and the responses thereto. Governments unlike commercial operations do not respond fast to events outside of the norm. This is reflected in the evolution of number management that this review has identified.

6.2 *Knowledge of Numbering Activities and Information*

The questions in the additional questionnaire contained in Appendix B, specifically those between Q1.1 and 1.7 demonstrate a lack of knowledge of the activities on numbering. For example knowledge of the 2010 report is very weak, as is knowledge of WTSA Resolution 61 and WTDC Resolution 78.

Consideration of the status of this knowledge is both alarming and understandable. It is alarming in the effort of the activities of the ITU to address number misuse appears not to be known on the ground as it were, and that this lack of knowledge also applies to the 2010 report. In at least two cases the reports of number misuse have come from the ITU rather than from within country. However it should be noted, and therefore it is understandable, that as markets liberalise and the responsibilities of telephone number administration moves from the incumbent operator to the Regulator or Ministry, a question of the transfer of knowledge arises. The lack of knowledge about either the history of number misuse reflects such changes in the responsibilities.

A further consideration that could account for the apparent lack of knowledge of processes to report instances of numbering misuse is a change in the personnel in the national body responsible for managing national numbering resources. This would indicate that there is a need to ensure transfer of knowledge about both the instances of numbering misuse and the processes to combat them. This may also account for a lack of reports to the ITU-T on instances of numbering misuse, perhaps.

Although the lack of knowledge of numbering activities and information is understandable, it does raise a further issue of the relevance of the activities that were identified, i.e. ITU T E.164, WTSA Resolution 61, WTDC Resolution 78 and the recommendations of the 2010 report. Whilst this is not perhaps a comprehensive list of possible activities within the ITU that should be considered, it perhaps indicates the need for more awareness of these activities through capacity building. This is a necessary consideration given the prevalence and visibility that numbering misuse and misappropriation of Pacific Island numbers has been given. Perhaps the most striking reaction to the misuse of numbers was the response from Ireland's Regulator, Commission for Communications Regulation (ComReg), who, in 2004, blocked access to a number of the Pacific Island telephone country codes.

The realisation of the need to address number misuse that occurs in other areas was noted in the 2010 report with the reference to occurrences of misuse in Africa. Within Europe, and in the position that the European Countries, through CEPT, submitted to WTSA 16 to amend Resolution 61, recognised that impacting the money flow for misappropriated was an avenue to be explored. This amendment was not accepted at that time but is perhaps worthy of further consideration in ITU-T SG2.

An additional activity in the direct action in addressing number misuse has had some success, as indicated in Section 6.3. The reference to direct action here and the reporting of number misuse needs further consideration. The role given to the ITU, specifically the TSB, in Recommendation

ITU-T E.156 reflects the limitations of the role of the ITU as established by its Constitution and Convention, and Council Resolution 262. The focus of the role is on notifying national regulators and requiring them to act to address misuse. An issue that arises is where the misuse occurs, and therefore under whose jurisdiction. Action by operators has proven to be more effective, either collectively (e.g. through industry organisations such as the GSMA), or individually, monitoring the outgoing traffic on their network to react quickly to artificially inflated traffic. In this latter case, and noting that the GSMA is for mobile operators, is there a role for the TSB to facilitate the distribution of apparent misappropriated numbers to other operators for the other operators to take action?

The answer is unknown but is perhaps worthy of further investigation, especially in the technical numbering group of ITU T SG2.

6.3 Level of Number Misuse/Misappropriation

In a manner similar to the level of knowledge on numbering activities discussed in Section

Above, the level of number misuse that is being acknowledged in the additional questionnaire is for the majority of the 10 countries responding either low or not sure. Is this an issue of awareness or an issue of a reduction in the actual activity for the Pacific Island member states?

The visibility that the misuse and misappropriation of telephone numbering resources of Pacific Island Member States has received in the last decade has perhaps had an impact. Other activities such as the direct action that has occurred with the perpetrators of misuse will have contributed to the apparent reduction.

7 Recommendations

As part of the evolution of the number management activities that are undertaken by Governments, and in order to assist in countering occurrences of numbering misuse, three main activities can be identified for action.

Underpinning all of the following activities is the fact the telecommunications regulatory environment of the Pacific Island Member States.

The first activity is assessing the status of a national numbering plan against number management best practice. A separate report[10 6] to this one identifies best practice associated with E.164 telephone numbers from the perspective of the two main stakeholders – National Number Plan managers (be they Regulator or Ministry) and service providers. Whilst it is a national matter as to whether Service provider Number management practices should be assessed, NNP managers should be encouraged to assess their number management practices. Such assessment should seek to ensure that the NNP has the sufficient powers, processes and knowledge to manage the national numbering resources.

The second activity reflects the need for certainty in the number management process as the activity to support number management evolves. As the number management responsibilities and processes within the telecommunication environment has evolved within the Pacific Islands, so there should be further consideration as to the possible further evolution of the national number processes to counter number misuse. In considering such a possibility evolution of process the focus should not be on Pacific Islands alone, but should be part of a wider consideration for all National Numbering Plan processes. In making such a Recommendation, recognition is taken of the sovereign right of Member States to manage their own numbering space according to their own national laws, regulations and social norms. However a possible evolved process could be as simple as identifying a contact within the national body responsible for telecommunication regulation and managing

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10 [6] Best practices to manage ITU-T Recommendation E.164 telephone Numbers, Phil Rushton October 2017

national numbering plans to be a focal point to be contacted regarding reports of potential misuse of numbering resources. At the moment such a direct reporting process does not exist.

The role of the ITU in assisting member states in this approach could be to

- publicize such contact points,
- identify the need for such contact points to be provided
    - **NB:** Care needs to be exercised so as to avoid infringing the sovereign rights of Member States
- assist in circulating information about the misuse of national numbers
    - **NB:** This would be complimentary to other industry bodies performing a similar function, and, like similar industry functions, would need to be indemnified.

Service Providers are able to react in a shorter time frame than regulators to events, such as number misuse in a number of ways. On the one hand service providers can utilise internal processes to identify possible misuse being associated with telephone numbers in terms of hours, for example by monitoring traffic levels and reacting to significant and unusual increases in traffic volumes and so minimising exposure to revenue loss. On the other hand service providers can share information through industry bodies as to number ranges being abused in terms of days. Any action by service providers and Governments should be seen as complimentary and not alternatives. In the longer term, consideration should be given to encouraging service providers to include requirements in their terms and conditions that reflect the need to reduce number misuse. Further consideration of activities by service providers is a national matter, and is not considered further in this report.

The third activity that is required is the development of a regulatory toolkit that covers both training, to allow for changes within the function performing national number management, and action that is possible in certain circumstances of number misuse.

The training could be in various forms, and whilst focusing on E.164 telephone Numbers, could also include E.212 IMSI's and E118 Issuer Identifier Numbers. The forms of such training could range from a simple overview, reflecting national practices to a more comprehensive exposure to the possible misuses that could occur and what actions are possible and under what circumstances. The extent to which these additional ITU-T identification resources are subject to misuse is less well known then for E.164 telephone numbers.

The specification and implementation of a toolkit is more problematic, given the fact that Member States have evolved their own national numbering regime to reflect their legal, regulatory and social norms. The toolkit should be based on good number management and the processes required achieving such a state. It could be divided into two parts and consider action that a Member State could take within its own jurisdiction and action to be requested when interacting with other jurisdictions. The specification of such a toolkit is outside the scope of this activity.

APPENDIX A: QUESTIONNAIRE

Country:

Respondent:

Job Title:

Organization:

1.0 Is there Government authorised website detailing information about Telecommunications regulation or national numbering plans available in your country? Please provide details
Answer:

2.0 Has the telecommunications sector been liberalised? (If yes please provide details).

3.0 Are there multiple operators in your country? (If yes please provide details)

a. For fixed
b. For mobile
c. Other (please specify)

Answer:

4.0 What legislation sets out the regulatory framework for telecommunications? (if yes, please provide details or where it can be accessed electronically)

Answer:

APPENDIX B ADDITIONAL QUESTIONNAIRE

Please provide your contact detail:

First Name
Last Name
Organization
Job Title
Email
Tel/Mobile

Q1 Are you aware of the following?

Q1.1 Issues about telephone number misappropriation (Number Hijacking)

Please provide further information if you have in below,
Q1.2 ITU-T E.164

Please provide further information if you have in below,
Q1.3 WTSA Resolution 61

Please provide further information if you have in below,

Q1.4 WTDC-14 Resolution 78 "Capacity building for countering misappropriation of Recommendation ITUT E.164 telephone numbers"

Please provide further information if you have in below,

Q1.5 Incidence of number hi-jacking in the Pacific in the past

Please provide further information if you have in below,

Q1.6 ITU ICB4PAC project "A review of numbering management practices in the Pacific Island Countries" study

Q1.7 If you tick the above box (1.6), what are your views on the study's "Way Forward" and "Recommendations"?

Q2 Is your country being affected by Number Misappropriation (Number Hijacking)?

Q2.1 If yes, how would you rank to seriousness of the problem:

Please provide further information if you have in below,
Q2.2 If yes, what kind of effect do you experience:

Please provide further information if you have in below,

Q2.3 If yes, how do you know that Number misappropriation is occurring?

Q3 Who is responsible for Numbering management and managing the resources under it in your country?

Q4 Do you have specific legislation/regulation or formal guidelines dealing with numbering in your country? (if yes, please provide details or where it can be accessed electronically)

Q5 What is the procedure for assigning numbers to a service? And is it documented? (if yes, please provide details or where it can be accessed electronically)

Q6 What kind of skills need to be developed in your country as far as numbering resources are concerned?

Q7 Any comments or your views of tackling the number misappropriation

Q8 Please submit your Numbering plan and relevant regulation to [redacted]@itu.int

Annex D:

Best practices to manage ITU-T Recommendation E.164 Telephone Numbers[11] A study for the ITU Funded by the Australian Government

Philip Rushton

[11] This report was the basis of a presentation to the PITA/ITU Conference on Numbering Misuse, held in Fiji April 2018 that supported the conclusions and the Recommendations that it made.

Contents

1. EXECUTIVE SUMMARY

This report is the second deliverable from the ITU D project, funded by Australia Government, seeking to contribute to combatting numbering misuse of national telephone numbers from Pacific Island countries.

The focus of this deliverable is on providing "Guidelines for Best Practice for the management of ITU-T Recommendation E.164 telephone numbers". In order to place the guidelines in context, consideration as to what constitutes numbering misuse is also considered. The report differentiates between the two types of numbering resource; those allocated by the ITU itself, and those allocated by Member States, and recognizes the role of the National Number Plan Administrator (NNPA) and service provider throughout the life cycle of utilizing a number. Though the focus of the report is on E.164 telephone numbers, the principles identified in the report could equally apply to other numbering resources.

Telephone numbering misuse occurs because of the exploitation of the difference between the number of digits required to establish and charge for a call when compared to the length of the telephone number as determined in a national numbering plan. This difference emerges from Recommendation ITU-T E.164 "The international public telecommunication numbering plan". This difference exists in a telephone environment that has evolved, and in a manner that reflects the national requirement and as a result is exploited by those seeking financial advantage. The numbers that perpetrators of misuse seek to exploit are those with high termination rates. Such rates reflect a legacy approach to costs associated with numbering, namely time and distance charging.

Efforts to counter misuse occur against a changing environment in which high termination rates. The use of commercial arrangements, as opposed to regulated prices, that has promoted the introduction of competition has further complicated the environment. The relationship between the entities originating and terminating points of a call has become more remote. What was once a close relationship between countries is now a distant relationship between operators, and that is reflected in the nature of the relationships that now exist.

The manner by which digits of a telephone number are analysed for routeing and charging makes knowledge of the complete number unnecessary. Indeed the status of numbers within a number block that has been allocated a number block continually change and is often only known to the operator to whom the number block has been assigned. Whilst this level of detail may not be required, knowledge of number blocks allocated would assist, as well knowledge as to whom the block has been allocated, in order to ameliorate numbering misuse.

The consideration of best practice needs to consider the position of both the NNPAs and service

providers. The best practice principles that are presented in the report though focussed on Telephone numbers can also be applied international identification plan for public networks and subscriptions, Issuer Identification Numbers and signalling point codes.

The best practice for NNPAs should include having the roles and responsibilities enshrined in national law and would permit the NNPA to

- ensure the availability of numbers,
- monitor and review the current number resources assignment
- have sufficient flexibility to allow for service providers to implement innovative services in a timely manner,
- ensure consumer protection
- enforce compliance with the rules of the national numbering plan.

Such goals would include defining the national numbering plan, the uses to which the numbers can be allocated, which entities can be assigned number blocks, and the processes that would exist to allocate such resources. Such management needs to exist across the life cycle of the use of a numbering resource.

Further management activities that should be considered by the NNPA should include the applicability of charging for numbers, if at all, as well as the routing of the numbers and maintaining records. Additionally the NNPA should manage the numbering resources in a manner to ensure their availability and to facilitate action to counter number misuse. This latter point could include a dedicated contact point, to facilitate contact from overseas Administrations in the countering of numbering misuse.

The best practice for service providers should be based upon requirements outlined in national regulation. These requirements should include the maintenance of accurate records in the assignment of numbers, manging the numbers allocated to the service provider supported by appropriate processes to utilise the numbers assigned to the greatest extent to contribute to the NNPA goal of maintaining the availability of numbers, as well as utilising numbers for the intent to which they have been allocated.

The management of numbers reflects legal regulatory and social norms of a member state. It is recommended that NNPA use this report to undertake a self-assessment of their regulatory

environment. This is a recommendation that is included in related reports[12]. In support of this self-assessment the contents of this report should be used as the basis of creating a supplement to Recommendation ITU-T E.164 to assist NNPAs undertake the self-review.

[12] An Update of the number management practices in the Pacific Island Countries and its application to countering numbering misuse" Phil Rushton September 2017

2. INTRODUCTION

This report is the second deliverable from the ITU D project, funded by Australia Government, seeking to contribute to combatting numbering misuse of national telephone numbers from Pacific Island countries.

The focus of this deliverable is on providing "Guidelines for Best Practice for the management of ITU-T Recommendation E.164 telephone numbers". In order to place the guidelines in context, consideration as to what constitutes numbering misuse is also considered. For this reference is made to both the first deliverable of the study ,"An update of numbering management practices in the Pacific Island States and its application to countering Numbering misuse"[13], the previous study " A review of numbering management practices in Pacific Island Countries"[14] and the responses to a questionnaire that occurred in ITU-D[15].

This report focuses upon best practice of managing telephone numbering resources that can contribute to combatting and countering the misuse of national telephone numbering resources that are administered by a National Number Plan Administrator (NNPA) behind a geographic country code. There are some telephone numbers that are allocated by the ITU. The numbering resources that are allocated by the ITU are non-geographic telephone numbers assigned from behind country codes that are managed by the ITU itself and take the form of numbers for services or numbers for service providers, such as network identity codes, and are assigned directly to the service provider. Whilst misuse of these directly assigned telephone numbering resources does occur, there is appropriate governance in place to address and resolve such reports of misuse. These telephone number resources are not considered further in this report.

The best practices that are identified in the report considers the life cycle of the management of telephone numbering resources. The full lifecycle includes the specification of the numbering structure, the allocation of the resources, and the assignment of the resources, and the withdrawal of numbers, from the perspective of both the NNPA and a service provider.

The promotion of number management best practice covers the actions required by the main stakeholders involved in the allocation, assignment and management of numbers, specifically NNPA

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13 ibid

14 "A review of numbering management practices in Pacific Island Countries"; Matthew O'Rourke Incyte Consulting LTD., June 2010

15 ITU-D Question6/1 "Consumer information, protection and rights: Laws, regulation, economic bases, consumer networks", Section 2.5 and Annex 3

and service providers. The consideration from the aspects of these stakeholders is a functional one, recognising that the NNPA is a generic term and could refer to the Ministry, an independent regulatory authority, or indeed an incumbent operator. In this latter case the operator would be both NNPA and user of the numbering resources.

In considering the best practices associated with numbering resources, the recommendations in the report could also be applied to resources other than telephone numbers, although they are not explicitly covered. Whilst not directly associated with numbering misuse the principles associated with best practice can also be applied to these other resources. . The use of the generic term telephone numbering resources mainly refers to those telephone numbers (as specified in Recommendation E.164) that are international.

In noting these other resources, reference will be included to the relevant ITU-T recommendations that define such resources. Other relevant ITU-T recommendations that will also be referenced are those that refer to management of numbering resources.

3. BACKGROUND

The issue of misuse of Pacific Island Telephone Numbers emerged at the turn of the century, and resulted in the impact of a number of factors coalescing for the first time. By 2000 competition in the telecommunication market in some countries was having a major impact across all countries for two reasons.

The emergence of new telecommunication players was resulting the lowering of prices (both retail and wholesale) in some countries only. New entrants were not only challenging the position of incumbent operators (for the most part ex-governmental departments) but providing services in a way that was changing the manner in which basic telecommunication services were being delivered. The established direct interconnectivity that existed between operators as a means to route calls both nationally and internationally was evolving into a market place that saw the emergence of aggregators, offering cheaper connectivity giving choice to the operators.

Liberalisation saw the emergence of a two tier situation. On the one hand many countries remained with established interconnect arrangements, based on time and distance charging, and specified in ITU-T regional recommendations that had agreed settlement rates and options, such as “sender keeps all”. On the other hand liberalisation saw countries moving away from such established interconnect arrangements. One characteristic of such a move was the evolution of the provision of international gateways. Many countries increased the means by which international interconnectivity was provided, and by allowing competition, the market also evolved to include aggregators - service

providers for service providers. As a consequence the settlement rates that were once the cornerstone of all international telecommunications were increasingly replaced by bi-lateral commercial relationships.

As the manner of providing international telecommunications changed with liberalisation, who were the providers also changed. Prior to liberalisation international telecommunication provision was based on bi-lateral relationships using established ITU Recommendations. For example ITU T SG3 was responsible for determining the international tariffs that were reflected in regional Recommendations. Liberalisation replaced this environment. New players entered the market providing wholesale connectivity.

These new players exploit the existence of under-utilised international traffic routes at different times of the day to route traffic and by doing so are able to lower the interconnection rates for traffic directed towards certain countries. The lowering of costs is achieved by having a flexible approach to routeing of international traffic. This flexible, or agile, approach was presented at a mini workshop prior to the ITU-T SG3 meeting (February2016)[16].

It is within this diverse environment that numbers are used to provide and charge for services.

4. TELEPHONE NUMBERING MISUSE

Numbering misuse occurs because of the exploitation of the difference between the number of digits required to establish and charge for a call when compared to the length of the telephone number as determined in a national numbering plan. This difference emerges from Recommendation ITU-T E.164 "The international public telecommunication numbering plan" that states that analysis of only up to the first seven digits of an international dialled telephone number is required to establish and charge for a call, whilst permitting the potential maximum number length of a telephone number to be 15 digits.
Those seeking to misuse numbers exploit the difference between the digits that are required to be analysed and the potential length of a number. There are two major ways in which telephone numbers are misused. The first is the misuse of the commercial context associated with a telephone number. The second is the extent to which the telephone number dialled is legitimate.

In reality, the analysis of the dialled digits for routeing a call is often less than the maximum 7

[16] The Continuing Evolution of International Carrier Billing and Commercial Arrangements (Fedarb & Cleave) ITU-T SG3 Mini workshop on "The Use of Commercial Agreements for Billing and Settlements in Competitive Markets" February 2016

specified in Recommendation ITU-T E.164. The maximum of 7 digits allows for the potential analysis of the country code and the network destination code element in the implemented structure of a telephone number specified in the structure detailed in Recommendation ITU-T E.164. The extent to which any analysis is required is determined by the structure of the national numbering plan, the relationship of that structure to the call charges that are associated with the number and the commercial arrangements that exist with the originating service provider. An originating service provider will do the absolute minimum analysis in order to route the call and initiate charges. An additional digit that has to be analysed is a delay in call establishment and that impacts the profitability of a call. On one call such a delay may not be an issue, but in the context of the millions, if not billions of calls that are made every day, seconds taken to do further analysis can be significant.

The call charges associated with a call are determined by the structure of the national numbering plan, such as the telephone ranges that specified to support different uses, such as for geographic numbers, mobile numbers, non-geographic numbers such as premium rate, Freephone and shared revenue/cost numbers, and the commercial arrangements that is implemented to support each of these telephone numbering range. In some cases there are commercial conditions of use attached to telephone numbers within the national numbering plan itself. An example is the charges associated with non-geographic premium rate numbers. The extent to which the digits in the dialled premium rate number have to be analysed to route a call and establish the relevant charges would be determined by any cost structure that is specified in the national numbering plan. In reality there are issues with making specific premium rate telephone number ranges accessible from overseas because of the potential for fraud, and therefore access to these ranges tends to be blocked. The potential fraud in relation to premium rate numbers abuses the payment schedule differences that exist between a consumer and a service provider and between service providers who route the call, and the failure to reconcile the two in the same time frame.

There are other cases where the national numbering plan attaches no commercial conditions of use to the number range in question, for example geographic numbers, yet there is still the potential of misuse and of fraud. This is in part due to the high termination rates associated with the geographic number, and is associated with time and distance charging. Time and distance charging was the method used to determine the cost of calls as the International Telephone service emerged and evolved but is no longer as universal as once it had been. Time and distance charging, using predetermined settlement rates, has been replaced by Service Providers putting international telephone access with other telecommunication services, into so called “bundles” and reducing the international charge to consumers to reflect the commercial relationships between international

service providers that in many cases vary daily, and in some cases hourly. Originally telephone calls were established manually by telephone operators, who then calculated the charge. The transition to automatic international direct dialling then required analysis of the dialled country code to determine call routeing and charging. This was further complicated by the evolution of the national number plans to reflect new services, such as mobile, Freephone, shared revenue etc. that had different charges associated with them, and which impacted the analysis required, going further than the country code element of the telephone number, to analyse the network destination code structure in order to be able to route and charge calls from overseas.

In many countries the time and distance charging has been replaced with a different commercial approach based on a general reduction of call termination rates with the onset of liberalisation and competition. The different commercial approaches may include offering telephone calls as part of a wider package, a bundle. This different approach where the telephone service may be offered not on a per usage basis but as an all in cost and where, in return for a set fee in a period, certain categories of calls in a given time period are free, or have reduced charges raised against them. This approach has the impact of reducing the termination rates in many categories of numbers that are deployed, and therefore contributes to minimising the extent that telephone numbers could be usefully used for misuse.

High termination rates are themselves not sufficient for numbering misuse to occur but rather they are exploited as part of the misuse activity. For high termination rates to be exploited and perpetuate the fraud associated with geographic telephone numbers requires additional activity, such as short stopping the international calls, or calls terminating in countries other than the country whose resources are the subject of misuse. High termination rates associated with other numbering ranges can similarly be exploited but can encounter issues, such as with premium rate numbers not being accessible from overseas. Indeed there was an example in 2004 of one country taking the same approach to international premium rate numbers as to those Pacific Islands that had high termination rates exploited, namely they banned access to the country codes unless explicitly requested by the consumer. This somewhat draconian approach was subsequently withdrawn.

The difference between the number of digits required to establish and charge for a call when compared to the length of the telephone number as determined in a national numbering plan is further exploited when number blocks or numbers within blocks that are not in service are used.

Numbers that are managed by the NNPA are done behind geographic country codes as part of the national significant number. An NNPA allocates telephone numbers to operators in blocks of numbers rather than individually. The use of number blocks allows for efficient management of the

telephone numbering resource, and is frequently used in determining the routeing and charging of national (as opposed to international) calls. The size of the block can differ both within a country, based on whether the numbers are being allocated from a geographic or non-geographic range, and between countries. The size of the block allocation is determined in order to meet the demands and needs of the country. One factor determining the size of number blocks is whether and to what extent there are multiple operators seeking access to the telephone number resources.

From within blocks of numbers operators assign numbers to customers according to the use and rules associated with the numbers as specified in the NNP. It is very rare to have a 100% utilisation of a number block. Numbers within a block can have various states, such ready to be allocated to a consumer, allocated (and in use) to a consumer, withdrawn from a consumer (and therefore in quarantine), or not able to be allocated (for technical reasons). The state of individual numbers within blocks is continually changing as an operator allocates and withdraws numbers to meet consumer requirements on a daily basis.

The information about number blocks, their assignment and allocation and the numbers allocated within the blocks are used nationally rather than internationally. This level of detail as to a state of a specific telephone number often exists in that part of the number that is not subject to analysis for the routeing and charging of international calls but is passed transparently to enable the call routeing to be completed at the destination of a call.

The possible misuse of telephone exploits the potential difference between the analysis of the dialled digits up to a maximum of seven digits required to route and charge for a call, and the total number of dialled digits by an originating customer. The analysis required to route and charge for a call is unlikely to include all possible number blocks within a national number plan, and as a consequence not all possible numbers within a number block, that would exist behind an allocated number range as specified in a NNP, would be identified. In both cases, of either all possible number blocks, or all possible numbers within a block, misuse (and potentially fraud) occurs in that part of a telephone number structure that exists beyond the digits that are needed to be analysed for international routeing in charging.

In such a space telephone number blocks or individual numbers within blocks that have not been allocated can be dialled and because they exist behind a legitimate number range that is analysed, they could be routed and charged for in a potential misuse situation. Combine this possibility with the concept of short stopping, and it is possible to see how misuse of numbers and fraud can occur. Where numbers that are not allocated, or blocks that are not in service are dialled by a consumer and are not being misused then the response is generally a message to the effect that the number is not in service.

The charges associated with the international routeing of telephone traffic is in many cases cost sensitive. As competition has emerged in the national telephone markets, it has been mirrored with the development of competition in the international arena. Operators originating international calls continually seek cheaper settlement rates when routeing calls, and amend their call routeing accordingly. Third party wholesalers have emerged whose sole business offering is to provide the cheaper settlement rates and this in turn has created a market for routeing of international calls. It is not unheard of for call routeings between countries that have high volume of calls between them to see call routeings change on daily basis and in some cases even more frequently. Direct connectivity between international operators in country has been increasingly replaced with an alternative network of wholesale providers offering cheaper settlement rates that reflect the reduction in the cost of telephone calls. These service providers are able to offer cheap rates for International calls by utilising spare capacity on routes that would not usually be used for routeing traffic between originating and destination points.

It is against this situation that efforts are taken to combat and counter misuse of telephone numbers. In seeking to understand how to counter and combat telephone numbering misuse, and to ameliorate its impact, then consideration is required both of the structure of numbers, how they are analysed and the process by which telephone numbers become accessible from overseas.

In a scenario where an originating operator wishes to route calls from their network in Country A to Country B, using the telephone numbers of Country B, the originating operator needs to provide access to the number and to establish commercial arrangements to route calls. In establishing such commercial arrangements various wholesale services can be employed. For example, in addition to using subsequent transit operators to directly route the call according to the commercial arrangements of the subsequent transit operator, the routeing of calls (and the subsequent transit operators that are used) can be dictated by the evaluation of such commercial agreements to meet the requirements of the originating operator's choice. These subsequent transit operators may be other operators in country A, who have international call routeing capability, operators in an intermediate country, or service providers who provide international call connectivity between countries. This scenario can be quite complex, but is underpinned by the exploitation of under-utilised traffic routes. Such exploitation is very dynamic and routes can change in very short periods of time.

An originating operator in Country A will seek to establish a commercial arrangement to route a call based on the digits of the destination telephone number. In negotiating that commercial arrangement, the subsequent operator will utilise various factors to determine the price, including the number of minutes of calls that will occur, the destination termination rate etc. As calls that

utilise these telephone numbers are passed forward to other carriers and the minutes of the calls are amalgamated from other originating operators in other countries, the resulting amount of traffic is the basis that drives cost down. As previously stated where costs are dynamic, and in some cases where the profit margin is a fraction of a cent, then the routes will change.

In establishing these commercial arrangements, and with respect to the role of telephone numbers, the focus of the originating operator is on utilising the minimal amount of information need to establish the call to the destination (and therefore the route) of a call. Minimising the amount of analysis required to establish the route and charge of a call on a specific number may not seem an issue, but if measured in terms of the millions of calls made in an hour by some operators the extra time taken to analyse an extra digit, and the possible additional equipment required to support additional analysis, without a charge being made, can lead to significant amounts of lost revenue across a longer period.

In negotiations to establish the commercial arrangements, with the focus on volume of call traffic, on interconnection financial rates, and on the manner of the routeing, whether at the behest of the originator (through transit traffic) or of the subsequent operator (driven by their immediate commercial arrangements) it is not possible to validate the rights of use of the originating operator over the destination telephone numbers, nor whether the numbers that they are seeking to route on are legitimate. Getting access to the status of all individual telephone numbers that are changing on a minute by minute basis is not possible. This is a weakness that contributes to the misuse of numbers.

The requirement for easy access to knowledge of the structure and allocation of national telephone numbers would contribute to ameliorating the misuse of telephone numbers. Having knowledge of the national telephone numbering estate that could be possible allocated and assigned would not be a total solution, because of its ever changing nature. Nor would having knowledge of the telephone numbering estate provide a total solution because of the current level of analysis that is undertaken to route calls using international telephone numbers. What is possible is to identify best practice with respect to number management, and associated processes, that if implemented and made transparent could make the misuse of telephone numbers that much more difficult.

Underpinning the description of the best practice of telephone number management is one principal, namely that a call destined for a geographic country should ultimately be delivered to the rules of the country whose resources are indicated by the country code. A call may be forwarded on by a consumer or it may be forwarded to another country (where the Administration has delegated some of its national telephone numbering space to a third country), but both of these cases should

only occur once the call has been routed and delivered according to the rules established by the country whose telephone number was used as the basis for the call.

An administration that chooses to delegate some of its telephone number resources to a third country, or to permit extra territorial use, should do so judiciously. Delegation, or extra territorial use, of telephone numbers for fixed and mobile telephone numbers are considered separately. Telephone numbers that are associated with fixed line service have less flexibility than telephone numbers used for mobile service. Fixed line telephone numbers are used to determine the route of a call to a given destination, whereas a mobile telephone is more complex. Calls to mobile handsets (and therefore mobile telephone numbers) utilise a separate identifier that is used to identify the location of the handset, namely by ITU-T Recommendation E.212 “The international identification plan for public networks and subscriptions”. A call to a mobile number will in part be determined by the telephone number dialled, in a manner similar to a fixed line telephone number, but will complete its call using the secondary separate identifier. This is especially true if the handset has roamed. This separation of number and routeing identifier allows for extra territorial use and allows greater flexibility for mobile telephone numbers.

An administration that has chosen to delegate part of its NNP to a third country needs to consider the implications of such a delegation. Without a separate routeing identifier, routeing to fixed line telephone numbers that have been delegated by an administration to a third country could be routed directly to the delegated country, done to simplify routeing and potentially minimise call set up time, would possible undermine an administration’s ability to manage their numbers and garner revenue. The flexibility provided by using the separate resource to determine the location and therefore the routeing to a specific telephone number utilises the home location of the number to determine the location. In that respect terminating calls outside the country that has delegated the numbering resources that have the additional and separate routeing information will be known (because of the use of the home location) and is therefore able to managed and monitored.

Delegation of telephone numbers for services that utilises separate routeing information brings with it a separate issue of misuse associated with SIM boxes. The misuse associated with SIM boxes occurs where an incoming call with one set of separate routeing resources from country A has those resources replaced with resources from Country B, the terminating country, in order that calls as national calls, with national rather than international interconnection and termination charges. This requires an alternative and additional set of E.212 identifiers from the country is required in which the SIM box is being deployed.

Extra territorial use for mobile telephone numbers is facilitated by ITU-T Recommendation E.212

"The international identification plan for public networks and subscriptions" that is used to support mobile communications (including roaming). One consequence of utilising the E.212 identifier is to allow mobile telephone numbers to be used permanently outside the country that has allocated the resource, for example to support M2M or IoT usage. In Europe the consideration at the time of this report being written is that mobile telephone numbers can be permanently used outside the country of assignment.

The best practices that are associated with E.164 telephone numbers can also be applied toE.212 identifiers in order to minimise any misuse of the resource. The context in which national telephone numbers are managed and regulated is established under national law. The scope of such a national law should establish the governance of the telecommunication environment including roles and responsibilities of governmental stakeholders, and how other stakeholders will be included in the governance process. There will be variations between national laws, to reflect national legal and cultural requirements.

Though national law determines the approach to telecommunication in a given country, other than briefly acknowledging the role of law in establishing the wider regulatory framework, and identifying some elements at a high level that could be of use in managing numbers and other related identification resources, detailed consideration of national regulatory issues, outside of the focus upon telephone and other identification resources, are not considered further.

5. NUMBER RESOURCES BEST PRACTICE

Consideration of best practice of managing telephone number resources to counter and combat the misuse of telephone numbers needs to involve the main stakeholders. These stakeholders have been alluded to previously in the report and breakdown into two broad categories - Administrations and Operators. Each of these stakeholders can be further structured to include those in the country where the telephone resources are assigned and allocated, the home environment, and those environments overseas that originate calls, the international environment. The International environment can be further structured to separate originating environment and transiting environment.

There are other identification resources that are used to establish a call. Not all of the resources are visible to the user, nor are the additional resources used all of the time. However these additional resources are also the responsibility of the NNPA to manage.

The additional resources to E.164 telephone numbers that are managed by the NNPA that could be

managed using the best practice identified in this report include the following[17]

- E.212 resources associated with the international identification plan for public networks and subscriptions,
- E.118 resources associated with Issuer Identification Numbers
- Q.708 resources associated with signalling point codes.

The extent to which these additional identification resources are managed utilising the best practices that are described in this report is a decision for the stakeholders involved.

As part of describing the best practices of number management for telephone number resources, noting that such practices can be applied to other identification resources, the general rules that set the environment in which the resources will be managed also needs to be considered. The environment sets the rules in which number management exists. It can (and should) include roles and responsibilities.

For NNPAs, the environment should establish the telecom regulator as independent body responsible for promoting and developing a country's telecom infrastructure and services. As part of this overall responsibility, the independent regulator should be given the necessary tools for the management of telephone numbers and other identification resources that are deemed to be a national resource. These tools include the specification of achieving measures enshrined in law that will allow the regulator to ensure a fair and equitable approach to regulation of telecommunication resources, including the process for the assignment and allocation of numbers, and in specific circumstances the action that can be taken in the light of misuse or bad management of telephone numbers and other identifiers by a national operator. These tools and the circumstances in which such tools can be deployed should also be clearly stated.

Also to be specified as part of the environment are the requirements placed upon operators, in terms of what is expected of them in general operations, and specifically number management and where there is flexibility in the management of telephone numbers and other identifiers.

The NNPA should have the responsibility for managing the numbering resources in an efficient manner that ensures availability to operators, that protects consumers and does so in a manner that is responsive to the needs of the market. Being responsive of the needs to the market will allow exploitation of new technologies in support of new and innovative service. Such an approach will

[17] The references E.212, E.118 and Q.708 refer to ITU-T Recommendations and are freely available from the ITU-T website ww.itu.int

facilitate the use of such resources in member states' attempts to take advantage of digital based services.

5.1 Best practice for NNP Administrators

In considering what constitutes best practice for NNPAs, it is assumed that the national regulatory framework exists. The national legal framework would set the roles and responsibilities of the stakeholders. The responsibilities for the NNPA would be to

- ensure the availability of numbers,
- monitor and review the current number resources assignment
- have sufficient flexibility to allow for service providers to implement innovative services in a timely manner,
- ensure consumer protection
- enforce compliance with the rules of the national numbering plan.

5.1.1 Defining the National Numbering Plan;

The NNPA should be responsible for defining the national numbering plan. It is unlikely that in to-day's highly interconnected world that there is not a country that does not have a structure that defines the use of those numbering resources that are under its remit.

The structure of the number that should be reflected in the NNP should indicate whether the numbering plan is supported by an open or closed dialling plan. The dialling plan is the means by which instructions are passed from a calling party (the originator of the call) to the network. In a closed dialling plan all digits of the national plan are dialled. In an open dialling plan a call within the local area will require fewer digits to be dialled, in effect only the subscriber number element as defined in Recommendation ITU-T E.164. Calls outside of the local area will then need a digit to indicate that the call is to leave the local area, and identity of the local area to where the call should be directed (this is the network destination code in the structure of a number defined by Recommendation ITU-T E.164) and the local number in that destination local area.

In those countries that support an open dialling plan, many utilise the digit "0" is used to indicate a call that is intended for a different local area. A consequence of this approach is that the digit "0" cannot be used to begin local numbers. It also allows the "0" to be used in the next place of the dialling sequence in an open dialling plan to indicate an international call. In a closed dialling plan the international dialling sequence can also be "00". Whilst this is the preferred option there are exceptions to this.

In the context of an open dialling plan the lead “0” is often seen as part of the number, and this can cause confusion to originate incoming international calls where the “0” is presented as part of the destination number. Where the lead “0” is included in the dialled digits then the call will fail. Mobile services avoid that issue by using an alternative character “+” to denote an international call. This symbol maps to the relevant international access element ion the signalling system and is achieved through the technology that is used in mobile networks.

Also specified in the NNP should be the length of the telephone numbers. The maximum length of a telephone number should be 15 digits. The length of 15 digits includes the country code. The NNPA should structure the NNP such that the necessary information for an overseas originated call to be routed and charged for should be present within the first 7 digits if such calls are to be routed correctly and charged appropriately.

In addition to having numbers for fixed lines (often referred to as a geographic numbers) the numbering plan can also be structured to permit telephone numbers to be assigned for other purposes, such as mobile telephony, shared cost (where the recipient of the call pays a percentage towards receiving the call, in effect offering the calling party a discount)

- Shared revenue (where the recipient takes a percentage of the cost of the call for receiving the call, in effect subsidised by the call originator
- Premium Rate numbers (similar to shared revenue, but with higher costs and often a separate range to shared revenue because of the different charges to the call originator)
- Freephone numbers (where the recipient of the call subsidises the complete cost of receiving the call).

These other purposes are often referred to as a non-geographic uses. Mobile telephony is unique in that for the most part it is still consumer telephony, and consider non geographic. Other non-geographic uses of the telephone number are used to indicate the allocation of costs associated with the call between the parties involved in the call. Care should be taken in making all of these types of non-geographic numbers available from overseas to avoid further types of numbering misuse.

The structure of the national numbers, the length of the national numbers, in terms of the number digits and the services that are supported, should be included in the Numbering Conventions. Whilst the numbering conventions should be under the control of the NNPA, the amendments and evolution of the conventions should be done in an open and transparent way to avoid unnecessary issues.

5.1.2 Purpose of number ranges

Part of inserting the structure of national numbers into a publicised National numbering plan, commonly called Numbering Conventions, is to identify the uses of the various uses within the national telephone number structures (or ranges). The numbering conventions is the most commonly used term to describe the National Numbering plan and in addition to the structure can also include additional information about the management and use of national numbering resources. The additional information that could be associated with the numbering conventions is dealt with in turn in the following sections.

Telephone numbering resources are not only telephone numbers that are accessible from overseas and may include telephone number resources that are national only numbers.
These are sometimes referred to as Access Codes or short numbers and are frequently less than 5 digits in length. These should be indicated in the National Numbering Plan (or Conventions), and the use that can be made of these resources identified. Current uses of national only telephone numbering resources, which as the name suggests are not accessible from overseas, may include but not limited to the following

- access to emergency services,
- carrier selection (both pre call and on a call by call basis)
- access to directory enquiries
- social helplines.

Numbering resources are usually assigned by the NNPA to Service Providers/Operators in blocks rather than individually. This is to allow for efficiency of management by both parties. The size of the block will be determined by various factors including but not limited to

- Number length of the national significant number
- Number of operators
- Whether geographic or non-geographic
- The availability of the current national telephone numbering resource
- The demand for the service being offered by the service provider

5.1.3 Who can have numbers?

In the late 20th century many countries moved from a monopolistic approach to the provision of telecommunication services to one of competition. This brought with it the need to specify what entities can receive telephone numbers. The early stages of telecommunication competition often utilise the concept of licences being issued to entities to operate telecommunication services. An

entity is assessed against predefined criteria to see whether or not they are competent to operate a network and provide telecommunication services. The type of licences that may exist in a national environment will reflect the national approach to the provision of telecommunication services and with it the types of national numbering resources that an entity that has been granted a licence can have assigned. For example a full licence may include access to all numbers or different classes of licences, or a specific class of licence for a specific service type may offer an entity access to specific number ranges, such as a mobile operator having assignment of mobile numbers.

An alternative to a licencing environment is a general authorisation environment. The difference between the two approaches to regulation is that the requirement in a licencing environment to assess the competency of an entity to operate a network or provide a service is replaced in an authorisation regime by a set of criteria that the entity has to agree to conform to in order to provide the network or service.

Irrespective of which approach is taken the numbering Conventions need to specify the rules that apply to the use and management of the relevant telephone numbering resources.

5.1.4 Procedures

The Conventions should also include the various processes that need to be followed in the various stages of the lifecycle of the various types of telephone numbers. The various types of numbers may be treated differently and reflect the extent to which a telephone numbering resource is considered stable. Stability in this case refers to the length of time a number range has been established, and the knowledge associated with such numbers. For example geographic numbers assigned for traditional telephone service use may be considered relatively more stable than telephone numbers being assigned for M2M/IoT. M2M/IoT is an emerging use being associated with telephone numbers and related resources that are being implemented using various technologies. The extent to which the use of telephone numbering and related telecommunication identifier resources continues in the future is unclear, hence such use can be considered relatively less stable.

5.1.5 Allocation

The mechanism of allocating telephone numbering resources will be influenced by the type of number that is being sought and the approach that has been taken to the use of telephone numbers in a national context.

The use of telephone numbers for fixed line telephone service often reflects a geographic division of the country. This geographic division is a legacy approach to the introduction of the voice telephone service that has continued to this day, and there are very few countries that do not have a degree of

geographic division within their borders. This geographic division will have an impact on the numbering resource for such services in that numbering resources will have to be allocated for each of the areas in which a service provider wants to provide service. The alternative is to remove such internal geographic borders, but that comes at a cost. Not least is the need to know the location of each individual telephone number that is assigned in order to be able to route to it. There are very few countries that have this approach.

Allocating numbers in areas in blocks, as previously indicated allows for flexibility in the management of the national numbering resource. Each of the stakeholders has a responsibility that reflects their role. The NNPA is meeting its responsibilities by making numbers available to the operators, and operators are then able to meet their responsibilities in managing the use of the assigned telephone numbers in response to consumer requirements.

The size of the block of numbers is again flexible, but can be considered a function of various factors that can include the number length of the number, whether it is an open or closed dialling plan, the demographics of the country and the potential demand for a type of telephone number by operators. Whilst the size of the number blocks being allocated does not have to be uniform the smaller number of block sizes that are available in the national numbering plan makes allocation processes (and management) easier.

The size of a number block for geographic numbers may be influenced by the geographic divisions that already exist (and these can be changed through a number change with the issues that such an action requires). The size of a non-geographic number block whilst influenced by similar issues such as number length, demographics, does not have to take account of the geographic divisions and therefore may be able to support telephone number blocks of a larger size than geographic numbers.

Subsequent allocation of telephone numbers to operators should be based on demonstrable need provided by the Service Providers, with the requisite evidence that the additional numbers are required. This places a responsibility on the Service Provider to manage their allocation of numbers appropriately. This is discussed in more detail below (see section 5.2.4).

To assist in the allocation of telephone numbering resources the regulator should develop a form, preferably electronically, in which a service provider can submit a request. It is possible for one form to be developed that is sufficiently flexible to be able to respond to requests for all numbers. The request should only come from the recognised contact within the Service Provider's organisation, and only be sent to the NNPA, or their designated representative. Requests to and from others should be rejected.

Such a form should seek information, in addition to the contact requesting the information,

- the type of numbers that are being requested (for geographic numbers the geographic area in which the numbers are being requested),
- the number of telephone number blocks being requested,
- the evidence as to why the numbers are being requested

The time scales that the number should be allocated to are discussed below (See Section 5.2). However the process should be detailed, with an agreed timeline. Part of the process and the associated timeline should include the possibility of the NNPA having the right to seek further information and clarification from the operator. If this additional step is required then the timescales for consideration of allocating the requested telephone numbers will be prolonged. Such a process may be iterative.

If a request is agreed to, then in addition to notifying the requestor for the number block(s) of the assignment, the NNPA should also notify other national operators of the assignment. This is to ensure that an audit trail of assigned national numbering resources exists, and that only telephone numbering resources managed in this way should be in use by the Service Provider(s).

In addition to notifying other national operators of the allocation of the number block(s), the NNPA should also place a notification in the ITU's Operational Bulletin[18] that the number block is allocated. The information published in the operational bulletin should utilise the format outlined in Recommendation ITU-T E.129. Whilst such publication cannot guarantee the availability of access to these numbers from overseas, not least because of potential commercial negotiations that might be required, it can assist in such negotiations in indicating the legitimacy of the number ranges.

Ensuring that information on the allocation of telephone number and other identification resources is available could assist in reducing the misuse of unassigned numbers. In addition to publishing the information of number resources that are unassigned vie the ITU, NNPA should also provide a definitive list of the allocation status of numbering resources, e.g. on their web site.

If a request for an assignment of a telephone number resource is rejected then the NNPA should have an appropriate process. As part of the process to reject applications, the NNPA should indicate the

[18] Member States or other classes of ITU members who wish to have information about numbering and other identifier information, or operational information, inserted into the ITU's operational bulletin, published every 2 weeks, should send the information to the ITU-TSB.

reason why the request has been rejected. Whilst it is impossible to identify all reasons for rejecting requests, possible reasons that are commonly encountered are

1) the utilisation of the number blocks already assigned do not warrant a further allocation of resources
2) the service to be provided as part of the requested number blocks is not appropriate to the additional number blocks being sought.

NNPA should be open to new and innovative requests from Service Providers to the use that could be made of telephone numbering resources. Encouragement should be given to such requests being made well in advance of when the telephone number resources would be required. Allowing sufficient time in advance of the possible use of the telephone number (or similar resource) will allow an assessment of whether current telephone number ranges can be used or a new telephone number range is required. If the latter, then the NNPA would need to give consideration to the rules and requirements of a new range and this would add to the time scale for its introduction, including any potential consultation with all stakeholders.

5.1.6 Reclamation

The conditions under which telephone numbers that have been allocated to Service Providers are withdrawn by a NNPA are limited. Reclamation is different from a voluntary return of an allocation of telephone number resources by a service provider (see clause 6.1.4.).

Telephone number blocks that are to be reclaimed from a service provider should occur where the service provider has misused the numbers, for example where the use being made of the numbers is not in alignment with the numbering plan, or the numbers are unassigned from the time of allocation. The extent to which other causes of misuse can apply is outside the scope of this report.

Furthermore reclamation of telephone numbering resources can occur when a Service Provider ceases to operate. Ion such circumstances the National Numbering Plan can seek to reclaim the numbers but need to take account of consumer protection issues, and may seek an alternative option of re-assigning the numbers to an operator of last resort. If this latter option is taken, then the numbers could be re-allocated using the processes that should exist for number re-allocation.

When telephone number resources are reclaimed then the NNPA should notify other Service Providers that that the numbers are no longer in service and requiring that the numbers be taken out of the networks. As with the allocation of numbers, and in addition to notifying the national service

providers, notice of reclamation should also be sent for inclusion in the ITU's Operational Bulletin[19]. Any publicly available information, such as web pages, should also be updated.

5.1.7 Re-assignment (quarantine)

Telephone numbering resources that are reclaimed by the NNPA from a service provider should be placed into quarantine. This should be for a minimum of three years.

There are exceptions to this such as the demand for numbers in the face of potential numbering exhaust. Although it should be noted that to re-allocate numbers that have just been reclaimed has the potential to cause consumer confusion and misdials. The time required before re-assignment occurs is to allow the numbers to be removed from the support systems and switches of the other operators.

If the demand for numbers is such that numbers have to be re-allocated using the processes outlined above, then the NNPA should consider whether a number change as an alternative is required. Number changes are outside the scope of this report.

5.1.8 Time-scales

The timescale for the NNP admini9strator to allocate number blocks from number ranges that are established, the so-called subsequent number allocation should start from the date the request for the allocation is received by the NNPA. A request for a number block should have an allocation made within 30 days. However if the NNPA seeks to have further information in support of the request then that time scale is stopped and re-initiated from the date the additional information is received from the service provider. There could be several iterations of this process.

Where a service provider seeks allocation of a telephone numbering resource for a new service then the timeline for allocation should be driven by the NNPA seeking input on the potential demand and use of the new requirement. Such input should be done through consultation with stakeholders. In addition to identifying the need for the new range, the consultation should also seek to establish the rules and governance of the new numbering resources. The complexity of the request for a new numbering resource to be allocated from the NNP and the impact that such an allocation would have on existing numbering resources, for example to accommodate any new numbering resource, would contribute to determining the time-scale for the NNPA to respond and to potentially allocate the numbers. An initial response could be given within 3-6 months, determining on whether further clarification is required, and the extent and scope of that further clarification.

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[19] During the PITA/ITU Numbering Misuse workshop held in Fiji (April 2018), at which this report was presented, there was no knowledge from operators and regulators present of the existence of the ITU Operational Bulletin

A further timescale to be identified is one associated with Service Providers building the newly allocated number blocks onto their networks to enable their use. The principle of "all operators must route" is discussed below (see section 5.4) but if the principle is implemented then following notification by the NNPA of the allocation of additional number blocks from an existing range, service providers should build the numbers into their network within an agreed period of 30 days. For numbering blocks from a new numbering regime, in the first instance the numbers should be made available from a date agreed by stakeholders, but no more than 12 months from the NNPA assigning resources from the number range.

5.1.9 Charges (if applicable)

If the national regulatory regime is one that charges service providers for allocation of telephone number resources, either at the time of allocation, or on an annual basis, or both, then requests for number blocks should incur charges that the NNPA has set.
Charges for new number ranges should be determined in the consultation that is held with respect to the introduction of any new range.

Charging for numbers is also a mechanism by which NNPA can attempt to achieve greater utilisation of telephone number resources, irrespective of whether charges are made for telephone number allocation, or annually or both. Whilst not directly related to countering and combating numbering misuse, charging for numbers, whether as a means of covering costs for the NNPA, or as a means of achieving greater utilisation of existing telephone number resources, should be considered as best practice by the NNPA.

5.1.10 All operators 'must route'

In the development of a competitive telecommunications environment the regulator should facilitate the interconnect arrangements for telephone number resources, under the principle that allocation of number blocks from existing number ranges should be routed once notified. Once established then notification by the NNPA of a new number block should follow business as usual processes.

New number ranges that have been agreed will, once the initial allocation and commercial arrangements have been agreed, be subject to the same rules. However in the first instance rather than agreeing a timeline, a date by which the numbers should be made available should be agreed.

Where the principle of "All operators must route" is not followed, and operators have to inform other operators of the allocation of numbers, and then delay to the availability and implementation of the numbering resources may occur. Additional information may also be required in such circumstances includes providing the necessary documentation to other service providers that the

numbers have been allocated and can be brought into service.

5.1.11 Maintaining Capacity

As part of the on-going management of the NNP, periodic reviews of the utilisation of allocated telephone number blocks should occur. Much of this review can be undertaken based on reports of telephone number utilisation provided by the service providers. This should be done periodically, at least once a year and should include for each number block allocated the number of numbers within that block that are

- Assigned to a customer
- Ported
- unusable (with a description of the circumstances)
- quarantined

Assessing the reports of utilisation of the number blocks and the previous demand for number blocks in the preceding periods, then the NNPA should be able to assess what availability of the resource is required to meet the demand trends that are developing. In order to extend the availability of numbering resource in the face of potential exhaust in a given number range, the NNP can consider regulatory measures, including charging for numbers, to make more numbers available.

In assessing the general trend of utilisation of a number range that is likely to result in potential exhaust some 3-5 years in the future, the NNPA should consider what measures can be applied (including charging) before a number change and begin to consult with stakeholders to make more numbers available. Undertaking a number change is a significant activity and whilst it should not be underestimated in terms of time and cost to achieve, it is not considered further in this report.

5.1.12 Records

Underpinning the role of the NNPA is the need for the NNPA to keep accurate and up-to-date records of the number ranges allocated, preferably in an electronic form. The structure of the records will reflect the national numbering plan but for each type of number range that is in service, every number block should be identified and where allocated, it should indicate to which operator the block has been allocated and the date it was allocated. Where a block is not allocated it should be indicated as free. This information should be freely and transparently available.

Allocation of number blocks to service providers that have met the allocation criteria should be the next available number block in the number range.

5.1.13 Mandate to manage

As part of the roles and responsibilities that are undertaken by the NNPA, it is important that the appropriate regulatory framework exists. The NNPA must have the ability to enforce the good management practices used by the NNPA on SP's who in turn should be mandated to implement. These practices that should be facilitated by the regulatory framework included

- being able to introduce new numbering regimes, in consultation with the stakeholders,
- requiring service providers to comply with requests for information
- to instruct and force service providers to take corrective action in clear circumstances, such as utilising unassigned telephone numbering resources

5.1.14 Number Plan Presentation

As part of the presentation of the NNP, the NNPA should present the national numbering plan, which will include international numbers (those national numbers that can be used for access to and from the country) and national only numbers (those numbers that are only available from within country) utilising the format specified in ITU-T Recommendation E.129 . This will assist overseas operators in understanding the structure of the National Number Plan utilising a consistent presentation method to understand what number ranges are in service, and therefore legitimate.

5.1.15 Conservation Measures

The identification of conservation measures in this report is for completeness, as part of the number management best practice. In of themselves they may not contribute directly to the countering and combatting of telephone numbering misuse, but they set the realms for the management of numbering misuse. By focussing on telephone number best practice in general terms the environment of managing the telephone numbers becomes more robust in of itself, and makes availability of telephone numbers (and ranges that would be susceptible to misuse) that much more difficult to exploit.

The use of conservation measures is closely allied to ensuring the availability of numbers that are part of the responsibility of the NNPA. These regulatory measures include

- Charging for Numbers
- Increasing Number Utilisation
- Amending the geographic areas (only for geographic numbers)
- Introducing number portability

- Number pooling
- Providing overlay telephone numbers (only for geographic numbers)

5.1.16 Telephone Number Misuse Management

As part of the management of the telephone numbers, the NNPA should provide contact details, of either an individual or a function, with the express purpose of facilitating overseas entities (both NNPAs and Service Providers) to make direct contact to report the perceived misuse of either the telephone number resources that are the responsibility of the NNPA or the misuse being carried out by a service provider within the regulatory regime.

The extent to which the NNPA are able to react to reports of perceived numbering misuse of its numbers that are occurring elsewhere is dependent upon where the misuse is occurring and what form the misuse is taking. However a better structured National Numbering Plan, with more formal rules in the management of the national numbering resources that are transparent can assist in minimise the potential for misuse.

With respect to the possible misuse of a telephone numbering resources by service providers, which are dealt with in more detail below, the regulatory regime should require

- Service providers to route telephone numbers to a destination based on the dialled country code
- Not terminate numbers in a country if it is not the allocated country code
- Require service providers to be able to identify the telephone resources that they have allocated to consumers.
- Withhold payment where misuse has impacted traffic flows

An NNPA who believes that their numbers are misused should contact the country where it believes such misuse is occurring. Examples of telephone number misuse include

- the use of number blocks or number ranges that have not been allocated.
- terminating of international calls to a country other than that indicated by the country code that has been dialled

5.1.17 Routeing on International Calls

The NNPA and the regulatory regime should require that only calls with the country code that indicates their geographic destination are terminated, and that such calls should only use allocated number blocks within ranges. Other country codes should be onward routed, and therefore treated

as transit traffic

5.2 Best Practice for Service Providers

The identification of best practice for service providers should be based upon requirements outlined in national regulation. Such regulation should require service providers, and recipients of national telephone numbers, to maintain records and provide required information to the NNPA periodically. National regulation should also contain the consequences that service provider will encounter should they fail to comply with the requirements stated in national regulation.

5.2.1 Records

Maintenance of accurate and up to date records of the assignment to indicate the status of individual telephone numbering resources will form the basis of providing information to the NNPA. Service providers should specify the form in which such records are kept, and the processes by which the information should be captured, accessed and used.

5.2.2 Recycling

Numbers assigned to consumers that are changed for whatever reason should be placed in quarantine for a minimum period. This period was historically governed by the production cycle of paper based telephone number directories and in many cases remains true in those countries that retain paper based telephone number directories. Where such directories are no longer used a quarantine period should still be employed. It is suggested that a period of a similar length be employed, namely 13 months.

In certain circumstances, where the demand for numbers exceeds the numbers available for assignment by the service provider and allocation by the NNPA, the quarantine period for specific numbers can be shortened. Shortening the quarantine period for telephone number resources is not without risks. One such risk is the potential negative consumer impact of re-using a telephone number, and the perception of misdialling calls and of unnecessary call charges leading to consumer complaints.

5.2.3 Responsibilities

In order to facilitate engagement with the NNPA, a Service Provider should identify a single point of contact within its organisation with respect to national numbering resources. This will facilitate the service provider meeting its regulatory obligations in a consistent, professional and clear manner.

In addition to the obligations identified under the national regulation, service providers can undertake further actions in order to combat numbering misuse. These actions are described in more detail in Section 5.2.5 but include

- Monitoring levels of traffic
- Reporting to other operators perceived number resources (both specific numbers and number ranges)) that are being misused

5.2.4 Number Management Processes

The processes that are used should be documented and reflect the good number management best practices to ensure compliance with the regulatory environment. The processes that need to be documented include managing the life cycle of a telephone number, from initiating the request for NNPA for the range, building the resource in the network and on OSS equipment, assigning, withdrawing and possible re- assigning the numbering resources within that number block, and potentially returning the number block to the NNPA. Also to be documented should be processes for the export and import of telephone numbers if a regulatory requirement exists. This latter process should be agreed by the industry

Other processes that should be documented, in addition to the management of the telephone numbering resources, should be to actively monitor the traffic level to specific number ranges and numbers, in order to identify the potential impact of traffic. Ranges that warrant such monitoring is where there are high termination rates. This can be for national or overseas number ranges.

As part of the process, and in addition to taking corrective action in response to variations on traffic to particular number ranges or numbers, the process should also provide the method by which information on number misuse is shared with other operators, both nationally, through industry forums, regional organisations and international standards development organisations [1], as well as taking direct action.

A further process that can be considered, in addition to the “use it or lose it” approach associated with number allocation, service providers should be obliged to return underused numbering resources to the NNPA. This under used numbers could initially be identified as part of the annual returns provided by the service provider to the NNPA.

5.2.5 Number Misuse Activity

In order to assist in combatting misuse of telephone numbers, service providers should not terminate calls in their national network unless the country code or the rules of the NNPA of the country code indicates that the call is for networks in the country. Whilst it is possible for calls to transit through a country, and for a service provider to hand of calls to another operator with whom it has a commercial relationship to continue to route the calls, this is not terminating the call.

Service providers who are being asked to provide access to international telephone numbering

resources should do so with those entities that have a commercial relationship with the service provider who has been assigned the number. Occurrences of numbering misuse are being driven in part by 3rd parties offering access to overseas telephone numbers over which they have no rights of use. Being able to identify the legitimacy of such telephone numbers, i.e. are the numbers from legitimate number blocks in legitimate number ranges, would assist originating service providers in deciding whether to build specific number ranges onto their network.

6. RECOMMENDATIONS

In considering the applicability of the best practices identified in this report, it is important to note that the management of the national element of ITU-T telecommunication resources reflects the legal, regulatory and social norms of a Member State. As such it is their sovereign right to evolve that environment as appropriate. The management of the telephone numbers happens within such an environment.

However, irrespective of such detail, NNPA should exist in an environment that allows appropriate action to be taken with respect to number management and as part of the approach to telecommunication regulation overall. For the purposes of this report the focus is on Number Management. The responsibilities should be enshrined in national laws, in order to create a fair, equitable and transparent telecommunications environment, and in a way that allows for the management of the telecommunications in general.

With respect to number management such laws should allow the NNPA to specify the management of numbers through the creation of the NNP. Furthermore the law should specify the scope of the actions associated with management, for example under what circumstances the NNPA can reclaim numbers, what information should be provided from national service providers, what is expected of service providers in terms of their management of the national numbering resources assigned to them. As part of the environment any retrospective and corrective action that is possible should also be specified. For example specifying under what circumstances could the NNPA seize information.

In addition to having the appropriate legal framework within which the management of numbers should occur, it is important that the NNP have the appropriate processes to support number management through its life-cycle. Undertaking an assessment of both the current framework and the management processes should be considered to ensure that the regulatory has sufficient powers and that they have created an appropriate environment in which to manage the life cycle of numbers.

Requiring Service Providers to manage numbers effectively and efficiently is complimentary to the

requirements of the NNPA. The requirement(s) that are placed on service providers to provide information to the NNPA is one example. Other examples of requirements could be to seek to have the service provider conform to various standards, such as those specified by ITU-T. The nature of such standards are continuously evolving, and ensuring they are fit for purpose within any given national environment should be part of the on-going assessment of their use by a national regulatory regime.

The best practices within this report should be seen as the basis from which NNPAs extract and evolve them to meet their needs and requirements. In some cases NNPAs will have elements of the best practices in place and may only seek to only adopt some further elements either to better manage the NNP or to direct the management environment within service providers. Undertaking an assessment of current laws and processes of all elements of the number management life cycle would be a first step to identifying where there were differences and ahead of understanding whether amendments to the laws or processes was required. Any such review must take account of the differences that exist between national telecommunication environments.

Consideration should be given to developing a supplement to Recommendation ITU-T E.164, to allow flexibility to reflect national telecommunication environments, which would identify best practices and would further detail the responsibilities, processes and actions for the consideration of the NNPA and Service Providers. In addition to presenting good number management, and its contribution to countering misuse of numbers, further activities such as identifying elements to be included in commercial arrangements could be considered, for example calls utilising telephone number to be delivered to the country identified in the telephone number. Close liaison would be required with industry bodies to identify such elements.

7. BIBLIOGRAPHY

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