

NUMBERING IN TELECOMMUNICATION SYSTEMS

EEEN 462– ANALOGUE COMMUNICATION

Tuesday, June 10, 2025

OBJECTIVE OF NUMBERING

1. Objective of Numbering Plan is to uniquely identify a subscriber who is connected to a telecommunications Network.
2. Initially numbering was restricted to single local exchanges with each exchange identified by its name.
3. With introduction of multi-exchange areas common numbering plans started evolving.
4. Introduction of Subscriber Trunk Dialing (STD) for inter town dialing led to the introduction of National Numbering.
5. Later, the development of International Subscriber Dialing led to the development of International Numbering Plans.

05-12-1958

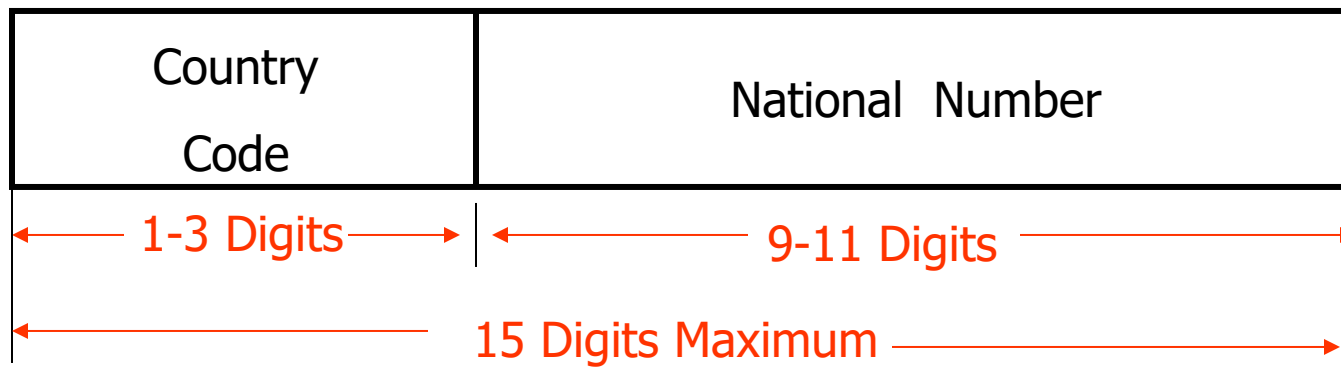
SUBSCRIBER TRUNK DIALLING BEGINS



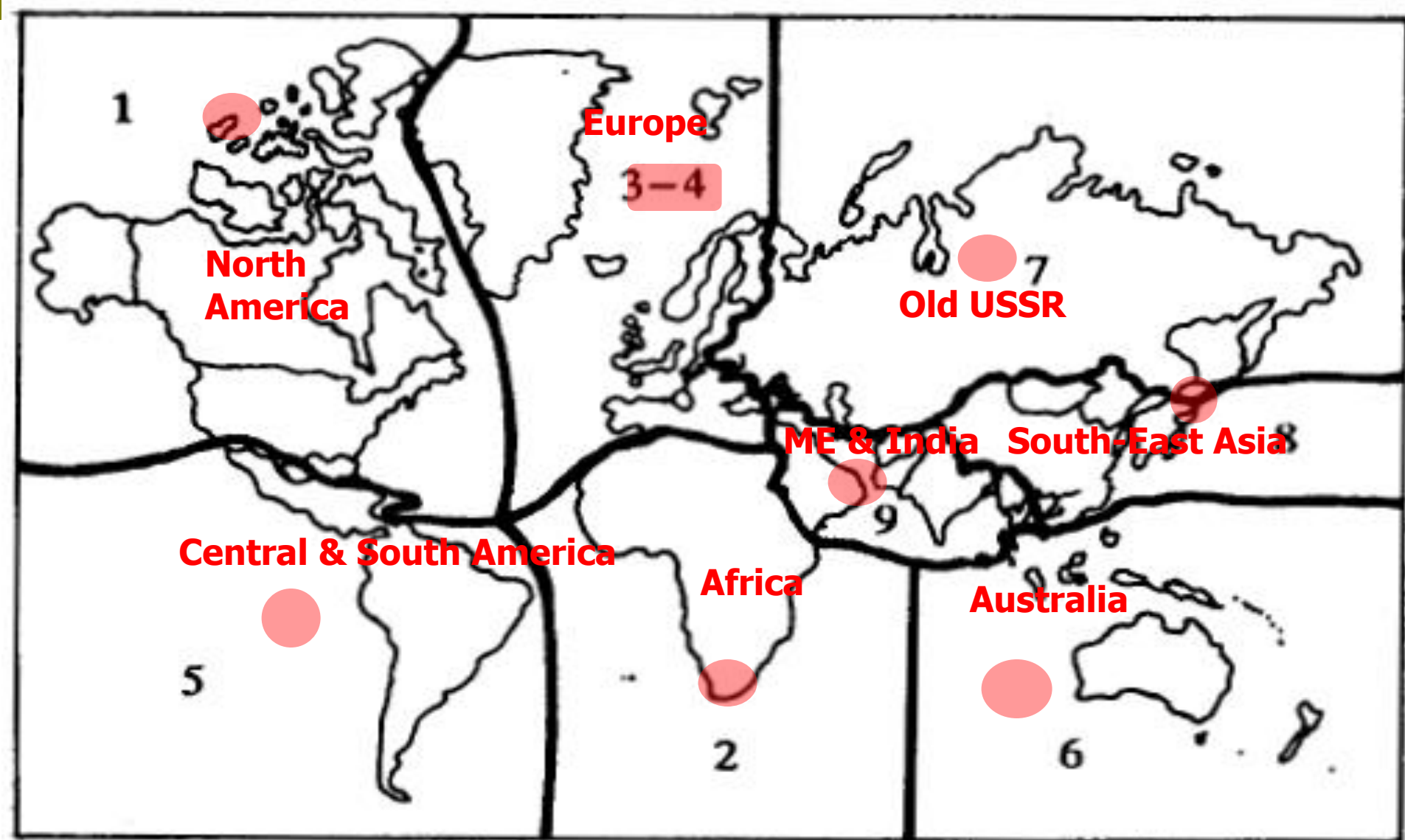
In the UK, STD started on **5 December 1958** when Queen Elizabeth II, who was in Bristol, publicized it by dialling Edinburgh – the farthest distance a call could be directly dialled.

INTERNATIONAL NUMBERING PLAN

- International Numbering Plan has been defined by ITU in recommendations E160-E164.
- E.164 (dev. 1984) defines a general format for international telephone numbers.
- Plan-conforming numbers are limited to a maximum of 15 digits, including the international call prefix.
- The presentation of a number is usually prefixed with the plus sign (+), indicating that the number includes the country calling code.



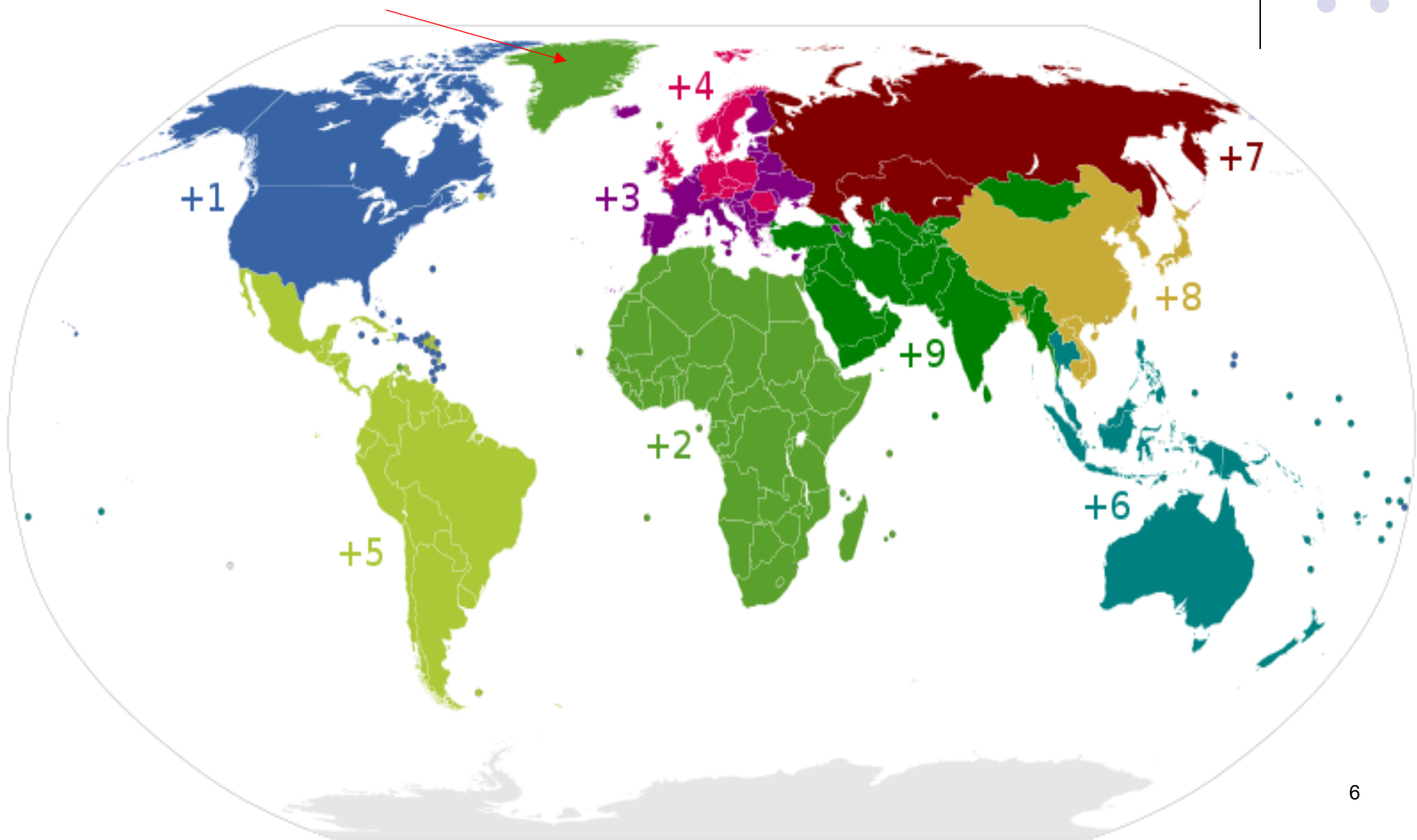
WORLD NUMBERING ZONES (1)



WORLD NUMBERING ZONES (2)



Iceland allocated +2



NATIONAL NUMBERING PLANS



Area/Trunk Code

- Identifies a particular numbering area or multi-exchange area.
- Examples 20 for Nairobi or 56 for Kakamega
- Code 7 was introduced in Kenya for find me anywhere (mobile).

Exchange Code

- Identifies a specific exchange within a numbering area, e.g. 21, 22 for Nairobi Central.
- This was modified to represent the operator for mobile communication initially

GENERAL CATEGORIES OF NUMBER SCHEMES

Number Schemes can be **Open**, **Semi-Open** or **Closed** as follows:

- **Open Number Scheme:** Also known as non-uniform numbering scheme **permits a wide degree of variations in the number of digits used to identify a subscriber within a country.**
- **Semi-Open:** allows the **number length to differ by 1-2 digits**
- **Closed numbering plan** or uniform numbering plan **has a fixed number of digits.** Used in USA, Canada, France.

CLASS DISCUSSION

- Is the Kenya Numbering Plan Open, Semi-open or closed?

Overview:

- The minimum number length (excluding the country code) is seven (7) digits.
- The maximum number length (excluding the country code) is nine (9) digits.

OPEN NUMBERING PLAN IN KENYA



INITIAL DIGITS	SERVICES
0	National Dialling Access
000	International Dialling Access
005	East Africa Regional Access Code for Kenya
006	East Africa Regional Access Code for Uganda
007	East Africa Regional Access Code for Tanzania
01	Reserved for future growth
020	National Destination Code/ Area Code for Nairobi Fixed Telephony Services
021-039	Reserved for future growth
040-045	Geographical NDC for Fixed Telephony Services
047-049	Reserved for future growth
050-059	Geographical NDC for Fixed Telephony Services
060-069	For Geographical Numbers (2-digit NDC and 7-Digit Geographical Numbers) Fixed Telephony Services
07	Mobile Telephony or “Find me anywhere” Services
08	Toll Free, Customer Services or Special Services (e.g. 0800)
09	Premium Rate or Specially-Tariffed Services (e.g. 0900)
1	Emergency Service 112, Short Codes for Customer, Premium Rate Services, Carrier Selection/Preselection and other helplines
2-8	7-digit Geographical Subscriber Numbers and Short Codes for SMS based Premium Rate Services
9	Emergency 999 and Short Codes for Premium Rate and Customer Services

1.2 GEOGRAPHICAL AREA CODES FOR FIXED TELEPHONY SERVICES

NDC/Area Code	Geographical Region
20	Nairobi City
40	Kwale, Ukunda, Msambweni, Lungalunga areas
41	Mombasa, Mariakani and Kilifi towns
42	Malindi, Lamu and Garsen towns
43	Voi, Taveta, Wundanyi and Mwatate towns
44	Machakos, Makueni, Kitui and Mwingi
45	Ngong, Kajiado, Loitokitok and Athi River
46	Garissa, Hola, Wajir and Mandera
50	Naivasha, Gilgil and Narok
51	Nakuru, Njoro, Molo areas
52	Kericho and Bomet
53	Eldoret, Turbo, Kapsabet, Iten and Kabarnet
54	Kitale, Moisbridge, Kapenguria and Lodwar
55	Bungoma and Busia
56	Kakamega, Butere, Mbale and Mumias
57	Kisumu, Maseno and Siaya
58	Kisii, Kilgoris, Oyugis and Nyamira
59	Homabay and Migori
60	Muranga and Kirinyaga
61	Nyeri and Karatina areas
62	Nanyuki
63	Reserved for future use
64	Meru, Maua and Chuka
66	Thika and Ruiru
67	Kiambu and Kikuyu towns
68	Embu
69	Marsabit and Moyale

[Click here for the Complete Kenya National Numbering Plan](#)

SHORT CODES



3 NATIONAL EMERGENCY SHORT CODES

NUMBER	SERVICE	Service Provider
999 and 112	National Emergency Number	Kenya Police

4 OTHER TOLL-FREE SHORT CODES FOR PUBLIC INFORMATION AND EMERGENCY SERVICES

SHORT CODE	SERVICE	Service Provider	Additional Information
108	Peace Building and Conflict Management	National Steering committee response centre on peace building and conflict management	
109	All Emergency Responses	National Emergency response centre	
110	Emergency Rescue Services in Lake Victoria	Lake Victoria Basin Commission (LVBC) Maritime Rescue and Coordination Centre (MRCC)-An East African Community initiative	Implementation in progress
116	Child Helpline	Child Helpline Kenya in collaboration with the Children department of Home Affairs Ministry	

SHORT CODES



5 TOLL FREE HELPLINES BY PUBLIC AND PRIVATE SERVICE PROVIDERS

SHORT CODE	SERVICE	Service Provider	Operational Status
1190	helpline for Victims and those affected by HIV/AIDS	Liverpool VCT	Operational
1191	Public Health for emergency health preparedness	Ministry of Public Health and Sanitation	Operational
1192	helpline for victims of Alcohol and Drug abuse	NACADA Authority	Operational
1195	helpline for victims of Gender Based Violence	HealthCare Assistance Kenya (HAK)	Operational
1197	G4S Security Services Kenya Limited public reporting/helpline on security, safety and disaster mitigation and general emergency responses	G4S Security Services Kenya Limited	Implementation in Progress
1199	Emergency disaster and health Response Services	Kenya Red Cross	Operational

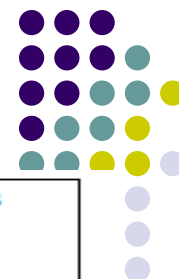
NAIROBI AREA



6.1 NAIROBI CITY

National Destination Code (NDC)	Current Number Series	National Significant Number (N (S) N)	Operator Assigned	Service Area	Activation Status
20	20x xxxx	9	Telkom Kenya	Nairobi Fixed Wireless	Active
20	21x xxxx 22x xxxx	9	Telkom Kenya	Nairobi Central	Active
20	23x xxxx	9	Telkom Kenya	Nairobi Fixed Wireless	Active
20	24x xxxx	9	Telkom Kenya	Nairobi Central	Active
20	25x xxxx	9	Telkom Kenya	Nairobi Wireless	Active
20	26x xxxx	9	Telkom Kenya	Nairobi Central	Active
20	270 xxxx 271 xxxx 272 xxxx 273 xxxx 28x xxxx	9	Telkom Kenya	Milimani	Active
20	29x xxxx	9	Telkom Kenya	Nairobi Central	Active
20	300 xxxx 301 xxxx 302 xxxx 303 xxxx	9	Flashcom	Nairobi	Active

NAIROBI (CONTINUED)



National Destination Code (NDC)	Current Number Series	National Significant Number (N (S) N)	Operator Assigned	Service Area	Activation Status
20	520 xxxx 521 xxxx	9	Wananchi Group	Nairobi	Active
20	55 xxxx	8	Telkom Kenya	Nairobi South	Active. <i>(To migrate to 655xxxx on systems replacement)</i>
20	600 xxxx 601 xxxx	9	Telkom Kenya	Nairobi West	Active
20	683 xxxx 684 xxxx 685 xxxx	9	Telkom Kenya	Embakasi	Active
20	612 00xx 612 01xx 612 02xx 612 03xx 612 04xx	9	Communicatio n Solution	Nairobi	Not Active
20	617 00xx 617 01xx 617 02xx 617 03xx 617 04xx	9	Wananchi Online	Nairobi	Not Active
20	618 00xx 618 01xx 618 02xx 618 03xx 618 04xx	9	MTN Business	Nairobi	Not Active
20	619 0xxx	9	iWayAfrica Kenya Limited	Nairobi	Active
20	64x xxxx	9	Telkom Kenya	JKIA	Active
20	653 xxxx	9	Telkom Kenya	Nairobi South	Active
20	655 xxxx	9	Telkom Kenya	Nairobi South	Active
20	66x xxxx	9	Telkom Kenya	Eastleigh	Active

KAKAMEGA REGION



6.15 KAKAMEGA, MBALE, BUTERE AND MUMIAS REGIONS

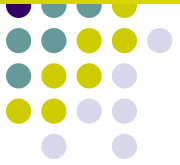
National Destination Code (NDC)	Current Number Series	National Significant Number (N (S) N)	Operator Assigned	Service Area	Notes and series Activation Status
56	30xxx	7	Telkom Kenya	Kakamega	Active; <i>(To migrate to 7-digit 203xxxx on systems replacements)</i>
56	45xxx	7	Telkom Kenya	Wodanga	Active; <i>(To migrate to 7-digit 464xxxx on systems replacements)</i>
56	51xxx	7	Telkom Kenya	Maragoli	Active; <i>(To migrate to 7-digit 555xxxx on systems replacements)</i>
56	641xxx	8	Telkom Kenya	Mumias	Active; <i>(To migrate to 7-digit 664xxxx on systems replacements)</i>
56	70xxxxx	9	Safaricom	Kakamega	Not Active

EXAMPLE: TO BE CARRIED OUT IN CLASS



- Consider a 11-digit international number with 2-digit country code, 2-digit area code and a 7-digit subscriber number. Prefixes '0' and '00' are used for identifying national and international numbers respectively.
- A few special services like fire, ambulance and police are given short subscriber numbers in the range 10-199. The network is designed for remote maintenance and the maintenance exchanges are identified by the number range 900-999.
- Determine the number space available for subscribers and the fraction of the space lost.

SOLUTION



- Maximum possible number space is $10^2 \times 10^2 \times 10^7 = 10^{11}$
- **Due to prefixes**, area codes and subscriber numbers cannot start with zero.
- **Due to special services**, the subscriber numbers cannot start with 1.
- Due to maintenance, the number range starting with 9 is not available for subscribers.
- Hence, we have the total available number space as:

$$10^2 \times 90 \times 7 \times 10^6 = 63 \times 10^9$$

- Fraction of Lost Space is

$$\frac{10^{11} - 63 \times 10^9}{10^{11}} = 0.37$$