X.25 (in)SECURITY in year 2005: What, Why, When, Who, How OR… (not anymore) uncovered data networks, (yet) covered targets.

[real life & field experiences on an underestimated and still actual security issue]

HITB 2005,

29th September

Kuala Lampur (MY)

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Telecom Security Task Force

Disclaimer

- X.25 protocol's theories and specs have been **intentionally uncovered** in this document.
- We do not recommend that you use this material for unauthorised access to telecommunications operators', private companies' or governments' infrastructures and/or systems.
- We cannot be held responsible if you decide nevertheless to explore such networks and systems, find them fascinating, start getting sloppy and leave tracks that finally gets you busted.
- The information contained within this presentation **does not infringe** on any intellectual property nor does it contain tools or recipe that could be in breach with known laws.
- The X.25 addresses used in the slides can be **sometimes real and sometimes fake**: in the first case they are out-of-date, else they've been used for clear example purposes.
- In any case, the real X.25 addresses mentioned as evidences have been taken from **public source** and their publication does not mean in any case an invitation to attack or test the connected systems.
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Agenda

- Intros
- */your nightmare starts here/*
- (a brief) technical overview
- So, how does it work ?
- Understanding NUAs and DNICs
- The history always teach…
- Some (cool) evidences !
- Differences between X.25 and the Internet
- Attacker’s typologies, preferred targets
- Conclusions
- Q&A
- */end of nightmare/*

TSTF: a short intro

- Founded by professionals and specialists.
- Located in Asia, Europe, USA.
- 30 years combined telecommunications experience.
- 50 years combined information security experience.
- A unique view on telco security – nobody else does it.
- Our field experience in worldwide networks makes the working difference, and let us know how to secure your infrastructures. For real.
- We know the slang, the terms, the devices and the techniques to use on X.25 networks as no one else does: we are the best on this topic and we know it.
- Active research (papers, tools, forums).
- Self-funded, no business cunts running it, no VCs.

The Speaker

- (direct) hacking experiences from 1986 to 1995
- Busted in the “Ice Trap” operation (13th December, 1995) managed by Criminalpol, Interpol and FBI
- Ethical hacker since that (well… I grow up ;)
- Professional Penetration tester (1996 -> today)
- Chief Technical Officer, @ Mediaservice.net Srl, a vendor-independent security consulting company based in Europe (Italy)
- OSSTMM (Open Source Security Testing Methodology Manual) Official Key Contributor (2002, 2003, 2004, 2005)
- Board of Directors Member:
  - T.S.T.F. (Telecom Security Task Force, www.tstf.net)
  - ISECOM (Institute for Security and Open Methodologies, www.isecom.org)
  - CLUSIT (Italian Computer Security Association, www.clusit.it)
  - OWASP – Italy Chapter (Open Web Applications Security Project, www.owasp.org)

"X.25 is used in a Packet Switched Network and in 1964 was designed by Paul Baran of the RAND Corporation for use with the Public Data Network (PDN) and unreliable analog telephone services.

The idea was to connect a dumb terminal to a packet-switched network.

In 1976 X.25 became a standard under the CCITT, now the International Telecommunications Union - Telecommunication Standardization Sector (ITU-T)."

Why are we talking about X.25 security in 2005 ?

- This speech is oriented towards network security while **working in X.25 worldwide environments** and its legal working framework.
- The information contained is based on personal, company's and other international researchers' professional **penetration testing experiences** and field observations.
- During the 90's we encountered a **huge number** of breaches on tested infrastructures, usually getting access via the main X.25 link. More than 90% of them was insecure.
- We kept on finding **open doors** while pentesting companies with X.25 leased lines (1999->2003); these doors always brought the Tiger Team to the **core of the target network**.
- New connections and new services that lay on X.25 communications **still get launched**, also when if you don't know it or even think of.
- We are now in year **2005**, and new breaches are still upcoming.

Introduction – What's this ?

- An International **P**acket **S**witched **D**ata **N**etwork (PSDN).
- A model **very similar** to Public Switched Telephone Networks (PSTN).
- 3 main packet type: **Data**, **Control**, **Facilities**.
- **International standards** (X.25/X.29, X.28, X.75, X.121) created by ITU (International Telecommunications Union, Switzerland) in the 70's.
- **First commercial global data network.** Widely used 'cause it was the only applicable choice (Internet was only available for the academics and the government's employees) from 70's to 80's; in the '90 many commercial companies went to the Internet, **but they kept their X.25 access** and contracts (that, usually, are still active, even if they forgot about it!).
- X.25 networks owned both by national telcos (**mainly**) and private operators.
- **Multinationals**, **Governments** and **private SMEs** with worldwide or interregional quality data-connection needing, are the typical **key clients**.

Introduction – How it works ?

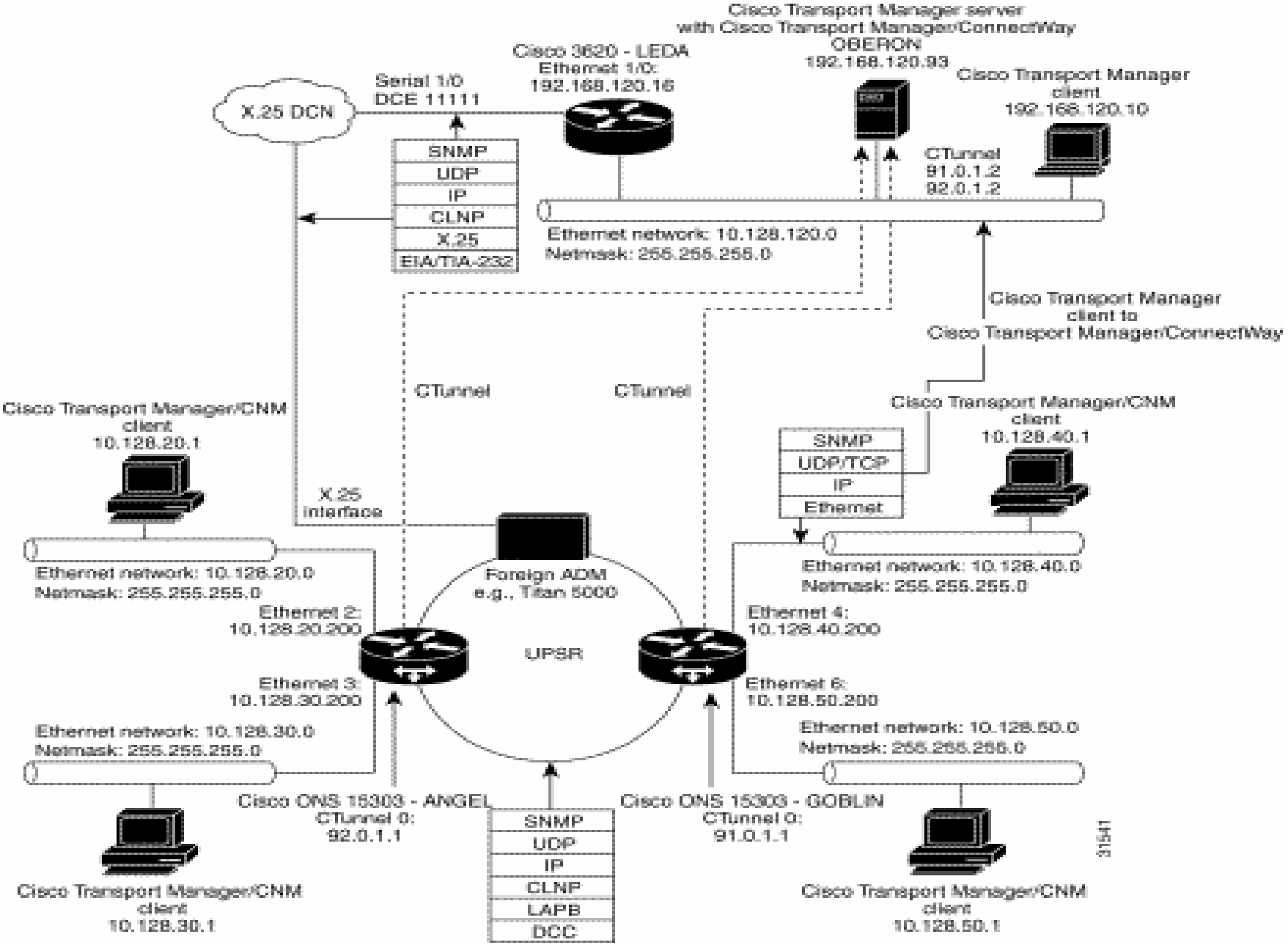
- Each subscriber has an **international X.25 address –** N.U.A. Network User Address **-** assigned to a **leased line**, with one or more **logical channels**.

- Subscriber A can call Subscriber B in order to establish a **switched virtual circuit** (SVC) call or a **permanent virtual circuit** (PVC).

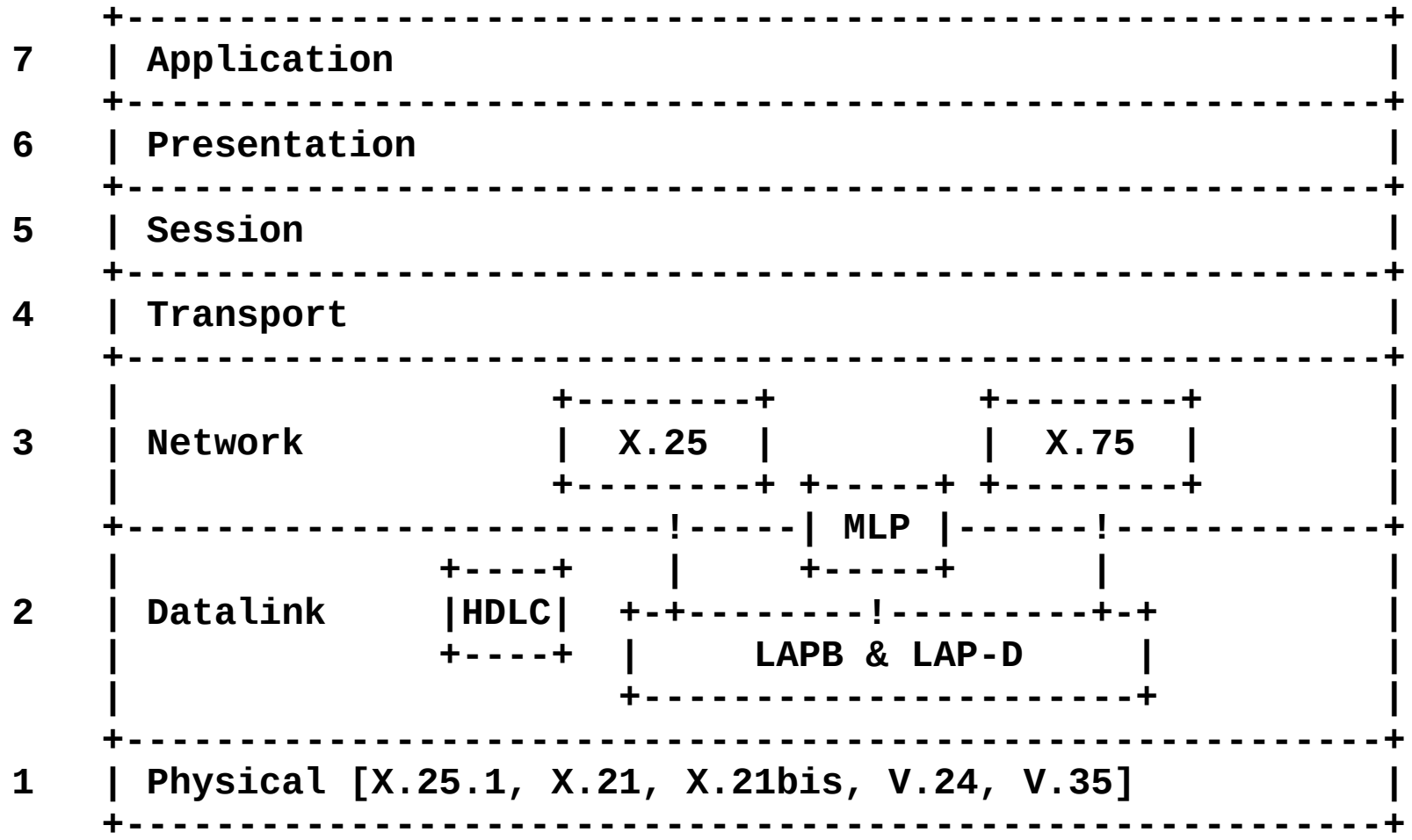
- **Only traffic is billed**, customer doesn't pay the connection-time.

- Both on SVCs and PVCs links is possible to talk over **many different protocols** (host-to-host, SNA, proprietary, voice, Kermit….).

- X.3 PAD capabilities are implemented in **major OS**:
  - *NIX
  - linux
  - VMS/OpenVMS
  - AS400
  - old stuff
  - strange/unknown systems (so many !!).


Cisco Transport Manager server
with Cisco Transport Manager/ConnectWay
OBERON
192.168.120.93
Cisco 3620 - LEDA
Ethernet 1/0:
192.168.120.16
Serial 1/0
DCE 11111
X.25 DCN
Cisco Transport Manager
client
192.168.120.10
CTunnel
91.0.1.2
92.0.1.2
SNMP
UDP
IP
CLNP
X.25
EIA/TIA-232
Ethernet network: 10.128.120.0
Netmask: 255.255.255.0
Cisco Transport Manager
client to
Cisco Transport Manager/ConnectWay
CTunnel
CTunnel
Cisco Transport Manager/CNM
client
10.128.20.1
Cisco Transport Manager/CNM
client
10.128.40.1
SNMP
UDP/TCP
IP
Ethernet
X.25
interface
Foreign ADM
e.g., Titan 5000
Ethernet network: 10.128.20.0
Netmask: 255.255.255.0
Ethernet network: 10.128.40.0
Netmask: 255.255.255.0
Ethernet 2:
10.128.20.200
Ethernet 4:
10.128.40.200
UPSR
Ethernet 3:
10.128.30.200
Ethernet 6:
10.128.50.200
Ethernet network: 10.128.30.0
Netmask: 255.255.255.0
Ethernet network: 10.128.50.0
Netmask: 255.255.255.0
Cisco ONS 15303 - ANGEL
CTunnel 0:
92.0.1.1
Cisco ONS 15303 - GOBLIN
CTunnel 0:
91.0.1.1
SNMP
UDP
IP
CLNP
LAPB
DCC
Cisco Transport Manager/CNM
client
10.128.30.1
Cisco Transport Manager/CNM
client
10.128.50.1
31541

X.25 in ISO/OSI



X.25 in ISO/OSI
(datalink-layer and network layer)

- **The Datalink Layer** (X25.1)

a) LAPB (Link Access Protocol Balanced)
b) LAP-D (Link Access Protocol for D-channel)
c) LAP-M (Link Access Protocol for Modems)
d) MLP (Multi-Link Procedure)
e) LLC (Logical Link Control)

- **The Network Layer** (X25.2)

a) PLP (X.25 Packet Layer Protocol)
   - Multiplexing of VCs on PSDN
   - VCs Switching/Routing between WAN's nodes

b) PVC (Permanent Virtual Circuit) e SVC (Switched Virtual Circuit)
c) VCI (Virtual Channel Identifier)
d) Call Setup
e) X.121 and LCN
   X.121: ITU recomendations (international data links)
   LCN: Routing (basing on X.121 specs); subaddressing functions.

X.25 in ISO/OSI higher layers

[Focus on X.25 User Facilities]

- **User Facilities are defined by ITU recomendations**

- **Each carrier implements different, customized U.F.**

- **X.25 User Facilities:**

Network User Identification

The NUI is never sent to remote node: it is verified on local PSDN switches (ACPs). NUI format is different from network to network.

ROA selection

This function let control the call routing: it recalls back the loose source routing in the IP world.

Call redirection

As in PSTN world, it’s possible to have certain calls redirect to other DTEs.

Hunt Group

Again another analogy with PSTN and PBXs world: a load balancing is possible for incoming calls.

Mnemonic codes

Some X.25 networks let the subscribers choose alphanumeric mnemonic codes, that are assigned to the real NUA. This makes easy the dialup connections via ACP (X.28 PAD).

How do I access to it ?

- TONS of X.25 assigned networks worldwide (all the countries of the globe).
- +100 of them are still active and in use.

worldwide: **SprintNet/MCI (formerly aka Telenet), SITA (airports)**
the big ones: **BT Tymnet, At&t/Accunet, Datex-P, C&W, …**
the "pac" ones: **Itapac, Transpac, Iberpac, Austpac, Datapac, MAYPAC…**
the "net" ones: **Isranet, Pacnet, Rosnet, …**

- Many ways to access to X.25 networks, legally and not:
- **Direct connection to a X.25 network from an X.25 leased line;**
- **X.28 PAD via Dialup using a NUI;**
- **X.28 PAD via toll-free Dialup, with or w/o NUI (national's and international carrier's on 800 #s);**
- **"Official" Internet -> X.25 Gateways (PADs) ;**
- **(Hacked) Systems linked both to the Internet and to a X.25 network – directly and/or via LAN/WAN;**
- **X.25 over TCP – XoT (RFC1613).**
- Outdials, CCs or abused PBXs are often used to call X.28 PADs.

→ **…the backtracing investigation technique won't so be easily applicable (or nearly impossible to do);**

→ **…it's possible to use NUIs from other countries** (phreaking and social engineering can help definitely a lot here)

X.25 Addressing

- Hosts are identified by:
  - **NUA**s: one system can have multiple assigned NUAs or linked on more networks with same NUA and different DNIC (SprintNet->WW Partners)
    …but you may also find more systems linked to a single NUA (subaddressing)
  - Mnemonics: only on some public network – eg Tymnet, SprintNet, Autonet
    …think of 031069 Tymnet-gw - and of private X.25 networks.
- **X.25 addressess are reserved** and should not be disclosed

- X.121 address: DNIC + NUA = 15 digits max.

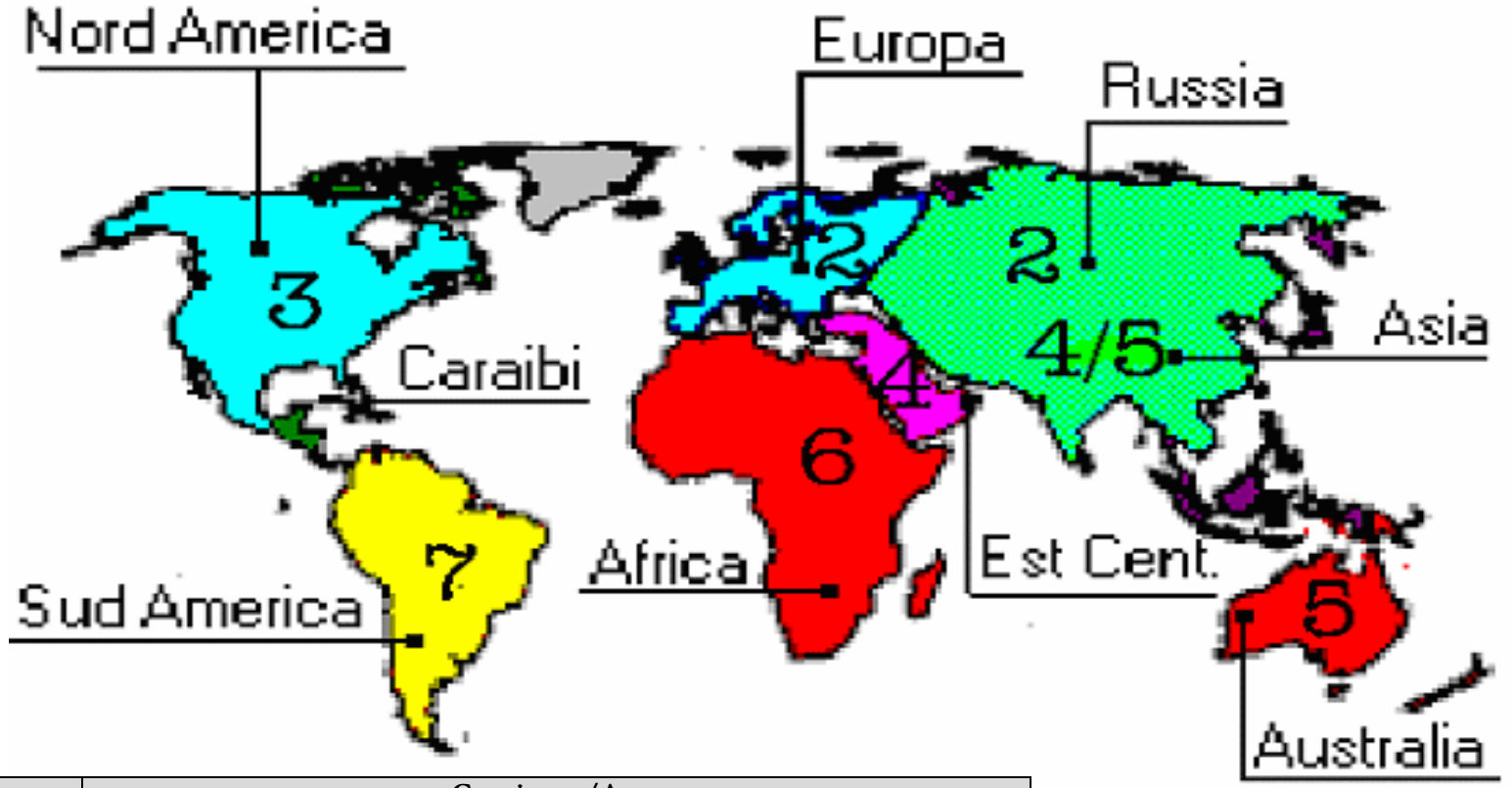
- DNIC: 4 digits international code: DCC + NCC
- DCC assigned on a geographical basis by ITU (world's areas)

- NUA: 12 digits max (typically 6->10). In many networks they have a structure derived from the PSTN numbering planning (area codes referred to towns/areas of the country)

- Example: DNIC (4) AC(3) NPA(5)

→	**3110**	**212**	**10126**	**(USA, Sprintnet, NYC)**
→	**2802**	**21**	**229**	**(Cyprus, Limassol)**

DNIC World Areas



Zone	Continent/Area
1	Satellite connections for InmarSAT Voice/Dati(Atlantic, Pacific and Indian oceans)
2	Europe, Ex URSS
3	North America, Central America, some Carribean areas
4	Asia
5	Oceania
6	Africa
7	Part of Central America, Carribean and South America

Annex to ITU Operational Bulletin
No. 798 – 15.X.2003

INTERNATIONAL TELECOMMUNICATION UNION

TSB
TELECOMMUNICATION
STANDARDIZATION BUREAU
OF ITU

LIST OF DATA NETWORK IDENTIFICATION CODES (DNIC) (According to ITU-T Recommendation X.121)

(POSITION ON 15 OCTOBER 2003)

Geneva, 2003

INDONESIA
INDONESIA.Annex to ITU OB 714-E – 11 – 15.04.2000
INMARSAT (OCEANI)
INMARSAT 111 1 Atlantic Ocean-East
111 2 Pacific Ocean
111 3 Indian Ocean
111 4 Atlantic Ocean-West
IRAN
IRAN (REPUBLIQUE ISLAMIQUE D') 432 1 IranPac
IRLANDA
IRLANDE 272 1 International Packet Switched Service
IRELAND 272 3 EURONET
IRLANDA 272 4 EIRPAC (Packet Switched Data Networks)
272 8 PostNET (PostGEM Packet Switched Data Network)
ISLANDA/ICELAND
ISLANDE 274 0 ISPAK/ICEPAC
ISRAELE
ISRAEL 425 1 ISRANET
ITALIA
ITALIE 222 1 Rete Telex-Dati (Amministrazione P.T. / national)
ITALY 222 2 ITAPAC X.25
ITALIA 222 3 PAN (Packet Network)
222 6 ITAPAC - X.32 PSTN, X.28, D channel
222 7 ITAPAC International
223 3 ALBADATA X.25
223 4 Trasmissione dati a commutazione di pacchetto X.25 (UNISOURCE ITALIA S.p.A.)
223 5 Trasmissione dati a commutazione di pacchetto X.25 (INFOSTRADA S.p.A.)
223 6 Trasmissione dati a commutazione di pacchetto X.25 (WIND Telecomunicazioni S.p.A.)
JAPAN/GIAPPONE
JAPON 440 0 GLOBALNET (Network of the Global VAN Japan Incorporation)
JAPAN 440 1 DDX-P (NTT Communications Corporation)
JAPON 440 2 NEC-NET (NEC Corporation)
440 3 JENSNET (JENS Corporation)
440 4 JAIS-NET (Japan Research Institute Ltd.)
440 5 NCC-VAN (NRI Co., Ltd.)
440 6 TYMNET-JAPAN (JAPAN TELECOM COMMUNICATIONS SERVICES CO., LTD.)
440 7 International High Speed Switched Data Transmission Network (KDD)
440 8 International Packet Switched Data Transmission Network (KDD)
441 2 Sprintnet (Global One Communications, INC.)
441 3 KYODO NET (UNITED NET Corp)
441 5 FENICS (FUJITSU LIMITED)
441 6 HINET (HITACHI Information Network, Ltd.)
441 7 TIS-Net (TOYO Information Systems Co., Ltd.)
441 8 TG-VAN (TOSHIBA Corporation)
JAPON 442 0 Pana-Net (MATSUSHITA ELECTRIC INDUSTRIAL CO. LTD.)
JAPAN 442 1 DDX-P (NTT Communications Corporation)
JAPON 442 2 CTC-P (CHUBU TELECOMMUNICATIONS CO., INC.)

DNICs - 1

Each country has got at least one X.25 network… or more

The Australia case

DNICs - 2

Australian Network Identifiers:

Prefix	Allocation Date	Organisation
5052	30 June 1991	Telstra Corporation Ltd
5053	30 June 1991	Telstra Corporation Ltd
50541	6 September 1994	AAPT Ltd
50542	6 September 1994	AAPT Ltd
50543	6 September 1994	AAPT Ltd
50560	16 February 1994	SingCom (Australia) Pty Ltd
50568	16 February 1994	SingCom (Australia) Pty Ltd
50569	16 February 1994	SingCom (Australia) Pty Ltd
50573000	30 June 1991	Fujitsu Australia Ltd
50573500	19 February 1992	Department Of Defence
505790	17 November 1993	Department Of Defence
505791	17 November 1993	Department Of Defence
505799	23 February 1995	Telstra Corporation Ltd

Sub-carrier

Sub-carrier

Critical
(and shared !)

5052 = Austpac
5053 = Austpac International (formerly Midas / OTC Data Access)
5054 = Australian Teletex Network
5057 = Australian Private Networks

NB The allocation dates are official allocation dates, not necessarily actual dates. Austpac existed long before 1991.

DNICs -3

The U.S.A. case

313 1	RCAG Telex Network
313 2	Compuserve Network Services
313 3	RCAG XNET Service
313 4	AT+T/ACCUNET Packet Switched Capability
313 5	ALASCOM/ALASKANET Service
313 6	Geisco Data Network
313 7	International Information Network Services - INFONET Service
313 8	Fedex International Transmission Corporation - International Document Transmission Service
313 9	KDD America, Inc. – Public Data Network
314 0	Southern New England Telephone Company - Public Packet Network
314 1	Bell Atlantic Telephone Companies - Advance Service
314 2	Bellsouth Corporation - Pulselink Servie
314 3	Ameritech Operating Companies - Public Packet Data Networks
314 4	Nynex Telephone Companies - Nyex Infopath Service
314 5	Pacific Telesis Public Packet Switching Service
314 6	Southwestern Bell Telephone Co. - Microlink II Public Packet Switching Service
314 7	U.S. West, Inc. - Public Packet Switching Service
314 8	United States Telephone Association - to be shared by local exchange telephone companies
314 9	Cable & Wireless Communications, Inc. - Public Data Network
315 0	Globenet, Inc. - Globenet Network Packet Switching Service
315 1	Data America Corporation - Data America Network
315 2	GTE Hawaiian Telephone Company, Inc. - Public Data Network
315 3	JAIS USA-NET Public Packet Switching Service
315 4	Nomura Computer Systems America, Inc. - NCC-A VAN public packet switching service
315 5	Aeronautical Radio, Inc. - GLOBALINK
315 6	American Airlines, Inc. - AANET
315 7	COMSAT Mobile Communications - C-LINK
315 8	Schlumberger Information Network (SINET)
315 9	Westinghouse Communications - Westinghouse Packet Network
316 0	Network Users Group, Ltd. - WDI NET packet
316 1	United States Department of State, Diplomatic Telecommunications Service Black Packet Switched Data Network
316 2	Transaction Network Services, Inc. -- TNS Public Packet-switched Network
316 6	U.S. Department of Treasury Wide Area Data Network

Data carriers

Multinationals

Spy Game ? ;)

DNICs - 4

The Malaysia case

MALAISIE	502 0	COINS Global Frame Relay
MALAYSIA	502 1	Malaysian Public Packet Switched Public Data Network (MAYPAC)
MALASIA	502 3	Corporate Information Networks
	502 4	ACASIA-ASEAN Managed Overlay Network
	502 6	Mutiara Frame Relay Network
	502 7	Mobile Public Data Network (WAVENET)
	502 8	Global Management Data Services (GMDS)

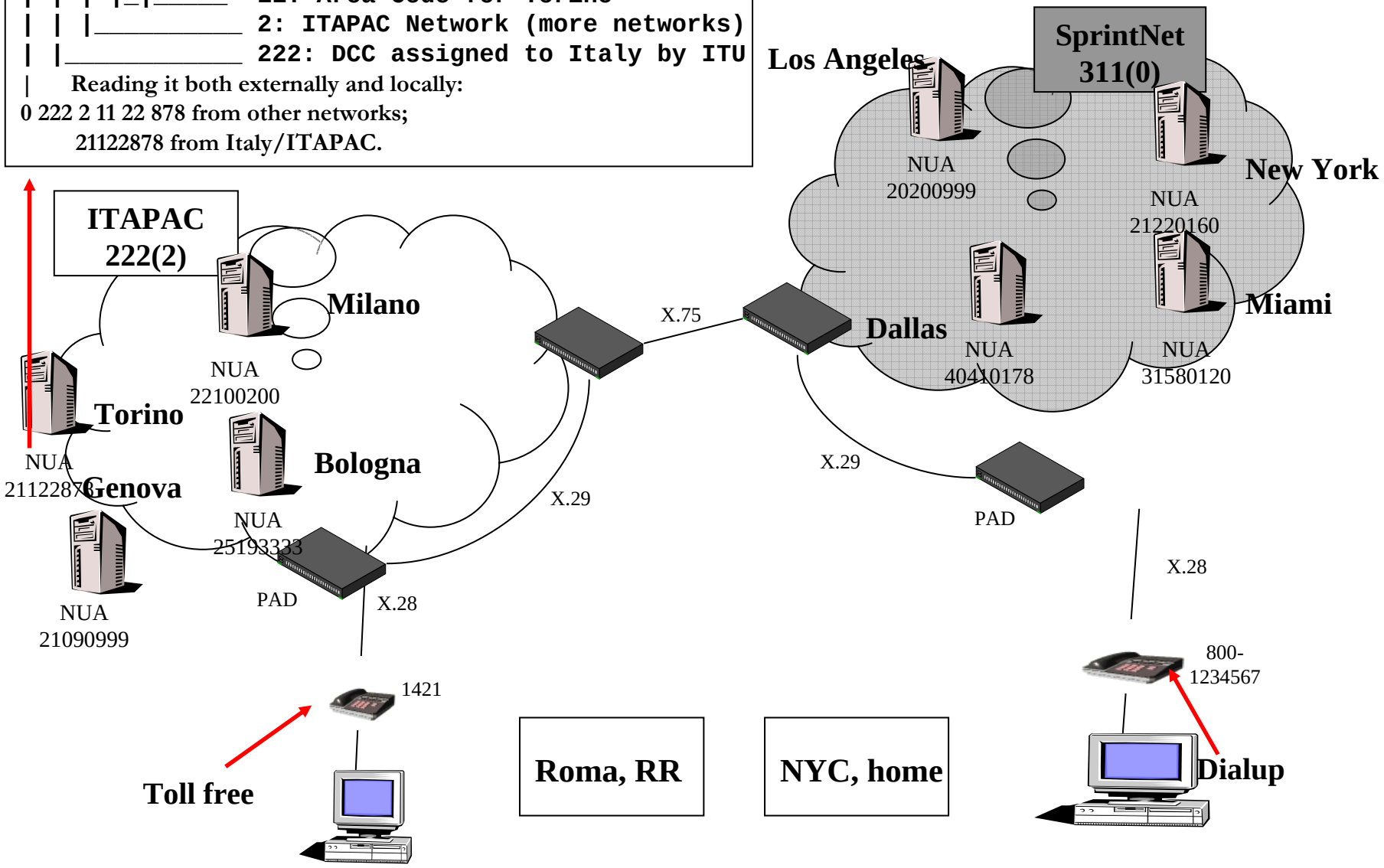
Homework

```
022221122878
|\ /|\_ _/|
| | | | | |____ 22878: Network Port Address (NPA)
| | | |_|_____  11: Area Code for Torino
| | |___________ 2: ITAPAC Network (more networks)
| |_____________ 222: DCC assigned to Italy by ITU
```

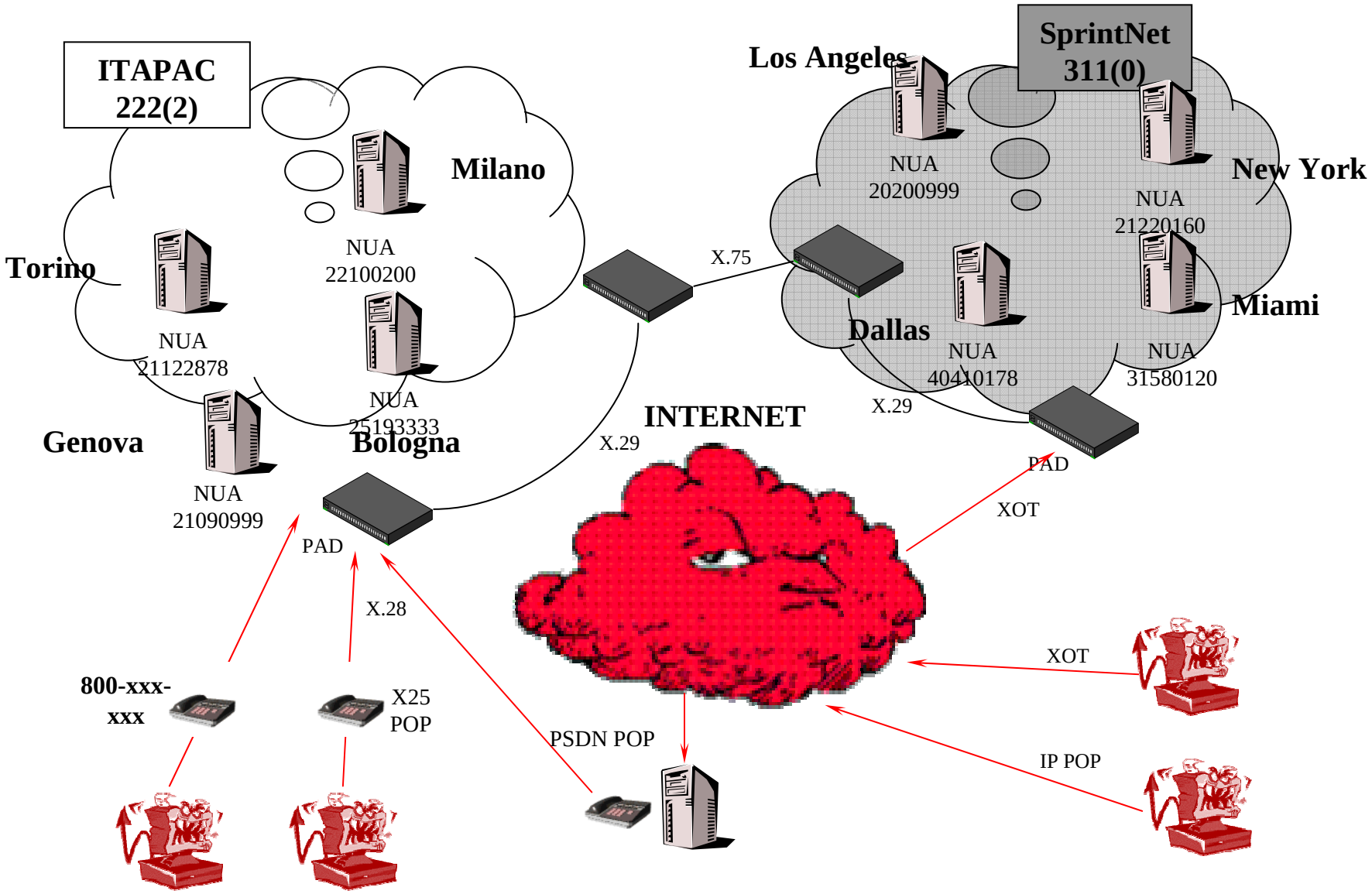
Reading it both externally and locally:

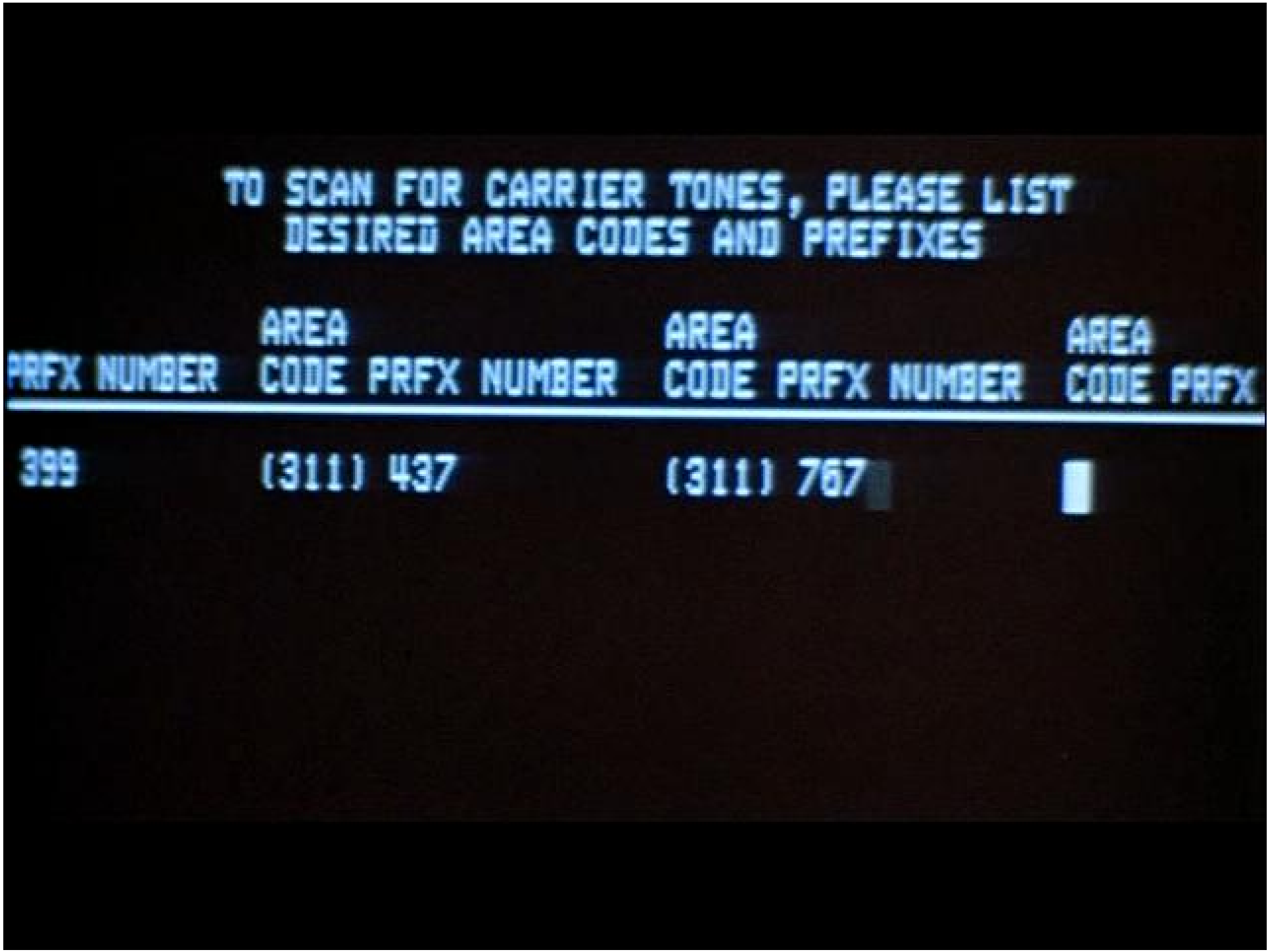
0 222 2 11 22 878 from other networks;

21122878 from Italy/ITAPAC.



Hackwork


ITAPAC
222(2)
Milano
NUA
22100200
Torino
NUA
21122878
NUA
25193333
Genova
Bologna
NUA
21090999
PAD
X.28
X.29
X.75
SprintNet
311(0)
Los Angeles
NUA
20200999
New York
NUA
21220160
Dallas
NUA
40410178
Miami
NUA
31580120
X.29
PAD
XOT
INTERNET
XOT
IP POP
PSDN POP
800-xxx-
xxx
X25
POP


TO SCAN FOR CARRIER TONES, PLEASE LIST
DESIRED AREA CODES AND PREFIXES
AREA
PRFX NUMBER CODE PRFX NUMBER
AREA
CODE PRFX NUMBER
AREA
CODE PRFX
399 (311) 437 (311) 767

X.25 Wardialing

scanning for targets 1/2

Scanning from NUA: 0280221000 started on 15-OCT-1994 15:29:30.75
0280221091 %COM **DROP STATION**
0280221092 %COM **ECHO STATION**
0280221093 %COM **TRAFFIC GENERATOR**
0280221101 %CLR_OCC
0280221102 %CLR_DTE
0280221106 %CLR_DTE
0280221107 %COM
0280221108 %CLR_DTE
0280221117 %CLR_OCC
0280221118 %CLR_DTE
0280221121 %COM **MINISTRY OF HEALT, VAX/VMS**
0280221122 %COM IBM AIX UNIX
0280221125 %CLR_DTE
0280221147 %CLR_RPE SUBADDRESS 48 CYTA Pager via x.25
0280221199 %COM CISCO
0280221206 %COM LOGON: ??
0280221225 %COM CISCO
0280221229 %COM CISCO **BYBLOS BANK S.A.L**. - LIMASSOL/CYPRUS ACS-CYPRUS LINE 6
0280221248 %COM COM/DTE
0280221273 %CLR_DTE
0280221274 %CLR_OCC
0280221276 %CLR
Scanning ended with NUA: 0280221396 on 15-OCT-2000 15:46:36.32

X.25 Wardialing

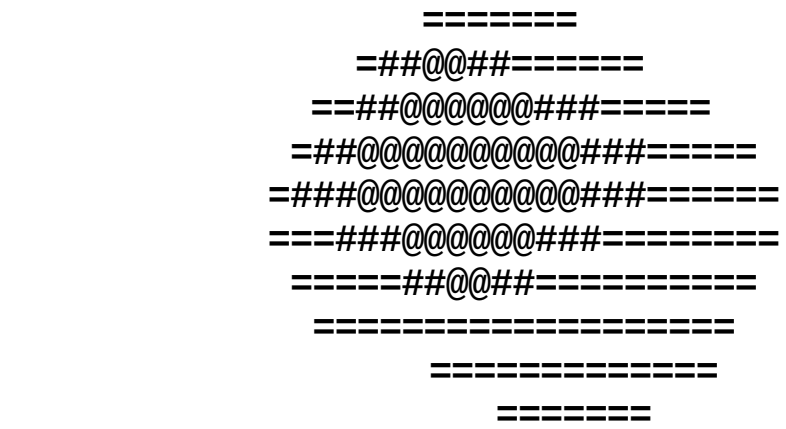
scanning for targets 2/2

```
- 202 - ONTARIO  - Up to 700
20200115          VAX/VMS
20200116          VAX/VMS
20200156          Diand Information System
20200214          $ UNIX      (gtagmhs2)
20200230        METS Dial-In Server  Enter your login:
2020024098        Control Port on Node Ottawa 6505 PAD
20200286          $ VAX/VMS
2020032099        MPX.25102: PASSWORD
20200321          SunOS     Rel 4.1.3 (X25)
20200322          SunOS          ""
20200330          INETCO    Magicbank
20200342        ::
20200497          VAX/VMS
202005421         $ VAX/VMS
20200548          SunOS     Rel 4.1.3 (TMS470)
20200582          $ VAX/VMS   Production System
```

Historical (big) problems

- **80's**: CCC members Pengo and Hagbard breaked into US Military, Government and Gov. Contractors computer systems, calling from Datex-P and using a TymNet gateway to access LBNL Laboratories.
- **1989**: the CITIBANK's CitiSaudi scandal and the Melbourne connection.
- **15 jan 1990**: MOD & LOD hacking groups crashed the AT&T interregional and international phone system. They also used X.25 links to get the final access.
- **90's**: The Aussie scene: Electron, The Force, Phoenix and the Primos scanner.
- **90's**: Kevin Mitnick got the SAS and eavesdropped on the FBI (the Russia and China NYC embassies tale).
- **90's**: NUA scanners available for PRIMOS, VMS, *NIX, DOS, Windows.
- **90's**: Kevin Poulsen used to play with COs via X.25.
- **1994-95**: AT&T, GTE and others major US telcos got hacked via X.25 (……)
- **Recent years**: worldwide famous ADM group released their own scanner (ADMx25 by Antilove).
- Recent years: **Multithread** and **multichannel** Sun Solaris X.25 scanner available in the wild: it's able to scan a whole country if a few hours.
- **2003-05**: Russian crackers perform mass huge scannings over SprintNet international networks and dialups (intl' reverse charge scans).

TLC carriers have always been targets (and will always be)



```
Welcome to At&T node attmail Unix System V/386 Release 3.2B

attmail login:
```

Connected to 0420160014025

INMARSAT-C Land Earth Station at INMARSAT C LES JEDDAH KSA

WELCOME TO INMARSAT C LES JEDDAH KINGDOM OF SAUDI ARABIA

Enter ?<CR> to get help information,

C<CR> to cancel input.

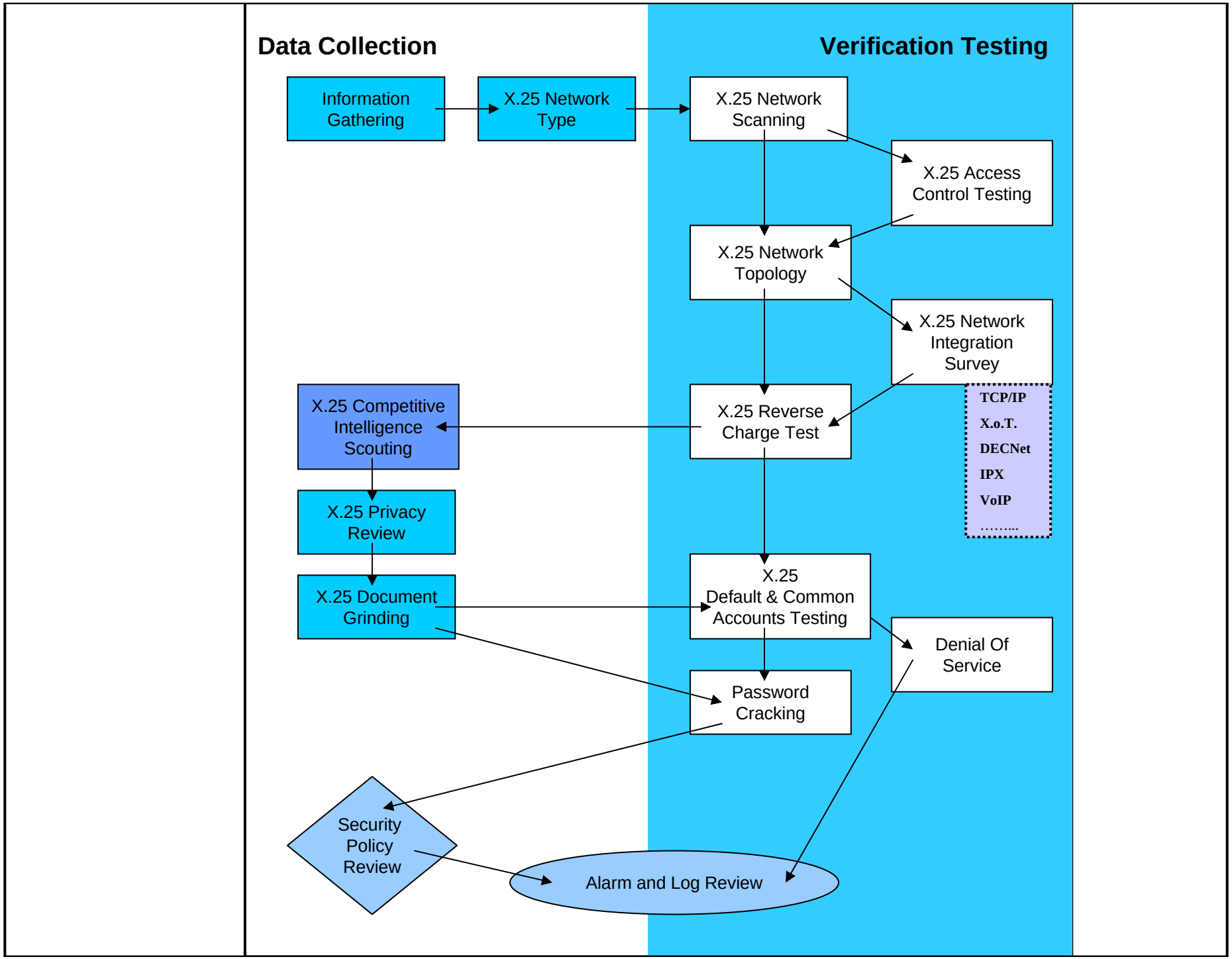
TLC carriers have always been targets (2)

```
$ pad 05057998210xxxx
Connected
Trying xxx.xx.xxx.xx ... Open
    ************************************************************************
    * Access to this computer system is limited to authorised users only. *
    * Unauthorised users may be subject to prosecution under the Crimes   *
    *                         Act or State legislation                    *
    *                                                                     *
    *   Please note, ALL CUSTOMER DETAILS are confidential and must       *
    *                             not be disclosed.                       *
    ************************************************************************


User Access Verification
Username:
```

Differences with the Internet

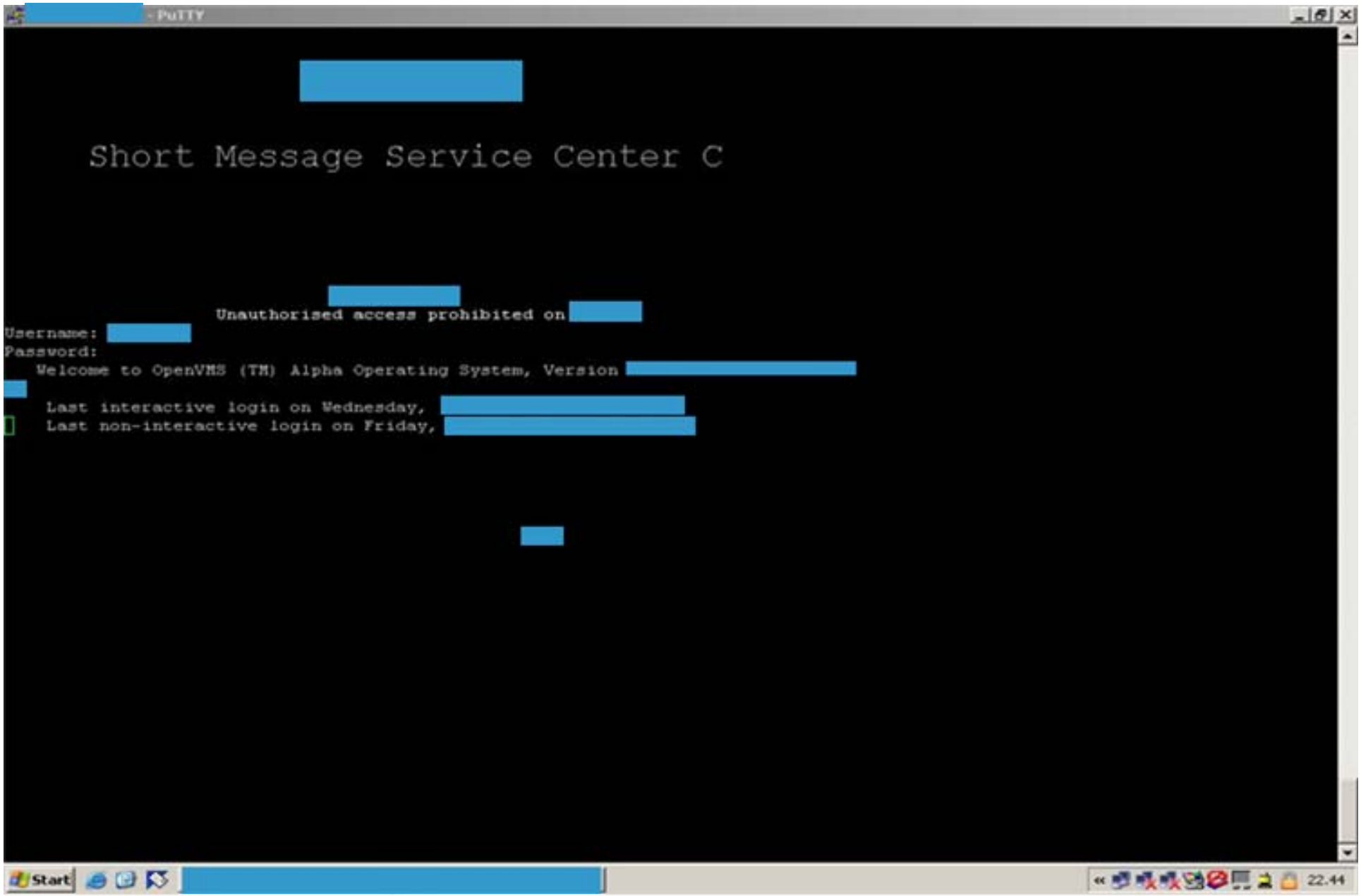
- **X.25 Addressing is reserved**: scanning is the mostly used way to find targets.
- WAN concept: a NUA can **open a whole new world** to the attacker.
- No TCP/IP stack, **no “exploiting” concept** (a kind of…).
- Primarily **brute force attacks** on login (always works!).
- Old school hacking, social engineering and smartness **may help a lot**.
- There are a few X.25 walkers all over the world: **no kiddies, no noise, no game’s playing**.
- If he isn’t a walker, he’s an attacker: probably the **highest skill level** you’ve ever encountered with.
- There are also just **a few X.25 security experts** all over the world.


Data Collection
Verification Testing
Information Gathering
X.25 Network Type
X.25 Network Scanning
X.25 Access Control Testing
X.25 Network Topology
X.25 Network Integration Survey
TCP/IP
X.o.T.
DECNet
IPX
VoIP
……...
X.25 Competitive Intelligence Scouting
X.25 Reverse Charge Test
X.25 Privacy Review
X.25 Document Grinding
X.25 Default & Common Accounts Testing
Denial Of Service
Password Cracking
Security Policy Review
Alarm and Log Review

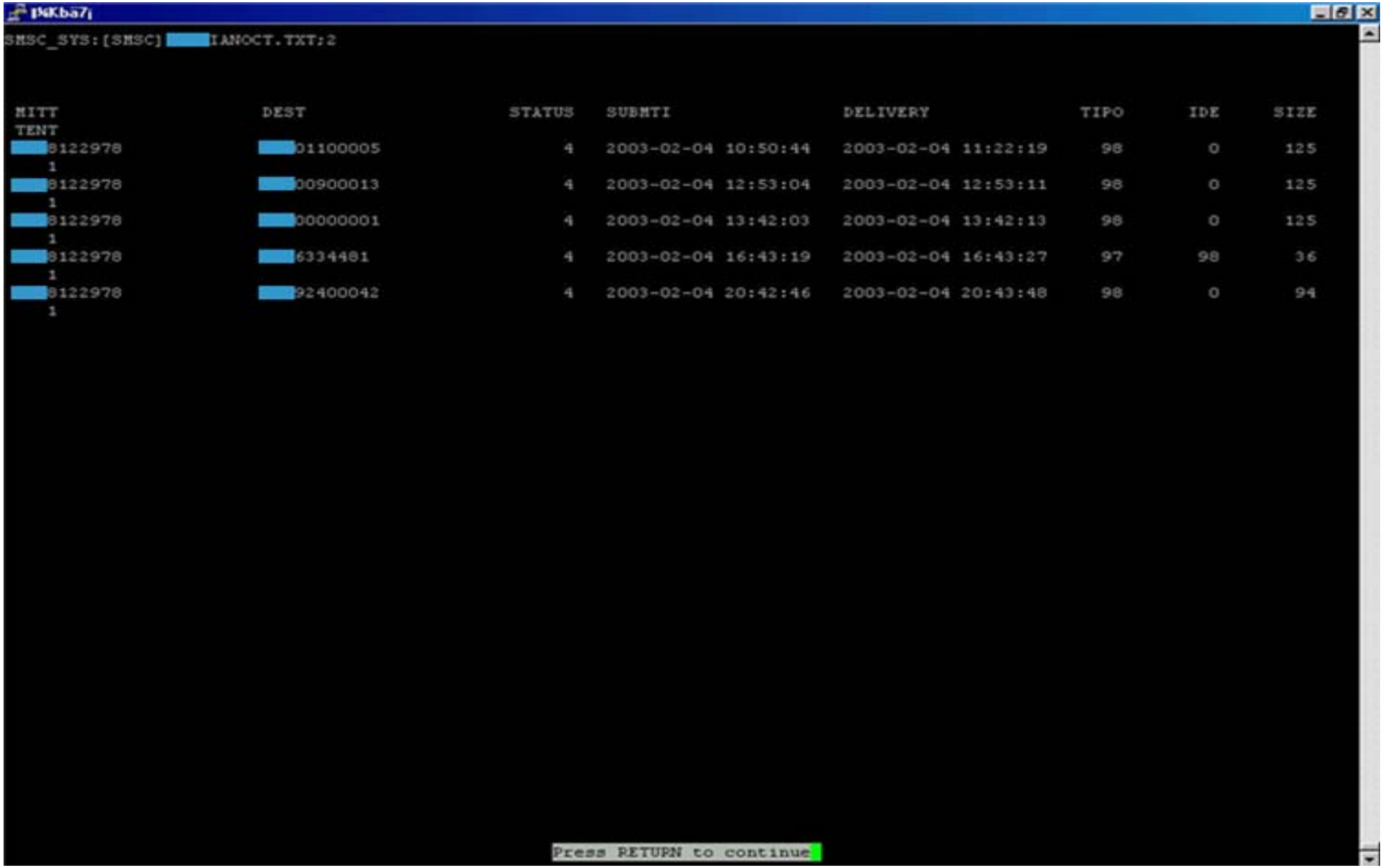
Major Target Areas

- Subscribers
- X.25 subscribers **always** run huge data networks.
- It's like having an **open door to the world**, that directly brings up strangers into our bedroom.
- Monitoring **isn't easy at all**, requires specific skills and the knowledge of high-level attackers' habits.
- Attackers abuse of X.25 resources to **scan for new targets**: this means **money** that will be billed to you as well as **legal problems |(**if someone will ever realize what happened).
- Services
- Telco Management Network (Central Offices, Switches, etc..)
- GSM and 3G SMSCs
- Bank to Bank transfers (SWIFT); E-payments (POS)
- Worldwide Logistics & Transports
- Heavy Industry
- Travelling and Hotels agencies/environments (airports and flight companies as well)
- Chemical and Pharmaceutical
- SAP and similars
- WHQ -> HQ -> Branches World Wide

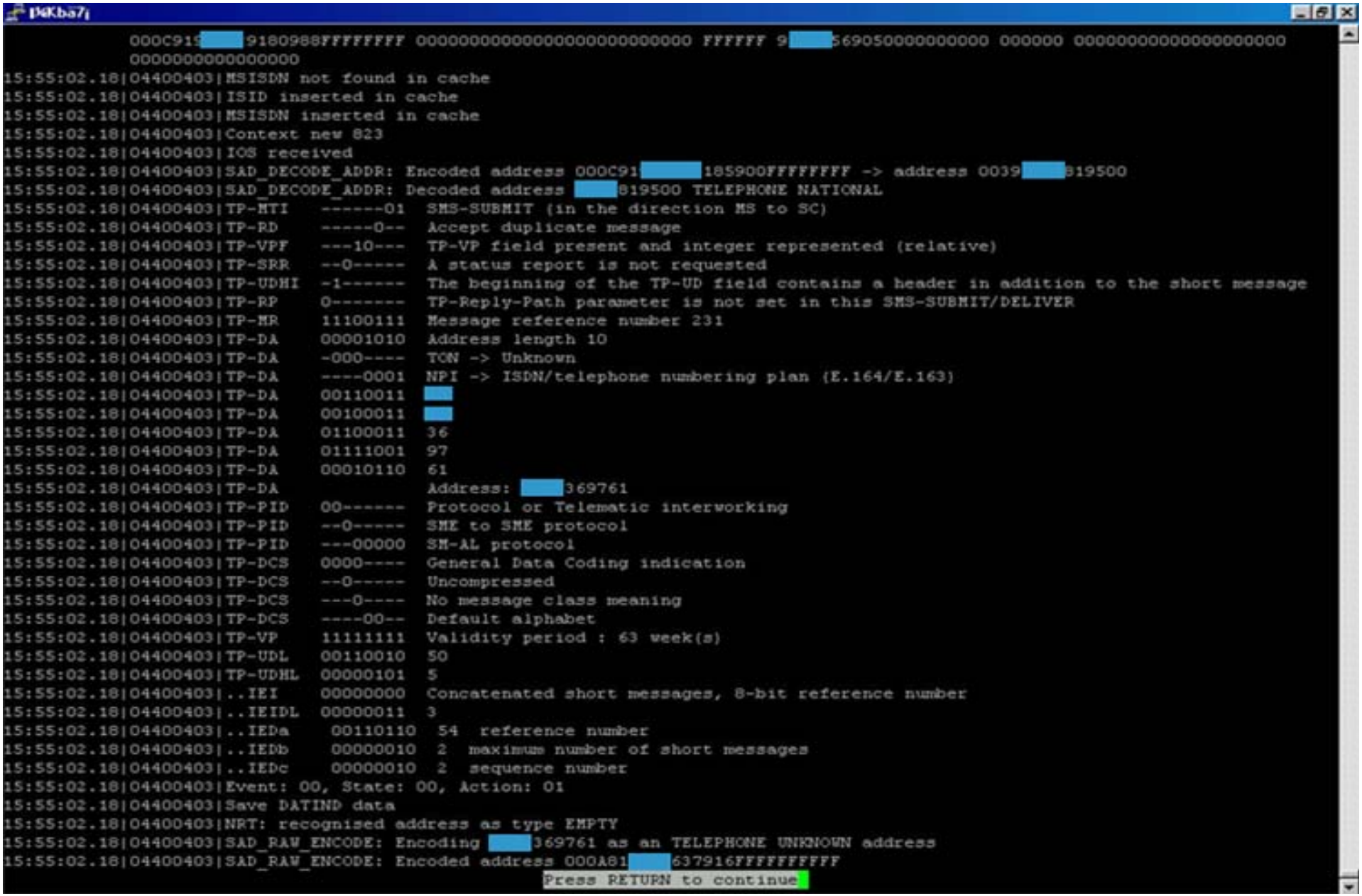
Uh, is this an SMSC ???



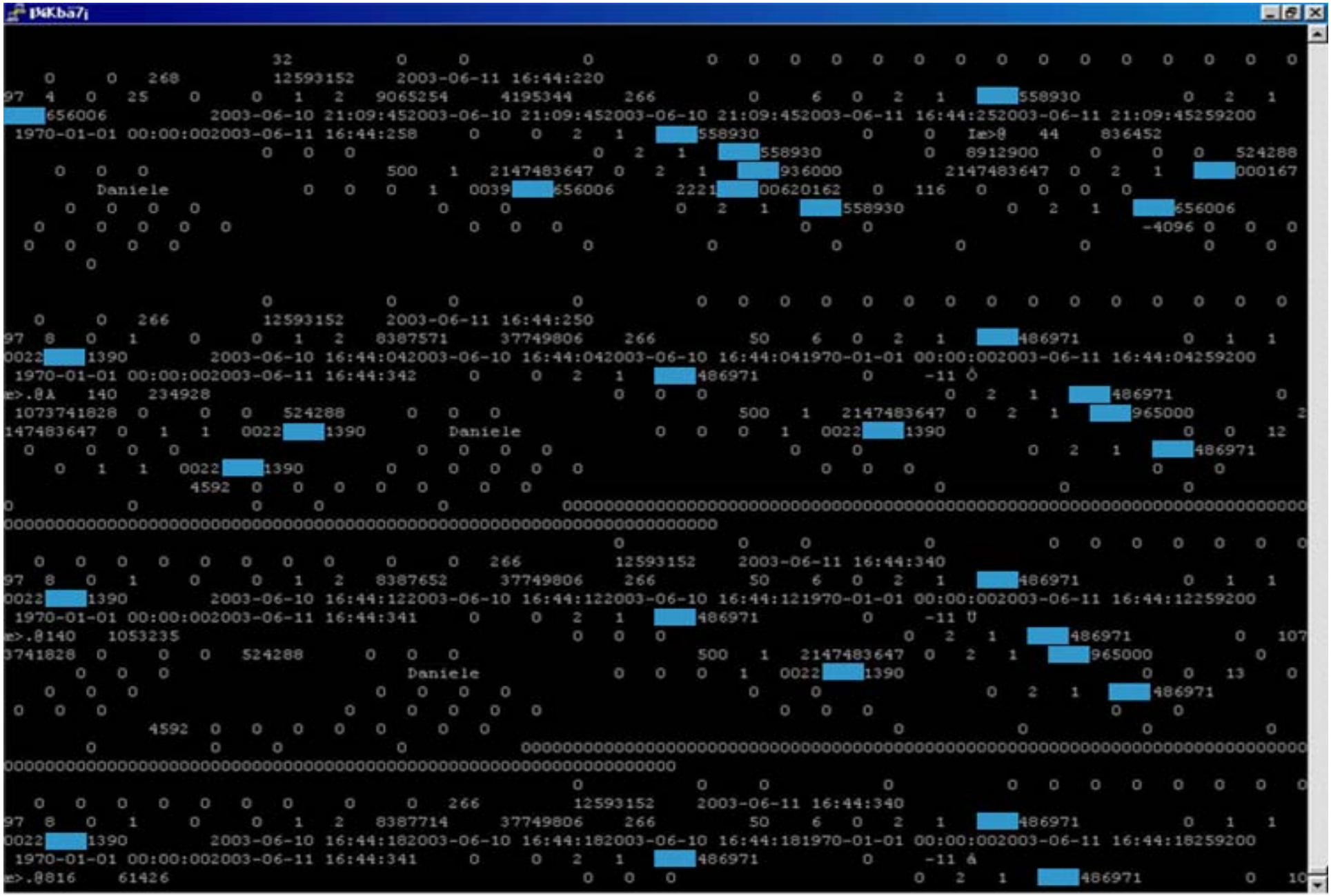
Processed SMSs: “FROM”, “TO”



SMS Processing que (!)



SMS sniffing (in real time !)



Attackers' typology

- "Newbies" (Russia & South America scene)
- Lonely attackers, old school hackers
- Security researchers / Elite hackers (la crème)

- Criminal organizations (w/insiders on target)
- Industrial spies
- Intelligence Agencies' agents
- (cyber) Terrorists (?)

The honey prizes: OS for prime time

- OS that you may find on X.25 networks

- AOS/VS
- *BBS Systems*
- Bull PAD (Bull DPX/2)
- CICS/VTAM
- Cisco IOS
- CDC NOS – Control Data Corporation
- DEC VAX/VMS and AXP/OpenVMS
- DEC Ultrix
- DEC Terminal Decserver
- DG/UX Aviion General
- DOS
- DRS/NX
- GS/1
- HP 3000
- HP/UX 9000
- IBM Aix
- IBM OS/400 (AS/400)
- IRIX SGI
- IRIS Operating System (PDP and others)
- Linux
- Motorola XMUX (Gandalf)
- Northern Telecom PBXs
- PACX/Starmaster (Starmaster Gandalf)
- **Pick Systems**
- PRIMOS Prime Computer
- RSTS
- SCO
- Shiva LAN Router
- Sun Solaris
- TOPS 10/20
- Unknown systems (you will find many of them)
- VCX Pad
- VM/CMS
- VM/370
- XENIX
- WANG Systems

NOTE: This list is an extract from the upcoming white paper "The (un)official Systems Catalogue", by Raoul Chiesa

The nightmares of the past

- Based on a TSTF 5-years study, encompassing 21 network operators:

  100% could be hacked from the Internet
  90% could be hacked through PSTN, X.25 or ISDN
  72% had a security incident in the last 2 years
  23% had appropriate perimeter security control
  0% had all their mission-critical hosts secured
  0% had comprehensive database security in place
  0% had integrity measures protecting billing data

- Based on a 15 years personal background and knowledge:
  1% of the Top 1.000 companies and nations' critical infrastructures with X.25 links worldwide are somehow "not penetrable".

  YES, 1% <u>O N L Y.</u>

The nightmares of today

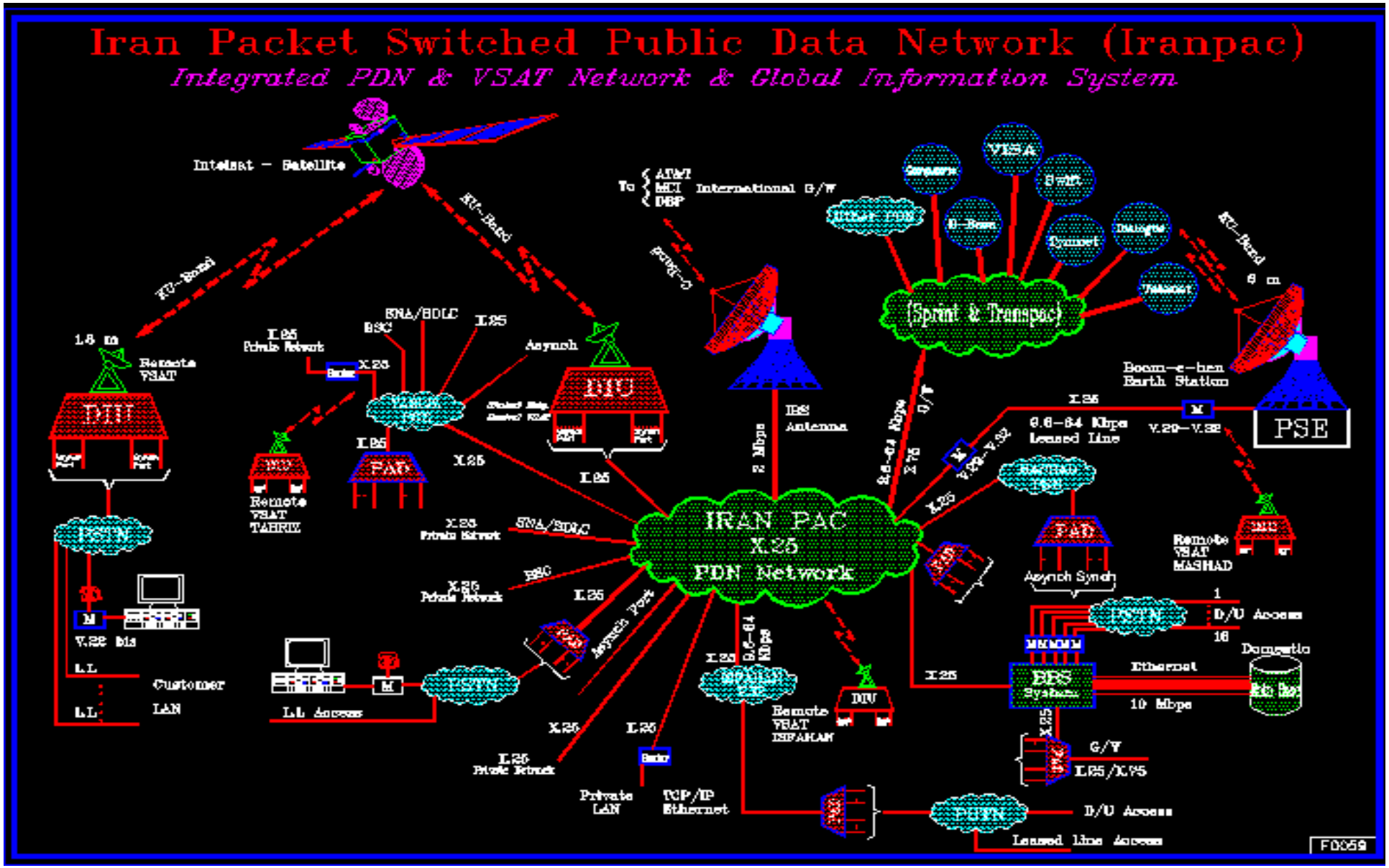
X.25 hacking is **still** a very attractive target.

- TELCOS. Bypassing toll, getting services without fees, setting up premium numbers, amusing CDRs, getting fun with calls details&logs.
- MOBILE OPERATORS. As above, plus everytime you send an SMS :)
- MULTINATIONALS. Privacy invasions, industrial espionage, exciting hacking playground.
- FINANCE. The easiest way to get into legacy production systems. Also, POS heavily use X.25.
- GOVERNMENT. Many countries still hang up on their national X.25 network for their official gov' stuff.
- NATIONAL CRITICAL INFRASTRUCTURES. Many countries (East Europe, Africa) still manage their national N.C.I. via X.25 management links.

Hot Points: strange things and possible problems that had already happened

- The security problem here is **really underestimated**.
- Everybody “forgot” about their X.25 direct links.
- **Closed countries** didn’t open to the Internet if not recently, but since more than a decade they’re opened to X.25 (unauthorized) access. (IRAN, CHINA)
- Some network **kindly gives** out X.25 addresses’ lists. (INDIA)
- When calling a NUA, you could also **reach an airplane** flying over the Atlantic Ocean. (INMARSAT)

Let’s make an X.25 hacker happy



How to help an X.25 hacker

Inet DIRECTORY ENQUIRY SERVICE

DIRECTORY ENQUIRY SERVICE ___NMC VER 2 ___ NETWORK : RABMN, INDIA PAGE 0

NETWORK #	NAME / ORGANISATION	LOCATION
404100000162	A C C	WADI
404100010681	A C C	BILASPUR
404100000589	A C C	BOMBAY
404100000381	A C C	CHAIBASA
404100000055	A C C	JAMUL
404100000420	A C C	KYMORE
404100010162	A C C	WADI
404100010589	A C C	BOMBAY
404100010626	A P RAYONS	KAMALAPURA
404100010625	A P RAYONS	HYDERABAD
404100000172	ANAND BAZAR PATRIKA	BOMBAY
404100010882	ANAND BAZAR PATRIKA	CALCUTTA
404100000362	ANAND BAZAR PATRIKA	NEW DELHI
404100010172	ANAND BAZAR PATRIKA	BOMBAY
404100000821	B A R C	BOMBAY

How to excite an X.25 hacker

The addressing plan for AMSS is treated in [3]. The scope and impact of the AMSS addressing plan is limited to the AMSS subnetwork. Systems not directly attached to the AMSS network are not affected by the AMSS addressing plan.

The two principal types of ATN systems which use the AMSS subnetwork are airborne routers and air/ground routers. The AMSS address of an airborne router is formatted using BCD-encoded digits as follows:

<AMSS airborne address> :: <DNIC> '5' <AES> > <D>

<DNIC> :: '1111' (AOR-E satellite) or '1112' (POR satellite) or '1113' (IOR satellite) or '1114' (AOR-W satellite)

<AES> :: 8-digit BCD-encoded 24-bit address of aircraft

<D> :: Optional subaddress digit

The digit '5' following the DNIC is a discriminator indicating that the address refers to an airborne system. A example AMSS address of an airborne router flying over the Atlantic Ocean may be `1111.5.46721005.`

The AMSS address of an air/ground router is formatted using BCD-encoded digits as follows:

<AMSS ground address> :: '26' <DNIC> <NTN>

<DNIC> :: 4-digit DNIC of the ground network as registered in [X.121] or by international convention (e.g. SITA's DNIC is '1116').

<NTN> :: Up to 9-digit network terminating number (DTE network address) of the air/ground router on the provider's network identified by the ASNID.

The digits '26' comprise a prefix indicating that the address is used to access an internetwork router within the AMSS addressing plan. As an example, a SITA air/ground router AMSS address may be `26.1116.2331123.`

X.25 Interception & real-time Investigation

- Getting the datas and the evidences from an X.25 incident…

…**it's not impossible**.

If you know HOW to do it.

```
==========================================================================

10:15:16:56    10  A   outgoing       RcvR     3 octets    8       136
           LGN=0   LCN=10   LCI=10    P(R)=4
10 0a 81

Command line:  x25decode
Trace protocol: /dev/x25
Trace date: Tue Apr  7 10:14:54 BST 1998

Timestamp      VC  Snid  Direction   Pkt Type      Size     Mod  PacketId
==========================================================================

10:15:16:98    10  A   outgoing       Data   126 octets    8       137
      D=0  LGN=0   LCN=10   LCI=10    P(S)=3    P(R)=4    M=0  Q=0
10 0a 86 56 2e 0d 56 48    48 47 2e 57 41 2f 45 31    * ...V..VHHG.WA/E1 *
42 54 55 4b 2f 49 31 31    47 49 41 2f 50 a0 25 d9    * BTUK/I11GIA/P.%. *
0d 56 47 59 41 0d 55 4e    42 2b 49 41 54 41 3a 31    * .VGYA.UNB+IATA:1 *
2b 31 47 2b 46 53 2b 39    38 30 34 30 37 3a 31 30    * +1G+FS+980407:10 *
31 35 2b 54 32 27 55 4e    48 2b 31 2b 48 53 46 52    * 15+T2'UNH+1+HSFR *
45 51 3a 39 34 3a 31 3a    49 41 27 4f 52 47 2b 46    * EQ:94:1:IA'ORG+F *
53 3a 4c 4f 4e 27 4c 54    53 2b 2a 52 27 55 4e 54    * S:LON'LTS+*R'UNT *
2b 34 2b 31 27 55 4e 5a    2b 31 2b 54 32 27          * +4+1'UNZ+1+T2'   *

==========================================================================
```

Take care when asking for help

- **Traditional security shops**: zero knowledge of X.25 security problems, telcos, poor understanding of global WANs logicals & procedures.
- **Traditional telcos consultants**: very poor knowledge of security issues.
- **X.25 carriers**: they'll try to sell you IP connections instead of fixing your X.25 and Frame Relay links, and they'll suggest you to migrate everything you have onto the IP world.
- Your **loved and trusted security consultant**: in this case he probably doesn't even know what you are talking about.
- The **"Big 5" audit firms**: focused on policies, no real expertise (they outsource their jobs to us).
- **In-house resources**: Very dangerous. Internal fraud overlooked. Interdepartmental ego problems. Good security and bad security looks the same.

Conclusions

Doing Nothing…

- … with your PSDN infrastructure today is like doing nothing with your Internet hosts in the 90’s and with your Wi-Fi networks in 2000: **how many hackers** played with your datas ?

- …in critical environments, the above is simply **an invitation for disaster**.

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Greetings

X.25 gurus

machine
Emmanuel Gadaix
Philippe Langlois
Vanja
Raist
Synack
Raptor
The Force (and the aussie scene)

Friends

Venix
d0
xant
dialtone
naif
rpunk and people at #x.25 (efnet)
Fyodor
The Xfocus team
Jim Geovedi
Anthony Zboralski
Fabrice Marie

Telcos

…just for being there :)

All of the HITB staff

For this great security event.

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I hope you enjoyed this “nightmare”

Thanks :)

QUESTIONS ?