

# **Point-of-Sale: A Technical Look**

**Mehmet Toygar Karadeniz**  
**Boğaziçi University**

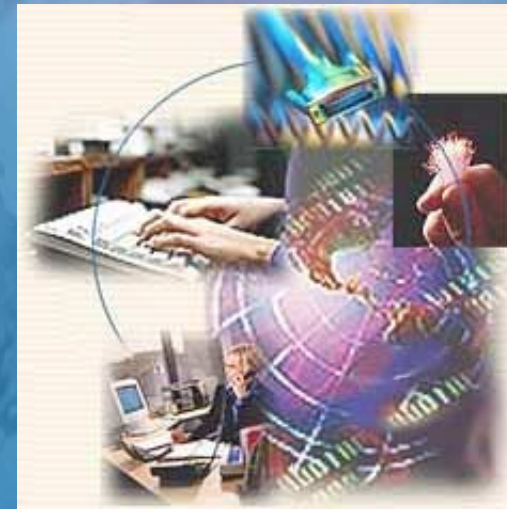
**Mehmet Toygar Karadeniz**

**14 November 2001**



# Introduction

- ***Point-of-Sale***
  - the system of buying and selling of products and services by the help of cash or an account over a bank.
  - two types of P.O.S.:
    - card authorization terminals
    - cash registers



# Desired POS Terminal Properties

- **multi-application ability**
- **merchant functionality**
- **convenience and ease-of-use**
- **fast transaction time**
- **low communication costs**
- **auto-downloading of software**
- **remote diagnostics**
- **ability to accept multiple card types**
- **small in size**



# Communication Media

- **Public Switching Telephone Network (PSTN)**
- **Wireless data link services**
  - GSM cellular communication link service
  - Mobitex cellular communication link service
  - DECT
- **LAN or WaN based systems**
  - TCP/IP (Internet/Intranet)



# **Current Hardware Requirements For a P.O.S Terminal**

- **at least 2 Mb of Flash-Disk for application**
- **write-protected RAM-Disk for data**
- **TouchScreen display**
- **fast Thermal Graphic Printer**
- **both-ways Magnetic Card Reader**
- **Smart Card utilization for PIN encryption**
- **secure PINPAD**
- **Real-Time-Clock**
- **multiple modems or RS-based connections**



# **Current Communication Requirements For a P.O.S Terminal**

- **modem protocols for asynchronous or synchronous operation**
  - **VISA-II (protocol for asynchronous operation)**
  - **ISO8583 (protocol for synchronous operation)**
- **local RS-232 port**
- **RS-485 software for low-cost LAN connectivity**
- **radio communication protocols**
  - **MOBITEX Network (MASC and MPAK Protocols)**
  - **CDPD and DATATC Networks (NATIVE Protocol)**
  - **GSM Network (V.110 Protocol)**

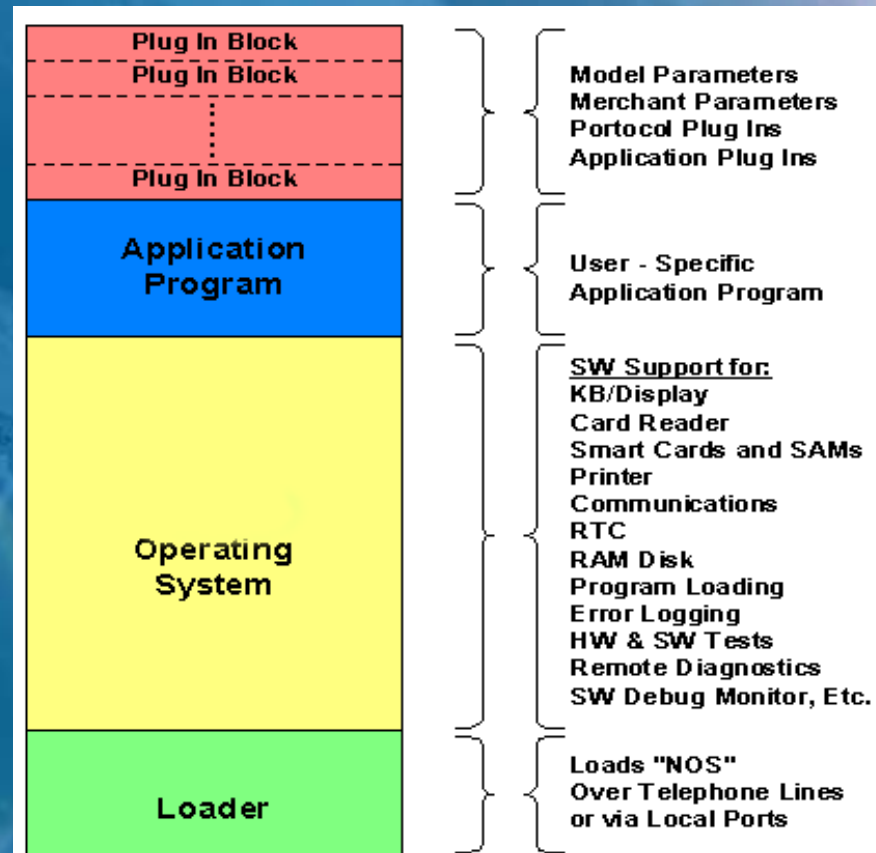


# **Current Software Requirements For a P.O.S Terminal**

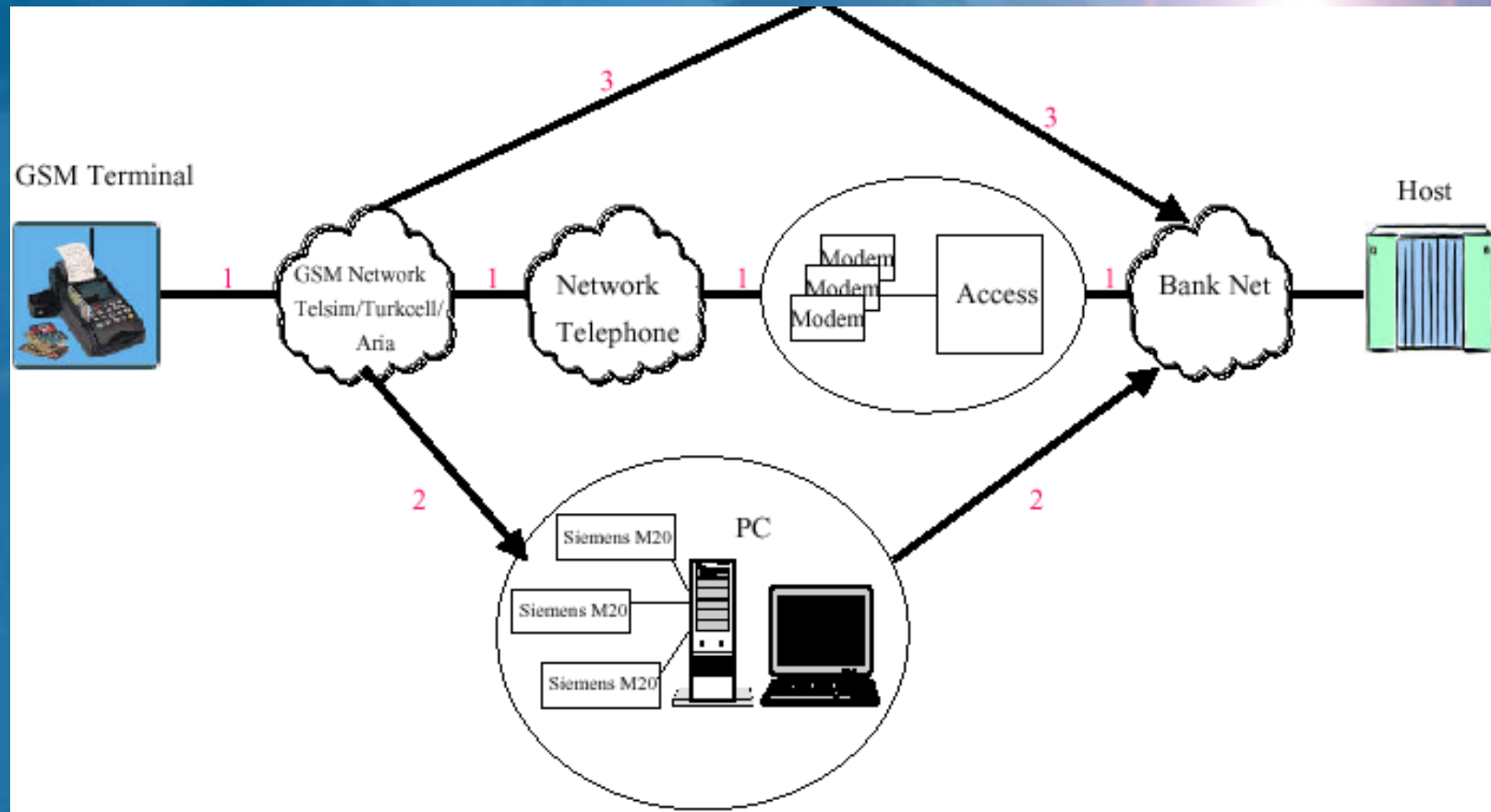
- **Remote Diagnostics Software**
- **Error Logger for OS and Its Applications**
- **Built-in Tests for Hardware and Software**
- **Built-in Monitor for Application Debugging**
- **Utility Functions to Minimize Application Size**
- **User-Friendly Menu Controls To All OS Functions**
- **Application Interruption Point Detection (Due to Power Outage)**



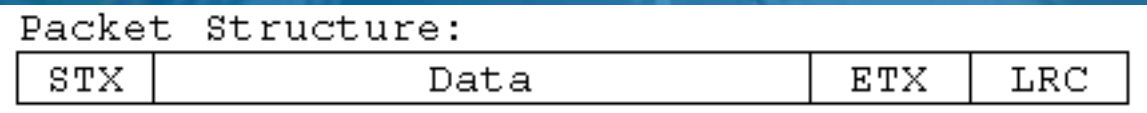
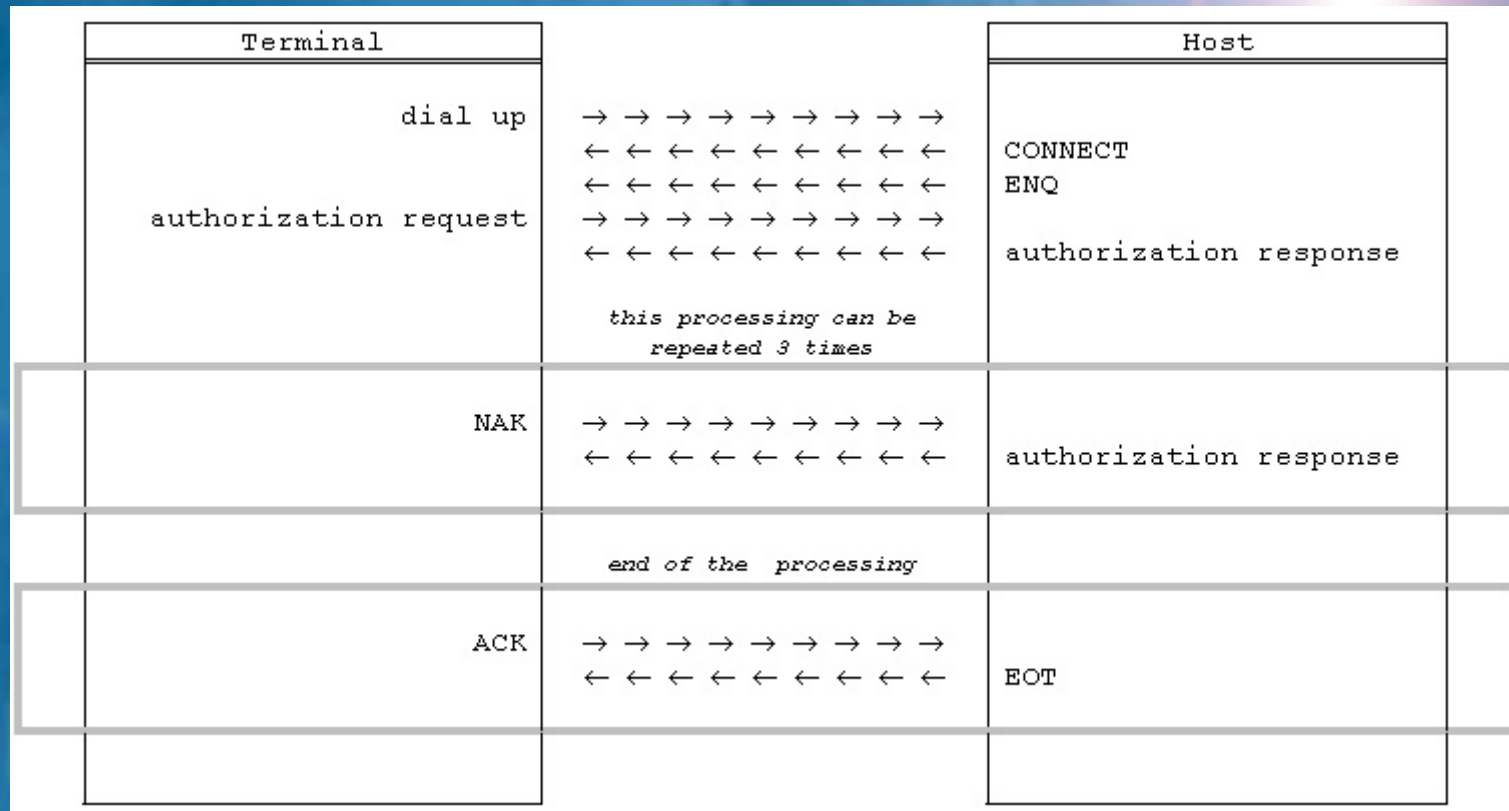
# POS Flash Memory Layers



# Communication Structure Example



# Protocol Example: VISA-II



# Packet Structure Example: ISO8583 Logon Packet (1)

BIT	NAME	FORMAT	ATTRIBUTE	MESSAGE TYPE IDENTIFIER																		
				BALANCE		SALE(*)		VOID		OFFLINE		REVERSAL		UPLOAD		SETTLE		LOGON		INIT		
				0100	0110	0200	0210	0200	0210	0220	0230	0400	0410	0320	0330	0500	0510	0800	0810	0800	0810	
2	PRIMARY ACCOUNT NUMBER	LLVAR	n	..19	O	-	O	-	-	-	O	-	-	-	M	-	-	-	-	-	-	-
3	PROCESSING CODE		n	6	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M
4	AMOUNT, TRANSACTION		n	12	-	M	M	M	M	M	M	-	M	-	M	-	-	-	-	-	-	-
11	SYSTEMS TRACE AUDIT NUMBER		n	6	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M
12	TIME, LOCAL TRANSACTION	hhmmss	n	6	-	M	-	M	-	M	M	-	-	M	M	-	-	M	-	M	-	-
13	DATE, LOCAL TRANSACTION	MMDD	n	4	-	M	-	M	-	M	M	-	-	M	M	-	-	M	-	M	-	-
14	DATE, EXPIRATION	MMDD	n	4	O	-	O	-	-	-	O	-	-	-	M	-	-	-	-	-	-	-
22	POINT OF SERVICE ENTRY MODE		n	3	M	-	M	-	M	-	M	-	M	-	M	-	-	-	-	-	-	-
24	NETWORK INTERNATIONAL IDENTIFIER		n	3	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M
25	POINT OF SERVICE CONDITION CODE		n	2	M	-	M	-	M	-	M	-	M	-	M	-	-	-	-	-	-	-
35	TRACK 2 DATA	LLVAR	z	..37	M	-	M	-	M	-	M	-	M	-	-	-	-	-	-	-	-	-
37	RETRIEVAL REFERENCE NUMBER		an	12	-	M	-	M	M	M	-	M	-	M	-	-	M	-	-	-	-	-
38	AUTHORIZATION IDENTIFICATION RESPONSE		an	6	-	M	-	M	M	M	M	-	-	-	M	-	-	-	-	-	-	-
39	RESPONSE CODE		an	2	-	M	-	M	-	M	-	M	-	M	M	-	-	-	-	M	-	M
41	CARD ACCEPTOR TERMINAL IDENTIFICATION		ans	8	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M
42	CARD ACCEPTOR IDENTIFICATION CODE		ans	15	M	-	M	-	M	-	M	-	M	-	M	-	M	-	-	-	-	-
52	PERSONAL IDENTIFICATION NUMBER ( PIN )		b	64	O	-	O	-	O	-	-	-	O	-	-	-	-	-	-	-	-	-
54	ADDITIONAL AMOUNTS	LLVAR	an	...120	-	-	O	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
57	TERMINAL SERIAL NUMBER	LLVAR	an	..11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	M	-
60	ORIGINAL DATA	LLLVAR	ans	..999	-	-	-	-	-	-	-	-	-	-	M	-	M	-	-	-	M	M
61	CASHIER ID	LLVAR	n	8	-	-	M	-	M	-	M	-	M	-	-	-	-	-	-	-	-	-
62	INVOICE NUMBER	LLVAR	ans	999	-	-	M	-	M	-	M	-	M	-	M	-	-	-	-	M	-	-
63	BATCH TOTALS	LLVAR	ans	..90	-	-	-	-	-	-	-	-	-	-	-	-	M	-	-	-	-	-
(*)	SALE/PRE-AUTH/CASH-ADVANCE																					



**LOGON MESSAGE**

```
***** record 00000017 26Jun01,13:38:49.00*****
VERB^REPLY      LU Name: $L0010.#U406      Session Id: 27
  Verb Code:    5  receive_data
  Return Code:  0  (OK)
  System Error: 0000 (hex)
  User Error:   0000 (hex)
  Retry Action: 0  not_applicable
Recovery tags:  3-3      Receive data queued ind: N
Enter send state ind: N      Transaction in progress ind:N
Message complete ind: Y      Definite response ind: 5
Data type received:partner_data      User data length: 34
```

```
----- HEX ----- ASCII -----
00000 7D40 4060 0004 8000 0800 2020 0100 0080 0000 9200 }@@`.....
00020 0000 3856 0004 4430 3239 3132 3032 ..8V..D0291202
```

```
***** record 00000018 26Jun01,13:38:49.03*****
VERB^REQUEST    LU Name: $L0010.#U406      Session Id: 27
  verb: receive_data
```

```
***** record 00000019 26Jun01,13:38:49.28*****
VERB^REQUEST    LU Name: $L0010.#U406      Session Id: 27
  verb: send_data
Prepare To Receive ind: N      End Transaction ind: Y
Formatted data ind: N      Notify ind: Y
Message complete ind: N      User data length: 127
```

```
----- HEX ----- ASCII -----
00000 F5C3 6080 0000 0408 1020 3801 0002 8000 0492 0000 ..`..... 8.....
00020 0038 5613 3848 0610 0004 3030 4430 3239 3132 3032 .8V.8H....00D0291202
00040 0085 185D FAC2 3FA4 786E 0000 0000 0000 0000 504C ...]..?.xn.....PL
00060 415A 4120 494E 444F 4E45 5349 4120 2020 2020 2020 AZA INDONESIA
00080 204A 414B 4152 5441 2020 2020 2020 2049 4420 2020 JAKARTA ID
00100 2020 2020 2020 2020 2020 2020 2020 2020 2020 2020
00120 2020 2020 2020 20
```

# Packet Structure Example: ISO8583 Logon Packet (2)

3	PROCESSING CODE (3 BYTES)
11	SYSTEMS TRACE AUDIT NUMBER (3 BYTES)
24	NETWORK INTERNATIONAL IDENTIFIER (2 BYTES)
41	CARD ACCEPTOR TERMINAL IDENTIFICATION (8 BYTES)

60	00	04	80	00	08	00	20	20	01	00	00	80	00	00	92	00	00	00	38	56	00	04	44	30	32	39	31	32	30	32
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

00100000	00100000	00000001	00000000	00000000	10000000	00000000	00000000
----------	----------	----------	----------	----------	----------	----------	----------



