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Computer Telecommunications Systems

Main Goal

Research and development of computer telecommunications systems and applications

Threefold Motivation

To business: Providing specialized electronic hardware and software solutions and innovations.

To students: Development of abilities to solve complex and non-trivial technical problems.

To applied science: Research and development in the area of high available and high performance parallel and distributed systems.

Expertise

- Microprocessor and microcontroller embedded systems;
- Real-time operating systems;
- *C++*, *C*, *Assembler* for *x86* and microcontrollers;
- *XC* parallel programming language for *XCore* multicore microcontrollers;
- RDBM *InterBase*
- Wireless embedded systems;
- Distributed systems;
- VoIP.

Key Partners

Bulgarian Telecommunications Company

60K International Contact Centers

Teletronic Ltd - Bulgaria

AVNET Technology Solutions GmbH - Germany

Main Results

This R&D direction is established in 1993 by request of Bulgarian Telecommunications Company (BTC).

As a result there were developed several systems deployed in tens of post-offices, tens of phone exchanges and several corporate call centers of Bulgarian Telecommunications Company and some other operators.

Common characteristics of solutions developed:

- Distributed architecture;
- Scalable (from middle- to big-sized);
- High traffic capability;
- High availability;
- Non-stop mode of working;
- Corporative quality metrics commitment.

List of main solutions developed:

1. Post-Office Monitoring and Billing System TELESERVICES (1993 – 2003)
2. Phone Monitoring and Billing System VECTRA (1995 – 2009) – digital overlay of analog exchanges
3. VoIP Based Call Center eMOSys.4K – 1st generation multifunctional call center solution (2000 - 2003)
4. VoIP Based Call Center eMOSys.6K – 2nd generation multifunctional call center solution (2004 – 2007)
5. VoIP Based Call Center eMOSys.6K BlueBird Edition – 3rd generation multifunctional call center solution (2008 -)
6. High Volume Voice Messaging System – 3rd generation (2010 -)
7. RTOS X-51 (1993 -)

Post-Office Monitoring and Billing System TELESERVICES

The system consists from operator workstation and 1-16 PLC modules connected over MicroLAN. PLC modules are installed in post-office phone cabinets and monitor calls and billing.

In 2003 there were deployments in more than 50 post-offices in Bulgaria, covering the capital Sofia and most of the country.

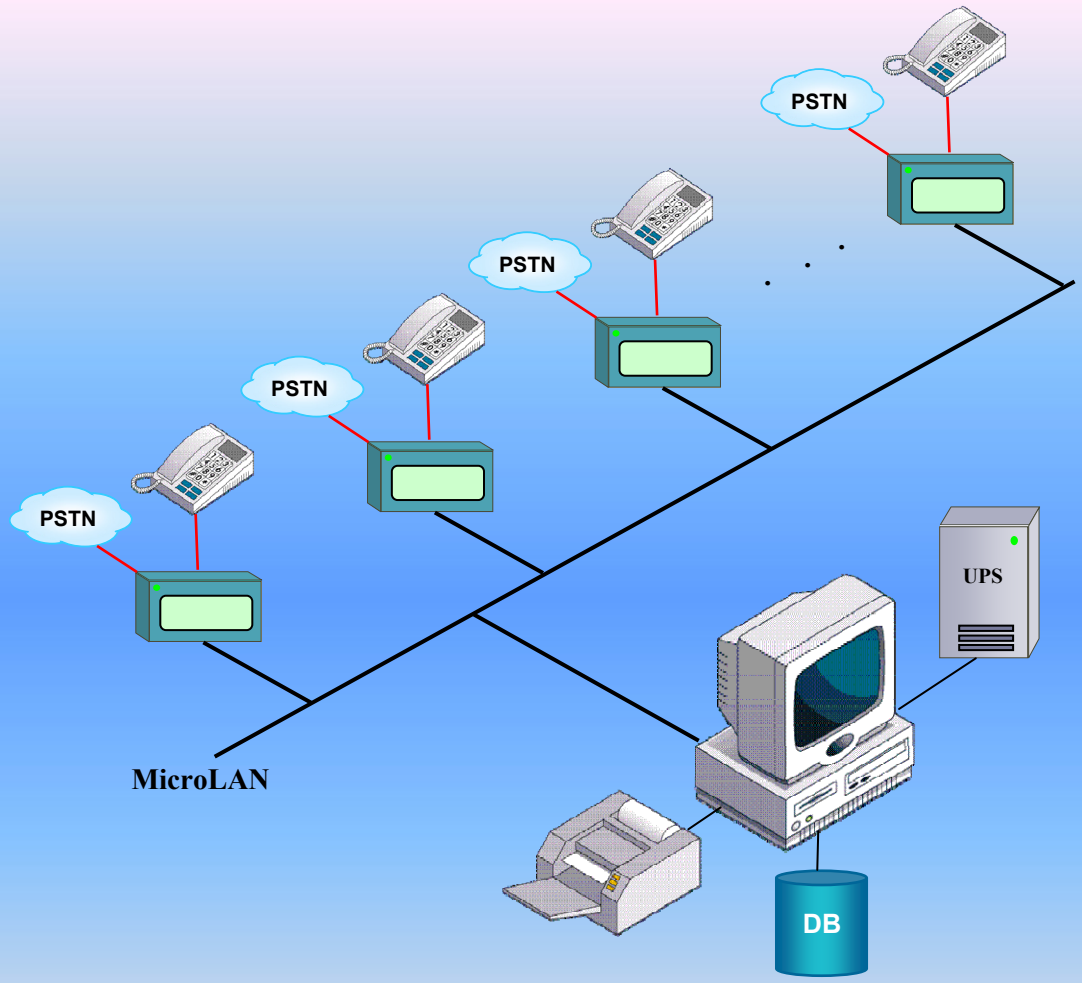

Fig.1.1. System General Structure

Fig.1.2. PLC module in post-office cabinet

Fig.1.3. System deployment in Sofia post-office

Phone Monitoring and Billing System VECTRA

Multilayer hierarchical distributed system developed by request of Bulgarian Telecommunications Company (BTC) as digital overlay of analog exchanges.

The first (low) system layer consists from several to about 100 PLCs mounted over analog exchange frames. The system pulse inputs are about 20 000 controlled at real-time. The traffic processed varies during the day/night from several to thousands of calls per minute.

The second (middle) system layer consists from high performance operator workstation. It is used as operator console and RDBM server. The volume of a month database for 10 000 subscribers exchange is about 300 – 500 MB.

The third (high) system layer collects billing information of regional exchanges.

The fourth super-layer collects billing information from the system nodes at third layer.

In 2005 there were more than 50 exchanges in Bulgaria equipped with, covering more than 200 000 subscribers of the biggest Bulgarian telecommunications operator.

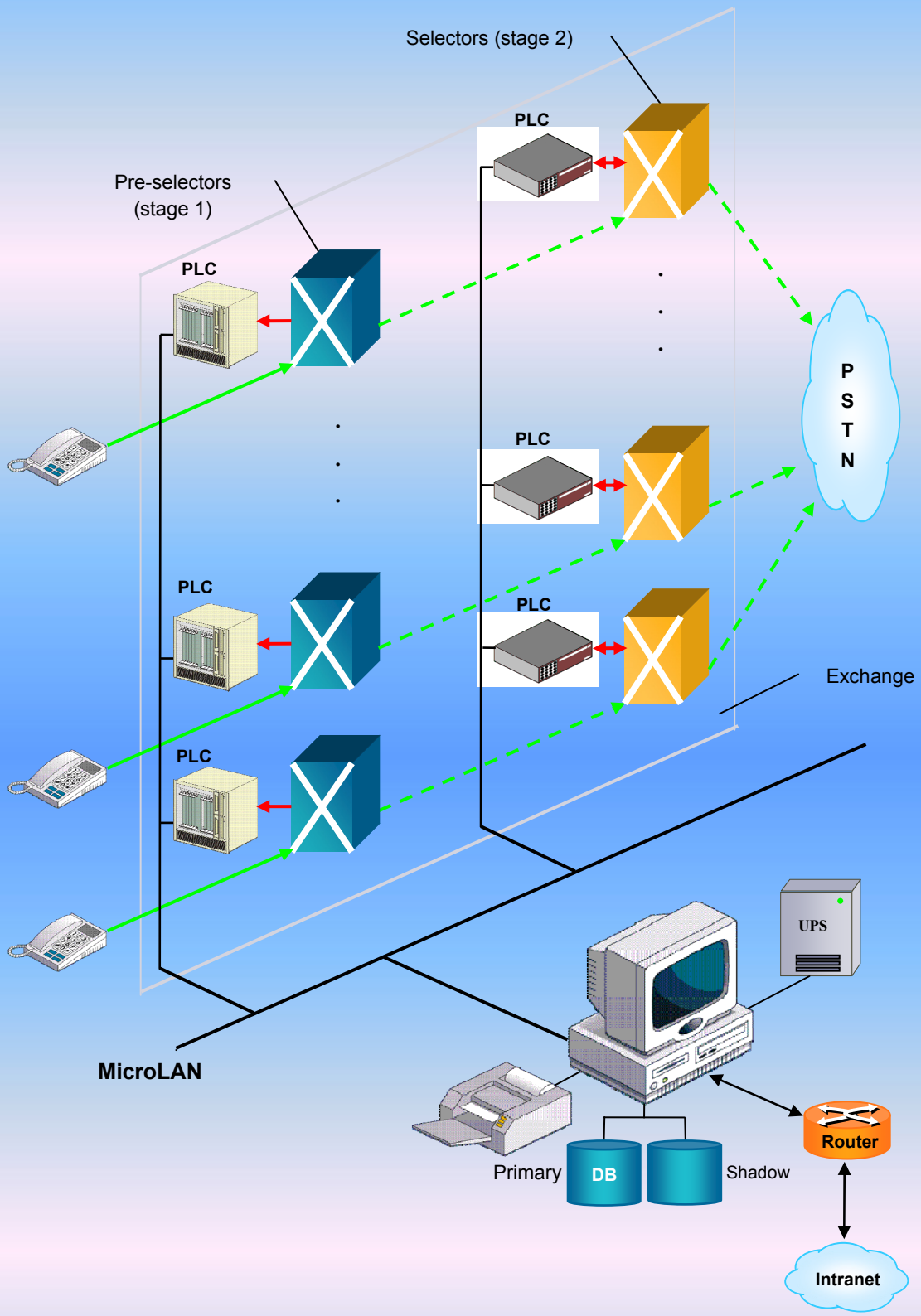

Fig.2.1. System General Structure

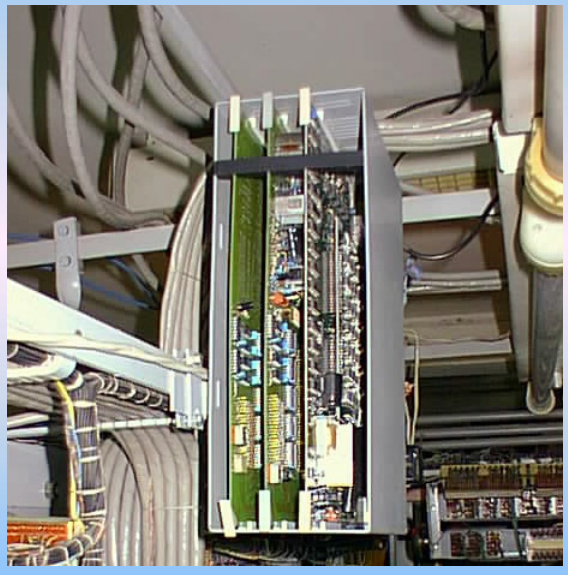

Fig.2.2. P-Modules at Pre-selector Frames

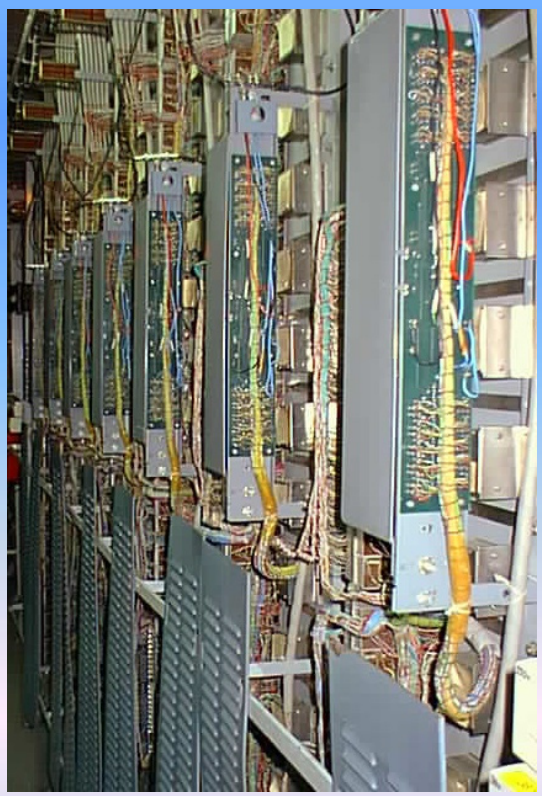

Fig.2.3. G-Modules at Selector Frames

VoIP Based Call Center eMOSys.4K

1st Generation of Multifunctional VoIP call-center eMOSys (2000 - 2003)

Capacity: 120 workstations

Traffic: 10 000 calls a day

Media DSP Boards: 1600 MIPS AG4000

External Connectivity: ISDN

Availability: 99.95%

It is the first Bulgarian digital call center, one of the first corporate packed switching call centers in the world. Developed as alternative to Siemens' ADMOSS. Deployed in Bourgass, Rousse, Stara Zagora, Pleven, Jambol, Razgrad, Silistra.

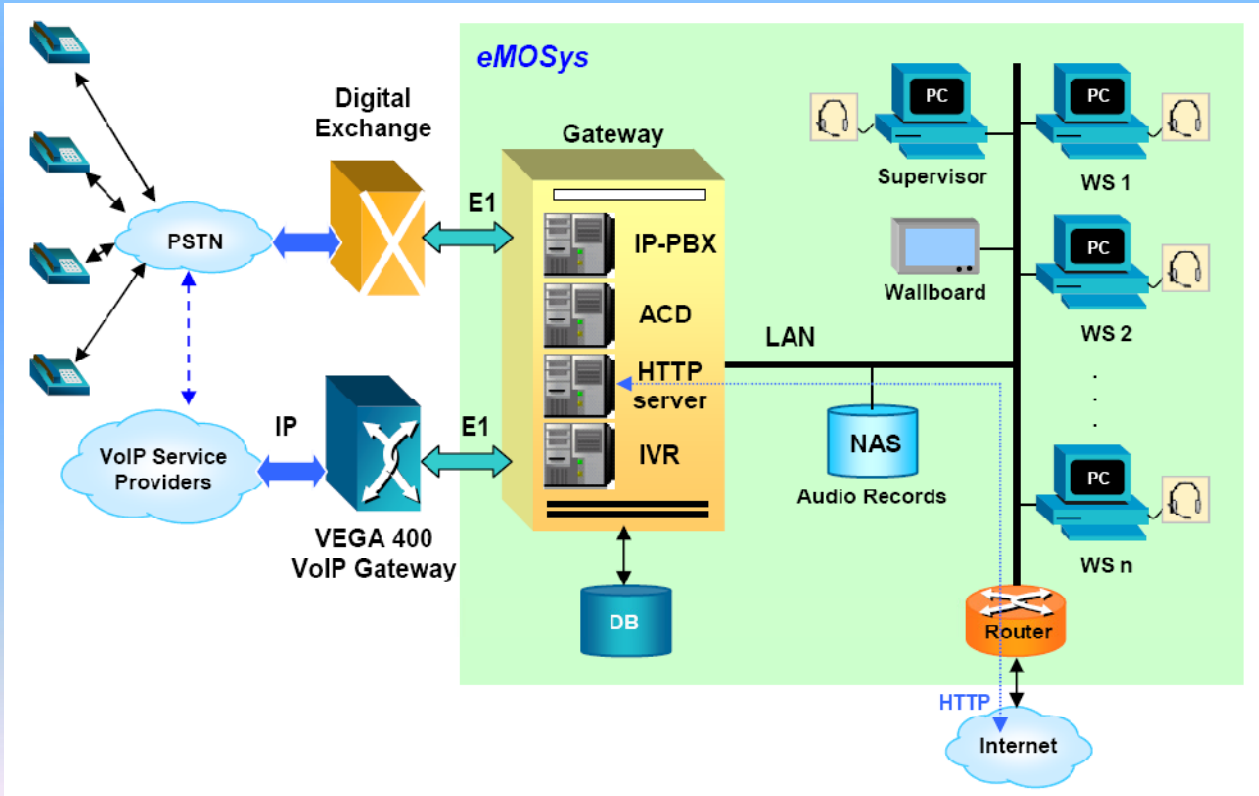

Fig.3. eMOSys System Architecture

VoIP Based Call Center eMOSys.6K

2nd Generation of Multifunctional VoIP call-center eMOSys (2004 - 2007)

Capacity: 240 workstations

Traffic: 25 000 calls a day

Media DSP Boards: 1600 MIPS CG6000

External Connectivity: ISDN, H.323

Availability: 99.995%

Deployed in BTC International Call Center in Sofia to serve MoneyGram European customers.

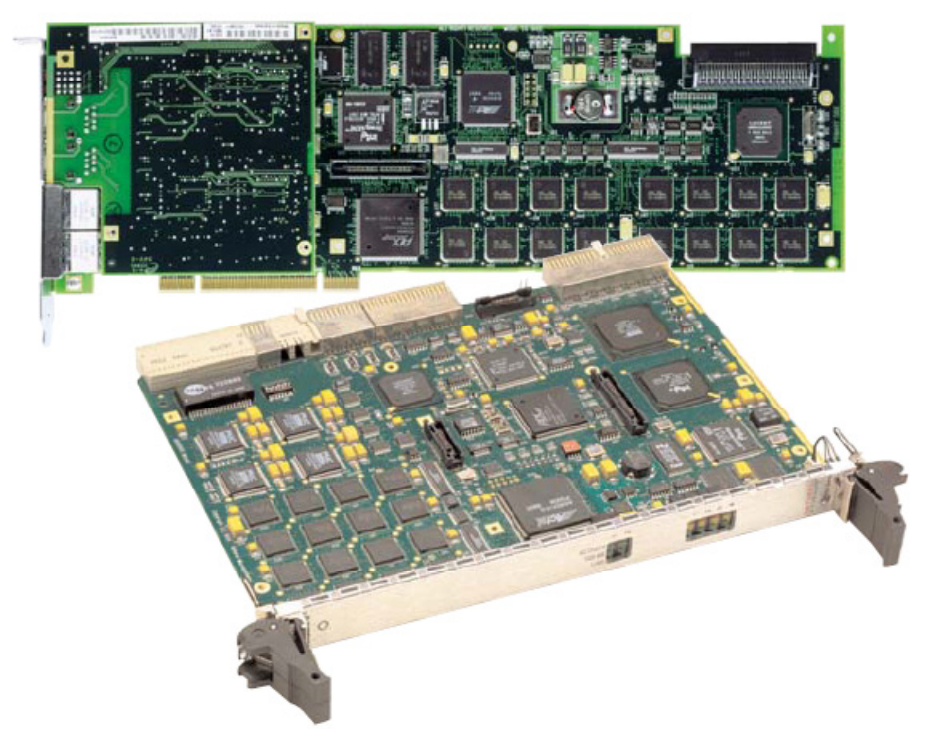

Fig.4.1. eMOSys.6K Media Boards - NMS CG 6000 Series

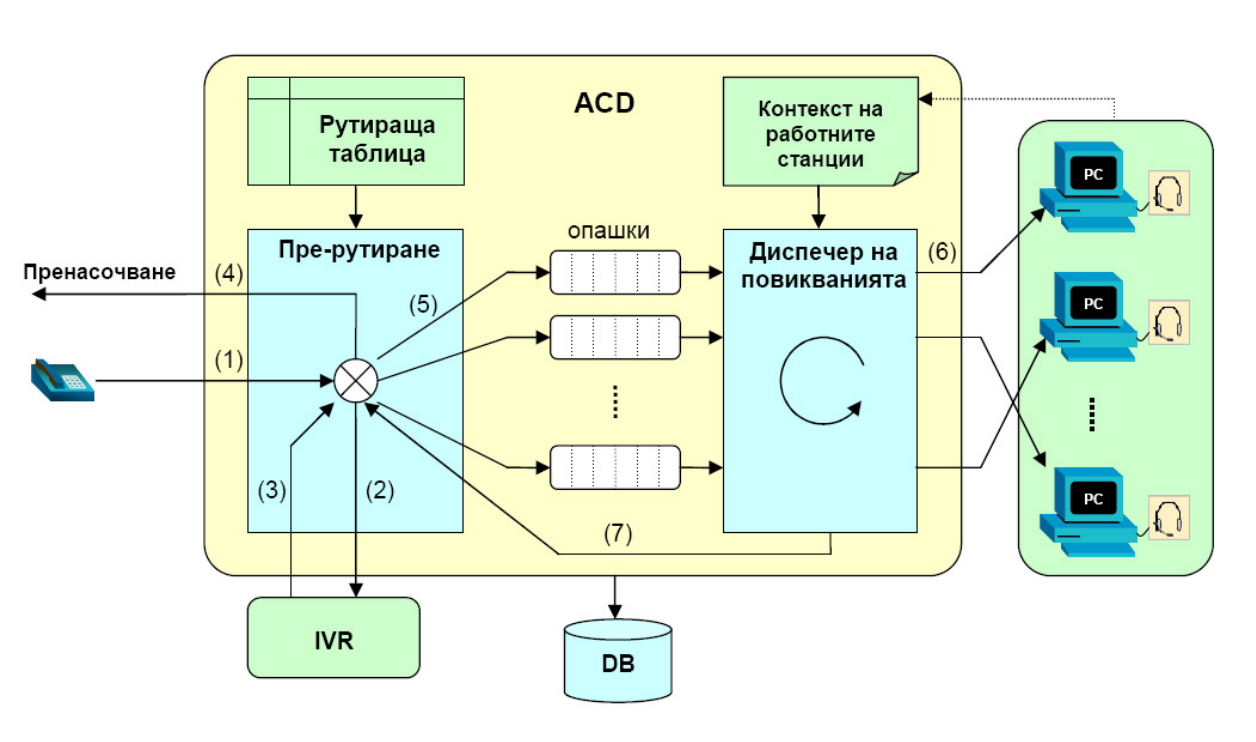

Fig.4.2. eMOSys.6K Automatic Call Distribution Module

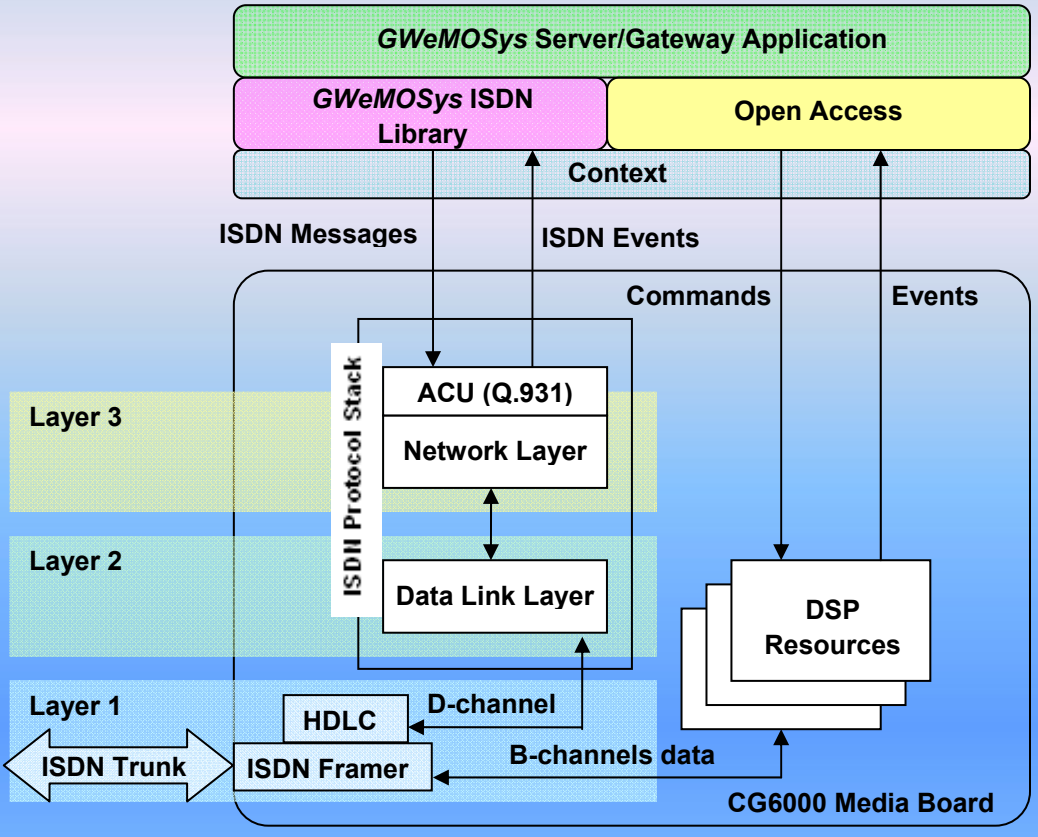

Fig.4.3. eMOSys.6K Gateway ISDN Trunks Integration

VoIP Based Call Center eMOSys.6K BlueBird Edition

3rd Generation of Multifunctional VoIP call-center eMOSys (2008 -)

Capacity: 2 400 workstations

Traffic: 100 000 calls a day

Media DSP Boards: 1600 MIPS CG6060

External Connectivity: ISDN, H.323, SIP

Availability: 99.9985% near to 5 nines

Deployed in BTC Call Center in Pleven and 60Key International Call Center in Sofia.

Fig.5.1. eMOSys.6K Contact Center of BTC

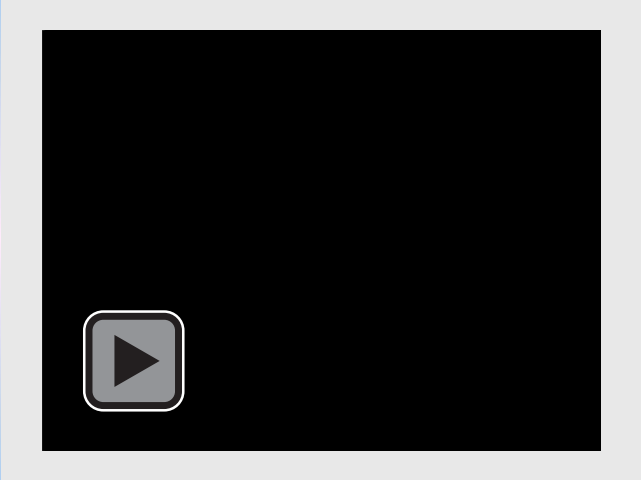

Fig.5.2. Inside an eMOSys.6K International Contact Center Atmosphere

High Volume Voice Messaging System

3rd generation developed in 2010 to meet high volume outgoing voice messaging demand of Bulgarian Telecommunications Company.

Capacity: 1–10–N Machines/1–20–2xN Multimedia DSP Boards/60–1200–120xN Channels Soft-switch

Control: local and remote

Traffic: 3000–30 000–3000xN calls per hour

External Connectivity: ISDN, SIP

Deployed: BTC Call Center in Pleven.

Fig.6. 5 Machine/10 Multimedia DSP Boards/5 x 120 Channels Soft-switch Configuration

RTOS X-51

X-51 is educational real-time OS for MCS-51 Series. Mixed C and Assembly ’51 code.

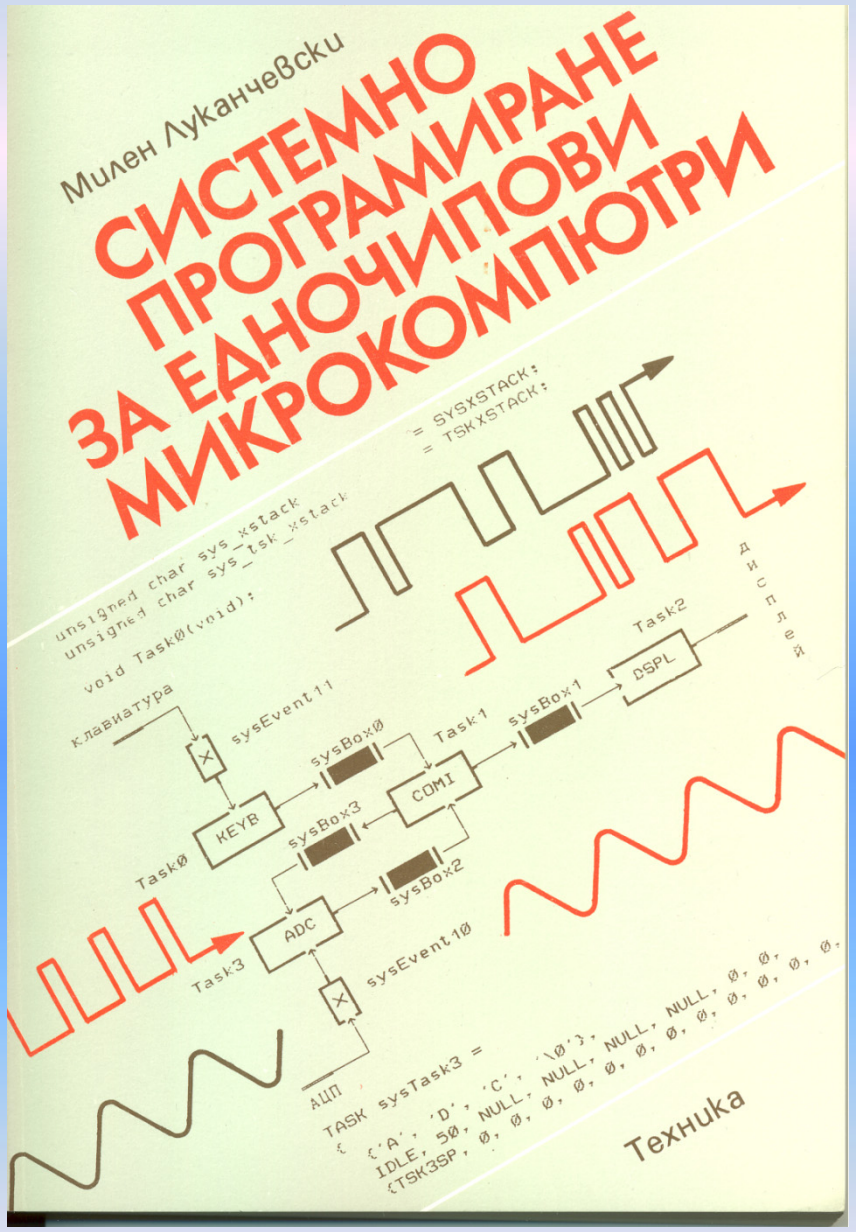

Fig.7. System Programming for Single-chip Microcontrollers book front page

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