

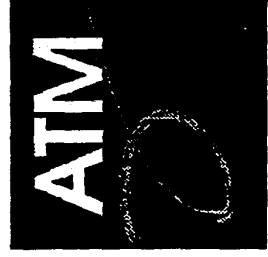
A Modular Approach to Low Cost Networked Multimedia

Hot Interconnects.

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Overview

- Modular ATM network design
- Modular ATM direct peripheral design
- Use many software modules, few hardware modules
- Keep the cost right down
- Allow for proxies

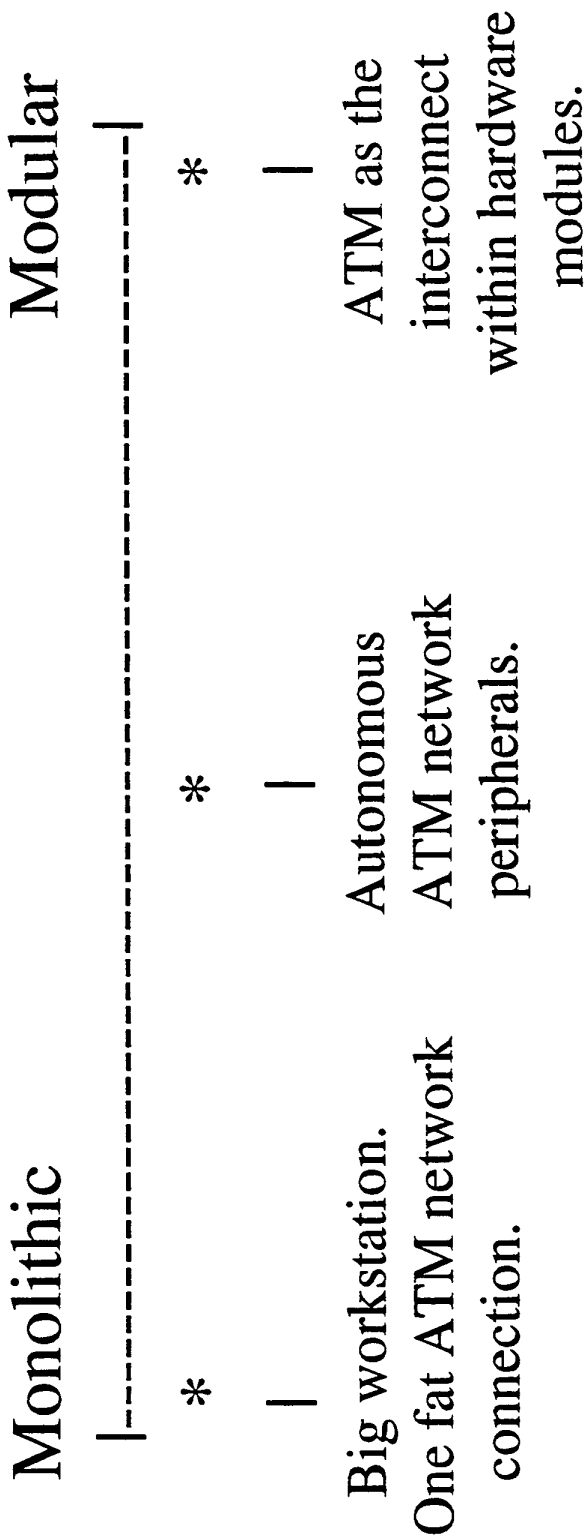
Low cost ATM is the 'Hot Interconnect'

Use the ATM layer as the interconnect between every module, however small or large:

- Transfer of a fixed size cell of 48 bytes
- Connection oriented virtual circuit with associated QoS
- One extra bit carried with each cell (in the header).
- All other header fields are below the ATM layer so can be flexible
- All other control is out of band.

An ATM system is any system which carries such cells.
When we get the price down, many things become possible !

A spectrum of multimedia devices:



Modular approach gives a kit of parts:

Hardware

- Utopia parallel interface
- 25.6 Mbps office ATM links
- 100 Mbps workstation ATM
- 2 and 34 Mbps G.703 connections
- 155 Mbps SDH transceivers

Software

- SAR in software
- Cell pacing for rate control
- MSNL/MAST lightweight signalling
- ATMoS kernel for scheduling
- Device drivers for all the peripherals

ARM microprocessors in every Module

Do everything in software and the price comes down
- a pleasant surprise.

The Utopia connection.

Each direction has

=====>	Data, 8 or 16 bits
----->	Start of cell wire
----->	Data valid wire
<-----	Clock
<-----	Cell transfer request

Clock rate may be freely varied 0 to 20 MHz.
160 Mbps full duplex on 24 wires (8 bit option).

Utopia should be the PCMCIA for multimedia modules ?

25.6 Mbit ATM links for the Home and Office.

- 16 Mbps token ring physical layer parts.
- 4B5B code replaces Manchester to get 4/5 of 32MHz = 25.6 Mbps.
- Can use CAT-3 UTP or better.
- 100 Metres range easily achieved.

ATML is one of ten companies backing the standard.

ATML's office products use the standard.

ATML advocates 25.6 as the Home ATM standard.

Unplug a PC from your office ATM LAN, take it home and plug it into the ATM port of the domestic Set Top Box and just carry on working.

Olivetti Research Four Port Switch.

[ARM processor, 4 Taxi ports, Flyby cell payload copy]

- Four ports of 100 Mbps block coded (AMD TAXI).
- ARM processor handles every cell with some hardware assist.
- White coaxial cable used bi-directionally.
- Suitable for desk and office use.

Abundant supply of the four port switches was the enabling factor to spawn a large, low-cost ATM network with multiple ports in every office.

Eight port switches and ATML's range of low-cost switches followed on.

ATMos card.

The ATMos card was the other key hardware component.

- ARM processor.
- 100 Mbps ATM link.
- RS232 link.
- Eprom.
- 4 to 32 Mbyte RAM.
- Coprocessor for AAL-5 CRC calculation.
- Bus brought out on the ATOMIC connector.
- XSI Bus adaptor for XSI multiple cards.

60 Mbps useful ATM throughput from 16 MHz ARM version.

Very cheap (dominated entirely by DRAM cost).

ATMos software.

- Single address space, no VM, no protection.
- Fast message passing.
- Simple scheduling between processes.
- Coroutines within a process.
- Modular, clean use of internal interfaces.
- Excellent implementation.
- Standard 'C' and ATMos libraries.
- TCP IP Telnet, pThreads.
- RPC system.
- XTP.
- ATM functions: MAST signalling, SAR, Pacing etc.

An imbedded system kernel that anyone can use.

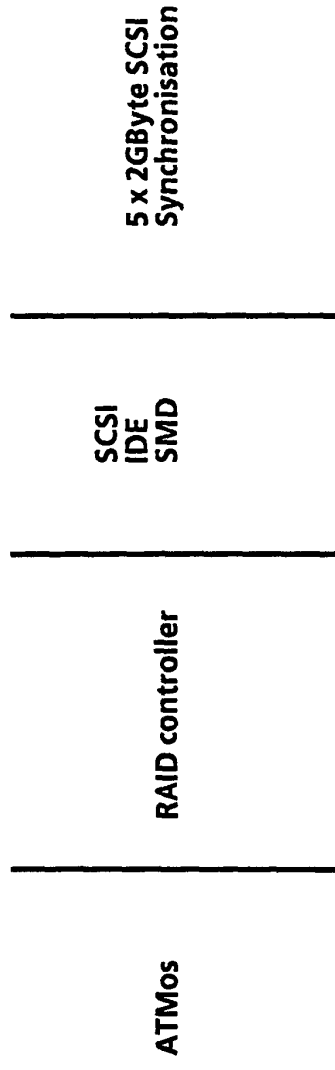
ATM disk brick.

[ATMos, RAID controller, SCSI, 5 by 2 Gbyte drives].

- RAID 3 for performance.
- Device driver handles RAID.
- Filing system optimised for sequential access.
- 80 Mbps max disk bandwidth to user process.
- 35 Mbps non DMA version, 60 Mbps DMA version.

Lowest cost per stream Video on Demand server.

ATM Disc Brick



- **RAID-3 for performance**
- **Device driver handles RAID array**
- **Filing system optimised for sequential access**
- **80Mbps max disc bandwidth to user process**
- **35 MBps non DMA, 60 Mbps DMA**

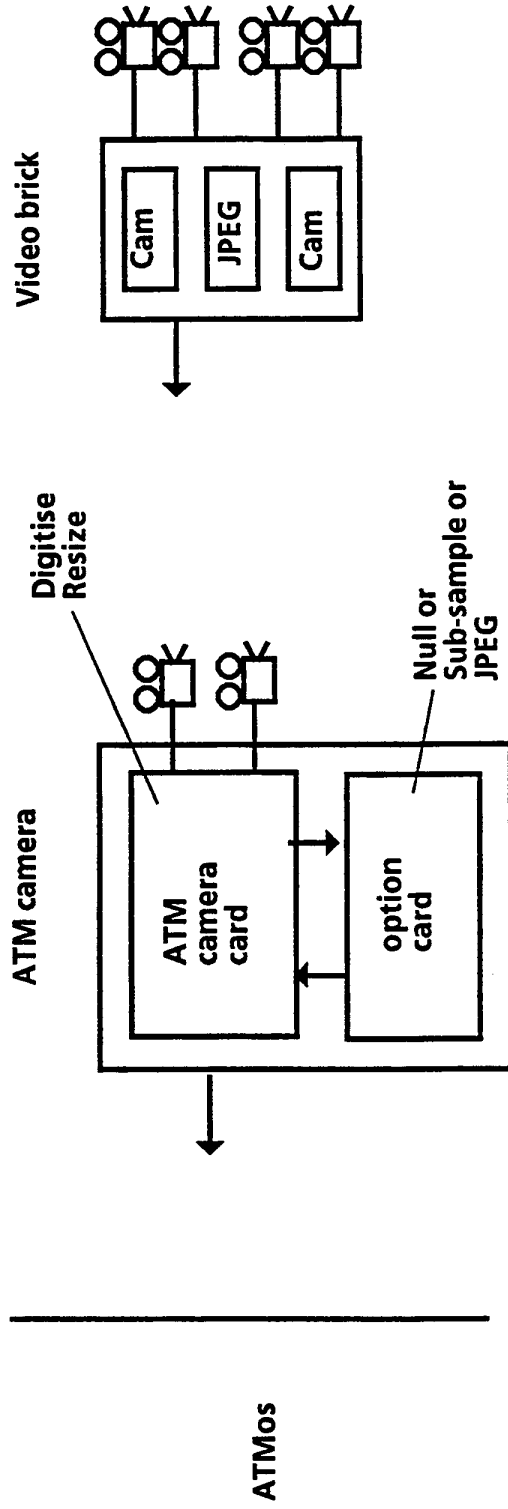
ATM Camera.

[ATMOS card, digitise and resize card, standard camera]

- Option card for JPEG compression
- Multiple streams on different VCIs
- 5,5 colour, hardware resizing, low latency.
- Six sizes available simultaneously.
- 766 x 567 max size.
- Special friendly camera head option.

Future: Two chip solution: Atom chip and a digital CCD camera chip.

ATM Camera



- 5,5,5 colour, hardware resizing, low latency
- six sizes available simultaneously:
 - or two 384x288 fields of different views
 - or two fields of different sizes same view
 - and sub-sampling ($\div 2, \div 4$)
- 766x576 max size
- JPEG card handles 2 camera cards (video brick)
- Special camera-head option

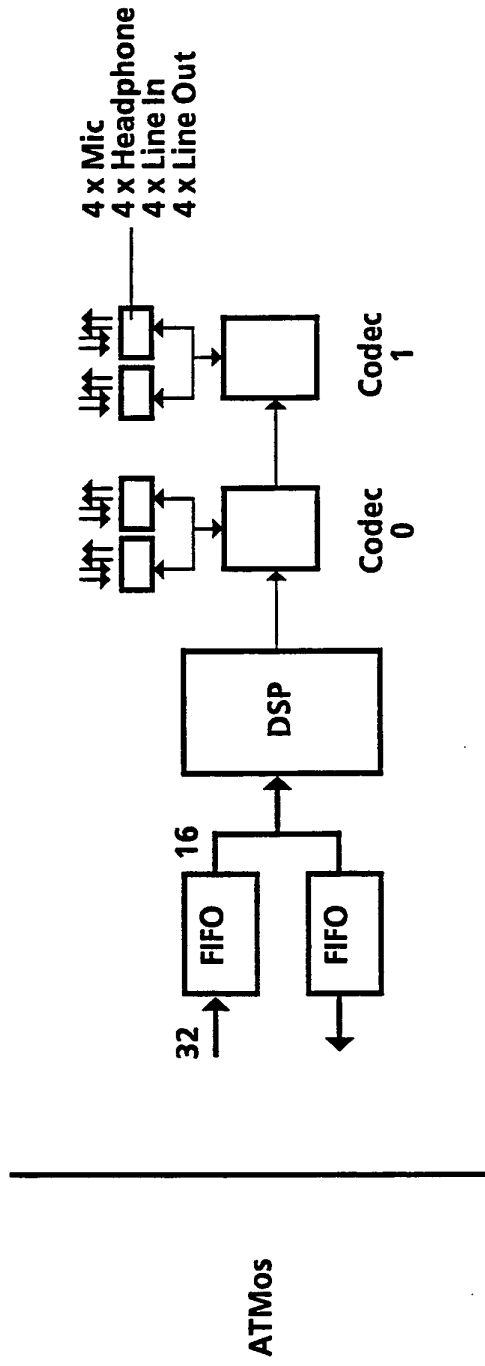
ATM Audio.

[ATMOS card, FIFOs, DSP, codecs].

- Multiple streams on different VCIs.
- 4 x mic inputs.
- 4 x Line outputs.
- All sampling modes from 4 kHz to 48 kHz
- DSP for audio processing.

Hands free audio is easy to design and easy to use if quality is high and latency is low.

ATM Audio



- all 4KHz - 48 KHz sampling modes
- DSP for audio processing

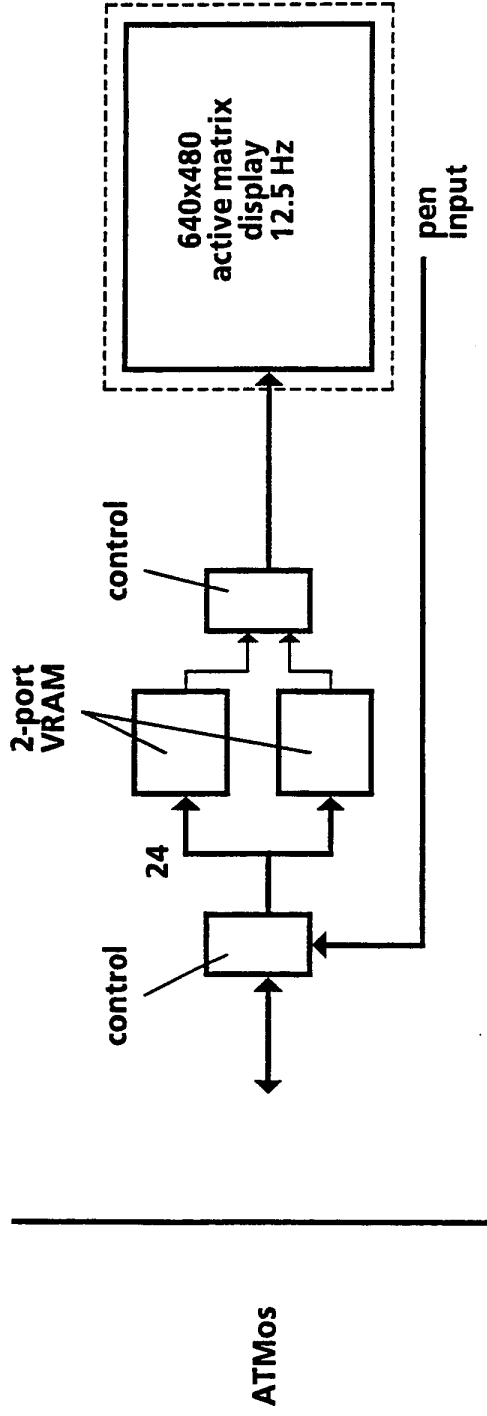
ATM LCD Tile.

[ATMos card, VRAM, control PAL, LCD panel]

- Full colour display, 640 x 48 active matrix.
- 12.5 frames per second.
- 5,5,5 or 24 bit formats.
- Pen input option.

*Dot them around the office or home. View TV, your computer display
or your child's cot remotely, anywhere.*

ATM LCD Tile



- video capable active matrix display
- pen input
- 5,5,5 or 24 bit format

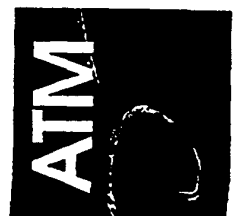
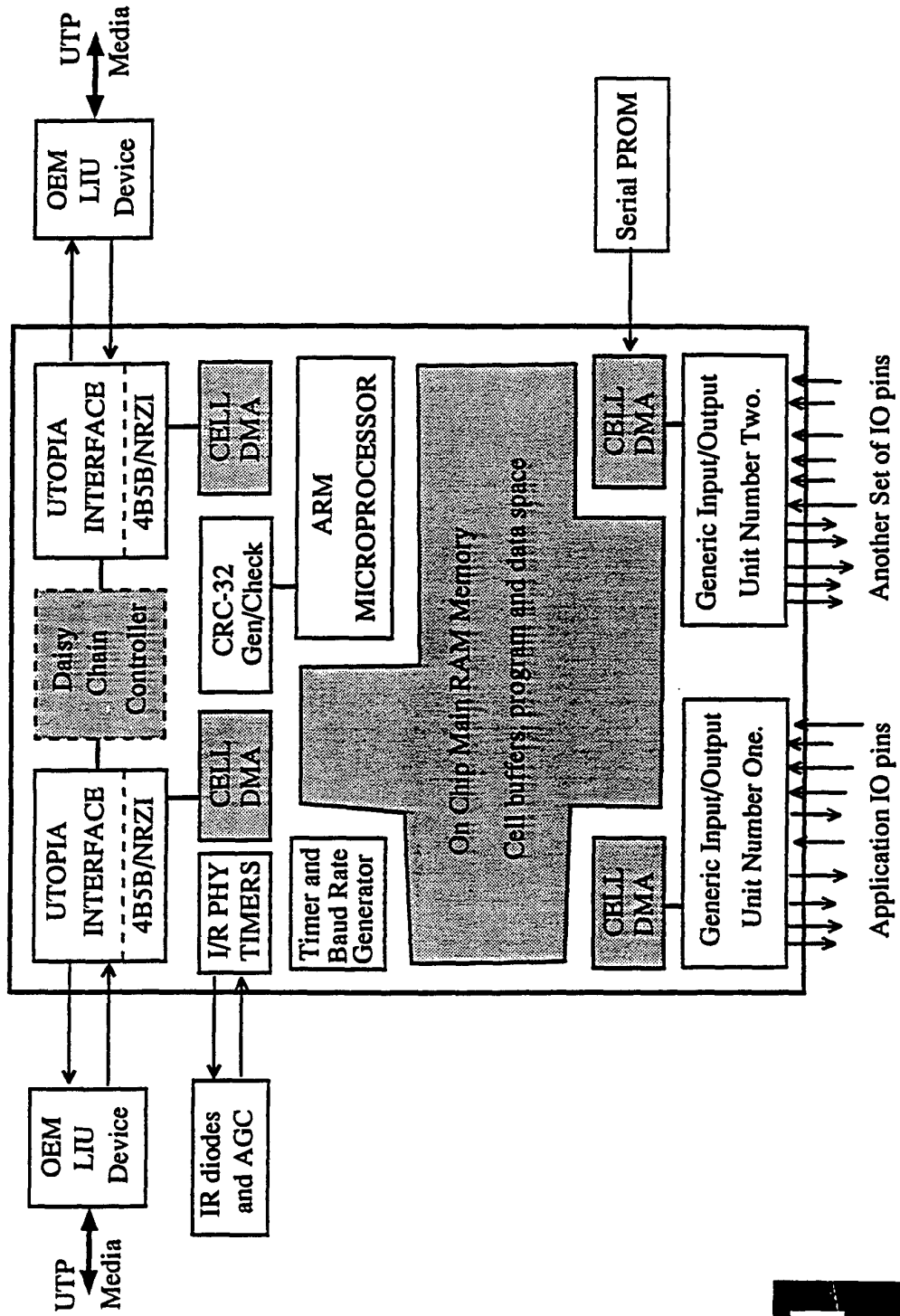
ATOM Chip - An ATMos card on a chip and more.

- RAM (32 Kbytes).
- 25 MHz ARM processor core.
- 4 Bi-directional, flexible ATM IO ports.
- Duplex Infrared port.
- Controller for external DRAM (if needed).
- Timer, baud generators and CRC-32 resources.

The IO ports are highly configurable and support:

- * 8/16 bit Utopia,
- * ATM multi-access daisychains and busses,
- * 25.6 Mbps line code,
- * Parallel port, serial port, keypad, LCD, digital audio format.

ATML 'ATOM' System General Module Chip



Lightweight Signalling.

MAST (*Minimal ATM Signalling Technology*) provides all you need in a few kilobytes of object code:

- Topology determination,
- Routing
- VCI set up, tear down, bandwidth allocation,
- Maintenance and management.

MAST uses single cell messages for everything.

A gateway running on the network at any point gives Q.2931 access.

MAST makes the simplest ATM object a full-service ATM network entity.

Proxy Signalling.

- Modules are no longer first class network objects.
- Modules require support from their proxy running on a server.
- Code needed on the module decreases in size drastically.

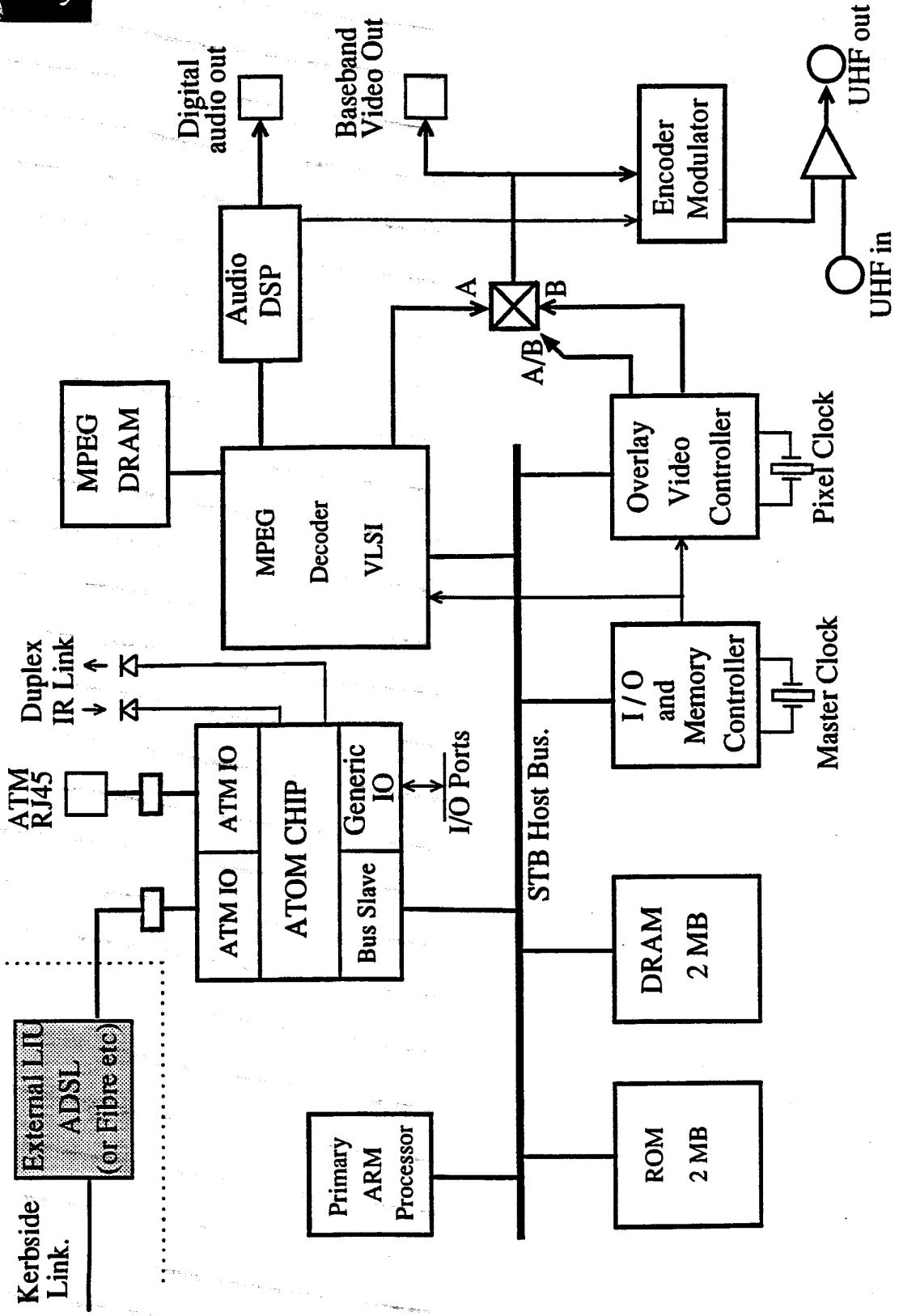
- * Server has one copy of the code, rather than copies in every module.
- * Proxy sends simple command cells to actual hardware modules.

Proxy signalling allows really low complexity ATM network objects.

AToM chip can appear as a network object through its proxy, but runs out of its (limited) internal RAM.

Make use of the separation of control and data within ATM !

ATML V-O-D Set Top Box Architecture



Set Top Box as a Trojan Horse

