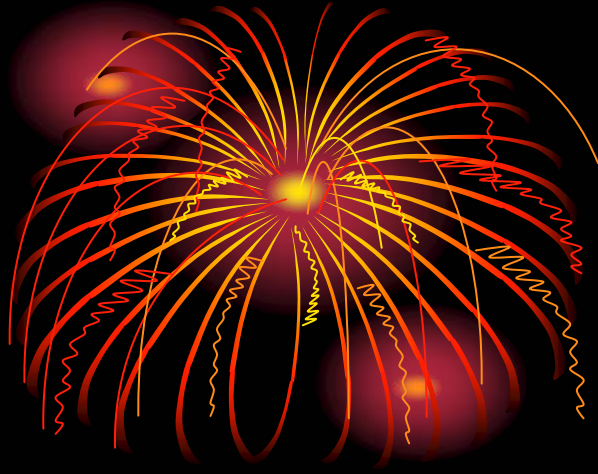
The Controller Unit

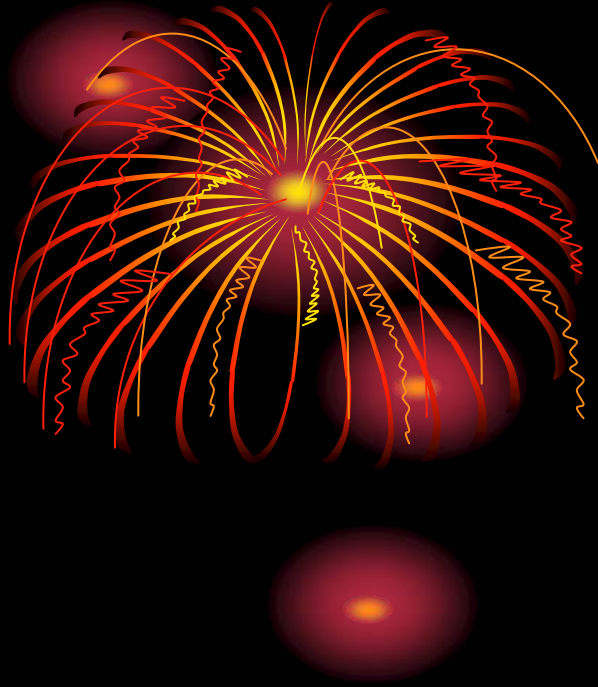
Bill Lutz
Bob Miller

Purpose



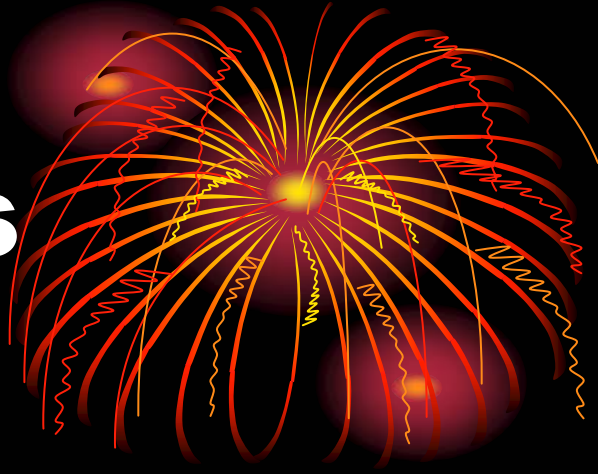
- **Develop the controller subsystem of an Ethernet based video communication system**

Requirements



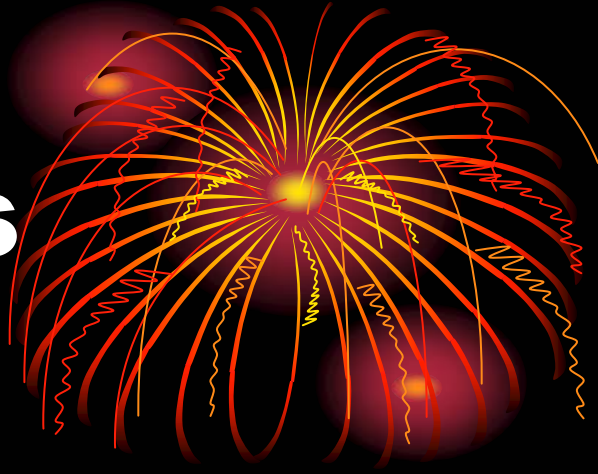
- Cost Effective Solution
- Portability
- Software Robustness
- Large Support Base
- Low Power Consumption

Possible Solutions



- ARM 922T Pros
  - Memory Manage Unit for use with multitasking Operating System
  - High Clock Speeds
  - TCP Stack support
  - GNU compiler support

Possible Solutions



- ARM 922T Cons
  - Requires special bussing to interface to other devices
  - Requires custom driver development
  - Softcore for ASIC development

Possible Solutions

- AMD ELANSC520 Pros
  - 5x86 Architecture
  - PCI bus
  - General Purpose I/O
  - Power Conscious Design
  - High Clock Speed
  - Large Software Support
  - Built using commodity-based components
  - Low Volume Pricing

Possible Solutions

- AMD ELANSC520 Cons
  - 600mA Power Draw
  - Lower Clock Speed than ARM9
  - CISC Architecture

Operating Systems

- Windows CE
- Linux
- FreeBSD
- OpenSBD
- NetBSD

Windows CE

- Large development drive from large corporation
- Product support
- Popular easy to use interface
- Requires expensive porting license
- Difficult to customize

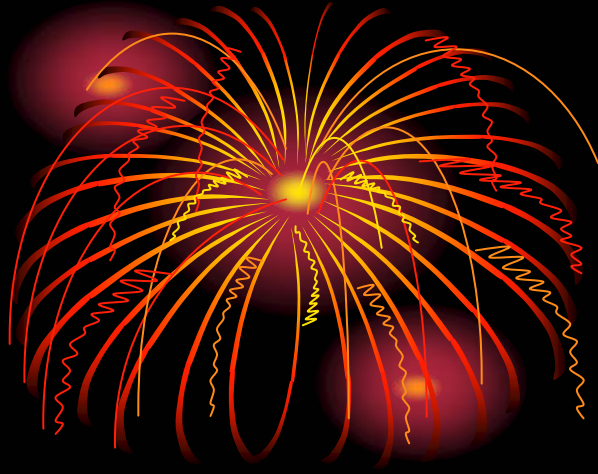
Linux

- Large online community for support
- Software Packages can take a lot of work to configure

FreeBSD

- Custom support for the ELAN processor
- Capable of Running all Linux binaries
- Ports Tree guarantees software packages to work correctly
- Designed to be fastest OS on x86 Architecture
- Good online documentation and support community

OpenBSD



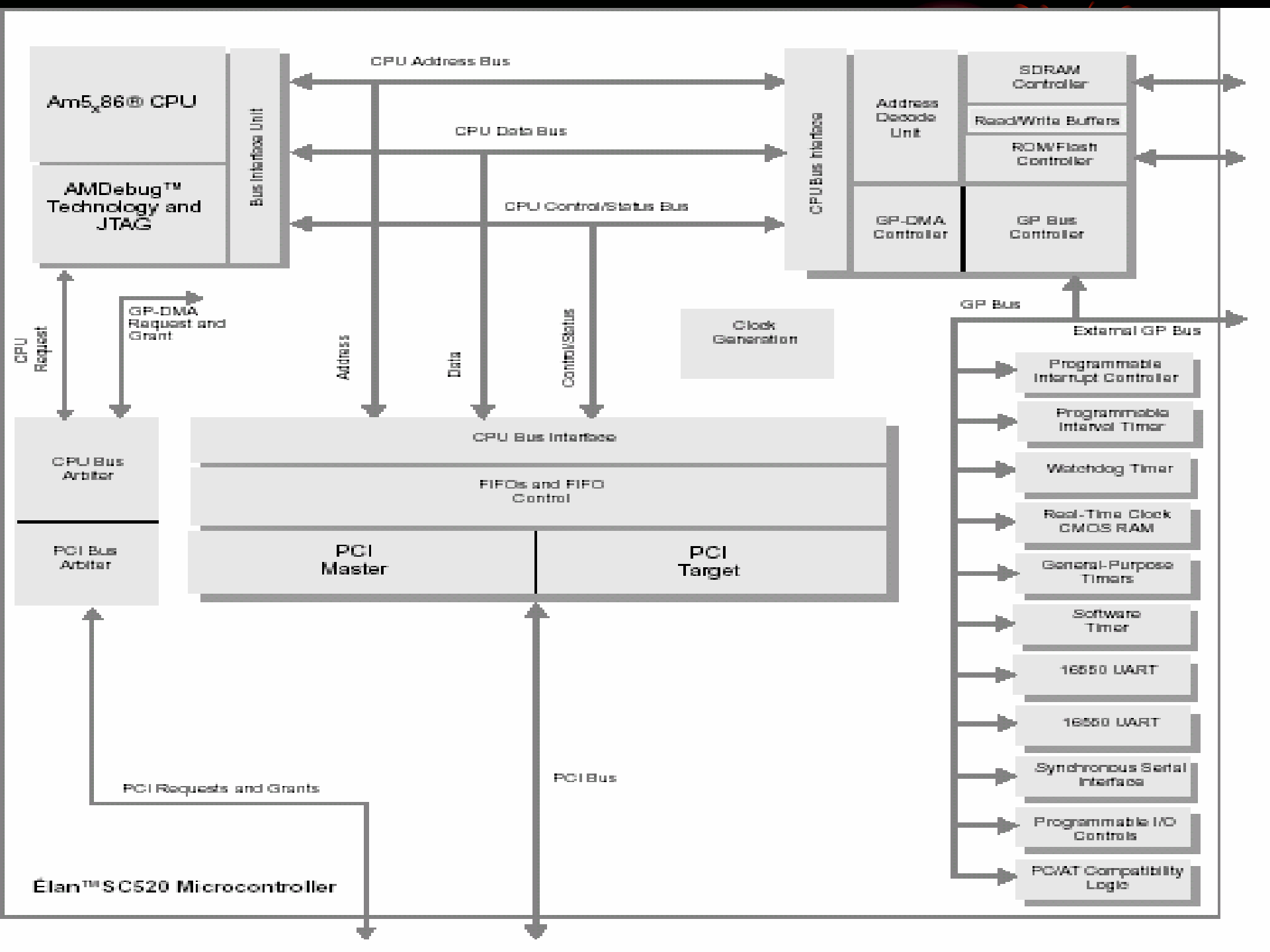
- Proactively Secure
- Wide range of network options
- Ports Tree is lacking compared to FreeBSD
- Slower on x86

NetBSD

- Wide range of multiplatform support
- Nothing custom to the ELANSC520 processor

Proposed Configuration

- ELAN processor
- PCI bus
- 10/100 Ethernet
- ATA compact Flash storage
- SDRAM main memory
- Serial Communications
- FreeBSD


Am5x86® CPU
AMDebug™ Technology and JTAG
Bus Interface Unit
CPU Address Bus
CPU Data Bus
CPU Control/Status Bus
CPU Bus Interface
Address Decode Unit
SDRAM Controller
Read/Write Buffers
ROM/Flash Controller
GP-DMA Controller
GP Bus Controller
GP Bus
External GP Bus
CPU Request
GP-DMA Request and Grant
Address
Data
Control/Status
Clock Generation
CPU Bus Arbiter
PCI Bus Arbiter
CPU Bus Interface
FIFOs and FIFO Control
PCI Master
PCI Target
Programmable Interrupt Controller
Programmable Interval Timer
Watchdog Timer
Real-Time Clock CMOS RAM
General-Purpose Timers
Software Timer
16550 UART
16550 UART
Synchronous Serial Interface
Programmable I/O Controls
PC/AT Compatibility Logic
PCI Requests and Grants
PCI Bus
Élan™SC520 Microcontroller

Software Support

- TCP Stack
- RTOS
- MPEG codec
- Device Drivers
- I/O Expansion
- Etc. Etc. Etc.

Power Consumption

- 600 mA: Processor
- 300 mA: Board
- 100 mA: Display

- Total Consumption
  1 A @ 5VDC

Market Analysis

Projected Sales:
10,000 Units

Market Analysis

Total Material Cost per Unit: $200

Unit Cost Breakdown

- $25: Processor
- $5: Ethernet Chipset
- $20: PCB
- $30: Input / Output
- $30: Memory / Storage
- $40: Audio / Video Unit
- $50: Display

- $200: Total Unit Cost

Development Costs

Total Development Cost for the Project:

$35,850

Development Costs

- 3 Engineers
- Estimated 1 Month for a Protoboard Design
- $400 per PCB board
- Projected 3 iterations of PCB

Development Costs

- 3 Engineers, each at $3850 / month for 3 months

- Total Wages: $34,650
- 3 Protoboards: $1200

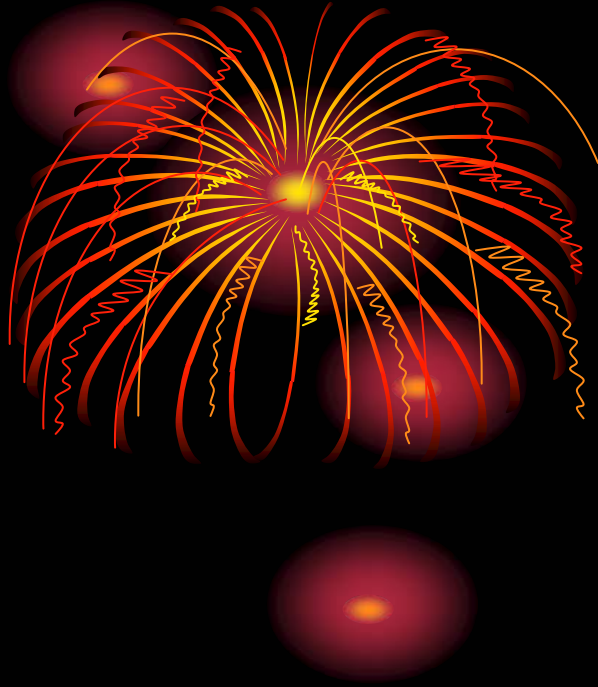
Total Development Cost: $35,850

Initial Investment

- **Total Materials for 10,000 Units:**
  $2,000,000
- **Total Development Costs:**
  $35,850

- **Initial Investment:**
  $2,035,000

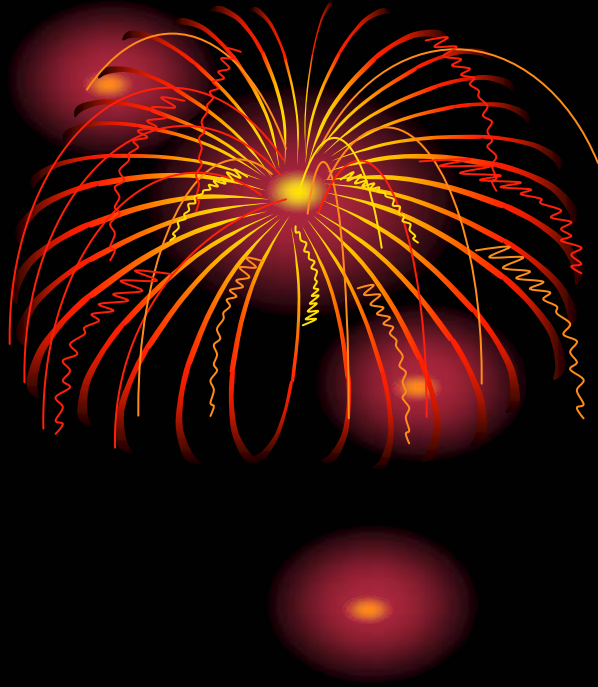
Profits



- **Initial Investor: 10%**
- **Company: 5%**

- **Total Gain: 15%**
- **Total Income: $2,314,227**

Market Price



- **Income: $2,341,227**
- **Units: 10,000**

- **Market Price:**
  $235 / Unit

Results

We Profit $305,377
For 3 Month Labor