

Energy Efficient Application
Specific Computer Design
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**Patrick Young
CEO Arlinx, Inc.**

Arlinx produces application specific computer products that are very energy efficient with the best performance per watt in the industry. We use IBM's Power Architecture System on a Chip Technology that executes 1.3 Billion Instructions per second with 1 GB low power DDR2 RAM with ECC, 512K NOR Flash, and CompactFlash Socket, an integrated encryption accelerator, a certified cryptographic storage module for strong authentication. Two GigE ports (copper and fiber) and Four USB 2.0 Ports. Powered by redundant 5 VDC power supplies. Our hardware platform comes with Linux and open API and SDK. Optional Media Processors for Voice and Video.

The platform is RoHS compliant, made from recyclable parts, long life cycle (20 year MTBF), uses only 6 Watts of power. So energy efficient and reliable that it will pay for itself with savings in long life cycle, low maintenance & repair, electricity, battery backup, air conditioning, and inexpensive non-cooled server cabinets.

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Green Application Specific Computer Design

- Very Energy Efficient
- Long Life Cycle (Reliability)
- Recyclable
- No Hazardous Materials (RoHS)
- No Batteries
- Environmentally Benign Manufacturing
- Research Supplier Eco Programs and Record

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Very Energy Efficient

- System on a Chip (SoC) Architecture
- Application Specific SoC
- Application Specific Co-Processors
- Low Voltage Semiconductors
- Efficient Microprocessor Architecture
- High Efficiency Optimized Power Supplies
- No Mechanical Components (Fans, Storage)

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System on a Chip Architecture

- Integrates Peripheral Controllers in SoC
- Choose SoC Optimized for Application
- Balance Performance with Power Consumption
- Less High Power and Slow Input/Output
- Fewer Components = Higher Reliability
- 1.33 Billion Instructions/Second @ 2 Watts
- Low Power, Low Heat = Higher Reliability

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Application Specific Co-Processors

- Multiple Very Low Power Micro-Controllers
 - System Status Monitoring
 - Security Micro-Controller
- Application Specific Computational Intensive μ P
 - Very High Performance per Watt Ratio
 - Voice and Tone Processing
 - Video and Image Processing
 - Transcoding

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Low Voltage Semiconductors

- Dynamic Power = Volts² x Frequency
- Use Lowest Voltages
 - DDR2 RAM 1.8V, DDR1 RAM 2.5V,
 - DDR1 38% more Voltage but 107% more Wattage
- Balance Performance and Geometry
 - Multiple Supply Voltages = Higher Efficiency
 - Smaller Geometries (nm) = Higher Static Power
 - Smaller Geometries = Higher Frequency/Performance
 - Large Geometries (µm) = High Dynamic Power

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Efficient Microprocessor Architecture

- Performance per Watt
 - Instructions Executed per Clock Cycle
 - Intel
 - AMD
 - Power PC
- Multiple Voltage Power Supply
- Power Management
- Various Task Optimized Transistors
- Transistor Junction Temperature
- Power and Clock Gating

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Power Supply Optimization and Efficiency

- Single Voltage System DC Power Supply
- On Board DC-DC Converters
 - One DC-DC Converter per System Voltage
 - Efficiency Optimized for Required Current
 - 95%+ Efficiency
 - Low Heat Generation
 - Reliable Design



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No Mechanical Components

- Mechanical Components Have High Failure Rates
- Long Product Life Cycle
- Very Low Maintenance and Repair
- Clean and Silent Operation
- Replace Mechanical Hard Drive with Flash Drive
- Use Network Attached Storage, No Hard Drive



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Long Life Cycle

- Low Power Low Heat
 - Semiconductors Life is Reduced by 50% for Every Fifteen Degrees Centigrade Increase in Temperature
- Fewer System Components
- Use High Reliability Components and Design
- No Mechanical Components
- Use Long Life Cycle Software
 - Minimal System Requirements
 - Most Users Can Get by with Less Processing Power
 - Internet Hosted Applications



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Produce Eco Friendly Products

- Use No Hazardous Substances (RoHS)
- No Batteries
- Use Recyclable Materials and Components
 - Metal Enclosure not Plastic
 - Steel Recycles 100%
 - Plastic Recycling Very Problematic
 - Biodegradable Plastics Use Too Much Energy to Produce
 - Use Packaging Produced from Recycled Material
 - Use Electronic Documentation Not Paper



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Environmentally Benign Manufacturing

- Use Recycled Materials
- Use No Hazardous Chemicals
 - If you must, use best known eco practices
- Recycle Everything Possible
- Use Energy Efficient Computers and Machinery
- Use Power Management Tools
- Use Green Building Technology
- Strive to Achieve Sustainability

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Research Suppliers Eco Programs and Record

- Choose Environmentally Responsible Suppliers
- Check Suppliers History for Eco Violations
- Investigate Suppliers Eco Policies and Programs
 - Printed Circuit Board and Semiconductor Manufacturing Processes Have Eco Issues
 - Water Recycling
 - Filtering Contaminants from Waste Water
 - Use Long Life Cycle Chemicals
 - Proper Disposal of Expended Hazardous Materials
 - Use Current Best Practice Eco Manufacturing Methods

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