



# Ark Systems Technology

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# Introduction

Ark Systems owns internally developed Intellectual Property (IP) consisting of a highly efficient, easy to support, portable, multiprocessing, multitasking Real Time Operating System (RTOS).

In addition to the RTOS, Ark developed and owns a full featured data storage software application and a real time remote location backup/data transfer system running on “off-the-shelf” hardware.

Ark Systems is seeking a buyer who desires to use Ark Systems technology in the marketplace to:

- ✓ Expand revenues and profits
- ✓ Save expensive development costs
- ✓ Accelerate time-to-market
- ✓ Gain market advantage
- ✓ Prevent the technology from being used by a competitor

The purchase of Ark Systems is being proposed to various companies in the RTOS, device software, data storage, and real time backup business.



# Ark Technology has Value for...

## • RTOS Vendors

- ✓ Looking to fill price band range gaps in product line
- ✓ Looking to address competitive issues
- ✓ Looking to expand into storage developer market

## • Storage Vendors

- ✓ Looking to decrease cost and TTM
- ✓ Looking to “outsource” storage middleware
- ✓ Looking for effective point-product development

## • Hardware Vendors

- ✓ Looking for value-add RTOS / middleware
- ✓ Looking to harden reference designs
- ✓ Looking for unique selling propositions

## • Storage OEM's

- ✓ Looking to create value-add products
- ✓ Looking to provide data access services
- ✓ Looking to provide professional services



# Company History

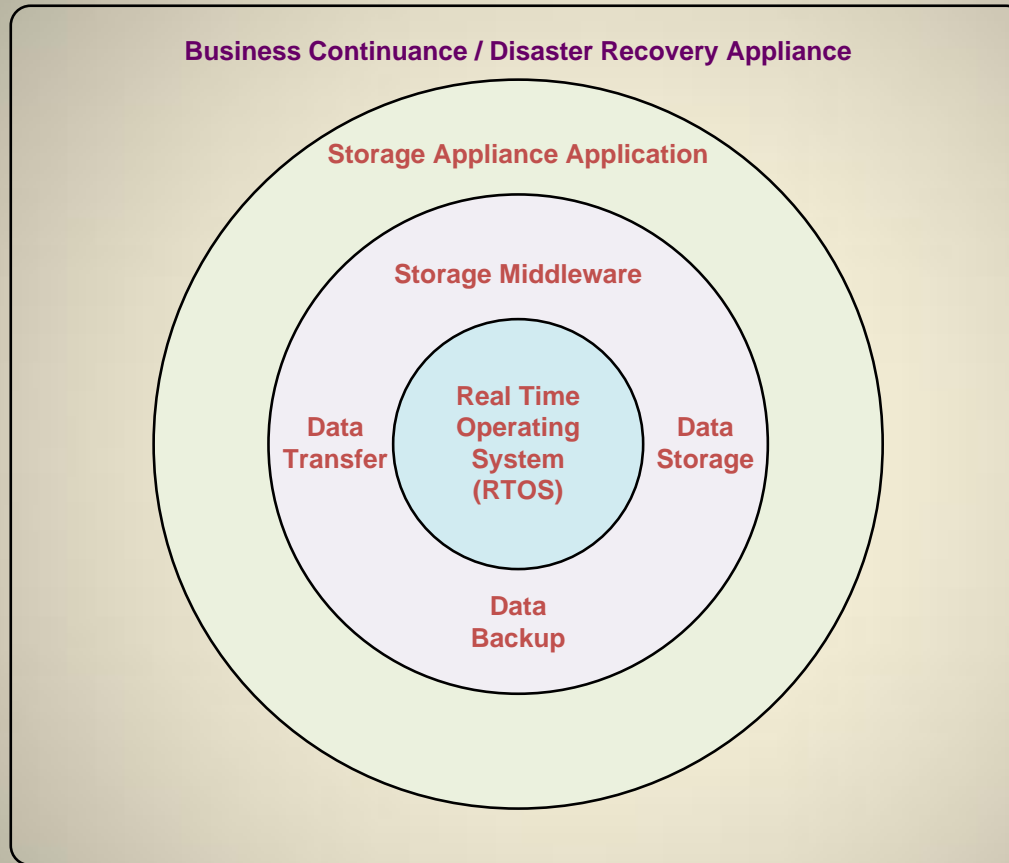
Ark Research was formed in 1995 to provide Information Technology (IT) with disaster recovery and business continuance solutions for the midrange open systems marketplace.

Ark Research was acquired by LSI Logic in 2000 to give LSI's customers remote data mirroring capabilities. Ark and LSI installed over sixty appliances worldwide at a cost of \$120,000 each. These appliances functioned in production environments without a single high severity problem. Due to business strategy changes and a severe business downturn, LSI discontinued the product in 2002. Ark Systems was formed in 2005 to reintroduce the storage and backup products to the marketplace.

Ark Systems was funded by its founder, James Bergsten, and never reached critical mass. Ark Systems has now chosen to sell its technology. Ark Systems has contracted with David Romano to complete the sale of the company.



# Technology Summary



# Proprietary RTOS

Fills the market need for a mid-range multiprocessing and multitasking RTOS. More sophisticated than existing low-end, single function RTOS offerings and simpler/easier to use than high-end, complex RTOS offerings.

Ark's Real Time Operating System has universal application – it can be used in any application incorporating computer-based devices.

Industry segments include medical, power/energy, transportation, telecommunications, information technology, manufacturing, education, entertainment, real estate, retail...



# RTOS Advantages

- Minimal development cost/NRE – easy to enhance and maintain
- Fast time-to-market - immediately bring your product to the marketplace
- Only midrange RTOS solution supporting full SMP
- Build customer base – compete against the small, migrate toward the big – lower end cheaper COGS
- Port to any hardware device
- Competition will not have “your product”
- Production-stable since 1997 - No “severity one” defect, ever!
- Architect and development team are available
- Developed locally (Silicon Valley)
- No need to license outside code
- No GPL / overseas issues



# RTOS Features

- Highly optimized for real-time processing
- Compact - small footprint (RTOS approximately 230K x86)
- Quick and fast development ("compile → link → load → boot" in under 30 seconds)
- Scalable - horizontal (multiple nodes) or vertical
- Portable - remove dependency on customers specific hardware vendor
- Simple - easy to control software process, develop, predictable, lower NRE and OPEX, faster TTM, simpler upgrade
- Robust - high quality, reliability, and provable correctness leads to easier certification
- Especially useful for critical applications
- Adds proprietary customized value to hardware offerings
- NOT a Linux/UNIX "knock off." ALL code developed in-house (Silicon Valley)



# RTOS Technical Features

- Locks, Semaphores
- “Atomic” queues
- Multiprocessing / Multitasking / Kernel/User modes
- Fast memory allocation / data structure pools / protected code/storage
- Task Scheduling / Signaling / inter-communication
- Sophisticated I/O subsystem / multipathing
- Simple Device Driver interface
- Support for FLASH, NVRAM, ATA, SATA, SCSI, FC, iSCSI...
- Full timer, alarm, timeslice, and watchdog support
- SCSI simulation and drivers (SCSI, FC, iSCSI...)
- UDP/TCP/IPv4 networking and protocols
- CLI, serial port, many debugging features
- Security / configuration
- Some POSIX / Simple API



# Storage Middleware

Fills the market need for storage application-specific middleware.

This solution fills the gap between Real Time Operating Systems and the low level storage access demands of data-oriented appliances. Today, developers need to either write or port their own hardware-dependant device drivers, or depend on those provided by the open-source user community. Such drivers tend to be buggy, have poor performance, little to no error recovery, and are not supported.

Adding this offering to your portfolio gives you a whole new market to sell to and provides a viable alternative to use of Linux/BSD, etc.



# Middleware Advantages

- Data-storage-specific middleware offering
- Another market segment!
- Another sales opportunity!
- Unique value for storage product creation – complex data access capabilities usually developed by each user are available and supported
- Fast time-to-market - immediately bring your product to the marketplace
- Can be ported to other operating systems to leverage existing customer base
- Minimal development cost/NRE – easy to enhance and maintain



# Middleware Features

- Highly optimized for real-time processing
- Robust - high quality, reliability, and provable correctness leads to easier certification
- Especially useful for critical applications
- Compact - small footprint (RTOS + Middleware + Application approx. 2MB x86)
- Quick and easy development ("compile → link → load → boot" in under 30 seconds)
- Simple - easy to control software process, develop, predictable, lower NRE and OPEX, faster TTM, simpler upgrade
- Scalable - horizontal (multiple nodes) or vertical
- Portable - remove dependency on customers specific hardware vendor
- Adds proprietary customized value to hardware offerings
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# Middleware Technical Features

- Leading vendor SCSI, Fibre Channel, SAS, ATA, SATA, iSCSI device drivers
- Initiator, Target, and “Dual-mode” SCSI support
- Multipathing
- Sophisticated error detection, correction, and reporting
- Heterogeneous, transparent host and device access
- Local and remote block-granular device virtualization
- Large, preemptive cache
- N-way volume mirroring, cascade mirroring
- Protocol translation
- Non-disruptive device testing and data migration
- No architectural restrictions – vertically and horizontally scalable



# Potential Applications

- **Blade / Storage Appliance products**

Switches, bridges, protocol converters, data migration, backup offload, tape simulation...

- **Real-time products**

Data collection, voting, kiosks, set-top boxes, home entertainment, Internet appliances...

- **Professional Services**

Data Center testing, migration, performance tuning...



# Storage Appliance Application

Software application to transfer, store, or backup data. Best described as the data storage “Swiss Army Knife” due to its tremendous flexibility.

An excellent demonstration vehicle for the power and utility of Ark RTOS and Middleware – features can be leveraged for your customers’ product requirements.

Application has real time mirroring capability, will backup to any storage media, and will connect anything to anything.

Leverages Ark RTOS and Middleware and can be ported to other operating systems.



# Appliance Advantages

- Excellent proof-of-concept to demonstrate underlying technology
- Mature business continuation and disaster recovery technology
- May be licensed to customers as a standalone offering or as a base for other development
- Backup multiple locations to one central backup location
- Reliable and easy recovery/restore
- Will connect any media to any media
- No architectural restrictions
- Minimal development cost/NRE – easy to enhance and maintain
- Fast time-to-market - immediately bring your product to the marketplace



# Appliance Features

- Heterogeneous, transparent host and device access
- Local and remote block-granular device virtualization
- Large, preemptive cache
- N-way volume mirroring, cascade mirroring
- Protocol translation
- Non-disruptive device testing and data migration
- Runs on anything - no hardware NRE
- Better margins than existing alternatives
- Immediate access to IP, bring storage appliance business in-house
- Implementation is not vendor-specific



# Reference Design - BC/DR Appliance



- Reference implementation
- Mature business continuation and disaster recovery technology
- Connects any server(s) to any storage
- No server or storage changes
- Protocol conversion
- Data migration
- Ark is a data storage "Swiss Army Knife"



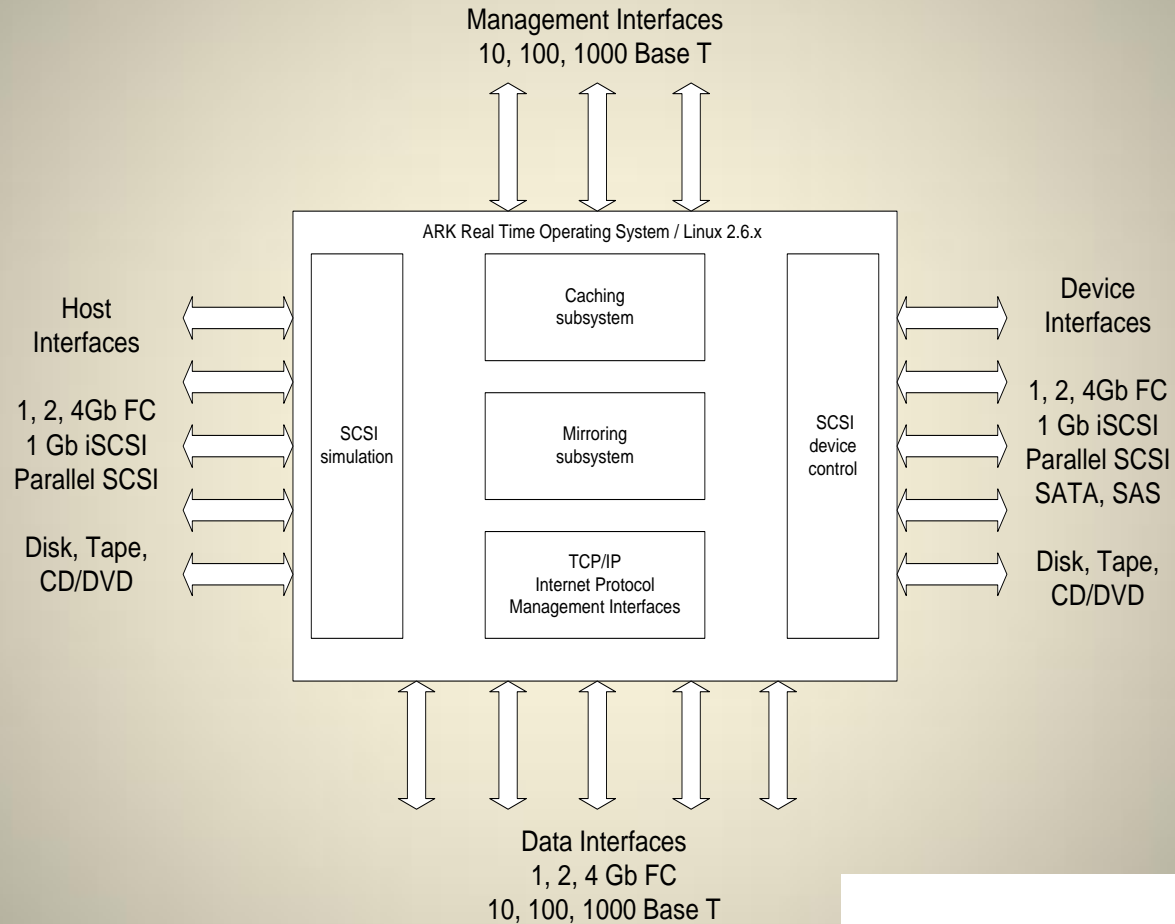
# Appliance Solutions

## Using Ark Technology...

- ✓ Bridging (shelf modules)
  - ✓ In-stream appliance to add advanced functionality to existing storage
  - ✓ Disaster recovery / business continuation
  - ✓ Virtualization, consolidation, zoning, partitioning
  - ✓ Non-disruptive data migration
  - ✓ Solid-state / FLASH disk
  - ✓ Vertical and horizontal scalability
- Product Complete
  - Documentation Complete



# Architecture



# RTOS SWOT

Strengths	Opportunities
Simple, easy development	Compete with lower end RTOS
Full-featured	Provide upgrade path
Built to be portable	Leverage data storage market
Mature	Base for middleware offerings
Easy to support / enhance	Base for BIOS offerings
Straightforward API	Cross-pollinate concepts
Acquire OS brain-trust	
Weaknesses	Threats
Not ported to PPC, ARM, MIPS	Linux
Needs polishing	Other RTOS'es
Needs documentation	



# Storage IP SWOT

Strengths	Opportunities
Full-featured	Middleware offering
Stable / mature / credible	IP for other RTOS products
Connect anything to anything	
Many potential applications	
Acquire storage-based IP	
Acquire storage brain-trust	
Weaknesses	Threats
Some drivers need updating	Existing storage vendor NIH
Middleware not “productized”	



# James R. Bergsten – Ark Founder

- 37 years computing / OS experience, 19 years in storage
- Sole inventor of 12 issued Patents
- Developed, sold 12+ hardware/software products
- Experienced with “everything” – mainframes, open systems...
- Founder of three semi-successful start-ups
- More info at <http://www.thebergstens.com/resume>



# Contact Information

## Website

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