

ALTERA®



SOPC
WORLD
2 0 0 2

Unitying the Desktop and Target

**Accelerated Technology,
Embedded Systems
Division of
Mentor Graphics**

Accelerated Technology Korea
(www.acceleratedtechnology.co.kr)

2002. 11. 6.

Accelerated Technology, Embedded Systems
Division of Mentor Graphics



Mentor Graphics

- Publicly Held: (NASDAQ: MENT)
- Founded 1981: HQ in Wilsonville, Oregon
- 3,700 Employees
- Revenues of \$600M Annually
- World-Class R&D
- 53 Locations Worldwide
- Only EDA Company with Embedded Software Focus
 - World-class embedded RTOS
 - Embedded Development Tools
 - Co-verification market leadership
 - Acquisition of Accelerated Technology strengthens this position further



Mentor Increasing Commitment to Embedded Systems

- Larger organization to help embedded systems division grow its product offering and market share
- Increased funding for Accelerated Technology products
- Experienced management team

*Mentor chose **Accelerated Technology Inc.** to provide them with the investment to dramatically increase embedded software support*

The Vision

As Mentor's Embedded Systems Division:

- Use the existing world class RTOS and tools technology to offer a unified desktop and target environment
- Give a better RTOS development environment for a royalty free RTOS than is offered by royalty-bearing RTOSs
- Continue to develop and enhance the Nucleus RTOS
 - Port to new processors and platforms
 - Provide extensive middle-ware
 - Support for new and emerging standards

Accelerated Technology

Mentor Graphics' Embedded Systems Division

*"In a simple statement, **all products** customers are using now from the combined companies will continue to be **maintained and improved.**"*

Neil Henderson,
General Manager,
Embedded Systems Division



Embedded Software Products

- Nucleus RTOS
 - Source Based Royalty Free
 - Large user-base and wide processor support
- code|lab EDE and code|lab Debug
 - Integrated development environment for embedded
 - Based on industry standard look and feel
 - Extensive connections and compiler support
- XRAY debugger
 - First embedded systems debugger
 - Multi-core support
- Microtec compilers
 - Optimizing C/C++ cross compilers
 - Intelligent linker allows most efficient use of C/C++

Nucleus Software Credentials

"Nucleus Software supports the most popular processors used in embedded applications being developed by our important customers, making Nucleus a proven solution."

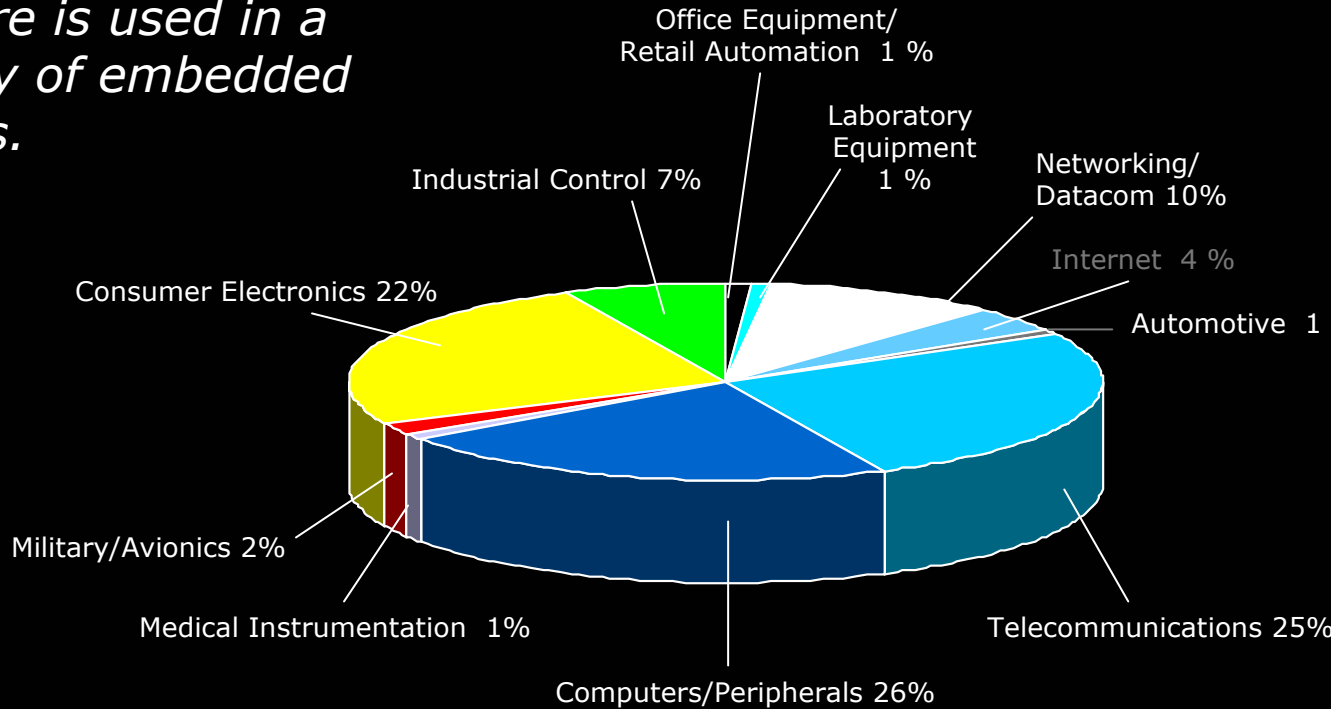
- Key Embedded Markets
- Korean Customer Applications



Key Embedded Market



Our software is used in a wide variety of embedded applications.



** Nucleus and code|lab Customer Design Wins for 2001*



Korean Customer Applications

“ Korean Customers implemented important embedded applications using Nucleus RTOS .”

PDA -- SH2, ARM7, ATMEL

PBX -- MPC860, MPC850, ARM7

Base Sys of Cell Phone -- i960Cx

CDMA Phone – ARM7, ARM9

IMT-2000 Phone -- ARM9, SA1110

Fast Ethernet Card -- MIPS, i960

Car Navigation -- 68328, ARM7

GPS Terminal -- 68360, ARM7

Satellite Sys. -- 80186, i960Cx

PLC Control -- 80186, ARM7

Web Phone – ARM7, SA1100

ISDN Phone –ARM7

GSM Phone – ARM7, TriCore, C166

**VoIP Gateway – ARM7, MPC850,
MPC860**

Bluetooth Gateway – ARM7, SH3

**Bluetooth Cordless Phone –
ATMEL**

**FingerPrint – ARM7, SA1110,
XScale**

Key Phone -- ARM7, MPC860

**DVD -- CIRRUS, MIPS, NEC,
80186, ARM9**

**WLL/Router -- i960Cx, MPC860
w/CDMA – ARM7, ARM9**

SmartPhone - ARM9

IMT-2000 Modem – ARM7

IMT-2000 Base Sys. – ARM7

Digital Camera –ARM7, ARM9

ITS – ARM7, ARM9, MCore

Gas Control -- 80386Ex

xADSL/VDSL – ARM7

DSTB -- MIPS, 68360, NEC, ARM9

CableSTB – MIPS.

Home PNA – ARM7, MPC860

Elevator -- 80186, i960

VoIP Phone – ARM7, ARM9

DTV – 68360, ARM7, C166

Customers Who Benefit...



3COM
Network Peripherals
Canon Corporation
Silicon Graphics
LAN Access Corporation
Ford Motor Company
Siemens
Texas Instruments
IBM

Nortel Networks
Navionics
Hitachi
Lucent Technologies
Bose
General Motors
Infineon Interface
Systems
Honeywell
Fujitsu
Eastman Kodak
GE Medical
Toyota
Motorola
Compaq Computers
Sony

NEC
General Electric
Xerox
Globespan
Samsung Electronics
Allied Signal
John Deere
Kenwood



Nucleus RTOS

All you need in an RTOS.
Royalty Free.



Nucleus. Embedded Software.

All You NEED in an RTOS. Royalty Free.

- Complete Product Line
- Vast CPU Support
- Royalty Free Business Model
- Source Code
- Scalable
- Proven

Kernels

Nucleus PLUS
Nucleus uiPLUS
Nucleus OSEK
Nucleus MMU
Nucleus DDL
Nucleus COM
Nucleus CAN

Prototyping

Nucleus MNT

Profiling

Nucleus ProView
SurroundView for Nucleus

C++

Nucleus C++ BASE
Nucleus C++ PLUS
Nucleus C++ NET
Nucleus C++ FILE

Network Stack

Nucleus NET
Nucleus PPP
Nucleus NAT
Nucleus SSL

Network Management

Nucleus SNMP
Nucleus RMON
Nucleus SPAN

Internet Connectivity

Nucleus WebServ
Nucleus Extended Protocol Pkg.
Nucleus EMAIL (SMTP, POP3)
Nucleus DHCP Server
Nucleus Sntp Client

Java Technology

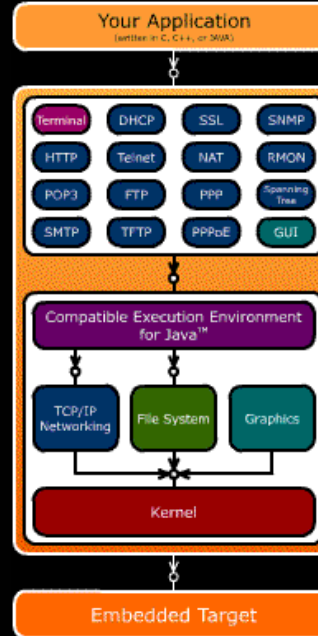
CEE-J (Virtual Machine for Embedded Devices)

Graphics

Nucleus GRAFIX
(Rendering Services/Windowing Toolkit)

File System

Nucleus FILE



Terminal Application

Nucleus SHELL

Processors Supported

68K

680x0
683xx

X86

Real Mode
Protected Mode

ARC

ColdFire

CF52xx
CF5307
CF5407

DSP

Analog Devices 21161
Share EZ
Texas Instruments
TMS320CS4x

i960

Tensilica

T1020
T1030
T1040

ARM

ARM Limited
6/7/9
(ARM and Thumb)

Atmel
40400
40807
55800
63200

Cirrus Logic
71111
72xx
7312

Hyundai
GMS C30

Intel
SA110-285
SA1110
Xscale

Samsung
50100
41000
41100
4125
8946

Texas Instrument
TI925

MIPS

MIPS Technologies
ATLAS/4Kx (Jade)

IDT
30xx
32334
46xx
4700
5000
503x

Lexra
LX4180

LSI Logic
LR33000

MiniRisc CW 40xx
TinyRisc 410x

NEC
VR41xx
VR4xxx

NKK
NR 4650

QED
RM700
SEAD/4Kx (Jade)

Toshiba
TX3904F
TX3927

PowerPC

PowerPC 40x
PowerPC 5xx
PowerPC 60x
PowerPC 7xx
PowerPC 8xx
PowerPC 8240
PowerPC 8260

Hitachi

H8
H8/300M
H8/2000
SH
SH-1
SH-2
SH-3
SH-4
SH2-DSP
SH3-DSP
SH-3 SE
SH-4 SE

M•CORE

2001
2107

National Semiconductor

CR16A/B/C
CR43A

Mitsubishi M16

C/62
C/80

NEC V8xx

V821
V830
V850
V851
V852
V853

Infineon

C167
TriCore

SPARC

Altera Nios
C-Cube 2151
C-Cube 9315
TS704



Licensing Models – Single Application



- **Standard Single Licensing Model**
 - Source Code provided on all Nucleus products
 - No Royalties charged on all embedded software
 - One-time License Fee
(development and unlimited production)
- **Single Application License Grant (3 primary factors)**
 - One embedded application
(defined by single product part number)
 - One development facility
 - One processor



Licensing Models – Standard OEM

- **Standard OEM Licensing (Semiconductor Mfg)**

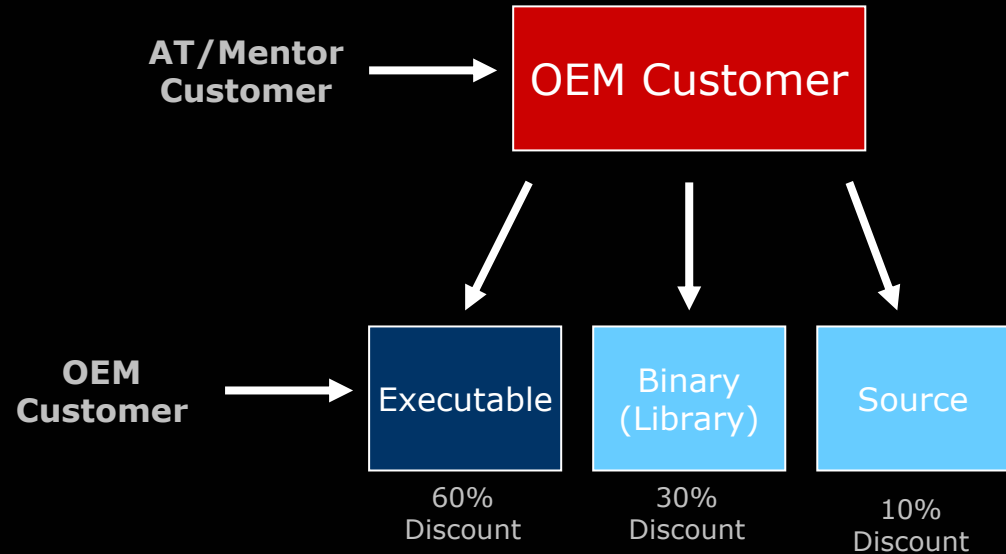
- Source Code
- No Royalties
- One-time License Fee (3x multiple)

- **OEM License Grant**

- One embedded product “family”
- One development facility
- One processor

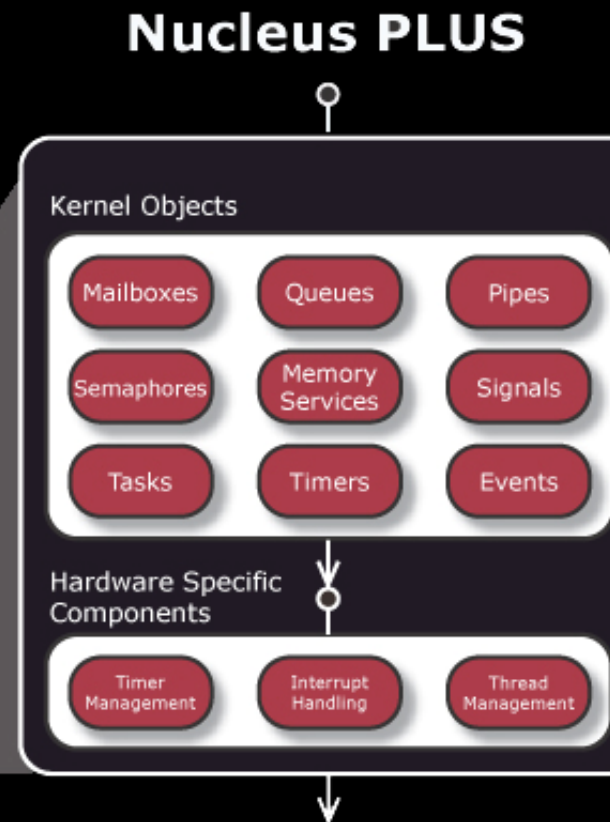
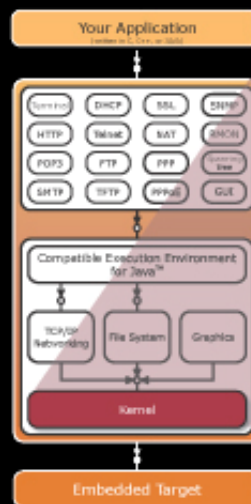
- **Sublicensing Rights**

- Source Code
- Object/Binary Code
- Executable



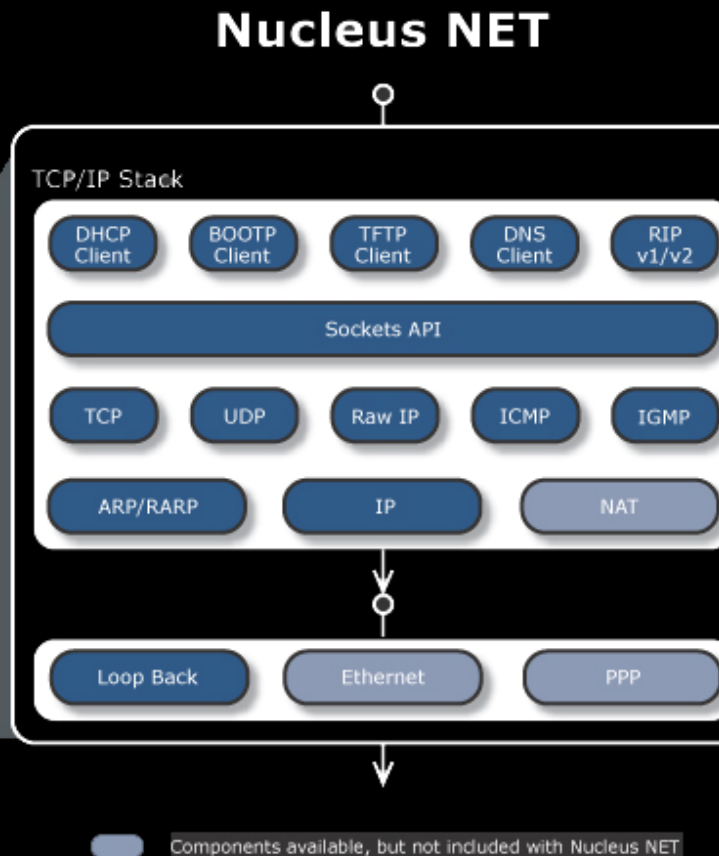
Nucleus PLUS

- Multitasking real-time kernel
- Priority, pre-emptive scheduler
- Inter-task synchronization (semaphores, signals, events)
- Memory Management (fixed or variable)
- Dynamic creation/deletion of all objects



Nucleus NET

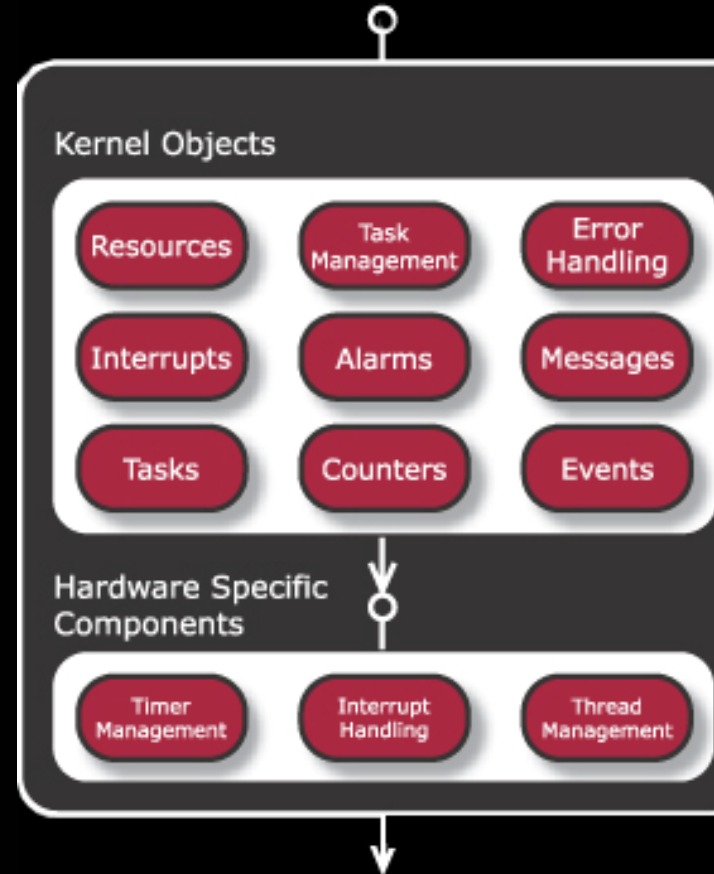
- TCP/IP Protocol Stack
- Protocols supported: BOOTP, UDP, TCP, ICMP, ARP, RARP, DNS, DHCP, IGMP, TFTP Client, RIP/RIPII
- Optional Components: PPP, Ethernet Drivers
- Minimum data copies
- Tightly integrated with Nucleus PLUS for optimal performance



Nucleus OSEK

- User-definable hook routines for error-handling and debugging
- Scalable, reliable, ROMable, and cost-sensitive operating system
- Low-level memory resource usage
- Support for all four conformance classes
- Mixed-preemptive scheduling method
- Resource and event management synchronization mechanisms
- Variant relative and absolute alarms

Nucleus OSEK

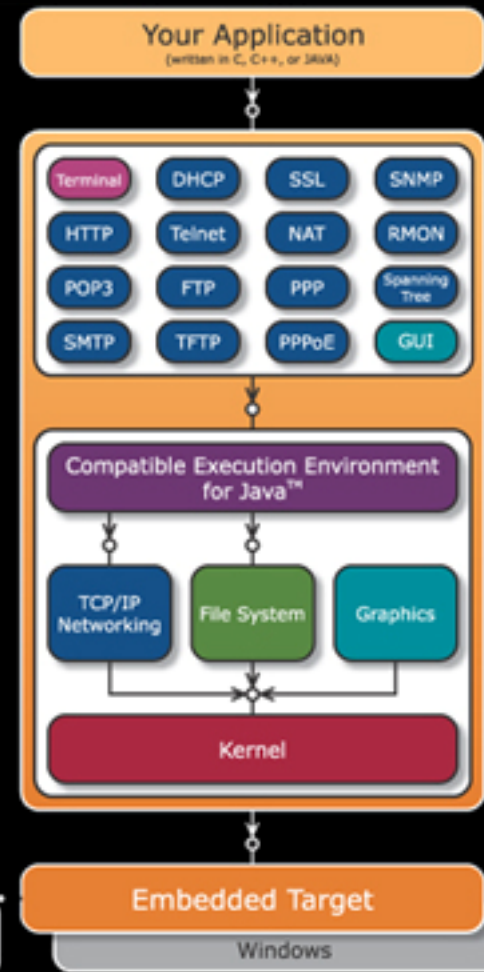
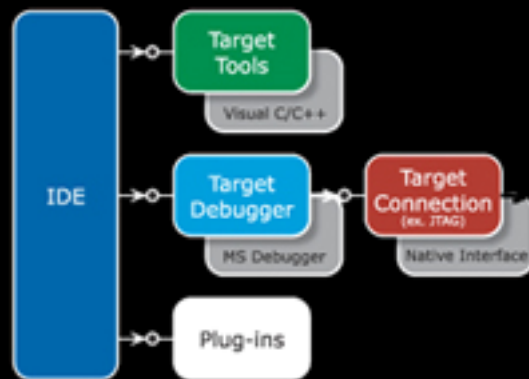


Nucleus MNT

- Every Nucleus Embedded product is available in Nucleus MNT environment:

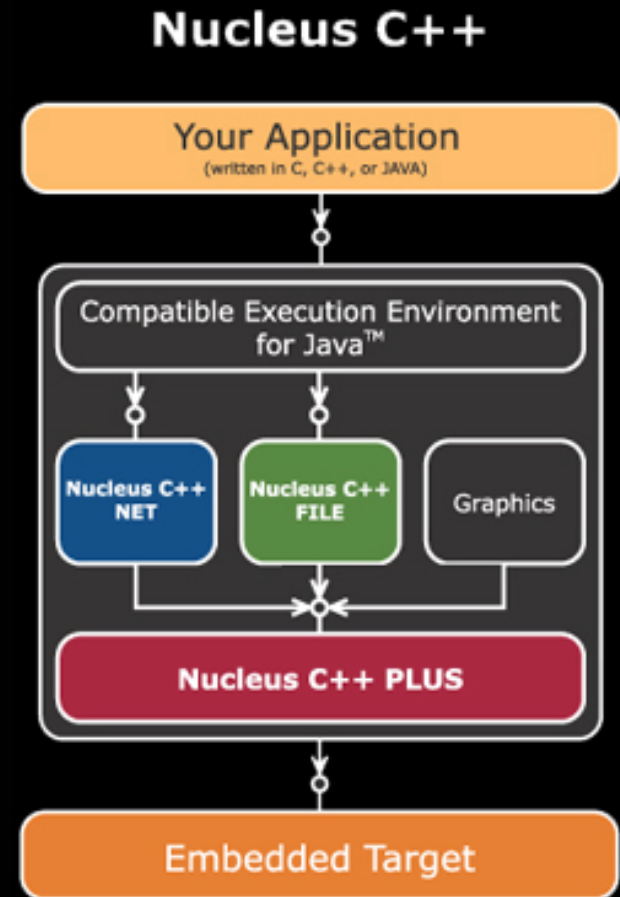
Nucleus PLUS for MNT
Nucleus NET for MNT
Nucleus GRAFIX for MNT
Nucleus WebServ for MNT
Nucleus FILE for MNT
Nucleus C++ for MNT

- Common API for Nucleus MNT and Target versions of Nucleus Products
- Based on Microsoft Visual Studio™
- Speeds development process while decreasing your time to market.



Nucleus C++

- Object-oriented interface for Nucleus PLUS
- Object-oriented approach to programming
- Objects can be statically or dynamically declared
- Service calls are handled as member functions
- Easy alternative to memory-sharing methods
- Full support for new and delete operators
- Available for any C++ compiler



Embedded Software Development Tools

A Complete Suite of Tools to
Support the Nucleus RTOS



code

lab

Embedded Developer Suite

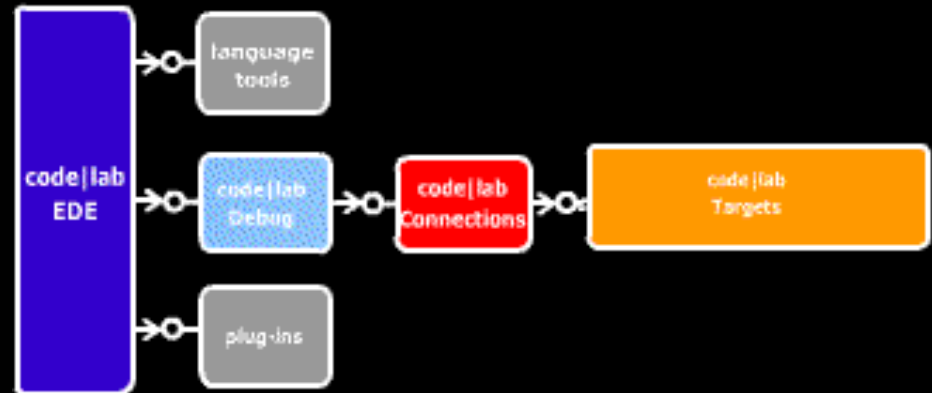
code|lab EDE

code|lab Debug

code|lab Connections

code|lab Targets

- Complete Development Environment
- Consistent Interface
- RTOS Independent



code | lab EDE

- An IDE based on Microsoft Visual Studio
- Desktop look and feel
- Project Management Dialog Box
- Includes a wide variety of compilers



code lab EDE

The screenshot displays the Nucleus IDE interface. The main window shows a C++ source file named `demo.c` with the following code:

```
void task_0_entry(UNSIGNED argc, VOID *argv);
void task_1_entry(UNSIGNED argc, VOID *argv);
void task_2_entry(UNSIGNED argc, VOID *argv);
void task_3_and_4_entry(UNSIGNED argc, VOID *argv);
void task_5_entry(UNSIGNED argc, VOID *argv);

/* Define external function prototypes */
extern void Convert_Number(char *string, UNSIGNED number);

/* Define the Application_Initialize routine that determines the
Nucleus PLUS application environment. */
void Application_Initialize(VOID *first_available_memory)
{
    VOID *pointer;

    /* Create a system memory pool that will be used to allocate
queue areas, etc. */
    NU_Create_Memory_Pool(&System_Memory, "SYSTEM",
first_available_memory, 8192, 50, NU_F...

    /* Create each task in the system. */

    /* Create task 0. */
    NU_Allocate_Memory(&System_Memory, &pointer, 1024, NU_NO_S...
    NU_Create_Task(&Task_0, "TASK 0", task_0_entry, 0, NU_NULL...
        1024, 1, 20, NU_PREEMP...

    /* Create task 1. */
    NU_Allocate_Memory(&System_Memory, &pointer, 1024, NU_NO_S...
    NU_Create_Task(&Task_1, "TASK 1", task_1_entry, 0, NU_NULL...
        1024, 10, 5, NU_PREEMP...

    /* Create task 2. */
    NU_Allocate_Memory(&System_Memory, &pointer, 1024, NU_NO_S...
    NU_Create_Task(&Task_2, "TASK 2", task_2_entry, 0, NU_NULL...
        1024, 10, 5, NU_PREEMP...
```

An "Application_Initialize" window is open, showing a list of compiler files (csc.c, dmc.c, dnce.c, dmd.c, dmf.c, dmi.c, erc.c, erd.c, eri.c, evc.c, evce.c, evd.c, evf.c, evic.c) and a list of options (Output File, Include Paths, Command File, Specifies the language, Compile only, Stop after Compiling, Stop after Preprocessing) with checkboxes. The "Argument" field contains: `-c -g -m4 -ml -DPLUS -o o\<SOURCE>.o <SOURCE>.c`. Buttons for "Show Files On Bottom" and "Add Files To Project" are visible.

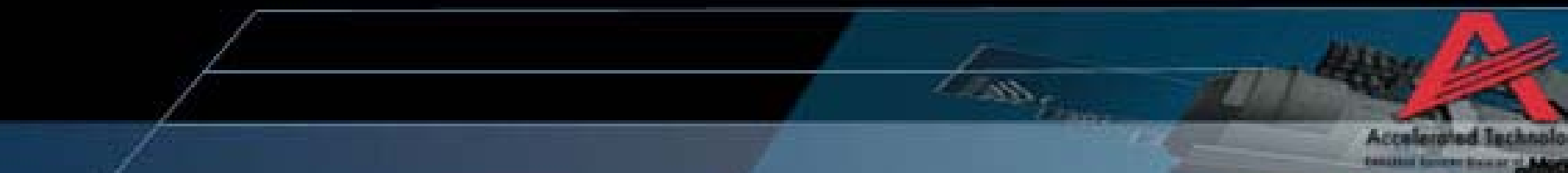
At the bottom, a command prompt window shows the configuration and compilation command:

```
Configuration: Plus_Demo - Win32 Release
.\demo.c
D:\PLUS_ATMEL40807_GNU\Plus\Demo\demo.c(58):: parse before '<='
-----GNU Tools For ARM Processors Output-----
D:\PLUS_ATMEL40807_GNU\Plus\Demo>"C:\Program Files\Arm\GNU\release\arm-unknown-elf\bin\gcc.exe" -gdwarf-2 -O0 -c
demo.c -I. -function Application_Initialize'
```



code | lab Debug

- Includes an extended set of tools for discovering problems with your code quickly and easily
- Uses many standard Windows™ capabilities
- Hardware assisted debugging available



code lab Debug

The screenshot displays the CodeLab Debug IDE interface. The main window shows the source code for a task management function. The code includes comments and logic for determining the highest priority task and scheduling the next task to execute.

```

task -> tc_ready_next =    NU_NULL;
task -> tc_ready_previous = NU_NULL;
}

/* Determine if this task the highest priority task. */
if (task == TCD_Execute_Task)
{
    /* Determine the next task to execute. */
    if (TCD_Highest_Priority < TC_PRIORITIES)
    {
        /* Put the next task to execute in TCD_Execute_Task. */
        TCT_Set_Execute_Task(TCD_Priority_List[TCD_Highest_Priority]);
    }
    else
    {
        /* No other task is ready for execution. */
        TCT_Set_Execute_Task(NU_NULL);
    }
}

/* See if the suspending task is the current thread. (SPT) */
if (task == (TC_TCB *) TCD_Current_Thread)
{
    /* Leave the task, transfer control to the system. */
    TCT_Control_To_System();
}
else
{
    /* Check for a pure suspension request. If present, the
    suspension flag is set. */
    if (suspend_type == NII_PIURE_SUSPEND)

```

Registers:

R...	Value
R0	0
R1	0
R2	0
R3	0
R4	201371764 (Tc
R5	7
R6	201394012
R7	10
R8	201344672 (QU
R9	0
R10	0
R11	0
R12	0
R13	0
R14	201386104
R15...	201386104
SR	1073741825
PC	201339960 (ta
PR	201339958 (ta
GBR	0
VBR	201326592
MACH	0

Variables:

Name	Type	Value
task_ptr	TC_TCB_STRUCT*	201370828
suspend_type	unsigned char	7 'I'
cleanup	function*	201364288 ..
information	void*	201394056
timeout	unsigned int	4294967295
task	TC_TCB_STRUCT*	201370828
index	int	1
temp	unsigned char	4 'I'

Current Task: task_1(unsigned int, voi) TCC_Task_Shell()

Memory: Address: ... ASCII ...

Line 406, Col 1 | Oh 0m 0.020s



code | lab Connections

Communication from your debugger to your target hardware

- Emulators
- On Chip Debugging
- JTAG, Nwire, and H-UDI
- Serial Connection
- Ethernet Connection



code | lab Targets

Hardware Boards and Architectural Simulators

Software Emulation - Monitor the execution of your code. Develop Assembly code and test it before your target is available.

Accelerated Technology Hardware - Hit the ground running with a range of target hardware and a number of specific CPUs supported.

Commercial Hardware - We have a number of commercial boards that we support. We also provide application notes to solve the problem of connecting the board to the debugger and getting the RTOS, or your own software, running on the boards.



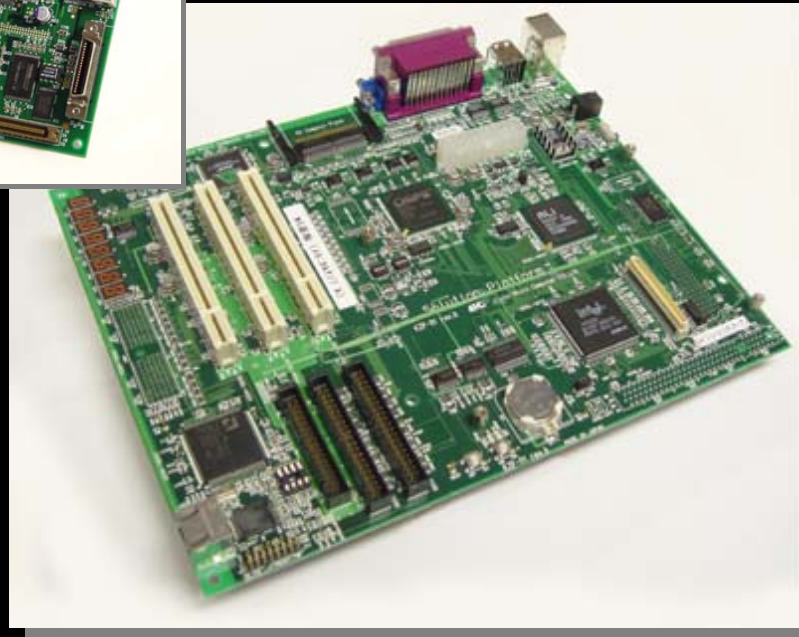
code

lab Targets

QuickStart Kit



SH4 Daughter Card



Kmc Solution Platform

code|lab Processor Support

Supported:

code|lab Partner-J (SH,
ARM, MIPS)

code|lab Monitor (ARM,
MIPS, NIOS, V85x,
XScale)

BDI (ARM)

Wiggler (ARM)

Raven (ARM)

Angel (ARM)

RDI (ARM)

MultiICE (ARM)

NEC-BOX (MIPS)

UMON (ARM, SH)

JEENI (ARM)

FS2(MIPS)

In-the-works:

ET 10A (H8/S)

ByteBlaster (ARM)

EmbeddedICE (ARM)

Planned:

Computex OCD (ARM)

MPdemon (ARM, Xscale,
MIPS, V85x)

ETM (ARM)

CodeTEST (ARM, MIPS)



XRAY Debugger

Mentor Graphics XRAY® Debugger is the key to success for all software developers using modern processors and cores in embedded and System-on-Chip (SoC) applications. XRAY brings all the benefits of an industry-standard debugger to engineers working in visibility- and resource-constrained environments.

- Powerful debugging capabilities
- State-of-the art development environment
- Powerful project management
- Industry-leading multi-core debug technology
- Heterogeneous and homogeneous target environments



XIRAY Multi-Core Debugging

- One debugger
- One debug port
- Multiple targets

- Code, register and memory windows per processor or core
- Color coding per processor and core for quick identification
- Synchronous breakpoints across processors and cores
- Simulation, JTAG, Co-verification and monitor connections
- Homogenous and heterogeneous environments

The screenshot displays the XIRAY Multi-Core Debugging interface with several windows open:

- Code = @ARM7_core:HP-Probe [Board Attached]**: Shows assembly code for the ARM7 core, including instructions like `STHDB r13!,{r4}`, `MOU r5,#0`, `LCD init();`, and `BL 0x1008`.
- Code = @ppc405gp:HP-Probe [Board Attached]**: Shows assembly code for the ppc405gp core, including instructions like `return *this;`, `};`, `serial operator<<(char *str)`, `{`, `while(*str)`, `*this << (*str++);`, `return *this;`, and `};`.
- Register = @ARM7_core:HP-Probe [Bo...]**: Shows the register window for the ARM7 core, displaying values for registers R0 through R15.
- Register = @ppc405gp:HP-Probe ...**: Shows the register window for the ppc405gp core, displaying values for registers HSR, CTR, LR, CR, FPSCR, R0 through R15.
- Managers**: Shows the Managers window, displaying active and available connections. Active connections include ARM7_core (HP-Probe, ARM HP Probe (TCP/IP)) and ppc405gp (HP-Probe, PowerPC HP Probe). Available connections include ARM7_core (HP-Probe, ARM HP Probe (TCP/IP)), ARM965 (ARMulator, Simulated Core), ppc405gp (HP-Probe, PowerPC HP Probe), and MIPS32_jade (Wiggler, Macraigor Wiggler on L...).

XRAY Processor Support

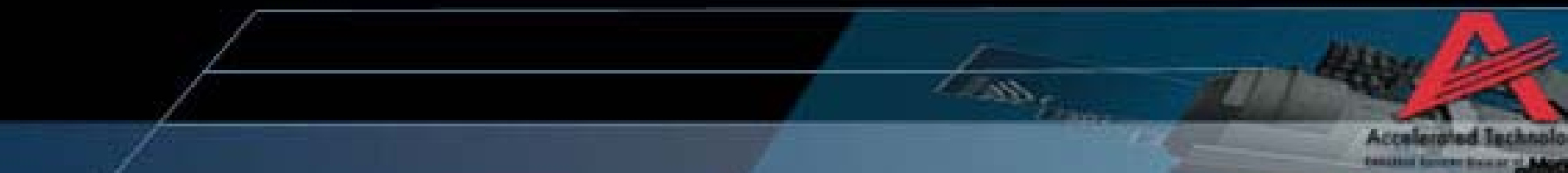
- Motorola 68xxx and Motorola CPU32
- Motorola/IBM PowerPC
- Motorola ColdFire
- ARM
- MIPS



Microtec Cross Compilers

- Advanced C++ optimizations dramatically reduce application memory usage
- Pre-compiled header files slash compile times
- Flexible code and data segmentation enables easy ROMing of applications
- C language extensions minimize the need for assembly language
- Compliance with ANSI C/C++ standards

Nucleus & code|lab Solution for ALTERA Excalibur



Nucleus and code|lab for ALTERA Excalibur NIOS1, 2

- Nucleus Software
 - Nucleus PLUS for ALTERA NIOS.
- Development Environment.
 - IDE : code|lab EDE
 - Compiler : Cygnus GNUPro Tools.
 - Debugger : code|lab Debug
 - Connection : code|lab Monitor(S/W)
 - Hardware : NIOS Board APEX EP20K200EFC484



Nucleus and code|lab for ALTERA Excalibur ARM922T

- Nucleus Software
 - Nucleus PLUS for ALTERA ARM922T.
- Development Environment.
 - IDE : code|lab EDE
 - Compiler : ARM ADS Tools.
 - Debugger : code|lab Debug
 - Connection : ByteBlaster MV(H/W)
 - Hardware : Excalibur XA10 Development Board



Technology Roadmap

A One Year Outlook
for Development Tools and RTOS

Product Technology

- Software Development Tools
 - Increase IDE functionality over multiple hosts
 - Windows and Unix
 - Support new processor cores and connection environments
 - Release new revolutionary debug technology
 - Link our products to other software development tools and test environments
 - Continue investment in compiler technology
 - Increase compatibility with other RTOS'

code|lab Debugger Evolution

codename="Opus"

- New generation of debug technology
 - Native UI's depending on host
 - MFC on Windows, Java on Unix
 - Distributed debugging
 - CORBA back-plane for efficient and extendable communications
- More portable to new targets/environments
- Increased set of processors and connections
- **All** features of code|lab and XRAY supported
 - Multi-core
 - Multitasking
 - RTOS independent

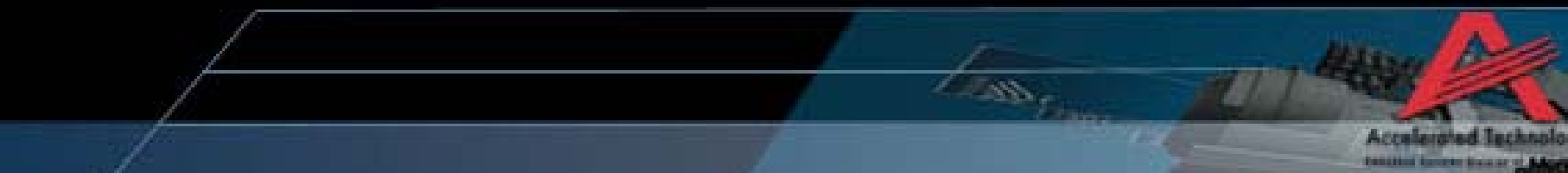


Product Technology

- RTOS
 - Increased processor and platform support
 - Additional focus on standards: OSEK, POSIX, Certifications
 - Increased middle-ware
 - Protocol stacks (e.g USB, IPv6)
 - JAVA support
 - Enhanced Web, Email, file and Graphics support
 - Nucleus PLUS 2.1

Service and Training

Helping You to Maximize Your
Efficiency Using Our Products



Outstanding Customer Service...



- Our technical support is available throughout the entire development process
 - We offer training worldwide at our locations or yours
 - Global Tracking System!
Another way that Mentor Graphics Customer Support delivers rapid, expert response to customers' technical issues
- Get a guided tour! www.mentor.com/supportne

Outstanding Customer Service...

“No one could ask for better support. Your help, and the manuals, confirm what we heard from many sources while we were shopping for an RTOS: Nucleus support is head-and-shoulders above anyone else's. Maybe even head, shoulders AND torso above anyone else's support.”

-Rick Corey, *Senior Programmer*

DPC Instrument Systems Division

Korean Training Course

- Nucleus 2 days course
 - Nucleus PLUS only
- Nucleus 3 Days course
 - Nucleus NET, Nucleus GRAFIX with 2 Days course
- Nucleus 5 Days course
 - Including Development Tools(IDE, Compiler, Debugger, etc)
Training with Nucleus PLUS training(theory and Exercise)

Why Accelerated Technology?



- Experience
- The Complete Solution
- Business Model
- Outstanding Customer Service
- Worldwide Presence
- Ability to standardize over different hosts and targets



Unifying the Desktop and Target



Accelerated Technology, Embedded Systems
Division of Mentor Graphics



Accelerated Technology
Embedded Systems Division of **Mentor**

157520 0001 0001

Thank you for your attention

Accelerated Technology Korea

2002. 11. 6

