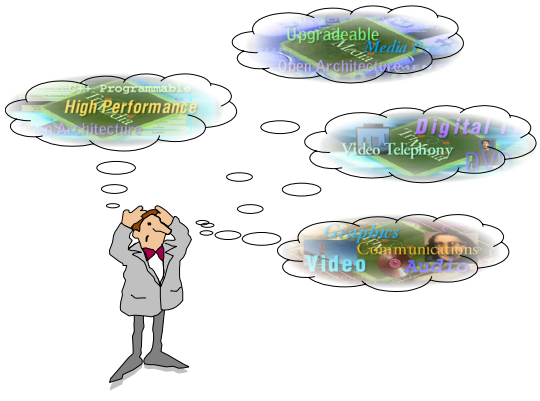
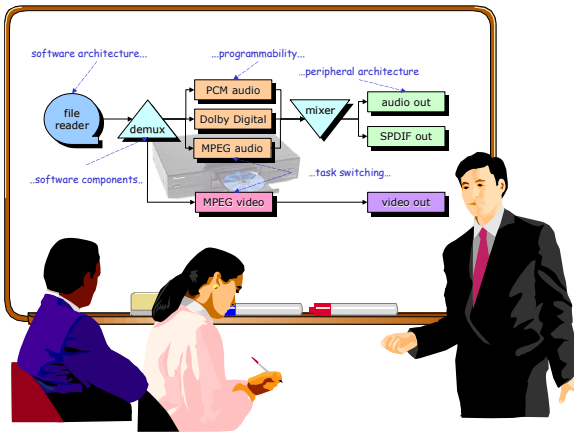
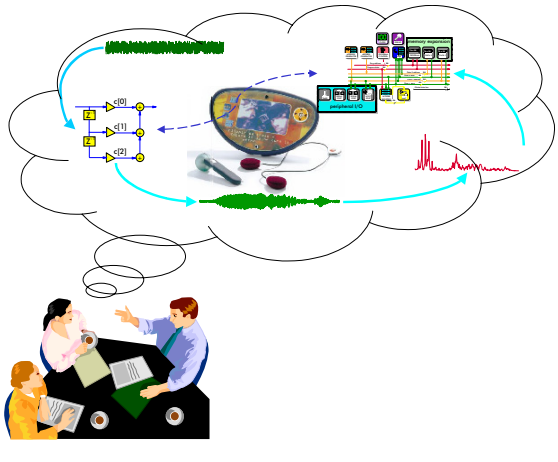
DSP and streaming media processing

Training classes







To find out more

Call us by 'phone or send email to book or to ask questions.

- contact: Dr Chris Bore
- 'phone: +44 (0)1483 740138
- mobile: +44 (0)7921 153219
- email: chris@bores.com

Training for engineers and managers working with DSP and streaming media processing

BORES Signal Processing, 'Fordwater', Pond Road, Woking, Surrey GU22 0JZ, England:
'Phone: +44 (0)1483 740138 Web site: www.bores.com email: chris@bores.com

Training classes in DSP and streaming media

Contents

Booking and questions

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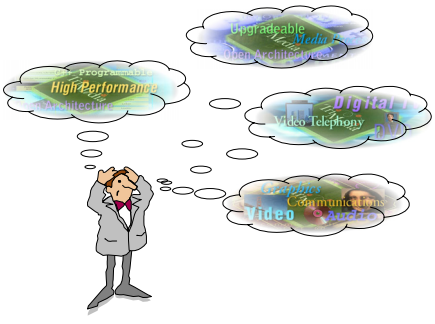
Technical training that works for you

BORES training

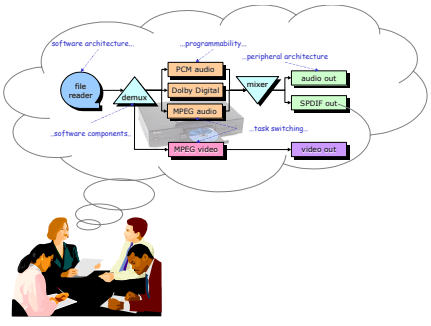
Benefits

- Get started quicker
- Work more productively
- Produce better results

Our training classes get you working quicker, faster and better. Customers agree they are effective and practical.



Need to know?



Know what you need.

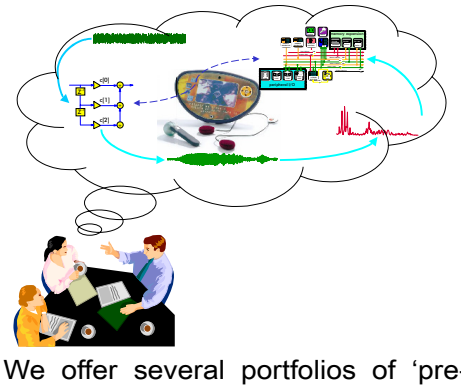
Expert guidance

In any project you must learn before you can start. Most project teams make do with books, documentation and the Internet. So why take our professional training?

Socrates knew the value of teaching: he said that a book gives you the same answer every time you ask: but an expert can explain, and guide, and advise.

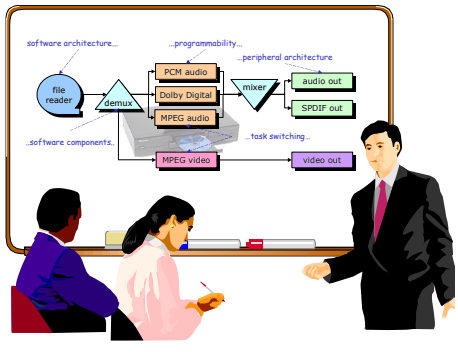
We apply years of experience, and recognised skill at communicating, to getting you up to speed fast. In just a few days we can lead you through insight, understanding and practical tips that might otherwise take months to gain: and we can correct misunderstandings that might cost months of delay.

Training classes



We offer several portfolios of 'pre-packaged' seminar series: and we can adapt any or all of these to the needs of your own company by arrangement. We also offer to create and present custom seminars, or design an overall program of knowledge transfer, for your company's specific and unique needs.

Foundation classes



'Foundation' classes offer a thorough treatment of all aspects of a field. They are pre-planned based on our experience of what people most often need to know.

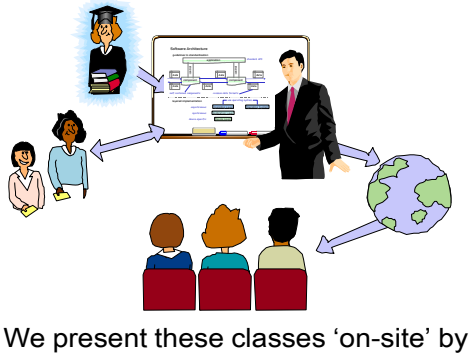
Pic'N'Mix classes

Specific classes focus on one aspect of a field. You can "Pic'N'Mix" these classes to tailor a custom class for your own specific needs.

Contact us for details and advice:

chris@bores.com

On-site

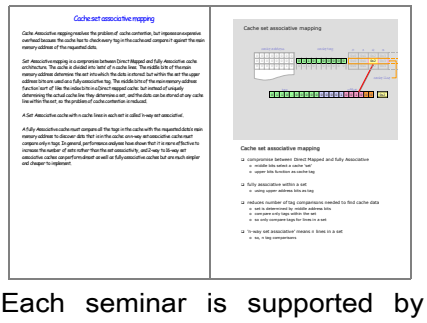


We present these classes 'on-site' by arrangement. This encourages you to involve a whole team and so benefit from common shared learning.

Adapting to your needs

All our seminars can be adapted to your specific needs: call and discuss this with us. We can also create custom seminars, or create a program of knowledge transfer, to order.

What you get



Each seminar is supported by excellent handouts which include copies of all the slides: plus, full supporting written notes, and summarising bullet points to assist in revising the slide-based material. And we keep in touch with attendees afterwards.

To find out more

Call us by 'phone or send email to book or to ask questions.

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- 'phone: +44 (0)1483 740138
- mobile: +44 (0)7921 153219
- email: chris@bores.com

Make contact

We will discuss your needs and offer advice and suggestions. If you want an adapted seminar we will agree the contents and a schedule, prepare the seminar and supporting notes, and present the seminar.

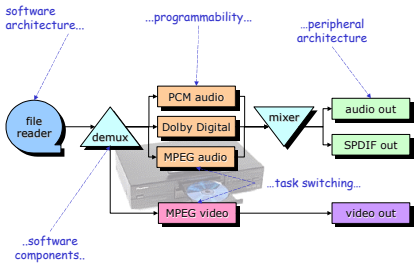
What you get is what you need

What you get

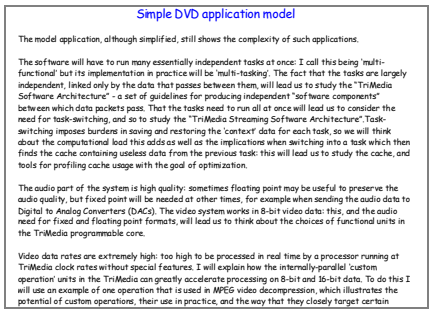
Benefits

- Clarity
- Simplicity
- Completeness

Our classes are clear, simple to follow, and complete: backed up with copies of slides and other materials, plus full written notes.



Clarity


Simple DVD application model

The model application, although simplified, still shows the complexity of such applications.

The software will have to run many essentially independent tasks at once: I call this being 'multi-functional' but its implementation in practice will be 'multi-tasking'. The fact that the tasks are largely independent, linked only by the data that passes between them, will lead us to study the "TriMedia Software Architecture" - a set of guidelines for producing independent "software components" between which data packets pass. That the tasks need to run all at once will lead us to consider the need for task-switching, and so to study the "TriMedia Streaming Software Architecture".Task-switching imposes burdens in saving and restoring the 'context' data for each task, so we will think about the computational load this adds as well as the implications when switching into a task which then finds the cache containing useless data from the previous task: this will lead us to study the cache, and tools for profiling cache usage with the goal of optimization.

The audio part of the system is high quality: sometimes floating point may be useful to preserve the audio quality, but fixed point will be needed at other times, for example when sending the audio data to Digital to Analog Converters (DACs). The video system works in 8-bit video data: this, and the audio need for fixed and floating point formats, will lead us to think about the choices of functional units in the TriMedia programmable core.

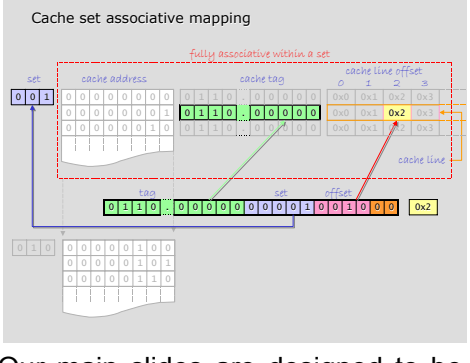
Video data rates are extremely high: too high to be processed in real time by a processor running at TriMedia clock rates without special features. I will explain how the internally-parallel 'custom operation' units in the TriMedia can greatly accelerate processing on 8-bit and 16-bit data. To do this I will use an example of one operation that is used in MPEG video decompression, which illustrates the potential of custom operations, their use in practice, and the way that they closely target certain

Communication

Completeness

Our classes are not just 'PowerPoint™' slides of bullet points. Slides are fully explained by an expert presenter, and backed up with copies and with full written notes to consult afterwards.

Good use of slides



Our main slides are designed to be explained by the presenter. They are usually diagrammatic and not 'bullet points': this makes best use of having a 'live' presenter.

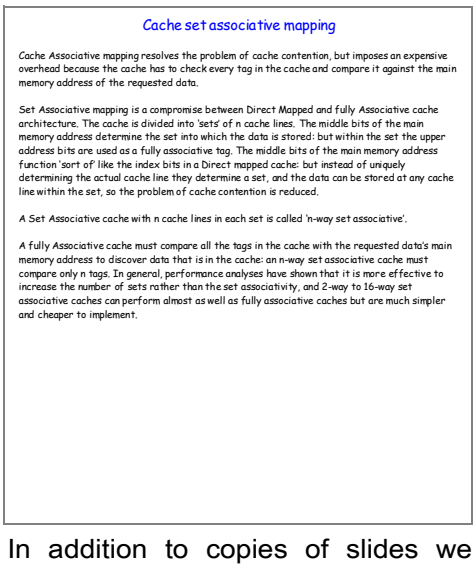
Text summaries

Cache set associative mapping

- compromise between Direct Mapped and fully Associative
  - middle bits select a cache 'set'
  - upper bits function as cache tag
- fully associative within a set
  - using upper address bits as tag
- reduces number of tag comparisons needed to find cache data
  - set is determined by middle address bits
  - compare only tags within the set
  - so only compare tags for lines in a set
- 'n-way set associative' means n lines in a set
  - so, n tag comparisons

Bullet points follow each main slide. They summarise but are not used as prompts for the presenter to read out. They are helpful to people whose first language is not English.

Full written notes


Cache set associative mapping

Cache Associative mapping resolves the problem of cache contention, but imposes an expensive overhead because the cache has to check every tag in the cache and compare it against the main memory address of the requested data.

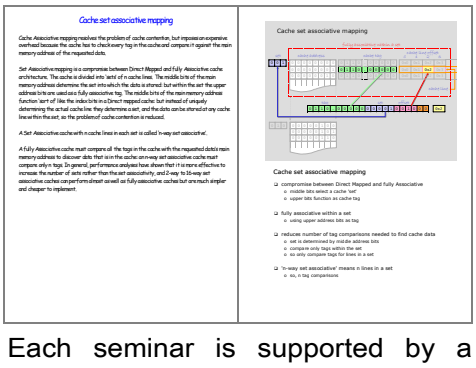
Set Associative mapping is a compromise between Direct Mapped and fully Associative cache architecture. The cache is divided into 'sets' of n cache lines. The middle bits of the main memory address determine the set into which the data is stored: but within the set the upper address bits are used as a fully associative tag. The middle bits of the main memory address function 'sort of' like the index bits in a Direct mapped cache: but instead of uniquely determining the actual cache line they determine a set, and the data can be stored at any cache line within the set, so the problem of cache contention is reduced.

A Set Associative cache with n cache lines in each set is called 'n-way set associative'.

A fully Associative cache must compare all the tags in the cache with the requested data's main memory address to discover data that is in the cache: an n-way set associative cache must compare only n tags. In general, performance analyses have shown that it is more effective to increase the number of sets rather than the set associativity, and 2-way to 16-way set associative caches can perform almost as well as fully associative caches but are much simpler and cheaper to implement.

In addition to copies of slides we provide a full set of written notes that complement the presentation and provide a way to revise later.

Supporting books



Each seminar is supported by a printed book which contains copies of the slides shown, bullet points to summarise, and full written notes. The books provide a valuable resource to revise and refresh your memory later.

Keeping in touch

We encourage students to keep in touch following a class. This can be through email or 'phone contact, for advice or with questions on the class material.

Student Forum

We support an Internet Forum that helps students to keep in touch after a class. The Forum is updated with new information, and serves as a useful place for students to ask questions later on and to look up previous questions and answers.

Certificates

Successful completion of our classes is recognised with certificates of achievement.

Booking and questions

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About us

BORES Signal Processing train managers, engineers and programmers to understand and use DSP and streaming media processing.

- established 17 years
- excellent reputation
- worldwide activities
- www.bores.com

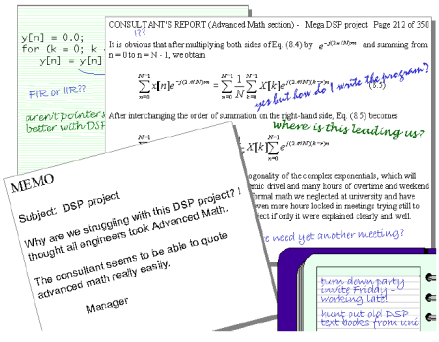
DSP Foundation class: a 4-day class

DSP Foundation

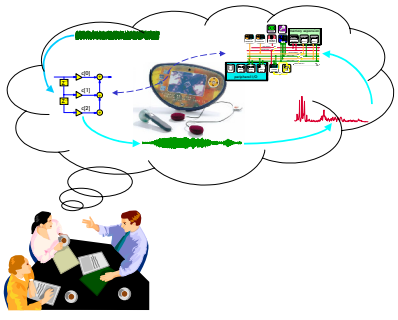
Benefits

- Understand DSP
- Write DSP programs
- Apply DSP properly

You will learn to apply DSP to real-world design problems, make well-informed design choices, and write DSP programs.



From academic dream...



...to practical reality

Contents

In this class we show why, when and how to apply DSP in real practical situations. The class offers insight and understanding without getting bogged down in math. We take a practical approach, considering from the outset computational load and limitations of implementation on real hardware.

Introduction to DSP

Learn about DSP including its advantages, applications and limitations.

- Why and when to use DSP
- Sampled data systems
- Aliasing and antialiasing
- Reconstruction
- Practical limitations
- Frequency & amplitude resolution
- Quantization and timing errors
- Correlation and convolution
- Frequency analysis
- Fourier transforms
- Frequency 'leakage'
- Windowing

C programming for DSP

Learn the basics of DSP programming in C.

- DSP data types
- Complex numbers
- DSP hardware
- Pointers and buffering

FIR digital filters

Learn how FIR digital filters are used, how to implement them efficiently on DSP hardware and how the aim of efficient implementation affects design choices.

- FIR filter basics
- Analysis of FIR filters
- Frequency & impulse responses
- The window design method
- Optimization design methods
- Parks-McLellan equiripple design
- Practical limitations of FIR filters
- DSP processors
- FIR programming in C
- FIR programming for a DSP

IIR digital filters

Learn why IIR filters fail so often when implemented on real DSP hardware. Understand the practical limitations when implementing on limited precision hardware, and learn how to avoid the common pitfalls.

- IIR filter basics
- Analysis of FIR filters
- Frequency & impulse responses
- IIR filter design
- Poles. zeroes and filter response
- IIR design models
- IIR filter programming
- Finite precision implementations
- Problem of quantization feedback
- Design workarounds & structures
- Group and order IIR sections
- Debunking nonsense

Time and arrangements

This class takes 4 days.

It is presented 'on-site' by arrangement - the material can be adapted if you have specific needs (at extra cost).

Sometimes we arrange 'public' classes: schedules are posted on the Internet:

http://www.bores.com/schedule.htm

Pic'N'Mix

'You can design a class to suit your specific needs. Each topic in this DSP Foundation class can be a self-contained session, from which you can "pic'n'mix" to make your own class.

Contact us for details and advice:

chris@bores.com

Booking and questions

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About us

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- established 17 years
- excellent reputation
- worldwide activities
- www.bores.com

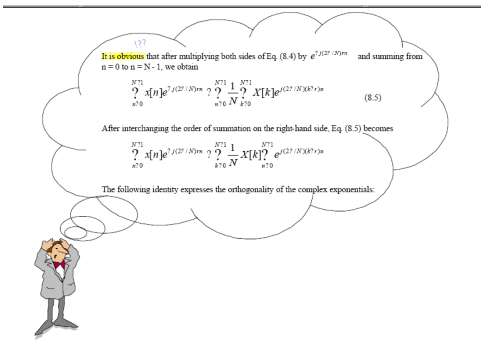
Introduction to DSP class: a 1-day class

DSP Foundation

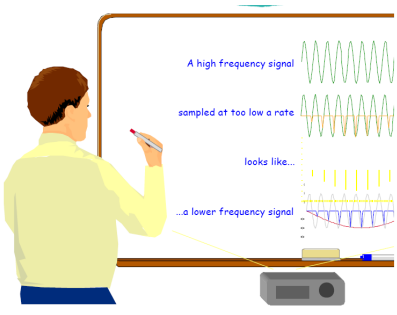
Benefits

- Understand DSP principles
- Make better DSP design choices
- Apply DSP properly

Learn real-world DSP. Put DSP principles into practice and understand their realities and limitations.



Too much theory?



Get practical

Contents

In this class we explain DSP including its advantages, applications and limitations, with a focus on practical questions.

DSP basics

Learn when and how to apply DSP correctly and productively, through a good grasp of the fundamentals of the subject.

- When and why to use DSP
- Converting analogue signals
- Sampled data systems
- Data representations
- Complex numbers
- Typical DSP signals
- Aliasing and antialiasing
- Reconstruction

Practical limitations

Know the real practical limitations of DSP and avoid common pitfalls.

- Frequency resolution
- Amplitude resolution
- Neglected effects of bad timing
- Quantization noise
- Sampling and aliasing

Time domain processes

Understand the basic time-domain processes and their applications.

- Correlation and convolution
- Detecting signals in noise
- Identifying signals
- Finding a reference signal

Frequency analysis

Fourier transform theory is easier than you think: practice is harder than you think. We clarify this crucial area and show how you can apply these techniques in practical ways.

- Spectral analysis
- Convolution
- Short Fourier transforms
- Frequency resolution
- Fourier transform limitations
- FT assumption of periodic signals
- Effects of short-duration signal
- Frequency ‘leakage’

Windowing

Windowing is important in FT analysis and in filtering. We explain how windows work and what they do.

- The basis for windowing
- Improving frequency resolution
- Unwanted side effects

Filtering

Filtering is the most common application of DSP. We give you insight into what it does, how it works, and how to do it.

- FIR and IIR filters
- Impulse and frequency responses
- Introduction to FIR filter design
- Introduction to IIR filter design

Time and arrangements

This class takes 1 day.

It is presented ‘on-site’ by arrangement - the material can be adapted if you have specific needs (at extra cost).

Sometimes we arrange ‘public’ classes: schedules are posted on the Internet:

http://www.bores.com/schedule.htm

DSP Foundation

‘Introduction to DSP’ is self-contained but we recommend it be taken as part of our 4-day ‘DSP Foundation’ class that covers DSP, FIR and IIR filters, and C programming.

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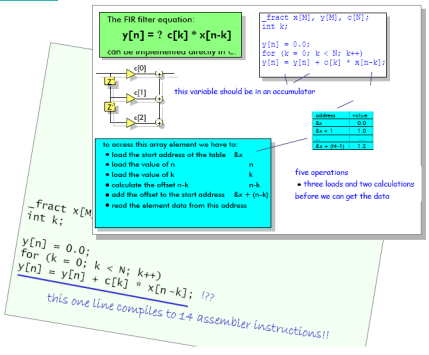
FIR digital filters class: a 1-day class

DSP Foundation

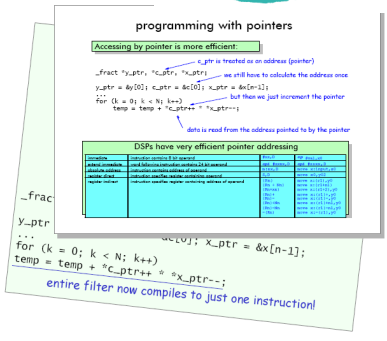
Benefits

- Understand FIR filters
- Design FIR filters
- Program FIR filters

Learn why and how to design, implement and use FIR filters: with a focus on efficient implementation using DSP hardware.



From poor design..



..to good design

Contents

In this class we explain how FIR filters are designed and used. We also give clear guidance on how to write programs for FIR filters that are efficient when implemented on typical DSP hardware.

FIR filter basics

We review the basics of FIR digital filtering, especially with regard to practical effects.

- Linear Filters
- Finite Impulse Response filter
- Filtering to smooth a signal

Analysis of FIR filters

We explain how to analyze the FIR filter operation, and how to calculate impulse and frequency responses.

- Fourier transforms
- Spectral analysis
- Fourier analysis of FIR filtering
- Filtering in frequency
- FIR frequency response
- Naive FIR filter design

Practical limitations

Understand the limitations and compromises faced in practical design situations.

- Effect of limited filter length
- Frequency resolution
- Broadening of frequency shape
- Frequency response leakage

Windowing

Windowing is an important design method for FIR filters. We explain how and why it works, and when it should be used.

- What windowing does
- Filter sharpening by windowing
- Window method of FIR design
- How windows shape the filter
- Problems of window designs
- Typical window design functions

FIR design by optimization

We introduce the idea of mathematical optimization methods of filter design, taking the Parks-McLellan design as an example.

- Window design as non-optimal
- Iterative FIR design optimization
- Parks-McLellan equiripple design

Filter programming

We develop an FIR filter program, from inefficient C to an optimal implementation in DSP assembly language.

- DSP processor operations
- A typical DSP core
- Naive FIR filter in C
- Efficiency gain of using pointers
- Using multiple memories
- Placing data in assembler
- Efficient C filter example
- Assembler multiply/accumulate
- Programming parallel operations
- Optimal DSP filter program

Time and arrangements

This class takes 1 day.

It is presented 'on-site' by arrangement - the material can be adapted if you have specific needs (at extra cost).

Sometimes we arrange 'public' classes: schedules are posted on the Internet:

http://www.bores.com/schedule.htm

DSP Foundation

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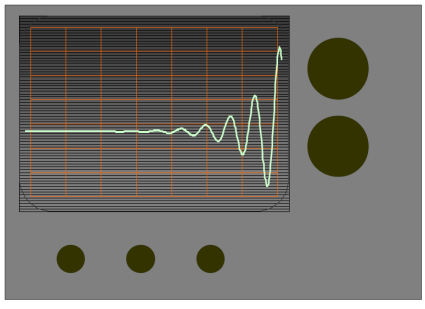
IIR digital filters class: a 1-day class

DSP Foundation

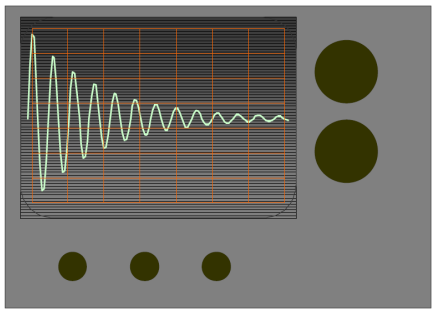
Benefits

- Analyze IIR filters
- Avoid common pitfalls
- Understand IIR implementation

Learn why and how to design, implement and use IIR filters: and how to make sure they really do work as you expect.



From 'should' work..



..to 'would' work

Contents

In this class we explain how IIR filters are designed and used.

IIR filter basics

We review the basics of IIR digital filtering, especially with regard to practical effects.

- Linear IIR Filters
- Filtering to smooth a signal

Analysis of IIR filters

We explain how the IIR filter operation can be analysed, and show how the impulse and frequency responses are calculated.

- Fourier transforms
- Spectral analysis
- Fourier analysis of IIR filtering
- IIR frequency response

IIR filter design

We explain why the problem of IIR filter design has never been solved We also give useful ways to relate filter response to poles and zeroes.

- Interpretation of z domain
- Poles, zeroes and filter response
- Design by impulse invariance
- Bilinear transform design

IIR filter programming

We present a program to implement an IIR filter, and show how this must be modified in order to actually work.

- A simple IIR filter program

Practical limitations

We analyse and explain the limitations and compromises faced in practical design situations, especially the difficult problems posed by implementing on hardware with finite precision arithmetic.

- Finite precision and quantization
- Fixed and floating point formats
- Precision and dynamic range
- The advantage of floating point
- Why floating point is faster too
- Quantization feedback
- Impracticality of high order filters

Design workarounds

We present ways to work around the practical limitations of implementing IIR filters, and show how the different implementation structures arise to address different problems.

- Why we use 2nd order sections
- effects of scaling and quantization
- Parallel and cascade structures
- group poles and zeros in sections
- How to order the sections
- Filters as block diagrams

Debunking nonsense

Some utter nonsense is talked regarding IIR filters. We review some dangerous notions and help to dispel some myths.

- Cascade & transposed structures
- The non-equivalence of structures
- Why most IIR filters go wrong

Time and arrangements

This class takes 1 day.

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DSP Foundation

'IIR digital filters' is self-contained but we recommend it be taken as part of our 4-day 'DSP Foundation' class that covers DSP, FIR and IIR filters, and C programming.

Contact us for details and advice:

chris@bores.com

Booking and questions

Call us by 'phone or send email to book or to ask questions.

- contact: Dr Chris Bore
- 'phone: +44 (0)1483 740138
- mobile: +44 (0)7921 153219
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About us

BORES Signal Processing train managers, engineers and programmers to understand and use DSP and streaming media processing.

- established 17 years
- excellent reputation
- worldwide activities
- www.bores.com

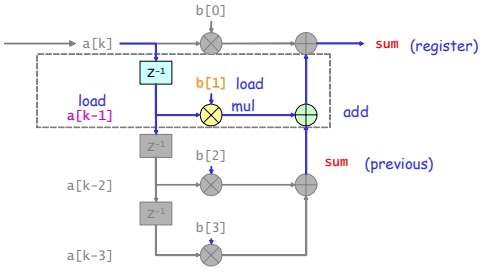
DSP programming class: a 1-day class

DSP Foundation

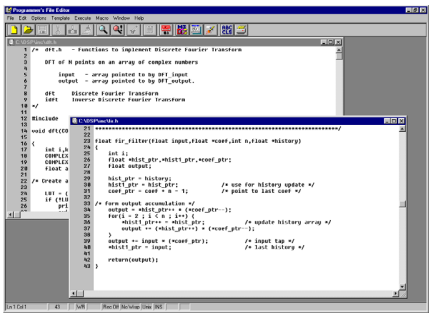
Benefits

- Relate C to DSP operations
- Program DSP efficiently
- Write DSP functions

Learn to write C programs that relate well to DSP operations, and that will run efficiently when compiled for DSP hardware.



See DSP...



..as C DSP

Contents

In this class we relate C programming to the DSP operations that we are implementing, with special reference to efficiency and appropriateness.

DSP data types and math

Learn the data types and 'data packets' that are suitable for DSP, and the special math associated with complex numbers.

- Data types
- Data structures
- Pointers
- Arrays
- Data packets
- Complex numbers

Operators for DSP

Learn the C operators most used in DSP, their order of evaluation, and how they relate to typical DSP hardware.

- Arithmetic
- Multiply/accumulate
- Logic
- Pointer arithmetic

DSP hardware

Know about DSP hardware and compilers, and understand what techniques make sense for each.

- Traditional DSP
- VLIW
- Compilers

Programming example

Follow a typical DSP program, step-by-step, from an initial simple version through various stages of optimization, and understand the compromises and advantages of each stage.

- FIR program
- Real-time issues
- Use of registers
- Use of pointers
- Using DSP hardware parallelism
- Going too far
- Data packets and structures
- Data buffering
- Pipelines and filters
- Component-based models

Example programs

We present and explain some example programs that implement common DSP functions.

- Signal generation
- Correlation and convolution
- FIR filtering
- IIR filtering
- Fourier Transforms
- Generating window functions
- Applying window functions
- FIR filter design
- Floating point and integer

Time and arrangements

This class takes 1 day.

It is presented 'on-site' by arrangement - the material can be adapted if you have specific needs (at extra cost).

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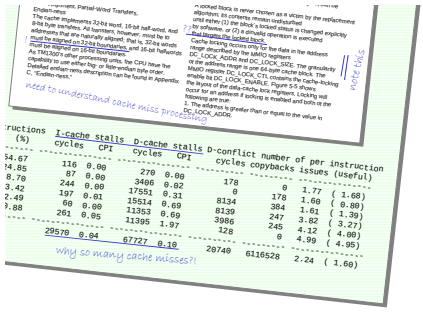
DSP cache architectures and optimization

DSP Extension

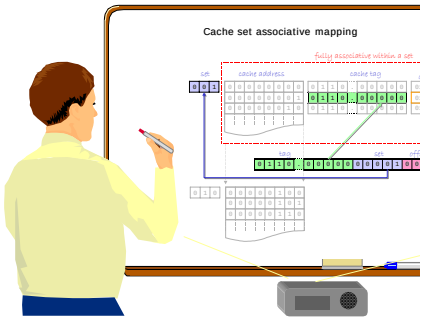
Benefits

- Understand cache architectures
- Optimize cache usage
- Avoid cache pitfalls

Learn how to write programs that use cache architectures efficiently, and avoid common pitfalls.



Missing something?



We show you the map

Contents

We describe and explain cache architectures and their impact on program execution speed. We also explain the question of 'cache coherency due to the operation of peripherals that bypass the cache to access memory directly.

Cache architecture

Learn the background to cache design including how and why caches can increase program execution speed. Including consideration of how certain types of pattern in data access can be very efficiently handled by caching, and when caching may be inappropriate.

- Purpose of a cache
- Temporal and spatial locality

Cache coherency

Understand cache coherency and how to cope with it.

- Cache coherency
- invalidation and copyback

Cache mapping

Learn how data is mapped into a cache: and the compromises that have to be accepted in the interests of economy and their impact on performance.

- Cache mapping
- Direct mapping
- Associative mapping
- Set associative mapping
- Sets and ways

Cache hits and misses

How a cache handles cache hits and cache misses (i.e. when data is not found already in the cache). Including explanation of what happens when a cache miss occurs, and an indication of how to calculate and measure the delays involved.

- Cache search mechanisms
- Least Recently Used status
- Copyback and copythrough
- Cache hits and misses
- Dirty and invalid status
- Pre-fetching
- Mini-caches
- Cache levels

Cache profiling

Tools to measure and estimate the effect of cache.

- Cache profiling
- Software tools for cache profiling

Optimization

Learn to make best use of caches, by organising your data and by arranging the flow of execution within your programs to take best advantage of the cache and register files available.

- The memory hierarchy
- Using the register file
- Data size
- Cache lines
- Data organization
- Cache sets and ways
- Optimizing for cache ways

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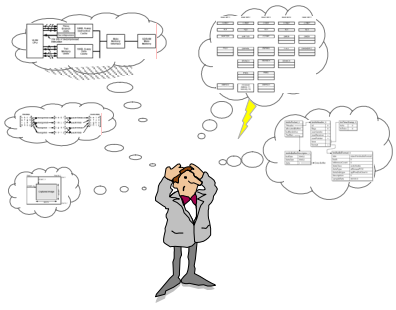
S/W Component Architectures: a 1-day class

DSP Extension

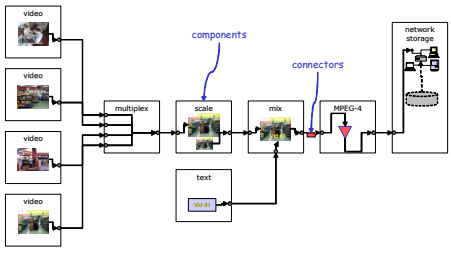
Benefits

- Understand component s/w
- Use & implement COM
- Specify and design components

Learn to design, specify and use component-based software architectures for DSP and streaming media applications.



Losing your composure?



Use components.

Contents

In this class we explain the fundamental principles of software component-based architectures, especially for DSP and streaming media processing. We also introduce models for implementation including embedded COM. And we lay out guidelines for decomposing an application into components.

Component architectures

Learn the basis for software component architectures and the different models that can be applied.

- Principles of component models
- Streaming media
- Connection management
- Pipelines and filters
- Buffering streaming data
- Multitasking
- Decomposing an application
- Component API usability

Interfaces

Understand how the idea of interfaces aims to separate specification from implementation and to allow re-use of components. Know how to decompose complex interfaces into hierarchies and interface suites.

- Components
- Contracts
- Interfaces
- Interface suites
- Interface naming
- Notifications

Embedded COM

We outline a model for an embedded implementation of Microsoft's Component Object Model (COM), and compare this with other possible component models.

- Component Object Model
- Pros and cons of embedded COM
- COM function tables
- Creating components with COM
- Getting interfaces
- Standard interfaces
- Interface navigation
- Need for custom navigation
- Sub-components
- Implementing embedded COM
- Implementing interface calls
- Implementing component creation

Example implementation

An in-depth look at a example implementation of DSP/streaming media component model - the Universal Home API (UHAPI).

- UHAPI context and scope
- Connection management
- Use cases
- Sample application
- Creating components
- Interface navigation
- Standard interfaces
- Notifications
- Implementation

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- Universal Home API
- TriMedia Foundation

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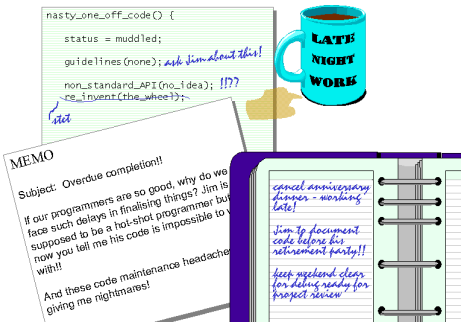
API usability for DSP: a 1-day class

DSP Extension

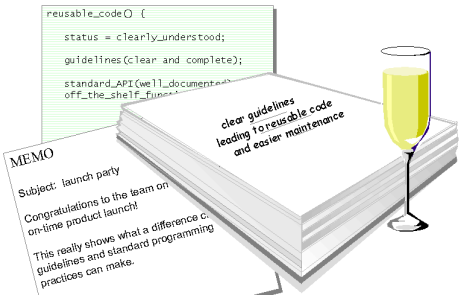
Benefits

- Assess API usability
- Design more usable APIs
- Understand usability discussions

Learn to assess the usability of an API, to design more usable APIs, and to discuss API usability in a well-informed way.



Unusable?



Or usable?

Contents

In this class we discuss the measure of 'usability' for an API in terms of the time it takes to learn about it, and to complete tasks using it. We outline simple but effective ways to assess the relative usability f an API, and set out guidelines for designing with usability in mind.

API usability

Understand what is meant by 'usability', how to measure it quickly and how to use this information.

- Usability
- Usability applied to an API
- Profiling API usability
- Guidelines for usable APIs

Profiling API usability

We explain how usability is measured, and relate this to traditional guidelines on programming style.

- Profiling usability: observation
- Microsoft's ™ way
- Cognitive dimensions
- Simplicity, generality, clarity

Cognitive dimensions

We explain what Cognitive Dimensions are, how they are used, and their limitations.

- Programmer profiles
- Cognitive dimensions
- Cognitive dimensions in practice

Simple API profiling

Learn straightforward guidelines for assessing usability, and a simple way to quickly asses API usability.

- The true aims of usability
- Kernighan's guidelines
- Simplicity, clarity, generality
- The importance of focus
- Programming style
- API mapping to application
- Generality and focus
- Measuring API generality
- Measuring API focus
- Simplicity
- Measuring API simplicity
- Clarity
- Measuring API clarity
- Layered APIs
- Examples: UHAPI and TSSA

Design for usability

We explain how to design an API for usability by following simple guidelines.

- Logical decomposition
- Choice of components
- Interface design
- Naming conventions
- Infrastructure versus application
- Layering
- Wrappers
- Abstraction layers
- Good and bad: UHAPI examples

Time and arrangements

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- Universal Home API
- TriMedia Foundation

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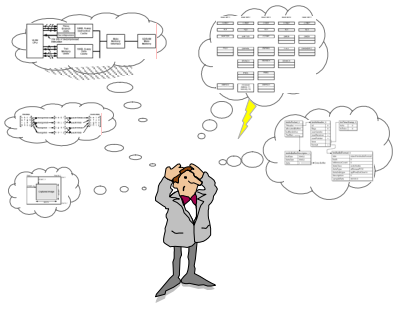
TriMedia Foundation class: a 4-day class

TriMedia Foundation

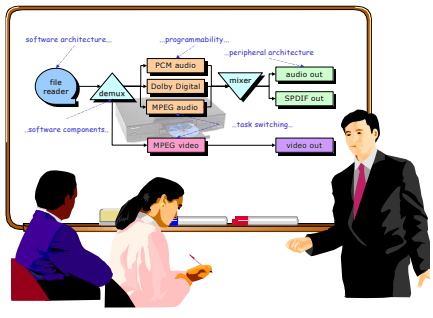
Benefits

- Get started quicker
- Work more productively
- Make better products

After this class engineers and programmers can immediately start work and build TriMedia systems that are well designed and efficient.



Thinking TriMedia?



Get a clear idea.

Contents

This 4-day class introduces all aspects of TriMedia including its implementation in various System on Chip devices. Sessions cover:

- System architecture
- Software architecture
- CPU core architecture
- Peripheral architecture
- Optimization (basics)

System architecture

Learn about TriMedia in its context as a platform for streaming media subsystems. Understand the design choices, why and how to work with TriMedia.

- Context and scope
- Streaming media
- Architectural choices
- Software, core, SoC architectures

Software architecture

TriMedia Software Architecture speeds product development. Learn why and how to use TriMedia Software Architecture: and how to add to it.

- Software architecture principles
- Purpose and use of layers
- Component architecture
- Using and making components
- Device layer programming
- Operating system abstraction
- Development environment
- Component management

CPU core architecture

Learn about the TriMedia CPU core including how to design with it and how to program it effectively.

- CPU architecture
- VLIW and scheduling
- Cache architecture
- using compilation tools
- Simulation and debugging
- Reading schedule reports
- Understanding profile reports
- Using custom operations

System on Chip architecture

TriMedia is designed as the core of System on Chip devices. Learn how it integrates with peripherals and co-processors, and how to program it for these devices.

- Peripheral architecture
- Device layer programming
- Handling interrupts
- Cache issues in SoC
- TriMedia-based SoC devices

Optimization

Optimization is essential. Learn basic strategies that are easy to apply and that work well.

- Compiler optimizations
- Parallel scheduling optimizations
- Memory-based optimizations
- Profiling and schedule reports
- Using custom operations

(We also offer a 4-day Advanced Optimization class.)

Time and arrangements

This class takes 4 days.

It is presented ‘on-site’ by arrangement - the material can be adapted if you have specific needs (at extra cost).

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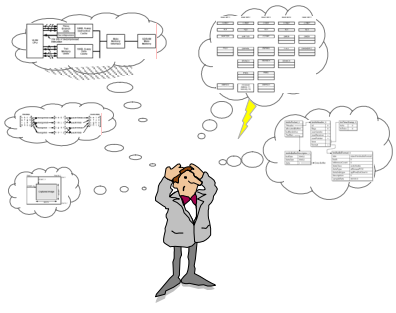
TriMedia system architecture: a 1-day class

TriMedia Foundation

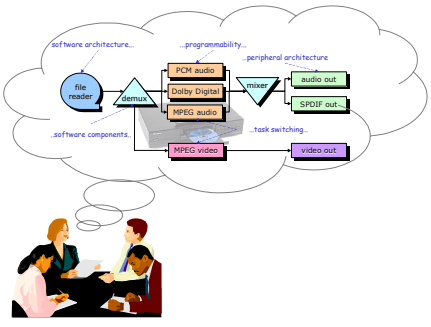
Benefits

- Understand TriMedia in context
- Overview h/w s/w integration
- Appreciate SoC issues

Understand TriMedia in its proper context. Learn how all the parts - software, hardware, SoC issues - fit together and should be used.



System overload?



We put it in context

Contents

In this 1-day seminar we explain the TriMedia system in its proper context, and make clear what it can do, why it is designed this way, and how best to use it. This gives a solid basis from which to learn about specific aspects of the system. Sessions cover:

- Context and scope
- Targeted applications
- System design issues
- Streaming media
- System architecture choices
- Software architecture
- CPU core architecture
- System on chip architecture
- Optimization
- Development tools

System context and scope

We explain how the background to TriMedia's design is driven by the desire for performance in certain applications, and show how the resulting design choices relate to performance.

- TriMedia system context
- Platforms
- Streaming media
- Architectural choices
- Application/architecture mapping
- TriMedia system architecture

Software Architecture

Understand how TriMedia software architecture speeds high-level product development and addresses problems of software re-use, maintenance and efficiency.

- Component architectures
- TriMedia Software Architecture
- Purpose and proper use of layers
- Streaming media tool kit
- MPEG-2/4
- Digital TV
- Operating system issues
- Development environment

System on Chip architecture

We explain how TriMedia fits into a System on Chip architecture, and how a peripheral architecture can surround it.

- System on chip architecture
- Co-processors and peripherals
- Example SoC devices

CPU core architecture

Learn why the TriMedia CPU is designed this way, what it can do, how it is programmed, and how its software tool chain works.

- CPU core architecture
- Reasons for VLIW
- TriMedia core design methods
- TriMedia core functional units
- Compilation tools
- Profiling and schedule reporting
- Purpose of custom operations
- Optimization

Time and arrangements

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Foundation class

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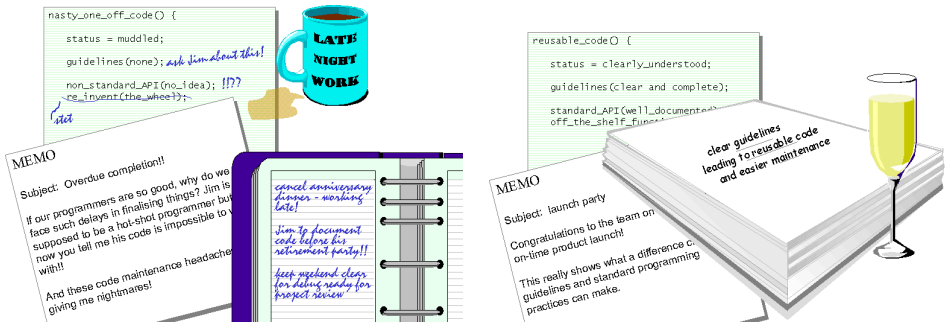
TriMedia Software Architecture: a 1-day class

TriMedia Foundation

Benefits

- Apply the component model
- Use the media processing tool kit
- Design new components

Learn to build systems from components, make new components, and work effectively with TriMedia's software layers.



From un-usable... ...to re-usable

Contents

This session describes and explains the TriMedia Streaming Software Architecture including software components, data packets, and connections. Sessions cover:

Software architecture

Learn the principles of the TriMedia software architecture including the evolution of different versions and their consequences for the programmer.

- TSSA 1.6, 1.5 and 1.4
- Operating Layer
- Operating System Abstraction
- Operating system
- Application Layer

Software components

Learn how to use, configure and identify software components and build complete systems.

- Component architecture
- Configuring components
- Component capabilities
- A/V synchronisation

Connections

Use connectors and components to build complete systems.

- Component connection
- Packet queues and pools
- Connection toolkit
- InOutDescriptors

Media processing tool kit

Understand the streaming Media Processing Tool Kit and be familiar with some example programs.

- Media Processing Tool Kit
- MPTK components
- DV decoder
- MPEG-2 decoding
- MPEG-2 transport stream
- MPEG-4 player

Data packets

Know how to define and use TriMedia software data packets.

- TriMedia data packets
- Audio and video data formats

Making components

Lean how to work at the Application Layer to make components that are efficient and that conform to the architecture rules.

- Purpose of the Application Layer
- Using the Default Layer
- Using Device Libraries
- Application Layer processing
- Component configuration

Development environment

Learn to organize, distribute and use component files and makefiles.

- Software environment
- Environment configuration
- Component file organization
- Building an application

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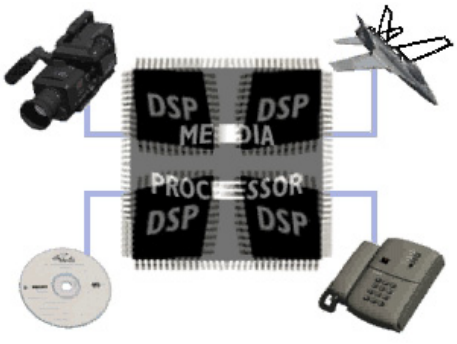
TriMedia peripheral architecture: a 1-day class

TriMedia Foundation

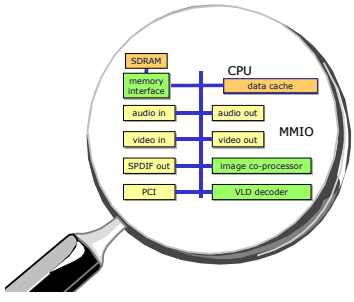
Benefits

- Use TriMedia peripherals
- Write peripheral device drivers
- Write interrupt handlers

After this seminar you will know how to use TriMedia peripherals, and how to write new device drivers including interrupt handlers.



Peripheral vision?



We give you focus

Contents

We describe and explain TriMedia peripheral architecture and show how peripherals are configured and programmed. This includes interrupt handling.

Peripheral architecture

Understand the TriMedia peripheral architecture and the basic peripheral organization of some TriMedia-based SoC devices.

- Peripheral architecture
- Pnx1300 peripherals
- Pnx1500 peripherals
- Pnx8550 peripherals

Peripheral registers

Know the memory-mapped registers through which peripheral devices are configured and controlled.

- SoC memory maps
- Peripheral MMIO registers

Software architecture

Learn how to use standard peripheral software support, including the relationship to the TriMedia Software Architecture (TSA) and software layers.

- Peripherals and TSA
- Device Layer
- Board Support Library
- Configuration structures
- Configuration functions

Interrupts

How interrupts are configured and handled. Including the connection between interrupts and scheduling 'decision trees'.

- Interrupt architecture
- Interrupt configuration
- Interrupt programming
- Interrupts and decision trees

Cache coherency

Explains the important question of synchronizing the cache with data entered directly to memory by peripherals (which bypass the cache).

- Data cache coherency and MMIO
- Data cache copyback
- Data cache invalidation
- Cache handling in ISRs

Peripheral programming

Follow a complete worked example of peripheral programming, putting into practice all the things learnt through the session.

- Overview of VO peripheral
- Video sampling formats
- File reading and cache coherency
- Device configuration structure
- Device configuration function
- Device set up
- Interrupt handling
- Video fields and frames

Time and arrangements

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We recommend this be part of the 4-day TriMedia Foundation class but it can stand on its own or be part of a custom class.

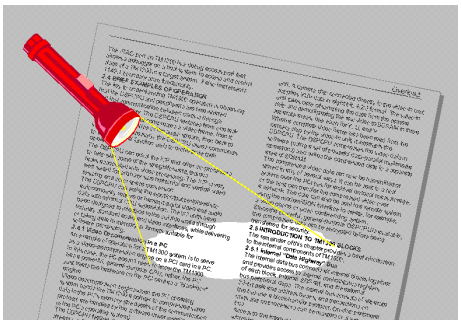
TriMedia CPU core: a 1-day class

TriMedia Foundation

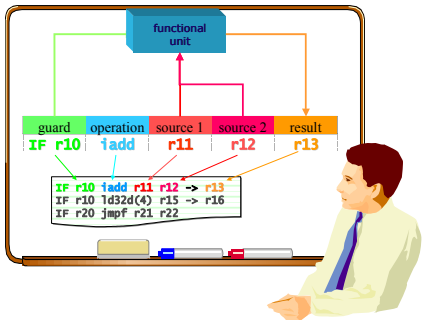
Benefits

- Program TriMedia efficiently
- Exploit parallelism better
- Use profile & schedule reports

Take full advantage of the TriMedia core. Use compilation tools, profile and schedule reports to guide you to writing more efficient programs.



Groping in the dark?



Let us instruct you

Contents

This session describes the TriMedia CPU core and explains both why it was made this way, and how to use it well to get the best performance. It includes basic understanding of how to generate, read and use schedule and profile reports to guide better and more efficient programming. Sessions cover:

CPU core architecture

Understand the design choices in the TriMedia CPU core including the challenges of parallel scheduling: and apply this understanding to maximize software efficiency.

- CISC, RISC and Superscalar
- VLIW architecture
- Parallel scheduling
- Program parallelism

Instruction set

Understand how the instruction set. is crucial to TriMedia's fast performance. Apply this understanding to evaluate and take advantage of TriMedia architecture.

- Instruction set design
- Instruction format

Registers and memory

Learn how to use TriMedia's 'register-based' design and the memory heirarchy.

- Registers and data formats
- Registers, cache and memory

CPU functional units

Know the types of functional units available and their purpose: consider basic optimization strategies, and know how to measure functional unit usage and efficiency.

- CPU functional units
- Measuring functional unit usage
- TM32A, 3260, 3270, 5250

Compilation tools

Know how to use the TriMedia compilation tools including for profiling, debugging and simulation.

- The compilation tool chain
- Decision trees and parallelism
- Schedule and profile reports
- Simulation and debugging

Cache architecture

Understand the basic cache architecture and its impact on performance and optimization.

- Cache architecture overview
- Using cache profile reports
- TM32A, 3260, 3270, 5250
- TM-Lite

Custom operations

Know the purpose and basic usage of custom operations.

- Custom operations
- SIMD operations
- TM32A, 3260, 3270, 5250
- TM-Lite

Time and arrangements

This session takes 1 day.

It is presented 'on-site' by arrangement - the material can be adapted if you have specific needs (at extra cost).

Sometimes we arrange 'public' classes: schedules are posted on the Internet:

http://www.bores.com/schedule.htm

Pic'N'Mix

You can design a class to suit your own specific needs. Each of the topics in this TriMedia Foundation class can be a self-contained session, from which you can "pic'n'mix" to make your own class.

Contact us:

chris@bores.com

Booking and questions

Call us by 'phone or send email to book or to ask questions.

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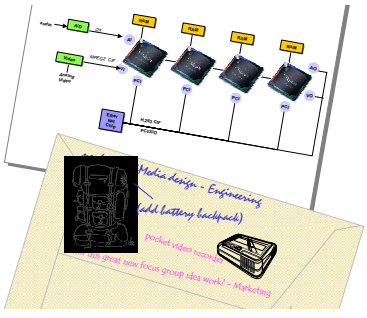
TriMedia Optimization basics: a 1-day class

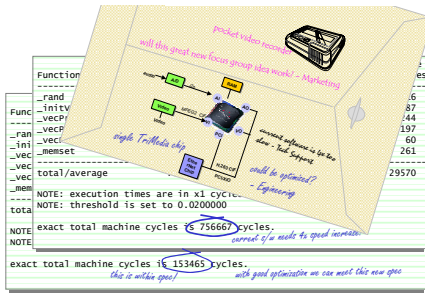
TriMedia Foundation

Benefits

- Increase program speed
- Use parallelism properly
- Lower hardware costs

Learn to increase the speed and reduce the size of TriMedia programs, by applying simple and straightforward strategies that work.





Optimizing: the alternative to bigger hardware

Contents

This session introduces the basic optimization strategies and tools. Sessions cover:

CPU and cache architecture

Learn how CPU and cache architectures affect program behavior and optimization.

- CPU and cache architectures
- Parallel scheduling

Profiling

Learn to investigate program behaviour and choose optimizations.

- Tree code and parallelism
- How to read schedule reports
- How to use profile reports

Optimization strategies

Why and how to choose an optimization strategy. Understanding levels of optimization.

- Increasing parallelism
- Reducing memory traffic
- Using the cache efficiently
- Using registers efficiently

Compiler optimizations

How and when to use compiler optimizations: what they do.

- Compiler optimization levels
- Unrolling, grafting and inlining
- Profile-driven optimization

Increasing parallelism

How to increase parallelism.

- Investigating parallelism in code
- Barriers to parallelism:
- Pointer (and array) aliasing

Reducing memory traffic

How to eliminate memory accesses.

- Avoiding implied memory loads
- Using packed memory data

Using cache efficiently

How to use the cache optimally.

- Keeping data in the cache
- Increasing temporal locality
- Organising data for the cache

Using registers efficiently

How to use the register file efficiently.

- Letting the compiler use registers
- Register-to-register operations
- Monitoring register usage

Custom operations

Why, when and how to use custom operations.

- SIMD - FIR example
- Pack and merge

Time and arrangements

This session takes 1 day.

It is presented 'on-site' by arrangement - the material can be adapted if you have specific needs (at extra cost).

Sometimes we arrange 'public' classes: schedules are posted on the Internet:

http://www.bores.com/schedule.htm

Advanced Optimization

We also offer a 4-day Advanced Optimization class. This is for engineers who already have experience with TriMedia. It is a 'hands-on' workshop.

Contact us:

- chris@bores.com

Booking and questions

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Foundation class

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We recommend this be part of the 4-day TriMedia Foundation class but it can stand on its own or be part of a custom class.

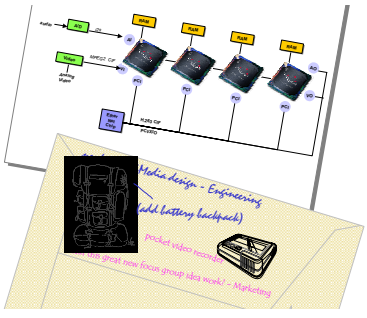
TriMedia Optimization Advanced: 4-day class

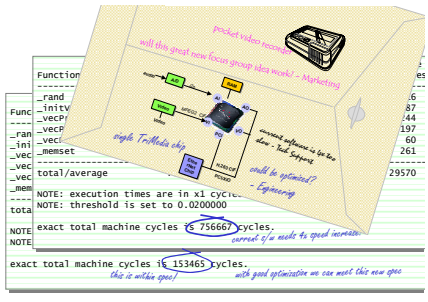
Advanced Class

Benefits

- Increase program speed
- Manage the cache well
- Reduce program size

Learn advanced optimization techniques and strategies that can work even in difficult cases.





Optimizing: the alternative to bigger hardware

Contents

This class progressively introduces optimization strategies and techniques, illustrating through 'hands-on' exercises. Sessions cover:

Profiling

In-depth profiling to investigate program behaviour. Using this knowledge to guide choice of optimization strategies.

- Registers, cache, parallelism.
- Read and graph dtree code
- Finding inherent parallelism
- Read and use schedule reports
- Profiling to guide optimization
- Using the profiling API
- Verilator for profiling

Optimization strategies

Why and how to choose an optimization strategy. Understanding levels of optimization.

- Increase parallelism
- Reduce memory traffic
- Use the cache efficiently
- Use registers efficiently
- Get more from each issue slot

Compiler optimizations

Compiler optimizations. Using pragmas and separately linked files to tune optimization.

- Unrolling, grafting and inlining
- Profile-driven optimization
- Tuning by independent linking

Increasing parallelism

How to increase parallelism.

- Investigating parallelism in code
- Barriers to parallelism:
- Pointer (and array) aliasing
- Dirty floating point
- Memory latency

Reducing memory traffic

How to eliminate memory accesses.

- Avoiding implied memory loads
- Using packed memory data
- Cache temporal locality
- Cache spatial locality
- Organize data for the cache
- Register-to-register operations
- Monitoring register usage

Custom operations

Progressively discover possibilities to use custom operations.

- SIMD - FIR example
- Pack and merge

More than speed

How to monitor and control code size when optimizing. Effect of optimizations on code size and power consumption.

- Reducing code size
- When not to optimize
- Difficulties with control code
- Optimizing for power consumption

Time and arrangements

This class takes 4 days.

Delegates need to bring their own laptops but software can be provided if needed (most delegates will already have TriMedia software installed).

It is presented 'on-site' by arrangement - the material can be adapted if you have specific needs (at extra cost).

Sometimes we arrange 'public' classes: schedules are posted on the Internet:

http://www.bores.com/schedule.htm

Basic Optimization

We also offer a 1-day Basic Optimization class that is part of the 4-day TriMedia Foundation class.

Booking and questions

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- email: chris@bores.com

Foundation class

The 'TriMedia Foundation' is a 4-day class on all aspects of the TriMedia. It is a good basis to prepare for this advanced class.

We recommend you take the 4-day TriMedia Foundation class before attending this advanced class but if you have a lot of experience with TriMedia then you may be able to cope.

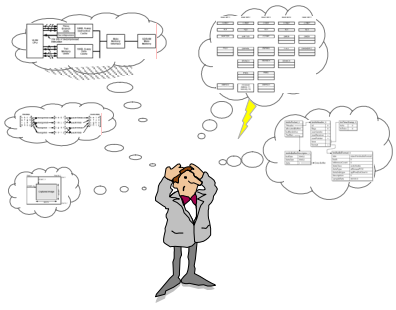
TriMedia TSSA 4: a 1-day class

TriMedia Extension

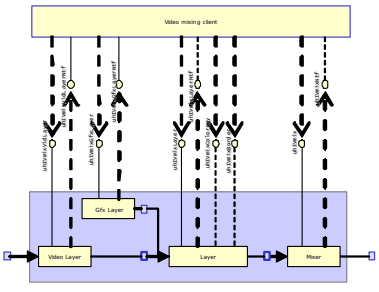
Benefits

- Understand TSSA 4
- Use TSSA 4 components
- Write TSSA 4 wrappers

Learn about the TSSA 4 software architecture, and how to write wrappers to make earlier TSSA components usable in TSSA 4.



Can't face it?



Interface it.

Contents

This session describes and explains the new TSSA 4 standard for TriMedia Streaming Software Architecture including software components, data packets, and connections. Sessions cover:

Software architecture

Learn the principles of the new TSSA 4 standard for the TriMedia software architecture including the evolution of different versions and their consequences for the programmer.

- TSSA 4, 1.6, 1.5 and 1.4
- Operating Layer
- Operating System Abstraction
- Operating system
- Application Layer

Software components

Learn how to use, configure and identify TSSA 4 components and build complete systems.

- Component architecture
- Configuring components
- Connections
- Component pins

Connections

Use connectors and components to build complete systems.

- Component connection
- Packet queues and pools
- Connection toolkit
- Streaming interfaces
- Connection sequence

Data packets

Know how to define and use TSSA 4 software data packets.

- TSSA 4 data packets
- Audio and video data formats

Clocks and synchronization

Lean how to use TSSA 4 clocks for audio/video synchronization.

- TSSA 4 clocks
- A/V synchronization

Creating components

Learn how to create and set up TSSA 4 components.

- Creating TSSA 4 components

Wrappers

Learn the history of evolution through different TSSA versions, the consequences of this for programmers, and learn to use and write wrappers for TSSA 1.5 and TSSA 1.4 components.

- History of TSSA versions
- TSSA 1.5 wrapper
- Creating component via wrappers
- Set up a component via a wrapper

Time and arrangements

This class takes 1 day.

It is presented 'on-site' by arrangement - the material can be adapted if you have specific needs (at extra cost).

Sometimes we arrange 'public' classes: schedules are posted on the Internet:

http://www.bores.com/schedule.htm

An extension class

The TSSA 4 class describes a new TSSA architecture. It is of interest to those who will use this new version, or wish to know about it, but this is a specialist topic.

Contact us for advice:

chris@bores.com

Booking and questions

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Foundation class

The 'TriMedia Foundation' is a 4-day class on all aspects of the TriMedia. It includes treatment of the Streaming Software Architecture, or all peripherals, and of the TriMedia Operating System. It is a more general class than this one.

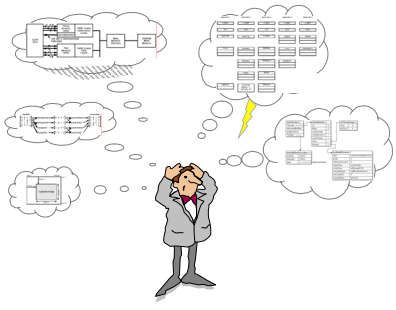
TriMedia for managers: a 1-day seminar

Executive overview

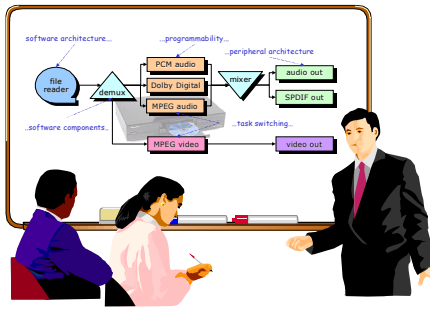
Benefits

- Evaluate TriMedia properly
- Understand TriMedia capabilities
- Guide TriMedia projects better

Learn enough to be well-informed in discussions and evaluations, and to make sensible decisions and recommendations for its proper use.



Too much detail?



We put it in context

Contents

In this 1-day executive seminar we explain the TriMedia system in its proper context, and make clear what it can do, why it is designed this way, and how best to use it. The seminar format follows a clear and logical narrative that makes complex issues clear but allows for plenty of specific discussion. Sessions cover:

- Context and scope
- Targeted applications
- System design issues
- Streaming media
- System architecture choices
- Software architecture
- CPU core architecture
- System on chip architecture
- Optimization
- Development tools

System context and scope

We explain how the background to TriMedia's design is driven by the desire for performance in certain applications, and show how the resulting design choices relate to performance in particular new projects.

- TriMedia system context
- Platforms
- Streaming media
- Architectural choices
- Application/architecture mapping
- TriMedia system architecture

Software Architecture

Understand how TriMedia software architecture speeds high-level product development and addresses problems of software re-use, maintenance and efficiency.

- Component architectures
- TriMedia Software Architecture
- Purpose and proper use of layers
- Streaming media tool kit
- Examples: MPEG-2/4, digital TV
- Operating system issues
- Development environment

System on Chip architecture

We explain how TriMedia fits into a System on Chip architecture, and how a peripheral architecture can surround it.

- System on chip architecture
- Co-processors and peripherals
- Example SoC devices

CPU core architecture

Learn why the TriMedia CPU is designed this way, what it can do, how it is programmed, and how its software tool chain works.

- CPU core architecture
- Reasons for VLIW
- TriMedia core design methods
- TriMedia core functional units
- Compilation tools
- Profiling and schedule reporting
- Purpose of custom operations
- Optimization

Time and arrangements

This seminar takes 1 day.

It runs from 10 am to 4 pm.

It is presented 'on site' by arrangement.

We encourage contact following the seminar for advice, consultation and 'networking'.

Follow-up training

This is an executive seminar. We also offer in-depth technical training for engineers and programmers who will be using TriMedia.

Contact us for details:

chris@bores.com

Booking and questions

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About us

BORES Signal Processing train managers, engineers and programmers to understand and use DSP and streaming media processing.

- established 17 years
- excellent reputation
- worldwide activities
- www.bores.com

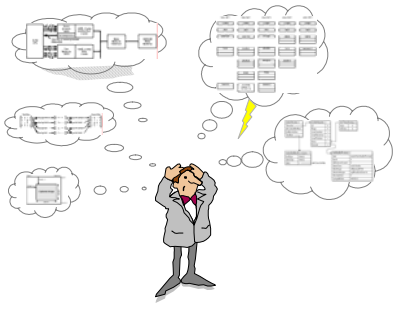
TriMedia for sales people: a 1-day seminar

TriMedia Introduction

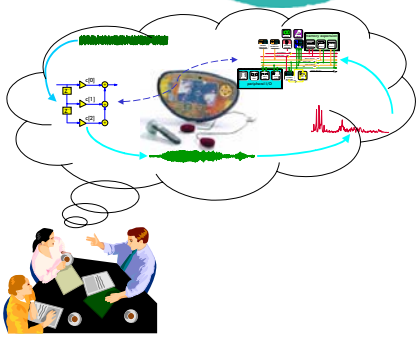
Benefits

- Assess customer requirements
- Propose TriMedia solutions
- Justify TriMedia design choices

Understand TriMedia and its aims so you can match customer requirements to TriMedia solutions and justify your proposals.



From confrontation...



..to consultation

Contents

This class equips sales people and FAEs to analyze and evaluate customer requirements; to suggest and demonstrate TriMedia-based solutions; to justify the TriMedia design choices; and to explain and demonstrate the TriMedia tools.

System context and scope

We explain how TriMedia's design delivers performance with economy, and show how the resulting design choices relate to performance in particular new projects.

- TriMedia system context
- Focus on streaming media
- Architectural choices
- TriMedia system architecture

Software Architecture

Understand how TriMedia software architecture speeds high-level product development and addresses problems of software re-use, maintenance and efficiency.

- Importance of development time
- Component architectures
- TriMedia Software Architecture
- Efficiency aim of layers
- Streaming media tool kit
- Example applications
- DVC
- MPEG-2 and MPEG-4
- Audio/video sync
- Sizing the application

System on Chip architecture

We explain how TriMedia fits into a System on Chip architecture, and the benefits of its smart and well-targeted set of peripherals.

- System on chip architecture
- Co-processors and peripherals
- Benefits of smart peripherals
- Focus on target applications

CPU core architecture

Learn why the TriMedia CPU is designed this way, what it can do, how it is programmed, and how its software tool chain works.

- CPU core architecture
- Reasons for VLIW
- TriMedia core design choices
- Compilation tools
- Support for optimization
- Profiling and schedule reporting
- Purpose of custom operations

Perceptions

Learn how different groups of customers and supporters perceive TriMedia and its relation to competitive products - and learn the facts that underlie those perceptions.

- Sales versus customer views
- Competition
- Know the target markets
- Pros and cons of TriMedia tools
- Third party network
- Technical support
- Reputation and roadmap

Time and arrangements

This seminar takes 1 day.

It runs from 10 am to 4 pm..

Time and content can be varied.

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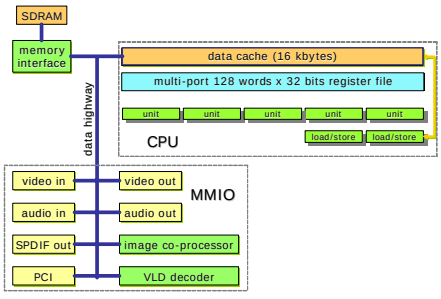
Nexperia pnx1300 peripherals: a 1-day class

TriMedia Extension

Benefits

- Know the pnx1300 peripherals
- Program pnx1300 I/O
- Program pnx1300 co-processors

Know the pnx1300 peripherals and co-processors, and how to program them using device libraries and interrupt service routines.



Learn the ins and outs of the pnx1300 SoC

Contents

This seminar describes the Nexperia pnx1300 peripheral architecture and explains how peripherals are configured and programmed. It also includes explanation of basic digital video and sampling schemes, as used in the video peripherals.

pnx1300 peripherals

Overview of the pnx1300 peripheral architecture and available peripherals.

- Pnx1300 peripheral architecture
- Pnx1300 MMIO registers

Digital video data

Learn the basics of digital video including details of sampling schemes and storage formats. Also how video data is stored by and for the pnx1300 video peripherals and co-processors.

- RGB and YUV color spaces
- Raster scan sampling
- Flicker and motion
- Video fields and frames
- Perceptual compression
- Video sampling schemes
- YUV 420 and 422
- Planar and semi-planar storage
- Packed video storage

pnx1300 video output

The pnx1300 video output peripheral as an example of a peripheral.

- Video output features
- Video output
- Video overlay

Software architecture

Describes the organization of peripheral software support, including the relationship to the TriMedia Software Architecture (TSA) and software layers.

- Peripherals and TSA
- Device Layer
- Board Support Library
- Configuration structures
- Configuration functions
- Interrupt handling
- Interrupt programming

Cache coherency

Explains the important question of synchronizing the cache with data entered directly to memory by peripherals (which bypass the cache).

- Data cache coherency and MMIO
- Data cache copyback simulation

pnx1300 peripherals

Learn the pnx1300 peripherals in detail.

- Video output
- Video output overlay
- Image Co-Processor
- ICP overlay
- VLD
- Audio input and output
- SPDIF output
- SSI and I2C
- PCI and XIO

Time and arrangements

This session takes 1 day.

It is presented ‘on-site’ by arrangement - the material can be adapted if you have specific needs (at extra cost).

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The pnx1300 class is optional. We recommend this be part of the 4-day TriMedia Foundation class but it can stand on its own or be part of a custom class.

Nexperia pnx1500 peripherals: a 1-day class

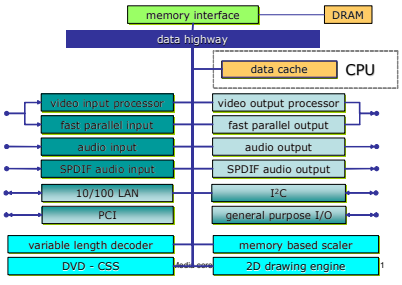
TriMedia Extension

Benefits

- Know the pnx1500 peripherals
- Program pnx1500 I/O
- Program pnx1500 co-processors

Know the pnx1500 peripherals and co-processors, and be able to program them using device libraries and interrupt service routines.

System on Chip?



Know the system.

Contents

This seminar describes the Nexperia pnx1500 peripheral architecture and explains how peripherals are configured and programmed. It also includes explanation of basic digital video and sampling schemes, as used in the video peripherals.

pnx1500 peripherals

Overview of the pnx1500 peripheral architecture and available peripherals.

- Pnx1500 peripheral architecture
- Pnx1500 MMIO registers

Software architecture

Describes the organization of peripheral software support, including the relationship to the TriMedia Software Architecture (TSA) and software layers.

- Peripherals and TSA
- Device Layer
- Board Support Library
- Configuration structures
- Configuration functions
- Interrupt handling
- Interrupt programming

Cache coherency

Explains the important question of synchronizing the cache with data entered directly to memory by peripherals (which bypass the cache).

- Data cache coherency and MMIO
- Data cache copyback simulation

pnx1500 peripherals

In-depth look at pnx1500 peripherals

Video input

- Video Input Processor
- Video scaling module
- Auxiliary video data extraction
- Test pattern generator module
- Fast generic Parallel input
- Video Input Router

Video output

- Video Composition Processor
- Layers and composition
- Video enhancement features
- Fast generic Parallel output
- Video Output Router
- LCD output

Memory based scaler

- Memory Based Scaler
- Scaling and conversion
- Video enhancement features

Other co-processors

- 2D Drawing Engine
- VLD

Audio I/O

- Audio input and output
- SPDIF input and output

General purpose I/O

- General Purpose I/O
- Time stamp units
- Signal generation
- Signal capture

PCI and XIO

- PCI and XIO

Time and arrangements

This session takes 1 day.

It is presented ‘on-site’ by arrangement - the material can be adapted if you have specific needs (at extra cost).

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The pnx1500 class is optional. We recommend this be part of the 4-day TriMedia Foundation class but it can stand on its own or be part of a custom class.

pnx1300 video programming: a 2-day class

TriMedia Specialist

Benefits

- Program the pnx1300 for video
- Work directly at the Device Layer
- Optimize programs

Know how to program the pnx1300 and to use video I/O, working directly at the Device Layer without the streaming software architecture.

A C language engine for video processing

Contents

In this class we explain how to program the pnx1300 Media Processor and to use its video I/O peripherals. We focus on direct C programming at the Device Layer, without using the higher-layer Streaming Software Architecture or the TriMedia Operating System. We also outline basic digital video and sampling schemes, as used in the video peripherals.

pnx1300 TriMedia core

Learn to understand and program the TriMedia core.

- CPU core architecture
- Cache architecture
- VLIW scheduling
- Schedule reports and profiling
- Custom operations

Digital video data

Learn how video data is stored by and for the pnx1300 video peripherals and co-processors.

- RGB and YUV color spaces
- Video fields and frames
- Video sampling schemes
- YUV 420 and 422
- Planar and semi-planar storage

Peripheral architecture

- Device Layer conventions
- Configuring peripherals
- Configuring interrupts
- Handling interrupts

Video input

- Pnx1300 video input
- Video input configuration
- Sampling schemes and storage
- Horizontal video scaling
- Worked example

Video output

- Pnx1300 video output
- Video output configuration
- Sampling schemes and storage
- Horizontal scaling
- Video overlay
- In-depth worked example

Image Co-Processor

- Pnx1300 ICP
- ICP configuration
- Vertical and horizontal scaling
- Color space conversion
- Overlay conversion

Optimization

- Compiler optimizations
- Schedule reports
- Scheduling optimizations
- Profile reports
- Cache optimizations
- Register optimizations
- Custom operations

Time and arrangements

This class takes 2 days.

It is presented 'on-site' by arrangement - the material can be adapted if you have specific needs (at extra cost).

Sometimes we arrange 'public' classes: schedules are posted on the Internet:

http://www.bores.com/schedule.htm

A specialist class

The pnx1300 video programming class is self-contained and specific to people who want to use this device but do not wish to use the streaming software architecture.

Contact us:

chris@bores.com

Booking and questions

Call us by 'phone or send email to book or to ask questions.

- contact: Dr Chris Bore
- 'phone: +44 (0)1483 740138
- mobile: +44 (0)7921 153219
- email: chris@bores.com

Foundation class

The 'TriMedia Foundation' is a 4-day class on all aspects of the TriMedia. It includes treatment of the Streaming Software Architecture, or all peripherals, and of the TriMedia Operating System. It is a more general class than this one.

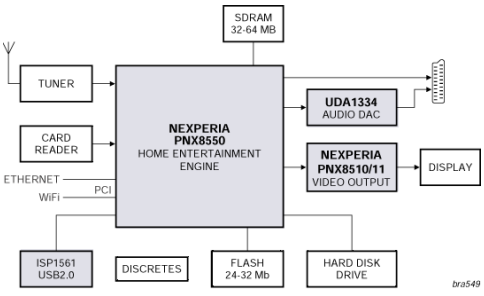
Programming the STB810 IP-TV platform

TriMedia training

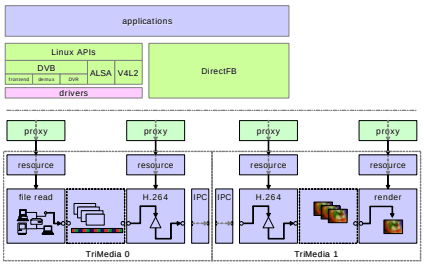
Benefits

- Build new VideoProviders
- Add components to STB810
- Leverage platform features

When you complete this class you should be ready to start productive work implementing or extending your own STB810 platform..



Waiting on the platform?



Take the train(ing).

Target audience

This class is aimed at engineers and managers involved in implementing or adding to an STB810 platform.. It is especially relevant tothose who wish to add components to the standard set.

Contents

In this class we explain and clarify the software architecture of the STB810 platform,, especially in the oontext of building new Videoproviders and adding new streaming media components. Class topics include:

- Concepts of architecture
- DirectFB implementation
- The resource model
- Standard resources
- Making VideoProviders
- Adding new components

Overview

Learn the concepts behind, and functions of, STB810, in the context of implementing or adding to a platform.. This overview also puts STB810 in the proper context with the DirectFB and VideoProvider programming models.

- The STB810 platform
- The DirectFB model
- VideoProviders
- The STB810 resource model
- Resources as components
- Media processing components

DirectFB

We explain how the DirectFB model relates to the STB810 streaming media components and rendering.

- DirectFB
- STB810 video rendering
- VideoProviders
- STB810 streaming networks

Software architecture

We explain the software architecture of the STB810 platform, illustrated with programming examples.

- The resource model
- Streaming media components
- Connecting resources
- Configuring resources
- VideoProviders

Components

We review some STB810 resources, their functionality and interfaces: and we show how to add your own new resource and Videoprovider.

- video and audio compression
- video enhancement
- video scaling and rendering
- adding a new resource
- making a new VideoProvider

Building systems

We show how to build components, VideoProviders and applications.

- The build environment
- building components
- building VideoProviders
- building applications

Time and arrangements

This class takes 4 days.

It is presented ‘on-site’ by arrangement - the material can be adapted if you have specific needs (at extra cost).

Sometimes we arrange ‘public’ classes: schedules are posted on the Internet:

http://www.bores.com/schedule.htm

TriMedia Foundation

An in-depth class on the TriMedia processor is also available:

- TriMedia Foundation

Contact us for details and advice.

Booking and questions

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- email: chris@bores.com

About us

BORES Signal Processing train managers, engineers and programmers to understand and use DSP and streaming media processing.

- established 19 years
- excellent reputation
- worldwide activities
- www.bores.com

BORES Signal Processing, ‘Fordwater’, Pond Road, Woking, Surrey GU22 0JZ, England:
‘Phone: +44 (0)1483 740138 Web site: www.bores.com email: chris@bores.com

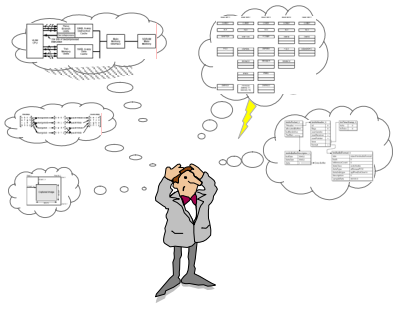
Using the UHAPI

UHAPI Foundation

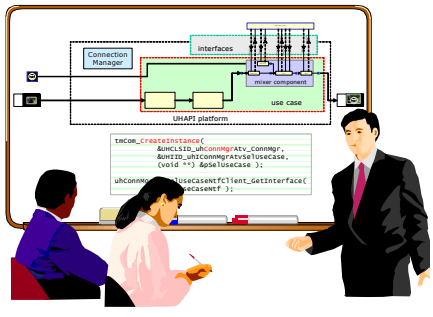
Benefits

- Get started sooner
- Finish products earlier
- Avoid mistakes

Learn how to program the UHAPI properly to build products and middleware that are robust and readily maintained.



Steep learning curve?



We make UHAPI

Contents

In this class we explain and clarify all aspects of UHAPI including:

- UHAPI architecture concepts
- The UHAPI component model
- Role & implementation of uhCOM
- UHAPI frameworks and platforms

We illustrate these points using worked examples on a generic UHAPI platform:

- An example UHAPI platform
- Study of a UHAPI component
- An example UHAPI application

Class sessions include:

UHAPI architecture

Understand the aims and design choices of the UHAPI architecture, in the proper context of designing a product or 'add-on'.

- UHAPI in overview
- Simple program example
- UHAPI aims
- Frameworks, platforms and SDKs
- Streaming Media
- Use cases

Concepts

Know the concepts behind UHAPI, through programming examples.

- Connection Management
- Components
- Interfaces

Software Development Kit

Know what to expect from a UHAPI Software Development Kit (SDK), and learn to use a generic PC-based UHAPI-PC SDK as an example of a platform implementation.

- UHAPI PC platform
- UHAPI PC components

Components

In-depth study of some typical UHAPI components, their functionality and interfaces.

- Component Object Model (COM)
- Role & implementation of uhCOM
- Components and interfaces

Sample application

Put into practice what you have learnt by working through a practical example application program:.

- UHAPI-PC platform
- Sample application
- Supported Use Cases
- Connection Manager
- Using uhCOM interfaces
- Example application components
- Interfaces, functions
- System design issues

Time and arrangements

This class takes 2 days.

It is presented 'on-site' by arrangement - the material can be adapted if you have specific needs (at extra cost).

Sometimes we arrange 'public' classes: schedules are posted on the Internet:

http://www.bores.com/schedule.htm

UHAPI Foundation

We offer other UHAPI classes, for example:

- Implementing the UHAPI
- the Nexperia NH8550 SDK

Contact us:

chris@bores.com

Booking and questions

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- excellent reputation
- worldwide activities
- www.bores.com

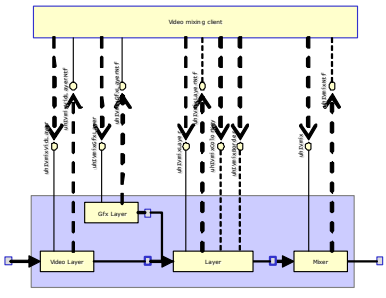
Implementing the UHAPI

UHAPI Specialist

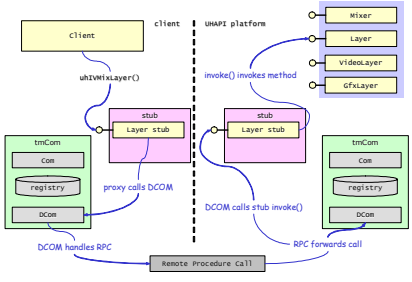
Benefits

- Get started sooner
- Be more productive
- Make a better UHAPI platform

When you complete this class you should be ready to start productive work implementing or extending your own UHAPI platform..



Inside the interface?



Call on us.

Target audience

This class is aimed at engineers and managers involved in implementing or adding to a UHAPI platform.

Contents

In this class we explain and clarify all aspects of UHAPI, focusing on how to implement it on your own platform, including:

- Concepts of UHAPI architecture
- The UHAPI component model
- UHAPI frameworks and platforms
- How to implement uhCOM
- Implementing UHAPI components
- Making a Connection Manager
- How to build Use Cases

We illustrate these points using worked examples on a generic UHAPI platform:

- An example UHAPI platform
- Designing Use Cases
- Implementing a component

Overview

Learn the concepts behind, and functions of, UHAPI, in the context of implementing or adding to a platform.

- UHAPI in overview
- Simple program example
- UHAPI aims
- Frameworks, platforms and SDKs
- Streaming Media
- Use Cases
- Implementing a UHAPI platform
- The COM model

Concepts

Concepts behind UHAPI, illustrated with concrete programming examples.

- Connection Management
- Components
- Interfaces
- Use Cases

Software Development Kit

Generic UHAPI Software Development Kit as an example of a platform implementation.

- UHAPI PC platform
- UHAPI PC components

Components

We review some UHAPI components, their functionality and interfaces.

- Component Object Model (COM)
- Implementation of uhCOM
- Components and interfaces

Implementation

Working with the generic UHAPI platform to implement some components and a Use Case:

- How to implement uhCOM
- Implementing UHAPI components
- Making a Connection Manager
- How to build Use Cases

Time and arrangements

This class takes 2 days.

It is presented 'on-site' by arrangement - the material can be adapted if you have specific needs (at extra cost).

Sometimes we arrange 'public' classes: schedules are posted on the Internet:

http://www.bores.com/schedule.htm

UHAPI Foundation

This class is aimed at people who are to implement or add to a UHAPI platform. Users of UHAPI will be better served by our class:

- Using the UHAPI

Contact us for details and advice.

Booking and questions

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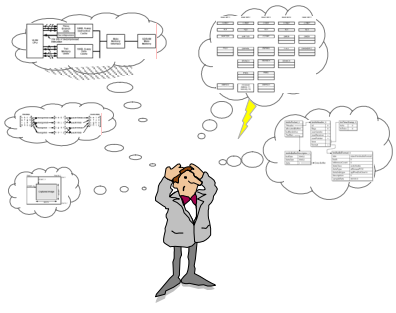
Effective technical training: a 1-day class

DSP Extension

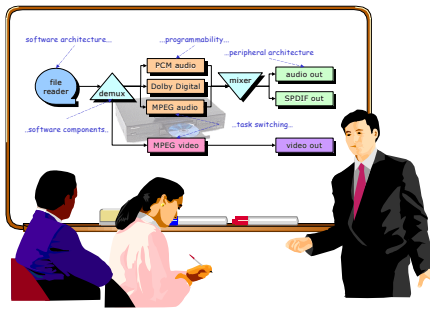
Benefits

- Present better technical training
- Improve team communications
- Improve knowledge transfer

Improve your ability to share knowledge with co-workers and clients, by learning to prepare technical training that is effective.



Troubled by training?



We tell you a story.

Contents

In this class we show you how to collect and organize material, and to present it in a logical narrative, so that you can share knowledge with co-worker or clients in the most effective way. The class deals with organization and logical narrative flow rather than on 'body language' or 'presentation skills'. We focus on DSP and streaming Media Processing, though the principles are universally applicable.

Aims of technical training

Learn to identify and clearly state the aims of the training, and to do so in terms that can be verified.

- Message versus messenger
- Learning versus teaching
- Presenter's aims
- Student's goals
- Stating learning goals
- Identifying scope of training
- The need for context
- Logical breakdown
- Narrative flow

The teaching plan

Learn how to develop a clear and complete lesson plan.

- Clarity, simplicity, completeness
- Top-down outlines
- Horizontal narrative
- Grouping topics
- Planning the narrative flow

The narrative

Learn how a good class tells a story, and how to design the narrative flow so that the story is compelling, complete and clear.

- Teaching as story-telling
- Parallel outline, sequential plan
- Logical flow of narrative
- The 'grammar' of presentations
- Identifying conceptual leaps
- The 'it is obvious' trap
- Focusing on the message
- Signposts and checkpoints
- Checking for completeness

Demos and hands-on

Learn to asses the value of demos and 'hands-on', and to use them effectively.

- Clarifying learning aims
- Planning for 'hands-on'
- Avoiding spoon-feeding
- Realistic goals for 'hands-on'
- Value of 'thought experiments'

Myths and legends

We explain why certain myths, legends and fantasies about presentation are less important than you think and suggest strategies that still work when things go wrong..

- Unimportance of body language
- Living with nerves
- Getting over humiliation
- Focusing on the message
- The importance of really caring

Time and arrangements

This class takes 1 day.

It is presented 'on-site' by arrangement - the material can be adapted if you have specific needs (at extra cost).

Sometimes we arrange 'public' classes: schedules are posted on the Internet:

http://www.bores.com/schedule.htm

Anyone can do it

We think that anyone can present effective technical training, but that most people benefit from guidance to enable them to do so. Our approach is based on setting clear goals and planning for a well-organized, coherent logical flow rather than on side-issues like 'body language' or what size fonts to use.

Booking and questions

Call us by 'phone or send email to book or to ask questions.

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