Getting Started with ITK

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Insight Software Consortium

What is ITK

- Image Processing
- Segmentation
- Registration
- No Graphical User Interface (GUI)
- No Visualization

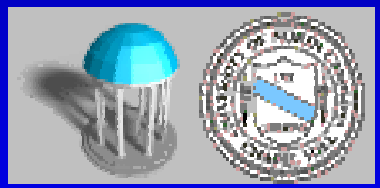
ITK Sponsors

The National Institute for Dental and Craniofacial Research

The National Science Foundation

The National Institute of Neurological Disorders and Stroke

ITK Developers



ITK Developers

GE CRD
Bill Lorensen

Insightful
Lydia Ng

U Penn
Dimitris Metaxas

Harvard BWH*
Ron Kikinis

U Penn*
Jim Gee

Columbia U.*
Celina Imielinska

Kitware
Will Schroeder

UNC-CH
Stephen Aylward

U Tennessee
Ross Whitaker

U Pittsburgh*
George Stetten

U Utah*
Ross Whitaker

* indicates a subcontractor.

ITK by the Numbers

- Public Investment
  - $13 Million
- March 2000
  - First code check-in
- 2,040
  - # of nightly builds
- 1,289
  - tests run nightly
- 42
  - # of platforms (software + hardware)
- 1,647
  - # of C++ classes
- 2,314
  - # of files with code (Insight / Code directory)

Numbers updated on September 29th 2007

ITK by the Numbers

- 136K
  - # of lines of code (Insight / Code directory)
- 102K
  - # of lines of test code (Insight / Testing directory)
- 81.6%
  - Code coverage (gcov)
- 27K
  - # of lines of examples (Insight / Examples directory)
- 114K
  - # of lines of Applications (InsightApplications checkout)
- 328
  - weekly t-cons
- 82
  - unique developers

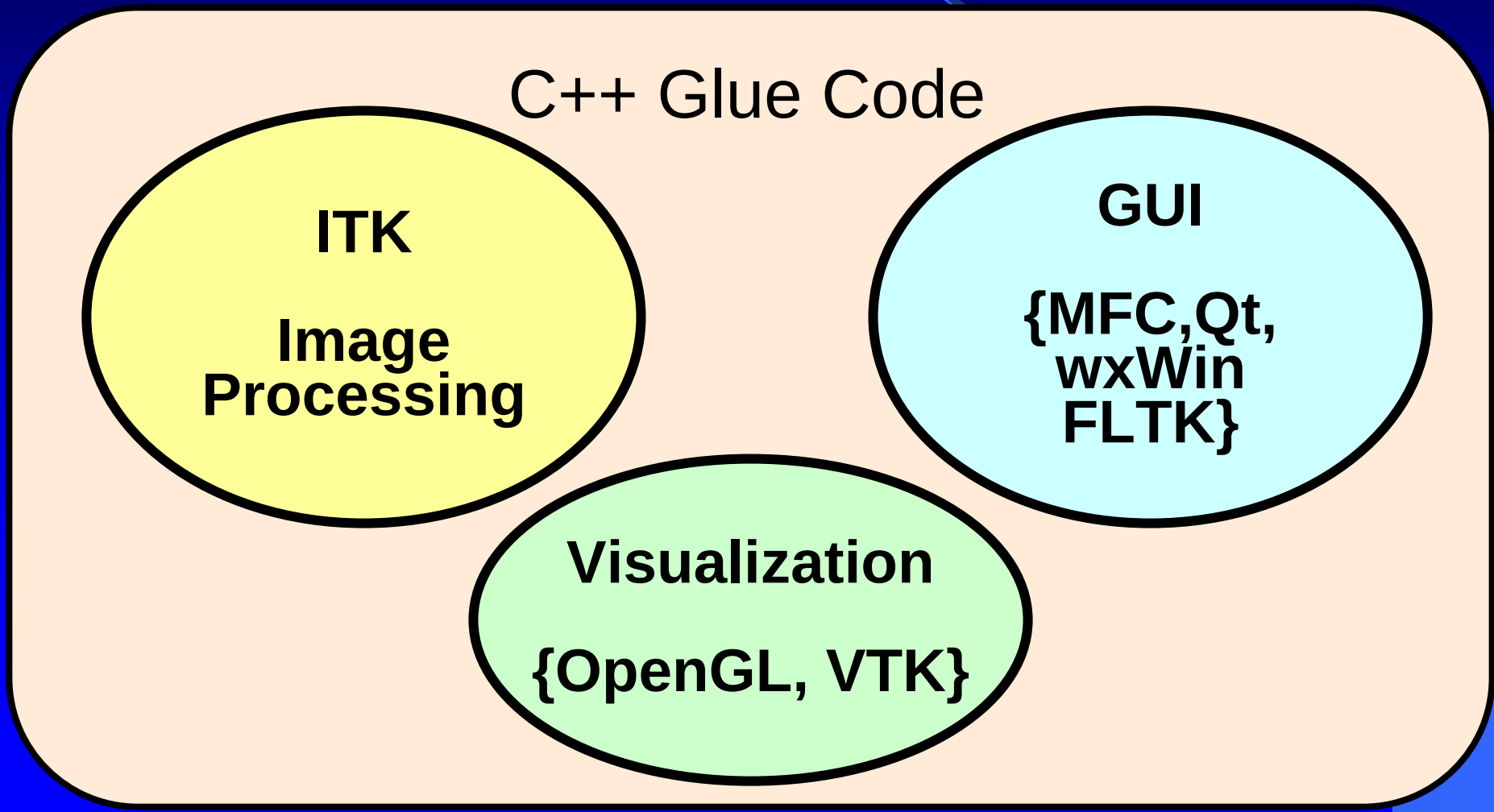
Numbers updated on September 29th 2007

ITK by the Numbers

- 1,380
  - # of users subscribed to the mailing-list
- 345
  - # of monthly emails in users-list (Oct'06 - Sep'07 average)
- 836
  - # of pages in the Software Guide PDF document
- 15,040
  - # of Software Guide PDF downloads (sourceforge)
- 3,393
  - # of monthly hits to the URL of the ITK Software Guide
- 4,169
  - # of Insight Applications downloads ITK 3.4 (sourceforge)
- 8,659
  - # of source code downloads ITK 3.4 (sourceforge)

Numbers updated on September 29th 2007

How to Integrate ITK in you application



What do I need ?

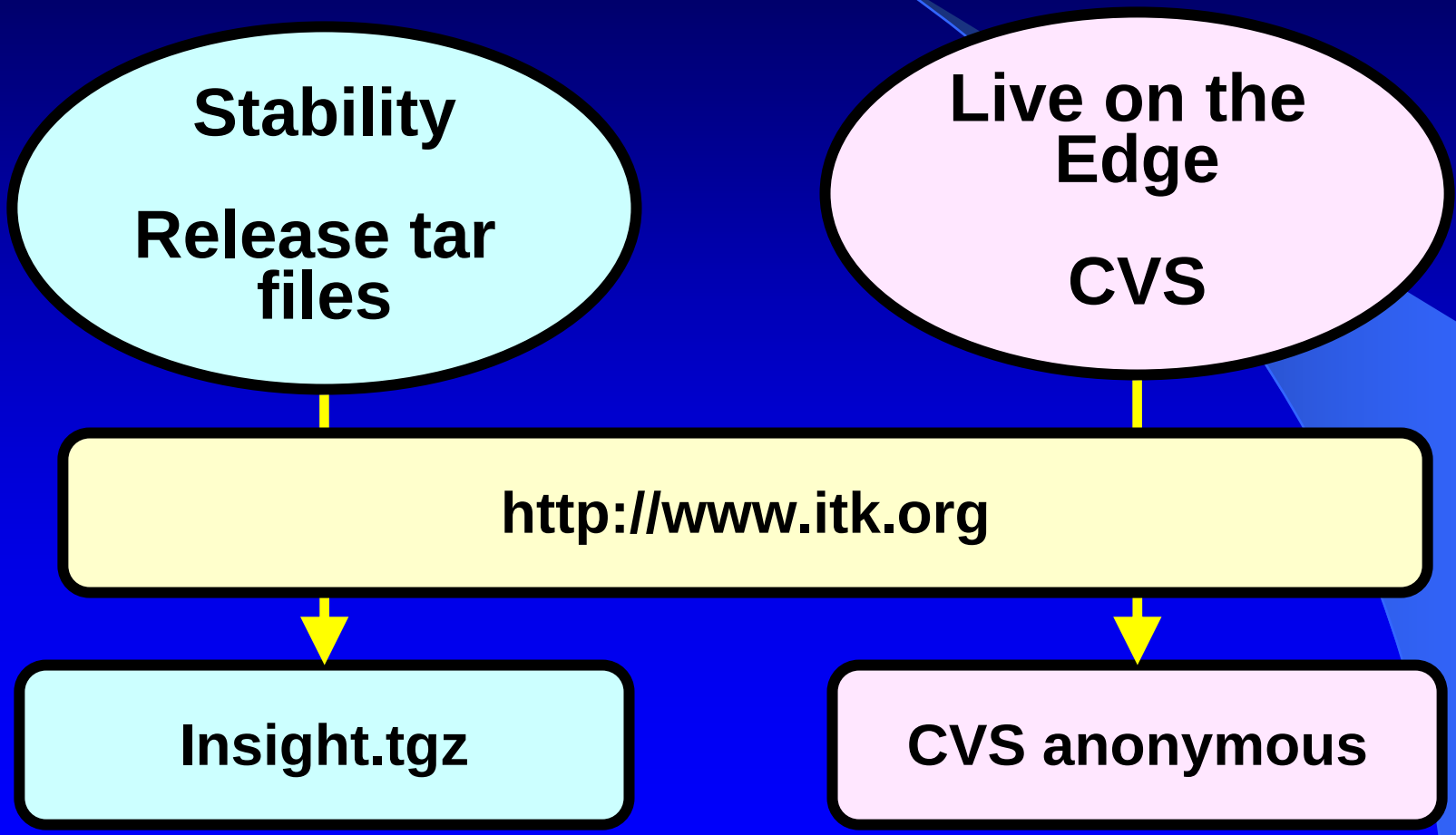
C++ Compiler

GCC 2.95 – 4.1
Visual C++ 6.0
Visual C++ 7.0
Visual C++ 7.1
Visual C++ 8.0
Intel 7.1
Intel 8.0-9.0
IRIX CC
Borland 5.5
Mac - gcc

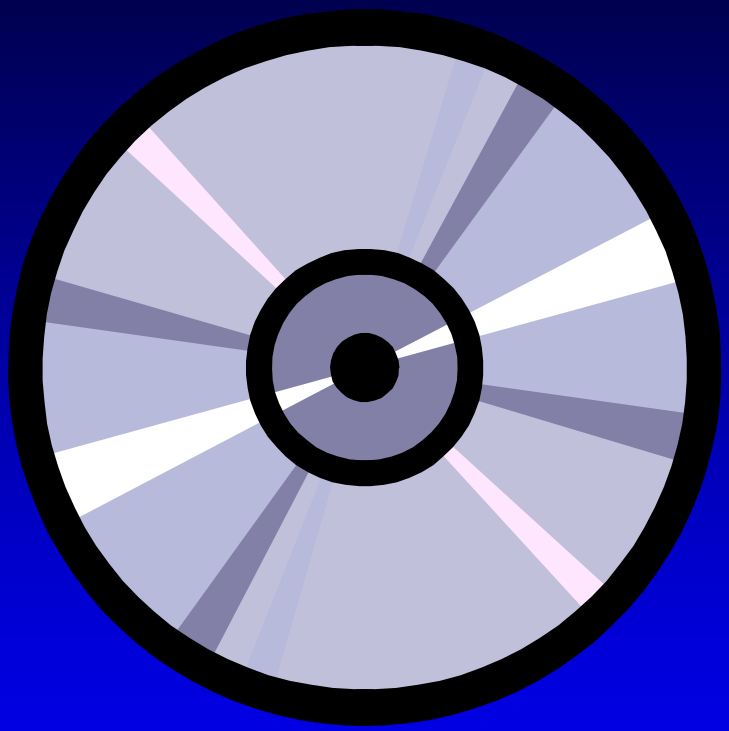
CMake

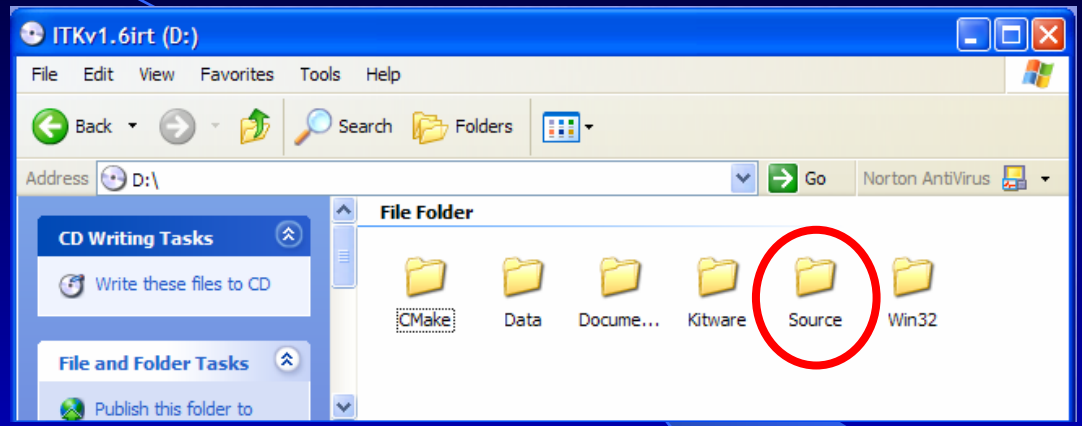
www.cmake.org

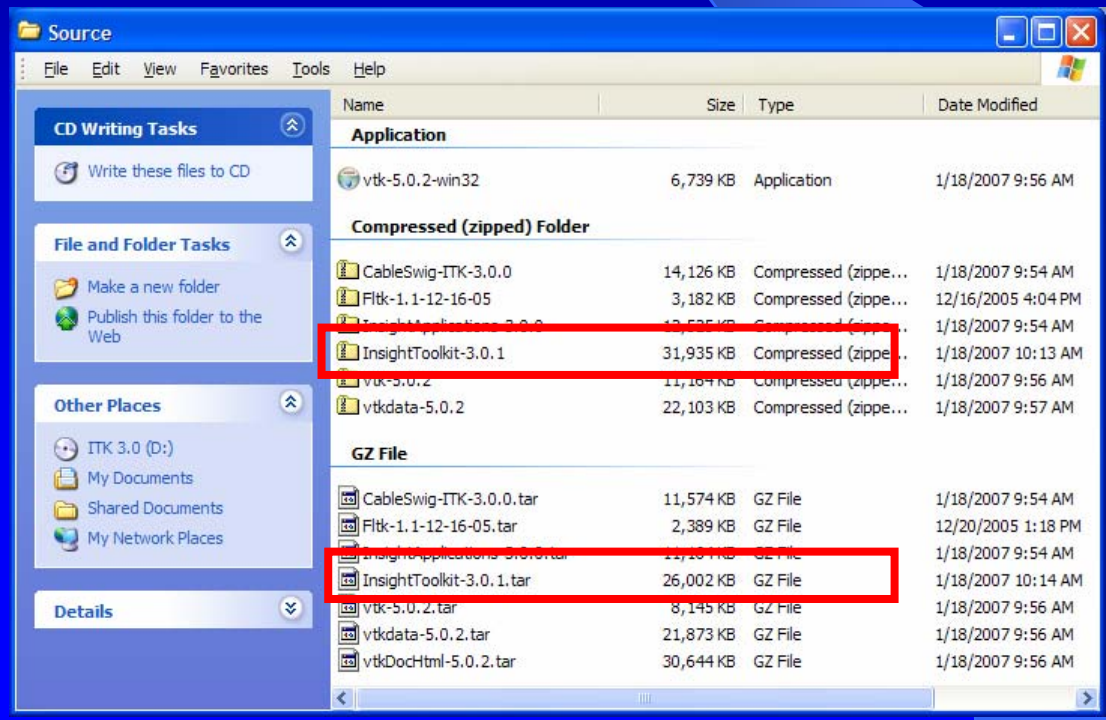
Step 1. Download ITK



Copying ITK from the CD

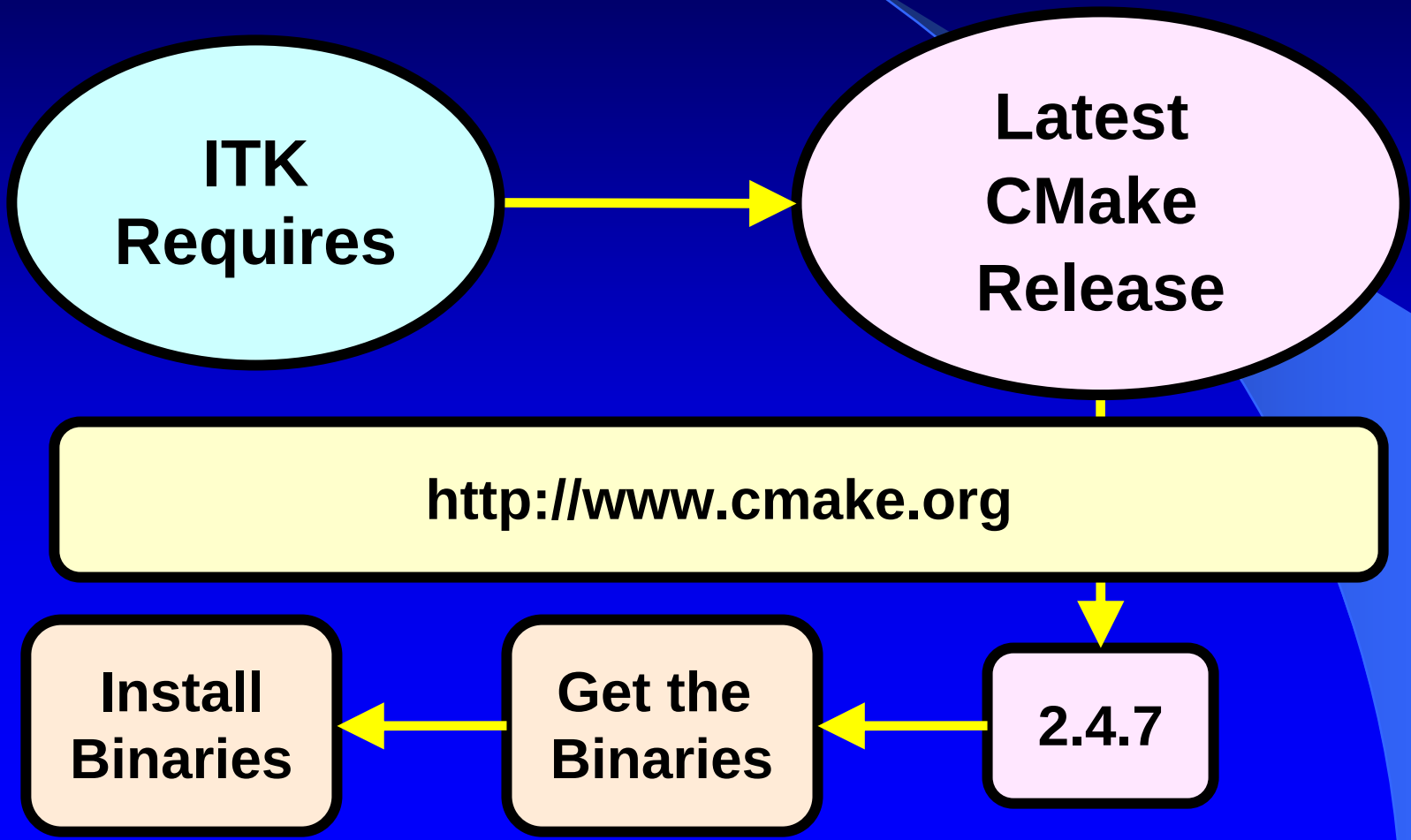




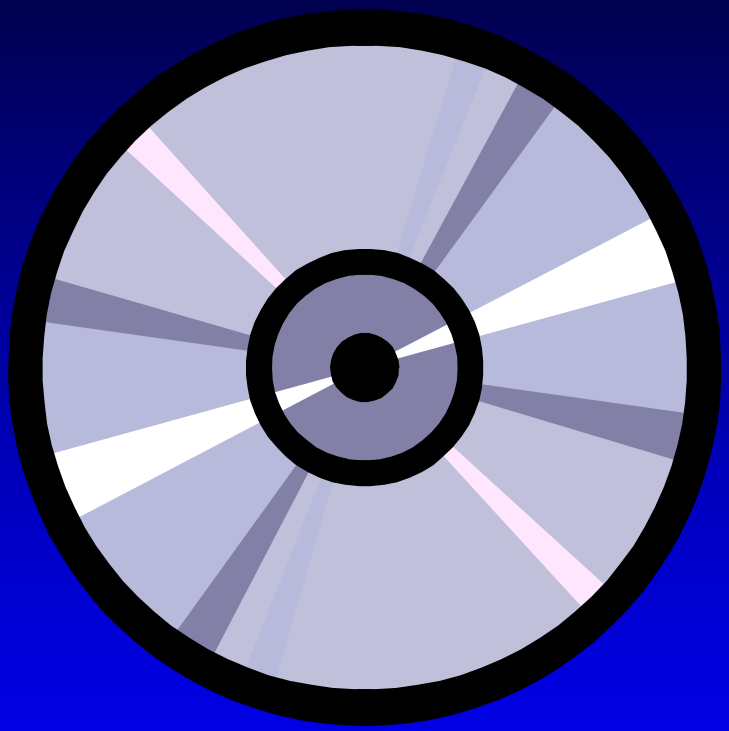


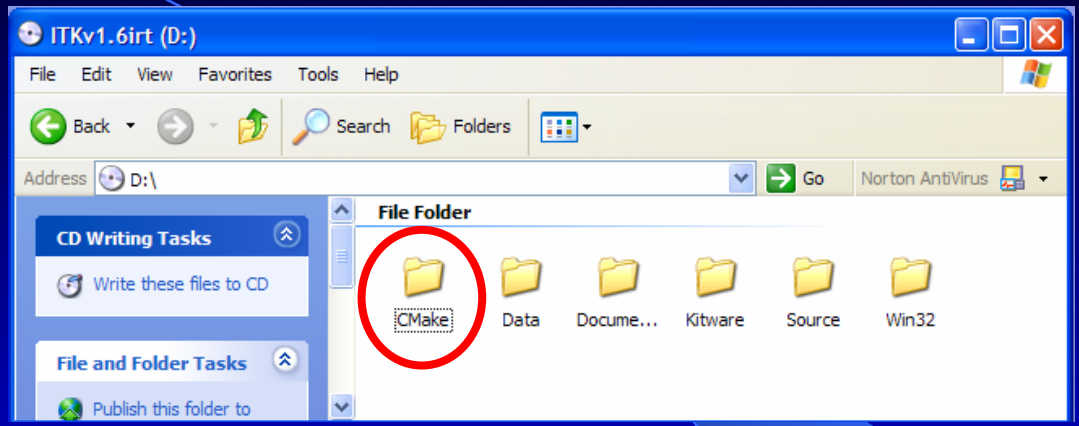
/Source/
- InsightToolkit-3.4.0.zip
- InsightToolkit-3.4.0.tar.gz

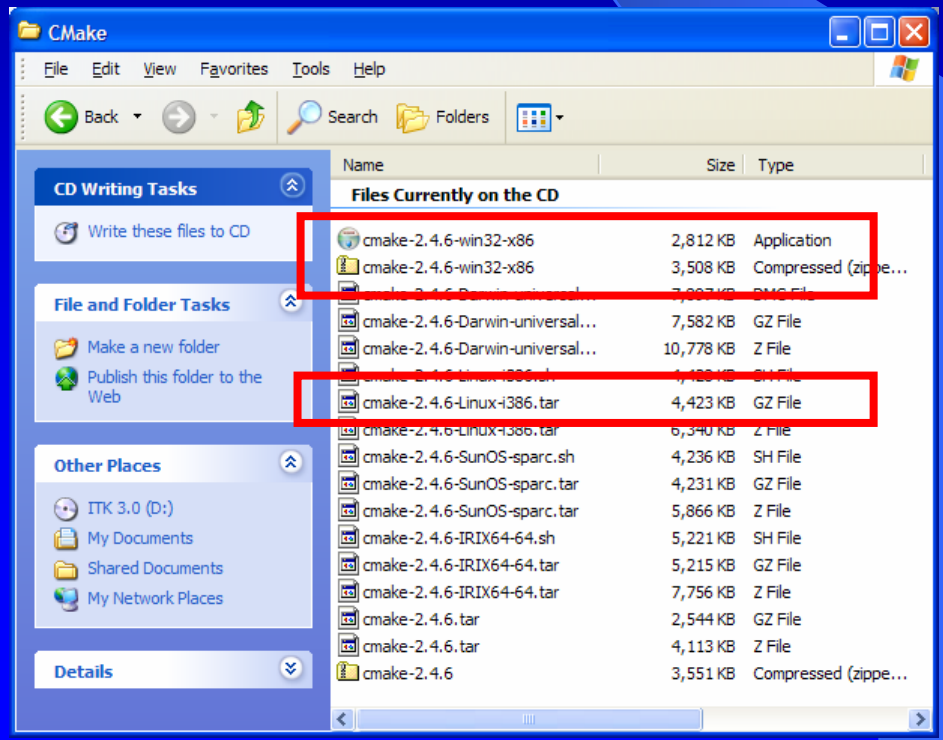
Step 2. Download CMake



Installing CMake from the CD

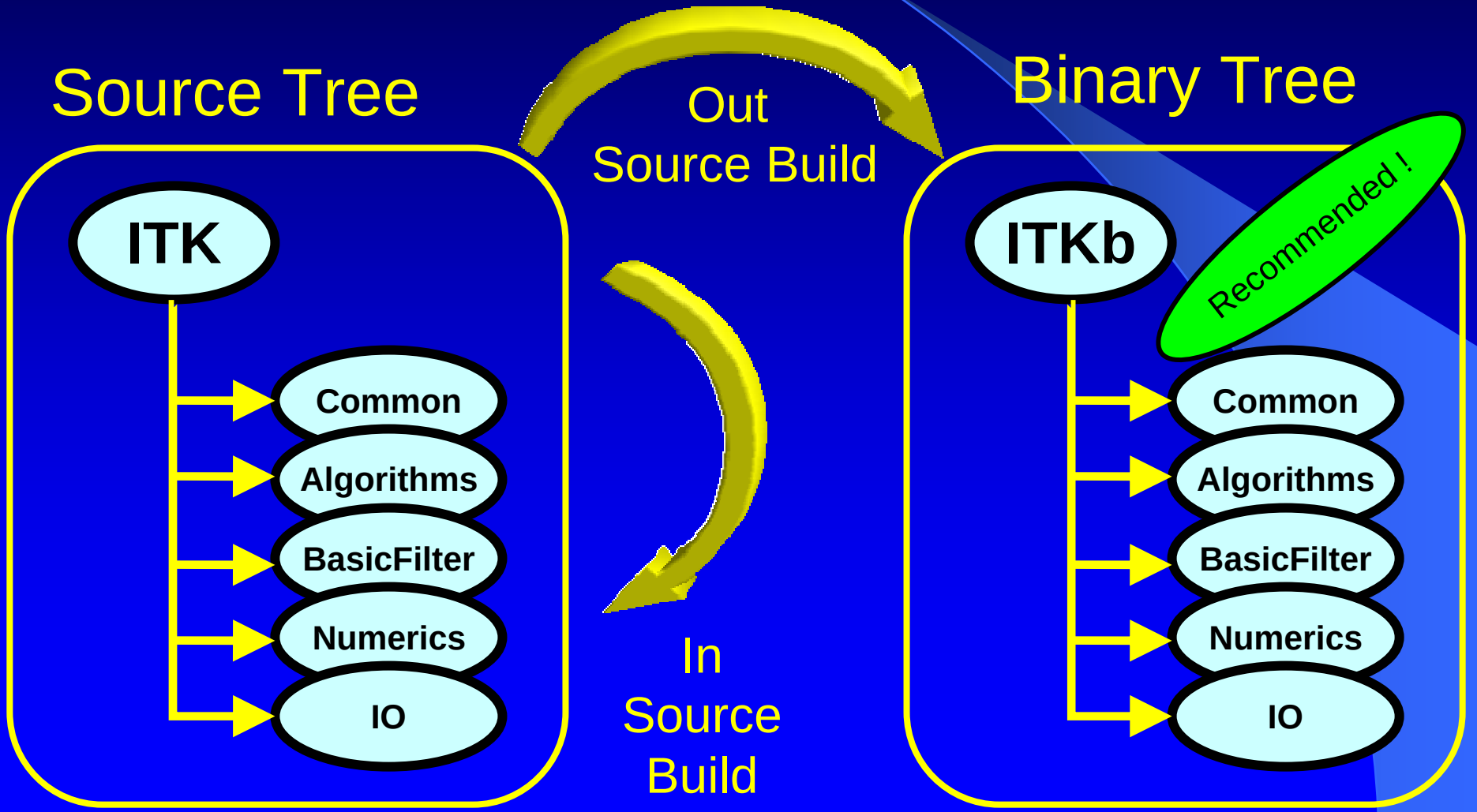






/CMake/
- cmake-2.4.7-win32-x86.zip
- cmake-2.4.7-win32-x86.exe
- cmake-2.4.7-Linux-i386.tar.gz

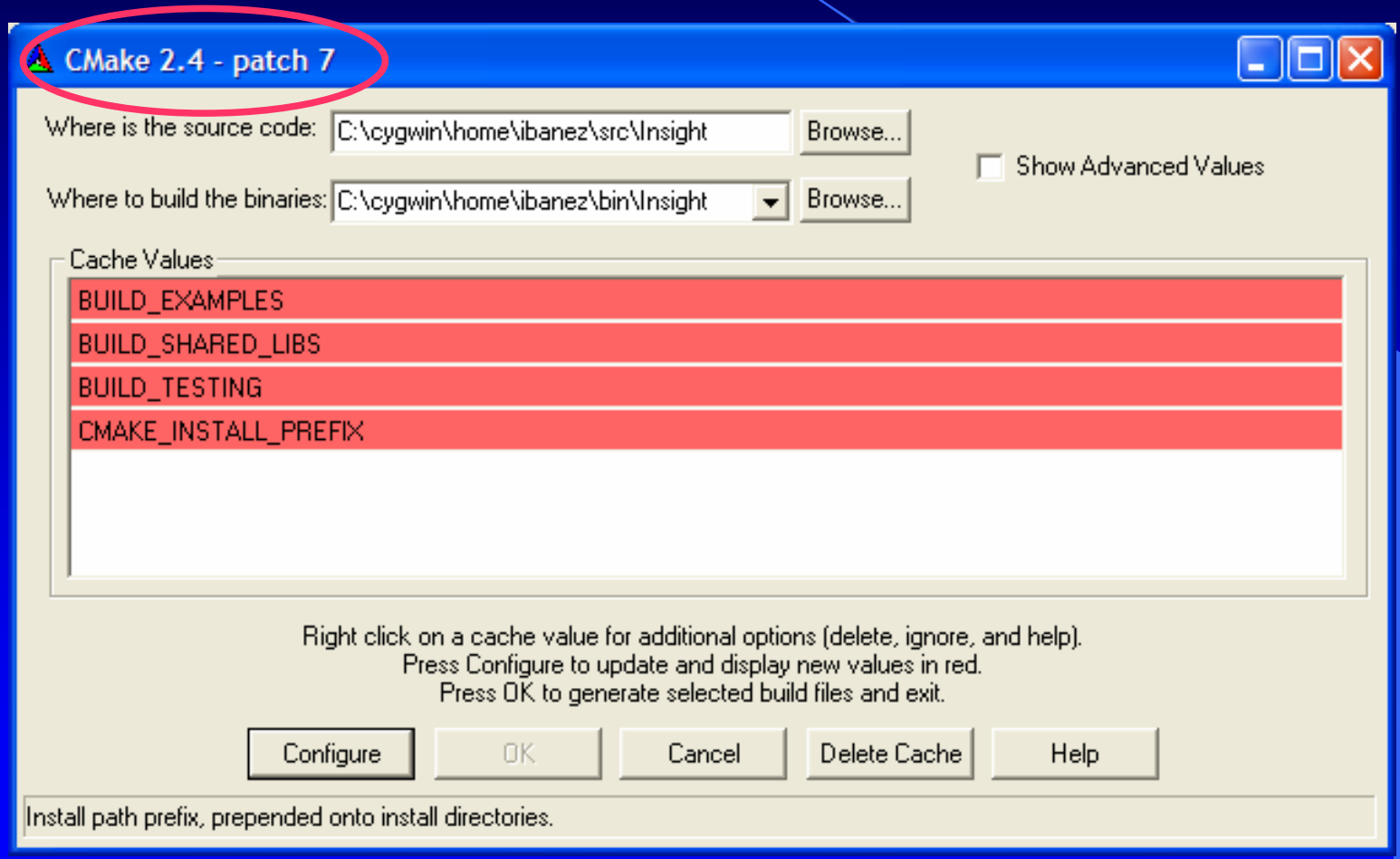
Step 3. Configure ITK



Configuring ITK – MS-Windows

- Run CMake
- Select the SOURCE directory
- Select the BINARY directory

Configuring ITK – MS-Windows



Configuring ITK – MS-Windows

- Set BUILD_EXAMPLES to OFF
- Set BUILD_SHARED_LIBS to OFF
- Set BUILD_TESTING to OFF

- Click “Configure” to configure
- Select the Compiler that you want to use
- Click “OK” to generate project files

Configuring ITK – GNU/Linux

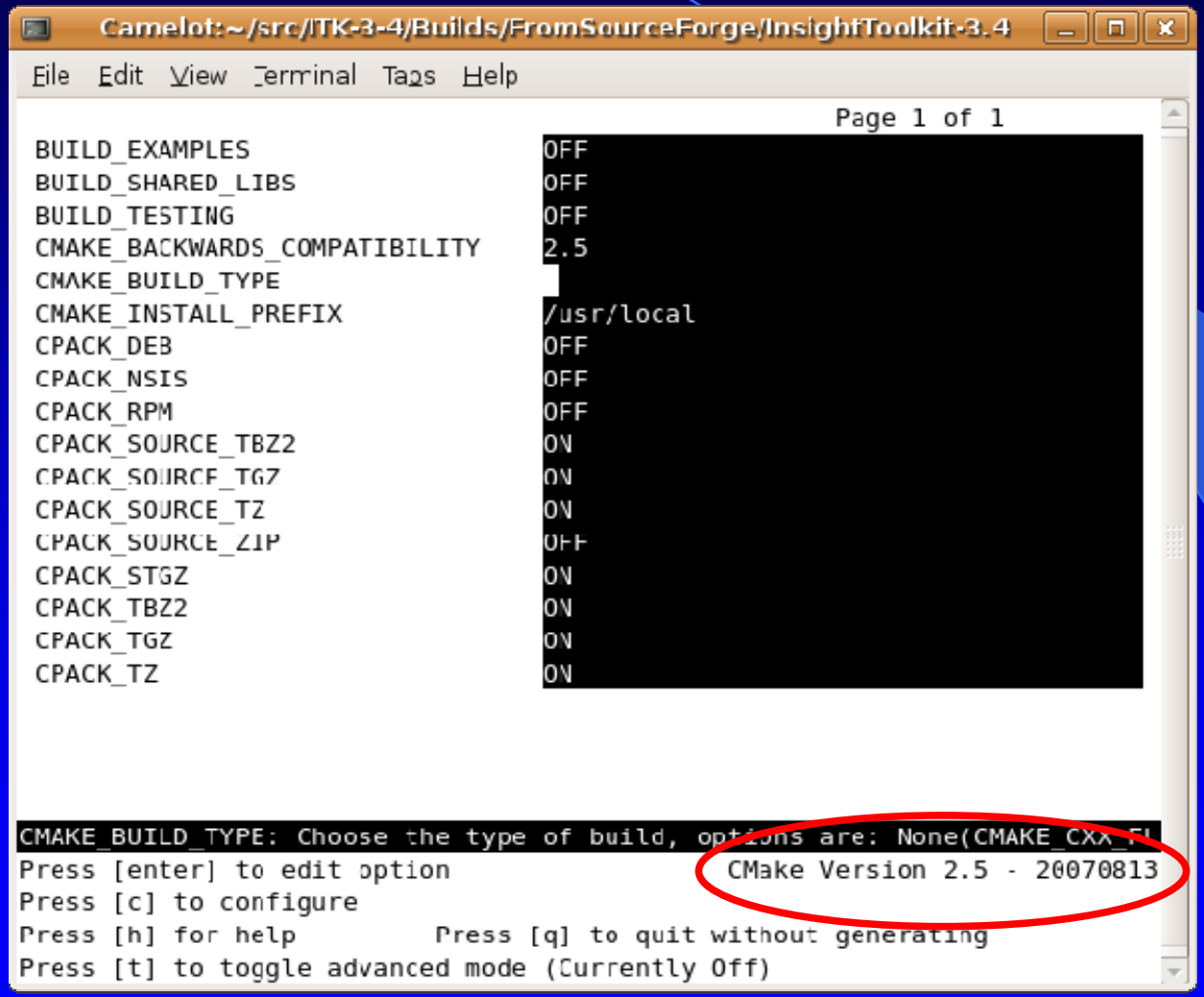
- Create the BINARY directory (mkdir)
- Change directory to the BINARY directory (cd)
- Set the environment variables CC and CXX

  setenv CC /usr/bin/gcc; setenv CXX /usr/bin/g++ OR

  export CC=/usr/bin/gcc; export CXX=/usr/bin/g++

- Type ccmake with argument the SOURCE directory

Configuring ITK – GNU/Linux

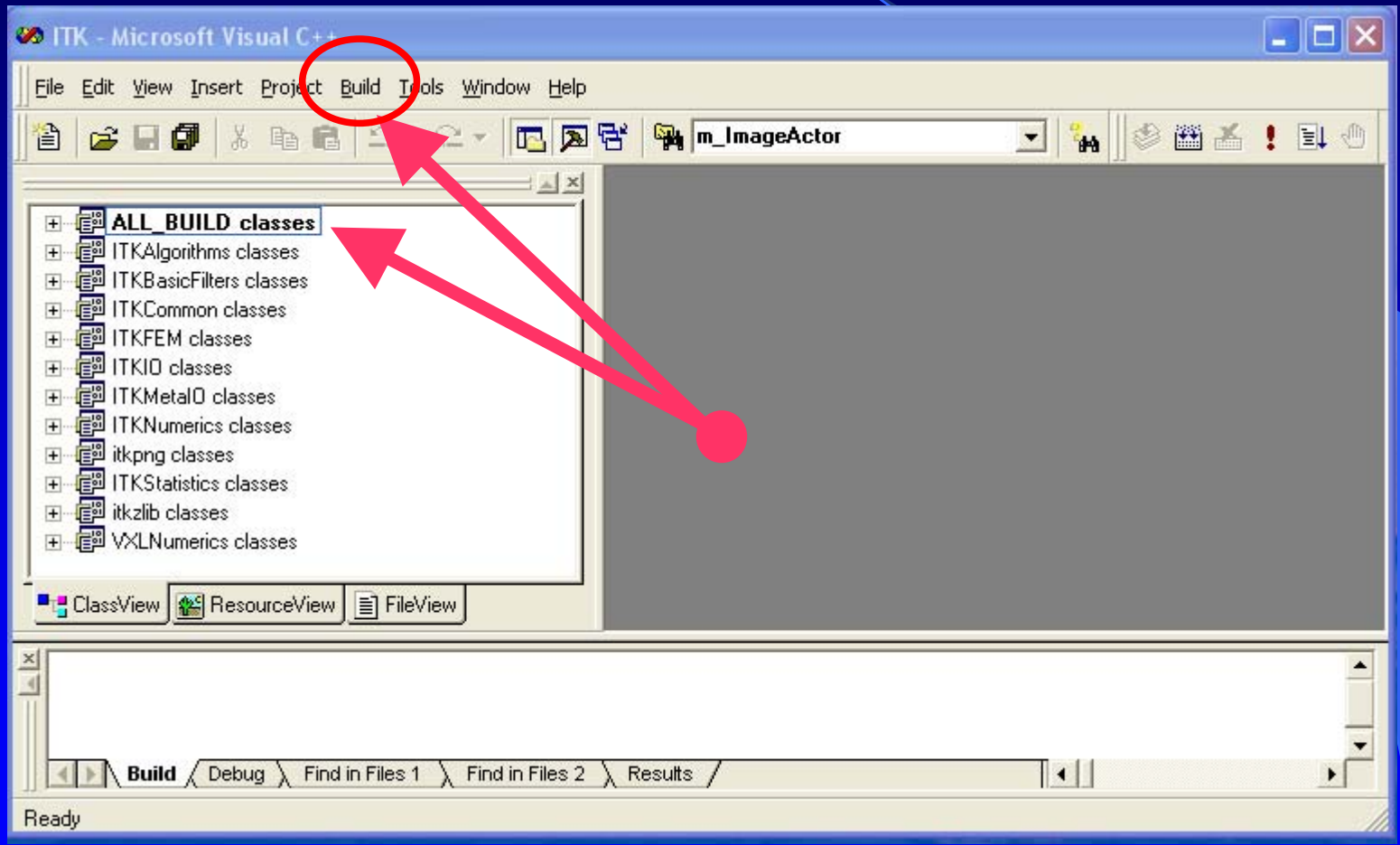


Configuring ITK – GNU/Linux

- Disable BUILD_EXAMPLES
- Disable BUILD_SHARED_LIBS
- Disable BUILD_TESTING

- Type “c” to configure
- Type “g” to generate the Makefiles
- Type “make” to start building

Building ITK

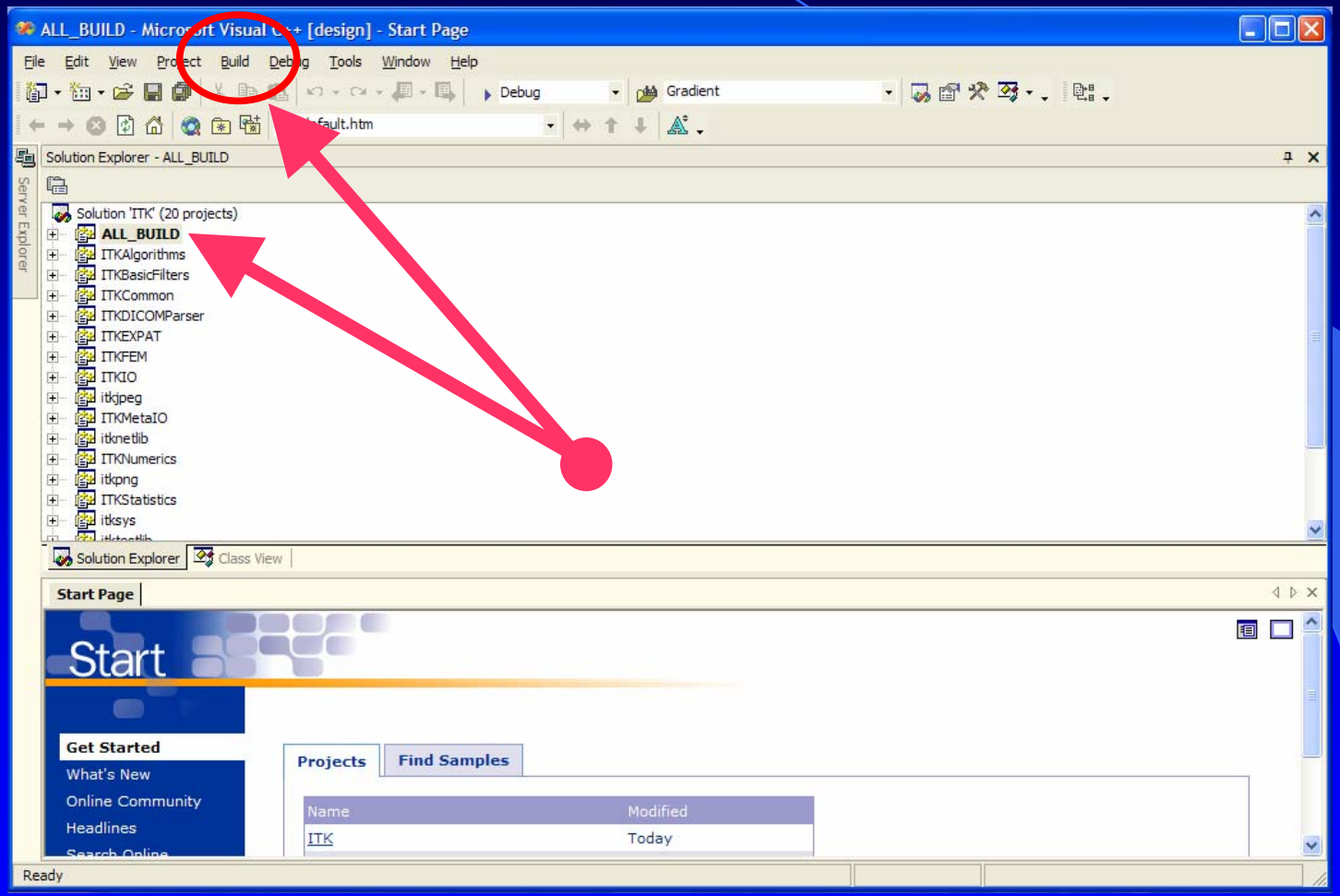


Building ITK

- Open ITK.dsw in the Binary Directory
- Select ALL_BUILD project
- Build it

  …It will take about 15 minutes …

Building ITK



Building ITK

- Open ITK.sln in the Binary Directory
- Select ALL_BUILD project
- Build it

  …It will take about 15 minutes …

Building ITK

- Most of ITK classes are C++ Templates
- Basic libraries are small

  they only contain non-templated classes
- Basic libraries are built in about 15 min

Step 5. Verify the Built

Libraries will be found in

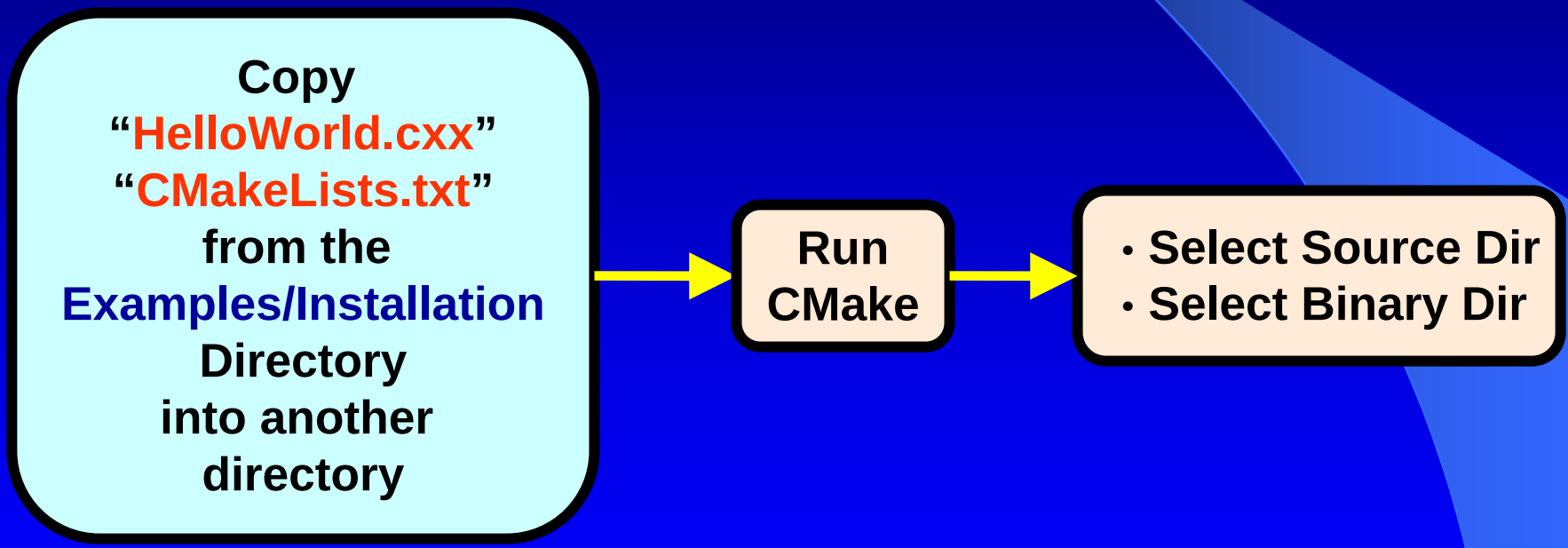
ITK_BINARY / bin / { Debug, Release }

Step 5. Verify the Build

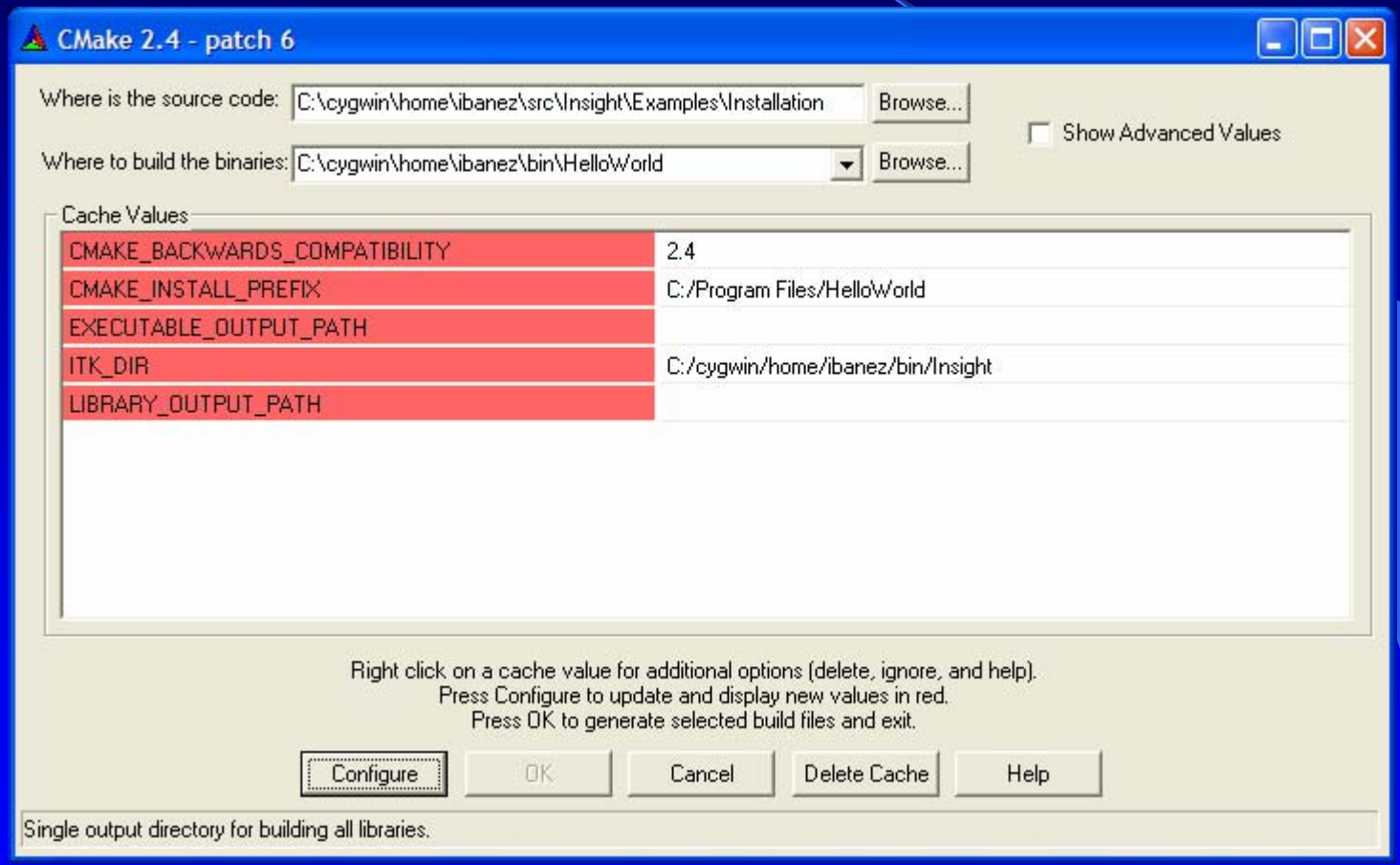
The following libraries should be there

- ITKCommon
- ITKBasicFilters
- ITKAlgorithms
- ITKNumerics
- ITKFEM
- ITKIO
- ITKStatistics
- ITKMetaIO
- itkpng
- itkzlib

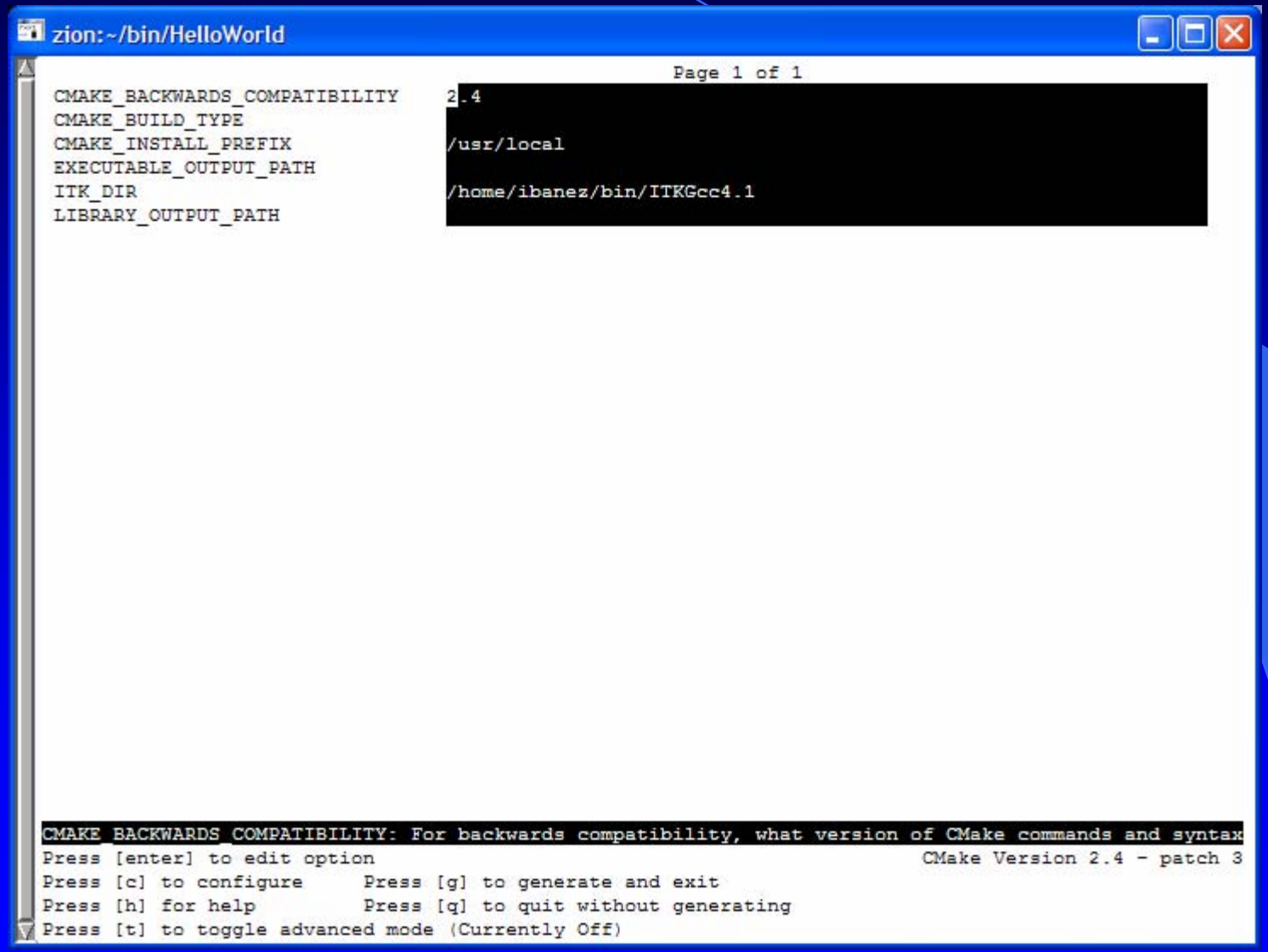
Step 6. Use ITK from an external Project



Using ITK – Hello World



Using ITK – Hello World



Step 6. Use ITK from an external Project

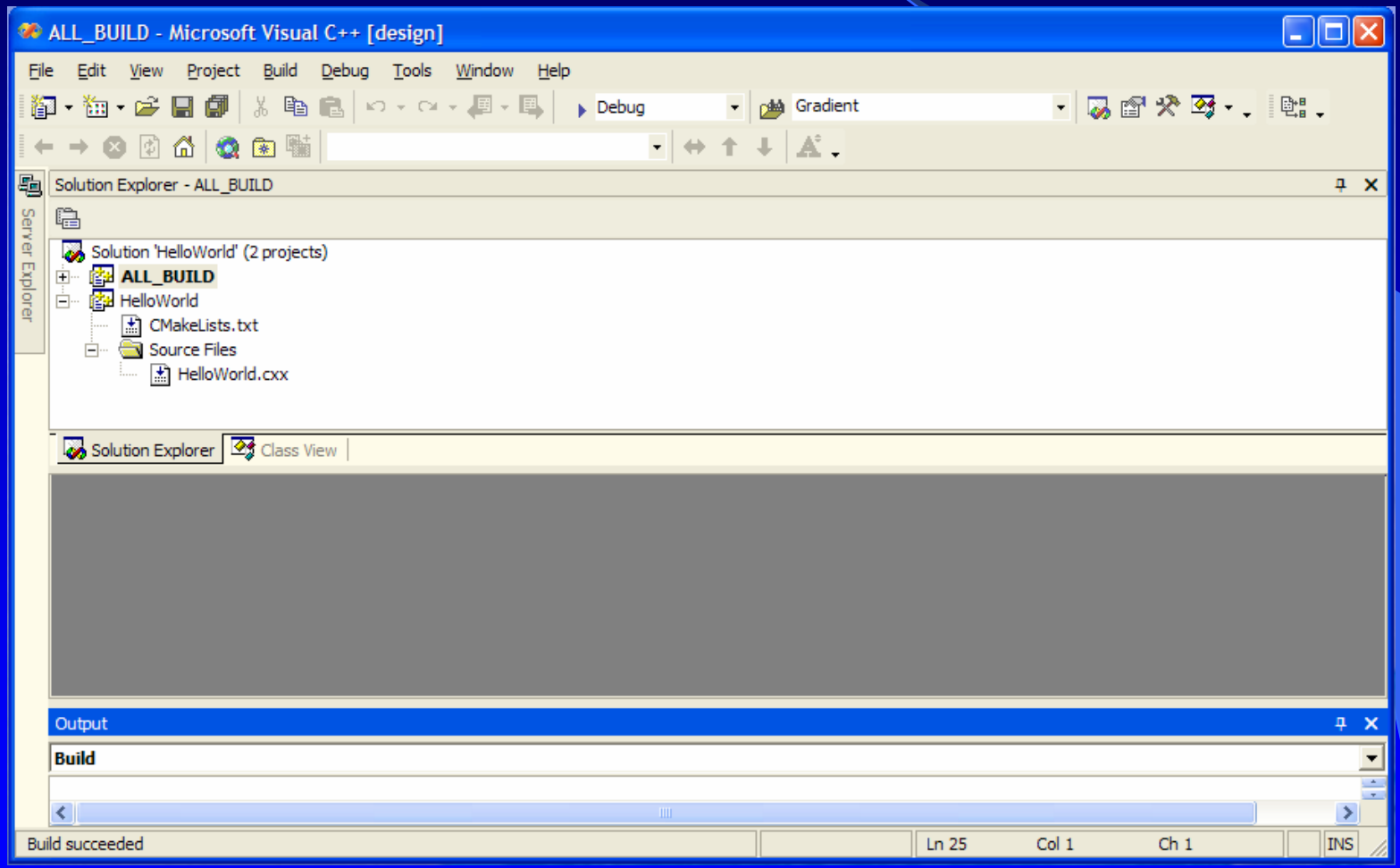
- accept the default in CMAKE_BACKBARD_COMPATIBILITY
- leave empty EXECUTABLE_OUTPUT_PATH
- leave empty LIBRARY_OUTPUT_PATH
- Set ITK_DIR to the binary directory where ITK was built

Step 7. Build Sample Project

- Open HelloWorld.dsw (or .sln) generated by CMake
- Select ALL_BUILD project
- Build it

  …It will take about 3 seconds …

Step 7. Build Sample Project



Step 8. Run the example

- Locate the file HelloWorld.exe
- Run it…
- It should produce the message:

ITK Hello World !

Starting your own project

- Create a clean new directory
- Write a CMakeLists.txt file
- Write a simple .cxx file
- Configure with CMake
- Build
- Run

Step 9. Writing CMakeLists.txt

```
PROJECT( myProject )

FIND_PACKAGE ( ITK   REQUIRED )
IF ( ITK_FOUND )
        INCLUDE( ${ITK_USE_FILE} )
ENDIF( ITK_FOUND )

ADD_EXECUTABLE( myProject   myProject.cxx )

TARGET_LINK_LIBRARIES ( myProject  ITKCommon   ITKIO)
```

Step 10. Writing myProject.cxx

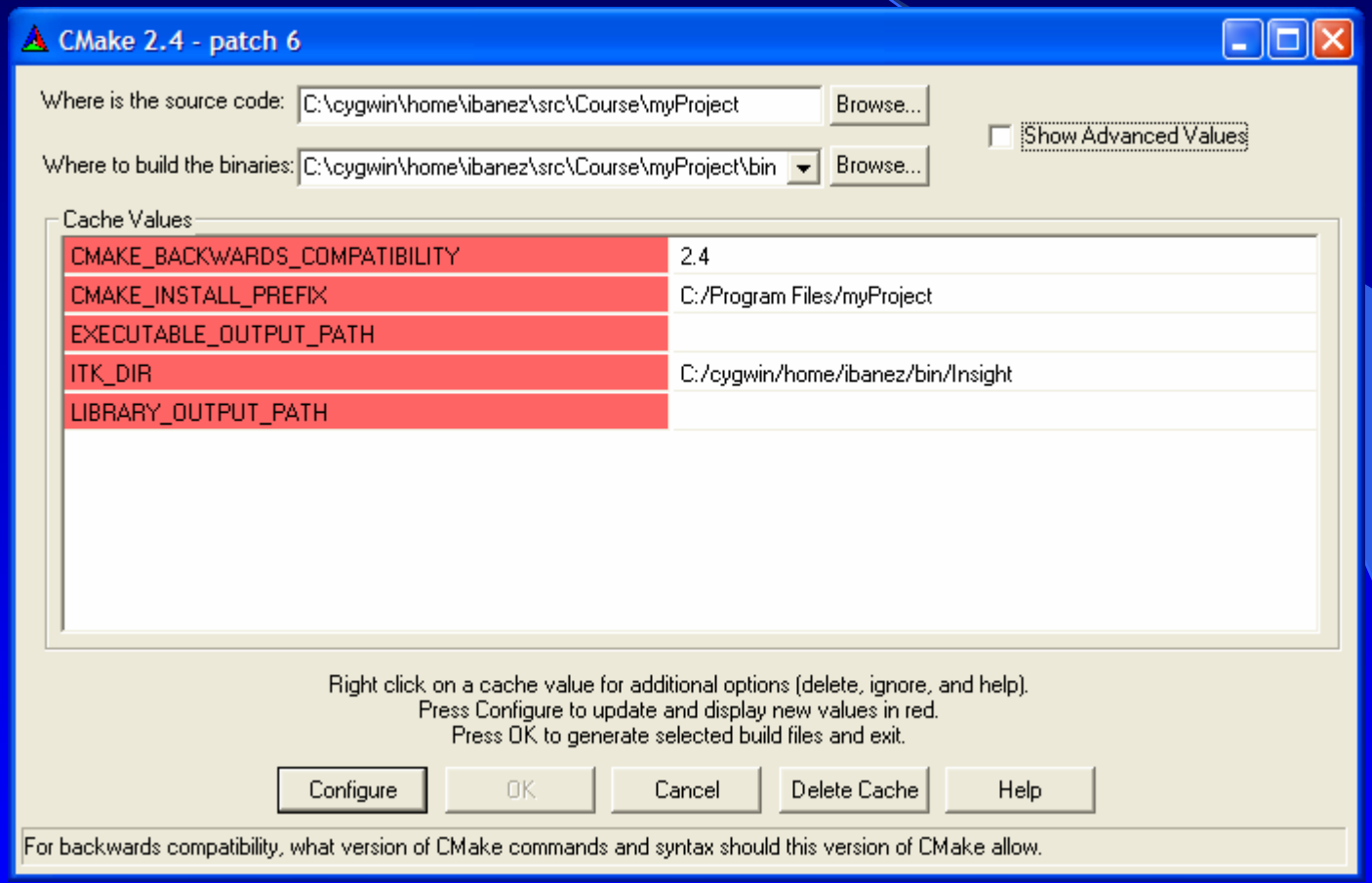
```
#include "itkImage.h"
#include "itkImageFileReader.h"
#include "itkGradientMagnitudeImageFilter.h"

int main( int argc, char **argv ) {
  typedef itk::Image<unsigned short,2>          ImageType;
  typedef itk::ImageFileReader<ImageType>       ReaderType;
  typedef itk::GradientMagnitudeImageFilter<
                       ImageType,ImageType>     FilterType;

  ReaderType::Pointer reader = ReaderType::New();
  FilterType::Pointer filter = FilterType::New();

  reader->SetFileName( argv[1] );
  filter->SetInput( reader->GetOutput() );
  filter->Update();
  return 0;
}
```

Step 11. Run CMake



Step 12. How to find what you need

http://www.itk.org/ItkSoftwareGuide.pdf

http://www.itk.org/Doxygen/html/index.html

- Follow the link Alphabetical List
- Follow the link Groups
- Post to the insight-users mailing list

Insight Toolkit

3.4.0

Introduction

Welcome to the National Library of Medicine Insight Segmentation and Registration Toolkit (ITK). ITK is an open-source sofware system to support the Visible Human Project. Currently under active development, ITK employs leading-edge segmentation and registration algorithms in two, three and more dimensions.

ITK Modules

Here is a list of all modules:

- **Data Representation Objects**
  - **Image Representation Objects**
  - **Mesh Representation Objects**
  - **Path Representation Objects**
  - **Geometry Representation Objects**
- **Data Access Objects**
  - **Image Access Objects**
  - **Mesh Access Objects**
  - **Iterators**
    - **Image Iterators**
- **Objects Related to Tensor Images**
- **Data Processing Objects**
  - **Filters**
    - **Image Filters**
      - **Intensity Image Filters**
        - **Mathematical Morphology Image Filters**
      - **Image Enhancement Filters**
      - **Image Feature Extraction Filters**

ITK Class Index

A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Z

A

AbortCheckEvent (itk)
AbortEvent (itk)
Abs (itk::Function)
AbsImageAdaptor (itk)
AbsImageFilter (itk)
AbsoluteValueDifference2 (itk::Functor)
AbsoluteValueDifferenceImageFilter (itk)
AbsPixelAccessor (itk::Accessor)
AccessorFunctor (itk::Functor)
AccumulateImageFilter (itk)
Acos (itk::Functor)
AcosImageAdaptor (itk)
AcosImageFilter (itk)
AcosPixelAccessor (itk::Accessor)

GrayscaleGeodesicDilateImageFilter (itk)
GrayscaleGeodesicErodeImageFilter (itk)
GrayscaleGrindPeakImageFilter (itk)
GrayscaleMorphologicalClosingImageFil
GrayscaleMorphologicalOpeningImageFi
GreaterThanComparable (itk::Concept)
GreaterThanComparable::Constraints (itl
GreenPixelAccessor (itk)
GreyLevelCooccurrenceMatrixTextureCo
(itk::Statistics)
GroupSpatialObject (itk)

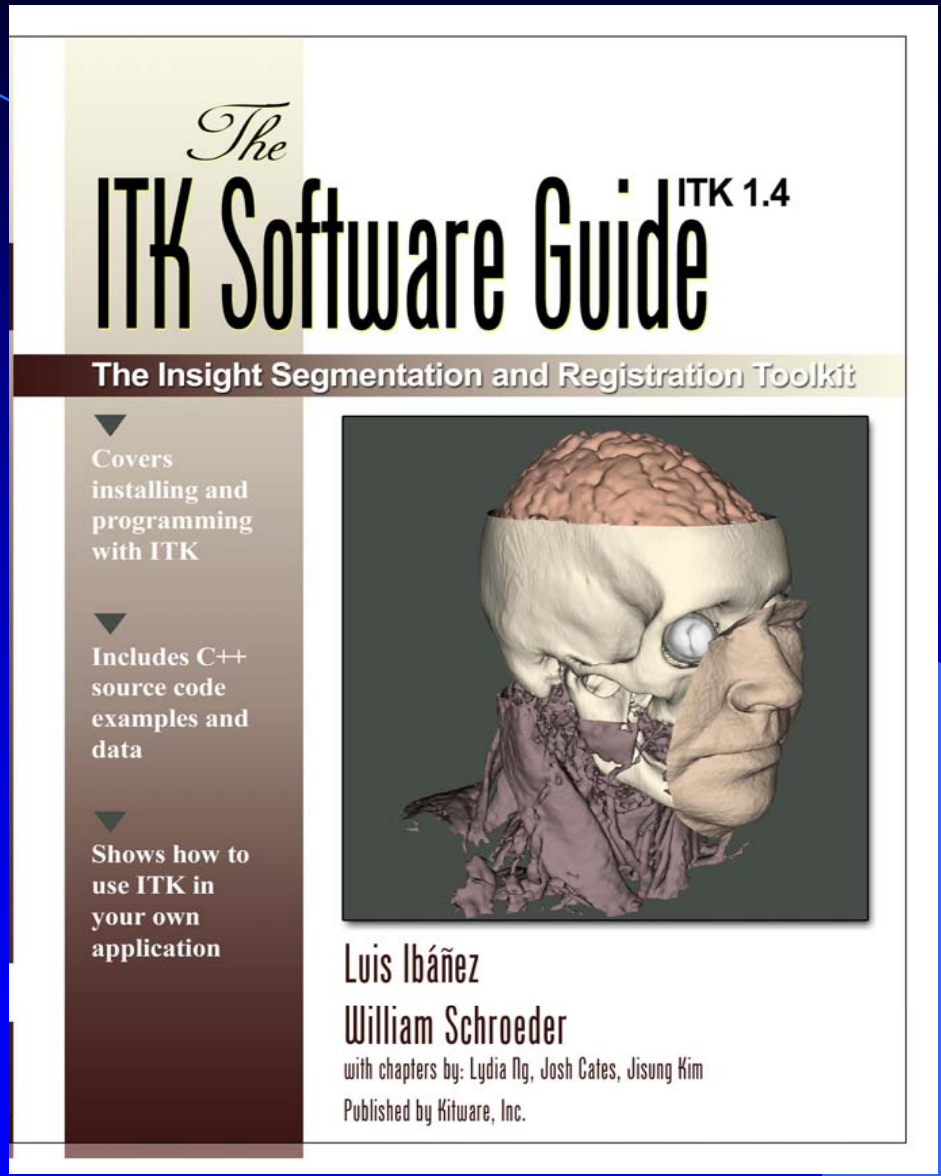
H

HammingWindowFunction (itk::Function)
HardLimitTransferFunction (itk::Statistic
hash (itk)
hash< char * > (itk)

The ITK Software Guide is freely available as a PDF document at

www.itk.org/ItkSoftwareGuide.pdf

Its paper version can be ordered from Amazon.com and from Kitware's e-store.



Enjoy ITK !