# Ape

DONTRELEASEME-148

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# Contents

# Chapter 1

# Main Page

## Welcome

Ape (Another PC Emulator) is an experimental IBM PC compatible emulator written in C++17.

### Classes worth reading up on

Machine Core::Machine Core::HW::FloppyDrive CPU Core::CPU::CPU Core::CPU::Instruction

# Chapter 2

# Hierarchical Index

## 2.1 Class Hierarchy

This inheritance list is sorted roughly, but not completely, alphabetically:

# Chapter 3

# Class Index

## 3.1 Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

# Chapter 4

# File Index

## 4.1 File List

Here is a list of all documented files with brief descriptions:

# Chapter 5

# Class Documentation

## 5.1 Core::CPU::CPU Class Reference

Representation of the Central Processing Unit.

`#include <CPU.h>`

### Public Member Functions

- **CPU** (Machine *machine)
- void Tick ()

  *Execute one CPU cycle.*
- void Start ()

  *Execute instructions until shutdown is requested.*

### Public Attributes

- u16 & AX = AX_struct.AX

  *AX (Accumulator)*
- u8 & AH = AX_struct.b8.AH

  *AH (High)*
- u8 & AL = AX_struct.b8.AL

  *AL (Low)*
- u16 & BX = BX_struct.BX

  *BX.*
- u8 & BH = BX_struct.b8.BH

  *BH (High)*
- u8 & BL = BX_struct.b8.BL

  *BL (Low)*
- u16 & CX = CX_struct.CX

  *CX.*
- u8 & CH = CX_struct.b8.CH

  *CH (High)*
- u8 & CL = CX_struct.b8.CL

*CL (Low)*

- u16 & DX = DX_struct.DX

  *DX.*

- u8 & DH = DX_struct.b8.DH

  *DH (High)*

- u8 & DL = DX_struct.b8.DL

  *DL (Low)*

- u16 CS = 0

  *Code Segment.*

- u16 DS = 0

  *Data Segment.*

- u16 ES = 0

  *Extra(?) Segment.*

- u16 SS = 0

  *Stack Segment.*

- u16 IP = 0

  *Instruction Pointer.*

- u16 BP = 0

  *Base Pointer.*

- u16 SP = 0

  *Stack Pointer.*

- u16 SI = 0

  *Source Index.*

- u16 DI = 0

  *Destination Index.*

- bool AF = false

  *Adjust Flag.*

- bool CF = false

  *Carry Flag.*

- bool IF = true

  *Interrupt Flag.*

- bool DF = false

  *Direction Flag.*

- bool OF = false

  *Overflow Flag.*

- bool PF = false

  *Parity Flag.*

- bool SF = false

  *Sign Flag.*

- bool ZF = false

  *Zero Flag.*

- bool simulate_msdos = false

  *Simulate MS-DOS (Handle its interrupts)*

- std::atomic< bool > running = false

  *Set whether the CPU is running.*

### 5.1.1 Detailed Description

Representation of the Central Processing Unit.

The documentation for this class was generated from the following files:

- /home/max/sources/ape/Source/Core/CPU/CPU.h
- /home/max/sources/ape/Source/Core/BIOS/Interrupt.cpp
- /home/max/sources/ape/Source/Core/CPU/CPU.cpp
- /home/max/sources/ape/Source/Core/CPU/Flags.cpp
- /home/max/sources/ape/Source/Core/CPU/Flags.h

## 5.2 Core::HW::FloppyDrive Class Reference

Representation of a floppy drive.

`#include <FloppyDrive.h>`

### Public Member Functions

- bool Insert (const std::string &path)
  *Insert an image into the drive.*
- bool HasDisc () const
  *Check if a disc is present.*
- u32 GetSize () const
  *Get the size of the inserted disc.*
- bool IsBootable ()
  *Check if the provided image is bootable.*
- u32 GetSectorSize () const
  *Get size of a floppy.*
- u32 GetSectorsPerTrack () const
  *Get sectors per track.*
- u32 GetHeadCount () const
  *Get head count.*
- void Eject ()
  *Eject the image.*
- bool Read (u32 offset, u32 size, u8 *buffer)
  *Read data from the image.*
- bool **Read** (u8 cylinder, u8 head, u8 sector, u8 count, u8 *buffer)

### 5.2.1 Detailed Description

Representation of a floppy drive.

The documentation for this class was generated from the following files:

- /home/max/sources/ape/Source/Core/HW/FloppyDrive.h
- /home/max/sources/ape/Source/Core/HW/FloppyDrive.cpp

## 5.3 Core::CPU::Instruction Class Reference

High-Level representation of a instruction.

`#include <Instruction.h>`

### Classes

- class Parameter

  *High-Level representation of a instruction parameter.*

### Public Types

- enum SegmentPrefix : u8

  *Enum of all possible segment prefixes.*
- enum Type : u8 { **PRIVATE** }

  *Determines the type of the instruction.*

### Public Member Functions

- Instruction (u8 opcode, u32 offset=0)

  *Turns the provided opcode into an Instruction.*
- Instruction (const Instruction &ins, u8 opcode, u32 offset=0)

  *One but with prefixes.*
- Type GetType () const

  *Get the Type associated with this instruction.*
- SegmentPrefix GetPrefix () const

  *Get the SegmentPrefix associated with this instruction.*
- bool IsResolved ()

  *Checks whether this Instruction needs further resolving.*
- bool IsPrefix () const

  *Checks if this instruction is actually a prefix.*
- bool Resolve (u8 mod, std::vector< u8 > data)

  *Resolves the Instruction.*
- u8 GetLength (u8 mod)

  *Get the length of the instruction provided.*
- std::string ToString () const

  *Get a disassembly for the Instruction provided.*
- const std::vector< Parameter > & GetParameters () const

  *Get a vector of parameters.*
- Parameter & GetParameter (size_t index)

  *Get a specific vector.*
- void AddParameter (Parameter parameter)

  *Add a new parameter.*

#### 5.3.1 Detailed Description

High-Level representation of a instruction.

### 5.3.2 Member Enumeration Documentation

#### 5.3.2.1 SegmentPrefix

```
enum Core::CPU::Instruction::SegmentPrefix :  u8  [strong]
```

Enum of all possible segment prefixes.

These prefixes override the default segment of an instruction.

### 5.3.3 Constructor & Destructor Documentation

#### 5.3.3.1 Instruction()

```
Core::CPU::Instruction::Instruction (
            u8 opcode,
            u32 offset = 0 )  [explicit]
```

Turns the provided opcode into an Instruction.

**Parameters**

| | |
|---|---|
| *opcode* | Opcode to be decoded |

### 5.3.4 Member Function Documentation

#### 5.3.4.1 GetLength()

```
u8 Instruction::GetLength (
            u8 mod )
```

Get the length of the instruction provided.

**Returns**

Length of the instruction in bytes

#### 5.3.4.2 Resolve()

```
bool Instruction::Resolve (
            u8 mod,
            std::vector< u8 > data )
```

Resolves the Instruction.

**Parameters**

| | |
|---|---|
| *mod* | Modifier byte. The byte after the opcode regardless if it is used as such |
| *data* | needs to have as many bytes as specified in GetInstructionLength() |

**Returns**

Returns `false` if there was an error during resolving.

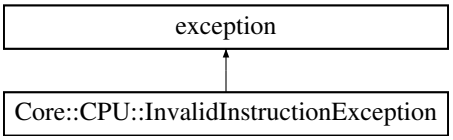
The documentation for this class was generated from the following files:

- /home/max/sources/ape/Source/Core/CPU/Instruction.h
- /home/max/sources/ape/Source/Core/CPU/Decoder.cpp
- /home/max/sources/ape/Source/Core/CPU/Instruction.cpp

## 5.4 Core::CPU::InvalidInstructionException Class Reference

`#include <Exception.h>`

Inheritance diagram for Core::CPU::InvalidInstructionException:




### 5.4.1 Detailed Description

Thrown when the CPU hits an instruction that couldn't be resolved / is invalid

The documentation for this class was generated from the following file:

- /home/max/sources/ape/Source/Core/CPU/Exception.h

## 5.5 Core::Machine Class Reference

Representation of a PC.

`#include <Machine.h>`

### Public Member Functions

- HW::FloppyDrive & GetFloppyDrive ()

  *Get this machines HW::FloppyDrive.*
- Memory & GetMemory ()

  *Get this machines Memory.*
- bool BootFloppy ()

  *Boot the machine from the floppy drive.*
- void Shutdown ()

  *Shutdown the machine.*
- bool BootCOM (const std::string &file, const std::string &&parameters="")

  *Directly execute a COM file.*

#### 5.5.1 Detailed Description

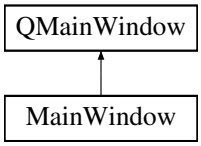
Representation of a PC.

The documentation for this class was generated from the following files:

- /home/max/sources/ape/Source/Core/Machine.h
- /home/max/sources/ape/Source/Core/Machine.cpp

## 5.6 MainWindow Class Reference

Inheritance diagram for MainWindow:




### Public Member Functions

- **MainWindow** (const std::string &&path="")

The documentation for this class was generated from the following files:

- /home/max/sources/ape/Source/ApeQt/MainWindow.h
- /home/max/sources/ape/Source/ApeQt/MainWindow.cpp

## 5.7 Core::Memory Class Reference

Wrapper around emulated RAM.

```
#include <Memory.h>
```

### Public Member Functions

- Memory (u32 size)
  *Create Memory of the specified size (in bytes)*
- std::vector< u8 > & Get ()
  *Get the contents of RAM.*
- template<typename T >
  T & **Get** (u16 segment, u16 offset)
- template<typename T >
  T * **GetPtr** (u16 segment, u16 offset)

### Static Public Member Functions

- static u32 VirtToPhys (u16 segment, u16 offset)
  *Converts a virtual address to an absolute one.*

#### 5.7.1 Detailed Description

Wrapper around emulated RAM.

The documentation for this class was generated from the following files:

- /home/max/sources/ape/Source/Core/Memory.h
- /home/max/sources/ape/Source/Core/Memory.cpp

## 5.8 Core::CPU::Instruction::Parameter Class Reference

High-Level representation of a instruction parameter.

`#include <Instruction.h>`

### Public Types

- enum Type : u8 { **PRIVATE** }
  *Enum to determine the types of parameters.*

### Public Member Functions

- Parameter (Parameter::Type type)
  *Create a parameter with the Instruction::Parameter::Type provided.*
- void Resolve (u32 data)
  *Provide the parameter with its missing data.*
- void Resolve (Parameter::Type type, u32 data=0)
  *Change the type of the parameter and provide missing data (if any)*
- Type GetType () const
  *Get the parameters type.*
- template<typename T >
  T GetData () const
  *Get the data associated with this parameter.*
- bool IsResolved () const
  *Returns `true` if this parameter is resolved.*
- bool IsWord () const
  *Returns `true` if this parameter points to or is a word.*
- std::string ToString (SegmentPrefix prefix=SegmentPrefix::None, u32 offset=0) const
  *Get a human readable form of this parameter.*

### 5.8.1 Detailed Description

High-Level representation of a instruction parameter.

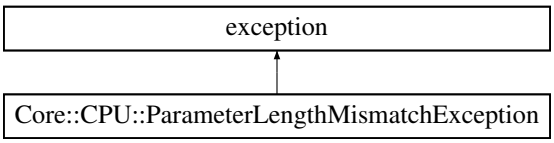
The documentation for this class was generated from the following files:

- /home/max/sources/ape/Source/Core/CPU/Instruction.h
- /home/max/sources/ape/Source/Core/CPU/Instruction.cpp

## 5.9 Core::CPU::ParameterLengthMismatchException Class Reference

`#include <Exception.h>`

Inheritance diagram for Core::CPU::ParameterLengthMismatchException:




### 5.9.1 Detailed Description

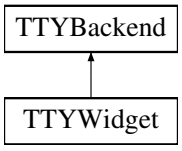
Thrown when a `word` and `byte` parameter are used together when they shouldn't be

The documentation for this class was generated from the following file:

- /home/max/sources/ape/Source/Core/CPU/Exception.h

## 5.10 TTYBackend Class Reference

Inheritance diagram for TTYBackend:



### Public Member Functions

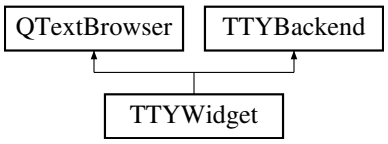
- virtual void **Write** (const std::string &string)=0
- virtual void **Write** (const char c)=0
- virtual void **Scroll** (const u8 lines, const u8 colors)=0
- virtual void **MoveCursor** (const u32, const u32)=0
- virtual u8 **GetCursorRow** () const =0
- virtual void **SetCursorRow** (u8 row)=0
- virtual u8 **GetCursorColumn** () const =0
- virtual void **SetCursorColumn** (u8 column)=0
- virtual void **Clear** ()=0
- virtual char **Read** ()=0
- virtual bool **IsCharAvailable** () const =0

The documentation for this class was generated from the following file:

- /home/max/sources/ape/Source/Core/TTYBackend.h

## 5.11 TTYWidget Class Reference

Inheritance diagram for TTYWidget:




### Public Member Functions

- void **Write** (const std::string &string) override
- void **Write** (const char c) override
- void **Scroll** (const u8 lines, const u8 colors) override
- void **MoveCursor** (const u32 x, const u32 y) override
- u8 **GetCursorRow** () const override
- void **SetCursorRow** (u8 row) override
- u8 **GetCursorColumn** () const override
- void **SetCursorColumn** (u8 column) override
- void **Clear** () override
- char **Read** () override
- bool **IsCharAvailable** () const override
- void **keyPressEvent** (QKeyEvent ∗event)
- void **keyReleaseEvent** (QKeyEvent ∗event)

### Public Attributes

- u8 **m_row** = 0
- u8 **m_column** = 0
- std::map< char, bool > **m_pressed_keys**

The documentation for this class was generated from the following files:

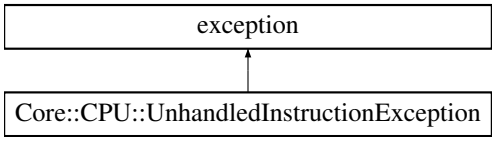
- /home/max/sources/ape/Source/ApeQt/TTYWidget.h
- /home/max/sources/ape/Source/ApeQt/TTYWidget.cpp

## 5.12 Core::CPU::UnhandledInstructionException Class Reference

Thrown when the CPU hits an unimplemented Instruction::Type.

`#include <Exception.h>`

Inheritance diagram for Core::CPU::UnhandledInstructionException:




### 5.12.1 Detailed Description

Thrown when the CPU hits an unimplemented Instruction::Type.

The documentation for this class was generated from the following file:

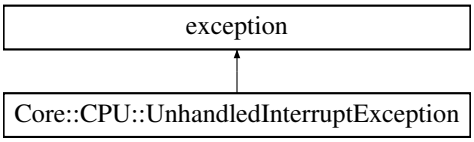
- /home/max/sources/ape/Source/Core/CPU/Exception.h

## 5.13 Core::CPU::UnhandledInterruptException Class Reference

Thrown when a interrupt is neither handled by software nor hardware.

`#include <Exception.h>`

Inheritance diagram for Core::CPU::UnhandledInterruptException:




### 5.13.1 Detailed Description

Thrown when a interrupt is neither handled by software nor hardware.

The documentation for this class was generated from the following file:

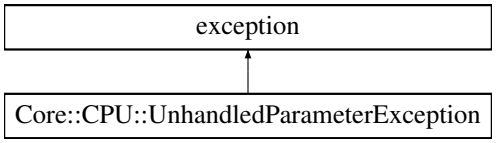
- /home/max/sources/ape/Source/Core/CPU/Exception.h

## 5.14 Core::CPU::UnhandledParameterException Class Reference

Thrown when the CPU hits an unimplemented Instruction::Parameter::Type.

`#include <Exception.h>`

Inheritance diagram for Core::CPU::UnhandledParameterException:




### 5.14.1 Detailed Description

Thrown when the CPU hits an unimplemented Instruction::Parameter::Type.

The documentation for this class was generated from the following file:

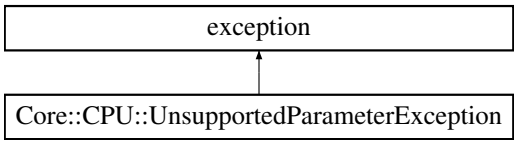
- /home/max/sources/ape/Source/Core/CPU/Exception.h

## 5.15 Core::CPU::UnsupportedParameterException Class Reference

Thrown when a instruction doesn't support the parameter type provided.

`#include <Exception.h>`

Inheritance diagram for Core::CPU::UnsupportedParameterException:




### 5.15.1 Detailed Description

Thrown when a instruction doesn't support the parameter type provided.

The documentation for this class was generated from the following file:

- /home/max/sources/ape/Source/Core/CPU/Exception.h

# Chapter 6

# File Documentation

## 6.1 /home/max/sources/ape/Source/Common/Logger.h File Reference

```
#include <string>
```

### Macros

- #define LOG(msg) __MSG("LOG", __FILE__, __LINE__, msg)

  *Log a message.*
- #define WARN(msg) __MSG("WARNING", __FILE__, __LINE__, msg)

  *Log a warning.*
- #define ERROR(msg) __MSG("ERROR", __FILE__, __LINE__, msg)

  *Log an error.*

## 6.2 /home/max/sources/ape/Source/Common/Types.h File Reference

```
#include <cstdint>
```

### Typedefs

- using u8 = uint8_t

  *A 8-bit unsigned integer (unsigned byte)*
- using i8 = int8_t

  *A 8-bit signed integer (unsigned byte)*
- using u16 = uint16_t

  *A 16-bit unsigned integer (unsigned word)*
- using i16 = int16_t

  *A 16-bit signed integer (unsigned word)*
- using u32 = uint32_t

  *A 32-bit unsigned integer.*
- using i32 = int32_t

  *A 32-bit signed integer.*
- using u64 = uint64_t

  *A 64-bit unsigned integer.*
- using i64 = int64_t

  *A 64-bit signed integer.*

## 6.3 /home/max/sources/ape/Source/Core/CPU/CPU.h File Reference

```
#include <atomic>
#include "Common/Logger.h"
#include "Common/String.h"
#include "Common/Types.h"
#include "Core/CPU/Exception.h"
#include "Core/CPU/Instruction.h"
#include "Core/Memory.h"
```

### Classes

- class Core::CPU::CPU

  *Representation of the Central Processing Unit.*

## 6.4 /home/max/sources/ape/Source/Core/CPU/Exception.h File Reference

```
#include <exception>
```

### Classes

- class Core::CPU::InvalidInstructionException
- class Core::CPU::UnhandledInstructionException

  *Thrown when the CPU hits an unimplemented Instruction::Type.*
- class Core::CPU::UnhandledParameterException

  *Thrown when the CPU hits an unimplemented Instruction::Parameter::Type.*
- class Core::CPU::ParameterLengthMismatchException
- class Core::CPU::UnsupportedParameterException

  *Thrown when a instruction doesn't support the parameter type provided.*
- class Core::CPU::UnhandledInterruptException

  *Thrown when a interrupt is neither handled by software nor hardware.*

## 6.5 /home/max/sources/ape/Source/Core/CPU/Instruction.h File Reference

```
#include <map>
#include <string>
#include <vector>
#include "Common/Types.h"
```

### Classes

- class Core::CPU::Instruction

  *High-Level representation of a instruction.*
- class Core::CPU::Instruction::Parameter

  *High-Level representation of a instruction parameter.*

### Functions

- std::string Core::CPU::TypeToString (const Instruction::Type &type)

  *Get the corresponding nmoroic for the Type provided.*
- std::string Core::CPU::ParameterTypeToString (const Instruction::Parameter::Type &type, Instruction::↩ SegmentPrefix prefix=Instruction::SegmentPrefix::None)

  *Get a human readable form of the Parameter::Type provided.*
- bool Core::CPU::ParameterNeedsResolving (const Instruction::Parameter::Type &parameter)

  *Checks whether this Parameter::Type needs resolving.*

## 6.6 /home/max/sources/ape/Source/Core/HW/FloppyDrive.h File Reference

```
#include <fstream>
#include <memory>
#include <string>
#include <vector>
#include "Common/Types.h"
```

### Classes

- class Core::HW::FloppyDrive

  *Representation of a floppy drive.*

## 6.7 /home/max/sources/ape/Source/Core/Machine.h File Reference

```
#include "Core/CPU/CPU.h"
#include "Core/HW/FloppyDrive.h"
#include "Core/Memory.h"
#include <vector>
```

### Classes

- class Core::Machine

  *Representation of a PC.*

## 6.8 /home/max/sources/ape/Source/Core/Memory.h File Reference

```
#include <vector>
#include "Common/Types.h"
```

### Classes

- class Core::Memory

  *Wrapper around emulated RAM.*

# Index