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UEFI & EDK II Training

Platform Configuration Database (PCD)

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LESSON OBJECTIVE

- Define Platform Configuration Database (PCD) and explain the syntax
- Differentiate types of PCDs
- Explain how changing a PCD value affects output
- Evaluate the results of a PCD value modification

PCD OVERVIEW

EDK II PCD's Purpose and Goals

Documentaton : MdeModulePkg/Universal/PCD/Dxe/Pcd.inf

Purpose

- Establishes platform common definitions
- Build-time/Run-time aspects
- Binary Editing Capabilities

Goals

- Simplify porting
- Easy to associate with a module or platform

EDK II PCD's Purpose and Goals

Documentaton : MdeModulePkg/Universal/PCD/Dxe/Pcd.inf

```
//////////////////////////////////////////////////////////////////////////
//                                                                      //
//                      Introduction of PCD database                    //
//                                                                      //
//////////////////////////////////////////////////////////////////////////

1, Introduction
   PCD database hold all dynamic type PCD information. The structure of PEI PCD
   database is generated by build tools according to dynamic PCD usage for
   specified platform.

2, Dynamic Type PCD
   Dynamic type PCD is used for the configuration/setting which value is determined
   dynamic. In contrast, the value of static type PCD (FeatureFlag, FixedPcd,
   PatchablePcd) is fixed in final generated FD image in build time.
```

See Link above to view the entire documentation

PCD TYPES

`FeatureFlag`

PCD TYPES

`FixedAtBuild`

`FeatureFlag`

PCD TYPES

FixedAtBuild

PatchableInModule

FeatureFlag

PCD TYPES

- FixedAtBuild
- Dynamic
- PatchableInModule
- DyanmicEx
- FeatureFlag
- DynamicHii
- DynamicVpd

PCD TYPES

FixedAtBuild

Dynamic

PatchableInModule

DyanmicEx

DynamicHii

FeatureFlag

DynamicVpd

Syntax Examples

```
[pcdsFeatureFlag.common] [pcdsFixedAtBuild.IA32]
```

PCD TYPES

FixedAtBuild

Dynamic

PatchableInModule

DyanmicEx

DynamicHii

FeatureFlag

DynamicVpd

Syntax Examples

```
[pcdsFeatureFlag.common]  [pcdsFixedAtBuild.IA32]
```

PCD TYPES

- FixedAtBuild
- Dynamic
- PatchableInModule
- DyanmicEx
- DynamicHii
- FeatureFlag
- DynamicVpd

Syntax Examples

```
[pcdsFeatureFlag.common] [pcdsFixedAtBuild.IA32]
```

PCD TYPES

FixedAtBuild

Dynamic

PatchableInModule

DyanmicEx

FeatureFlag

DynamicHii

DynamicVpd

Syntax Examples

```
[pcdsFeatureFlag.common] [pcdsFixedAtBuild.IA32]
[PcdsFixedAtBuild, PcdsPatchableInModule, PcdsDynamic,
PcdsDynamicEx]
```

UEFI Platform Initialization (PI) 1.x Spec & PCDs

PEI

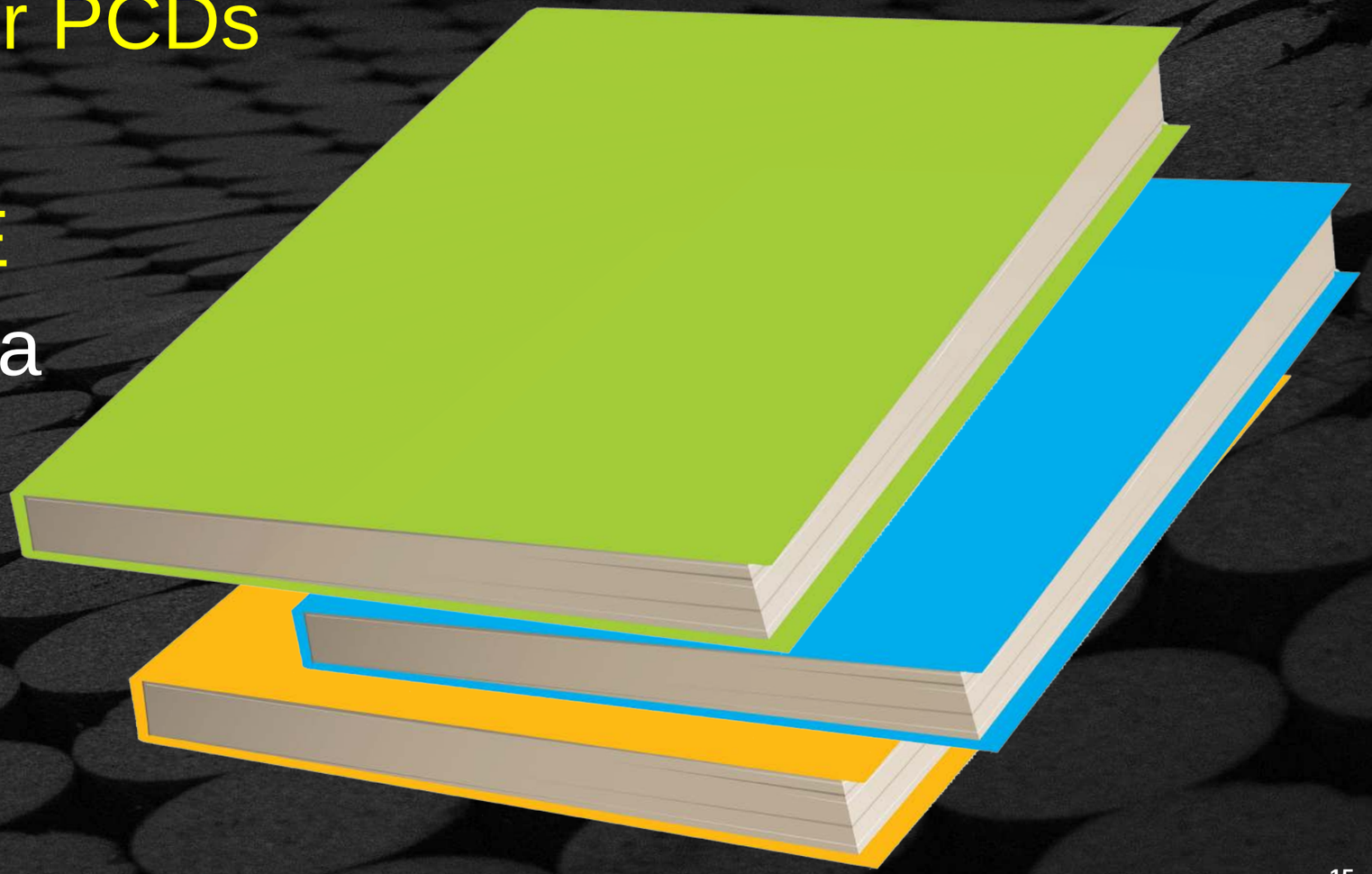
- PCD PEIM produces PCD database
- Two PCD PPIs: `PCD_PPI` and `EFI_PEI_PCD_PPI`

DXE

- DXE Driver Manages PCDs
- Two PCD Protocols: `PCD_PROTOCOL` and `EFI_PCD_PROTOCOL`

PCD LIBRARY

- Provides interface for PCDs
- PCD PPI - PEI
- PCD Protocol – DXE
- Allows access to data



PCD LIBRARY CALLS: PCD PROTOCOL AND PCD PPI FUNCTIONS

```
PcdGetXX()
PcdSetXX()
PcdGetExXX()
PcdSetExXX()
PcdToken()
PCDSetSku()
PcdGetNextToken()
PcdGetNextTokenSpace()
CallBackOnSet()
CancelCallBack()
```

Where “XX” =

```
8
16
32
Size
Ptr
Boolean
```

PCD SYNTAX

PCDs can be located anywhere within the Workspace even though a different package will use those PCDs for a given project

.DEC

Define PCD

PCD SYNTAX

PCDs can be located anywhere within the Workspace even though a different package will use those PCDs for a given project

.DEC

Define PCD

.INF

Reference PCD

PCD SYNTAX

PCDs can be located anywhere within the Workspace even though a different package will use those PCDs for a given project

PCD SYNTAX EXAMPLE

PCD SYNTAX EXAMPLE

PCD defined in the DEC file from any package

```
[Guids.common]
PcdTokenSpaceGuidName={ 0xXXXXXXXX, 0xXXXX, 0xXXXX, { 0xXX, . . .}}

.  .  .
[Pcds...]
PcdTokenSpaceGuidName.PcdTokenName|Value[|DatumType[|MaxSize]]|Token
```

PCD SYNTAX EXAMPLE

PCD defined in the DEC file from any package

```
[Guids.common]
PcdTokenSpaceGuidName={ 0xXXXXXXXX, 0xXXXX, 0xXXXX, { 0xXX, . . .}}

.  .  .
[Pcds...]
PcdTokenSpaceGuidName.PcdTokenName|Value[|DatumType[|MaxSize]]|Token
```

PCD usage listed in INF file for module

```
[…Pcd…]
PcdTokenSpaceGuidName.PcdTokenName|[Value]
```

PCD SYNTAX EXAMPLE

PCD defined in the DEC file from any package

```
[Guids.common]
PcdTokenSpaceGuidName={ 0xXXXXXXXX, 0xXXXX, 0xXXXX, { 0xXX, . . .}}

.  .  .
[Pcds...]
PcdTokenSpaceGuidName.PcdTokenName|Value[|DatumType[|MaxSize]]|Token
```

PCD usage listed in INF file for module

```
[…Pcd…]
PcdTokenSpaceGuidName.PcdTokenName|[Value]
```

Value of PCD set in Platform DSC

```
[Pcds...]
PcdTokenSpaceGuidName.PcdTokenName|Value[|DatumType[|MaximumDatumSize]]
```

PCD VARIABLE EXAMPLE

PCD VARIABLE EXAMPLE

Defined

```
[PcdsFixedAtBuild, PcdsPatchableInModule]
gEfiMdeModulePkgTokenSpaceGuid.PcdMaxVariableSize|0x400|UINT32|0x30000003
```

PCD VARIABLE EXAMPLE

Defined

```
[PcdsFixedAtBuild, PcdsPatchableInModule]
gEfiMdeModulePkgTokenSpaceGuid.PcdMaxVariableSize|0x400|UINT32|0x30000003
```

Referenced

MdeModulePkg\Universal\Variable\RuntimeDxe\VariableRuntimeDxe.inf

```
[Pcd]
  gEfiMdeModulePkgTokenSpaceGuid.PcdMaxVariableSize ## CONSUMES
```

PCD VARIABLE EXAMPLE

Defined

```
[PcdsFixedAtBuild, PcdsPatchableInModule]
gEfiMdeModulePkgTokenSpaceGuid.PcdMaxVariableSize|0x400|UINT32|0x30000003
```

Referenced

MdeModulePkg\Universal\Variable\RuntimeDxe\VariableRuntimeDxe.inf

```
[Pcd]
  gEfiMdeModulePkgTokenSpaceGuid.PcdMaxVariableSize ## CONSUMES
```

Modified

```
[PcdsFixedAtBuild]
gEfiMdeModulePkgTokenSpaceGuid.PcdMaxVariableSize|0x008400
```

PCD VARIABLE EXAMPLE

Defined

```
[PcdsFixedAtBuild, PcdsPatchableInModule]
gEfiMdeModulePkgTokenSpaceGuid.PcdMaxVariableSize|0x400|UINT32|0x30000003
```

Referenced

MdeModulePkg\Universal\Variable\RuntimeDxe\VariableRuntimeDxe.inf

```
[Pcd]
  gEfiMdeModulePkgTokenSpaceGuid.PcdMaxVariableSize ## CONSUMES
```

Modified

```
[PcdsFixedAtBuild]
gEfiMdeModulePkgTokenSpaceGuid.PcdMaxVariableSize|0x008400
```

Used

MdeModulePkg\Universal\Variable\RuntimeDxe\Variable.c // max NV variable size

```
 mVariableModuleGlobal->MaxVariableSize = PcdGet32 (PcdMaxVariableSize);
```

PCD VARIABLE EXAMPLE

Defined

```
[PcdsFixedAtBuild, PcdsPatchableInModule]
gEfiMdeModulePkgTokenSpaceGuid.PcdMaxVariableSize|0x400|UINT32|0x30000003
```

Referenced

MdeModulePkg\Universal\Variable\RuntimeDxe\VariableRuntimeDxe.inf

```
[Pcd]
  gEfiMdeModulePkgTokenSpaceGuid.PcdMaxVariableSize ## CONSUMES
```

Modified

```
[PcdsFixedAtBuild]
gEfiMdeModulePkgTokenSpaceGuid.PcdMaxVariableSize|0x008400
```

Used

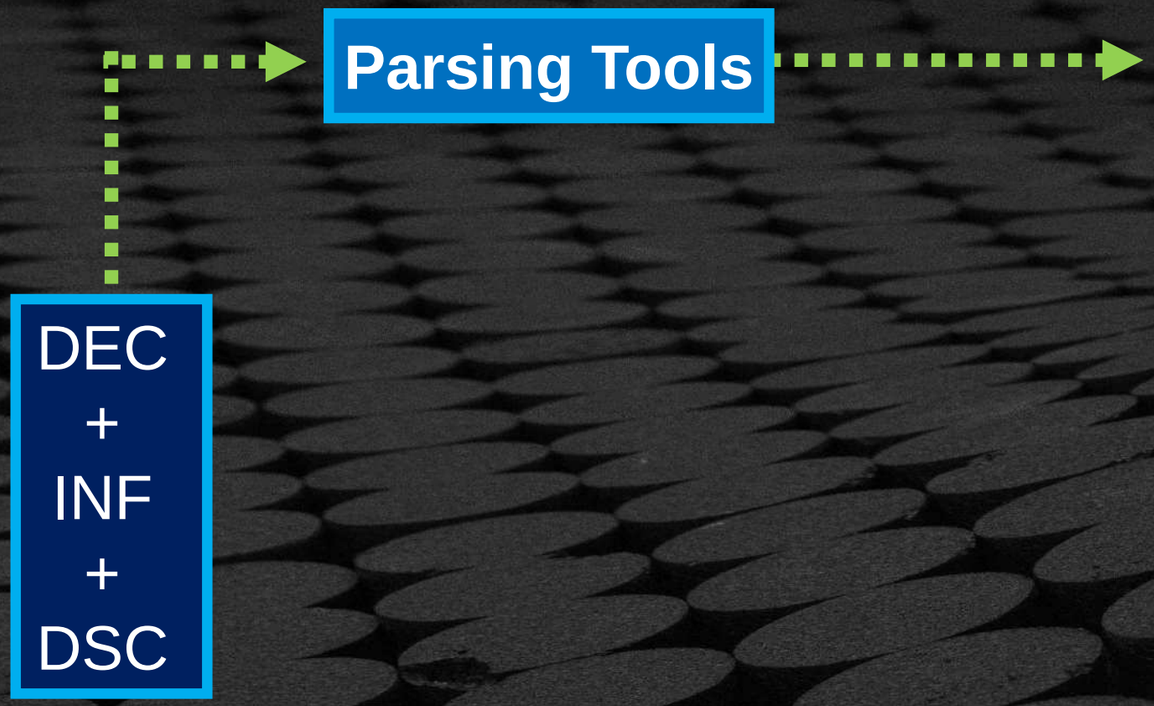
MdeModulePkg\Universal\Variable\RuntimeDxe\Variable.c // max NV variable size

```
 mVariableModuleGlobal->MaxVariableSize = PcdGet32 (PcdMaxVariableSize);
```

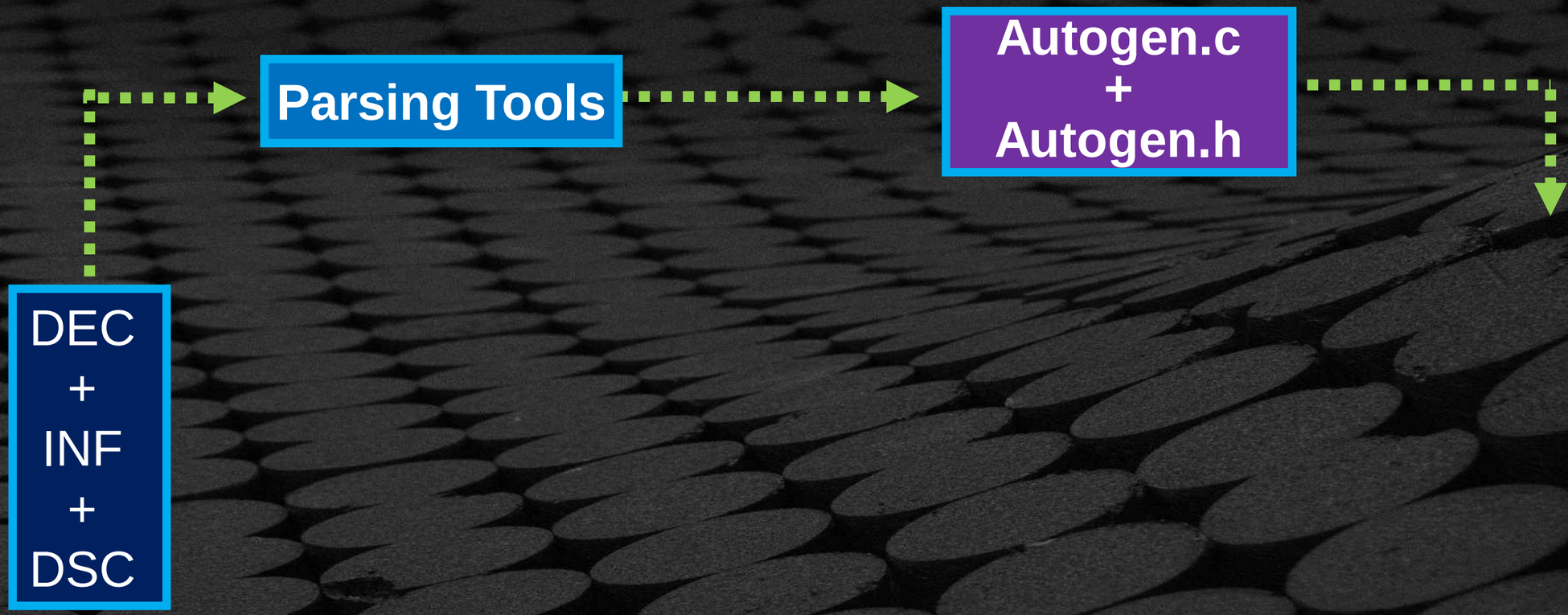
PCD SOFTWARE

DEC
+
INF
+
DSC

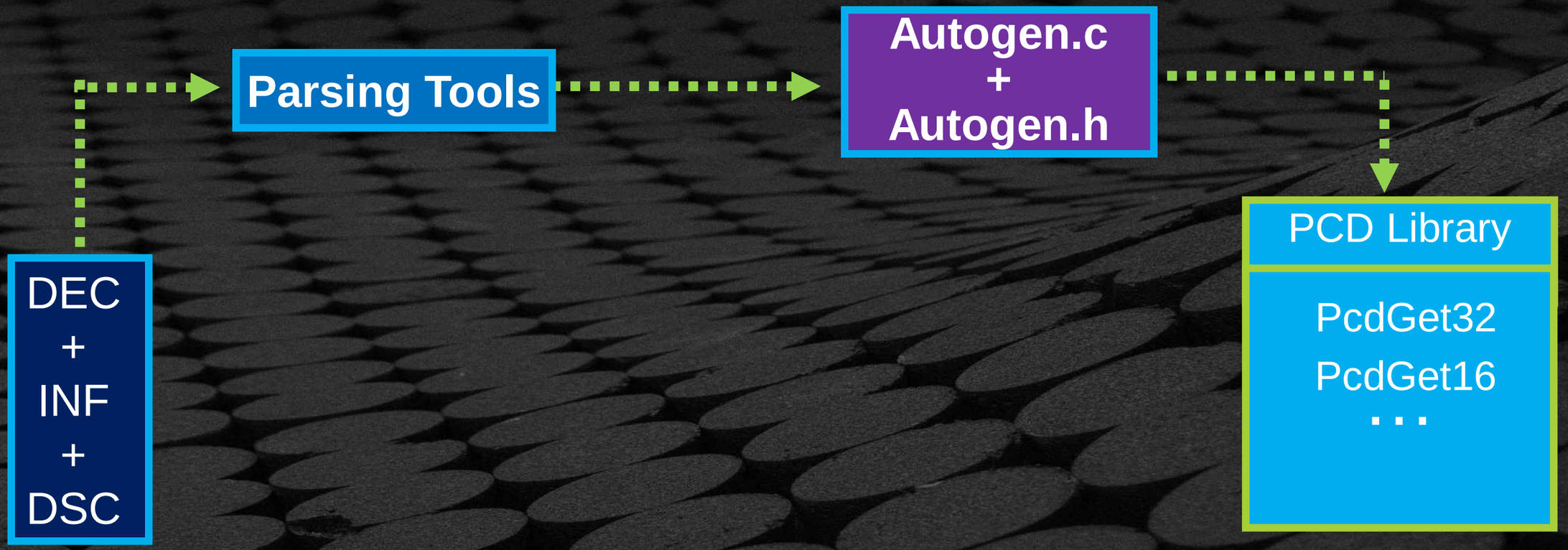
PCD SOFTWARE



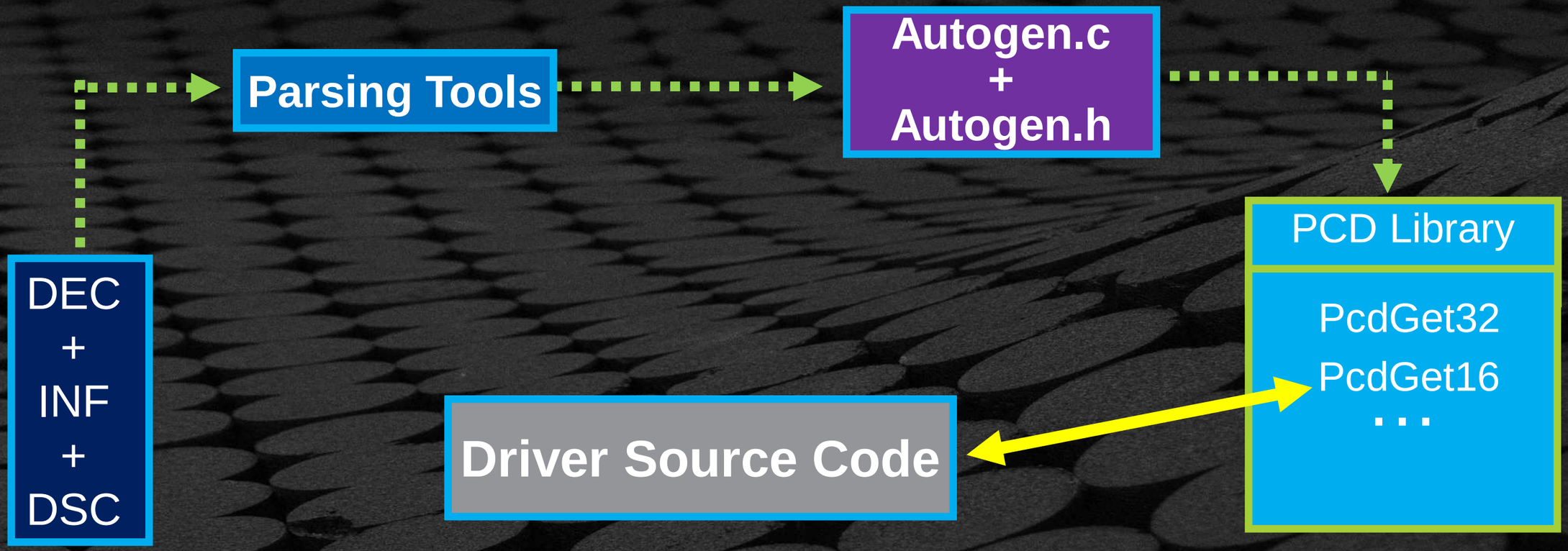
PCD SOFTWARE



PCD SOFTWARE



PCD SOFTWARE



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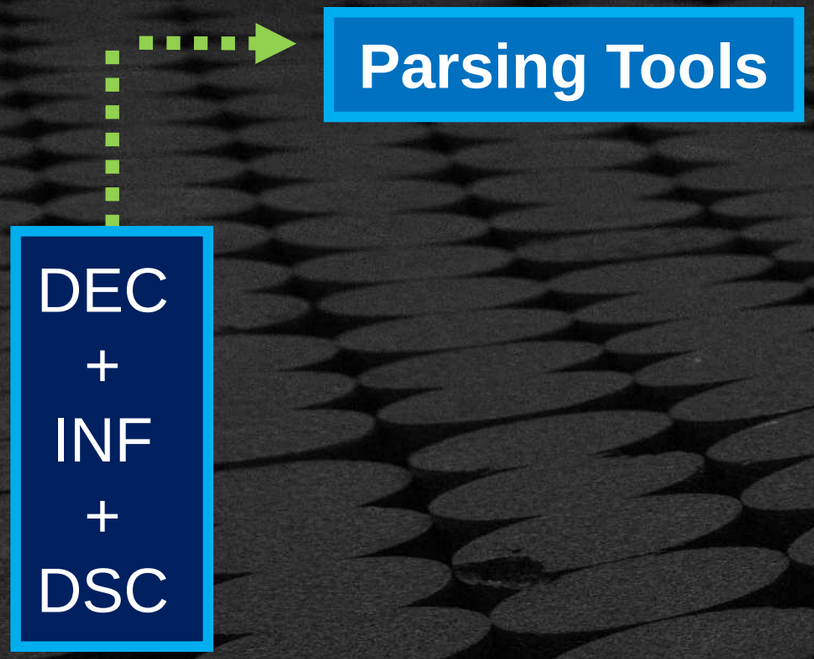
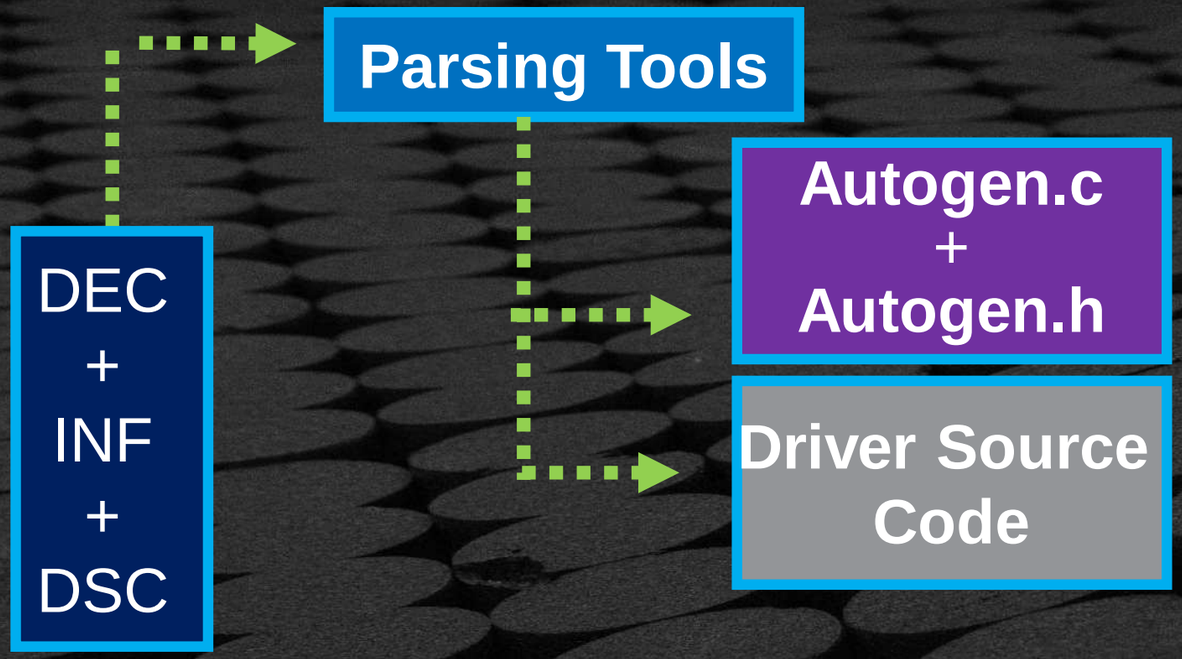
PCD DRIVER

DEC
+
INF
+
DSC

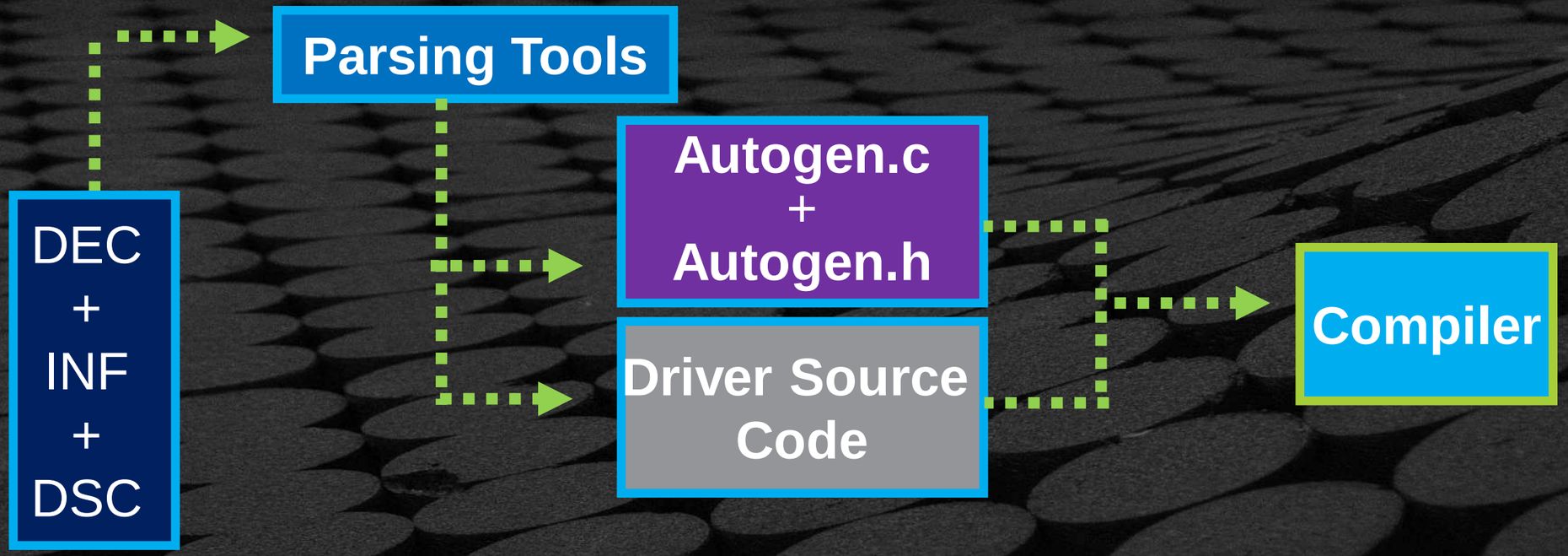
PCD DRIVER



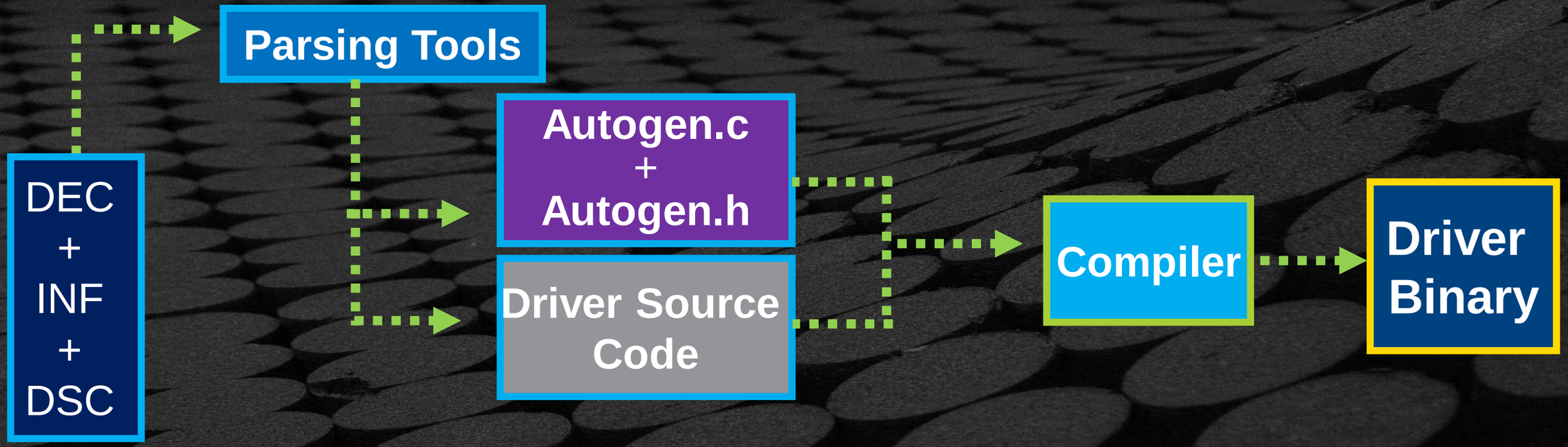
PCD DRIVER


Parsing Tools
DEC
+
INF
+
DSC
Autogen.c
+
Autogen.h
Driver Source
Code

PCD DRIVER


DEC
+
INF
+
DSC
Parsing Tools
Autogen.c
+
Autogen.h
Driver Source
Code
Compiler

PCD DRIVER


DEC
+
INF
+
DSC
Parsing Tools
Autogen.c
+
Autogen.h
Driver Source Code
Compiler
Driver Binary

Fixed PCD AutoGen files

Example : MdeModulePkg\Universal\Variable\RuntimeDxe\VariableRuntimeDxe

Autogen.h

```
#define _PCD_TOKEN_PcdMaxVariableSize  250U
#define _PCD_SIZE_PcdMaxVariableSize 4
#define _PCD_GET_MODE_SIZE_PcdMaxVariableSize  _PCD_SIZE_PcdMaxVariableSize
#define _PCD_VALUE_PcdMaxVariableSize  0x8400U
extern const  UINT32  _gPcd_FixedAtBuild_PcdMaxVariableSize;
#define _PCD_GET_MODE_32_PcdMaxVariableSize  _gPcd_FixedAtBuild_PcdMaxVariableSize
```

Autogen.c

```
// Definition of PCDs used in this module
. . .
GLOBAL_REMOVE_IF_UNREFERENCED const UINT32
   _gPcd_FixedAtBuild_PcdMaxVariableSize = _PCD_VALUE_PcdMaxVariableSize;
```

What about a Dynamic PCDs?

- Only can be Set and changed during Boot time.
- PCD can be set with the library Set: LibPcdSet…
- PCD can be retrieved with the library Get: LibPcdGet…

Example: Use the variable `PcdPlatformBootTimeOut` defined for the platform time in seconds before booting, modified for a value of `03` seconds

DYNAMIC PCD

Defined

```
[PcdsDynamic]
gEfiIntelFrameworkModulePkgTokenSpaceGuid.PcdPlatformBootTimeOut|0xffff|UINT16|0x
```

DYNAMIC PCD

Defined

```
[PcdsDynamic]
gEfiIntelFrameworkModulePkgTokenSpaceGuid.PcdPlatformBootTimeOut|0xffff|UINT16|0x
```

Modified

```
[PcdsDynamicDefault]
  gEfiIntelFrameworkModulePkgTokenSpaceGuid.PcdPlatformBootTimeOut|03
```

DYNAMIC PCD

Defined

```
[PcdsDynamic]
gEfiIntelFrameworkModulePkgTokenSpaceGuid.PcdPlatformBootTimeOut|0xffff|UINT16|0x
```

Modified

```
[PcdsDynamicDefault]
  gEfiIntelFrameworkModulePkgTokenSpaceGuid.PcdPlatformBootTimeOut|03
```

Setting

IntelFrameworkModulePkg/Universal/BdsDxe/BootMaint/BootMaint.c

```
PcdSet16 (PcdPlatformBootTimeOut,
                        NewBmmData->BootTimeOut);
```

DYNAMIC PCD

DEC

Defined

```
[PcdsDynamic]
gEfiIntelFrameworkModulePkgTokenSpaceGuid.PcdPlatformBootTimeOut|0xffff|UINT16|0x
```

DSC

Modified

```
[PcdsDynamicDefault]
  gEfiIntelFrameworkModulePkgTokenSpaceGuid.PcdPlatformBootTimeOut|03
```

C

Setting

IntelFrameworkModulePkg/Universal/BdsDxe/BootMaint/BootMaint.c

```
PcdSet16 (PcdPlatformBootTimeOut,
                        NewBmmData->BootTimeOut);
```

C

Used

OvmfPkg\Library\PlatformBootManagerLib\BdsPlatform.c

```
Timeout = PcdGet16 (PcdPlatformBootTimeOut);
```

DYNAMIC PCD

Defined

```
[PcdsDynamic]
gEfiIntelFrameworkModulePkgTokenSpaceGuid.PcdPlatformBootTimeOut|0xffff|UINT16|0x
```

Modified

```
[PcdsDynamicDefault]
  gEfiIntelFrameworkModulePkgTokenSpaceGuid.PcdPlatformBootTimeOut|03
```

Setting

IntelFrameworkModulePkg/Universal/BdsDxe/BootMaint/BootMaint.c

```
PcdSet16 (PcdPlatformBootTimeOut,
                        NewBmmData->BootTimeOut);
```

Used

OvmfPkg\Library\PlatformBootManagerLib\BdsPlatform.c

```
Timeout = PcdGet16 (PcdPlatformBootTimeOut);
```

DYNAMIC PCD AUTOGEN FILES

Example Module: **(OvmfPkg\Library\PlatformBootManagerLib)**

DYNAMIC PCD AUTOGEN FILES

Example Module: (OvmfPkg\Library\PlatformBootManagerLib)

Autogen.h

• • •

```
#define _PCD_SET_MODE_16_PcdPlatformBootTimeOut(Value) \
 LibPcdSet16(_PCD_TOKEN_PcdPlatformBootTimeOut, (Value))
#define _PCD_SET_MODE_16_S_PcdPlatformBootTimeOut(Value) \
 LibPcdSet16S(_PCD_TOKEN_PcdPlatformBootTimeOut, ( Value ))
```

DYNAMIC PCD AUTOGEN FILES

Example Module: (OvmfPkg\Library\PlatformBootManagerLib)

Autogen.h

• • •

```
#define _PCD_SET_MODE_16_PcdPlatformBootTimeOut(Value) \
 LibPcdSet16(_PCD_TOKEN_PcdPlatformBootTimeOut, (Value))
#define _PCD_SET_MODE_16_S_PcdPlatformBootTimeOut(Value) \
 LibPcdSet16S(_PCD_TOKEN_PcdPlatformBootTimeOut, ( Value ))
```

Example Module: (MdeModulePkg/Universal/PCD/Dxe/Pcd)

DYNAMIC PCD AUTOGEN FILES

Example Module: (OvmfPkg\Library\PlatformBootManagerLib)

Autogen.h

```
• • •
#define _PCD_SET_MODE_16_PcdPlatformBootTimeOut(Value) \
 LibPcdSet16(_PCD_TOKEN_PcdPlatformBootTimeOut, (Value))
#define _PCD_SET_MODE_16_S_PcdPlatformBootTimeOut(Value) \
 LibPcdSet16S(_PCD_TOKEN_PcdPlatformBootTimeOut, (Value))
```

Example Module: (MdeModulePkg/Universal/PCD/Dxe/Pcd)

Autogen.c

```
DXE_PCD_DATABASE_INIT gDXEPcdDbInit = {
• • •
 /* LocalTokenNumberTable */
• • •
 offsetof(DXE_PCD_DATABASE, Init.PcdPlatformBootTimeOut_*1) | PCD_TYPE_DATA |
PCD_DATUM_TYPE_UINT16,
• • •
            /*  PcdPlatformBootTimeOut_*1 [1] */,
```

*1 GUID of PCD Variable **PcdPlatformBootTimeOut**

DYNAMIC PCD AUTOGEN FILES

Example Module: (OvmfPkg\Library\PlatformBootManagerLib)

Autogen.h

```
• • •
#define _PCD_SET_MODE_16_PcdPlatformBootTimeOut(Value) \
 LibPcdSet16(_PCD_TOKEN_PcdPlatformBootTimeOut, (Value))
#define _PCD_SET_MODE_16_S_PcdPlatformBootTimeOut(Value) \
 LibPcdSet16S(_PCD_TOKEN_PcdPlatformBootTimeOut, (Value))
```

Example Module: (MdeModulePkg/Universal/PCD/Dxe/Pcd)

Autogen.c

```
DXE_PCD_DATABASE_INIT gDXEPcdDbInit = {
• • •
 /* LocalTokenNumberTable */
• • •
 offsetof(DXE_PCD_DATABASE, Init.PcdPlatformBootTimeOut_*1) | PCD_TYPE_DATA |
PCD_DATUM_TYPE_UINT16,
• • •
{ 0x3U } /*  PcdPlatformBootTimeOut_*1 [1] */,
```

*1 GUID of PCD Variable **PcdPlatformBootTimeOut**

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SUMMARY

- Define Platform Configuration Database (PCD) and explain the syntax
- Differentiate types of PCDs
- Explain how changing a PCD value affects output
- Evaluate the results of a PCD value modification


Questions?


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