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UEFI & EDK II Training

How to Write a UEFI Driver

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LESSON OBJECTIVE

- What is the UEFI Driver Model
- Details on Driver Binding Protocol
- Example of UEFI Driver

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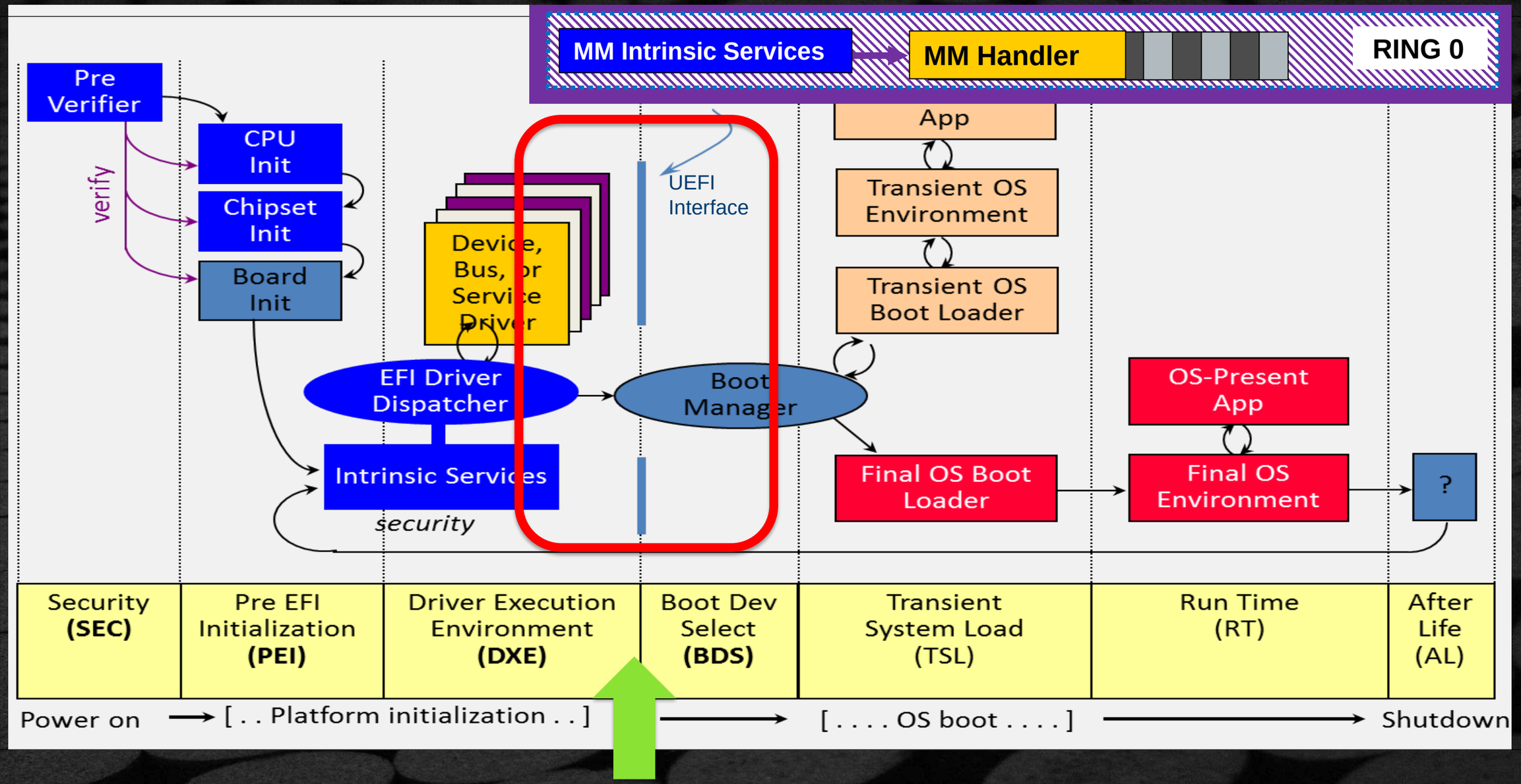
UEFI DRIVER MODEL

UEFI Drivers - Location



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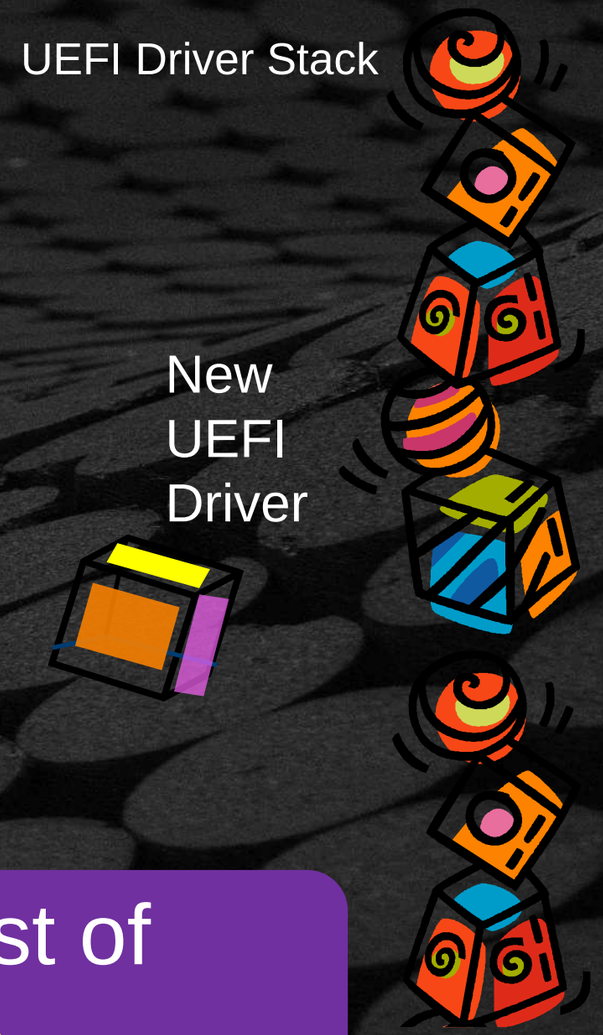
What are UEFI Drivers ?

- UEFI Drivers extend firmware
- Portable across platforms
- Enables rapid development
- Produce Protocols



UEFI driver is chained into a link list of
Drivers Managing Devices

Defining a UEFI Driver

UEFI Loadable Image

May produce/consume protocols

Supports complex bus hierarchies

Driver Binding Protocol matches drivers to devices, adds version management

Supports specific hardware, can be unloaded or override an existing driver

What is a UEFI protocol?

Protocols

- Interfaces consisting of functions and data structures named by a GUID and stored in the Handle Database

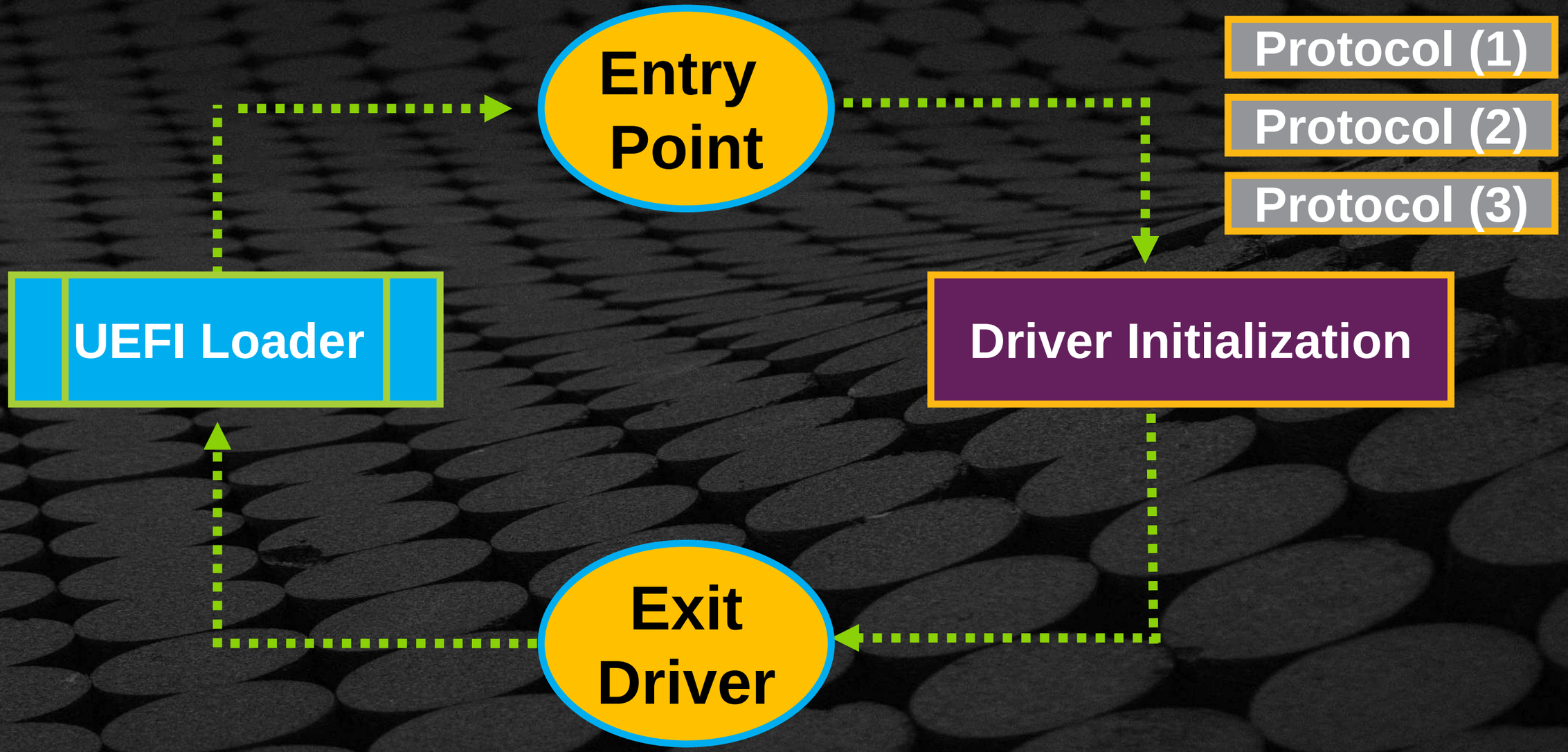
Handle Database

- Everything in the platform system gets a handle, drivers, devices, Images, etc.

GUIDs

- The UEFI Platform only knows items in the Handle Database by its GUID

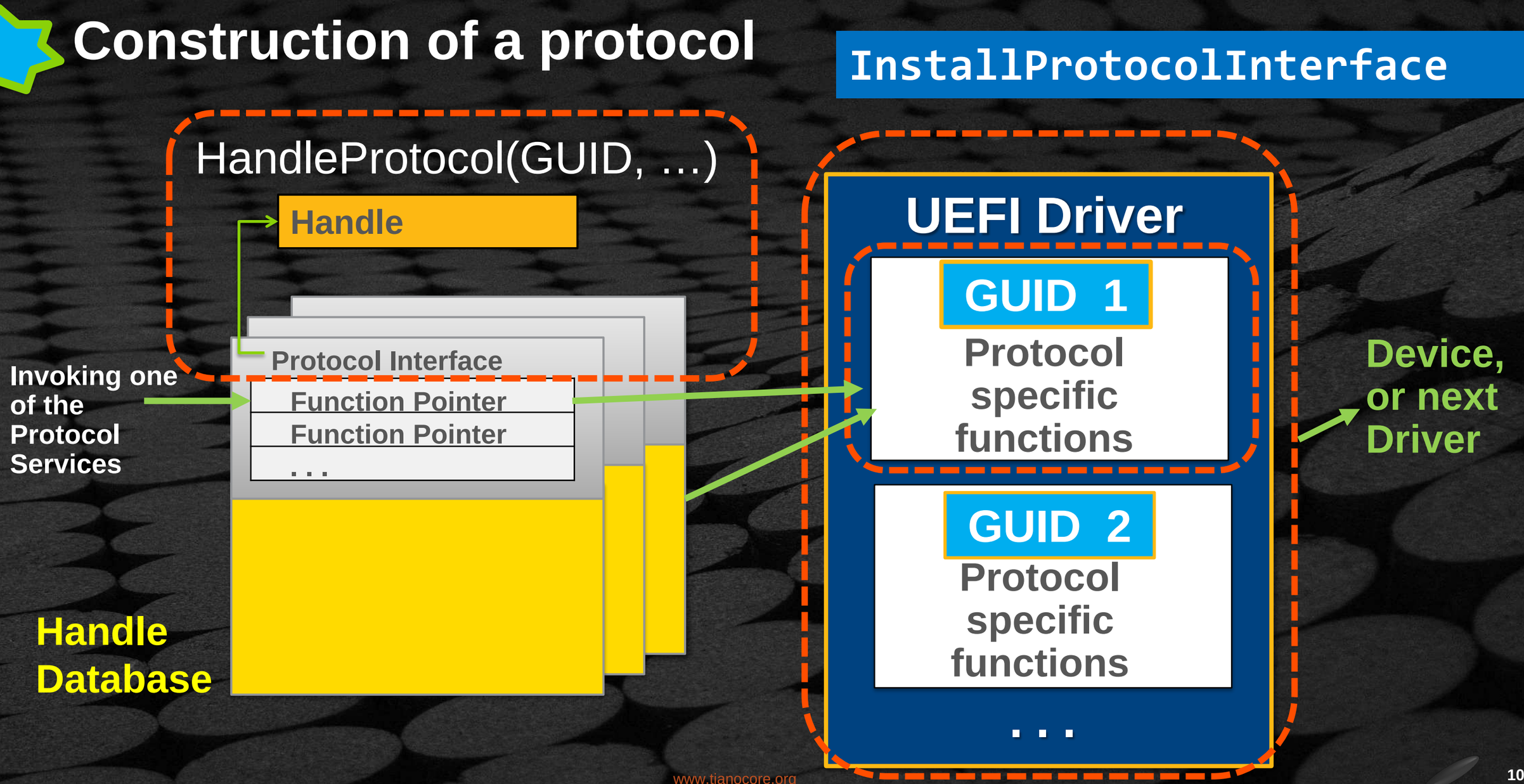
UEFI Drivers Vs. Applications



UEFI Drivers Vs. Applications

Drivers Produce Protocols

Construction of a protocol



UEFI Driver Binding Protocol

`Supported()`

Determines if a driver supports a controller

`Start()`

Starts a driver on a controller & Installs Protocols

`Stop()`

Stops a driver from managing a controller

Supported - PCI Controller Device Handle

PCI Controller Device Handle
EFI_DEVICE_PATH_PROTOCOL
EFI_PCI_IO_PROTOCOL

Tasks

1. ***Opens*** PCI_IO Protocol
2. Checks
3. ***Closes*** PCI_IO Protocol
4. Returns: *Supported* or *Not Supported*

See § 10.1 UEFI 2.x Spec.

Inputs:

- "This"
- Controller to manage
- Remaining Device Path

Supported()

- Checks to see if a driver supports a controller
- Check should not change hardware state of controller
- Minimize execution time, move complex I/O to Start()
- May be called for controller that is already managed
- Child is optionally specified

Start - PCI Controller Device Handle

PCI Controller Device Handle
EFI_DEVICE_PATH_PROTOCOL
EFI_PCI_IO_PROTOCOL
EFI_BLOCK_IO_PROTOCOL

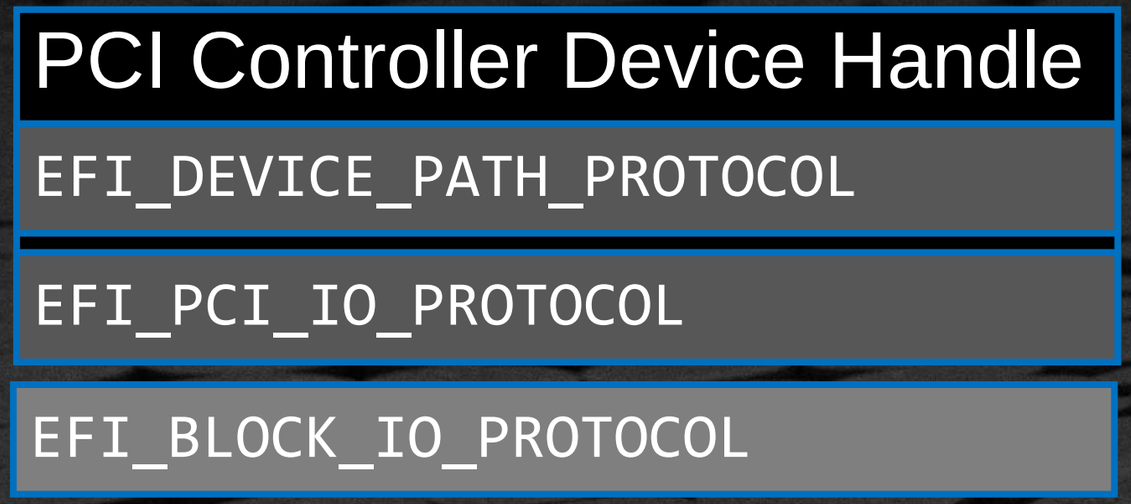
Inputs:

- “This”
- Controller to manage,
- Remaining Device Path

Start()

- ***Opens*** PCI I/O
- Starts a driver on a controller
- Can create ALL child handles or ONE child handle

Stop - PCI Controller Device Handle



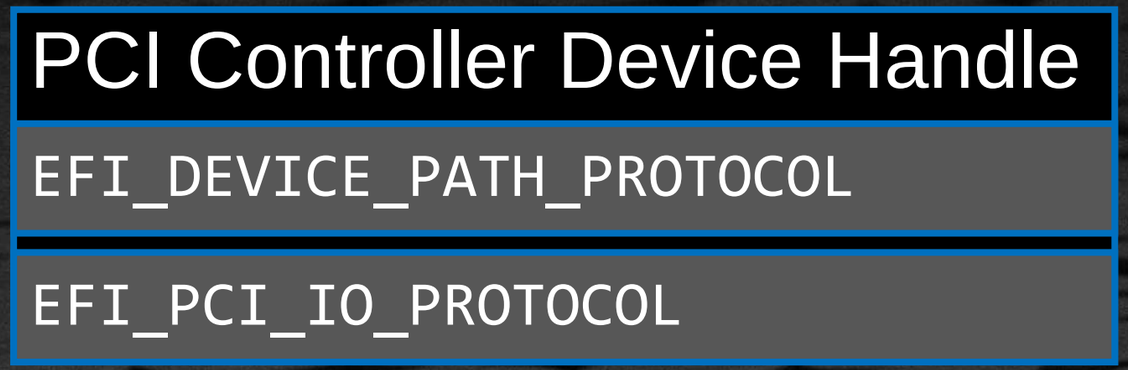
Inputs:

- “This”
- Controller to manage,
- Remaining Device Path

Stop()

- ***Closes*** PCI I/O
- Stops a driver from managing a controller
- Destroys all specified child handles
- If no children specified, controller is stopped
- Stopping a bus controller requires 2 calls
  - One call to stop the children. A second call to stop the bus controller itself

Stop - PCI Controller Device Handle



Inputs:

- “This”
- Controller to manage,
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Stop()

- ***Closes*** PCI I/O
- Stops a driver from managing a controller
- Destroys all specified child handles
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- Stopping a bus controller requires 2 calls
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UEFI DRIVER EXAMPLE

Examine details of the UEFI Driver - ScsiDiskDxe

Example: UEFI Driver - ScsiDiskDxe

edk2/MdeModulePkg/Bus/Scsi/ScsiDiskDxe

- ScsiDiskDxe.inf
- ScsiDisk.c
- ScsiDisk.h

Example: UEFI Driver - ScsiDiskDxe

edk2/MdeModulePkg/Bus/Scsi/ScsiDiskDxe

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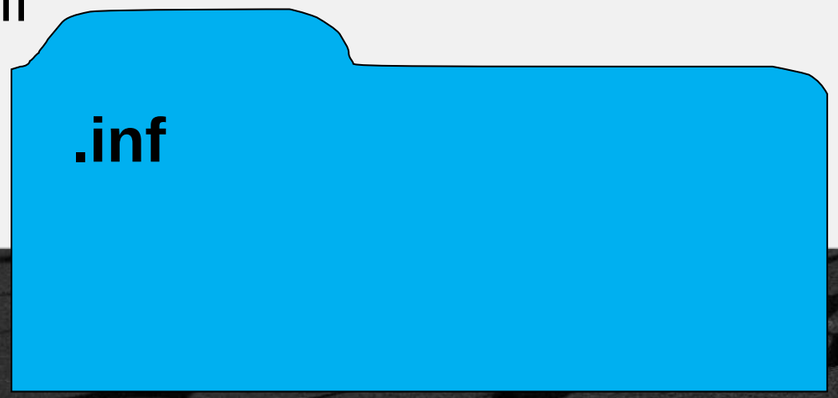


[.inf] Entry, Global Protocols

Example: UEFI Driver - ScsiDiskDxe

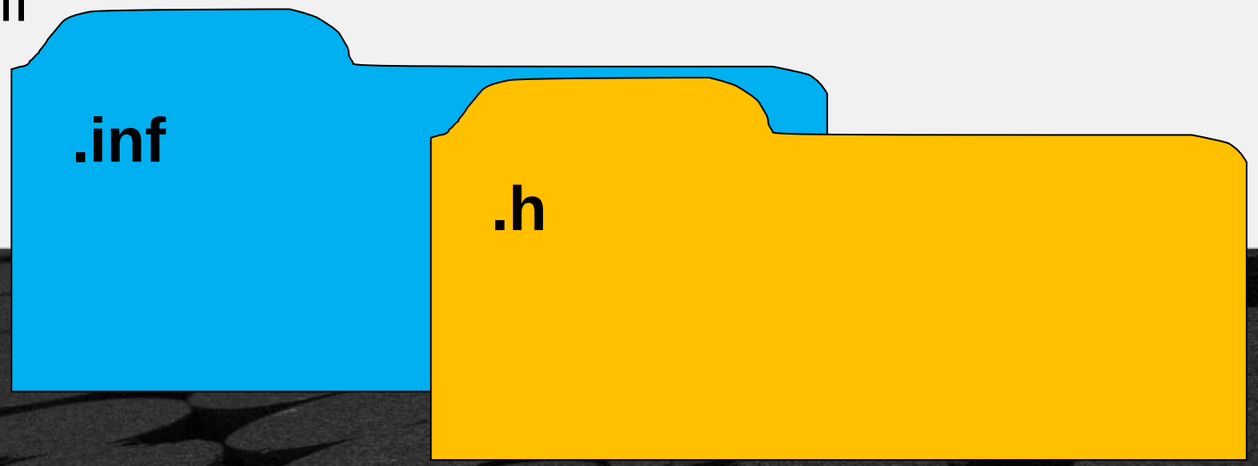
```
[Defines]
  INF_VERSION                    = 0x00010005
  BASE_NAME                      = ScsiDisk
  MODULE_UNI_FILE                = ScsiDisk.uni
  FILE_GUID                      = 0A66E322-3740-4cce-AD62-BD172CECCA35
  MODULE_TYPE                    = UEFI_DRIVER
  VERSION_STRING                 = 1.0

  ENTRY_POINT                    = InitializeScsiDisk

[Sources]
  ComponentName.c
  ScsiDisk.c
  ScsiDisk.h

[Packages]
  MdePkg/MdePkg.dec
```

Link to .inf - Entry point function `InitializeScsiDisk`
`Guids` and `Protocols` Usage Fields

Example: UEFI Driver - ScsiDiskDxe

edk2/MdeModulePkg/Bus/Scsi/ScsiDiskDxe

- ScsiDiskDxe.inf
- ScsiDisk.c
- ScsiDisk.h



[.inf] Entry, Global Protocols

[.h] Driver’s Private Data Structure declaration

Example: ScsiDisk.h

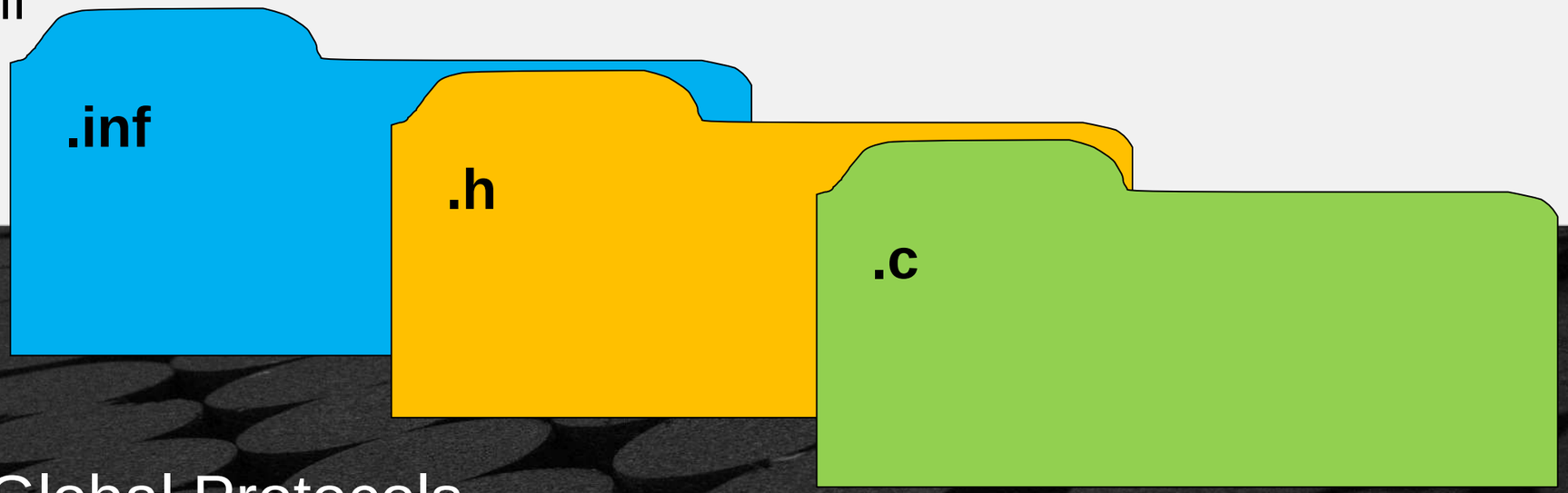
```
#ifndef _SCSI_DISK_H_
#define _SCSI_DISK_H_


#include <Uefi.h>


#include <Protocol/ScsiIo.h>
#include <Protocol/ComponentName.h>
#include <Protocol/BlockIo.h>
#include <Protocol/BlockIo2.h>
#include <Protocol/EraseBlock.h>
#include <Protocol/DriverBinding.h>
#include <Protocol/ScsiPassThruExt.h>
#include <Protocol/ScsiPassThru.h>
#include <Protocol/DiskInfo.h>
```

Link to ScsiDisk.h UEFI Driver's Private Data Structure declaration

Example: UEFI Driver - ScsiDiskDxe

edk2/MdeModulePkg/Bus/Scsi/ScsiDiskDxe

- ScsiDiskDxe.inf
- ScsiDisk.c
- ScsiDisk.h



- [.inf] Entry, Global Protocols
- [.h] Driver’s Private Data Structure declaration
- [.c] Review the Supported, Start and Stop functions

Example: ScsiDisk.c

```
#include "ScsiDisk.h"

EFI_DRIVER_BINDING_PROTOCOL gScsiDiskDriverBinding = {
  ScsiDiskDriverBindingSupported,
  ScsiDiskDriverBindingStart,
  ScsiDiskDriverBindingStop,
  0xa,
  NULL,
  NULL
};

EFI_DISK_INFO_PROTOCOL gScsiDiskInfoProtocolTemplate = {
  EFI_DISK_INFO_SCSI_INTERFACE_GUID,
  ScsiDiskInfoInquiry,
  ScsiDiskInfoIdentify,
  ScsiDiskInfoSenseData,
  ScsiDiskInfoWhichIde
};
```

Link to ScsiDisk.c

Review:

- Driver Binding Protocol
- Initialization Entry point
- Supported
- Start - Installs
- Stop - Uninstalls

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SUMMARY

- UEFI Drivers manage HW and extend the Firmware
- The UEFI Driver Binding Protocol: Supported, Start and Stop
- Example of UEFI Driver `ScsiDisk` Driver

Questions?

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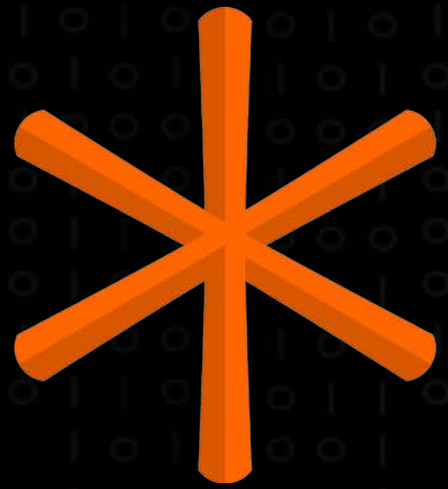

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