

# Integration of a PXE based image publisher on the UForge platform

Presented by **SID-LAKHDAR Riyane**  
(M1 MoSIG: ENSIMAG / UJF)

Supervised by **BREMOND Joris**  
(Software Development Engineer: UShareSoft)



September 11, 2016

# MOTIVATION: THE PXE TECHNOLOGY FOR AN IMAGE PUBLISHER

WHAT IS THE PXE SPECIFICATION?

UFORGE-INTEGRATED IMPLEMENTATIONS AND  
ARCHITECTURES

EVOLUTION AND MAINTAINABILITY

# THE PXE SPECIFICATION

## PXE: Preboot Execution Environment

- ▶ Standardized client-server environment (part of the UEFI standard)
- ▶ Boots a software assembly retrieved from a network
- ▶ Most frequent choice for operating system booting, installation and deployment.

# THE PXE SPECIFICATION

## PXE: Preboot Execution Environment

- ▶ Standardized client-server environment (part of the UEFI standard)
- ▶ Boots a software assembly retrieved from a network
- ▶ Most frequent choice for operating system booting, installation and deployment.

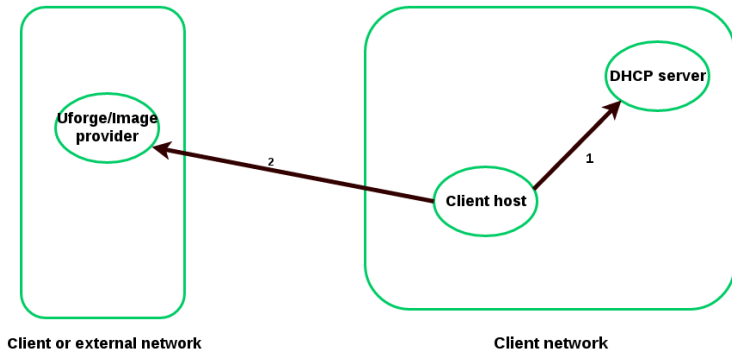
# THE PXE SPECIFICATION

## PXE: Preboot Execution Environment

- ▶ Standardized client-server environment (part of the UEFI standard)
- ▶ Boots a software assembly retrieved from a network
- ▶ Most frequent choice for operating system booting, installation and deployment.

# TECHNICAL PRINCIPLES

## The PXE boot process



# TECHNICAL PRINCIPLES

## The PXE light client binary: iPXE

### **Boot program**

- **Print user interface**
- **Log the user to UForge**
- **Download the required image step by step:**

### **PXE server informations**

- **Server IP**
- **PXE binary URI**

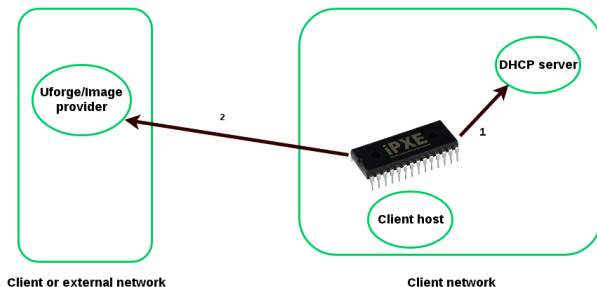
### **Mini kernel for PXE boot**

- **ABI**
- **Full system stack**

# LIMITATIONS

The PXE boot process needs to fit

- **Network card ROM size**



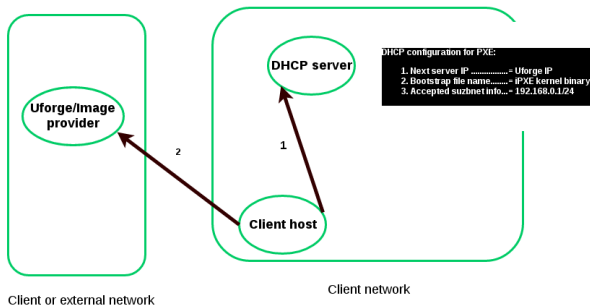
- Mandatory DHCP server configuration on the client network
- Client processor architecture



# LIMITATIONS

The PXE boot process needs to fit

- ▶ Network card ROM size
- ▶ **Mandatory DHCP server configuration on the client network**

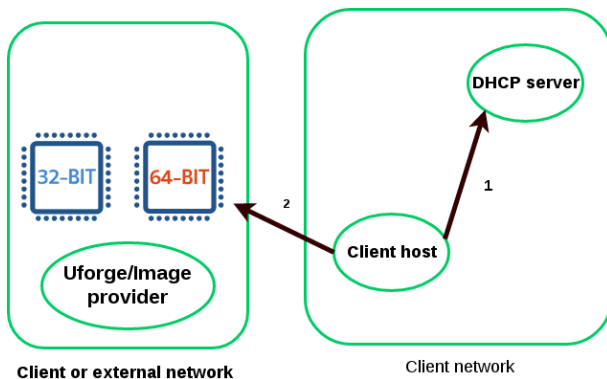


- ▶ Client processor architecture

# LIMITATIONS

The PXE boot process needs to fit

- ▶ Network card ROM size
- ▶ Mandatory DHCP server configuration on the client network
- ▶ **Client processor architecture**



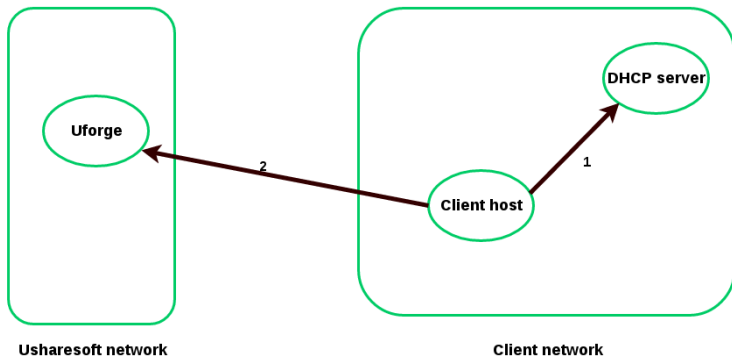
WHAT IS THE PXE SPECIFICATION?

UForge-INTEGRATED IMPLEMENTATIONS AND  
ARCHITECTURES

EVOLUTION AND MAINTAINABILITY

# FIRST SOFTWARE ARCHITECTURE

## Straightforward client/UForge communication



# STRAIGHTFORWARD CLIENT/UFORGE COMMUNICATION

## Advantages

- ▶ No **package** or tool to install on client network
- ▶ Any **upgrade** is offered without any intervention of the customer
- ▶ No need to any **connector** or specific tools for specific user processor or architecture

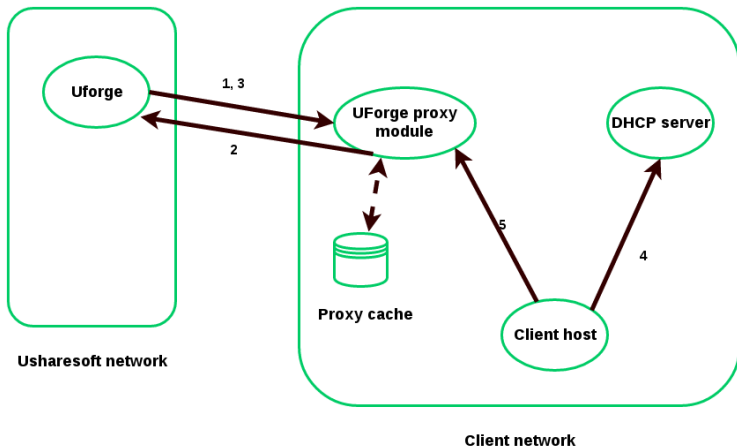
# STRAIGHTFORWARD CLIENT/UFORGE COMMUNICATION

## Drawbacks

- ▶ Limited set of features offered to the customer
- ▶ Creates useless contention on the UForge server and client network
- ▶ Don't take advantage of space and time locality

# SECOND SOFTWARE ARCHITECTURE

## Proxy on the client network



# DEMONSTRATION

- ▶ Straight forward UForge/Client communication
- ▶ 3 custom web services to answer all the PXE requests
- ▶ Set of tools to dynamically build the iPXE code for each request
- ▶ Custom PXE target format



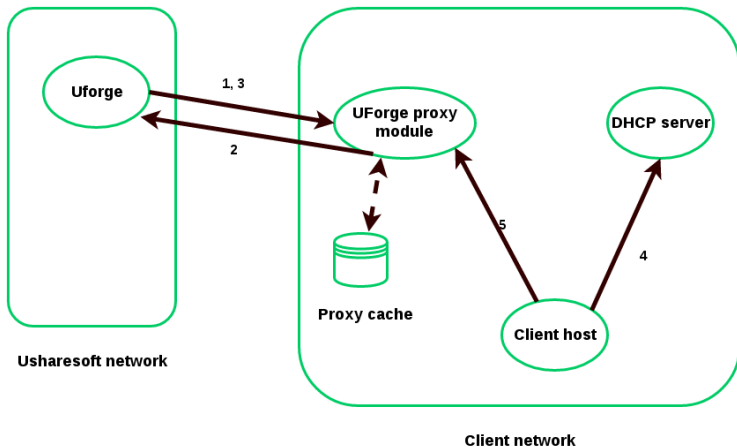
WHAT IS THE PXE SPECIFICATION?

UForge-INTEGRATED IMPLEMENTATIONS AND  
ARCHITECTURES

EVOLUTION AND MAINTAINABILITY

# RETHINK THE UFORGE DESIGN

## Modules based on services/aspects



# RETHINK THE UFORGE DESIGN: MODULE SPLIT

- ▶ Split the UForge code in independent **modules**
- ▶ Delegate some services to modules deployed out of UForge
- ▶ Reduce contention on UForge: speed up image download
  - ▶ Network traffic
  - ▶ Code concentration

# GET RIDE OF THE CONNECTORS FOR EACH NEW CLOUD ENVIRONMENT

- ▶ Same publish process for all the light client environments and platforms
- ▶ Backup solution for buggy or nonexistent connectors

# AUTOMATIZE MACHINE INSTALLATIONS

- ▶ Open an image for a set of machines (sub networks)
- ▶ Get ride of UForge authentication for a set of machine deployment

## OTHER ADVANTAGES

- ▶ Get ride of the ISO format: Non user friendly boot process (external hard drive)
- ▶ Possible adaptations depending the client processors
- ▶ Upgrades and evolution require no customer intervention

# SUMMARY

- ▶ PXE: secure, user-friendly and efficient image publisher
- ▶ Get rid of the connector issue on heterogeneous host environment
- ▶ Get rid of customer intervention for any fix or upgrade
- ▶ Fits the current and future expectations of UShareSoft

# Integration of a PXE based image publisher on the UForge platform

Thank you for your attention



September 11, 2016