# Linux For Embedded Systems

*For Arabs*

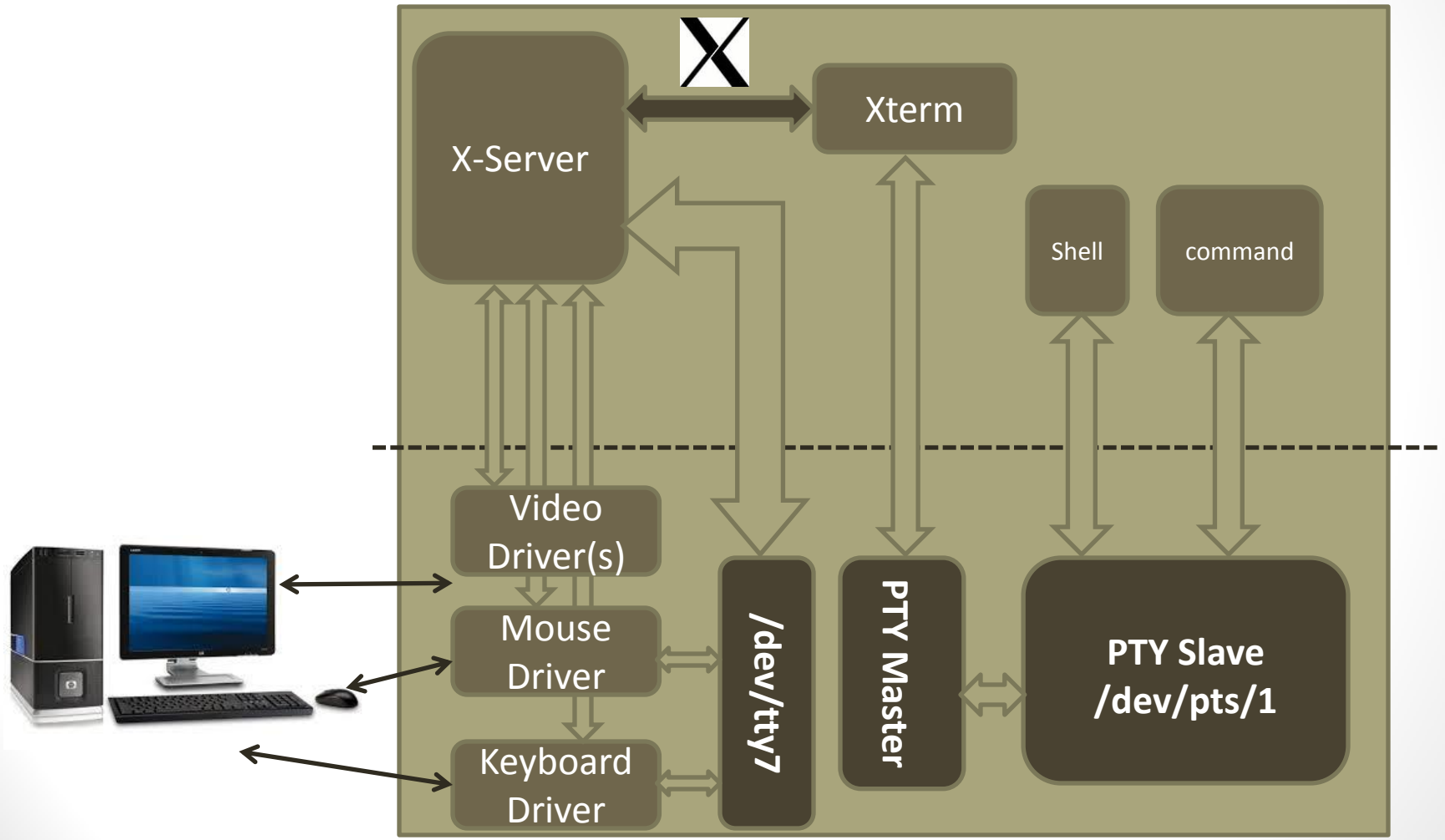
# Course 102:

## Understanding Linux

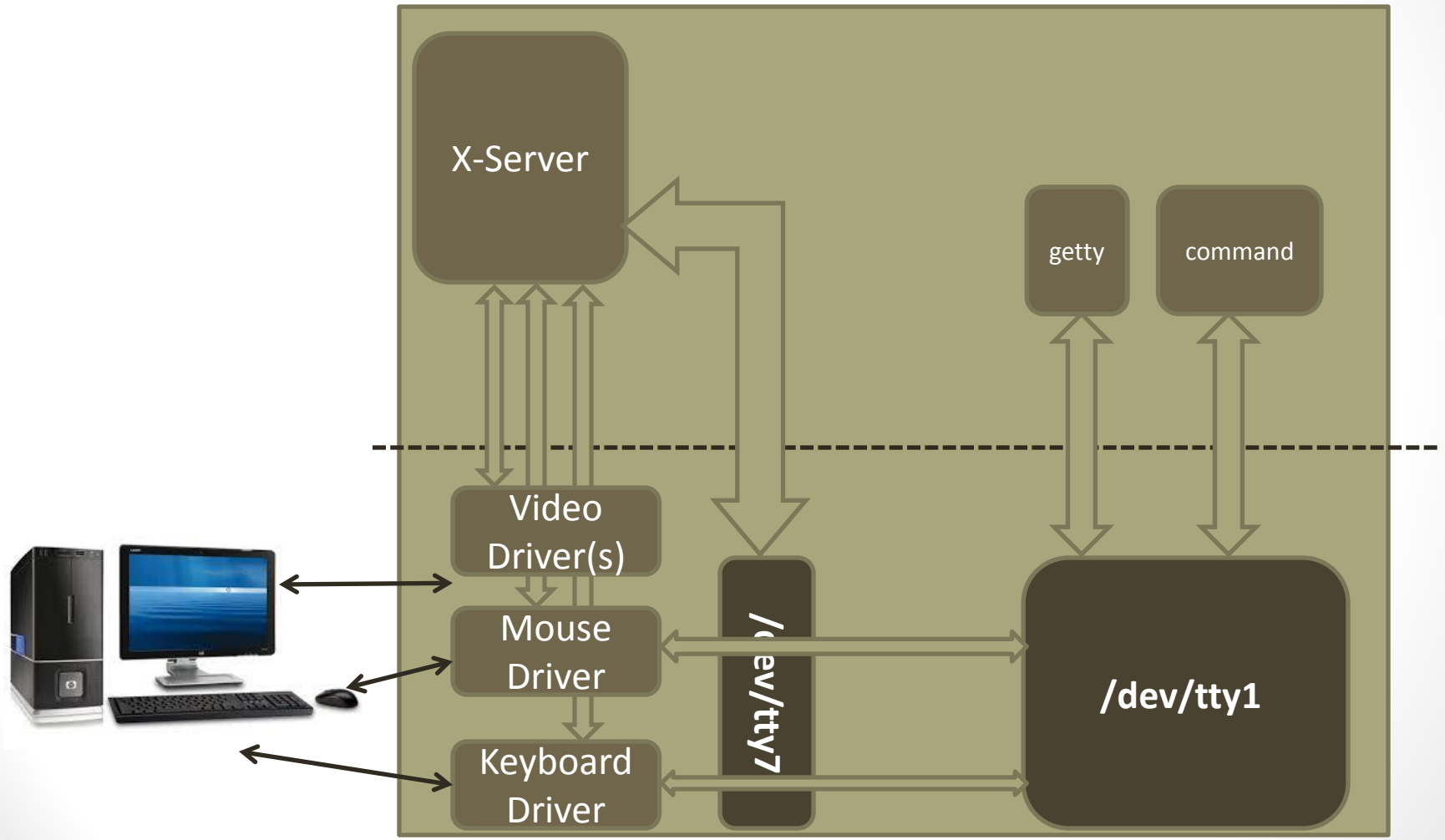
Ahmed ElArabawy

# Lecture 10:
# Learning About the Shell

# Running a Shell Command

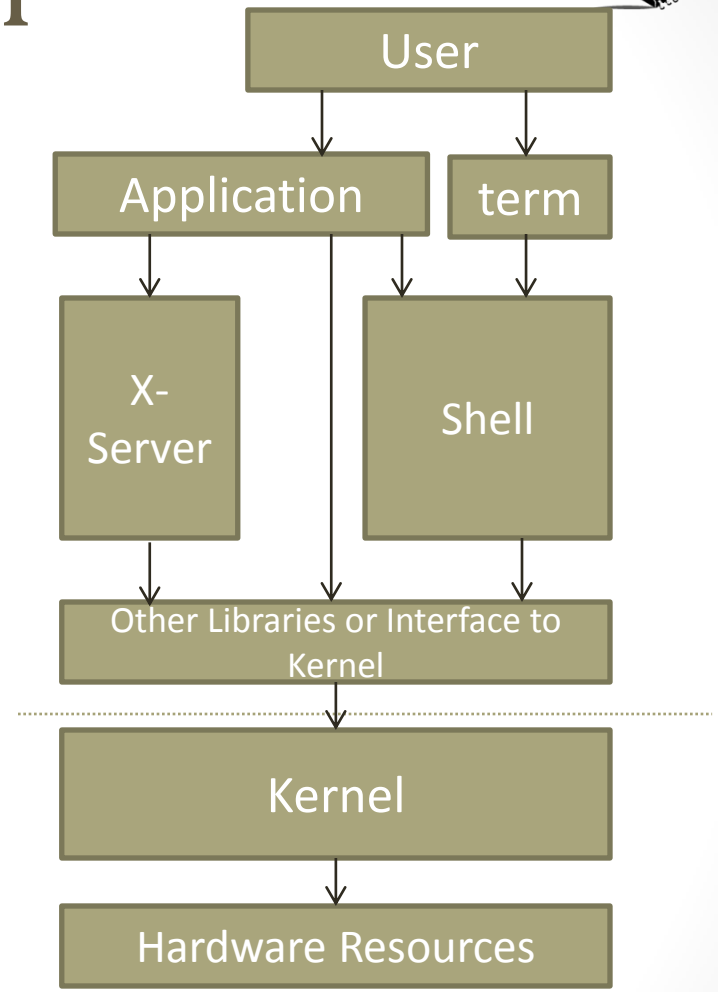


# Running a Shell Command

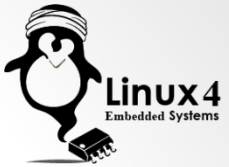


# What is the “Shell”

- The Shell is a user space program that accepts text input
- It performs parsing and some expansion of the input
- It uses the ***readline*** library for text parsing
- It is accessed through a terminal or terminal emulator program
- It then passes control to appropriate functionality (within the shell or outside it)
- "a shell manages the interaction between the system and its users"
- A shell will come with some builtin functionality, other functionality will be provided by separate binaries



# Types of Shells




- First Shell is the **sh** shell, also called the Bourne shell. It is currently obsolete
- That was followed by the **csh** which is C-like shell. This is also currently obsolete
- Then there is the **tcsh** which is still around but not that popular
- The most popular shell (and the one we will be using) is the **bash** shell. This is part of the GNU project

# Types of Shells

- Supported shells will be listed in the file /etc/shells
- Default shell for the user will be stated in /etc/passwd
- To switch to a different shell, call its binary, for example if you are running with a different shell and want to use bash,

  ***$ bash***

  Then you can exit to the original shell by,

  ***$ exit***
- To know what shell you are using,

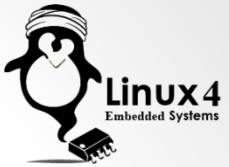
  ***$ echo $SHELL***

# Commands Categories

Commands can be one of the following

1. Built-in command within the shell program (such as '***cd***')
2. A binary or executable in the system, that is called by the shell program. This binary should be in the PATH to be accessible (they normally reside in ***/usr/bin***)
3. Alias to another command (we will see how to do that)
4. A shell function (we will learn more about it in bash scripting course)

# Identify the Command Category (type Command)




**$ type <Command>**

This identifies the category of the <command>

- Examples:

  ***$ type cd***

  **cd is a shell builtin**

  ***$ type rm***

  **rm is /bin/rm**

  ***$ type ls***

  **ls is aliased to `ls --color=auto`**

# Builtin Commands

- Those are functionality implemented inside the shell binary
- No separate binary for it
- Very limited set, and for very basic commands only
- Examples,

  ***$ cd***

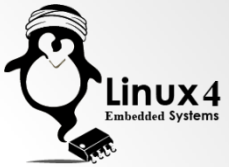
  ***$ pwd***
- Since they don't have a separate binary, you can not do

  ***$ cd --help***

  Instead you can use the shell built in command

  ***$ help cd***

# Separate Binary Commands




- This is a separate program that resides in the Linux directory structure
- Most commands belong to this category
- Each command will have its own version

  ***$ rm --version***
- To get the command usage

  ***$ rm --help***
- To locate the binary for the command

  ***$ which rm***

# Aliases

- Aliases are an abbreviation of another command (with options/arguments)

- To make an alias command

  ***$ alias newCommand='long command'*** (Make sure no spaces)

  Example:

  ***$ alias ll='ls -al'***

- To remove an alias command

  ***$ unalias <alias command>***

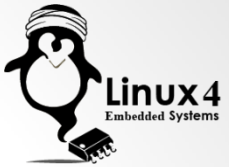
  Example:

  ***$ unalias ll***

- To list all of aliases

  ***$ alias***

# Aliases




- If the new command is a used command, it will still work (the new command will override the old one)

  ***$ alias ls= 'ls --color=auto'***

- Make sure you don't do this by mistake, check the existence of a command with the alias name before you do the aliasing

  ***$ type <alias candidate>***

  It should tell you it is not found

# Command History

- When you enter a command, Linux stores it in a history file ***~/.bash-history***
- To browse through command history

  ***$ history***
- Now you can do the following,

  ***$ !!*** (to enter the last command)

  ***$ ! <n>*** (to enter the command # n in the histroy

  ***$ ! abc*** (to enter the last command starting with 'abc')

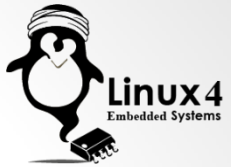
  ***$ ^abc ^def*** (enter the last command but replace 'abc' with 'def')

  ***$ command2 !**** (run command2 with all arguments from the last command)

  ***$ command2 !$*** (run command2 with only last argument from the last command)

  ***$ command2 !^*** (run command2 with only the first argument from the last command)

# Writing Commands to a file (script Command)




**$ script <file>**

To write commands and their output to a file

***$ script file***

***$ script -a file*** (append the existing file)

***$ script -t file*** (put time stamp in front of each command)

***$ script -f file*** (flush after each command)

# Shell Types

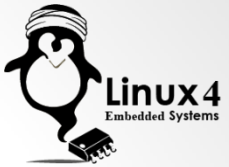
- Shells belong to two categories
  - Login shell
    - Shells that require login before starting
  - Non-Login shell
    - Those shells don't require a login
    - They are children of login shells
- To exit a shell,
  - For Login shell

    ***$ logout***
  - For non-login Shells

    ***$ exit***

# Why Do we Call it a Shell ???

# Shell Startup --Login Shells




When the Login Shell starts up, it goes through these steps to set the proper environment

- System Wide Configurations
  - It reads ***/etc/profile*** for global configurations (for all users)
- User Specific Configurations
  - Then it reads one of the following for user specific extensions/overrides (if it finds one of the files starting from the first, it will read it and skip the rest)

    ***~/.bash-profile***

    ***~/.bash-login***

    ***~/.profile***
  - Note that those files normally call ***~/.bashrc*** internally

# Shell Startup – Non-Login Shells

Non-Login Shells build their environment as follows,

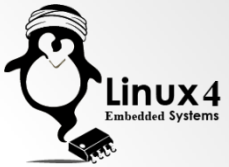
- First, they inherit the environment from their parent Login Shells
- On top of that, it reads the following configuration files,
  - For Global settings they read the files:

    ***/etc/.bashrc***

    ***/etc/bash.bashrc***
  - For user specific settings, they read,

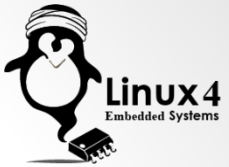
    ***~/.bashrc***

# Updating ~/.bashrc




- Each user can put his own settings in ***~/.bashrc*** such as,
  - Set environment Variables
  - Set Command Aliases
  - Define Shell Functions
- The new settings in ***~/.bashrc*** will not take effect in the current shell, since it is only read at shell startup
- Solution,
  - Start a new shell
  - Manually Force a ***~/.bashrc*** read

# Running the ~/.bashrc Script (source Command)




- Normally, scripts are run by calling them from the prompt

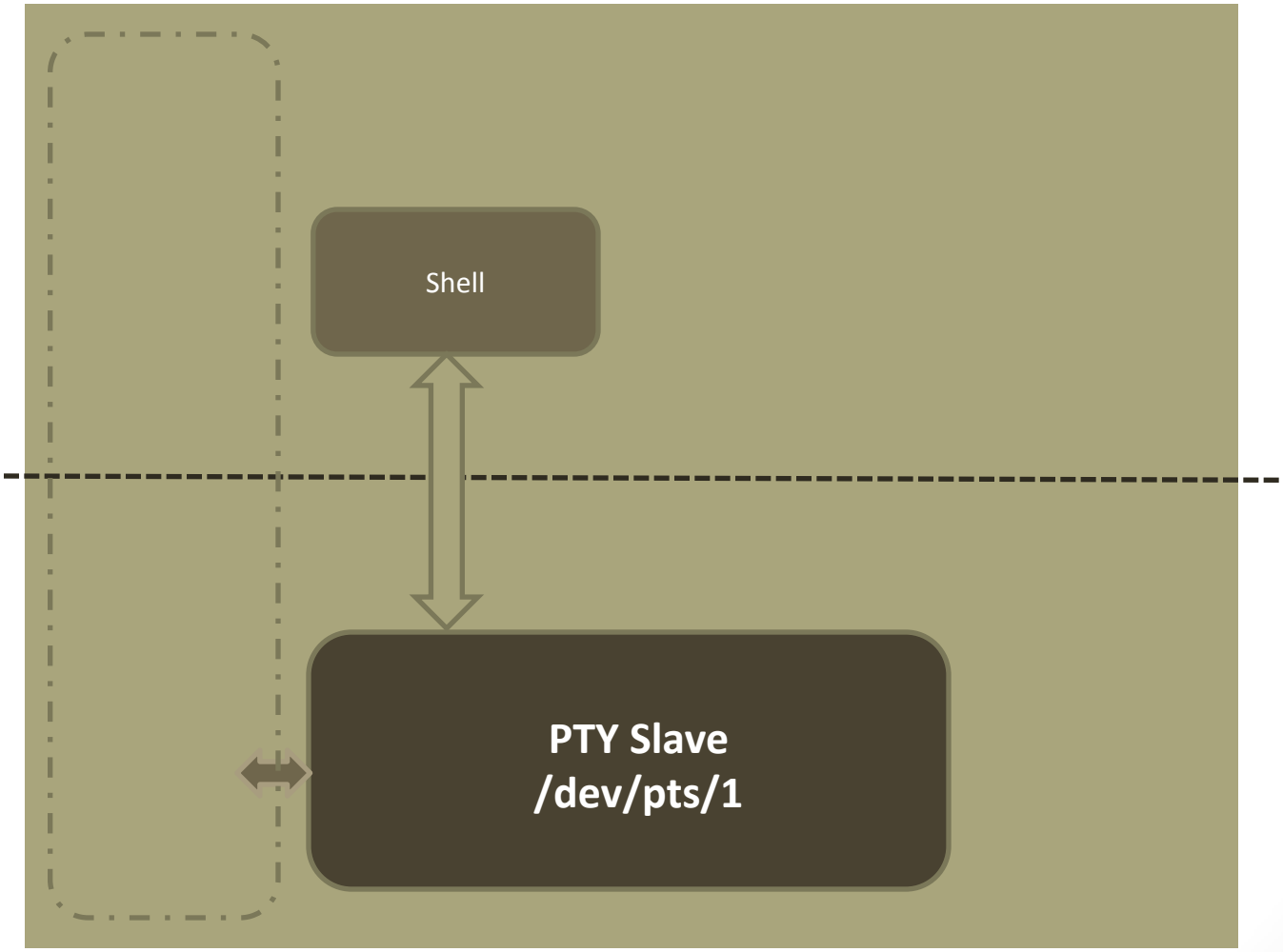
  ***$ <script name>***

- We can not just call the script in ***~/.bashrc*** like normal script … WHY??
  - When a script is run, it runs in a child shell
  - When the script completes, the child shell closes, and control gets back to the original shell
  - This means, anything that was set in the script will apply to the child shell, and when it is closed, these settings will be lost
- We need a new way to force the script to run in the current shell, and not in a child shell, so settings will apply to the current shell

  ***$ source .bashrc***

  ***$ . .bashrc***

# Running a Shell Command



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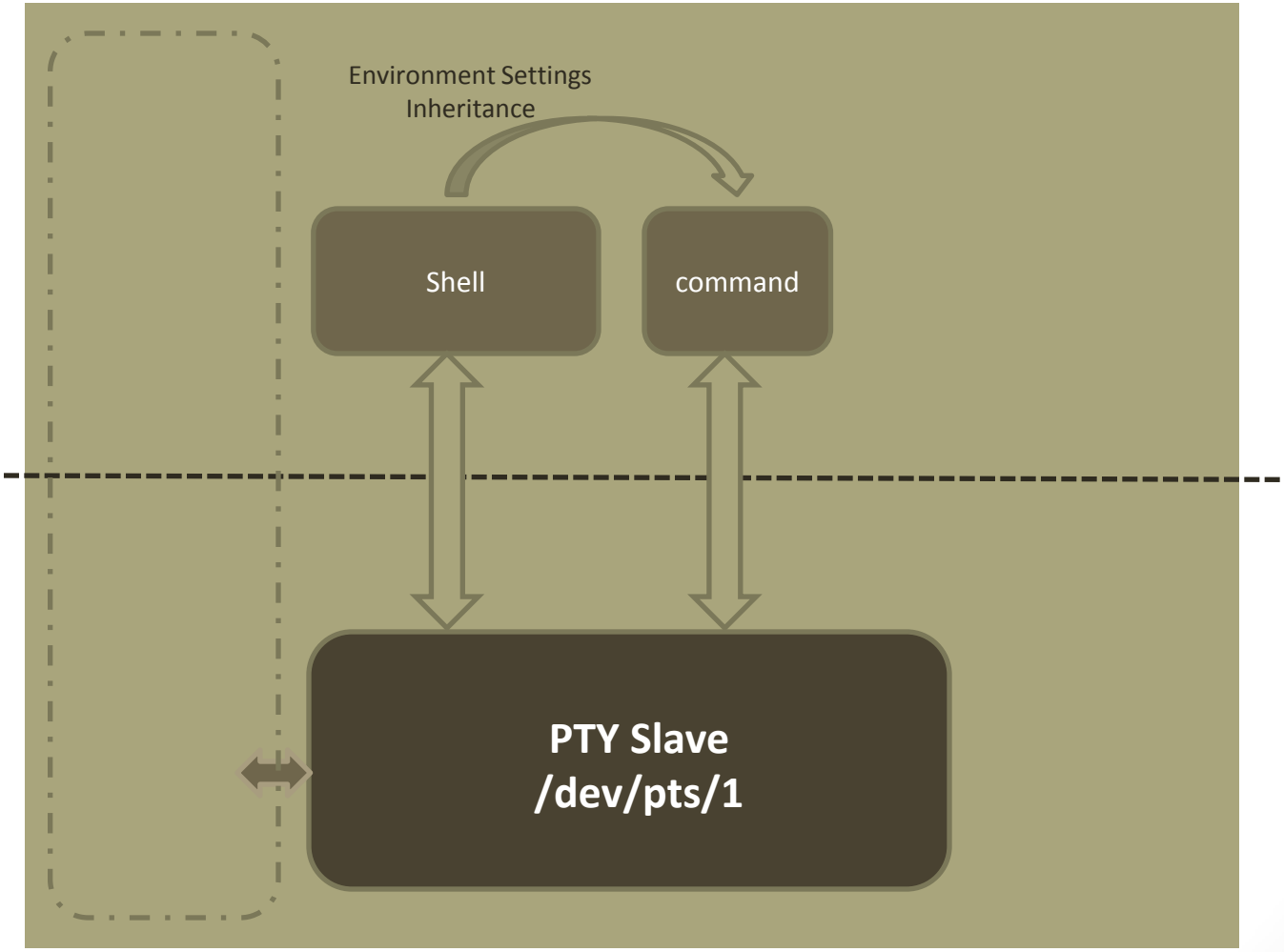

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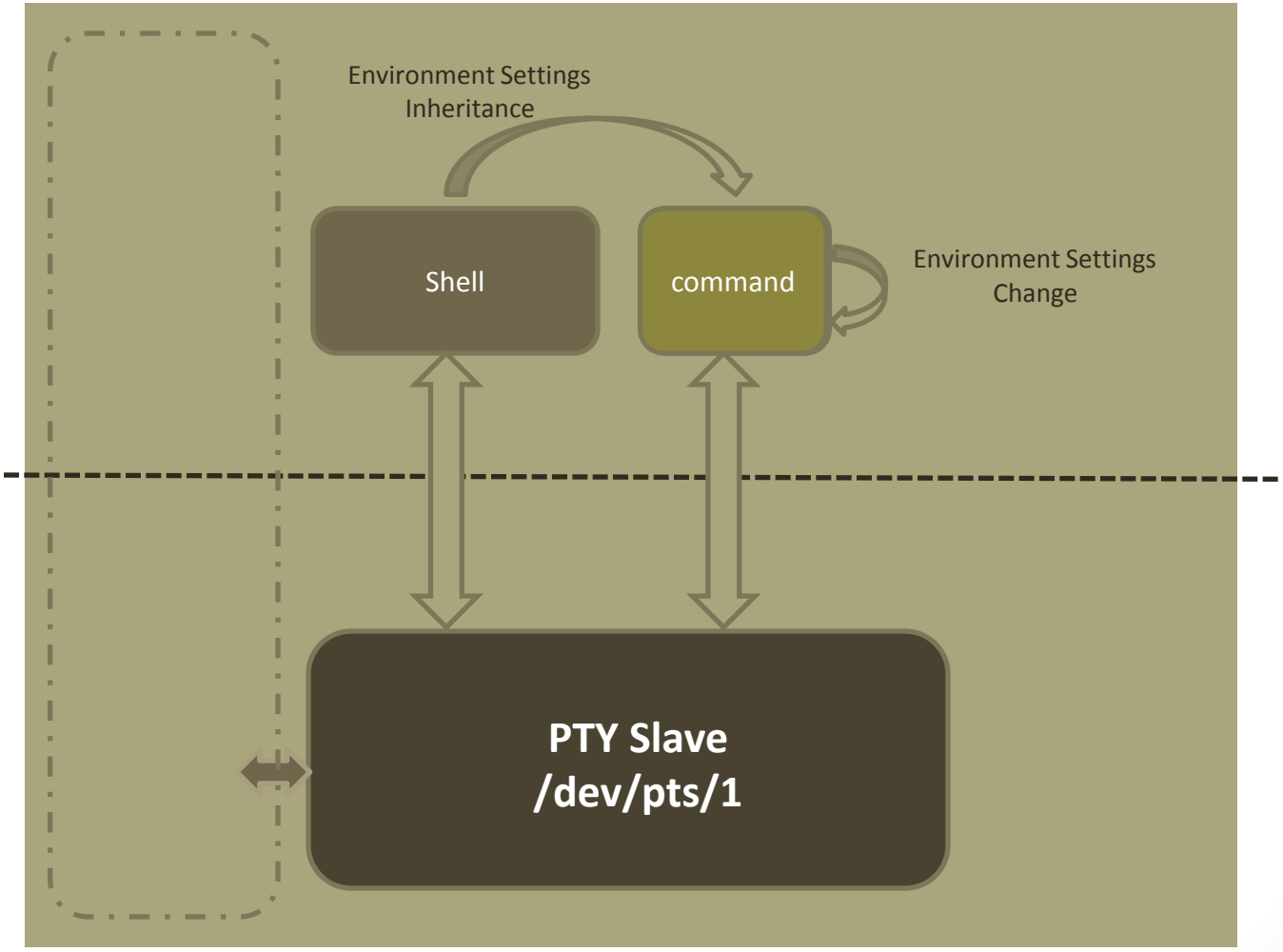

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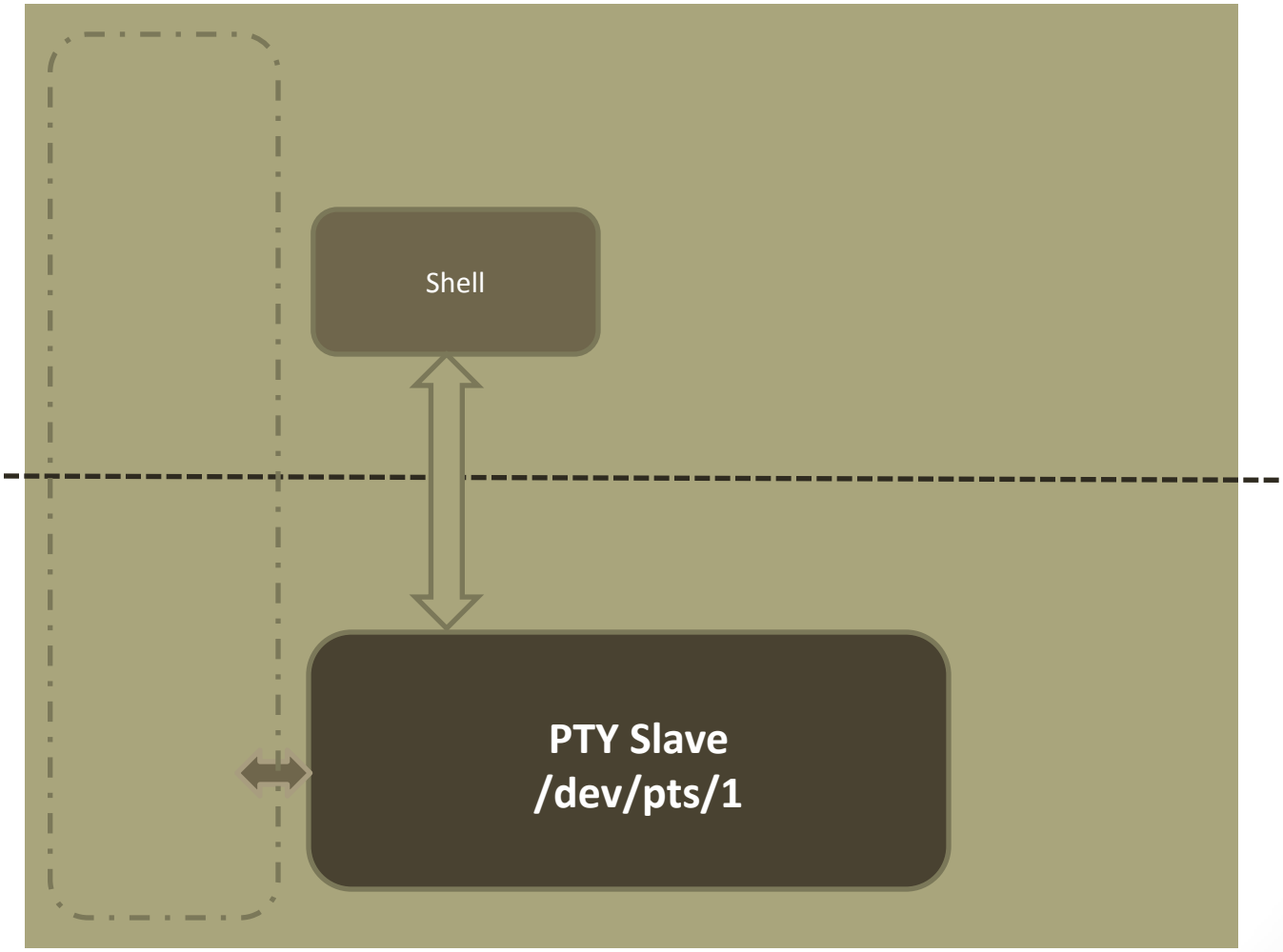

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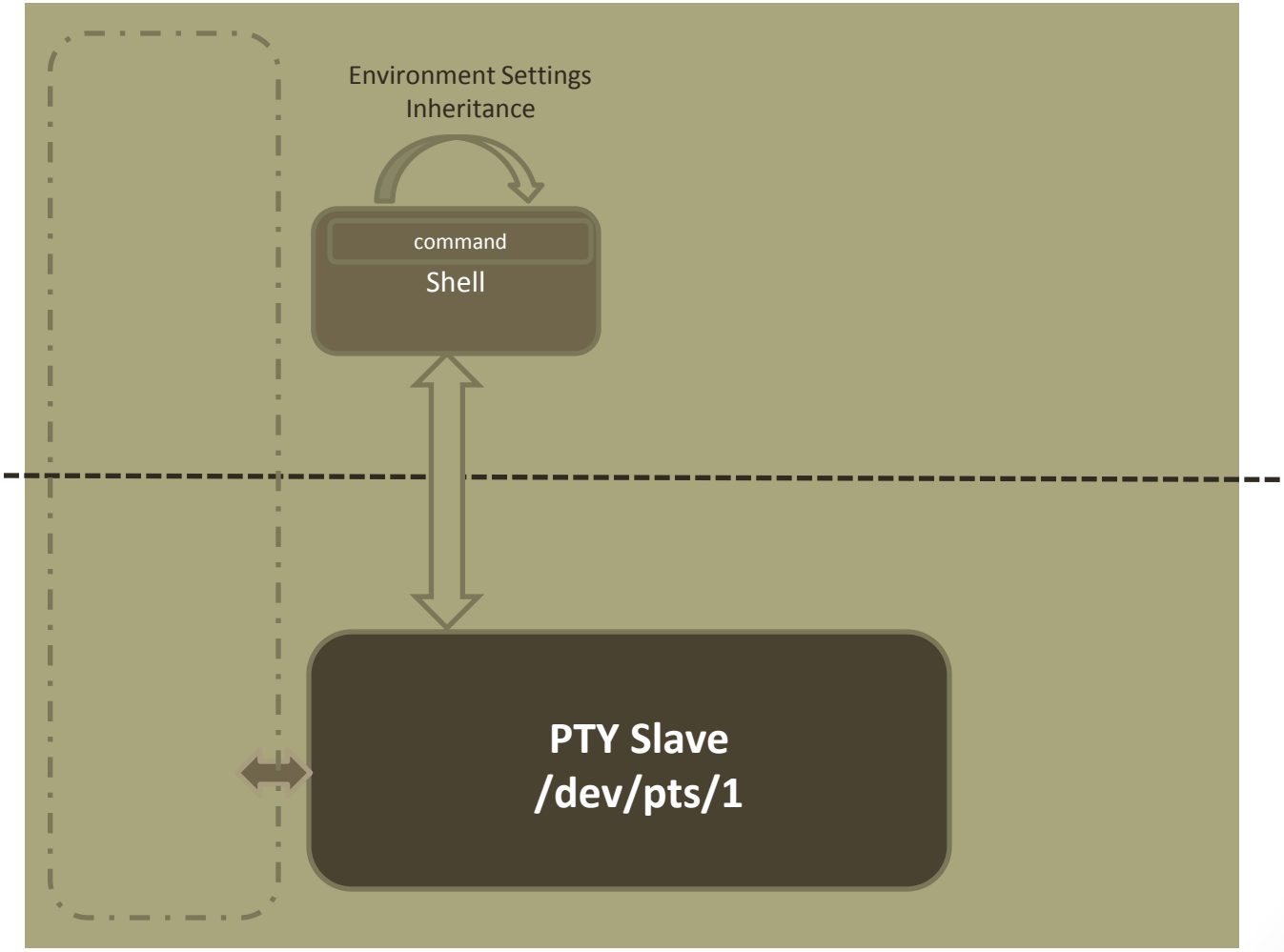

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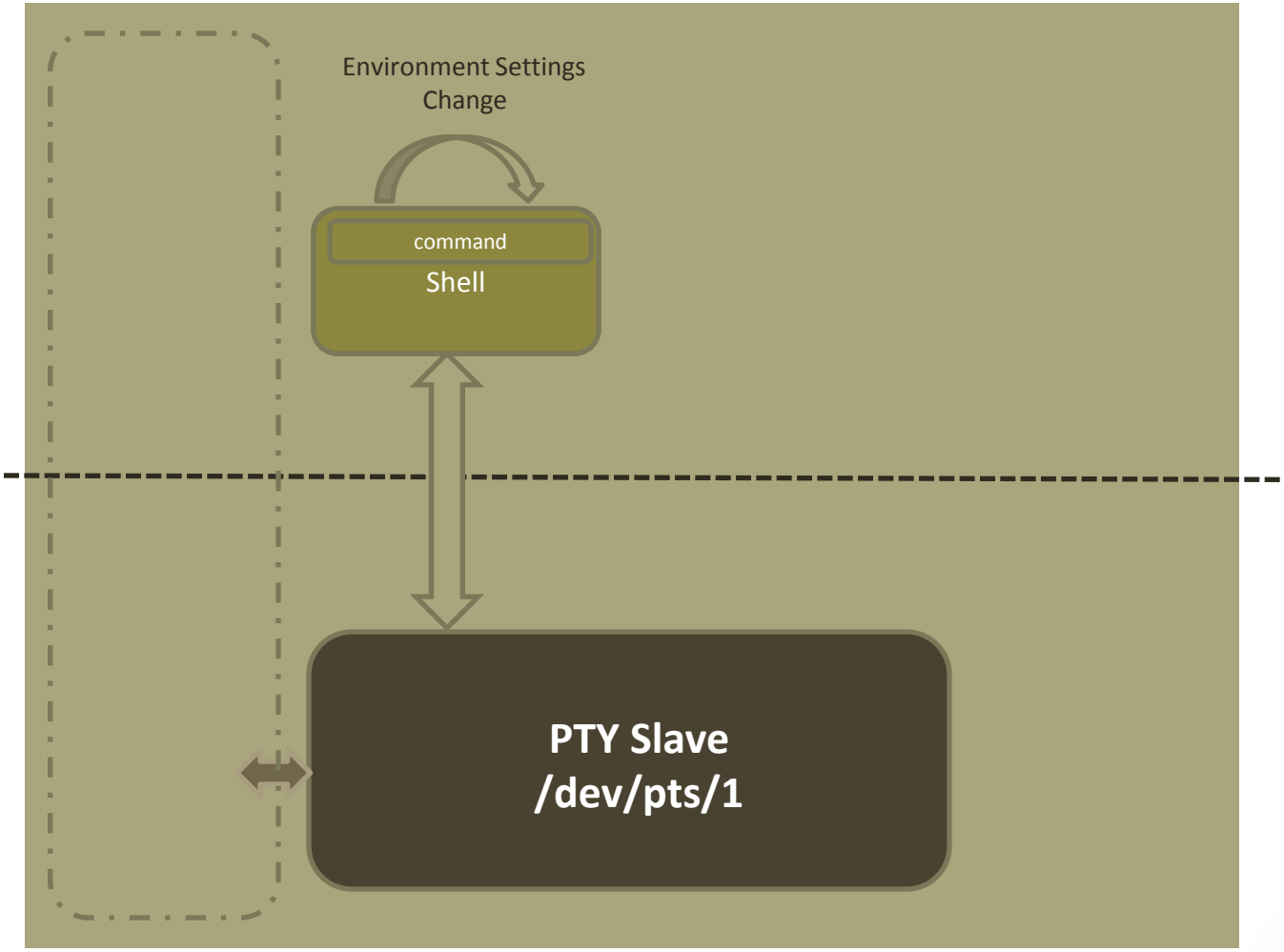

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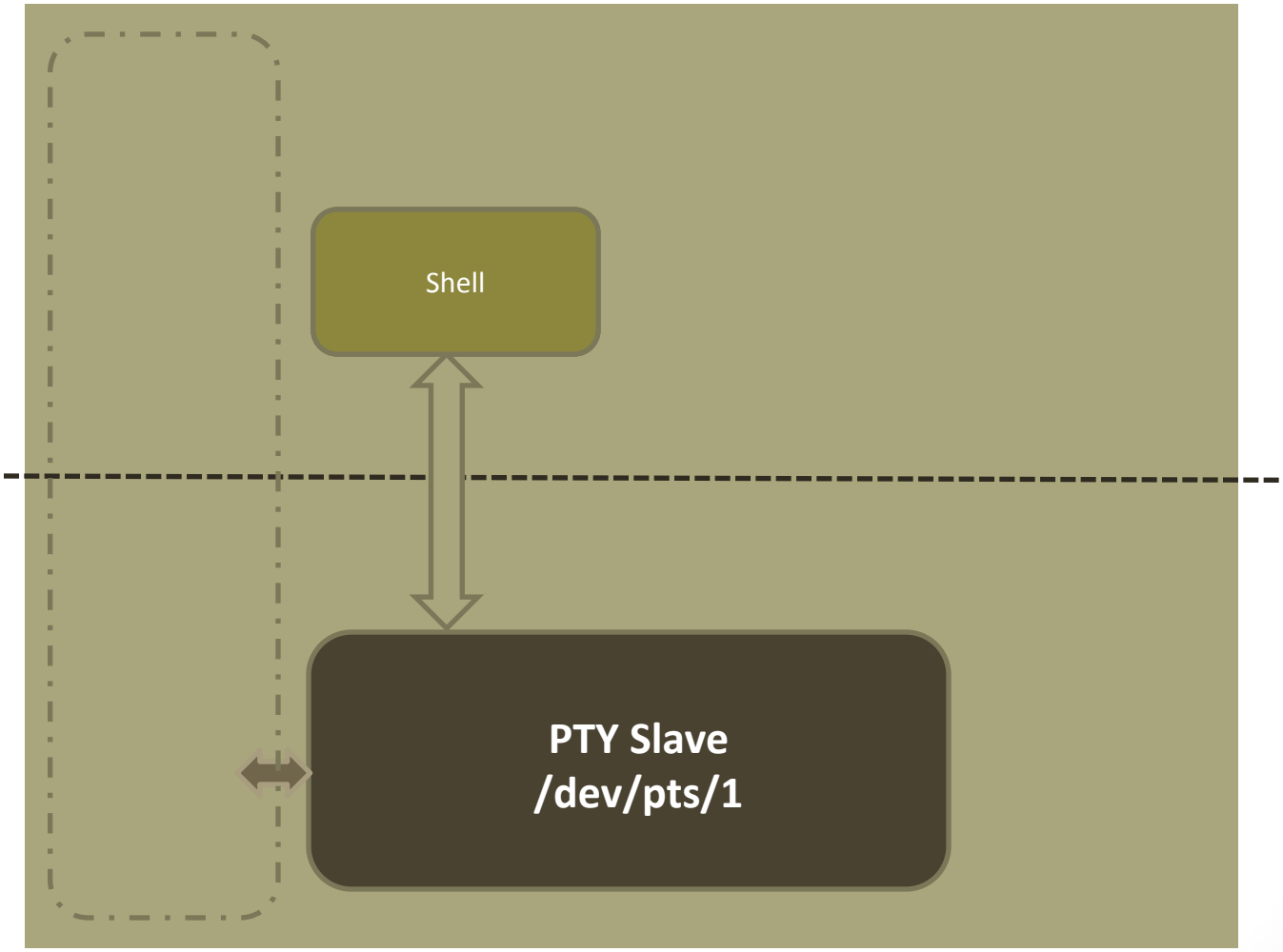
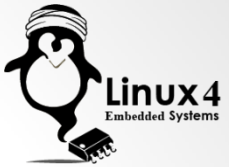


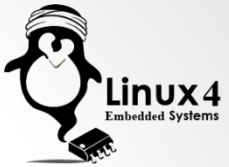
# USEFUL SETTINGS IN ~/.bashrc

# Common Settings




- Setting Aliases
  - A good place to set Aliases is in the ~/.bashrc
  - Note that these aliases only apply for that user, so if you run as root, you will not have these aliases set
- Setting Environment Variables for the user
- Define shell functions

# Protecting from File Over-Write (Setting noclobber)




- Clobbering a file means over-writing a file (normally in an unintentional way)
- This happens very often through output redirection

  ***$ echo "Good Morning" > file.txt***
- To avoid that we adjust the noclobber settings in ***~/.bashrc***
- Example:

  ***$ set -o noclobber*** (this will protect files from being over-written)

  ***$ set +o noclobber*** (this will remove the protection)
- Note
  - If files are protected from over-writing, you can still force an over-write

    ***$ echo "Good Morning" >| file.txt***

# Linux 4 Embedded Systems

http://Linux4EmbeddedSystems.com