BUILDING AND LEVERAGING A CROSS PLATFORM VFX/ ANIMATION DEVELOPMENT ENVIRONMENT

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INTRODUCTION AND BRIEF OVERVIEW OF THE TALK

- making life easy via a simple concept
- controlled environments
- cross platform build management

WHAT DOES CROSS PLATFORM MEAN IN THE CONTEXT OF THIS TALK?

- Multiple OS platforms (Linux, Windows, OSX)
- Multiple Third Party applications (Maya, Houdini, Nuke & myriad of renderers)
- Cross platform Shaders and Shader DSO's (Arnold c++, Renderman DSO's etc.)
- Cross Platform APIs (Boost, Qt, etc).

YOUR ENVIRONMENT

- where you work (home, office, on set, traveling)
- what you're working on (Windows, Linux, Mac)
- the current state (variables, installation locations, versions)
- production requirements

FORESHADOWING (IE. PROBLEMS WITH UNCONTROLLED ENVIRONMENTS)

- versions of applications
  - production vs. testing betas
  - staging new builds
  - R&D
- dependencies
- deployment
- per show, sequence and shot dependencies (and how to stage control over these)

HOW CAN THIS BE MANAGED?

(ONE PERSONS OPINION)

- always start fresh
- use the shell! (or at least wrap it up nicely)
- break down each chunk of information into manageable pieces
- pick your weapon (python)
- make it a requirement to work this way

BUILD THE FOUNDATION

(REQUIRED CHEESY SLIDE)

- a common means of resolving non cross platform requirements
- defining each applications environment needs (packages)
- resolving dependencies
- easy to execute

NON CROSS PLATFORM CONSIDERATIONS

- make decisions on how to represent non-cross platform requirements
    - base directories
    - users
    - system libraries, shared libraries etc.
- build a myStudioCrossPlatform.py library which resolves directory locations and wraps up global environment variables that lets you do:

myPath = myStudioCrossPlatform.getPluginsDirectory()

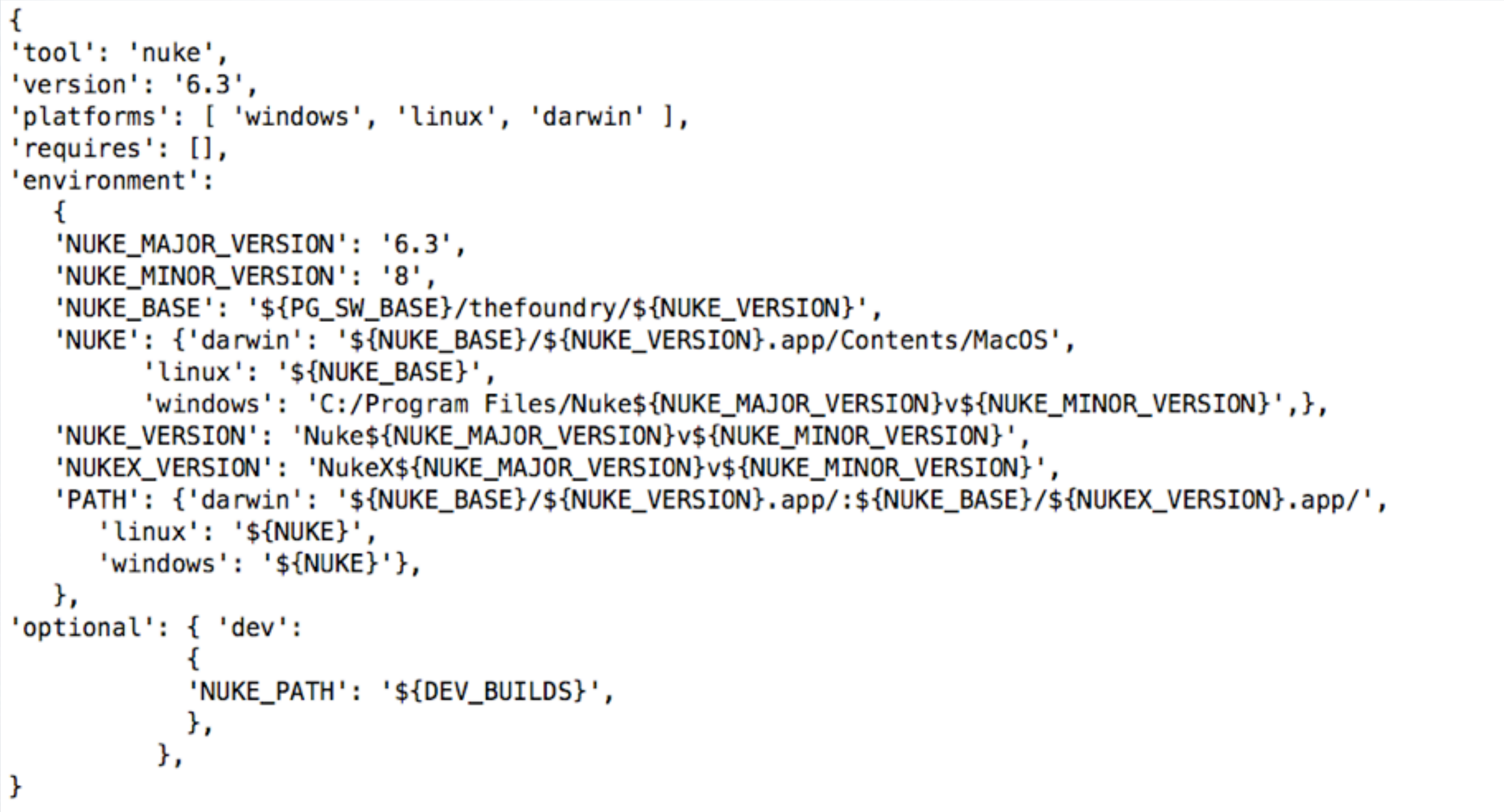
PACKAGES

- a package contains a description of environment needs
    - platforms supported (Windows, OSX and Linux)
    - the version this represents
    - environment variables (path to binaries, libraries, etc.)
    - dependencies and their specific environment needs (unique to this package)

RESOLVE DEPENDENCIES

- each package should list dependencies and/or define how to behave in another package has been requested
- dependencies can also include other environment variables (base directories etc.)
- both dependencies and environment variables should be "resolved" and unrolled for a clean environment

EXAMPLE PACKAGE



```
{
'tool': 'nuke',
'version': '6.3',
'platforms': [ 'windows', 'linux', 'darwin' ],
'requires': [],
'environment':
   {
   'NUKE_MAJOR_VERSION': '6.3',
   'NUKE_MINOR_VERSION': '8',
   'NUKE_BASE': '${PG_SW_BASE}/thefoundry/${NUKE_VERSION}',
   'NUKE': {'darwin': '${NUKE_BASE}/${NUKE_VERSION}.app/Contents/MacOS',
         'linux': '${NUKE_BASE}',
         'windows': 'C:/Program Files/Nuke${NUKE_MAJOR_VERSION}v${NUKE_MINOR_VERSION}',},
   'NUKE_VERSION': 'Nuke${NUKE_MAJOR_VERSION}v${NUKE_MINOR_VERSION}',
   'NUKEX_VERSION': 'NukeX${NUKE_MAJOR_VERSION}v${NUKE_MINOR_VERSION}',
   'PATH': {'darwin': '${NUKE_BASE}/${NUKE_VERSION}.app/:${NUKE_BASE}/${NUKEX_VERSION}.app/',
      'linux': '${NUKE}',
      'windows': '${NUKE}'},
   },
'optional': { 'dev':
            {
            'NUKE_PATH': '${DEV_BUILDS}',
            },
          },
}
```

EXECUTION

[insert inappropriate image here]

- user requests the versions of software they need
- list of dependencies are built and packages sourced
- the environment and dependencies are resolved
- a flattened (unrolled) environment is stored
- this is used to “set” the current working environment
- success!

A TOOL BY MANY NAMES

- need (Weta, originated at POP)
- use (Tippett and others)
- fuse (Fuel "use")
- rez (Dr. D, open sourced and very verbose)
- ecosystem (Peregrine)

ECOSYSTEM= AN EXAMPLE - TO THE SHELL!

CAVEATS

- python doesn’t let you set the current environment
  - on unix platforms the environment can be stored to a temporary file and sourced
  - on windows the environment can be launched/set for each invocation of applications wrapped in a .cmd file

SOME BENEFITS

(IF NOT OBVIOUS)

- it's easy to push out new package descriptions to support newly installed software
- no environment clashes, especially on Windows (Maya 2012 and 2013 plugins fighting for resolution etc.)
- easy to separate development and release version where staging and testing is extremely easy
- control over sequence and shots dependencies, may be controlled by artists or supervisors

NOW WE CAN THINK ABOUT BUILD SYSTEMS

- a system to wrap up the dependencies and steps needed to build (compile) source code to produce a tool
- generally referred to as tool chains; compiler, linker and other build tools
- Visual Studio, XCode, makefiles, Scons and CMake

CMAKE FOR THE WIN

- cross platform
- mature and becoming more widely supported
- generators for different toolchains
- a module concept, very useful for defining dependencies

CMAKE GENERATORS

- used to build intermediate files for the target platform all from a common source
- Makefiles on Linux
- Makefiles/XCode Projects on OSX
- NMake files/MSVC Projects on Windows (Jom for NMake builds)

CMAKE MODULES

- Call FindPackage.cmake, ie. FindQT4, FindTiff, FindHDF5 etc.
- We can derive our own, ie. FindMaya, FindNuke, FindPRMan, FindHoudini, FindArnold
- having a common environment makes this much easier to resolve/implement the desired version and dependencies
- let's look at one!

CMAKE TARGETS & CONFIGURATIONS

- each cmake project can contain multiple targets
- each target inherits a global environment with the option of specifying/overriding target specific options
- a configuration can be one of Debug, RelWithDebInfo and Release
- each configuration controls global build options to provide a specific style of binary output

CMAKE EXAMPLE - BACK TO THE SHELL!

I DON'T WANT TO BUILD C++, SHOULD I STILL CARE?

- no one said you have to do any of this, but it's hard not to argue the merit in having a controlled environment across multiple platforms
- managing software dependencies and show/seq/shot requirements it's probably worth leveraging beyond any sort of development
- python, perl, tcl, your language of choice, still requires modules to be installed - virtual env and other tools can be used but it still good to have a studio wide means of managing these

TAKING IT A STEP FURTHER

- easy to set an environment on the render farm (keys become need dependencies to be sourced)
- store environment “needs” in EXR meta data for historical purposes
- easy to expand to external locations (on set equipment and outsource)
- integrate license and resource management (choose to access different pools of a render farm based on dependencies)

THE CLOUD

(“ON A BEACH IN COSTA RICA”)

- leverage version control for global access to the toolset (GitHub)
- S3 for distribution
- a new tag in a package, bundle://
- bundle encapsulates the cross platform installation for the package based on hdf5 and fuse file system (like a dmg or custom image)
- a nice side effect is easy disaster recovery

RE-ITERATING GOAL

- simple control
- clear understanding of context
- flexibility of tools
- a common environment

QUESTIONS/DISCUSSION ?