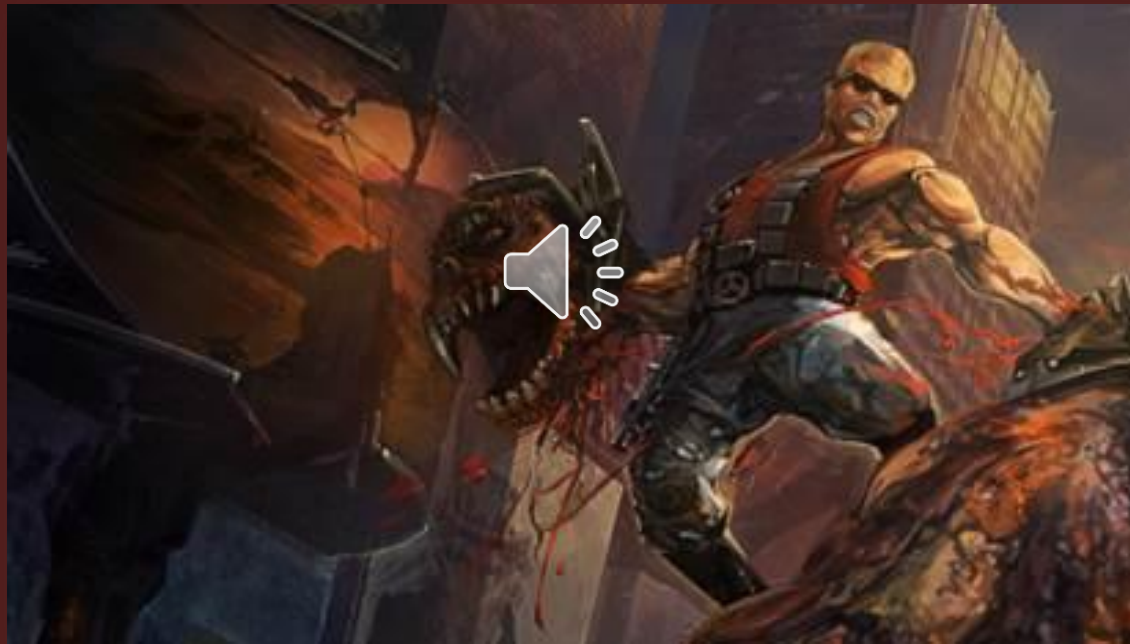


Raiders of the Lost Duke: Video Game Source Discs at the LOC



David Gibson
MBRS, Library of Congress
Digital Preservation 2014
7/22/2014

Some facts about the collection...

- MBRS custodial division since 2006
- ~ 2500 video games
- ~ 1600 strategy guides
- ~ 1100 periodicals
- 13 gaming platforms
- Source code excerpts
- DVDs and VHS of gameplay

Some background on *Duke Nukem: Critical Mass*



- Developed by Apogee Software
- Scheduled for release in 2009 as the first part of a trilogy
- PSP and Nintendo DS versions – different narrative and mechanics
- PSP version never released, DS version released in June 2011

What we received:



Duke Nukem: Critical Mass (PSP)

Type of Work: Computer File

Registration Number / Date: PAu003496314 / 2010-11-08

Application Title: Duke Nukem: Critical Mass (PSP)

Title: Duke Nukem: Critical Mass (PSP)

Description: Videodisc (DVD+R)

Copyright Claimant: Apogee Entertainment, LLC d.b.a. Apogee Software. Address: 5702 Highgate Lane, Rowlett, TX, 75088, United States.

Date of Creation: 2010

Authorship on Application: Apogee Entertainment, LLC d.b.a. Apogee Software, employer for hire; Domicile: United States; Citizenship: United States.

Authorship: Entire video game; computer code; artwork; and music.

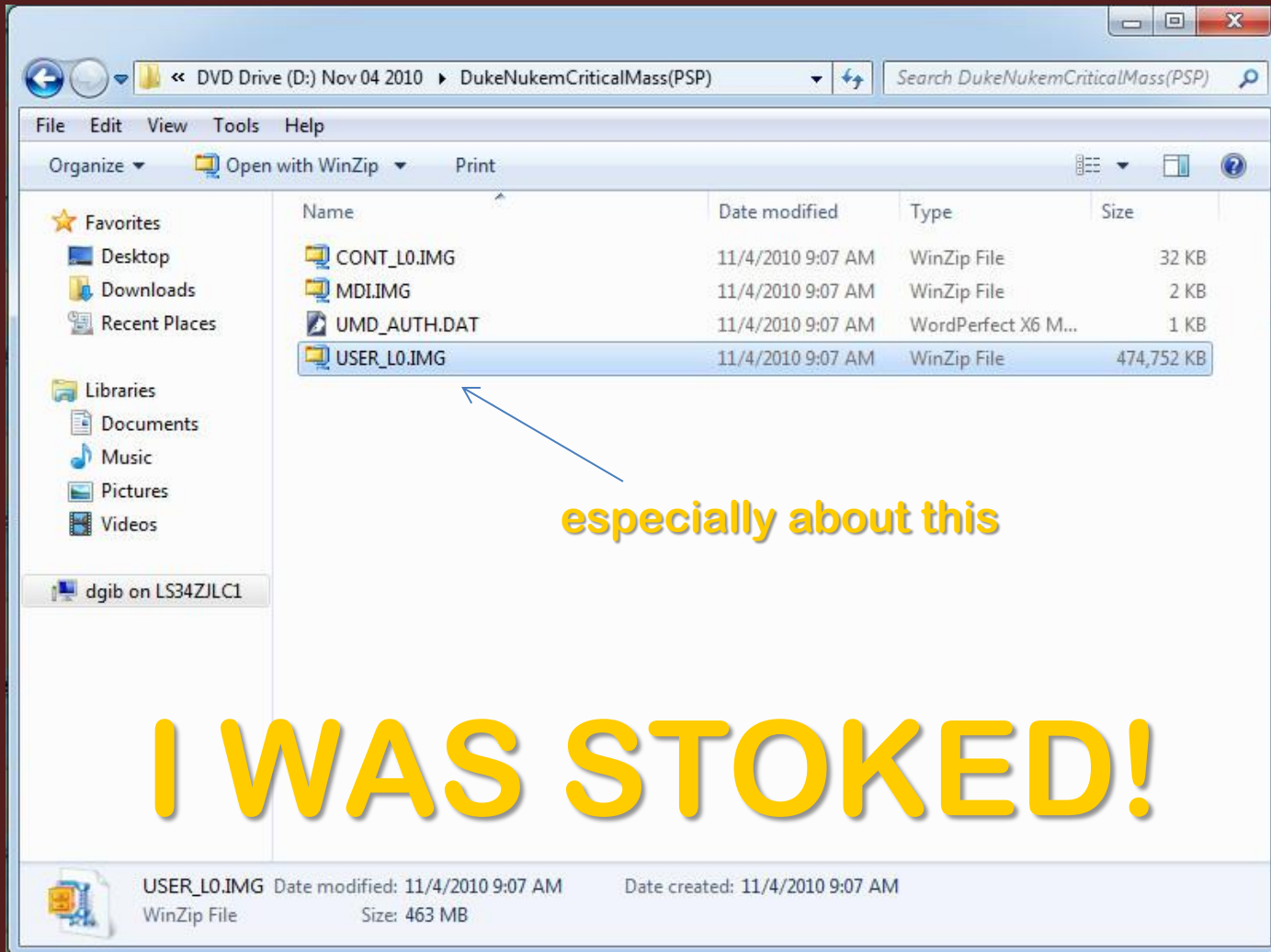
Rights and Permissions: Dan Lutter, 5702 Highgate Lane, Rowlett, TX, 75088, United States, (847) 816-7552, danl@apogeesoftware.com

Copyright Note: C.O. correspondence.

Names: [Apogee Entertainment, LLC](#)

[Apogee Software](#)

When I put the disc in my computer,
I found:



A quick look at the file directory...

PSP_GAME

```
|
|---SYSDIR
|   |--Update
|   |--BOOT
|       |--boot.bin (holds compiled binaries and ASCII text)
|   |--EBOOT (nothing)
|   |--OPNSSMP (nothing)
|---USRDIR
|   |--data
|       |--cutsscenes
|           |--cut_##
|               |--models (.gmo files) - ojbdefault.gmo
|               |--pictures (.gim files)
|       |--fonts
|       |--levels
|       |--music (full of .at3 files)
|       |--SD (title screen logos and music)
|       |--selector
|       |--shared_data
|       |--shared_models (lots of .gmo files - 3d models - animated gifs come from
here)
|       |--shared_pictures (lots of .gim files - texture files / jpegs come from here)
|       |--sounds (
|---ICON0
|---PARAM.SFO
```

- 1,968 files
- 28 different file formats – many proprietary

.at3 .phy .gmo .bin .nps
.gso .mpb .duk .pmf .gss
.drs .bbs .mpd .sfo .fss
.pss .lay .mpt .ind .mpl
.cus .gim .pus .chr

So, now what...

- Met with Packard Campus software developer, Matt Derby
- Pulled files off of DVD submission
- Found asset files in PSP_GAME folder in USRDIR subdirectory
- Standard folder structure for UMD authoring
- How to get access to proprietary files?

HOMEBREW!!!

Señor Casaroja's 
Engineering Oasis

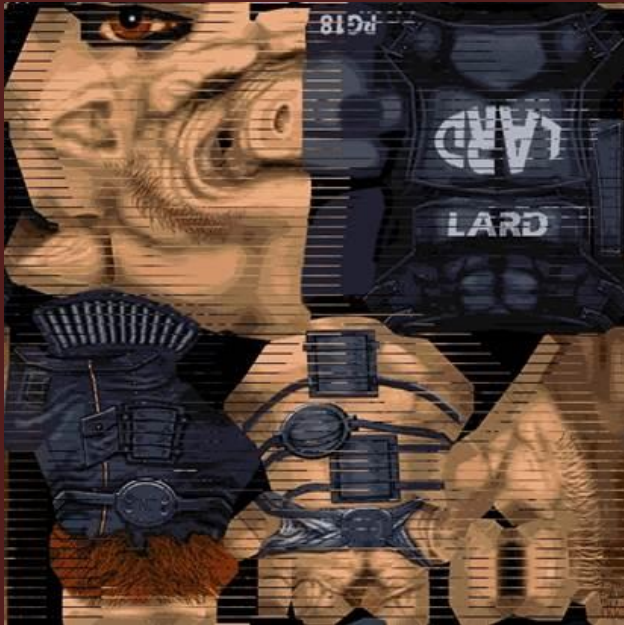
The Señor is dead.

Casaroja is no longer. Noesis may still be on Rich's personal site.

Just one problem...

Working with Noesis gave us access to the .gim and .gmo files....

.gim files include textures and still images – specific to PSP

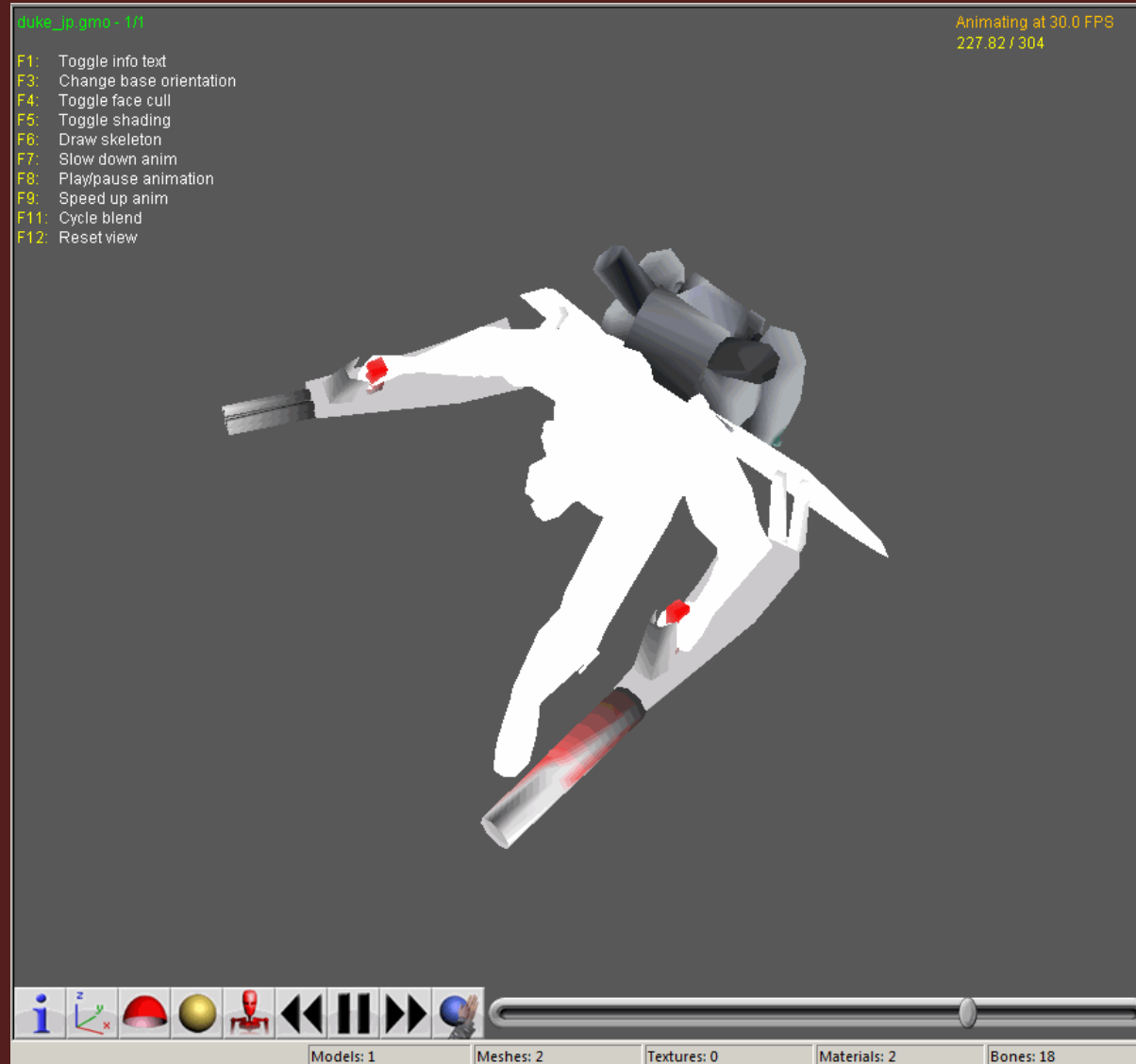


Pig Cop texture

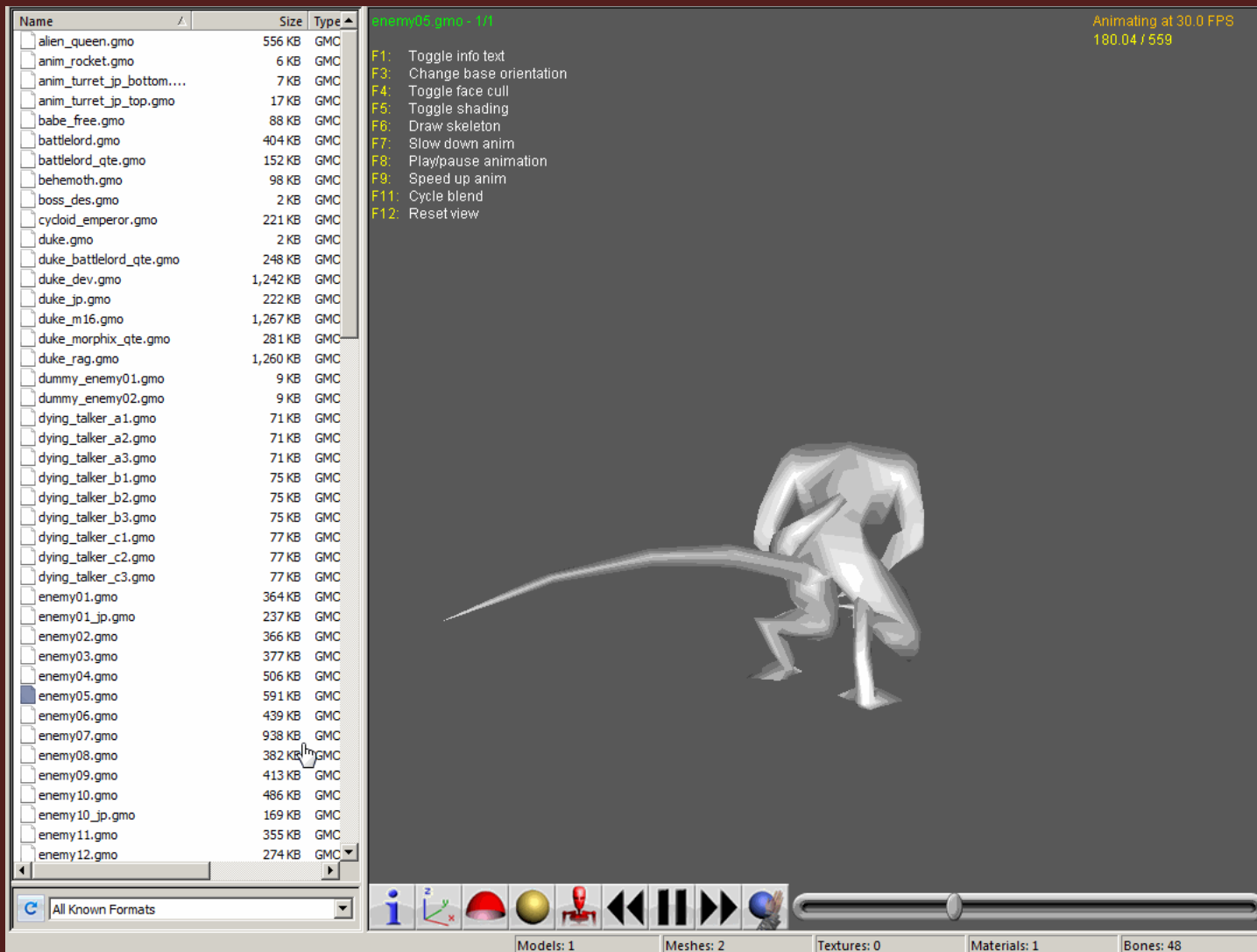


Propaganda posters

.gmo files include 3D models



Duke & his jetpack

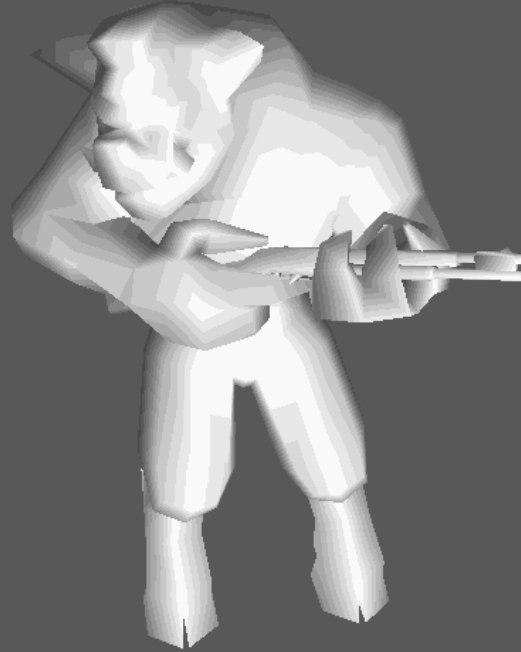


Rat

sniper_pig.gmo - 1/1

Animating at 35.0 FPS
1023.72 / 1208

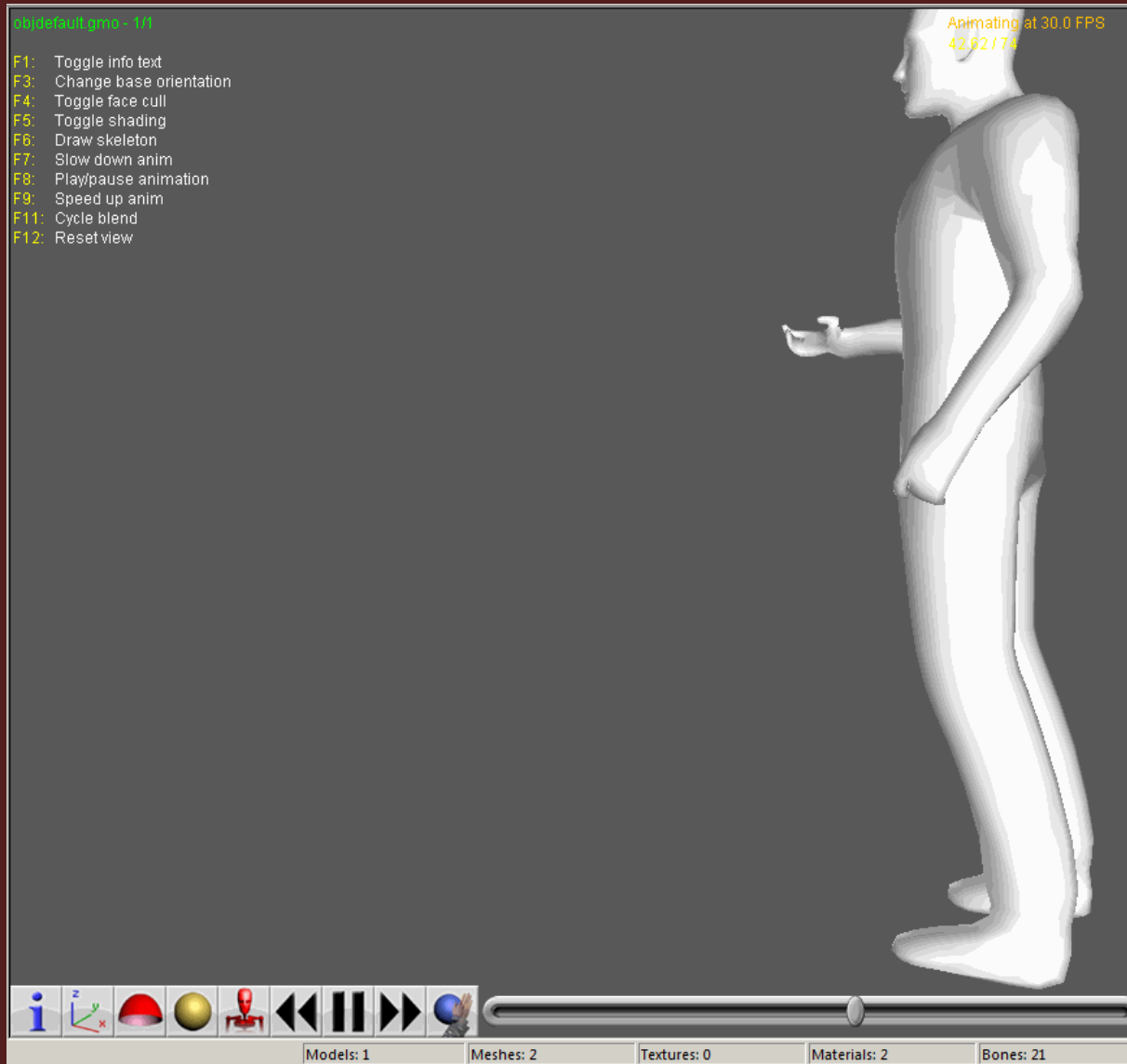
- F1: Toggle info text
- F3: Change base orientation
- F4: Toggle face cull
- F5: Toggle shading
- F6: Draw skeleton
- F7: Slow down anim
- F8: Play/pause animation
- F9: Speed up anim
- F11: Cycle blend
- F12: Reset view



Navigation and animation controls including icons for info, axes, shading, skeleton, play/pause, and a timeline slider.

Models: 1	Meshes: 2	Textures: 0	Materials: 2	Bones: 32
-----------	-----------	-------------	--------------	-----------

Sniper Pig



Dying Talker

Used mediacoder to convert .at3s to MP4, and VLC to convert MP4 to MP3 📢

mediacoder provided technical metadata for .at3 files:

Atrac3
128 Kbps
44.1 kHz
2 channel

and .vag files:

spdifaac encoded in AAC
container
758 Kbps
48 kHz
2 channel

Used hex editor to open boot.bin in order to see ASCII text for the game

Folder contains compiled binaries and ASCII text of code, credits, and dialogue from the game

```
HxD - [C:\Users\Matthew Derby\Desktop\Duke Nukem copyright submission\DukeNukemCriticalMass(PSP)\PSP_GAME\SYSDIR\BOOT.BIN]
File Edit Search View Analysis Extras Window ?
ANSI hex
BOOT.BIN
Offset(h) 00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F 10 11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E 1F 20 21 22 23 24 25 26 27 28
00200AE2 41 44 59 00 00 00 52 45 41 44 59 00 00 44 4E 54 43 4D 00 00 20 25 64 20 2F 20 25 64 00 00 00 00 44 4D 00 00 43 54 42 ADY...READY...DNICM... %d / %d...DM..CTB
00200B0B 00 25 64 20 6D 69 6E 00 00 4C 41 20 53 74 72 65 65 74 73 00 00 55 6E 6B 6E 6F 77 6E 00 4D 41 50 20 53 45 54 54 49 4E 47 53 .%d min..LA Streets..Unknown.MAP SETTINGS
00200B34 00 00 00 00 46 61 63 74 6F 72 79 00 32 00 00 33 00 00 00 34 00 00 35 20 6D 69 6E 00 00 00 31 35 20 6D 69 6E 00 00 32 ....Factory.2...3...4...5 min...15 min..2
00200B5D 35 20 6D 69 6E 00 00 4D 50 5F 45 56 45 4E 54 5F 4E 55 4C 4C 00 00 4D 50 5F 45 56 45 4E 54 5F 41 43 4B 00 00 00 4D 50 5 min..MP_EVENT_NULL...MP_EVENT_ACK...MP
00200B86 5F 45 56 45 4E 54 5F 4E 45 45 44 5F 41 4E 53 57 45 52 00 00 00 4D 50 5F 45 56 45 4E 54 5F 48 49 54 5F 50 4C 41 59 45 52 _EVENT_NEED_ANSWER...MP_EVENT_HIT_PLAYER
00200BAF 00 4D 50 5F 45 56 45 4E 54 5F 48 49 54 5F 54 45 4C 45 50 4F 52 54 00 00 4D 50 5F 45 56 45 4E 54 5F 48 49 54 5F 50 49 43 .MP_EVENT_HIT_TELEPORT...MP_EVENT_HIT_PIC
00200BD8 4B 55 50 00 4D 50 5F 45 56 45 4E 54 5F 48 49 54 5F 44 49 54 5F 44 49 45 44 00 00 4D 50 5F 45 56 45 4E 54 5F 50 41 57 4E 20 00 4D KUP.MP_EVENT_HIT_DIED...MP_EVENT_SPAWN ..M
00200C01 50 5F 45 56 45 4E 54 5F 53 48 4F 4F 54 20 00 4D 50 5F 45 56 45 4E 54 5F 53 54 41 52 54 5F 47 41 4D 45 00 4D 50 5F 45 56 45 4E 54 5F 45 56 45 4E 54 5F 53 50 41 57 4E 20 00 4D P_EVENT_SHOOT ..MP_EVENT_START_GAME.MP_EV
00200C2A 4E 54 5F 54 52 49 47 47 45 52 00 00 00 4D 50 5F 45 56 45 4E 54 5F 52 45 41 44 59 09 00 4D 50 5F 45 56 45 4E 54 5F 48 49 49 NT_TRIGGER...MP_EVENT_READY..MP_EVENT_HI
00200C53 54 5F 4F 42 4A 45 43 54 00 4D 50 5F 45 56 45 4E 54 5F 54 49 4D 45 00 00 4D 50 5F 45 56 45 4E 54 5F 44 45 41 44 53 54 41 T_OBJECT.MP_EVENT_TIME...MP_EVENT_DEADSTA
00200C7C 54 55 53 00 4D 50 5F 45 56 45 4E 54 5F 53 43 4F 52 45 09 00 4D 50 5F 45 56 45 4E 54 5F 44 45 54 4F 4E 41 54 45 00 00 4D TUS.MP_EVENT_SCORE..MP_EVENT_DETONATE...M
00200CA5 50 5F 45 56 45 4E 54 5F 43 48 41 4E 47 45 5F 57 45 41 50 4F 4E 00 00 4D 50 5F 45 56 45 4E 54 5F 54 48 52 4F 57 5F 50 42 00 P_EVENT_CHANGE_WEAPON..MP_EVENT_THROW_PB.
00200CCE 00 00 53 43 45 4E 45 5F 50 52 45 56 49 45 57 00 00 63 61 6D 65 72 61 2D 30 00 00 00 62 61 62 65 5F 66 72 65 65 2E 67 ..SCENE_PREVIEW...camera-0....babe_free.g
00200CF7 6D 6F 00 00 25 73 20 66 6F 75 6E 64 20 62 61 62 65 2E 00 00 25 73 20 62 72 69 6E 67 20 6E 65 77 20 62 61 62 65 20 74 6F 6F mo...%s found babe...%s bring new babe to
00200D20 20 68 69 73 20 63 61 72 2E 00 00 59 6F 75 72 00 62 61 62 65 20 77 61 73 20 73 74 6F 6C 65 6E 20 62 79 20 25 73 2E 00 25 his car...Your babe was stolen by %s.%s
00200D49 73 20 6C 65 66 74 20 74 68 65 20 67 61 6D 65 2E 00 00 25 73 20 77 61 73 20 6B 69 6C 6C 65 64 20 62 79 20 25 73 2E 00 25 s left the game...%s was killed by %s...
00200D72 00 00 42 72 69 6E 67 20 62 61 62 65 20 74 6F 20 79 6F 75 72 20 62 61 73 65 21 21 00 00 42 61 62 65 20 69 73 20 79 6F 75 ..Bring babe to your base!!...Babe is you
00200D9B 72 73 21 21 00 62 6C 6F 6F 64 2E 67 69 6D 00 00 43 54 42 31 00 00 00 54 72 69 61 6E 67 6C 65 00 00 00 32 00 00 00 00 rs!!..blood.gim...CTB1...Triangle....2...
00200DC4 4F 76 65 72 66 6C 6F 77 20 69 6E 20 41 41 42 42 2C 20 6F 62 6A 65 63 74 20 72 65 6D 6F 76 65 64 20 66 72 6F 6D 20 73 69 6D Overflow in AABB, object removed from sim
00200DED 75 6C 61 74 69 6F 6E 00 00 00 49 66 20 79 6F 75 20 63 61 6E 20 72 65 70 72 6F 64 75 63 65 20 74 68 69 73 2C 20 70 6C 65 ulation...If you can reproduce this, ple
00200E16 61 73 65 20 65 6D 61 69 6C 20 62 75 67 73 40 63 6F 6E 74 69 6E 75 6F 75 73 70 68 79 73 69 63 73 2E 63 6F 6D 0A 00 50 6C 65 ase email bugs@continuousphysics.com..Ple
00200E3F 61 73 65 20 69 6E 63 6C 75 64 65 20 61 62 6F 76 65 20 69 6E 66 6F 72 6D 61 74 69 6F 6E 2C 20 79 6F 75 72 20 50 6C 61 74 66 ase include above information, your Plat
00200E68 6F 72 6D 2C 20 76 65 72 73 69 6F 6E 20 6F 66 20 4F 53 2E 0A 00 00 00 54 68 61 6E 6B 73 2E 0A 00 00 00 54 72 69 61 6E orm, version of OS.....Thanks.....Trian
00200E91 67 6C 65 00 00 00 42 6F 78 00 42 56 48 54 52 49 41 4E 47 4C 45 4D 45 53 48 00 43 61 70 73 75 6C 65 53 68 61 70 65 00 00 gle...Box.BVHTRIANGLEMESH.CapsuleShape..
00200EBA 00 00 43 61 70 73 75 6C 65 58 00 00 00 43 61 70 73 75 6C 65 5A 00 00 00 43 6F 6D 70 6F 75 6E 64 00 00 00 43 6F 6E ..CapsuleX...CapsuleZ...Compound...Con
00200EE3 65 00 00 00 43 6F 6E 76 65 78 00 00 43 6F 6E 76 65 78 54 72 69 6D 65 73 68 00 00 43 79 6C 69 6E 64 65 72 59 00 00 00 e....Convex..ConvexTrimesh...CylinderY...
00200F0C 43 79 6C 69 6E 64 65 72 58 00 00 43 79 6C 69 6E 64 65 72 5A 00 00 45 6D 70 74 79 00 00 48 45 49 47 48 54 46 49 45 CylinderX...CylinderZ...Empty...HEIGHTFIE
00200F35 4C 44 00 4D 69 6E 6B 6F 77 73 6B 69 53 75 6D 00 00 4D 75 6C 74 49 49 53 70 68 65 72 65 00 62 74 42 55 5F 53 69 6D 70 6C LD.MinkowskiSum...MultiSphere.btBU_Simpl
00200F5E 65 78 31 74 6F 34 00 00 53 50 48 45 52 45 00 53 54 41 54 49 43 50 4C 41 4E 45 00 54 52 49 41 4E 47 4C 45 4D 45 53 48 exlto4....SPHERE..STATICPLANE.TRIANGLEMES
00200F87 48 00 00 00 55 6E 69 66 6F 72 6D 53 63 61 6C 69 6E 67 53 68 61 70 65 00 54 72 69 61 6E 67 6C 65 00 00 00 76 65 63 74 H....UniformScalingShape.Triangle....vect
00200FB0 6F 72 3A 3A 5F 4D 5F 69 6E 73 65 72 74 5F 61 75 78 00 00 76 65 63 74 6F 72 3A 3A 5F 4D 5F 69 6E 73 65 72 74 5F 61 75 78 or:: _M_insert_aux...vector:: _M_insert_aux
00200FD9 00 00 00 76 65 63 74 6F 72 3A 3A 5F 4D 5F 66 69 6C 6C 5F 69 6E 73 65 72 74 00 00 73 72 63 2F 43 6F 6C 64 65 74 2F 63 6F 6C ...vector:: _M_fill_insert..src/Coldet/col
00201002 64 65 74 2E 63 70 70 00 00 66 69 72 73 74 21 3D 4E 55 4C 4C 00 73 65 63 6F 6E 64 21 3D 4E 55 4C 4C 00 00 00 73 31 21 det.cpp...first!=NULL.second!=NULL....s1!
0020102B 3D 4E 55 4C 4C 00 00 73 32 21 3D 4E 55 4C 4C 00 00 66 31 21 3D 4E 55 4C 4C 00 00 66 32 21 3D 4E 55 4C 4C 4C =NULL....s2!=NULL....f1!=NULL....f2!=NULL
00201054 00 00 00 00 63 61 6E 6E 6F 74 20 6C 6F 61 64 20 73 63 65 6E 65 20 28 20 77 72 6F 6E 67 20 69 6E 64 65 78 20 29 .....cannot load scene ( wrong index )
0020107D 00 00 00 6C 6F 61 64 20 73 63 65 6E 65 20 28 20 25 64 20 62 79 74 65 73 20 29 0A 00 00 00 76 65 63 74 6F 72 3A 3A 5F 4D ...load scene ( %d bytes )....vector:: _M
002010A6 5F 69 6E 73 65 72 74 5F 61 75 78 00 00 25 64 20 25 73 20 25 6C 66 20 25 6C 66 20 25 6C 66 0A 00 00 00 76 65 63 74 _insert_aux...%d) %s %lf %lf %lf....vec
002010CF 74 6F 72 3A 3A 5F 4D 5F 69 6E 73 65 72 74 5F 61 75 78 00 00 62 61 73 69 63 5F 73 74 72 69 6E 67 3A 3A 61 74 00 00 00 00 tor:: _M_insert_aux...basic_string::at....
002010F8 62 61 73 69 63 5F 73 74 72 69 6E 67 3A 3A 63 6F 6D 70 61 72 65 00 00 62 61 73 69 63 5F 73 74 72 69 6E 67 3A 3A 63 6F 70 basic_string::compare...basic_string::cop
00201121 79 00 00 62 61 73 69 63 5F 73 74 72 69 6E 67 3A 3A 5F 53 5F 63 72 65 61 74 65 00 62 61 73 69 63 5F 73 74 72 69 6E 67 3A 3A y..basic_string::_S_create.basic_string:
0020114A 5F 53 5F 63 6F 6E 73 74 72 75 63 74 20 4E 55 4C 4C 20 6E 6F 74 20 76 61 6C 69 64 00 00 62 61 73 69 63 5F 73 74 72 69 6E _S_construct NULL not valid...basic_strin
00201173 67 3A 3A 61 73 73 69 67 6E 00 00 62 61 73 69 63 5F 73 74 72 69 6E 67 3A 3A 5F 4D 5F 72 65 70 6C 61 63 65 5F 61 75 78 g::assign...basic_string::_M_replace_aux
0020119C 00 00 00 62 61 73 69 63 5F 73 74 72 69 6E 67 3A 3A 72 65 70 6C 61 63 65 00 00 62 61 73 69 63 5F 73 74 72 69 6E 67 3A ....basic_string::replace...basic_string:
002011C5 3A 69 6E 73 65 72 74 00 00 62 61 73 69 63 5F 73 74 72 69 6E 67 3A 65 72 61 73 65 00 62 61 73 69 63 5F 73 74 72 69 67 3A :insert...basic_string::erase.basic_stri
002011FF 5F 67 23 23 61 70 70 65 6F 64 00 00 62 61 73 69 63 5F 73 74 72 69 6E 67 3A 65 72 61 73 65 00 62 61 73 69 63 5F 73 74 72 69 67 3A _insert...basic_string::erase...bas
```

Obstacles moving forward

- Reliance on homebrew community to get access to proprietary files
- No infrastructure in place for researcher access
- Difficulties in cataloging unpublished software
- Reluctance on the part of game companies to send in source discs/code

But it's not all bad...

- Ability to preserve an unreleased game in its pre-compiled state
- Opportunity to provide researchers access to game mechanics/layers of game design
- Source discs for unreleased or digitally distributed software titles
- Fits in with the recommended format specifications

**Thanks to Matt Derby,
Packard Campus Software
Developer, for his assistance
with this presentation.**

For more info on video games @
the LOC, contact:

Dave Gibson – dgib@loc.gov



Brian Taves – btav@loc.gov

David March – dmarch@loc.gov