

Portal9 Hy3D for ComfyUI

Controllable Mesh Paint, Priority Prep, Humanoid Auto-Rig, and Photo-to-3D Scene

White Paper

Version: 3.0

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Status: Living distribution draft for the ComfyUI_Portal9_Hy3D pack

GitHub: [N8Skully/Portal9_3d_Comfyui_nodes](https://github.com/N8Skully/Portal9_3d_Comfyui_nodes)



Abstract

AI mesh generation solves only the first third of a production character or environment pipeline. Artists still need **UV-aware remeshing**, **controllable PBR paint**, **skinned skeletons**, and — for photographs of rooms and towns — a path from **segmentation to placed GLB scenes**. Stock ComfyUI Hunyuan paint paths hide critical bake and camera knobs; remesh/rig rarely stay in-graph; photo-to-scene orchestration (disk contracts, isolate, layout, assemble) is missing from upstream packs.

Portal9 Hy3D is a self-contained ComfyUI custom-node product that closes those loops:

1. **Priority Prep** — body-part segment, density remesh, part UV, pack (Comfy-only).

- 2. **Mesh Paint (TexGen)** — Hunyuan3D 2.1 paintpbr with exposed controls; runtime **vendored** (vendor/hy3dpaint/, pipe P9_TEXGEN_PIPE).
- 3. **Auto-Rig** — Mixamo-style presets, landmark editor (mirror + bone aim), Blender heat bind, skinned export.
- 4. **Photo-to-Scene** — job folders, SAM isolate, Kontext/Hy3D/TexGen gates, photo-match layout, assemble to scene.glb.

This paper states the problem, architecture, full node inventory, environment contract, and operating guidance.

1. Problem statement

Gap	Typical pain	Portal9 answer
Topology / UV	Uniform remesh wastes faces; xatlas ignores parts	Priority remesh + part UV + pack
Texture	Stock TexGen hard-codes bake/cameras/enhance	Load + TexGen widgets + presets
Rig	Separate DCC auto-rig	Estimate → landmark editor → Blender bind
Scene from photo	No shared folder contract or placement loop	Scene Job → Isolate → gates → Layout → Assemble

Portability also failed when paint lived only inside ComfyUI-3D-Pack or when custom_rasterizer mismatched Python/torch/CUDA. Portal9 vendors paint and ships build/verify scripts.

2. Goals and non-goals

Goals

- One brand/category family for prep → paint → rig → scene
- Self-contained paint (no 3D-Pack on sys.path)
- Explicit bake, camera, sampling, upscale, and remesh budgets
- Interactive prep/rig UIs (part painter, UV packer, landmark editor)
- Scene orchestration around **existing** Comfy SAM / Kontext / Hunyuan shape nodes

Non-goals

- Vending Flux, Kontext, Alpha LoRA, SAM3 weights, or Hunyuan **shape**
- One CUDA wheel for every OS/torch combo
- Guaranteeing production skin weights without landmark review
- Replacing ComfyUI itself

3. Architecture

■	ComfyUI graph (UI / API workflows)	■
■	Portal9 Hy3D nodes	■
■	Paint Load TexGen · TexGen	■
■	Prep Segment · Density · Remesh · UV · Pack · Preview	■
■	Rig Load · Estimate · Auto Rig · Preview · Export	■
■	Scene Job · Segment · Isolate · Layout · Assemble · gates	■
■	JS landmarks · part painter · UV packer · viewers	■
■	Runtime	■
■	vendor/hy3dpaint/ p9_prep/ p9_rig/ p9_scene/	■
■	Native / external	■
■	custom_rasterizer · Blender 4.x (rig)	■
■	Optional: SAM3 · Flux Kontext · Hunyuan shape · upscalers	■

Brand as **Portal9**, not a TexGen fork. Paint pipe type: **P9_TEXGEN_PIPE**.

4. Full node inventory

4.1 Paint — Portal9/Hy3D (2)

Class	Display name	Role
Portal9_hy3d_LoadTexGenPipeline	Load TexGen Pipeline	Load/cache paint pipe (preset, views, bake, cameras, weights)
Portal9_hy3d_TexGen	TexGen	Multiview paint → textured mesh

4.2 Prep — Portal9/Hy3D/Prep (12)

Class	Display name
Portal9_hy3d_PrepMesh	Prep Mesh
Portal9_hy3d_SegmentParts	Segment Parts
Portal9_hy3d_SegmentPartsSAM3	Segment Parts SAM3
Portal9_hy3d_PaintParts	Paint Parts
Portal9_hy3d_PartsToDensity	Parts To Density
Portal9_hy3d_PriorityRemesh	Priority Remesh
Portal9_hy3d_PartUV	Part UV
Portal9_hy3d_PackUV	Pack UV
Portal9_hy3d_ManualUVPack	Manual UV Pack

Class	Display name
Portal9_hy3d_PreviewMesh	Preview Mesh
Portal9_hy3d_PreviewHeat	Preview Heat
Portal9_hy3d_SaveGLB	Save GLB

4.3 Auto-rig — Portal9/Hy3D (5)

Class	Display name
Portal9_hy3d_LoadMesh	Load Mesh
Portal9_hy3d_EstimateRigLandmarks	Estimate Rig Landmarks
Portal9_hy3d_AutoRig	Auto Rig
Portal9_hy3d_PreviewRigged	Preview Rigged
Portal9_hy3d_ExportRigged	Export Rigged

4.4 Scene — Portal9/Hy3D/Scene (20)

Class	Display name
Portal9_hy3d_SceneGlobalSettings	Scene Global Settings
Portal9_hy3d_SceneCleanVRAM	Scene Clean VRAM
Portal9_hy3d_SceneJob	Scene Job
Portal9_hy3d_SceneSegment	Scene Segment
Portal9_hy3d_SceneFilter	Scene Filter
Portal9_hy3d_SceneIsolate	Scene Isolate
Portal9_hy3d_ScenePreview	Scene Preview
Portal9_hy3d_SceneItemPick	Scene Item Pick
Portal9_hy3d_SceneSaveImage	Scene Save Image
Portal9_hy3d_SceneSaveMesh	Scene Save Mesh
Portal9_hy3d_SceneSurfaces	Scene Surfaces (planes + walls)
Portal9_hy3d_SceneEnvAnalyze	Scene Env Analyze (sun / weather)
Portal9_hy3d_SceneLayout	Scene Layout
Portal9_hy3d_SceneImageGate	Scene Image Gate

Class	Display name
Portal9_hy3d_SceneCleanVRAMGate	Scene Clean VRAM Gate
Portal9_hy3d_SceneWaitImage	Scene Wait Image
Portal9_hy3d_SceneWaitMesh	Scene Wait Mesh
Portal9_hy3d_SceneWaitHy3D	Scene Wait Hy3D
Portal9_hy3d_SceneWaitTexGen	Scene Wait TexGen
Portal9_hy3d_SceneGate	Scene Gate
Portal9_hy3d_SceneAssemble	Scene Assemble

Total registered Portal9 nodes: 39.

5. Pipeline narratives

5.1 Paint

Load caches a configured pipeline (12GB / hero / custom). TexGen paints from image + mesh_path/MESH. After Prep, set use_remesh=False and use_existing_uv=True. Upscale: wired Comfy model → else RealESRGAN if enabled.

5.2 Prep

```
MESH → Segment (geometric or SAM3) → Paint Parts (optional)
→ Parts To Density → Priority Remesh → re-tag/paint
→ Part UV → Pack UV → Manual UV Pack → Save GLB → TexGen
```

Default remesh **50k** faces; recommend **≤200k** on ≈12GB and **≤500k** high-end.

5.3 Auto-rig

Estimate landmarks → Landmark Editor (mirror L↔R, aim tip, yaw/pitch/roll, foot ankle→ball→tip) → Auto Rig (Blender bind) → Preview / Export. Presets: basic_rig, basic_rig_thumb_index.

5.4 Photo-to-scene

```
Photo → depth → Scene Job → Segment/Filter → Isolate (crops/masks)
→ Clean VRAM → Item Pick → Kontext complete → Save Image → gates
→ Hunyuan mesh → Save Mesh → remesh → TexGen → Save textured
→ Surfaces / Env Analyze (optional) → Layout → Assemble (scene.glb)
```

Portal9 owns folder I/O, isolate, layout, assemble — not Flux/SAM/Hunyuan shape weights. Details: [SCENE_PIPELINE.md](#).

6. Control surface

6.1 Paint presets

Preset	Views	Resolution	Render	Texture
12GB	8	512	2048	4096
hero	12	1024	4096	8192

6.2 Landmark editor

Drag joints; axis lock; snap; **Aim tip** / Length; yaw / pitch / roll / local swing; **Mirror** L↔R.

6.3 Scene global settings

Broadcasts Kontext scheduler, Hunyuan steps, VAE octree (default **320**, not a power of two — see SCENE_PIPELINE), gen/paint remesh faces, TexGen views/res/render/texture across indexed branches.

7. Distribution contract

Shipped	Not shipped
Nodes, p9_*, vendor/hy3dpaint/, js/, rig presets	Paint Diffusers weights, CUDA .pyd/wheels
Docs, HOWTO, example workflows	Flux / SAM3 / Hunyuan shape checkpoints

Hard deps: ComfyUI + GPU · custom_rasterizer · paint weights for TexGen · Blender for Auto Rig.

Soft deps: SAM3, upscalers, scene-side Comfy model packs.

Licensing: [NOTICE](#), vendor/hy3dpaint/LICENSE, upstream HF model terms.

8. Recommended operating envelope

Setting	≈12GB	High-end
Paint preset	12GB	hero
Remesh faces	50k · ≤200k	≤500k
Scene gen remesh (typical workflows)	~45k paint remesh	Tune via Global Settings
MMGP	On	On if available

Calibrate with scripts/verify_install.py, then the full paint or photo-to-scene example for your preset (room / town / city / indoor / outdoor).

9. Comparison

Approach	Strength	Weakness for this loop
Stock 3D-Pack TexGen	Upstream	Hidden knobs; external dep
Wrapper full I2M	End-to-end gen	Weak prep/rig/scene
DCC-only remesh/rig	Artist control	Breaks Comfy batching
Portal9 Hy3D	Prep + paint + rig + scene orchestration	Needs matching rasterizer; scene still uses external models

10. Conclusions

Portal9 Hy3D is the Comfy control plane for **texturable, UV-aware, optionally skinned** assets and **photo-matched scene GLBs**. Vendored paint removes the 3D-Pack hard dependency; prep and rig keep studio steps in-graph; scene nodes supply the missing disk and placement contract around models teams already run.

Future work: richer scene surface/env defaults, ue_advanced skeleton, optional wheel CI for known portables.

Appendix A — Brand assets

File	Use
docs/assets/portal9_hy3d_nodes_logo.png	Wordmark + mark (README / docs)
docs/assets/portal9_hy3d_icon.png	App / Comfy pack icon
docs/assets/portal9_mark.png	Source mark reference

Appendix B — Pack layout (abridged)

```
ComfyUI_Portal9_Hy3D/  
nodes.py · prep_nodes.py · rig_nodes.py · scene_nodes.py  
p9_prep/ · p9_rig/ · p9_scene/ · vendor/hy3dpaint/ · js/  
docs/ · HOWTO.md · README.md · example_workflows/ · scripts/
```

Appendix C — References

- Brief — [Portal9_Hy3D_Brief.md](#)
- Prep — [PREP_PIPELINE.md](#)
- Scene — [SCENE_PIPELINE.md](#)
- Install — [HOWTO.md](#)
- Hunyuan3D 2.1 — <https://github.com/Tencent-Hunyuan/Hunyuan3D-2.1>
- Public pack — https://github.com/N8Skully/Portal9_3d_Comfyui_nodes