



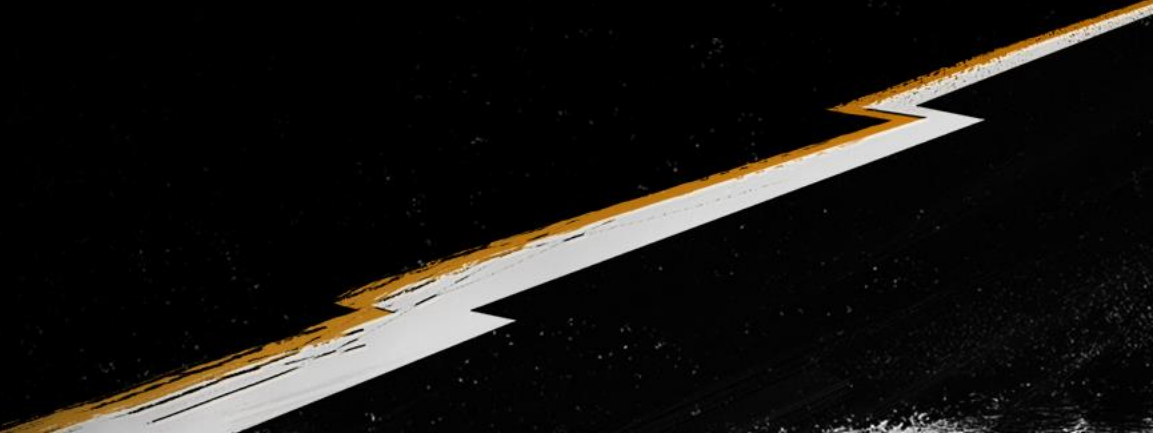
SUNSET OVERDRIVE

PLAYER CHOICE -
GENDER & BODYTYPE

Adalbert Kinsey - Insomniac Games



Player choice of gender and body type in Sunset Overdrive

- *How did Insomniac give the player full control of who they are in the game*
 - *What methods were successful*
 - *Retargeting*
 - *Animation Layers*
 - *Translation Scaling*
 - *Simple IK in rig and engine*
 - *Cinematic tools*
 - *Automatic Garment Resizing*
 - *What ideas did not quite work*
 - *Some ideas to get more diversity in games*
- 



Goals for Sunset Overdrive

- *All about Player Choice!*
 - *Hero Choice of Gender*
 - *Race*
 - *Body Type*
 - *Faces 50+*
 - *Outfits 100+*
- *Open World Traversal*
- *Fast Action Gunplay*



Preconceived notions with having male/female heroes

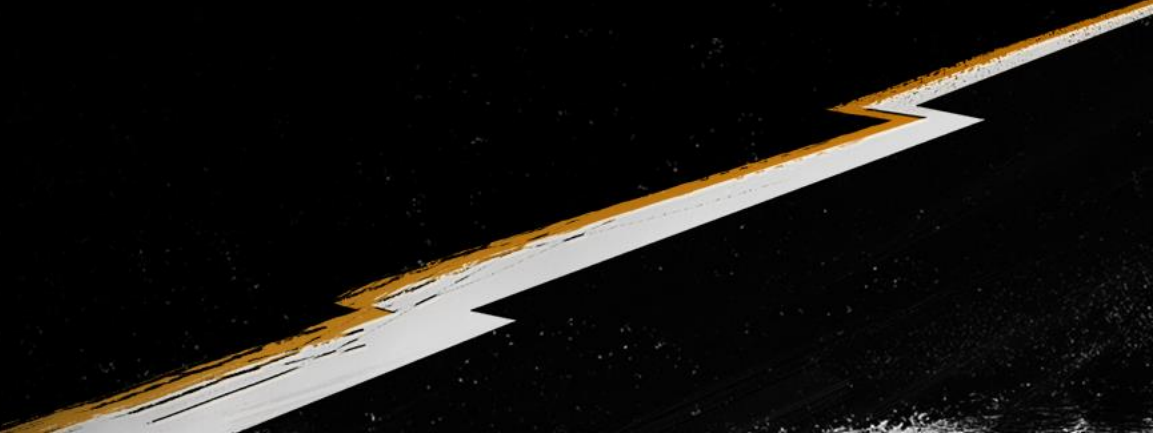
- *Myth that 2 genders = double the workload*

- *Character*
- *Rigging*
- *Animation*
- *Story*
- *Audio*
- *Gameplay*





Preconceived notions with different body types

- *The myths of having different proportions = a lot of extra work*
 - *Slider type*
 - *Too easy to make something look funky*
 - *Distinct choices*
 - *Increasing workload per body type*
 - *3 body types X 2 genders = 6X workload*
- 

Lessons from FUSE

- FUSE both genders on 2 body types
 - Female 10% smaller
- A lot of animation work to distinguish male from female
- A lot of animation work to make 2nd body type work
 - Cover
 - Takedowns
 - Vaults
- Extra gameplay code
- Over 15% of unique animations for 2nd body type



Worst Case Scenario: LADDERS

- ***Climbing Ladders***
 - *4 contact points*
 - *Locomotion same for male and female*
 - *Custom animation for body type*
 - *No real procedural solution*
- ***Lesson: Use one body type***



Things on Sunset that were in our favor

- Open World Traversal Action Shooter
- No cover mechanic or takedowns
 - No extra animations just to satisfy the needs of the different body types
- No ladders!
 - No 4 simultaneous attach points
- No competitive multiplayer
 - No Deathmatch



Things that were not

- Traversal gameplay
 - 3 attach points to the environment
 - Feet



Things that were not

- Traversal gameplay
 - 3 attach points to the environment
 - Feet
 - Hands



Things that were not

- *Traversal gameplay*
 - 3 attach points to the environment
 - Feet
 - Hands
 - Side (hand and feet)
- *Vast Player look customization*
 - Hundreds of pieces
 - Thousands of combinations



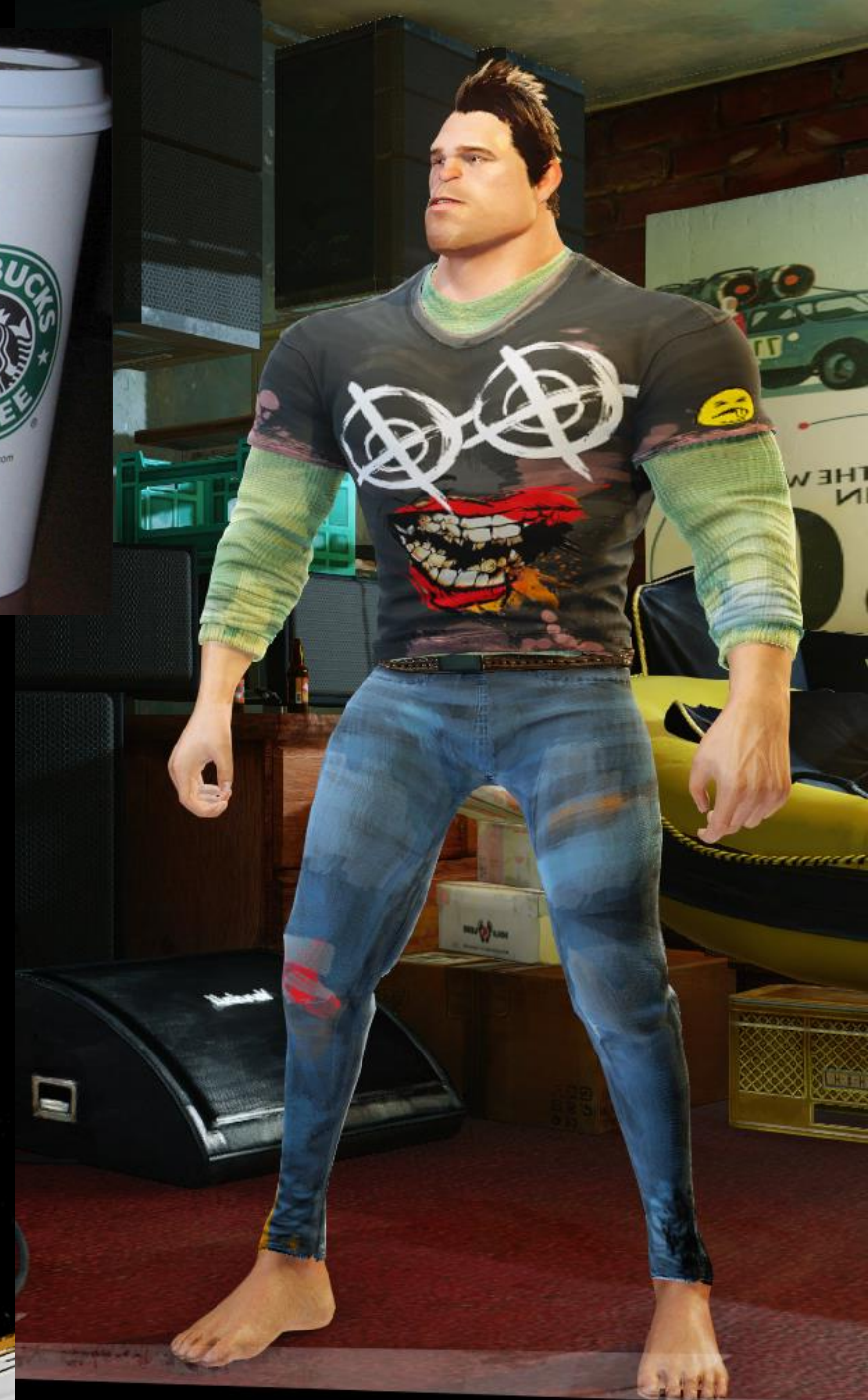
Both Genders

- *Share the same skeleton*
 - *Few Animations needed to differentiate*
 - *All traversal animations shared*
 - *All other animations shared (ingame & cinematic)*
- *Clothing: only make one item*
 - *Automatically generate for the other gender*
 - *Manually generate for the other gender*

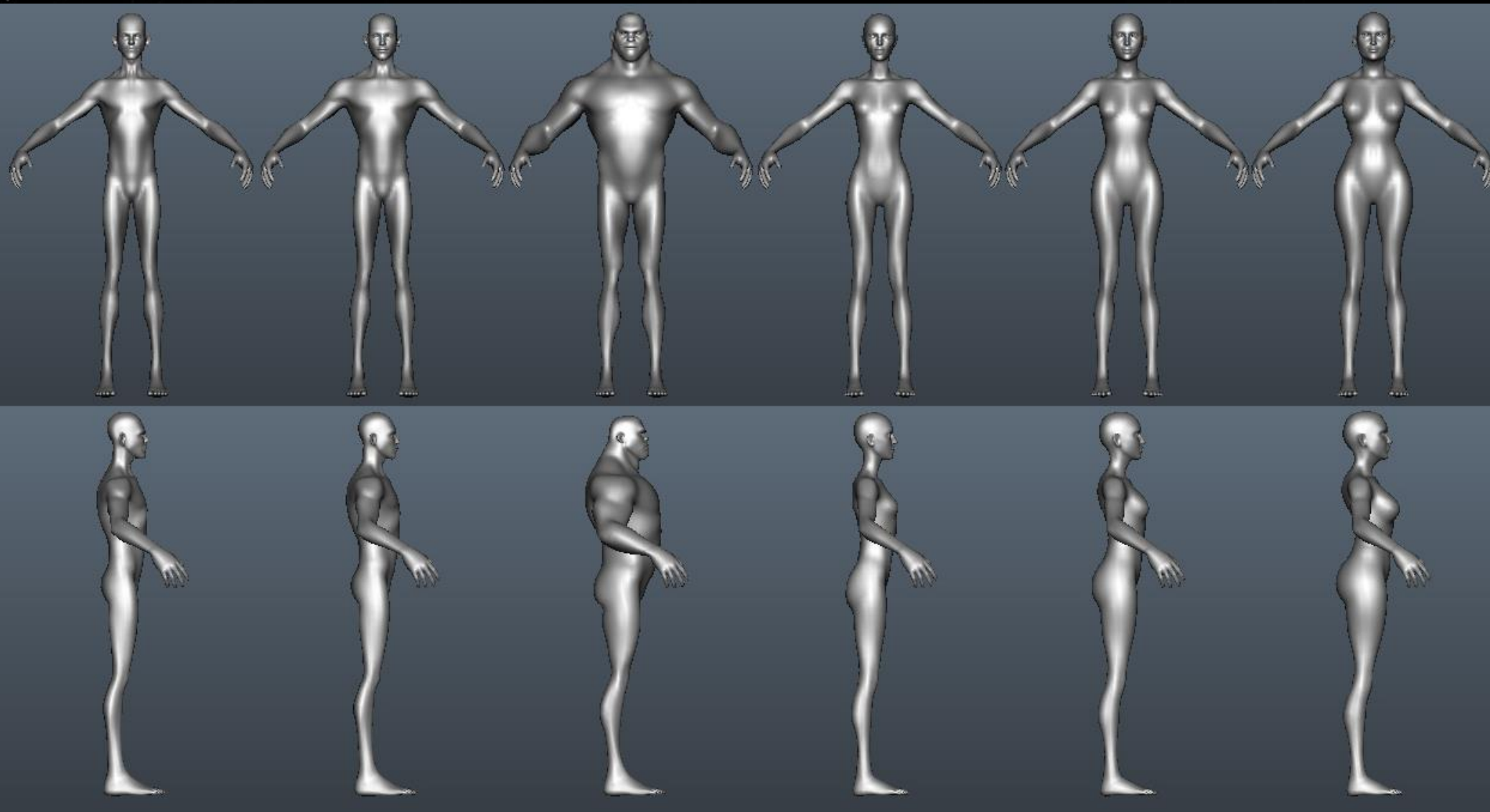


Diverse Body Types

- Small, Medium and Large
- Share skeleton
 - Could work for all
 - Maybe not the heavy male
 - Few custom animations needed
- Custom skeletons
 - Lots of custom animations or retargeting
- Clothing per body type and gender
 - 2 genders X 3 body types = 6 times the work
 - Must have an automated system to generate for other body types

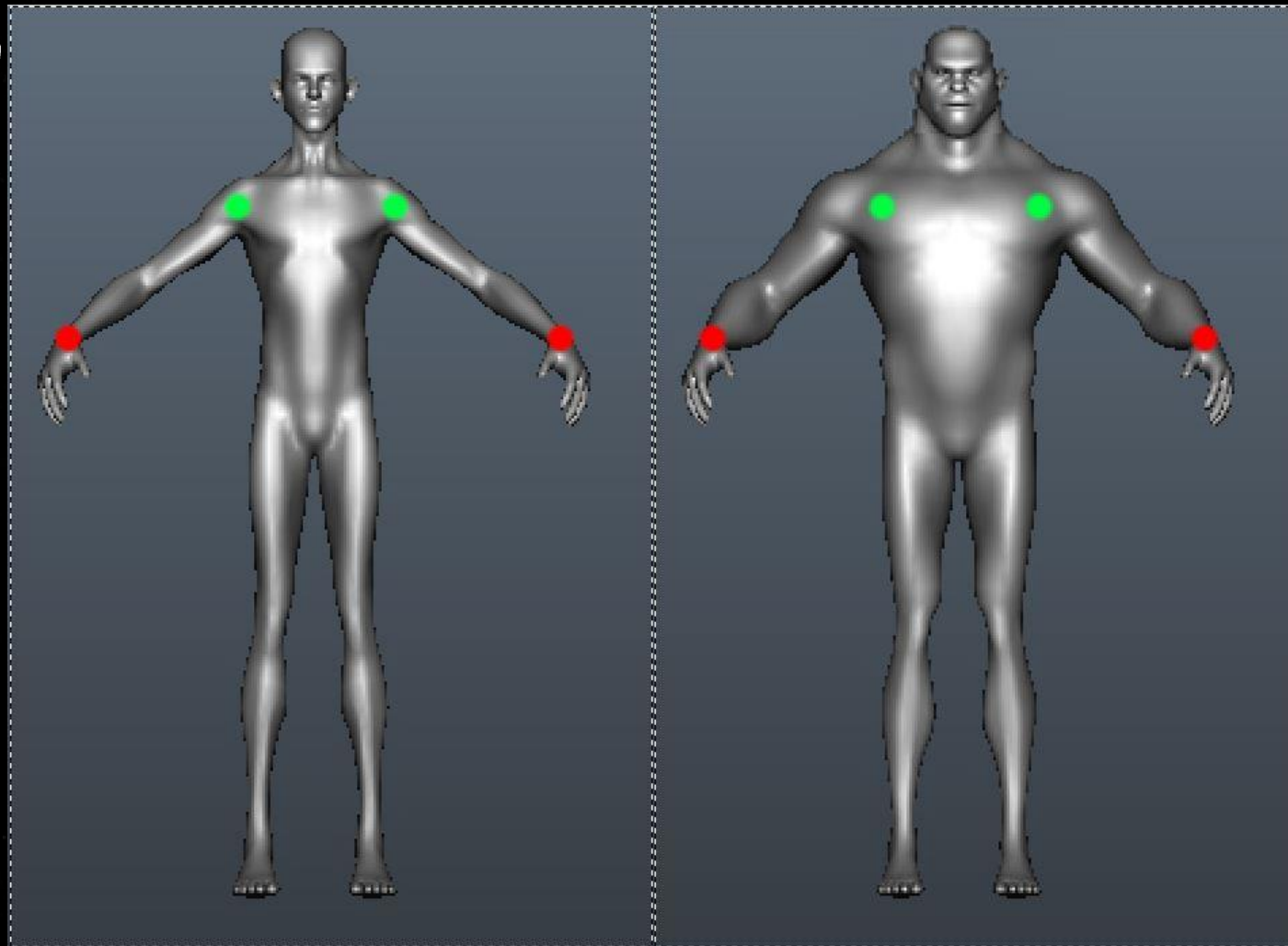


All 6 body types on a single skeleton



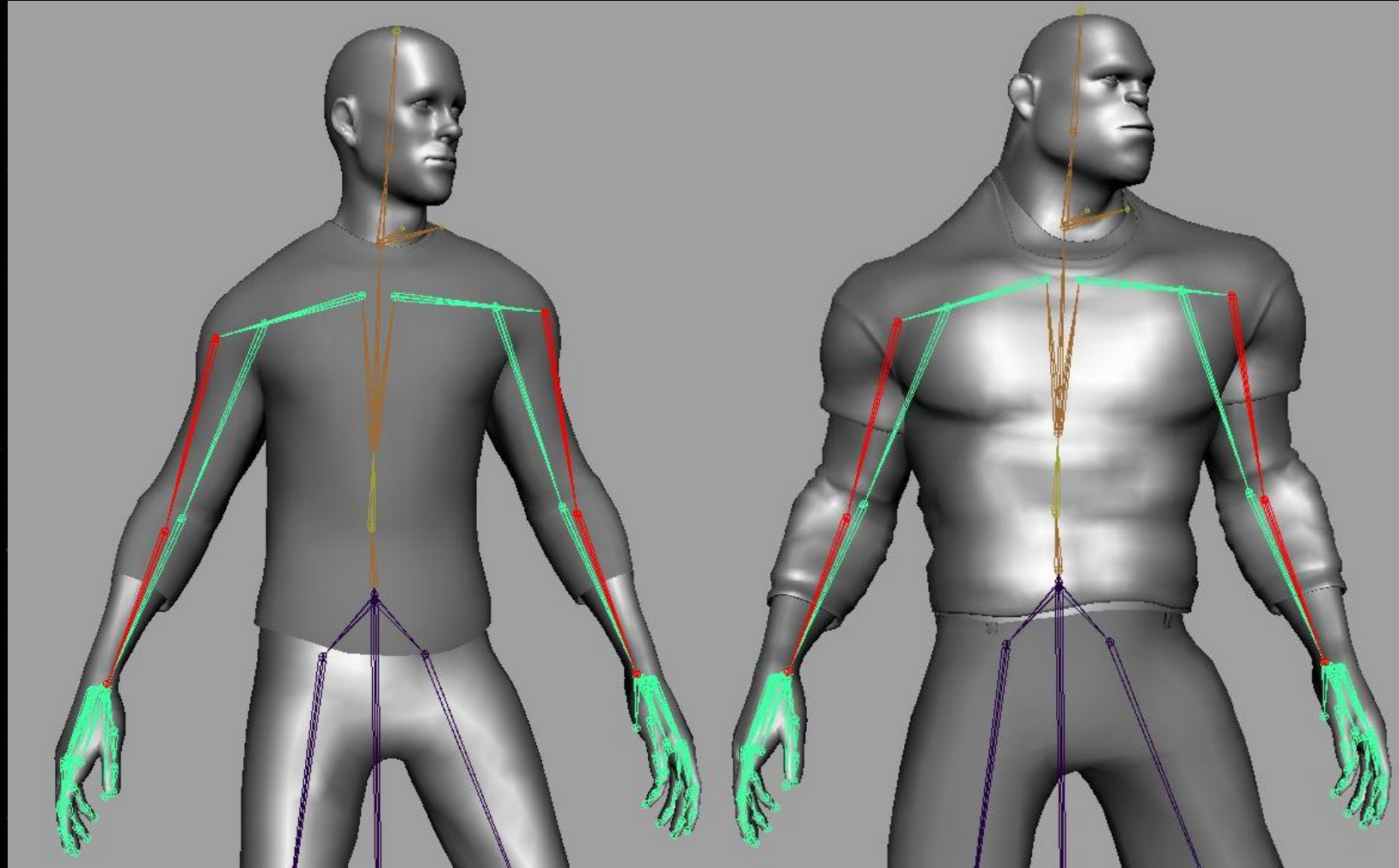
All 6 body types on a single skeleton - almost

- *All but the large male fit on the same skeleton*
 - *Large male to have wider shoulder*
- *There is a little leeway in joint positions*
 - *But not that much*
- *Obvious solution: In engine retargeting*
 - *Issues with hand holds*
 - *Vaults, ledge grabs, guns*
 - *In game IK would solve that*
 - *But that's not coming on for a few months...*



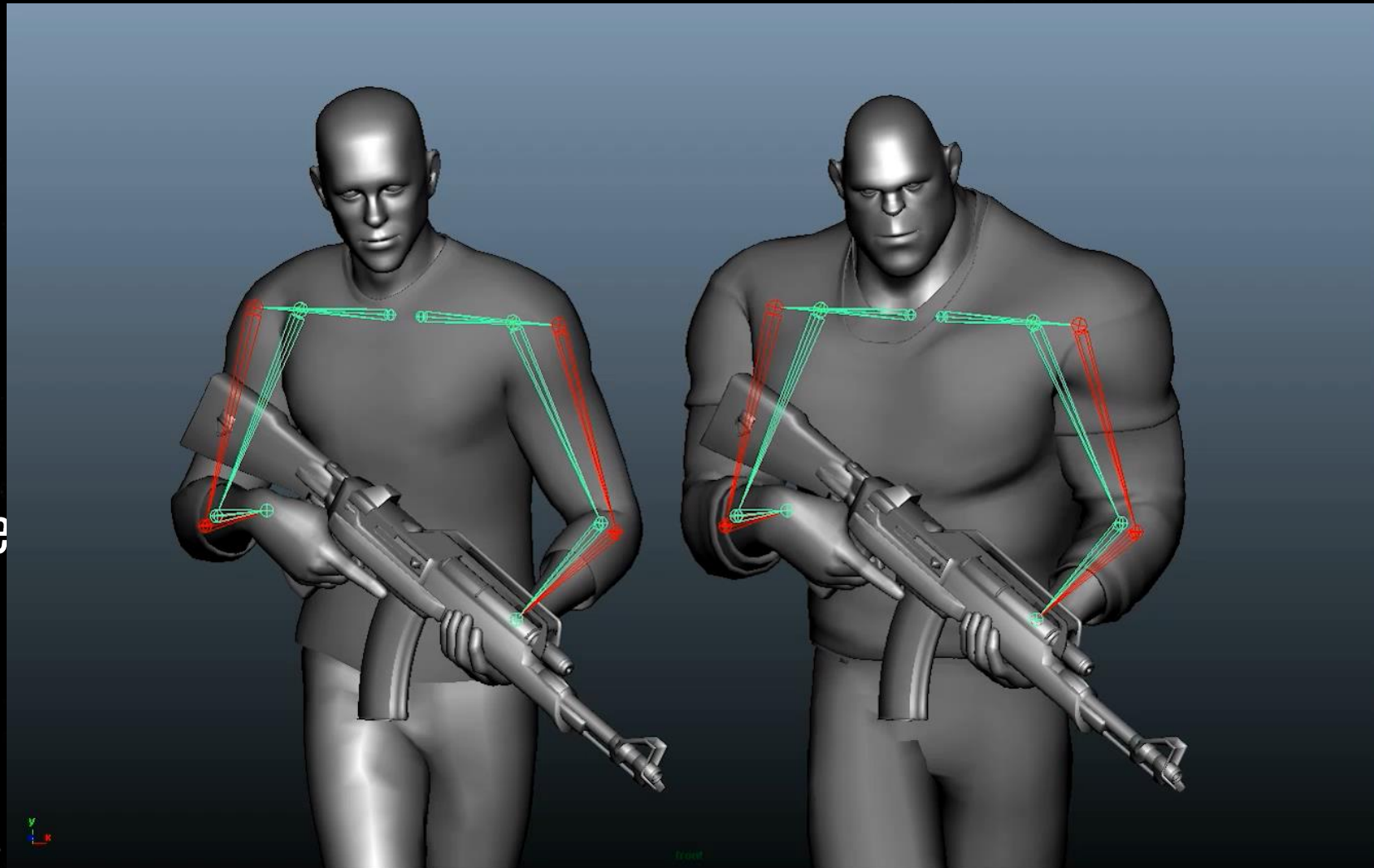
In rig retargeting

- Main arms run a 2nd set of IK arm
 - Wrist is goal
 - PV points at the original elbow
 - Additional twist attribute
- Realizes art direction of the game
- Meets technical goals
 - Hand placement same for both arms
 - No extra animations needed

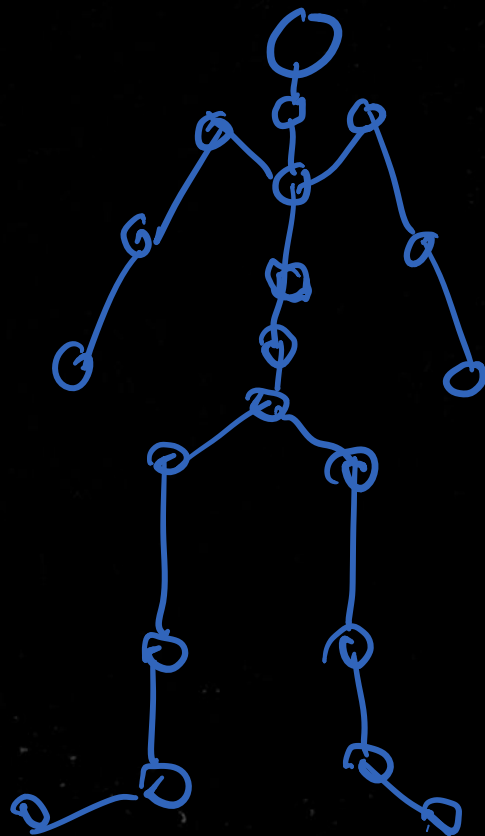


In rig retargeting

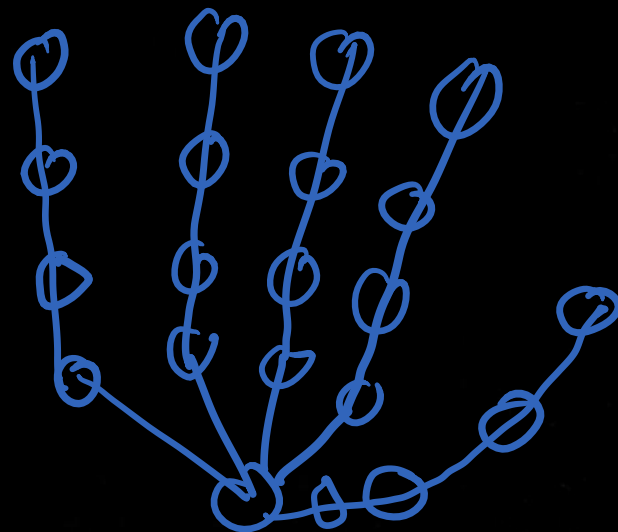
- Main arms run a 2nd set of IK arm
 - Wrist is goal
 - PV points at the original elbow
 - Additional twist attribute
- Realizes art direction of the game
- Meets technical goals
 - Hand placement same for both arms
 - No extra animations needed



Body vs Hands – joint count



20



20 x 2

Little snags with the 2nd set of arms

- **Ragdoll**

- *In-game IK runs after ragdoll, attaches arms to hands*
- *Might be some collision penetration with elbows*



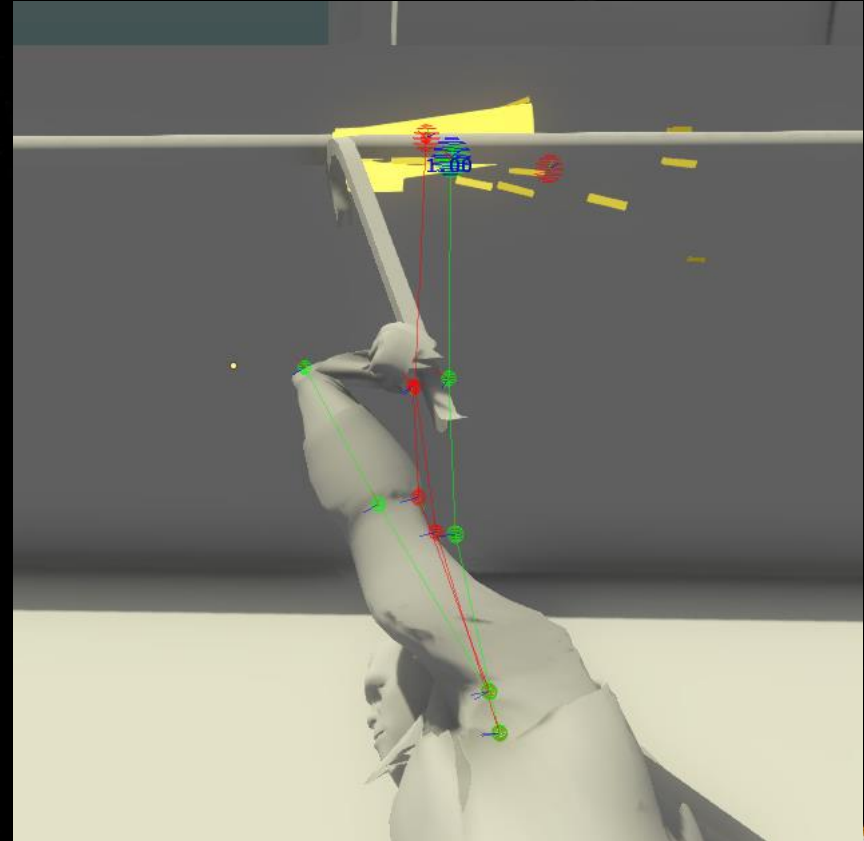
Little snags with the 2nd set of arms

- **Ragdoll**

- In-game IK runs after ragdoll, attaches arms to hands
- Might be some collision penetration with elbows

- **In-Game IK**

- All IK runs at the same time
- Can't solve to another IK solve
- Under grinds, gun grips



Little snags with the 2nd set of arms

- Ragdoll

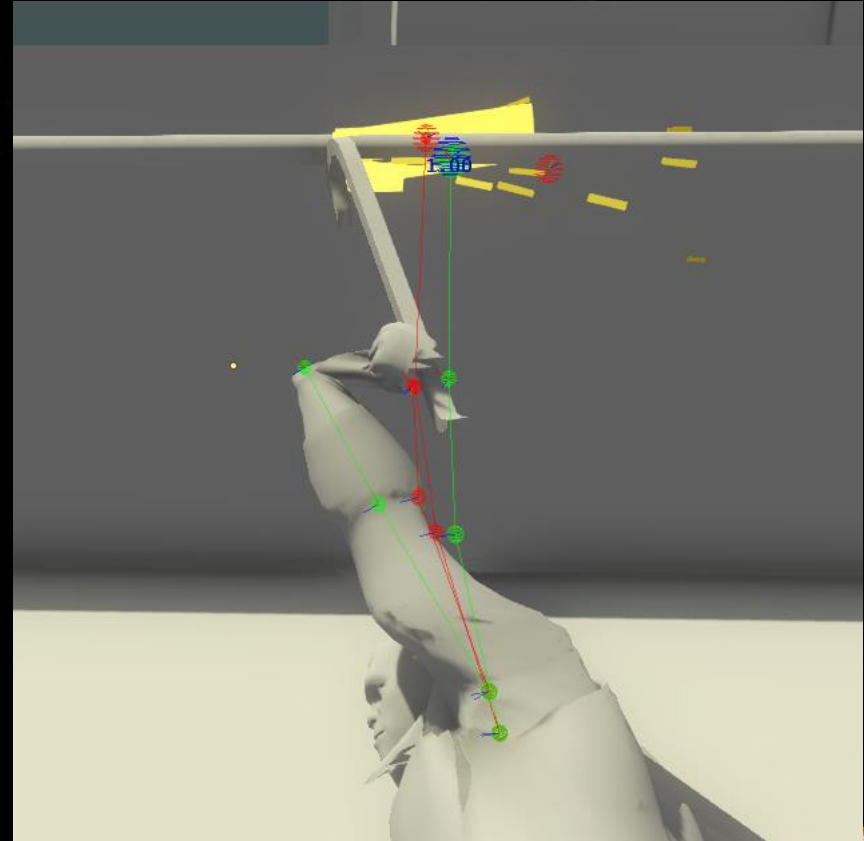
- In-game IK runs after ragdoll, attaches arms to hands
- Might be some collision penetration with elbows

- In-Game IK

- All IK runs at the same time
- Can't solve to another IK solve
- Under grinds, gun grips

- Solution: Second set of hands for wide arms

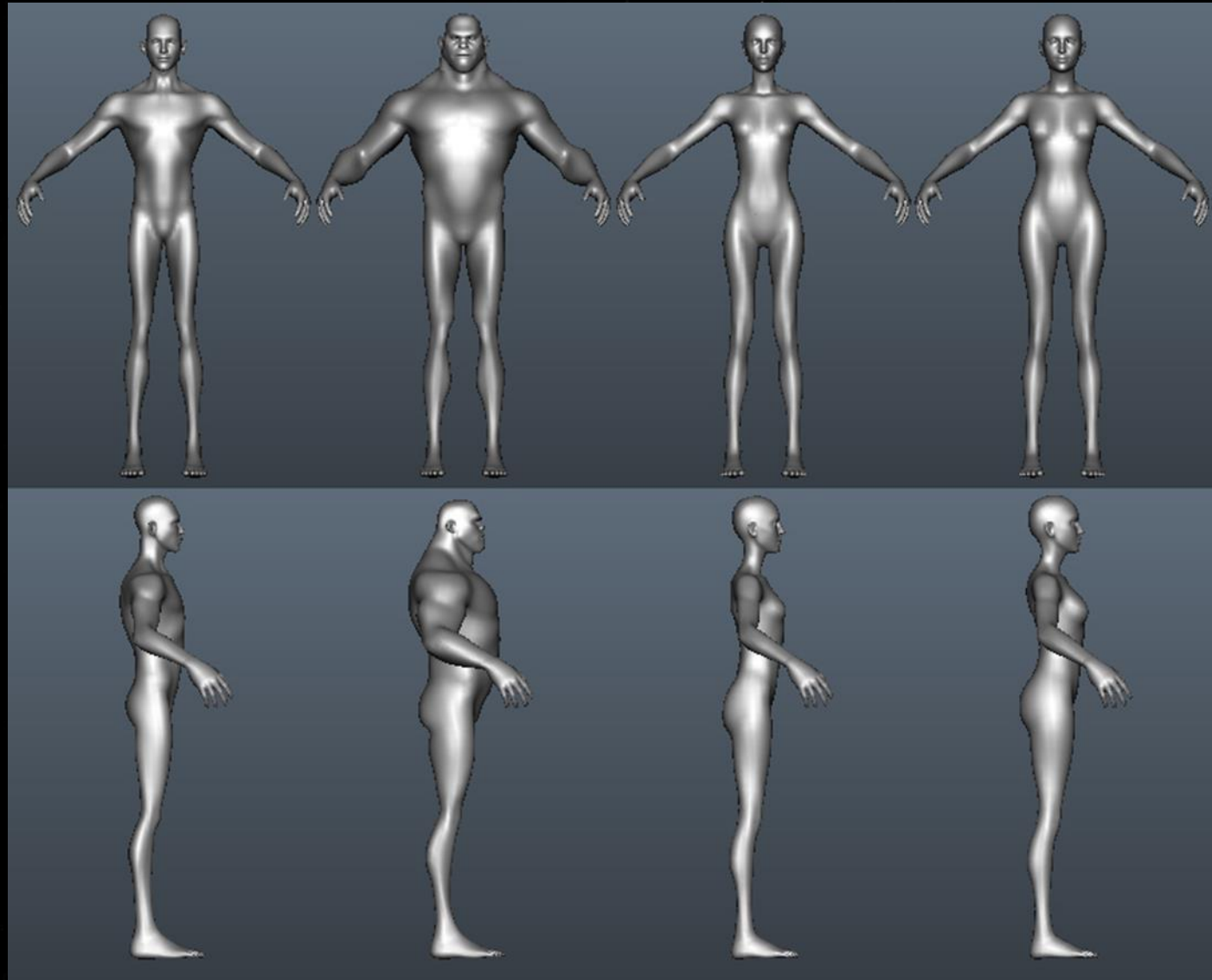
- Own ragdoll setup and in-game IK chains
- Direct connected fingers to the first hand
- Possible solution to smaller female hands



All 4 body types

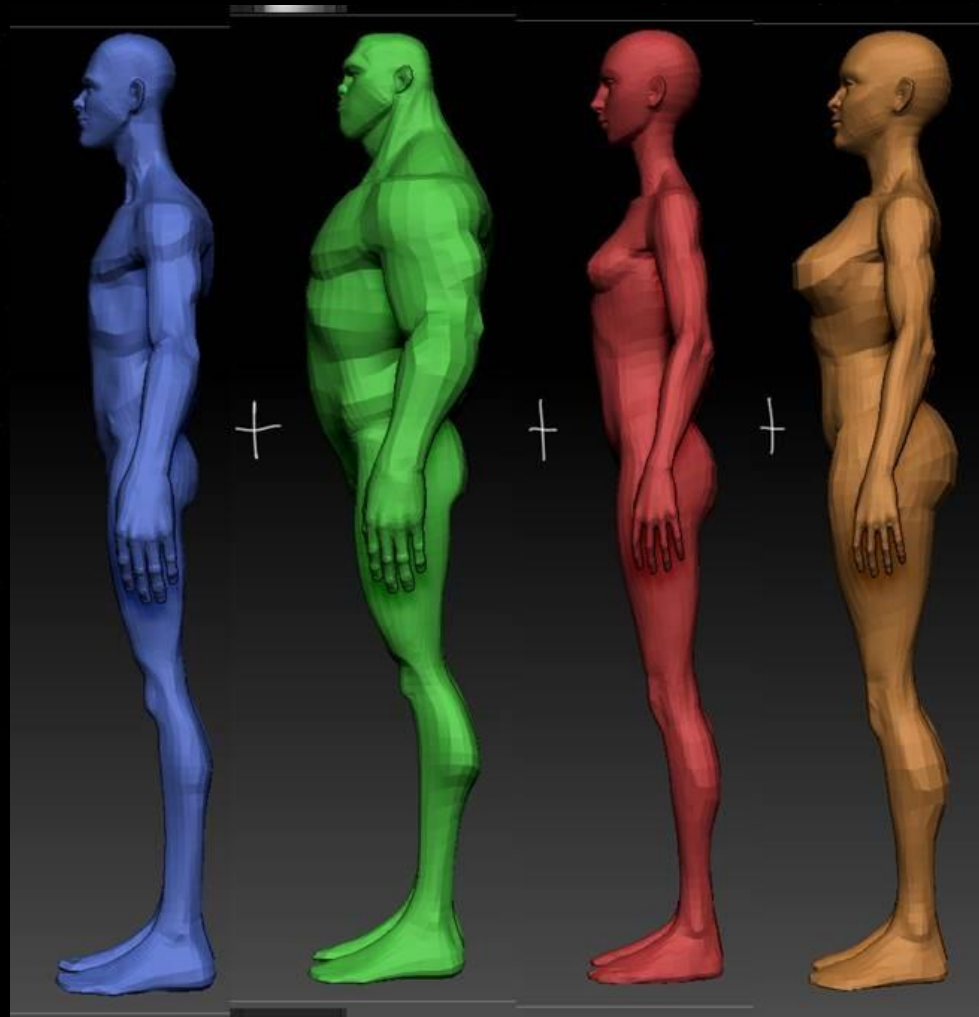
- *Removed the outliers*

- *Skinny male and average male look too similar*
- *People cant tell the difference in the game*
- *Same with average female and heavy female*
- *To differentiate heavy female becomes too exaggerated*
- *Does not fit the tone of the game*



Success!

- All character on the same skeleton
- All unnecessary work issues avoided
 - See slide: "lessons from FUSE"



Success!

- All character on the same skeleton
- All unnecessary work issues avoided
 - See slide: "lessons from FUSE"
- But, wait!
 - Doesn't look quite right...
 - In game as well



Scale the characters

- Quick test in Maya
 - Scale up and down by 10%
- Quick test in engine
 - Let's try 5%
 - How about 10%
- Final verdict
 - Skinny female %95
 - Heavy male %110



Success: We have our final heroes

- 4 hero body types
 - Average male and average female same skeleton
 - Heavy male 10% larger
 - Skinny female 5% smaller
- Fix up the female hands and feet
 - Make them 10% smaller
- But doesn't that gets us back to square one?
 - See slide: "lessons from FUSE"
 - Not quite, we have ideas



Scaling in engine vs using retargeting

- All in game animation done on the same size rig for all body types
- Scale the heroes programmatically in engine
 - A lot less work for everybody (esp. the riggers), but the programmers
 - Especially for the riggers - work on just one rig
 - Many game systems do not support scale
 - Collision, navigation, cloth and ragdoll physics, etc..
- Create custom skeletons for each hero at theirs size (no scale in the rig)
 - A lot more work on the art side, esp. for the riggers
 - Can retarget to the different skeletons in engine
 - Works with all game systems, since there is no scale on the skeletons

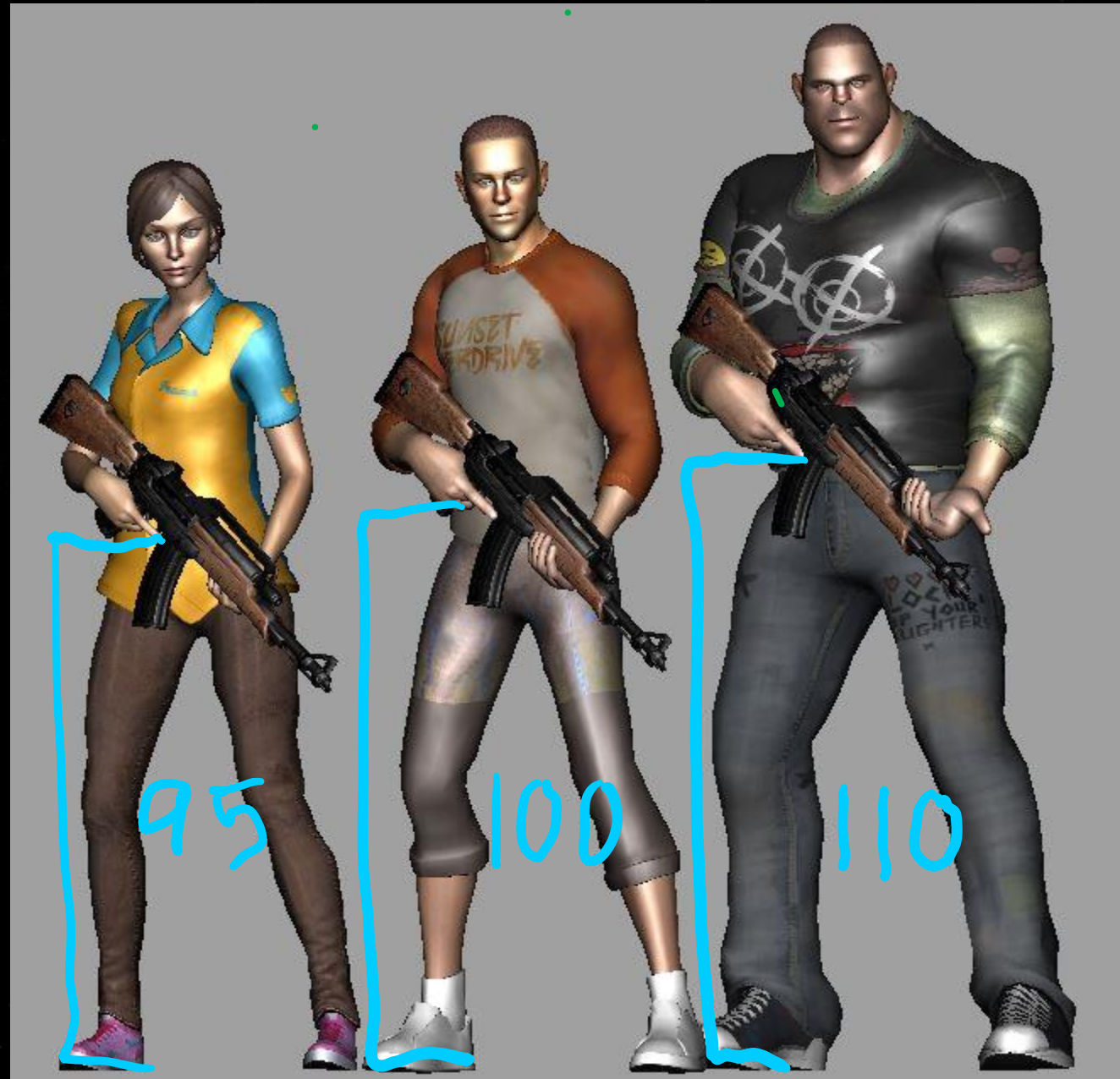
Retargeting

- *Translations based on offset between skeletons*
- *Rotations copied over directly*



Retargeting

- Translations based on offset between skeletons
- Rotations copied over directly
- Overall translation multiplied by ratio between COGs on both skeletons
 - Approximates the change in stride/gate
 - Results in different translation speeds
 - Animations speed changed to keep pace



Retargeting

- *Translations based on offset between skeletons*
- *Rotations copied over directly*
- *Overall translation multiplied by ratio between COGs on both skeletons*
 - *Approximates the change in stride/gate*
 - *Results in different translation speeds*
 - *Animations speed changed to keep pace*
- *Does not handle world space end points well*



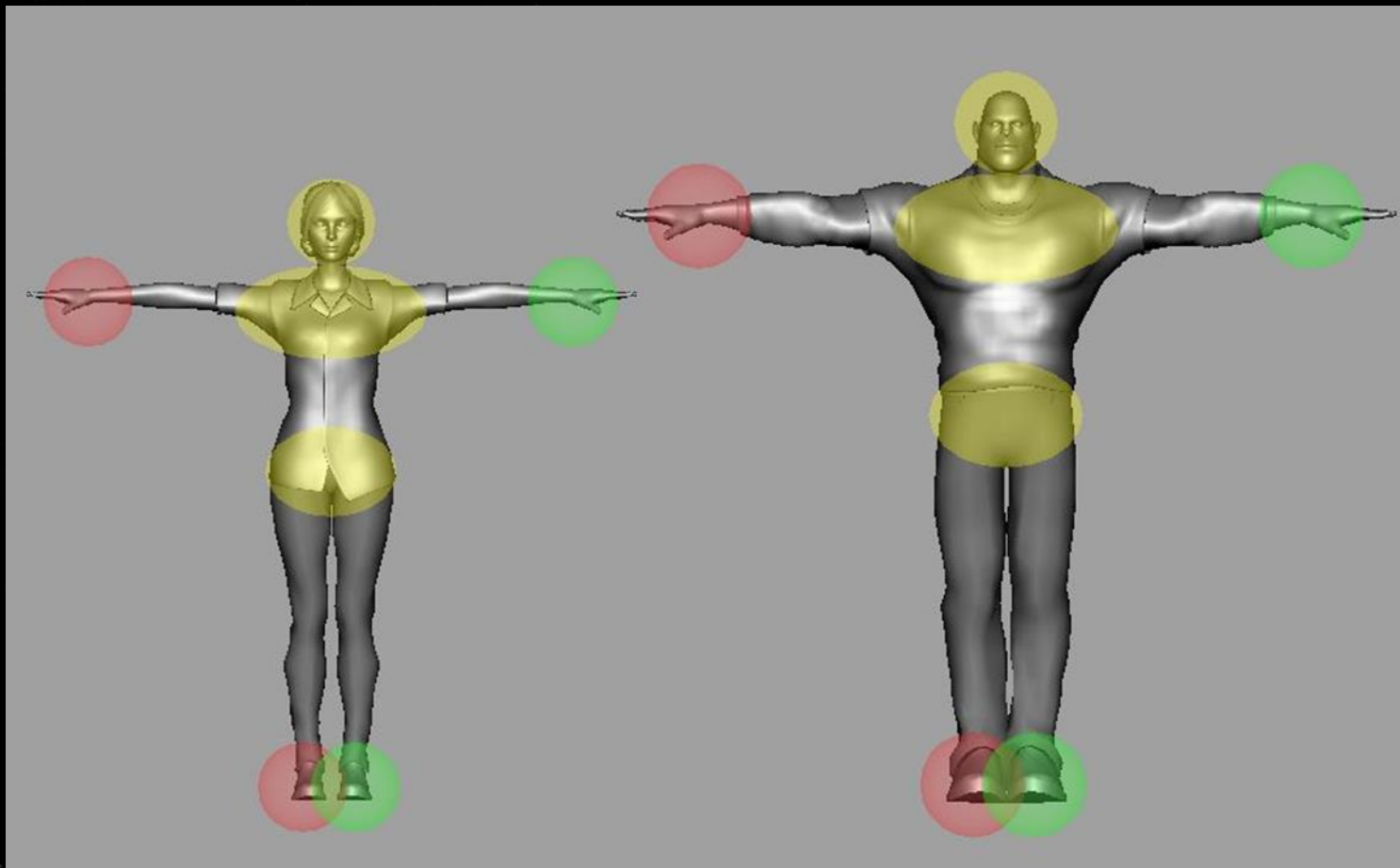
Retargeting

- *Translations based on offset between skeletons*
- *Rotations copied over directly*
- *Overall translation multiplied by ratio between COGs on both skeletons*
 - *Approximates the change in stride/gate*
 - *Results in different translation speeds*
 - *Animations speed changed to keep pace*
- *Does not handle world space end points well*
- *But it sure works and most engines support it*



Goal based retargeting

- IK chains solve one skeleton to the goals of the other skeleton
- Easier for the larger to reach the goals of the smaller



Traversal



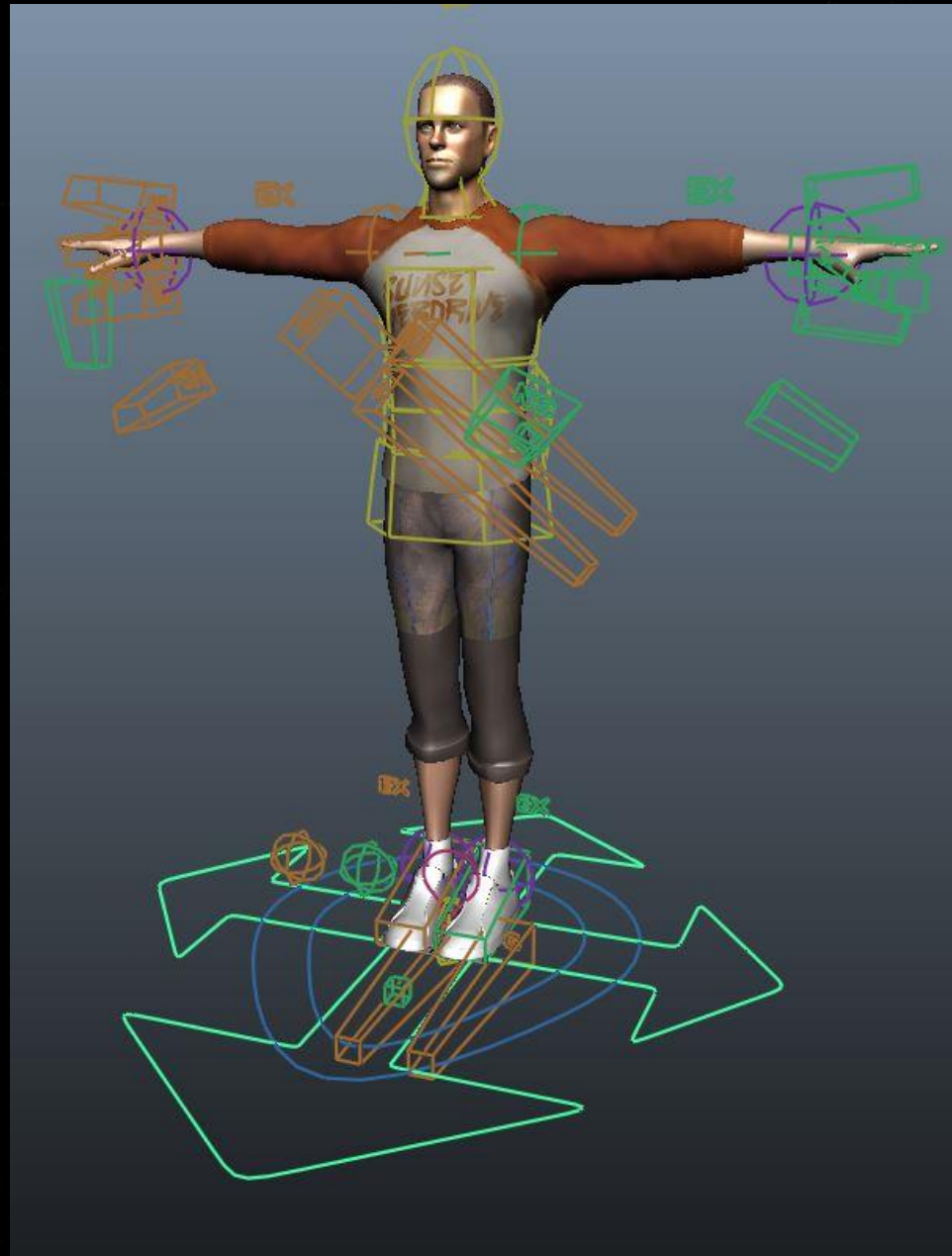
Scaling affects traversal

- Scale root always on the ground
- Traversal attaches on all sides
 - Bottom – grinds and runs
 - Both sides – wall runs
 - Top – under-grinds, ceiling checks
 - Front – vaults and pole swings
- Movable root



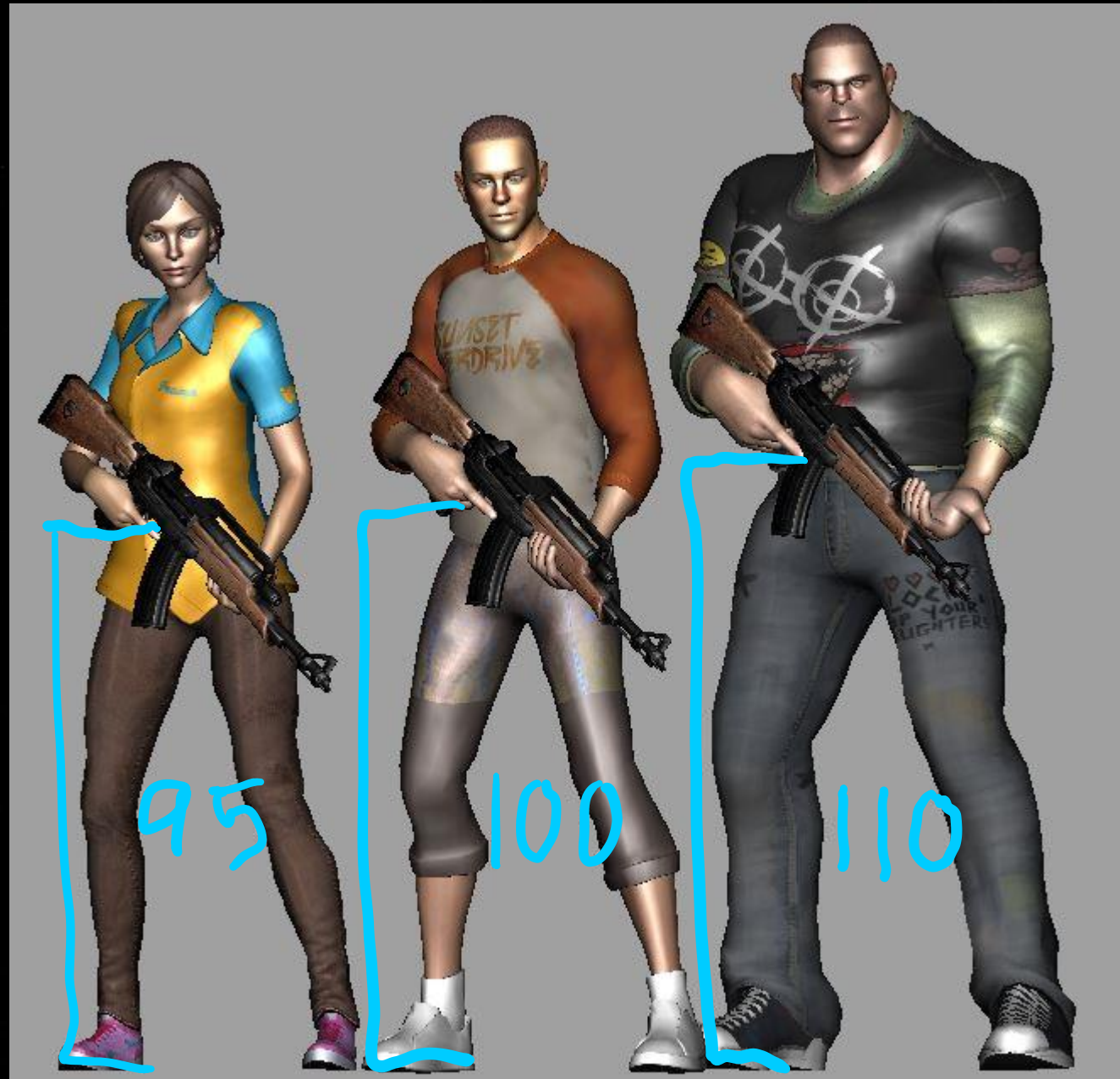
Scaling affects traversal

- Scale root always on the ground
- Traversal attaches on all sides
 - Bottom – grinds and runs
 - Both sides – wall runs
 - Top – under-grinds, ceiling checks
 - Front – vaults and pole swings
- Movable root
- Motion Joint
- Good for prototyping, not a long term solution



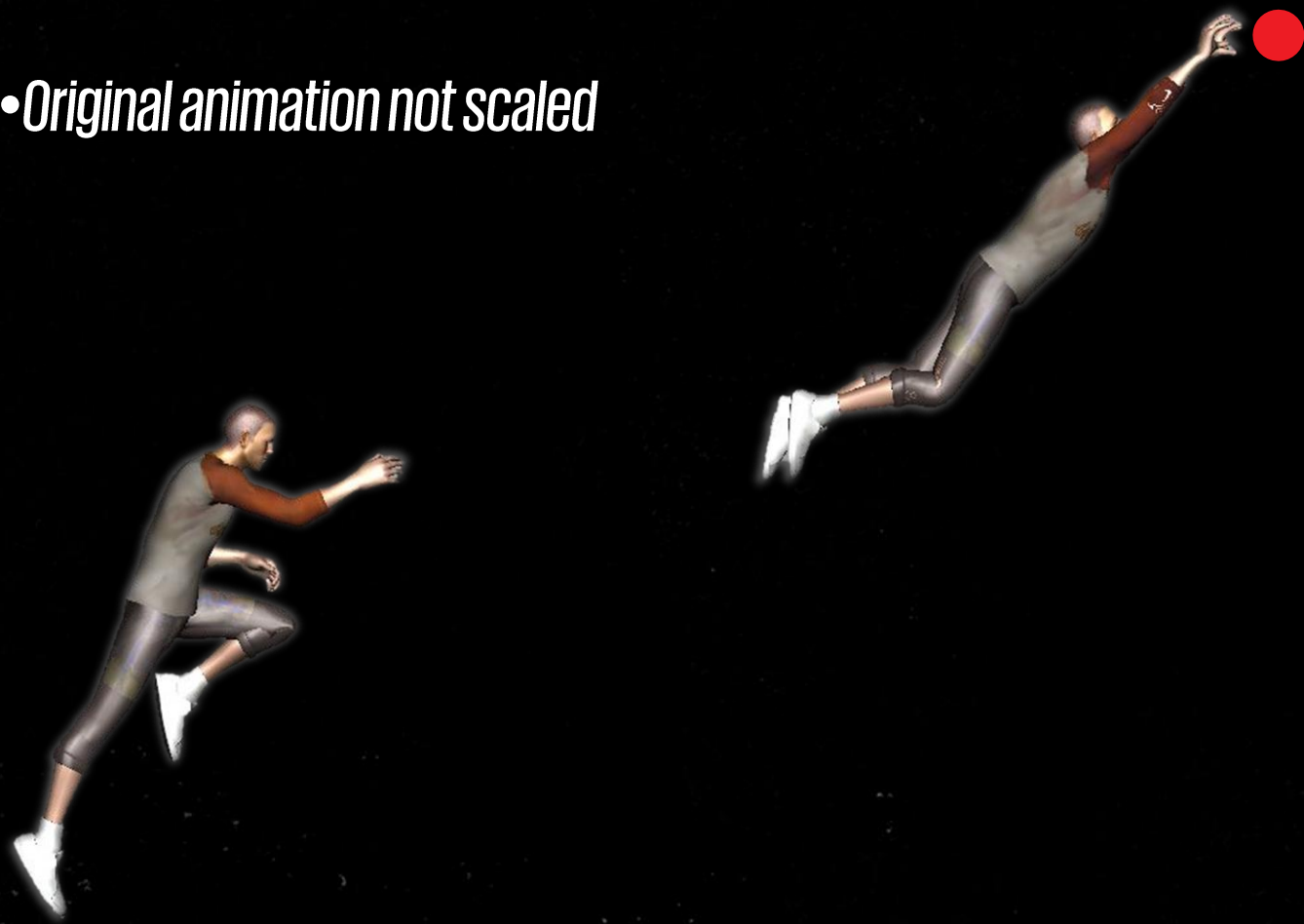
In game translation scaling

- Translation is scaled by the ratio between the original animation and the target skeleton
- When the large male jumps into a vault he overshoots, the skinny female comes up short
- Removing the translation scale won't solve it, character scale still interferes



In game translation scaling

- *Original animation not scaled*



In game translation scaling

- Retargeted to heavy male, animation is scaled 110%



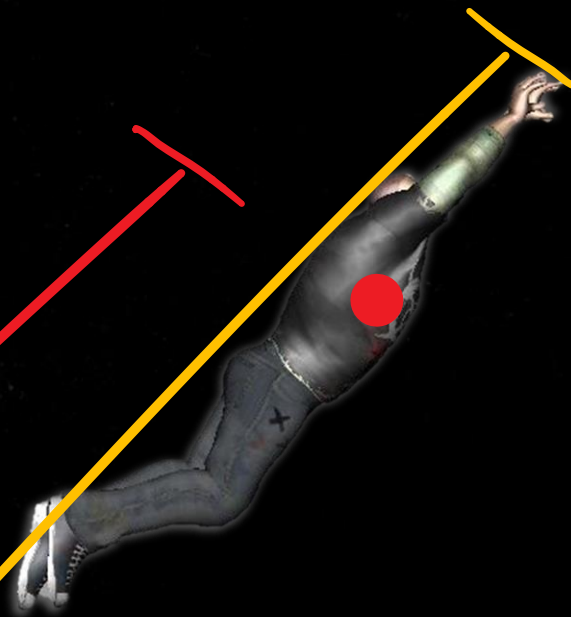
In game translation scaling

- Even if we remove the scale the heavy missies goal because he is bigger*



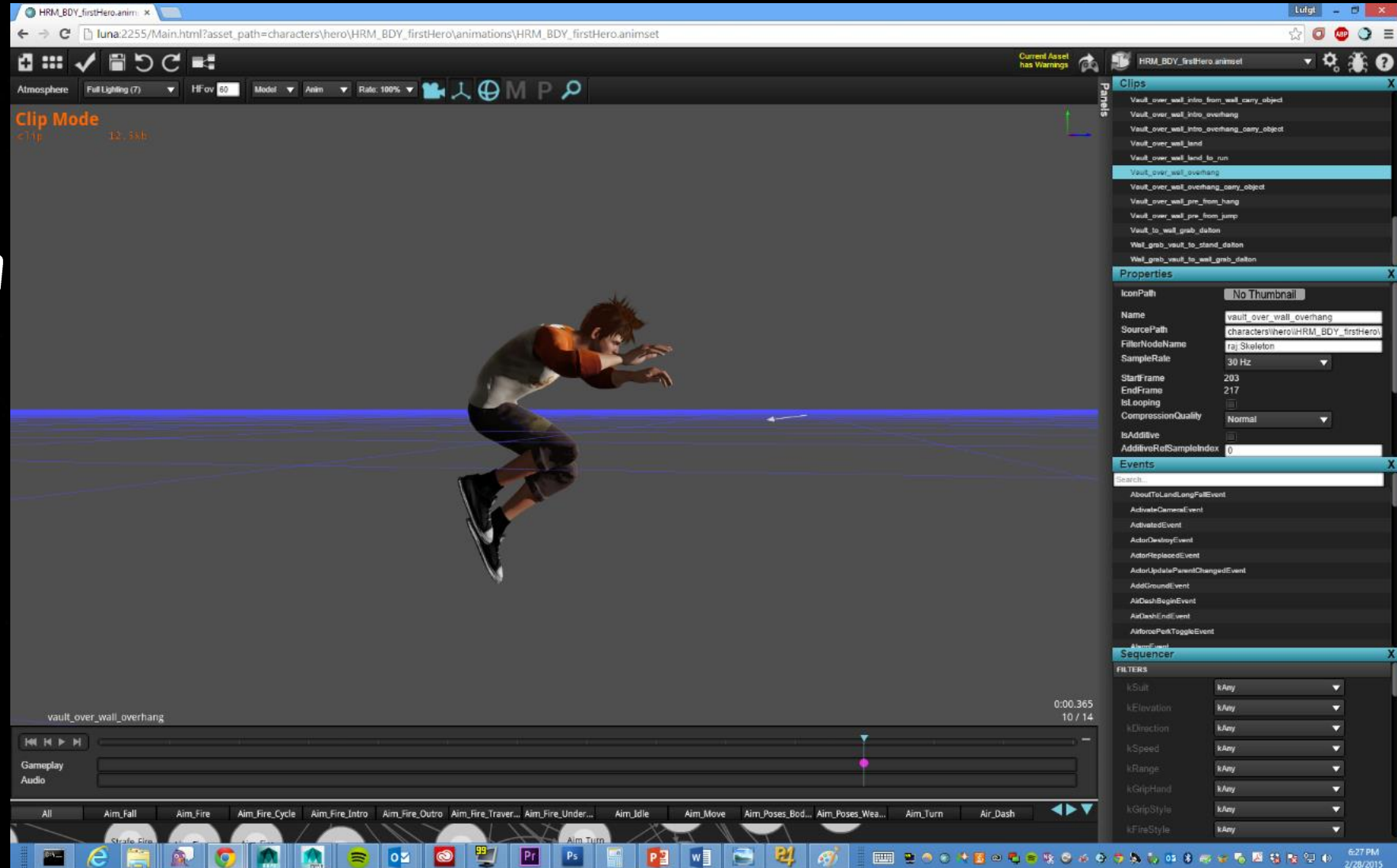
In game translation scaling

- *Based on markup in the anim clip the animation is scaled back from the origin*



In game translation scaling

- Based on locators in the wrists
- Animator marked up attach events in animations clips
- Engine scales clip back from its beginning

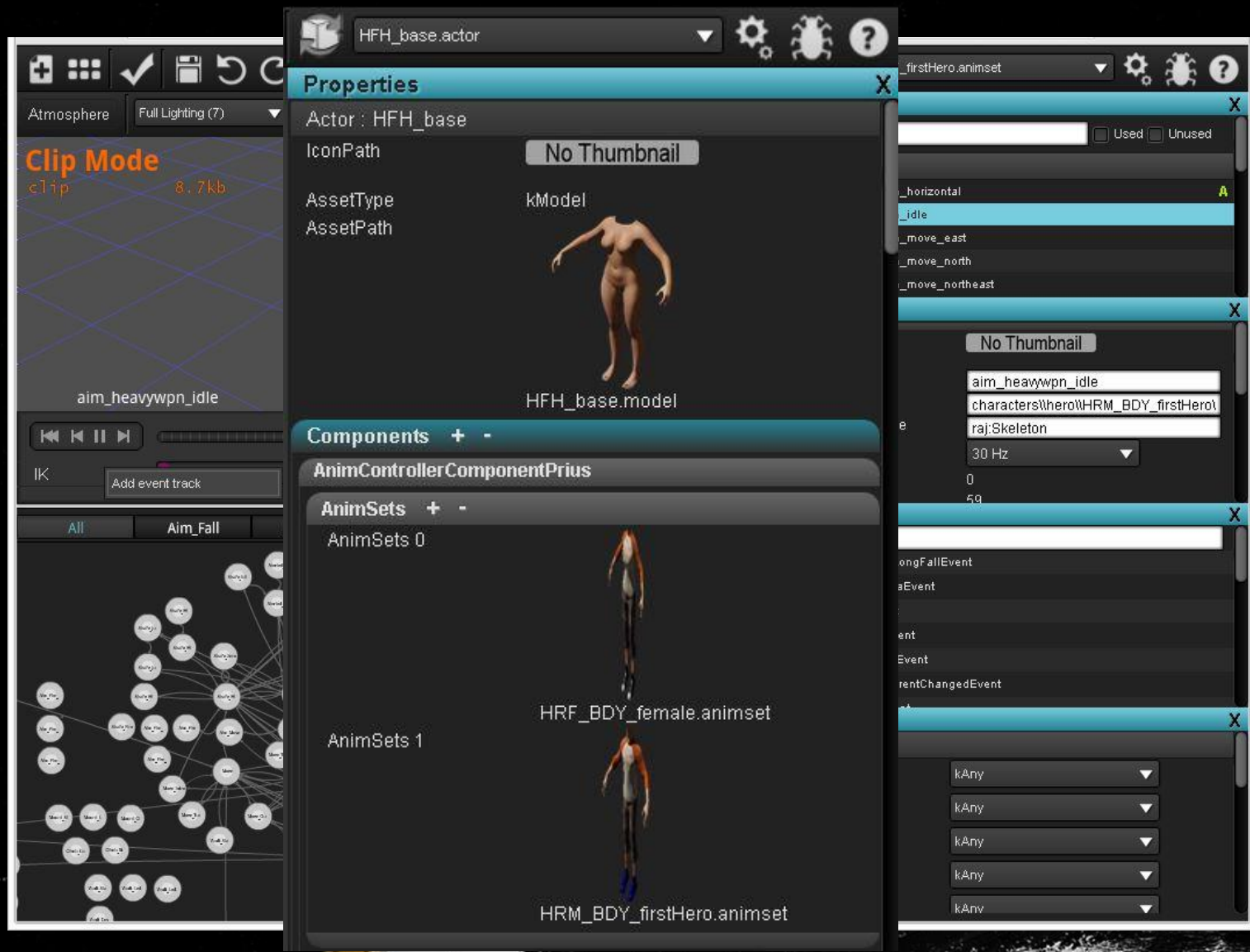


Another traversal clip



Animation editor and animation sets stacking

- *Average male animset 2900 clips*
- *Layered female animset 260 clips*
 - *That's less than 9%*
 - *All traversal: Grinding, undergrinding, wall runs, water dashing, etc.. retargeted*
 - *Custom animations for core locomotion: Idles, walks, runs, intros and outros*



Animation editor and animation sets stacking

- *Average male animset 2900 clips*
- *Layered female animset 260 clips*
 - *That's less than 9%*
 - *All traversal: Grinding, undergrinding, wall runs, water dashing, etc.. retargeted*
 - *Custom animations for core locomotion: Idles, walks, runs, intros and outros*



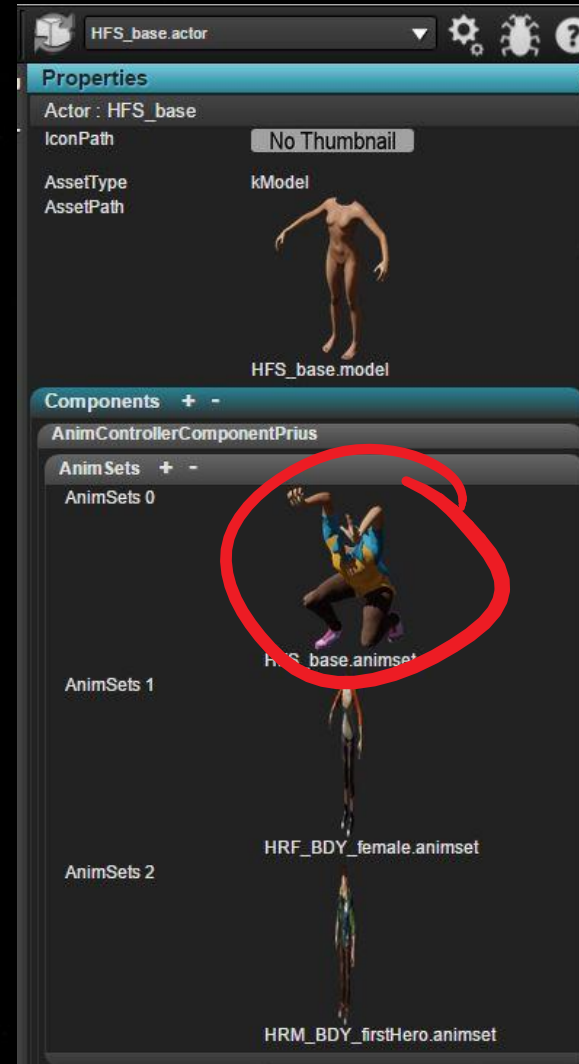
Animation editor and animation sets stacking

- *Average male animset 2900 clips*
- *Layered female animset 260 clips*
 - *That's less than 9%*
 - *All traversal: Grinding, undergrinding, wall runs, water dashing, etc.. retargeted*
 - *Custom animations for core locomotion: Idles, walks, runs, intros and outros*



Animation editor and animation sets stacking

- *Average male animset 2900 clips*
- *Layered female animset 260 clips*
 - *That's less than 9%*
 - *All traversal: Grinding, undergrinding, wall runs, water dashing, etc.. retargeted*
 - *Custom animations for core locomotion: Idles, walks, runs, intros and outros*
 - *Skinny female anim set only 1 anim clip*



Animation editor and animation sets stacking

- *Average male animset 2900 clips*
- *Layered female animset 260 clips*
 - *That's less than 9%*
 - *All traversal: Grinding, undergrinding, wall runs, water dashing, etc.. retargeted*
 - *Custom animations for core locomotion: Idles, walks, runs, intros and outros*
 - *Skinny female anim set only 1 anim clip*



Animation editor and animation sets stacking

- Average male animset 2900 clips
- Layered female animset 260 clips
 - That's less than 9%
 - All traversal: Grinding, undergrinding, wall runs, water dashing, etc.. retargeted
 - Custom animations for core locomotion: Idles, walks, runs, intros and outros
 - Skinny female anim set only 1 anim clip
- Heavy male animset 220 clips
 - Custom animations for weight and size



Animation editor and animation sets stacking

- Average male animset 2900 clips
- Layered female animset 260 clips
 - That's less than 9%
 - All traversal: Grinding, undergrinding, wall runs, water dashing, etc.. retargeted
 - Custom animations for core locomotion: Idles, walks, runs, intros and outros
 - Skinny female anim set only 1 anim clip
- Heavy male animset 220 clips
 - Custom animations for weight and size



Animation editor and animation sets stacking

- Average male animset 2900 clips
- Layered female animset 260 clips
 - That's less than 9%
 - All traversal: Grinding, undergrinding, wall runs, water dashing, etc.. retargeted
 - Custom animations for core locomotion: Idles, walks, runs, intros and outros
 - Skinny female anim set only 1 anim clip
- Heavy male animset 220 clips
 - Custom animations for weight and size
 - Additive offsets to fix longer arms
 - Game IK fixes undergrinds and gun grips



Cinematics



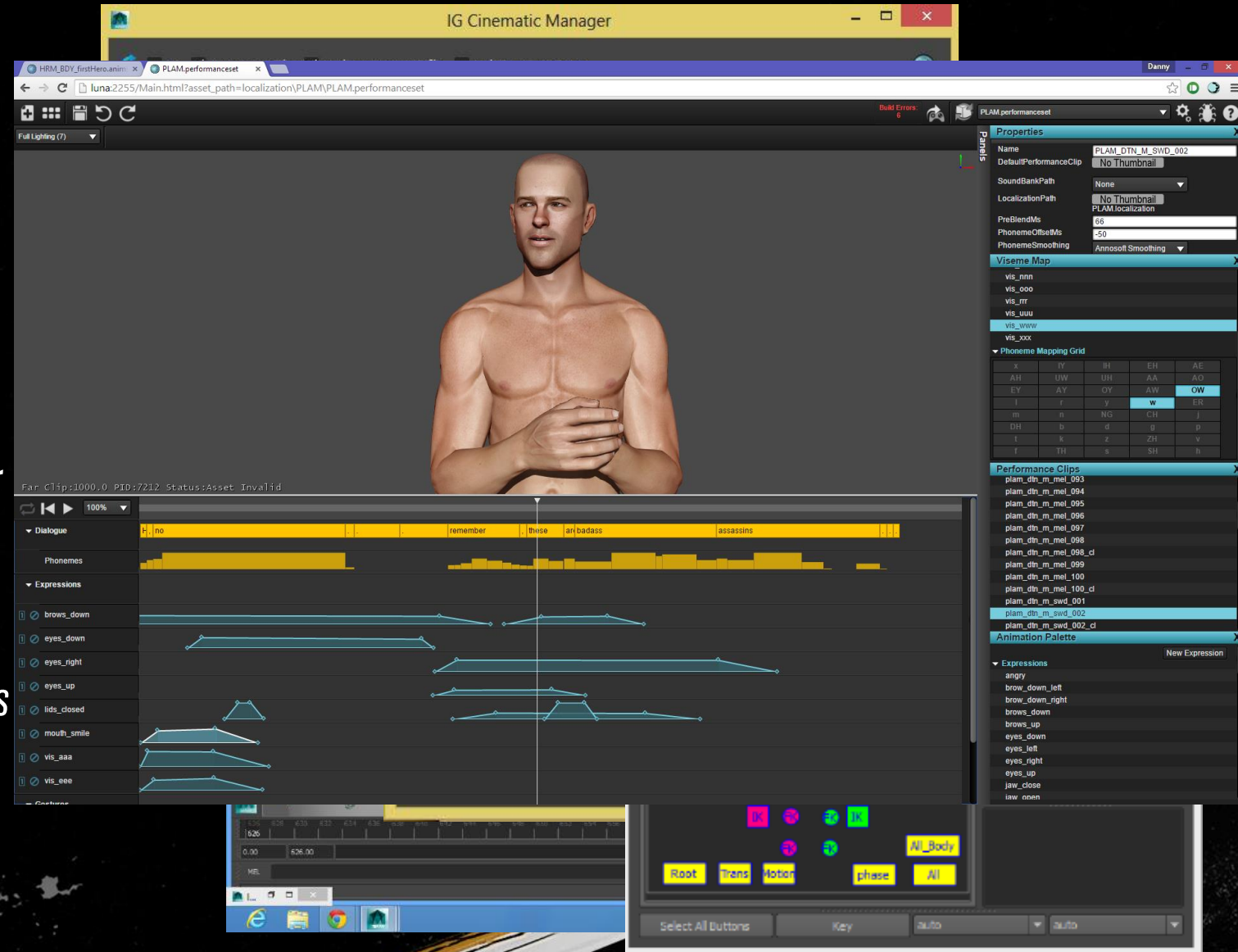
Cinematics

- Mocaped male and female body performances
 - Voice recorded for male and female
- Retargeting in cinematics
 - Average male to heavy male
 - Average female to skinny female
 - Did not quite work



Cinematics

- Custom animations for all body types
 - All heroes in a single Maya file
 - Names paces to track each hero: Hero, Hero_male, Hero_male_large, Hero_female, Hero_female_small
- Tools in Maya
 - Load new heroes and copy animations over
 - Manage scenes
- Cinematic engine tools
 - Separate anim tracks for each hero type
 - Per type audio, fx, props, NPC performances
- Performance editor
 - Same per type, granularity if needed

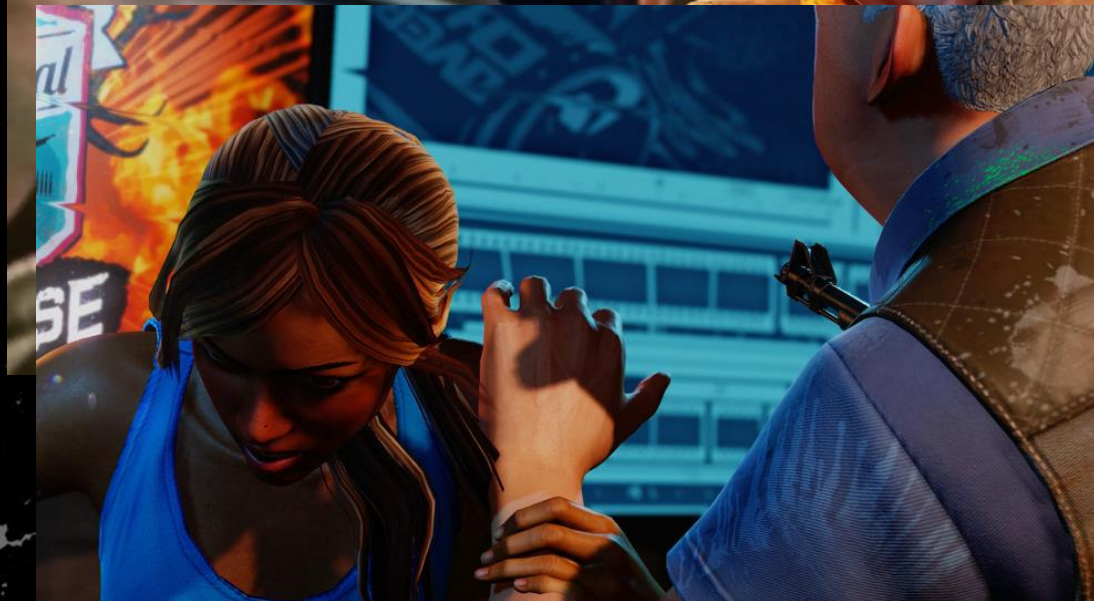


Cinematics



Cinematics

- **Workarounds to 4 hero types**
 - Establishing shots give a sense of size
 - Move the heroes
 - Cheat them up or down in medium shots
 - Maintain eye line with NPCs
 - They already have custom animations on them
 - Align for what is best for each shot
 - Less custom cameras per hero type
 - Over the shoulder shots problematic
 - No Touchy!
 - The less the hero touches, the better
- Often can't be avoided...



Buck

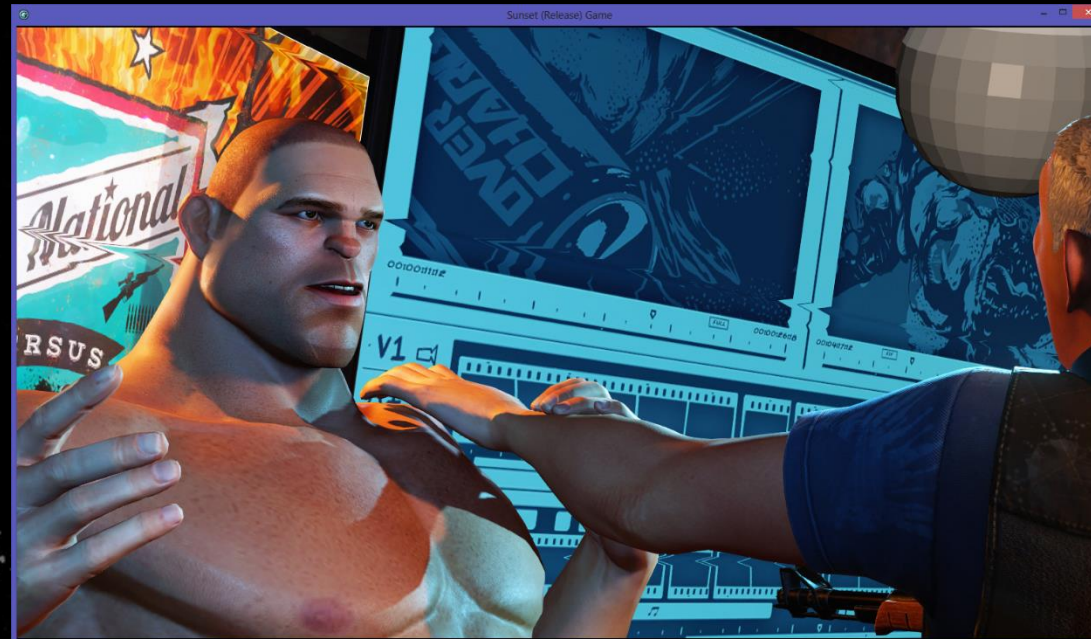
• Video Loading...



Cinematics

- Case study – Buck Intro

- A lot of touching
- Close interaction of hero and NPC
 - NPC pushes hero into the environment
 - Heavy male takes up a lot more space than average male
- Everything custom
 - Heroes
 - Cameras
 - NPC
 - Props (NPC holding gun)



Heads – first try

- Player diversity comes from the faces
 - At least 50 heads
 - No time to make them – busy with vanity
- Morph based system in engine
 - Prototyped in Maya
 - One time morph at creation – joint based anims
 - Combines ethnic features with standard offsets
 - Joint positions per shape combined for pivots
- Disappointing results
- Second life as NPC head generator in Maya
 - Based on hand sculpted hero heads



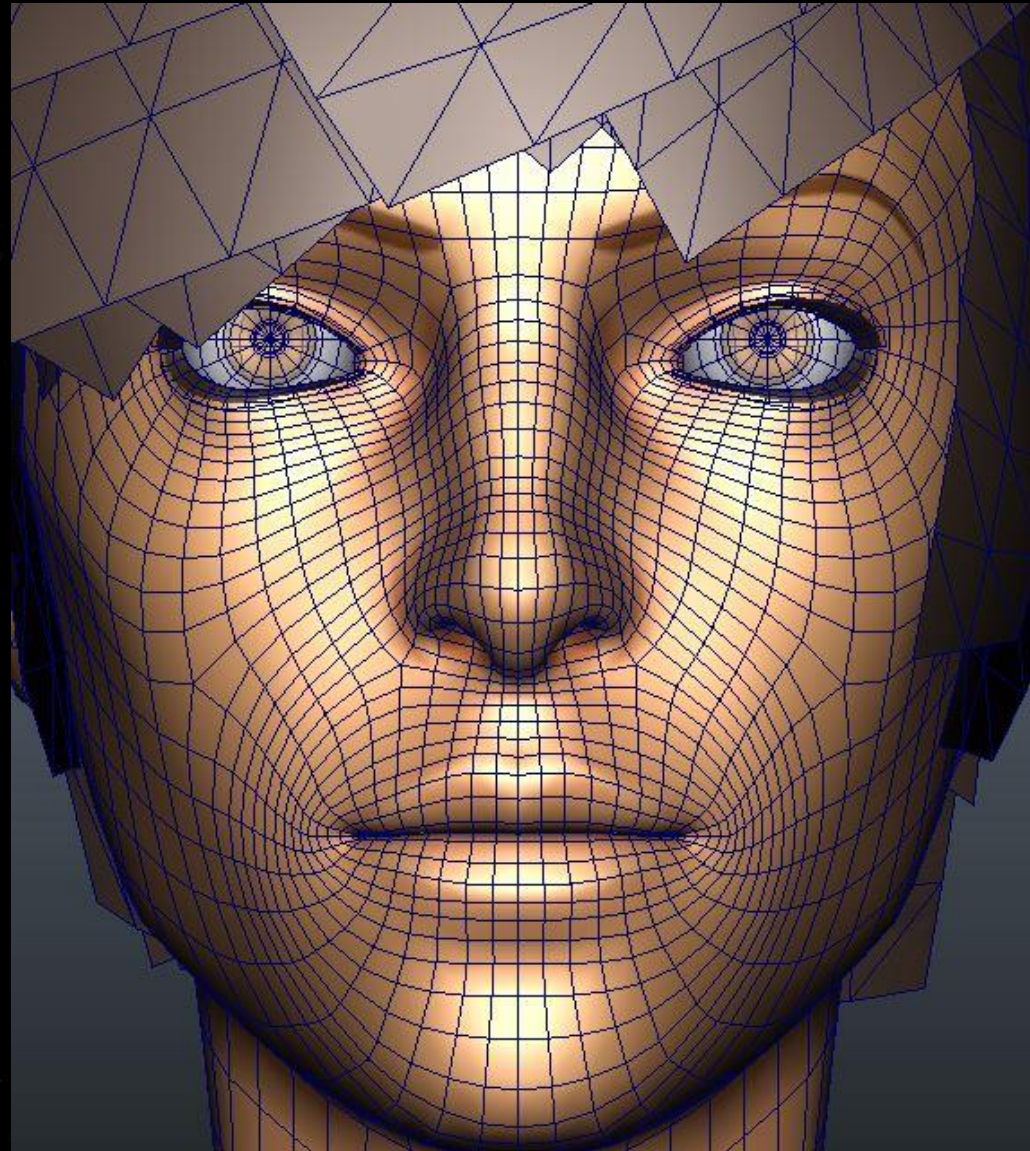
Heads – for real

• 60+ unique heads



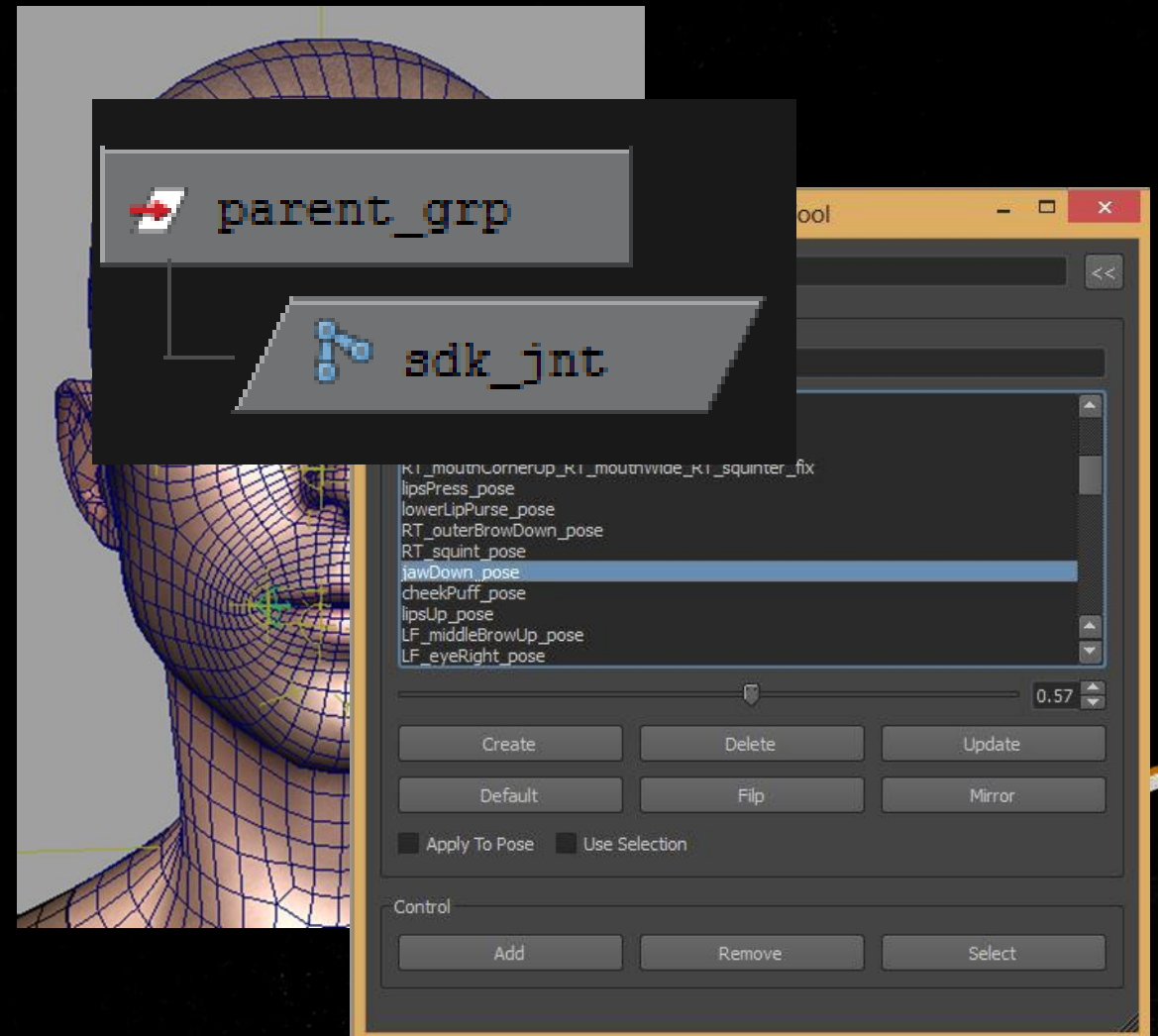
Heads – for real

- Simple art requirements for rigging
 - Same topology, vert order
 - Heads in similar vicinity per body type
 - Similar eye height per body type
 - Inside lips flat, as if holding a business card
 - Even spacing on the edge loops
 - Not too concerned with the eye lid shape
 - Fix in weight painting
- All heads tested in game



Heads – for real

- *FACS shape based, SDK driven joint rig*
 - *With muscle joints*
 - *75 joints and 135 SDK shapes inc. correctives*
 - *Easily repositioned parent groups of driven joints*
 - *Offsets the SDK poses without changing the curves*
 - *Can be transferred to new head in minutes*
- *5 rigs retargeted to all the heads*
 - *Male, female and child*
 - *Large male and small female*
 - *Worked very well*



Face retargeting



Face retargeting



Face retargeting



Face retargeting



Vanity

•Video loading....



Story and Audio

- More challenging to write story and dialogue for both genders
- You can get around the he/she pronoun
 - “get them” instead of “get him”
 - But not in French or Spanish – go with “he”
- Less opportunity for comedy
- Both performances need to match tone
 - Male sounds jerky, female apathetic
- Autotune higher and lower – only large male sounds OK



More diversity for NPCs and enemies

- NPCs can have same body types as heroes
- Instead of just the Scab Shooter
- We get the Scab Rusher
 - Small female
- And the Scab Tosser
 - Large male
- For a lot less work if we did them from scratch



That's it, then

- Things that worked out well
 - Retargeting bodies and faces
 - Translation scaling
- Things that did not
 - Everybody on same size skeleton
 - Slider based face creation system



But, wait!

- *It's all about the kids*
- *Up to you to do it*
- *You can get the other gender in your game right now*
 - *Same skeleton - few core animations*
- *Use retargeting for different body types and faces*
 - *If you don't have IK, scale the guns*
- *ADR dialogue for the other gender*
 - *Or don't have the hero speak - HF*
- *More diversity through Art*





Questions?

- *Please state name and where you are from*
- 



Thank you very much!