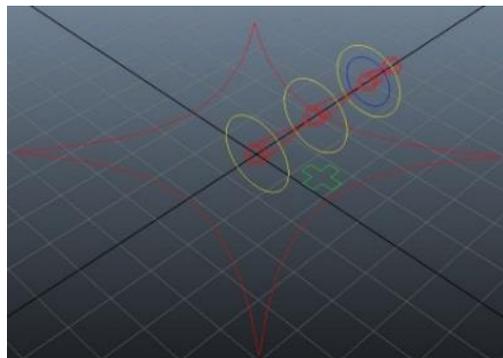
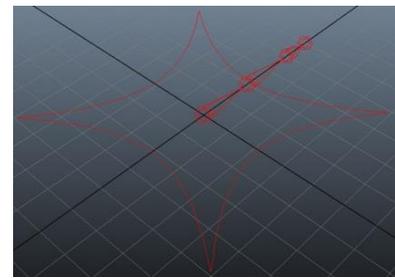


IK/FK Switch

The ability to switch between IK and FK control can be very valuable in animation. One of the most common applications for this are character arms. For the most part arms want to be animated in FK because it allows a more natural movement however some actions, especially those where interaction with another object is concerned, are much more effective under IK Control. This means that we want to be able to use both on our character, and switch between the two during our animation.

For our IK/FK switch system, we will have three identical joint chains. One will have FK control (with its own control curves), one will have IK control (with its own control curve) and our third joint chain will be the driver for our character which will have a control curve to blend between the FK and IK.

Create a joint chain. Duplicate this joint chain twice, adding the prefix 'ik' to the joints in one duplicate, and the prefix of 'fk' to the other. This helps us identify our joints. We want to create a few control curves ready for the system. First create a large global control around the system. Here I have started with a large circle and then in component mode (*F8*) adjusted the shape.

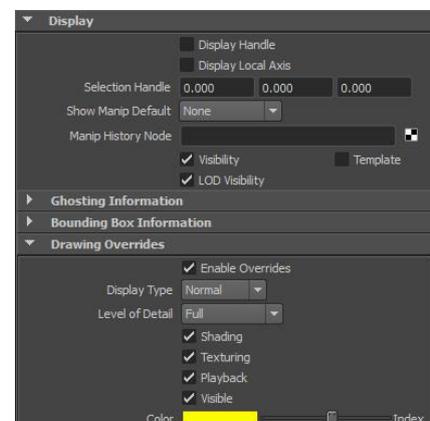
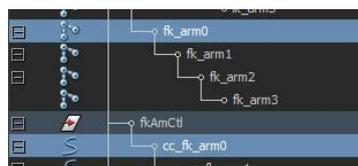


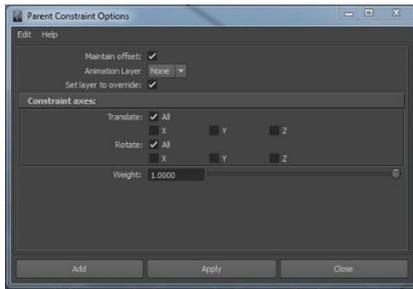
Create a control curve for each joint and label them with the prefix 'cc_fk_' these are going to be our FK controls. Parent each one below the one before.

Create a control now for the IK control (at the location of the wrist) and an extra control next to the joint chain that we will use to switch from

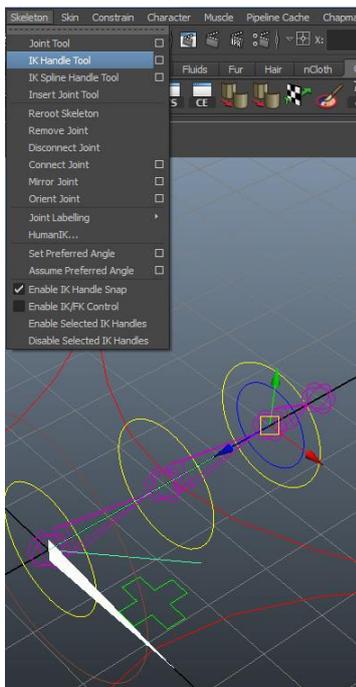
IK to FK. I have used the display override attribute to colour the different control groups.

Your outliner should fit the following hierarchy:

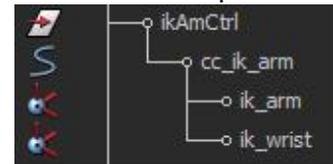




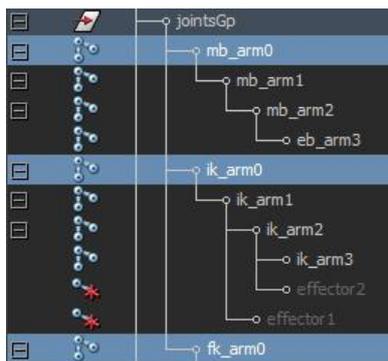
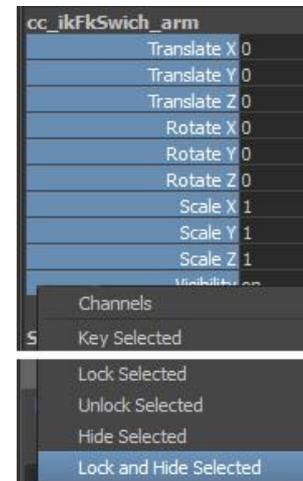
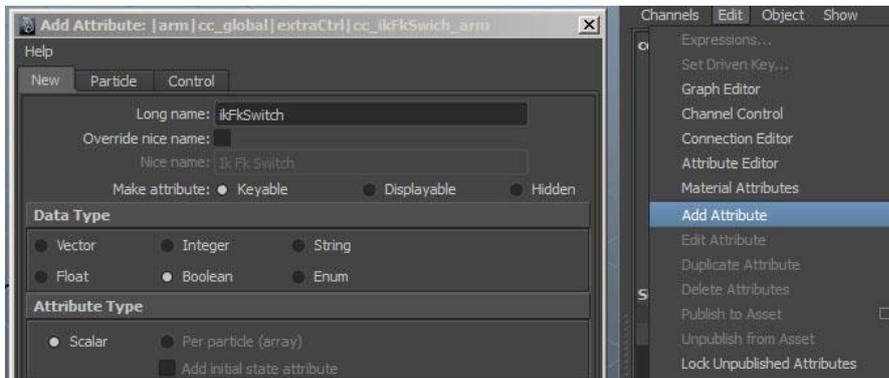
We are going to create parent constraints to connect the FK controls to the FK joints. Select the control, and then *ctrl-select* the corresponding joint in the outliner. In the animation menu set, click the *Constrain > Parent Constraint* tool to link the two objects, and then repeat this process with the other controls and joints in the chain.



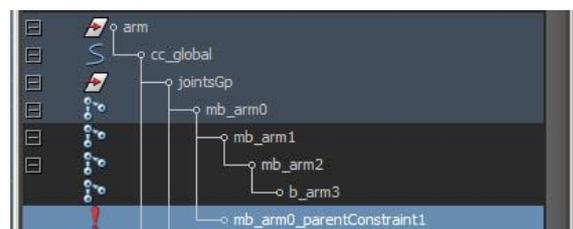
For the IK system, select the *ikHandle tool* control and *ctrl-select* the first and third joint of the chain in the outliner. Repeat this process with the last two joints. Parent the *ikHandles* to the *cc_ik_arm* control curve.



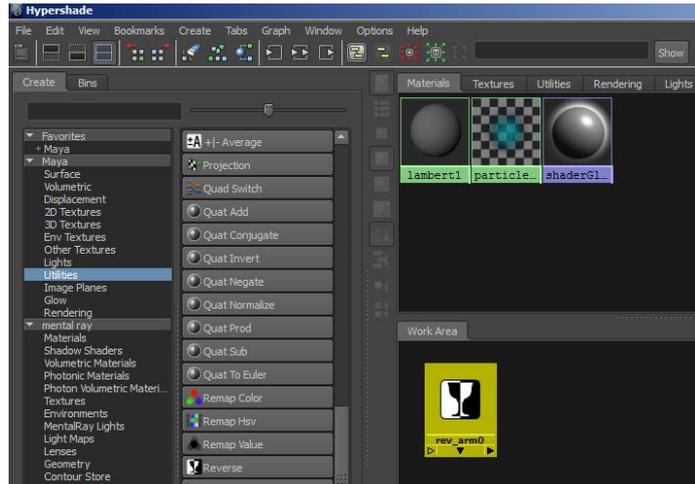
Now that our control systems are set up (you can test them if you wish) we need to feed both into our control chain and build the system to swap between each one. Select the *cc_ikFkSwitch_arm* control and add a new attribute called *ikFkSwitch* with the minimum value of 0 and a maximum value of 1. We can also lock and hide all of the other attributes on the control.



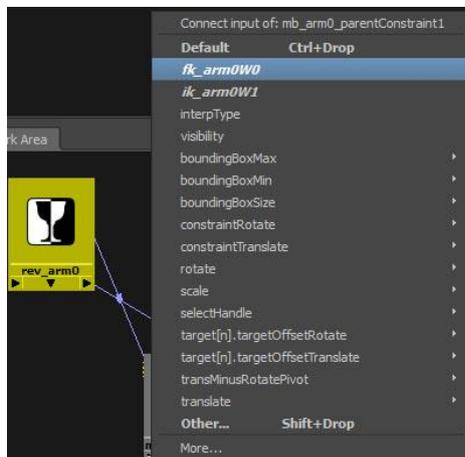
To feed the control chain, select the first *FK, IK* and control joint in that order. Now create a parent constraint.



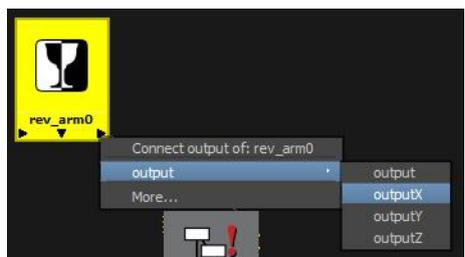
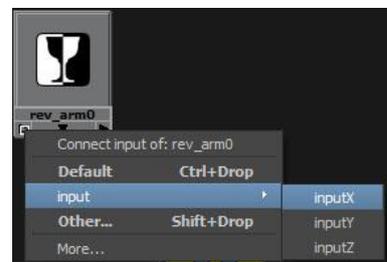
Open up your Hypershade. Although primarily for working with shaders, this is one of the most useful areas for us to build rigging systems by directly connecting specific attributes. On the left of the Hypershade is a menu, under *Maya > Utilities* create a reverse node and name it *rev_arm0*.



Middle click drag the *mb_arm0_parentConstraint* into the Hypershade.

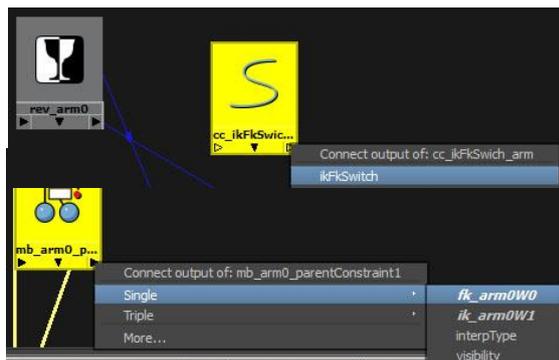
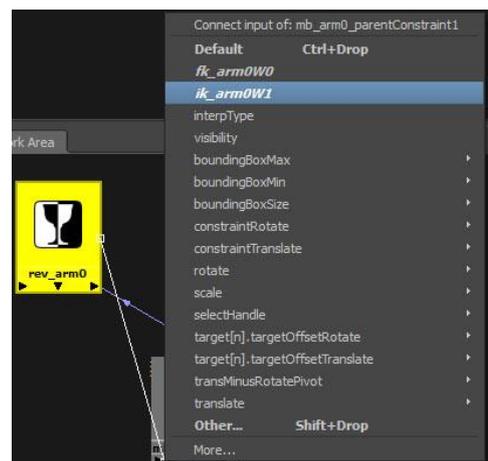


Right click hold and select *fk_arm0W0*, then left click hold and select the *inputX* attribute on the reverse node to connect the two.



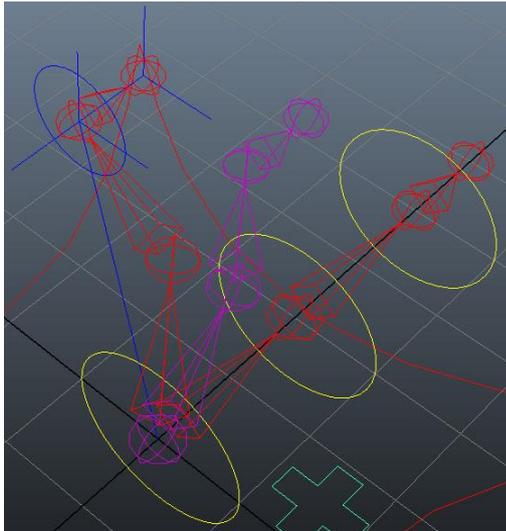
Then we want to take the *outputX* attribute from the reverse node and connect it to the

ik_arm0W1 attribute in the parent Constraint Node.



Middle click drag the *cc_ikFkSwitch_arm* curve into the Hypershade and connect the *ikFkSwitch* attribute to the *fk_arm0W0* attribute.

Repeat this process for the other joints in our chain.



Now if we change the *ikFkSwitch* attribute on our control, it will swap the parent constraint influence between our FK and IK joints.

If we grab the IK handle and move it, the joint chain will follow, but if we change the value of the *cc_ikFkSwitch* control you will see the control chain blend between the two.

This concludes our tutorial however one important thing to note is that we can use the technique to switch between any two joint chains, regardless of how they are rigged. This means that we could swap between FK and a Dynamic link chain for example (this gives us control over the dynamics if we run into problems) or even an IK chain as above with an IK Spline type chain that we will be building soon.

An important thing to consider is that with this specific method, a change in the scale of the joints will not be reflected onto the driving joint chain. If we want the scale information to be passed on (and also be switchable) then we need to repeat the parent constraint processes with scale constraints, including building new reverse nodes and linking everything together with the *ikFkSwitch* control curve (we can use the same switch attribute).