PARALLEL CODE: FOURIER TRANSFORM ACCELERATION

- O Spend 90% of time doing FFTs!
- O Therefore optimise carefully for each machine
- O Use vendor supplied FFTs
- O Use shared memory whenever possible
- O Avoid hot spots in communication (scheduling)

e.g. FORWARD TRANSFORM

```
DO my_z=my_z%min , my_z%max
```

local fft over x:

vendor routine (T3E: hgfft)

(x,y,z) −> (kx_y,z)
real −> complex

```
 real_field(x,y,my_z) -> complex_field(nx/2+1,ny,my_z)
```

local transpose (including x−dealias):

T3E: shared memory usage: lgetv, lputv

(kx,y,z) −> (y,kx,z)

```
complex_field(nx/2+1,ny,my_z) -> complex_field(ny,nx_dealias/2+1,my_z)
```

local fft over y:

vendor routine (T3E: ggfft)

(y,kx,z) −> (ky,kx,z)
(complex −> complex)

```
complex_field(ny,nx_dealias/2+1,my_z) -> complex_field(ny,nx_dealias/2+1,my_z)
```

y−dealias and re−pack:

T3E: shared memory usage: lgetv, lputv

```
 complex_field(my_z,ny_dealias,nx_dealias/2+1)

END DO
```

Distributed transpose: I have all kxy for certain z. Send right kxy's to the right processor

```
DO pp=1,N_p
```

p = schedule(mod(mype+p,N_p)) *randomise send scheduling*

T3E: shared memory usage: shmem_put

```
  SEND : Processor p gets sent
   complex_field(all_my_nz,p*nxy_dealias/N_p:(p+1)*nxy_dealias/N_p − 1)
END DO

BARRIER
```

T3E: shared memory usage: shmem_barrier

T3E: shared memory usage: lgetv, lputv

```
DO p=1,N_p
  RECEIVE : Processor p receives
   complex_field(1+nz*p/N_p:nz*(p+1)/N_p,all_the_kxy)
END DO
```