INTER*CTIVE supercomputing

Very High Level Languages (VHLL) for No Pain Scalable Computing on High Performance Systems (Linux Clusters, MS HPC 2008 clusters, GPUs, SGI Altix, Cray XT5)

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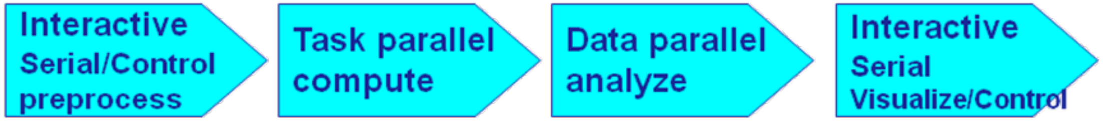
VHHL Overview

Use Very High Level Languages

- MATLAB or Python



Interactive Serial/Control preprocess

Task parallel compute

Data parallel analyze

Interactive Serial Visualize/Control

Star-P runtime handles memory decomposition & management

Star-P runtime is abstract HPC resource: SMP or Cluster

- M language:

```
>> n = 50000*p;
>> x = rand(n);
>> y = rand(n);
>> z = x * y;
>> [q r] = qr(x);
```

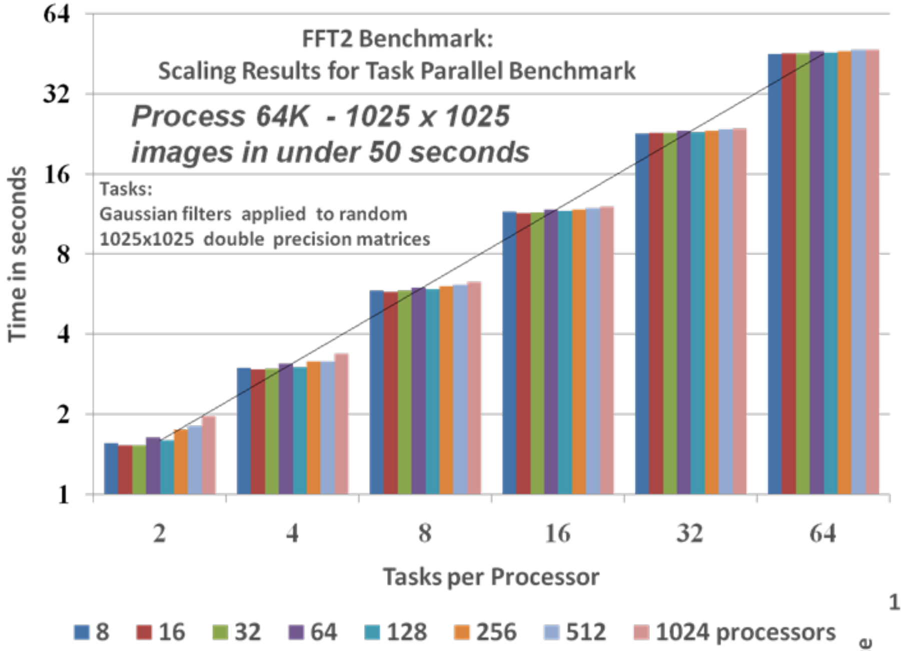
◀ x , y distributed objects

◀ qr performed in parallel

- Python:

```
>>> n = 50000
>>> x = starp.numpy.random.rand(n,n)
>>> y = starp.numpy.random.rand(n,n)
>>> z = starp.numpy.dot(x,y)
```

Scalability

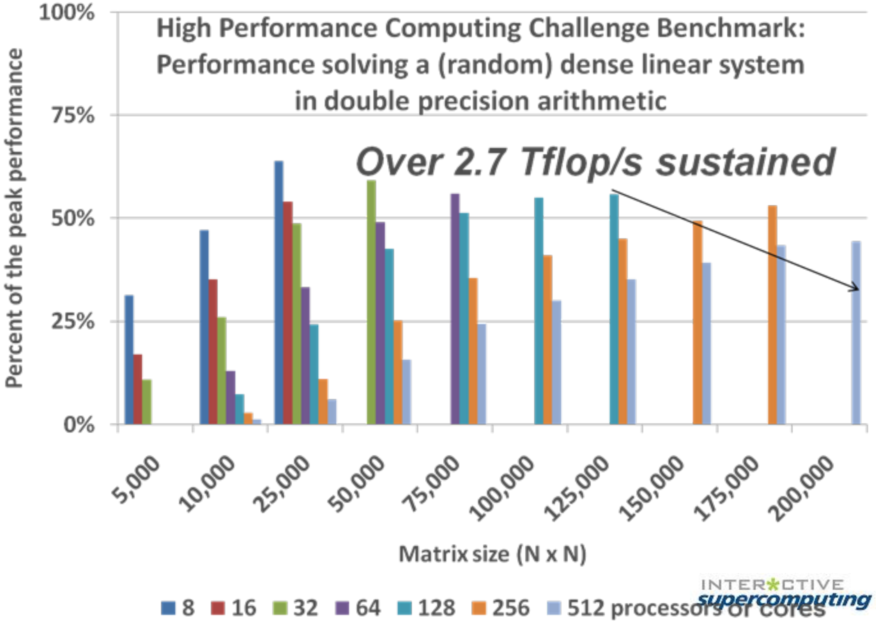


Task parallel computation

```
x =
rand(1025,1024,idx*p);
y =
ppeval('fft2filter',x);
```

Data parallel computation

```
idx= 200000
x = rand(idx,idx*p);
y = rand(idx*p,1);
tic; z=x\y; toc;
```



Real world Problem

Application

- Radio frequency (RF) tomography imaging

Method

- Illuminate area of interest with transmitting antenna
- Measure scattered field with receiving antennas
- Determine reflectivity function from scattered field (“inverse scattering”)

Issues

- Inversion algorithms quite computationally intensive
- Signal processing algorithms frequently modified & written in Very High Level Languages, e.g., M language of MATLAB®
- RF tomography sensor systems have mission requirements for timeliness in deployment scenarios

Solution

- Visit our poster for more details!!!