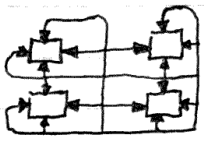
CSCI 455 – Parallel Pgm

DJ

Assignment #1

Darwin J Groskleg
200903596

Q. 1. Structure	Diameter
• n-node ring	$n/2$
• sqrt(n) X sqrt(n) mesh	$2\sqrt{\sqrt{(n)} - 1}$
• sqrt(n) X sqrt(n) mesh w/ wrap row link (torus)	 $2\left(\sqrt{\frac{\sqrt{(n)}}{2}}\right)$
• n-level balanced binary tree	$2 \log_2 ((n+1)/2)$
• d-dimensional hypercube network	$\log p$ at most, node labels differ by $\log p$ positions.

Q. 2. procs = $p = 10$
sequential: 10%

Gustafson's Law: $S_s(n) = s + n \cdot p$
$= 10\% + 90\% (10)$
$= 9.1$

Amdahl's Law: $S(p) = \dfrac{10}{((10\% \cdot 10) + (1 - 10\%))}$

$= \dfrac{10}{1.9} \doteq 5.26$

Q. 3. Rewrite Section 3.2.1 to deal w/ 80x80 region instead of rows.

```
// Master
for (int j=0; j <640/80; j+=80) {

    for (int i=0, block=0; i<480; i++, block += 80) {
        send(block, Pi );

    }
}

for (int i=0; i<480; i++)
    for (int j=0; j<640; j++)
        temp_map[i][j] = 0;

for (int i=0; i<(640*480); i++) {

    recv(oldrow, oldcol, newrow, newcol, Pany);

    if !( newrow<0 || newrow>=480
        || newcol<0 || newcol >= 640 )
        temp_map[newrow][newcol] = map[oldrow][oldcol];

}
for (int i=0; i<480; i++)
    for (int j=0; j<640; j++)
        map[i][j] = temp_map[i][j];
```

```
//slave
recv(block, pmaster);
for (oldrow = block; oldrow < (block+80); oldrow += 80) {
    for (oldcol = 0; oldcol < 640; oldcol += 80) {
        newrow = oldrow + delta_x;
        newcol = oldcol + delta_y;
        send(oldrow, oldcol, newrow, newcol, Pmaster);
    }
}
```

Q 5. Rewrite Monte Carlo in Section 3.2.3.

// Master

```
for (int i=0; i< N/n; i++) {
    Pi = i;
    for (int j=0; j<n; j++)
        xr[j] = rand();

    send(xr, &n, Pi, tag);
}
for (int i=0; i<slaves; i++) {
    recv(Pi, request_tag);
    send(Pi, stopping_tag);
}
sum=0;
```

// Slave

```
sum = 0
recv(xr, &n, Pi, source_tag);

while (source_tag == compute_tag) {

    for(int i=0; i<n; i++)
        sum += (xr[i] * xr[i]) - (3 * xr[i]);
    send(Pmaster, request_tag);
    recv(xr, &n, Pmaster, source_tag);
}
reduce_add(&sum, Pgroup);
```