

Gather:

GPU Device Code for 2-level Parallelism

update vertex state of v using apply(vertex update array[v.val])

Gather map:

parfor each in edge array e

update to edge update array using gatherMap(vertex array[e.src]) deviceSynchronizeBarrier()

Gather reduce:

parfor each vertex v in the interval: update vertex update array list using

gatherReduce(edge update array, UserGatherReduce)

if(v.val updated)

v.active = trueScatter:

parfor each out_edge_array *e* in the shard: update edge state of e using scatter(e)

parfor each vertex *v* in the interval:

FrontierActivate:

parfor each out_edge_array *e* in the shard: if(e.src.active = true)activity list = activity list U $\{e.dst\}$

(b)