Operation	Linear Array	2-D Mesh (wraparound, square)	Hypercube
Bandwidth Insensitive Operations			
One-to-all broadcast	$(t_s + t_w m)\log p$ $+t_h(p-1)$	$(t_s + t_w m)\log p$ $+2t_h(\sqrt{p}-1)$	$(t_s + t_w m)\log p$
One-to-all broadcast with $\Theta(p)$ slack	$2(t_s p + t_w m)$	$2(2t_s\sqrt{p} + t_w m)$	$2(t_s \log p + t_w m)$
All-to-all broadcast	$(t_s + t_w m)(p-1)$	$2t_s(\sqrt{p}-1) + t_w m(p-1)$	$t_s \log p + t_w m(p-1)$
One-to-all personalized	$(t_s + t_w m)(p-1)$	$2t_s(\sqrt{p}-1) + t_w m(p-1)$	$t_s \log p + t_w m(p-1)$
Bandwidth Sensitive Operations			
All-to-all personalized	$(t_s + t_w mp/2)(p-1)$	$(2t_s + t_w mp)(\sqrt{p}-1)$	$(t_s + t_w m)(p-1)$ $+(t_h/2)p\log p$
Circular q-shift	$(t_s + t_w m)\lfloor p/2 \rfloor$	$(t_s + t_w m)(2\lfloor \sqrt{p}/2 \rfloor + 1)$	$t_s + t_w m$ $+t_h \log p$