

## Pixel-Planes 5 Performance

System Values	
Number of polygons	<u>160,000</u>
% polygons on screen	<u>100%</u>
On-screen polygons	160,000
Poly size (% screen vert.)	<u>0.35%</u>
% polys in largest region	<u>4.0%</u>
Using High Res FB	<u>TRUE</u>
Zoomed In	<u>FALSE</u>
Region size	<u>128</u>
Vert. Screen Size	1,024
Horiz. Screen Size	1,280
Num. Screen Regions	80
Max Frame rate	24
Poly size (pixels per side)	3.58
Overlap Factor	1.057
Clock rate	<u>4e+07</u>
µsecs per sec	<u>1e+06</u>

GP Performance	
Number of SGPs	46
Cycles Per Polygon	<u>490</u>
Overlap proc cost %	<u>20.0%</u>
Offscreen proc cost %	<u>50.0%</u>
% lost for RC	<u>5.0%</u>
% lost in DB dist	<u>2.0%</u>
% lost for editing	<u>2.0%</u>
Communication time (µs)	18,908
RC token proc. time (µs)	<u>50</u>
RC time per frame (µs)	4,000
Time Per Polygon (µs)	12.25
% overhead	9.0%
Effective polygon time (µs)	12.39
Frames per Second	13.79

Renderer Performance	
Number of Renderers	22
Usable Renderers	22
Cycles per Polygon	<u>270</u>
End of Frame (µs)	<u>1,000</u>
% renderer busy	<u>95%</u>
Time per Polygon (µs)	6.75
Regions / Renderer	3.64
% for End of Frame	5.0%
Frames per Second	17.11

Algorithm Performance	
Token arrival latency	<u>50</u>
Token hop time (µs)	331.86
Num Token Paths	1
Serial Hops per Frame	170.91
Frames per Second	17.63

Actual Performance	
Actual Frames per Second	13.79
Polygons per second	2,206,032
GP Utilization	100.00%
Renderer Utilization	80.57%

<b>Data Sizes</b>			
Polygon #words	<u>36</u>	Bin chunk size	<u>970</u>
SOF #words	<u>150</u>	Avg. bin size (words)	1,654
EOF #words	<u>1,600</u>	Avg. chunks per bin	2.71
Region #words	16,384		
Ring bandwidth	<u>160,000,000</u>		
RC #words per region, gp	<u>22</u>		
RC #words per frame, gp	<u>500</u>		
RC #words per frame	<u>500</u>		

<b>Ring Bandwidth</b>			% of max
Polygon traffic	83,926,786		52.45%
SOF, EOF traffic	1,930,278		1.21%
Pixel traffic	18,071,816		11.29%
RC traffic	1,440,263		0.90%
<b>Total traffic</b>	<b>105,369,144</b>		
<b>Ring Utilization</b>	<b>65.86%</b>		

<b>Data movement cost</b>	(all times are in microseconds)		
Time to read msg	<u>73.8</u>	Time to send msg	<u>20.9</u>
Time to read word	<u>0.0637</u>	Time to send word	<u>0.0783</u>
		Time send uncached msg	<u>17</u>
		Time send uncached word	<u>0.0287</u>
		RC chunk overhead	<u>15</u>
RC #msgs per region, gp	<u>1</u>	RC #msgs per region/gp	<u>1</u>
RC #msgs per frame, gp	<u>4</u>	RC #msgs per frame/gp	<u>1</u>
		(below are per frame, across all gps)	(% per gp)
		Time to send SOF	1,704
		Time to send EOF	6,394
		Time to send poly data	483,883
		(figures below are per frame, per gp)	
RC time per region	75	RC time per region	23
RC time	327	RC time	60
Time to read data	6,343	Time to send data	12,565
% of time reading data	8.75%	% of time sending data	17.32%

Pixel-Planes 5 Performance Formulas

System Values		Using High Res FB	TRUE
Number of polygons	160,000		
% polygons on screen	100%		FALSE
On-screen polygons	PercentOnscreen*NumPolygons		128
Poly size (% screen vert.)	0.35%		IF(HighRes, IF(ZoomedIn, 512, 1024), 512)
% polys in largest region	4.0%		IF(HighRes, IF(ZoomedIn, 640, 1280), 640)

  

GP Performance		Render Performance	Algorithm Performance
Number of SGPs	46	Number of Renderers	50
Cycles Per Polygon	490	Usable Renderers	MIN(NumRends, ScreenRegions)
Overlap proc cost %	20.0%	Cycles per Polygon	Z10
Offscreen proc cost %	50.0%	End of Frame (µs)	1,000
% lost for RC	5.0%	% renderer busy	95%
% lost in DB dist	2.0%		
% lost for editing	2.0%		
Communication time (µs)	ReadTime+SendTime		
RC token proc. time (µs)	50		
RC time per frame (µs)	RC*TokenTime*ScreenRegions		
Time Per Polygon (µs)	GpCycPerPoly/(ClockRate/UsecsPerSec)	Time per Polygon (µs)	RendCycPerPoly/(ClockRate/UsecsPerSec)
% overhead	PercentRC+PercentDBdist+PercentEditing	Regions / Renderer	ScreenRegions/UsableRends
Effective polygon time (µs)	GPPolygonTime*(PercentOnscreen+(1-PercentOnscreen)*OffscreenCostPercent)* (1+OverlapFactor.1)*OverlapCostPercent	% for End of Frame	RegionsPerRend*EOF_Time/UsecsPerSec* Num_FPS
Frames per Second	((GpEffPolyTime*NumPolygons)/NumSGPs+ RCTimePerFrame+PercentComm)	Frames per Second	PercentRendBusy/(OnscreenPolygons* OverlapFactor*(RendCycPerPoly/ClockRate)* MAX(1/UsableRends, PolysLargestRegion)+ RegionsPerRend*EOF_Time/UsecsPerSec)

  

Actual Performance		GP Utilization	Render Utilization
Actual Frames per Second	MIN(GP_FPS, Rend_FPS, Alg_FPS, MaxFrameRate)	GP Utilization	Num_FPS/GP_FPS
Polygons per second	Num_FPS*OnscreenPolygons	Render Utilization	Num_FPS/(PercentRendBusy/ (OnscreenPolygons*OverlapFactor* RendCycPerPoly/ClockRate)/UsableRends+ RegionsPerRend*EOF_Time/UsecsPerSec)

  

Num. Screen Regions		Max Frame rate	Poly size (pixels per side)	Overlap Factor	Clock rate	µsecs per sec
	-INT((-VertScreenSize*HorizScreenSize/(RegionSize*RegionSize)) IF(HighRes, IF(ZoomedIn, 72, 24), 30)		VertScreenSize*PolySizeScreen			
			(PolySizePixels+RegionSize)^2/ (RegionSize*RegionSize)			
					4e+07	1e+06

  

Token arrival latency		Token hop time (µs)	Num Token Paths	Serial Hops per Frame	Frames per Second
	TimeReadMsg+TimeReadWord* RCNumWordsRegionGP+		1		
	TokenAttrivLatency+RCTokenTime+ (TimeSendUCMsg+RCChunkTime)* AvgChunksPerBin+AvgBinSize* TimeSendUCWord+TimeSendMsg+ TimeSendWord*RCNumWordsRegionGP				
					1/(SerialHopsPerFrame*TokenHopTime/ UsecsPerSec)



### Pixel-Planes 5 Performance

Variable Names (---- means none defined)

<b>System Values</b>	NumPolygons	HighRes	ScreenRegions
Number of polygons	PercentOnscreen	ZoomedIn	MaxFrameRate
% polygons on screen	OnscreenPolygons	RegionSize	PolySizePixels
On-screen polygons	PolySizeScreen	VertScreenSize	OverlapFactor
Poly size (% screen vert.)	PolysLargestRegion	HorizScreenSize	ClockRate
% polys in largest region			UsecsPerSec

<b>GP Performance</b>	NumSGPs	NumRends
Number of SGPs	GpCycPerPoly	UsableRends
Cycles Per Polygon	OverlapCostPercent	RendCycPerPoly
Overlap proc cost %	OffscreenCostPercent	EOF_Time
Offscreen proc cost %	PercentRC	PercentRendBusy
% lost for RC	PercentDBdist	
% lost in DB dist	PercentEditing	
% lost for editing	PercentComm	
Communication time (µs)	RC-TokenTime	
RC token proc. time (µs)	RC-TimePerFrame	
RC time per frame (µs)		
Time Per Polygon (µs)	GPPolygonTime	
% overhead	GPPercentOverhead	
Effective polygon time (µ-GpEffPolyTime)	GP_FPS	
Frames per Second		

<b>Renderer Performance</b>	NumRenders	NumRends
Number of Renderers	Usable Renderers	UsableRends
Usable Renderers	Cycles per Polygon	RendCycPerPoly
Cycles per Polygon	End of Frame (µs)	EOF_Time
End of Frame (µs)	% renderer busy	PercentRendBusy
% renderer busy		
Time per Polygon (µs)		
Regions / Renderer		
% for End of Frame		
Frames per Second		

<b>Algorithm Performance</b>	TokenArrivLatency	TokenArrivLatency
Token arrival latency	TokenHopTime	TokenHopTime
Token hop time (µs)	NumTokenPaths	NumTokenPaths
Num Token Paths	SerialHopsPerFrame	SerialHopsPerFrame
Serial Hops per Frame		
Frames per Second		Alg_FPS

<b>Actual Performance</b>	GP Utilization	GPUUtil
Actual Frames per Second	Renderer Utilization	RendUtil
PolysPerSec		

