

Processing Challenges in Shrinking HPEC Systems into Small Platforms

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The Ultimate Performance Machine

Platforms with SWAP Constraints - UAVs

UAV	Global Hawk	Predator B	Heron A	Hunter	Eagle Eye	Fire-Scout	Sentry	Dragon Warrior	Dragon Eye
Picture									
Length (ft)	44.4	36	26	22	17	23	8.4	10	3
Wingspan (ft)	116	66	54	29	17	20	12.8	9	3.8
Height (ft)	14	9.5	5.9	5.6	5.5	9.5	4	5	1
Payload Weight (lbs)	1000	800	550	250	200	200	75	35	5
Max Altitude (ft)	65k	50k	25k	15k	20k	20k	15k	4k	1.2k
Sensors	EO/IR SAR ISAR SIGINT MTS	EO/IR SAR ISAR SIGINT MTS	EO/IR SAR ISAR SIGINT MTS	EO/IR SAR ISAR MTS	EO/IR SAR ISAR SIGINT MTS	EO/IR SAR ISAR SIGINT MTS	EO/IR	EO/IR	EO/IR
Endurance (hrs)	36	36	36	10	5	4	3	3	1
Max Airspeed (kts)	320	220	120	100	220	120	100	70	35

- UAVs height is very small; tends to lead to smaller system designs than 6U arrayed on base of fuselage/wings
- Payload weight is small, thus weight constrained solutions are demanded

- UAVs tend to fly fairly high. A consequence is that without life support environments (no man) at this altitude, conduction cooled becomes mandatory.
- All traditional HPEC applications are represented on all the platforms.

Scaling the Processing

500 MHz class PPC x 4
 = 16 GFLOPS per slot =>

- ♦ 6 slot=96 GFLOPS
- ♦ 12 slot=192 GFLOPS
- ♦ 20 slot=320 GFLOPS

Current PPC-only Solutions
 (e.g. 6U VME chassis)

Similar Processing –
 smaller system

2-10x processing – same
 system dimensions

2-4x
 processing –
 same system
 dimensions

Small

Future Heterogeneous Solutions

Future PPC-only Solutions

2x 1GHz class PPC per board or 2 FPGA per board=>

- ♦ 2 slot=96-216 GFLOPS
- ♦ 4 slot=112-616 GFLOPS
- ♦ 8 slot=224-1232 GFLOPS

=> Future FPGA + PPC exploitation on 3U better than existing 6U

4x 1.5 GHz class PPC = 48 GFLOPS per slot =>

- ♦ 6 slot=288 GFLOPS
- ♦ 12 slot=576 GFLOPS
- ♦ 20 slot=960 GFLOPS

=> PPC exploitation of VITA 46

4x 1 GHz class PPC per board or 2 FPGA per board=>

- ♦ 6 slot=192-1032 GFLOPS
- ♦ 12 slot=384-2232 GFLOPS
- ♦ 20 slot=640-3832 GFLOPS

=>FPGA + PPC exploitation on VME