

Dorado Bioacoustics SBC Trade Study

901807 NEXT GEN BIOACOUSTICS ON DORADO

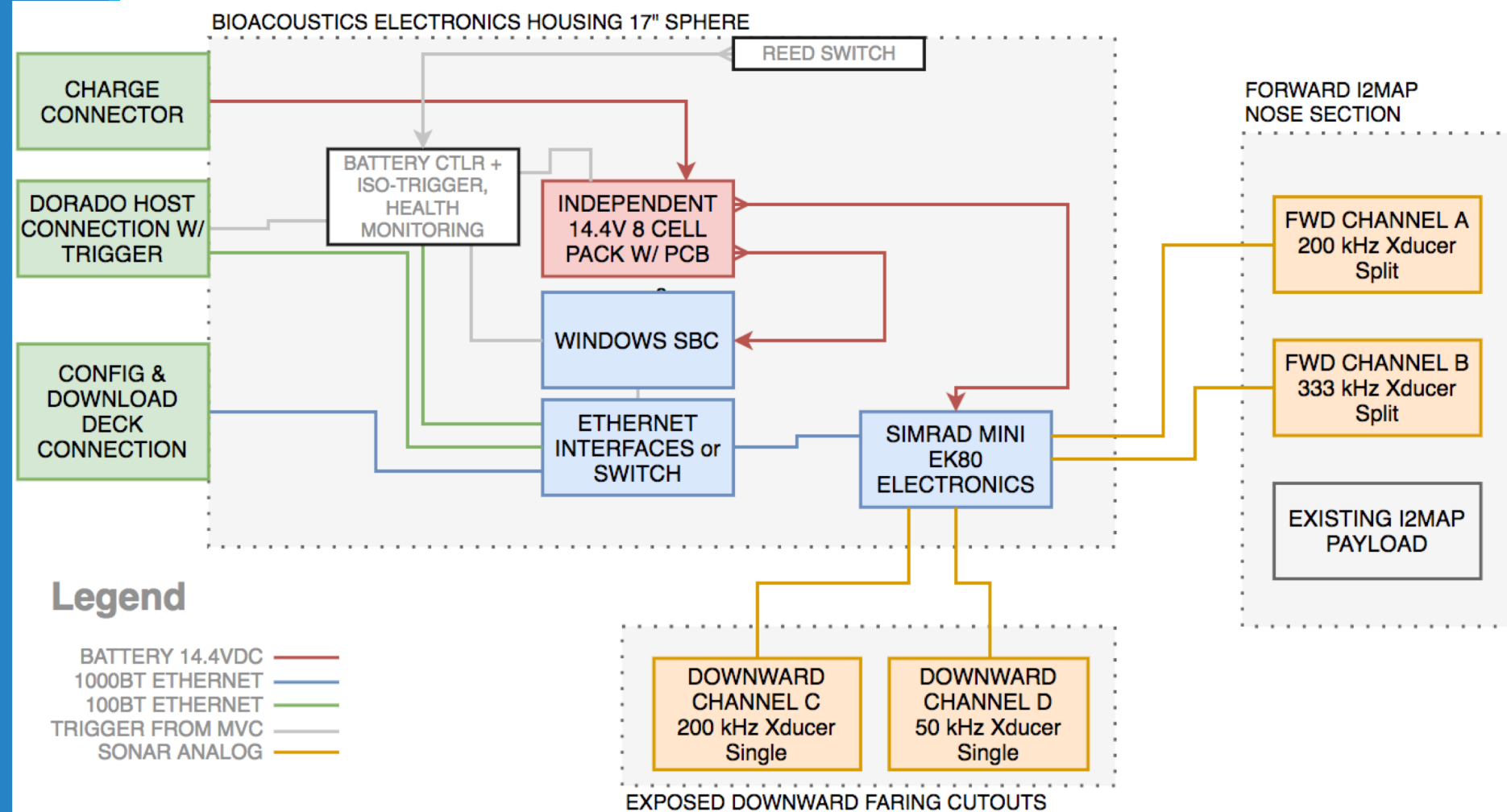
MBARI 2018



Monterey Bay Aquarium
Research Institute

Notional Wiring Concept

- SBCs exist that can offer the 4 connections as drawn through mini PCIe connections



SBC Requirements

- Celeron or better x86/x64
 - Test on atom was not encouraging
 - Previous SBC used a Celeron N2807, 2.16GHz 2-Core 2-Thread
- 10-16.8V Input range desired
- 2x Gig-Ethernet & 2x 100BT-Ethernet
- Serial port or dig IO for trigger
- Runs windows 7 or better
- SATA 3 or mSATA storage interfaces
- Storage Volume Requirement:
 - 25-GB/hr
 - Initial max deployment is 7-hr, or 175GB of data
 - Download at 1-Gbps is ~25 minutes
 - Download at 100-Mbps is ~ 4 hours
- I2C-SMBus also desired (unlikely support for windows)

Preliminary Power Budget

Batteries

Hotel Battery Energy	4.6 kWhr	Single Sphere 8x PH2054HD34
Sonar Battery Energy	0.744 kWhr	

Payload

i2MAP Payload Hotel	97.6 watts	Instruments, Micro, Fan, Switch, Camera LSL-2050 Sealite
i2MAP Payload Lamps	364 watts	
AUV Hotel Payload	157 watts	
Propulsion Speed	0.5 knots	
Propulsion Power	0.66 watts	Based on propulsion budget from M. Chaffey
Total AUV Battery Load	619.26 watts	

Duration

Duration All Items On	7.43 hours
Recording On Percentage	30 %
Duration On Percentage	12.62 hours

BioAcoustics Payload

Transceiver Hotel	10 watts	Minimum Required Well exceeds an estimate for opportunistic lamp usage.
SBC	12 watts	
Duration Two Cells	8.45 hours	
Duration 8 Cells	33.82 hours	

Best Options

- By finding a wide power input unit, we can eliminate another costly power supply development when none other is needed at the moment.
- Having all 4 Ethernet connections at the PC eliminates the need for the switch, and all items are communicating centrally to the small board computer.
- Mini-PCI Express slots allow for Ethernet expansion (including dual NIC) without USB converters
- Also allow for compact enough mSATA (up to 1-TB)

Initial Findings

- Found a few with the wide input power.
- Many offer the industrial communications, such as Digital I/O and I2C, but only support those features for Linux installations.
 - This means we won't be able to initially talk to the batteries with the SBC, but some other options do exist via usb/etc.
 - Could do it by writing a kernel mode windows driver, but is a high risk design choice.
- I think we should consider a move from the Celeron® class to the Core U-Series®, which will allow for more onboard processing in future developments. Cost of the board is mostly driven by the chip selection.
- I conducted a brief trade study to help elucidate the differences.
- Following options all meet requirements for wide power inputs, passive cooling solutions, and all can be self-contained solutions (no USB adaptors or hard drives).

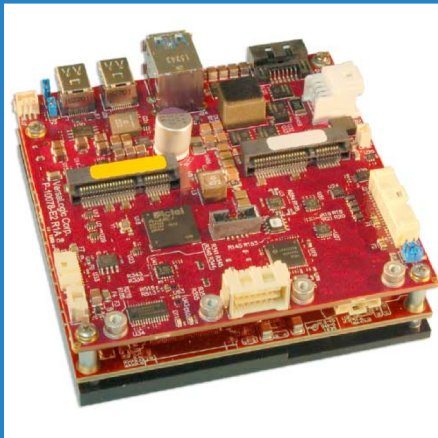
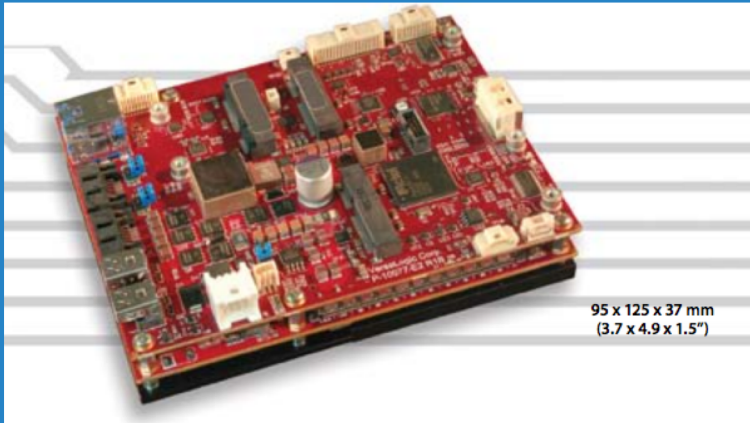
Potential Solutions

TRADE STUDY AT END



Versalogic Blackbird or Condor

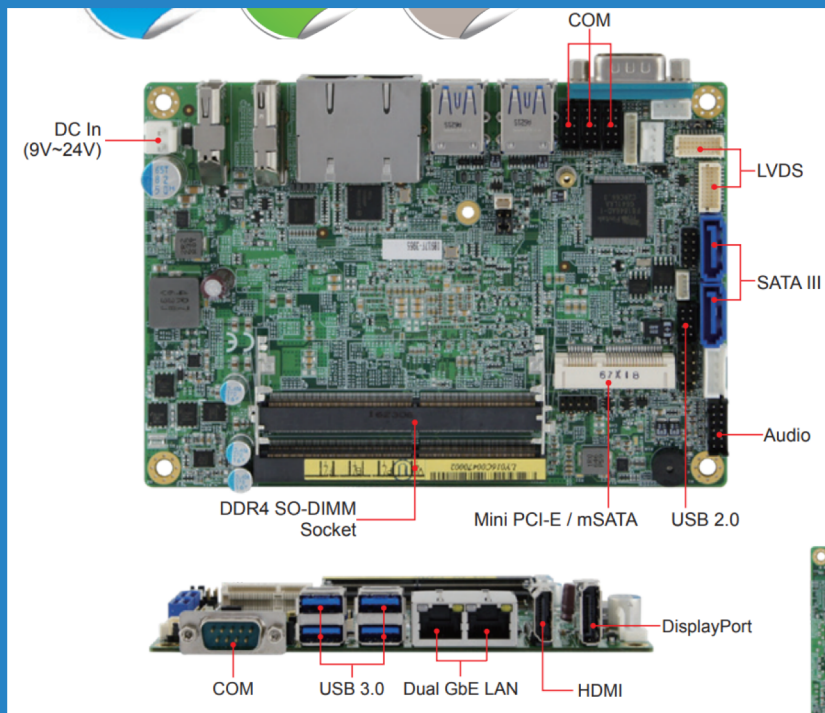
Blackbird



Condor

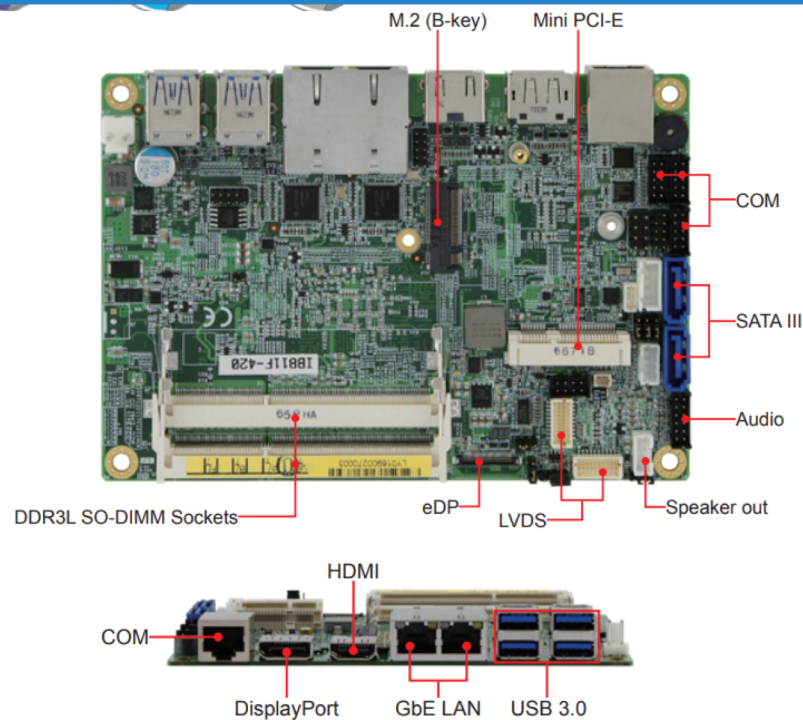
- 7th Gen (current) Core (Condor) / 6th Gen (Blackbird)
- Wide input power (8-30V)
- Mil-spec Shock/Vibration (better connectors)
- Most expensive
- Blackbird has 3 Mini PCI-E slots, Condor has 2
- Soldered on memory
- Min price is condor at \$2,100, and the accessories add another \$200
- Condor has good consumption in Core i3 Model (14W)
- Has I2C/SPI, but no windows support at this time
- DataSheets
 - [BlackBird](#)
 - [Condor](#)

iBase IB917



- 7th Gen Core U-Series
- Wide input power (9-24V)
- 20-30W Typical, so a little less efficient than the Versalogic options for similar processors.
- Only 1 Mini PCI Express slot, would need SATA Hard drive
- No I2C flexibility, no win drivers for its Dig IO
- Biggest processor at the cheapest price
- External Memory, Max 16GB
- DataSheet: [IB917](#)

iBase IB811



- Celeron/Pentium Product
- Also wide input power (9-36)
- Comparable to Gigabyte PC in size
- Meets requirements as base model
- One mSata for needed Gig-Ethernet expansion
- One M.2 Slot for up to 2TB storage
- External Memory, max 8GB
- 8W Typical
- Lowest Cost: \$350
- Standard connectors/
- DataSheet: [IB811](#)



Trade Study Findings

- iBase has a comparable model to the condor, also wide input, but will never replace the battery controller.
- Versalogic could replace the battery controller, but likely significant effort will be required and is too much risk at present time.
- The Blackbird, Condor and IB811 have the same ranking. The added cost but high quality of the versalogic is a good trade against the savings of the IB811 and its lower power consumption.

Product Comparison Sheet

		Advantech MIO-5272			Versalogic BlackBird			Versalogic Condor			iBase ib917			iBase 811		
Category	Weight	Stat	Score	Weighted	Stat 2	Score	Weighted	Stat 2b	Score	Weighted	Stat 3	Score	Weighted	Stat 4	Score	Weighted
Size	0	146 x 102 mm	3	0	125 x 95 mm	3	0	95 x 95 mm	3	0	147 x 102 mm	3	0	147 x 102 mm	3	0
Voltage Input Range	15	12V ± 10%	1	15	8-30 V	5	75	8-30 V	5	75	9-24 V	5	75	9-36V	5	75
Temp Range	0	0 ~ 60°C	3	0	0 ~ 60°C	3	0	0 ~ 60°C	3	0	0 ~ 60°C	3	0	0 ~ 60°C	3	0
Thermal Design Power	10	17-22W	4	40	23-32W	2	20	14-23W	4	40	30-40W	2	20	14W	4	40
Typical Power	0	4.88-6.46W	4	0	15-22W	3	0	10-15W	3	0	Not given (20-30W)	2	0	Not given (8W)	2	0
Cooling	0	Heat Spreader & Sink	3	0	Heat Spreader & Sink	3	0	Heat Spreader & Sink	3	0	Heat Spreader & Sink	3	0	Heat Spreader & Sink	3	0
											0					0
Core											0					0
Processor	0	7th gen Celeron to Core i7 2-3 Ghz	3	0	6th gen Core i7 2-3 Ghz	3	0	6th gen Core i7 2-3 Ghz	3	0	7th gen Celeron to Core i7 2-3 Ghz	3	0	Atom to Celeron	3	0
Memory	0	2x 204 SODIMM Max 16GB	3	0	On board up 32GB	3	0	On board up 16GB	3	0	2x DDR4-2133 SODIMM max 32GB	3	0	2x DDR4-2133 SODIMM max 8GB	3	0
Storage	0	2 SATA 3	3	0	2x SATA 3	3	0	2x SATA 3	3	0	2x SATA 3	3	0	2x SATA 3	3	0
Watchdog	1	Yes	3	3	No	2	2	On Condor	2	2	Yes	3	3	Yes	3	3
											0					0
Peripherals											0					0
Network	0	2x GbE	3	0	2x GbE	3	0	2x GbE	3	0	2x GbE	3	0	2x GbE	3	0
Mini PCI Express	15	2x Full Size (mSata on 1)	4	60	2x Full Size 1x Half	5	75	2x Full Size	4	60	1x Full Size	3	45	1x Full Size 1x M.2	4	60
I2C / SMBus	1	1x No win support	2	2	1x No win support	2	2	1x No win support	2	2	No	1	1	No	1	1
RS-232	1	2x RS-232/422/485	3	3	4x RS-232/422/485	5	5	2x RS-232/422/485	3	3	1x RS-232/422/485 & 3x RS-232	4	4	1x RS-232/422/485 & 3x RS-232	4	4
GPIO	1	8-bit GPIO	3	3	24-bit GPIO	4	4	8-bit GPIO	4	4	Yes (no spec)	1	1	Yes (no spec)	1	1
SPI	1	No	1	1	1x	3	3	1x	3	3	No	1	1	No	1	1
USB	1	2x USB 2.0 & 2x USB 3.0	3	3	4x USB 2.0 & 2x USB 3.0	2	2	4x USB2.0 & 2x USB 3.0	2	2	2x USB2.0 & 4x USB3.0	4	4	2x USB2.0 & 4x USB3.0	4	4
								0			0					0
Overall								0			0					0
Cost w/ Accessories	15	700-1200	5	75	2300-4000	1	15	2300-3300	1	15	600-1200	4	60	350	4	60
Quality	10	Mid-range	3	30	Mil-spec	5	50	Mil-spec	5	50	Low US Support	2	20	Low US Support	2	20
Design Flexibility	10	Can bring memory down	2	20	Little, but lots of IO	4	40	Little, but lots of IO	4	40		3	30		3	30
Design Reduction	10	Would need BEC	2	20	Replace LPC?	4	40	Replace LPC?	3	30	No Industrial comms	3	30	No Industrial comms	3	30
	91			60%			73%			72%			65%			72%



Moving Forward

- I would recommend the Versallogic Condor or the iBase IB811
- The Condor future proofs, but sparing it would be expensive, and it will take more power.
- The IB811 is the lowest performance I would like to test, and likely will work well.
- At its low cost, perhaps we should test the IB811, and if it fails, we can upgrade later.