Infinite Possibilities, Infinite Choices, Infinite Challenges?

How a Chassis Manufacturer Manages the Broad I/O Options of the VPX Form Factor

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What challenges does a chassis manufacturer face when implementing VPX?
What is LCR’s perspective?

Our products include:

• Electronics Packaging
• Rugged chassis & backplanes
  – MIL-STD-810, MIL-S-901, MIL-STD-41, etc.
• Mostly open-standards-based
  – VPX, VME, cPCI, ATCA, COM-E
• Substantial design expertise
What is LCR’s perspective?

Our customers include:

• Predominantly mil-aero
• Low volume/high mix
• Custom solutions

“I need COTS, but …”
The Increasing Demand for VPX

• VPX is proving to be the current choice for many new defense programs.

• The majority of new opportunities (according to LCR) are in the 3U VITA 48.2 form factor with an ARINC 404 enclosure.
VPX Backplanes: Infinite Possibilities

• VPX backplanes bring an unparalleled degree of “openness” when compared to other open architectures.

• Backplane users have a nearly infinite possibilities when designing their backplane interconnects.
VPX Backplanes: Infinite Possibilities

• Unparalleled support of I/O variety:
  – Quantity
  – Speeds/Signal Integrity
  – Flexibility
  – Copper alternatives (RF/Fiber)
Too good to be true...?

- Customers are choosing VPX for new designs and housing them in the rugged ARINC 404 form factor,
- VPX backplanes offer tremendous flexibility, and
- VPX offers unparalleled I/O support.

*Sounds Great!!!! But...*
Infinite Possibilities, Infinite Challenges?

So many options that no two customers ever want the same I/O coming out of the system!
Infinite Possibilities, Infinite Challenges?

A backplane and its I/O, designed around a given CPU board, will very likely require a “re-spin” if a different CPU board is used.
Infinite Possibilities, Infinite Challenges?

Also, ARINC 404 chassis form factor severely limits the card cage orientation and backplane access.
Managing the Possibilities

A lot of planning must be done for potential I/O combinations to minimize:

- High development costs,
- Longer development lead times, and
- Risks associated with new development.
Managing the Possibilities

How to get the I/O out in an organized way?
• Offer the most flexibility,
• Best cost
• Best schedule efficiency,
• Best performance, and
• Least risk

_in a rugged design that can support the military environment._
What are the options?

1. Monolithic Backplane & Flex
2. Discrete Backplane & Flex
3. Backplane Cables
4. I/O Transition Board
5. RTM I/O Board
6. VPX RTM Cables
1. Monolithic Backplane & Flex

+ Offers good signal performance
+ High signal density

- Expensive (in low volumes)
- No flexibility:
  - Any change to backplane or I/O incurs expensive development
- Specialized manufacturing/design skills
2. Discrete Backplane & Flex

+ Offers good signal performance
+ High signal density

- Expensive (in low volumes)
- Better flexibility than monolithic flex, but still not great
- Specialized manufacturing & design skills
3. Backplane Cables

- Flexible and can be easily replaced.
- Inexpensive

- Hard to match performance levels
- Cable management is difficult in rugged environment.
- Susceptible to assembly error
4. I/O Transition Board

+ Good signal integrity
+ Can add supporting circuitry
  • Filtering, circuit protection, processing
+ Rugged

- Expensive (in low volume)
- Tight tolerances required
- Flexibility is limited
5. RTM I/O Board

+ Good signal integrity
+ Can add supporting circuitry
  - Filtering, circuit protection, processing
+ Rugged

- Expensive
  - Mostly to add supporting card cage
- Flexibility is limited
- Still potentially requires cabling to route to I/O panel
- Most importantly, not an option in many ATR enclosures where RTM access is not available
6. VPX RTM cables

+ Most flexible (any pin on backplane can be connected)
- Expensive
- Long lead times
- Hard to match performance levels
- Cable management difficult in rugged environment
- Most importantly, not an option in many ATR enclosures where RTM access is not available
Choosing the Best Solution

Factors to balance:

1. Cost
2. Schedule
3. Risk
4. Performance
   - Electrical
   - Environment
5. Flexibility
   - What is most likely to change or upgrade in the future?

Which ones matter most?
Choosing the Best Solution

General guidelines:

– Minimize connection points to improve signal integrity

– Boards/flexes vs. cable assemblies:
  • Less error-prone
  • More $$ in low vol (cable assemblies more $$ in high vol)
  • Better performance
  • Less flexibility

– Hard-mounted products more durable, but require tighter tolerances

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LCR EMBEDDED SYSTEMS, INC.
Helping Our Customers Achieve Their Mission
Combining solutions

Sometime combining various techniques is best

I/O Transition Board & Blade Cables

Discrete Flex & Backplane Cables
Thank you!

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