Radiall

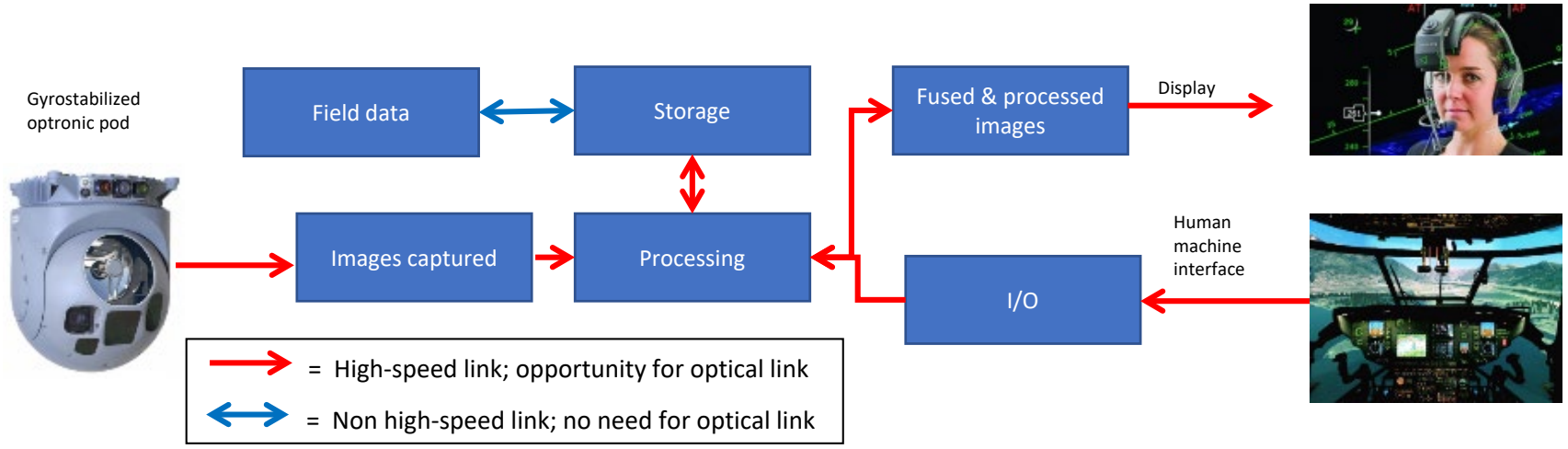
SIMPLIFICATION is our INNOVATION

Inside-the-box Optical Links

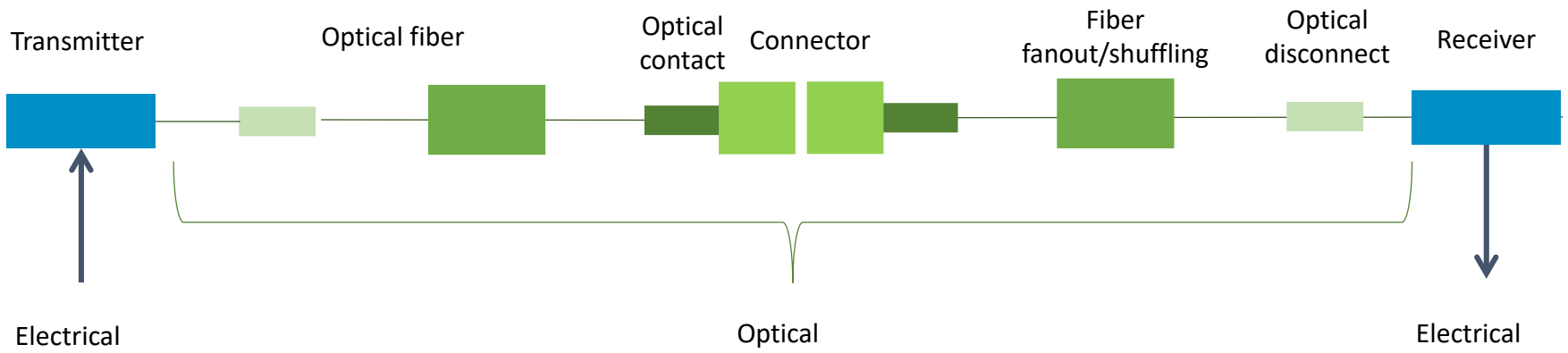
High Speed Interconnect Solutions for harsh environments

Data links: need for speed

- Digitalization of video, communication and radar signals has been a groundswell trend for decades as data converters, sensors and signal processors become faster
- High-speed links are requested more and more to combine data coming from distributed equipment and provide users with enhanced information
- Used in looped real time systems, the need for high speed is going down to Board-to-Board and device-to-device links to ensure a minimum latency



Optical link breakdown



- **Data rate** depends on:
  - Transmitter and receiver speed
  - Fiber BW
  - Link budget (Tx power, Rx sensitivity, fiber and disconnect loss)

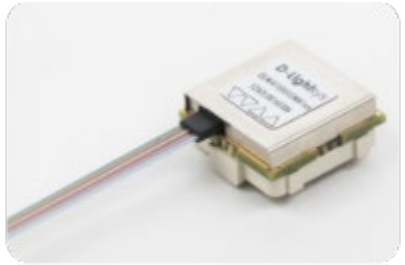
Key parameters for dense and harsh environments:
- Size: density
- Power consumption
- Robustness (vibrations, temperature, shocks)

Opto-electronic converters: small & robust

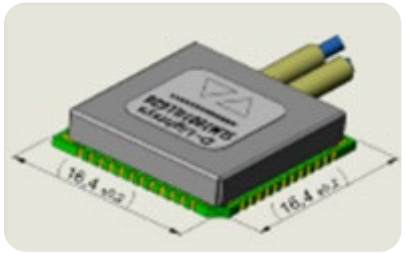
- 100 mW/ channel
- Tx optical power stabilized over -40/+95 °C
- Technology has been flying since 2007 (ARINC 804 compliant)

Size and density

- From 1 to 12 channels per device
- From 0, 1 to 12 Gbps per channel
- Single fiber or ribbon fiber interface



16x16 mm, h< 9 mm

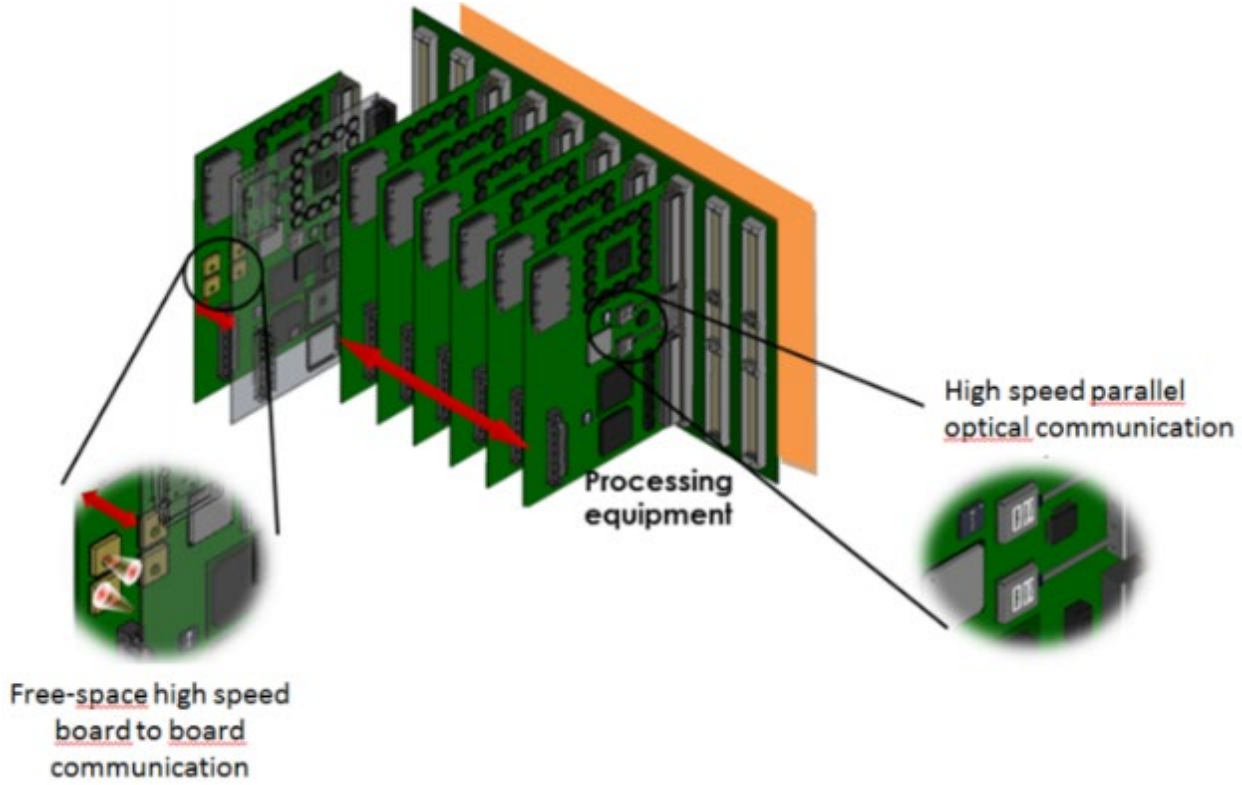


16x16 mm, h< **3.9 mm**

Opto-electronic converters

- Free-space Tx/Rx link can be set between 2 boards, adding direct point-to-point connectivity without loading the backplane board

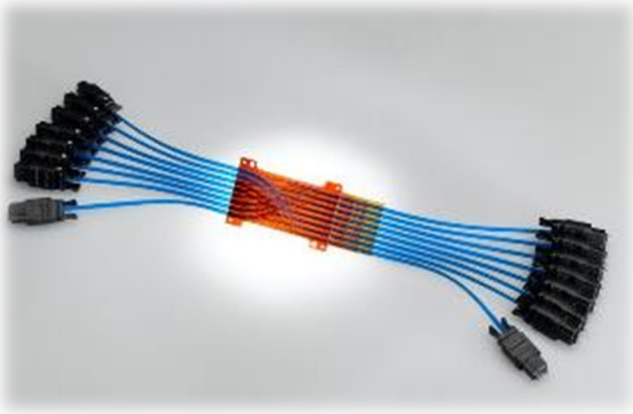
F-Light



Fibers: routing and shuffling

- Fibers must be able to link mid/edge-board components to front/rear panels through a tight path that may cross sharp, hot edges and many components
- Need for thin, strong and agile fiber routes

Ribbon to single fiber fanout



Fiber shuffling through optical flex board

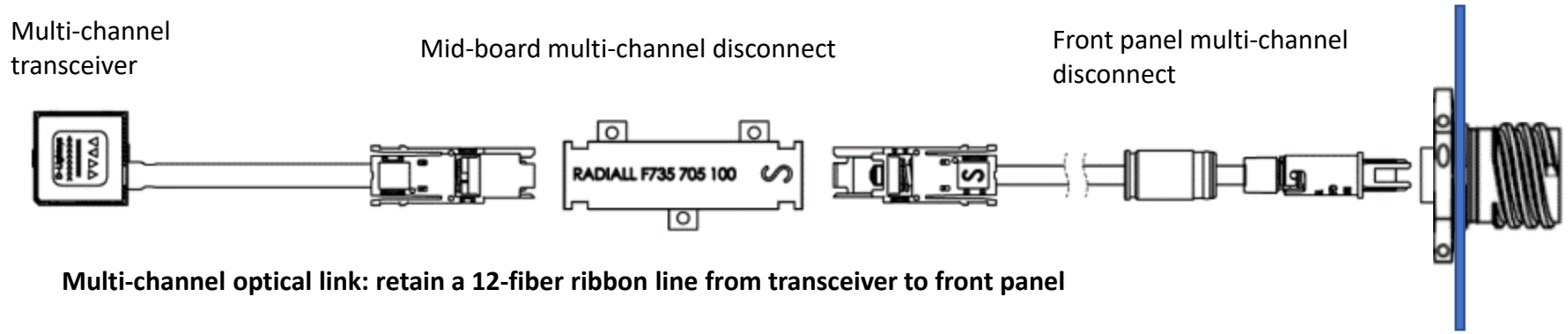
Optical contacts & connectors

- Multi-channel contacts for high density and single-channel contacts for easy shuffling
  - Handling fibers by packs of 12 or through an individual route depends on the box architecture
  - Both solutions are needed in the optical link toolbox and must be mixable along the link

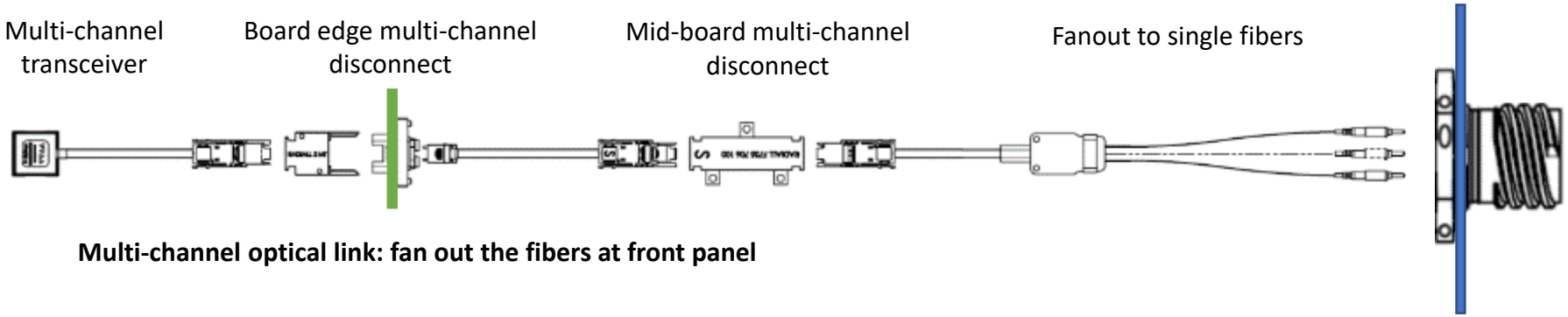
Single channel transceiver equipped with Luxcis ARINC801 contact in 38999 connector

Multi-channel transceiver equipped with Q-MTitan ARINC846 contact in 38999 connector

Complex optical path



Multi-channel optical link: retain a 12-fiber ribbon line from transceiver to front panel



Multi-channel optical link: fan out the fibers at front panel

Front panel
Back plane

Trends for tomorrow

- More speed in smaller size
- Expanding optical links inside the box will require more:
  - Data rate: 28 Gbps, 56 Gbps per channel
  - Density: contacts handling 24, 36, 48 fibers in one disconnect (as far as link budget is kept good enough)
  - Complex shuffling components
- Expansion of optical links inside the box will require less:
  - Component footprints
  - Installation time
  - Optical link TCO

Embedded optical links

- Optical links are fully available to use inside high-speed data processing units
  - Thanks to a well-furnished toolbox, including single-channel and multi-channel components, complex link architectures can be easily set
  - A high number of fibers can be handled in tiny enclosures, leading to huge embedded data streams
  - A full range of ruggedized optical interconnects and transceivers is available for embedded systems operating in harsh environments. Most of them are already qualified for aviation standards

- The end-to-end link has to be designed as a whole to optimize density and TCO versus functionality
  - Choice of single or multi-channel package
  - Shuffling parts to achieve complex point-to-point links

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Thank You