An FPGA Mezzanine Card (FMC) is a compact, high-performance add-on card that follows the VITA 57 standard. It provides a flexible, modular way to expand the functionality of FPGAs (Field-Programmable Gate Arrays), especially in applications requiring high-speed data acquisition, signal processing, and communication.

Key Features of FPGA Mezzanine Cards (FMCs):

1. High-Speed Connectivity – FMCs use high-density, low-latency connectors to interface directly with FPGA boards.
2. Modular Design – They allow for swappable I/O interfaces, making it easy to adapt FPGA systems to different use cases.
3. Analog & Digital Interfaces – FMCs support various I/O types:
    - Analog-to-Digital (ADC) / Digital-to-Analog (DAC)
    - RF transceivers
    - Camera interfaces
    - Networking (e.g., 10G Ethernet)
4. VITA 57 Standardization – Ensures interoperability between FPGA platforms and mezzanine cards from different vendors.
5. Compact & Rugged – Designed for high-reliability applications, including aerospace, defense, and industrial automation.

Types of FMCs:

- FMC (Standard): Supports single-ended and differential signals.
- FMC+ (Enhanced): Offers more pins and bandwidth, following VITA 57.4.

Common Applications:

- Software-Defined Radio (SDR)
- Radar and Signal Processing
- High-Speed Data Acquisition
- Machine Learning and AI Acceleration
- Networking and Communication Systems

The VCU108 is a development board from Xilinx (now AMD), designed for high-performance applications using the Virtex UltraScale XCVU095 FPGA. It serves as a versatile platform for prototyping and evaluating high-speed interfaces, DSP applications, and advanced system designs.

Key Features of the VCU108 Board:

1. FPGA Chip:
    - Virtex UltraScale XCVU095-2FFVA2104E
    - High DSP and logic density for compute-intensive applications
2. Memory & Storage:
    - 4GB (2x2GB) DDR4 SODIMM with ECC support
    - 512MB QSPI Flash for FPGA configuration
    - SD card slot for external storage
3. High-Speed I/O & Expansion:
    - FMC+ (FPGA Mezzanine Card) Connector – Compatible with VITA 57.4 standard
    - QSFP+ Cage (2x) – Supports up to 100G Ethernet or optical networking
    - PCIe Gen3 x8 interface – Enables FPGA acceleration in host systems
    - SMA connectors – For clock and RF signal testing
4. Clocking & Debugging:
    - Onboard programmable clocks for flexible frequency settings
    - JTAG, UART, and I2C interfaces for debugging and control
    - System Monitor (XADC) for real-time voltage and temperature tracking
5. Power & Form Factor:
    - Runs on a 12V power input with efficient regulators
    - ATX form factor, suitable for lab and rack-mounted setups

Applications of VCU108:

- High-speed networking (Ethernet, PCIe, InfiniBand)
- Radar & Signal Processing
- Data Centers & AI acceleration
- Aerospace & Defense prototyping
- Video processing and broadcast applications