

# ETX-5

## Ethernet Service Aggregation Platform



- Feature-rich CE2.0-certified aggregation platform, the cornerstone of RAD's Service Assured Access (SAA) solution
- Ideal for carriers, wholesalers and mobile operators, building fully redundant networks with diverse topologies for delivery and monitoring of MEF-certified Ethernet and TDM-over-packet services
- Unmatched level of resiliency with self-healing Ethernet rings and LAG, enhanced traffic management capabilities for fully color-aware networks
- Hardware-based OAM and diagnostics for scalable and accurate traffic monitoring, quick fault detection and user-friendly troubleshooting
- Easy service provisioning, using the Service Manager application and Performance Monitoring portal



### MARKET SEGMENTS AND APPLICATIONS

The ETX-5 Carrier Ethernet aggregation platform, together with the ETX-2 Carrier Ethernet demarcation device, are the main components of RAD's Service Assured Access solution, providing SLA-based services, Ethernet business services, legacy TDM service emulation and mobile backhaul. It is ideal for carrier-to-carrier connectivity applications complying with MEF 26, as well as for high capacity grooming of Ethernet OAM and performance monitoring sessions. This 3U modular system features high port density for space-restricted facilities.

ETX-5 features non-blocking architecture, allowing wire-speed forwarding of all packet sizes. It is designed for high availability and "Always-On" service.

Operating over various topologies (linear, daisy chain, and self-healing G.8032v2 rings), ETX-5 builds a complete color-aware access network.

ETX-5 provides CE2.0-certified Ethernet services including:

- E-Line (EPL and EVPL) for LAN-to-LAN, VoIP and IP-VPN connectivity, as well as for storage and dedicated Internet access
- E-LAN (EP-LAN and EVP-LAN) for multipoint Layer-2 VPN, transparent LAN services and multicast networks
- E-Tree (EP-Tree and EVP-Tree) for combining multiple Ethernet technologies across different domains
- E-Access for reaching the service provider's out-of-franchise subscriber locations as part of the end-to-end service
- 2G, 3GPP, LTE and LTE-A transport.

ETX-5 is available as temperature-hardened or NEBS-compliant (DC only) chassis intended for street-cabinets and cellular-tower installations. These options operate at the extended temperature range of -20 to 65°C (-4 to 149°F). The temperature-hardened model requires hardened main, I/O and service cards, as well as industrially hardened SFPs and XFPs.



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### CARRIER INTEROPERABILITY

ETX-5 is interoperable with RAD's intelligent Ethernet demarcation devices (ETX-2, ETX-1, MiNID), and TDM pseudowire gateways (IPmux), to build optimized access networks – both TDM and packet-based – over PSN.

Fault-tolerant hardware design with fully redundant timing, management and power sub-systems, prevents service downtime.

### ETHERNET 2.0

ETX-5 incorporates a complete set of CE 2.0-certified Ethernet service tools that allow the service provider to distinguish between high- and low-priority traffic, and to optimize TCP sessions.

### Traffic Management

ETX-5 efficiently handles multi-priority traffic on a per-flow basis. Its 120-Gbps capacity enables simultaneous processing of thousands of flows, allowing service providers to deploy true traffic-engineered, color-aware networks.

The powerful H-QoS traffic manager performs hierarchical scheduling and shaping at port-, tunnel- and EVC-level. It employs two-rate, three-color policers and advanced color mapping/marking techniques to deliver a true multi-CoS solution. Multi-curve WRED profiles assure CIR traffic priority over EIR.

### OAM

A hardware-based OAM CFM mechanism with Up and Down MEP support provides enhanced scale of line-rate CCM/DMM/LMM measurement for end-to-end service assurance, according to IEEE 802.1ag-D8 requirements. ETX-5 monitors performance per Y.1731.

Point-to-point Ethernet links can be monitored, using OAM EFM technology, as defined by IEEE 802.3ah. ETX-5 uses OAM EFM for discovery of OAM-enabled entities, event notification and loopback control.

### SMART SFP

GbE ports on the E5-GbE-20 card can host up to ten unmanaged smart SFPs for Ethernet over TDM (MiRiCi-E1/T1 or MiRiCi-E3/T3) or pseudowire (MiTOP-E1/T1 or MiTOP-E3/T3) functionality.

### RESILIENCY

ETX-5 functions as a fully-redundant aggregation and demarcation point that enables end-to-end visibility and smooth service hand-off. ETX-5 offers various tools to ensure continuous availability and sub-50 ms restoration in the event of network outage.

The following port and service protection mechanisms are employed: LAG (protection and load-balancing), ERP (G.8032v2, including multiple virtual rings on the same physical ports), Ethernet protection grouping (dual homing), TDM MSP/APS.

A fault propagation mechanism propagates failures from and to Ethernet ports, LAG or at OAM (CFM) level. This ensures that the traffic is sent via operational links. If a failure occurs, the unit triggers redundancy mechanisms at user equipment.

## Applications

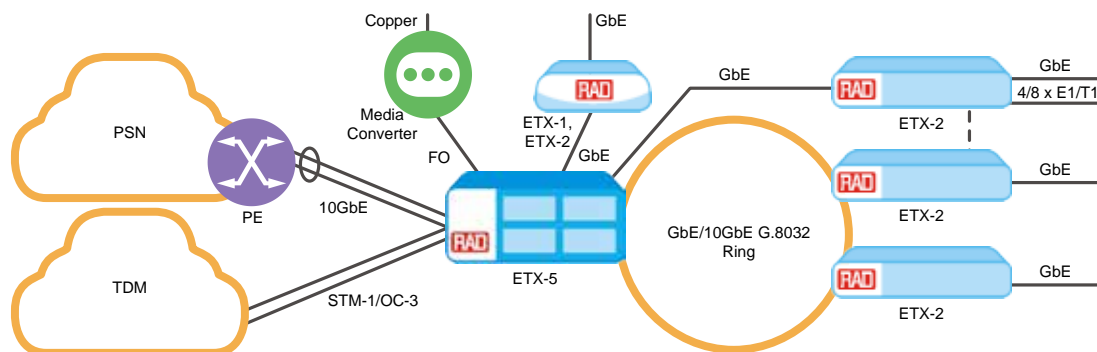


Figure 1. Access Aggregation with SLA-Based Services

ETX-5 supports multiple access topologies (linear, mesh and ring) and services (E-Line, E-LAN, E-Access) with redundancy (LAG, ring). It aggregates Ethernet traffic from a variety of advanced NIDs, featuring hardware OAM and traffic management.

## TIMING AND SYNCHRONIZATION

Incorporating RAD's SyncToP synchronization over packet and Ethernet physical layer (Sync-E), ETX-5 utilizes standard technologies to ensure accurate clock recovery and distribution, with IEEE-1588v2 grandmaster functionality and Sync-E support over all Ethernet ports.

## MONITORING AND DIAGNOSTICS

### Performance Management Portal

ETX-5 is integrated into the Performance Management portal of the RADview network management system, enabling real-time monitoring of Ethernet service performance by collecting KPI data from RAD devices.

### Y.1564

A standard service activation tool (Y.1564 generator/responder) is used to assess the configuration and performance of an Ethernet service prior to customer notification and delivery.

### Loopback Tests

Local and remote port loopbacks, as well as flow MAC swap loopbacks, offer advanced diagnostic tools.

## LLDP

Link Layer Discovery Protocol (LLDP) allows ETX-5 ports to advertise information to management systems.

## MANAGEMENT AND SECURITY

The device can be managed via RADview, RAD's carrier-class NMS for Windows, Unix and Linux. ETX-5 also supports a variety of access protocols, including CLI over Telnet, SNMPv3, and TFTP. Security features include SSH, SNMPv3, RADIUS and TACACS+.

ETX-5 uses the **RADview Service Manager** provisioning system for creating, testing and monitoring networks.

Windows-based standalone element manager, Shelf View, displays a dynamic graphic representation of the device panel(s), providing an intuitive, user-friendly GUI for monitoring and configuration.

## Specifications

### CAPACITY

#### Switching

200 GB half duplex

#### MTU

Up to 12 kB (user configurable for 1GbE IO card ports and 10GbE IO card ports)

#### Classification

According to outer or outer+inner VLAN, P-bit, IP Precedence, DSCP, Ethertype, IP/MAC source/destination address

#### VLAN Editing

Inner/outer VLAN editing per VLAN and P-bit

#### Ring over Load Balancing LAG

Up to 40/4 GbE over 4x10Gb ports

### 10GBE INTERFACES

Four 10GbE on main card, NNI

Two 10GbE on I/O card, UNI/NNI

SFP+/XFP: 10GBASE-SR, 10GBASE-LR and 10GBASE-ER

### FE/GBE INTERFACES

20 GbE on I/O card, NNI or UNI, SFP or UTP

SFP: 100BaseFx/1000BaseSx/Lx, 10/100/1000BaseTx

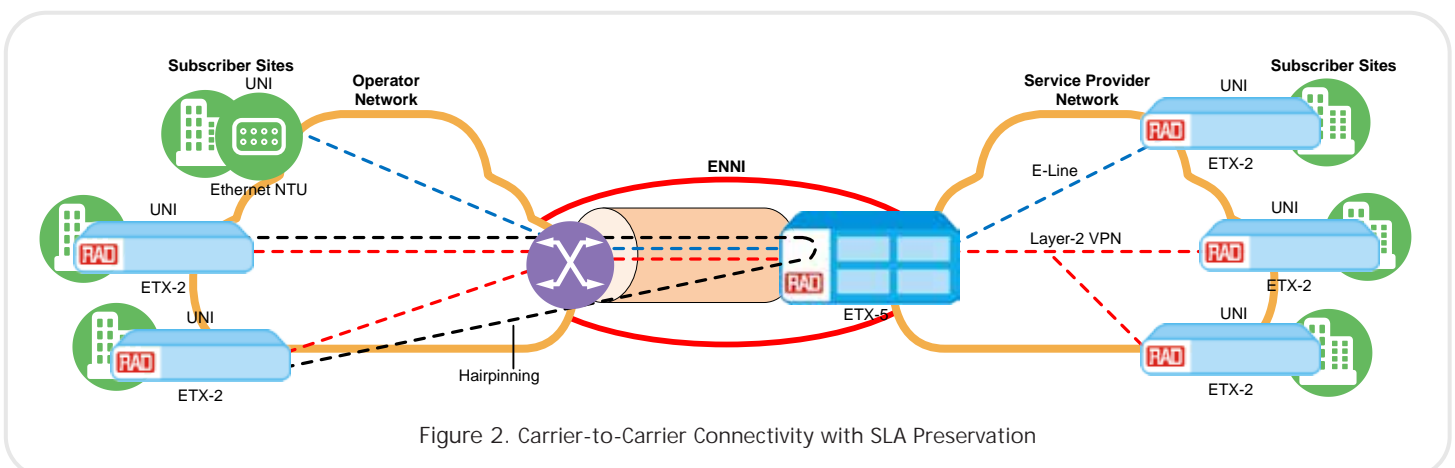


Figure 2. Carrier-to-Carrier Connectivity with SLA Preservation

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### FE/GBE AND 10GBE SFP/SFP+/XFP

For the list of supported SFP/SFP+/XFP transceivers, see the [SFP/XFP Compatibility](#) document on the product webpage.

**Note:** It is strongly recommended to order this device with **original** RAD SFP/SFP+/XFP devices **installed**. This will ensure that prior to shipping, RAD has performed comprehensive functional quality tests on the entire assembled unit, including the SFP/XFP devices. RAD cannot guarantee full compliance to product specifications for units using non-RAD SFPs.

### SDH/SONET INTERFACES

4 channelized STM-1/OC-3 on I/O card  
2 × STM-4/OC-12 (1+1 redundant) on I/O card  
Compliance: G. 783/G.825 (STM-1),  
Telecordia GR-253 core (OC-3), G.707

### NETWORK TOPOLOGY

Linear, ring per G.8032v2 with ladder topology

**Services**  
E-Line, E-LAN, E-Tree, E-Access

**Compliance**  
CE2.0, MEF 6, MEF 8, MEF 9,  
MEF 10/10.1/10.2, MEF 11, MEF 14,  
MEF 22, MEF 26

### BRIDGE

**Compliance**  
802.1D, 802.1Q, 802.1ad (provider bridge)

**Mode**  
VLAN-aware

**Spanning Tree Protocols**  
Up to 32 RSTP/MSTP instances per chassis

### ROUTER

IP forwarding, static routing  
Multiple IP addresses (up to 10) per router interface

### PSEUDOWIRE

**Payload Encapsulation**  
CESoPSN, SAToP

**Network Encapsulation**  
MEF 8, UDP/IP

**Capacity**  
Up to 252 E1 or 336 T1 TDM PWs per I/O card

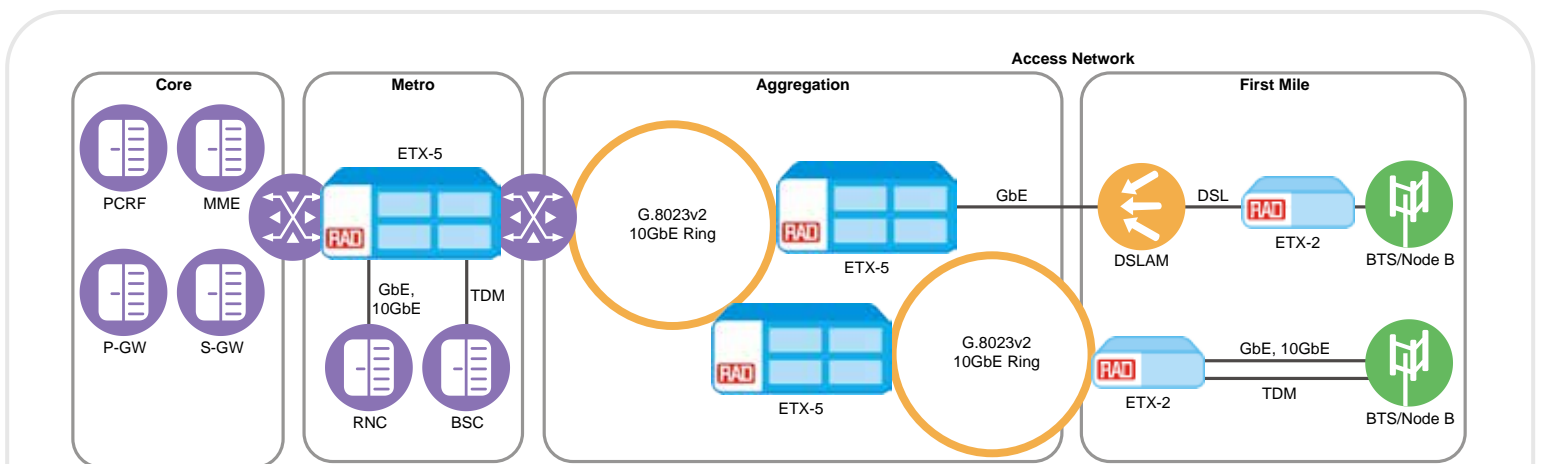


Figure 3. Mobile Backhaul

ETX-5 can be used by fixed and mobile carriers building their own access infrastructure to provide cell-site connectivity. It aggregates base station traffic, serves as an intelligent demarcation device with GbE/10GbE fiber connectivity and allows ring connectivity towards the backhaul.

**QUALITY OF SERVICE (H-QoS)****Capacity**

3 levels with EVC, tunnel and port-level scheduling and shaping

8 ' CoS per EVC scheduling and shaping elements

**CoS Mapping**

Per flow, P-bit, DSCP, IP precedence

**Congestion Avoidance**

WRED per queue

**Shapers**

Single- and dual-rate

**Policers**

Dual-rate three-color policer on ingress flows with up to 10 Gbps rate

**OAM CFM****Type**

Hardware-based, per EVC and EVC.CoS

**Compliance**

IEEE-802.1ag, ITU-TY.1731

**OAM EFM****Type**

Active, passive

**Functions**

Discovery, event notification, loopback control

**Compliance**

IEEE 802.3ah

**TIMING****Synchronous Ethernet**

G.8261, G.8263, G.781

**1588v2 PTP**

Ordinary clock grandmaster or slave

E2E, one-step transparent clock (TC)

Phase and frequency synchronization

TOD interface

1 PPS, 10 MHz signal

**Clock Sources**

Domain:

Synchronous Ethernet

1588v2 packets

BITS (2.048 MHz, 1.544 MHz)

TOD interface (10 MHz)

STM-1/OC-3

STM-4/OC-12

E1/T1:

Tx clock derived from internal E1/T1

Adaptive, recovered from TDM PW

**Domain Clock Resiliency**

Redundant clock sources per main card:

- 1588v2 grandmaster and slave
- GPS interface (1PPS/10 MHz/TOD)
- BITS

**Compliance**

GR-253-CORE (SONET), GR-1244-CORE (Stratum 3), ITU-G813 Option 1/2 (SDH Equipment Clock)

**MANAGEMENT****Ethernet Management Port**

Type: 10/100/1000BaseT  
Connector: RJ-45

**Control Port**

Interface: V.24/RS-232 DCE  
Connector: 9-pin D-type, female

**Management Options**

Command line interface with password protected access, authorization levels

Telnet/SSH, SNMPv2/v3, RADview, SFTP

RADIUS, TACACS+, management ACL

Default IP address for management "out of the box"

IPv6 management capable

**RESILIENCY**

Hot-swappable cards

Card- and port-level traffic redundancy

Management sub-system redundancy

Domain clock redundancy

Dual power supply

Replaceable fan tray

**Link Aggregation**

Protection or load-balancing LAG with LACP between Ethernet ports on the same or different cards as per IEEE 802.3-2005, and 802.1ax requirements

**G.8032v2 Ring**

Up to 16 simultaneous rings between Ethernet ports on the same or different cards

**MSP/APS**

1+1 unidirectional between TDM ports on the same or different I/O cards

**Ethernet Dual Homing**

Up to 8 1:1 bidirectional protection groups

**Ring over Load Balancing LAG**

Up to 40/4 GbE over 4x10Gb ports

**MONITORING AND DIAGNOSTICS****Alarms**

Hard-coded alarm severity, masking

**ITU Y.1564**

Verification of Ethernet service configuration and delivery

Up to 64 generators, 40 responders

**Digital Diagnostics Monitoring SFPs**

SFF-8472-compatible SFPs, excluding external calibration

**LLDP**

LLDP is supported for main card ports, I/O card ports, and the Ethernet management port for the mode nearest bridge (Tx and Rx)

**Loopbacks**

Local and remote loopbacks on 1GbE and 10GbE IO card ports, and main card ports

Flow MAC swap loopbacks when egress port is IO card port (1GbE, 10GbE) or IO card LAG (protection or load balancing)

**MEF 36**

Support for standard OAM/CFM counters

**In-Service Ping**

Single command provides simple connectivity test across L2 service paths

**GENERAL****Physical**

Regular chassis:

Height: 133 mm (5.2 in)

Width: 440 mm (17.3 in)

Depth: 380 mm (15 in), DC version

Depth: 455 mm (23.6 in), AC version

Weight: 12 kg (26.4 lb), maximum

NEBS-compliant chassis:

Height: 132.5 mm (5.2 in)

Width: 541.6 mm (21.3 in)

Depth: 385.2 mm (15.1 in)

Weight: 20 kg (44 lb), maximum

**Power**

AC: 100 to 240 VAC (115/230 VAC nominal), 50/60 Hz

DC: 40–72 VDC (48 or 60 VDC nominal)

**Power Consumption**

AC: 590W max, 540W average under full traffic load

DC: 520W max, 480W average under full traffic load

**Environment**

Temperature:

Operating: Regular chassis: 0 to 50°C (32 to 122°F)

Temperature-hardened chassis: –20 to 65°C (–4 to 149°F)

Storage: –20 to +70°C (0 to 150°F)

Humidity: Up to 93%, non-condensing

Cooling: Replaceable fan tray

## Ordering

ETX-5 must be ordered with the RADcare BasicPlus Service Package (minimum 1 year) and the RADcare Professional Service Package.

In the USA and Canada, ETX-5 must be ordered with the RADcare Project Assurance Package only.

### RECOMMENDED CONFIGURATIONS

#### Chassis

##### ETX-5300A/AC

Chassis with fan unit, AC power supply and AC power inlet

##### ETX-5300A/ACDC

Chassis with fan unit, AC and DC power supplies, AC and DC power inlets

##### ETX-5300A/ACR

Chassis with fan unit, two AC power supplies and two AC power inlets

##### ETX-5300A/DC

Chassis with fan unit, DC power supply and DC power inlet

##### ETX-5300A/DCR

Chassis with fan unit, two DC power supplies and two DC power inlets

##### ETX-5300A/NB/DC

NEBS-compliant chassis with fan unit, DC power supply and DC power inlet

##### ETX-5300A/NB/DCR

NEBS-compliant chassis with fan unit, two DC power supplies and two DC power inlets

##### ETX-5300A/NBH/DC

NEBS-compliant chassis with fan unit, DC power supply and DC power inlet, temperature-hardened

##### ETX-5300A/NBH/DCR

NEBS-compliant chassis with fan unit, two DC power supplies and two DC power inlets, temperature-hardened

**Notes:** NEBS-compliant chassis must be ordered with air filter (ETX-5300A-AF), see the Service Card section below.

#### Main and I/O Cards

**Note:** Temperature-hardened chassis supports up to two temperature-hardened E5 GBE-20 or E5-10GBE-2 cards.

##### ETX-5300A-MC/4 XFP/AT

Main card with four 10GbE ports, XFP slots, advanced timing capabilities

##### ETX-5300A-MC/4 XFP/AT/H

Main card with four 10GbE ports, XFP slots, advanced timing capabilities, temperature-hardened

##### ETX-5300A-ETH/20XGE/SFP

GbE card with 20 GbE ports, SFP slots

##### ETX-5300A-ETH/20XGE/SFP/H

GbE card with 20 GbE ports, SFP slots, temperature-hardened

##### ETX-5300A-ETH/20XGE/UTP

GbE card with 20 GbE ports, UTP

##### ETX-5300A-ETH/20XGE/UTP/H

GbE card with 20 GbE ports, UTP, temperature-hardened

##### ETX-5300A-ETH/2X10GE/XFP

10GbE card with two 10GbE ports, XFP slots

##### ETX-5300A-ETH/2X10GE/XFP/H

10GbE card with two 10GbE ports, XFP slots, temperature-hardened

##### ETX-5300A-MS/CH/S4

SDH/SONET card with four channelized STM-1/OC-3 ports, SFP slots

##### ETX-5300A-MS/CH/S4/H

SDH/SONET card with four channelized STM-1/OC-3 ports, SFP slots, temperature-hardened

##### ETX-5300A-MS/CH/STM4

SDH/SONET card with an STM-4/OC-12 port (1+1 redundant), SFP slots

##### ETX-5300A-MC/4SFP-P/AT

ETX-5300A Main Card, quad 1/10GbE SFP+ port, advanced timing capabilities, 1588v2 master mode & SyncTop

##### ETX-5300A-MC/4SFP-P/AT/H

ETX-5300A Main Card, quad 1/10GbE SFP+ port, advanced timing capabilities, 1588v2 master mode & SyncTop, hardened enclosure

#### Service Cards

##### ETX-5300A-FAN

Fan unit

##### ETX-5300A-FAN/H

Fan unit, temperature-hardened

##### ETX-5300A-FAN/NBH

NEBS-compliant fan unit, temperature-hardened

##### ETX-5300A-FAN/NB

NEBS-compliant fan unit

##### ETX-5300A-PS/AC

AC power supply

##### ETX-5300A-PS/AC/H

AC power supply, temperature-hardened

##### ETX-5300A-PS/DC

DC power supply

##### ETX-5300A-PS/DC/H

DC power supply, temperature-hardened

##### ETX-5300A-PSI

AC power inlet

##### ETX-5300A-AF

Air filter, required for NEBS-complaint chassis

### SPECIAL CONFIGURATIONS

Contact your local RAD partner for additional configuration options.



## ETX-5

## Ethernet Service Aggregation Platform

## SUPPLIED ACCESSORIES

**RM-ETX-5300-3U-19-FRONT**

Hardware kit for front-edge mounting of ETX-5 into a 19" rack

**RM-ETX-5300-AC-3U-19-FRONT**

Hardware kit for front-edge mounting and rear-end fastening of ETX-5 in a 19" rack

## OPTIONAL ACCESSORIES

**RM-ETX-5300-3U-23-FRONT**

Hardware kit for front-edge mounting of ETX-5 into a 23" rack

**RM-ETX-5300-3U-23-FRAME**

Hardware kit for mid-chassis mounting of ETX-5 into a 23" rack

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