LIN

BLF Logging Format

Specification

Version 1.14 of 2020-02-07

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VECTOR

Document Management

Revision list

Version	Date	Editor	Section	Changes, comments
1.0	2009-04-08	Sha	All	Creation
1.1	2009-04-15	Sha	3.3, 3.4, 3.5	Format has been extended for CANoe/CANalyzer 7.1 SP3
1.2	2009-04-15	Sha	2.5	Added explanation of State code=14
1.3	2009-05-19	Gia	1	Added Disclaimer
1.4	2009-08-27	Sha	3.3.3, 3.4.3, 3.5.3, 3.6.2	Format has been extended for CANoe/CANalyzer 7.2
1.5	2010-01-15	Sc	All	New member mObjectVersion in VBLObjectHeader and VBLObjectHeader2 and mChecksumModel in VBLLINMessageDescriptor.
1.6	2010-02-09	Sc	3.1.6	Correction of typo (mObjectHeader => mObjectVersion)
1.7	2010-02-17	Sha	3.1.6; 3.3.3; 3.4.3; 3.5.3; 3.6.2	Cosmetic correction to changes done in v. 1.5 and v1.6
1.8	2010-08-24	Sc	3.17, 3.18	New events VBLLINUnexpectedWakeup and VBLLINShortOrSlowResponse
1.9	2010-08-27	Sc	3.19	New event VBLLINDisturbanceEvent
1.10	2010-10-27	Sha	3.17, 3.18; 3.19	Cosmetic correction to changes done in v. 1.8 and v1.9
1.11	2013-03-11	Vrd	3.4.3, 3.5.3,3.6.2	New reserved fields VBLLINSendError2, VBLLINCRCError2 & VBLLINReceiveError2
1.12	2014-09-15	Mth	3.20	New event VBLLINShortOrSlowResponse2
1.13	2016-03-02	Set	3.14	Extended event VBLLINSchedulerModeChange
1.13.1	2017-04-19	Mom	All	CI and layout
1.14	2020-02-07	vsn	3	Public API uses standard types, e.g. uint32_t instead of DWORD. Mentioned Linux libbinlog.so

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1 Disclaimer

Severability clause - Restrictions for the usage of Vector logging data formats outside of Vector products

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2 Overview

The document specifies the format of LIN events in the CANoe/CANalyzer BLF logging. The described structures can be used to read and write BLF logging files using the binlog.dll or libbinlog.so, which can be found in the CANoe/CANalyzer User Data folder:

<UserDataFolder>\Programming\BLF_Logging

3 Format Description

3.1 Common Data Types

3.1.1 VBLObjectHeaderBase

Description: Object header base structure.

Parameter	Type	Description
mSignature	uint32_t	Object signature, normally `BL_OBJ_SIGNATURE`.
mHeaderSize	uint16_t	Size of header in bytes `sizeof(VBLObjectHeader)` or `sizeof(VBLObjectHeader2)` depending on the object header type used for the object.
mHeaderVersion	uint16_t	Version number of object header. Following values are possible: 1: Object has a member of type `VBLObjectHeader`. 2: Object has a member of type `VBLObjectHeader2`.
mObjectSize	uint32_t	Object size in bytes.
mObjectType	uint32_t	Object type (`BL_OBJ_TYPE_*`).

3.1.2 VBLObjectHeader

Description: Object header. Version 1.

Parameter	Type	Description
mBase	VBLObjectHeaderBase	Common object header base. See 3.1.1.
mObjectFlags	uint32_t	Unit of object timestamp. Following values are possible: 1: Object time stamp is saved as multiple of ten microseconds (`BL_OBJ_FLAG_TIME_TEN_MICS`) 2: Object time stamp is saved in nanoseconds. (`BL_OBJ_FLAG_TIME_ONE_NANS`)
mReserved	uint16_t	Reserved, has to be set to 0.
mObjectVersion	uint16_t	Object specific version, has to be set to 0 unless stated otherwise in the description of a specific event.
mObjectTimeStamp	uint64_t	Timestamp of this object in the unit specified in mObjectFlags.

3.1.3 VBLObjectHeader2

Description: Object header. Version 2.

Parameter	Type	Description
mBase	VBLObjectHeaderBase	Common object header base. See 3.1.1.
mObjectFlags	uint32_t	Unit of object timestamp. Following values are possible: 1: Object time stamp is saved as multiple of ten microseconds (`BL_OBJ_FLAG_TIME_TEN_MICS`) 2: Object time stamp is saved in nanoseconds. (`BL_OBJ_FLAG_TIME_ONE_NANS`)
mTimeStampStatus	uint8_t	Bit field. The bits have the following meanings: Bit 0: Determines whether original timestamp member is valid (1) or not (0). Bit 1: Timestamp is generated by software (1) or by hardware (0). Bit 5: This bit has protocol specific meaning.
mReserved1	uint8_t	Reserved, has to be set to 0.
mObjectVersion	uint16_t	Object specific version, has to be set to 0 unless stated otherwise in the description of a specific event.
mObjectTimeStamp	uint64_t	Time stamp of this object in the unit specified in mObjectFlags.
mOriginalTimeStamp	uint64_t	Original timestamp in the unit specified in mObjectFlags..

3.1.4 VBLLINBusEvent

Description: Common header of LIN bus events

Parameter	Type	Description
mSOF	uint64_t	Timestamp of frame/event start
mEventBaudrate	uint32_t	Baudrate of frame/event in bit/sec
mChannel	uint16_t	Channel number where the frame/event notified
mReserved[2]	uint8_t	Reserved, has to be set to 0.

3.1.5 VBLLINSynchFieldEvent

Description: Common header of LIN bus events containing break field data

Parameter	Type	Description
mLinBusEvent	VBLLINBusEvent	Common LIN bus event header. See 0
mSynchBreakLength	uint64_t	Length of dominant part [in nanoseconds]
mSynchDelLength	uint64_t	Length of delimiter (recessive) [in nanoseconds]

3.1.6 VBLLINMessageDescriptor

Description: Common header of LIN bus events containing LIN header data

Parameter	Type	Description
mLinSynchFieldEvent	VBLLINSynchFieldEvent	Common LIN bus event header. See 3.1.5
mSupplierID	uint16_t	Supplier identifier of the frame's transmitter as it is specified in LDF. LIN protocol 2.0 and higher
mMessageID	uint16_t	LIN protocol 2.0: Message identifier (16-bit) of the frame as it is specified in LDF in the list of transmitter's configurable frames. LIN protocol 2.1: Position index of the frame as it is specified in LDF in the list of transmitter's configurable frames.
mNAD	uint8_t	Configured Node Address of the frame's transmitter as it is specified in LDF. LIN protocol 2.0 and higher
mID	uint8_t	Frame identifier (6-bit)
mDLC	uint8_t	Frame length [in bytes]
mChecksumModel	uint8_t	Expected checksum model of checksum value. Only valid if mObjectVersion >= 1.

3.1.7 VBLLINDatabyteTimestampEvent

Description: Common header of LIN bus events containing response data bytes

Parameter	Type	Description
mLinMsgDescrEvent	VBLLINMessageDescriptor	Common LIN bus event header. See 3.1.6
mDatabyteTimestamps[9]	uint64_t	Data byte timestamps [in nanoseconds] Index 0 corresponds to last header byte Indexes 1-9 correspond to response data bytes D1-D8

3.1.8 Direction

Direction of bus events.

Value	Description
0	Rx (received)
1	Tx (transmit receipt)
2	Tx Request (transmit request)

3.2 Obsolete Types

3.2.1 VBLLINMessage

Description: LIN frame received or transmitted on a LIN channel.

Corresponding object type: `BL_OBJ_TYPE_LIN_MESSAGE`

Obsolete object. Used up to CANoe/CANalyzer version 6.0

Parameter	Type	Description
mHeader	VBLObjectHeader	Common header type. See 3.1.2.
mChannel	uint16_t	Channel number where the frame sent/received.
mID	uint8_t	Frame identifier
mDLC	uint8_t	Frame length
mData[8]	uint8_t	Databyte values
mFSMId	uint8_t	Slave Identifier in the Final State Machine (obsolete)
mFSMState	uint8_t	State Identifier of a Slave in the Final State Machine (obsolete)
mHeaderTime	uint8_t	Duration of the frame header [in bit times]
mFullTime	uint8_t	Duration of the entire frame [in bit times]
mCRC	uint16_t	Checksum byte value
mDir	uint8_t	See 3.1.8
mReserved	uint8_t	Reserved, has to be set to 0.

3.2.2 VBLLINCRCError

Description: Checksum error event occurring when Slave sends an incorrect checksum value for a frame response that is otherwise correct.

Corresponding object type: `BL_OBJ_TYPE_LIN_CRC_ERROR`

Obsolete object. Used up to CANoe/CANalyzer version 6.0

Parameter	Type	Description
mHeader	VBLObjectHeader	Common header type. See 3.1.2.
mChannel	uint16_t	Channel number where the event notified
mID	uint8_t	Frame identifier
mDLC	uint8_t	Frame length
mData[8]	uint8_t	Databyte values
mFSMId	uint8_t	Slave Identifier in the Final State Machine (obsolete)
mFSMState	uint8_t	State Identifier of a Slave in the Final State Machine (obsolete)
mHeaderTime	uint8_t	Duration of the frame header [in bit times]
mFullTime	uint8_t	Duration of the entire frame [in bit times]
mCRC	uint16_t	Checksum byte value
mDir	uint8_t	See 3.1.8
mReserved	uint8_t	Reserved, has to be set to 0.

3.2.3 VBLLINReceiveError

Description: This event may have a wide variety of causes.

An external Master can cause a receive error event:

- by transmitting sync break that is too short,
- by not returning the correct value `0x55` in the sync field,
- by assigning an incorrect parity to the frame identifier.

Other reasons:

- Slave transmitting an illegal character during a Bus Idle phase (e.g. because it did not finish transmission quickly enough and the checksum byte of the response was sent during the Bus Idle phase),
- Faulty (dominant) stop bit (i.e. framing error),
- LIN hardware receives a character that is different from the character sent during transmission
- LIN hardware only receives part of a frame, at the start of a measurement (in a correctly functioning system).

Corresponding object type: `BL_OBJ_TYPE_LIN_RCV_ERROR`

Obsolete object. Used up to CANoe/CANalyzer version 6.0

Parameter	Type	Description
mHeader	VBLObjectHeader	Common header type. See 3.1.2.

Parameter	Type	Description
mChannel	uint16_t	Channel number where the event notified
mID	uint8_t	Frame identifier
mDLC	uint8_t	Frame length
mFSMId	uint8_t	Slave Identifier in the Final State Machine (obsolete)
mFSMState	uint8_t	State Identifier of a Slave in the Final State Machine (obsolete)
mHeaderTime	uint8_t	Duration of the frame header [in bit times]
mFullTime	uint8_t	Duration of the entire frame [in bit times]
mStateReason	uint8_t	The lower 4 bits indicate the LIN hard-ware state at the time the error has occurred, while the upper 4 bits indicate the reason of the error Values for the state: 0: Bus idle 1: Waiting for SynchBreak 2: Waiting for SynchField 3: Waiting for frame ID 4-12: Waiting for data byte or checksum byte depending on the frame length. E.g. value 4 for FrameLength=0, value 12 for FrameLength=8 15: Not expected event (i.e. not WakeupRequest) during sleep mode. Occurs for LIN hardware in Master mode only Values for the reason: 0: Timeout 1: Received an unexpected byte violating protocol. In this case, mOffendingByte member contains its value 2: Received a byte with framing error (with dominant stop bit). In this case, mOffendingByte member contains its value 3: Unexpected Break field 4: Unidentified error
mOffendingByte	uint8_t	Byte value that resulted the protocol violation. Only valid for certain values of mStateReason
mShortError	uint8_t	Specifies the detail level of the event. Following values are possible: 0: short 1: full Most members are not valid unless this member is 1

Parameter	Type	Description
mTimeoutDuringDlcDetection	uint8_t	Flag indicating if the error is a result of an attempt to resolve frame length. Following values are possible: 0: False 1: True

3.2.4 VBLLINSendError

Description: This event occurs when no Slave responds to a frame header from Master.

Corresponding object type: `BL_OBJ_TYPE_LIN_SND_ERROR`

Obsolete object. Used up to CANoe/CANalyzer version 6.0

Parameter	Type	Description
mHeader	VBLObjectHeader	Common header type. See 3.1.2.
mChannel	uint16_t	Channel number where the event notified
mID	uint8_t	Frame identifier
mDLC	uint8_t	Frame length
mFSMId	uint8_t	Slave Identifier in the Final State Machine (obsolete)
mFSMState	uint8_t	State Identifier of a Slave in the Final State Machine (obsolete)
mHeaderTime	uint8_t	Duration of the frame header [in bit times]
mFullTime	uint8_t	Duration of the entire frame [in bit times]

3.2.5 VBLLINSyncError

Description: Synchronization errors occur if the LIN hardware cannot synchronize with an external Master. This might happen if the baud rate actually used by the Master deviates by more than 15 % from the baud rate specified by the LIN hardware. In this case the baud rate value should be modified. This error event may also occur if the Master transmits an invalid or corrupted Sync field.

Corresponding object type: `BL_OBJ_TYPE_LIN_SYN_ERROR`

Obsolete object. Used up to CANoe/CANalyzer version 6.0

Parameter	Type	Description
mHeader	VBLObjectHeader	Common header type. See 3.1.2.
mChannel	uint16_t	Channel number where the event notified.
mDummy	uint16_t	Reserved, has to be set to 0.
mTimeDiff[4]	uint16_t	Time intervals [in us] detected between the falling signal edges of the Sync field

3.2.6 VBLLINWakeupEvent

Description: LIN Wakeup-Frame received or transmitted on a LIN channel.

Corresponding object type: `BL_OBJ_TYPE_LIN_WAKEUP`

Obsolete object. Used up to CANoe/CANalyzer version 6.0

Parameter	Type	Description
mHeader	VBLObjectHeader	Common header type. See 3.1.2.
mChannel	uint16_t	Channel number where the frame sent/received.
mSignal	uint8_t	Byte value used by wakeup frame.
mExternal	uint8_t	Flag indicating whether the wakeup frame has been transmitted by an external device (selector set) or by the LIN hardware itself (selector not set).

3.2.7 VBLLINSpikeEvent

Description: This event occurs when a short (normally less than 1 bit time) dominant signal has been detected on a LIN channel.

Corresponding object type: `BL_OBJ_TYPE_LIN_CHECKSUM_INFO`

Obsolete object. Used up to CANoe/CANalyzer version 6.0

Parameter	Type	Description
mHeader	VBLObjectHeader	Common header type. See 3.1.2.
mChannel	uint16_t	Channel number where the frame sent/received.
mWidth	uint32_t	Spike length in microseconds

3.2.8 VBLLINLongDomSignalEvent

Description: This event occurs when a LIN channel remains in the dominant state for a time, which is longer than a valid wakeup frame and it is not a valid sync break.

Corresponding object type: `BL_OBJ_TYPE_LIN_int32_t_DOM_SIG`

Obsolete object. Used up to CANoe/CANalyzer version 6.0

Parameter	Type	Description
mHeader	VBLObjectHeader	Common header type. See 3.1.2.
mLinBusEvent	VBLLINBusEvent	Common LIN bus event header. See 3.1.4

Parameter	Type	Description
mType	uint8_t	One dominant signal can be reported with multiple events. This field indicate the order of this event in a sequence: 0: Signal just detected 1: Signal continuation 2: Signal finished
mReserved[3]	uint8_t	Reserved, has to be set to 0.

3.2.9 VBLLINStatisticEvent

Description: This info event is sent by the LIN hardware and transports bus statistics.

Corresponding object type: `BL_OBJ_TYPE_LIN_STATISTIC`

Obsolete object. Used up to CANoe/CANalyzer version 5.2

Parameter	Type	Description
mHeader	VBLObjectHeader	Common header type. See 3.1.2.
mChannel	uint16_t	Channel number where the frame sent/received.
mBusLoad	double	Bus load in percent
mBurstsTotal	uint32_t	Total number of bursts
mBurstsOverrun	uint32_t	Number of overrun bursts
mFramesSent	uint32_t	Number of transmitted frames
mFramesReceived	uint32_t	Number of received frames
mFramesUnanswered	uint32_t	Number of frames without response

3.3 VBLLINMessage2

Description: LIN frame received or transmitted on a LIN channel.

Corresponding object type: `BL_OBJ_TYPE_LIN_MESSAGE2`

3.3.1 Version 1

Object from CANoe/CANalyzer version 6.1

Parameter	Type	Description
mHeader	VBLObjectHeader	Common header type. See 3.1.2.
mLinTimestampEvent	VBLLINDatabyteTimestampEvent	Common LIN bus event header. See 3.1.7
mData[8]	uint8_t	Databyte values

Parameter	Type	Description
mCRC	uint16_t	Checksum byte value
mDir	uint8_t	See 3.1.8
mSimulated	uint8_t	Flag indicating whether this frame a simulated one: 0: real frame 1: simulated frame
mIsETF	uint8_t	Flag indicating whether this frame is Event-Triggered one: 0: not ETF 1: ETF
mETFAssocIndex	uint8_t	Event-Triggered frame only: Index of associated frame, which data is carried
mETFAssocETFId	uint8_t	Event-Triggered frame only: Frame identifier (6-bit) of associated frame, which data is carried
mFSMId	uint8_t	Slave Identifier in the Final State Machine (obsolete)
mFSMState	uint8_t	State Identifier of a Slave in the Final State Machine (obsolete)
mReserved[3]	uint8_t	Reserved, has to be set to 0.

3.3.2 Version 2

Object from CANoe/CANalyzer version 7.1 SP3

Parameter	Type	Description
mHeader	VBLObjectHeader	Common header type. See 3.1.2.
mLinTimestampEvent	VBLLINDatabyteTimestampEvent	Common LIN bus event header. See 3.1.7
mData[8]	uint8_t	Databyte values
mCRC	uint16_t	Checksum byte value
mDir	uint8_t	See 3.1.8
mSimulated	uint8_t	Flag indicating whether this frame a simulated one: 0: real frame 1: simulated frame
mIsETF	uint8_t	Flag indicating whether this frame is Event-Triggered one: 0: not ETF 1: ETF

Parameter	Type	Description
mETFAssocIndex	uint8_t	Event-Triggered frame only: Index of associated frame, which data is carried
mETFAssocETFId	uint8_t	Event-Triggered frame only: Frame identifier (6-bit) of associated frame, which data is carried
mFSMId	uint8_t	Slave Identifier in the Final State Machine (obsolete)
mFSMState	uint8_t	State Identifier of a Slave in the Final State Machine (obsolete)
mReserved[3]	uint8_t	Reserved, has to be set to 0.
mRespBaudrate	uint32_t	Event's baudrate measured in response [in bits/sec]

3.3.3 Version 3

Object from CANoe/CANalyzer version 7.2

Important: The current object version (VBLObjectHeader::mObjectVersion) is 1.

Parameter	Type	Description
mHeader	VBLObjectHeader	Common header type. See 3.1.2.
mLinTimestampEvent	VBLLINDatabyteTimestampEvent	Common LIN bus event header. See 3.1.7
mData[8]	uint8_t	Databyte values
mCRC	uint16_t	Checksum byte value
mDir	uint8_t	See 3.1.8
mSimulated	uint8_t	Flag indicating whether this frame a simulated one: 0: real frame 1: simulated frame
mIsETF	uint8_t	Flag indicating whether this frame is Event-Triggered one: 0: not ETF 1: ETF
mETFAssocIndex	uint8_t	Event-Triggered frame only: Index of associated frame, which data is carried
mETFAssocETFId	uint8_t	Event-Triggered frame only: Frame identifier (6-bit) of associated frame, which data is carried

Parameter	Type	Description
mFSMId	uint8_t	Slave Identifier in the Final State Machine (obsolete)
mFSMState	uint8_t	State Identifier of a Slave in the Final State Machine (obsolete)
mReserved[3]	uint8_t	Reserved, has to be set to 0.
mRespBaudrate	uint32_t	Event's baudrate measured in response [in bits/sec]
mExactHeaderBaudrate	double	Event's baudrate measured in header [in bits/sec]
mEarlyStopbitOffset	uint32_t	Early stop bit offset in frame header for UART timestamps [in ns]
mEarlyStopbitOffsetResponse	uint32_t	Early stop bit offset in frame response for UART timestamps [in ns]

3.4 VBLLINCRCError2

Description: Checksum error event occurring when Slave sends an incorrect checksum value for a frame response that is otherwise correct.

Corresponding object type: `BL_OBJ_TYPE_LIN_CRC_ERROR2`

3.4.1 Version 1

Object from CANoe/CANalyzer version 6.1

Parameter	Type	Description
mHeader	VBLObjectHeader	Common header type. See 3.1.2.
mLinTimestampEvent	VBLLINDatabyteTimestampEvent	Common LIN bus event header. See 3.1.7
mData[8]	uint8_t	Data byte values
mCRC	uint16_t	Checksum byte value
mDir	uint8_t	See 3.1.8
mFSMId	uint8_t	Slave Identifier in the Final State Machine (obsolete)
mFSMState	uint8_t	State Identifier of a Slave in the Final State Machine (obsolete)
mSimulated	uint8_t	Flag indicating whether this frame a simulated one: 0: real frame 1: simulated frame

Parameter	Type	Description
mReserved[2]	uint8_t	Reserved, has to be set to 0.

3.4.2 Version 2

Object from CANoe/CANalyzer version 7.1 SP3

Parameter	Type	Description
mHeader	VBLObjectHeader	Common header type. See 3.1.2.
mLinTimestampEvent	VBLLINDatabyteTimestampEvent	Common LIN bus event header. See 3.1.7
mData[8]	uint8_t	Data byte values
mCRC	uint16_t	Checksum byte value
mDir	uint8_t	See 3.1.8
mFSMId	uint8_t	Slave Identifier in the Final State Machine (obsolete)
mFSMState	uint8_t	State Identifier of a Slave in the Final State Machine (obsolete)
mSimulated	uint8_t	Flag indicating whether this frame a simulated one: 0: real frame 1: simulated frame
mReserved[2]	uint8_t	Reserved, has to be set to 0.
mRespBaudrate	uint32_t	Event's baudrate measured in response [in bits/sec]

3.4.3 Version 3

Object from CANoe/CANalyzer version 7.2

Important: The current object version (VBLObjectHeader::mObjectVersion) is 1.

Parameter	Type	Description
mHeader	VBLObjectHeader	Common header type. See 3.1.2.
mLinTimestampEvent	VBLLINDatabyteTimestampEvent	Common LIN bus event header. See 3.1.7
mData[8]	uint8_t	Data byte values
mCRC	uint16_t	Checksum byte value
mDir	uint8_t	See 3.1.8

Parameter	Type	Description
mFSMId	uint8_t	Slave Identifier in the Final State Machine (obsolete)
mFSMState	uint8_t	State Identifier of a Slave in the Final State Machine (obsolete)
mSimulated	uint8_t	Flag indicating whether this frame a simulated one: 0: real frame 1: simulated frame
mReserved[2]	uint8_t	Reserved, has to be set to 0.
mRespBaudrate	uint32_t	Event's baudrate measured in response [in bits/sec]
mReserved[4]	uint8_t	Reserved, has to be set to 0.
mExactHeaderBaudrate	double	Event's baudrate measured in header [in bits/sec]
mEarlyStopbitOffset	uint32_t	Early stop bit offset in frame header for UART timestamps [in ns]
mEarlyStopbitOffsetResponse	uint32_t	Early stop bit offset in frame response for UART timestamps [in ns]

3.5 VBLLINReceiveError2

Description: This event may have a wide variety of causes.

An external Master can cause a receive error event:

- by transmitting sync break that is too short,
- by not returning the correct value `0x55` in the sync field,
- by assigning an incorrect parity to the frame identifier.

Other reasons:

- Slave transmitting an illegal character during a Bus Idle phase (e.g. because it did not finish transmission quickly enough and the checksum byte of the response was sent during the Bus Idle phase),
- Faulty (dominant) stop bit (i.e. framing error),
- LIN hardware receives a character that is different from the character sent during transmission
- LIN hardware only receives part of a frame, at the start of a measurement (in a correctly functioning system).

Corresponding object type: `BL_OBJ_TYPE_LIN_RCV_ERROR2`

3.5.1 Version 1

Object from CANoe/CANalyzer version 6.1

Parameter	Type	Description
mHeader	VBLObjectHeader	Common header type. See 3.1.2.
mLinTimestampEvent	VBLLINDatabyteTimestampEvent	Common LIN bus event header. See 3.1.7
mData[8]	uint8_t	Data byte values
mFSMId	uint8_t	Slave Identifier in the Final State Machine (obsolete)
mFSMState	uint8_t	State Identifier of a Slave in the Final State Machine (obsolete)
mStateReason	uint8_t	The lower 4 bits indicate the LIN hard-ware state at the time the error has occurred, while the upper 4 bits indicate the reason of the error Values for the state: 0: Bus idle 1: Waiting for SynchBreak 2: Waiting for SynchField 3: Waiting for frame ID 4-12: Waiting for data byte or checksum byte depending on the frame length. E.g. value 4 for FrameLength=0, value 12 for FrameLength=8 14: Consecutive event (i.e. event resulting from further data interpretation, after already notified error for first offending byte) 15: Not expected event (i.e. not WakeupRequest) during sleep mode. Occurs for LIN hardware in Master mode only Values for the reason: 0: Timeout 1: Received an unexpected byte violating protocol. In this case, mOffendingByte member contains its value 2: Received a byte with framing error (with dominant stop bit). In this case, mOffendingByte member contains its value 3: Unexpected Break field 4: Unidentified error
mOffendingByte	uint8_t	Byte value that resulted the protocol violation. Only valid for certain values of mStateReason

Parameter	Type	Description
mShortError	uint8_t	Specifies the detail level of the event. Following values are possible: 0: short 1: full Most members are not valid unless this member is 1
mTimeoutDuringDlcDetection	uint8_t	Flag indicating if the error is a result of an attempt to resolve frame length. Following values are possible: 0: False 1: True
mIsETF	uint8_t	Flag indicating whether this frame is Event-Triggered one: 0: not ETF 1: ETF
mHasDatabytes	uint8_t	Flag indicating whether at least one data byte value is valid

3.5.2 Version 2

Object from CANoe/CANalyzer version 7.1 SP3

Parameter	Type	Description
mHeader	VBLObjectHeader	Common header type. See 3.1.2.
mLinTimestampEvent	VBLLINDatabyteTimestampEvent	Common LIN bus event header. See 3.1.7
mData[8]	uint8_t	Data byte values
mFSMId	uint8_t	Slave Identifier in the Final State Machine (obsolete)
mFSMState	uint8_t	State Identifier of a Slave in the Final State Machine (obsolete)

Parameter	Type	Description
mStateReason	uint8_t	The lower 4 bits indicate the LIN hardware state at the time the error has occurred, while the upper 4 bits indicate the reason of the error Values for the state: 0: Bus idle 1: Waiting for SynchBreak 2: Waiting for SynchField 3: Waiting for frame ID 4-12: Waiting for data byte or checksum byte depending on the frame length. E.g. value 4 for FrameLength=0, value 12 for FrameLength=8 14: Consecutive event (i.e. event resulting from further data interpretation, after already notified error for first offending byte) 15: Not expected event (i.e. not WakeupRequest) during sleep mode. Occurs for LIN hardware in Master mode only Values for the reason: 0: Timeout 1: Received an unexpected byte violating protocol. In this case, mOffendingByte member contains its value 2: Received a byte with framing error (with dominant stop bit). In this case, mOffendingByte member contains its value 3: Unexpected Break field 4: Unidentified error
mOffendingByte	uint8_t	Byte value that resulted the protocol violation. Only valid for certain values of mStateReason
mShortError	uint8_t	Specifies the detail level of the event. Following values are possible: 0: short 1: full Most members are not valid unless this member is 1
mTimeoutDuringDlcDetection	uint8_t	Flag indicating if the error is a result of an attempt to resolve frame length. Following values are possible: 0: False 1: True

Parameter	Type	Description
mIsETF	uint8_t	Flag indicating whether this frame is Event-Triggered one: 0: not ETF 1: ETF
mHasDatabytes	uint8_t	Flag indicating whether at least one data byte value is valid
mRespBaudrate	uint32_t	Event's baudrate measured in response [in bits/sec]

3.5.3 Version 3

Object from CANoe/CANalyzer version 7.2

Important: The current object version (VBLObjectHeader::mObjectVersion) is 1.

Parameter	Type	Description
mHeader	VBLObjectHeader	Common header type. See 3.1.2.
mLinTimestampEvent	VBLLINDatabyteTimestampEvent	Common LIN bus event header. See 3.1.7
mData[8]	uint8_t	Data byte values
mFSMId	uint8_t	Slave Identifier in the Final State Machine (obsolete)
mFSMState	uint8_t	State Identifier of a Slave in the Final State Machine (obsolete)

Parameter	Type	Description
mStateReason	uint8_t	The lower 4 bits indicate the LIN hardware state at the time the error has occurred, while the upper 4 bits indicate the reason of the error Values for the state: 0: Bus idle 1: Waiting for SynchBreak 2: Waiting for SynchField 3: Waiting for frame ID 4-12: Waiting for data byte or checksum byte depending on the frame length. E.g. value 4 for FrameLength=0, value 12 for FrameLength=8 14: Consecutive event (i.e. event resulting from further data interpretation, after already notified error for first offending byte) 15: Not expected event (i.e. not WakeupRequest) during sleep mode. Occurs for LIN hardware in Master mode only Values for the reason: 0: Timeout 1: Received an unexpected byte violating protocol. In this case, mOffendingByte member contains its value 2: Received a byte with framing error (with dominant stop bit). In this case, mOffendingByte member contains its value 3: Unexpected Break field 4: Unidentified error
mOffendingByte	uint8_t	Byte value that resulted the protocol violation. Only valid for certain values of mStateReason
mShortError	uint8_t	Specifies the detail level of the event. Following values are possible: 0: short 1: full Most members are not valid unless this member is 1
mTimeoutDuringDlcDetection	uint8_t	Flag indicating if the error is a result of an attempt to resolve frame length. Following values are possible: 0: False 1: True

Parameter	Type	Description
mIsETF	uint8_t	Flag indicating whether this frame is Event-Triggered one: 0: not ETF 1: ETF
mHasDatabytes	uint8_t	Flag indicating whether at least one data byte value is valid
mRespBaudrate	uint32_t	Event's baudrate measured in response [in bits/sec]
mReserved[4]	uint8_t	Reserved, has to be set to 0.
mExactHeaderBaudrate	double	Event's baudrate measured in header [in bits/sec]
mEarlyStopbitOffset	uint32_t	Early stop bit offset in frame header for UART timestamps [in ns]
mEarlyStopbitOffsetResponse	uint32_t	Early stop bit offset in frame response for UART timestamps [in ns]

3.6 VBLLINSendError2

Description: This event occurs when no Slave responds to a frame header from Master.

Corresponding object type: `BL_OBJ_TYPE_LIN_SND_ERROR2`

3.6.1 Version 1

Used from CANoe/CANalyzer version 6.1

Parameter	Type	Description
mHeader	VBLObjectHeader	Common header type. See 3.1.2.
mLinMsgDescrEvent	VBLLINMessageDescriptor	Common LIN bus event header. See 3.1.6
mEOH	uint64_t	End of header timestamp [in nanosecond]
mIsETF	uint8_t	Flag indicating whether this frame is Event-Triggered one: 0: not ETF 1: ETF
mFSMId	uint8_t	Slave Identifier in the Final State Machine (obsolete)
mFSMState	uint8_t	State Identifier of a Slave in the Final State Machine (obsolete)
mReserved	uint8_t	Reserved, has to be set to 0.

3.6.2 Version 2

Used from CANoe/CANalyzer version 7.2

Important: The current object version (VBLObjectHeader::mObjectVersion) is 1.

Parameter	Type	Description
mHeader	VBLObjectHeader	Common header type. See 3.1.2.
mLinMsgDescrEvent	VBLLINMessageDescriptor	Common LIN bus event header. See 3.1.6
mEOH	uint64_t	End of header timestamp [in nanosecond]
mIsETF	uint8_t	Flag indicating whether this frame is Event-Triggered one: 0: not ETF 1: ETF
mFSMId	uint8_t	Slave Identifier in the Final State Machine (obsolete)
mFSMState	uint8_t	State Identifier of a Slave in the Final State Machine (obsolete)
mReserved	uint8_t	Reserved, has to be set to 0.
mReserved[4]	uint8_t	Reserved, has to be set to 0.
mExactHeaderBaudrate	double	Event's baudrate measured in header [in bits/sec]
mEarlyStopbitOffset	uint32_t	Early stop bit offset in frame header for UART timestamps [in ns]

3.7 VBLLINSyncError2

Description: Synchronization errors occur if the LIN hardware cannot synchronize with an external Master. This might happen if the baud rate actually used by the Master deviates by more than 15 % from the baud rate specified by the LIN hardware. In this case the baud rate value should be modified. This error event may also occur if the Master transmits an invalid or corrupted Sync field.

Corresponding object type: `BL_OBJ_TYPE_LIN_SYN_ERROR2`

Used from CANoe/CANalyzer version 6.1

Parameter	Type	Description
mHeader	VBLObjectHeader	Common header type. See 3.1.2.
mLinSynchFieldEvent	VBLLINSynchFieldEvent	Common LIN bus event header. See 3.1.5
mTimeDiff[4]	uint16_t	Time intervals [in us] detected between the falling signal edges of the Sync field

3.8 VBLLINWakeupEvent2

Description: LIN Wakeup-Frame received or transmitted on a LIN channel.

Corresponding object type: `BL_OBJ_TYPE_LIN_WAKEUP2`

Used from CANoe/CANalyzer version 6.1

Parameter	Type	Description
mHeader	VBLObjectHeader	Common header type. See 3.1.2.
mLinBusEvent	VBLLINBusEvent	Common LIN bus event header. See 3.1.4
mLengthInfo	uint8_t	Wake-up length validity indicator: 0: Wake-up length is OK 1: Wake-up is too short 2: Wake-up is too long
mSignal	uint8_t	Byte value used by wakeup frame.
mExternal	uint8_t	Flag indicating whether the wakeup frame has been transmitted by an external device (selector set) or by the LIN hardware itself (selector not set).
mReserved	uint8_t	Reserved, has to be set to 0.

3.9 VBLLINSpikeEvent2

Description: This event occurs when a short (normally less than 1 bit time) dominant signal has been detected on a LIN channel.

Corresponding object type: `BL_OBJ_TYPE_LIN_SPIKE_EVENT2`

Used from CANoe/CANalyzer version 6.1

Parameter	Type	Description
mHeader	VBLObjectHeader	Common header type. See 3.1.2.
mLinBusEvent	VBLLINBusEvent	Common LIN bus event header. See 3.1.4
mWidth	uint32_t	Spike length in microseconds
mInternal	uint8_t	Flag indicating whether this event is a simulated one: 0: real event 1: simulated event
mReserved[3]	uint8_t	Reserved, has to be set to 0.

3.10 VBLLINLongDomSignalEvent2

Description: This event occurs when a LIN channel remains in the dominant state for a time, which is longer than a valid wakeup frame and it is not a valid sync break.

Corresponding object type: `BL_OBJ_TYPE_LIN_int32_t_DOM_SIG2`

Used from CANoe/CANalyzer version 6.1

Parameter	Type	Description
mHeader	VBLObjectHeader	Common header type. See 3.1.2.
mLinBusEvent	VBLLINBusEvent	Common LIN bus event header. See 3.1.4
mType	uint8_t	One dominant signal reported with multiple events (at least 2). This field indicate the order of this event in a sequence: 0: Signal just detected 1: Signal continuation 2: Signal finished
mReserved[7]	uint8_t	Reserved, has to be set to 0.
mLength	uint64_t	Current total signal length [in nanoseconds]

3.11 VBLLINDLCInfo

Description: This info event occurs when the LIN hardware successfully detected the frame length of an unknown frame. This frame length value is set as the one to be expected for this frame in the future.

Corresponding object type: `BL_OBJ_TYPE_LIN_DLC_INFO`

Parameter	Type	Description
mHeader	VBLObjectHeader	Common header type. See 3.1.2.
mChannel	uint16_t	Channel number where the frame sent/received.
mID	uint8_t	Frame identifier
mDLC	uint8_t	Frame length

3.12 VBLLINChecksumInfo

Description: This info event occurs when the LIN hardware successfully detected the checksum model of an unknown frame. This checksum model is set as the expected one for this frame in the future.

Corresponding object type: `BL_OBJ_TYPE_LIN_CHECKSUM_INFO`

Parameter	Type	Description
mHeader	VBLObjectHeader	Common header type. See 3.1.2.
mChannel	uint16_t	Channel number where the event notified
mID	uint8_t	Frame identifier
mChecksumModel	uint8_t	Used checksum model. Following values are possible: 0: Classic 1: Enhanced 0xFF: Unknown

3.13 VBLLINSlaveTimeout

Description: This event occurs on a timeout in Final State Machine defined on LIN Hardware via CAPL. The technology of Final State Machine on LIN Hardware is still supported, but it is obsolete.

Corresponding object type: `BL_OBJ_TYPE_LIN_SLV_TIMEOUT`

Parameter	Type	Description
mHeader	VBLObjectHeader	Common header type. See 3.1.2.
mChannel	uint16_t	Channel number where the event notified
mSlaveID	uint8_t	Slave Identifier in the Final State Machine
mStateID	uint8_t	Source state identifier of a Slave in the Final State Machine
mFollowStateID	uint32_t	Target state identifier of a Slave in the Final State Machine

3.14 VBLLINSchedulerModeChange

Description: This info event occurs when a Master is simulated and a frame header of a new schedule table is transmitted for the first time. This info event may appear on starting a measurement.

Corresponding object type: `BL_OBJ_TYPE_LIN_SCHED_MODCH`

3.14.1 Version 1

Parameter	Type	Description
mHeader	VBLObjectHeader	Common header type. See 3.1.2.
mChannel	uint16_t	Channel number where the frame sent/received.
mOldMode	uint8_t	Index (0-based) of a previously active schedule table
mNewMode	uint8_t	Index (0-based) of the newly activated schedule table

3.14.2 Version 2

Used from CANoe/CANalyzer version 10.0

Important: The current object version (VBLObjectHeader::mObjectVersion) is 1.

Parameter	Type	Description
mHeader	VBLObjectHeader	Common header type. See 3.1.2.
mChannel	uint16_t	Channel number where the frame sent/received.
mOldMode	uint8_t	Index (0-based) of a previously active schedule table
mNewMode	uint8_t	Index (0-based) of the newly activated schedule table
mOldSlot	uint8_t	Index (0-based) of a previously active schedule table slot

Parameter	Type	Description
mNewSlot	uint8_t	Index (0-based) of the newly activated schedule table slot

3.14.3 Version 3

Used from CANoe/CANalyzer version 10.0

Important: The current object version (VBLObjectHeader::mObjectVersion) is 2.

Parameter	Type	Description
mHeader	VBLObjectHeader	Common header type. See 3.1.2.
mChannel	uint16_t	Channel number where the frame sent/received.
mOldMode	uint8_t	Index (0-based) of a previously active schedule table
mNewMode	uint8_t	Index (0-based) of the newly activated schedule table
mOldSlot	uint8_t	Index (0-based) of a previously active schedule table slot
mNewSlot	uint8_t	Index (0-based) of the newly activated schedule table slot
mFirstEventAfterWakeUp	uint8_t	Flag which indicates if this is the first LINSchedulerModeChange event after wake-up

3.15 VBLLINBaudrateEvent

Description: This info event is sent by the LIN hardware at the start of a measurement and whenever the baud rate changes by more than 0.5 % during a measurement. If this info event occurs, then the LIN hardware is synchronized with the baud rate of the external Master.

Corresponding object type: `BL_OBJ_TYPE_LIN_BAUDRATE`

Parameter	Type	Description
mHeader	VBLObjectHeader	Common header type. See 3.1.2.
mChannel	uint16_t	Channel number where the frame sent/received.
mDummy	uint16_t	Reserved, has to be set to 0.
mBaudrate	int32_t	Measured baud rate [in bits/sec]

3.16 VBLLINSleepModeEvent

Description: This info event occurs at the start of a measurement in order to report the initial state of the LIN hardware and every time the mode (awake/asleep) of LIN hardware changes.

Corresponding object type: `BL_OBJ_TYPE_LIN_SLEEP`

Parameter	Type	Description
mHeader	VBLObjectHeader	Common header type. See 3.1.2.
mChannel	uint16_t	Channel number where the event notified
mReason	uint8_t	This value indicates the reason for an event. Following values are possible: 0: Start state Transition to Sleep mode 1: Go-to-Sleep frame 2: Bus Idle Timeout 3: Silent SleepMode command (for shortening the BusIdle Timeout) Leaving Sleep mode: 9: External Wakeup signal 10: Internal Wakeup signal 11: Bus traffic (can only occur if the LIN hardware does not have a Master function) LIN hardware does not go into Sleep mode in spite of request to do so: 18: Bus traffic (can only occur if the LIN hardware does not have a Master function)
mFlags	uint8_t	Bit mask with bit values as following: Bit 0 (LSB): Indicates the state of the LIN hardware before this event occurred: 1: Awake 0: Asleep Bit 1: Indicates the current state of the LIN hardware: 1: Awake 0: Asleep Bit 2: Indicates whether this event caused by external or internal event: 1: External event 0: Internal event

3.17 VBLLINUnexpectedWakeup

Description: This event occurs if an unexpected byte received in bus idle phase of wake mode could be a wakeup frame

Corresponding object type: `BL_OBJ_TYPE_LIN_UNEXPECTED_WAKEUP`

Used from CANoe/CANalyzer version 7.5

Parameter	Type	Description
mHeader	VBLObjectHeader	Common header type. See 3.1.2.
mLinBusEvent	VBLLINBusEvent	Common LIN bus event header. See 3.1.4

Parameter	Type	Description
mWidth	uint64_t	Width of the unexpected wakeup in nanoseconds. Valid for LIN 2.x
mSignal	uint8_t	Byte signal of the unexpected wakeup. Valid for LIN 1.x
mReserved[7]	uint8_t	Reserved, has to be set to 0.

3.18 VBLLINShortOrSlowResponse

Description: This event occurs if a set of receive errors could be a valid header followed by a short or slow response.

Corresponding object type: `BL_OBJ_TYPE_LIN_SHORT_OR_SLOW_RESPONSE`

Used from CANoe/CANalyzer version 7.5

Parameter	Type	Description
mHeader	VBLObjectHeader	Common header type. See 3.1.2.
mLinTimestampEvent	VLBLINDatabyteTimestampEvent	Common LIN bus event header. See 3.1.7
mNumberOrRespBytes	uint32_t	The number of response bytes.
mRespBytes[9]	uint8_t	The response bytes (can include the checksum).
mSlowResponse	uint8_t	Non-zero, if the response was too slow; otherwise zero.
mInterruptedByBreak	uint8_t	Non-zero, if the response was interrupted by a sync break; otherwise zero.
mReserved[1]	uint8_t	Reserved, has to be set to 0.

3.19 VBLLINDisturbanceEvent

Description: This event occurs if CANoe/CANalyzer explicitly caused to disturb one bit or a sequence of bits.

Corresponding object type: `BL_OBJ_TYPE_LIN_DISTURBANCE_EVENT`

Used from CANoe/CANalyzer version 7.5

Parameter	Type	Description
mHeader	VBLObjectHeader	Common header type. See 3.1.2.
mChannel	uint16_t	Channel number of the event
mID	uint8_t	Identifier of a disturbed response or 0xFF if a header was disturbed.
mDisturbingFrameID	uint8_t	Identifier of a disturbing header, if disturbing with a header (mDisturbanceType == 2), otherwise 0xFF.

Parameter	Type	Description
mDisturbanceType	uint32_t	The type of disturbance: 0: dominant disturbance 1: recessive disturbance 2: disturbance with a header 3: disturbance with a bitstream 4: disturbance with a variable bitstream
mByteIndex	uint32_t	The 0-indexed byte where the disturbance occurred. 0 is the first data byte, 9 is the checksum in case of a dlc 8 frame. If a header was disturbed (mID == 0xFF), 0 is the sync field and 1 is the PID.
mBitIndex	uint32_t	The index of the bit that was disturbed. 0 is the first data bit, 8 is the stop bit, 9 is the first bit in interbyte space.
mBitOffsetInSixteenthBits	uint32_t	The offset in 1/16th bits into the disturbed bit.
mDisturbanceLengthInSixteenthBits	uint32_t	The length of a dominant or recessive disturbance in units of 1/16th bits.

3.20 VBLLINShortOrSlowResponse2

Description: This event occurs if a set of receive errors could be a valid header followed by a short or slow response.

Corresponding object type: `BL_OBJ_TYPE_LIN_SHORT_OR_SLOW_RESPONSE2`

Used from CANoe/CANalyzer version 7.5

Parameter	Type	Description
mHeader	VBLObjectHeader	Common header type. See 3.1.2.
mLinTimestampEvent	VLBLINDatabyteTimestampEvent	Common LIN bus event header. See 3.1.7
mNumberOrRespBytes	uint32_t	The number of response bytes.
mRespBytes[9]	uint8_t	The response bytes (can include the checksum).
mSlowResponse	uint8_t	Non-zero, if the response was too slow; otherwise zero.
mInterruptedByBreak	uint8_t	Non-zero, if the response was interrupted by a sync break; otherwise zero.
mReserved[1]	uint8_t	Reserved, has to be set to 0.
mExactHeaderBaudrate	double	Event's baudrate measured in header [in bits/sec]

mEarlyStopbitOffset	uint32_t	Early stop bit offset in frame header for UART timestamps [in ns]