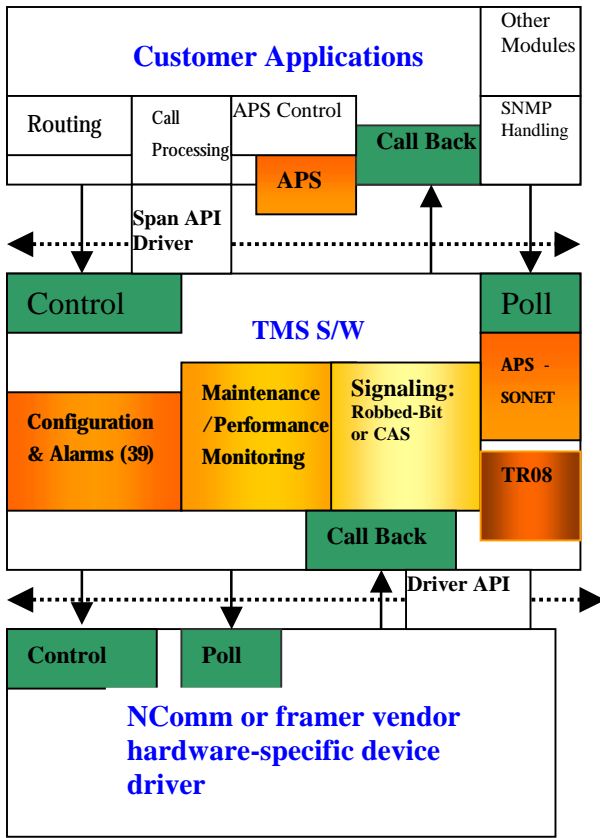


Comparison: NComm's LSI Device Drivers & TMS

About the Drivers

This overview is designed to help our customers compare and contrast the features/functionality of our Trunk Management Software (TMS) and associated LSI device drivers. This analysis can also be helpful in understanding how other drivers provided with framer devices contrasts with NComm's drivers and NComm's Trunk Management Software (TMS).



Functionally, drivers do not process data or make high-level decisions (That's where TMS adds tremendous value). Drivers are framer (hardware) specific. The NComm drivers provide the same API for all vendor framer devices within a technology (T1, etc.). These drivers accommodate device differences and nuances. By the time you get to the top of the driver, all framers are the same to applications above it. Thus, code written to the NComm Driver API will talk to any framer device.

Other framer vendors' drivers are specific to their hardware. Therefore, WAN developer's code written to other framer vendors' drivers will be tied into the hardware.

TMS is architected to be hardware independent. Layered on top of the device driver, NComm's TMS code is an application middleware, which provides all of the high-level algorithmic processing of the raw data to and from the low-level driver. NComm provides well-defined APIs utilizing only 3 function calls: Control, Callback & Poll. This allows for the fastest & simplest integration time possible to your upper level applications (such as routing, call processing, APS Control (SONET/SDH), SNMP handling, etc.). Additionally, NComm's architecture provides for maximum portability

should design decisions change later (for performance, price, or functional rationales) - since nearly 135 drivers are available from NComm.

NComm (and other framer vendors' premium) drivers provide access to the register information in the local framer. TMS uses this functionality and adds higher-level capabilities, such as:

I. CONFIGURATION MANAGEMENT (NOT PROVIDED IN NCOMM'S OR FRAMER VENDORS' DRIVERS)

Base level TMS

- Configures according to high level functionality, not low-level registers – providing ease-of-use.
- Single commands may set off multiple activities including full initialization, takedown and re-initialization of the entire trunk.
- Interfaces to T1 spans controlled by TMS.
- Maintains configuration data for the spans.

II. ALARM MANAGEMENT (NOT PROVIDED IN NCOMM'S OR FRAMER VENDORS' DRIVERS)

All alarm functionality comes up fully functional and working (provided hardware is ready & debugged!)

- Alarm processing (detection, declaration, and clearing) fully standard compliant per T1.231 (US)
- Programmable alarm integration timers for OOF, LOS, AIS, RAI and others.
- The E1 alarm capabilities will meet standards per I.431, G.732, and ETSI 300-233.
- All integration is completed per standard - with default settings of programmable integration timers.
- Alarm states are reported to your value-added application and a response alarm is automatically sent back into the network per T1.231
 - Example: When OOF (Out-Of Frame) detected, 2 ½ second timer started. If condition persists for 2 ½ seconds, an OOF (RED) alarm state is declared and an RAI (Yellow) alarm is sent back into the network.
- Standard compliant alarm responses maintained for simultaneous event/defect occurrences.
- Alarm information also used by Maintenance/Performance Monitoring and Signaling Modules.
- The alarm functionality is architected to allow for the proper implementation of signaling (bit freezing) should that be required in initial development, or as added functionality during the product's life cycle.



III. MAINTENANCE MANAGER

NComm and framer vendors' premium drivers provide the raw performance information that must be processed from the local framer. TMS then uses this functionality and adds the capabilities to:

- Establish performance reports captured in 192 15-minute buckets (48 hrs) for near and far end (T1.231 for US)
- Provide Time-Of-Day reporting including time resets and associated data classification (T1.231)
- Provide performance reports captured in 96 15-minute buckets (24 hrs) for near and far end (TR-54016 for T1)
- Establish the Facility Data Link (FDL) and handle request/response automatically
- Provide programmable TCAs (Threshold Crossing Alerts), as per T1.231
- All maintenance capabilities come up fully functional and working.
- Standard compliant performance is immediately achieved.

IV. LOOPBACKS

NComm and framer vendors' premium drivers provide the ability to put the local framer into loopback and out of loopback. TMS uses this functionality and adds the high-level capabilities to:



- Initiate requests for loop backs (T1.403 US)
- Respond to requests for loop backs (T1.403 US)
- Program Loop back codes
- Program Loop back code detection times



IV. BIT ORIENTED CODES (USES THE FACILITY DATA LINK)

NComm's driver provides the raw BOC/BOM information from the local framer. (NComm has not determined if all of the leading vendors' Premium drivers do anything with FDL, BOCs & TR54016 packets.) TMS uses this functionality and adds the capabilities to provide:

- BOC (Bit Oriented Codes) and BOM (Bit Oriented Messages) transmitted and received
- Facility for custom BOC/BOM transmissions and receipt
- Bit Oriented Message (BOM/BOC) handling per T1.403

V. SIGNALING

NComm's driver provides the raw AB/ABCD bits to and from the local framer. (NComm has not determined if all of the leading vendors' Premium drivers handle AB/ABCD bits.) TMS uses this functionality and adds the capabilities to provide:

- All signaling capabilities are fully functional and working when brought up
- Standard compliant performance is immediately achieved
- All known T1 Robbed Bit signaling models included in:
 - T1.403
 - TR-008
 - GR-303
 - GR-506
 - ATT Pub 43801
- Bit freezing and debouncing to accommodate line hiccups
- E1 Channel Associated Signaling (CAS) models including Q.421 and Q.422

- **All robbed bit signaling models specified in T1.403.02-1999 are supported including:**
 - Loop start
 - Loop start with RLCF
 - Ground Start
 - Ground Start with RLCF
 - Loop-Reverse Battery Signaling
 - Network provided reverse battery signaling
 - E & M Signaling
 - Customer-installation-provided loop-start supervision (FXS/FXO)
 - Private line auto ring
 - Ringdown
 - Both SF/D4 and ESF version of these signaling models are supported. In addition, the DS0 alarms states are provided for all ESF models.

- **All 6 signaling models specified by TR-08 are supported including:**
 - Superimposed Ringing Multiparty
 - Direct Inward Dialing Dial Pulse Terminating
 - Frequency Selective Ringing Multiparty
 - Single Party
 - Superimposed Ringing Multiparty
 - Universal Voice Grade

- **The GR-303 models are supported including:**
 - COIN CF/DTF
 - Loop-reverse-battery (GR-303-CORE-Rev3)
 - Loop-start with Reverse Loop Current Feed (RLCF)
 - Multiparty Signaling
 - GR-303 Foreign Exchange Originating Ground-start
 - GR-303 Foreign Exchange Originating Loop-start
 - GR-303 Foreign Exchange Station Ground-start
 - GR-303 Foreign Exchange Station Loop-start

- **The Bell PUB 43801 models are supported including:**
 - Ringdown 2 Wire 900 Ohm or 4 Wire 600 Ohm
 - Dial Pulse Originating (DPO)
 - Dial Pulse Terminating (DPT)
 - Duplex 2 or 4 Wire
 - 2 or 4 Wire Ear and Mouth (E & M)
 - Private Line Auto Ring
 - Pulse Link Repeater
 - Revertive Pulse Originating
 - Revertive Pulse Terminating
 - Sleeve Dial Pulse Originating
 - AT&T 43801 Foreign Exchange Originating Ground-start
 - AT&T 43801 Foreign Exchange Station Ground-start
 - AT&T 43801 Foreign Exchange Originating Loop-start
 - AT&T 43801 Foreign Exchange Station Loop-start

VI. TR-008 MANAGEMENT

NComm's driver provides the raw CAMS bits from the local framer. (NComm has not determined if all of the leading framer vendors' Premium drivers handle the CAM bits.) TMS uses this functionality and adds the capabilities to provide:

- All TR-008 capabilities come up fully functional and working.
- Processes TR-008 Specific Alarms
- Data link processing of the Concentration, Maintenance, Alarm, and Switch (CMAS) bits
- Operates in MODE I, MODE II and/or MODE III
- Allows the implementation of either the Local Digital Switch (LDS), the Remote Terminal (RT), NOTE side of the interface