FreeSWITCH ISDN

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Agenda

- FreeTDM overview
- ISDN modules (lots of them!)
- FreeTDM Sangoma ISDN configuration
- FreeSWITCH Sangoma ISDN configuration
- Sangoma ISDN Troubleshooting

FreeTDM Overview

- Analog and TDM interface library and FreeSWITCH endpoint for FXO/FXS, ISDN (PRI/BRI), SS7, MFCR2, GSM
- All freetdm code is at libs/freetdm in the FreeSWITCH git repo
- libs/freetdm/src/ has the freetdm library code
- mod_freetdm/ has the FreeSWITCH endpoint code (mod_freetdm.c)
- libs/freetdm/src/ftmod/ folder has IO and signaling modules/plugins for freetdm

FreeTDM Overview

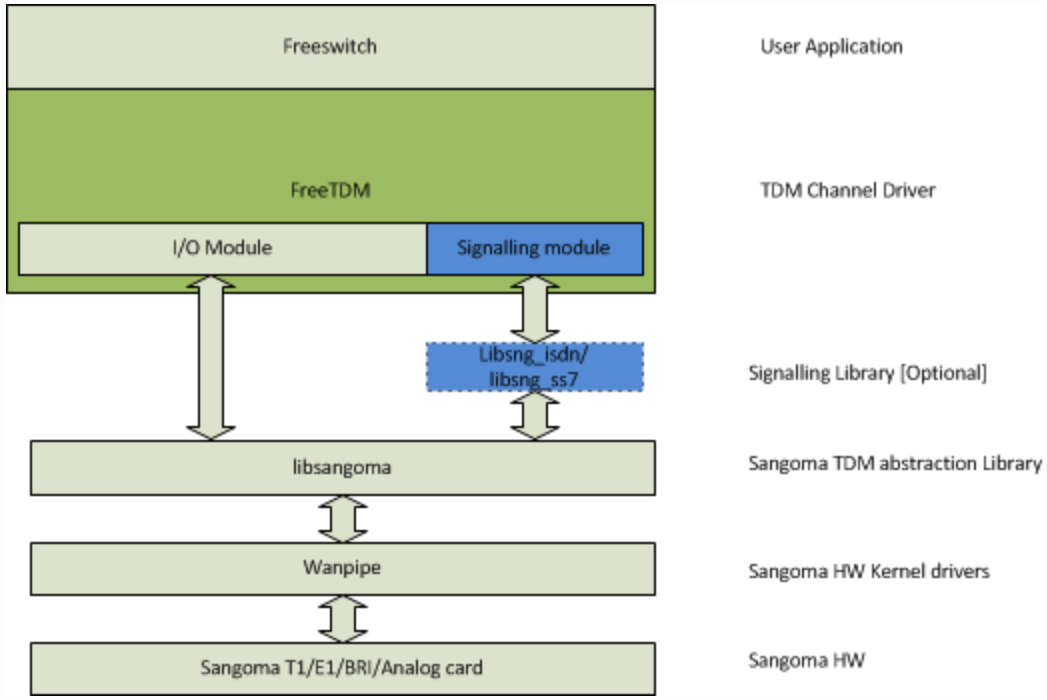
- Linux has the best support
- Windows support is limited to Sangoma boards and the Analog and Sangoma ISDN and MFCR2 stacks
- More information: http://wiki.freeswitch.org/wiki/FreeTDM

ISDN Modules Overview

- ftmod_isdn – Unmaintained for the most part. Ask ‘stkn’ in IRC about its state. Uses a home-brew ISDN stack
- ftmod_libpri – Requires the open source “libpri” stack to work
- ftmod_misdn – Another plugin written by ‘stkn’. Depends on the mISDN Linux stack
- ftmod_sangoma_isdn – Stack fully supported by Sangoma, depends on the library libsng_isdn

Sangoma ISDN

- Trillium ISDN stack by Continuous Computing (now acquired by Radisys), stable and well maintained (free of charge with Sangoma boards)



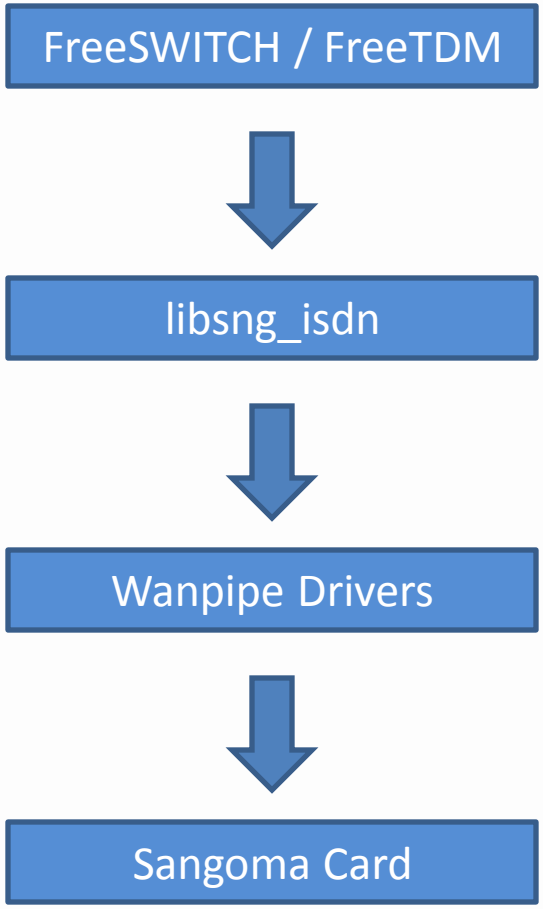
Sangoma ISDN

- List of supported variants
  - National ISDN 2 (T1)
  - NT DMS-100 (T1)
  - Lucent 5ESS (T1)
  - Lucent 4ESS (T1)
  - EuroISDN (E1 and BRI point to point and point to multipoint)
  - INSNET/NTT (BRI and J1*)
  - QSIG** (E1)

  *INSNET support on J1 is not fully tested yet
  **QSIG support is not fully integrated/tested

Installation (in a nutshell)

- Install Sangoma T1/E1/BRI
- Download and install the Wanpipe Drivers
- Download and Install libsng_isdn
- Download and install FreeSWITCH



Configuration

- See sample comments at libs/freetdm/conf/freetdm.conf and libs/freetdm/conf/freetdm.conf.xml
- The non-XML configuration is read by the FreeTDM library to enumerate the Wanpipe spans and setup basic I/O options
- The XML configuration is read by mod_freetdm, the FreeSWITCH endpoint module to setup the ISDN signaling parameters

Configuration

- Simplest freetdm.conf (basic IO settings) looks like this:

[span wanpipe wp1]
trunk_type => T1
b-channel => 1:1-23
d-channel => 1:24

The syntax is for Wanpipe spans is:
[span wanpipe <span-name>]
b-channel => <span-number>:<channel-range>
d-channel => <span-number>:<channel-range>

Configuration

- Simplest freetdm.conf.xml (signaling) looks like this:

```
<sangoma_pri_spans>
    <span name="wp1">
        <param name="signalling" value="cpe" />
        <param name="switchtype" value="national" />
        <param name="dialplan" value="XML" />
        <param name="context" value="default" />
    </span>
</sangoma_pri_spans>
```

Configuration

- Advanced settings are documented here:

http://wiki.sangoma.com/wanpipe-freeswitch-config-freetdm-isdn
http://wiki.sangoma.com/FreeTDM-Sangoma-ISDN-Library-Configuration-Files

Troubleshooting

- Follow the bottom – top approach
  - Layer 1, Physical layer (T1/E1/BRI)
  - Layer 2, D-channel reliability (Q.921)
  - Layer 3, Call Control (Q.931)

Physical Layer Troubleshooting

- Check the physical layer status:
  - #> wanrouter status

```
Wanrouter Status:

Device name  | Protocol  | Station | Status       |
wanpipe1     | AFT TE1   | N/A     | Connected    |
wanpipe2     | AFT TE1   | N/A     | Connected    |
wanpipe3     | AFT TE1   | N/A     | Disconnected |
wanpipe4     | AFT TE1   | N/A     | Disconnected |
```

Confirm that the relevant ports are in **Connected** state

Are the ports in “Disconnected” state?

- Make sure you are plugging the cable in the right port
  - Use wanpipemon to blink the port leds to identify them
    - wanpipemon –i w1g1 –c dled_blink –timeout 20
- You may be using the wrong type of cable or a faulty cable:
  - Use a cable tester to verify the cable works
  - Straight-through cable
    - http://wiki.sangoma.com/Cablepinouts#t1_rj45
  - T1/E1 cross-over cable
    - http://wiki.sangoma.com/Cablepinouts#t1_e1_cross

- Telco may have not enabled/provisioned the line yet
  - Contact the telco to verify that the line is provisioned

Verify there are no alarms

- #> wanpipemon –i w1g1 –c Ta

```
***** w1g1: T1 Rx Alarms (Framer) *****

ALOS:    OFF     | LOS:  OFF
RED:     OFF     | AIS:  OFF
LOF:     OFF     | RAI:  OFF

***** w1g1: T1 Rx Alarms (LIU) *****

Short Circuit:  OFF
Open Circuit:   OFF
Loss of Signal: OFF

***** w1g1: T1 Tx Alarms *****

AIS:     OFF     | YEL:  OFF


***** w1g1: T1 Performance Monitoring Counters *****

Line Code Violation     : 3146
Bit Errors (CRC6/Ft/Fs) : 0
Out of Frame Errors     : 0


Rx Level          : > -2.5db
```

1. Confirm that all alarms are **OFF**
2. Confirm that performance monitoring counters are not incrementing rapidly
3. Confirm that Rx Level > -2.5 dB

Troubleshooting alarms

- Defective cable
- Loose RJ-45 connectors
- Incorrect line coding and/or line framing configuration
- Both sides configured as the master clock

Layer 2, D-channel reliability (Q.921)

- Use FreeTDM CLI to verify signaling on all spans:

- fscli> ftdm sangoma_isdn show_spans

```
freeswitch@dy-devel.sangoma.local> ftdm sangoma_isdn show_spans

span:wp1 physical:OK signalling:UP
span:wp2 physical:OK signalling:UP
span:wp3 physical:ALARMED signalling:DOWN
span:wp4 physical:ALARMED signalling:DOWN
Command executed OK
```

Confirm that:

1. Physical status is OK
2. Signalling status is UP

Layer 2, D-channel reliability (Q.921)

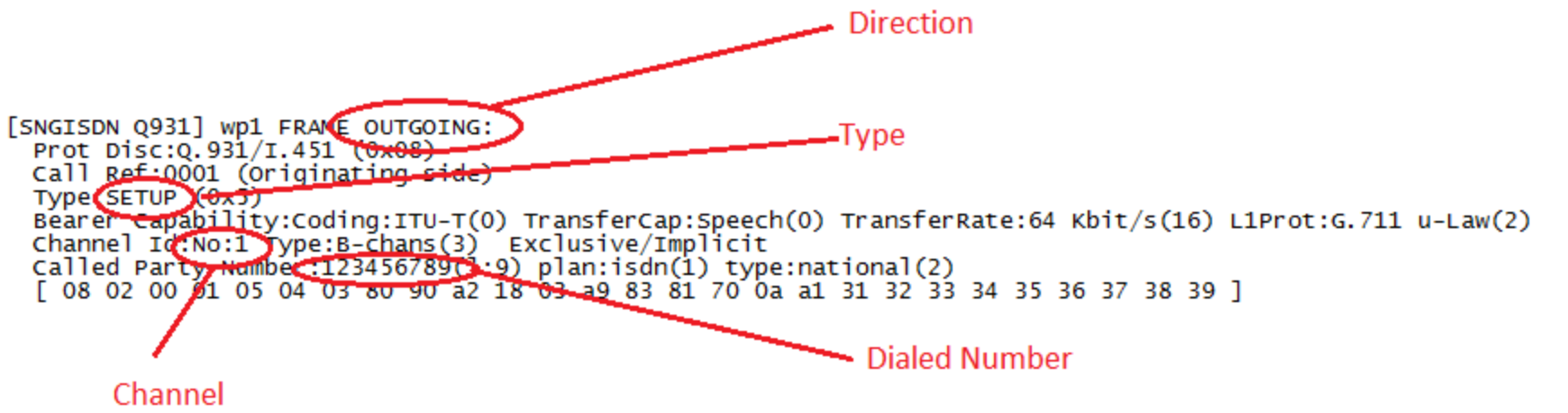
- If physical status is **Alarmed**
  - Go back to troubleshoot the physical layer

- If signalling status is **DOWN**
  - Enable Q.921 debug tracing
    - fscli> ftdm sangoma_isdn trace q921 <span_name>
  - If you see only outgoing SABME's and no response from the remote switch, then this line is not provisioned, you should contact your telco
  - If you see FRMR frames (Frame Reject), then bothlines are configured as either PRI-NET or PRI-CPE

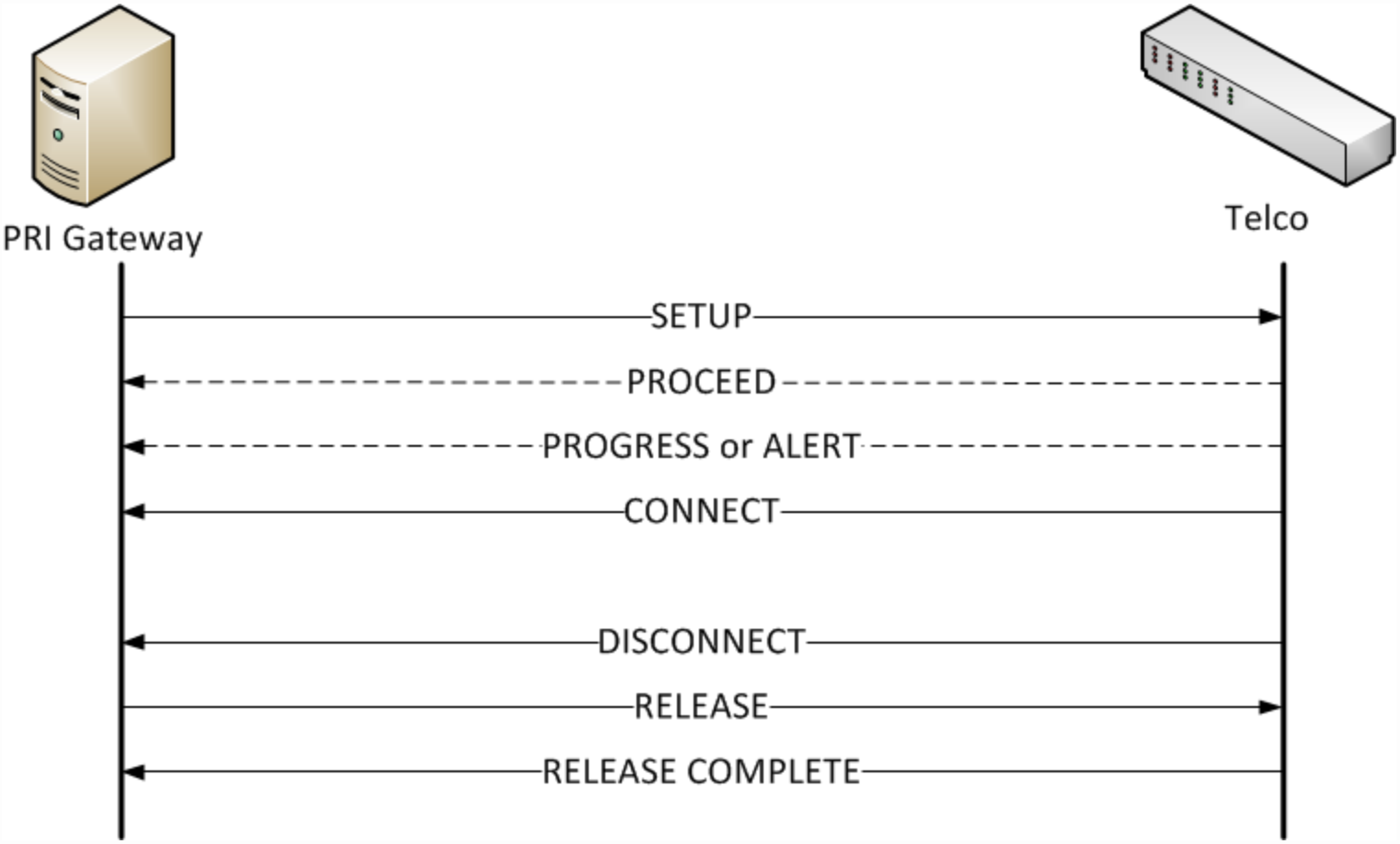
Layer 3, Call Control (Q.931)

- Enable Q.931 tracing
  - fscli> ftdm sangoma_isdn trace q931 <span_name>

- Q.931 message example:



Q.931 message flow for a call



Troubleshooting Inbound Calls

- If you did not see any incoming SETUP message from the Q.931 traces, then you are dialing the wrong number or the telco is not routing your DID to this PRI link

- If an incoming SETUP was received but FreeSWITCH responded with a RELEASE or DISCONNECT message, then this is a problem with your dialplan, confirm that there is valid routing rules for the context configured for this PRI link

Troubleshooting Outbound Calls

- If you did not see any outgoing SETUP message from the Q.931 traces, then you may not be dialing on the correct span/group (no bridge(freetdm/… was executed), check your dialplan

- If an outgoing SETUP message was transmitted on the line but the remote side did not respond with any message you should contact your telco

- If an outgoing SETUP message was transmitted on the line but the remote side rejected the call with a DISCONNECT or RELEASE message, look at the cause code for a possible reason:

  - http://networking.ringofsaturn.com/Routers/isdncausecodes.php
  - http://wiki.freeswitch.org/wiki/Hangup_causes

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