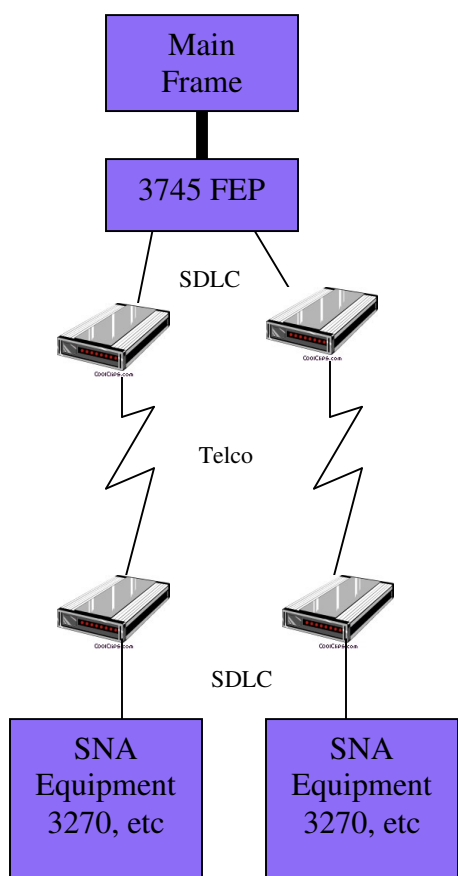


SNA Network Migration

This white paper outlines the typical steps that are used to migrate a network from SNA to TCP. The description starts with a typical SNA network and shows the logical progression to an all TCP network. In the process the paper shows where the Gcom Protocol Appliance can assist in this migration process.

Typical SNA Network

Original SNA networks were built around leased lines from a 3745 front end processor (FEP) reaching out to remote locations with SNA devices. The following diagram illustrates such a network.



The Main Frame computer had a channel-attached front end processor (3745) which handled data communications operations. The SNA protocol resided within the Main Frame (VTAM) and the link layer protocol (SDLC) resided within the FEP.

Communication with the remote SNA devices was via SDLC and leased lines from the telephone company (originally there was only one telephone company). A modem at each end of the telco line converted binary to analog for transmission over the line.

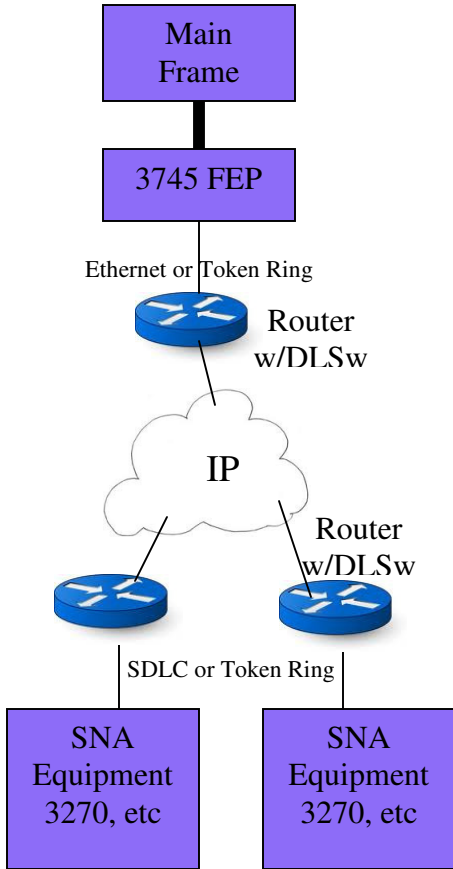
The SNA equipment at the remote sites was connected to a local modem and communicated using SDLC. The remote equipment acted as an SDLC secondary. The SNA Equipment implemented the secondary (terminal) mode of SNA and performed its function with the payload data — display, print, etc.

The SNA Equipment would typically consist of a cluster controller such as a 3274 or 3174 with attached devices such as displays and printers.

The cluster controller is referred to as a Physical Unit (PU) in SNA parlance and the individual devices as Logical Units (LUs). Each SDLC link connects to a PU and carries SNA protocol messages containing LU numbers within them to identify the ultimate source/destination of the data.

SNA Network with Routers

An evolution of SNA networks is to use routers in place of the modems. This allows the use of an IP network backbone which is less expensive than leased lines. These types of networks look something like the following.



The Main Frame still has the 3745 FEP attached via a channel.

The FEP now uses Ethernet or Token Ring to communicate to the router on the Main Frame end. The FEP uses LLC protocol to communicate with the router. It uses a different LLC session (DSAP/SSAP combination) for each remote SNA controller. The router uses DLSw (Data Link Switching) to forward the data link protocol to the routers at the remote sites. Each remote site has a separate TCP connection with DLSw protocol sent as TCP packets.

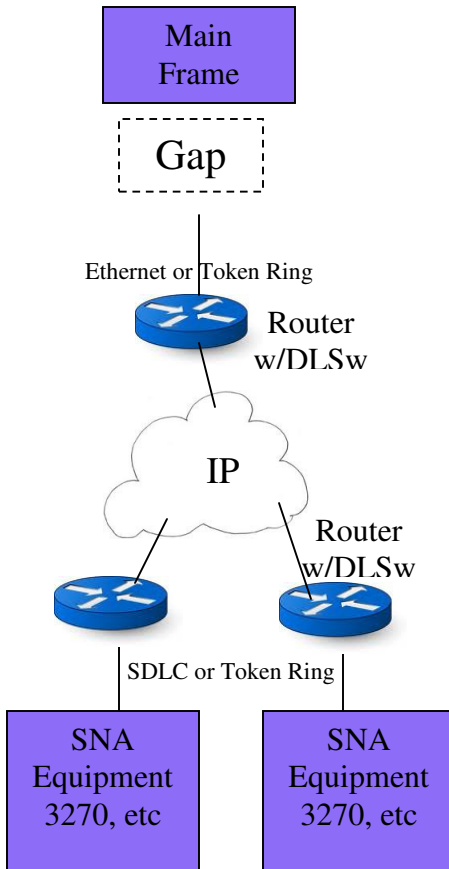
At each remote site a router communicates with the host site router using DLSw and then uses either SDLC or LLC over Token Ring to communicate with the SNA Equipment.

The SNA Equipment still maintains the PU/LU relationship of the SNA protocol. The SDLC link now goes only between the SNA PU and the router. In some cases the SDLC link is replaced by LLC over Token Ring. The local SDLC or LLC link to

the router is connected to a DLSw connection inside the router. Thus the data link is "switched" from the FEP to the SNA PU via the routers.

Removing the 3745 — The Problem

IBM users are motivated to decommission their 3745 FEPs due to IBM's withdrawal of support for this device. Removing the 3745 poses an architectural problem as illustrated here.



If you remove the 3745 from the picture, and retain SNA on the Main Frame, then there is a gap created where the link layer protocol for SNA is to reside. Whether SDLC or LLC the 3745 FEP performed this protocol function.

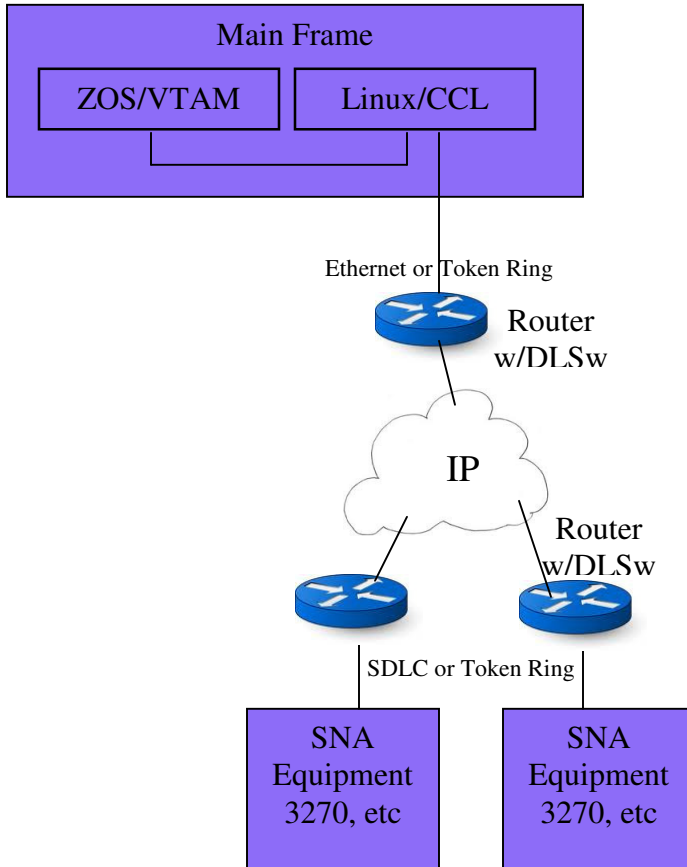
How you proceed at this point depends upon the decision to retain SNA applications on the Main Frame or to replace them with TCP/IP based applications.

If you retain the SNA applications then IBM offers a solution. If you migrate the applications to TCP/IP then the old SNA remote equipment becomes a problem.

We address these two subjects in the next sections.

The IBM Linux/CCL Solution

If you retain your SNA applications IBM has a solution involving running Linux as a guest under z/VM (or in an LPAR). They provide a Communication Controller for Linux (CCL) package that can perform the NCP (link layer) functions of the old 3745. This solution is illustrated as follows.



VTAM uses a local OSA link to communicate to the CCL package in the Linux guest. The CCL package implements the link layer of SNA and communicates via another OSA port to the local router and the DLSw network as it already exists.

This is a clean solution that requires minimal changes to applications (or none) or to the existing network.

There may be a problem or two with this solution depending upon the predilections of individual network managers. The first is that some network managers may not want to use Main Frame cycles for performing link layer protocols. Consider that some networks may have hundreds of link layer connections each

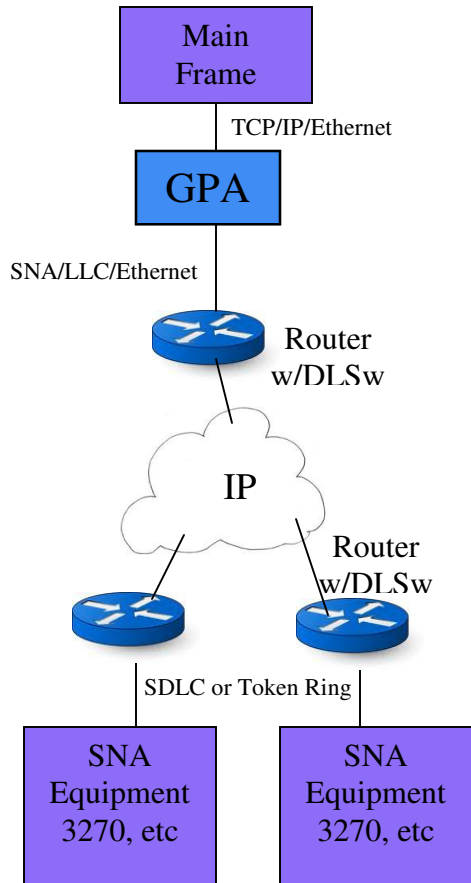
running a one second timer to generate idle line traffic over these links. This is a non-productive use of Main Frame CPU cycles.

Some may regard OSA ports as too valuable to use for this purpose.

And, finally, you may not have recent enough hardware and Main Frame software to utilize these new features.

Using TCP Based Applications

If you choose to migrate your applications to TCP/IP then the aforementioned gap must be filled in with something that can translate TCP packets into SNA packets. This is where the Gcom Protocol Appliance (GPA) comes into the picture.



Application messages leave and enter the Main Frame as TCP/IP packets in this case. The GPA connects to the Main Frame using Ethernet and receives the TCP packets.

The GPA submits the message contents to its SNA protocol stack, configured to run in host mode, using LLC as the data link layer and Ethernet as the transmission medium.

These LLC frames then enter the router which converts the LLC to DLSw as before.

Each TCP connection from the Main Frame to the GPA corresponds with one LU session to a remote device. Each LLC (in the GPA) and DLSw (in the router) session corresponds to a single PU connection as before. That is, a connection to a 3174 cluster controller or the equivalent.

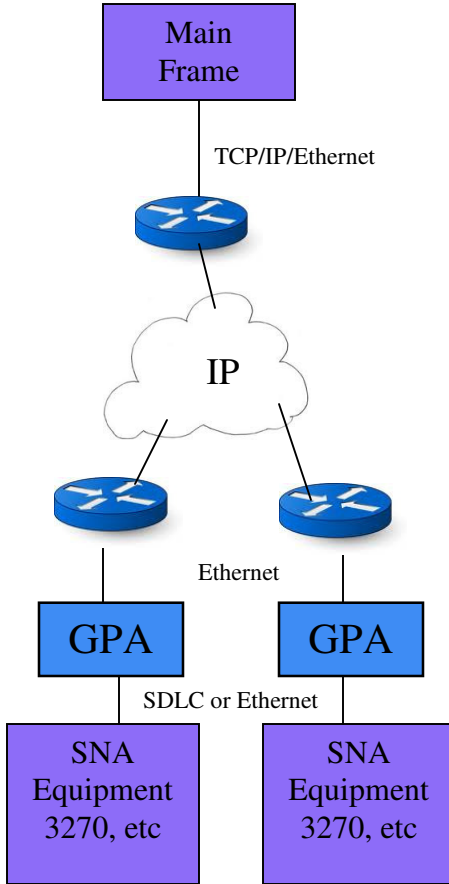
Since TCP is a byte stream protocol that does not preserve message boundaries it is necessary for the TCP packets to/from the Main Frame to

have a simple byte-count header that establishes the message boundaries. The header appears as data to the TCP protocol stack. The GPA implements a variety of such headers.

This configuration requires only the change to the application programs, plus configuration of the GPA. It leaves in place the DLSw network within the routers.

Using a Pure TCP/IP Backbone

You may find it desirable to eliminate the management of the DLSw router network and use pure IP routing from the Main Frame to the remote sites where the SNA Equipment is located. The GPA allows you to do this while retaining the SNA Equipment.



As in the previous example, the applications are now using TCP/IP. But now the Ethernet link from the Main Frame is connected directly to a router. TCP connections are routed over IP to the selected remote sites. There is no DLSw in this network configuration, simplifying management and maintenance.

At each remote site a GPA is connected to the router via Ethernet. The TCP connection from the Main Frame terminates in the GPA.

The GPA implements the SNA protocol locally to the SNA Equipment with the TCP data inserted as the payload data of the SNA RUs. The physical link can be Ethernet or SDLC. (Token Ring is impractical since Token Ring adapter cards are difficult to obtain.)

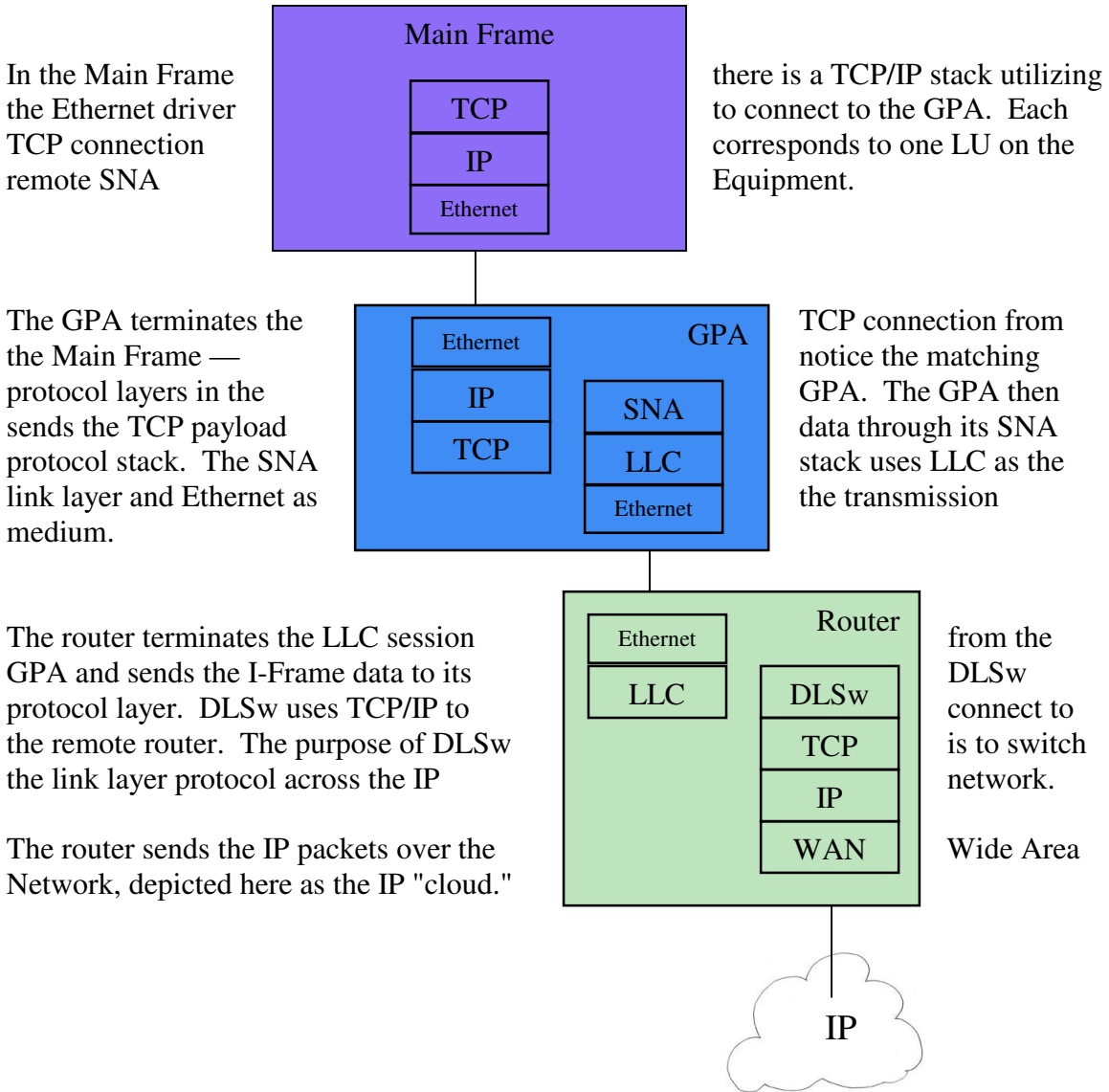
The same IP backbone can be used to access the GPAs for management purposes.

This solution can be implemented gradually from the previous example by placing a GPA at a remote site and then de-configuring the DLSw in the two routers for that site.

This solution gives you time to gradually replace the SNA Equipment with TCP/IP capable equivalents. At each site that is to be upgraded to TCP you simply connect the new equipment to the router and disconnect the GPA. This upgrading can be performed over a period of years if need be and can be done gradually.

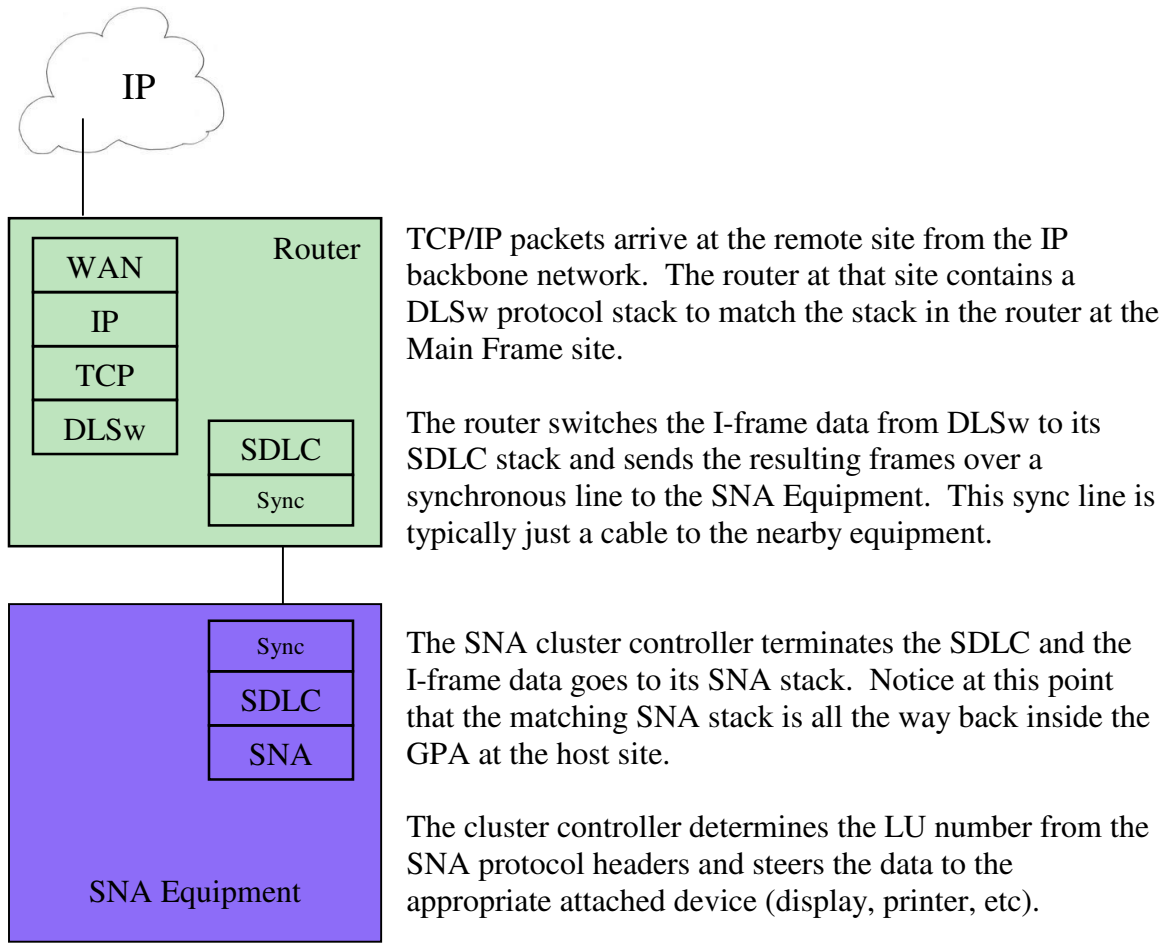
Protocol Layering at the Host Site

The following diagram illustrates the protocol layering from the Main Frame to the GPA and router with the GPA performing TCP to SNA translation at the Main Frame site.



Protocol Layering at the SNA Equipment Site

The following diagram illustrates the protocol layering at the site where the network equipment is located.



Summary

Migration from an SNA network to a TCP network can be daunting if it involves changing the application software, networking configurations and remote equipment all at the same time.

By utilizing the Gcom GPA and its ability to translate from TCP to SNA you can perform this migration in stepwise fashion.

The first step involves the elimination of the 3745 FEP and the GPA can play a role in this first step. This allows you to solve the problem of the unsupported FEP right away and then gradually migrate the remainder of your network.

You can introduce further gradual steps by placing a GPA at each remote site so that the network can be migrated from DLSw to pure IP. This makes the network easier to manage and maintain.

Finally, as circumstances allow, you can gradually replace the SNA Equipment with TCP capable equivalents and decommission the GPAs one at a time.

This process allows you to migrate from SNA to TCP over a period of years in small manageable steps, a process that is much less risky than attempting to completely change the entire network all at once.

Further Resources

The details of IBM's CCL solution can be found at the following link. [http://www-03.ibm.com/support/techdocs/atsmastr.nsf/5cb5ed706d254a8186256c71006d2e0a/9a5f1c03284b730e862570d800123a88/\\$FILE/ccl_vs_ee.pdf](http://www-03.ibm.com/support/techdocs/atsmastr.nsf/5cb5ed706d254a8186256c71006d2e0a/9a5f1c03284b730e862570d800123a88/$FILE/ccl_vs_ee.pdf)

A quick summary of DLSw is available here. <http://www.javvin.com/protocolDLSw.html>

The RFC for DLSw may be viewed here. <http://www.rfc-archive.org/getrfc.php?rfc=1795>

Information about the Gcom GPA may be found at the following link. <http://www.gcom.com/products/gcom-protocol-appliance-2g.html>

A summary of the GPA's encapsulation headers may be viewed at the following link. <http://www.gcom.com/products/gcom-protocol-appliance-2g/architecture/gcom-header-format-summaries.html>