



Bergen Cabling – Maritime LAN – the history

History behind by: Per Schulhus

Bergen, June 2011

During my 40 years of working with cabling my opinion has changed many times based on new knowledge and experience, and my mind is still open to learn more. There is still copper and glass we are talking about, but the quality and application has changed from basic telephony to high speed data transmission. This article is based on my knowledge and understanding summer 2011.

We started with 2 pair screened IBM cabling solution Token Ring and 4 pair unscreened Ethernet cabling in the late of 80`s. This - together with coax solutions was the data cabling for the 80`s.

At that time I was working for the cable and telecom company in Norway –STK. We had our own cables and agreement for connectivity from other Norwegian partners as Elko and Telesafe. Our limit was 4/16 Mbit Token Ring cabling. Later 10 Mbit Ethernet was an application for our clients. Around 1990 one of the huge companies in Norway asked for a hybrid cable. We were able to design and produce a cable with 8 pairs surrounding a fiber optic OM1 cable. This was the first hybrid cable in the market and should be able to support 4 pair telephony, 4 pair 10 Base T Ethernet as well as fiber optic security signaling.

STK developed the first RJ45 on printed circuit board together with outlet producer Elko, and we were able to support the market with domestic produced products when we used patch panels from Telesafe.

STK was bought by Alcatel and from Alcatel Business System we were asked to create a complete Norwegian Cabling System – the result was Multinet with 12 ports RJ45 modules at PCB`s with interface to Ethernet, Token Ring and 4 pair UTP 1:1 for open applications.

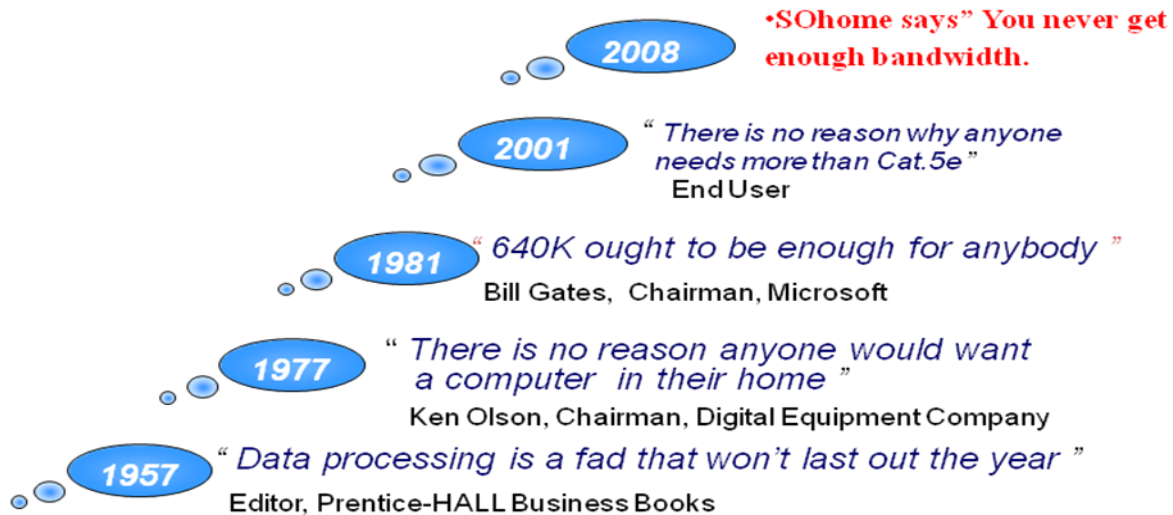
In the beginning of 90`s we were again asked to join an international group in order to develop Alcatel Cabling Solution. Alcatel had more than 20 cabling solutions (one in each country), and the target was to standardize into one system.

The end of this history was choosing the Norwegian solution based on Multinet with Alcatel colours. Still produced in Norway we were able to reach 100 MB Ethernet and had started with screened cables (FTP) from France.

During my time in Alcatel and Nexans I have given some statements in the papers that was not so smart, like UTP and fibre cabling is the future and the limit for copper will be cat.5 - but I have learned during the years and nobody can see the future.



We can only talk about what we know of today and believe will happen, but we never know. To my defense I will say I was in good company:



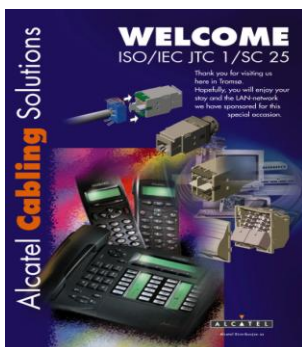
Starting with Alcatel Cabling Solution as a 120 Ohms foiled cable was not easy to bring into a 100 Ohm UTP market, but after some years we increased our Norwegian market share from 2 to 20% - and were the fastest growing cabling solution market within Alcatel.

The ACS competence centre was established in Brussels with representatives from Germany – France – Belgium and of course Norway.

When need of speed in cabling solution was needed, the competence centre was responsible for creating the new jacks. Now most was screened solutions, with a basic cat.5 unshielded cable and connectivities for “cheap solutions”.

At this time the discussion of higher bandwidth had started in the standardization committees, and of course we were all there. The target was to reach 200 MHz and 600 MHz.

ISO/IEC meeting in Tromsø



- Target was to agree upon a solution for Cat.6 connectors
- Alcatel had a proposal of the new design of plug.
- And we installed our proposal for Cat.6 for all delegates during the meeting.



SOhome as

Sandviksboder 77c – N 5035 Bergen

Tel: +47 55 31 27 00 Fax: +47 55 31 27 01

e-post: per@sohome.no



Some very smart guys in Brussels (Paul De Win and Gunther Gubbelmans) had started development of what later became Alcatel Cat.6 connector and the GG45.

When Alcatel sold the copper cable factories including ACS, to a new developed group called Nexans, the name was changed to Nexans Cabling Solutions.

In 2003 I quit Nexans in Norway in lack of support for development of new products for the new markets we saw in shipping and offshore. Winter 2004 we established SOhome AS based in Bergen (close to the shipping market).

In 2005 we agreed to join the competence centre in Brussels in order to develop Maritime LAN solutions that we launched in 2006. Our target was to follow ISO/IEC 11801 with solid wires in order to be able supporting the application 100m as the standard requires.

Stranded wires are not fit to this because of higher attenuation and for most out of the ISO/IEC 11801 standard for structured cabling.

Besides most of the connectivity is made for solid cores and will create damage for a stranded cable. During all our time with maritime and offshore we have never discovered problems with solid cores, but we have discovered problems with flexible wires and the knife of connectors.

First vessel to have this Maritime Cat.7 solution was the UK Research vessel James Cook. After that the sales of close 2 000 km Maritime Cat.7 cable and close to 80 000 of GG45 from Nexans tells its own story.

Most of the shipyards in Norway and several abroad chooses the solution in order to have DNV approved secure cabling. The biggest issue was the cable and someone chooses to use other connectors than GG45, like Cat.5 and 6 connectors.

The other problem was the outlet on a vessel with vibrations. Plastic to plastic could easily fall apart during heavy weather. So our answer to this was outlets that screw plastic to plastic, and all kind of connectors should be of snap in type in order to have a good connection.

On a project we started discussion with people from ConocoPhillips the idea to create a new hybrid cable (STP and FO) became a target in order to solve weight, cable penetration and space together with reduction of pulling cost (Pulling cost offshore was more than the value of the products).

At that time there was no solution and no idea how to solve this, what we did in earlier STK time was useless for this kind of speed.

Later in 2008 I had the possibility to get support for Innovation Norway to start development of this without requirement for success – so we started. The interest from cable manufactures was low, but I checked worldwide with different producers. As a member in the local working group ISO/IEC for cabling I was together with an old friend from Draka, and the ideas from earlier days came up again.

I named the solution Bergen Cabling because SOhome are located in the town and wanted to put it on the map as the Maritime Center the city is.



We started looking into the type of fiber we want to try, and ended up with a new construction. The target was solving 10 Gbit over copper and has the fiber for future or other solutions. At the Draka factory in Norway we managed to make the first hybrid Cat.7 + 2 OS1 fibers. Then the upgrade of EN 11801 came with OS2 and we just started again. We used the solution with Draka Bend Bright fiber that accept really hard crushing and was the best we could find.

When we knew how to do this, the decision of connectivity had to be decided. During spring 2010 all available information was studied. Basic was checking what was under development for higher applications like 40 or 100 Gbit over copper cabling. All I found was parallel communication based on 10 Gigabit. Both for copper and multimode fiber the solution was add 4 or 10 links parallel. From a customer's point of view this is impossible. They cannot have one connector in a patch panel (10Gbit) and 3 spare positions in order to prepare for 40 gigabit).

IEEE 802.3ba working with 40 & 100 Gbit Ethernet applications and protocols.

100GBASE-CR10 At least 7 meter on copper transmitting 10x10Gbit.
Supporting 100Gbit over 10 pair Twinax cable.

100GBASE-SR10 At least 100m on OM3 and 125m on OM4 10x10Gbit parallel fiber.
Using 850 nm Multi mode fiber 10 parallele for sending og 10 parallel for receiving. Total 20 fibre for 10 Gigabit.

100GBASE-L4 At least 10 km on single mode fiber 4x25Gigabit
Using DWDM (dense wavelength division multiplexing) in order to send 4 x 25Gbit per fiber. Using 1295 nm - 1300 nm – 1305 nm – 1310 nm.
Able to handle 100 Gigabit over 2 fibers.

100GBASE-ER4 Same as above, but distance increased to 40 km.

With this knowledge there was no sense in using Cat.7 or Cat.7A connectors as basic for copper. In order to reach 10 Gigabit - Cat.6A screened connectors were good enough, easier to work with and cheaper in production. There are only 2 accepted Cat.7/7A connectors in the standard (GG45 from Nexans & TERA from Siemon).

All of them support max 10 Gigabit but with different limit in bandwidth from 500 to 1000 MHz.

The future could show this was a wrong decision, but today it seems reasonable and maybe the next step in copper will be a complete new connector with more than 8 pins, and a new design of cables. Or as I stated 20 years ago – now will be the time for fiber?



For the copper cable I wanted to use an advanced Cat.7 cable in order to have good signal margin on our side when testing links. And this cable has to be fully screened and with SHF1 sheeting. For connectors I chose my old friends from the 80`s (Elko and Telesafe) with the target to show there is possible to use Norwegian products and still not be too expensive.

The solution was delivered to Delta in order to verify the 10 Gigabit link on copper, and DNV was responsible for the fire tests.

So we ended up with Bergen Cabling and two cables for the moment. (More will come).

An advanced Maritime LAN Cat.7 cable with SHF1 sheeting and good screening and protection, and a hybrid cable based on the Cat.7 with two OS2 fibers in a strong impact as an extra pair.

In Denmark we did very hard crushing test with DNV. After passing the crush tests we increased 10 times harder than requested just in order to see the limits. We managed to destroy the copper part of the cable, but the fiber was still working without nearly any kind of notice.

Design and creation of stainless steel patch panels was a must. We had several discussions with our customers and ended up with adjustable 24 port panels 1HU. We came up with same solution for basic copper on RJ45 as well as for hybrid with LC adaptors, and a producer located in the middle of Norway with no experience from the sea, but very good understanding of what to deliver. Feedback from the market was also - solve the BNC and XLR as well, and come up with patch guides with whole to be able bringing the patch cords into the cabinets.

So this is the beginning of Bergen Cabling, a solution for shipping and offshore.

