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ISO 11801
3RD EDITION

To clarify and explain further
issues concerning the normalization of structured
– ISO11801 3rd edition

Aim:	*To clarify and explain furtherissues concerning the normalization of structured cabling - 3rd edition ISO11801*
Applications:	*All subsystems of the transmission channel*
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In November 2017 the long awaited 3rd edition of ISO 11801 norm was published. In the area of structured cabling systems, it is a very important publication, which brings a number of significant changes.

In this piece of writing, I will try to shed some light on the key issues as, after all, in the near future all netowork desi-gners, installers and administrators of telecommunications networks will have to face them.

1. The structure of norm

Since the third edition of ISO 11801 norm was issued we will need to get used to a new structure of this document.
Specific areas of the standards were divided into 6 parts as is the case of EN 50173-x-branded by CENELEC. Previous 2nd edition of the norm of ISO 11801 ed.3.0 constitute the content of the previous norm and they include general requirements for the structured networks and requirements that relate to, among others, layout and performance of the structured cabling installed in the office environment. Requirements for other specific environments, such as Data Center or home cabling are included in the further parts of the standard.
Below the complete norm is presented.

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- **ISO/IEC 11801-1:** General Requirements
  This part is the basis for all other parts
- **ISO/IEC 11801-2:** Office premises
  The section designed for office areas, including part 1 of ISO 11801 replaces ed.2.2.
- **ISO/IEC 11801-3:** Industrial premises
  The section about requirements applicable to industrial environment, including part 1 is replaced by the ISO/IEC 24702.
- **ISO/IEC 11801-4:** Single-tenant homes
  The section about residential areas, together with part 1 replaces ISO/IEC 15018
- **ISO/IEC 11801-5:** Data centres
  The section about Data Centers, together with part 1 replaces ISO / IEC 24764
- **ISO/IEC 11801-6** Distributed Building Services
  A completely new standard, which applies to all of the above, inseparably linked with the concept of IoT (Inter-net of Things).

2. Applications

Application	Specification reference	Date	Additional date / reference
Class A (defined up to 0,1 MHz)			
PBX	**National requirements**		
X.21	ITU-T Rec. X.21	1992	
V.11	ITU-T Rec. X.21	1998	
Class B (defined up to 1 MHz)			
SO-Bus (extended)	ITU-T Rec. 1.430	1993	ISDN Base Access (Physical Layer)
SO Point-to-Point	ITU-T R.. 1.430	1993	ISD2 Basic Access (Physical Layer)
S1/S2	ITU-T Rec. 1.431	1993	ISDN Primary Access (Physical Layer)
Class C (defined up to 16 MHz)			
Ethernet 10BASE-T	ISO/IEC/IEEE 8802-3:2017, Clause 14[a]	2005	IOM Ethernet over Twisted Pairs
Class D 1995 (defined up to 100 MHz)			
Ethernet 100BASE-TX...	ISO/IECIIEEE 8802-3:2017, Clause 25[a]	2005	100M Ethernet over Twisted Pairs
PoE Type 1	ISO/IEC/IEEE 8802-3:2017. Clause 33[b]	2015	Power over Ethernet
Class D 2002 (defined up to 100 MHz)			
Ethernet 1000BASE-T	ISO/IEC/IEEE 8802-3:2017. Clause 40[a]	2005	Gigabit Ethernet over Twisted Pairs
Fibre Channel 1 Gbit/s	ISO/IEC 14185-115	2007	Twisted-pair Fibre Channel 1G
Firewire 100 Mbit/s	IEEE 1394b	2002	Firewire/Category 5
PoE Type 2	ISO/IEC/IEEE 8802-3:2017, Clause 33[b]	2015	Power over Ethernet
PoE Type 3	IEEE 802.3bt:2018. Clause 33[b]	2018	Power over Ethernet. IEEE 802.3bt
PoE Type 4	IEEE 802.3bt:2018. Clause 33[b]	2018	Power over Ethernet. IEEE 802.3bt
Class E 2002 (defined up to 250 MHz)			
Class E_A 2008 (defined up to 500 MHz)			
Ethernet 2.5GBASE-T	IEEE 802.3bz.2016, Clause 126[a]	2016	2.5 Gigabit Ethernet over Twisted Pairs. IEEE 802.3bz
Ethernet 5GBASE-T	IEEE 802.3bz.2016, Clause 126[a]	2016	5 Gigabit Ethernet over Twisted Pairs.IEEE 802.3bz
Ethernet 10GBASE-T	ISO/IEC/IEEE 8802-3:2017, Clause 55[a]	2006	10 Gigabit Ethernet over Twisted Pairs
Fibre Channel 2 Gbit/s	INCITS 435	2007	Twisted-pair Fibre Channel 2G-FCBASE-T
Fibre Channel 4 Gbit/s	INCITS 435	2007	Twisted-pair Fibre Channel 4G-FCBASE-T
Multimedia distribution	IEEE 1911.2	2015	HDBaseT
Class F 2002 (defined up to 600 MHz)			
FC 100 MByte/s	ISO/IEC 14165-114	2005	FC-100-DF-EL-S
Class F_A 2008 (defined up to 1 000 MHz)			
Class I 20xx (defined up to 2 000 MHz)			
Ethernet 25GBASE-T	IEEE 802.3bq:2018. Clause 113	2018	25 Gigabit Ethernet over Twisted Pairs. IEEE 802.3bq
Ethernet 40GBASE-T	IEEE 802.3b 2018. Clause 113	2018	40 Gigabit Ethernet over Twisted Pairs. IEEE 802.3bq
Class II 20xx (defined up to 2000 MHz)			
Ethernet 25GBASE-T	IEEE 802.3bq:2018. Clause 113	2018	25 Gigabit Ethernet over Twisted Pairs. IEEE 802.3bq
Ethernet 40GBASE-T	IEEE 802.3bq:2018. Clause 113	2018	40 Gigabit Ethernet over Twisted Pairs. IEEE 802.3bq

Table 1. Applications supported by symmetrical cabling

In the new 3rd edition of the ISO/IEC 11801-1, the first thing that strikes my eyes (at least mine) are new applications for copper cabling. Please note that applications are the key ones for structured cabling as the structured cabling serves only to support them. The performance of individual components or links is inextricably connected with applications, and being more precise with the possibility of operating them on given distances. Table 1 shows a set of applications in relation to the required performance of cabling. The first change compared to the 2nd edition of ISO/IEC 11801 is the presence of new Power over Ethernet applications, that is PoE Type 3 and PoE Type 4 (IEEE 802.3bt). They guarantee remote power supply of peripheral devices with power of min. 60/90W in full 100m channel. The application requires a minimum performance of Class D channel, but neverthless it is suppose to support transmission speeds of 10GBase-T and new 2.5GBase-T or 5GBase-T as well. The ratification of the IEEE 802.3bt is expected at the beginning of 2018.

Already mentioned 2.5GBASE-T Ethernet and 5GBASE-T applications are of one of the youngest 802.3bz IEEE Ethernet applications. They were „hung" under the performance of Class E_A channel, although it had been planned to assign them, in turn, to, Class D and Class E. However, these hopes came to nothing because it could not be guaranteed in any case to support 2.5G and 5G applications by enumerated performance of the channel. It is a pity, as perhaps it would give a new breath of life in Class D and at the same time we would get a clear diversification between performance of D and E class. It should be noted that the E-Class does not currently have any application that would distinguish it from the previous class D. In the previous edition of ISO 11801 ed.2.2 such application was the ATM LAN 1.2Gbit/sec. But unfortunately, it was not popular enough, as a consequence it has been omitted in the 3rd edition of the standard.

It is worth mentioning that ISO/IEC has prepared a technical report **(ISO / IEC TR 11801-9904 Assessment and mitigation of installed balanced cabling channels that support 2.5GBase-T and 5GBase-T)** that can be helpful in qualifications if already installed cable links of capacities of class D and E, are able to handle applications 2.5G and 5G applications.

Two further applications, which appeared in this edition, that are 40GBASE-T and 25GBASE-T standard have been positioned in new channels' capacities i.e. Class I and Class II. Both applications are successors of 10GBASE-T and for both, for technical reasons, it was necessary to shorten the length of the channel from 100m to 30m, which make them very useful in data centers, where we have to deal with both the short distances and high performance links necessary to support the most demanding applications. The history of 40GBASE-T is quite complex. ISO/IEC in 2010 defined the requirements for Cat 6_A components (previously they defined requirements for Class E_A channel), thus enabling the support of 10GBase-T in full 100m channel using RJ45 connectors. At the same time, requirements under Class F_A/Cat. 7_A were published. Such performance would be sufficient to use the so-called „killing application" that is the highest application of the Ethernet i.e. 40GBASE-T, which was supposed to occur in the future. It quickly turned out that the capacity is insufficient and the work on a new performance for this application has been initiated. Taking into account the high crosstalks that appear in the line for such high frequency (2GHz assumed), it was stated that 100m is the length of the channel, which cannot be achieved now, and therefore it should be reduced to 30m. Due to shorter distance, RJ45 connector is back in the game. In ISO 11801-1 two already mentioned performances (Class I and Class II) for the same applications were defined. The first is based on the RJ45 and the second on components of Category 7 (i.e. Tera, GG45, ARJ45). In my view, such division is a bit artificial, even because these three connectors cannot be found in active devices. Thus in the final calculation we are forced to use expensive hybrid patch cords, which in turn, results in the so called bottlenecks in the transmission channel. 25GBASE-T application was published at about the same time as the 40GBASE-T although the idea to implement it appeared much later. There are signs that this application fits very well into the concept of migration to 50G and 100G applications over copper, which as we all hope, will appear in the foreseeable future.

3. The minimum performance of copper components in given subsystems

A fairly significant change which occurred with the new edition of this standard is a minimum performance in the segment of horizontal cabling. The ISO/IEC 11801-1 defines it on Class E/ Category 6. As a reminder, in the second edition it was Class D/Cat 5e. In other words, in an office environment for applications max. 1 Gbit/s, the performance of Class E / category 6_A is recommended. All applications above 1 Gbit / s will be supported by the links with performance of min Class E_A/Cat.6_A.

This does not mean, of course, that Class D/Cat 5e does not exist any longer. It is still permitted to be used even in the bulding backbone (vertical cabling subsystem).

This may, however, raise some questions and they will be probably often asked, but the only thing we can do, is to accept this fact.

In the ISO/IEC 11801-5 some changes were made as well. Theu defined a minimum performance of links at level of class E_A/ Kat.6_A which will be sufficient to support max. 10 Gbit/s, full-channel 100m. Higher applications i.e. 25G and 40G require the performance of Class I or Class II, but remember that they can be operated only up to 30m channel or 24m Permanent Links.

4. Changes concerning the performance of FO fibers

The 3rd edition of ISO/IEC 11801 in the first part introduced changes also on the performance of optical fibers. First of all OM1, OM2 and OS1 categories became the things of the past. Being precise OS1 disappeared completely and the other two have been moved to the end of the ISO/IEC 11801-1 to the Appendix F, where requirements concerning them are included, but only as an informative. The use of cables with the listed categories is not recommended anymore and also a note was inlcuded That in the next edition of the standards they will be removed permanently. God took it but also gave something in return. In this case, two new categories were introduced. OM5 category for mutlimodes and OS1a for singlemodes.

As it can be seen in Table 2, the fiber OS1a replaced OS1 but the difference is quite low-keyed. Trivializing, the requirement concerning the maximum attenuation in 1393 nm window, were introduced. This is a wavelenght of occuring so called water peak (high attenuation in the area around the 1383 nm wavelength). This is important mainly for xWDM systems, as they most often use this window for transmissions. Therefore, it should be noted that the water peak was a problem of rather old fibers, as in case of newer fibers such as G.652.D this phenomenon has been marginalized and OS1 fiber produced today also meet the requirements of OS1a.

In addition, many manufacturers of structured cabling have in their product portfolios only OS2 fiber since a long time, thus as we can see from the table they are a special case of OS1a fibers and can be labeled i.e. OS1a/OS2. The introduction of a new category for multimode or OM5 category seems to be slightly more significant. The introduction of the OM3/OM4 fiber categories, in the past, in my opinion had a special implication OM3/OM4 category of fibers, which in my opinion had a special implication. Well, this allowed us to handle 10GBase -SR applications, the most popular application on the market operating at a wavelength of 850 nm, for distances of about 300 m/500m (OM3/OM4). To compare, OM1 fber the same application served for about 30m and OM2 for about 80m, which is less than copper.

Cabled optical fibre attenuation (maximum) [dB/km]										
	OM3 and OM4 multimode		OM5 multimode		OS1a single-mode			OS2 single-mode		
Wavelength	850 nm	1300 nm	850 nm	1300 nm	1310 nm	1383 nm	1550 nm	1310 nm	1383 nm	1550 nm
Attenuation	3,5	1,5	3,0	1,5	1,0	1,0	1,0	0,4	0,4	0,4

Table 2. Maximum attenuations of cabled optical fibers

Today, however, I will dare to say that we will not get such effect. The amount of data that can be transmitted on a given link using fiber optic medium does not only depend on attenuation of the fiber, but above all on the modal bandwidth. A quick glance at Table 3 is enough to note that for a wavelength of 850 nm and 1300 nm OM5 fiber does not differ from OM4 and presents the same value. Therefore, all standardized IEEE 802.3 Ethernet applications which use only these two wavelengths will be handled in the same way, regardless of whether OM4 or OM5 fiber is used. In this connection, one significant question arises - what is the advantage of such OM5 fiber and in what situations should we think about using such a cable? Let's look again at the table 3. There is a new 953 nm window. OM5 fiber is optimized to the transceivers of the spectrum that operate in the range of 850nm - 953nm in the other words multimode xWDM transmitters that can transmit and receive a signal at several different wavelengths. Unfortunately, as mentioned earlier, standardized IEEE 802.3 Ethernet applications, operate today, in the case of MM, only at 850nm and 1300nm wavelenghts, so OM5 fiber, in this case, brings no benefits compering to OM4 fiber. We should not forget, however, apart from standard applications available on the market, there are also offered propriety application of network equippmen manufactures, and among them are also MM xWDM applications. To give an example 40G/100G SWDM and 40G/100G BIDI are the application that can be handled by OM5 fibers and offering transmission benefits.

In this case OM5 reveals its advantages allowing to handle a longer distances for transmission. However, the distance longer than 150m, it is not always necessary. We should pay our attention to one thing, we are talking about applications more than 10G and such applications are mainly used in the Data Center, where high data rates are needed, but because of the compact size of the server rooms, they are rarely operated at distances longer than 100m. Also, if we do not need to go beyond the 100/150m, then fiber OM5 cannot offer us anything valuable. Table 4 is a summary of the lengths of service of each application as a function of fiber. Among identified applications only 40/100GBase-SR are standard applications compliant with IEEE standard 802.3. In the table we can see that for standard applications the difference between OM4 vs. OM5 does not exist. For propriety applications, however, we are able to have something more, but as I mentioned before, firstly extended distance is not always necessary for us and secondly own applications tied their users with only one producer of the active equipment, which is not always a good thing . The question of what will happen in the future remains open. There is a high chance that the xWDM application for MM fibers will be created, and then they will turn the today world order upside down. We will see.

Minimum modal bandwidth [MHz x km]						
		Overfilled launch bandwidth			Effective modal bandwidth	
Wavelength		850 nm	953 nm	1300 nm	850 nm	953 nm
Category	Nominal core diameter [μm]					
OM3	50	1500	N/A	500	2000	N/A
OM4	50	3500	N/A	500	4700	N/A
OM5	50	3500	1850	500	4700	2470

NOTE 1 – Modal bandwidth requirements apply to the optical fibre used to produce the revelant cabled optical fibre category and are assured by the parameters and test methods specified in IEC 60793-2-10
NOTE 2 – In addition to supporting the same 850 nm and 1 300 nm bandwidth as OM4, OM5 offers advantage for future applications using wavelength division multiplexing in the 850 nm to 953 wavelength range.

Table 3. Modal band for multimode fiber optic cables

	40G transceivers				100G transceivers			
Fiber type	40 GBase-SR4	eSR4	BiDi	SWDM	100 GBase-SR4	eSR4	BiDi	SWDM
OM3	100	300*	100	240	70	200	70	75
OM4	150	400*	150*	350	100	300	100	100
OM5	150	400*	200	440	100	300	150	150

NOTE – Distances represent guidance published by the transceiver manufacturers; some switch vendors could provide different guidance.
* Longer supported distances are possible, using some connectivity solutions available on market

Table 4. Transmission distance per fiber type and transceiver type*

** source: Corning Optical Communications*

5. Performance of the fiber optic channel

Another innovation of the 3rd edition of ISO/IEC 11801 are FO chanel performances or in the other words criteria for fiberoptic selection has been changed. In the second edition, there was the concept of optical channels of OF-300, OF-500, OF-2000 Class, which in a quite flexible way connected the application operations associated with a defined optical channel, which gave e.g. the network designers fairly simple tool for the proper design of the optical network.

300/500/2000 meant meters and if the application has been assigned to one of the channel class, it meant that it can be operated at the minimum distance appropriate for the class, i.e. 300m, 500m and 2000m. At the same time the table in the standard indicated which fibers are recommended for the application. In the third edition, the optical channels disappeared. They disappeared, as it seems to me, through the multiplication of 10/25G channels into 40/100G applications. Higher throughput meant higher price and the IEEE wanted to avoid it, hence it was enough to figure out what are the maximum lengths of the links in the data center (query to the managers in the USA) and on this basis, the distance could be reduced accordingly using less expensive components to network interface adapters, of course their costs were reduced at the same time. Unfortunately, the concept of OF-300/500/2000 channels suffered in this case quite heavily which required correction method of selection of fiber optic components.

In the new edition of the standard we have a table with the maximum attenuations that are permitted in relation to given application. In other words, a network designer, who needs to prepare a project must at first select those applications that in his opinion will be used in the network at the time of start-up, and then attempt to forecast those which may be needed in the future. Having this knowledge, then he verifies what kind the attenuation of the individual components may occur on them so as to ensure proper operation of the application at a given distance. The ISO/IEC 14763-3 standard was indicated as the one in regard to which measurements of attenuation in the channel should be taken. No more and no less.

In my opinion, the previous model, which assumes the class of channels was easier to implement. The choice of the class meant a choice of several applications at the same time. It seems that in the reality of new edition of ISO / IEC 11801 network designers will have slightly harder nut to crack. There was a change in attitude as before the criteria for selecting the components were strongly associated with applications, whereas now applications are still very important but the method of selecting components involves estimating maximum attenuation in the optical channel, this approximation determines the boundaries between „Pass and Fail."

Network application	Max. channel attenuation [dB]		
	Multimode		Single-mode
	850 nm	1300 nm	1310 nm
ISO/IEC/IEEE 8802-3:2017. Clause 9: FOIRL	6,8	-	-
ISO/IEC/IEEE 8802-3:2017. Clauses 15.18: 10BASE•Fland FB	6,8	-	-
ISO/IEC/IEEE 8802-3:2017. Clause 38: 1000855E-SX[a]	3,56	-	-
ISO/IEC/IEEE 8802-3:2017. Clause 38: 1000BASE-LX[a]	-	2,35	4,56
ISO/IEC/IEEE 8802-3:2017. Clause 26: 100BASE-FX	-	6,0	-
ISO/IEC/IEEE 8802-3:2017. Clause 53: 10GBASE-LX4[a]	-	2,00	6,20
ISO/IEC/IEEE 8802-3:2017. Clause 68: 10GBASE-LRM[a]	-	1,9	-
ISO/IEC/IEEE 8802-3:2017. Clause 52: IOGBASE-ER	-	-	10,9
ISO/IEC/IEEE 8802-3:2017. Clause 52: 10GBASE-SR[a]	2,60 (OM3) 2,90 (OM4)	-	-
ISO/IEC/IEEE 8802-3:2017. Clause 52: 10GBASE-LR	-	-	6,20
ISO/IEC/IEEE 8802-3:2017. Clause 86: 40GBASE-SR4[a,b]	1,9 (OM3) 1,5 (OM4)	-	-
ISO/IEC/IEEE 8802-3:2017. Clause 87: 40GBASE-LR4	-	-	6,7
ISO/IEC/IEEE 8802-3:2017. Clause 89: 40GBASE-FR		-	4,0
ISO/IEC/IEEE 8532-3:2017. Clause 95: 100G8ASE-SR4[a,b]	1,8 (OM3) 1,9 (OM4)	-	-
ISO/IEC/IEEE 8802-3:2017. Clause 86: 100GBASE-SR10[a,b]	1,9 (OM3) 1,5 (OM4)	-	-
ISO/IEC/IEEE 8802-3:2017. Clause 88: 100GBASE-LR4	-	-	6,3
ISO/IEC/IEEE 8802-3:2017. Clause 88: 100GBASE-ER4	-	-	18,0
1 Gbit/s FC (1,0625 GBd)[a]	2,62 (OM3)	-	7,8
2 Gbit/s FC (2,125 GBd)[a]	3,31 (OM3)	-	7,8
4 Gbit/s FC (4,25 GBd)[a]	2,88 (OM3) 2,95 (OM4)	-	4,8
8 Gbit/s FC (8,5 GBd)[a]	2,04 (OM3) 2,19 (OM4)	-	6,4
16 Gbit/s FC (14,025 GBd)[a]	1,86 (OM3) 1,95 (OM4)	-	6,4
32 Gbit/s FC (1,0625 GBd)[a]	1,75 (OM3) 1,86 (OM4)	-	6,4

a – bandwidth-limited application at the channel lengths shown. The use of lower attenuation components to produce channels exceeding the values shown cannot be recommended

b – these are multi-fibre applications and are subject to a delay skew requirement which is met by design if all the optical fibres providing a channel transverse the same cable and cord sheaths from end-to-end.

Table 5. Maximum attenuation for given applications

6. MICE scale

The last change I noticed is the introduction of environmental scale called MICE to the 3rd edition of the ISO 11801. In the previous edition this scale was not included in the norm. The scale MICE is not a new creation, it was introduced a long time ago to e.g. EN 50173, but as a reminder, I will say a few words about it.

	1	2	3
Mechanical rating	M_1	M_2	M_3
Ingress rating	I_1	I_2	I_3
Climatic rating	C_1	C_2	C_3
Electromagnetic rating	E_1	E_2	E_3

Table 6. Classification of the MICE scale

MICE is the acronym derived from external factors to which structured cabling may be exposed to:

M – Mechanical (mechanical resistance)

I – Ingress (resistance to ingress of dust and liquids)

C – Climatic (resistance to weather and chemical conditions)

E – Electromagnetic (resistance to external EMC radiation)

Each factor is defined in a 3- grade scale, and also in this way working conditions to which cabling will be exposed can be described quite accurately. As an example office environment is called light environment thus in a MICE scale is described as M1I1C1E1. At the other extreme you can imagine the automation plant in the factory where the conditions are rather harsh and in the MICE scale these conditions will be described as M3I3C3E3. Any other combination is possible, and each describes a slightly different situation.The above-mentioned parameters describing the scale have been defined in a table. Consequently, a working environment is characterized on a basis of it.

7. Summary

The new has come - to put a new edition of ISO-11801 in a nutshell. Firstly, compared to the previous edition, a volume of a new norm has been highly increased by introducing division into parts and adding new areas. In my opinion, however, it is not the most important.

To start, it contains a record-breaking number of new the IEEE 802.3 Ethernet applications. In this respect, the year 2016 was very affluent. 2.5GBase-T and 5GBase-T applications have been introduced and even if not everything went well and had a successful ending, it is a significant change. The fact that these standards are assigned to Class E_A, fortunately, does not close the way to use them for Class D and E. Therefore, 25GBase-T application was created as a good start for the future 50GBase-T and who knows, perhaps even 100G. There are also long-awaited 40GBase-T. Both 25G and 40G applications are limited to 30m long distance which eliminates them from use in the office environment. This is the first case of this type. It should be noted, however, that the work is ongoing on establishing conditions to reach longer range. On the top of that, 2 new classes of performance have been also created to support the same applications.

Another perhaps surprising for a number of people change, is the determination of cat. 6/Class E as the minimum performance of a channel in a subsystem of the horizontal cabling. Thus, it becomes a choice of standard components for the construction of the channel in this sector. Category 5/Class D is slowly becoming a thing of the past but from a technical point of view, is doing incredibly well so far and in no way stands out from its successor.

The new has also come in fiber optic optic cables mainly thanks to the new category-OM5. Even if today it has only little to offer, I am pretty sure that soon it will change due to new applications such as SWDM and will gain recognition among end users and network designers.

A new approach to the criteria of fiber optic components is for me also something that I will associate with the new edition of the standard. This is an important change not only for network designers, as I have already mentioned, but also because the installers if they do not want to repeat the measurements, they should quickly equip themselves with necessary knowledge.

We – FIBRAIN, as the manufacturer of structured cabling, are of the opinion that only a well-trained partner guarantees that our products will gain more and more recogniction among end-users. Therefore, we will make every effort to promote knowledge about the new regulations related to the third edition of ISO / IEC 11801.

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