

Program Manual



Topology Description Generator Quick Start Guide

V.1.0 2020/1/30

Please download the latest version at https://unit.aist.go.jp/esprit/cppc/

Contact: cppc-secretariat-ml@aist.go.jp

* Please note that we do not accept questions or inquiries regarding how to use the TDG.



Disclaimer of Warranties:

Topology Description Generator is provided AS IS, with all faults, without any warranty of any kind.

License:

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1. PREPARING YOUR SOFTWARE ENVIRONMENT

- Install the KiCAD software: <u>https://kicad-pcb.org/</u>
- Install Python 3.6: <u>https://www.python.org/</u>
- Download and uncompress TDG, as shown below.

¥TDG	
+doc	
CPP-TPDG_manual.v.	.1.pdf
LICENSE-2.0.txt	
+KiCADLibrary	
OptNetModel100GHz.	v1.lib
OptNetModel12.5GHz	.v1.lib
OptNetModel50GHz.v	1.lib
+SampleTopology	
+OptNetSampleModel	100GHz
Dnode1.sch	OptNetSampleModel100GHz.kicad_pcb
Dnode2.sch	OptNetSampleModel100GHz.pro
Dnode3.sch	OptNetSampleModel100GHz.sch
Dnode4.sch	sym-lib-table
OptNetSampleMode	el100GHz.pdf
OptNetSampleMode	el100GHz.xml
OptNetSampleMode	el100GHz_tpl.xml
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	yml
	vml
xml2topology2 pv	



2. STARTING UP A SAMPLE PROJECT

 Open "\TDG\SampleTopology\OptNetSampleModel100GHz\ OptNetSampleModel100GHz.pro"

📧 Dnode1.sch	2019/12/19 1
📧 Dnode2.sch	2019/12/19 1
📧 Dnode3.sch	2019/12/19 1
👪 Dnode4.sch	2019/12/19 1
OptNetSampleModel100GHz.bak	2019/12/19 1
OptNetSampleModel100GHz.kicad_pcb	2019/12/19 1
😎 OptNetSampleModel100GHz.pdf	2019/12/19 1
OptNetSampleModel100GHz.pro	2019/12/19 1
OptNetSampleModel100GHz.sch	2019/12/19 1
OptNetSampleModel100GHz.xml	2019/12/19 1
OptNetSampleModel100GHz_tpl.xml	2019/12/19 1
OptNetSampleModel100GHz-cache.lib	2019/12/19 1
sym-lib-table	2019/12/19 1

- The KiCAD software is opened.
- · Click on "Preferences" and then on "Manage Symbol Libraries."

📓 KiCad (5.1.2)-2 D:¥D_Document¥Model_KAKEN¥201908Experiment¥OFC2020RTopo¥OFC2020RTopo3¥OFC20... — 🛛 🛛 🛛

File View Tools Browse	e Prefe	rences Help		
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OFC2020RTopo3	4	Set Language	>	
< >				v
Edit the global and project sy	mbol lib	rary tables		

 Add "\TDG\KiCADLibrary\OptNetModel100GHz.v1.lib" to the "Project Specific Libraries."



• Open "Schematic Layout Editor."



Now, you can edit and modify the topology according to your requirements.



3. EXPORTING THE TOPOLOGY DESCRIPTION

After editing the topology, you can export the complete information describing the topology.

• Click on "Generate netlist."

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• Click on "Add Plugin..."

Netlist	×
Pcbnew OrcadPCB2 CadStar Spice Top. ● ● Options: ✓ ✓ Generate Netlist ✓ Default format ✓ ✓ Close Add Plugin Remove Plugin. ✓	t

 Enter the below command in the field "Netlist command:." python "\TDG\src\xml2topology2.py" –a "\TDG\src\AdditionalInfoWDM32.xml" –l "%I" "%O"

*The folder path should be modified according to your system environment

- Enter some name in the field "Name:" for recognizing the added plugin, e.g., "TDGwithFBD"
- Click on "OK."
- Click the newly generated tub "TDGwithFBD" and then click the "Generate Netlist."

Netlist				×
Spice Option	Topology for PF2.0	TDGwithFBD	•	Generate Netlist
Def	fault format			Close
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🚺 ダウンロード	Inode1.sch	2019/12/19 17:27	KiCad Schematic	19 KB	
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11 最近表示した場所	E Dnode3.sch	2019/12/19 17:27	KiCad Schematic	21 KB	
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	OptNetSampleModel100GHz.bak	2019/12/19 15:45	BAK ファイル	1 KB	
	OptNetSampleModel100GHz.kicad_pcb	2019/12/19 15:45	KiCad Board	1 KB	
51759	🔁 OptNetSampleModel100GHz.pdf	2019/12/19 17:32	Adobe Acrobat	126 KB	
◎ ドキュメント	OptNetSampleModel100GHz.pro	2019/12/19 17:32	KiCad Project	1 KB	
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😸 ビデオ	OptNetSampleModel100GHz.xml	2019/12/19 17:28	XML ドキュメント	94 KB	
	OptNetSampleModel100GHz_tpl.xml	2019/12/19 17:28	XML ドキュメント	123 KB	
	OptNetSampleModel100GHz-cache.lib	2019/12/19 17:27	VisualStudio.lib	18 KB	
	sym-lib-table	2019/12/19 15:45	ファイル	1 KB	
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ファイル名(N): OptN	etSampleModel100GHz				
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• Save it with a file name, e.g., OptNetSampleModel100GHz.

• Two new files are generated. One is the OptNetSampleModel100GHz.xml, which describes the schematic circuit diagram content. The other is OptNetSampleModel100GHz_tpl.xml, which describes the optical network topology description, including the channel table information.

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書き込む 新しいフォルダー		:≕ ▼ 🗔	0
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Inode2.sch	2019/12/19 17:27	KiCad Schematic	
📧 Dnode3.sch	2019/12/19 17:27	KiCad Schematic	
🗿 Dnode4.sch	2019/12/19 17:27	KiCad Schematic	
OptNetSampleModel100GHz.bak	2019/12/19 15:45	BAK ファイル	
OptNetSampleModel100GHz.kicad_pcb	2019/12/19 15:45	KiCad Board	
🗾 OptNetSampleModel100GHz.pdf	2019/12/19 17:32	Adobe Acrobat	
OptNetSampleModel100GHz.pro	2019/12/19 17:32	KiCad Project	
OptNetSampleModel100GHz.sch	2019/12/19 17:27	KiCad Schematic	
OptNetSampleModel100GHz.xml	2019/12/19 17:28	XML ドキュメント	
OptNetSampleModel100GHz_tpl.xml	2019/12/19 17:28	XML ドキュメント	
OptNetSampleModel100GHz-cache.lib	2019/12/19 17:27	VisualStudio.lib	
sym-lib-table	2019/12/19 15:45	ファイル	

• The "OptNetSampleModel100GHz_tpl.xml" is the topology description file that includes complete information for the topology. The data structure is shown below.



</th <th>Pxml version="1.0" ?></th>	Pxml version="1.0" ?>
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(1)	<pre><design> <source/>D:\u00e4D_ocument\u00e4Model_KAKEN\u00e4TopoGenPublish\u00e4TDG\u00e4SampleTopology</design></pre>
(2)	<channelinfo> <channeltable id="WDM32" type="optical"> <channel no="1"> <doubleparam name="frequency" unit="THz">195.5</doubleparam> <doubleparam name="bandWidth" unit="GHz">100</doubleparam> </channel></channeltable></channelinfo>
(3)	<pre><components> <components> <components> <comp ref="N202"> <field name="idname">/TEST_WSS1X9_100GHz_N202</field> <field name="residence">/Dnode1/</field> <field name="residence">/Dnode1/</field> <field name="Controller">192.168.60.1</field> <field name="Controller">192.168.60.1</field> <field name="Controller">192.168.60.1</field> <field name="GLPK">(3)-a <field glpkchanneltableid="WDM32" glpktype="switching" name="GLPK">(3)-b <pre>set AvailableConnection := {i in InputPort, j in Channels, k in OutputPort,</pre></field></field></comp></components></components></components></pre>
	<pre>c/componente></pre>
(4) </td <td><pre> </pre></td>	<pre> </pre>

(1) The *design* element describes the header information, such as the software version and the date of update.



- (2) The *channelInfo* element describes the wavelength channels supported by the network. Here, the 100 GHz-grid and 32 WDM channels are described.
- (3) The *components* element describes all instances of the optical components. The *comp* element describes each component instance.
 - (3)-a: The intermediate controller address to which the instance belongs
 - (3)-b: The switching functionalities of the component instance is described in GNU MathProg modeling language
 - (3)-c: Information for the intermediate controllers such as the corresponding operation program type invoked by the intermediate controller
 - (3)-d: The detailed port attributes of the component instance
- (4) The *nets* element describes all the fiber cablings (connections) among the optical ports of the component instances. The *net* element describes each cabling defined by a pair of optical ports.

By reading and analyzing the _tpl.xml topology description file, we can perform optical path computation or optical node switching functionality analysis. Some studies using TDG have been published, as shown in Sec.4. TDG does not include tools for analyzing the topology description files currently; we plan to publish them in the future.



4. RELATED PUBLICATIONS

Journal:

• Kiyo Ishii, Atsuko Takefusa, Shu Namiki, Tomohiro Kudoh, "Optical Network Resource Management Supporting Physical Layer Reconfiguration," IEEE/OSA Journal of Lightwave Technology, Vol. 37, No. 21, pp. 5442-5454, Aug. 2019.

Proceedings:

- Kiyo Ishii, Sugang Xu, Noboru Yoshikane, Atsuko Takefusa, Shigeyuki Yanagimachi, Takeshi Hoshida, Kohei Shiomoto, Tomohiro Kudoh, Takehiro Tsuritani, Yoshinari Awaji, Shu Namiki, "Automatic Resource Mapping Using Functional Block-Based Disaggregation Model for ROADM Networks," in Proc. OFC2020, SDN/NFV Demo-zone
- Kiyo Ishii, Shu Namiki, "Toward Automatized Handling of Future Agile Networks Employing Various Optical Switching Functionalities," in Proc. OECC/PSC2019
- Kiyo Ishii, Atsuko Takefusa, Shu Namiki, Tomohiro Kudoh, "Path Computation and Topology Description Scheme for Consistently Supporting Heterogeneous Optical Node Structures," in Proc. Advanced Photonics Congress, OSA, 2019
- Kiyo Ishii, Atsuko Takefusa, Shu Namiki, Tomohiro Kudoh, "Efficient Path Calculation Scheme for Advance Reservation of Hierarchical Optical Path Network Using Continuous Variables to Represent Switch States," in Proc. PSC2018





ABOUT CPPC

Cyber Photonic Platform Consortium (CPPC) has been established on 2018/4/1 as one of the AIST consortia. The purpose of CPPC is driving the automation of the optical network layer leading to the creation of new markets, and pursuing sustainable development of the future information communication industry. For more information about CPPC, please visit <u>https://unit.aist.go.jp/esprit/cppc/</u>.

AIST developed this manual and TDG.