

TOSHIBA

2018 International Technical Exhibition Seminar

Future concept of machine vision camera by Toshiba Teli Co.

Visual Component Development Div.

Toshiba Teli Corporation

December 7th 2018

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01 Trend of latest sensor

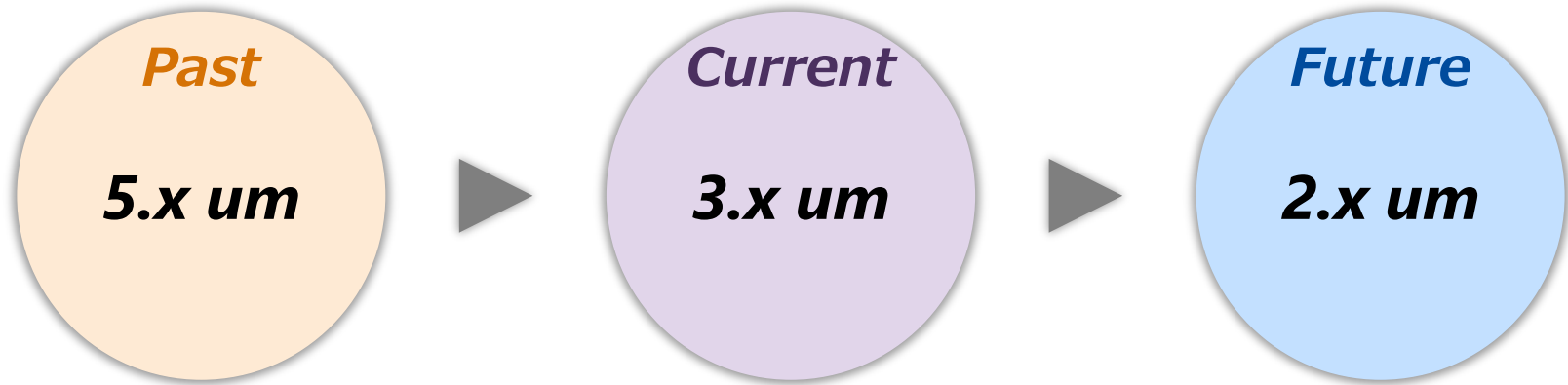
02 Overview of interface in next generation

03 Forecast by product category

01

Trend of latest sensor

Trend of image sensor for machine vision



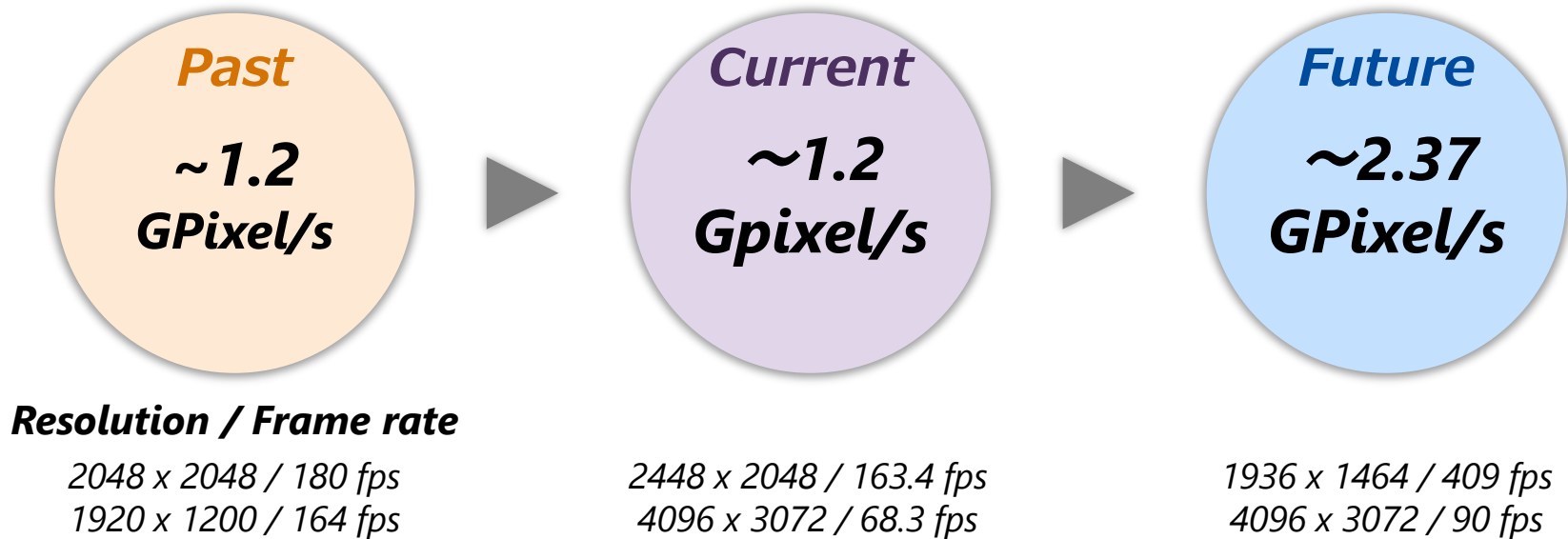
Optical format / Resolution

1 type / 2048 x 2048@5.5um
1.1 type / 2560 x 2560@5.0um

1 type / 3072 x 3072@3.6um
1.1 type / 4000 x 4000@3.2um

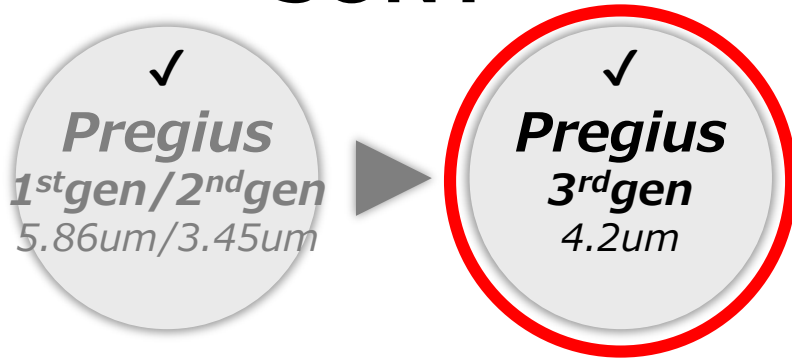
1 type / 4096 x 4096@2.8um
1.1 type / 5120 x 5120@2.5um

Trend of image sensor for machine vision

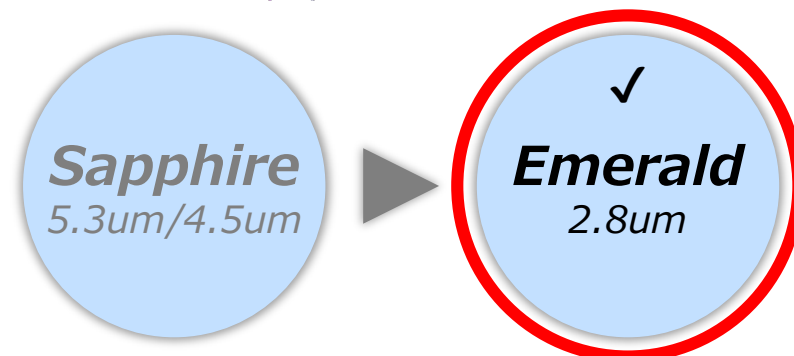
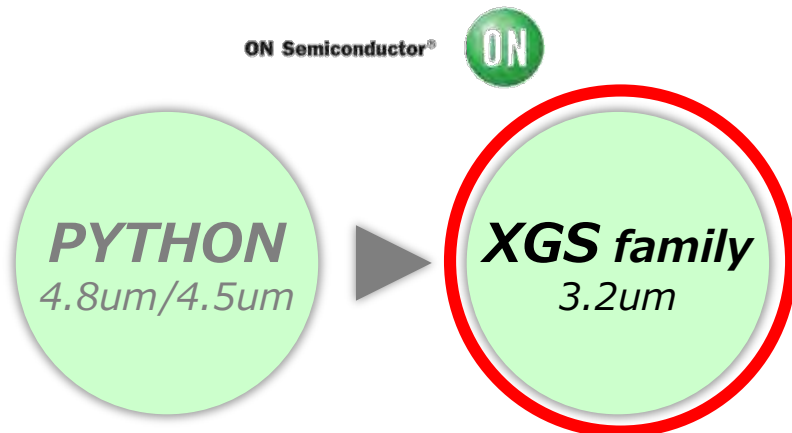
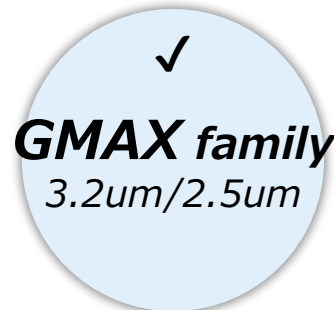
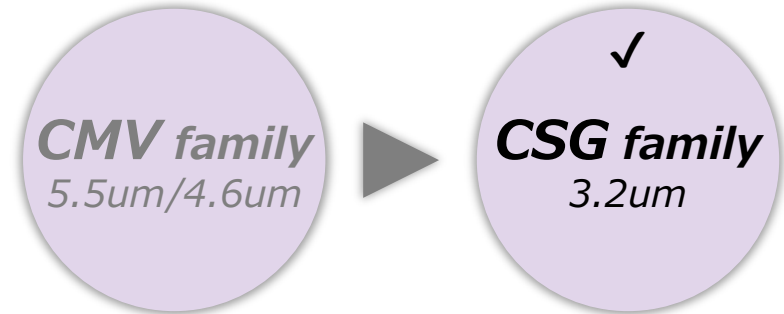


Global shutter sensor family in next generation

SONY



amn



What Toshiba Teli is working on

SONY

USB camera with 3rd generation Pregius™

USB™
VISION



BU285MG (tentative)

<i>Imager</i>	GS-CMOS
<i>Imager type</i>	Sony / IMX421
<i>Pixel</i>	2.8M 1936 × 1464
<i>Optical format</i>	2/3 type
<i>Pixel size</i>	4.5um
<i>Aspect ratio</i>	4:3
<i>Frame rate</i>	140fps

What Toshiba Teli is working on



USB camera with Emerald sensor



DDU1606MG (tentative)

<i>Imager</i>	GS-CMOS
<i>Imager type</i>	TELEDYNE e2v / EV2S16M
<i>Pixel</i>	16M 4096 × 4096
<i>Optical format</i>	1 type
<i>Pixel size</i>	2.8um
<i>Aspect ratio</i>	1:1
<i>Frame rate</i>	30 fps

What Toshiba Teli is working on



USB camera with XGS sensor



BU1206MG (tentative)

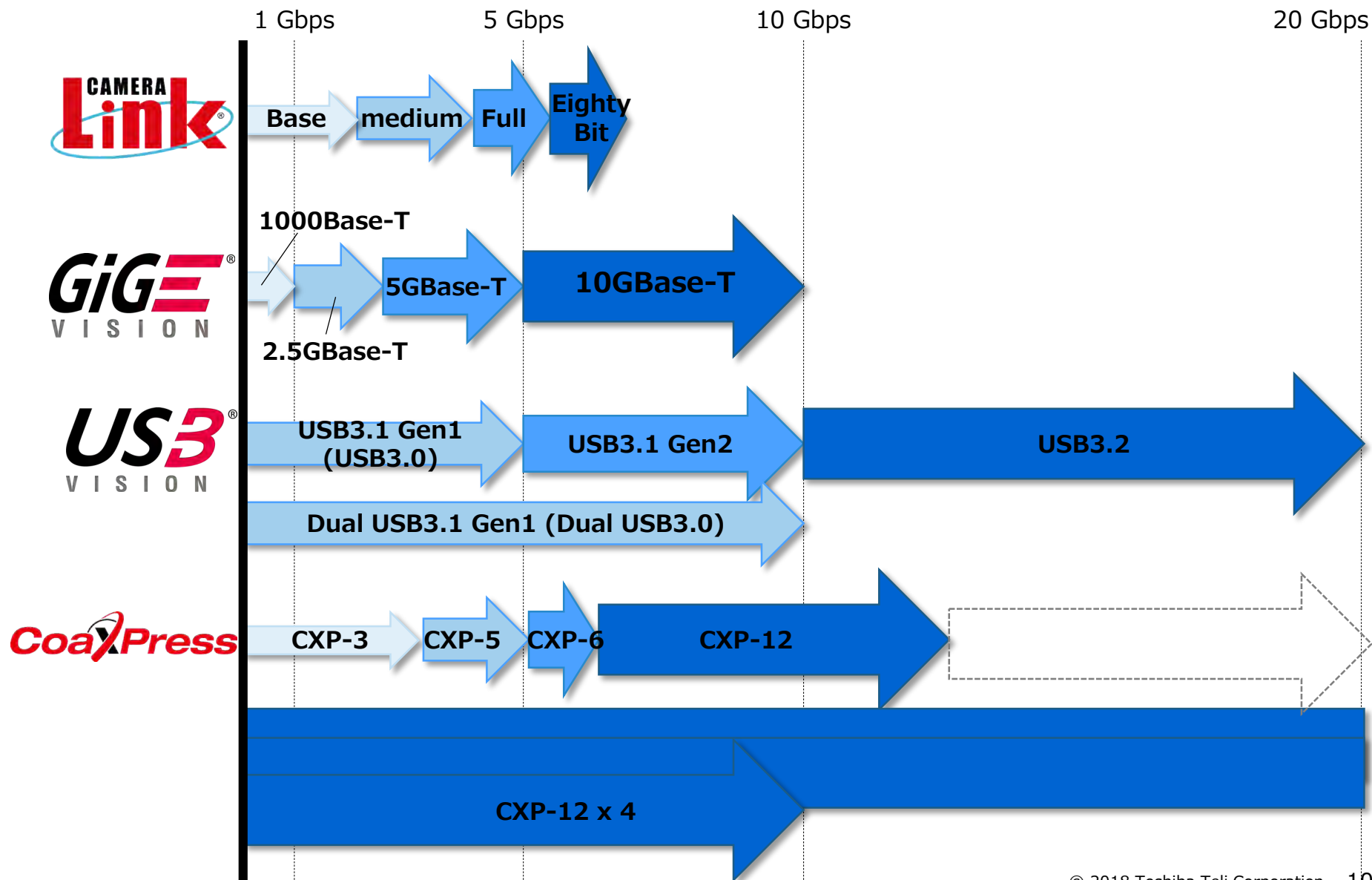


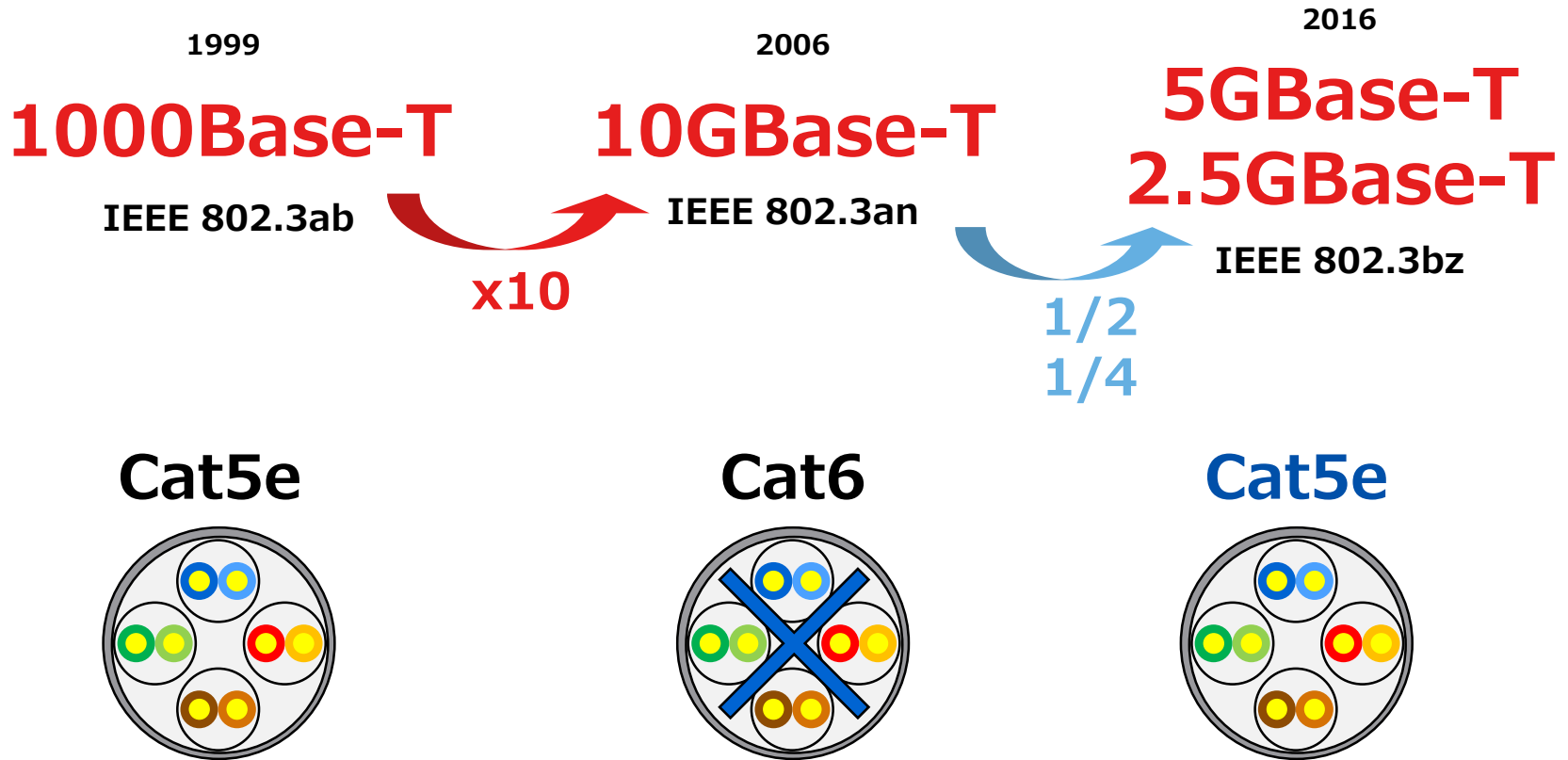
<i>Imager</i>	GS-CMOS
<i>Imager type</i>	ON Semiconductor/ XGS 12000
<i>Pixel</i>	12M 4096 × 3072
<i>Optical format</i>	1 type
<i>Pixel size</i>	3.2um
<i>Aspect ratio</i>	4:3
<i>Frame rate</i>	28 fps

02

Overview of interface in next generation

Speed comparison of interface





1000Base-T

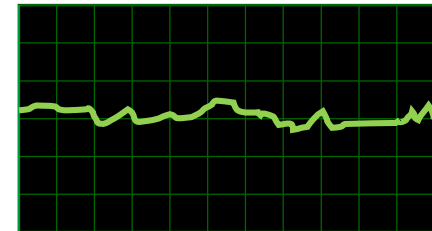
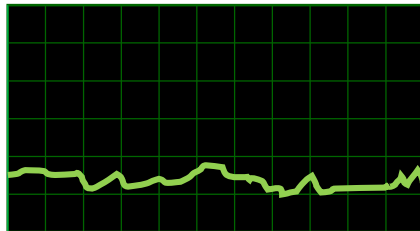
10GBase-T

**5GBase-T
2.5GBase-T**

Electricity consumption



CPU occupation



LDPC

Low Density Parity Check

1963 Released (by Dr. Robert Gray Gallager, MIT)

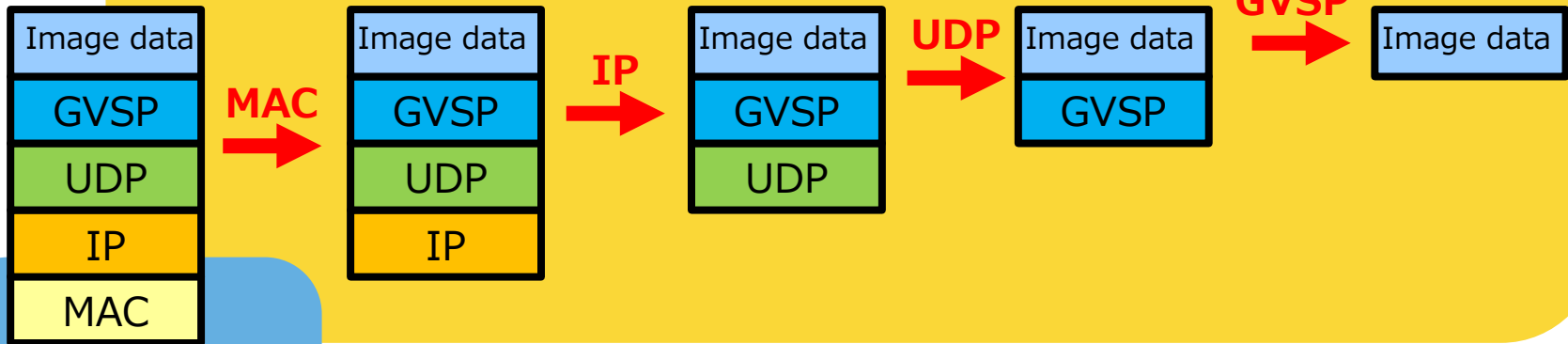
2003 Applied to DVB-S2

2005 Applied to mobile WiMAX(IEEE802.163)

2006 Applied to 10GBase-T (IEEE 802.3an)

CPU occupation

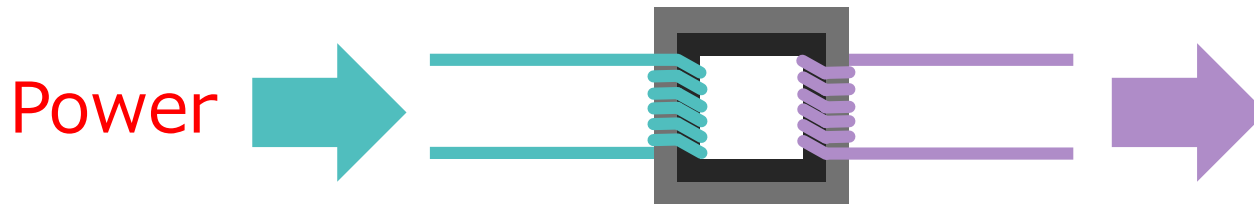
Software processing



Hardware processing

PoE

Power over Ethernet
IEEE 802.3af



2008



USB3.1 Gen1



2013



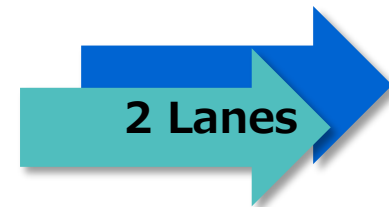
USB3.1 Gen2



2017



USB3.2 Gen2x2





USB3.1 Gen1

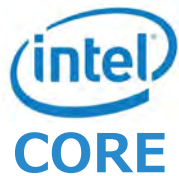


USB3.1 Gen2



USB3.2 Gen2x2

	USB3.1 Gen1	USB3.1 Gen2	USB3.2 Gen2x2
Physical bandwidth	5 Gbps	10 Gbps	20 Gbps
Encoding method	8b/10b	128b/132b	128b/132b
Effective bandwidth	4 Gbps	9.7 Gbps	19.3 Gbps



USB3.1 Gen1



USB3.1 Gen2



USB3.2 Gen2x2

1st Nehalem

2nd Sandy Bridge

3rd Ivy Bridge

4th Haswell

5th Broadwell

6th Skylake

7th Kaby Lake

8th Coffee Lake

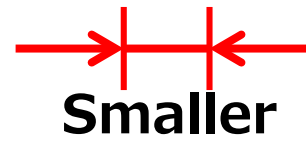
9th Coffee Lake Refresh



Micro-B



Type-C



Smaller

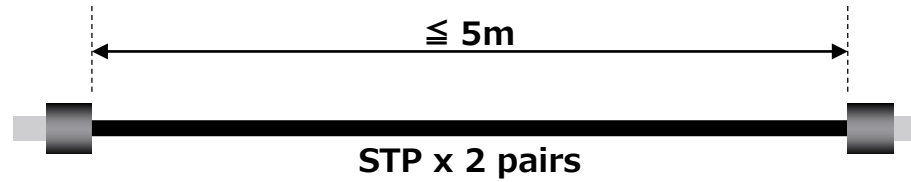


Reversible

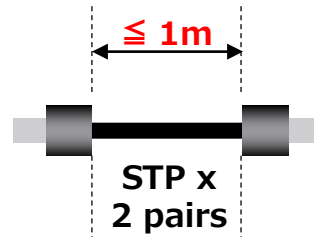
USB PD
Power Delivery



USB3.1 Gen1



USB3.1 Gen2



USB3.2 Gen2x2



* "SUPER SPEED USB" and "SUPER SPEED+ USB" are registered trademarks of USB IF.







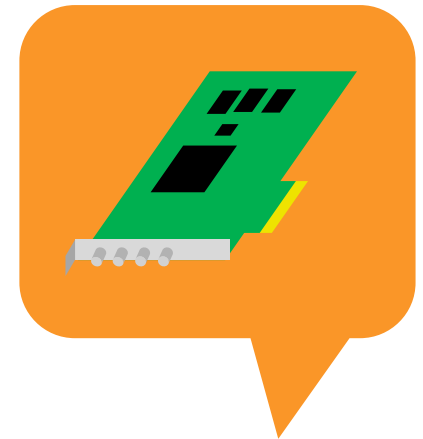
Micro-B



Type-C

	Micro-B	Type-C
USB2.0	✓	✓
USB3.1 Gen1	Optional	Optional
USB3.1 Gen2	Optional	Optional
USB3.2 Gen2x2		Optional
Power Delivery		Optional

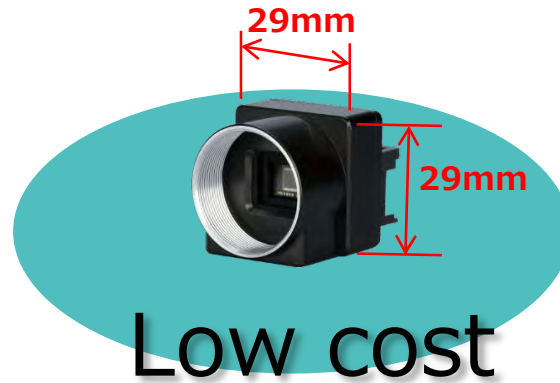
	 CXP-3	 CXP-5	 CXP-6	 CXP-12
1 Cable	3.125 Gbps	5 Gbps	6.25 Gbps	12.5 Gbps
2 Cables	6.25 Gbps	10 Gbps	12.5 Gbps	25 Gbps
4 Cables	12.5 Gbps	20 Gbps	25 Gbps	50 Gbps



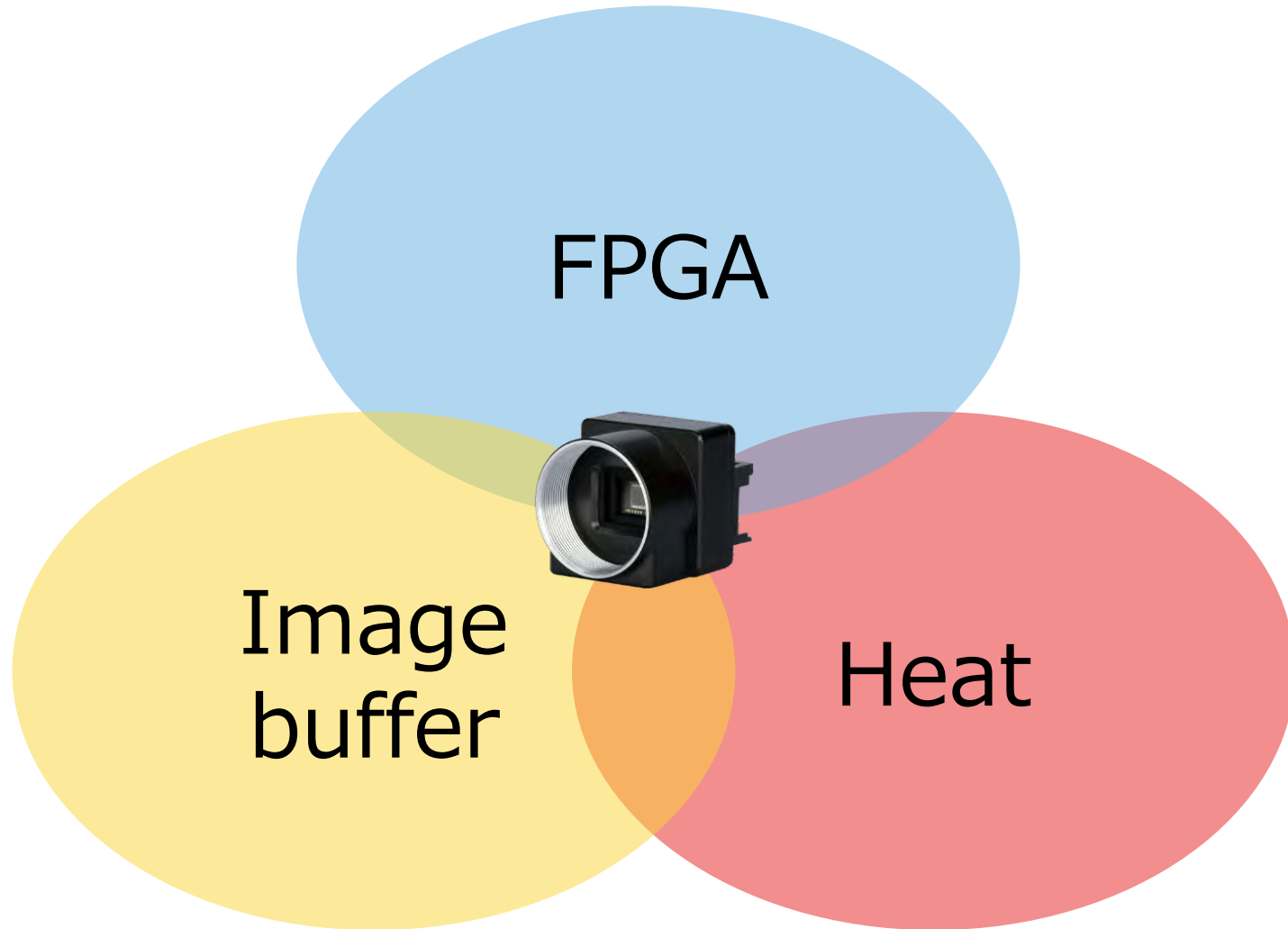
03

Forecast by product category

Definition of product category

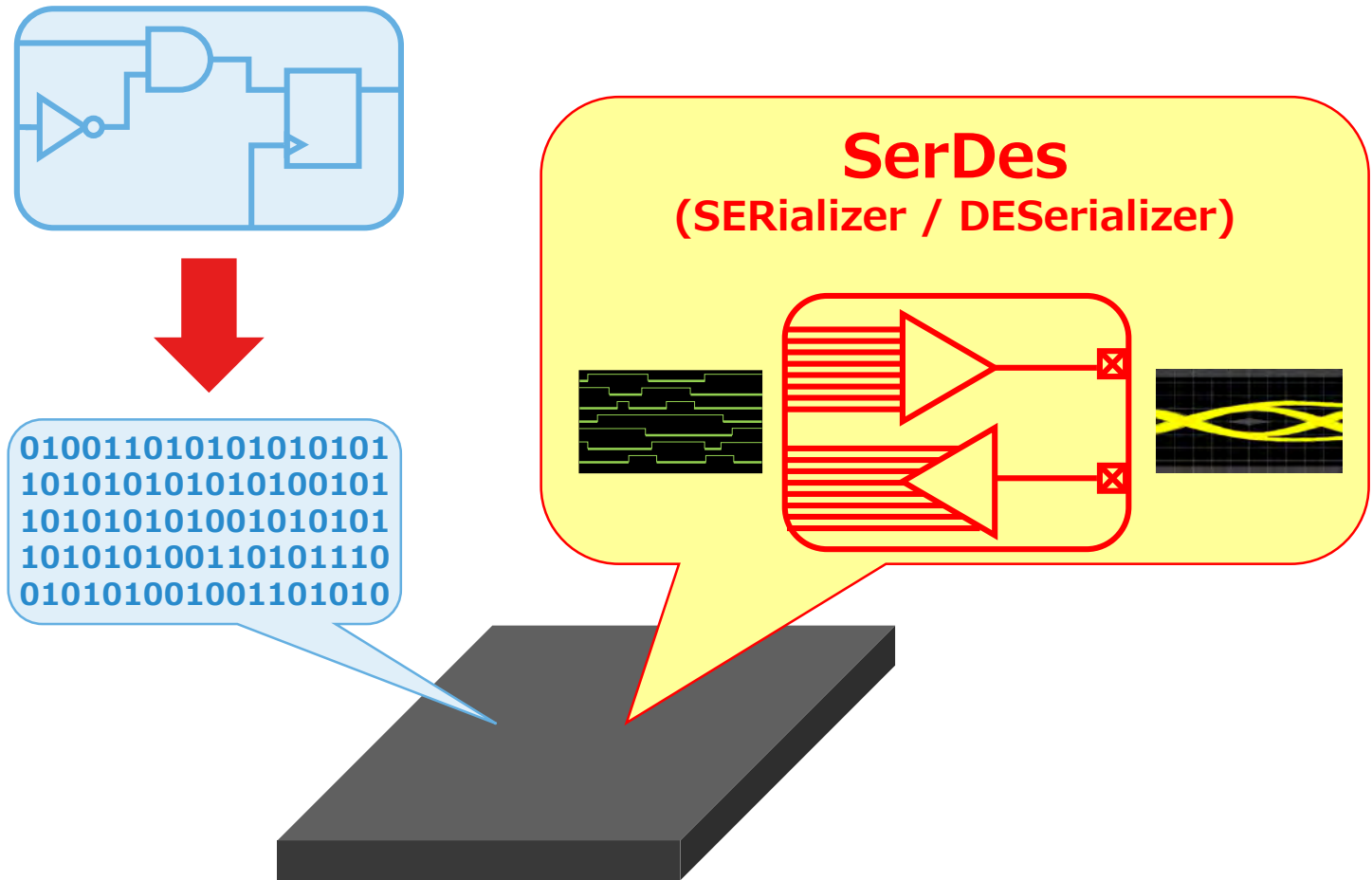


What decides cabinet size?

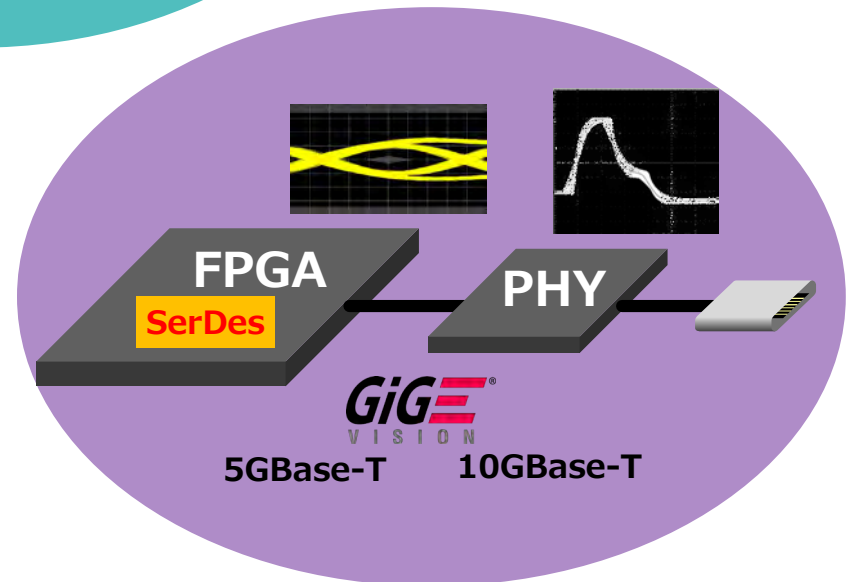
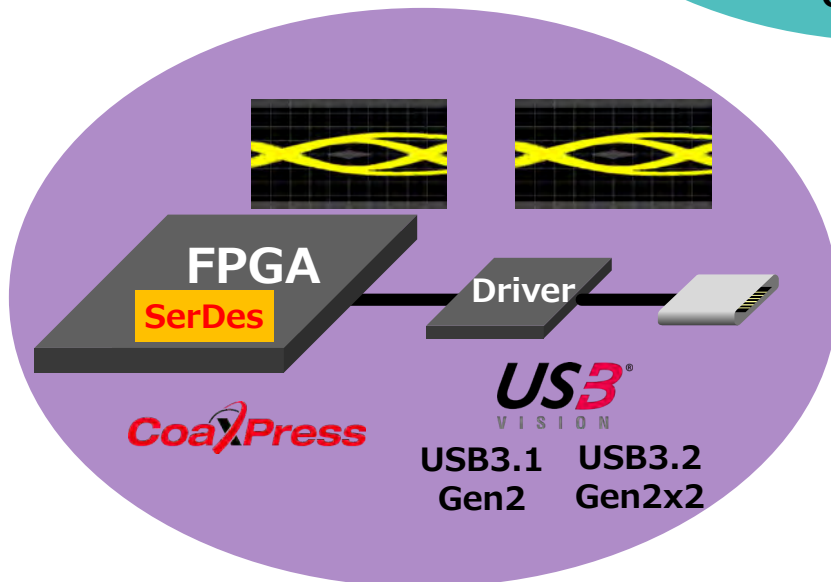
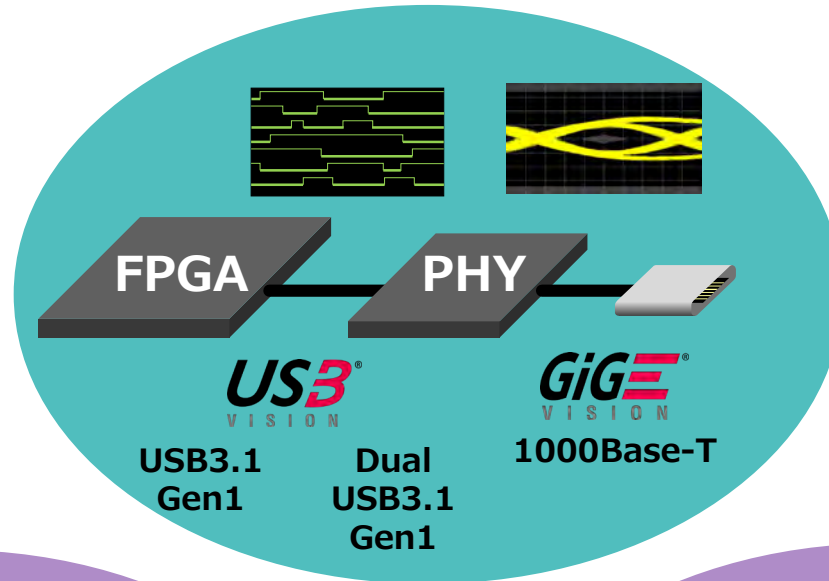


What's FPGA?

Field Programmable Gate Array



What's FPGA?



High speed serial interface of FPGA

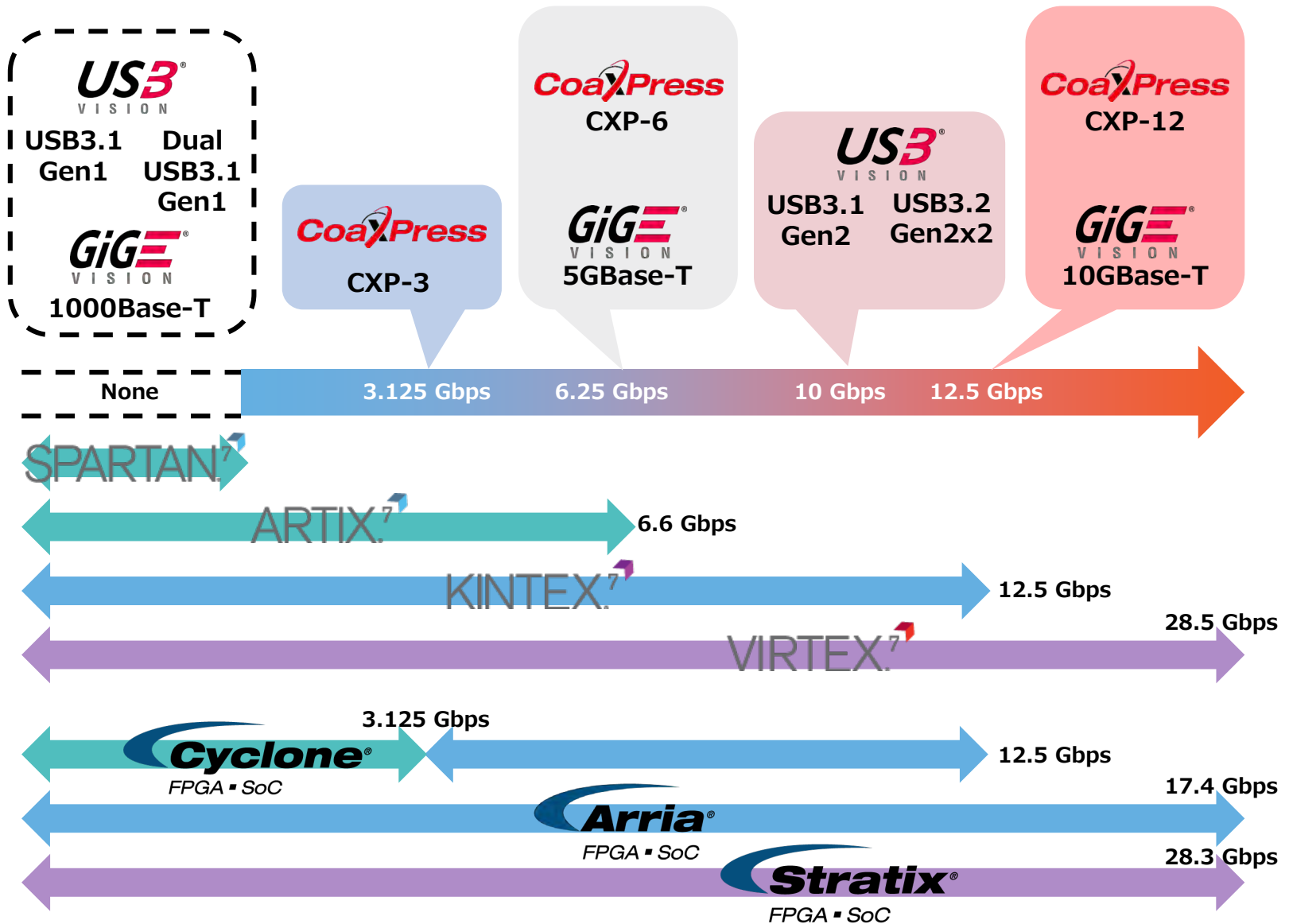


Image buffer

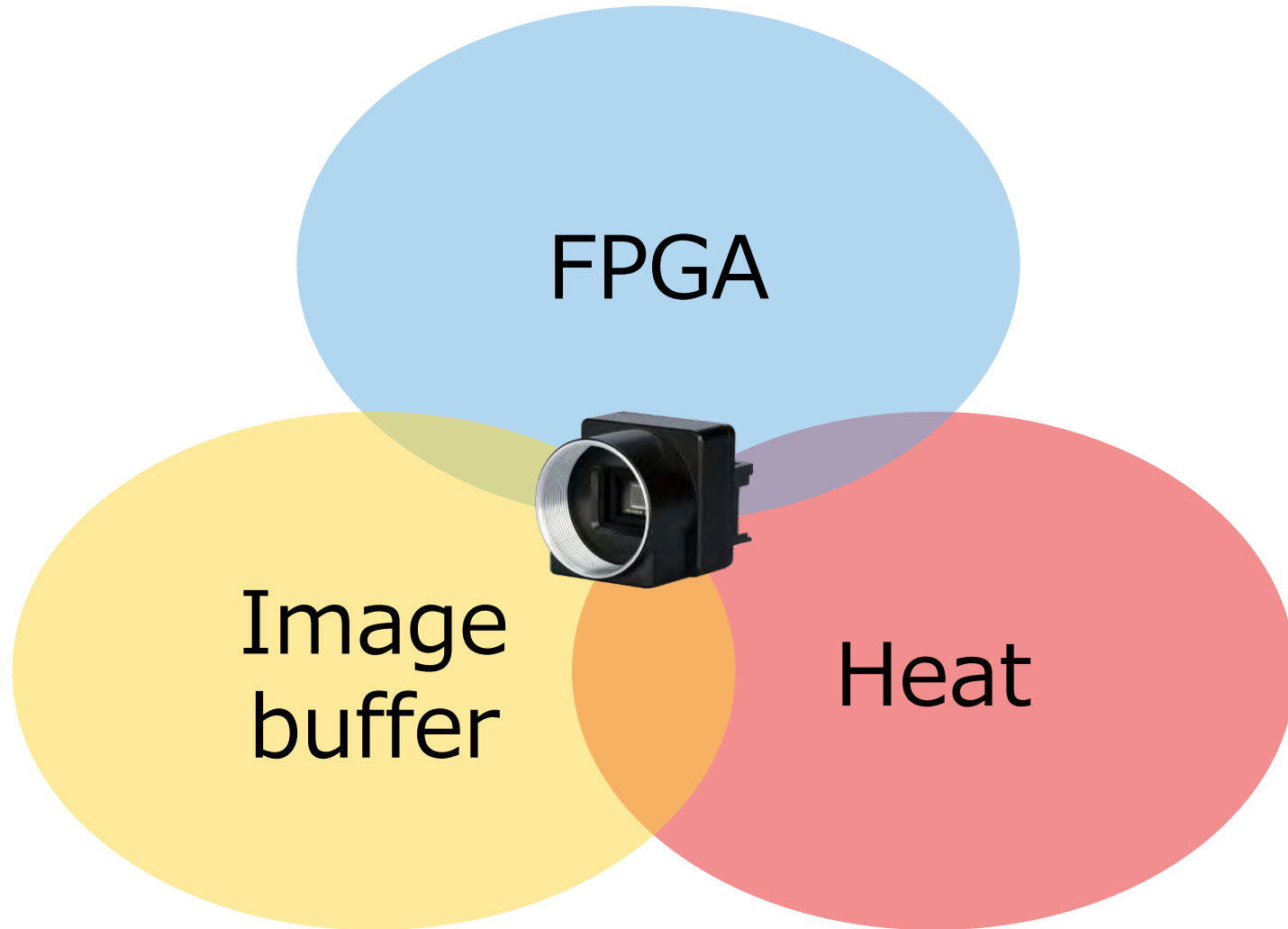


Image buffer

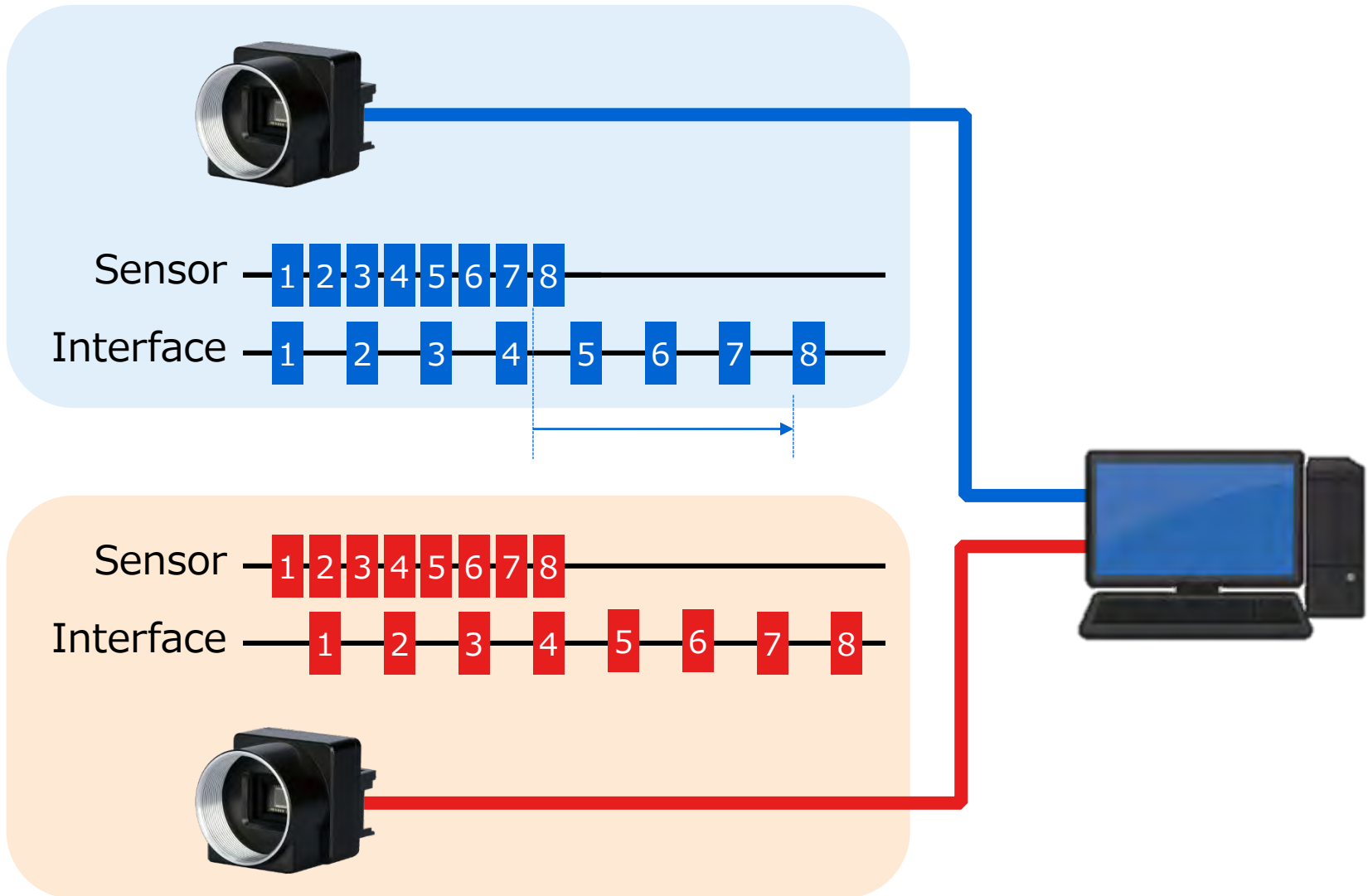
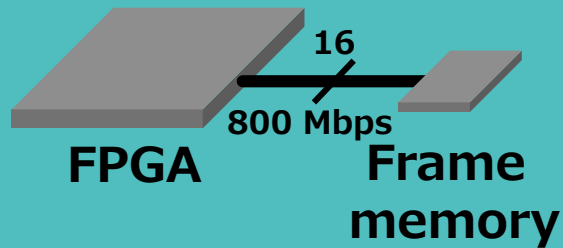


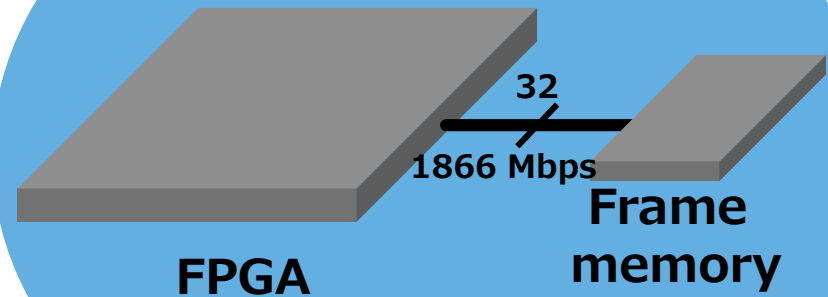
Image buffer

Low cost



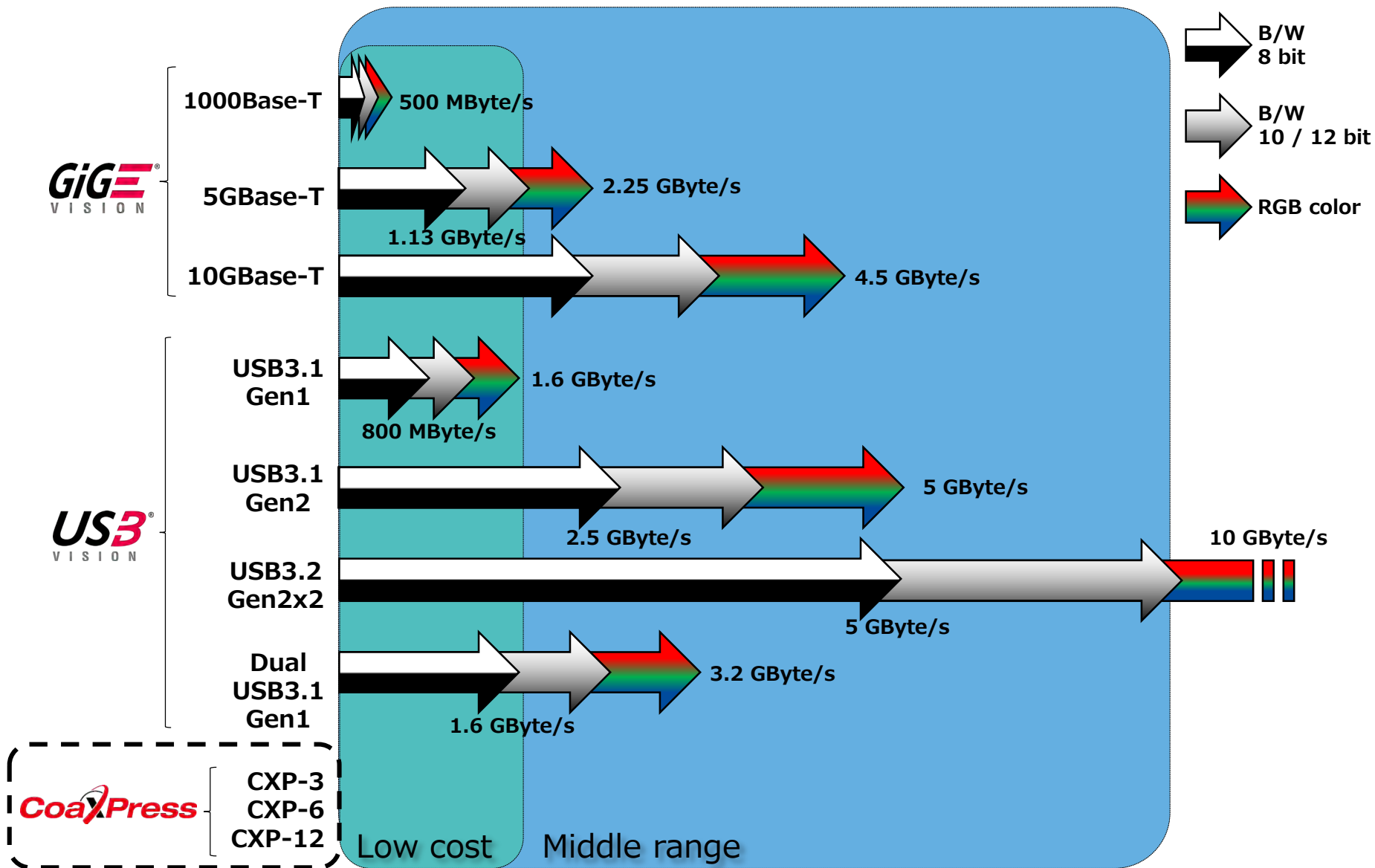
1.6 GByte/s

Middle range

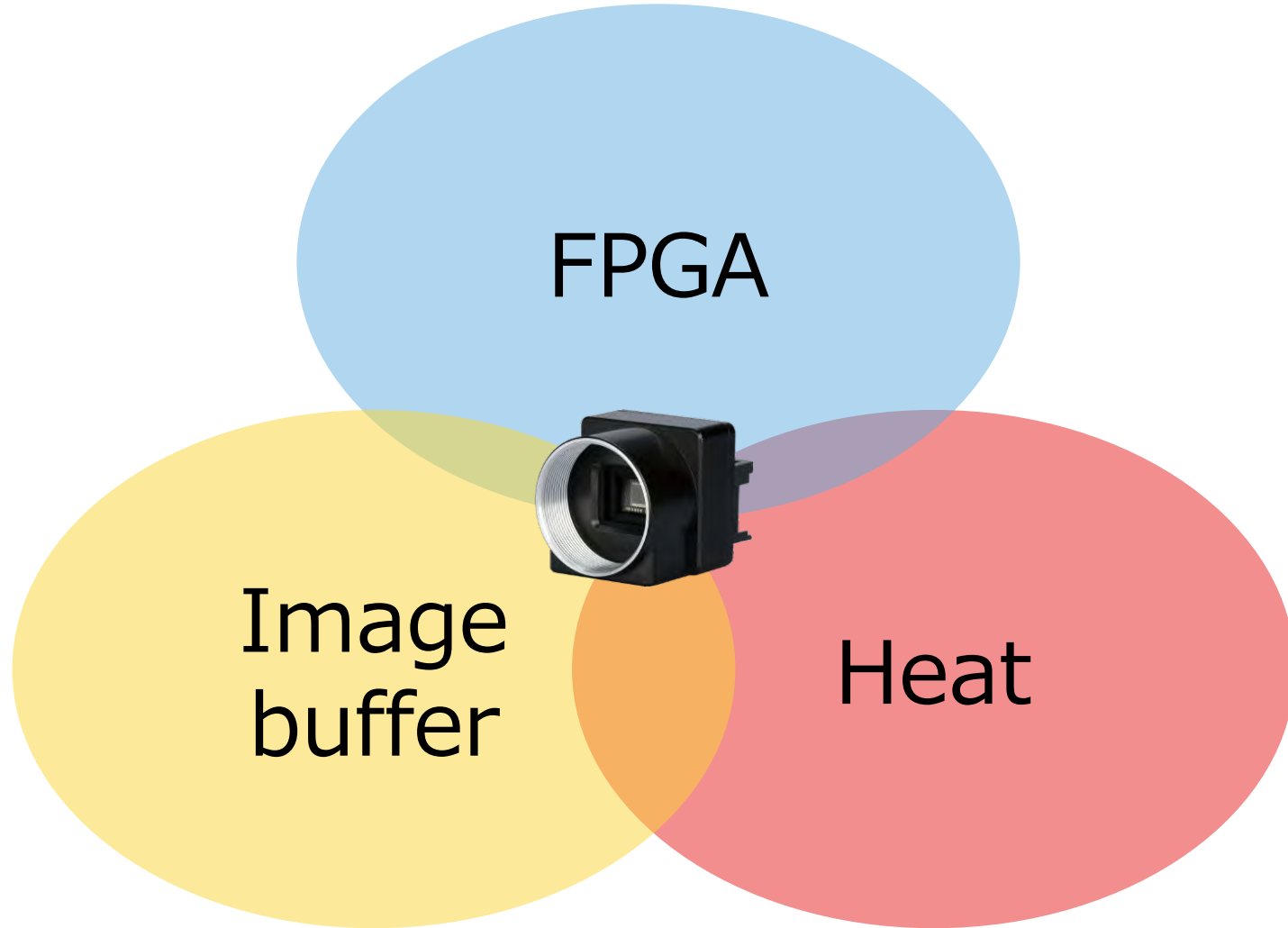


7.4 GByte/s

Image buffer

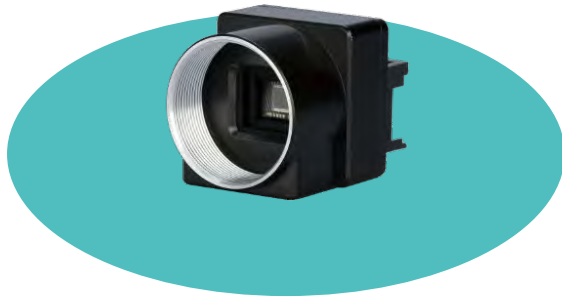


Heat



Heat

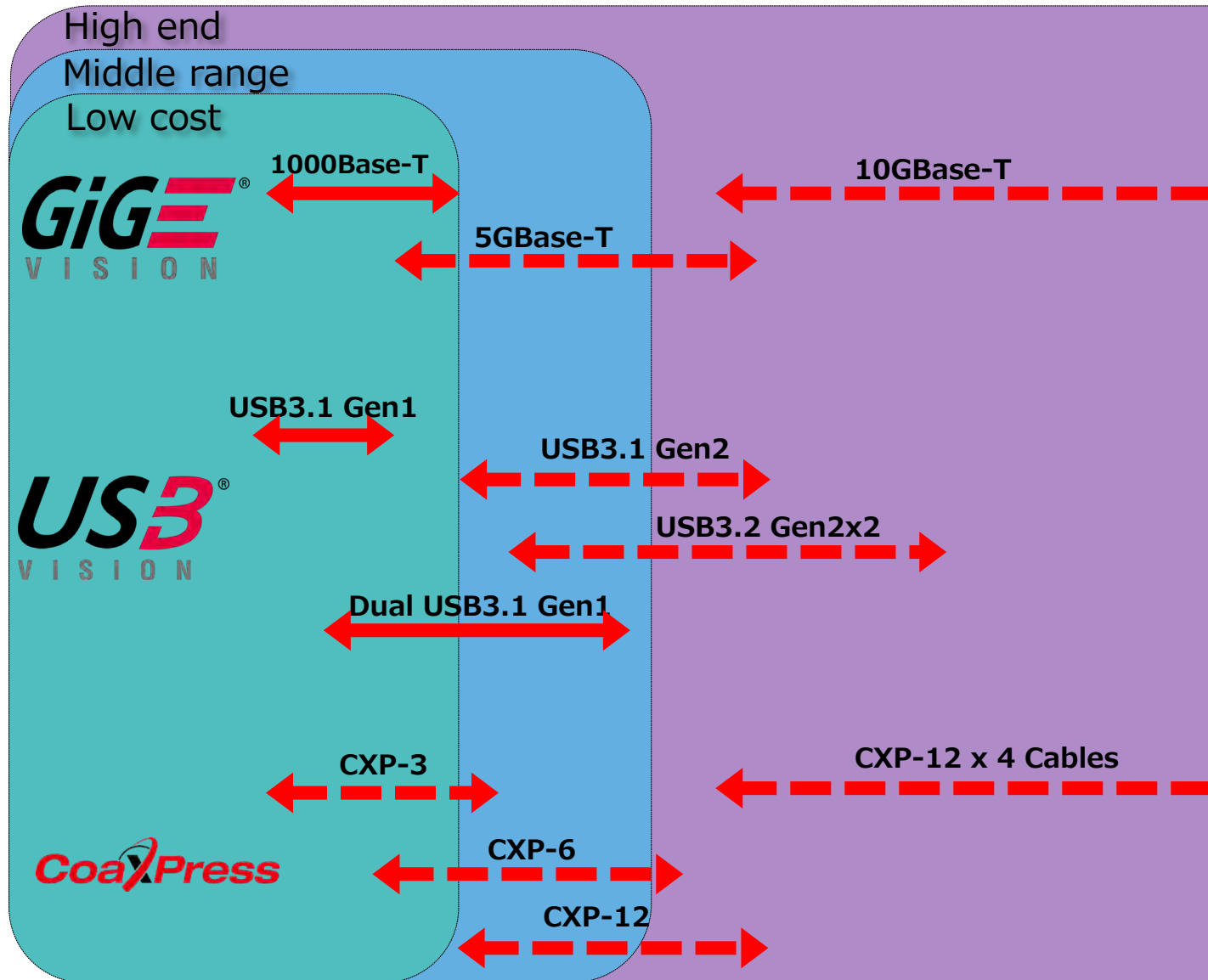
$\leq 3.5 \text{ W}$




$\leq 5 \text{ W}$



Heat



Estimated summary



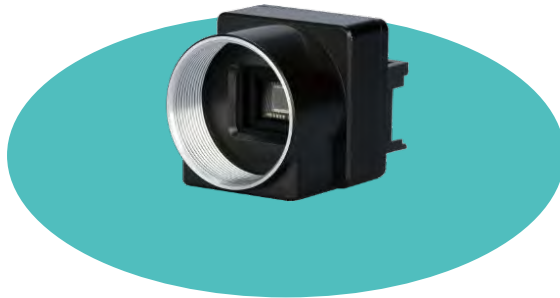
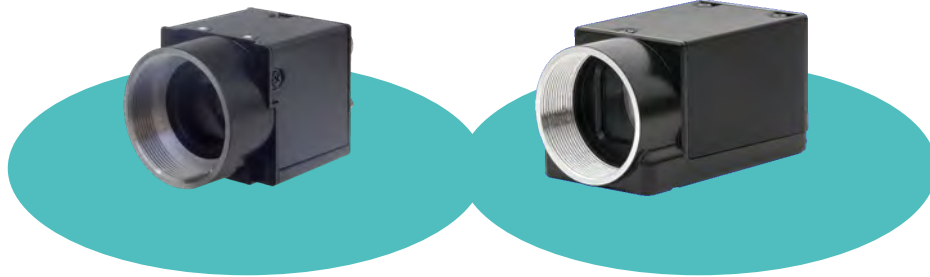
Estimated
summary

Estimated summary

		FPGA	Image buffer	Heat	Summary
GiG VISION	1000Base-T	L	L	L	L
	5GBase-T	L	M	M	M
	10GBase-T	M	M	H	H
USB VISION	USB3.1 Gen1	L	L	L	L
	USB3.1 Gen2	M	M	M	M
	USB3.2 Gen2x2	M	H	H	H
	Dual USB3.1 Gen1	M	M	M	M
Coax Press	CXP-3	L	L	L	L
	CXP-6	M	L	M	M
	CXP-12	M	L	M	M
	CXP-12 x 4 Cables	M	L	H	H

Estimated summary

BC Series **BG Series**

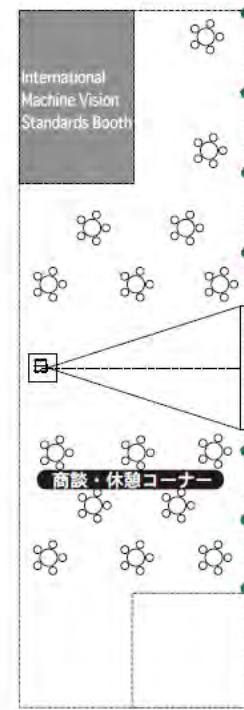
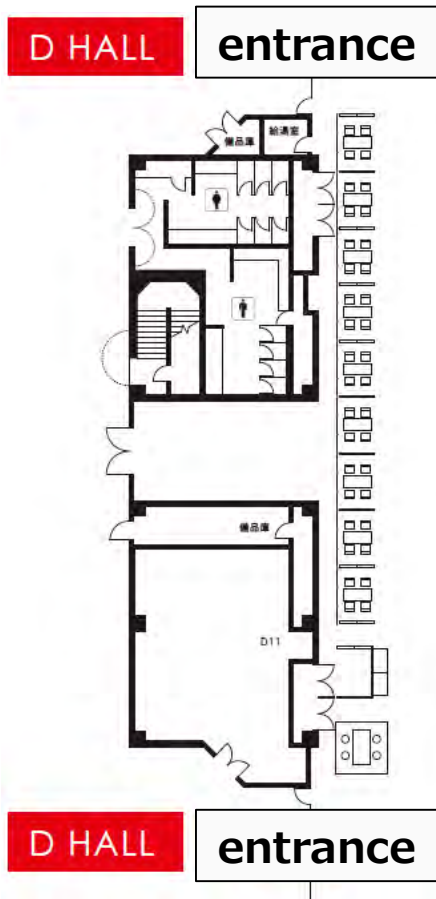


BU Series



DDU Series

Location of Toshiba Teli booth



Toshiba Teli booth

TOSHIBA

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