第4回 フラウンホーファーシンポジウム 東京 2019
Digital Photonics made in Germany Tokyo 2019 October 9, 2019

日本のレーザ加工市場の現状紹介と世界のスマート製造へ向けての産業、科学レーザー技術の糾合活動及びフラウンホーファーとのコラボレーションの経験

Overview of Laser Processing Market in Japan and Activities to Integrate Industrial and Scientific Laser Technology for Global Smart Manufacturing Supported by Collaborations with Fraunhofer

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Senior Chief Engineer, Senior Chief Technologist
Factory Autometion Systems Group, Mitsubishi Electric Corporation

1. Introduction: who I am

Key machine supplier to emerging healthy markets

Today's Market

On-going and Future Market

Molding / Connector

Coating for Jet Engine

Metal Processing

Smart Manufacturing

Material Processing

Laser Drilling for Smart Phone

Compact Turbo

e-F@ctory (Industrie4.0)

EUV Lithography

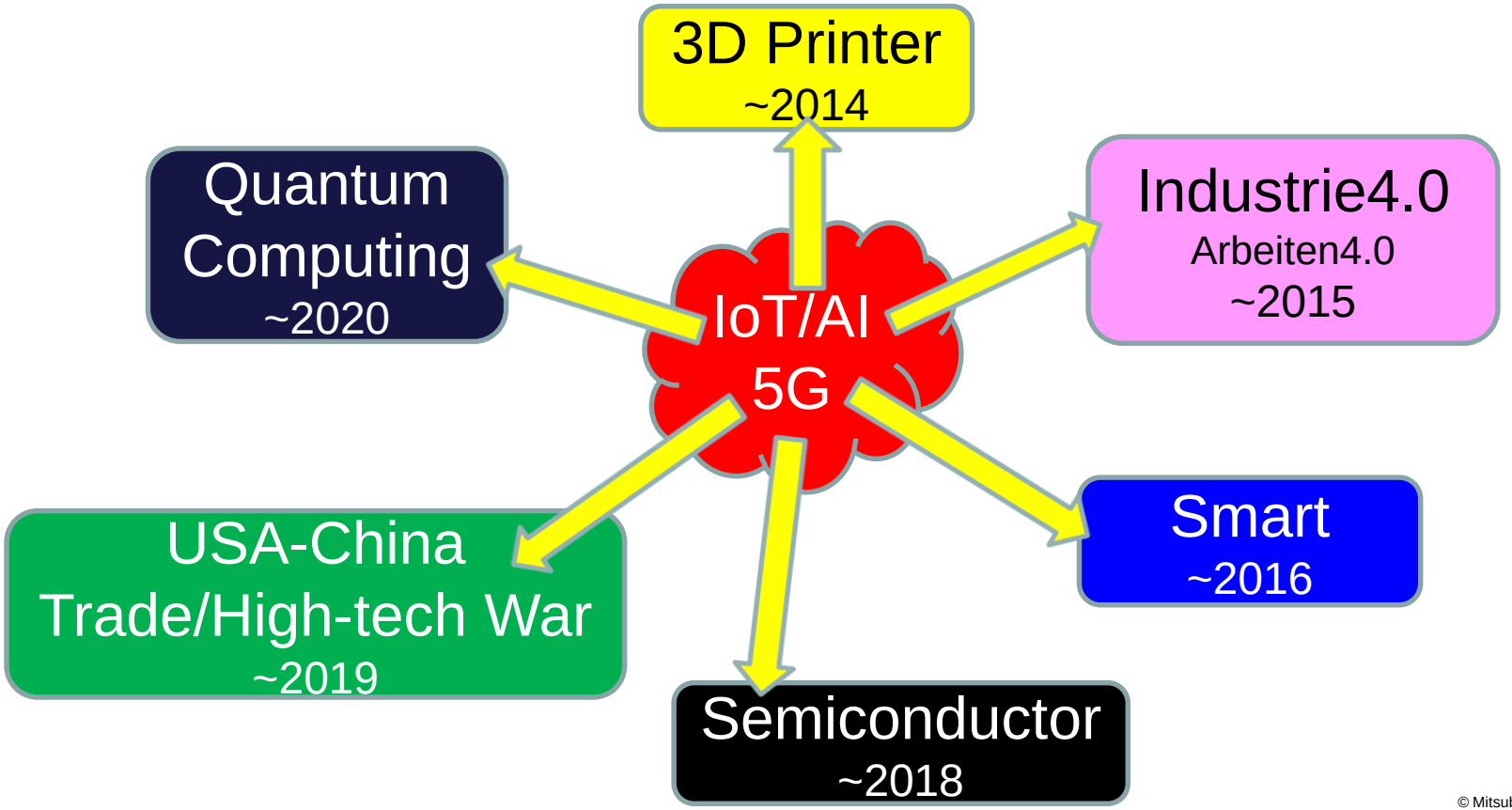
Electronics Parts Processing

3D Printing

IoT/AI

1. Introduction: who I am

Handling recent hot topics originated in IoT/AI+5G



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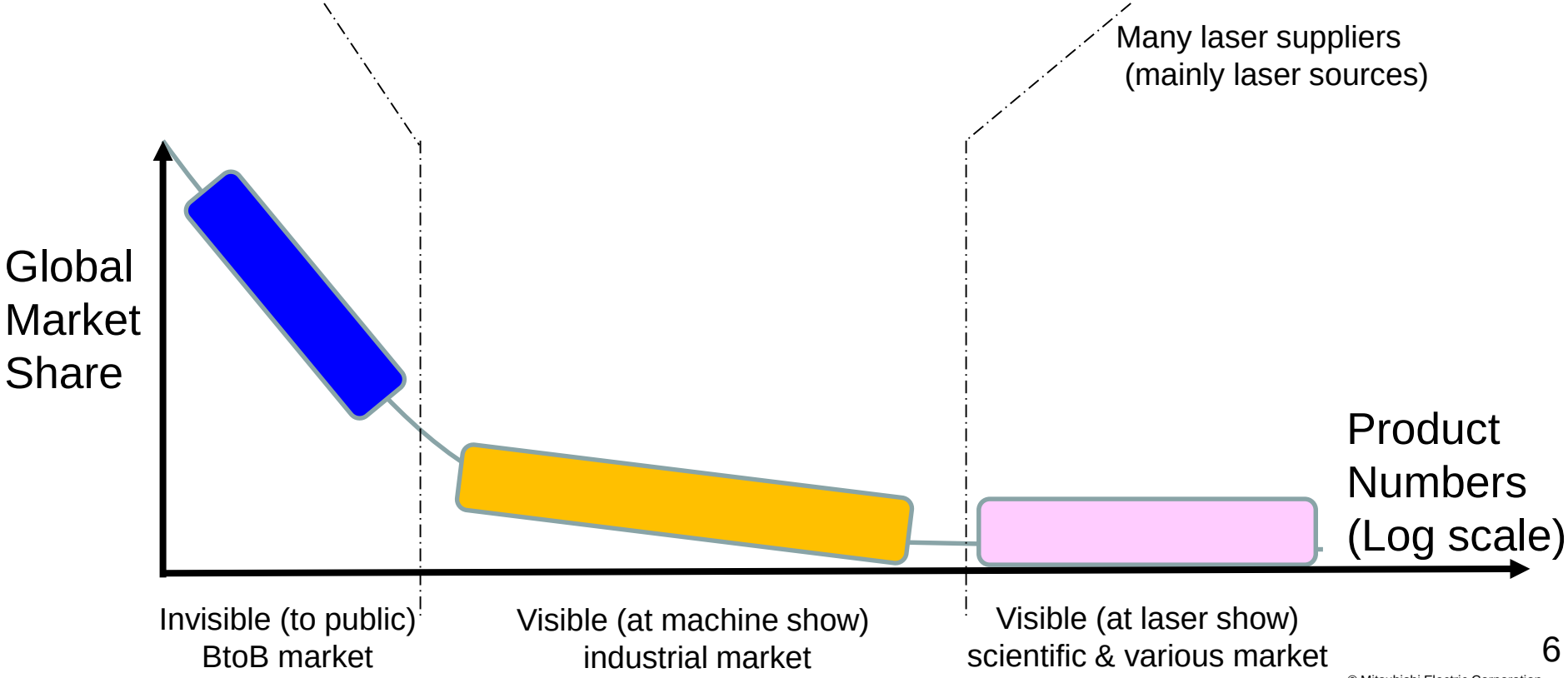
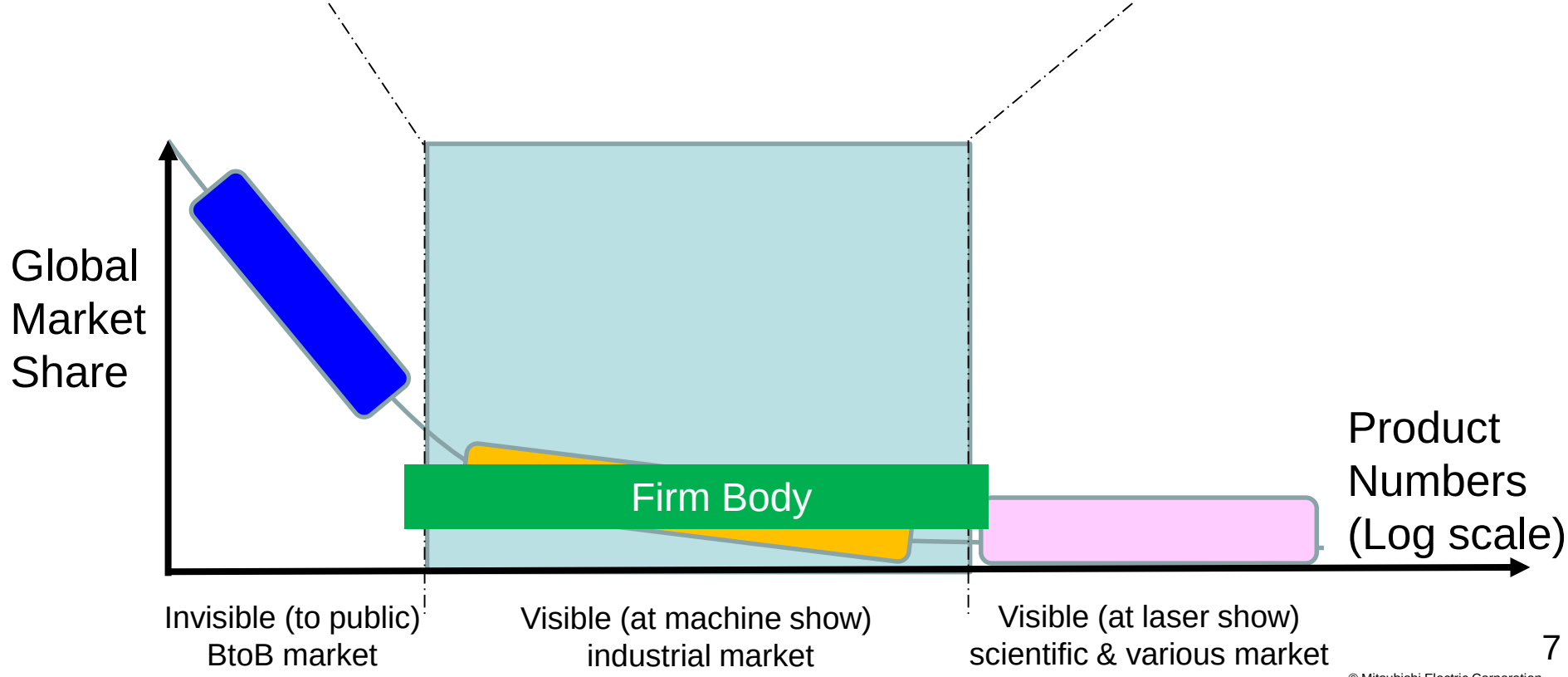
Schematic laser market situation: Over View



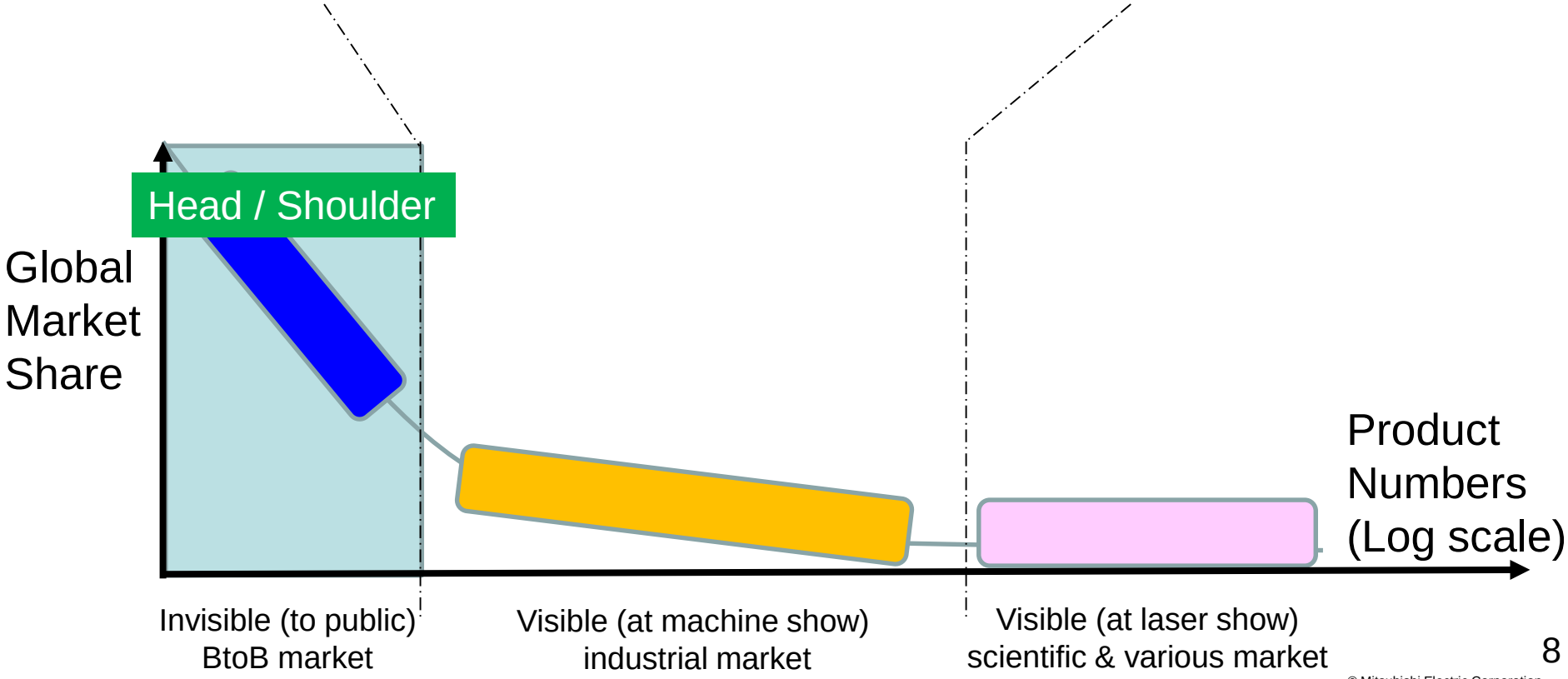
2. Over view of laser processing market: Japan

Schematic laser market situation: Firm Body



2. Over view of laser processing market: Japan

Schematic laser market situation: Head / Shoulder

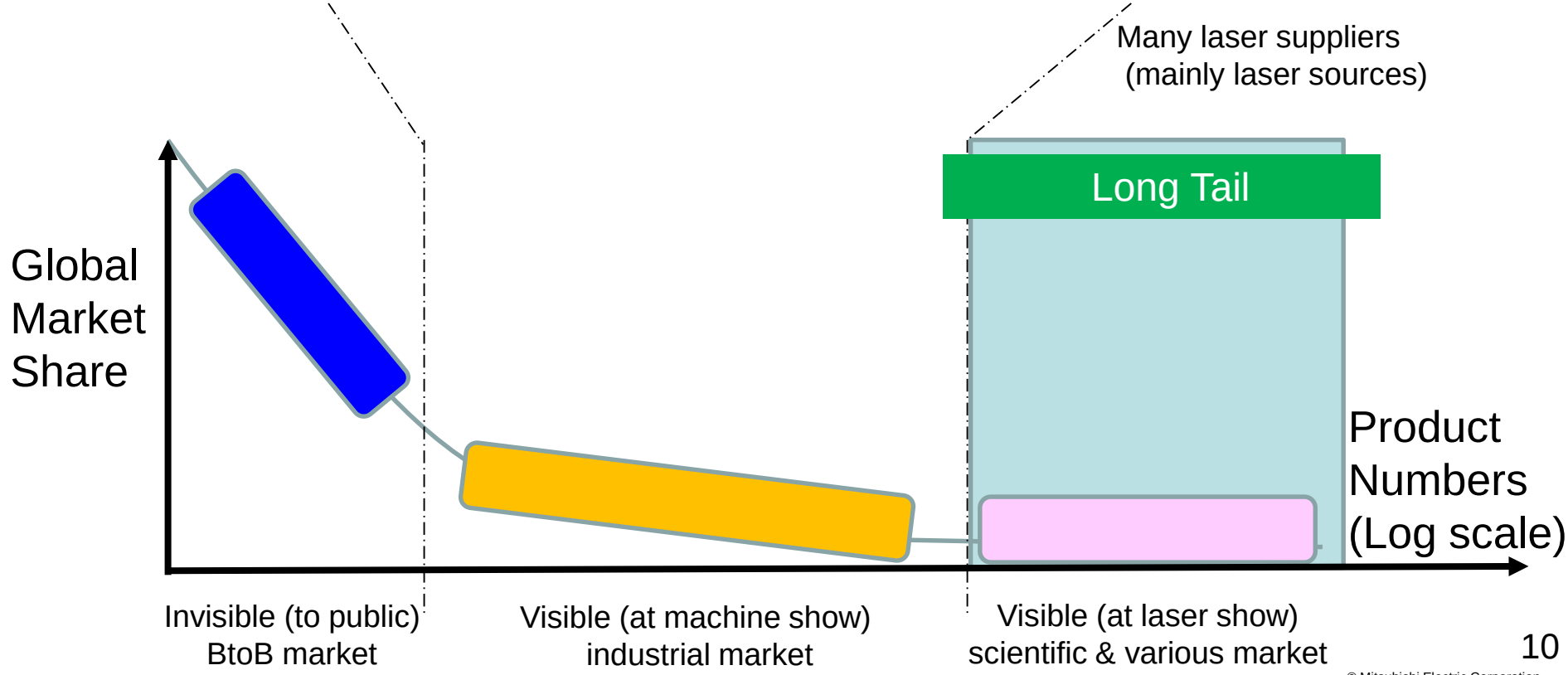


2. Over view of laser processing market: Japan

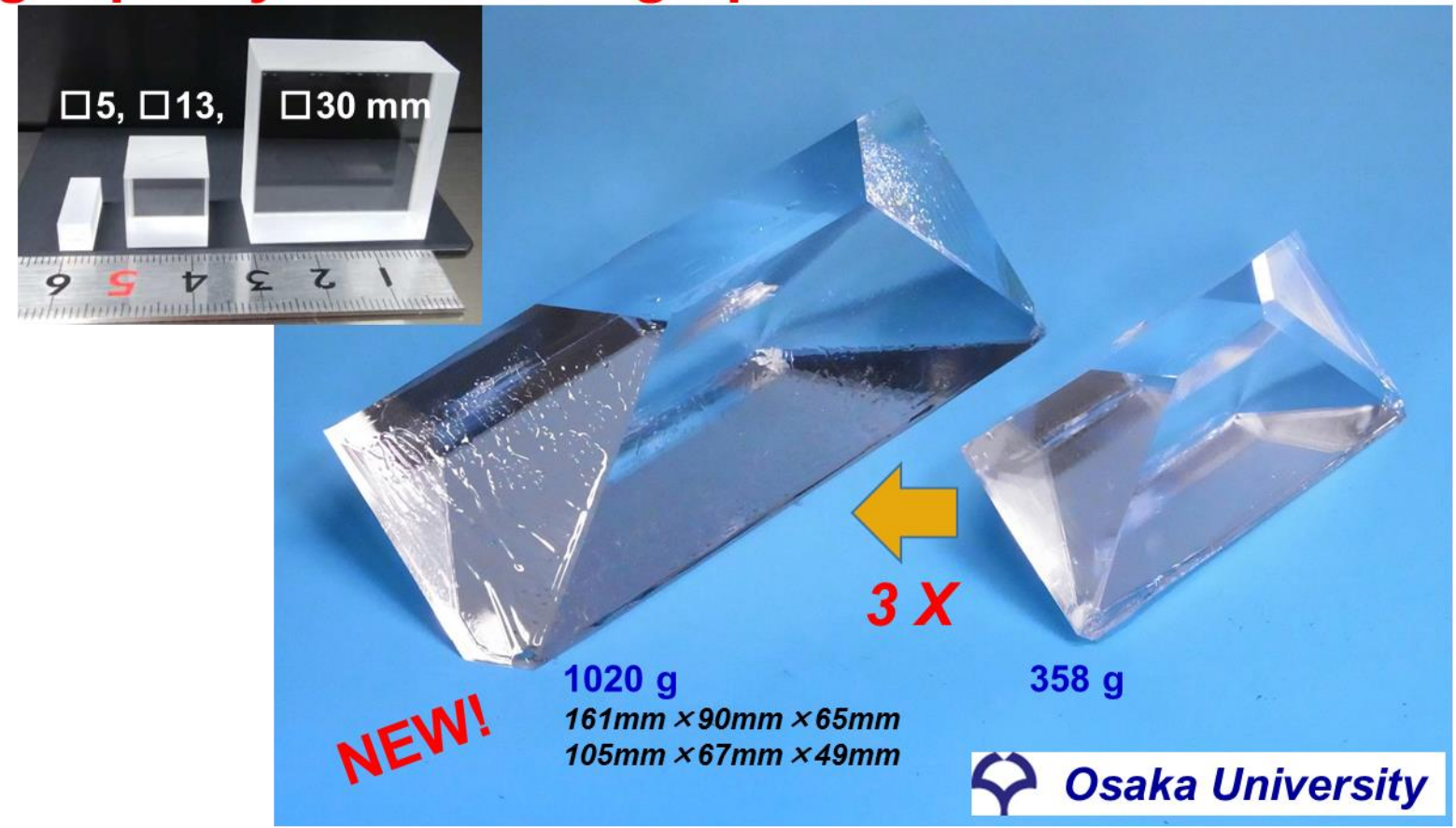
Example: Invisible (to public) BtoB market products

2. Over view of laser processing market: Japan

Schematic laser market situation: Long Tail



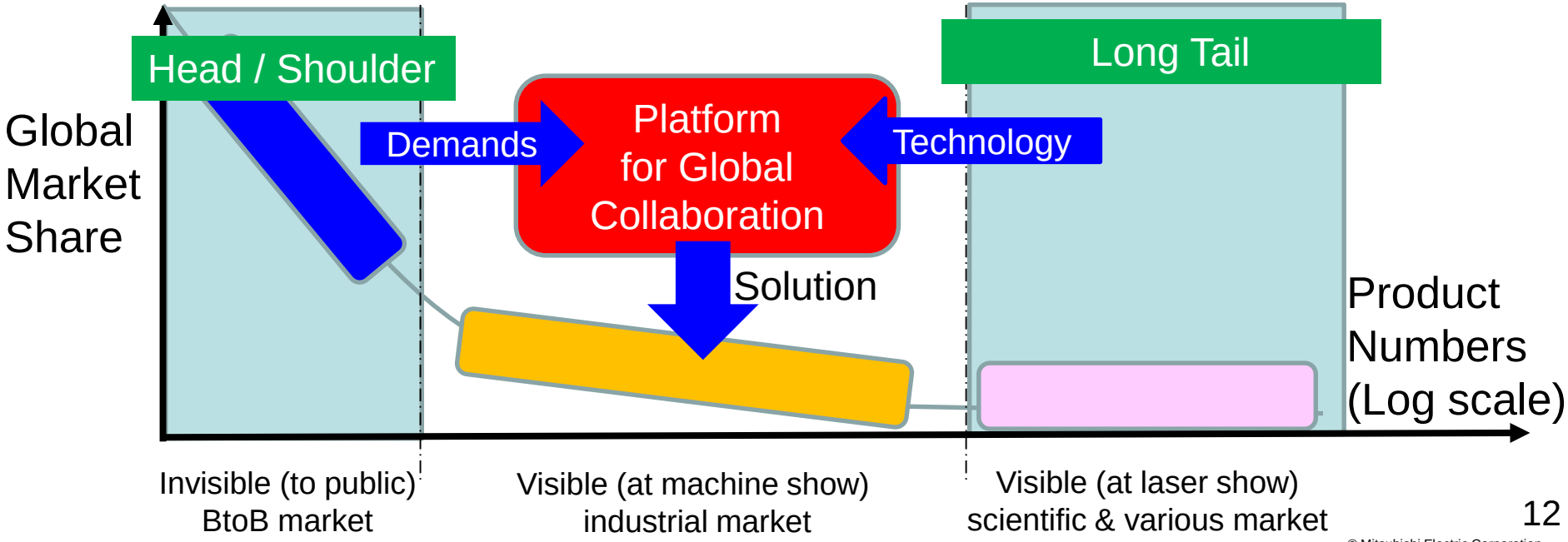
1-kg, high-quality CLBO for high-power DUV laser



Ref. Osaka University

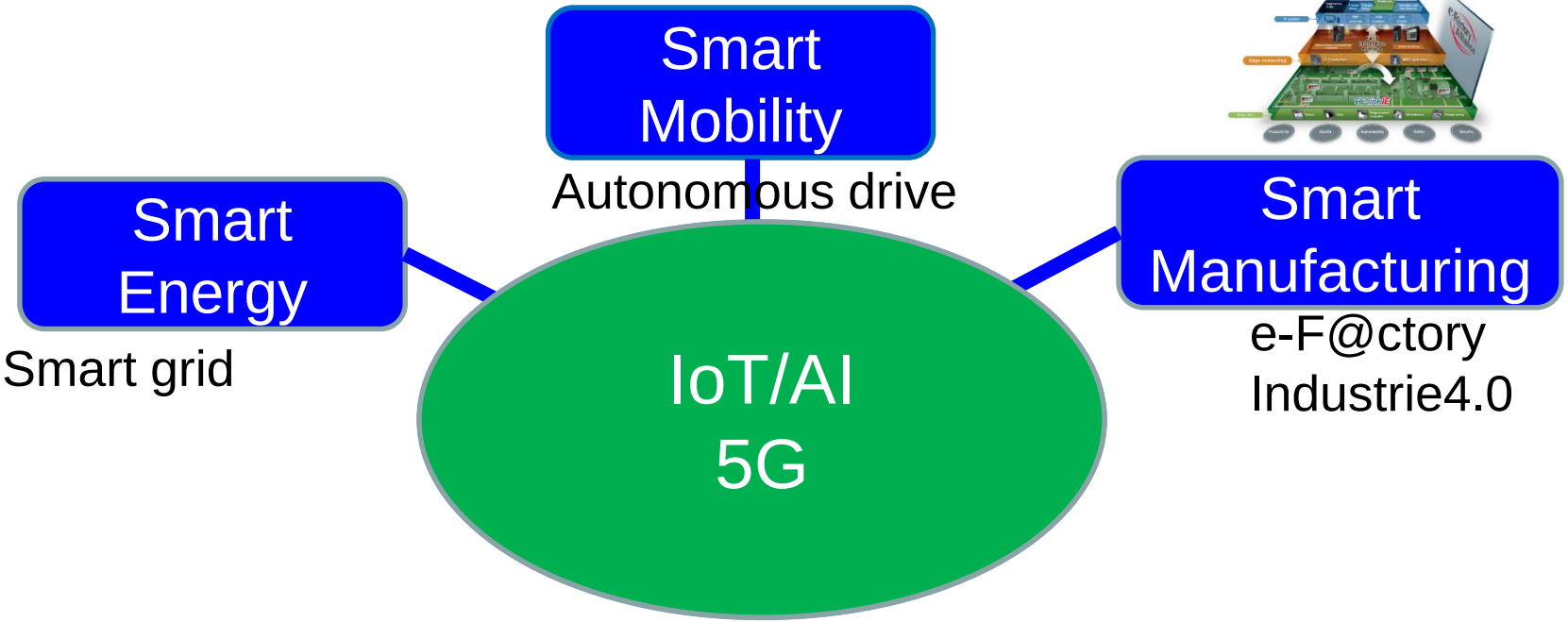
2. Over view of laser processing market: Japan

New scheme is required to cope with strong demands



3. Laser processing in IoT/AI+5G era

3. Laser processing in IoT/AI era



IoT: Internet of Things, AI : Artificial Intelligence

3. Laser processing in IoT/AI era

Smart Mobility

Autonomous drive

Smart Energy

Smart grid

Smart Manufacturing

e-F@ctory

Industrie4.0

IoT/AI

5G

Smart House

ZEH

(Net Zero Energy House)

Smart Health care

Smart *****

Smart ######

IoT: Internet of Things, AI : Artificial Intelligence

3. Laser processing in IoT/AI era

$400Trillion
Smart Mobility
Autonomous drive

$1600Trillion
Smart Energy
Smart grid

$100Trillion
Smart Manufacturing
e-F@ctory
Industrie4.0

Ultimate Smart Society(Society5.0)

Smart Ecosystem

Smart House
ZEH
(Net Zero Energy House)

Smart Health care
$560Trillion

Smart *****

Smart ######

IoT: Internet of Things, AI：Artificial Intelligence

3. Laser processing in IoT/AI era

Customers are requesting laser processing on CPS

Digital Manufacturing
is essential for physical space

Laser processing including additive manufacturing should cover all areas?

Smart manufacturing must be optimized in cyber space

Laser processing must be expressed as digital twin models

Industrial laser processing machines based on Cyber Physical System

3. Laser processing in IoT/AI era

Goal image is same globally

Cyber Space

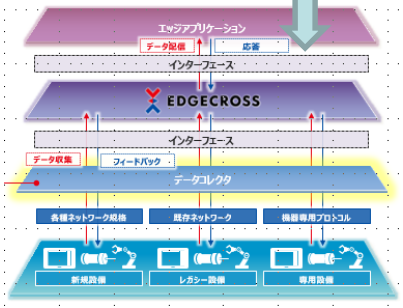
Physical Space

Cloud/Fog/On Premises/Edge

Digital Twin
(Digital Shadow)

Digital Twin
(Digital Shadow)

Machines



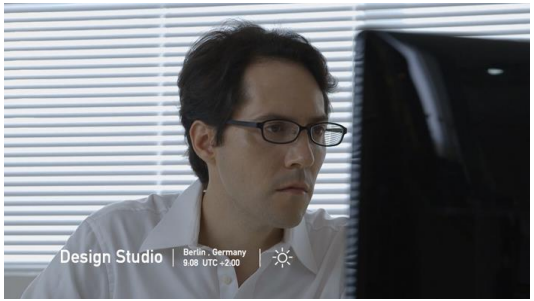
CC-Link IE TSN

Production Lines

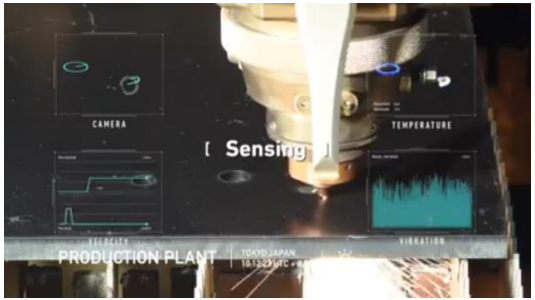
3. Laser processing in IoT/AI era

Smart manufacturing based on CPS (Cyber Physical System)

1. Design and Manufacturing Verify (Simulation) in Cyber Space (Digital Space) for New Orders
2. Function (Intelligent operation) to automatically adjust for changes in materials received at the production site, and operating environment, etc.
3. Function for building an optimal value chain to meet customer requirements (Total optimization)



Process simulation service



Intelligent operation

Total optimization

Ref. https://youtu.be/TyfoYsIOuSI

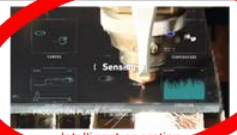
3. Laser processing in IoT/AI era

Industries are supported by universities and research institutes

Smart-manufacturing using CPS (Cyber Physical System)

1. Design and Manufacturing Verify (Simulation) in Cyber Space (Digital Space) for New Orders
2. Function (intelligent operation) to automatically adjust for changes in materials received at the production site, operating environment, etc.
3. Functions for building an optimal value chain to meet customer [illegible] (to[illegible]imization)

Process simulation service



Intelligent operation

Total optimization

MITSUBISHI ELECTRIC
Changes for the Better

(FA No.1907)

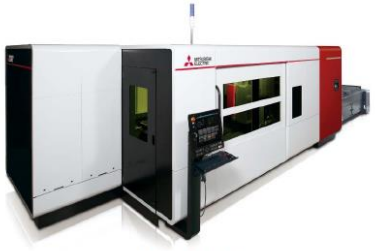
2019 年 4 月 10 日
三菱電機株式会社

NEWS RELEASE

自社製の新型ファイバーレーザー発振器と AI 機能の搭載などで、生産性・保全性を向上
三菱ファイバー二次元レーザー加工機「GX-F シリーズ」発売のお知らせ

三菱電機株式会社は、ファイバー二次元レーザー加工機の新シリーズとして、「GX-F シリーズ」3 機種を 4 月 10 日に発売します。自社製の新型ファイバーレーザー発振器と、世界で初めて※1AI で加工条件を自動で調整する「AI アシスト」の搭載などにより、板金加工の生産性・保全性の向上に貢献するとともに、自動化ソリューションのニーズに対応します。

※1 2019 年 4 月 10 日現在。当社調べ



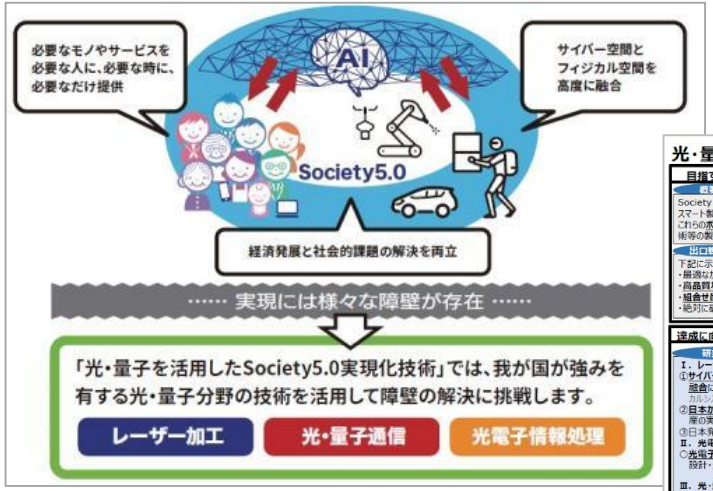
ML3015GX-F80

Intelligent Laser Machines

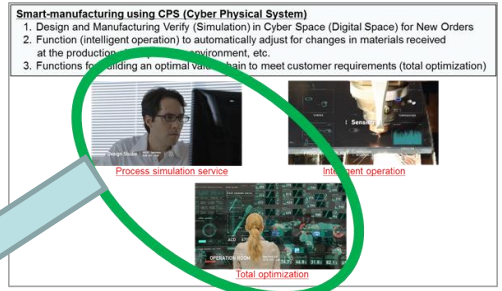
Ref：http://www.mitsubishielectric.co.jp/news/2019/pdf/0410-b.pdf

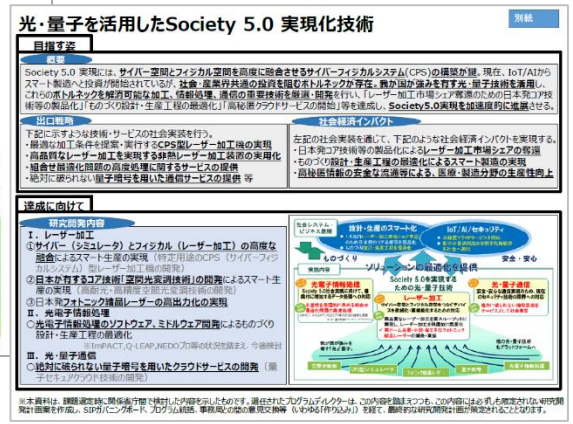
3. Laser processing in IoT/AI era

Advanced technology of universities and research institutes are proved by industrial companies



Ref：https://www.qst.go.jp/site/collaboration/20660.html





Ref：https://www8.cao.go.jp/cstp/gaiyo/sip/kenkyugaiyo2.pdf

One more thing

Smart manufacturing based on laser processing CPS should contribute to reach smart society and off course should lead to enhancement of laser processing market

Further merit

Deep physical insight in cyber space
could lead to striking results in physical space.
This also should lead to further enhancement of
laser processing market.

4. Target area for global collaboration

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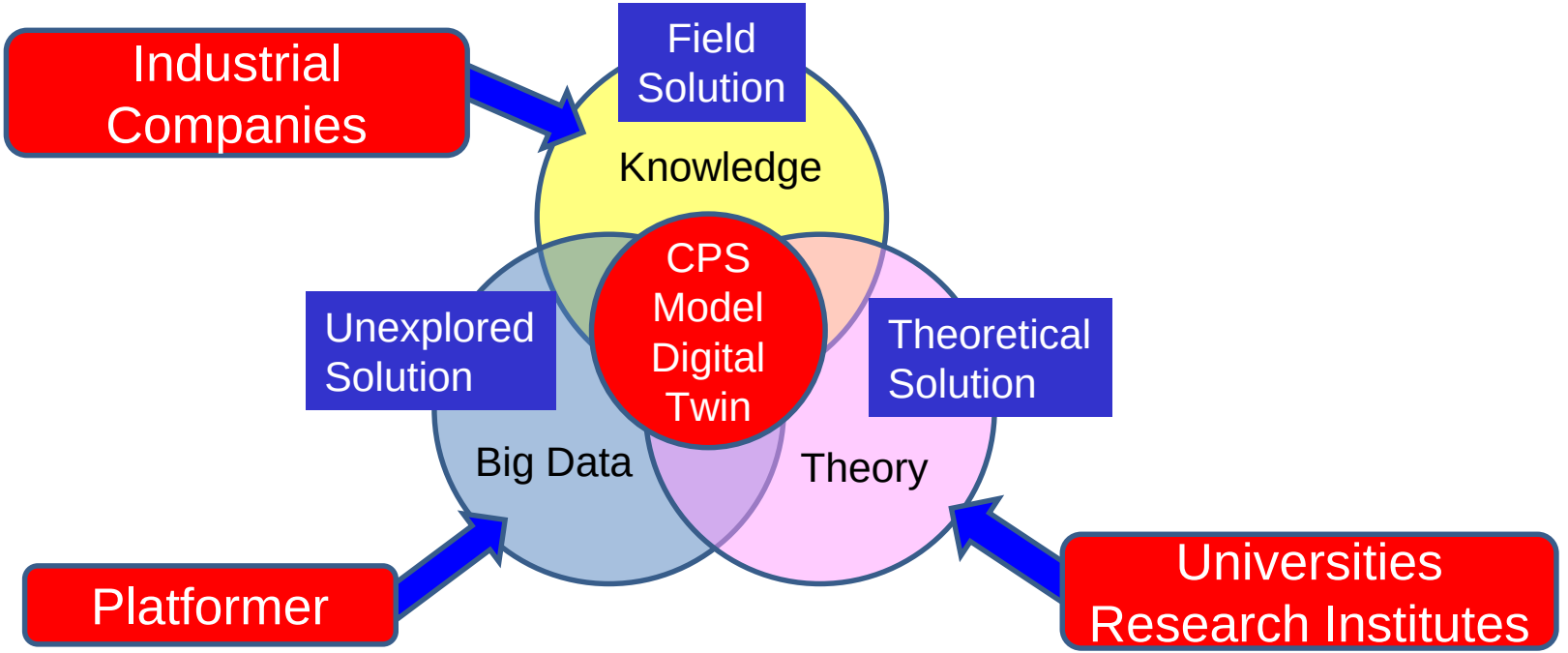
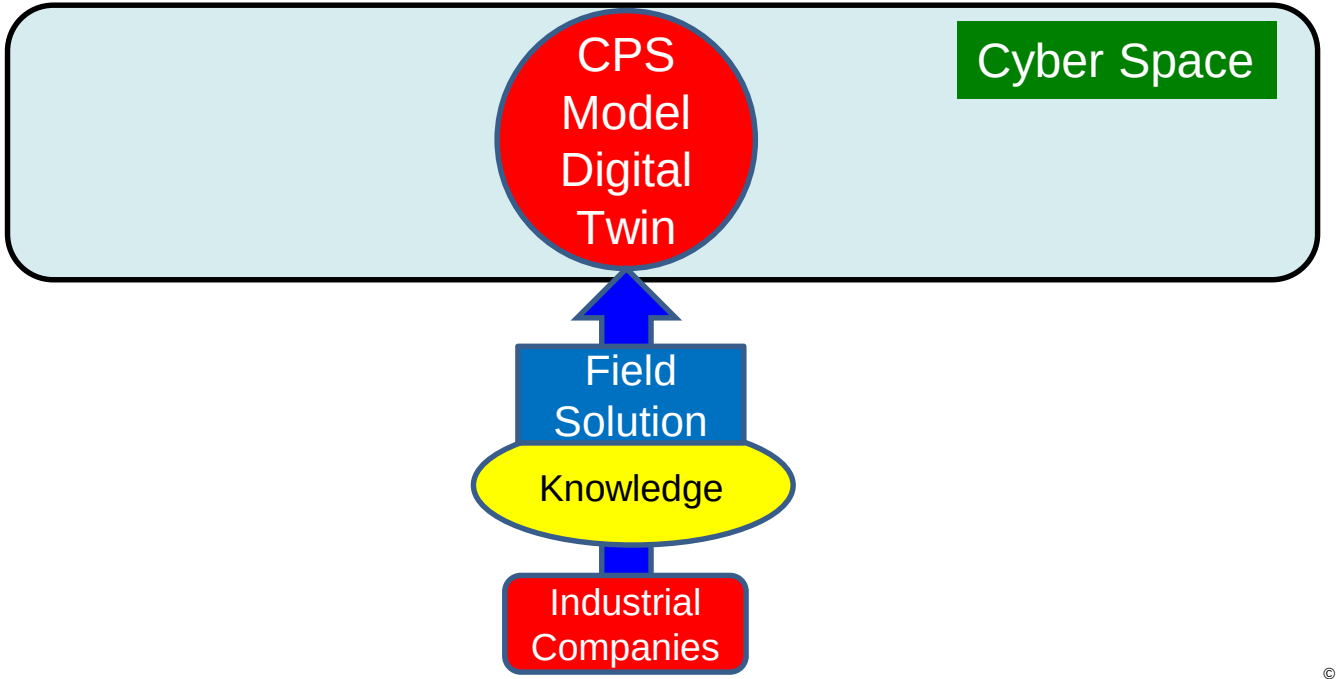
Digital Twins have been discussed from three directions.
This misleads that there should three ways to reach Digital Twins.



4. Target area for global collaboration

To obtain reliable Digital Twins in a variety of field companies, platformers, and universities must collaborate.



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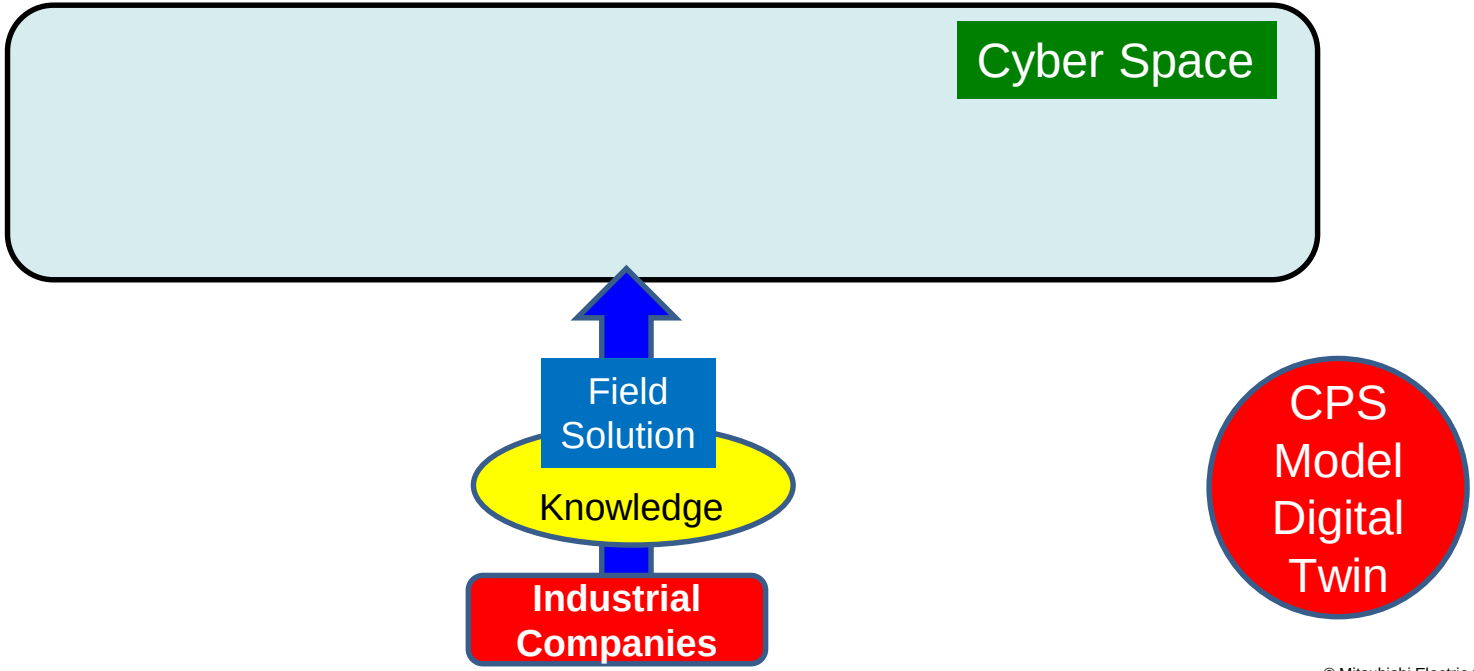

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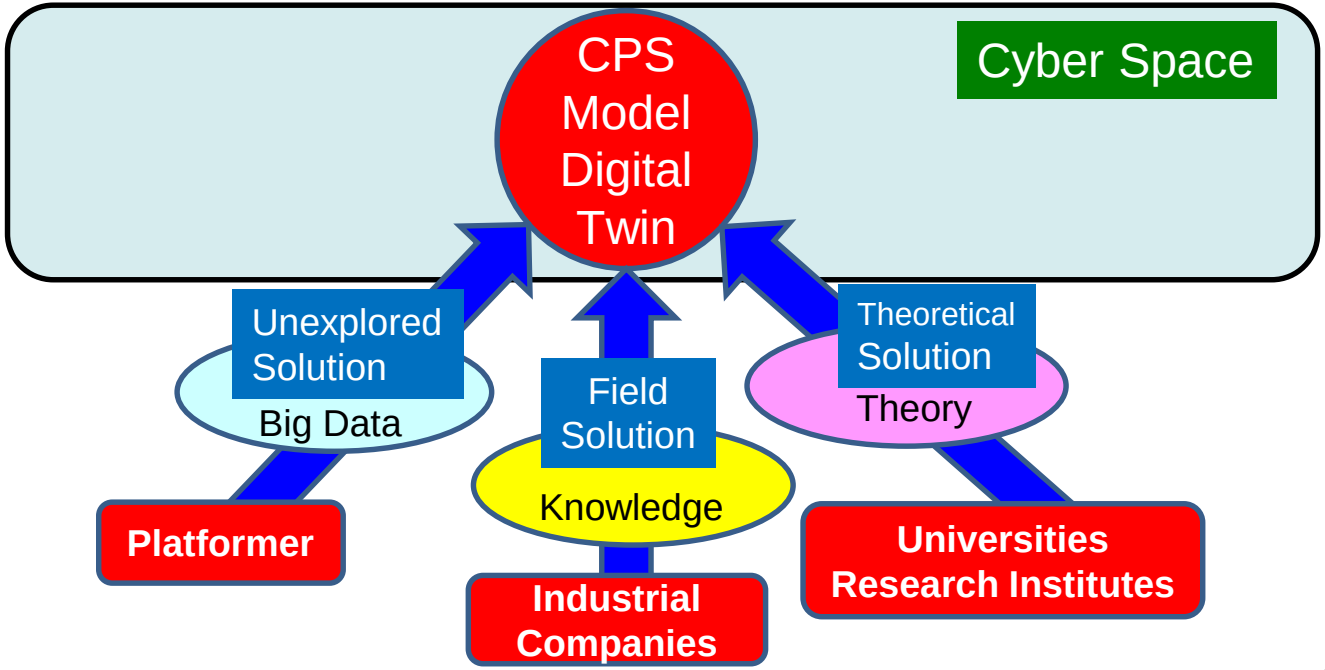

5. Global collaboration with Fraunhofers

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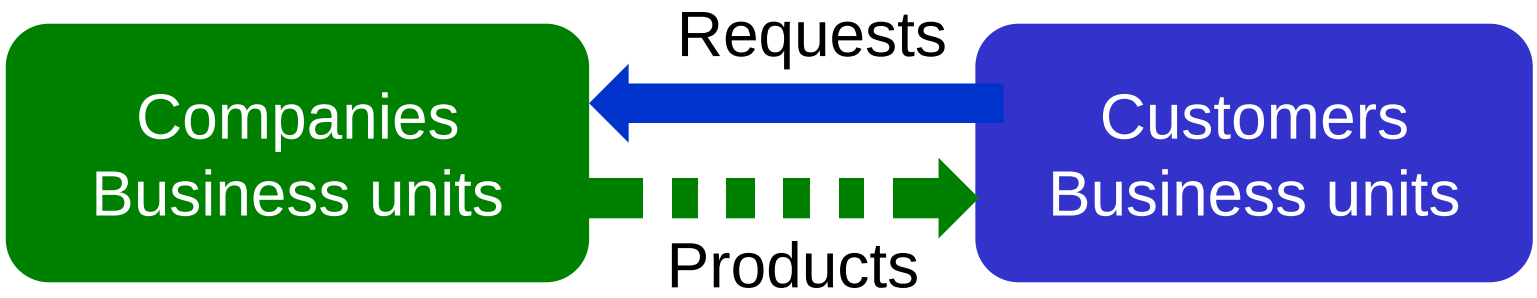
How do you want to work with research platformers?



5. Global collaboration with Fraunhofers

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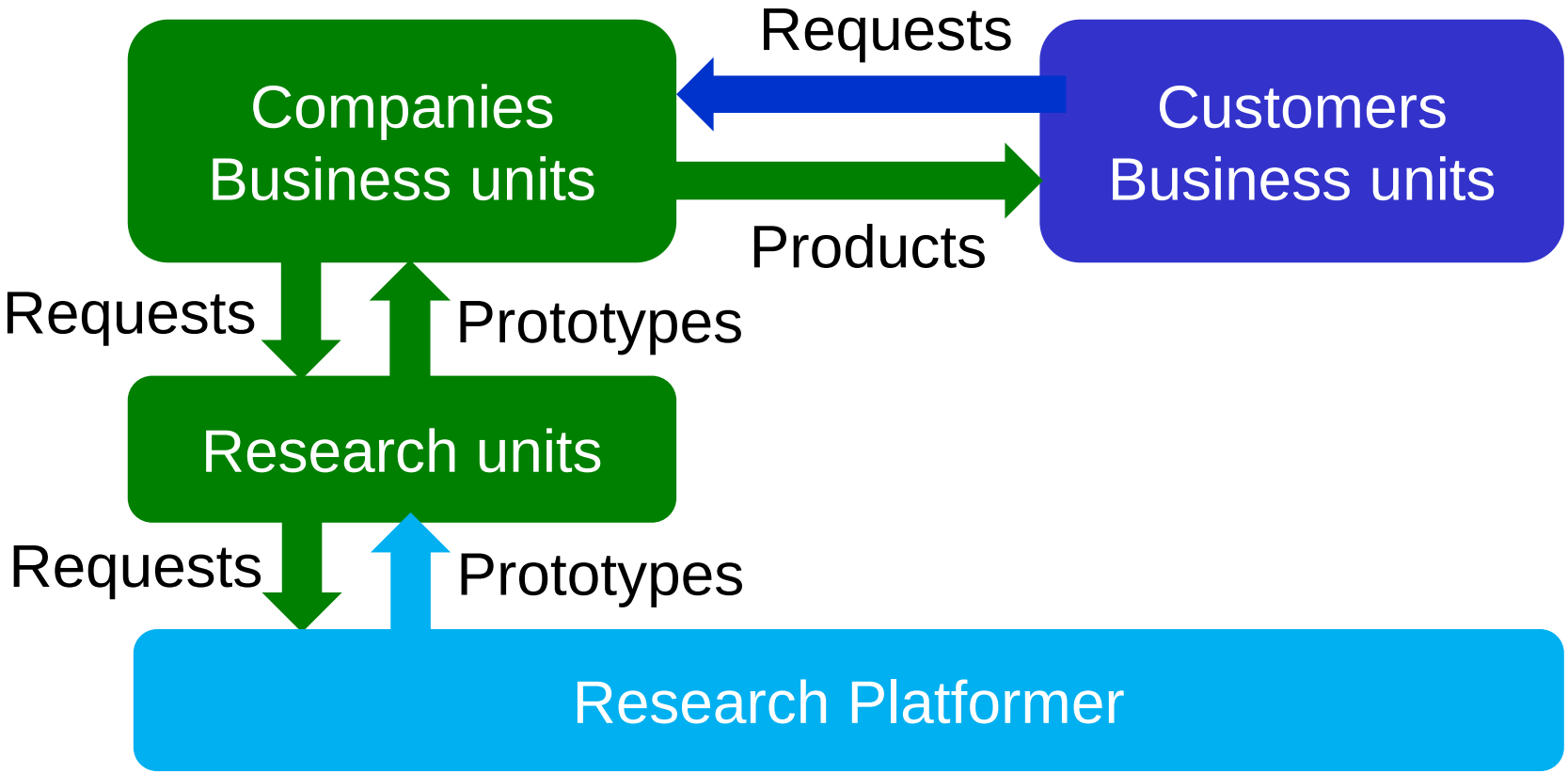
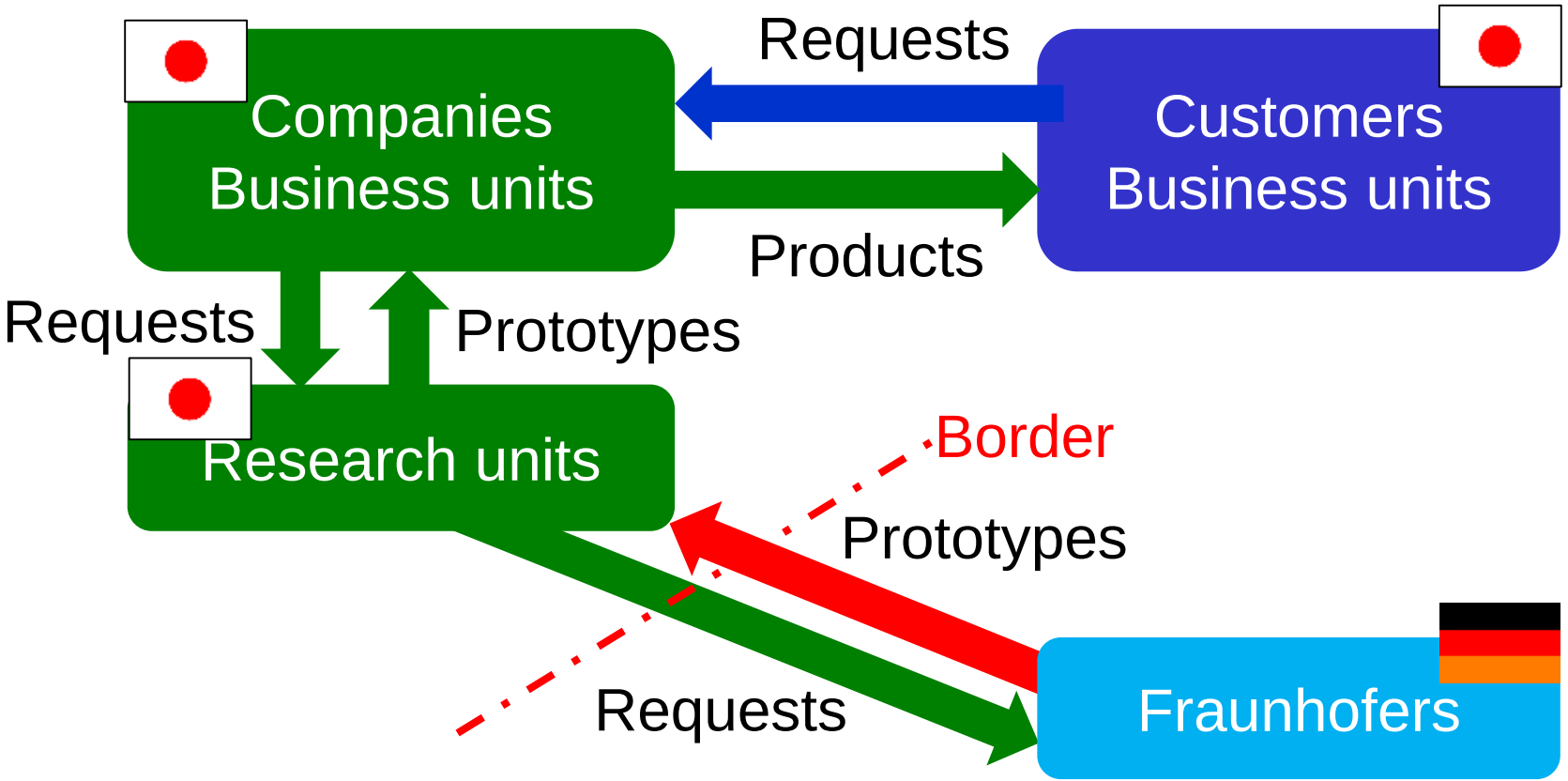


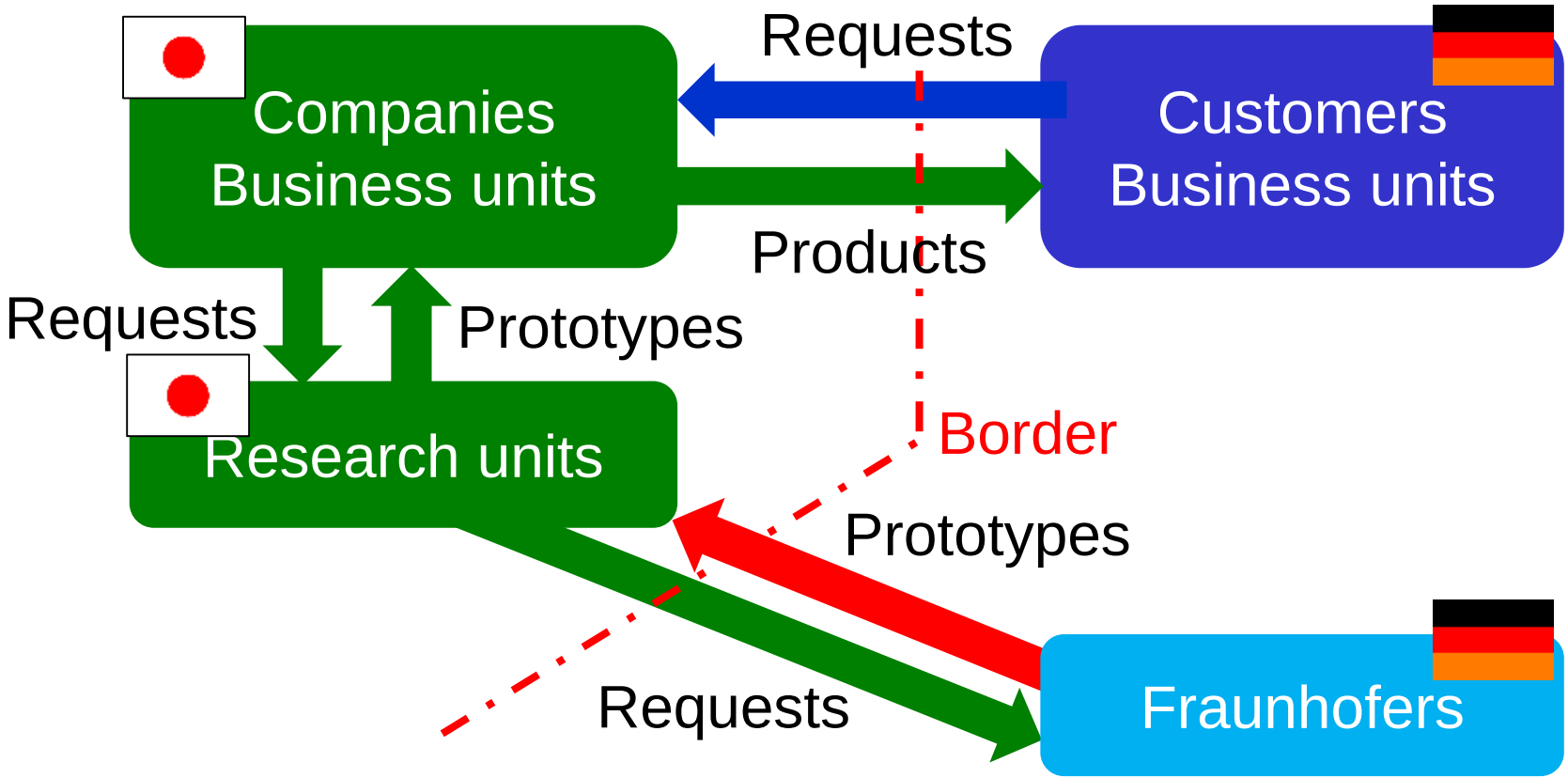
5. Global collaboration with Fraunhofers

How about if platformers exist outside Japan?



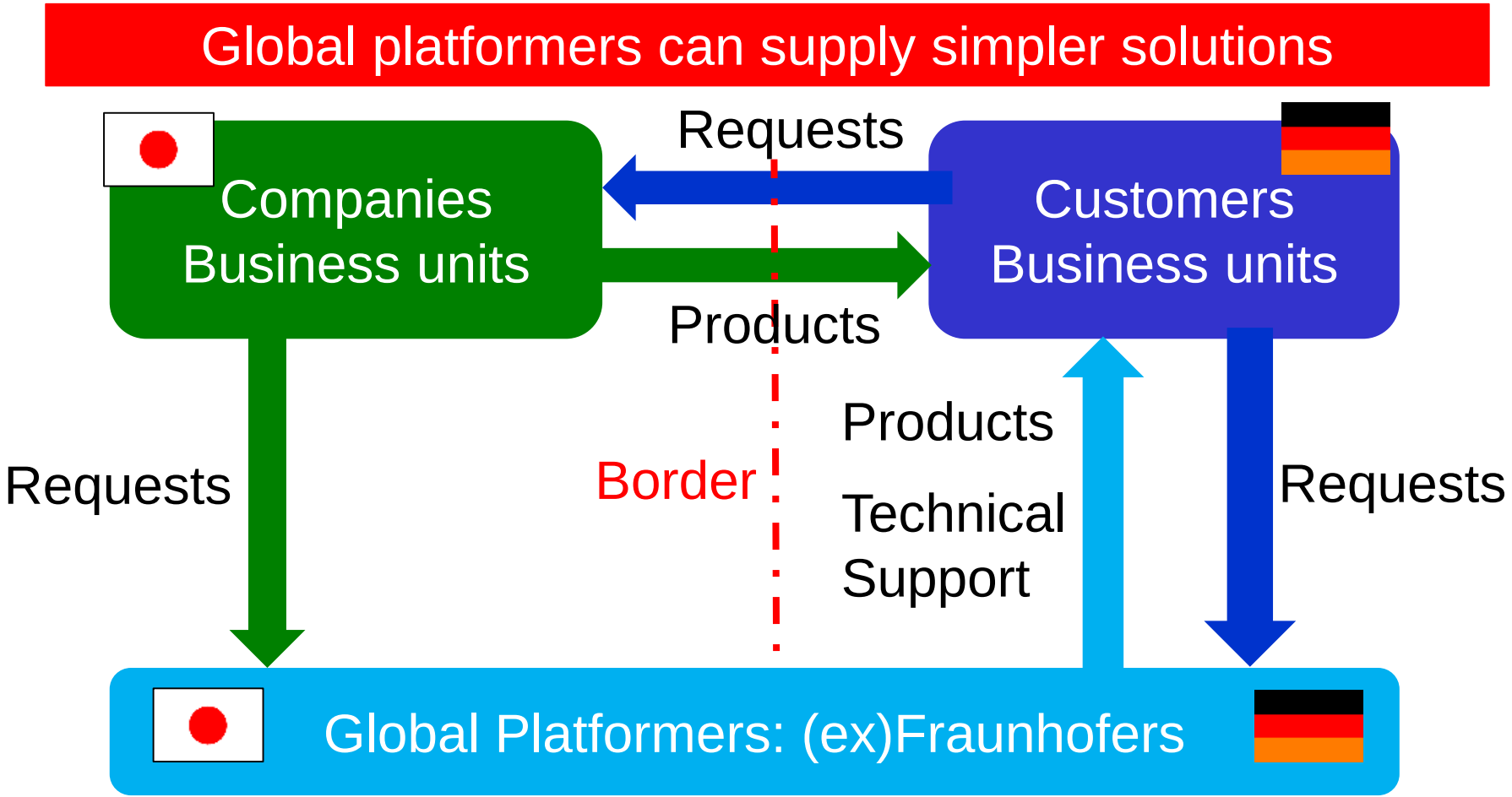
5. Global collaboration with Fraunhofers

How about if customers also exist outside Japan?



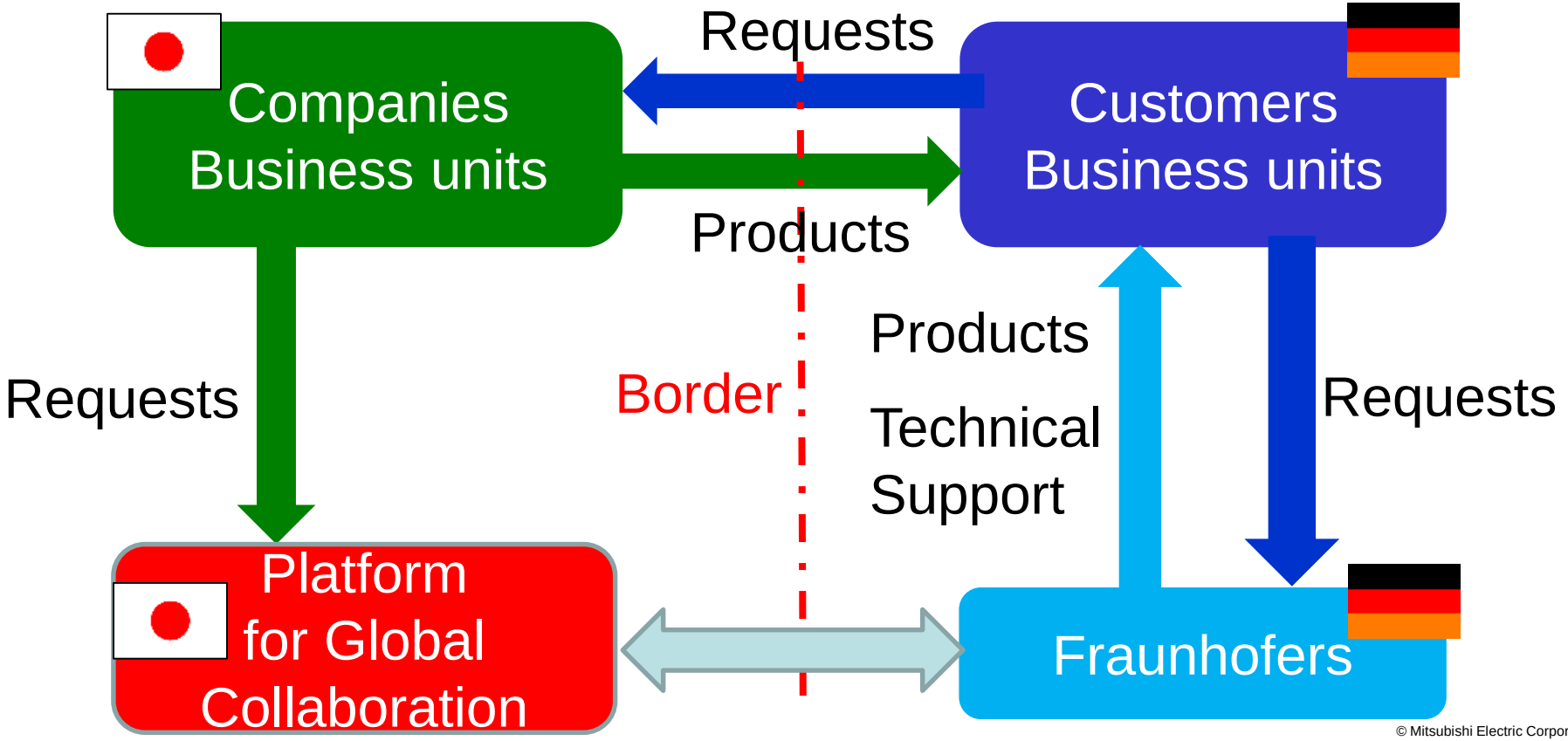
Smarter Ways?

5. Global collaboration with Fraunhofers



5. Global collaboration with Fraunhofers

Global collaborations are another ways



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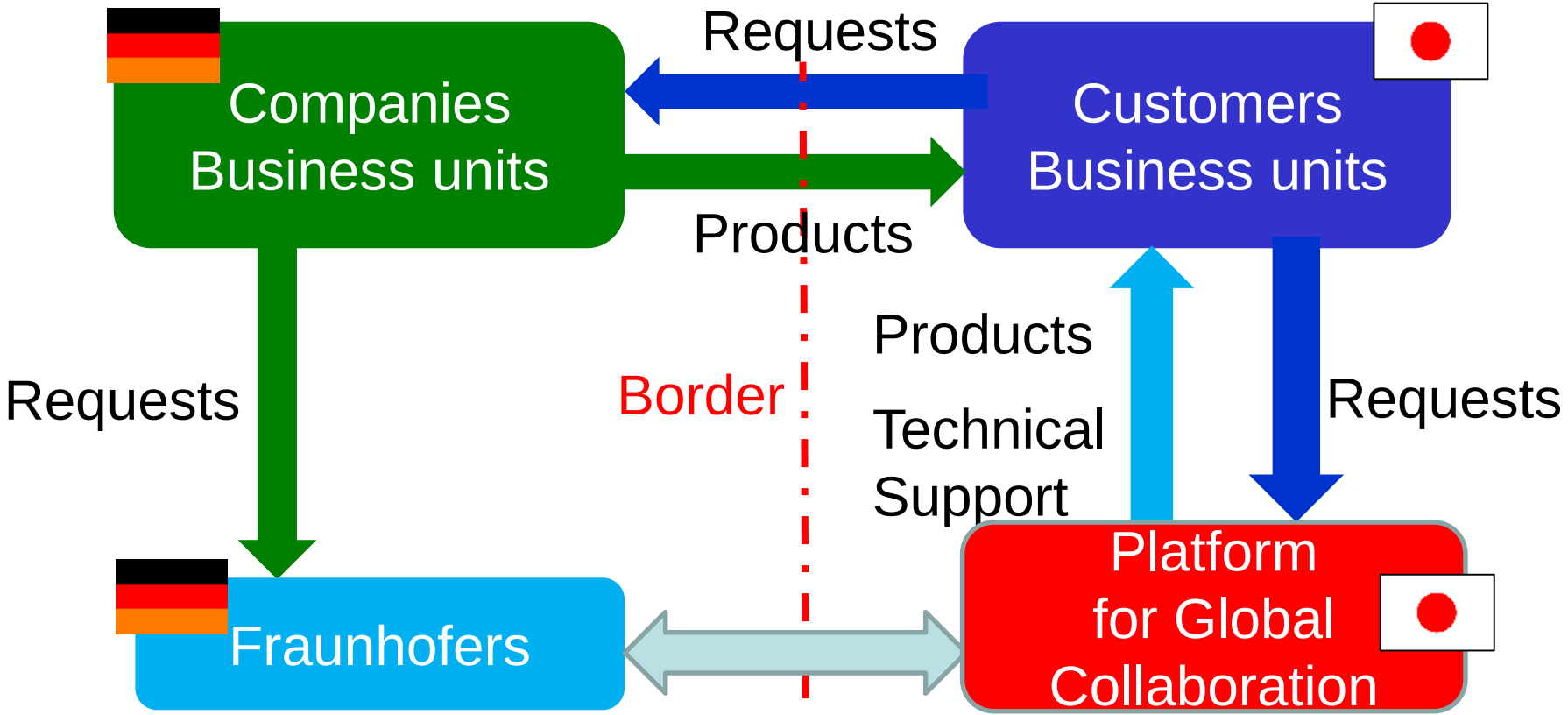
Global collaborations are another ways



6. Conclusions

1. Introduction: Who I am
   ⇒Key machine supplier to emerging healthy markets
2. Over view of laser processing market: Japan
   ⇒We need global platforms
3. Laser processing in IoT/AI+5G era
   ⇒CPS based laser processing is must item for IoT/AI+5g era
4. Target area for global collaboration
   ⇒Digital twin for laser processing is typical target area
5. Global collaboration with Fraunhofer
   ⇒Smarter ways for global business