

FLEXION

CYBERSECURITY INDUSTRIAL MEDICAL AUTOMOTIVE

WHO WE ARE

Flexxon designs, manufactures and markets Industrial NAND Flash Storage solutions and products, serving specifically the **CYBERSECURITY, INDUSTRIAL, MEDICAL & AUTOMOTIVE (IMA)** verticals.





SSD



PCIe/SATA/ PATA
FLASH MODULE



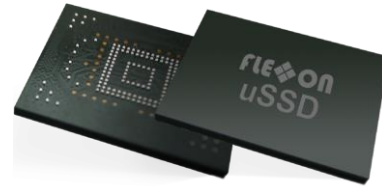
USB DRIVE



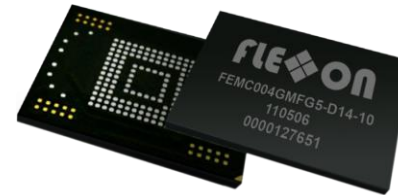
CF/CFast/CFX CARD



MICROSD/ SD CARD



USSD (BGA)
MO-276



EMMC (BGA)



CUSTOMISATION

Medical Application

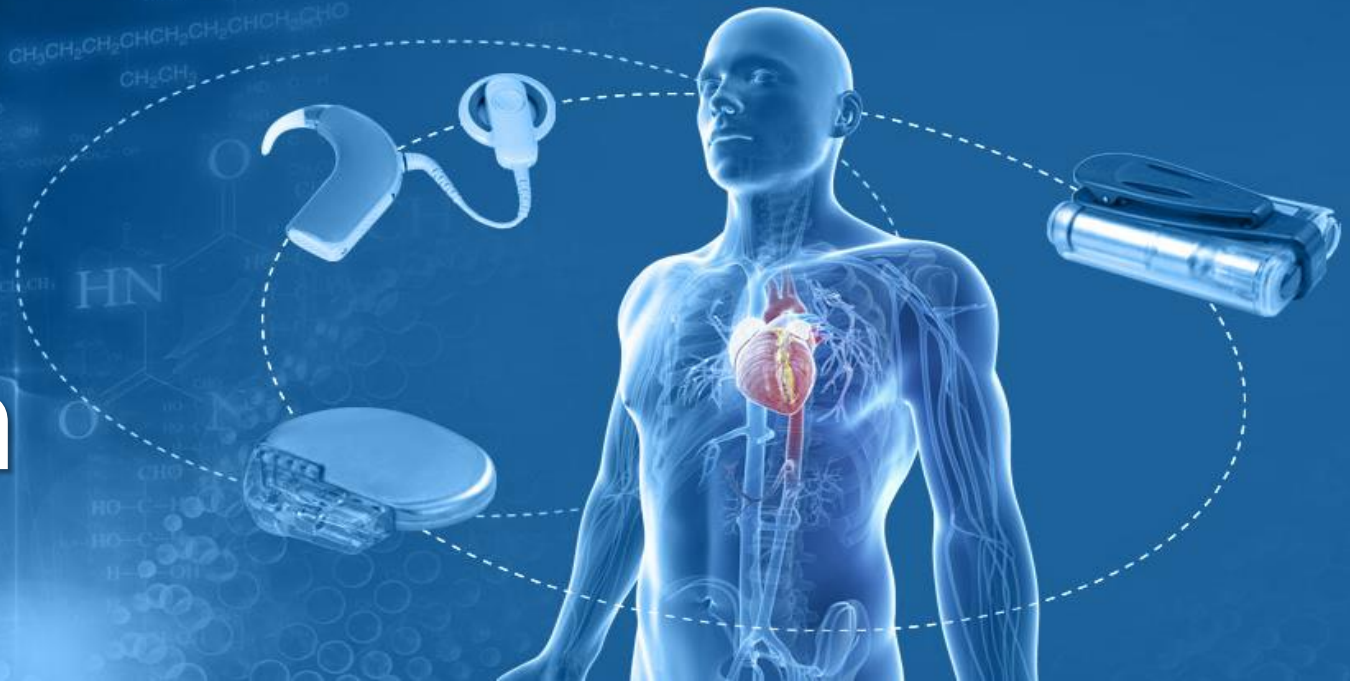


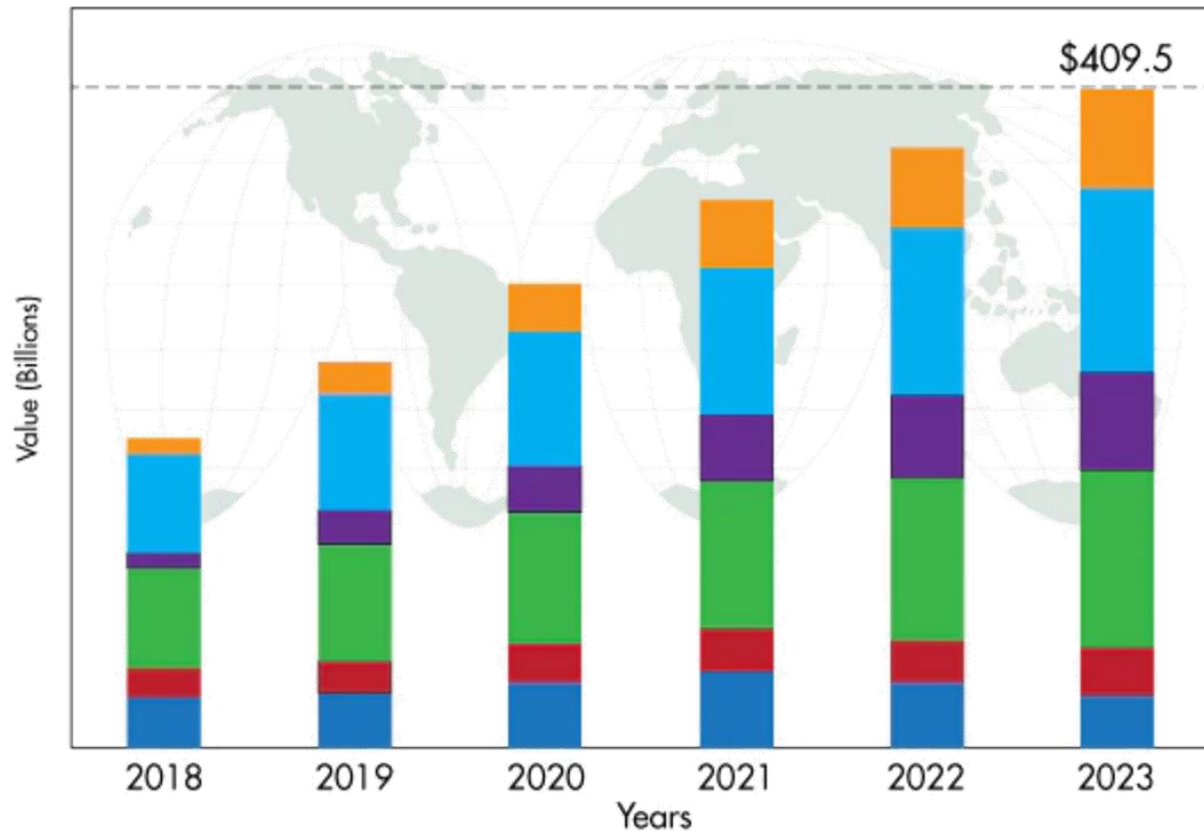
Figure 2: Global "Medtech" Market Development: Materials Versus Electronics: 2005-2016; 2017-2022

MedTech Market Growth and Forecasts by Type (Electronics Versus Materials): 2005-2016; 2017-2022 Forecast (in Billions of USD)

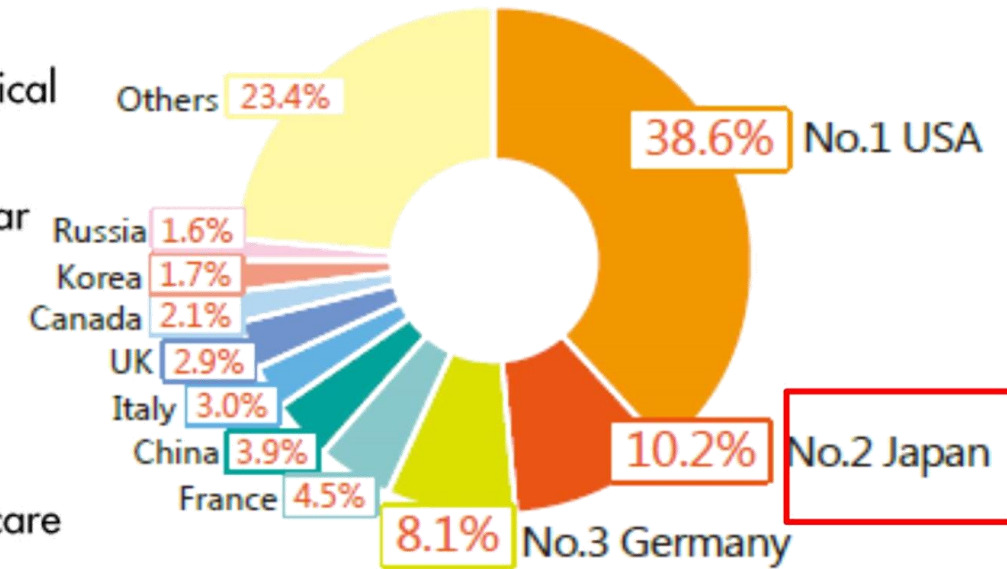


Source: Paumanok Publications, Inc.

GLOBAL MEDICAL DEVICE MARKET (\$B) FORECAST BY APPLICATION FROM 2018 TO 2023



- Surgical and Infection Control Devices
- General Medical Devices
- Cardiovascular devices
- Orthopedic devices
- Home healthcare devices
- Other devices



Top 10 medical device companies in 2019

Total revenue (USD billions)

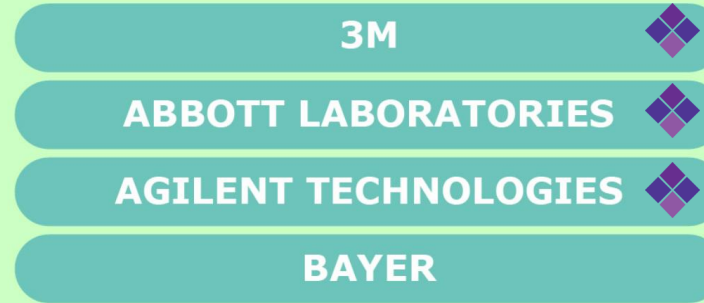
◆ Flexxon Customer



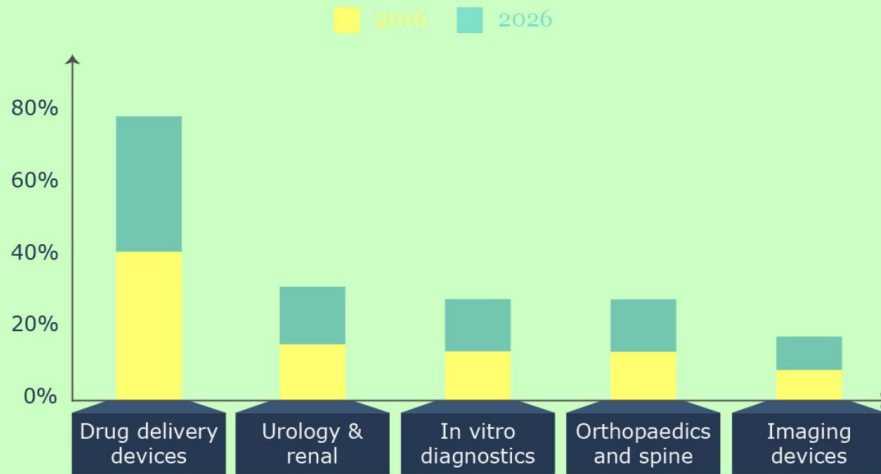
GLOBAL SURGICAL AND MEDICAL DEVICES MARKET FORECAST 2017-2026



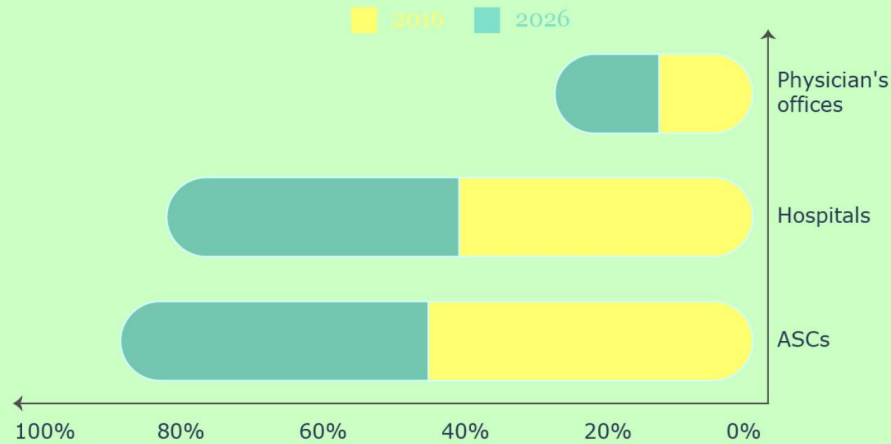
TOP COMPANIES



MARKET BY TECHNOLOGY



MARKET BY END USER



Flexxon Customer

MEDICAL IMAGING AND MONITORING

Discovery of:

- An X-ray machine
- Kidney dialysis machine
- Artificial organs
- Electronic thermostat

1880–1919

TECHNOLOGY

- Analog semiconductors
- PET
- SPECT

1970–2010

2010 Onwards

DIAGNOSIS

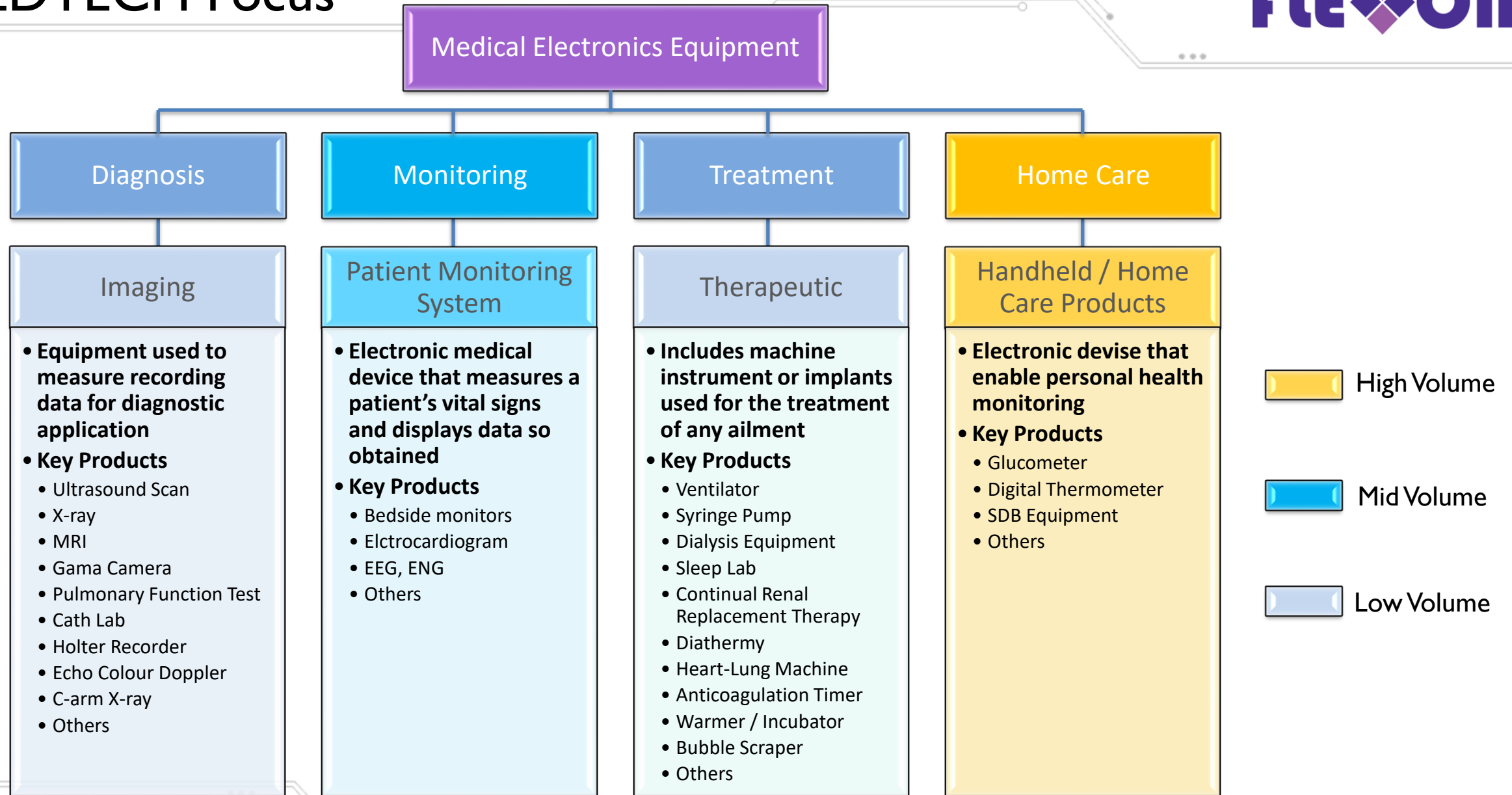
Discovery of:

- Traction splint
- Medical sensor
- CT scanner
- MRI scanner

1920–1969

PORTABLE AND TELEHEALTH

- Development of telehealth systems
- Wearable electronics
- Digital microprocessors
- Wireless ECG systems, mobile monitoring devices





High Quality

Stringent Reliability Test



Robust Design

Embedded Compatibility Design

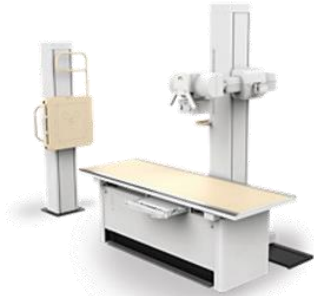


Longevity

Fixed BOM



Diagnosis



Diagnosis

Diagnosis of the Peripheral Vascular Circulation	SD Card
Life Science Laboratory Instrument	microSD, eMMC
Medical Cardiovascular Devices	eMMC
Medical Imaging	mSATA, microSD
Microbial Identification	USB
Precision Instrument	PATA DOM

Diagnosis	Products	Read/Write Behavior	Capacity
Diagnosis of the Peripheral Vascular Circulation	SD Card	mostly write	low
Life Science Laboratory Instrument	microSD, eMMC	mixed read/ write	mid
Medical Cardiovascular Devices	eMMC	mixed read/ write	low
Medical Imaging	mSATA, microSD	heavy write	very high
Microbial Identification	USB	mixed read/ write	low
Precision Instrument	PATA DOM	mostly write	low
Ultrasound Monitor	CFAST, 2.5"/ M.2 SSD	mostly write	mid to high
Blood Testing	microSD, SD Card, eMMC	mostly write	mid



Patient Monitoring System	
Dosimeter	microSD
Medical Cardio-respiratory	SD Card
Patient Data Monitors System	microSD, eMMC, USB DOM

Patient Monitoring System	Products	Read/Write Behavior	Capacity
Dosimeter	microSD	mostly write	low
Medical Cardio-respiratory	SD Card	mostly write	low
Patient Data Monitors System	microSD, eMMC, USB DOM	mostly write	low
Gas Monitoring	microSD, SD Card, eMMC	mostly read	low



Treatment	
Defibrillators	microSD
Medical Aesthetics Device	microSD
Medical Hearing Aids	eMMC, microSD
Minimally Invasive Therapy	eMMC, microSD
VNS Therapy System	SD Card
Vision Impairment	microSD

Treatment	Products	Read/Write Behavior	Capacity
Defibrillators	microSD	mixed read/ write	low
Medical Aesthetics Device	microSD	mixed read/ write	low
Medical Hearing Aids Test Equipment	eMMC, microSD	mixed read/ write	mid
Minimally Invasive Therapy	eMMC, microSD	mixed read/ write	mid
VNS Therapy System	SD Card	mostly read	mid
Vision Impairment	microSD	mostly read	mid
Ventilation Unit	microSD, SD Card, eMMC	mostly read	low



Home Care

CPAP Machine	SD Card
ECG Signal Tracking	microSD
In-home Medication Dispenser	eMMC
Infusion Pump Analyzer	microSD
Medical Video Glasses	microSD, 2.5" SSD
Medical Wearable Device	eMMC

HomeCare	Products	Read/Write Behavior	Capacity
CPAP Machine	SD Card	mostly write	low
ECG Signal Tracking	microSD	mostly write	low
In-home Medication Dispenser	eMMC	mixed read/ write	low
Infusion Pump Analyzer	microSD	mostly read	low
Medical Video Glasses	microSD, 2.5" SSD	heavy write	mid to high
Medical Wearable Device	eMMC	mixed read/ write	mid



Others	
Precision Lens Edging Equipment	CFast

Others	Products	Read/Write Behavior	Capacity
Precision Lens Edging Equipment	CFast	heavy write	high
Endoscopy	M.2, 2.5" SSD	heavy write	high
Configuration Storage	USB	mixed read/ write	low
Chemical Analyzer	mSATA, M.2, 2.5" SSD	heavy write	mid to high

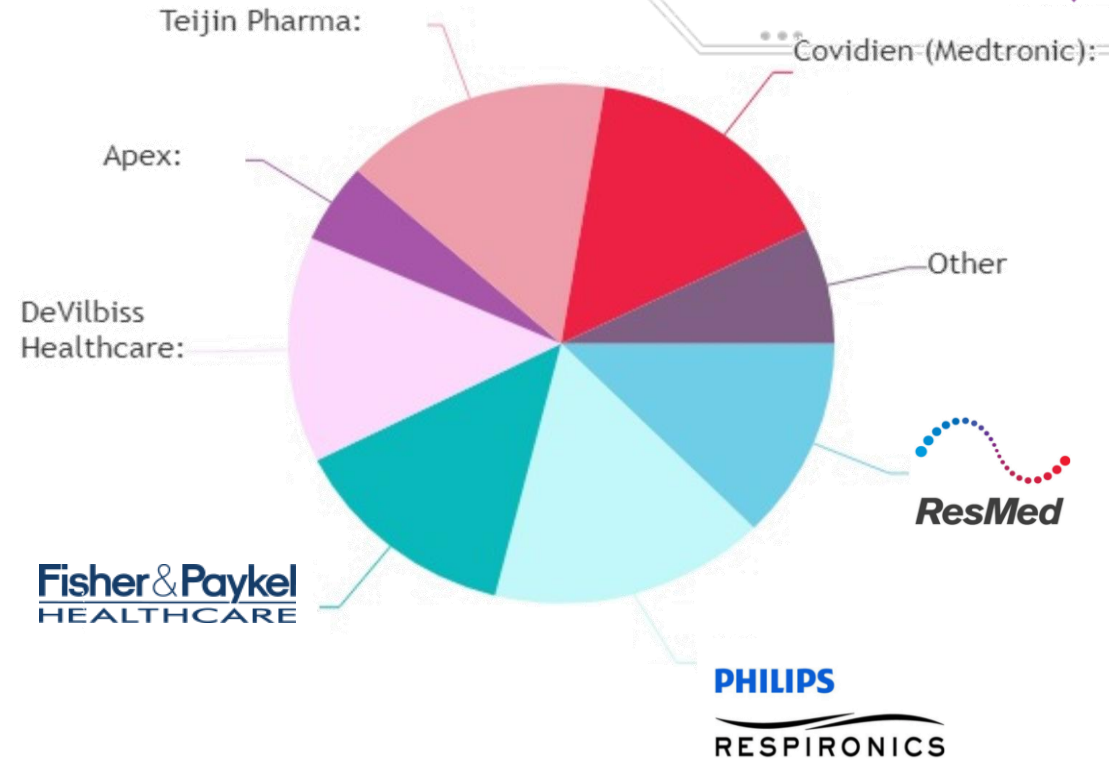
Use Cases – CPAP (Continuous Positive Airway Pressure)



- CPAP typically is used for people who have breathing problems, such as [sleep apnea](#).
- With estimates of sleep apnea prevalence reaching [1 billion](#) worldwide
- Compact design require small form factor. Removable memory card require power loss protection



FLEZON
FMS Series
Mylar Speaker





Philips Respironics
ResMed
Fisher and Paykel Healthcare
DeVilbiss Healthcare
Apex
Teijin Pharma
Covidien (Medtronic)
Koike Medical
Fosun Pharma

2019 CPAP Top 9 Companies

Use Cases – CPAP (Continuous Positive Airway Pressure)

 Advance Wear Levelling

 Power Loss Protection
Removable devices

 S.M.A.R.T Tool

 HighIOPS
A lot of small file size writes

- During writing host data
- During updating system data
- During defrag operation
- During Wear Leveling
- Pair-page power loss protection

8GB MLC SD Card	Competitor (Standard)	Flexxon (High IOPS)
Sequential Read (MB/s)	95	95
Sequential Write (MB/s)	30	30
4k Random Read (IOPS)	1980	3400
4k Random Write (IOPS)	336	1200

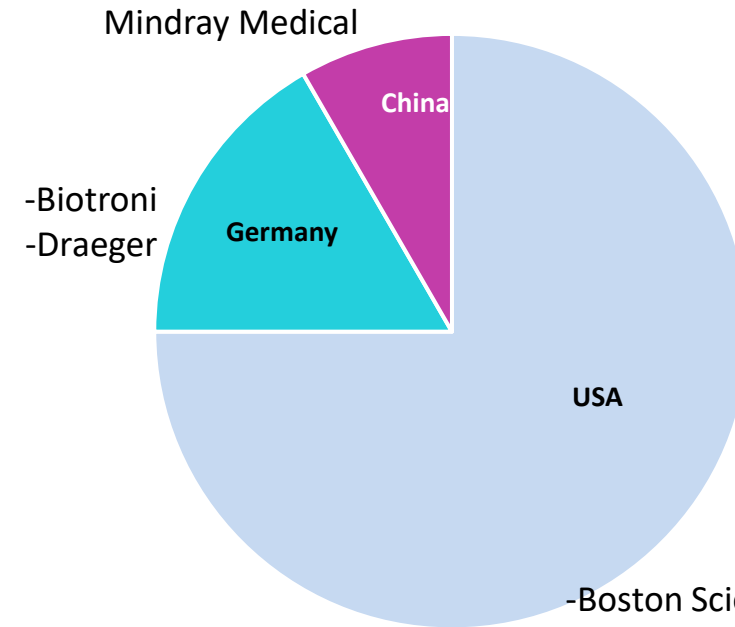
Comparison	Competitor Solutions	Flexxon HighIOPS
Bottleneck	When merging buffer blocks to static block	When writing to buffer block
Sequential Performance	High	Mid-High
Random Performance	Low	High
RAM Requirement	Low	High
Performance Consistency	High	Mid



Use Cases – Patient Monitoring Devices

- Healthcare market for ECG monitoring , respiration & body temperature.
- Continuous measure patient heart rate and rhythm, respiratory rate, blood pressure, blood-oxygen saturation, and many other parameters
- Heavy write of small files
- Small capacity size – 128MB-8G (SLC, pSLC, MLC)

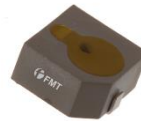
Worldwide Patient Monitoring Devices Maker



microSD FxPro I HighIOPS
microSD FxAdv / FxAdv II



Magnetic Transducer
FMT Series



microSD

push push connector

- High Endurance
- HighIOPS.
- S.M.A.R.T Tools.
- Power Loss Protection
- Advance Wear Levelling

- Biotroni
- Draeger
- Boston Scientific
- Infinium Medical
- Welch Allyn (Subsidiary of Hill-Rom)
- Avante Health Solutions
- GE Healthcare
- Medtronic
- St Jude/Abbott
- Philips Medical
- Masimo

Use Cases – Patient Monitoring Devices

FLEXON®



USB DOM FxAce Series
HighIOPS

128GB MLC USB DOM	Competitor (Standard)	Flexxon (High IOPS)
Sequential Read (MB/s)	25	31
Sequential Write (MB/s)	17	23
4k Random Read (IOPS)	1800	2000
4k Random Write (IOPS)	86	1000



HighIOPS



AES encryption



High Endurance
High TBW



FLEXON

Speaker FMS Series

Use Cases – Medical Cardiovascular/ ECG



Flexxon eMMC Features Designed for Medical Application

- Data Integrity In Reflow
- Dynamic Wear Leveling
- System Block Protection
- Write Reliability
- Auto Read Refresh

eMMC Highlight

- Customize power behaviour
- Customize timing: setup, hold, suspend
- Customize boot sector
- Configure registers and initialization
- Configure to support legacy interface
- Assist to access S.M.A.R.T Info

eMMC XTRA III
Low Density
4G/8G

Piezo Buzzer
FMB series

Top 10 ECG Manufacturers

- GE Healthcare
- Philips Healthcare
- Nihon Kohden Corporation
- Schiller Ag
- Opto Circuits Limited
- Johnson And Johnson
- Mindray Medical International Limited
- Medtronic Plc
- Mortara Instrument Inc.

CF Card Legacy II Series

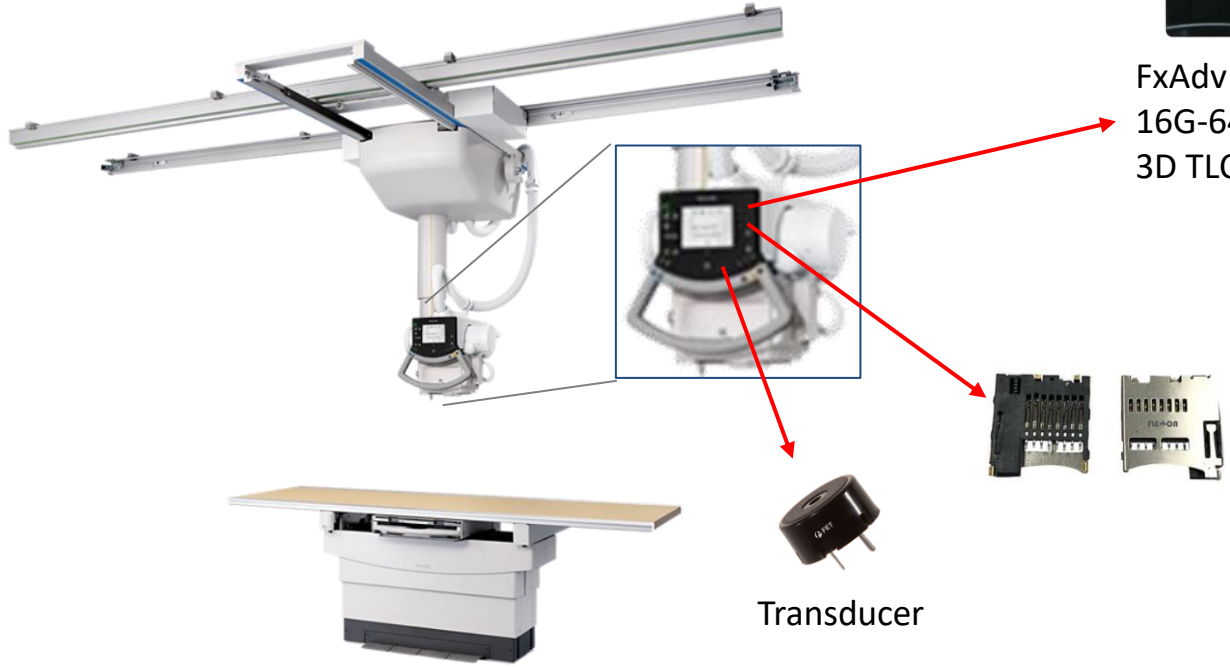
- Global Wear Leveling
- Customize Erase Sectors Command
- Customize UDMA interface
- Support Low capacity 128MB



Use Case – Large Scale Radiographic Systems



Large Scale Radiographic Systems



FxAdv /FxAdv II Series
16G-64G
3D TLC/ 3D pSLC

Highlight for Medical Imaging Application

- High Sequential and Random Performance (U3,V30, A1);
- High Endurance (PE cycle: 30K)

Top 10 Diagnostic Imaging Device Manufacturers

Advance Wear Levelling

S.M.A.R.T Tool

Power Loss Protection
Removable devices

HighIOPS
A lot of small file size writes

Use Case - X-Ray Machines



Mobile Radiographic Machines

mSATA (256GB)	Competitor (standard)	Flexxon (Hardware PLP)
Sequential Read (MB/s)	520	550
Sequential Write (MB/s)	500	520
Endurance	MLC	MLC
Total Bytes Written (TBW)	100	384
Hardware PLP	-	Yes

M.2 (512GB)	Competitor (standard)	Flexxon (Hardware PLP)
Sequential Read (MB/s)	3000	3400
Sequential Write (MB/s)	2000	2100
Endurance	3D TLC (1,000 (PECycle)	3D TLC (3,000 PE Cycle)
Total Bytes Written (TBW)	300	918
Firmware PLP	-	Yes
AES 256 / TCG Opal	Yes	Yes



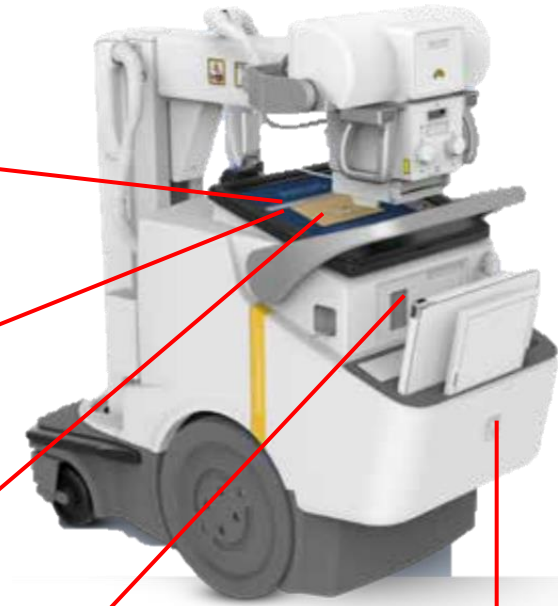
mSATA
256GB - 512GB



or
PCIe M.2
512GB



Transducer



Sensor (to prevent collision)



16GB USB drive
(Can propose WORM/ROM USB)



Advance Wear Levelling

Power Loss Protection
Removable devices

Encryption Security

High Endurance
High TBW

Customization
Especially drive compatibility to OS support
Security

Other opportunity

- Large scale radiographic system is connected to their workstation and also a DICOM Server.
- Able to promote Cybersecurity and WORM/ROM products

Use Case - Surgical Robotic System

Removable USB Stick

- Continue heavily write
- storing video to the USB
- Require high endurance -pSLC or SLC
- High capacity size

Comparison	Competitor	Flexxon
Grade	Commercial	Industrial
Endurance	Low TBW	High TBW
Robust Design	No	Yes
Customization	No	Yes



Industrial FxAce Robust
USB 3.1 Gen 1 Pen Drive

Top 5 Surgical Robotics System

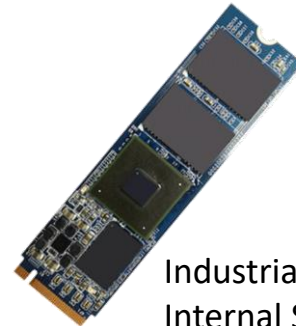
- CMR
- Corindus
- Mako
- Synaptive
- Monarch

PCIe / SATA SSD

- PCIe M.2 2280 512GB / 1TB - DEX Pro Series
- SATA M.2 2280 512GB - INSPIRE Series

Highlight

- Better compatibility in Linux OS
- Advance ECC Management
- Power Loss Protection
- DRAM Design
- High Performance



Industrial SSD as
Internal Storage



Use Case – Medical Aesthetics Device



microSD Card
FxStd Series

Requirement Highlight

- Embedded OS causing a lot of compatibility issue
- Most of the card fail for qualification
- Write a lot of small files
- Boot OS from microSD Card
- Heavy operation to card and solutions robustness design is a must

Secure USB Stick
FLEXXON SEC I series USB



Requirement Highlight

Preload content on the Operator's Manual in the Flexxon Sec I USB stick to replace CD-ROM. The content in the stick will be Read-access only, not writable under any circumstance.

Flexxon Solutions

- Customize Secure USB
- Configure public partition & read-only partition capacity % as per customer requirements
- Software tool for storing data into the read-only partition which is not editable for user
- Data stored in secure partition cannot be accessed (read or write) without a password



Customize to provide **extensive compatibility** solutions is the biggest **differentiator** for Flexxon storage devices in Medical Application

Use Case – Medical Diagnostics Device



Read Only Mode USB Stick

FLEXXON Security ROM series USB

Requirement Highlight

- Software update Tool stored in Flexxon ROM stick to update drivers of clinicians and laboratory devices.
- To replace CD / DVD ROM where the content cannot be modify, overwrite or delete.

Flexxon Solutions

- Crucial data in a tamper-proof storage solution.
- Ensure the utmost data security in a USB device.
- It keeps the data in read only mode and prohibit data from the risk of alteration.
- Data stored in ROM mode stick cannot be modify, overwrite, delete and format
- Brand Logo Customization
- Customized tool for content duplication and password update - up to 16 USB stick at the same time.

Clone Tool 0.0.0.4

Settings

[Ready]

Total: 4 Pass: 2 Fail: 2 Yield: 50.00 %

Serial Number: 00000000

No	Drive	Flash	Status
1	D		COPY FILE (40.00%)
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			

Flexxon Read Only Drive V1.0

Drive

D: 7366 MB [FAT32]

7.15 GB Free

Total : 7.19 GB

Drive Security Status Authentication Set Password Remove Password

You are in Read Only Mode now

Use Case – Surgical Vision Equipment



Invisible Data

Conceal and preserve critical data by **making the Drive invisible**



Security Mechanism

Only accessible using security tool and **password protection**.

FLEXON X-Mask SD Card – Data Confidentially

Requirement Highlight

- Data in the SD card can be encrypted
- System specific read access controls.
- HighIOPS for small data writes
- Customized windows command line tool for user.

```
C:\Windows\System32\cmd.exe
Microsoft Windows [Version 10.0.19042.985]
(c) Microsoft Corporation. All rights reserved.

D:\Security Card Tool V1.2>sdsec -ver
Rev. 1.2

D:\Security Card Tool V1.2>sdsec e: -v
Support Security Feature: Yes
D:\Security Card Tool V1.2>sdsec e: -s
Card Status: Normal Mode
D:\Security Card Tool V1.2>sdsec e: -e Flexxon
Encrypted Card Completed
D:\Security Card Tool V1.2>sdsec e: -s
Card Status: Unencrypted
D:\Security Card Tool V1.2>sdsec e: -s
Card Status: Encrypted
D:\Security Card Tool V1.2>sdsec e: -d 123
Decrypt Card failed, the password is incorrect
D:\Security Card Tool V1.2>sdsec e: -d Flexxon
Decrypted Card Completed
D:\Security Card Tool V1.2>sdsec e: -s
Card Status: Unencrypted
D:\Security Card Tool V1.2>sdsec e: -r Flexxon
Removed Encryption Completed
D:\Security Card Tool V1.2>sdsec e: -s
Card Status: Normal Mode
D:\Security Card Tool V1.2>
```

Note: Unplug & Reinsert the SD card to activate mask function.

WORM Solution

- **Tamper-proof** Write-Once-Read-Many solution that **protects sensitive files** from being deleted, modified, or overwritten.
- **Replaces old WORM media** such as CD-R / DVD-R disk storage, optical disk, zip disk, and WORM tape
- Comes in
 - SD: 4GB~256GB
 - microSD: 4GB~128GB
 - USB: 8GB~32GB





Unalterable data storage

Turns into a write-protect mode when any illegal action* is attempted

*changing/overwrite/rename/delete/format/clone



Default WORM card mode

Unlike other's WORM solution, our solution don't require to enable any software

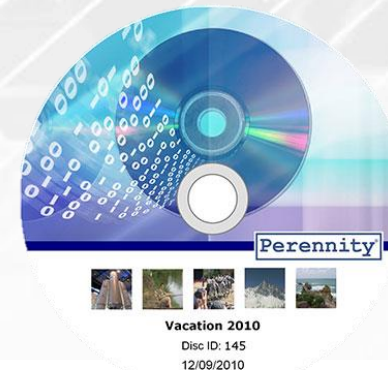
DICOM (Digital Imaging and Communications in Medicine) is a **international standard format** and protocol for handling, storing, printing, and transmitting information in **medical imaging**.

WORM card technology can be utilised in the following uses:

- electronic health record (EHR), or electronic medical record (EMR)
- Store patient's confidential records to prevent alteration
- Replace old media like CD / DVD / Blueraay as it will be obsolete soon

Target: Solution provider for medical industry

Example: Perennity, a solution provider for electronic data archiving & distribution that supports multiple companies in the medical imaging and record management field. Their solution provides output Patient's medical images into CD, DVD & Blueraay for archival.



DICOM members



AGFA HealthCare

Bayer Healthcare

Brainlab

Canon Medical Systems U.S.A

Carestream Health

Carl Zeiss Meditec

Change Healthcare

Corista

Elekta

FUJIFILM Medical Systems U.S.A.

GE Healthcare

Hitachi Healthcare

Hologic

IBA

Konica Minolta Medical Corporation

Laitek

Leica Biosystems

Merge Healthcare

Panasonic Healthcare

Philips

PixelMed

Sectra Imtec AB

Seno Medical Instruments

Siemens Healthcare

Sony

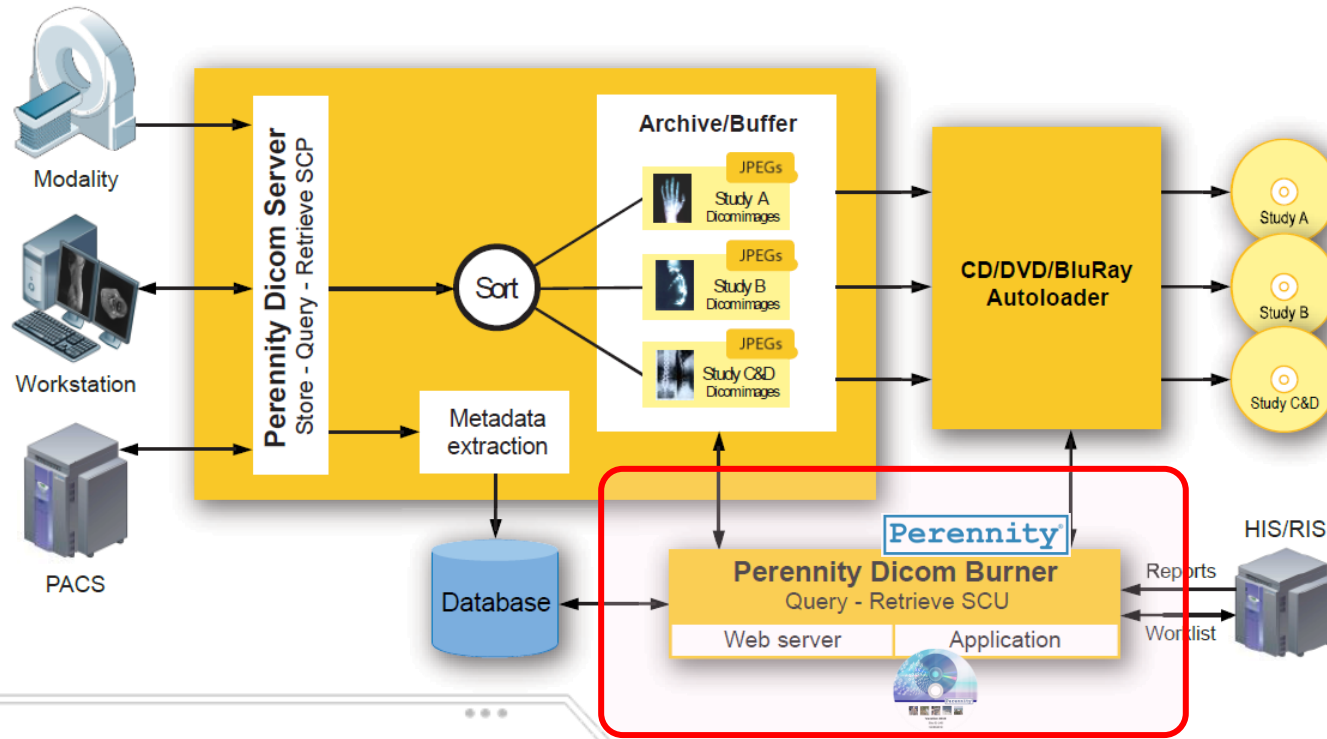
SuperSonic Imagine

Varian Medical Systems

VISUS



- An **electronic health record (EHR)**, or **electronic medical record (EMR)**, is the systematized collection of patient and population electronically-stored health information in a digital format.
- These records can be shared across different [health care](#) settings.
- Records are shared through network-connected, enterprise-wide information systems or other information networks and exchanges. EHRs may include a range of data, including [demographics](#), medical history, medication and allergies, [immunization](#) status, laboratory test results, radiology images, vital signs, personal statistics like age and weight, and billing information.



Key Consideration – EMR Storage

- **Security**
- **Retention Period**
- **Data Integrity**
- **Scalability**

EMR Vendor

[e-MDs](#),
[Allscripts](#),
[NextGen Healthcare Information Systems](#)
[GE Healthcare](#)

Why Flexxon?

Long Product
Life

Fixed BOM

Industrial
Grade

Special Capacity
& Customize
Memory Solution

Strong Technical
Support

Support HMLV
(High-Mixed Low
Volume)

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