Innodisk iReport
2015 Q1

DRAM BU

Q1 2015

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✓ DRAM Price Trends

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✓ Mini DIMM

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DRAM 2015 Q1 Market Overview

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DRAM Market Information

- 2015 turning points: 20nm production & DDR4
- Market shares and planning from main suppliers:

Samsung 41.1%

- Applied 20nm production on all DRAM products
- The yield of 20nm DRAM mass production rose to 50%

Hynix 27.7%

- Enhanced competitiveness with 20nm production
- Developed high-end DRAM to reach mobile DRAM market

Micron 24%

- Planning to transition to 20nm production by the end of 2015
- Partnered with Taiwanese companies to beat Korean suppliers
- Focused on mobile and server DRAM market

Source: The Liberty Times/Digi Times/Tech News

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DRAM Price Trends

2015 General Forecast

The global DRAM demand is stable this year.
The output value is forecasted to be US$523 billion with 14% growth in revenue.

2015 Q1 DRAM Price Trends

The price is predicted to drop slightly in Q2. However, the demand from OEM and channel partners may rise in March.

2015 Q2/H2 Forecast

Unit costs will decline due to 20nm production and will lead to increasing profit in H2.

Source: Trend Force/money.udn/Tech News

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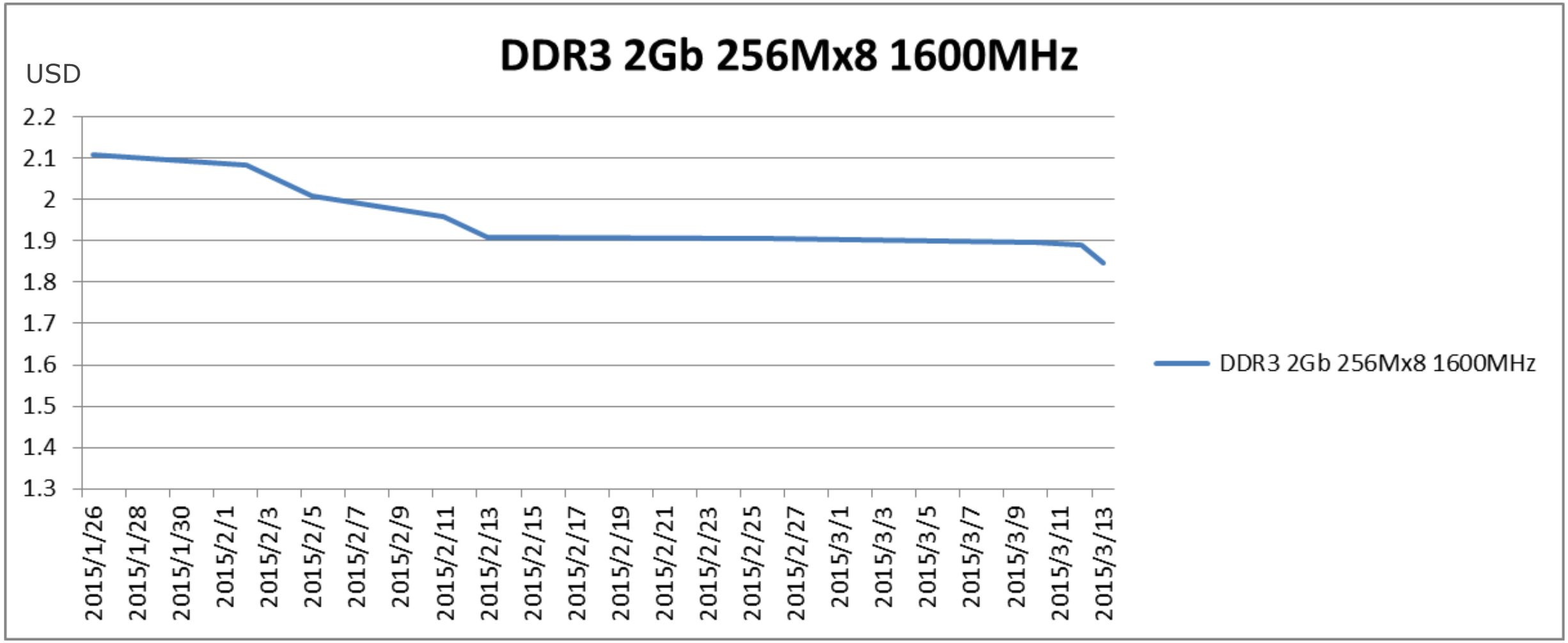
DRAM Price Record – DDR3 2GB 256Mx8 1600MHz

- The price declined slightly due to excess supply and a low season in Q1.



Source: DRAMeXchange

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Big Issue - Internet of Things (IoT)

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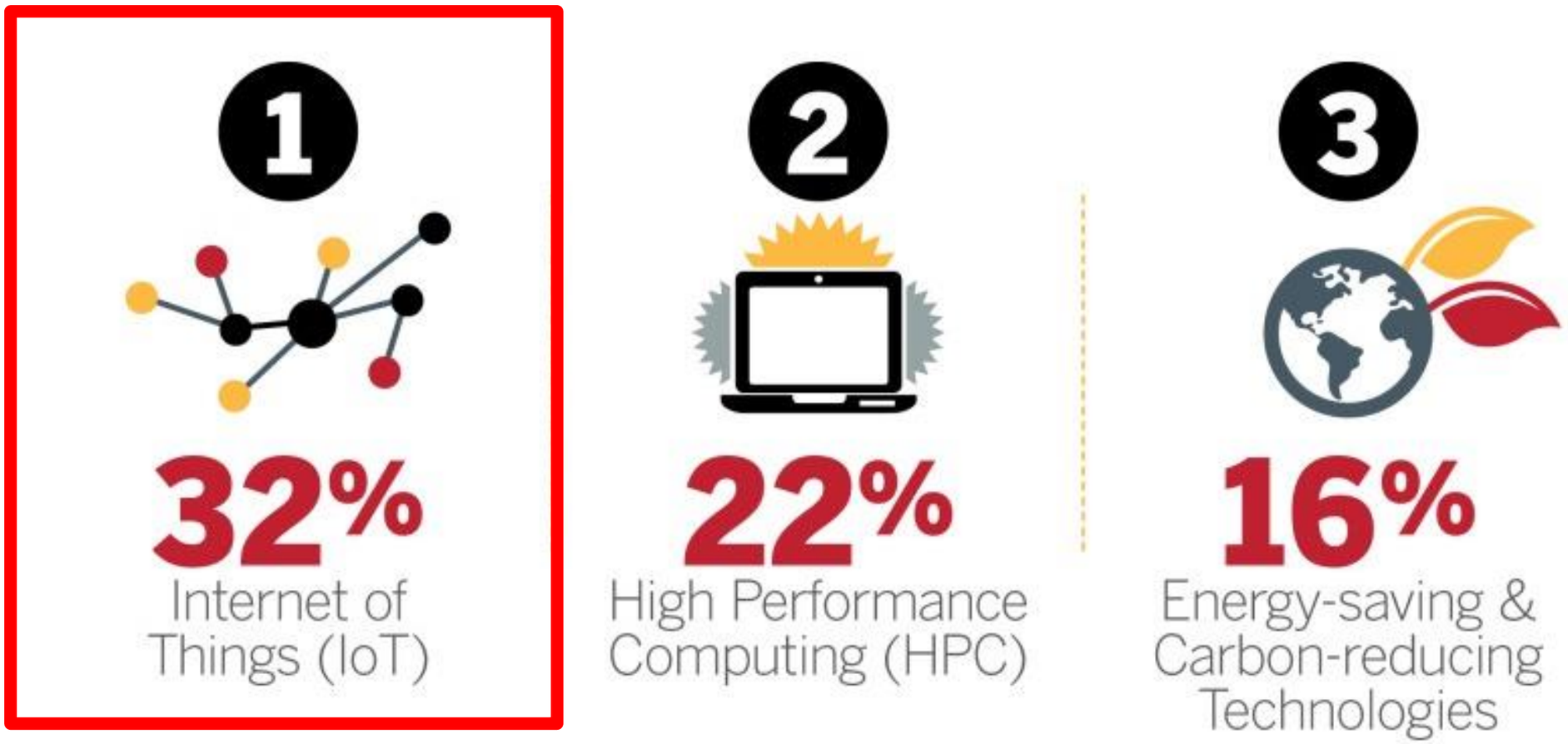
Big Issue - Development of IoT (Internet of Things)

- Top new areas of IT spending in 2015 include the Internet of Things (IoT) (32%), High Performance Computing (HPC) (22%), and Energy-saving & Carbon-reducing technologies (16%). It can be concluded that IoT application is consistently a hot issue within the IT industry for 2015.



Source: Forbes

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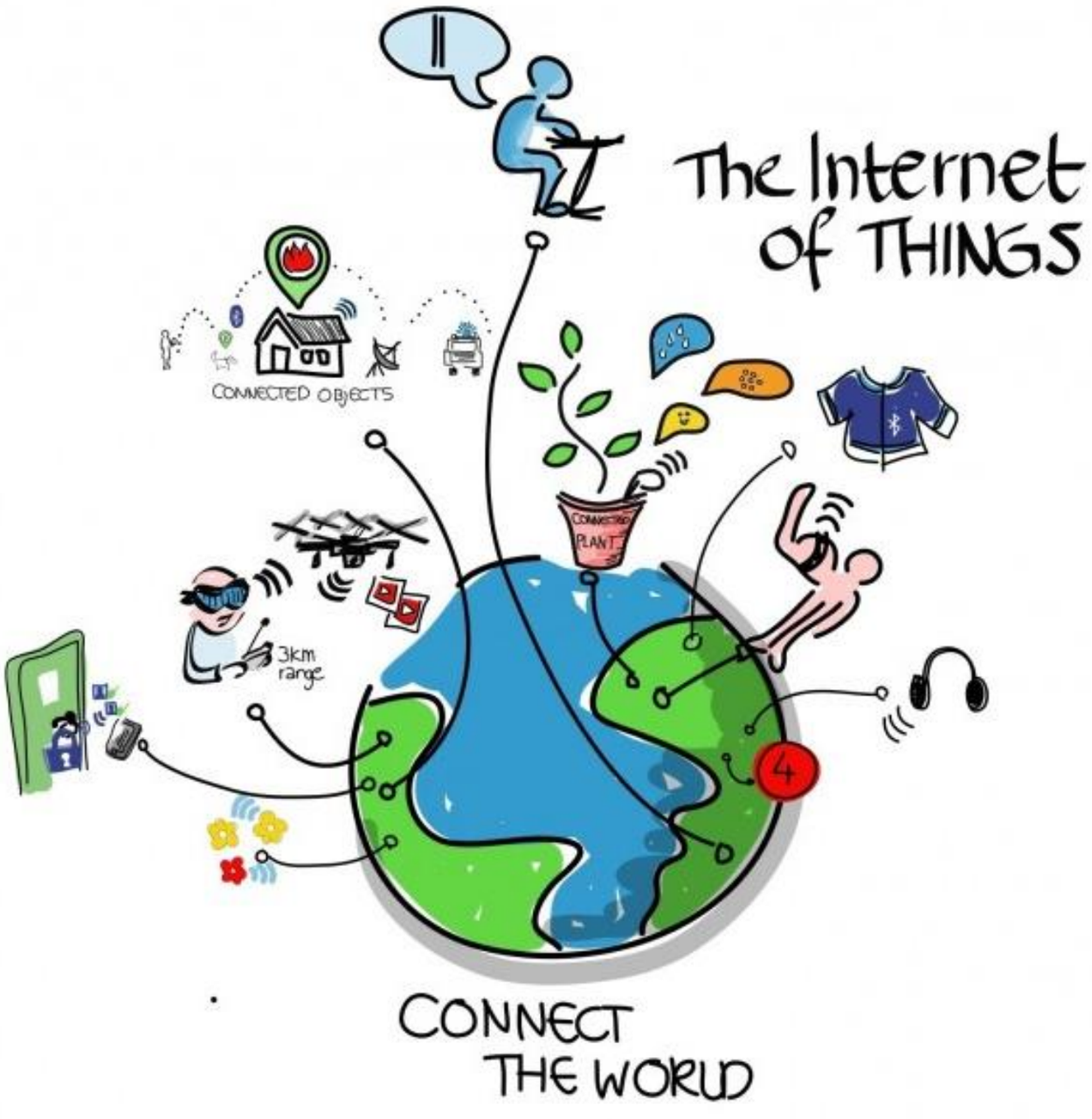
Big Issue - Development of IoT (Internet of Things)



- The Internet of Things (IoT) is a scenario in which objects, animals or people are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction (Kevin Ashton, 1999).

- IEK pointed out that the ICT industry established the infrastructure related to IoT last year. It also forecasted that growth will reach US$261 billion in 2019 from this year's US$146 billion.

- Google executive chairman Eric Schmidt said that the Internet will disappear, since "…there will be so many IP addresses… so many devices, sensors, things that you are wearing, things that you are interacting with that you won't even sense it."

Source: Tech News/udn.com/Apple Daily

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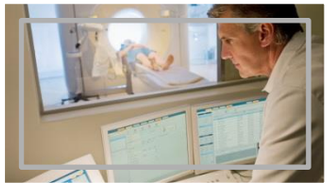
Influence of IoT on IPC Industry

In-Vehicle

Aerospace

POS



Medical

Automation

Military

- The research institution Gartner predicted that growth of IPC revenue could attain 9.1%, and that output volume from IoT is one of the drivers of growth in 2015 and 2016.
- IPC manufacturers are making inroads in IoT. They integrate consumers' various needs in relation to Smart Cities, Smart Home, Smart Car and mobility, and even cross-field integration.
- IEK analysts pointed out that the revenue from Smart Home in 2015 will be US$202 billion with 19% growth, with demand breaking out in 2016.

Source: cnYES/ Apple Daily

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IoT in Medicine and Healthcare

- As the population ages and the public becomes highly health-conscious, healthcare has become a key point in Smart City.

- The market is moving forward with 4P concept, meaning:
  "Predictive, Preventive, Personalized, and Participatory Medicine."

- As MIC predicted, the number of end-devices that advanced basic medical and healthcare needed will increase to US$11 billion in 2010.

Source: China Times/Digi Times/The Epoch Times

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DRAM Application in IoT Surveillance System - Medicine and Healthcare

innodisk DDR4 RDIMM

Remote monitoring

innodisk UDIMM SODIMM

Home Healthcare Equipment
Webcam/
Digital device/sensors

Health Database
Records blood pressure, heartbeat, temperature, etc.

Instant consulting
Remote examination

Physical index management
Self-health maintenance

- ✓ **Decreases medical cost**
- ✓ **Reduces the time that patients commute and wait**
- ✓ **Relieves medical personnel's workload**

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IoT in Telecommunication

- Due to the growing applications from LTE, M2M, and Smart Home, vendors predict that the demand from telecommunication based on IoT structure will emerge considerably. The growth of telecommunication is forecasted to increase above 15% in Q1.

- This year is key, since global 4G developing, ADSL, mobile telecom, cable, Google, and Apple all entered the Smart Home market heavily.

- Ericsson ConsumerLab revealed 10 trends in the application of telecom at the end of 2014, noting that video related application was the most prevalent.

- Three main media streaming vendors (Amazon, Netflix, and Hulu) invest more capital in online streaming media. YouTube, AOL, and Yahoo have also entered the market.

Source: The Liberty Times/YoWu Report/Tech News/udn.com

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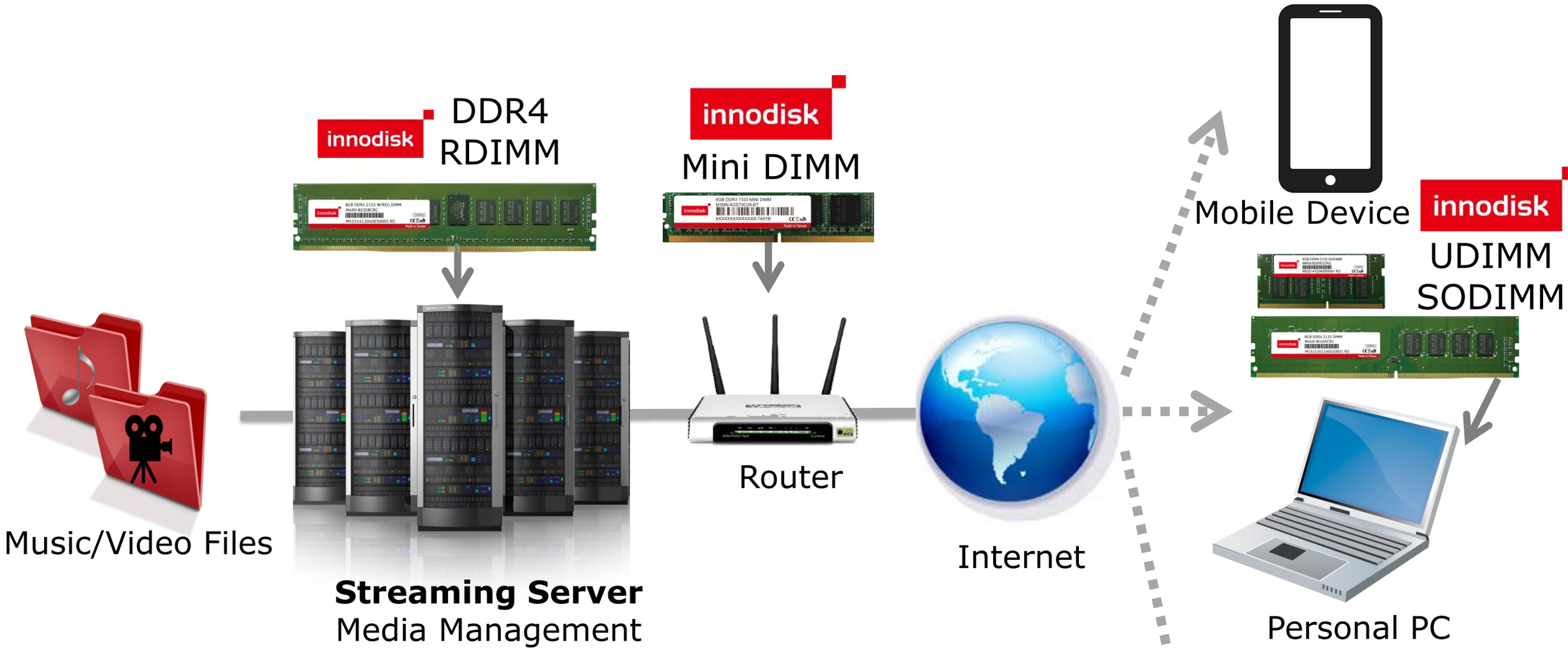
DRAM Application in IoT
Telecommunication - Media Streaming



- ✓ **Media can be played without being completely downloaded**
- ✓ **Time-saving and capacity saving**
- ✓ **Reduces issues related to intellectual property rights**

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New Product from Innodisk

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New Product Introduction

DDR4

DDR4 may become the mainstream memory product within the server market in the end of this year due to Intel's leading and the cooperation from DRAM manufacturers.

The market penetration rate of DDR4 in personal PC and NB is predicted to increase rapidly and could become the mainstream within the memory market in the first half of 2016.

- Introduction: Comparison with DDR3
- Application
- Innodisk Product Availability
- Strengths of Innodisk DDR4

Mini DIMM

With increasing applications related to IoT, telecommunication equipment such as blade servers, routers, firewalls, etc., need to adopt stable and hi-speed memory modules to address data transmission and analysis.

- Introduction
- Application
- Innodisk Product Availability
- Strengths of Innodisk Mini DIMM

Source: udn.money

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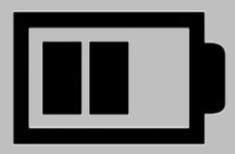
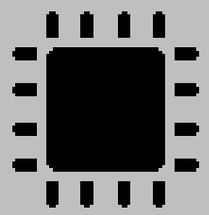
DDR4 Introduction- Comparison with DDR3

	DDR3	DDR4	Description
Voltage 	1.5V	1.2V	DDR4 improves upon DDR3 with at least 20% lower voltage.
Speed 	800/1066/1333/ 1600/1866/2133	1600/1866/2133/ 2400/2666/3200	DDR4 improves performance up to 30% (compared with the mainstream DRAM of DDR4-2133 SODIMM with DDR3-1600 SODIMM).
IC Density 	512Mb-8Gb	4Gb-16Gb	The density of a single DDR4 IC doubles that of a single DDR3 IC. In other words, the density of DDR4 module is quadruple that of the DDR3 module, at most.

Source: Micron

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DDR4 Product Application

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DDR4 DIMM Product Availability

Type	Speed	IC No.	Rank	PCB High		1Gbx4	4Gbx8	DDP 2Gbx4
SODIMM	2133	16	2	STD	30mm		8GB	
SODIMM	2133	8	1	STD	30mm		4GB	
UDIMM	2133	16	2	STD	31.25mm		8GB	
UDIMM	2133	8	1	STD	31.25mm		4GB	
ECC SODIMM	2133	18	2	STD	30mm		8GB	
ECC SODIMM	2133	9	1	STD	30mm		4GB	
ECC UDIMM	2133	18	2	STD	31.25mm		8GB	
ECC UDIMM	2133	9	1	STD	31.25mm		4GB	
ECC RDIMM	2133	18	2	STD	31.25mm	16GB		
ECC RDIMM	2133	9	1	STD	31.25mm	8GB		
VLP ECC RDIMM	2133	18	2	STD	18.75mm			16GB

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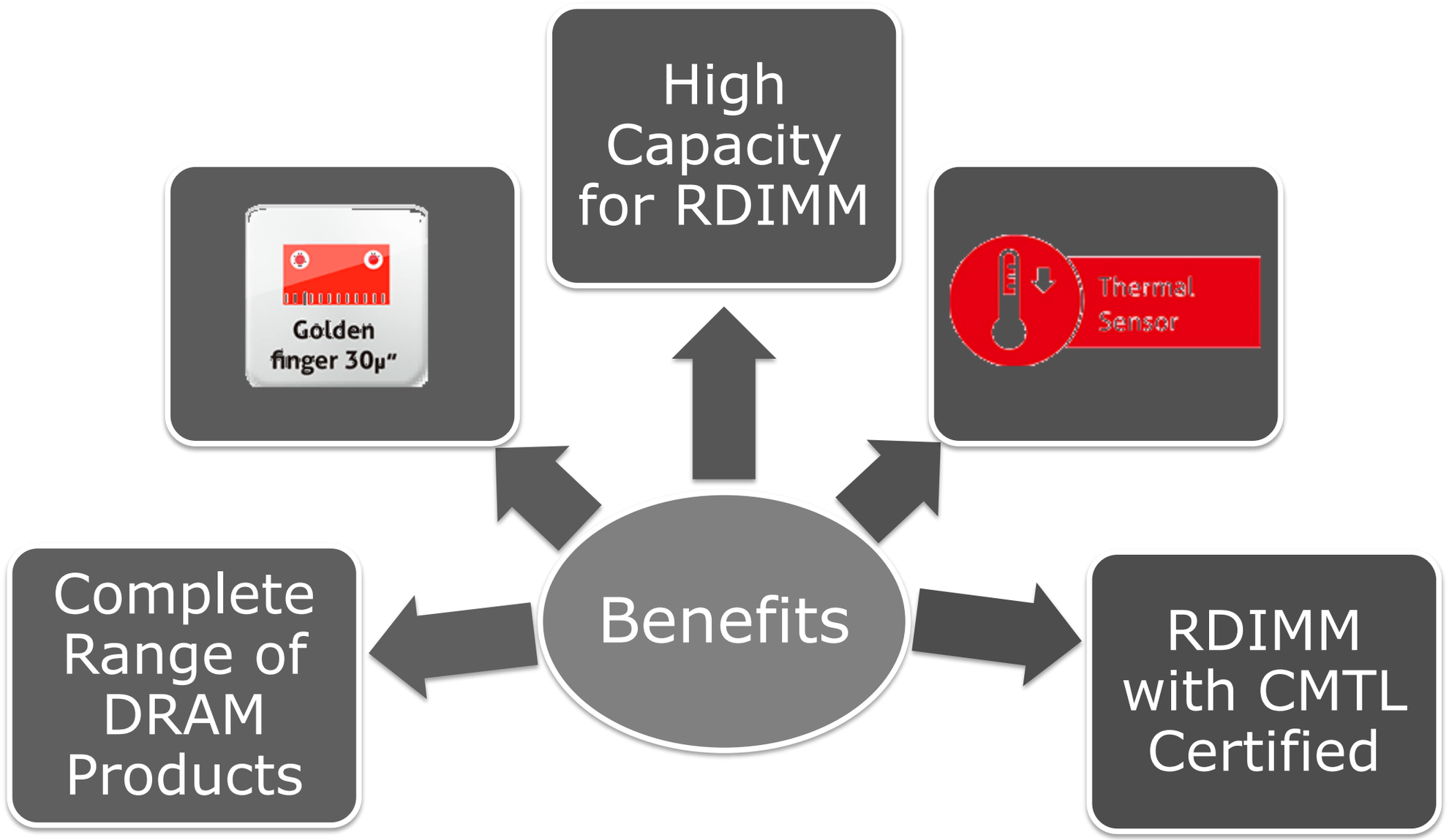
Strengths of DDR4 from Innodisk



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Mini DIMM Introduction

Mini-RDIMM_VLP

Designed with 17.9mm high dimension (VLP)

Designed to improve thermal resistance

Mini- DIMM w/REG_STD

Registered/ECC/PLL enabled

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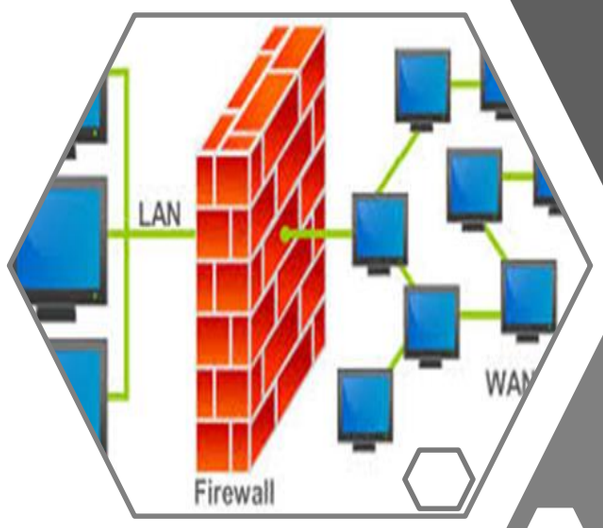
Mini DIMM Product Application

Telecommunication

High-end switch



Router

Firewall

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Mini DIMM Product Availability

Model	Type	Speed	IC No.	Rank	PCB High		Register	1Gbx8	512Mbx8	256Mbx8	128Mbx8
Mini-U	DDR3 SDRAM	1600	18	2	STD	30mm	N/A	16GB	8GB	4GB	2GB
	DDR3 SDRAM	1600	9	1	ULP	17.78mm	N/A	8GB	4GB	2GB	1GB
Mini-R	DDR3 SDRAM	1600	18	2	STD	30mm	Y	16GB	8GB	4GB	2GB
	DDR3 SDRAM	1600	9	1	VLP	18.75mm	Y	8GB	4GB	2GB	1GB

Mini-RDIMM_VLP

Mini- DIMM w/ECC_ULP

Mini- DIMM w/REG_STD

SO- DIMM w/ECC_STD

SO- DIMM w/ECC_VLP

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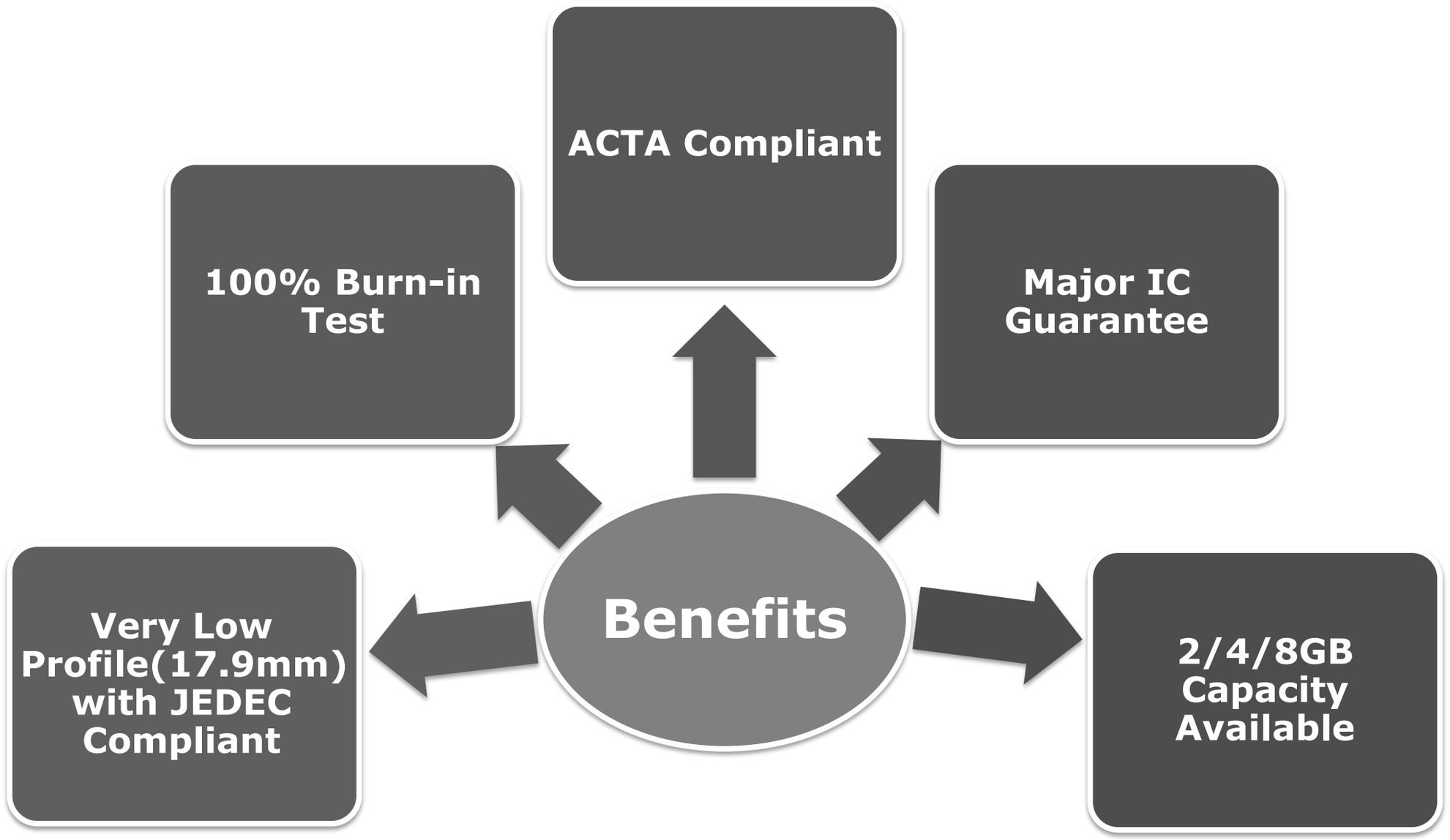
Strengths of Mini DIMM from Innodisk



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