



RichWave Technology Corp. Investor Presentation

Macquarie Taiwan Corporate Day

Oct. 2017



About RichWave

COMPANY OVERVIEW

SHANGHAI
SHENZHEN
SUWON
TAIPEI
CHUPEI

LOS ANGELES



Founded
Jan. 2004



Listed in TSE
Nov. 2015

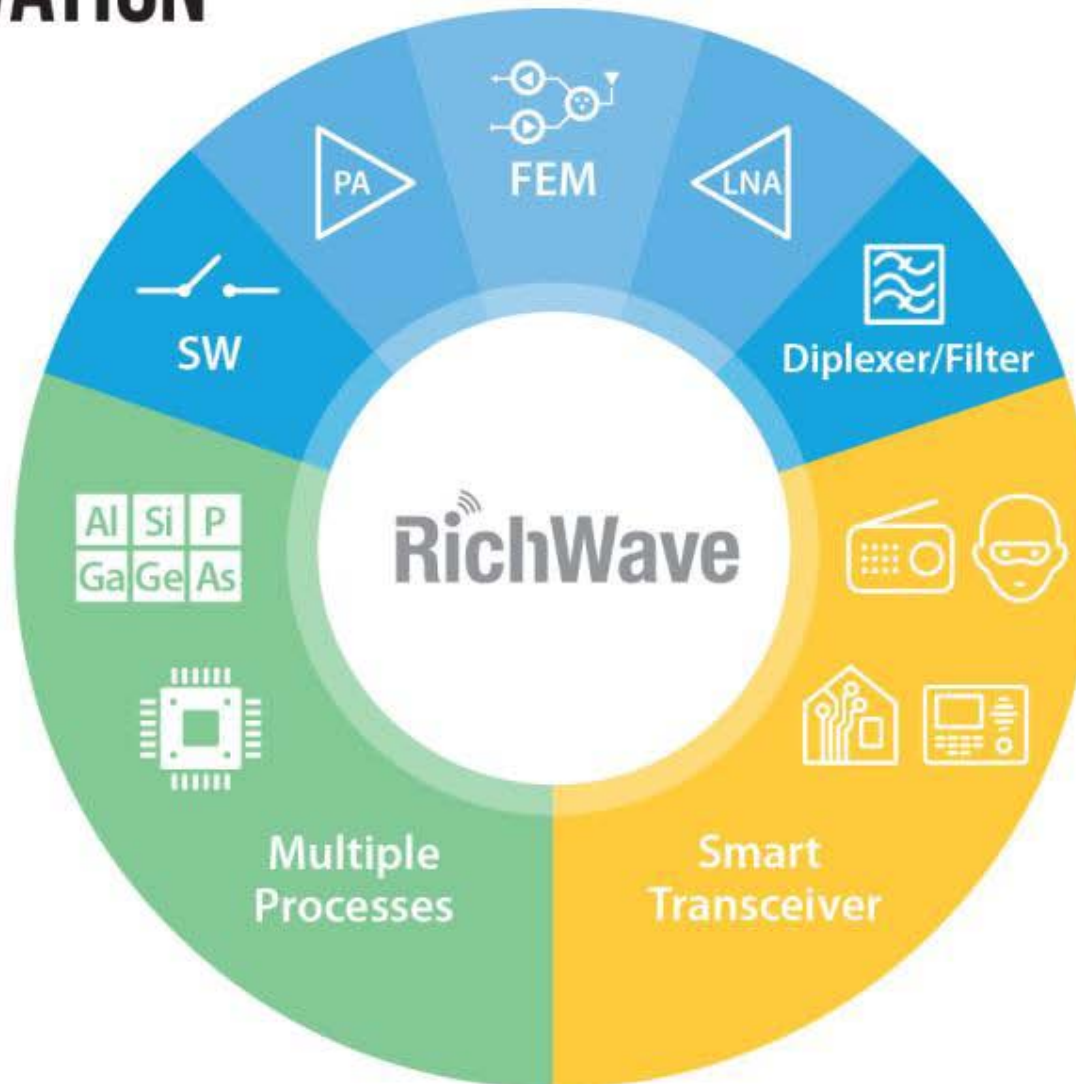


Customers
350



Products
270

DIFFERENTIATION & INNOVATION



WIFI



PA



LNA



SW



FEM

NETGEAR

SAMSUNG

belkin

Nintendo

amazon.com

ARRIS

T

RICHWAVE CONFIDENTIAL 3

MOBILE



Lte™



PA



LNA



SW



SONY

ASUS

TCL

freebox

SYSTEM ON THE CHIP



FM Tuner

Transceiver

Transmitter

Receiver

AM Tuner

Video Processing

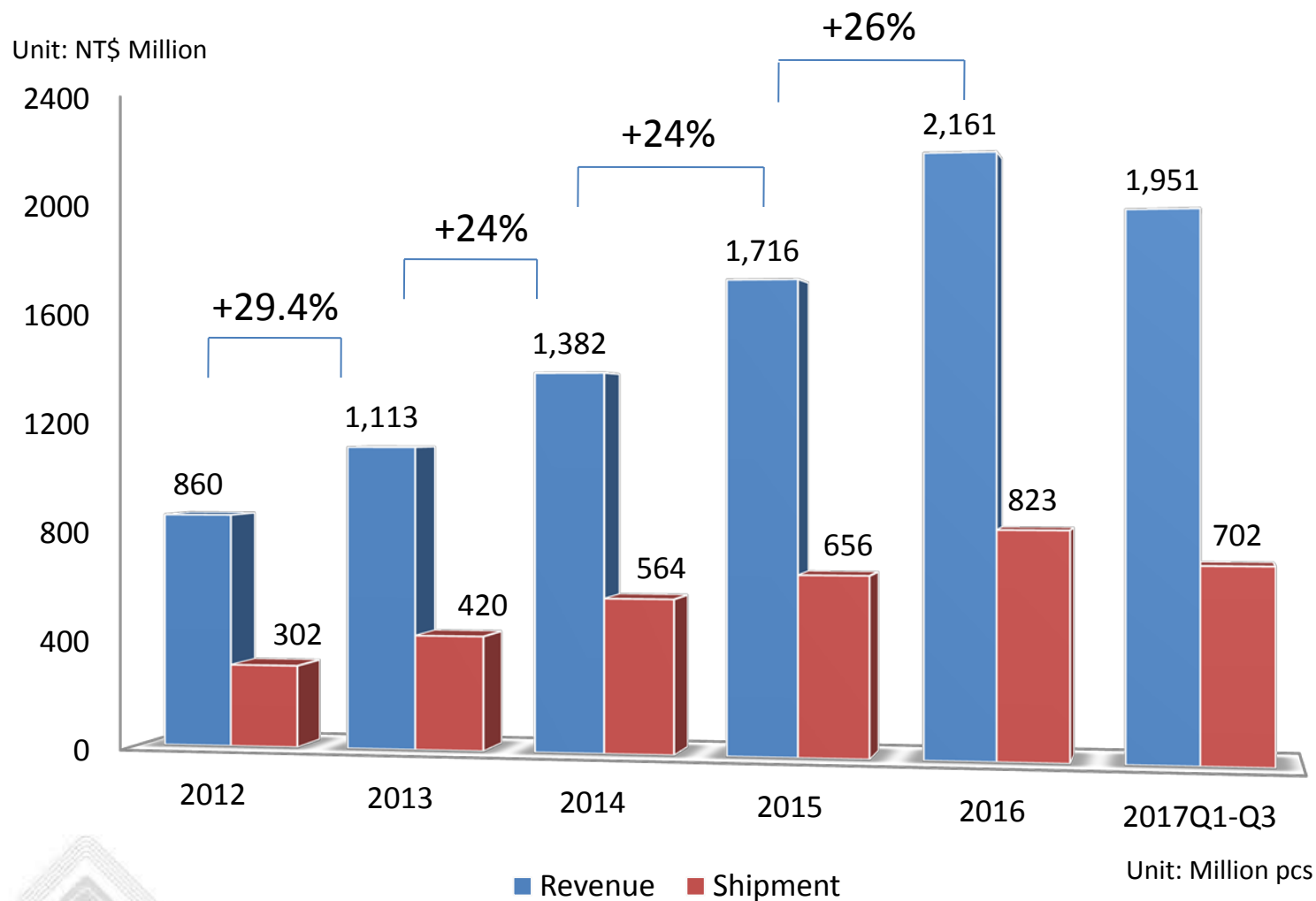


GOSCAM

FURRION

dji

Trend in Net Sales & Units

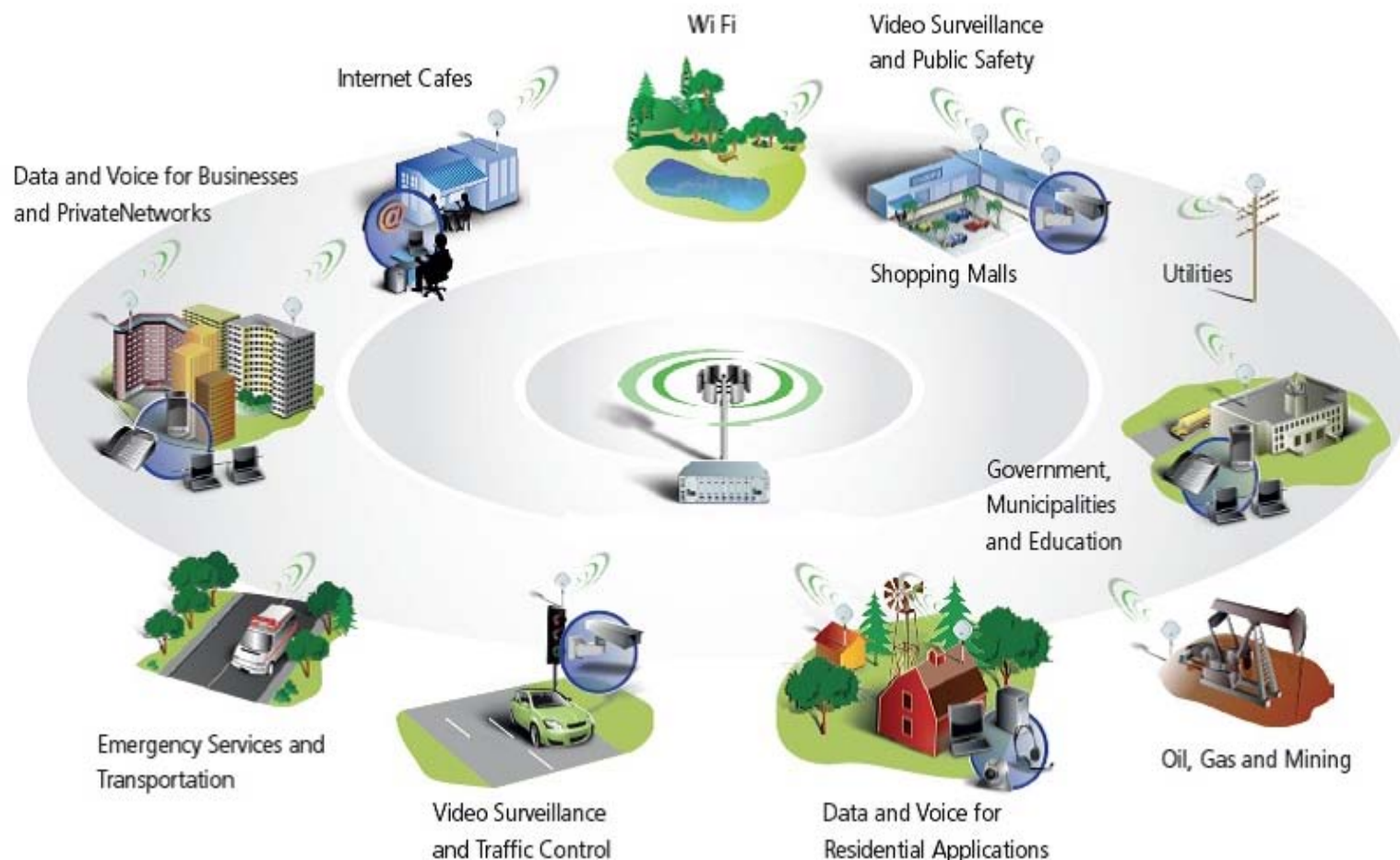


WiFi Is Ubiquitous Access All Industries



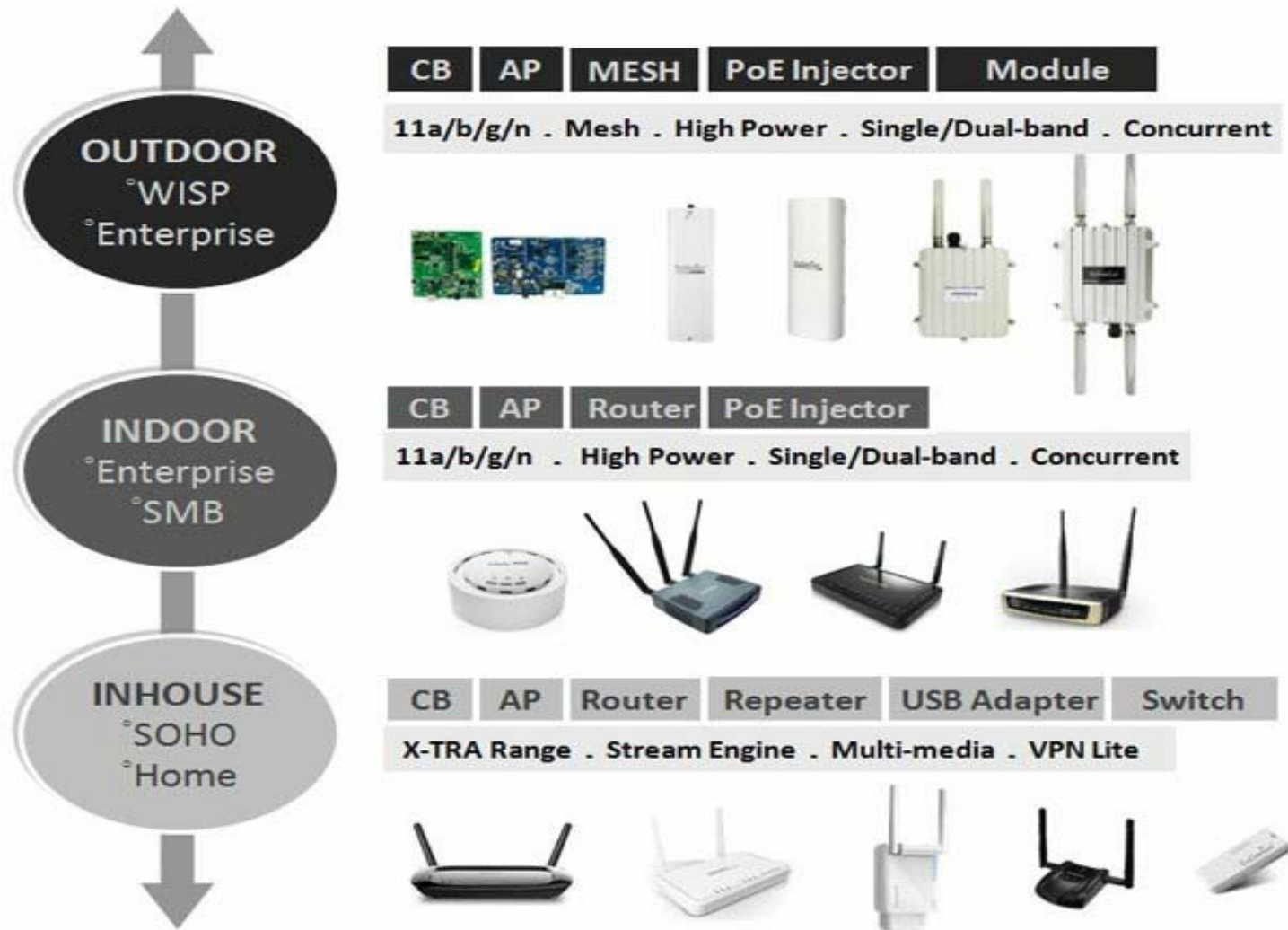
Embedded-WiFi Connects IoT

Point to Multi-Point – Enterprise Outdoor/Indoor Applications



Source: SIPSS-GLOBAL

Product Range



Source: SIPSS-GLOBAL

WiFi in AI ERA

Router

Cable

Fiber

IP Cam

Automotive

Smarthome

Robotics

Gaming

IoT

Wireless Router Network Diagram



Source: www.Conceptdraw.com

Segments Embedding WiFi & Players

Retail Router	• TP-Link, ASUS, Netgear, Belkin, Buffalo...
Enterprise Router	• Cisco, HP/Aruba, HUAWEI
IP Cam	• Hike-Vision, Netgear, Nest
STB/ OTT	• Roku, Technicolor, Xiaomi
Gaming	• Nintendo, SONY, Microsoft
Smart Speaker	• Amazon, Google, Harman, Xiaomi, Alibaba
Smart TV	• Samsung, LG, Xiaomi
Smart Phone	• ASUS, Samsung, LG, TCL, Xiaomi, Meizu
Automotive	• KOR/JPN module companies
AI/ Robotics	• ASUS- Zenbo, Softbank- Pepper, Anki- Cozmo
IoT	• Gemtek, Azureware, WNC, Fujitsu, Panasonic

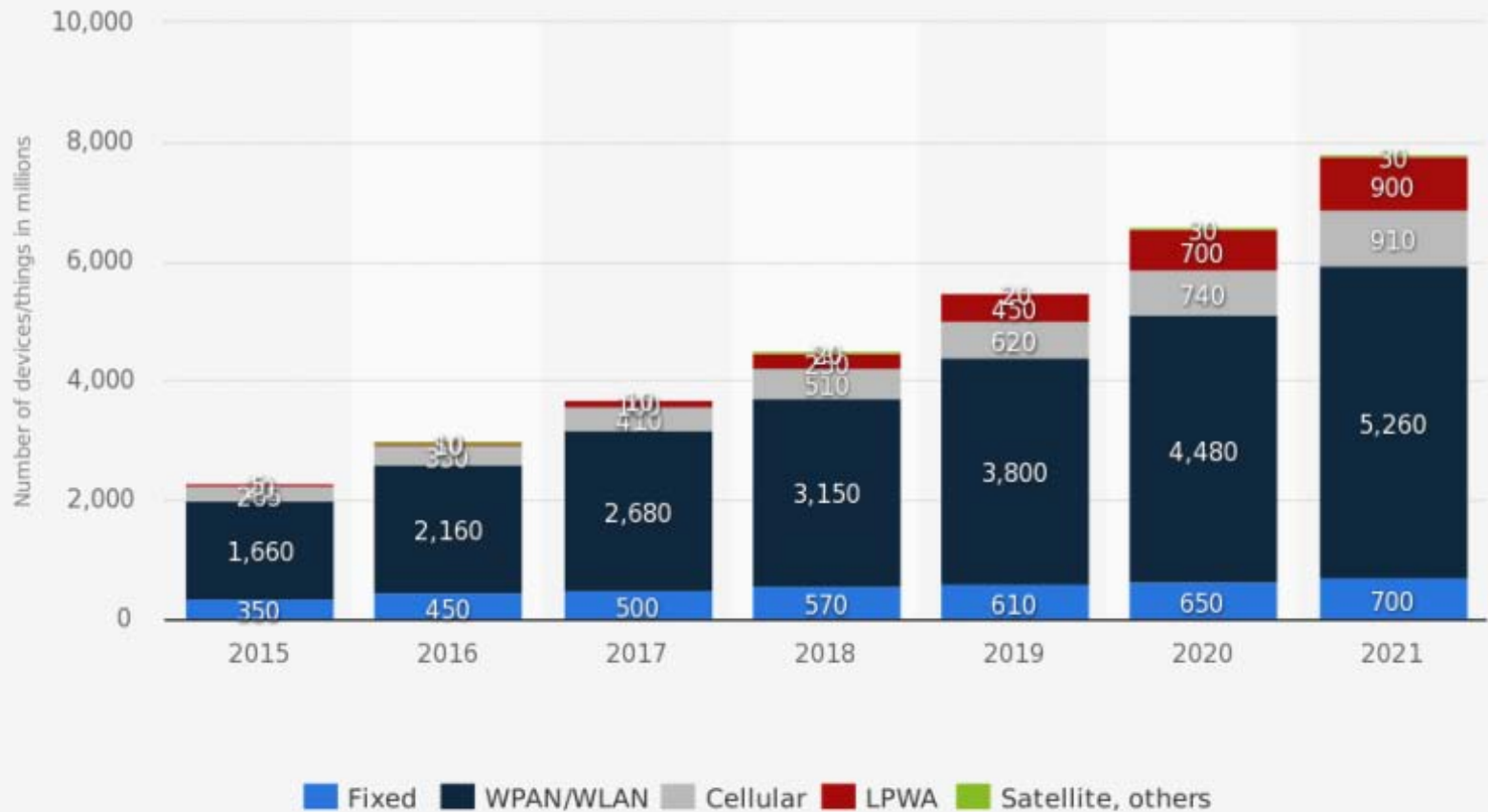


Total Addressable Market for RichWave

Segments	2017 (f)	2020 (f)	Growth (%)	Remarks
AP Router (DSL, Cable, PON)	350	400	14%	M units
STB/OTT	380	460	21%	M units, 2020
Smart Phone	1,517	1,697	11.91%	M units
Smart TV	104	114	9.6%	M units, 2018
Game Consoles	33,800	46,000	36%	US\$M
Smart Speaker	8.3	94	1075%	M units, US, 2016
IoT	20,000	30,000	50%	M units
Smart Home	65	320	392%	M units
Automotive (info..)	1,062	7,914	645%	US\$M, 2016
PC/Laptop/ Tablet	435	433	-0.5%	M units, 2016

Source: IDC, IHS, Accelerating Biz analysis, frost & Sullivan, Ovum, Statista, IDATE, Gartner, Voicebot.ai, Edison Research, Digital Market Outlook, ABI Research

Number of connected devices/things by technology worldwide from 2015 to 2021 (in millions)*

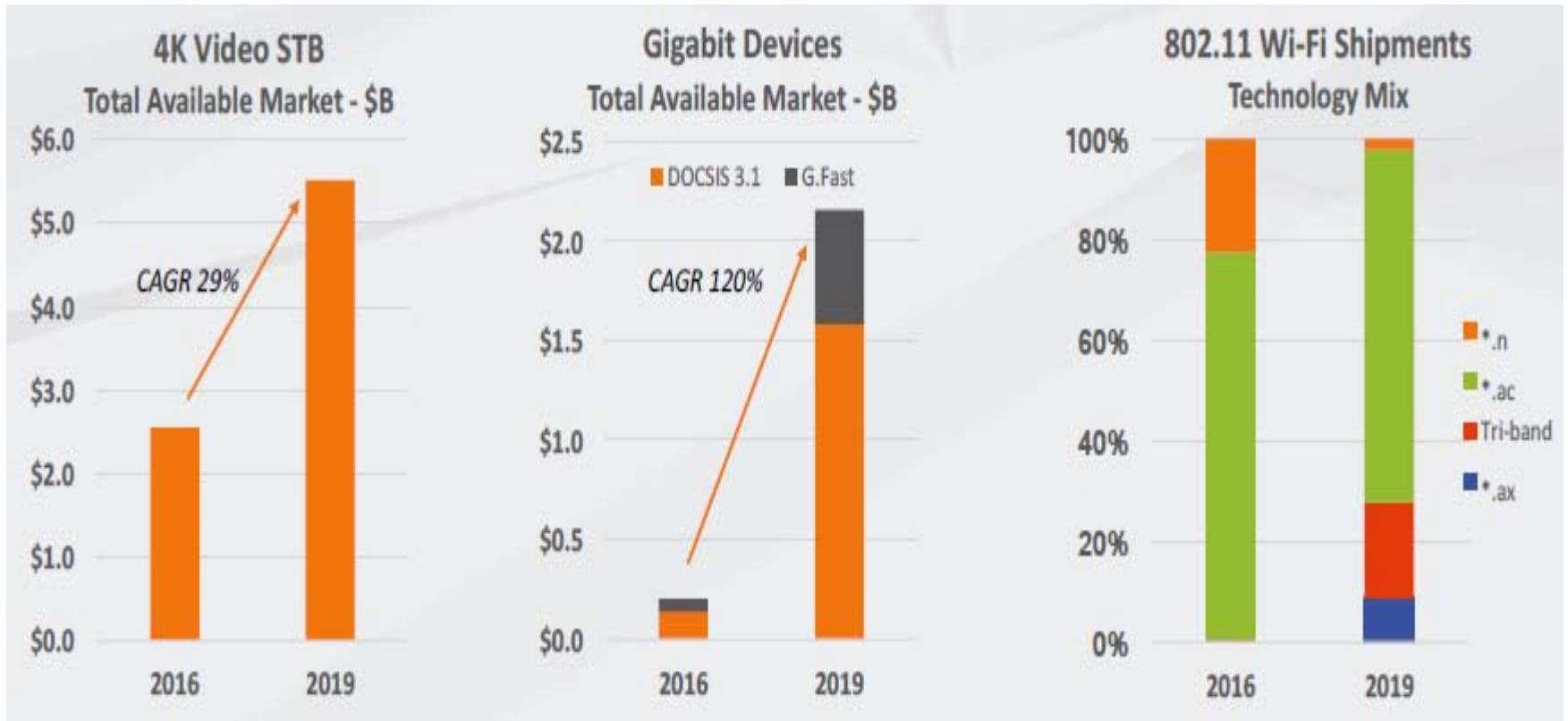


Source
Berg Insight
© Statista 2017

Additional Information:
Worldwide; Berg Insight; 2015 to 2016

statista

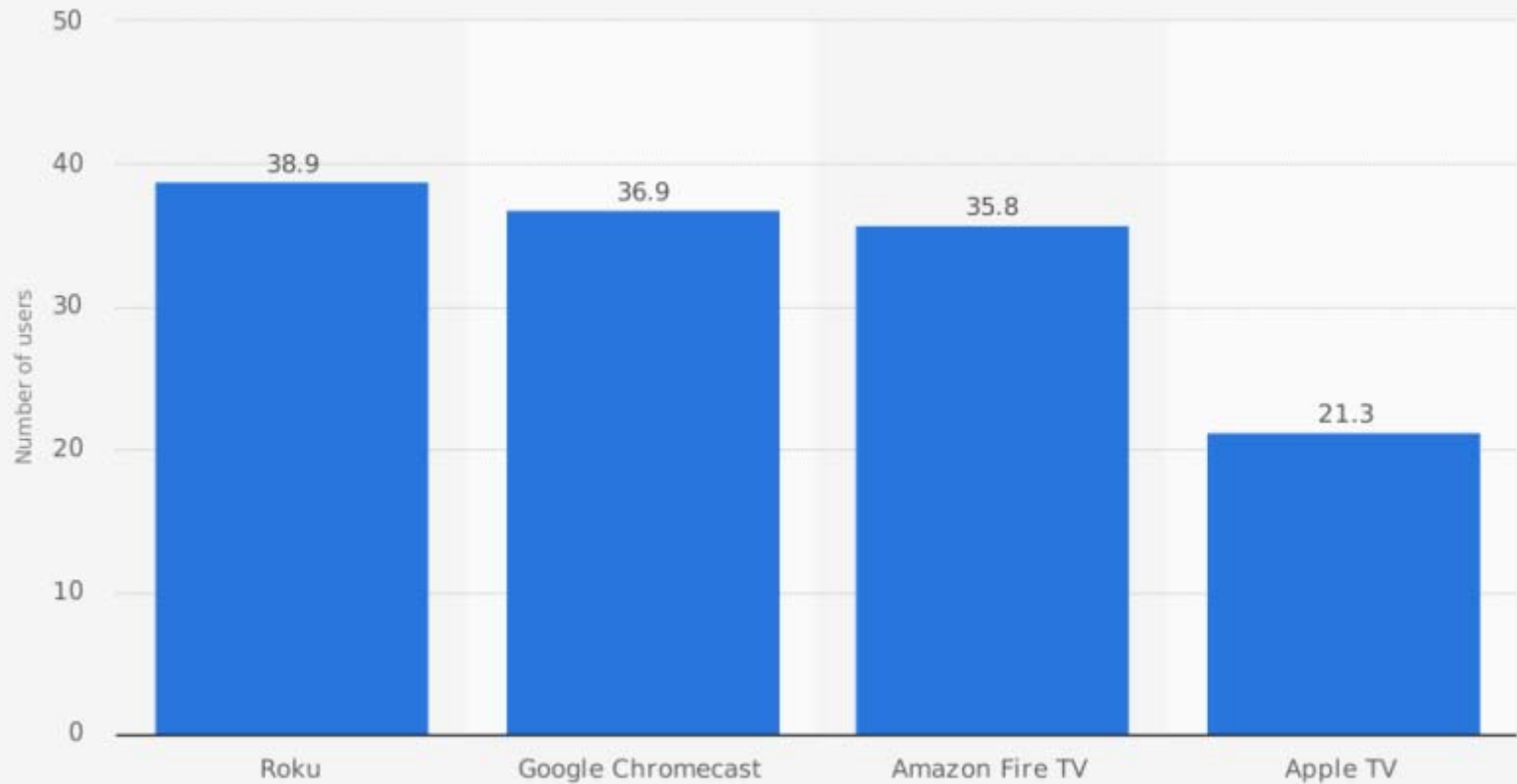
Cable & STB Drives WiFi Adoption



Source: ARRIS Investor Day 2017



Number of connected TV users in the United States as of July 2017, by brand

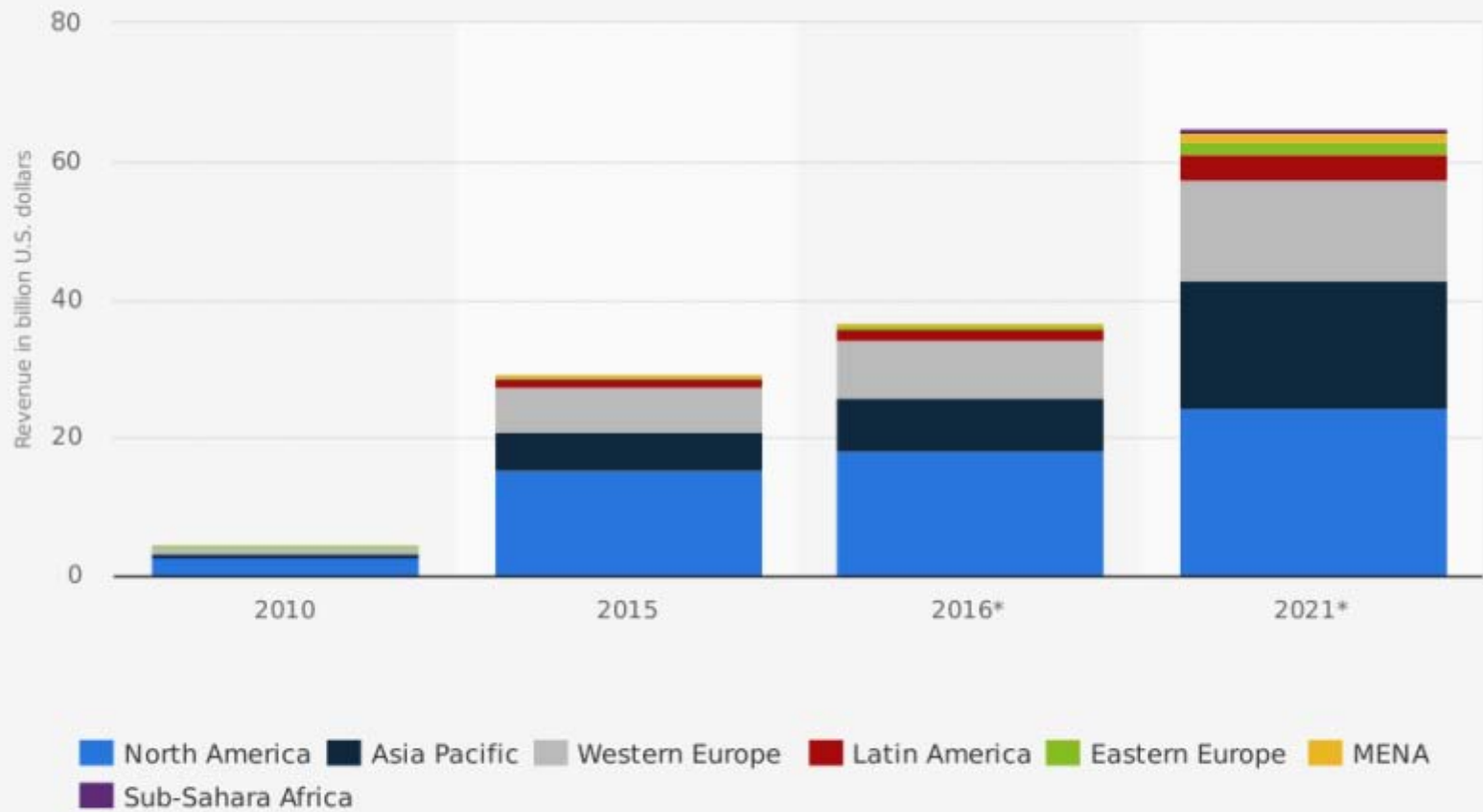


Source
eMarketer
© Statista 2017

Additional Information:
Worldwide; July 2017; based on individuals of any age who use the internet through each device at least once per month

statista

Over-the-top (OTT) TV and video revenue worldwide from 2010 to 2021, by region (in billion U.S. dollars)



Source
Digital TV Research
© Statista 2017

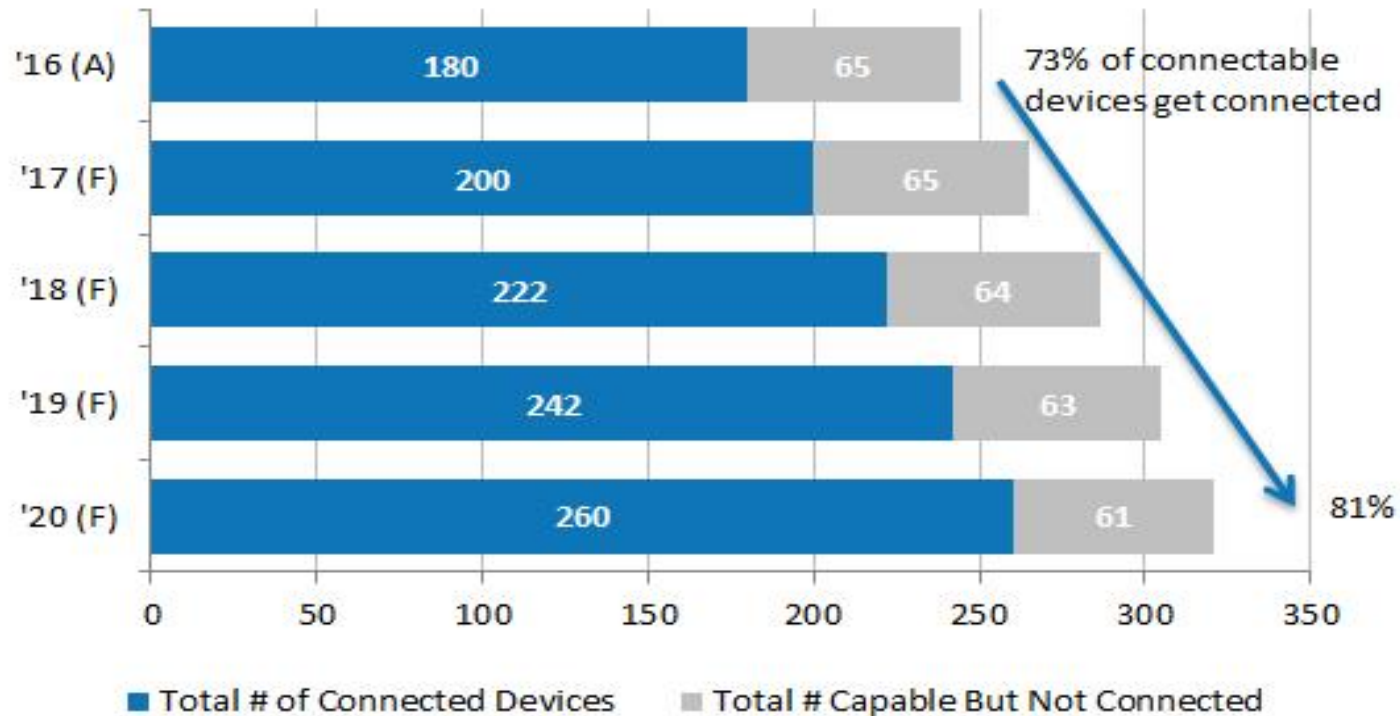
Additional Information:
2010 and 2015

statista

Living-Room WiFi-Connectivity Fast Increase

Internet Connectable Device Forecast

(Connectable TVs, Blu-ray Disc Players, Game Consoles, & Streaming Media Players)

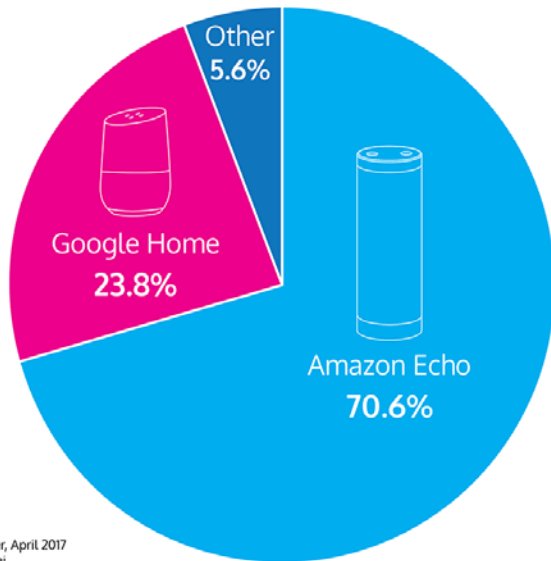


Base: U.S. Internet households

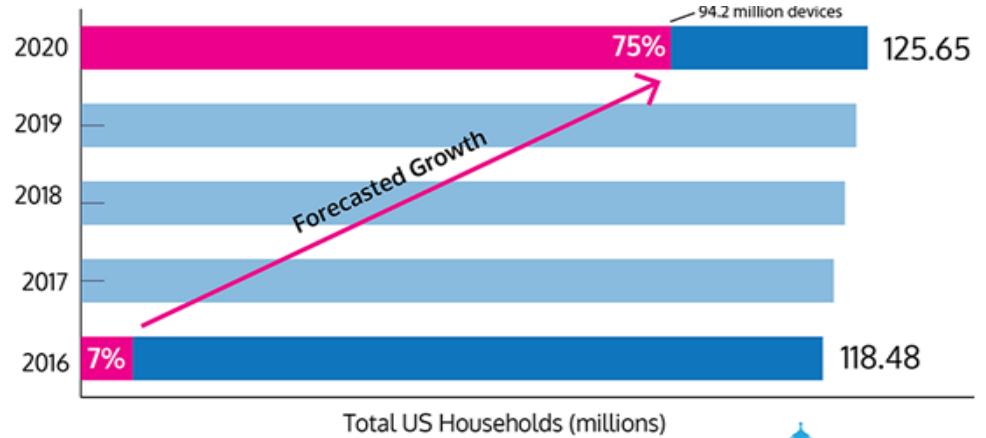
Source: The NPD Group/Connected Intelligence, TV-Connected Device Forecast
Includes a small percent of game consoles that are non-connectable

WiFi-in-Smart Speaker Grows Rapidly

US Voice-Enabled Speaker User Share by Player, 2017



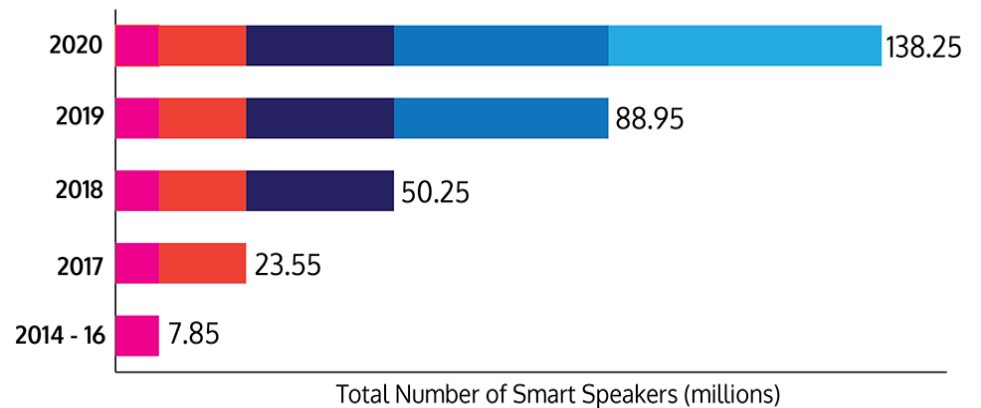
US Household Smart Speaker Ownership 2016-2020



Source: US Census, Gartner, Edison Research, Voicebot.ai



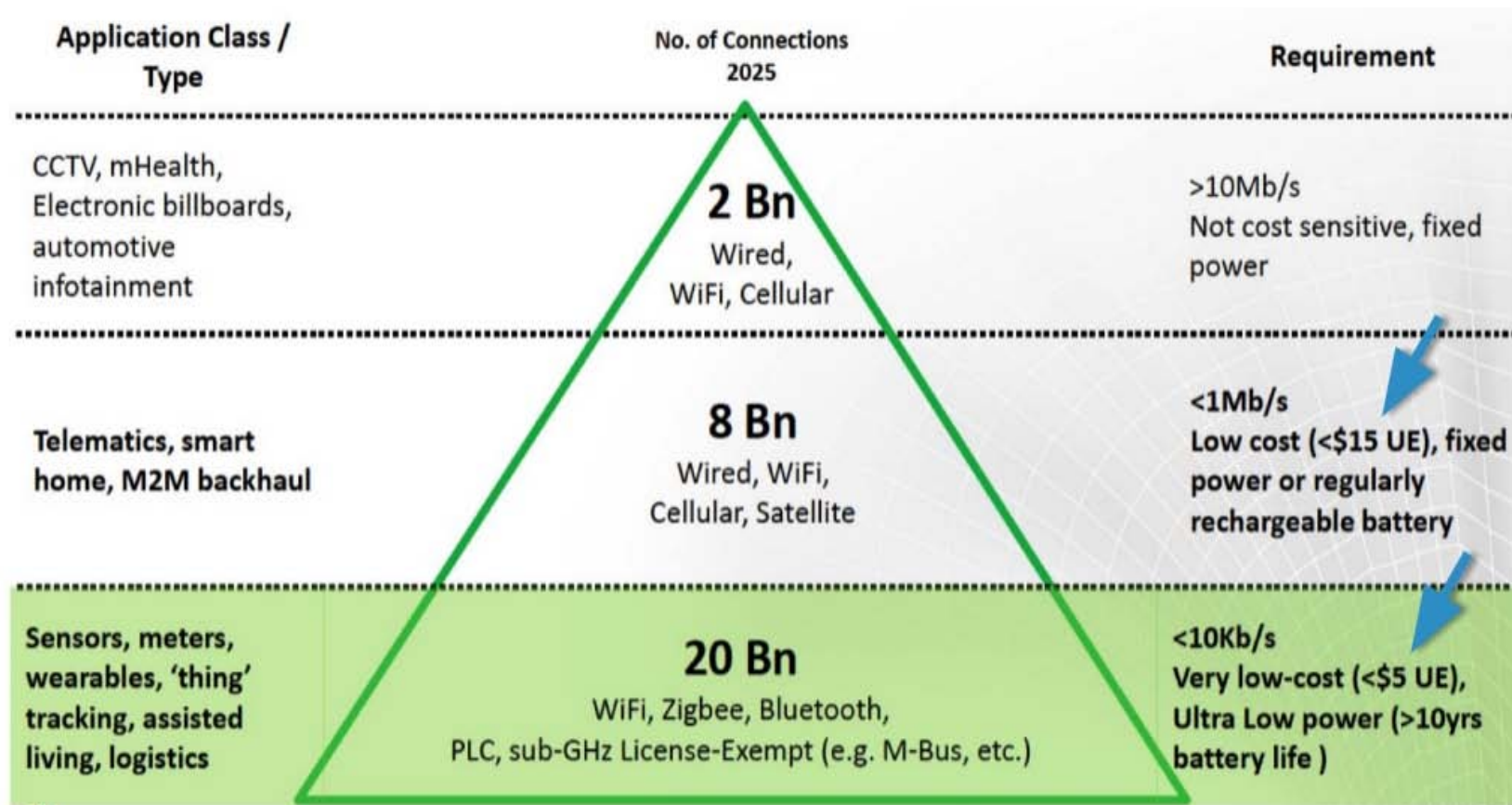
US Smart Speaker Installed Base - 2016 to 2020



Source: CIRP, VoiceLabs, Statista, Edison Research, Voicebot.ai



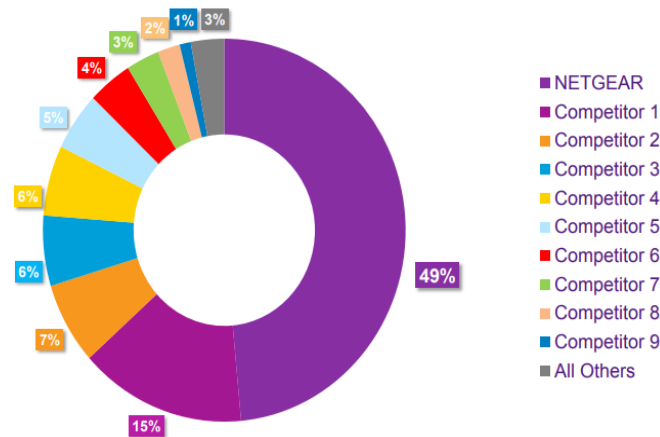
WiFi is Adopted from IOT, Home, M2M to Cloud and Everywhere



Consumer WiFi AP-Routers Widely Adopted, High-end to Low-end in Variety Fields

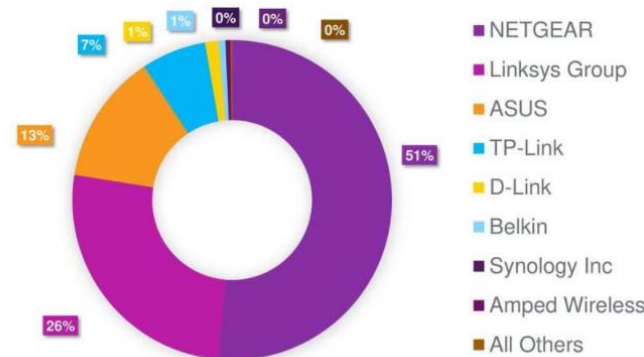
Consumer WiFi Market Share

Wireless Routers, Gateways, and Mesh Systems, US 2Q17

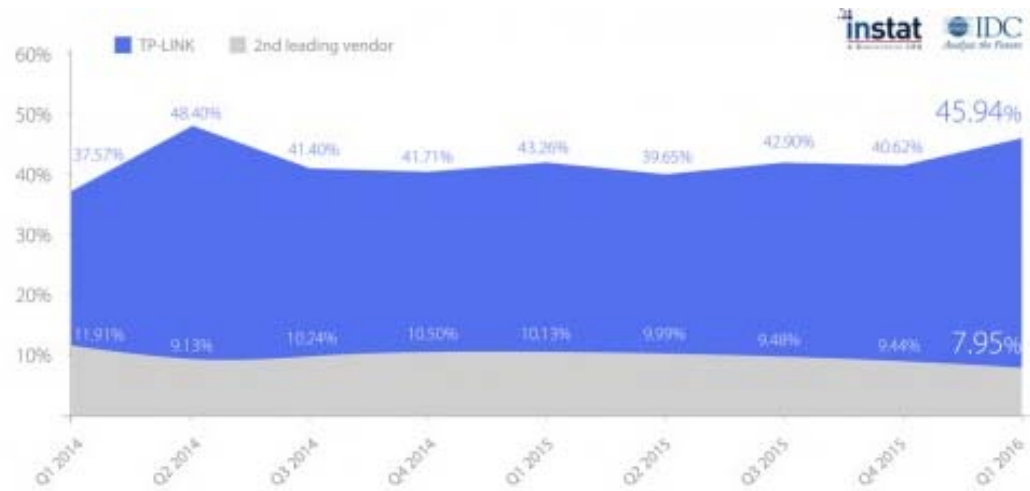


High End WiFi Router Market Share

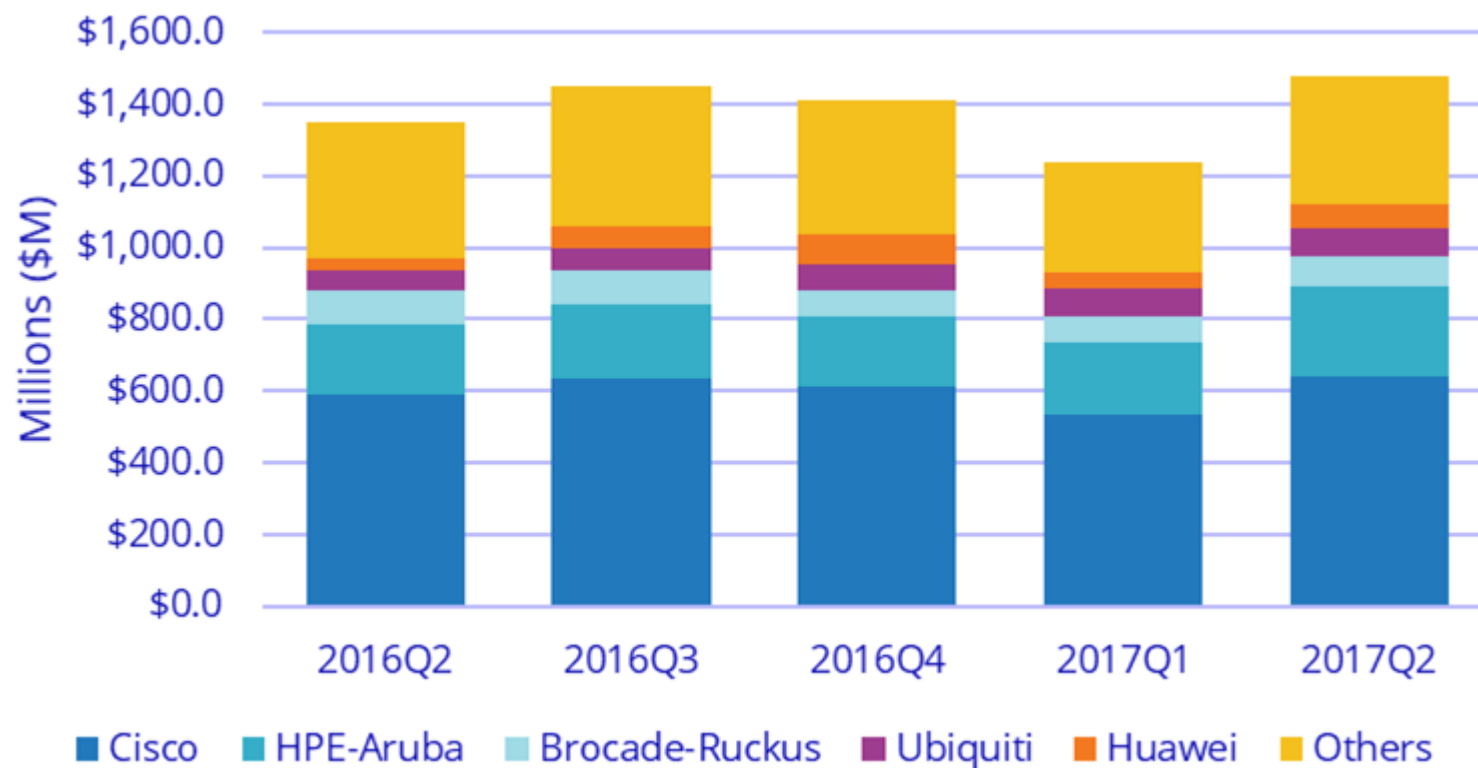
IPD, AC1800-AC5400, US 4Q16



Source: Netgear, 2017/08



Enterprise WiFi AP-Routers are Different



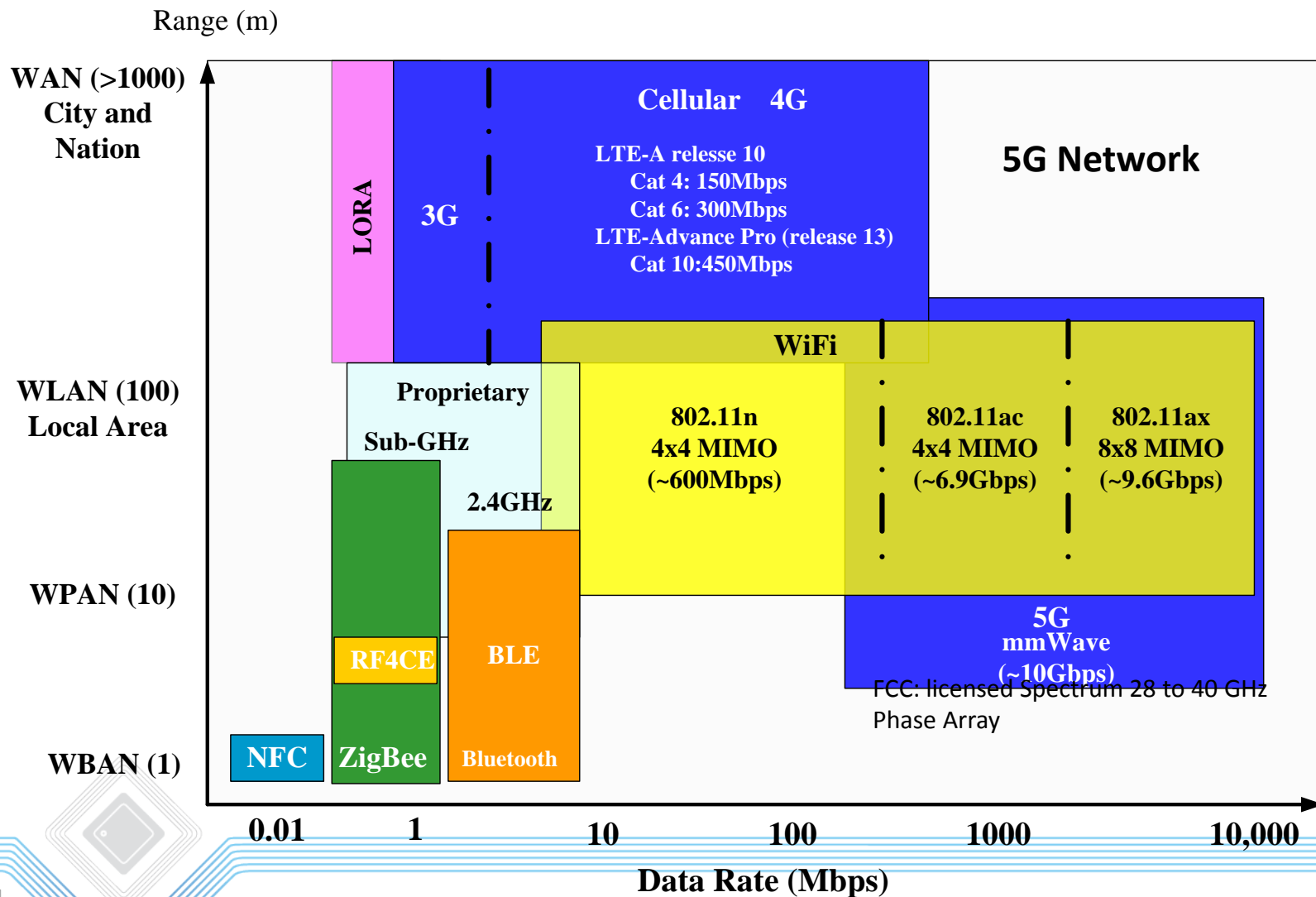
Source: IDC 2017



Wireless RF and Various Systems

Coming Wireless: WiFi, 4G, 5G & IOT

Complement Each Other



Next Generation: 802.11ax Giving Faster Data Rate

802.11ax promises:

- Up to 4X capacity increase
- Higher efficiency
- Improved coverage and performance

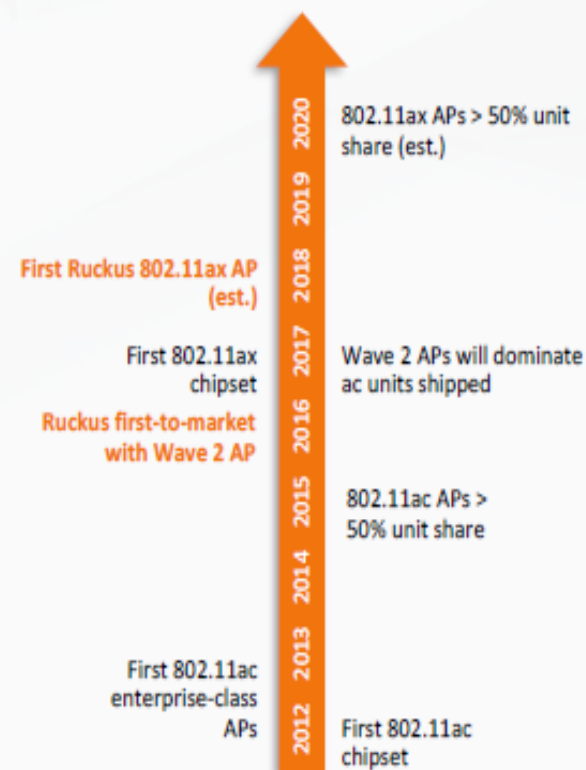
vs. 802.11ac Wave 2

11ax: simultaneously serves lots of devices per AP...



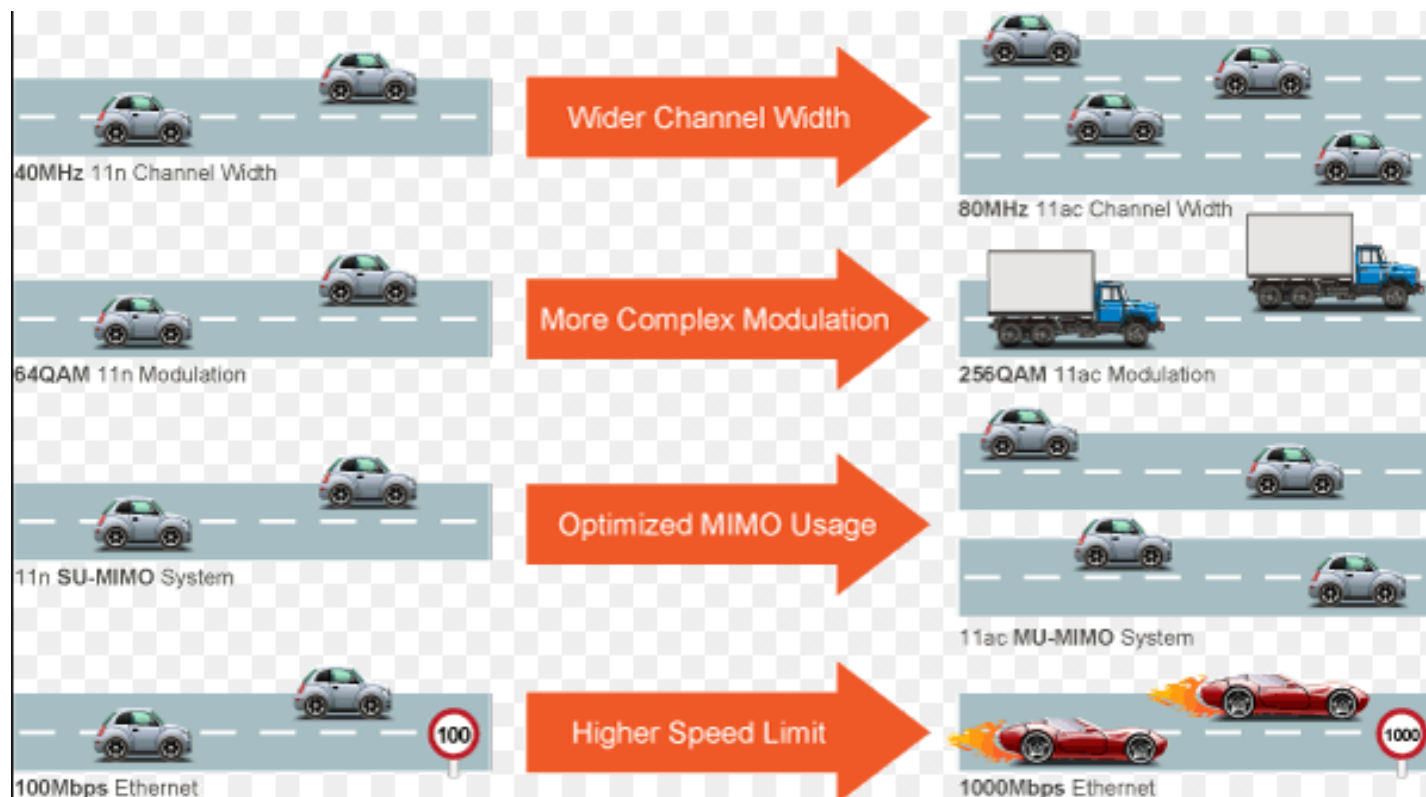
...and delivers optimal performance in dense environments with many APs

Enterprise AP Timeline



Source: ARRIS Investor Day 2017

WiFi Generation Migration: Increasing Bandwidth, Modulation & MIMO

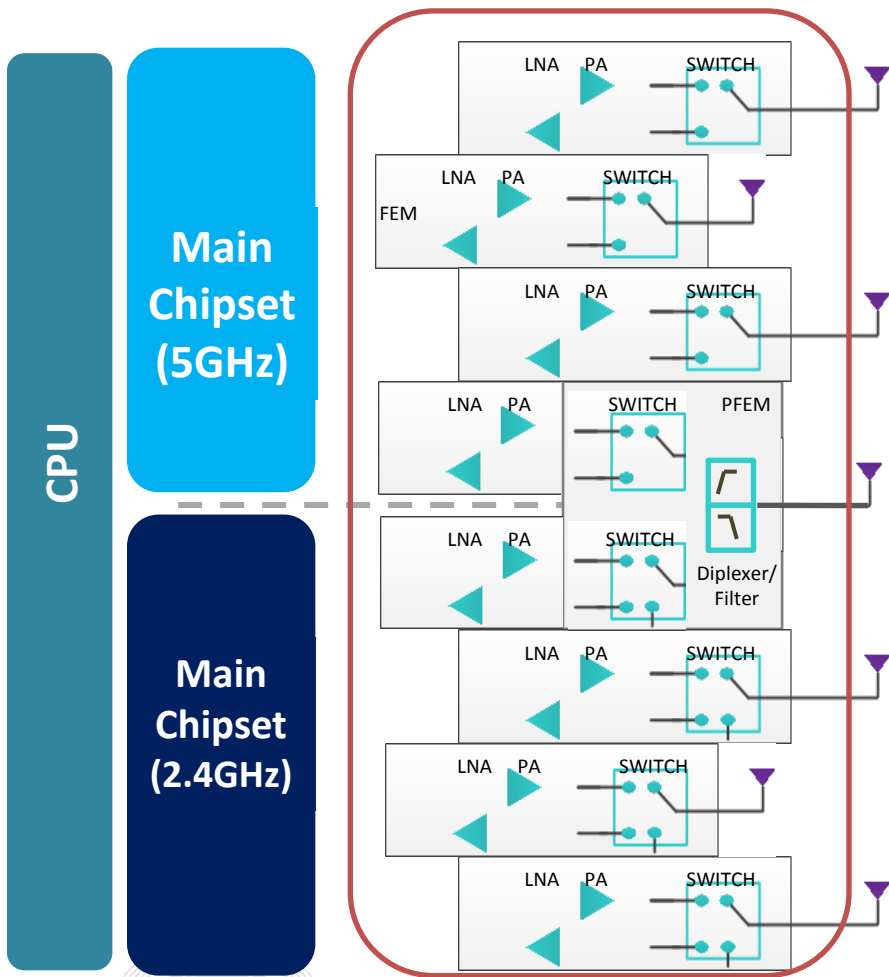


Go faster in wired & wireless

Take Advantage of 11ac to Optimize Data Link Speed

RichWave has Complete WiFi RFFE Solutions

WiFi RFFE is Key for Performance: MU- MIMO Features Increase # RF Front End PA for range, LNA for Sensitivity. RFFE Quantity Proportional to MIMO

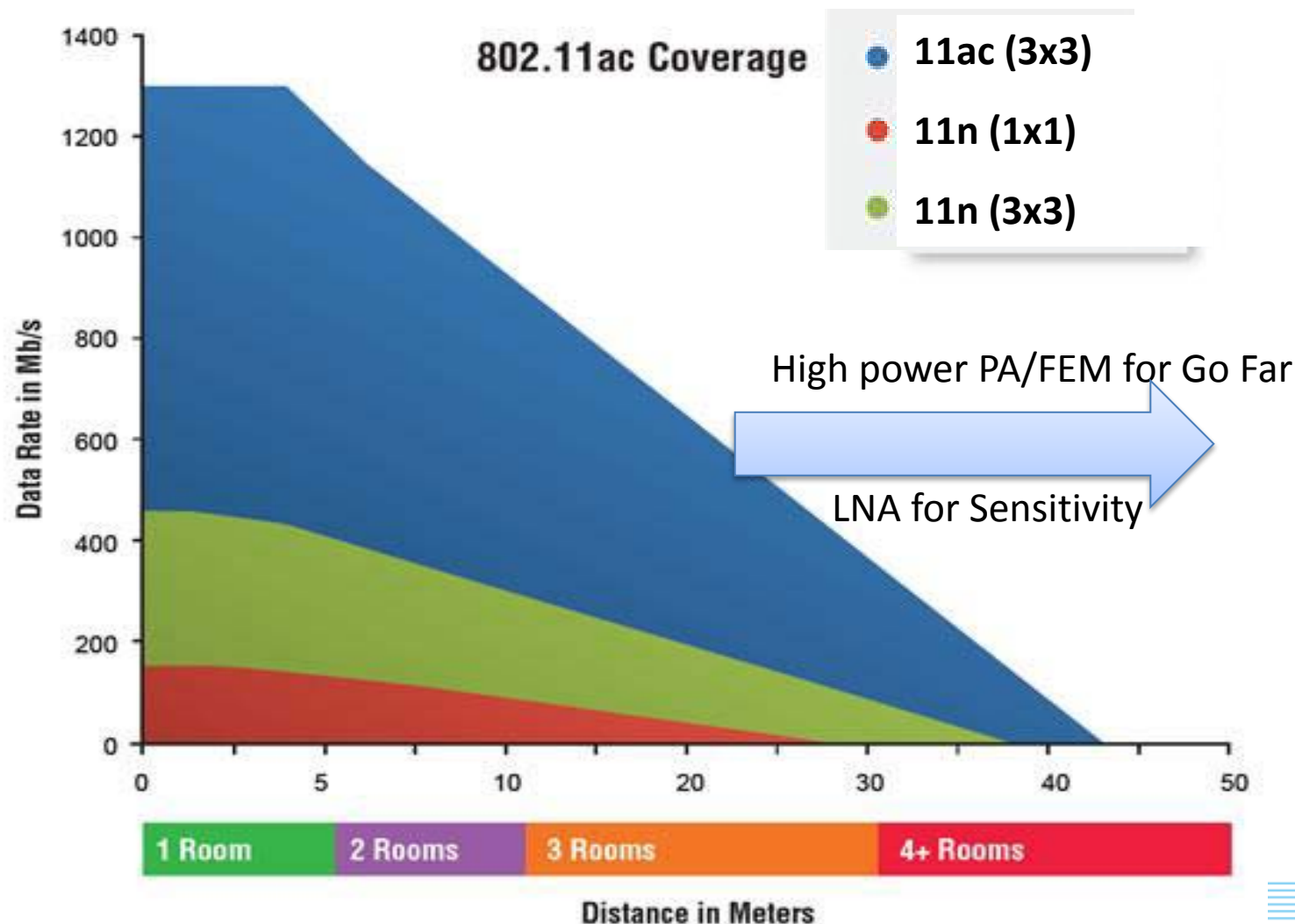


Source: D-Link

Antenna output	5GHz 11ac	5GHz 11n	2GHz 11ac	2GHz 11n
PA/LNA/SW	V	V	V	V
FEM (PA+LNA+SW)	V	V	V	V
FEM(LNA+SW)	V	V	V	V
Enterprise FEM (PA+LNA+SW)	V	V	V	V
Mobility FEM (PA+LNA+SW)	V	V	V	V

WiFi Range Coverage in 11ac & Beyond

- Need High Power FEM/PA & LNA



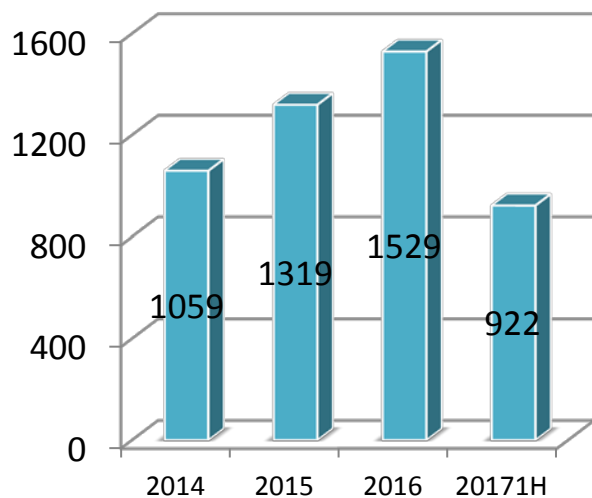


Growth Strategy & Advantages

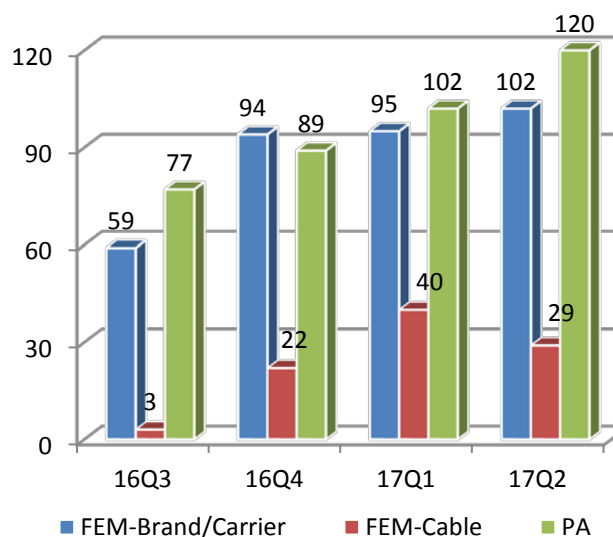
Annually Solid Growth over 30% in WiFi

- 2017Q2 PA QoQ growth 17% with 802.11ac Retail Router, YoY 66%.
- 2017Q2 WiFi Overall QoQ growth 11%, YoY growth 32% .
- Driven by 11ac worldwide share, MIMO 2x2 and 3x3, and increasing Range-coverage.

Unit: NT\$ Million



Unit: NT\$ Million



WiFi FEM for Mobile Will Take Off

- 11ac 2-in-1 FEM and switch already adopted by leading players.
- 11ac 3-in-1 FEM will start to be adopted by leading mobile players and contribute to revenue in 2018.

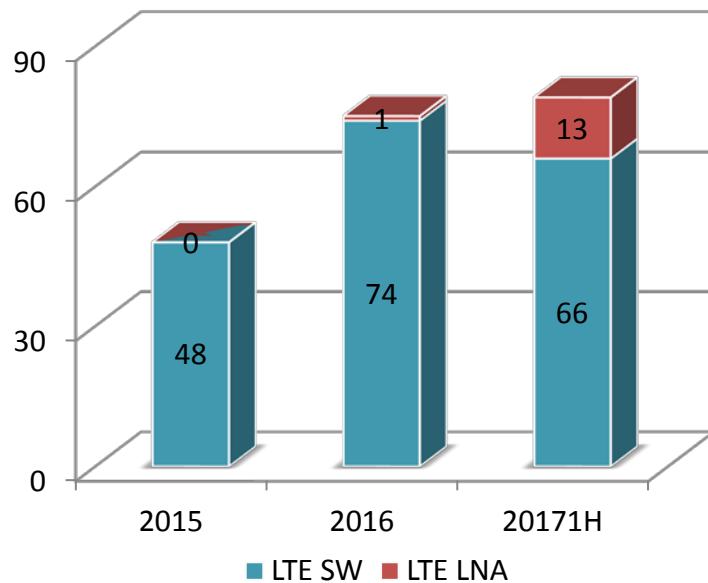
Vendor Rank	Vendor	Units	Unit Share	YoY
1	Samsung	233,900,226	22%	-2%
2	Apple	137,113,763	13%	-13%
3	Huawei	93,949,822	9%	26%
4	OPPO	68,208,679	7%	141%
5	vivo	52,565,708	5%	102%
6	LG Electronics	40,895,805	4%	-8%
7	Xiaomi	36,972,405	4%	-30%
8	ZTE	32,372,138	3%	-12%
9	TCL-Alcatel	22,807,700	2%	-6%
10	Gionee	21,477,873	2%	134%
11	Lenovo	21,082,932	2%	-35%
12	LeEco	16,479,983	2%	794%
13	Motorola	14,783,246	1%	-30%
14	Coolpad	13,620,170	1%	-40%
15	HTC	13,418,833	1%	-6%
	Others	222,451,069	22%	-13%
	Grand Total	1,042,100,352	100%	1%

Source: IDC: Top 15 Smart Phone Vendors in 2016-2017

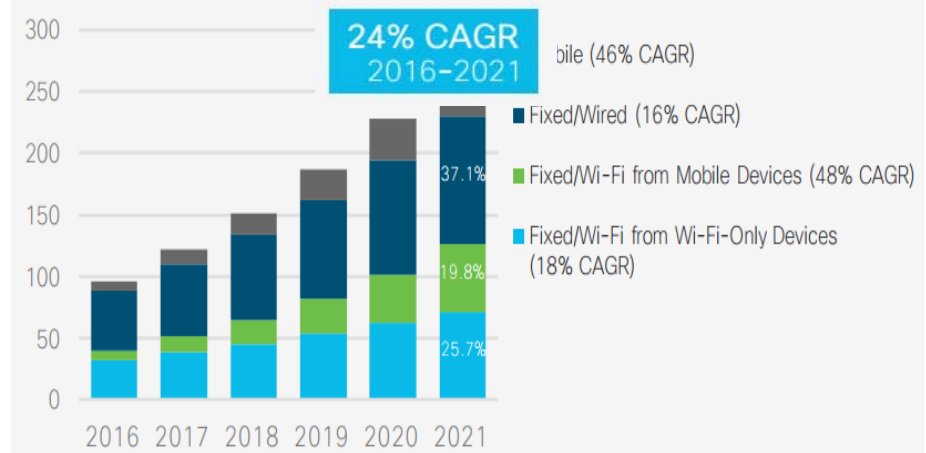
Win 150~200% Growth on Brand Players in LTE

- 2017 1H LTE SW/LNA overall revenue exceed 2016 entire year.
- LTE SW/LNA growth mainly come from China top brand.
- Continue penetrating into global brands in 2017 2H.

Unit: NT\$ Million



Unit: Exabytes per month

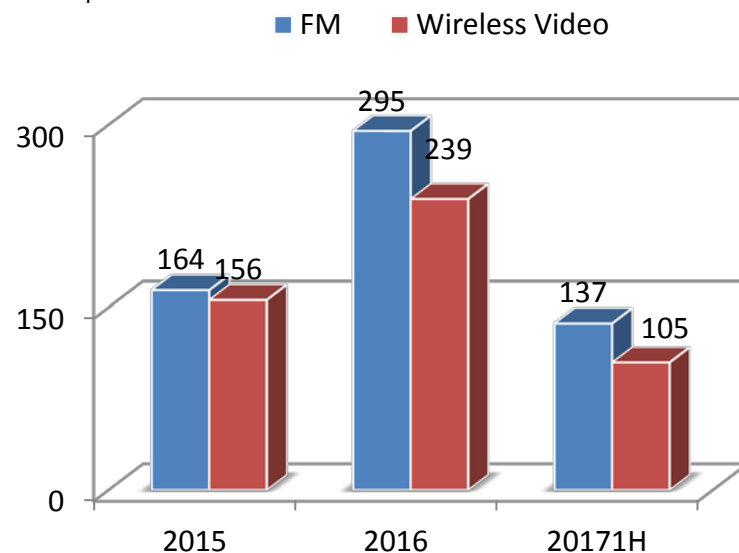


Source: Cisco VNI, 2017

Broadcasting and Wireless Video

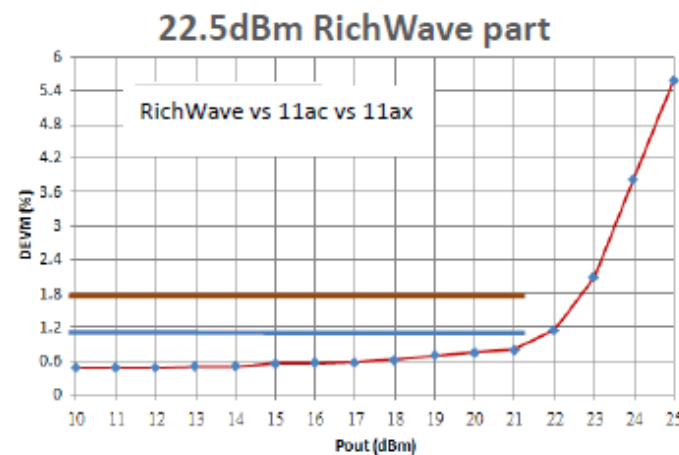
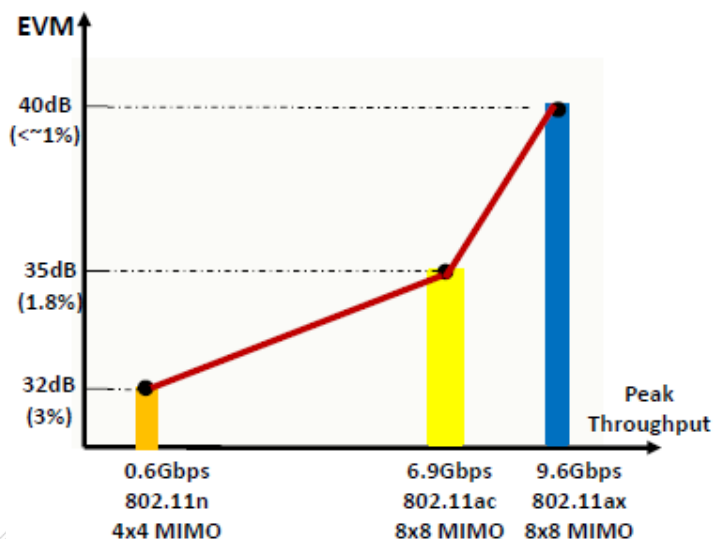
- Keep expanding in broadcast and wireless video.
- FM continue win in Korea flagship phone.
- Wireless long-distance HD video ship to smart home, car backup, drone... with our proprietary transceiver.

Unit: NT\$ Million



Our Coming Years Advantages

	Industry Trend	Our advantage
WiFi	11AC => 11AX+ 1AC MIMO 2x2~4x4 In Router/Cable/STB/PON	Good EVM Tech. Good Noise Tech. Complete FEM/PA+Passive-integration Integrated-Simple Process Tech.
Smarthome	Smart Speaker and Video	Good EVM Tech. Flexible Application Specific FEM

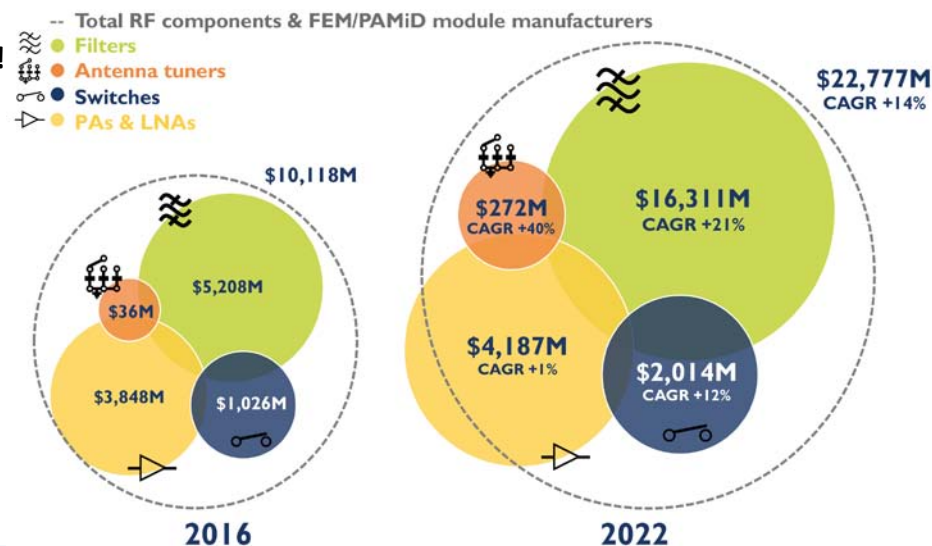


EVM floor and EVM win

Our Coming Years Advantages

	Industry Trend	Our advantage
IOT	Multiple protocol	Complete FEM/SW+Passive-Integration Low Power Technology
LTE	WiFi-Mob => 11AC CA complexity & PAMid blended	Small-form/LP WiFi-Mob FEM technology With complete active-elements & Integration
5G	Antenna/Active/Integrated EM- Lumped-concept obsolete	Antenna technology & Antenna/Active integrations

A MARKET THAT WILL MORE THAN DOUBLE IN SIX YEARS!
RF component and front end module ecosystem:
2016-2022 market outlook



(Source: RF Front End Modules and Components for Cellphones 2017 report, March 2017, Yole Développement)

Our WiFi 802.11ac Win by Performance

Output Power

H



Video Stream



Data Connected



Set-top box



Data Connected



IOT

L

	Parameter	RichWave	Ref.
5GHz FEM	Pout @1.8% EVM	22.5dBm	22.5dBm
	Pout @1.8% EVM	20dBm	19dBm
	Pout @1.8% EVM	16dBm	16dBm
2GHz FEM	Pout @3% EVM	27dBm	26dBm



RichWave