

# KEYSIGHT TECHNOLOGIES

## Investor Presentation

Results as of fiscal year-end 2018 (October 31, 2018)

MAY 2019



# Safe Harbor

This communication contains forward-looking statements as defined in Section 27A of the Securities Act of 1933, as amended, and Section 21E of the Securities Exchange Act of 1934, as amended, and is subject to the safe harbors created therein. Statements preceded by, followed by, or that otherwise include the words “anticipate,” “plan,” “estimate,” “expect,” “intend,” “forecast,” “target,” “project,” “believe,” “outlook,” “prospect” and similar words or expressions, or future or conditional verbs such as “will,” “should,” “would,” “may,” or “could”, or statements regarding the company’s goals, priorities, anticipated revenues, anticipated demand, growth opportunities, customer service and innovation plans, new product introductions, anticipated financial condition, anticipated gross and operating margins, future earnings, the anticipated continued strengths and expected growth of the markets the company sells into, and future operations, earnings, and tax rates are intended to identify forward-looking statements. These forward-looking statements involve risks and uncertainties that could cause Keysight’s actual results to differ materially from management’s expectations contemplated by these forward-looking statements. Keysight disclaims any intention to, and undertakes no responsibility to, update or revise any forward-looking statement, whether as a result of new information, a future event, or otherwise. Such risks and uncertainties include, but are not limited to, changes in the demand for current and new products, technologies, and services; customer purchasing decisions and timing; and our ability to realize the savings or benefits expected from integration and restructuring activities. For additional risks and uncertainties that could impact Keysight’s actual results, please see our latest Form 10-Q filed with the SEC on March 5, 2019, included but not limited to the discussion under “Risk Factors” therein, which may be viewed at [www.sec.gov](http://www.sec.gov).

This presentation includes a number of different financial measures, both GAAP and non-GAAP, in analyzing and assessing the overall performance of the business, for making operating decisions and for forecasting and planning for future periods. Non-GAAP measures exclude primarily the impacts of amortization of acquisition-related balances, share-based compensation, acquisition and integration costs, non-recurring items such as goodwill impairment, legal settlement, gain on divestitures, Northern California wildfire-related costs and others. Also excluded are tax benefits or expenses that are not directly related to ongoing operations and which are either isolated or cannot be expected to occur again with any regularity or predictability. Most of these excluded amounts pertain to events that have not yet occurred and are not currently possible to estimate with a reasonable degree of accuracy. Accordingly, no reconciliation to GAAP amounts has been provided. The definitions of these non-GAAP financial measures may differ from similarly titled measures used by others, and such non-GAAP measures should be considered supplemental to and not a substitute for financial information prepared in accordance with GAAP. Keysight generally uses non-GAAP financial measures to facilitate management’s comparisons to historic operating results, to competitors’ operating results and to guidance provided to investors. In addition, Keysight believes that the use of these non-GAAP financial measures provides greater transparency to investors of information used by management in its financial and operational decision-making. Refer to slide 23 for more details on the use of non-GAAP financial measures.

# Videos - 2018 Investor Day Presentations

YouTube – One-Click Access Below

Topic	Presenter	Duration (min)
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# Keysight's Compelling Investor Value Proposition

## MARKET LEADERSHIP

Market-leading position in diverse and growing end markets



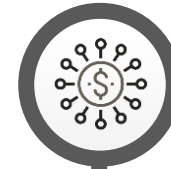
## GAINING MARKET SHARE

Four consecutive years of market share gains since separation from parent in 2014<sup>1</sup>



## INCREASING RECURRING REVENUE

Growing software and services solutions portfolio



## RAISED THE BAR

Increased target operating margin 400bps to 21-22% revenue and increased FCF conversion expectations



## TECHNOLOGY LEADERSHIP

Recognized technology leader with broadest portfolio of software, hardware and services solutions; ~50% of non-services revenue from products released within the last 5 years



## BROAD CUSTOMER DIVERSITY

>32,000 end customers annually with no single customer accounting for more than 3% of revenue<sup>2</sup>



## OPERATIONAL EXCELLENCE

Profit expansion through culture of continuous improvement, proven track record of acquisition cost synergy capture, highly leverageable operating model and operational expertise

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# Company Overview and Strategic Direction

**Ron Nersesian**

President and Chief Executive Officer

# Key Messages

1

Industry leader with 80 years' experience at the forefront of the communication revolution

2

Deeply knowledgeable, experienced and enhanced leadership team, which has significantly transformed Company for success

3

Aligned to critical industry growth themes and attractive end markets; increasing growth through recent share gains and market expansion

4

Accelerated R&D investment to innovate ahead of emerging technologies; enabling our customers to win through end-to-end design, test and optimization solutions

5

Executed three-year strategy ahead of plan; balanced capital allocation to drive shareholder value

6

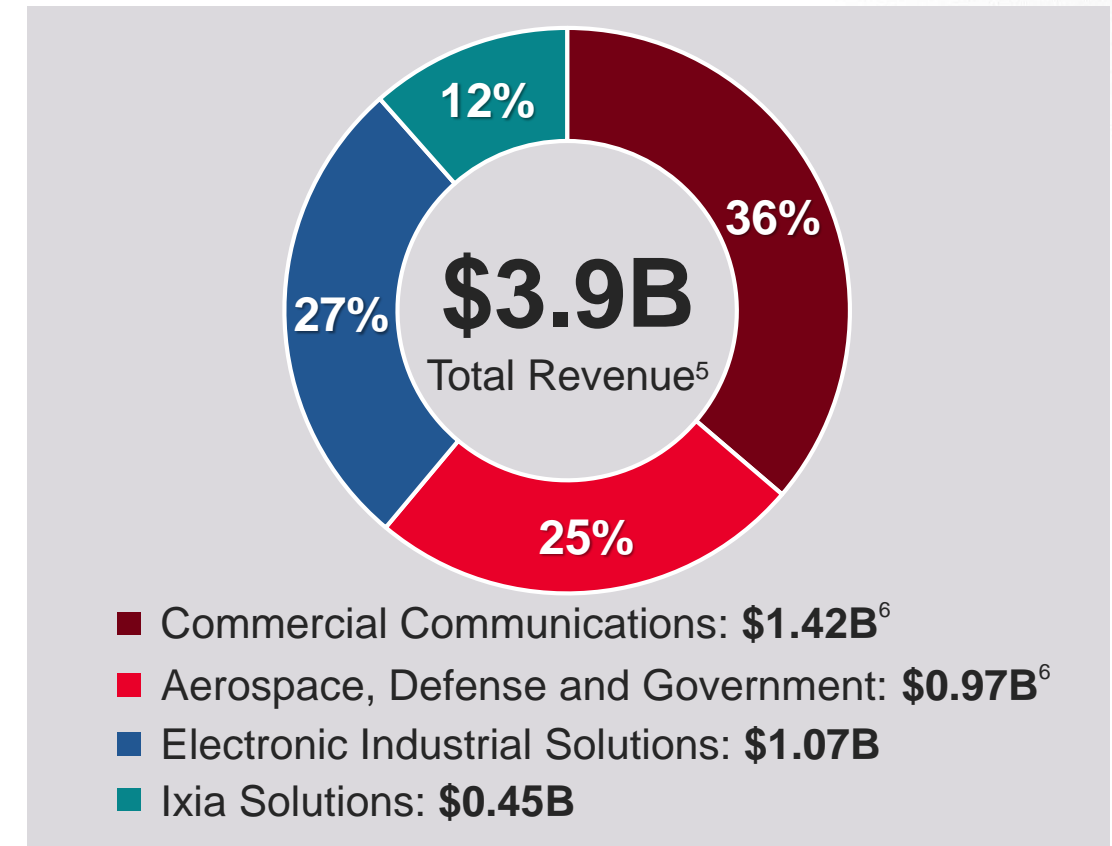
Well-positioned to achieve higher growth, operating margins and free cash flow...*an exciting time at Keysight*

# Keysight Technologies at a Glance

## FY'18 KEY STATISTICS

<b>Headquarters</b>	<b>Santa Rosa, CA</b>
<b>Spin-off Date<sup>1</sup></b>	<b>November 1, 2014</b>
<b>Market Capitalization</b>	<b>~\$10.7B (as of 10/31/18)</b>
<b>Revenue Growth<sup>2,4</sup></b>	<b>20% (13% core)</b>
<b>Free Cash Flow<sup>3</sup></b>	<b>\$423M</b>
<b>Operating Margin<sup>4</sup></b>	<b>18.8%</b>
<b>Total Customers<sup>5</sup></b>	<b>&gt;32,000</b>
<b>Countries Served</b>	<b>100+</b>

## FY'18 REVENUE MIX



<sup>1</sup> Spin-off from Agilent <sup>2</sup> Core revenue growth excludes the impact of acquisitions, divestitures and currency <sup>3</sup> Free cash flow is operating cash less capital expenditure <sup>4</sup> Non-GAAP measure, refer to reconciliation in Appendix. Operating Margin restated to reflect the Q1'19 adoption of ASU 2017-07, "Improving the Presentation of Net Periodic Pension Cost and Net Periodic Postretirement Benefit Cost" <sup>5</sup> Includes indirect sales channels; no customer >3% of total revenue <sup>6</sup> Communication Solutions: \$2.39B

# We Are at the Heart of the Digital Revolution



## SMART TECHNOLOGY CONNECTS THE WORLD

INNOVATION IS EVERYWHERE

- ✓ **Devices** ✓ **Infrastructure**
- ✓ **Cities** ✓ **Defense**
- ✓ **Vehicles** ✓ **Wearables**

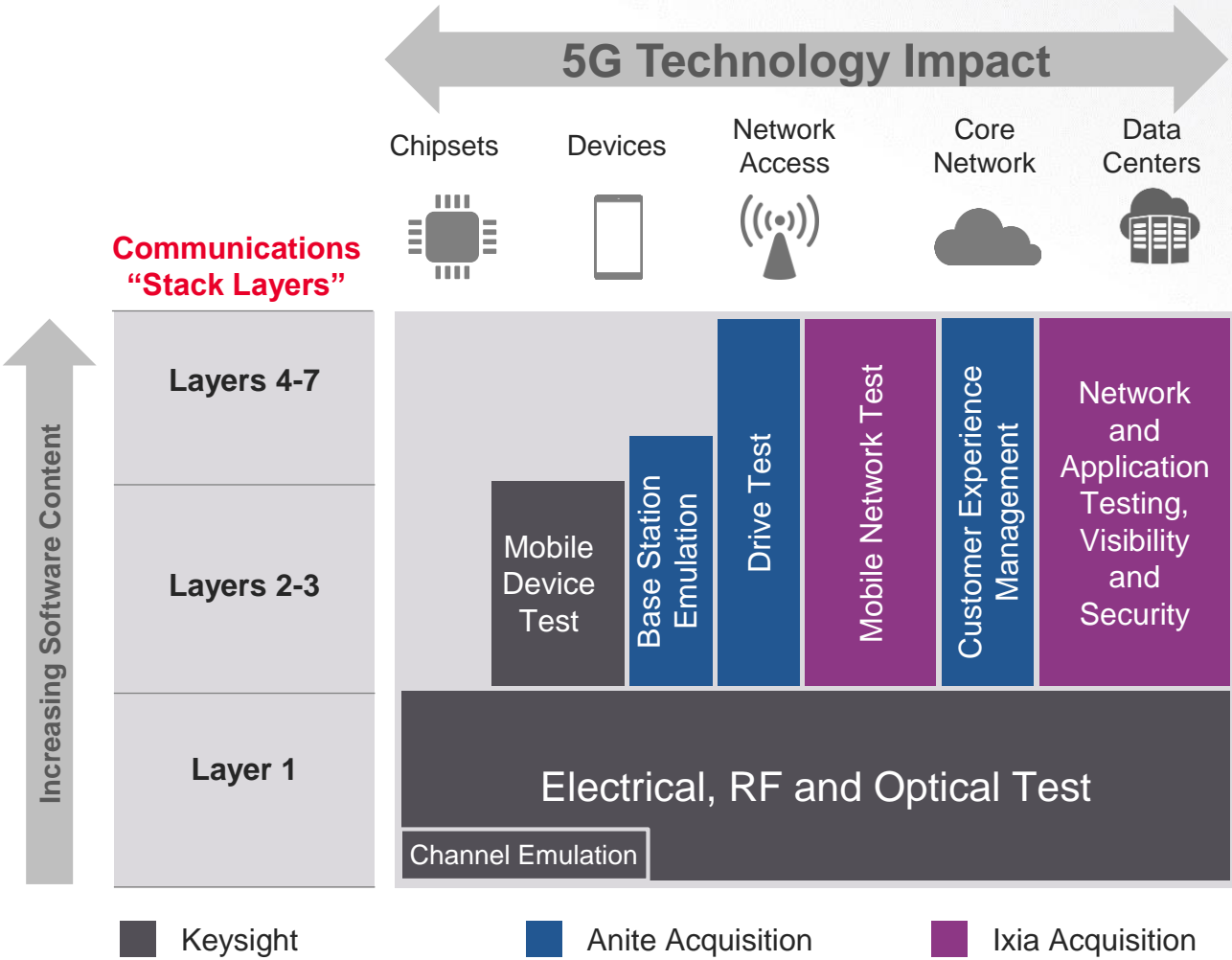
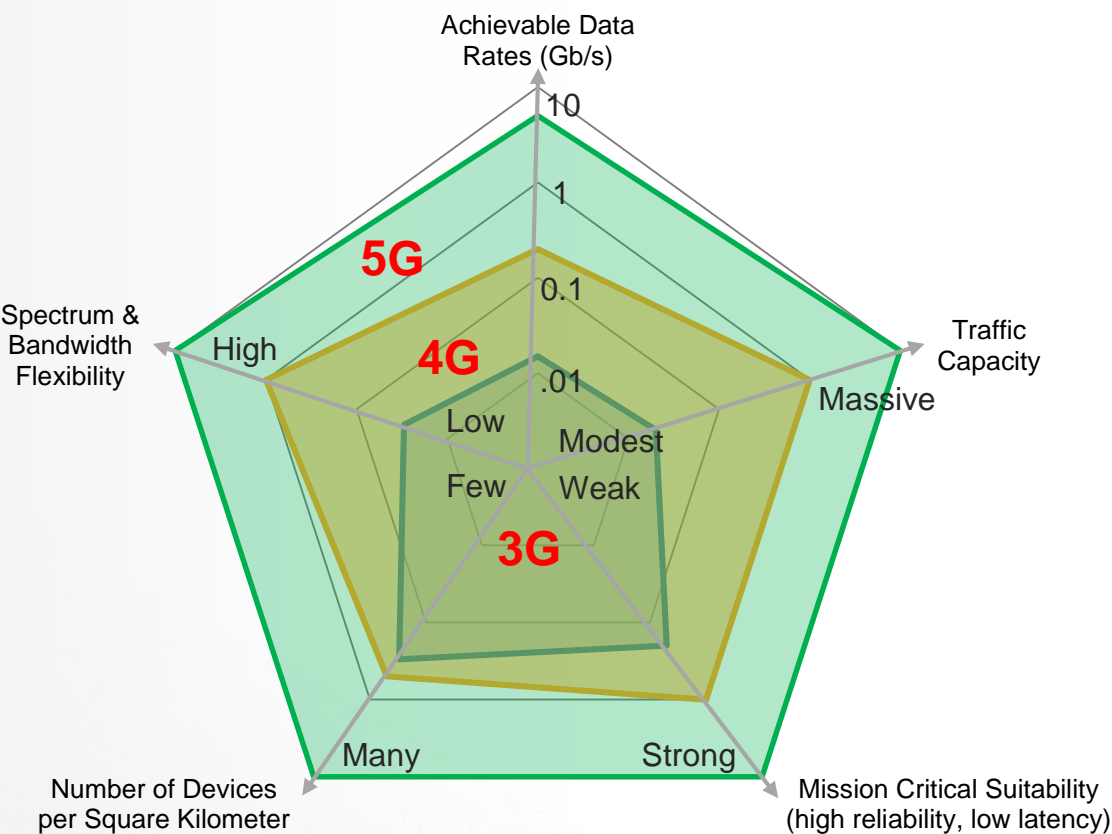
**Transforming from  
Hardware-centric Product to  
Software-centric Solutions  
Company**

**ACCELERATING INNOVATION TO CONNECT AND SECURE THE WORLD**

RELENTLESS DEMAND FOR DATA BANDWIDTH DRIVES 5G, TRANSFORMING WIRELESS AND WIRED NETWORK

# Network Transformation Requires New Solutions End-to-End

5G Brings >10X Expansion on Most Attributes\*



KEYSIGHT IS UNIQUELY POSITIONED, WITH SOLUTIONS ACROSS THE NETWORK AND UP & DOWN THE STACK

# Segment Overview: World-Class Electronic Measurement Capabilities Making the World More Productive and Secure

OVERVIEW

## Communications Solutions (CSG)

Serves customers spanning worldwide communications end market

- Wireless Communications
- Internet Infrastructure
- Aerospace, Defense and Government



**Commercial Companies and  
Government  
Agencies Worldwide**

## Electronic Industrial Solutions (EISG)

Serves electronic industrial end markets, focusing on high growth applications

- Automotive and Energy
- Semiconductor Design and Mfg.
- Consumer Electronics
- Education
- Medical Electronics



**OEMs and suppliers of  
Electronic Industrial Products  
and Services**

## Ixia Solutions (ISG)

Helps customers worldwide validate performance and the security of their networks and associated applications

- Network Test
- Network Visibility



**NEMs, Enterprise, Operators and  
Government Organizations**

CUSTOMERS

# Keysight Leadership



**Chief Executive Officer**  
Ron Nersesian

Corporate  
Planning and  
Technology



Jay  
Alexander

Communications  
Solutions  
Group



Satish  
Dhanasekaran

Ixia  
Solutions  
Group



Mark  
Pierpoint

Electronic  
Industrial  
Solutions  
Group



Gooi  
Soon Chai

Keysight  
Global  
Services



John  
Page

Keysight  
Global  
Sales



Mark  
Wallace



**Finance**  
Neil Dougherty



**Legal**  
(Acting) Jeffrey Li



**Chief Administrative  
Officer**  
Ingrid Estrada



**Keysight  
Global Marketing**  
Marie Hattar



**Order Fulfillment  
& IT**  
Gooi Soon Chai

# Keysight Has Transformed for Long-Term Growth

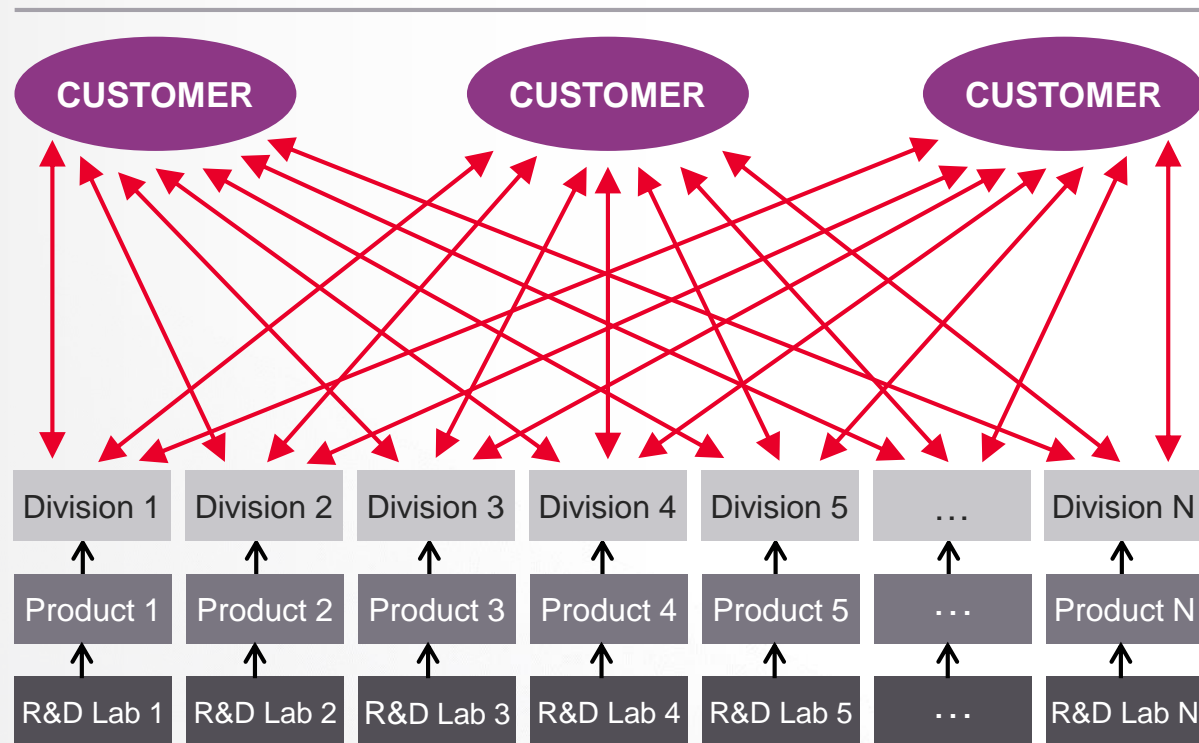
- **Transformed organization from product-focused to industry-focused**  
Create differentiated solutions combining Hardware, Software and Services; enable customer success through new Go-to-Market and R&D strategies
- **Increased investment in R&D process**  
Began investing earlier in the cycle to be first-to-market with leading R&D solutions
- **Dramatically increased emphasis on customer**  
Increased focus on Voice of Customer to accelerate innovation
- **Strengthened portfolio; diversified and expanded SAM through strategic M&A**  
Focused on faster-growing markets and higher-margin software
- **Invested in our talent**  
Built out senior leadership team with key hires; focused on reinvigorating culture, speed to opportunity and enhancing skillsets (e.g., software, services)

# New Go-To-Market Strategy for Customer Success

## FROM

- Individual Products with hardware bias
- Slower, complex decision-making due to multiple owners interfacing with customers
- Incentivized and compensated on “parts” of a solution

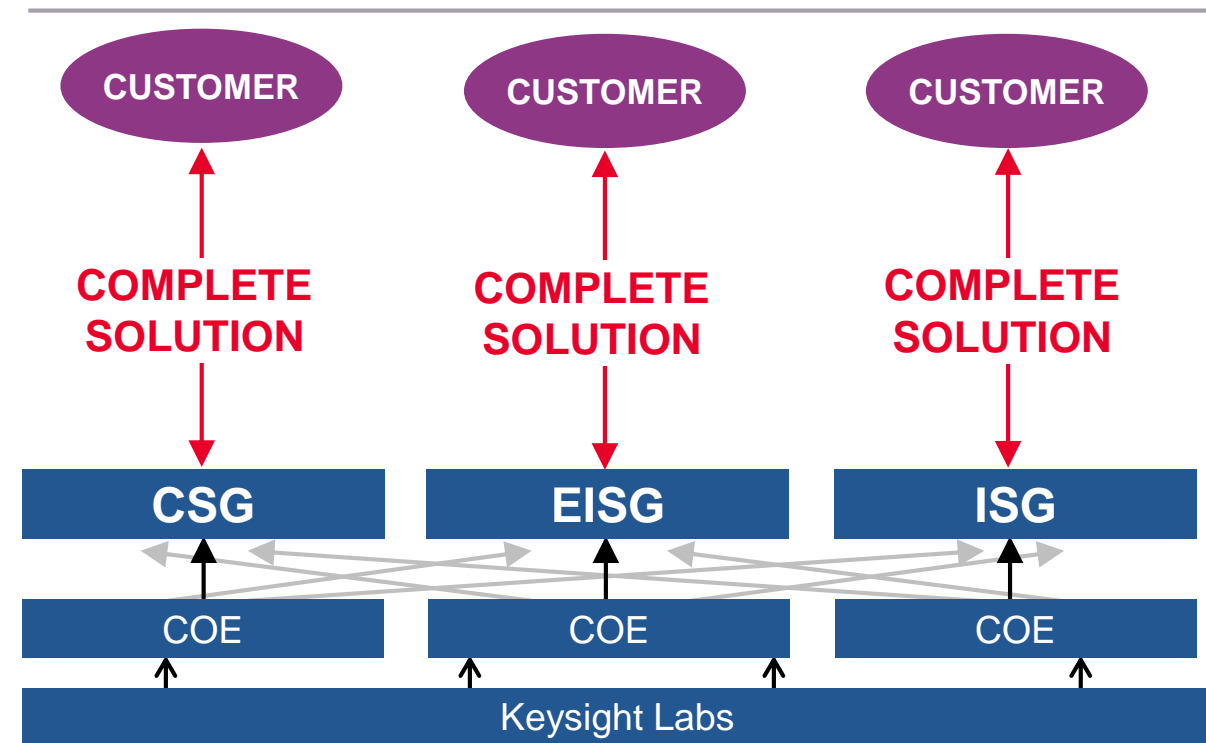
## OLD



## TO

- Complete Solutions: Hardware + Software + Services
- Faster customer commitments and solution development; one decision owner
- Incentivized and compensated on total customer solutions by industry organization

## NEW



# Growth Initiatives – Significant Progress Since 2015

Be First in 5G Wireless	Enter New Verticals (e.g., Automotive)	Expand Leadership in Design and Test SW	Grow Services
<ul style="list-style-type: none"> <li>• First-to-market with 5G design solutions</li> <li>• Winning in the market with triple-digit 5G order growth in FY'18</li> <li>• Collaborating with top industry leaders and customers</li> </ul>	<ul style="list-style-type: none"> <li>• 70+ auto and IoT solutions introduced</li> <li>• Strong double-digit auto order growth in FY'18</li> <li>• Opened automotive solutions centers in strategic locations around the globe</li> </ul>	<ul style="list-style-type: none"> <li>• &gt;\$500M software portfolio in FY18</li> <li>• 13% core SW order CAGR since 2015</li> <li>• Ixia and Anite materially expanded software revenues and engineering capabilities</li> <li>• Won Frost &amp; Sullivan award 2018</li> </ul>	<ul style="list-style-type: none"> <li>• Focused on multi-brand calibration, Test Asset Optimization services and refurbished equipment</li> <li>• Integrated Services into CSG and EISG; logical next step in Keysight's customer solutions oriented go-to-market strategy</li> </ul>
Well-positioned to capitalize on early lead	“Early innings” for a large market opportunity	Launched PathWave; our new integrated simulation, design, test and analysis platform	Launched KeysightCare; Industry's first cloud-based customer experience with dedicated, proactive support


**ACHIEVED 13% CORE<sup>1</sup> GROWTH IN FY18**

# Leveraging Our Strengths and Competitive Advantages

## CORE STRENGTHS

- Aligned to **critical industry growth trends** in attractive and diversified end markets
- **Strong culture of execution** focused on accountability, urgency and customer first
- Proven **operational excellence** with a focus on continuous improvement
- Attractive and **flexible financial foundation** to drive long-term profitable growth

## COMPETITIVE DIFFERENTIATORS



Experienced leadership; globally recognized technologists and expertise; institutionalized knowledge and IP

Depth of technology, proprietary technical and measurement science expertise and scale

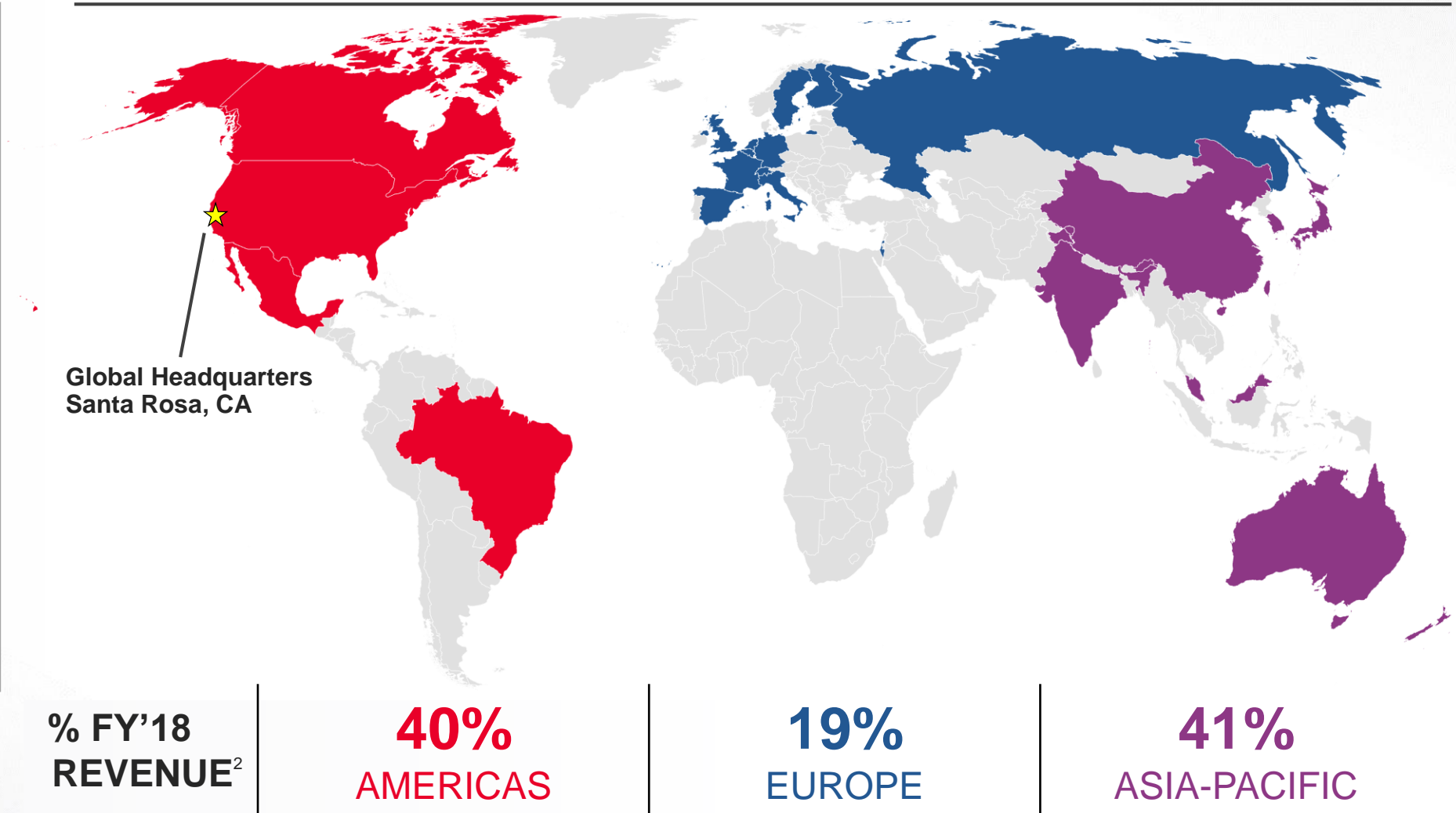
Market leader with broadest offering of software, hardware and service solutions in the industry

Deep, long-term customer relationships; embedded with market leaders across multiple industries

# Global Footprint Unmatched in the Industry

## OUR GLOBAL PRESENCE

- 12,900 employees worldwide<sup>1</sup>
- Operating in over 100 countries around the world; naturally-hedged expenses and revenues
- Aligned with our customers' local needs across all regions



# Social Responsibility is Ingrained in Our Culture

## OUR Corporate Social Responsibility VISION

Build a better planet by accelerating innovation to connect and secure the world and employing a global business framework of ethical, environmentally sustainable and socially responsible operations



### Selected Recognitions



# Delivering for our Customers

## DEEP CUSTOMER RELATIONSHIPS & MARKET-LEADING POSITIONS

### CUSTOMER COVERAGE<sup>1</sup> (2018)

- 29 of 30** Top Technology Companies
- 25 of 25** Top Auto Electronics Suppliers
- 24 of 25** Top Telecom Operators
- 10 of 10** Top Telecom Equipment Companies
- 23 of 25** Top Aero and Defense Contractors<sup>2</sup>
- 25 of 25** Top Semiconductor Suppliers
- 25 of 25** Top Engineering & Tech Universities

### BREADTH OF CUSTOMERS<sup>3</sup>

ADI Hittite • Alphabet • Amazon • Arris • AT&T  
BAE Systems • Boeing • Broadcom • Cisco  
Continental Auto • Daimler • Datang • Delphi  
Denso • Facebook • Finisar • Fujitsu • Harris  
HP • HTC • Infineon • Innolight Tech • Leonardo  
LG • Lumentum • Marvell Semiconductor  
MediaTek • Microsoft • muRata • Naval Research Lab  
Nvidia • Qorvo • Qualcomm • SAIC Motor  
Samsung • Schneider • Siemens • Skyworks  
Sporton International • Spreadtrum • Tesla  
Thales • Toyota • Tsinghua University  
TSMC • Wistron Neweb • ZheJiang University

### LEADING POSITIONS<sup>4</sup>

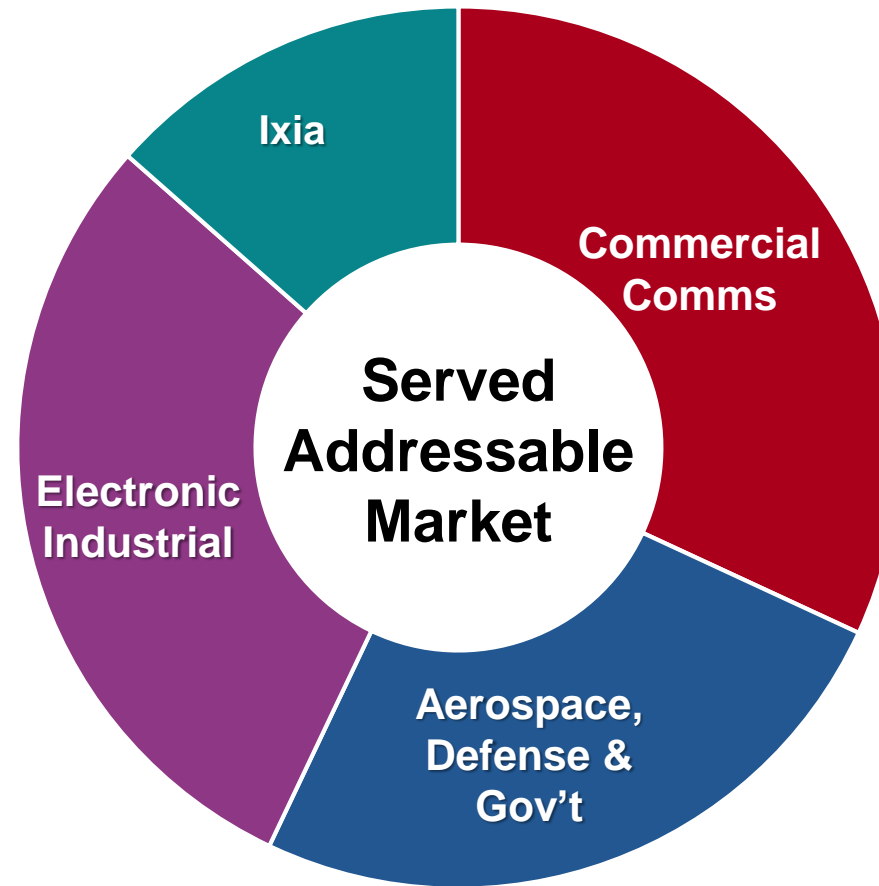
- #1** Software Revenue For Electronic Design and Test
- #1** Hardware Revenue For Electronic Design and Test
- #1** Commercial Comms, Aerospace and Defense, Electronic Industrial, Network Test (Ixia)

**HARDWARE + SOFTWARE + PEOPLE = INSIGHTS**

# Leadership Position with Room to Grow

**\$16.3B**

Served Addressable  
Market<sup>1</sup>



**3-5%**

Avg. Market Growth  
Rate<sup>3</sup>

**Keysight Market Share: ~24%<sup>2</sup>**

**KEYSIGHT WELL-POSITIONED FOR CONTINUED SHARE GAINS**

# A Strategic Framework for Value Creation



# Sustain and Accelerate Organic Growth



Aggressively  
Pursue  
Opportunities  
Aligned with Strong  
Macro Growth  
Trends



Be First-to-Market  
with Differentiated  
Technology  
Solutions via  
Superior Innovation  
Approach



Moving from  
Hardware-centric to  
Software-centric  
Approach; Advance  
Intimate Solution  
Selling



Innovate Ahead of  
Emerging  
Technologies and  
Extend Industry  
Lead

**IDENTIFY TRENDS AND INVEST EARLY TO PROVIDE INNOVATIVE SOLUTIONS**

# The Keysight Leadership Model (KLM)

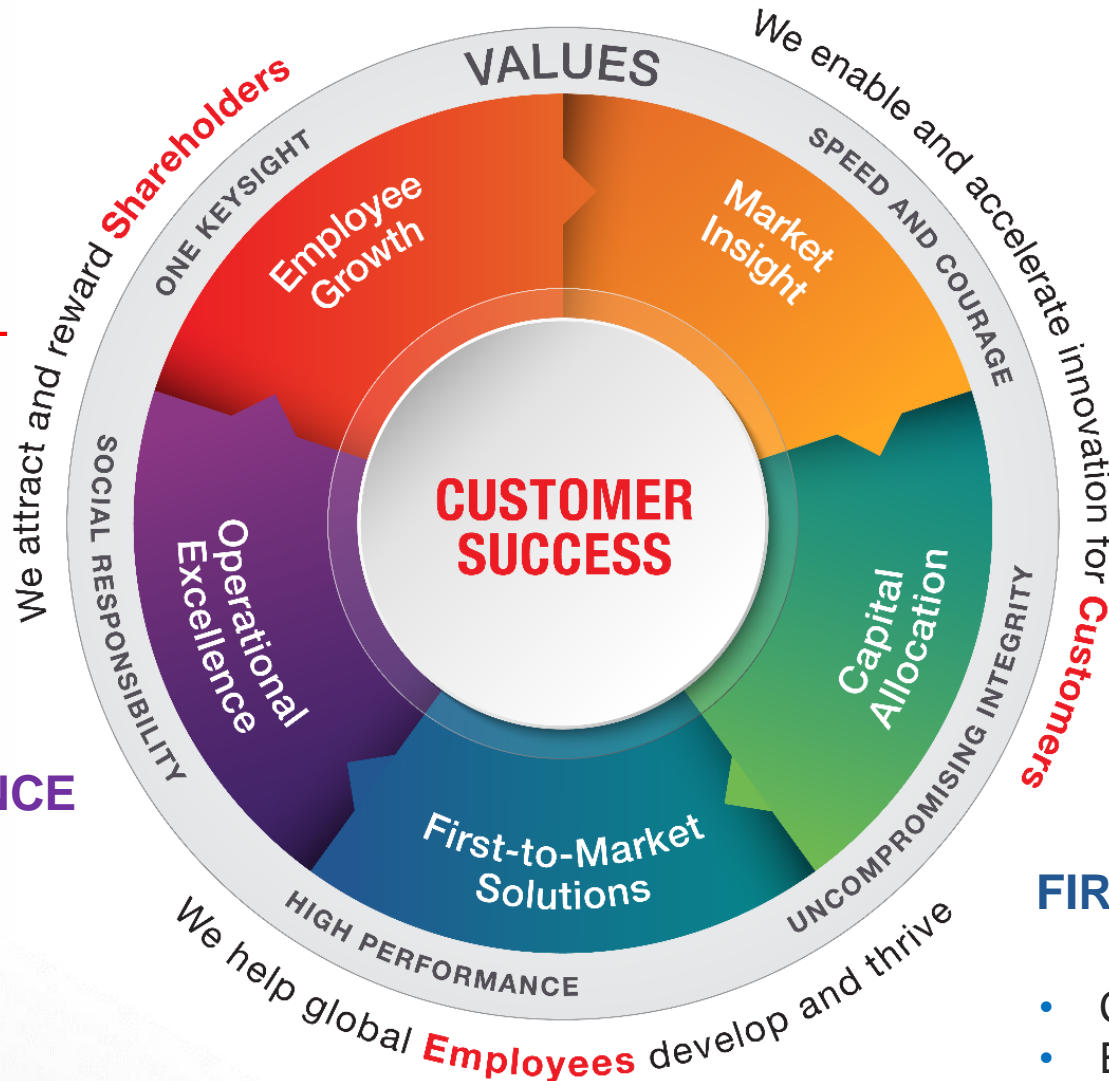


## EMPLOYEE GROWTH

- Encourage passion
- Inspire and facilitate growth
- Anticipate change

## OPERATIONAL EXCELLENCE

- Highest quality
- Continuous improvement
- Flexible operating model



## MARKET INSIGHT

- Early trend identification
- Accelerate Innovation

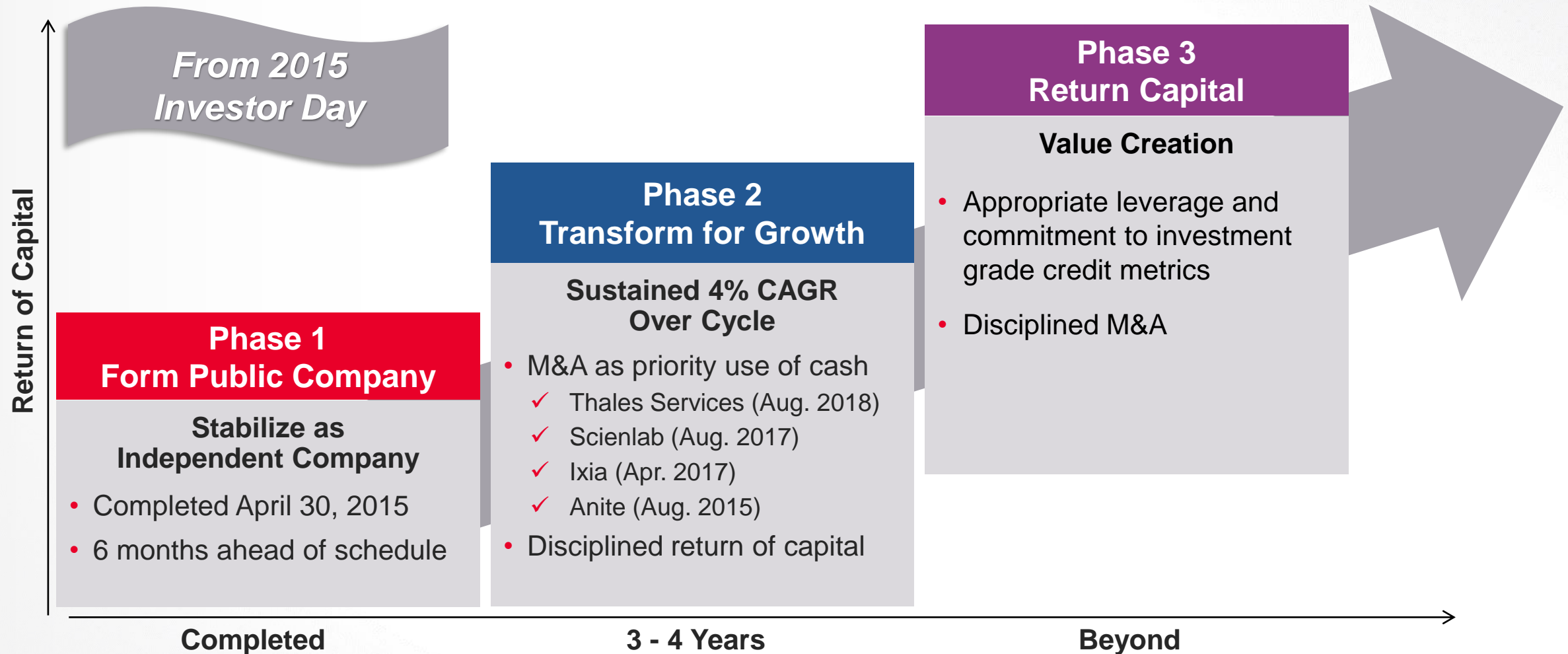
## CAPITAL ALLOCATION

- Focus on ROIC
- Flexible, balanced approach

## FIRST-TO-MARKET SOLUTIONS

- Committed to being first
- Exceed the customer needs

# Three Phases to Keysight's Transformation



**TRANSFORMATION LARGELY COMPLETE; TRANSITIONING TO PHASE 3**

# Capital Allocation Priorities – Dynamic and Return-Based



**1 Reinvestment to Drive Organic Growth**

**2 Disciplined M&A**

**3 Return of Capital**

**OPERATING PRINCIPLE – MAINTAIN FLEXIBILITY AND LIMIT EXCESS CASH**

# Our Long-Term Expectations

	Previous Target (2015 Investor Day)	NEW Target
Core Revenue Growth <sup>1</sup>	Sustainable 4% CAGR	Sustainable 4-5% CAGR 
Operating Margin <sup>1</sup>	17-18%	21-22% 
EPS Growth <sup>1</sup>	8-10%	≥10% 

Operating Margin targets restated to reflect the Q1'19 adoption of ASU 2017-07, "Improving the Presentation of Net Periodic Pension Cost and Net Periodic Postretirement Benefit Cost"

# Transformed, Growing, and Exceeding Commitments

Transformed  
organizational  
structure to align with  
customers and  
increased investments  
focused on key growth  
initiatives

Accelerated  
profitable growth  
and momentum  
driven by focus on  
customer success  
and solutions

Differentiated  
business model  
enabling superior  
execution

Strong  
management team  
meeting and  
exceeding  
commitments

*An exciting time  
at Keysight...  
significant  
runway ahead*





# Technology Leadership

**Jay Alexander**

Senior Vice President and Chief Technology Officer

# Technology Leadership | Key Messages

1

Increased R&D investment from ~12% to ~16% of revenue in 4 years; emphasizing first-to-market innovations that enable our customers' growth

2

Improved R&D efficiency with industry-focused solutions groups that capitalize on differentiated technology supplied by central Keysight Labs team

3

Expanding our leadership on all three dimensions of Keysight's differentiation: Hardware + Software + People (expertise)

4

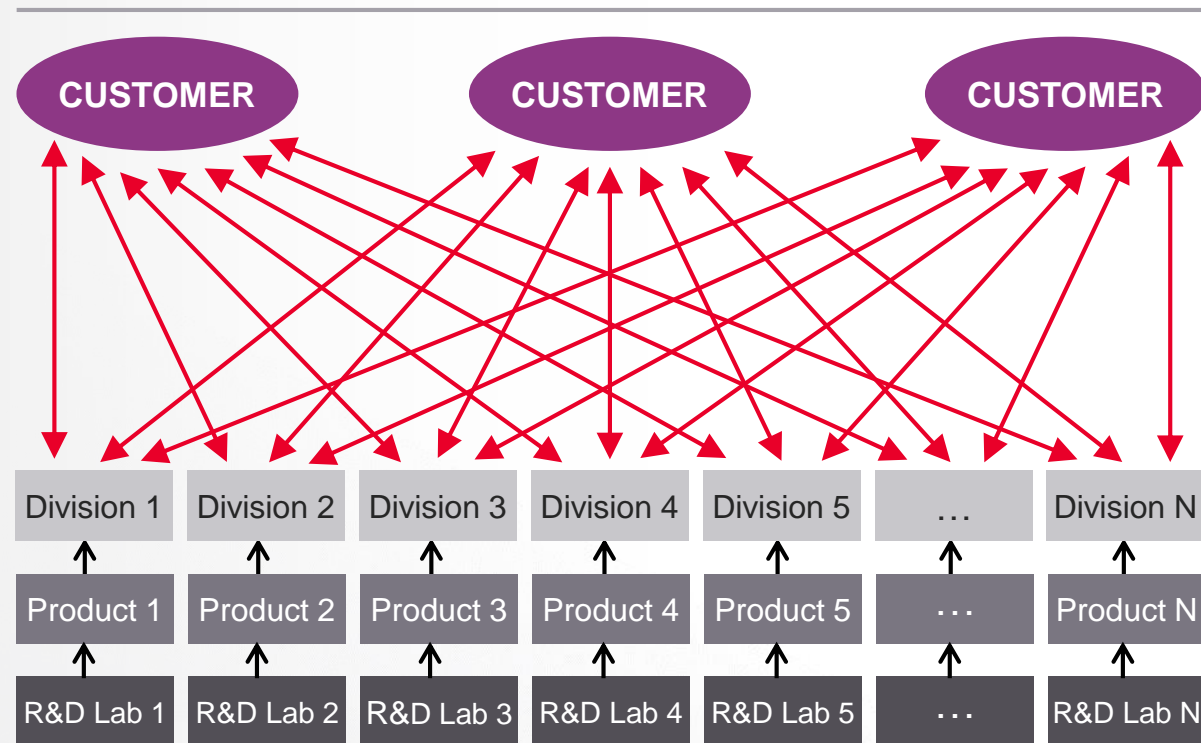
Executing on strategic software initiative – added \$200M+ of incremental annual software revenue over 3 years and introduced PathWave, a breakthrough design and test software platform

# Transformed R&D for Solutions and Customer Success

## FROM

- Product-focused divisions
- Internal goals
- One form factor
- Product line run-rate funding

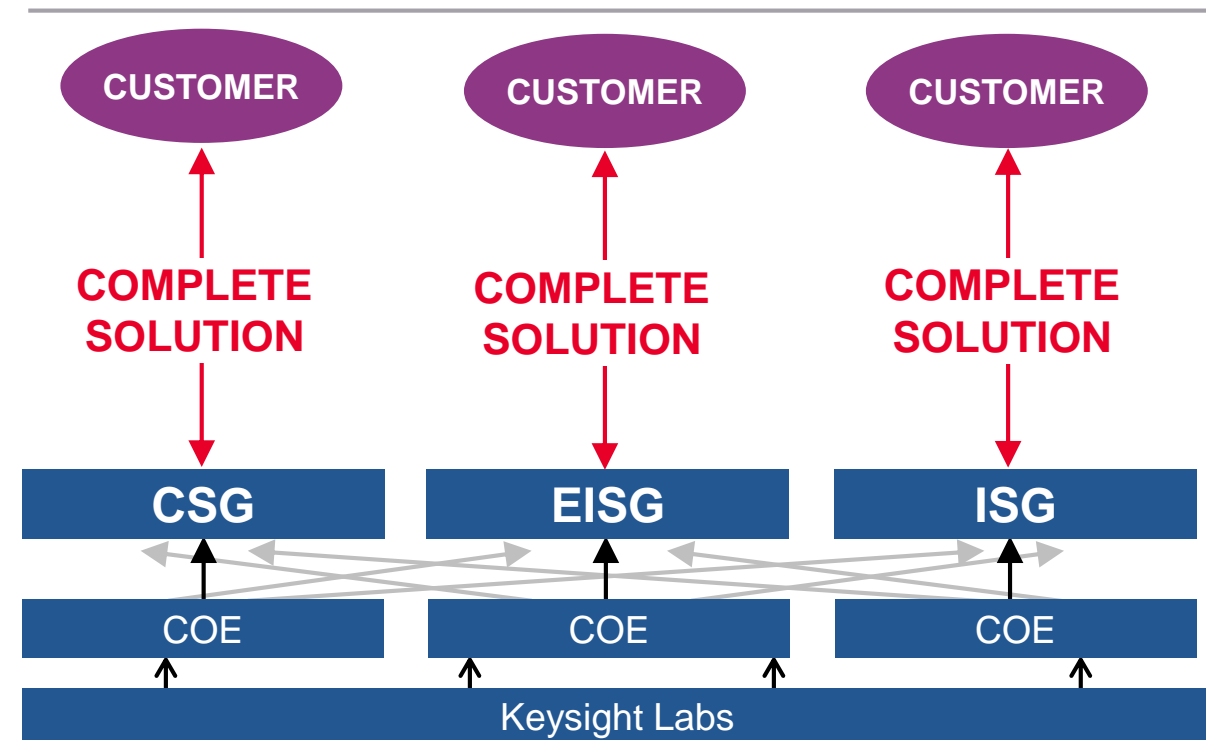
## OLD



## TO

- Solution-centric business groups
- Customer-driven specifications and timetables
- Multiple implementations (feature-rich box, modular, handheld)
- Strategic Keysight growth investments

## NEW



# R&D Overview – 3 Differentiators that Enable R&D Efficiency and Customer Success

**1**  **Keysight Labs Central Teams**

Develop game-changing hardware and software innovations – breakthroughs created for maximum impact and scale

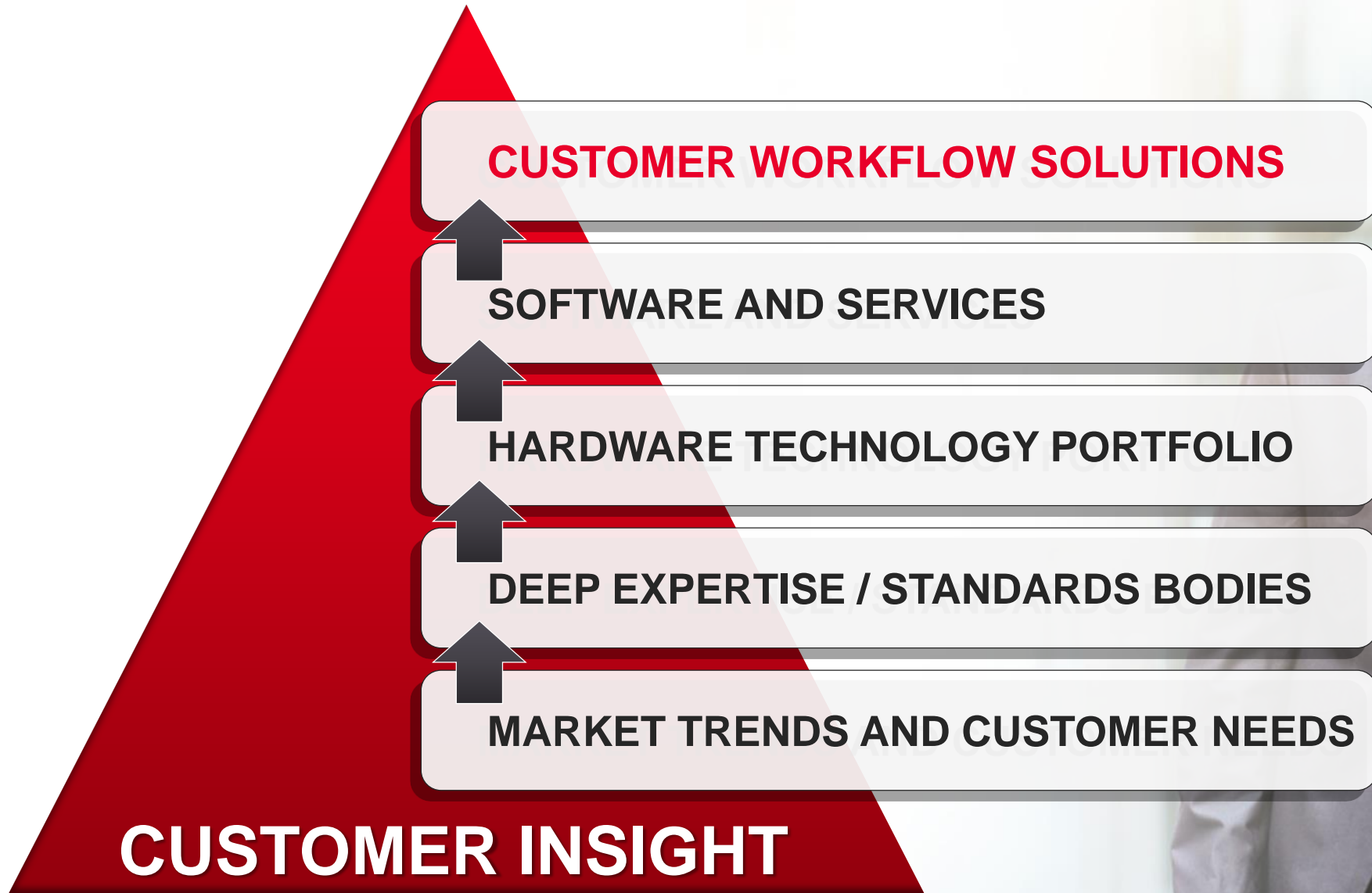
**2**  **R&D Centers of Excellence**

Create hardware and software solution components that can address many applications, focusing on deep competency areas such as High Frequency Measurements and Digital and Photonics Measurements

**3**  **Solutions Groups**

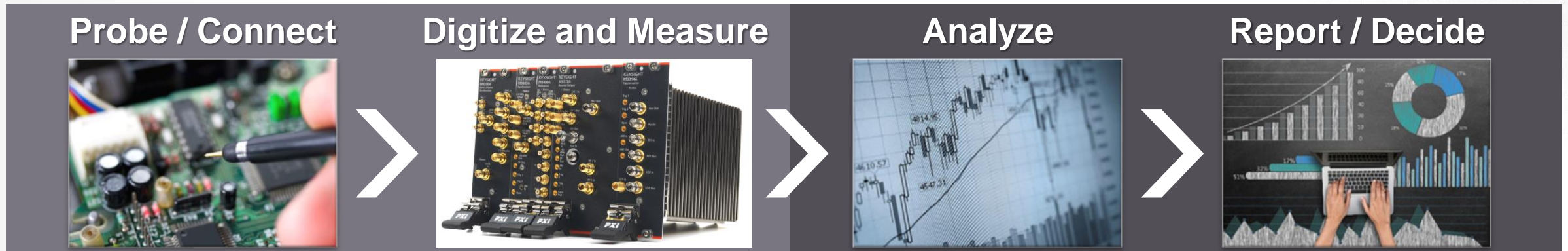
Partner with leading customers to create high-value solutions with faster time-to-market than previously possible

# Leveraging Insight and Expertise to Deliver Solutions



# Investing to Win with Leadership in Hardware + Software ...

## TYPICAL MEASUREMENT PROCESS



### Leading-Edge Hardware

- Critical foundation for world-class measurements; needs to be 10X better than what is being measured
- Keysight is vertically integrated to develop and deliver these differentiated core technologies
- Key enabler for high-margin solutions

**CUSTOM CHIPS, MODULES & INTERCONNECTS ENABLE SUPERIOR PERFORMANCE AND TIME-TO-MARKET**

### Software and Value-Added Services

- Hundreds of high-value SW application packages
- >\$500M<sup>1</sup> software business; market leader by revenue; recognized with Frost & Sullivan award
- Increasing recurring revenue with more time-based licenses, support contracts and additional services

**SOFTWARE AND SERVICES DELIVER DIFFERENTIATION, HIGHER MARGINS AND REVENUE STABILITY**

# ... + People | Delivering Our Unique Expertise



## INDUSTRY-LEADING TECHNOLOGISTS

- ~3,000 R&D engineers, over 1/3 with M.S. or Ph.D. degrees
- Deep connections with leading research universities such as Stanford, UCSD, Georgia Tech, Bristol, Tsinghua, among others



## THOUGHT LEADERSHIP

- Active in 30+ standards bodies and industry consortia
- 3,000+ patents awarded<sup>1</sup>, with hundreds of new applications and trade secrets generated each year



## EMBEDDED WITH MARKET LEADERS

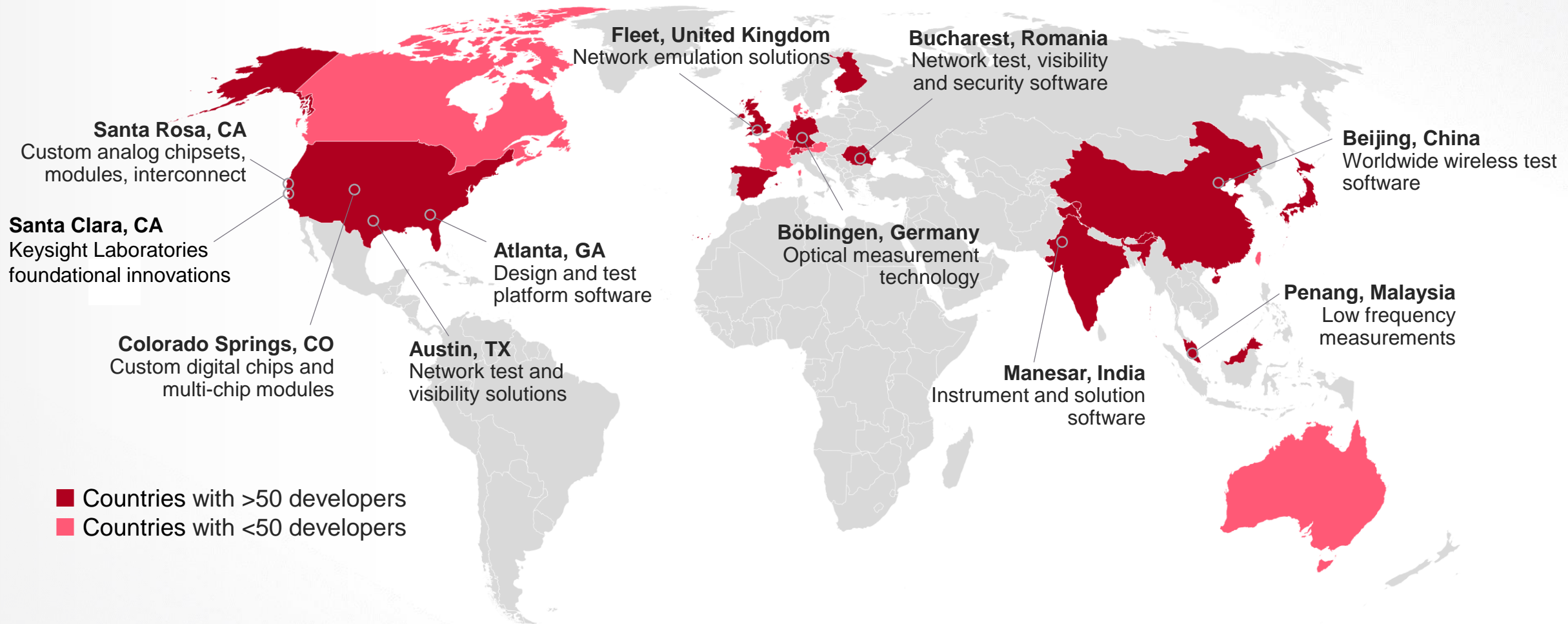
- Diverse and deep customer relationships around the world
- Viewed as trusted advisor and partner



**WE ARE A PARTNER OF CHOICE FOR INNOVATION-ACCELERATING EXPERTISE**

# Keysight Developers Are Close to Customers Worldwide

## Key Technology Development Centers



**HARDWARE + SOFTWARE + PEOPLE = INSIGHTS**

# Used M&A to Gain Capabilities & Expand Our Served Market

Increased  
Served Market  
and Added  
New Growth  
Vectors

## COMMUNICATIONS SOLUTIONS

**Anite** **ixia**<sup>1</sup>

## ELECTRONIC INDUSTRIAL SOLUTIONS

**scienlab**  
electronic systems

## SERVICES SOLUTIONS

Thales Calibration Services Australia  
Liberty Calibration  
Electroservices  
PSNA

## ADDED CAPABILITIES

Wireless protocol development test,  
full stack network test, visibility and  
security

Charging infrastructure test,  
automotive battery, and power  
system

Multi-brand and dimensional  
calibration; leadership position in  
antenna test

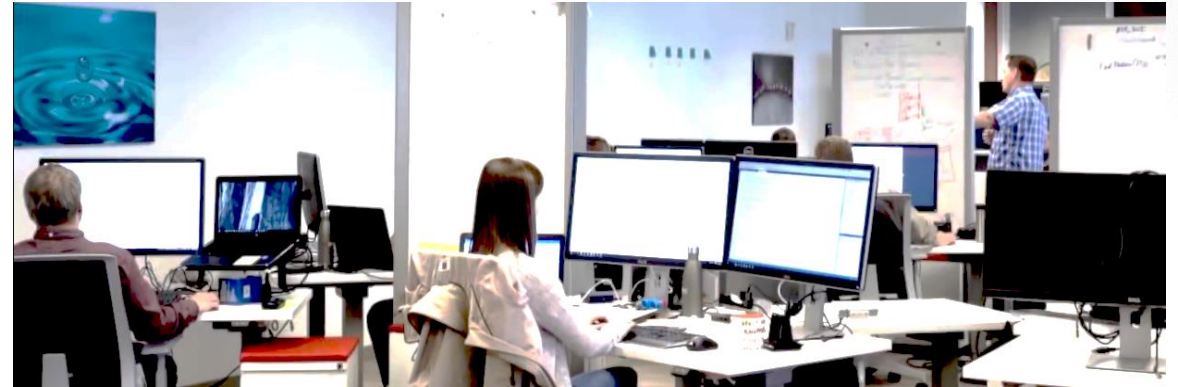
# Increased our Competitive Differentiation

## KEYSIGHT FAB Santa Rosa, CA



- Proprietary chips, modules, and interconnects, purpose-built for advanced solutions such as 5G
- Optimized with hundreds of years of expertise
- ***Delivers performance, time-to-market and cost benefits for Keysight and our customers***

## KEYSIGHT SOFTWARE DESIGN CENTER Atlanta, GA



- Platform software developed with Agile methods; used by Keysight businesses to speed customers' time-to-market by connecting the entire design and test workflow
- 60+ new developers growing to 200 focused on:
  - Big data analytics and visualization
  - Cloud-first design and deployment
  - Data management and streaming
- In partnership with the Georgia Institute of Technology

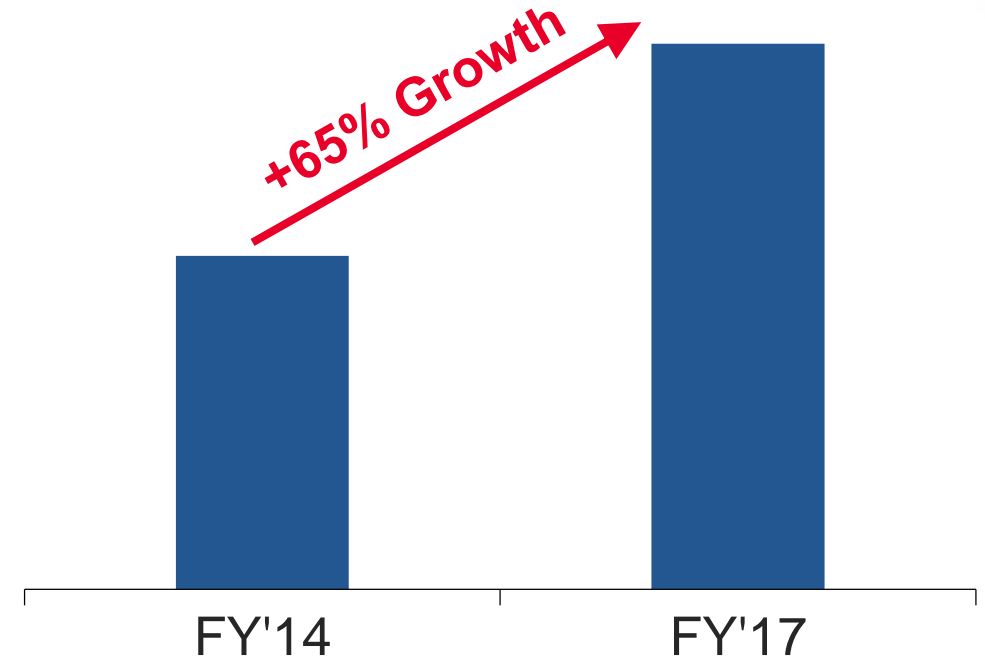
**VERTICALLY INTEGRATED FOR DIFFERENTIATED TECHNOLOGIES**

# Dramatically Increasing Software Development Capabilities

## KEY INITIATIVES

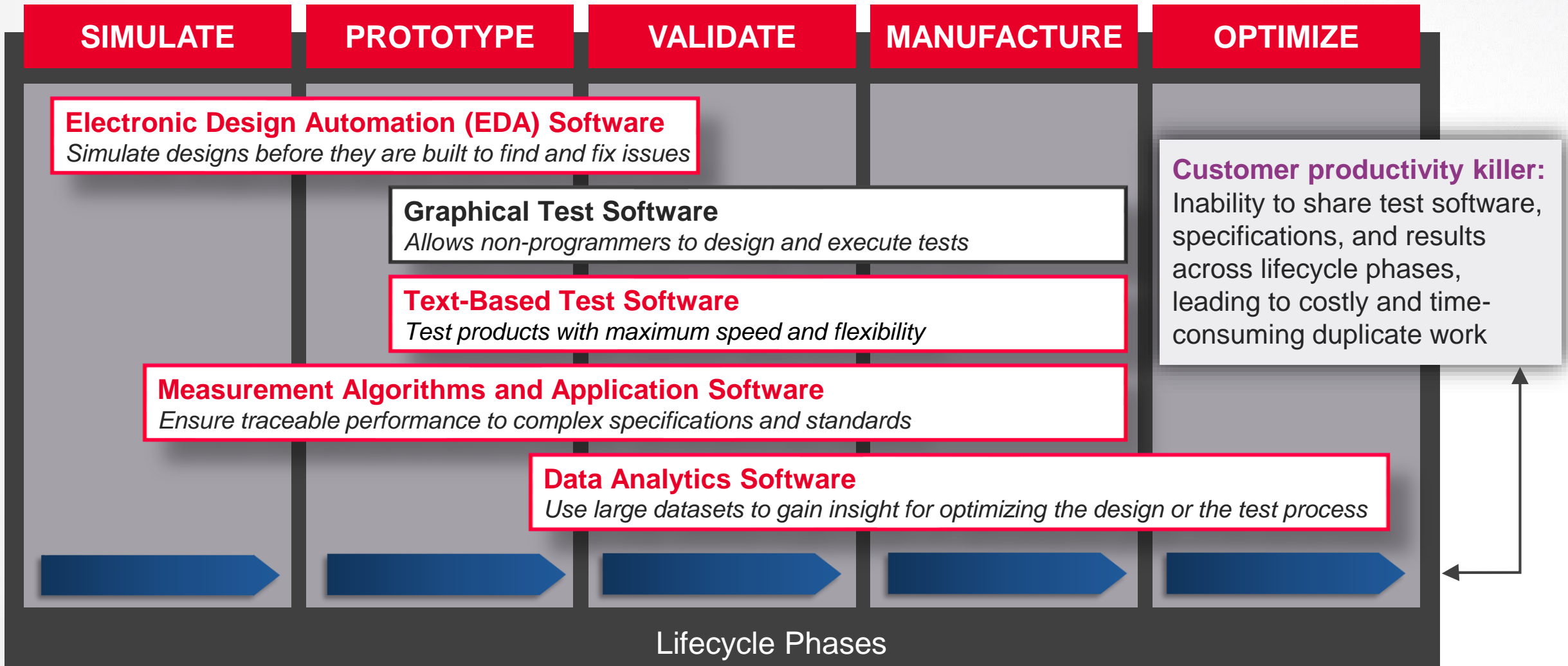
- Consolidated core software technology development under CTO (Nov. 2015)
- Advanced our software leadership with acquisitions of software-centric businesses
  - Anite (Aug. 2015)
  - Ixia (Apr. 2017)
- Opened Atlanta Software Design Center (Oct. 2016)

~1,800 SOFTWARE ENGINEERS

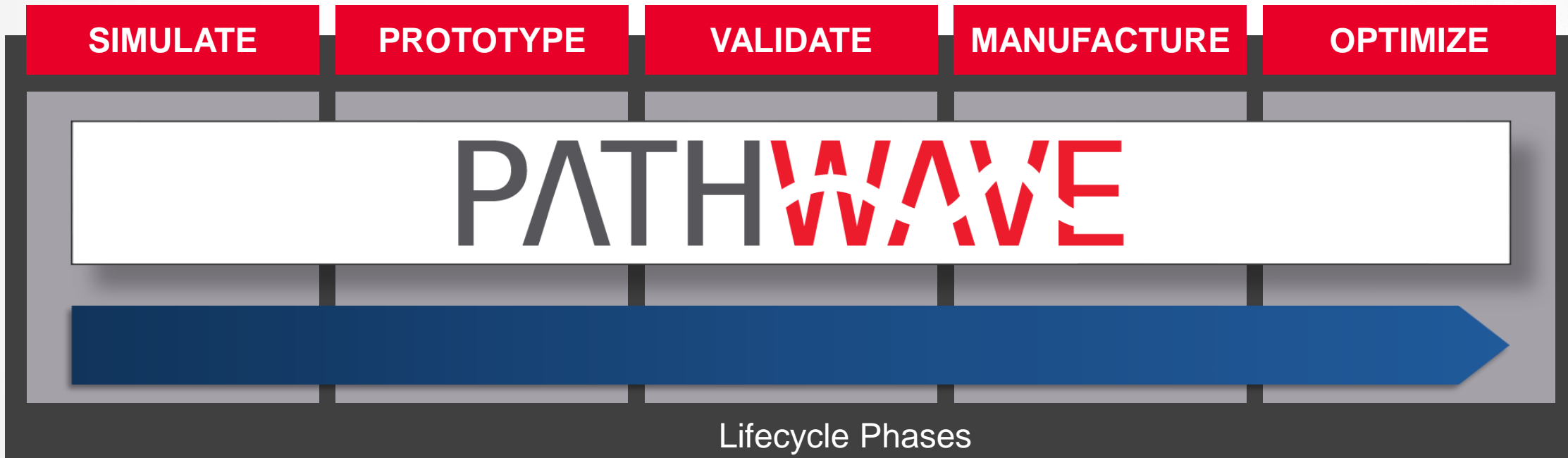


INVESTING IN CAPABILITIES THAT DRIVE DIFFERENTIATION AND VALUE CAPTURE

# Major Unaddressed Market Need: Unify Fragmented Design & Test SW for Faster Time-to-Market & Lower Costs



# PathWave – A Superior Software Platform that Increases Productivity Across the Overall Workflow



A breakthrough design and test software solution that accelerates the overall workflow from simulation of early concepts through manufacturing and optimization of deployed systems

- **Integrates** Keysight's leading software solutions, including design software, measurement applications, and instrument control
- Adds an open and flexible development environment with **common data formats** and a **consistent user experience**
- Result is an **open**, **scalable** and **predictive** platform that will be the foundation for many customer solutions going forward

# PathWave Elements in Action: 5G Wireless Design

- In order to achieve its performance goals, 5G is far more complex than 4G
  - Higher frequencies; to 28 GHz and beyond
  - Advanced modulation (signal processing)
  - Multi-element antennas using **beamforming**
- Requires detailed simulation, prior to building a prototype and then validation of actual performance



## PATHWAVE

SIMULATE

PROTOTYPE

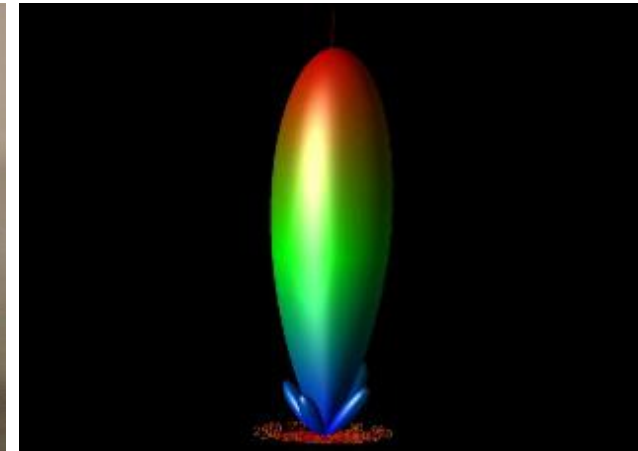
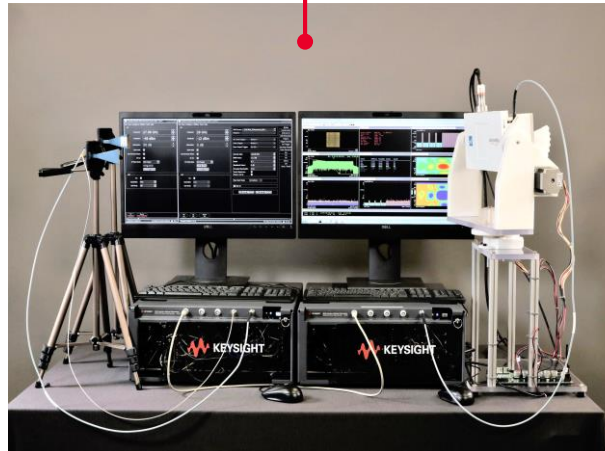
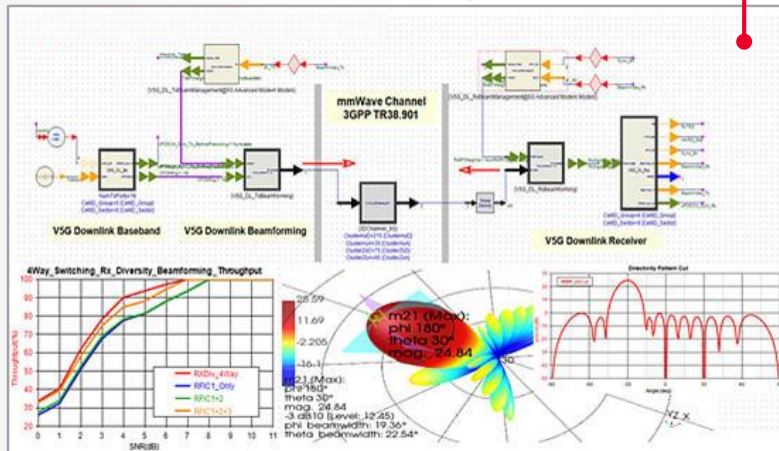
VALIDATE

MANUFACTURE

OPTIMIZE

Beamforming = Dynamic adjustment of antenna patterns

### 5G mmWave Beamforming



Control of directed beams is simulated and then measured, using parameters imported from the simulation

**KEYSIGHT'S SOLUTIONS MAKE THE 5G REVOLUTION POSSIBLE**

# Our R&D Strategy Builds On Our Leadership Position

## Accelerate Investment in Software

- Solutions for higher layers in the stack
- Additional staffing of Software Design Center in Atlanta
- PathWave platform proliferation

## Continue High-Return Investments to Extend Lead in 5G

- Custom chips for higher frequencies and more channels
- Systems architecture to enable scalable solutions
- Over-The-Air (OTA) and millimeter-wave technology

## Leverage Technology Synergies from Ixia Acquisition

- Leverage Keysight hardware expertise into Ixia solutions
- Apply Ixia software and services expertise to Keysight

## Enable Diversified Growth Beyond Communications

- Differentiated Automotive solutions
- Value-added services beyond Calibration and Repair

# Continuing to Extend Keysight's Technology Leadership

Global R&D capabilities  
with central Keysight Labs  
fueling first-to-market  
innovations and solutions

Furthering our  
unmatched value  
proposition:  
Hardware + Software +  
People = Insights

Accelerating our software  
platform and solutions  
investments to continue  
introducing breakthroughs  
such as PathWave





# Communications Solutions Group

**Satish Dhanasekaran**

Senior Vice President, President - Communications Solutions Group

# Communications Solutions Group | Key Messages

1

#1 position in CSG end markets with ~27% share<sup>1</sup>

2

Transformed organization to industry focus, creating a go-to-market competitive advantage

3

Established first-mover advantage in 5G through early investments and acquisitions

4

Well-positioned with industry leaders; relationships permeate end market ecosystems

5

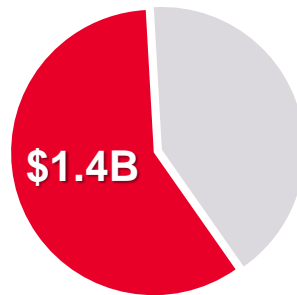
Strong operating model to deliver on financial commitments

# Overview: Communications Solutions Group

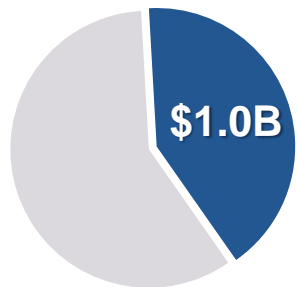
## FY'18 HIGHLIGHTS

Revenue <sup>1</sup>	<b>\$2.4B</b> <b>+16% YoY</b>
Orders	<b>\$2.5B</b> <b>+15% YoY</b>
Operating Income <sup>2</sup>	<b>\$0.47B</b> <b>+36% YoY</b>
Operating Margin <sup>2</sup>	<b>19.8%</b> <b>+300 bps</b>

### Commercial Communications



### Aerospace, Defense and Government



### *Recognized leadership in 5G trials and standards*

- Provide end-to-end solutions beyond the physical layer for mobile chipsets, smart sensors/devices, wireless base stations, networks, data centers and cloud
- Solve challenges around user Quality of Experience, mobility and security

### *Decades of experience delivering mission-critical solutions*

- Provide solutions to agencies, primes and supply chain for electronic warfare, radar, space and signal monitoring
- Solve challenges around new mission threats enabled by digital transformation
- Provide public safety solutions required for increased intelligence (e.g., public events, power plants, airports, border security)

# Significant Steps Taken to Transform CSG



## INITIAL OBSERVATIONS

- 5G technology wave drives growth across the communications ecosystem as industry invests for time to market advantage
- Geopolitical dynamics create opportunities in Aerospace and Defense Communications
- CSG focuses on operational excellence to create value across the business cycle



## ACTIONS TAKEN FY17, FY18

- Transformed to industry-focused solution-centric organization - launched 50+ new solutions
- Expanded software talent with Anite to gain a first-mover advantage in 5G
- Operational initiatives in place to drive profitable growth and margin expansion



## SIGNIFICANT ACCOMPLISHMENTS

### Commercial Communications

- Double-digit order growth 3 of past 4 quarters<sup>1</sup>
- 12 consecutive quarters of double or triple digit 5G order growth
- Strong adoption of 400G R&D solutions

### Aerospace Defense & Government

- Double-digit order growth 4 of past 5 quarters<sup>2</sup>
- Strong adoption of Electronic Warfare and Signal Monitoring solutions

# Hardware + Software + People Accelerates Innovation to Connect and Secure the World

## VALUE

- Expertise brings customer insight, workflow analysis, and improved business outcomes

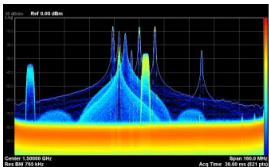
**EXPERTISE**



100 industry experts  
300 R&D hardware engineers  
550 R&D software engineers

- PathWave leverages measurement platforms to enable customer workflows

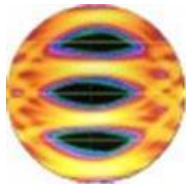
**PATHWAVE  
WORKFLOW  
SOFTWARE**



Electronic Warfare



5G Network Emulation



Computer Datacom

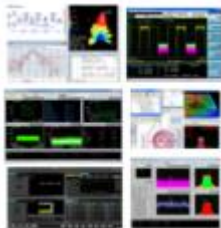
- Broadest offering of industry-leading measurement platforms

**MEASUREMENT  
PLATFORMS**

**#1** in  
Hardware<sup>1</sup>



**#1** in  
Software<sup>2</sup>



# Communications Solutions Group Well-Positioned in Attractive Market

## LARGE, GROWING MARKET

Total Market<sup>1</sup>  
**\$9.3B**

Our  
Share  
**\$2.4B**

Market Dynamics	Commercial Communications	Aerospace and Defense Communications
Size <sup>1</sup>	\$5.2B	\$4.1B
Growth Rate <sup>2</sup>	3-6%	2-3%
Drivers	<ul style="list-style-type: none"><li>• Explosive data growth and effective use of spectrum</li><li>• New business models and services for operators (e.g., artificial intelligence, cloud)</li><li>• China's push to become innovation leader</li></ul>	<ul style="list-style-type: none"><li>• Global defense modernization in response to emerging threats</li><li>• Security needs in public safety infrastructure</li><li>• Connected battlefield</li></ul>

# Communications Solutions Value Creation Strategy



- Win the technology waves
- Advance software solutions offering
- Differentiate through business model



- Extend market leadership
- Capture the outsourcing trend
- Expand into information warfare solutions



- Deliver solutions with leverageable platform strategy
- Drive supply chain excellence and continuous cost reductions
- Lead with rigorous customer experience and quality management

# Investments in Place to Capture Mega Trend Opportunities

**5G**

**EDGE  
COMPUTING**

**ELECTRONIC  
WARFARE**

**INDUSTRY 4.0**

**CONNECTED  
SMART  
DEVICES (IoT)**

**EMERGING  
APPLICATIONS**  
(VIRTUAL REALITY, AI, BIG DATA, AUTONOMOUS  
DRIVING)

**CLOUD**

**SIGNAL  
MONITORING**



# Commercial Communications

# Technology Waves Are Driving Growth Across Communications Ecosystem



## COMMERCIAL COMMUNICATIONS

Technology Waves: 5G, WLAN, MIPI<sup>1</sup>

400G, Terabit, Optical

### Value Chain



**Component/  
Chipsets**



**Devices**



**Base  
Stations**



**Network  
Equipment/  
Storage**

**WE PROVIDE END-TO-END SOLUTIONS  
THROUGHOUT THE INNOVATION LIFECYCLE**





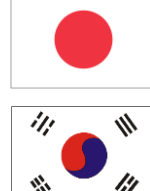


## Attractive Industry Attributes

- Business focused on technology advancement for the Information and Communications Technology industry
- Industry leaders invest for time-to-market advantage, which creates opportunities in R&D
- Standards and regulations mandate new design and test requirements
- Operators specify additional testing to their supply chain for better user experience

# 5G Ecosystems Have Formed



INTEROPERABILITY IS KEY FOR GLOBAL DEPLOYMENT

		sub-6GHz					mmWave				
Spectrum		<1GHz	2.5GHz	3.4 – 3.7GHz		4.4 – 4.9GHz	ISM	28GHz	39GHz		
GEOGRAPHY											
OPERATOR		AT&T T-Mobile	Sprint China Mobile	Three Orange EE Vodafone Telecom Italia	China Telecom	NTT Docomo KT SK Telecom	NTT Docomo SoftBank China Mobile		Verizon AT&T T-Mobile	NTT Docomo SoftBank KT SK Telecom	Verizon AT&T T-Mobile
COMMERCIAL SERVICES		Launch 2019	Launch Early 2019	Launch 2019/2020	Launch 2020	Launch 2019	Launch 2020		Launch 2018	Launch 2020	Launch 2018

# Robust Solution Portfolio Propels 5G Growth



## KEYSIGHT SOLUTIONS

Protocol Design

MIPI<sup>1</sup> Digital Test

5G Waveforms

Beamforming

Channel  
Emulation

WiFi Coexistence

Over-The-Air  
(OTA) Test

mmWave  
Parametric

Key Performance  
Indicators

Uniquely  
enables  
Keysight  
to deliver  
customer  
success

### INDUSTRY FIRSTS

- 5G full stack connection
- Demonstrated 5G data rates >4Gbps, Over-the-Air
- Solution for narrow-band IoT deployments
- Enabled IMT 2020<sup>2</sup> progression

Solution enabled by acquisition:

Anite

Ixia

AT4

Qualcomm



# Keysight Uniquely Positioned to Win in 5G



## KEYSIGHT 5G VALUE PROPOSITION

1. Invested early in broad set of differentiated technology to enable 5G
2. Broad solution portfolio solving 5G challenges from research to deployment
3. Insights from industry engagements and trials

## SIGNIFICANT PROGRESS

- ✓ Triple-digit 5G order growth in FY18
- ✓ Strong order results driven by first-to-market solutions
- ✓ Industry-leading millimeter wave solutions
- ✓ 60+ key contributions made to industry technology standards



# Aerospace, Defense and Government Communications



# Geopolitical Dynamics Are Creating Growth Opportunities



## AEROSPACE AND DEFENSE COMMUNICATIONS



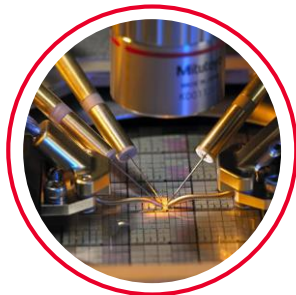
**DoD/  
Agencies**



**Prime  
Contractors**



**Public  
Safety**



**Supply  
Chain**

**SOLUTIONS FOR DESIGN AND MANUFACTURING  
INCLUDING MULTI-DECADE SUPPORT**

## Attractive Industry Attributes

- Mission-critical requirements demand extreme performance and highest reliability
- Security challenges multiply as commercial technology proliferates
- Multi-decade programs require multi-decade support and service
- 2-3% CAGR<sup>1</sup> in global defense spend – geopolitical dynamics lead to business diversification
- Public safety concerns drive technology infrastructure investments

# Providing Solutions Across Entire Defense Ecosystem



SIMULATE

PROTOTYPE

VALIDATE

MANUFACTURE

SUSTAIN

Solutions Across Aerospace and Defense Communications Workflow

## Defense Modernization Requires Broad Solutions



### ELECTRONIC WARFARE AND RADAR

#### Threat Simulation

- Mission effectiveness
- Hardware-in-loop
- Open-air ranges



### SIGNAL MONITORING

#### Public Safety

- Signal intelligence
- Unmanned aerial vehicle detection
- Compliance



### SUPPLY CHAIN

#### Subsystems

- Materials
- Integrated circuits
- Metrology



### OPERATIONS

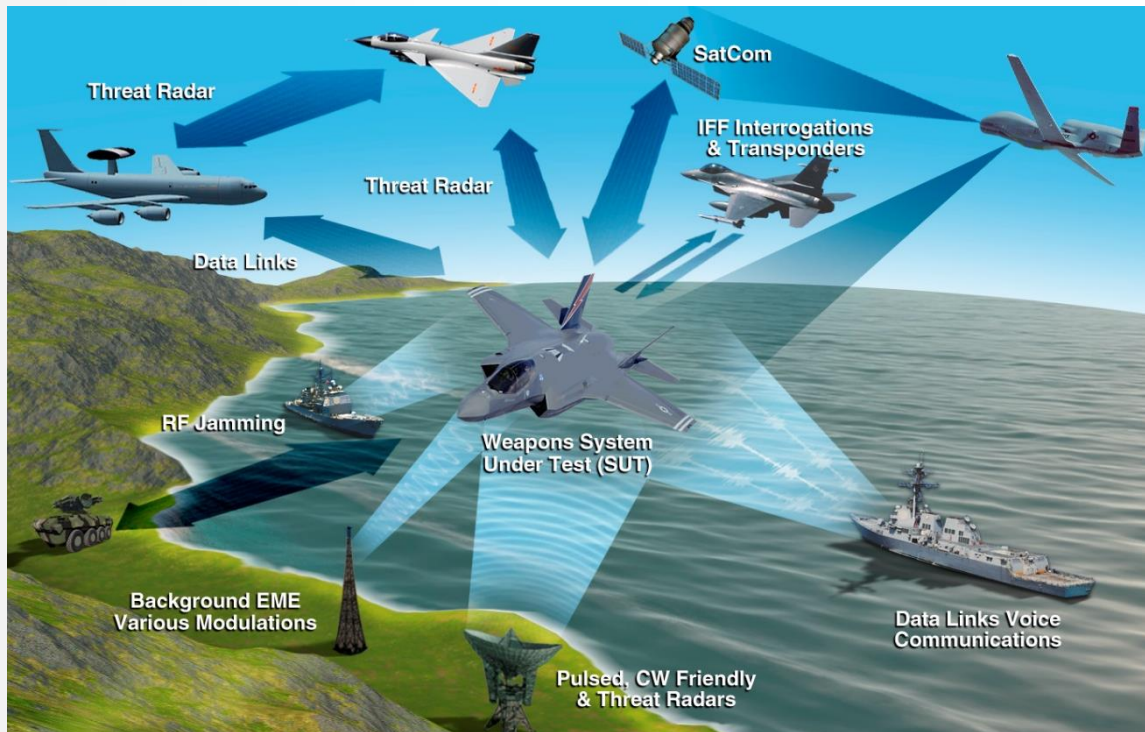
#### Field and Service

- On-board or pre-flight check
- Uptime services in-country

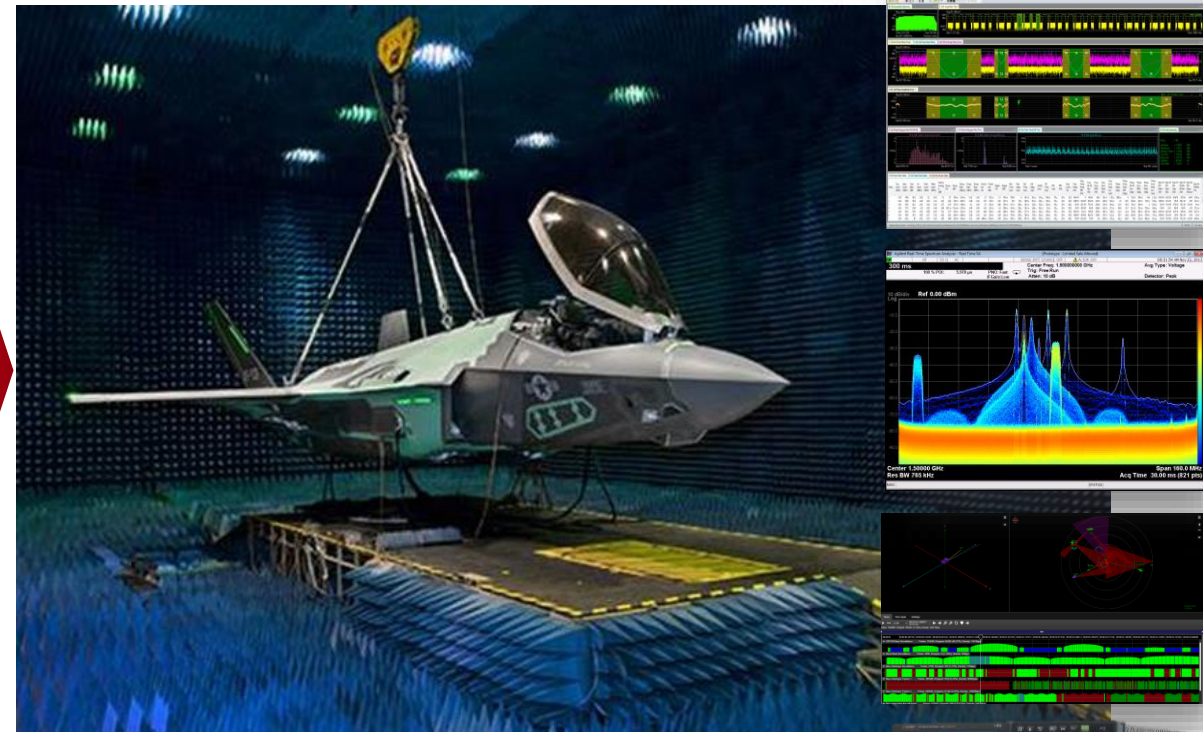
# Keysight Enables Virtualized Connected Battlefield



## REAL WORLD



## RF ELECTRONIC WARFARE SIMULATION LAB



Keysight threat simulators selected by U.S. DoD for *hardware-in-the-loop* simulation<sup>1</sup>

# Focus on Operational Excellence in Communications Solutions Group



## EXECUTING A LEVERAGEABLE PLATFORM STRATEGY

- Developing solutions on PathWave software framework
- Increasing investment across all form factors for faster development of solutions
- Accelerating technology investments to sustain differentiation

## RELENTLESS FOCUS ON SUPPLY CHAIN EXCELLENCE

- Maximizing margins through cost reductions, supply chain optimization and value engineering
- Increased manufacturing capacity to meet demand for high-frequency products

## RIGOROUS CUSTOMER EXPERIENCE AND QUALITY MANAGEMENT

- Certified by: ISO9001:2015, ISO17025:2005, ISO14001 and AS9100D
- Laser focus on highest product quality
- Voice of Customer processes enable continuous improvement and high satisfaction scores

**CREATING VALUE THROUGH OPERATIONAL EXCELLENCE**

# Customer Validation of Our Superior Offerings

“We need a **leading partner with your attributes.**”

“Keysight is a **strategic partner** and we want to outsource test activity to you.”

“**We need your expertise** to define the IoT security space.”

“We value your collaboration on IoT. **We depend on your team.**”

“You are ahead of the competition in the 5G space - **very different than what we are used to from you in 4G.**”

“The whole chipset ecosystem is **embracing you for mmW.**”

“You give us the **fastest path to execute** our project.”

“I trusted you and **you delivered.**”



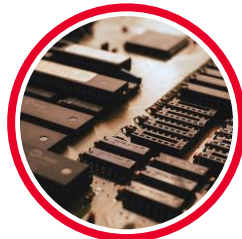
# Market Leader – Positioned to Drive Revenue and Earnings Growth

Portfolio repositioned to focus on higher margin R&D solutions

Acquisitions augmented solution portfolio and expanded SAM

Organization focused on 5G solutions and defense modernization challenges

Strong momentum exiting FY'18 in a \$9.3B<sup>1</sup> market





# Ixia Solutions Group

**Mark Pierpoint**

Senior Vice President, President - Ixia Solutions Group

# Ixia Solutions Group | Key Messages

1

We make networks and applications stronger

- Expanding from pre-deployment network test into production networks

2

Be first and best in the markets we serve

- Highest performance with virtual and cloud scalability

3

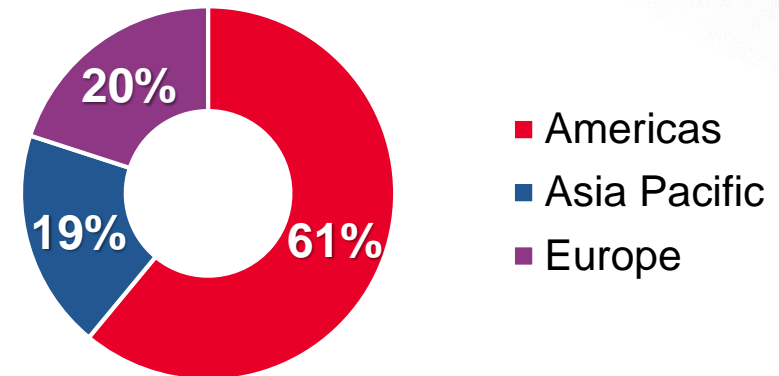
Keysight + Ixia combination drives customer expansion and new revenue opportunities and profit expansion

# Overview: Ixia Solutions Group

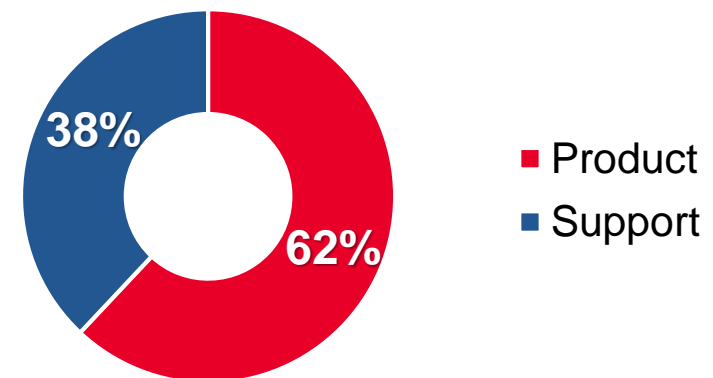
## 2018 HIGHLIGHTS

<b>Net Revenue<sup>1</sup></b>	<b>\$0.45B</b>
<b>Gross Margin<sup>2</sup></b>	<b>74%</b>
<b>Operating Income<sup>2</sup></b>	<b>\$0.02B</b>
<b>Operating Margin<sup>2</sup></b>	<b>3.6%</b>

## REVENUE BY REGION

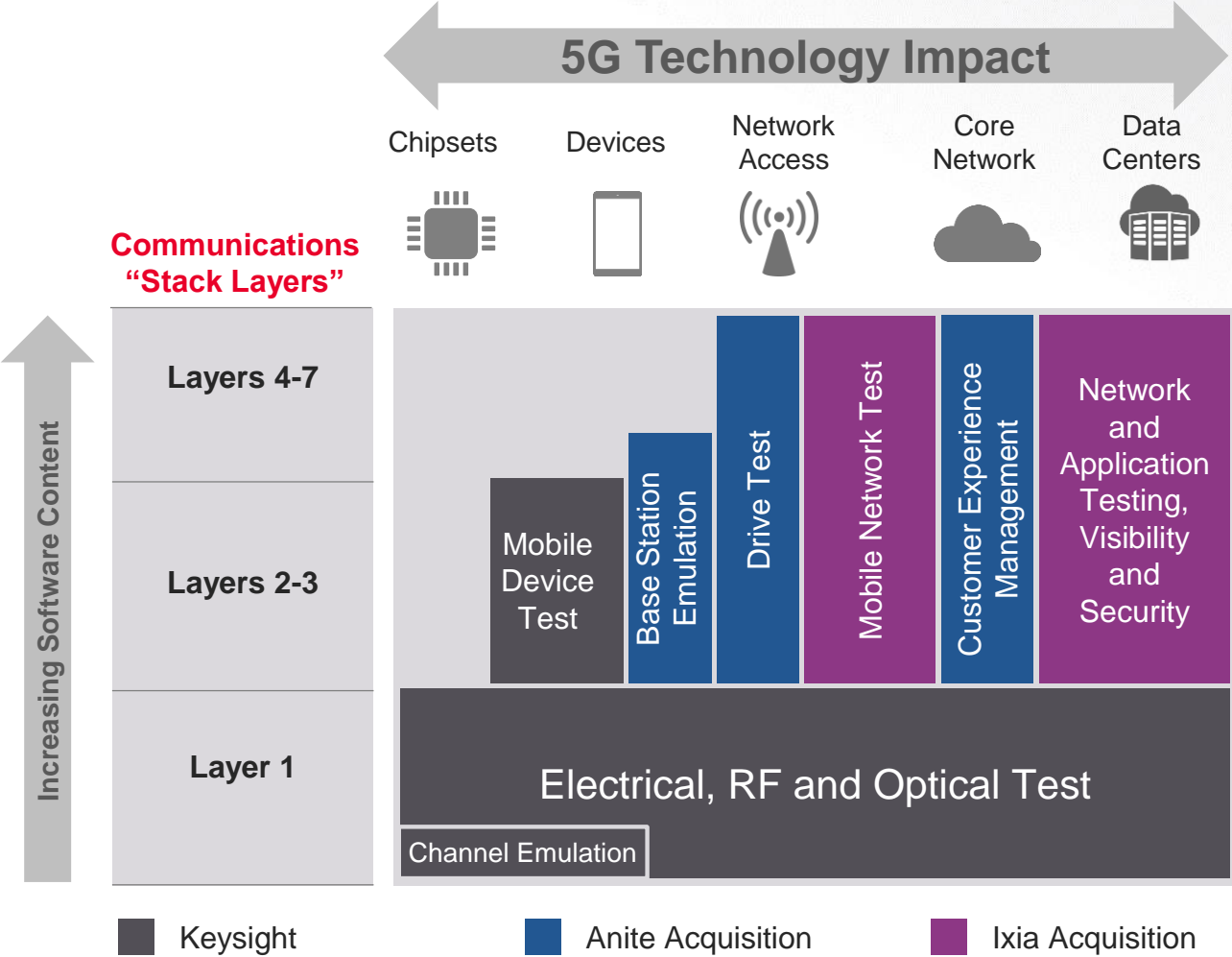
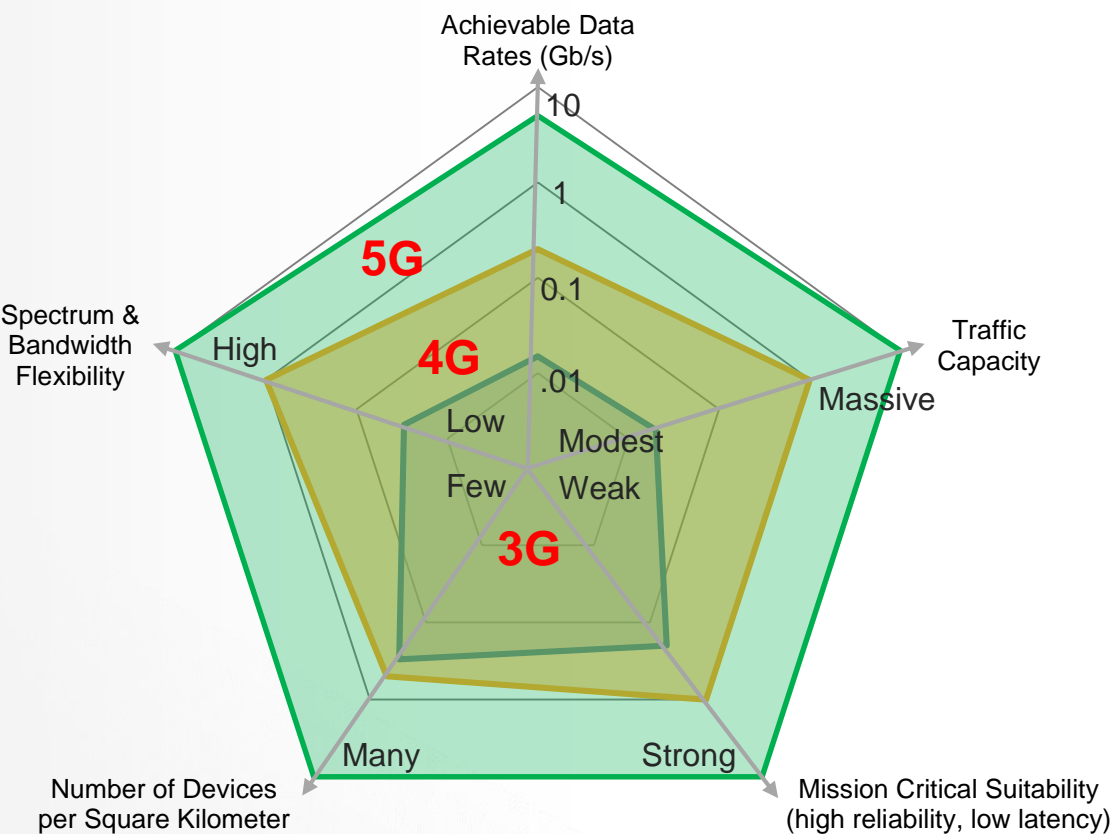


## REVENUE MIX



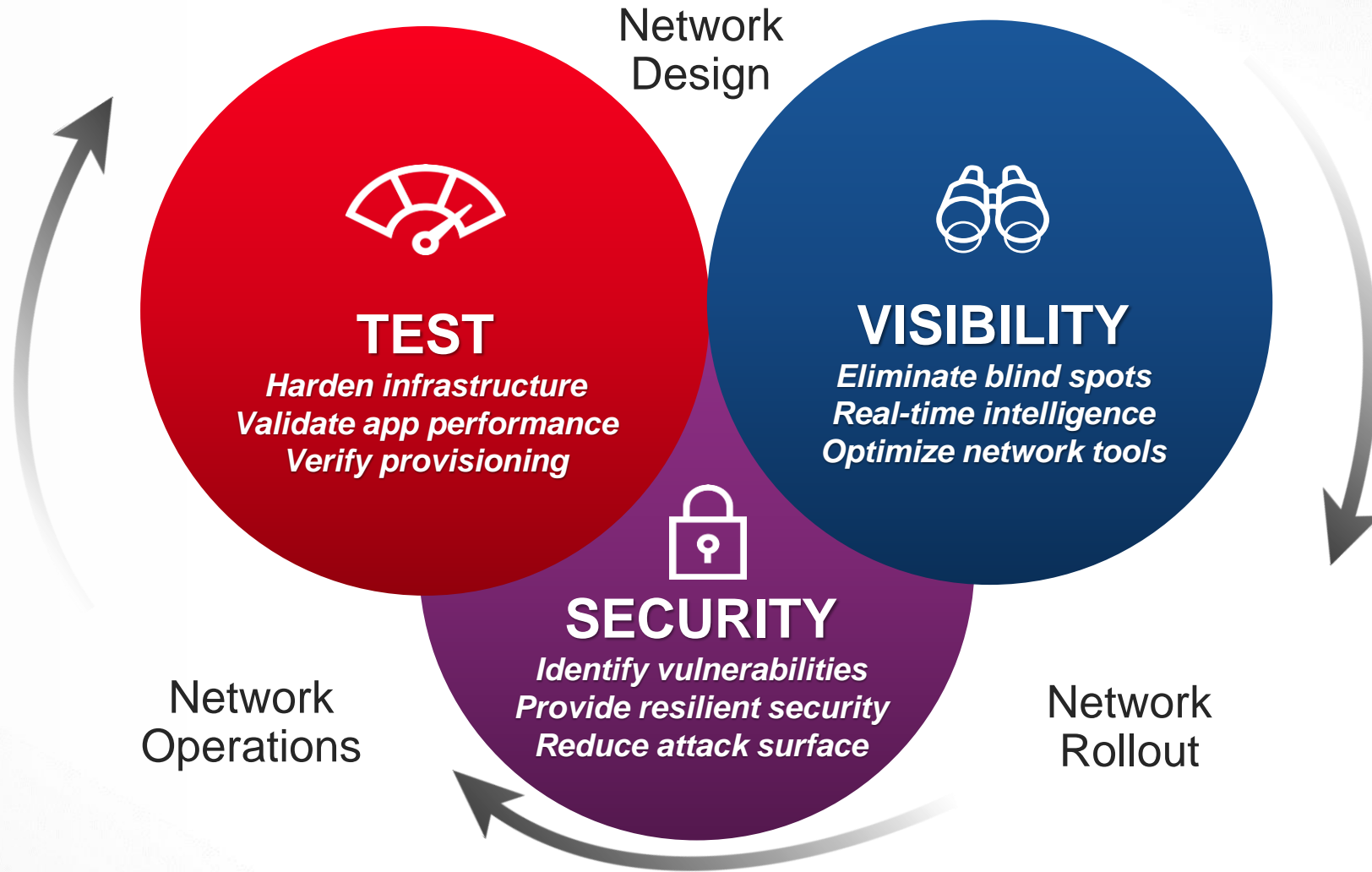
# Ixia Adds Solutions for Layers 2-7 in the Core and Cloud

5G Brings >10X Expansion on Most Attributes\*



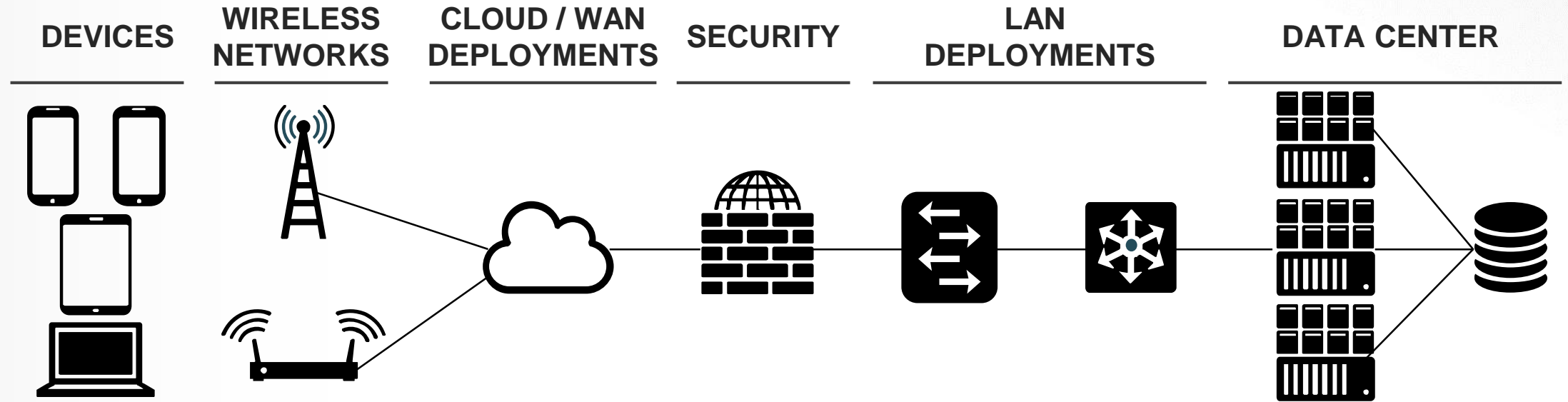
WITH IXIA, KEYSIGHT ADDRESSES THE ENTIRE NETWORK TRANSFORMATION, FROM WIRELESS TO THE CLOUD

# What We Do: Make Networks and Applications Stronger



**WE CHALLENGE THE INFRASTRUCTURE, HARDEN SECURITY & VISUALIZE THE APPLICATIONS**

# Value-Added in Network Test: End-to-End Validation, Conformance and Certainty

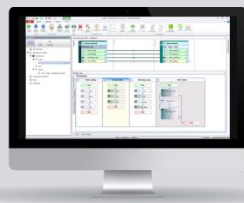


WiFi Performance  
/ Reliability



**IxVeriwave**

Wireless / LTE



**LTE**

Infrastructure  
Performance



**IxLoad/IxChariot**

Security  
Resilience



**PerfectStorm  
CloudStorm**

SDN / NFV  
Migration



**IxNetwork**

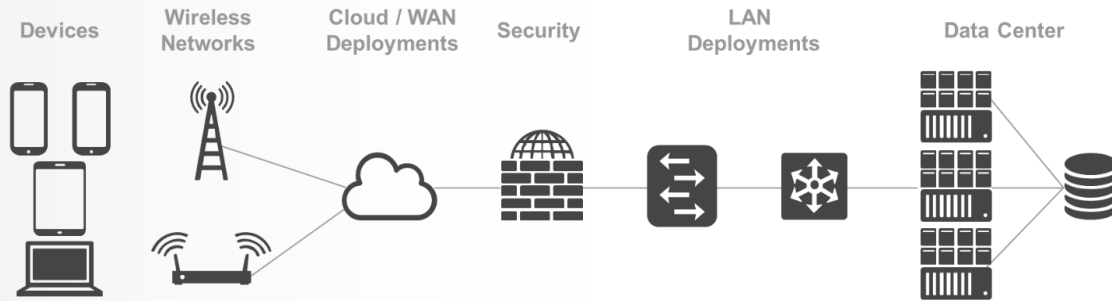
Application QoE  
Hyper Scale DC Performance



**IxLoad and IxNetwork**

# Highly Differentiated, Software-Driven Solutions

## NETWORK TEST



### Technology Leadership

- Scale, performance, density
- First-to-market: 10G, 25G, 40G, 50G, 100G, 400G

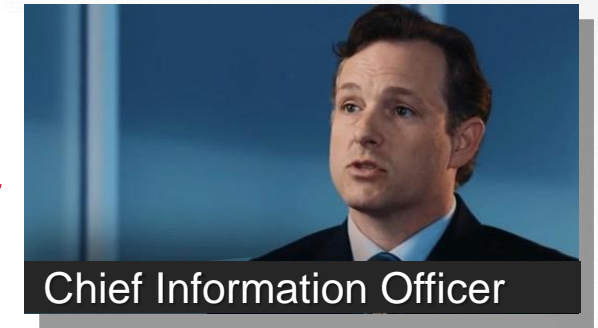
### End-to-End Coverage

- Physical, virtual, cloud
- Device, Network, Mobility, Data Center

### Comprehensive Offering

- Protocol and application depth
- Real-world attacks and applications

## Financial Services Company



### CUSTOMER NEED

Fortune 1000 financial derivatives marketplace needed to evaluate Distributed Denial of Service (DDoS) mitigation and ensure DDoS attack response

### IXIA SOLUTION

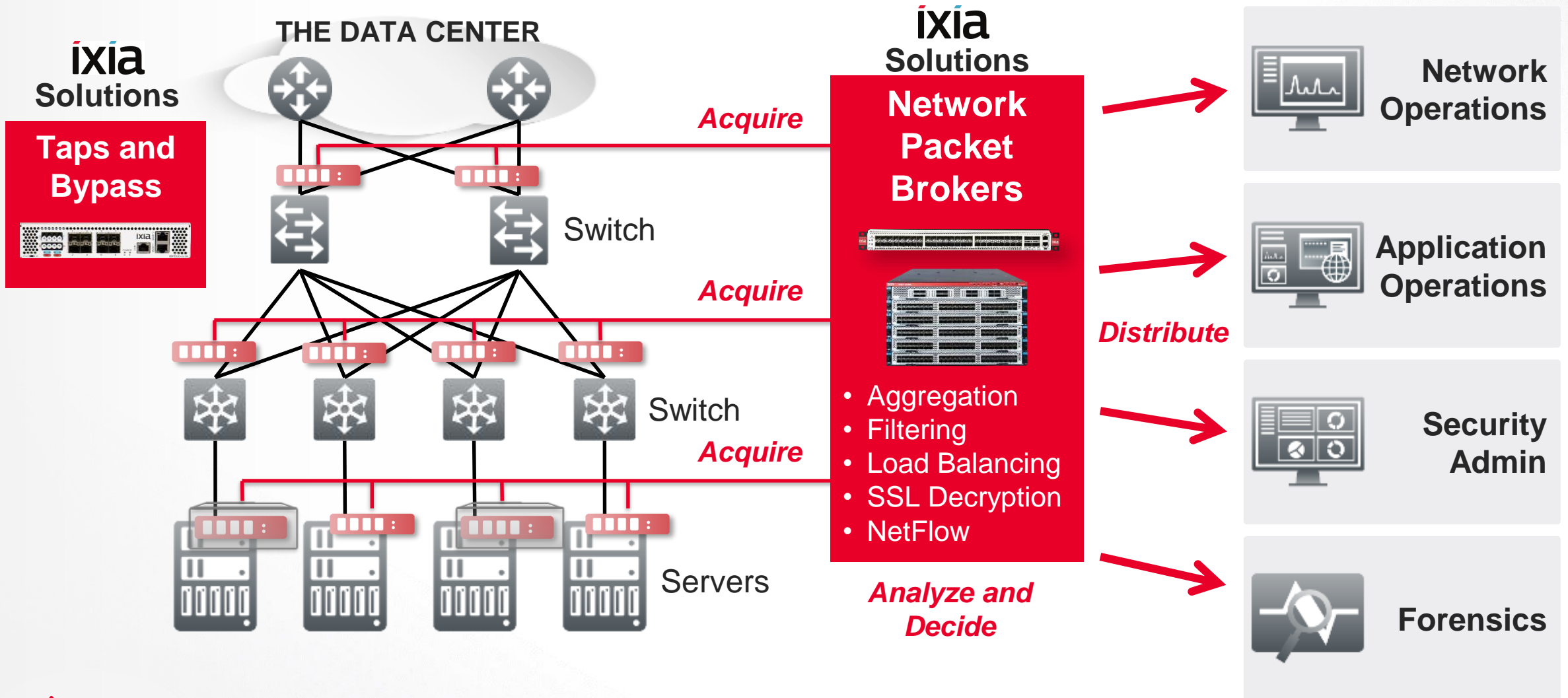
- BreakingPoint Security Solution
- Tested configuration and mitigation process with real-life application profile and DDoS attacks

### OUTCOME

**10x Reduction in Response Time**

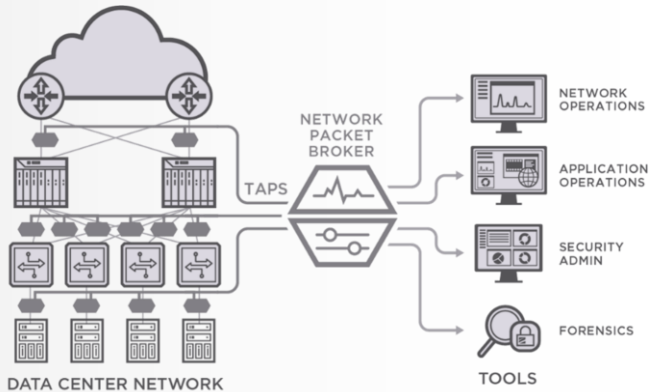
**REAL AND SIGNIFICANT BUSINESS IMPACT**

# Value-Added in Network Visibility: Access and Optimization of Security and Performance



# Highly Differentiated, Software-Driven Solutions

## NETWORK VISIBILITY



### Massive Scale and Performance

- Single pane of glass
- Physical, virtual, cloud, passive and in-line

### True Intelligence

- Application, session, threats, load balancing

### Human User Experience

- Patented Dynamic Filter Engine - exponentially easier to configure and manage

## Director of Banking



### CUSTOMER NEED

Large European bank needed to analyze suspect traffic entering network and ensure high availability of security tools

### IXIA SOLUTION

Deployed iBypass 40-10 with inline Network Packet Brokers (NPB) for high-availability security and reduce overall deployment costs

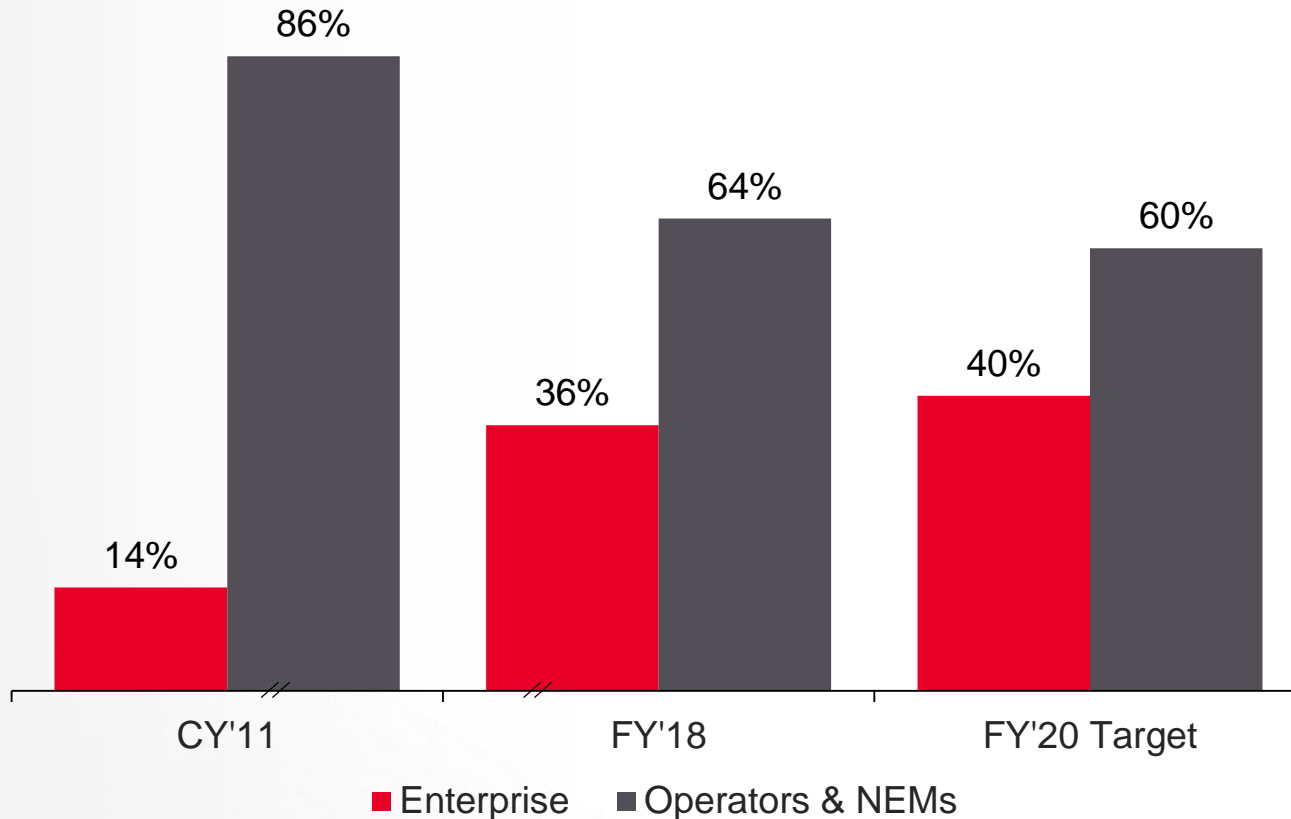
### OUTCOME

**50% Reduction in Deployment Costs**

**REAL AND SIGNIFICANT BUSINESS IMPACT**

# Capturing Growth in Enterprise Segment

## REVENUE MIX



- Digitization is impacting every business
- Added solutions and capability to address Enterprise segment
- Expect this to continue to achieve target mix by 2020

**CUSTOMER BASE CONTINUES TO GROW AND DIVERSIFY**

# Addressing Growing Market with Differentiated Solutions



## MARKET GROWTH DRIVERS

### CLOUD

**90%**

Mobile Data Traffic Moves  
to Cloud Apps by 2019<sup>3</sup>

### NETWORK SECURITY

**36%**

Growth in Global Security  
Incidents 2015 to 2016<sup>4</sup>

### BIG DATA

**25GB**

of Data per Capita per  
Month by 2020<sup>5</sup>

### IoT

**20B**

Connected Devices  
by 2020<sup>6</sup>

# Looking Ahead: Key Trends Align with Keysight Strengths

## IMPLICATIONS

### Massive Data Growth Drives New Technologies

#### Higher speeds and wider bandwidths

- 400G+
- 5G, WiFi and IoT

#### Big Data and Machine Learning

#### Automation

- Transportation
- Industry 4.0

### Digitization Pervasive Across Businesses

#### Pressure on costs and scalability

- Virtualization | Cloud |  
Automation

#### Increased risk of security and privacy breaches

- Increased use of encryption
- New security standards

#### Challenge of deploying complex technologies across enterprises

- Increased need for solutions

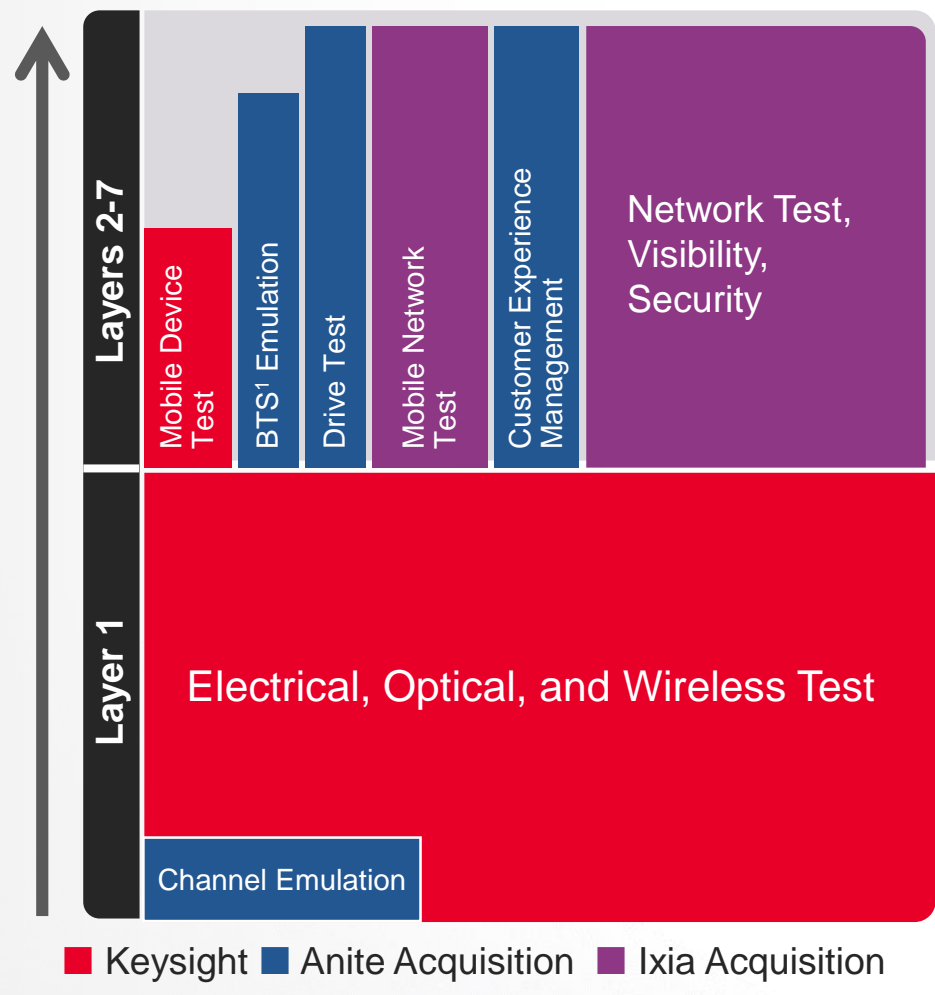
### Shift to the Cloud Challenges Existing Business Models

#### Restructuring of the market

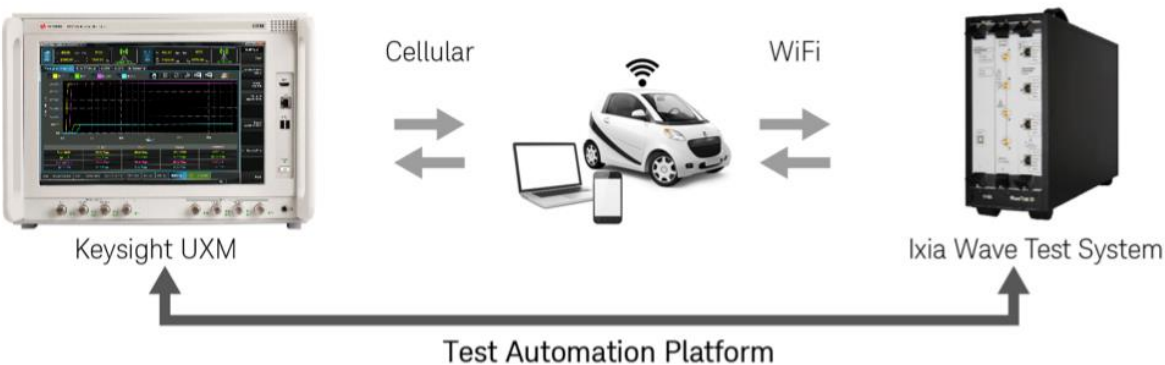
- Consolidations
- New, non-traditional customers

**INCREASED DEMAND FOR COST EFFECTIVE, WORLD-CLASS SOLUTIONS**

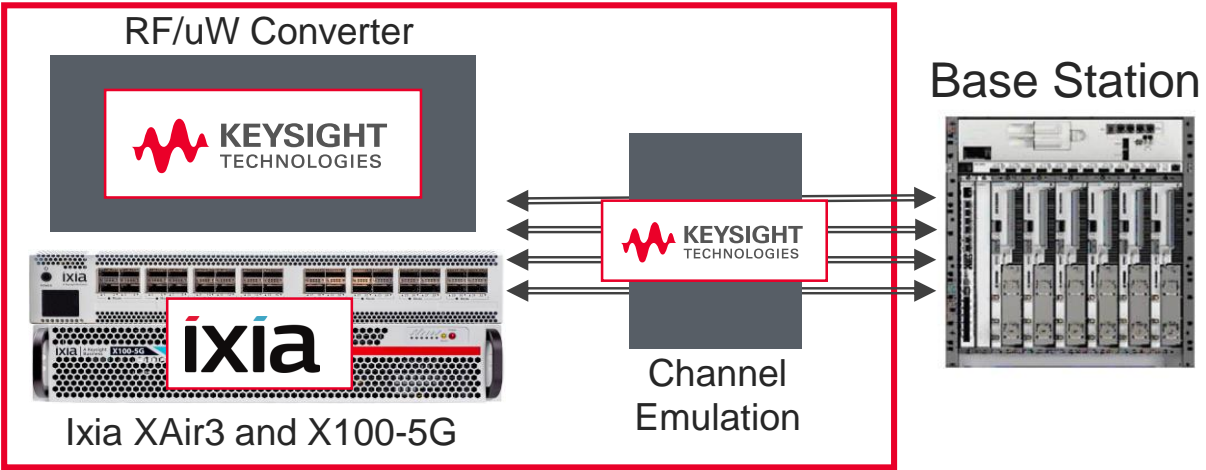
# Winning Combination Delivers New Solutions



## WiFi / Cellular Interworking

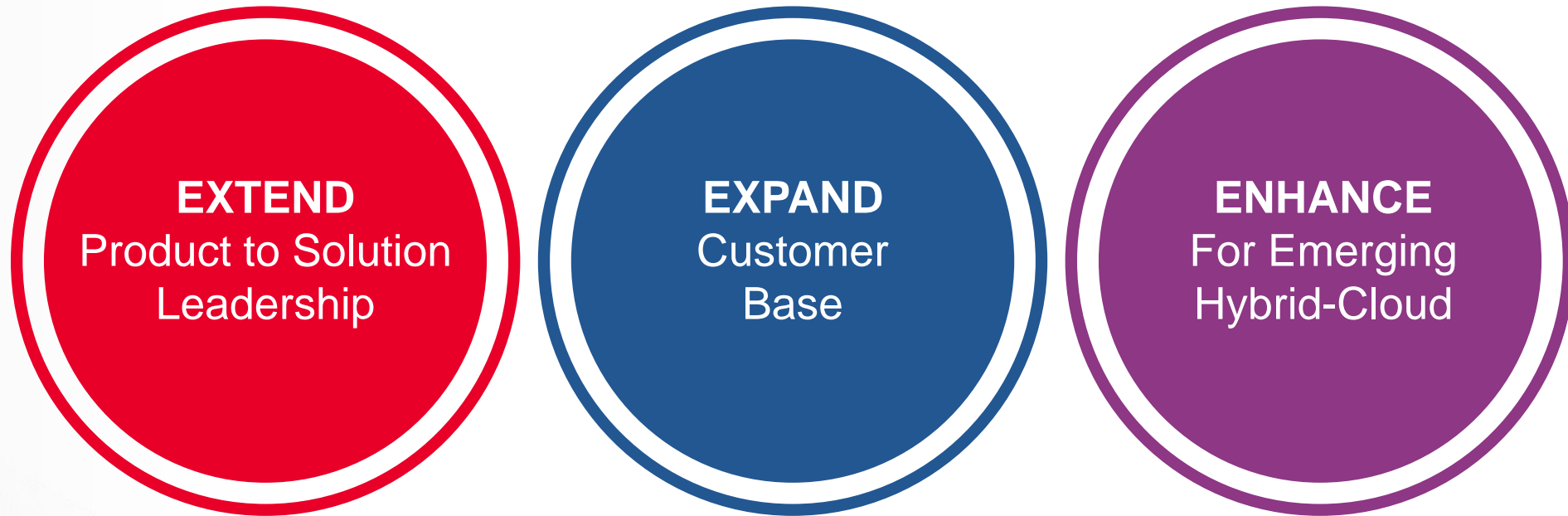


## 5G Network Stress Testing



+ Automotive, IoT, Video Test and more

# Ixia Solutions Value Creation Strategy



# Extend Product to Solution Leadership



- Be first-to-market with market-leading speeds and performance: 400G+, 5G, 802.11ax and SSL
- Streamline hardware platforms with fewer more scalable offerings across portfolio
- Leverage key software platforms for virtualization and cloud as networking evolves – new business models
- Develop sources of external innovation
- Provide complete solutions for application driven needs in enterprise cloud operations, threat intelligence and security risk reduction



**LEVERAGE PLATFORMS TO ENABLE END-TO-END SOLUTIONS**

# Expand Customer Base

- Capitalize on sales leverage
  - Geographic expansion in Europe and Asia-Pacific | Aerospace, Defense and Government and Primes | Tier 2 / Tier 3 Service Providers
- Increased go-to-market investment in visibility and security
- Continue to develop and enhance indirect go-to-market partners and programs
- Enhance solutions to include needed tools, deployment and support for target areas
- Combine IP and technology expertise from Keysight and Ixia
  - WiFi | 5G Base Station Test | Automotive Test



**CONTINUE STRATEGIC EXPANSION WITH NEW SOLUTIONS AND ENTERPRISE**

# Enhance intelligence and security for hybrid-cloud



- Offer our customers and partners
  - Increased network and application intelligence
  - Enhanced security solutions
- Highly scalable and software offerings for traditional, hybrid, and cloud networks
- Evolve visibility and test solutions for artificial intelligence and machine learning



**BUILD ON NETWORK EXPERTISE AND TECHNOLOGY LEADERSHIP**

# Keysight + Ixia Combination Extends Our Technology Leadership and Drives New Opportunities

Powerful  
long-term growth drivers

Combination of leading  
capabilities creating  
breakthrough products

Expanding customer  
base and market  
opportunities





# Electronic Industrial Solutions Group

**Gooi Soon Chai**

Senior Vice President, President - Electronic Industrial Solutions Group  
Head of Order Fulfillment and IT

# Electronic Industrial Solutions Group | Key Messages

1

Targeted investments to win in our markets with an emphasis on high growth and expanding end markets (high-value automotive, emerging IoT applications)

2

Rapid expansion of solutions for the connected and autonomous automobile

3

Strategy in place to continue to win and capture profitable growth from China semiconductor investments

4

Deep relationships with customers to provide next-generation solutions; leveraging our global presence, scale and decades of measurement expertise

5

Well-positioned to win through technology leadership

# Overview: Electronic Industrial Solutions Group

A Leader in Test and Measurement Solutions Across a Broad Set of Electronic Industrial End Markets

## FY'18 HIGHLIGHTS

Revenue	\$1.1B +15% YoY
Orders	\$1.1B +13% YoY
Operating Income <sup>2</sup>	\$0.25B +18% YoY
Operating Margin <sup>2</sup>	22.9% +40 bps

## \$4.8B ADDRESSABLE MARKET<sup>1</sup>

### AUTOMOTIVE



### GENERAL ELECTRONICS



### SEMI-CONDUCTOR



## KEY CUSTOMERS

- Automotive OEMs and components suppliers
- Electronics manufacturers
- Academic institutions
- Semiconductor foundries
- Semiconductor equipment manufacturers

# Global Trends Shaping the World

1

## PROLIFERATION OF CONNECTED DEVICES

- 20B connected devices by 2020<sup>1</sup>
- Each person will be connected to more than 10 devices by 2020<sup>2</sup>



2

## AUTOMOTIVE INDUSTRY TRANSFORMATION

- Electronic content in vehicles to double by 2030<sup>3</sup>
- 90% of new cars will be connected cars by 2020<sup>4</sup>
- 30% electric vehicles (EVs) by 2030<sup>5</sup>



3

## MASSIVE DATA VOLUMES

- 50 Trillion gigabytes of stored data by 2020<sup>6</sup>
- Demand for faster processing, low power, higher density integrated circuits



# Significant Steps Taken to Transform EISG



## INITIAL OBSERVATIONS

- Opportunities in high-value automotive, emerging IoT applications and China semiconductor investments
- Product-centric vs. solution-centric
- Realigning to needs of the ecosystem



## ACTIONS TAKEN FY17, FY18

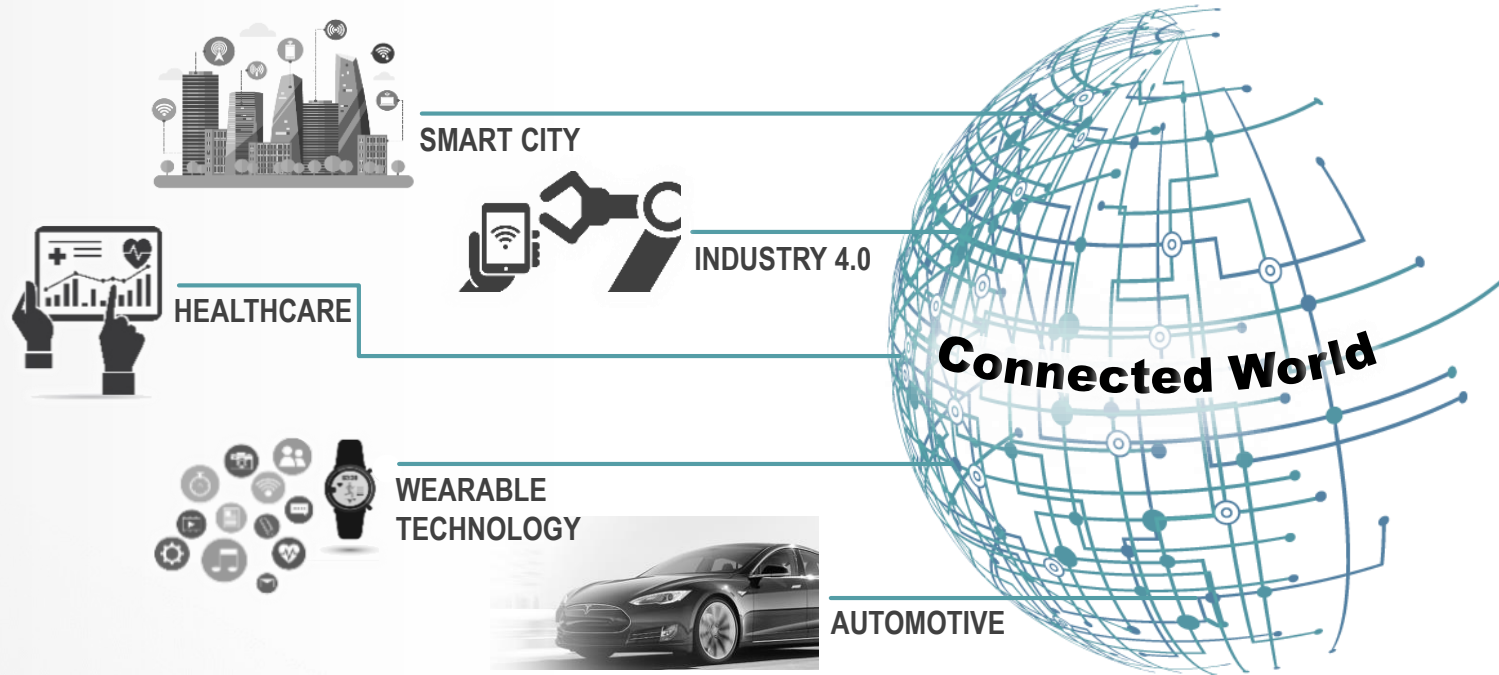
- Expanded into automotive and emerging IoT applications by broadening solutions portfolio
- Established Detroit and Japan Automotive Solutions Centers to complement existing presence in Europe (Germany) and Asia (China)
- Collaborated with key foundries to enable leading-edge process node migration and new memory architectures
- Focused on operational excellence through Lean activities across R&D and Supply Chain



## SIGNIFICANT ACCOMPLISHMENTS

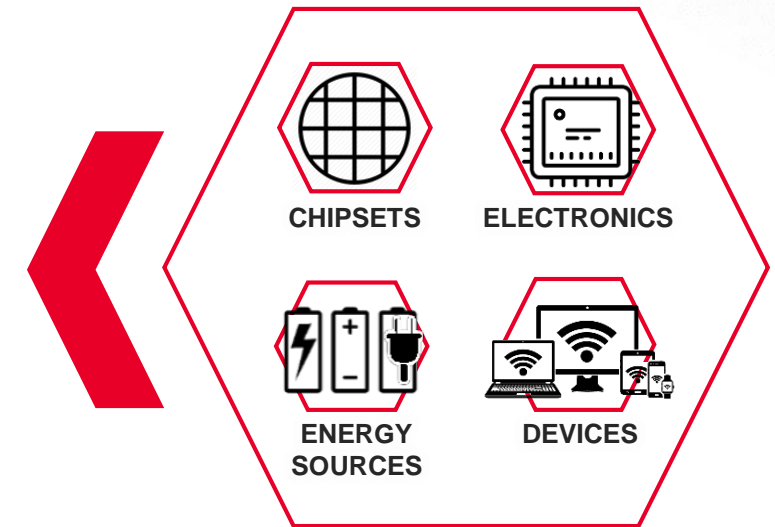
- Delivered 15% revenue growth and 18% profit growth in FY'18<sup>1</sup>
- Eight consecutive quarters<sup>2</sup> of double-digit Automotive and Energy order growth
- Added 100+ new automotive and IoT applications customers
- Introduced 70+ solutions for automotive and IoT
- Captured new investment in China foundries (new setup and expansion)

# Keysight Helps Accelerate Innovation to Connect and Secure the World



## OUR ROLE

Enabling building blocks that power the connected devices ecosystem



Providing End-to-End Solutions throughout the Innovation Lifecycle

**SIMULATE**

**PROTOTYPE**

**VALIDATE**

**MANUFACTURE**


**OPTIMIZE**

# Electronic Industrial Solutions Value Creation Strategy



**ACCELERATE**  
growth in the  
Connected Devices  
Ecosystem

- High-value automotive
- Emerging IoT



**ENABLE**  
technology  
advancement and  
expansion in the  
semiconductor  
industry

- Process nodes advancement
- Capture China semiconductor investments

# Solutions to Accelerate Growth in the Connected Devices Ecosystem



## CONNECTED DEVICES ECOSYSTEM



Smart Home



Personal Wearable



Medical Diagnostic



Industry 4.0



Digital Healthcare



Automotive

Growth

## KEYSIGHT DIFFERENTIATED SOLUTIONS

- Design Simulation
- Wireless Coexistence
- Compliance Tests
- RF Over-the-Air (OTA) Test Solutions
- Digital Signal and Data Test
- Battery and Power Consumption Test
- e-Mobility

PROVIDING SOLUTIONS TO ENABLE INNOVATION

# Providing Total Solutions for e-Mobility



**70+**  
**Solutions**  
**Introduced**  
**Over Past**  
**3 Years**

## INTELLIGENCE

### Electronics

- Engine Control Unit
- Body Control Unit
- Tire Pressure Monitoring Systems
- Safety (Radar and ADAS<sup>1</sup>)
- Airbag Control Unit



## CONNECTIVITY

### Telematics and Infotainment

- Navigation systems
- Automatic emergency call
- “Vehicle-to-everything” (V2X) communications
- Entertainment and information



## POWER

### Battery and Charging Infrastructure

- Li-ion cell performance test
- Charging function and interoperability test
- Power converters
- Optimize testing time from weeks to hours



## SECURITY

### Network and Safety

- Engine Control Unit (ECU) Security
- Automotive internet security
- Leveraging Ixia solutions



# Deliver Automotive Innovations through Multiple Technologies



Power Steering Control  
Rear-view Camera  
Backup Sensors  
Power Seat Control

Infotainment / Navigation Modules  
(DVD, eCalls, Hands-Free Telephony, GPS)

Climate Control System

Fuel Injection Module  
Power Train and Engine  
Management (MiL, SiL, HiL)

Emission Control Module

Radar Collision Avoidance

Adaptive Lighting Control

Hybrid Electric Vehicle  
(HEV) / Electric Vehicle (EV)

Electronic Stability  
Control Module

Remote Keyless Entry

Instrument Clusters

Personnel Occupancy  
Detection Systems  
(PODS) for Air Bag  
systems

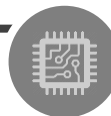
Anti-Lock Brake System  
Tire Pressure Monitoring System



Automotive  
OEMs



Electronic  
Components  
Suppliers



Semiconductor  
Chipset  
Manufacturers



Battery and  
Charging  
Infrastructure  
Providers



Compliance  
Lab

**PROVIDING BUMPER-TO-BUMPER TEST SOLUTIONS FOR THE CONNECTED CAR**

# Case Study: Winning Projects by Tailoring Testing Solutions (Radar Target Simulator)



## CUSTOMER NEED

Develop long-range radar for Advanced Driver Assistance Systems (ADAS)

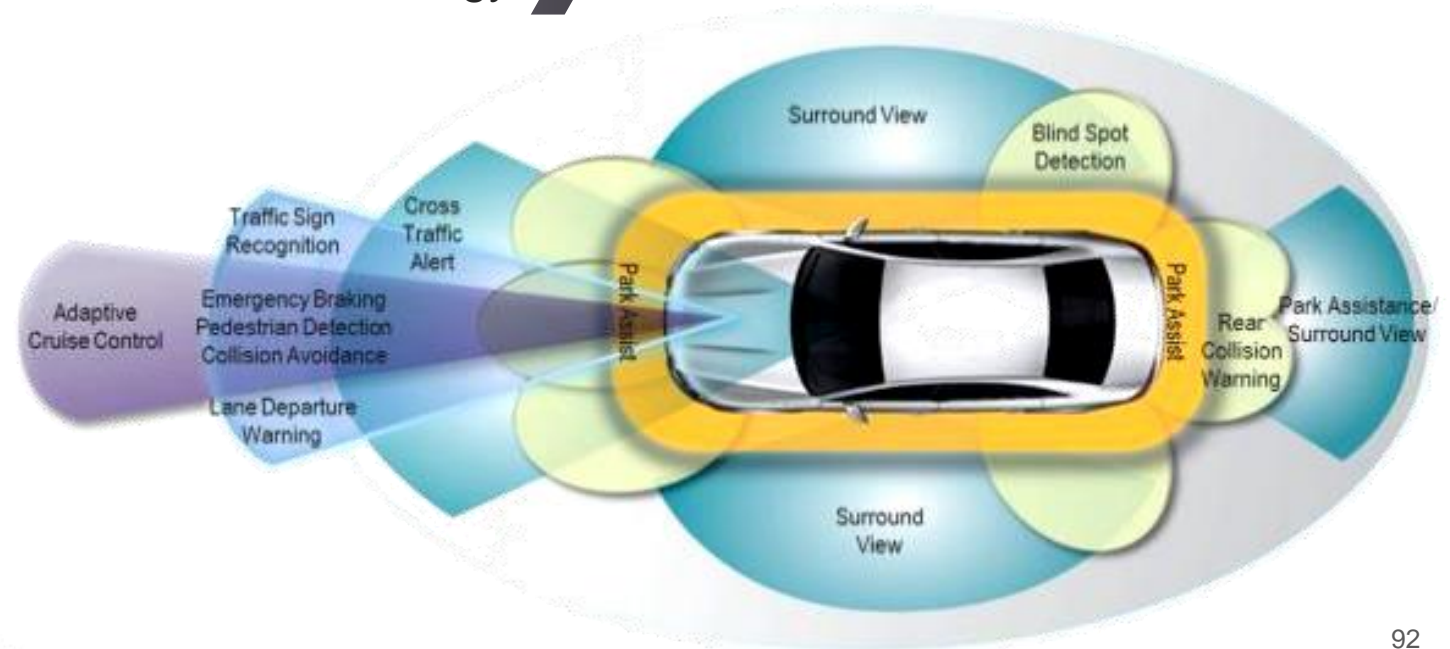
## The Challenge

Rapid developments in the autonomous vehicle with demand for greater safety features are fueling the need for highly sensitive and accurate auto radar technology

## The Solution

Provided a high-accuracy, high-throughput test solution to simulate radar targets in various realistic scenarios

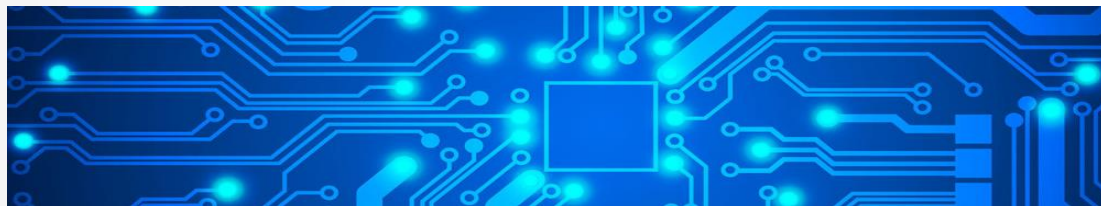
“Keysight solutions provide reliable and fast radar target simulation capabilities at a lower total cost of test.”



# Enabling Technology Advancement and Expansion in the Semiconductor Industry



## DRIVERS



### Continuously Shrinking Dimensions

- Smaller, faster and denser chipsets

### New Device Architectures

- 3D memory topology

### China

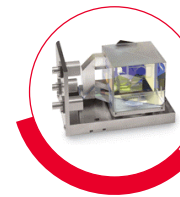
- Semiconductor Independence by 2025

## KEYSIGHT'S SOLUTIONS



### DESIGN VERIFICATION

- Device modeling and characterization



### PRECISION POSITIONING

- Nano-scale positioning supporting next-generation lithography process



### WAFER PARAMETRIC TEST

- In-line process monitoring and wafer acceptance test

TECHNOLOGY DIFFERENTIATION IN TARGETED MARKETS

# Case Study: Providing Parametric Solutions for Shrinking ICs



## MARKET NEED

Address complexity of shrinking integrated circuits (ICs)

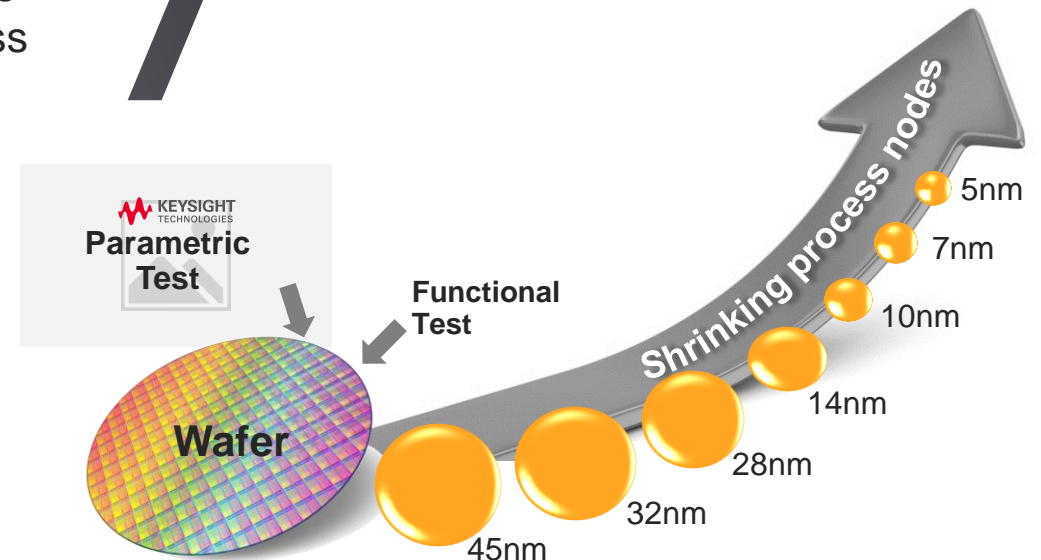
## The Challenge

- Advancements in device structure and new applications require IC chipsets that have higher performance and increased functionality
- As device size shrinks, packing these chips into a small area requires complex manufacturing process

## The Solution

State-of-the-art parametric test systems used to characterize wafer structure that enable customers to achieve faster time-to-market and lower cost-of-test

“Keysight parametric solutions used extensively by key wafer foundries for **leading-edge process nodes**.”



# A Leader in Test and Measurement Solutions; Positioned to Win through Technology Leadership

Delivered strong results:  
15% revenue and  
13% order growth in  
FY'18

Broad range of  
solutions and strong  
global reach to  
address the new  
connected world

Maintaining  
leadership and  
enabling technology  
advancement in  
semiconductor  
industry

Well-positioned to  
accelerate growth in  
automotive and  
emerging IoT  
segments





# Global Sales

**Mark Wallace**

Senior Vice President – Global Sales

# Global Sales | Key Messages

1

Deep and trusting customer relationships

2

Global scale, leverage and capability drives high efficiency and low selling cost

3

Optimizing structure, compensation and skills for industry focus and growth

4

Doubling frontline sales capacity without increasing cost envelope

5

Deploying enhanced digital demand generation capability

# Global Sales at a Glance

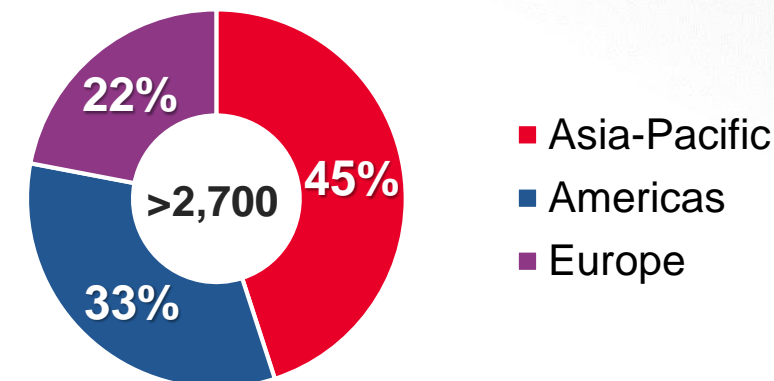
## OVERVIEW

- Large global footprint with 2,700+ customer-facing and customer support resources
- 600+ peaked solution, industry and application experts
- Dedicated global services sales channel
- Global network of 650+ channel resellers and solution partners (~75/25 direct/indirect channel)

## FY'18 KEY STATISTICS

<b>Total Orders</b>	<b>\$4.1B</b>
<b>Core Order Growth</b>	<b>12%<sup>1</sup></b>
<b>End Customers Served Annually</b>	<b>&gt;32,000<sup>2</sup></b>
<b>Countries Served</b>	<b>100+</b>
<b>Call Center Customer Touches</b>	<b>~1.3M</b>

## GEOGRAPHIC SALES TEAM



## CUSTOMERS

Unique access to industry leaders, innovators and decision-makers in commercial, government and education accounts

29 of 30 Top Technology Companies  
25 of 25 Top Auto Electronics Suppliers  
23 of 25 Top Aerospace and Defense Contractors<sup>3</sup>  
25 of 25 Top Engineering and Tech Universities



# Customer Buying Trends Are Driving Structural Shifts



## SHRINKING MARKET WINDOWS

- Invest earlier in pre-standards R&D
- Require innovative solutions to speed time-to-market



## OPERATIONAL DEMANDS

- Focused on:
- Reduced costs
  - Increased asset utilization
  - Optimized workflow



## INDUSTRY EXPANSION

- More companies creating smart, connected devices
- More complexity and challenges to get to market



## CHANGING BUYING PRACTICES

- Spend >50%<sup>1</sup> of buying journey online
- Use “good enough” negotiation

# Significant Steps Taken to Transform Global Sales



## FY16 OBSERVATIONS

- Great customer relationships, satisfaction and loyalty
- Viewed by market as trusted advisors with strong expertise
- Insufficient growth and reach
- Services sales not structured to capitalize on opportunity
- Sales tuned to products, not solutions



## ACTIONS TAKEN

- Shift to solutions-based selling
- Repurposed organization to increase frontline sellers
- Transformed marketing demand generation
- Deployed dual-channel model to grow services
- Maintaining Ixia specialist focus while leveraging Keysight's reach



## SIGNIFICANT ACCOMPLISHMENTS

- Increased frontline sales capacity by 30% FY16-FY18
- Grew FY18 5G solutions orders by triple-digits and automotive solutions by strong double-digits
- Captured multi-brand services business in every region

**DELIVERED 12% CORE ORDER GROWTH IN FY'18**

# Global Sales Strategy to Grow



**GROW**  
New Customers

- Double selling capacity
- Scale industry marketing to reach emerging customers



**ACCELERATE**  
Solutions

- Engage first and deeply with industry leaders
- Leverage first-mover advantage across entire ecosystem



**EXPAND**  
Services

- Deploy new services channel
- Improve customers' business results through services
- Increase attach rates

# Grow New Customers through Redeployment



## KEYSIGHT APPROACH

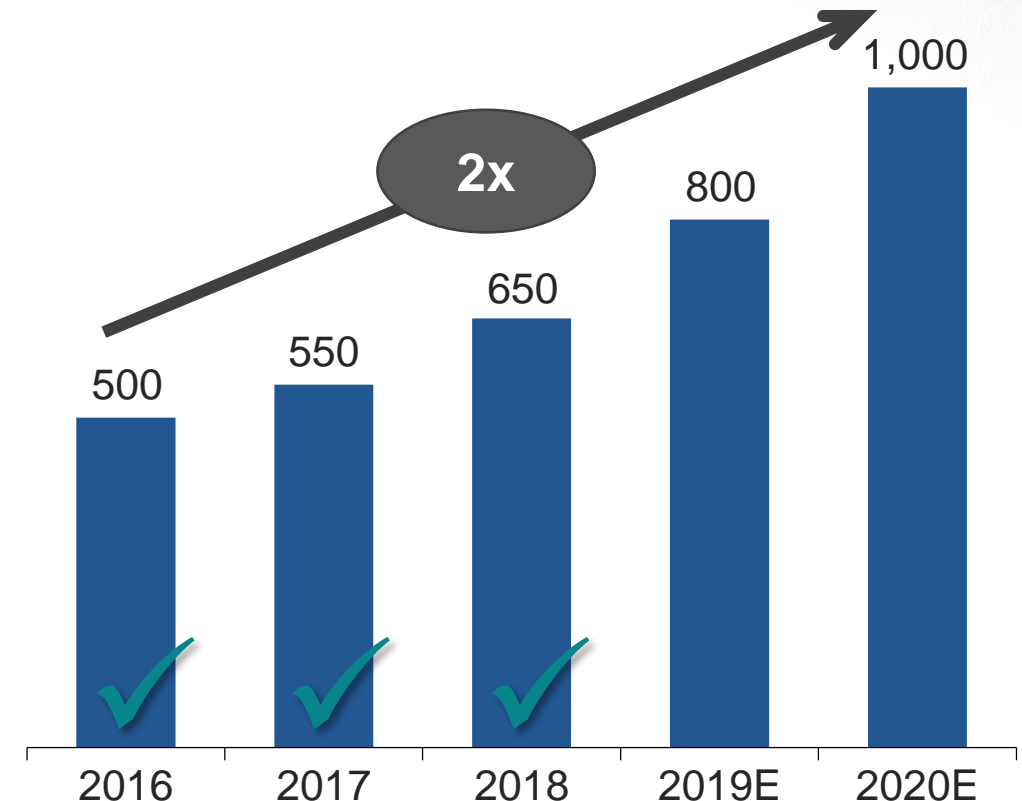
- Double frontline salesforce and deploy leading-edge, digital marketing to accelerate new customer acquisition
- Hold selling costs flat through resource reallocation and reinvestment



## 2018 RESULTS

- ✓ Double-digit lead generation growth
- ✓ Added 2,500+ new customers; grew broad regional account orders by 18%
- ✓ Delivered 12% core order growth<sup>1</sup>

## GLOBAL SALES FORCE GROWTH

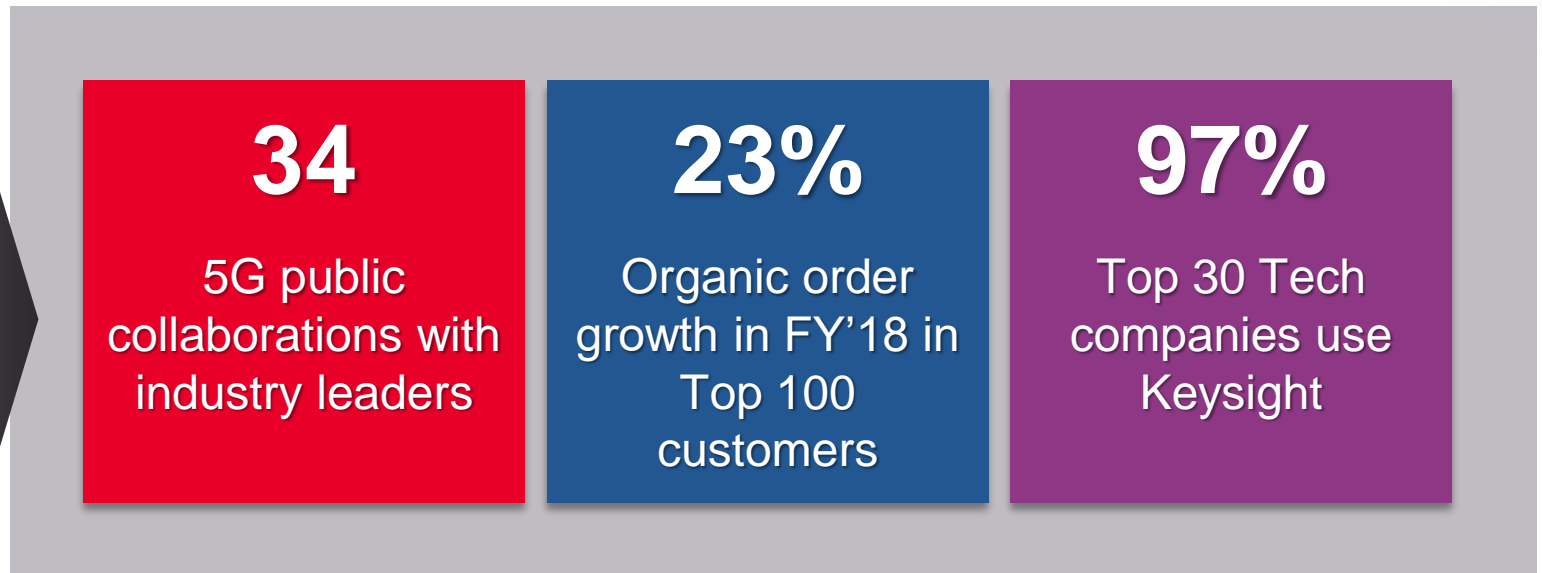


**INCREASE SELLING CAPACITY WITHOUT INCREASING SALES COSTS**

# Accelerate Solutions through Deep Customer Engagements Earlier in the Cycle



- Dedicated Keysight global account teams, focused on Tier 1 industry leaders and their global ecosystems
- Keysight customer engagement process harnesses Keysight's full capability – from sales to R&D to marketing – and aligns to customers' business priorities
- Regional Solutions Delivery Centers deliver local, responsive capability to customers' on-going solution needs



# Expand Services with Dual-Channel Model



## Renewals

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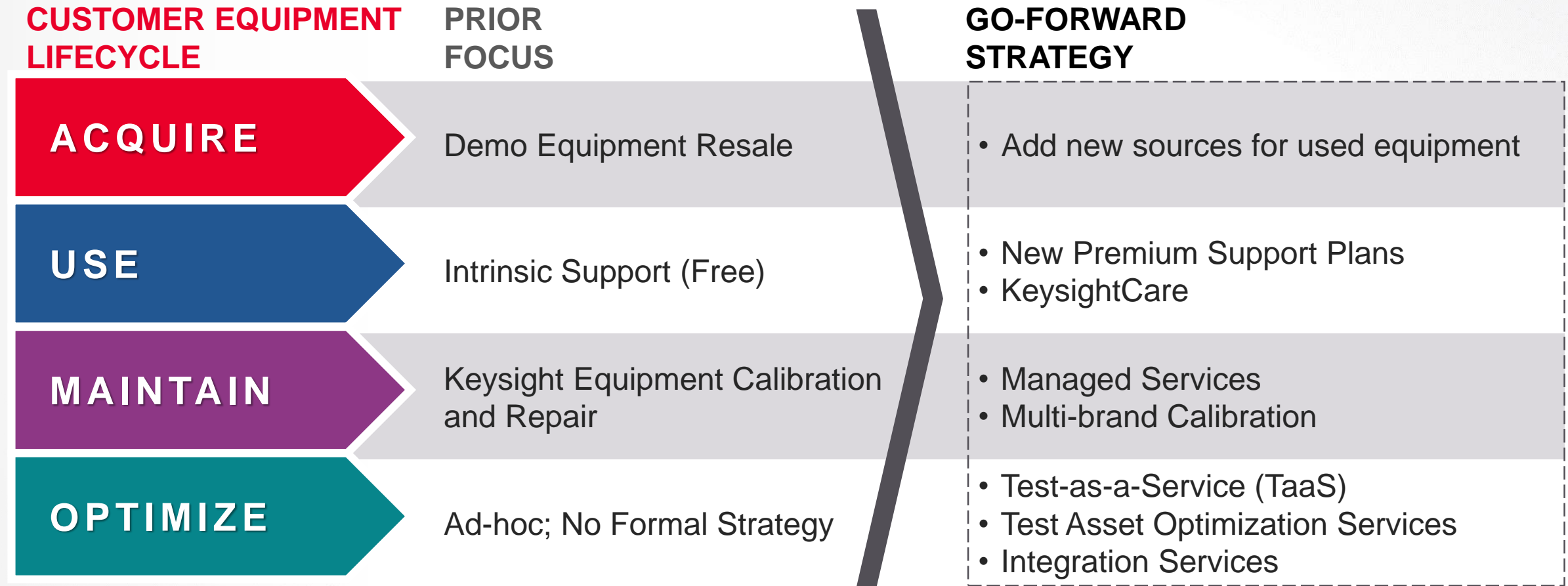
- Focused on maintaining a high renewal rate (>80%)
- Customer Success Specialists: distinctive roles who are experts at process

## New Business

---

- Channel tuned for new business acquisition
- Skills, measures, and incentive compensation aligned to new business capture

# Services: Integral to Solutions-Centric Approach



**EXPANDING SERVICE SOLUTIONS FOR THE ENTIRE LIFECYCLE**

# Focused Sales Deployment to Drive Growth

## THE SITUATION

Significant growth of R&D investments in communications sector in California

## THE CHALLENGE

Account teams focused on established accounts, no capacity for expansion

## THE SOLUTION

Complete management overhaul, account and territory restructuring and frontline sales expansion

- Changed **80%** of managers, increased sellers by **44%** and application experts by **30%**
- Created **Test-as-a-Service** lab to provide new business model options to customers
- With restructuring, sales have increased **50%**

**FOCUSED SALES DEPLOYMENT IN BAY AREA TO CAPITALIZE ON DISRUPTIONS**

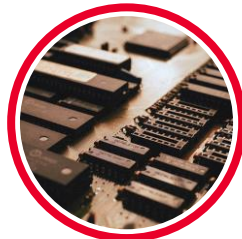
# Global Sales Driving Long-Term Growth

Well-positioned to  
capitalize on  
shifting customer  
trends

Distinct  
advantages enable  
greater customer  
value creation

Global scale and  
leverage drives  
growth  
with low selling  
cost

Doubling frontline  
sellers while  
maintaining flat  
selling costs





# Financial Update

**Neil Dougherty**

Senior Vice President and Chief Financial Officer

# Financial Update | Key Messages

1

Executed on targeted growth initiatives and gaining momentum

2

Delivering on our financial commitments

3

Driving expansion of operating margin

4

Increasing our focus on free cash flow conversion

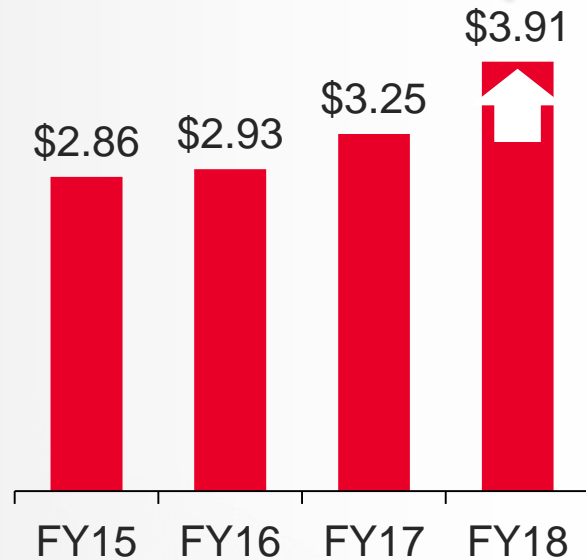
5

Transitioning to a more balanced approach to capital allocation

# Solid Performance Despite Transformation Investments

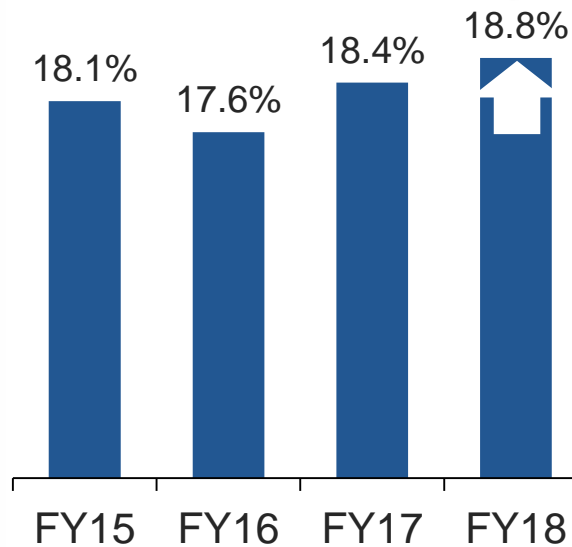
Revenue (\$B)<sup>1</sup>

**+20% y/y**  
**+13% core**



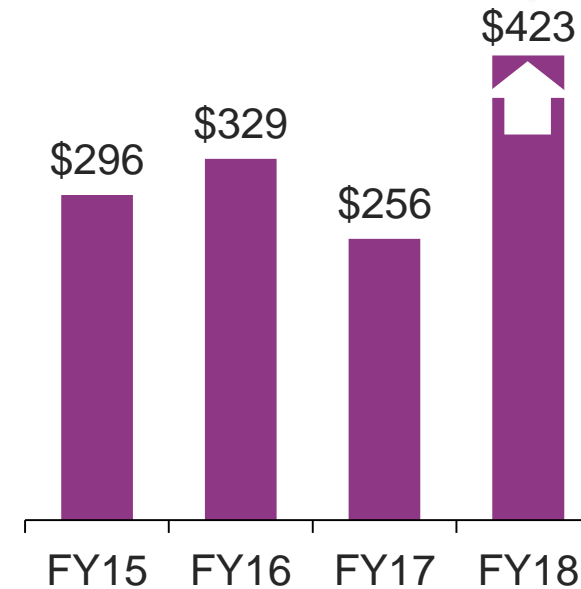
Operating Margin %<sup>1,2</sup>

**+0.4 pts y/y**



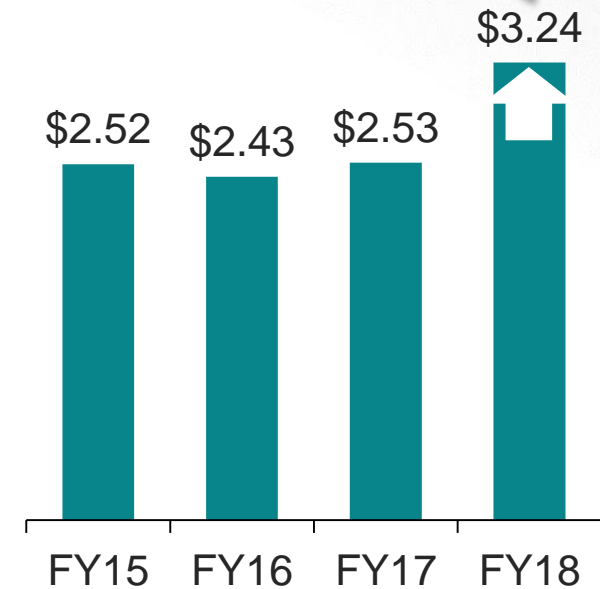
Free Cash Flow (\$M)<sup>1,3,4</sup>

**+65% y/y**



EPS<sup>1</sup>

**+28% y/y**



**Growth through share gains  
and M&A...**

**...operating margins in-  
line with target model...**

**... solid cash  
generation...**

**...and increasing  
earnings**

**POSITIONED TO EXTEND EACH OF THESE FINANCIAL METRICS**

# Delivering on Our Commitments

	COMMITMENT	PROGRESS
<b>Top-line Growth</b>	Achieve 4% revenue growth by FY'19	Achieved 13% core growth in FY'18 Four consecutive years of market share gains <sup>2</sup>
<b>Operating Margin<sup>1</sup></b>	Deliver 40% OM incremental on 4% core growth Baseline operating margin of 17-18%	Achieved committed incremental in FY'18 OM% above 17% each of last 3 years
<b>Anite Acquisition</b>	Synergies	Cost synergies achieved Revenue synergies ahead of plan (5G)
<b>Ixia Acquisition</b>	Mid-teens accretion to adjusted EPS within 24 months	Behind plan. Long-term thesis remains intact
<b>Growth Initiatives</b>	Drive growth in targeted market opportunities	4 of 5 initiatives ahead of target – 5G, automotive, software and modular on-track; services lagging
<b>EPS Growth<sup>1</sup></b>	Deliver 8-10% EPS growth by FY'19	Achieved 28% EPS growth in FY'18

# Flexible Balance Sheet and Capital Structure

## Leverage Profile

(\$M)	As of Q2'19 (\$M)
\$450M Revolving Credit Facility	Undrawn
3.30% Senior Notes due 2019	500
4.55% Senior Notes due 2024	600
4.60% Senior Notes due 2027	700
Gross Debt <sup>1</sup>	1,800
<b>Net Debt<sup>1</sup></b>	<b>520</b>
<b>Total Capital<sup>1</sup></b>	<b>4,598</b>
LTM Adjusted EBITDA <sup>1</sup>	\$1,047
Gross Debt-to-Capital	39.15%
Gross Debt-to-Adjusted EBITDA	1.72x

## Capital Structure

- ~\$1.7B available liquidity
  - \$1,277M cash/cash equivalents
  - \$450M revolving credit facility
- Committed to investment grade rating
 

<b>Moody's</b>	Baa3
<b>S&amp;P</b>	BBB-
<b>Fitch</b>	BBB
- Gross Debt-to-EBITDA Target of 1.75x - 2.25x

**AMPLE LIQUIDITY WHILE STRENGTHENING INVESTMENT GRADE POSITION**

# Keysight Leadership Model (KLM) – Dynamic Cost Structure Key to Value Creation

## LASER FOCUS ON COST MANAGEMENT

## STRUCTURAL FLEXIBILITY

## LONG-TERM EVOLUTION



- LEAN
- Eliminate waste
- Continuous improvement
- High G&A leverage
- Low-cost locations







- Minimal fixed cost growth
- Outsourced supply chain
- Indirect sales channel
- Variable pay scales with results
- Flexible expenses and technology leverage



- Allocate resources to highest return opportunities
- Proactive structural cost management
- Value engineering to reduce COGS

**EXPECT 40% INCREMENTAL OPERATING MARGIN ON CORE GROWTH AT OR ABOVE 4%**

# Driving Improved Operating Margin Targets<sup>1</sup>

	PRIOR TARGET	NEW TARGET BY 2021	IMPROVEMENT
Gross Margin	56-58%	61-63%	500 bps 
R&D %	13%	15%	200 bps 
SG&A %	25-27%	25-26%	(50) bps 
Operating Margin %	17-18%	21-22%	400 bps 



## DRIVERS

- Improved market position
- Operating leverage
- Favorable mix shift (SW, R&D)
- Ixia synergy realization
- Ongoing cost reductions

Operating Margin targets restated to reflect the Q1'19 adoption of ASU 2017-07, "Improving the Presentation of Net Periodic Pension Cost and Net Periodic Postretirement Benefit Cost"

# KLM – Resilience Over the Economic Cycle



Revenue Sensitivity

**-10%**

**BASELINE**

**+10%**

Operating Margin<sup>1</sup>

-3-4 ppts

17-18%



21-22%

**Current**

**2021**

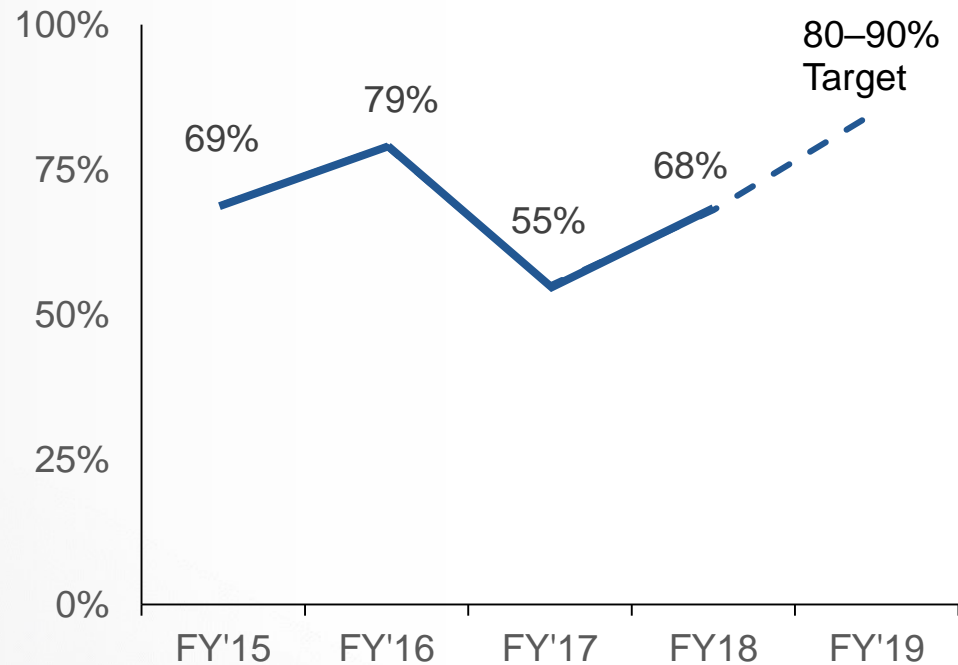
+2-3 ppts

Operating Margin targets restated to reflect the Q1'19 adoption of ASU 2017-07, "Improving the Presentation of Net Periodic Pension Cost and Net Periodic Postretirement Benefit Cost"

**ENABLED BY STRUCTURAL FLEXIBILITY OF BUSINESS**

# Improving FCF Conversion Post-Transformation

## Free Cash Flow Conversion<sup>1</sup>



## Large Investments Complete

- ✓ Post-separation IT investments
- ✓ Anite and Ixia acquisition integration completed
- ✓ Pension funding improved

**FCF CONVERSION<sup>1</sup> TARGET OF 80-90% BEGINNING IN FY19**

# Tax Reform Increases Balance Sheet Flexibility

## Tax Rate Reduction

Tax rate<sup>1</sup> reduced from ~17% in FY17 to 12% exiting FY18

## Increased Cash Availability

Move to modified territorial system increases projected U.S. cash availability from ~25% of FCF to 90%+

## Cash Repatriation

Deemed repatriation provided one-time U.S. cash influx of >\$500M in 2018 with associated net cash tax cost of ~\$95M, payable over 8 years

## Capital Deployment

Go-forward capital allocation strategy based on global cash generation

# Capital Allocation Priorities

## 1 Reinvestment in Core Business to Drive Organic Growth

- Maintain R&D investment at ~15% of revenue
- Average annual capex of ~\$100-120M<sup>1</sup>
- Increase sales channel capacity without increasing costs

## 2 Disciplined M&A

- Continued focus on tuck-in acquisitions
- Aligned with targeted growth strategies
- Focused on software, high-value automotive and services

## 3 Return of Capital

- Driven by return to organic growth
- Further enabled by tax reform
- \$350M share repurchase authorization
- Initial intent to offset share dilution

**TARGETED LEVERAGE OF 2X GROSS DEBT TO EBITDA**

# A Disciplined Approach to Acquisitions



## STRATEGIC CRITERIA

---

- Aligns with strategic growth priorities
- Expands Served Addressable Market (SAM)
- Increases/adds exposure to higher-growth end markets
- Provides high gross margin R&D or software solutions
- Adds key technology
- Expands services capability or reach



## FINANCIAL CRITERIA

---

- Accretive to EPS within 18 months
- ROIC materially above WACC by year 5
- Cost and/or revenue synergies

**Anite**

**ixia**

**scienlab**  
electronic systems

PSNA  
Electroservices  
Liberty Calibration  
Signadyne  
Thales Services Australia

# Great Position in Attractive \$16.3B Market<sup>1</sup>






Keysight Segments	Key Markets	Market Size <sup>1</sup>	End-Market Growth Rates <sup>1,2</sup>	Revenue <sup>3</sup>	Position <sup>4</sup>	Share
Communications Solutions	Commercial Communications	\$5.2B	3 - 6%	\$1.4B	#1	~27%
	Aerospace, Defense & Gov't	\$4.1B	2 - 3%	\$1.0B	#1	~24%
Electronic Indust. Solutions	Electronic Industrial	\$4.8B	2 - 3%	\$1.1B	#1	~23%
Ixia Solutions	Network Test & Visibility	\$2.2B	5 - 9%	\$0.4B	#1	~18%
Total		\$16.3B	3 - 5%	\$3.9B	#1	~24%

**KEYSIGHT'S CORE GROWTH EXPECTATION 4 – 5%<sup>1,2</sup>**



<sup>1</sup> Per Company estimates <sup>2</sup> 3-5 year average <sup>3</sup> FY'18 segment revenue excludes impact of deferred revenue fair value adjustment. Non-GAAP measure, refer to reconciliation in Appendix. Revenue values rounded to tie to \$3.9B total <sup>4</sup> Market-leading positions sources: Prime Data, IHS Technology, Company estimates. #1 in Network Test, #2/3 in Network Visibility

# Our Long-Term Expectations

	Previous Target (2015 Investor Day)	New Target
Core Revenue Growth <sup>1</sup>	Sustainable 4% CAGR	Sustainable 4-5% CAGR 
Operating Margin <sup>1</sup>	17-18%	21-22% 
EPS Growth <sup>1</sup>	8-10%	≥10% 

## ASSUMPTIONS:

- 21-22% operating margin to be achieved in 2021
- Share count maintained flat

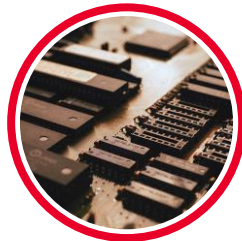
# Keysight Delivering Solid Performance and Growing EPS

Meeting or  
exceeding key  
financial goals

Increasing  
focus on FCF  
conversion

Returning  
capital  
driven by  
growth

Driving EPS  
growth



# Appendix

# Reconciliation of GAAP to non-GAAP Revenue

	FY18	FY17	FY16	FY15
GAAP Revenue	\$ 3,878	\$ 3,189	\$ 2,918	\$ 2,856
Acquisition-related Fair Value Adjustments	36	60	12	6
Non-GAAP Revenue	\$ 3,914	\$ 3,249	\$ 2,930	\$ 2,862

# Reconciliation of Income from Operations to non-GAAP Income from Operations

	FY18	FY17	FY16	FY15
<b>Income (loss) from operations, as reported</b>	\$ (394)	\$ 148	\$ 375	\$ 390
Goodwill impairment	709	-	-	-
Amortization of acquisition-related balances	265	256	56	23
Share-based compensation expense	59	56	49	55
Acquisition and integration costs	49	57	18	16
Separation and related costs	2	20	24	20
Legal Settlement	25	-	-	-
Gain on divestitures	(20)	-	-	-
Acquisition-related compensation expense	-	28	-	-
Northern California wildfire-related costs	7	16	-	-
Restructuring and related costs	17	11	-	14
Other	16	6	(7)	-
<b>Non-GAAP income from operations</b>	<b>\$ 735</b>	<b>\$ 598</b>	<b>\$ 515</b>	<b>\$ 518</b>
<b>GAAP Operating Margin</b>	<b>-10.2%</b>	<b>4.6%</b>	<b>12.9%</b>	<b>13.7%</b>
<b>Non-GAAP Operating Margin</b>	<b>18.8%</b>	<b>18.4%</b>	<b>17.6%</b>	<b>18.1%</b>

# Non-GAAP Net Income and Diluted EPS Reconciliation

	FY18	FY17	FY16	FY15
GAAP Net income	\$ 165	\$ 102	\$ 335	\$ 513
Non-GAAP adjustments:				
Goodwill impairment	709	-	-	-
Amortization of acquisition-related balances	265	256	56	23
Share-based compensation	59	56	49	55
Acquisition and integration costs	49	67	17	15
Legal settlement	25	-	-	-
Acquisition-related compensation expense	-	28	-	-
Separation and related costs	2	20	24	20
Pension curtailment and settlement expense (gains)	1	(69)	-	-
Northern California wildfire-related costs	7	16	-	-
Restructuring and related costs	17	11	-	14
Gain on divestures	(20)	-	-	-
Other	16	(4)	(7)	5
Adjustment for taxes	(677)	(21)	(55)	(213)
Non-GAAP Net income	\$ 618	\$ 462	\$ 419	\$ 432
Weighted average shares outstanding - diluted	191	182	172	171
GAAP Diluted EPS	\$ 0.86	\$ 0.56	\$ 1.95	\$ 3.00
Non-GAAP Diluted EPS	\$ 3.24	\$ 2.53	\$ 2.43	\$ 2.52

# Reconciliation of GAAP to non-GAAP Revenue by Segment

	GAAP Revenue	Acquisitions Related Fair Value Adjustments	Non-GAAP Revenue
<u>Revenue by Segment</u>	<u>FY18 (in millions)</u>		
Communications Solutions Group	\$ 2,391	\$ 1	\$ 2,392
Electronic Industrial Solutions Group	1,071	-	\$ 1,071
Ixia Solutions Group	416	35	\$ 451
Keysight	\$ 3,878	\$ 36	\$ 3,914

# Free Cash Flow as a Percent of non-GAAP Net Income

	FY18	FY17	FY16	FY15
<b>Net Cash Provided by Operating Activities</b> <sup>1</sup>	\$ 555	\$ 328	\$ 420	\$ 388
Less: Investments in PP&E	(132)	(72)	(91)	(92)
<b>Free Cash Flow</b>	<u>\$ 423</u>	<u>\$ 256</u>	<u>\$ 329</u>	<u>\$ 296</u>
Non-GAAP Net Income	618	462	419	432
FCF/NI	68%	55%	79%	69%

<sup>1</sup> restated for ASU 2016-09, Improvements to Employee Share-Based Payment Accounting.

# Reconciliation of Net Income to LTM Adjusted EBITDA

	LTM April 30, 2019
Net Income	\$ 274
Add: Provision (benefit) for Income Taxes	(432)
Income (loss) before taxes	<u>(158)</u>
Add:	
Interest Income	(17)
Interest Expense	80
Depreciation and amortization	<u>304</u>
<b>EBITDA</b>	<u>209</u>
Add back: Non-GAAP adjustments	
Goodwill Impairment	709
Amortization of acquisition-related balances	15
Share-based compensation expense	75
Acquisition and integration costs	16
Legal Settlement	25
Gain on divestitures	(13)
Pension curtailment and settlement expense (gains)	1
Restructuring and related costs	10
Net unrealized gain on equity investments still held	(3)
Other	<u>3</u>
<b>Adjusted EBITDA</b>	<u>\$ 1,047</u>

# Reconciliation for Gross Debt, Net Debt and Total Capital

	<u>As at April 30, 2019</u>	
	(in millions)	
Term Loan	\$	-
Senior notes, par value		(1,800)
<b>Gross Debt</b>	\$	<u>(1,800)</u>
Less:		
Cash and cash equivalents	\$	1,277
Restricted Cash		3
<b>Net Debt</b>	\$	<u>(520)</u>
Gross Debt as above	\$	1,800
Add: Shareholders equity		2,798
<b>Total Capital</b>	\$	<u><u>4,598</u></u>



# Executive Biographies

# Biographies



## RON NERSESIAN

### PRESIDENT AND CHIEF EXECUTIVE OFFICER

Ron Nersesian is president and chief executive officer of Keysight Technologies. In November, 2011, he was named executive vice president and chief operating officer of Agilent Technologies. The following year, in November 2012, he was promoted to president and chief operating officer.

When Agilent announced the separation of its electronic measurement business in 2013, Nersesian was appointed Keysight president and CEO and led the launch of the new company. Keysight became a public, independent company in November 2014.

Nersesian began his career in 1982 with Computer Sciences Corporation as a systems engineer for satellite communications systems. In 1984, he joined Hewlett-Packard and served in a range of management roles during his tenure.

In 1996, Nersesian joined another industry player as vice president of worldwide marketing. He subsequently assumed other senior management roles through 2002, including senior vice president and general manager of the company's digital storage oscilloscope business.

Nersesian joined Agilent Technologies in 2002 as vice president and general manager of the company's Design Validation Division. In 2005, he was named vice president and general manager of the company's Wireless Business Unit and manager of Agilent's Santa Rosa, California site. In 2009 Nersesian was named president of Agilent's Electronic Measurement Group.

Nersesian holds a bachelor's degree in electrical engineering from Lehigh University and an MBA from New York University, Stern School of Business. He also serves as an independent director on the Board of Directors of Trimble Inc. and as a member of Georgia Tech's Advisory Board.

# Biographies



## NEIL DOUGHERTY

### SVP AND CHIEF FINANCIAL OFFICER

Neil Dougherty is senior vice president and Chief Financial Officer of Keysight Technologies. As CFO Dougherty leads the company's global finance operations including tax, treasury, and investor relations.

Dougherty joined Hewlett-Packard in 1996 as a financial analyst. He subsequently held division and business unit controllership positions with both H-P and Agilent before becoming Agilent's assistant treasurer in 2006. In 2010, Dougherty joined Corporate Development as a senior director where he was responsible for domestic and international acquisitions and divestitures. Dougherty was most recently Agilent Technologies' vice president and treasurer.

Dougherty holds an MBA from the University of Chicago Booth School of Business, and a B.A. in economics from the University of California, San Diego.

# Biographies



## JAY ALEXANDER

### SVP AND CHIEF TECHNOLOGY OFFICER

Jay Alexander is senior vice president and chief technology officer of Keysight Technologies.

Alexander leads Keysight's centralized planning and technology development team to focus on top opportunities and market trends to address unmet needs. Alexander's role is to optimize Keysight resources to grow in areas that provide competitive advantage across the ecosystem, and to leverage Keysight's world-class technology and platform offerings.

Alexander has held numerous leadership positions within Agilent's Electronic Measurement Group, including his most recent role as vice president and general manager for the Oscilloscope and Protocol Division.

Alexander joined Hewlett-Packard (HP) in 1986 as a manufacturing and test engineer. During his tenure, Alexander has served as a test engineering manager with HP's Oscilloscopes and Logic Analyzers group; product planning manager for Agilent's Design Verification Division, marketing manager in Agilent's Network and Digital Solutions Business Unit and served as Agilent's electronic measurement architecture and business intelligence manager.

Alexander earned a bachelor's degree in electrical engineering from Northwestern University and a master's degree in computer science from the University of Colorado at Boulder. He is a licensed professional engineer and a senior member of IEEE. He holds 24 U.S. patents.

# Biographies



## SATISH DHANASEKARAN

### SVP, PRESIDENT – COMMUNICATIONS SOLUTIONS GROUP

Satish Dhanasekaran is senior vice president of Keysight Technologies, and president of the Communications Solutions Group (CSG).

Named CSG president in July 2017, Dhanasekaran leads the \$1.8 billion business which addresses the complete communications ecosystem which includes wireless, wireline and aerospace and defense design and test businesses.

Dhanasekaran was most recently the company's vice president and general manager, Wireless Devices and Operators business segment. In this role, he managed solution conception, development, and go-to-market strategies of design and test solutions for the wireless industry. He led transforming Keysight's portfolio to test software layers in mobile devices. Prior to that, he served as marketing manager for Keysight's Microwave and Communications Division which produced industry-leading performance products in the RF space. During his career with Agilent Technologies and Keysight Technologies, Dhanasekaran has held a variety of customer-facing leadership positions, including wireless 4G business development manager and national application engineering manager.

Before joining Agilent Technologies in 2006, Dhanasekaran worked at Motorola designing and leading development for first-generation smartphone devices.

Dhanasekaran holds a master's degree in Electrical Engineering from Florida State University. He actively sponsors Keysight representation in standards bodies such as 3GPP, CTIA - The Wireless Association, GCF/PTCRB and industry consortia including IMT-2020 and the International Wireless Industry Consortium (IWPC).

# Biographies



## GOOI SOON CHAI

### SVP, PRESIDENT – ELECTRONIC INDUSTRIAL SOLUTIONS GROUP

Gooi Soon Chai is senior vice president, Keysight, and president of the Electronic Industrial Solutions Group which addresses the automotive, energy, general electronics, manufacturing, and semiconductor businesses.

Gooi is also responsible for Keysight's Order Fulfillment, Global Procurement and IT functions. This includes the end-to-end supply chain that encompasses Manufacturing Operations, Engineering, Technology Centers and Worldwide Logistics; Global Procurement and Strategic Supplier Management; as well as IT infrastructure and application services.

Gooi was previously the president of Agilent Order Fulfillment for the company's Life Sciences, Chemical Analysis and Electronic Measurement business groups. He was responsible for leading efforts to leverage the company's strength in supply chain and engineering operations across the three business groups.

In 2006, he was named the vice president and general manager of the Electronic Instruments Business Unit (EIBU) at Agilent Technologies. In this role, he managed a diverse portfolio of businesses serving the general purpose, semiconductor, board-test and nanotechnology markets.

He holds a bachelor of science degree, with first class honors, in electrical and electronics engineering from the University of London, and a master of science degree in computing science from the Imperial College of Science and Technology, London.

# Biographies



## MARK WALLACE

### SVP – GLOBAL SALES

Mark Wallace is senior vice president, global sales for Keysight. As the leader of the company's global sales function, Wallace is responsible for orders and customer satisfaction for the company.

Most recently, Wallace was vice president and general manager of the Americas Field Operations for Keysight. Prior to that position, Wallace held a variety of leadership positions across sales, marketing, and channel management.

Wallace joined Hewlett-Packard in 1985 as a field engineer selling test and measurement products to the wireless industry. In 1995, he was named global business development manager responsible for sales and business development in Asia and Europe for major wireless accounts. Two years later, he was promoted to wireless sales manager for major accounts in the U.S.

Following the Agilent split from Hewlett-Packard in 1999, Wallace joined the Wireless Business Unit as channel manager responsible for global account management and business development into the wireless industry worldwide. He was later promoted to worldwide marketing manager responsible for all inbound and outbound marketing within the Wireless Business Unit. In August 2004, he was named national sales manager within North America and through several assignments has managed all portions of the US and Canadian test and measurement sales organizations, until his promotion to Americas Field Operation vice president in November 2011.

Wallace graduated from the Illinois Institute of Technology with a bachelor's degree in electrical engineering in 1987 and has attended the University of Chicago for executive studies. He is a member of IIT's Armour College of Engineering Advisory Board.

# Biographies



## MARK PIERPOINT

### SVP, PRESIDENT – IXIA SOLUTIONS GROUP

Mark Pierpoint is senior vice president of Keysight Technologies, and president of Keysight's Ixia Solutions Group which provides network test and visibility solutions for validating, optimizing and securing networks.

Before being named ISG president in 2018, Pierpoint served as vice president and general manager of the Internet Infrastructure business within the Communications Solutions Group at Keysight Technologies, where he was responsible for developing and delivering solutions across the commercial communications network from network access points to data centers and the cloud. Prior to this, he led Keysight's move in modular products, growing the business to over \$150 million in FY'15.

Pierpoint joined the company in 1987, when it was still part of Hewlett-Packard. He has held multiple management positions in R&D, sales, marketing, and operations across various businesses within Hewlett Packard and Agilent Technologies in both the United States and Europe.

Pierpoint holds a Ph.D. in Microwave Engineering, and a B.Sc. in Electrical and Electronic Engineering from the University of Leeds in the UK.