

Maximizing Cost Efficiencies and Productivity for AMOLED Backplane Manufacturing

Elvino da Silveira



Agenda

Introductions & Trends

Consumer products driving
AMOLED Adoption!

Lithography Challenges

Devices performance increase
lithography requirements

Meeting the Challenges

Innovative solutions to meet
demanding cost targets!

Future Solution

Beyond lithography,
process control!

Introduction

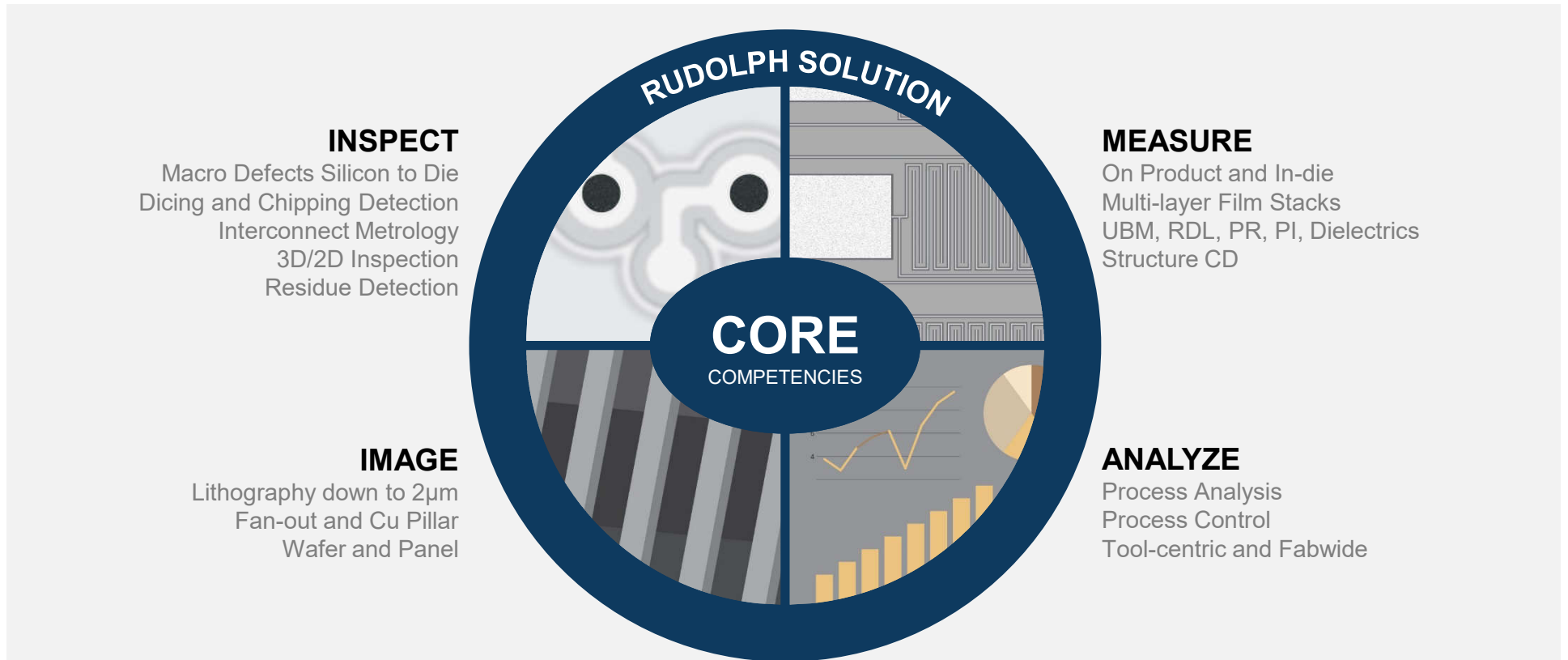
ELVINO DA SILVEIRA

Vice president of business development at Rudolph Technologies, with responsibilities to identify new markets and develop strategies to prosecute the opportunities. Until the Rudolph acquisition in December 2012, he served as president and operations manager of Azores since its inception in March 1999. Prior to forming the company, he was employed by MRS Technology, Inc., as the vice president of operations and worldwide customer support. da Silveira has also held engineering and customer support roles at Hampshire Instruments from 1991 to 1993 and GCA/General Signal from 1984 to 1991. Mr. da Silveira holds a B.S. in Mechanical Engineering from Northeastern University.



About Rudolph

Process solutions across the semiconductor industry



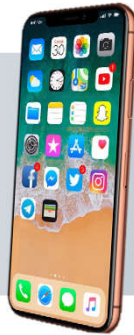
AMOLED Trends

Increased Mobility & Function Driving New Technology Adoption

*Adoption of
AMOLED*



*Products driving
more adoption*



*New Form
Factors*



*Next generation
products*



OLED Materials

Flexible Substrates

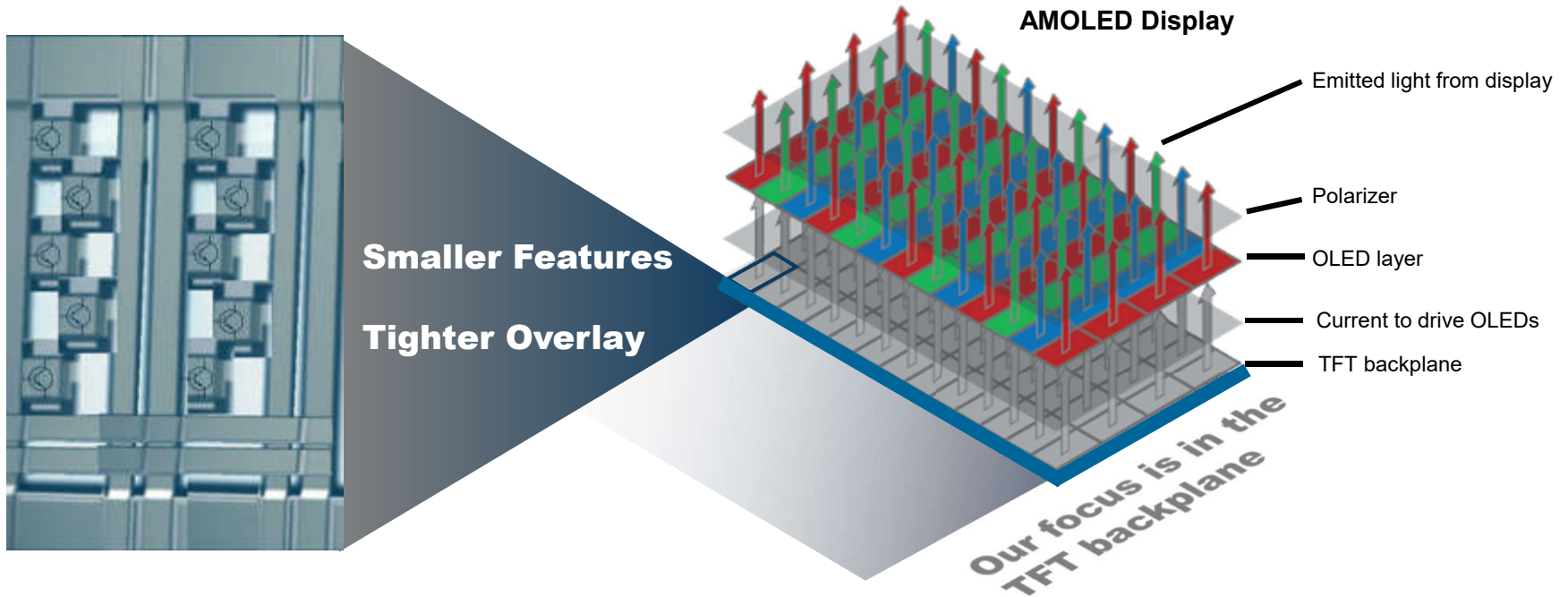
*Higher pixel per
inch (PPI)*

Trends Mandate Changes in Display Production Equipment

Source: IHS

AMOLED Display Overview

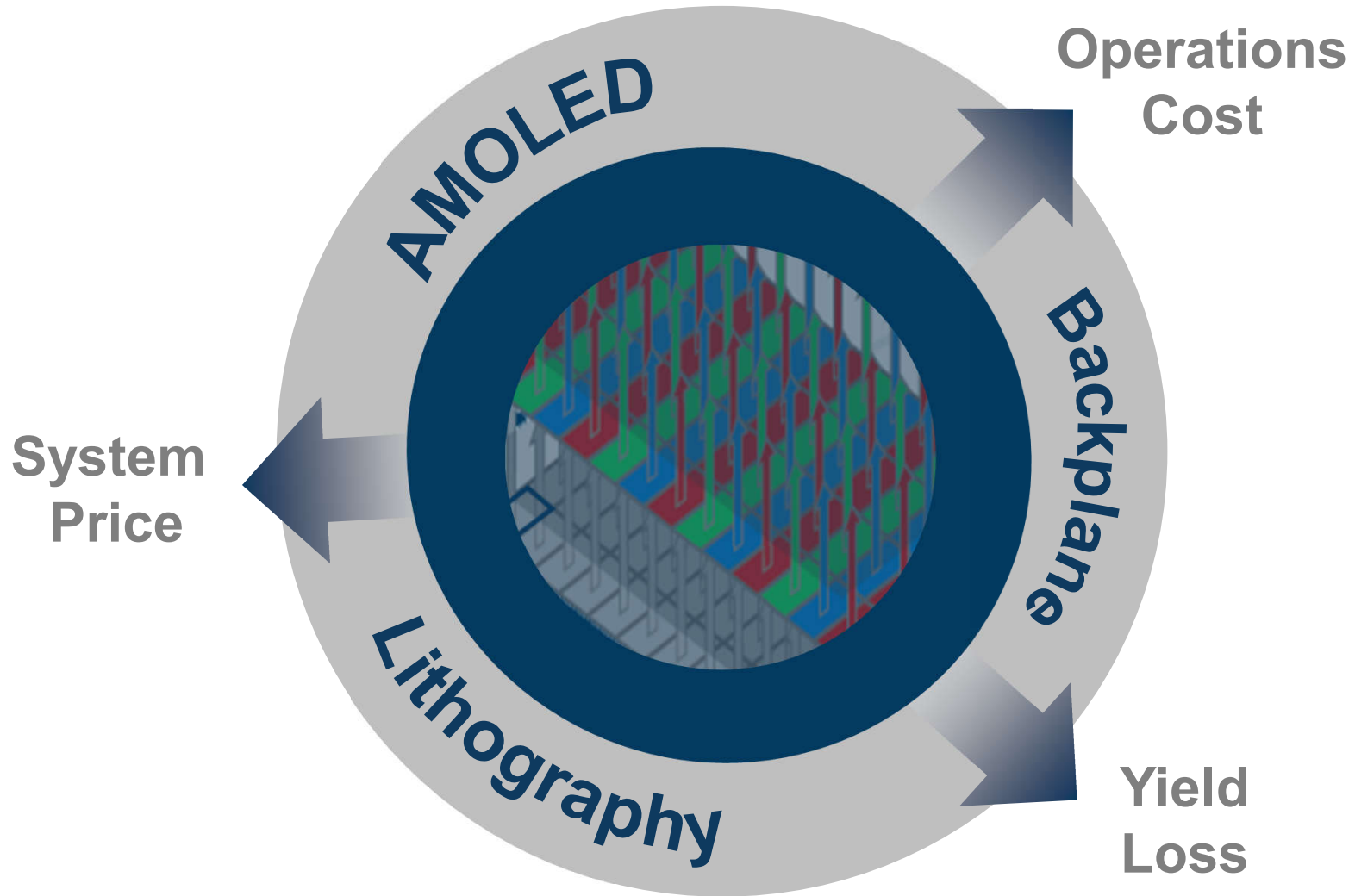
Backplane common to all displays



**Increasing number of transistors and electrical requirements
Drive stringent lithography to meet AMOLED backplanes**

Building Up the Model

AMOLED cost drives



Lithography Solution Based on innovation

Technology

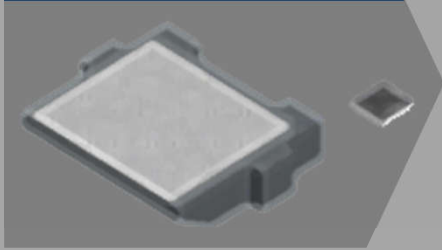
METROLOGY



LARGE FIELD LENS



SCALABLE STAGE



Software Capability

PARALLEL EXPOSURE

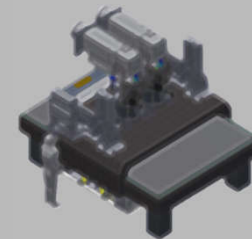


SOFTWARE SUITES



AMOLED Solution

G6 LITHOGRAPHY



Leveraging Technology and Software

Tolling Cost

GEN 6 MASK SIZE COMPARISON GRAPHIC

Glass Size: 177.6 mm x 177.6 mm

Cost: USD \$2-3k per mask

Magnification: 1.25x (enlarger)

Number of Masks per exposure: 2

GEN 6 COST COMPARISON

850 mm x 1200 mm

Cost: USD >\$30k per mask

Magnification: 1:1

Number of Masks per Exposure: 1

Size A: 850*1200

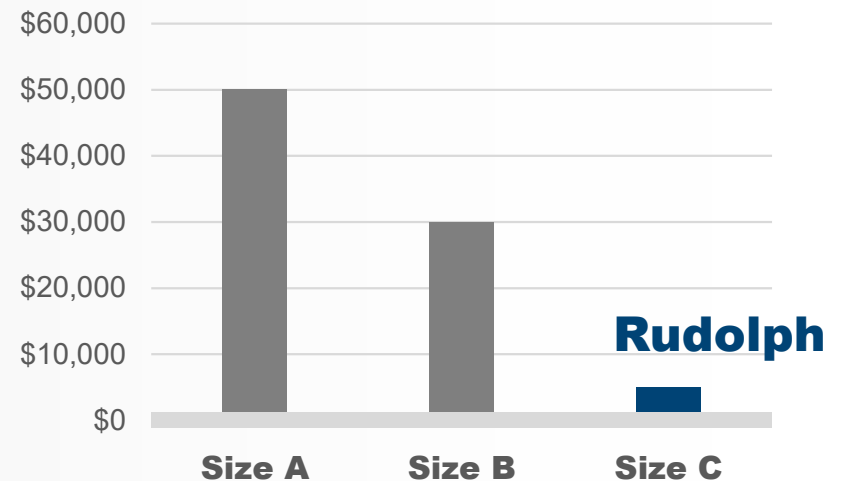
Size B: 800*920

Rudolph

Size C: 177.6*177.6mm



Individual Mask Cost



Reduce Costs and Improve Utilization

Reduces Consumables Costs

No lamp replacement (est. 79K savings/year)

Reduces Operation Costs

> 21000 KW/mo and 500 CFM cleanroom air

Improves Performance

Better dose control

Increases Throughput

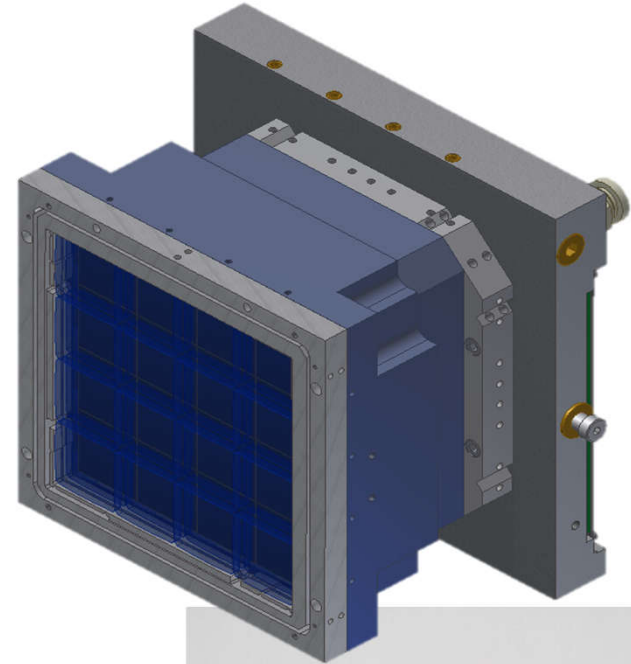
No shutter delays

Higher System Utilization

No machine down to replace lamp

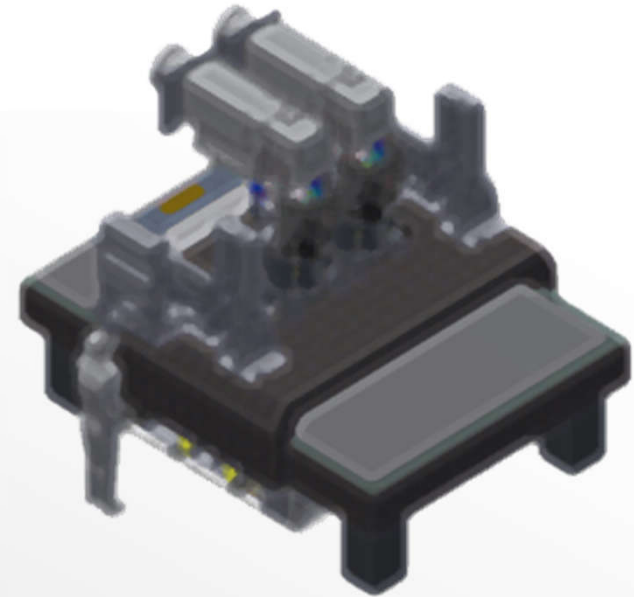
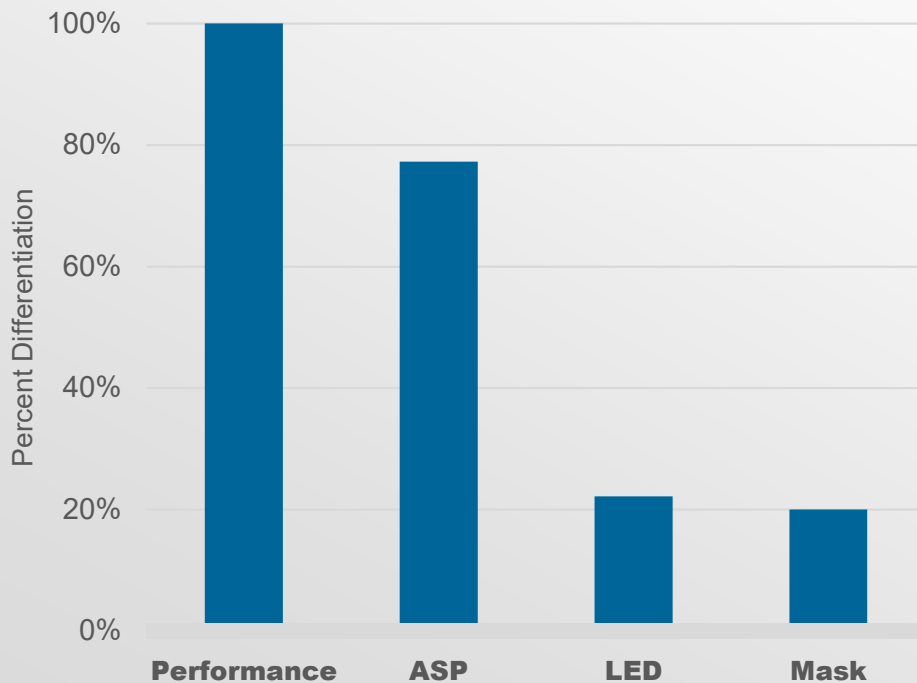
Improved Reliability

No moving parts



Lithography Cost Differentiation

Percent Reduction Comparison



Equal Performance

22% Lower ASP

LED Light Source

No High Power Hg Lamp
>70% Lower Consumable Cost

Lower Mask Cost

Results >5X savings per layer

Superior Value of Ownership

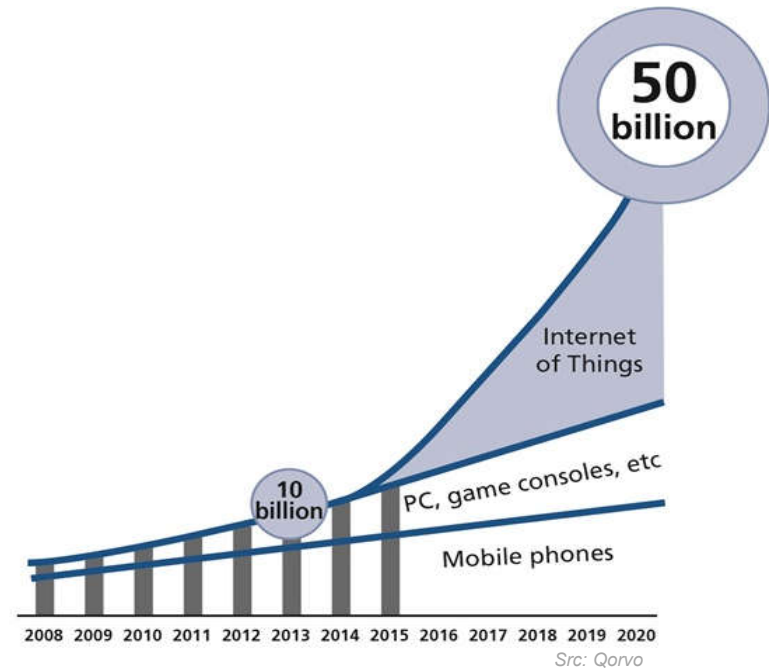
Addressing Quality in the Display Industry

Increased complexity

Higher unit counts and I/O

Strict quality-control metrics

Digital Threading enabled for rapid product diagnostics

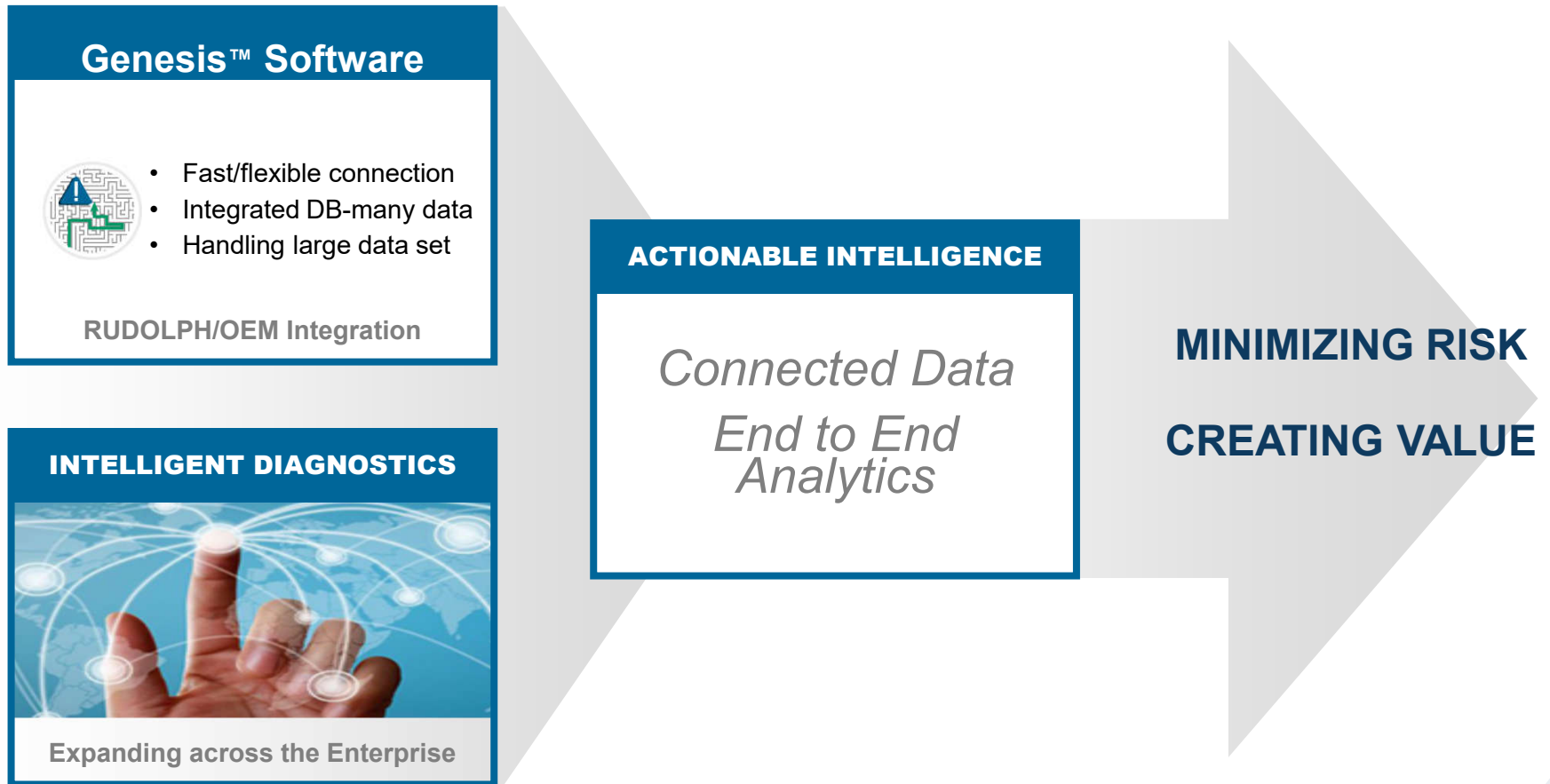


APPLE ON THE IMPORTANCE OF QUALITY

*“We started off with a very idealistic perspective-that doing something with the highest quality, **doing it right the first time**, would really be cheaper than have to go back and do it again”*

Software Expanding Rudolph Value

Innovative software solutions contributing to Rudolph growth



Summary

Comprehensive Solution

Accelerated Adoption of AMOLED in Mobility Products

Increased unit counts and AMOLED Adoption

Driving need for comprehensive cost containment solutions

Integrated Solutions Address

Factory Wide Monitoring and Diagnostics,

Capability to Expand into Enterprise

谢谢 | 謝謝

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ありがとう

Thank You!

감사합니다

merci

obrigado

info@rudolphtech.com
www.rudolphtech.com

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