Delivering IP the Way Chip Designers Want

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EDPS
Monterey, CA
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Big trends are driving market growth

Mobility

250M+ tablets in 2014

Internet of Things

50B devices by 2020

Cloud Computing

3.3 ZB traffic with 25% CAGR

Sources:
idc.com
cisco.com
marketsandmarkets.com

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Great opportunities for creative technology

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Challenges

Incredible pace of innovation

Samsung photos courtesy of http://www.pcmag.com/slideshow/story/309047/samsung-s-smartphone-history-from-zero-to-galaxy-s4/10

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Increasing time-to-market pressures

Samsung photos courtesy of http://www.pcmag.com/slideshow/story/309047/samsung-s-smartphone-history-from-zero-to-galaxy-s4/10

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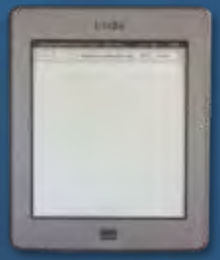
Big changes with each new generation

	Kindle 2007	Kindle Touch 2011	Kindle Fire HD 2012	Kindle Fire HDX 2013
				
Processor	1 x ARM 11*	1 x ARM A8	2 x ARM A9	4x ARM A15**
Storage	250MB	4GB	Up to 64GB	Up to 64GB
Display	4 grayscale levels	16 grayscale levels	1920x1200 HD	2560x1600 HD
Interfaces	Keyboard, CDMA	Touch screen, 3G, Wi-Fi	Touch screen, 4G LTE, dual-band Wi-Fi, Bluetooth, HDMI, accelerometer, gyro, Dolby audio, HD front camera	Touch screen, 4G LTE, dual-band Wi-Fi, Bluetooth, HDMI, accelerometer, gyro, Dolby audio, HD front camera, 8MP rear camera

Notes: * Kindle's Marvell Xscale CPU core comparable to ARM 11
** Kindle Fire HDX's Qualcomm Snapdragon CPU cores comparable to ARM A15

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Ever changing standards

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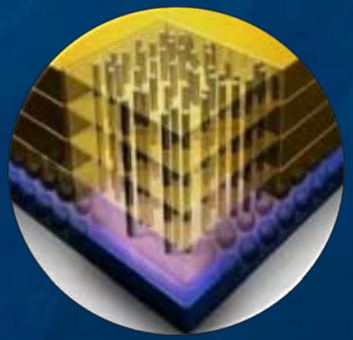
New packaging technologies

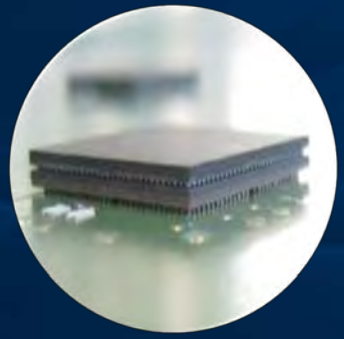
2.5D and 3D packaging

- Much more complexity
- Thermal constraints
- Reliability
- Cost



Through Silicon Vias

Stacked die



Package-on-package

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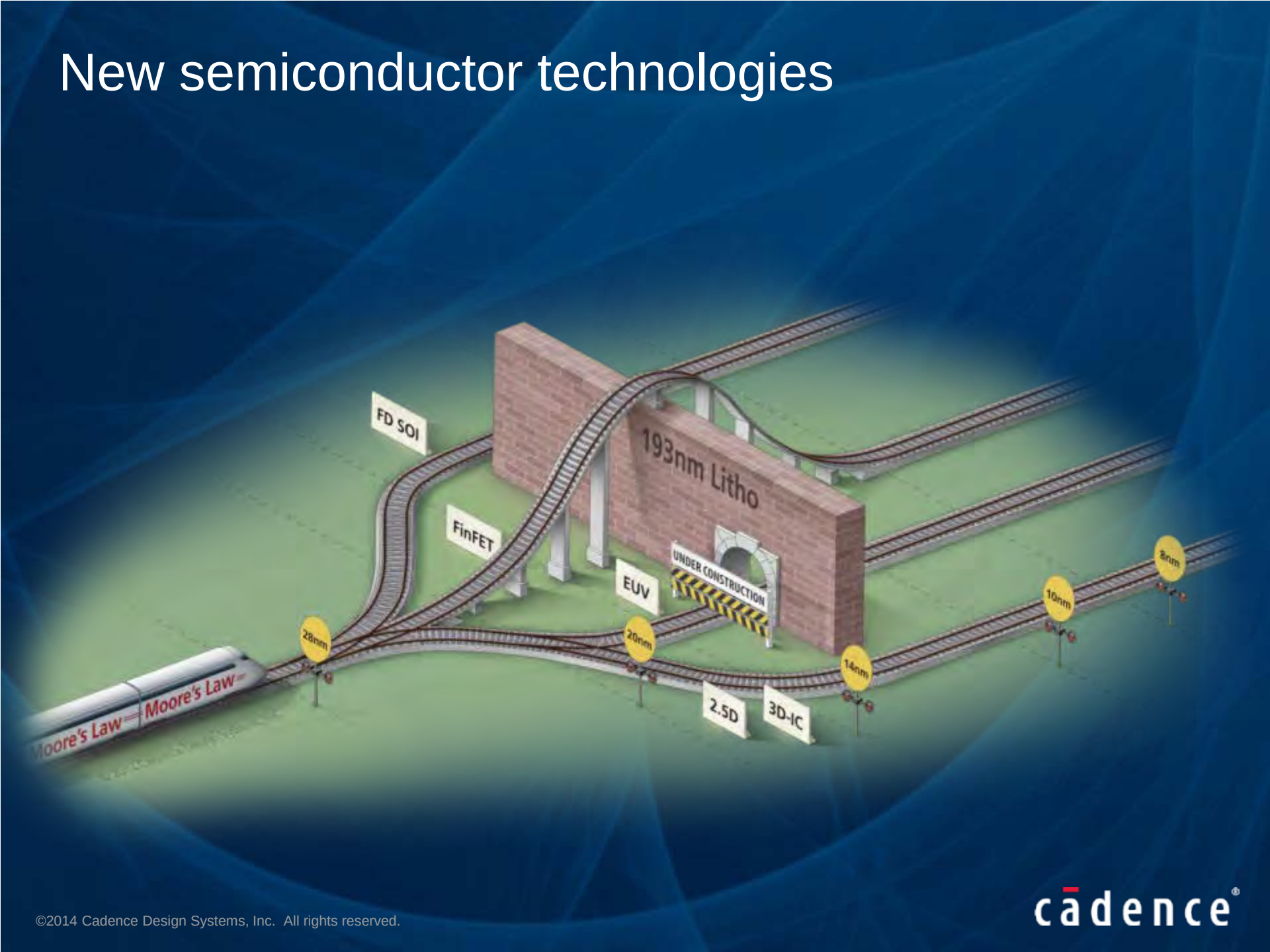
New semiconductor technologies



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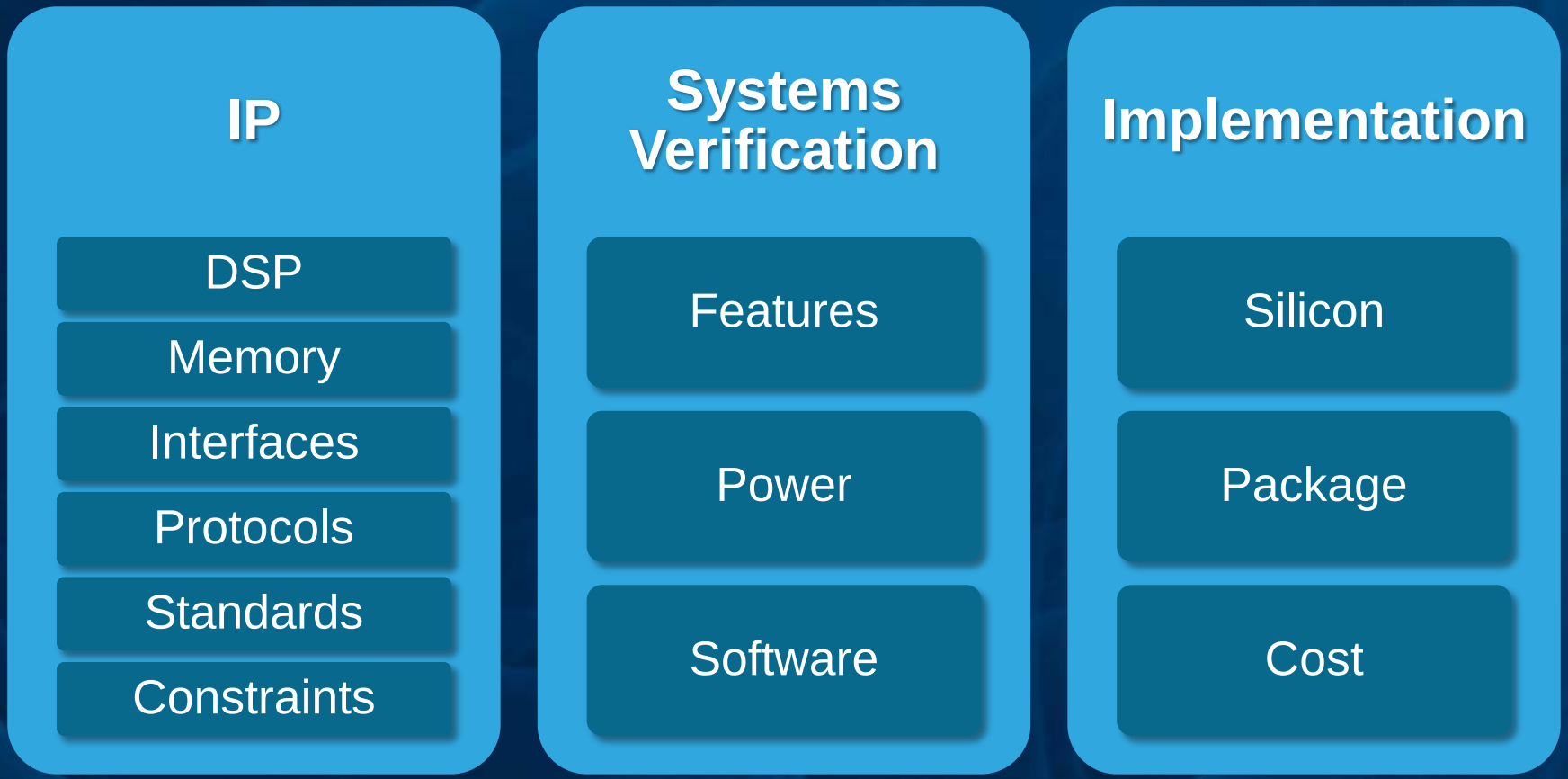
Creative Solutions Required

Systems oriented design approach



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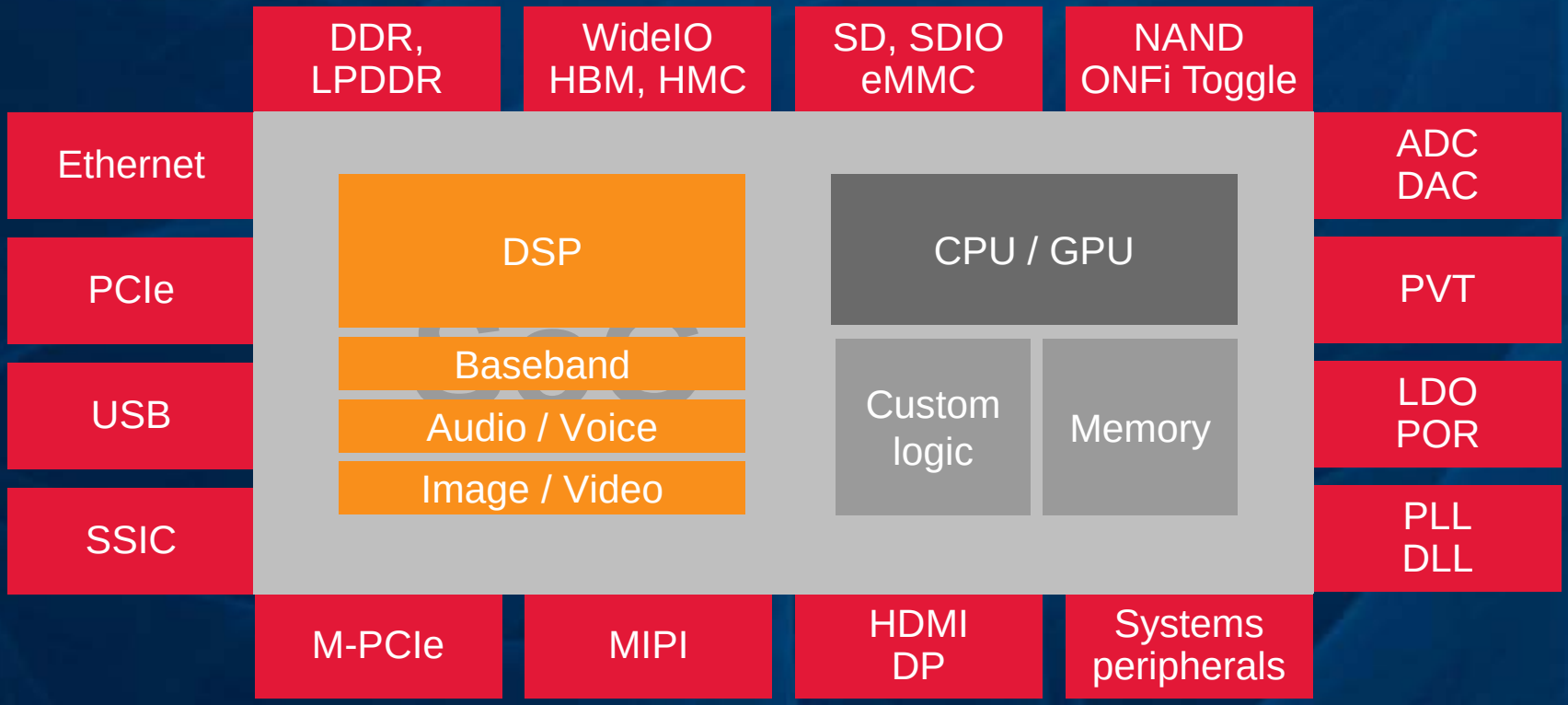
IP

Typical SoC design



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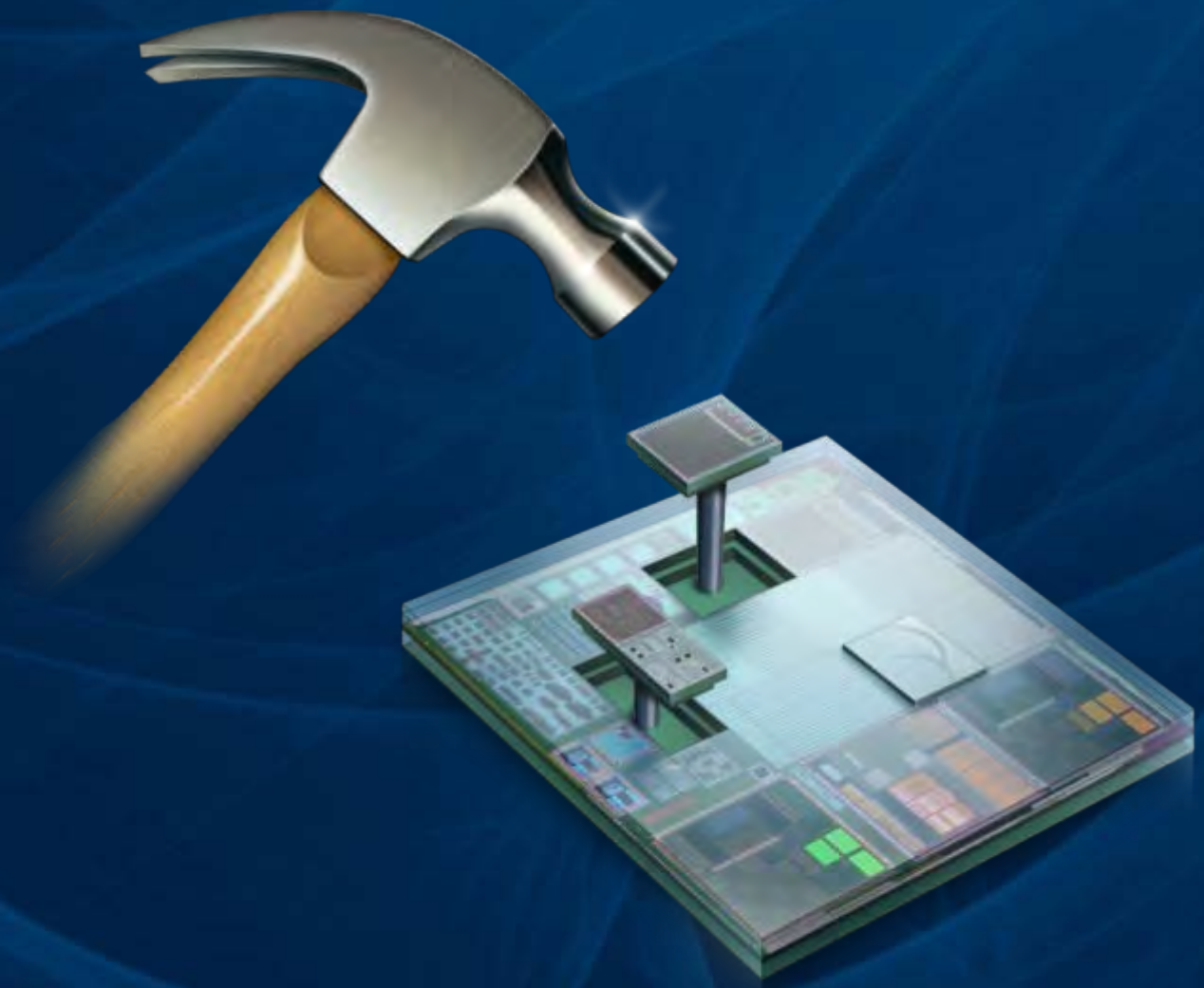
If all you have is a hammer – everything looks like a nail



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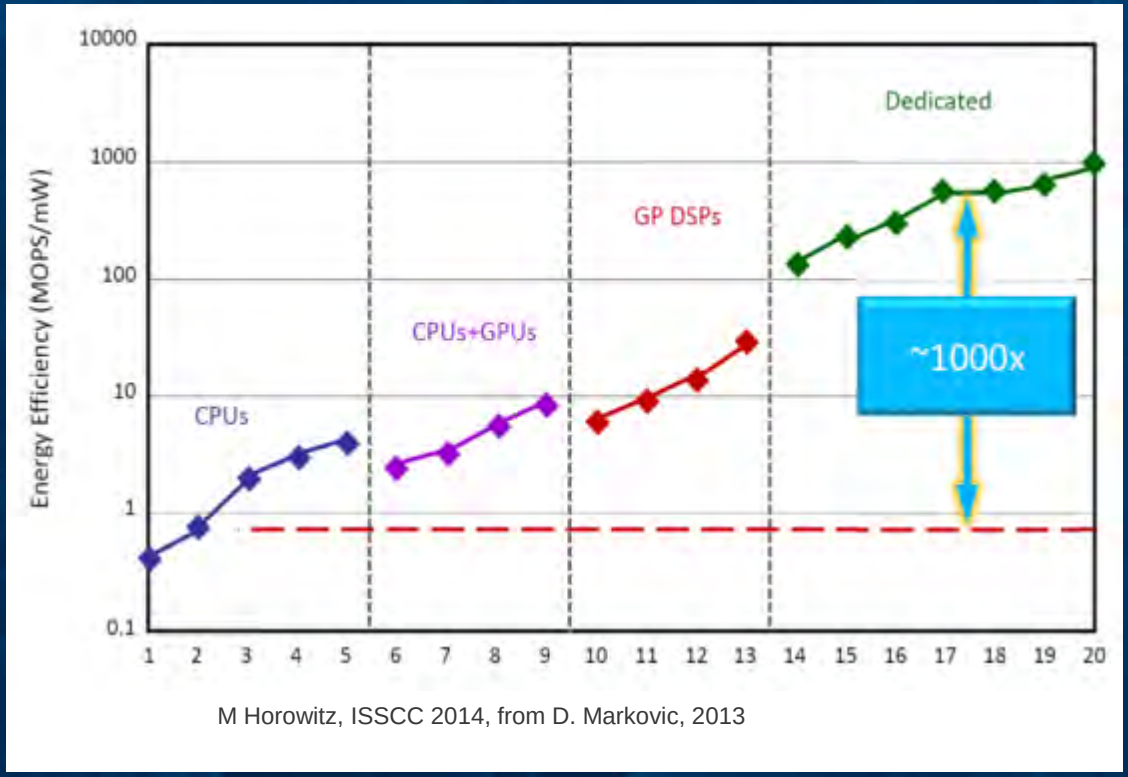
Dedicated logic is the most efficient answer, right?

- Conventional wisdom: dedicated logic up to 1000x more efficient than CPUs
- True only in special circumstances: minimal memory references per op
- For memory-intensive tasks, fixed logic little better than best processor methods



M Horowitz, ISSCC 2014, from D. Markovic, 2013

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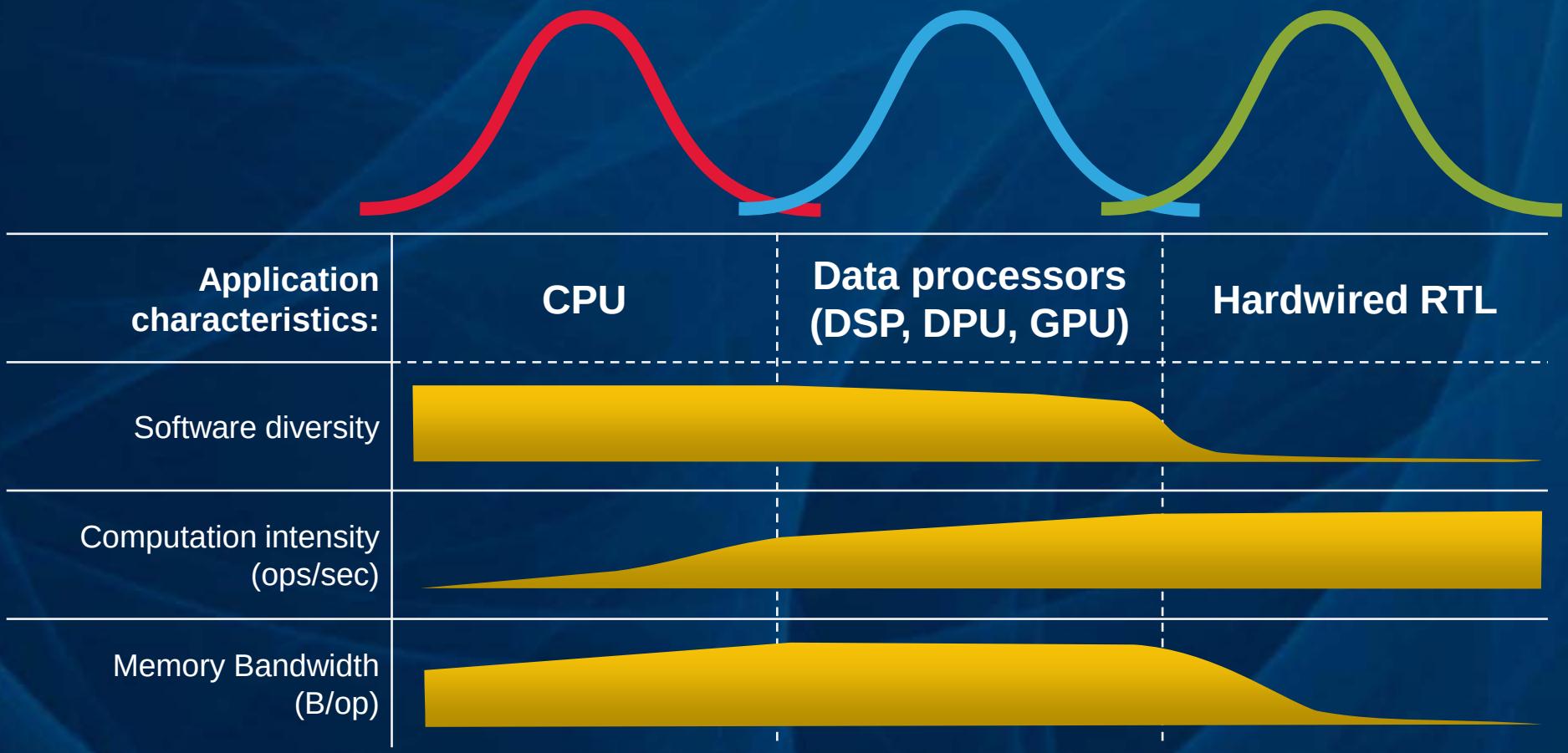
Data processing and the three sweet-spots



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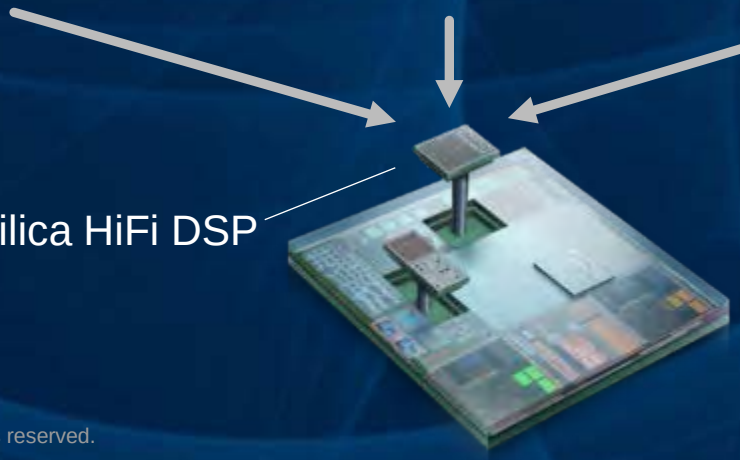
Integrating multiple functions onto one core

Flexibility and efficiency

AEC Wideband	AMR Wideband	DAB/MP2
DRM	Dolby Digital	Dolby DM3Plus
Dolby MS10	Dolby Prologic	Dolby TrueHD
DRA	DTS Boost	DTS HD
DTS Symmetry	FLAC	MP3
MPEG-4 aacPlus	mSBC	Ogg Vorbis
SBC Bluetooth	WMA	WMA 10 Pro
AMR Speech	G722 Speech	G.729AB Speech
SILK Speech	GSM-FR Speech	G726 Speech



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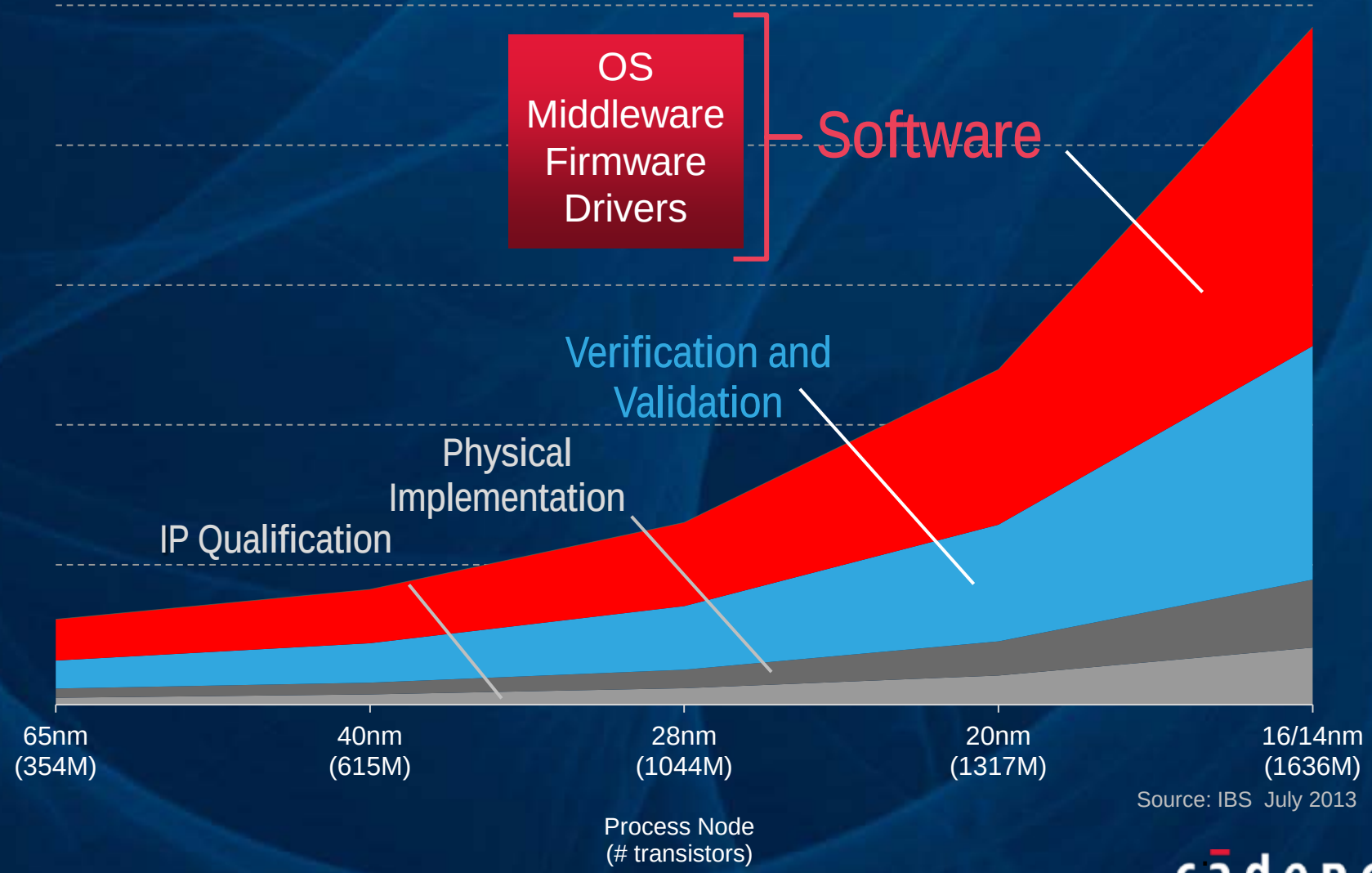
Systems Verification

80% of SoC development costs come from software, verification, and validation



Source: IBS July 2013

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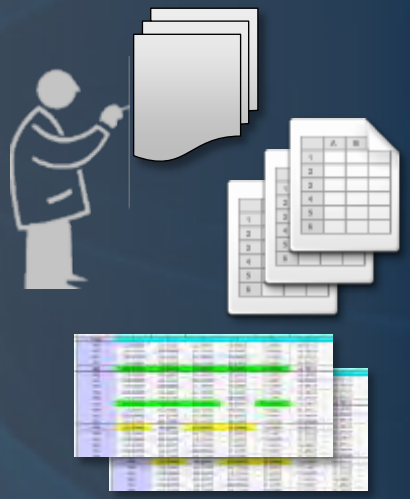
Need scalable solution for metric-driven verification

Traditional approach

Spreadsheets

Scripts

Lists



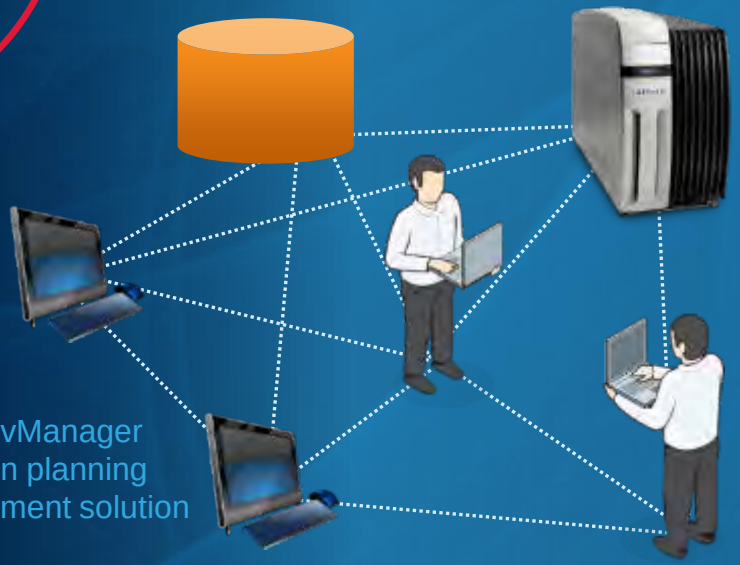
Scalable approach

Robust SQL database

Synchronous data

Real-time reports

2X Productivity



Incisive® vManager
verification planning
and management solution

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Hardware acceleration is essential for today's SoCs

Palladium® XP II

Verification Computing Platform

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Concurrent software development with hybrid verification technology

Start SW validation up to six months earlier

60 X faster OS boot

Virtual Prototyping

ARM® Fast Models

Acceleration & Emulation

SpeedBridge Adapters

FPGA Prototyping

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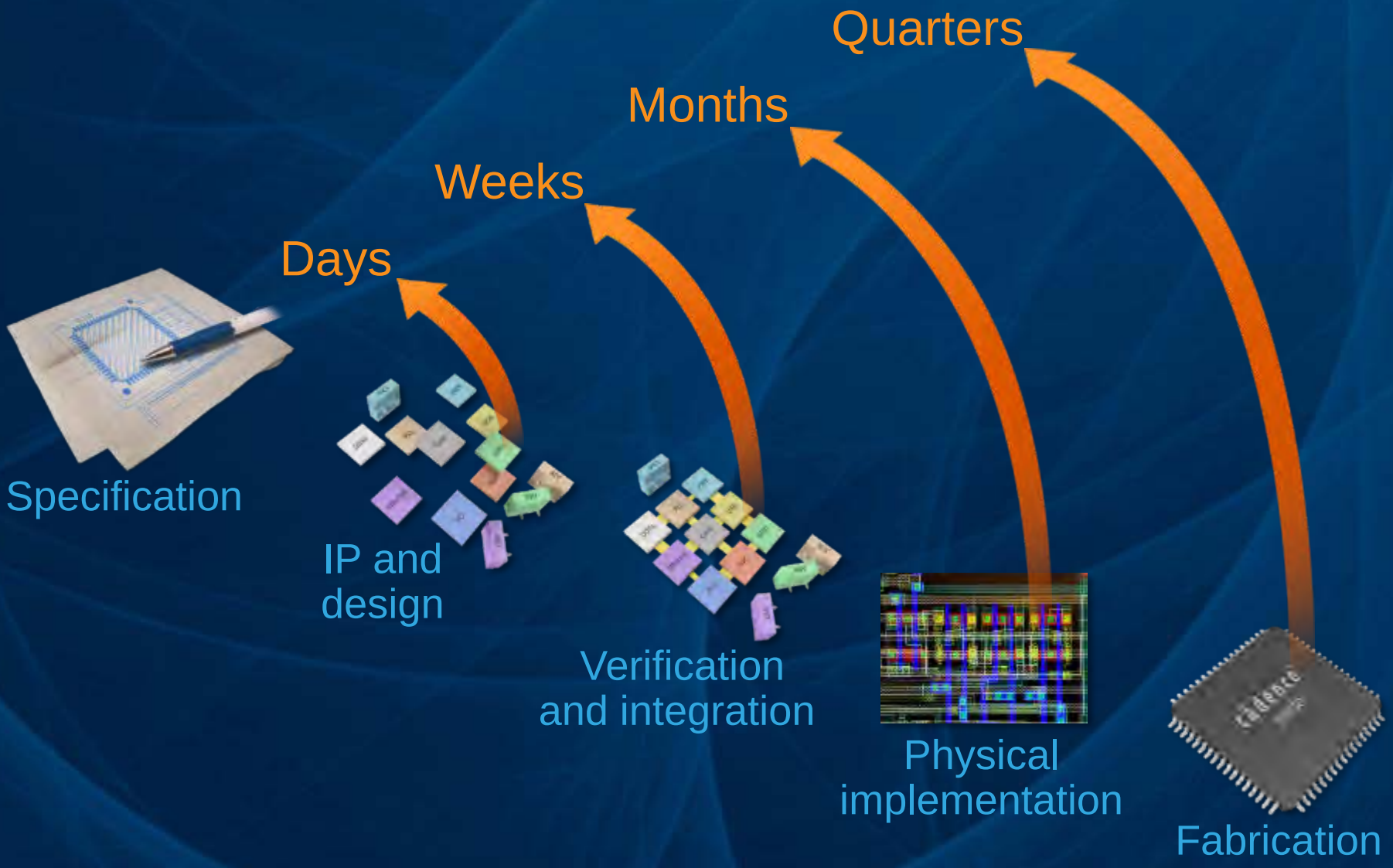
Implementation

Late bugs kill time-to-market



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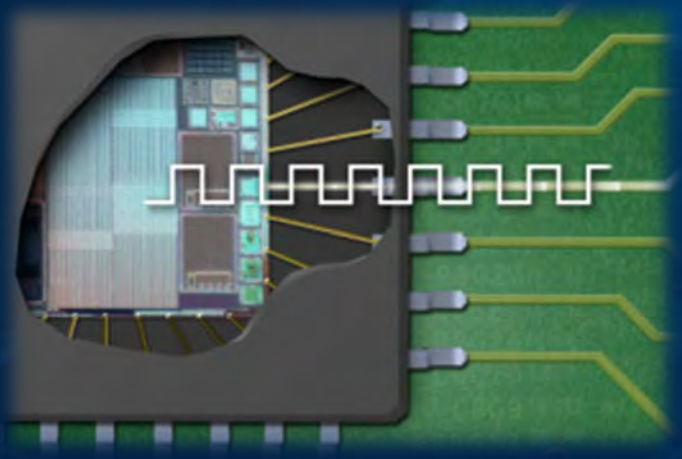
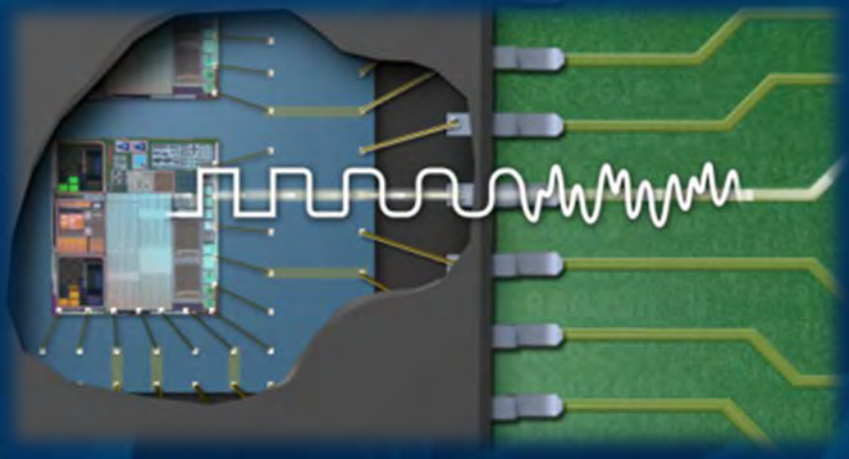
IP implementation is increasingly complex

PAST



Megahertz signals
Simple static timing analysis
Static power analysis

TODAY



Gigahertz signals
Package and board effects
Signal integrity analysis
Analog channel models
Dynamic power analysis
Advanced library characterization

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Requirements for IP today

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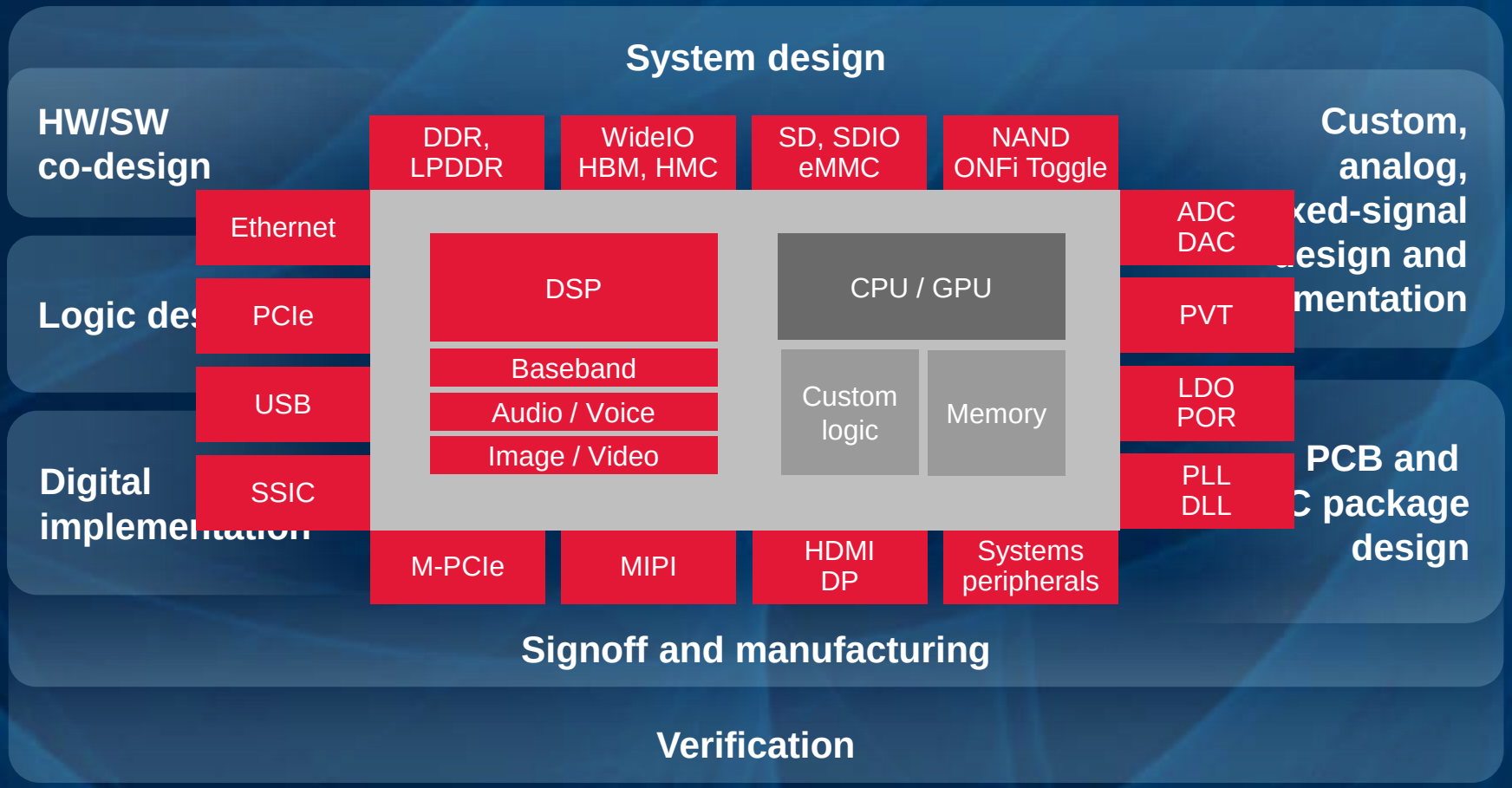
IP requires comprehensive EDA support



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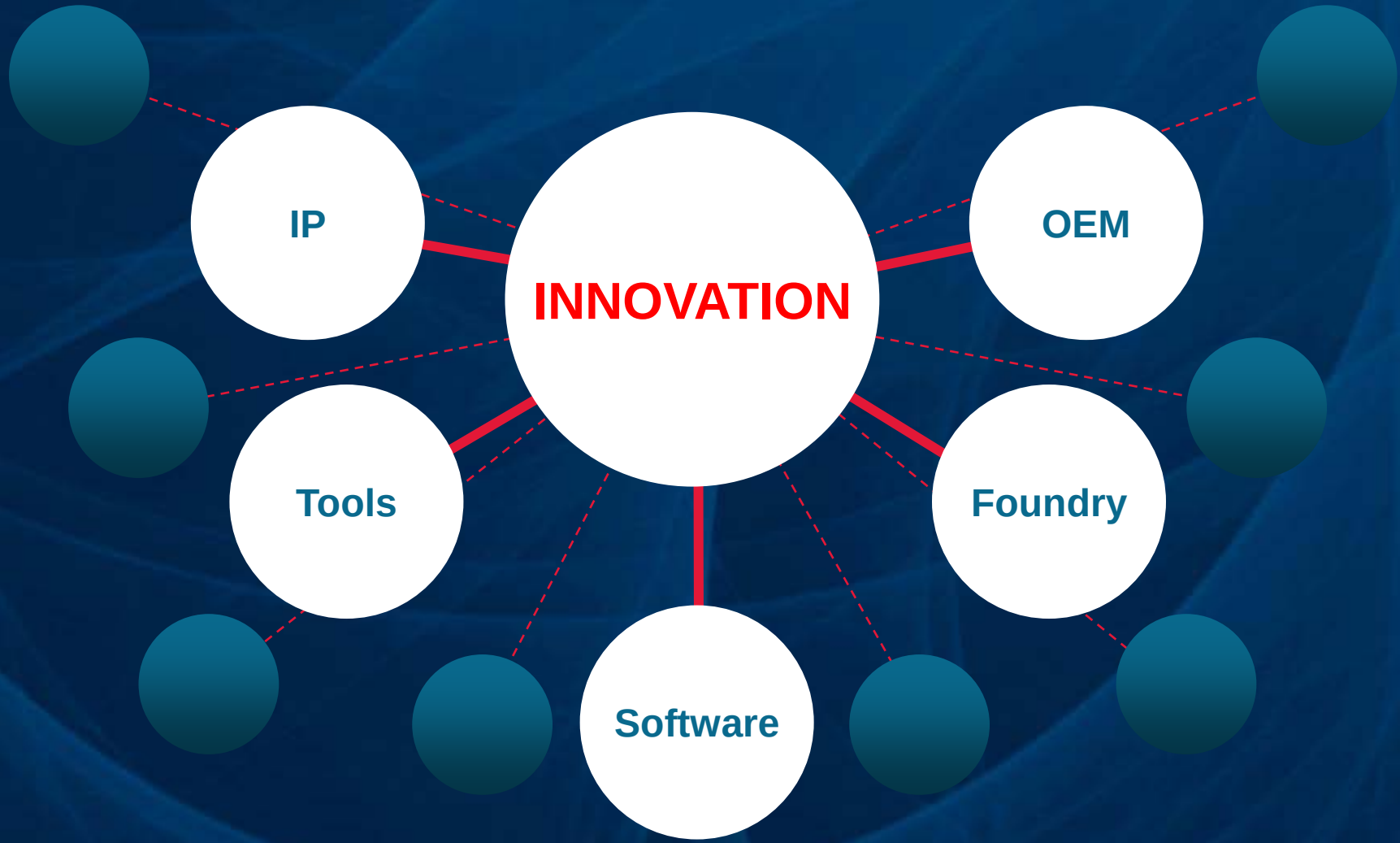
Today's SoCs require closer collaboration than ever before – from IP through manufacturing



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