

ITU-T standards development lifecycle in the context of the broader standards ecosystem

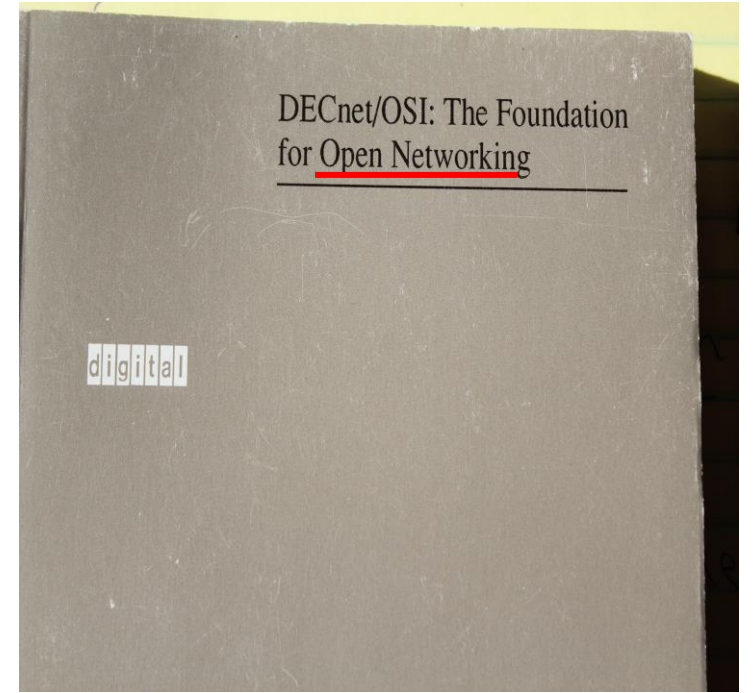
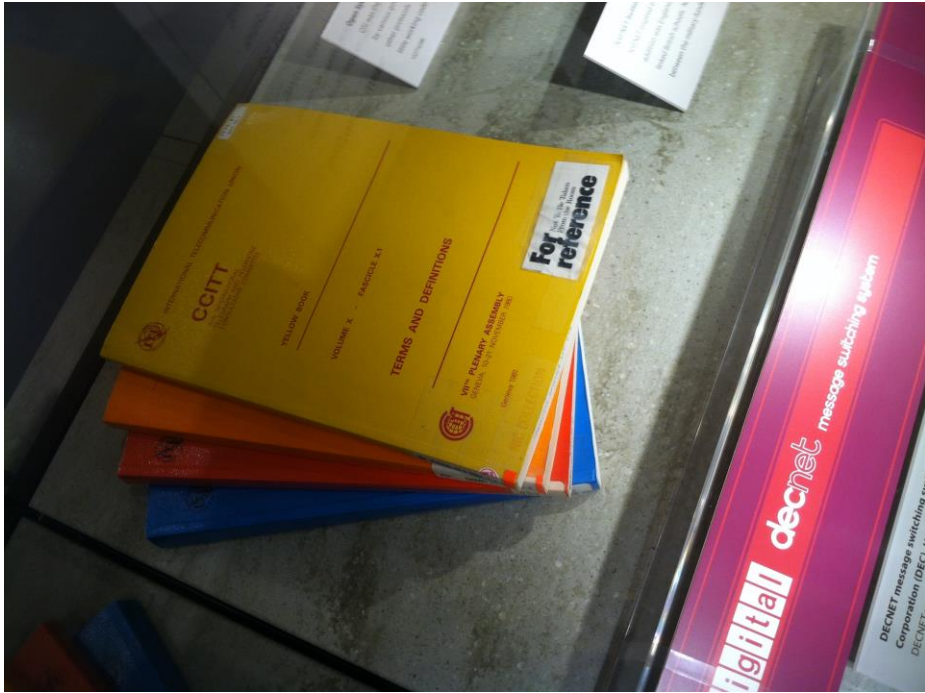
- *A personal view from the trenches*

Paul Doolan

- **Chair ITU-T SG15 WP2**
- **Senior Director Standardization Activities, Infinera**

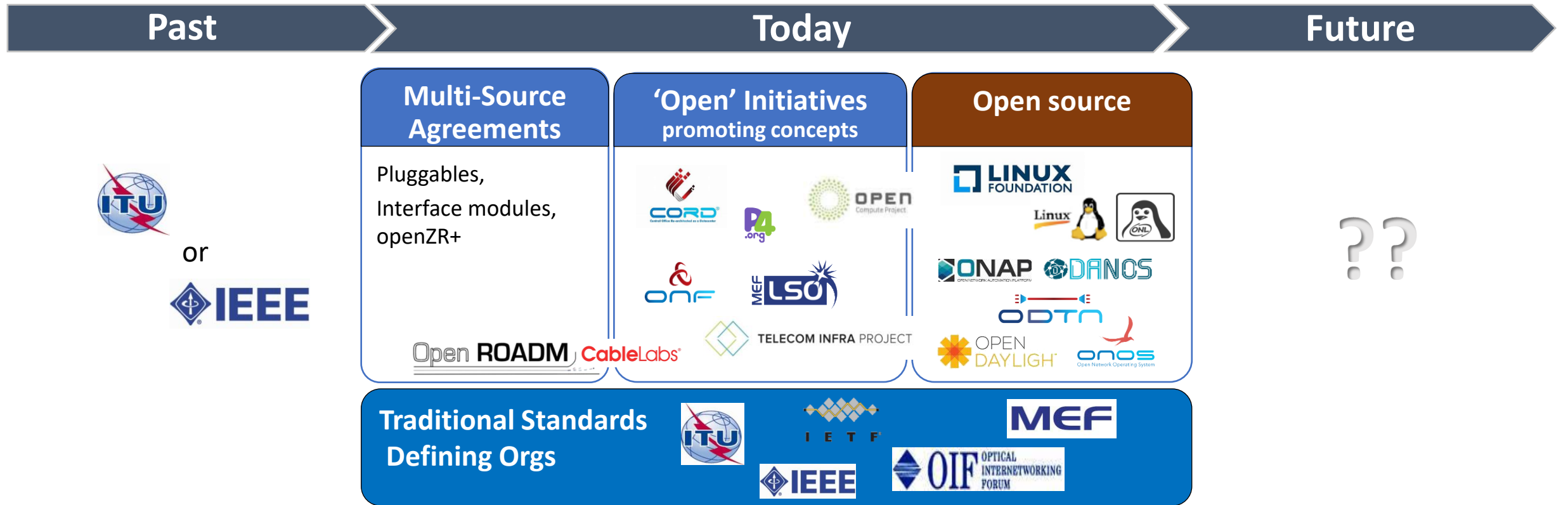
Outline

- A little history
- The Standards ecosystem
- The key tool in standards work
- An example of the problem
- Attempts at a solution in SG15
- Take aways



“The nice thing about standards is that there are so many of them to choose from.” – Ken Olsen

The century old model for standards development is changing

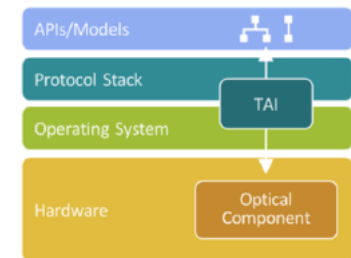
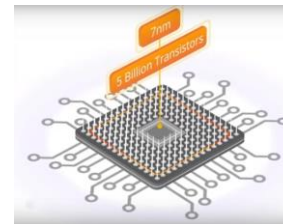
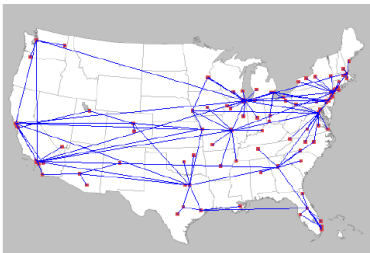
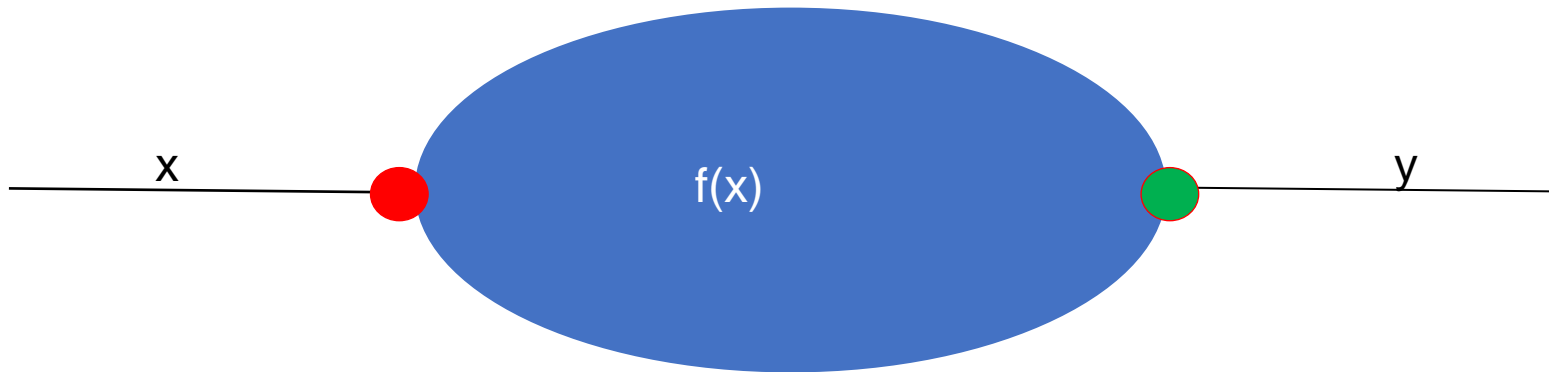


Bock/Doolan
(2019 slide)

Tiers in the ecosystem

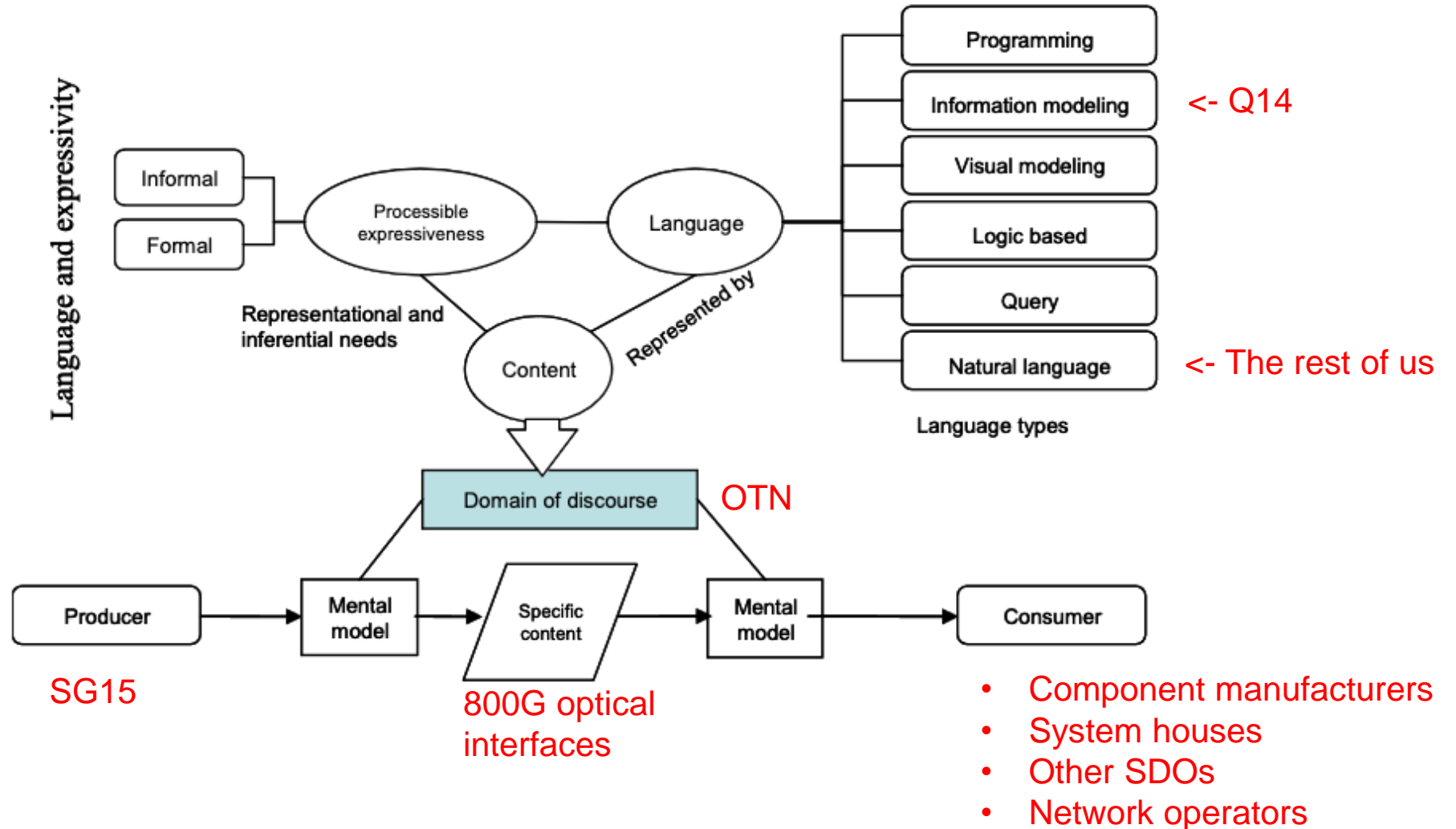
	Tier 1 (the I 's)	Tier 2 (the F 's)	Tier 3 (the M 's)
Characteristics	Global scope. Recognised by government, regional and international bodies. Broad participation from government, academic, industrial and commercial interests Primary standards development bodies.	The 'Forums' Second level standards – often referred to as implementation agreements - that reference or quote primary material from the Tier 1s	MSAs 'Clubs' of industry participants who create ad hoc specifications for systems or components. System level MSAs often reference Tier 1 & 2 SDOs
Applications	Broad	Use cases	Very specific
Time to develop	Long (~3,5 years)	Shorter(~2 years)	Shortest (can be months)
Driver	Whole industry	User community	Aligned vendors
Lifetime	Long	As long as use case persists	Medium
Examples	ITU, ISO, IEC, IETF, IEEE	OIF, MEF, BBF, ONF	OpenROADM, Pluggables, Interface modules, ZR+

The fundamental model




Instantiations of the model.

Specifying the model



$$3 \cdot 10^2 \times 7 \cdot 10^3 = ?$$



IEEE SA
STANDARDS
ASSOCIATION


IEEE Standard for Ethernet

IEEE Computer Society

Developed by the
LAN/MAN Standards Committee

IEEE Std 802.3™-2022
(Revision of IEEE Std 802.3-2018)

STANDARDS



IEEE Std 802.3-2022, IEEE Standard for Ethernet
SECTION NINE

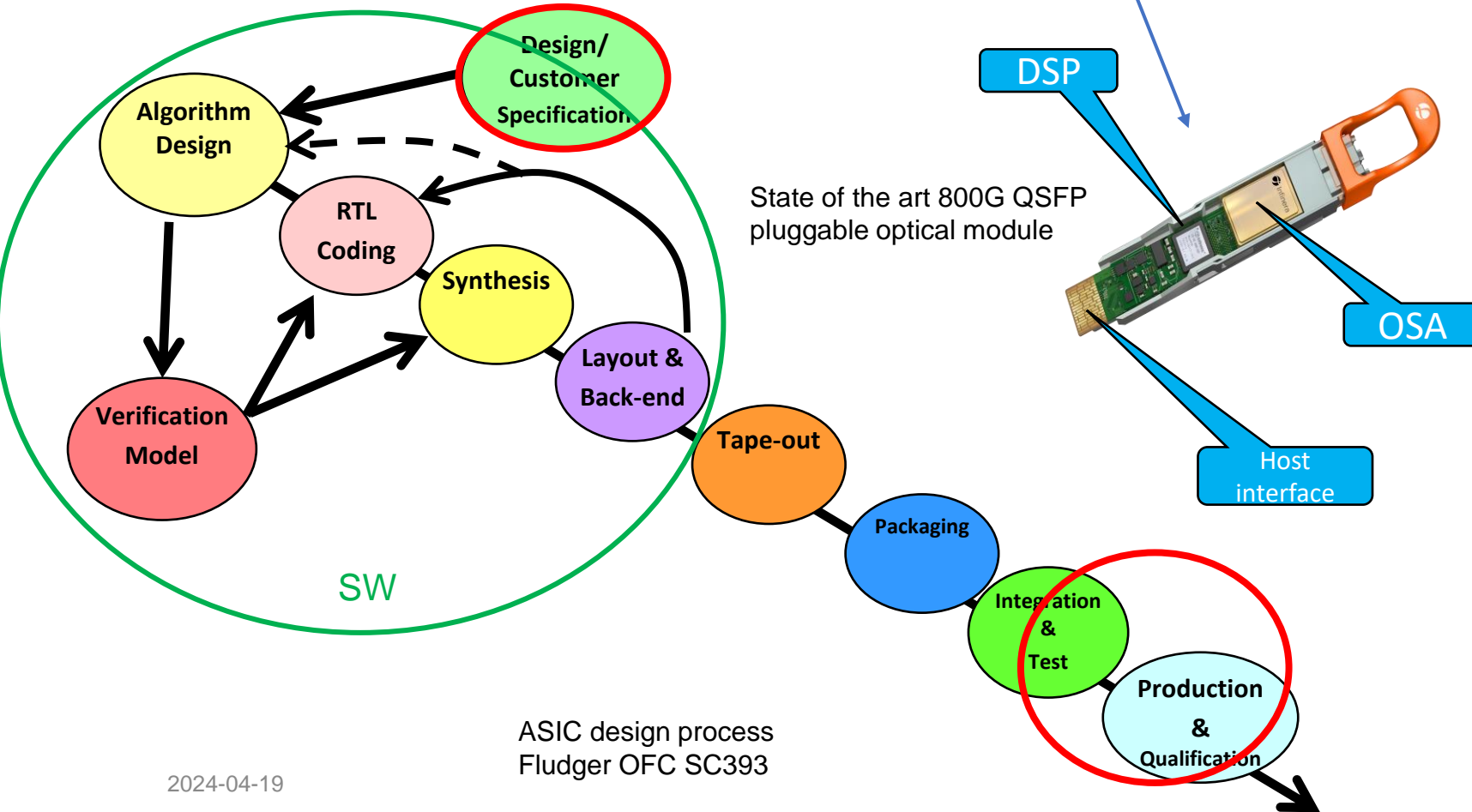
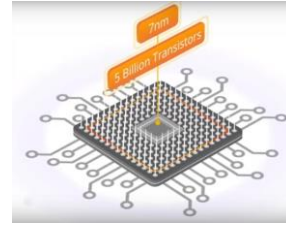
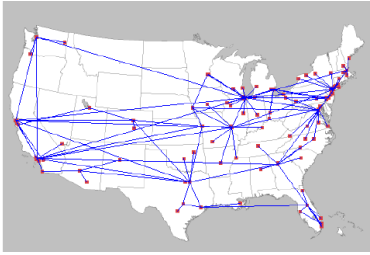
**Table 154A-5—1 channel example DWDM black link application
with OSNR (TP3) ≥ 35 dB (12.5 GHz)**

Description	Value	Unit
Available loss budget TP2 to TP3	19	dB
Allocation for loss of patch panels	2	dB
Remaining loss available for fiber plant	17	dB
Potential distance for 0.25 dB/km cabled fiber attenuation coefficient	68	km

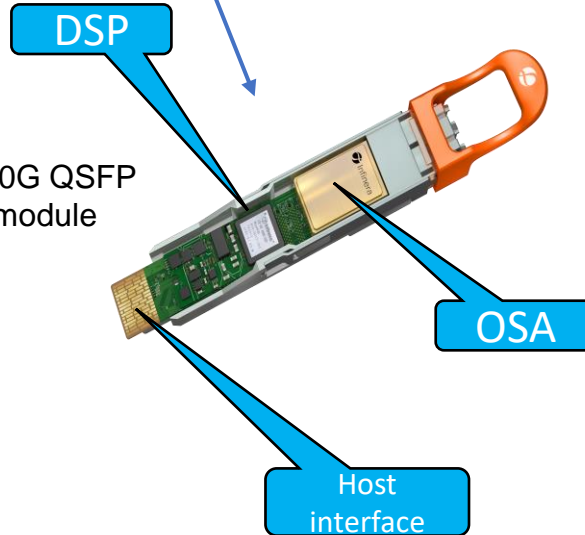
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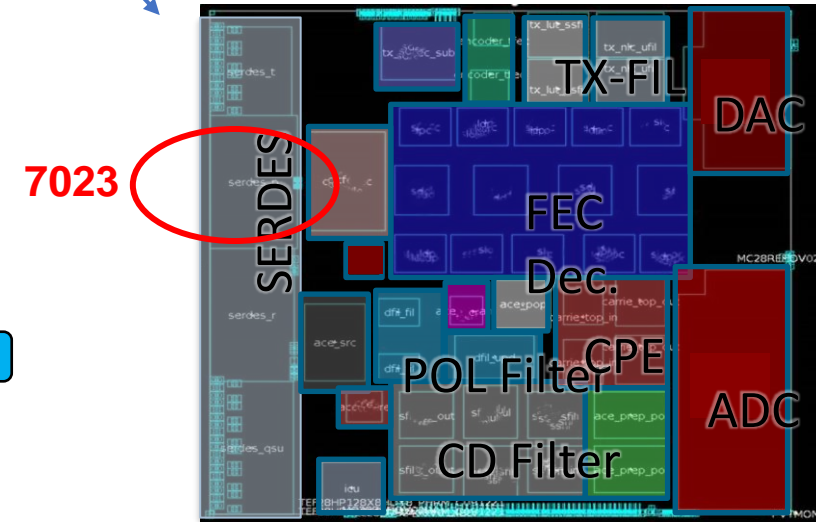
The Hardware/Software paradox



State of the art 800G QSFP pluggable optical module



Blocks in the DSP ASIC inside it



IEEE, OIF, ITU, OpenROADM, 800G Pluggable MSA all have 800G projects

Emergence of SW in SG15 work

- Baby steps.....
- Spans multiple aspects and companies
 - FEC reference implementation – (Acacia)
 - Design verification – test vectors (Infinera)
 - Conformance – Error Vector Magnitude as a conformance metric for optical transmitters (Keysight) – used in OIF & IEEE
 - System behavior – Timing simulators (Huawei)
 - Q14 - Mr Kam Lam's talk
- However.....
 - Provenance, licensing, accessibility, maintenance are all work in progress
 - No clear ownership
 - How do we make these initiatives influence the rest of the ecosystem ?
 - Etc etc
- Challenge and opportunity



Take aways

- There are too many organizations developing *Standards*
 - A vibrant ecosystem leads to local inefficiency
- Semiconductor and ASIC technology allows for staggering complexity
 - Huge development cost
 - Words fail us - so we need something else
- Do we need a fundamental change in the way we do our work?
 - SW methods seem to offer a way forward

Thank you!