

Open Optical White Line Systems – Similar Hype as SDN?

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Open Optical White Line Systems – Similar Hype as SDN?

- Slides based on the NGON 2017@Nice presentation from the same authors.
- Outline:
- What are OOWLSs?
- Any comparison with other open (data) systems?
- Are there any practical scenarios with OOWLSs?
- Are OOWLSs the real thing or just another ,hot‘ term as SDN?
- Can we conclude anything useful?

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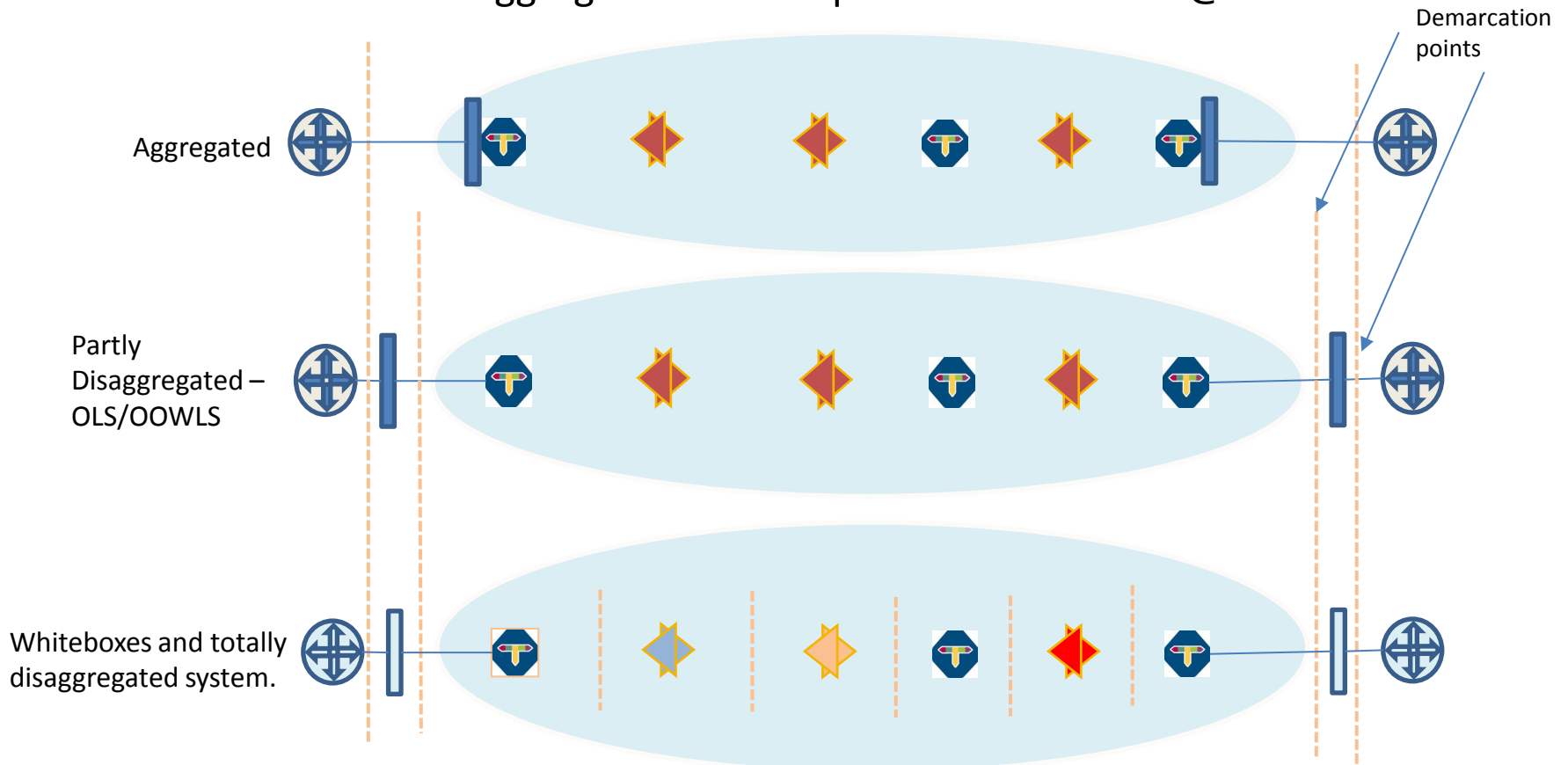
- Usual naming is Open Line Systems (OLS), extended it to OOWLS to emphasise ‚white box‘ aspects.
- White box: Separating network equipment in functionally independent component which could be independently optimized and independently deployed.
 - Usual for L2 ethernet, not so common for optical equipment.
- Open Line System: Separation of the line system (Mux/Demux, ROADMs, amplifiers,...) from the transponders (3R functionality). Others may think different.
- Interesting thoughts from Rodney Dellinger, ALU, Agile Open Line System, ECOC 2014.

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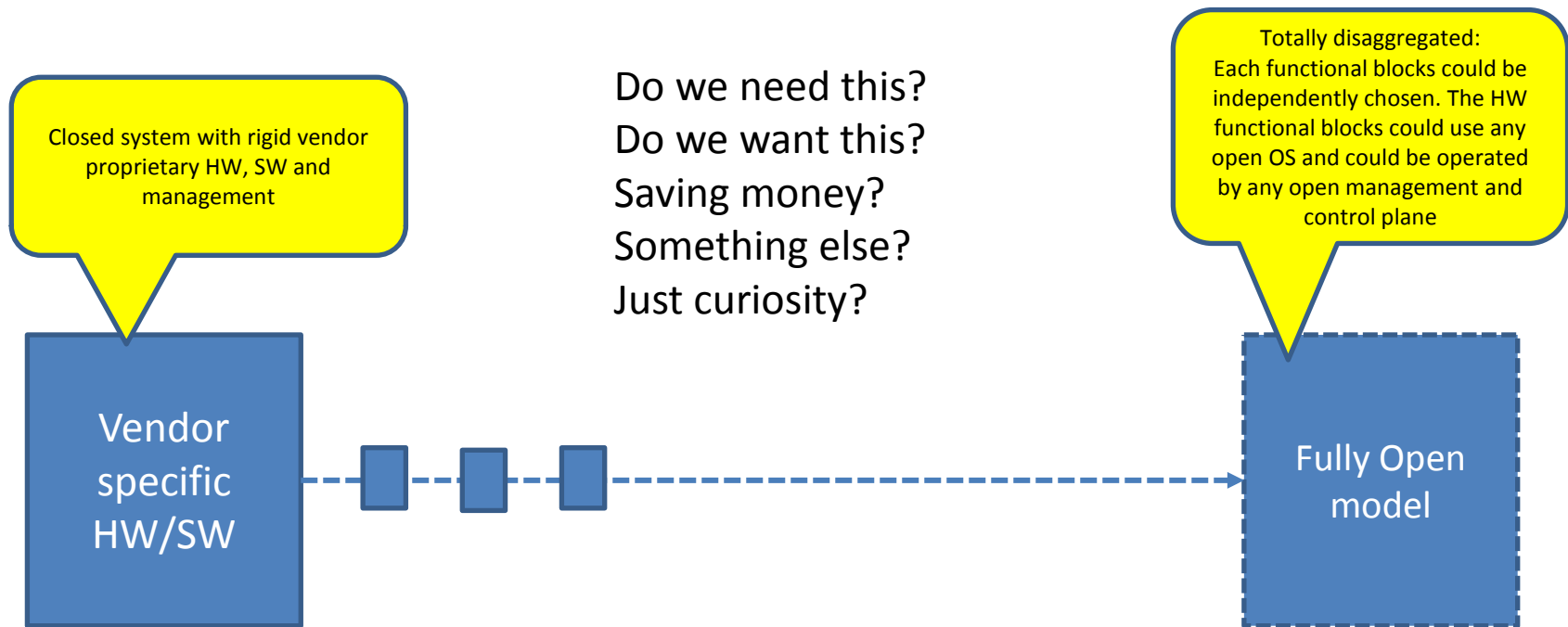
- Different levels of aggregation:
 - Aggregated (all from one vendor: transponders, amps, SW,...).
 - Partly Disaggregated – OLS/OOWLS (transponders and amps).
 - Totally disaggregated system – Whiteboxes (all boxes independent).
- There is long way to go from totally closed and vendor specific systems to totally disaggregated systems.
- There will be different degrees of openness and important question is what kind of openness we want or need...
- Perhaps not needed at all? If we are happy?
- Interesting slides from N. Robinson@OFC 2017: White Box Optics: Will It Kill or Encourage Innovation?

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Disaggregation in data plane – from NGON@Nice.



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- This ,SDN‘ term is here for few years now.
- Also many other terms and (perhaps strange) abbreviations like NFV, OF-Config, OVSDB, YANG and others.
- It looks SDN is not so popular or catchy anymore?
- Intended mainly for switching, routing, storage, clouds,...or not?
- Interesting also for optical devices/layer (L0).
- Not easy because lack of standards – this is true not only for L0 but also for routing and switching equipment.
- We have new trends with white boxes (open networking) on optical layer.

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- Example of SDN?
- Border Gateway Protocol BGP (used from 1994).
- Is it software?
- Yes.
- Do we define something (packets accepted/rejected,...).
- Yes.
- Is it networking?
- Of course.

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- How many real SDN applications do exist?
- One subtle example: CESNET optical SDN demo on TNC2017.
- May be called a ‚Train‘ demo.
- Using Czech Light™ ROADMs.
- SDN application for Optical Path Protection.
- Done with YANG and NETCONF.
- All intelligence embedded in this application.
- Also GÉANT Testbed Service (GTS), will be available in CESNET and other NRENs in near future.
- In CESNET: TS for SDN and other experiments.

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- It looks SDN has been here for many years – but in disguise?
- Is SDN here right now?
- Or gone?
- SDN controllers more robust but not all functionalities implemented...
- **BUT NEW SW (driver) MUST BE WRITTEN FOR A ,SDN CONTROLLER‘.**
 - SW for a controller is basic, new features in ,applications‘ (just another SW).
- But SDN can offer resources optimization and cost effective solutions.
 - Or we are told so.
- New real-world applications are needed.

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- Back to optics: Do we have some nice OLS/OOWLS examples? Yes.
- SUNET: AWs used in production (almost) everywhere.
 - Source: P. Nihlen, SUNET, TNC2016.
- UNINETT: Cisco and Juniper AWs over Coriant.
 - Source: K. Bozorgebrahimi, TNC2016.
- Also CESNET – Cisco AWs over Czech Light™ equipment AND time/frequency transfer.
- And other examples in Europe, US, Australia...

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- Some useful documents available:
- ITU-T G.698.2: Provides optical parameter values for physical layer interfaces of DWDM systems, 2009. Not very fresh.
- IETF: Draft-kunze-black-link-management-framework-00, 2011.
- Broadband Forum: TR-319 Part A, Achieving Packet Network Optimization using DWDM Interfaces - Physically Integrated Model, 2015.
- TR-319 Part-B, Achieving Packet Network Optimization using DWDM Interfaces - Physically Separated Model, 2016.

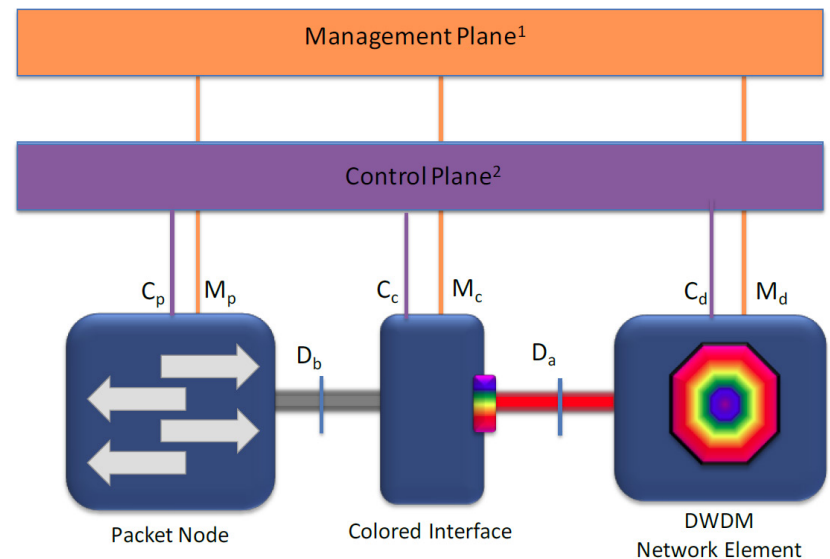


Figure 1: Reference Architecture^{1,2}

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- Industry initiatives.
 - We are not alone of course.
- Optical Internetworking Forum OIF.
- Telecom Infra Project TIP.
 - Voyager testing in GÉANT.
- Open ROADM.
- Open Networking Foundation ONF.
- And others I am not aware of, my apologies.

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- Conclusion:
- There is a long way to go achieving full openness in optical domain.
 - OLS/OOWLS could be considered as a first step toward this vision.
- Different degrees of openness to be developed and the question is where you as ,operator‘ would like to be.
- OLS/OOWLS should support flexible grid and other interesting features, Alien Waves (must be) supported/possible.
 - Ability to support capacity beyond 100G for long haul as we heard from our colleagues from different NRENs.
- NREN community are likely one of the first communities able to deploy OLS/OOWLS solutions.
 - Not only IP and Ethernet.

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- Acknowledgment:
- Too many to name:-)
- Colleagues from NREN community and also from industry colleagues/partners.
- Thank you for your attention.