

# DRCN 2016

## Network Disaster Management & Recovery

### **Potential of SDN Control for urgent Optical Network reprovisioning**

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- March 16<sup>th</sup> 2016

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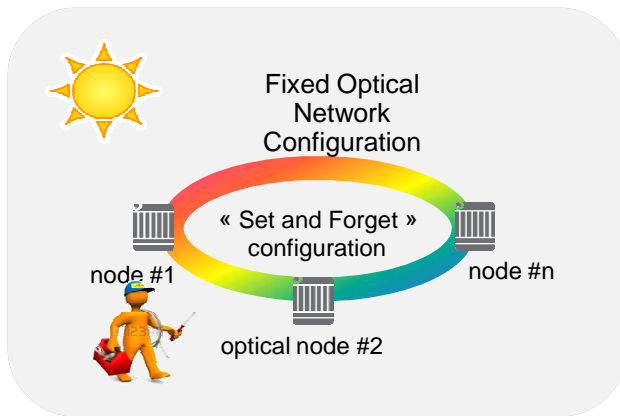
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# Towards Disaster Recovery Defined Wavelength Switched Connections (1/2)

Media channels will be reconfigured where the needs are ...

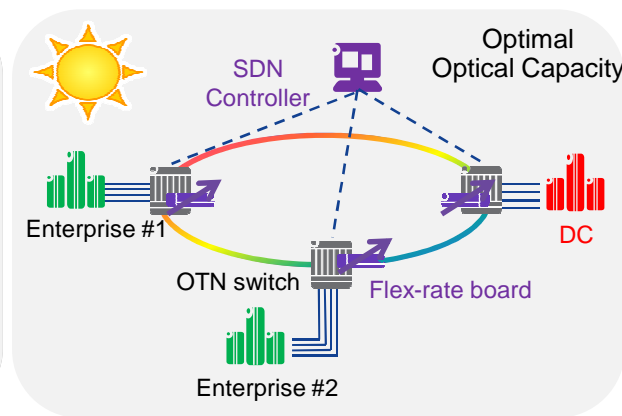
## TODAY



Media Channels on dumb network

«Set and Forget»  
Configured Media channels are never automatically changed

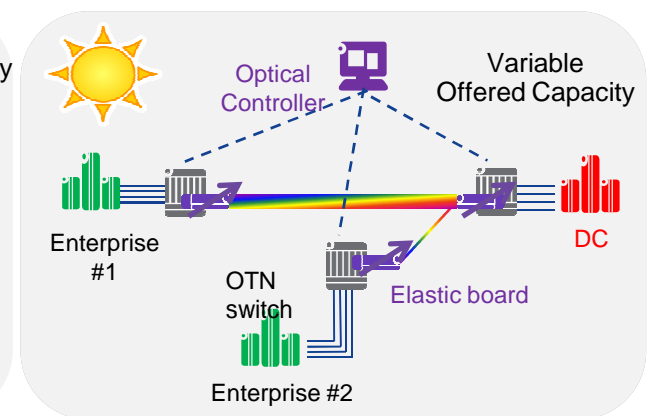
## COMING SOLUTIONS



SDN controlled Media Channels

Service Defined Wavelengths exploit spectral and spatial flexibility of optical systems to optimize bandwidth usage

## FUTURE



Media Channel settings on-demand

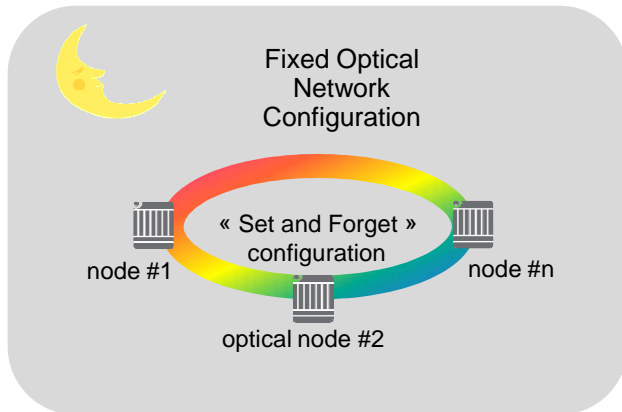
Media channel setting as easy as VLAN - User centric media channels automatically configured for the demand of Cloud Services

SDN Controllers reconfigure Optical Network down to switching & transmission

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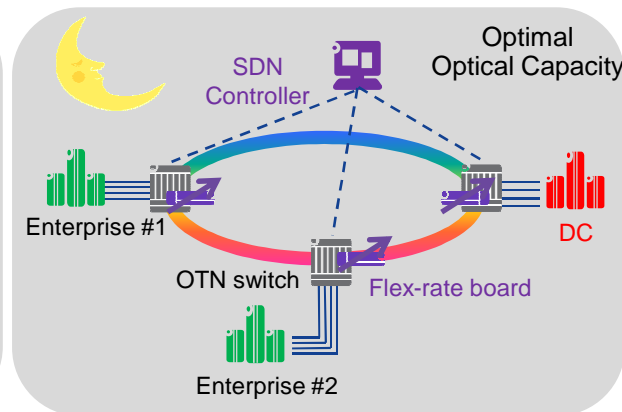
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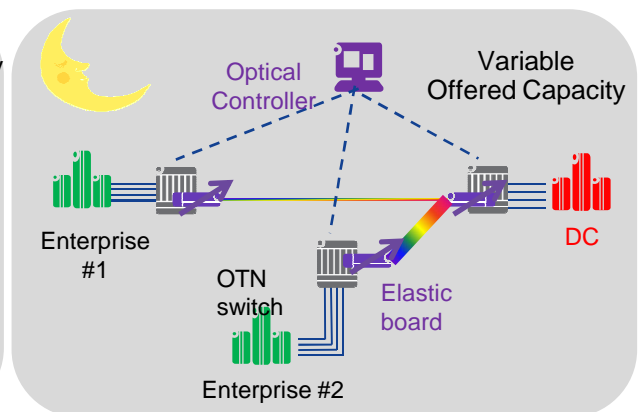
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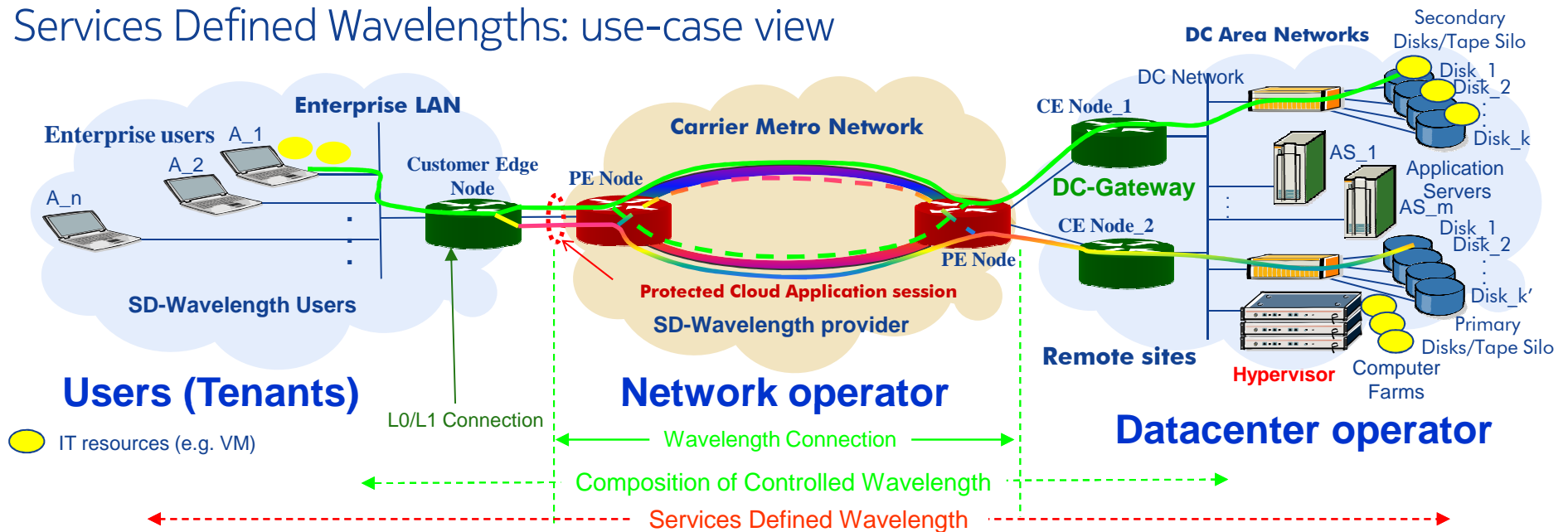


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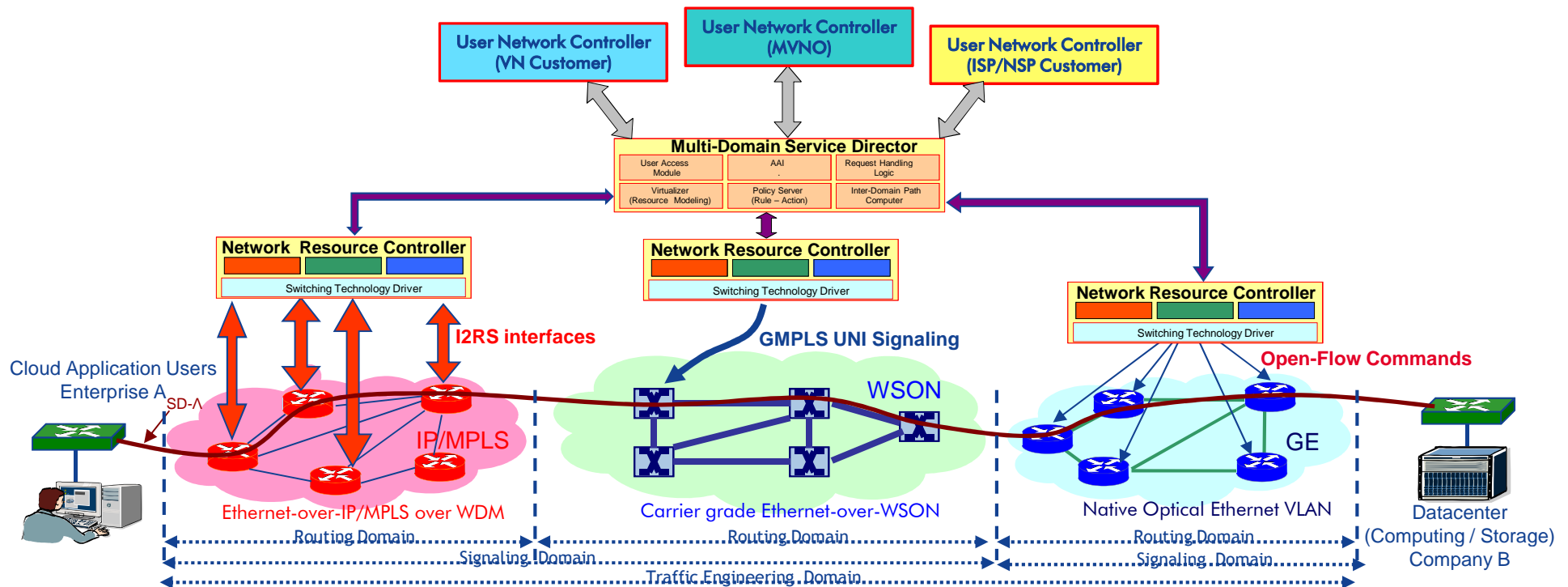
## Services Defined Wavelengths: use-case view



- Stitching of services i.e., Datacenter and Transport network services to create package on-demand for end- user needs.
  - Custom service packages are complex to be provisioned on several domains and to be activated on demand.
- PCE computes the routes of the connectivity services to be stitched according to the available IT resources at access points (IT appliances and Network appliances) and the rules configured them as reported in SDN-RDB
- Network Resource Controller (SDN) implements the node configurations of each service slice.

# Multi-Domain end-to-end Services Defined Wavelength Control

- Each reconfigured SD-wavelength can be deployed over many Administrative Network Domains
- Control procedures for non-technology specific inter-domain:
  - Challenges to define Authentication Authorization & Accounting (AAA) and Negotiation control
- Switching capabilities are never uniform over multiple network domains
  - Automatic end-to-end path computations and network resource reservation are always specific



## Next steps for Control functions of Elastic Optical Networks

- To increase availability, on-line reconfiguration of Elastic Optical Systems is a must
  - Spectral elasticity: frequency slots, FEC coding scheme, modulation formats, super-channel carriers, ...
  - Spatial elasticity: optical path flexibility, CDC-F nodes, ...
- Optical System reconfigurations should be performed with minimal Cloud service disruptions
  - Media channel reconfiguration must be hitless for critical emergency communications
  - The network control of media channel reconfiguration must be programmed i.e. automatic
- The control of Elastic Optical Networks according to environmental context imposes to define new operation rules
  - Optical system constraints will drive specifications of the possible automatic network operations
  - With standardized operational rules, multi-domain Service Defined Wavelengths can be envisioned ...

## References

1. « SDN Architecture » Issue 1 – June 1, 2014 ONF Technical Report – Architecture – Framework WG
2. «A PCE-Based Architecture for Application-Based Network Operations» D. King et al. IETF RFC 7491, March 2015
3. « Optical Transport Use Cases» ONF Technical Report – OTWG
4. « Optical Transport Protocol Extensions v.1.0 » ONF TS-022 March 15, 2015
5. « Next Generation Elastic Optical Networks: The Vision of the European Research Project IDEALIST» A. Napoli et al. IEEE Comm. Mag. Vol. 53, No. 2 February 2015
6. «Framework and Requirements for GMPLS-based control of Flexi-grid DWDM networks » O. Gonzalez de Dios et al. IETF RFC7698, November 2015
7. «Framework for Abstraction and Control of Traffic Engineered Networks» D. Ceccarelli et al. draft submitted at IETF, draft-ceccarelli-teas-actn-framework-01, March 2016



