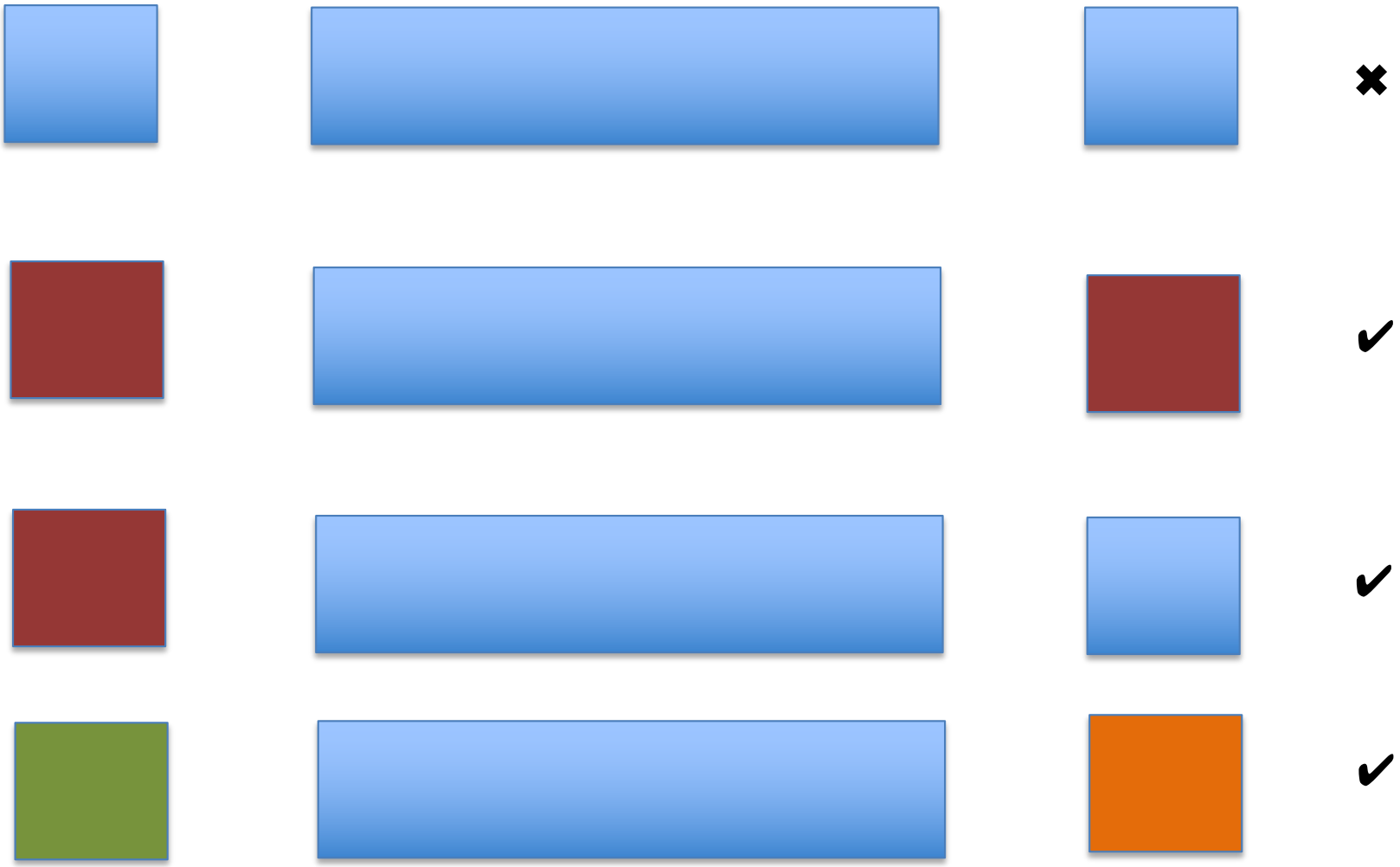
# AI/AC in Openconfig

Paul Doolan

Coriant

# Interoperability (aka transverse compatibility)



# Enabling TC in systems

- Optical interface specifications (we ignore higher layers here)
  - ITU-T Recommendations under responsibility of Q6
- Signaling and/or management
  - ITU-T Q6,Q12,Q14
  - TAPI
  - Openconfig
  - IETF

| Parameter | Units | DN50C-2A2(C)<br>DN50C-2A3(L)<br>DN50C-2A5(C) |
|---|---|---|
| **General information** | | |
| Minimum channel spacing | GHz | 50 |
| Bit rate/line coding of optical tributary signals | – | NRZ 10G |
| Maximum bit error ratio | – | $10^{-12}$ |
| Fibre type | – | G.652, G.653, G.655 |
| **Interface at point $S_S$** | | |
| Maximum mean channel output power | dBm | +6 |
| Minimum mean channel output power | dBm | –3 |
| Minimum central frequency | THz | 191.5 for (C)<br>186.0 for (L) |
| Maximum central frequency | THz | 196.2 for (C)<br>191.5 for (L) |
| Maximum spectral excursion | GHz | ±11 (±12.5 Note 1) |
| Minimum side mode suppression ratio | dB | 30 |
| Minimum channel extinction ratio | dB | 8.2 |
| Eye mask | – | NRZ 10G 1550 nm region per G.959.1 |
| Maximum transmitter (residual) dispersion OSNR penalty | dB | 2 |
| **Optical path from point $S_S$ to $R_S$** | | |
| Maximum ripple | dB | 2 |
| Maximum (residual) chromatic dispersion | ps/nm | +800 |
| Minimum (residual) chromatic dispersion | ps/nm | –300 |
| Minimum optical return loss at $S_S$ | dB | 24 |
| Maximum discrete reflectance between $S_S$ and $R_S$ | dB | –27 |
| Maximum differential group delay | ps | 30 |
| Maximum polarization dependent loss | dB | ffs |
| Maximum inter-channel crosstalk | dB | –16 |
| Maximum interferometric crosstalk | dB | –40 |
| Maximum optical path OSNR penalty | dB | 5 |
| **Interface at point $R_S$** | | |
| Maximum mean input power | dBm | 0 (Note 2) \| –8 (Note 3) |
| Minimum mean input power | dBm | –11 (Note 2) \| –17 (Note 3) |
| Minimum OSNR | dB (0.1 nm) | 27 |
| Receiver OSNR tolerance | dB (0.1 nm) | 22 |
| Maximum reflectance of receiver | dB | –27 |

NOTE 1 – If the ripple specification of the black link is met over a width of at least ±12.5 GHz, then the transmitter can have a maximum spectral excursion of ±12.5 GHz.
NOTE 2 – These power levels are appropriate for P type-intrinsic-n type (PIN) receivers. As an alternative, the power levels appropriate for avalanche photodiode (APD) receivers can be used.
NOTE 3 – These power levels are appropriate for APD receivers. As an alternative, the power levels appropriate for PIN receivers can be used.

- Lots of numbers, lots of notes, lots of definitions
- Required to build one of these
- But a bit of a mouthful
- **Application Code** is the notational shorthand

From this

To this

L-16.2

Long haul, STM 16, G.652 fibre

**ACs are defined in ITU Recommendations**

# Introduction of AI

- What about 'non standard' interfaces? Ones for which no AC has been defined?
- Application Identifier is introduced in G.872 "covers both standard and proprietary applications"
- Management of AI introduced in G.874. Definition is in G.874.1:

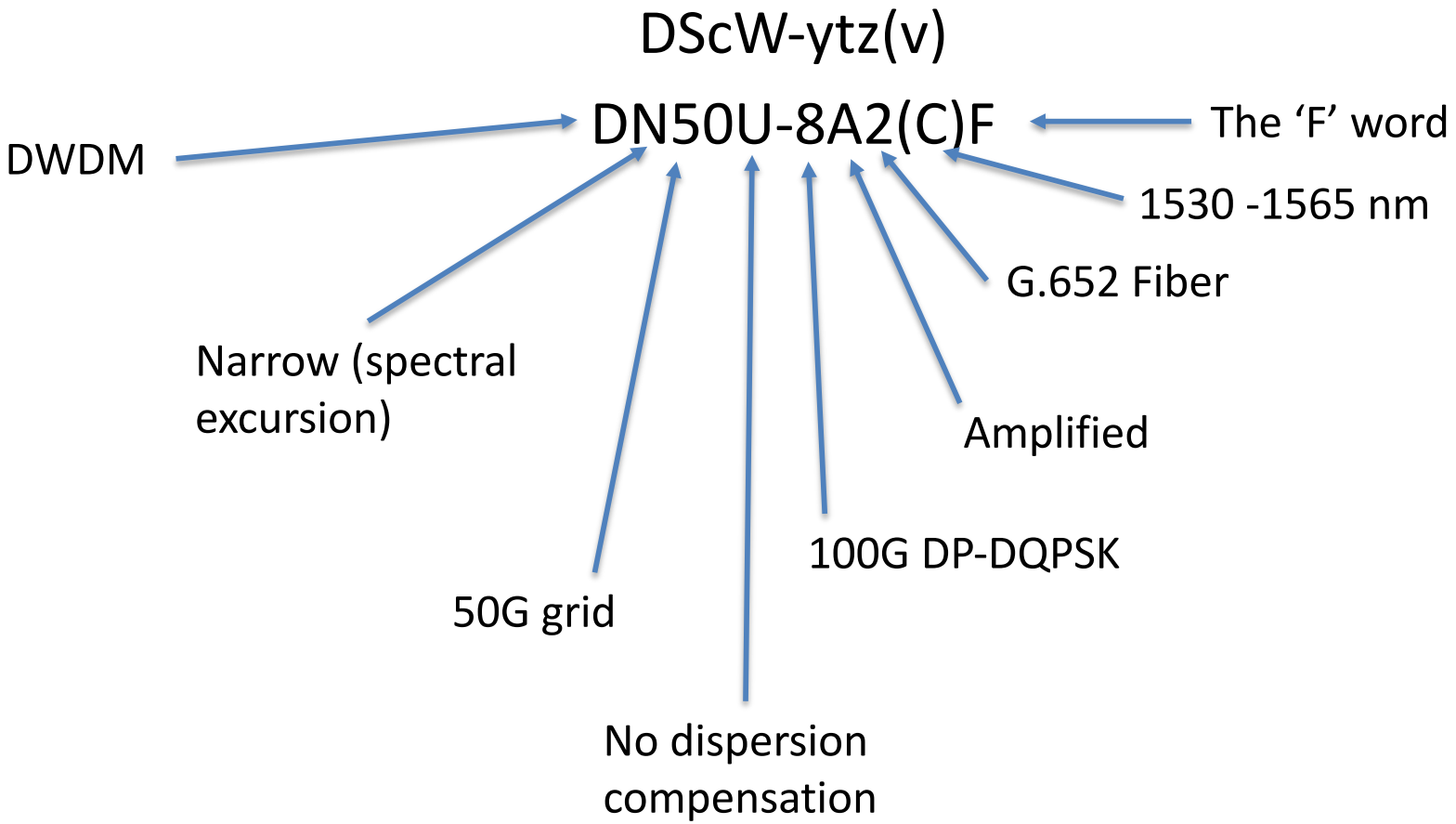
The syntax of **ApplicationIdentifier** is a **pair {ApplicationIdentifierType, PrintableString}.**

The value of **ApplicationIdentifierType** is either **STANDARD or PROPRIETARY.**

The value of **PrintableString** represents the **standard application code** as defined in the ITU-T Recommendations or a **vendor-specific proprietary code**.

- This was broken (risk of collision because ***vendor*** not identified)
- Fixed in Amd2of G.874.1
  - "Amendment 2 added: (1) the use of an organizationally unique identifier (OUI) to the description of the attributes selectedApplicationIdentifier and supportableApplicationIdentifierList;"

# But what does AC even look like?




Government health warning: This is a hypothetical example of a 100G AC. No such thing has yet been defined by ITU-T. Any similarity between this example and one that might appear is a remarkable coincidence. Caveat empetor.

# (Sort of) AC in Openconfig…..

```
grouping terminal-operational-mode-state {
  description
    "Operational state data for vendor-supported operational
    modes";

    leaf mode-id {
      type uint16;
      description
        "Two-octet encoding of the vendor-defined operational
        mode";
    }

    leaf description {
      type string;
      description
        "Vendor-supplied textual description of the characteristics
        of this operational mode to enable operators to select the
        appropriate mode for the application.";
    }

    //TODO: examples of the kind of info that would be useful to
    //report in the operational mode:
    //Symbol rate (32G, 40G, 43G, 64G, etc.)
    //Modulation (QPSK, 8-QAM, 16-QAM, etc.)
    //Differential encoding (on, off/pilot symbol, etc)
    //State of polarization tracking mode (default, med.
    //high-speed, etc.)
    //Pulse shaping (RRC, RC, roll-off factor)
    //FEC mode (SD, HD, % OH)

    leaf vendor-id {
      type string;
      description
        "Identifier to represent the vendor / supplier of the
        platform and the associated operational mode information";
    }
}
```

It's not designed for humans.
It's machines read this.

?

AC ?

?

```
container operational-modes {
  description
    "Enclosing container for list of operational modes";

  list mode {
    key "mode-id";
    config false;
    description
      "List of operational modes supported by the platform.
      The operational mode provides a platform-defined summary
      of information such as symbol rate, modulation, pulse
      shaping, etc.";

    leaf mode-id {
      type leafref {
        path "../state/mode-id";
      }
      description
        "Reference to mode-id";
    }
```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