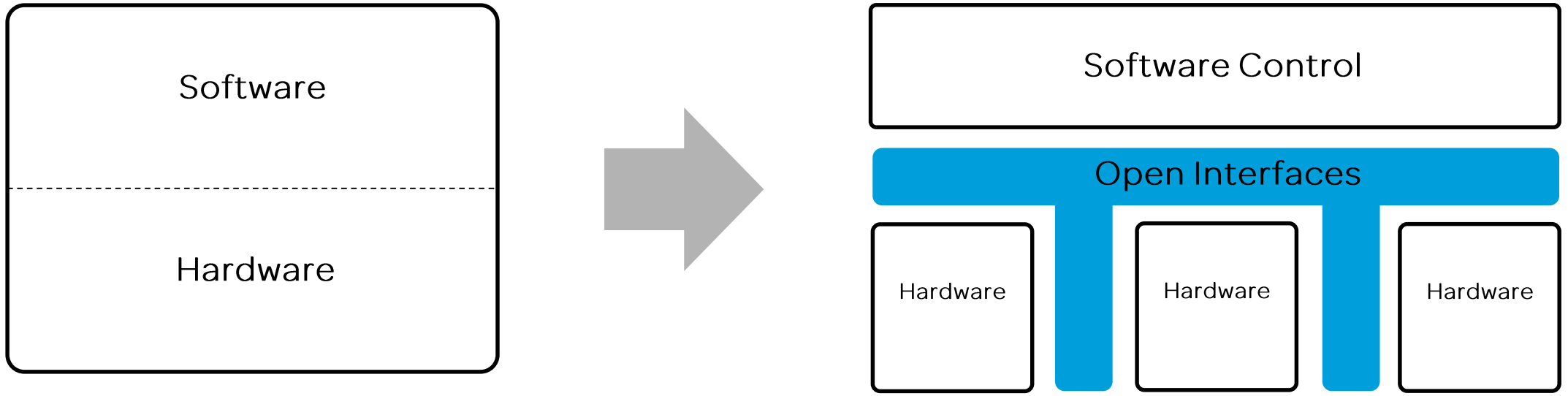
Open ROADM and MSA overview

Open ROADM team

© 2016 AT&T Intellectual Property. All rights reserved. AT&T, Globe logo, Mobilizing Your World and DIRECTV are registered trademarks and service marks of AT&T Intellectual Property and/or AT&T affiliated companies. All other marks are the property of their respective owners.

AT&T

Shift to Open & Flexible



Proprietary

Fixed

Siloed

Open - Standard

Flexible

Modular

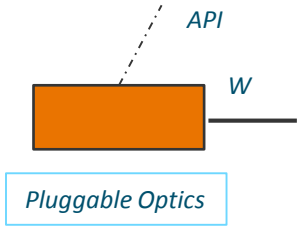
© 2016 AT&T Intellectual Property. All rights reserved. AT&T, Globe logo, Mobilizing Your World and DIRECTV are registered trademarks and service marks of AT&T Intellectual Property and/or AT&T affiliated companies. All other marks are the property of their respective owners.

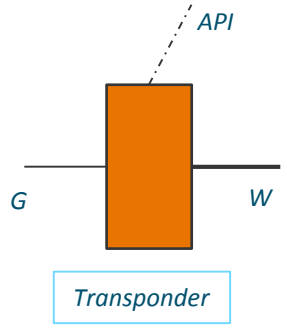
AT&T

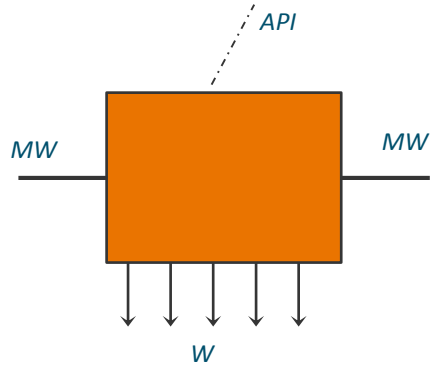
Proposed Optical Functions

- We want to standardize the framework for optical functions
  - Multi-vendor, Interchangeable, inter-workable components supporting standard APIs for control

- Pluggable optics: Fully open to pluggable optics , used in a ROADM system or packet element, independently controllable
- Transponder: Fully open to pluggable optics on client and line; Interoperable with other vendors/pluggables on line side
- ROADM: Open, flexible interoperable ROADM; Multi-vendor in a Metro; Individually controllable CD or CDC



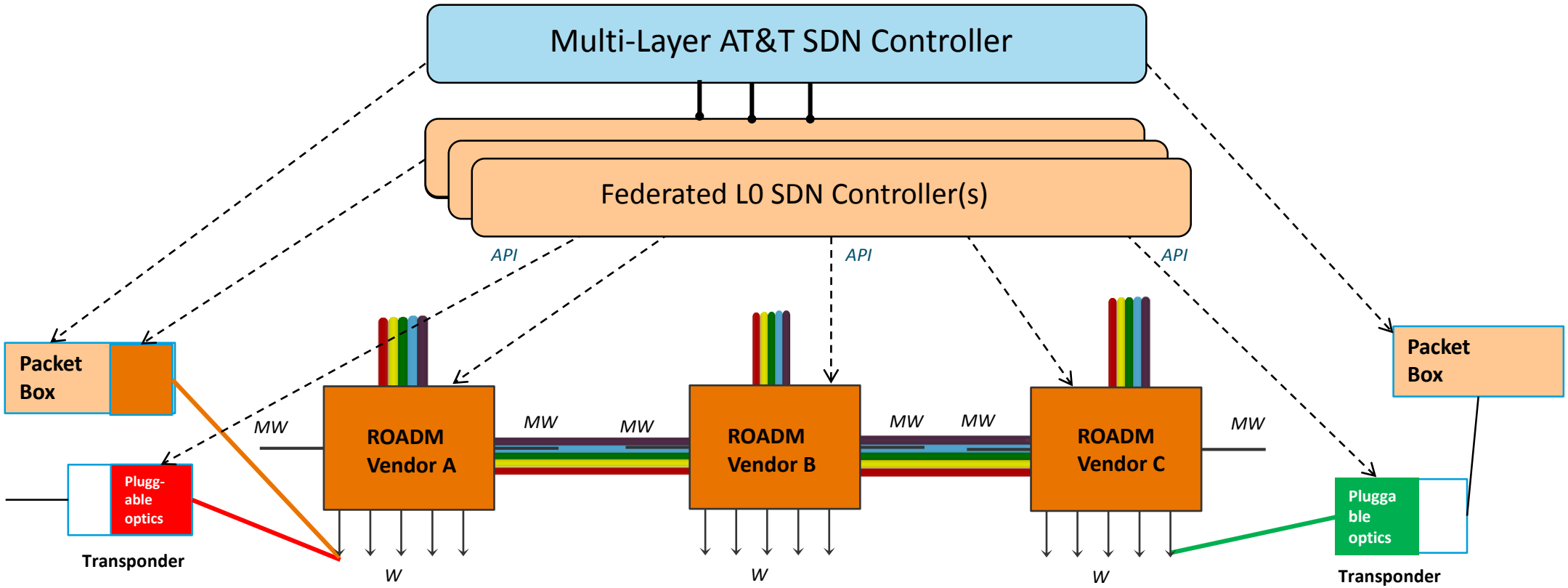




G: Grey (client, well covered in standards) W: Wavelength MW: Multi-Wavelength

© 2016 AT&T Intellectual Property. All rights reserved. AT&T, Globe logo, Mobilizing Your World and DIRECTV are registered trademarks and service marks of AT&T Intellectual Property and/or AT&T affiliated companies. All other marks are the property of their respective owners.

Metro SDN Controllers for Packet-Optical Network

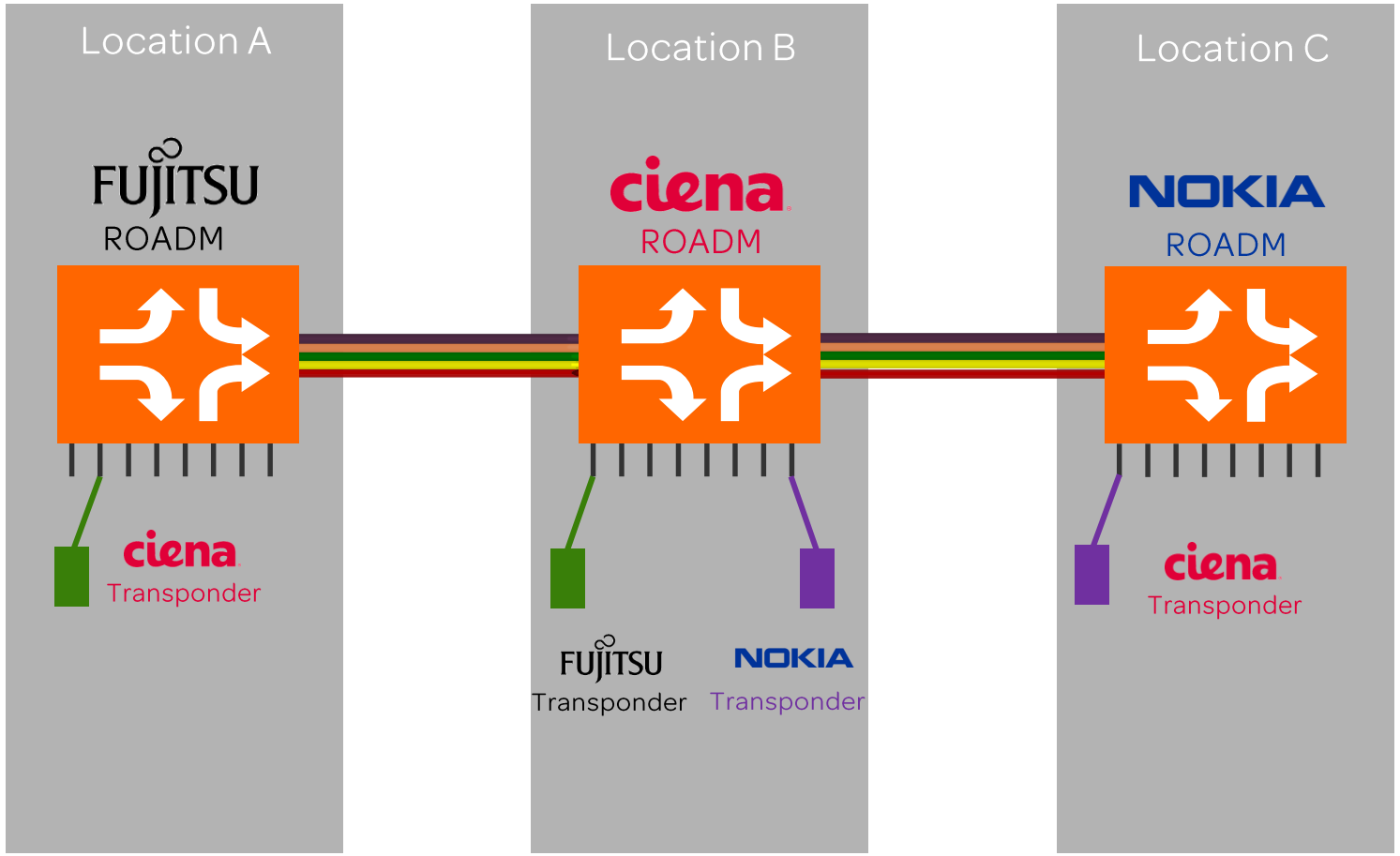


- Key Objectives
  - Open Disaggregated Interoperable Optical Layer
  - Standards-based API from each component to SDN Controller
  - Pluggable Long Reach Optics (on transponder or router)
  - Software controlled ROADMs (C/D & C/D/C)
  - Metro to start with, since less performance sensitive

© 2016 AT&T Intellectual Property. All rights reserved. AT&T, Globe logo, Mobilizing Your World and DIRECTV are registered trademarks and service marks of AT&T Intellectual Property and/or AT&T affiliated companies. All other marks are the property of their respective owners.

AT&T

Open ROADM for the Metro



- AT&T internal demo
- First to show open single and multi wavelength interfaces

History in the making!
February 2016

© 2016 AT&T Intellectual Property. All rights reserved. AT&T, Globe logo, Mobilizing Your World and DIRECTV are registered trademarks and service marks of AT&T Intellectual Property and/or AT&T affiliated companies. All other marks are the property of their respective owners.

Open ROADM Multi-Source Agreement (MSA)

openroadm.org

- Open ROADM specifications available

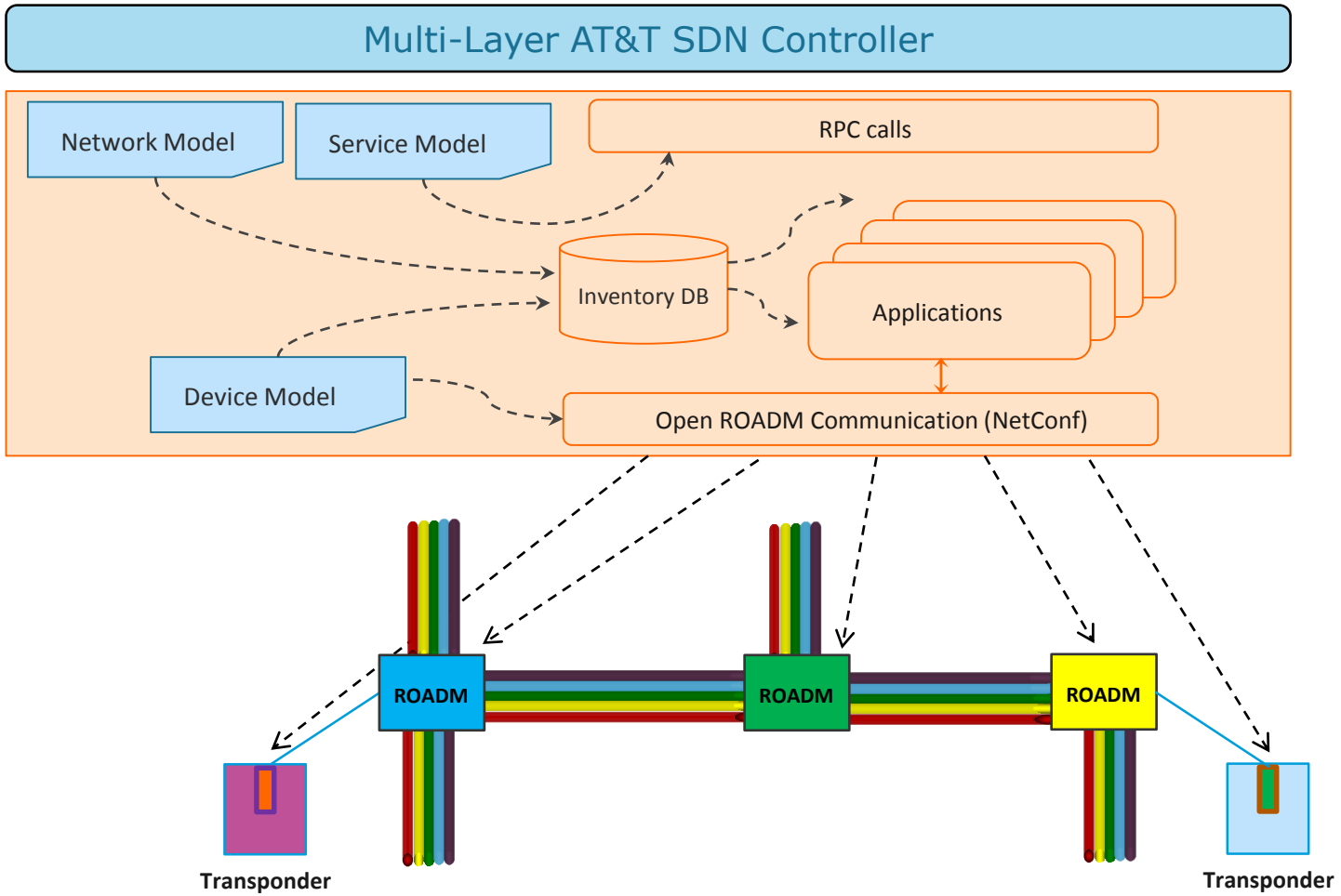
  Optical spec and YANG data models
- Current members:

  AT&T, Ciena, Fujitsu, Nokia, SK Telecom
- Current work:

  Finished data models by end of June

© 2016 AT&T Intellectual Property. All rights reserved. AT&T, Globe logo, Mobilizing Your World and DIRECTV are registered trademarks and service marks of AT&T Intellectual Property and/or AT&T affiliated companies. All other marks are the property of their respective owners.

YANG Model Based Open ROADM Controller



© 2016 AT&T Intellectual Property. All rights reserved. AT&T, Globe logo, Mobilizing Your World and DIRECTV are registered trademarks and service marks of AT&T Intellectual Property and/or AT&T affiliated companies. All other marks are the property of their respective owners.

YANG Data models

- Network abstraction
  - Devices can be changed without having to re-code applications
  - AT&T's abstraction open sourced as an example, can be changed by user
- Service RPC commands
  - AT&T's RPCs open sourced as example, can be changed as per desire
- Device template
  - Hardware suppliers fill in their device specific information into template
  - Enables "plug-and-play"

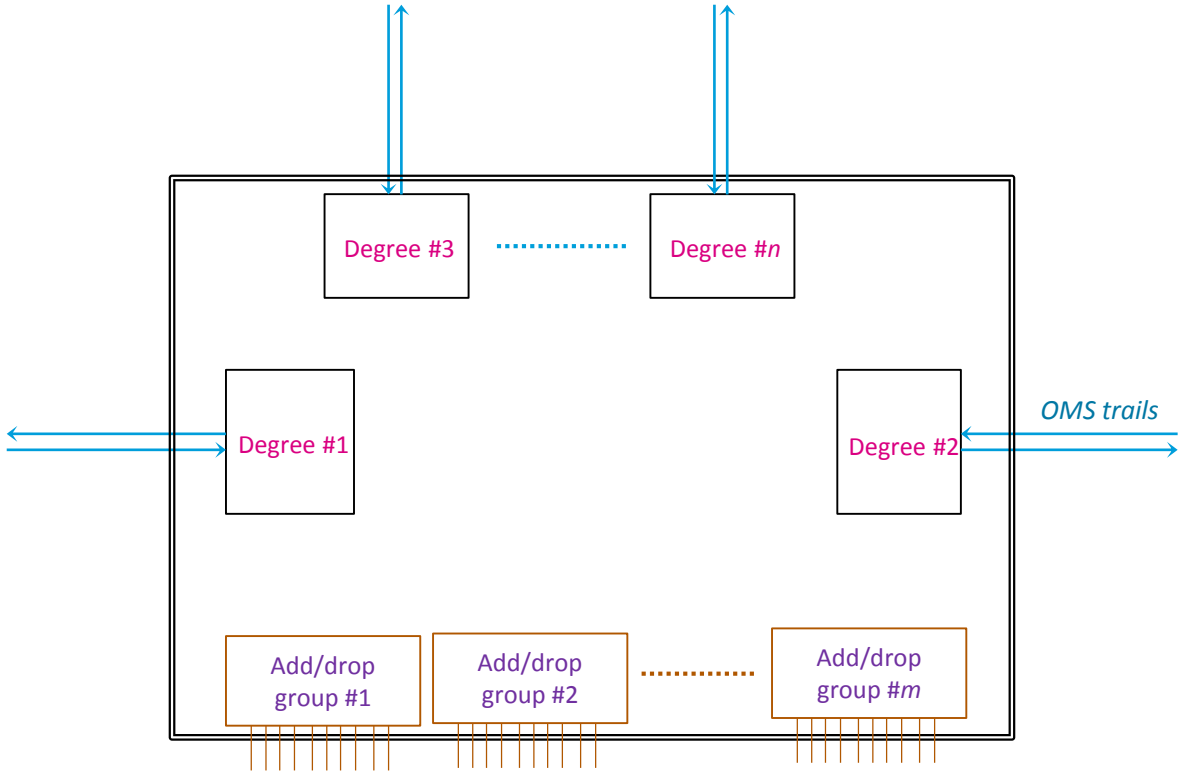
© 2016 AT&T Intellectual Property. All rights reserved. AT&T, Globe logo, Mobilizing Your World and DIRECTV are registered trademarks and service marks of AT&T Intellectual Property and/or AT&T affiliated companies. All other marks are the property of their respective owners.

AT&T

Open ROADM Network Model

Basic building blocks:

- Degree
- Add/drop group / Shared Risk Group (SRG)

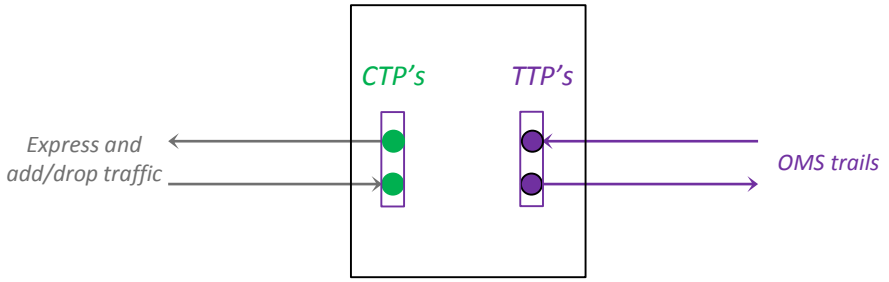


© 2016 AT&T Intellectual Property. All rights reserved. AT&T, Globe logo, Mobilizing Your World and DIRECTV are registered trademarks and service marks of AT&T Intellectual Property and/or AT&T affiliated companies. All other marks are the property of their respective owners.

Degree and SRG Constructs

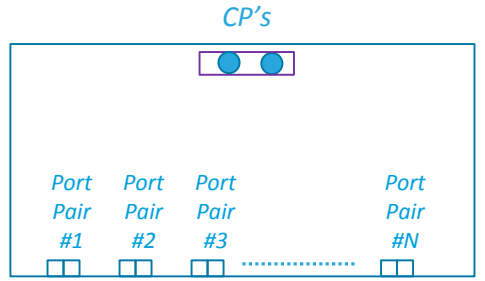
Degree:

- Trail Termination Points (TTPs)
- Connection Termination Points (CTPs)



SRG:

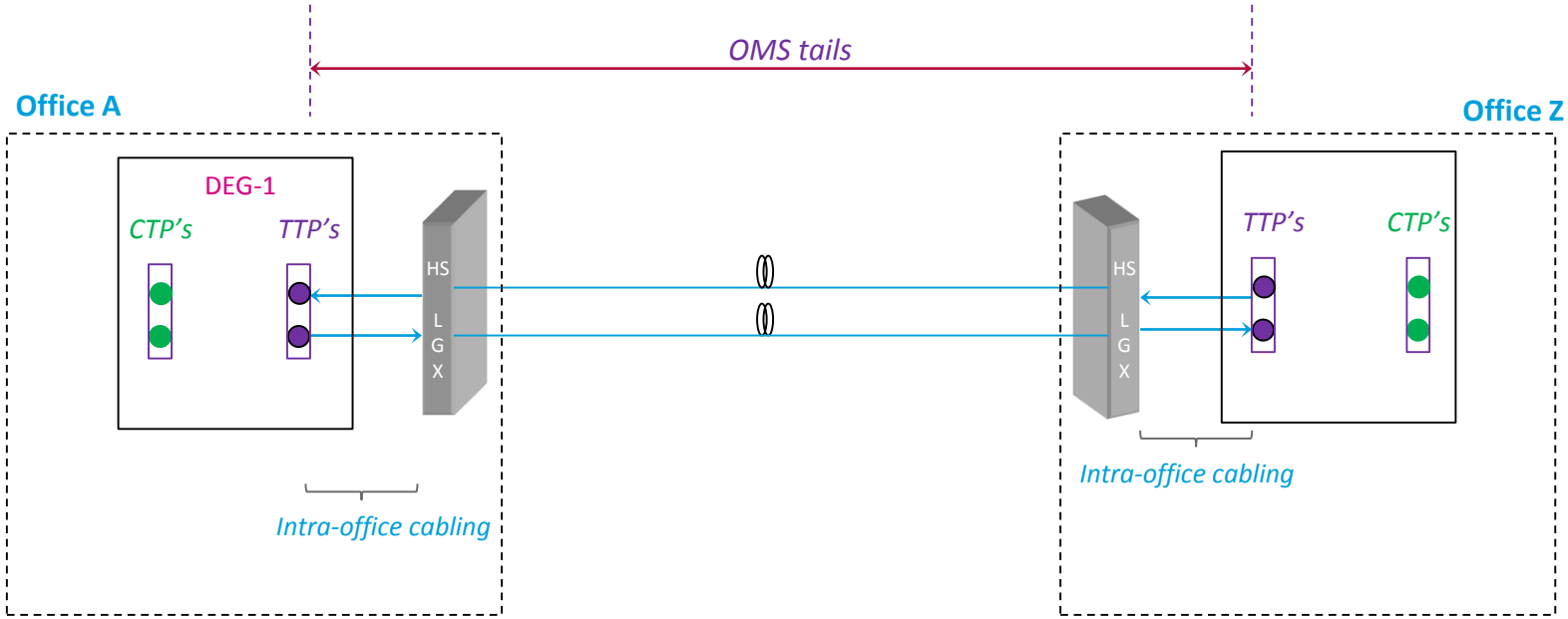
- Connection Points (CPs)
- *N* Port pairs (*pp*'s)



© 2016 AT&T Intellectual Property. All rights reserved. AT&T, Globe logo, Mobilizing Your World and DIRECTV are registered trademarks and service marks of AT&T Intellectual Property and/or AT&T affiliated companies. All other marks are the property of their respective owners.

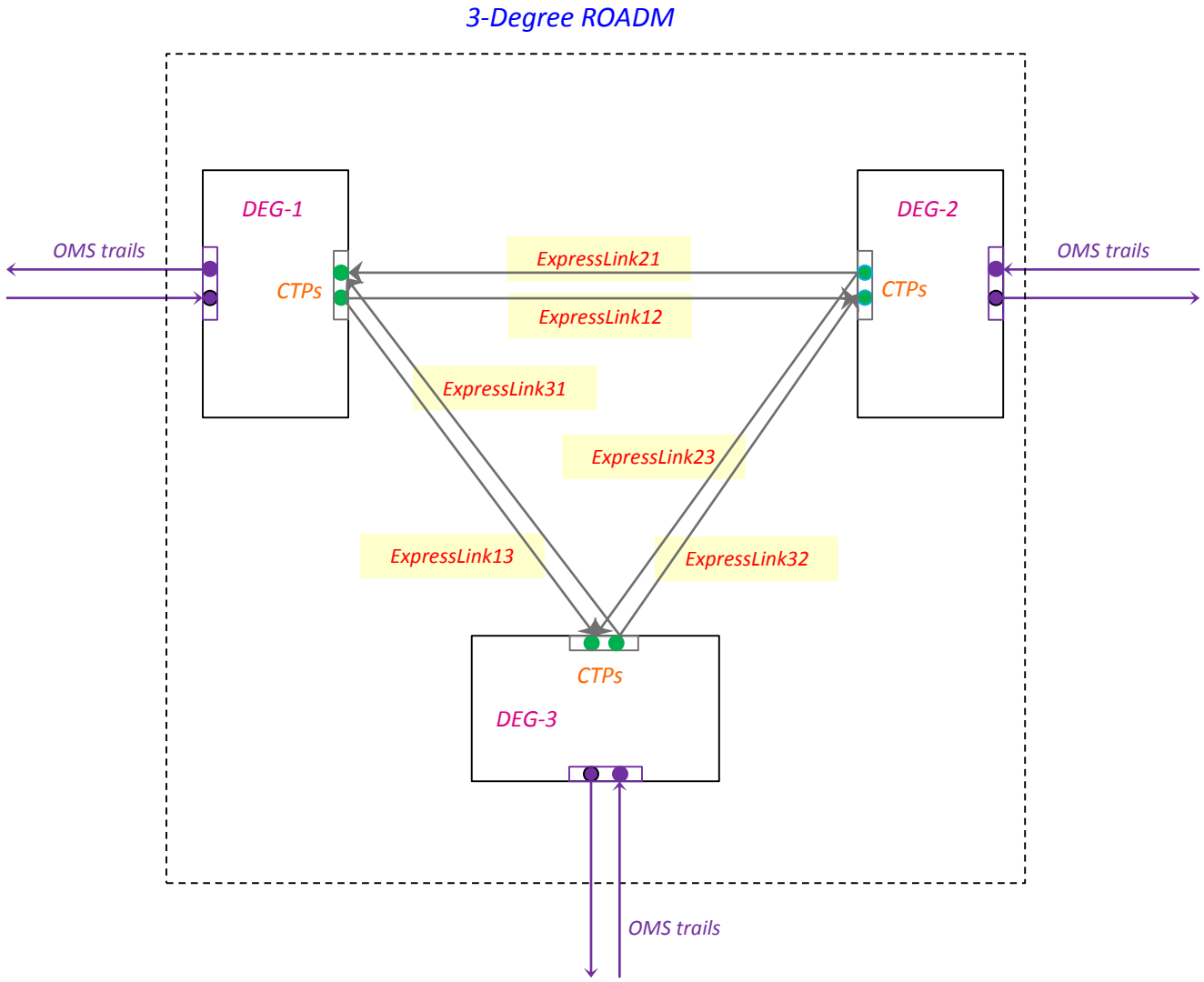
AT&T

External Connections via TTPs in Degrees



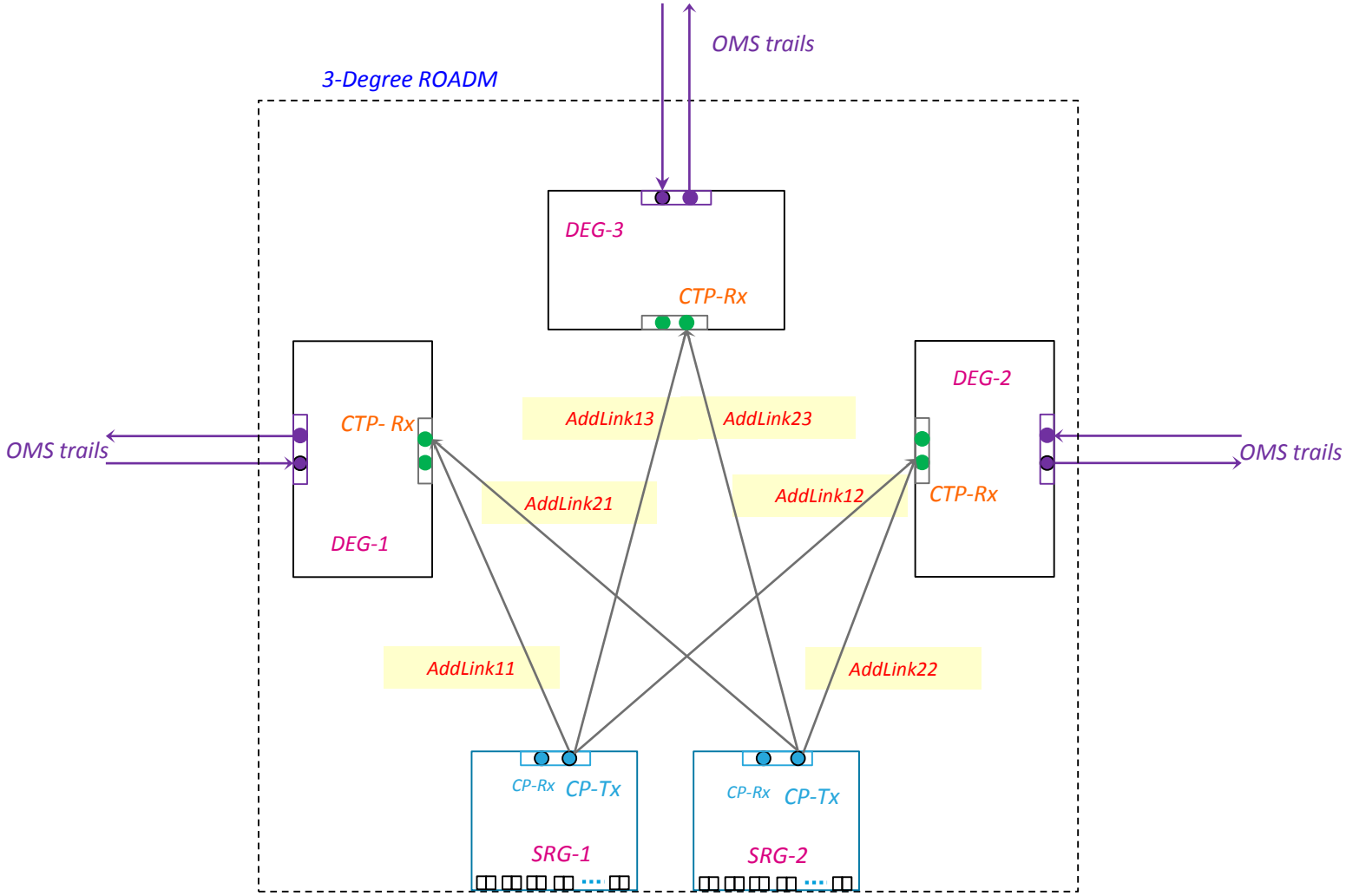
© 2016 AT&T Intellectual Property. All rights reserved. AT&T, Globe logo, Mobilizing Your World and DIRECTV are registered trademarks and service marks of AT&T Intellectual Property and/or AT&T affiliated companies. All other marks are the property of their respective owners.

Internal Connections via CTPs in Degrees



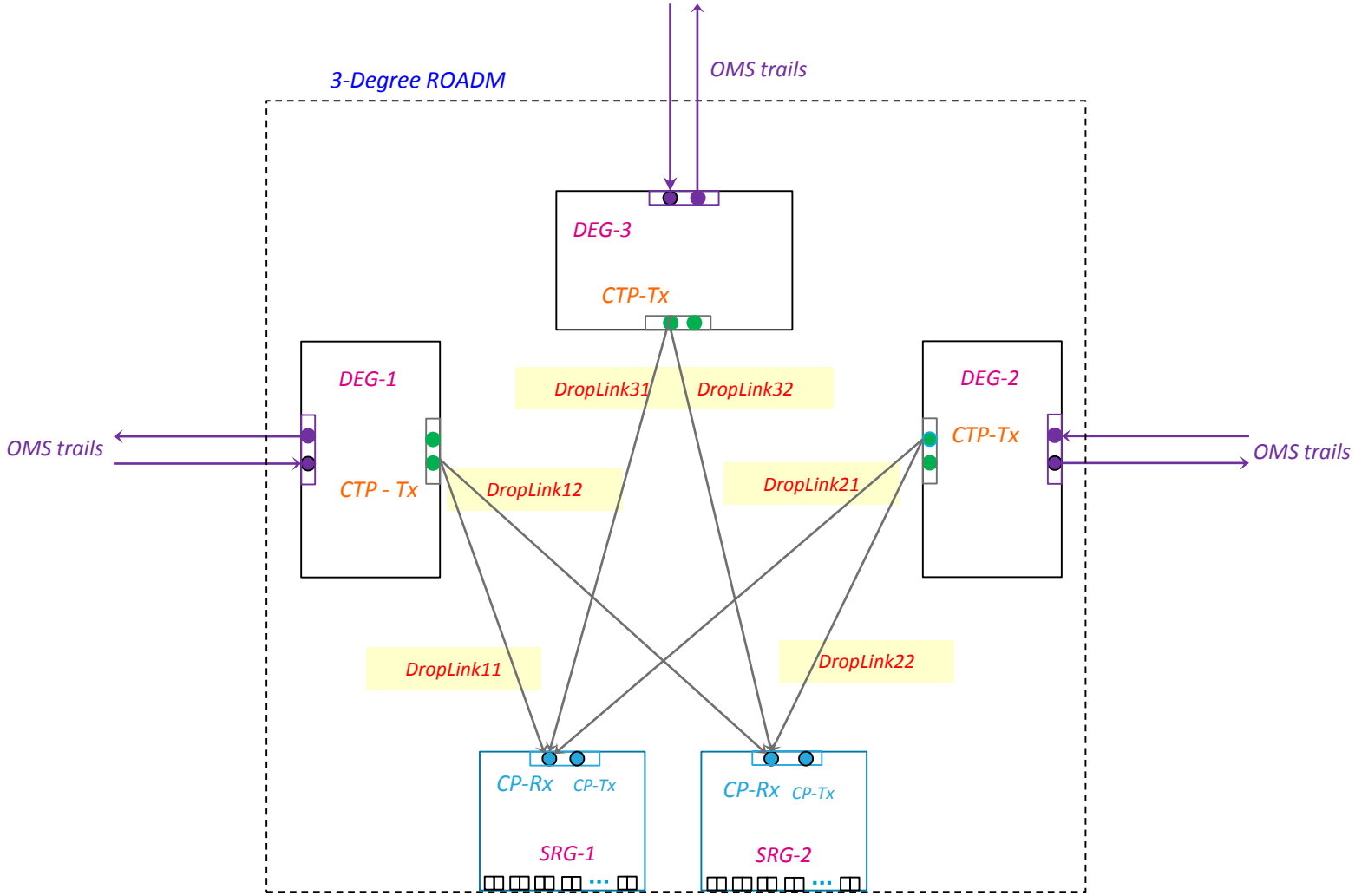
© 2016 AT&T Intellectual Property. All rights reserved. AT&T, Globe logo, Mobilizing Your World and DIRECTV are registered trademarks and service marks of AT&T Intellectual Property and/or AT&T affiliated companies. All other marks are the property of their respective owners.

Internal Connections via CTPs and CPs (1)



© 2016 AT&T Intellectual Property. All rights reserved. AT&T, Globe logo, Mobilizing Your World and DIRECTV are registered trademarks and service marks of AT&T Intellectual Property and/or AT&T affiliated companies. All other marks are the property of their respective owners.

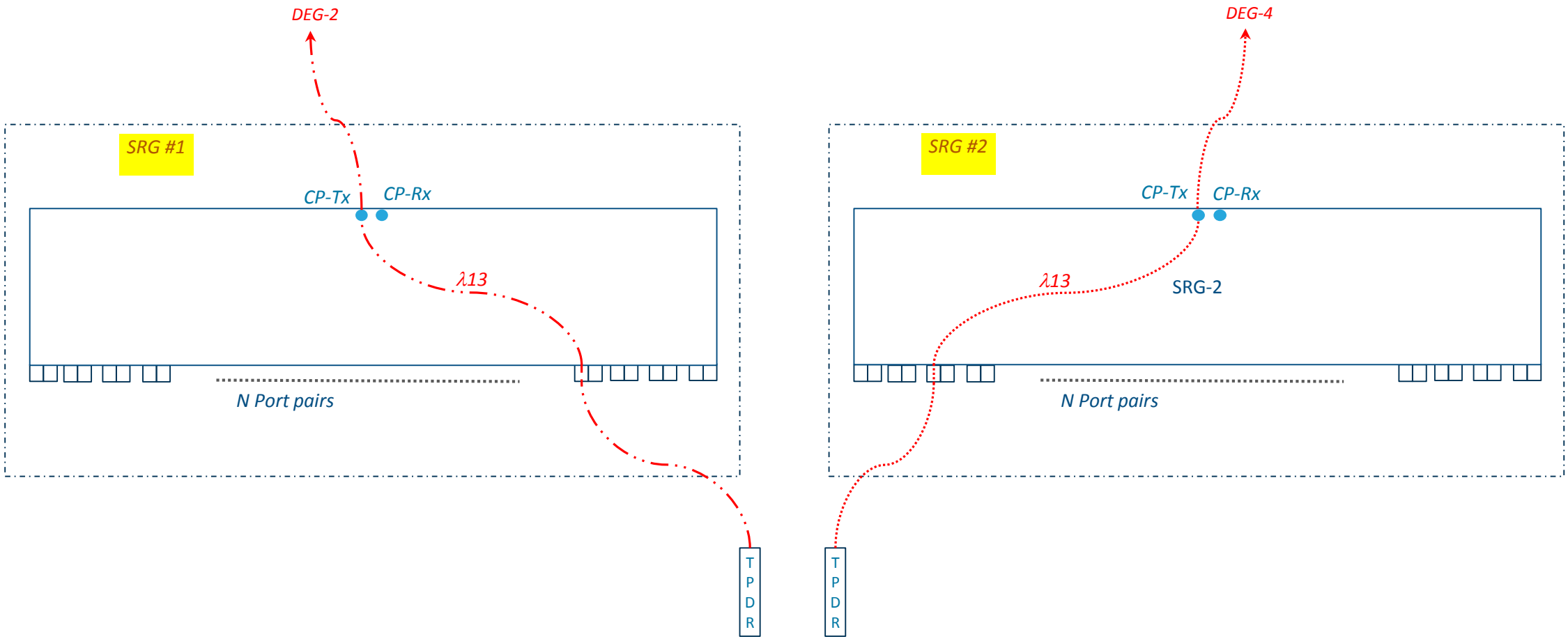
Internal Connections via CTPs and CPs (2)



© 2016 AT&T Intellectual Property. All rights reserved. AT&T, Globe logo, Mobilizing Your World and DIRECTV are registered trademarks and service marks of AT&T Intellectual Property and/or AT&T affiliated companies. All other marks are the property of their respective owners.

SRG – C/D Model

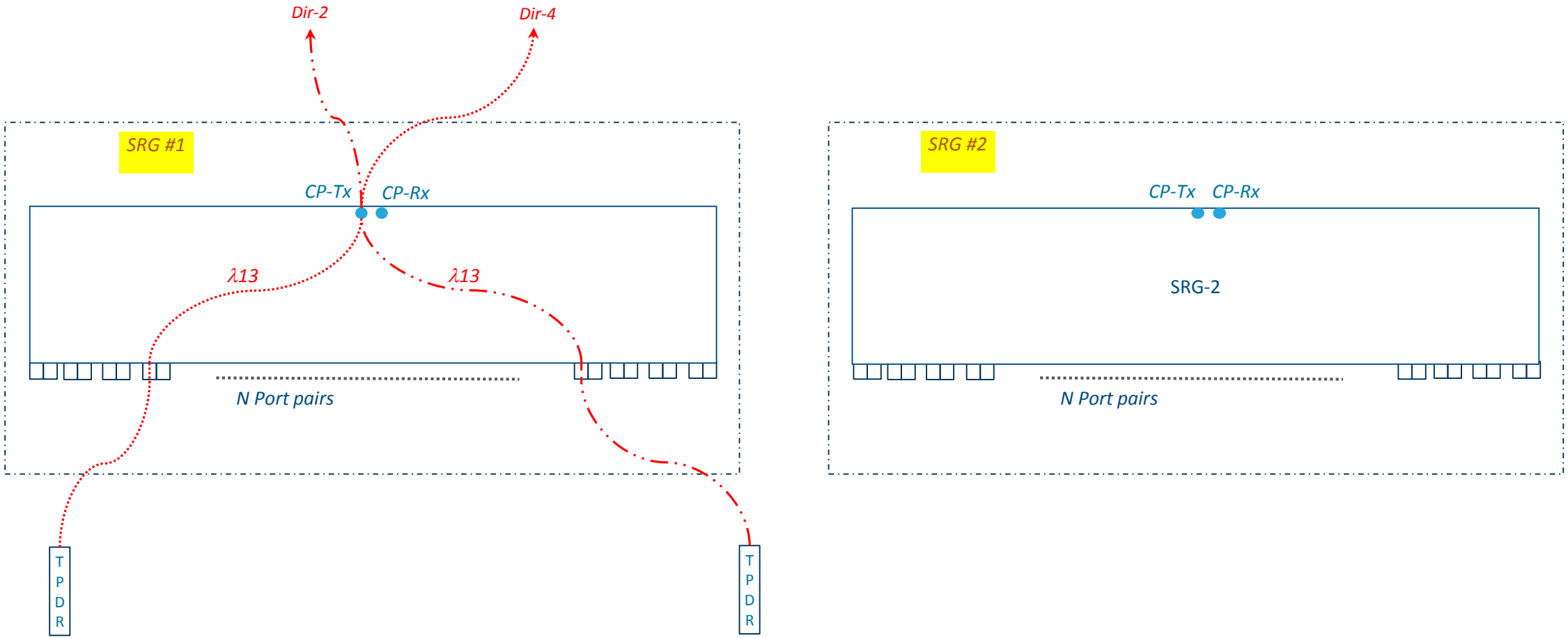
- Wavelength assignment at each SRG's CP-Tx and CP-Rx: *One per SRG*



AT&T

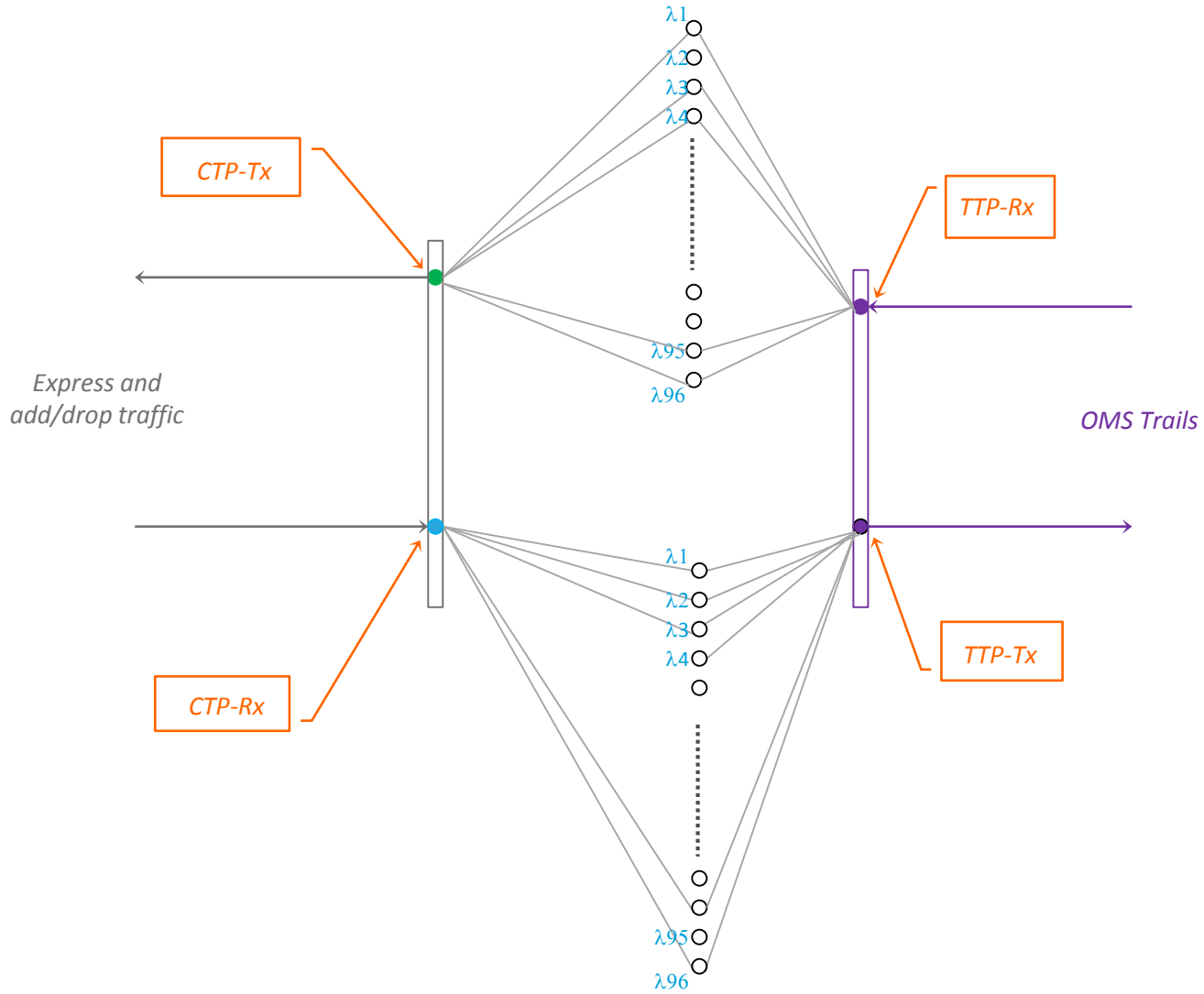
SRG – C/D/C Model

- Wavelength assignment at each SRG's CP-Tx and CP-Rx: *One per Degree*



AT&T

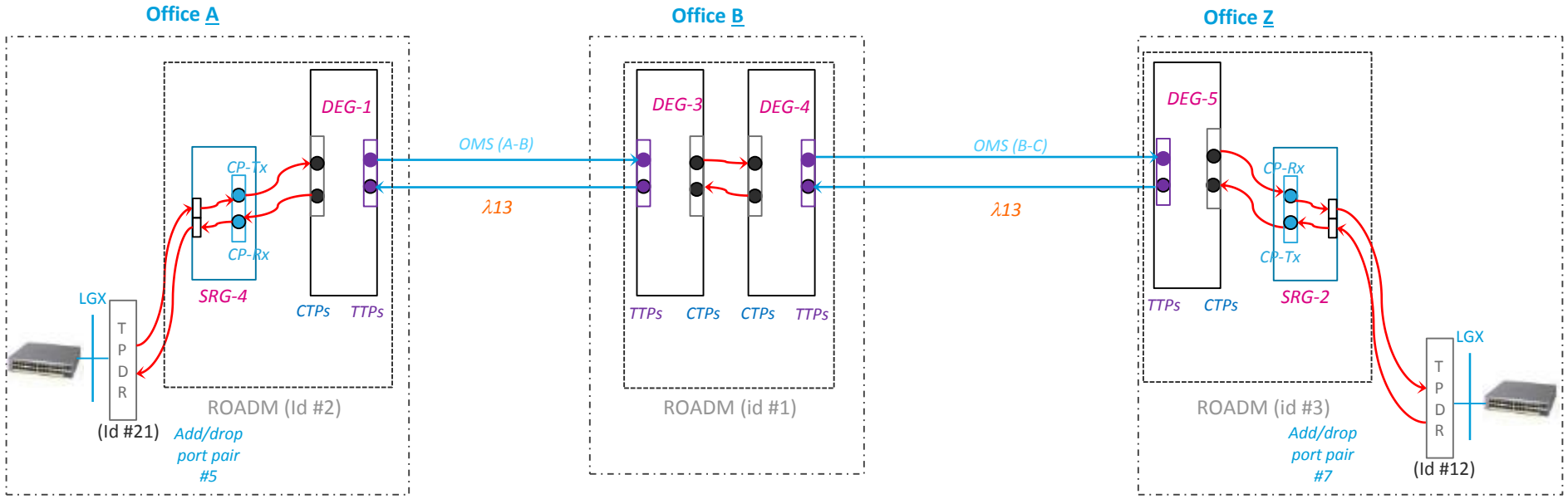
Multi-wavelength TTPs and CTPs



© 2016 AT&T Intellectual Property. All rights reserved. AT&T, Globe logo, Mobilizing Your World and DIRECTV are registered trademarks and service marks of AT&T Intellectual Property and/or AT&T affiliated companies. All other marks are the property of their respective owners.

AT&T

A Service Example



Office A/Node #2	SRG #4 / CP-Tx–5
	AddLink41
	DEG-1 / CTP-Rx–13
	DEG-1 / TTP-Tx–13
OMS (A-B)	
Office B/Node #1	DEG-3 / TTP-Rx–13
	DEG-3 / CTP-Tx–13
	ExpressLink34
	DEG-4 / CTP-Rx–13
	DEG-4 / TTP-Tx–13
OMS (B-C)	
Office Z/Node #3	DEG-5 / TTP-Rx–13
	DEG-5 / CTP-Tx–13
	DropLink52
	SRG #2 / CP-Rx–7

© 2016 AT&T Intellectual Property. All rights reserved. AT&T, Globe logo, Mobilizing Your World and DIRECTV are registered trademarks and service marks of AT&T Intellectual Property and/or AT&T affiliated companies. All other marks are the property of their respective owners.

AT&T

Vendor-Specific Device Model

- Circuit Packs
  - Name
  - Location (bay, shelf, slot)
  - Input ports
    - Port name
    - Physical Link name
    - Logical Connection Point
    - …..
  - Output ports
    - Port name
    - Physical Link name
    - Logical Connection Point
    - ….
- Physical Connections
  - Name
  - Source
    - Degree ID / SRG ID
    - Circuit Pack Name
    - Port Name
    - Logical Link Name
    - …..
  - Destination
    - Degree ID / SRG ID
    - Circuit Pack Name
    - Port Name
    - Logical Link Name
    - …..
- Circuit Pack Internal Connections

© 2016 AT&T Intellectual Property. All rights reserved. AT&T, Globe logo, Mobilizing Your World and DIRECTV are registered trademarks and service marks of AT&T Intellectual Property and/or AT&T affiliated companies. All other marks are the property of their respective owners.

More about Device Model

- Attributes
  - Interface
  - protocols
  - External links
  - Wavelength Map
  - Connection Map
  - Syslog
  - Current PM list
  - Historical PM list
  - …..
- Notifications
  - Inventory
  - Alarms
  - TCA
  - …..

- RPCs
  - DB-backup
  - DB-restore
  - DB-activate
  - Cancel-rollback (cancel rollback timer)
  - Restart
  - Reinitialize
  - Get connection port trail
  - Change password
  - Start scan
  - Software stage
  - Software activate
  - …..

© 2016 AT&T Intellectual Property. All rights reserved. AT&T, Globe logo, Mobilizing Your World and DIRECTV are registered trademarks and service marks of AT&T Intellectual Property and/or AT&T affiliated companies. All other marks are the property of their respective owners.

Service Model

— A collection of RPCs for the SDN-C to manage L0 services and obtain network information

- Service creation
- Service deletion
- Service feasibility check
- Temporary service creation
- Temporary service deletion
- Service roll
- Service reconfigure
- Service restoration (regen failure)
- Service re-route (OMS failure)
- Network re-optimization
- Network topology
- Service layout

© 2016 AT&T Intellectual Property. All rights reserved. AT&T, Globe logo, Mobilizing Your World and DIRECTV are registered trademarks and service marks of AT&T Intellectual Property and/or AT&T affiliated companies. All other marks are the property of their respective owners.

AT&T

AT&T