OPEN Compute Project

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Road to 5G · AI · Edge Computing

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Building a Smarter Greener Data Center in the IoT Era

▶ Richard Chan/ Director

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OCP Membership

AT&T (since 2015)	Baidu (since 2019)	Facebook (since 2011)	Delta Electronics (since 2016)	Intel (since 2011)	IBM (since 2013)
Deutsche Telekom (since 2016)	LinkedIn (since 2018)	Nokia (since 2015)	Flex (since 2016)	JD.com (since 2018)	Lenovo (since 2016)
Alibaba (since 2017)	Google (since 2015)	HPE (since 2015)	Huawei (since 2018)	Microsoft (since 2014)	Tencent (since 2018)

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Delta – ICT (Information Communication Technology) Business Group

Telecom, Networking and
Data Center Infrastructure Solutions

Revolution of Telecom/Data Center

New Architecture

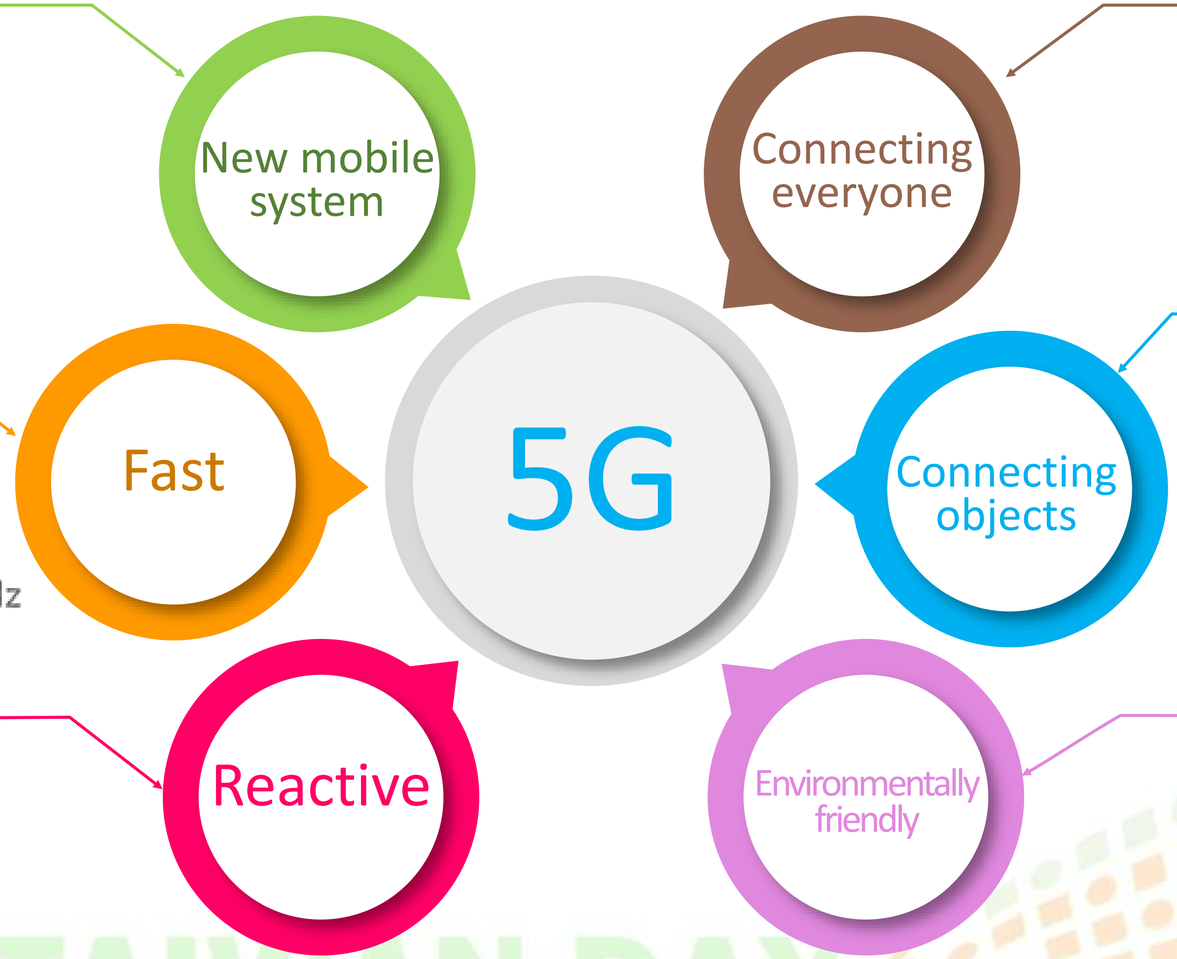
- Edge Computing
- NextGen Data Center Switch
- NextGen Telecom Switch
- IoT
- SDWAN

New Technology

- Optical Switching
- Peak Data Rates 20 Gb/s
- Available Spectrum 30 GHz

High Reliability

- Edge Computing
- Latency <1 ms



Large Traffic

- Radio over Ethernet
- 50 Exabytes / Month(2021)

Large Capacity

- IoT
- 35B devices connected (2023)
- Connection Density - 1 Million Connections/Km^2 (2021)

Energy Efficiency

- Optical Switching
- High Power demand and efficiency

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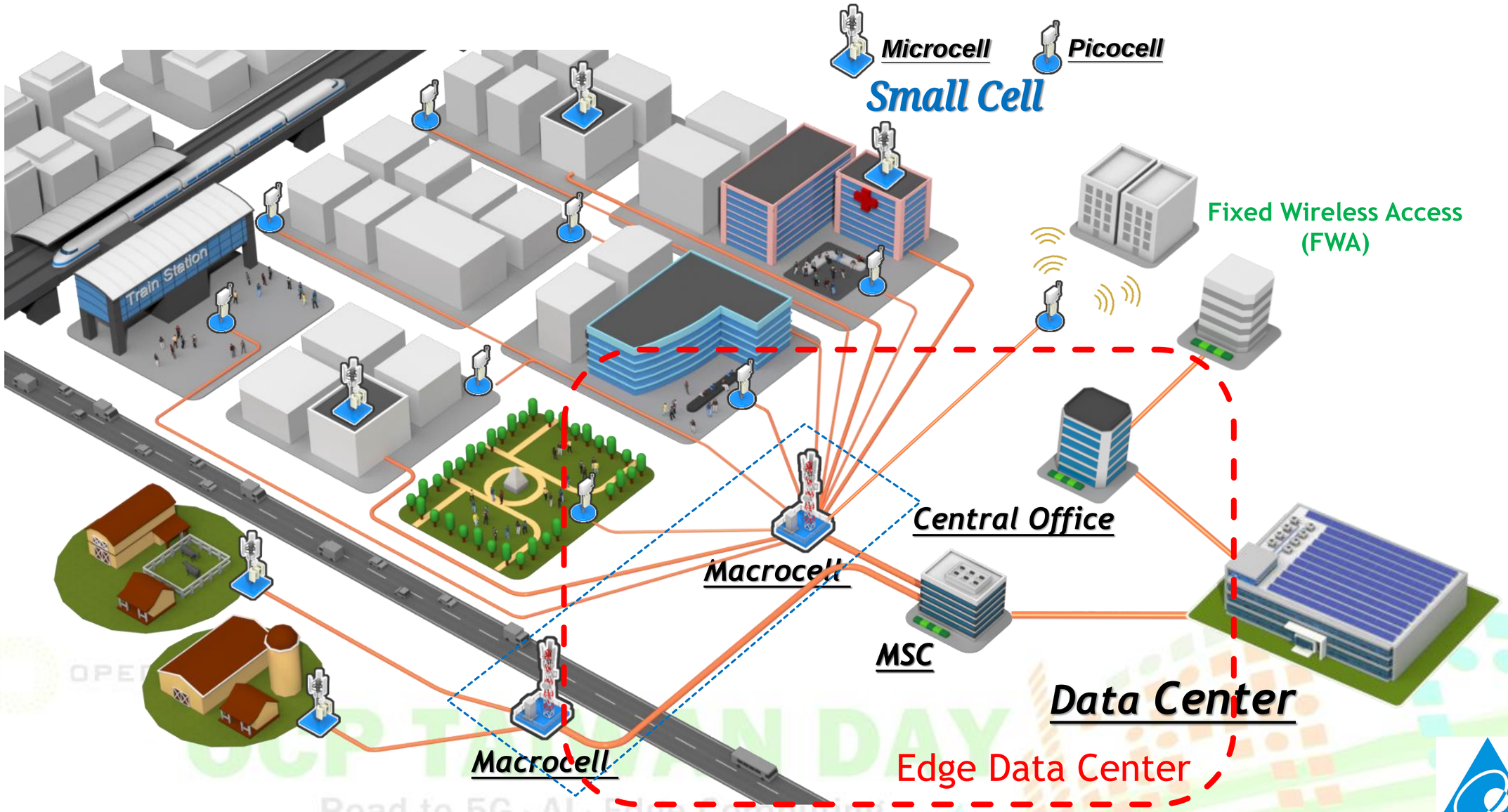
5G Telecom Infrastructure



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Delta Telecom Power Infrastructure Solution

Power Module / Control Unit

PV Charger

Rectifier

DC-DC Converter

Power System Controller

DC-AC Inverter

Site & Solution Controller

Power System

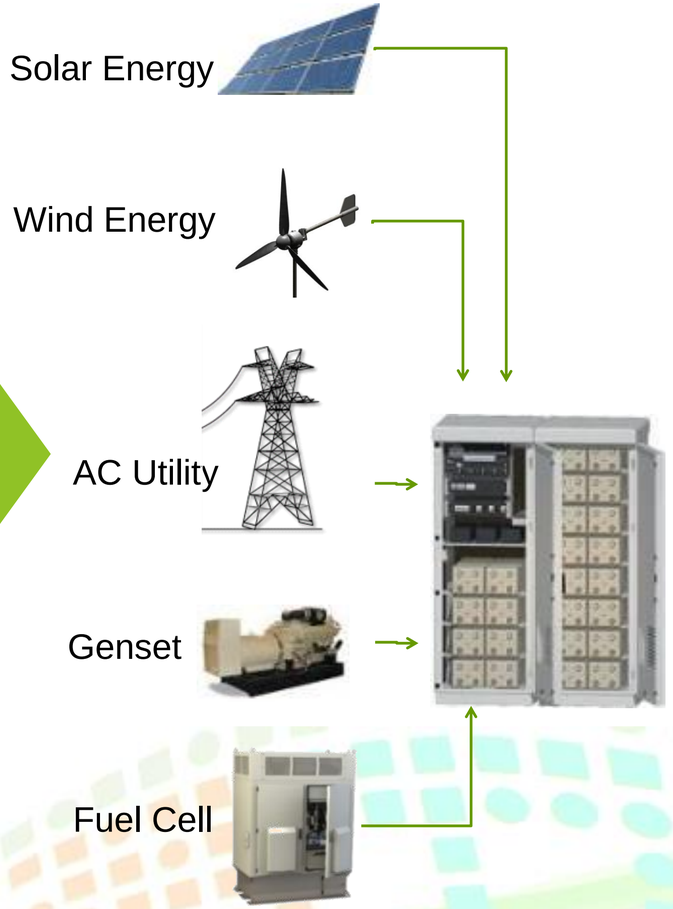
Shelf Power

Medium-range Power System

Large Power Cabinet

Outdoor Cabinet

Renewable / Hybrid Solutions



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Delta Data Center Solution

Switch

IT Room

Power Shelf
12V/48V

BBU Shelf
12V/48V

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Rack

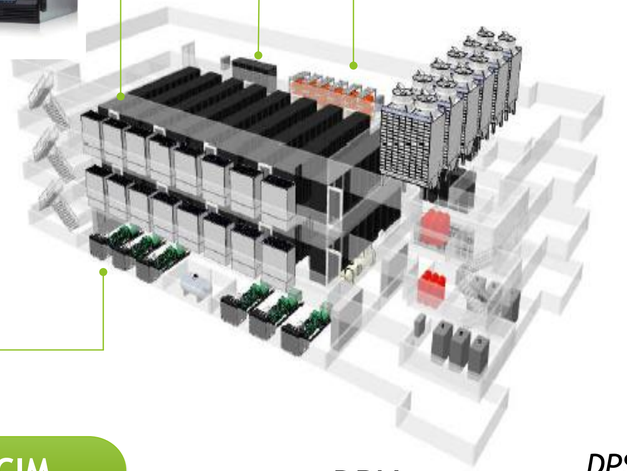
RPP

Rack

rPDU

rRPP

rSTS

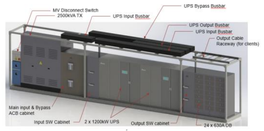


MDF Room

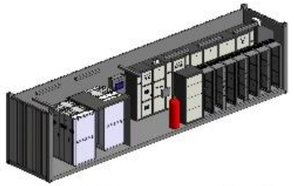
48V DC module

Power Room

Prefab : Power Skid



Prefab : Power Container

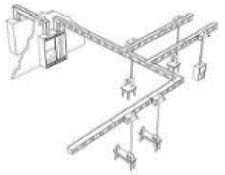


Modular Data Center *Cabinet*

PDU

STS

Busway

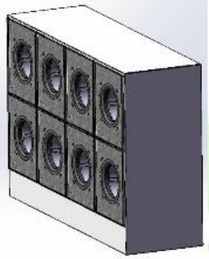


Cooling Room

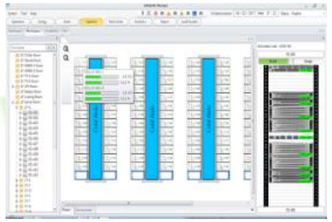
RoomCool

RowCool

AHU
60/205/400KW



DCIM



DPM
500~1500kW

DPS
500-1500kW

DPH
500/600kW

HVDC
150/300kW

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OCP Power & Rack solution

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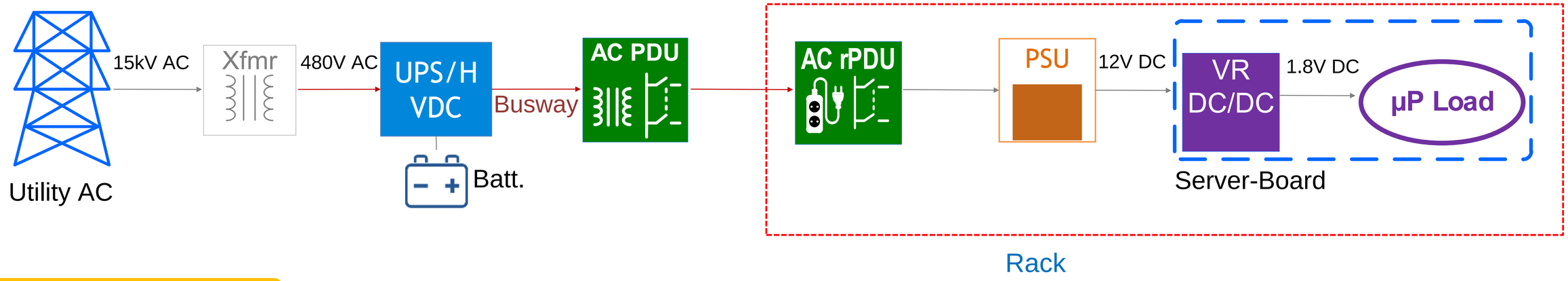
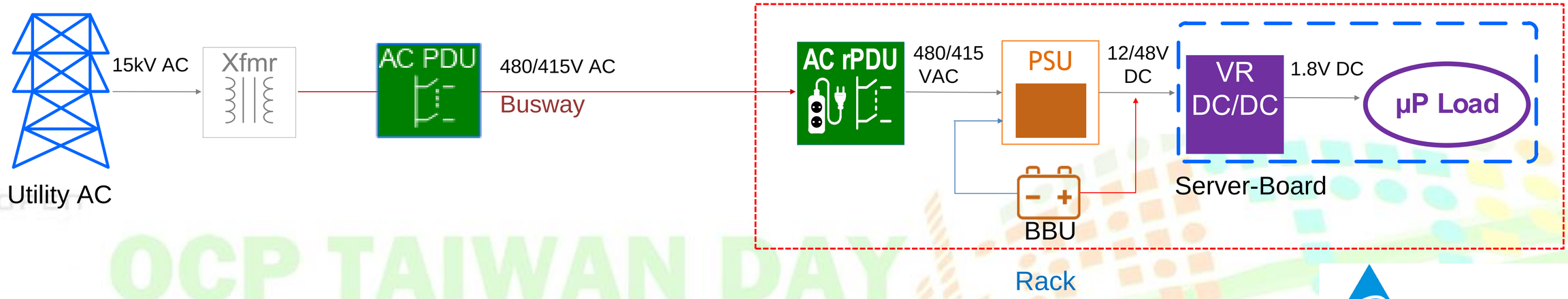
Data Center Power Architecture

Facility Level



Rack Level



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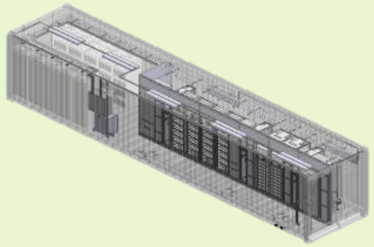
Data Center Infrastructure Technology Developing Strategy

Requirement	DCIM	CAPEX & OPEX	Availability & Reliability	Rapid Deployment
Delta Existing Solution	**Real-time monitoring management** 	**PSU Eff. : 98%** **UPS Eff. : 97%** - IGBT , Mosfet device **DC architecture** - High efficiency Power Module	**Redundant Design & Pre-alarm System** - Circuit / communication path / Component level Redundancy - Key component health check	**Customized POD**
Developing Strategy	• Capacity overload prediction. • PUE modeling and optimization **Machine Learning**	**PSU & UPS Eff.: 98%** - WBG device **DC architecture** - DC feed directly - Li Battery BMS Control **High Efficiency**	 **Predictive Maintenance**	 **High-density Power Container**

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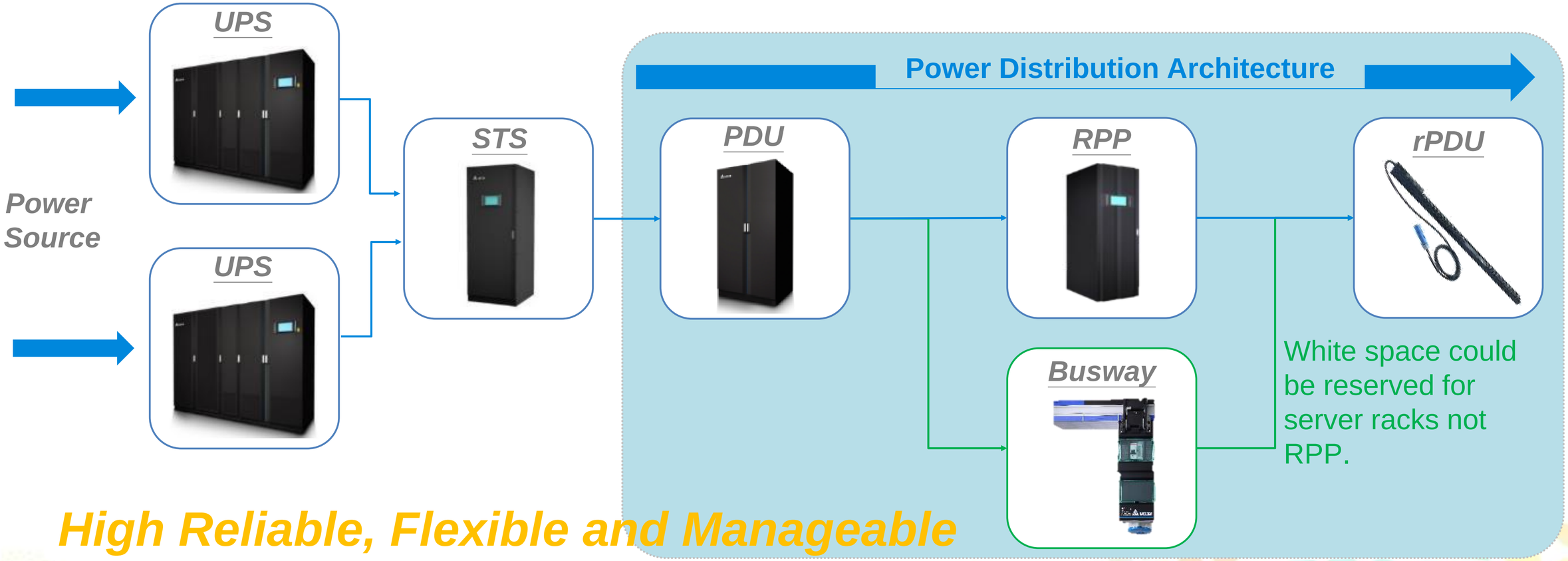
Data Center Upstream Power Distribution



High Reliable, Flexible and Manageable

STS: Static Transfer Switch
PDU: Power Distribution Units
RPP: Remote Power Panel
rPDU: Rack Power Distribution Units

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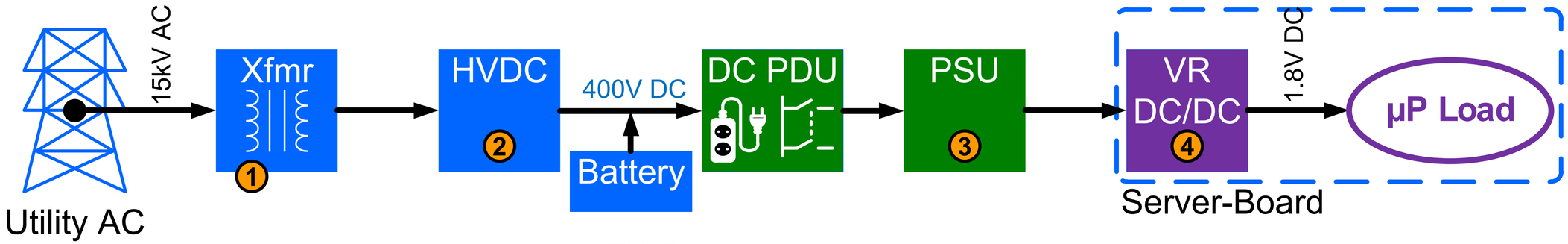
HVDC Upstream Power System



- Power module hot plugged
- Advanced energy saving functionality
- > 96.5 % efficiency --- rectifier module
- N+1 redundant system

150KW/ 300KW
HVDC System

HVDC Rectifier

HVDC I/P 48V or 12V Converter

Ground Fault Detector

HVDC CSU

HVDC PDU

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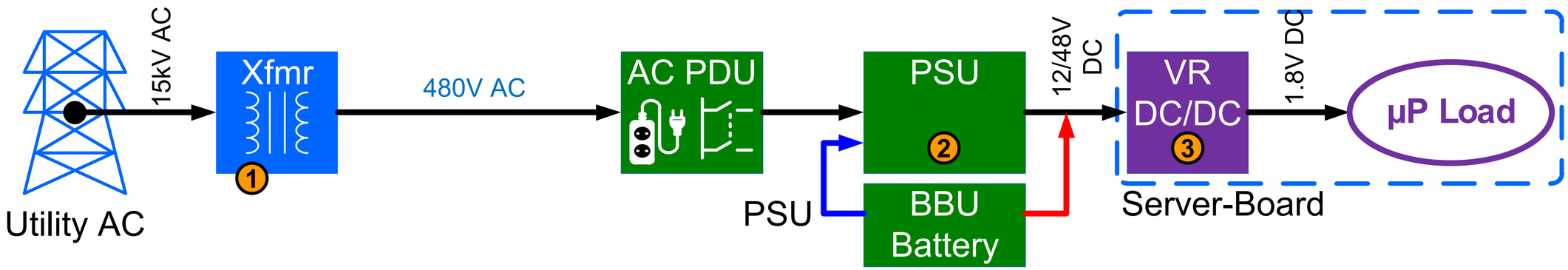
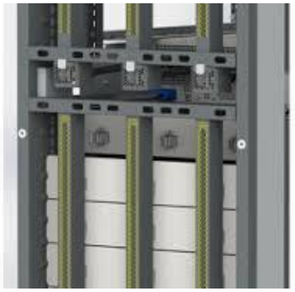
48V/12Vdc with BBU Backup



- Smart & Intelligent Rack
- Single or Dual input Power Source
- 48V or 12V Bus Bar link
- Intelligent ATS function
- Li-Battery Power Back Up



Power Distribution Bus Bar

33KW/ 48V Power Shelf

15KW/ 12V Power Shelf

RMC

33KW/ 48V BBU Shelf

Dual Input ATS

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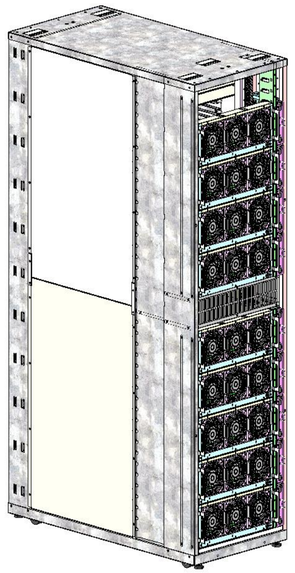
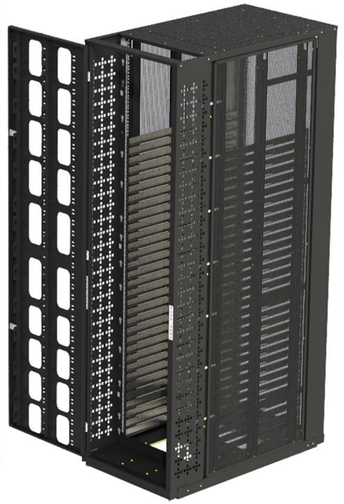
Delta Rack Family

Single AC I/P V1
open rack
12.5V/ 12.5KW



AC+ HVDC input
Fan Wall Open Rack
12.5V/ 15KW

Dual AC Input
V1 open rack
12.5V/ 28KW



Dual AC Input
ATS + PDU
15KW

Dual AC I/P
V2 open rack
12.5V/ 12.5KW

Single AC Input
V2 open rack
48V/ 33KW

DCIM : Data Center Infrastructure Management

e-mail

Client...

Mobile app...

Organizational Privilege

Chiller

PV Inverter

Power Shelf

Power Meter

IP Camera

Pump

BMS

rPDU

rATS

UPS

EMS1x00

Motioning

Water Meter

Door Access

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Networking Communications

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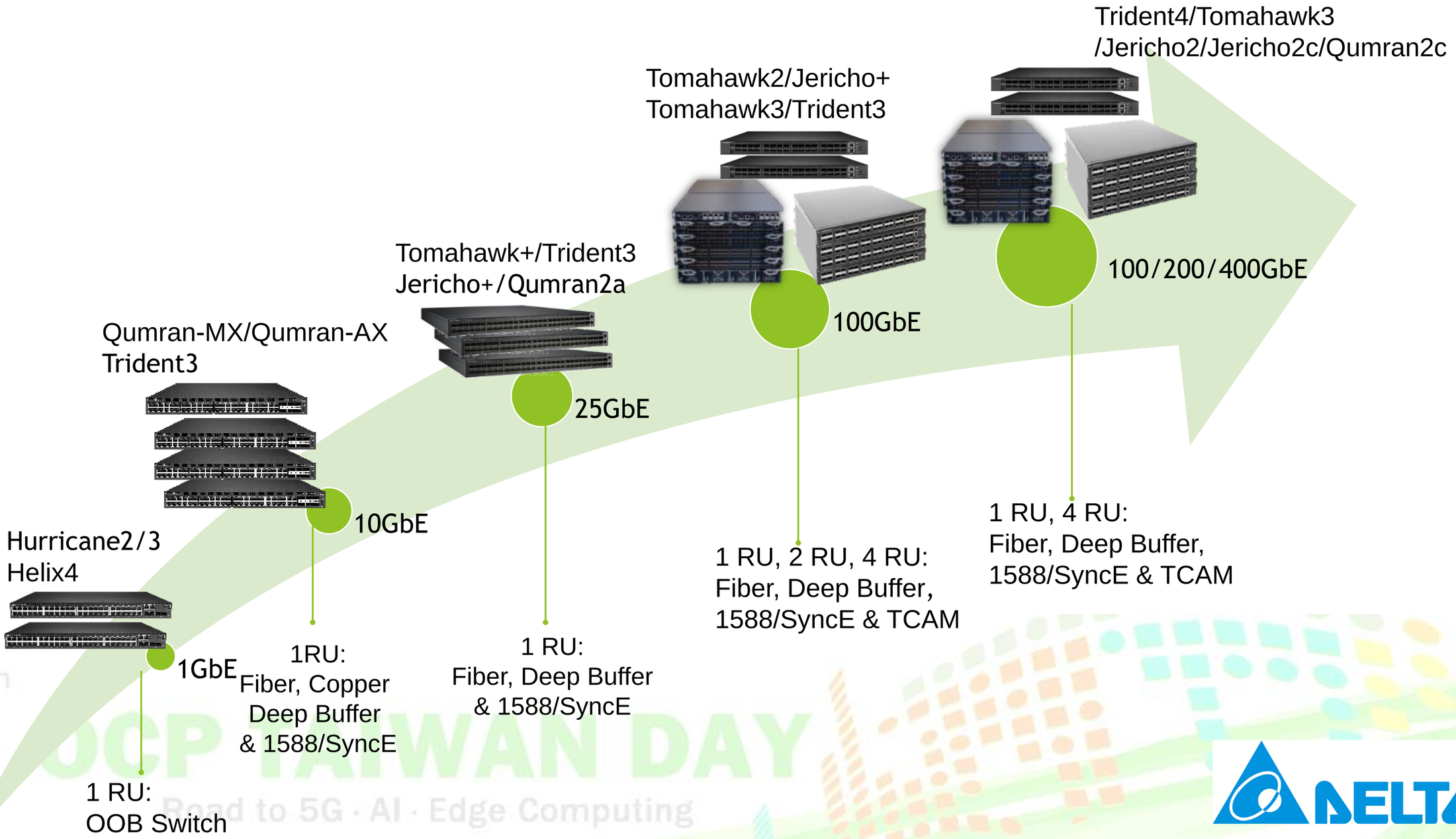
Delta Networking Product Portfolio



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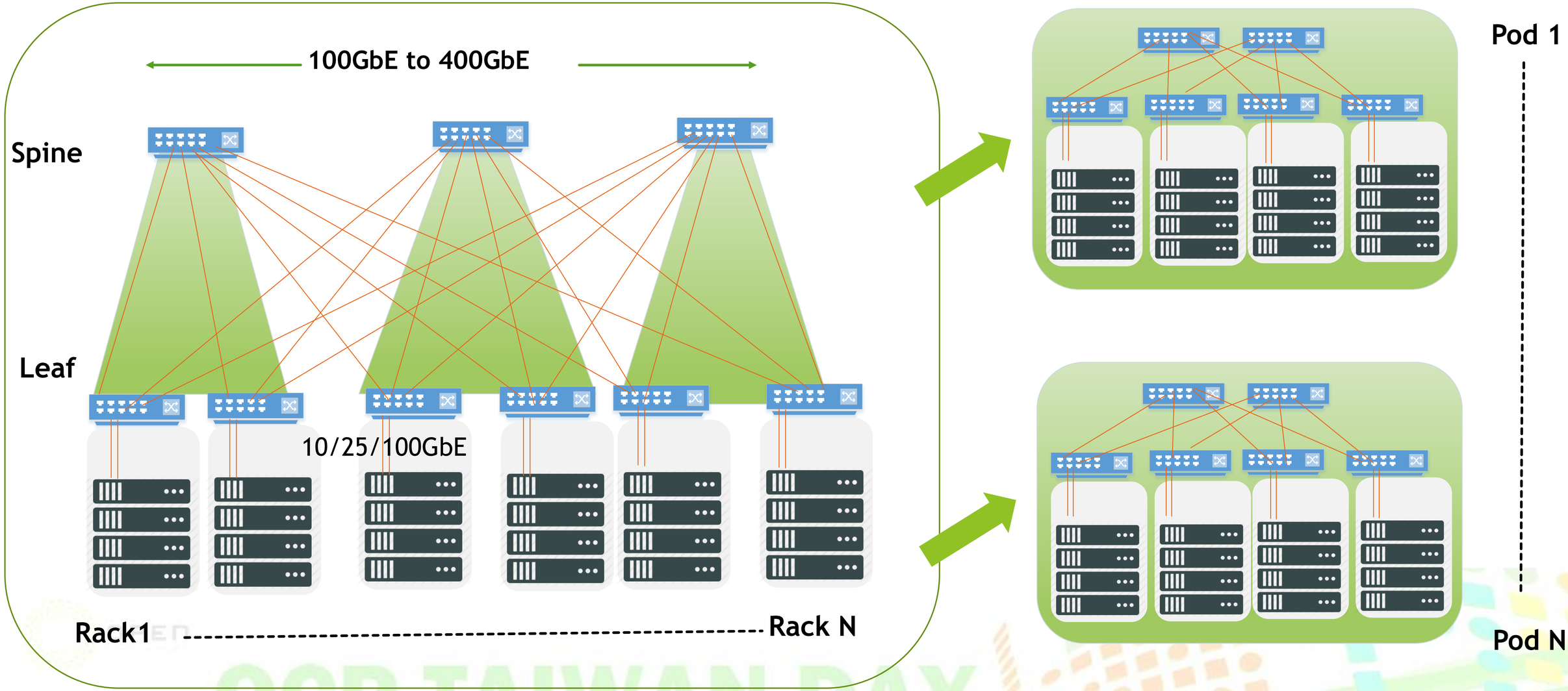
Data Center PoD Network Architecture



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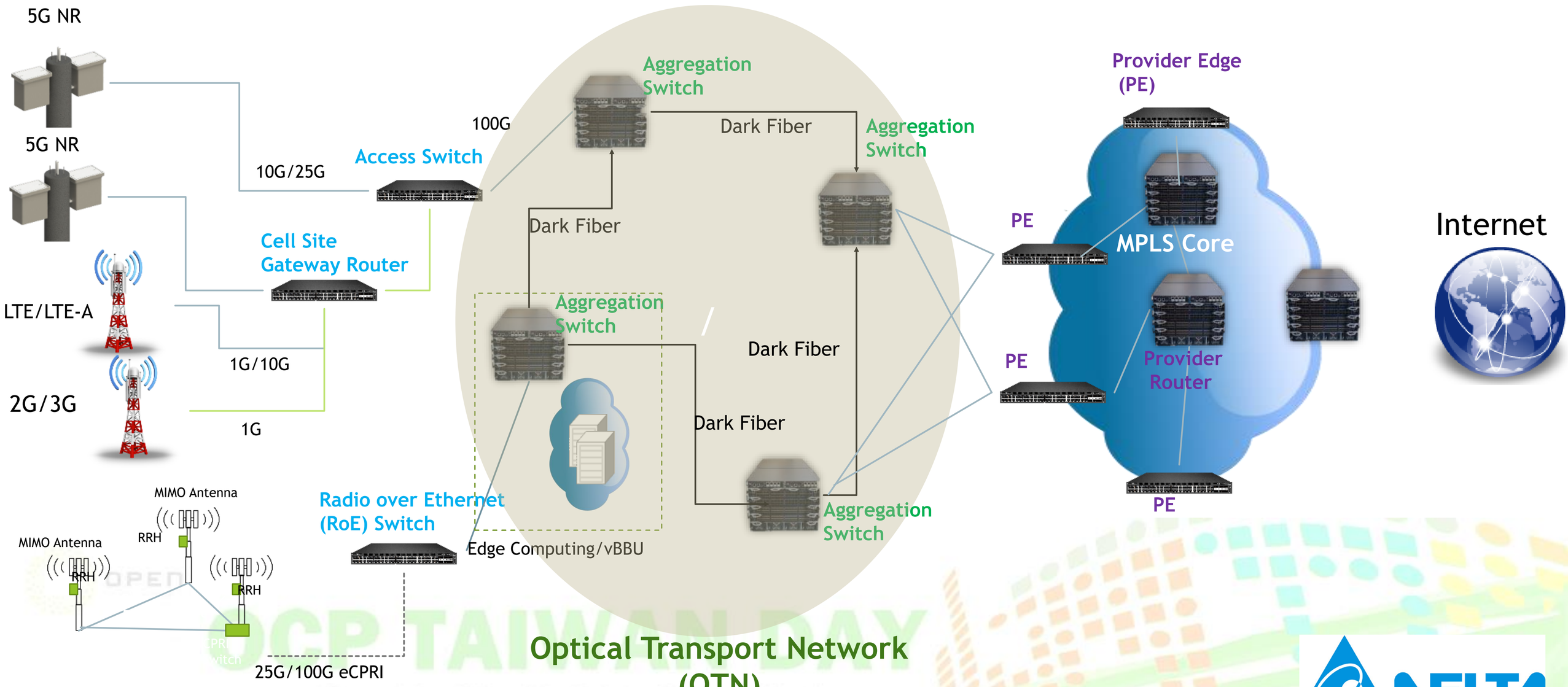
Telecom Carrier Network Architecture



Optical Transport Network
(OTN)

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Delta Hardware Advantage

Scalability

Based on open networking standard, Delta team utilize our extensive experiences in architecture, thermal and mechanical

Modular design to meet different port configuration requirement

Utilize Line-Card Design to scale up for high switching capability

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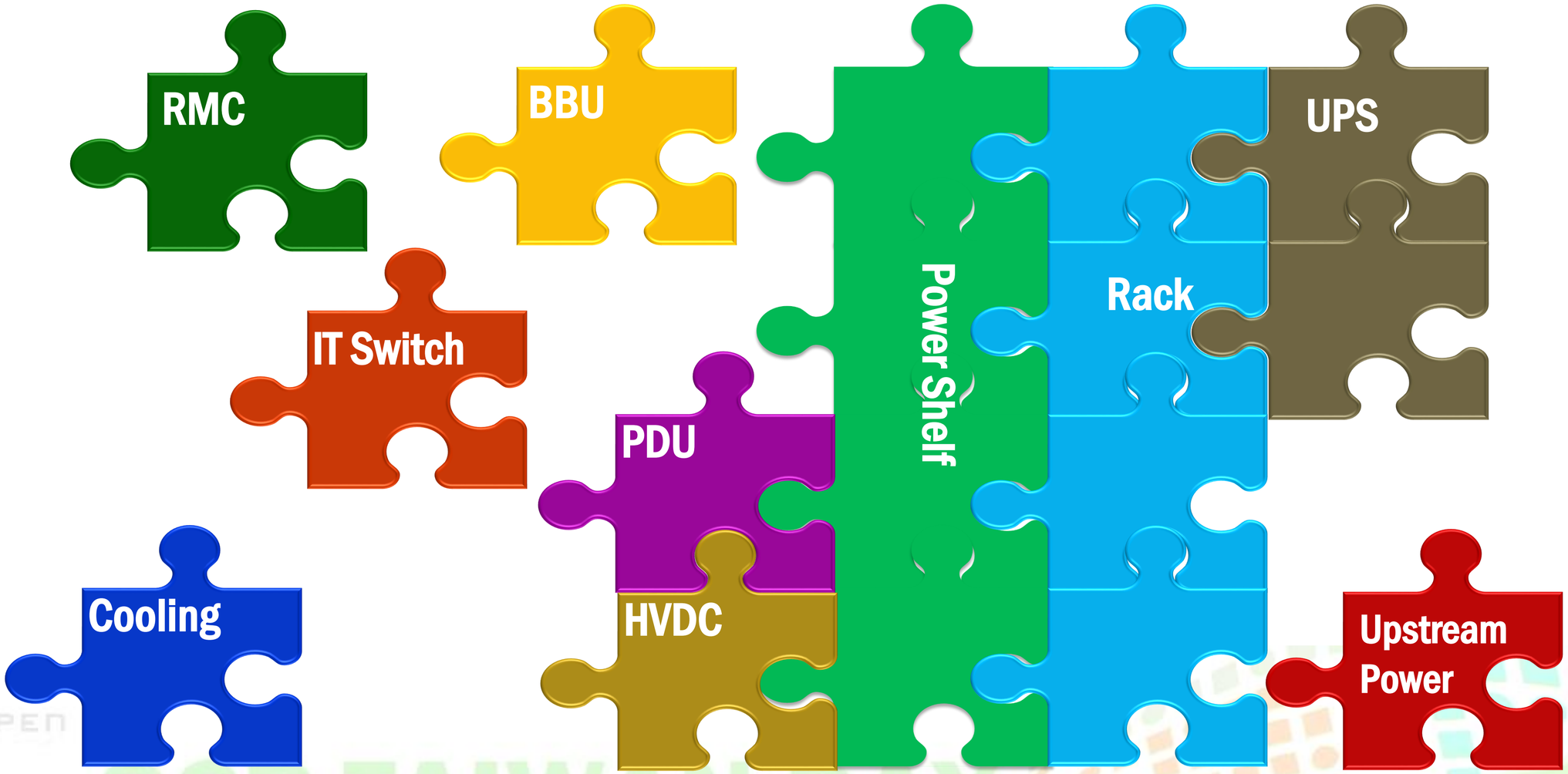
OCP Contributions

Model	Family	Project	Accept Year	Configuration
AGC5648S	Network Switch	Networking	2018	48*25GbE + 6*100GbE Deep Buffered Switch
AGC7648A	Network Switch	Networking	2018	48*10GbE + 6*100GbE Deep Buffered Switch
AGC9032v1	Network Switch	Networking	2018	32*100GbE Spin Switch
AGC7648C	Network Switch	Networking	2018	48*10GbE+ 6*40GbE Leaf Switch
AG5648v1	Network Switch	Networking	2018	48*25GbE + 6*100GbE Leaf/ToR Switch
AG6248C-PoE	Network Switch	Networking	2018	48*1GbE + 2*10GbE PoE Switch

https://www.opencompute.org/contributions?refinementList%5Bcontributor%5D%5B0%5D=Delta%20Electronics&page=1&configure%5BfacetFilters%5D%5B0%5D=archived%3Afalse

Delta OCP Platform Development



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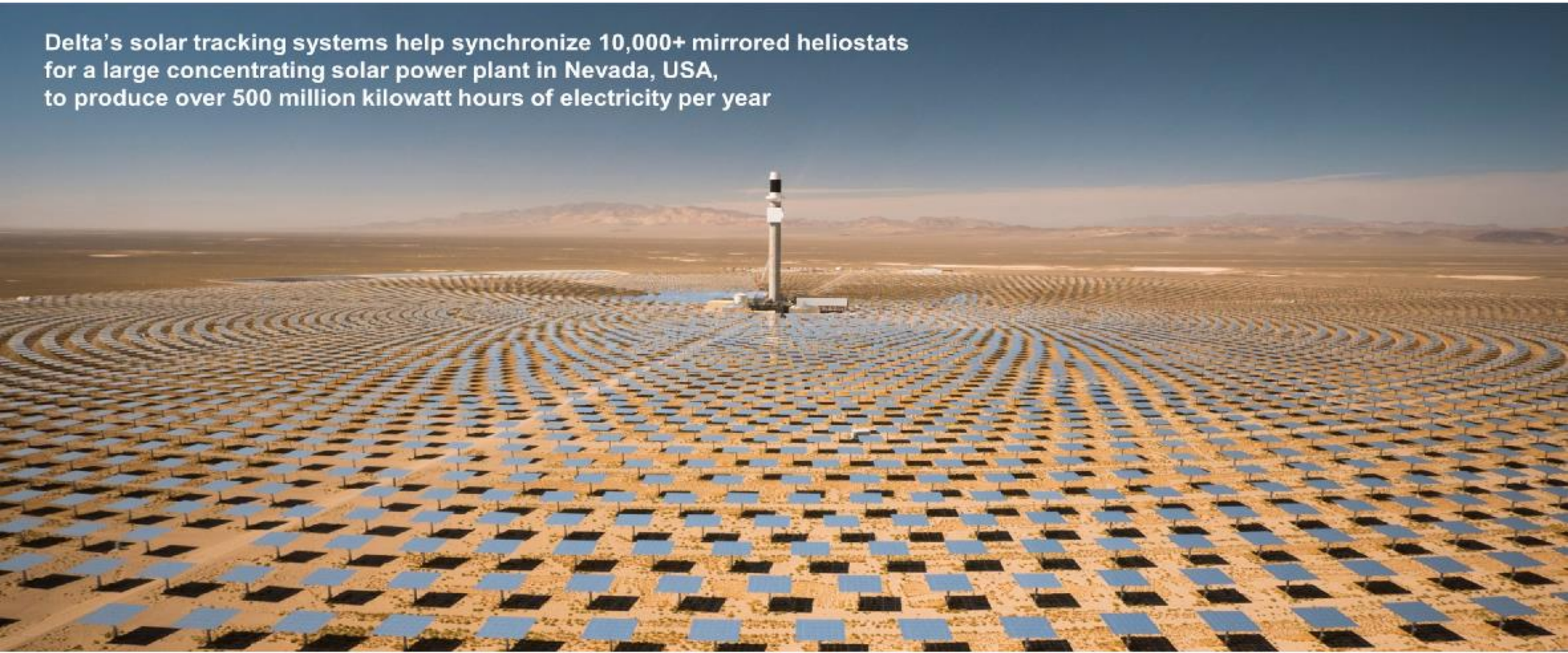
Delta Corporate Mission

To provide innovative, clean and energy-efficient solutions for a better tomorrow



Energy Saving for customers

From 2010 to 2017
Delta's high efficiency products and solutions helped customers

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Smarter, Greener, Together

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