

An aerial view of the New York City skyline at sunset. The sky is filled with orange and blue clouds. The Empire State Building is prominent in the center. A semi-transparent grey box is overlaid on the top half of the image, containing the text "Keeping You Connected and Safe ... in a Rapidly Changing World ...".

Keeping You Connected and Safe ...  
in a Rapidly Changing World ...

A blue square logo with the word "SOLiD" in white, bold, sans-serif font. The letters are spaced out, with the 'i' in 'LiD' being lowercase and smaller than the other letters.

**S O L i D**



# Company overview

Established in 1998, IPO in 2005  
(KOSDAQ)

2016 Revenue \$145M  
(21.9% CAGR over 6 yrs.)

Robust R&D based RAN & WDM  
Solution Development

Expansive Global Deployments

***Korean Engineering &  
Manufacturing !***

***Customers in 20+  
countries, 9 local offices  
worldwide***

***Over 673K units  
Commercially Deployed***



# Business portfolio

- Analog/Digital DAS
- RF/ICS Repeater

- WDM
- Fronthaul / Backhaul Solutions

- Energy-Saving Cooling System
- Government Projects

**WIRELESS  
COVERAGE SOLUTIONS**

**WIRESLINE  
WDM SOLUTIONS**

**R&D Innovation  
Development**



## Products & Solution

### SUBSIDIARIES

#### KRF

- RF Power Amplifiers

#### SOLiD Networks

- Engineering Services

#### SOLiD WINTeCH

- Government projects

#### SOLiD Edu

- Digital Pen solutions

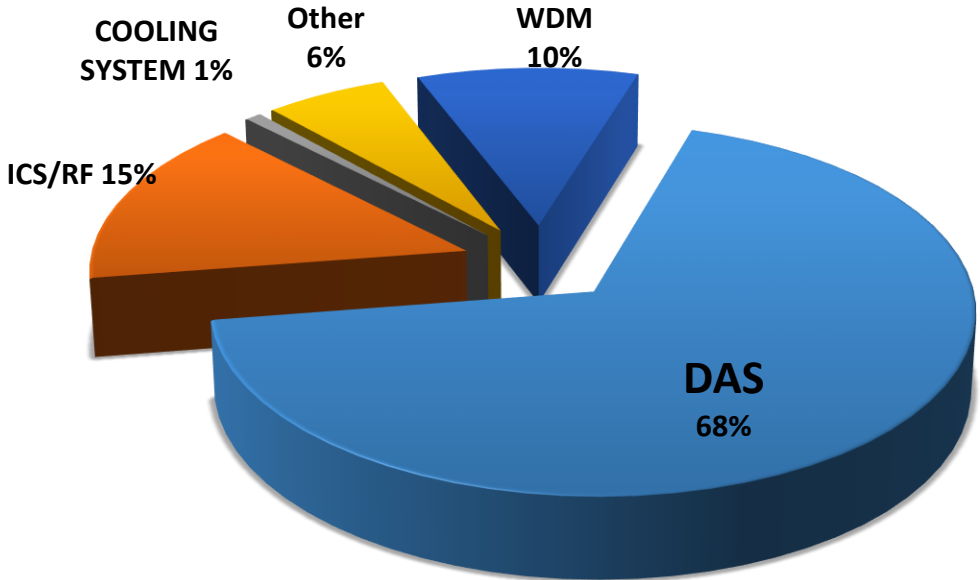
#### SOLiD Systems, SOLiD Link

- WDM-based optical equipment

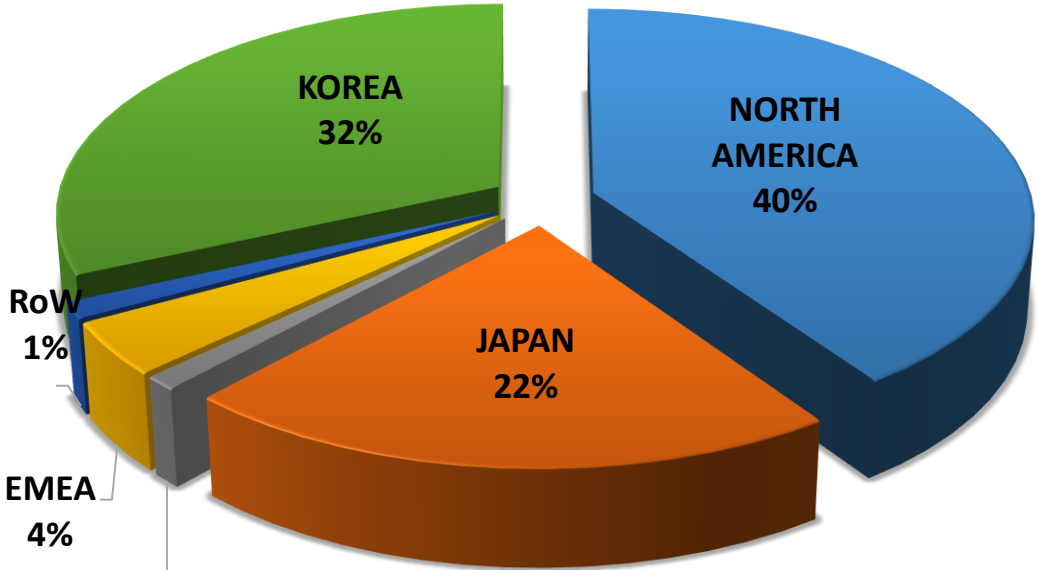
#### PANTECH

- Mobile Handset
- Cellular IOT module & devices

# Revenue break-down (FY 2016)



**PRODUCTS**



**REGIONS**

# Global presence

## OPERATIONS IN 9 COUNTRIES





# Major customers

## DAS & Repeater Customers: Carriers



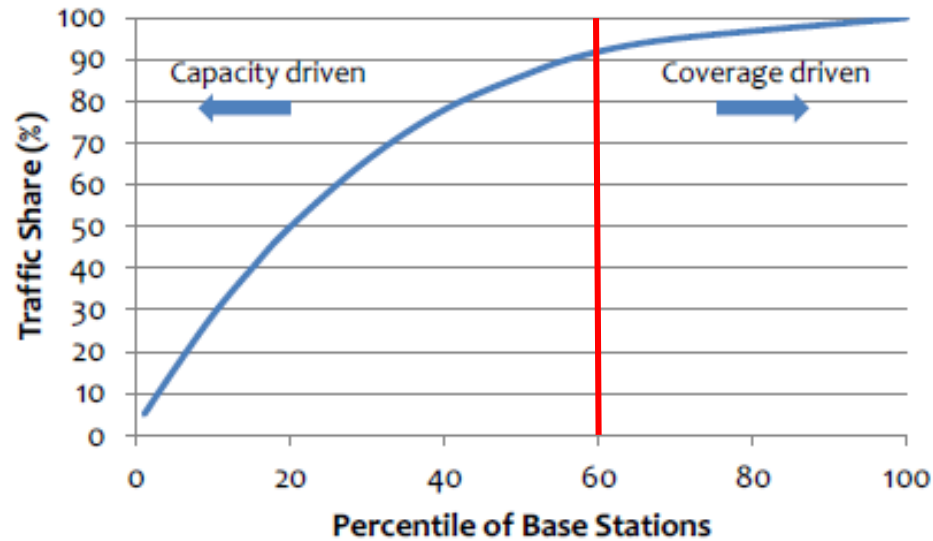
## WDM Customers



## DAS & Repeater Customers: Tower companies, Neutral hosts, Enterprises and Integrators



# Coverage is the key



[Cumulative distribution function (CDF) for the distribution of wireless traffic, "Discovery of Cloud-RAN," Nokia Siemens Networks]

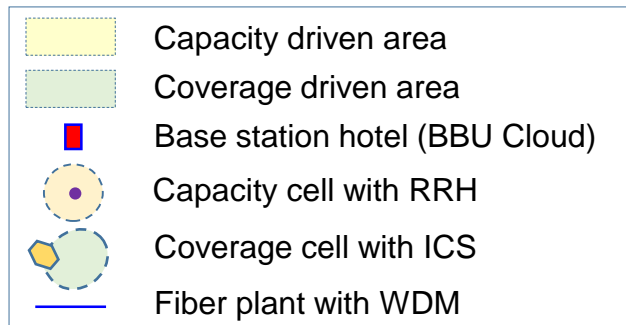
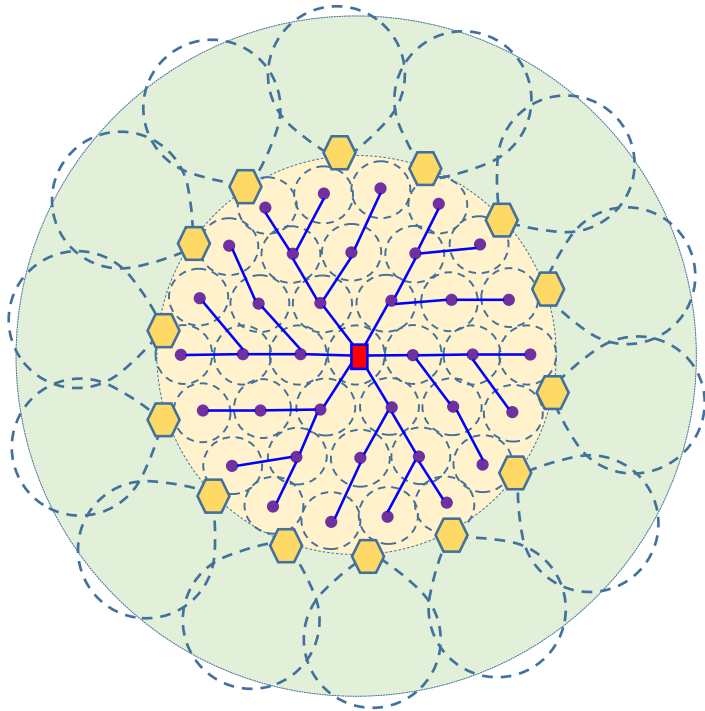
## Capacity driven area

- Carries the majority of network traffic: 60% of base stations for 90% traffic
- The more coverage, the better ROI
- 80~85% of traffic is originated from in-building; but only 2% is properly covered
- Key element is **in-building solution**

## Coverage driven area

- 40% of base station for 10% traffic
- What is more efficient way of deployment?
- **Repeater from cell edge** can be the answer
- **Scalable MFH/MBH** is also a key element here in case of traffic increase by urbanization

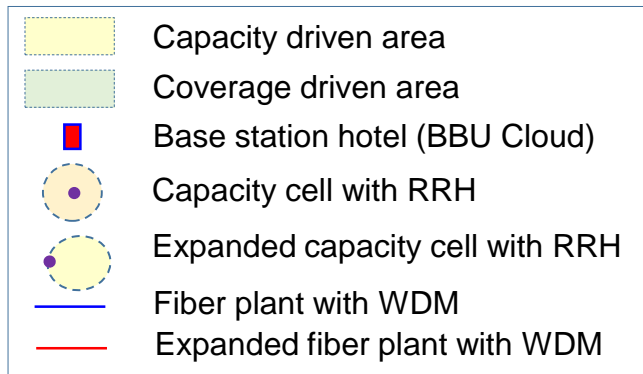
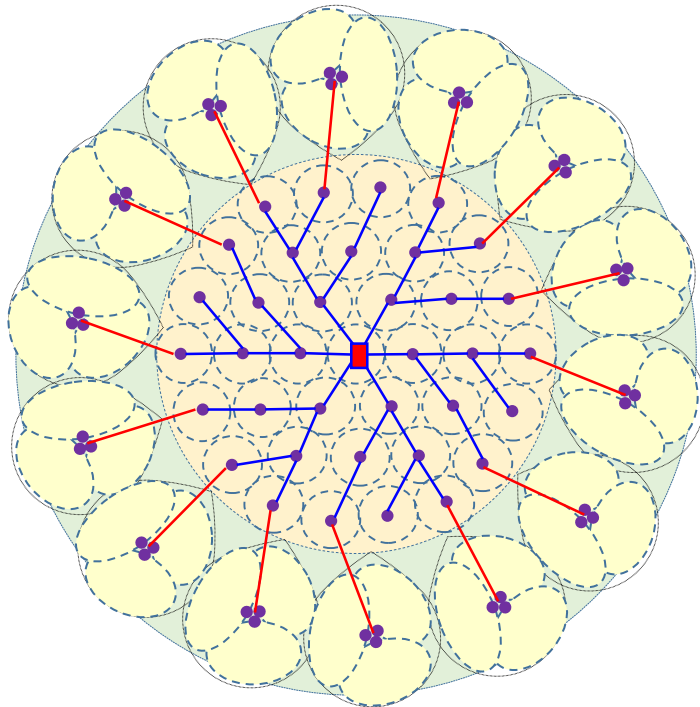
# Network deployment scenario



- C-RAN architecture for capacity driven area
  - Future proven technology towards virtualization and SDN/NFV
  - Benefits of enhanced radio performance in LTE-A/5G: CoMP, eICIC, etc.
  - CAPEX/OPEX savings
- ICS repeaters for coverage driven area
  - Expanding service with ICS repeaters at the edge of the capacity driven area
  - CAPEX/OPEX compared to base station case
- WDM based scalable MFH/MBH
  - Investment protection for the future capacity expansion
  - Path to RAN evolution to 4G, 5G and beyond



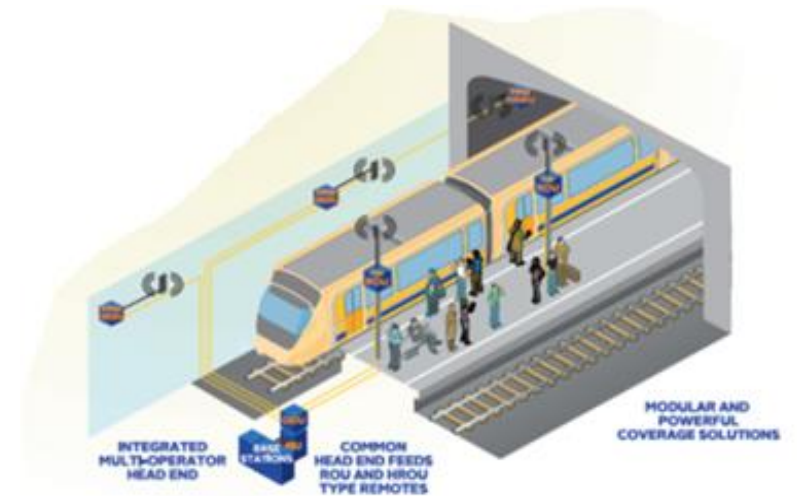
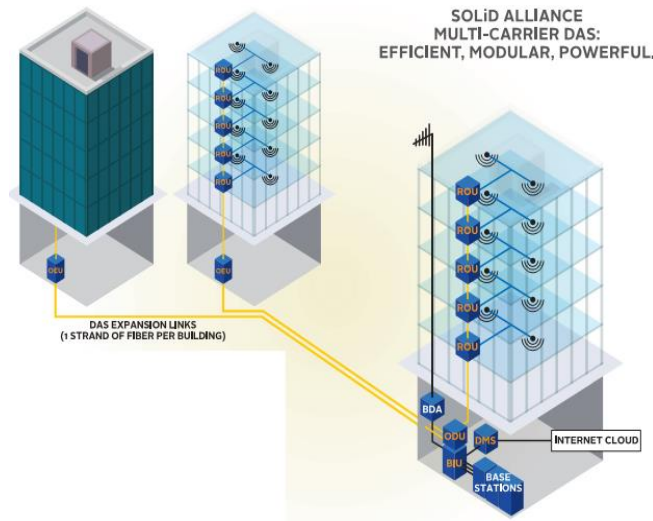
# Network expansion



- Growing capacity demands in underserved market
  - Replace coverage with capacity
  - Benefits of centralization and virtualization is still valid
- Incremental fiber network investment
  - Leverage the existing fiber infrastructure
  - Just add new wavelengths and extend MFH/MBH connection from the closest point
  - Minimize fiber deployment to cover newly added capacity cells
- ICS repeaters can be relocated in other underserved markets/coverage-driven areas

# Coverage solution: DAS

- DAS for mid-to-large indoor and outdoor: Commercial/Residential Buildings, Stadiums, Subways/Trains, Airports, Hospitals and Campuses
- SOLiD is No.1 in Korea and No.3 in US market \* in terms of no. of DAS nodes deployed
- References include world famous land marks and major stadiums/subways in 5 continents
- Enablers to lower TCO model: Multi-operators/technologies/bands support with high reliability and low power consumption



# Coverage solution: ICS

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- ICS for suburban/rural, island, cruise ship and small venue in-building
  - Cost benefits over base stations: No need for backhaul, less operation space and easier installation, commissioning & maintenance
- Solution for a) alternative to fixed broadband and b) customer complaint
  - Overall deployment time is shorter than base station and other RF repeaters
- 3G and 4G ready; Single-band and multi-band ready
- Solar-cell power option enhances benefits



**Rural Area**



**Mountain Area**



**High Way**



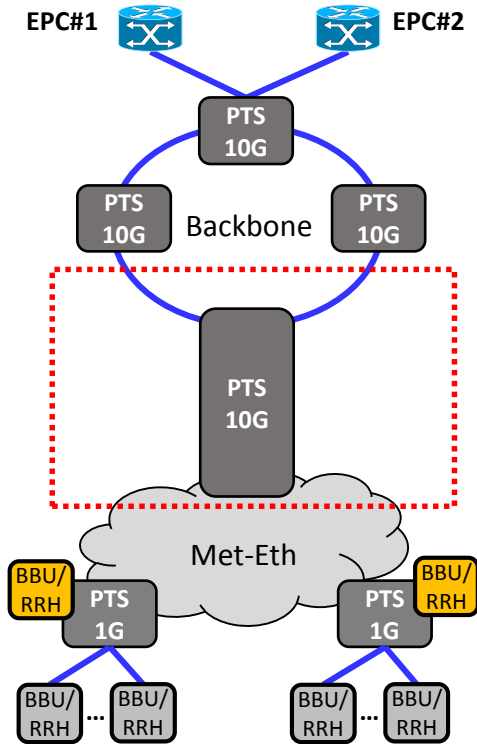
**Island**



# RAN Implementation Strategy

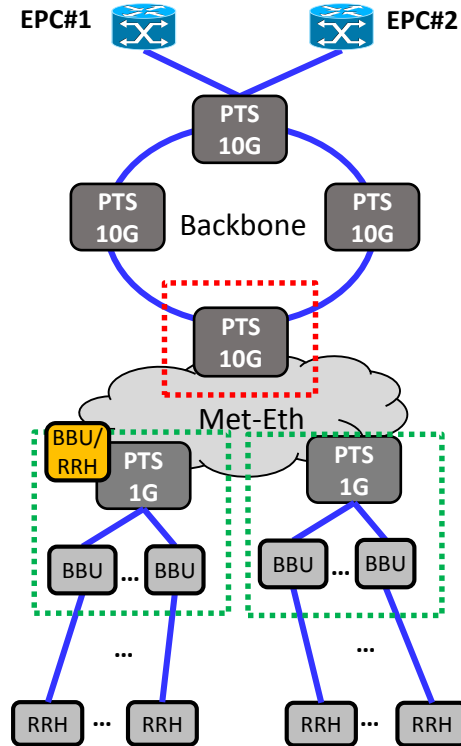
BBU/RRH Macro cell   
 BBU/RRH Micro cell

## Co-located BBU-RRH



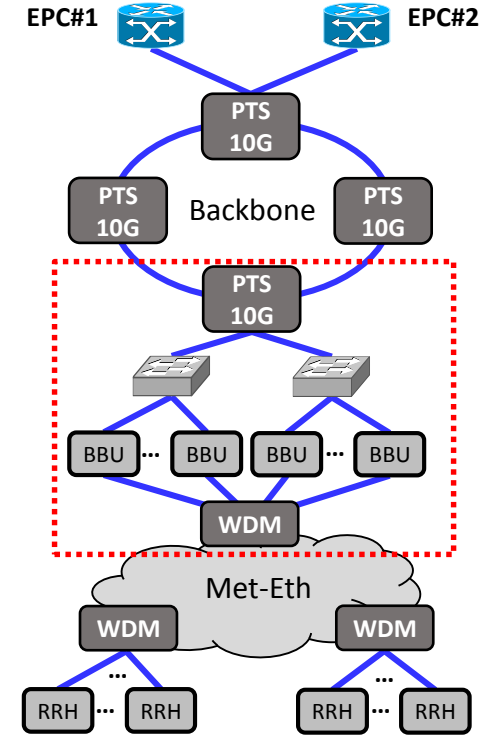
- BBU-RRH co-location
- Met-Eth as backhaul
- Limited scalability: Backhaul bandwidth dependency

## Centralized RAN: P2P



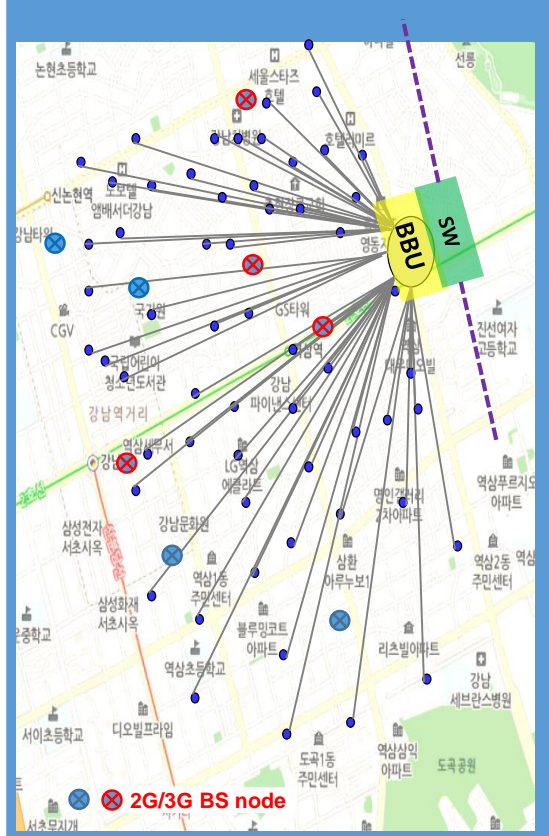
- BBU concentration
- PtP fronthaul
- Huge investment for the fiber plant
- **More BBU concentration**

## Centralized RAN: WDM

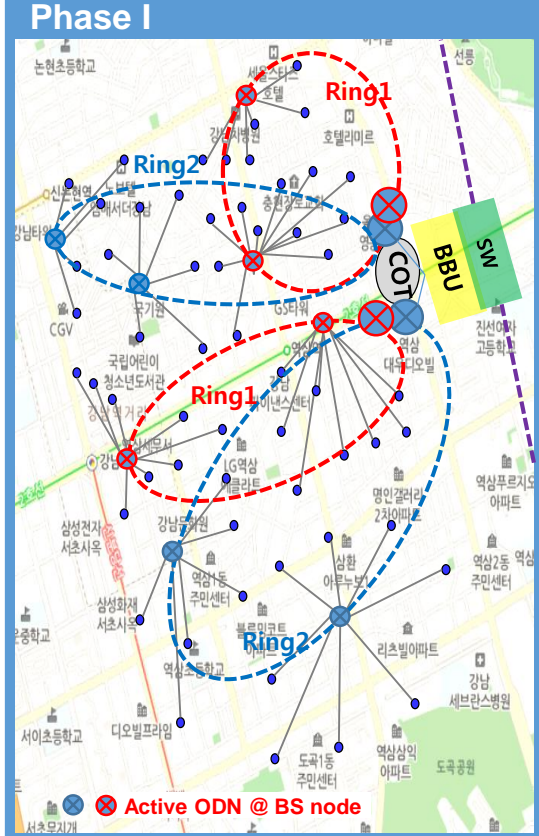


- BBU concentration
- WDM fronthaul
- Leverage Met-Eth as a part of fronthaul

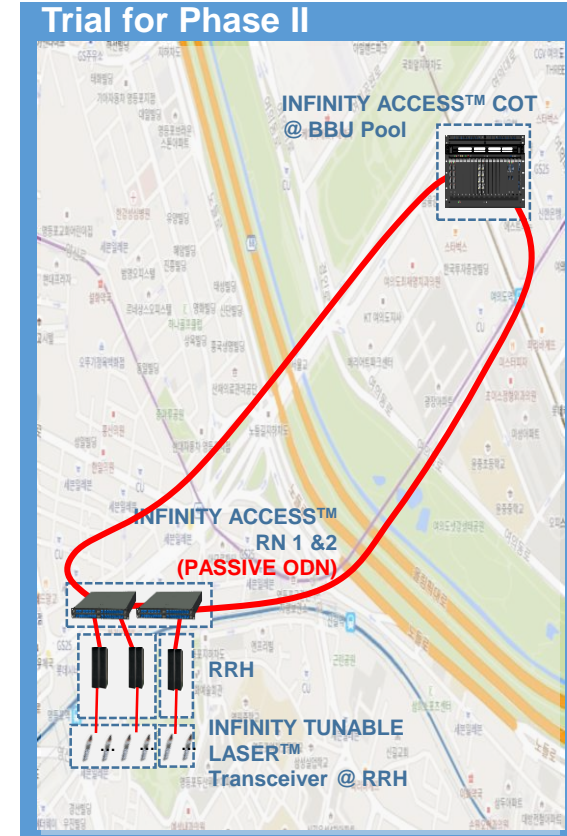
# Optical solution: network evolution enabler



- Centralization with P2P fronthaul
- Requires huge amount of fibers
- Not scalable; big OPEX by P2P fiber lease and/or management
- Not actually deployed



- Centralization with WDM fronthaul
- Actual deployment: 26% CAPEX and 50% OPEX saving over years
- Very scalable; main driver for the nation-wide build out in two years
- Also big contributor to the world's first multi-band carrier aggregation service launch



- Further migration towards 5G ready network
- Accommodate more fiber connections
- Save more OPEX by deploying full passive ODN
- Field trial is underway; mass from Q2, 2017

# THANK YOU!



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