Distributed Antenna System - defined

- DAS Forum definition: A network of **spatially separated antenna nodes** connected to a common source via transport medium that provides wireless service within a geographic area or structure.

![Diagram](image-url)
History of DAS

- Fiber was used to carry RF signals to discrete modules in the early Phased Array Radar systems designed in the 1970s.
- DAS networks became commercially viable in the late 1980s with the advent of optical fiber as a transport medium.
- First commercial analog fiber DAS network in 1989.
- Today, DAS networks are deployed indoors and outdoors across the country.
Benefits of DAS

- **Coverage**: DAS provides coverage in areas underserved by traditional sites.

- **Capacity**: DAS can closely align capacity to actual market requirements, managing available radio resources.

- **Spectrum**: DAS uses available frequency spectrum efficiently through multiple low-power transmission points.

- **Interference**: DAS reduces interference through low radiation centers and lower output power.

- **Data**: DAS provides better data throughput given signal strength and proximity of transmission points to user equipment.

- **Scalability**: DAS is a scalable network that can meet future capacity requirements, or additional carriers, by adding additional nodes.

- **Adaptability**: DAS can respond to market dynamics, equipment architecture changes and new technologies.
Comparing DAS to a macro site

EXISTING NETWORKS

This Wireless Service Provider portion of the infrastructure remains the same

Public Switched Telephone Network

Carrier Switches

Macro-Site System

ADD-ON NETWORK (for capacity and coverage requirements)

Base Station Hotel

Distributed Antenna System

Photos: Hood River Valley Residents Committee, OSP Magazine
Drivers for DAS

20% Users
20% Coverage

80% Users
80% Coverage
Outdoor DAS – Coverage and Capacity

- Networks support current generation technologies
  - New services, frequencies can create coverage gaps
- DAS fills in interstitial gaps
  - Smaller cells support increased capacity
Drivers for DAS

*Rapid changes in the wireless world…*

- Wireless penetration in US approaching 100%¹
- Wireless only households approaching 30%¹

- Connected devices make up majority of growth in US²
  - Tablets, e-readers, M2M, etc
  - Predicted to be >10% of market by year end

- Average consumer spends 50-60% of time in an indoor environment³
- 80% of all worldwide data connections initiate inside a building⁴

- Estimates for global usage include:
  - 200,000 text messages sent every second
  - 35 hours of YouTube video uploaded every minute
  - Average 21-year old has spent 10,000 hours on a mobile phone

¹ www.ctia.org; ² Chetan Sharma Consulting; ³ www.wirelessweek.com; ⁴ AT&T, 2011
Drivers for DAS

80% Users
20% Coverage

20% Users
80% Coverage
DAS Drivers

Data’s impact on the network

Smaller cells provide the keys to providing reliable high speed data delivery:
1. Get the user closer to the source
2. Limit the number of users in the cell

Source: Cisco Visual Networking Index
DAS Value Proposition

• Benefits to the end-user
  – Better voice quality with fewer dropped calls
  – Faster Internet access
  – Longer battery life
  – Seamless handoffs with the macro network
  – No dead zones

• Benefits to the venue owner
  – Reduced customer complaints about wireless service
  – Competitive advantage for obtaining/retaining customers

• Benefits to the wireless carriers
  – Increased customer satisfaction and lower associated churn
  – Dedicated coverage and capacity for facility
  – Multi-carrier, multi-band, multi-technology solution
  – Offload traffic from the macro
  – Solves the “tall building” problem in dense urban environments
Summary

• Changing device usage patterns require carriers to deploy new coverage and capacity strategies
• Wireless, new connected devices, and DAS are powerful tools for helping communities bridge the “digital divide”
• DAS is a proven tool gaining new importance
• DAS provides benefits which match up well with end-user, venue, and carrier needs