Economics of FTTH

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Discovering Beyond Imagination

Agenda

- Worldwide FTTH activity
- Economic Model
 - First Installed Costs
 - Financial Model
- Business Case Example
 - Net Income
 - Operational Expense (OPEX)
- Sensitivity Analysis
 - Initial Penetration Rate
 - Homes Passed
 - Percent Aerial Cable Installed
- Conclusions & Summary

Global Broadband Leaders



Americas

USA is the regional leader

Europe/Middle East/Africa

Sweden is the regional leader



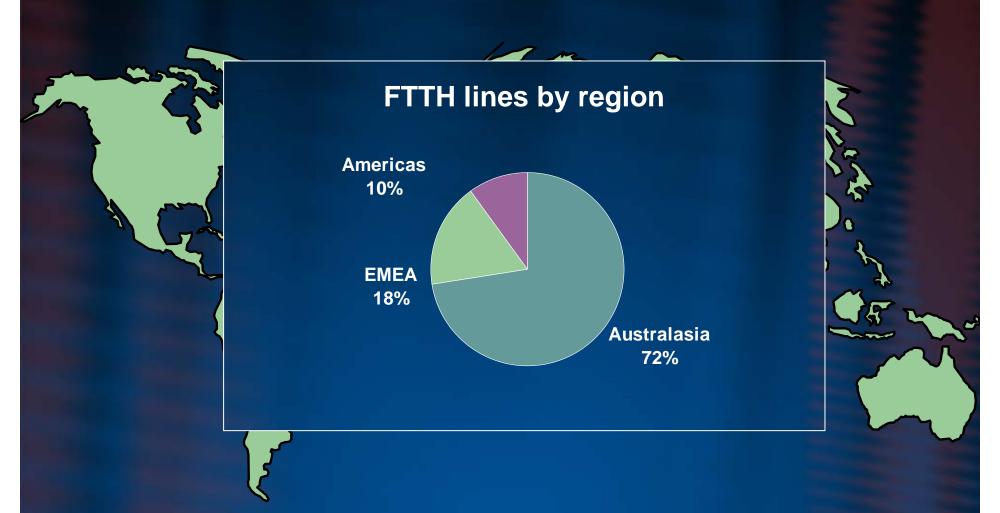
Japan is the world's leader in FTTH

China and Korea lead the world in # of DSL subs and BB penetration respectively

Source: RHK, Corning, Point Topic Q2 2004

2004 Fiber-to-the-Home Conference & Expo-FTTH 101 Track - Economics of FTTH



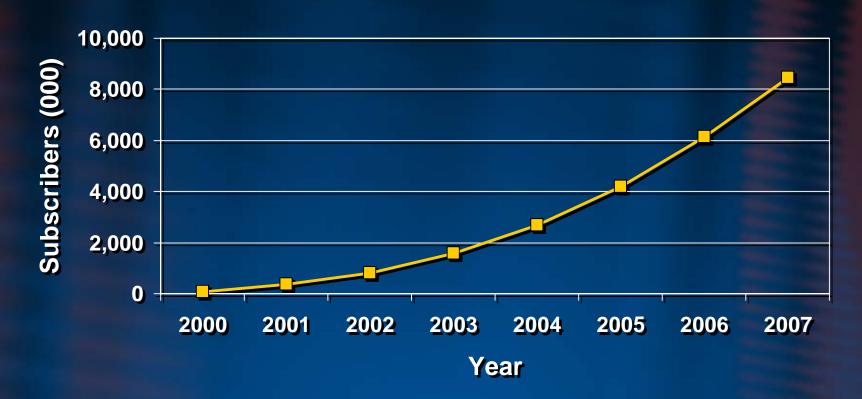


Source: RHK, Corning, Point Topic Q2 2004

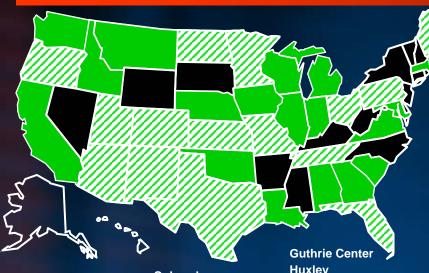
2004 Fiber-to-the-Home Conference & Expo- FTTH 101 Track - Economics of FTTH

Worldwide FTTH Opportunity Subscribers expected to grow at 220% CAGR

Fiber to the Home Broadband Subscribers



FTTH overview List of Lit 'US Optical Fiber Communities'*



Alabama Sylacauga **Union Springs** Arizona *La Bernie California **Amerige Heights** Canvon Hills Kenwood **Lincoln Crossing** Palo Alto Parc Metropolitan Poppy Meadows **Mission Bay** Roseville Sacramento

Talavera

Colorado **Buckhorn Valley Chatfield Corner** Colorado City Eagle Ranch Rve *Two Rivers Village **Florida** *John's Creek Magnolia Lake *Palencia *Stone Hurst *Tesoro **Tradition** Georgia Dunwoodv Dalton lowa Cambridge

Huxley Slater Idaho **Bear Creek** Illinois **Paxton** Salem Indiana **Bay Creek Gateway Crossing Rochester** Kansas **Almena Hill City** *Kiowa luka Norton

Osborne **New Mexico** Quinter *Brettana *San Vincinte Sharon **North Dakota** Turon *Jamestown Wakeeney Ohio Wamego *St Marvs Louisiana Oklahoma Squire Creek Homes Hinton Maine Oregon *Auburn *Scio *Lewiston Woodburn Norway Penn Massachusetts Pin₁ Tau Mic Daniel I Cob **Minnesota** exas Avery Ranch

..oliway
Morris
Town Lakes
Victor Garden
Missouri
*Macon
Montana
Baxter Meadows
Ironwood
Nebraska

Greenfield Addition

Canyon Gate Brazos
*Cooperstone
Crystal Falls
*Fountain Hills
Grand Lake Estates
Hometown
Lake Ridge South
Lakes on Eldridge
*Lakewood Estates
Laredo
*Monterey

Nothpointe
*Oak Trail
*Preston Manner
Rock Creek
Stone Gate
*Suncrest
*The Falls
*Tivoli Estates
Victory Lakes
*Willow Creek
**Willow Creek
**Willow Creek
**Willow Creek
**Travis Mountain

*Mountain Valley Lakes

Virginia Braemar Brambleton **Bristol** Independence Lansdowne Southern Walk Washington **Chelan County Clallam County Douglas County Grant County Issaquah Highlands Mason County** Wisconsin Berkseth **Prairie View** Reedsburg

New in 2004



Pre-2004



No deployments

* New to the list

Source: Render, Vanderslice & Associates

Mount Valley Heights

Why are communities going with FTTH?



Broadband Economic Model Conceptual structure





Financial Model



Broadband Economic Model

Architecture

Technology

- GPON
- APON
- Cable modem
- EPON
- VDSL
- Active node

Construction

Services

Carrier assumptions

Take rates

Services

Op Ex

Deployment assumptions

Build type

Density

Profit and loss

Depreciation

Financing

Debt schedule

Op Ex

Cap Ex

Revenue

Pay-back period

Cash flow positive

Profitability

Net present value

IRR

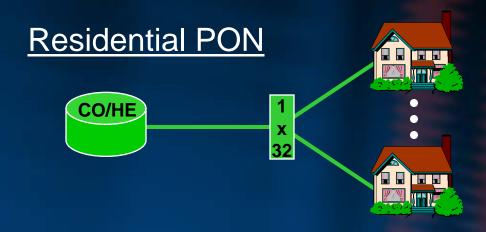
Detailed Business Case Analysis

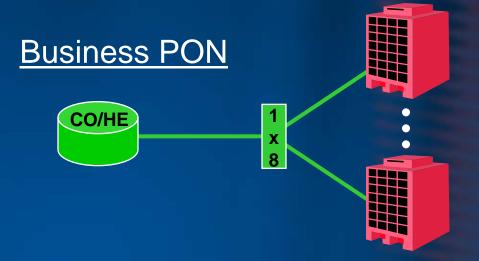
FTTH Cost Analysis What to expect...

- What this is not...
 - A discussion of individual equipment costs
 - A comparison of active and passive fiber architectures
 - An analysis of the sub-components of FTTH electronics
- What this is...
 - An analysis of generic FTTH networks based on several different modeling techniques
 - An understanding of how some levers impact cost
 - An exploration of life-cycle costs

FTTH Cost Analysis Background and model network architecture

- Based on prominent FTTH vendor solutions and network adjunct equipment
 - Specifications
 - Pricing
- Only assumptions are the configuration of the subscriber base





FTTH Business Case Analysis Inputs to establish the base case

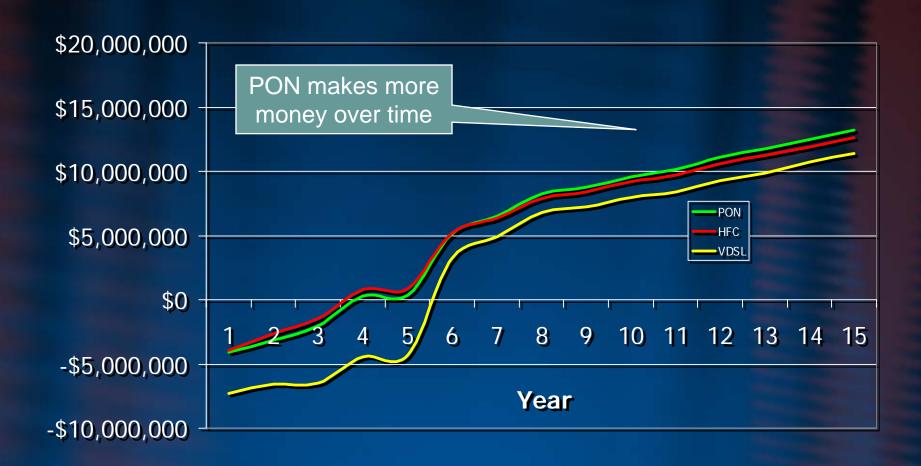
- 28,555 residential subscribers
- 2,358 business subscribers
- 25% reserve fiber
- 65% aerial cable
- 36.12 square miles
- Overbuild

Network Input Variables	
Residential Variables	
Penetration Rate	35%
Single Family Dwelling Units Total	28,555
1 Unit Detached	26,531
1 Unit Attached	1,198
Mobile Homes	826
Low Density MDUs Total Units	
2 Units	351
3 to 4 Units	1,228
Medium Density MDUs Total Units	
5 to 9 Units	1,108
10 to 19 Units	980
High Density MDUs	
20 or more Units	3619
Design Bandwidth (Mbps) per Apartment in High Density MDUs	5
High Density MDU Penetration Rate	100%
Business Variables	
Business Penetration Rate	35%
Business Units Potential	2,358
Business Units by Penetration Rate	825

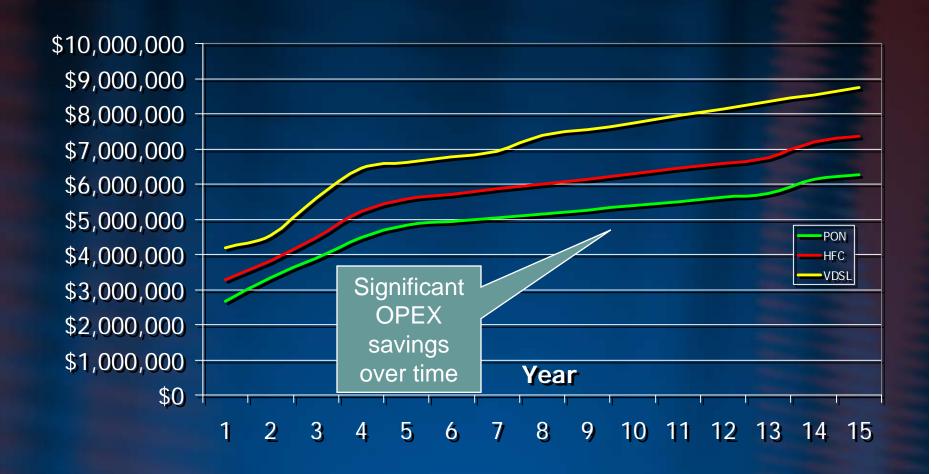
FTTH Business Case Analysis Comparison to other technologies

- Three architectures studied
 - PON architecture
 - HFC architecture
 - VDSL architecture
- Results analyzed
 - Net Income
 - Operational Expenses

Architecture Comparison on Net Income PON, HFC, VDSL



Architecture Comparison on OPEX PON, HFC, VDSL



OPEX Savings with FTTH is Significant

- HFC OPEX (>1.15X) and VDSL OPEX (>1.4X) are larger than PON OPEX
- Drivers
 - Employees required to maintain PON is less than HFC (1.38X) and VDSL (1.54X)
 - Less salary and expenses
 - Less office related expenditures
 - Cost of repair is larger for VDSL and HFC (~1.55X) than for PON
 - More truck rolls
 - More tools & vehicles
 - Power consumption of the PON is 20X smaller than HFC or VDSL

Other Factors Driving FTTH

- Competition is driving carriers to become triple play providers
- Loss of access lines by RBOCs creating need for new revenue streams
- Operational expenses for legacy networks are in desperate need of improvement
- Regulations have lowered the risk of investment to RBOCs
- Municipalities business case is viable due to long payback periods
- FTTH electronic costs have been in steep decline
- Other economical considerations
 - new fiber types and pre-connectorized drop cables allow optimal network design and add flexibility

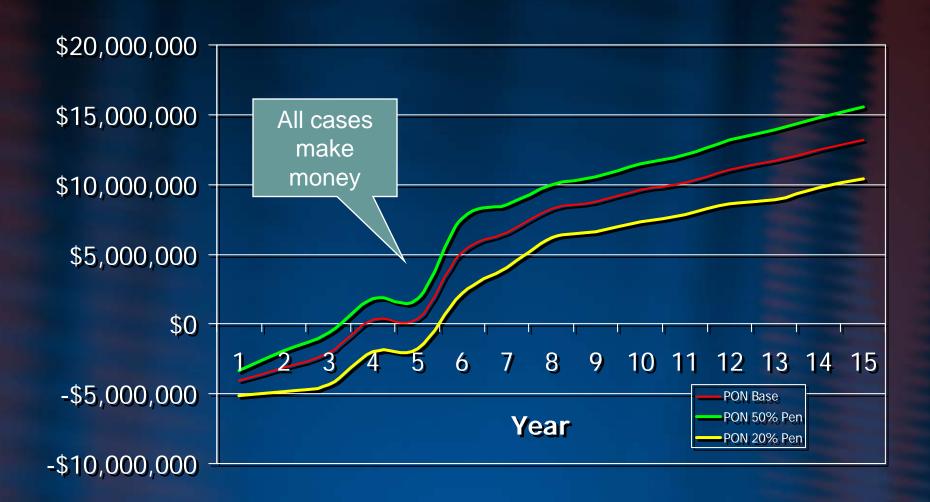
The Conclusion?

There is an economical business case for FTTH!!!

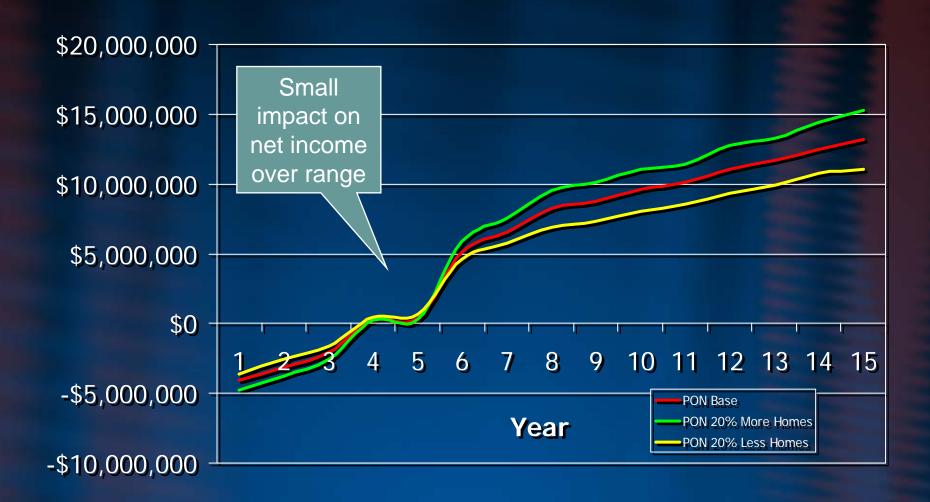
FTTH Business Case Analysis

- Input Variable Studied
 - Initial Penetration Rate
 - Homes Passed
 - % Aerial cable installed
- Output Variable Studied
 - Net Income

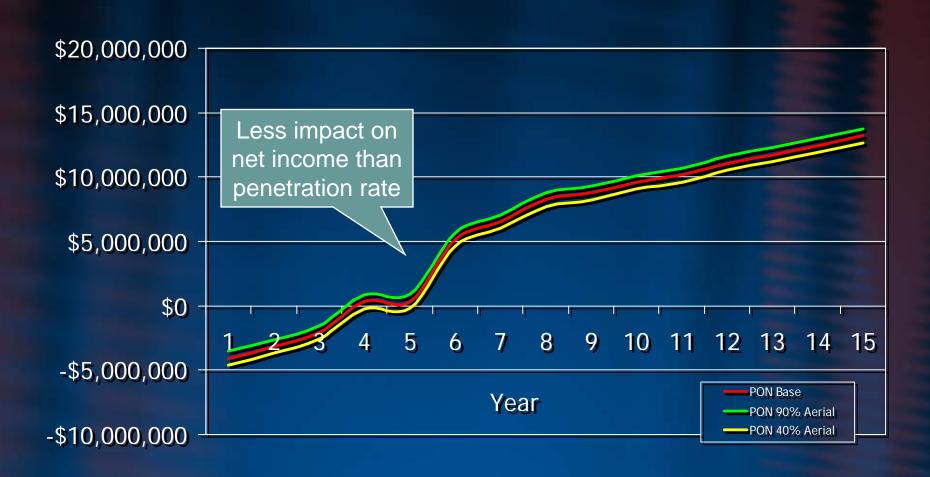
Effect of Initial Penetration Rate on Net Income PON Network



Effect of Homes Passed on Net Income PON Network



Effect of % Aerial on Net Income PON Network



FTTH Cost Analysis Conclusions and other observations

Basic financial cost levers

- Initial penetration rate has a moderate impact on net income but a wide range of rates make money over time
- Homes passed in a fixed area has a small to moderate impact on net income over time
- % Aerial of the network has a small impact on net income over time

Other observations of cost levers

 Percentage of aerial installation versus buried installation has a significant impact on initial cost per subscriber

Questions?

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